

INTEREST RATE TRANSMISSION IN INDIA: AN EMPIRICAL STUDY USING ARDL AND ECM MODELS

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1. INTRODUCTION

Monetary policy transmission through the interest rate channel plays an important role in achieving macroeconomic stability by influencing inflation, investment, and overall economic activity. In India, the effectiveness of monetary policy transmission has often been constrained by structural rigidities, administered interest rates, and inefficiencies in the banking sector. To improve the responsiveness of bank lending rates to policy changes, the Reserve Bank of India introduced several reforms, including the Benchmark Prime Lending Rate (BPLR), Base Rate, Marginal Cost of Funds Based Lending Rate (MCLR), and finally the External Benchmark Lending Rate (EBLR) system in 2019. The EBLR framework linked lending rates directly to external benchmarks such as the repo rate to strengthen and accelerate monetary policy transmission.

Against this background, the study examines the effectiveness of interest rate pass-through in India, particularly under the EBLR regime. The study employs the ARDL–ECM framework, which is suitable for analysing both short-run and long-run relationships among variables with mixed orders of integration. Monthly data on the repo rate, Consumer Price Index (CPI), Index of Industrial Production (IIP), and lending rates of different banking groups are used to evaluate the transmission mechanism. The study also incorporates a structural dummy variable to capture the impact of the EBLR regime. By analysing the responsiveness of lending rates to policy rate changes, the study provides insights into the effectiveness of recent monetary policy reforms and their implications for the Indian banking sector and overall economy.

2. LITERATURE REVIEW

The theoretical foundation of monetary policy transmission originates from the work of Ben Bernanke and Mark Gertler (1995), who emphasized the importance of the credit channel in influencing real economic activity through banking systems. Subsequent developments in econometric modeling, particularly the error correction framework introduced by Anindya Banerjee et al. (1998), provided tools to examine long-run equilibrium relationships. The methodological breakthrough by M. Hashem Pesaran, Shin, and Smith (2001) introduced the ARDL bounds testing approach, allowing researchers to analyze relationships among variables with mixed orders of integration. Studies such as Kuttner (2001) further highlighted the sensitivity of interest rates to monetary policy surprises, while Hofmann and Mizen (2004) and Sander and Kleimeier (2004) explored interest rate pass-through in banking systems, emphasizing incomplete and asymmetric transmission. Evidence from emerging and transition economies, including Chmielewski (2004) and Narayan (2005), reinforced the importance of institutional structures in shaping pass-through dynamics. Sorensen and Werner (2006) and Gambacorta (2008) further demonstrated that bank-specific characteristics significantly influence the speed and completeness of transmission.

In the Indian context, early studies such as Bhaumik and Piesse (2008) examined the impact of financial sector reforms on lending rate adjustments, highlighting gradual improvements in transmission efficiency. Aleem (2010) provided evidence on the working of various channels of monetary transmission in India, noting structural rigidities in the banking system. Singh and Sensarma (2011) and Bhattacharya and Sensarma (2011) emphasized the role of financial markets and credit channels, suggesting that monetary policy effects extend beyond traditional interest rate mechanisms. Empirical contributions by Deepak Mohanty (2012) and Mridul Sagar Patra and Kapur (2012) provided institutional insights into the effectiveness of monetary policy frameworks in India, identifying lagged and incomplete pass-through as persistent challenges.

The Reserve Bank of India has played a central role in documenting and reforming the transmission mechanism. Its publications, including the Report on Trend and Progress of Banking in India (2014) and Monetary Policy Report (2015), highlighted structural bottlenecks in interest rate adjustments. Complementary international perspectives, such as the International Monetary Fund (2015), emphasized that emerging market economies often experience weaker transmission due to financial frictions. Micro-level evidence from Das (2015) and Ghosh (2016) confirmed the presence of asymmetric and delayed pass-through in Indian banks, suggesting that institutional reforms were necessary.

In response, the Reserve Bank of India introduced the Marginal Cost of Funds Based Lending Rate (MCLR), evaluated in its 2017 internal study group report, which aimed to improve transparency and responsiveness of lending rates. However, subsequent studies and policy reviews indicated that transmission remained partial. Banerjee and Mehrotra (2018) highlighted the importance of financial market development, while the RBI's 2019 report on external benchmarking introduced the External Benchmark Lending Rate (EBLR) system to strengthen transmission by linking lending rates directly to external policy benchmarks.

Recent empirical work, including Kumar and Rao (2020), examined the effectiveness of the MCLR regime and found improvements, though still incomplete pass-through. Continued monitoring by the Reserve Bank of India through its Monetary Policy Reports (2020, 2022) and Report on Currency and Finance (2021) suggests that transmission has improved under the EBLR framework, particularly in the short run. Broader perspectives from Mishra, Montiel, and Spilimbergo (2021) reaffirm that structural factors and banking sector characteristics remain critical in developing economies. The most recent statistical compilations, such as the RBI's Handbook of Statistics on Indian Economy (2023), provide comprehensive data supporting ongoing empirical investigations into transmission dynamics.

Overall, the literature indicates that while monetary policy transmission in India has historically been weak and delayed, successive reforms—particularly the shift from administered rates to MCLR and further to EBLR—have progressively enhanced the responsiveness of bank lending rates. However, the degree of pass-through remains incomplete, justifying further empirical investigation using advanced econometric techniques such as ARDL and ECM to capture both short-run dynamics and long-run equilibrium relationships.

3. RESEARCH GAP

Despite extensive research on monetary policy transmission in India, limited evidence exists on the effectiveness of the post-EBLR regime introduced in 2019. Most earlier studies focus on pre-EBLR frameworks, use low-frequency data, or ignore structural breaks and regime shifts in transmission. Further, few studies employ the ARDL–ECM framework with dummy interaction terms to examine changes in pass-through after policy reforms. Therefore, this study fills the gap by using monthly data and an ARDL–ECM model with structural dummy interactions to analyse both short-run and long-run monetary policy transmission under the EBLR regime in India.

4. OBJECTIVES OF THE STUDY

4.1 Main Objective

To examine the extent and dynamics of interest rate pass-through in India, and to assess the impact of the External Benchmark Lending Rate (EBLR) regime introduced by the Reserve Bank of India on monetary policy transmission.

4.2 Specific Objectives

1. To analyze the long-run relationship between the policy rate (REPO) and bank lending rates (WALR/PSBs) in India.
2. To examine the short-run dynamics of interest rate pass-through using the ARDL–ECM framework.
3. To measure the degree and speed of adjustment of lending rates in response to changes in the policy rate.
4. To evaluate whether the introduction of the EBLR regime has improved the effectiveness of monetary policy transmission.
5. To assess the impact of macroeconomic variables, such as inflation (CPI) and output (IIP), on lending rate behaviour.
6. To test the existence of cointegration (long-run equilibrium relationship) among the variables using the bounds testing approach.
7. To compare pre-EBLR and post-EBLR pass-through using a dummy and interaction term.
8. To examine whether the pass-through is complete, partial, or asymmetric in the Indian context.

5. RESEARCH METHODOLOGY

5.1 Research Design

The study adopts a quantitative and empirical research design to examine the dynamics of interest rate pass-through in India. It employs time-series econometric techniques to capture both short-run adjustments and long-run relationships among the selected variables. The analysis is based on secondary data obtained from reliable and authoritative sources, primarily the Reserve Bank of India through its Database on Indian Economy (DBIE). Monthly data are utilized for the period from January 2015 to the February, 2026, ensuring a comprehensive assessment of policy transmission over time. The selected timeframe is particularly relevant as it encompasses significant structural changes in India's monetary policy framework, including the introduction of the Marginal Cost of Funds-based Lending

Rate (MCLR) regime and the subsequent transition to the External Benchmark Lending Rate (EBLR) system from October 2019. This period thus allows for a detailed evaluation of interest rate pass-through under different regulatory regimes.

Table 1: Construction of the variables

Variable	Description	Transformation
PSBs,FBS,PVTBs ,SCCBs/ WALR	Weighted Average Lending Rate (Dependent Variable)	Level
REPO	Policy interest rate	Level
CPI	Consumer Price Index	Logged form of CPI
IIP	Index of Industrial Production	Logged form of IIP
Dummy	EBLR regime (0 before Oct 2019, 1 after)	Level
repo_dummy	Interaction (REPO × Dummy)	Derived

Source: Researcher's contribution

5.2 Model Specification

The functional form of the model is:

$$WALR_t = f(REPO_t, IIP_t, CPI_t, DUMMY_t, (DUMMY \times REPO)_t)$$

Where:

WALR = Weighted Average Lending Rate (for PSBs, PVTBs, FBS, SCCBs)

REPO = Policy rate

IIP = Index of Industrial Production (output proxy)

CPI = Inflation

DUMMY = Structural break (EBLR Regime)

DUMMY × REPO = Interaction capturing regime-specific pass-through

The study employs a rigorous econometric methodology to analyse interest rate pass-through in India. The Augmented Dickey–Fuller (ADF) test is used to examine the stationarity of variables, followed by the ARDL model developed by M. Hashem Pesaran et al. (2001), which is suitable for variables integrated at I(0) and I(1). The Bounds Testing approach is applied to test for cointegration, while the Error Correction Model (ECM) is used to estimate short-run dynamics and the speed of adjustment toward long-run equilibrium. The optimal lag structure is selected using the Akaike Information Criterion (AIC). Further, diagnostic tests such as the Breusch–Godfrey LM test, heteroskedasticity test, Jarque–Bera normality test, and CUSUM/CUSUMSQ stability tests are conducted to ensure model robustness and reliability. The empirical analysis is carried out using EViews software.

6. DATA ANALYSIS AND RESULTS

6.1 Descriptive Statistics

The descriptive statistics indicate that macroeconomic variables, particularly CPI and IIP, exhibit greater volatility than lending rate variables during the study period. Private Sector Banks recorded relatively higher average lending rates compared to other banking groups. The normality tests show that some variables deviate from normal distribution, while most lending rate variables are approximately normal. Overall, the results support the suitability of the ARDL framework for analysing monetary policy transmission in India.

Table 2: Descriptive Statistics of the variables

Stats	CPI	FBS	IIP	PSBS	PVTBS	REPO	SCCBS
Mean Value	152.417	8.756	129.352	9.003	10.089	5.884	9.429
Median Value	148.600	9.240	129.050	8.840	10.144	6.250	9.431
Max. Value	196.800	11.110	161.600	11.320	12.170	8.000	11.520
Min. Value	119.400	5.750	54.000	6.770	8.270	4.000	7.510
Std. Dev.	23.111	1.354	14.998	1.137	0.933	1.120	0.989
Skewness Value	0.359	-0.888	-0.849	0.221	0.215	-0.512	0.070
Kurtosis Value	1.856	2.786	6.853	2.318	2.556	2.384	2.485
Jarque-Bera	9.577	16.788	93.050	3.469	2.006	7.499	1.495
P-Value	0.008	0.000	0.000	0.176	0.367	0.024	0.474
Observations	126	126	126	126	126	126	126

Source: Researcher's computations

6.2 Correlation Analysis

The correlation analysis shows strong interlinkages among macroeconomic variables and bank lending rates. The Repo Rate has a strong positive relationship with WALR across all banking groups, confirming effective monetary policy transmission, particularly for Foreign Banks. Lending rates of different banking groups also exhibit high co-movement, while CPI shows a negative relationship with lending rates.

Table 3: Correlation Analysis of the Variables

	CPI	FBS	IIP	PSBS	PVTBS	REPO	SCCBS
CPI	1.000	-0.367	0.736	-0.723	-0.513	-0.289	-0.606
FBS	-0.367	1.000	-0.101	0.863	0.895	0.943	0.921
IIP	0.736	-0.101	1.000	-0.462	-0.242	-0.028	-0.334
PSBS	-0.723	0.863	-0.462	1.000	0.926	0.830	0.981
PVTBS	-0.513	0.895	-0.242	0.926	1.000	0.894	0.976
REPO	-0.289	0.943	-0.028	0.830	0.894	1.000	0.898
SCCBS	-0.606	0.921	-0.334	0.981	0.976	0.898	1.000

Source: Researcher's computations

6.3 Unit Root Test Results (Stationarity Analysis)

The unit root test results reveal a mixed order of integration, with IIP stationary at level $I(0)$, while CPI, REPO, and lending rate variables are stationary at first difference $I(1)$. Since no variable is integrated of order two $I(2)$, the ARDL framework is appropriate for examining both short-run and long-run relationships among the variables.

Table 4: Stationarity of the variables

Variable	I(0)	I(1)
CPI	Non-stationary	Stationary
FBS	Non-stationary	Stationary
IIP	Stationary	
PSBS	Non-stationary	Stationary
PVTBS	Non-stationary	Stationary
REPO	Non-stationary	Stationary
SCCBS	Non-stationary	Stationary

Source: Researcher's contribution

6.4 ARDL Bound Test (Public Sector Banks)

The results of the ARDL bounds test indicate the presence of a long-run equilibrium relationship among the variables included in the model. The computed F-statistic (10.30720) is significantly higher than the upper bound critical values at the 1%, 5%, and 10% significance levels (4.680, 3.790, and 3.350 respectively). This clearly leads to the rejection of the null hypothesis of no level relationship.

Similarly, the t-statistic (-6.748026) is more negative than the lower bound critical values at all conventional significance levels, further confirming the existence of cointegration among the variables. Since both the F-statistic and t-statistic exceed their respective critical bounds, the evidence strongly supports a stable long-run relationship.

Therefore, it can be concluded that the variables included in the model move together in the long run, justifying the estimation of both long-run coefficients and an error correction model (ECM) to capture short-run dynamics. The presence of cointegration also implies that any short-run deviations from equilibrium will be corrected over time, ensuring convergence towards long-run stability.

Table 5: ARDL Bound Test (Public Sector Banks)

Test	Statistic	Value
F-stats		10.3072
t-stats		-6.74803
F-statistic		
Significance Level	I(0)	I(1)
10%	2.26	3.35
5%	2.62	3.79
1%	3.41	4.68
t-statistic		
Significance Level	I(0)	I(1)
10%	-2.57	-3.86
5%	-2.86	-4.19
1%	-3.43	-4.79

Source: Researcher's computations

6.5 ARDL-ECM MODEL (Public Sector Banks)

The Autoregressive Distributed Lag (ARDL) model is estimated to examine the relationship between Public Sector Banks' Weighted Average Lending Rate (PSBS) and key macroeconomic variables such as CPI (LCPI), Industrial Production (LIIP), Repo Rate (REPO), and a policy dummy variable over the period January 2015 to February 2025 using

monthly data. The selected model is ARDL(3,4,0,0,0,0) based on the Akaike Information Criterion (AIC), indicating appropriate lag structure.

LONG-RUN RELATIONSHIP

The long-run results indicate the existence of a stable equilibrium relationship between PSBS and the explanatory variables. The coefficient of PSBS(-1) is negative and highly significant (-0.293, $p < 0.01$), confirming convergence toward long-run equilibrium. The coefficient of LCPI(-1) is negative and statistically significant, indicating that inflation is associated with a decline in lending rates in the long run. This may reflect asymmetric monetary transmission, accommodative liquidity conditions, or banks' limited adjustment of lending rates in response to inflationary pressures. LIIP is negative but statistically insignificant, indicating that industrial production does not have a strong long-run influence on lending rates. REPO rate shows a positive and highly significant impact (0.212, $p < 0.01$), confirming strong monetary transmission from policy rates to lending rates. The DUMMY variable and interaction term (DUMMY*REPO) are insignificant, suggesting no structural shift or differential policy effect during the dummy period.

It is concluded that, there is strong evidence of interest rate pass-through from the repo rate to public sector bank lending rates, while inflation exerts a negative influence.

SHORT-RUN RELATIONSHIP

The ARDL results indicate gradual short-run adjustments in Public Sector Banks' lending rates, with lagged values of PSBS showing significant correction dynamics. Inflation (CPI) exhibits a delayed impact, becoming significant only at lag 3, which suggests partial and lagged pass-through effects. The error correction term is negative and highly significant, indicating that nearly 29.3% of short-run disequilibrium is corrected each month, confirming the existence of a stable long-run relationship among the variables.

The model demonstrates moderate explanatory power with an R^2 of 0.41, while the significant F-statistic confirms the overall validity of the model. The Durbin-Watson statistic indicates the absence of serious autocorrelation, supporting the reliability of the estimates. Overall, the findings reveal that the repo rate is the most significant determinant of lending rates in both the short run and long run, while inflation exerts mixed and lagged effects. The results confirm the robustness and suitability of the ARDL-ECM framework for analysing interest rate pass-through in India.

Table 6: ARDL-ECM Estimation (Public Sector Banks)

Long Run				
Variable	Coefficient	Std. Error	t-Statistic	Prob
PSBS(-1)	-0.293	0.043	-6.748	0.000
LCPI(-1)	-0.953	0.396	-2.404	0.018
LIIP	-0.217	0.137	-1.587	0.115
DUMMY	-0.120	0.288	-0.417	0.677
REPO	0.212	0.047	4.476	0.000
DUMMY*REPO	0.025	0.056	0.457	0.649
Short Run				
D(PSBS(-1))	-0.228	0.081	-2.820	0.006
D(PSBS(-2))	-0.169	0.081	-2.087	0.039
D(LCPI)	2.851	2.145	1.329	0.187
D(LCPI(-1))	1.420	2.274	0.624	0.534
D(LCPI(-2))	1.386	2.249	0.616	0.539
D(LCPI(-3))	4.345	2.083	2.086	0.039
Co-integration				
COINTEQ	-0.293	0.036	-8.042	0.000
C	7.152	0.896	7.981	0.000
R-squared	0.408			
Adjusted R-squared	0.371			
F-statistic	11.213			
Prob(F-statistic)	0.000			
Durbin-Watson	1.878			

Source: Researcher's computations

6.6 ARDL Bound Test (Foreign Banks)

The study employs the ARDL Bounds Testing approach to examine the existence of a long-run relationship among the variables. The test is conducted under the assumption of an unrestricted constant (Case III) with five explanatory variables, using a sample size of 122 observations. The hypothesis tested includes the null hypothesis (H_0) that no long-run (levels) relationship exists among the variables, against the alternative hypothesis (H_1) that a long-run relationship is present. The empirical results yield an F-statistic of 8.134 and a t-statistic of -6.334. These values are compared with the corresponding critical bounds to determine cointegration. At the 1 percent significance level, the upper bound critical value for the F-test is 4.680, and since the calculated F-statistic exceeds this value ($8.134 > 4.680$), the null hypothesis is rejected. Similarly, for the t-bounds test, the lower bound critical value at the 1 percent level is -4.790, and the calculated t-statistic is more negative than this threshold ($-6.334 < -4.790$), leading to rejection of the null hypothesis.

Overall, both the F-statistic and t-statistic exceed their respective critical bounds, providing strong evidence against the null hypothesis of no cointegration. This confirms the existence of a stable and statistically significant long-run equilibrium relationship among the variables included in the model. The bounds test results clearly indicate that the variables are cointegrated, justifying the use of the ARDL-ECM framework for further analysis. This implies that despite short-run fluctuations, the variables move together in the long run and maintain equilibrium relationships.

Table 7: ARDL Bounds Test (Foreign Banks)

Test Statistic	Value	
F-statistic	8.134097	
t-statistic	-6.334096	
F-statistic		
Significance Level	I(0)	I(1)
10%	2.26	3.35
5%	2.62	3.79
1%	3.41	4.68
t-statistic		
Significance Level	I(0)	I(1)
10%	-2.57	-3.86
5%	-2.86	-4.19
1%	-3.43	-4.79

Source: Researcher's computations

6.7 ARDL-ECM Model (Foreign Banks)

The Autoregressive Distributed Lag (ARDL) model is estimated to examine interest rate pass-through for Foreign Banks (FBS) using monthly data from January 2015 to February 2025. Based on the Akaike Information Criterion (AIC), the optimal lag structure is identified as ARDL(3,4,2,0,0,0), indicating appropriate dynamic adjustments within the model. The long-run results show that the coefficient of the policy rate (REPO) is positive and statistically significant ($\beta = 0.1787$, $p < 0.01$), confirming the presence of interest rate pass-through from the monetary policy rate to foreign banks' lending rates. This implies that a 1 percent increase in the repo rate leads to approximately a 0.18 percent increase in the weighted average lending rate in the long run. The dummy variable, representing structural or

policy regime changes, is negative and statistically significant ($\beta = -1.1775$, $p < 0.05$), indicating a downward shift in lending rates during the specified regime period. However, the interaction term ($DUMMY \times REPO$) is positive and significant ($\beta = 0.2066$, $p < 0.05$), suggesting that the effectiveness of monetary transmission improves in the post-regime period, reflecting a stronger pass-through mechanism under the revised policy framework. In contrast, macroeconomic variables such as inflation (CPI) and output (IIP) are statistically insignificant in the long run, implying that foreign banks' lending rates are more responsive to policy rates than to broader macroeconomic fundamentals.

The short-run dynamics are captured through the Error Correction Model (ECM), where the error correction term (ECT) is negative and highly significant ($ECT = -0.2758$, $p < 0.01$), confirming the existence of a long-run equilibrium relationship among the variables. The magnitude of the coefficient indicates that approximately 27.6 percent of the disequilibrium is corrected each month, reflecting a moderate speed of adjustment toward equilibrium. In the short run, the lagged dependent variable $\Delta FBS(-1)$ is negative and significant, indicating partial adjustment behavior. Among the explanatory variables, inflation exhibits mixed effects, with only higher lag ($LCPI(-3)$) being positive and statistically significant, suggesting delayed inflation pass-through. Similarly, output (IIP) shows a positive and significant effect at lag 1, indicating that economic activity influences lending rates with a lagged response.

The model diagnostics further demonstrate a reasonably good fit, with an R-squared value of approximately 0.47, indicating that about 47 percent of the variation in foreign banks' lending rates is explained by the model. The F-statistic is statistically significant, confirming the overall validity of the model, while the Durbin-Watson statistic (approximately 2.07) suggests the absence of autocorrelation in the residuals, indicating a well-specified model. Overall, the findings confirm that monetary policy transmission to foreign banks' lending rates is effective in both the short run and the long run, with stronger pass-through observed during the post-policy regime period. The presence of a significant error correction mechanism further validates the stability and robustness of the long-run relationship.

Table 8:ARDL-ECM Estimation (Foreign Banks)

Variable	Coefficient	Std. Error	t-Statistic	Prob
FBS(-1)	-0.276	0.044	-6.334	0.000
LCPI(-1)	-0.498	0.538	-0.926	0.357
LIIP(-1)	-0.052	0.288	-0.182	0.856
REPO	0.179	0.063	2.848	0.005
DUMMY	-1.178	0.518	-2.272	0.025
DUMMY*REPO	0.207	0.099	2.094	0.039
Short Run				
D(FBS(-1))	-0.211	0.079	-2.687	0.008
D(FBS(-2))	0.121	0.080	1.514	0.133
D(LCPI)	1.521	3.458	0.440	0.661
D(LCPI(-3))	11.383	3.194	3.564	0.001
D(LIIP)	0.226	0.223	1.015	0.312
D(LIIP(-1))	0.522	0.228	2.283	0.024
Co-integration				
COINTEQ	0.276	0.039	-7.147	0.000
C	4.102	2.797	1.467	0.145
R-squared	0.474			
Adjusted R-squared	0.405			
F-statistic	6.876			
Prob(F-statistic)	0.000			
Durbin-Watson	2.077			

Source: Researcher's computations

6.8 ARDL Bound Test (Private Banks)

To examine the existence of a long-run relationship among the variables, the Bounds Testing approach to cointegration within the ARDL framework is employed. The null hypothesis of no levels relationship is tested against the alternative hypothesis of a long-run equilibrium relationship among the variables. The computed F-statistic is 4.9647, which exceeds the upper bound critical value at the 5 percent significance level ($I(1) = 3.79$) and is also higher than the 1 percent upper bound value ($I(1) = 4.68$), leading to the rejection of the null hypothesis of no cointegration. Furthermore, the t-statistic value of -3.8172 is more negative than the lower bound critical value at the 5 percent level ($I(0) = -2.86$), providing additional support for the presence of a long-run relationship among the variables. These findings confirm that the dependent variable and its regressors move together over time, indicating the existence of a stable long-run equilibrium relationship. Consequently, it is appropriate to proceed with the estimation of the Error Correction Model (ECM) to capture short-run dynamics and the speed of adjustment toward long-run equilibrium.

Overall, the Bounds Test results provide strong evidence of cointegration among the variables, thereby validating the use of the ARDL-ECM framework for analyzing interest rate pass-through. The presence of a long-run relationship implies that any short-term deviations from equilibrium are temporary and are gradually corrected over time.

Table 9: ARDL Bound Test (Private Sector Banks)

Test	Statistic	Value
F-statistic		4.964695
t-statistic		-3.817213
F-Statistic		
Significance Level	$I(0)$	$I(1)$
10%	2.26	3.35
5%	2.62	3.79
1%	3.41	4.68
t-Statistic		
Significance Level	$I(0)$	$I(1)$
10%	-2.57	-3.86
5%	-2.86	-4.19
1%	-3.43	-4.79

Source: Researcher's computations

6.9 ARDL-ECM Model (Private Sector Banks)

The study employs the Autoregressive Distributed Lag (ARDL) model to examine interest rate pass-through for Private Sector Banks' Weighted Average Lending Rate (PVTBs WALR). Based on the Akaike Information Criterion (AIC), the optimal lag structure is identified as ARDL (3, 0, 4, 1, 0, 1), indicating an appropriate dynamic specification of the model. The estimation is carried out using monthly data from January 2015 to February 2025, comprising 122 observations. The long-run coefficients reveal the equilibrium relationship between lending rates and the explanatory variables. The coefficient of the lagged dependent variable PVTBS(-1) is negative and statistically significant (-0.1816, $p < 0.01$), confirming convergence toward long-run equilibrium. The repo rate (REPO) exhibits a positive and highly significant impact (0.2297, $p < 0.01$), indicating that monetary policy changes are effectively transmitted to private sector bank lending rates in the long run. The Industrial

Production Index (LIIP) shows a positive effect (0.5377) and is marginally significant at the 10 percent level, suggesting that economic activity influences lending rates. In contrast, the inflation variable (LCPI) is statistically insignificant, implying that inflation does not have a direct long-run effect on lending rates in private banks. The dummy variable (DUMMY) has a positive and borderline significant coefficient (0.7560), indicating that structural shifts or policy changes influence lending behavior, while the interaction term (DUMMY $\times$ REPO) is negative and weakly significant, suggesting a slight weakening of monetary transmission during the structural break period.

The short-run dynamics highlight the speed and pattern of adjustment in lending rates. The lagged differences of PVTBS, namely D(PVTBS(-1)) and D(PVTBS(-2)), are negative and highly significant, confirming the presence of short-run adjustment dynamics. The contemporaneous change in industrial output, D(LIIP), is positive and highly significant, indicating that short-term economic growth leads to higher lending rates, while the third lag of LIIP, D(LIIP(-3)), is negative and significant, reflecting delayed adjustment effects. The interaction term D(DUMMY $\times$ REPO) is positive and significant, suggesting that short-run monetary transmission improved during the structural change period, whereas the dummy variable itself remains insignificant in the short run.

The error correction mechanism further supports the existence of a stable long-run relationship, as the error correction term (COINTEQ) is negative and highly significant (-0.1816, $p < 0.01$). The magnitude implies that approximately 18.16 percent of the disequilibrium is corrected each month, indicating a moderate speed of adjustment toward long-run equilibrium. The model diagnostics confirm a reasonably good fit, with an R-squared value of 0.51, suggesting that about 51 percent of the variation in lending rates is explained by the model. The F-statistic is highly significant, validating the overall model, while the Durbin-Watson statistic (approximately 1.98) indicates the absence of serious autocorrelation issues.

Overall, the findings suggest that monetary policy transmission through the repo rate is effective in private sector banks in both the short run and the long run. Economic activity, as captured by industrial production, plays a meaningful role in influencing lending rates, whereas inflation does not directly affect lending rate determination, possibly due to forward-looking pricing behavior. Structural changes have also influenced the dynamics of monetary transmission, as reflected in the interaction effects. In conclusion, private sector banks exhibit a moderate but significant degree of interest rate pass-through, characterized by relatively faster short-run adjustments and stable long-run convergence.

Table 10:ARDL-ECM Estimation (Private Sector Banks)

Variable	Coefficient	Std. Error	t-Statistic	Prob
PVTBS(-1)	-0.182	0.048	-3.817	0.000
LCPI	-0.051	0.484	-0.105	0.916
LIIP(-1)	0.538	0.296	1.814	0.073
DUMMY(-1)	0.756	0.382	1.978	0.051
REPO	0.230	0.066	3.478	0.001
DUMMY(-1)*REPO(-1)	-0.132	0.073	-1.823	0.071
C	-1.931	2.349	-0.822	0.413
Short Run Regressors				
D(PVTBS(-1))	-0.276	0.082	-3.347	0.001
D(PVTBS(-2))	-0.275	0.080	-3.446	0.001
D(LIIP)	0.717	0.184	3.891	0.000
D(LIIP(-3))	-0.399	0.179	-2.236	0.027
D(DUMMY)	-1.316	0.870	-1.513	0.133
D(DUMMY*REPO)	0.320	0.159	2.015	0.046
Co-integration				
COINTEQ	-0.182	0.033	-5.584	0.000
C	-1.931	0.341	-5.670	0.000
R-squared	0.514			
Adjusted R-squared	0.475			
F-statistic	13.165			
Prob(F-statistic)	0.000			
Durbin-Watson	1.988			

Source: Researcher's computations

6.10 ARDL Bound Test (Scheduled Commercial Banks)

The presence of a long-run relationship among the variables is examined using the ARDL Bounds Testing approach developed by Pesaran et al. The null hypothesis of no level relationship is tested against the alternative of cointegration.

The estimated F-statistic is 7.320722, which is higher than the upper bound critical values at the 1% significance level (4.680). Similarly, the computed t-statistic is -5.073075, which is more negative than the upper bound critical value at the 1% level (-4.790).

Since both the F-statistic and t-statistic exceed their respective upper bound critical values, the null hypothesis of no long-run relationship is rejected. This confirms the existence of a stable long-run cointegrating relationship among the variables included in the model.

The results indicate that the dependent variable and its regressors move together in the long run, despite short-run fluctuations. Therefore, it is appropriate to proceed with the estimation of both long-run coefficients and the associated Error Correction Model (ECM) to capture short-run dynamics and speed of adjustment.

Table 11: ARDL Bound Test (Scheduled Commercial Banks)

Test	Statistic	Value
F-statistic		7.320722
t-statistic		-5.07308
F-Statistic		
Significance Level	I(0)	I(1)
10%	2.26	3.35
5%	2.62	3.79
1%	3.41	4.68
t-Statistic		
Significance Level	I(0)	I(1)
10%	-2.57	-3.86
5%	-2.86	-4.19
1%	-3.43	-4.79

Source: Researcher's computations

6.11 ARDL-ECM Model (Scheduled Commercial Banks)

The Autoregressive Distributed Lag (ARDL) model is estimated to examine both the long-run and short-run dynamics of interest rate pass-through for Scheduled Commercial Banks (SCCBs). Based on the Akaike Information Criterion (AIC), the selected specification is ARDL(3,4,0,0,2,2), using monthly data from January 2015 to February 2025 with a total of 122 observations. The long-run results indicate that the coefficient of the lagged dependent variable SCCBS(-1) is negative and statistically significant (coefficient = -0.2396, $p < 0.01$), confirming the existence of a stable long-run equilibrium relationship. Among the explanatory variables, the repo rate (REPO) has a positive and statistically significant impact (coefficient = 0.2013, $p < 0.01$), suggesting effective monetary policy transmission to lending rates in the long run. In contrast, variables such as inflation (LCPI) and industrial production (LIIP) are statistically insignificant, implying that they have limited influence on SCCBs' weighted average lending rate in the long run. Similarly, the dummy variable and its interaction with the repo rate are insignificant, indicating the absence of any structural break effect on long-run transmission.

The short-run dynamics reveal significant adjustment behavior. The lagged differences of the dependent variable, $D(\text{SCCBS}(-1))$ and $D(\text{SCCBS}(-2))$, are negative and statistically

significant, indicating short-run adjustments toward equilibrium. Inflation exhibits mixed effects, with only the third lag being positive and statistically significant, suggesting delayed price transmission. The lagged dummy variable, $D(DUMMY(-1))$, is negative and significant, reflecting temporary structural influences on lending rates. Furthermore, the interaction term $D(DUMMY(-1) \times REPO(-1))$ is positive and significant, implying that the effectiveness of monetary policy transmission may vary under different structural conditions in the short run.

The error correction mechanism further supports the existence of a long-run relationship, as the error correction term (COINTEQ) is negative and highly significant (coefficient = -0.2396, $p < 0.01$). The magnitude of this coefficient indicates that approximately 23.96 percent of short-run disequilibrium is corrected each month, reflecting a moderate speed of adjustment toward long-run equilibrium. The model diagnostics indicate a reasonable fit, with an R-squared value of 0.5534, suggesting moderate explanatory power. The F-statistic is statistically significant ($p < 0.01$), confirming the overall validity of the model, while the Durbin–Watson statistic (approximately 1.96) indicates the absence of autocorrelation in the residuals.

Overall, the results confirm that monetary policy transmission through the repo rate is effective for scheduled commercial banks in the long run. However, short-run adjustments are gradual and influenced by lag structures as well as structural conditions. The presence of a significant error correction term further validates the stability of the model and confirms the existence of a long-run equilibrium relationship among the variables.

Table 12 : ARDL-ECM Estimation (Scheduled Commercial Banks)

Long Run Regressors				
Variable	Coefficient	Std. Error	t-Statistic	Prob
SCCBS(-1)	-0.240	0.047	-5.073	0.000
LCPI(-1)	-0.234	0.366	-0.639	0.524
LIIP	0.063	0.131	0.483	0.630
REPO	0.201	0.047	4.250	0.000
DUMMY(-1)	0.114	0.254	0.451	0.653
DUMMY(-1)*REPO(-1)	-0.026	0.050	-0.522	0.602
Short Run Regressors				
D(SCCBS(-1))	-0.407	0.081	-5.057	0.000
D(SCCBS(-2))	-0.249	0.077	-3.215	0.002
D(LCPI)	1.765	1.828	0.966	0.336
D(LCPI(-1))	2.822	1.971	1.432	0.155
D(LCPI(-2))	-2.059	1.964	-1.048	0.297
D(LCPI(-3))	6.113	1.817	3.364	0.001
D(DUMMY)	-0.684	0.612	-1.117	0.267
D(DUMMY(-1))	-1.272	0.593	-2.145	0.034
D(DUMMY*REPO)	0.139	0.112	1.234	0.220
D(DUMMY(-1)*REPO(-1))	0.260	0.113	2.298	0.024
Co-integration				
COINTEQ	-0.240	0.035	-6.784	0.000
C	1.886	1.922	0.981	0.329
R-squared	0.553			
Adjusted R-squared	0.509			
F-statistic	12.392			
Prob(F-statistic)	0.000			
Durbin-Watson	1.956			

Source: Researcher's computations

6.12 Residual Diagnostic Tests

The residual diagnostic and stability tests confirm the robustness and adequacy of the estimated ARDL models for Public Sector Banks, Foreign Banks, Private Sector Banks, and Scheduled Commercial Banks. The results indicate the absence of serial correlation and heteroskedasticity, while the Jarque–Bera test confirms the normality of residuals. Further, the CUSUM of Squares test demonstrates parameter and structural stability throughout the

study period. Overall, all models satisfy the essential econometric assumptions and are suitable for analysing interest rate transmission in India.

7. IMPLICATIONS OF THE STUDY

The empirical findings from the ARDL–ECM models confirm the existence of a stable long-run relationship between the Repo Rate and the Weighted Average Lending Rates (WALR) of different banking groups in India. The results indicate that monetary policy transmission through the policy rate is effective across Public Sector Banks (PSBs), Foreign Banks (FBs), Private Sector Banks (PVTBs), and Scheduled Commercial Banks (SCCBs), although the magnitude and speed of transmission differ among bank groups.

The positive and statistically significant impact of the Repo Rate in all models implies that changes in the policy rate are transmitted to commercial bank lending rates in both the short run and long run. This confirms the effectiveness of the monetary policy framework of the Reserve Bank of India in influencing borrowing costs and credit conditions in the economy.

The findings further reveal heterogeneity in transmission mechanisms across banking groups. Foreign Banks exhibit relatively stronger and faster pass-through, suggesting greater responsiveness to policy signals and market conditions. Private Sector Banks also demonstrate effective transmission with comparatively better short-run adjustments, reflecting operational flexibility and competitive pricing behaviour. In contrast, Public Sector Banks and Scheduled Commercial Banks show relatively gradual adjustments, indicating the presence of rigidities, administrative delays, or balance-sheet constraints in lending rate revisions.

The significance of the Error Correction Terms (ECTs) across all models confirms that deviations from long-run equilibrium are temporary and gradually corrected over time. However, the moderate speeds of adjustment suggest that monetary policy transmission in India is not instantaneous and may involve transmission lags.

The macroeconomic variables show mixed effects. Inflation (CPI) exhibits delayed or weak influence on lending rates in several models, while industrial production (IIP) affects lending rates mainly in Private Sector and Foreign Banks. These findings imply that lending rate determination in India is driven more strongly by policy rates than by short-run macroeconomic fluctuations.

The significance of dummy interaction terms in some models also indicates that structural or policy regime changes have influenced the effectiveness of monetary transmission, particularly in Foreign Banks and Private Sector Banks.

8. POLICY RECOMMENDATIONS

Public Sector Banks exhibit relatively slower adjustment toward equilibrium. Therefore, reforms aimed at improving operational efficiency, balance-sheet strength, and interest rate flexibility may enhance the responsiveness of PSBs to monetary policy changes.

The relatively stronger transmission observed in Foreign and Private Sector Banks suggests that greater competition improves policy responsiveness. Policies encouraging efficiency, digital banking, and market-based pricing mechanisms may improve overall transmission efficiency.

The moderate speed of adjustment observed through the ECM results indicates the existence of rigidities in the banking system. Policymakers should address issues such as high non-

performing assets (NPAs), liquidity mismatches, and administrative constraints that may slow lending rate revisions.

Although Repo Rate remains the dominant determinant, inflation and industrial activity also influence lending rates in certain cases. Therefore, monetary policy decisions should continue to account for both price stability and economic growth objectives.

The findings support the importance of external benchmark-based lending systems such as the External Benchmark Lending Rate (EBLR) framework, which can improve transparency and accelerate the transmission of policy rate changes to borrowers.

Since structural changes influence transmission dynamics in some banking groups, policymakers should maintain consistency and clarity in monetary policy communication to avoid disruptions in lending rate adjustments.

Overall, the study suggests that while monetary policy transmission in India is effective, the degree and speed of pass-through vary across banking groups. Strengthening institutional efficiency, improving competition, and reducing structural rigidities can further enhance the effectiveness of interest rate transmission in the Indian banking system.

9. LIMITATIONS OF THE STUDY

The present study focuses exclusively on the External Benchmark Lending Rate (EBLR) framework to analyze interest rate transmission in India. Deposit rates were not incorporated into the analysis due to the non-availability of consistent monthly data for the study period.

The analysis is based on aggregate banking group data such as Public Sector Banks, Private Sector Banks, Foreign Banks, and Scheduled Commercial Banks. Therefore, bank-specific heterogeneity and institutional differences are not captured.

The study relies on monthly secondary data obtained from official sources. Any revisions or inconsistencies in published data may influence the empirical results.

The study primarily examines the lending rate channel of monetary transmission and does not incorporate other channels such as the credit channel, exchange rate channel, or expectations channel.

The ARDL framework captures linear long-run and short-run relationships among variables. Possible nonlinearities and structural changes in monetary transmission mechanisms are not explicitly modeled.

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