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Reforms, Efficiency, and Productivity of Indian Banking Sector in the Last Decade : A DEA Approach

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Soumya Kanti Ghosh

Tapas Kumar Parida

Reforms, Efficiency, and Productivity of Indian Banking Sector in the last decade : A DEA Approach*

Soumya Kanti Ghosh and Tapas Kumar Parida[1]

ABSTRACT

Beginning 2014, the Indian banking sector has undergone one of its most consequential transformations from a legacy of stalled infrastructure projects and restructuring of stressed loans. Formal financial access was also uneven, while digital banking remained at an early stage. The reform cycle that followed combined balance-sheet recognition, insolvency reform, recapitalisation, consolidation, governance improvement, financial inclusion and digital public infrastructure. By 2026, the sector had moved from repairing legacy stress to financing a broader investment and consumption cycle.

This paper tries to find out the impact of banking sector reforms post 2014 on efficiency, productivity and profitability. We selected 47-banks for the study period, FY15 to FY26 (12-Years) and employed Data Envelopment Analysis (DEA) to calculate efficiency & productivity of the banks. The results indicate that the mean technical efficiency (TE) of the sample banks had improved from 77.99% in FY20 to 88.34% in FY26. The bank group wise results for FY15 to FY26 indicate that contrary to popular perceptions, public sector banks (PSBs) efficiency improved to 93.12% in FY26. The efficiency of private banks was at 86.02% in FY26. Foreign banks efficiency remained 83-85% during FY20 to FY26. The productivity change of the banks, reveal that there is a continuous improvement in the technology till FY21, a marginal drop till FY23 and currently at 1.0087 in FY26. This implies that technological innovations have peaked in FY23 and the new breed of Artificial Intelligence and Machine Learning will beget more innovations for banks in future currently unfolding.

Thus, the study found that the efforts made by the Government and RBI to bring efficiency and productivity in the Indian banking sector have achieved the objective. In the long-term banking in India will change. Some of the main drives of this change will include hyper-personalization through AI that will tailor the needs of young individual customers. Subsequently, there will be a shift from reactive to proactive service deepening customer relationships and increase institutional loyalty. In principle, banks will increasingly focus on data-driven customer experiences, AI automation, and robust data security. Thus, product offerings and delivery will become customized in the coming years. In this context, India being multi-language country the creation of foundational AI models will gather pace. Banks will be exploring at suitable time to harness these India specific foundational models for Multiple language onboarding and hyper customization of services.

The long-term positive outlook of India remains intact. India's sovereign rating remains stable at BBB after its revision in August 2025. Given the strong fundaments such as high savings rate, adequate FX reserves at more than $700 billion, well capitalized banking and cash rich corporate balance sheet the long-term outlook of high growth is feasible.

JEL Classification: G21, C14, C25 Key words: DEA, MPI, Total Factor Productivity

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1 Soumya Kanti Ghosh is Part-time member, EAC-PM and Group Chief Economic Advisor at State Bank of India. Tapas Kumar Parida is economist at Economic Research Department, State Bank of India, Mumbai

1. Introduction

The journey of the Indian banking sector has undergone a significant regime change since 2014, especially in the post-Asset Quality Review (AQR) period, which was initiated in 2015 to clean up and fully cushioning of bank balance-sheets by bringing to the fore the high incidence of non-performing assets / NPAs that had built up post the global financial crisis. With RBI and Governments' efforts, the sector has been moved from a period characterised by under-recognised corporate stress, weak public-sector banks (PSBs) capitalisation and constrained credit creation to one of historically low NPAs, strong common-equity buffers, sustained profitability and accelerating credit growth. The scheduled commercial banks (SCBs) credit and deposit growth reached 19.3% and deposits at 15.4% respectively for the month end-July 2026, from 9% and 10.7% respectively in FY15. The gross NPA ratio has declined to a multi-decadal low level of 1.68% in June 2026, from 11.5% in end March 2018. Further, the capital position of the banks remained healthy, with aggregate CRAR of 17.78% in end June 2026, compared to 13.0% in end-March 2013. Liquidity buffers were robust, with an LCR of 126.94% as of end June 2026. The Return on Assets / RoA and Return on Equity / RoE in June 2026 stood at 1.32% and 13.23% compared to -0.2% and -1.9 % respectively in FY18.

This paper tries to review and benchmark the growth, efficiency, productivity and profitability of the Indian banking sector during the post AQR period, starting from FY15 to FY26 (12-years). To measure the efficiency and productivity of the sector, we employ data envelopment analysis (DEA) technique as banks are multi-input, multi-output institutions and DEA allows researchers to compare these multiple dimensions without assuming a production function. It may be noted that ownership structure, regulatory regimes, risk profiles, and technology adoption differ across banks.

The rest of the paper is divided into seven sections. Section 2 describes the overview of Indian banking sector since FY15. Section 3 discusses the existing literature in the study and Section 4 discusses the objectives. In section 5, data and methodology of the study are discussed. Section 7 discusses empirical results. Section 7 discusses the limitations of the study and future area of research and section 8 concludes.

2. A Review of Indian Banking Sector since AQR

The Indian banking system has historically combined three functions: financial intermediation, implementation of public-policy objectives and preservation of macro-financial stability. This hybrid character differentiates India from most financial systems across the globe in which

capital markets and privately owned banks dominate intermediation. Bank nationalisation in 1969 had sought to widen access to credit and move the system from "class banking" towards “mass banking”. The reforms initiated in the early 1990s subsequently introduced stronger prudential standards, greater competition, private-bank entry, risk-based capital requirements and more transparent income-recognition and asset-classification norms.

The present structure of the Indian banking sector is outlined below, where PSBs plays a pivotal role with holding more than 50% market share in both deposits and advances as of end-March 2026.

Table 1: Structure of India's Banking Sector in FY26

Banks Groups	No of Banks	Market Share (%)			
		Offices	ATMs	Deposit	Credit
PSBs	12	53	64	56	53
SBI	1	15	31	22	20
PSBs_Ex SBI	11	39	33	33	30
Private Banks	21	28	34	35	39
Foreign Banks	44	0	0	5	3
Payment Banks	4	1	0	0	-
Small Finance Banks (SFBs)	11	5	2	1	2
Regional Rural Banks (RRBs)	28	13	-	3	3
Local Area Banks (LABs)	4	0	-	-	-
Scheduled Commercial Banks (SCBs)	**124**	100	100	100	100

Source: RBI, SBI Research

2.1 Reforms Undertaken in the Indian Banking Sector since 2014

The most recent transformation followed the corporate and infrastructure-credit cycle of the early and mid-2010s. However, since 2014, the Indian banking sector has undergone one of its most consequential transformations. At the beginning of the period, banks, particularly public sector banks (PSBs), were confronting the legacy of stalled infrastructure projects, weak credit appraisal and substantial evergreening or restructuring of stressed loans. Formal financial access was also uneven, while digital banking remained at an early stage. The reform cycle that followed combined balance-sheet recognition, insolvency reform, recapitalisation, consolidation, governance improvement, financial inclusion and digital public infrastructure. By 2026, the sector had moved from repairing legacy stress to financing a broader investment and consumption cycle.

The major reforms undertaken by Government/RBI, since FY15, are listed in table 2.

Table 2: Major Reforms in the Indian Banking Sector Since FY15		
Year	**Major reform**	**Measures**
2014-15	Pradhan Mantri Jan-Dhan Yojana (PMJDY)	A national financial-inclusion mission centred on basic bank accounts, RuPay cards, overdraft access and linkage with direct-benefit transfers.
2015-16	Indradhanush Plan for Public-Sector Banks	A seven-part PSB reform programme covering professional appointments, the Banks Board Bureau, recapitalisation, de-stressing, empowerment, accountability and governance.
	Asset Quality Review (AQR)	A system-wide review of large loan accounts requiring banks to recognise and provide for stressed assets that had earlier remained restructured or under-recognised.
	Inflation Targeting	Flexible inflation targeting (FIT) was formally adopted in India in 2016 for 2016–21 (First Review Period) through an amendment to the RBI Act, 1934. Target set CPI at 4%, ± 2%, with an acceptable range of 2% to 6%
2016-17	Marginal Cost of Funds-based Lending Rate (MCLR)	Replacing the loans linked to Base Rate with floating-rate loans with a benchmark more closely linked to banks' marginal funding costs and reset periods.
	Insolvency and Bankruptcy Code (IBC), 2016	Creating a unified, creditor-driven and time-bound insolvency-resolution framework for companies and other debtors through the NCLT and an institutional insolvency ecosystem.
2017-18	Merger of SBI Associate Banks and Bharatiya Mahila Bank with SBI	Five associate banks and Bharatiya Mahila Bank were absorbed into State Bank of India.
	Revised Prompt Corrective Action (PCA) Framework	Strengthening supervisory intervention based on capital, asset quality, profitability and leverage, with graduated restrictions and corrective actions for weak banks.
	Banking Regulation Amendment for Stressed-Asset Resolution	Inserting Sections 35AA and 35AB, enabling the Government to authorise RBI to direct banks to initiate insolvency proceedings and issue directions on stressed-asset resolution.
	PSB Recapitalisation and EASE Reform	A large recapitalisation programme was combined with benchmarked reforms in responsible lending, customer service, governance, risk management, technology and human resources.
2018-19	Merger of Bank of Baroda, Vijaya Bank and Dena Bank	Vijaya Bank and Dena Bank were amalgamated into Bank of Baroda in India's first three-way public-sector bank merger.
2019--20	Prudential Framework for Resolution of Stressed Assets	Replacing multiple earlier restructuring schemes with a principle-based lender-led framework requiring early recognition of default, coordinated resolution and additional provisioning for delay.

Table 2: Major Reforms in the Indian Banking Sector Since FY15		
Year	**Major reform**	**Measures**
	External Benchmark-linked Lending Rates	All new floating-rate retail and MSME loans to be linked to an external benchmark such as the policy repo rate, Treasury-bill yield or another published market benchmark.
	Increase in Deposit Insurance Cover	Raising the DICGC insurance limit from Rs 1 lakh to Rs 5 lakh per depositor per bank, including principal and interest within the ceiling.
2020-21	Consolidation of Public-Sector Banks	Ten PSBs were consolidated into 4-banks: Punjab National Bank, Canara Bank, Union Bank of India and Indian Bank, reducing the total number of PSBs to 12.
	Stronger RBI Regulation of Co-operative Banks	The Banking Regulation (Amendment) Act, 2020 expanded RBI's powers over governance, management, audit, capital raising, reconstruction and amalgamation of co-operative banks.
	Inflation Targeting (2nd Review)	Target of CPI at 4%, ± 2%, with an acceptable range of 2% to 6, were retained for another five-years ending in March 2026 (Second Review Period)
2021-22	Time-bound Deposit Insurance Payouts	The DICGC Amendment enabled interim payment of insured deposits up to Rs 5 lakh within a prescribed 90-day process when a bank is placed under all-inclusive restrictions.
	NARCL-IDRCL Stressed-Asset Resolution Framework	A government guarantee for security receipts issued by the National Asset Reconstruction Company, supported by specialised resolution expertise through IDRCL.
2025-26	One State-One RRB Consolidation	26 RRBs were amalgamated in the fourth consolidation phase, reducing the total number of RRBs from 43 to 28.
	Banking Laws (Amendment) Act, 2025	Implementing changes to banking governance and administration, including a higher substantial-interest threshold, longer tenure for co-operative-bank directors, audit-related changes for PSBs, updated statutory reporting dates and up to four nominees.
	Inflation Targeting (3rd Review)	Government retained the retail inflation target at 4% (with a tolerance band of +/- 2%, meaning a range of 2% to 6%) for the next five-year cycle from April 1, 2026, to March 31, 2031
2026-27	Amendment to the Payment and Settlement Systems Act (PSS Act) 2026	An enabling provision designed to ensure UPI's long-term sustainability, technological advancement, and resilience against emerging risks.
	High-level committee on 'Banking for Viksit Bharat'	Committee to be setup to comprehensively review the Indian Banking sector and align it with India's next phase of growth.
Source: Author's Compilation		

Among all the first decisive and bold first step was transparent recognition of stress in the sector, by Asset Quality Review (AQR), which was initiated in 2015, requiring banks to identify and provide for previously unrecognised problem loans. Consequently, the reported gross non-performing asset ratio of scheduled commercial banks rose from 3.8% in March 2014 to a peak of 11.2% in March 2018. This increase largely reflected the recognition of accumulated stress built up post 2008-09 rather than a sudden deterioration in a single year. The clean-up imposed heavy provisioning costs and temporarily weakened profitability, but it established a more credible and sustainable foundation for recovery that is prevalent today.

Resolution mechanisms were strengthened alongside recognition. The Insolvency and Bankruptcy Code, 2016 created a time-bound, creditor-led framework for resolving corporate distress and altered the balance of power between borrowers and lenders. Amendments to recovery laws, specialised stressed-asset units, the RBI's Prompt Corrective Action (PCA) framework and later the prudential framework for stressed assets encouraged earlier identification and resolution. Government capital support in 2018 and subsequent raising resources through markets rebuilt public sector bank capital, while the EASE reform programme promoted governance, responsible lending, technology adoption, customer service and outcome-based monitoring.

Further, the bank consolidation was intended to create institutions with stronger capital bases, wider geographic reach and greater capacity to finance large projects. The merger of State Bank of India's associate banks in 2017, the Bank of Baroda-Vijaya Bank-Dena Bank merger in 2019, and the consolidation of 10 public sector banks into 4 banks in 2020 reduced the number PSBs from 27 to 12. Consolidation brought scale and potential operational synergies, although the full benefits did materialise on successful technology integration, harmonised risk cultures and sustained improvements in productivity.

The banking landscape also became more diverse. Small finance banks (SFBs) and payments banks (PBs) expanded competition and last-mile access, while account aggregators, digital lending platforms and fintech partnerships created new channels for savings, payments and credit. At the same time, regulation increasingly focused on governance, consumer protection, cyber resilience and the risks arising from outsourcing and digital intermediation.

2.2 Progress of Banking Indicators – Post AQR Period

Post-2014, the Indian banking sector is now considerably stronger, more inclusive and more technologically capable than it was in 2014; preserving this progress will require disciplined

growth, continuous supervision and innovation anchored in trust. The risk map is shifting towards the liability side of bank balance sheets, household and consumption credit, gold-backed lending, fintech-originated small-ticket loans, bank-NBFC interconnectedness and technology-related operational risk. The structural migration of household savings from low-cost bank deposits towards market instruments is raising the marginal cost of funds and making deposit franchises a central determinant of bank profitability. At the same time, strong corporate balance sheets and improved bank capital provide a favourable platform for financing a possible private-investment revival. Credit growth rebounded to 20.2% and deposits growth of 13.5% in FY24 but declined to 11.0% and 10.3% respectively in FY25. However, with the increase in income tax exemption limit and GST rate rationalisation, the demand for credit grew by 16.1% and deposits by 13.5% in FY26. The same trend has been continuing in 2026-27, with credit growth accelerating to 19.3% and deposits at 15.4% for the month end July 2026. The wedge between deposit growth and credit growth is close to 4% and driving loan-to-deposit ratios above 82%. However, the measures announced by RBI in June to bolster capital inflows has already resulted in significant accretion to FCNR(B) deposits and might shrink the credit deposit wedge in the later part of current fiscal year.

Table 3: Indian Banking Health Tracker

%		FY14	FY15	FY18	FY23	FY24	FY25	FY26	FY 27 (Q1)
Banking Business	Credit Growth	13.9	9.0	10.0	15.0	20.2	11.0	16.1	**17.7**
	Deposits Growth	14.1	10.7	6.2	9.6	13.5	10.3	13.5	**12.7**
Asset Quality and Provisioning	GNPA Ratio	3.8	4.3	11.2	3.9	2.8	2.3	1.8	**1.7**
	NNPA Ratio	2.1	2.4	6.0	1.0	0.6	0.5	0.4	**0.4**
	Slippage Ratio	-	3.3	7.6	3.3	1.6	1.5	1.2	**-**
	PCR	44.7	44.0	48.1	74.1	76.2	76.3	75.6	
Liquidity	LCR	-	96.3	126.0	143.5	130.3	132.5	124.2	**126.9**
Earnings	NII Growth	11.3	9.3	7.5	21.6	15.4	7.9	4.0	**-**
	Profit (Rs Cr)	809	891	-324	2426	3206	3786	4053	**1025***
	Growth %	-11.2	10.1	-173.9	39.7	31.5	16.8	7.2	**15.5***
Profitability	NIM	2.7	2.6	2.5	3.7	3.7	3.5	3.3	**3.2**
	ROA	0.8	0.8	-0.2	1.1	1.3	1.4	1.3	**1.3**
	ROE	9.5	9.4	-1.9	12.3	13.7	13.5	12.6	**13.2**
Capital	CRAR	12.9	13.0	13.8	17.2	16.8	17.4	17.7	**17.8**

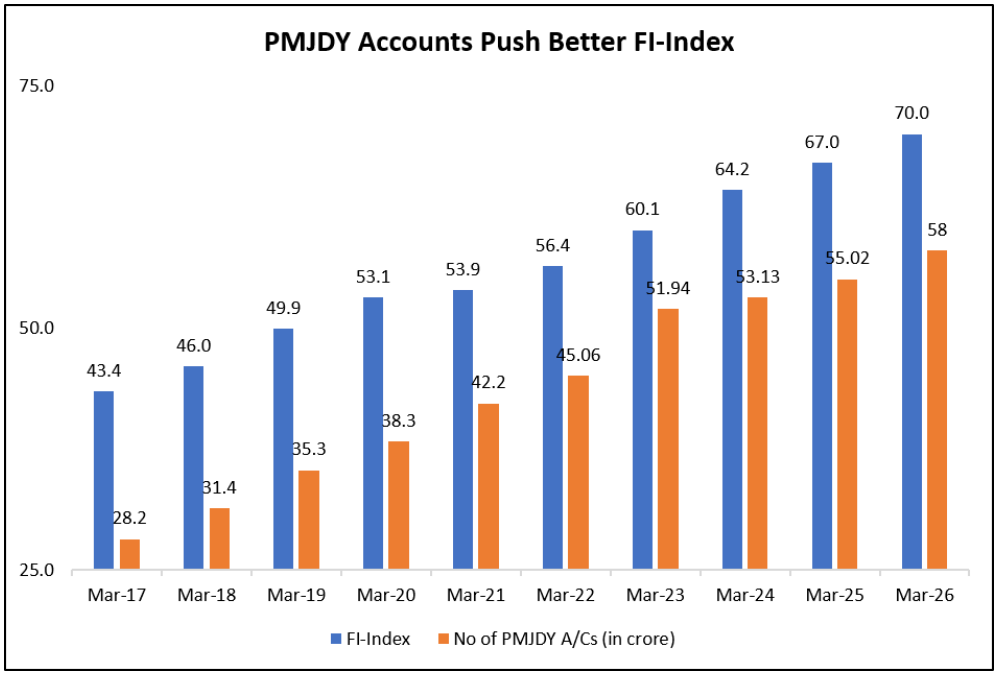
Source: RBI; SBI Research * PSBs plus 11 Major Private Sector Banks

The gross NPA ratio of banks have declined to a multi-decadal low level of 1.68% in June 2026, from 11.5% in end March 2018. The improvement in asset quality was broad-based across bank groups. Agriculture, despite improvement, continued to exhibit the highest GNPA ratio of 5.1%, industry at 1.6%, Services at 1.5% and personal loans NPA is at 1.0%. Further,

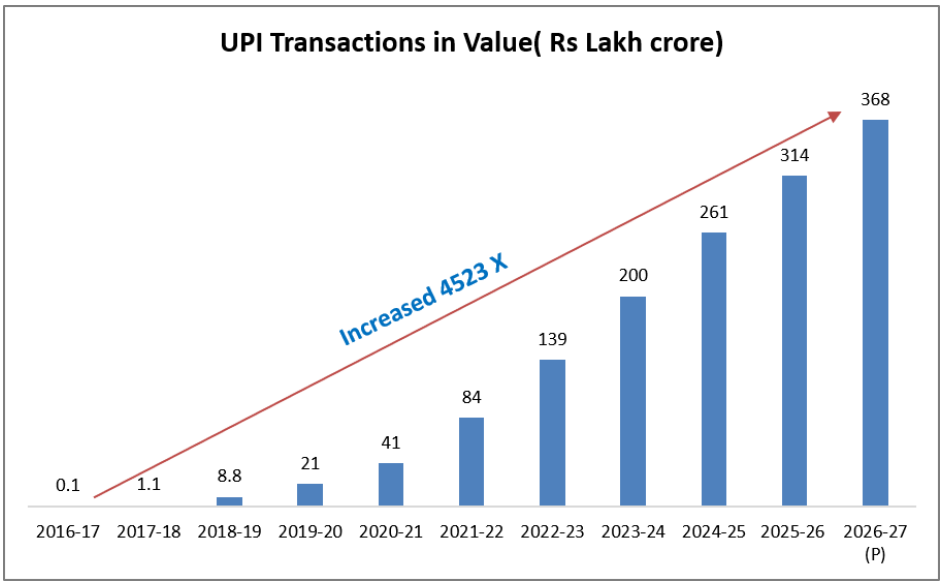
the capital position of the banks remained healthy, with aggregate CRAR of 17.8% as at end June 2026, compared to 13.0% in end-March 2013. Liquidity buffers were robust, with an LCR of 126.94% as of end June 2026. The RoA and RoE in June 2026 stood at 1.32% and 13.23% compared to -0.2% and -1.9 % respectively in 2017-18. With this the current banking structure in India can be termed as a "golden period" of health, marked by clean balance sheets, decadal-low NPAs, and robust profitability after years of repair work unleashed after 2014.

The COVID-19 shock tested the reforms. Regulatory moratoria, restructuring windows, liquidity support and the Emergency Credit Line Guarantee Scheme (ECLGS) protected viable borrowers and preserved credit flows. Unlike earlier episodes, the banking system entered the recovery with better capital, higher provisioning and stronger recognition standards. The ECLGS (1.0 to 4.0) scheme was a huge success with 1.2 crore guarantees issued of Rs 3.7 lakh crore. As per the research report by *SBI Special Report*, at least 13.5 lakh MSMEs (93.7% of which are in Micro and Small category) accounts were saved due to ECLG scheme (including the 2 lakh restructured accounts eligible for ECLG credit). In absolute terms, MSME loan accounts worth Rs 1.8 lakh crore (including Rs 12,000 crore of restructured) have improved during the period. This means that around 14% of the outstanding MSME credit (including 2% of restructured) has been saved from slipping into NPA because of the ECLG scheme. If such units had slipped into NPA, 1.5 crore workers would have become unemployed.

Financial inclusion is now a central pillar of banking policy. The Pradhan Mantri Jan-Dhan Yojana (PMJDY), supported by Aadhaar, mobile connectivity, business correspondents (BC) and direct benefit transfers (DBT) have brought millions of households into the formal financial system. As of July 2026, more than 59 crore beneficiaries have been brought into the formal banking system under PMJDY, with deposits exceeding Rs 3 lakh crore. Women account holders constitute nearly 56% of the total, while almost 78% of accounts are in rural and semi-urban centres, reflecting the programme's success in reaching the most underserved sections of society. PSBs account for ~77% of PMJDY accounts, reflecting their pivotal role in driving financial inclusion, followed by RRBs, which account for ~19% of the total accounts. The RBI composite Financial Inclusion Index (FI-Index) has increased to 70 in March 2026, compared to 43.4 in March 2017. This highlights the continuous dedication of government to include every citizen in the growing digital financial infrastructure of the country.



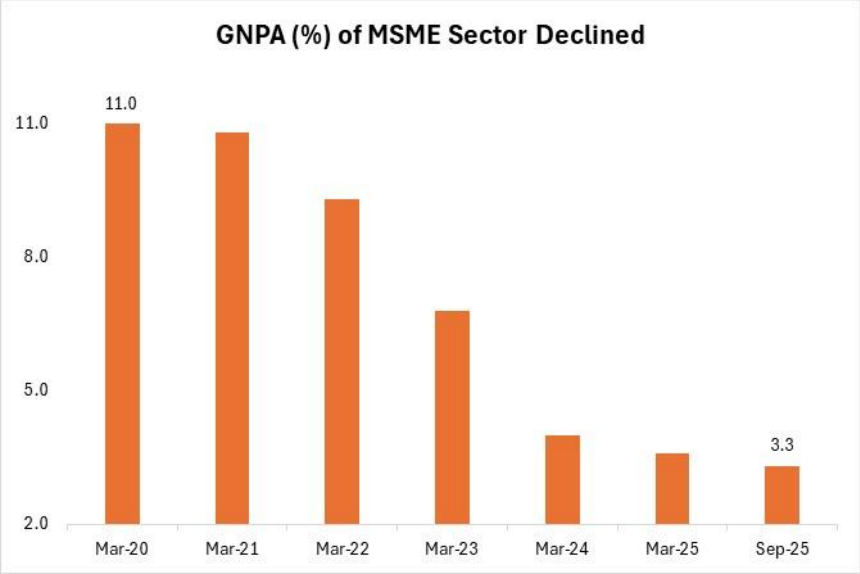
Source: PMJDY Website, RBI, SBI Research



Source: NPCI, SBI Research

The Unified Payments Interface (UPI), launched in 2016 has transformed the relationship between banks, customers and merchants. In FY26, UPI processed about 24,162 crore transactions valued at roughly Rs 314 lakh crore, which is handling ~85% of the retail transactions of the country. Low-cost, interoperable payments have reduced transaction frictions, formalised small-business activity and enabled new financial products. For banks, however, digital scale has also increased the importance of fraud prevention, data protection, operational continuity and sustainable business models for payment services. The recent amendment to the Payment and Settlement Systems Act (PSS Act) aims to ensure UPI's long-term sustainability, technological advancement, and resilience against emerging risks.

International experience offers useful lessons. Brazil's PIX ecosystem operates with merchant charges estimated around 0.33%, while merchant charges in China's digital payment market are estimated at approximately 0.40%. This indicates that a reasonable MDR framework can coexist with widespread adoption and continued ecosystem growth.



Source: RBI, SBI Research

Further, to tide over the challenges arising from the West Asia conflict, the Union Cabinet has approved ECLGS 5.0 on 5 May 2026. The de-risking mechanism of ECLGS is strong incentive for flow of funds to industry. Till 21 July 2026, 5.17 lakh guarantees issued with guaranteed amount reaching over Rs 1.90 lakh crore under the scheme.

2.3 Agenda Ahead

Since FY23, credit growth has consistently surpassed the deposits growth, which has resulted in gap widening to 5% in July 2026. This raises concerns among the banks to finance the credit demand, which has pushed up their CoF as they have to depend on other sources of funding like CDs, Money Market including TREPs, Bonds (local/overseas) etc. Going forward, the agenda for banks to mobilise stable deposits to support credit expansion, avoid excessive concentration in unsecured retail or rapidly growing segments, deepen productive lending to micro, small and medium enterprises (SMEs), infrastructure and green investment, and improve climate-risk assessment. Additionally, banks must also strengthen board governance, talent, customer grievance redressal and cyber defence.

3. Review of Literature

The table below documents the existing literature on estimating banking sector efficiency and productivity across countries, including India.

Table 4: Review of Banking Efficiency and Productivity Studies

Study	Sample/Period	Methodology	Key Findings
Dar et al. (2021), India	Indian banks, 2014-2020; public/private ownership; NPAs treated as an undesirable output.	DEA, Malmquist Productivity Index (MPI), stochastic frontier analysis (SFA), and Tobit regression.	Private banks recorded higher DEA efficiency scores; productivity declined over 2014-2020; higher NPAs adversely affected efficiency.
Kumar & Kar (2021), India	19 Indian commercial banks, 2013-2018.	Output-oriented DEA-based MPI using the intermediation approach.	Productivity change was decomposed into technical efficiency, pure technical efficiency, scale efficiency, technological change, and total factor productivity (TFP).
Shah et al. (2022), South Asia	147 commercial banks across South Asian countries, 2013-2018.	DEA meta-frontier and MPI.	Average technical efficiency was low; Nepalese banks led the region; overall TFP declined slightly, including in India and Bangladesh.
Sachdeva & Sivakumar (2022/2023), India	70 Indian commercial banks, 2005-2017.	DEA-based Malmquist Productivity Index.	Only 44% of banks recorded positive TFP growth; private banks benefited more from technological change, while public banks had greater scope for improvement.
Tiwari et al. (2023), India	36 BSE-listed banks, 2005-2019.	DEA-MPI followed by value-added intellectual coefficient (VAIC) analysis and system GMM.	Productivity growth was driven mainly by efficiency change; intellectual capital, human capital, and capital employed supported productivity.
Gulati et al. (2023), India	Indian banks before and during COVID-19, 2014/15-2020/21.	Two-stage directional-distance network DEA incorporating undesirable outputs.	Indian banks were broadly resilient to the initial COVID-19 shock, although large and medium-sized banks lost some operating efficiency.
Kundu & Banerjee (2025), India	35 scheduled commercial banks, 2010-2019.	DEA, Tobit, Malmquist DEA, and seemingly unrelated regression (SUR) models.	Public-sector bank productivity improved over the decade, but operating performance remained weaker than that of private banks.

Table 4: Review of Banking Efficiency and Productivity Studies			
Study	**Sample/Period**	**Methodology**	**Key Findings**
Jain et al. (2025), India	15 private-sector and 20 public-sector banks, 2009-2019.	DEA-based Malmquist Productivity Index.	TFP growth was concentrated in 2011 and 2019; public-sector banks adapted better to technical change, while many private banks faced scale and managerial inefficiency.
Arora et al. (2025), India	Public-sector banks, 2004/05-2018/19.	Slack-based DEA with NPAs as an undesirable output; panel regression.	Efficiency measurement improved when NPAs were treated as an undesirable output; efficiency declined in later years; the cost of deposits and capital adequacy affected efficiency.
Zhu et al. (2021), Pakistan	Private, public, and foreign banks in Pakistan, 2006-2017.	DEA and MPI.	Operational efficiency and productivity differed across ownership groups, and efficiency outcomes did not necessarily align with productivity outcomes.
Mai et al. (2023), Islamic banks	79 Islamic banks in 16 countries, 2005-2020.	Two-stage DEA double-frontier analysis.	Islamic banking efficiency increased over time and remained resilient during COVID-19; economic development supported efficiency.
Gökgöz et al. (2023), Turkey	Turkish banks; resource and profit stages of the banking production process.	Two-stage DEA and MPI.	Average resource efficiency exceeded profit efficiency; the results indicated scope for both technological and technical improvement.
Stubelj et al. (2023), CEE	181 commercial banks in 11 Central and Eastern European (CEE) countries, 2013-2018.	Malmquist Productivity Index using asset- and profit-oriented intermediation approaches.	Asset-oriented results showed productivity declines in many countries, while profit-oriented results showed growth, demonstrating that the choice of output matters.
Istaiteyeh et al. (2024), Jordan	15 Jordanian banks, 2006-2021.	Variable returns to scale (VRS) DEA and Tobit regression.	ROA, ROE, and GDP growth were associated with efficiency; Islamic banks were more efficient than conventional banks.
Wang et al. (2024), China	42 listed Chinese commercial banks, 2015-2021.	Three-stage DEA and Tobit regression, incorporating undesirable outputs.	Adjusted efficiency scores were higher after controlling for environmental factors and random error; bank size, innovation, profitability, and development capacity improved efficiency.

Table 4: Review of Banking Efficiency and Productivity Studies			
Study	**Sample/Period**	**Methodology**	**Key Findings**
Skvarciany & Jureviciene (2024), Lithuania	Lithuanian commercial banks and deposit institutions during the pandemic and post-pandemic period.	Input-oriented constant returns to scale (CRS) DEA and Malmquist Index.	Efficiency varied across institutions, but all models indicated overall productivity growth, reflecting technological advancement.
Amirteimoori et al. (2024), Iran	15 Iranian banks, 2014-2021.	Firm-specific stochastic DEA-based Malmquist model and double-bootstrap DEA.	The NPL ratio and branch numbers were negatively associated with efficiency and productivity; the study illustrates a stochastic/contextual extension of DEA.
Abel et al. (2024), SADC	Banks in the Southern African Development Community (SADC) region.	Two-stage DEA and Tobit regression.	Banks were relatively inefficient; efficiency was associated with capitalization, size, research costs, and automation.
Alsharif (2024/2025), Saudi/GCC dual banking	Conventional and Islamic banks in major dual-banking markets during crisis periods.	Cost Malmquist/Global Cost Malmquist indices with complementary parametric tests.	Islamic banks showed resilience during crises, although liquidity sensitivity remained important; the cost-productivity perspective complements standard DEA-MPI analysis.
Wu et al. (2026), Cambodia	52 Cambodian commercial banks.	Enterprise Competitiveness Index, two-stage DEA, and back-propagation neural network (BPNN).	The hybrid approach distinguishes technical efficiency from competitiveness and predicts profitability using machine-learning support.
Prithwis De (2004), India	Indian commercial banks, 1985-86 to 1995-96 (panel data).	Stochastic frontier production function with Cobb-Douglas technology.	Bank efficiency improved only marginally after liberalization; foreign banks were the most efficient ownership group.
Das, Nag, & Ray (2005), India	Major Indian commercial banks, 1996/97-2002/03 (71 banks initially; 68 in the final year).	Non-parametric DEA covering technical, cost, revenue, and profit efficiency.	Technical and cost efficiencies differed little across banks, whereas revenue and profit efficiencies varied more; median efficiency generally improved during the reform period.
Sujeesh Kumar S. (2013), India	Public-, private-, and foreign-sector banks operating in India, 2005-2012.	Non-parametric DEA and Malmquist Productivity Index.	Indian banking productivity increased during 2008-2010, but growth weakened in subsequent years.

Table 4: Review of Banking Efficiency and Productivity Studies			
Study	**Sample/Period**	**Methodology**	**Key Findings**
Jayaraman & Srinivasan (2014), India	Indian banks, 2005-2012.	Nerlovian profit indicator approach incorporating NPAs as an undesirable output	Profit inefficiency was driven primarily by allocative inefficiency, with technical inefficiency playing a smaller role.
Ulas & Keskin (2015), Turkey	Turkish commercial banks, 2005-2013.	DEA measuring technical, pure technical, and scale efficiency	State-owned banks were more efficient than privately owned banks.
Kaur & Gupta (2015), India	57 Indian banks (8 SBI-group, 19 nationalized, and 30 private-sector banks), 2009-2013.	Non-parametric frontier DEA	The SBI group recorded the highest average efficiency, followed by private-sector banks and nationalized banks.
Kumar & Singh (2015), India	10 Indian commercial banks (5 public and 5 private), 2006-2010.	CCR (constant returns to scale) and BCC (variable returns to scale) DEA models.	Efficiency improved after deregulation; private banks outperformed public banks, and scale inefficiency was the main source of inefficiency.
Maity & Sahu (2022), India	Public-, private-, and foreign-sector bank groups in India, 2009/10-2018/19.	DEA from revenue and financial-inclusion supply-side perspectives; Friedman test	Foreign banks were the most efficient on average, followed by private and public banks; differences across the three groups were not statistically significant.
Kaur, Shrivastav, & Oberoi (2022), India	Public- and private-sector Indian banks, 2000-2018 (up to 838 bank-year observations).	Survival analysis using the Cox proportional hazards model	Smaller banks faced a significantly higher failure risk; failure risk did not differ significantly between public- and private-sector banks.
Ghosh & Parida (2024), India	43 banks (12 public-sector, 19 private-sector, and 12 foreign banks), 2005/06-2022/23.	Data envelopment analysis (DEA)	Bank efficiency generally improved, except in the COVID-19 year FY21. Public-sector banks outperformed private and foreign banks. Productivity improved overall, although takeovers of weaker banks affected the efficiency and productivity of acquiring banks.

4. Objectives of the Study

The objective of this paper is as under

- Recent Reforms & its Impact on performance of Indian banking sector
- Impact of the reforms and regulatory measures on efficiency and productivity of banks
- To evaluate the relative efficiency of banks in India, along with bank group-wise efficiency
- Measuring productivity change during the period

5. Data, Variables & Methodology

5.1 Data and Sources

This study considers period between FY15 to FY26 (12-Years), when the Indian banking sector underwent major structural reforms to overcome the crisis led by AQR. This period was identified because during this period Government and RBI apart from AQR exercise has taken numerous steps, like Bankruptcy Code, 2016 (IBC), creation of National Asset Reconstruction Company Limited (NARCL), Recapitalisation of PSBs, Merger & Consolidation among PSBs, reforms in many banking operations like comprehensive and automated Early Warning Systems (EWS), enhancing the bank efficiency through digitalisation of process and product and payment systems like UPI.

The sample consists of 47 banks (12-PSBs, 21 Private Banks and 14-FBs) listed in appendix, having operations consistently in all the years of the sample period FY15 to FY26 (12-Years). The primary source of the data used is RBI's Handbook of Statistics on Indian Economy, Statistical Tables Related to Banking and other reports like Annual reports, Trends and Progress of Banking, Financial Stability Report etc. To get the latest data, Individual banks Annual Report and other Quarterly public disclosers has been followed.

As many banks were merged during the study period, we have merged the earlier year's data to have a better comparison. The selected 47 banks for our study cover more than 95% of the assets of the banking system. The selected 14-FBs cover more than 80% of the assets of the total foreign banks in India. Many small banks, both in foreign and private, category have been ignored as data is not available for all the years.

5.2 Selection of Variables

An important step in efficiency analysis is the selection of input and output. Indeed, the result can be misleading or meaningless if these are not properly defined. This problem is especially acute in the service sector such as banking etc., where many outputs are intangible, and many

prices are implicit resulting in measurement difficulties. The best way to resolve this is to identify the services provided by such institutions and find measurable proxies that are highly correlated with those services. There has been considerable disagreement in the literature over the appropriate proxies to be used as the output for the banking services. Different sets of variables are considered in the existing literature to analyze efficiency of banks.

We have selected the variables in table 5, on the basis that the efficiency measurement is focussed on internal control and productivity of banks. However, banks in practice uses various resources to serve their customer. According to existing literature, the input and output in DEA model should be limited to get accurate results.

Table 5: Choice of Input and Output Variables

Nature of Variable	**Variable Name**	**Variable Description**
Input Variables	Fixed Assets (FA)	Fixed assets of the bank
	Borrowings (BOR)	Borrowings by the bank
	Operating expenses (OPEEXP)	Operating Expenses of the bank
	Employees Cost (EMPLCOST)	Payments to and provisions for employees
Output Variables	Investments (INV)	Investments by the Bank
	Advances (ADV)	Advances by the Bank (Loans)
	Deposits (DEP)	Total Deposits of the Bank
	Profit (PROFIT)	Net Profit/Loss of the Bank

Source: Author's estimates

5.3 Methodology

This study employs DEA and MPI to assess the efficiency and change in productivity of banks in India for the period, FY15 to FY26 (12-Years). The DEA is employed mainly due to two reasons. *Firstly,* it decomposes technical efficiency (TE) to pure technical efficiency (PTE) and scale efficiency (SE). *Secondly,* the DEA based Malmquist approach measures the productivity and efficiency over time. Thus, the use of DEA permits us to use the same methodology consistently throughout the paper. To estimate the results, the study employs *DEA-Solver Software Pro-8.0 version* to measure the TE, SE, PTE and MPI index as well the Catch-up & Frontier-shift of the 47 banks of the study period.

5.3.1 *EfficiencyMeasurement*

The research design calls for the assessment of the relative technical efficiency (TE) of each bank considered in the sample, and the identification of the main sources of inefficiency. The TE can be further decomposed into two efficiency indices to determine the sources of overall technical inefficiency. The first one is pure technical efficiency (PTE) index, which determines the efficiency of the banks relative to a frontier that exhibits constant as well as variable returns to scale (VRS). The other index, the SE index, measures whether the banks operate at constant returns to scale (CRS) or at increasing or decreasing returns to scale.

In practice, the TE scores are obtained by running the original DEA model under the CRS assumption, known as the CRR model (Charnes *et al.1978*). The PTE scores are obtained by running the DEA model under assumption of variable returns to scale (VRS), known as BCC model (Banker *et al. 1984).*

DEA Models: CCR & BCC Model

The CCR model of Charnes, Cooper and Rhodes (1978) and the BCC model of Banker, Charnes and Cooper (1984) are the two classical radial DEA specifications used in banking. CCR assumes constant returns to scale (CRS) and measures overall technical efficiency. BCC adds a convexity restriction, allows variable returns to scale (VRS), and measures pure technical efficiency. This distinction is important in bank studies because banks differ in size, ownership, branch networks, regulation, and market coverage.

Let there be n banks or DMUs. Bank j uses inputs x_{ij}, i = 1,...,m, to produce outputs y_{rj}, r = 1,...,s. For the bank under evaluation, DMU o, λ_j is the peer weight and θo is the radial input-efficiency score. Under input orientation, $\theta_o < 1$ indicates that inputs could be proportionally reduced while maintaining the same output levels.

Input-oriented CCR envelopment model (CRS)

$$\min_{\theta,\lambda} \quad \theta_o$$

$$\text{s.t.} \quad \sum_{j=1}^{n} \lambda_j x_{ij} \le \theta_o x_{io}, \quad i = 1, \ldots, m$$

$$\sum_{j=1}^{n} \lambda_j y_{rj} \ge y_{ro}, \quad r = 1, \ldots, s$$

$$\lambda_j \ge 0, \quad j = 1, \ldots, n$$

In the CCR model, $\theta_o = 1$ means the bank lies on the CRS frontier, while $\theta_o < 1$ means it is inefficient. Because CRS is assumed, the CCR score combines managerial efficiency and scale effects.

Input-oriented ***BCC envelopment model (VRS)***

$$\min_{\theta,\lambda} \quad \theta_o^{BCC}$$

$$\text{s.t.} \quad \sum_{j=1}^{n} \lambda_j x_{ij} \le \theta_o^{BCC} x_{io}, \quad i = 1, \ldots, m$$

$$\sum_{j=1}^{n} \lambda_j y_{rj} \ge y_{ro}, \quad r = 1, \ldots, s$$

$$\sum_{j=1}^{n} \lambda_j = 1$$

$$\lambda_j \ge 0, \quad j = 1, \ldots, n$$

The BCC model differs from CCR by the convexity condition $\Sigma\lambda_j = 1$. The bank is compared with a convex combination of similar observed banks, so the resulting score is interpreted as pure technical efficiency.

Scale-efficiency relationship

$$SE_o = \frac{OTE_o}{PTE_o} = \frac{\theta_o^{CCR}}{\theta_o^{BCC}}, \quad 0 < SE_o \le 1$$

Scale efficiency close to one suggests that the bank operates near the most productive scale size. A lower value suggests that the bank may be too small or too large relative to the CRS frontier. Therefore, reporting CCR, BCC, and scale-efficiency scores together helps distinguish inefficiency caused by poor resource management from inefficiency caused by inappropriate operating scale.

Any significant difference between the TE and PTE scores indicates the existence of scale inefficiency, a deviation from operating at the appropriate scale. The SE scores can be computed by means of the ratio of the overall TE to that of PTE, as explained in Coelli *et al. (2005)*

Technical* Efficiency = *Pure Technical Efficiency x Scale Efficiency

$$TE = PTE \times SE$$

$$SE = TE_{CRS} / PTE_{vrs}$$

In this study we use the input-oriented model, which aims at minimizing input consumed by the DMUs for the same target of outputs. The DMU is efficient when the score is 1 and all slacks are 0 (Cooper et al, 2006). A DMU is an inefficient or low-efficiency level for a score < 1. For example, a value of 0.80 of a DMU indicates that 20% reduction of all inputs (while maintaining the output level) would be needed to reach efficiency.

5.3.2 Productivity Change: Malmquist Productivity Index (MPI)

To see the productivity change over the years, this study used the Malmquist Productivity Index (MPI) introduced by *Caves, Christensen and Diewert (*1982*)*, which is a normative measure constructing a production frontier representing the technology and uses the corresponding distance functions evaluated at different input-output combinations for productivity comparisons that is by comparing the proportion of output to input over two periods of time. DEA-MPI studies are commonly associated with Malmquist (1953) and the productivity decomposition popularized by Färe et al. (1994).

Let D_0^t (x, y) denote the output distance function relative to the production frontier in period t. For a bank observed in periods t and t+1, a standard DEA-based output-oriented Malmquist Productivity Index can be written as:

Output-oriented Malmquist Productivity Index (MPI)

$$M_0^{t,t+1} = \left[\frac{D_0^t(x^{t+1}, y^{t+1})}{D_0^t(x^t, y^t)} \times \frac{D_0^{t+1}(x^{t+1}, y^{t+1})}{D_0^{t+1}(x^t, y^t)} \right]^{1/2}$$

Under this convention, MPI > 1 indicates total factor productivity growth, MPI = 1 indicates no productivity change, and MPI < 1 indicates productivity decline. The same idea can be adapted to input-oriented distance functions, but the orientation and interpretation must be stated clearly in the empirical study.

In practice, as reported in Cooper *et al.* (2007), MPI is further decomposed into two components, namely a *catch-up index and a frontier-shift index*. The catch-up index measures the efficiency change, while frontier shift index measures the technological change. It evaluates

the productivity change of decision-making units (DMUs), the bank in our case, between two time periods. The catch-up (recovery) term relates to the degree to which a DMU improves or worsens its efficiency, while the frontier-shift (or innovation) term measures the change in the technology in the sector formed by the DMUs considered in the sample, the banking industry in India in the case of this study.

MPI = (Catch-up) x (Frontier-shift)

The interpretation of the indices obtained from the decomposition of the MPI is:

- **A (catch-up)>1;** indicates progress in relative efficiency from period t to t+1. While (catch-up) =1 and (catch-up) <1; indicate no change and regress in efficiency, respectively.
- **A (frontier-shift)>1;** indicates progress in the frontier technology around the corresponding DMU from the period t to t+1. While (frontier-shift) =1 and (frontier-shift) <1; indicate the status quo and regress in the frontier technology, respectively.
- **A value greater than 1 (MPI>1)** implies that total factor productivity progress has occurred, while MPI values of less than 1 (MPI<1) and equal to 1 (MPI=1) indicates deterioration in total factor productivity and no productivity change respectively.

6. Empirical Results & Discussion

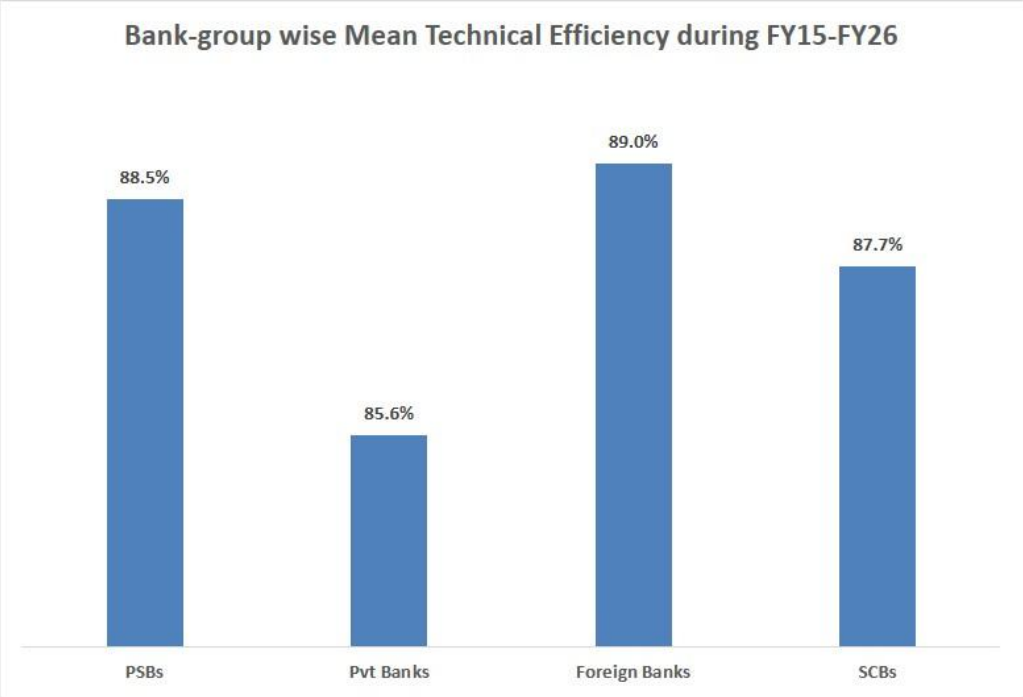
As we have measured efficiency and productivity, both the results are discussed separately, before comparing with each other.

6.1 Measurement *of Technical Efficiency (TE) and its Classification*

The analysis of efficiency in DEA is based on the input oriented vs. output oriented. In this study, the *DEA results are based on the input-oriented model, which aims to minimise the inputs to produce the same level of output.* The model was run twice, once under the CRS assumption and then under the VRS assumption. CRS assumes that there is no significant relationship between the scale of operations and efficiency, thus small banks can be as efficient as large banks in converting the specified inputs into the specified outputs. DEA under VRS assumption is run to check for scale inefficiency. The scale inefficiency should be understood as disproportional change in output compared with any change in inputs.

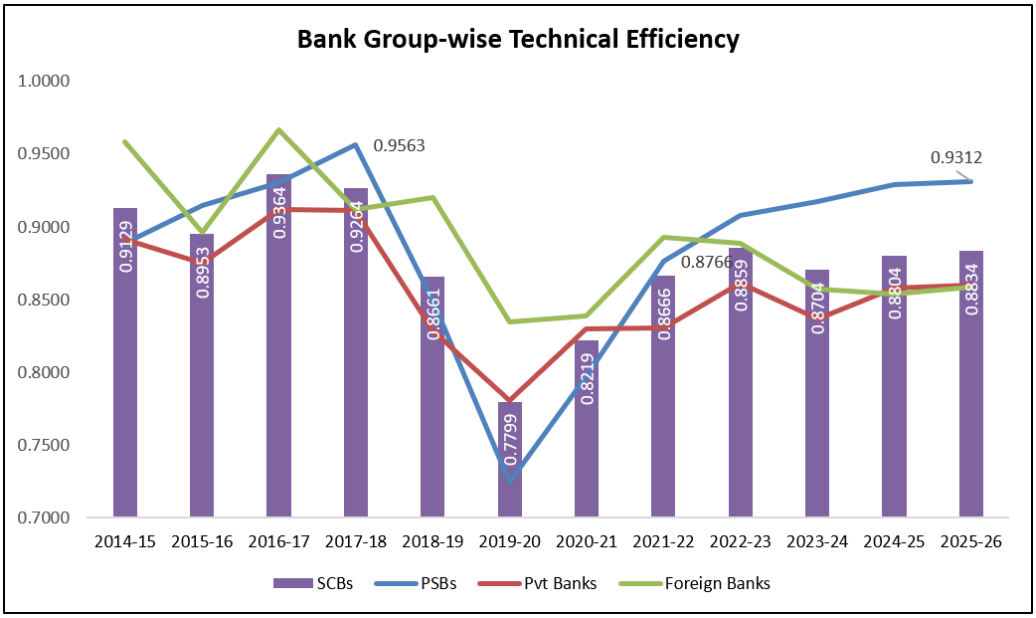
The CRS efficiency score of each bank measures its TE, which indicates the inefficiencies due to the input/output (I/O) configuration and the size of operations. On the other hand, VRS efficiency score represents pure technical efficiency (PTE) that is the measure of efficiency,

after eliminating the scale inefficiency. Therefore, SE score is calculated by dividing the TE score by the PTE score (SE = TE/PTE).



Source: Author's Calculations

- ***Technical Efficiency (TE):*** The estimated results indicate that the mean technical efficiency of the SCBs was at 91.29% in FY15 but declined thereafter to 77.99% in FY20, which may be due to a number of issues like higher NPAs, Covid-19 pandemic, Mergers & Acquisition etc but increased thereafter to 88.59% in FY23 and remained above that till now and is at 88.34% in FY26. During the full sample period FY15 to FY26, the overall banking industry operates at 87.7% level, i.e., inputs can be reduced by 12.3% corresponding to the same level of output. The bank group wise results for FY15 to FY26 indicate that public sector banks (PSBs) efficiency has declined to 72.46% in FY20 with the onset of COVID but improved smartly more than 20% upward to 93.12% in FY26 with subsequent capital infusion and technological upgradation in select PSBs. Private banks reached the low level of 78.03% in FY20 but recovered around 8% to 86.02% in FY26. Foreign banks (FBs) efficiency remained 83-85% during FY20 to FY26. Further, it is interesting to know that the performance of PSBs is in a better position compared to private banks, especially during the last 3 years, i.e., FY24 to FY26.



Source: Author's calculations

In relative performance of individual banks, among PSBs, SBI performs relatively better and scored 97.49% during the full sample period FY15-FY26, followed by Bank of Maharashtra (BoM) at 90.49%. Among the private banks, HDFC bank has scored 97.54% followed by IDBI Bank at 96.51%. Among foreign banks, HSBC & JP Morgan has scored 1, in TE. During the whole study period FY15 to FY26, in terms of TE, JP Morgan and HSBC has been ranked at 1st place followed by Citi Bank at 3rd, HDFC Bank at 4th and SBI at 5th position. The FBs efficiency is better than the domestic banks mostly due to their prevalent business models

The study found in 2026; out of 47 banks 15 banks are technical efficient scoring 1. As we estimated an input-oriented model, so there is a need to cut down the inputs to produce the same level of output, which can be done through budget benchmarks, cost rationalisation etc. The minimum and maximum numbers indicate that there is a divergence in TE among banks. The lowest TE score is 40% in 2021-22 of DBS Bank India Limited, which may be due the merger of Laxmi Villas Bank (LVB) with DBS in 2020.

The below table 6 highlights technical efficiency of the bank groups in 4-periods:

- PSBs are relatively more efficient than private banks except FY19-FY22, which may be due to merger and rationalisation of business, branches, and employees.
- Despite many structural changes, PSBs are operating at 88.53%, compared to SCBs at 87.71%.

- In overall study period, pvt banks operating at 85% level, which is primarily due to DCB Bank and IDFC First Bank. It seems takeover of weaker banks affected the efficiency in private sector.

Table 6: Bank-Group-wise Average Technical Efficiency				
Bank Group	FY15-FY18	FY19-FY22	FY23-FY26	FY15-FY26
PSBs	0.9226	0.8119	0.9215	**0.8853**
Pvt Banks	0.8974	0.8254	0.8540	0.8562
FBs	0.8063	0.8637	0.8646	0.8898
SCBs	**0.9333**	**0.8386**	**0.8800**	**0.8771**
Source: Author's Calculation				

- The technical efficiency ***divided*** into two parts ***(i) Pure technical Efficiency (PTE) and Scale Efficiency (SE).*** The PTE is termed as managerial efficiency and the results reveal many banks are efficient and score 1. The bank group-wise results indicate that all the bank group are efficient in terms of PTE. Among the 12-PSBs, SBI has scored 1 in all the years during FY15 to FY26, while in Pvt Banks HDFC Bank has scored 1 in all the years and among the foreign banks HSBC, DB, JP Morgan & Citi Bank has scored 1 and efficient in PTE. The mean score of the sample banks indicates that during the whole study period starting from FY15 to FY26, the PTE score was above 90%, highest of 97.37% in FY19 and minimum 91.44% in FY26. This indicates that in returns to scale most of the banks performed well. If we look the individual banks relative PTE, DBS bank scored 0.4222 in FY22, which is minimum among all the banks, which may be due the merger of the Laxmi Vilas Bank with itself in 2020.
- ***Scale Efficiency:*** In SE results indicate many banks are inefficient. Out of the sample 47-banks, only 7 banks are scale efficient in 2025-26, compared to 21 banks in FY15. However, if we look the year-wise mean numbers, which is consistently scored above 95% till the year FY18 but declined thereafter to 82.86% in FY20 but improved to 95.50% in FY26. Among the PSBs, SBI has scored 97.49% in SE during the whole study period FY15-FY26, followed by PNB at 94.55%. Among, private banks HDFC bank scored 97.54% followed by IndusInd Bank at 97.68%. JP Morgan has scored 1.0.

Further, the contribution of scale inefficiency in overall technical inefficiency has been observed to be smaller than what been observed due to managerial inefficiency (i.e., pure technical inefficiency).

6.2 Productivity Change: Results from Malmquist Productivity Index

To measure productivity change, we followed the input oriented MPI approach. While working with Malmquist indices, it is important to adopt an assumption with respect to the returns to scale of the underlying technology, with the choices generally being CRS and VRS. However, *Ray and Desli (1997)* show that the underlying assumption does not affect the overall Malmquist productivity index which is correctly measured by the ratio of CRS distance functions even when the underlying technology exhibits VRS. However, the return to scale benchmark does affect the decomposition of the index, which can be decomposed into indices representing pure efficiency change, technical change, and scale change.

To measure Malmquist Productivity Index (MPI) and the Catch-up & Frontier-shift efficiency measures, specification of outputs and inputs is essential; we use the same inputs and outputs used in the DEA Bank efficiency. To estimate the MPI index and its components for the 47 sample banks for the period FY15 to FY26, the study employs Malmquist-Radial Program in the DEA Solver-Pro-8.0 and adopted an *input-orientation with CRS,* which is in consistent with our approach in the DEA analysis of firm efficiency. The estimated results of MPI and its components are outlined in the tables below.

- **Catch-up Efficiency Scores:** The catch-up component of the MPI scores in annex table 4 indicates that out of the 47-Banks, not a single bank has scored consistently 1 over the years, indicating that no change in internal efficiency level. However, SCBs score indicates that there is consistent improvement in relative efficiency as the score rose from 0.7945 in FY15-16 to 0.9513 in FY25-26. Overall, during FY15-26, catch-up efficiency average score of SCB stood at 1.0212, highest contributed by PSBs 1.0118, followed by FBs 0.9238 and Pvt Banks 0.9589. By looking at the sample 47 banks, the overall catch-up efficiency score is at 1.0108, which indicate 1% increase in relative efficiency over the study period.
- **Frontier Shift Efficiency Scores:** The score of frontier-shift component of the MPI is presented in annex table 5, which indicates that PSBs has consistently improved the frontier shift scores from 0.9036 in FY15-16 to 1.1401 in FY25-26, which means there is an increase a relative improvement in technology. Among the PSBs, SBI has scored mostly above 1 in most of the years. The private banks attained frontier-efficiency scores above 1 only in patches but not on a consistent basis over the years. In the recent period PSBs are performing better than private banks in terms of frontier shifts. At the SCB level, the year-wise mean relative frontier-shift scores shows that there is a continuous improvement in the technology till FY21, there after it declined to 0.7634 in FY23, but improved after that

to 1.0087 in FY26. Interestingly, all the sample banks show a decline in frontier shift scores in FY23 and the yearly average declined to 0.6966, implying that technological innovations have already peaked in FY23 and the new breed of Artificial Intelligence and Machine Learning begets more innovations for banks in future that are yet to unfold fully. In principle, Indian banking system is currently moving towards cognitive banking system. A cognitive bank is enabled by AI and cognitive computing across all business functions and processes. By employing AI-enabled capabilities so broadly, a cognitive bank can personalize customer engagement through its ability to exploit continually deeper insights contextual understanding and real-time learning at the fraction of a time.

- **Malmquist Productivity Index:** The Malmquist Total Factor Productivity (TFP) Index indicates that the productivity change of the production point (X_{t+1}, Y_{t+1}) relative to the production point (Xt, Yt). The change in Malmquist total factor productivity index is the product of catch-up and frontier-shift effects. In the table below the year-wise and bank-wise relative Malmquist total factor productivity index scores are given. The estimated average MPI index of SCBs is at 0.43% (Score: 1.0043) for the entire period FY15 to FY26, which is negatively contributed by efficiency change (catch up) of 0.83% (Score: 0.9917) and technological change (frontier shift) of 1.27% (Score: 1.0127). The bank-wise MPI indicates a mixed result. The foreign banks average MPI during FY15 to FY26 indicate 2.64% growth in productivity, while PSBs average productivity declined by 1.96% (Score: 0.9804) but private banks average MPI index declined by 6.5% (Score: 0.9345).

Table 7: Malmquist Index of Total Factor Productivity (Average)

	ASCB				PSB			Pvt Banks			Foreign Banks		
year	Catch-up Efficiency	Frontier-shift Efficiency	Malmquist Index	MPI (Avg of Sample Banks)	Catch-up Efficiency	Frontier-shift Efficiency	Malmquist Index	Catch-up Efficiency	Frontier-shift Efficiency	Malmquist Index	Catch-up Efficiency	Frontier-shift Efficiency	Malmquist Index
FY14=>FY15	0.9515	1.0659	1.0142	1.0133	0.9849	1.0230	1.0076	0.9451	1.0761	1.0169	0.9186	1.3451	1.2356
FY15=>FY16	0.7945	1.1239	0.8930	1.0365	0.9814	0.9036	0.8868	0.7154	1.3613	0.9739	0.7884	1.3686	1.0789
FY16=>FY17	1.2495	0.8108	1.0130	1.1241	1.0080	0.9488	0.9564	1.3131	0.8386	1.1012	1.3012	1.1405	1.4840
FY17=>FY18	0.9892	0.9673	0.9568	1.0233	1.0342	0.9630	0.9959	1.0384	0.9349	0.9708	1.1121	0.7141	0.7942
FY18=>FY19	0.9165	1.1221	1.0285	1.1710	0.9210	1.0998	1.0129	0.9689	1.0710	1.0376	0.8541	1.2539	1.0710
FY19=>FY20	0.9858	1.0453	1.0304	1.0311	1.0440	0.9836	1.0269	0.9319	1.0416	0.9707	0.9341	1.2376	1.1560
FY20=>FY21	0.9172	1.1624	1.0661	1.0836	0.9054	1.1836	1.0717	1.0302	1.0695	1.1018	0.9090	1.1090	1.0081
FY21=>FY22	1.5811	1.0651	1.6841	1.1495	0.6789	1.5477	1.0508	0.9635	1.0341	0.9963	0.8725	1.0067	0.8784
FY22=>FY23	0.6392	0.7634	0.4880	0.6729	1.1796	0.5596	0.6601	0.6125	0.6855	0.4199	0.8885	0.6665	0.5922
FY23=>FY24	0.9660	1.0089	0.9746	1.0382	0.8475	1.1112	0.9417	0.9138	0.9586	0.8760	0.9330	1.0552	0.9845
FY24=>FY25	0.9586	1.0088	0.9671	1.0343	0.8256	1.1256	0.9294	0.9078	0.9523	0.8645	0.9284	1.0550	0.9794
FY25=>FY26	0.9513	1.0087	0.9596	1.0305	0.8037	1.1401	0.9163	0.9018	0.9460	0.8531	0.9238	1.0547	0.9744
Average	**0.9917**	**1.0127**	**1.0043**	**1.0340**	**0.9345**	**1.0491**	**0.9804**	**0.9369**	**0.9975**	**0.9345**	**0.9470**	**1.0839**	**1.0264**

Source: Authors Calculation

The sample banks mean productivity has increased by 3.40% (Score: 1.0340) for the entire period FY15 to FY27, which is contributed by efficiency change (catch up) of 1.08% (Score: 1.0108) and technological change (frontier shift) of 5.16% (Score: 1.0516).

Table 8: Bank Group-wise: MPI vs Technical Efficiency										
Year	ASCB				PSB		Pvt Banks		Foreign Banks	
	TE*	TE^	MPI*	MPI^	TE	MPI	TE	MPI	TE	MPI
FY15	0.9116	0.9129	1.0133	1.0142	0.8890	1.0076	0.8913	1.0169	0.9586	1.2356
FY16	0.8914	0.8953	1.0365	0.8930	0.9147	0.8868	0.8750	0.9739	0.8961	1.0789
FY17	0.9330	0.9364	1.1241	1.0130	0.9304	0.9564	0.9121	1.1012	0.9667	1.4840
FY18	0.9228	0.9264	1.0233	0.9568	0.9563	0.9959	0.9111	0.9708	0.9117	0.7942
FY19	0.8612	0.8661	1.1710	1.0285	0.8494	1.0129	0.8286	1.0376	0.9203	1.0710
FY20	0.7823	0.7799	1.0311	1.0304	0.7246	1.0269	0.7803	0.9707	0.8346	1.1560
FY21	0.8241	0.8219	1.0836	1.0661	0.7972	1.0717	0.8298	1.1018	0.8388	1.0081
FY22	0.8608	0.8666	1.1495	1.6841	0.8766	1.0508	0.8305	0.9963	0.8926	0.8784
FY23	0.8813	0.8859	0.6729	0.4880	0.9079	0.6601	0.8612	0.4199	0.8886	0.5922
FY24	0.8634	0.8704	1.0382	0.9746	0.9173	0.9417	0.8369	0.8760	0.8571	0.9845
FY25	0.8749	0.8804	1.0343	0.9671	0.9294	0.9294	0.8579	0.8645	0.8538	0.9794
FY26	0.8779	0.8834	1.0305	0.9596	0.9312	0.9163	0.8602	0.8531	0.8588	0.9744
Average	**0.8737**	**0.8771**	**1.0340**	**1.0043**	**0.8853**	**1.0145**	**0.8562**	**0.9646**	**0.8898**	**1.0226**
Source: Authors Calculation *Average of Sample Banks ^Full Banking Industry										

6.3 Comparison of Efficiency and Productivity of Indian Banking Industry

To compare the technical efficiency score and productivity change, we summarize the values of both TE and its components and MPI and its components in table 8 below. The technical efficiency of the sample banks indicates that efficiency of the banks improved to 0.8779 in FY26. Similarly, the MPI index also seen declining to 0.6729 in FY23 but improved thereafter to 1.0305 in FY26.

7. Limitations of the Study and Future Research

The limitations of the study entail the scope of future research. The study concerns specifically to the Indian banking system; therefore, its findings cannot be generalized to compare with other countries due to several factors such as geographical proximities, nature of operations and the ownership criteria. In consideration with a greater number of operational issues considering efficiency, the future study may further be directed in line with development of dynamic models; by analyzing bank-group wise relative efficiency separately in a more detailed manner like state-wise and bank-wise. As DEA has some methodological disadvantages like results are sensitive to the selection of inputs and outputs, high-efficiency values can be obtained by being truly efficient or having a niche combination of inputs/outputs. Further, DEA is good at estimating relative efficiency of a bank/DMU compared to the efficient bank but not indicating the theoretical efficiency level.

Separately, in addition to technology, the main differentiator for success in coming years will be human resources. With a dynamic and rapidly changing environment, the skill gap is widening. To address this, banks and financial institutions have to attract, train and retain talent. This is where capacity building will play a major role in the financial sector and future areas on productivity could specifically look at this aspect apart from how digitization could have impacted productivity.

8. Conclusion & Policy Implications

India's banking sector underwent a massive turnaround post 2014 from high NPAs and losses to robust health and record profitability with a series of reforms undertaken. To measure the impact of such reforms on efficiency, productivity and profitability, in this study, we selected 47-sample banks for the study period, FY15 to FY26 (12-Years). This paper employed DEA to calculate efficiency & productivity of the banks. The DEA score of 1 (0) indicates that the firm is efficient (inefficient). To see the productivity change over a period, the MPI was calculated. The MPI allows for changes in productivity to be broken down into changes in efficiency (catch-up index) and technological changes (frontier-shift index). If MPI > 1, it indicates a favourable development: MPI< 1 is a negative development, that is, a decline in TFP between two periods; and if MPI = 1, productivity remains unchanged.

The estimated results indicate that the mean technical efficiency (TE) of the sample banks at 77.99% in FY20 following the AQR review but increased thereafter to 88.59% in FY23 and remained above that till now and is at 88.34% in FY26. During the full sample period starting from FY15 to FY26, the overall banking industry operates at 87.7% level, i.e., inputs can be reduced by 12.3% corresponding to the same level of output. The bank group wise results for FY15 to FY26 indicate that public sector banks (PSBs) are operating at 88.5%, private banks (PBs) are operating at 85.6%, and foreign banks (FBs) are at 89.0%. It is interesting to know that the performance of PSBs were better compared to private banks during the last 12 years.

To measure the productivity change of the banks, the study used Malmquist Productivity Index (MPI) and the estimated average MPI index of SCBs is at 0.43% (Score: 1.0043) for the entire period FY15 to FY27, which is positively contributed by technological change (frontier shift) of 1.27% (Score: 1.0127). At the SCB level, the year-wise mean relative frontier-shift scores shows that there is a continuous improvement in the technology till FY21, a marginal drop till FY23 and currently at 1.0087 in FY26. This implies that technological innovations have already peaked in FY23 and the new breed of Artificial Intelligence (AI) and Machine Learning (ML) begets more innovations for banks in future currently unfolding.

Thus, the efforts made by the Government and RBI to bring efficiency and productivity in the Indian banking sector have achieved the objective, However, the takeover of the weaker banks impacted the efficiency and productivity of the acquiring banks. In future, bank digitization paired with artificial intelligence (AI) will increase efficiency by autonomous, self-optimizing ecosystems.

At last, not the least, though the concentration in the Indian banking industry is low, but the market share of the banks varies significantly, starting from 20% to below 1%. In this context, India should make efforts to consolidate the banks in such a manner that a few big banks of equal size would be created, without compromising market competition in the industry. This will help to support the growing credit need of the economy as India strives to be Viksit Bharat by 2047.

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Appendix 1

Bank-Wise Technical Efficiency (TE) Scores (CCR)													
Banks	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**FY15-FY26**
BANK OF BARODA	1	0.8524	0.9784	0.9317	0.7179	0.5950	0.6567	0.7508	0.8700	1	1	1	0.8627
BANK OF INDIA	1	0.9444	0.9652	0.9471	0.7258	0.6298	0.7697	0.8207	0.8602	0.8693	0.8645	0.8598	0.8547
BANK OF MAHARASHTRA	0.7824	0.9461	0.8324	0.9836	0.9458	0.6345	0.8673	0.8672	1	1	1	1	0.9049
CANARA BANK	0.9277	0.9482	0.9010	0.8967	0.7485	0.6400	0.7347	0.8575	0.9218	1	1	1	0.8813
CENTRAL BANK OF INDIA	0.6767	0.7845	0.8486	1	1	0.7605	0.9323	0.9118	0.8208	0.7211	0.7654	0.7097	0.8276
INDIAN BANK	0.9173	0.9144	0.8944	0.9050	0.8072	0.7033	0.7549	0.9308	0.9717	1	1	1	0.8999
INDIAN OVERSEAS BANK	0.8343	0.7230	0.7459	1	0.8076	1	0.8481	0.9793	0.9752	0.8750	0.8885	0.8402	0.8764
PUNJAB AND SIND BANK	0.8583	1	0.9986	1	0.9050	0.5718	0.7958	0.8617	0.8482	0.8305	0.8675	0.8830	0.8684
PUNJAB NATIONAL BANK	0.8122	0.9028	0.9999	0.8691	0.8178	0.6965	0.8237	0.9016	0.9326	1	1	1	0.8964
STATE BANK OF INDIA	0.9658	0.9610	1	0.9442	0.9030	0.9252	1	1	1	1	1	1	0.9749
UCO BANK	1	1	1	1	1	0.7319	0.6420	0.7553	0.7404	0.8601	0.9093	0.9585	0.8831
UNION BANK OF INDIA	0.8932	1	1	0.9985	0.8139	0.8073	0.7412	0.8821	0.9545	0.8511	0.8573	0.9235	0.8935
PUBLIC SECTOR BANKS	**0.8890**	**0.9147**	**0.9304**	**0.9563**	**0.8494**	**0.7246**	**0.7972**	**0.8766**	**0.9079**	**0.9173**	**0.9294**	**0.9312**	0.8853
AXIS BANK LIMITED	1	0.9907	1	0.9572	0.8557	0.9403	0.9091	0.8263	0.8779	0.8209	0.8639	0.8769	0.9099
BANDHAN BANK LIMITED		0.5133	1	1	1	0.8098	0.6779	0.7902	0.8210	0.8110	0.8262	0.8242	0.8249
CITY UNION BANK LIMITED	1	1	1	1	1	0.7340	0.9782	0.7274	0.8933	0.7389	0.7965	0.7540	0.8852
CSB BANK LIMITED	0.7511	1	0.7783	0.8908	1	0.9112	0.9657	0.9558	0.8814	0.8793	0.8581	0.8368	0.8924
DCB BANK LIMITED	0.7963	0.7917	0.7923	0.6754	0.5657	0.4829	0.5806	0.5344	0.6252	0.6469	0.6692	0.6914	0.6543
THE DHANALAKSHMI BANK LT	0.6801	0.8571	0.6864	0.8552	0.6781	0.6255	0.6676	0.6600	0.6497	0.6323	0.6233	0.6144	0.6858
FEDERAL BANK LTD	0.8598	0.8207	0.9088	0.8493	0.8168	0.5691	0.7427	0.6604	0.8811	0.9690	1	1	0.8398
HDFC BANK LTD.	1	0.8780	1	1	1	0.9994	0.9968	1	0.9107	0.95665	0.9636	1	0.9754
ICICI BANK LIMITED	0.9498	0.8897	0.9180	0.8812	0.7599	0.7094	0.8270	0.8232	0.8081	0.8912	1	1	0.8715
IDBI BANK LIMITED	1	1	0.9456	1	1	1	0.9389	0.9614	0.9426	0.9376	0.9317	0.9230	0.9651
IDFC FIRST BANK LIMITED		1	1	0.9738	0.96506	0.95196	0.9389	0.92575	0.91265	0.8995	0.88644	0.87334	0.9389
INDUSIND BANK LTD	0.8357	0.7668	0.8855	0.8458	0.8864	0.9400	0.9471	0.9947	0.9559	0.9429	0.9835	0.9380	0.9102
JAMMU & KASHMIR BANK LTD	1	1	1	0.9424	0.6229	0.6273	0.7575	0.6386	0.7938	0.7845	0.8027	0.8209	0.8159
KARNATAKA BANK LTD	0.9994	1	1	1	0.9026	0.5501	0.8330	0.7971	0.9688	0.9242	0.9621	1	0.9114
KARUR VYSYA BANK LTD	0.8521	0.8843	0.9942	0.8996	0.7410	0.8042	0.6305	0.7670	0.9457	0.7516	0.7330	0.7143	0.8098
KOTAK MAHINDRA BANK LTD	0.7404	0.6385	0.6986	0.7530	0.6530	0.8081	0.8178	0.8364	0.8748	0.8726	0.9353	0.9446	0.7978
NAINITAL BANK LTD	1	1	0.9977	0.9242	0.8695	0.8909	0.9219	1	0.7628	0.65624	0.5767	0.5971	0.8497
RBL BANK LTD	0.6276	0.6418	0.7105	0.7540	0.7749	0.8029	0.8261	0.8506	0.8750	0.8994	0.9238	0.9483	0.8029
SOUTH INDIAN BANK LTD	0.8416	0.8972	1	1	0.8440	0.5894	0.6453	0.7470	0.7259	0.8270	0.8673	0.9076	0.8244
TAMILNAD MERCANTILE BANI	1	1	1	1	0.7253	0.6403	0.8963	1	1	0.8006	0.8571	0.8186	0.8948
YES BANK LTD.	1	0.8052	0.8386	0.9313	0.7396	1	0.9263	0.9439	0.9787	0.9328	0.9545	0.9807	0.9193
PRIVATE SECTOR BANKS	**0.8913**	**0.8750**	**0.9121**	**0.9111**	**0.8286**	**0.7803**	**0.8298**	**0.8305**	**0.8612**	**0.8369**	**0.8579**	**0.8602**	0.8562
THE HONGKONG AND SHANG	1	1	1	1	1	1	1	1	1	1	1	1	1.0000
STANDARD CHARTERED BANK	1	1	0.7889	0.8276	0.6306	0.7328	0.6821	0.9508	0.6738	0.7564	0.7522	0.7481	0.7953
CITIBANK N.A	1	0.9547	1	1	1	1	0.9754	1	1	1	1	1	0.9942
DEUTSCHE BANK AG	1	1	0.9977	0.9242	0.8695	0.8909	0.9219	1	0.7628	0.85624	0.8767	0.8971	0.9164
JPMORGAN CHASE BANK NAT	1	1	1	1	1	1	1	1	1	1	1	1	1.0000
DBS BANK INDIA LIMITED	1	0.7078	1	0.6790	1	0.4282	0.4527	0.4012	0.4736	0.4573	0.4177	0.4782	0.6246
BANK OF AMERICA	0.7720	0.6304	1	0.8691	0.9943	1	1	1	1	1	1	1	0.9388
BNP PARIBAS	1	1	1	1	0.8414	0.6517	0.7331	0.8639	0.7760	0.8554	0.8768	0.8983	0.8747
BARCLAYS BANK PLC	1	1	1	0.7684	0.9153	1	1	1	1	1	1	1	0.9736
MUFG BANK LTD.	0.8717	0.8037	1	0.8620	0.9626	0.7750	0.8234	1	1	0.80603	0.94328	0.8263	0.8895
SUMITOMO MITSUI BANKING	1	1	1	1	1	1	0.9626	0.7750	0.8234	0.6449	0.5753	0.5057	0.8572
MIZUHO BANK LTD	1	1	0.7475	0.8331	0.9458	1	0.7699	0.8313	0.9804	0.7639	0.8167	0.8695	0.8798
CREDIT AGRICOLE CORPORAT	1	1	1	1	0.7253	0.6403	0.8963	1	1	0.92101	0.72869	0.8225	0.8945
AUSTRALIA AND NEW ZEALAN	0.7766	0.4486	1	1	1	0.5659	0.5259	0.6748	0.9504	0.9379	0.9660	0.9783	0.8187
FOREIGN BANKS	**0.9586**	**0.8961**	**0.9667**	**0.9117**	**0.9203**	**0.8346**	**0.8388**	**0.8926**	**0.8886**	**0.8571**	**0.8538**	**0.8588**	0.8898
ALL SCHEDULED COMMERCIA	**0.9129**	**0.8953**	**0.9364**	**0.9264**	**0.8661**	**0.7799**	**0.8219**	**0.8666**	**0.8859**	**0.8704**	**0.8804**	**0.8834**	0.8771
Memo:													
Mean (%)	0.9116	0.8914	0.9330	0.9228	0.8612	0.7823	0.8241	0.8608	0.8813	0.8634	0.8749	0.8779	0.8736
SD (%)	0.1102	0.1414	0.0998	0.0898	0.1264	0.1706	0.1400	0.1383	0.1190	0.1237	0.1352	0.1365	0.0792
Minimum (%)	0.6276	0.4486	0.6864	0.6754	0.5657	0.4282	0.4527	0.4012	0.4736	0.4573	0.4177	0.4782	0.6246
Maximum (%)	1	1	1	1	1	1	1	1	1	1	1	1	1
No of fully Efficient Banks	22	20	23	18	13	10	5	12	10	11	13	15	2

Appendix 2

Bank-Wise Pure Technical Efficiency (PTE)													
Banks	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**FY15-FY26**
BANK OF BARODA	1	1	1	1	0.9907	1	0.9960	0.9852	1	1	1	1	0.9977
BANK OF INDIA	1	1	1	1	0.9816	0.9957	1	1	0.9341	0.9874	0.9875	0.9877	0.9895
BANK OF MAHARASHTRA	0.7849	0.9902	0.9320	1	1	1	1	1	1	0.9755	0.9817	0.9880	0.9710
CANARA BANK	1	1	0.9142	1	0.9348	1	0.9696	1	1	0.9760	0.9746	0.9731	0.9785
CENTRAL BANK OF INDIA	0.7647	1	1	1	1	1	1	1	1	0.9725	0.9763	0.9801	0.9745
INDIAN BANK	1	1	0.9141	0.9915	1	1	1	1	1	0.9900	0.9895	0.9890	0.9895
INDIAN OVERSEAS BANK	0.9086	0.8196	0.9358	1	1	1	1	1	0.7546	0.9217	0.9229	0.9241	0.9323
PUNJAB AND SIND BANK	1	1	1	1	1	0.9774	1	0.9568	0.7867	0.9848	0.9903	0.9958	0.9743
PUNJAB NATIONAL BANK	0.9360	1	1	1	1	1	1	1	1	0.9958	0.9958	0.9957	0.9936
STATE BANK OF INDIA	1	1	1	1	1	1	1	1	1	1	1	1	1.0000
UCO BANK	1	1	1	1	1	1	0.8287	0.9077	0.8135	0.9169	0.9112	0.90552	0.9403
UNION BANK OF INDIA	0.9597	1	1	1	1	1	1	1	1	0.99737	0.99733	0.99729	0.9960
PUBLIC SECTOR BANKS	**0.9462**	**0.9842**	**0.9747**	**0.9993**	**0.9923**	**0.9978**	**0.9829**	**0.9875**	**0.9407**	**0.9765**	**0.9773**	**0.9780**	0.9781
AXIS BANK LIMITED	1	1	1	1	0.9810	1	0.9621	0.8630	0.9462	0.9506	0.9469	0.9431	0.9661
BANDHAN BANK LIMITED		0.5155	1	1	1	1	0.9262	1	0.7945	0.7752	0.7094	0.7435	0.8604
CITY UNION BANK LIMITED	1	1	1	1	1	1	1	0.8820	0.9783	0.9713	0.9691	0.9669	0.9806
CSB BANK LIMITED	0.7626	1	0.7828	1	1	0.4598	0.4949	0.5142	0.7062	0.6487	0.6399	0.6310	0.7200
DCB BANK LIMITED	0.8109	0.8017	0.7951	0.6800	0.6834	0.6209	0.7485	0.6323	0.6283	0.6641	0.6584	0.6528	0.6980
THE DHANALAKSHMI BANK LTD	0.6973	0.9211	0.7070	0.8686	0.6884	0.6279	0.6701	0.6942	0.7627	0.6533	0.6437	0.6342	0.7141
FEDERAL BANK LTD	1	0.9951	1	1	1	1	1	1	1	0.9966	0.9983	0.9876	0.9981
HDFC BANK LTD.	1	1	1	1	1	1	1	1	1	1	1	1	1.0000
ICICI BANK LIMITED	1	1	1	1	0.9660	0.8945	1	1	1	1	1	1	0.9884
IDBI BANK LIMITED	1	1	1	1	1	1	0.7914	0.8613	0.8326	0.8965	0.8886	0.8808	0.9293
IDFC FIRST BANK LIMITED		1	1	1	0.8290	0.5856	0.5077	0.5338	0.5819	0.5638	0.6892	0.7615	0.7320
INDUSIND BANK LTD	0.8374	0.8514	0.8855	0.8534	0.9205	0.9861	0.9537	1	0.8155	0.88107	0.87837	0.87567	0.8949
JAMMU & KASHMIR BANK LTD	1	1	1	1	1	1	1	0.8873	1	0.97717	0.97543	0.97368	0.9845
KARNATAKA BANK LTD	1	1	1	1	1	0.9342	0.9730	0.8993	1	0.96391	0.96124	0.95857	0.9742
KARUR VYSYA BANK LTD	0.8545	0.9661	1	0.9625	1	1	0.7558	1	1	0.9314	0.92865	0.92591	0.9437
KOTAK MAHINDRA BANK LTD.	0.7512	0.8451	0.8407	1	0.8485	0.8024	0.9462	1	1	0.9333	0.9418	0.9503	0.9050
NAINITAL BANK LTD	0.7512	0.6451	0.8407	1	0.8485	0.8024	0.9462	1	1	0.9157	0.9223	0.9289	0.8834
RBL BANK LTD	0.6281	0.6869	0.7681	0.8039	0.7949	0.8032	0.6975	0.7385	0.6845	0.63737	0.61981	0.60225	0.7054
SOUTH INDIAN BANK LTD	0.8526	0.9012	1	1	1	0.8929	0.8230	0.8306	0.7516	0.84346	0.83432	0.82518	0.8796
TAMILNAD MERCANTILE BANK LTD	1	1	1	1	1	0.7492	0.8359	0.9060	0.8871	0.9679	0.9763	0.9846	0.9422
YES BANK LTD.	1	1	1	1	1	1	0.8161	0.7029	0.7201	0.8539	0.8435	0.83318	0.8975
PRIVATE SECTOR BANKS	**0.8919**	**0.9109**	**0.9343**	**0.9604**	**0.9314**	**0.8647**	**0.8499**	**0.8545**	**0.8614**	**0.8583**	**0.8583**	**0.8600**	0.8863
THE HONGKONG AND SHANGHAI BANKING (	1	1	1	1	1	1	1	1	1	1	1	1	1.0000
STANDARD CHARTERED BANK	1	1	1	1	1	0.9996	1	1	1	0.99994	0.99993	0.99993	1.0000
CITIBANK N.A	1	1	1	1	1	1	1	1	1	1	1	1	1.0000
DEUTSCHE BANK AG	1	1	1	1	1	1	1	1	1	1	1	1	1.0000
JPMORGAN CHASE BANK NATIONAL ASSOCI	1	1	1	1	1	1	1	1	1	1	1	1	1.0000
DBS BANK INDIA LIMITED	1	1	1	1	1	0.8110	0.5821	0.4222	0.4898	0.66219	0.63654	0.61089	0.7679
BANK OF AMERICA	0.797519215	1	1	0.9143	1	1	1	1	1	0.97409	0.97401	0.97393	0.9695
BNP PARIBAS	1	1	1	1	1	0.7492	0.7359	0.9060	0.7871	0.9410	0.9490	0.9571	0.9188
BARCLAYS BANK PLC	1	1	1	0.8349	1	1	1	1	1	0.99815	0.9601	0.95056	0.9786
MUFG BANK LTD.	0.8757	0.8138	1	0.8658	1	0.8966	1	1	1	0.93595	0.93325	0.93055	0.9376
SUMITOMO MITSUI BANKING CORPORATION	1	1	1	1	1	1	0.8658	1	0.8966	0.89046	0.86979	0.8491	0.9477
MIZUHO BANK LTD	1	1	0.7523	0.8445	1	1	0.8542	0.8967	1	0.90717	0.90122	0.89526	0.9209
CREDIT AGRICOLE CORPORATE AND INVESTM	1	1	1	1	0.9646	1	1	1	1	0.9348	0.9435	0.9521	0.9829
AUSTRALIA AND NEW ZEALAND BANKING GI	1	0.6807	1	1	1	1	1	1	1	1	1	1	0.9734
FOREIGN BANKS	**0.9767**	**0.9639**	**0.9823**	**0.9614**	**0.9975**	**0.9612**	**0.9313**	**0.9446**	**0.9410**	**0.9460**	**0.9405**	**0.9371**	0.9570
ALL SCHEDULED COMMERCIAL BANKS	**0.9382**	**0.9530**	**0.9638**	**0.9737**	**0.9737**	**0.9412**	**0.9214**	**0.9289**	**0.9144**	**0.9269**	**0.9254**	**0.9250**	0.9405
Memo:													
Mean (%)	0.9327	0.9454	0.9589	0.9706	0.9666	0.9274	0.9081	0.9153	0.9054	0.9146	0.9132	0.9131	0.9305
SD (%)	0.1048	0.1133	0.0805	0.0687	0.0775	0.1331	0.1390	0.1458	0.1364	0.1181	0.1172	0.1178	0.0887
Minimum (%)	0.6281	0.5155	0.7070	0.6800	0.6834	0.4598	0.4949	0.4222	0.4898	0.5638	0.6198	0.6023	0.6980
Maximum (%)	1	1	1	1	1	1	1	1	1	1	1	1	1
No of fully Efficient Banks	29	33	35	37	34	29	24	28	27	9	9	9	6

Appendix 3

Bank-Wise Scale Efficiency (SE)													
Banks	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**FY15-FY26**
BANK OF BARODA	1	0.8524	0.9784	0.9317	0.7247	0.5950	0.6593	0.7620	0.8700	1.0000	1.0000	1.0000	0.8648
BANK OF INDIA	1	0.9444	0.9652	0.9471	0.7394	0.6325	0.7697	0.8207	0.9208	0.8804	0.8754	0.8705	0.8638
BANK OF MAHARASHTRA	0.9969	0.9555	0.8931	0.9836	0.9458	0.6345	0.8673	0.8672	1	1	1	1	1
CANARA BANK	0.9277	0.9482	0.9856	0.8967	0.8007	0.6400	0.7578	0.8575	0.9218	1.0245	1.0261	1.0276	0.9007
CENTRAL BANK OF INDIA	0.8849	0.7845	0.8486	1	1	0.7605	0.9323	0.9118	0.8208	0.7416	0.7840	0.7241	0.8493
INDIAN BANK	0.9173	0.9144	0.9785	0.9127	0.8072	0.7033	0.7549	0.9308	0.9717	1.0101	1.0107	1.0112	0.9095
INDIAN OVERSEAS BANK	0.9183	0.8821	0.7971	1	0.8076	1	0.8481	0.9793	1.2924	0.9493	0.9628	0.9092	0.9401
PUNJAB AND SIND BANK	0.8583	1.0000	0.9986	1	0.9050	0.5850	0.7958	0.9006	1.0782	0.8434	0.8761	0.8867	0.8913
PUNJAB NATIONAL BANK	0.8677	0.9028	0.9999	0.8691	0.8178	0.6965	0.8237	0.9016	0.9326	1.0042	1.0043	1.0043	0.9021
STATE BANK OF INDIA	0.9658	0.9610	1.0000	0.9442	0.9030	0.9252	1	1	1	1	1	1	1
UCO BANK	1	1	1	1	1	0.7319	0.7748	0.8322	0.9102	0.9381	0.9980	1.0585	0.9392
UNION BANK OF INDIA	0.9307	1.0000	1.0000	0.9985	0.8139	0.8073	0.7412	0.8821	0.9545	0.8533	0.8596	0.9260	0.8972
PUBLIC SECTOR BANKS	**0.9396**	**0.9295**	**0.9545**	**0.9570**	**0.8560**	**0.7263**	**0.8111**	**0.8877**	**0.9651**	**0.9394**	**0.9510**	**0.9521**	**0.9052**
AXIS BANK LIMITED	1	0.9907	1	0.9572	0.8723	0.9403	0.9449	0.9574	0.9278	0.8636	0.9124	0.9298	0.9419
BANDHAN BANK LIMITED		0.9957	1	1	1	0.8098	0.7319	0.7902	1.0333	1.0462	1.1646	1.1085	0.9587
CITY UNION BANK LIMITED	1	1	1	1	1	0.7340	0.9782	0.8247	0.9131	0.7608	0.8219	0.7799	0.9027
CSB BANK LIMITED	0.9848	1.0000	0.9942	0.8908	1.0000	1.9818	1.9512	1.8590	1.2481	1.3554	1.3410	1.3262	1.2394
DCB BANK LIMITED	0.9819	0.9875	0.9965	0.9932	0.8278	0.7777	0.7758	0.8452	0.9950	0.9741	1.0163	1.0591	0.9374
THE DHANALAKSHMI BANK LTD	0.9753	0.9306	0.9709	0.9845	0.9849	0.9961	0.9963	0.9507	0.8519	0.9678	0.9683	0.9688	0.9604
FEDERAL BANK LTD	0.8598	0.8247	0.9088	0.8493	0.8168	0.5691	0.7427	0.6604	0.8811	0.9723	1.0017	1.0126	0.8414
HDFC BANK LTD.	1	0.8780	1	1	1	0.9994	0.9968	1	0.9107	0.9567	0.9636	1.0000	0.9754
ICICI BANK LIMITED	0.9498	0.8897	0.9180	0.8812	0.7866	0.7931	0.8270	0.8232	0.8081	0.8912	1.0000	1.0000	0.8817
IDBI BANK LIMITED	1	1	0.9456	1	1	1	1.1864	1.1162	1.1321	1.0458	1.0485	1.0479	1.0385
IDFC FIRST BANK LIMITED		1	1	0.9738	1.1641	1.6255	1.8494	1.7343	1.5684	1.5955	1.2862	1.1469	1.2825
INDUSIND BANK LTD	0.9979	0.9006	1	0.9911	0.9631	0.9532	0.9930	0.9947	1.1722	1.0702	1.1197	1.0711	1.0171
JAMMU & KASHMIR BANK LTD	1	1	1	0.9424	0.6229	0.6273	0.7575	0.7197	0.7938	0.8029	0.8229	0.8431	0.8288
KARNATAKA BANK LTD	0.9994	1	1	1	0.9026	0.5888	0.8561	0.8864	0.9688	0.9588	1.0009	1.0432	0.9356
KARUR VYSYA BANK LTD	0.9972	0.9154	0.9942	0.9347	0.7410	0.8042	0.8343	0.7670	0.9457	0.8069	0.7893	0.7715	0.8581
KOTAK MAHINDRA BANK LTD.	0.9856	0.7555	0.8310	0.7530	0.7696	1.0072	0.8643	0.8364	0.8748	0.9350	0.9931	0.9940	0.8816
NAINITAL BANK LTD	1.3312	1.5501	1.1868	0.9242	1.0247	1.1103	0.9744	1	0.7628	0.7167	0.6253	0.6428	0.9619
RBL BANK LTD	0.9992	0.9343	0.9250	0.9379	0.9748	0.9996	1.1843	1.1518	1.2784	1.4111	1.4905	1.5745	1.1382
SOUTH INDIAN BANK LTD	0.9870	0.9956	1	1	0.8440	0.6601	0.7841	0.8993	0.9658	0.9804	1.0395	1.0998	0.9372
TAMILNAD MERCANTILE BANK LTD	1	1	1	1	0.7253	0.8546	1.0723	1.1038	1.1273	0.8271	0.8780	0.8314	0.9497
YES BANK LTD.	1	0.8052	0.8386	0.9313	0.7396	1.0000	1.1350	1.3429	1.3592	1.0925	1.1315	1.1770	1.0243
PRIVATE SECTOR BANKS	0.9993	0.9606	0.9763	0.9487	0.8896	0.9024	0.9763	0.9718	0.9998	0.9750	0.9994	1.0002	0.9660
THE HONGKONG AND SHANGHAI BANKIN	1	1	1	1	1	1	1	1	1.0000	1.0000	1.0000	1.0000	1.0000
STANDARD CHARTERED BANK	1	1	0.7889	0.8276	0.6306	0.7331	0.6821	0.9508	0.6738	0.7565	0.7523	0.7481	0.7953
CITIBANK N.A	1	0.9547	1	1	1	1	0.9754	1	1	1	1	1	1
DEUTSCHE BANK AG	1	1.0000	0.9977	0.9242	0.8695	0.8909	0.9219	1	0.7628	0.8562	0.8767	0.8971	0.9164
JPMORGAN CHASE BANK NATIONAL ASSO	1	1.0000	1	1.0000	1.0000	1.0000	1.0000	1	1	1	1	1	1
DBS BANK INDIA LIMITED	1	0.7078	1	0.6790	1	0.5280	0.7777	0.9503	0.9670	0.6905	0.6563	0.7828	0.8135
BANK OF AMERICA	0.9680	0.6304	1	0.9506	0.9943	1	1	1	1	1	1	1	1
BNP PARIBAS	1	1	1	1.0000	0.8414	0.8699	0.9962	0.9536	0.9859	0.9090	0.9239	0.9386	0.9520
BARCLAYS BANK PLC	1	1	1	0.9203	0.9153	1	1	1	1	1	1	1	1
MUFG BANK LTD.	0.9954	0.9876	1	0.9956	0.9626	0.8643	0.8234	1	1	1	1	1	1
SUMITOMO MITSUI BANKING CORPORATI	1.0000	1.0000	1	1	1	1	1.1118	0.7750	0.9183	0.7242	0.6614	0.5955	0.9046
MIZUHO BANK LTD	1.0000	1.0000	0.9936	0.9864	0.9458	1	0.9013	0.9271	0.9804	0.8420	0.9062	0.9712	0.9554
CREDIT AGRICOLE CORPORATE AND INVES	1	1	1	1	0.7519	0.6403	0.8963	1	1	1	1	1	1
AUSTRALIA AND NEW ZEALAND BANKING	0.7766	0.6590	1	1	1	0.5659	0.5259	0.6748	0.9504	0.9379	0.9660	0.9783	0.8411
FOREIGN BANKS	**0.9815**	**0.9296**	**0.9841**	**0.9483**	**0.9227**	**0.8683**	**0.9007**	**0.9450**	**0.9444**	**0.9060**	**0.9078**	**0.9165**	**0.9298**
ALL SCHEDULED COMMERCIAL BANKS	**0.9730**	**0.9394**	**0.9716**	**0.9514**	**0.8895**	**0.8286**	**0.8921**	**0.9329**	**0.9689**	**0.9390**	**0.9513**	**0.9550**	**0.9327**
Memo:													
Mean (%)	0.9790	0.9455	0.9731	0.9513	0.8923	0.8646	0.9313	0.9604	0.9879	0.9552	0.9665	0.9702	0.9436
SD (%)	0.0739	0.1313	0.0663	0.0687	0.1186	0.2606	0.2494	0.2172	0.1618	0.1682	0.1616	0.1627	0.0934
Minimum (%)	0.7766	0.6304	0.7889	0.6790	0.6229	0.5280	0.5259	0.6604	0.6738	0.6905	0.6253	0.5955	0.7953
Maximum (%)	1.3312	1.5501	1.1868	1	1.1641	1.9818	1.9512	1.8590	1.5684	1.5955	1.4905	1.5745	1.2825
No of fully Efficient Banks	21	19	23	18	13	10	5	11	9	5	6	7	2

Appendix 4

Bank-wise Catch-up Efficiency Scores													
Banks	FY14=>FY15	FY15=>FY16	FY16=>FY17	FY17=>FY18	FY18=>FY19	FY19=>FY20	FY20=>FY21	FY21=>FY22	FY22=>FY23	FY23=>FY24	FY24=>FY25	FY25=>FY26	Average
BANK OF BARODA	0.9173	0.5901	1.6018	1.0082	0.7713	0.9549	1.0376	0.6591	1.4554	0.9883	0.9824	0.9764	**0.9952**
BANK OF INDIA	1.0093	0.8011	1.2491	0.9857	0.7619	1.0253	1.3015	0.5782	0.8760	0.8904	0.8782	0.8660	**0.9352**
BANK OF MAHARASHTRA	1.0074	1.2204	0.8805	1.3501	1.0395	0.9626	0.8303	0.7213	1.6954	1.1467	1.1599	1.1731	**1.0989**
CANARA BANK	0.9957	1.0736	0.9314	1.0297	0.8774	1.1474	1.0000	0.6944	1.3218	1.0367	1.0421	1.0476	**1.0165**
CENTRAL BANK OF INDIA	0.9637	1.0414	1.0137	1.7484	1.0392	0.9608	0.8806	0.4963	1.1079	0.9829	0.9799	0.9768	**1.0160**
INDIAN BANK	0.9874	1.0021	0.9543	1.0584	0.9975	1.2957	0.9609	1.0090	0.8679	0.9984	0.9954	0.9924	**1.0099**
INDIAN OVERSEAS BANK	0.9961	0.8002	1.0487	2.0413	0.6898	1.7294	0.3336	1.9693	0.4017	1.1412	1.1505	1.1598	**1.1218**
PUNJAB AND SIND BANK	0.7903	1.2878	0.8738	1.1248	0.9909	0.7503	0.6278	1.0309	0.8566	0.9593	0.9594	0.9596	**0.9343**
PUNJAB NATIONAL BANK	0.9393	1.0574	1.2365	0.8369	1.2022	1.0013	0.9959	0.6642	1.1175	0.9790	0.9751	0.9711	**0.9980**
STATE BANK OF INDIA	0.8034	0.7768	1.0762	1.6336	0.7638	0.9683	0.9203	0.9135	1.1088	0.9872	0.9832	0.9792	**0.9929**
UCO BANK	1.0395	0.9335	1.0014	1.0975	0.9409	0.9620	0.3947	0.9777	0.9701	0.8174	0.7976	0.7778	**0.8925**
UNION BANK OF INDIA	0.8946	1.1793	1.0273	1.0357	0.9392	1.0397	0.9756	0.5996	1.3826	1.0017	0.9999	0.9981	**1.0061**
PUBLIC SECTOR BANKS	**0.9849**	**0.9814**	**1.0080**	**1.0342**	**0.9210**	**1.0440**	**0.9054**	**0.6789**	**1.1796**	**0.8475**	**0.8256**	**0.8037**	**0.9345**
AXIS BANK LIMITED	0.9952	0.9819	1.0102	0.6550	1.0852	1.4035	0.7274	0.8377	0.6217	0.8625	0.8523	0.8421	**0.9062**
CITY UNION BANK LIMITED	1.0030	1.0286	0.9462	1.0852	1.1409	0.7526	1.0289	0.6160	1.0296	0.8917	0.8810	0.8703	**0.9395**
CSB BANK LIMITED	1.0676	1.9039	0.4394	1.6011	1.3094	0.4761	0.7804	0.8917	1.3893	1.1161	1.1253	1.1344	**1.1029**
DCB BANK LIMITED	1.0737	1.0132	1.0044	0.7110	1.2728	0.9747	0.8737	0.7968	0.8195	0.9010	0.8915	0.8821	**0.9345**
THE DHANALAKSHMI BANK LTD	1.0508	1.3118	0.6310	1.5039	0.9312	0.9811	0.6250	1.5862	0.7214	0.9737	0.9649	0.9561	**1.0197**
FEDERAL BANK LTD	0.9866	1.0140	1.2936	1.0583	1.0671	0.9506	1.0022	1.0225	0.6486	0.9321	0.9241	0.9160	**0.9846**
HDFC BANK LTD.	0.9334	0.7145	1.4391	1.0140	1.0235	0.9783	1.0666	0.5952	0.7786	0.8996	0.8908	0.8821	**0.9347**
ICICI BANK LIMITED	1.0986	0.6605	1.1529	1.0763	1.0636	0.8853	1.3865	0.4524	1.2138	1.0505	1.0592	1.0679	**1.0139**
IDBI BANK LIMITED	0.9221	1.0074	0.5699	1.6738	1.0455	0.9780	0.3724	0.8140	1.2547	0.9374	0.9337	0.9299	**0.9532**
INDUSIND BANK LTD	0.8770	0.8085	1.4232	1.0320	1.0140	0.9438	0.9556	0.4422	1.4504	1.0192	1.0244	1.0295	**1.0017**
JAMMU & KASHMIR BANK LTD	0.7872	0.9832	1.1402	0.8773	0.9994	1.0144	0.4774	1.3152	0.9284	0.9328	0.9272	0.9216	**0.9420**
KARNATAKA BANK LTD	0.9982	1.1198	0.9057	1.1622	0.8582	0.7805	1.0070	0.9562	0.9978	0.9288	0.9214	0.9141	**0.9625**
KARUR VYSYA BANK LTD	1.0073	1.0655	1.1998	0.8516	0.9802	0.9495	0.7408	0.9480	1.6371	1.0591	1.0637	1.0684	**1.0476**
KOTAK MAHINDRA BANK LTD.	0.9338	0.8785	1.3135	1.2768	0.8273	0.8485	1.1023	1.4104	0.5764	1.0047	1.0023	0.9998	**1.0145**
NAINITAL BANK LTD	0.9781	0.7267	0.6270	1.0000	1.0000	1.0000	1.0000	0.4675	0.9391	0.8064	0.7962	0.7860	**0.8439**
RBL BANK LTD	0.9544	0.8287	1.3443	1.2334	1.0261	0.7550	1.0560	0.8817	0.6278	0.7817	0.7536	0.7255	**0.9140**
SOUTH INDIAN BANK LTD	0.9256	1.0206	1.3453	0.9813	0.9856	0.8226	0.7507	1.6133	0.4568	0.9828	0.9838	0.9847	**0.9878**
TAMILNAD MERCANTILE BANK LTD	1.1838	0.8970	0.7795	1.3626	0.7339	1.5674	0.6380	0.3334	0.7757	0.8049	0.7869	0.7688	**0.8860**
YES BANK LTD.	1.0043	0.5979	1.1639	1.3766	0.7560	1.5455	0.4728	0.7175	0.6931	0.7962	0.7740	0.7518	**0.8875**
PRIVATE SECTOR BANKS	**0.9451**	**0.7154**	**1.3131**	**1.0384**	**0.9689**	**0.9319**	**1.0302**	**0.9635**	**0.6125**	**0.9138**	**0.9078**	**0.9018**	**0.9369**
THE HONGKONG AND SHANGHAI B	0.3349	1.0000	1.0000	1.0000	1.0000	1.0000	1.0971	0.9732	0.6340	0.6407	0.5904	0.5401	**0.8175**
STANDARD CHARTERED BANK	0.8441	1.0728	0.5782	1.5571	1.0505	0.5563	0.8512	2.1175	0.3851	0.9967	0.9895	0.9823	**0.9984**
CITIBANK N.A	0.9914	1.0391	1.1258	1.0295	1.0096	1.0560	0.5807	1.3755	2.1687	1.3231	1.3498	1.3765	**1.2021**
DEUTSCHE BANK AG	1.1685	0.8664	0.9968	1.1497	0.8843	1.1051	0.9144	1.0015	0.7741	0.8327	0.8027	0.7726	**0.9391**
JPMORGAN CHASE BANK NATIONA	1.0703	0.7629	0.4389	1.2521	1.4796	0.8229	1.7524	0.4138	0.5190	0.8523	0.8261	0.7999	**0.9158**
DBS BANK INDIA LIMITED	0.9010	0.4867	2.0446	1.0153	2.2063	0.2629	0.7727	0.5951	0.9005	0.9400	0.9290	0.9179	**0.9977**
BANK OF AMERICA , NATIONAL ASS	0.7484	0.7453	2.7278	0.7088	1.1276	1.3024	2.0235	6.9397	0.1130	2.4463	2.5600	2.6737	**2.0097**
BNP PARIBAS	0.7171	1.1459	0.9546	1.0677	0.8909	0.6330	0.7146	1.1169	1.1895	0.9301	0.9111	0.8922	**0.9303**
BARCLAYS BANK PLC	0.9491	0.9732	0.9614	0.7994	1.0482	1.9455	2.0510	0.3735	1.0978	1.2000	1.2043	1.2087	**1.1510**
MUFG BANK LTD.	0.8796	0.7415	2.0126	0.7232	1.3663	1.0836	1.0777	1.0120	1.0696	1.0515	1.0496	1.0478	**1.0929**
MIZUHO BANK LTD	0.7924	0.9149	0.7379	1.0407	1.3982	1.0606	0.9442	0.6881	1.3439	1.0082	1.0047	1.0013	**0.9946**
CREDIT AGRICOLE CORPORATE AND	1.8797	0.9679	0.9833	1.0809	0.5744	1.6471	0.9569	0.9978	1.0962	1.0905	1.0897	1.0890	**1.1211**
FOREIGN BANKS	**0.9186**	**0.7884**	**1.3012**	**1.1121**	**0.8541**	**0.9341**	**0.9090**	**0.8725**	**0.8885**	**0.9330**	**0.9284**	**0.9238**	**0.9470**
ASCB	**0.9515**	**0.7945**	**1.2495**	**0.9892**	**0.9165**	**0.9858**	**0.9172**	**1.5811**	**0.6392**	**0.9660**	**0.9586**	**0.9513**	**0.9917**
Average	**0.9628**	**0.9545**	**1.0973**	**1.1374**	**1.0272**	**1.0205**	**0.9316**	**1.0376**	**0.9770**	**0.9982**	**0.9946**	**0.9910**	**1.0108**
Max	**1.8797**	**1.9039**	**2.7278**	**2.0413**	**2.2063**	**1.9455**	**2.0510**	**6.9397**	**2.1687**	**2.4463**	**2.5600**	**2.6737**	**2.6287**

Appendix 5

Bank-wise Frontier-shift Efficiency Scores													
Banks	**FY14=>FY15**	**FY15=>FY16**	**FY16=>FY17**	**FY17=>FY18**	**FY18=>FY19**	**FY19=>FY20**	**FY20=>FY21**	**FY21=>FY22**	**FY22=>FY23**	**FY23=>FY24**	**FY24=>FY25**	**FY25=>FY26**	**Average**
BANK OF BARODA	1.0442	1.0752	0.9035	0.9902	1.0724	1.0580	0.8776	1.6528	0.5298	1.0151	1.0141	1.0131	**1.0205**
BANK OF INDIA	0.9900	0.9420	1.0015	0.9200	1.1242	1.2276	0.9704	1.7589	0.5940	1.0732	1.0749	1.0767	**1.0628**
BANK OF MAHARASHTRA	1.0191	0.9439	0.9431	0.9045	1.1042	1.1415	1.2286	1.6072	0.7183	1.0984	1.1035	1.1085	**1.0767**
CANARA BANK	1.0050	0.8232	0.9737	0.9928	1.1182	1.0004	0.9566	1.6687	0.5712	1.0273	1.0278	1.0283	**1.0161**
CENTRAL BANK OF INDIA	1.0235	1.0019	1.1214	0.7840	1.1865	0.9971	1.4184	1.4710	0.4703	1.0661	1.0701	1.0741	**1.0570**
INDIAN BANK	1.0174	0.8896	0.9521	0.9722	1.1890	0.8855	0.9942	1.3332	0.9740	1.0256	1.0248	1.0239	**1.0235**
INDIAN OVERSEAS BANK	1.0181	0.9331	1.0014	0.7701	1.1762	0.9201	1.7651	1.1695	0.7742	1.0774	1.0799	1.0824	**1.0640**
PUNJAB AND SIND BANK	0.9809	0.9477	0.9693	0.9347	1.0124	0.9228	1.3167	0.7734	0.5989	0.9553	0.9577	0.9601	**0.9442**
PUNJAB NATIONAL BANK	1.0364	0.9627	0.9836	0.8624	1.1211	1.0042	0.9994	1.6186	0.5988	1.0254	1.0258	1.0263	**1.0221**
STATE BANK OF INDIA	1.1751	1.2055	0.9332	0.9299	1.0904	1.1788	0.9925	1.4407	0.9649	1.1111	1.1148	1.1185	**1.1046**
UCO BANK	1.0055	0.9634	0.9956	0.9131	1.1246	0.9645	1.2144	1.2514	0.7583	1.0316	1.0335	1.0354	**1.0243**
UNION BANK OF INDIA	1.0262	0.8198	0.9916	0.9874	1.0387	0.8960	0.9857	1.7242	0.5769	0.9912	0.9874	0.9836	**1.0007**
PUBLIC SECTOR BANKS	1.0230	0.9036	0.9488	0.9630	1.0998	0.9836	1.1836	1.5477	0.5596	1.1112	1.1256	1.1401	1.0491
AXIS BANK LIMITED	0.9999	1.3351	0.7553	1.4298	0.9909	0.8796	1.2417	1.1251	0.6940	1.0525	1.0562	1.0598	**1.0517**
CITY UNION BANK LIMITED	1.0881	0.8630	1.0419	0.8816	1.1668	0.9857	1.0668	1.2572	0.6312	0.8744	0.8539	0.8333	**0.9620**
CSB BANK LIMITED	1.0270	0.8934	2.1551	0.5375	1.2766	1.0094	1.2206	1.1701	0.6190	1.0249	1.0178	1.0106	**1.0802**
DCB BANK LIMITED	0.9835	1.0655	0.9437	1.0190	1.1366	0.9996	1.0974	1.2556	0.5595	1.0412	1.0485	1.0557	**1.0172**
THE DHANALAKSHMI BANK LTD	0.9804	0.8720	1.4266	0.6893	1.1049	0.9038	1.6950	1.3557	0.5444	1.0490	1.0468	1.0446	**1.0594**
FEDERAL BANK LTD	1.0666	0.9544	0.9463	1.0413	1.2731	1.0036	1.0312	0.9980	0.7629	0.9672	0.9615	0.9558	**0.9968**
HDFC BANK LTD.	1.1178	1.1709	0.9234	0.9866	1.1261	1.0344	1.0485	1.1230	0.7138	1.0141	1.0149	1.0157	**1.0241**
ICICI BANK LIMITED	0.9606	1.5780	0.8862	0.9076	0.9961	1.0937	1.1010	1.1869	0.7826	1.0366	1.0377	1.0389	**1.0505**
IDBI BANK LIMITED	0.9443	1.0221	1.0094	0.9287	1.4665	0.9083	1.7751	1.1710	0.6617	1.1340	1.1418	1.1496	**1.1094**
INDUSIND BANK LTD	1.1059	1.2980	0.9147	0.8967	1.2362	1.0132	1.2891	1.1493	0.4865	1.0312	1.0332	1.0353	**1.0408**
JAMMU & KASHMIR BANK LTD	0.9441	0.9973	1.1842	0.9618	1.0102	1.1867	2.1087	1.3093	0.4699	1.1968	1.2111	1.2254	**1.1505**
KARNATAKA BANK LTD	1.0213	0.9820	1.0903	0.9148	1.0551	0.9427	1.1458	1.1178	0.6395	0.9851	0.9868	0.9885	**0.9891**
KARUR VYSYA BANK LTD	1.0196	1.0280	0.9653	1.0646	1.1540	1.1423	1.2218	1.2855	0.6296	1.0453	1.0458	1.0463	**1.0540**
KOTAK MAHINDRA BANK LTD.	1.2130	1.0804	0.9444	0.9030	1.3135	1.1175	1.1058	1.0110	0.7768	1.0350	1.0357	1.0364	**1.0477**
NAINITAL BANK LTD	0.4472	0.4957	5.8438	1.0000	1.0000	1.0000	1.0000	1.0687	0.5133	1.2842	1.2953	1.3065	**1.3546**
RBL BANK LTD	1.0427	1.3932	0.8567	0.9283	1.0991	1.0942	0.9973	1.1686	0.6023	0.7922	0.7535	0.7148	**0.9536**
SOUTH INDIAN BANK LTD	1.0371	0.9410	0.9477	1.0046	1.0152	0.9448	0.9721	1.1102	0.8756	1.0000	1.0033	1.0066	**0.9882**
TAMILNAD MERCANTILE BANK LTD	1.0755	0.8392	1.1072	0.8837	1.1492	0.8290	0.8378	0.8373	0.4594	0.7792	0.7614	0.7436	**0.8585**
YES BANK LTD.	1.1109	1.5745	0.8469	0.9939	1.2873	0.5565	1.0576	1.3245	0.5884	0.9745	0.9694	0.9642	**1.0207**
PRIVATE SECTOR BANKS	1.0761	1.3613	0.8386	0.9349	1.0710	1.0416	1.0695	1.0341	0.6855	0.9586	0.9523	0.9460	0.9975
THE HONGKONG AND SHANGHAI BANKII	1.6560	0.9975	1.0000	0.9755	1.0000	1.0000	1.0161	1.0010	0.9084	1.0206	1.0176	1.0146	**1.0506**
STANDARD CHARTERED BANK	1.1751	0.9397	1.6479	0.5770	1.1277	1.7602	1.5967	0.7074	1.0657	1.2357	1.2525	1.2692	**1.1962**
CITIBANK N.A	1.3305	0.9995	1.5279	0.6802	1.0928	1.3151	1.8678	0.8361	1.0383	1.2432	1.2581	1.2729	**1.2052**
DEUTSCHE BANK AG	1.3175	1.1362	0.8337	0.9129	1.0868	1.0371	0.9854	1.0496	0.8359	1.0010	1.0010	1.0009	**1.0165**
JPMORGAN CHASE BANK NATIONAL ASS	0.9286	1.3931	1.1269	0.7810	0.9822	1.3310	1.0134	1.4297	0.6616	1.0230	1.0160	1.0090	**1.0580**
DBS BANK INDIA LIMITED	1.0873	2.0536	0.7531	0.7330	1.5270	1.0276	1.1424	1.3088	0.7834	1.1528	1.1589	1.1649	**1.1577**
BANK OF AMERICA , NATIONAL ASSOCIA	1.3411	1.6027	0.7555	0.9017	1.1007	1.1369	1.2465	0.7286	0.9280	1.0000	0.9901	0.9801	**1.0593**
BNP PARIBAS	1.1714	1.3201	0.9316	0.9947	1.0583	1.2481	1.0714	1.0466	0.6343	1.0017	0.9989	0.9961	**1.0394**
BARCLAYS BANK PLC	1.4870	1.3994	0.9691	0.9167	1.2514	0.8382	1.5790	0.9392	0.6201	1.0763	1.0764	1.0764	**1.1024**
MUFG BANK LTD.	0.9510	1.6925	0.5891	1.1778	1.0668	0.9701	0.9322	1.1340	0.8558	1.0023	0.9990	0.9957	**1.0305**
MIZUHO BANK LTD	0.9276	1.3626	0.9008	0.9900	0.9500	1.0561	1.0980	1.2213	0.6805	0.9268	0.9145	0.9021	**0.9942**
CREDIT AGRICOLE CORPORATE AND INVE	0.9350	1.4645	0.7912	1.0739	1.3107	0.9966	1.1975	0.9901	0.9116	1.1005	1.1055	1.1104	**1.0823**
FOREIGN BANKS	1.3451	1.3686	1.1405	0.7141	1.2539	1.2376	1.1090	1.0067	0.6665	1.0552	1.0550	1.0547	1.0839
ALL SCHEDULED COMMERCIAL BANKS	**1.0659**	**1.1239**	**0.8108**	**0.9673**	**1.1221**	**1.0453**	**1.1624**	**1.0651**	**0.7634**	**1.0089**	**1.0088**	**1.0087**	**1.0127**
Average	**1.0659**	**1.1222**	**1.1253**	**0.9221**	**1.1342**	**1.0362**	**1.1972**	**1.2067**	**0.6992**	**1.0372**	**1.0367**	**1.0362**	**1.0516**
Max	**1.6560**	**2.0536**	**5.8438**	**1.4298**	**1.5270**	**1.7602**	**2.1087**	**1.7589**	**1.0657**	**1.2842**	**1.2953**	**1.3065**	**1.9241**

Appendix 6

Bank-wise Malmquist Index Scores over the Period													
Banks	**FY14=>FY15**	**FY15=>FY16**	**FY16=>FY17**	**FY17=>FY18**	**FY18=>FY19**	**FY19=>FY20**	**FY20=>FY21**	**FY21=>FY22**	**FY22=>FY23**	**FY23=>FY24**	**FY24=>FY25**	**FY25=>FY26**	**Average**
BANK OF BARODA	0.9578	0.6345	1.4472	0.9984	0.8271	1.0103	0.9106	1.0894	0.7711	1.0032	0.9962	0.9892	**1.0156**
BANK OF INDIA	0.9992	0.7547	1.2510	0.9069	0.8566	1.2586	1.2630	1.0170	0.5204	0.9556	0.9440	0.9323	**0.9939**
BANK OF MAHARASHTRA	1.0266	1.1519	0.8304	1.2212	1.1478	1.0988	1.0201	1.1592	1.2178	1.2595	1.2799	1.3004	**1.1833**
CANARA BANK	1.0007	0.8838	0.9068	1.0223	0.9811	1.1478	0.9565	1.1588	0.7550	1.0650	1.0711	1.0772	**1.0328**
CENTRAL BANK OF INDIA	0.9864	1.0433	1.1368	1.3708	1.2330	0.9581	1.2491	0.7300	0.5211	1.0479	1.0485	1.0492	**1.0739**
INDIAN BANK	1.0045	0.8914	0.9086	1.0289	1.1861	1.1473	0.9554	1.3452	0.8453	1.0240	1.0200	1.0161	**1.0336**
INDIAN OVERSEAS BANK	1.0141	0.7467	1.0502	1.5719	0.8113	1.5912	0.5889	2.3031	0.3110	1.2295	1.2424	1.2554	**1.1935**
PUNJAB AND SIND BANK	0.7752	1.2205	0.8470	1.0514	1.0031	0.6924	0.8266	0.7973	0.5130	0.9164	0.9189	0.9213	**0.8821**
PUNJAB NATIONAL BANK	0.9735	1.0179	1.2161	0.7217	1.3479	1.0055	0.9953	1.0750	0.6692	1.0039	1.0003	0.9966	**1.0200**
STATE BANK OF INDIA	0.9441	0.9364	1.0043	1.5190	0.8328	1.1415	0.9134	1.3161	1.0700	1.0968	1.0960	1.0952	**1.0967**
UCO BANK	1.0452	0.8993	0.9970	1.0022	1.0581	0.9279	0.4793	1.2235	0.7356	0.8433	0.8243	0.8054	**0.9142**
UNION BANK OF INDIA	0.9180	0.9668	1.0187	1.0227	0.9756	0.9316	0.9617	1.0338	0.7976	0.9929	0.9873	0.9818	**1.0068**
PUBLIC SECTOR BANKS	1.0076	0.8868	0.9564	0.9959	1.0129	1.0269	1.0717	1.0508	0.6601	0.9417	0.9294	0.9163	**0.9804**
AXIS BANK LIMITED	0.9951	1.3109	0.7630	0.9365	1.0753	1.2345	0.9032	0.9425	0.4315	0.9078	0.9002	0.8925	**0.9530**
CITY UNION BANK LIMITED	1.0914	0.8877	0.9858	0.9567	1.3312	0.7418	1.0977	0.7744	0.6499	0.7798	0.7523	0.7253	**0.9038**
CSB BANK LIMITED	1.0965	1.7010	0.9470	0.8606	1.6715	0.4806	0.9526	1.0433	0.8600	1.1439	1.1453	1.1465	**1.1913**
DCB BANK LIMITED	1.0559	1.0796	0.9479	0.7246	1.4466	0.9743	0.9588	1.0004	0.4585	0.9381	0.9348	0.9313	**0.9506**
THE DHANALAKSHMI BANK LTD	1.0302	1.1439	0.9002	1.0366	1.0289	0.8867	1.0594	2.1504	0.3928	1.0214	1.0100	0.9987	**1.0803**
FEDERAL BANK LTD	1.0523	0.9677	1.2240	1.1020	1.3585	0.9540	1.0334	1.0205	0.4948	0.9016	0.8885	0.8755	**0.9815**
HDFC BANK LTD.	1.0433	0.8367	1.3289	1.0005	1.1526	1.0119	1.1183	0.6684	0.5558	0.9123	0.9041	0.8959	**0.9572**
ICICI BANK LIMITED	1.0553	1.0423	1.0218	0.9768	1.0595	0.9682	1.5265	0.5369	0.9499	1.0890	1.0992	1.1094	**1.0651**
IDBI BANK LIMITED	0.8707	1.0297	0.5753	1.5544	1.5332	0.8884	0.6610	0.9532	0.8302	1.0630	1.0660	1.0690	**1.0575**
INDUSIND BANK LTD	0.9699	1.0494	1.3018	0.9254	1.2535	0.9563	1.2318	0.5083	0.7057	1.0510	1.0584	1.0659	**1.0425**
JAMMU & KASHMIR BANK LTD	0.7432	0.9805	1.3502	0.8437	1.0096	1.2038	1.0068	1.7221	0.4363	1.1164	1.1229	1.1293	**1.0838**
KARNATAKA BANK LTD	1.0195	1.0997	0.9875	1.0631	0.9055	0.7358	1.1539	1.0689	0.6381	0.9149	0.9092	0.9036	**0.9520**
KARUR VYSYA BANK LTD	1.0270	1.0953	1.1583	0.9066	1.1312	1.0847	0.9051	1.2186	1.0307	1.1071	1.1125	1.1178	**1.1042**
KOTAK MAHINDRA BANK LTD.	1.1327	0.9492	1.2405	1.1529	1.0867	0.9482	1.2190	1.4259	0.4478	1.0399	1.0381	1.0362	**1.0629**
NAINITAL BANK LTD	0.4374	0.3602	3.6643	1.0000	1.0000	1.0000	1.0000	0.4996	0.4820	1.0356	1.0314	1.0269	**1.1431**
RBL BANK LTD	0.9951	1.1546	1.1516	1.1450	1.1277	0.8262	1.0532	1.0303	0.3781	0.6192	0.5678	0.5186	**0.8716**
SOUTH INDIAN BANK LTD	0.9600	0.9604	1.2750	0.9858	1.0005	0.7772	0.7298	1.7911	0.4000	0.9828	0.9870	0.9912	**0.9761**
TAMILNAD MERCANTILE BANK LTD	1.2731	0.7527	0.8631	1.2041	0.8434	1.2995	0.5345	0.2791	0.3564	0.6272	0.5992	0.5717	**0.7607**
YES BANK LTD.	1.1157	0.9414	0.9857	1.3682	0.9732	0.8602	0.5000	0.9504	0.4078	0.7759	0.7503	0.7249	**0.9059**
PRIVATE SECTOR BANKS	1.0169	0.9739	1.1012	0.9708	1.0376	0.9707	1.1018	0.9963	0.4199	0.8760	0.8645	0.8531	**0.9345**
THE HONGKONG AND SHANGHAI BANKING	0.5546	0.9975	1.0000	0.9755	1.0000	1.0000	1.1149	0.9742	0.5759	0.6539	0.6008	0.5480	**0.8589**
STANDARD CHARTERED BANK	0.9919	1.0081	0.9528	0.8984	1.1847	0.9792	1.3591	1.4979	0.4105	1.2317	1.2393	1.2467	**1.1944**
CITIBANK N.A	1.3190	1.0387	1.7201	0.7002	1.1032	1.3888	1.0846	1.1500	2.2518	1.6448	1.6981	1.7521	**1.4488**
DEUTSCHE BANK AG	1.5395	0.9844	0.8310	1.0496	0.9610	1.1460	0.9011	1.0511	0.6470	0.8336	0.8034	0.7733	**0.9545**
JPMORGAN CHASE BANK NATIONAL ASSOC	0.9939	1.0628	0.4945	0.9779	1.4532	1.0952	1.7759	0.5916	0.3434	0.8719	0.8393	0.8071	**0.9689**
DBS BANK INDIA LIMITED	0.9797	0.9994	1.5399	0.7442	3.3690	0.2702	0.8827	0.7790	0.7054	1.0837	1.0766	1.0693	**1.1550**
BANK OF AMERICA , NATIONAL ASSOCIATIO	1.0037	1.1944	2.0608	0.6391	1.2411	1.4807	2.5223	5.0564	0.1048	2.4462	2.5346	2.6206	**2.1289**
BNP PARIBAS	0.8400	1.5126	0.8893	1.0621	0.9428	0.7900	0.7657	1.1690	0.7545	0.9317	0.9101	0.8887	**0.9670**
BARCLAYS BANK PLC	1.4113	1.3618	0.9317	0.7329	1.3117	1.6307	3.2385	0.3508	0.6808	1.2916	1.2963	1.3011	**1.2689**
MUFG BANK LTD.	0.8365	1.2550	1.1856	0.8518	1.4575	1.0512	1.0047	1.1476	0.9154	1.0539	1.0485	1.0432	**1.1263**
MIZUHO BANK LTD	0.7350	1.2466	0.6647	1.0303	1.3282	1.1200	1.0367	0.8404	0.9145	0.9345	0.9188	0.9032	**0.9888**
CREDIT AGRICOLE CORPORATE AND INVEST	1.7575	1.4174	0.7780	1.1608	0.7528	1.6415	1.1459	0.9879	0.9993	1.2001	1.2047	1.2092	**1.2134**
FOREIGN BANKS	1.2356	1.0789	1.4840	0.7942	1.0710	1.1560	1.0081	0.8784	0.5922	0.9845	0.9794	0.9744	**1.0264**
ALL SCHEDULED COMMERCIAL BANKS	1.0142	0.8930	1.0130	0.9568	1.0285	1.0304	1.0661	1.6841	0.4880	0.9746	0.9671	0.9596	**1.0043**
Average	**1.0133**	**1.0365**	**1.1241**	**1.0233**	**1.1710**	**1.0311**	**1.0836**	**1.1495**	**0.6729**	**1.0382**	**1.0343**	**1.0305**	**1.0340**
Max	**1.7575**	**1.7010**	**3.6643**	**1.5719**	**3.3690**	**1.6415**	**3.2385**	**5.0564**	**2.2518**	**2.4462**	**2.5346**	**2.6206**	**2.6544**