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EVALUATING THE DECISIVE FACTORS OF PROFITABILITY OF THE BANKING SECTOR USING A PANEL REGRESSION MODEL

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Abstract *The aim of this paper is to compute various measures to examine the determinants of financial profitability for the listed Indian public sector banks. This paper will also identify the relationship between the return on equity (ROE) and other independent variables of the Indian banking sector, including all public sector banks, over the past 11 years, starting from April 1, 2009, to March 31, 2020. Therefore, a sample of 12 registered public banking companies and a total of 120 balanced observations are selected for the purpose of analysis. The author has used financial profitability as a dependent variable, represented by the return on equity (ROE), and return on assets (ROA), financial leverage (FL), and credit deposit ratio (CDR) as independent variables. In this study, both fixed effects and the random effects model have been used to look at panel data regression. The author also confirmed both panel techniques with Hausman test-correlated random effects, a widely used procedure for selecting a panel effect. For testing series stationarity, the author used the PP–Fisher 2; ADF–Fisher 2; Levin, Lin, and Chu t; Im, Pesaran, and Shin W-stat; and Breitung t-stat. The results show that return on assets (ROA) and financial leverage (FL) increased the effectiveness of banks in India, while the credit deposit ratio (CDR) reduced the profitability of all public sector banks in India. Only two variables, FL and ROA, were found significant under public sector banks, while taking ROE as the dependent variable. On the other hand, the overall PSB data showed that the CDR reduced the profitability of total PSBs in India. The conclusion of this study will help policymakers, financial managers, and investors in making investment decisions.*

Keywords: *Return on Equity, Financial Leverage, Return on Assets, Credit Deposit Ratio, Fixed Effects Panel, Public Sector Banks, Radom Effect Panel*

INTRODUCTION

It is essential that banks remain financially healthy. The Indian banking sector is the backbone of the Indian economy, and it is sufficiently capitalised and well regulated. The Indian banking sector dodged the global financial meltdown that hit all the leading economies in 2008. The financial and economic conditions in the country are far superior to those of any other country in the world. The Indian banking sector is passing through high competition, regulatory changes, and slow growth of the Indian economy, which has affected it tremendously. The recent events that have affected the banking sector are NPA, demonetisation, GST, Digital India, payment wallets, and payments bank in India. The recent developments in the Indian banking sector are the UPI payment service "Go Live", a healthy life programme with HDFC and Apollo hospital, mergers and acquisitions of public sector banks, SBI and its associate banks' merger, recapitalisation of regional rural banks, and mobile banking facilities in all post offices.

The foreign exchange of India reached an all-time high in the last four years; the NPAs (Non-Performing Assets) of commercial banks showed a record recovery, but it is a long run to the lead. The banking sector should be ready for the challenging times ahead with an increased risk of deterioration in asset quality and lower demand for loans. The Reserve Bank has introduced various measures to support the banking sector, including relaxation in recognition and provisions for bad loans, to protect lenders and creditors during the coronavirus pandemic. The current focus on infrastructure, speedy implementation of projects, and continuation of reforms are expected to provide further impetus to growth in the banking sector. The government used public sector mergers and acquisitions (state-owned banks) to further consolidate their financial health, allowing banks to streamline their operations and size, while strengthening regional focuses.

The number of public sector banks has been reduced to 12 from 27 (Table 1). In this study, the author wants to discover the profitability factors for PSBs and elaborate on those that affect the return on equity (ROE). Financial performance is the defining characteristic of any business organisation. The future evolution and present operations of banks will be influenced by profitability. In this study, which includes 12

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public banks, the profitability, which represents the ratio that supports quantifying the financial performance of banks, is examined.

REVIEW OF LITERATURE

The author's objective in this study is to determine what factors influence PSB profitability and return on equity (ROE). A company's financial performance is a well-known indicator of its success. Profitability will have an impact on banks' future evolution and current operations. This study looked at 12 public banks, and profitability is one way to figure out how well they did financially. Goddard et al. (2004) investigated using cross-sectional, pooled cross-sectional time-series, and dynamic panel models. They found that the relationship between the capital-assets ratio and profitability is positive. Mittal (2007) compared various categories of banks on their productivity and profitability. The results found no remarkable difference in the spread ratio; the author reported a significant difference in the burden ratio among the public sector and private sector and foreign banks. The profitability for the public sector banks showed increased productivity. Prasad and Chari (2011) attempted to analyse the financial performance of four major banks in India: SBI, PNB, ICICI, and HDFC. The variables taken for the study were spread ratios, burden ratios, and profitability ratios. The results found comparative efficiency among the selected banks. Gupta et al. (2011) found that bank ownership affects the availability of credit to the private sector. They concluded that after liberalisation, public banks allocated a larger share of their assets to government securities, compared to private banks.

Chaudhary and Sharma (2011) analysed the public and private sector banks managing NPA. The authors suggested that public banks must pay attention to their functioning to contend with private banks. Gul (2011) loans, equity, deposits, economic growth, inflation and market capitalization on major profitability indicators i.e., return on asset (ROA examined the link between bank-specific and macro-economic characteristics over bank profitability of Pakistan commercial banks. The author found strong evidence that both internal and external factors had a strong influence on profitability. Khan (2011) Net- Profit Margin, Operating Profit Margin, Return on Capital Employed (ROCE) investigated various factors that influenced mergers and acquisitions in the Indian banking sector. The author indicates that the banks have been positively affected by the event of mergers and acquisitions (M&As). Ahmad and Ikram (2012) tested the Indian capital market's efficiency with respect to the announcement of mergers and acquisitions. They had observed that neither before nor after the merger announcement, were investors able to earn abnormal/excess returns. Paramasivan (2013) attempted in determining digital financial inclusion in Tirunelveli district with respect to availability of banking facilities, availability of ATM facilities, awareness of government. Kumar and Paramasivan (2013) attempted to analyse the financial performance of four major banks in India; the author focused on financial inclusion playing a crucial role in rural development and how it can be implemented effectively through Indian Bank. Ong and Teh (2013) found that no evidence was in support of the macroeconomic variable's impact on profitability. The results indicated that ROA was the best profitability measure.

Olalekan and Adeyinka (2013) revealed a positive and significant relationship between capital adequacy and profitability of a bank in Nigeria. Lartey et al. (2013) studied the relationship between the liquidity and the profitability of banks listed on the Ghana Stock Exchange. The authors found a fragile positive relationship between liquidity and the profitability of the listed banks in Ghana. Hassan and Adam (2014) investigated the financial performance of Erbil Bank for Investment and Finance, Kurdistan Region of Iraq. The authors reported that the overall financial performance of Erbil Bank was improving in terms of liquidity ratios, assets quality ratios or credit performance, and profitability ratios (NPM, ROA, and ROE). Petria et al. (2015) revealed the consistency in credit and liquidity risk, management efficiency, the diversification of business, the market competition, and economic growth's influence on bank profitability. Barua et al. (2016) examined the impact of structural changes and the conduct of Indian commercial banks on their profitability; they had found that capitalisation and credit risks were the most significant determinants of the profitability of Indian banks. Varshney (2016) compared the financial performance of two leading public sector banks in India. The author reported that banks' liquidity, profitability, management capacity, capital structure, and share performance are more reliable in SBI than PNB. Kedia (2016) analysed the determinants of profitability of Indian public sector banks, and found that only two of the independent variables, credit deposit ratio and net interest income, affect the net profitability of Indian public sector banks. Varshney (2016) investigated the factors that influenced bank profitability. The author used static and dynamic panel data techniques of 86 banks from eight countries, and the results showed evidence of significant effects of bank-specific factors, bank-industry factors, and bank macroeconomic factors. Ahmad (2017) studied the critical factors that could affect banks after a merger, in terms of enterprise value and market capitalisations. The author reported that after the merger, particularly in relation to operating efficiency, solvency, and enterprise value and business performance, the bank's profitability did not change

significantly. Miyan (2017) found that the performance of PSU banks was less than that of private sector banks, and the NPAs showed a downward trend; however, Non-Performing Assets of public sector banks were still higher than those of private sector banks. Khan and Javed (2017) explained the volatility structure of the residuals obtained for the used data series. The authors reported the significant result of the ARCH and GARCH effect. The foreign market return volatility or outside shock can influence the volatility of BANKEX return. Adelopo et al. (2018) studied macroeconomic factors and bank profitability before and after the financial crisis. The authors argued that the financial crisis did not affect the relationships between some specific determinants and bank profitability. Brahmaiah (2018), in his study, indicated that the profitability of banks in India is affected by both internal and external factors. The author found that the GDP growth and inflation were significantly negative in relation to ROA, and inflation had a positive influence on ROE. Bapat (2018) found that the bank-specific factors, non-performing loans, and cost-to-income ratio negatively affected bank profitability, and diversification measures did not affect bank profitability. Bansal et al. (2018) found significant results for public banks while taking ROA as the dependent variable. The authors quantified several measures to examine the determinants of profitability for the listed Indian banks. Alarussi and Alhaderi (2018) found a strong positive relationship between firm size, working capital, company efficiency (assets turnover ratio), and profitability in Malaysian listed companies. Almaqtari et al. (2019) reported that bank size, number of branches, assets management ratio, operational efficiency, and leverage ratio were the most critical factors determining the effect on the profitability of Indian commercial banks. Ahmad Khan and Zia (2019) examined the impact of merger announcements on the volatility of stock returns by using Arch-Garch model; they suggested that merger announcements showed negative or positive reaction in the Indian banking sector. Jin and Hutagaol-Martowidjojo (2019) found that banks should pay attention to developing its ICT facilities as one of the competitiveness sources in the digital era.

Ali and Dhiman (2019), in their study, found that credit risk management methods have a statistically significant impact on the financial performance; however, capital adequacy ratio and liquidity indicators were found to be statistically significant. Biswas and Bhattacharya (2020) measured the performance of the new generation private banks in India using the CAMEL model approach. Kaur and Kaur (2021) found that large banks are more likely to use websites to release information. Financial performance and corporate governance practices, on the other hand, have shown no correlation with the disclosure score of Indian banks. Agarwal et al. (2021) examined the impact of non-performing assets on bank performance under the Basel regime, with empirical evidence from India. They discovered that in India, NPAs have been severely undermining the performance of SCBs. It indicates that as the number of non-performing assets (NPAs) rises, banks' profit margins decline and provisioning requirements rise. This deterioration further erodes depositors' and investors' trust in banks. As a result, governments must ensure that problematic loans are managed efficiently. They discovered that the Bandhan Bank was in the first place, followed by the HDFC Bank.

Table 1: List of Public Sector Banks in the Indian Banking Sector as of April 1, 2020

Banks	Government Shareholding	Merged Banks	Branches	Established	Headquarter
Bank of Baroda	71.6%	VB, DB	9,481	1908	Vadodara, Gujarat
Bank of India	89.1%		5,000	1906	Mumbai, Maharashtra
Bank of Maharashtra	92.49%		1,897	1935	Pune, Maharashtra
Canara Bank	78.52%	SB	10,342	1906	Bengaluru, Karnataka
Central Bank of India	92.39%		4,666	1911	Mumbai, Maharashtra
Indian Bank	88.06%	ALB	6,104	1907	Chennai, Tamil Nadu
Indian Overseas Bank	95.84%		3,400	1937	Chennai, Tamil Nadu
Punjab and Sind Bank	83.06%		1,554	1908	New Delhi, Delhi
Punjab National Bank	85.59%	OBC, UBI	11,437	1894	New Delhi, Delhi
State Bank of India	56.92%	SBBJ, SBH, SBIND, SBM, SBP, SBS, SBT, BMH	24,000	1955	Mumbai, Maharashtra
UCO Bank	94.44%		4,000	1943	Kolkata, West Bengal
Union Bank of India	89.07%	AB, CB	9,609	1919	Mumbai, Maharashtra

Note: The number of public sector banks has been reduced to 12 from 27. The recent amalgamation became effective from April 1, 2020. Merged banks are Vijaya Bank, Dena Bank, Syndicate Bank, Allahabad Bank, Oriental Bank of Commerce, United Bank of India, State Bank of Bikaner & Jaipur, State Bank of Hyderabad, State Bank of Indore, State Bank of Mysore, State Bank of Patiala, State Bank of Saurashtra, State Bank of Travancore, Bhartiya Mahila Bank, Andhra Bank, and Corporation Bank.

RESEARCH PROBLEM AND OBJECTIVES

- To investigate the factors of profitability for public sector banks by taking Return on Equity as the dependent variable.
- To determine the influence of the chosen determinants on profitability, under a fixed or random effect model.
- To measure panel regression by applying the Hausman test.

HYPOTHESES OF THE STUDY

$H_0$1: There is no significant impact of FL, ROA, and CDR on profitability under the fixed effect model.

$H_0$2: There is no significant impact of FL, ROA, and CDR on profitability under the random effect model.

$H_0$3: The null hypothesis states that the random effect model is appropriate.

RESEARCH METHODOLOGY

The purpose of this research paper is to quantify and evaluate the profitability, represented by Return on Equity, of the Indian banking sector that is listed on the BSE, from April 2009 to March 2020. As part of the research process, we have obtained the financial statements (profit and loss account, balance sheet) for 11 years (April 2009 to March 2020) of the listed public sector banking companies from BSE, and the annual reports of banks, ending on March 31 every year. Financial ratios were calculated from the banks' financial statements; they were then used in the analysis to brief the profitability of banking companies (Table 2). Presently, in the Indian banking sector, there are 12 public sector banks and 21 private sector banks which are working and listed in BSE. Therefore, a sample of 12 public sector banks was selected, which are central banks in India, where more than 50 per cent of the share is held by the government. Gujarati (2004) and Dougherty (2011) recommended a regression model approach using fixed effect and random effect models. After applying the panel data regressions model, the author runs the Hausman test for the model selection.

Fixed Effect Model

In the FE model, the regression equation focuses on a specific set of N firms, i.e., PSBs listed on the BSE. In this case, the inference is conditional on the specific N firms. For banks that are observed, it is assumed that the individual-specific coefficient, B_{0i}, is fixed for each bank. That is, it is time-invariant.

Table 2: Determinants of Profitability

Variable	Sign/ Symbol	Formula
Return on Equity	ROE	Return on Equity = Profit after tax / Shareholders equity
Return on Assets	ROA	Return on Assets = Profit after tax / Total assets
Financial Leverage	FL	Financial Leverage = Total debt / Shareholders equity
Cash Deposit Ratio	CDR	Cash Deposit Ratio = Advances / Deposit

Note: Return on Equity has been used as the dependent variable, and the Return on Assets, Financial Leverage, and Credit Deposit Ratio have been used as the independent variables in this study; their descriptions are given in the table.

FE regression equation model:

$$\text{Return on Equity (ROE)}_{it} = B_{0i} + B_1\text{ROA}_{it} + B_2\text{Fl}_{it} + B_3\text{CDR}_{it} + U_{it}$$

Where, B_{0i} is the y-intercept of bank i; ROE_{it}, the Return on Equity of each bank i at time t (dependent variable in the model); ROA_{it}, the profit after tax / total assets employed of each bank i at time t; FL_{it}, the total debt to shareholders equity ratio of each bank i at time t; CDR_{it}, the credit deposit ratio of each bank i at time t; and U_{it}, the error term of bank i at time t or between bank error.

Random Effect Model

In this model, a standard mean value for the intercept is assumed. The random effect model assists in controlling for unobserved heterogeneity; when the heterogeneity is constant over time and not correlated with the independent variable, it allows individual effects. For this, we have included public sector banks which are listed on the BSE.

$$\text{Return on Equity (ROE)}_{it} = B_{0i} + B_1\text{ROA}_{it} + B_2\text{Fl}_{it} + B_3\text{CDR}_{it} + U_{it} + e_{it}$$

Where, B0i is the y-intercept of the bank, i.e., ROE_{it} is the Return of Equity of each bank i at time t (dependent variable in model); ROA_{it} is the profit after tax to total assets employed of each bank i at time t; Fl_{it} is the total debt to shareholder equity ratio of each bank i at time t; CDR_{it} is the advances to total deposit ratio of each bank i at time t; U_{it} is the error term of bank i at time t or between the bank's error; and e_{it} is the within the banks' error.

The Hausman Test

The Hausman test (1978) for the econometric model was used to compare two different estimators, i.e., the RE and FE, since it is an important consideration to choose between the RE and FE models. Assumptions are made about the likely correlation between the cross-section specific error components, C_i and X_{it}. It is essential to have a method of testing this assumption to find if the model is appropriate.

EMPIRICAL RESULTS

Panel Unit Root Test

- *Assuming Common Unit Root Process*

  Panel data of the Indian banking sector has a unit root at the first difference, so the author converted data into a second difference. For the panel unit root test for Return on Equity (dependent variable), the value of Levin-Lin-Chu test statistic is −23.34 with individual effects, −22.45 with individual effects and individual linear trends, and without individual effects and individual linear trends it is −24.28. All the results indicate the non-presence of unit root at the second difference. Therefore, we can say that the problem of unit root does not exist in the Indian PSBs' data.

- *Assuming Individual Unit Root Process*

  The Pesaran and Shin W-stat test has a null hypothesis that the series has a unit root; the Pesaran and Shin W-statistic is −13.71, the Augmented Dickey-Fuller (ADF) test result is 126.70, and the Fisher x^2 test (PP) statistic is 200.93. We conclude that public sector banking data are a stationary dataset.

  (Tables 3, 4, and 5)

Table 3: Summary of Panel Unit Root Test of Return on Equity with Individual Effects

Method	Statistic	Prob.**	Cross-Sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	−23.3499	0.0000	12	102
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	−13.7110	0.0000	12	102
ADF – Fisher Chi-square	126.705	0.0000	12	102
PP – Fisher Chi-square	200.933	0.0000	12	108

**Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Table 4: Summary of Panel Unit Root Test of Return on Equity with Individual Effects and Individual Linear Trends

Method	Statistic	Prob.**	Cross Sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	−22.4556	0.0000	12	101
Breitung t-stat	0.15019	0.5597	12	89
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	−5.90402	0.0000	12	101
ADF – Fisher Chi-square	85.2585	0.0000	12	101
PP – Fisher Chi-square	169.482	0.0000	12	108

**Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Table 5: Summary of Panel Unit Root Test of Return on Equity without Individual Effects and Individual Linear Trends

Method	Statistic	Prob.**	Cross-Sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	−24.2821	0.0000	12	103
Null: Unit root (assumes individual unit root process)				
ADF – Fisher Chi-square	175.918	0.0000	12	103
PP – Fisher Chi-square	194.910	0.0000	12	108

**Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Panel Unit Root Test

- *Assuming Common Unit Root Process*

The panel unit root test is for return on assets, financial leverage, and credit deposit ratio (independent variables). The author conducted a panel unit root test, and it is found that the data series of these independent variables have a unit root at first difference. The Levin, Lin & Chu test unit root has a null hypothesis that the panel dataset has a unit root (non-stationary). The statistic of ROA, FL, and CDR are −11.35, −12.88, and −21.34 with individual effects, respectively; −11.05, −12.36, and −16.98 with individual effects and individual linear trends, respectively; and finally, −16.06, −16.75, and −22.22 without individual effects and individual linear trends, respectively. From this, it can be said that all the results indicate the non-presence of unit root

at the second difference. Hence, we conclude that public sector banks (PSBs) do not exit the unit root at the second difference of the dataset.

- *Assuming Individual Unit Root Process*

Panel data null hypothesis: Data has unit root (non-stationary) for individual effects on the ROA, FL, and CDR. The value of Pesaran and Shin W-stat are −11.75, −10.49, and −11.71, respectively; and for the individual effects and individual linear trends, the values are −5.66, −4.28, and −4.60, respectively. The value of the ADF Fisher x^2 test for ROA, FL, and CDR are −139.84, 133.21, and 125.74 with individual effects, respectively; 111.69, 92.21, and 86.25 with individual effects and individual linear trends, respectively; and finally, 188.25, 206.36, and 198.11 without individual effects and individual linear trends, respectively. The Fisher (PP) x^2 panel unit root test has a hypothesis of the unit in all the series of panel dataset. The statistics for ROA, FL, and CDR are 208.26, 201.32, and 217.76 with individual effects, respectively; the values are 189.96, 158.22, and 176.82 with individual effects and individual linear trends, respectively; and finally, the statistics are 218.19, 214.83, and 232.86 without individual effects and individual linear trends, respectively. Therefore, it can be said that the Indian public sector banks (PSBs) do not exit the unit root problem in the panel dataset. All the results indicate that the data are stationary (non-presence of the unit root) at the second difference of panel dataset (Tables 6, 7, 8, 9, 10, 11, 12, 13, and 14).

Table 6: Summary of Panel Unit Root Test of Return on Assets with Individual Effects

Method	Statistic	Prob.**	Cross Sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	−11.3507	0.0000	12	102
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	−11.7585	0.0000	12	102
ADF – Fisher Chi-square	139.841	0.0000	12	102
PP – Fisher Chi-square	208.265	0.0000	12	108

**Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality

Table 7: Summary of Panel Unit Root Test of Return on Assets with Individual Effects and Individual Linear Trends

Method	Statistic	Prob.**	Cross-Sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	−11.0506	0.0000	12	101
Breitung t-stat	−0.42097	0.3369	12	89
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	−5.66775	0.0000	12	101
ADF – Fisher Chi-square	111.693	0.0000	12	101
PP – Fisher Chi-square	189.965	0.0000	12	108

**Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Table 8: Summary of Panel Unit Root Test of Return on Assets without Individual Effects and Individual Linear Trends

Method	Statistic	Prob.**	Cross Sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	−16.0689	0.0000	12	102
Null: Unit root (assumes individual unit root process)				
ADF – Fisher Chi-square	188.259	0.0000	12	102
PP – Fisher Chi-square	218.196	0.0000	12	108

**Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Table 9: Summary of Panel Unit Root Test of Financial Leverage with Individual Effects

Method	Statistic	Prob.**	Cross-Sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	−12.8884	0.0000	12	102
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	−10.4927	0.0000	12	102
ADF – Fisher Chi-square	133.213	0.0000	12	102
PP – Fisher Chi-square	201.321	0.0000	12	108

**Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Table 10: Summary of Panel Unit Root Test of Financial Leverage with Individual Effects and Individual Linear Trends

Method	Statistic	Prob.**	Cross Sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	−12.3603	0.0000	12	102
Breitung t-stat	−2.18077	0.0146	12	90
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	−4.28773	0.0000	12	102
ADF – Fisher Chi-square	92.2102	0.0000	12	102
PP – Fisher Chi-square	158.229	0.0000	12	108

**Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Table 11: Summary of Panel Unit Root Test of Financial Leverage without Individual Effects and Individual Linear Trends

Method	Statistic	Prob.**	Cross-Sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	−16.7562	0.0000	12	102
Null: Unit root (assumes individual unit root process)				
ADF – Fisher Chi-square	206.366	0.0000	12	102
PP – Fisher Chi-square	214.832	0.0000	12	108

**Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Table 12: Summary of Panel Unit Root Test of Credit Deposit Ratio with Individual Effects

Method	Statistic	Prob.**	Cross-Sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	−21.3497	0.0000	12	104
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	−11.7124	0.0000	12	104
ADF – Fisher Chi-square	125.744	0.0000	12	104
PP – Fisher Chi-square	217.765	0.0000	12	108

**Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Table 13: Summary of Panel Unit Root Test of Credit Deposit Ratio with Individual Effects and Individual Linear Trends

Method	Statistic	Prob.**	Cross-Sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	−16.9874	0.0000	12	103
Breitung t-stat	−3.07208	0.0011	12	91
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	−4.60930	0.0000	12	103
ADF – Fisher Chi-square	86.2519	0.0000	12	103
PP – Fisher Chi-square	176.820	0.0000	12	108

**Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Table 14: Summary of Panel Unit Root Test of Credit Deposit Ratio without Individual Effects and Individual Linear Trends

Method	Statistic	Prob.**	Cross-Sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	−22.2206	0.0000	12	105
Null: Unit root (assumes individual unit root process)				
ADF – Fisher Chi-square	198.113	0.0000	12	105
PP – Fisher Chi-square	232.864	0.0000	12	108

**Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Descriptive Statistics for the Public Sector Banks (PSBs) in Indian Banking Sector

Table 15 shows the descriptive statistics of listed public sector banks in the Bombay Stock Exchange (BSE) from April 2009 to March 2020. It contains determinant variables that have been used under this study. Return on equity (dependent variable), return on assets (ROA), financial leverage (FL), and credit deposit ratio are the independent variables. A total of 120 observations (number of samples) have been used to accumulate the total balanced panel data of public sector banks in India. The mean of ROE is −0.0066; it is found that PSBs are losing shareholders, and it can be said

that the period was not satisfactory for the investors.

The return on assets is 0.00054, which is less than 1; which means that banks have increased investment in assets and are not able to make maximum use of their assets for getting more profit. The financial leverage is −0.403, which means that banks are facing problems in generating enough revenue to increase their investment in assets through profit. The credit deposit ratio is −0.0067, which means that banks have less money for advances or loans to customers. The financial performance of the banks in terms of creditability has fallen with respect to non-performing assets; banks do not have enough funds to meet the demands of customers.

The output of Pearson correlation coefficient matrix is shown in Table 16. Before examining the panel data models, it is vital to estimate the correlation among variables to the presence of multicollinearity. The outcomes authorised that there is no cause of multicollinearity in the models, as the values of correlation do not surpass the cut-off point of 0.70. In the end, we conclude that all the variables, i.e., return on equity (ROE), return on assets (ROA), financial leverage (FL), and credit deposit ratio (CDR), taken in this study are free from multicollinearity.

Table 15: Descriptive Statistics of Public Sector Banks in India

	ROA	ROE	FL	CDR
Mean	0.000546	−0.006652	−0.403981	−0.006790
Median	−0.000644	−0.004642	0.064831	−0.005867
Maximum	0.093436	0.961044	39.03436	0.266591
Minimum	−0.088386	−2.108410	−34.80242	−0.746014
Std. Dev.	0.015909	0.270712	7.422146	0.090870
Skewness	0.502785	−3.304179	0.487071	−4.249877
Kurtosis	19.67276	33.10660	14.36323	38.17275
Jarque-Bera	1394.961	4750.387	650.3595	6546.839
Observations	120	120	120	120

Table 16: Pearson Correlation Coefficient Matrix

Correlation				
t-Statistic				
Probability	ROE	ROA	FL	CDR
ROE	1.000000			
ROA	0.621670	1.000000		
FL	0.128766	0.273754	1.000000	
CDR	0.054658	0.052085	0.066637	1.000000

Note: This table represents the calculations of the Pearson correlation coefficient matrix; all the values are less than 0.70; therefore, there is no multicollinearity among the variables.

RESULTS AND FINDINGS

(Tables 17, 18, and 19)

The tables exhibit the results of panel regression analysis for the public sector banks (Government banks) in India. Return on equity (ROE) has been used as a dependent variable under FE and RE panel to know the cross-sectional effects. At the same time, return on assets (ROA), financial leverage (FL), and credit deposit ratio (CDR) have been used as independent variables. The total numbers of observations in this panel are 120, and 12 are included in the cross-section. Eleven years' data, starting from April 2009 to March 2020, have been used in this study. Out of all the determinants' independent variables, return on asset (ROA) and financial leverage (FL) were found significant with the profitability values of 0.000 and 0.0001, respectively, under the fixed effect (FE) regression model for the public sector banks in India. However, there is a positive association between return on assets and profitability of banks, which is represented by return on equity in India. Financial leverage has been found significant; however, it shows a negative relationship with the return on equity for the public sector banks. Although another independent variable, i.e., credit deposit ratio (CDR), has been found to be insignificant with the return on equity for the public sector banks, this variable did not influence the return on equity of the banking sector. Therefore, the first null hypothesis is rejected. The R^2 of this FE panel regression model is 88.26 per cent, while the adjusted R^2 is 86.69 per cent, under the cross-section analysis. The R^2 explains 88 per cent of the existence of the included variables from 2009 to 2020. The adjusted R^2 of this panel explains 86 per cent variations. The model is acceptable as f-test statistics is 56.39, with a probability value of 0.00. The value of Durbin Watson statistics is 1.31, which explains that there is no autocorrelation problem in the FE model, and it is also clear from heteroscedasticity.

The FE affects the panel equation:

$$\text{Return on Equity (ROE)}_{it} = B_{0i} + B_1\text{ROA}_{it} + B_2\text{Fl}_{it} + B_3\text{CDR}_{it} + U_{it}$$

The RE affects the panel equation:

$$\text{Return on Equity (ROE)}_{it} = B_{0i} + B_1\text{ROA}_{it} + B_2\text{Fl}_{it} + B_3\text{CDR}_{it} + U_{it} + e_{it}$$

These have been used in this study for the regression model purpose. Panel EGLS (cross-section random effect) method has been employed to quantify the relationship. Cross-section random and idiosyncratic random effects have been done under the specification module.

Durbin Watson's test has been used for testing autocorrelation

and checking heteroscedasticity. ANOVA f-test has been used to test the goodness-of-fit of this model at 5 per cent level of confidence.

Under the RE regression model, return on assets (ROA) and financial leverage (FL) were found to be significant with profitability values of 0.000 and 0.0002, respectively. We found a negative relationship between financial leverage (FL) and profitability, which is represented by the return on equity of public sector banks in India. The financial leverage reduced the return on equity of public sector banks in India. However, the return on assets increased the return on equity. The second null hypothesis is rejected. The credit deposit ratio (CDR) has been found to be insignificant with the profitability of public sector banks, which is represented by return on equity (ROE) under the RE regression model. The credit deposit ratio (CDR) does not influence the return on equity of public sector banks in India. The R^2 of the RE model is 87 per cent, while the adjusted R^2 is 86 per cent. The R^2 explains 87 per cent variation from 2009 to 2020. The adjusted R^2 of this panel regression model explains 86 per cent variability in the return on equity. However, the model is a good fit with an f-statistic of 260, with a probability value of 0.000, while the Durbin Watson statistic is 1.21, which indicates that there is a positive autocorrelation problem that exists in the RE panel regression model. Of the above two models (FE and RE), the X^2 value under the FE model is 1.79, which is insignificant and substantial at the 5 per cent level of confidence. To check the validity of the two models, the author runs the Hausman test to decide the best model between the two options. The FE model explains that variables ROA and FL are significant with the return on equity for the public sector banks in India, whereas CDR has been found to be insignificant. The null hypothesis stated that the random effect model is appropriate; therefore, the probability value is more than 0.05. Hence, it is concluded that the random-effects model is best for the public sector banks. Therefore, the third hypothesis is accepted.

Table 17: Public Sector Banks with Return on Equity as the Dependent Variable

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	−0.017242	0.009065	−1.902058	0.0599
ROA	16.32980	0.593500	27.51438	0.0000
FL	−0.005076	0.001276	−3.978249	0.0001
CDR	0.054682	0.102659	0.532659	0.5954
	Effects Specification			
Cross-section fixed (dummy variables)				
R-squared	0.882621	Mean dependent var		−0.006652
Adjusted R-squared	0.866970	S.D. dependent var		0.270712
S.E. of regression	0.098737	Akaike info criterion		−1.676237
Sum squared resid	1.023653	Schwarz criterion		−1.327801
Log likelihood	115.5742	Hannan-Quinn criter.		−1.534735
F-statistic	56.39538	Durbin-Watson stat		1.315015
Prob(F-statistic)	0.000000			

The fixed effects panel equation (Return on Equity (ROE)$_{it} = B_{0i} + B_1\text{ROA}_{it} + B_2\text{Fl}_{it} + B_3\text{CDR}_{it} + U_{it}$) has been used in this table for regression analysis purposes. Note: For this model, the dependent variable is return on equity, and the independent variables are ROA, FL, and CDR. Panel least squares method is used to examine the FE model. The data used is from April 2009 to March 2020. The total balanced observations used under this study was 120.

Table 18: Public Sector Banks with Return on Equity as the Dependent Variable

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	−0.017246	0.011097	−1.554026	0.1229
ROA	16.30816	0.592448	27.52673	0.0000
FL	−0.004958	0.001272	−3.898615	0.0002
CDR	0.045366	0.100793	0.450088	0.6535
	Effects Specification			
			S.D.	Rho
Cross-section random			0.022182	0.0480
Idiosyncratic random			0.098737	0.9520
	Weighted Statistics			
R-squared	0.870879	Mean dependent var		−0.005423
Adjusted R-squared	0.867540	S.D. dependent var		0.269877
S.E. of regression	0.098222	Sum squared resid		1.119117
F-statistic	260.7941	Durbin-Watson stat		1.210214
Prob(F-statistic)	0.000000			
	Unweighted Statistics			
R-squared	0.866158	Mean dependent var		−0.006652
Sum squared resid	1.167219	Durbin-Watson stat		1.160341

The random effects panel equation (Return on Equity (ROE)$_{it} = B_{0i} + B_1\text{ROA}_{it} + B_2\text{Fl}_{it} + B_3\text{CDR}_{it} + U_{it} + e_{it}$) has been

used in this table for regression analysis purpose. Note: For this model, the dependent variable is return on equity, and the independent variables are ROA, FL, and CDR. Panel least squares method is used to examine the RE model. The data is used for the period from April 2009 to March 2020. The total balanced observations used under this study was 120.

Table 19: Hausman Test of Public Sector Banks with Return on Equity as the Dependent Variable

Test Summary		Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random		1.792155	3	0.6166
Cross-section random effects test comparisons:				
Variable	Fixed	Random	Var(Diff.)	Prob.
ROA	16.329798	16.308159	0.001248	0.5402
FL	−0.005076	−0.004958	0.000000	0.2490
CDR	0.054682	0.045366	0.000380	0.6325

CONCLUSION

We have applied panel regression analysis for the return on equity, which indicates the profitability of public sector banks. The independent variables ROE, FL, and CDR influence the ROE for the years 2009 to 2020 for public sector banks. The panel regression model is considered a more reliable and authenticated technique. We have come to a certain conclusion about this study. Returns on assets (ROA) are increasing the profitability of banks, which is represented by the return on equity. On the other hand, financial leverage has a negative relationship with profitability. It seems that FL maintained the solvency of banks and indicated a sound capital structure, which significantly contributed to increasing the return on equity. CDR is reducing the effectiveness of public banks, because CDR is not significantly affected by the return on equity of public sector banks, while public sector banks are focusing on CDR to increase the profitability of banks. The result indicates that there is a positive relationship between ROA and ROE of public sector banks. The finding reveals that FL has a significant negative relationship with the return on equity, which explains its contribution to generating the returns or profit for the shareholders of public sector banks. The CDR has a positive relationship with the profitability of the banks, but not a significant one; the credit of public sector banks is very small compared to their deposits. So, it is suggested that banks provide loans or credit to customers so that the return on equity will increase. It seems that public sector banks are able to maintain their ROA ratio in sound condition, compared to the CDR. However, the findings show that there is no relationship between CDR and the profitability of banks while taking FL and ROA as profitability measures. The author suggests that public sector banks explore new areas to generate more revenue. The author also suggests that PSBs should invest some money to improve the quality of the banks' products and services, which would help the banks improve their image in the market, which in turn would help increase their customer base (Table 20). Finally, the author suggests that public sector banks should try to improve the CDR ratio to generate the profitability of banks, which is represented by the return on equity.

Table 20: Summary of Profitability (Return on Equity as the Dependent Variable) for Public Sector Banks

Dependent Variable (Return on Equity)	Public Sector Banks (Government Banks)	
Independent Variables	Fixed panel	Random panel
Return on Assets (ROA)	Positive	Positive
Financial Leverage (FL)	Negative	Negative
Credit Deposit Ratio (CDR)	No effect	No effect

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