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A Performance Evaluation of Indian Public Sector Banks: Panel Regression Analysis

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Abstract

The study aims to evaluate the factors determining the financial performance of public sector banks in India. To facilitate the analysis, we used a panel of 14 public sector banks from 2000 to 2020. The results show that debt equity ratio and return on assets affect the net profit margin and return on equity positively. Further, the results imply that public sector banks in India are trailing money due to the cost of interest paid to return on capital and overall debt relative to owners' funds. However, the profitability of these banks is rising due to total debt equity ratio and SIZE. Public sector banks were found to be better in terms of credit to corporates and size compared with past performance. These banks could benefit from diversifying their income generation efforts by providing customer-based financial services, enhancing the financial system's overall performance. Decreasing non-performing assets (NPAs), this study suggests that public sector banks should investigate other strategies to increase profitability by providing additional choices to customers, lenders, and borrowers.

Keywords: NPM, ROA, Fixed Effect, Random Effect, Financial Performance.

1. Introduction

Bank performance evaluation is a critical task for stakeholders in the financial industry, including investors, regulators, and customers. Evaluating a bank's financial health, risk management practices, and overall efficiency is necessary to determine its capacity to meet its obligations, generate profits, and contribute to its stability. Evaluating bank performance is a complex and multifaceted process that requires various metrics, tools, and techniques. One of the key metrics used to assess bank performance is profitability, which refers to a bank's ability to generate income from its assets and liabilities. Profitability metrics can be used to evaluate a bank's revenue streams, cost structure, and efficiency in generating profits. Profitability metrics include net interest margin, return on assets, and return on equity (Berger & DeYoung, 2002). Another critical metric for evaluating bank performance is liquidity, which refers to a bank's ability to meet its short-term obligations using its available cash and cash equivalents. Liquidity metrics can provide insights into a bank's ability to withstand sudden market conditions and customer demand changes. Examples of liquidity metrics include the loan-to-deposit ratio, the cash reserve ratio, and the liquidity coverage ratio (Basel Committee on Banking Supervision, 2013).

Asset quality is another essential aspect of bank performance evaluation, which measures the quality and riskiness of a bank's loan portfolio. To evaluate a bank's credit risk management practices, we generally rely on asset quality metrics, nonperforming loans level, and loan loss provision adequacy. Examples of asset quality metrics include the nonperforming loan ratio, the loan loss reserve ratio, and the loan-to-value ratio (Price water house Coopers (PwC) 2019). Capital adequacy is another crucial metric for evaluating bank performance, which refers to a bank's ability to absorb losses and maintain its financial solvency. Capital adequacy metrics can provide insights into a bank's ability to manage risks and meet regulatory requirements. Examples of capital adequacy metrics include the capital adequacy ratio, leverage ratio, and Tier 1 capital ratio (Basel Committee on Banking Supervision, 2017).

In addition to these primary metrics, other tools and techniques are used to evaluate bank performance, such as stress testing, peer analysis, and benchmarking. Stress testing involves subjecting a bank's financial position to hypothetical

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Vol 3 Issue 2 (2023)

scenarios to assess its resilience to adverse conditions (Dodd-Frank Act, 2010). Peer analysis compares a bank's performance to its competitors to identify areas of strength and weakness (Larcker & Tayan, 2016). Benchmarking involves comparing a bank's performance to industry-wide or best-practice standards to identify opportunities for improvement (Crouhy et al., 2006).

This study has developed the empirical framework to identify the factors of profitability that affect the public sector banks' performance. Identification of the relevant variables is a highly important task for bank management and potential national and international investors. The literature on bank performance in terms of profitability in India and the world is vast, but the objective is to evaluate the financial performance determinants of the public sector banks in India from 2000 to 2020.

2. Review of Literature

The Modigliani and Miller irrelevance theory (MM 1958) declares that financial decision-making has no substantial impact on value under the circumstances of capital market perfection with the absence of transaction and bankruptcy costs, taxes, information asymmetry, and varying borrowing costs (Le & Phan, 2017). However, other alternative theories, trade-off theory, and pecking order theory assert the presence of a linkage between leverage and performance, and their propositions are empirically testable. Trade-off theory proposes that an optimum capital structure created by a firm can boost firm value. The trade-off theory is initially developed out of the argument over the MM theory. The trade-off theory argues that organizations could enhance their value by trade-off the benefits and costs of borrowing. The advantage of debt is considered the tax shield of debt, which can improve firm value through debt issuance (Myers 1984). Moreover, Modigliani and Miller (1963) emphasize that tax savings are the key benefit of debt which assists firms in reducing their total taxable income by interest payment.

Empirical investigations to understand whether one of the two theories, pecking order or trade-off, is a more appropriate descriptor of experimental capital structures provide evidence to support both theories e.g., (Fama & French, 2002; Tong & Green, 2005; Adair & Adaskou, 2015; Serrasqueiro & Caetano, 2015; Detthamrong et al., 2017; Jouida, 2018). Thus, empirical evidence supports the hypotheses of trade-off and pecking order theories. The trade-off theory and pecking order theory can also explain the logic of the reverse causal association between performance and leverage. There is some empirical evidence to support it . The trade-off theory expects a positive effect of profitability on leverage. It is argued that the possibility of bankruptcy moves in reverse with profitability (Fama & French, 2002).

Furthermore, highly profitable firms tend to bear more outstanding debt aiming to benefit from the tax-saving (Frank & Goyal, 2009). Wiwattanakantang (1999) adds that firms with high cash flow shall obtain debts more quickly compared to low-profitable firms. Therefore, bankruptcy and agency costs imply high profitability is related to a higher debt ratio. In other words, firm performance can positively impact capital structure (Muthukumar, Riasudeen, Dutta, 2016). The results of previous empirical studies could support the proposition of the trade-off theory e.g., (Adedeji, 2002; Salawu & Agboola, 2008). At the same time, the pecking order theory argues that highly profitable companies are more potentially dependent on the earned surplus to finance their assets, not external sources (Ghosh & Cai, 1999; Myers, 1984). Consequently, profitability's effect on leverage is presumed to be negative, holding the investment level stable (Tong & Green, 2005). Empirically, several studies observed a negative association between the ratios of debt and profitability (Viviani, 2008; Yolanda & Soekarno, 2012; Guner, 2016; Jarallah et al., 2019; Moradi & Paulet, 2019) and Some studies have witnessed that debt financing has a negative and considerable influence on return on assets (Nwude & Anyalechi, 2018). While on the other side, several studies observed a positive relationship between the amount of financial leverage a company has and its overall financial performance, higher profitability levels can increase their financial performance by increasing the amount of financial leverage they use (Akhtar, 2012).

The selected studies cover various topics related to bank performance, focusing on using profitability to measure bank performance. The studies highlight different metrics used to evaluate bank profitability, such as net interest margin and return on assets. They also examine factors influencing bank profitability, such as market competition, risk, and prudential regulation. Some studies argue for a more nuanced approach to bank regulation, considering the diversity of banks and the importance of preserving franchise value. Other studies examine the relationship between bank profitability and corporate

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Vol 3 Issue 2 (2023)

governance, highlighting the importance of effective oversight and accountability. These studies suggest that profitability is a crucial measure of bank performance, but it should be considered in conjunction with other metrics, such as liquidity and solvency. Effective bank regulation and governance are also essential in promoting sustainable bank profitability and reducing systemic risk in the financial sector.

3. Theoretical framework

The profitability of banks can be analysed using various financial ratios, including the debt-equity ratio (DER), return on capital employed (ROCE), return on assets (ROA), and net interest margin (NIM), current ratio (CR). These ratios provide insights into the financial health and performance of banks.

The Debt-Equity Ratio (DER) reflects the bank's leverage and risk profile. A higher debt-equity ratio indicates higher financial leverage and increased risk. Therefore, a very high debt-equity ratio can adversely affect profitability, as it exposes the bank to higher interest expenses and potential solvency issues.

Return on Capital Employed (ROCE) It indicates how effectively the bank generates profits from its total invested capital. A higher ROCE indicates better profitability and efficient utilization of capital. Banks with a high ROCE are typically more attractive to investors and can sustain long-term profitability. However, a low ROCE suggests inefficiency in capital allocation, which can negatively impact profitability.

Return on Assets (ROA) indicates how efficiently a bank utilizes its assets to generate profits. A higher ROA suggests better profitability and effective asset utilization. Banks with a high ROA are generally more efficient in generating income from their asset base. However, a low ROA may indicate poor asset quality, lower interest income, or ineffective management of assets, which can hamper profitability.

Net Interest Margin (NIM) reflects the bank's ability to generate income from its core lending and borrowing activities. Banks with wider interest rate spreads typically have higher NIMs, indicating better profitability. Conversely, a narrower NIM can compress profit margins and impact profitability, especially in a low-interest-rate environment.

Overall, these ratios collectively impact the profitability of banks. A lower DER, higher ROCE, ROA, and NIM are generally associated with increased profitability. These ratios indicate efficient capital utilization, effective asset management, and higher interest income. However, it is important to consider that other factors such as market conditions, regulatory environment, operational efficiency, and risk management practices also influence bank profitability. Literature highlights the importance of financial ratios in influencing the profitability of public sector banks in India. While lower DER, higher ROCE, ROA, and NIM are generally associated with improved profitability and current ratio appears to be less consistent across studies.

4. Data and Methodology

The study is based on secondary data followed by empirical estimation using different econometric models. The data for income and financial statements of listed commercial banks have been collected from the CMIE PROWESS database from 2000 to 2020. This study has verified the Hadri LM test to determine whether the data set is free from unit root problems. This study has used panel data regression models to overcome the issue of endogeneity and to trace the causal dynamics of the relationship between dependent and independent variables.

In our model we have used bank-based variables like Return on Equity (ROE) and Net Profit Margin (NPM), and independent variables like Return on Capital employed (ROCE), Debit Equity Ratio (DER), and, Net Interest Margin (NIM), Return on Assets (ROA), Current ratio (CR) as financial ratios. The analytical step involved using financial ratios gleaned from the bank's financial statements and other activities used to measure performance (Profitability). Therefore, 14 banks were chosen to represent the sample.

Fixed effect regression equation:

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Vol 3 Issue 2 (2023)

$ROE_{it} = \beta_{0i} + \beta_1 DER_{it} + \beta_2 ROCE_{it} + \beta_3 NIM_{it} + \beta_4 ROA_{it} + \beta_5 SIZE_{it} + \beta_6 CR_{it} + u_{it}$ *... (1)*

$NPM_{it} = \beta_{0i} + \beta_1 DER_{it} + \beta_2 ROCE_{it} + \beta_3 NIM_{it} + \beta_4 ROA_{it} + \beta_5 SIZE_{it} + \beta_6 CR_{it} + u_{it}$*... (2)*

- $\beta 1, \beta 2, \beta 3, \beta 4\ldots$ are slope coefficients.

where β_{0i} is the y-intercept of bank *i*; ROE_{it} the return on equity of each bank *i* at time *t*, ratio of profitability of each bank *i* at time, DER_{it} the Debit Equity Ratio of each bank *i* at time *t*; $ROCE_{it}$ the Return on Capital employed of each bank *i* at time *t*; NIM_{it} the Net Interest Margin of each bank *i* at time *t*; ROA_{it} the Return on Assets of each bank *i* at time *t*; CR_{it} Current ratio of each bank *i* at time *t*, u_{it} the error term of bank *i* at time *t* or between bank's error.

Random effect regression equation:

$ROE_{it} = \beta_{0i} + \beta_1 DER_{it} + \beta_2 ROCE_{it} + \beta_3 NIM_{it} + \beta_4 ROA_{it} + \beta_5 SIZE_{it} + \beta_6 CR_{it} + u_{it} + e_{it}$*... (3)*

$NPM_{it} = \beta_{0i} + \beta_1 DER_{it} + \beta_2 ROCE_{it} + \beta_3 NIM_{it} + \beta_4 ROA_{it} + \beta_5 SIZE_{it} + \beta_6 CR_{it} + u_{it} + e_{it}$*... (4)*

- $\beta 1, \beta 2, \beta 3\ldots$ are slope coefficients.

where β_{0i} is the y-intercept of bank *i*; ROE_{it} the return on equity of each bank *i* at time *t*, NPM_{it} the profitability of each bank *i* at time, DER_{it} the Debit Equity Ratio of each bank *i* at time *t*; $ROCE_{it}$ the Return on Capital employed of each bank *i* at time *t*; NIM_{it} the Net Interest Margin of each bank *i* at time *t*; ROA_{it} the Return on Assets of each bank *i* at time *t*; CR_{it} Current ratio of each bank *i* at time *t*, u_{it} the error term of bank *i* at time *t* or between bank's error; and e_{it} the within bank's error term.

Description of variables.

Variables	Abbreviations	Measure	Calculation
Return on Equity	ROE	Financial Performance	Net Income/Average Shareholders' Equity
Return on Assets	ROA	Financial Performance	EBIT / book value total assets
Debt to Equity Ratio	DER	Capital structure	Total Liabilities/Total Shareholders' Equity
Return on Capital Employed	ROCE	Capital Structure/ Profitability	EBIT/Capital Employed
Net Profit Margin	NPM	Capital Structure	Net income/Revenue∗100
Net Interest Margin	NIM	Capital Structure / Profitability	Investment returns - Interest expenses/ Average Earning Assets
Total Assets	SIZE	Firm Size	Natural log. of total assets at year-end
Current Ratio	CR	Financial health	Current Assets / Current Liability

The study employs two performance metrics: the return on equity (ROE) and net profit margin (NPM). The ROE variable is calculated by dividing Net Income/Average Shareholders' Equity. The NPM ratio is calculated by Investment Returns - Interest Expenses/ Average Earning Assets. ROE and NPM have been utilized in most bank performance analyses. NPM evaluates the profit made per rupee of assets and reflects the efficiency with which bank management uses the bank's real investment resources to generate profits. In contrast, ROE focuses on the profit earned on equity operations. Bank size is also included as an independent variable for size-related economies and diseconomies. Most finance literature uses bank assets to measure bank size. However, since total assets are related to other dependent variables like ROA, total assets should be logged before being included in the models. We also anticipate that the higher the equity-to-asset ratio, the

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Vol 3 Issue 2 (2023)

smaller the requirement for external finance and, consequently, the greater the profitability. It is also unfortunate that well-capitalized banks incur fewer costs when they fail, decreasing funding costs. To facilitate the analysis, we use robust panel data estimation. Hausman's specification test has validated the suitability of the panel regression.

5. Empirical Analysis:

Table:1 Descriptive Statistics

Variables	Obs.	Mean	Std. Dev.	Min	Max	p1	p99	Skew.	Kurt.
ROE	224	6.327	17.102	-85.923	31.621	-52.452	27.978	-1.862	7.871
NPM	294	2.803	12.016	-49.19	17.13	-49.19	15.9	-2.097	7.907
DER	292	1.16	.548	.2	3.96	.22	2.53	.796	4.577
ROCE	292	4.049	11.121	-45.32	23.95	-40.03	21.92	-1.648	6.938
NIM	222	3.984	17.335	1.32	261	1.8	4	14.78	219.631
ROA	293	.422	.898	-3.48	1.72	-3.48	1.64	-1.817	7.318
SIZE	294	14.189	1.159	11.687	17.492	11.832	17.358	.142	2.747
CR	294	4.036	1.89	1.32	13.03	1.39	11.75	1.614	6.631

Descriptive statistics for public sector banks serve the purpose of presenting quantitative descriptions in a manageable and comprehensible form. Descriptive statistics enable us to effectively condense copious amounts of data into a coherent and meaningful representation. It is customary to report the standard deviation to a means of the variables. It contains descriptive statistics of given variables i.e., return on equity (ROE), Net profit margin (NPM), debt to equity ratio (DER), return on capital employed (ROCE), Net interest margin (NIM), return on assets (ROA), SIZE of the banks and Current ratio (CR). Descriptive stat. dependent variables NPM and ROE are (2.803), (12.065) and (6.327), (17.102).

Table:2 Correlation Matrix

Variables	ROE	NPM	DER	ROCE	NIM	ROA	SIZE	CR
ROE	1.000							
NPM	0.760	1.000						
DER	0.191	0.059	1.000					
ROCE	0.738	0.974	0.041	1.000				
NIM	0.059	0.074	-0.053	0.091	1.000			
ROA	0.746	0.966	-0.010	0.941	0.084	1.000		
SIZE	-0.286	-0.287	0.140	-0.337	-0.089	-0.302	1.000	
CR	-0.360	-0.452	-0.087	-0.470	-0.029	-0.456	0.322	1.000

Before examining the panel data models, it is important to estimate the correlation *(Pearson's correlation coefficient matrix)* among variables to the presence of multicollinearity. The outcomes authorize that there is no cause of multicollinearity in the models as the values of correlation do not surpass a cut point of 0.9. We conclude that all the variables, i.e., return on equity (ROE), Net profit margin (NPM), debt to equity ratio (DER), return on capital employed (ROCE), Net interest margin (NIM), return on assets (ROA), SIZE of the banks and Current ratio (CR) have been taken in this study are free from multicollinearity.

6. Results and findings

The fixed effect panel equation $ROE_{it} = \beta_{0i} + \beta_1 DER_{it} + \beta_2 ROCE_{it} + \beta_3 NIMit + \beta_4 ROA_{it} + \beta_5 SIZE_{it} + \beta_6 CR_{it} + u_{it}$ and random effect panel equation $ROE_{it} = \beta_{0i} + \beta_1 DER_{it} + \beta_2 ROCE_{it} + \beta_3 NIMit + \beta_4 ROA_{it} + \beta_5 SIZE_{it} + \beta_6 CR_{it} + u_{it} + e_{it}$ have been used in this table for regression analysis purpose. Panel EGLS (cross-section random effects) method has been employed to quantify the relationship. Cross-section random and idiosyncratic random effects have been done under the

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Vol 3 Issue 2 (2023)

effects specification module. Durbin–Watson test has been used for checking autocorrelation and heteroscedasticity. ANOVA *F*-test has also been used for testing a good fit of this model.

6.1. Hadri panel unit root test

The Hadri panel unit root test operates under the null hypothesis that none of the series in the panel contains a unit root (all panels are trend stationery). The test is based on the residuals from the individual OLS regressions that have been performed on a constant, or a constant and a trend:

$$y_{it} = d_i + h_{it} + e_{it} \quad \ldots (5)$$

Table: 3. *Hadri test for ROE and NPM*

	ROE Statistic	p-value	NPM Statistic	p-value
Hadri Z-Stat.	2.442	0.007	6.030	0.000

Panel Unit root test by Hadri LM.

Panel unit root test by Hadri LM (2000) accepts that there is a stationarity process so that is identical across cross-sections. Under the null hypothesis, there is stationarity, while under the alternative hypothesis, there is no stationarity. Total (unbalanced) observations: 222, cross-sections included: 14. Estimates of the above "unit root test" are free from the unit root.

Two-step GLS estimation (Heteroskedastic linear regression) has been performed, results state that there is no correlation between residuals and independent variables. In the preceding, all the results indicate the presence of a stationarity, as the Hadri tests do not reject the null of a stationarity. We conclude that the public sector banking panel data are a stationarity data set.

6.2. Return on equity (ROE) as a dependent variable.

Results of FE and RE panel regression for the public sector banks in India have been illuminated with return on equity (ROE) has been used as a dependent variable, whereas debt to equity ratio (DER), return on capital employed (ROCE), Net interest margin (NIM), return on assets (ROA), SIZE of the banks and Current ratio (CR) has been used as an independent variable. The total number of observations under this panel is 222, and 14 public sector banks included as a cross-section from 2000 to 2020 have been used in this study.

Table:4 *(Public Sector banks with return on equity (ROE) as dependent variable)*

	Fixed effect			Random effect		
Variable	**Coefficient**	**t-Stat.**	**Prob.**	**Coefficient**	**t-Stat.**	**Prob.**
DER	8.881	5.15	0.000***	6.675	4.48	0.000***
ROCE	.229	1.01	0.313	.303	1.44	0.151
NIM	-.008	-0.17	0.865	-.002	-0.04	0.969
ROA	8.702	3.35	0.001***	9.944	4.18	0.000***
SIZE	-6.239	-3.71	0.000***	-1.694	-1.91	0.056*
CR	.599	0.97	0.333	.285	0.57	0.567
C	80.738	3.37	0.001***	17.817	1.42	0.156

Out of all variables, DER, ROA, and SIZE are found significant with the probability value of 0.000*, 0.001*, and 0.056* respectively, under the FE regression model for the public sector banks in India. There is a positive statistically significant relationship between DER, ROA, and a negative statistically significant relationship between SIZE and viability of the Indian banking sector. Although other independent variables, i.e., return on capital employed (ROCE), Net interest margin (NIM), and Current ratio (CR) have been found insignificant with the return on equity (ROE), these variables did not

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Vol 3 Issue 2 (2023)

influence the performance (profitability) of the banking sector in India. The R^2 of this FE panel model is 62.00 per cent, which states variations in the profitability in this panel from 2000 to 2020. The model is acceptable as F-test is 50.756. There is no autocorrelation problem exists in this FE panel model, and this model is also permitted from heteroscedasticity. In the random effect model, DER, ROA, and SIZE are found significant with the performance (probability) values of 0.000, 0.000, and 0.05 respectively. Results state that there is a positive relationship between DER, ROA, and the performance of the public sector banks. However, there is a negative relation between SIZE with the performance of the public sector banks. Although other independent variables, i.e., ROCE, NIM, and CR are found to be insignificant with the return on equity (ROE) by the RE regression model, these variables did not influence the performance (profitability) of the banking sector in India. The R^2 (within) of this RE panel model is 0.598 per cent, and R^2 (Between) is 0.743 per cent. The R^2 explains 60.00 per cent variations during 2000–2020.

Effects Specification

Fixed effect.		**Random effect**	
Mean dependent var	6.477	Mean dependent var	6.477
R-squared	0.616	Overall r-squared	0.609
F-test	50.756	Chi-square	315.611
Akaike crit. (AIC)	1594.928	R-squared within	0.598
SD dependent var	17.474	SD dependent var	17.474
Number of obs.	210	Number of obs.	210
Prob > F	0.000	Prob > chi2	0.000
Bayesian crit. (BIC)	1618.358	R-squared between	0.743

Hausman's test

	Chi-square test value	**Prob.**
Cross-section random	16.029	.014

Hausman's test for public sector banks with return on equity (ROE) as a dependent variable

Hausman's test signifies that, in the above two models Fixed Effect model (FE) and Random Effect model (RE), the Chi-square value of this test 16.03 under the FE model is significant at the 1 per cent level of significance. The Fixed Effect model (FE) has three significant variables which include DER, ROA, and SIZE of the bank, whereas other independent variables, i.e., ROCE, NIM, and CR, have been found insignificant with the return on equity (ROE). Hence, we can conclude that the fixed effects model is suitable for this study.

6.3. *Net Profit Margin (NPM) as a dependent variable.*

The net profit margin (NPM) of the public sector banks in India has been revealed through the results of FE and RE panel regression. The independent variables included the banks' SIZE, current ratio (CR), debt to equity ratio (DER), return on capital employed (ROCE), net interest margin (NIM), and return on assets (ROA). This panel contains 222 total observations. A cross-section of 14 public sector banks from 2000 to 2020 is used in this analysis.

Table:7 *(Public Sector banks with Net Profit Margin (NPM) as dependent variable)*

	Fixed effect			**Random effect**		
Variable	**Coef.**	**t-Stat.**	**Prob.**	**Coef.**	**t-Stat.**	**Prob.**
DER	.772	2.32	0.022**	.917	2.91	0.004***
ROCE	.656	15.33	0.000**	.634	15.17	0.000***
NIM	.003	0.34	0.732	-.001	-0.08	0.935

Journal of Informatics Education and Research
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Vol 3 Issue 2 (2023)

ROA	6.025	12.13	0.000***	6.288	13.11	0.000***
SIZE	.516	1.71	0.09*	.414	1.89	0.059*
CR	-.032	-0.27	0.791	.019	0.18	0.86
C	-9.995	-2.36	0.019**	-8.883	-2.89	0.004***

Under the Fixed Effect regression model, DER, ROCE, ROA, and SIZE have been found significant with the probability values of 0.022, 0.000, 0.000, and 0.09, respectively, for the public sector banks in India using Net Profit Margin (NPM) as a dependent variable. There is a negative association between CR and NPM, but this ratio doesn't have much effect on the NPM of public sector banks of India. Nevertheless, DER, ROCE, ROA, and SIZE have a positive association with the Net Profit Margin ratio of public sector banks in India. These variables increased the performance of public sector banks. Although other independent variables, i.e., NIM, and CR, have been found insignificant with the NPM these variables did not influence the performance of public sector banking in India. The R-Squared of this Fixed Effect panel model is 97.00 per cent, which explains 97.00 per cent deviations.

In the Random Effect regression, only DER, ROCE, ROA, and SIZE have been found significant with the performance (probability) with values of 0.004, 0.000, 0.000, and 0.059 respectively. There is no positive association between independent variables with the NPM for public sector banks in India. Where we can say that these ratios are not viably continuing returns for public sector banks in India. Though other independent variables, i.e., NIM and CR, have been found insignificant with NPM by the Random Effect regression model, these variables did not influence the performance of public sector banks in India. The R-Squared (within) and R-Squared (between) of this Random Effect panel model are 97.00 per cent and 95.00 per cent, which states that 97.00 per cent variations in this panel from 2000 to 2020.

Effects Specification

Fixed effect		**Random effect**	
Mean dependent var	2.239	Mean dependent var	2.239
R-squared	0.971	Overall r-squared	0.968
F-test	1119.678	Chi-square	6902.536
Akaike crit. (AIC)	971.758	R-squared within	0.971
SD dependent var	13.001	SD dependent var	13.001
Number of obs.	222	Number of obs.	222
Prob > F	0.000	Prob > chi2	0.000
Bayesian crit. (BIC)	995.577	R-squared between	0.951

Hausman's test

	Chi-square test value	**Prob.**
Cross-section random	13.15	0.041

Hausman's test for public sector banks with Net Profit Margin (NPM) as a dependent variable

Hausman's test asserts that the Fixed Effect Regression model is significant from the above two models. The outcome suggests that the most appropriate model is the FE model because the Chi-square test value of this test 13.15 is significant at the 5 per cent level of significance. The FE model with these variables, i.e., DER, ROCE, ROA, and SIZE found insignificant with the NPM for the public sector banks in India.

7. Conclusion

The performance of public sector banks is reduced by NIM, CR, and Quick ratio because they are unable to keep their interest-earned ratios at a standard limit. However public sector banks are shifting their attention to DER, and ROA to boost their bottom lines. Using ROE as a proxy for profitability to study the impact on performance, however, the findings have shown that public sector banks in India are losing money due to the cost of interest paid to ROCE and overall debt

relative to owners' funds. However, DER and SIZE have a positive impact on the profitability of public sector banks. There is evidence that public sector banks are statistically better in terms of credit to corporates and total assets ratio (SIZE). Decreasing nonperforming assets (NPAs) this study suggests that public sector banks should invest in their public customer-based reputation to remain competitive. Finally, we recommend that public banks strive to increase the net interest margin, credit deposit and the ratio of interest spent to interest earned to generate more income than they spend on various services.

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Appendix

Table: I.

Heteroskedastic linear regression Number of obs. = 222
Two-step GLS estimation Wald chi2(6) = 31651.94

NPM	Coef.	Std. Err.	z	P>z	[95%Conf.	Interval]
NPM						
DER	0.927	0.199	4.650	0.000	0.537	1.318
ROCE	0.359	0.047	7.570	0.000	0.266	0.452
NIM	-0.005	0.001	-5.250	0.000	-0.006	-0.003
ROA	8.317	0.538	15.460	0.000	7.263	9.372
SIZE	-0.169	0.037	-4.620	0.000	-0.241	-0.098
CR	-0.047	0.089	-0.520	0.602	-0.221	0.128
lnsigma2						
DER	-0.957	0.291	-3.290	0.001	-1.526	-0.387
ROCE	-0.031	0.040	-0.770	0.441	-0.109	0.048
NIM	-0.022	0.009	-2.550	0.011	-0.039	-0.005
ROA	-0.264	0.459	-0.570	0.566	-1.164	0.637
SIZE	0.196	0.169	1.160	0.245	-0.134	0.527

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CR	0.050	0.098	0.510	0.608	-0.142	0.242
_cons	-0.259	2.365	-0.110	0.913	-4.895	4.377

Wald test of lnsigma2=0: chi2(6) = 41.81 Prob > chi2 = 0.0000

Hadri Z-Stat Matrix

	H_0 is True	***H_1 is True***
b_1 (RE estimator)	Constant Effective	Unreliable
b_0 (FE estimator)	Constant ineffective	Reliable

Table: II

Pedroni test for cointegration

Ho: No cointegration Number of panels = 14
Ha: All panels are cointegrated Avg. number of periods = 13.786

Cointegrating vector: Panel specific
Panel means: Included Kernel: Bartlett
Time trend: Included Lags: 2.00 (Newey-West)
AR parameter: Panel specific Augmented lags: 1

Cross-sectional means removed

	Statistic	p-value
Modified Phillips-Perron t	5.4231	0.0000
Phillips-Perron t	-4.1292	0.0000
Augmented Dickey-Fuller t	-4.1645	0.0000

Table: III: Cross-sectional time-series FGLS regression

ROE	Coef.	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
DER	2.936	1.07	2.74	.006	.839	5.033	***
ROCE	-.018	.193	-0.09	.925	-.396	.36	
NIM	-.001	.047	-0.03	.975	-.094	.092	
ROA	14.191	2.228	6.37	0	9.824	18.557	***
SIZE	-.072	.16	-0.45	.651	-.385	.241	
CR	-.338	.331	-1.02	.307	-.986	.311	

Mean dependent var	6.477	SD dependent var	17.474
Number of obs.	210	Chi-square	796.826
Prob > chi2	0.000	Akaike crit. (AIC)	1560.827

*** *p<.01, ** p<.05, * p<.1*

Table: IV: Cross-sectional time-series FGLS regression

NPM	Coef.	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
DER	.724	.248	2.92	.004	.238	1.211	***
ROCE	.526	.043	12.24	0	.442	.61	***

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NIM	-.008	.014	-0.59	.553	-.035	.019	
ROA	6.943	.503	13.80	0	5.957	7.929	***
SIZE	-.158	.038	-4.14	0	-.232	-.083	***
CR	.016	.087	0.18	.857	-.154	.185	

Mean dependent var	2.239	SD dependent var	13.001
Number of obs.	222	Chi-square	8446.442

*** p<.01, ** p<.05, * p<.1*

Table: V: Cross-sectional time-series FGLS regression

ROE	Coef.	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
DER	2.936	1.07	2.74	.006	.839	5.033	***
ROCE	-.018	.193	-0.09	.925	-.396	.36	
NIM	-.001	.047	-0.03	.975	-.094	.092	
ROA	14.191	2.228	6.37	0	9.824	18.557	***
SIZE	-.072	.16	-0.45	.651	-.385	.241	
CR	-.338	.331	-1.02	.307	-.986	.311	

Mean dependent var	6.477	SD dependent var	17.474
Number of obs.	210	Chi-square	796.826
Prob > chi2	0.000	Akaike crit. (AIC)	1560.827

*** p<.01, ** p<.05, * p<.1*

Table: VI: Cross-sectional time-series FGLS regression

NPM	Coef.	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
DER	.289	.157	1.85	.065	-.018	.596	*
ROCE	.568	.03	19.08	0	.51	.626	***
NIM	-.007	.018	-0.39	.695	-.042	.028	
ROA	6.026	.35	17.22	0	5.34	6.712	***
SIZE	-.096	.028	-3.44	.001	-.151	-.041	***
CR	.013	.069	0.18	.856	-.123	.148	

Mean dependent var	2.239	SD dependent var	13.001
Number of obs.	222	Chi-square	17956.855
Prob > chi2	0.000	Akaike crit. (AIC)	955.799

*** p<.01, ** p<.05, * p<.1*