Evaluating factors of profitability for Indian banking sector: a panel regression

Rohit Bansal and Arun Singh
Rajiv Gandhi Institute of Petroleum Technology, Raebareli, India
Sushil Kumar
National Institute of Technology Warangal, Warangal, India, and
Rajni Gupta
Delhi University, Delhi, India

Abstract

Purpose – The purpose of this paper is to quantify several measures to examine the determinants of profitability for the listed Indian banks. The authors include both public sector (PSUs) and private sector's banks in the study. The authors have taken all the banks that are registered on the Bombay stock exchange (BSE) in the sample. This paper also intends to identify the association between the net profit margin (PM) and return on assets (ROA) with the several other independent variables of the Indian banking sector including private banks and public banks over the past six years starting from April 1, 2012 to March 31, 2017. Therefore, a sample of 39 listed banking companies and total 195 balanced observations are selected for the analysis purpose.

Design/methodology/approach – The authors have used profitability as a dependent variable represented by net PM, ROA and several financial ratios as independent variables. Financial statement and income statement of all listed banks were obtained from BSE and particular company's website. Panel data regression has been analyzed with both the descriptive research techniques, i.e., fixed effects and random effects. The authors also verified both panel techniques with Hausman's specification test, which is a widely used procedure for selecting a panel effect. The authors applied PP – Fisher χ^2, PP – Choi Z-statistics and Hadri to testing whether the data set is free from unit root problem and data set is a stationary series.

Findings – Results imply that interest expended interest earned (IEIE) and credit deposit ratio (CRDR) reduced the profitability of private banks in India. IEIE, CRDR and quick ratio (QR) reduced the profitability of public banks in India, while cash deposit ratio (CDR) and Advances to Loan Funds (ALF) increased the effectiveness of public banks. Under the total banks IEIE, CRDR reduced the profitability, on the other side, CDR, ALF and Total Debt to Owners Fund (TDOF) increased the profitability of total banks in India. Under the dependency of ROA, CRDR and TDOF reduced the return of private banks in India, while CDR, ALF and QR enhanced the profitability of private banks.

Originality/value – No variables found significant under public banks while taking ROA as a dependent variable. Under the overall banking data, CRDR reduced the profitability. On the other side, capital adequacy ratio and ALF increased the profitability of total banks in India. The findings of this study will support policy creators, financial executives and investors in constructing investment decisions.

Keywords Profitability, Assets turnover, Fixed effects panel, PSUs banks, Profit margin, Radom effect panel

Paper type Research paper

Introduction

Indian banking sector is one part of the shifting business paradigms across the globe. The sector is passing through from an era of high competition, regulatory changes and the slow growth of the Indian economy, which has affected it. The recent few events have affected the

banking-related operations, i.e. NPAs, demonetization, digit India, payment wallet, goods & service tax and payment banks in India. The RBI has extended the timeline for Basel III compliance and licenses to private sector entities. So, competition is going to intensify. Increasing competition is going to be a problem as well as an opportunity also to explore new area and scope of banking services. Customer satisfaction, service innovation and technology-driven banking would be the focus points. Economic solidity remains engrained though, with inflation continuing moderate, and the fiscal deficit on the path of consolidation.

In this reading, we want to discover the factors of profitability for private and public sector banks and would like to elaborate, which factors are affecting profit margin (PM), interest income, deposits and certain expenses. Financial performance is the key indicator for any business organization. The future evolution and present operations of corporate would be influenced by profitability. The profitability is the ratio which supports to quantify the financial performance of business uniqueness of this study, which divides whole banking data into three categories, i.e. private bank, public bank and combined (private and public). Amandeep (1983) studied several variables that affect the profitability with the help of regression analysis. The author had tried to define various factors that affect the dependent variable, i.e. profitability, also used trend analysis and ratio analysis for commercial banks in India. Mishra (1992) studied and evaluated the profitability of scheduled commercial banks considering the interest and non-interest income and interest expenditure, manpower expenses and other expenses. He said that the growing preemption of funds in the form of liquidity ratio, cash reserve ratio, as compared to the income, advances and total investment than interest income has contributed to the deteriorating profitability of Indian commercial banks. Ramamoorthy (1998) studied profitability and productivity for the Indian banking sector during the period of 1993–1996. The author evaluated and tested profitability as well as the efficiency of Indian banks with its global equals. The results disclosed that Indian banks have higher interest spread than banks abroad, higher operating cost banks in foreign countries and higher risk provision levels. Vennet (2002) described the cost and profit efficiency of European financial conglomerates and universal banks. The author concluded that operational efficiency has become the major determinant of bank profitability. Goddard *et al.* (2004a, b) revealed that the relationship between the capital-assets ratio and profitability is positive. Satish *et al.* (2005) scrutinized the performance of 55 banks for the period 2004–2005. They concluded that the Indian banking system gazes rigorous and upcoming advances technology which will assist the banking system to propagate in the coming era. Bhayani (2006) tried to analyze the performance of new private banks through the help of the CAMEL model. The author found the satisfactory performance of these private banks in the Indian scenario.

Vyas and Dhade's (2007) study was primarily focused on the State Bank of India (SBI), as to how much it had been affected by the entry of new private sector banks. The authors used several financial ratios and applied the *t*-test to evaluate the changes in the business of SBI, especially before and after the entry of private sector banks. Singla (2008) had tried to analyze the role of financial management in the growth of banking. The study was related to measuring the profitability of selected 16 banks for a period from 2000–2001 to 2006–2007. The study concluded that the profitability position was reasonable when likened with the preceding years. Rao (2008) pointed few observations during their research and found that following factors, such as competition, new information technologies and falling costs, have all frolicked a major role for public sector banks in India. The author had taken public, private and foreign banks working in India for a period from 2005–2006 to 2010–2011. Pat (2009) illustrated the various groups of banks and some financial ratio like net profit, return on assets (ROA) and return on equity. The author reported the improvements in net profits margin, ROA and return on equity.

Prasad and Chari (2011) described the financial performance of four major banks in India. The following variables had been taken for the study, spread ratios, burden ratios and profitability ratios. The study brings out the comparative efficiency of SBI, PNB, ICICI and HDFC. Devanadhen (2013) discussed about the financial soundness of the Indian banking sector. He had included 14 public and 3 private banks from April 1, 2000 to March 31, 2011 in their study. Central Bank of India erected last in the total performance and SBI exhibited better performance than ICICI Bank. Barua *et al.* (2017) found a negative link between profitability and market concentration. Other findings suggested that capitalization, credit risk, leverage and ownership structure are the most important elements of the viability of Indian banks. Ozili (2017) investigated the determinants of African bank profitability. Using static and dynamic panel estimation techniques, the conclusions specify that bank size, total regulatory capital and loan loss provisions are substantial elements of the ROA of listed banks compared to non-listed banks.

Research problem and objectives

- to examine the determinants of profitability for the banking companies listed on Bombay stock exchange (BSE) by taking PM and ROA as a dependent variable;
- identify various financial ratios, affecting the measurements of profitability;
- apply Hausman's test to measure panel regression;
- to quantify various determinates for the profitability of listed public banks (PSUs) and private banks; and
- compare the determinants of profitability between public banks and private banks and identify those elements that are moving the productivity of listed banks in India.

Research methodology

This research paper's purpose is to quantify the determinants of PM of the Indian banking sector that is listed on the BSE for the period of April 2012 to March 2017. As a research procedure, we have obtained the income and the financial statements for the five periods (April 2012–March 2017) of the listed banking companies from BSE and the company's website. Financial analysis for Indian companies is based on the data of the financial year ending on March 31. Financial ratios were collected from the company's financial statements, then brief to arise with profitability and other activity ratios that were used in the analysis phase. Therefore, a sample of 39 listed banking companies was selected. Current study excludes eight companies as they do not have audited income statement and financial statement. Finally, only 41 listed oil companies have been included in our study for analysis purpose. Dougherty (2007) recommended a regression model in panel data approaches, i.e. fixed effects (FE) and random effects (RE) panel. After applying both panel data approaches authors must run Hausman's specification test, if this test provides a significant result, then they should reject the following null hypothesis, "difference in coefficients not systematic" (Table I).

The FE model

The FE model is a specific set of *N* firms, i.e. private and public listed banks on BSE, and our inference is limited to the behavior of these groups of companies. Inference is conditional on the particular *N* firms, companies that are observed.

Variable	Sign	Formula
Profit margin	PM_{it}	Profit margin $=$ (Profit after tax/Net sales) $\times$ 100
Return on assets	ROA_{it}	Return on assets $=$ (Profit after tax/Average total assets) $\times$ 100
Interest income to total funds ratio	$IITF_{it}$	IITF $=$ Interest income/Total funds
Total income to capital employed	$TICE_{it}$	TICE $=$ Total income/Capital employed
Capital adequacy ratio	CAR_{it}	CAR $=$ (Tier one capital $+$ Tier two capital)/Risk weighted assets
Advances to loans funds	ALF_{it}	ALF $=$ Advances/Loans funds
Credit deposit ratio	$CRDR_{it}$	Credit deposit ratio $=$ (Total advances/Total deposits) $\times$ 100
Cash deposit ratio	CDR_{it}	CDR $=$ (Cash in hand $+$ balances with RBI)/Total deposits
Total debt to owners fund	$TDOF_{it}$	TDOF $=$ Total debt/Owners funds
Quick ratio	QR_{it}	OR $=$ (Current assets $-$ inventories)/Current liabilities
Interest expended to interest earned	$IEIE_{it}$	IEIE $=$ Interest expended/Interest earned

Note: Profit margin has been used as a dependent variable and debtors turnover, working capital turnover and assets turnover ratio have been used as independent variables in this study, their descriptions are provided in the table

Table I.
Determinants
of viability

FE regression equation Model A:

$$LOGPM_{it} = \beta_{0i} + \beta_1 LOGTICE_{it} + \beta_2 LOGIITF_{it} + \beta_3 LOGCAR_{it} + \beta_4 LOGALF_{it}$$
$$+ \beta_5 LOGCRDR_{it} + \beta_6 LOGCDR_{it} + \beta_7 LOGTDOF_{it}$$
$$+ \beta_8 LOGQR_{it} + \beta_9 LOGIEIE_{it} + u_{it}.$$

FE regression equation Model B:

$$LOGROA_{it} = \beta_{0i} + \beta_1 LOGTICE_{it} + \beta_2 LOGIITF_{it} + \beta_3 LOGCAR_{it} + \beta_4 LOGALF_{it}$$
$$+ \beta_5 LOGCRDR_{it} + \beta_6 LOGCDR_{it} + \beta_7 LOGTDOF_{it}$$
$$+ \beta_8 LOGQR_{it} + \beta_9 LOGIEIE_{it} + u_{it},$$

where β_{0i} is the y-intercept of company i; PM_{it} the profitability of each company i at time t (dependent variable in Model A); $LOGROA_{it}$ the return on assets of each company i at time t (dependent variable in Model B); $LOGTICE_{it}$ the total income/capital employed of each company i at time t; $LOGIITF_{it}$ the interest income to total funds ratio of each company i at time t; $LOGCAR_{it}$ the capital adequacy ratio of each company i at time t; $LOGALF_{it}$ the advances/loans fund ratio of each company i at time t; $LOGCRDR_{it}$ the credit deposit ratio of each company i at time t; $LOGCDR_{it}$ the cash deposit ratio of each company i at time t; $LOGTDOF_{it}$ the total debt to owners fund of each company i at time t; $LOGQR_{it}$ the quick ratio of each company i at time t; $LOGIEIE_{it}$ the interest expended to interest earned of each company i at time t; and u_{it} the error term of company i at time t or between company's error.

The RE models
There are unique, time constant attributes of individuals that are the results of random variation and do not correlate with the individual regressors. We have included private and public listed banks on BSE.
   RE regression equation Model A:

$$LOGPM_{it} = \beta_{0i} + \beta_1 LOGTICE_{it} + \beta_2 LOGIITF_{it} + \beta_3 LOGCAR_{it} + \beta_4 LOGALF_{it}$$
$$+ \beta_5 LOGCRDR_{it} + \beta_6 LOGCDR_{it} + \beta_7 LOGTDOF_{it}$$
$$+ \beta_8 LOGQR_{it} + \beta_9 LOGIEIE_{it} + u_{it} + e_{it}.$$

RE regression equation Model B:

$$LOGROA_{it} = \beta_{0i} + \beta_1 LOGTICE_{it} + \beta_2 LOGIITF_{it} + \beta_3 LOGCAR_{it} + \beta_4 LOGALF_{it}$$
$$+ \beta_5 LOGCRDR_{it} + \beta_6 LOGCDR_{it} + \beta_7 LOGTDOF_{it}$$
$$+ \beta_8 LOGQR_{it} + \beta_9 LOGIEIE_{it} + u_{it} + e_{it},$$

where β_{0i} is the y-intercept of company i; PM_{it} the profitability of each company i at time t (dependent variable in Model A); $LOGROA_{it}$ the return on assets of each company i at time t (dependent variable in Model B); $LOGTICE_{it}$ the total income/capital employed of each company i at time t; $LOGIITF_{it}$ the interest income to total funds ratio of each company i at time t; $LOGCAR_{it}$ the capital adequacy ratio of each company i at time t; $LOGALF_{it}$ the advances to loan funds ratio of each company i at time t; $LOGCRDR_{it}$ the credit deposit ratio of each company i at time t; $LOGCDR_{it}$ the cash deposit ratio of each company i at time t; $LOGTDOF_{it}$ the total debt to owners fund of each company i at time t; $LOGQR_{it}$ the quick ratio of each company i at time t; $LOGIEIE_{it}$ the interest expended to interest earned of each company i at time t; u_{it} the error term of company i at time t or between company's error; and e_{it} the within company's error.

The Hausman's test
The Hausman's (1978) test compares the RE and FE estimators, since the key consideration in choosing between an RE and FE approaches is whether c_i and x_{it} are correlated, it is important to have a method for testing this assumption (Tables II and III).

Empirical results
Tables IV and V.

Panel unit root test
Table VI.
    The value of fisher χ^2 test (PP) statistic is 59.91 and Choi Z-stat. is 5.88. All of the results indicate the non-presence of a unit root, as both Fisher and Choi Z-tests do not fail to reject the null of a unit root. We can say that unit root problem does not exist into the Indian banking panel data.

Hadri panel unit root test
The Hadri panel unit root test has a null hypothesis of no unit root in any of the series in the panel. The test is based on the residuals from the individual OLS regressions of on a constant, or on a constant and a trend:

$$y_{it} = d_i + h_{it} + e_{it}.$$

Table VII.
    The Hadri Z-statistic value is 10.67 and Heteroscedastic consistent Z-stat. is 10.54. At the preceding, all of the results indicate the presence of a stationarity, as the Hadri tests do not reject the null of a stationarity. We conclude that the Indian banking panel data are stationarity data set.

	H_0 is true	$H1$ is true
b_1 (RE estimator)	Constant effective	Unreliable
b_0 (FE estimator)	Constant ineffective	Reliable

Table II.
The Hadri Z-statistic matrix

S. No.	Security code	Security ID	Security name	Type	ISIN No.
1	532480	ALBK	Allahabad Bank	PSU	INE428A01015
2	532418	ANDHRABANK	Andhra Bank	PSU	INE434A01013
3	532134	BANKBARODA	Bank of Baroda	PSU	INE028A01039
4	532149	BANKINDIA	Bank of India	PSU	INE084A01016
5	532525	MAHABANK	Bank of Maharashtra	PSU	INE457A01014
6	532483	CANBK	Canara Bank	PSU	INE476A01014
7	532885	CENTRALBK	Central Bank of India	PSU	INE483A01010
8	532179	CORPBANK	Corporation Bank	PSU	INE112A01023
9	532121	DENABANK	Dena Bank	PSU	INE077A01010
10	500116	IDBI	IDBI Bank Ltd	PSU	INE008A01015
11	532814	INDIANB	Indian Bank	PSU	INE562A01011
12	532388	IOB	Indian Overseas Bank	PSU	INE565A01014
13	500315	ORIENTBANK	Oriental Bank of Commerce	PSU	INE141A01014
14	533295	PSB	Punjab & Sind Bank	PSU	INE608A01012
15	532461	PNB	Punjab National Bank	PSU	INE160A01022
16	532218	SOUTHBANK	South Indian Bank Ltd	PSU	INE683A01023
17	501061	SBBJ	State Bank of Bikaner & Jaipur	PSU	INE648A01026
18	500112	SBIN	State Bank of India	PSU	INE062A01020
19	532200	MYSOREBANK	State Bank of Mysore	PSU	INE651A01020
20	532191	SBT	State Bank of Travancore	PSU	INE654A01024
21	532276	SYNDIBANK	Syndicate Bank	PSU	INE667A01018
22	532505	UCOBANK	UCO Bank	PSU	INE691A01018
23	532477	UNIONBANK	Union Bank of India	PSU	INE692A01016
24	533171	UNITEDBNK	United Bank of India	PSU	INE695A01019
25	532401	VIJAYABANK	Vijaya Bank	PSU	INE705A01016
26	532215	AXISBANK	Axis Bank Ltd	Private	INE238A01034
27	532210	CUB	City Union Bank Ltd	Private	INE491A01021
28	532772	DCBBANK	DCB Bank Limited	Private	INE503A01015
29	532180	DHANBANK	Dhanlaxmi Bank Limited	Private	INE680A01011
30	500469	FEDERALBNK	Federal Bank Ltd	Private	INE171A01029
31	500180	HDFCBANK	HDFC Bank Ltd	Private	INE040A01026
32	532174	ICICIBANK	ICICI Bank Ltd	Private	INE090A01021
33	532187	INDUSINDBK	Indusind Bank Ltd	Private	INE095A01012
34	532209	J&KBANK	Jammu & Kashmir Bank Ltd	Private	INE168A01041
35	532652	KTKBANK	Karnataka Bank Ltd	Private	INE614B01018
36	590003	KARURVYSYA	Karur Vysya Bank Ltd	Private	INE036D01028
37	500247	KOTAKBANK	Kotak Mahindra Bank Ltd	Private	INE237A01028
38	534690	LAKSHVILAS	Lakshmi Vilas Bank Ltd	Private	INE694C01018
39	532648	YESBANK	Yes Bank Ltd	Private	INE528G01019

Income statement and financial statement of the following companies are not available

40	539437	IDFCBANK	IDFC Bank Ltd	Private	INE092T01019
41	540065	RBLBANK	RBL Bank Ltd	Private	INE976G01028
42	580001	STAN	Standard Chartered PLC	Private	INE028L21018

Notes: This table characterizes all banks listed on Bombay stock exchange (BSE) India from April 2012, out of the total samples 39 companies have been listed on the basis of their security code, security ID, name, type and ISIN number. Income statement and financial statement have been taken from BSE of all respective companies from April 2012 to March 2017. Total 42 companies had been listed under the banking sector (given in the table) on BSE but the unavailability of the income statement and financial statement of three

	TICE	TDOF	ROA	NPM	IITF	IEIE	CRDR	CDR	CAR	ALF	QR
Mean	9.95	15.51	319.15	7.51	8.96	70.28	75.69	5.52	12.74	73.14	23.9
Median	9.79	15.76	173.38	7.50	8.88	71.43	74.76	5.26	12.40	73.34	24.0
Max.	19.25	29.94	1,584.3	22.76	17.5	82.24	105.0	9.82	18.8	96.23	49.9
Min.	6.89	0.00	19.12	−19.4	6.25	53.79	59.86	3.08	7.51	55.78	6.20
SD	1.20	4.90	317.32	7.96	1.06	6.19	7.66	1.08	2.08	6.13	6.94
Skewness	2.51	−0.19	1.54	−0.87	2.76	−0.54	1.12	1.20	0.85	−0.28	−0.06
Kurtosis	20.57	3.37	4.76	4.51	24.4	2.70	5.80	5.22	3.54	3.86	3.38
Jarque–Bera	2,713.84	2.20	102.61	43.23	3,994	10.30	104.3	86.6	25.62	8.54	1.30
Observation	195	195	195	195	195	195	195	195	195	195	195

Notes: This table includes descriptive statistics for listed banks on Bombay stock exchange from April 2012 to March 2017. It contains a number of variables which have been used in this study, i.e. total income to capital employed (TICE), total debt to owners fund (TDOF), return on assets (ROA), net profit margin (NPM), interest income to total funds ratio (IITF), interest expended to interest earned (IEIE), credit deposit ratio (CRDR), cash deposit ratio (CDR), capital adequacy ratio (CAR), advances to loans funds (ALF) and quick ratio (QR). Total 195 numbers of samples have been used to comprise a balanced panel of banking sector from the years 2012–2016. Descriptive statistics have been employed in this study. Mean of net profit margin is 7.51, and the return of assets is 319.15

Table IV.
Descriptive statistics
for listed PSU's and
private banks

Cross-section regression results

Results and findings

Table VIII signifies the results of FE and RE panel regression for the private banking sector in India. Net profit margin (LOGPM) has been used as a dependent variable, whereas IITF, interest expended interest earned (IEIE), credit deposit ratio (CRDR), CDR, CAR, advances to loans funds (ALF), quick ratio (QR), total debt to owners fund (TDOF) and total income to capital employed (TICE) have been used as an independent variable. The total number of observations under this panel is 195, and 39 is included as a cross-section. Five years of data from 2012 to 2017 have been booked in this study.

Out of all variables, IEIE and CRDR are found significant with the probability value of 0.069 and 0.02, respectively, under the FE regression model for the private banks in India. There is a negative statistically significant relationship between IEIE and CRDR and the viability of the Indian banking sector. Although other independent variables, i.e. IITF ratio, cash deposit ratio (CDR), capital adequacy ratio (CAR), advances to loans funds, QR, total debt to owners fund and total income to capital employed, have been found insignificant with the net PM, these variables did not influence the profitability of the banking sector in India. The R^2 of this FE panel model is 81.00 percent, while adjusted R^2 of this panel is 77.00 percent. The R^2 explains 81.00 percent variations in the profitability in this panel from 2012 to 2017. Adjusted R^2 of this panel explains the 77.00 percent variations in the profitability. Model is acceptable as F-test is 23.27. The value of Durbin–Watson stat. is 02.09, which explains there is no autocorrelation problem exists in this FE panel model, and this model is also permitted from hetroscadisticity.

Under the RE regression model, IITF ratio, IEIE, CRDR, CAR and ALF are found significant with the probability value of 0.095, 0.007, 0.011, 0.001 and 0.020, respectively. We found a positive significant relationship between IITF and ALF and the profitability of the private banking sector. However, there is a negative statistically significant connection between IEIE, CRDR and CAR with the profitability of the private banking sector. Although other independent variables, i.e., CDR, QR, total debt to owners fund and total income to capital employed, have been found insignificant with the net PM by the RE regression model, these variables did not influence the profitability of banking sector in India. The R^2 of this RE panel model is 49.00 percent, while adjusted R^2 of this panel is 42.00 percent. The R^2 explains 49.00 percent variations during 2012–2017. Adjusted R^2 of this panel explains

	LOGPM	LOGALF	LOGCAR	LOGCDR	LOGCRDR	LOGIEIE	LOGIITF	LOGQR	LOGTDOF	LOGTICE
LOGPM	1.00									
LOGALF	0.55	1.00								
LOGCAR	0.58	0.36	1.00							
LOGCDR	0.18	0.25	0.16	1.00						
LOGCRDR	0.36	0.60	0.49	0.34	1.00					
LOGIEIE	-0.60	-0.44	-0.59	-0.09	-0.40	1.00				
LOGIITF	0.18	0.30	0.16	0.19	0.15	-0.12	1.00			
LOGQR	-0.33	-0.15	-0.48	-0.26	-0.41	0.49	0.15	1.00		
LOGTDOF	-0.44	-0.29	-0.60	-0.11	-0.45	0.48	-0.46	0.29	1.00	
LOGTICE	0.33	0.36	0.37	0.17	0.25	-0.19	0.54	-0.14	-0.59	1.00

Notes: This table represents the calculation of Pearson's correlation coefficient matrix. Before examining the panel data models, it is important to estimate the correlation among variables in order to the presence of multicollinearty. The outcomes authorize that there is no cause of multicollinearty in the models as the values of correlation do not surpass from a cut point 0.70. At the end, we conclude that all the variables, i.e. total income to capital employed (TICE), total debt to owners fund (TDOF), net profit margin (NPM), IITF, IEIE, CRDR, CDR, capital adequacy ratio (CAR), advances to loans funds (ALF) and quick ratio (QR) have been taken in this study are free from multicollinearty

Table V.
Pearson correlation
coefficient matrix

42.00 percent variations in that model. However, the model is not acceptable as F-test is 06.58. The value of Durbin–Watson stat. is 01.62, which explains there is a positive autocorrelation problem exists in this panel model (Table IX).

As out of the above two models (FE and RE), the χ^2 value of this test 47.43 under FE model is significant at the 1 percent level of significance. The FE model has two significant variables which include IEIE and CRDR of the firm, whereas other independent variables, i.e. interest income to total funds ratio, CDR, CAR, advances to loans funds, QR, total debt to owners fund and total income to capital employed, have been found insignificant with the net PM.

Results and findings

Table X indicates the results of FE and RE panel regression for the public banking sector in India. Net profit margin (LOGPM) has been used as a dependent variable under FE and RE panel, whereas IITF, IEIE, CRDR, CDR, CAR, ALF, QR, total debt to owners fund (TDOF) and total income to capital employed (TICE) have been used as independent variables. The total number of observations under this panel is 195, and 39 included as a cross-section. Five years of data from 2012 to 2017 have been used in this study.

Out of all variables, IEIE, CRDR, CDR, advances to loans funds and QR are found significant with the probability values of 0.01, 0.07, 0.07, 0.00 and 0.08, respectively, under the FE regression model for the public banks in India. We have found a negative statistical association between IEIE, CRDR and QR and the viability of public banks in India. However, there is a positive association between CDR and advances to loan funds with the profitability of public banks in India. Although other independent variables, i.e. IITF ratio, CAR, total debt to owners fund and total income to capital employed, have been found insignificant with the net PM for the public banks, these variables did not influence the profitability of banking sector. The R^2 of this FE panel model is 74.00 percent, while adjusted R^2 of this panel is 65.00 percent. The R^2 explains the 74.00 percent existence of included variables from 2012 to 2017. Adjusted R^2 of this panel explains the 65.00 percent variations. Model is acceptable as F-stat. in 08.21. The value of Durbin–Watson stat. is 01.71,

LOGPM Method	Statistic	Prob.	LOGROA Method	Statistic	Prob.
PP – fisher χ^2	59.9178	0.9361	PP – fisher χ^2	89.6914	0.1721
PP – Choi Z-stat.	5.89951	1.0000	PP – Choi Z-stat.	0.7305	0.7675

Notes: This table calculated these types of panel unit root tests: fisher-type tests using the PP method, and PP – Choi Z-stat. Null hypothesis: unit root (individual unit root process). Newey–West automatic bandwidth selection and Bartlett kernel. Total (balanced) observations: 195, cross-sections included: 39

Table VI.
Summary

Method	LOGPM Statistic	Prob.	LOGROA Statistic	Prob.
Hadri Z-stat.	10.6738	0.0000	07.33698	0.0000
Heteroscedastic consistent Z-stat.	10.5478	0.0000	10.4470	0.0000

Notes: This table presents the panel unit root test by Hadri Z-stat. and heteroscedastic consistent Z-stat. Hadri (2000) accept that there is a stationarity process so that is identical across cross-sections. Under the null hypothesis, there is a stationarity, while under the alternative, there is no stationarity. Null hypothesis: stationarity. Sample: 2012 2017 Newey–West automatic bandwidth selection and Bartlett kernel. Total (balanced) observations: 195, cross-sections included: 39

Table VII.
Panel unit root test by Hadri Z-stat.

	Fixed effect panel regression			Random effect panel regression		
Variable	Coefficient	t-Stat.	Prob.	Coefficient	t-Stat.	Prob.
C	21.56	2.20	0.032	8.14	1.51	0.13
LOGIITF	05.87	1.55	0.127	−3.58	−1.69	0.095***
LOGIEIE	−03.29	−1.85	0.069***	−2.64	−2.78	0.007*
LOGCRDR	−02.46	−2.26	0.02**	−2.12	−2.62	0.011**
LOGCDR	0.38	1.06	0.317	−0.03	−0.08	0.928
LOGCAR	−0.04	−0.06	0.952	2.31	4.19	0.001*
LOGALF	0.76	0.77	0.439	1.86	2.37	0.020**
LOGQR	−0.17	−0.68	0.496	−0.07	−0.43	0.667
LOGTDOF	0.19	0.33	0.741	0.25	0.53	0.591
LOGTICE	−4.88	−1.35	0.181	3.43	1.51	0.138
	Effects specification				Effects specification	
R^2	0.81			R^2	0.49	
Adjusted R^2	0.77			Adjusted R^2	0.42	
Durbin–Watson	2.09			SE of regression	0.39	
SE of regression	0.30			F-statistic	6.58	
F-statistic	23.27			Prob. (F-statistic)	0.02	
Prob. (F-statistic)	0.00			Durbin–Watson stat	1.62	

Notes: The fixed effect panel equation $LOGPM_{it} = \beta_{0i} + \beta_1 LOGTICE_{it} + \beta_2 LOGIITF_{it} + \beta_3 LOGCAR_{it} + \beta_4 LOGALF_{it} + \beta_5 LOGCRDR_{it} + \beta_6 LOGCDR_{it} + \beta_7 LOGTDOF_{it} + \beta_8 LOGQR_{it} + \beta_9 LOGIEIE_{it} + u_{it}$ and random effect panel equation $LOGPM_{it} = \beta_{0i} + \beta_1 LOGTICE_{it} + \beta_2 LOGIITF_{it} + \beta_3 LOGCAR_{it} + \beta_4 LOGALF_{it} + \beta_5 LOGCRDR_{it} + \beta_6 LOGCDR_{it} + \beta_7 LOGTDOF_{it} + \beta_8 LOGQR_{it} + \beta_9 LOGIEIE_{it} + u_{it} + e_{it}$ 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 effects specification module. Durbin–Watson test has been used for checking autocorrelation and hetroscadisticity. Anova F-test has also been used for testing a good fit of this model. *,**,***Significant at the 1, 5 and 10 percent levels, respectively

Table VIII.
Private banks with
profit margin as a
dependent variable

Test summary	χ^2 statistic	χ^2 df	Prob.
Cross-section random	47.4335	9	0.00

Table IX.
Hausman's test for
private banks with
profit margin

which explains there is no autocorrelation problem exists in this FE panel model and this model is also permitted from hetroscadisticity.

Under the RE regression model, interest income to total funds ratio, CRDR, CAR, advances to loans funds and total income to capital employed are found significant with the probability values of 0.04, 0.01, 0.00, 0.00 and 0.05, respectively. We found a negative association between IITF ratio and CRDR with the profitability of public banks in India. These ratios reduced the PM of public banks in India. However, we find a positive relationship between CAR, ALF and TICE and the profitability of public sector banks. Although other independent variables, i.e. IEIE, CDR, QR and total debt to owners fund, have found insignificant with the PM of public sector banks by the RE regression model, these variables did not influence the profitability of public banks. The R^2 of this RE panel model is 57.00 percent, while adjusted R^2 of this panel is 54.00 percent. The R^2 explains 57.00 percent variations from 2012 to 2017. Adjusted R^2 of this panel is explain 54.00 percent variations in the profitability. However, the model is a good fit as F-stat. is 17.44. Conversely, the value of Durbin–Watson stat is 01.75, which explains there is a positive autocorrelation problem exists in this RE panel (Table XI).

As out of the above two models (FE and RE), the χ^2 value of this test 31.01 is significant and substantial at the 1 percent level of importance under FE. For the checking validity of

	FE panel regression				RE panel regression		
Variable	Coefficient	t-Statistic	Prob.	Variable	Coefficient	t-Statistic	Prob.
C	−3.46	−0.29	0.76	C	−25.78	−3.44	0.00
LOGIITF	−2.05	−0.49	0.61	LOGIITF	−5.74	−2.04	0.04**
LOGIEIE	−4.96	−2.55	0.01**	LOGIEIE	−0.05	−0.05	0.95
LOGCRDR	−4.23	−1.77	0.07***	LOGCRDR	−4.2	−3.77	0.01**
LOGCDR	0.75	1.81	0.07***	LOGCDR	0.21	0.8	0.42
LOGCAR	0.31	0.37	0.71	LOGCAR	2.43	4.24	0.00*
LOGALF	9.35	6.14	0.00*	LOGALF	9.1	7.93	0.00*
LOGQR	−0.72	−1.73	0.08***	LOGQR	−0.04	−0.19	0.84
LOGTDOF	0.22	1.04	0.29	LOGTDOF	0.04	0.29	0.76
LOGTICE	3.77	0.88	0.37	LOGTICE	5.66	1.91	0.05**
	Effects specification				Effects specification		
R^2	0.74			R^2	0.57		
Adjusted R^2	0.65			Adjusted R^2	0.54		
Durbin–Watson stat.	1.71			Durbin–Watson stat.	1.75		
F-statistic	8.21			F-statistic	17.44		
Prob. (F-statistic)	0.02			Prob. (F-statistic)	0.01		

Notes: The fixed effect panel equation $LOGPM_{it} = \beta_{0i} + \beta_1 LOGTICE_{it} + \beta_2 LOGIITF_{it} + \beta_3 LOGCAR_{it} + \beta_4 LOGALF_{it} + \beta_5 LOGCRDR_{it} + \beta_6 LOGCDR_{it} + \beta_7 LOGTDOF_{it} + \beta_8 LOGQR_{it} + \beta_9 LOGIEIE_{it} + u_{it}$ and random effect panel equation $LOGPM_{it} = \beta_{0i} + \beta_1 LOGTICE_{it} + \beta_2 LOGIITF_{it} + \beta_3 LOGCAR_{it} + \beta_4 LOGALF_{it} + \beta_5 LOGCRDR_{it} + \beta_6 LOGCDR_{it} + \beta_7 LOGTDOF_{it} + \beta_8 LOGQR_{it} + \beta_9 LOGIEIE_{it} + u_{it} + eit$ have been used in this table for panel, and idiosyncratic random effects had done under effects specification module. Durbin–Watson test has been used for checking autocorrelation and hetroscadisticity. Anova F-test has also been used for testing the good fit of this model. *,**,***Significant at the 1, 5 and 10 percent levels, respectively

Table X.
Public banks with
profit margin as a
dependent variable

Table XI.
Hausman's test for
public banks with
profit margin as a
dependent variable

Test summary	χ^2 statistic	χ^2 df	Prob.
Cross-section random	31.017754	9	0.0003

these two models, we run a Hausman's specification test in order to decide the one appropriate model from two possible options. The FE model explains that variables which include IEIE, CRDR, CDR, ALF and QR are significant with the net PM for the public sector banks in India whereas other independent variables, i.e. IITF ratio, CAR, total debt to owners fund and total income to capital employed, have been found insignificant.

Results and findings
Table XII indicates the results of FE and RE panel regression for the private banking sector in India. LOGROA has been used as a dependent variable under FE and RE, whereas IITF, IEIE, CRDR, CDR, CAR, advances to loans funds (ALF), QR, total debt to owners fund (TDOF) and total income to capital employed (TICE) have been used as an independent variable. The total number of observations under this panel is 195, and 39 included as a cross-section. Five years of data from 2012 to 2017 have been used in this study.

Out of all variables under the FE regression model, QR, CRDR, CDR, advances to loans funds and total debt to owners fund have found significant with the probability values of 0.09, 0.00, 0.09, 0.06 and 0.09, respectively, for the private banks in India using ROA as a dependent variable. We find a negative significant association between CRDR, and total debt to owners fund and the return of asset's ratio of private banks in India. These two

	Fixed effect panel				Random effect panel		
Variable	Coefficient	t-Statistic	Prob.	Variable	Coefficient	t-Statistic	Prob.
C	26.17	1.35	0.18	C	20.98	1.82	0.07
LOGQR	0.74	1.67	0.09***	LOGQR	0.48	1.28	0.21
LOGIITF	5.75	0.94	0.35	LOGIITF	−1.13	−0.25	0.80
LOGIEIE	−5.12	−1.55	0.13	LOGIEIE	−3.62	−1.77	0.08
LOGCRDR	−5.24	−2.97	0.00*	LOGCRDR	−2.60	−1.62	0.11
LOGCDR	1.76	1.70	0.09***	LOGCDR	0.74	1.12	0.27
LOGCAR	0.68	0.53	0.60	LOGCAR	2.90	2.68	0.01**
LOGALF	3.28	1.92	0.06***	LOGALF	−0.12	−0.08	0.94
LOGTDOF	−1.91	−1.71	0.09***	LOGTDOF	0.76	0.82	0.42
LOGTICE	−2.63	−0.44	0.66	LOGTICE	0.59	0.13	0.90
		Effects specification					
R^2	0.84			R^2	0.21		
Adjusted R^2	0.74			Adjusted R^2	0.09		
Durbin–Watson stat.	1.28			Durbin–Watson stat.	1.24		
F-statistic	8.61			F-statistic	1.77		
Prob. (F-statistic)	0.02			Prob. (F-stat)	0.09		

Notes: The fixed effect panel equation $\text{LOGROA}_{it} = \beta_{0i} + \beta_1\text{LOGTICE}_{it} + \beta_2\text{LOGIITF}_{it} + \beta_3\text{LOGCAR}_{it} + \beta_4\text{LOGALF}_{it} + \beta_5\text{LOGCRDR}_{it} + \beta_6\text{LOGCDR}_{it} + \beta_7\text{LOGTDOF}_{it} + \beta_8\text{LOGQR}_{it} + \beta_9\text{LOGIEIE}_{it} + u_{it}$ and Random effect panel equation $\text{LOGROA}_{it} = \beta_{0i} + \beta_1\text{LOGTICE}_{it} + \beta_2\text{LOGIITF}_{it} + \beta_3\text{LOGCAR}_{it} + \beta_4\text{LOGALF}_{it} + \beta_5\text{LOGCRDR}_{it} + \beta_6\text{LOGCDR}_{it} + \beta_7\text{LOGTDOF}_{it} + \beta_8\text{LOGQR}_{it} + \beta_9\text{LOGIEIE}_{it} + u_{it} + eit$ have been used in this table for the regression analysis purpose. Panel EGLS (cross-section random effects) method has been employed. Cross-section random, and Idiosyncratic random effects have been done under effects specification module. Durbin–Watson test has been used for checking autocorrelation and hetroscadisticity. Anova F-test has also used for testing good fit of this model. *,**,***Significant at the 1, 5 and 10 percent levels, respectively

ratios have affected the ROA for the private sector banks. Nevertheless, QR, CDR and advances to loan funds found to have a positive association with the return of asset's ratio of private banks in India. These variables increased the return of private sector banks. Although other independent variables, i.e. IITF, IEIE, CAR and total income to capital employed, have been found insignificant with the ROA for the private banks, these variables did not influence the return of private banking in India. The R^2 of this FE panel model is 84.00 percent, while adjusted R^2 of this panel is 74.00 percent. The R^2 explains 84.00 percent deviations. Adjusted R^2 of this panel explains 74.00 percent variations. The model is acceptable as F-stat. in 08.61. The value of Durbin–Watson stat is 01.28, which explains there is a serial autocorrelation problem exists in this FE panel.

Under the RE regression, only CAR has found significant with the probability value of 0.01. We have found a positive association between CAR and with the ROA for private banks. These ratios continue the return in India. Though other independent variables, i.e. QR, IITF ratio, IEIE, CRDR, CDR, ALF, total debt to owner's fund and total income to capital employed, have found insignificant with the ROA for private sector banks by RE regression model, these variables did not influence the return of private sector banks in India. The R^2 of this RE panel model is 21.00 percent, while adjusted R^2 of this panel is 09.00 percent. The R^2 explains 21.00 percent variations in this panel from 2012 to 2017. Adjusted R^2 of this panel explains 09.00 percent variations. However, the model is not a good fit as F-test is 01.77. The value of Durbin–Watson stat. is 01.24, which explains that there is a positive autocorrelation problem exists in this RE panel (Table XIII).

As out of the above two models (FE and RE), the FE model is significant. The outcome suggests that the most appropriate model is the FE model because the χ^2 value of this test 14.40 is significant at the 10 percent level of significance. The FE model with these variables, i.e. QR, CRDR, CDR, ALF and total debt to owners, and IITF ratio, IEIE, CAR and total income to capital employed have been found insignificant with the ROA for the private banks in India.

Results and findings
Table XIV indicates the results of FE and RE panel regression for the public sector banking in India. LOGROA has been employed as a dependent variable under FE and RE panel, IITF, IEIE, CRDR, CDR, CAR, advances to loans funds (ALF), QR, total debt to owners fund (TDOF) and total income to capital employed (TICE) have been used as an independent variable. The total number of observations under this panel is 195, and 39 is included as a cross-section. Five years of data from 2012 to 2017 have been used in this study.

On the view of all variables under the FE regression model, not a single variable has found significant for the public banks using ROA as a dependent variable. Accordingly, all independent variables, i.e. QR, CRDR, CDR, ALF, TDOF, IITF ratio, IEIE, CAR and TICE, have been found insignificant with the ROA for the public sector banks in India. These variables did not influence the return of the public banking sector in India. The R^2 of this FE panel model is 89.00 percent, while adjusted R^2 of this panel is 84.00 percent. The R^2 explains 89.00 percent variations from 2012 to 2017. Adjusted R^2 of this panel explains the 84.00 percent variations in profitability. Model is a good fit as *F*-stat. is 21.41. The value of Durbin–Watson stat. is 01.20, which explains there is a serial autocorrelation problem exists in this FE.

Under the RE regression, only CRDR has found significant with the probability value of 0.09. We have found a positive association between CRDR and with the ROA for public banks. These ratios continue the return of public banks in India. Though other independent

Test summary	χ^2 Statistic	χ^2 df	Prob.
Cross-section random	24.406952	9	0.086

Fixed effect panel				Random effect panel			
Variable	Coefficient	*t*-Statistic	Prob.	Variable	Coefficient	*t*-Statistic	Prob.
C	−1.97	−0.21	0.83	C	−2.28	−0.26	0.79
LOGQR	0.41	1.21	0.23	LOGQR	0.09	0.31	0.76
LOGIITF	−0.80	−0.24	0.81	LOGIITF	−2.51	−0.81	0.42
LOGIEIE	−1.67	−1.08	0.28	LOGIEIE	−2.01	−1.44	0.15
LOGCRDR	1.85	0.98	0.33	LOGCRDR	2.73	1.70	0.09***
LOGCDR	−0.29	−0.87	0.39	LOGCDR	−0.13	−0.42	0.67
LOGCAR	0.06	0.09	0.93	LOGCAR	−0.08	−0.13	0.90
LOGALF	0.73	0.60	0.55	LOGALF	0.88	0.76	0.45
LOGTDOF	0.12	0.73	0.47	LOGTDOF	0.04	0.26	0.79
LOGTICE	1.71	0.51	0.61	LOGTICE	2.75	0.85	0.40
			Effects specification				
R^2	0.89			R^2	0.14		
Adjusted R^2	0.84			Adjusted R^2	0.07		
Durbin–Watson stat.	1.20			Durbin–Watson stat.	0.96		
F-statistic	21.42			*F*-statistic	2.01		
Prob. (*F*-statistic)	0.001*			Prob. (*F*-statistic)	0.04**		

Notes: The fixed effect panel equation $LOGROA_{it} = \beta_{0i} + \beta_1 LOGTICE_{it} + \beta_2 LOGIITF_{it} + \beta_3 LOGCAR_{it} + \beta_4 LOGALF_{it} + \beta_5 LOGCRDR_{it} + \beta_6 LOGCDR_{it} + \beta_7 LOGTDOF_{it} + \beta_8 LOGQR_{it} + \beta_9 LOGIEIE_{it} + u_{it}$ and random effect panel equation $LOGROA_{it} = \beta_{0i} + \beta_1 LOGTICE_{it} + \beta_2 LOGIITF_{it} + \beta_3 LOGCAR_{it} + \beta_4 LOGALF_{it} + \beta_5 LOGCRDR_{it} + \beta_6 LOGCDR_{it} + \beta_7 LOGTDOF_{it} + \beta_8 LOGQR_{it} + \beta_9 LOGIEIE_{it} + u_{it} + eit$ have been used in this table for regression analysis purpose. Cross-section random and idiosyncratic random effects have been done under effects specification module. Durbin–Watson test has been used for checking autocorrelation and hetroscadisticity. Anova *F*-test has also been used for testing the good fit of this model. *,**,***Significant at the 1, 5 and 10 percent levels, respectively

variables, i.e. QR, IITF ratio, IEIE, CAR, CRDR, ALF, TDOF and TICE, have found insignificant with the ROA for public sector banks by RE regression model, these variables did not influence the return of public banks in India. The R^2 of this RE panel model is 14.00 percent, while adjusted R^2 of this panel is 07.00 percent. The R^2 explains 14.00 percent variations from 2012 to 2017. Adjusted R^2 of this panel explains 07.00 percent variations in the profitability. However, the model is not a good fit as F-stat. is 02.01. The value of Durbin–Watson stat is 00.96, which explains there is a positive autocorrelation problem exists in this RE panel (Table XV).

As out of the above two models (FE and RE), none of these two models are significant at the desired level of significance. The outcome suggests that the χ^2 value of this test 11.68 is insignificant at the 1, 58 and 10 percent levels of significance according to the criteria of selecting a model described earlier.

Results and findings
Table XVI indicates the results of FE and RE panel regression for overall banking sectors in India. Net profit margin (LOGPM) has been used as a dependent variable under FE and RE panels, whereas IITF, IEIE, CRDR, CDR, CAR, ALF, QR, TDOF and TICE have been used as independent variables. The total number of observations under this panel is 195, and 39 included as a cross-section. Five years of data from 2012 to 2017 have been used in this study.

Test summary	χ^2 statistic	χ^2 df	Prob.
Cross-section random	11.684047	9	0.134

Table XV.
Hausman's test

	Fixed effect panel				Random effect panel		
Variable	Coefficient	t-Stat.	Prob.	Variable	Coefficient	t-Stat.	Prob.
C	1.71	0.20	0.84	C	−5.86	−1.27	0.21
LOGALF	5.10	5.23	0.00*	LOGALF	4.75	6.57	0.01*
LOGCAR	0.71	1.25	0.21	LOGCAR	2.63	6.83	0.00*
LOGCDR	0.76	2.36	0.02**	LOGCDR	0.31	1.35	0.18
LOGCRDR	−3.01	−2.38	0.02**	LOGCRDR	−2.71	−3.78	0.02**
LOGIEIE	−4.30	−3.08	0.00*	LOGIEIE	−2.31	−3.18	0.01*
LOGIITF	4.60	1.52	0.13	LOGIITF	−2.00	−1.16	0.25
LOGQR	−0.36	−1.31	0.19	LOGQR	−0.03	−0.16	0.87
LOGTDOF	0.35	1.87	0.06***	LOGTDOF	0.08	0.56	0.57
LOGTICE	−1.49	−0.47	0.64	LOGTICE	2.57	1.42	0.16
		Effects specification					
R^2	0.80			R^2	0.57		
Adjusted R^2	0.74			Adjusted R^2	0.55		
Durbin–Watson stat.	1.94			Durbin–Watson stat.	1.36		
F-statistic	12.75			F-statistic	27.53		
Prob. (F-statistic)	0.00			Prob. (F-statistic)	0.00		

Notes: The fixed effect panel equation $LOGPM_{it} = \beta_{0i} + \beta_1 LOGTICE_{it} + \beta_2 LOGIITF_{it} + \beta_3 LOGCAR_{it} + \beta_4 LOGALF_{it} + \beta_5 LOGCRDR_{it} + \beta_6 LOGCDR_{it} + \beta_7 LOGTDOF_{it} + \beta_8 LOGQR_{it} + \beta_9 LOGIEIE_{it} + u_{it}$ and random effect panel equation $LOGPM_{it} = \beta_{0i} + \beta_1 LOGTICE_{it} + \beta_2 LOGIITF_{it} + \beta_3 LOGCAR_{it} + \beta_4 LOGALF_{it} + \beta_5 LOGCRDR_{it} + \beta_6 LOGCDR_{it} + \beta_7 LOGTDOF_{it} + \beta_8 LOGQR_{it} + \beta_9 LOGIEIE_{it} + u_{it} + eit$ have been used in this table for the regression analysis purpose. Panel EGLS (cross-section random effects) method has been employed. Cross-section random, and Idiosyncratic random effects has been done under effects specification module. Durbin–Watson test has been used for checking autocorrelation and hetroscadisticity. Anova F-test has also been used for testing the good fit of this model. *,**,***Significant at the 1, 5 and 10 percent levels, respectively

Table XVI.
Total banks with
profit margin as a
dependent variable

Out of all variables under the FE regression model, advances to loans funds, CDR, CRDR, interest expended to interest earned and total debt to owners fund are found significant with the probability values of 0.00, 0.02, 0.02, 0.00 and 0.06, respectively, under the FE regression model for total banks in India. We find a negative significant association between the CRDR and interest expended to interest earned with the profitability of all banks in India. However, advances to loan funds, CDR and total debt to owner fund found to be positively associated with the profitability of all banks. Although other independent variables, i.e. CAR, interest income to total funds ratio, QR and total income to capital employed, have been found insignificant with the PM for all the banks in India, these variables did not influence the profitability of all banks in India. The R^2 of this FE panel model is 80.00 percent, while adjusted R^2 of this panel is 74.00 percent. The R^2 explains 80.00 percent variations from 2012 to 2017. Adjusted R^2 of this panel explains the 74.00 percent variations in profitability. The model is a good fit as F-stat. is 12.75. The value of Durbin–Watson stats is 01.94, which explains there is no autocorrelation problem exists in this FE panel model, and this model is also permitted from hetroscadisticity.

Under the RE regression model, advances to loans funds, CAR, CRDR and interest expended to interest earned are found significant with the probability values of 0.01, 0.00, 0.02 and 0.01, respectively. We found a negative association between the CRDR and interest expended to interest earned with the profitability of all the banks in India. These ratios reduced the PM of banks in India. However, there is a positive significant association between the advances to loans funds and CAR with the effectiveness of all banks in an Indian context. Although other independent variables, i.e., CDR, IITF ratio, QR, TDOF and TICE, have found insignificant with the PM of all the banks by the RE regression model, these variables did not influence the profitability of banks in India. The R^2 of this RE panel model is 57.00 percent, while adjusted R^2 of this panel is 55.00 percent. The R^2 explains 57.00 percent variations from 2012 to 2017. Adjusted R^2 of this panel explains the 55.00 percent variations in profitability. However, the model is a good fit as F-stat. is 27.53. Conversely, the value of Durbin–Watson stat. is 01.36, which explains that there is a positive autocorrelation problem exists in this RE panel (Table XVII).

As out of the above two models (FE and RE), the FE model is significant at the 1 percent level of significance. The outcome suggests that the FE model is more relevant because the χ^2 value of this test is 41.30. The Husaman's test recommends that the FE model is suitable for this study. We have found the following important variables which include advances to loans funds, CDR, CRDR, interest expended to interest earned and total debt to owners fund are found significant, and other independent variables, i.e. CAR, interest income to total funds ratio, QR and total income to capital employed, found insignificant with the PM for all the banks in India.

Results and findings
Table XVIII indicates the results of FE and RE panel regression for the overall banking sector in India. LOGROA has been used as a dependent variable under FE and RE panel, whereas interest income to total funds (IITF), interest expended to interest earned (IEIE), CRDR, CDR, CAR, advances to loans funds (ALF), QR, total debt to owners fund (TDOF) and total income to capital employed (TICE) have been used as independent variables. The total number of observations under this panel is 195, and 39 included as a cross-section. Five years of data from 2012 to 2017 have been used in this study.

Test summary	χ^2 statistic	χ^2 df	Prob.
Cross-section random	41.300533	9	0.004

Table XVII.
Hausman's test??

Variable	Random effect panel			Variable	Random effect panel		
	Coefficient	t-Statistic	Prob.		Coefficient	t-Statistic	Prob.
C	2.00	0.32	0.78	C	4.09	0.55	0.58
LOGALF	1.75	1.79	0.08***	LOGALF	1.47	1.6	0.11
LOGCAR	1.08	1.9	0.06***	LOGCAR	0.8	1.55	0.12
LOGCDR	−0.11	−0.34	0.74	LOGCDR	0.13	0.45	0.65
LOGCRDR	−2.3	−1.82	0.07***	LOGCRDR	−1.12	−1.07	0.29
LOGIEIE	0.37	0.26	0.79	LOGIEIE	−0.59	−0.51	0.61
LOGIITF	1.79	0.59	0.55	LOGIITF	0.67	0.27	0.79
LOGQR	0.3	1.1	0.27	LOGQR	0.05	0.21	0.84
LOGTDOF	0.14	0.77	0.45	LOGTDOF	0.03	0.16	0.87
LOGTICE	−0.7	−0.22	0.83	LOGTICE	−0.71	−0.27	0.79
	Effects specification						
R^2	0.83			R^2	0.05		
Adjusted R^2	0.77			Adjusted R^2	0.01		
Durbin–Watson stat.	1.87			Durbin–Watson stat.	1.61		
F-statistic	14.78			F-statistic	1.19		
Prob. (F-statistic)	0.00*			Prob. (F-statistic)	0.3**		

Notes: The fixed effect panel equation $\text{LOGROA}_{it} = \beta_{0i} + \beta_1\text{LOGTICE}_{it} + \beta_2\text{LOGIITF}_{it} + \beta_3\text{LOGCAR}_{it} + \beta_4\text{LOGALF}_{it} + \beta_5\text{LOGCRDR}_{it} + \beta_6\text{LOGCDR}_{it} + \beta_7\text{LOGTDOF}_{it} + \beta_8\text{LOGQR}_{it} + \beta_9\text{LOGIEIE}_{it} + u_{it}$ and random effect panel equation $\text{LOGROA}_{it} = \beta_{0i} + \beta_1\text{LOGTICE}_{it} + \beta_2\text{LOGIITF}_{it} + \beta_3\text{LOGCAR}_{it} + \beta_4\text{LOGALF}_{it} + \beta_5\text{LOGCRDR}_{it} + \beta_6\text{LOGCDR}_{it} + \beta_7\text{LOGTDOF}_{it} + \beta_8\text{LOGQR}_{it} + \beta_9\text{LOGIEIE}_{it} + u_{it} + eit$ have been used in this table for the regression analysis purpose. Cross-section random, and Idiosyncratic random effects have been done under effects specification module. Durbin–Watson test has been used for checking autocorrelation and hetroscadisticity. Anova F-test has also used for testing good fit of this model. *,**,***Significant at the 1, 5 and 10 percent levels, respectively

Table XVIII.
All banks with return
on assets as a
dependent variable

Out of all variables under the FE regression model, advances to loans funds, CAR and CRDR are found significant with the probability values of 0.08, 0.06 and 0.07, respectively, under the FE regression for total banks in India. We have found a negative statistical association between the CRDR and the ROA of all the banks in India. However, advances to loan funds and CDR found to be positively associated with the profitability of all the banks in India. Although other independent variables, i.e. CDR, IEIE, IITF ratio, QR, TDOF and TICE, have been found insignificant with the ROA for all the banks in India, these variables did not influence the profitability of the banking sector in India. The R^2 of this FE panel model is 83.00 percent, while adjusted R^2 of this panel is 77.00 percent. The R^2 explains 83.00 percent variations. Adjusted R^2 of this panel explains 77.00 percent variations in the profitability. The model is a good fit as F-stat. is 14.78. The value of Durbin–Watson stat. is 01.87, which explains that there is no autocorrelation problem exists in this FE panel model, and this model is also permitted from hetroscadisticity.

Under the RE regression model, all the independent variables have been found insignificant with the ROA of all the banks in India. These variables did not influence the profitability of banks in India. The R^2 of this RE panel model is 05.00 percent, while adjusted R^2 of this panel is 01.00 percent. The R^2 explains 05.00 percent variations from 2012 to 2017. Adjusted R^2 of this panel explains the 01.00 percent variations in profitability. However, the model is not a good fit as F-stat. is 01.19. Conversely, the value of Durbin–Watson stat is 01.71, which explains there is a positive autocorrelation problem exists in this RE (Table XIX).

Test summary	χ^2 statistic	χ^2 df	Prob.
Cross-section random	17.603842	9	0.0401

Table XIX.
Hausman's test

The FE model is significant, the χ^2 value of this test is 17.60 at the 5 percent level of significance. The Husaman's specification test recommends that the FE model is suitable for this study. The FE model is significant with the following variables which include advances to loans funds, CAR and CRDR, whereas other independent variables, i.e. IEIE, CDR, ALF, QR, IITF ratio, TDOF and TICE, have been found insignificant with the ROA for all the banks in India.

Conclusion and implication

We had applied panel data regression for the profitability measures of the Indian banks, panel regression is quite authenticated and reliable analysis techniques. Subsequently after conducting an inclusive profitability analysis of the Indian banking sector (private and public), we arrived at the following conclusions: IEIE ratio and CRDR are reducing the profitability of private banks. On the other side, interest earned ratio, CRDR and QR are reducing the effectiveness of public banks. It seems that public banks are not capable to maintain their QR as compare to private banks up to a standard limit, so that it is reducing their profitability. However, public banks are focusing on CDR and advances to loan funds, increasing their profitability. Results describe that there is a positive association between CDR and advances to loan funds with the profitability of public banks. Findings reveal that interest expended to CRDR and total debt to owners fund are reducing the profitability of private banks in India. On the other side, CRDR, advances to loan funds and QR are increasing the profitability of private banks in India. It seems that private banks are able to maintain their ROA ratio in good condition as compare to public banks. However, results describe that there is no association between various financial ratio and with the profitability of public banks, while taking ROA as a profitability measure.

Indian companies should also try different strategies like offering more options to consumers, lenders, and borrowers to try and generate more revenue. We recommend that PSU's banks should and be competitive and must allocate some funds to improve their image. Finally, we suggest that private banks should try to boost the CRDR and interest expended to interest earned to generate more revenue than to spend on various services (Tables XX and XXI).

Dependent variable (net profit margin)	Private bank		Public bank		All banks	
Independent Variables	Fixed panel	Random panel	Fixed panel	Random panel	Fixed panel	Random panel
Interest income to total funds ratio (IITF)	No effect	Positive	No effect	Negative	No effect	No effect
Interest expended to interest earned (IEIE)	Negative	Positive	Negative	No effect	Negative	Negative
Credit deposit ratio (CRDR)	Negative	Positive	Negative	Negative	Negative	Negative
Cash deposit ratio (CDR)	No effect	No effect	Positive	No effect	Positive	No effect
Capital adequacy ratio (CAR)	No effect	Negative	No effect	Positive	No effect	Positive
Advances to loans funds (ALF)	No Effect	Positive	Positive	Positive	Positive	Positive
Quick ratio (QR)	No effect	No effect	Negative	No effect	No effect	No effect
Total debt to owners fund (TDOF)	No effect	No effect	No effect	No effect	Positive	No effect
Total income to capital employed (TICE)	No effect	No effect	No effect	Positive	No effect	No effect

Notes: Summary reveals that IEIE ratio and CRDR are reducing the profitability of private banks in India. On the other side, interest earned ratio, credit deposit ratio and quick ratio are reducing the effectiveness of public banks. It seems that public banks do not control their quick ratio as compare to private banks up to a standard limit, so that it is reducing their profitability. However, public banks are focusing on cash deposit ratio and advances to loan funds, increasing their profitability. Results describe that there is a positive association between cash deposit ratio and advances to loan funds with the profitability of public banks

Table XX.
Summary for profitability (net profit margin) with private, public and total banks

Dependent variable (return on assets)	Private bank		Public bank		All banks	
	Fixed panel	Random panel	Fixed panel	Random panel	Fixed panel	Random panel
Independent variables						
Interest income to total funds ratio (IITF)	No effect	No effect	No effect	No effect	No effect	No effect
Interest expended to interest earned (IEIE)	No effect	No effect	No effect	No effect	No effect	No effect
Credit deposit ratio (CRDR)	Negative	No effect	No effect	Positive	Negative	No effect
Cash deposit ratio (CDR)	Positive	No effect	No effect	No effect	No effect	No effect
Capital adequacy ratio (CAR)	No effect	Positive	No effect	No effect	Positive	No effect
Advances to loans funds (ALF)	Positive	No effect	No effect	No effect	Positive	No effect
Quick ratio (QR)	Positive	No effect	No effect	No effect	No effect	No effect
Total debt to owners fund (TDOF)	Negative	No effect	No effect	No effect	No effect	No effect
Total income to capital employed (TICE)	No effect	No effect	No effect	No effect	No effect	No effect

Notes: Summary reveals that interest expended to credit deposit ratio and total debt to owners fund are reducing the profitability of private banks in India. On the other side, credit deposit ratio, advances to loan funds and quick ratio are increasing the profitability of private banks in India. It seems that private banks are able to maintain their return on assets ratio in good condition as compare to public banks. However, results describe that there is no association between various financial ratio and with the profitability of public banks, while taking return on assets as a profitability measure

Table XXI.
Summary for
profitability (return on
assets) with private,
public and total banks

References

Amandeep (1983), *Profits and Profitability in Commercial Banks*, Deep & Deep Publications, New Delhi.

Barua, R., Roy, M. and Raychaudhuri, A. (2017), "Structure, conduct and performance analysis of Indian Commercial Bank", *South Asian Journal of Macroeconomics and Public Finance*, Vol. 5 No. 2, pp. 157-185.

Bhayani, S.J. (2006), "Performance of the New Indian Private Sector Banks: a comparative study", *ICFAI Journal of Management, Research*, Vol. 5 No. 11, pp. 53-70.

Devanadhen, K. (2013), "Performance evaluation of large-size commercial Banks in India", *Indian Journal of Finance*, Vol. 7 No. 1, pp. 5-16.

Dougherty, C. (2007), *Introduction to Econometrics*, Department of Sociology, Baylor University, Oxford University Press, Waco, TX.

Goddard, J., Molyneux, P. and Wilson, J.O.S. (2004a), "The profitability of European banks: a cross-sectional and dynamic panel analysis", *The Manchester School*, Vol. 72 No. 3, pp. 363-381, doi: 10.1111/j.1467-9957.2004.00397.

Goddard, J.A., Molvneux, P. and Wilson, J.O.S. (2004b), "Dynamics of growth and profitability in banking", *Journal of Money, Credit, and Banking*, Vol. 36 No. 6, pp. 1069-1090, doi: 10.1353/mcb.2005.0015.

Hadri, K. (2000), "Testing for stationarity in heterogeneous panel data", *Econometric Journal*, Vol. 3 No. 2, pp. 148-161.

Hausman, J.A. (1978), "Specification tests in econometrics", *Econometrica*, Vol. 46 No. 6, pp. 1251-1271.

Mishra, M.N. (1992), "Analysis of profitability of commercial banks", *Indian Journal of Banking and Finance*, Vol. 5.

Ozili, K. (2017), "Bank profitability and capital regulation: evidence from listed and non-listed banks in Africa", *Journal of African Business*, Vol. 18 No. 2, pp. 143-168, doi: doi.org/10.1080/15228916.2017.1247329.

Pat, K.A. (2009), "Why Indian banks are healthy in this global crisis?", *Economic and Political Weekly*, Vol. 44 No. 17, pp. 21-22.

Prasad, K.V.N. and Chari, A.A. (2011), "Financial performance of public and private sector banks: an application of post-hoc Tukey HSD test", *Indian Journal of Commerce & Management Studies*, Vol. 2 No. 5, pp. 1-14.

Ramamoorthy, K.R. (1998), "Profitability and productivity in Indian Banking", *Charted Financial Analyst*, Vol. February No. 2, pp. 53-54, available at: http://shodhganga.inflibnet.ac.in/bitstream/10603/38111/13/13_bibliography.pdf

Rao, S.C.D. (2008), *Banking Reforms in India-an Evaluate Study of the Performance of Commercial Banks*, Regal Publications, New Delhi, pp. 978-981.

Satish, D., Sharath, J. and Surender, V. (2005), "Indian banking – performance and development 2004-05", *Chartered Financial Analyst*, Vol. 11 No. 10, pp. 6-15.

Singla, H.K. (2008), "Financial performance of banks in India", *The IUP Journal of Bank Management*, No. 1, pp. 50-62, available at: https://ideas.repec.org/a/icf/icfjbm/v7y2008i1p50-62.html

Vennet, V.R. (2002), "Cost and profit efficiency of financial conglomerates and universal banks in Europe", *Journal of Money, Credit, and Banking*, Vol. 34 No. 1, pp. 254-282, doi: 10.1353/mcb.2002.0036.

Vyas, R. and Dhade, A. (2007), "A study on the impact of new private sector banks on State Bank of India", *The ICFAI Journal of Bank Management*, Vol. 6 No. 3, pp. 61-76.

Further reading

Afia, A. and Khaled, M. (2014), "Liquidity-profitability relationship in Bangladesh banking industry", *International Journal of Empirical Finance*, Vol. 2 No. 4, pp. 143-151.

Badola, B.S. and Verma, R. (2006), "Determinants of profitability of banks in India a multivariate analysis", *Delhi Business Review*, Vol. 7 No. 2, pp. 79-89.

Gujarati, N. (2006), *Basic Econometrics*, 4th ed., Tata McGraw-Hill, New Delhi, pp. 178-180.

Jain, D. and Shaikh, N. (2012), "Non-performing assets of private sector Banks in India", *International Journal of Economics*, Vol. 1 October-December.

Kumbirai, M. and Webb, R. (2010), "A financial ratio analysis of commercial bank performance in South Africa", *African Review of Economics and Finance*, Vol. 2 No. 1, pp. 30-53.

Prasad, K.V.N., Ravinder, G. and Reddy, D.M. (2011), "A CAMEL model analysis of public & private sector banks in India", *Journal of Banking, Financial Services & Insurance Research*, Vol. 1 No. 5, pp. 50-72.

Internet sources.

www.dnaindia.com/money/interview-india-is-a-market-ripe-for-an-innovations-consultant-2025561

http://businesstoday.intoday.in/story/market-for-consulting-still-maturing-in-india-jim-moffatt/1/201261.html

Department of Industrial Policy and Promotion (DIPP) statistics report 2016.

Department of Information and Technology (DIT) annual reports 2016.

Media Reports, Press Information Bureau (PIB), December 2016 Edn.

Corresponding author
Rohit Bansal can be contacted at: rbansal@rgipt.ac.in