GALGOTIAS UNIVERSITY

(Established under Galgotias University Uttar Pradesh Act No. 14 of 2011)

PROJECT REPORT

ON

"Profitability drivers for Indian banks: a dynamic paneldata analysis"

BY

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Submitted to

SCHOOL OF BUSINESS

GALGOTIAS UNIVERSITY

In partial fulfilment of the requirements for the award of the degree of

BACHLOR OF BUSINESS ADMINISTRATION

Under the guidance of

Dr. Shakeb Akhtar

CERTIFICATE

This is to certify that **Aman Dwivedi** is a bonafide student of Bachlor of Business Administration course of the Institute 2019-22. The project report on "**Profitability drivers for Indian banks: a dynamic panel data analysis**" is prepared by them
under the guidance of **DR. Shakeb Akhtar** , in partial fulfilment of requirements for the award ofthe degree of Bachlor of Business Administration of Galgotias university.

Signature of Internal Guide

Name of the Examiners with affiliation Signature with date

1. External Examiner

2. Internal Examine

Date:

PROJECT WORK CERTIFICATE

This is to inform that **Aman Dwivedi** has successfully completed freelance project work under the guidance of **Dr. Shakeb Akhtar**

We found her extremely inquisitive and hard working. She has demonstrated active interest in learning and was also willing to put in her best efforts. Her performance on task assigned was highly appreciated.

Her association with me was very fruitful and I wish them best luck for their career ahead.

Sincerely,
Dr. Shakeb Akhtar

DECLARATION

WE, hereby declare that the project report on "Profitability drivers for Indian banks: a dynamic paneldata analysis" prepared by **Aman Dwivedi** under the guidance of **Dr. Shakeb Akhtar** , faculty of BBA Department, Galgotias university.

I also declare that this project report is towards the partial fulfilment of the university regulations for the award of the degree of bachelors of business administration from Galgotias University

I have undergone an industry project for a period of Twelve weeks. I further declare that this report is based on the original study undertaken by me and has not been submitted for the award of a degree/diploma from any other University / Institution.

Signature of Student

Date:

ACKNOWLEDGEMENT

We are thankful to my internal guide Dr. Shakeb Akhtar, for his constant support and inspiration throughout the project and invaluable suggestions, guidance and also for providing valuable information.

Finally, I express my gratitude towards my parents and family for their continuous support during the study.

Aman Dwivedi

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1. EXECUTIVE SUMMARY

The study aims to find the factors such as bank specific factors, banking industry factors and macroeconomic factors that affect bank profitability in India. The paper employs the data from Indian Public sector and Indian private sector banks. Both these banks contribute to more than 90% of total business of scheduled commercial banks in India. The study applies the dynamic panel data analysis. The analysis is conducted over a period of 10 years in which the Indian banking sector has gone under different changes such as demonetization and issues related to banking sector sustainability and banking sector frauds. The analysis is based on balanced panel data over a period ranging from 2008 to 2017 for commercial Indian banks. Profitability of Indian banks is measured by two proxies, namely, return on assets (ROA) and return on equity (ROE), whereas bank size, assets quality, capital adequacy, liquidity, operating efficiency, deposits, leverage, assets management, and the number of branches are used as bank-specific factors. Further, a set of macroeconomic determinants such as gross domestic product, inflation rate, interest rate, exchange rate, financial crisis, and demonetization, include bank specific factors, banking industry factors, and economic factors. Among the bank specific factors, non-performing loans and cost to income ratio negatively affects the bank profitability, and diversification measures do not affect the bank profitability are used as independent variables. Stationary test along with pooled, fixed, random effect models and panel correction standard error are used in this study. The results revealed that bank size, the number of branches, assets management ratio, operational efficiency, and leverage ratio are the most important bank-specific determinants that affect the profitability of Indian commercial banks as measured by ROA. Furthermore, among the bank-specific determinants, the results revealed that bank size, assets management ratio, assets quality ratio, and liquidity ratio are found to have a significant positive impact on ROE. With regard to the macroeconomic determinants, the results revealed that the inflation rate, exchange rate, the interest rate, and demonization are found to have a significant impact on ROA. However, in the case of ROE, the results show that all macroeconomic determinants except demonization have a significant impact on the bank's profitability as measured by ROE.

And also the paper examines the impact of bank-specific, industry-specific and macroeconomic factors affecting the profitability of Indian Banks in a dynamic model framework. The persistence of bank profits and endogeneity of the factors had been accounted for using Generalized Method of Moments as suggested in Arellano and Bond (Rev Econ Stud 58(2):277–297, 1991). The panel data for the study have been obtained from 42 Indian Scheduled Commercial Banks for the period from 2000 to 2013. The lag of bank profit variable ROA has been found to be significantly indicating a moderate degree of persistence of profits in Indian Banking Industry. The study finds that the product markets of Indian

Banks are moderately competitive, and less opaque due to asymmetry in information. The adjustment towards equilibrium is partial and not instantaneous, implying that the elimination of abnormal profits through competition is by no means instant, and banks can continue to retain a significant percentage profits from 1 year to another. The Indian banking sector is not far away from becoming a perfectly competitive industry. Bank specific variables; capital to assets ratio, operating efficiency and diversification have been found to be significantly and positively affecting the bank profits. Credit risk, measured by provisions for bad debts, negatively impacts the bank profitability. The study also tests the Structure Conduct Hypothesis by using Herfindahl–Hirschman Index and finds evidence in its support. Bank profits respond positively to GDP growth, indicating that bank profits a pro-cyclical to the growth of economy whereas the increase in inflation rate affects bank profits negatively. It is observed that the crisis period did not make any significant impact on the profitability of banks. The study concludes that there is a moderate degree of persistence of bank profits, and most of the determinants of profits have a positive and significant impact on profitability of banks, which implies that Indian Banks in the last decade have been moving towards efficiency and dynamism.

The performance of a country's economy to a large extent depends on the performance of its banking sector. Banks play a vital and substantial role in the development of any economy (Menicucci & Paolucci, 2016). Since the 1990s, India has witnessed a significant liberalization with the intentions to increase productivity and to enhance the efficiency of Indian banks (Ghosh, 2016). Following the liberalization in 1991, the Indian banking sector has become a fast flourishing industry that has contributed to the growth of other major industries (Singh, Sidhu, Joshi, & Kansal, 2016). India is the largest country in South Asia with a considerable financial system characterized by diversified financial institutions (Ghosh, 2016). The banking system in India composes of 27 public, 26 private, 46 foreign, 56 regional rural, 1,574 urban cooperative, and 93,913 rural cooperative banks. Public sector banks represent about 70% of the total assets of the Indian banking system (Shrivastava, Sahu, & Siddiqui, 2018). The financial system of India is dominated by the commercial banks. In a competitive, challenging, and regulatory environment like India, the Indian commercial banks have to allocate effectively and efficiently their assets and liabilities to increase the profitability (Viswanathan, Ranganatham, & Balasubramanian, 2014). Return on asset (ROA) and returns on equity (ROE) have deteriorated over the period from 2013 to 2017. In spite of declining the profitability of Indian banks in the last recent years, some critical questions that may arise in this regard are “What are the determinants of the profitability of Indian commercial banks?” And also, what are the main causes for such kind of decline in the profitability measures during this period?

The main aim of this paper is to evaluate the impact of bank-specific factors and macroeconomic determinants on profitability of the Indian commercial banks. The current study focuses on a major and important sector in an emerging economy such as India. Taking into consideration some new governmental policies and procedures such as demonetization process that may affect the profitability of Indian banks and global financial crisis 2008. Moreover, fraud cases that raised recently in Feb 2018 when tax department estimated that Indian banks could take a hit of more than U.S. $3 billion as a result of Punjab National Bank scam which is the country's second-biggest governmental bank. Furthermore, the biannual Financial Stability Report of India's central bank (Reserve Bank of India [RBI]) was released on June 30, 2017, which raised some big concerns about the sustainability of the country banking system. RBI warned that the sector is under severe stress, with mounting bad loans and an increase in banking frauds. All the above policies and measures show the importance of this study that pushes all policymakers and researchers to examine the external and internal factors affecting the profitability of the Indian commercial banks.

Chapter 1 – Theoretical background of the study

Indian banking

The Indian banking sector is broadly classified into scheduled banks and nonscheduled banks. The scheduled commercial banks include scheduled Commercial Banks and scheduled Co-operative Banks. Scheduled Co-operative Banks consist of Scheduled State Co-operative Banks and Scheduled Urban Cooperative Banks. Scheduled Commercial Banks in India include following major types: State Bank of India and its Associates, Nationalized Banks, Private Sector Banks, Foreign Banks, Regional Rural Banks. Both state bank and its associate and nationalized banks are considered as public sector banks. Based on ownership, Indian banking can be divided into public sector banks, old private sector banks, foreign banks, new private sector banks, cooperative banks and regional rural banks. Among the scheduled commercial banks, both public sector and private sector banks contribute to about 93% of the deposits and 92.8% of the credit in the year March 2013. Among the banks, banks types such as regional rural banks and cooperative banks have a regional focus but do not command a large banking share. There is no regulatory restriction for other banks to operate in specific regions We provide an overview of evolution of banks in India by including banking structure in India. India inherited a financially weak banking system, and was overly urban focus though majority of population lived in rural areas at the time of independence in the year 1947. After the independence, Indian Government have shown interest in offering social banking. As a result, the trend was towards strengthening Indian public sector movement and the major objective was to spread banking among general public. India went through bank nationalization during the year 1955 (State Bank of India), 1959 (State Bank and its associate), 1969 (14 Nationalized Banks) and 1980 (7 Nationalized Banks). In the year 1990, a large account deficit led to balance of payment crises. By the year 1990, Public sector banks had 91% of the total bank branches and handled 85% of the total banking business in the country and there was a marginal presence of foreign banks. Government introduced economic reforms, leading to the liberalization, privatization and globalization of Indian economy (Bapat and Naik 2013). The structural reforms in 1990s led to privatization with new private sector banks entering the Indian Banking. Although foreign banks and new private sector banks contributed to growth in their balance sheet, the public sector banks continued to have predominant share in total deposits, advances and investments (Patt 2009). The new entrants, majorly domestic private sector banks, made large investments in technology right from the start. The results of privatization were mixed as some banks emerged as strong players, some banks incurred losses and got merged. The type of bank credit underwent a change as the banking system continued to develop. There was a sharp increase in retail exposure with contribution of retail loan increasing from 10% in 1980 to 25% in March 2007 (Chandrasekhar 2009). With the financial sector reforms in 1990s, Government allowed private sector banks to enter the banking industry with an objective to enhance competition and to improve efficiency. Performance of these banks were mixed as few banks (Global Trust Bank; United Western Bank) incurred loss, few banks (Times Bank, Centurian Bank of Punjab) underwent merger and acquisition and some banks (ICICI Bank, Axis Bank, HDFC Bank and Yes Bank) performed well. Countries where banking system is well developed find a higher contribution of bank's credit in its GDP. In India, the ratio of outstanding bank credit to GDP increased from 27.3% in March 1997 to 60% by March 2008. This indicates that role of banks is growing in economy. It was in the year 2007–2008 that global financial crisis impacted the banking industry across the world. It was in the year 2007–2008 that global financial crisis affected the global banks.

The global financial crisis highlighted the fact that bank failures could lead to huge financial costs because of the need to deal with inherited bad debt.
The Indian economy exhibited significant resilience in the backdrop of an intense global financial crisis (Bapat 2012). With the growing pressure on traditional income source, banks looked for revenues from other sources. Banks in India are permitted to engage in investment banking, securities trading and derivatives trading (Ramasastri et al. 2004). The intensified competition in core banking business has resulted in lower interest margins, which led to switching to noninterest income more attractive.

Banking has been transformed by knowledge as a source of wealth, compared to other tangible and physical assets (Bontis, 1998). Knowledge has become the new engine driving organizations' wealth, and the World Bank (1999) stated that "knowledge is our most powerful engine of production." Banks as service firms have been classified as a knowledge intensive sector (Branco, Delgado, Sousa, & Sa, 2011), and studies explore the relevance of knowledge to bank performance (Edvinsson & Malone, 1997; Firer & Mitchell Williams, 2003; Kamath, 2015). This makes the recognition and development of knowledge management (intangible asset) an important aspect of bank management. Originally, the entire operations of banks depended on creativity, offering edge products and providing unique services in creating competitive advantage. Therefore, Chen, Cheng, and Hwang (2005) stated that banks are sources of economic value, and higher productivity comes from their intellectual capital (IC). This phenomenon has made the concept of IC popular in the current era of knowledge economies, building on the knowledge-based theory (KBV) of a firm. Barney (1991) considered these intellectual assets resources that can be physical capital, organizational capital, and human capital resources. Additionally, the resources are exactly what Pulic (1998) referred to as the components of IC that form the value added intellectual coefficient (VAIC) model. This model is useful in evaluating IC and in distinct features of organizations (El-Bannany, 2008). The model combines capital employed and human and structural capital efficiency, which enables comparative analysis between firms, sectors, industries, and countries.

Aside from this, the growing internalization that has been driven by the continuous deregulation has increased competition and technological advancement in the Indian banking sector. Boden and Miles (2000) have hinted that these transformations are considered features of a knowledge-based economy. Deregulation, for instance, reduced public monopolies, which encouraged foreign banks to operate, creating a more competitive environment that is conducive to innovation and growth. This is because these foreign banks are already advanced in technology and acquainted with international banking standards and practices, hence desire high competition in the industry. This is why in the second phase of the Narsimham Committee recommendation in 1998 stated that the Indian banking system is completely outdated and needs technological support in this knowledge era (RBI report, 1999). Because of these drawbacks, banks ought to be technologically sound and be more innovative to be able to compete. To build and maintain a sustainable competitive advantage, banks face a critical moment in managing their intellectual assets, given that they rely on their intangible assets to excel. That is, banks' potential in building their competitive advantage relies on the investment and efficient management of IC (Al-Musali & Ku Ismail, 2016). This is why it is so important to examine how investment in IC has influenced productivity of commercial banks in India.

Bank performance

The topic of bank performance has been the subject of considerable research and past studies examined various drivers of bank performance. In the literature on banking, we find that bank profitability is measured by return on average assets (Bapat 2013). Rivard and Thomas (1997) argued in favor of ROAA as it is not distorted by high equity multipliers and it represents a better measure of the ability of firms to generate returns on their portfolio of assets. ROAA depends on bank's policy decisions as well as on bank's uncontrollable factors relating to the economy and government regulations. In recent years, we find that ROAA, as a measure of profitability, has continued to receive acceptance (Apergis 2014; Menicucci et al. 2016). While investigating the impact of ownership on ROAA and other efficiency parameters, the results indicate that privatization is not enough in transition countries (Bonin et al. 2005). Tan and Floros (2012) investigated the reasons of low profitability using two step generalized method of moment. Chronopoulos et al. (2015) suggested that changes in regulation affected both the level and persistence of bank profitability for the period 1984–2010 in US. While assessing bank profitability using ROAA and equity profitability using ROE, expense management was identified as a variable affecting bank profitability (Islatince 2015). Researchers have examined the influence of internal determinants and external determinants on bank profitability. According to study by Duca and McLaughlin (1990), variations in bank profitability are attributable to variations in credit risk. The use of ROE is considered as analogous to profit efficiency rank. ROE is a function of the allocation of equity to different asset categories (Berger et al. 2005).

Various drivers of bank performance

Various drivers of bank performance such as asset quality, bank capital, ownership, financial structure, size, non-performing loans (NPL), credit deposit ratio, ownership, size, economic factors and diversification have been examined in the past. Banks pursued diversification because they faced pressure on core banking business. Fee based income were at varied levels among various bank types and the study found the contribution of fee based income at 13.3% for cooperatives; 15.4% for savings bank and 34.6% for commercial banks in Germany. The advantages of diversification include increase in alternate sources of income, reduction in information asymmetry, and stabilizing income (Shim 2013). The positive influence of diversification on bank performance has been examined (DeYoung and Roland 2001; Stiroh 2004; Stiroh and Adrienne 2006; Mercieca et al. 2007). Busch and Kick (2015) observed that risk adjusted returns on equity and total assets are positively affected by fee business for German universal banks. Edirisuriya et al. (2015) found strong evidence that diversification is favorable to the performance of Australian banks. DeYoung and Tara (2004) found difference between European and US banking sector and observed that well managed banks are less engaged in non-interest income and large banks are more engaged in non-interest income. However, there is disadvantage of diversification as it was realized that increased activity of US banks in non-traditional business led to excessive risk taking. The analysis on Chinese banks for the period 1996–2006 reveals that diversification were associated with reduced profits (Berger et al. 2010).

Chapter 3 – Research Methodology

DETERMINANTS OF PROFITABILITY OF INDIAN COMMERCIAL BANKS

3.1| Dependent variables

A measure for profitability substantially depends on the type of industry in which the company is functioning. In case of banks, return on assets is the commonly used indicator of profitability, and it is defined as the ratio of profit after taxes to the total of average assets of a bank. ROA measures how effectively a bank's management can generate revenue from its assets. A much simpler and more widely adopted approach is to use ROA as a profitability measure, which finds support from studies, such as Evanoff and Fortier (1988). Golin (2001) also considers ROA as a key ratio for the measuring profitability of banks. Return on equity (ROE) could be used as an alternative measure of profitability of banks, which measures the return to shareholders on their investments. Banks with lower leverage or higher capital may report lower ROA but higher ROE. However, higher ROE disregards the risk associated with higher leverage.
Two common measures were used by prior studies to measure the profitability of banks which are ROA and ROE. Following prior studies (e.g., Athanasoglou et al., 2008; Garcia & Guerreiro, 2016; Naeem et al., 2017;
Pathneja, 2016; A. Singh & Sharma, 2016; Tiberiu, 2015; Zampara et al., 2017), this study uses ROA and ROE as proxies of banks' profitability. ROA is used to evaluate bank's ability to generate returns from available sources of funds. It has been calculated as the ratio of net profit for a year to the total assets of the same year. Additionally, ROE is used to analyse the return generated by the funds that shareholders have invested. It has been calculated as the ratio of net profit for a year to the total equity of the same year.

3.2 Independent variables

Two categories of independent variables were used in this study as shown in Figure 3. Bank-specific (independent) variables were considered as internal factors, which include bank size, assets quality, capital adequacy, liquidity, operating efficiency, deposits, leverage, assets management, and the number of branches. Another category of independent variables is macroeconomic (external) determinants of profitability, which includes GDP, inflation rate, interest rate, exchange rate, financial crisis, and demonetization. Following is an explanation of both categories of independent variables.

3.2.1 Bank-specific determinants

Assets size (natural logarithm of total assets [LNAS]) Bank size is measured by total assets as a proxy. Assets size proxy is commonly used in the prior literature (e.g., Acaravci & Çalim, 2013; AL-Omar & AL-Mutairi, 2008; Anbar & Alper, 2011; Bougatef, 2017; Chowdhury & Rasid, 2017; Masood & Ashraf, 2012; Petria et al., 2015; A. Singh & Sharma, 2016). Bank's size is represented by the LNAS. A positive and negative impact of bank size on profitability were found by prior literature. Anbar and Alper (2011) and Masood and Ashraf (2012) found a positive impact of banks size on profitability whereas Gul, Irshad, and Zaman (2011) A. Singh and Sharma (2016) reported a negative impact of bank size on bank's profitability.

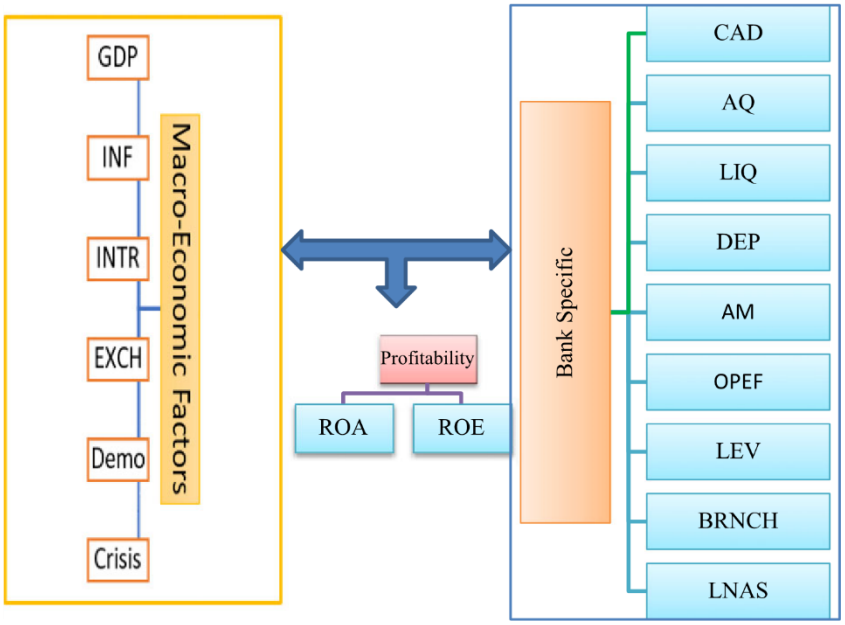

FIGURE Framework of the study.
AM: assets management (%);
AQ: assets quality (%);
BRNCH: no. of branches;
CAD: capital adequacy ratio (%);
CRISIS: a dummy variable of 0 for the financial years 2008 and 2009 and 1 for the year 2010 to 2017;
DEMO: a dummy variable of 0 for the years from 2008 to 2016 and 1 for the year 2017;
DEP: deposits of the total assets (%);
EXCH: exchange rate;
GDP: real gross domestic product (%);
INF: annual inflation rate (%);
INTR: lending Interest rate (%);
LEV: financial risk (%);
LIQ: liquidity ratio (%);
LNAS: natural logarithm of total assets;
OPEF: ratio of operating efficiency (%);
ROA: ratio of bank net profit to total assets;
ROE: ratio of net profit to shareholders equity

Capital adequacy (CAD)
Capital adequacy ratio is one of the basic ratios to determine the strength of capital. Capital adequacy is calculated as the ratio of equity to total assets (Abel & Le Roux, 2016; Anbar & Alper, 2011; Masood & Ashraf, 2012). A positive relationship was found between capital adequacy and profitability of commercial banks (Ebenezer, Omar, & Kamil, 2017).

Assets quality (AQ)
Assets quality is measured as the ratio of loans to total assets. The ratio of loans to total assets measures the bank's income source and is expected to affect bank's profitability negatively except the bank is at unbearable level of risk (Rani & Zergaw, 2017).

Liquidity (LIQ)
Following Bougatef (2017), Chowdhury and Rasid (2017), Jara-Bertin et al. (2014), Menicucci and Paolucci (2016) in measuring bank's liquidity, the ratio of liquid assets to total assets is used. Higher liquidity ratio implies that banks are more liquid and accordingly an opportunity cost of higher return may arise. Inadequate liquidity is considered as one major cause of bank's failure. Both negative and positive relationships between liquidity and banks profitability were reported by prior studies (Ebenezer et al., 2017; Loh, 2017).

Deposits (DEP)
Deposits are the major source of funds for banks. However, banks are required to maintain adequate liquidity to meet customers' demand (A. Singh & Sharma, 2016). Numerous studies measured deposits as the ratio of total deposits to total assets (Acaravci & Çalim, 2013; Anbar & Alper, 2011; Menicucci & Paolucci, 2016; Zampara et al., 2017). The negative relationship was exhibited between banks profitability and deposits (Gul et al., 2011).

Asset management (AM)
The ratio of assets management is calculated by dividing operating income to total assets. The higher assets management ratio, the better banks' profitability (Masood & Ashraf, 2012).

Operating efficiency (OPEF)
Operating efficiency can be defined as the ratio of total expenditure to run a business operation to the total revenues obtained from the business. For banks, this ratio is defined in term of operating expenses and interest income (Rashid & Jabeen, 2016).

Leverage (LEV)
Leverage is the ratio of total debt scaled by total assets (Bose, Saha, Zaman, & Islam, 2017). Banks with higher equity (lower leverage) generally exhibit lower ROE but higher ROA (Athanasoglou et al., 2008).

Branches (BRNCH)
It is the number of branches that every bank has. It reflects the market share, power, and the geographical distribution of the bank.

3.2.2 Macroeconomic determinants

This study aims to investigate the impact of macroeconomic variables represented by GDP, inflation rate, interest rate, exchange rate, financial crisis, and demonetization on the profitability of Indian commercial banks.

Annual real GDP

GDP is the most widely common macroeconomic measurement that is used to measure the impact of macroeconomic factors on banks' profitability. Further, it is a measure of total economic activity within an economy (Francis, 2013; Marijana et al., 2012; Masood & Ashraf, 2012; Ongore & Kusa, 2013; Pasiouras & Kosmidou, 2007; Petria et al., 2015; Rani & Zergaw, 2017; Saona, 2016; A. Singh & Sharma, 2016).

Annual inflation rate (INF)

It is the rate at which the general price level of goods and services rises and, as a result, the purchasing power of currency falls (A. Singh & Sharma, 2016). Different authors from finance literature advocated the impact of inflation rate on banks' profitability (Anbar & Alper, 2011; Chowdhury & Rasid, 2017; Jara-Bertin et al., 2014; Masood & Ashraf, 2012).

Interest rate (INTR)

It is the lending interest rate that a bank can earn. It is expected to affect positively the profitability of banks. Empirical findings of INTR on banks' profitability from prior studies are mixed. For example, Rashid and Jabeen (2016) found that interest rate has a negative impact on banks' performance. Contradictory, Yahya, Akhtar, and Tabash (2017) reported a positive impact.

Exchange rate (EXCH)

It is the real exchange rate calculated as the average exchange rate during the year. Several studies recommend that foreign exchange rate should be considered as an important determinant of banks profitability (Chowdhury & Rasid, 2017; Menicucci & Paolucci, 2016).

Financial crisis (CRISIS)

Bogdan and Ihnatov (2014), Dietrich and Wanzenried (2014), Maria, Lodh, and Nandy (2017), and Tafri, Hamid, Meera, and Omar (2009) have used financial crisis impact in their studies. They used a dummy variable for the crisis period. This study measured the financial crisis as a dummy variable of 0 for the years of financial crisis and 1 otherwise.

Demonetization (Demo)

It is a dummy variable of 0 for the years before demonization and 1 for the year of demonization.

3.2.3 Provisions for non-performing assets to total loans

This ratio is obtained from a bank’s income statement, signifies credit quality and acts as a proxy for credit riskiness. Banks, as per the standards set by RBI, set aside a specific amount to cushion them from any degeneration which may occur in their profits due to credit risks. Since, a higher exposure to credit risk is expected to decrease profitability; an inverse relationship between the two is hypothesized.

3.2.4 Capital to assets ratio

This variable is the ratio of total capital to total assets, and the resultant effect of this variable on bank profits has been found positive and negative both in previous studies. Berger (1995) in the context of the conventional risk-return hypothesis describes that a lower capital on the bank's balance sheet indicates a risky position so that we might expect a negative association with profitability. However, lower capital and a risky position can generate higher profits. Molyneux and Thornton (1992) finds that higher equity can cause a decline in the cost of capital, which signals a positive impact on profitability. However, a larger capital in capital structure for any institution in developing economy acts as a buffer to resist any adverse situation during a crisis.

3.2.5 Annual growth of deposits

It is a measure of bank's growth. A bank with faster growth in deposits can expand its business quickly and acquire higher profits. However, this increase in profits due to higher deposit growth depends on a number of other factors as well. Primarily, it depends on the ability of a bank to convert its deposits into income generating assets, which reflects its operational efficiency. Higher growth is generally associated with higher profitability. However, higher growth may also attract more competition from other players, which in turn may reduce the profits.

3.2.6 Bank size

To explain the effect of bank size, we use total assets of banks in our study. It is a debatable topic in the literature, whether lower bank size or higher bank size optimizes bank profits. To examine this, we use a dummy variable for large and small banks based on their total assets. Larger banks attribute to economies of scale and greater diversification, which reduces risk and increases bank profits. Smirlock (1985) shows a positive relationship between bank profits and size. However, Stiroh and Rumble (2006) and Pasiouras and Kosmidou (2007) suggest that an increased bank size may have an opposite effect of decreasing bank profits because the expenses are also incurred in managing such large banks, expenses include overhead and bureaucratic processes costs.

3.2.6 Non-interest income

Banks have moved away from their traditional activities, they offer more diversified services since they have risk in capital markets, and face more competition within the banking sector as well as from non-banking companies. As a consequence, the sources of income generation have shifted from the fund based activities to more fees and nonfund based activities. It has been argued that, more diversification can yield better profits. However, fee-based income can actually exert a negative impact on profitability since non-interest income, such as trade in derivatives, etc., are subject to more intense competition in comparison traditional income activities. Nevertheless, higher revenue stemming from non-traditional activities increases the share of non-interest income, which in turn increases the profitability of the bank.

3.2.7 Operating expenses to total assets

This ratio includes the expenditure made towards the general operations of a bank, which takes account of salary paid to staff and property costs. Higher operating costs may put a negative impact on profitability. However, it has also been argued that higher operating costs to total assets accounts for operational efficiency, and many efficient banks may effectively manage these expenses to generate higher profits.

4.3 Industry-specific variables

A whole new trend of studies, relating to market power and financial profits started with the emergence of Structure Conduct Hypothesis (SCP), which states that an increased market concentration will yield monopoly profits. We measure the market concentration in terms of Herfindahl– Hirschman Index (HHI) which is calculated as the sum of squares of market shares of each bank, where market share is expressed as fractions. Banks in an extremely competitive industry set up, earn monopoly profits due to collusive behaviour, (Gilbert 1984). This collusive behaviour involves price setting by larger firms. In case of banking industry, this collusion could be in the form of higher interest rates for loans and lower rates given to customers on deposits. Thus, a higher concentration may lead to a positive impact on profitability. Arguments also point out that this increase in profits is not due to collusive behaviour but due to exploitation of economies of scale, and efficiencies achieved by larger banks. Opponents of the SCP hypothesis argue that higher profits may not always be due to collusion by the banks but also due to efficiency of scale. This hypothesis has been termed as the efficient structure hypothesis (ESH). Although the effect of concentration on profits is similar in both the theories, the reasons for the impact of concentration are different. We empirically wish to determine the impact of this market power on profits.

4.1| Data collection and sampling

We use annual bank level data for Indian Public Sector Banks and Indian Private Sector Banks from Performance Highlights for Indian Public Sector Banks and Performance Highlights for Indian Private Sector Banks published by Indian Banks Association. Table presents the summary statistics of the selected variables. 42 banks were part of the study of which 25 banks were public sector banks and 17 banks were private sector banks. The period of the data was from the year 2007 to the year 2013. Other economic indicators were captured from World Bank statistics. Table describes the summary of variables.
Our study incorporates various variables such as banking industry specific variables, bank specific variables and macroeconomic indicators. The study included both public sector banks and private sector banks. Both these bank groups constitute more than 90% of the business of scheduled commercial banks. The source of data was performance highlights for public sector banks and performance highlights for private sector bank, a publication from Indian Banks Association (IBA) and database from AceEquity.

The dataset for the bank-specific variables used by this study is fetched from RBI database, which supplies all information regarding all banks working in India. Thus, it is considered the most common and authenticated database for banking system information. The database provides annual information for 27 public banks, 26 private banks, 46 foreign banks, 56 regional rural banks, 1,574 urban cooperative banks, and 93,913 rural cooperative banks, in addition to cooperative credit institutions. The current study focuses only on commercial banks working in India as shown in Table 1. It is clear from Table 1 that there are 101 commercial banks in India. The sample of this study is based on panel data that consists of 69 commercial banks with 690 observations for a period of 10 years from 2008 to 2017. Importantly, the study covered all public-sector banks that include both National and State Bank of India and its Associates, which accounts for about 70% of the banking system assets. The criteria for selection of these banks are based on the availability of data for the period covered by this study. Further, the current study considers only the commercial banks whereas regional rural banks and urban rural cooperative banks were excluded.
The empirical investigation of Indian banks' profitability using panel dataset of commercial banks over a period ranging from 2008 to 2017 is considered very critical during this period as the financial performance of commercial banks in India has declined during this period as shown in Figure 1. Moreover, several financial challenges in this period hit commercial banks, particularly, demonetization process that took place in November 2016 and some fraud cases that reported during this period. This makes the investigation of banks profitability during this period very interesting and very useful for policymakers.

As far as the comparison of the used sample in this study with the samples of prior studies is concerned, most of the conducted studies on banks' profitability in different countries have employed panel data. For example, AL-Omar and AL-Mutairi (2008) sampled seven Kuwaiti banks for the period 1993–2005, Athanasoglou et al. (2008) studied Greek banks that covers the period 1985– 2001. In the same context, Rashid and Jabeen (2016) covered the period 2006 to 2012 to investigate the profitability of Pakistani banks, Bougatef (2017) examined the effect of perceived level of corruption on banks' profitability in Tunisia over the period 2003–2014, Garcia and Guerreiro (2016) analysed the profitability of 27 universal banks in Portugal over the period from 2002 to 2011, and Marijana et al. (2012) studied 16 banks in the Macedonian banking system in the period between 2005 and 2010.

4.2 Model specification and econometric

4.2.1 Tools

Regulators and investors consider Return on average assets (ROAA) as the best measure of bank profitability. Berger et al. (2000) suggested that bank is able to

Table 1 Summary of variables

Variable	Description	Mean	SD	Source data base
Dependent variable Return on average assets (ROAA in %)	A proxy measure of bank profitability measured as the return to the average total assets of the bank	1.02	0.458	IBA
Return on equity (ROE in %)	A profitability efficiency measure	16.9	6.7	Ace Equity Database
Independent variables	Bank specific factors			
Non-performing loans (NPL)	Calculated as net non performing loans multiply by 100 divided by average net advances	0.97	0.68	IBA
Income diversification (other income to operating income)	It is measured as the ratio between other income to operating income	0.12	0.04	IBA
Credit deposit ratio	It is calculated as the ratio between total loans to total deposits	0.73	0.12	IBA

Cost to income ratio	It is the ratio of operating expense to the operating income	0.50	0.11	Ace Equity Database
Independent variables	Banking industry factors			
Banking industry ownership	Specific. It was a dummy variable. Public sector banks were given value of 1 and private sector banks were given value of 0			IBA
Bank size	Logarithmic of the bank business	4.94	0.52	IBA
Independent variables	Economic indicators			
Financial crisis	Dummy values of 0 to the year 2007, 2008 & 2009 and value of 1 to the year 2010, 2011, 2012 and 2013	0.57	0.49	–
GDP growth	The average GDP growth rate for the country	7.00	2.27	World Bank
Inflation	The average consumer inflation rate for the country	9.42	1.91	World Bank

sustain performance over time. Gracia-Herrero et al. (2009) highlighted the problem of potential endogeneity when assessing bank profitability determinants. In addition, additional proxy of dependent variable, return on equity (ROE), was also considered as dependent variable. In our study, we introduced a lagged dependent variable in the regression models by employing the generalized method of moments (GMM) estimators. The advantage of GMM is that it allows us to control for persistence and endogeneity issues. It results in consistent estimates. Our study is unique since it captures the impact of bank specific factors, banking industry factors and economic indicators.

To test the relationship between bank profitability, bank specific factors, banking industry factors and macroeconomic determinants, we estimate a line on regression in the following form:

$ROAA_{jt} = \beta_1 ROAA_{jt-1} + \beta_2 \Sigma$ Bank Specific factors $+ \beta_3 \Sigma$ Banking Industry factors $+ \beta_4 \Sigma$ Macroeconomic factors $+ I_j + \varepsilon_{i,t}$

$ROE_{jt} = \beta_1 ROE_{jt-1} + \beta_2 \Sigma$ Bank Specific factors $+ \beta_3 \Sigma$ Banking Industry factors $+ \beta_4 \Sigma$ Macroeconomic factors $+ I_j + \varepsilon_{i,t}$

where $ROAA_{jt}$ is the return of assets, ROE_{jt} is return on equity, b_1 is coefficient for Bank Specific factors, b_2 is coefficient for Banking industry factors and b_3 is coefficient for macroeconomic factors. Bank specific factors, banking industry specific factors and macroeconomic factors are identified as independent variables.

The correlation matrix is shown in Table 2.
We negate the existence of multicolinearity as the correlation is less than 0.80 and variance inflation factor (VIF) was less than figure of 10. We present the regression equation as follows:

$$ROAA_{jt} = \beta_1 ROAA_{j\,t-1} + \beta_2 \times npl + \beta_3 \times \text{Other Income to operating income} + \beta_4 \times \text{Cost to income ratio} + \beta_5 \times \text{Credit deposit ratio} + \beta_6 \times \text{Dummy financial crisis} + \beta_7 \times \text{GDP growth} + \beta_8 \times \text{Inflation} + \beta_9 \times \text{log GDP per capita} + I_{j+} \varepsilon_{jt}$$

$$ROE_{jt} = \beta_1 ROE_{j\,t-1} + \beta_2 \times npl + \beta_3 \times \text{Other Income to interest income} + \beta_4 \times \text{Cost to income ratio} + \beta_5 \times \text{Credit deposit ratio} + \beta_6 \times \text{Dummy financial crisis} + \beta_7 \times \text{GDP growth} + \beta_8 \times \text{Inflation} + \beta_9 \times \text{log GDP per capita} + I_{j+} \varepsilon_{jt}$$

where j denotes the bank, t the time period from the financial year 2006–2007 to 2012–2013 and e_{ε} represents the disturbance term.

5 Empirical findings

The regression results between bank profitability and other independent variables are presented in Table 3. The model exhibits goodness of it as confirmed by Wald X^2 statistics. Using Arrelano–Bond A R (2) test, at the 5% significance level, our instruments are appropriately orthogonal and it is confirmed that no second order serial correlation is detected. To validate the findings, we evaluate using Sargan's test which are captured through X^2. The significant lagged dependent variable coefficient confirms the dynamic character of the model specification. So, it justifies the application of dynamic panel data model estimation (Sufian and Habibullah 2010). The following Table 3 presents the dynamic panel regression results.
We present the results obtained from dynamic Arellando–Bond panel GMM robust estimators using two step difference. Since two-step estimates are considered

Table2 Correlationmatrix

	ROAA	ROE	Logof bank business	NPL	Diverse=otherincome tooperatingincome	Costto income ratio	Credit deposit ratio	Financial crisis	GDP growth	Inflation	LogGDP percapita	Square of diverse
ROAA	1.00											
ROE	0.54	1.00										
Logofbank business	0.16	0.29	1.00									
NPL	- 0.66	- 0.45	- 0.03	1.00								
Diversification	0.19	- 0.05	0.02	- 0.17	1.00							
Costtoincome ratio	- 0.46	- 0.49	- 0.49	0.27	0.06	1.00						
Creditdeposit ratio	0.09	- 0.19	0.18	- 0.01	0.22	- 0.05	1.00					
Financialcrisis	0.08	- 0.06	0.30	- 0.08	- 0.18	- 0.07	0.15	1.00				
GDPgrowth	- 0.09	0.07	- 0.15	0.04	0.19	0.00	- 0.08	- 0.12	1.00			
Inflation	0.08	0.00	0.20	- 0.05	- 0.06	- 0.11	0.07	0.49	0.03	1.00		
LogGDPper capita	0.09	- 0.06	0.32	- 0.08	- 0.20	- 0.07	0.15	0.76	- 0.16	0.50	1.00	
Squareof diversification	0.16	- 0.09	0.02	- 0.13	0.74	0.05	0.23	- 0.14	0.15	0.04	- 0.17	1.00

Table3 Dynamicpanelregressionresults

	Dependentvariable:ROAADependentvariable:ROE					
	OverallOwnership	publicsectorbank	Ownership(private sectorbank)	OverallOwnership(public sectorbank)		Ownership(private sectorbank)
Laggeddependent0.47***(0.082)0.36**(0.10)0.28***(0.097)0.54***(0.10)0.41***(0.13)0.18***(0.098)						
NPL	- 0.23***(0.033)	- 0.24**(0.042)	- 0.28***(0.049)	- 2.26***(0.70)	- 2.75*(1.35)	- 3.72***(0.60)
Logofbusiness	- 0.58(0.304)	- 0.21(0.48)	- 0.85*(0.35)	- 10.50(6.00)	- 18.2(11.61)	- 9.0*(4.47)
Diversification=otherincome tooperatingincome	1.76(4.02)2.47(4.01)		- 1.67(6.33)	- 52(77.7)	- 47(95.68)42.42(81.40)	
Square-diversification2.82(4.43)		- 7.14(4.58)13.00(7.06)139.02(88.09)142.9(109.09)165.88(92.18)				
Costtoincome	- 0.02***(0.00)	- 0.00(0.00)	- 0.02***(0.00)	- 0.38***(0.05)	- 0.48***(0.07)	- 0.34(0.04)
Credittodeposit0.21(029)0.29(0.236)			- 0.04(0.54)	- 7.54(5.66)	- 6.57(5.58)	- 2.47(7.23)
Financialcrisis	- 0.17(0.10)	- 0.17(0.10)	- 0.16(0.18)0.88(2.02)1.91(2.48)			- 1.04(2.33)
GDPgrowth	- 0.08***(0.019)	- 0.03(0.023)	- 0.09*(0.028)0.21(0.37)0.78(0.57)			- 0.87(0.35)
Inflation0.056*(0.02)0.02(0.026)0.08*(0.03)0.12(0.43)					- 0.54(0.65)0.73(0.379)	
LogofGDPpercapita2.66*(1.17)1.66(1.50)3.57(1.95)6.46(22.54)					- 7.4(35.81)26.84(24.33)	
Sargantest0.080.120.120.150.060.06						
n	422517422517					

n Totalnumberofobservations

Thefigureintheparenthesisindicatesstandarderror

***,**,*indicates1,5,10%significancelevelsrespectively

n Total number of observations

The figure in the parenthesis indicates standard error
***,**,*indicates1,5,10%significancelevelsrespectively
more efficient than the one-step estimate, we have used two-step estimate for analysis. The analysis was based on methodology suggested by Arellano and Bond (1991), Blundell and Bond (1998), Windmeijer (2005) and Bond (2002). As the analysis is relevant for lagged values of dependent variable, there is a possibility of weak endogenity (Bond 2002). The Sargan test deals test of the validity of instrumental variables and is a test involving overidentifying restrictions. The calculated values of Sargan test also supports the analysis. In order to check the robustness of the results, various tests were performed.
Model specification and econometric Prior literature on bank profitability revealed that the functional linear form is the suitable form of analysis (Menicucci & Paolucci, 2016). Prior studies of banks' profitability either used a linear regression models (pooled, fixed, or/and random effect models;e.g., AL-Omar & AL-Mutairi, 2008; Pathneja, 2016; Rjoub et al., 2017; Salike & Ao, 2017; Tiberiu, 2015) or both generalized moments method (GMM) and linear regression models (e.g., Athanasoglou et al., 2008; Bougatef, 2017; Chowdhury & Rasid, 2017; Dietrich & Wanzenried, 2014; Louzis et al., 2012; Masood & Ashraf, 2012; Rashid & Jabeen, 2016; Saona, 2016; Tiberiu, 2015).

TABLE 2 Sample description

Banks	Foreign	Private	National	SBI and its Associates	Others	Total
No.	46	26	21	6	2	101
Sample	25	18	20	6	0	69
Sample%	54%	69%	95%	100%	0%	68%

Note. SBI: State Bank of India.

GMM estimator accounts for possible correlations between any of the independent variables (Athanasoglou et al., 2008). Further, Saona (2016) states that problems and issues related to individual heterogeneity are some justifications for using GMM that are not present in this study. The difference of GMM estimators can be subjected to serious finite sample biases if the instruments used have near unit root properties (Chowdhury & Rasid, 2017). Both difference and system GMM estimators are suitable for situations with "small T, large N" panels; independent variables that are not strictly exogenous; fixed individual effects; heteroscedasticity; and autocorrelation (Roodman, 2006). Against this background, this study used linear regression models with pooled, fixed, and random effect with an examination of all assumptions required to conduct a linear regression. Using a linear regression of three models could help in obtaining more consistent and comparable estimates for the parameters models. As such, panel data analysis is used rather than the new proposed GMM. Two main advantages of adopting panel data analysis are confirmed by researchers. The first advantage is its efficiency of econometric estimates over pure cross-sectional or pure time-series data analysis techniques (Baltagi, 2005; Hsiao, 2003). The second one is its ability to control for individual heterogeneity and multicollinearity (Kyereboah-Coleman, 2007). Panel data of 10 years for 69 Indian commercial banks is used to analyse the impact of bank-specific and macroeconomic factors on bank's profitability. Following Anbar and Alper (2011), Brooks (2014), Chowdhury and Rasid (2017), and Masood and Ashraf (2012), the essential structure and context of the panel data is defined as per the following regression model

$$\gamma_{nt} ¼ \alpha þ \beta x_{nt} þ \varepsilon_{nt}; \quad (1)$$

where γ_{nt} denotes the dependent variable (Profitability), α, is the intercept term on the explanatory variables, β is a k × 1 vector of parameter to be estimated, and vector of observations is x_{nt}, which is 1 × k, t = 1 …, T; n = 1, …, N. the practical and operational form, the aforementioned model can be expressed as follows:

Profitability ¼ ʃðBank − specific variables; (2) Macroeconomic variablesÞ:

Profitability is measured by ROA and ROE. Bankspecific variables include asset size, capital adequacy, assets quality, liquidity, deposits, assets management, operational efficiency, leverage, and branches. Macroeconomic variables include GDP, inflation, exchange rate, interest rate, financial crisis, and demonetization. Expanding the proxies used in Model 2, two models have been developed to investigate the factors that may determine banks' profitability in India.

The models hypothesize that the banks' profitability in India depends on internal factors (bank-specifics) and external factors (macroeconomic) that are as follows:

ROAit ¼ αi þβ1CAit þβ2AQit þβ3LIQit þβ4DEPit þβ5AMit þβ6OPEFit þβ7Log ASit þβ8LEVit þβ9BRNCHit þβ10GDPit þβ11INFit þβ12INTRit þβ13EXCHit þβ14CRISISit þβ15DEMOit þεit (3)

ROEit ¼ αi þβ1CAit þβ2AQit þβ3LIQit þβ4DEPit þβ5AMit þβ6OPEFit þβ7Log ASit þβ8LEVit þβ9BRNCHit þβ10GDPit þβ11INFit þβ12INTRit þβ13EXCHit þβ14CRISISit þβ15DEMOit þεit; (4)

where i refers to an individual bank; t refers to year; β1: β15 are the coefficients of determinant variables and ε is the error term; and all other variables are as defined in Table 2.

Both models are estimated through pooled, random, and fixed effect regression. Further, the Hausman test is applied to determine whether to select fixed effect estimates or random effect estimates. Pasiouras and Kosmidou (2007) indicated that if the value obtained by the Hausman test is larger than the critical chi-square χ^2 0.5,10 = 9.341 or χ^2 0.005,10 = 25.182, then the fixed effects estimator is the appropriate choice.

5| DATA ANALYSIS AND RESULTS

Descriptive statistics

Table 3 provides descriptive statistics for intra and extra bank determinants of the banks' profitability variables over the period from 2008 to 2017. The minimum value of ROA and ROE are −4.21 and −44.37 whereas the maximum values are 10.23 and 31.37, respectively. The mean values are 1.17 for ROA and 10.16 for

ROE. This indicates the negative skew distribution of ROA and ROE during 2008–2017. It is also shown in Table 3 that there is a variation between the average values and standard deviation of all independent variables. For bank-specific variables, the average value of LNAS is 12.65, the ratio of CAD, AM, DEP, and OPEF are 19.30%, 2.59%, 71.55%, and 0.65% with standard deviation of 16.85%, 1.69%, 18.52%, and 0.69%, respectively.

Further, the average values of AQ, LEV, and LIQ are

3.92%, 4.34%, and 3.65% with standard deviation of 0.47%, 0.34%, and 0.28%, respectively. With consideration of industry-specific variables, the interest rate has an average value of 7.10 with a standard deviation of 1.06 and (Min. = 4.75, Max. = 8) and mean value of exchange rate

TABLE Definitions of commercial banks' profitability variables

Variable	Acronym	Measure	Exp. effect	Evidence from prior studies
Dependent variables				
Profitability	ROA	$ROA_{it} = \frac{\text{Net Prof}_{it}}{\text{Total Assets}_{it}}$		Garcia and Guerreiro (2016); Pathneja (2016); Masood and Ashraf (2012); Menicucci and Paolucci (2016); Naeem et al. (2017);
	ROE	$ROE_{it} = \frac{\text{Net Prof}_{it}}{\text{Total Equity}_{it}}$		Rani and Zergaw (2017); Yahya et al. (2017); Zampara et al. (2017)
Independent variables: bank-specific				
Assets size	LNAS	Natural logarithm of total assets	±	Bougatef (2017); Pathneja (2016); A. Singh and Sharma (2016)
Capital adequacy	CAD	Equity/total assets	±	Bougatef (2017); Dietrich and Wanzenried (2014); Ongore and Kusa (2013); Petria et al. (2015); Salike and Ao (2017)
Assets quality	AQ	$AQit = \frac{\text{Loan}}{\text{Total Assets}_{it}}$	+	Acaravci and Çalim (2013); Anbar and Alper (2011); Naeem et al. (2017); Ongore and Kusa (2013)
Liquidity	LIQ	$LIQit = \frac{\text{Liquid Assts}}{\text{Total Assets}_{it}}$	−	Anbar and Alper (2011); Bougatef (2017); Francis (2013); Ongore and Kusa (2013); Pasiouras and Kosmidou (2007); Rani and Zergaw (2017)
Deposit	DEP	$DEPit = \frac{\text{Deposits}}{\text{Total Assets}_{it}}$	+	Acaravci and Çalim (2013); Menicucci and Paolucci (2016); Naeem et al. (2017); Zampara et al. (2017)
Asset management	AM	$AMit = \frac{\text{Operating Income}}{\text{Total Assets}_{it}}$	+	Yahya et al. (2017)
Financial risk	LEV	$LRit = \frac{\text{Total Liabilities}}{\text{Total Assets}_{it}}$	±	
Operating efficiency	OPEF	$OPEFit = \frac{\text{Total Operating Expense}}{\text{Net Interest Income}_{it}}$	−	Rashid and Jabeen (2016)
Branches	BRNCH	Number of branches	+	
Independent variables: macroeconomic				
Economic activity	GDP	Annual real GDP growth rate	±	Anbar and Alper (2011); Francis (2013); Garcia and Guerreiro (2016); Marijana et al. (2012); Ongore and Kusa (2013); Zampara et al. (2017)

Inflation	INF	Annual inflation rate	+	Jara-Bertin et al. (2014); Pasiouras and Kosmidou (2007); Petria et al. (2015); Saona (2016)
Exchange rate	EXCH	Average exchange rate of U.S. $ in a year	+	Acaravci and Çalim (2013); Rani and Zergaw (2017); Rjoub et al. (2017)
Interest rate	INTRT	Lending interest	+	Acaravci and Çalim (2013); Anbar and Alper (2011); Rjoub et al. (2017)
Financial crisis	CRISIS	A dummy variable	−	A variable of 0 for the years 2008 and 2009 and 1 for the years 2010 to 2017
Demonetization	DEMO	A dummy variable	−	A variable of 0 for the years from 2008 to 2016 and 1 for the year 2017

is 52.94 (Min. = 41.49, Max. = 67.18). Macroeconomic variables show average values of 7.33 and 8.32 for GDP and INF (SD = 1.81 and 2.40), respectively. The GDP varies between a minimum of 3.89 and a maximum of 10.26. Similarly, inflation fluctuates between 4.91 and 11.99.

Descriptive statistics

Variables	Obs.	Maximum	Minimum	Mean	Median	Std. dev.
Panel A: dependent variables						
ROA	690	10.23	−4.21	1.17	1.06	1.27
ROE	690	31.37	−44.37	10.16	10.97	9.78
Panel B: bank specific determinants						
LNAS	690	17.11	5.89	12.65	13.25	2.24
CAD	690	277.45	7.51	19.30	13.74	16.85
AQ	690	4.42	−0.34	3.92	4.08	0.47
LIQ	690	4.56	2.65	3.65	3.59	0.28
DEP	690	92.25	9.98	71.55	81.00	18.52
AM	690	12.98	−0.68	2.59	2.11	1.69
OPEF	690	9.39	0.13	0.65	0.57	0.69
LEV	690	4.55	0.26	4.34	4.45	0.34
BRNCH	690	18,280.00	1.00	1,306.46	469.00	2,230.28
Panel C: macroeconomic determinants						
GDP	690	10.26	3.89	7.33	7.11	1.81
INF	690	11.99	4.91	8.32	8.86	2.40
INTR	690	8.00	4.75	7.10	7.58	1.06
EXCH	690	67.18	41.49	52.94	48.30	8.73
CRISIS	690	1	0	0.80	1	0.40
DEMO	690	1	0	0.10	0.00	0.30

Note. AM: assets management (%); AQ: assets quality (%); BRNCH: no. of branches; CAD: capital adequacy ratio (%); CRISIS: a dummy variable of 0 for the financial years 2008 and 2009 and 1 for the year 2010 to 2017; DEMO: a dummy variable of 0 for the years from 2008 to 2016 and 1 for the year 2017; DEP: deposits of the total assets (%); EXCH: exchange rate; GDP: real gross domestic product (%); INF: annual inflation rate (%); INTR: lending Interest rate (%); LEV: financial risk (%); LIQ: liquidity ratio (%); LNAS: natural logarithm of total assets; OPEF: ratio of operating efficiency (%); ROA: ratio of bank net profit to total assets; ROE: ratio of net profit to shareholders equity.

Unit root test

As shown in Table 4, all variables used in the models are found to be stationary at the first difference in all the applied tests. This leads to reject the null hypothesis of a unit root. between dependent and independent variables. With regard to bank-specific variables, there is a positive/negative correlation between bank-specific variables and both ROA and ROE. Where LNAS, AQ, BRNCH, DEP, and LEV have a negative correlation with ROA, they have a positive correlation with ROE. However, CRISIS, DEMO, GDP, and INF have a negative correlation with both ROA and ROE. Similarly, AM, EXCH, and INTR rate have a positive correlation with ROA and ROE. Further, CAD ratio and LIQ ratio exhibit a negative correlation with ROE but a positive with ROA. GDP and INF have a negative relationship with both ROA and ROE.

All independent variables have a low correlation that indicates the absence of multicollinearity issues in this study. For more reliable analysis, Variance Inflation Factor (VIF) test is conducted to test multicollinearity issues. As it is shown in Panel B of Table 5, VIF values do not exceed 6.33 for all variables that indicate that there is no multicollinearity between independent variables.

| Results of model estimation

Tables 6 and 7 show the estimation results of pooled Ordinary Least Squares (OLS), fixed and random effect

TABLE 4 Unit root test

	Level				1st difference			
Variables	Levin, Lin, & Chu t*	PP–Fisher chi-square	Im, Pesaran, and Shin W-stat	ADF–Fisher chi-square	Levin, Lin, Pesaran, & Chu t*	Im, and Shin W-stat	ADF–Fisher chi-square	PP–Fisher chi-square
Panel A: dependent variables								
ROA	0.000	0.993	0.239	0.005	0.000	0.000	0.000	0.000
ROE	0.000	0.972	0.045	0.003	0.000	0.000	0.000	0.000
Panel B: bank specific determinants								
LNAS	0.000	0.105	0.007	0.000	0.000	0.330	0.314	0.000
CAD	0.000	0.037	0.022	0.000	0.000	0.000	0.000	0.000
AQ	0.002	0.842	0.797	0.398	0.000	0.018	0.000	0.000
LIQ	0.000	0.625	0.708	0.038	0.000	0.000	0.000	0.000
DEP	0.000	0.193	0.150	0.000	0.000	0.000	0.000	0.000
AM	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OPEF	0.000	0.165	0.044	0.000	0.000	0.000	0.000	0.000
LEV	0.000	0.089	0.050	0.000	0.000	0.000	0.000	0.000
BRNCH	0.091	1.000	0.998	1.000	0.001	0.258	0.054	0.000

Panel C: macroeconomic determinants								
GDP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
INF	0.000	0.000	0.000	0.794	0.000	0.020	0.120	0.009
INTR	0.000	0.000	0.000	0.030	0.000	0.000	0.000	0.000
EXCH	0.000	0.999	1.000	0.858	0.000	0.000	0.000	0.000

Note. AM: assets management (%); AQ: assets quality (%); BRNCH: no. of branches; CAD: capital adequacy ratio (%); CRISIS: a dummy variable of 0 for the financial years 2008 and 2009 and 1 for the year 2010 to 2017; DEMO: a dummy variable of 0 for the years from 2008 to 2016 and 1 for the year 2017; DEP: deposits of the total assets (%); EXCH: exchange rate; GDP: real gross domestic product (%); INF: annual inflation rate(%); INTR: lending Interest rate (%); LEV: financial risk (%); LIQ: liquidity ratio (%); LNASLNA: natural logarithm of total assets; OPEF: ratio of operating efficiency (%); ROA: ratio of bank net

profit to total assets; ROE: ratio of net profit to shareholders equity.

models in Equations (1) and (2). The analysis of the results is presented below and categorized into two groups; bank-specific and macroeconomic determinants of profitability using both ROA and ROE as dependent variables that are regressed independently against both categories of explanatory variables as explained in Equations (3) and (4). Following is the discussion of the results based on these two categories.

1.Bank-specific determinants of Indian banks' profitability

As shown in Table 6, ROA is used as a dependent variable and a function of both categories of bank-specific and macroeconomic determinants. To some extent, all the three models conducted show similar results. The results in these models demonstrate that LNAS, AM, OPEF, LEV, EXCH, and DEMO have a significant impact on profitability measured by ROA. However, only BRNCH shows a significant result in the case of pooled and random effects models and AQ shows a significant impact in the case of pooled and fixed effect models. As expected in Table 2, across the three models, it has been found that LNAS, AM affect significantly and positively the profitability of Indian banks as measured by ROA at the level of 1% level of significance (P value < 0.01). This is consistent with some earlier studies (e.g., AL-Omar & AL-Mutairi, 2008; Athanasoglou et al., 2008; Chowdhury & Rasid, 2017; Menicucci & Paolucci, 2016) who agreed that banks with larger assets size lead to greater profitability. On the contrary, Francis (2013) reported that bank size has a negative effect on banks' profitability and Athanasoglou et al. (2008) found that bank size does not affect bank profitability significantly. On the other hand, Yahya et al. (2017) consistently revealed that assets management has a significant and positive impact on banks' profitability.

Along the same line, the results declare that LEV ratio affects significantly ROA at the level of 1% (P value < 0.01). Expectedly, the coefficient of LEV ratio is found to have a negative value. The results are similar with the studies of

TABLE5 Correlationandmulticollinearitydiagnostics

	AM	AQ	LNAS	BRNCH	CAD	CRISIS	DEMO	DEP	EXCH	GDP	INF	INTR	LEV	LIQ	ROE	ROA	OPEF
PanelA:Pearsoncorrelation																	
AM	1																
AQ	-0.42	1															
LNAS	-0.49	0.53	1														
BRNCH	-0.23	0.31	0.56	1													
CAD	0.35	-0.35	-0.57	-0.22	1												
CRISIS	-0.07	0.09	0.14	0.08		-0.01	1										
DEMO	-0.02	-0.01	0.05	0.05		-0.03	0.15	1									
DEP	-0.60	0.47	0.43	0.31		-0.42	-0.01	0.02	1								
EXCH	0.05	-0.09	-0.16	-0.10	0.03	-0.73	-0.41	0.01	1								
GDP	-0.02	-0.01	0.03	0.04	0.00	-0.06	0.42	0.02	-0.14	1							
INF	-0.05	0.11	0.12	0.07	0.01	0.73	-0.24	-0.04	-0.55	0.10	1						
INTR	0.04	-0.05	-0.05	-0.04	0.02	0.04	0.15	0.01	0.16	-0.58	-0.41	1					
LEV	-0.80	0.42	0.67	0.30		-0.60	-0.02	-0.04	0.71	0.02	0.02	0.00	-0.03	1			
LIQ	0.36	-0.93	-0.56	-0.26	0.39	-0.10	-0.02	-0.31	0.13	-0.02	-0.12	0.08	-0.40	1			
ROE	0.09	0.15	0.24	0.06		-0.28	-0.24	-0.20	0.29	0.35	-0.09	-0.17	0.12	0.28	-0.12	1	
ROA	0.68	-0.29	-0.34	-0.22	0.26	-0.12	-0.16	-0.42	0.19	-0.09	-0.06	0.07	-0.51	0.27	0.47	1	
OPEF	0.18	-0.30	-0.45	-0.15	0.05	0.00	0.04	-0.10	0.02	0.01	-0.04	0.04	-0.22	0.28	-0.09	0.06	1
PanelB:diagnosticsofmulticollinearity																	
VIF	1.42	6.27	1.99	1.30	1.09	2.75	2.07	1.60	3.68	4.44	1.81	4.85	1.72	6.33	1.23		

Note AM:assetsmanagement(%);AQ:assetsquality(%);BRNCH:no.ofranches;CAD:capitaladequacyratio(%);CRISIS:adummyvariableof0forthefinancialyears2008and2009and1fortheyear2010to2017;DEMO:adummyvariableof0fortheyearsfrom2008to2016and1fortheyear2017;DEP:depositsofthetotalassets(%);EXCH:exchangerate;GDP:realgrossdomesticproduct(%);INF:annualinflationrate(%);INTR:lendingInterestrate(%);LEV:financialrisk(%);LIQ:liquidityratio(%);LNAS:naturallogarithmoftotalassets;OPEF:ratioofoperatingefficiency(%);ROA:ratioofbanknetprofittototalassets;ROE:ratioofnetprofittoshareholdersequity.

TABLE 6 Model estimation results summary

ROA Variable	Pooled				Fixed					Random			
		Coeff.	Sd. Er.	t	Prob.	Coeff.	Sd. Er.	t	Prob.	Coeff.	Sd. Er.	t	Prob.
C	1.08	1.60	0.67	0.50	0.89	0.86	1.03	0.30	0.04	0.81	0.05	0.96	
Bank-specific determinants													
LNAS	1.68	0.39	4.28	0.00	1.34	0.25	5.31	0.00	1.56	0.26	6.03	0.00	
BRNCH	0.00	0.00	−3.87	0.00	0.00	0.00	−0.43	0.67	0.00	0.00	−2.01	0.04	
AM	0.32	0.05	5.88	0.00	0.36	0.03	12.31	0.00	0.15	0.03	5.26	0.00	
CAD	0.00	0.00	−0.59	0.56	0.00	0.00	−0.59	0.56	0.00	0.00	−0.71	0.48	
AQ	0.03	0.02	2.00	0.05	0.02	0.01	1.89	0.06	0.01	0.01	1.50	0.13	
LIQ	0.01	0.02	0.52	0.60	0.00	0.01	0.31	0.76	0.00	0.01	0.43	0.66	
DEP	0.01	0.01	0.77	0.44	0.00	0.01	0.86	0.39	0.00	0.01	0.49	0.63	
OPEF	0.27	0.12	2.22	0.03	0.17	0.07	2.61	0.01	0.13	0.06	2.11	0.04	
LEV	−0.04	0.01	−3.62	0.00	−0.03	0.01	−5.51	0.00	−0.02	0.01	−3.02	0.00	
Macroeconomic determinants													
GDP	0.07	0.69	0.11	0.91	0.13	0.37	0.35	0.72	−0.08	0.35	−0.24	0.81	
INF	−0.03	0.03	−0.97	0.33	−0.02	0.02	−1.22	0.22	0.00	0.01	0.09	0.93	
EXCH	−0.05	0.03	−1.74	0.08	−0.05	0.01	−3.31	0.00	−0.04	0.01	−3.09	0.00	
INTR	−0.12	0.12	−1.04	0.30	−0.10	0.06	−1.54	0.13	−0.08	0.06	−1.39	0.16	
DEMO	−0.63	0.28	−2.23	0.03	−0.65	0.15	−4.30	0.00	−0.40	0.15	−2.70	0.01	
CRISIS	−0.28	0.28	−0.98	0.33	−0.24	0.15	−1.60	0.11	−0.23	0.14	−1.62	0.11	
Adjusted R^2	0.17				0.76				0.21				
F-statistic	9.64				25.06				10.85				
Prob (F-statistic)	0.00				0.00				0.00				
Hausman test					0.000								

Note. AM: assets management (%); AQ: assets quality (%); BRNCH: no. of branches; CAD: capital adequacy ratio (%); CRISIS: a dummy variable of 0 for the financial years 2008 and 2009 and 1 for the year 2010 to 2017; DEMO: a dummy variable of 0 for the years from 2008 to 2016 and 1 for the year 2017; DEP: deposits of the total assets (%); EXCH: exchange rate; GDP: real gross domestic product (%); INF: annual inflation rate (%); INTR: lending Interest rate (%); LEV: financial risk (%); LIQ: liquidity ratio (%); LNAS: natural logarithm of total assets; OPEF: ratio of operating efficiency (%); ROA: ratio of bank net profit to total assets; ROE: ratio of net profit to shareholders equity.

Yahya et al. (2017) and Jara-Bertin et al. (2014) who revealed that LEV ratio is negatively related to banks' profitability (ROA).

In addition, the results in Table 6 demonstrate a significant impact of OPEF ratio on ROA in the three models at the level of 5% (P value < 0.05). The coefficient has the expected positive sign that reveals a positive impact on ROA. Consistently, AL-Omar and AL-Mutairi (2008), Marijana et al. (2012), Petria et al. (2015), Rashid and Jabeen (2016), and Salike and Ao (2017) agreed that operating expenses ratio is significant and is one of the most important determinants of banks' profitability. This argument is supported also by Jara-Bertin et al. (2014) and Salike and Ao (2017) who proved that operational efficiency is a significant determinant in explaining banks' profitability. Contradictory, Chowdhury and Rasid (2017), Francis (2013), and Yahya et al. (2017) found that OPEF ratio has statistically significant negative impact on ROA but Naeem et al. (2017) reported a negative as well as insignificant relationship with ROA.

TABLE 7 Model estimation results summary

	Pooled				Fixed				Random			
ROE Variable	Coeff.	Sd. Er.	t	Prob.	Coeff.	Sd. Er.	t	Prob.	Coeff.	Sd. Er.	t	Prob.
C	2.48	0.12	20.11	0.00	2.55	0.10	25.11	0.00	2.49	0.11	22.72	0.00
Bank-specific determinants												
LNAS	0.00	0.00	2.01	0.04	0.00	0.00	2.20	0.03	0.00	0.00	2.98	0.00
BRNCH	0.00	0.00	1.18	0.24	0.00	0.00	−0.56	0.57	0.00	0.00	0.13	0.90
AM	0.15	0.04	4.03	0.00	0.16	0.03	5.52	0.00	0.16	0.03	5.36	0.00
CAD	0.00	0.00	−0.35	0.73	0.00	0.00	−0.37	0.71	0.00	0.00	−0.41	0.68
AQ	0.01	0.01	1.04	0.30	0.01	0.01	1.31	0.19	0.01	0.01	1.29	0.20
LIQ	0.01	0.01	1.10	0.27	0.01	0.01	0.77	0.44	0.01	0.01	0.92	0.36
DEP	0.00	0.01	−0.03	0.98	0.00	0.01	0.47	0.64	0.00	0.01	0.38	0.70
OPEF	0.09	0.08	1.08	0.28	0.09	0.07	1.42	0.15	0.09	0.07	1.42	0.16
LEV	0.00	0.01	0.01	0.99	0.00	0.01	−0.40	0.69	0.00	0.01	−0.27	0.79
Macroeconomic determinants												
GDP	−0.09	0.05	−1.92	0.06	−0.10	0.04	−2.75	0.01	−0.10	0.04	−2.68	0.01
INF	0.03	0.02	1.39	0.17	0.04	0.02	2.20	0.03	0.03	0.02	2.09	0.04
EXCH	−0.08	0.02	−3.70	0.00	−0.09	0.02	−5.15	0.00	−0.09	0.02	−5.06	0.00
INTR	−0.20	0.08	−2.49	0.01	−0.23	0.07	−3.52	0.00	−0.23	0.07	−3.43	0.00
DEMO	0.13	0.34	0.37	0.71	0.24	0.27	0.88	0.38	0.22	0.27	0.80	0.43
CRISIS	−0.56	0.18	−3.20	0.00	−0.65	0.14	−4.57	0.00	−0.63	0.14	−4.48	0.00
Adjusted R^2	0.12				0.44				0.17			
F-statistic	6.09				6.43				8.48			
Prob (F-statistic)	0.00				0.00				0.00			
Hausman test					0.0001							

Note. AM: assets management (%); AQ: assets quality (%); BRNCH: no. of branches; CAD: capital adequacy ratio (%); CRISIS: a dummy variable of 0 for the financial years 2008 and 2009 and 1 for the year 2010 to 2017; DEMO: a dummy variable of 0 for the years from 2008 to 2016 and 1 for the year 2017; DEP: deposits of the total assets (%); EXCH: exchange rate; GDP: real gross domestic product (%); INF: annual inflation rate (%); INTR: lending Interest rate (%); LEV: financial risk (%); LIQ: liquidity ratio (%); LNAS: natural logarithm of total assets; OPEF: ratio of operating efficiency (%); ROA: ratio of bank net profit.

Furthermore, the expected sign of BRNCH is revealed by the results of both pooled and random effect models. Although BRNCH is found to be positively significant at the level of 1% (P value < 0.01) in the case of pooled model, it is positively significant at the level of 5% in the random effect model (P value < 0.05) but no significant impact is found in the fixed effect model. Similarly, AQ ratio has the expected (positive) sign in both; pooled and fixed effect models. This indicates that AQ ratio has a significant positive impact on ROA at the level of 10% (P value < 0.10). This is in agreement with AL-Omar and AL-Mutairi (2008) who concluded a significant relationship between AQ and ROA. Inconsistently, to total assets; ROE: ratio of net profit to shareholders equity.

Naeem et al. (2017) found a negative relationship between AQ and ROA.
However, CAD ratio, LIQ ratio, and DEP ratio show insignificant impact on profitability of the Indian banks as measured by ROA (P value > 0.10). Notably, the coefficients of these variables are found to have a positive sign as predicted except for LIQ that expected to have a negative impact on ROA. These results are in agreement with Ongore and Kusa (2013) who revealed that bankspecific factors significantly affect the performance of commercial banks in Kenya, except for liquidity variable. Further, Bougatef (2017), Marijana et al. (2012), Naeem et al. (2017), and Yahya et al. (2017) disclosed a positive impact of liquidity on bank's profitability. But this contradicts Jara-Bertin et al. (2014) and Francis (2013) who found a negative impact of liquidity on ROA. However, Tiberiu (2015) declared that the level of liquidity has a mixed influence. Concerning CAD ratio, the results of this study is in accordance with Naeem et al. (2017) who stated that CAD ratio has a positive but insignificant impact on the profitability of banks. Differently, Bougatef (2017) and Salike and Ao (2017) reported a significant positive impact whereas Yahya et al. (2017) declared a negative impact on the bank's profitability. In the same vein, a similar result regarding DEP ratio was found by Menicucci and Paolucci (2016) who suggested that banks with higher deposits tend to be more profitable but the effects on profitability are statistically insignificant in some cases.
With regard to the impact of bank-specific variables on the profitability of Indian banks as measured by ROE, the results indicate that LNAS and AM are found to be significant and have an impact on ROE. Both variables show a positive coefficient that is consistent with the expected sign. However, LNAS has a positive significant impact on ROE at the level of 1% (P value < 0.01) in case of the random effect model, it is significant at the level of 5% (P value < 0.05) in the pooled and fixed effect models. This finding is consistent with Masood & Ashraf, 2012 and Jara-Bertin et al. (2014) who indicated that bank size is an important determinant of bank's profitability. On the other hand, AM indicates a positive significant impact on ROE at the level of 1% (P value < 0.01) in all the three models. This is in agreement with Yahya et al. (2017) who declared that assets management has a significant and positive impact on banks' profitability. All other variables of bank-specific factors show insignificant impact on the profitability of Indian banks as measured by ROE across the three models. No evidence is found at any level of significance (P value > 0.10).

For the reliability of the three used models, the adjusted R square in case of ROA is 17% for the pooled model, 76% in the fixed effect model, and 21% in the case of the random effect model. It shows that both bankspecific and macroeconomic determinants are explaining about 17% to 76% of the variation of a bank's profitability as measured by ROA. Similarly, the value of the adjusted R square in case of ROE is 12% in the pooled model, 44% in the fixed effect model, and 17% in the random effect model exhibiting that both bank-specific and macroeconomic determinants are contributing about 12% to 44% to the profitability. To evaluate and compare the results of the three models applied, it is clearly seen from the results of Tables 6 and 7 that all models have a P value of less than 1% revealing that all models are fit and significant. Furthermore, Hausman test was conducted for deciding the appropriate estimated model between both fixed and random effect models. The P value suggests that fixed effect model is superior and appropriate than random effect model as the P value of Hausman test is less than 0.05 (P value = 0.00 < 0.01). Accordingly, Hausman test suggests that fixed effect model is more appropriate than random effect model.

2. Macroeconomic determinants of Indian banks' profitability

Regarding the set of external factors affecting the profitability of Indian banks as measured by ROA, the findings of this study reveal that GDP, INF, INTR, and CRISIS have no significant impact on ROA at any level of significance but they are found to have statistically significant impact on ROE. Although both EXCH and DEMO exhibited a significant impact on ROA and ROE, only DEMO shows no significant impact in the case of ROE.

EXCH is found to have a significant impact on ROA at the level of 1% (P value < 0.01) in the fixed and random effect models but it is significant at the level of 10% (P value < 0.10) in the case of pooled model. Further, EXCH shows statistically significant impact on ROE at the level of 1% (P value < 0.01) in all the three models. Unexpectedly, the coefficient sign is found to be negative in both cases that indicate a negative impact on ROA and ROE. This could be attributed to deterioration of exchange rate of the Indian Rupee as compared with the other foreign currencies especially the U.S. $ (41.49 in 2008 and 67.18 in 2017). This contradicts Saona (2016) and Tiberiu (2015) who found a positive association between foreign exchange and banks profitability. Furthermore, DEMO shows a significant impact only on ROA at the level of 1% (P value < 0.01) in the case of fixed effect model but it has a significant impact at the level of 5% (P value < 0.05) in the case of both pooled and random effect models. It is found to have statistically insignificant impact on ROE at any level of significance. As expected, DEMO reveals a negative coefficient that suggests a negative impact on ROA.

Although CRISIS has a significant impact on ROE at the level of 1% (P value < 0.01) across the three applied models, other significant factors have different directions of impact from a model to another a model. Consistently, Bogdan and Ihnatov (2014) and Maria et al. (2017) found a negative and significant impact of CRISIS with profitability measured by ROA and ROE. Further, Dietrich and Wanzenried (2014) stated that the financial crisis has statistically negative significant in high-income countries. On the contrary, Saona (2016) revealed that the financial crisis is positively and statistically significant.

GDP has statistically significant impact on ROE at the level of 5% (P value < 0.05) in case of both fixed and random effect models but it is statistically significant at the level of 10% (P value < 0.10) in the pooled model. This result is consistent with Garcia and Guerreiro (2016) and Rashid and Jabeen (2016) who reported that the real GDP growth has a negative impact on profitability. However, a contradictory result is found by Acaravci and Çalim (2013) and Yahya et al. (2017) who stated that banks performance are positively related to economic growth. Similarly, INTR rate is found to have a significant impact at the level of 1% (P value < 0.01) in the fixed and random effect models but it is statistically significant at the level of 5% (P value < 0.05) in the pooled model. Unexpectedly, it shows a negative coefficient that indicates a negative impact on ROE. This is in agreement with Rashid and Jabeen (2016) who revealed that interest rate is negatively related to bank's performance. Differently, from the aforementioned external factors, INF rate has a statistically significant impact only under fixed and random effect models at the level of 5% (P value < 0.05). The same finding was found by Jara-Bertin et al. (2014) and Yahya et al. (2017) who declared that INF has a positive and significant impact on banks' profitability. Overall, and in connection with the Hausman Test, fixed effect model should be considered superior to the random effect model. In this view, it can be concluded that all macroeconomic factors investigated by this study except DEMO are substantial determinants of profitability of the Indian banks measured by ROE. In the same vein, both EXCH rate and DEMO are significant and important macroeconomic determinants of profitability as measured by ROA.

Robustness analysis

Beck and Katz (1995) validated that feasible generalized least squares (FGLS) generates severely underestimated standard errors coefficients. However, as compared with FGLS, the “panel-corrected standard errors,” (PCSE) estimator creates accurate standard error estimate with no loss in efficiency. Accordingly, an alternative estimator, based on OLS but using PCSE, produces accurate coefficient standard errors (Reed & Webb, 2010). The PCSE standard error estimate is robust not only to unit heteroskedasticity but it is also robust against possible contemporaneous correlation across the units (Bailey & Katz, 2011). Coupled with the fact that FGLS is appropriate for panels with T > N; this study applied PCSE where the panel is constituted by 69 banks in 10 years, the PCSE is the most suitable estimator (Marques, Fuinhas, & dos Santos Gaspar, 2016).

Table 8 provides results of the PCSE. PCSE is a panel correction standard error that arbitrary accounts for heteroscedasticity within cross-sectional correlation (Beck & Katz, 1995). With reference to bank-specific factors and ROA, PCSE model provides evidence that LNAS, BRANCH, AM ratio, OPEF ratio, and LEV ratio have statistically significant impact on ROA. All of these factors are found to be statistically significant at the level of 1% (P value < 0.01) except LNAS that is statistically significant at the level of 5% (P value < 0.05). Notably, they all have a positive coefficient that denotes a significant positive impact or increase on profitability of the Indian banks as measured by ROA except LEV ratio that has a negative coefficient suggesting a significant decrease in ROA. The coefficient sign is met with the expected sign stated in Table 2.

In terms of ROE, among the bank-specific factors, the results show that only LNAS, AM ratio, AQ ratio, and LIQ ratio have statistically significant impact on ROE. Although both LNAS and AM ratio have a significant effect on ROE at the level of 1% (P value < 0.01), AQ ratio is statistically significant at the level of 5% (P value < 0.05). However, the LIQ ratio is significant at the level of 10% (P value < 0.10).

However, the majority of macroeconomic results factors show significant impact on profitability as measured by ROA. All factors except GDP growth and CRISIS have a significant impact on ROA. INF rate and DEMO are significant at the level of 1% (P value < 0.01) but EXCH rate and INTR rate are significant at the level of 5% (P value < 0.05). Similarly, all macroeconomic factors excepting DEMO reveal a significant impact on ROE. This significant impact is at the level of 1% (P value < 0.01) for GDP growth, EXCH rate, INTR rate, and CRISIS and at 5% (P value < 0.05) level of significance for INF rate.

Overall, the estimated adjusted R squared for PCSE model is 55% in case of ROA and 42% for ROE. This suggests that both bank-specific and macroeconomic variables investigated by this study are contributing about 55% and 42% to the variability of ROA and ROE, respectively. In other words, 55% and 42% of the total variability is accounted for by the models stated in Equations 3 and 4.

Bank-specific determinants								
LNAS	0.64	0.28	2.26	0.02	0.00	0.00	3.17	0.00
BRNCH	0.00	0.00	−3.78	0.00	0.00	0.00	0.08	0.94
AM	0.36	0.03	10.96	0.00	0.19	0.05	3.76	0.00
CAD	0.00	0.00	−1.55	0.12	0.00	0.00	−0.70	0.49
AQ	0.01	0.01	0.92	0.36	0.04	0.01	2.51	0.01
LIQ	0.00	0.01	0.17	0.87	0.02	0.01	1.71	0.09
DEP	0.00	0.01	0.84	0.40	0.00	0.01	−0.08	0.94
OPEF	0.15	0.05	2.87	0.00	0.10	0.07	1.41	0.16
LEV	−0.03	0.01	−3.82	0.00	−0.01	0.01	−0.55	0.58
Macroeconomic determinants								
GDP	0.01	0.35	0.04	0.97	−0.16	0.05	−3.26	0.00
INF	−0.05	0.01	−3.46	0.00	0.04	0.02	2.23	0.03
EXCH	−0.03	0.01	−2.58	0.01	−0.12	0.02	−5.47	0.00
INTR	−0.14	0.07	−2.08	0.04	−0.40	0.09	−5.47	0.00
DEMO	−0.72	0.16	−4.58	0.00	0.30	0.36	0.86	0.39
CRISIS	−0.13	0.14	−0.97	0.34	−0.96	0.19	−5.19	0.00
No. of obs	620				620			
No. of groups	69				69			
Est. covariances	2,415				2415			
Est. coefficients	16				16			
R2	0.55				0.42			
Wald χ^2 (15)	354.34				92.67			
Prob > χ^2	0.0000				0.000			

Note. AM: assets management (%); AQ: assets quality (%); BRNCH: no. of branches; CAD: capital adequacy ratio (%); CRISIS: a dummy variable of 0 for the financial years 2008 and 2009 and 1 for the year 2010 to 2017; DEMO: a dummy variable of 0 for the years from 2008 to 2016 and 1 for the year 2017; DEP: deposits of the total assets (%); EXCH: exchange rate; GDP: real gross domestic product (%); INF: annual inflation rate (%); INTR: lending Interest rate (%); LEV: financial risk (%); LIQ: liquidity ratio (%); LNAS: natural logarithm of total assets; OPEF: ratio of operating efficiency (%); ROA: ratio of bank net profit to total assets; ROE: ratio of net profit to shareholders equity.

Another study using different set of data

Econometric specification

In general, the model for determinants of bank profits can be given by the following equation:

$$ROA_{it} = c + \sum_{j=1}^{J} \beta_j X_{it}^j + \sum_{k=1}^{K} \beta_k Y_{it}^k + \sum_{l=1}^{L} \beta_l Z_{it}^l + \varepsilon_{it} \qquad (1)$$

where $\varepsilon_{it} = v_i + u_{it}$.

Berger et al. (2000) specifies that bank profits tend to persist over time reflecting impediments to market competition, informational opacity and/or sensitivity to regional/macroeconomic shocks to the extent that they are serially correlated. Goddard et al. (2004) suggests that bank profits tend to persist. Therefore, we use the following dynamic specification by including a lagged dependent variable as one of the regressors, to empirically test the effect of internal and external determinants on the profitability of Indian Banks

$$ROA_{it} = c + \delta ROA_{i,t-1} + \sum_{j=1}^{J} \beta_j X_{it}^j + \sum_{k=1}^{K} \beta_k Y_{it}^k + \sum_{l=1}^{L} \beta_l Z_{it}^l + \varepsilon_{it} \qquad (2)$$

ROA_{it} denotes the profitability of bank i at time t with i = 1,….N and t = 1,….T. c is the constant term. X_{it}^j, Y_{it}^k and Z_{it}^l l are explanatory variables representing bank-specific factors, industry-specific factors and macroeconomic factors, respectively. ε_{it} is the disturbance term with unobserved bank-specific effect vi and uit the idiosyncratic error where $v_i \sim IIN(0, \sigma_v^2)$ and $u_{it} \sim IIN(0, \sigma^2)$. Here, one period lag of profit variable $ROA_{i,t-1}$ as one of the independent variables makes the specification dynamic, and its coefficient d denotes the speed of adjustment. A value of d between 0 and 1 indicates the persistence of profits. A d value near 0 suggests that the industry is relatively competitive (high adjustment speed), and a d value near 1 indicates that the industry is less competitive (slow as adjustment speed). It is possible to remove the unobserved firm specific effects by taking first difference of the Eq. (2) as follows

$$\Delta ROA_{it} = c + \delta \Delta ROA_{i,t-1} + \sum_{j=1}^{J} \beta_j \Delta X_{it}^j + \sum_{k=1}^{K} \beta_k \Delta Y_{it}^k + \sum_{l=1}^{L} \beta_l \Delta Z_{it}^l + \varepsilon_{it} \qquad (3)$$

Static panel data model, estimation is done using fixed or random effects model. However, using a lagged dependent variable as one of the regressors would yield a model which is of dynamic in nature. Consequently, least square estimation would produce biased and inconsistent results (Baltagi 2008). Arellano and Bond (1991) suggest that ‘‘consistency and efficiency gains can be achieved by using all available lagged values of the dependent variables as instruments plus the lagged values of all independent variables, as instruments.’’ Another estimation issue is that the capital to total assets ratio variable may potentially suffer from endogeneity. Banks could increase their earnings by increasing their capital to assets ratio and the reverse causality can also be true. Therefore, capital to assets ratio should be modelled as an endogenous variable.

Table 1 Description of the factors used in the study

Dependent variable	Description	
Profit variable		
Return on assets	Profit after tax to the total assets	
Independent variables		Expected effect
Loan loss provisions (credit risk)	Loan loss provisions to total loans	Negative
Capital variable	Capital to total assets	Positive
Non-interest income	Non-interest income to total assets	Positive
Deposit growth	Annual deposit growth (%)	Negative/positive
Bank size	Dummy variable for different bank sizes. Accounting value of total assets	Negative/positive
Operational efficiency		Negative/positive
GDP	The yearly real GDP-growth	Positive/negative
Inflation	Rate of inflation (WPI)	Negative/positive
Herfindahl–Hirschman Index	Market shares of all banks expressed as fractions	Negative/positive

Moreover, the level of provisions to be kept aside for bad debts are decided and adjusted for at the beginning of each financial year by the banks. Therefore, provision for loan losses to total loans ratio, which accounts for credit risk, is modelled as a predetermined variable in the above model. The lagged dependent variable as a regressor in Eq. (3) creates a problem of endogeneity, as it becomes correlated with the differenced error terms. To account for the endogeneity bias, following Garcı´a-Herrero et al. (2009) and Athanasoglou et al. (2008), we address the above
Mentioned issues by using the generalized method of moments (GMM) for estimating the parameters of the model. We use the difference GMM estimator proposed by Arellano and Bond (1991), in which lagged levels of the endogenous variables are used as instruments in the differenced equation. Thus, this estimation process accounts for the endogeneity of factors and dynamic nature of the dependent variable as well.

Data

We use bank-level data for 42 Scheduled Indian Commercial banks, as reported by RBI and CMIE over a period of 14 years from 2000 to 2013. This forms a balanced panel data set resulting in 588 bank-year observations. The model estimation is done using ROA as a dependent variable as specified in Eq. (3) using data from 2000 to 2013 as a whole. We also estimate the same model separately for the crisis period from 2006 to 2009. We make all explanatory variables stationary at the same level to estimate the dynamic model given in Eq. (3) by using GMM estimation technique. The problems related to stability of coefficients, presence of autocorrelation in the errors, problem of over-identifying restrictions and goodness of fit of the model have been duly addressed. Table 2 shows results of cross-correlation analysis among the independent variables. It is observed that the variables do not possess multicollinearity problem. Descriptive statistics of the variables in the study reveal some interesting insights (Table 3). The mean for return on assets is recorded at 0.93 % over the entire sample period. The large gap between the minimum and maximum values of credit risk (loan loss provisions to total loans ratio) suggests that some banks suffer from a huge burden of bad loans whereas a few banks have managed their bad debts quite well. The mean for capital to asset ratio is 10 % suggesting Indian Banks are well capitalised. The difference between maximum and minimum values of deposit growth variable suggests the heterogeneity of bank deposits among banks.

Empirical results

To select fixed or random effects model, we estimate the Eq. (2) using random effects and then check for the presence of fixed effects using Hausman Test. However, as mentioned earlier, least square estimation with fixed effects in the presence of lagged dependent variable as a regressor will produce biased and inconsistent results. Therefore, we use GMM to account for the problems in the estimation and consistency of results. We report the results of Hansen J Statistics and Wald's test for testing over-identifying restrictions in the model and to test the goodness of fit, respectively. Lagged dependent variable of profitability measure, ROA, comes out to be highly significant across both the time periods in the study. Therefore, it confirms the dynamic nature of the model specification and justifies the use of a dynamic model. The coefficient of lagged dependent profit variable takes a value of 0.337, indicating a moderate degree of persistence of profits. This shows that the product markets of Indian Banks are moderately competitive, and less opaque due to asymmetry in information. The positive significance of lagged dependent variable suggest that the banks are able to retain a considerable amount of their profits from 1 year to another, and the elimination of abnormal profits by competition is by no means instantaneous. This implies that the adjustment towards equilibrium is partial and not instantaneous (Table 4). To check for the stability of our coefficients, we run the model regression twice, once with bank-specific, industry specific and macroeconomic variables and for a second time with only bank-specific variables. Our results indicate towards stable coefficients of the variables under study. Hansen J test shows a case of no over-identifying restrictions, and it suggests that the model seems to be valid in the present context.

The AR(1) term is found to be significant with p value 0.0409 whereas AR(2) term is found to be insignificant with p value 0.4113. This implies the presence of negative first order autocorrelation, but this does not imply inconsistency in the results. Inconsistency will imply if second order autocorrelation is present, (Arellano and Bond 1991). Wald's test gives Chi square value 1648.2 with 10 degrees of freedom rejecting the null hypothesis that all regression coefficients are equal to 0 indicating that the model has predictive power (Table 4). We run the model across different time periods to assess the changes in the determinants especially during the crisis period as it would be of interest to see the impact of financial variables on profitability during the crisis period (Table 5).

Table 2 Cross-correlation matrix of all explanatory variables

Independent variables	CA	LLP	NII	OPEXP	DEP	HHI	Inflation	GDP	SIZE
Capital to total assets (CA)	1								
Loan loss provisions to total loans (LLP)	0.1052	1							
Non-interest income to total assets (NII)	0.1196	0.3282	1						
Operating expenses to total assets (OPEXP)	0.1507	0.0350	0.0927	1					
Deposit growth (DEP)	−0.0671	−0.1955	−0.0713	−0.0635	1				
HHI	0.1584	0.0258	−0.0024	−0.0042	−0.0166	1			
Inflation	−0.1686	−0.4070	−0.2138	−0.0510	0.0759	−0.2129	1		
GDP	−0.1271	−0.0668	−0.0665	−0.0338	0.0352	−0.4791	0.1704	1	
Dummy (size)	−0.2633	−0.2326	−0.1638	−0.2698	0.0687	−0.1827	0.3867	0.1304	1

Table 3 Descriptive statistics of variables

Independent variables	Mean	Median	Maximum	Minimum	Std. dev.
Capital to total assets	0.10354	0.04935	1.45056	0	0.017826
Loan loss provisions to total loans	0.01094	0.008829	0.047239	−0.0362	0.008308
Non-interest income to total assets	0.53882	0.451226	1.913445	0.086167	0.322688
Operating expenses to total assets	0.03095	0.01818	0.532558	0.00013	0.049492
Deposit growth	15.5214	14.65847	100	−30.7294	10.31009
HHI	632.334	602.1625	784.4081	532.7816	82.35939
Inflation	6.99143	6.03	14.97	3.2	3.329407
GDP	7.13915	7.51	9.57	3.88	1.953428
ROA	0.94	0.96	4.25	−3.38	0.56

Table 4 Estimation results

Bank-specific, industry-specific and macroeconomic factors (2000–2013)			Only bank-specific factors	
Variable	Coefficient	Prob.(*p* value)	Coefficient	Prob.(*p* value)
ROA(−1) (δ)	0.337648	0.0000	0.335134	0.0000
Capital/assets	9.928739	0.0001	10.44716	0.0000
Loan-loss provisions/total loans	−9.895391	0.0000	−4.596639	0.0000
Non-interest income/total assets	13.79037	0.0000	12.1108	0.0000
Operating expenses/total assets	2.110851	0.0250	2.616414	0.0000
Dummy (size)	0.213513	0.0001		
Deposit growth	0.015897	0.0000	0.017776	0.0000
GDP	0.0258	0.0000		
Inflation (rate)	−0.019605	0.0000		
H-HI	0.001061	0.0000		
Prob(J-statistic)	0.236488		0.256364	
Serial correlation test	Prob.(*p* value)		Prob.(*p* value)	
AR(1)	0.0409		0.004	
AR(2)	0.4113		0.109	
Wald test (chi-sq)	Chi square	1648.2(10)		10679.43(6)

J-statistic—the test for over-identifying restrictions in a GMM dynamic model estimation

AR(1) Arellano–Bond test that average autocovariance in residuals of order 1 is 0 (*H*0: no autocorrelation)

AR(2) Arellano–Bond test that average autocovariance in residuals of order 2 is 0 (*H*0: no autocorrelation)

Table 5 Estimation results during crisis period

Bank-specific, industry-specific and macroeconomic factors during crisis		
Variable	Coefficient	Prob.
ROA(−1)	0.213495	0.0000
Capital/assets	15.63241	0.0214
Loan loss provisions/total loans	−46.38148	0.0000
Non interest income/total assets	14.81183	0.0020
Operating expenses/total assets	0.340631	0.5477
Dummy (size)	0.213083	0.1997
Deposit growth	0.009717	0.0359
GDP	0.071418	0.0000
Inflation (rate)	−0.010322	0.1448
H-HI	0.00081	0.2795
Prob(J-statistic)	0.547122	
Test order	Prob.(*p* value)	
AR(1)	0.0039	
AR(2)	0.3996	
Wald test (chi-sq)	Chi square	694.0575(10)

J-statistic—the test for over-identifying restrictions in GMM dynamic model estimation

AR(1) Arellano–Bond test that average autocovariance in residuals of order 1 is 0 (*H*0: no autocorrelation)

AR(2) Arellano–Bond test that average autocovariance in residuals of order 2 is 0 (*H*0: no autocorrelation)

5 CONCLUSION AND RECOMMENDATIONS

The Indian banking sector has witnessed significant issues and changes. Different changes such as demonization, banking fraud, and sustainability are recently noteworthy issues that affect the performance of Indian banks. Further, the increasing trend of the balance sheet indicators especially deposits, borrowings, loans and advances, and the declining in profitability over the few last years raises a major concern on the performance of Indian banks. This study examined bankspecific and macroeconomic determinants of 69 Indian commercial banks' profitability over a period ranging from 2008 to 2017. ROA and ROE were taken as dependent variables, whereas independent variables were divided into two categories. The first category includes bank-specific variables (internal), namely, assets size, capital adequacy, asset quality, liquidity, deposit, asset management, operating efficiency, and financial risk. The second category represents macroeconomic variables such as GDP, inflation rate, exchange rate, interest rate, financial crisis, and demonization.

5.1 RESULT

The results indicate that bank-specific factors such as bank size, number of branches, assets management ratio, and operational efficiency have a positive impact on ROA. On the other hand, there is a negative impact of leverage on ROA. With regard to the impact of macroeconomic determinants on ROA, the results revealed that inflation rate, exchange rate, interest rate, and demonization have a negative impact on ROA. Concerning the bank-specific and macroeconomic determinants of profitability of Indian banks measured by ROE, the results indicate that bank size, assets management ratio, assets quality ratio, liquidity ratio, and inflation rate are found to have a significant positive impact on ROE. Further, there is a negative relationship between economic growth, exchange rate, interest rate, and the financial crisis from one side and the profitability of Indian banks measured by ROE on the other.

By using balanced bank level panel data, the study seeks to examine the impact of bank specific factors, banking industry factors and macroeconomic factors on the performance of Indian Banks. Using information from 44 banks which included 25 public sector banks and 17 private sector banks, we deployed return on average assets (ROAA) and return on equity (ROE) as a dependent measure for bank profitability. We find that bank specific factors affect bank profitability in a pronounced manner. The findings indicate that non-performing loan (NPL) and cost to income ratio negatively affects the bank profitability, but diversification measure does not affect the bank profitability. The results are same across ownership with a change in values. Asset quality, which is measured through NPL is a major determinant to assess financial soundness and health of the bank. The deterioration in NPL can put additional stress as Indian corporates exhibit difficulty in servicing the bank loans. Cost to income ratio is used to differentiate banks from the perspective of operational efficiency. The high cost to income ratio makes it vulnerable, the ratio is used by investors to judge future prospects. The negative relationship with bank profitability requires the need for regular monitoring. The results indicate that diversification does not affect bank profitability. While diversification measures vary on ownership structure, there is viewpoint that higher diversification is risky for banks with inadequate prior experience. However, the level of diversification is comparatively low than that in developed countries. The results indicate that diversification did not influence bank profitability.

Ever since the financial reforms of early 90's, the Indian banking industry has observed unprecedented changes in its structure. Most of these changes notably occurred in terms of capital adequacy, market concentration and non performing assets. The study assesses the impact of bankspecific, industry-specific and macroeconomic determinants on bank profitability, in a dynamic model framework and provides useful insights into factors that determine the profitability of banks and their relevance. The study also assesses the resilience of the banking system during the financial crisis period. It applies GMM technique developed by Arellano and Bond (1991), an appropriate technique for dynamic panel data estimation, which accounts for the problem of endogeneity of factors by specifying a dynamic econometric model, to study the persistence of bank profits. The lag of profit variable ROA has been found to be significant across all the time periods indicating its persistence. Persistence in bank profits is defined as the tendency for an individual bank to retain the same place in the profit performance distribution of banking industry. The level of bank profit persistence determines the degree of competitiveness of product market, informational asymmetry. This shows that the product markets of Indian Banks are moderately competitive and less opaque due to asymmetry in information.
At the outset, the Indian Banking sector is not far away from becoming a perfectly competitive industry. Bank-specific variables, capital to assets ratio, operating efficiency, deposit growth and ratio of non-interest income to total assets, are found to be significantly positively related to bank profits. Whereas the credit risk has been found to be substantially negatively affecting bank profits. Large banks have been found more profitable than the small banks. We also find evidence in support of the SCP (market power). Herfindahl–Hirschman Index indicates that banks in the Indian banking industry respond positively to market concentration. Even though the number of market players within the industry is increasing, they have structures with greater productive efficiency and are able to exploit the updated technologies which increase their efficiency. Profit variable ROA also responds positively to GDP growth indicating profits are pro-cyclical, and banks earn higher profits during boom periods. However, the effect of inflation has been found to be negative. The effect of size of the banks and operational efficiency on profitability has been found insignificant during the crisis period. However, the variable for credit risk is found to be highly significant suggesting that banks with higher credit riskiness have been less profitable during the crisis period.

5.2 Suggestions

The following policy implications are suggested: 1. There exists a moderate to a high degree of competition within the Indian banking industry. Therefore, banks need to offer more diversified products and services to gain competitive advantage and maintain a particular profit level within the industry. 2. Capital to asset ratio, in the case of banks, acts as a buffer to withstand any financial shocks in the economy. It contributes towards an increase in profits. The study finds that higher capital to asset ratio reaps higher bank profits. 3. Since banks in India have been trying to bring operational efficiency, they can afford to spend on human capital, which may help them to achieve higher profitability through their managerial expertise. Since we observe that ratio of operational expenses to total assets has a positive impact on return on assets of banks, this implies that banks may spend on human capital, which will be positively affecting returns. 4. Banks need to focus on attracting a greater amount of deposits, which will be further converted into income generating assets since we find a positive significance of deposits on return on assets. 5. Being productively efficient Indian Banks can become more profitable even though if market concentration increases, due to the increase in number of market players within the industry.

The findings of this study have considerable implications for bankers, policymakers, regulator, analysts, and academicians. Bankers and policymakers should focus on the bank-specific factors that play an important role in the profitability of Indian banks. More emphasis should be given to the deposits and liquidity ratios for efficient utilization and effective performance of the Indian banks. Further, minimizing the costs, increasing the portfolio of the equity financing over the debt financing, and an efficient managing of the financial risk are some important bank-specific factors that should be given more consideration by bankers and policymakers. Banks' managers, bankers, and other professionals should focus on the bank-specific factors for effectively utilizing their resources in such a way that affect positively the financial performance of the Indian banks. In addition, policymakers and regulators should give more consideration to the macroeconomic factors especially interest rate, exchange rate, inflation, and demonization which proved that have an important role in the profitability of Indian banks. It is recommended that regulators and policymakers should consider the macroeconomic factors in such a way that improve the profitability of the Indian banks. Finally, future research could investigate this issue by including more variables or using other techniques of analysis such as GMM, ARDL or other techniques. Further, future studies may compare the profitability of Indian banks with the private and public sectors.

This study sought to bridge a gap by providing new empirical evidence on the bank-specific and macroeconomic determinants that affect the profitability of Indian commercial banks. The findings of the present study have considerable contributions to the existing stock of prior studies by comprehensively explaining and empirically analysing the current state of profitability among the commercial banks of India. It focuses on a major and important sector in an emerging economy like India. It gives attention to some crucial events that happened during the period of the study such as demonetization process, some big concerns about the sustainability of the country's banking system, severe stress, bad loans, and an increase in banking frauds. Further, a unique contribution of this study is to consider the impact of demonization and the number of branches on the profitability of Indian banks.

5.3 Managerial discussions and implications

This study has important implications for managers and scholars. Banks in India underwent followed the prescription of privatization as a fallout of financial sector reforms in 1990s. While the study by Boateng et al. (2015) considered both banking and economic factors, our study included banking industry factors such as ownership and size in addition to banking and economic factors.
The impact of privatization banks was mixed in India. By 2008–2009, although global banks were affected by financial crisis, past studies confirm that banks in India were not affected by global financial crisis. During the period, the performance of public sector banks was comparable with private sector banks. Our major area of interest is drivers of bank profitability. We considered the major variables such as non-performing loans, cost to income ratio, and diversification. Non performing loans are area of concern and are associated with bank failures and financial crisis in the past. They play a role in economic downturns and macroeconomic volatility. Regulator needs to be concerned with increase in NPL beyond the permissible levels. Cost to income ratio is considered as an important efficiency parameter. Diversification was calculated as ratio of non-interest income to operating income. Different measurements are available to calculate diversification. For instance, Gambacorta et al. (2014) consider the diversification measure as the ratio of non-interest income to total income, Mostak (2017) calculate the diversification measure similar to Herfindahl–Hirshman measure, and referred the measure as focus. The higher value indicates the focus, the lower value shows the diversification. There is considerable gap when we review the income from bancassurance for public sector and private sector banks. For example, the income for 26 public sector banks is Rs. 73 billion and income for 20 private sector banks is 196 billion. The findings indicate that diversification did not affect the bank profitability, which was calculated using ROAA and ROE.

During the period under study, the performance of public sector slipped downwards and increasing level of non-performing assets is negatively affecting bank profitability. With the higher requirement of capital after the post global financial crisis, banks are required to generate higher level of profits from the same assets. There was a significant increase in NPL for public sector banks in recent years, and in such a scenario, effective bad debt management is crucial to maintaining profitability. NPL is identified as the threat for banking stability and regulators have expressed concern over deteriorating asset quality in Indian banks, particularly public sector banks. Among various factors, directed lending in the priority sector credit and interference of government in distorting the credit culture, specifically for public sector banks. It is suggested that public sector banks need to change their focus on improving profitability factors rather than relying on increasing the balance sheet size.
Acknowledgements The author wish to thank the Editors and anonymous reviewers for providing notes that significantly improved the manuscript in all stages of the peer review process.

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