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ON

LINKAGES BETWEEN COMPETITIVE STRUCTURE AND FINANCIAL STABILITY: AN EMPIRICAL ANALYSIS OF INDIAN BANKS

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Submitted by

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Needless to say, the views expressed, and the approach pursued in the Study solely reflects the personal opinion of the author.

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EXECUTIVE SUMMARY

- The scope of the study has two main dimensions (1) structure and (2) strength. In the first objective the study aims to analyse in current era, in what type of environment Indian banking sector is operating. Are they operating in a competitive environment ensuring a fair price and optimum productivity or the sector is monopoly under the shed of regulation and Government. Secondly, within the market structure what is their financial stability, what are the determinants of their financial stability, what extent the determinants of market structure are responsible to maintain financial stability are some of the questions that come to my mind to answer.
- Although earlier studies try to answer whether deregulation induced competition should lead to efficiency and better performance in banking industry. But there is no indemnity that efficiency and comitative structure can assure financial stability. The potential of asset liquidity is the root cause of the financial turmoil and failure of banking structure across the glove (DeYoung and Jang, 2016). Although, we have encountered some international experience integrating liquidity risk and credit risk with financial stress of the banks but integrating the structure of banking sector with respect to consolidation of market power with financial stability through liquidity risk and credit risk management has hardly been addressed. Hence, in the second objective, the study aims to analyse how financial stability of banks is explained by liquidity risk, credit risk and key factors that determines consolidation of market power of Indian banking sector.
- The present study is expected to contribute the existing literature in several ways. Firstly, it tries to empirically investigate the structure of Indian banking sector and the factors that helps in achieving consolidation of market power in Indian banking sector. Secondly, the attempt to integrate the degree of banking structure consolidation with financial stability is a huge research gap that the study has attempted to answer. Thirdly, the use of advanced econometrics models on latest data adds to the credibility of the study and robustness to its estimates.
- The study uses annual data of Indian commercial banks over from 2009 to 2022 and the data is collected from subscribed sources of Centre for Monitoring Indian Economy (CMIE), the handbook of statistics on Indian economy.

- The data is divided into 4 samples. Sample 1 contains 12 public sector banks, Sample 2 contains 21 private sector banks, sample 3 contains 33 both public sector and private sector banks and finally, sample 4 contains 115 banks including public sector, private sector and some other banks whose data are available in CMIE data base.
- Since the data of Indian banks are highly heterogeneous, the study has used Generalised Least Square estimates to fit the model. Since the implications of the study are model based, we have taken enough precaution for selection of appropriate econometric model and required amount of pre-estimation and post estimation test has been undertaken. To ensure robust estimates, the GLS estimates are compared with estimates of PCSE model.
- The study conclude that price of capital measured as ratio of bank's capital asset over total fixed asset is negatively impacting revenue of public sector banks, private sector banks as well as combining both public and private sector banks. On the contrary, it is positively impacting revenue at sector level. By decoding this variable, it is understood that increase in bank's net worth over total asset may decrease bank revenue.
- Employee cost is positively impacting revenue of banks at all levels. We may imply that Indian banking sector can absorb an increased employee expense without impacting revenue. Hence banks may look of more investment to increase employee productivity through training and capacity development.
- Price of fund is negatively impacting revenue of public sector banks, but it is weekly significant. However, in case of private sector banks as well as for both public sector and private sector banks, it has positive impact on revenue. Hence, an increase in interest expense over total loanable fund can boost revenue of Indian public sector and private sector banks. But as a sector (by considering all banks), increase in interest expense has adverse effect on revenue. Here policy makers and bankers may note that public sector and private sector banks may afford an increase in interest expense.
- Among the bank specific variables, risk asset is positively impacting bank revenue for private sector banks and combination of public and private sector banks. That is provision has a positive impact on generating revenue. Interestingly, it is negatively impacting revenue of public sector banks. Since provisions are scaled

with total asset base, policy makers may note that differential asset base may dilute the impact of provisions over revenue.

- Branch concentration is considered to be another parameter where bank's decision to increase number of branches. The study observed that except public sector banks, branch concentration is positively impacting revenue of private sector banks, combining private and public sector banks as well as for the sector itself.
- Credit risk is impacting the revenue positively across all the category of banks. Hence, increasing interest income is all time positive indicator for banking sector. All the banks must focus on maximising interest income to boost their revenue.
- The impact of Liquidity risk is negative on revenue of public sector and in most of the cases it is observed as insignificant as well as with very minimal impact. Hence, the public sector banks should focus more on total loan component as compared to other banks.
- With respect to market structure, the public sector banks represent characteristics of monopolistic competition, the private sector banks exclusively as an entity operates in monopolistic competition. Since it is closer to unit, we may say it as closer to perfect competition and finally the market structure of all banks including public, private and all the other banks is closer to monopoly.
- Further, the study finds that the market structure of both private and public sector banks closer to monopolistic competition. Since it is closer to unit, we may say it as closer to perfect competition also.
- After clustering public and private sector banks from lower quantile to higher quantiles of distribution of revenue, the H statistics is ascending from lower quantile to higher quantiles. High revenue public and private sector banks, i.e., banks with 90% and above quantile of revenue are operated in competitive market with H coefficient 0.995 (closer to one), followed by banks with 75% quantile of revenue. \
- Public, and private sector banks with revenue form median to bottom 10% quantile are having H coefficient around 0.6, hence considered to be operating in monopolistic competitive environment.
- The study also cluster banks from lower quantile to higher quantiles of distribution of revenue, the H statistics is descending from lower quantile to higher quantiles. The top 10% banks i.e., banks with 90% quantile of revenue are having the H

coefficient of 0.265, followed H coefficients of 0.269, 0.363, 0.450 and 0.527 by banks with 75%, 50%, 25% and 10% quantile of revenue.

- Among the banking parameters, price of capital and employee cost (i.e., price of labour) is positively and significantly impacting revenue of banks from all the quantiles of profitability. Price of fund, branch concentration, and liquidity risk is having insignificant and quite minimal impact on bank revenue. Risky asset is also appearing insignificant in the findings of quantile regression.

- Secondly the present study attempted to explore how financial stability of banks is being explained by liquidity risk, credit risk and by key factors that determines consolidation of market power. The study observed that except public sector banks, increasing price of capital is positively impacting banks financial stability. That means, public sector banks should not focus more on accumulating capital assets further. Increasing employee cost is also hampering financial stability of both public sector and private sector banks. However, it does not have any implication at sector level.
- Price of capital is negatively impacting both revenue and financial stability of public sector banks. Hence policy maker should notice that further increase of capital asset is not going to boost either revenue or stability of public sector banks. However, price of capital is negatively impacting revenue of private sector banks and combining all private and public sector banks but impacting negatively to financial stability. Hence, bankers from private sector banks can take a note that although capital asset contributes to enhance revenue but hampers financial stability. However, at sector level it carries a positive impact.
- Similarly, the study finds a mixed response of Price of labour i.e., employee cost on revenue and financial stability of banks. The study finds positive impact of increase in employee cost on revenue whereas negative impact on financial stability. Although at sector level, it has a positive impact, but public and private sector banker should notice that although increase in employee cost increases revenue but carries an inverse impact on financial stability.
- Price of fund, it is negatively impacting both revenue and stability of public sector banks, but for private sector banks, like employee cost, it is impacting revenue positively, but financial stability negatively. Among firm specific variables, risk asset is negatively impacting both revenue and stability of public sector banks,

whereas private sector banks are boosting their revenue and stability. Policy makers and bankers should notice that increasing provision over total asset is creating value for private sector banks by boosting revenue and stability.

- Interestingly, except public sector banks, branch concentration is increasing value by increasing revenue and stability. Bankers should note that private sector banks should focus more on increased number of branches for more value creation.

- The study has concluded that credit risk has a significant positive impact on both revenue and financial stability of banks of all categories. Bankers should note that increase in interest income is all time good indicator to increase banks revenue and stability for both public and private sector banks. On the contrary, banks experience missed response for the impact of liquidity risk. Liquidity risk impacts public sector banks revenue negatively, whereas financial stability positively. However, for private sector banks, although liquidity risk impacts revenue positively, but it impacts their stability adversely. Hence, the bankers of private sector banks should monitor it accordingly.

Contents

CHAPTER I

Introduction, Motivation, Objectives and Scope of the Study

1.1 Introduction and Background of the Study

Indian banking sector is policy-oriented and also highly regulated and has experienced series of financial sector reforms over time. Moreover, its structure comprising of public, private, and other banking sector being enough heterogeneity that not only makes its interesting but demands credible methodology to decode their features empirically. Some of the earlier studies like, Prasad and Saibal (2007) discussed level of competition among Indian banks during 1996-2004. Similarly, Ariss (2009) studied structure of competition among banks of Middle East and North African countries during the period 2000-2006. Using non-structural approaches, the study concluded that monopolistic structure among the banking system. In the similar dimension, Majid and Sufian (2007) and Stavarek and Repkova (2011) studied competition in Malaysian Islamic banking industry and Czech banking system respectively. Recent studies have focused on analyzing the banking industries in various countries and their impact on concentration, competitiveness, and financial stability. Guidi F. (2021) conducted a study on 169 commercial banks in Albania, Bosnia-Herzegovina, Bulgaria, Croatia, FYROM, Romania, and Serbia, exploring the evolution of concentration, competition, and financial stability in the South-East Europe (SEE) region. The research also investigated how concentration and competition affected the financial stability of banks in this region. In 2017, Osuagwu and Nwokoma examined the consolidation of the Nigerian banking sector between 2005 and 2014. Their study, using the Panzar and Rosse model, revealed that the Nigerian banking sector operated under monopolistic competition. The revenue function of the Panzar and Rosse model utilized operating income and interest income as dependent variables. Similarly, Lartey et al. (2023) employed the Panzar and Rosse model to investigate the relationship between concentrated interbank markets, bank collusion, monopolistic pricing, and bank performance. They analysed data from 109 commercial banks in the United Kingdom during the period 2010-2020. Additionally, Khan et al. (2018) explored the ASEAN banking industry to determine whether banks in concentrated markets increased their profits through monopoly pricing. The researchers found evidence of anti-competitive behaviour resulting in higher profitability. They utilized the Panzar and Rosse model in their analysis. Tahir et al. (2016) examined the competitiveness of Pakistan's banking sector and its long-run equilibrium using annual panel data from 30 banks between 2007 and 2015. Their study, employing the Rosse and Panzar (1977) technique, concluded that the banking sector in Pakistan operated under monopolistic competition and was not in long-run equilibrium.

All these studies used Panzar Rosse H (PRH) approach i.e., Panzar & Rosse (1977, 82 and 87) method to assessing market power is based on the idea that, differing on the market structure in which they operate, banks would utilise different pricing approaches in response to changes in input costs.

Several studies have employed the Panzar Rosse H (PRH) approach to assess market competition across different regions and industries. For instance, Majid and Sufian (2007) and Ariss (2009) utilized the PRH model with non-structural methods to examine competition levels in Middle Eastern and North African countries, as well as the Islamic banking sector in Malaysia. These studies uncovered evidence of monopolistic competition. Notably, Majid and Sufian highlighted the presence of a dual banking system in Malaysia, where the Islamic banking sector shares similarities with the conventional system of banking. Similarly, Stavarek and Repkova (2011) focused on analyzing competition in the Czech banking system from 2001 to 2009 using the PRH statistic. Their findings indicated the existence of monopolistic competition during the analyzed period. In the context of the Indian banking sector, several studies, including Bhattacharya and Das (2003), Varma and Saini (2011), and Prasad and Saibal (2007), investigated competition and market concentration. Bhattacharya and Das identified a significant change in concentration levels in the early 1990s. Varma and Saini (2011), explored the impression of bank size on competition using the conjectural variation model and suggested that increased bank size, combined with market consolidation, may not necessarily have negative effects favoring larger banks. Similarly, Prasad and Saibal analyzed bank competition in India using the PRH model and found evidence of monopolistic competition throughout the entire period, with higher levels of competition observed in the second sub-period before 2004. In a slightly different approach, Zhao et al (2010) examined the effects of deregulation on competition and the financial performance of Indian banks. Their study concluded that competition-driven deregulation could lead to improved efficiency and performance within the banking sector.

Secondly, irrespective of its structure, the series of financial sector reforms and increasing interlinkages with macroeconomic dynamics of domestic as well as world economy, has increased the risk exposure of Indian banking sector. As a result, business cycles, economic downturn, and the international financial crisis have sparked a debate about accessing and evaluating banks' risk management capabilities across time. Hong et al. (2014), believed that liquidity risk was a significant factor in bank failures in 2009-10 because of the 2007-08 global financial crisis. Previously, Wagner (2007) and Acharya and Naqvi (2012) argued that excessive asset liquidity may increase bank risk and, as a result, may attract additional attention that increases the welfare cost of risky institutions. However, according to DeYoung and Jang, (2016) the root cause of financial turmoil was the liquidity

risk that led to failure of many banks across globe during 2007-09. Similarly, Dalecka and Konovalova (2014) concluded that the foremost contribution of banks' financial stability is rooted with capital adequacy of the banks that ensured stability between liquidity risk and capital availability. This leads to the motivation to understand the nexus between structure and stability of Indian banking system.

1.2 Significance of the Study and Research Gap

In prior discussions, it was found that certain investigations have faced challenges when studying competition and concentration within the banking system. These studies aim to understand the factors that contribute to the consolidation of market power and the establishment of a monopoly structure in the sector. Most of the research questions attempt to determine whether increased competition due to deregulation leads to enhanced efficiency and performance in the banking industry. However, it is important to note that efficiency and a competitive structure alone do not guarantee financial stability. The root cause of financial turbulence and failures in the banking sector worldwide is often attributed to the potential lack of liquidity in assets (DeYoung and Jang, 2016). While some international experiences have integrated liquidity risk and credit risk management to assess bank financial stress, there has been limited focus on integrating the structure of the banking sector, particularly in terms of market power consolidation, with financial stability or stress arising from liquidity risk and credit risk management.

1.3 Contribution of the Study:

The current study promises to add to the prevailing literature in a variety of ways. To begin, it endeavours to through empirical observation study the structure of the Indian banking sector and the factors that support to the concentration of market supremacy in the banking sector of India. Secondly, the attempt to integrate the degree of banking structure consolidation with financial stability is a huge research gap that the study will be addressing. Thirdly, the use of advanced econometrics models on latest data adds to the credibility of the study and robustness to its estimates.

1.4 Objectives of the Study:

- The objective of the study is to investigate the competitive structure and the consolidation of market power of Indian banking sector.
- To analyze the relationship between the determinants of consolidation of market power, credit risk and liquidity risk of banks with their financial stability. Here, the focus is to study how financial stability of banks is explained by liquidity risk, credit risk and key factors that determines consolidation of market power of Indian banking sector.

1.5 Organization of the Report:

Comprehension the competitive dynamics of the Indian banking sector is crucial for comprehending its market dominance. This study aims to explore the influence of liquidity risk, credit risk, and other key factors on the consolidation of market dominance and its impact on the financial stability of banks in India. The report is organized as follows: Chapter 1 provides an introduction and background, Chapter 2 presents the theoretical framework based on the Panzar & Rosse model, Chapter 3 offers an overview of Indian banks using relevant sector parameters, Chapter 4 describes the data and research methodology utilized, Chapter 5 presents the empirical findings and facilitates discussion, and Chapter 6 concludes the study, accompanied by a bibliography.

CHAPTER II

Theoretical Background

2.1 Introduction:

Unlike other economics, the bank dominated financial system of India, banks play a notable role to mobilize savings of the economy to Investment. In such process, the nature of banking sector plays an important role and hence to study its structure, it has drawn research attention of both academicians and policymakers. Attention of bankers and policy makers on the problems of bank competition and their respective shape of market have become relevant due to deregulation and liberalized financial environment across economies. Because it is a natural phenomenon that potency of bank competition upgrades the quality of financial products and improves the access to quality financial services. It may also inflate the efficiency of the banking sector's mode of operation. Encouraging a higher degree of innovation can have a positive impact on the net worth of banks, ultimately leading to significant changes in the overall performance of the banking industry over time. Hence, it has become the key motivation for many researchers to investigate the nature of banking sector's competitive structure and the relationship between competition, stability and scenario of liquidity and credit risk. Earlier research, including Carletti and Hartmann (2003), Vives (2001, 2010), Beck et al. (2013), Akins et al. (2016), and Rakshit and Bardhan (2020), has underscored the importance of both theoretical and empirical investigations in the field of competition policies.

Several studies have examined the measurement of competition among banks, including Bikker et al. (2012), Molnar et al. (2013), and Shaffer and Spierdijk (2015, 2017). These studies have commonly used the Panzar-Rosse (P-R) model to assess the market power of the banking industry. The P-R model measures the elasticity of the revenue function in response to changes in input costs while controlling for firm-specific parameters. However, alternative approaches have been proposed. In contrast, Staikouras et al. (2006) and Matthews et al. (2007) have taken a different approach by focusing on estimating the price equation within the P-R framework to evaluate bank competitive structure. They deviate from the traditional emphasis on the revenue equation. Additionally, instead of using the unscaled bank revenue equation, some studies have employed the ratio of bank revenues to total assets as the measure of the explained variable in the P-R model. This modification is made in response to concerns that using unscaled bank revenue equations can yield different estimates of the H-statistic, as noted by Vesala (1995) and Gischer

and Stiele (2009). In summary, while many studies have utilized the P-R model to measure bank competition by assessing market power, alternative approaches have been suggested. These alternatives involve estimating the price equation within the P-R framework and using different measures for the explained variable, such as the ratio of bank revenues to total assets, to address potential issues associated with unscaled bank revenue equations.

2.2 Bank Competition Theories:

The basic concepts to study bank competition are derived from theories of industrial organization. These theories attempted to analyse how banks operates and respond towards their respective environment in which their financial system operate. These industrial organisation theories apply to bank competition are based on two broad types of namely structural and non-structural approach. To understand the competition structural approach involves analysing various aspects of an industry's structure, such as the number of participants, market coverage, and concentration levels. Within this approach, two prominent hypotheses are the Structure-Conduct-Performance (SCP) theory and the Efficiency Hypothesis (EH). The SCP theory posits that the characteristics of a market shape firm conduct, which, in turn, influences firm performance. Conversely, the EH suggests that superior operational efficiency is the basis for an industry's success, as firms with low-cost structures can increase profitability by lowering prices and gaining larger market shares. However, the SCP theory also acknowledges that fierce competition in any industry can lead to the misuse of market power, potentially resulting in reduced competition in highly concentrated markets. In the banking sector, for example, market concentration may allow banks to exploit their market power, leading to higher loan prices and lower deposit rates, ultimately harming competition. On the other hand, the EH argues that efficient banks can expand their size and profitability through their superior performance, potentially leading to market concentration. Nevertheless, establishing a direct and unequivocal relationship between market concentration and competition is challenging. This is where non-structural models, developed within the framework of the New Empirical Industrial Organization (NEIO), come into play. These models recognize that firms' behavior varies depending on the specific market structure in which they operate. They focus on analyzing bank revenue behavior under different market structures, without explicitly relying on assumptions about the nature of the market. Among the various non-structural approaches, the Panzar-Rosse H-statistic (PRH) has garnered significant attention as a tool for assessing bank competition. This statistic quantitatively measures the competitive behavior of banks by estimating changes in competitive

pricing. One advantage of the PR model is its ability to incorporate firm-detailed data and account for the distinctive appearance of individual banks. By doing so, it provides a valuable indicator of competition. Therefore, the objective of this study is to employ the PR statistic as a means of measuring competition, leveraging its advantages in incorporating firm-specific data and assessing competitive behavior based on variations in factor input prices

2.3 Mathematical Framework of Panzar – Rosse Model as measure of Market Structure:

The influential work of Panzar and Rosse in 1977, 1982, and 1987 highlighted the appealing aspects of bank equilibrium, which can be empirically analyzed by studying the elasticity of the revenue function concerning variations in factor prices. In this regard, Stephen Martin (2001) and Panda and Nanda S. (2016) further elucidated and simplified the P-R model, providing a concise framework.

Suppose a Revenue function is defined as: $R(q,n) = pq$ and a cost function is defined as: $C(q,w,r)$. Here $q =$ (stands) for firm's total output, $w =$ (stands) for employee cost or wage rate of labour, $r =$ (stands) for interest rate of capital or price of capital and $n =$ stands for number of firm or banks. When the industry is governed by single firm (i.e., in case of monopoly) $n = 1$, the total revenue function can be expressed as $R(\mathrm{q}) = \mathrm{pq}$ and the total cost function can be clarified complete restriction optimisation method. Here, the cost function must be optimised with respect to specific production constraints identified as budget constraint. We may write this as $C(q,w,r) = \min wL + rk$ where $q = f(k,L)$, $q = f(k,L)$. The given function is described as a neoclassical production function where the output is always non-negative. The cost function is also assumed to be homogeneous of degree one for all input prices.

In this context, the profit can be defined as the disparity between the revenue and cost functions, resulting in a linear relationship. Mathematically, this can be written as,

$$\pi(q,w,r) = R(q) - C(q,w,r)$$

where $\pi =$ stands for profit, and profit is a natural function of output and inputs i.e., output quantity (q), Labour price (w) and price of capital (r).

In this equation, the profit function is considered as homogeneous of degree one in output price and input prices. Hence, we can rewrite as

$$q(h) = \max \pi\left[q,(1+h)w,(1+h)r\right] \qquad (1)$$

where $h \geq 0.$ It indicates non-negative output and input prices and $q(h)$ is the profit maximizing output.

While, optimum quantity $q(h)$ depends on $(1+h)w$ and then revenue $R(h)$ also be subject to on $(1+h)w$ and $(1+h)r$. Therefore, the profit equation can be extracted into

$$R(h)-(1+h)C\left[q(h),w,r\right] \geq R(0)-(1+h)C\left[q(0),w,r\right] \tag{2}$$

As well,

$$R(0)-C\left[q(0),w,r\right] \geq R(h)-C\left[q(h),w,r\right] \tag{3}$$

by multiplying $(1+h)$ in both side of the equation (3) and add to equation (2)

$$R(h)-(1+h)C\left[q(h),w,r\right]+(1+h)R(0)-(1+h)C\left[q(0),w,r\right] \geq R(0)-(1+h)C\left[q(0),w,r\right] \\ +(1+h)R(h)-(1+h)C\left[q(h),w,r\right] \tag{4}$$

After simplifying equation (4), we will get following inequality,

$$\frac{R(h)-R(0)}{h} \leq 0. \tag{5}$$

Equation (5) can be written as

$$\frac{R\left[(1+h)w,(1+h)r\right]-R(w,r)}{h} \leq 0. \tag{6}$$

Doing the limit as $h \to 0,$ it acquire the Rosse-Panzar fulfills (ψ). Let's use a partial differentiation of equation (6) with regard to to compute the change in revenue caused by a small in.

$$\frac{\partial R(h)}{\partial h} = w\frac{\partial R\left[(1+h)w,(1+h)r\right]}{\partial w} + r\frac{\partial R\left[(1+h)w,(1+h)r\right]}{\partial r} \leq 0.$$

$$\left.\frac{\partial R(h)}{\partial h}\right|_{h=0} = w\frac{\partial R(w,r)}{\partial w} + r\frac{\partial R(w,r)}{\partial r} \leq 0.$$

$$\psi \equiv \frac{1}{R(0)} \frac{\partial R(h)}{\partial h}\bigg|_{h=0} = \frac{w}{R(w,r)} \frac{\partial R(w,r)}{\partial w} + \frac{r}{R(w,r)} \frac{\partial R(w,r)}{\partial r} \leq 0. \tag{7}$$

Equation (7) represents the theorem 1of Panzar and Rosse (1987) that sates "the sum of the factor price elasticity of a monopolist's reduced form revenue function is non positive."

This is further stated as follows:

Let, $k = 1 + h \Rightarrow h = k - 1,\ \tilde{R}(k) = R(k-1)$ then

$$\psi = \frac{1}{R(0)} \frac{\partial R(h)}{\partial h}\bigg|_{h=0} = \frac{1}{\tilde{R}(1)} \frac{\partial \tilde{R}(k-1)}{\partial (1+h)}\bigg|_{k-1=0} = \frac{1}{\tilde{R}(1)} \frac{\partial \tilde{R}(k)}{\partial (k)}\bigg|_{k=1}$$

Here ψ is also the elasticity of revenue with respect to a small expansion in factor prices.

Hypothesis 1: ψ ***is*** ≤ 0, ***in case of a monopolist revenue function***,

The question is now what the value of ψ ought to have (the elasticity of revenue function) in the event market of perfectly competitive. Let us return to the equations that determine the equation of an industry with "n" businesses. In general, firms attend equation when profit is decreased to zero.

Placing it in equation,

$$R(q,n) - C(q,w,r) \equiv 0. \tag{8}$$

(or)

$$\frac{\partial R(q,n)}{\partial q} = \frac{\partial C(q,w,r)}{\partial q} \equiv 0. \tag{9}$$

that is, $TR = TC$ (or) $MR = MC$.

Then, we differentiate equation (9) with respect "w", and reorganise then we will get the developing equation,

$$\left[\frac{\partial^2 R(q,n)}{\partial q^2} - \frac{\partial^2 C(q,w,r)}{\partial q^2} \right] \frac{\partial q}{\partial w} + \frac{\partial^2 R(q,n)}{\partial q \partial n} \frac{\partial n}{\partial w} = \frac{\partial^2 C(q,w,r)}{\partial q \partial w} \tag{10}$$

With respect to q join together above equation (10)

$$\left[\frac{\partial R(q,n)}{\partial q}-\frac{\partial C(q,w,r)}{\partial q}\right]\frac{\partial q}{\partial w}+\frac{\partial R(q,n)}{\partial n}\frac{\partial n}{\partial w}=\frac{\partial C(q,w,r)}{\partial w}\quad . \tag{11}$$

Therefore, the writing equation (10) and (11) into matrix form:

$$\begin{bmatrix}\frac{\partial^2 R(q,n)}{\partial q^2}-\frac{\partial^2 C(q,w,r)}{\partial q^2} & \frac{\partial^2 R(q,n)}{\partial q\partial n}\\ \frac{\partial R(q,n)}{\partial q}-\frac{\partial C(q,w,r)}{\partial q} & \frac{\partial R(q,n)}{\partial n}\end{bmatrix}\begin{bmatrix}\frac{\partial q}{\partial w}\\ \frac{\partial n}{\partial w}\end{bmatrix}=\begin{bmatrix}\frac{\partial^2 C(q,w,r)}{\partial q\partial w}\\ \frac{\partial C(q,w,r)}{\partial w}\end{bmatrix} \tag{12}$$

In above equation (9), $\frac{\partial R(q,n)}{\partial q}=\frac{\partial C(q,w,r)}{\partial q}\equiv 0,$ according to the equation, the element of the matrix can be

$$D=\left(\frac{\partial^2 R(q,n)}{\partial q^2}-\frac{\partial^2 C(q,w,r)}{\partial q^2}\right)\frac{\partial R(q,n)}{\partial n}>0$$

Solving the matrix (12) for $\frac{\partial q}{\partial w}$ and $\frac{\partial n}{\partial w}$ that implies that

$$\begin{bmatrix}\frac{\partial q}{\partial w}\\ \frac{\partial n}{\partial w}\end{bmatrix}=\frac{1}{D}\begin{bmatrix}\frac{\partial R(q,n)}{\partial n} & -\frac{\partial^2 R(q,n)}{\partial q\partial n}\\ 0 & \frac{\partial^2 R(q,n)}{\partial q^2}-\frac{\partial^2 C(q,w,r)}{\partial q^2}\end{bmatrix}\begin{bmatrix}\frac{\partial^2 C(q,w,r)}{\partial q\partial w}\\ \frac{\partial C(q,w,r)}{\partial w}\end{bmatrix}$$

i.e., $$\frac{\partial q}{\partial w}=\frac{1}{D}\left[\frac{\partial R(q,n)}{\partial n}\frac{\partial^2 C(q,w,r)}{\partial q\partial w}-\frac{\partial^2 R(q,n)}{\partial q\partial n}\frac{\partial C(q,w,r)}{\partial w}\right]$$

$$\frac{\partial n}{\partial w}=\frac{1}{D}\left[\frac{\partial^2 R(q,n)}{\partial q^2}\frac{\partial C(q,w,r)}{\partial w}-\frac{\partial^2 C(q,w,r)}{\partial q^2}\frac{\partial C(q,w,r)}{\partial w}\right]$$

If $L=\frac{\partial C(q,w,r)}{\partial w}$,

$$\frac{\partial q}{\partial w}=\frac{1}{D}\left[\frac{\partial R(q,n)}{\partial n}\frac{\partial^2 C(q,w,r)}{\partial q\partial w}-\frac{\partial^2 R(q,n)}{\partial q\partial n}L\right].$$

Analogously,

If $K=\frac{\partial C(q,w,r)}{\partial r}$,

$$\frac{\partial q}{\partial r} = \frac{1}{D}\left[\frac{\partial R(q,n)}{\partial n}\frac{\partial K}{\partial q} - \frac{\partial^2 R(q,n)}{\partial q \partial n}K\right].$$

Returning to the equation (8), this means

$$R(q,n) = C(q,w,r), \tag{13}$$

With respect to "w" differentiating the equation (13)

$$\frac{\partial R}{\partial w} = \frac{\partial C}{\partial q}\frac{\partial q}{\partial w} + \frac{\partial C}{\partial w}$$

i.e.,

$$\frac{\partial R}{\partial w} = \frac{\partial C}{\partial q}\frac{\partial q}{\partial w} + L. \tag{14}$$

With respect to "r" again differentiating above equation (13)

$$\frac{\partial R}{\partial r} = \frac{\partial C}{\partial q}\frac{\partial q}{\partial r} + \frac{\partial C}{\partial r}$$

If $K = \dfrac{\partial C(q,w,r)}{\partial r}$

$$\frac{\partial R}{\partial r} = \frac{\partial C}{\partial q}\frac{\partial q}{\partial r} + K. \tag{15}$$

Now to compute the monopolistic competitive value ψ. reshape calculation of equation (7) as

$$\psi = \frac{w}{R}\frac{\partial R}{\partial w} + \frac{r}{R}\frac{\partial R}{\partial r},$$

$$\psi = \frac{w}{R}\left[\frac{\partial C}{\partial q}\frac{\partial q}{\partial w} + L\right] + \frac{r}{R}\left[\frac{\partial C}{\partial q}\frac{\partial q}{\partial r} + K\right]$$

that implies

$$\psi = \frac{wL + rK}{R} + \frac{1}{R}\left[w\frac{\partial q}{\partial w} + r\frac{\partial q}{\partial r}\right]\frac{\partial C}{\partial q}$$

For the reason that, $C = wL + rK$

$$\psi = \frac{C}{R} + \frac{1}{R}\left[w\frac{\partial q}{\partial w} + r\frac{\partial q}{\partial r} \right]\frac{\partial C}{\partial q}$$

As the equation $R = C,$ that indicates, $\frac{C}{R} = 1,$

$$\Rightarrow \psi = 1 + \frac{1}{R}\left[w\frac{\partial q}{\partial w} + r\frac{\partial q}{\partial r} \right]\frac{\partial C}{\partial q}. \qquad (16)$$

Replacing the equations for $\frac{\partial q}{\partial r}$ and $\frac{\partial q}{\partial w}$ in above equation and make straightforward,

$$\psi = 1 + \frac{1}{RD}\frac{\partial R}{\partial q}\left[\frac{\partial R(q,n)}{\partial n}\frac{\partial R}{\partial q} - R\frac{\partial^2 R(q,n)}{\partial q \partial n} \right]. \qquad (17)$$

In above equation (17) ψ is communicated in sounds of three components $\frac{\partial R}{\partial w}$, $\frac{\partial R}{\partial n}$ and $\frac{\partial^2 R}{\partial q \partial n}$.

Now $R(q,n) =$ Total revenue $= pq$

Modify in revenue due to change in number of firms in the market or change in output is

$$\frac{\partial R}{\partial n} = q\frac{\partial p}{\partial n} \qquad (18)$$

$$\frac{\partial R}{\partial q} = p + q\frac{\partial p}{\partial q} \qquad (19)$$

With respect to "n" differentiate the equation (19)

$$\frac{\partial^2 R}{\partial q \partial n} = \frac{\partial p}{\partial n} + q\frac{\partial^2 p}{\partial q \partial n} \qquad (20)$$

discovering the value in structures of equation (17) under {} parentheses:

$$\frac{\partial R}{\partial n}\frac{\partial R}{\partial q} - R\frac{\partial^2 R}{\partial q \partial n} = \left[q\frac{\partial p}{\partial n}\left(p + q\frac{\partial p}{\partial q} \right) - pq\left(\frac{\partial p}{\partial n} + q\frac{\partial^2 p}{\partial q \partial n} \right) \right]$$

That means,

$$\frac{\partial R}{\partial n}\frac{\partial R}{\partial q} - R\frac{\partial^2 R}{\partial q \partial n} = q^2\left(\frac{\partial p}{\partial n}\frac{\partial p}{\partial q} - p\frac{\partial^2 p}{\partial q \partial n}\right) \qquad (21)$$

Replace with the equation (21) in equation (17),

$$\psi = 1 + \frac{q^2}{RD}\frac{\partial R}{\partial q}\left(\frac{\partial p}{\partial n}\frac{\partial p}{\partial q} - p\frac{\partial^2 p}{\partial q \partial n}\right) \qquad (22)$$

The price elasticity of demand is now expressed as a change in price owing to a change in the number of businesses (n) or quantity (q). i.e:

$$e_p = -\left(\frac{\partial q}{\partial p}\frac{p}{q}\right) \text{ or } -\frac{\mathrm{p}}{\mathrm{q}\dfrac{\partial \mathrm{p}}{\partial \mathrm{q}}}$$

$$\frac{\partial e_p}{\partial n} = -\left[\frac{\dfrac{\partial p}{\partial q}\dfrac{\partial p}{\partial n} - p\dfrac{\partial^2 p}{\partial p \partial n}}{q\left(\dfrac{\partial p}{\partial q}\right)^2}\right].$$

We presumed that the price elasticity of demand for a single firm did not decrease as the number of firms increases of firms $\frac{\partial e_p}{\partial n}$ is non-negative. Nonetheless,

$$\frac{\partial p}{\partial n}\frac{\partial p}{\partial q} - p\frac{\partial^2 p}{\partial q \partial n} = q\left(\frac{\partial p}{\partial q}\right)^2\frac{\partial e_p}{\partial n} \geq 0. \qquad (23)$$

Substituting right hand side of equation (23) in equation (22)

$$\psi = 1 - \frac{q^3}{RD}\frac{\partial R}{\partial q}\left(\frac{\partial p}{\partial q}\right)^2\frac{\partial e_p}{\partial n} \leq 1.$$

If $\frac{q^3}{RD}\frac{\partial R}{\partial q}\left(\frac{\partial p}{\partial q}\right)^2\frac{\partial e_p}{\partial n} = 0 \Leftrightarrow \psi = 1.$

If $\frac{q^3}{RD}\frac{\partial R}{\partial q}\left(\frac{\partial p}{\partial q}\right)^2\frac{\partial e_p}{\partial n} > 0 \Leftrightarrow \psi < 1.$

Panzer and Rosse demonstrated that $\psi = 1$ in logarithm equation describing a perfectly competitive industry as the number of firms expands, profit per firm decline until they reach zero. According to their model firms attend equation at marginal cost prime $(\rho = mc)$ and profit decreased to zero in long run. But the P-R model assumes that the entire "n" firm are identical so that equation is methodical. But reasonably it is very difficult to accept.

Hypothesis 2: ***Although*** $\psi = 1$ ***in case of a perfectly competitive industry***.

2.4 Theoretical Base of Financial Stability:

Financial stability encompasses various macroeconomic aspects and is crucial for the efficient allocation of economic resources, effective risk assessment and management, and maintaining a favorable employment environment. It also aims to minimize fluctuations in asset prices and promote monetary stability. Furthermore, a financially stable system should have the ability to address internal imbalances and external shocks, demonstrating resilience and self-corrective mechanisms. The significance of financial stability becomes particularly evident during periods of financial instability. In such times, financial institutions and banks may exhibit reluctance to provide funding for potentially profitable projects, leading to a lack of investment. This, in turn, causes asset prices to deviate from their natural levels and disrupts the smooth flow of money within the circular flow of payments. Consequently, this instability can trigger broader macroeconomic instability, including bank runs, hyperinflation, or even a stock market crash. The detrimental effects on economic and investor confidence are profound, as uncertainty and a loss of trust pervade the financial system. Therefore, ensuring financial stability is paramount for sustained economic growth and the smooth functioning of the real economy. By maintaining a stable and resilient financial system, countries can better navigate turbulent periods and mitigate the adverse consequences associated with financial instability.

2.5 Firm-level stability and its measures

Financial stability at industry or firm level can be measured in couple of ways. The most common way to measure stability is using z-score. Z score compares firms' capitalization and returns with risk of return. Here, the risk of return can be measured by the volatility of returns series. Here, the Z score measures the bank's or institution's solvency risk. Symbolically, the z-score can be defined as $Z = \left(\frac{E+R}{\sigma}\right)$ where E represents equity capital as percent of assets, R represents return as percent of assets. Both equity and returns are considered as a ratio to its total

asset just to scale these two parameters with respect to firm size. Because scaled parameters are comparable across firms. Finally, the denominator i.e., Sigma (σ) represents the standard deviation of return on assets. It is used as a proxy to measure return volatility. The z-score is a useful metric for assessing the probability of financial insolvency in institutions. It demonstrates a negative relationship with insolvency risk, meaning that a higher z-score indicates a lower likelihood of insolvency, and vice versa. One of the key advantages of using the z-score is its applicability to institutions that lack more sophisticated, market-based data. Additionally, it enables the comparison of default risks across different groups of institutions. The z-score is also valuable in measuring the risk of insolvency for diverse institutions that vary in ownership and business objectives. Several studies, including Boyd and Runkle (1993), Beck, Demirgüç-Kunt, Levine (2007), Demirgüç-Kunt, Detragiache, and Tressel (2008), Laeven and Levine (2009), and Čihák and Hesse (2010), have employed the z-score as an indicator of financial stability. However, the z-score has certain limitations. Primarily, it relies solely on accounting information, making it susceptible to biases if financial institutions manipulate reported data. This raises concerns about its accuracy and the potential for providing a misleading assessment of an institution's financial stability. Furthermore, as the z-score focuses on individual institutions, it may overlook systemic risks at a broader level, failing to capture vulnerabilities within the entire financial system.

In supplement to the Z Score, researchers have also utilized the Merton model to assess the financial stability of institutions. This particular model enables the evaluation of a firm's capacity to fulfill its financial commitments and determines the overall likelihood of default. Within the financial literature, the Merton model is commonly referred to as an asset value model, as it considers a company's equity as a call option while accounting for asset volatility. By employing put-call parity, the model establishes the value of the "put" option, which represents the firm's credit risk. Consequently, the Merton model gauges the worth of the firm's assets at the point when debt holders anticipate repayment and exercise their put option.

CHAPTER III

Outlook of Indian Banks based on key bank specific parameters.

3.1 Introduction:

The Indian banking sector plays a crucial role in the country's economy and consists of a diverse range of banks, including public sector, private sector, foreign, regional rural, and cooperative banks. The regulatory authority responsible for overseeing and managing this sector is the Reserve Bank of India (RBI), which acts as the central banking institution. The RBI's primary responsibilities involve ensuring monetary stability, overseeing credit and currency policies, and regulating the financial markets within India.

Public sector banks, where the government holds a majority stake, are the largest category of banks in India. Private sector banks, on the other hand, are privately owned and managed by individuals or companies. Foreign banks operate as branches of international banks within India, while regional rural banks focus on serving the financial needs of rural areas. Reforms in the banking sector, such as the introduction of technology-enabled services, liberalization, and bank mergers, have led to its growth, increased competition, and improved customer services and products.

The Indian banking sector encounters several confronts, consist of non-performing assets, insufficient capitalization, and limited financial inclusion. To tackle these issues and ensure stability and growth, the RBI and the government have implemented various measures. These efforts aim to address the sector's challenges and facilitate its role in promoting economic growth and development.

Overall, the Indian banking sector plays a vital role in the country's economy, and through ongoing reforms and regulatory actions, it continues to contribute to the nation's progress while providing essential services to customers.

3.2 Performance Parameter:

There are several parameters that can be used to evaluate the performance of the banking sector. Some of the key parameters include:

1. **Quality of Asset:** This implies to the characteristic of loans and other assets held by the banks. A high percentage of non-performing assets (NPAs) can indicate poor asset quality, which can lead to losses and negatively impact the bank's financial health.

2. **Adequacy of Capital:** This is the amount of capital a bank has on hand to cover its risks. Banks must maintain a particular level of capital adequacy in order to withstand losses and remain solvent. A bank's incapacity to withstand losses might be indicated by a low capital adequacy ratio, which can lead to failure.

3. **Profitability:** This parameter measures the bank's ability to generate profits. Banks generate profits through their interest income, fees, and commissions. A bank's profitability is reflected in its return on assets (ROA), net interest margin, and ROE (return on equity).

4. **Liquidity:** This signifies to a bank's competence to meet its short-term requirements. Banks need to maintain sufficient liquidity to ensure that they can meet their depositors' demands and fund their lending activities.

5. **Efficiency:** This parameter measures a bank's ability to generate revenue and manage its costs. A bank's efficiency can be evaluated through parameters such as the operating expenses-to-assets ratio and the cost-to-income ratio.

6. **Customer service:** This parameter evaluates a bank's ability to provide high-quality customer service, which can lead to customer loyalty and retention. Customer service can be evaluated through parameters such as the level of customer satisfaction and the speed of service.

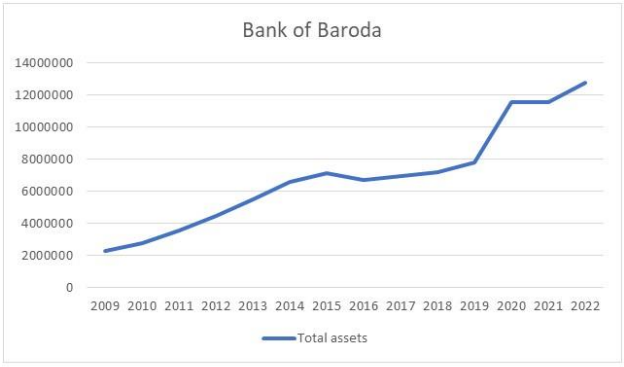
Overall, these parameters can provide insights into the banking sector's performance and help stakeholders make informed decision. A few more trends that might help us to evaluate the performance of banks are:

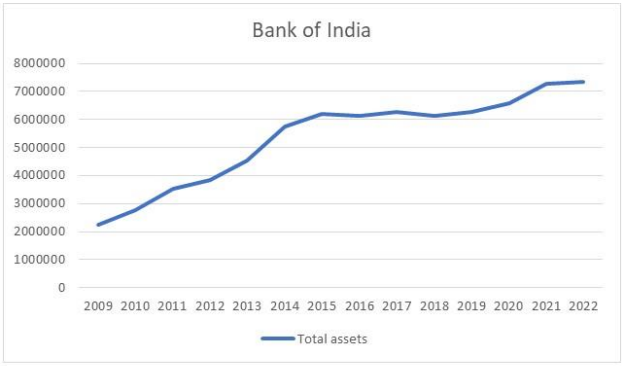
1. Total assets
2. Total loans & advances
3. Provisions for NPAs
4. Credit deposit ratio
5. Deposits (accepted by commercial banks)
6. Income from financial services
7. Compensation to employees
8. Total income
9. Return of Assets (ROA)
10. No. of branches
11. Income/Branch
12. Employee/Income
13. TA/Branch
14. Liquidity Ratio (LR) = Total Loan/Deposits
15. Credit Ratio (CR) = Income from int/Total Assets

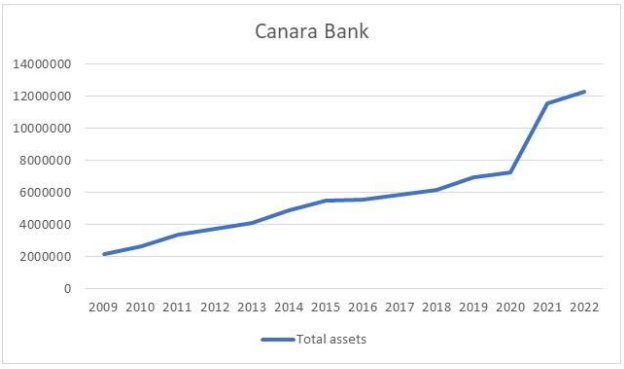
Let’s have a bird’s eye view of these parameters to understand the performance of banks (public sector bank followed by private bank) from last few years. Although we are not discussing the trends of all these parameters in details, but some discussion and graphical view may provide us some overall understanding for Indian Banking industry.

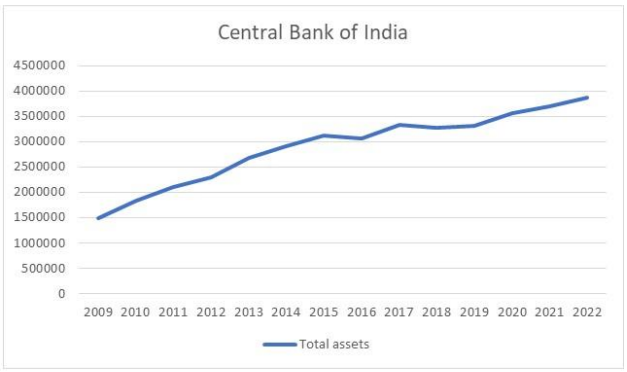
Public Sector Bank Analysis

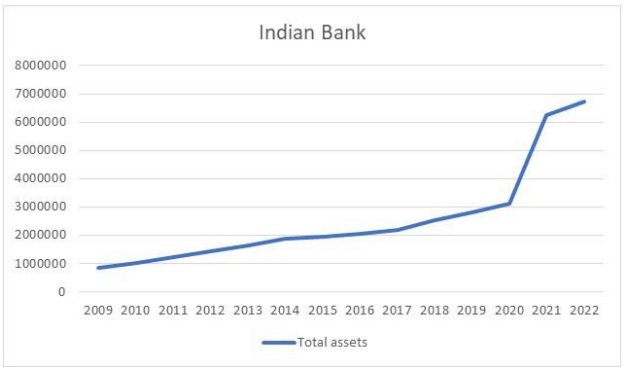
Total assets

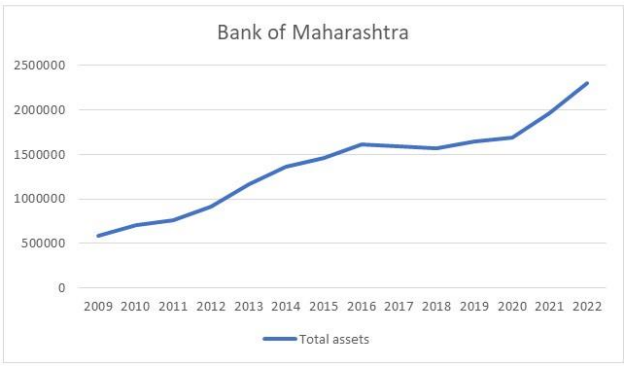


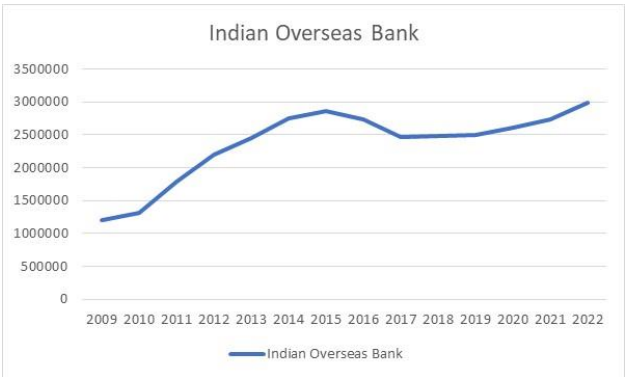


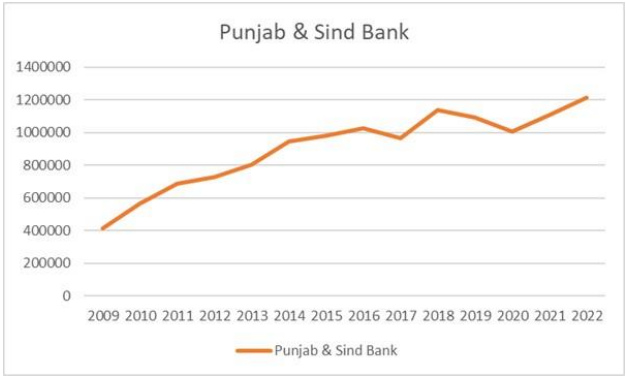


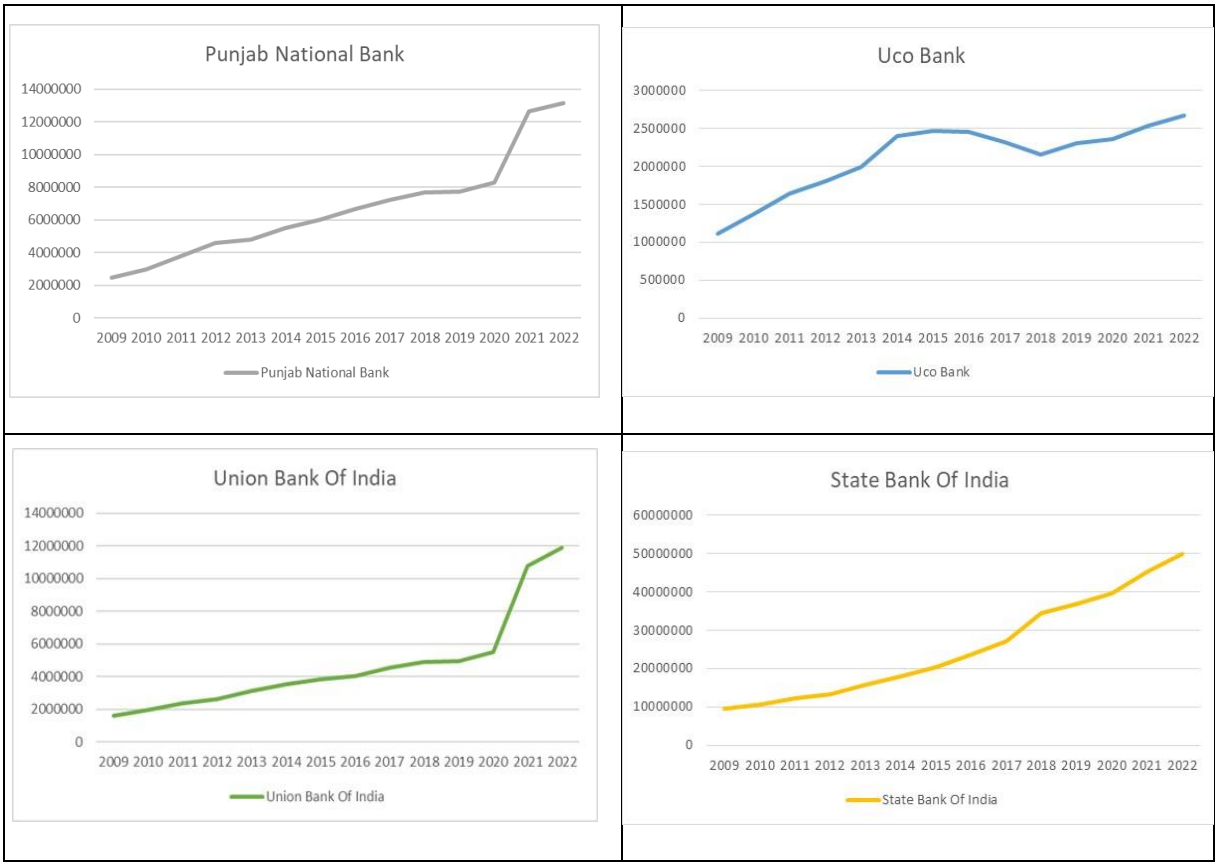








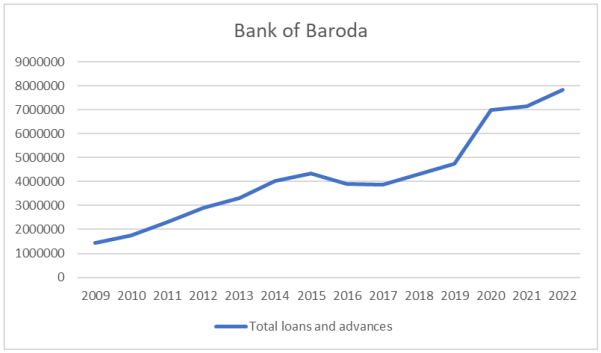


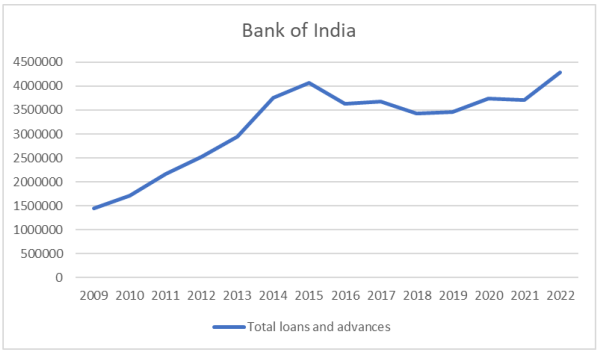


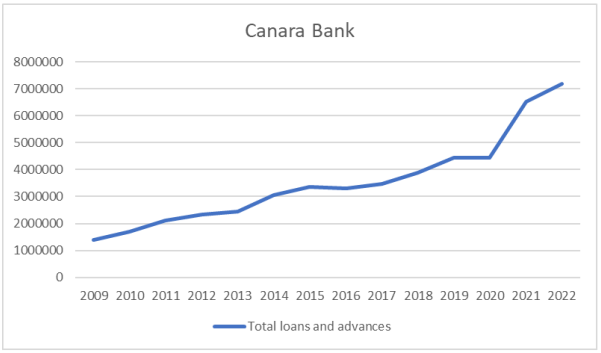
Insights:

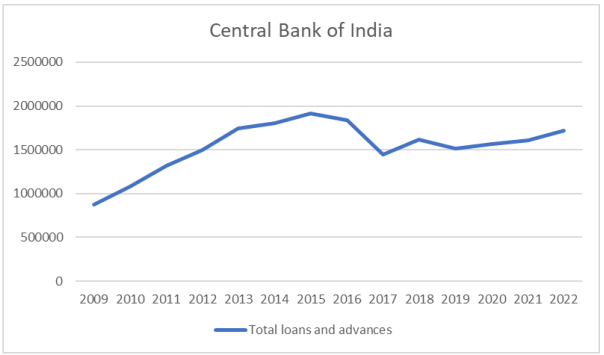
1. Sudden growth of Total Assets of Union Bank of India, Punjab National Bank, Indian Bank, Canara Bank & Bank of Baroda is seen during 2020-2021 phase.
2. UCO Bank has seen decline in Total Assets during 2015-17
3. Central Bank of India has seen 13x growth over the last 10 years which is highest among all followed by Union Bank & Indian Bank.
4. UCO bank has seen only 2.39x growth in total assets.
5. Indian Overseas Bank had a tough time during 2015-18
6. Growth of Punjab & Sind bank is fluctuating since 2014 although it had a positive growth.

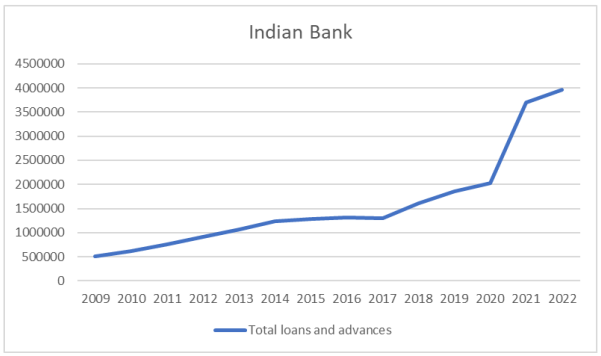
TOTAL LOANS AND ADVANCES

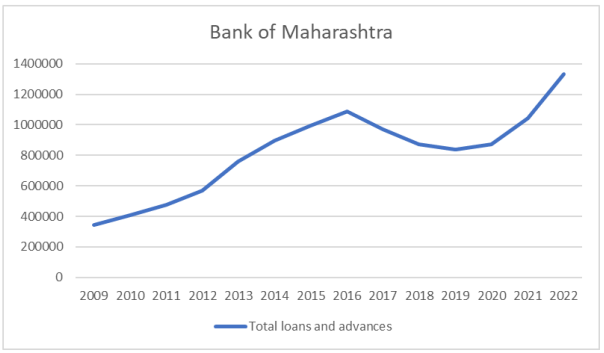


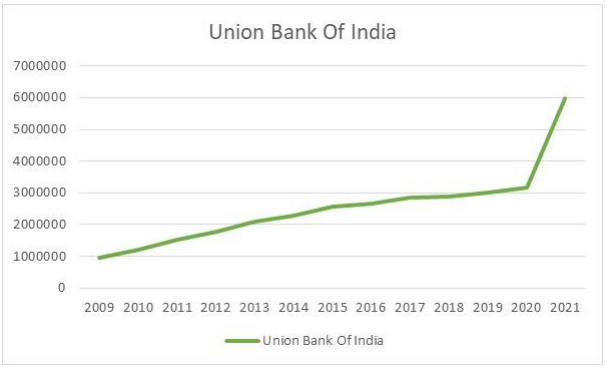


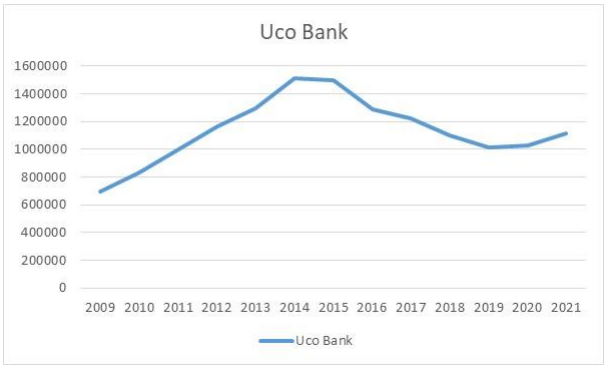


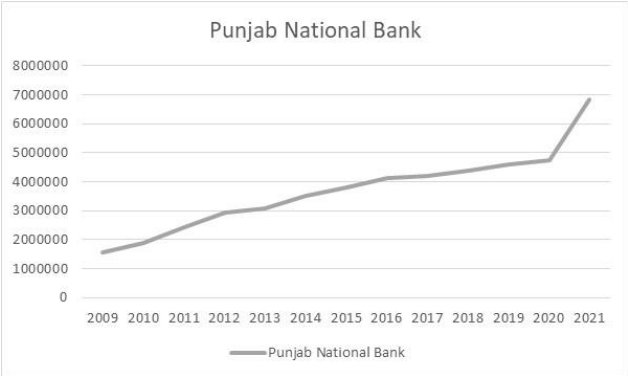


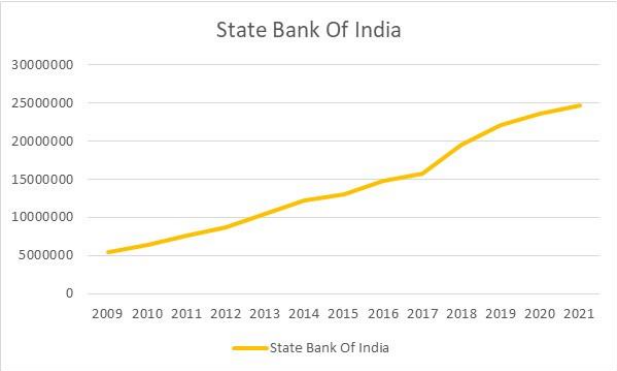


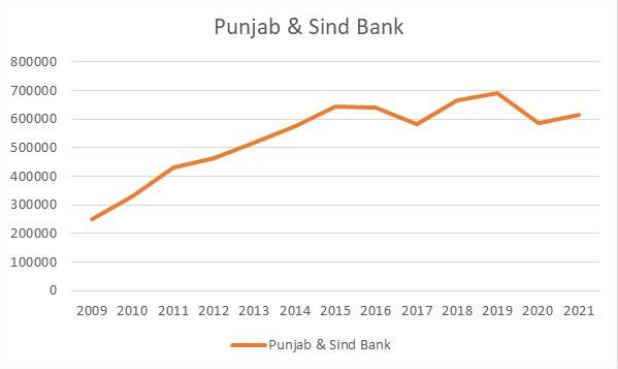


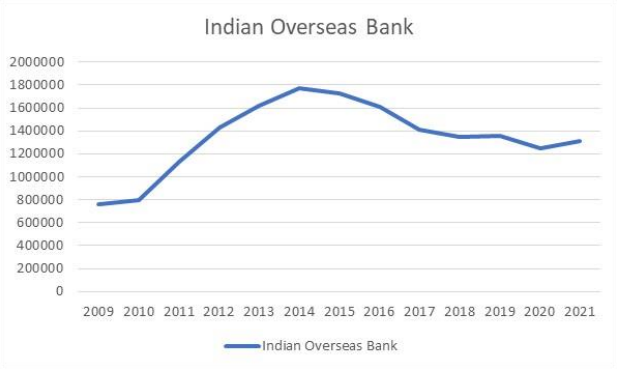








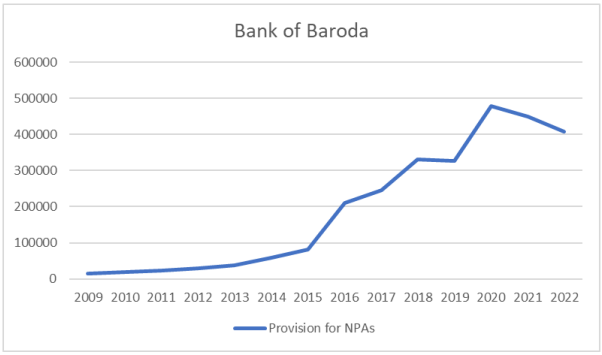


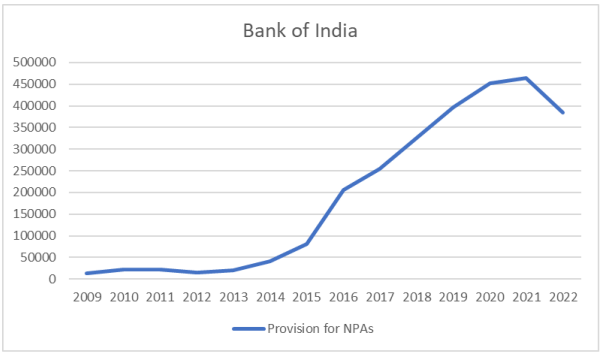


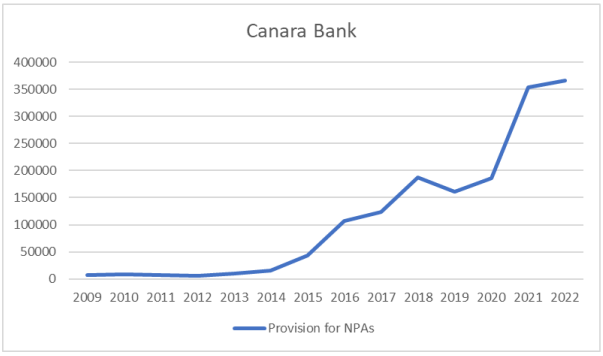
Insights:

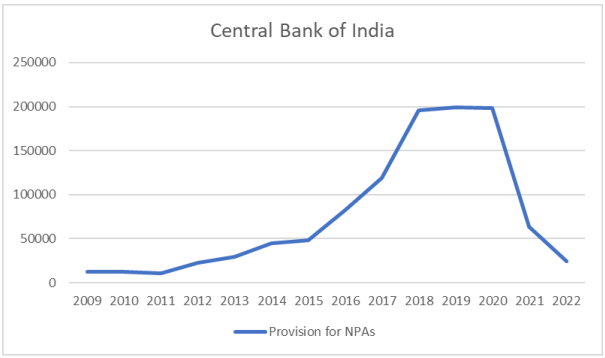
1. Maximum banks saw sudden increase in their lending i.e., total loans and advances during the year 2020-21.
2. For Indian Overseas Bank the lending has decreased.
3. During pandemic the digital lending has increased.
4. India’s digital lending market value 110 billion dollars during 2019. By 2023, it is expected that the value of digital lending market will be worth around 350 billion dollars.

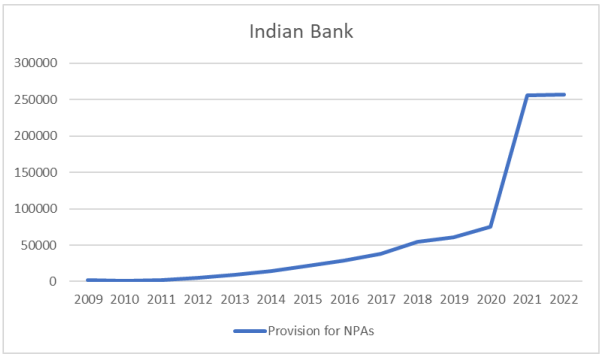
PROVISION FOR NPAs

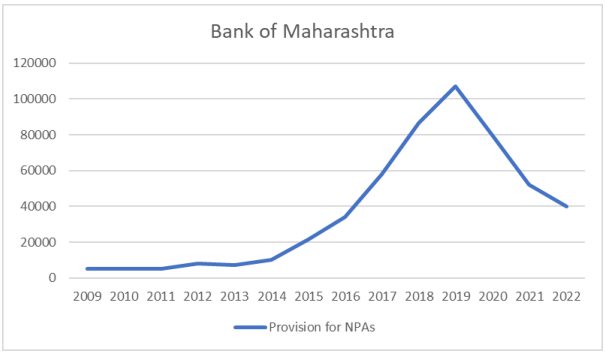


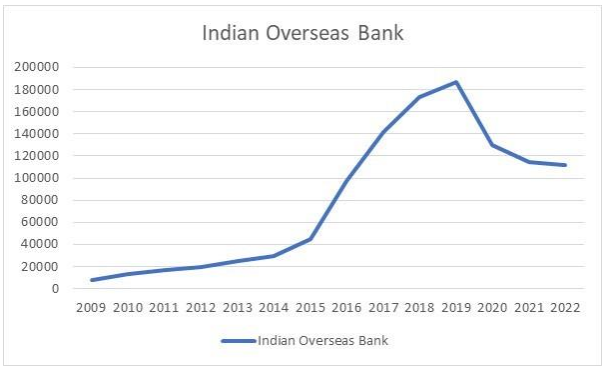


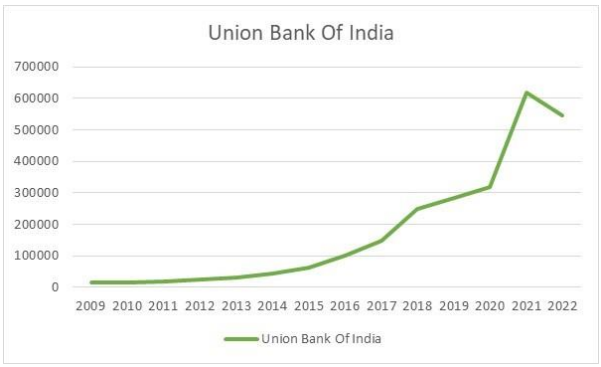


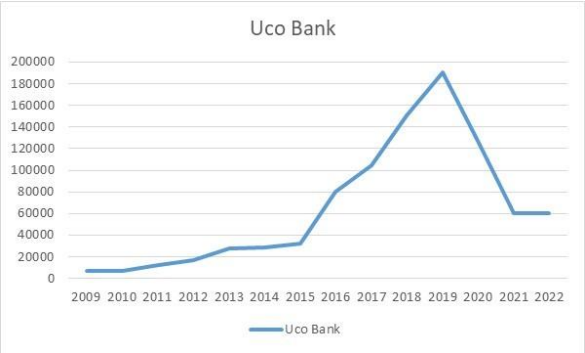


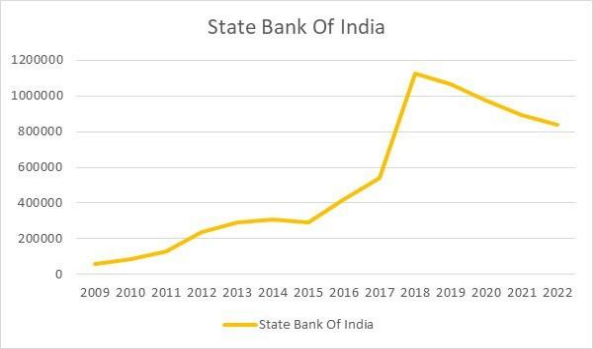


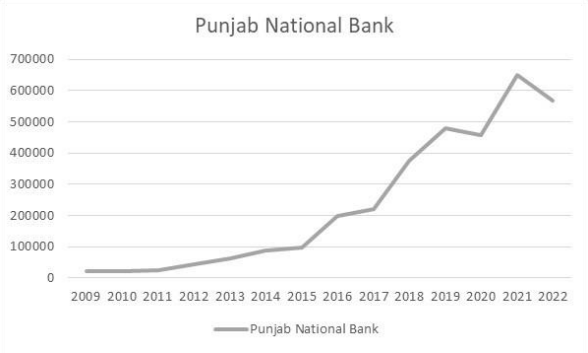


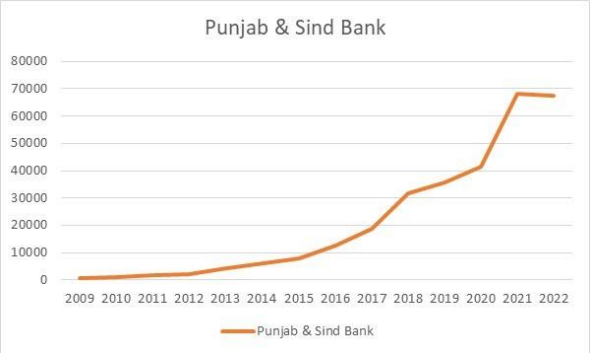








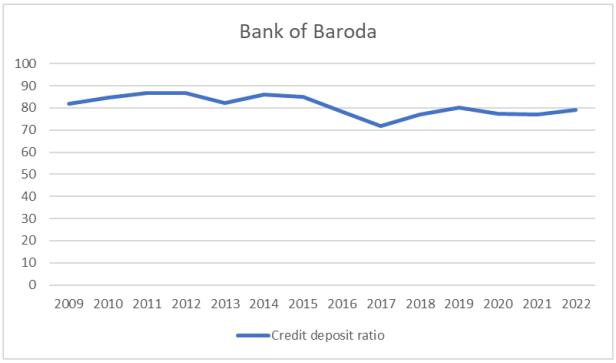


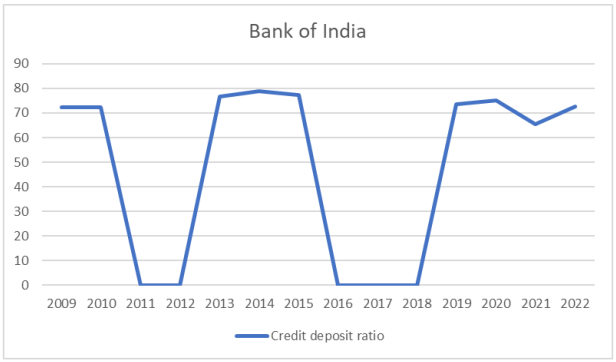


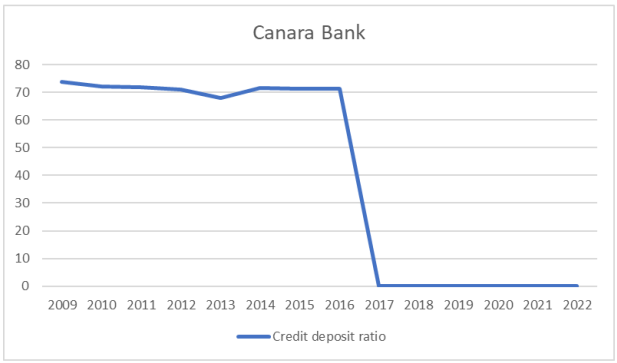
Insights

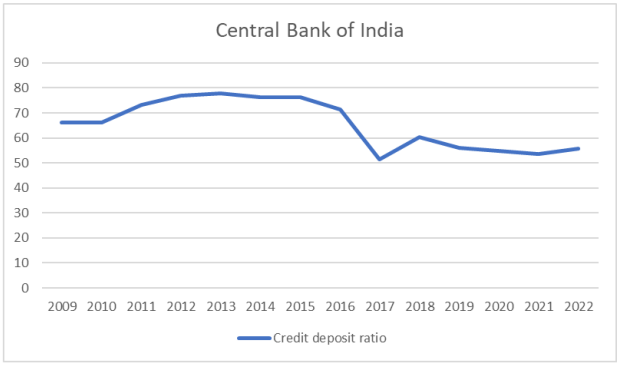
1. For IOB, provisions against bad loans have overshoot to Rs 2666 cr from Rs 986 crore in 2016. The ratio of bad loans as a percentage of total advances has gone up to 17.4% from 8.3% in 2016.
2. Union Bank of India has seen the least rise in PNPAs.
3. Canara Bank has seen the highest PNPAs.
4. Overall PSU banks have seen decline in PNPAs since 2018. Major banks responsible for this trend are State Bank of India (SBI), Bank of Maharashtra, UCO Bank, Indian Overseas Bank(IoB), and Central Bank of India.
5. Growth Rate of PNPAs for Public Sector Banks has been 0.66% PA till 2018.

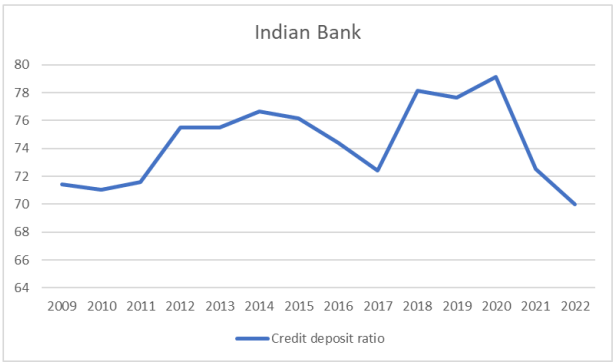
CREDIT DEPOSIT RATIO

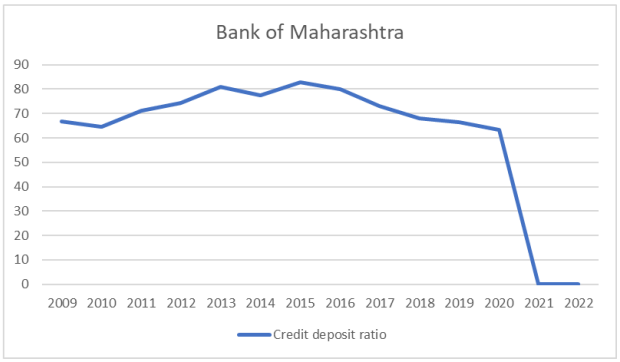


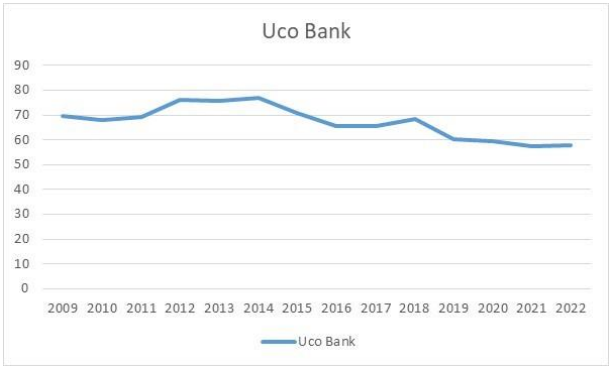


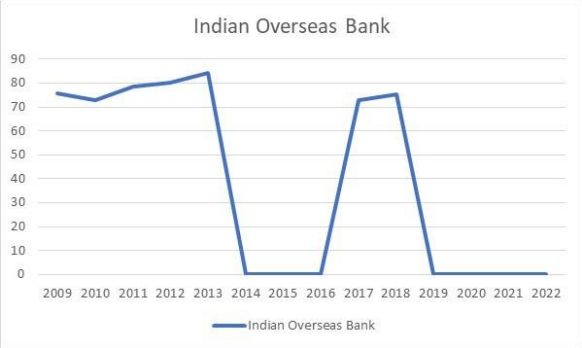


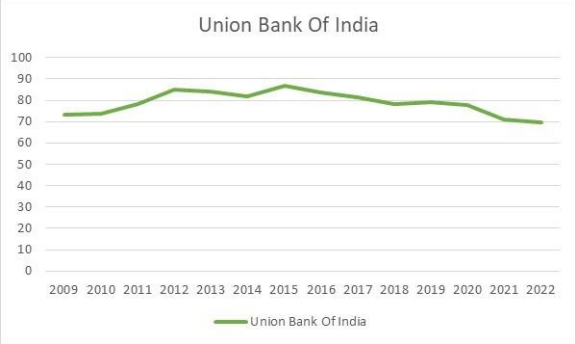


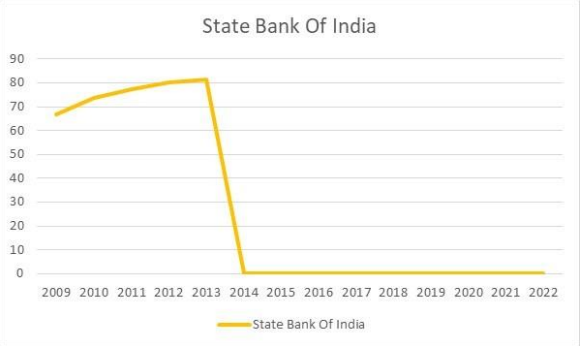


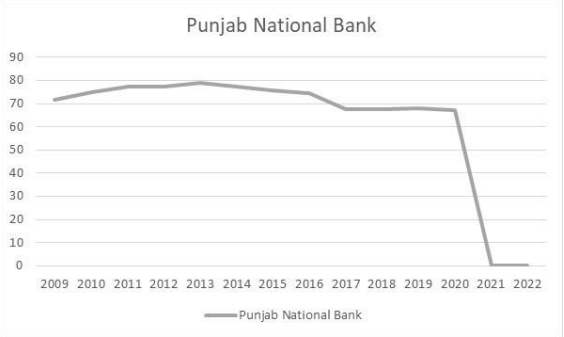








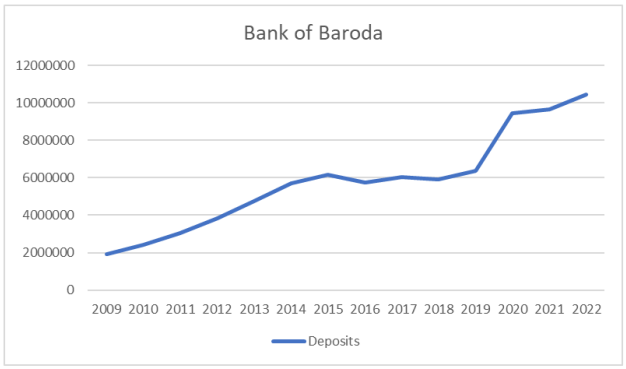




Insights

1. The CDR (ratio of deposits to liabilities) has seen a significant decline post 2019, i.e., outbreak of Covid-19.
2. The rise deposits indicate that people seem to be saving more, probably as forced savings, owing to the risk arising from pandemic and second round of lockdowns.
3. It indicates that that both corporates and individuals are looking for slow movements on borrowing due to economic contraction.
4. The fixed deposits are expected to collapse due to high savings rate with low borrowing status.

DEPOSITS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6000000
4000000
2000000
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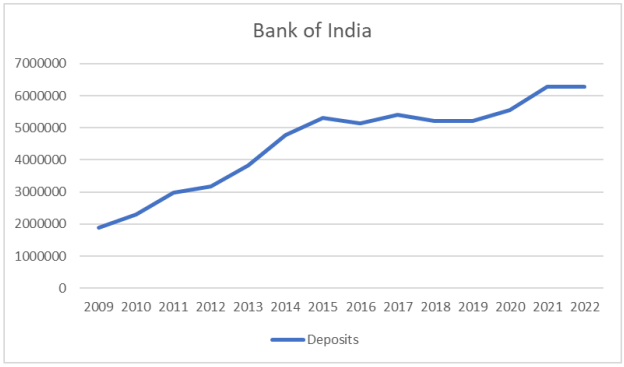
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Deposits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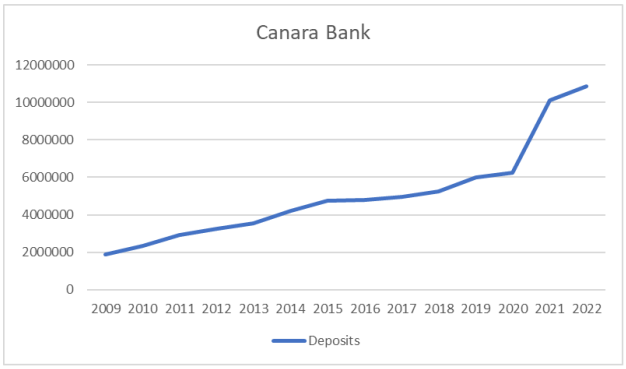
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Deposits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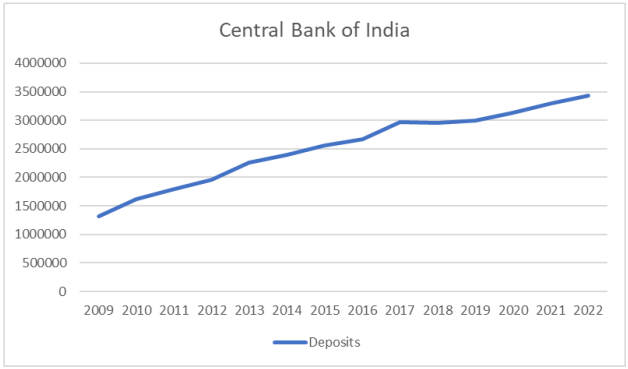
Deposits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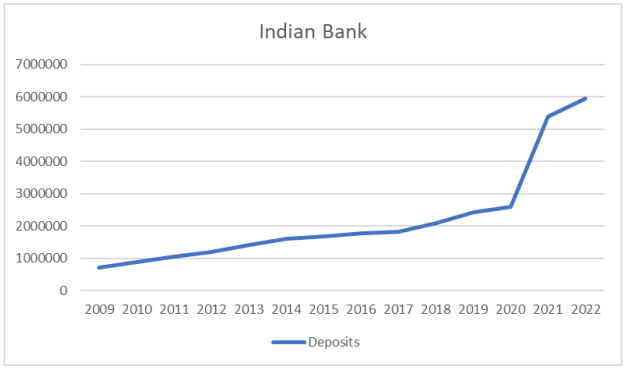
Deposits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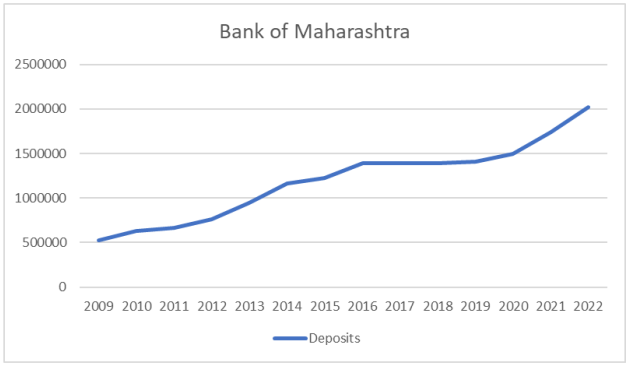
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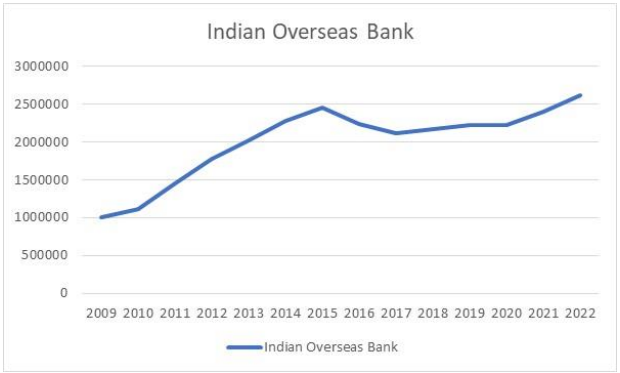
Deposits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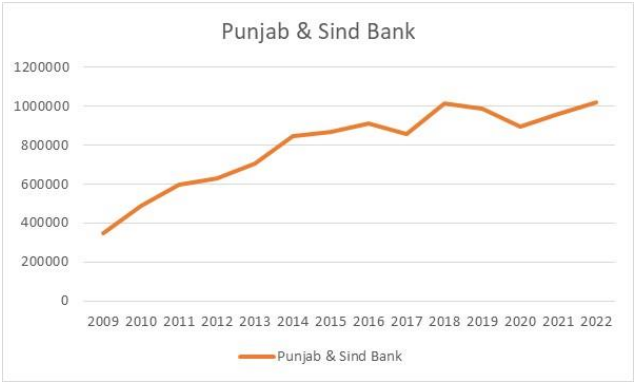
Indian Overseas Bank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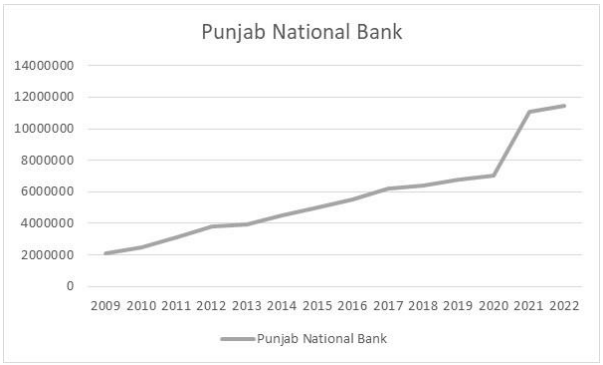
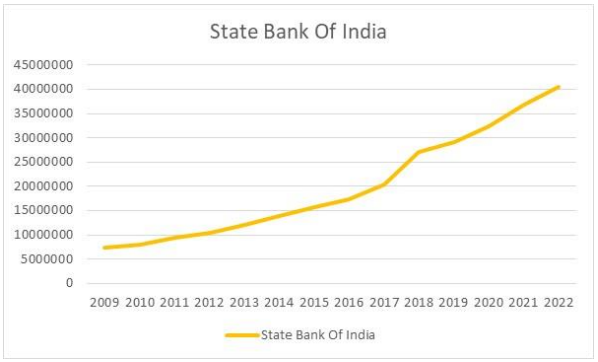
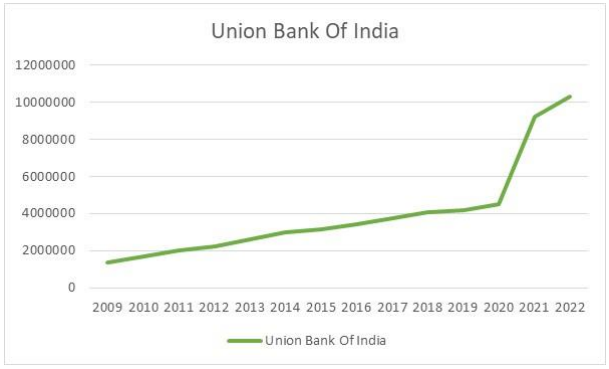
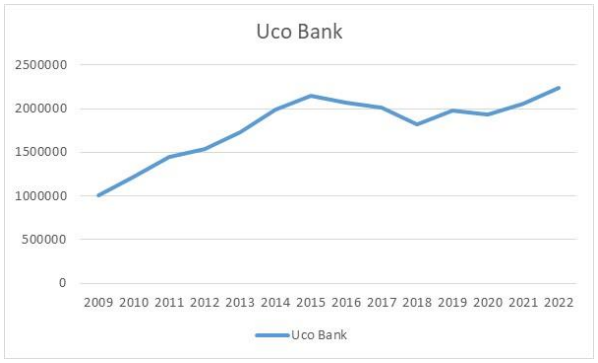
Punjab & Sind Bank





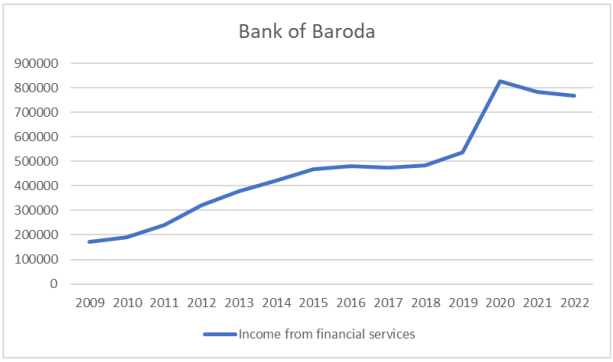


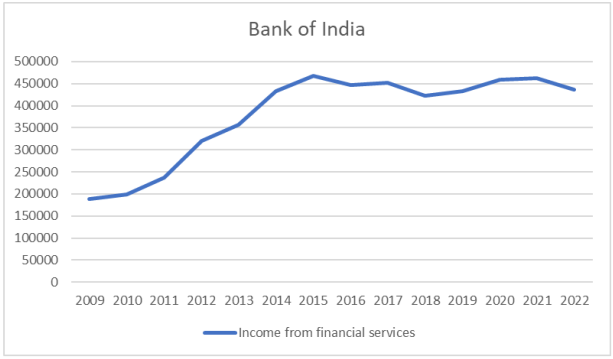


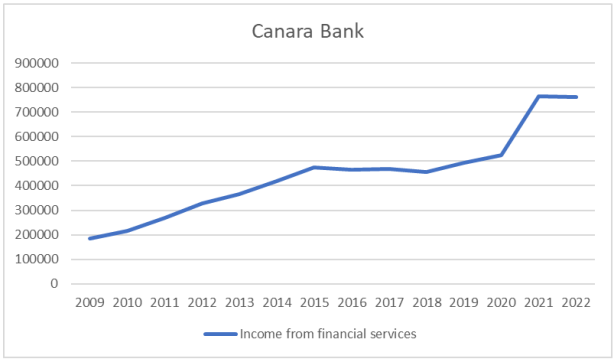
Insights

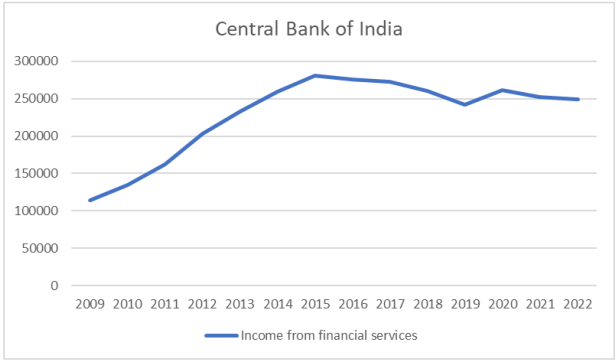
1. Over the last decade, overall deposits in the Indian banking system have frequently surged.
2. Total deposits in the banking sector were roughly Rs. 53.6 lakh crore in March 2011, rising to Rs. 151.1 lakh crore in March 2021 (a growth rate of around 181% over the preceding decade).
3. Deposits in public sector banks (PSBs) fell from over 74% in March 2011 to around 66% in March 2021.

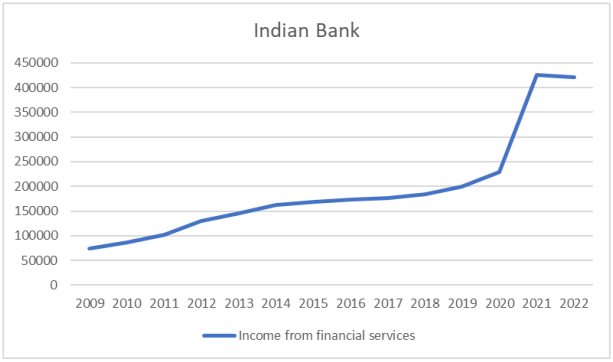
INCOME FROM FINANCIAL SERVICES

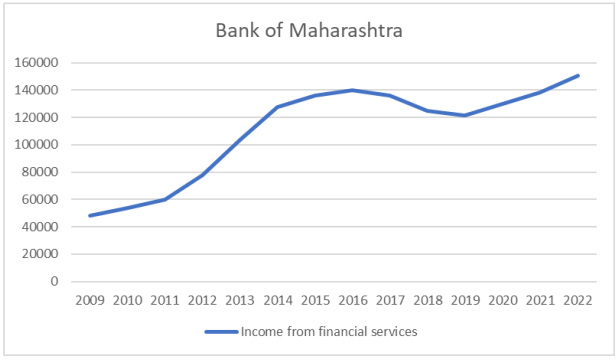


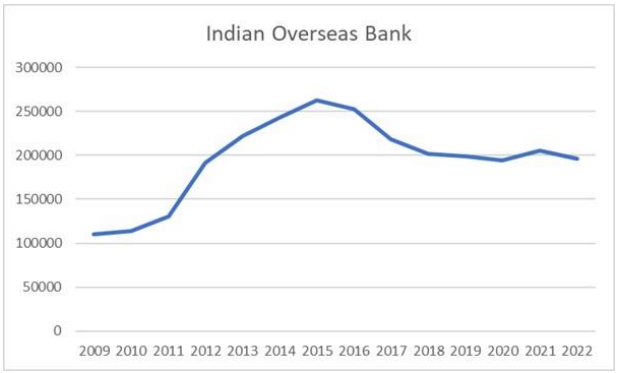


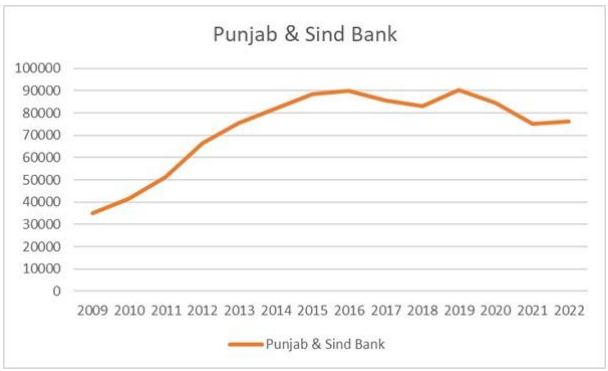


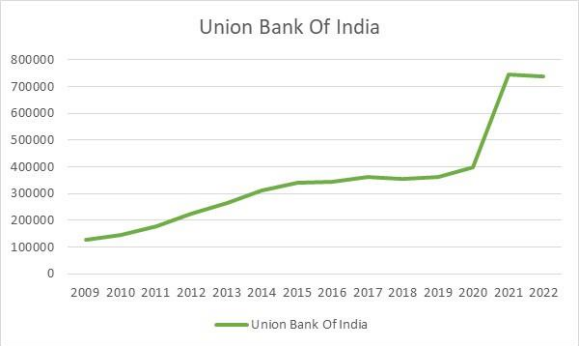


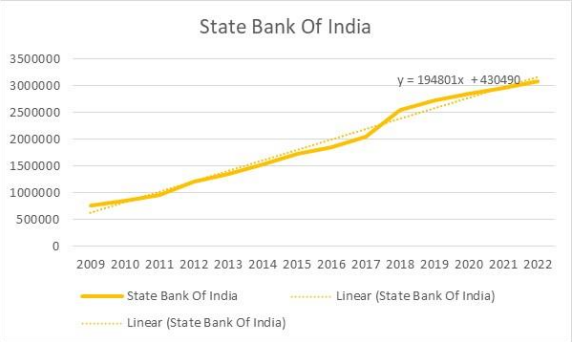


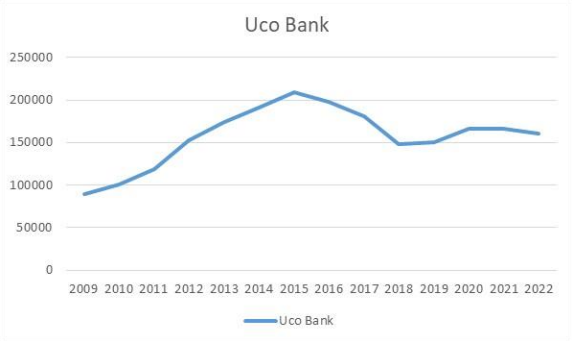


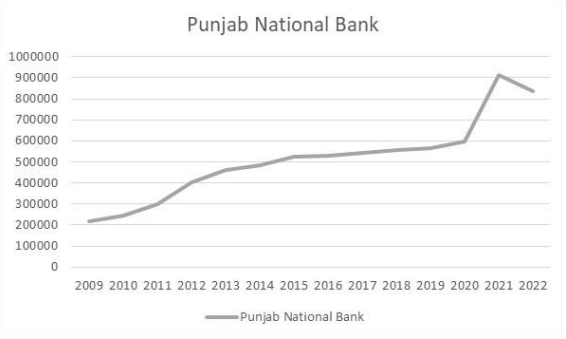








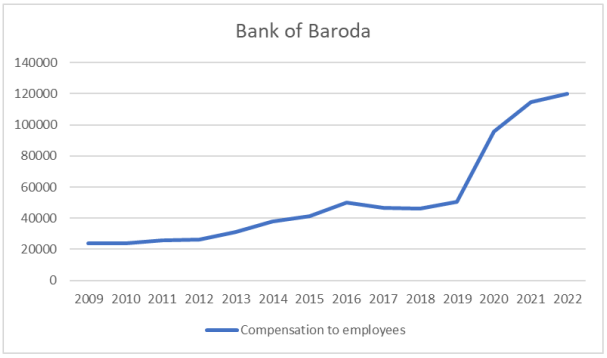


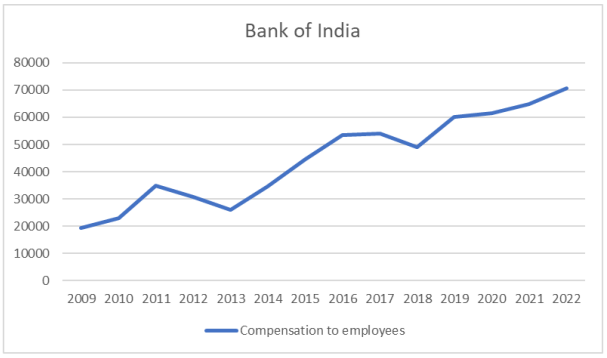


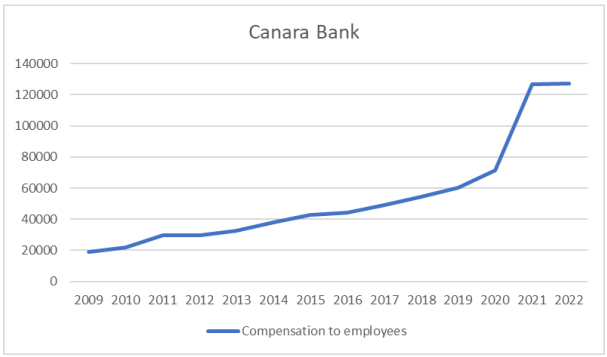
Insights

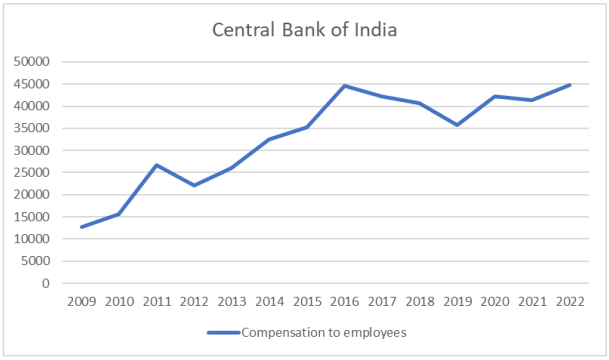
1. It is observed that in December 2022, net interest income of banks grew by 25.5% (in absolute figure to Rs 1.78 lakh crore) as quarter on-year. The credit goes to good credit off-take and higher yield on advances.
2. Since, the deposit cost have increased marginally, because Indian banks are able to pass higher rates to borrowers and the consequence is bank net interest margins have soared.

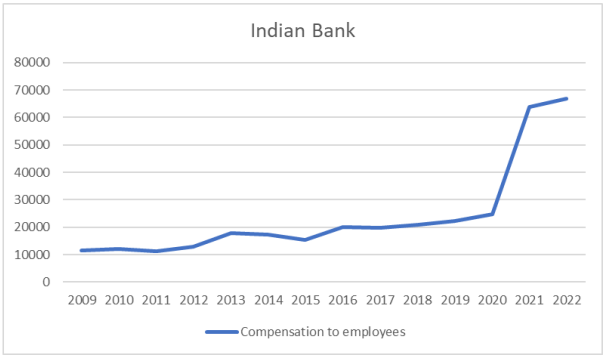
COMPENSATION TO EMPLOYEES

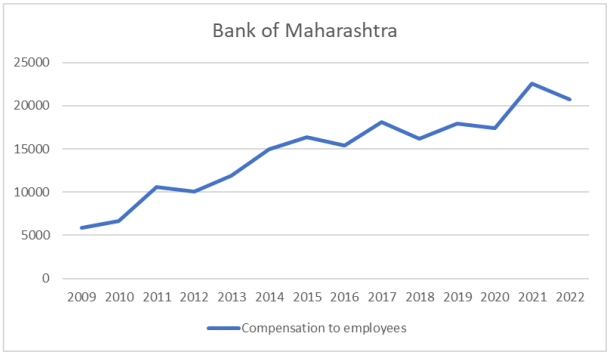


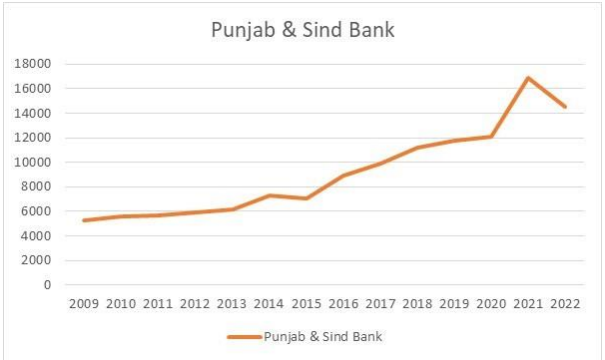


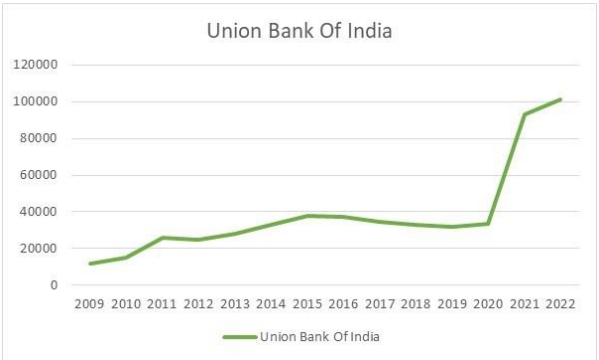


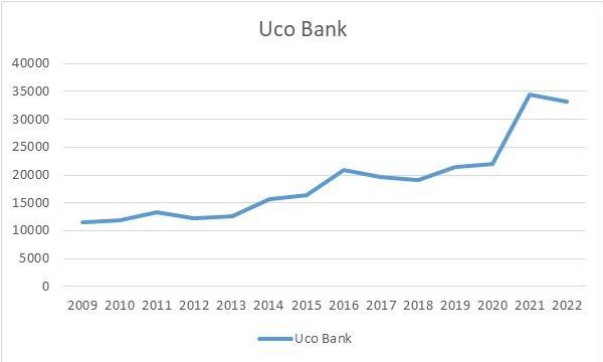


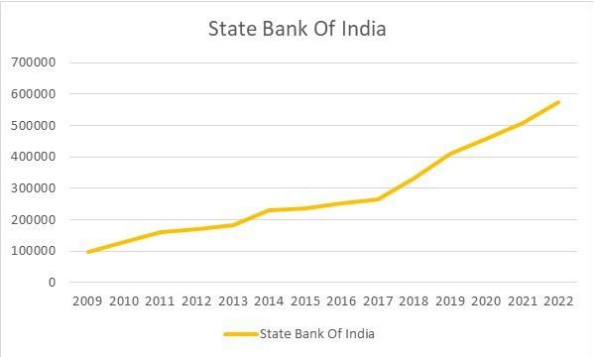


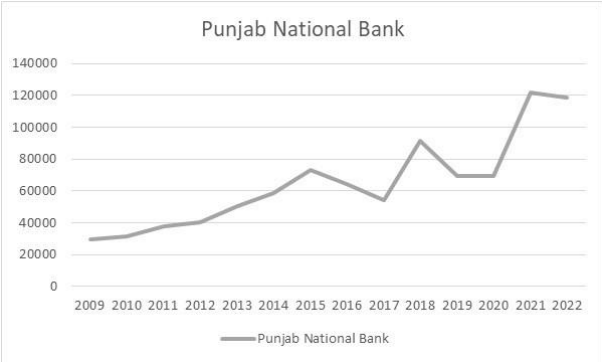


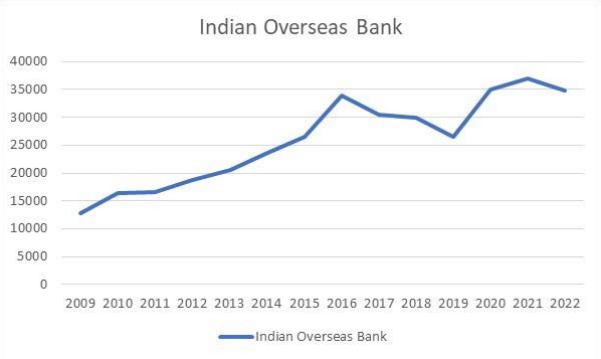








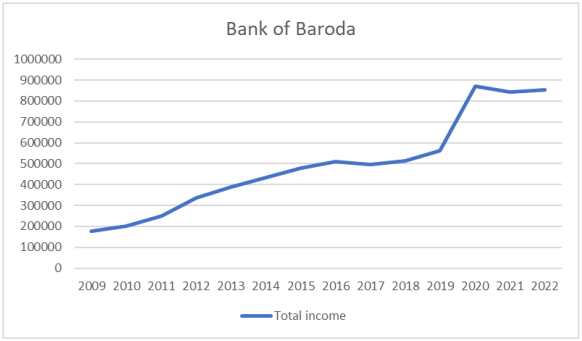


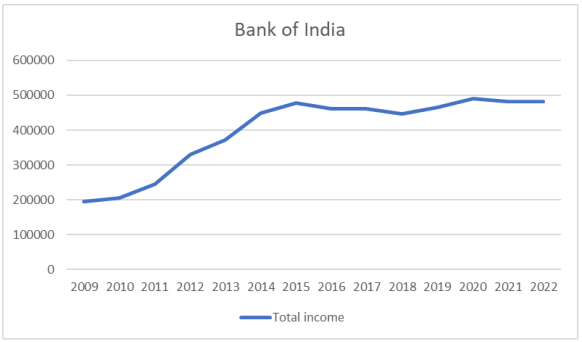


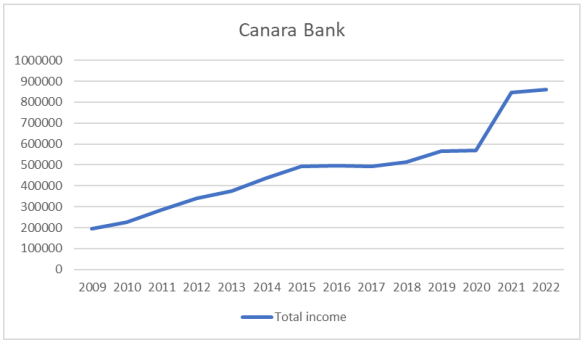
Insights

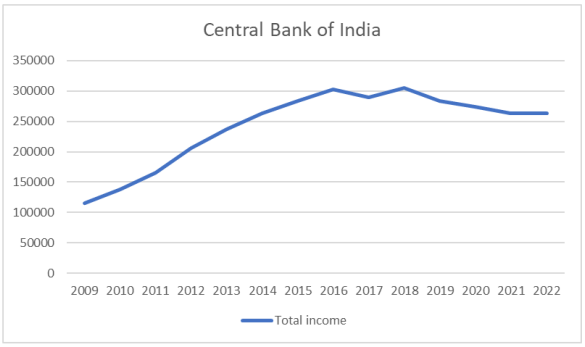
- The dearness allowance has been hiked to 27.79 per cent from Aug 2021 up by 2.1 per cent over the last quarter, giving a hike in salary of bank employees.
- In 2021-22, the total number of employees of PSB bank is 770,000 as against 857000 during 2016-17.
- Though the employees count has decreased but the compensation is upward trend indicating higher pay to employees.
- During covid, PSU banks initiated medical assistant and insurance cover up to INR 20 lakhs to employees, increasing their total compensation to employees.

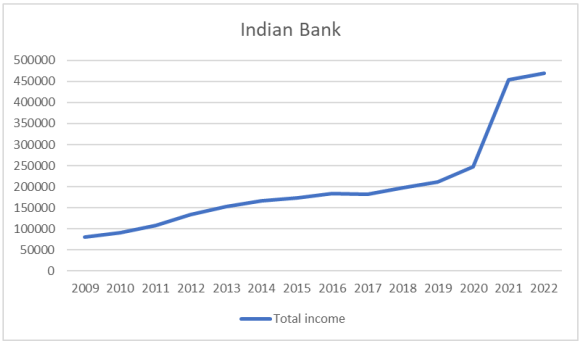
TOTAL INCOME

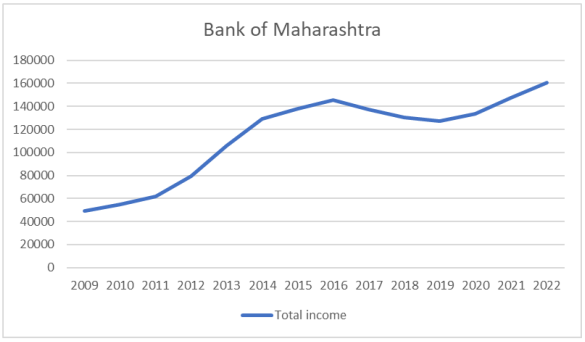


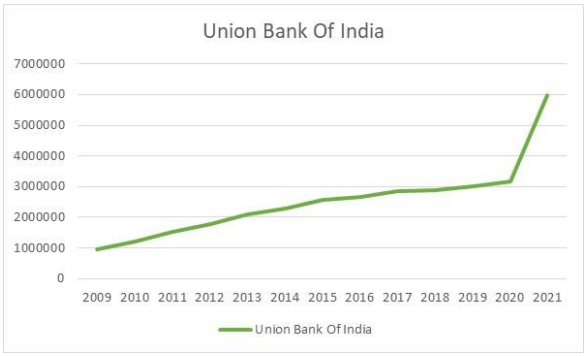


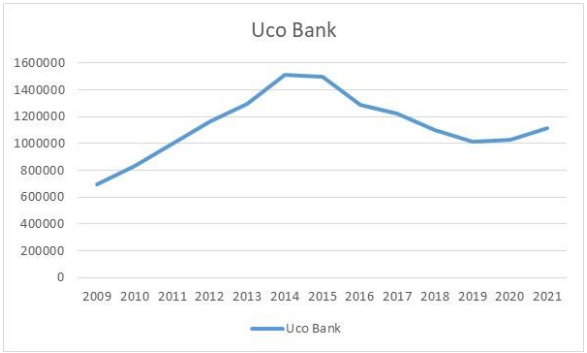


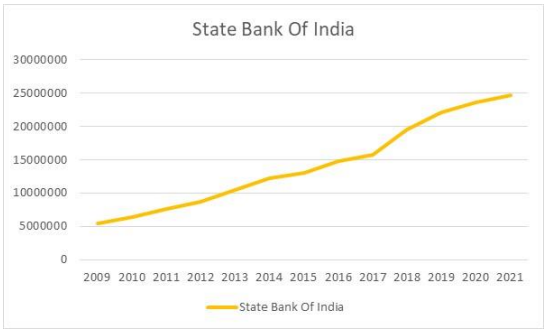


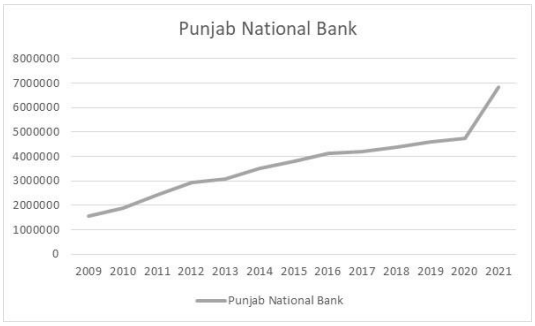


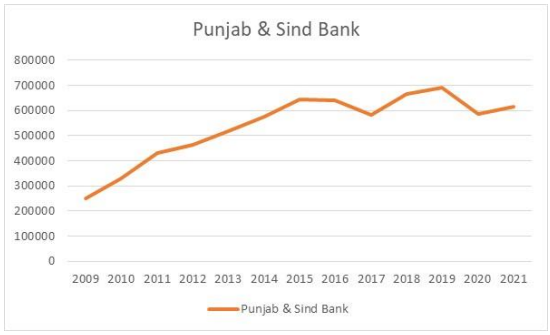


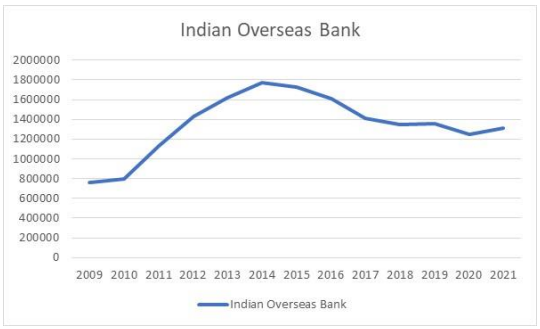










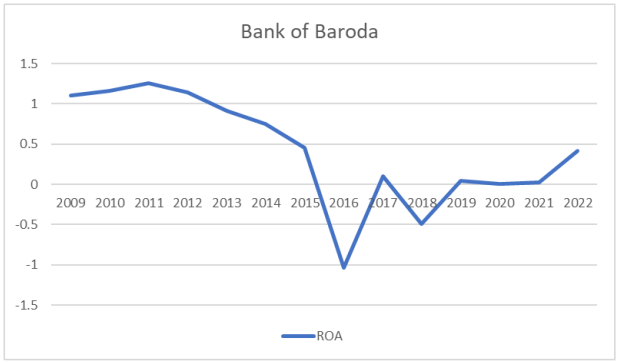


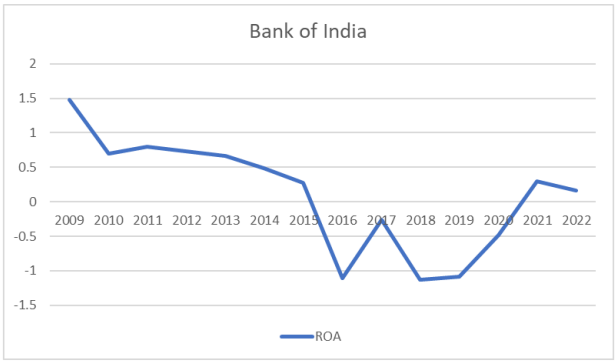
Insights

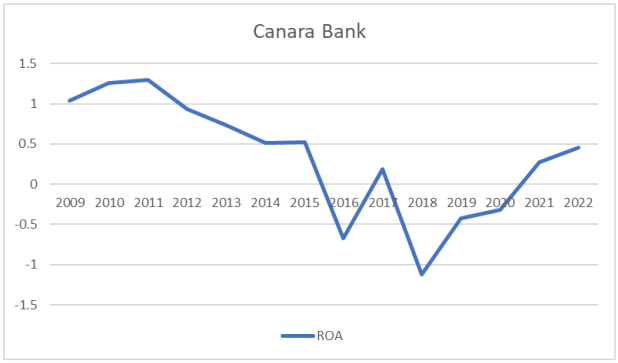
1. Indian Overseas Bank & UCO Bank is under downturn.
2. Union Bank of India saw steep rise in 2021.
3. The overall income of India's public sector banks for fiscal year 2020-21 was roughly Rs. 12.8 lakh crore. (approximately USD 172 billion)
4. A lot of factors determine the total income level:
    a. Interest Income
    b. Asset Quality
    c. Non-Interest Income
    d. Net Interest Margin
    e. Economic Conditions
    f. Competition
5. Top Banks in descending order of Total Income:
    a. State Bank of India (SBI): A total income of Rs. 3.99 lakh crore ($54 billion USD approximately), SBI was the largest PSB in India by income.
    b. Punjab National Bank (PNB): With a total income of Rs. 72,331 crore ($9.8 billion USD approximately), PNB was the second largest PSB in India by income.

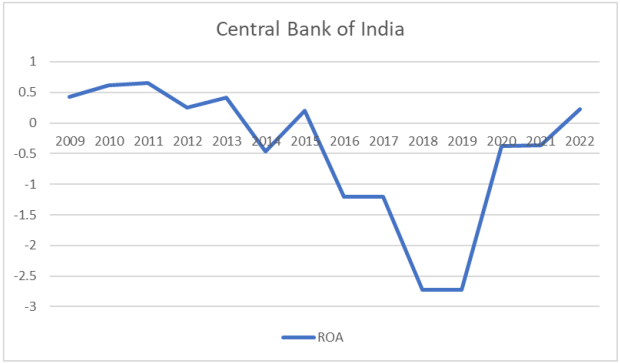
c. Bank of Baroda (BoB): With a total income of Rs. 65,843 crore ($8.9 billion USD approximately), BoB was the third largest PSB in India by income.
d. Canara Bank: With a total income of Rs. 53,623 crore ($7.3 billion USD approximately), Canara Bank was the fourth largest PSB in India by income.

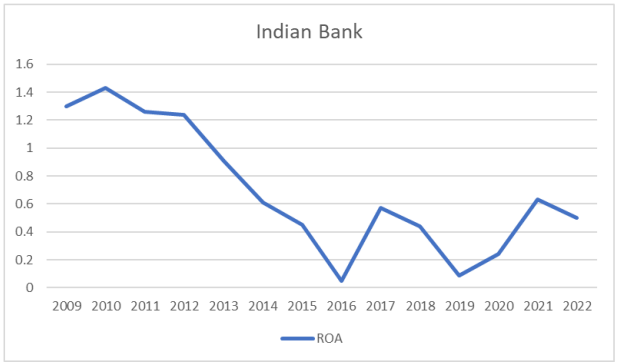
RETURN ON TOTAL ASSETS

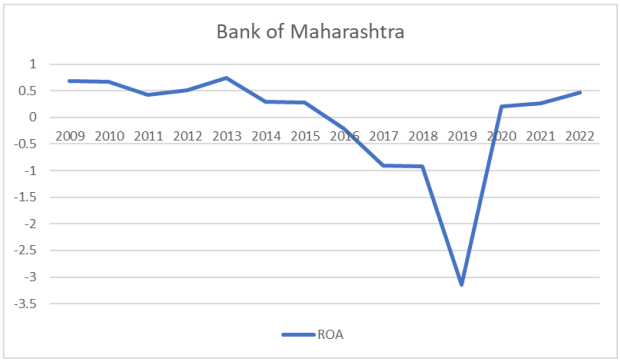


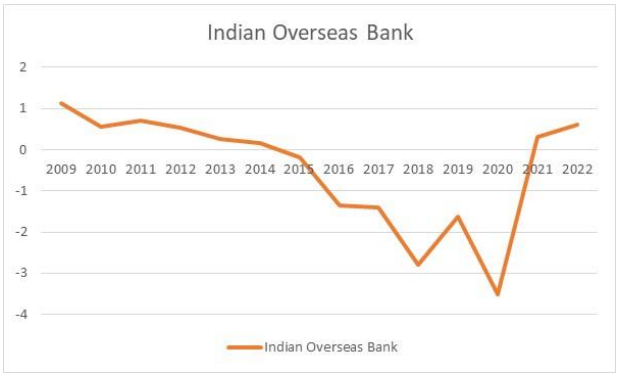


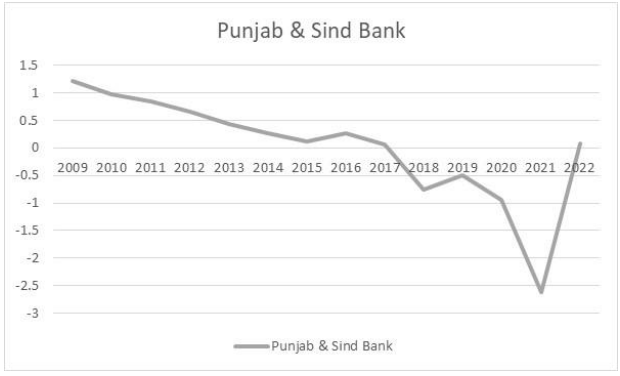


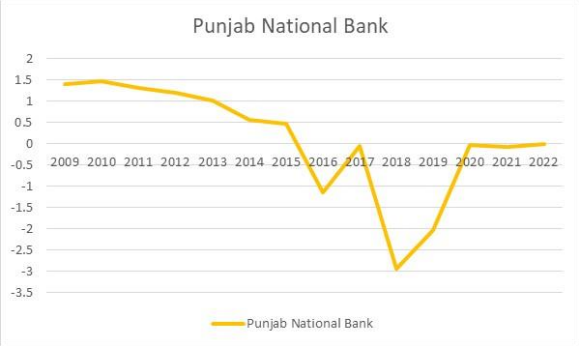


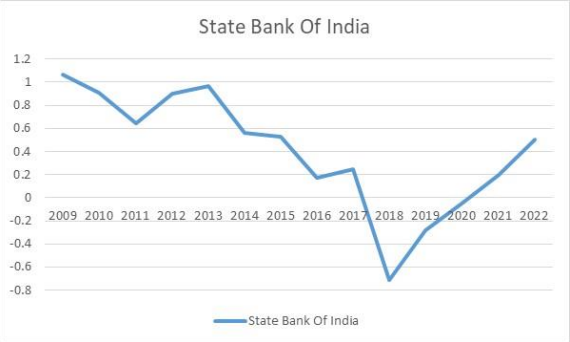


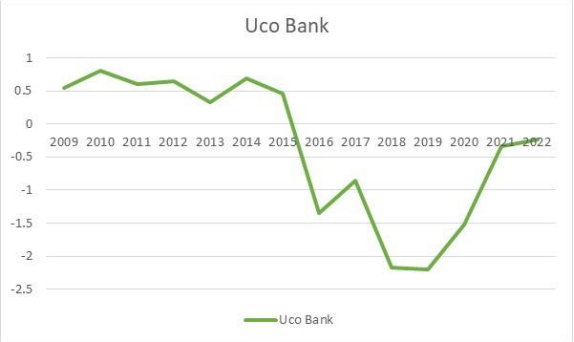


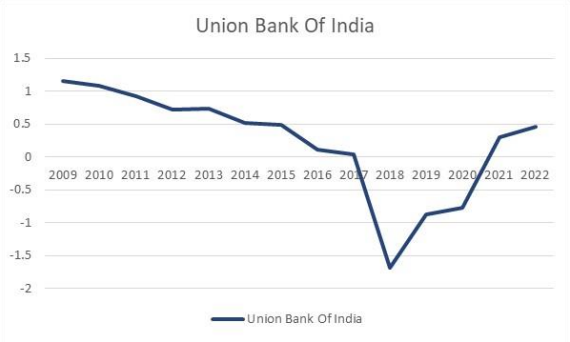












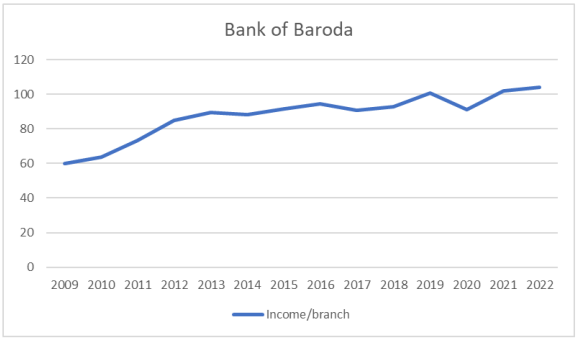
Insights

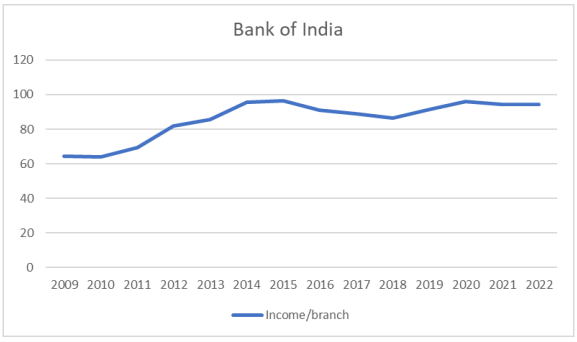
1. In 2016-17, the Indian government's demonetization policy directed to a deterioration in the ROA of banks due to the sudden withdrawal of cash from the economy, and the average ROA dropped to around 0.6%.
2. In 2020-21, the epidemic of the COVID-19 disease had a significant impact on the Indian economy, and the average ROA of banks dropped to around 0.5%.
3. In the fiscal year 2011-12, the average ROA of PSBs was around 0.7%.
4. From 2012-13 to 2015-16, the ROA of PSBs remained relatively stable at around 0.6% to 0.7%
5. In 2016-17, the Indian government's demonetization policy led to a decline in the ROA of PSBs due to the sudden withdrawal of cash from the economy, and the average ROA dropped to around 0.4%.
6. From 2017-18 to 2019-20, the ROA of PSBs improved and remained around 0.5% to 0.6% due to various government initiatives to recover the health of the Indian banking sector.
7. The breakout of the COVID-19 pandemic had a substantial impact on the Indian economy in 2020-21, and the average ROA of PSBs fell to roughly 0.2%.As of 2021-22, the ROA

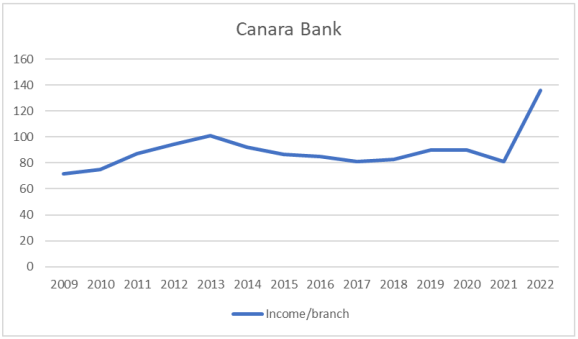
of PSBs has shown some improvement, and it is anticipated to tolerate to improve gradually in the impending years.

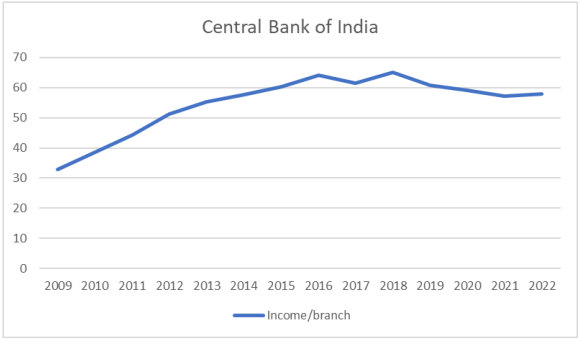
8. It's worth noting that PNB's negative ROA is due to a large loss incurred in the fourth quarter of the fiscal year 2020-21.
9. According to RBI, the overall ROA for the Indian banking sector was 0.32% in March 2021, down from 0.60% in March 2020. This decline in ROA can be attributed to the economic impact of the COVID-19 pandemic, which has led to higher provisions for bad loans and a slowdown in lending activity.

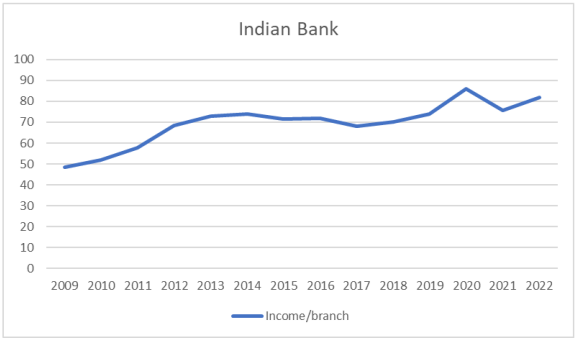
PROPORTION OF INCOME OVER NO. OF BRANCHES (INCOME/BRANCH)

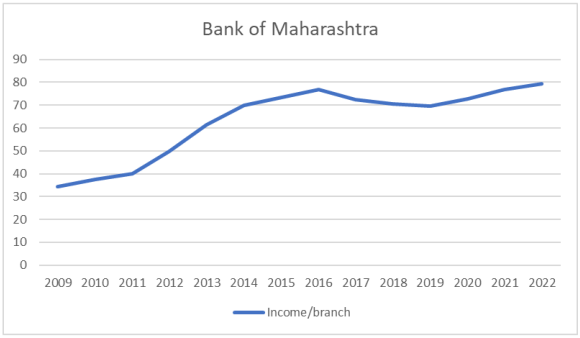


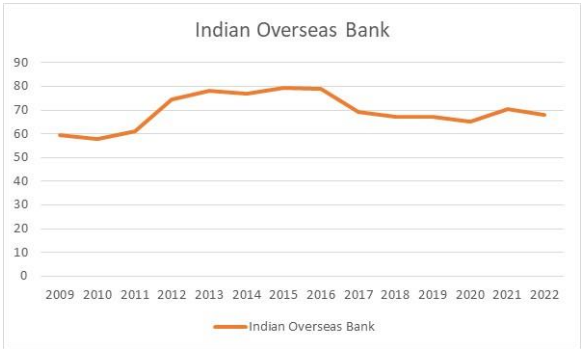


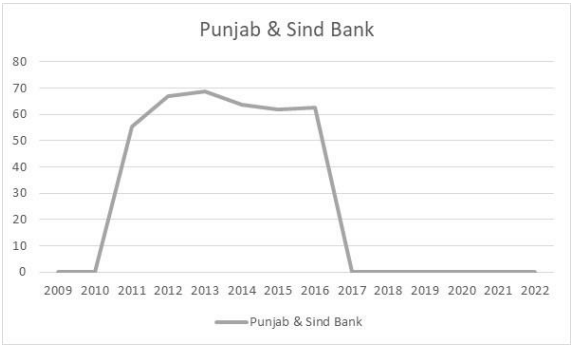


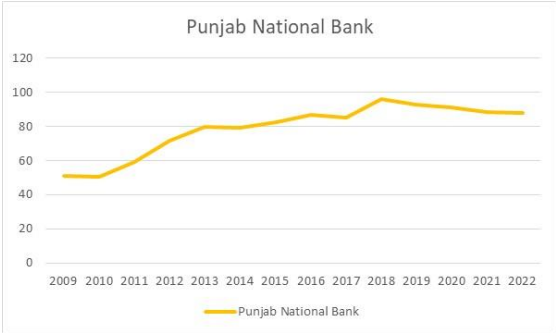


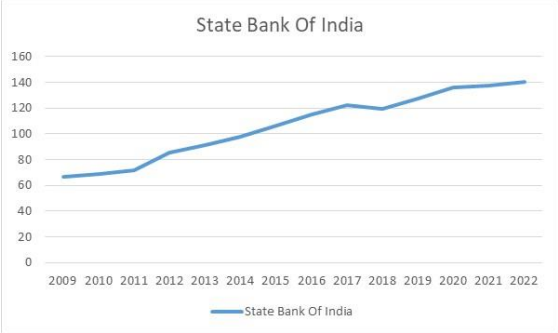


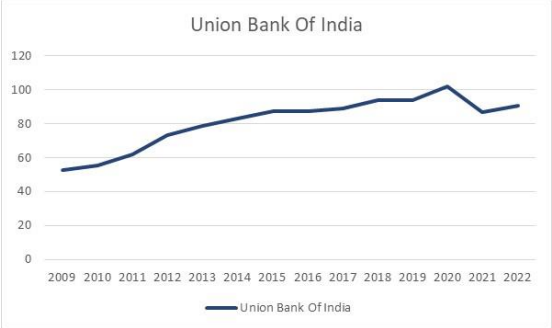


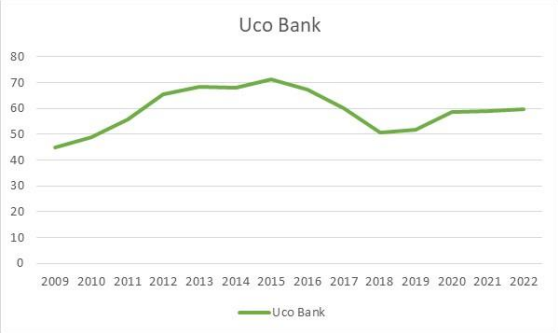








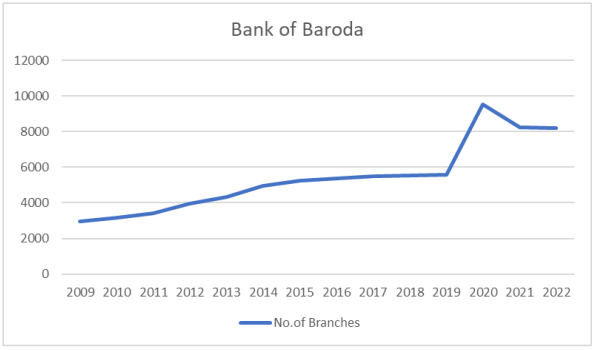


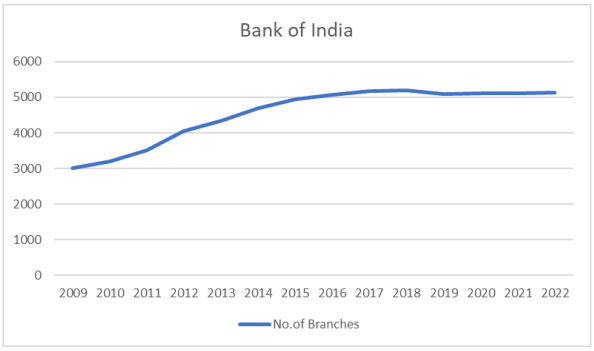


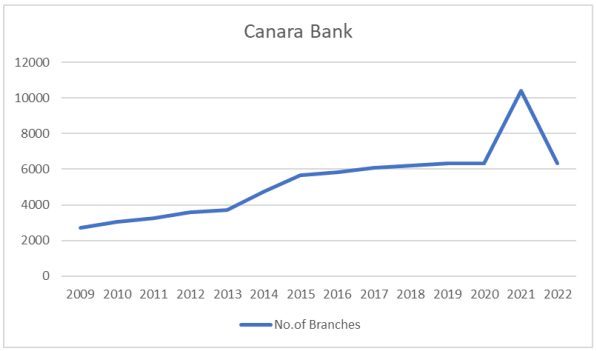
Insights

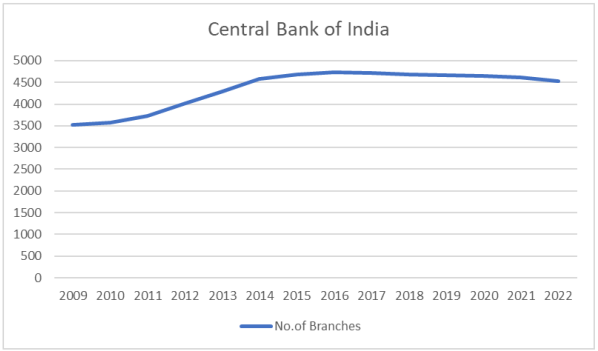
1. Generally, income/branch is increasing with time.
2. State Bank of India has highest growth over time.
3. UCO Bank is fluctuating with time in terms of income/branch.
4. Indian Overseas Bank seems to be constant over time.

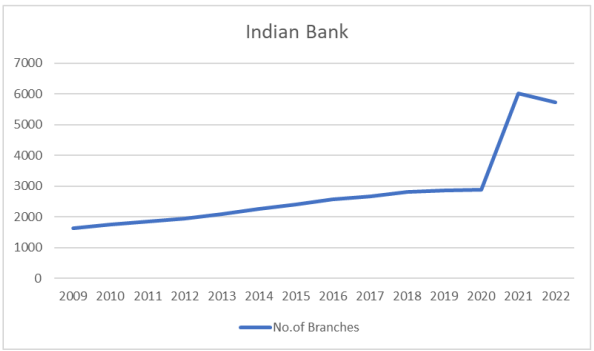
NO. OF BRANCHES

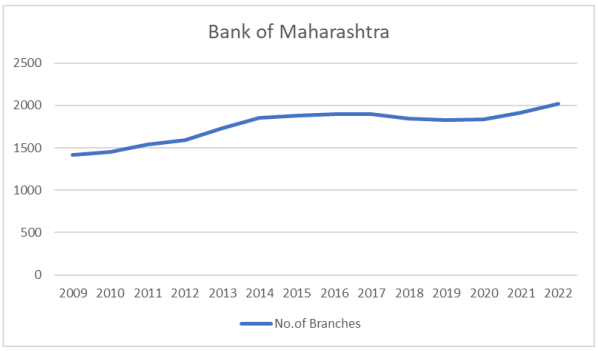


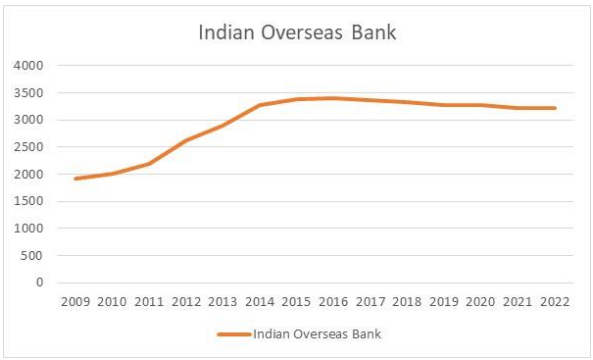


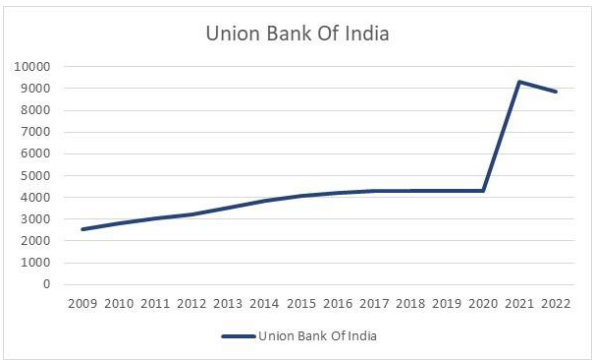


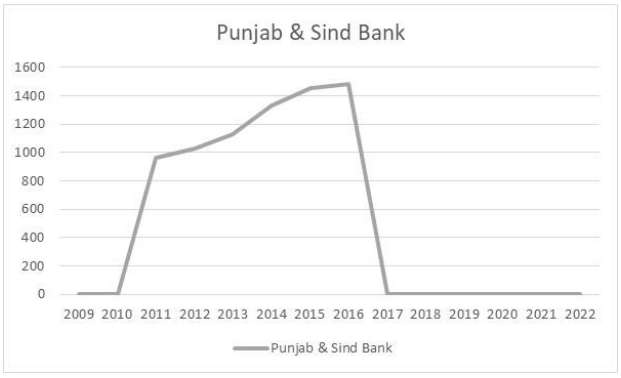


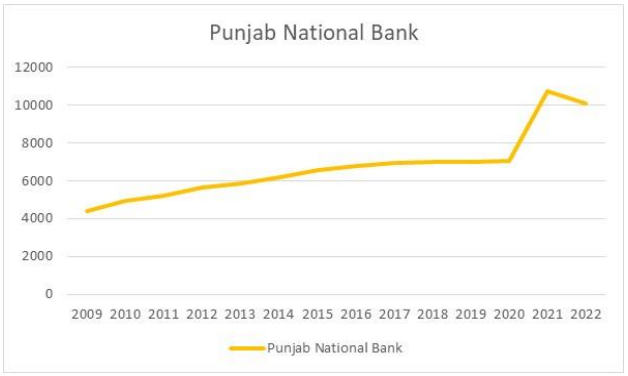


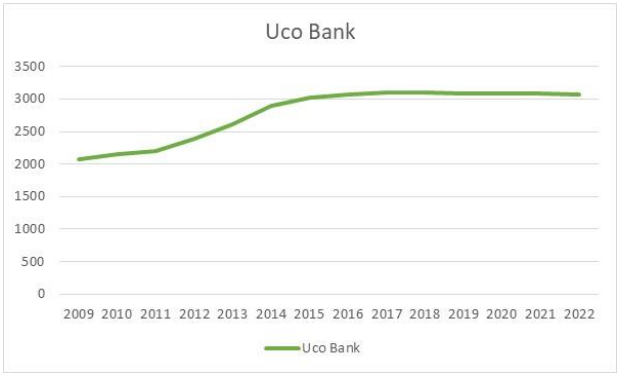


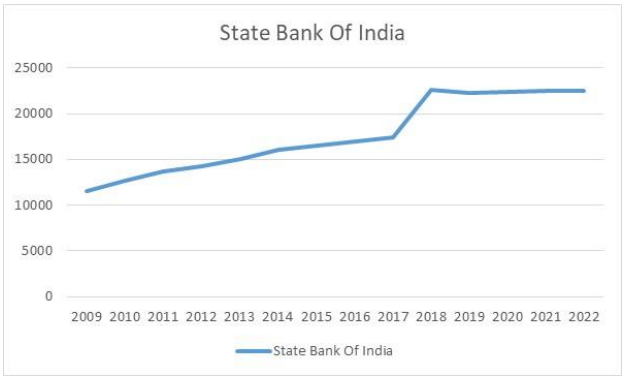










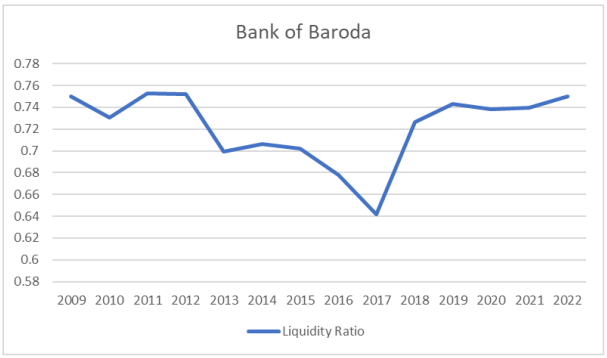


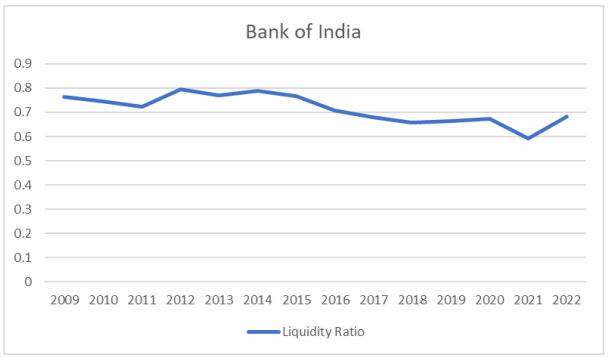
Insights

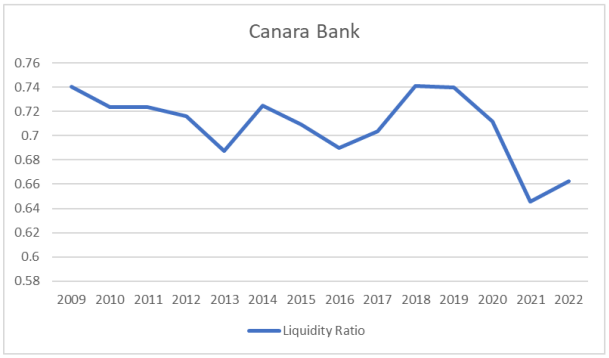
1. It was estimated that there were approximately 63,000 public sector bank branches in India as of 2021. Public sector banks are government-owned and run banks that play a crucial part in delivering financial services to individuals across the country.
2. Banks typically expand their branches in areas where there is a growing demand for financial services, such as in urban areas with increasing population and economic activity, as well as in rural areas where there may be a need for greater access to banking services.
3. In contemporary time, there has been a trend of banks expanding their digital presence and offering more online and mobile banking services. This has allowed them to reach customers who may not have easy access to physical bank branches, such as in remote areas.
4. In addition, the COVID-19 epidemic has raised demand for contactless financial services, and banks have been extending their digital capacities to accommodate this need.

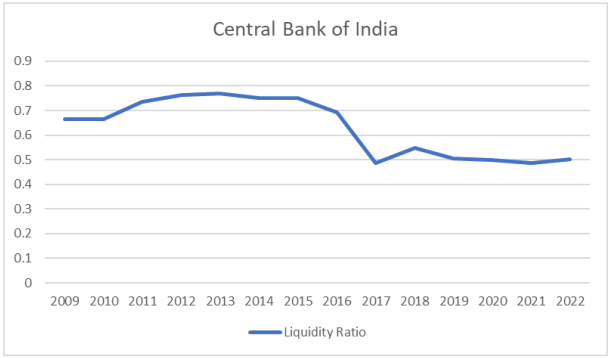
5. It is also important to note that banks may prioritise their development plans based on a variety of reasons, including regulatory constraints, market competitiveness, and profitability considerations.

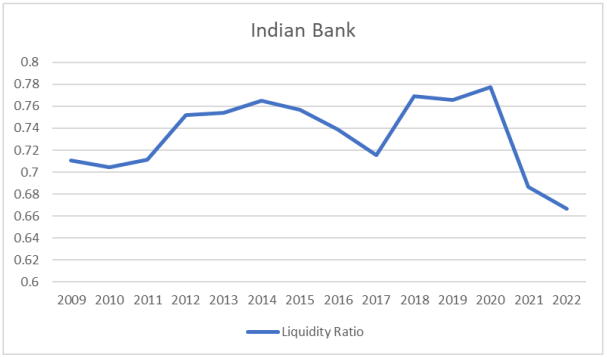
LIQUIDITY RATIO

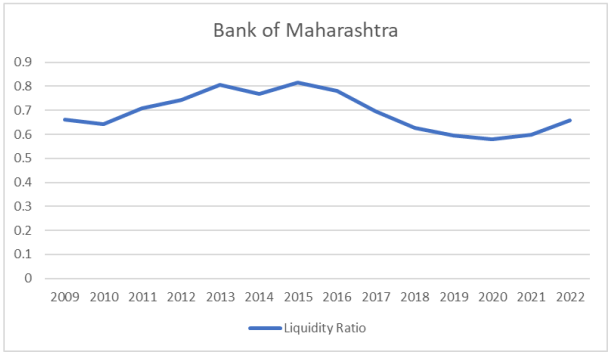


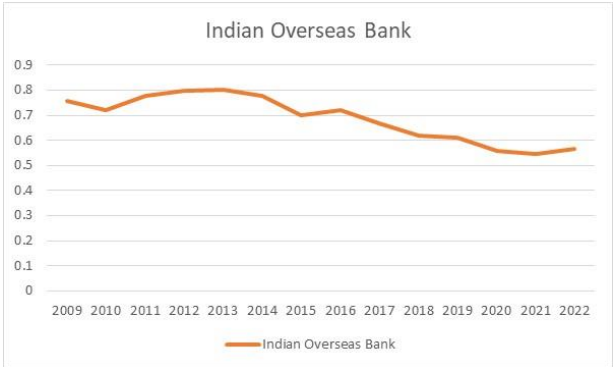


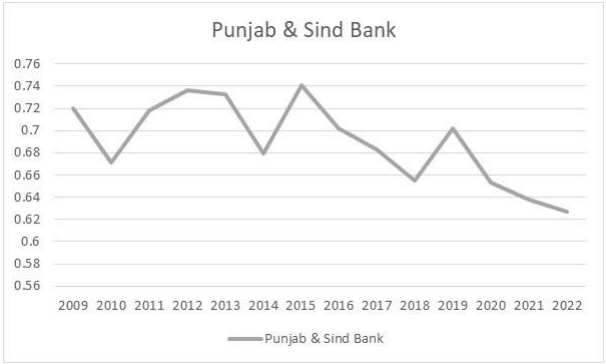


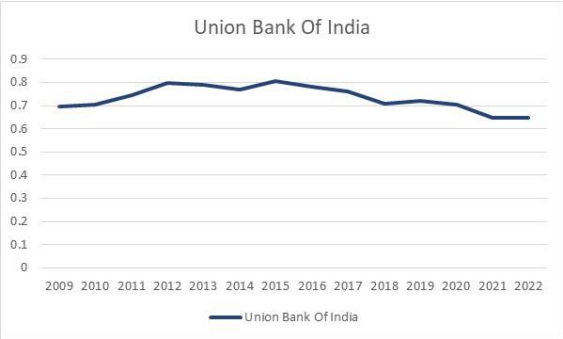


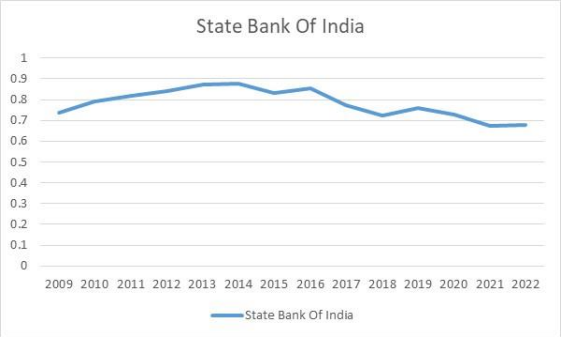


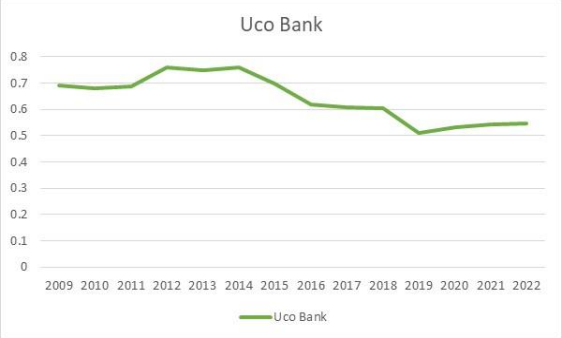


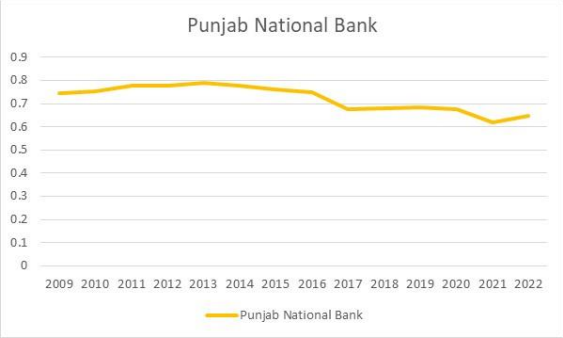








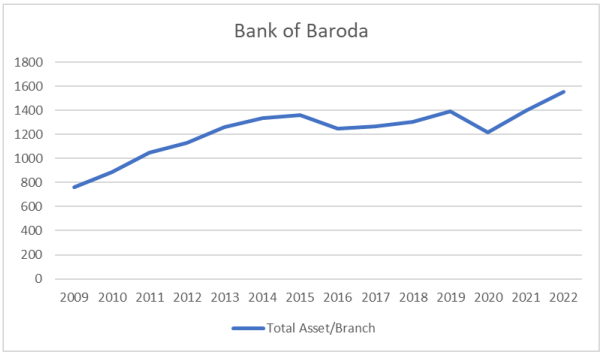


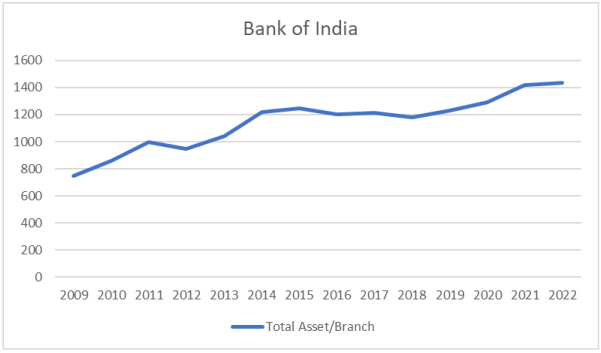


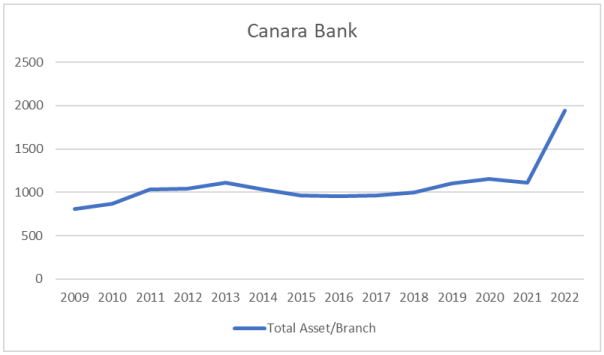
Insights

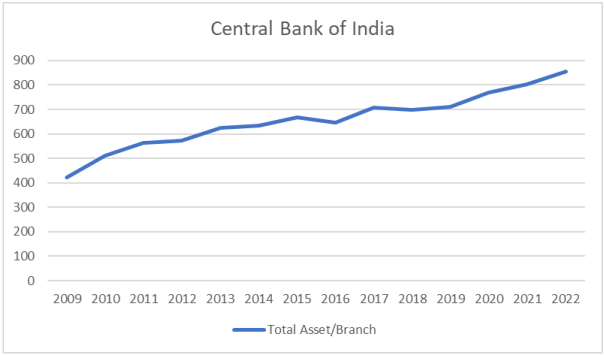
1. Liquidity ratio here is defined by: Loans/Deposit
2. Most banks' liquidity is dwindling over time.
3. In recent years, India's public sector banks have suffered liquidity issues as a result of an increase in non-performing assets (NPAs) or bad loans, which has harmed their profitability and capital adequacy ratios.
4. The Government of India (GOI) has announced respective measures to tackle the liquidity issues faced by these banks, including capital infusions and reforms to improve their governance and management.
5. The LCR framework expects banks to hold a minimum close of high-quality liquid assets (HQLAs) that can be easily converted into cash during a stress scenario. This framework is aimed at ensuring that banks have sufficient liquidity buffers to meet their short-term funding needs and avoid a liquidity crisis.
6. The government has also implemented other measures to improve these banks' liquidity, including the granting of a credit line from the RBI and the implementation of a liquidity coverage ratio (LCR) framework.
7. The government suggested the acquisition with multiple public sector banks in August 2019 in order to establish larger, stronger institutions with superior economies of scale and risk management skills.

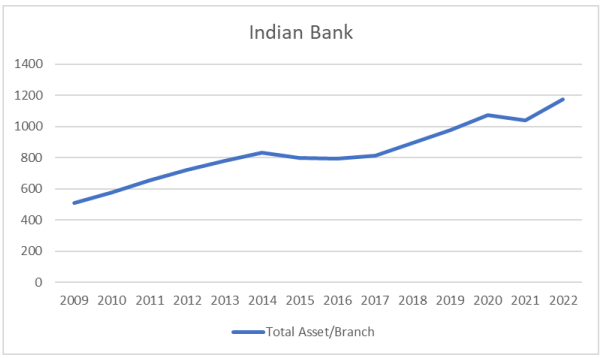
TOTAL ASSETS/ BRANCH

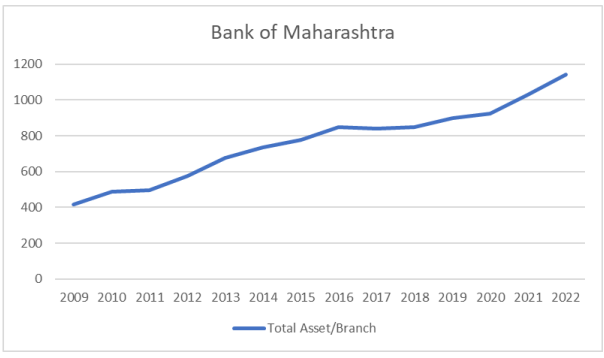


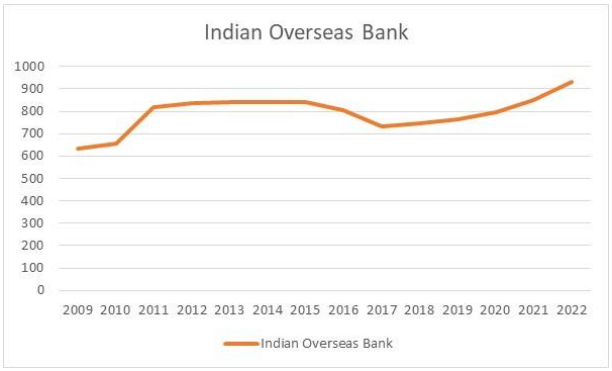


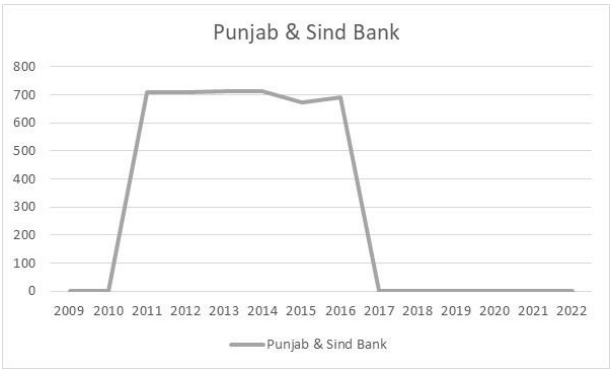


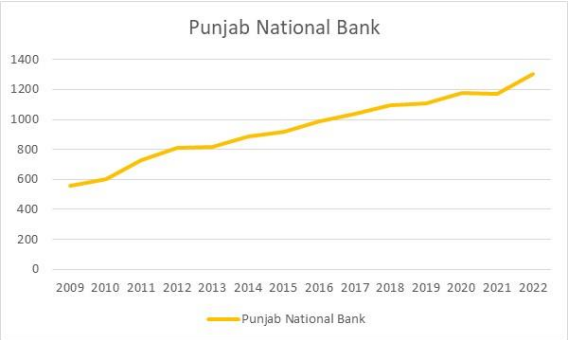


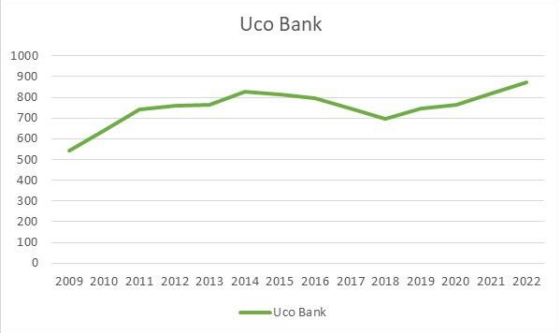


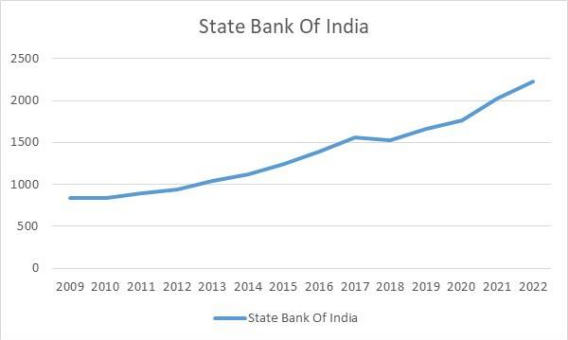


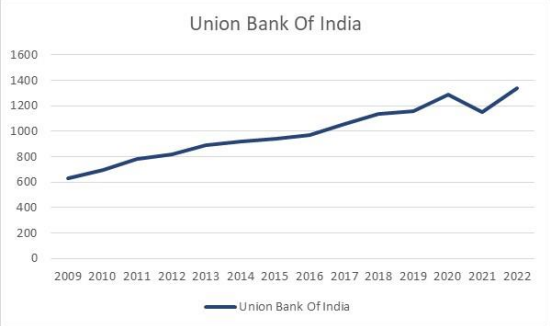










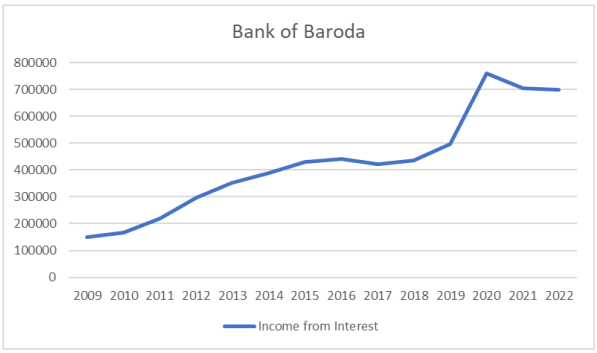


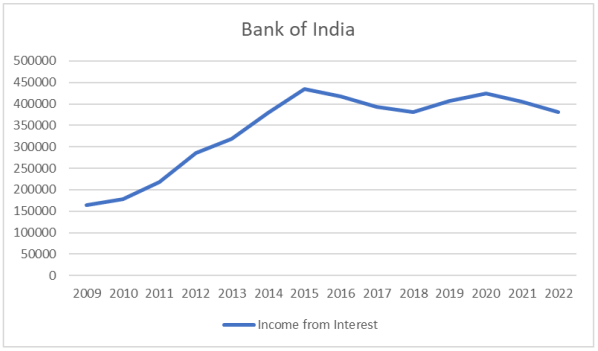
Insights

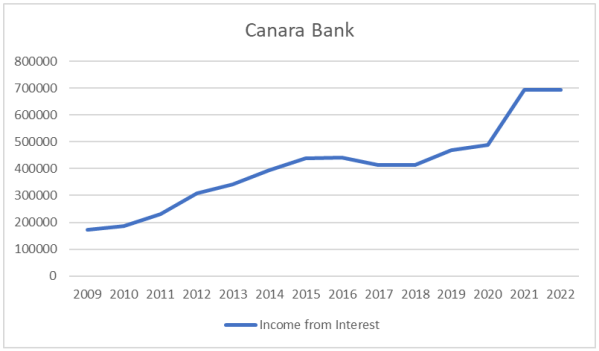
1. Total assets per branch is on a rise with time.
2. There are several reasons why public sector banks' assets are rising in India. Some of the key factors are:
    a. Government initiatives: The government of India has launched a number of creativities to boost the banking sector in the country, including the Atal Pension Yojana, the Pradhan Mantri Jan Dhan Yojana, and the MUDRA Yojana. Because of these initiatives, the number of bank accounts has increased and loans, leading to a rise in assets for public sector banks.
    b. Economic growth: India has been undergoing significant financially viable growth throughout the past few years, which has resulted in increased demand for credit and loans. Public sector banks have been able to capitalize on this trend by expanding their lending activities and increasing their assets.
    c. Consolidation and mergers: The Indian government has undertaken several measures to consolidate the banking sector in the country. This has included merging several public sector banks to create larger and more efficient entities. The assets of public sector banks have grown considerably as a result of these mergers.

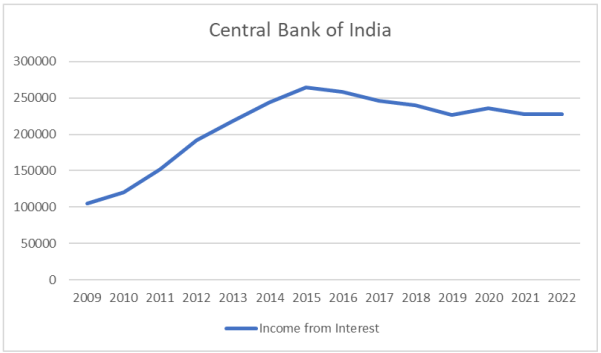
d. Digitalization: PSBs (Public sector banks) have been investing heavily in digitalization to enhance their services and reach more customers. This has resulted in increased efficiency and productivity, which has contributed to the rise in assets.

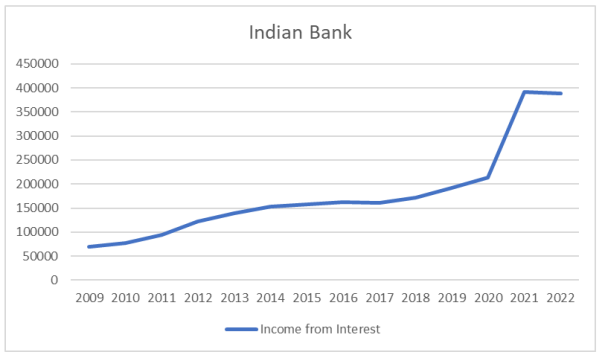
INCOME FROM INTEREST

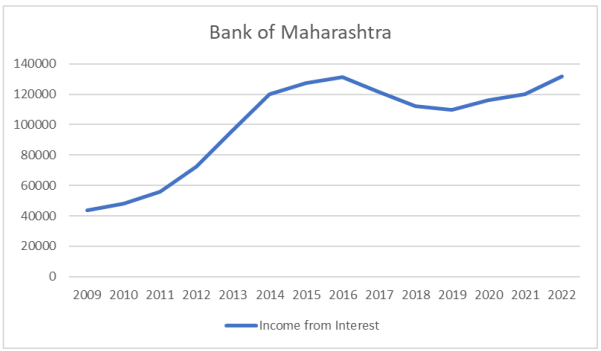


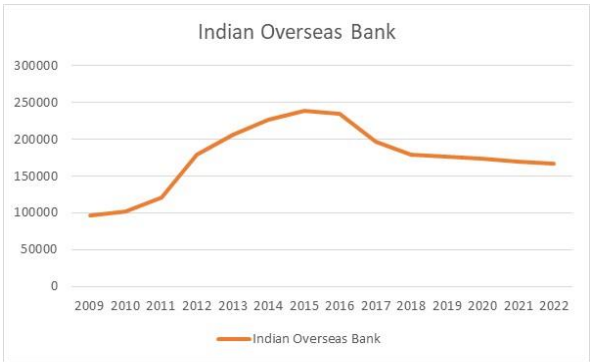


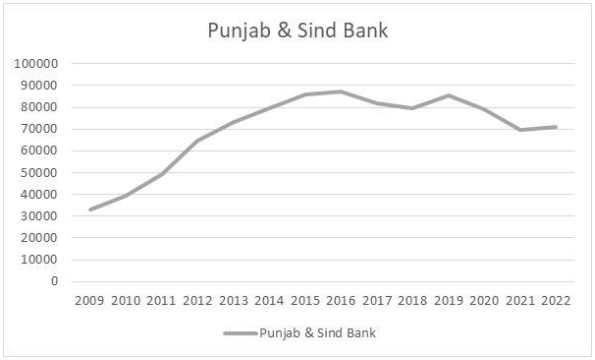


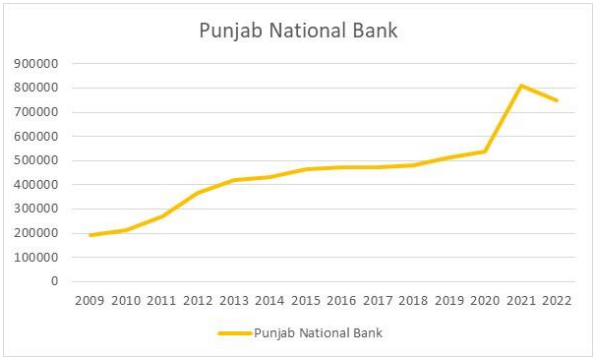


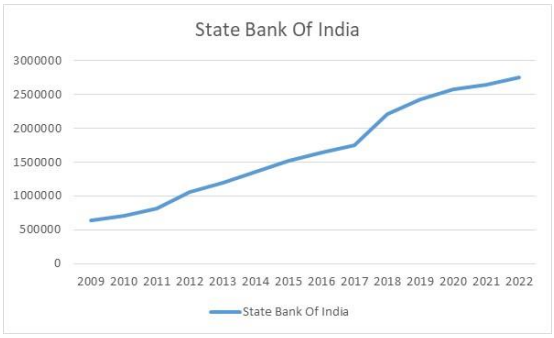


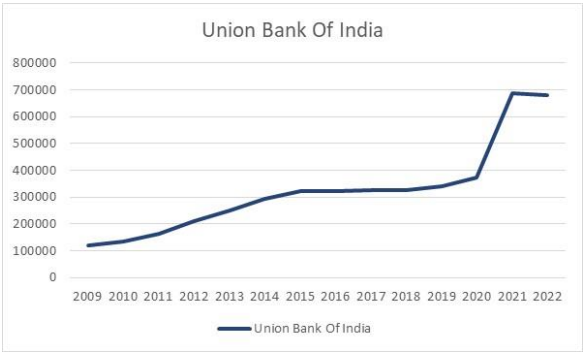


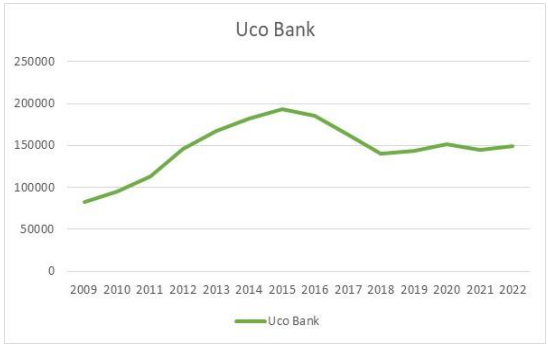












Insights

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1. Government initiatives: The Indian government has launched various creativities to boost the banking sector in the country, including the MUDRA Yojana, the Pradhan Mantri Jan Dhan Yojana, and the Atal Pension Yojana. These proposals have assisted to expansion the total of bank accounts and loans, leading to a rise in assets for public sector banks.
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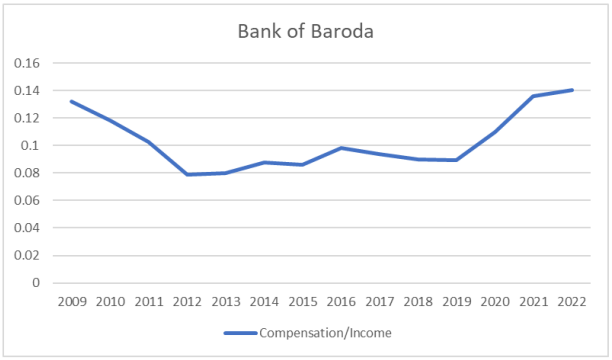
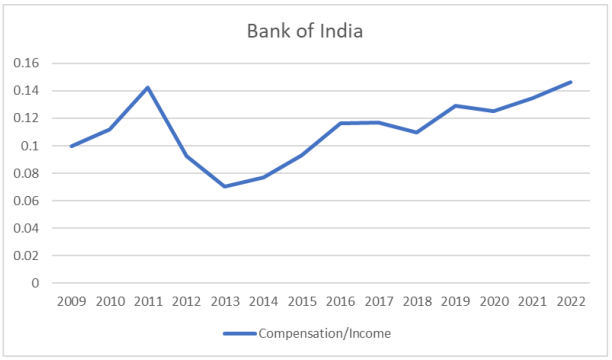
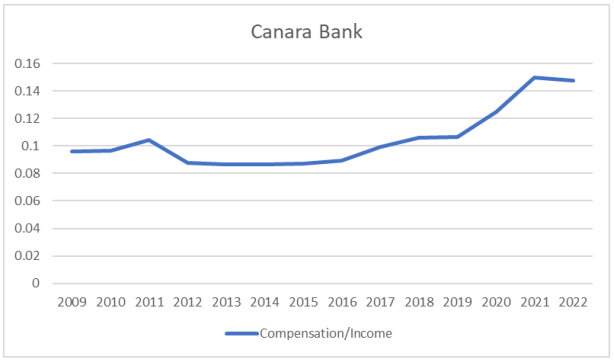
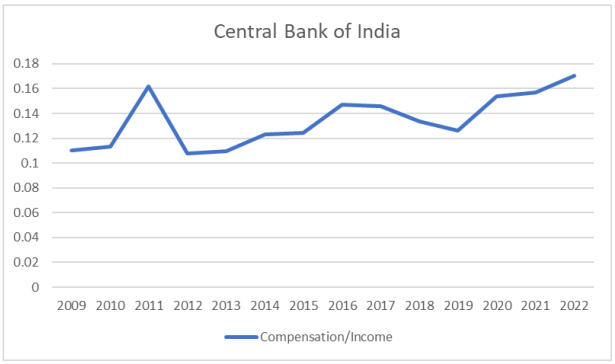
4. Digitalization: Public sector banks (PSBs) have been investing heavily in digitalization to enhance their services and reach more customers. This has resulted in increased efficiency and productivity, which has contributed to the rise in assets.

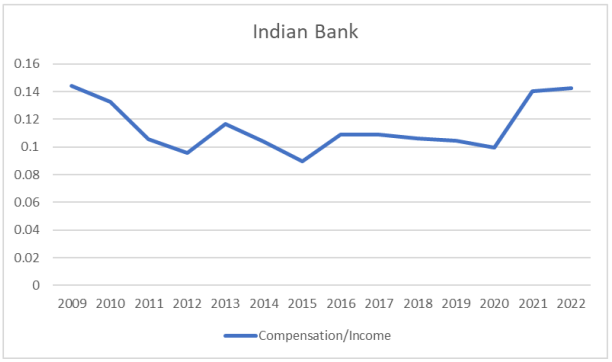
COMPENSATION/INCOME

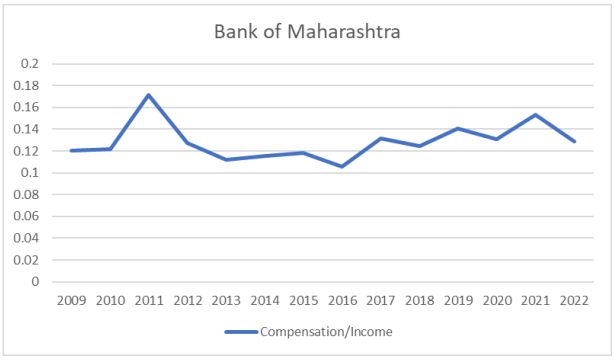


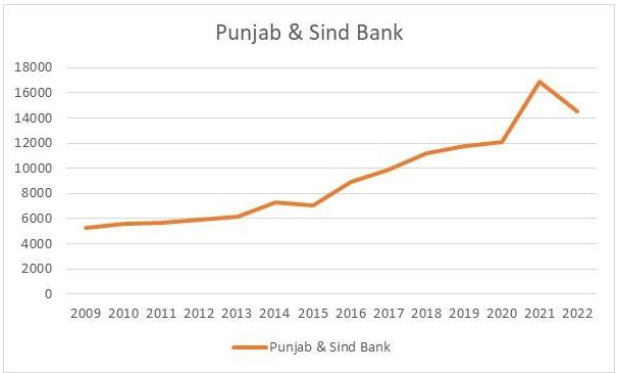


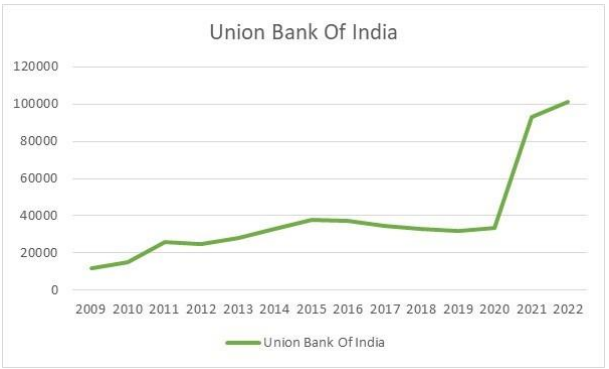


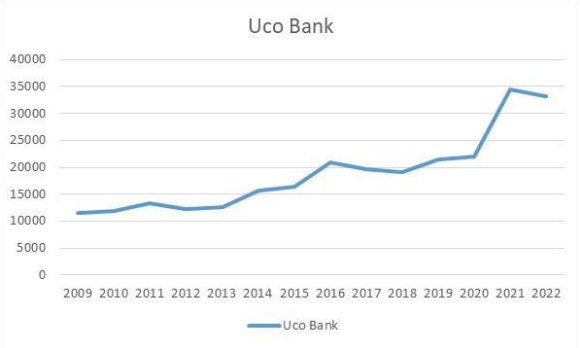


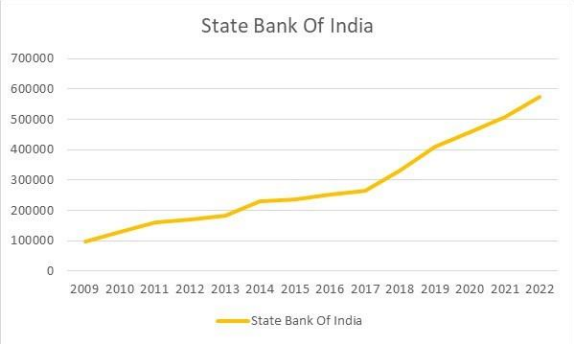


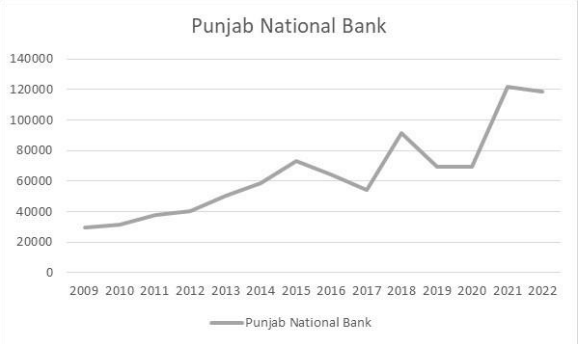


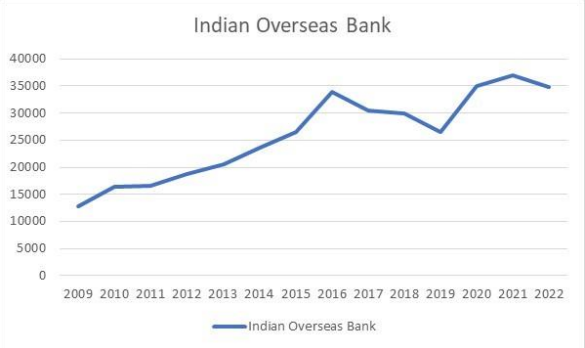








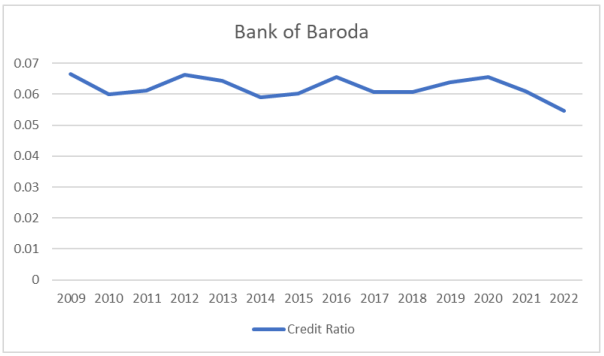


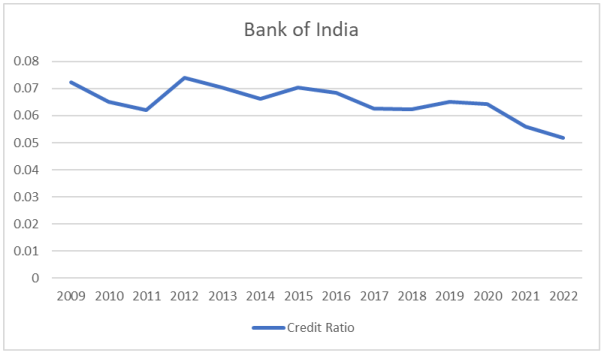


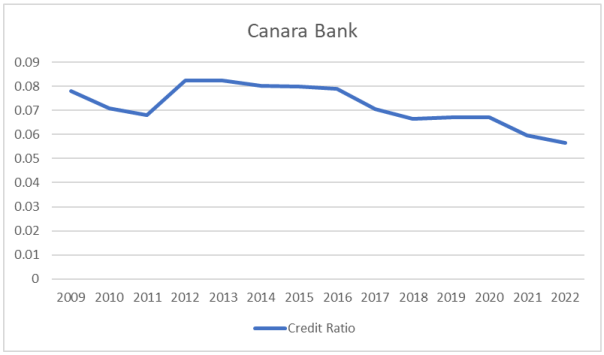
Insights

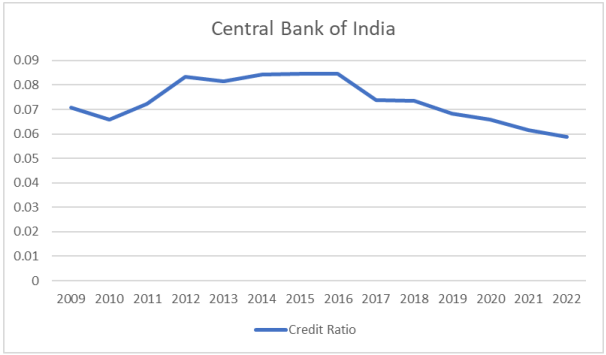
1. Employee compensation as a proportion of total income in India fluctuates depending on numerous criteria such as the size of the bank, the number of employees, and the level of profitability.
2. As per the latest available data, the total employee expenses, including salaries, allowances, and other benefits, for public sector banks in India ranged from around 10% to 15% of their total income for the fiscal year 2020-21. However, it is important to note that this percentage can vary significantly depending on the size and profitability of the bank.
3. It is also worth noting that employee expenses in public sector banks are subject to regulatory oversight and are generally governed by the Bipartite Settlements, which are agreements reached between bank management and employee unions. The compensation paid to employees is usually reviewed and adjusted periodically through these agreements.
4. As of the 11th Bipartite Settlement in 2020, the basic pay for a clerk in a public sector bank in India ranges from Rs. 11765 to Rs. 31540 per month, while the basic pay for a probationary officer ranges from Rs. 23700 to Rs. 42020 per month.

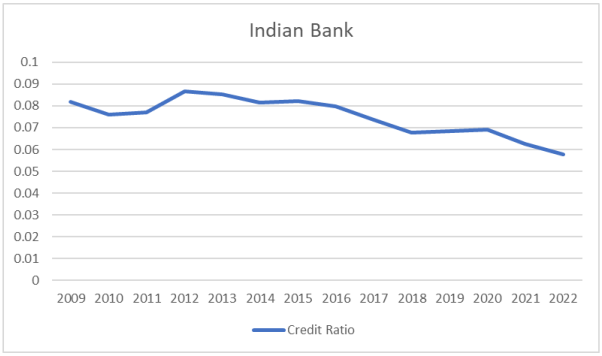
CREDIT RATIO

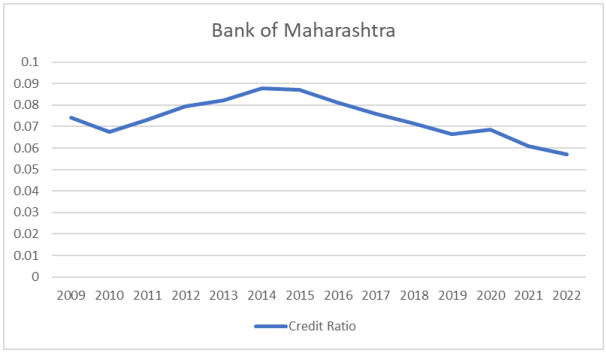


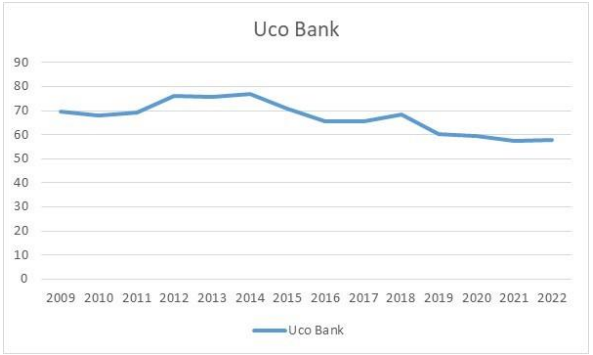


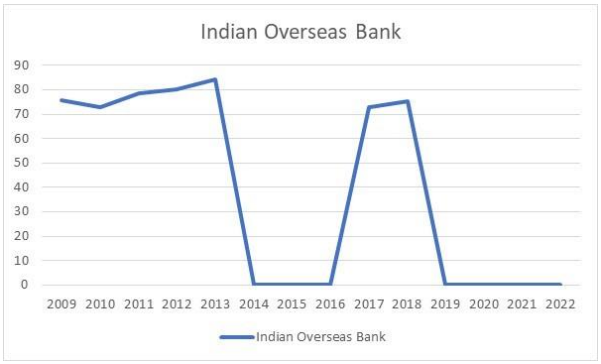


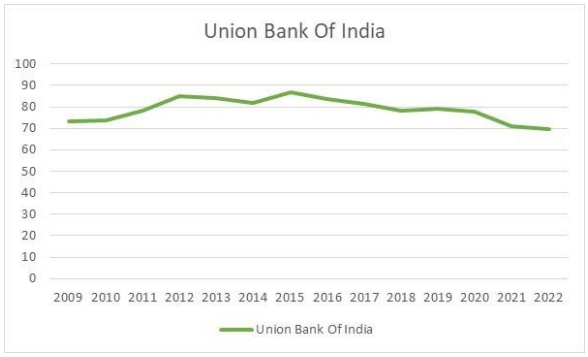


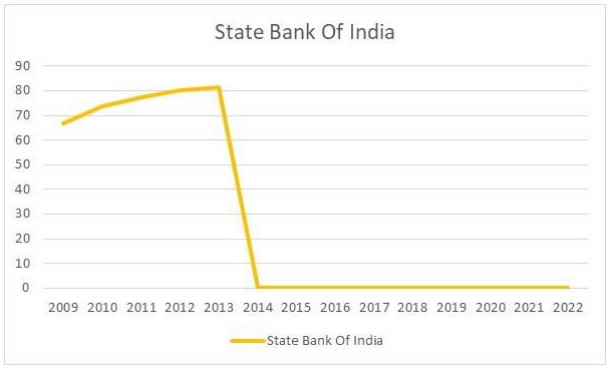


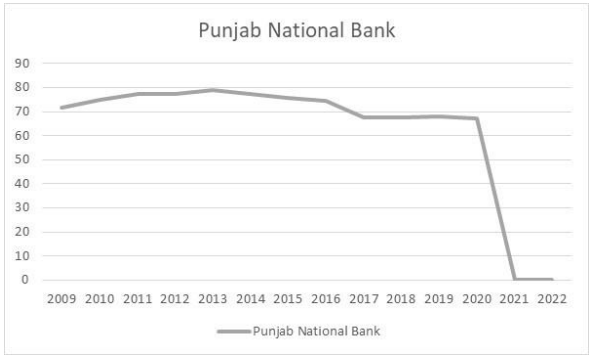










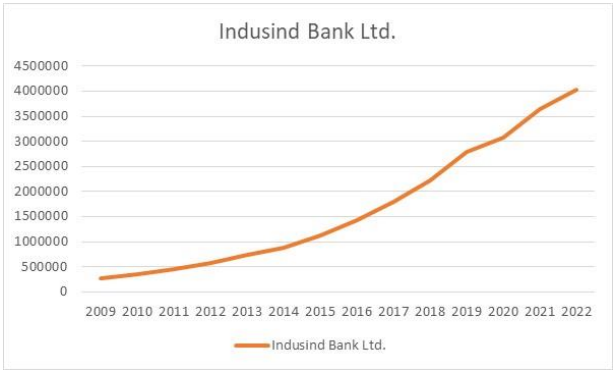


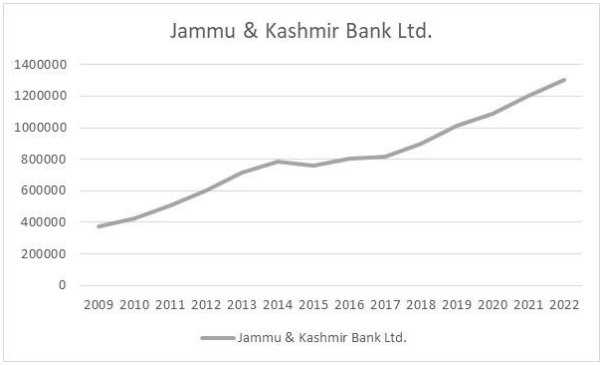
Insights

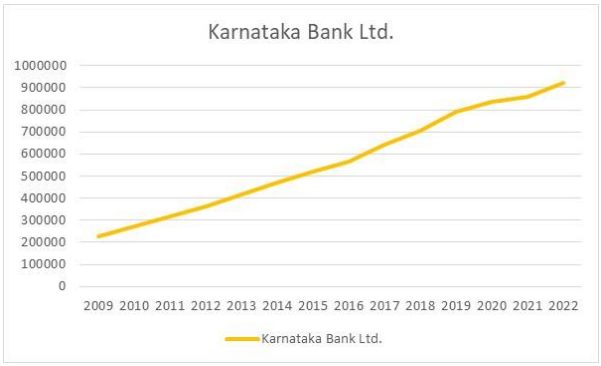
1. In this case, CR denotes interest income as a proportion of total asset.
2. Generally, trend is such that it is decreasing with time.
3. We lack the data of this parameter for Punjab & Sind Bank.
4. Interest income as a ratio of total assets (TA) may be declining due to several reasons, some of which are:
    a. Low interest rates: The low-interest-rate environment is one of the key drivers for the reduction in interest revenue as a ratio of TA. When rates of interest are poor, banks must drop their interest rates on loans and advances, resulting in fewer interest income.
    b. An upsurge in non-interest income: A rise in non-interest income is another explanation for the reduction in interest income as a percentage of total assets. Banks are diversifying their revenue streams by producing money from a variety of sources, including fee-based income, commission income, and other non-interest income.
    c. Shift in loan portfolio mix: Banks may have shifted their loan portfolio mix from higher-yielding loans such as corporate loans to lower-yielding loans such as retail loans. This shift may have resulted in a decline in the overall interest income as a ratio of TA.

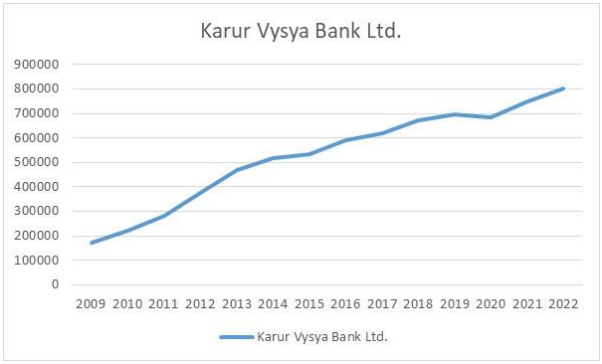
Private Sector Bank Analysis

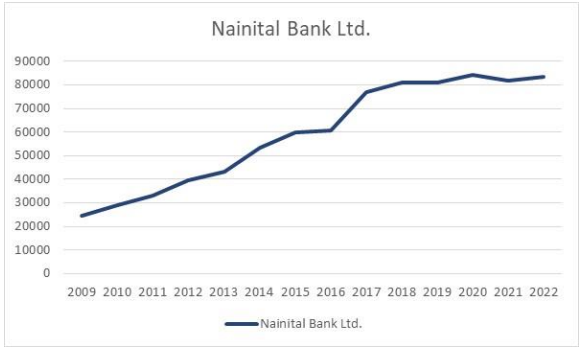
Total Assets:

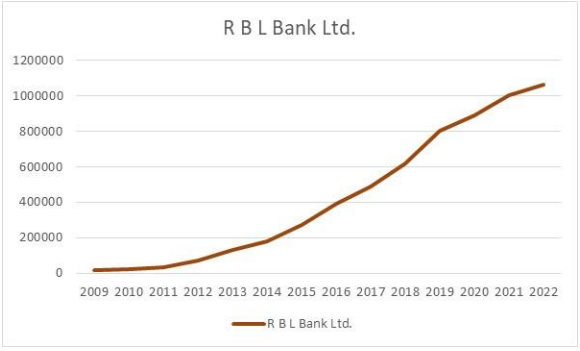


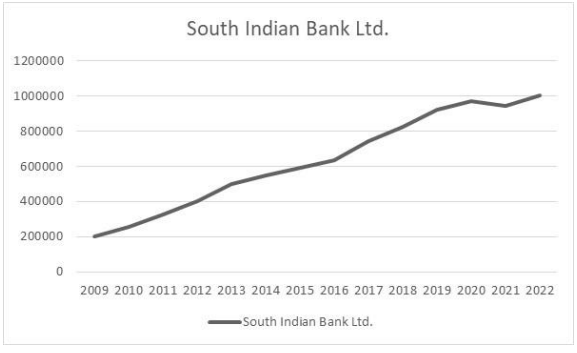


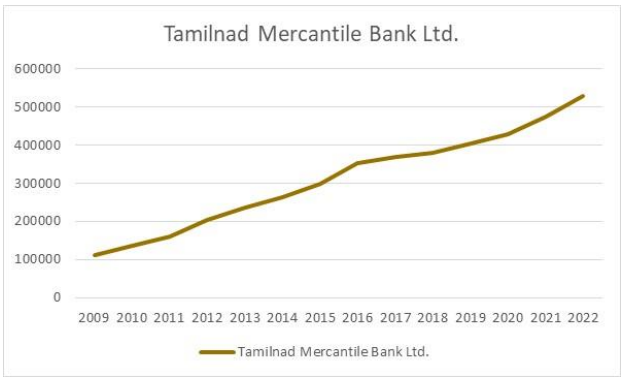








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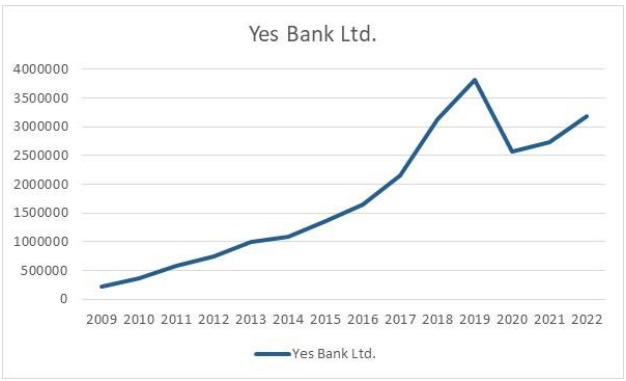
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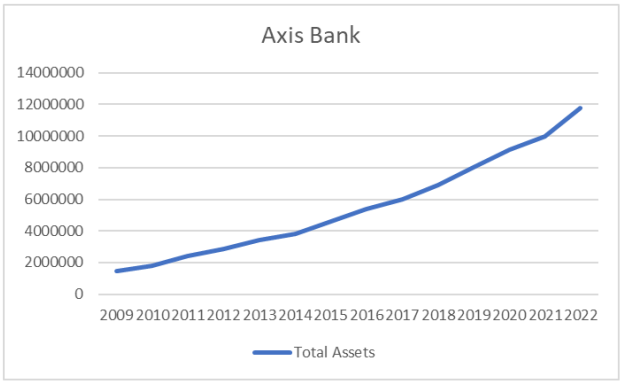
Yes Bank Ltd.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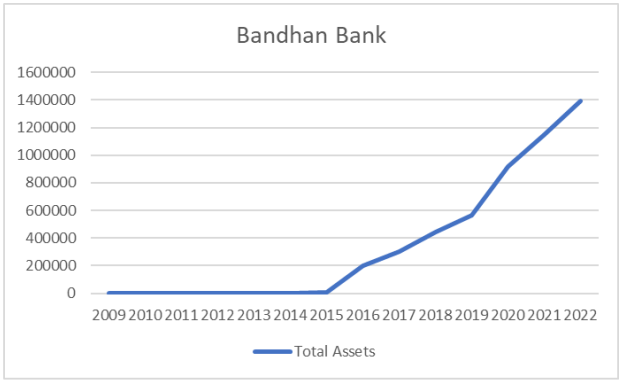
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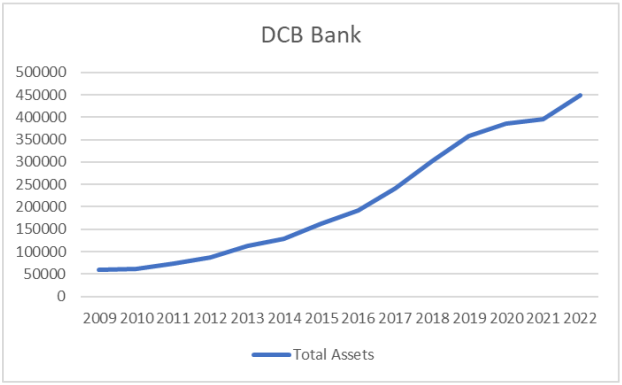
Total Assets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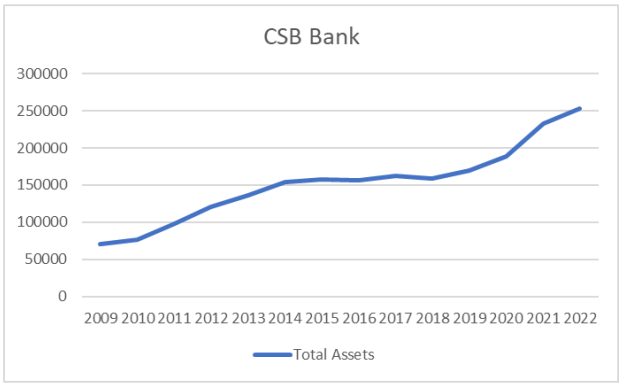
Total Assets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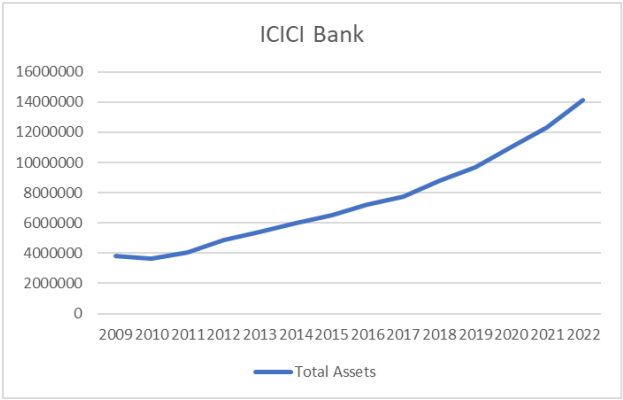
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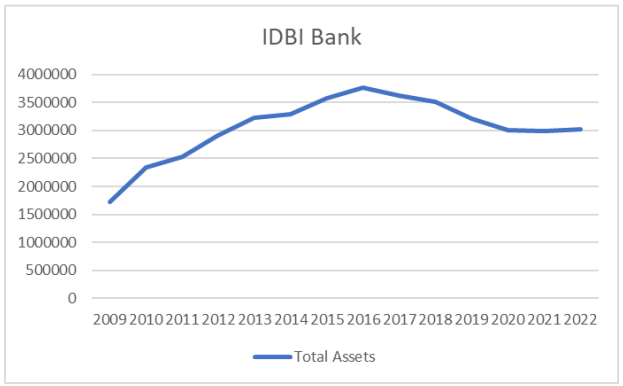
Total Assets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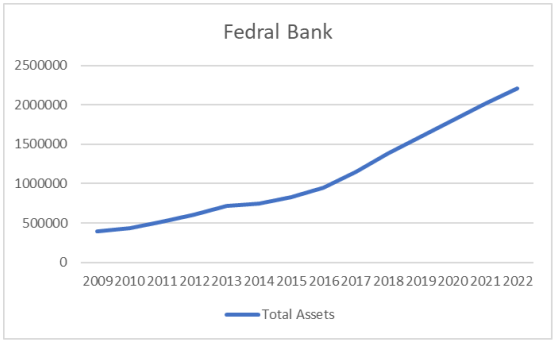
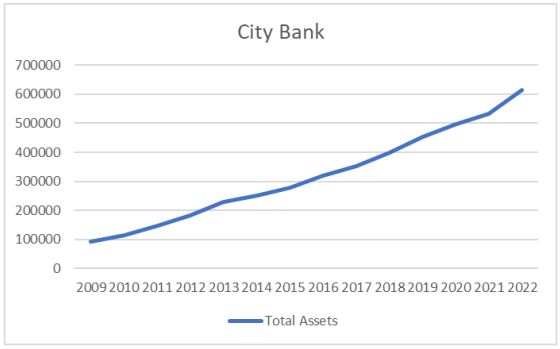
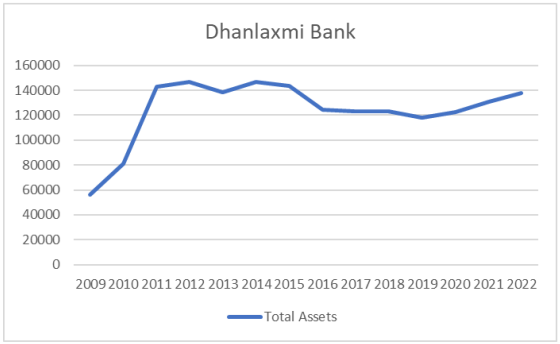
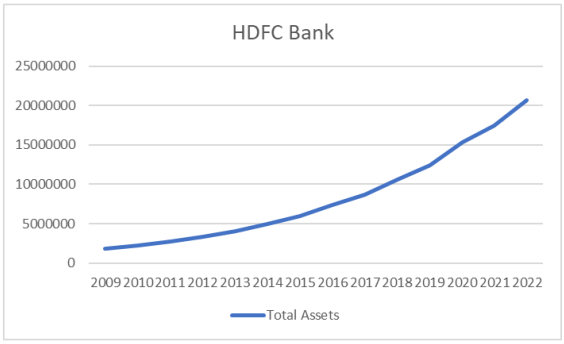
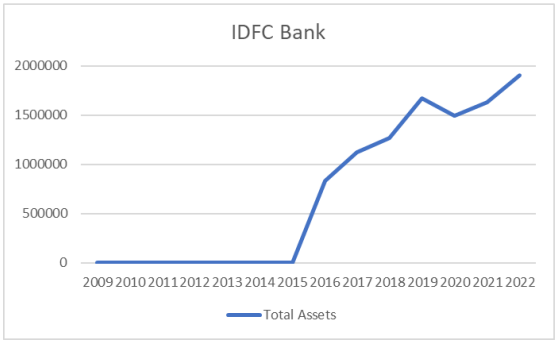
Total Assets







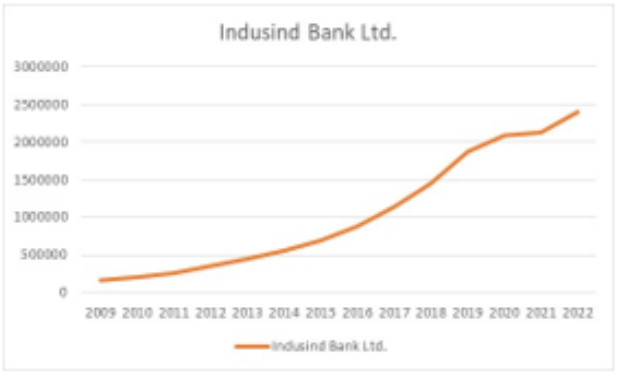


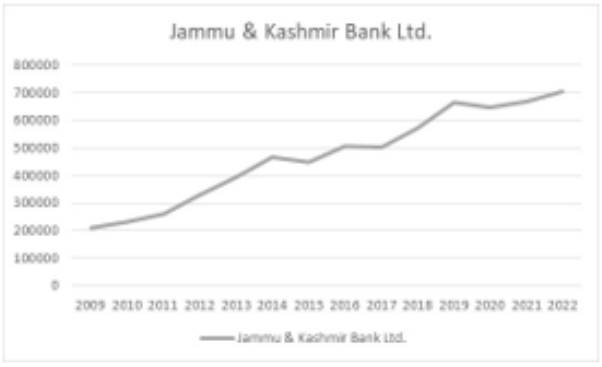


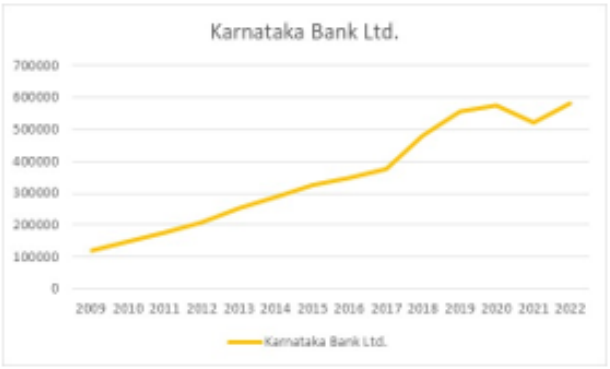
Insights

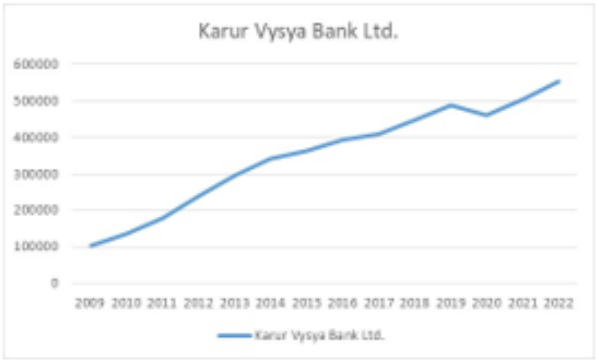
1. Throughout the past decade, private Indian banks' overall assets have grown significantly. The total assets of private sector banks surged by more than 300% from Rs. 24.5 lakh crore in March 2011 to Rs. 100.2 lakh crore in March 2020.T
2. his growth can be ascribed to various causes such as the expansion of branch networks, increasing customer base, rising demand for credit, & new product offerings.
3. IDBI Bank & Dhan Laxmi Bank, total assets have shown a mixed trend over the past decade, The bank's total assets witnessed significant growth till 2015 and then it started decreasing.
4. The decline in the bank's total assets can be attributed to various factors such as a intensification in non-performing assets (NPAs), the bank's exposure to stressed sectors such as infrastructure and power, and a slowdown in the Indian economy.

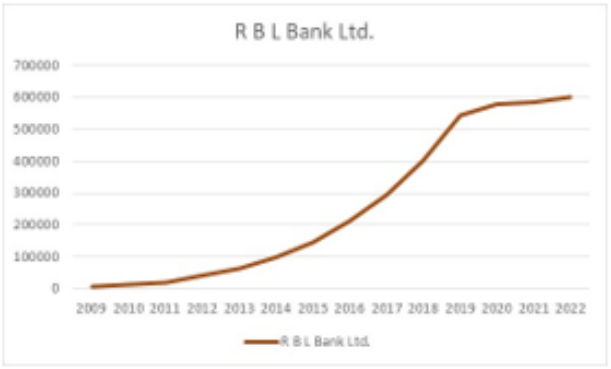
LOANS & ADVANCES

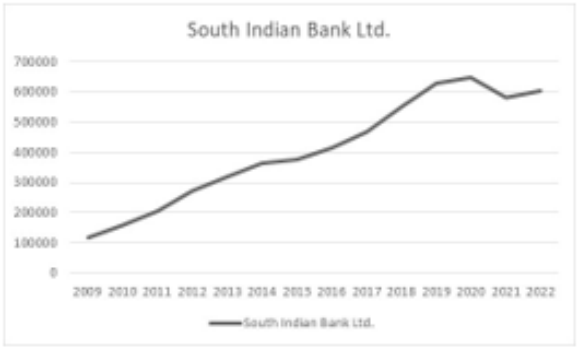


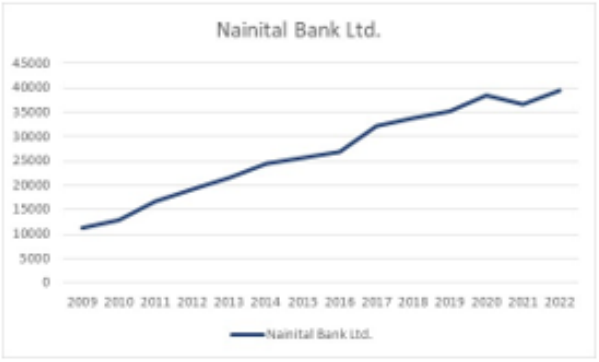


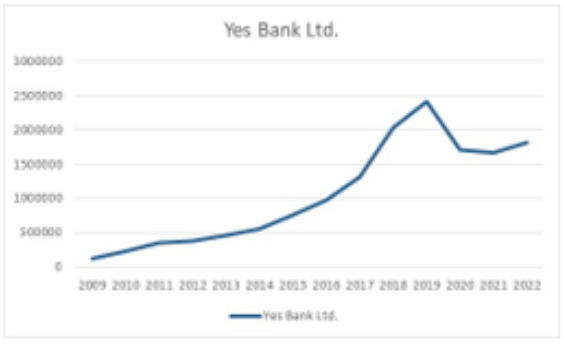


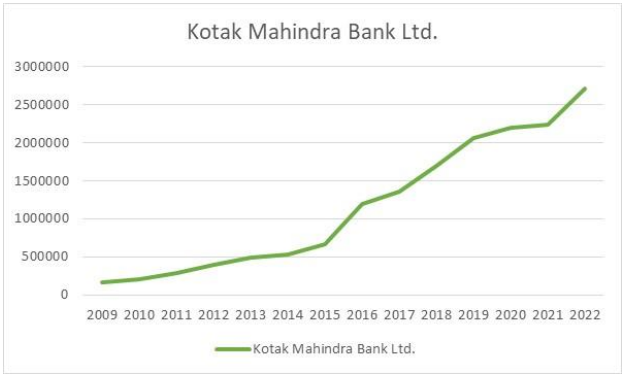








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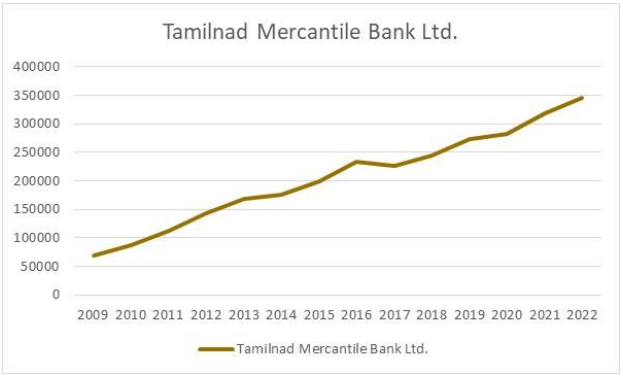
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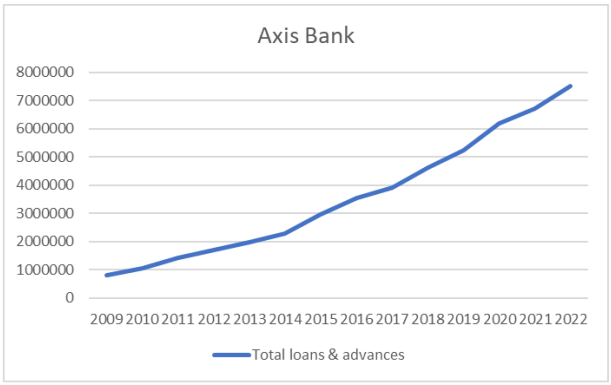
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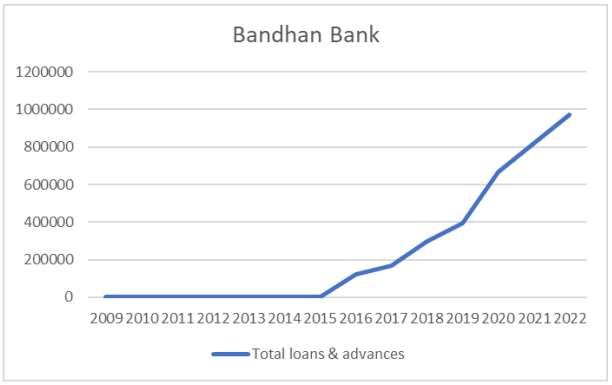
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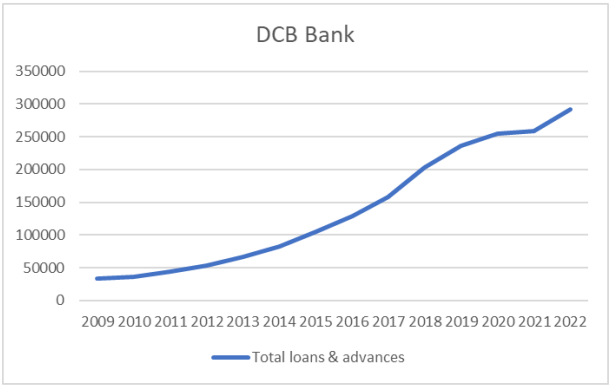
Total loans & advances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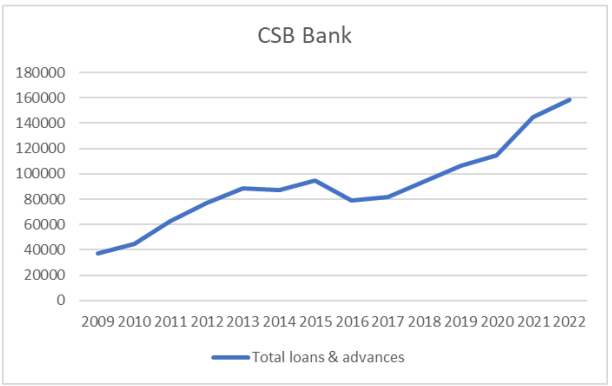
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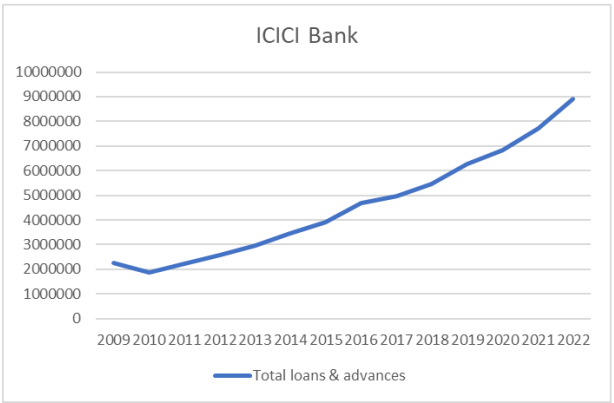
Total loans & advances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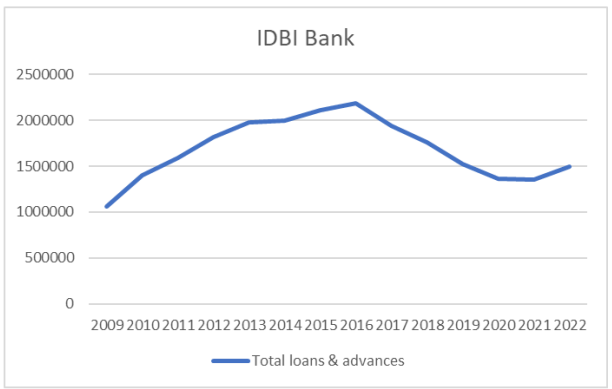
Total loans & advances


IDBI Bank
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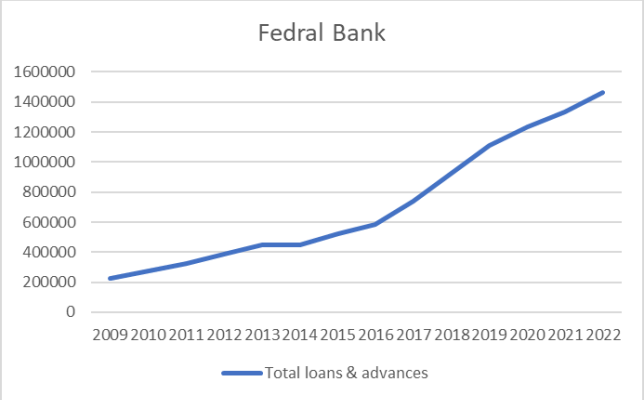
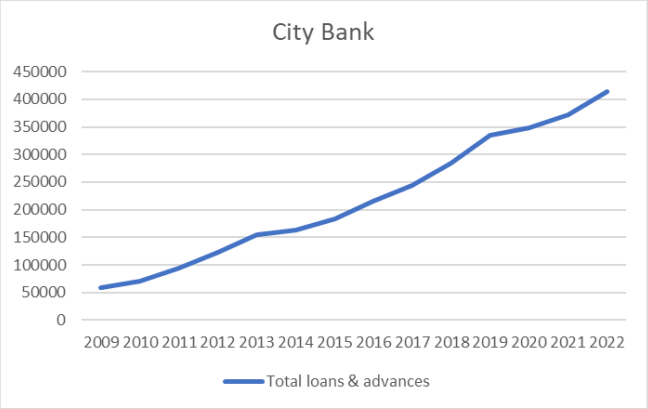
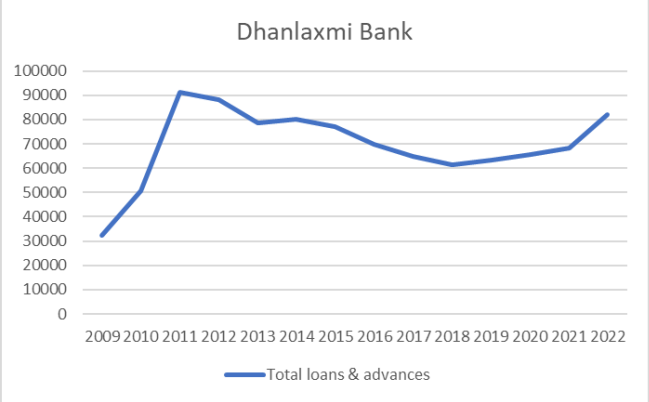
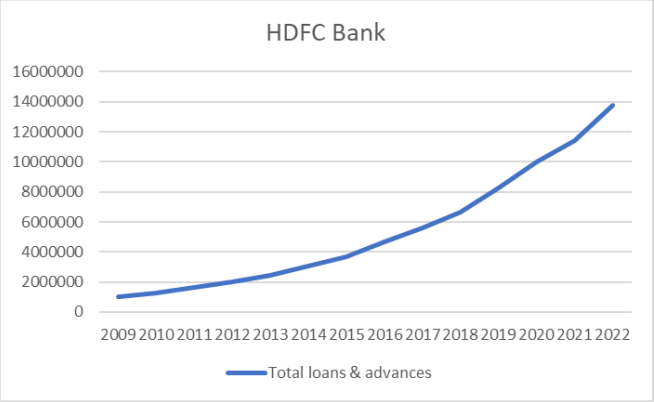
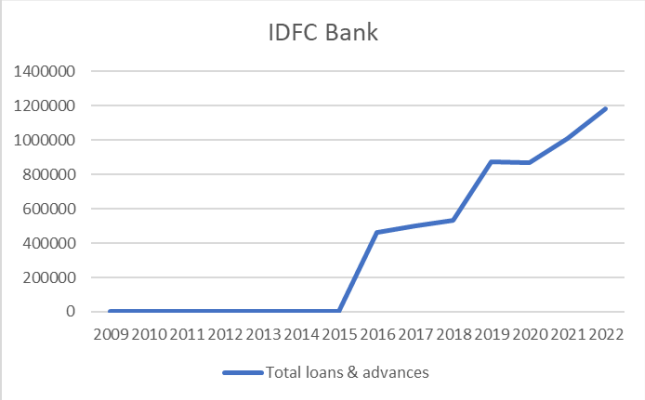
Total loans & advances









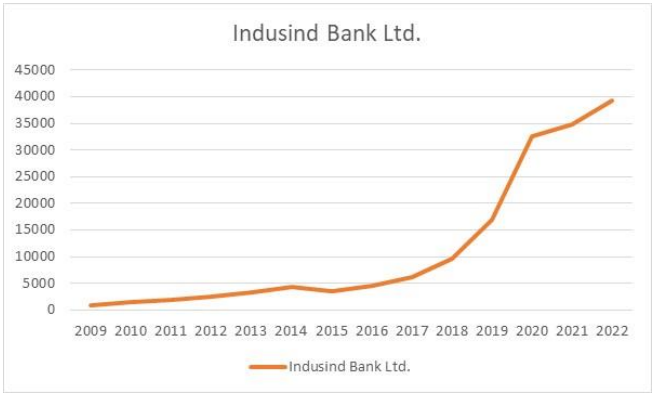


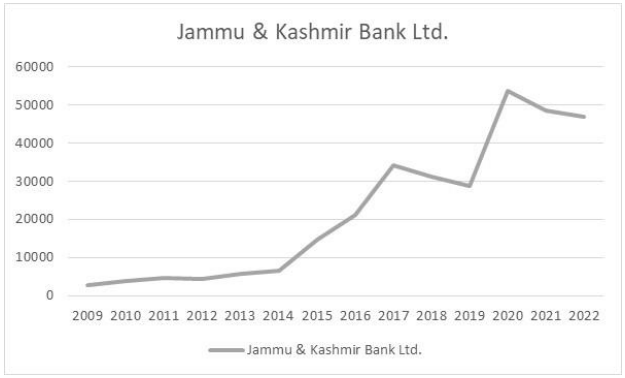
Insights

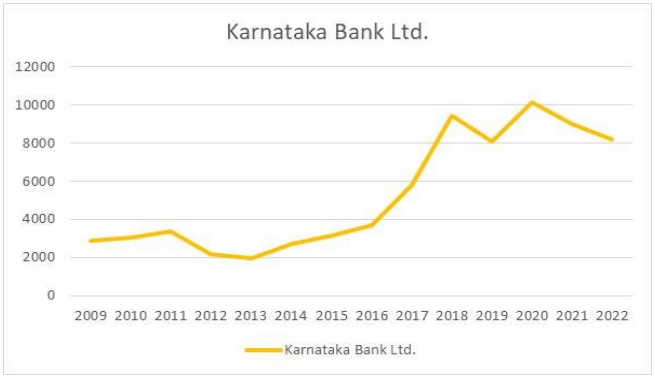
1. In March 2011, the total loans and advances of private sector banks in India were around 22.67 trillion rupees and by March 2021, it had reached around 68.82 trillion rupees, which is almost three times the amount of loans and advances in 2011.
2. Several instances of economic slowdowns, such as the 2008 global financial crisis and the COVID-19 epidemic, have influenced the growth rate of loans and advances for private Indian banks during the last decade.

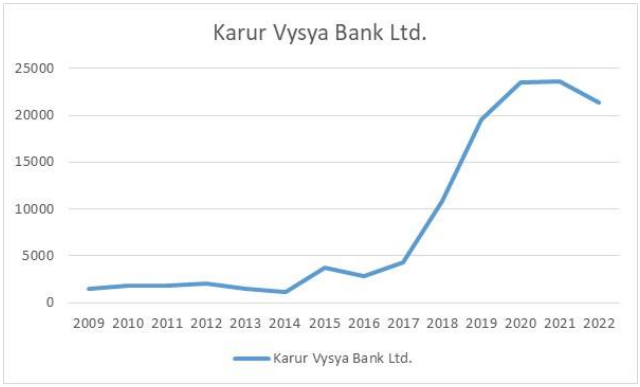
3. IDBI bank and Dhan Laxmi bank has shown mix trend over the past decade. In the starting years it increased and then it started decreasing since 2017.

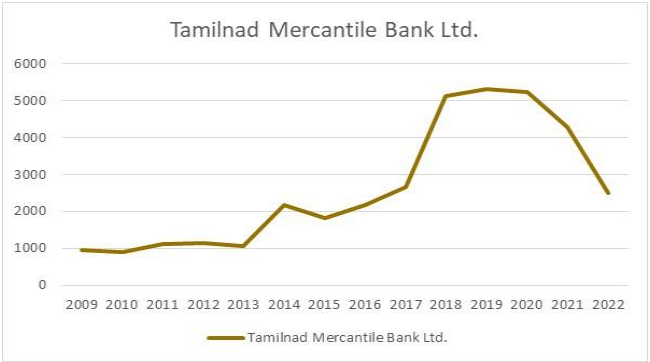
Provisions for NPAs

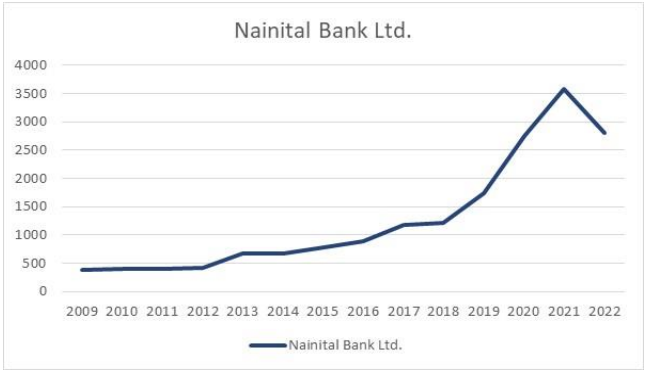


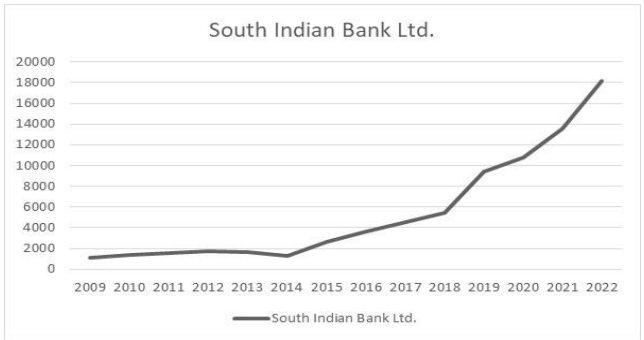


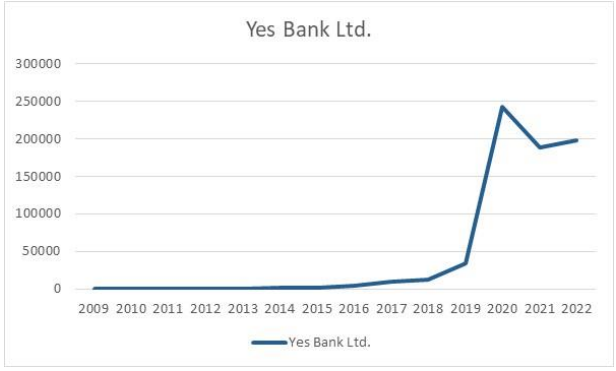


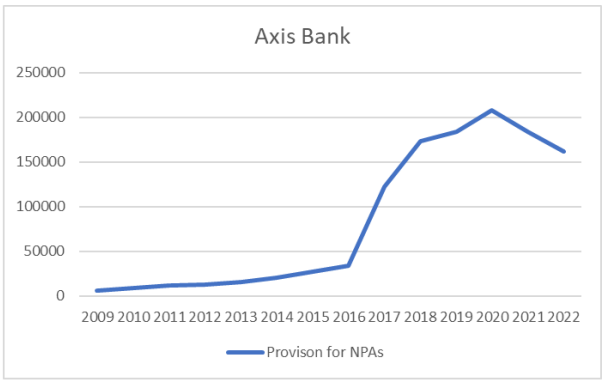











Axis Bank
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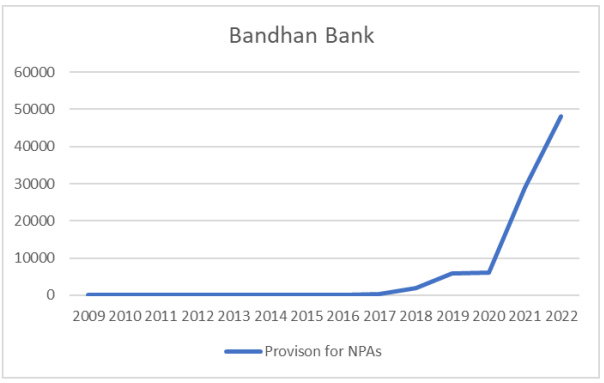
Provison for NPAs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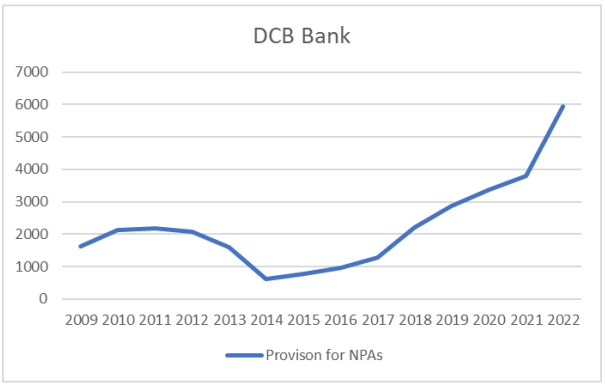
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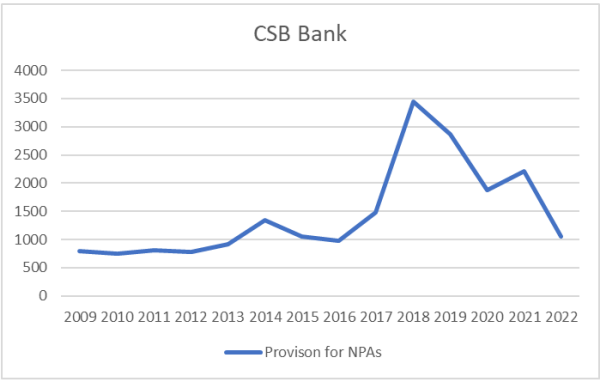
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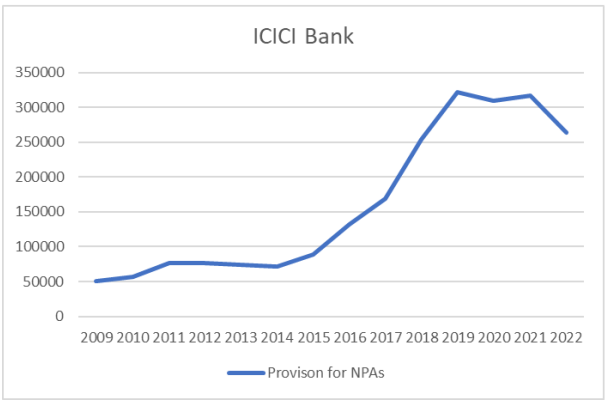
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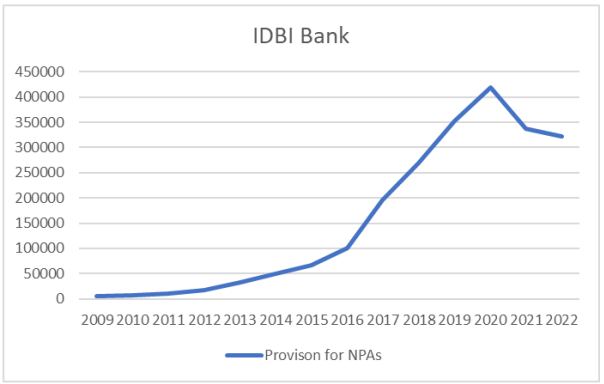
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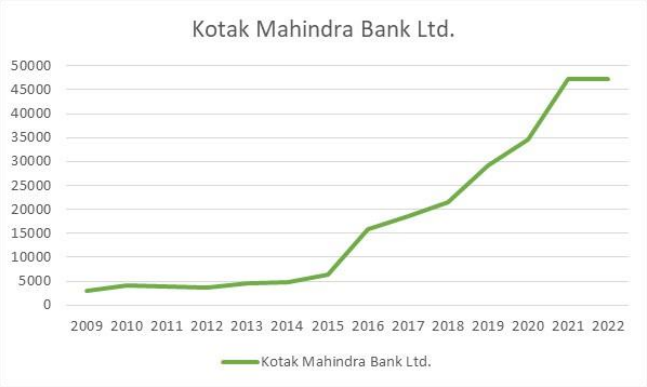
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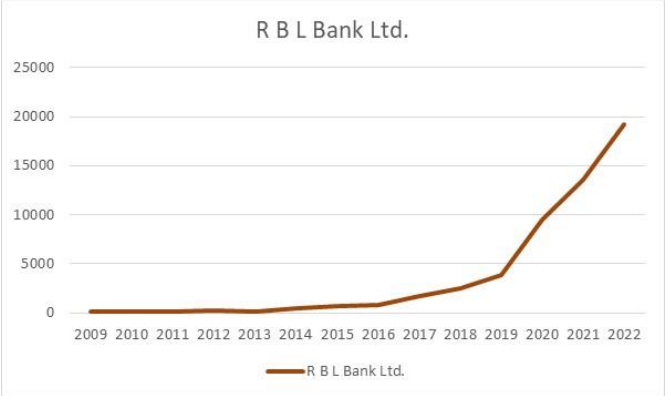
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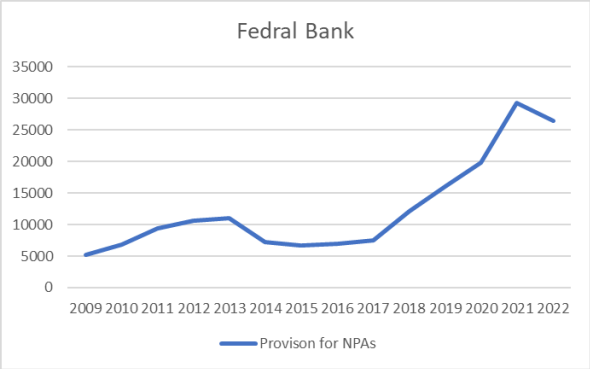
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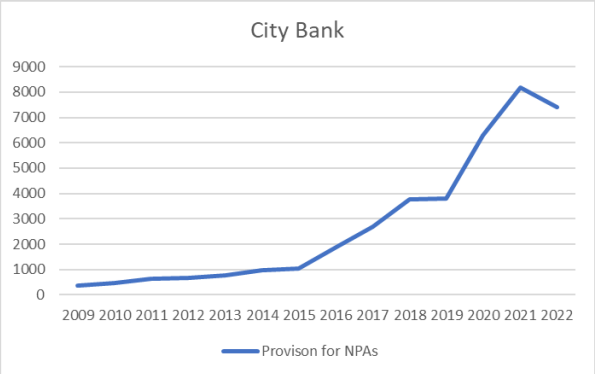
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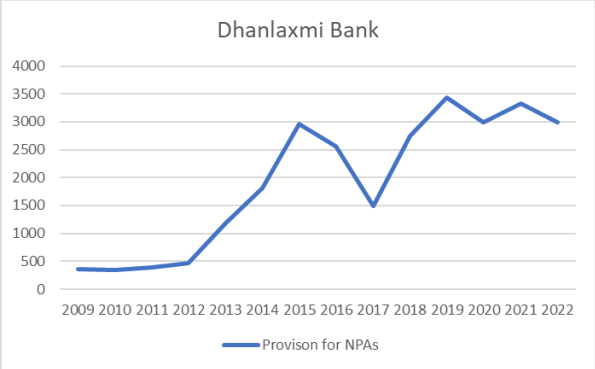
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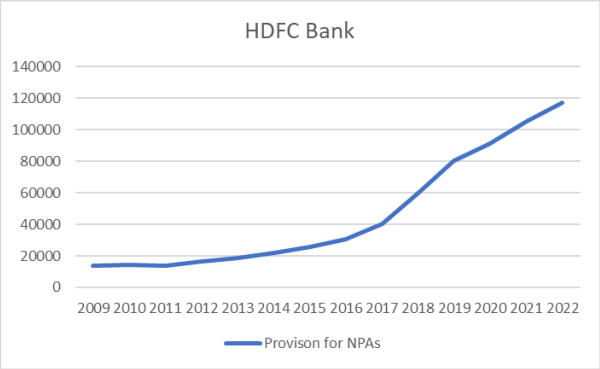
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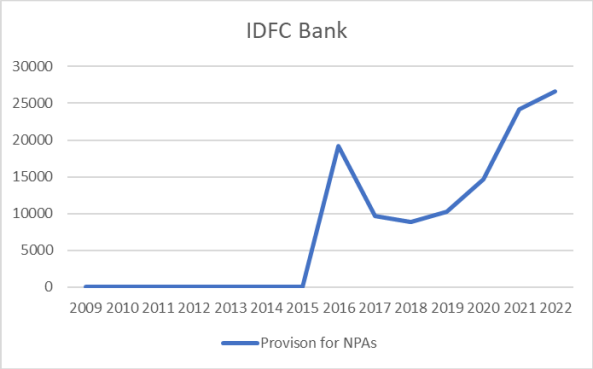
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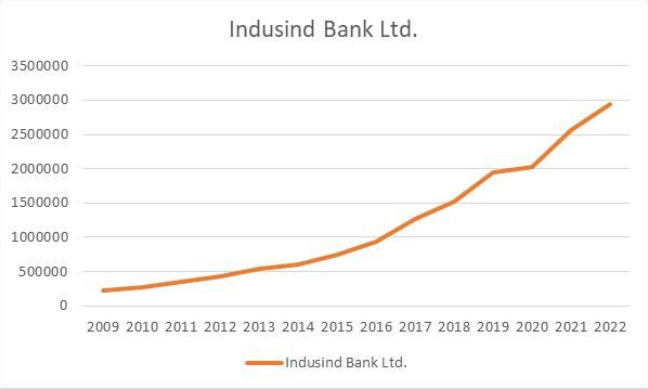
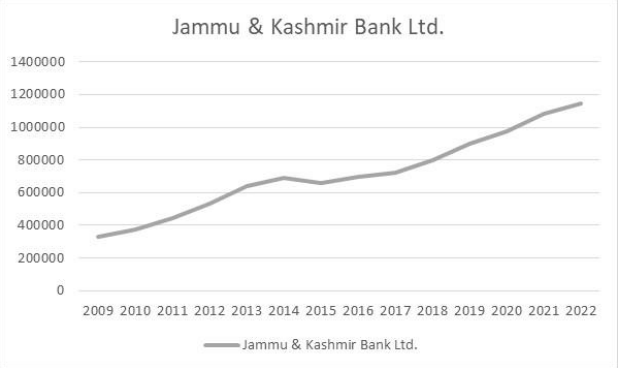
Provison for NPAs

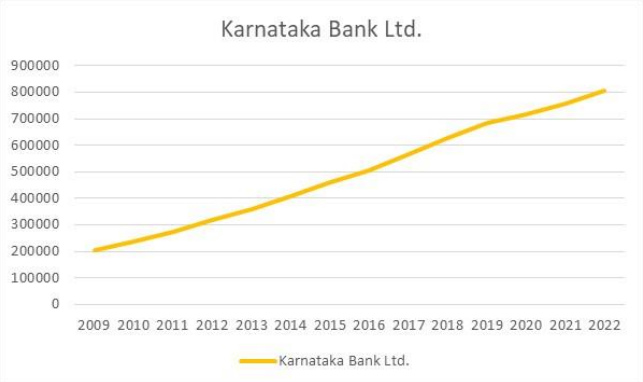
Insights

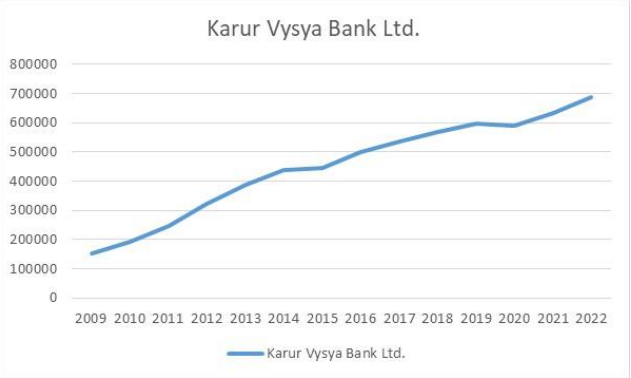
1. The trend of provisions for NPAs in the private banking sector in India has been largely positive over the past few years.
2. Private sector banks in India have been relatively more than capable in managing their NPAs as contrasted to their public sector banks counterparts.
3. The provision coverage ratio (PCR) for private sector banks increased from 73.3% in September 2020 to 75.6% in March 2021.
4. Alongside these regulations are the Insolvency and Bankruptcy Code (IBC) and the Prompt Corrective Action (PCA) framework.
5. As a result of these measures, private sector banks have been making higher provisions for NPAs to improve their asset quality and comply with regulatory requirements.

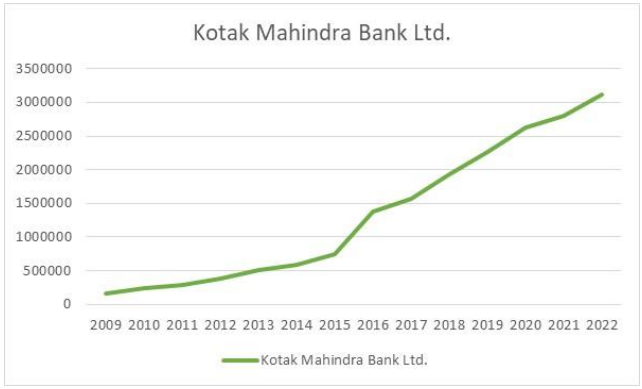
DEPOSITS







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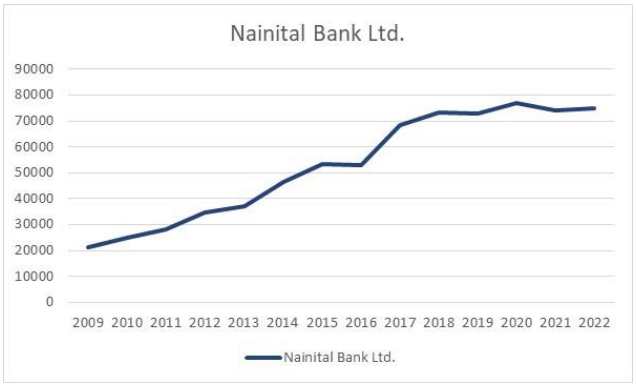
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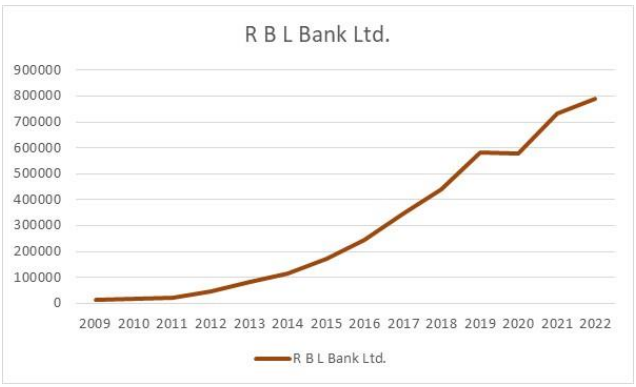
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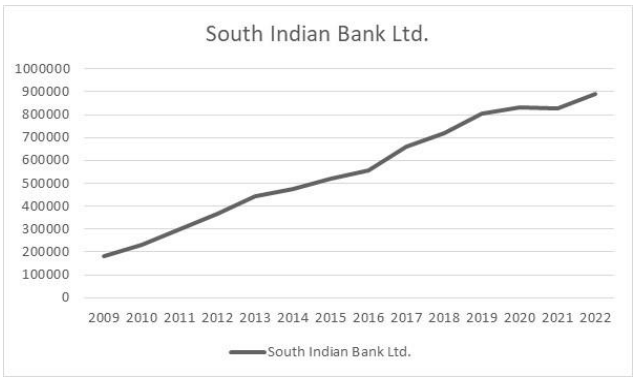
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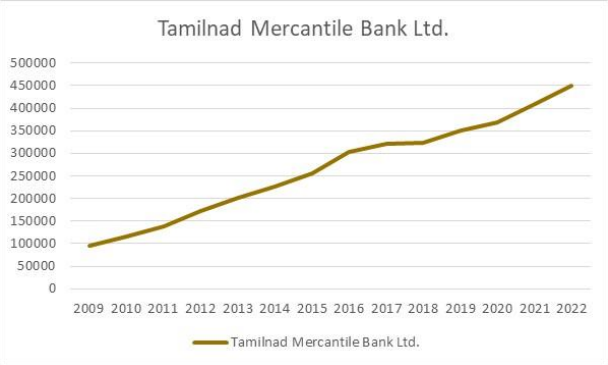
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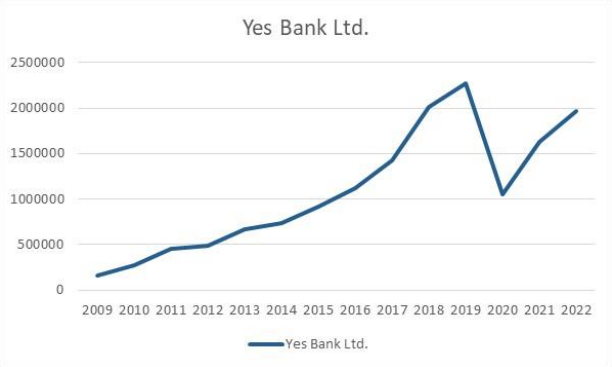
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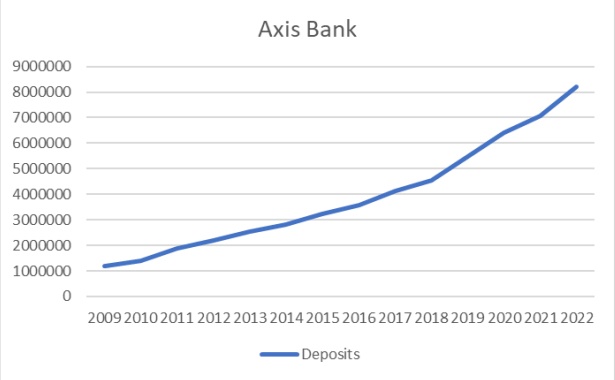
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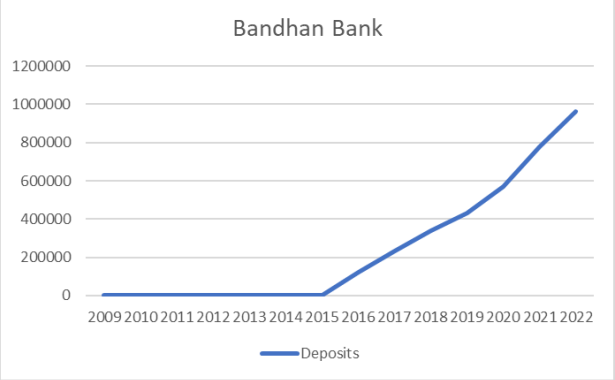
Deposits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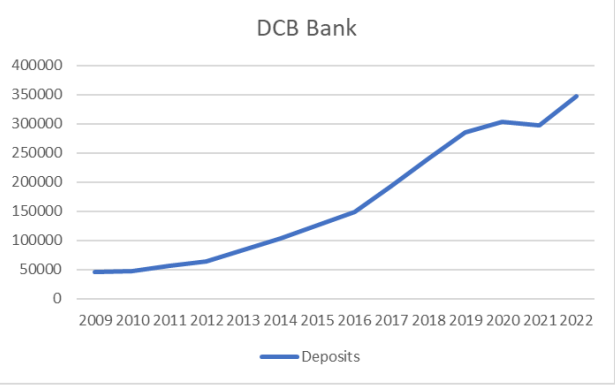
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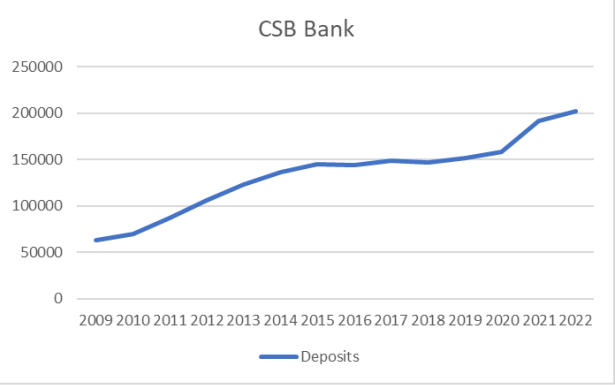
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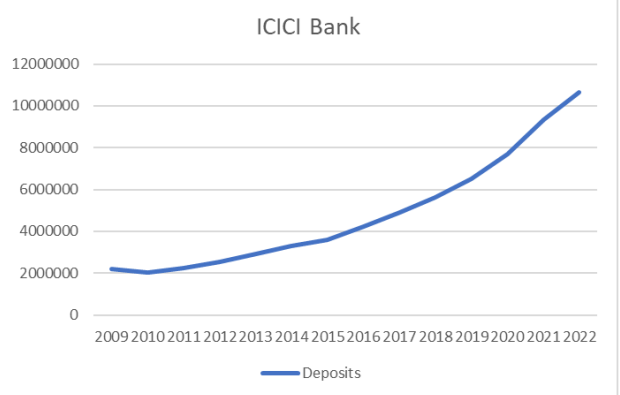
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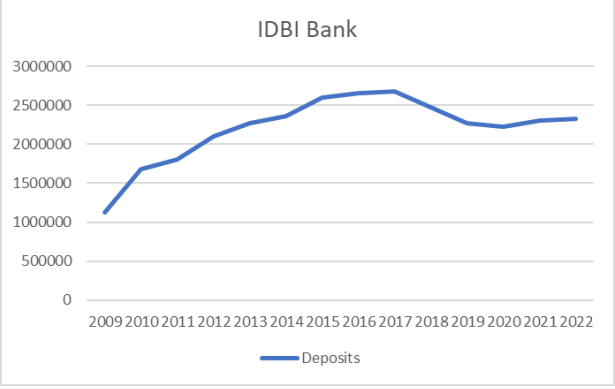
Deposits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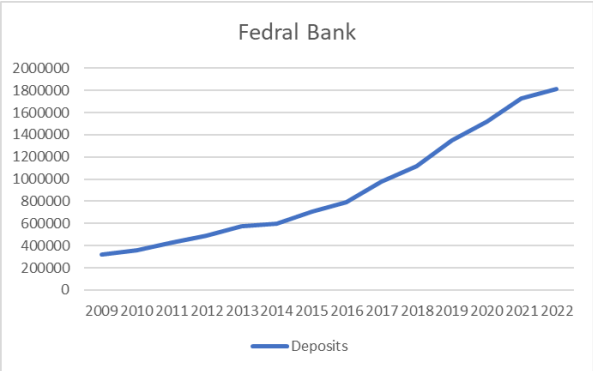
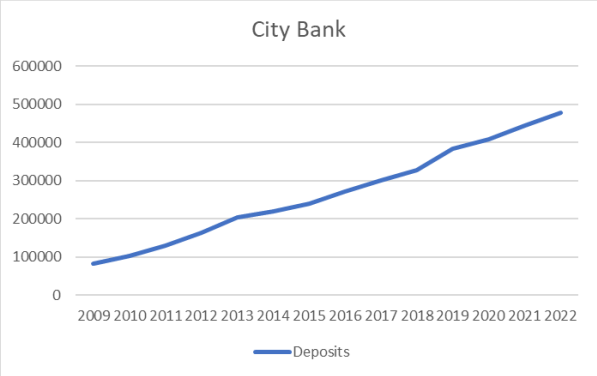
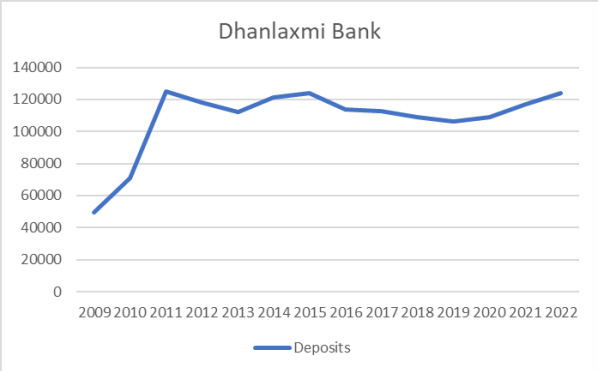
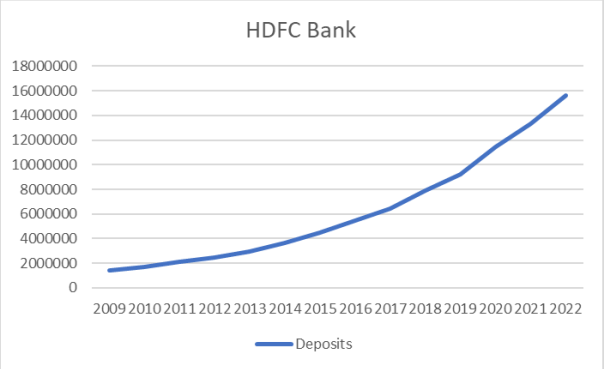
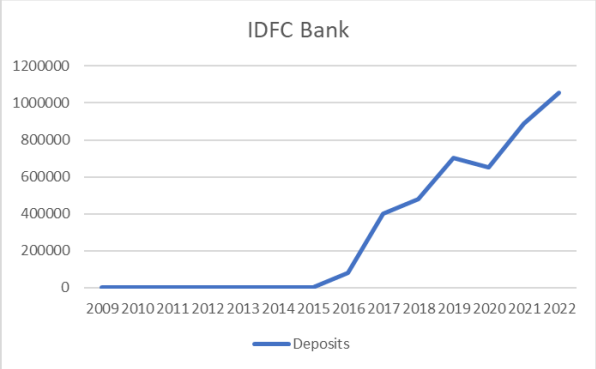
Deposits









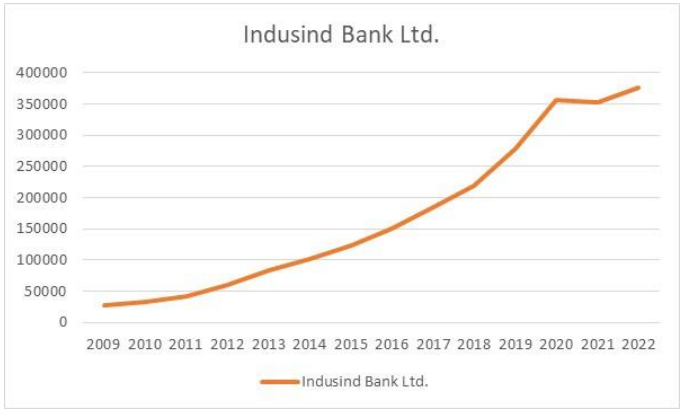


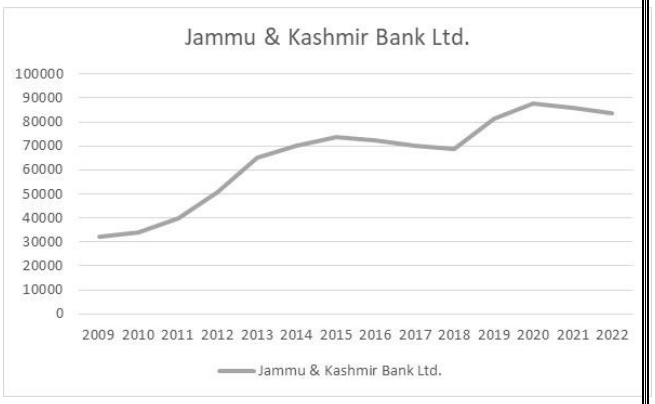
Insights

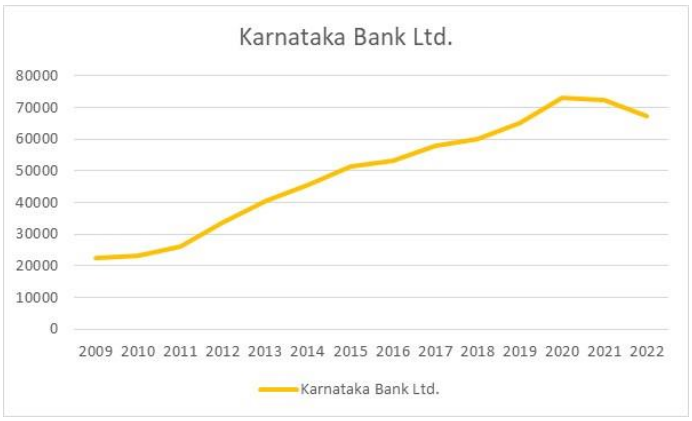
1. As of the third month of 2021, private sector bank deposits amounted for approximately 32% of total banking system deposits.
2. Private sector banks have been focusing on expanding their retail banking operations and offering attractive interest rates on these deposits to attract more customers.
3. Another trend in contemporary years has been the expansion of digital banking channels, which has allowed customers to easily open and operate their accounts remotely.
4. Between 2011 and 2016, Yes Bank's deposit base grew at a rapid pace, but in 2017, the bank's deposit growth began to slow down due to concerns over its asset quality and governance issues.

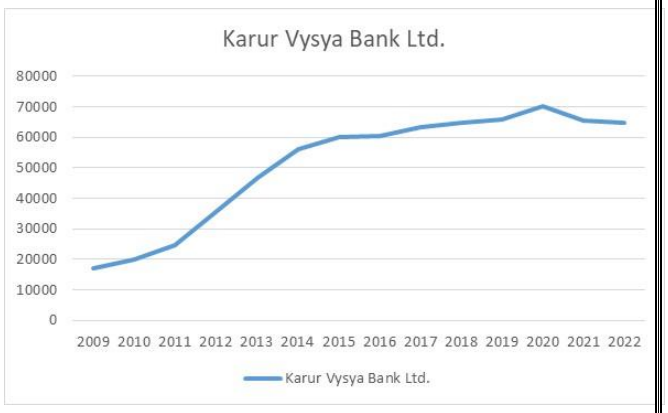
5. In 2020, Yes Bank faced a severe crisis when the RBI placed it under a moratorium due to deteriorating financial health. The bank's depositors were unable to withdraw more than Rs. 50,000 from their accounts for a few weeks and it deteriorated the bank deposit base.

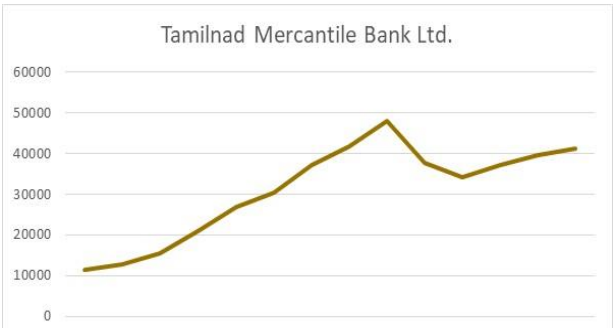
INCOME FROM FINANCIAL SERVICES

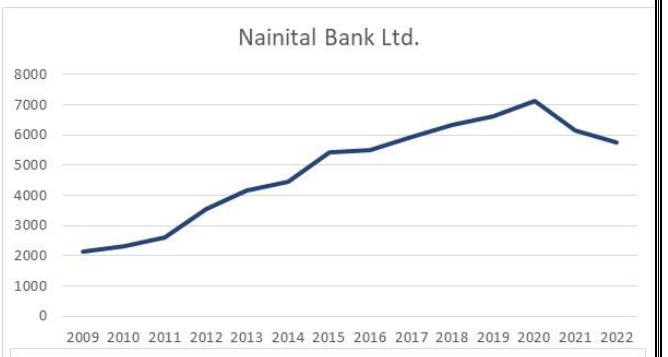


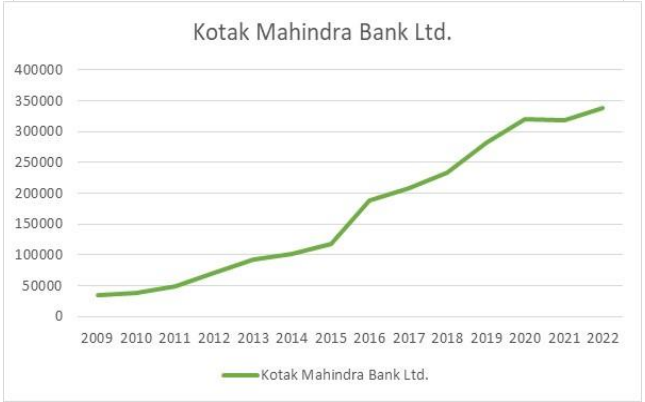


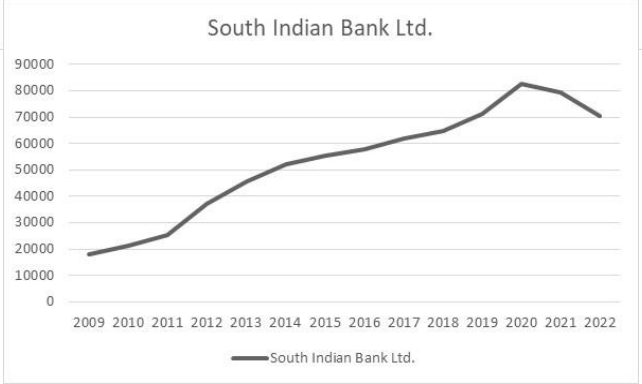


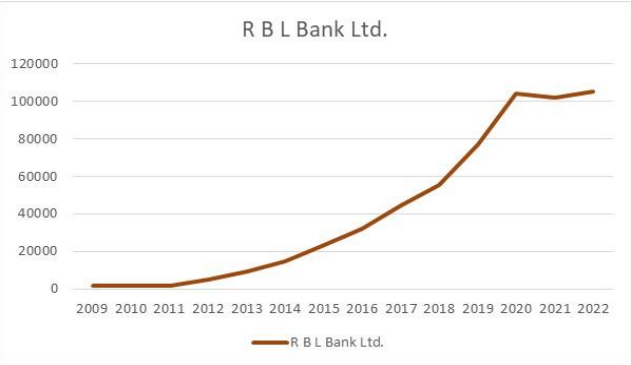








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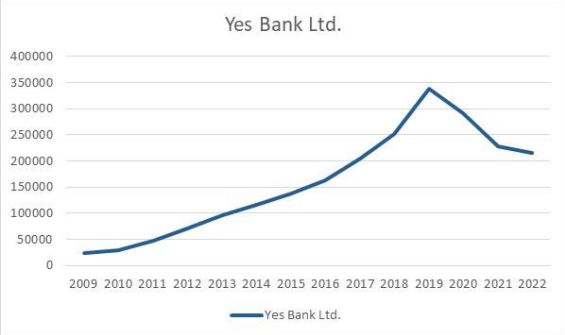
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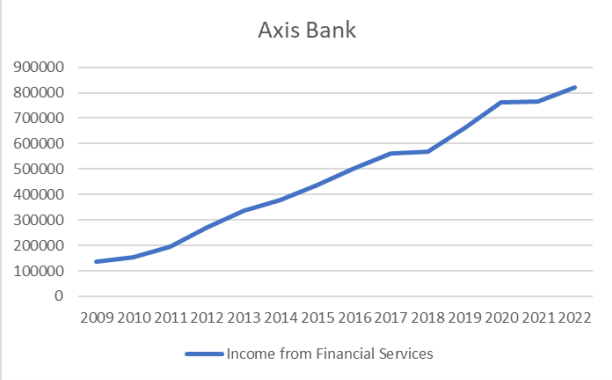
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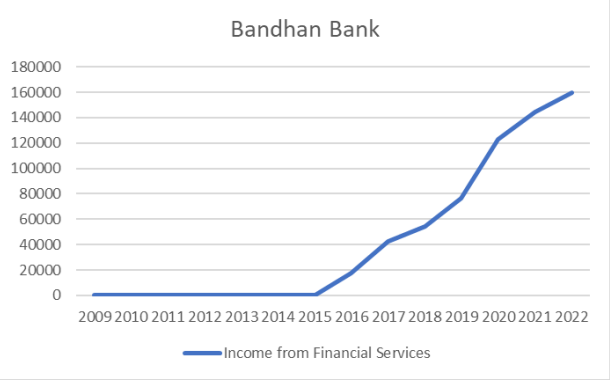
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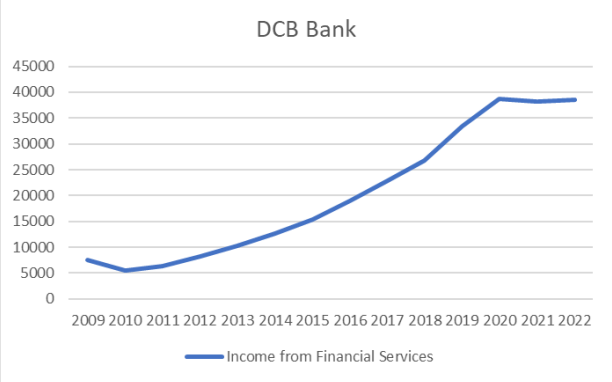
Income from Financial Services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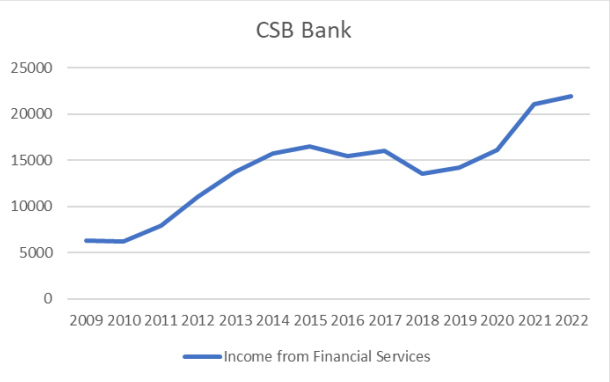
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Income from Financial Services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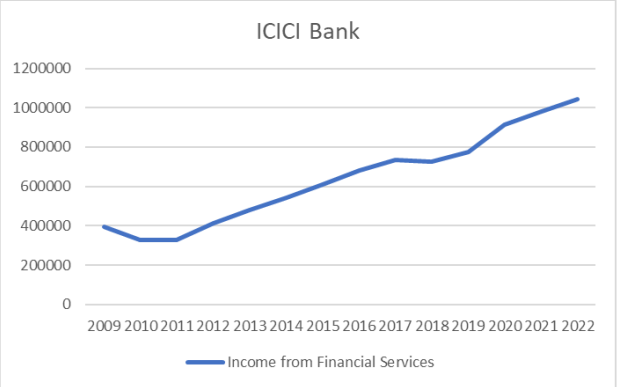
Income from Financial Services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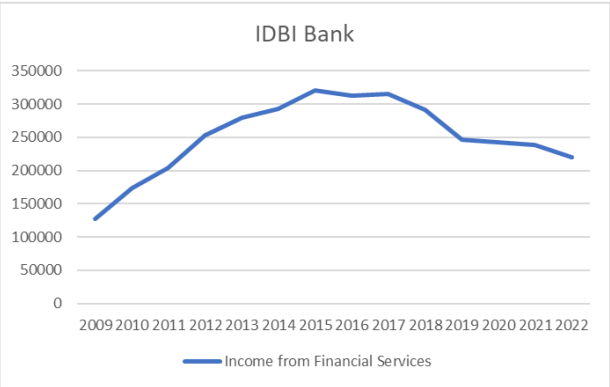
Income from Financial Services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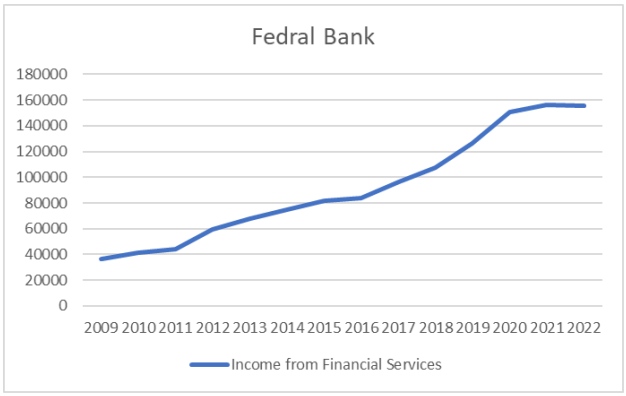
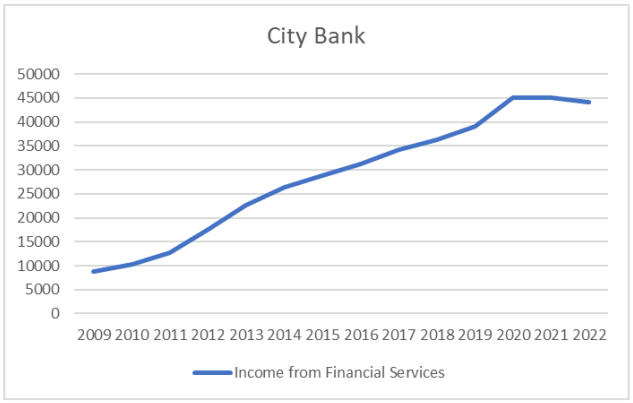
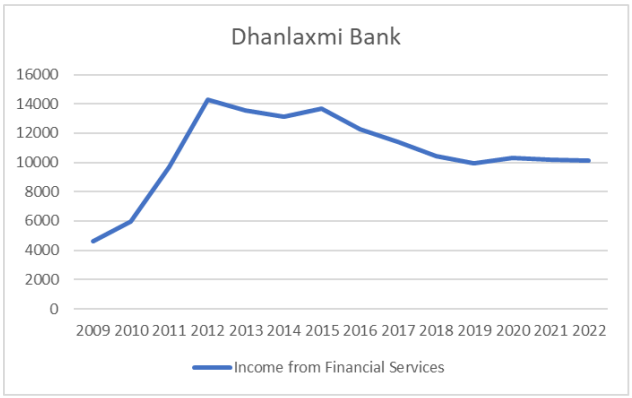
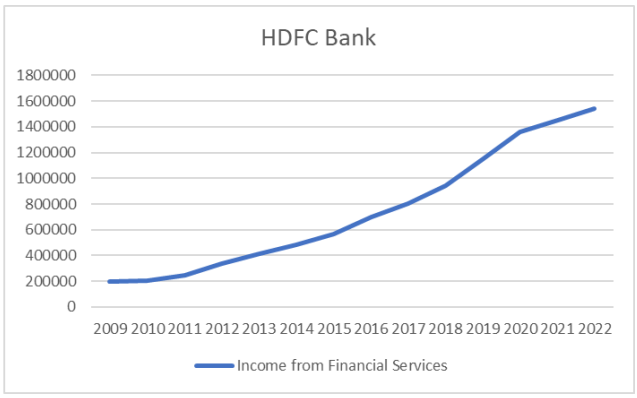
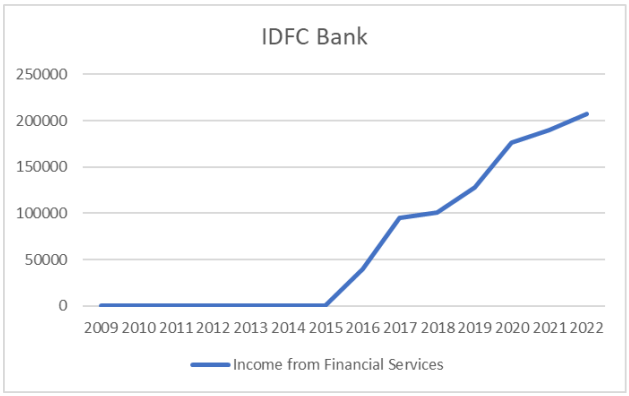
Income from Financial Services







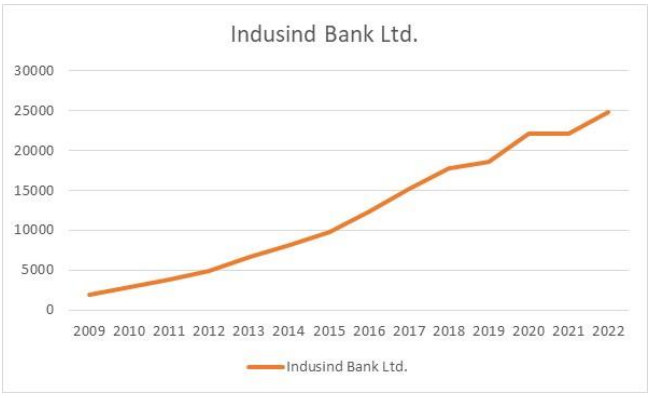


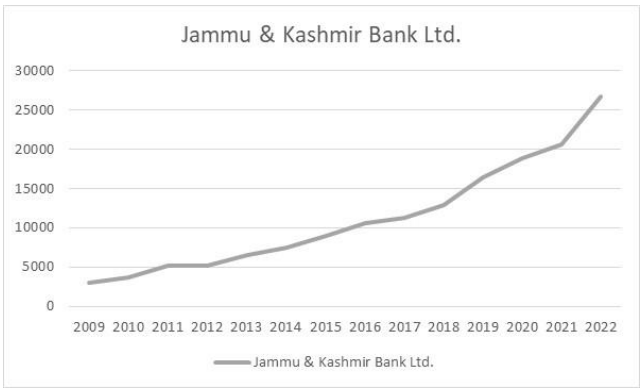


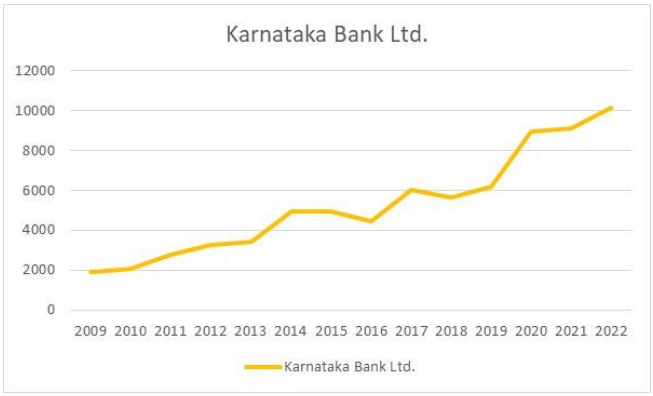
Insights

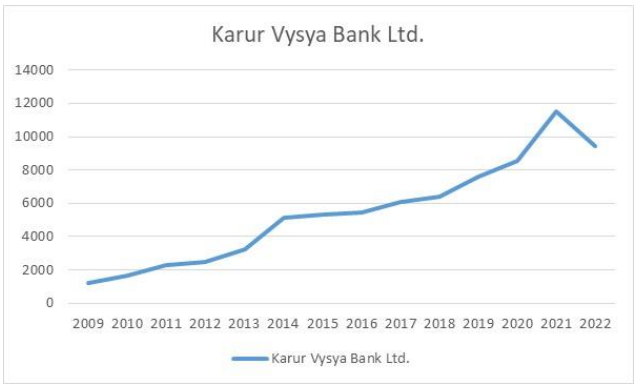
1. Private banks often generate revenue from services related to finance such as wealth administration, banking on investments, managing assets, and personal banking.
2. According to a McKinsey & Company analysis, income from wealth management services in private banks is likely to expand at an annualised pace of roughly 5-7% in the next years.

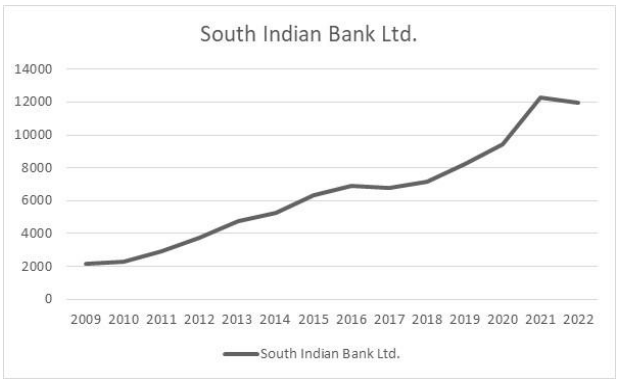
COMPENSATION

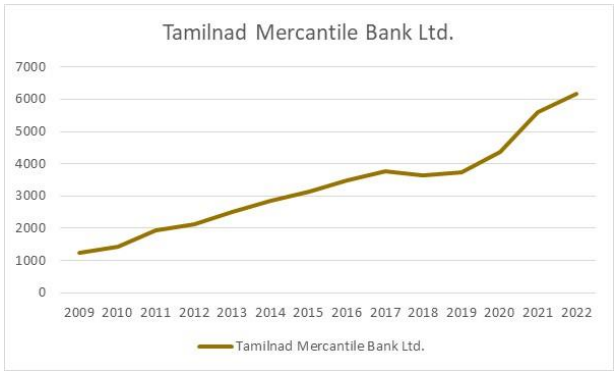


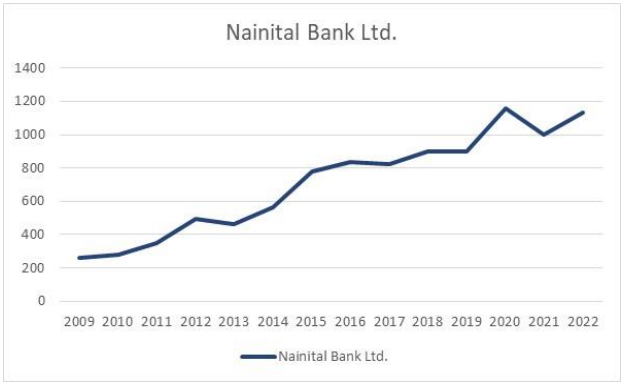


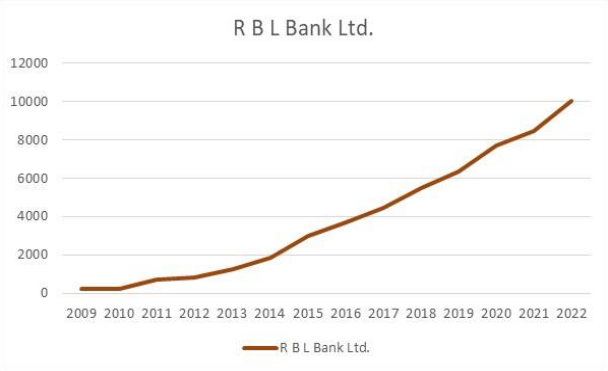








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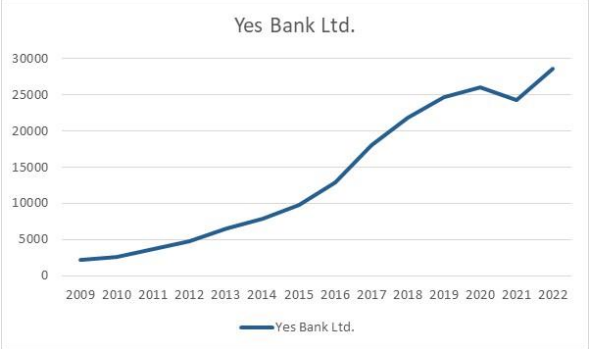
R B L Bank Ltd.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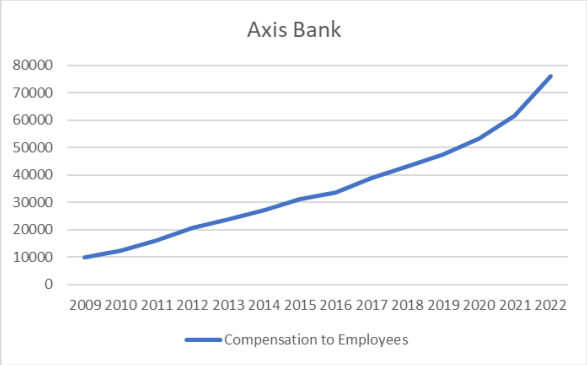
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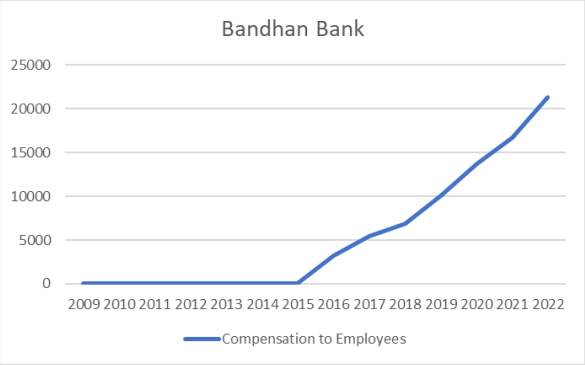
Compensation to Employees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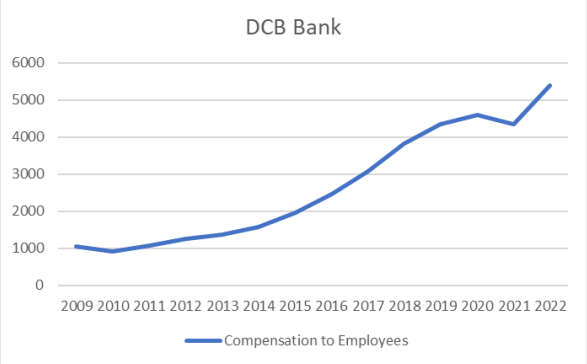
Compensation to Employees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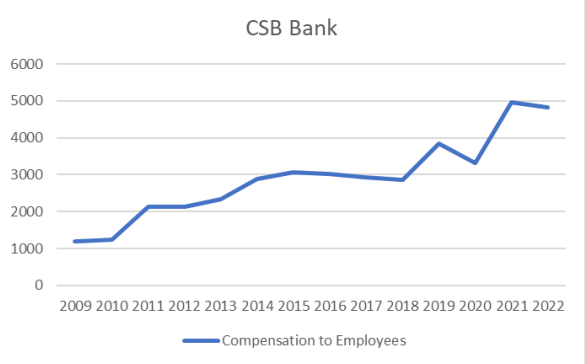
Compensation to Employees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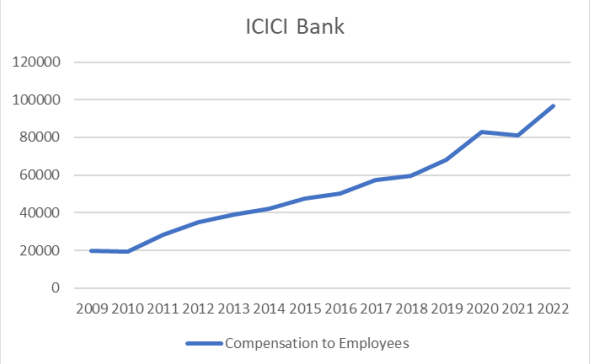
Compensation to Employees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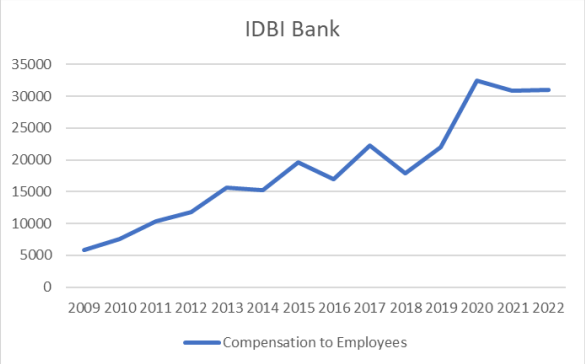
Compensation to Employees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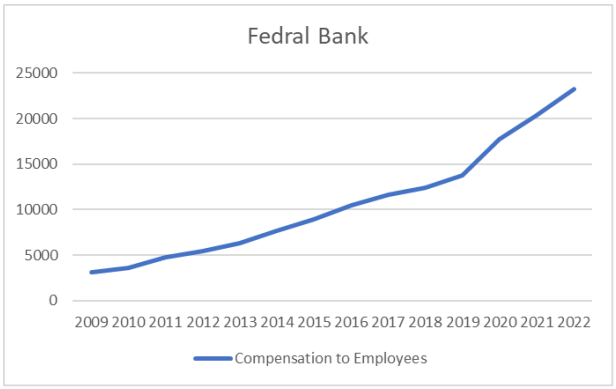
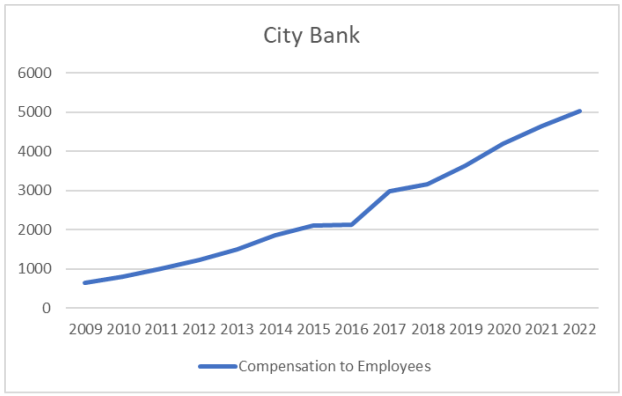
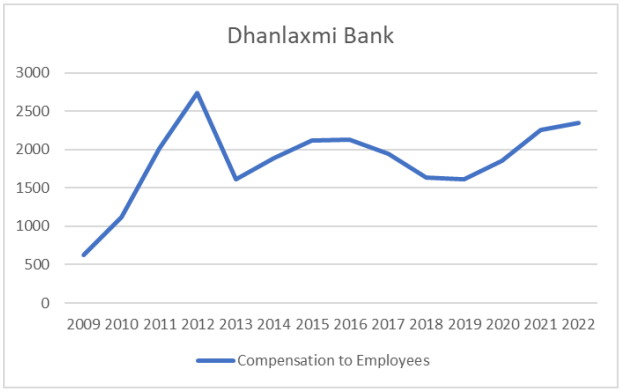
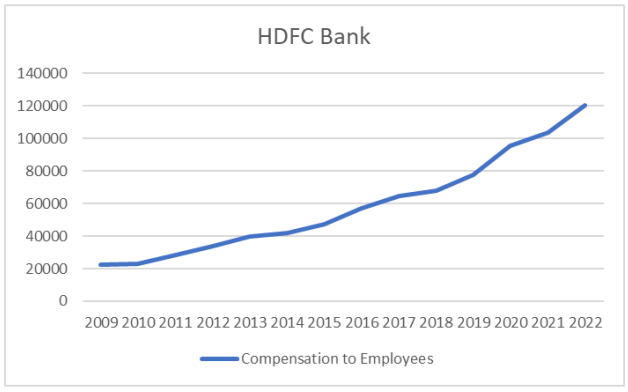
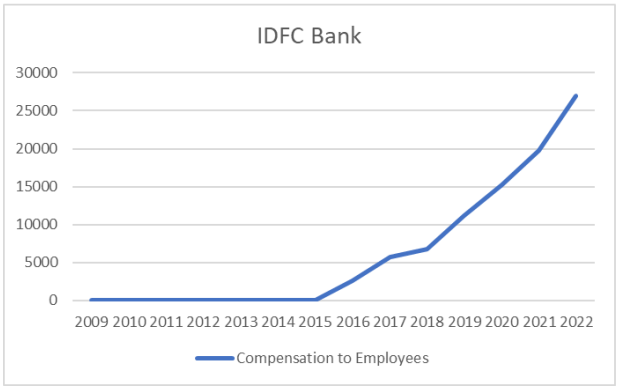
Compensation to Employees







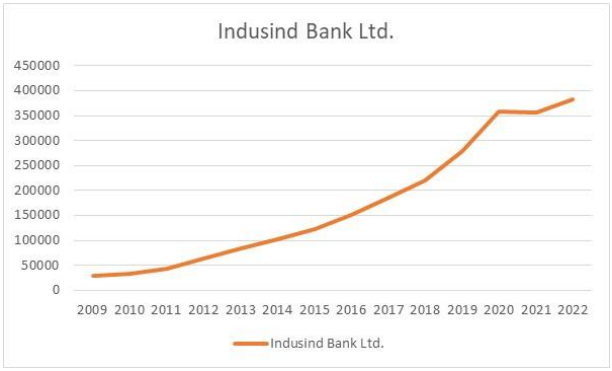


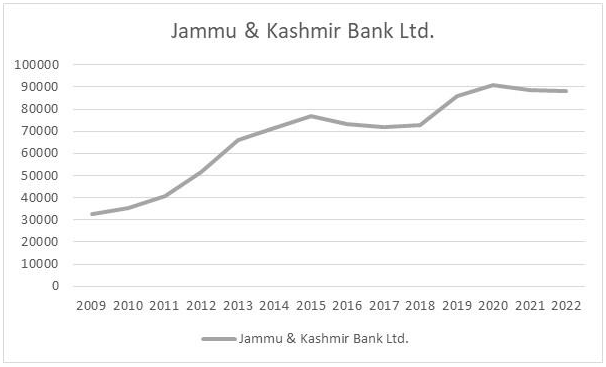


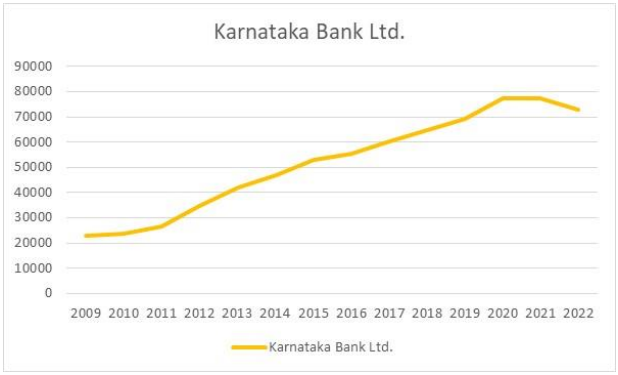
Insights

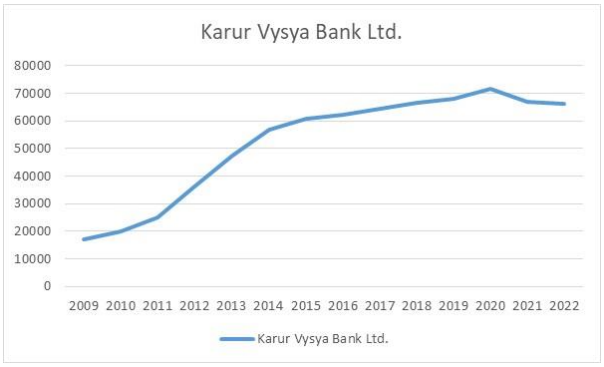
- In recent years, private sector Indian banks have been increasing salaries to attract and retain talent, particularly in high-demand roles such as technology, risk management, and compliance.
- Additionally, performance-based incentives and bonuses are common in the banking industry and can significantly impact an employee's total compensation**.**

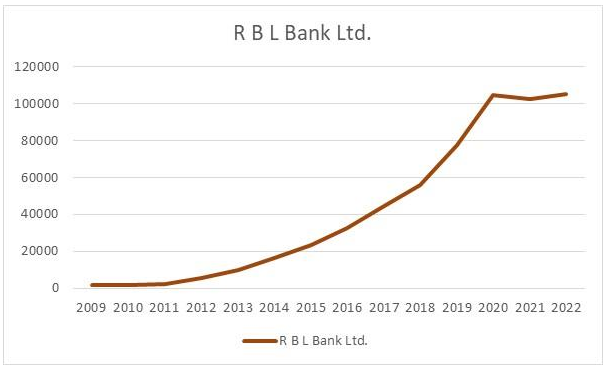
TOTAL INCOME

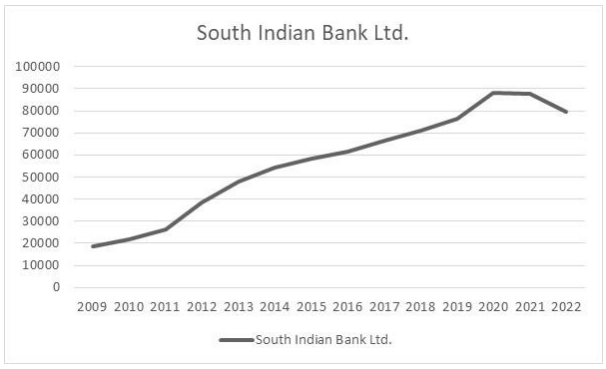


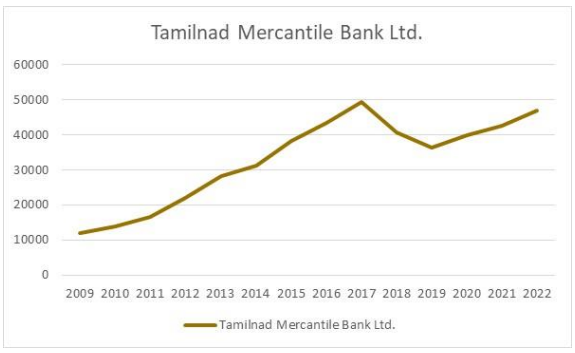


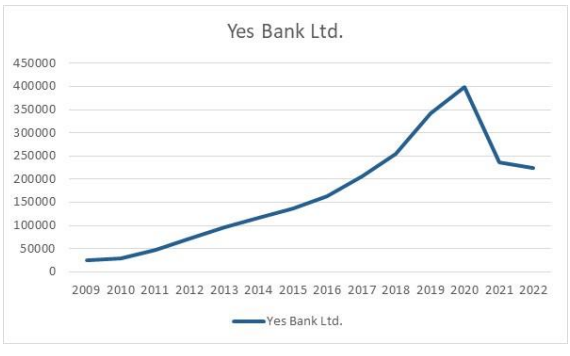


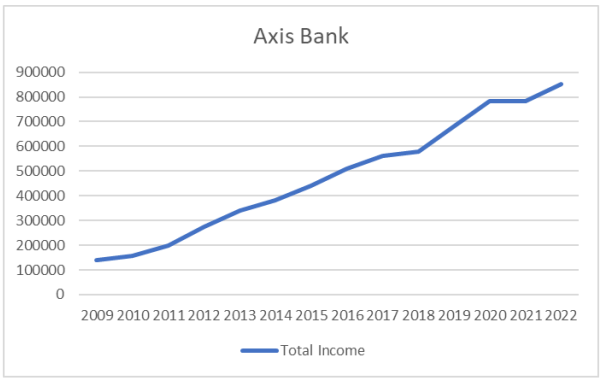








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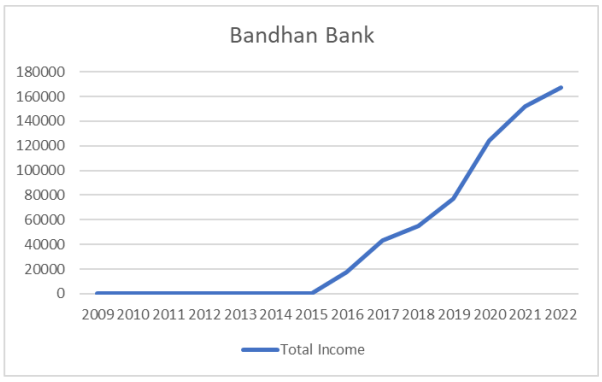
Total Income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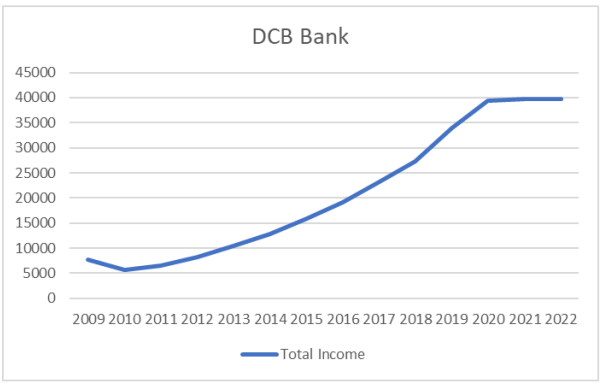
Total Income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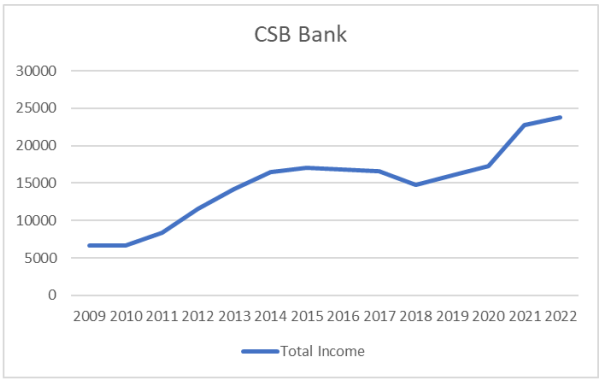
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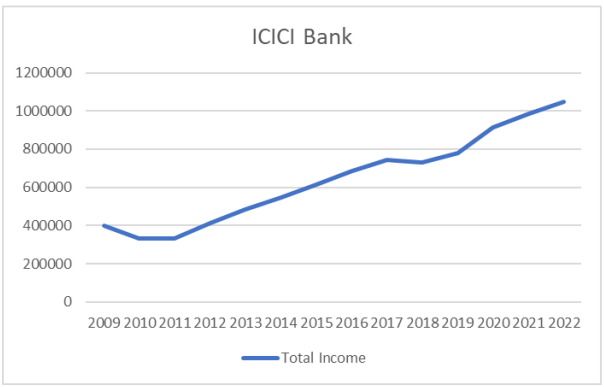
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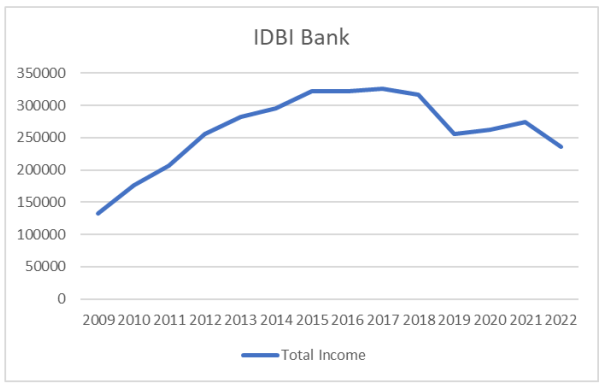
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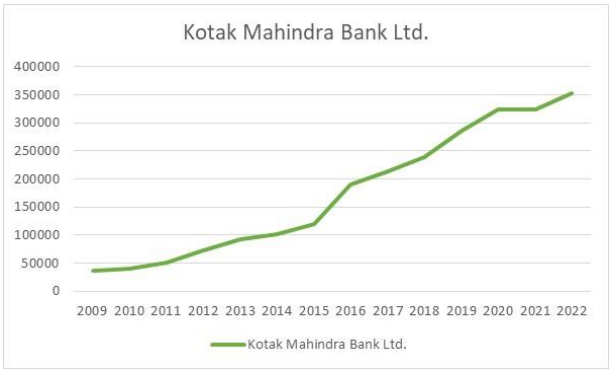
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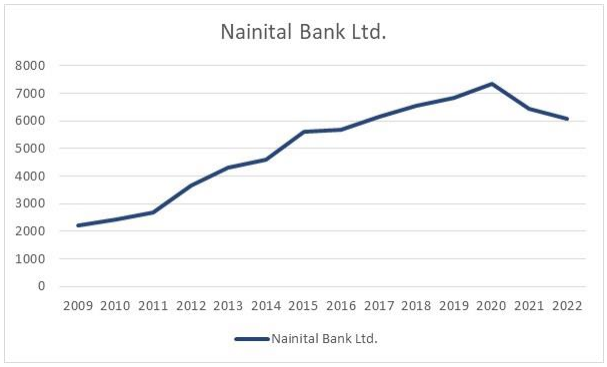
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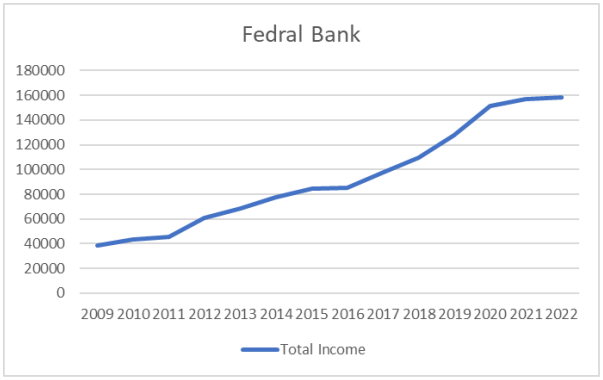
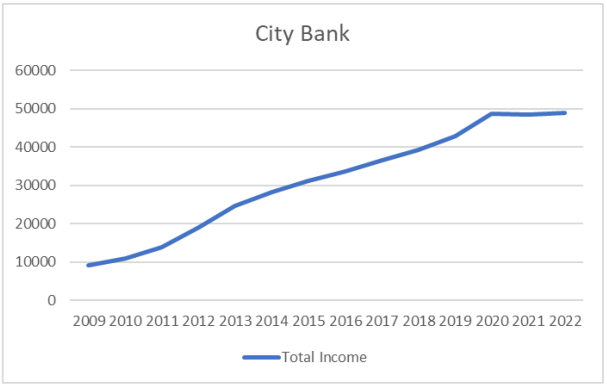
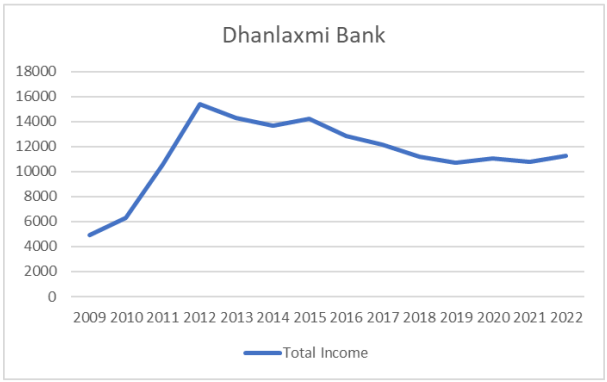
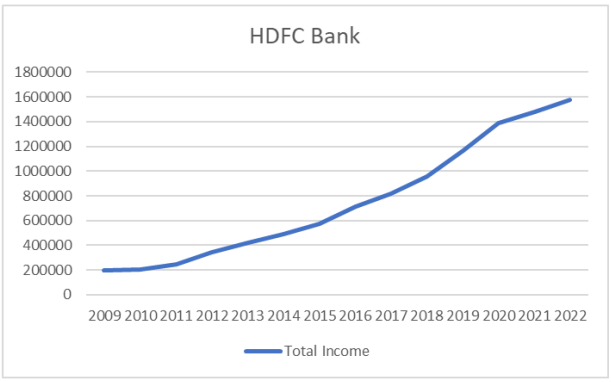
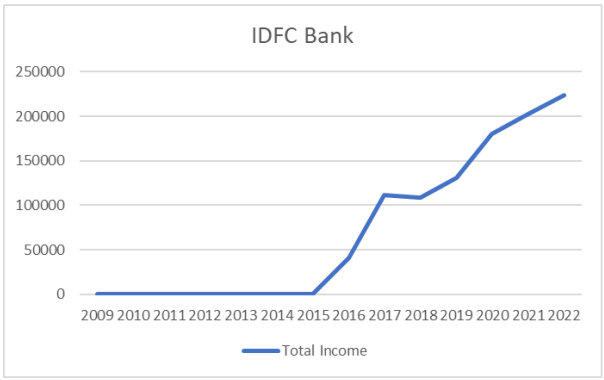
Nainital Bank Ltd.









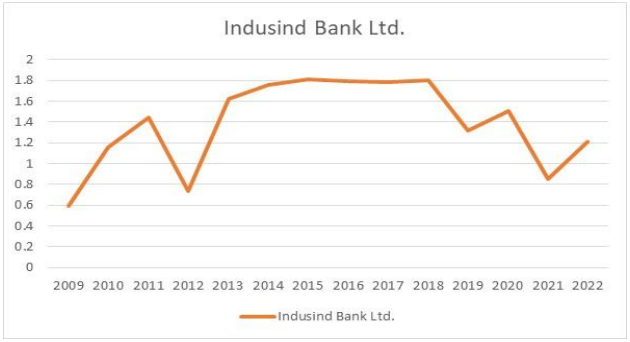


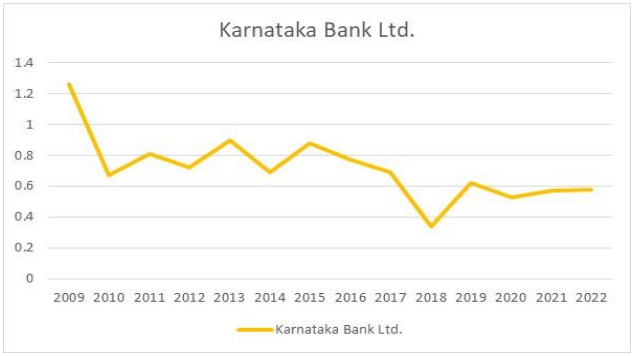
Insights

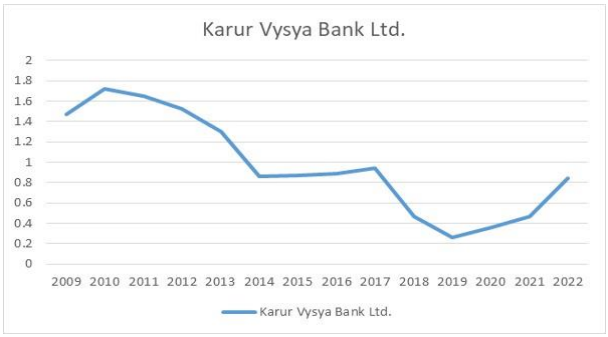
1. The income trend of Indian private sector banking has been positive over the prior few years. Private sector banks have consistently shown higher profitability compared to public sector banks, driven by higher interest income, fee-based income, and improved asset quality.
2. Interest income is the primary snout of revenue for private banking sector in India, and it has been growing steadily over the years. Private sector banks have been able to maintain healthy net interest margins (NIMs) due to their focus on high-yielding loans and investment.

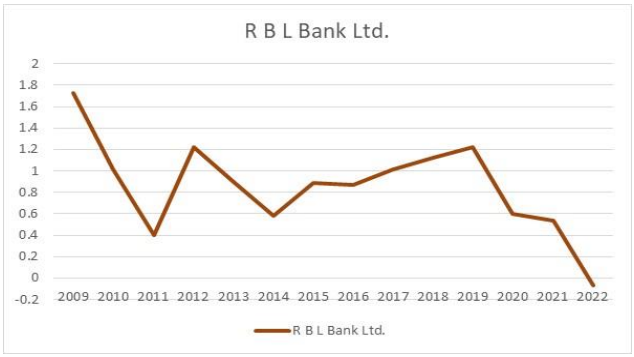
3. Fee-based income has also been growing for private sector banks in India. Private sector banks have been able to produce more fee-based income than public sector banks due toa larger client base and a broader range of services.

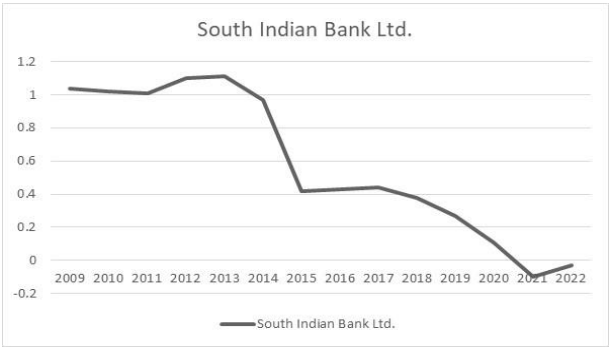
RETURN ON ASSET (ROA)

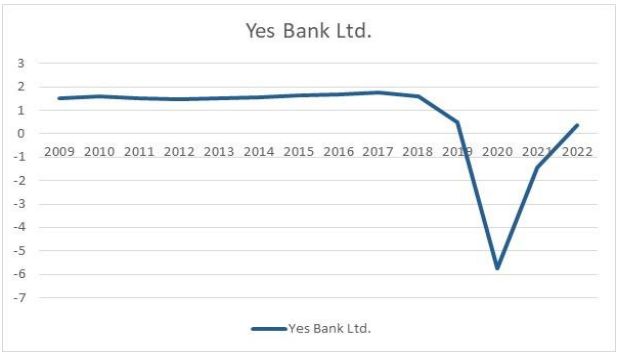


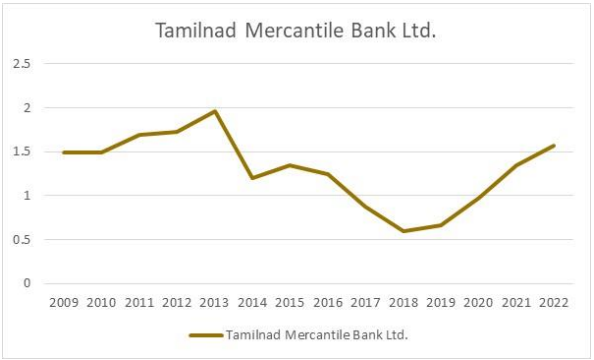


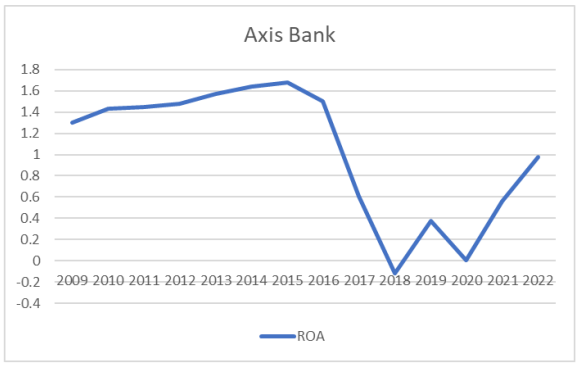


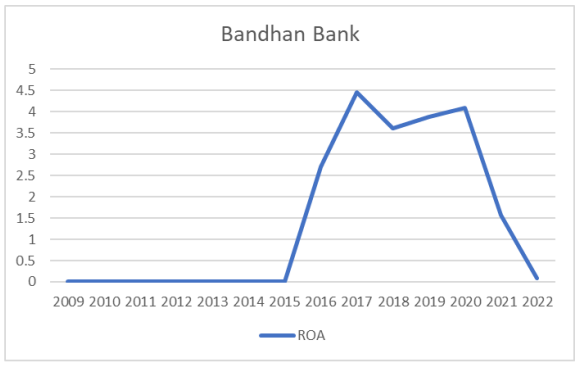


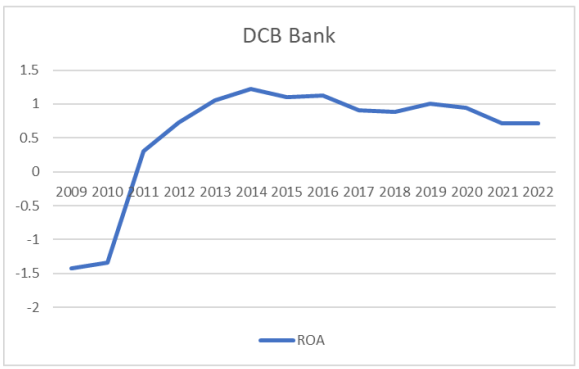


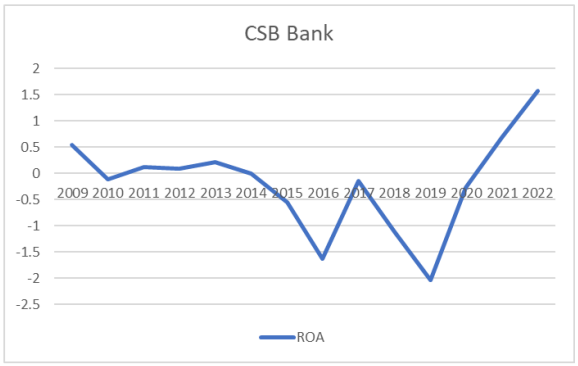


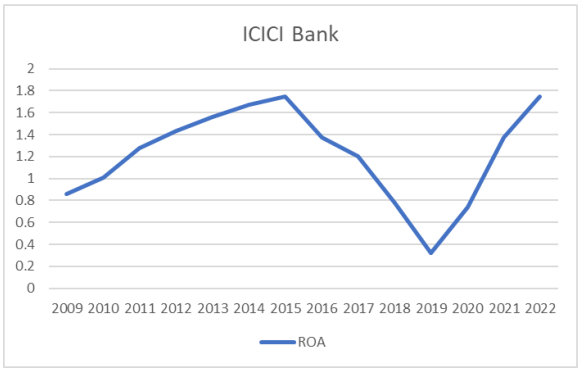


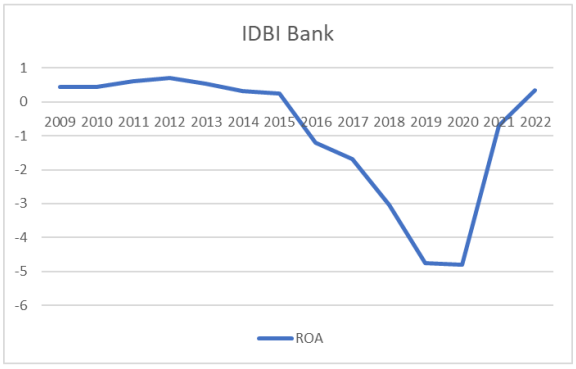

Axis Bank
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
ROA

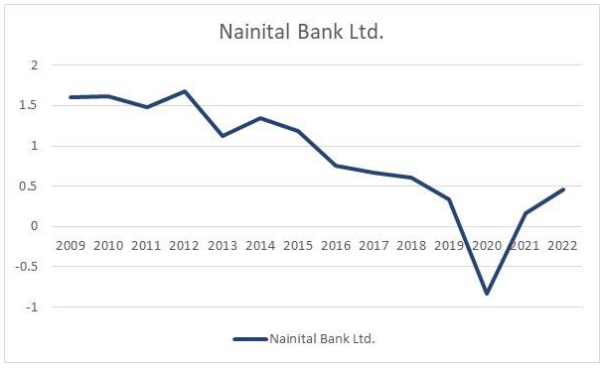

Bandhan Bank
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
ROA

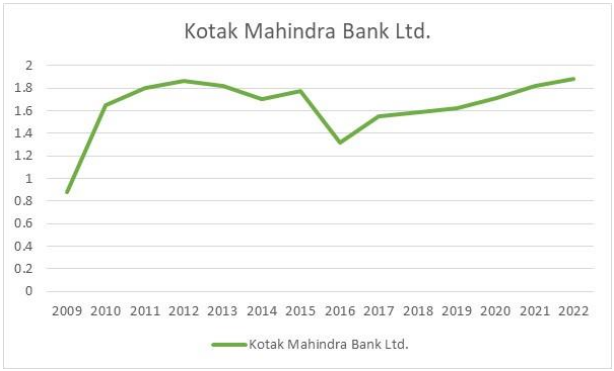

DCB Bank
1.5
1
0.5
0
-0.5
-1
-1.5
-2
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
ROA

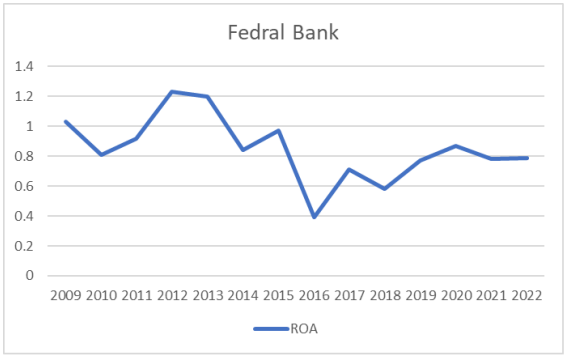

CSB Bank
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
ROA

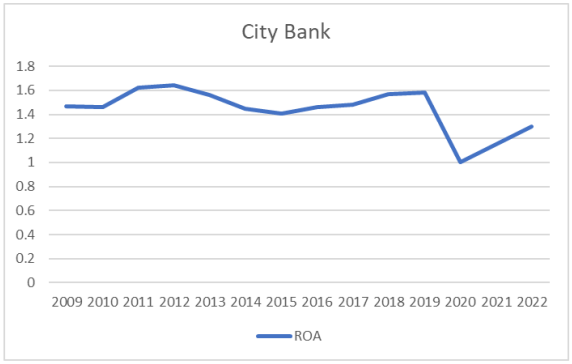

ICICI Bank
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
ROA

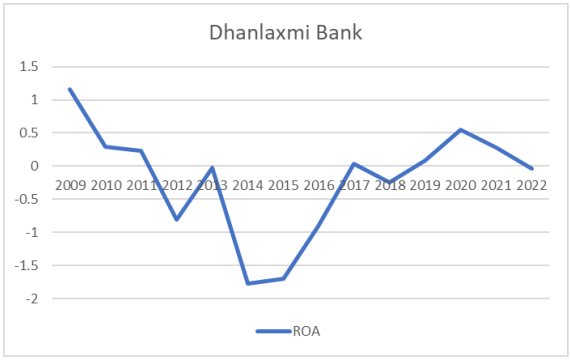

IDBI Bank
1
0
-1
-2
-3
-4
-5
-6
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
ROA

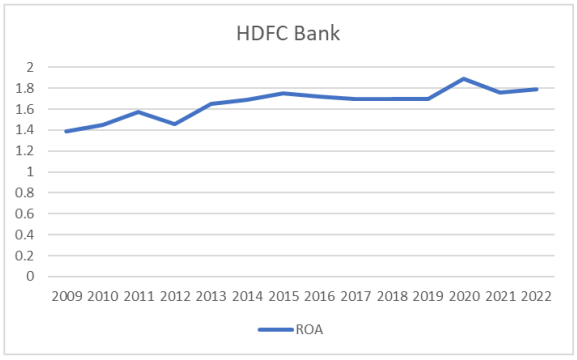

Nainital Bank Ltd.
2
1.5
1
0.5
0
-0.5
-1
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Nainital Bank Ltd.

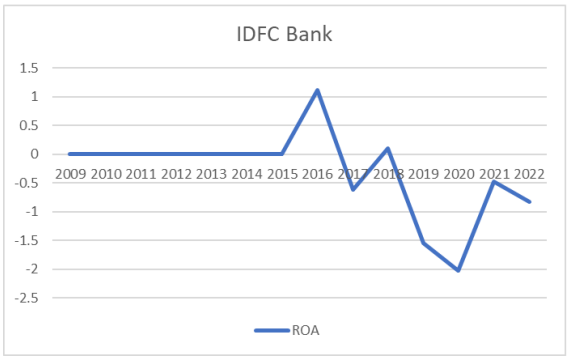

Kotak Mahindra Bank Ltd.
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Kotak Mahindra Bank Ltd.


Fedral Bank
1.4
1.2
1
0.8
0.6
0.4
0.2
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
ROA


City Bank
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
ROA


Dhanlaxmi Bank
1.5
1
0.5
0
-0.5
-1
-1.5
-2
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
ROA

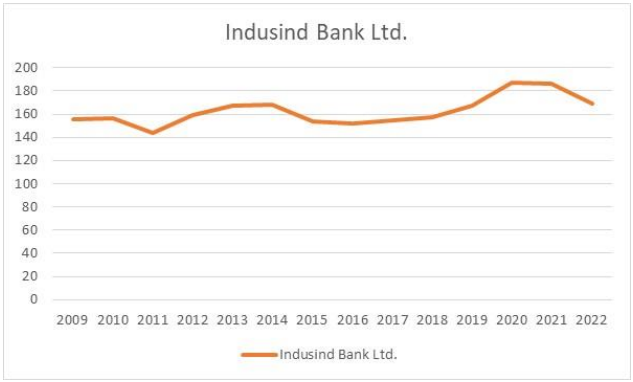

HDFC Bank
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
ROA

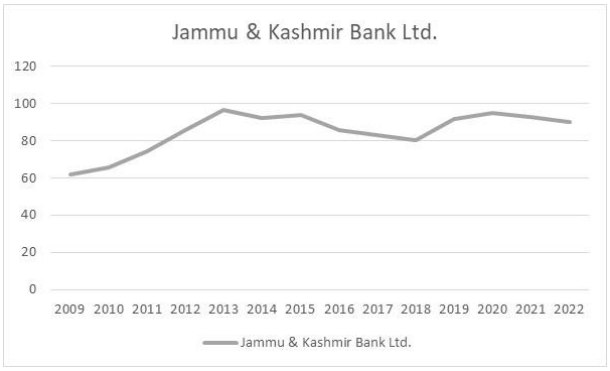

IDFC Bank
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
ROA

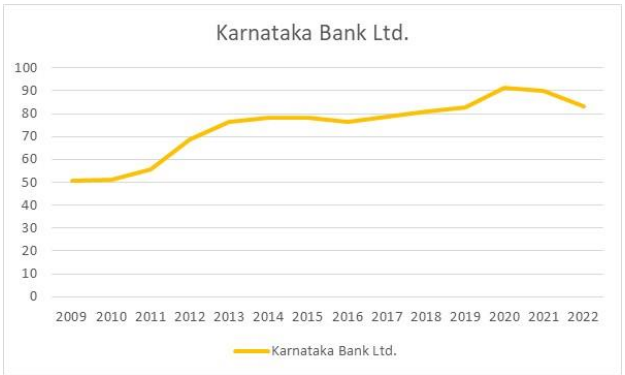
Insights:

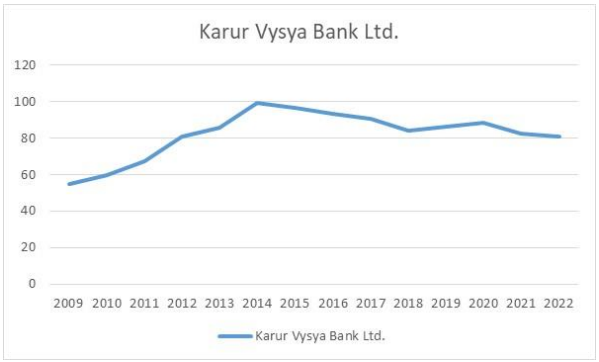
1. According to the RBI, the overall ROA representing the banks in India was 0.32% in March 2021, down from 0.60% in March 2020. This decline in ROA can be attributed to the economic impact of the COVID-19 pandemic, which has led to higher provisions for bad loans and a slowdown in lending activity.
2. HDFC Bank: 1.95%, ICICI Bank: 1.22%, Axis Bank: 0.70%
3. Major factors that affect ROA are: (a) economic conditions (b) interest rates (c) asset quality (d) Operating Expenses (e) Regulatory Changes
4. As a general guideline, a healthy ROA for Indian banks is considered to be in the range of 0.8% to 1.2%.

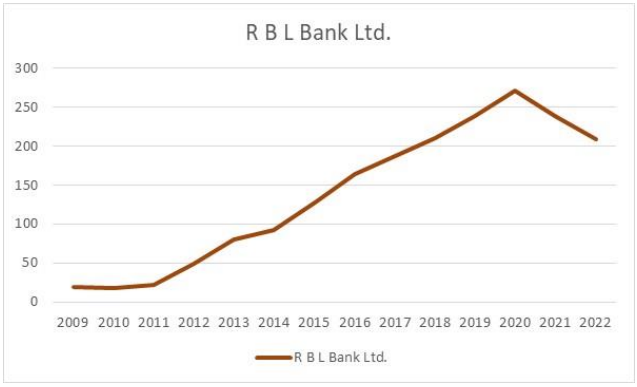
RATIO OF INCOME OVER NO. OF BRANCH

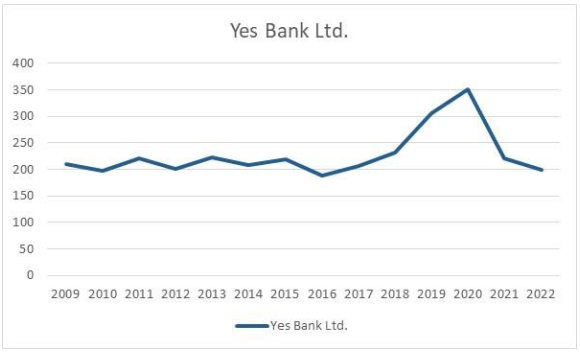


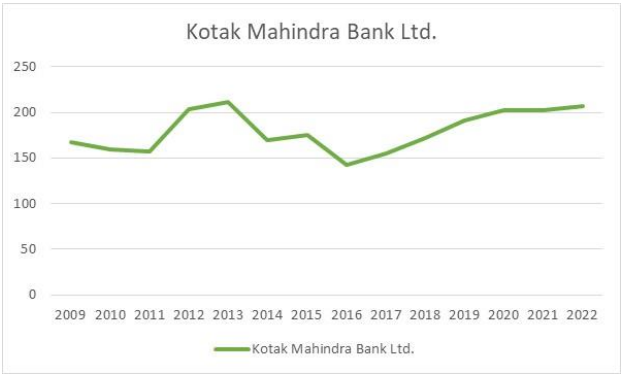


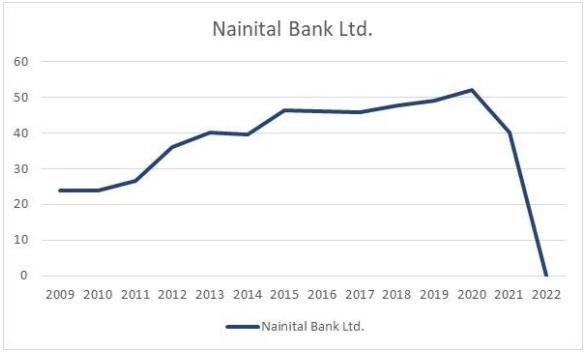


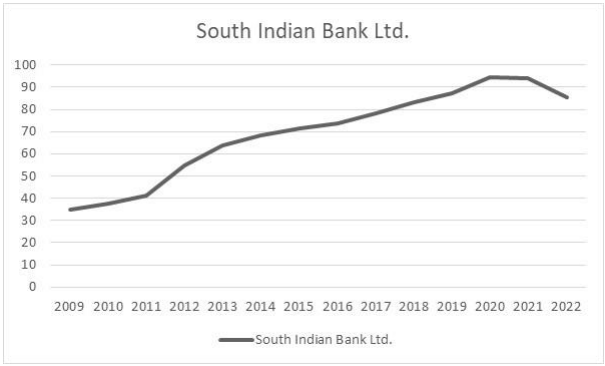


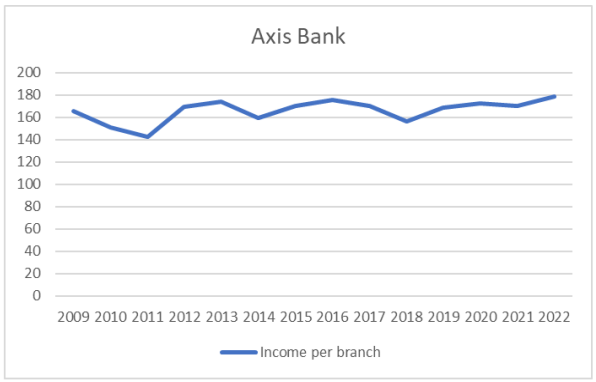

R B L Bank Ltd.
300
250
200
150
100
50
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
R B L Bank Ltd.

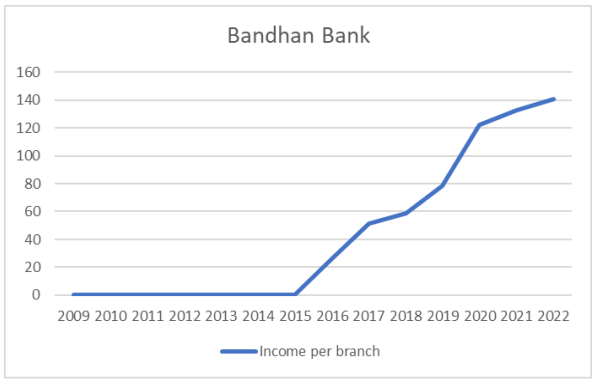

Yes Bank Ltd.
400
350
300
250
200
150
100
50
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Yes Bank Ltd.

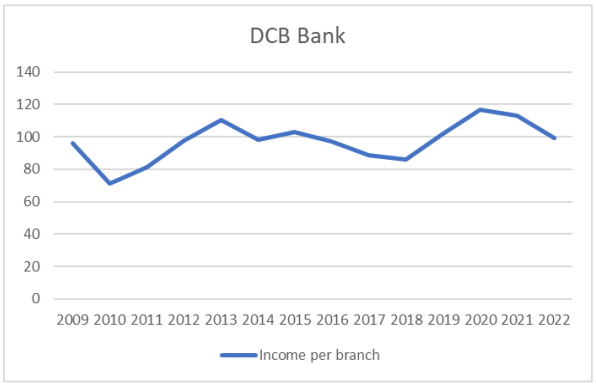

Kotak Mahindra Bank Ltd.
250
200
150
100
50
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Kotak Mahindra Bank Ltd.

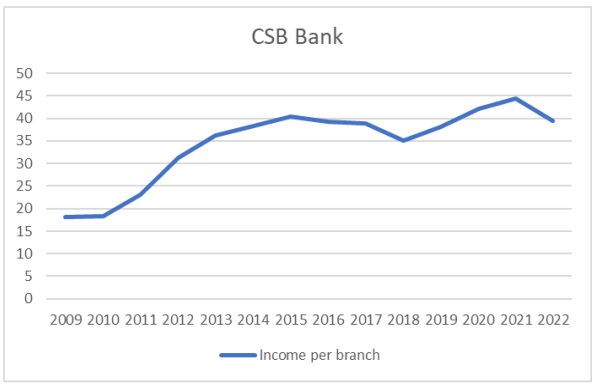

Nainital Bank Ltd.
60
50
40
30
20
10
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Nainital Bank Ltd.

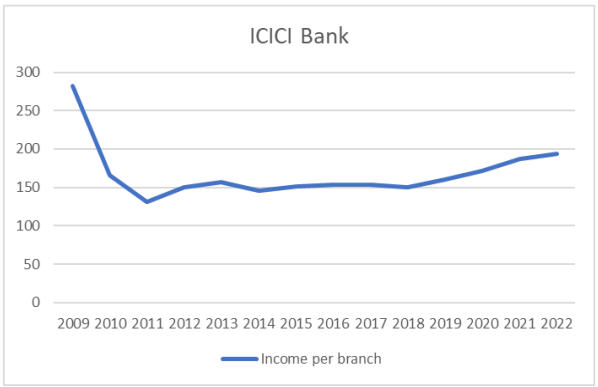

South Indian Bank Ltd.
100
90
80
70
60
50
40
30
20
10
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
South Indian Bank Ltd.

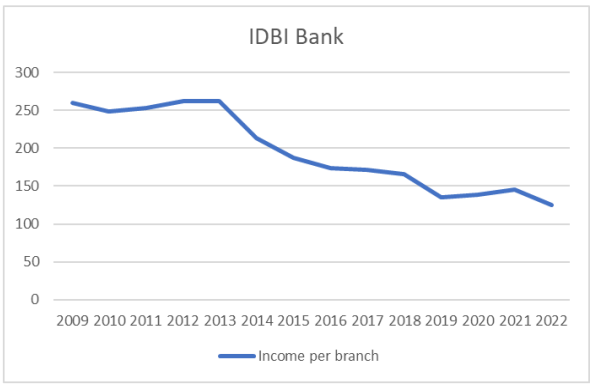

Axis Bank
200
180
160
140
120
100
80
60
40
20
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Income per branch

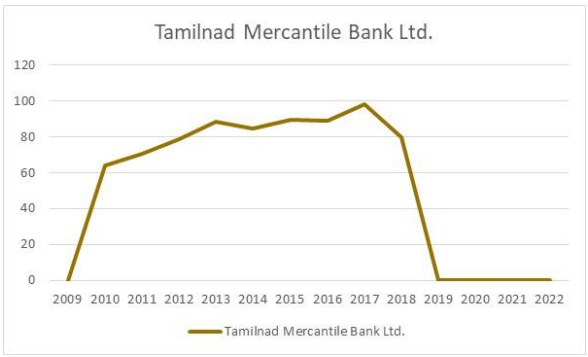

Bandhan Bank
160
140
120
100
80
60
40
20
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Income per branch

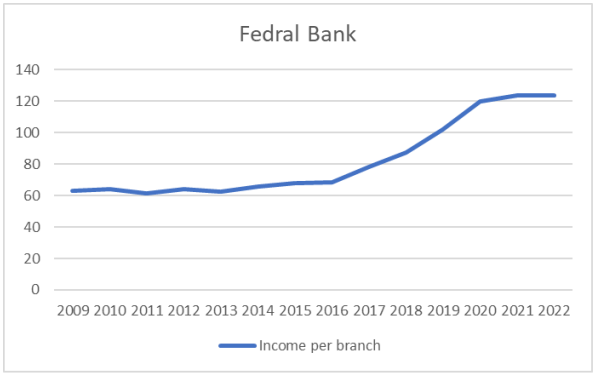

DCB Bank
140
120
100
80
60
40
20
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Income per branch

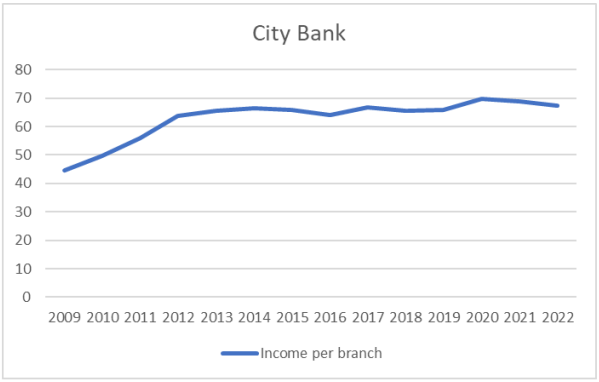

CSB Bank
50
45
40
35
30
25
20
15
10
5
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Income per branch

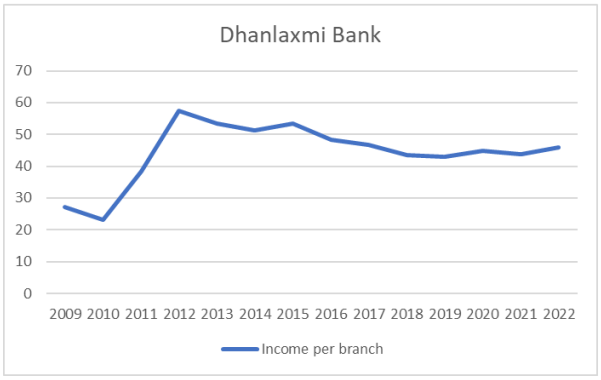

ICICI Bank
300
250
200
150
100
50
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Income per branch

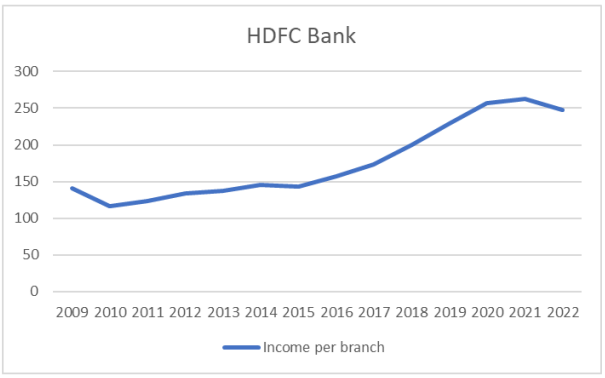

IDBI Bank
300
250
200
150
100
50
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Income per branch

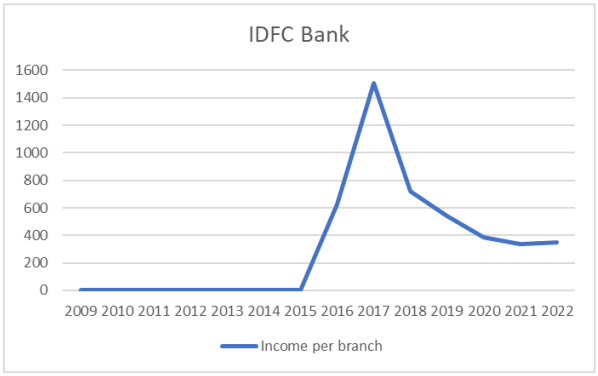

Tamilnad Mercantile Bank Ltd.
120
100
80
60
40
20
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Tamilnad Mercantile Bank Ltd.







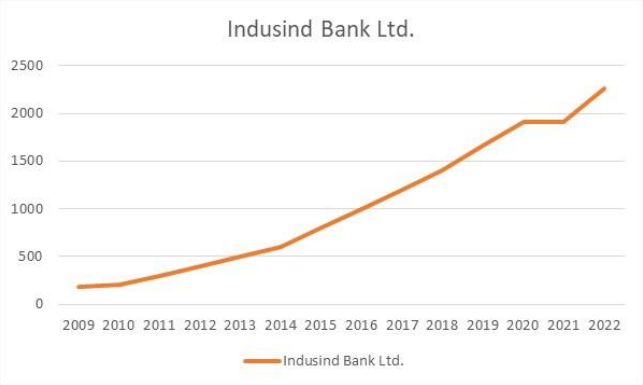


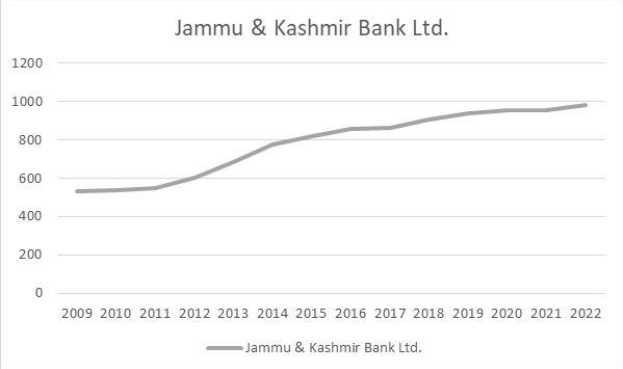


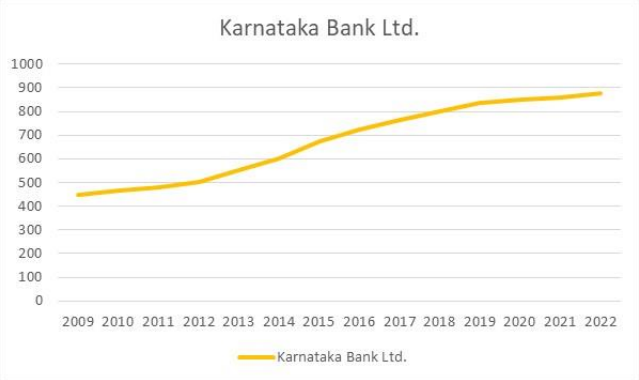
Insights:

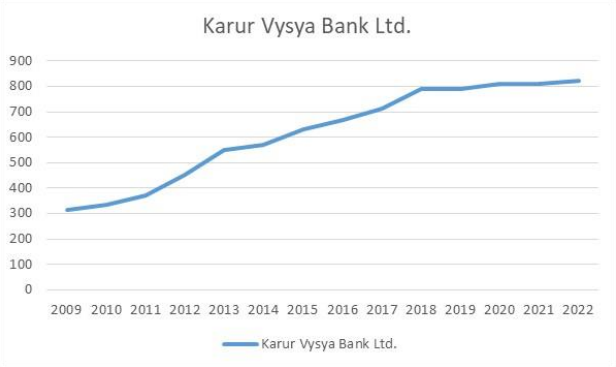
1. Income/Branch of IDFC was very high followed by decrement due to expansion.
2. Dhanalakshmi, IDBI has seen continuous decrease & RBL, Nainital & Tamilnad seen downward spikes in the last 2-3 years.
3. HDFC Bank has the highest income/branch despite of highest no. of branch followed by Yes Bank.
4. Most of the banks especially the well-established ones are having flat curve for income/branch

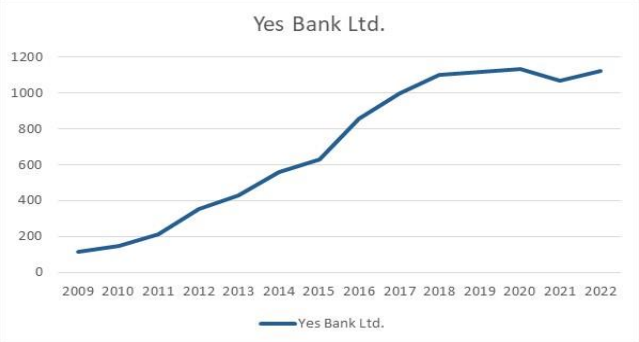
NO. OF BRANCHES

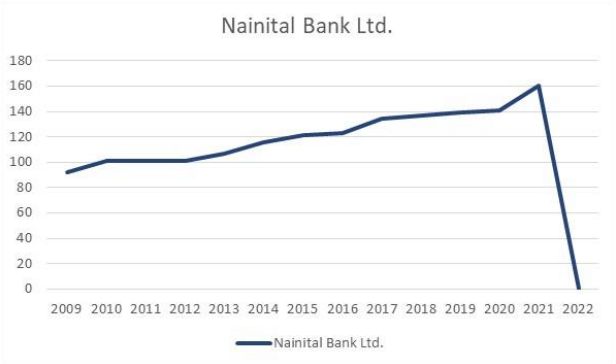


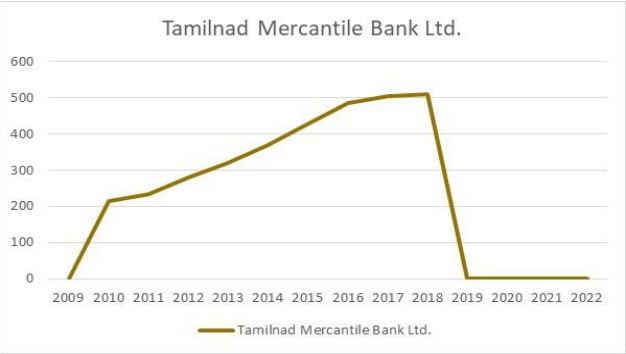


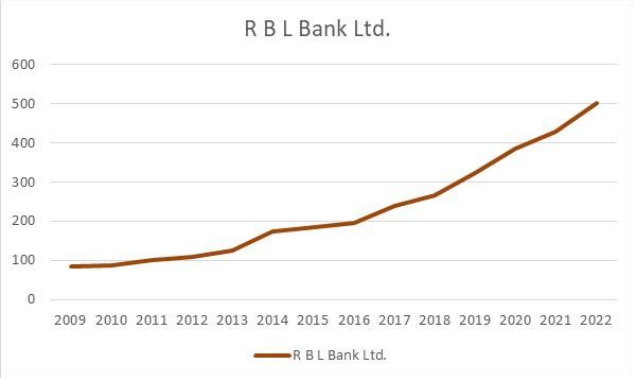


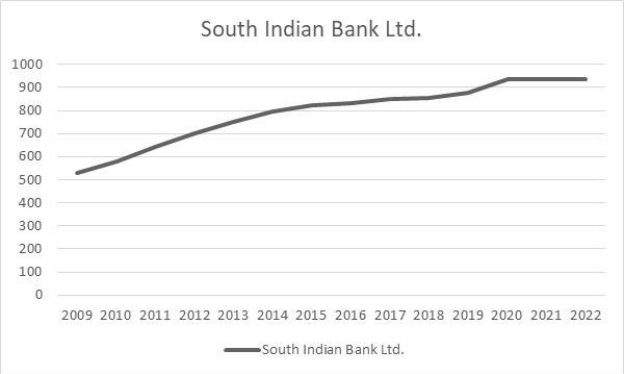




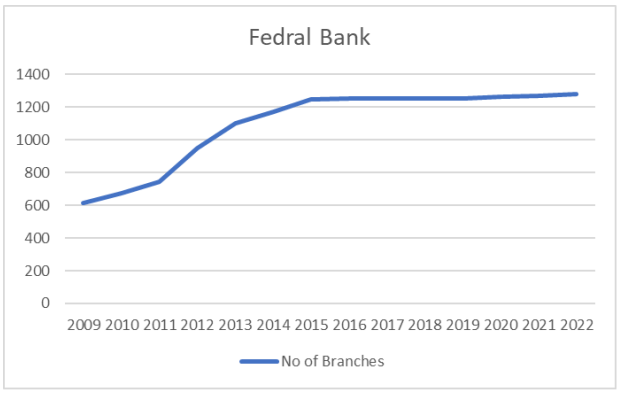


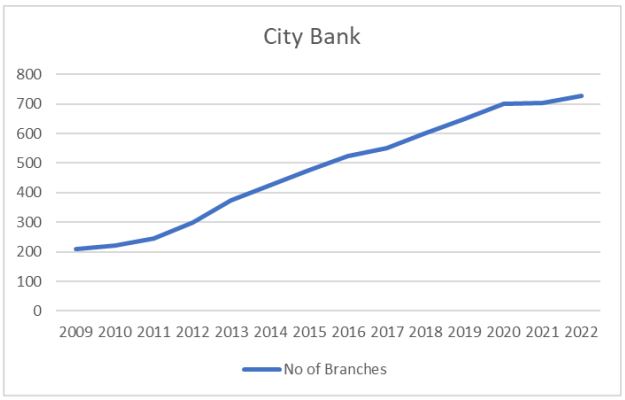


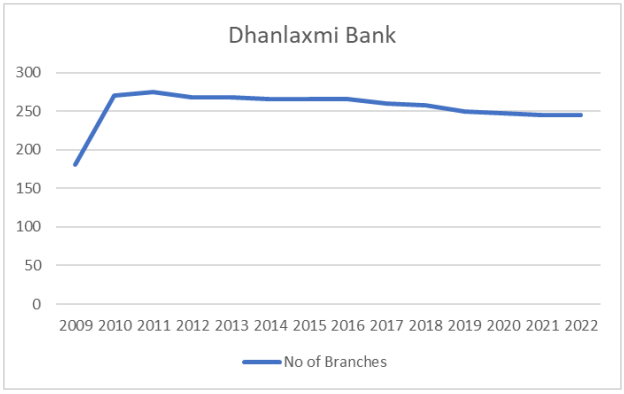

R B L Bank Ltd.
600
500
400
300
200
100
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
R B L Bank Ltd.

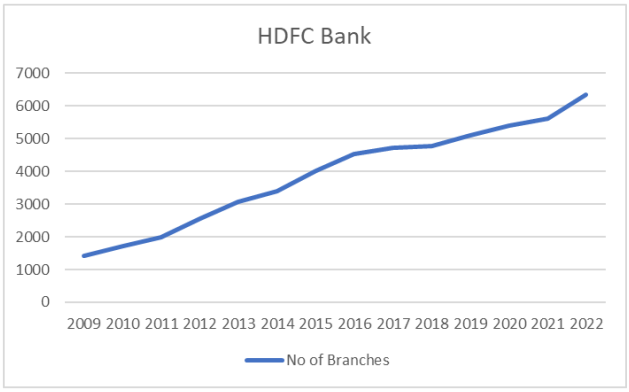

South Indian Bank Ltd.
1000
900
800
700
600
500
400
300
200
100
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
South Indian Bank Ltd.

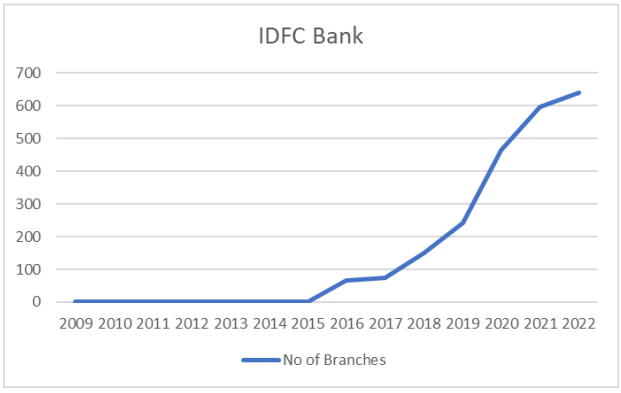

Kotak Mahindra Bank Ltd.
1800
1600
1400
1200
1000
800
600
400
200
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Kotak Mahindra Bank Ltd.

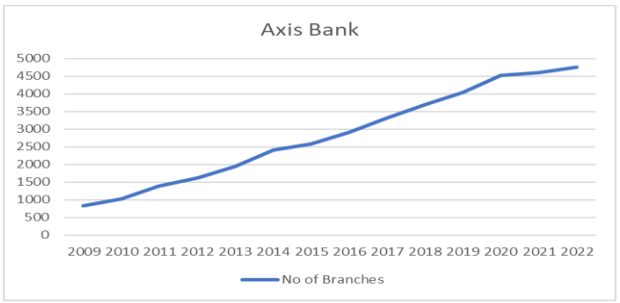

Fedral Bank
1400
1200
1000
800
600
400
200
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
No of Branches

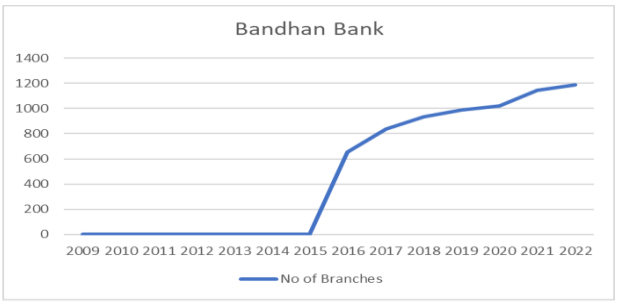

City Bank
800
700
600
500
400
300
200
100
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
No of Branches

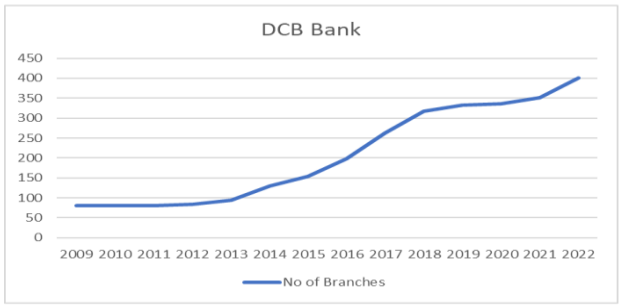

Dhanlaxmi Bank
300
250
200
150
100
50
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
No of Branches

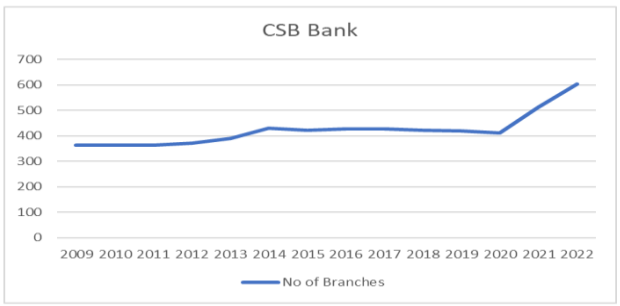

HDFC Bank
7000
6000
5000
4000
3000
2000
1000
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
No of Branches

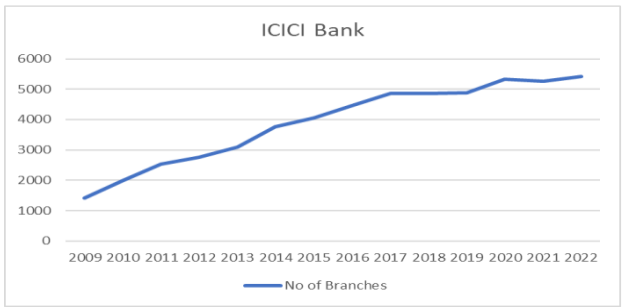

IDFC Bank
700
600
500
400
300
200
100
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
No of Branches

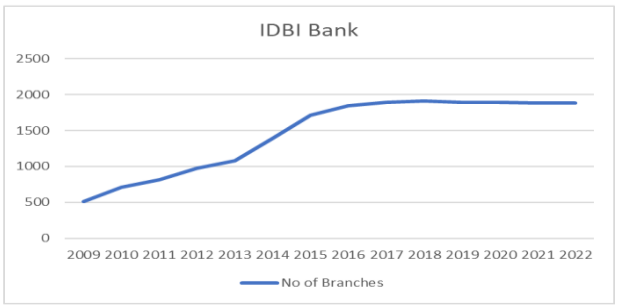








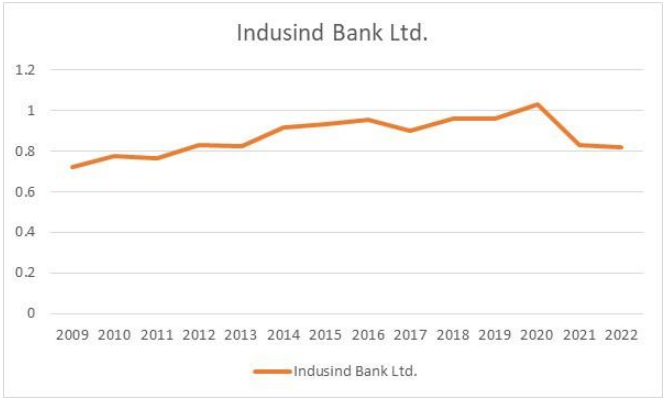


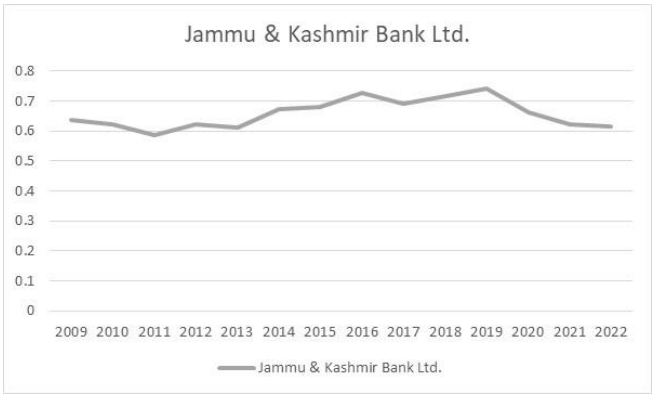


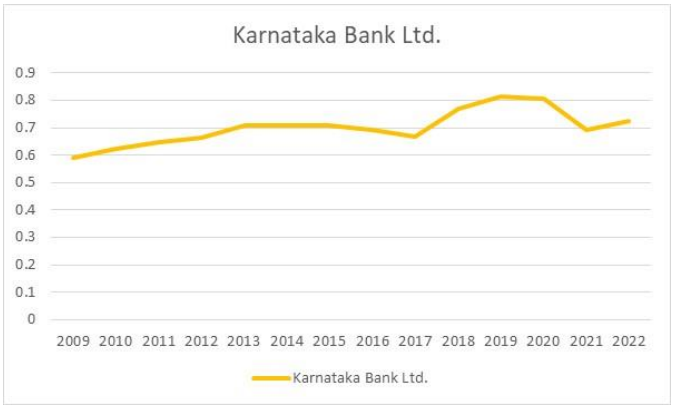
Insights

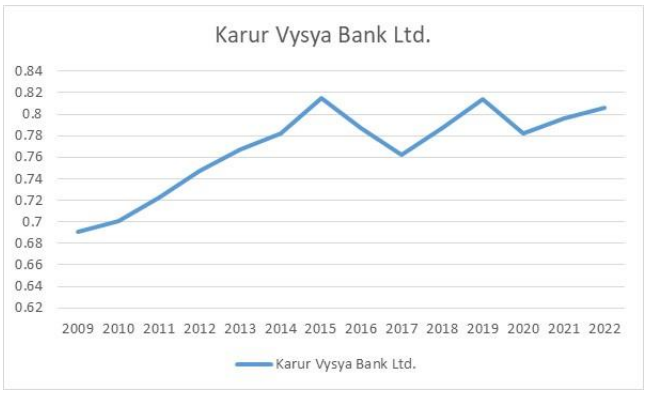
1. Number of branches have increased over the period of time as the government promoted all the individual to have their own account and promoted it with schemes like PM Jan Dhan Yojana and other social schemes.
2. Likewise, increase in branches also reflects the deeper penetration of banking services in deeper parts of the nation trying to connect all Indians to the banking network.
3. Nanital bank is owned subsidiary of BOB and is present mainly in Uttarakhand. BoB is also trying to disinvest its share in Nanital as per RBI regulations, thus expansion of Nanital is slower compared to other banks.

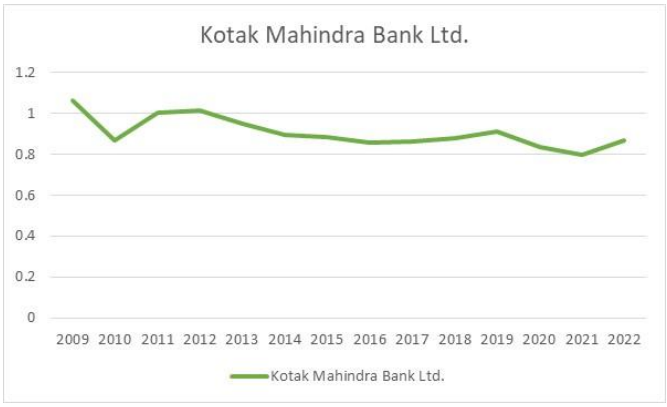
LIQUIDITY RISK

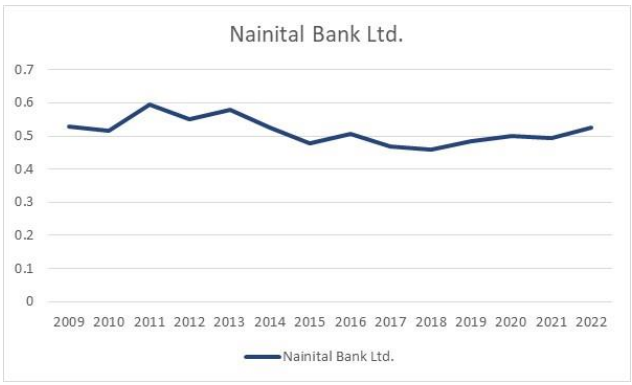


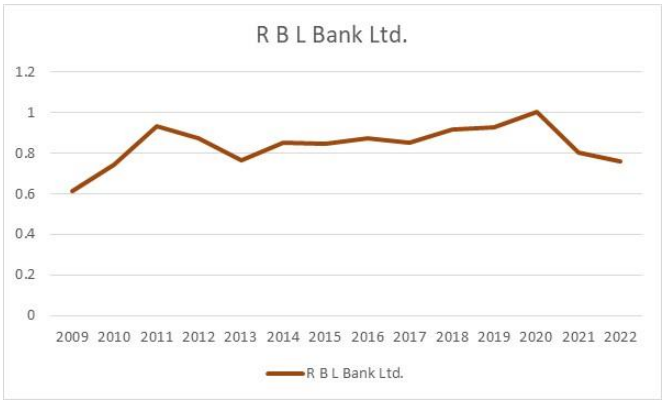


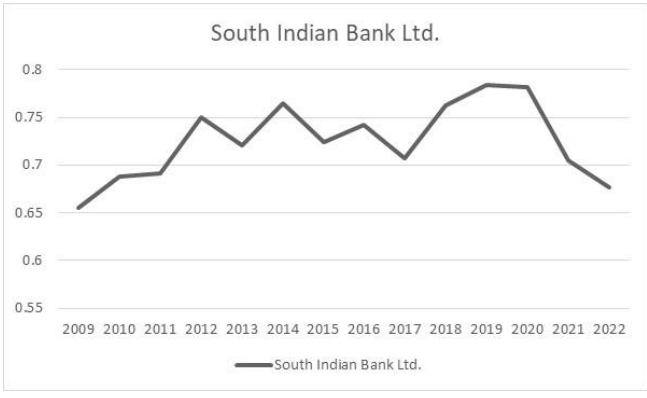


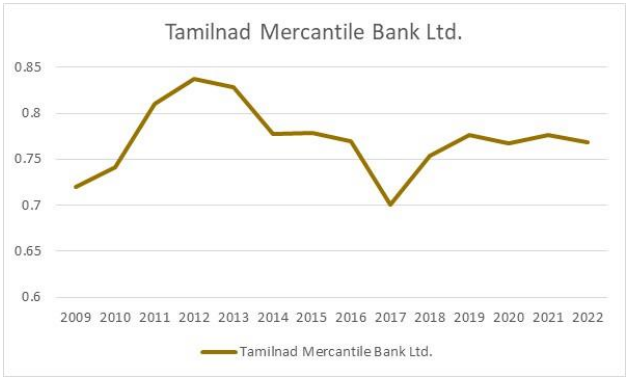


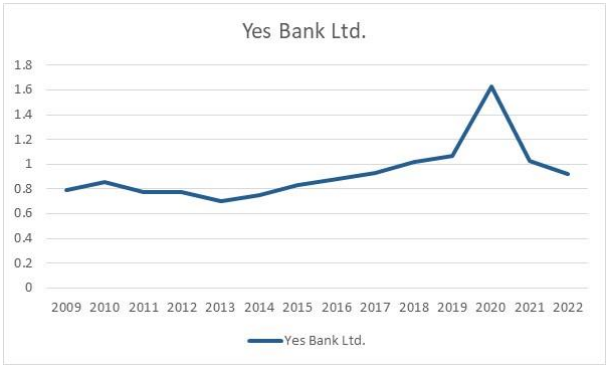


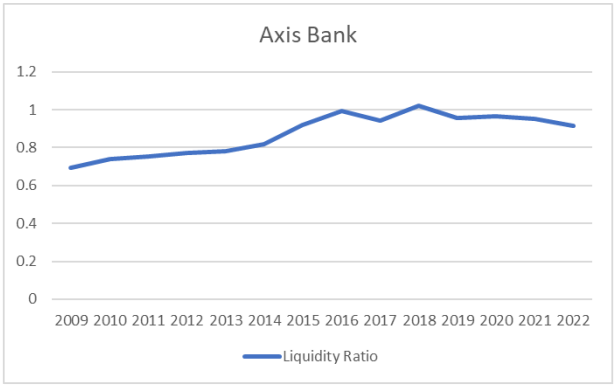


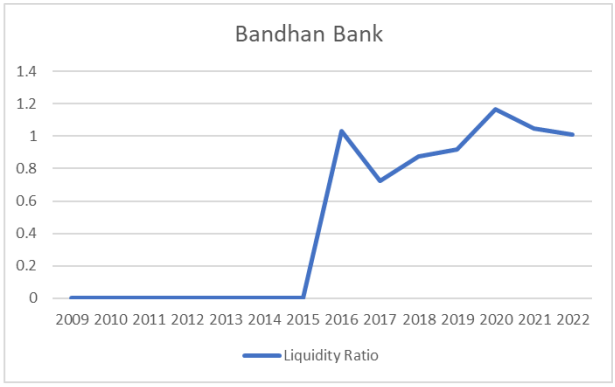


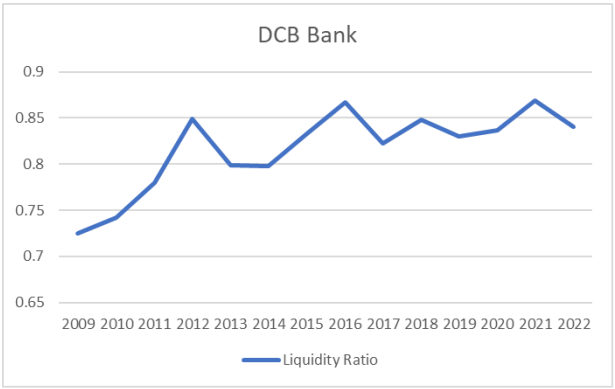


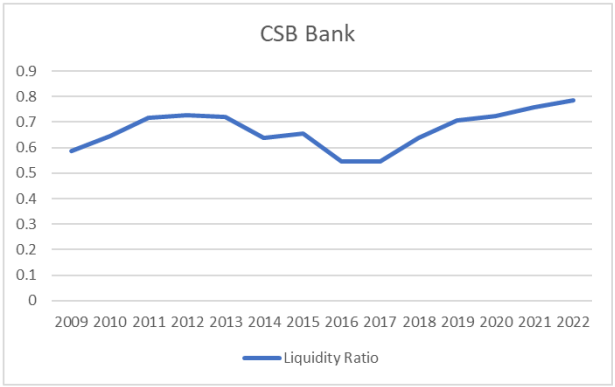

Tamilnad Mercantile Bank Ltd.
0.85
0.8
0.75
0.7
0.65
0.6
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Tamilnad Mercantile Bank Ltd.

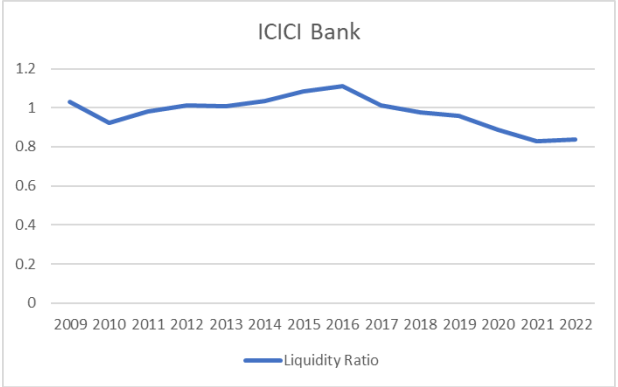

Yes Bank Ltd.
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Yes Bank Ltd.

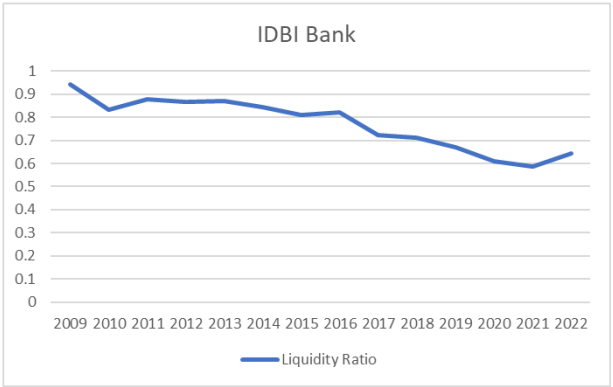

Axis Bank
1.2
1
0.8
0.6
0.4
0.2
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Liquidity Ratio

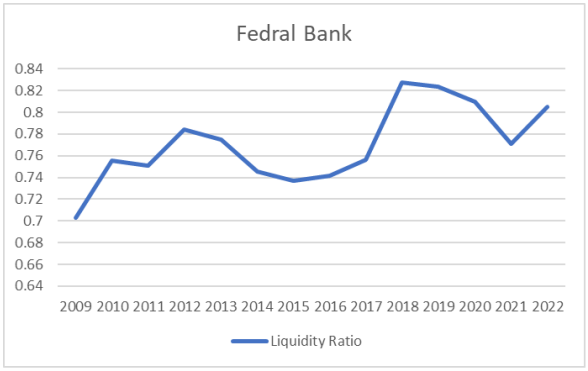

Bandhan Bank
1.4
1.2
1
0.8
0.6
0.4
0.2
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Liquidity Ratio

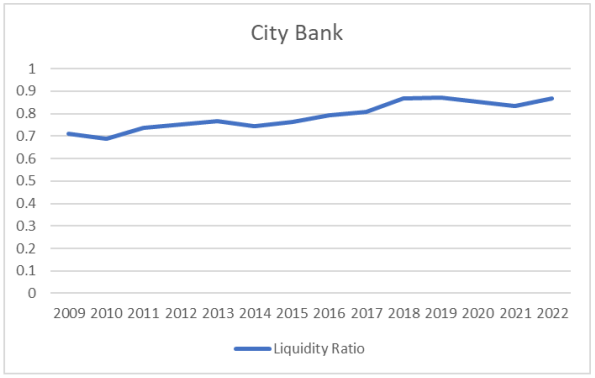

DCB Bank
0.9
0.85
0.8
0.75
0.7
0.65
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Liquidity Ratio

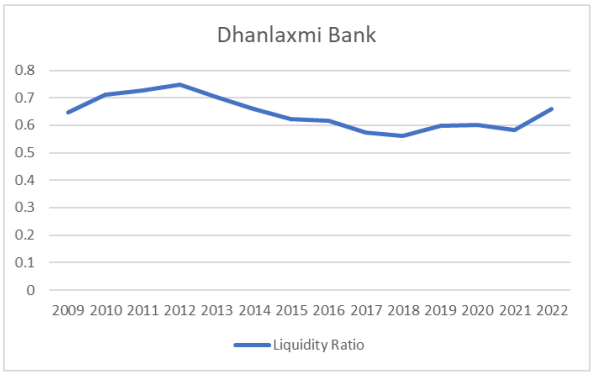

CSB Bank
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Liquidity Ratio

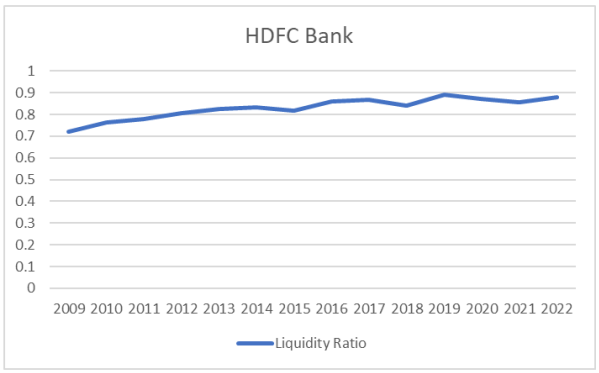

ICICI Bank
1.2
1
0.8
0.6
0.4
0.2
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Liquidity Ratio

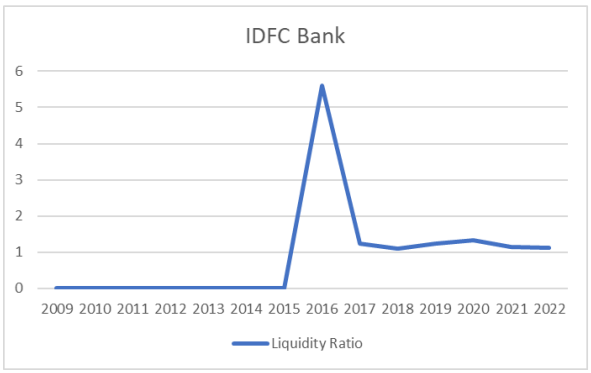

IDBI Bank
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Liquidity Ratio







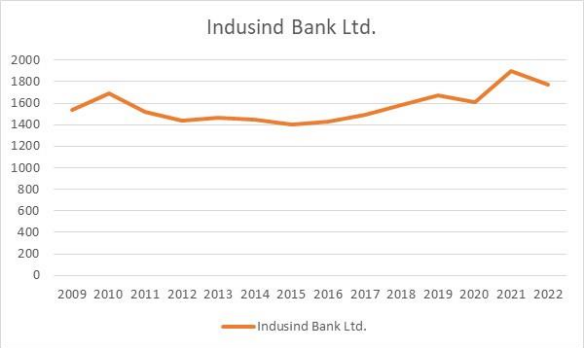


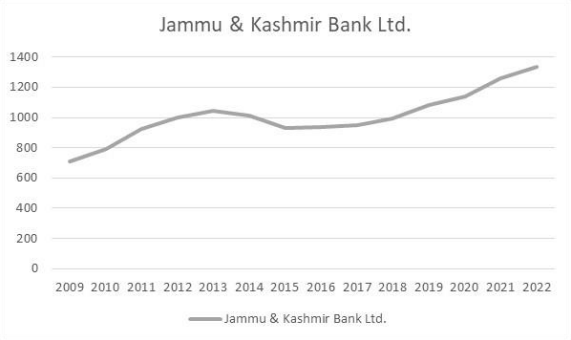


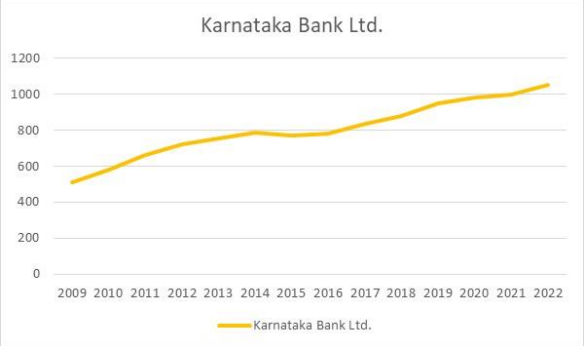
Insights

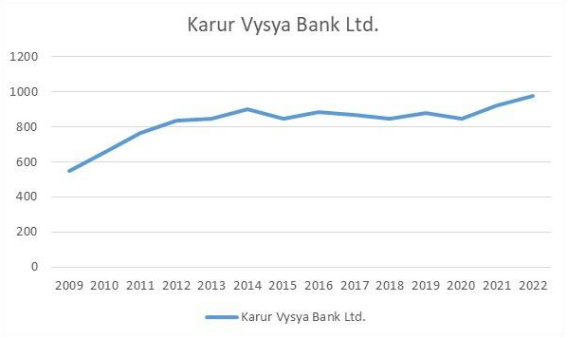
1. Kayur Vyasa Bank, Federal Bank, City Bank & HDFC Bank saw growing trend.
2. IDBI, ICICI has seen a little declination in LR.
3. Most of the banks are having slight deviations.
4. Generally, LR lies between 0.6 – 1.

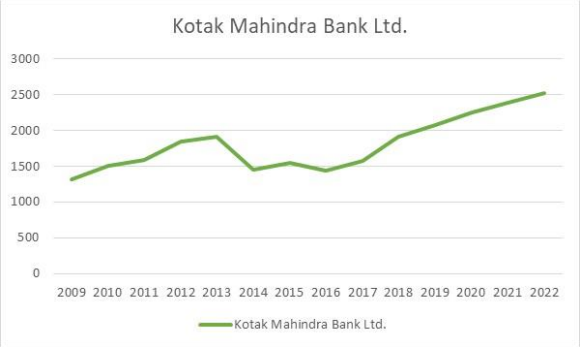
RATIO OF TOTAL ASSETS OVER NO. OF BRANCH

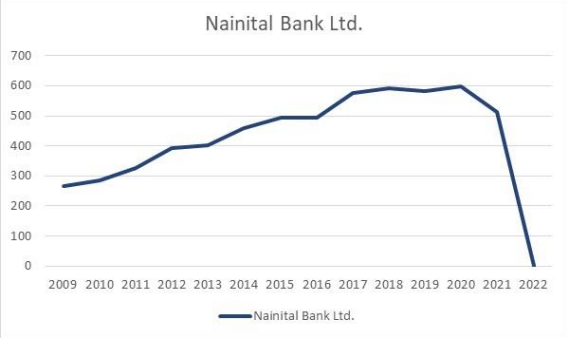


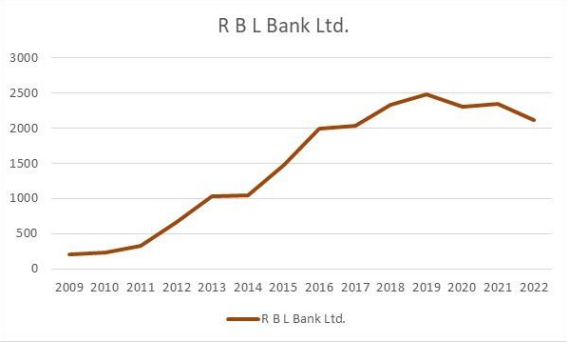


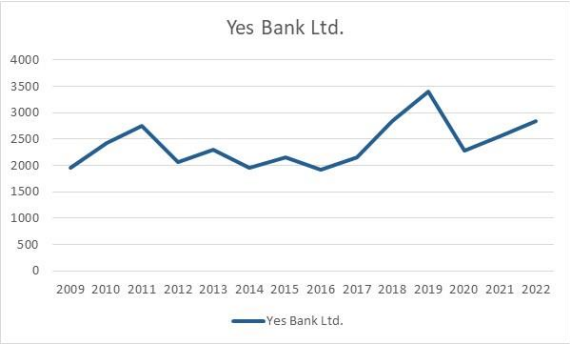


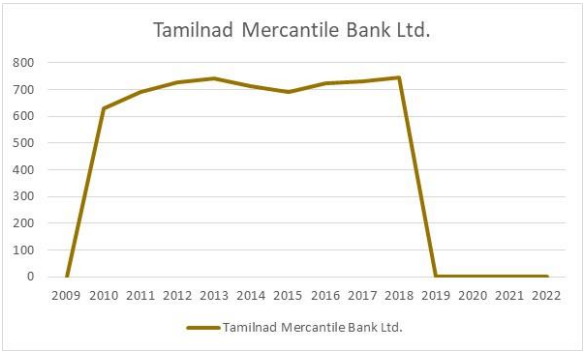


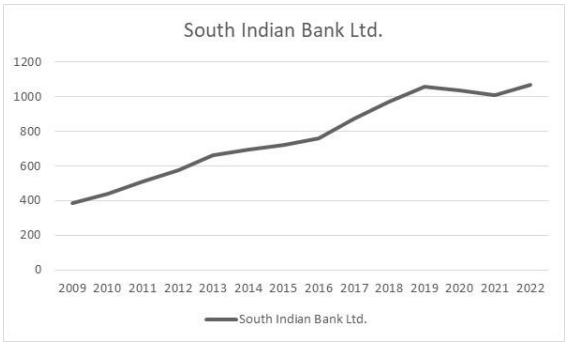


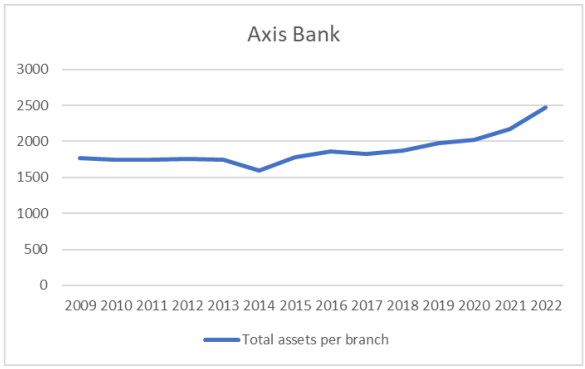


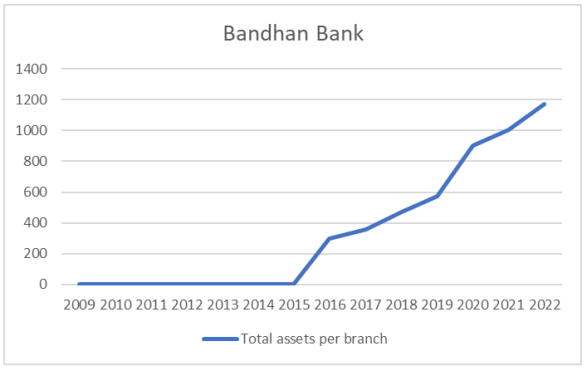


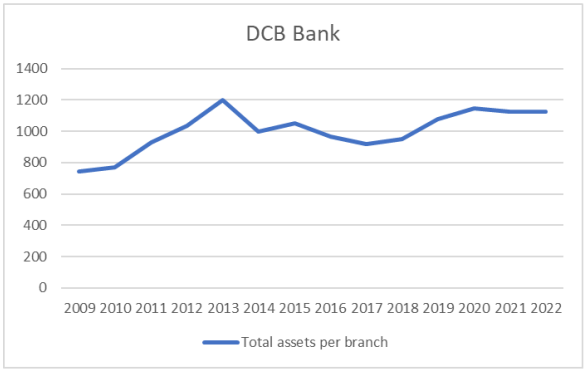


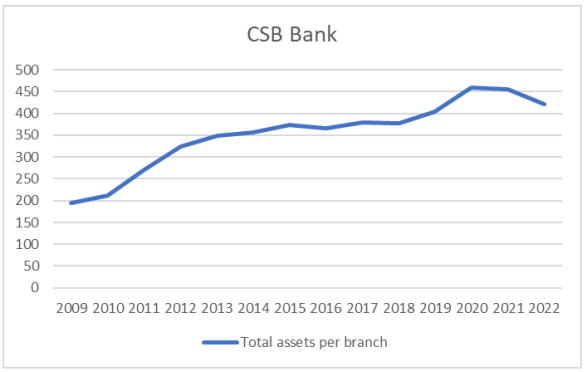

Tamilnad Mercantile Bank Ltd.
800
700
600
500
400
300
200
100
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Tamilnad Mercantile Bank Ltd.

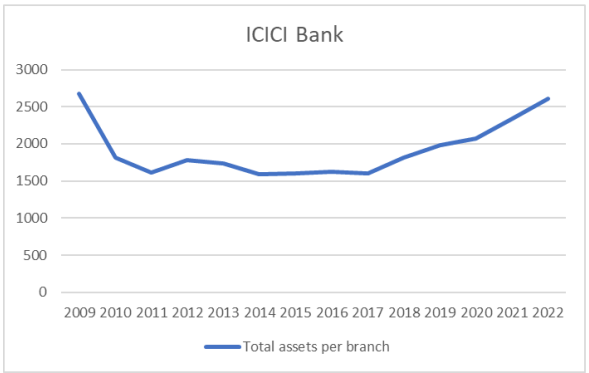

South Indian Bank Ltd.
1200
1000
800
600
400
200
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
South Indian Bank Ltd.

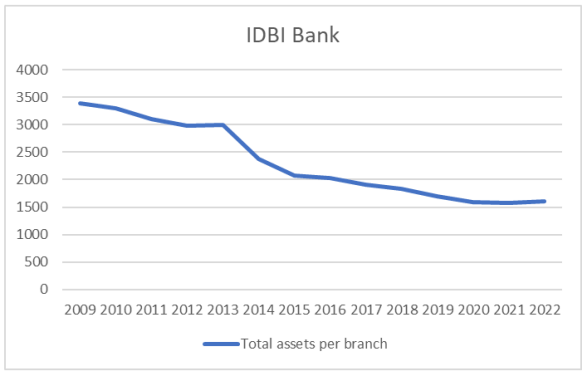

Axis Bank
3000
2500
2000
1500
1000
500
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Total assets per branch

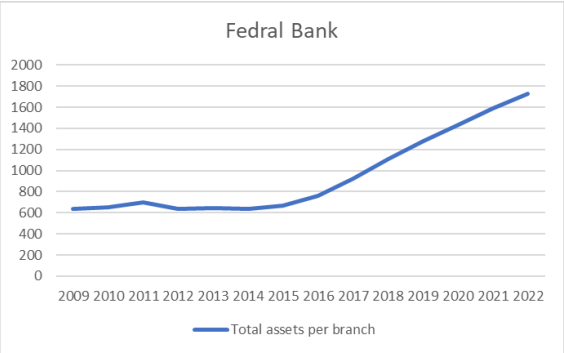

Bandhan Bank
1400
1200
1000
800
600
400
200
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Total assets per branch

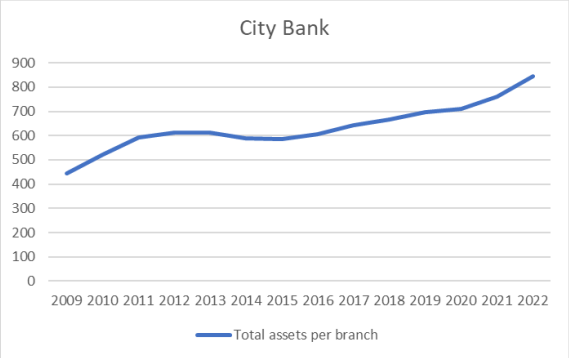

DCB Bank
1400
1200
1000
800
600
400
200
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Total assets per branch

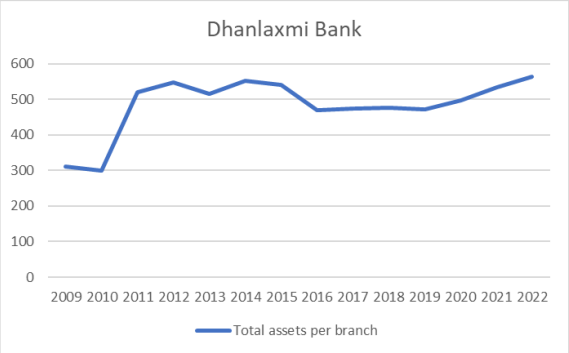

CSB Bank
500
450
400
350
300
250
200
150
100
50
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Total assets per branch

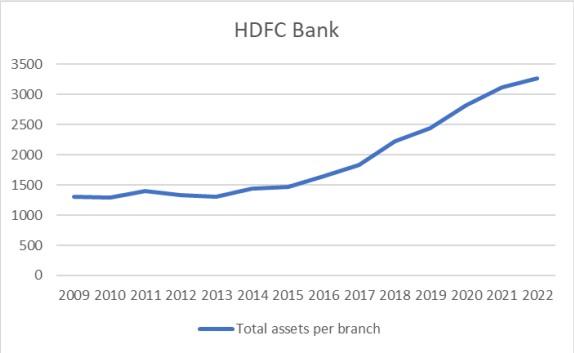

ICICI Bank
3000
2500
2000
1500
1000
500
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Total assets per branch

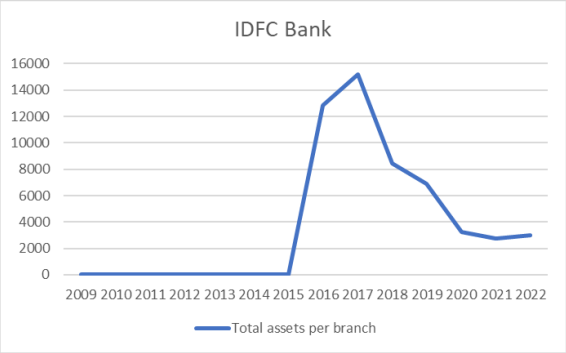

IDBI Bank
4000
3500
3000
2500
2000
1500
1000
500
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Total assets per branch







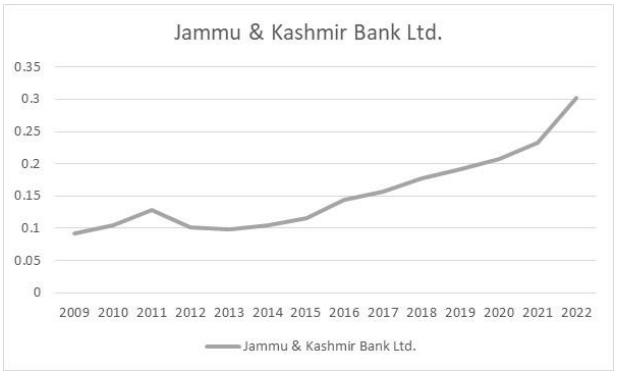


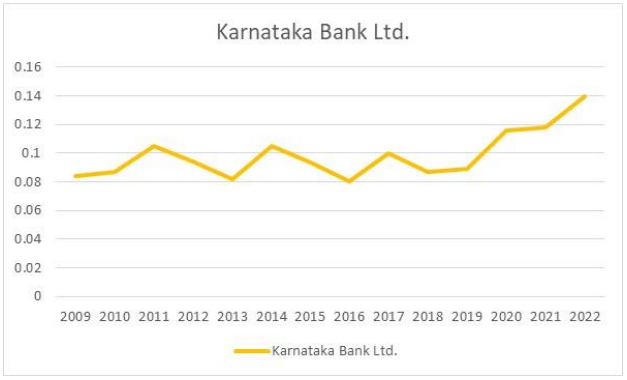


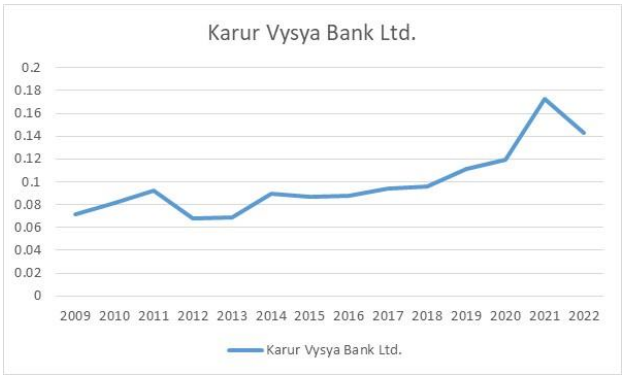
Insights

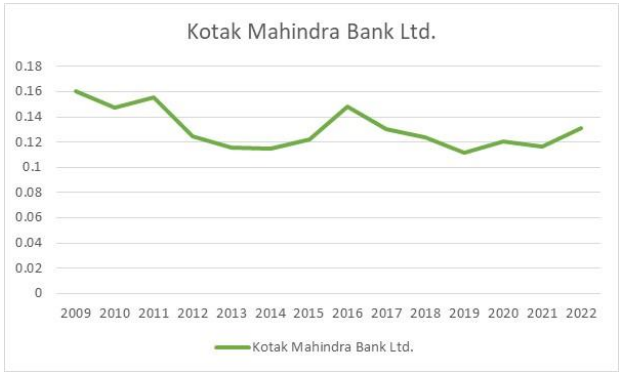
1. Large, nationalized banks typically have more assets per branch than smaller regional banks or cooperative banks.
2. Additionally, the types of assets held by a bank can also affect this metric. For example, a bank that primarily holds real estate loans may have higher asset values per branch than a bank that focuses on consumer loans.
3. For IDBI Bank, Total Assets per Branch is on a continuous decline mode.
4. For IDFC, the initial year experienced high value but declined heavily over the time because of high branch expansion.
5. CSB has least value for Total Asset/Branch
6. ICICI bank saw a bathtub curve.

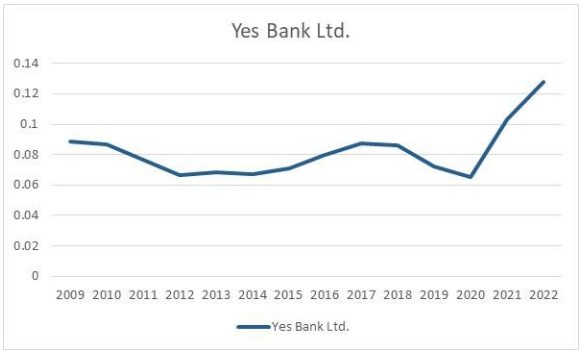
NO OF EMPLOYEES AS RATIO OF INCOME

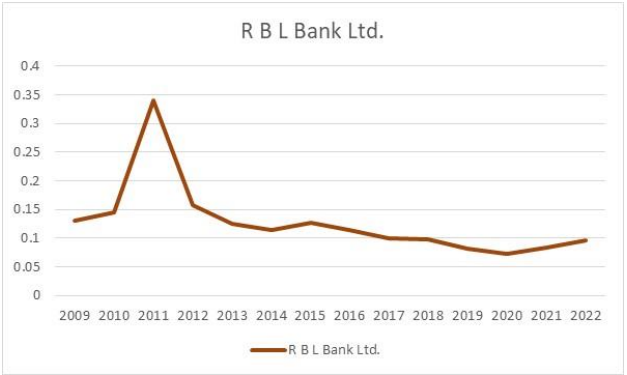


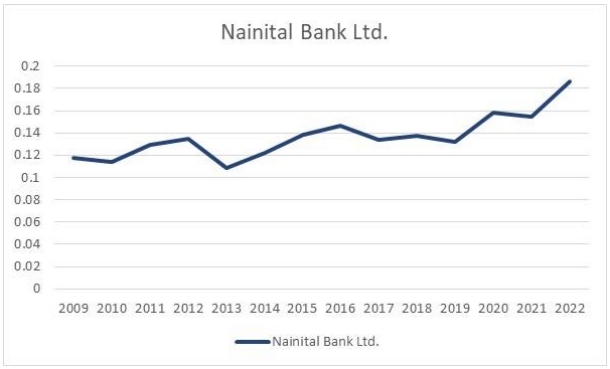


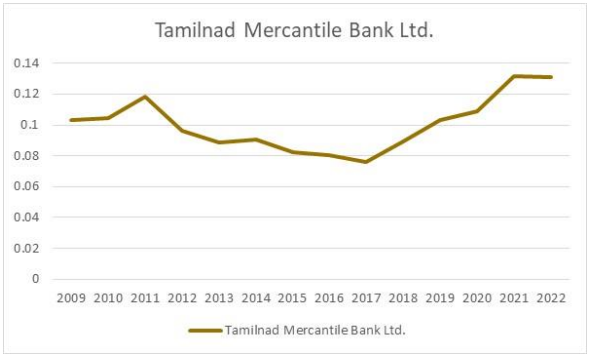











Tamilnad Mercantile Bank Ltd.
0.14
0.12
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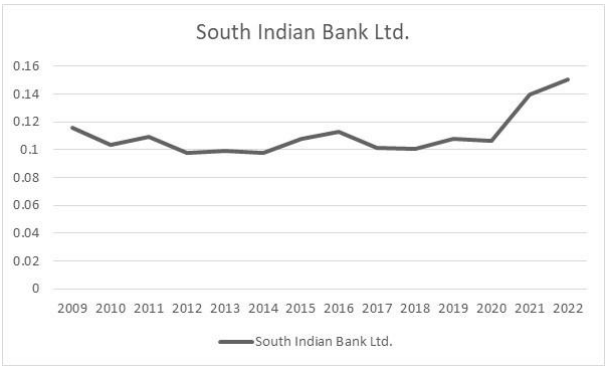
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Tamilnad Mercantile Bank Ltd.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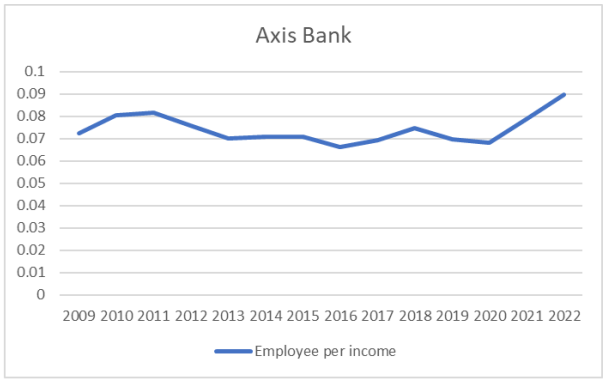
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
South Indian Bank Ltd.


Axis Bank
0.1
0.09
0.08
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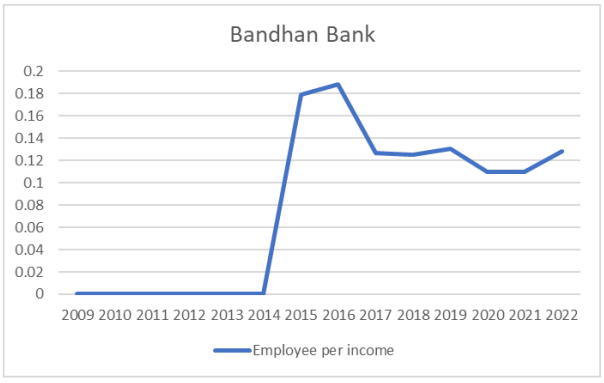
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Employee per income


Bandhan Bank
0.2
0.18
0.16
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0.1
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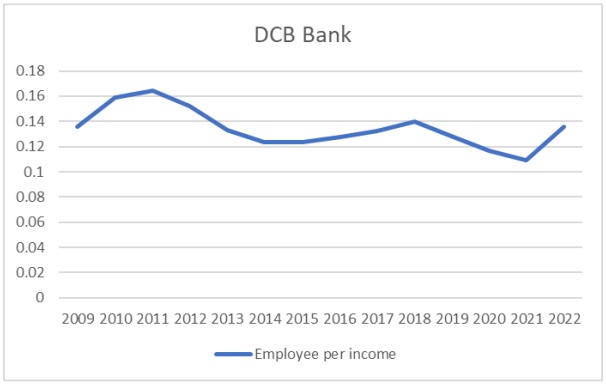
Employee per income


DCB Bank
0.18
0.16
0.14
0.12
0.1
0.08
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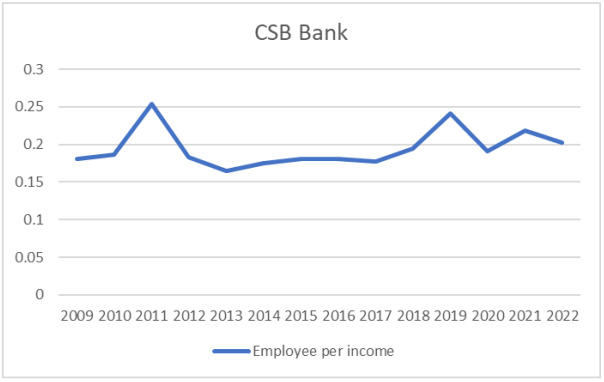
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Employee per income


CSB Bank
0.3
0.25
0.2
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0.05
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Employee per income


ICICI Bank
0.1
0.09
0.08
0.07
0.06
0.05
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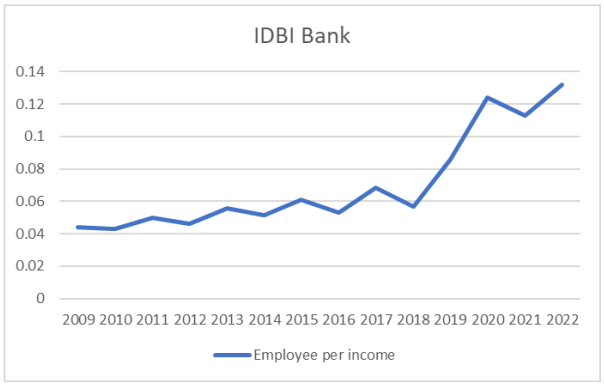
0.02
0.01
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Employee per income


IDBI Bank
0.14
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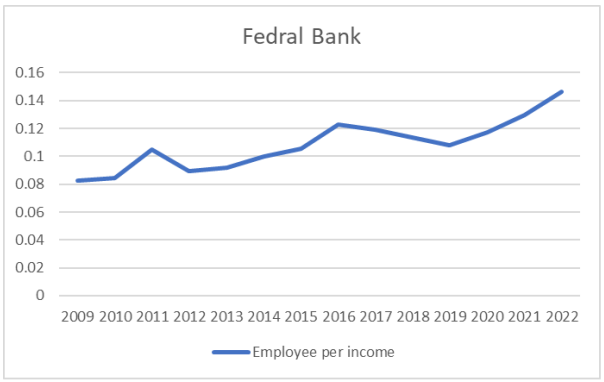
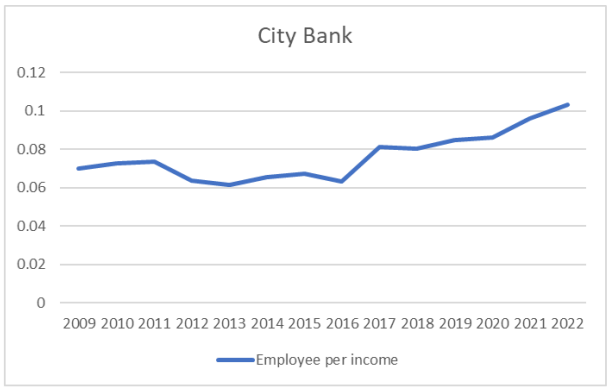
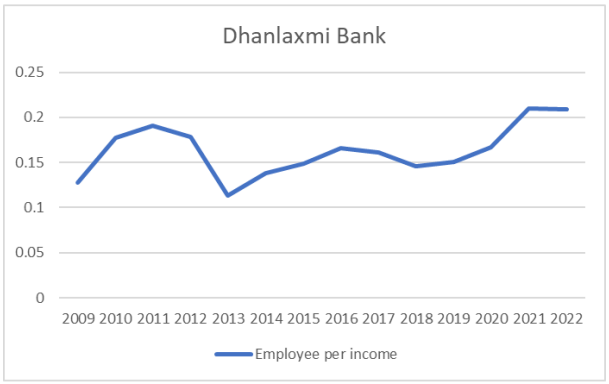
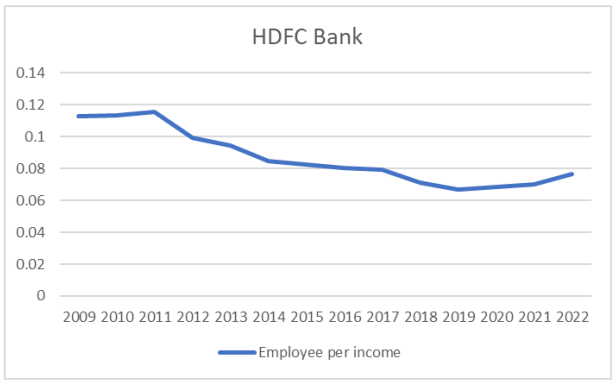
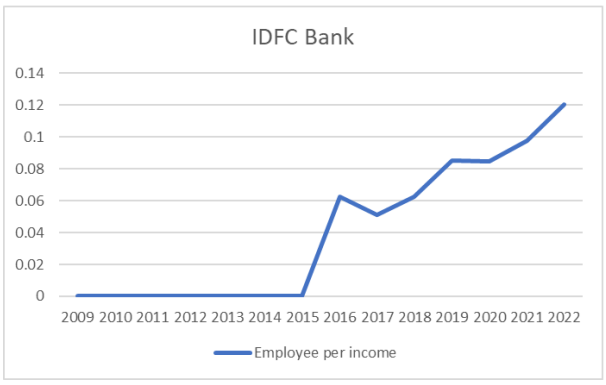
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Employee per income







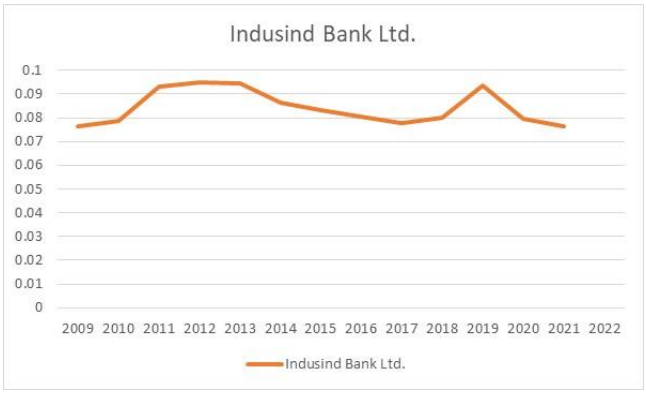


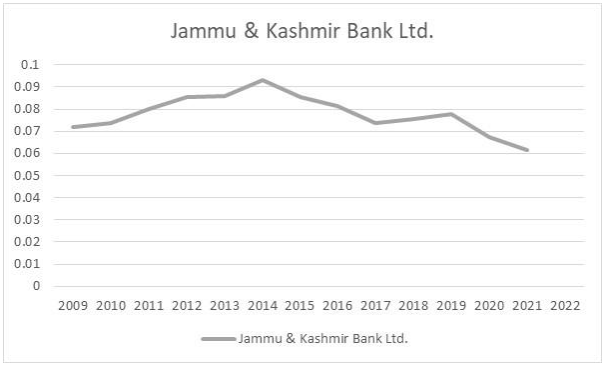


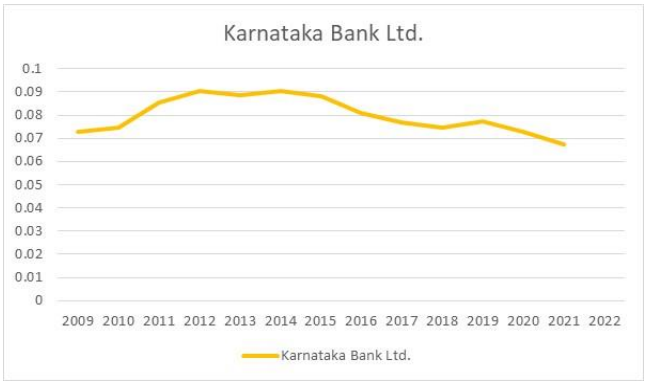
Insights

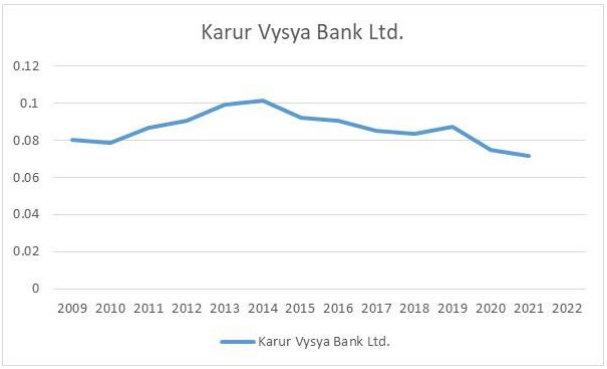
1. According to the RBI, the average monthly salary of employees in public sector banks as of March 2020 was approximately INR 34,247 (around USD 461). However, this figure includes all types of employees, from clerks to executives.
2. The range of employee salary as a percentage of total income ranges from 7% to 30%
3. IDFC has highest growth rate in this parameter because they started hiring more people but industry average is intact.
4. HDFC bank managed to reduce it from 11% to 8% by increasing net income
5. J&K bank has seen huge growth from 10% to 30%

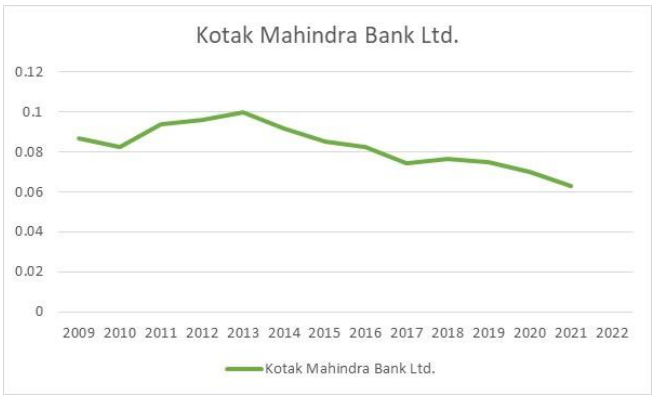
CREDIT RATIO

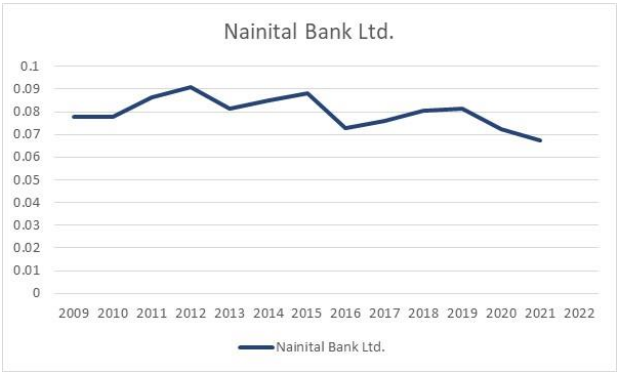


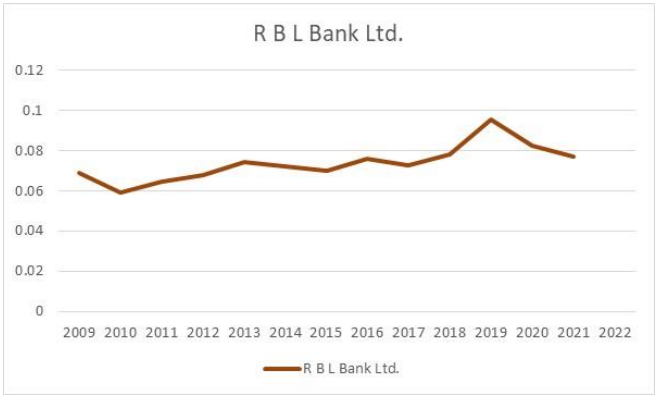


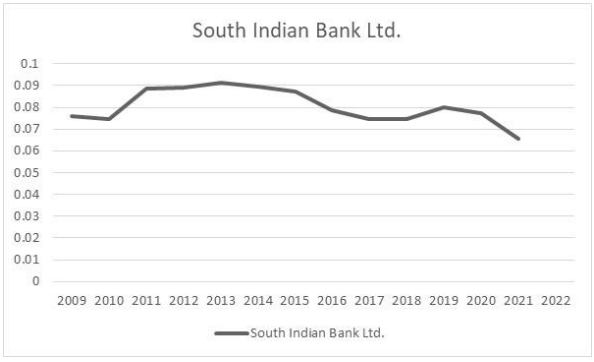


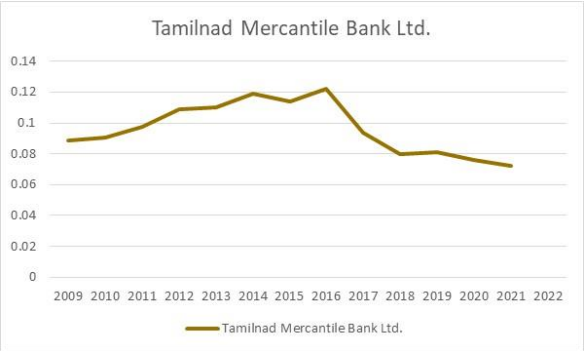











Tamilnad Mercantile Bank Ltd.
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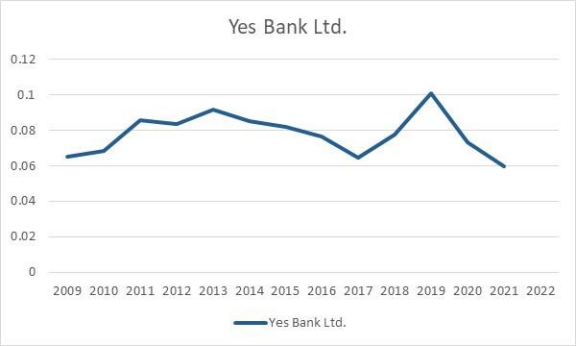
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Tamilnad Mercantile Bank Ltd.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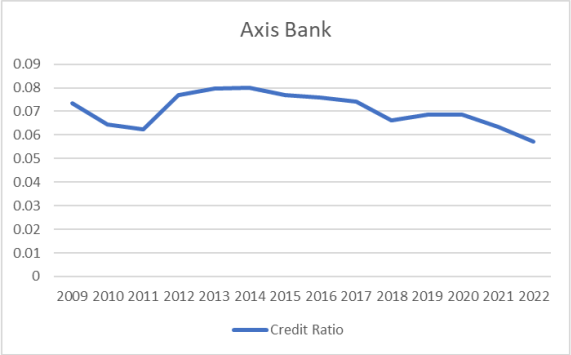
Yes Bank Ltd.


Axis Bank
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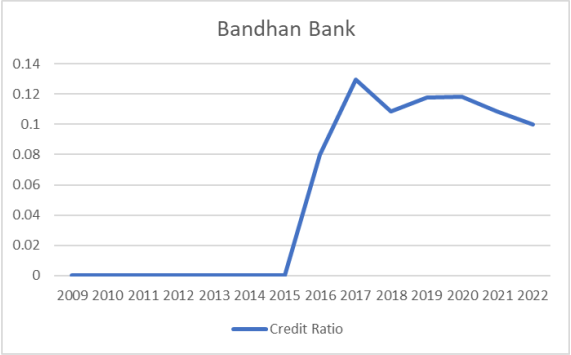
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Credit Ratio


Bandhan Bank
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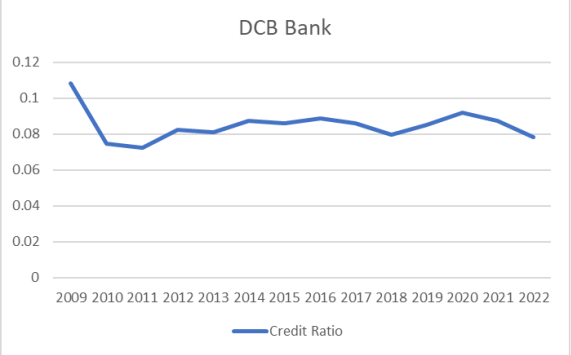
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Credit Ratio


DCB Bank
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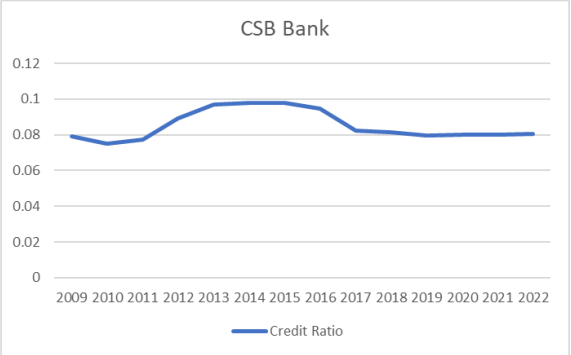
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Credit Ratio


CSB Bank
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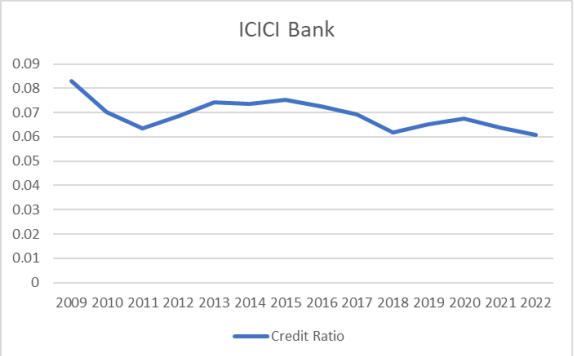
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Credit Ratio


ICICI Bank
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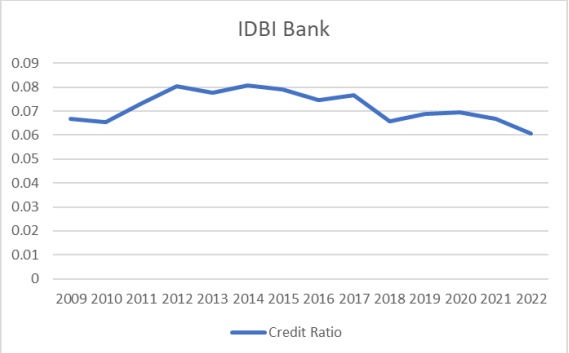
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Credit Ratio


IDBI Bank
0.09
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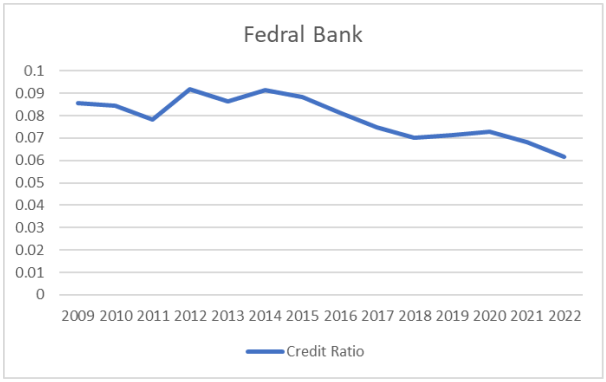
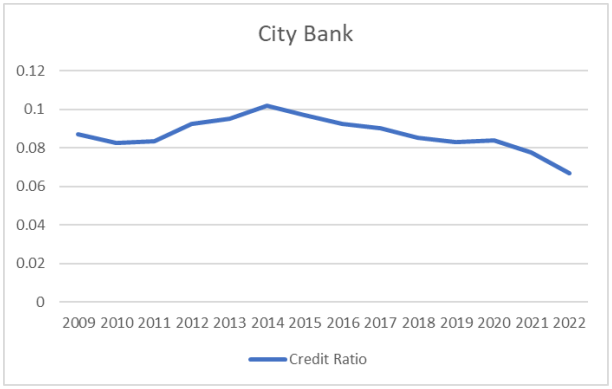
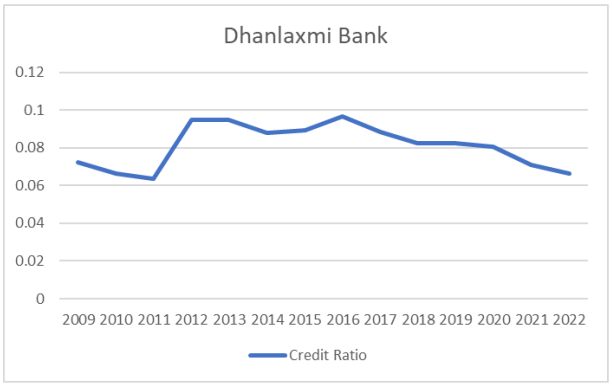
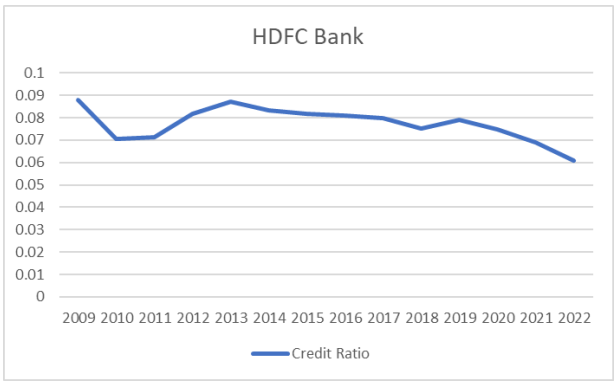
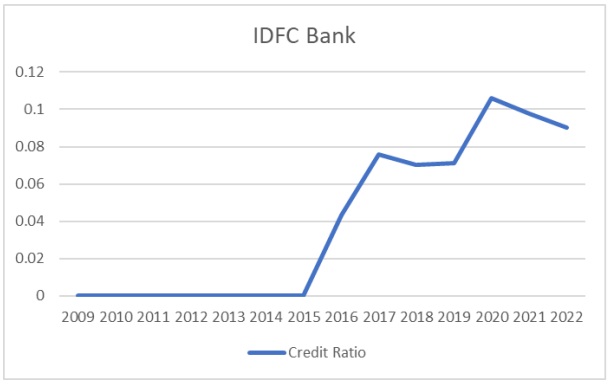
Credit Ratio











Insights

1. Here CR means, interest income as a ratio of TA (total assets).
2. Generally, trend is such that it is decreasing with time.
3. We lack the data of this parameter for Punjab & Sind Bank.
4. Interest income as a percentage of total assets may be declining due to several reasons, some of which are:
    a. Low-interest rates: One of the primary reasons for the decline in interest income as a ratio of TA is the low-interest-rate environment.
    b. Increase in non-interest income: Another reason for the decline in interest income as a ratio of TA is the increase in non-interest income.
    c. Shift in loan portfolio mix: Banks may have shifted their loan portfolio mix from higher-yielding loans such as corporate loans to lower-yielding loans.

3.3 Important Events in India's Banking Sector in the Last Decade

The Indian banking sector has experienced significant changes over the last decade. Some of the major events that have shaped the sector during this period include:

1. Insolvency and Bankruptcy Code (IBC) implementation in 2016: The IBC was created to address the problem of non-performing assets (NPAs) or bad loans in the banking industry. The code established a time-bound method for resolving insolvency, which aided banks' financial health.
2. Public-sector bank merger: In 2019, government officials announced the merging of ten public-sector banks into 4 large banks in order to create more powerful and effective banks. The merger was projected to boost bank credit growth and profitability while lowering operating costs.
3. Introduction of Digital Technologies: The implementation of digital technologies has converted in the Indian banking sector. The introduction of Unified Payments Interface (UPI) has made banking more accessible and convenient for customers, while mobile banking and internet banking have also gained significant traction.
4. Demonetization in 2016: demonetization of high-value currency notes by the government in 2016 had a significant influence on the banking sector. The measure was intended to reduce black money and promote digital payments, and it resulted in an increase in bank deposits.
5. Non-performing assets (NPAs): NPAs have been a major challenge for the banking sector in India, particularly for public sector banks. The RBI established the Prompt Corrective Action (PCA) framework in 2018 to address the issue and improve the financial health of banks.
6. RBI's new guidelines on ownership and governance: In 2020, the RBI introduced new strategies on proprietorship and governance of private banking sector. The guidelines aimed to ensure that private sector banks are well-governed and that their ownership is transparent and in line with the interests of depositors.

In summary, the last decade has witnessed several significant events in the Indian banking sector, including the induction of newfound rules and principles, the implementation of digital technologies, and the merger of public sector banks. Although the sector has faced several challenges, it has also shown resilience and continued to grow, with the adoption of digital technologies playing a significant role in this growth.

CHAPTER IV

Description of the data and research Methodology

4.1 Research Design and Data Sample

The study recommends employing yearly data from Indian commercial banks, covering a substantial period of investigation, ideally spanning from 2009 to 2022. The data will be gathered from reliable sources, specifically the subscribed resources of the Centre for Monitoring Indian Economy (CMIE) and the handbook of statistics on the Indian economy.

Sample Size in Number of Firms			
Sl. No	**Sample**	**Types of Banks**	**Sample Size**
1	Sample 1	Private Sector Banks	21
2	Sample 2	Public Sector Banks	12
3	Sample 3	Public Sector + Private Sector Banks	33
4	Sample 4	All Banks ((Public + Private + Other Banks)	115

4.2 Variable Description:

Variables	Variable Definition	Sources
Measure of Revenue equation		
Rev	Revenue over total asset. Bank revenue is measures as sum of banks interest income and income from financial services.	CMIE & Author's Calculation
Measure of Financial stability		
FS	The financial stability of a company can be assessed using a metric called the Z Score. The Z Score is determined by adding the Return on Assets (ROA) and the capital ratio and dividing the sum by the standard deviation of the ROA and Capital Ratio is the ratio of equity over total asset (TA).	CMIE & Author's Calculation
Measure of Input Price		
PK	Price of capital calculated as ratio of capital assets to fixed assets	CMIE & Author's Calculation
PL	Price of labour calculated as personnel operating expense to employees as a percentage of TA	CMIE & Author's Calculation
PF	The fund's price is computed as a ratio of annual interest expenditures to total loanable funds.	CMIE & Author's Calculation
The logarithms of PK, PL, and PF are used to calculate the elasticity of revenue owing to changes in input prices such as capital (PK), labour (PL), and fund (PF).		
Control Variables		
RA	Risky Asset calculated as ratio of provisions to total assets	CMIE & Author's Calculation
BC	Branch concentration measured as ratio of banks number of branches to the total number of branches in the industry	CMIE & Author's Calculation
CR	Credit Risk measured as ratio of interest income to TA	CMIE & Author's Calculation
LR	Liquidity risk computed as ratio of total loan over total deposit	CMIE & Author's Calculation
Size	Bank size calculated as log of TA	CMIE & Author's Calculation
NWTA	Proxy for financial leverage, measured as Net Worth over Total Assets	CMIE & Author's Calculation
CMIE: Centre for Monitoring Indian Economy		

4.3 Empirical Interpretation of the P-R Approach into Econometric Specifications:

The structural approach measures the banks level competition and market concentration by measuring market structure through concentration ratios based on measured of HHI (Herfindhal-Hirschman index). Structure-Conduct-Performance paradigm presents the theoretical justification to measure of competition. On the contrary, Cetorelli (1999) found that intensity is not a trustworthy measure of competition. In this context, Panzar and Rosse (1987) proposed a model called general equilibrium market. In other words, Panzar and Rosse advocates to determine competition regarding changes in revenue function as a function change in input prices.

4.4 To measure consolidation of Market Power:

We will be applying the Panzar-Rosse H (PRH) model to measure power of market and consolidation structure of market. This model provides a methodology to assess competition in the banking industry by analyzing its structure of market through ratio of concentration or the Herfindahl-Hirschman index. The PRH model is an effective framework developed by Panzar and Rosse (1977, 1982, and 1987) in their studies conducted. To gain more clarity, it is crucial to translate the PRH model into an econometric specification for empirical analysis. The PRH model utilizes cross-sectional data to evaluate the competitive structure of banks, employing a reduced form revenue equation to measure the revenue elasticity using detail to changes in input prices. Therefore, the theoretical equations of the model suggest that both the dependent variable (revenue) and the input variables should be logarithmically transformed. Thus, we incorporate the requirements and desirable methodological aspects of the PRH model while implementing it. To account for the diverse banking sector, we calculate the Panzar-Rosse H-statistic for four distinct samples: private sector banks, public sector banks, a combination of private and public sector banks, and all banks, allowing for sector-level analysis. The structural equation is explained below.

$$LRev_{it} = \alpha_0 + \gamma_1 LPK_{it} + \gamma_2 LPL_{it} + \gamma_2 LPF_{it} + \beta_1 RA_{it} + \beta_2 BC_{it} + \beta_3 CR_{it} + \beta_4 LR_{it} + \lambda_t + \eta_i + \varepsilon_{it} \quad (1)$$

Together the subscripts *i* and *t* refer to *i* th bank at time *t*. The LRev (log of revenue), the dependent variable is total revenue over total assets, LPK (Log of PK) is the price of capital

calculated as the ratio of capital assets to fixed assets, LPL (Log of PL) is the price of labour or personnel expenses to employees and LPF (log of PF) is the price of fund calculated as ratio of annual interest expenses to total loanable funds. Finally, the control variable are in this model such as: LR, BC, RA, and CR, represent liquidity risk, branch concentration, risky assets, and credit risk, respectively. Since Panzar Rosse H (PRH) approach measures elasticity of revenue due to change in input price (i.e., price of capital, price of labour and price of fund; PK, PL and PF respectively, these variables are taken in logarithm.

Model (1) represents the revenue equation of P-R model that measures the sum of the elasticity of the bank's total revenue to change of its input prices provides important estimates to test the degree of completion in the banking sector. In the empirical model (1) the coefficients γ_1, γ_2, & γ_2 represent the input elasticity of the three key input of the banking sector. Hence the contestability statistics H is the sum of all the three input coefficients. Panzar and Rosse (1987) give the total of a bank's revenue elasticity with respect to input prices. The H-statistic can be used to identify the competitive structure of banks. During ideal competition, the P-R H statistics is unit. It indicates that every increase in input prices should result in a one-to-one increase in total revenues, because under perfect competition, banks will be driven to depart the market if their input prices rise. However, if the H-statistic is zero or negative, the market structure is said to be monopolistic, because an upward shift in the marginal cost curve is associated with no change or a decrease in income. It could happen due to the monopolist's optimality condition. However, the banking sector is characterized by monopolistic competition, when the H-statistic will lie between 0 to 1.

If H = 1; It implies banking sector operates under Perfect competition.
If H $\leq$ 0; It implies banking sector operates under Monopoly.
If 0 < H < 1; It implies banking sector operates under monopolistic competition.

Shaffer, (1982a) have used P-R model test for market level equilibrium in which firm's revenue function is proxied by return on assets (ROA). The study indicates that, in a steadiness between standardized businesses, market forces should equalise ROA among firms, so that the amount of ROA is independent of input prices, and define an HROA analogously to H, failing to reject the market equilibrium hypothesis. In a similar context, Bikker and Haaf (2002) and Claessens and Laeven (2004) used the P-R model to investigate market structure.

4.5 To measure the impact on financial stability

To explore the combined effect of liquidity risk and credit risk on the financial stability of the banks, the present study proposes following equations.

$$FS_{it} = \alpha_0 + \gamma_1 LR_{it} + \gamma_2 CR_{it} + \beta_1 Size_{it-1} + \beta_2 RA_{it-1} + \beta_3 NWTA_{it-1} + \beta_4 BC_{it} + \lambda_t + \eta_i + \varepsilon_{it}$$

$$FS_{it} = \alpha_0 + \gamma_1 PK_{it} + \gamma_2 PL_{it} + \gamma_3 PF_{it} + \gamma_4 LR_{it} + \gamma_5 CR_{it} + \beta_1 Size_{it-1} + \beta_2 RA_{it-1} + \beta_3 NWTA_{it-1} + \beta_4 BC_{it} + \lambda_t + \eta_i + \varepsilon_{it}$$

Here FS_{it} represents financial stability of the bank *i* at time *t.* Financial stability is proxied by Z score measured as sum of ROA and capital ratio divided as standard deviation of ROA. *LR* stands for liquidity risk, *CR,* stands for credit risk, *LDR* stands for loan -to-deposit ratio that measures bank liquidity, *NWTA* stands for net worth-to-Asset ratio that measures financial leverage of banks.

4.6 Econometric Model and Generalised regression:

The ordinal least squares (OLS) approach is used to estimate unfamiliar parameter of sample which is minimised by the residual sum of squares. This presumptively assumed that the mistakes are homoscedastic, non-autocorrelated, and so normally distributed. But practically, the nature of industry data is largely heterogeneous, and the variances are Heteroskedastic and serially correlated due to the impact of time. Hence, in such cases, OLS estimates are not advisable as they are statistically ineffective and generates deluding inferences. As an replacement to ordinary least square, generalised least square estimates can be used. The generalised least square (GLS) estimates, in a typical linear approach are presented below.

$$Y_t = \beta X_t + \varepsilon_t \text{ where } E[\varepsilon_t | X_t] = 0 \text{ and } var[\varepsilon_t | X_t] = \Omega_0$$

The underlying assumption in this context is that the conditional mean of the dependent variable (Y), considering a given set of explanatory variables (X), can be expressed as a linear function of X. Additionally, it is assumed that the variability of the error terms, given X, can be described by a known matrix 'Ω'. GLS can be used when the conditional variance matrix 'Ω' of the error terms are known. GLS estimator cannot be estimated since, 'Ω' is not known in most of the cases. Substituting the un-estimated excess variance matrix with an estimated excess variance matrix,

($\widehat{\Omega_t}$for Ω), give feasible GLS (FGLS) estimator. Here $\widehat{\Omega_t}$, is an expected conditional variance matrix of the error terms for an FGLS model that are heteroscedastic. But occasionally these models are uncovered to be restricted with its applications. Because the disturbances are assumed to be either heteroscedastic across panels or heteroscedastic. It might also be correlated across panels in real time. The variations can alternatively undertake to be autocorrelated within the panel, with the autocorrelation parameter being persistent across panels or for each variable. PCSE (Panel Correlated Standard Error) is discovered to be a viable complementary to the FGLS approach in such instances. Thus, model can be written as follows:

$y_{it} = X_{it}\beta + \varepsilon_{it}$ where i = 1,2, 3, ..., P is the panel numbers

t = 1,2,.....T_i time period in panel.

T_i= number of period in panel i. ε_{it} = it is the residual error term that can be autocorrelated alongside "t" and concurrently correlated across "i". It is also possible to write it as:

$$\begin{bmatrix} Y_1 \\ Y_2 \\ \vdots \\ Y_p \end{bmatrix} = \begin{bmatrix} X_1 \\ X_2 \\ \vdots \\ X_p \end{bmatrix} \beta + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \vdots \\ \varepsilon_p \end{bmatrix}$$

If the data structure heteroskedastic and the estimated errors are contemporaneous correlation without autocorrelation, the estimated error covariance matrix can be written as

$$E[\varepsilon\, \varepsilon'] = \mathbf{\Omega} = \begin{bmatrix} \sigma_{11} I_{11} & \cdots & \sigma_{1p} I_{1p} \\ \vdots & \ddots & \vdots \\ \sigma_{p1} I_{p1} & \cdots & \sigma_{pp} I_{pp} \end{bmatrix}$$

Where σ_{it}, presents the main diagonal with variance of the error term in the panel i. It implies σ_{11} presents variance of the error for panel one, σ_{22} stands for variance of the error for panel two and so on till σ_{pp} as error variance for p^{th} panel. The off diagonal "σ_{ij}" represents the co-variance of the disturbances between panel i and j. I represent the identity matrix of $T_i \times T_i$ order. Hence, $E[\varepsilon\, \varepsilon'] = \Sigma\ p*p * I_{TiTi}$ where Σ p*p is the p*p panel by panel covariance matrix and I is $T_i \times T_i$ identity matrix. The panel-corrected standard error (PCSE) method utilizes least square values of the parameters in model while assuming '0' (zero) autocorrelation. The autocorrelation implies that parameter estimates depend on autocorrelation parameter estimates. FGLS estimates the variance-covariance matrix (**Ω**) and parameter estimates, both conditional on estimated

autocorrelation parameters. If the conditional mean (Xitβ) is correctly specified, both estimates will be consistent. When we anticipated structure of covariance is correct, FGLS values are further useful.

PCSE allows for different error covariance structures, including heteroskedasticity and contemporaneous correlation across panels, with or without autocorrelation. This study used heteroskedastic panel-corrected standard error models to account for the elasticity of the estimated parameters. The Modified Wald test and the Breusch-Pagan test were used to address heterogeneity.

4.7 Quantile Regression Modelling:

With linear regression, specified as $Y_i = X_i'\beta_q + \mu_i$, where β_q represents the vector of parameters of q[th] quantile. Unlike OLS regression that minimizes $\sum \mu_i^2$, quantile regressions minimize the least absolute deviation i.e. $\sum |\mu_i|$. By minimizing $\sum q|\mu_i| + \sum(1-q)|\mu_i|$, quantile regression models minimizes the sum that assign asymmetric penalty $q|\mu_i|$ for under prediction and $\sum(1-q)|\mu_i|$ for over prediction of predicted random error. It is argued that, the estimates of quantile regression are assumed to be robust in the presence of large outliers and heterogeneous conditional distributions.

Hao and Naiman (2007) conducted a study that investigates how independent variables relate to different aspects of the allocation network, which are connected to the dependent variable. They employed quantile regression models to offer unique interpretations of the behavior of various components within conditional probability distributions. The sample of firms analyzed in the study consisted of firm-specific parameters, exhibiting higher variations both within and across firms over a long period. Moreover, the disturbances in the distribution were found to deviate from a normal distribution. Consequently, using conditional mean estimators with such diverse data would be inappropriate and could yield misleading results in panel OLS estimates. However, quantile regression is vigorous to differences from familiarity and can handle biased tails (Mata and Machado, 1996). Previous studies by Coad and Rao (2006, 2008), Fotopoulos and Louri (2004), Reichstein, Dahl, Ebersberger, and Jensen (2009) have also utilized quantile regression methods to analyze firm growth. Likewise, Coad and Rao (2008) examined innovativeness, Tiwari and Krishnankutty (2015) and Cheng (2009) analyzed capital structure using the quantile regression approach. Mueller (1998) employed quantile regressions to evaluation the size of the public sector wage premium.

CHAPTER V

Empirical Findings and Discussion

5.1 Estimated Statistics for Objective I

5.1.1 Estimated Statistics of FGLS and PCSE model to measure competitive structure and the consolidation of market power of Indian Public sector Banks (Sample-1):

Table-1 presents the summary statistics and Table-2 reports the matrix of correlation coefficients of banking parameters for public sector banks throughout the study period. It is commented that revenue, price of labour, and credit risk is negatively shewed implying a longer leger left tail. It also indicates that small proportion of banks received very low figures in case of revenue, price of labour, and credit risk score. On the contrary, variables like price of capital, branch concentration, price of fund, Risk Asset, and liquidity ratio are rightly skewed, implying a long tail on the right of the distribution. Analysing the kurtosis, it is very clear that all the banking parameters are non-normally distributed. Liquidity ratio is highly skewed with highest kurtosis. Here we get initial inputs that the data structure is not suitable for least square estimates. The correlation matrix depicted in Table-2 also shows that revenue is negatively correlated with price of capital and liquidity ratio, whereas positively correlated with cost of employee, price of fund, risky asset, branch concentration and credit risk. Interestingly, cost of employee and branch concentration is positively correlated with revue where correlation coefficient is relatively high.

Since the implications of the study are model based, we have taken enough precaution for selection of appropriate econometric model. Required amount of pre-estimation and post estimation test has been undertaken and results are analysed to ensure robust estimates. Table-3 contains three pre-estimation such as White test, Cameron & Trivedi IM test and Breusch-Pagan Test to justify model selection. White's Test tests the null hypothesis (H_0); "Homoskedasticity" against alternate hypothesis (H_1); "Unrestricted heteroskedasticity", Breusch-Pagan (B&P) Test also called as Cook-Weisberg test for heteroskedasticity test the null hypothesis (H_0); "Constant variance", and Cameron & Trivedi decomposition of IM-Test ensured whether model contains no heteroskedasticity, skewness and Kurtosis to a significant degree. Hence IM test tests the null hypothesis of no heteroskedasticity, no Skewness and no Kurtosis. All the three tests reject their respective null hypothesis at 1% level implying that the data structure is heterogeneous and largely non-normally distributed. High heterogeneity data set is better modelled by Generalised Least Square (GLS) estimates.

Secondly, since the data sample has long time series, the samples are expected to be correlated across panel. It is presented by "rhos" coefficients in respective result tables. To handle that we have used Panel Corrected Standard Error (PCSE) model. PCSE is alternate to GLS model for fitting linear cross-sectional time-series models when the distributions are not assumed to be independently and identically distributed. PCSE model fits well to the data sample when error distribution is heteroskedastic and contemporaneously correlated across panels. Based on this we have used FGLS and PCSE model to answer our research objectives. When sample size increases, i.e., in case of sample 3 and 4, we have used quantile regression to capture the distribution wise estimates. The estimated statistics are presented from Table-4 to Table 14.

Table:1 Descriptive Statistics for banking parameters

	Mean	**Median**	**STD**	**Skewness**	**Kurtosis**
LREV	5.169	5.344	0.968	-2.395	8.538
LPK	4.185	4.074	0.851	2.043	10.206
LPL	9.916	10.190	1.865	-1.900	7.116
LPF	-1.102	-1.101	0.194	2.137	19.898
RA	0.013	0.012	0.009	1.948	10.919
BC	0.078	0.067	0.071	2.194	7.710
CR	0.070	0.070	0.014	-2.628	13.689
LR	6.253	0.719	67.896	13.342	179.328

Note: *LREV: Log of revenue, LPK: Log of Price of capital, LPL: Log of Price of labour, LPF: Log of Price of fund, RA: Risky Asset, BC: Branch concentration, CR: Credit Risk, LR: Liquidity Risk*

Table:2 Correlation Matrix for Banking parameters

	LREV	LPK	LPL	LPF	RA	BC	CR	LR
LREV	1.000							
LPK	-0.398	1.000						
LPL	0.988	-0.360	1.000					
LPF	0.099	0.218	0.070	1.000				
RA	0.290	-0.118	0.307	0.009	1.000			
BC	0.590	-0.192	0.655	-0.075	0.036	1.000		
CR	0.302	-0.030	0.228	0.439	0.112	-0.004	1.000	
LR	-0.246	-0.063	-0.244	-0.125	-0.127	-0.090	0.006	1.000

Note: *LREV: Log of revenue, LPK: Log of Price of capital, LPL: Log of Price of labour, LPF: Log of Price of fund, RA: Risky Asset, BC: Branch concentration, CR: Credit Risk, LR: Liquidity Risk*

Table: 3 Pre estimation test to Justify selection model.

White Test		Cameron & Trivedi IM-Test		Breusch-Pagan Test	
Chi	59.24***	Heteroskedasticity	Chi = 59.24***	Chi	651.31***
Prob.	0.0064	Skewness	Chi = 9.20***	Prob.	0.0000
		Kurtosis	Chi = 3.39***		
		Total	Chi = 71***		

Note: *The superscript ***, **, and * represent the 1% level of significance. 5% and 10% are the equivalent levels. Cook-Weisberg (or B&P) test suggests Breusch-Pagan to evaluate heteroskedasticity using Null Hypothesis; H0: Constant variance. White's Test of Homogeneity, with Null hypothesis; H0: Homoskedasticity vs H1: unconstrained heteroskedasticity, and Cameron & Trivedi decomposition of IM-Test ensured that the model had no substantial heteroskedasticity, skewness, or Kurtosis. As a result, the IM test examines the null hypothesis of no heteroskedasticity, Skewness, or Kurtosis.*

5.1.2 Estimated Statistics of FGLS and PCSE model to measure competitive structure of Public sector Banks:

Table-4 presents the estimates of FGLS and PCSE models for public sector banks. The estimates of FGLS model are the lead findings and we have used PCSE model for robustness check. It is observed that revenue of public sector banks is negatively and significantly impacted by increase in price of capital, price of fund, increase in risk assets, branch concentration and liquidity risk score, whereas revenue is positively impacted by increase in employee cost and credit risk score. Both FGLS and PCSE model recommends the H coefficient closer to 0.5 (0.469 and 0.478 by FGLS and FCSE model respectively) and recommends that the public sector banks represent characteristics of monopolistic competition.

Table: 4 Estimated Statistics of FGLS and PCSE model to measure competitive structure and the consolidation of market power of Indian Public sector Banks

LREV	FGLS		PCSE	
Variable	**Coef.**	**Prob**	**Coef.**	**Prob**
LPK	-0.048***	0.000	-0.037***	0.001
LPL	0.540***	0.000	0.526***	0.000
LPF	-0.023*	0.072	-0.011	0.836
RA	-3.837***	0.000	-1.976**	0.049
BC	-1.183***	0.000	-0.977***	0.000
CR	4.613***	0.000	4.509***	0.000
LR	-0.019***	0.000	-0.010**	0.040
Cons	-0.090**	0.026	-0.129	0.324
H Coeff.	**0.469**		**0.478**	
Wald Chi	908.58***		504.69***	
Rhos	0.8462			

Note: *Dependent Variable LREV: Log of revenue, and independent variables are LPK: Log of Price of capital, LPL: Log of Price of labour, LPF: Log of Price of fund, RA: Risky Asset, BC: Branch concentration, CR: Credit Risk, LR: Liquidity Risk. H Coefficient represents Panzar Rosse H Statistics. The superscripts ***, **, and * denote the significance level at 1%, 5%, and 10%, respectively. Wald Chi2 statistics provide the overall significance level of the model, indicating that all the model's coefficients are statistically different from zero. Rho is the autocorrelation parameter. A higher rho and high standard errors is expected if there is autocorrelation within the panel timeseries and hence, PCSE model is expected to fit well to such data set.*

5.1.3 Estimated Statistics of FGLS and PCSE model to measure competitive structure and the consolidation of market power of Indian Private sector Banks (Sample-2):

Coming to private sector banks, Table-5 presents the summary statistics and Table-6 reports the matrix of correlation coefficients of banking parameters for private sector banks over the study period. It is observed that mean revenue of public sector banks is higher than private sector banks. The revenue, price of capital, price of labour, and credit risk is negatively shewed implying a longer leger left tail. It also indicates that small proportion of banks received very low figures in case of revenue, price of capital, price of labour, and credit risk score. On the contrary, variables like price of fund, Risk Asset, branch concentration and liquidity ratio are rightly skewed, implying a long tail on the right of the distribution. Analysing the kurtosis, it is very clear that all the banking parameters are non-normally distributed. Like public sector banks, private sector banks Liquidity ratio parameter is highly skewed with highest kurtosis. Here we

get initial inputs that the data structure is not suitable for least square estimates. The correlation matrix presented in Table-6 also shows that unlike public sector banks, revenue of private sector banks is negatively correlated with price of fund only, whereas positively correlated with cost of employee, price of fund, risky asset, branch concentration, credit risk and liquidity risk.

The pre-estimation test statistics of White test, Cameron & Trivedi IM test and Breusch-Pagan Test are presented in Table-7. White's Test tests the null hypothesis (H_0); "Homoskedasticity" against alternate hypothesis (H_1); "Unrestricted heteroskedasticity", Breusch-Pagan (B&P) Test also called as Cook-Weisberg test for heteroskedasticity test the null hypothesis (H_0); "Constant variance", and Cameron & Trivedi decomposition of IM-Test ensured whether model contains no heteroskedasticity, skewness and Kurtosis to a significant degree. Hence IM test tests the null hypothesis of no heteroskedasticity, no Skewness and no Kurtosis. All the three tests reject their respective null hypothesis at 1% level implying that the data structure is heterogeneous and largely non-normally distributed. High heterogeneity data set private sector banks is better modelled by Generalised Least Square (GLS) estimates. Secondly, since the data sample has long time series, the samples are expected to be correlated across panel. It is presented by "rhos" coefficients in respective result tables.

Table-8 presents the estimates of FGLS and PCSE models for private sector banks. The estimates of FGLS model are the lead findings and we have used PCSE model for robustness check. It is observed that revenue of private sector banks is negatively and significantly impacted by increase in price of capital only, whereas positively impacted by employee cost, price of fund, increase in risk assets, increase in number of branches, credit risk and liquidity risk. Both FGLS and PCSE model recommends the H coefficient above to 0.8 (0.750 and 0.778 by FGLS and FCSE model respectively) and recommends that the private sector banks exclusively as an entity operates in monopolistic competition, since it is closer to unit, we may say it as closer to perfect competition also.

Table:5 Descriptive Statistics for banking parameters

	Mean	Median	STD	Skewness	Kurtosis
LREV	4.422	4.656	1.282	-2.012	7.527
LPK	4.045	4.115	1.503	-0.663	5.424
LPL	8.037	8.532	2.617	-1.871	6.509
LPF	-1.016	-1.057	0.344	0.824	11.519
RA	0.011	0.011	0.009	2.227	12.304
BC	0.049	0.031	0.055	1.720	4.893
CR	0.075	0.079	0.024	-1.896	7.103
LR	0.854	0.769	0.981	8.294	86.192

Note: *LREV: Log of revenue, LPK: Log of Price of capital, LPL: Log of Price of labour, LPF: Log of Price of fund, RA: Risky Asset, BC: Branch concentration, CR: Credit Risk, LR: Liquidity Risk*

Table:6 Correlation Matrix for Banking parameters

	LREV	LPK	LPL	LPF	RA	BC	CR	LR
LREV	1.000							
LPK	0.576	1.000						
LPL	0.957	0.620	1.000					
LPF	-0.643	-0.659	-0.715	1.000				
RA	0.524	0.377	0.534	-0.305	1.000			
BC	0.539	0.224	0.538	-0.231	0.255	1.000		
CR	0.675	0.516	0.702	-0.619	0.395	0.042	1.000	
LR	0.024	0.310	0.074	-0.632	-0.051	-0.026	0.101	1.000

Note: *LREV: Log of revenue, LPK: Log of Price of capital, LPL: Log of Price of labour, LPF: Log of Price of fund, RA: Risky Asset, BC: Branch concentration, CR: Credit Risk, LR: Liquidity Risk*

Table: 7 Pre estimation test to Justify selection model.

White Test		**Cameron & Trivedi IM-Test**		**Breusch-Pagan Test**	
Chi	196.48^{***}	Heteroskedasticity	Chi = 196.48^{***}	Chi	878.49^{***}
Prob.	0.0000	Skewness	Chi = 34.29^{***}	Prob.	0.0000
		Kurtosis	Chi = 9.04^{***}		
		Total	Chi = 239.81^{***}		

Note: *The superscript ***, ** and * indicate the level of significance at 1%. 5% and 10% level respectively. Cook-Weisberg test (or) B & P Test indicates Breusch-Pagan to measure heteroskedasticity with Null Hypothesis; H_0: Constant variance. White's Test of Homogeneity, with Null hypothesis; H_0: Homoskedasticity against H_1: unrestricted heteroskedasticity, and Cameron & Trivedi decomposition of IM-Test ensured whether model contains no heteroskedasticity, skewness and Kurtosis to a significant degree. Hence IM test tests the null hypothesis of no heteroskedasticity, no Skewness and no Kurtosis.*

Table: 8 Estimated Statistics of FGLS and PCSE model to measure competitive structure of Indian Private sector Banks:

LREV	FGLS		PCSE	
Variable	**Coef.**	**Prob**	**Coef.**	**Prob**
LPK	-0.029***	0.009	-0.0529**	0.0403
LPL	0.467***	0.000	0.4313***	0.0000
LPF	0.311***	0.000	0.3993**	0.0474
RA	1.319***	0.000	2.7632	0.3320
BC	0.921***	0.000	1.3140**	0.0520
CR	2.475***	0.000	3.3102*	0.0815
LR	0.017	0.216	0.0218	0.7450
Cons	0.723***	0.000	0.7943***	0.0080
H Coeff.	**0.750**		**0.778**	
Wald Chi	1084.15***		1953.41***	
Rhos	0.6790			

Note: *Dependent Variable LREV: Log of revenue, and independent variables are LPK: Log of Price of capital, LPL: Log of Price of labour, LPF: Log of Price of fund, RA: Risky Asset, BC: Branch concentration, CR: Credit Risk, LR: Liquidity Risk. H Coefficient represents Panzar Rosse H Statistics. The superscript ***, ** and * indicate the level of significance at 1%. 5% and 10% level respectively. Wald Chi^2 statistics presents overall significance level of the model that all the coefficients of the model are significantly other than zero. Rho is the autocorrelation parameter. A higher rho and high standard errors are expected if there is autocorrelation within the panel timeseries and hence, PCSE model is expected to fit well to such data set.*

5.1.4 Estimated Statistics for Sample-3 (Public plus Private Sector Banks)

The study has attempted to analyse the competitive structure of the Indian banking sector by using sample 3 that contains both the public and private sector banks. Since the sample size is relatively big, we have extended the methodological scope of the study by adding quantile regression. Now the study is one step ahead to capture the elasticity of revenue due to change in input prices/cost of the banks by categorised the banks into different quantiles of revenue distribution. The estimated statistics are presented in Table 9

The Table-9 presents the pre-estimation test statistics of White test, Cameron & Trivedi IM test and Breusch-Pagan Test. We have noticed that all the three tests reject their respective null hypothesis at 1% level implying that the data structure is heterogeneous and largely non-normally distributed. High heterogeneity data set private sector banks is better modelled by Generalised Least Square (GLS) estimates. Secondly, since the data sample has long time series, “rhos”

coefficients in respective result tables indicate the presence of autocorrelation within the panels also which justifies the use of FGLS and PCSE model to fit sample 3.

Table-10 presents the estimates of FGLS and PCSE models for the sample of all the public and private sector banks. It is observed that revenue is negatively and significantly impacted by increase in price of capital and liquidity risk, whereas positively impacted by employee cost, price of fund, increase in risk assets, increase in number of branches and credit risk. Both FGLS and PCSE model recommends the H coefficient approximates to 0.7 (0.678 and 0.640 by FGLS and FCSE model respectively) and recommends that the market structure of both private and public sector banks closer to monopolistic competition. Since it is closer to unit, we may say it as closer to perfect competition also.

When we cluster banks from lower quantile to higher quantiles of distribution of revenue, the H statistics is ascending from lower quantile to higher quantiles. High revenue public and private sector banks, i.e., banks with 90% and above quantile of revenue are operated in competitive market with H coefficient 0.995 (closer to one), followed by banks with 75% quantile of revenue. However, public, and private sector banks with revenue form median to bottom 10% quantile are having H coefficient around 0.6, hence considered to be operating in monopolistic competitive environment (Table-11).

Among the banking parameters, price of capital is negatively impacting revenue of banks from all the quantiles of profitability. Revenue of banks from median level and below quantiles are negatively impacted by risk assets, whereas banks with higher level of revenue are utilising risky asset favourably. Similar is the case for branch concentration. Lower revenue banks are negatively impacted by a greater number of branches whereas bank with revenue from median level to high quantile can boost their revenue from larger number banks. Credit risk is insignificant for higher quantile banks and positively impacting the revenues of lower to median quantile banks. Liquidity risk is having very minimal and insignificant impact on the revenues of banks from all quantiles of profitability.

Table: 9 Pre estimation tests to Justify selection model.

White Test		Cameron & Trivedi IM-Test		Breusch-Pagan Test	
Chi	287.65***	Heteroskedasticity	Chi = 287.65***	Chi	451.39***
Prob.	0.000	Skewness	Chi = 63.52***	Prob.	0.000
		Kurtosis	Chi = 9.65***		
		Total	Chi = 459.92***		

Note: *The superscript ***, ** and * indicate the level of significance at 1%. 5% and 10% level respectively. Cook-Weisberg test (or) B & P Test indicates Breusch-Pagan to measure heteroskedasticity with Null Hypothesis; H_0: Constant variance. White's Test of Homogeneity, with Null hypothesis; H_0: Homoskedasticity against H_1: unrestricted heteroskedasticity, and Cameron & Trivedi decomposition of IM-Test ensured whether model contains no heteroskedasticity, skewness and Kurtosis to a significant degree. Hence IM test tests the null hypothesis of no heteroskedasticity, no Skewness and no Kurtosis.*

Table: 10 Estimated Statistics of FGLS and PCSE model to measure competitive structure and the consolidation of market power of Indian (Public + Private sector) Banks

LREV	FGLS		PCSE	
Variable	**Coef.**	**Prob**	**Coef.**	**Prob**
LPK	-0.025***	0.000	-0.023*	0.057
LPL	0.467***	0.000	0.476***	0.000
LPF	0.236***	0.000	0.187	0.825
RA	0.950**	0.028	0.803	0.547
BC	0.282*	0.076	0.642	0.187
CR	3.664***	0.000	3.578**	0.024
LR	-0.002***	0.011	0.010	0.950
Cons	0.678***	0.000	0.708***	0.005
H Coeff.	**0.678**		**0.640**	
Wald Chi	969.74***		1635.22	
Rhos	0.7672			

Note: *Dependent Variable LREV: Log of revenue, and independent variables are LPK: Log of Price of capital, LPL: Log of Price of labour, LPF: Log of Price of fund, RA: Risky Asset, BC: Branch concentration, CR: Credit Risk, LR: Liquidity Risk. H Coefficient represents Panzar Rosse H Statistics. The superscripts ***, **, and * denote the significance level at 1%, 5%, and 10%, respectively. Wald Chi2 statistics provide the overall significance level of the model, indicating that all of the model's coefficients are statistically different from zero.. Rho is the autocorrelation parameter. A higher rho and high standard errors are expected if there is autocorrelation within the panel timeseries and hence, PCSE model is expected to fit well to such data set.*

Table: 11 Estimated Statistics of Quantile regression models to measure competitive structure and the consolidation of market power of Indian Public and Private Sector banks under different quantiles of Revenue distribution.

LREV	Q(0.10)	Q(0.25)	Q(0.50)	Q(0.75)	Q(0.90)
LPK	-0.0438***	-0.0035	0.0071	-0.0144***	-0.0321***
LPL	0.5083***	0.5071***	0.4817***	0.4222**	0.3789***
LPF	0.1069*	0.1856**	0.0883*	0.4892**	0.6481***
RA	-0.7779	-2.0923*	-1.809	0.5549	3.6385***
BC	-0.4422*	-0.4919	0.4325	1.307***	1.6808***
CR	4.924***	5.423***	7.138***	-0.226	-3.643
LR	0.0011	-0.001	-0.003	-0.0005	-0.0007
Cons	0.0012	0.0013	0.0001	1.6708	2.5249
H Coeff.	**0.571**	**0.689**	**0.577**	**0.897**	**0.995**
Pseudo R^2	0.987	0.857	0.806	0.746	0.744

Note: *Dependent Variable LREV: Log of revenue, and independent variables are LPK: Log of Price of capital, LPL: Log of Price of labour, LPF: Log of Price of fund, RA: Risky Asset, BC: Branch concentration, CR: Credit Risk, LR: Liquidity Risk. H Coefficient represents Panzar Rosse H Statistics. The superscript ***, ** and * indicate the level of significance at 1%. 5% and 10% level respectively. Q(0.10) represents banks with lower 10% quantile of revenue, Q(0.5) represents banks with median quantile of revenue and Q(0.90) represents banks with 90% quantile of revenue i.e. top 10% banks as per Revenue,*

5.1.5 Estimated Statistics for a sample-4 (Public, Private and other Banks)

The study has attempted to analyse the competitive structure of the Indian banking sector by using sample 4 that contains 115 Indian banks comprising from both public, private sector and other banks. Like sample 3, since the sample size of sample 4 is also relatively big, we have extended the methodological scope of the study by adding quantile regression. Now the study is one step ahead to capture the elasticity of revenue due to change in input prices/cost of the banks by categorised the banks into different quantiles of revenue distribution. The estimated statistics are presented in Table 12.

The Table-12 presents the pre-estimation test statistics of White test, Cameron & Trivedi IM test and Breusch-Pagan Test. We have noticed that all the three tests reject their respective null hypothesis at 1% level implying that the data structure is heterogeneous and largely non-normally distributed. High heterogeneity data set of samples 4 is better to be modelled by Generalised Least Square (GLS) estimates. Secondly, since the data sample has long time series, “rhos” coefficients in respective result tables indicate the presence of autocorrelation within the panels also which justifies the use of FGLS and PCSE model to fit sample 4.

Table-13 presents the estimates of FGLS and PCSE models for the sample of all the public and private sector banks. It is observed that revenue is positively and significantly impacted by increase in price of capital, cost of employee, branch concentration and credit risk, whereas negatively impacted by price of fund. The impact of risky asset and liquidity risk is having insignificant impact on revenue of banks when all the banks are cluster together. Both FGLS and PCSE model recommends the H coefficient approximates to 0.35 (0.351 and 0.340 by FGLS and FCSE model respectively) and recommends that the market structure of all banks including public, private and all the other banks is closer to monopoly.

When we cluster banks from lower quantile to higher quantiles of distribution of revenue, the H statistics is descending from lower quantile to higher quantiles (See Table-13). The top 10% banks i.e., banks with 90% quantile of revenue are having the H coefficient of 0.265, followed H coefficients of 0.269, 0.363, 0.450 and 0.527 by banks with 75%, 50%, 25% and 10% quantile of revenue. Among the banking parameters, price of capital and employee cost (i.e., price of labour) is positively and significantly impacting revenue of banks from all the quantiles of profitability. Price of fund, branch concentration, and liquidity risk is having insignificant and quite minimal impact on bank revenue. Risky asset is also appearing insignificant in the findings of quantile regression.

Table: 12 Pre estimation tests to Justify selection model.

White Test		**Cameron & Trivedi IM-Test**		**Breusch-Pagan Test**	
Chi	174.42^{***}	Heteroskedasticity	Chi = 174.41^{***}	Chi	28.50^{***}
Prob.	0.000	Skewness	Chi = 46.98^{***}	Prob.	0.000
		Kurtosis	Chi = 12.72^{***}		
		Total	Chi = 234.11^{***}		

Note: *The superscript ***, ** and * indicate the level of significance at 1%. 5% and 10% level respectively. Cook-Weisberg test (or) B & P Test indicates Breusch-Pagan to measure heteroskedasticity with Null Hypothesis; H_0: Constant variance. White's Test of Homogeneity, with Null hypothesis; H_0: Homoskedasticity against H_1: unrestricted heteroskedasticity, and Cameron & Trivedi decomposition of IM-Test ensured whether model contains no heteroskedasticity, skewness and Kurtosis to a significant degree. Hence IM test tests the null hypothesis of no heteroskedasticity, no Skewness and no Kurtosis.*

Table: 13 Estimated Statistics of FGLS and PCSE model to measure competitive structure and the consolidation of market power of Indian All Banks (Public + Private + other Banks)

LREV	**FGLS**		**PCSE**	
Variable	**Coef.**	**Prob**	**Coef.**	**Prob**
LPK	0.045***	0.000	0.034***	0.000
LPL	0.461***	0.000	0.466***	0.000
LPF	-0.154***	0.000	-0.160***	0.000
RA	0.486	0.403	-0.021	0.872
BC	0.024**	0.033	0.002***	0.003
CR	1.578***	0.000	2.286***	0.000
LR	-0.002	0.126	-0.001	0.460
Cons	0.086**	0.029	0.014	0.684
H Coeff.	**0.351**		**0.340**	
Wald Chi	555.24***		626.71	
Rhos	0.9278			

Note: *Dependent Variable LREV: Log of revenue, and independent variables are LPK: Log of Price of capital, LPL: Log of Price of labour, LPF: Log of Price of fund, RA: Risky Asset, BC: Branch concentration, CR: Credit Risk, LR: Liquidity Risk. H Coefficient represents Panzar Rosse H Statistics. The superscript ***, ** and * indicate the level of significance at 1%. 5% and 10% level respectively. Wald Chi^2 statistics presents overall significance level of the model that all the coefficients of the model are significantly other than zero. Rho is the autocorrelation parameter. A higher rho and high standard errors are expected if there is autocorrelation within the panel timeseries and hence, PCSE model is expected to fit well to such data set.*

Table: 14 Estimated Statistics of Quantile regression models to measure competitive structure and the consolidation of market power of All Indian Banks (Public + Private + Other banks) under different quantiles of Revenue distribution.

LREV	Q(0.10)	Q(0.25)	Q(0.50)	Q(0.75)	Q(0.90)
LPK	0.039***	0.038***	0.041***	0.050***	0.040***
LPL	0.496***	0.494***	0.482***	0.466***	0.444***
LPF	-0.008	-0.081*	-0.161***	-0.247***	-0.219
RA	0.150	-0.024	-0.085	-0.207	1.276
BC	0.0001	-0.001***	-0.001***	-0.001**	-0.001**
CR	0.608	0.799**	2.584***	4.122***	1.720***
LR	0.0001	0.0001	0.0001	0.0001	0.0001
Cons	-0.094	0.0001	0.0001	0.0001	0.660
H Coefficient	**0.527**	**0.450**	**0.362**	**0.269**	**0.265**
Pseudo R^2	0.762	0.808	0.823	0.811	0.778

Note: *Dependent Variable LREV: Log of revenue, and independent variables are LPK: Log of Price of capital, LPL: Log of Price of labour, LPF: Log of Price of fund, RA: Risky Asset, BC: Branch concentration, CR: Credit Risk, LR: Liquidity Risk. H Coefficient represents Panzar Rosse H Statistics. The superscript ***, ** and * indicate the level of significance at 1%. 5% and 10% level respectively. Q(0.10) represents banks with lower 10% quantile of revenue, Q(0.5) represents banks with median quantile of revenue and Q(0.90) represents banks with 90% quantile of revenue i.e. top 10% banks as per Revenue,*

5.2 Estimated Statistics for Objective II

5.2.1 Estimated Statistics for sample-1 (Public Sector Banks)

The second objective of the study is to capture how financial stability of banks is explained by liquidity risk, credit risk and key factors that determines consolidation of market power of Indian banking sector. Table-15 contains three pre-estimation such as White test, Cameron & Trivedi IM test and Breusch-Pagan Test to justify model selection. White's Test tests the null hypothesis (H_0); "Homoskedasticity" against alternate hypothesis (H_1); "Unrestricted heteroskedasticity", Breusch-Pagan (B&P) Test also called as Cook-Weisberg test for heteroskedasticity test the null hypothesis (H0); "Constant variance", and Cameron & Trivedi decomposition of IM-Test ensured whether model contains no heteroskedasticity, skewness and Kurtosis to a significant degree. Hence IM test tests the null hypothesis of no heteroskedasticity, no Skewness and no Kurtosis. All the three tests reject their respective null hypothesis at 1% level implying that the data structure is heterogeneous and largely non-normally distributed. High heterogeneity data set is better modelled by Generalised Least Square (GLS) estimates. Secondly,

since the data sample has long time series, the samples are expected to be correlated across panel. It is presented by "rhos" coefficients in respective result tables. To handle that we have used Panel Corrected Standard Error (PCSE) model. PCSE is alternate to GLS model for fitting linear cross-sectional time-series models when the distributions are not assumed to be independently and identically distributed. PCSE model fits well to the data sample when error distribution is heteroskedastic and contemporaneously correlated across panels. Based on this we have used FGLS and PCSE model to answer our research objectives. Our analysis is mostly focused on FGLS estimates and the estimates of PCSE model is the used for robustness test. We have also used quantile regression to capture the distribution wise estimates when sample size increases, i.e., in case of sample 3 and 4. The estimated statistics are presented from Table-15 to Table 24.

Table-16(a) presents the estimates of FGLS and PCSE models for sample 1 i.e., for public sector banks and explains the relationship of financial stability with banks input prices and with key banking parameters. It is observed that financial stability of public sector banks is negatively and significantly impacted by increase in price of capital, increase in employee cost (or increase in price of labour) and increase in price of fund. Similarly, among key banking parameters, bank size, risk assets and financial leverage are also having negative impact on financial stability of public sector banks. Interestingly, only increase in branch concentration is increasing financial stability of Indian public sector banks, whereas increase in all the parameters like, price of capital, employee cost, price of labour, price of fund, bank size, risk asset and financial leverage is decreasing financial stability. Table- 16(b) presents the estimates that explains the relationship between credit risk and liquidity risk with financial stability of public sector banks. It is observed that liquidity risk is having very minimal impact on financial stability, whereas credit risk is having very strong impact on financial stability. It implies, increase in interest income over total asset is going to strengthen the financial stability of public sector banks.

Table: 15 Pre estimation test to Justify selection model.

White Test		**Cameron & Trivedi IM-Test**		**Breusch-Pagan Test**	
Chi	114.01^{***}	Heteroskedasticity	Chi = 114.01^{***}	Chi	351.23^{***}
Prob.	0.000	Skewness	Chi = 74.44^{***}	Prob.	0.0000
		Kurtosis	Chi = 1.74		
		Total	Chi = 190.99^{***}		

Note: *The superscript ***, ** and * indicate the level of significance at 1%. 5% and 10% level respectively. B & P Test indicates Breusch-Pagan / Cook-Weisberg test for heteroskedasticity with H_0: Constant variance, White's Test tests the H_0: Homoskedasticity against H_1: unrestricted heteroskedasticity, and* Cameron & Trivedi decomposition of IM-Test ensured whether model contains no heteroskedasticity, skewness and Kurtosis to a significant degree. Hence IM test tests the null hypothesis of no heteroskedasticity, no Skewness and no Kurtosis.

Table: 16 (a) Estimated Statistics of FGLS and PCSE model to explore the relationship of financial stability with Input prices for Public Sector Banks.

FS	FGLS		PCSE	
Variable	**Coef.**	**Prob**	**Coef.**	**Prob**
PK	-0.055***	0.00	-0.052	0.525
PL	-0.28***	0.00	-0.191	0.658
PF	-1.14***	0.00	-0.789*	0.073
SIZE	-0.23***	0.01	-0.446	0.617
RA	-9.06***	0.00	-4.25***	0.000
NWTA	-3.18***	0.00	-3.412**	0.025
BC	5.75***	0.00	6.060	0.037
Cons.	4.35***	0.00	5.149	0.120
Wald Chi	544.04***		446.01***	
Rhos	0.599			

Note: *Dependent Variable FS: Financial Stability, and Core independent variables are Input rices/input costs of banks i.e., PK, PL, PF) PK: Price of capital, PL: Price of labour, PF: Price of fund, and some control variables like SIZE: Bank size, RA: Risky Asset, NWTA: Financial leverage, BC: Branch concentration. The superscript ***, ** and * indicate the level of significance at 1%. 5% and 10% level respectively. Wald Chi^2 statistics presents overall significance level of the model that all the coefficients of the model are significantly other than zero. Rho is the autocorrelation parameter. A higher rho and high standard errors are expected if there is autocorrelation within the panel timeseries and hence, PCSE model is expected to fit well to such data set.*

Table: 16 (b) Estimated Statistics of FGLS and PCSE model to explore the relationship of financial stability with credit risk and liquidity risk for Public Sector Banks.

FS	FGLS		PCSE	
Variable	**Coef.**	**Prob**	**Coef.**	**Prob**
CR	7.824***	0.000	7.388*	0.070
LR	0.001***	0.006	0.001***	0.004
SIZE	-0.424***	0.000	-0.094***	0.000
RA	-7.189***	0.000	-6.097***	0.000
NWTA	-1.845***	0.000	-0.462***	0.001
BC	4.156***	0.000	3.267	0.258
Cons	3.255***	0.000	1.009	0.827
Wald Chi	624.04***		146.01***	
Rhos	0.589			

Note: *Dependent Variable FS: Financial Stability, and Core independent variables are Credit Risk (CR) and Liquidity Risk (LR), and some control variables like SIZE: Bank size, RA: Risky Asset, NWTA: Financial leverage, BC: Branch concentration. The superscript ***, ** and * indicate the level of significance at 1%. 5% and 10% level respectively. Rho is the autocorrelation parameter. A higher rho and high standard errors are expected if there is autocorrelation within the panel timeseries and hence, PCSE model is expected to fit well to such data set.*

Estimated Statistics for sample-2 (Private Sector Banks)

5.2.2 Estimated Statistics of FGLS and PCSE model to explore the relationship of financial stability with Input prices for Private Sector Banks.

Table 17, 18(a) and 18(b) presents the estimated statistics for sample 2 i.e., for private sector banks. Table-17 contains three pre-estimation such as White test, Cameron & Trivedi IM test and Breusch-Pagan Test to justify model selection. White's Test tests the null hypothesis (H_0); "Homoskedasticity" against alternate hypothesis (H_1); "Unrestricted heteroskedasticity", Breusch-Pagan (B&P) Test also called as Cook-Weisberg test for heteroskedasticity test the null hypothesis (H0); "Constant variance", and Cameron & Trivedi decomposition of IM-Test ensured whether model contains no heteroskedasticity, skewness and Kurtosis to a significant degree. Hence IM test tests the null hypothesis of no heteroskedasticity, no Skewness and no Kurtosis. All the three tests reject their respective null hypothesis at 1% level implying that the data structure is heterogeneous and largely non-normally distributed. High heterogeneity data set is better modelled by Generalised Least Square (GLS) estimates.

Table-18(a) presents the estimates of FGLS and PCSE models for sample 2 i.e., for private sector banks and explains the relationship of financial stability with banks input prices and with key banking parameters. It is observed that financial stability of private sector banks is negatively and significantly impacted by increase in employee cost (or increase in price of labour), increase in price of fund and risky asset. On the other hand, price of capital, bank size and branch concentration are impacting financial stability of private sector banks positively. Leverage effect is having very negligible impact. Table- 18(b) presents the estimates that explains the relationship between credit risk and liquidity risk with financial stability of private sector banks. It is observed that like public sector banks, liquidity risk is having very minimal impact on financial stability, of private sector banks, whereas credit risk is having very strong impact on financial stability. It implies, increase in interest income over total asset is also going to strengthen the financial stability of private sector banks.

Table: 17 Pre estimation test to Justify selection model.

White Test		Cameron & Trivedi IM-Test		Breusch-Pagan Test	
Chi	288.62***	Heteroskedasticity	Chi = 288.62***	Chi	860.00***
Prob.	0.000	Skewness	Chi = 105.89***	Prob.	0.0000
		Kurtosis	Chi = 1.17		
		Total	Chi = 395.63***		

Note: *The superscript ***, ** and * indicate the level of significance at 1%. 5% and 10% level respectively. B & P Test indicates Breusch-Pagan / Cook-Weisberg test for heteroskedasticity with H_0: Constant variance, White's Test tests the H_0: Homoskedasticity against H_1: unrestricted heteroskedasticity, and* Cameron & Trivedi decomposition of IM-Test ensured whether model contains no heteroskedasticity, skewness and Kurtosis to a significant degree. Hence IM test tests the null hypothesis of no heteroskedasticity, no Skewness and no Kurtosis.

Table: 18 (a) Estimated Statistics of FGLS and PCSE model to explore the relationship of financial stability with Input prices for Private Sector Banks.

FS	FGLS		PCSE	
Variable	**Coef.**	**Prob**	**Coef.**	**Prob**
PK	0.083***	0.000	0.269**	0.0510
PL	-1.216***	0.000	-2.051***	0.0000
PF	-2.760***	0.000	-2.005**	0.0440
SIZE	4.383***	0.000	7.047***	0.0000
RA	-11.022***	0.000	-8.584**	0.0150
NWTA	0.0001***	0.000	-0.0001***	0.0060
BC	8.276***	0.000	-0.407	0.9840
Cons.	-14.348***	0.000	-12.22***	0.0000
Wald Chi	492.94***		154.97***	
Rhos			0.191	

Note: *Dependent Variable FS: Financial Stability, and Core independent variables are Input prices/input costs of banks i.e., PK, PL, PF) PK: Price of capital, PL: Price of labour, PF: Price of fund, and some control variables like SIZE: Bank size, RA: Risky Asset, NWTA: Financial leverage, BC: The superscript ***, ** and * indicate the level of significance at 1%. 5% and 10% level respectively. Rho is the autocorrelation parameter. A higher rho and high standard errors are expected if there is autocorrelation within the panel timeseries and hence, PCSE model is expected to fit well to such data set.*

Table: 18 (b) Estimated Statistics of FGLS and PCSE model to explore the relationship of financial stability with credit risk and liquidity risk for Private Sector Banks.

FS	FGLS		PCSE	
Variable	**Coef.**	**Prob**	**Coef.**	**Prob**
CR	9.206***	0.000	6.097**	0.015
LR	-0.292***	0.000	-0.108	0.731
SIZE	1.415***	0.000	3.189***	0.004
RA	-11.121***	0.000	-9.849**	0.010
NWTA	0.0001***	0.000	0.0001***	0.000
BC	14.919***	0.000	-15.375	0.512
Cons	-4.891***	0.000	-8.433**	0.025
Wald Chi	404.93***		170.37***	
Rhos			0.276	

Note: *Dependent Variable FS: Financial Stability, and Core independent variables are Credit Risk (CR) and Liquidity Risk (LR), and some control variables like SIZE: Bank size, RA: Risky Asset, NWTA: Financial leverage, BC: Branch concentration. The superscript ***, ** and * indicate the level of significance at 1%. 5% and 10% level respectively. Wald Chi^2 statistics presents overall significance level of the model that all the coefficients of the model are significantly other than zero. Rho is the autocorrelation parameter. A higher rho and high standard errors are expected if there is autocorrelation within the panel timeseries and hence, PCSE model is expected to fit well to such data set.*

Estimated Statistics for sample-3 (Public Sector + Private Sector Banks)

5.2.3 Estimated Statistics of FGLS and PCSE model to explore the relationship of financial stability with Input prices for both Public sector and Private Sector Banks.

Table 19, 20(a) and 20(b) presents the estimated statistics for sample 3 i.e., for both public sector and private sector banks. Table-19 contains three pre-estimation such as White test, Cameron & Trivedi IM test and Breusch-Pagan Test to justify model selection. White's Test tests the null hypothesis (H_0); "Homoskedasticity" against alternate hypothesis (H_1); "Unrestricted heteroskedasticity", Breusch-Pagan (B&P) Test also called as Cook-Weisberg test for heteroskedasticity test the null hypothesis (H0); "Constant variance", and Cameron & Trivedi decomposition of IM-Test ensured whether model contains no heteroskedasticity, skewness and Kurtosis to a significant degree. Hence IM test tests the null hypothesis of no heteroskedasticity, no Skewness and no Kurtosis. All the three tests reject their respective null hypothesis at 1% level

implying that the data structure is heterogeneous and largely non-normally distributed. High heterogeneity data set is better modelled by Generalised Least Square (GLS) estimates.

Table-20(a) presents the estimates of FGLS and PCSE models for sample 3 and explains the relationship of financial stability with banks input prices and key banking parameters. It is observed that financial stability of the group of public sector and private sector bank is positively and significantly impacted by increase in price of capital, bank size, and branch concentration. On the other hand, employee cost, price of capital, and risky asset is impacting financial stability negatively. Leverage effect is having very negligible impact on financial stability. Table- 20(b) presents the estimates that explains the relationship between credit risk and liquidity risk with financial stability of banks. It is observed that financial stability of public and private sector banks, are positively and significantly impacted by credit risk parameter. Also, credit risk component measured as interest income over total asset is having a substantial impact on bank stability whereas, liquidity risk is having very minimal impact. It implies, increase in interest income over total asset is also going to strengthen the financial stability of public and private sector banks as compared to total loan over total deposit.

Table: 19 Pre estimation tests to Justify selection model.

White Test		**Cameron & Trivedi IM-Test**		**Breusch-Pagan Test**	
Chi	437.69^{***}	Heteroskedasticity	Chi = 437.69^{***}	Chi	315.49^{***}
Prob.	0.000	Skewness	Chi = 162.61^{***}	Prob.	0.000
		Kurtosis	Chi = 1.27		
		Total	Chi = 601.57^{***}		

Note: *The superscript ***, ** and * indicate the level of significance at 1%. 5% and 10% level respectively. B & P Test indicates Breusch-Pagan / Cook-Weisberg test for heteroskedasticity with H_0: Constant variance, White's Test tests the H_0: Homoskedasticity against H_1: unrestricted heteroskedasticity, and* Cameron & Trivedi decomposition of IM-Test ensured whether model contains no heteroskedasticity, skewness and Kurtosis to a significant degree. Hence IM test tests the null hypothesis of no heteroskedasticity, no Skewness and no Kurtosis.

Table: 20 (a) Estimated Statistics of FGLS and PCSE model to explore the relationship of financial stability with Input prices for Public + Private Sector Banks.

FS	FGLS		PCSE	
Variable	**Coef.**	**Prob**	**Coef.**	**Prob**
PK	0.296***	0.000	0.150	0.206
PL	-1.284***	0.000	-2.068***	0.000
PF	-2.487***	0.000	-0.761	0.262
SIZE	3.081***	0.000	5.209***	0.000
RA	-7.392***	0.000	-6.473***	0.000
NWTA	0.0001***	0.000	0.0001***	0.000
BC	7.348***	0.000	-3.503	0.684
Cons.	-8.130***	0.000	-10.45***	0.000
Wald Chi	492.94***		164.74***	
Rhos			0.916	

Note: *Dependent Variable FS: Financial Stability, and Core independent variables are Input prices/input costs of banks i.e., PK, PL, PF) PK: Price of capital, PL: Price of labour, PF: Price of fund, and some control variables like SIZE: Bank size, RA: Risky Asset, NWTA: Financial leverage, BC: The superscript ***, ** and * indicate the level of significance at 1%. 5% and 10% level respectively. Wald Chi^2 statistics presents overall significance level of the model that all the coefficients of the model are significantly other than zero. Rho is the autocorrelation parameter. A higher rho and high standard errors are expected if there is autocorrelation within the panel timeseries and hence, PCSE model is expected to fit well to such data set.*

Table: 20 (b) Estimated Statistics of FGLS and PCSE model to explore the relationship of financial stability with credit risk and liquidity risk for Public + Private Sector Banks.

FS	FGLS		PCSE	
Variable	**Coef.**	**Prob**	**Coef.**	**Prob**
CR	12.652***	0.000	14.138***	0.006
LR	-0.002**	0.048	0.002	0.533
SIZE	0.104	0.149	2.003**	0.036
RA	-9.535***	0.000	-7.459***	0.000
NWTA	0.0001***	0.000	0.0001***	0.000
BC	9.709***	0.000	8.129	0.217
Cons	-0.079	0.850	-3.859	0.249
Wald Chi	677.37***		157.24***	
Rhos			0.978	

Note: *Dependent Variable FS: Financial Stability, and Core independent variables are Credit Risk (CR) and Liquidity Risk (LR), and some control variables like SIZE: Bank size, RA: Risky Asset, NWTA: Financial leverage, BC: Branch concentration. The superscript ***, ** and * indicate the level of significance at 1%. 5% and 10% level respectively. Rho is the autocorrelation parameter. A higher rho and high standard errors are expected if there is autocorrelation within the panel timeseries and hence, PCSE model is expected to fit well to such data set.*

Estimated Statistics for sample-4 All banks (Public Sector + Private Sector + Other Banks)

5.3 Estimated Statistics of FGLS and PCSE model to explore the relationship of financial stability with Input prices for all Banks.

Table 21, 22(a) and 22(b) presents the estimated statistics for sample 4 i.e., for all banks including public sector, private sector and other banks. Table-21 contains three pre-estimation such as White test, Cameron & Trivedi IM test and Breusch-Pagan Test to justify model selection. White's Test tests the null hypothesis (H_0); "Homoskedasticity" against alternate hypothesis (H_1); "Unrestricted heteroskedasticity", Breusch-Pagan (B&P) Test also called as Cook-Weisberg test for heteroskedasticity test the null hypothesis (H0); "Constant variance", and Cameron & Trivedi decomposition of IM-Test ensured whether model contains no heteroskedasticity, skewness and Kurtosis to a significant degree. Hence IM test tests the null hypothesis of no heteroskedasticity, no Skewness and no Kurtosis. All the three tests reject their respective null hypothesis at 1% level implying that the data structure is heterogeneous and largely non-normally distributed. High heterogeneity data set is better modelled by Generalised Least Square (GLS) estimates.

Table-22(a) presents the estimates of FGLS and PCSE models for sample 4 and explains the relationship of financial stability of Indian banks with their respective input prices and key banking parameters. It is observed that financial stability of Indian banks is positively and significantly impacted by increase in price of capital, bank size, and financial leverage whereas price of fund, and risky asset is impacting financial stability negatively. Branch concentration is having very negligible impact on financial stability. Table- 22(b) presents the estimates that explains the relationship between credit risk and liquidity risk with financial stability of all banks. It is observed that financial stability of all Indian banks, are positively and significantly impacted by credit risk and liquidity risk parameter. However, credit risk component measured as interest income over total asset is having a substantial impact on bank stability whereas, liquidity risk is having very minimal impact. It implies, increase in interest income over total asset is also going to strengthen the financial stability of public and private sector banks as compared to total loan over total deposit.

Table: 21 Pre estimation tests to Justify selection model.

White Test		Cameron & Trivedi IM-Test		Breusch-Pagan Test	
Chi	581.11***	Heteroskedasticity	Chi = 581.11***	Chi	417.57***
Prob.	0.000	Skewness	Chi = 157.43***	Prob.	0.000
		Kurtosis	Chi = 1.98		
		Total	Chi = 709.67***		

Note: *The superscript ***, ** and * indicate the level of significance at 1%. 5% and 10% level respectively. Cook-Weisberg test (or) B & P Test indicates Breusch-Pagan to measure heteroskedasticity with Null Hypothesis; H_0: Constant variance. White's Test of Homogeneity, with Null hypothesis; H_0: Homoskedasticity against H_1: unrestricted heteroskedasticity, and Cameron & Trivedi decomposition of IM-Test ensured whether model contains no heteroskedasticity, skewness and Kurtosis to a significant degree. Hence IM test tests the null hypothesis of no heteroskedasticity, no Skewness and no Kurtosis.*

Table: 22 (a) Estimated Statistics of FGLS and PCSE model to explore the relationship of financial stability with Input prices for All Banks.

FS	FGLS		PCSE	
Variable	**Coef.**	**Prob**	**Coef.**	**Prob**
PK	0.108***	0.0000	0.103***	0.0000
PL	0.007	0.8300	0.011	0.6510
PF	-0.185*	0.0810	-0.175*	0.0730
SIZE	0.449***	0.0000	0.455***	0.0000
RA	-3.082***	0.0000	-2.139***	0.0060
NWTA	1.255***	0.0020	1.056***	0.0000
BC	-0.007	0.1490	-0.003	0.4950
Cons.	-1.662***	0.0000	-1.658***	0.0000
Wald Chi	212.68***		99.94***	
Rhos			0.726	

Note: *Dependent Variable FS: Financial Stability, and Core independent variables are Input prices/input costs of banks i.e., PK, PL, PF) PK: Price of capital, PL: Price of labour, PF: Price of fund, and some control variables like SIZE: Bank size, RA: Risky Asset, NWTA: Financial leverage, BC: The superscript ***, ** and * indicate the level of significance at 1%. 5% and 10% level respectively. Wald Chi^2 statistics presents overall significance level of the model that all the coefficients of the model are significantly other than zero. Rho is the autocorrelation parameter. A higher rho and high standard errors are expected if there is autocorrelation within the panel timeseries and hence, PCSE model is expected to fit well to such data set.*

Table: 22 (b) Estimated Statistics of FGLS and PCSE model to explore the relationship of financial stability with credit risk and liquidity risk for All Banks.

FS	FGLS		PCSE	
Variable	**Coef.**	**Prob**	**Coef.**	**Prob**
CR	9.761***	0.000	9.029***	0.000
LR	0.002**	0.052	0.003**	0.020
SIZE	0.471***	0.000	0.520***	0.000
RA	-9.401**	0.010	-1.837**	0.010
NWTA	1.429***	0.000	1.360***	0.000
BC	-0.002	0.551	-0.003	0.457
Cons	-1.739***	0.000	-2.020***	0.000
Wald Chi	148.73***		87.06***	
Rhos			0.898	

Note: *Dependent Variable FS: Financial Stability, and Core independent variables are Credit Risk (CR) and Liquidity Risk (LR), and some control variables like SIZE: Bank size, RA: Risky Asset, NWTA: Financial leverage, BC: Branch concentration. The superscript ***, ** and * indicate the level of significance at 1%. 5% and 10% level respectively. Rho is the autocorrelation parameter. A higher rho and high standard errors are expected if there is autocorrelation within the panel timeseries and hence, PCSE model is expected to fit well to such data set.*

CHAPTER-VI

CONCLUSION

When a highly regulated and policy-oriented sector of India encompasses through a series of financial reforms, it not only opens the door of opportunity, but also brings lots of challenges. If I try to summarise all the scopes and challenges of Indian banking sector in today's time, I will say two points (1) structure and (2) strength. At current era, in what type of environment Indian banking sector is operating. Are they operating in a competitive environment ensuring a fair price and optimum productivity or the sector is monopoly under the shed of regulation and Government. Secondly, within the market structure what is their financial stability, what are the determinants of their financial stability, what extent the determinants of market structure are responsible to maintain financial stability are some of the questions that come to my mind to answer. Hence, the present study aims to examine the competitive structure Indian banking sector. Although there are studies those try to answer whether deregulation induced competition should lead to efficiency and better performance in banking industry. But there is no indemnity that efficiency and comitative structure can assure financial stability. The potential of asset liquidity is the root cause of the financial turmoil and failure of banking structure across the glove (DeYoung and Jang, 2016). Although, we have encountered some international experience integrating liquidity risk and credit risk with financial stress of the banks but integrating the structure of banking sector with respect to consolidation of market power with financial stability through liquidity risk and credit risk management has hardly been addressed. Hence, in the second objective, the study aims to analyse how financial stability of banks is explained by liquidity risk, credit risk and key factors that determines consolidation of market power of Indian banking sector.

The present study is expected to contribute the existing literature in several ways. Firstly, it tries to empirically investigate the structure of Indian banking sector and the factors that helps in achieving consolidation of market power in Indian banking sector. Secondly, the attempt to integrate the degree of banking structure consolidation with financial stability is a huge research gap that the study has attempted to answer. Thirdly, the use of advanced econometrics models on latest data adds to the credibility of the study and robustness to its estimates. The study uses annual data of Indian commercial banks over from 2009 to 2022 and the data is collected from subscribed sources of Centre for Monitoring Indian Economy (CMIE), the handbook of statistics

on Indian economy. The data is divided into 4 samples. Sample 1 contains 12 public sector banks, Sample 2 contains 21 private sector banks, sample 3 contains 33 both public sector and private sector banks and finally, sample 4 contains 115 banks including public sector, private sector and some other banks whose data are available in CMIE data base. Since the data of Indian banks are highly heterogeneous, the study has used Generalised Least Square estimates to fit the model. Since the implications of the study are model based, we have taken enough precaution for selection of appropriate econometric model and required amount of pre-estimation and post estimation test has been undertaken. To ensure robust estimates, the GLS estimates are compared with estimates of PCSE model.

Form the empirical findings, it is observed that price of capital measured as ratio of bank's capital asset over total fixed asset is negatively impacting revenue of public sector banks, private sector banks as well as combining both public and private sector banks. On the contrary, it is positively impacting revenue at sector level. By decoding this variable, it is understood that increase in bank's net worth over total asset may decrease bank revenue.

Whereas employee cost is positively impacting revenue of banks at all levels. We may imply that Indian banking sector can absorb an increased employee expense without impacting revenue. Hence banks may look of more investment to increase employee productivity through training and capacity development.

Price of fund is negatively impacting revenue of public sector banks, but it is weekly significant. However, in case of private sector banks as well as for both public sector and private sector banks, it has positive impact on revenue. Hence, an increase in interest expense over total loanable fund can boost revenue of Indian public sector and private sector banks. But as a sector (by considering all banks), increase in interest expense has adverse effect on revenue. Here policy makers and bankers may note that public sector and private sector banks may afford an increase in interest expense.

Among the bank specific variables, risk asset is positively impacting bank revenue for private sector banks and combination of public and private sector banks. That is provision has a positive impact on generating revenue. Interestingly, it is negatively impacting revenue of public sector banks. Since provisions are scaled with total asset base, policy makers may note that differential asset base may dilute the impact of provisions over revenue.

Branch concentration is considered to be another parameter where bank's decision to increase number of branches. The study observed that except public sector banks, branch

concentration is positively impacting revenue of private sector banks, combining private and public sector banks as well as for the sector itself.

Credit risk is impacting the revenue positively across all the category of banks. Hence, increasing interest income is all time positive indicator for banking sector. All the banks must focus on maximising interest income to boost their revenue. The impact of Liquidity risk is negative on revenue of public sector and in most of the cases it is observed as insignificant as well as with very minimal impact. Hence, the public sector banks should focus more on total loan component as compared to other banks.

With respect to market structure, the public sector banks represent characteristics of monopolistic competition, the private sector banks exclusively as an entity operates in monopolistic competition. Since it is closer to unit, we may say it as closer to perfect competition and finally the market structure of all banks including public, private and all the other banks is closer to monopoly.

Further, the study finds that the market structure of both private and public sector banks closer to monopolistic competition. Since it is closer to unit, we may say it as closer to perfect competition also. When we cluster public and private sector banks from lower quantile to higher quantiles of distribution of revenue, the H statistics is ascending from lower quantile to higher quantiles. High revenue public and private sector banks, i.e., banks with 90% and above quantile of revenue are operated in competitive market with H coefficient 0.995 (closer to one), followed by banks with 75% quantile of revenue. However, public, and private sector banks with revenue form median to bottom 10% quantile are having H coefficient around 0.6, hence considered to be operating in monopolistic competitive environment. Further, we cluster banks from lower quantile to higher quantiles of distribution of revenue, the H statistics is descending from lower quantile to higher quantiles (See Table-13). The top 10% banks i.e., banks with 90% quantile of revenue are having the H coefficient of 0.265, followed H coefficients of 0.269, 0.363, 0.450 and 0.527 by banks with 75%, 50%, 25% and 10% quantile of revenue. Among the banking parameters, price of capital and employee cost (i.e., price of labour) is positively and significantly impacting revenue of banks from all the quantiles of profitability. Price of fund, branch concentration, and liquidity risk is having insignificant and quite minimal impact on bank revenue. Risky asset is also appearing insignificant in the findings of quantile regression.

Secondly the present study attempted to explore how financial stability of banks is being explained by liquidity risk, credit risk and by key factors that determines consolidation of market

power. The study observed that except public sector banks, increasing price of capital is positively impacting banks financial stability. That means, public sector banks should not focus more on accumulating capital assets further. Increasing employee cost is also hampering financial stability of both public sector and private sector banks. However, it does not have any implication at sector level.

Price of capital is negatively impacting both revenue and financial stability of public sector banks. Hence policy maker should notice that further increase of capital asset is not going to boost either revenue or stability of public sector banks. However, price of capital is negatively impacting revenue of private sector banks and combining all private and public sector banks but impacting negatively to financial stability. Hence, bankers from private sector banks can take a note that although capital asset contributes to enhance revenue but hampers financial stability. However, at sector level it carries a positive impact.

Similarly, the study finds a mixed response of Price of labour i.e., employee cost on revenue and financial stability of banks. The study finds positive impact of increase in employee cost on revenue whereas negative impact on financial stability. Although at sector level, it has a positive impact, but public and private sector banker should notice that although increase in employee cost increases revenue but carries an inverse impact on financial stability. Coming to price of fund, it is negatively impacting both revenue and stability of public sector banks, but for private sector banks, like employee cost, it is impacting revenue positively, but financial stability negatively. Among firm specific variables, risk asset is negatively impacting both revenue and stability of public sector banks, whereas private sector banks are boosting their revenue and stability. Policy makers and bankers should notice that increasing provision over total asset is creating value for private sector banks by boosting revenue and stability. Interestingly, except public sector banks, branch concentration is increasing value by increasing revenue and stability. Bankers should note that private sector banks should focus more on increased number of branches for more value creation.

Coming to analyse the impact of credit risk and liquidity risk on banks revenue and stability, the study has concluded that credit risk has a significant positive impact on both revenue and financial stability of banks of all categories. Bankers should note that increase in interest income is all time good indicator to increase banks revenue and stability for both public and private sector banks. On the contrary, banks experience missed response for the impact of liquidity risk. Liquidity risk impacts public sector banks revenue negatively, whereas financial

stability positively. However, for private sector banks, although liquidity risk impacts revenue positively, but it impacts their stability adversely. Hence, the bankers of private sector banks should monitor it accordingly.

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