CHAPTER 3

RESEARCH METHODOLOGY

3.0 Backdrop

This chapter contains the methodology adopted for the present study and is divided into three sections in all. The first is related to the hypothesis used in the study. Second section includes the sources of data and sample design. The last section deliberates on the theoretical aspects of different tools and techniques used to analyze the stated hypothesis of the study.

3.1 Statement of the Problem

The large number of banks' failure in the different economies of the world has compelled the bank regulators to think about the viability and stability of the banks in the present competitive environment. The main focus of the policy makers is to make sturdy guidelines for the banking system to trim down the banking fragility. Basel III regulations are framed for the strong capital base, sufficient liquidity and solvency of the banks at international level. In India also deregulation and several other regulations has been done for the banks. This has lead to the diversification of the banking operations. In this regulatory environment not only the revenue generation capacity of the banks has been increased but also the competition of the banks. The increased competition of the banks has forced them work hard and performs consistently to successfully survive in the market.

In the light of changed economic scenario, there is a need of comprehensive study to measure the financial viability of the commercial banks in India. Further, it is expected that the strict regulations may adversely affect the profitability of the banks. Many of the banks may not be able to stay alive in this environment. They may be exposed to distress and probe to failure or book value insolvency. So these situations need to be cared off timely before this happened in real life. That’s why the present study is an attempt in this direction to analyze the financial viability and distress of Indian commercial banks.
3.2 Research Objectives of the Study

The main objective of this study is to evaluate the financial viability and distress of Indian commercial banks. The sub-objectives are mentioned as follows:

1) To measure the liquidity, profitability and solvency of public and private sector banks of India.
2) To examine the financial viability of public and private sector banks of India.
3) To assess the financial distress of public and private sector banks.
4) To evaluate the impact of global financial crisis on public and private sector banks of India.

3.3 Hypotheses of the Study

The present study has used different approaches for measuring financial viability and its indicators for the commercial banks. Hypotheses which the study specifically takes into account are:

1. There is no significant difference in the liquidity of public and private sector banks in India.
2. There is no significant difference in the profitability of public and private sector banks in India.
3. There is no significant difference in the solvency of public and private sector banks in India.
4. There is no impact of crisis on the stock price volatility of Indian commercial banks.

3.4 Nature and Sources of Data

The present study is based on secondary data published by RBI and various departments of government of India (GOI). Most of the relevant data has been taken from various issues of RBI publications such as Statistical Tables Relating to Banks in India, Trends and Progress Reports of Banks in India, Report on Currency and Finance and Financial Stability Reports. Various issues of annual reports of Indian commercial banks, IBA (Indian Banks Association) National Accounts Statistics and from Centre for Monitoring the Indian Economy (CMIE), Bombay and India stat data is also used in this study. Different authentic online sources namely www.rbi.org.in, www.bseindia.
com, www.indiainfoline.com and www.finmin.nic.in are also accessed for the data collection. For analyzing the data SPSS, E-views and Ms-Excel computer software has been used.

3.5 Sample Design

The present study aims at evaluating the financial viability and distress of Indian commercial banks. Initially, the sample of 47 Indian commercial banks is selected for this study including 26 public sector banks and 21 private sector banks. But one of the private sector banks, SBI Commercial and International Bank merged with State Bank of India with effect from July 28, 2011. So it is excluded from the study. Finally the sample of 46 Indian commercial banks including 26 public sector banks and 20 private sector banks (given in Annexure) is taken for the analysis. Therefore, foreign banks, co-operative banks and regional rural banks are not included in the analysis. The time period of recent 11 financial years (2001-02 to 2011-12) is taken for this study. To assess the distress among Indian commercial banks 12 banks are selected that are exposed to insolvency risk. The banks that are exposed to insolvency risk are identified on the basis of Z-statistic. The banks having low Z score (exposed to insolvency risk) are further analyzed to assess the financial distress among them.

To know the impact of recent financial crisis on Indian banking sector, the above time period is divided into following sub-periods: (i) period of 1st January 2004 to 30th June 2007 is taken as pre crisis period; (ii) period of 1st July 2009 to 31st December 2012 is taken as post crisis period. The banks that are listed on BSE Bankex Stock Index are used to analyze the impact of recent crisis on Indian banking sector. It includes 14 major Indian commercial banks (given in Annexure) representing 90 percent of total market capitalization of Indian banking sector listed on BSE.

3.6 Statistical Tools and Techniques

Different statistical tools and techniques are used to fulfill the objectives for the present study. The methodology used for different objectives is as follows:

3.6.1 Liquidity, Profitability and Solvency of Indian Commercial Banks

Liquidity, profitability and solvency of Indian commercial banks are measured through different ratios. On the basis of review of existing literature, 76 different ratios are identified to measure the Liquidity, Profitability and Solvency of Indian commercial
banks. Out of these ratios 12 ratios are selected on the basis of their relevance in the literature, after discussion with experts and on the basis of ratios used in RBI publications (Statistical tables relating to banks in India, Trends and progress of banking in India) and the Banking Annual of Business Standard. Further, ‘t’ test is used to compare the public and private sector banks.

Table 3.1: Liquidity, Profitability and Solvency Indicators of Commercial Banks

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Ratios Used</th>
<th>Calculation of Ratios</th>
<th>Abb. Used</th>
<th>Economic Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquidity</td>
<td>Liquid Assets to Demand Deposits</td>
<td>(Cash and cash equivalent assets)/ Demand Deposits</td>
<td>LDD</td>
<td>Higher the ratio better for the bank to pay liabilities due on demand</td>
</tr>
<tr>
<td></td>
<td>Liquid Assets to Total Assets</td>
<td>(Cash and cash equivalent assets)/ Total Assets</td>
<td>LAA</td>
<td>Higher the ratio better the liquidity position of the bank</td>
</tr>
<tr>
<td></td>
<td>Demand Deposits to Total Deposits</td>
<td>Demand Deposits/ Total Deposits</td>
<td>DTD</td>
<td>Higher the ratio more requirement of the bank to hold liquidity at hand</td>
</tr>
<tr>
<td></td>
<td>Advances to Deposits</td>
<td>Advances/Deposits</td>
<td>ADD</td>
<td>Higher the ratio more the illiquidity situation for the bank</td>
</tr>
<tr>
<td>Profitability</td>
<td>Return on Assets</td>
<td>Profit Before Tax/Total Assets</td>
<td>ROA</td>
<td>Higher the ratio better the efficiency of bank in utilizing its assets</td>
</tr>
<tr>
<td></td>
<td>Return on Equity</td>
<td>Profit After Tax/Equity Shareholders Fund</td>
<td>ROE</td>
<td>Higher the ratio better the effectiveness of bank in utilizing shareholders fund</td>
</tr>
<tr>
<td></td>
<td>Net Interest Margin</td>
<td>(Interest Income-Interest Expenses)/Total Assets</td>
<td>NIM</td>
<td>Higher the ratio enhanced capability of the bank in earning the interest income</td>
</tr>
<tr>
<td></td>
<td>Cost to Income Ratio</td>
<td>Operating Expenses/Operating Income</td>
<td>CII</td>
<td>Higher the ratio more inefficiency of the bank management in managing operational expenses</td>
</tr>
</tbody>
</table>
![Table]

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<tr>
<td>Solvency</td>
<td>Capital Adequacy Ratio</td>
<td>Risk Weighted Assets/Total Assets</td>
<td>CAR</td>
<td>Higher the ratio better the capacity of the bank to bear unexpected shocks</td>
</tr>
<tr>
<td></td>
<td>Equity to Total Assets</td>
<td>Equity Capital Assets/Total Assets</td>
<td>EQA</td>
<td>Higher the ratio more use of internal sources to finance assets</td>
</tr>
<tr>
<td></td>
<td>Debt-Equity Ratio</td>
<td>(Deposits + Borrowings)/Equity Share Capital</td>
<td>DEQ</td>
<td>Higher the ratio more use of leverage in the capital structure of the bank</td>
</tr>
<tr>
<td></td>
<td>Interest Coverage Ratio</td>
<td>Earnings before Interest and Taxes/Interest Expenses</td>
<td>INC</td>
<td>Higher the ratio better the ability of bank to pay its interest charges</td>
</tr>
</tbody>
</table>

Source: Researcher’s Elaboration.

### 3.6.2 Financial Viability and Distress of Indian Commercial Banks

Z statistic developed by Hannan & Hanweck (1988) is used to measure the financial viability of the banks. It has already been widely used in different researches such as Boyd et al. (1993), Sinkey and Blasko (2001), Boyd and De Nicolo (2005), Laeven and Levine (2009), Demirguc-Kunt and Huizinga (2010), Alturbas et al. (2011) and Pascual et al. (2013) in different parts of the world to measure the banks’ default risk. It measures the distance from insolvency (Roy, 1952). Insolvency is defined as a state in which losses surmount equity. Z statistic uses the data on the banks’ expected profits, the likelihood of these profits to be realized and the bank’s capital base. Z statistic captures the likelihood of bank earnings in a given year becoming low enough to exhaust the bank’s capital base and thus the likelihood of bank becoming insolvent (Sinha et al., 2010). Z statistic is defined as:

\[
Z = \frac{ROA + CAR}{\sigma ROA}
\]

Where,

\[Z = \text{Solvency/Safety Index}\]

\[ROA= \text{Return on Assets}\]
\[ CAR = \text{Capital to Total Assets} \]
\[ \sigma \text{ROA} = \text{Standard deviation of Return on Assets} \]

Further, ROA and CAR are calculated as follows:

\[
\text{Return on Assets} = \frac{\text{Net Income}}{\text{Average of Total Assets}}
\]

\[
\text{Capital to Asset Ratio} = \frac{\text{Equity}}{\text{Total Assets}}
\]

Z statistic is calculated for the whole sample period. Z-statistic is the inverse of the probability of insolvency i.e. higher the value of Z indicates that the bank incurs fewer risks and is more financially stable. Financial stability of the bank indicates that the bank is capable of carrying out its operations itself successfully which ensures its long term survival i.e. financial viability of the bank. Besides studying Z statistic which is a composite measure of bank stability, volatility of assets return and leverage is also examined separately in the present study. Volatility of returns on assets (\(\sigma \text{ROA}\)) which is a component of Z statistic is examined to assess whether the changes in Z score are due to the riskiness of bank assets or whether other components of Z-statistic, such as capital to assets ratio account for changes in bank fragility. Variability of ROA is a comprehensive measure of the overall risk of a bank. It reflects not only the credit risk but also the interest rate risk, liquidity risk, operating risk and any other risk that is realized in bank earnings (Naimy, 2005). Portfolio risk and leverage risk are defined as:

\[
\text{Portfolio risk} = \frac{\text{ROA}}{\sigma \text{ROA}}
\]

\[
\text{Leverage Risk} = \frac{\text{CAR}}{\sigma \text{ROA}}
\]

In both the cases, higher value indicates the banks are more financially stable. There are several other methods to measure the financial viability of the banks. Some of these cannot be used due to non-availability of required data and others are not suitable as per Indian banking regulations. Overall, Z statistic is an appealing risk measure because it includes ROA; the most widely accepted accounting measure of overall bank performance, variability of ROA which is a standard measure of risk in
financial economics and book capital adequacy which represents an industry standard for bank safety and soundness.

10 different indicators (as shown in Table 3.2) related to liquidity, profitability, solvency, stability and growth (Singh and Makkar, 2013) are used to determine the financial distress in the selected banks.

**Table 3.2: Financial Distress Indicators of Commercial Banks**

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Ratios Used</th>
<th>Calculation of Ratios</th>
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<tr>
<td>Liquidity</td>
<td>Demand Deposits to Total Deposits</td>
<td>Demand Deposits/ Total Deposits</td>
<td>DTD</td>
<td>Higher the ratio more requirement of the bank to hold liquidity at hand</td>
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<td>Advances to Deposits</td>
<td>Advances/Deposits</td>
<td>ADD</td>
<td>Higher the ratio more the illiquidity situation for the bank</td>
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<td>Return on Assets</td>
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<td>Equity to Total Assets</td>
<td>Equity Capital Asset/ Total Assets</td>
<td>EQA</td>
<td>Higher the ratio more use of internal sources to finance assets</td>
</tr>
<tr>
<td>Stability</td>
<td>Non-performing loans to Total Advances</td>
<td>NPA/Total Advances</td>
<td>NPA</td>
<td>Lower the ratio better the ability of the bank to earn interest income</td>
</tr>
<tr>
<td></td>
<td>Interest Coverage Ratio</td>
<td>Earnings before Interest and Taxes/ Interest Expenses</td>
<td>INC</td>
<td>Higher the ratio better the ability of bank to pay its interest charges</td>
</tr>
<tr>
<td>Growth</td>
<td>Advances Growth Rate</td>
<td>(A_t-A_{t-1})/ A_t</td>
<td>AGR</td>
<td>Higher the ratio better the earnings of the bank</td>
</tr>
<tr>
<td></td>
<td>Deposits Growth Rate</td>
<td>(D_t-D_{t-1})/ D_t</td>
<td>DGR</td>
<td>Higher the ratio better the credit creation ability of the bank</td>
</tr>
</tbody>
</table>

Source: Researcher’s Elaboration.
3.6.3 Impact of Global Financial Crisis on Indian Commercial Banks

The impact of global financial crisis is verified mainly on the stock price volatility of the Indian commercial banks. BSE Bankex stock index is used as a proxy of stock returns of Indian commercial banks. Bankex index consists of major public and private sector banks listed on BSE. Bankex displays on-line performance of equity of listed banks. It has 14 stocks which represent 90 percent of the total market capitalization of all banking sector stocks listed on BSE. The time series data of banks daily closing stock prices is collected from the official website of Bombay Stock Exchange (www.bseindia.com) for 9 years (1 January, 2004 to 31 December, 2012). The stock market returns (R_t) is calculated from the daily closing stock prices of Bankex index is defined as:

\[ R_t = \log \left( \frac{P_t}{P_{t-1}} \right); \]

Where, \( R_t \) = Logarithmic daily return, \( P_t \) = daily closing stock price for the present day, \( P_{t-1} \) = daily closing stock price for the previous day.

To compare the banks stock returns volatility data is divided into two parts, i.e. pre crisis (1 January 2004 to 30 June 2007) and post crisis period (1 January 2009 to 31 December 2012). The volatility of stock prices is estimated through Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model. The model is mainly used to analyze the financial data and has proven its efficacy in estimating the volatility in developed and developing markets. Statistically, volatility denotes strong autocorrelation in squared returns and which can be detected through Heteroscedasticity tests.

GARCH is a generalized form of ARCH, which helps in estimating the volatility (Bollerslev, 1986). GARCH captures the tendency for estimating time series data for volatility clustering. The model helps to know the behaviour of returns where the behaviour of the dependent variable is postulate to be a function of past values of the dependent and independent variables (Engle, 2002). It enables to understand the relation between information and volatility. GARCH (1, 1) model for daily stock return is:

\[ r_t = a + br_{t-1} + \varepsilon_t \]

Variance equation is given as:

\[ h_t = \omega + \alpha_1 \varepsilon_{t-1}^2 + \beta_1 h_{t-1} \]
Where, $\omega > 0$, $\alpha \geq 0$, $\beta \geq 0$. $h_t$ is the conditional variance and $h_{t-1}$ is the conditional variance calculated based on past information. Using GARCH it is possible to interpret the current fitted variance ($h_t$) as a weighted function of a long term average value (dependent on $\omega$), information about the volatility during the previous period ($\alpha \varepsilon_{t-1}^2$) and the fitted variance from the model during the previous period ($\beta h_{t-1}$) (Brooks, 2008). The stationarity condition for GARCH (1, 1) is $\alpha_1 + \beta_1 < 1$. In order to avoid spurious regression, stationarity of the data is checked through Augmented Dickey Fuller (ADF) test. Minimum Akaike information Criteria is used to determine the number of lags.

### 3.7 Organization of the Study

The study is organized in six chapters as follows:

1. **Chapter-I** provide a brief introduction to the banking system and highlight the story of Indian banking sector from its birth to till date. It also covers the problems and prospects faced by Indian banking sector in the current scenario.

2. **Chapter-II** presents a review of literature on banking sector and brings out research gap in order to logically state the research problem.

3. **Chapter-III** is on research methodology and provides a quick view about the process of research followed to achieve the objectives of the study. The chapter also outlines the description of all statistical tools and techniques used for analysis and interpretation of the data in the present study.

4. **Chapter-IV** titled Liquidity, Profitability and Solvency Analysis of Indian Commercial Banks, presents the research results of first objective used in this study. The result and discussions are based on extensive analysis of different ratios relating to liquidity, profitability and solvency of commercial banks.

5. **Chapter-V** Financial Viability and Distress Analysis of Indian Commercial Banks present comprehensive analysis of Indian commercial banks using different techniques. It outlines the results of second and third objective of the present study.

6. **Chapter-VI** evaluates the impact of global financial crisis on Indian commercial banks. This chapter has employed various statistical tests on the
time series data to draw research results with respect to this specific research objective.

7. Finally, Chapter VII entitled ‘Summary of Findings and Policy Implications’ summarize the major findings of the study. It also outlined some suggestions and recommendations on the basis of these findings to give a meaningful end to the present research.

3.8 Significance of the Study

Being one of the most important sectors of the economy, faced with mounting competition and adversely affected by global economic environment, banking industry got a lot of attention of the regulators. Evaluation of financial viability has become essential for the bank regulators and policy makers in this frequently changing regulatory environment. The level of financial viability in the banks is the reflection of the various aspects such as liquidity, profitability, solvency and many other factors like capital structure, solvency, risk management and the competitiveness of the banking system. The low level of financial viability entails inefficient use of the accessible resources which results into poor financial performance.

The first step to improve the financial viability of the banks is to identify the factors that are adversely affecting the banks on different dimensions. The next step is to remove these constraints that are adversely affecting the financial viability of the banks. The present study will be useful for the bank regulators in India, as it clearly indicates the level of financial viability with which banks are operating. The weak spot of the banks in their consistent performance threatens to their solvency. Distress of the banks reveals the probability of the bank to collapse or insolvency. The present study would help the banks to improve the financial performance on each dimension and removing the constraints affecting their survival.