# CHAPTER 5

# RELATIONSHIP BETWEEN GREEN BANKING PERFORMANCE AND CORPORATE CHARACTERISTICS OF BANKS

## 5.1 Introduction

Being a new concept, Green Banking requires additional efforts, time and costs to be incurred for its proper implementation. Green Banking can be costly for banks in the initial years of its implementation as banks may have to incur capital costs (Awino, 2014). Also, implementation of Green Banking in India is voluntary till date for the banks, which makes it convenient for banks to implement Green Banking at their own pace. This brings an important question in front of us which is if financial and non-financial characteristics have some impact on Green Banking Performance. The main purpose of the chapter is to find relationship between banks' corporate features and Green Banking Performance. Green Banking Performance is measured using the Green Banking Performance Evaluation Index (GBPEI) as discussed in Chapter 4. The term 'corporate characteristics' used in this chapter refers to the financial and non-financial characteristics of the banks. The corporate characteristics of banks considered in this study are:

**Table 5.1:** Corporate Characteristics of Banks

| Nature | Variable Name | Variable Measurement |
|---|---|---|
| Financial | 1) Bank Size | Bank Total Assets |
| | 2) ROA | Proportion of Net Profit over total assets |
| | 3) NPA | Net NPA Ratio = Gross NPA- Provisions related to unpaid debt / Gross Advances |
| Non-Financial | 1) Size of Board | Number of board members |
| | 2) Age | Number of years since establishment of the bank |
| | 3) Count of Women Director | Number of female directors |

**Source:** Compiled by the researcher

The financial characteristics considered are bank size, Return on Asset (ROA) and Non-Performing Asset (NPA). The non-financial variables considered are size of board, bank's age and count of women director. The dependent variable is the value of Green Banking Performance Evaluation Index. Independent variables are listed in Table 5.1. Panel Data Regression is used for analyzing this objective.

It is important to study the association between Green Performance of Banks and corporate features (financial and non-financial) of banks so as to know if Green Banking Performance is influenced by the characteristics of banks. Additionally, there is a scarcity of empirical research on whether financial and non-financial characteristics

of banks impacts Green Banking Performance in Indian context. Review of Literature chapter discusses studies in global context which have tried to find the association between Green Banking Performance and corporate characteristics. However, it is stated in that chapter that in Indian context the existing studies have measured Green Banking Performance only by measuring it as dummy variable that is whether Green Banking is implemented or not (Rajput et al., 2013) or by measuirng Green Banking Performance only with adoption of electronic and digital tecchnology (Ramila, 2016). The scope of measurement of Green Banking Performance is very narrow in the existing studies and hence they donot give a comprehensive picture. Thus, after measuring the bank's performance based on the Green Banking Performance Evaulation Index (GBPEI), an attempt is made in this study to find and establish the relation between Green Banking Performance and corporate characteristics of banks.

This chapter is divided into three sub-sections. The first sub-section (5.1) discusses the introduction to the chapter, the second sub-section (5.2) discusses the development of hypotheses of the chapter, the third sub-section (5.3) elaborates the findings of the chapter and the last sub-section (5.4) summarizes the chapter.

### 5.2 Development of Hypothesis

This section discusses the development of the various hypotheses which are tested in this chapter.

i. **Size**: Size of a bank is an important factor that might influence the way a bank performs and discloses its activities on non-financial parameters like Green Banking. In reference to the banking community, bank size is a significant explanatory factor in explaining amount of disclosure (Hossain & Reaz, 2007). Large banks have higher amount of resources at their disposal which they can use to meet their environmental responsibilities. It is said that larger firms undergo a higher amount of scrutiny because they receive greater attention from the media (Stanny & Ely, 2008). Also, the cost involved in sharing and accumulating information about a firm's activities is lower for large size entities and higher for small firms (Diamond, 1985; Singhvi & Desai, 1971). Considering all the factors cited above, it is important to see if the size of bank influences Green Banking Performance of a bank. In context of Indian banks, no study could be found that has addressed the association between Green Banking Performance and bank size.

The size of bank is measured as the total assets of a bank (Stanny & Ely, 2008; Bose et al., 2018; Islam & Ahmed, 2012). The hypothesis tested for addressing this gap is:

$H_{3a}$= There is no significant effect of bank size on Green Banking Performance

$H_{3b}$= There is significant effect of bank size on Green Banking Performance

ii. **Profitability**: Profit is a vital indicator of efficiency of an organization. It is the ability of a company or a firm to earn profits in business. Profit earned by an organization is a major factor that influence the way an organization operates. Any entity with surplus funds is able to take care of matters which are not legally mandatory. Profitable banks with surplus funds are able to invest their time and resources in social and environmental activities. In this study the impact of profitability on Green Banking Performance is tested. Return on Assets is used as the indicator for profitability. Return on Assets means the profit earned by a company on the total assets owned by a company (Bukit et al., 2018). Some literature found an association between Return on Assets and Green Banking Performance like Hoque et al., (2022) found a direct relationship between Green Banking Performance of Bangladesh banks and Return on assets. However, in reference to India, no study could be found that has tested the association between Return on Assets and Green Performance of banks. Thus, to fill up the above gap, the hypothesis tested is mentioned below:

$H_{4a}$= There is no significant effect of return on assets on Green Banking Performance

$H_{4b}$= There is significant effect of return on assets on Green Banking Performance

iii. **Non-Performing Assets**: Non-Performing Assets (NPA) are loans and advances on which principal and interest remains unpaid for over a period of time (The Economics Times, 2022). A Non-Performing Assets cease to produce income for a bank (Lok Sabha Secretariat, 2014). NPA is a significant problem for the banking industry. A bank having an enormous sum of NPA reflects a poor financial position. As such, the bank would not be in a position to take up activities which are not mandated by law. A bank with a higher amount of NPA would be majorly focusing on ways to reduce the NPA amount. Weber (2016) considered NPA as one of the parameters of financial performance and tried to analyze the relationship between NPA and Green Banking Performance. However, no study could be found in Indian

context that tried to analyze the relationship between NPA and Green Banking Performance. Thus, to fill up the above mentioned gap, hypothesis tested is stated below:

$H_{5a}$= There is no significant effect of NPA on Green Banking Performance

$H_{5b}$= There is significant effect of NPA on Green Banking Performance

iv. **Size of Board**: Board Size is a factor that might influence the way a particular firm performs or communicates its activities. Boards with higher number of members have connections with numerous stakeholders making it possible to get access to higher amount of financial resources. As such firms with higher number of members allow a firm to carry out green or environmental activities (Villiers & Staden, 2011). Also, members on a board come from different background and have diverse experiences and expertise. As such, the size of board influences the way a firm or a company communicates and discloses its information on environmental activities (Villiers & Staden, 2011; Tauringana & Chithambo, 2015). A large board having a higher number of directors may include specialists in the domain of environment, which ultimately might help a corporation to deal with difficulties involved in implementing green initiatives (Martin & Herrero, 2019). However, no study could be found in Indian context that has tried to analyze the impact of board size on Green Banking Performance. As such, this study tests the influence of board size on Green Banking Performance with the help of following hypothesis:

$H_{6a}$= There is no significant effect of board size on Green Banking Performance

$H_{6b}$= There is significant effect of board size on Green Banking Performance

v. **Women Director*:*** Gender is an important factor which differentiates the way a male and female responds to the environment. Women compared to men react slightly in a different manner towards the natural environment because of their greater awareness of the problems in the environment and their willingness to fight the problems that exists in the natural environment (Gaard, 2015). A study made by Arayssi et al.; (2016) found that women managers have improved the environmental performance of companies by sharing environmental information to stakeholders and by actively participating in environmental decision making. Likewise there are several other studies which have confirmed that corporations with women on their board are more environmentally conscious and responsible (Post et al., 2011).

Having a diverse board with different gender makes it possible to have diverse opinions, manner of working and thus makes the whole decision making process more effective (Liao et al., 2015). Hence, it becomes necessary to examine if women directors on board influences Green Banking Performance of Indian banks over the period. The hypothesis tested for the same is:

$H_{7a}$= There is no significant effect of number of women directors on Green Banking Performance

$H_{7b}$= There is significant effect of number of women directors on Green Banking Performance

**vi. Age of the Bank*:*** Age of an entity impacts the degree of performance and the nature of activities performed over time. Younger entities find it difficult to measure, gather, process and disseminate information on activities other than those which are mandated by law. The same process is relatively easier for the older firms (Ansah, 1998). Older banks might be in a situation to perform, gather and report on non-financial matters over and above legal requirement (Hawashe, 2015). The measure used to calculate age of a bank is number of years from the year of its incorporation. However, there still lies confusion whether older banks can actually have better Green Banking Performance than the younger banks and thus, considering the above factors, the hypothesis tested to examine the impact of age over its Green Banking Performance is stated below:

$H_{8a}$= There is no significant effect of age of bank on Green Banking Performance

$H_{8b}$= There is significant effect of age of bank on Green Banking Performance

## 5.3 Association between Green Banking Performance and Corporate Characteristics

The first part of sub-section 5.3 analyzes the dependent and independent variables using descriptive statistical techniques namely, mean, standard deviation, minimum and maximum.

### *5.3.1 Calculation of Descriptive Statistics*

In this sub-section, descriptive statistics is calculated for dependent and independent variables. Table 5.2 states the results of the descriptive statistics of dependent variable

which is GBPEI (Green Banking Performance Evaluation Index). GBPEI is the score calculated for the banks for their Green Banking Performance over the 10 years period.

**Table 5.2:** Descriptive Statistics of GBPEI

| | | 2009-2010 | 2010-2011 | 2011-2012 | 2012-2013 | 2013-2014 | 2014-2015 | 2015-2016 | 2016-2017 | 2017-2018 | 2018-2019 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| N | Valid | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 38 |
| | Missing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| Mean Value | | 10.67 | 12.42 | 13.55 | 17.95 | 20.07 | 20.67 | 23.50 | 29.22 | 30.82 | 31.63 |
| Median Value | | 8.00 | 10.00 | 11.00 | 13.00 | 12.00 | 14.00 | 18.00 | 28.50 | 30.00 | 30.50 |
| Standard Deviation | | 6.58 | 9.06 | 9.22 | 12.85 | 15.61 | 14.78 | 15.16 | 13.14 | 13.94 | 15.41 |
| Range Value | | 26.0 | 47.0 | 45.0 | 44.0 | 53.0 | 49.0 | 53.0 | 52.0 | 56.0 | 62 |
| Minimum Value | | 1.0 | 1.0 | 2.0 | 5.0 | 4.0 | 6.0 | 6.0 | 9.0 | 10.0 | 9 |
| Maximum Value | | 27.0 | 48.0 | 47.0 | 49.0 | 57.0 | 55.0 | 59.0 | 61.0 | 66.0 | 71 |

**Source:** Compiled by the researcher

Table 5.2 depicts the mean Green Banking Performance Evaluation Index score for the total 40 banks over the 10 year period. The minimum mean GBPEI is 10.675 and the maximum mean GBPEI is 31.63. Also, there is a gradual growth in mean value from 2009-2010 to 2019-2019. The difference (range) between the highest and lowest GBPEI has increased gradually over the years. Range value starts from 26 and the maximum range value is observed in 2018-2019. The minimum GBPEI scored by a bank over the span of study is 1 and the maximum GBPEI score secured by a bank is 71. The minimum value of GBPEI has increased from 1 to 10 over the study period. Also, the maximum value of GBPEI has increased over the years. Thus, it can be concluded that there is a gradual increase in the mean value, minimum value, maximum value and range of GBPEI over the 10 year period. It shows that the Indian banks are adopting and implementing more Green Banking initiatives with time.

**Table 5.3:** Independent Variables: Descriptive Statistics

| Variables | N | Range | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|---|
| Bank Size | 398 | 57305138009 | 13881991 | 57319020000 | 2651375494.13 | 4757206641.11 |
| ROA (%) | 398 | 6.70 | -4.68 | 2.02 | .55 | 1.00 |
| Net NPA (%) | 398 | 39.00 | .00 | 39.00 | 2.96 | 3.57 |
| Board Size | 398 | 13 | 6 | 19 | 10.72 | 2.00 |
| Age | 398 | 147.58 | 6.36 | 153.94 | 79.74 | 32.53 |
| Women Director | 398 | 3 | 0 | 3 | .89 | .75 |
| Valid N | 398 | | | | | |

**Source:** Compiled by the researcher

Table 5.3 presents the descriptive statistics of the independent variables. Average size of bank is 2,65,13,75,494.13. The average board size is 10.72. The maximum size of the board is 19 and the minimum is 6. Mean ROA is 0.55% and mean NPA is 2.96%. Maximum NPA is 39% and minimum NPA is 0%. Maximum number of women directors on board is 3 and the minimum is 0. Banks have age from 6 years to 154 years. Average age of banks under sample is 79.7 years. The key outcome of the table is the difference between minimum and maximum value of the six independent variables which is represented by range. Based on the table, it can be concluded that there is a large difference in the assets of the sample banks. Also, there is a large difference in return on assets (ROA) of banks as there are banks having negative ROA and banks having positive ROA. Also, other key findings are the minimum values observed for NPA and women directors. In both the cases, there are banks which have had 0 women directors and 0 NPA. While 0 number of women directors depicts the scenario where banks didn't give due consideration to representation of different genders in boards. On the other hand, nil NPA shows there were situations when Indian banks had no problem of NPA which is the opposite of today's scenario, wherein the banks are crowded with the problems of NPA. Also, another key outcome of the table is that among the sample banks, there are banks which are just 6 years older and there are banks which are 154 years older. This shows the wide range of young and old banks covered in this study.

### *5.3.2 Panel Data Regression*

Panel Data means data for N individuals that are observed for a T period of time. Panel Data represents more informative data and also has less collinearity amongst the

variables (Hiestand, 2005). Other benefits of Panel Data Analysis are that it increases reliability, and helps in coping with the problem of multicollinearity amongst the independent variables (Fanbasten & Escobar, 2016). For analyzing the association between Green Banking Performance of banks and their corporate characteristics, Panel Data Regression is used. The hypotheses stated under Section 5.2 are tested for Objective 2. The model tested in this study is:

$$GBPEI = \beta_0+\beta_1 BankSize+\beta_2 ROA+\beta_3 NPA +\beta_4 BRDSIZE +\beta_5 WOMNDIR+ \beta_6 BANKAGE +\varepsilon_{it}$$

Where, GBPEI= Green Banking Disclosure Performance Index, BankSize is measured as the total assets of the bank, ROA is return on assets measured as proportion of net profit over total assets, NPA is Net Non-Performing Assets which is calculated as proportion of Gross NPA minus provisions related to unpaid debts over Gross Advances, BRDSIZE is Size of Board which is measured as count of directors on the board, WOMNDIR is Women Directors, calculated as the number of Women Directors on board, BANKAGE means age of the bank since its incorporation, $\varepsilon_{it}$= Error Term

Before applying Panel Data Regression, the assumptions are checked and tested. The key assumptions of Panel Data Regression which are tested throughout the literatures and are used by researchers before applying Panel data regression are multi-collinearity, heteroscedasticity and stationery tests (Elseoud, et., 2020; Boadi, 2015). To ensure consistent and reliable results of Panel Data regression, the stationery tests, heteroscedasticty and multi-collineairty needs to be checked out (Boadi, 2015). In addition to the above assumptions, Auto-correlation needs to be tested and checked (Fanbasten & Escobar, 2016). In total, the assumptions of Panel Data Regression tested are: multi-collinearity, stationery tests, heteroscedasticity and auto-correlation.

**1. Multi-collinearity**: Multi-collinearity refers to the problem where the independent variables are highly correlated with each other (Boadi, 2015). Multi-collinearity can be checked using different techniques, in this study the correlation value between the independent variable is used to check multicollinearity. The results of the multicollinearity tests are displayed below:

**Table 5.4:** Correlation between Independent Variables

| | Bank Size | ROA | NPA | Board Size | Age | Women Director |
|---|---|---|---|---|---|---|
| Bank Size | 1 | **-0.05** | **0.078** | **0.24** | **-0.06** | **0.24** |
| ROA | - | 1 | **-0.5** | **0.15** | **-0.35** | **-0.09** |
| NPA | - | - | 1 | **-0.16** | **0.24** | **0.07** |
| Board Size | - | - | - | 1 | **-0.05** | **0.28** |
| Age | - | - | - | - | 1 | **-0.18** |
| Women Director | - | - | - | - | - | 1 |

**Source**: Compiled by the researcher

The correlation value between the variables is depicted in the above table. The highlighted figures are the relevant correlation value. In all the cases, it is seen that none of the variables have a high correlation. A correlation of more than 0.7 is considered as significant correlation [(Calkins, 2005), (Clark, 2018)]. However in this case all the values are less than 0.7. Thus, the multi collinearity doesn't pose a problem in this study.

**2. Panel Stationery Test**: It is a test for determining whether mean, variance and co variance of time series are dependent on time (Maheta, 2022). It means when there is no trend in time series data, it is considered to be stationery (QRSchool, 2020). The stationery test is important because if the data are non-stationery then the regression output cannot be relied upon. The Stationery test is done with the help of Unit Root test. There are various techniques to calculate Unit Root test, namely: Levin, Lin and Chu (2002), Im, Pesaran and Shin (2003), PP - Fisher Chi-square, ADF - Fisher Chi-square. The null hypothesis for Unit Root tests is that there is no Unit Root in the data (Maheta, 2022). The alternate hypothesis is that there is Unit Root in the data. The results of the Unit Root tests are displayed below.

**Table 5.5:** Panel unit root test: Summary

| Exogenous variables: Individual effects, individual linear trends | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| User-specified lags: 1, Newey-West automatic bandwidth selection and Bartlett kernel | | | | | | | | | |
| Balanced observations for each test | | | | | | | | | |
| **Series: GBPEI** | | | | | **Series: Board Size** | | | | |
| Method | Statistic | Prob.** | Cross-sections | Obs | Method | Statistic | Prob.** | Cross-sections | Obs |
| Levin, Lin & Chu t* | -22.81 | 0.00 | 38 | 304 | Levin, Lin & Chu t* | -9.48 | 0.00 | 38 | 304 |
| Im, Pesaran and Shin W-stat | -0.24 | **0.40** | 38 | 304 | Im, Pesaran and Shin W-stat | -0.12 | **0.45** | 38 | 304 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ADF - Fisher Chi-square | 74.18 | **0.53** | 38 | 304 | ADF - Fisher Chi-square | 88.24 | **0.16** | 38 | 304 |
| **Series: Bank Size** | | | | | **Series: ROA** | | | | |
| Method | Statistic | Prob.** | Cross-sections | Obs | Method | Statistic | Prob.** | Cross-sections | Obs |
| Levin, Lin & Chu t* | 0.91 | **0.81** | 38 | 304 | Levin, Lin & Chu t* | -0.86 | **0.19** | 37 | 294 |
| Im, Pesaran and Shin W-stat | 2.96 | **0.99** | 38 | 304 | Im, Pesaran and Shin W-stat | 2.11 | **0.98** | 37 | 294 |
| ADF - Fisher Chi-square | 44.04 | **0.99** | 38 | 304 | ADF - Fisher Chi-square | 47.87 | **0.99** | 37 | 294 |
| **Series: Women Director** | | | | | **Series: Net NPA** | | | | |
| Method | Statistic | Prob.** | Cross-sections | Obs | Method | Statistic | Prob.** | Cross-sections | Obs |
| Levin, Lin & Chu t* | -35.30 | 0.00 | 34 | 238 | Levin, Lin & Chu t* | 4.96 | **1.00** | 37 | 296 |
| Im, Pesaran and Shin W-stat | -1.01 | **0.15** | 34 | 238 | Im, Pesaran and Shin W-stat | 0.39 | **0.65** | 37 | 296 |
| ADF - Fisher Chi-square | 75.93 | **0.23** | 34 | 238 | ADF - Fisher Chi-square | 78.57 | **0.34** | 37 | 296 |

| **Series: Age** | | | | |
|---|---|---|---|---|
| Method | Statistic | Prob.** | Cross-sections | Obs |
| Levin, Lin & Chu t* | 0.003 | **0.50** | 1 | 8 |
| Im, Pesaran and Shin W-stat | 0.82 | **0.79** | 1 | 8 |
| ADF - Fisher Chi-square | 0.29 | **0.86** | 1 | 8 |

**Source**: Compiled by the researcher

Table 5.5 gives cumulated results of various methods, namely Levin, Lin and Chu (2002), Im, Pesaran and Shin (2003), and ADF - Fisher Chi-square. These are the various methods of Unit Root tests, and for all the methods, the null hypothesis is that there is no unit root. The probability value (p value) is greater than 0.05 for all the methods in case of variable age, NPA, bank size and ROA. The probability value (p value) is greater than 0.05 for majority of the methods in case of the variables: women director, GBPEI and board size. The results given by majority of the methods should be considered for Unit Root test (Maheta, 2022). Thus, null hypothesis cannot be rejected in this case. Panel data doesn't have Unit Root for the all the variables, namely GBPEI, board size, bank size, women director, NPA, ROA, and age.

**3. Heteroscedasticity**: When the variances of the error terms or residuals vary between observations, the problem of heteroscedasticity is present [(Boadi, 2015) (Fanbasten & Escobar, 2016)]. It explains the situation where the model's variance of errors is not the same for all observations (Lumivero, 2023). The Bruesch-Pagan Test helps to measure heteroscedasticity in a regression model. The Breusch-Pagan, also known as BP Test is

used to detect the presence of heteroscedasticity in a regression model (Tan, 2023). The existence of homoskedasticity is one of the key assumptions of Pooled OLS. The non-existence of homoskedasticity would make the use of Pooled OLS not appropriate. The Lagrange Multiplier gives the results for the Bruesch-Pagan Test. The null hypothesis of Bruesch-Pagan test is that error variances are equal (Williams, 2020). The corresponding alternate hypothesis is that error variances are not equal. The result of the Bruesch-Pagan Test is displayed below in table 5.6.

**Table 5.6:** Heteroscedasticity Test

| Lagrange Multiplier Tests for Random Effects | | | |
|---|---|---|---|
| Null hypotheses: No effects | | | |
| Test Hypothesis | | | |
| | Cross-section | Time | Both |
| Breusch-Pagan value | 242.4703 | 182.8927 | 425.3630 |
| | (0.0000) | (0.0000) | (0.0000) |

**Source:** Compiled by the researcher

The p value of Bruesch-Pagan Test for both (Cross Section and Time) is less than 0.05; thus null hypothesis for the test cannot be accepted. It means that the error variances are not equal. Thus, when error variances are not equal, the problem of heteroscedasticity exists. When the assumption of homoskedasticity is violated, and heteroscedasticity exists, then Fixed Effect Model (FEM)/ Random Effect Model (REM) are more suitable (Brugger, 2021). The Pooled OLS cannot be thus used and hence Bruesch-Pagan test helps to choose between Pooled OLS and Fixed Effect Model / Random Effect Model. In this study, thus Fixed Effect Model is used.

**4. Auto-correlation**: Presence of Auto-correlation means the error terms are correlated. It means that errors are correlated over time (Liu, 2021). It is also known as Serial correlation. There can be positive auto-correlation, negative auto-correlation or no auto-correlation. Auto-correlation is a problem because existence of auto-correlation would nullify the results of regression analysis, and the findings cannot be relied upon (Shekhawat, 2021). The Durbin-Watson test helps to measure the existence of auto-correlation in a study (CFI Team, 2022). The value of Durbin-Watson Statistics should be near 2. However, values below 1 and above 3 are considered problems in research, otherwise not (Field, 2009; Statistics How To, 2023).

**Table: 5.7**: Auto-Correlation Test

| Tests | Durbin-Watson Test |
|---|---|
| Pooled OLS | 0.5 |
| Random Effect Model | 0.41 |
| Fixed Effect Model | 1.1 |

**Source**: Compiled by the researcher

The value of Durbin-Watson statistics is detailed out in Table 5.8, 5.10, 5.12. In this study, after checking various assumptions, the Fixed Effect Model is considerd appropriate and is used. The Durbin-Watson Statistics is more than 1 in case of Fixed Effect Model. As it has been already stated by Field (2009) that values more than 1 are not a concern, thus auto-correlation is not a concern for this study. Since, all the assumptions are met, the Panel data regression is applied and the results are initiated below.

*Pooled OLS Regression Model/ Panel Least Square Method*: Panel Data Regression is used to perform regression for data having a combination of cross section data and time series data. Commonly, 3 models exist of Panel Data Analysis, namely POLS (Pooled OLS regression), FEM (Fixed Effects Model), and REM (Random Effects Model) (Fanbasten & Escobar, 2016). All the models of Panel Data Regression start with simple regression or Pooled Regression (Baltagi, 2008). Pooled OLS Regression Model is used when all entities / firms under consideration have similar intercept or coefficient (Jawaid, 2021). The Pooled OLS Regression Model / Panel Data Least Square method assumes that the intercepts are same across entities. This method denies the heterogeneity that exists amongst the different entities and time periods. It does not differentiate between time series and cross section nature of the data (Hossain, 2013). The Panel Data Regression is performed starting with the Pooled Regression Method and the results of the Pooled Regression are stated below.

**Table 5.8: Pooled OLS Regression**

| | | | | |
|---|---|---|---|---|
| Dependent Variable: GBPEI | | | | |
| Method: Panel Least Squares/ Pooled OLS Regression | | | | |
| Sample (adjusted): 4/01/2009 4/01/2018 | | | | |
| Periods: 10 | | | | |
| Cross-sections included: 40 | | | | |
| Total panel (unbalanced) observations: 398 | | | | |
| Variables | Coefficient | Standard | t-Statistic | Probability |

| | Value | Error | | |
|---|---|---|---|---|
| C | 33.43950 | 3.696941 | 9.045182 | 0.0000 |
| Bank Size | 1.2001065 | 1.268712 | 9.459245 | 0.0000 |
| ROA | 0.889086 | 0.797466 | 1.114888 | 0.2656 |
| NPA | 0.727409 | 0.215300 | 3.378581 | 0.0008 |
| Board Size | -0.873828 | 0.311801 | -2.802518 | 0.0053 |
| Women Director | 4.414214 | 0.838493 | 5.264463 | 0.0000 |
| Age of The Bank | -0.161147 | 0.019426 | -8.295288 | 0.0000 |
| R-squared value | 0.410542 | Mean dependent variable | | 21.00000 |
| Adjusted R-squared value | 0.401497 | S.D. dependent variable | | 14.69300 |
| S.E. of regression | 11.36694 | Akaike info criterion | | 7.716727 |
| Sum squared residual | 50520.07 | Schwarz criterion | | 7.786840 |
| Log likelihood | -1528.629 | Hannan-Quinn criteria | | 7.744498 |
| F-statistic | 45.38691 | Durbin-Watson statistic | | 0.554976 |
| Probability (F-statistic) | 0.000 | | | |

**Source of table**: Compiled by researcher

Pooled OLS Regression is conducted for 40 banks as shown in 'Cross-Section Included' and for 10 years period. Table 5.8 shows that p value is less than 0.05 for Bank Size, NPA, Board Size, Women Director and Age of the bank. It means all these variables are significant variables in explaining the Green Banking Performance of banks. However, for Return on Assets (ROA), probability value is higher than 0.05, thus it isn't a significant variable in explaining the Green Banking Performance of banks. The value of R Squared is 0.4105. It means the independent variables explain 41.05% of the variation in the dependent variable (GBPEI), which is not a high percentage. The Estimated Regression equation from the Pooled OLS Regression/Panel Least Squares is:

$$GBPEI = 33.4395 + 1.200BankSize + 0.889ROA + 0.727NPA$$
$$- 0.873BRDSIZE + 4.41WOMNDIR - 0.166BANKAGE + \varepsilon_{it}$$

The regression equation under Pooled Regression Method can be understood this way: If Bank Size increases by 1 unit, GBPEI rises by 1.2 units, keeping other factors constant. If ROA increases by 1 unit, GBPEI rises by 0.889 units, keeping other factors constant. If NPA increases by 1 unit, GBPEI rises by 0.727 units, keeping other factors constant. If Board Size rises by 1 unit, the GBPEI decreases by 0.873 units, keeping other factors constant. If the number of women director rises by 1 unit, the GBPEI

increases by 4.41 units, keeping other factors constant. If the age of the bank rises by 1 unit, the GBPEI decreases by 0.166 units, keeping other factors constant.

The assumption of equal intercepts across entities in Pooled OLS Regression Model (POLS) is tested through the Bruesch-Pagan Test (Boadi, 2015; Jawaid, 2021).The hypothesis for the Bruesch-Pagan Test is:

$H_{9a}$: POLS is appropriate than Fixed Effect Model /Random Effect Model

$H_{9b}$: Fixed Effect Model /Random Effect Model is more appropriate than POLS

The Lagrange Multiplier which gives the results for the Bruesch-Pagan Test is applied to see if the Pooled Regression Analysis is appropriate for the study. The result of the Bruesch-Pagan Test is displayed below in table 5.9.

**Table 5.9:** Bruesch Pagan Test

| Lagrange Multiplier Tests for Random Effects | | | |
|---|---|---|---|
| Null hypotheses: No effects | | | |
| Test Hypothesis | | | |
| | Cross-section | Time | Both |
| Breusch-Pagan value | 242.4703 | 182.8927 | 425.3630 |
| | (0.0000) | (0.0000) | (0.0000) |
| Honda | 15.57146 | 13.52378 | 20.57344 |
| | (0.0000) | (0.0000) | (0.0000) |
| King-Wu | 15.57146 | 13.52378 | 18.93260 |
| | (0.0000) | (0.0000) | (0.0000) |
| Standardized Honda | 16.68639 | 15.14047 | 17.58745 |
| | (0.0000) | (0.0000) | |
| | | | (0.0000) |
| Standardized King-Wu | 16.68639 | 15.14047 | 16.85202 |
| | (0.0000) | (0.0000) | (0.0000) |
| Gourierioux, et al.* | -- | -- | 425.3630 |
| | | | (< 0.01) |
| Mixed chi-square asymptotic critical values: | | | |
| 1% | 7.289 | | |
| 5% | 4.321 | | |
| 10% | 2.952 | | |

**Source:** Compiled by the researcher

The p value of Bruesch Pagan Test for both (Cross Section and Time) is fewer than 0.05; thus null hypothesis for the test cannot be accepted. It means that the intercept across the different banks are not same. The Pooled OLS Regression method is not

appropriate for finding association between dependent and independent variables. Hence, Fixed Effect Model / Random Effect Models are to be used for regression analysis in this study.

*Random Effect Model / Fixed Effect Models*: Pooled OLS Regression model cannot be applied because the assumption that the intercept of the entities are the same does not stand true. Hence, Random Effect Model (REM) is applied. The Random Effect Model assumes that the difference in intercept of entities is due to the randomness of the model (Jawaid, 2021). In Random Effect Model, all the entities have common mean value of the intercept. Results of the REM are tabulated below:

**Table 5.10:** Random Effect Model

| | | | | |
|---|---|---|---|---|
| Dependent Variable: GBPEI | | | | |
| Method: Panel EGLS | | | | |
| Sample (adjusted): 4/01/2009 4/01/2018 | | | | |
| Periods included: 10, Cross-sections included: 40 | | | | |
| Variable | Coefficient | Standard Error | t-Statistic | Probability |
| C | 30.03793 | 3.901655 | 7.698767 | 0.00 |
| Bank Size | 9.448985 | 1.04981 | 9.000615 | 0.0000 |
| NPA | 0.638122 | 0.133098 | 4.794384 | 0.0000 |
| ROA | -2.511872 | 0.553307 | -4.539743 | 0.0000 |
| Board Size | -0.653745 | 0.222397 | -2.939544 | 0.0035 |
| Women Director | 3.268759 | 0.559625 | 5.840985 | 0.0000 |
| Age | -0.100331 | 0.035191 | -2.851024 | 0.0046 |
| Effects Specification | | | | |
| | | | S.D. | Rho |
| Cross-section random | | | 6.876782 | 0.5242 |
| Idiosyncratic random | | | 6.551701 | 0.4758 |
| Weighted Statistics | | | | |
| R-squared | 0.315446 | Mean dependent variable | | 6.066248 |
| Adjusted R-squared | 0.304941 | S.D. dependent variable | | 10.07276 |
| S.E. of regression | 8.400220 | Sum squared residual | | 27590.40 |
| F-statistic | 30.02911 | Durbin-Watson statistic | | 0.865796 |
| Probability (F-statistic) | 0.000000 | | | |
| Unweighted Statistics | | | | |
| R-squared | 0.314166 | Mean dependent variable | | 21.00000 |
| Sum squared residual | 58780.07 | Durbin-Watson statistic | | 0.406391 |

**Source:** Compiled by researcher

In Table 5.10, 'Cross-Sections included' shows the number of banks considered in the analysis which is 40 in this case, and 'Periods Included' states the number of years for which the analysis is done, which is 10 in this case. As can be observed in Table 5.10, the p value for all the independent variables is less than 0.05, it means all the independent variables make a significant impact on dependent variable. Coefficient value of C shows mean intercept of all firms. As can be observed value of R Squared is 0.3154, it means 31.54% of the deviation in the dependent variable (GBPEI) is explained by independent variables, which is not a high percentage. Thus, this brings doubt about the appropriateness of the fit of the model. The Estimated Regression equation from the Random Effect Model (REM) is:

$$GBPEI = 30.037 + 9.44BankSize - 2.51ROA + 0.63NPA$$
$$-0.65BRDSIZE + 3.26WOMNDIR - 0.1BANKAGE + \varepsilon_{it}$$

The regression equation under REM can be understood in this way: If the Bank Size rises by 1 unit, the GBPEI will rise by 9.44 units, keeping other factors constant. If ROA rises by 1 unit, the GBPEI decreases by 2.51 units, keeping other factors constant. If NPA rises by 1 unit, the GBPEI increases by 0.63 units, keeping other factors constant. If Board Size rises by 1 unit, the GBPEI decreases by 0.65 units, keeping other factors constant. If number of women director rises by 1 unit, the GBPEI increases by 3.26 units, keeping other factors constant. If the age of the bank increases by 1 unit, the GBPEI will decrease by 0.1 units, keeping other factors constant.

The next step is to check whether the Random Effect Model is appropriate or not. This is checked through the Hausman Test. Hausman Test helps to find out the appropriate test for the data for conducting regression analysis (Hiestand, 2005). It helps to decide whether Random Effect model or Fixed Effect Model is appropriate for the study (Hossain, 2013; Boadi, 2015; Elseoud et al., 2020). The null hypothesis for the Hausman Test is (Irawan, 2020):

$H_{10a}$: REM is appropriate.

$H_{10b}$: FEM is appropriate

If Hausman Test's null hypothesis gets rejected, then FEM (Fixed Effect Model) is to be chosen (Ioan et al., 2020). The findings of the Hausman Test are illustrated below in Table 5.11.

**Table 5.11:** Hausman Test

| Correlated Random Effects - Hausman Test | | | | |
|---|---|---|---|---|
| Test cross-section random effects | | | | |
| Test Summary | | Chi-Sq. Statistic | Chi-Sq. d.f. | Probability |
| Cross-section random | | 257.742068 | 6 | 0.000 |
| Cross-section random effects test comparisons: | | | | |
| Variable | Fixed | Random | Var (Diff.) | Probability |
| Bank Size | 0.000000 | 0.000000 | 0.000000 | 0.0000 |
| Npa | 0.158280 | 0.638122 | 0.001178 | 0.0000 |
| Roa | 0.614254 | -2.511872 | 0.071217 | 0.0000 |
| Board Size | -0.150100 | -0.653745 | 0.003889 | 0.0000 |
| Women Director | -0.964414 | 3.268759 | 0.081400 | 0.0000 |
| Age | 2.449055 | -0.100331 | 0.028073 | 0.0000 |

**Source:** Compiled by researcher

The p value of Cross-section random can be observed in Table 5.11 which is lower than 0.05. Thus the null hypothesis cannot be accepted. The FEM (Fixed Effect Model) is appropriate. The FEM (Fixed Effect Model) assumes that different banks have different intercepts due to certain specific factors (Jawaid, 2021). Every single bank have own intercept value (Hossain, 2013). Findings of FEM are discussed below in Table 5.12.

**Table 5.12:** Fixed Effect Model

| Dependent Variable: GBPEI | | | | |
|---|---|---|---|---|
| Method: Panel Least Squares | | | | |
| Sample (adjusted): 4/01/2009 4/01/2018 | | | | |
| Periods included: 10 | | | | |
| Cross-sections included: 40 | | | | |
| Total panel (unbalanced) observations: 398 | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Probability |
| C | -173.8703 | 13.96604 | -12.44951 | 0.0000 |
| Bank Size | 4.66131 | 1.14435 | 4.073322 | 0.0001 |
| Npa | 0.158280 | 0.137452 | 1.151533 | 0.2503 |
| Roa | 0.614254 | 0.614301 | 0.999923 | 0.3180 |
| Board Size | -0.150100 | 0.230976 | -0.649854 | 0.5162 |
| Women Director | -0.964414 | 0.628155 | -1.535312 | 0.1256 |
| Age | 2.449055 | 0.171205 | 14.30479 | 0.0000 |
| | Effects Specification | | | |
| Cross-section fixed (dummy variables) | | | | |
| R-squared | 0.823705 | Mean dependent variable | | 21.00000 |
| Adjusted R-squared | 0.801167 | S.D. dependent variable | | 14.69300 |
| S.E. of regression | 6.551701 | Akaike info criterion | | 6.705661 |
| Sum squared residual | 15109.52 | Schwarz criterion | | 7.166407 |

| | | | |
|---|---|---|---|
| Log likelihood | -1288.427 | Hannan-Quinn criterion | 6.888159 |
| F-statistic | 36.54790 | Durbin-Watson statistic | 1.17266 |
| Probability (F-statistic) | 0.00000 | | |

**Source:** Compiled by researcher

It can be observed in Table 5.12 that the independent variables are bank size, NPA, ROA, board size, women director and age of the bank. The p values (probability value) for bank size and age of the bank are less than 0.05, which means only bank size and age of the bank are significant predictors of the dependent variable (Green Banking Performance). Thus, the 3rd null hypothesis (there is no significant effect of bank size on Green Banking Performance) and 8th null hypothesis (there is no significant effect of age of bank on Green Banking Performance) gets rejected. The remaining other variables, namely NPA, ROA, women directors on board and board size have probability value greater than 0.05. These variables are thus not good predictors of the dependent variable. Thus, the 4th null hypothesis (there is no significant effect of return on assets on Green Banking Performance), 5th null hypothesis (there is no significant effect of NPA on Green Banking Performance), 6th null hypothesis (there is no significant effect of board size on Green Banking Performance), 7th null hypothesis (there is no significant effect of number of women directors on Green Banking Performance) stands accepted. The value of R Squared is 0.8237. Cumulatively all independent variables explain 82.37% of the variation in the dependent variable. The greater the value of R Squared, the better is the regression model. Thus, the regression model obtained through Fixed Effect Model is a good one. From the coefficient values, it can seen that bank size, ROA, NPA and age of the bank positively impacts the GBPEI and board size and women directors on board negatively impacts the GBPEI. The coefficient value shows increase in the value of dependent variable if value of independent variable increases by 1 unit. The Estimated Regression equation from the Fixed Effect Model is:

$$GBPEI = -173.8703 + 4.66BankSize + 0.61ROA + 0.15NPA - 0.15BRDSIZE - 0.964WOMNDIR + 2.44BANKAGE + \varepsilon_{it}$$

Following conclusions can be drawn from the above regression equation:

- If the Bank Size rises by 1 unit, the GBPEI rises by 4.66 units, keeping other factors constant.

- If the ROA rises by 1 unit, the GBPEI rises by 0.61 units, keeping other factors constant.
- If the NPA rises by 1 unit, the GBPEI rises by 0.15 units, keeping other factors constant.
- If the Board Size rises by 1 unit, the GBPEI decreases by 0.15 units, keeping other factors constant.
- If the number of women director rises by 1 unit, the GBPEI decreases by 0.96 units, keeping other factors constant.
- If the age of the bank rises by 1 unit, the GBPEI increases by 2.44 units, keeping other factors constant.

  The probability value of F-Statistic shows the combined effect of independent variables on the dependent variable (Jawaid, 2020). Since, the p value is less than 0.05, thus it can be concluded that the combined effect is significant. The model is a significant one in explaining the variation in the dependent variable by the independent variables.

### 5.4 Chapter Summary

This chapter includes the findings of objective 2 of the study. In objective 2 the relationship between Green Banking Performance and financial and non-financial characteristics of banks is analyzed. Panel Data Regression is used to study the association between GBPEI and age of bank, bank size, board size, return on assets, NPA and number (count) of women directors. The Fixed Effect Model is found appropriate for analyzing the data. In the study Fixed Effect Model found that bank size, ROA, NPA and age of the bank positively impacts the GBPEI. Board size and number of women directors negatively impacts the GBPEI. Out of all the variables, bank size and age of a bank are significant predictors of Green Banking Performance. The model predicted by FEM is:

$$GBPEI = -173.8703 + 4.66BankSize + 0.61ROA + 0.15NPA - 0.15BRDSIZE - 0.964WOMNDIR + 2.44BANKAGE + \varepsilon_{it}$$

The model derived from the FEM is a significant one, as is reflected by the F-Statistic value and R-Squared value (0.8237). 82.37% of the variation in the dependent variable is explained by the independent variables taken into consideration.