CHAPTER 3
METHODOLOGY

This section deals with the methodology adopted in the research study. Section 3.1 discusses the need for the present study. Sections 3.2, 3.3 and 3.4 discuss respectively, the objectives, hypotheses and data description. Section 3.5 discusses the methodologies adopted and parameters considered in the computation of governance index.

3.1 Need for the present study

a) Corporate Governance and financial performance: A number of studies to explore the relationship between Corporate Governance, as measured by index and firm performance have been conducted both in developed countries and in emerging markets. However, in India on this aspect, only two studies-1.Balasubramanian et al., (2010) covering the year 2005-06 and 2.Mohanty (2003) covering the year 2002, have been carried out. Therefore, there is a dearth of index-based studies on Corporate Governance in India. Mohanty’s (2003) study is on general Corporate Governance attributes with a focus on stakeholders (Customers, society, employees and others). It does not cover any of the regulations of clause 49 which came into force in the year 2000. The study of Balasubramanian et al., (2010) is a survey based one. This kind of study has its limitations. Moreover, this was conducted prior to the amendment to clause 49 of the listing agreements which came into force from 1st January, 2006. The amendment reflects many of the provisions of the post Enron’s SOX Act, 2002. As these studies cover only one year period, dynamics of the relations between Corporate Governance and firm value using panel data could not be examined.

Apart from the Corporate Governance Index based study, this study covers other individual attributes of Corporate Governance mechanisms and financial performance.

b) Board size, Board independence and CEO duality and firm values: Some research studies in Indian context about board size, board independence and CEO duality are; Jackling and Johl’s (2009) study covering a period of one year (2005-06)
about large companies; Lange and Sahu’s (2008) study covering a period of 3 years from 2005 to 2007 of NIFTY 50 companies; Kaur and Gill’s (2008) study covering a period from 2001 to 2006; Dwivedi and Jain’s (2005) study covering a period of 5 years from 1997 to 2001. The findings of these researchers are mixed. Hence there is a need to revisit the issue.

c) Promoters’ holding and firm performance: The ownership structure influences the Corporate Governance and firm value. Khanna and Palepu (1999) and Pattanayak (2008) report that the insider ownership has positive and significant impact on firm value. Sarkar and Sarkar (1999, 2005); Saravanan (2009) investigate the relation between promoters’ shareholding and its impact on firm values. The first study of Sarkar and Sarkar reports a non-linear relationship between promoters’ holding and firm values. On the other hand, in their second study, they find that promoters’ holding has no impact on firm values in case of low growth firms while it has positive impact on firm values for high growth firms. Saravanan (2009) studied the Corporate Governance characteristics of Family Owned (not less than 51% shareholding) and Non-Family Owned businesses of India. He documents that value of the firm as measured by Tobin’s Q is not affected by type of the firm. The results of these studies are ambiguous. Therefore, it warrants closer scrutiny.

d) Other governance mechanisms: Corporate Governance is affected by the size and sector of the firm and listing on foreign bourses. There have been few studies in India on these aspects. Kumar (2005) and Pattanayak (2008) have used sales as a proxy for firm size in their study about ownership structures and firm values. Mohanty (2003), Sarkar and Sarkar (2000) have used log of assets as a control variable. To the best of my knowledge, the impact of GDR/ADR on firm valuation has only been examined by Balasubramanian et al., (2010). Again no study has been conducted on the non-linear relationship between CGI and Financial performance in India. The present study aims to examine these issues.

There is a boom in the Indian Economy. Business firms are pursuing growth strategies acquiring foreign firms. In the recent past there has been financial crisis in US and Europe affecting the economies of many countries of the world including India. All these have a profound impact on the Governance processes, warranting a fresh study.
3.2 Objectives of the study

a) To examine the relationship between Corporate Governance index and firm values/ performance of companies as measured by Tobin’s Q, MVBV and ROA.

b) To ascertain whether the relationship between Corporate Governance index and firm values is linear or not.

c) To assess the impact of Board structures comprising of Board size, Board independence, CEO Duality on firm values as measured by Tobin’s Q.

d) To explore the relation between sales, assets and margin on firm performance/ valuation.

e) To investigate the relationship between promoters’ holding and financial performance as measured by Tobin’s Q.

f) To examine the differences in valuation/ performance across manufacturing and services sectors as measured by Tobin’s Q, MVBV and ROA.

g) To ascertain the differences in performance/ valuation between large tangible and small tangible asset intensive companies.

h) To examine the impact of sales differentials on firm performance/valuation.

i) To examine the differences in firm values/ performance between the firms which have issued ADRs/GDRs and those which have not.

3.3 Hypotheses

The following hypotheses have been evaluated:

**H01**: There is no relationship between Corporate Governance index and financial performance as measured by Tobin’s Q, MVBV and ROA.

**H02**: There is no relationship between sales and financial performance as measured by Tobin’s Q, MVBV and ROA.

**H03**: There is no relationship between assets and financial performance as measured by Tobin’s Q, MVBV and ROA.

**H04**: There is no relationship between margin and financial performance as measured by Tobin’s Q, MVBV and ROA.
$H_{05}: $ There is no relationship between promoters' holding and financial performance as measured by Tobin’s Q, MVBV and ROA.

$H_{06}: $ The relationship between Corporate Governance index and financial performance measured by Tobin’s Q is not linear.

$H_{07}: $ There is no relationship between the Board size and firm values as measured by Tobin’s Q.

$H_{08}: $ The number of independent directors in the board composition does not impact firm performance measured by Tobin’s Q.

$H_{09}: $ CEO duality has no impact on firm value.

$H_{10}: $ There is no difference in financial performance/valuation across sectors.

$H_{11}: $ There is no difference in firm valuations/ performance between large tangible asset companies and small tangible asset companies.

$H_{12}: $ The impact of sales differential on financial performance/valuation is non-existent.

$H_{13}: $ Margin differentials cast no influence on valuation/ performance of the firms.

$H_{14}: $ There is no difference in firm valuations/ performance between firms which have issued Depository receipts and which have not.

### 3.4 Data description and sample

The study comprises of BSE 100 index companies. The sample is representative of the market as it accounts for 70% of market capitalization. The sample period is from 2004-2008. The data required to construct Corporate Governance index and board structure and composition were obtained from the annual reports of the companies. Research literature provides evidence that annual report disclosures reveal credible, relevant information that is priced by investors, reduces estimation risk and information asymmetry (Lang & Lundholm 1996; Botosan & Plumlee 2002; Lundholm & Myers 2002).
The following are the sources of Annual reports:

1. Company web sites
2. SEBI EDIFAR site
3. NSE/BSE website
4. Commercial agencies like Report junction, Cygnus etc.

The purpose of using the data available in the public domain is that it circumvents potential problems of survey-based governance rating such as incomplete respondent knowledge, self reporting bias and other factors (Cheung et al., 2007).

The financial data used in the study has been obtained from the database of Centre for Monitoring of Indian Economy (CMIE). The data consisted of sales, assets, promoters’ holding, EBIT, book value of debt and Market price of equity shares. For the purposes of uniformity all financial data is for the month ending December of the particular year.

Some of the companies were eliminated from the sample due to non-availability of data. The number of companies that formed the sample, ranged from 78 to 100. The number of companies in the years 2004, 2005, 2006, 2007 and 2008 were 78, 83, 91, 96 and 100 firms respectively. In all, 448 firm-years observations were available.

3.5 Methodology adopted in analyzing the relationship between Corporate Governance index and financial performance

3.5.1 Construction of Corporate Governance Index

This has been done in three stages. First stage consisted of the selection of parameters which form the basis of Governance index. Second stage consists of assigning binary values-‘1’ for positive factor of governance and ‘0’ otherwise. Finally computation of the index scores for each year for each firm over the 5 year period was done.

3.5.1.1 Selection of parameters for this research study

21 parameters have been considered in this research study for the computation of overall Corporate Governance index. The reasons for selecting 21 parameters are:
a) The reporting of these parameters in the Annual reports has been consistently available which facilitated panel data analysis.

b) They are uniform across all the sectors and all firms.

The 21 parameters have certain commonality with the parameters considered by researchers like Balasubramanian et al., (2010) who have considered 49 parameters in their survey and most of them are privy in nature or not mandatory.

In the Governance index constructed by Mohanty (2003) almost all the parameters are not the reporting requirements of clause 49 of the listing agreement, old and revised. Perhaps this is the reason for the same not being considered in the survey of Balasubramanian et al., (2010).

**These 21 parameters have been categorized into the following four sub-indices.**

1. **Board structure index**
   - B1 Attendance - 75% and above
   - B2 Board meetings 5 and above
   - B3 Remuneration/compensation committee composed of fully independent directors
   - B4 Nomination committee exists
   - B5 Attendance of each Director is indicated in the last Annual General Meeting

2. **Auditing systems index**
   - A1 Totally independent audit committee
   - A2 Audit committee attendance-75% and above
   - A3 Audit committee meetings 5 and above
   - A4 No Qualified audit report .ie no adverse remarks from the statutory Auditors regarding financial statements.

3. **Investor management & Disclosures index**
   - I1 The composition of investors’ Grievance committee consists of independent directors.
   - I2 Firm puts annual/quarterly financial statements on web
13 Share holding pattern indicated.
14 Not accused of insider trading.
15 Provision of postal ballot facility
16 No significant changes are made in accounting policies impacting sales and profits

4 External Control Mechanisms index

E1 Listing on foreign bourses including its parent company
E2 Existence of Whistle Blower policy
E3 Issuance of ESOPS to its employees and Directors.
E4 Whether Management Discussion and analysis report is a part of annual report.
E5 Whether disclosures of materially significant related party transactions have been indicated.
E6 Whether disclosure of contingent liabilities, which are likely to impact on the future, is made.

Each firm was studied for Corporate Governance practices based on the above mentioned parameters. Score of 1 was assigned in case the company was adopting a particular parameter or the reply is affirmative, if not 0 score was assigned. Thus each firm could score a maximum of 21 and a minimum of 0 depending on the firm’s Corporate Governance practices. This formed the basis for overall Corporate Governance index of a firm. Thus the overall Corporate Governance index is the sum of values of each sub index.

BRD-IND + ADT-IND + INV-IND + ECM-IND=5+4+6+6=21

Based on this method Corporate Governance indices have been computed for each of the firms belonging to the BSE 100 index of the Bombay stock exchange for each year over a five year period from 2004-2008.
3.5.1.2 Basis of selection of parameters

1. Board attendance

Directors do their job by exercising their judgment on various crucial issues during board meetings. Attendance tells shareholders as to how seriously the governance responsibilities are met. Not attending meetings is a visible way that investors might construe that a director is evading the responsibility (Jiraporn et al., 2008). The number of board meetings captures the impact of board diligence on the auditor’s opinion. If a board meets often, this might be interpreted as a signal that an active monitoring is taking place. Vafeas (1999) and Carcello and Neal (2000), report a mean (median) of 7.54 (7) meetings, while Abbott, Park and Parker (2000) document a figure of 6.94 meetings. Aggarwal and Williamson (2006), Brown and Caylor (2006), Balasubramanian et al., (2010), have considered this aspect in the construction of Governance indices.

2. Number of Board meetings

The number of board meetings is a signal that an active monitoring is taking place. Attendance in the meetings, in ways, is the most basic measure of effectiveness of corporate directors (Aggarwal & Williamson, 2006). Stewart and Munro (2007) found that the frequency of the meetings was significantly associated with a reduction in audit risk. Similar is the experience of the researcher Cotter et al., (1997) who considered the number of board and audit committee meetings in the construction of index as a further measure of the strength of the oversight role performed by the board. Following the Horwath Report (2002) recommendations, strong oversight was defined as the board, meeting at least six times annually and the audit committee at least four times annually.

3. Independence of Remuneration Committee

Constituting a Remuneration Committee is a non-mandatory requirement. To avoid conflicts of interest, independence is desirable. Good monitoring reduces the agency costs. Ferrarini et al., (2009) suggest that the remuneration committee should consist of exclusively non-executive and independent members for better governance. In
2001, Piot’s (2001) analysis suggests that independence of the Remuneration Committee contains manager’s opportunism and controls agency costs.

Remuneration Committees have evolved from ad hoc committees with few defined responsibilities to committees with growing responsibilities that are accountable to the board of directors, and ultimately to shareholders. Brought to prominence in 1995 through Sir Richard Greenbury’s report on Directors’ Remuneration, the duties of Remuneration Committees have grown with successive Corporate Governance reports. These culminated in the Financial Reporting Council’s revised Combined Code on Corporate Governance and the related guidance for non-executive directors by Sir Derek Higgs, issued in 2003.

4. Existence of Nomination committee

Nomination committee facilitates selection of board of directors, including the chairman, in a transparent manner and has a major role to play in the performance evaluation. A research study by Barnes (2009) analyzing the listing rules of nine international stock exchanges, finds that all of them encourage the use of nomination committees to encourage further involvement of independent directors and for creating an International Governance Regime.

5. Attendance of each Director in the last AGM

This invokes responsibility of the Directors and is an extension of “reputation hypothesis”. The classic argument put forth by Fama (1980) and Fama and Jensen (1983) is that directors’ incentives come from their desire to develop a reputation as expert decision makers and their presence instill confidence measure among investors.

6. Complete Independence of Audit Committee

Of the many demands of the Sarbanes-Oxley Act, none has had more far-reaching consequences than the requirement of more number of independent directors and that audit committees are composed entirely of independent directors. The objective is to oversee the related party transactions and earnings management. Requiring more independent directors on audit committees or boards was done in order to obtain better governance, not better performance, and better governance could be considered...
a value in itself, irrespective of its effect on corporate performance. SEBI’s requirement is that the chairman of the Audit committee should be an independent director. However, good Corporate Governance measures necessitate fully independent Audit committee. Anderson et al., (2004) examined board characteristics and the cost of debt for S&P firms in the US and found cost of debt to be inversely related to board size and independence and audit committee independence, size and meeting frequency.

7. Audit committee attendance

Attendance in ways is the most basic measure of effectiveness of corporate directors (Aggarwal and Williamson, 2006). The clause 49 requires that the Audit committee should meet at least thrice in a year. The quorum should be a minimum of two members or one third of the strength of Audit committee which ever is higher. As a logical extension 75% attendance has been extended to this aspect also. This will monitor manager’s behavior thereby addressing agency problems and facilitating better management of risk (Ojo, 2009).

9. No qualified audit report

Auditors do qualify reports in cases where financial statements of the company may not reflect ‘the true and fair view of the company’. When there are no qualified audit reports, it means adoption of good Corporate Governance practices (Lutzenberger, 2010).

9. Independence of the Investors’ Grievance Committee

If the Remuneration Committee consists solely of independent directors there is a possibility of fair redressal of grievances of share holders. Gompers et al., (2003) has stressed on mechanisms for protection of shareholder, particularly the minority shareholders. Redressal of grievances and transfer of shares ensures better protection and fully independent Investors Grievance Committee can ensure transparency.

10. Firms put annual/quarterly financial statements on website

This ensures transparency, fewer manipulations and facilitates better monitoring (Davies and Whittred, 1980). Rating agencies like S & P consider this as an important
factor. Financial statements published on time facilitate investors in better decision making. (Aktas & Kargin, 2011; Velury & Jenkins, 2006)

11. Share-holding patterns are indicated

Investors are informed indirectly about the proxy controls and undue influence in the related party transactions. Bertrand et al., (2002) has observed the tunneling effect in the Indian context. Family control seems to affect firm performance depending on the level of transparency and regulation in the country (La Porta et al., 2000). Proper disclosure can facilitate traceability and the extent of control.

12. Insider trading

If insider trading is unregulated dominant shareholder will collude with the management at the expense of minority shareholders as a result of which the effectiveness of Corporate Governance and firms values are reduced (Maug, 1999)

13. Postal ballot facility

Postal ballot facilitates exercising share holder rights (La Porta et al., 2002). Section 192A of the Companies Act, 1956 provides for passing of resolutions by postal ballot. Since share holders are geographically dispersed it would be difficult for them to exercise their votes physically during passing of resolutions by the companies and hence the need for postal ballots.

14. Accounting policy changes

Companies do make changes in accounting policies. If the purpose of changing is to comply with mandatory requirements then it is considered to be fair. If not, the changes made to inflate the profitability are considered to be bad governance

15. Listing on Foreign Bourses: (Parent or subsidiary companies)

This ensures greater transparency in the management process and disclosures, particularly when complying with SOX Act requirements.
16. Whistle Blower policy

Employees and other stakeholders are sometimes aware of the bad governance practices which cannot be communicated in the normal course. Provision of whistle blower policy facilitates communication and acts as an external control mechanism.

17. ESOPS to its employees and Directors

Issue of ESOPS is one of the governance mechanisms to reduce agency costs. When employees become shareholders of the company, alignment of interest takes place and thereby agency cost is reduced (Donaldson & Davies, 1991).

18. Management Discussion and analysis Report

Management Discussion and analysis statements forming a part of annual reports provides a ‘bird’s eye view’ of the strategies of the company. Analysts and investors can use these statements to decide upon their investment strategies.

19. Related party transactions

Companies have to report all transactions with related parties including their bases. Records of such transactions should be placed before the independent Audit committee for formal approval or ratification. Good Corporate Governance means that the transaction should be on an “arm’s length” basis. If not the management should justify the same to the Audit committee. This aspect is an extension of Jensen and Meckling’s (1976) Agency theory. Related party transactions are a source of diversion of funds and indirectly increase the agency costs. Accounting standard AS18 of ICAI and Para 26 of the Cost Audit reports cover these aspects.

20. Contingent liabilities

Companies have to make disclosures of all contingent liabilities which have a bearing on the future performance as a good governance practice.

21. Audit committee meetings

Audit committee size, independence and number of meetings are considered proxies for audit committee effectiveness and governance (Dhaliwal et al., 2007). Audit
committee effectiveness over financial reporting is a multidimensional one. This is affected by number of factors and the number of meetings is one such important factor (Menon & Williams, 1999; Chen & Zhou, 2007).

3.5.1.3 Computation of financial data

Financial data, collected from the Prowess CMIE data base for the companies belonging to the BSE 100, group was analyzed.

The following table describes the principal variables used in this study:

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Table 3.1

<table>
<thead>
<tr>
<th>Variables Description</th>
<th>Proxy for</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tobin’s Q</td>
<td>Financial performance /Firm value</td>
<td>(Mkt Cap + Total debt)/TA</td>
</tr>
<tr>
<td>MVBV</td>
<td>Financial performance /Firm value</td>
<td>Market Value of the share/book value of the share</td>
</tr>
<tr>
<td>ROA</td>
<td>Financial performance</td>
<td>EBIT/Assets</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CGI</td>
<td>Corporate Governance index</td>
</tr>
<tr>
<td>Log assets</td>
<td>Natural logarithm of book value of assets</td>
</tr>
<tr>
<td>Asset dum¹</td>
<td>Asset dummy is set to one if the firm belongs to the above median asset group and ‘0’ otherwise</td>
</tr>
<tr>
<td>Log sales</td>
<td>Natural logarithm of Sales</td>
</tr>
<tr>
<td>Sales dum²</td>
<td>Sales dummy is set to one if the firm belongs to the above median sales group and ‘0’ otherwise</td>
</tr>
<tr>
<td>Margin</td>
<td>EBIT/Sales or income</td>
</tr>
<tr>
<td>Mrgn dum³</td>
<td>Margin dummy is set to one if the firm belongs to the above median margin group and ‘0’ otherwise</td>
</tr>
<tr>
<td>Pro hol</td>
<td>Percentage share ownership by promoters ie Promoters’ holding</td>
</tr>
<tr>
<td>GDR dum</td>
<td>GDR dummy is set to one if the firm has issued depository receipts /Foreign currency convertible bonds and ‘0’ otherwise</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Sector dummy</th>
<th>Sector dummy is set to one if the firm belongs to manufacturing sector and ‘0’ otherwise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brd Siz</td>
<td>Number of directors in the board</td>
</tr>
<tr>
<td>Brd ind</td>
<td>Number of independent directors in the board</td>
</tr>
<tr>
<td>Log Brd Siz</td>
<td>Natural Logarithm of number of directors in the board</td>
</tr>
<tr>
<td>Log Brd ind</td>
<td>Natural Logarithm of number of independent directors in the board</td>
</tr>
<tr>
<td>CEO duality</td>
<td>value ‘1’ is assigned in case the post of CEO and Chairman is held by the same person, otherwise ‘0’</td>
</tr>
</tbody>
</table>

1 also referred to as large/small tangible asset intensive companies
2 also referred to as sales differentials
3 also referred to as margin differentials

### 3.5.2 Estimation methods

Multiple regressions using Tobin’s Q, MVBV and ROA as dependent variables have been conducted.

Tobin’s Q has been widely used by many researchers as financial performance/valuation measure (Khanna & Palepu, 1999; Sarkar & Sarkar, 2000; Balasubraminam et al, 2010; Keil & Nicholson, 2003; Surroca & Tribo, 2009; Chung & Pruitt, 1994; Dowell et al., 2000).

MVBV is considered as another important measure for firm values. Researchers use this as an additional financial measure. Mohanty (2003); Fich and Shivdasani (2004); Sarkar and Sarkar (2005); Garay and Gonzalez (2009) and others have adopted this ratio as proxy for financial performance/firm value in their governance studies.

Similarly the financial measure Return on Assets (ROA) has been considered as a dependent variable in the regressions by researchers. Bhagat and Bolton (2008); Brown and Caylor (2006); Kumar (2005) have considered this as one of the financial measures.

In several studies, the correlation between Tobin’s Q and MVBV is found to be high and accordingly they are not considered as separate dependent variables. In their studies, Villalonga (2004); Chung and Pruitt (1994) have found the correlation
between Tobin’s Q and MVBV to be 0.97, which is high and so separate regressions
were not conducted in their studies. However in this study the correlation between
Tobin’s Q and MVBV; Tobin’s Q and ROA; MVBV and ROA are not high. Hence
separate regressions have been run using the three financial performance measures as
dependent variables. The correlation between these dependent variables is shown in
the table below:

Table: 3.2
Correlations between the dependent variables
This table presents the minimum and maximum correlation values between Tobin’s Q
and MVBV; Tobin’s Q and ROA; MVBV and ROA over the five year period 2004-2008

<table>
<thead>
<tr>
<th>Variables</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobin’s Q and MVBV</td>
<td>0.0495</td>
<td>0.7719</td>
</tr>
<tr>
<td>Tobin’s Q and ROA</td>
<td>0.3750</td>
<td>0.6280</td>
</tr>
<tr>
<td>MVBV and ROA</td>
<td>-0.0781</td>
<td>0.2698</td>
</tr>
</tbody>
</table>

The above table shows the correlation values between the dependent variables over a
period of five years which ranges from low to medium and hence separate regressions
have been run using them as dependent variables.

The independent variables considered in the multiple regressions are CGI index, Log
sales, Log assets, Margin and promoter’s holding. The regressions also include sales,
asset, margin, GDR and sector dummy variables.

Sector dummy is set to one if the firm belongs to manufacturing sector and ‘0’
otherwise. Assets have been divided into two groups based on the median value of
assets. Asset dummy is set to one if the firm falls in the above median asset group and
‘0’ otherwise. Similarly based on the median values of sales firms are divided into
two groups. Sales dummy is set to one if the firm falls in the above median sales group
and ‘0’ otherwise. Based on the median values of margin (EBIT/Sales) firms are
divided into two groups and Margin dummy is set to one if the firm falls in the above
median margin group and ‘0’ otherwise. Companies which have issued ADRs/GDRs
/FCCBs have been identified. GDR dummy is set to one if the firm has issued depository receipts and ‘0’ otherwise.

To analyze the non linear relationship of CGI, multiple regressions of Tobin’s Q on CGI index, CGI square, Log sales, Log assets, margin and promoter’s holding have been conducted. To analyze further the association between CGI and Tobin’s Q, companies were sorted on the basis of the CGI score. The mean CGI score was used to divide the companies into two groups; one above mean and other below the mean. Non linearity of promoters’ holding was analyzed using quadratic and cubic specifications as variables in the regressions. To analyze the relationship between the components of Board structures and firm performance, regressions of Tobin’s Q on Board size, Board independence, CEO duality, Log sales, Log assets, margin and promoter’s holding have been run.

Diagnostic test of regression consisted of multi-collinearity, heteroscedasticity and autocorrelation. Multi collinearity was diagnosed using correlation and variance inflation factor. VIF values less than 10 have been considered (Myers, 1999). The standard errors were calculated using white’s heteroskedasticity-consistent standard errors. The hypotheses were tested using usual t-test.

3.5.2.1Panel regression

Panel data refers to the combination of time series and cross sectional observations. The data contains observations on multiple parameters observed over multiple time series for the same firms. Panel data studies in Corporate Governance have been one of the approaches which are gaining importance, of late. Research on the relationship between Corporate Governance and financial performance faces a set of empirical challenges because of inferences being drawn on data for a year or two. Hence some researchers contend that, because of these challenges, little is known about how Corporate Governance affects share values or firm performance (Chidambaram, Palia & Zheng, 2006; Lehn, Patro & Zhao, 2007; Listokin, 2007; Wintoki, Linck & Netter, 2007). This is because most governance-to-value studies lack time series data on governance. Usage of panel data helps in robustness checks (Black et al., 2010).
3.5.2.2 Pooled regression:

Pooled regression analysis combines time series for several cross-sections and facilitates to test the impact of a large number of dependent variables within the framework of a multivariate analysis (Schmidt, 1997). Another reason to support pooled regression is that it is possible to capture not only the variation of what emerges through time or space, but the variation of these two dimensions, simultaneously (Pennings, Keman Kleinnijenhuis, 1999). It is extensively used in Corporate Governance and other studies (Kumar, 2005; Black et al., 2010).

The equation for pooled regression

\[ Y_t = C + \beta_1 (\log \text{sales}) + \beta_2 (\log \text{assets}) + \beta_3 (\text{Margin}) + \beta_4 (\text{Pro hol}) + \beta_5 (\text{CGI}) + \beta_6 (\text{Sales dum}) + \beta_7 (\text{Asset dum}) + \beta_8 (\text{Mrgn dum}) + \beta_9 (\text{GDR dum}) + \beta_{10} (\text{Sect dum}) + \epsilon_t \]  

(Eq for CG index...1)

\[ \text{Tobin's } Q = C + \beta_1 (\log \text{sales}) + \beta_2 (\log \text{assets}) + \beta_3 (\text{Margin}) + \beta_4 (\text{Pro hol}) + \beta_5 (\text{Log brd siz}) + \beta_6 (\text{Log brd ind}) + \beta_7 (\text{CEO duality}) + \epsilon_t \]  

(Eq for board structures......2)

Where: 
- \( C \) = intercept
- \( \beta_1, \beta_2, \beta_3, ..., \beta_{10} \) are the slopes of the corresponding independent variables.
- \( \epsilon_t \) = error term
- \( Y_t \) = dependent variable (Tobin’s Q/MVBV/ROA)

3.5.2.3 Fixed and Random Effects

The term “fixed effects model” is usually contrasted with “random effects model”. In the classic view, a fixed effects model treats unobserved differences between individuals as a set of fixed parameters that can either be directly estimated, or partialed out of the estimating equations. In a random effects model, unobserved differences are treated as random variables with a specified probability distribution. Statistically, fixed effects are always a reasonable thing to do with panel data (they
always give consistent results) but they may not be the most efficient model to run. Random effects will give better p-values as they are a more efficient estimator, so one should run random effects if it is statistically justifiable to do so. Random effects methods also typically have less sampling variability than fixed effects methods. In general, random effects is efficient, and should be used (over fixed effects) if the assumptions underlying it are believed to be satisfied.

**The equation for fixed effects model/random effects model**

\[ Y_t = C + \beta_1 \text{(log sales)} + \beta_2 \text{(log assets)} + \beta_3 \text{(Margin)} + \beta_4 \text{(Pro hol)} + \beta_5 \text{(CGI)} + \beta_6 \text{(Sales dum)} + \beta_7 \text{(Asset dum)} + \beta_8 \text{(Mrgn dum)} + \beta_9 \text{(GDR dum)} + \beta_{10} \text{(Sect dum)} + \mu_i + u_{it} \]

(Eq for CGIndex, .. 3)

\[ Y_t = C + \beta_1 \text{(log sales)} + \beta_2 \text{(log assets)} + \beta_3 \text{(Margin)} + \beta_4 \text{(Pro hol)} + \beta_5 \text{(Log brd siz)} + \beta_6 \text{(Log brd ind)} + \beta_7 \text{(CEO duality)} + \mu_i + u_{it} \]

(Eq for Board structures, .. 4)

Where: \( C = \text{intercept} \)

\( \beta_1, \beta_2, \beta_3, ..., \beta_{10} \) are the slopes of the corresponding independent variables.

Where: \( \mu_i \) is the individual error component and \( u_{it} \) is the combined time series and cross-section error component

\( Y_t = \text{dependent variable (Tobin’s Q/MVBV/ROA)} \)

However for the selection, between Random and Fixed effects models, Hausman specification test needs to be conducted after running both these tests. In addition to this Breusch and Pagan Lagrangian multiplier test for Random effects are also run. Estimation with the panel data has been undertaken by testing the null that all intercepts are equal. If this null is accepted then the data is poolable. If the null is rejected, Hausman test is applied. If the null is not rejected, random effects are used. The equality of the intercept can be tested by using Lagrangian multiplier test for random effects developed by Breusch and Pagan. The null here is that there is no random effect (Kennedy, 2008).
3.5.2.4 Dynamic panel data:

Arellano, Bond, and Bover developed one and two step general methods of moments (GMM) estimators for panel data analysis. GMM is usually robust to deviations of the underlying data generation process to violations of heteroskedasticity. Arellano and Bond estimator uses moment conditions in which lags of the dependent variable and first differences of the exogenous variables are instruments for the first-differenced equation. Robust estimation, when one has heteroskedasticity, autocorrelation, or outliers to contend with, may be performed with the general methods of moments and combination to obtain robust panel standard errors. They introduced lagged dependent variables into their model to account for dynamic effects. Maia-Ramires (2009); Kyereboah et al., (2007); Rashid (2008) and others have conducted similar studies in Corporate Governance.