An Exploratory Analysis of Corporate Governance using Supervised Data Mining Learning

Jyotsna Ghildiyal Bijalwan, Anchit Bijalwan, Lisanework Amare

Abstract: The corporate governance is a much discussed issue among the corporate and regulators. With the time and advancement in information and technology, the methods of investigations in the field have also changed for the better and accurate outputs. The study primarily investigates the nature and effect of good corporate governance on the firm's financial performance using data mining analysis. For the investigation the board meetings and board remunerations are taken as the components of corporate governance whereas firm performance is a depended variable which is measured by return on capital employed (ROCE), return on equity (ROE), and return on assets (ROA). The study results are suggestive of a positive and significant relationship between board meetings and the firm performance whereas the board remuneration has no impact over the firm performance.

Keywords : Supervised data mining; corporate governance; firm performance; board meeting; board remuneration; classification

I. INTRODUCTION

Post industrial revolution factory system paved the ways for various socio economic changes, in which not only the society but the corporate sector also had gone through a metamorphosis. This change was very evident in the form of scales of operations, capital acquisition methods and organization structure of the corporate. The newly evolved structure diluted the concentration of ownership and control. It witnessed a major shift of corporate reins from few elite class businessmen to in the hands of widespread shareholders. The new form of organization structure gave birth to two tier management system which consisted of management (agents) and owners (principles) in the long run clash of their interested resulted into agency problems in the organization. Series of corporate frauds all around the globe such as Ahold, Enron WorldCom, Satyam fiasco and many more in the line revealed the loopholes in the corporate governance

mechanism. In order to overcome these lacunas series of corporate governance reforms took place both at domestic and international level. Many committees, forums, norms, standards and guidelines for good corporate governance were made in order to protect and immune the investor against corporate frauds. Corporate governance (CG) has become a much discussed issue amongst the corporate world, researchers, and academicians, regulating and controlling authorities.

The root of the word corporate governance is from 'gubernate' which means to steer. Corporate governance (CG) would mean to steer an organization in the desired direction. It can be viewed as a mechanism that ensures external investors receive proper returns on their investments. Effective corporate governance provides an assurance on the safety of the invested funds and the returns on investment (Shleifer, J.A. &Vishny, R .W. 1997).

In our study we have utilized data mining tools to address the corporate governance issues. Data mining analysis helps in focusing on the problematic areas so that the firm can improve its financial performance by overcoming those lacunas and can frame a strong corporate governance framework. It is the concept of mining every year's financial record and analyzes them in the light of good corporate governance practices so that the company can evaluate their financial performance in light of good governance policies. We have applied both pre and post mining technique to find the accurate results. We used both data cleaning and data integration for pre mining task and data evaluation and presentation for post mining analysis.

In this paper, section 1 is about the introduction and the general discussion on the proposed study. Section 2 enlightens the related work. In section 3 we discussed the development of the hypothesis. In section 4, mining methodology is set and then applied which is finally shows the results and their discussion in section 5 and finally concluded the paper in section 6.

II. BACKGROUND STUDIES

Many researchers have been investigating the relationship between corporate governance and firm performance by using the empirical data. There is no unanimous consent on the outcome of the studies (Patterson D. J. 2000). Some studies show that the corporate governance has a strong impact on the firm performance during the 1997-98 East Asian financial crises.

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Some of the studies also propounds that the independent directors have traditionally been hailed as a way of improving, monitoring management (Kim, B. & Lee, I. 2003).

Some of the researchers have also applied the data mining techniques for studying corporate governance on Taiwan stock market revealed the significance of the good governance by applying data mining techniques (Lu, C. L., & Chen, T. C. 2009). N gaiet al. (2011) in their study applied data mining techniques such as logistic models, neural networks, Bayesian belief network and decision tree for identification and classification of financial fraud detection (FDD).

Tsai, C.F et al (2012) further, studied factors affecting value of the intangible assets of the firms by utilizing five feature selection methods of data mining such as step wise regression, principal component analysis, decision trees, association rules and genetic algorithms. Bijalwan, J. G. &Madan, P. (2013) in their study found a direct and positive relationship between corporate governance and firm performance. Moldovan, D. &Mutu S. (2015) identified the relationship between corporate governance behaviour and firm performance using date mining techniques.

Further in map reduce paradigm and scorecard which are data mining techniques were applied detection of corporate governance frauds from the company's annual reports. (Sadasivam, G. S. &Subrahmanyam, M. et al. 2016). Based on the previous studies and review of literature on the corporate governance and firm performance we have taken Board meetings, shareholders meetings (BSM) and Board remuneration (BR) as the factors of corporate governance, whereas financial performance of the firm is measured with the accounting measures. Financial ratios i.e. Return on Capital employed (ROCE), Return on the equity (ROE), Return on assets (ROA).The study is based on the 121 small cap , mid cap and large cap companies listed on the Bombay Stock Exchange (BSE) India, for the period of 2010 -2011. The data is collected through Prowess database, maintained by CMIE Center for monitoring Indian economy.

However there had been many studies in the past on the subject but none of them provided a deep integrated insight to issue of corporate governance. We have made an attempt to endeavour our investigation using the advanced data mining tools in the most comprehensive and scientific manner. In order to test the relationship between corporate governance and firm performance we have tested the governance with the three different financial parameters such as Return on capital employed (ROCE), Return on the equity (ROE) and Return on assets (ROA) which supports our results more strongly. We have also utilized Tamhen Post Hoc test to investigate the inter dependence among the variables which is used for the first time in the studies related to corporate governance.

III. DEVELOPMENT OF HYPOTHESIS

Generally the studies on corporate governance and firm performance are based on the principal-agent theory. Since Berle& Means (1932) first proposed the characteristics of the modern corporation i.e. the ownership and control power separation, mostly corporate governance and performance is researched from internal control and supervisory mechanisms that constitute by the specific forms of corporate governance such as the shareholder's meeting, the board of directors and the management of the company and so on. Our study focuses

on the management incentives to board, frequency of board and shareholders meeting and constraints. Therefore it can be said that our study is also formulated on the grounds of the agency theory of corporate governance, where the management or board acts as agent and owners i.e. equity share holders are principal.

Board meetings play a very crucial role in determining the direction of the company. All the matters related to significant interest are discussed in the board meetings, and all the decision taken in the board meetings decide the fortune of a company. As per the companies act, the board shall meet at least four times a year, with a maximum time gap of three months between any two meetings and one annual general meeting (AGM) of shareholders per year is mandatory. There should not be a gap of more than 18 months between two consecutive annual general meetings. The board of directors conference activity often does not have an effect, when has a problem, it's often accompanied by higher board of directors conference frequency (Jensen, M. C. &Meckling W. H. 1976). In an empirical study by Conger, J. A. &Finegold, D. et.al.(1998) on examining the relationship between the board and shareholders meetings, results show that the board of director's frequency is an important means to improve the efficiency of meetings.

The study results show that the increased oversight and monitoring by board results into increased firm value. All the above given arguments and the review of literature on the subject formed the grounds for development of the hypothesis number 1 for the study.

H01: The numbers of board meetings and shareholder's meetings have no significant impact on the firm's performance.

Board remuneration (BR) in the study refers to the norms related to remuneration of directors and remuneration committee. In the study Board Remuneration (BR) as an independent variable reveals the firms' level of compliance to the mandatory and voluntary provisions in Companies Act, it also tries to find out the relationship and the nature of relationship between the Board Remuneration (BR) and the firms 'performance.

Conyon, M. J.(1997) studied the impact of the corporate governance innovations on top director's compensation, with the help of 213 large firms based in UK. The study results reveal that the director's compensation and shareholders returns are positively correlated. Another study related to director's remuneration and firm performance by Cladera, R. and Gispert,C. (2003) on large Spanish firms also attempted an investigation about the relationship between director's remuneration and firm performance. The empirical evidence from the study suggests a positive relationship between corporate governance and firm performance. Abdullah, S.N. (2004) in his study based on 86 non distressed firms in Malaysia attempted to find a relationship between directors' remuneration, firm's performance and corporate governance. The empirical evidence suggests that there is a negative and significant association is observed between director's remuneration and firm's profitability. The study further reveals that the directors' remuneration is positively related with the firm growth and size. On the basis of review of literature hypothesis number 2 was developed for the study.

H_{02} : **There is no significant impact of remuneration provisions on the firm's performance**.

IV. DATA MINING METHODOLOGY ON CG

In this section we have shown the data mining methodology on corporate governance. For this purpose we have applied pre mining task including data cleaning, data integration and later on post mining technique for pattern evaluation and their presentation on dataset of the BSE listed companies. Figure 1 shows the overall framework through which all process is carried out.
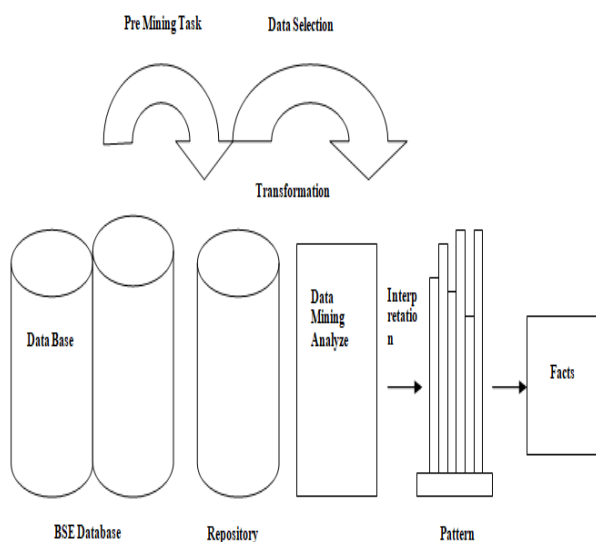

Figure1: *Framework for Investigation on CG & FP*

This Framework initially shows pre mining task on Bombay stock exchange (BSE) databases which works as a data warehouse and obtained our dataset for data mining which is further interpreted for pattern and facts.

A. Data Selection

The sample is selected on the random sampling basis, which involved two stages of sample selection.
1. At the first stage, companies listed on the stock exchange are identified on the basis of their capital base i.e. as small cap, mid cap and large cap companies.
2. Second phase involved qualified corporate governance report and financial reports by way of modification, qualification or adverse opinion. Initially the sample size was 300 listed on the Bombay Stock Exchange (BSE). Due to unavailability of appropriate data the sample size shrink to 121 companies. Out of which forty companies are from large cap category, forty are from mid-cap category and forty one companies are from the small cap category. The companies belong to different industrial sectors such as power, fuel, cement sugar, textile, telecommunication, petroleum, automobile, entertainment, mining , iron , steel, pharmaceutical, fast moving consumer goods (FMCG) etc.. The data is collected through Prowess database, maintained by CMIE (Center for Monitoring Indian Economy).

B. Variable Selection and Model Construction

For the study purpose corporate governance is the independent variable which comprises of the factors of corporate governance as board meetings and shareholders meetings, whereas firm's performance is dependent variable.

There are many other factors which affect the firm's performance they are taken as control variables.

Independent Variable

Based on the various conceptual and empirical studies in India and around the world few independent variables were selected, definition and description of which is given in the table 1.

Table 1: Independent Variable

S N	Variable	Explanation of components	Abbreviation
1	Board meetings and share holder's meetings	(A) Total number of Board meetings held during the year. (B) Total number of Shareholders meetings held during the year.(including provisional meetings)	BSM
2	Board Remunerations	Remuneration paid to the top 3 executives in their natural algorithm	BR

Dependent Variable

Review of the literature on the corporate governance and the firm performance suggests that the firm performance can be mainly measured in two ways first market based performance and secondly accounting based performance. Market based performance measures and Accounting based performance measures differ in two main aspects. First is time based in which the market value is forward looking and accounting value is backward looking, whereas market based measure is what management will accomplish, whereas accounting based measure is an estimates of what management has accomplish. Many researchers have utilized Tobin Q as a market based performance measure for the firm performance.

Though the accounting value constrained by the standards set by the accountant, accounting policies opted by his firm and the accounting norms and standards prevailing in the country, still the accounting rates can be better as they are free from the investors bias and speculations to a large extent. Secondly very few countries have developed capital markets; therefore we preferred the accounting based method to measure the firm performance. Finally different financial ratios such as Return on Capital employed (ROCE), Return on the equity (ROE), Return on assets (ROA) are utilized for the study.

Control Variable

For the purpose of investigation we have utilized size of the firm, leverage, liquidity and inventory ratio as control variables which are denoted by total assets (TA), debt equity ratio (LEV), liquidity ratio (COR) and average inventory (IR) respectively. The control variables are described in the table 2

Table2: Control Variable Description

SN	Control Variables	Description	Symbolic
1	Size of the firm	Total assets	TA
2	Leverage	Debt/Equity	LEV
3	Liquidity	Current assets /Current Liabilities	COR
4	Inventory Ratio	Cost of goods sold/ Average inventory	IR

C. Measurement of Corporate Governance Score (CGS) and Development of Questionnaire

The study is based on the structured questionnaire .The questionnaire consist of 51 questions related to the corporate governance factors. The Corporate Governance Scores (CGS) reflects the scores obtained by an individual company on a particular corporate governance factor or component. The corporate scores (CGS) are based on the information provided by the firms in their annual reports. The annual corporate governance report was carefully and extensively reviewed for the study. The corporate governance score (CGS) was developed on the bases of Standards & Poor's (S&P) –Governance, Management, Accountability Metrics and Analysis (GAMMA).

Board & Shareholder Meeting and Firm Performance

BSM here refers to the number of board meetings and shareholders meetings held during a particular financial year. As the AGM is mandatory, all the firms adhere to the norms, so during the study it is found that all the firms have one shareholders meeting per year. None of the firms from the sample data was defaulter. The only difference was in the number of board meetings per year. Therefore the firms are classified into three categories. i.e. firms with few numbers of meetings, the firms with adequate number of meetings (as per provision) and the firms with more number of meetings.

1 Firms with few numbers of meetings include the firm whose board of directors meets less than 4 times in a particular financial year. The firms scoring up to 30 points in the particular segment of the questionnaire are included in this category.

2 Further the firms who fulfil the provisions regarding board meetings and shareholders meetings were included in this category. The firms scoring between 31 to 69 points were included in this category.

3 The firms whose number of board and shareholders meetings is more than the prescribed numbers by the law were included in this category. The firms scoring between 70 to 100 points were included in this category. In order to check the level of the significance various statistical tests were applied results thereof are mentioned in the following given tables.

Board Remuneration and Firm Performance

BR in the study refers to the norms related to remuneration of directors and remuneration committee. For the study purpose the board remuneration of a company was categorized into four categories i.e. highly compliant firms, average compliant firms, firms with satisfactory level of compliance and poorly compliant firms.

1. Highly compliant firms

This category includes the firms which show the highest level of adherence to the norms and provisions as stipulated in the regulatory framework in relation with the board remuneration. The firms scoring between 75 points to 100 points in the given category of the questionnaire came under this category.

2. Average compliant firms

In this category the firms which fulfil a little more than mandatory provisions are covered. The firms scoring between 50 to 75 points in the given segment of the questionnaire were included in this category.

3. Satisfactory Compliant firms

The firms which just fulfil the mandatory clauses and ignore the voluntary measures in order to improve the corporate governance of the firm were included in this category. Further the firms scoring between 25 to 50 came under this category.

4. Poorly compliant firms

This category consists of the firms which fail to fulfil the mandatory provisions. The firms scoring below 25 points the given segment of the questionnaire come under this category.

V. RESULTS & DISCUSSION

In this section we have analyzed and interpreted in search of patterns through statistical data mining tool on given data set.

A. Data Mining Analysis of BSM with FP

The analysis of relationship between BSM and FP depends upon the results of descriptive analysis, nature of relationships and strength of relationship between these two variables and among the different groups thereof which can be tested with the help of descriptive analysis of BSM, homogeneity test of variances, ANOVA test, multiple comparison of BSM categories and dependent variables.

The Table 3 displays descriptive statistics for each group and for the entire data set with N indicating the size of each group and the standard deviation and standard error statistics confirm that as ROCEP, ROA, ROE increase, variation in performance decreases.

Deviation shows the score variability amount in each group. Levene test showed finally 95% confidence interval true value of population

Table 3: Descriptive Data Mining Analysis of BSM

Dependent Variables	Parameters for BSM	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	Upper Bound	Minimum	Maximum
ROCE	Few Meetings	53	14.2330	10.69550	1.4691	11.2850	17.1811	.00	60.68
	Adequate no. of Meetings	58	22.4048	19.94111	2.6184	17.1616	27.6481	-1.09	112.62
	More Meetings	10	10.9800	9.05881	2.8646	4.4997	17.4603	1.74	28.30
	Total	121	17.8812	16.2587	1.4780	14.9548	20.8077	-1.09	112.62
ROA	Few Meetings	53	7.6711	11.3759	1.5626	4.535	10.806	-48.76	43.351
	Adequate no. of Meetings	58	2.4492	60.6359	7.9618	8.548	40.435	-91.76	390.46
	More Meetings	10	6.4503	5.8745	1.8576	2.248	10.652	.256	17.196
	Total	121	1.5633	43.3366	3.9396	7.832	23.433	-91.76	390.46
ROE	Few Meetings	53	9.9562	17.3855	2.3880	5.164	14.748	-86.78	64.400
	Adequate no. of Meetings	58	1.4084	24.3644	3.1992	7.678	20.490	-95.30	87.200
	More Meetings	10	8.7680	9.1305	2.8873	2.236	15.299	-9.100	20.700
	Total	121	1.1836	20.5910	1.8719	8.130	15.543	-95.30	87.200

Table 4: Test of Homogeneity of Variances of BSM

	Levene Statistic	df1	df2	Sig.
ROCE Percentage	5.052	2	118	.008
ROA	4.733	2	118	.011
ROE	1.497	2	118	.228

Table 5: ANOVA TEST on BSM

Dependent Variable	Category	Sum of Squares	Df	Mean Square	F	Sig.
ROCE Percentage	Between Groups	2368.521	2	1184.26	4.761	0.01
	Within Groups	29352.959	118	248.754		
	Total	31721.479	120			
ROA	Between Groups	8755.127	2	4377.563	2.385	0.097
	Within Groups	216612.62	118	1835.7		
	Total	225367.74	120			

	Between Groups	574.678	2	287.339	0.674	0.512
	Within Groups	50304.191	118	426.307		
ROE	Total	50878.869	120			

Table 6 is about multiple comparison on board and shareholders meeting with their sub components. For the purpose of investigation the number of board and share holders meetings held every year are divided in three categories which are explained in detail in the section 4 of the paper they are a) Few meetings - which means less than the minimum standard or the benchmark set b) Adequate numbers of meeting – it means just meeting the benchmark or the minimum standard set for Board and shareholders meeting (BSM) i.e. 4 meetings in a year and c) More meetings – more

meetings represents the companies having board and shareholders meeting (BSM) more than the minimum number of times prescribed by the standards. Further in table 6 column I represent the different categories of independent variable and J is reference to which the sub component will be compared mean difference (I-J) represents difference between mean values of one subcomponent to the other subcomponents of BSM.

Table 6: Multiple Comparisons on BSM

Dependent Variable	(I)BSM Category	(J) BSM Category	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Mean	
						Lower Bound	Upper Bound
ROCE	Few Meetings	Adequate no. of Meeting	-8.17181	2.99705	.020	-15.28	-1.0578
		More Meetings	3.25302	5.43773	.821	-9.654	16.1603
	Adequate no. of Meetings	Few Meetings	8.17181	2.99705	.020	1.0578	15.2858
		More Meetings	11.42483	5.40039	.091	-1.393	24.2435
	More Meetings	Few Meetings	-3.25302	5.43773	.821	-16.16	9.6543
		Adequate no. of Meetings	-11.42483	5.40039	.091	-24.24	1.3938
ROA	Few Meetings	Adequate no. of Meetings	-16.82109	8.141612	.101	-36.14	2.5042
		More Meetings	1.220762	1.477179	.996	-33.84	36.2838
	Adequate no. of Meetings	Few Meetings	16.821091	8.141612	.101	-2.504	36.1464
		More Meetings	18.041853	1.467038	.438	-16.78	52.8642
	More Meetings	Few Meetings	-1.22076	1.477179	.996	-36.28	33.8423
		Adequate no. of Meetings	-18.04185	1.467038	.438	-52.86	16.7805
ROE	Few Meetings	Adequate no. of Meetings	-4.12842	3.923473	.546	-13.44	5.1845
		More Meetings	1.18822	7.118581	.985	-15.70	18.0852
	Adequate no. of Meetings	Few Meetings	4.12842	3.92347	.546	-13.44	5.18453
		More Meetings	5.31665	7.06970	.733	-11.46	22.09769
	More Meetings	Few Meetings	-1.18822	7.11858	.985	-18.08	15.70881

		Adequate no. of Meetings	-5.31665	7.06970	.733	-22.09	11.46438

Table 7: Tamhane T2 post hoc test

Dependent Variables	BSM Category	N	Subset for alpha=0.05	
			1	2
ROCE Percentage	More Meeting	10	10.9800	
	Few meeting	53	14.2330	14.2330
	Adequate no. of Meet.	58		22.4048
	Sig.		.773	
ROA	More Meeting	10	6.45037	
	Few meeting	53	7.67113	
	Adequate no. of Meet.	58	24.49222	
	Sig.		.345	
ROE	More Meeting	10	8.76800	
	Few meeting	53	9.95623	
	Adequate no. of Meet.	58	14.08466	
	Sig.		.670	

Following table 7 shows Tamhane T2 post hoc test which shows pair wise comparisons and displays means for groups in homogeneous subsets.

As per data of corporate governance parameters in the research instrument, we were interested in finding out if financial parameters varied depending on different categorize of number of board and shareholders meetings or not and for that ANOVA test was applied, the total variation was partitioned into two components. Between Groups represents variation of the group means around the overall mean. Within Groups represents variation of the individual scores around their respective group means. If desired, the between groups variation can be partitioned into trend components.

According to table no5 the significance value of the F test in the ANOVA table is 0.010 (ROCEP), 0.097(ROA) and 0.512(ROE). Small significance value of 0.010(<.05) and 0.001 (<0.05) indicate group differences. Thus, we rejected the hypothesis that average financial parameters varied equally across different board compositions. The difference in financial parameters across different categorize of the board and shareholders meetings is significant for ROCE only as the significance values of this parameters is less than 0.005. The tests of between-subjects effects helped us to determine the significance of a factor. However, they do not indicate how the levels of a factor differ. The post hoc tests show the differences in model-predicted means for each pair of factor levels. For more detailed analysis we used Tamhane T2 Post hoc test for pair wise comparisons in One-Way ANOVA whose results are shown in table7. The groups differ in some way. The means plot helped us to "see" this structure. The graphs show the mean of ROCE , ROA, ROE and the firm categorization with the few number of board and shareholders meetings ,firms with adequate numbers of board and shareholders meetings and the firms with the more number of board and shareholders meetings.

The figure 2(a) shows that the firms with the adequate number of board and shareholders meetings have highest mean of ROCE whereas the firms with more board and shareholders meetings have the lowest mean of ROCE even the firms with the few number of board and shareholders meetings have higher mean as compare to the firms with the more meetings.
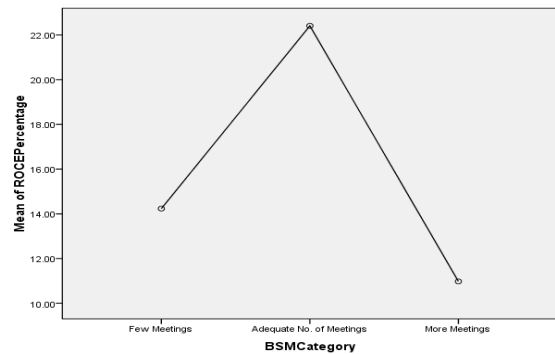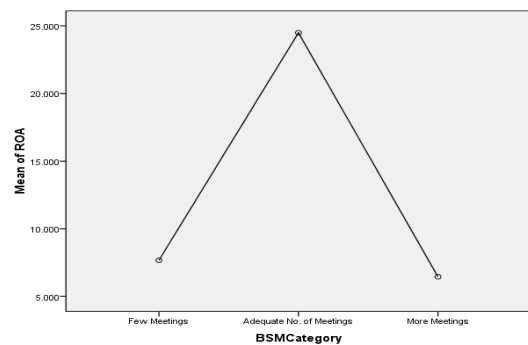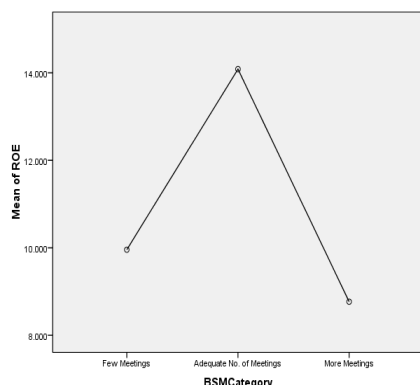

Figure 2(a)

Figure 2(b)

Figure 2(c)
Figure2: Means of BSM and FP

Further the figure 2(b) shows the graph which reveals a relationship between the mean of ROA 0and number of board and shareholders meetings categorization. The graph shows that the firms with adequate number of board and shareholders meetings have highest mean of ROA as compare to their other counter parts, and the firms with the more meetings show the lowest mean of ROA . The point to notice in this graph is that there is a small marginal difference between the means of ROA of firms with few meetings and firms with more meetings. In fact it clearly show that the firm with number of board and shareholders meetings have a higher mean of ROA as compare to the firms with the more meetings.

Figure 2(c) shows graph with the mean of ROE and board and shareholders meetings categorization also show nearly the same picture, here the firms with adequate numbers of board and shareholders meetings show the highest mean of ROE. Whereas the firms with more board and shareholders meetings show the lowest mean of ROE and the firms with only few meetings have higher mean of ROE as compare to the firms with more number of board and share holders meetings.

B. Data Mining Analysis of BR with Firm Performance (FP)

The analysis of relationship between BR and FP depends upon the results of descriptive data mining analysis, nature of relationships and strength of relationship between these two variables and among the different groups thereof which can be tested with the help of descriptive analysis of BR, homogeneity test of variances, ANOVA test, multiple comparisons of BR categories and dependent variables.

Table 8 displays descriptive statistics for each group and for the entire data set with N indicating the size of each group and the standard deviation and standard error statistics confirm that as ROCEP, ROA, ROE increase, variation in performance decreases. The Levene statistic of table no 9 accepts the null hypothesis that the group variances are not equal in any of the case ROCE, ROA & ROE. ANOVA is robust to this violation when the groups are of equal or near equal size; however, we decided to continue to use F-test for other parameters too.

Table 8: Descriptive Analysis of BR

Dependent Variable	Category	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
ROCE	Non Compliance	11	19.559	10.5452	3.179	12.474	26.643	7.47	47.39
	Satisfactory	8	16.641	15.0251	5.312	4.0799	29.202	.00	47.61
	High	7	28.788	24.7893	9.369	5.8623	51.714	5.81	75.38
	Very High	95	16.987	16.1080	1.652	13.706	20.269	-1.09	112.6
	Total	121	17.8812	16.2587	1.478	14.954	20.807	-1.09	112.6
ROA	Non Compliance	11	1.3825	7.30423	2.202	8.9183	18.732	5.780	32.39
	Satisfactory	8	-1.0006	37.7095	1.333	-32.52	30.525	-91.7	28.75
	High	7	1.8304	21.7518	8.221	-1.812	38.421	-1.26	63.79
	Very High	95	1.7046	47.2152	4.844	7.428	26.66	-48.7	390.4
	Total	121	1.5633	43.3366	3.939	7.8329	23.433	-91.7	390.4
ROE	Non Compliance	11	1.53	9.1716	2.765	9.1738	21.497	5.600	36.08
	Satisfactory	8	-.1287	40.6311	1.436	-34.09	33.839	-95.3	37.50
	High	7	1.9002	19.8770	7.512	.61965	37.386	-4.76	54.90
	Very High	95	1.1911	19.1497	1.964	8.0104	15.812	-86.0	87.20
	Total	121	1.1836	20.5910	1.871	8.130	15.543	-95.3	87.20

As per data of corporate governance parameters in the research instrument, we are interested in finding out if financial parameters varied depending on Level of transparency or not and for that ANOVA test is applied, the total variation is partitioned into two components. Between Groups represents variation of the group means around the overall mean. Within Groups represents variation of the individual scores around their respective group means. If desired, the between groups variation can be partitioned into trend components. According to table no 10, the significance value of the F test in the ANOVA table is 0.311 (ROCEP), 0.728(ROA), 0.278 (ROE) . All the significance values of financial performance parameters i.e. ROCE, ROA and ROE are (>0.05) indicate no group differences. Thus, you must accept the hypothesis that average financial parameters varied equally across different board remuneration compliance level. The difference in financial parameters across different level of board remuneration compliance level is insignificant for ROCEP, ROA, and ROE as the significance values of all these parameters are more than 0.005.

Table 10: ANOVA Test on BR

		Sum of Squares	Df	Mean Square	F	Sig.
ROCE Percentage	Between Groups	951.909	3	317.303	1.207	.311
	Within Groups	30769.571	117	262.988		
	Total	31721.479	120			
ROA	Between Groups	2489.131	3	829.710	.436	.728
	Within Groups	222878.611	117	1904.945		
	Total	225367.743	120			
ROE	Between Groups	1640.038	3	546.679	1.299	.278
	Within Groups	49238.831	117	420.845		
	Total	50878.869	120			

Table 11 is about multiple comparisons on board remuneration (BR) with its sub components. For a better understanding about the Board remuneration and its sub components it is further classified into four categories details of which are given in the section 4 of the paper. They are a) Non Compliance – This category refers to the companies who don't fulfil the norms related to remuneration clause. b) Satisfactory – This category includes the companies who just fulfil minimum standards related to BR. c) High – The companies under this category fulfil more than the minimum prescribed norms and finally d) Very high – This category refers to the companies who not only follows the mandatory minimum standards but also follows the voluntary regulations and are have one of the best remuneration policy in the industry. Further in table 11 column I represent the different categories of independent variable and J is reference to which the sub component will be compared mean difference (I-J) represents difference between mean values of one subcomponent to the other subcomponents of board remuneration (BR).

The test of between-subjects effects helps us to determine the significance of a factor. However, they do not indicate how the levels of a factor differ. The post hoc tests show the differences in model-predicted means for each pair of factor levels. For more detailed analysis we used Tukey HSD Post hoc test for pair wise comparisons in One-Way ANOVA whose results are shown in the table 11 and table 12.

The means plot explains clearly about the structure of the differences of groups. In this structure it shows the mean of ROCE, ROA, ROE and the board remuneration category which is categorized into noncompliance, satisfactory compliance high compliance and very high compliance.

The graph plotted for ROCE mean and board remuneration compliance categorization reveals that the high board remuneration compliance shows the highest mean in ROCEP as compare to their other counterparts, whereas the satisfactory board remuneration category shows the lowest ROCE mean as Shown in figure 3(a).

In the case of mean of ROA high board remuneration shows the highest mean and very high board remuneration shows the nearby highest, whereas the satisfactory board remuneration shows the lowest mean of ROA .It further shows that the firms with the non-compliance in the board remuneration category have higher mean of ROA as compare to the firms with satisfactory board remuneration category in figure 3(b)

In the case of mean of ROE the firms with the high board remuneration category shows the highest ROE means, whereas the firms with the satisfactory board remuneration shows the lowest mean of ROE. Point to notice in this parameter is that the firms with the very high Board remuneration compliance category have lower mean of ROE as compare to the firms with non-compliance in the board remuneration category as shown in the figure 3(c).

C. Results

Based on our scientific and unbiased investigation we found that relationship of significant nature exist between board & share holders' meetings (BSM) and firm performance (FP). Whereas in case of board remuneration (BR) by establishing and analyzing the correlation among the variables, it was found that relationship of insignificant nature exist between board remuneration (BR) and firm performance (FP).

In case of BSM groups it can be said that these factors are correlated and do have an impact on each other as well and the strength of relationship is also strong. Meanwhile in the case of BR variables are not correlated.

It can be further said that the number of boards and shareholders meetings (BSM) affects the firm's performance. Data mining results reveals that the firms who hold less than minimum prescribed numbers of meetings (4 meetings in a financial year) show the lowest level of mean of ROCE, ROE and ROA so it can be clearly said that the number of board and shareholders meetings (BSM) have a positive and significant impact on the firms performance levels. But in case of BR it can be clearly said that the board remuneration (BR) does not affect the firm's performance.

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Table 11: Multiple Comparison of BR

Dependent Variable	(I) BR Category	(J) BR Category	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Mean	
						Lower Bound	Upper Bound
ROCE	Non Compliance	Satisfactory	2.9178	7.5353	.980	-16.7218	22.5575
		High	-9.2294	7.8407	.642	-29.6652	11.2062
		Very High	2.5714	5.1649	.959	-10.8901	16.0329
	Satisfactory	Non Compliance	-2.917	7.5353	.980	-22.557	16.721
		High	-12.147	8.3930	.473	-34.022	9.727
		Very High	-.3464	5.9700	1.000	-15.906	15.213
	High	Non Compliance	9.229	7.840	.642	-11.206	29.665
		Satisfactory	12.147	8.393	.473	-9.727	34.022
		Very High	11.800	6.3512	.252	-4.752	28.354
	Very High	Non Compliance	-2.571	5.1649	.959	-16.032	10.890
		Satisfactory	.3464	5.970	1.00	-15.213	15.906
		High	-11.800	6.351	.252	-28.354	4.752

Table 12: Tamhane T2 post hoc test

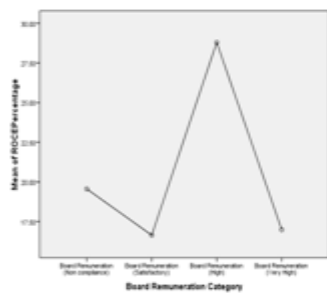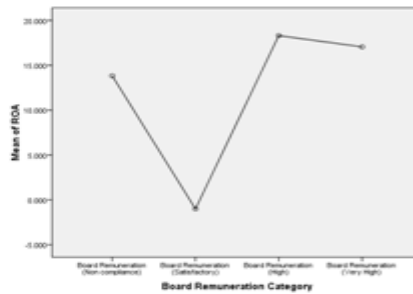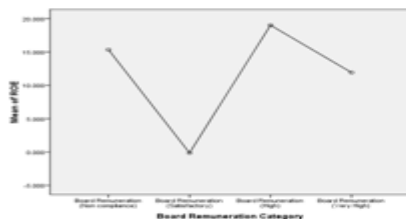| Parameter	BR Category	N	Subset for alpha=0.5
			1
ROCE Percentage	Satisfactory	8	16.6413
	Very High	95	16.9877
	Non compliance	11	19.5591
	High	7	28.7887
	Sig.		.306
ROA	Satisfactory	8	-1.00065
	Very High	95	17.04649
	Non compliance	11	13.82541
	High	7	18.30444
	Sig.		.733
ROE	Satisfactory	8	-.12875
	Very High	95	11.91147
	Non compliance	11	15.33545
	High	7	19.00286
	Sig.		.138

Figure 3(a)

Figure 3(b)

Figure 3(c)

Figure 3: Means of BR & FP

VI. CONCLUSION

On establishing and analyzing the correlation among the independent variables using data mining statistical tool as per the proposed investigation, it was found that relationship of significant nature exist between board & share holders' meetings (BSM) and firm performance (FP). Hence, in simple words it can be said that these factors are correlated and do have an impact on each other as well and the strength of relationship is strong. It can be further said that the number of boards and share holders meetings affects the firm's performance. Data mining results also reveals that the firms who hold less than minimum prescribed numbers of meetings (4 meetings in a financial year) show the lowest level of mean of ROCE, ROE and ROA so it can be clearly stated that the number of board and shareholders meetings have a positive and significant impact on the firms performance levels.

Data mining statistical results in the case of Board remuneration (BR) establishing and analyzing the correlation among the variables, it was found that relationship of insignificant nature exist between board remuneration and firm performance. Hence, in simple words it can be said that these two variables are not correlated. It can be further said that the board remuneration does not affects the firm's performance. The results can be backed by the previous research outcomes, for an example Abdullah S.N (2004) in his study found a negative and insignificant association is observed between director's remuneration and firm's profitability.

The study results are primarily suggestive that the frequency of the board meetings is an important means to improve the efficiency. Not only has the number of board meetings but the director's day devoted to the meetings also played a significant role. One of the arguments in favour of more board meetings can be that it increases the oversight and monitoring by board which further results into increased firm value. Secondly it improves the transparency and the quality of decision making in the long run.

Thirdly majority of the firms from the population (Universe) for the study do not have remuneration committee and clear and transparent norms for the remuneration of executives, particularly in the case of small cap firms, mid cap firms and family owned firms.

And finally adherence to the remuneration provisions is observed only in some large cap firms. There are very few firms in the mid cap which fulfils the conditions related to remuneration of the executives, and the number becomes negligible in the case of small cap firms.

The research outcome can be differentiated from the previous studies on the grounds that it addresses the corporate governance issue in a more integrated and comprehensive way than ever before. The data mining tools and Tamhane Post Hoc Test backs the results more scientifically and objectively. The firm performance which is tested using three different financial ratios supports the research outcomes more strongly.

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