

## Paradigm Shift in the Role of Independent Directors in Indian Public Sector Undertakings Using Data Mining Method

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**ABSTRACT**— The objective of this paper is to identify the relationship between Independent Directors and Public Sector Undertakings (PSU) financial performance by data mining method. We have taken the dependent variables, Altman Z-Score ratio to measure the Indian Public Sector Undertakings (PSU) financial performance. The independent variable is response of Independent Directors of Public Sector Undertaking (PSU) through our questionnaire. We used Pearson and Spearman correlation to find the relationship between the two variables. We found that there is a ‘weak correlation’ among the variables, before the amendment of Companies Act, 2013 and “strong correlation” after the amendment of Companies Act, 2013. So we can say that there exists a paradigm shift in the role of Independent Directors post the legislative changes.

**KEYWORDS**- Independent Director, Public Sector Undertaking (PSU), Association Rules, Data Mining, Financial Performance.

### I. INTRODUCTION

It is widely accepted that the presence of Independent Directors in the Boardroom improves the quality of corporate governance. Accordingly, corporate governance mechanisms all over the globe, including in India, focus on Independent Directors. The Independent Directors are expected to protect the interest of non-controlling shareholders. They should be watchful to identify weaknesses before they surface in the product market. But, they should not be over reactive. After the passing of the Companies Act, 2013 and India getting a modern Companies Act, the expectations from all fronts are high. The history of corporate India suggests that in spite of having vested power under clause 49 of the Listing Agreement with stock exchanges enforced by market watchdog SEBI, Independent Directors were forced to act like lame ducks. The code for Independent Directors included in schedule IV to the Act, requires a number of provisions, which are expected to be fulfilled by the Independent Directors. As a financial performance, we used the dependent variable: the PSU financial performance represented by the Altman Z-Score and the independent variable is response of Independent Directors from Maharatna and Navaratna of Indian Public Sector Undertaking (PSU) through our questionnaire. We have designed the questionnaire in four major categories with five questions in each category and given weightage to every question, according to response. We got 32 Independent Directors responses. The dependent variable’s data collected through Prowess. Prowess is a database of the financial performance of Indian companies. It is a subscription service from the Centre for Monitoring Indian Economy Pvt. Ltd. (CMIE).

The objective of this paper is to highlight the journey of the Independent Directors (ID), being an integral part of the Corporate Governance frame work, from its gestation period up to the enactment of companies act, 2013 and the paradigm shift in their role post year 2013 amendments with particular reference to Indian Public Sector Undertakings (PSU).

### II. CORPORATE GOVERNANCE

Corporate governance is concerned with set of principles, ethics, values, morals, rules regulations, & procedures etc. Corporate governance establishes a system whereby directors are entrusted with duties and responsibilities in relation to the direction of the company’s affairs. The term “governance” means control i.e. controlling a company, an organization etc. or a company & corporate governance is governing or controlling the corporate bodies i.e. ethics, values, principles, morals. For corporate governance to be good the manager needs to meet its responsibilities towards its owners (shareholders), creditors,

employees, customers, government and the society at large. Corporate governance helps in establishing a system where a director is showered with duties and responsibilities of the affairs of the company. For effective corporate governance, its policies need to be such that the directors of the company should not abuse their power and instead should understand their duties and responsibilities towards the company and should act in the best interests of the company in the broadest sense. The concept of 'corporate governance' is not an end; it's just a beginning towards growth of company for long term prosperity.

### **1. Independent Directors-**

An Independent director (also sometimes known as an outside director) is a director member of a board of directors who does not have a material or pecuniary relationship with company or related persons, except sitting fees. Independent Directors do not own shares in the company. Some sources state non-executive directors are different from independent ones in that non-executive director are allowed to hold shares in the firm while independent directors are not. As per Section 2(47) of the Companies Act, 2013, an Independent Director means a Director as referred to in sub-section (5) of section 149. The new Act along with the definition of ID's also provides the criteria for appointing, qualifications, tenure, remuneration and liability of ID's. Independence is a quality that can be possessed by individuals and is an essential component of professionalism and professional behaviour. It refers to the avoidance of being unduly influenced by a vested interest and to being free from any constraints that would prevent a correct course of action being taken. It is an ability to stand apart from inappropriate influences and to be free of managerial capture, to be able to make the correct and uncontaminated decision on a given issue.

### **2. Public Sector Undertakings in India**

The Public Sector Enterprises are run by the Government under the Department of Public Enterprises of Ministry of Heavy Industries and Public Enterprises. The government grants the status of Maharatna, Navratna and Miniratna to Central Public Sector Enterprises based upon the profit made by these CPSEs. The Maharatna category has been the most recent one since 2009 the other two have been in function since 1997. In our country, a Public Sector Undertaking (PSU) is a government-owned corporation. These companies are owned and operated by the Union Government of India, or a state government, or both. This company's equity is majorly owned by the government, hence the named PSU. The need for setting up of PSUs arises because industrial development of any country requires a strong foundation supported by reliable infrastructure. And infrastructure development is fundamentally a capital-intensive industry, which may not be lucrative for the private sector. Therefore, Government runs the Public Sector Enterprises. Here we are concentrating only Maharatna and Navaratna Companies.

### **3. Maharatna and Navratna in India**

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#### 4. Name of Companies

**Maharatna Category**-Bharat Heavy Electricals Limited, Coal India Limited, GAIL (India) Limited, Indian Oil, Corporation Limited, NTPC Limited, Oil & Natural Gas Corporation Limited, Steel Authority of India Limited.

**Navaratna Category**-Bharat Electronics Limited, Bharat Petroleum Corporation Limited, Container, Corporation of India Limited, Engineers India Limited, Hindustan Aeronautics Limited, Hindustan Petroleum Corporation Limited, Mahanagar Telephone Nigam Limited, National Aluminium Company Limited, National Buildings Construction Corporation Limited, NMDC Limited, Neyveli Lignite Corporation Limited, Oil India Limited, Power Finance Corporation Limited, Power Grid Corporation of India Limited, Rashtriya Ispat Nigam Limited, Rural Electrification Corporation Limited, Shipping Corporation of India Limited.

### III. LITERATURE REVIEW

Qaemi and Shahryari (2009), in their project called “Corporate Governance and Financial Performance of Companies”, studied 77 companies that were accepted in stock market from 2003-2005 and concluded that there is no significant correlation between arrangement of board of directors and financial performance of firms. Nikbakht et al. (2010) investigated the relationship between the attributes of boards of directors and company’s performance. In order to measure company’s performance grade, they used 5 criteria of revenue growth, operational profit growth, net profit growth, assets efficiency and return on equity. Their findings reveal that board of directors has no significant influence on company performance in Iran’s stock market. Marck, Shleifer, and Vishny (1988) and Hermalin and Weisbach (1991) investigated the effect of ownership structure on company performance. Results of their research demonstrate an important and positive correlation between ownership structure and company performance. Corporate governance, as a system connecting several scientific branches such as accounting, financial management, economy and law and maintaining balance between social and economic objectives and group and individual goals, encourages and enhances efficient and optimal use of resources and accountability of companies in regard to other stakeholders in the company. On the other hand, implementation of corporate governance system can lead to optimal appropriation of resources and improvement of transparency of financial information spread in the market and eventually economic development (John and Senbet, 1988, quoted by Ghaemi and Shahriari, 2009; 114). Coleman and Bikpi studied the relationship between the arrangement of board of directors and duality of board of directors and company performance in Ghana stock exchange market in years from 1990 to 2001. Results of the analysis of this model confirmed a negative correlation between board of directors’ arrangement with company performance and a positive correlation between roles of head of board of directors and CEO with company performance in Ghana. Gedajlovic and Shapiro (2002) explored the relationship between ownership localization and financial performance in Japanese companies. Results of their research showed a significant and positive relationship between these two variables. Cui and Mac (2002) tested the correlation between management ownership and performance of research and development companies. Furthermore, observation expenses of bond owners increases with the fall of management ownership level. Himmelberg, Hubbard and Palia (1999) found no relationship between outside members and relational performance.

### IV. DATA PROCESSING AND METHODOLOGY

Here we used both primary and secondary data. The primary data are used through our questionnaire and secondary data are used through annual report of said companies form CMIE database. The sample size for this research is 24. Questionnaire is used as the tool for data collection from Independent Directors of Maharatna and Navaratna categories of Indian Public Sector Undertaking (PSU). Questionnaire is a self-report data collection instrument that each Independent Director participant fills out as a part of a research study. Independent Directors responses used as an independent variable and Maharatna and Navaratna companies financial performance represented as Altman Z-Score ratio are used for secondary variable.

The aim of this paper is to find the correlation and its impact of Independent Directors to Indian Public Sector Undertaking (PSU). Here the major parameters have been taken with twenty questions. The questionnaire is designed for the survey form Independent Directors of Maharatna and Navaratna companies. The questionnaire we have designed in four major categories, i) Innovation and Contributions, ii) Policy and Corporate Governance of the Company, iii) Performance monitoring and iv) Experience of Independent Director. Each category having five questions and given weightages according to the responses.

We have taken five years financial performance data from year 2011-12 to year 2015-16. Here we used the median value of Independent Directors responses and Altman Z-Score ratios of Maharatna and Navaratna Category Companies financial performance. The analysis is used to find correlation between Independent director and financial performance using Data mining methods.

## V. ANALYSIS

The Altman Z-score is a linear combination of four or five common business ratios, weighted by coefficients. The coefficients were estimated by identifying a set of firms which had declared bankruptcy and then collecting a matched sample of firms which had survived, with matching by industry and approximate size (assets). The indicator is computed considering the following formula.

**1. Altman Z-Score** =  $1.2 * (\text{Working Capital}/\text{Total Assets}) + 1.4 * (\text{Retained Earning}/\text{Total Assets}) + 3.3 * (\text{EBIT} / \text{Total Assets}) + 0.6 (\text{Market Value of Equity}/\text{Total Liabilities}) + (\text{Sales}/ \text{Total Assets})$

Zone of Discrimination:

$Z > 2.6$  "Safe" Zone

1.1  $Z < 2.6$  "Gray" Zone

$Z < 1.1$  "Distress" Zone

The company that has a Z-Score above 2.6 is considered to be in the "Safe" zone, if the score is below 2.6 but above 1.1, it is considered to be in the "Gray" zone and if it lies below 1.1 then it is in financial Distress. Altman Z-Score ratio being an indicator for bankruptcy, Maharatna and Navaratna companies financial performance. Our objective is to find correlation between Independent Directors (ID) and Maharatna, Navaratna Companies financial performance in before and after corporate governance act. 2013.

**2. Correlation Coefficient, r-** The quantity  $r$ , called the linear correlation coefficient, measures the strength and the direction of a linear relationship between two variables. The linear correlation coefficient is sometimes referred to as the Pearson product moment correlation coefficient in honor of its developer Karl Pearson. The mathematical formula for computing  $r$  is:

Where  $n$  is the number of pairs of data.-

The value of  $r$  is such that  $-1 < r < +1$ . The  $+$  and  $-$  signs are used for positive linear correlations and negative linear correlations, respectively.

**Positive correlation:** If  $x$  and  $y$  have a strong positive linear correlation,  $r$  is close to  $+1$ . An  $r$  value of exactly  $+1$  indicates a perfect positive fit. Positive values indicate a relationship between  $x$  and  $y$  variables such that as values for  $x$  increase, values for  $y$  also increase.

**Negative correlation:**  $x$  and  $y$  have a strong negative linear correlation,  $r$  is close to  $-1$ . An  $r$  value of exactly  $-1$  indicates a perfect negative fit. Negative values indicate a relationship between  $x$  and  $y$  such that as values for  $x$  increase, values for  $y$  decrease.

**No correlation:** If there is no linear correlation or a weak linear correlation,  $r$  is close to  $0$ . A value near zero means that there is a random, nonlinear relationship between the two variables, that  $r$  is a dimensionless quantity; that is, it does not depend on the units employed.

A perfect correlation of  $\pm 1$  occurs only when the data points all lie exactly on a straight line. If  $r = +1$ , the slope of this line is positive. If  $r = -1$ , the slope of this line is negative.

Generally a correlation ratio is greater than (0.8) is described as “strong” correlation, whereas the ratio is less than (0.5), it described as “weak” correlation.

## VI. ION BETWEEN INDEPENDENT DIRECTORS AND PSU

As earlier mentioned that the study to find correlation between Independent Directors and financial performance of PSU Companies. Here we used the methodology of Pearson Correlation and Spearman Rho Correlation. The independent variable is Median value of Independent Director’s responses and the dependent variables are Altman Z-score of 24 Public Sector Undertaking Companies for the financial year 2011-12 to 2015-16. The following (figure no. 2), shows the Pearson correlation and (figure no. 3) shows Spearman correlation.

## VII. FINDINGS

After analysis of Pearson Correlation and Spearman Correlation of median value of Independent Director’s responses and Altman Z-Score ratio of financial performance of Indian Public Sector Undertaking (PSU) of year 2011-12, we found the “r” value is positive but 0.343 (shows in figure no. 2). In Spearman Correlation, we found the “r” value is also positive but 0.304 (shows in figure no. 3). There is slide difference of “r” value (0.038) in the both techniques, but the “r” value is less than (0.5), which indicates that there is “weak correlation” of responses of Independent directors on Corporate Governance and financial performance of Indian Public Sector Undertakings under Maharatna and Navratna Categories. It is graphically represented in figure 6.3, which is given bellow in graphical scatterplot.

Similarly in subsequent years we found the “r” value in financial years 2012-13 and 13-14 as per Pearson Correlation is 0.375 and 0.358 (shows in figure no. 2). In Spearman Correlation, we found the “r” value is 0.327 and 0.376 (shows in figure no. 3). Using both techniques, the “r” value in the pre companies Act, 2013 is less than (0.5), which also indicates that there is positive but “weak correlation” of responses of Independent directors on Corporate Governance and financial performance of Indian Public Sector Undertakings under Maharatna and Navratna Categories.

However the major difference is observed in the financial year 2014-15 where the ‘r’ value as per Pearson Correlation is 0.358 and as per Spearman Correlation is 0.427 (shows in figure no. 2 & 3), which is near to (0.5) thereby showing a tendency towards moving to a strong correlation. In the financial year 2015-16 the ‘r’ value as per Pearson Correlation is 0.811 and as per Spearman Correlation 0.823 (shows in figure 2 & 3), which is indicates that there is a positive strong correlation between the responses of Independent directors on Corporate Governance and financial performance of Indian Public Sector Undertakings under Maharatna and Navratna Categories.

All these findings are graphically (scatter plot) represented in figure no 4 to figure no 8 in different financial year.

## VIII. CONCLUSION

This paper develops a framework that applies data mining methods for correlation between independent director and Private Sector Undertaking (PSU), Maharatna and Navaratna (24 companies). The dependent variables are taken all 24 companies Z-score of financial performance from year 2012 to year 2016 (in figure no.1) and independent variables are the median value of weightages of independent director’s responses. Based on this values of after analyze correlation, we found there are ‘weak correlation’ before the amendment of corporate governance act. 2013 and we found the “strong correlation” after the amendment of corporate governance act. 2013 shows in figure no 8 & 9. So we can say the paradigm shift in the role of Independent Director is now very much improved and strongly recommended.

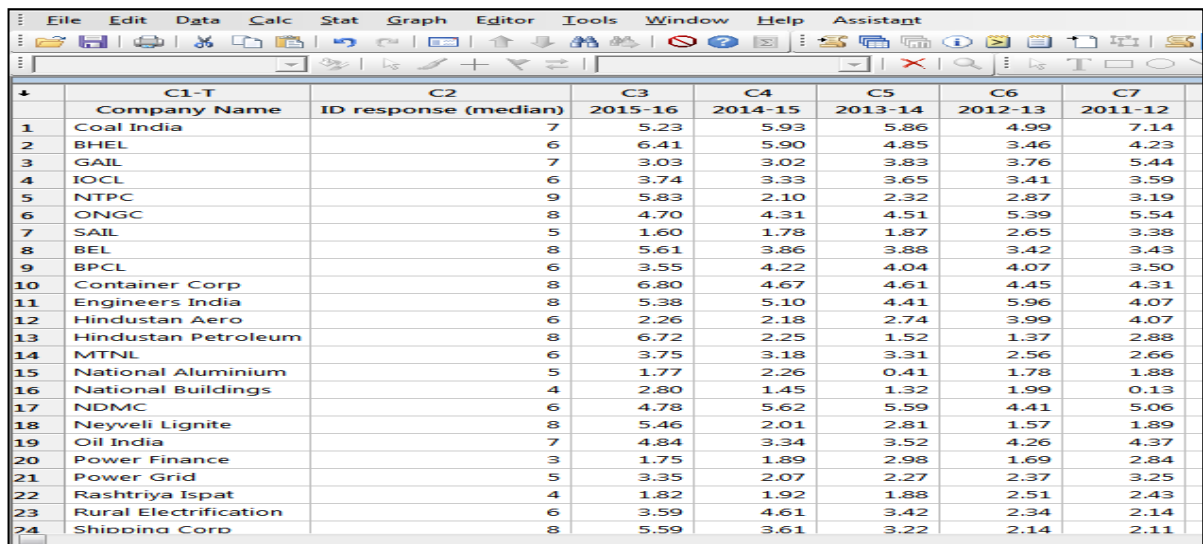
Our suggestions are based on finding of the study, valuable insights provided by the Independent Directors of the Public Sector Undertakings and a close study of the legislative reforms provided in the present scenario.

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Schedule IV, Code for Independent Directors, Companies Act, 2013

The following table’s data are used to analysis of Correlation using Data Mining Methods.



	C1-T	C2	C3	C4	C5	C6	C7
	Company Name	ID response (median)	2015-16	2014-15	2013-14	2012-13	2011-12
1	Coal India	7	5.23	5.93	5.86	4.99	7.14
2	BHEL	6	6.41	5.90	4.85	3.46	4.23
3	GAIL	7	3.03	3.02	3.83	3.76	5.44
4	IOCL	6	3.74	3.33	3.65	3.41	3.59
5	NTPC	9	5.83	2.10	2.32	2.87	3.19
6	ONGC	8	4.70	4.31	4.51	5.39	5.54
7	SAIL	5	1.60	1.78	1.87	2.65	3.38
8	BEL	8	5.61	3.86	3.88	3.42	3.43
9	BPCL	6	3.55	4.22	4.04	4.07	3.50
10	Container Corp	8	6.80	4.67	4.61	4.45	4.31
11	Engineers India	8	5.38	5.10	4.41	5.96	4.07
12	Hindustan Aero	6	2.26	2.18	2.74	3.99	4.07
13	Hindustan Petroleum	8	6.72	2.25	1.52	1.37	2.88
14	MTNL	6	3.75	3.18	3.31	2.56	2.66
15	National Aluminium	5	1.77	2.26	0.41	1.78	1.88
16	National Buildings	4	2.80	1.45	1.32	1.99	0.13
17	NDMC	6	4.78	5.62	5.59	4.41	5.06
18	Neyveli Lignite	8	5.46	2.01	2.81	1.57	1.89
19	Oil India	7	4.84	3.34	3.52	4.26	4.37
20	Power Finance	3	1.75	1.89	2.98	1.69	2.84
21	Power Grid	5	3.35	2.07	2.27	2.37	3.25
22	Rashtriya Ispat	4	1.82	1.92	1.88	2.51	2.43
23	Rural Electrification	6	3.59	4.61	3.42	2.34	2.14
24	Shipping Corp	8	5.59	3.61	3.22	2.14	2.11

Fig.1 Median value of Independent Directors responses and Altman Z-Score ratio of PSU's year wise financial performance

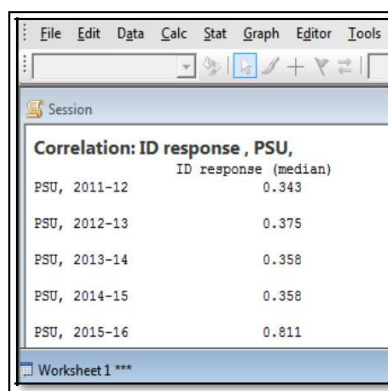


Fig.2 Pearson Correlation

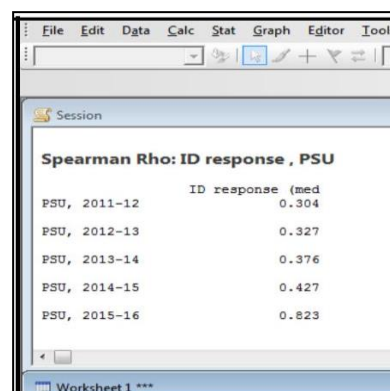


Fig.3 Spearman Correlation

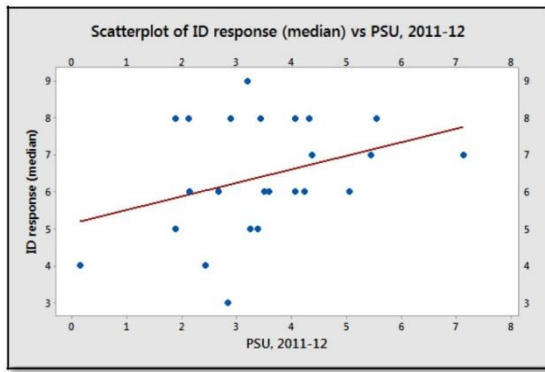


Fig. 4 Scatterplot of correlation year 2011-12

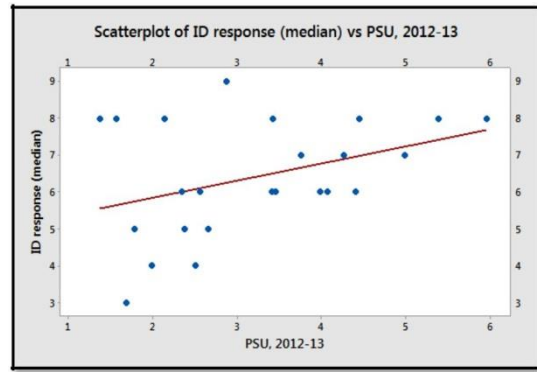


Fig.5 Scatterplot of correlation year 2012-13

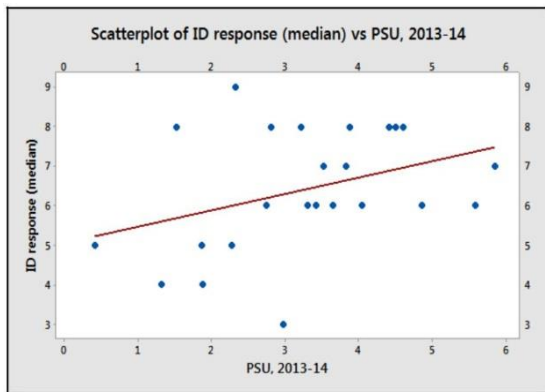


Fig.6 Scatterplot of correlation year 2013-14

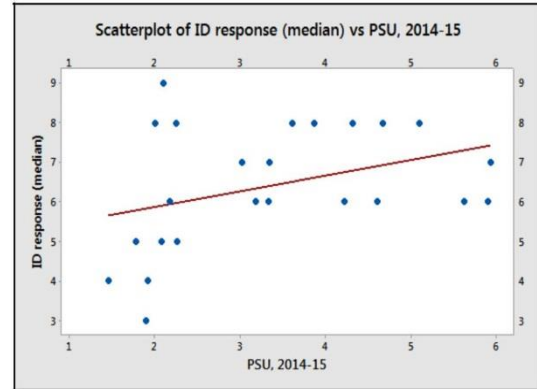


Fig.7 Scatterplot of correlation year 2014-15

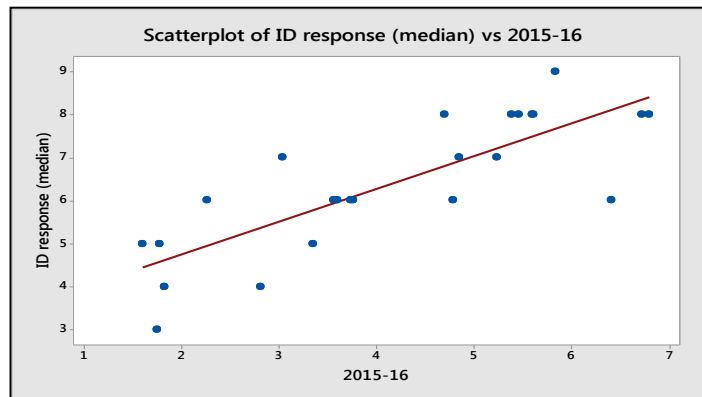
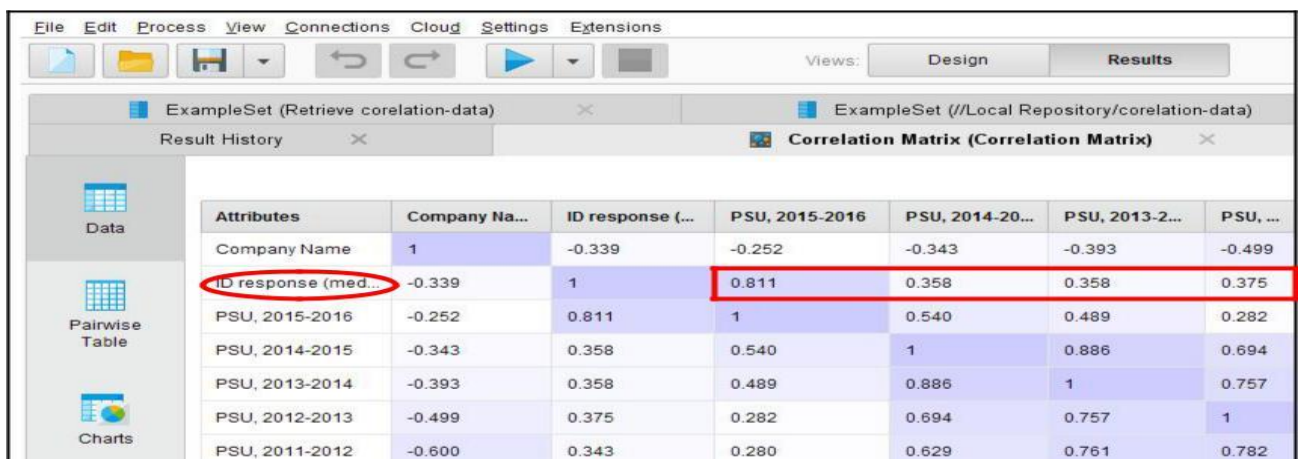


Fig. 8 Scatterplot of correlation year 2015-16



Attributes	Company Na...	ID response (...)	PSU, 2015-2016	PSU, 2014-20...	PSU, 2013-2...	PSU, ...
Company Name	1	-0.339	-0.252	-0.343	-0.393	-0.499
ID response (med...)	-0.339	1	0.811	0.358	0.358	0.375
PSU, 2015-2016	-0.252	0.811	1	0.540	0.489	0.282
PSU, 2014-2015	-0.343	0.358	0.540	1	0.886	0.694
PSU, 2013-2014	-0.393	0.358	0.489	0.886	1	0.757
PSU, 2012-2013	-0.499	0.375	0.282	0.694	0.757	1
PSU, 2011-2012	-0.600	0.343	0.280	0.629	0.761	0.782

Fig.9 Correlation between Independent Directors responses and Maharatna and Navaratna Companies financial performance from year 2011-12 to 2015-16