



The Relationship Between Social Performance and Corporate Financial Performance

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ABSTRACT

This study investigates the relationship between social performance and corporate financial performance based on the information of companies listed in Tehran Stock Exchange - Iran. Today, economic entity has to identify the needs of their surrounding environment and community and in general interested parties to continue their survival and link with executive operation of the manufacturing of their products and by explaining the necessities of community provide the best services and achieve their organizational goals by selling more products. Overall, the process to identify community needs and interested parties and surrounding environment and provide services to them placed in social performance framework which is considered as the important issues to achieve success for organizations in today's competitive world. Therefore, we can say that the companies which do better their social functions financially might be in a desirable place than other competitor. In this study have been selected 90 companies of Tehran stock exchange based on elimination sampling and in order to investigate whether good social performance also leads to better financial performance. Financial variables are ROA and ROE and social variables contain five dimensions of Mark vinola model which obtain from tracking in financial statements and notes and based on score between -2 and +2. Finally, we conclude that there is no significant relationship between the social performance and corporate financial performance.

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INTRODUCTION

In general, there is no similar framework for the pursuit of corporate social responsibility. (Clarkson, 1995) Each company has its special and individual features which is affective on perspectives toward performance method and explaining social responsibility strategies. (Harrison & Freeman, 1999). Move towards the institutionalization of corporate social responsibility in corporate governance should be in line with the organizational culture, vision and long-term strategies of company so that implementing social responsibility programs are not considered as a costly program on behalf of employees and shareholders. (Maon *et al.*, 2009)

Top companies should express their commitments to corporate social responsibility through their values and ensure that these commitments stream throughout the company. (Verschoor, 1998) Commitment to implementing these principles creates high level of assurance for interested parties and maintains them and due to awareness of their responsibilities against community in addition to risk management seek and persuade opportunities that implement useful project along with community and be careful to minimize any undesirable consequences. (Jardine *et al.*, 2003) For us, concept of corporate social responsibility i.e. how can we create wealth through responsible business. Therefore, the business practices of company contain scopes of employees, customers, contractors, environment, and community. Thus, a win – win relation and creating shared value both for community and for business is a conceptual foundation of corporate responsibility. Corporate social responsibility emphasizes on responsibility and response as base and foundation of

organization behavior in community and look on what responsible business is along with wealth production. (Carroll, 1999). This is a social need of community that defines the economic markets. (Wenger, 2000) Economic entities are responsible for all interested parties and interested parties include customer, employees, organization, consumer, environment, local community, neighbors, university and the nation's economy. (Holder-Webb *et al.*, 2009) Thus, business success is connected with the development community and there is a direct relationship between them. Why Microsoft and the Gates Foundation invest in Africa? (Letiche, 2010). The main reason is because by jumping from one level to the other level of development in this continent, Africa market will become the largest market for Microsoft products. Why the big oil companies like Shell spent nearly 5 percent of their income in R&D investments on renewable energies? (Sovacool, 2009) In fact, as we know, the system in the oil company has been well-developed. (Putra, 2016) This is because now they are leader of market in fossil fuels markets and they want to remain leader of energy market when these fossil fuels finish. Social damage of stunted development communities ultimately increases costs for firms. Why the world's largest enterprises are formed in developed countries and why their largest markets are in the developed societies? (Von Zedtwitz & Gassmann, 2002) Today, companies look corporate responsibility as a tool to how they can maximize their business benefits through it. (Porter & Kramer, 2002) Can expand market share through corporate responsibility activities? Can put itself as a more valid company through corporate responsibility activities? Can manage their own social risk through corporate responsibility activities and

cooperation with local organizations and has local permits for work? Can market through corporate responsibility activities and link its marketing with the social challenges to have a lasting name? Can near to policy makers and local authorities through corporate responsibility activities and provide its interests? Can flow a new soul in company through corporate responsibility activities and create more motivation in employees? Can solve some local problems around the company through corporate responsibility activities with collaboration and helping of a local charity? Can offer a new product to market through corporate responsibility activities and presence in less developed markets? Can create market for itself from the social-cultural and sport context of its activity area through corporate responsibility activities? The goals of economic entities from the movement toward corporate social responsibility and performance base on central interested party can express as follows: Fill the gap between the company's activities and the outside picture of company -Corporate social responsibility as a tool for market development- targeting and integrating the company's current diffuse activities in the field of corporate social responsibility in order to connection and synergy of corporate social responsibility activities in the other interorganizational processes in line with organizational ascendancy- Priority and selecting corporate social responsibility activities that can have the highest value-added for the company - Develop a framework of social responsibility annual report.

Our purposes of this study consider and focus on organizational responsibility and social responsibility in order to develop and survive our organization. In all level of

organization (corporate level, business level and functional level) this issue must be consider and it may change financial performance in long and short time. This issue effect on net profit and other financial factors who related on corporate. In this article we examine that this relationship and corporate financial performance. to show and test this relationship we consider hypotheses regarding the collected data. We do correlation analysis between variables which include return on assets in the given companies and returns on equity in these companies with corporate social performance and in fact among financial indexes or in other words financial performance and corporate social performance.

2. REVIEW OF PREVIOUS RESEARCHES

So far, research about the relationship between financial performance and social performance has met diverse results. (Orlitzky *et al.*, 2003) In some results, the relationship between financial performance and social performance was positive and some other was negative and also some other was neutral. (McWilliams & Siegel, 2001) Basic theory used in the definition of social performance, in fact, derived from shareholder's theory and neoclassical economic theory. (Donaldson & Preston, 1995) Some bodies, who have used the neoclassical economic theory, achieved negative results from this relationship and some bodies, who have used the shareholder's theory, achieved positive results from this relationship. (Hoskisson & Hitt, 1990) Husted has defined social performance in 2000 as follows: "The ability of companies to meet or expand the needs

of shareholders with regard to their social problems." (Husted, 2000)

In relation to the relationship between financial performance and social performance, there are two important issues. The issues are "direct relationship" and "cause and effect of relationship". (Ibua, 2014)

In direct relationship, there is positive and negative results and neutral to relationship. (Teasdale, 1983) The positive relationship means that the increase in social performance leading to an increase in the financial performance. In other words, any changes in social performance will lead to changes in financial performance. And when changes in social performance cause changes in financial performance but in a different way (for example increase in former cause decrease in later) there is negative relationship and when changes in social performance have no impact on financial performance, this relationship is natural or has not relationship.

Cause and effect of relationship between financial performance and social performance means that each of performance can be dependent or independent. In these circumstances, if social performance is independent variable, it comes first and then effects on financial performance. (Pearce *et al.*, 1985) But, if financial performance is independent variable, it comes first and then effects on social performance. Some researchers presented two theories about cause and effect relationship between social performance and financial performance that include: Scarce resources theory and good management theory. (Berman *et al.*, 1999)

Based on scarcer sources theory, business unit or company must obtain a

good financial position to be able to participate in social activities. (Szulanski, 1996) Company in social performance needs to obtain funds to success in financial performance. Based on this theory, financial performance comes first and social performance comes later. Thus, financial performance is independent variables that effects on social performance.

Based on good management theory, social performance comes first and then result in the effect on financial performance. (McGuire *et al.*, 1988). Based on this theory, social performance is Independent variable and thus a company is recognized by its shareholders by which obtaining the social good fame and background will result in positive changes in financial performance.

Seventeen researches conducted in 1970 which 12 cases achieve positive results and 1 case are negative results and 5 studies are meaningless. Thirty-six researches conducted in 1980 which 14 cases achieve positive results and 17 cases are negative results and 5 studies are meaningless. Eight researches conducted in 1990 which 7 cases achieve positive results and 1 case are negative results in relationship.

Also, some researchers investigated the relationship between social and financial performance. (Roman *et al.*, 1999) In their investigation on articles about relationship between social performance and financial performance, they achieved that a total of 127 articles between 1972-2002, 70 articles (55%) have positive result and 7 article (5%) have negative result and 28 articles (22%) achieve to insignificant relationship and 24 articles (18%) were also positive and negative. Here, we mention to a few examples of these studies and investigation of these results:

So far, most studies have achieved positive results and statistically insignificant relationship and negative results have been less. (Greenhaus *et al.*, 1990) We can understand from these researches that determination the relationship between social performance and financial performance is not possible under any circumstances. Using variables and probable aspects, it is required in different conditions in order to validate the results. These four variables that can be used to investigate the probable relationships between social performance and financial performance are: Business environment, business strategy, corporate structure and control system. (Shin, 2004)

Change performance in the organization or company is explained using environmental variables, strategy and organizational structure. (Child, 1972) In addition, accounting literature also explained organizational performance changes. (Abernethy & Brownell, 1999). As one of the important factors in organizational performance, organization or business environment can define as conditions that are changing usually and are unpredictable.

Lenz takes into account market structure, controlled industry and other related environments in concept of business environment as a factor effected in corporate performance under corporate financial performance. (Lenz, 1981) This definition of business environment have expanded in terms of market turbulence, competitive intensity and technological turbulence. (Jaworski & Kohli, 1993) In fact, market turbulence is the changes degree in customer composition and advantages can be predictor of business performance. Organization's activities in terms of market

turbulence constantly lead to changing products and services in order to customers' satisfaction. In lack of competition, a company performs its activity without any substantial effort and customers have not any selection or alternative to meet their needs. But, in the high competition by numerous alternatives to meet customers demand, the company will devote most effort to satisfy customers. Thus, the intensity of competition is directly related to organizational performance. The last aspect of organizational environment is technological turbulence, which is expressed as the rate of technological change. For a company with a characteristic of sensitivity to technological change, innovation from technological change can increase the competitive advantage of company without more focus on market orientation. Conversely, for a company that is no innovation in technology, greater efforts are towards market orientation. Thus, technological change is indirectly related to organizational performance. This concept of business environment is in line with the concept of some researchers from strategic uncertainty, which includes technological dependence, discipline and maintenance of market, complexity of value chain and simplicity of tactical response. (Pateman, 2015) Technological dependence is close to the concept of technological turbulence while discipline and maintenance of market refer to competitive intensity. (Menguc & Auh, 2006). According to the concept of business environment as multidimensional structure, some reports expand the concept of business environment with creating formal environment, which include more components like shareholders concept. These dimensions include: 1) competitors 2) Customer 3) suppliers 4) Specialist 5) regulators 6) economics 7) social - cultural,

and 8) international. (Achrol, 1997) According to the construction defined in the previous section, the business environment will be encountered with increase and decrease in corporate performance with regard to some studies. The organization which is faced with high uncertainty in the business environment has less ability to achieve organizational goals. (Daft & Lengel, 1986) This discussion has been represented by several studies, which show this claim that business environment is one of the factors that lead to strategic uncertainty and in turn decrease in organization ability to achieve organizational goals.

The strategy is a complex concept and will lead to the many definitions from strategy (Lenz, 1981). Some researchers classified the views of strategy that includes strategy as a view, strategy as a position, strategy as a program, strategy as a practice pattern, strategy as an action. (Chaffee, 1985) Strategy as a view refers to mission and insight of company that can be a base for all activities of company and determine the real value of company. Strategy as a position is a way that company will follow to compete in the market. This view led to the use of Porter's typology strategy (differentiation and low cost). (Porter & Kramer, 2002) Strategy as a program addresses a short-term program that is series of long-term program that is called strategy as a position. In this view, a company can successfully assess the implement of strategy. Strategy as a practice pattern is a practical program of company that supervises the failure of implement of strategy. In this view, the emergence of a new strategy is called emerging strategy. (Mintzberg & Waters, 1985) Last case, the strategy as an action is a technique that the company can do to fight competitors. If the views of strategy perform well, the strategy

can be an important factor in company performance. (Ghemawat, 2002)

A study that is related directly to the fitness of organization structure and performance is Sandino study. (Dittman *et al.*, 2008) He found that the interaction between control systems and organizational structure effects on organizational performance. Moreover, this view considers given which the fitness of relation for performance can be predicted based on the direct relationship between organizational structure variable and job satisfaction. If employees feel satisfied, the company is expected to increase its performance.

One of the functions of control system management or in short control system, it is to be a management tool for implementing the organization strategy. (Simons, 1991) With regard to the typology in control system, the system is comprehensive and includes: belief systems, boundary systems, diagnostic control systems and interactive control systems. In the control definition, control process focuses on the normal mechanisms or the process of comparison the realized and expected actions. (Collins *et al.*, 1997) According to this study, concept of control should be expand by adding three other concepts, belief systems, boundary systems and interactive control systems to avoid this problem. Belief system performance is imposing people to seek ways and new alternatives by providing an explicit picture from organization, mission, goals and beliefs by applying formal and informal system in organization. It is expected from mechanism of belief system that innovation and creativity in the organization will be updated to meet the expected growth constantly. Using boundary systems means to prevent unwanted effects of creativity and innovation by making some

restrictive rules for the conduct of business rules, strategic boundary and internal control. (Frow *et al.*, 2010) The role of interactive control system is to provide a solution to address the emergence of new and ambiguous strategies in those terms.

Based on above discussion, each of these variables according to scarce resources theory and good management theory might have positive and negative results as a modifier in relationship between social performance and financial performance of companies. According to the discussions in the previous section and review the background research, research hypotheses are as follows: There is a significant relationship between social performance and corporate financial performance.

3. METHODOLOGY

To test the research hypotheses regarding the collected data, we did correlation analysis between variables which include return on assets in the given companies and returns on equity in these companies with corporate social performance and in fact among financial indexes or in other words financial performance and corporate social performance.

First, we calculate the correlation coefficients between the mentioned variables separately since given years. It should be noted that calculation is performed base on the calculation method of Pearson correlation coefficients(r). The reason of this selection is normality of data. Then we address concept of significant in correlations and use the Fisher test for testing significance of calculated coefficients

to show that can be considered the correlation between two variables randomly or there is really a correlation.

Then, we calculated the determination or detection coefficients that how much dependent variable (social performance) is described by the independent variables (return on assets and returns on equity). In the end of this article, we designed and performed 10 regression models for 2 independent variables in 5 different years with dependent variable (social performance) to present more explicit analysis from relationship between variables.

The location of this study is limited to companies listed in Tehran Stock Exchange. The issue of this study is to investigate the relationship between corporate social performances and their relationship with financial performance and the time of this study contain companies listed in Tehran Stock Exchange during the five years 1384-1389. Statistical Society is all companies listed in Tehran Stock Exchange which are listed from 1380 in Stock Exchange and their trading symbol is not out of stock panel during the period of the study. The sampling method of this research is elimination method. In this method, a company that has not following conditions among all present companies should be eliminate and others are selected as sample: (a) At least they have been accepted in Tehran Stock Exchange from the beginning of 1380; (b) Their fiscal year lead up to December 31; (c) The companies that their stocks were traded during the course of study should not be interrupted in trading; (d) Data needed to calculate the variables in the research about companies is available during the study period; and (e) It shouldn't be investment and mediator companies. With regard to

these conditions, 90 companies are accepted in this research which overall performed 450 observations for five years and is applied elimination method.

4. RESULTS

In short of the results, we described into several tables. **Tabel 1** shows overall classification of social responsibility, whereas **Table 2** is calculated coefficient used in this study. **Tabel 3** discussed on result in respective likelihood, and **Tabel 4** presented result in probability.

The five dimensions used in this study derived using the following method. The evaluation of social performance indicators that can be extracted from financial statements and quantify them. For this purpose, we follow 4 dimensions of implementing these activities from financial statements and notes and will score them between -2 and +2. And finally from the sum of each of these activities, total score of social responsibility is derived. These aspects are as follows:

4.1 Social variables

The five dimensions used in this study derived using the following method. The evaluation of social performance indicators that can be extracted from financial statements and quantify them. For this purpose, we follow 4 dimensions of implementing these activities from financial statements and notes and will score them between -2 and +2. And finally from the sum of each of these activities, total score of social responsibility is derived. These aspects are as follows:

A: when we consider score +2 that companies perform these responsibility each year and insist on them. Overall it is

both component of organizational goals and also is performed.

B: when we consider score +1 that companies perform these cases in special time intervals or under conditions. Overall it isn't component of organizational goals but is considered.

C: when we consider score -1 that companies have not any attention to these responsibilities but if they don't perform these responsibilities, they aren't accountable to them.

D: when we consider score -2 that companies have not any attention to these responsibilities but if they don't perform these responsibilities, they are accountable to them. For example, some companies that disarrange eco-system and pollute environment but they cannot compensate or do complement duties.

$$\text{Return on assets} = \frac{(\text{Net income} + \text{interest})}{(\text{total assets})}$$

4.2. Financial variables

The financial performance also is calculated using indicators of returns on assets and returns on equity as follows:

1. Return on assets (ROA): This ratio is obtained from net income plus interest on the loan divided by total assets. The returns on total assets ratio show returns after income tax according to shareholders and borrowers in comparison with their total investment.

$$\text{Return on equity} = \frac{(\text{Net income of common stockholders})}{(\text{common equity})}$$

2. Return on equity (ROE): This ratio is obtained from net income to common stockholders (i.e. net income minus dividends paid to owners of preferred stock) divided by common equity.

Tabel 1. Overall classification of social responsibility

Description of social responsibility dimensions	Types of tasks in each of social responsibility dimension that can be extracted from Financial Statements and notes
corporate social responsibility dimension in leadership	1 - according to human rights and welfare assistance - (Charity) 2 - The fight against bribery and financial corruption (existence of internal control units and internal audit and inspection in connection with the evaluation of managers performance and report to shareholders) 3 - according to safety and health of products (existence of quality control unit)
social responsibility dimension in the workplace	1- existence of conditions to encourage employees (rewards and remuneration, and ...) 2- According to aspects of family welfare employees (lack of dejection and tranquility in the workplace) 3 - the possible of promotion of qualified employees in the workplace 4 - Training to employees while serving in Company 5 - The arrival of women in high-class Board of Directors and Management
corporate social responsibility dimension in responsibility	1 - Transparency and publish reports to interested parties 2 - Report in relation to organizational performance and achieve organizational goals 3 - accountability to interested parties (existence of services after presentation of products and warranty and...)
social responsibility dimension in market environment	1- serious attention to the environment and consideration to spending based on the type of products and production (disarrange the eco-system) 2 - existence of research and development unit 3 - pay attention to the type of production and equipment in production lines (new equipment to reduce energy and increase productivity) 4 - Organizing Seminars and meetings and sessions to relationship with interested parties and competitors and customers in order to identify and improving products (fair competition – lack of monopoly - responsibly advertising)
social responsibility dimension in community	1- relationship with the local environment and community (participation in school construction - Religious Places - bridges - the hospital and...some problems that community not able to solve them or responsibility Performance toward community like awareness of environment from danger of addicted to narcotic drugs or trainings for a good life

Tabel 2. Calculated coefficients

Correlation coefficient of return on assets 1385	r = 0.387
Correlation coefficient of return on assets 13856	r = 0.396
Correlation coefficient of return on assets 1387	r = 0.384
Correlation coefficient of return on assets 1388	r = 0.399
Correlation coefficient of return on assets 1389	r = 0.411
Correlation coefficient of return on equity 1385	r = 0.247
Correlation coefficient of return on equity 1386	r = 0.313
Correlation coefficient of return on equity 1387	r = 0.365
Correlation coefficient of return on equity 1388	r = 0.363
Correlation coefficient of return on equity 1389	r = 0.399

4.3. Data analysis and hypothesis test

In this study, we use the Pearson correlation coefficient to measure the relationship between two variables but in correlation coefficient changing it is necessary to pay attention to this fact that this coefficient only measures the linear correlation intensity between two random variables. If the correlation coefficient between two random variables is equal to zero, it means that there is no linear relationship between these two variables but may be have nonlinear correlation. However there is this fact that existence of intense correlation between two variables doesn't mean necessarily a cause and effect relationship between two variables.

4.4. Hypothesis test for correlation coefficient

Observations to calculate the correlation coefficient is generally a random sample of community and it isn't its total, thus the correlation coefficient calculated from the sample (r) will be estimation of the correlation coefficient of community (ρ). Sometimes it may happened to obtain extreme negative or positive correlation

between two variables based on a random sample and while these two variables haven't any association with each other, in other words, the reality is that the two random variables are not correlated with each other and correlation coefficient of these two variables in the community is zero, but the correlation coefficient calculated in sample shows non-zero quantity. To clarify the issue, we performed the Fisher hypothesis test for correlation coefficient.

Test statistic has t distribution with $n-2$ degrees of freedom. Therefore we can use from the table t (and in some cases where n is greater than 30 of Table z) for this test. If H_0 is accepted, we will conclude that our variables haven't linear correlation with each other and If H_0 isn't accepted, we will conclude that our variables have linear correlation with each other.

$$T \text{ statistic test} = R \sqrt{\frac{n-2}{1-R^2}}$$

$$H_0: \rho = 0$$

$$H_1: \rho \neq 0$$

Tabel 3. Result in respective likelihood

Variable Name	Determination Coefficient	Correlation coefficient	Computational statistics	Table statistics	Respective likelihood
B85	0.150	0.387	3.972	2.633	0.05
B86	0.156	0.396	4.045	2.633	0.05
B87	0.147	0.384	3.897	2.633	0.05
B88	0.159	0.399	4.083	2.633	0.05
B89	0.168	0.411	4.229	2.633	0.05
D85	0.061	0.247	2.391	2.633	0.05
D86	0.097	0.313	3.089	2.633	0.05
D87	0.133	0.365	3.677	2.633	0.05
D88	0.131	0.363	3.652	2.633	0.05
D89	0.159	0.399	4.081	2.633	0.05

4. DISCUSSION

The quantity of the test statistics (computational statistics) from the critical value of t table is more in all variables. Thus, hypothesis H_0 is rejected. With regard to above table results, calculated correlation coefficients (shown in **Table 3**) are significant at 5 level and because all sign of calculated correlation coefficients for all variables are positive, we can be concluded that there is a direct relationship between return on corporate assets and their social performance in all years. But, according to the regression coefficients estimated for the model, we should interpret significant or no significant to the relationship between social performance and financial performance of companies engage in this research which refer to the following.

4.1. Estimation of models

For evaluation of the relationship between social performance and financial performance of companies engage in this research for two variables of returns on assets and returns on equity during 5 years, we can be estimated 10 linear regressions between these two variables and social performance.

To estimation of designed regressions, we should do tests to ensure from

establishing the classical assumptions and ordinary least squares method is accepted as the best estimation method of linear regression. These tests were initially normality test of error terms. Then, we use LM correlation test to examine the autocorrelations between error terms and at last we use ARCH LM test for testing the presence or absence of variance heterogeneity in given models. Results from tests show that the designed models have the classical assumptions and can estimate OLS method for them.

According to results that are presented in **Table 4**, the β_{85} coefficient value is equal to 0.060521 positive and is significant at the 5% level. β_{86} coefficient value is 0.015163 and no significant, which represents the lack of relationship between social performance and return on equity in 1386. β_{87} coefficient value is 0.024342 and no significant and shows the same results in 1387. β_{88} coefficient value is 0.018988 and no significant. β_{89} coefficient value is 0.032648 and also no significant. δ_{85} , δ_{86} , δ_{87} coefficients values are, respectively, 4.468077, 0.034063, 0.066633. All of the three values are no significant. the δ_{89} and δ_{88} coefficients values are 0.075325 and 0.310852, respectively. This confirmed the values have significant.

Tabel 4. Result in probability

Coefficient	Amount	SD	t-statistic	Probability
β_{85}	0.060521	0.025245	2.397304	0.0186
β_{86}	0.015163	0.017403	0.871302	0.3860
β_{87}	0.024342	0.019587	1.242740	0.2173
β_{88}	0.018988	0.015614	1.216062	0.2273
β_{89}	0.032648	0.015811	2.064933	0.419
δ_{85}	4.468077	2.763143	1.617027	0.1096
δ_{86}	0.034063	0.039930	0.853055	0.3961
δ_{87}	0.066633	0.038706	1.721501	0.0888
δ_{88}	0.075325	0.035290	2.134469	0.0357
δ_{89}	0.310852	0.034797	2.333042	0.0220

Finally, given the small amounts of correlation coefficients and lack of significant in correlation coefficients in most years, we can interpret that social performance and financial performance of companies have no significant relationship with each other, in which this has been in a good correlation with several reports. (Murray *et al.*, 2006)

4.2. Suggestions based on research results

According to the present research results, we recommend to the companies and managers and decision makers in companies to have a broader vision and a deeper look into social performance. With regard to the lack of significant in the relationship between social performance and corporate financial performance based on research results and investigation observations of the executive board reports and financial statements (Griffin & Mahon, 1997), unfortunately corporate performance in most social indicators is negative and is

do not pay attention to this issue. Another important issue is that creditors and potential investors also don't pay attention to the importance of this issue and this issue will lead to social performance impact on the financial performance of companies become no significant.

It is also important that the community and citizens haven't awareness of their certain and civil laws and this issue cause while social responsibility don't observe on behalf of companies (e.g. environment destruction) they don't pursuit their rights and due to the lack of strong legal backing discouraged from pursuing these rights.

Therefore, we recommend that the government with positive measures that can perform in this field and by creating some legal requirements for companies and inform in this area, change the community perspective in corporate responsibility in comparison with what is now just as profitability into their surrounding

community to utilize both companies and interested parties from it.

Companies can also cause remarkable attention for users and increase profitability with responsible advertising and more participation in social affairs in today's competitive world.

5. CONCLUSIONS

ANN model was used to predict biodiesel yield conducted under supercritical MTBE condition. This study shows that ANN is a powerful tool for modeling and predicting biodiesel yield that was proven by a high value of coefficient of determination (R) of 0.9969, 0.9899, and 0.9658 and a low value of mean squared error (MSE) of 2.52×10^{-4} , 2.62×10^{-3} , and 4.46×10^{-3} for training, validation, and testing, respectively. Using this technique, the highest FAME yield can be determined of

0.93 mol/mol (corresponding to the actual FAME yield of 0.94 mol/mol) that was achieved at 400 °C, under the reactor pressure of 10 MPa, oil-to-MTBE molar ratio of 1:40 within 15 min reaction time. The model prediction using ANN gave R value higher than that using least square method, indicating that ANN model had better generalization ability to predict FAME yield.

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7. AUTHOR'S NOTES

The author(s) declare(s) that there is no conflict of interest regarding the publication of this article. Authors confirmed that the data and the paper are free of plagiarism.

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