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The Ranking of Fraudulent Financial Reporting By Using Data Envelopment Analysis: Case of Pharmaceutical Listed Companies

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ABSTRACT

Fraudulent financial reporting has been one of the most sensitive issues on the business world. Financial statements that conceal the company's facts have caused great losses to its stakeholders. The ranking of companies based on fraudulent financial reporting is one of the key issues for performance analysis. This study, by using financial variables and the data envelopment analysis methodology, ranked the pharmaceutical companies listed on the Tehran Stock Exchange in terms of fraudulent financial reporting. The data and theoretical framework of the research are based on library studies and data analysis has been done based on the data envelopment analysis model. The results of this study indicate that the most manipulation of profits in 2015 was in the Daru Amin and Faravordehaye Tazrighi companies, as well as Iran Daru and Sina Daru in 2016. This will lead to the companies being ranked at the highest level of fraudulent financial reporting.

1 Introduction

Over the past decade, fraudulent financial reporting has been one of the most sensitive issues on the business world, and also one of the critical, social and economic concerns. Previous research (e.g. [35]) has been shown that fraudulent financial reporting is one of the most common cases of litigation. Fraud can lead to manipulation, forgery or alteration of accounting information [47]. The study conducted by Association of Certified Fraud Examiner in 2012(ACFE) points to the fact that fraudulent financial reporting has become an increasingly important issue for both accounting and the community. This even undermined the reliability of the financial statements, which was used as a tool for assessing the future prospects of the business entity [34]. Financial statements that conceal the company's facts have caused great losses to its stakeholders. The ranking of companies based on fraudulent financial reporting is one of the key issues for performance analysis. DEA is a program to measure the relative efficiency of various observations and various researchers such as Cooper et al. [8] and Conrad, et al. [3] have measured the performance of sets of companies in a particular industry. Efficiency is usually defined as maximizing outputs for a fixed input level or minimizing inputs for a constant output level. In recent years, we have seen an increase in the use of data envelopment analysis in accounting research. For example, Nasr Esfahani et al. [32], by using data

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envelopment analysis, investigated the causes of reduced automotive productivity. Sherman et al. [39] also used the DEA to compare the performance of several bank branches to identify the branch to improve their performance. In recent years, we have witnessed various kinds of fraud in the financial sector. This is still a concern for the profession. Lack of earnings management in financial reporting by providing a positive and reliable picture can help to attract investors' capitals into country, which ultimately leads to a successful and strong economy [20]. On the one hand, the special importance of this issue for the country's economy, on the other hand we see the expansion and growth of companies listed to the stock exchange and the need for foreign investment. So awareness of instances of corruption, such as fraud, has become very important. The purpose of this paper is to rank the companies listed in the pharmaceutical industry using the data envelopment analysis approach. The contributions of this article can be summarized as follows: First, the results of this research can expand theoretical frameworks of previous studies on fraudulent financial reporting. Secondly, this awareness can provide useful information to policy makers in accounting in setting related rules to fraud issues.

2 Literature Review

This section reviews some of the related works.

2.1 Theoretical Fundamentals and Research Background

Many efforts have been made to provide a framework to distinguish earnings management behavior from fraudulent financial reporting. But so far, none of these efforts has been able to provide a framework that is agreed upon by the public. There is a narrow border between earnings management and fraud. According to many researchers in contrast to fraud, earnings management is conducted within the framework of Generally Accepted Accounting Principles and corporate rules [14, 45]. Nevertheless, both issues have similar goals and have the same effect on financial reporting. On the other hand, it is not always easy to determine whether some of the actions taken in relation to earnings management have crossed legal limits or not [28]. Based on Perols and Lounge [38], Firms engage in financial fraud because of limitations to manage their earnings. According to them, companies that have previously managed their earnings, are more likely to commit fraud. In fact, the accuracy of financial reports is dependent on the existence of these behaviors. Earning management plays an important role in determining financial information. Many evidence suggests that investors consider information content of the earnings more than operating cash flows [19]. Although many studies have been conducted on earnings management, however, few of these studies address the effective factors and motivations for such behaviors. Evidence suggests that companies manage earnings for different purposes. For example, the findings of Burgstahler, et al. [6] indicated that the widespread use of accounting information by stockholders and analysts to stock valuations can create incentives for managers to manipulate earnings for short-term impact on stock prices. Some researchers view the cause of manipulating earning information as the willingness of managers to increase stakeholder confidence, change the amount of tax and prevent losses due to violations of Debt covenants [20]. To avoid such behaviors, we need to know the motives behind these actions. Awareness of these factors can increase the disclosure and transparency of information in financial reporting [20]. The most important factors affecting earnings management that are used in this paper are as follows:

Financial leverage: The financial leverage ratio shows how much the business entity has borrowed for its financial needs. According to researches done by Spathis [40], companies with a high leverage ratio are at risk of bankruptcy if they do not pay their debt. Based on the debt hypothesis, restrictions are created in

order to protect lenders against managers' opportunistic actions. Since violations of debt covenants incur cost to managers, preventing such consequences creates incentives for managers to manage earnings considering the flexibility of accounting methods. Dechow et al. [10], argued the effects of high debt ratios on motivation to manipulate earnings. Sweeney's research [41] also showed unlike a number of companies that did not violate debt covenant, other sample companies took measures to increase earnings using accounting changes. In fact, the companies' financial leverage ratio will create incentives for earnings management. According to Iatridis and Kadorinis [22], companies that operate in a way that violates a debt contract, tend to manage earnings in order to control and overcome the financial suffering.

Tax: Prediction of the political hypothesis is that large companies use change in accounting methods to reduce reported earnings. This hypothesis is based on the assumption that bigger companies are attracting more attention than smaller ones. Deegan and Unerman [11] showed that the companies under political attention create an incentive for managers to reduce the reported earnings by adopting different methods. This hypothesis has been studied over the years in different countries. For example, the result of a research in China, showed between 2005 and 2006, when oil prices had risen, petrochemical companies decreased earnings in order to reduce the political costs. But the corporate tax rate is also considered an important scale for political costs. Governments easily identify companies with high profits to get more taxes. Trying to reduce the amount of payable tax creates incentives for managers to reduce their profits. A study by Boynton et al. [5] reviews the relationship between earnings management and the US Tax Reform Act of 1986. The results of this study confirmed the use of earnings management to avoid tax payments. Also, Desai et al. [12] showed tax avoidance can create opportunity for managers to manipulate earnings. Research Adhikari et al. [1] showed that Malaysian companies in accordance with the tax policy changes, manage their earnings. Marques et al. [29] found that firms would reduce their earnings by almost zero in case of high tax rates.

Operating cost to sales: Managers cannot achieve their goals by relying on accrual earnings management and they also use earnings management based on real activities. Increasing operating costs as a component of income statement can lead to manipulation of earnings by management as an influential factor. The high operational cost ratio creates this incentive for managers to manage earnings by shifting income statement items. This leads to a change in operating profit, which is a good basis for predicting financial analysts. Ultimately, it will spread false signals to the market and causes financial losses to investors. When managers' ability to manipulate accruals is limited, this incentive is created to manage earnings with real activities. The results of Fun et al. [18] showed that managers' disability in achieving the expected indicators leads to the targeted manipulation of operating profit. Many recent studies in accounting have focused on earnings management. The results of Etemadi et al. [16] indicated that free cash flows in companies are an incentive to manage earnings. Kordler et al. [13] showed companies manage their earnings through the sale of assets. Nouravesh et al. [33] by reviewing the companies listed in Tehran Stock Exchange concluded that companies manage earnings to minimize their taxes. According to Yoon et al. [46], if the operating performances are poor firms are more likely to manage earnings. Generally, companies can manipulate financial statements by using earnings management and committing fraud. Research by Perols et al. [38] showed earnings management in prior years increases the probability of committing fraud in financial statements. However McNicholas et al. [30] showed that earnings management influences investors' decisions. Researchers Beneish [4] and Palmrose et al. [36] found out that the market reacts negatively to misleading reporting, even if they are not fully aware of the manipulation. The analysis of financial statements allows decision makers to be aware of the company's status. Investors are looking for the best company to invest. Hence, the evaluation of firm' performance is important. There are many quantitative

and qualitative approaches for assessing performance and ranking. Dastgir et al. [9] analyzed the financial statements of 100 listed companies in Tehran Stock Exchange using data envelopment analysis. Saberi et al. [2] evaluated and ranked financial performance of the chemical firms listed in Tehran stock exchange via DEA. Izadikhah [24] employing the same approach, evaluate performance of bank branches in Markazi province. Furthermore, Hemmasi et al. [21] evaluated the efficiency of companies listed in a particular industry and then ranked by means of DEA.

2.2 Data Envelopment Analysis

Data Envelopment Analysis is a method based on linear programming approach, which aims to evaluate and compare the efficiency of several decision-making units of the same type. DEA is a completely nonparametric estimate that can assess the efficiency of decision-making units with multiple inputs and outputs. DEA models can be employed as an alternative for performance improvement, compared to other techniques, because of its unique characteristics in identifying the best performance [23]. Over the past decades, the number of researches on the performance and efficiency of business entities has increased. In this context, Thore et al. [42] should be mentioned. They examined the efficiency of manufacturing units in a particular industry using DEA. Wu [44] also, studied the performance of steel industry companies for a period of time and finally, by assessing the performance of these companies using data envelopment analysis, results revealed that nearly half of these business entities are inefficient. In fact, measuring performance is one of the aspects of measuring the performance of a business entity. According to Ludwin [27] it would not be possible, with just a few financial ratios, to evaluate firm's performance that produces multiple outputs. Chandra et al. [7] evaluated the efficiency of textile companies using a model of data envelopment analysis. They used the ratio of one output to two inputs for this assessment. Hatice et al. [15] also analyzed the performance of a significant number of industrial companies in Turkey by employing a non-radial DEA model. Mohammadi et al. [31] studied the performance of pharmaceutical companies listed in the stock market using data envelopment analysis. By specifying the most effective pharmaceutical company at that timeframe, suggested that managers of other companies listed in this industry should also develop efficiency frontier by optimizing the weighted output (input) ratio. A research by Khajavi et al. [26] to eliminate the constraints of traditional financial statements, used the data envelopment analysis technique with four inputs and seven outputs to evaluate the efficiency of 267 listed companies in the stock market. Jafari et al. [25] also using data envelopment analysis, identified the most efficient insurance companies listed on the capital market of Iran. Although the origin of the efficiency measurement is Farrell in 1957, which evaluated the efficiency of units as a ratio of output to input, but the theoretical development of this approach can be attributed to Charnes et al. In the CCR model which was presented by Charnes, Cooper, Rhodes [8], it is assumed that there are n decision-making units (DMUs) that every of them consumes m distinctive input of x_{ij} (i=1,..,m)and has s distinctive output of y_{rj} (r=1,…,s) . The objective is to obtain the ratio of the weighted output to the weighted input weights. Finally, the following linear programming model was introduced to evaluate the efficiency of the DMU. Basic efficiency is a ratio of output over input.

$$\begin{aligned} &\boldsymbol{max} \sum_{\boldsymbol{r=1}}^{\boldsymbol{s}} \boldsymbol{u_r y_{ro}} \\ &s.t. \\ &\quad \textstyle\sum_{\boldsymbol{i=1}}^{\boldsymbol{m}} \boldsymbol{v_i x_{io}} = \mathbf{1} \end{aligned} \tag{1}$$

$$\sum_{r=1}^{s} u_r y_{rj} - \sum_{i=1}^{m} v_i x_{ij} \leq 0, \qquad j = 1, \dots, n$$

$$u_r \geq 0, \quad v_i \geq 0 \quad \forall\, i, r$$

Where v_i and u_r are representation of ith input weights and r^{th} output weights of DMU.

$$\begin{aligned} &\theta^* = Min\ \theta \\ &Min\ \theta \\ &s.t. \\ &\sum_{j=1}^{n} \lambda_j x_{ij} \leq \theta x_{io} \qquad i = 1, \dots, m \\ &\sum_{j=1}^{n} \lambda_j y_{rj} \geq y_o \qquad r = 1, \dots, s \\ &\lambda_j \geq 0 \qquad j = 1, \dots, n \end{aligned} \tag{2}$$

λ_j: multipliers used for computing linear combinations of DMUs' inputs and outputs.

The dual problem of the linear program (1) is expressed with a real variable θ and a nonnegative vector λ_j of variables. CCR describe efficiency score between 0 and 1. $\theta^* = 1$ is optimal value. Model (2) is called a radial model, which can reduce the inputs along the radius with the same scale and can make decision-making units more efficient. In fact, radial models are based on the assumption that the decrease (increase) in the input (output) leads to reaching the efficiency frontier and may display the DMU efficiently while its input or output can be improved. This is while there are slacks in the real world that prevent them from reaching planned targets [43]. In fact, this decrease (increase) in the input (output) is heterogeneous. By deleting input excess and output shortfall, DMU can improve and become efficient. This problem can be solved by applying new variables as follows:

$X_0 = X\,\lambda + s^-$

$Y_0 = Y\,\lambda + s^+$

s^- : non-negative slack or potential reduction of input i of DMU

s^+: non-negative slack or potential increase of output r of DMU

Färe and Lovell [17] presented a non-radial model (3) for efficiency evaluation. Since their formulation is difficult to compute, so in this article we use the extended model (4) presented by Pastor et al. [37]. This means that instead of combining input and output in an additive way in the Russell model, the ratio between them was considered in the measurement.

(X_0, Y_0): The input and output vectors of the decision-making units.

$$\begin{aligned} &\boldsymbol{min}\ \boldsymbol{R_g(X_0, Y_0)} \frac{1}{m+s} \left(\sum_{i=1}^{m} \theta_i + \sum_{r=1}^{s} \frac{1}{\emptyset_r}\right) \\ &\boldsymbol{s.t.} \\ &\sum_{j=1}^{n} \lambda_j x_{ij} \leq \theta_i x_{io} \qquad i = 1, \dots, m \\ &\sum_{j=1}^{n} \lambda_j y_{rj} \geq \emptyset y_o \qquad r = 1, \dots, s \\ &\lambda_j \geq 0 \qquad j = 1, \dots, n \\ &\emptyset_r \geq 1 \qquad 0 < \theta_i \leq 1. \end{aligned} \tag{3}$$

And also

$$
\begin{aligned}
&\boldsymbol{min}\ \boldsymbol{R_e(X_0, Y_0)} \frac{\frac{1}{m}\sum_{i=1}^{m}\theta_i}{\frac{1}{m}\sum_{r=1}^{s}\emptyset_r} \\
&\boldsymbol{s.t.} \\
&\quad \textstyle\sum_{j=1}^{n}\boldsymbol{\lambda_j x_{ij}} \le \boldsymbol{\theta_i x_{io}} \qquad \boldsymbol{i = 1, \dots, m} \\
&\quad \textstyle\sum_{j=1}^{n}\boldsymbol{\lambda_j y_{rj}} \ge \boldsymbol{\emptyset y_o} \qquad \boldsymbol{r = 1, \dots, s} \\
&\quad \boldsymbol{\lambda_j \ge 0} \qquad \boldsymbol{j = 1, \dots, n} \\
&\quad \boldsymbol{\emptyset_r \ge 1} \\
&\quad \boldsymbol{\theta_i = \frac{X_i - s^-}{X_i}} \\
&\quad \boldsymbol{\emptyset = \frac{y_r + s^+}{y_r}}
\end{aligned}
\tag{4}
$$

θ : the technical efficiency score of a DMU in input-oriented approach
$\emptyset$: the technical efficiency score of a DMU in output-oriented approach

In fact, the model (4) uses incremental (decreasing) $\theta_i$and $\emptyset_r$ ratios for each input and output and calculates the full efficiency for a DMU. Given that model (4) offers the full functionality of DMUs, it is an efficient model for data envelopment analysis that can be used for evaluation and ranking. So, in the next section, we will use this model to rank the statistical population of the study.

3 Methodology of Research

The studied companies in this research include listed pharmaceutical companies in the Tehran Stock Exchange in 2015 and 2016. The number of these companies is 19 per year and a total of 36. Russell model (4) suitable criteria for evaluating and ranking companies in the study. According to previous studies, variables such as operating cost to sales, debt to asset ratio, tax ratio, and earnings management were selected for measuring. The mentioned indicators are divided into two categories: input and output:

Inputs
1- Operating cost to sales ratio
2- Debt to asset ratio
3- The tax to profit ratio

Output
1- Earnings Management

Total accruals can be categorized into nondiscretionary and discretionary accruals. Discretionary accruals often provide managers the opportunities to manipulate earnings due to the flexibility available. So, they are a better proxy for earnings quality. This study employs the following model in estimating total accruals:

$$TAC_{it} = (\Delta CA_{it} - \Delta CASH_{it}) - (\Delta CL_{it} - \Delta STD_{it}) - DEP_{it}$$

where $TACit$ is the total accrual for firm i in time period t; $\Delta CAit$ is the change in current assets for firm i in time period t–1 to t; $\Delta CASHit$ is the change in cash balance for firm i in time period t–1 to t; $\Delta CLit$ is the change in current liabilities for firm i in time period t–1 to t; $\Delta STDit$ is the change in long-term debt included in current liabilities for firm i in time period t–1 to t; and $DEPit$ is the depreciation and

amortisation expense for firm *i* in time period *t*–1 to *t.* There are many regression model used to estimate discretionary accrual. In this research, we used the following model to measure earnings management. The error resulting from the estimation of the model represents the level of earnings management practices.

$$TAC_t/ TA_{t-1}= a_0 + a_1\ 1/TA_{t-1}+a_2(\triangle REV_{it} - \triangle REC_{it}) + a_3\ PPE_{it} + a_4\ ROA_{it} + e_{it}$$

Where *it TAC* is total accrual for firm *i* in year *t*, *TA i*,*t*- 1 is total assets for firm *i* at the end of year *t*–1, ⊿ *REV it* is change net sales for firm *i* between years *t*=1 and *t*; ⊿*REC it* is change in receivables for firm *i* between years *t*–1 and *t*, *PPE it* is gross property, plant and equipment for firm *i* in the year *t, ROA_{it} is* the return on assets for firm *i* in the year *t* and ε*it* is the error term.

Table 1: Information on the input and output of companies

Row	Company	Year	Input 1	Input 2	Input 3	Output 1
1	Alborz Daru	2015	0.4985446	0.4065088280	0.207371909	0.020318696
2	Iran Daru	2015	0.6789177	0.6316476543	0.159238262	0.015252845
3	Pars Daru	2015	0.6573496	0.6271215446	0.108663777	0.130447698
4	Mavad daru pakhsh	2015	0.6229347	0.6508207322	0.129904174	0.049406486
5	Abourihan Daru	2015	0.6554250	0.8207873536	0.118619309	0.107064473
6	Osweh Daru	2015	0.4824998	0.5842941004	0.163691532	0.023748191
7	Exir Daru	2015	0.7500942	0.8381164502	0.067137995	0.135698201
8	Daru Amin	2015	0.6520399	0.4699244542	0.120095645	0.217666706
9	Jabben Hayan Daru	2015	0.5104709	0.5499368287	0.107195931	0.012107825
10	Zahrawi Daru	2015	0.6348318	0.7977819317	0.118036027	0.126989556
11	Farabi Daru	2015	0.6834450	0.6399090437	0.101904734	0.098937532
12	Kosar Daru sazi	2015	0.8129436	0.4576543837	0	0.11112935
13	Loghman Daru	2015	0.8910788	0.7695637915	0	0.157194706
14	Darupakhsh Shimi	2015	0.8047098	0.7975099903	0.107351442	0.014684917
15	Faravordehaye Tazrighi	2015	0.4503185	0.2039711914	0.198638465	0.153251135
16	Karkhanegat Darupakhsh	2015	0.6652416	0.8172448483	0.097147972	0.197888233
17	Kimi Daru	2015	0.6661069	0.5956976081	0.145626398	0.018891934
18	Razak Daru	2015	0.6884054	0.6946980503	0.113381434	0.179718297
19	Sina Daru	2015	0.4627340	0.4704044894	0.190469775	0.053500222
20	Alborz Daru	2016	0.5076888	0.4210040577	0.210202159	0.019183393
21	Iran Daru	2016	0.6347274	0.6917893905	0.145658834	0.180597793
22	Pars Daru	2016	0.6265261	0.6235027547	0.135509232	0.01942938
23	Mavad daru pakhsh	2016	0.6420554	0.6281742170	0.12794119	0.093950985
24	Abourihan Daru	2016	0.6067694	0.7439141650	0.139734497	0.035919228
25	Osweh Daru	2016	0.4999302	0.6067576059	0.18526513	0.000108637
26	Exir Daru	2016	0.7314391	0.8181873159	0.075892662	0.09109924
27	Daru Amin	2016	0.6398248	0.5125772182	0.163934897	0.056619178
28	Jabben Hayan Daru	2016	0.5410082	0.5665499709	0.110812966	0.010942833
29	Zahrawi Daru	2016	0.6044599	0.8465418246	0.12668705	0.050379844
30	Farabi Daru	2016	0.7215869	0.6534670149	0.150752748	0.111222489
31	Kosar Daru sazi	2016	0.8621624	0.5484009321	0	0.035786529
32	Loghman Daru	2016	0.8721202	0.7731267501	0.013601715	0.076148556
33	Darupakhsh Shimi	2016	0.8189227	0.6780847718	0.129485987	0.148118667
34	Faravordehaye Tazrighi	2016	0.4253983	0.2188546053	0.205166131	0.027884726
35	Karkhanegat Darupakhsh	2016	0.6448103	0.8247423405	0.097830391	0.093959984
36	Kimi Daru	2016	0.6677834	0.6337926737	0.126416535	0.051986849
37	Razak Daru	2016	0.6089496	0.7203798182	0.121801475	0.141930323
38	Sina Daru	2016	0.4691468	0.4198949708	0.198139541	0.1343426

We calculated discretionary accruals, by matching the firm-year observation of the sample firm from the same industry and year through using the cross-sectional in Eviews. Discretionary accruals for firm *i* at year *t* is the absolute value of the residual from the estimation model.

4 Research Findings

The input and output data for companies are presented in Table 1. At this stage, by using the model (4), we evaluate the efficiency of pharmaceutical companies. We will use the Lingo 11 software to run the model. The results of model implementation are presented in Table 2 below.

Table 2: Corporate Performance Score

Row	Company	Year	Efficiency
1	Alborz Daru	2015	0.094
2	Iran Daru	2015	0.057
3	Pars Daru	2015	0.568
4	Mavad daru pakhsh	2015	0.203
5	Abourihan Daru	2015	0.422
6	Osweh Daru	2015	0.105
7	Exir Daru	2015	0.609
8	Daru Amin	2015	1.000
9	Jabben Hayan Daru	2015	0.060
10	Zahrawi Daru	2015	0.512
11	Farabi Daru	2015	0.434
12	Kosar Daru sazi	2015	0.666
13	Loghman Daru	2015	0.666
14	Shimi Darupakhsh	2015	0.056
15	Faravordehaye Tazrighi	2015	1.000
16	Karkhanegat Darupakhsh	2015	0.858
17	Kimi Daru	2015	0.075
18	Razak Daru	2015	0.738
19	Sina Daru	2015	0.248
20	Alborz Daru	2016	0.087
21	Iran Daru	2016	0.700
22	Pars Daru	2016	0.079
23	Mavad daru pakhsh	2016	0.388
24	Abourihan Daru	2016	0.141
25	Osweh Daru	2016	0.001
26	Exir Daru	2016	0.417
27	Daru Amin	2016	0.231
28	Jabben Hayan Daru	2016	0.052
29	Zahrawi Daru	2016	0.199
30	Farabi Daru	2016	0.412
31	Kosar Daru sazi	2016	0.184
32	Loghman Daru	2016	0.325
33	Shimi Darupakhsh	2016	0.548
34	Faravordehaye Tazrighi	2016	0.179
35	Karkhanegat Darupakhsh	2016	0.404
36	Kimi Daru	2016	0.212
37	Razak Daru	2016	0.588
38	Sina Daru	2016	0.640

Since the purpose of this research is corporate rating based on fraudulent financial reporting, the company with the highest proportion is known as the most non-transparent unit. As can be seen from Table 2, Daru Amin and Faravordehaye Tazrighi both in 2015, as well as Iran Daru and Sina Daru in 2016 were identified as companies that the most manipulative earning has taken place in them. However, Osweh Daru in 2016, and also Shimi Darupakhsh in 2015 with a lower output to input ratio, have better status.

5 Discussion and Conclusions

This paper studied and evaluated the data of 19 listed companies in the pharmaceutical industry of Tehran Stock Exchange between 2015 and 2016. By using data envelopment analysis approach, they are ranked according to fraudulent financial reporting. Data Envelopment Analysis is an effective and flexible approach that can simultaneously consider multiple input and output variables for corporate assessment. By doing this, it's easy to compare different business entities in an industry. In fact, Data envelopment analysis (DEA) approach compares any company with other companies with the same industry in terms of efficiency. This comparison is a suitable one because in traditional analyses, efficiency of each company is compared with mean or median of the sample companies of the research. In this study, the variables of operating cost to sales, debt to asset ratio, tax rate as input and earnings management as output were selected. Then, using the Russell model and its implementation in the Lingo 11 software, it was observed that Daru Amin and Faravordehaye Tazrighi both in 2015, as well as Iran Daru and Sina Daru in 2016, according to the input and output indicators had the most manipulation of earnings. This will lead to the companies being ranked at the highest level of fraudulent financial reporting. At the same time, Osweh Daru in 2016 and also Shimi Darupakhsh in 2015 with the lowest output-to-input ratio, ranked at the bottom of this classification. Evidence and findings of his research can provide useful information to investors to rely on financial statements and also give useful information to the policymakers in the pharmaceutical industry to limit these behaviors by applying rules. It is suggested that the Tehran Stock Exchange, by ranking companies in terms of fraudulent financial reporting, using data envelopment analysis, can create incentive for business entity managers to enhance the reliability of financial statements. In fact, to improve efficiency awareness of corporate performance is essential. DEA is a simple practical method that plays an important role in achieving this goal and thereby increasing their competitive ability in domestic and foreign markets. Many researchers used DEA in operations and management accounting contexts to evaluate the relative efficiency of small sets of firms within a specific industry and location. The advantages of this method is that it creates a natural ranking of companies in terms of efficiency and also highlights the strengths and weaknesses of each company. Over the past decades, the number of researches on the performance and efficiency of business entities has increased. On the other hand, since investment is an important issue that leads to the development of countries, the DEA approach by evaluating efficiency of companies can offer for investors to reinforce decision making.

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