



# Modern Analysis of Financial Statements: Pharmaceutical companies in Iran

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## ABSTRACT

**Objective:** In this paper aims to overcome the problems associated with traditional financial analysis, have studied new methods for financial analysis in the Iran pharmaceutical industry. **Methodology:** In this regard, single-stage and two-stage DEA has been used. The data has been gathered from financial statements for 2014 and the analysis focused on efficiency. Finally, by pay attention to the second sheet of paper, concluded that DEA single-stage and two-stage complement each other. **Results:** The results showed that the gabor based unsupervised learning described in the present study was able to produce accurate results in the classification of breast cancer data and the classification rule identified was more acceptable and comprehensible. **Conclusion:** There is a strong correlation between the two methods, and they don't show the same things so these two methods are complementary. Also not superiority On each other and both should be used with financial ratios. so The results in this research are not in same way with the results saravanan article but But the same with pitchumani research.

## 1. Introduction

Classical methods for the analysis of financial statements is not enough, because it is contradictory. Therefore complementary approaches need to be able to more thoroughly analyze. Thus, we use the single-stage and two-stage DEA.

### 1.1 Research framework

In this section, describe activity Based Costing, industry, DEA and DEA two-stage

### 1.2 Activity-Based Costing

It is a new system costing and can be used to provide appropriate information in decision-making. Activity-based costing is a costing method in which costs are allocated primarily to activities and then the total cost will be prorated according to each product (Based on the consumption of activity). Therefore, activity-based costing is based on activities consumption by products and resource consumption by activities (Angayarkanni and Saravanan, 2007).

### 1.3 DEA

When the routine Measurement method of efficiency is unable, dea helps us to solve the problems mentioned above, such data input and data output with different scales and incomparable And Weight valuation differently in terms of per unit. dea allowed to each decision-making unit to choose a set of weights that show the units in the most favorable situation than other units (Atash Pour and Noorbakhsh, 2010).

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#### 1.4 Industry

The same set of companies that work in the fields of raw materials and production and sales

#### 1.5 DEA two-stage

It is convenient for process that have two-stage And measures the efficiency of the first stage , the second stage , And the whole process . DEA two-stage provides the inefficiency of the whole process

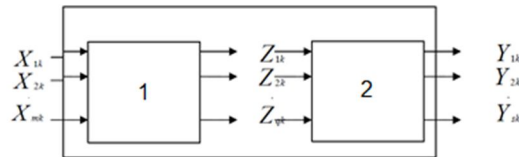


Figure 1. input and output and intermediate scale

#### 1.6 Literature review

In an article, (Abolfathi, 2015) have tried to identify the appropriate number of clusters using k-means. Then, the proposed method has been used along with the neural network to determine the appropriate number of final clusters. The clustering neural network has been used for the final clustering. The SOM architecture has been employed in neural network. The data were collected from the users of the central library of Science and Research University through using questionnaire. Finally, they stated that this approach can properly identify the number of clusters and provide appropriate clustering

In an article entitled the hybrid model of neural network and data envelopment analysis for the analysis of financial statements of companies in the Tehran Stock Exchange, (Abolfathi, 2013) have explained the disadvantages of traditional analysis. Then, they have used their hybrid model to identify companies which are more productive. They have stated that the hybrid model along with the traditional analysis can depict the status of companies and their financial health better (Chavan, 2009).

G. S. Uttreshwar, A. A. Ghatol in article by name, Hepatitis B Diagnosis Using Logical Inference and Self-Organizing Map presents analyzed the application of artificial intelligence in conventional hepatitis B diagnosis In this research, an intelligent system that worked on basis of logical inference utilized to make a decision on the type of hepatitis that is likely to appear for a patient, if it is hepatitis B or not. Then Kohonen's self-organizing map network was applied to hepatitis data for predictions regarding the Hepatitis B which gives severity level on the patient. Results: SOM which is a class of unsupervised network was used as a classifier to predict the accuracy of Hepatitis B. Conclusion: We concluded that the proposed model gives faster and more accurate prediction of hepatitis B and it works as promising tool for predicting of routine hepatitis B from the clinical laboratory data (Christsen, 2008).

S.Pitchumani Angayarkanni, V.Saravanan have presented an article titled SOM Based Visualization Technique for Detection of Cancerous Masses in Mammogram.

They got a fair segmentation is obtained The artificial neural network with unsupervised learning together with texture based approach leads to the accuracy and positive predictive value of each algorithm were used as the evaluation indicators. 121 records acquired from the breast cancer patients at the MIAS database. The results revealed that the accuracies of texture based unsupervised learning has 0.9534 (sensitivity 0.98716 and specificity 0.9582 which was detected thorough the ROC. The results showed that the gabor based unsupervised learning described in the present study was able to produce accurate results in the classification of breast cancer data and the classification rule identified was more acceptable and comprehensible (Shokri Nooshnagh, 2008).

Smruti Sourava Mohapatra, Prasanta Kumar Bhuyan have presented an article titled Self Organizing Map of Artificial Neural Network for Defining Level of Service Criteria of Urban Streets in this study, Defining LOS is basically a classification problem and application of cluster analysis is found to be a suitable technique to solve the problem. Self-Organizing Map (SOM) a type of Artificial Neural Network (ANN) used to solve this classification problem. For this study, lot of speed data is required for which GPS is found to be the most suitable method of data collection and hence extensively used. Free flow speed (FFS) and average travel speed during peak and off peak hours inventory of road segments are used in this study. FFS ranges for different urban Street Classes and speed ranges of LOS categories found to be lower than that mentioned in HCM-2000

Eshlaghy and Alinejad (2011) , have presented a model to predict the behavior of customers in selected restaurants by using neural network . they have considered the quality and perceived values of the customer experience and used the neural network to predict the behavior of customers . in this research Customers behavioral factors were classified in four classes also the neural network model showed the correlation coefficient equal to 84% . finally their results offered that neural network has been strong to recognize the behavior of customers .

Yousefipourjeddi and radfar (2014) , have used neural network and fuzzy qfd to understand customer needs in product development . They combined Qfd matrix results and Fuzzy ahp. Also they trained neural network by using qfd matrix data. Their results showed that the combination of neural network and and fuzzy qfd provide a robust decision support system (Smruti Sourava and Kumar Bhuyan, 2009).

## 2. Materials and methods

### 2.1 Methods

This article related to the financial sector And the instruments used is Operations Research. The data was contained in the financial statements midterm second half of 2014. The financial statements belonging to the Iran Pharmaceutical industry. These companies were selected on the basis that they are not losing and they have appropriate financial ratios. We used the single-stage and two-stage DEA models to analyze the data. We present in the following formula to calculate efficiency in two-stage procedure. In the following we presented formula to calculate efficiency in two-stage procedure:

$$\begin{aligned}
 E_k &= \max \frac{\sum_{r=1}^s u_r Y_{rk}}{\sum_{i=1}^m v_i X_{ik}} \\
 \text{s.t.} \quad & \frac{\sum_{r=1}^s u_r Y_{rj}}{\sum_{i=1}^m v_i X_{ij}} \leq 1, \quad j = 1, \dots, n \\
 & u_r, v_i \geq \epsilon, \quad r = 1, \dots, s; \quad i = 1, \dots, m.
 \end{aligned}
 \qquad
 \begin{aligned}
 E_k &= \max \sum_{r=1}^s u_r Y_{rk} \\
 \text{s.t.} \quad & \sum_{i=1}^m v_i X_{ik} = 1, \\
 & \sum_{r=1}^s u_r Y_{rj} - \sum_{i=1}^m v_i X_{ij} \leq 0, \quad j = 1, \dots, n, \\
 & \sum_{p=1}^q w_p Z_{pj} - \sum_{i=1}^m v_i X_{ij} \leq 0, \quad j = 1, \dots, n, \\
 & \sum_{r=1}^s u_r Y_{rj} - \sum_{p=1}^q w_p Z_{pj} \leq 0, \quad j = 1, \dots, n, \\
 & u_r, v_i, w_p \geq \epsilon, \quad r = 1, \dots, s; \quad i = 1, \dots, m; \\
 & p = 1, \dots, q.
 \end{aligned}$$

The second stage efficiency model is similar to the first stage efficiency. In this research, Input is administrative costs and sales data, financial expenses, tax expenses and the Output is net profit, operating profit and the intermediate scale is Net sales. Their selection was based on activity-based costing techniques and matlab was used in this study (Sparks, 2001).

## 3. Discussion and results

### 3.1 The findings and conclusions

At first, present the table of the data collected:

**Table1. present the table of the data collected**

Administrative and selling expenses	Financial expenses	Tax expense	Net profit	Operating Profit	net sales	companies
21257	17594	29240	104613	147042	301982	Iran daroo
15764	42332	9666	35602	84305	258969	roze
5668	1676	607	12098	11696	66355	shirin
84975	44750	70386	255578	364955	816304	osveh
8091	32699	7763	51015	89654	362775	Alborz yalk
49181	318779	48198	162201	524118	1306634	Pakh daroo
21837	7250	39903	131161	175448	461795	Tolid daroo
27301	50309	25263	125208	205119	476194	amin
5417	372	7343	32176	32976	90684	jam
36558	19151	77336	264003	358504	693514	sobhan
35986	111757	42361	149820	302513	777506	reyhan
25137	24753	64309	223900	309320	643119	sina
60815	40751	79373	274791	392836	916105	alborz
13439	22805	19993	71715	71715	283785	fars daroo

38051	188992	74107	269591	269591	1327254	zahravi
35144	72190	44124	177442	177442	927856	jaber
81259	110418	58585	377429	377429	991580	razak
61311	146738	59419	238560	238560	1204814	farabi
11578	7001	7468	42319	44334	274942	loghman
128220	149497	19192	40083	204284	658484	abidi

Table 2 shows the calculation of the different efficiency

**Table 2. efficiency of single-stage and two-stage method**

Second sub efficiency DEA two-stage	First sub efficiency DEA two-stage	Total efficiency DEA two-stage	Total efficiency DEA single-stage	companies
94.19%	56.56%	53%	90.58%	Iran daroo
62.97%	52.36%	33%	72.10%	roze
47.89%	100.00%	48%	100.00%	shirin
86.49%	42.10%	36%	83.87%	osveh
47.81%	100.00%	48%	100.00%	Alborz yalk
77.60%	59.25%	46%	96.04%	Pakh daroo
74.61%	100.00%	75%	97.52%	Tolid daroo
83.33%	55.65%	46%	99.75%	amin
93.21%	100.00%	93%	100.00%	jam
100.00%	82.56%	83%	100.00%	sobhan
75.27%	55.27%	42%	80.53%	reyhan
93.04%	98.10%	91%	100.00%	sina
82.95%	62.38%	52%	90.62%	alborz
66.38%	69.35%	46%	79.11%	fars daroo
53.36%	77.80%	42%	89.53%	zahravi
50.24%	80.88%	41%	79.63%	jaber
99.99%	43.01%	43%	100.00%	razak
52.01%	56.59%	29%	68.01%	farabi
40.43%	100.00%	40%	91.95%	Iran daroo
60.01%	38.43%	23%	63.37%	roze

According to Table, jam and sina have the most efficiency in both ways . for osveh company , The total efficiency in two-stage model is 36 percent and Total efficiency in single-stage model is 84 percent . for fars daroo Total efficiency in single-stage model is 80 percent and The total efficiency in two-stage model is 46 percent Which one against the expectance . It must be understood has the mathematical reason (Uttreshwar, 2008).

#### 4. Conclusion

There is a strong correlation between the two methods, and they don't show the same things so these two methods are complementary. Also not superiority On each other and both should be used with financial ratios. so The results in this research are not in same way with the results saravanan article but But the same with pitchumani research . Also enjoying all the modern and traditional methods alongside each other is better And gives photorealistic Status of Company.

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