Ranking of Companies Considering TOPSIS-DEA Approach Methods (Evidence from Cement Industry in Tehran Stock Exchange)

Ali Mansouri
Accounting and Management Department
University of Zanjan, Zanjan, Iran
alli_mansory@yahoo.com

Naser Ebrahimi
Department of Accounting and Management
Zanjan Branch, Islamic Azad University, Zanjan, Iran
mor_ram_2005@yahoo.com

Morteza Ramazani
Department of Accounting and Management
Zanjan Branch, Islamic Azad University, Zanjan, Iran
mortezaramazani@ymail.com

Abstract

Ranking techniques has always been the main concerns of managers. There are a lot of qualitative and quantitative approaches for ranking. However most of the approaches to ranking corporations in stock market suffer from low validity thus the obtained results will be invalid. When the evaluation carried out merely through qualitative or quantitative approaches alone, the advantages of integration will be ignored. Thus logically the efficiency of result will be questionable. Therefore in this paper the advantages of qualitative and quantitative approaches are integrated to bring about more precision in values of input and output indices. Hence in this paper integrated approach, Technique for Order Preference by Similarity to the Ideal Solution (TOPSIS) and Data Envelopment Analysis (DEA), have been introduced to rate active companies in cement industry accepted in Tehran Stock Market. The approach adopted in this paper is applicable at any condition to stock ranking. The research carried out during 2006-2012 and the population of the research includes accepted companies in stock market in cement industry (28 companies). Finally a precise ranking of the companies is presented by hybridized technique. When the result presented to stock market experts, the majority of participants admired integrated approach to companies ranking.

Keywords: Ranking Companies, Cement industry, DEA, TOPSIS, DEA-TOPSIS.

1. Introduction

Investment is an important matter which brings about development and advancement to all countries. While investment is injected into proper areas it will be valuable otherwise it will be useless. Stock market is one of the proper areas for investment (Mehrghan, 2004). In the modern world, economic development owes to stock market and activities of capital market. Stock market is an official and organized market in which the bonds accepted in it are traded between buyers and sellers based on specific rules. Regarding vast volume of transactions, stock market seems to be among the main investment centers. Thus the extent of accepted companies in stock market somehow brings about astonishment among investors (Shahrabadi, 2010). Correct evaluation of companies in industries can reflect the status of various companies considering their rivals, specific pros and cons, opportunities and threats of companies. Firm evaluation plays prominent

role in industry. Investors are always looking for the best area to invest in order to gain more interests. Thus they always try to evaluate and separate successful and unsuccessful companies. Regarding the weak performance of ranking approaches adopted in Tehran stock market, offering an efficient, reliable and capable approach is matter of tremendous importance (Danesh Shakib et al, 2009).

The DEA approach is an important technique through which relative efficiency of companies is evaluated. This approach can offer for investors to reinforce decision making. The DEA approach is a technique which utilizes several real inputs and outputs and using them it can obtain various types of efficiency such as assignment and technical efficiency and so on for any companies. Using this approach also they can determine whether the development of the firm has been successful or firm should reduce the volume of its activities in the current situation. This circumstance can be determined through increasing return to scale or decreasing return to scale which determined by DEA (Banker and Cooper, 1984).

However the DEA approach has some fundamental difficulties which has been result not to be dependable in the most cases (Mansoury et al, 2012). Hence in this paper through TOPSIS approach which is one of the best for decision making, we have tried to overcome its inadequacies and consequently offer the most efficient approach to grading companies through integration of techniques.

2. Research Backgrounds

Saeed Samadi et al. studied the relationship between development of economic markets and economic growth in Iran and 13 other countries during the years of 1988- 2003 through three approaches; Granger, ARDL test and the approach of estimating Panel Data. Estimating causality relationship between the size of stock market and production growth indicated that bank and stock market in Iran do not have considerable effect on economic growth. However the effect of economic growth on stocks is positive and meaningful. The results showed that in all countries, which studied, in very real sense investment and work force status have a positive and meaningful effect on economic growth. In the monetary section on economic growth, the effect of banks is positive and meaningful. Although the effect of stock on economic growth was positive but wasn't considerably meaningful. The results of ARDL test for Iran between the years 1976–2003 indicated that there isn't long term positive relationship between financial markets and economic growth. Generally long term relationship between financial market and economic growth was negative which means that there is no long term meaningful relationship between capital market and economic growth. Rafiee (2008) has evaluated the effect of financial mediators on economic growth and thus applied an intuitive growth pattern by means of auto- regressive. The results obtained from the pattern indicates that the relationship between financial intermediaries and economic growth in Iran is negative and its impact on Iran's economic growth is meager and there is not a tight relationship between financial intermediaries and economic growth in Iran but they may affected by financial intermediaries through efficient financial market. Düzakın and Düzakın (2007) in his research has tried to evaluate the performance of different industrial sections of Turkey. He considered 3 factors of net assets, number of employees and gross added value as the input and

two factors including the interest prior to cutting taxes and export revenues of each section as the output for evaluation of all companies. The results indicate that during 2003 only 65companies from among all of the companies had operated efficiently. 278 companies have also been identified as the most inefficient companies that had worked far less than average. Other research conducted under the title of utilizing the DEA approach in selecting bonds in a big market by Aparicio and et *al* (2005). This research applied DEA technique to choose portfolio or proper bonds out of a list of 185 cases. This selection process includes application of research in operations and reflects efficiency of decision making units. This analysis considers appropriateness of many ratios in relation to stocks such as income efficiency and risk. The result revealed that out of 185 stocks were analyzed, 14 were considered more appropriate and from among these 14 efficient stocks several were resistant to inappropriate changes while the rest were not. In this paper the Duk and Canon companies were among the ones with high rate efficiency. In the United States a research was conducted by Redman and *et al* (2000) on seven portfolios using SHARP indices, Trainor and Jensen's alpha. The results of their research during two periods of time; 1985-1989 and 1990-1994 showed that the ranking obtained from two criteria of SHARP and Trainor for 4 portfolios is identical. This fact showed that the results obtained are similar to total risk and systematic risk. Thus the total risk was close to systematic one. In their research, Johnson and Soenen (2003), concluded that there are meaningful relationship between ranking companies based on performance criteria of economic added value, ratio of SHARP and Jensen's alpha and some other financial criteria such as firm size, the ratio of asset value to the value of stock market, growth of sale rate, capital structure, liquidity, cash cycle, profitability changes and the rate of the efficiency of assets. Another study was conducted by Mohanram (2005) which titled separating successful companies from unsuccessful ones. The results indicated that the strategy of combining fundamental signs for companies with office value at the market with low value could lead to unconventional efficiency. A research was implemented by Sabetisaleh (2009) under the title of "Offering fuzzy multi-criteria decision making model in order to grade the companies" which applied to financial support from banks. In their work, the researcher has tried to identify the most important indices having an impact on firm stock from the viewpoint of credit assigner (banks and financial institutions) and rate top 50 stocks in Tehran's stock market through the fundamental analysis in fuzzy environment. Thus the researcher has put forth a comprehensive model for choosing appropriate options for financial support from financial point of view. Therefore the researcher in the first step of their studies utilized the analysis approach to detect the main factors (questionnaire issued to stock experts) which may identify fundamental indices having an impact on ranking stock and in order to analyze the questionnaire, non-parametric approach utilized. In the next step the researcher took advantages of fuzzy ANP technique to determine the value of identified indices. In this step viewpoints of stock experts about importance of indices and their value were solicited through questionnaire. Finally after gathering the data relevant to fundamental indices, identified 50 top companies in Tehran stock market. They used TOPSIS technique to rate and determine companies priorities too. Regarding the results obtained from this research; *Mines and Industries* Firm ranked at top, *Egtesade Novin Bank* at second, *Mehvarsazan* firm at third and *Saipa Dizel* firm stood at 50^{th} positions. Tavakkoli et.al.(2010) used fuzzy logic to evaluate financial performance of companies under uncertain condition and used verbal measures to achieve their objectives. However integrating quantitative and qualitative techniques is new approach to ranking that considered in this paper.

2.1 The DEA model

The DEA approach is one of the basic non-parametric approaches which is employed to measure efficiency and productivity of units. The DEA is a linear programming technique to evaluate decision making units having homogeneous inputs to yield homogeneous outputs. In this approach an identical production curve of observed points in the comparison group is obtained which indicates efficiency frontier for group and efficiency of other units in relation to this frontier of efficiency is measured. DEA considers the most appropriate weight for each decision making unit. That is a set of weights which maximize efficiency of a decision making unit without raising efficiency of other decision making units. In other words DEA helps decision makers to classify decision making units into two groups of efficient and inefficient units (Mansoury et al, 2012).

Generally the DEA analytic models are divided into two groups of input-oriented and output-oriented. Input-oriented models are those that utilize given input to obtain the maximum amount of output but output-oriented models obtain less input without any change in output rate. (Momeni, 2011).

In this paper the input-oriented CCR[1] model is used. In an input-oriented model, a unit is inefficient if the possibility of raising each one of the outputs will exist without raising an input or reducing an output. A unit is efficient only when the case mentioned above cannot happen. Efficiency of less than one for a unit means that linear combination of other units can create the same output by utilizing less input.

An output-oriented model conveys this meaning more assertively. A unit under examination is efficient only when no convex combination out of the other units $\left(x_o = \sum_{j=1}^{n} \lambda_j x_j , \quad y_o = \sum_{j=1}^{n} \lambda_i y_j \right)$, in which x_j is a vector that demonstrate j[th] DMU's input value and $\sum_{1}^{n} \lambda_j = 1$ which means that the inputs of under examination DMU cab be defined as a convex combination of all DMUs and similarly y_j is a output vector which related to j[th] DMU and this means that output of under examination DMU cab be defined as a convex combination of all *n* DMUs, can produce more output in relation to the unit under examination by consuming same resources (inputs). Parameter θ, as defined at bottom, indicates relative reduction of the inputs of objective unit while output is steady. This reduction is simultaneously applied to all inputs and leads to radial movement along with frontier line and consequently in order to rationalize the units under examination according to the image of the border, it determines slack variables in a way so that the point of objective unit is driven towards the image on the border. For this purpose the following conditions should be considered:

1. The value of θ^*, optimal value of first stage dual DEA model, must equals one.
2. All slack variables must equal zero (Cooper et al, 1999).

1. *The CCR model was the first developed by Charnes Cooper and Rhodes in 1978.*

Primary multiple output-oriented model of BCC[2] is according to the following:

$$MinZ_0 = \sum_{i=1}^{m} v_i x_{io} + w$$

$$St:$$

$$\sum_{r=1}^{s} u_r y_{ro} = 1$$

$$\sum_{i=1}^{m} v_i x_{ij} - \sum_{r=1}^{s} u_i y_{rj} + w \geq 0$$

$$u_r, v_i > 0$$

If $u_r \geq \varepsilon, v_i \geq \varepsilon$ we can supposes that the above model can modify to a BCC model which is input-oriented. Secondary model is as the following:

$$MaxZ = \theta$$

$$St:$$

$$\sum_{j=1}^{n} \lambda_j x_{ij} \leq x_{io} \quad (i = 1,2,...,m)$$

$$\sum_{j=1}^{n} \lambda_j y_{rj} \geq \theta y_{ro} \quad (r = 1,2,....s)$$

$$\sum_{j=1}^{n} \lambda_j = 1 \qquad (j = 1,2,...n)$$

And θ free in sign;

The objective of this model is to maximize θ in order to achieve maximum output. The secondary shield model is modified when and if it is supposed $u_r \geq \varepsilon, v_i \geq \varepsilon$ achieved in the first model;

$$Max\, Z = \theta - \varepsilon(\sum_{i=1}^{m} S_i^- + \sum_{r=1}^{s} S_r^+)$$

$$St:$$

$$\sum_{j=1}^{n} x_{ij}\lambda_j + S_i^- = x_{io} \qquad (i = 1,2,...,m)$$

$$\sum_{j=1}^{n} y_{rj}\lambda_j - S_r^+ = \theta\, y_{ro} \qquad (r = 1,2,...S)$$

$$\sum_{i-1}^{n} \lambda_i = 1 \qquad (j = 1,2,...n)$$

$$\lambda_j,\ S_i^-, S_r^+ \geq 0$$

2. Introduced by Banker, Chames and Cooper (1984), this model measures technical efficiency as the convexity constraint ensures that the composite unit is of similar scale size as the unit being measured.

In which S_i^- and S_r^+ are surplus and slack variable respectively *i* and *r* shows the number of inputs and outputs of model respectively.

2.2 TOPSIS model

This model was proposed by Hwang Yoon in 1981. This model is one of the best multi-criteria decision making models which is used more often. In this model *m* options by *n* indices evaluates. This model is based on the notion that the options must have the least distance with the positive ideal and the most distance with the negative ones. The solution process through this model requires following steps:

1. Identifying scale less Matrix (N): Scale less matrix will be obtained by making scale less norm.

$$n_{ij} = \frac{a_{ij}}{\sqrt{\sum_{i=1}^{n} a_{ij}^2}}$$

2. Defining normalized Matrix (*V*): Normalized scale less matrix will obtained through multiplication of Matrix (*N)* and weight matrix (W_{nxn}) as following:

$$V = N \times W_{nxn}$$

In order to obtain normalized scale less matrix, it is essential to consider indices. For this purpose we computed the weights of indices by means of Shannon Entropy. These weights obtained through the following steps:

First step: calculation of p_{ij}:

$$p_{ij} = \frac{a_{ij}}{\sqrt{\sum_{i=1}^{m} a_{ij}}}$$

Second step: Computing of the value of entropy which denoted as E_j:

$$Ej = -k\sum_{i=1}^{m}\left[p_{ij} \ln \ p_{ij}\right] \quad ,\forall j$$

Third step: Calculation of the deviation which denoted as d_j:

$$d_j = 1 - E_j \quad ,\forall_j$$

Forth step: determining of weights which denoted as w_j:

$$W_j = \frac{d_j}{\sum_{j=1}^{n} d_j} \quad ,\forall_j$$

Fifth step: Calculation of normalized weights which denoted as w'_j

$$W'_j = \frac{\lambda_j W_j}{\sum_{j=1}^{n} \lambda_j W_j}$$

λ_j is the pre-selected weights by any expert which determined by 12 industry expert independently that not only used for determining weights but also for computing standard deviation of weights (σ_{u_i} , σ_{v_j}) to confidence interval controlling .

These weights were entered to DEA model as u_i and v_j controller.

2.3 Integrating DEA and TOPSIS

As mentioned before the DEA technique regardless of its orientation tries assign the maximum or minimum value to u_i and v_j, regardless of their initial values, accomplishes the best value for objective function and as clearly realizable objective function demonstrate the DMUs' various efficiencies. This means that DEA analysis does not consider the initial values of inputs and outputs variables thus the final value of objective function will be questionable. Solving this dilemma in this study TOPSIS's w'_j used to consider initial values of inputs and outputs variables. Since the final ranking of alternatives will take advantage of sustainability.

3. Research Design

In this section we deal with analytic model of the research first and then describe research variables separately according to input and output.

3.1 Research Model

This research is conducted to attain a foundation for ranking cement's companies in Tehran stock market. The number of active cement companies in stock market is 28 which operate during the years 2008- 2012. In order to rate the companies through DEA model, efficiency of each unit has been measured. Since there are some defects in DEA model and as mentioned before it may give incorrect values to the input and output variables to achieve maximum efficiency value for target decision making unit and thus may result in unreal efficiency value. Therefore in order to overcome this obstacle and control the inputs and outputs variable values, we have employed the TOPSIS model with above mentioned specifications. Consequently the analytic model of the research is as follows:

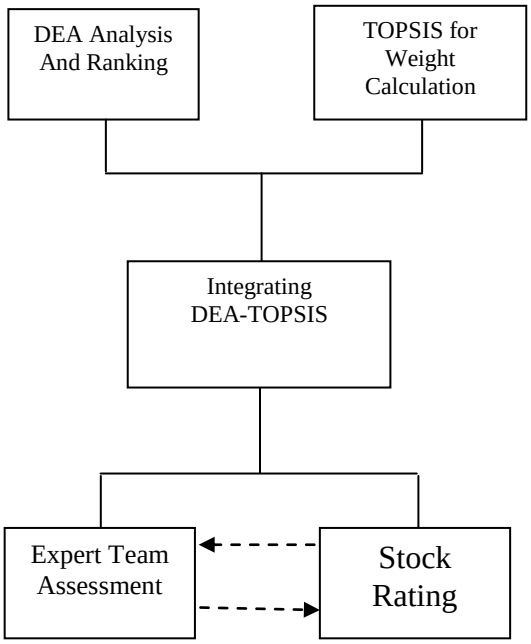

Figure.1. The Research Model

After combining DEA model with TOPSIS, through LINGO[3] release 12, we extract efficiency of each firm. The efficiency obtained through combination of these two models, as declared by stock market experts, has more validity than the efficiency obtained from implementation of each model separately.

3.2 Research variables

In the current study some effective variables introduced as inputs and outputs. Outputs included average values of 1 to 5 year Return on Investment (ROI) and the last dividends for each share, it is clear that all investor demand high rates for these two ratios. The ratio of price to income and sigma tolerance are considered as inputs since these are those factors that any investor may pay close attention in order to invest on any share (powers, 2000).

The investor will demand these ratios to be at the least possible rate. The following table demonstrate descriptive form of input and output variables.

Table 1: Descriptive Form of Input and Output Variables

Variables	classification	Definition
Average of 5 year ROI	Output	The mean of ROI in 5 years as percent
Dividends of stock	Output	Ratio of income to the number of stocks left
Ratio of price to income	Input	Price of stocks divided by income according to stocks
5 year sigma	input	5 year division of efficiency standards

[3] .Available at: www.lingo.com

4. Data analysis

We used the following methods so that the research has a high level of credibility

- DEA model with variable return to scale efficiency using CCR scale.
- The integrative TOPSIS-DEA model based on steady weights.
- The integrative TOPSIS-DEA model based on variable weights.
- Comparing three approaches result by stock market expert.

4.1 DEA model with variable return to scale efficiency using CCR scale

This model which is also known as DEA, variable return to scale, applied to calculate efficiency of any DMU. For this purpose Win4deep[4] was utilized and the following results extracted:

Table 2: Calculated Efficiency through Traditional DEA based on CCR approach

Row	Company Cement	Efficiency
1	Hormozghan	1
2	Khazar	1
3	Urmia	0.809
4	Bojnourd	0.413
5	Kordestan	1
6	Behbaha	0.768
7	Sofiyan	0.639
8	Tehran	0903
9	Shomal	0.908
10	Doroud	0.576
11	Sepahan	0.812
12	Heghmatan	0.700
13	Kerman	1
14	Fars and Khozestan	0.755
15	Shahroud	0.558
16	Gharb	0.089
17	Sefide Neyriz	0.798
18	Fars	0.194
19	Dashtestan	1
20	Shargh	0.717
21	Ardabil	0420
22	Esfahan	0.296
23	Ghaen	0.710
24	Khash	1
25	Darab	1
26	Ilam	0.654
27	Karoun	1
28	Mazandaran	0.516
Average		0.723

As shown at then the table above, there are many companies that graded as the most efficient companies with the high efficiency which criticized by most of experts is.

[4]. Available at:win*4deap.software.informer.com/1.1/*

4.2 TOPSIS Fixed Weight and Efficiency

As mentioned above we utilized TOPSIS model to weigh all input and output variables by the expert team member then by multiplication of any input and output weight vector to inputs and outputs of any firm respectively and considering simple following efficiency (E_i) formula; we achieved efficiency of any DMU with fixed weight algorithm.

$$E_i = \frac{\sum_{r=1}^{2} w_r y_{ri}}{\sum_{t=1}^{2} w_t x_{ti}} \qquad i = 1,2,...,28;$$

The following table demonstrate TOPSIS weights for any input and output variables.

Table 3: Input and Output Weight Extracted of TOPSIS Model

Variables	Average of 5 year ROI	Last dividends of each stock	Price to income	sigma risk
Weights	0.1624	0.1876	0.4459	0.242

After obtaining weights of the variables, as mentioned above, the companies efficiency separately computed; the result summarized at table 4.

Table 4: Calculated Efficiency in the Integrative Model TOPSIS-DEA Based on Fixed

Row	Company Cement	Efficiency
1	Hormozghan	0.7439
2	Khazar	1
3	Urmia	0.424609
4	Bojnourd	0.166734
5	Kordestan	0.94164
6	Behbaha	0.513789
7	Sofiyan	0.289572
8	Tehran	0.757516
9	Shomal	0.493609
10	Doroud	0.460241
11	Sepahan	0.735401
12	Heghmatan	0.203676
13	Kerman	0.394194
14	Fars and Khozestan	0.414685
15	Shahroud	0.311293
16	Gharb	0.023465
17	SefideNeyriz	0.259974
18	Fars	0.095822
19	Dashtestan	0.334233
20	Shargh	0.34338
21	Ardabil	0.117884
22	Esfahan	0.09125
23	Ghaen	0.168521
24	Khash	0.19036
25	Darab	0.154121
26	Ilam	0.087921
27	Karoun	0.621029
28	Mazandaran	0.149455

Because of exceeding some efficiencies from one; we divided all efficiency to the maximum efficiency value to furnish comparing result with other methods consequences.

4.3 Integrated TOPSIS-DEA considering confidence level

The problem with the above mentioned efficiency calculation model is that, there is always the possibility of changes in weight (regarding changes of the experts sample) then the obtained weights may differ significantly. This error may result in miss efficiency computation respectively. Thus it is essential to utilize statistical confidence interval techniques to remove the defect and control all weights. As we mentioned, the primary weight of variables determined by 12 industry experts then standard deviation of weight also computed to conduct confidence level for input and output variables weight in DEA Analysis; Kolmogorov–Smirnov test used to determine the normality of u_i, v_j distribution; the result showed no significance differences between the u_i, v_j distribution and normal distribution ($\alpha > 0.05$). Thus $\bar{u}_i$ *and* $\bar{v}_j$, mean of u_i and v_j, would have normal distribution too. Thus determination of confidence interval to their value in the population will be possible; the summarized result of confidence interval to all weights are as following:

$$P(\bar{u}_i - 1.96\sigma_{\bar{u}_i} \le u_i \le \bar{u}_i + 1.96\sigma_{\bar{u}_i}) = 1-\alpha \;\; i = 1,2;$$

$$P(\bar{v}_i - 1.96\sigma_{\bar{v}_i} \le v_i \le \bar{v}_i + 1.96\sigma_{\bar{v}_i}) = 1-\alpha \;\; i = 1,2;$$

In which

u_i : exp *ected value to ith output*

$\bar{u}_i$: *Average of of ith output weight which* det *er* min *ed by* exp *erts*

v_i : exp *ected value to ith input tolerance*

$\bar{v}_i$: *Average of of ith input weight which* det *er* min *ed by* exp *erts*

$1-\alpha$: Confidence interval level that 95 percent considered

And $\sigma_{\bar{v}_i}$ and $\sigma_{\bar{u}_i}$ are the standard deviation of input and output variables that inference through experts ideas.

Having determined this range for each weights, input and output will be controlled at the favorite level of confidence. Thus the results obtained through this model will have more dependability than previous models.

In this case the integrative model will be as follows;

$$MinZ_0 = \sum_{i=1}^{m} v_i x_{io} + w$$

$$St:$$

$$\sum_{r=1}^{s} u_r y_{ro} = 1$$

$$\sum_{i=1}^{m} v_i x_{ij} - \sum_{r=1}^{s} u_i y_{rj} + w \geq 0$$

$$\bar{u}_i - 1.96\sigma_{\bar{u}_i} \leq E(u_i) \leq \bar{u}_i + 1.96\sigma_{\bar{u}_i}$$

$$\bar{v}_i - 1.96\sigma_{\bar{v}_i} \leq E(v_i) \leq \bar{v}_i + 1.96\sigma_{\bar{v}_i}$$

$$u_r, v_i > 0$$

Using above mentioned formula and utilizing the LINGO.12 software, all of 28 companies efficiency calculated, the following table demonstrates results:

Table 5: DMUs Efficiencies Using Integrated TOPSIS-DEA Model Considering Confidence Interval

Row	Cement Company Name	Efficiency
1	Hormozghan	1
2	Khazar t	0.987961
3	Urmia	0.731945
4	Bojnourd	0.348197
5	Kordestan	1
6	Behbaha	0.589024
7	Sofiyan	0.615926
8	Tehran	0.44318
9	Shomal	0.965706
10	Doroud	0.731557
11	Sepahan	0.769046
12	Heghmatan	0.562896
13	Kerman	0.994599
14	Fars and Khozestan	0.620087
15	Shahroud	0.558362
16	Gharb	0.580343
17	SefideNeyriz	0.125003
18	Fars	0.19323
19	Dashtestan	0.909293
20	Shargh	0.545744
21	Ardabil	0.99602
22	Esfahan	0.286309
23	Ghaen	0.581399
24	Khash	0.879213
25	Darab	1
26	Ilam	0.61277
27	Karoun	0.994925
28	Mazandaran	0.495934

As shown at the table 5, among 28 companies only 3 have maximum efficiency equal to 1 and Sefide Neyriz with 0.125003 efficiency level located at the bottom. Statistical confidence interval ensures that the variable weight will not exceed from its real worth with 95 percent of confidence.

5. Result Analysis

As observed in previous sections we have calculated selected companies efficiency by three fairly different ways. Now it is time to compare the result of them and conclude, which of them have greater validity among them. For this purpose at the first step the differences in efficiency by three ways compared. Facilitating analysis the efficiencies classified into three group including:

a) Data envelopment analysis CCR efficiencies
b) Integrative TOPSIS-DEA method considering fix weight
c) Integrative TOPSIS-DEA method considering confidence interval

Then differences among three techniques calculated. The differences among three type of analysis depicted in table 6.

Table 6: Differences of Efficiencies

Row	Company	A-B	A-C	C-B
1	Hormozghan	0.256100195	0	0.256100195
2	Khazar	0	0.0120393	-0.0120393
3	Urmia	0.384390544	0.077055	0.307335544
4	Bojnourd	0.246266045	0.064803	0.181463045
5	Kordestan	0.058360065	0	0.058360065
6	Behbaha	0.254211234	0.1789762	0.075235034
7	Sofiyan	0.349428307	0.0230744	0.326353907
8	Tehran	0.14548415	0.4598205	-0.31433635
9	Shomal	0.414390781	-0.0577058	0.472096581
10	Doroud	0.115759314	-0.1555569	0.271316214
11	Sepahan	0.076599056	0.0429544	0.033644656
12	Heghmatan	0.49632445	0.1371038	0.35922065
13	Kerman	0.605805832	0.0054015	0.600404332
14	Fars and Khozestan	0.340314757	0.1349129	0.205401857
15	Shahroud	0.246706713	-0.0003615	0.247068213
16	Gharb	0.065535372	-0.4913434	0.556878772
17	SefideNeyriz	0.538026491	0.6729972	-0.134970709
18	Fars	0.098177652	0.00077	0.097407652
19	Dashtestan	0.665767273	0.0907074	0.575059873
20	Shargh	0.373620453	0.1712558	0.202364653
21	Ardabil	0.302116257	-0.5760199	0.878136157
22	Esfahan	0.204750154	0.0096909	0.195059254
23	Ghaen	0.541479262	0.128601	0.412878262
24	Khash	0.809640439	0.1207874	0.688853039
25	Darab	0.845879349	0	0.845879349
26	Ilam	0.566079116	0.0412304	0.524848716
27	Karoun	0.378970799	0.0050755	0.373895299
28	Mazandaran	0.366545165	0.020066	0.346479165

Comparing the results shows that there are considerable differences between the efficiency evaluated through three mentioned methods. The significant difference rise a question that which of them take advantage of high validity. The answer to this critical question can be given only by focusing on foundation and structure of three models.

As mentioned before the DEA techniques regardless of its orientation tries assign the maximum or minimum value to u_i and v_j accomplish the best value for DMU's objective function and as clearly realizable, objective function demonstrate the DMUs' efficiencies. This means that DEA analysis does not consider the initial values of inputs and outputs variables and it may be some inputs or outputs with low value get weights greater than their worth. Thus the final value of objective function will be questionable. Solving this dilemma in this study we used TOPSIS's w'_j's weights to consider initial values of inputs and outputs variables; But as explained before using fixed mean weights due to expert team ideas will be unsteady since any changes among experts or selecting new expert team will result in new weights and thereinafter bring about new efficiency. But setting confidence interval for weights according to experts idea remove both difficulties. Thus third model take advantages of great sustainability against other two models. In addition, we asked 12 stock market experts to contribute ideas again, after ranking companies, which majority of them admired TOPSIS- DEA with confidence interval approach results for grading and ranking closeness to reality. Table 6 below demonstrate the geometric mean of three approaches consistency to real condition according to experts ideas.

Table 6: Geometric mean of three approaches consistency to real condition

Approaches	CCR-DEA	TOPSIS-DEA with Steady Weights	TOPSIS-DEA Considering Confidence Interval
Consistency Rate(Percent)	54.7	84.5	87.3

As seen, from the table above, the TOPSIS-DEA considering confidence interval approach gain the highest consistency.

Furthermore regarding what was mentioned above in the cited research the Kolmogorov-Smirnov test was employed to test unity distribution of differences. The results concerning the difference of efficiency are as follows:

a) Comparison of the results obtained from prioritizing DEA and integrative method TOPSIS-DEA based on fix weights according to Kolmogorov-Smirnov test revealed that distribution of differences in these two methods is significantly different ($\alpha<0.05$). This means that ranking by two model have considerable differences at 95 percent confidence level.

b) Comparison of the results obtained from DEA prioritizing and integrative TOPSIS-DEA considering confidence level according to Kolmogorov-Smirnov test showed that distribution of differences in these two methods is significantly different too ($\alpha<0.05$). This means that ranking by two model does not have unity distribution and have considerable differences at 95 percent confidence level.

c) Comparison of the results obtained from prioritizing TOPSIS-DEA considering fix weights and TOPSIS-DEA considering confidence level according to Kolmogorov-Smirnov test showed that distribution of differences in these two methods don't have significantly differences (α>0.05). This means that ranking by two models does not have considerable differences at 95 percent confidence level. However the foundation of confidence interval strengthening the third one.

5. Conclusion

Weighing and ranking all companies in stock exchange market is advantageous to many organizations, companies president, investor, credit assigner and so on. In this paper we suggested three way for weighing and ranking companies. As mentioned before the reliability and infrastructure organization of integrative DEA-TOPSIS considering confidence level is highly dependable. However, comparison of differences between two integrative model didn't show significant difference but this doesn't mean these model have same value in ranking and weighing companies since volatile of result in fix weight approach due to expert team considerably affects the result; this difficulty not only takes the finding under question but also may change the result of comparison between two integrative model consequences. Finally we propose that integrative DEA-TOPSIS model considering confidence interval for weighing and ranking of DMUs rather than two other models. However there were some limitation. In the first place, some of input and output variables may be affected by social and political changes differently. In the second place, because of weak database we couldn't select some other important factors such The mean of ROI in 10 years and Bata risk.

References

1. Aparicio, J., Ruiz, J. L. and Sirvent, I. (2005). *Closest targets and minimum distance to the efficient frontier in DEA.* Centro de Investigación Operativa, Universidad Miguel Hernández de Elche.
2. Banker, R. D., Charnes, A., Cooper, W. W. (1984). Some models for estimating technical and scale inefficiencies in data envelopment analysis. *Management science*, *30*(9), 1078-1092.
3. Cooper, W. W., Park, K. S., Pastor, J. T. (1999). RAM: a range adjusted measure of inefficiency for use with additive models, and relations to other models and measures in DEA. *Journal of Productivity Analysis*, *11*(1), 5-42.
4. Danesh Shakib, M. and Fazli, S. (2009). Rating cement firms in Tehran stock market using integrative approach (TOPSIS_AHP). *Cheshmandaz-e-Modiryat*, 32(3), 109-129.
5. Düzakın, E., and Düzakın, H. (2007). Measuring the performance of manufacturing firms with super slacks based model of data envelopment analysis: An application of 500 major industrial enterprises in Turkey. *European Journal of Operational Research*, *182*(3), 1412-1432.
6. Johnson, R., and Soenen, L. (2003). Indicators of successful companies. *European Management Journal*, *21*(3), 364-369.

7. Mansoury, A., Salehi, M. (2012). Developing Fuzzy AHP-DEA Combined Model for Efficiency Analysis in Banking System: Evidence from Iranian Banks. *International Journal of the Physical Sciences*. 6(13), 3205–3217.
8. Mehrgan, M. (2004). Quantitative models in evaluating performance of organizations. *Management faculty of Tehran University*, Tehran.
9. Mohanram, P. S. (2005). Separating Winners from Losers among Low Book-to-Market Stocks using Financial Statement Analysis. *Review of Accounting Studies*, *10*(2-3), 133-170.
10. Momeni, M. (2012). Modern discussions of operation research. Aghah, Tehran.
11. Powers, J. (2000). Using Data Envelopment Analysis to Efficient Large Market Cap Securities. *Journal of Business and Management*, 7(2), 31-42
12. Rafiee, R. (2008). The impact of financial intermediaries and economic growth in Iran. *Pazhoheshnameh*, 28(1), 13-30.
13. Redman, A. L., Gullett, N. S., and Manakyan, H. (2000). The performance of global and international mutual funds. *Journal of Financial and strategic Decisions*, *13*(1), 75-85.
14. Sabetisaleh, E. (2009). Fuzzy multi-criteria decision making model for ranking firms seeking bank financing (Case study: fifty top companies in Tehran Stock Exchange), Second International Conference on Financial System Development in Iran, Tehran.
15. Shahrabadi, A. (2010). Capital management in stock market. *Stock services and information co.* 2.
16. Tavakkoli, M., Jamali, A, Ebrahimi. A. (2010). New Method to Evaluate Financial Performance of Companies by Fuzzy Logic: case study, drug industry of Iran. *Asia Pacific Journal of Finance and Banking Research*, 4(4), 15-24.