Ranking the factors influencing the shareholders' decision making with regard to the stock purchase through a mixed approach based on cross efficiency and Shannon Entropy

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Abstract: The main goal of this paper to identify and rank the factors that influence the shareholders` decision making with regard to the shareholders` decision making with regard to purchasing a portfolio of assets from the stock exchange by using a mixed approach based on two methods: Cross Efficiency and Shannon Entropy. A numerical experiment is made. The assets included in the experiment include companies listed on the Tehran Securities Exchange in 2018. The number of these companies was estimated after systematic removal and screening of 142 companies. Based on the experts' opinions, a number of 25 factors influencing the shareholders' decision-making with regard to stock purchase was selected Based on the experts' opinions, a number of 25 factors influencing the shareholders' decision-making with regard to stock purchase was Based on the experts' opinions, a number of 25 factors influencing the shareholders' decision-making with regard to stock purchase was selected Based on the experts' opinions, a number of 25 factors influencing the shareholders' decision-making with regard to stock purchase was selected. A prioritization of these factors was done by using a mixed model based on the above-mentioned approach. The results showed that the factors related to gross margin ratio on sales, to the difference between the realized profit and the predicted profit and to the price-to-book ratio were ranked on the first three positions.

Keywords: purchase decision-making, stock, Tehran Securities Exchange, cross efficiency, Shannon Entropy.

1. Introduction

The main role of Securities Exchanges is to attract the wandering and scattered liquidities as well as savings in the economy and guide them to the optimal path in a way that would ensure an optimal allocation of rare financial resources that this important factor depends on for identifying? investment priorities (Daniel et al., 2002). Also on the other hand, the closer these priorities are to market reality in the long run, the higher the confidence the investors will gain in the stock market and their eagerness to invest in the market will increase (Al-Tamimi, 2006). In the recent years, appropriate actions have been taken in order to improve, develop and increase the clarity of Tehran Securities Exchange which approximately resulted in the improvement of people's shareholding culture. Furthermore, determining the priority reasons for an investment can have a significant effect on identifying the existing limitations as well as on amending the future expansion path of the Securities Exchange.

(Murphy, 2009) who aimed to investigate the effective factors that influence the shareholders' decision making with regard to the purchase of stocks, also examined other important economic variables such as interest rate changes, inflation rate changes, and the effect of investment substitutions Tiryaki and Ahlatcioglu (2009), investigated the effective variables for the selection of Turkish stocks. Beshkooh and Afshari (2012), evaluated the effective factors on the stock market through a hierarchical analysis. Aziz and Abdullah Khan (2016) in a research paper titled "behavioral factors that influence the decisions and performance of individual investors in Pakistan stock exchange, a case study of the stock exchanges in Pakistan", investigated the influential behavioral parts pertaining to for and investment decision making of investors in the stock exchange of Pakistan. (Essid et al., 2018) in a research paper with the title “A Game Cross-Efficiency Approach to portfolio selection, an application to Paris stock exchange" proposed a framework for portfolio selection based on a combination between the maverick index and Data

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Envelopment Analysis (DEA) game cross-efficiency approach. (Karimi et al., 2016; Karimi et al., 2018) applied DEA to real-world problems.

(DEA) game cross-efficiency approach was first introduced by Sexton and his colleagues (1986) and then expanded by decision making with regard to the stock purchase (Doyle and Green, 1994). (Soleimani-Damaneh, M., Zarepisheh, 2009) used the Shannon Entropy technique for summing up the efficiency results of different models of DEA. (Wu et al., 2011) employed Shannon Entropy for in the final cross efficiency score. (Wang & Chin, 2011) used OWA (Ordered Average Weight) operator weights for determining the total cross efficiency that allows the decision maker to have a certain level of optimism with regard to the best relative efficiency. (Wang & Wang, 2013) introduced a triple approach for determining the relative importance of weights for total DEA cross efficiency. (Moeini et al., 2015) proposed a linear secondary objective model for evaluating cross efficiency for decision making units with undesirable output.

Recently (Song & Liu, 2016) have amended the combined approach based on Data Envelopment Analysis (DEA) Cross efficiency through the Shannon Entropy They proposed a coefficient of Variance based on Shannon Entropy to remove the drawbacks caused by cumulative DEA cross efficiency.

In the recent years, appropriate actions have been taken in order to improve, develop and increase the clarity of Tehran Security Exchanges that they approximately resulted in the people's shareholding culture improvement. Furthermore, the determination of priority reasons of an investment can have a significant effect on identifying the existed limitations as well as amending the future expansion path of the Securities Exchanges. This study, through identifying and ranking the effective factors which influence shareholders' decision makings in purchasing common stock, aims to improve the shareholder's motivation to buy stock. In fact, we intend to achieve this goal by using a mixed approach based on cross efficiency and Shannon Entropy. Actually, in this article, we consider the rank of the factors influencing the shareholders' decision making in buying common stock in Iran.

The framework of this article, based on the mixed approach of cross efficiency and Shannon Entropy will be presented in the next section and in the third section, we will explain the methodology employed and the information related to the statistical population. In the fourth section, the rank of factors influencing the shareholders' decision makings in buying common stock in Iran will be investigated and data analysis will be performed. Finally, section five will set forth the conclusion and recommendations.

2. The theoretical foundations of the study

Data envelopment analysis (DEA) is a method for measuring relative efficiency of equivalent decision making units (DMU) based on several input and output indices (Charnes et al., 1978). This method's flexibility in selecting input and output weights and have been criticized. The model used in the present study is the collaborative approach based on cross efficiency and Shannon Entropy. This model provides the rank of the factors that influence the shareholders' decision making in buying stock.

2.1. Cross efficiency

Cross-efficiency is an extended method for data envelopment analysis (DEA) for ranking decision-making units (DMUs) (Bazrkar et al., 2018). The cross-efficiency Method introduces the cross-efficiency Matrix in which the aforementioned units are evaluated as self-contained and integrated in this method, the performance of one decision unit is compared with the optimal weights of the other units. The cross-efficiency approach was first introduced by (Sexton et al., 1986) and then expanded by (Doyle and Green, 1994). The main idea behind it is to use DEA as a reference evaluation by contrast to absolute evaluation (self-evaluation). Two important advantages of the cross efficiency evaluation are:

1. cross efficiency provides an efficient ranking among all the decision making units (DMUs) for making a distinction between those with the best application and those with the worst application.
2. cross efficiency can eliminate the need for weight limitations for a number of applications so that it violates the falsified weighting method of DEA (Anderson et al., 2002; Liang et al., 2008).

There is a set of n DMU. Every DMU_j, ($j=1,2,...,n$) has a distinguished number of m inputs x_{ij}, ($i=1,2,…,m$), and a distinguished number of s outputs y_{rj}, ($r=1,2,…,s$).

Cross efficiency DEA is a traditional development which consists in a two-phase process. More precisely, in the first phase, self-evaluation efficiency of each DMU is calculated based on DEA model of Constant Returns Scale (CRS), from now on called CCR, developed by Charnes, A., Cooper, W.W., Rhodes, E. (1987). In the second phase, the weights provided in the first phase are used for calculating the efficiency score of self-evaluation, from now on called Cross efficiency evaluation score, which will be applied to each DMU. The mathematical model for the two-step process described above will be presented below.

Phase 1: self-evaluation efficiency of DMU_d is shown as following by using the CCR model in DEA:

$$\max E_{dd} = \sum_{r=1}^{s} u_{rd} y_{rd}$$

S.t

$$\sum_{i=1}^{m} v_{id} x_{ij} - \sum_{r=1}^{s} u_{rd} y_{rj} \geq 0 \quad j = 1, \dots, n \tag{1}$$

$$\sum_{i=1}^{m} v_{id} x_{id} = 1$$

$$v_{id} \geq 0 \quad i = 1, \dots, m$$

$$u_{rd} \geq 0 \quad r = 1, \dots, s$$

Where u_{rd} and v_{id} are of the weights of the r-th output (respectively of the i-th input) of DMU_d. Also x_{ij}, ($i=1,…,m$) and y_{rj}, ($r=1,…,s$) are the inputs (respectively the outputs) for DMU_j. By solving the model (1) we obtain for each DMU_d, a set of optimal weights $v_{1d}^*, v_{2d}^*, \dots, v_{md}^*, u_{2d}^*, \dots, u_{sd}^*$.

Phase 2: Cross efficiency E_{dj} of each pair DMU_j, DMU_d can be calculated as following by using the optimal weights:

$$E_{dj} = \frac{\sum_{r=1}^{s} u_{rd}^* y_{rj}}{\sum_{i=1}^{m} v_{id}^* x_{ij}} \quad d, j = 1, \dots, n \tag{2}$$

Therefore, cross efficiency Matrix (CEM[4]) is shown in Table 1.

Table 1. Cross Efficiency Matrix

DMU	1	2	3	4	.	.	.	N
1	E_{11}	E_{12}	E_{13}	E_{14}	.	.	.	E_{1N}
2	E_{21}	E_{22}	E_{23}	E_{24}	.	.	.	E_{2N}
3	E_{31}	E_{32}	E_{33}	E_{34}	.	.	.	E_{3N}
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
N	E_{N1}	E_{N2}	E_{N3}	E_{N4}	.	.	.	E_{NN}

For each DMU_j ($j=1,\dots,n$) the mean of E_{dj} ($d=1,\dots, n$), is defined as follows:

$$\bar{E}_j = \frac{1}{n}\sum_{d=1}^{n} E_{dj} \tag{3}$$

Is expressed as the cross efficiency scale for DMU_j. Cross efficiency can be also named as the total score with the same weight $\frac{1}{n}$.

2.2. The collaborative approach based on cross efficiency and Shannon Entropy

The purpose of this section is to combine Shannon Entropy and Cross Efficiency, so we will introduce a Shannon entropy-based variable coefficients method for Cross Efficiency.The process stages introduced by Song, L., Liu, F. (2016) are as follows:

1. Mean measurement: for the rank, DMU_d , the mean scale can be calculated as follows:

$$\bar{h}_j = \frac{1}{n}\sum_{d=1}^{n} h_{dj} \quad j=1,\dots,n \tag{4}$$

2. Standard Deviation measurement: for every DMU_d the Standard Deviation can be written as follows:

$$\sigma_d = \sqrt{\frac{1}{n}\sum_{j=1}^{n}(h_{dj}-\bar{h}_d)^2} \quad d=1,\dots,n \tag{5}$$

3. Coefficient of variation measurement: according to the provided mean and standard deviation, the coefficient of variation for DMU_d is defined as follows:

$$\delta_d = \frac{\sigma_d}{\bar{h}_d}, \quad d=1,\dots,n \tag{6}$$

4. Weights specification: for the rank of DMU_d , the weights can be determined as follows:

$$\lambda_d = \frac{\delta_d}{\sum_{j=1}^{n}\delta_j}, \quad d=1,\dots,n \tag{7}$$

5. Collective cross efficiency: for the rank of DMU_d, cross efficiency can be collectively written.

$$E_j^{cross} = \sum_{d=1}^{n} E_{dj}\lambda_d, \quad j=1,\dots,n \tag{8}$$

3. Methodology

3.1. The research method

This study is a cross-sectional descriptive survey with a practical nature. In this research paper, the survey method is used for gathering the required data. Therefore, it can be considered a field study. The statistical population of this study includes the active companies listed on listed on the Tehran Securities Exchanges. The assets included in the experiment include companies listed on the Tehran Securities Exchange in 2018. The number of these companies was estimated after systematic removal and screening of 142 companies. The data pertaining to the active companies will be collected from websites related to the stock market. The factors influencing the shareholders' decision making with regard to buying stock will be provided by the valid books and articles on this subject. Then some of these factors will be chosen by the academic experts and the experts in the exchange of securities and the remaining will be removed. After collecting the required data, the data will be analyzed.

3.2. The statistical population

The statistical population of this study include all the accepted companies in the Tehran Securities Exchanges which satisfy the following conditions and have the following characteristics:

1. they must not be a part of investing, credit and financial institutions or institutions that supply banking services;
2. the company shares should not be traded for more than 90 consecutive days;
3. their financial year must end on March 19th;
4. it must be a part of companies' main hall.

The information above is related to the data gathered in 2018. Furthermore, systematic random sampling has been used for sampling companies. The number of these companies was estimated after systematic removal and screening of 142 companies.

3.3. Factors influencing the investment

In this study, we investigate the factors influencing the shareholders' decision making with regard to stock purchase based on the theoretical framework of the factors influencing the stock selection as well as on the related practical studies and experts' opinions. The final factors are listed in table (2).

Table 2. The final selected factors influencing shareholders' stock purchase decision making

No.	Description	No.	Description	No.	description
1	Current ratio	10	Dividend per share	18	Debt to capital ratio
2	Quick ratio	11	Earnings per share	19	Realized profit and forecast profit difference
3	Total debt to total assets	12	P/E ratio	20	Price-to-book ratio
4	Total assets turnover	13	Stock price trend	21	Degree of liquidity
5	Rate of return on assets	14	Dividend trend	22	Net profit
6	Rate of return on common stockholders' equity	15	Distributed Dividend trend	23	Operating cash flow to sales ratio
7	Net profit to sales ratio	16	Trading volume	24	Free float
8	Operating profit to sales ratio	17	Beta coefficient per share	25	Stock available for institutional investors
9	Gross profit to sales ratio				

3.4. The selection of standards for prioritizing factors

Evaluating and prioritizing the above-mentioned factors under investigation through the combined approach based on cross efficiency and Entropy requires the selection of certain appropriate standards, to be employed in the aforementioned model.to precisely prioritize the factors by using the model. To this aim, many studies have been conducted and finally based on the analysis of previous articles and theses and on field studies and the opinions of experts in this field, four standards have been chosen, as follows:

Standards:

Mean factor in more active companies

Mean factor in bankrupt companies

Mean factor in helpless companies

Mean factor in healthy companies

3.5. The determination of input and output standards for prioritizing factors

In this article certain mathematical techniques have been employed for prioritizing the selected factors. Therefore, this model needs to determine appropriate inputs and outputs out of the aforementioned standards. In fact, the desired standards must be divided into two groups consisting of input variables and output variables.

Input variables:

Mean factor in bankrupt companies.

Mean factor in helpless companies.

Output variables:

Mean factor in more active companies.

Mean factor in healthy companies.

3.6. The data collection concerning the aforementioned factors

To collect the information about the factors influencing the shareholders` decision making with regard to stock purchase, the annual documents and reports of companies available on the Kodal website were analysed. Furthermore, to gather information related to some of the standards above, we accessed the Herrick database of every stock company. The data related to the input and output of decision making units, the factors influencing decision making on stock purchase are included in the table (3) as follows.

Table 3. The data related to the input and output of decision making factors with regard to stock purchase

No.	Factors	**Input variables**		**Output variables**	
		Mean factor in bankrupt companies	Mean factor in helpless companies	Mean factor in healthy companies	Mean factor in more active companies
1	Current ratio	7.02	6.70	32.03	114.87
2	Quick ration	7.73	6.96	35.22	142.41
3	Total debt to total assets	2.87	1.39	0.48	0.85
4	Total assets turnover	3.89	3.79	5.79	8.93
5	Rate of return on assets	21.87	22.66	11.37	48.02
6	Rate of return on common stockholders' equity	3.82	5.41	13.25	21.05
7	Net profit to sales ratio	0.23	0.35	0.21	0.45
8	Operating profit to sales ratio	0.41	0.36	0.45	0.36
9	Gross profit to sales ratio	0.34	0.52	0.32	0.38
10	Dividend per share	0	0	188	320
11	Earnings per share	0	0	220	350
12	P/E ratio	41	341	940	2589
13	Stock price trend	0.3	0.36	0.75	0.943
14	Dividend trend	0.4	0.2	0.3	0.3
15	Distributed Dividend trend	0.8	0.4	0.5	0.4
16	Trading volume	68269	59269	1130881	11614023
17	Beta coefficient per share	68269	59269	1130881	11614023
18	Debt to capital ratio	1.39	1.08	0.25	0.58
19	Realized profit and forecast profit difference	0.5	0.7	0.2	0.4
20	Price-to-book ratio	0.32	0.23	0.57	0.62
21	Degree of liquidity	0.21	0.32	0.87	0.71
22	Net profit	211.34	411.3	585.2	1428.92

23	Operating cash flow ratio to sales	0.12	0.39	0.87	1.37
24	Free float	211	411	585	1428
25	Stock available for institutional investors	0.38	0.42	0.56	0.86

4. The performance of the combined approach and the data analysis

In this section we shall analyses the way we prioritize the factors influencing the shareholders' decision making with regard to stock purchase by using the combine method based on cross efficiency and Entropy. The stages of this analysis are as follows:

$$\max E_{dd} = \sum_{r=1}^{s} u_{rd} y_{rd}$$

$$S.t$$

$$\sum_{i=1}^{m} v_{id} x_{ij} - \sum_{r=1}^{s} u_{rd} y_{rj} \geq 0 \quad j = 1, \dots, n \tag{9}$$

$$\sum_{i=1}^{m} v_{id} x_{id} = 1$$

$$v_{id} \geq 0 \quad i = 1, \dots, m$$

$$u_{rd} \geq 0 \quad r - 1, \dots, s$$

In this model v_{id} (i=1,…,m) and u_{rd} (r=1,…,s) are the inputs and outputs weight obtained by solving model (9) for evaluation of DMU_d. Also the optimal value of the model (9) is the efficiency score of self-evaluation for DMU_d . In addition to, the set of $v_{1d}^*, v_{2d}^*, \dots, v_{md}^*, u_{2d}^*, \dots, u_{sd}^*$ is optimal solution of model (9).

Phase 1: self-evaluation efficiency of DMU_d is shown by using CCR model in DEA as follows:

Where u_{rd} and v_{id} are of the weights r^n output and i^n input of DMU_d , respectively. For each DMU_d , we provide a set of optimal weights $v_{1d}^*, v_{2d}^*, \dots, v_{md}^*, u_{2d}^*, \dots, u_{sd}^*$ by solving the model (9).

Phase 2: cross efficiency of each DMU_j , can be calculated as following by using the optimal weights of DMU_d , that is E_{dj} :

$$E_{dj} = \frac{\sum_{r=1}^{s} u_{rd}^* y_{rj}}{\sum_{i=1}^{m} v_{id}^* x_{ij}} \quad d, j = 1, \dots, n \tag{10}$$

Therefore, Cross Efficiency Matrix (CEM) is shown in Table 4. It is worth mentioning that due to the high number of calculations only the values of 6 factors out of the total of 25 factors are shown here and the complete information of this table will be included in the attachment file.

Table 4. Cross efficiency Matrix (CEM) for the effective factors influencing the decision making with regard to stock purchase

	1	2	3	...	23	24	25
1	0.376	0.270	0.523	...	0.504	0.581	0.730
2	0.376	0.270	0.523	...	0.133	0.177	0.191
3	0.267	0.266	0.258	...	0.504	0.581	0.731
...	...	...	...	...	...	...	...
4	0.414	0.455	0.473	...	0.498	0.567	0.668
5	0.031	0.009	0.032	...	0.514	1	0.765
6	0.203	0.091	0.248	...	0.083	1	0.186

Phase 3. In this stage, we calculate h_{dj} that is defined as follows:

$$h_{dj} = -e_{dj} Ln e_{dj}$$

Where $e_{dj} = \frac{E_{dj}}{\sum_{j=1}^{n} E_{dj}}$. These results, for 25 factors, are shown in the table (5).

Table 5. h_{dj} values for the factors influencing the shareholders' decision making concerning stock purchase

	1	2	3	...	23	24	25
1	0.128014	0.101358	0.159855	....	0.129158	0.142305	0.165513
2	0.128014	0.101358	0.159855	....	0.086178	0.10602	0.111914
3	0.115558	0.115253	0.112797	....	0.129151	0.142297	0.165651
...	....	...	....	....	...	...	...
23	0.12056	0.128993	0.131284	....	0.135601	0.148015	0.164896
24	0.110463	0.118068	0.121314	....	0.128514	0.198375	0.167661
25	0.056816	0.021202	0.05822	....	0.117558	0.363965	0.199982

Phase 4: in this stage, the mean value can be calculated for DMU_d rank as follows:

$$\bar{h}_j = \frac{1}{n} \sum_{d=1}^{n} h_{dj} \quad j = 1, \dots, n$$

That the results are shown in the table (6).

Table 6. The calculation of mean value of $\bar{h}_j$ for the factors influencing the shareholders' decision makings for stock purchase

factor	1	2	3	......	23	24	25
$\bar{h}_j$	0.117927	0.092828	0.122745	....	0.116287	0.174446	0.169651

Phase 5: in this stage, standard deviation values are used to rank DMU_d. Calculate the standard deviation value based on the following relation:

$$\sigma_d = \sqrt{\frac{1}{n} \sum_{j=1}^{n} (h_{dj} - \bar{h}_d)^2} \quad d = 1, \dots, n$$

The results are shown in table 7.

Table 7. The calculation of SD value of σ_d for the factors influencing the shareholders' decision making as regards the stock purchase

Factor	1	2	3	......	23	24	25
α_d	0.024597	0.024104	0.045532	....	0.024539	0.058668	0.023485

Phase 6: considering the provided mean value and SD, the variation coefficient for DMU_d rank can be expressed as follows:

$$\delta_d = \frac{\sigma_d}{\bar{h}_d}, \quad d = 1, \dots, n$$

The results are shown in the table 8.

Table 8. The calculation of variation coefficient of δ_d for the factors influencing the shareholders' decision making with regard to the stock purchase

factor	1	2	3	......	23	24	25
δ_d	0.208574	0.259663	0.370948	....	0.211019	0.336309	0.138432

Stage 7: in this stage, the weights can be determined for DMU_d rank as follows:

$$\lambda_d = \frac{\delta_d}{\sum_{d=1}^{n} \delta_d}, \quad d = 1, \dots, n$$

That the results are shown in the table (9).

Table 9. The calculation of λ_d value for the factors influencing the shareholders' decision making concerning stock purchase

factor	1	2	3	......	23	24	25
λ_d	0.04438	0.055251	0.07893	.....	0.04381733	0.069833	0.028745

Phase 8: in this stage, the cross efficiency can be cumulative for DMU_d rank

$$E_j^{cross} = \sum_{d=1}^{n} E_{dj} \lambda_d, \quad j = 1, \dots, n$$

The results are shown in table 10.

Table 10. The calculation of cross efficiency values for the factors influencing the shareholders' decision making as regards stock purchase

factor	1	2	3	....	23	24	25
E_j^{cross}	0.307915	0.227832	0.36156	....	0.392416	0.651233	0.633021

The results in Table 10 show that the cross efficiency value for the factors influencing the shareholders' decision making as stock purchase is concerned. Based on the provided cross efficiency values the factors influencing the shareholders' decision making with regard to stock purchase can be ranked. The results are shown in table 11.

Table 11. Ranking the factors influencing the shareholders' decision making with regard to stock purchase

No.	Factors	Cross efficiency value	Factor rank
1	Current ratio	0.307915	15
2	Quick ration	0.227832	22
3	Total debt to total assets	0.36156	13
4	Total assets turnover	0.452118	8
5	Rate of return on assets	0.326288	14
6	Rate of return on common stockholders' equity	0.275402	18
7	Net profit to sales ratio	0.170292	25
8	Operating profit to sales ratio	0.288101	19
9	Gross profit to sales ratio	0.949281	1
10	Dividend per share	0.30528	16
11	Earnings per share	0.299163	17

12	P/E ratio	0.180935	24
13	Stock price trend	0.224829	23
14	Dividend trend	0.460033	7
15	Distributed Dividend trend	0.361594	12
16	Trading volume	0.643532	5
17	Beta coefficient per share	0.268017	20
18	Debt to capital ratio	0.425208	9
19	Realized profit and forecast profit difference	0.933052	2
20	Price-to-book ratio	0.93186	3
21	Degree of liquidity	0.256615	21
22	Net profit	0.38465	11
23	Operating cash flow to sales ratio	0.392416	10
24	Free float	0.651233	4
25	Stock available for institutional investors	0.633021	6

In this table, the factors of "gross profit to sales ratio", "Realized profit and forecast profit difference" and" Price-to-book ratio" are ranked as the first to third most important factors influencing the shareholders' decision making with regard to stock purchase in the context of Tehran Securities Exchanges. Furthermore, the factors of "Stock price trend"," P/E ratio" and" Net profit to sales ratio" are the least important ones in the prioritization of the aforementioned factors

5. Conclusion

The main goal of the present study was to identify and rank the factors influencing the decisions the shareholders make for speculating on the stock market. This study is based on a cumulative approach which focuses on cross efficiency and Shannon Entropy. The cross efficiency model is a model developed on the basis on Data Envelopment Analysis (DEA) Technique which is used for evaluating the application and ranking of decision making units. This model has some weak points. Recently, the aforementioned cumulative model based on cross efficiency and Shannon Entropy, which is very powerful in this area, has been proposed to remedy the weak points peculiar to the cross efficiency method? Accordingly, this study first identified the factors influencing the shareholders' decision making with regard to stock purchase in the context of the Tehran Securities Exchanges based on a review of the specialized literature. As a next step, based on interviews with the field experts, 25 factors were selected for being identified and prioritized. Finally, these 25 factors were prioritized through the cumulative approach based on cross efficiency and Shannon Entropy model. The results of the numerical experiment showed that the factors of "gross profit to sales ratio", "Realized profit and forecast profit difference" and" Price-to-book ratio" as the first to third most important factors influencing the shareholders' decision making with regard to stock purchase in the context of Tehran Securities Exchanges. The results obtained through this analysis can be used for the policy making for the Tehran Securities Exchanges in order to increase the efficiency of more active companies. The result of providing information about the prioritization of factors playing a vital role for the survival of companies is that the financial information users no longer limit themselves to the available information on financial statements, but, in order to make optimal decisions, they focus on the productivity factor, which is one of the most important factors for the continuity and survival of companies The model presented in this paper can be presented as uncertain numbers, such as fuzzy and probabilistic, or used for other statistical communities, each of which can be considered in future research.

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