
Evaluation of Performance of Investment Funds Based on Decision Models (DEA)

Alireza Samet¹, Mohammadreza Shahriari^{2*}, Hossein Mombeini³, Niloofar Sabet joo⁴

(1) Islamic Azad University, North Tehran branch, Tehran, Iran

(2) Faculty of Management, South Tehran Branch, Islamic Azad University, Tehran, Iran

(3) Islamic Azad University, Dubai, UAE

(4) Commerce and marketing, Wollongong University, UAE

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Abstract

Selection of a suitable investment funds is very important from investors' point of view and may have a significant impact on the profit or loss of the funds. Therefore, evaluation of performance of investment funds to choose the most suitable fund will be given special emphasis. One of the new techniques for evaluating the performance of the Funds based on efficiency is the Data Envelopment Analysis technique. Accordingly, the present study is aimed to analyze and evaluate the performance of investment Funds in capital market of Iran, using the technique of efficiency evaluation through data envelopment analysis technique (DEA).

This research is a descriptive - applicable study and to analyze the efficiency and effectiveness, 53 investment funds in the capital market of Iran in 2013 were considered as the sample. To analyze the efficiency of these funds, data envelopment analysis (DEA) is used.

Research findings showed that in 2013, of a total of 53 examined funds, 11 funds were in the efficiency situation and the other 42 funds were in a state of inefficiency. Also the reference funds and virtual composited funds of all inefficient funds were evaluated.

Keywords: Investment Funds, Efficiency, Data Envelopment Analysis, Performance Evaluation

1 Introduction

In recent years, investment fund is known as an active financial entity in the capital market that has considerably grown. Households and businesses units that provide the capital required by financial markets have a systematic plan for receiving profit. The profit is an essential component for ensuring the supply of resources; so that, without a constantly supply, financial markets cannot transfer money to the needful sectors.

Therefore, the critical role of entities such as investment funds, facilitating cash flow, is meaningful. According to the bond market, mutual funds is a financial entity whose main activity is investment in bond and its owners pertaining to the volume of investment share in the profit and loss of the fund.

* Corresponding Author. Email address: Shahriari.mr@gmail.com

Hence, from fundamental point of view, there is no difference between a certain investor and a mutual fund. However, from creational viewpoint, investment funds by integrating capitals result in making a competitive environment for companies in order to attract the resources and forming a portfolio to mitigate the risks involved in investments as well (Erfanian and Shirzadi, 1389 [2]).

Accordingly, from investors' viewpoint, the choice of an appropriate fund is a key decision making and can have a significant impact on their profit or loss. Most investors for investment fund selection utilize the historical data and/or personal knowledge and/or statistical information. However, if an investment fund acts as a decision maker unit, it is clear that an accurate estimation of the future performance of an investment fund can significantly increase the value of assets (Valery, 2009) [14].

On the other hand, the intensive fluctuations in returns, arising from ignoring a portfolio of shares, leads to the active investors abandon the capital market and the potential investors cannot be attracted by the market. Therefore, it is essential to make an attempt in order to formulate Iran capital market and implement a new approach for evaluating the performance to facilitate the entry of new investors and eliminate the difficulty of the existing investors.

From the micro point of view, it can be stated that a transparent and comparable criterion in evaluating the performance of investment funds in addition to the accurate control of the assets in the capital markets, can determine an efficient methodology to form a portfolio for investment fund managers, and make a comparison between the investment funds in order to select the best one (Jawe and Wang, 2007) [15].

In order to attract investors, capital markets need to set up the investment funds, which not only balance the market; but also lead to a rational investment. However, in recent years, the selection of investment funds is an important problem. Therefore, there is a necessary need to measure the overall performance of the fund more accurately. The main issue in this study is the lack of a comprehensive criterion for ranking the investment funds in Iran. The traditional methods of the fund ranking in Iran usually apply return and risk criteria to evaluate the performance of the investment funds. However, the multi-criteria decision-making methods utilize a set of tangible and intangible criteria for estimating the future returns and current performance. These techniques eliminate the drawbacks of the conventional methods.

According to the principal concepts of the data envelopment analysis (DEA) technique, used in this study, investment funds are compared based on their efficiency. This criterion is adopted by Morningstar Institute as a tool for classification of small scale investment funds and is taken into account a link between theory and practice. Accordingly, this study intends to rank the investment funds on the basis of a reasonable and logical approach in order to accurately calculate the efficiency of the funds (Gholami, 1390) [4].

2 Performance evaluation

Performance evaluation is a feedback system that includes a direct assessment of the performance of firms or organizations. Although the performance evaluation is an activity that was begun with the human civilization, but the use of this tool as an evaluation technique in organizational level belongs to Robert Owen (1800) in Scotland. Performance evaluation can be examined from different aspects. There are two important insights about performance evaluation: 1) the traditional viewpoint 2) the new viewpoint. The former states that the purpose of evaluation is judgment and performance assessment, while the new viewpoint shows that the philosophy of assessment focuses on growth and development and improve the capacity of the evaluated organization (Valery and Stan, 2009) [14]. In the management science, performance evaluation is declared for two levels, including employees and organizations. According to the matter of debate that focuses on performance and investment fund priority, this paper emphasizes organizational performance evaluation. Kaplan and Johnson (1987) showed that the traditional viewpoint of the organizational performance has been obsoleted because of the rapid growth of modern organizations. Kaplan and Johnson stated that the traditional methods of organizational performance are introduced in the industrial revolution and reflect a control system for markets and organizations that are established in modern society, and they declared that the traditional tools of the performance evaluation decrease management

productivity on account of collecting and processing information about them has been very time-consuming and providing the detailed reports on product costs due to the process and overhead costs are expensive and difficult. Finally, the tool allows managers to only evaluate the performance of their organizations for a short time (Saidi and Moghaddasian, 1389 [1]).

3 Investment fund performance

Investment funds have grown in size and number in emerging economies in Asia and the opportunity for investment funds is significant in the period in which the investment is connected with worry. In such countries, for every investor, there are different programs for investments with diverse risks that is different from the stock markets in North America and Europe (Lai and Lew 2010). On the other hand, provide a proper model for portfolio management of investment funds is investigated by many researchers in developed countries that the results can be used in Asian countries, especially Iran. According to the key importance of investment funds in capital market, the survey of performance of investment funds is an attractive matter for academic and professions; so that, experts make an attempt to establish a optimum performance for their investment funds. In the definition of the performance of investment funds, it should be noted that there is a similarity between companies and investment funds and can use a mutual theoretical viewpoint. The performance of companies in financial science focus on stock holders and performance pertaining to share price. A number of researches are conducted to determine the share performance by using risk and returns. The main idea in performance evaluation is to compare portfolio return with the return of one or more suitable portfolio. The reason for this comparison is very clear because the performance should be relatively evaluated (Sensoy, 2009) [5].

4 Performance evaluation based on efficiency

The matter of efficiency was first introduced in 1760; when a Frenchman named Jean Brvnh conducted a study on operations of making a pin for modifying its interactions. Even a hundred years ago, the French and British industrialists use the efficiency measurement to determine performance standards (efficiency). At the beginning of the scientific management movement in the early 1900s, Frederick Vynsl, Taylor, Frank and Lillian Gylbrys accomplished a set of studies in order to enhance efficiency, improve working conditions and determine the workers' division and assign the working standard time (measuring efficiency). Improving efficiency does not guarantee boost productivity, people often think if efficiency is improved then productivity will increase. Efficiency is a necessary component for productivity but not a sufficient component. In fact, for a better productivity, both effectiveness and efficiency are required. Efficiency is defined as deviation of the real product (or service) to the expected product, while the effectiveness is described as the degree of goals of the organization that are received and productivity is a function of efficiency and effectiveness. The concept of productivity involves effectiveness and efficiency concepts (Kerstens, 2011) [11].

Efficiency is a mathematical concept that the cost of resources spent on business process is evaluated. In other words, efficiency is resulted from comparison between the outputs and the inputs. To assess the efficiency, human resources supply cost, equipment cost, facility maintenance, and the rate of return on investment, etc. are considered. In other words, the most efficient unit is the unit with the lowest cost of materials and daily wage. Efficiency means that the optimal use of resources for achieving the goals and the effectiveness means that a goal is accurately selected. Effectiveness refered to the goal and achievement of the goal. The manager is the effectiveness that can provide the goal of the organization, but the efficiency is how to achieve a goal and how to do the work. Generally, the efficiency concept is pervasive and applied in the fields of engineering, management and economics. Therefore, different definitions of efficiency by various sources have been proposed (Alizadeh, 1387) [3].

Faral is one of the most famous researchers that conducted different researches in the field of efficiency and has proposed an approach to evaluate the efficiency. In an article entitled "Measuring production efficiency in 1957", the efficiency of a firm is to "produce a given amount of output to input". Farrell also uses this definition to the expression of efficiency for technical efficiency, allocative and economic efficiency (Faral economic efficiency model is the product of technical efficiency with allocative efficiency). Farrell's viewpoint can be considered as a base of the data envelopment analysis (DEA) technique. In order to evaluate the efficiency, different methods by different researchers have been developed, which often can be divided into two categories: parametric and non-parametric.

- i) The parametric approach: the parametric approach is naturally subdivided into deterministic and stochastic models. Deterministic models envelope all the observations, identifying the distance between the observed production and the maximum production, defined by the frontier and the available technology, as technical inefficiency. On the other hand, stochastic approaches permit one to distinguish between technical efficiency and statistical noise.
- ii) The non-parametric approach: non-parametric analysis does not require the specification of any particular functional form to describe the efficient frontier or envelopment surface. The flexibility of non-parametric techniques allows for several alternative formulations.

5 Research variables

As noted, in the study, data envelopment analysis technique is applied to assess and analyze the efficiency of investment funds. The DEA technique, described in next section, is employed for evaluating the efficiency of decision making units (investment funds) by comparing inputs and outputs. The comparison between the input and output show the considered fund and/or unit is able to receive the desired performance and can be located in sufficient area or not. The input and output of funds are the research variables that play a key role in the efficiency of investment funds and is a base for evaluating the efficiency by DEA techniques.

5.1. Inputs and outputs

The DEA relative models (such as the CCR and BCC models) are employed to evaluate the efficiency of decision making units that can be companies, individuals, etc. In evaluating the efficiency of the units by the relative models, a number of inputs and outputs are considered as criteria for comparing the efficiency of the units. The inputs are the resources for achieving the desired results of the decision making unit. In other words, the inputs are the raw materials and the cost spent by decision making units to obtain the desired results. The outputs are the result of the decision making unit after accomplishing a series of processes on the inputs. The efficiency of each of the units is obtained based on the ratio of output to input and each unit with a high ratio is more efficient (Charnes et al., 1985) [7]. In the following subsections, we will formally discuss the determination of the inputs and outputs.

Input variables

If the increase of an input will not reduce the desirable outputs, then it is desirable. Otherwise, it is undesirable. Because the purpose of a practical system is to obtain the desirable outputs, the undesirable outputs are not considered when we determine the desirability of inputs. In the following, a detailed description on input variables is presented.

Ratio of investments in deposits and bonds to total assets of the Fund: best judgment criteria to evaluate fund performance is to compare their performance with others in different periods of time. Investment funds capitalize in four categories of financial instruments: asset securities (stocks), debt securities (corporate bonds) and bonds / government partnership (no risk) and bank deposits. In this study, a process is implemented to rank and evaluate the performance of mutual fund shares.

Total turnover on the current account brokerage (buying and selling): a high turnover generated by broker reflects a more and more transactions showing the expected output of the total investment funds is increased on the bases of the purchase and sale of shares in the investment fund (referred to as Fund).

Organizational cost related to wages: the organization of investment funds can be comprised the manager of the Fund, trustee of the fund and guarantee fund. Naturally, with rising costs in the fund performance, it is expected to increase the output. Fund Manager is a legal person and to select one or more of the assets of the fund, the fund manager chooses the director of investment fund. Investment manager or managers, a key role in managing fund assets. The main task is responsible for monitoring the proper implementation of the regulation in order to protect the assets of investors. The guarantor guarantees the timely liquidation of the fund if the fund's assets are not sold on the market then the assets of the funds are received and the value of the fund is paid.

Periodic costs: such costs can be mentioned in the following: the cost of the accountant: the service fee should be paid for the financial year to accountant of the fund. Establishment and liquidation costs: the costs paid for licensing activities and costs for matters relating to the settlement and the Fund activity is anticipated in the prospectus. These costs are amortized over the period of the fund, the cost of meetings and membership in councils. Other costs: other costs are anticipated in the Fund.

Output variables

The output variables are often determined by the Decision Maker (DM) in real applications. What the DM hopes to produce as much as possible are effective outputs and otherwise they are non-effective outputs in our framework. Thus the types of outputs reflect the subjective judgment of the DM. In the following, the output variables are described clearly:

Return: assets are all property and rights that have monetary value. Assets of a unit may be objective phenomena. The price of an investment fund unit unlike the stock price is not affected by supply and demand. The net asset value per day based on the value of the assets forming the Fund is calculated. Fund returns over a period is calculated based on the change in NAV compared to its value at the start of the period and can be extracted from the information listed in the financial statements.

Investment Fund cash Flow: In this study, the net flow of funds has been used as a criterion to indicate the performance of the Fund. Investment Fund cash Flow has some advantages and drawbacks. One of the disadvantages is pertaining to different interpretations and the related difficulties in separating financial behavior. The most advantage is manager ability to see trends and is a valuable resource for investors' tendencies (Ryan Barnes, 2010)

6 Research methodology

Research approach

In this study, a systematic approach is handled to evaluate and prioritize investment funds. Research method depends on the objectives, nature and subject as well as its administrative facilities. According to the study is based on data gathered from the field and the type of questions, the research is descriptive. The type of this study is practical. Therefore, in sum, the research is a descriptive-practical study.

Population and statistical sample

The population in this study consisted of all investment funds in the capital market in 1392. Since the mutual investment funds are licensed by the Tehran Stock Exchange, they must obey the regulatory requirements of the Stock Exchange. Therefore, it is expected that the information provided by the funds are trustable and strength. With regard to the available financial statements, 53 investment funds were selected for this study.

Data gathering

In this study, real data is gathered to the investment funds be analyzed. According to the data collected, validity and reliability of information collected is approved.

Data analysis

In the present study, to analyze the data collected, data envelopment analysis (DEA) is used.

Data envelopment analysis (DEA)

DEA is a section of operations research that evaluate efficiency of decision making units, and has many applications in other area of OR. DEA utilizes techniques such as mathematical programming, which can handle large numbers of variables and relations (constraints), and this relaxes the requirements that are often encountered when one is limited to choosing only a few inputs and outputs because the techniques employed will otherwise encounter difficulties (charnes & cooper, 1978) [6].

Relaxing conditions on the number of candidates to be used in calculating the desired evaluation measures makes it easier to deal with complex problems and to deal with other considerations that are likely to be confronted in many managerial and social policy contexts (Cooper, 2006). Moreover, the extensive body of theory and methodology available from mathematical programming can be brought to bear in guiding analyses and interpretations (Cooper, 2005).

CCR model

We measure the efficiency of each DMU once and hence need n optimizations, one for each DMU_j to be evaluated. Let the DMU_j to be evaluated on any trial be designated as DMU_o where o ranges over 1, 2,..., n. We solve the following fractional programming problem to obtain values for the input "weights" (v_i) $\{i = 1, \dots, m\}$ and the output "weights" (u^r) $\{r = 1, \dots, s\}$.

$$\begin{aligned} \text{Max } e_p &= \sum_{i=1}^n u_i y_{ip} \\ \sum_{i=1}^m v_i x_{ip} &= 1 \\ \sum_{i=1}^n u_i y_{ij} - \sum_{i=1}^m v_i x_{ij} &\leq 0 \quad j=1, 2, \dots, k \\ u_i &\geq 0, v_i &\geq 0 \end{aligned}$$

when the efficiency coefficient for more than one unit is equal to 1, CCR model cannot rank the units. Therefore, Andersen-Petersen technique should be applied.

Andersen & Petersen model

A model proposed by Andersen and Petersen that leads to a concept called super-efficiency (Andersen & Petersen, 1993). The efficiency scores from these models are obtained by eliminating the data on the DMU_o to be evaluated from the solution set. For the input model, this can result in values, which are regarded as according DMU_o the status of being super-efficient. These values are then used to rank the DMUs and thereby eliminate some (but not all) of the ties that occur for efficient DMUs.

Other uses of this approach have also been proposed. Wilson (1993), for example, suggests two uses of these measures in which each DMU_o is ranked according to its influence in either (or both) of the following two senses:

- (1) The number of observations that experience a change in their measure of technical efficiency as a result of these eliminations from the solution set and
- (2) The magnitude of these changes. Still other interpretations and uses are possible, and we shall add further to such possibilities (See also Ray, 2000).

There are troubles with these super-efficiency measures. These troubles can range from a lack of units invariance for these measures and extend to non-solution possibilities when convexity constraints are to be dealt with—as in the BCC model.

The model used by Andersen and Petersen which takes the form of a CCR model and thereby avoids the possibility of non-solution that is associated with the convexity constraint in the BCC model. Andersen and Petersen formula is presented as follows:

$$\begin{aligned} \text{Max } e_p &= \sum_{i=1}^n u_i y_{ip} \\ \sum_{i=1}^m v_i x_{ip} &= 1 \\ \sum_{i=1}^n u_i y_{ij} - \sum_{i=1}^m v_i x_{ij} &\leq 0 \quad j=1, 2, \dots, k, j \neq p \\ u_i \geq 0, v_i &\geq 0 \end{aligned}$$

7 Research finding

In the present study, we evaluate the performance of funds in 1392, using input oriented DEA CCR. The central criteria and dispersion related to the efficiency of the funds are presented. Finally, reference and virtual combined funds for each of the inefficient funds are discussed.

8 Efficiency index and the rank of investment funds

In sum, 53 funds are investigated that the names given in the table below. The performance of investment funds using the input-oriented CCR model was evaluated. The result of the study showed that 11 funds from 53 fund are efficient, including “Aryan”, “Agah”, “Omid e Iranian”, “Pasargad”, “Pasargad”, “Pishgam”, “Tadbirgaran Farda”, “Sina”, “Karafarinan Bartar”, “Bank mellat agency”, “Mehr Iranian”, and “Mehre Sharia”. To rank and compare the efficiency of the funds, the AP method also were used. Fund efficiency rankings is shown in the table below. In the last column, the final ranking of investment funds is presented. The fund “Omid e Iranian” is the most efficient fund and fund “Bursieh Bimeh” is the most inefficient Fund among 53 funds.

Table 1: efficiency coefficient

Final ranking	Ranking based on AP	Efficiency based on AP	Ranking based on CCR	Efficiency based on CCR	Fund investment
11	11	1	1	1	Atieh mellat
3	3	2.20	1	1	Aryan
23			23	0.45	Agah
32			32	0.21	Arg
1	1	64.82	1	1	Omid Iranian
14			14	0.91	Omid Sahn
34			34	0.2	Amin Karafarin
37			37	0.183	Bank eghtesad Novin
16			16	0.798	Bank dey
42			42	0.126	Bank keshavarzi
31			31	0.233	Bank gardeshgari
13			13	0.943	Bank maskan
33			33	0.204	Burs 24
53			53	0	Burs Bimeh
30			30	0.272	Bursiran
49			49	0.008	Bimeh dey

47			47	0.032	Pars
10	10	1.018	1	1	Pasargad
26			26	0.322	Pouya
51			51	0.005	Pishtaz
18			18	0.696	Pishro
6	6	1.061	1	1	Pishgam
15			15	0.829	Tajrobeh iranian
28			28	0.303	Tadbirgar sarmayeh
39			39	0.152	Tadbirgaran agah
2	2	6.535	1	1	Tadbirgaran farda
50			50	0.006	Toseh saderat
22			22	0.481	Toseh farda
40			40	0.142	hafez
43			43	0.107	khobregan
45			45	0.038	Kharazmi
29			29	0.273	Rahnama
35			35	0.189	Razavi
36			36	0.184	Refah
21			21	0.631	Sepehr aval saderat
4	4	1.533	1	1	sina
41			41	0.139	Shakhesi karafarini
44			44	0.042	saba
24			24	0.366	Sanat va madan
27			27	0.313	Aghigh
46			46	0.036	Farabi
52			52	0.003	Firuzeh
9	9	1.038	1	1	Karafarinan bartar
17			17	0.785	Kargozari bank tejarat
20			20	0.633	Kargozari bank saderat iran
8	8	1.046	1	1	Kargozari bank mellat
48			48	0.019	Kargozari bank melli iran
25			25	0.347	Kargozari kaspian mehr iranian
19			19	0.634	Ganjineh bahman
12			12	0.984	Momtaz
5	5	1.083	1	1	Mehr iranian
7	7	1.06	1	1	Mehr sharieh
38			38	0.18	Naghsh jahan

Parameters related to the coefficient of efficiency of investment funds is shown in the table below. As can be seen in the table, the average coefficient of efficiency of the fund is equal to 0.49. In sum, 20% of the investment funds are efficient.

Table 2: central parameters related to fund efficiency coefficient

Year	Efficiency parameters based on CCR model
1392	
53	The number of funds
25.98	Sum of efficiency coefficient
0.49	efficiency Average
0.374	efficiency Standard deviation
0	Minimum efficiency coefficient
1	Maximum efficiency coefficient
20.75	Efficient funds (%)
79.25	Inefficient funds (%)

9 Reference fund for each inefficient fund

According to the results based on input-oriented CCR method among 53 funds surveyed, 11 funds and 42 funds were efficient and inefficient, respectively. In addition to the DEA is capable of calculating the relative efficiency and finally ranking them, this model can introduce the reference units as a benchmark for each of the inefficient units. In other words, the reference units are a base for inefficient units in order to become efficient. The inefficient units try to adapt inputs or outputs with those of the reference units. In the following, reference units (Reference Fund) related to all inefficient funds are investigated.

10 Reference Fund and inefficient fund

In sum, 42 funds from 53 fund surveyed are inefficient. Reference fund for each inefficient fund is listed in the following table. For example, inefficient fund "Agah" to be efficient need to adapt its inputs and outputs with funds, "Omid e Iranian", "Tdbyrgran Farda", "Karafarinan Bartar" and "Mehr Iranian". Because these four funds have the closest inputs and outputs to the inefficient fund "Agah".

Table 3: reference fund

Reference funds				Inefficient funds
Mehr Iranian (0.245)	Karafarinan Bartar (0.222)	Tadbirgaran Farda (0.02)	Omid Iranian (0.016)	Agah
Sina (0.094)	Tadbirgaran Farda (0.005)	Pishgam (0.024)	Omid Iranian (0.096)	Arg
		Mehr sharieh (0.822)	Pishgam (0.001)	Omid Sahn
Mehr Iranian (0.08)	Karafarinan Bartar (0.007)	Pishgam (0.005)	Omid Iranian (0.024)	Amin Karafarin
		Tadbirgaran Farda (0/015)	Aryan (0.136)	Bank eghtesad Novin
Mehr sharieh (0.001)	Kargozari bank mellat (0.9)	Pishgam (0.018)	Omid Iranian (0.005)	Bank dey
		Omid Iranian (0.011)	Atieh mellat (0.028)	Bank keshavarzi
	Sina (0.611)	Omid Iranian (0.033)	Atieh mellat (0.02)	Bank gardeshgari
		Tadbirgaran Farda (0.009)	Aryan (0.79)	Bank maskan
		Omid Iranian (0.003)	Aryan (0.19)	Boors 24
			Aryan (0.071)	Burseh bimeh
			Aryan (0.934)	Poursiran
			Aryan (0.213)	Bimeh dey
		Omid Iranian (0.016)	Aryan (0.003)	Pars
		Omid Iranian (0.001)	Aryan (0.523)	Pouya
		Pishgam (0.005)	Omid Iranian (0.131)	Pishtaz
	Kargozari bank mellat (0.278)	Tadbirgaran Farda (0.574)	Aryan (0.196)	Pishro

	Sina (0.613)	Tadbirgaran Farda (0.033)	Omid Iranian (0.018)	Tajrobeh Iranian
		Omid Iranian (0.002)	Aryan (0.519)	Tadbirgar Sarmayeh
		Omid Iranian (0.188)	Aryan (0.144)	Tadbirgaran Agah
			Aryan (0.413)	Toseh Saderat
		Pasargad (0.433)	Omid Iranian (0.006)	Toseh Farda
		Omid Iranian (0.017)	Aryan (0.036)	HAfez
	Sina (0.46)	Pishgam (0.004)	Omid Iranian (0.03)	Khobregan
Mehr Iranian (0.001)	Karafarinan Bartar (0.003)	Pishgam (0.004)	Omid Iranian (0.017)	Kharazmi
			Aryan (0.993)	Rahnama
		Sina (0.07)	Atieh mellat (0.006)	Razavi
			Omid Iranian (0.01)	Refah
		Tadbirgaran Farda (0.185)	Aryan (0.414)	Sepehr Aval Saderat
			Omid Iranian (0.026)	Shakhesi Karafarini
			Aryan (0.157)	Saba
Mehr sharieh (0.543)	Kargozari bank Mellat (0.437)	Pishgam (0.005)	Omid Iranian (0.004)	Sanat va Madan
		Sina (0.148)	Atieh mellat (0.003)	Aghigh
		Omid Iranian (0.016)	Aryan (0.009)	Farabi
			Aryan (0.007)	Firouzeh
			Tadbirgaran Farda (0.088)	Kargozari bank Tejarat
		Tadbirgaran Farda (0.187)	Aryan (0.412)	Kargozari bank Saderat Iran
		Omid Iranian (0.03)	Aryan (0.083)	Kargozari bank Melli Iran
			Aryan (0.598)	Kargozari Kaspian mehr Iranian
		Tadbirgaran Farda (0.187)	Aryan (0.412)	Ganjineh Bahman
	Mehr sharieh (0.002)	Kargozari mellat (0.967)	Pishgam (0.002)	Momtaz
Sina (0.167)	Tadbirgaran Farda (0.002)	Pishgam (0.0006)	Omid Iranian (0.003)	Naghsh Jahan

11 Virtual combined funds and inefficient funds

In Table 3, the shadow price of the Reference Fund of inefficient Fund is written reference in brackets in front of each Fund. With the help of these shadow prices can be obtained virtual fund of each inefficient fund. Virtual combined funds are determined to transfer inefficient funds into efficient ones. That indicates that an inefficient fund how can change the value of its inputs and outputs to become an efficient fund. Virtual combined Funds for each inefficient fund is given in Table 4. The values show the inputs and outputs for each of the inefficient funds and the input and the output value of the ideal fund to achieve the efficiency.

Table 4: Virtual combined funds and inefficient funds

Input and output of virtual combined funds						Inefficient fund
		inputs				
	Capital ratio		Capital ratio		Capital ratio	
303546	0.1	613	1301	113781	0.37	Agah
12074	0.31	112	522	157623	0.27	Arg
6341	0.32	432	109	39578	0.005	Omid Sahm
1959	0.04	30	411	789023	0.25	Amin Karafarin

2960	0.05	342	891	322517	0	Bank eghtesad Novin
106741	0.15	873	3982	590325	0	Bank dey
-6571	0.5	22	400	26680	0.03	Bank keshavarzi
51384	0.2	772	2156	409521	0.67	Bank gardeshgari
730	0.05	103	301	90872	0	Bank maskan
-18131	0	78	456	57802	0.06	Boors 24
0	0.25	21	1520	220963	0	Burseh bimeh
-21342	-0.16	213	8901	272071	0	Poursiran
0	0.21	94	202	52789	0.53	Bimeh dey
-19885	0.14	87	513	156782	0.19	Pars
-52374	0	103	3752	278930	0	Pouya
-98527	0.2	123	3051	256789	0	Pishtaz
151103	0.42	127	8926	1098725	0	Pishro
147882	0.15	912	2009	298023	0.63	Tajrobeh Iranian
-76529	0.05	623	2167	299087	0.002	Tadbirgar Sarmayeh
-4767	-0.15	103	417	61484	0.001	Tadbirgaran Agah
5090	0.13	82	434	59863	0.47	Toseh Saderat
-840	0.15	106	187	82761	0.51	Toseh Farda
18929	0.4	8	671	23451	0.03	HAfez
467	0.21	27	422	312456	0.72	Khobregan
0	0.25	620	1982	165278	0.2	Kharazmi
38960	0	81	500	276891	0	Rahnama
-3959	0.14	231	8428	56719	0.45	Razavi
-2536	0.15	96	198	67901	0.52	Refah
50213	0.35	7	561	321001	0	Sepehr Aval Saderat
7713	0.05	98	3451	718952	0.21	Shakhesi Karafarini
-2631	0.06	25	376	334789	0	Saba
-1226	-0.1	378	987	578192	0.02	Sanat va Madan
14526	0.25	912	995	49821	0.4	Aghigh
15627	0	102	3894	162093	0.16	Farabi
9824	0	92	230	52142	0.46	Firouzeh
18790	0.2	99	532	247067	0	Kargozari bank Tejarat
39215	0.3	23	210	298537	0	Kargozari bank Saderat Iran
-28880	0.4	109	1342	28753	0.7	Kargozari bank Melli Iran
-29819	0.15	621	3871	28617	0	Kargozari Kaspian mehr Iranian
39215	0.16	109	2092	27891	0	Ganjinih Bahman
101625	0	102	3245	26819	0.004	Momtaz
6999	0.05	81	416	54091	0.05	Naghsh Jahan

12 Conclusions

Investment funds, including financial institutions, act in the country's capital market that during the short period of their activity have achieved significant growth and are one of the main ways of the country to transfer cash flow to capital markets. Investors provide capital and financial markets for investors and receive profit. Households and businesses units that provide the capital required by financial markets have a systematic plan for receiving profit. The profit is an essential component for ensuring the supply of resources; so that, without a constantly supply, financial markets cannot transfer money to the needful sectors. The evaluation of these funds to investors will be important. Existing methods for evaluating and measuring the efficiency of investment funds cannot accurately handle the difficulties pertaining to ranking and prioritizing. The DEA method has a numerous applications in measuring efficiency and can evaluate the efficiency of units. On the basis of this study, using data envelopment analysis as a new tool for evaluating the performance of investment funds listed in the stock exchange is considered.

A total of 53 funds are evaluated by using the input-oriented CCR model to calculate the efficiency of investment funds. Results of the study showed that 11 funds from 53 funds have suitable efficiency and are then ranked by the Anderson model Peterson. Results demonstrated that "Aryan", "Agah", "Omid e Iranian", "Pasargad", "Pasargad", "Pishgam", "Tadbirgaran Farda", "Sina", "Karafarinan Bartar", "Bank mellat agency", "Mehr Iranian", and "Mehre Sharia". Thus, the fund "Omid e Iranian" is the most efficient fund and fund "Bursieh Bimeh" is the most inefficient Fund among 53 funds.

Reference funds are also identified and the input and output of virtual combined funds for each of the inefficient funds are calculated as well. Virtual combined funds show how inefficient funds can be efficient. That indicates that an inefficient fund how can change the value of its inputs and outputs to become an efficient fund.

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