The Social Sciences 11 (9): 2210-2216, 2016
ISSN: 1818-5800
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Evaluate the Performance of the Dispute Resolution Councils by Additive Data Envelopment Analysis (DEA) and Anderson and Peterson Methods

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Abstract: One of the most important changes in the country is setting dispute resolution council. Before this time, the process of complaint was done in counts and Judicial official centers, until this Dispute Resolution Council as a quasi-Judicial entity. The judge enter and responsible resolving were Part of disputes citizens. In this study is used data envelopment analysis model to evaluate the performance of the dispute resolution councils. Data envelopment analysis a type linear programming technique is nonparametric to measure the relative efficiency of organizational units. In this research, the relative efficiency of dispute resolution council are reviewed and evaluated based on the relationship between output data and input data councils. For this purpose, the first stage was used of additive data envelopment analysis model and then using Anderson and Peterson techniques, the final ranking of the dispute resolution council are achieve First half 2011. Results of this study suggest that dispute resolution council provinces of Qom, Sistan and Baluchestan, North Khorasan and Semnan are the most efficient.

Key words: Dispute resolution council, evaluation performance, additive data envelopment analysis, anderson and pterson mthod, Iran

INTRODUCTION

We are social beings and have always been forced to survive among our fellows. Although, the social relations and life of human beings together lead to human development, conflict between their interests and their rights comes into existence. This led to fights and differences between human beings. Traditionally there have been fights and differences in human societies, therefore to resolve this conflict there were methods and solutions that have been changed according to period, time andsocial circumstances.

In this regard, during the last few years to resolve disputes more quickly in urban and rural communities, quasi-judicial body under the Dispute Resolution Council is formed. It Regulations are based on Article 189 of the Third Development Plan dated 17.09.2000 and itwas approved to reduce people's recourse to courts of law and the development of public participation to resolve local disputes and matters that are not judicial in nature or they are a little complicated in nature public participation in its own judicial affairs. With The emergence of every institution in society, public opinion understands the necessity of its existence andin fact there is no institution in society unless vacancies and the need for it is felt.

What is the dispute resolution provisions of the Council Regulations establishing and expanding judicial dispute resolution is the ultimate goal of councils.What is most necessary to the formation of the judicial body in the communities, is the high volume of court cases, long proceedingtime, nature of relatively simple majority of disputes, the need to resolve it fast, reducing the cost of litigation and increasing participation of people in their own judicial affairs. According to the dispute resolution provisions of the Council establishing and expanding judicial dispute resolution is the ultimate goal of councils.

The first step to improve the functioning of the Dispute Resolution Councils is assessing their current situation. In this study for the first time, data envelopment analysis, a quantitative method that provides realistic performance analysis and standards is used. Today this method widely evaluates the performance of both public and private service units.

Data Envelopment Analysis (DEA) is one of the valid methods for assessing the performance of similar companies, based on the inputs and outputs. In this way, using mathematical programming models, the boundary consists of companies with the best relative performance is achieved and the border is used to measure and deliver solutions to improve the performance of other companies.

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due to the lack of production function In DEA, any prejudice of the surveyed companies do not apply to andthus DEA models thanks to the use of less assumptions in the process of evaluating companies, have found a special place among similar models.

Theoretical framework of research

The concept of dispute resolution council: The council called dispute resolution council consists of three words, the resolution, the council and the dispute. "Council" means counsel, advice andsurvey by visiting the others, "Resolution" meansopeningthe node andthe "Dispute" means strife, choosing any other way in working and talking is insubordination.

The term Dispute Resolution Council is chosen by the judiciary, the city, district or village council and composed of three elements of one trusted person in neighborhood by a delegation of the President of jurisdiction, governor, police chief and the EmamJome or Rouhani for a period of three years to establish peace andsecurity, In civil and criminal matters and resolve disputes.

Dispute Resolution Council is an institution which has spread among various people and civilizations. There was an institution Among Jewish as Jehoshaphat whose members were honest and chaste and consult each other to settle their affairs. In ancient Iran to avoid long courts, a specified period was appointed for each dispute to be issued at that time and also the two sides were suggested to compromise by arbitration of disputes to be resolved peacefully by a referee. During Sassanid period there were disputes resolution council only in major cities but also in rural areas. In the middle ages, in Europe the best institution to resolve the disputes was arbitration based on maintaining group cohesion, ensuring peaceful coexistence among different groups and the establishment of peace based on justice. Religious leaders advised people that instead of going to the courts, their religious brothers resort to arbitration.

Iran prior to the solar year of 1927 set seasons on arbitration rules in the temporary law for the principles of legal proceedings. According to the principles, at the time of dispute the parties assign one or more persons to arbitrate which is based on a contract that will be included in the agreement. After the Islamic Revolution again establishing the council was approved and by adopting Article 189 of the Law of the Third Economic, Social and Cultural plan in Islamic Republic of Iran, the implementing regulations were formed in 23 articles.

Literature review: Coelli (1996)'s study is among the most important Foreign research in the field of performance evaluation in higher education (1996) cited in Australia. In this study, the researcher evaluated technical and scale efficiency among 36 universities in Australia. The average technical efficiency and scale of surveyed universities are 95.5 and 96.6%, respectively and nearly 26% of universities were working in the state of decreasing returns to scale.

In 2005 Othman Joumady and Catherine Ris, surveyed the performance of 209 higher education institutions in eight European countries. They used three models for evaluation. Competency model is the first model, this model offers educational services and features and focuses on the students and their academic level. During the study a comparative model is presented to assess the quality of services provided by universities to students and their employment in the labor market. Finally, the last model is comprehensive, the model considers input and output of the previous two models at the same time and assess the overall performance of universities.

Another study is done by Tyagi *et al.* (2009). They have measured technical efficiency and scale efficiency of 19 Indiana University using DEA and provide solutions for the improvement of inefficient units. The total yield of educational and research units were evaluated using sensitivity analysis.

Among domestic studies in evaluating the performance of universities in the country, Sameti and Rezvani study can be noted. They calculated the technical efficiency of 36 large public universities based on the assumption of constant and variable returns to scale. The average efficiency of the surveyed entities are 8.80 and 8.85%, respectively based on the mentioned assumption. By using DEA in addition to evaluating the performance of each branch, can the allocation of resources among branches can be used. More funding is granted to universities that have more production with a certain level of budget andthe tips are given to inefficient branches to improve their performance and achieve an acceptable level.

Naebi and coauthors studied changes in total factor productivity of Iranian public higher education institutions and the roles of efficiency and technological change in this change using Tornqvist index and combined them with data envelopment analysis models.

The results show that changes in Total Factor productivity (TFC) of public higher education is decreasing in recent years (2002-2005). Which is due to a reduction of the technology and technical knowledge and efficiency changes had lesser share than technological change in declining the growth of TFC.

Ardakani *et al.* evaluated the relative efficiency of 12 public hospitals in Yazd Province during the years of 2004-2006. The results showed that in 2006 five hospitals

were efficient and seven were inefficient out of 12 hospitals. Studies show "Rene David's" research activities are one of the first studies in the field of judicial institutions. In his 1960 studies he evaluated the judgment institution of the first civilizations. He studies the conditions of communities and the settlement of disputes in that period.

During the recent years some studies were conducted on the subject of newly developed Dispute Resolution Council such as Abbas Jamshidi in "an evaluation of the legal status of the dispute resolution councils under Article 189 of the third development plan" introduced the institution, counted the reasons for the formation and the strengths and weaknesses of it.

The present research studies performance evaluation of Dispute resolution councils however no research has done on theefficiency evaluation of dispute resolution councils in the country.

Data envelopment analysis: Charnes, Cooper and Rhodes presented a model that had the ability to measure performance with multiple inputs and outputs. This model was named as Data Envelopment Analysis (DEA) andfor the first time it was mentioned in Edward Rhodes' doctoral thesis with Cooper's guidance as the National Assessment of Students' Educational Progress in American's school at Carnegie in 1976 (Mehregan, 2004). the fact that this pattern was presented by Charnes, Cooper and Rhodes (Rohdes), the model is famous to CCR which is composed of the first letters of the names of the three individuals andit was presented in an article as "measuring the efficiency of decision-making units" in 1978 (Charnes *et al*., 1978). Today scientists have concluded that by an optimal use of all data and the reform process higher output and thereby productivity can be achieved.

DEA is a technique that not only measures and evaluates the efficiency and performance but also suggests ways to increase them using the output data for each separate leveland shows how to increase productivity at all levels. Data envelopment analysis is a technique of linear planning that managers can use it formodeling the best Decision-Making Unit (DMU) for the other units. Figure 1 shows the input and output for each DMU.

And how to increase productivity at all levels offers. DEA is a linear programming techniques that managers can use it to the best Decision-Making Unit (DMU) modeling for the other units. The figure below shows the input and output for each DMU.

Data Envelopment Analysis (DEA) has a major flaw and that is a purely mathematical approach far from a mentalitysome times its decisive weight is at odds with

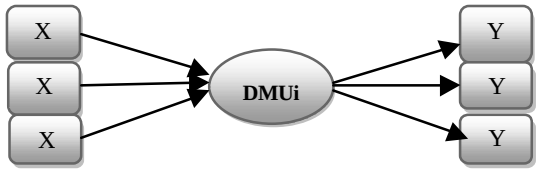

Fig.1: Overview of the input and outputs in DEA model

reality, so there is a possibility that More important indicator is not more weighty or vice versa. On the other hand in DEA an efficiency score is calculated for each firm which is between zero and one. The firm with an efficiency score of one is called an effective agent. Therefore efficiency score of enterprises is used to rank them. But the problem is created when more than one firm has a score of one.

DEAdivides the units under investigation into groups of "Efficient" and "inefficient" units. In Efficient units the efficiency score is equal to one. Inefficient units become efficientwith significant performance rating. However units with efficiency score of oneare not ranked with a classic model of DEA. In DEA different methods are provided for ranking efficient units such as Anderson Peterson, model q, cross efficiency ranking model and Mehrabian. In this study, Peterson Anderson model has been used to rank efficient units.

DEA collaborative model: Input models on one hand control the amount of output and on the other hand decrease the amount of inputs. And vice versa output models with preserving the appropriate input increase output. Collective model which is also called slack-based modelis a model that simultaneously focuses on reducing inputs and increasing outputs.

The model was introduced in 1985 by Charnes, Cooper, Golany, Sifordand Storez. Mathematical model is as follows:

$$\text{Max } y_l = \sum y_{rl}u_r - \sum x_{il}v_i + w$$

St:

$$\sum u_r \geq 1, \quad \sum y_{rj}u_r - \sum x_{ij}v_i + w \leq 0,$$

$$(j = 1,2,\ldots\ldots,n) \sum u_r v_i \geq 1$$

Where:

$\sum u_r v_i \geq 0$ = Is the free symbol

$x_{ij}i=1,2,\ldots,m$ = The amount of i input for the j unit

y_{rj} = The amount of r output for the unit of jr =1,2,…s

ur = The weight of r output(the price of r output)

vi = The weight of I input (the price of I input)

w = The amount of weight which is determined to judge

Another difference of DEA model with other models is in the amount of objective function after problem solving where z * = 1 in the effective unit however the efficacy in these models is related to units that y * is equal to zero. In DEA models an efficient unit with a secondary variable of zero is a stronger efficient unit that can be selected as a reference unit. However an efficient unit with one or more zero secondary variable is called weak efficient unit which is due to the multiple optimization of the model. The weak-form efficient unitscannot be chosen as reference unit for firms with non-zero secondary variable. Different methods for classification of functional units (such as Andersen-Petersen, performance crossover and) have been proposed that could be used for ranking efficient units.

Andersen-Petersen method: Andersen and Petersen (1993) proposed a method for ranking efficient units in 1993which was able to determine the most efficient units. Efficient units can have a higher score with this technique, in this way they are rated like inefficientunits. After determining efficient units with DEA, units with efficiency score of one will be considered, then the limitations of the model will be removed and the model is resolved. Peterson Anderson shown mathematical model is shown below:

$$\text{Max } z_k = \sum y_{rk} u_r$$

St:

$$\sum x_{ik} v_i = 1$$

$$\sum y_{rj} u_r - \sum x_{ij} v_i + w \leq 0$$

$$(j = 1,2,\ldots\ldots,n) n \neq k$$

$$\sum u_r v_i \geq \varepsilon$$

MATERIALS AND METHODS

The study is a descriptive-analytical cross-sectional study to evaluate the function of dispute settlement councils across the country using Data Envelopment Analysis (DEA) has been done. The study population Dispute resolution councils in all governorates. Information and data required for this research through existing data in the database Dispute resolution councils are collected in the first six months of 2011.

Concept of model: DEA is based on linear planning and is used for efficiency evaluation of decision making units with same responsibilities. Conceptual model should be designed to show relationships between variables. Designing the framework or conceptual model help us to improve our knowledge of dynamic situations. According to the survey made in this research and the related ones performance evaluation, dispute resoloution councils, surveys, conversations with experts and after all three inputs and six outputs were identified. It should be noted that the choice depends on the intent and purpose of the evaluation index. Thus, the concept model can can be observed in Fig. 2. The indicators that have been examined in dispute resolution councils across the country include:

- Beginning inventory
- The criminal data
- The legal data
- Settlment of legal case
- Sentenceing the case
- Criminal reconciliation

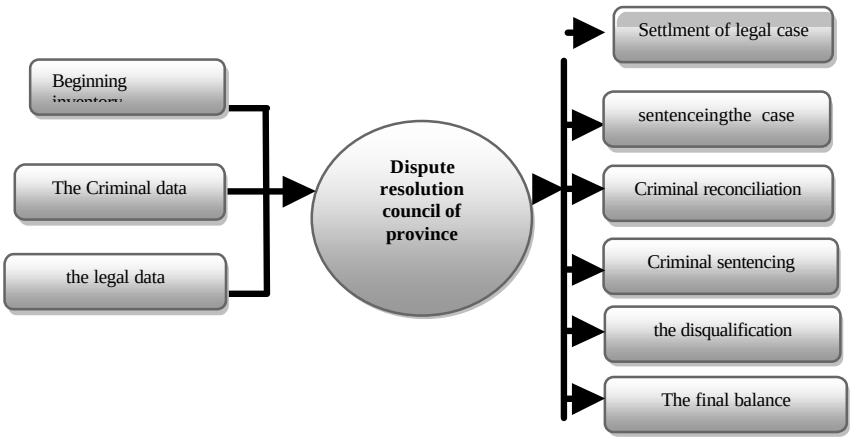

Fig. 2: The conceptual framwork based on theories and literature

Table 1: Input and output figure relatred to dispute resolution councilds of the islamic republic of Iran

Dispute resolution councils	Inputs				Outputs				
Province	Beginning inventory	The criminal data	The legal data	Settlement of legal case	Sntencing the case	Criminal reconciliation	Criminal sentencing	The disqualification	The final balance
East Azerbaijan	24953	52740	51781	10894	40086	8745	33057	12723	23969
West Azerbaijan	20635	53156	52203	12669	32375	14342	28295	14541	23772
Ardebil	5914	13561	17205	4866	13640	1986	10981	1854	3353
Esfahan	31725	37507	83973	13683	54207	2632	40390	5817	36476
Alborz	12461	32783	25012	3218	21125	3433	24843	5018	12619
Ilam	2261	6265	10565	2977	6820	1529	4129	1317	2319
Boushehr	12955	16835	18787	9308	10145	6908	11462	1763	8991
Tehran	5604	175919	171402	23900	134934	16989	158540	13676	55328
Charmahal Bakhtiyari	5940	9504	15492	4028	10060	2349	4931	2391	7177
Southern Khorasan	774	5915	7555	1455	6066	684	5103	331	605
Khorasan Razavi	29681	66808	91444	13251	74956	6311	57706	4309	31400
Northern Khorasan	2371	9339	15199	7774	5903	2265	5311	1665	3991
Khouzestan	33935	49615	64053	11864	39240	8219	36793	15866	35621
Zanjan	4699	15214	19430	6346	11947	6012	9284	991	4763
Semnan	7220	11671	7865	1819	9291	1012	6422	1743	6469
Sistan Balouchestan	7061	27541	13214	3057	9242	2541	25144	1536	6296
Fars	13951	44812	71475	16644	46515	5355	34735	9580	17409
Qazvin	11765	21223	21448	6509	16069	4440	15464	1645	10309
Qom	2402	16422	20678	2869	12900	4814	12101	2669	4149
Kordestran	10737	17296	20689	4526	14607	2815	12865	3098	10811
Kerman	17441	37525	41846	13687	25101	9234	24171	5067	19552
Kermanshah	19235	28534	32658	9419	26796	8515	19806	10284	5634
Kohgiloye Boyer Ahmad	2417	7636	11922	4357	6474	1016	6108	1367	2653
Golestan	9583	9291	26079	4762	20104	713	8771	1936	8667
Gilan	15121	25889	41912	9367	28025	4587	16553	10397	13993
Lorestan	10573	21576	40566	16148	18107	4865	13675	9425	10495
Mazandaran	30132	44876	62318	11356	46149	7691	31865	9982	30292
Markazi	7890	14315	23557	6722	15146	1716	9622	3011	9545
Hormozgan	5863	16006	14420	5754	6874	1789	19949	2331	5802
Hamedan	11859	23265	27229	8564	18208	4513	17286	1986	11796
Yazd	7101	14556	16301	5098	9918	1882	12276	995	7795

- Criminal sentencing
- The disqualification
- The final balance

Data collection: In this stage, first data related to the councils' function were collected from their data bank (first six months of the year 2011). In addition information based on the factors mentioned above can be seen in the Table 1. It should be reminded that in the future identified inputs in the dispute resolution councils using a systematic process are converted to identified outputs.

RESULTS AND DISCUSSION

One of the features related to DEA is that they provide a convex space consist of all the evaluated units and cover them. Thus, they are called "cover model". In these models, those DMUs that convex space is located on and the shape the boundary of space are called efficient units. This unit provides maximum output from existing data or consume the lowest data to produce certain outcomes (resources) Table 2.

Table 2: Planning DEA models for research

Collaborative DEA	Assessment Units	Collaborative DEA	Assessment Units
0	Sistan Balouchestan	0	East Azerbaijan
0	Fars	0	West Azerbaijan
0	Qazvin	0	Ardebil
0	Qom	0	Esfahan
0	Kordestan	0	Alborz
0	Kerman	0	Ilam
0	Kermansha	0	Boushehr
0	Kohgiloye Boyerahmad	0	Tehran
0	Golestan	0	CharmahalBAkhtyari
0	Gilan	0	Southern Khorasan
0	Lorestan	0	Khorasan Razavi
0	Mazandaran	0	Northern Khorasan
0	Markazi	0	Khouzestan
0	Hormozgan	0	Zanjan
0	Hamedan	0	Semnan
		0	Yazd

Other units located within the convex are known as inefficient units, these units can handle their production

Table 3: Dispute resolution councils raking by anderson and peterson model

Ranking	Assessment units	Efficiency	Ranking	Assessment units	Efficiency
1	Qom	1.167	17	Ilam	0.076
2	Sistan Balouchestan	0.916	18	Khorasan Razavi	0.072
3	Northern Khorasan	0.856	19	Hormozgan	0.07
4	Semnan	0.576	20	Fars	0.061
5	Golestan	0.497	21	Alborz	0.057
6	Boushehr	0.43	22	Yazd	0.046
7	Lorestan	0.381	23	Tehran	0.042
8	Western Azerbaijan	0.312	24	Kerman	0.036
9	Zanjan	0.249	25	Southern Khorasan	0.021
10	Kermansha	0.245	26	Markazi	0.02
11	Esfahan	0.208	27	Mazandaran	0.016
12	Khouzestan	0.194	28	Qazvin	0.009
13	Charmahal Bakhtyari	0.15	29	East Azerbaijan	0.007
14	Gilan	0.125	30	Kordestan	0.003
15	Kohgilouye Boyer Ahmad	0.092	31	Hamedan	0.003
16	Ardebil	0.081			

with lesser data or get more output with the same data. Of course efficientunits can also be ranked. Andersen-Petersen (1993) "rossover efficiency rating model is used for ranking efficient units. In this research to measure the effectiveness of dispute settlement councils, collective model DEA've taken full advantage. In this model the focus is simultaneously on reducing inputs and increasing outputs.

As it is shown in Table 3 all the units are efficient. Since in the first step of evaluating the performance of dispute resolution councils all councils were efficient, therefore, the above techniques should be used to rank these units. Table 3 shows the results of the councils' ranking.

Determining the effective units using DEA collective model: According to information collected from the dispute resolution councils across the country, each council's model was designed separately based on the model (1), then to determine the performance of the various councils LINGO software was used to solve them. Table 2 shows the results of the model and the functioning of the dispute resolution councils.

CONCLUSION

Data Envelopment Analysis (DEA) is a new method to measure the relative efficiency in operation researches. This model is expanded day by day and finds a variety of applications. By the year 2001, nearly 18 thousand pages were published on DEA. This method is based on linear programming. Since, it is an optimization method it is superior to other methods of efficiency analysis (Momeni, 2006). As it is observed in this study, collaborative DEA is used which is a combination of the input shaft and output shaft. In this way, the number zero is effective for dispute resolution councils. As can be seen (Table 2), 31 provincial Dispute Resolution Council were ranked with the efficiency Anderson and Peterson model and higher number indicates a higher ranking. Final ranking of Dispute resolution councils are shown in Table 3.

Table 4: Categories of provinces on the basis of performace

Efficiency level	Ranking	Assessment unit
Excellent	1	Qom
	2	SystanBalouchestan
	3	Northern Khorasan
	4	Semnan
Average	5	Golestan
	6	Boushehr
	7	Lorestan
	8	West Azerbaijan
	9	Zanjan
	10	Kermansha
	11	Esfahan
Weak	12	Khouzestan
	13	CharmahalBakhtyari
	14	Gilan
	15	Kohgiloye Boyer Ahmad
	16	Ardebil
	17	Ilam
	18	Razavi Khorasan
	19	Hormozgan
	20	Fars
	21	Alborz
	22	Yazd
	23	Tehran
	24	Kerman
	25	Southern Khorasan
	26	Markazi
	27	Mazandaran
	28	Qazvin
	29	East Azerbaijan
	30	Kordestan
	31	Hamedan

According to the above table the provinces with efficiency level more than 0.5, are the most effective ones and the provinces with less than 0.2 efficiency level are less efficient and weak. Provinces between these two ranges have average practice. Table 4 shows the categories of dispute resolution councils.

According to the input and output of each top province in Table 1, it can be deduced that the output of top provinces is higher than the others. Qom, Sistan-Baluchestan, Northern Khorasan and Semnan have excellent performance and are at a higher level than the other provinces. Dispute Resolution Council as judicial and quasi-judicial body could play an effective role in the development of a culture of compromise, consultation and participation of people.

RECOMMENDATIONS

Using collaborative DEA shows most efficient councils and the most efficient provinces are Qom, Sistan-Baluchestan, Northern Khorasan and Semnan. Based on these findings, if directors, officers and staff of the Council want to achieve successful performance in their work, they have to model these councils will.

Due to the important role of dispute resolution councils, it is suggested to measure the performance of councils by using network DEA, phase DEA or other techniques used to evaluate performance in order to achieve more useful and more efficient results.

It is recommended that provincial authorities of dispute resolution councils identify inputs and outputs as one of the factors to consider in order to improve their performance.

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