DATA ENVELOPMENT ANALYSIS MODEL FOR MEASURING EFFICIENCY OF ZAKAT COLLECTION AND DISTRIBUTION

Nurulhazwani Mohammad, *Noraini Noordin

Faculty of Computer and Mathematical Sciences
Universiti Teknologi MARA (UiTM) Cawangan Perlis
02600 Arau, Perlis, Malaysia

*Corresponding author's email: norainiNoordin@perlis.uitm.edu.my

Abstract

Some quarters have voiced concerns over the efficiency of zakat collection and distribution in Kelantan. This case study has attempted to maximise the efficiency of zakat collection and distribution of the Majlis Agama Dan Istiadat Melayu Kelantan (MAIK) by applying a two-stage linked DEA model. MAIK has focused only on five out of eight asnafs: fakir, miskin, al-gharimin, ibnu sabil and fi sabilillah. Variables for the model included number of zakat payers, total allocations, total expenditures, total collections and total recipients. Results for stage 1 involving zakat collection showed full efficiency for earnings and agriculture with efficiency score, $\lambda = 1$. In the second stage involving zakat distribution, only fi-sabillah scored efficiency $\lambda < 1$, which suggested that it has not achieved full efficiency in comparison to other asnafs. Overall efficiency also achieved a score of $\lambda = 1$, thus the Data Envelopment Analysis (DEA) model has established that MAIK has achieved full efficiency for zakat collection and distribution in 2014. With this achievement, it is recommended that MAIK review its principles of priority and include the other asnafs as well.

Keywords: asnaf; collection; DEA model; distribution; full efficiency; overall efficiency

1.0 INTRODUCTION

Zakat institutions in Malaysia have complemented the government's role in helping the poor and needy Muslims. Enhancements of these institutions such as infrastructure, human capital, delivery system and government transparency have also improved their delivery system. However, issues regarding inefficient distribution of zakat collection have been raised continuously by the public (Ab Rahman, Alias, & Syed Omar, 2012).

Zakat collection has failed to reach some targeted eligible recipients (asnafs) for various reasons. These reasons included inefficient zakat institution and insufficient number of zakat payers (Ab Rahman et al., 2012), insufficient zakat collection and inadequate number of amils (Zulkifli, 2015) as well as technical issues in zakat distribution for university students.

Efficiency in zakat distribution is proportionately related to the ability of the institution to manage and distribute zakat collected systematically. A high efficiency score for collection and distribution of zakat obtained by any zakat institution defines it as a systematic financial institution for those who require financial assistance. The 2010 Pusat Pungutan Zakat ("Zakat Collection Centre") report has highlighted that the total amount of zakat needed for distribution to zakat recipients exceeded amount of zakat

collection in Selangor (Ab Rahman et al., 2012). Similar complaints have also been raised regarding zakat distribution in Kelantan (Mohd Ghazi, Ahmad, & Wahid, 2013). Therefore, the current study attempts to determine the efficiency score for zakat collection and distribution in Kelantan.

Most recent work at measuring efficiency of zakat distribution was done by Ahmad and Ma'in (2014). Although there are eight asnafs who are qualified to receive zakat, the trend of zakat distribution in Kelantan has focused more on the fakir, miskin, gharimin, ibnu sabil and fi-sabilillah due to the fact that the poor and needy make up a big percentage of population in Kelantan. Therefore, this study has adapted the works of Ahmad and Ma'in (2014) in defining efficiency scores for zakat collection and zakat distribution as well as overall efficiency scores for MAIK.

2.0 LITERATURE REVIEW

The discussion in this section will be presented in two parts: i) current practice in zakat collection and distribution and ii) efficiency score.

2.1 Current Practice in Zakat Collection and Distribution

It has been the general practice for zakat to be distributed based on availability of applications and proposals by the zakat institutions themselves (Ab Rahman et al., 2012). In brief, the applications are reviewed based on eligible asnafs defined by the zakat institutions: faqir - the needy with no source of income or wealth and has less than half of his dependent's basic, miskin - the recipient with minimal income insufficient to fulfil his dependent's basic, amil - person registered with zakat institutions who can collect and distribute zakat, muallaf – person who converts to Islam, al-Gharimin - individuals who are burdened with debts and property loss, ibnu-Sabil - person who travels for a good purpose that is in line with the syariah, fi-sabilillah - the warrior who fights in the cause of Allah S.W.T and Riqab - slaves who need emancipation funds (Che Yaacob, Mohamed, Daut, Ismail, Don, & Ali, 2013).

Under conditions of inadequate collection or incomplete documentation of the prospective recipients, zakat in Malaysia has been distributed to at least three targeted asnafs: faqir, miskin and fi-sabilillah (Wahid, Ahmad, & Kader, 2010). In this case study, the trend of zakat distribution by MAIK has focused more on the faqir, miskin, al-gharimin, ibnu sabil and fi-sabilillah due to the fact that the poor and needy make up a big percentage of population in Kelantan. Since there are more zakat payers than recipients, it is possible to increase zakat collection to be distributed among the poor. Consequently, zakat can help reduce income inequality by narrowing the gap between the rich and poor and increasing the purchasing power of the poor.

2.2 Efficiency Score

Efficiency, a production unit that compares between observed and optimal values in input and output, is normally obtained as a maximum ratio of weighted outputs to weighted inputs in a system (Abd Wahab & Abdul Rahman, 2012). Economic theory defines efficiency as a term to describe how the system is performing in generating the output for given inputs of variables provided (Farrel, 1957). An economic system is considered as efficient if it can provide more goods and services, without having to seek out more than the available resources.

The measurement of efficiency is a non-parametric approach. These models do not assume any particular functional and easy handling of multiple input and output cases. DEA model is a multi-factor

productivity analysis model for measuring the efficiency score (ES) in the presence of multiple inputs and outputs (Ahmad & Ma'in, 2014). DEA model uses mathematical programming to evaluate the efficiency level for each set of Decision-Making Units (DMUs) which can be anything from an individual or cost centre to a whole organization. For this study, DMUs will be the state of efficiency at different points of time.

If more outputs are produced from a number of given inputs in the zakat collection and distribution system, then the system is more efficient. In the current study, weighted input and output (λ) is assumed as the coefficient to identify the ES for each level of DMUs. Specifically, λ less than 1 $(\lambda < 1)$ shows inefficiency while λ equal to 1 $(\lambda = 1)$ shows efficiency. In addition, overall efficiency is the ratio of weighted efficiency of collection to weighted efficiency of distribution. However, when running the overall efficiency test, both the collection and distribution amount were considered as the outputs. As a result, the ES has optimized the input proportionately to ensure maximum score to produce a given output at a given input.

3.0 METHODOLOGY

Certain steps were undertaken in the process to determine the overall efficiency for zakat collection and distribution by MAIK, as shown in Figure 1.

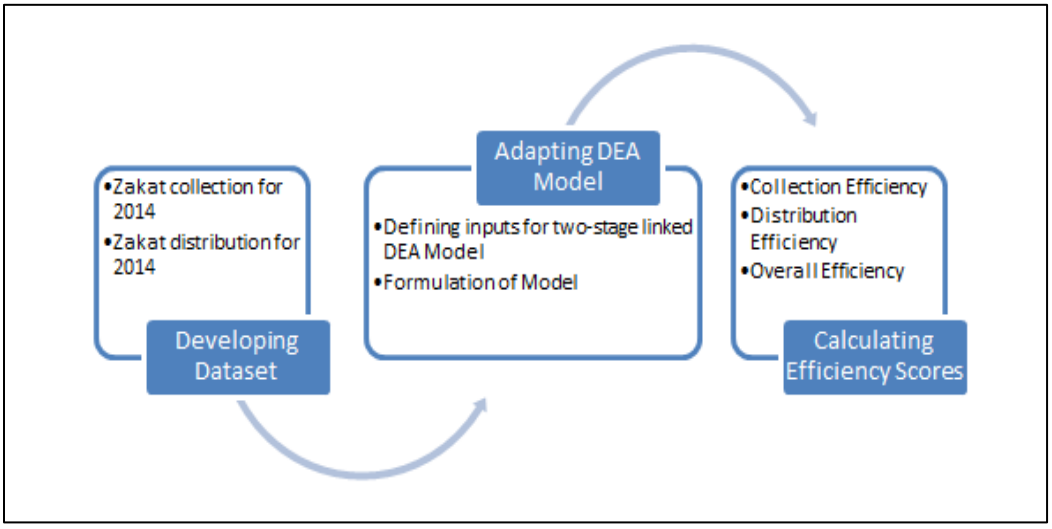

Figure 1 Procedures to determine efficiency scores

3.1 Developing Dataset

Efficiency scores calculated in this study has used data for zakat collection and zakat distribution by MAIK for 2014 as shown in Table 1 and Table 2, respectively. From Table 2, the largest amount of the collection has been allocated for distribution to faqir and miskin followed by minute volumes to fi-sabilillah, al-gharimin and ibnu sabil. In addition, total distribution to faqir and miskin as well as al-gharimin has exceeded the total amount allocated for the purpose. Interestingly, total distribution for all four components has surpassed the total allocation by 6.2%. As explained earlier on, MAIK has identified Kelantan as having a huge population consisting of the poor and needy.

Table 1 Zakat collection in Kelantan for 2014

Item	Types of zakat collection	Total Amount (RM)	Number of Zakat Payers (person)
1	Paddy	533,464.25	289
2	Fitrah	8,106,349.04	1,193
3	Savings	8,450,044.06	5,016
4	Earnings	91,877,185.81	44,392
5	Stocks	304,753.10	160
6	Business/Commercial	23,429,610.93	2,060
7	Gold/Silver	526,676.54	661
8	Property	11,243,025.35	2,227
9	Qadha	62,212.35	129
10	Agriculture	980.00	9
11	Livestock	17,020.00	3
Total collection :		**144,551,321.43**	**56139**

Table 2 Zakat distribution to 5 asnafs by MAIK for 2014

	Total Allocation (RM)	Total Distribution (RM)	Percentage of distribution (%)	Total recipients
Faqir & Miskin	82,730,000	90,242,334.30	109.08	47,736
Fi-sabilillah	5,000,000	2,939,780.55	58.76	8
Al-Gharimin	30,000	36,090.00	120.3	70
Ibnu Sabil	20,000	1,250.00	6.25	14
	87,780,000	**93,219,454.85**	**106.2**	**47,828**

3.2 Adapting DEA Model

A DEA model can be input or output oriented. An inefficient unit can be transformed as an efficient unit by proportional reduction of its inputs by keeping the proportions of the outputs constant. On contrary, an inefficient unit is made efficient in an output oriented model by expanding the outputs proportionally and keeping control of the inputs.

This study has adapted the DEA model from Ahmad and Ma'in (2014). The model has two stages which are connected to each other. However, both stages were defined by different inputs and outputs. For clarity, the following sections will discuss i) definitions of inputs for both stages of the DEA model and ii) formulation of the DEA Model.

3.2.1 Defining inputs for both stages

The inputs and outputs for both stages were defined accordingly before using the two-stage linked DEA model adapted from Ahmad and Ma'in (2014).

Inputs for Stage 1: The zakat collection variables were considered as input and the collection amount as output. In particular, the total amount collected (TC) and the number of zakat payer who acted as collection agents (AgB) were denoted as the input while the total zakat collection (ZC) as the output. The function for ZC is expressed as the following:

$$ZD = f_1(AC, AgB) \tag{1}$$

The set of variables to define TC and AgB are given in Table 1 below:

Table 1 Set of variables for zakat collection

Items	Sets
Total Collected (*TC*) **Zakat Collection (*ZC*)**	Paddy, fitrah, savings, earnings, saham, business/commercial, gold/silver, property, qadha, agriculture, and livestocks.
Collection Agents (*AgB*)	Number of amil

Inputs for Stage 2: The same process was repeated with total zakat collection denoted as input. It has also included the total distribution expenditure (DE), total allocation for distribution (TA) and total recipients (St) as additional inputs in producing the output, which is the zakat distribution (ZD) with the given expression:

$$ZD = f_2(ZC, DE, TA, St) \tag{2}$$

Error! Reference source not found. displays the set of variables for zakat distribution used in this study.

Table 4 set of variables for zakat distribution

Items	Sets
Total Distribution Expenditure (*DE*) **Total Allocation for Distribution (*TA*)**	Monthly assistance, monthly financial recovery assistance, programs of life skills, medical treatment and care, school/university fee, scholarships, assistance to traditional religious school ("sekolah pondok"), contribution for Eid, Residential Rehabilitation assistance, fund and qualified asnaf.
Total Recipients (*St*)	Faqir, miskin, al-gharimin, fi-sabilillah and ibnu sabil

3.2.2 Formulation of the DEA Model

The DEA model adapted from Ahmad and Ma'in (2014) is formulated as the following:

$$\max\ h_0(u,v) = \frac{\sum_{r=1}^{s} v_r y_{r0}}{\sum_{i=1}^{m} u_i x_{i0}} \tag{3}$$

subject to:

$$\frac{\sum_{r=1}^{s} v_r y_{rj}}{\sum_{i=1}^{m} u_i x_{ij}} \leq 1 \quad \text{for} \quad j = 0,1,..., n \tag{4}$$

$$u_i \geq 0 \quad \text{for} \quad i = 1,2,..., m \tag{5}$$

$$v_r \geq 0 \quad \text{for} \quad r = 1,2,..., s \tag{6}$$

where

x_{ij} = the amount of input i utilised by the j th DMU,

y_{rj} = the amount of output r produced by the j th DMU,

u_i = weight given to input i ,

v_j = weight given to output r , and

j = number of DMUs.

3.3 Calculating Efficiency Scores (ES)

There are three types of efficiency scores: collection efficiency score, distribution efficiency score and overall efficiency score. As explained earlier on, the current study has assumed the weighted input and output (λ) as the coefficient for identifying ES for each level of DMUs. Any value less than $\lambda = 1$ denotes inefficiency. In addition, overall efficiency has been calculated as the ratio of weighted efficiency of collection to weighted efficiency of distribution. In particular, the total ES of zakat distribution was considered as output (ZD) while the total ES of zakat collection (ZC) as inputs. Then, the ES was calculated as follows:

$$\text{ES of DEA model} = \frac{weighted\ sum\ of\ outputs}{weighted\ sum\ of\ inputs} = \frac{ZD}{ZC} \tag{7}$$

4.0 RESULTS AND DISCUSSION

Table 5 displays the descriptive statistics of the inputs and output used in this study. The differences between the minimum and maximum amount of inputs used and outputs produced by MAIK took place because the increase in zakat collection and distribution every year was proportional to the different size of population. MAIK has been using different categories of input and output in their operation. Three inputs and two outputs were considered in this study to investigate the efficiency of zakat institutions for the year 2014 in MAIK. The inputs were the number of zakat payers, total allocation and total expenditure while the outputs were the total collection and total recipients.

Table 5 Descriptive statistics of the inputs and outputs used in the DEA Model

	Mean	Median	Mode	Maximum	Minimum
INPUT					
No of Zakat Payer (person)	$4.43x10^2$	$6.61x10^2$	NULL	$4.47x10^4$	$0.302x10^1$
Total Allocation (RM)	$9.72x10^5$	$1.51x10^6$	$1.995x10^6$	$2.8x10^7$	$1.995x10^4$
Total Expenditure (RM)	$7.30x10^5$	$7.94x10^5$	$5.01x10^5$	$3.63x10^7$	$1.26x10^3$
OUTPUT					
Total Collection (RM)	$8.39x10^5$	$5.37x10^5$	NULL	$9.12x10^7$	$9.77x10^2$
Total Recipients (person)	$3.8x10^2$	$2.81x10^2$	$9.33x10^3$	$1.07x10^4$	$0.794x10^1$

4.1 Efficiency Score

Computational experiments for the DEA model were run in DEA Excel Solver to rate efficiency scores for collection and distribution as well as overall efficiency for MAIK. As stated earlier on, a scale of $\lambda = 1$ indicated full efficiency whilst a scale of $\lambda < 1$ denoted inefficiency.

4.1.1 Collection Efficiency Score

Results after running the DEA software in the first stage are given in Table 6. As highlighted in the table, zakat collection has achieved full efficiency for earnings and agricultures.

Table 6 DEA results for MAIK collection efficiencies

Types of Zakat	Total Amount (RM)	No of Zakat Payers (person)	Efficiency Score
Earnings	7.96	4.65	1
Savings	6.93	3.7	0.9645
Property	7.05	3.35	0.8814
Business/Commercial	7.37	3.31	0.8358
Fitrah	6.91	3.08	0.8468
Gold/Silver	5.72	2.82	0.9619
Paddy	5.73	2.46	0.8758
Stock	5.48	2.2	0.852
Qadha	4.79	2.11	0.9495
Agriculture	2.99	0.95	1
Livestock	4.23	0.48	0.7069

4.1.2 Distribution Efficiency Score

Results obtained after running the second stage of data through the DEA software are shown in Table 7. In contrast to previous conclusions for Table 6, only fi-sabilillah displayed a value $\lambda < 1$ (meaning inefficiency) while the other recipients obtained full efficiency for zakat distribution in 2014.

Table 7 DEA results for MAIK distribution efficiencies

	Total Allocation	Total Expenditure	Total Distribution	Efficiency Score
Faqir & Miskin	110.26	109.11	50.27	1
Al-gharimin	4.48	4.56	1.85	1
Fi-sabilillah	6.7	6.47	0.9	0.6418
Ibnu Sabil	4.3	3.1	1.15	1

4.1.3 Overall Efficiency Score

Both the total weighted (λ) of DMU for efficiency score of DEA model for zakat collection and distribution were 1, thus the sum of weighted zakat distribution (output) per sum of weighted zakat collection (input) was also equal to 1. Therefore, the DEA model for MAIK has achieved full efficiencies for zakat collection and distribution in 2014.

5.0 CONCLUSIONS

The DEA model in this study aimed to maximize the efficiency of zakat collection and distribution among asnafs in Kelantan. The findings of the study have concluded that DEA model for zakat collection is efficient for both earning and agricultures (with $\lambda = 1$). As for zakat distribution, only fi-sabillah displayed inefficiency (with $\lambda < 1$) in comparison to the other asnafs. Upon running overall efficiency, the results obtained by the DEA model demonstrated that MAIK has achieved efficiency in year 2014. In light of the findings, further study is required in this area to improve the efficiency of the measurement of zakat distribution for fi-sabilillah. The findings can be used as reference at improving efficiency of zakat institutions throughout Malaysia. As for MAIK, there should be a review on their principle of priority to also include other qualified asnafs to the current set of selected asnafs.

References

Ab Rahman, A., Alias, M. H., & Syed Omar, S. M. N. (2012). Zakat institution in Malaysia: Problems and issues. *Global Journal Al-Thaqafah, 2*(1), 35-41.

Abd Wahab, N., & Abdul Rahman, A. R. (2012). Efficiency of zakat institutions in Malaysia: An application of data envelopment analysis. *Journal of Economic Cooperation and Development*, *33*(1), 95-112.

Ahmad, I., & Ma'in, M. (2014). The efficiency of zakat collection and distribution: Evidence from two stage analysis. *Journal of Economic Cooperation & Development*, *35*(3), 133.

Che Yaacob, A., Mohamed, S., Daut, A., Ismail, N., Don, M., & Ali, M. (2013). Zakat disbursement via capital assistance: A case study of Majlis Agama Islam Johor.

Farrel, M. J. (1957). The measurement of productive efficiency. Royal Statistical Society, 120.

Mohd Ghazi, A., Ahmad , S., & Wahid, H. (2013). Analisis pengurusan dan agihan dana zakat di Negeri Kelantan. *Prosiding Perkem VIII*, *3*, 1291 - 1301.

Wahid, H., Ahmad, S., & Kader, R. A. (2010). Pengagihan zakat oleh institusi zakat kepada lapan asnaf: kajian di Malaysia1.

Zulkifli, Z. (2015). Sinful to give zakat directly, says FT zakat chief. Retrieved from https://www.malaysiakini.com/news/320084APA 6th