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Performance Measurement in Selangor Foods and Beverages Industry

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Abstract. The Small and Medium Enterprises (SMEs) is one of the main contributors in contributing country economic growth. SMEs are divided into 3 main sectors, which are manufacturing, services and agriculture. Moreover manufacturing sector engages a large portion to the SMEs productivity. In the manufacturing industries, the major contributor among SMEs in Malaysia is from foods and beverages sub-sector with 32.3% share. This study only focuses on foods and beverages sub-sector in Selangor. From the previous research, a little attention is given by researcher in order to highlight the important contribution from this sector. The objective of the study is to measure the relative financial efficiency score of companies in order to identify which companies are efficient and not efficient in handling the financial constraint resources to sustain in the competitive environment. Some steps that must be taken by the companies in order to increase their financial efficiency score are suggested. Data Envelopment Analysis (DEA) is implemented in this study to calculate the financial efficiency score. The result of this study highlighted the financial efficiency score of the companies. The results show from all the DMUs, only DMU1 and DMU2 are efficient compared to other DMUs. For DMU3 and DMU4, there show much decreasing of current asset and share capital compared to DMU5. Percentage shows the difference between them is more than 30%. It can be said that DMU3 and DMU4 were put more than 30% of their asset compared to the actual value of assets that have been allocated. Only DMU5 shows gap between actual and target value so close. It is less than 1% gap between them. This finding would help the companies to ensure they could sustain in competitive environment and also raise their efficiencies in utilization of their financial resources.

Keywords: Financial Efficiency, Small and Medium Enterprises (SMEs), Data Envelopment Analysis (DEA), Performance Measurement.

1. Introduction

Small and Medium Enterprises (SMEs) play an important role on the Malaysian economic growth due to their contribution in supporting the growth for industry expansion and development [1]. A successful business is driven by the strong financial factor. In order to meet the requirements in terms of capital financing, SMEs must have the strong financial status. There is still a large gap remain in our knowledge about of SME's efficiency in utilizing financial resources. According to [1] highlighted that many challenges facing SMEs in a globalized environment, for example, lack of financing, difficulties in exploiting technology, constrained managerial capabilities, low productivity and a heavy regulatory burden, have become more acute in a globalized, technology-driven environment. Therefore, these prevent SMEs from growing further and put them in a critical position, to face a new challenges that arising from globalization, liberalization and extensive organizational, institutional and technological change [1].

In order to make SMEs well being and competitiveness in the global market, it is essential for SMEs to improve their performance regarding components in companies financial especially on how to utilize their financial resources. Hence, the objective of this study is to analyze the performance of SMEs based on how they utilize their financial resources in terms of financial inputs used to produce financial outputs. The financial inputs and financial outputs were identified based on the previous studies from other researchers

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and the availability of the data. The analysis on how they used the financial inputs to produce financial outputs had been done by measuring their efficiencies score of SMEs/DMUs by using efficiency model in the framework of Data Envelopment Analysis (DEA) model.

2. Solution Architecture

The previous studies by other researchers for measuring efficiency of SMEs used Data Envelopment Analysis (DEA) techniques for example [2] and [3]. [2] conducted a study aimed to gauge the performance of SMEs in Northern Corridor Economic Region in Malaysia with respect to their relative operating efficiency in channeling financial resources. They had analyzed 1047 SMEs. The result showed that was only 20 SMEs efficient and the scored are 100% or 1. [2] analyzed the technical efficiency, the productivity index and input resources utilization of supported Small and Medium-sized Enterprises (SMEs) in Korea and indexed them. They measured the efficiency index of the fund-receiving enterprise as the data for input and output factors relating to an enterprise's production activity during 2000 – 2002. Comparison of the efficiency between enterprises located in the capital region and those enterprises located in non-capital region has been made to induce the political significance of regional perspective in the global era. As a result of the study, they had found that the efficiency index of large-sized enterprises efficient, and noticed an efficiency index difference for each region.

2.1. Model development

Data Envelopment Analysis (DEA) is a linear programming based technique for measuring the relative efficiency of homogeneous organizational units [4]. It was pioneered by [4] and is used to measure organizational unit relative efficiency based on input/output measures [5]. DEA is an approach to compare organization units' efficiency. This organization is known as DMU (Decision Making Unit) or units [4]. The relative efficiency of a DMU is calculated using a ratio definition of efficiency [4]. This technique has been widely used to the public and private sector for example schools, universities, hospitals and banks. Therefore, in this study, DEA is selected to determine the relative efficiency of the SMEs. The orientation of the DEA model used in this study is input oriented. To obtain the efficiency scores for SMEs, there are two options models using linear programming technique either primal model or dual model.

a) Primal model

The concept in this model is to maximize h_0. Primal model is published in linear form by setting the denominator to a constant, one and maximizing the numerator. Below is the primal model which is the basic DEA model called CCR model proposed by [4].

$$Maximize\ h_0 = \sum_{j=1}^{n} w_j y_{jk_0}$$

subject to

$$\sum_{i=1}^{m} v_i x_{ik_0} = 1$$

$$\sum_{j=1}^{n} w_j y_{jk} - \sum_{i=1}^{m} v_i x_{ik} \le 0 \qquad k = 1, 2, \ldots, p$$

$$w_j, v_i \ge \varepsilon$$

$$j = 1,2,\ldots,n$$

$$i = 1,2,\ldots,m$$

The efficiency scores also can be determined by using dual model.

b) Dual model

The model is computationally simpler; the model is obtained by taking the dual of the previous model.

$$Minimum\ h_0 = z_0 - \varepsilon \sum_{j=1}^{n} t_j - \varepsilon \sum_{i=1}^{m} s_i$$

subject to

$$\sum_{k=1}^{p} S_k x_{ik} + s_i = z_0 x_{ik_0} \quad ; \quad i = 1,2,\ldots, m$$

$$\sum_{k=1}^{p} S_k y_{jk} = y_{jk_0} + t_j \quad ; \quad j = 1,2,\ldots, n$$

$$S_k, s_i, t_j \geq 0 \quad \forall\, k, i, j \;\&\; z_0 \text{ unconstrained}$$

The model which inserted in the software is as follows.

$$Minimum \;\; z_0$$

subject to

$$\sum_{k=1}^{p} S_k x_{ik} - z_0 x_{ik_0} \leq 0 \quad ; \quad i = 1,2,\ldots, m$$

$$\sum_{k=1}^{p} S_k y_{jk} - y_{jk_0} \geq 0 \quad ; \quad j = 1,2,\ldots, n$$

y_{jk_0} = amount of output j from unit k_0

y_{jk} = amount of output j from unit k

x_{ik_0} = amount of input i from unit k_0

x_{ik} = amount of input i from unit k

w_j = the weight given to output j

v_i = the weight given to input i

p = the number of units

n = the number of outputs

m = the number of inputs

ε = a small positive number

z_0 = efficiency score

S_k = dual weight

s_i , t_j = slack

DMU₀ is efficient if $z_0 = 1$, on the other hand if $z_0 < 1$, the company is inefficient and z_0 value gives the financial efficiency score. In this study, LINDO computer package was used. LINDO (Linear, Interactive and Discrete Optimizer) is developed by Linus Schrage in 1986, is a computer package user's friendly that can be used to settle the issues of linear programming. The use of this package facilitates DEA model calculation and it is brief and easily to understand.

3. Data Analysis

The data for this study is obtained from "Suruhanjaya Syarikat Malaysia" (SSM). In this study, the number of SMEs is five companies, which are called DMU1, DMU2, DMU3, DMU4 and DMU5. The selection of inputs and outputs are based on previous studies and the availability of the data. According to both conditions, we have selected three inputs (current asset, share capital and cost of sales) and one output (revenue). Regarding to that, the terms financial efficiency used in this study refers to how the company used their financial inputs (current asset, share capital and cost of sales) to produce financial output (revenue).

Table 1 shows the efficiency score for each DMU. Only DMU1 and DMU2 are efficient ($z_0 = 1$), whereas DMU3, DMU4 and DMU5 are less than 1. It means, DMU1 and DMU2 are efficient compared to other DMUs. DMU3 shows the value of 0.754 and DMU5 shows the value of 0.997. It defines that both DMUs are inefficient in usage of inputs to produce certain level of revenue.

Table 1: Efficiency Score for Each DMU

DMU	2010				
	Output (RM)	Input(RM)			Efficiency score
	Revenue	Current Asset	Share Capital	Cost of Sales	
1	14023719	5374184	1500000	12226660	1.000
2	50170881	25406759	975000	33626228	1.000
3	4282138	2293346	753002	4698518	0.754
4	337337	234465	500000	253819	0.891
5	41879	19615	2000	39148	0.997

In order to make inefficient DMUs to become efficient, the current input level of DMU3, DMU4 and DMU5 need to be improved. The improvement in this case refers to how to minimize the use of input level. This improvement is important for the inefficient DMUs to identify the area of weakness. The improvement level of input can be done by using the dual weights from each reference set. Based on the reference set and the dual weights for each efficient DMU in Table 2, the target of input level can be obtained. Reference set and the dual weights are determined by DEA model. Reference set consists of efficient DMUs and acts as the basis for calculating the target of input level.

Table 2: Reference Set for Inefficient DMUs

DMU	Reference Set	Dual Weight
3	{DMU1,DMU2}	0.247018, 0.016305
4	{DMU2}	0.006724
5	{DMU1,DMU2}	0.000961, 0.000566

Table 3: Suggestion to improve input level for inefficient DMUs

DMU		2010			
		Input(RM)			Output (RM)
		Current Asset	Share Capital	Cost of Sales	Revenue
3	Actual	2293346	753002	4698518	4282138
	Target	1741777	386424.4	3568481	
	Difference	551569	366578	1130037	
	% Difference	31.67	94.86	31.67	
4	Actual	234465	500000	253819	337337
	Target	170835	6555.9	226102.8	
	Difference	63630	493444	27716	
	% Difference	37.25	7526.72	12.26	
5	Actual	19615	2000	39148	41879
	Target	19544.82	1993.35	30782.27	
	Difference	70	7	8366	
	% Difference	0.36	0.35	27.18	

The result shows the suggestion for all inefficient DMUs to increase their efficiency score to 1, which the inputs will be minimized while the output is remain. Sometimes, certain improvement of input level cannot be controlled by the DMUs is occurred. If this happens, the DMUs managements should discuss among them which input they need to consider most. To make DMUs efficient, they are suggested to reduce the usage of current asset, share capital and cost of sales. It means that currently, the DMUs were using their inputs not in the efficient way. For DMU3 and DMU4, show that percentage of the difference between target and actual inputs level for current asset and share capital are higher than DMU5.

4. Conclusion

The use of DEA is to determine the relative efficiency of foods and beverages SMEs in Selangor. Measuring efficiency uses DEA extremely suitable because DEA formation of model is not difficult to carry out. In using DEA, the selection of input and output factor must emphasize, this is because input and output factor are the major components in evaluating the DMUs. Therefore, it must be determined clearly and normally it based on what kind of performance measurement indicator we want to obtain because the input and output can influence the efficiency score. After using DEA, the efficiency score is obtained. Unit that is efficient and inefficient can be identified. For unit that is inefficient, target input that should be used and output that should be produced to improve the efficiency score can be determined.

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