

PERFORMANCE EVALUATION USING DATA ENVELOPMENT MULTIPLIERS MODEL ANALYSIS CASE STUDY: TOURISM SECTOR IN EAST JAVA PROVINCE INDONESIA

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Abstract

Tourism had moved into a market-driven industry in Indonesia. It presents and promotes the growth potential and attracting the attention of investors and government. By having abundant natural resources and as the center of Eastern Indonesia Region, the local government of East Java Province had made the consideration that the development of the tourism sector as one of a large-scale program of priority. In order to achieve this goal it is necessary to evaluate the performance evaluation of HAI (hotel and accommodation industry). Therefore, it will be able to grow and compete in facing the global competition.

The method used in this study is the method of DEA (Data Envelopment Analysis) Multipliers Model. Input and output data used in this study are the data of Statistic Tourism in East Java Province during year 2014 (January–February). The result of this study indicated that as many as 11 DMU-months had an efficient condition with the value of 91.67% and only 1 DMU-month had an inefficient condition with the value of 8.33%. The DMU-months efficient were DMU1-January, DMU2-February, DMU3-March, DMU4-April, DMU5-May, DMU6-June, DMU7-July, DMU8-August, DMU9-September, DMU11-November and DMU12-December. The DMU-month inefficient was DMU10-October. Therefore, it is necessary to find the factors that caused the inefficiency performance of tourism sector and its effects.

Keywords: Evaluation performance; DEA multipliers; Tourism sector.



Introduction

One of indicators in assessing the economic stability and security of a region is to see the progress of the tourism sector. In a comprehensive, foreign tourists visiting have contributed to growth and development in a variety of economic sectors. This is a chain that begins from the added value creation up to the increase in the amount of labor required. It takes an effort to increase the provision of HAI (hotel and accommodation industry). Therefore, the demand and supply of HAI would not cause disparities. The development and advancement of HAI can be seen from the indicators which include: the occupancy rate of hotel room and other accommodation, number of rooms sold, and the average duration of the guest's stay. To define policies in developing the HAI, the above data can be used as a basis for planning and evaluation by institutions of the government, private sector, and the business people of hotel and other accommodation [1].

Tourism is one of the important economic sectors in Indonesia. Every year an increasing number of foreign tourist who come to Indonesia. Based on data from the Central Bureau of Statistics, there are eleven provinces of the most frequented by tourists, namely: East Java, Bali, West Java, Central Java, Jakarta, North Sumatra, Lampung, South Sulawesi, South Sumatra, Banten and West Sumatra. The purpose of their visit was for vacation (62%), business (34%) and other reasons (4%). Tourism has moved into a market-driven industry. It presents and promotes the growth potential and attracting the attention of investors and government [2].

East Java is a province in the eastern part of Java Island, Indonesia. Its capital is located in Surabaya. Its region consists of several islands which include: Madura Island, Bawean Island, Kangean Island and several small islands in the Java Sea (Masalembu Islands), and the Indian Ocean (Sempu Island and Nusa Barong Island). It had contribution to the national Gross Domestic Product, i.e., with a value of 14.85%. This indicated that it had economic significance, which was quite high [3].

By having abundant natural resources and as the center of Eastern Indonesia Region, the local government of East Java Province had made the consideration that the development of the tourism sector as one of a large-scale program of priority. In order to achieve this goal it is necessary to evaluate the performance evaluation of HAI. Therefore, it will be able to grow and compete in facing the global competition.

Methodology

Performance Evaluation

The performance evaluation of business activities had attracted interest for all organizations. The results of a positive performance evaluation had an impact on the business unit to continue to grow and develop. Therefore, they were able to survive in facing the global competition and can also achieve success in their business environment. The performance evaluation of company has two goals as the following: (1) Evaluate the current operating internally; and (2) Evaluate the current operation externally through benchmarking. By conducting the evaluation of performance, the company will be able to do the following: (1) Be able to know the strengths

and weaknesses of their company; (2) Prepare the activities of their company with a better way; and (3) It can identify business opportunities as a reference to improve the operations and processes of their company [4].

The DEA Multipliers Model

In this method, the value of weighted outputs divided by weighted inputs will get the results of efficiency value. It is between 0 and 1. The value of 1 indicates that DMU is the most efficient. The formula for this method is as shown in equation 1.

$$\begin{aligned}
 &\text{Maximum} && \sum_{r=1}^s \mu_r Y_{r0} \\
 &\text{Subject to} && \sum_{r=1}^s \mu_r Y_{rj} - \sum_{i=1}^m V_i X_{ij} \leq 0, \quad J=1, \dots, n \quad (1) \\
 &&& \sum_{i=1}^m V_i X_{i0} = 1 \\
 &&& \mu_r, V_i \geq 0
 \end{aligned}$$

Where: Y_{r0} = the r th output for DMUs under evaluation, X_{i0} = the i th input for DMUs under evaluation, Y_{rj} = j th DMU's r th output ($r=1, \dots, s$ for output), X_{ij} = j th DMU's i th output ($i=1, \dots, m$ for input), V_i = output multiplier, μ_r = input multiplier.

Results & Discussion

Input and output data

Input and output data used in this study were the data of Statistic Tourism in East Java during 2014 from January to February. The input data consist of (1) Number of foreign tourist visited Indonesia on a national scale; (2) Number of foreign tourist visited East Java through Juanda Airport using the document of Free Visa for Short Visiting (FVSV); (3) Number of foreign tourist visited East Java through Juanda Airport using the document of Visa on Arrival (VOA); (4) Number of foreign tourist visited East Java through Juanda Airport using the document of Visa for Visiting; (5) Number of foreign tourist visited East Java through Juanda Airport using the other document; and (6) The number of hotels and other accommodation.

The output data consist of (1) The rate of hotel room occupancy; (2) The room occupancy rate of other accommodation establishments; (3) The length average to stay at hotel; (4) The length average to stay at other accommodation establishments; (5) The number of guests per room at the hotel (in average); (6) The number of guests per room at the other accommodation establishments (in average); (7) The usage rate of hotel bed; and (8) The usage rate of beds at the other accommodation establishments. Input and output data are shown in table 1 and 2 respectively.

Data Processing

The Multiplier Excel Spreadsheets Model in the DEA method used in this study to solve the problems as shown in table 3. It had obtained the input value of input multiplier, output



multiplier and efficiency as shown in table 4, 5 and 6, respectively. The value of input and output multipliers were as the basis to obtain the value of efficiency.

Based on table 4, DMU1-January had the input multipliers for input1 (1.02E-06), input2 (2.03E-05), input3 (3.7E-05), input4 (0), input5 (0), input6 (0) and so on until DMU12-December. Based on table 5, DMU1-January had the output multipliers for output1 (0), output2 (0), output3 (0), output4 (0), output5 (0), output6 (0), output7 (0), output8 (0.01535862), and so on until DMU12-December.

The value of input and output multipliers in table 4 and 5 were as the basis to obtain the value of efficiency in table 6. The result of it indicated that the efficiency value of each DMU-month as the following: DMU1-January (1), DMU2-February (1), DMU3-March (1), DMU4-April (1), DMU5-May (1), DMU6-June (1), DMU7-July (1), DMU8-August (1), DMU9-September (1), DMU10-October (0.996), DMU11-November (1) and DMU12-December (1).

Government efforts to develop the tourism industry in Indonesia

The industry of Indonesia tourism had proven its ability to be able to survive against the global crisis. At the time of the global economy collapsed but it remained growing. And even then, its growth had exceeded the growth rate of the national economy [5]. In a situation of Indonesian exports declined as a result of the slowing world trade, tourism sector was the sector with the most potential to bring in foreign exchange and easiest to create jobs [6]. Some of the underlying reasons that Indonesia had become a tourist destination for foreign tourists as the following: (1) Indonesia has a variety of natural attractions which it is very beautiful and still natural; (2) Indonesia society is very friendly and smiling; and (3) As a tropical country, Indonesia has only two seasons (dry and rainy seasons). Sunlight can be shine all year round even in the rainy season [7].

Government had made various efforts to develop the tourism industry. Therefore, the number of foreign tourists will be increasing every year. These efforts are as follows: (1) Strengthen the branding of Wonderful Indonesia in the countries as the major markets through marketing and promotion strategy. Thereby, Indonesia would be the wish list of countries that became a tourist destination; (2) Conduct campaigns and marketing communications for Indonesian tourism; (3) Follow international tourism fairs in the special interest, such as: DEMA show, Cruise Shipping, Boot Dusseldorf, GOLF, and MICE; (4) Conduct sales missions in a number of countries, namely: the region of Southeast Asia, Asia Pacific, Europe, Middle East, Africa and North America; and (5) Invite the foreign tourism stakeholders by visiting tourist destinations across Indonesia as an effort for “seeing is believing” [8].

Conclusion

The result of this study indicated that as many as 11 DMU-months had an efficient condition with the value of 91.67% and only 1 DMU-month that had an inefficient condition with the value of 8.33%. The DMU-months efficient were DMU1-January, DMU2-February, DMU3-March, DMU4-April, DMU5-May, DMU6-June, DMU7-July, DMU8-August, DMU9-September, DMU11-November and DMU12-December. The DMU-month inefficient was DMU10-October. Therefore,

it is necessary to find the factors that caused the inefficiency performance of tourism sector and its effects, such as factor: man, method, materials, support equipment, and environmental capital. And furthermore take action to resolve the problems that occurred. Therefore, the tourism sector in East Java Province will be able to develop towards more advanced and able to face the global competition.

In a situation of Indonesian exports declined as a result of the slowing world trade, tourism sector was the sector with the most potential to bring in foreign exchange and easiest to create jobs. Indonesian government had made various efforts to develop the tourism industry in Indonesia. Therefore, the number of foreign tourists will be increasing from year to year.

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Appendix A

Table 1 Input Data

Month	Input (persons)					Input 6 (units)
	1	2	3	4	5	
January	753,079	5,412	3,293	1,361	6,804	2,235
February	702,666	5,840	3,862	1,446	5,328	2,235
March	765,607	6,667	4,103	1,562	6,444	2,235
April	726,332	6,951	4,342	1,595	6,257	2,235
May	752,363	8,022	4,085	1,511	6,681	2,235
June	851,475	6,267	4,061	1,644	6,713	2,235
July	777,210	3,962	3,655	1,338	7,219	2,235
August	826,821	5,214	5,015	1,967	6,043	2,235
September	791,296	5,829	4,501	1,552	5,242	2,235
October	808,767	6,928	4,076	1,391	5,602	2,235
November	764,461	8,336	3,740	1,497	4,751	2,235
December	915,334	8,735	3,511	1,245	5,593	2,235

Source: BPS–2014 Tourism Statistics of East Java Province

Table 2 Output Data

Month	Output (%)							
	1	2	3	4	5	6	7	8
January	32.80	32.91	2.43	1.45	226	2.17	44.07	65.11
February	36.31	30.95	1.99	1.35	193	2.10	38.72	63.70
March	39.37	32.97	1.81	1.47	196	2.16	43.22	63.33
April	39.37	33.24	1.88	1.41	171	2.17	45.45	53.51
May	35.55	37.60	1.85	1.49	191	2.03	47.79	66.90
June	62.37	31.83	1.90	1.36	178	2.13	42.45	68.28
July	25.64	26.72	2.08	1.40	206	2.13	35.38	54.74
August	29.91	32.26	1.99	1.34	198	2.12	42.79	60.94
September	27.28	32.38	1.94	1.40	191	2.21	43.22	58.69
October	30.62	31.89	1.72	1.34	181	2.16	41.88	54.83
November	32.94	32.20	1.90	1.37	203	2.14	41.80	70.81
December	29.49	31.77	1.90	1.27	178	2.20	42.74	56.88

Source: BPS–2014 Tourism Statistics of East Java Province

Table 3 Multiplier Spreadsheet Model

Months	DMU	INPUT						OUTPUT								Constr.	Eff.
		1	2	3	4	5	6	1	2	3	4	5	6	7	8		
January	1	753079	5412	3293	1361	6804	2235	32.8	32.91	2.43	1.45	2,26	2.17	44.07	65.11	-5.1E-12	1
February	2	702666	5840	3862	1446	5328	2235	36.31	30.95	1.99	1.35	1,93	2.1	38.72	63.7	4.7E-12	1
March	3	765607	6667	4103	1562	6444	2235	39.37	32.97	1.81	1.47	1,96	2.16	43.22	63.33	-6.2E-02	1
April	4	726332	6951	4342	1595	6257	2235	39.37	33.24	1.88	1.41	1,71	2.17	45.45	53.51	-5.2E-02	1
May	5	752363	8022	4085	1511	6681	2235	35.55	37.6	1.85	1.49	1,91	2.03	47.79	66.9	-4.1E-12	1
June	6	851475	6267	4061	1644	6713	2235	62.37	31.83	1.9	1.36	1,78	2.13	42.45	68.28	-1.4E-01	1
July	7	777210	3962	3655	1338	7219	2235	25.64	26.72	2.08	1.4	2,06	2.13	35.38	54.74	-1.3E-01	1
August	8	826821	5214	5015	1967	6043	2235	29.91	32.26	1.99	1.34	1,98	2.12	42.79	60.94	-1.8E-01	1
September	9	791296	5829	4501	1552	5242	2235	27.28	32.38	1.94	1.4	1,91	2.21	43.22	58.69	6.0E-12	1
October	10	808767	6928	4076	1391	5602	2235	30.62	31.89	1.72	1.34	1,81	2.16	41.88	54.83	-3.8E-03	0.996
November	11	764461	8336	3740	1497	4751	2235	32.94	32.2	1.9	1.37	2,03	2.14	41.8	70.81	-3.7E-12	1
December	12	915334	8735	3511	1245	5593	2235	29.49	31.77	1.9	1.27	1,78	2.2	42.74	56.88	7.2E-12	1

Multipliers	0E+00	1E-05	0	0.00	4E-05	0E+00	0	0.02	0	0	0	0.00	0	0.006	0
DMU under evaluation	12														
Efficiency	1														

Table 4 Input Multipliers

Month	DMU	Input Multipliers					
		1	2	3	4	5	6
January	1	1.02E-06	2.03E-05	3.7E-05	0	0	0
February	2	1.32E-06	1.19E-05	0	0	0	0
March	3	5.19E-07	0	0	0	0	0.00027
April	4	1.18E-06	2.08E-05	0	0	0	0
May	5	1.24E-06	8.08E-06	0	0	0	0
June	6	5.26E-07	2.48E-05	0	0	0	0.000178
July	7	5.72E-07	0.00014	0	0	0	0
August	8	0	3.95E-05	0	0	4.22E-05	0.000241
September	9	0	3.93E-05	0	2.15E-06	4.47E-05	0.000239
October	10	2.12E-07	1.25E-05	0	0.000305	4.85E-05	2.09E-05
November	11	1.31E-06	0	0	0	0	0
December	12	0	1.1E-05	0	0.000543	4.08E-05	0



Table 5 Output Multipliers

Month	DMU	Output Multipliers							
		1	2	3	4	5	6	7	8
January	1	0	0	0	0	0	0	0	0.01535862
February	2	0	0	0	0	0	0	0	0.01569859
March	3	0.002024	0.005692	0	0	0	0.265317	0	0.00251923
April	4	0.004761	0	0	0	0	0.04991	0.010859	0.00393794
May	5	0	0	0	0	0	0	0.004653	0.01162357
June	6	0.000993	0	0	0	0	0	0	0.01373888
July	7	0	0	0	0	0	0	0	0.01826818
August	8	0	0.018306	0	0	0	0	0	0.00671892
September	9	0	0.017416	0	0	0	0	0.00101	0.00668637
October	10	0	0.020224	0	0	0	0.162592	0	0
November	11	0	0	0	0	0	0	0	0.0141223
December	12	0	0.01998	0	0	0	0	0	0.00642107

Table 6 Efficiency

Month	DMU	Efficiency	Category
January	1	1	Efficient
February	2	1	Efficient
March	3	1	Efficient
April	4	1	Efficient
May	5	1	Efficient
June	6	1	Efficient
July	7	1	Efficient
August	8	1	Efficient
September	9	1	Efficient
October	10	0.996	Inefficient
November	11	1	Efficient
December	12	1	Efficient