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Study of financial efficiency in companies certified with the BASC label using Data Envelopment Analysis: Case applied in Cali - Colombia *

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ABSTRACT

The present research is about the analysis financial efficiency of Colombian companies based on the city of Cali certified by the BASC label, for this purpose we used the linear programming technique called Data Envelopment Analysis (DEA), applying the CCR-O routine aimed to outputs. As input variables, it was worked with: Subtotal of inventory, Total Current Assets, Plant and Equipment property and Suppliers, and as output variable, Operating Income. The quality of this work is based on the use of primary information collected by the Superintendence of Corporations in 2014. As results we find that average efficiency of 42 companies under study was 33.95%, besides only five companies reached highest efficiency levels.

KEYWORDS

Efficiency, logistic processes, CCR model.

JEL CLASSIFICATION

L69

Estudio de la eficiencia financiera en compañías certificadas con el sello BASC usando Análisis Envoltante de Datos: Caso aplicado en Cali – Colombia

RESUMEN

La presente investigación desarrolla un análisis de eficiencia de empresas colombianas localizadas en la ciudad de Cali, certificadas en el sello BASC. Para este propósito se utilizó la técnica de programación lineal llamada Análisis Envoltante de Datos (DEA), aplicando la metodología CCR-O enfocada a las salidas. Como variables de entradas, se trabajó con: Sub-inventario total, Activos totales actuales, plantas propiedades, equipos y proveedores. Como variable de salida se utilizó el ingreso operativo. La calidad de este trabajo está dada por el uso de información primaria recolectada por la Superintendencia de Sociedades en 2014. Como resultados se encontró que la eficiencia promedio de las 42 empresas en estudio fue del 33.95%, además solo cinco empresas alcanzaron altos niveles de eficiencia.

PALABRAS CLAVE

Eficiencia, procesos logísticos, modelo CCR-O

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Estudo da eficiência financeira em empresas certificadas com o selo BASC usando Data Envelopment Analysis: Caso aplicado em Cali - Colombia

R E S U M O

Esta pesquisa desenvolve uma análise de eficiência de empresas colombianas localizadas na cidade de Cali, certificadas no selo BASC. Para tanto, utilizou-se a técnica de programação linear denominada Data Envelopment Analysis (DEA), aplicando a metodologia CCR-O focada nas saídas. Como variáveis de entrada, trabalhamos com: Sub-estoque total, Ativo total atual, propriedades da planta, equipamentos e fornecedores. Como variável de saída, foi utilizado o lucro operacional. A qualidade deste trabalho é dada pelo uso de informações primárias coletadas pela Superintendência de Empresas em 2014. Como resultado, verificou-se que a eficiência média das 42 empresas pesquisadas foi de 33,95%, e apenas cinco empresas atingiram altos níveis de eficiência.

PALAVRAS-CHAVE

Eficiência, processos logísticos, modelo CCR-O

CLASSIFICAÇÕES JEL

L69

Introduction

At international level, standards have been established to ensure the safe trade. One of these models for the standardization of secure logistics processes is BASC (Business Anti Smuggling Coalition), in this sense it is important to be able to analyze how this process of standardization contributes to improving internal operations, and the efficiency of this type of organizations that have taken these good standardized practices.

Which is why, in this research the answers to the following questions will be given:

What type of items and variables should be used to calculate the efficiency of Cali- Colombia firms that have assumed the BASC model?, what is the level of efficiency that the companies purpose of this study have reached?, can be established some sort of positive causation between the companies that were certified in BASC and the improvement of their level of efficiency?, what are the projections required to make inefficient companies reach their optimal efficiency?

Initially in this research, the concepts associated with the DEA Basic Model (Model CCR - O) and the evaluation of the efficiency of logistics processes through the Data Envelopment Analysis (DEA) are showed. For this study, the companies certified in BASC that submitted their financial statements in the Superintendency of Corporations of Colombia in 2014 were taken.

Then the variables and items used in this study are presented; subsequently the correlation of variables of inputs and outputs required for the calculation of the efficiency is analyzed. After this, it is presented the results of the financial efficiency analysis of the BASC certified

companies in the city of Cali - Colombia with the efficiency scores calculated by the CCR – O model; subsequently, the efficient firms that can act as peer evaluators for the inefficient firms and the required projection for the output variable to achieve efficiency are determined.

I. Literature review

I.1. Growth of the economy

The current growth of the economy, the opening of markets and the trend of the same level, make a series of challenges for organizations which demands a greater effort to remain productive and thus achieve greater competitiveness in the market.

In the logic of the growth of the companies, these need efforts to increase their market share, financial efforts in human resources and efforts in fixed assets that may affect the level of efficiency of the companies and assist with compliance of organizational objectives. In this regard, it is necessary an effort not alien to the growth of the company, which from a broad point of view should cover the efforts mentioned above and in this way improve the logistics processes. Free trade treaties create a series of challenges in which in addition to the improvement of quality and price, the quality of the acquisition processes from the raw materials up to the delivery of the products and/or services must be improved.

As previously mentioned, it is necessary the implementation of a management system to ensure the safety of the processes that integrate the supply chain; and for this reason standards for secure commerce are implemented, as it is the BASC certification (Business Anti Smuggling Coalition), which seeks answers to the issue of control management and safety of the trade. According to, processes in the international trade

require formality and timely responsiveness, guarantees on the transactions and assurance of the supply chain, which is precisely achieved with the BASC certification.

1.2. DEA CCR - O

For the measurement of how effective the BASC model is, in this research work is defined a structure of input and output variables, with which it was measured the efficiency of the DEA CCR-OR model in this group of companies that assumed that standard in the city of Cali - Colombia.

The data envelopment analysis (DEA) is a tool that allows the measurement of efficiency in the public or private organizations through a linear programming model. Charper, Cooper and Rhodes originally proposed this tool of analysis of efficiency in 1978. It is important to note that this tool proposes models for the evaluation of efficiency, one model oriented to entries (CCR - I) and another aimed at the outputs (CCR - O), the latter one seeks to maximize the outputs from the resources available. Maximize the efficiency seeks a fractional programming solution which has multiple solutions, in this sense, it is necessary the implementation of a linear programming model, and this is achieved by leaving the numerator constant (assuming a value of 1) and maximizing the numerator; this is called CCR oriented to the outputs or commonly called CCR - O.

1.3. DEA Basic Model (Model CCR - O)

This model is expressed mathematically as it follows, if $Y_o = (y_{1o}, y_{2o}, y_{3o}, \dots, y_{so})$ and $X_o = (x_{1o}, x_{2o}, x_{3o}, \dots, x_{mo})$, represent the inputs and the outputs of the DMU_o respectively, the measure of efficiency of the unit being evaluated can be obtained with the optimal solution of the following model:

$$Max Z = \frac{\sum_{r=1}^s u_{ro} y_{ro}}{\sum_{i=1}^m u_{ro} x_{io}}$$

s.a.:

$$Max Z = \frac{\sum_{r=1}^s u_{rj} y_{rj}}{\sum_{i=1}^m V_{ij} x_{ij}} \leq 1; \quad j = 1, \dots, n$$

$$u_{rj} \geq 0, \quad V_{ij} \geq 0$$

$$r = 1, \dots, s \quad i = 1, \dots, m$$

Being u_{ro} y v_{ro} the group of DMU more favorable, the previous model can be converted to:

$$Max Z = \sum_{r=1}^s u_{ro} y_{ro}$$

s.a.:

$$\sum_{i=1}^m v_{io} x_{io} = 1$$

$$\sum_{r=1}^s u_{rj} y_{rj} \leq \sum_{i=1}^m v_{ij} x_{ij} \quad ; \quad (j = 1, 2, \dots, n)$$

$$u_{rj} \geq 0, \quad V_{ij} \geq 0$$

Where n is the number of DMU, m is the number of input variables and s is the number of output variables.

1.4. Evaluation of the efficiency of logistics processes using Data Envelopment Analysis (DEA, CCR - O)

The DEA tool is one of the most used in the evaluation of performance of public and private organizations (Nijkamp, Suzuki 2009). Within the logistics processes, its use is necessary to assess the efficiency, productivity, and observe the units that can be improved as a measure of competitiveness. The use of the technique has many applications within the logistics processes, for example, evaluation of the efficiency with a focus on the suppliers (Azadeh, Alem 2010; Çelebi, Bayraktar 2008; Farzipoor Saen 2009; Jong Joo, Min 2006; Kontis, Vrysagotis 2011; Min, Joo 2009; Mohammady Garfamy 2006; Narasimhan, Talluri, Mendez [no date]) in the evaluation of manufacturing (Shorouyehzad, Lotfi, Aryanezhad, Dabestani 2011), in the evaluation of reverse logistics (Haas, Murphy, Lancioni 2003; Tonanont, Yimsiri, KJ Rogers PhD 2009; Tonanont, Yimsiri, Jitpitaklert, Rogers 2008).

The data envelopment analysis (DEA) is a parametric tool that allows the evaluation of efficiency; it is important to note that the Data Envelopment Analysis looks for the obtaining of an efficient frontier, which is estimated by maximizing the outputs with a certain level of income; and the estimate of the inefficiency, which depends on the orientation and is calculated in the same way as the efficient frontier (Morollón, Morán, Cuervo 2005)

2. Methodology

3. Results

For this study of efficiency, 42 companies certified in BASC Cali-Colombia were taken into account, and the information associated with the financial items, collected in the Superintendency of corporations of Colombia in 2014. Table 1 shows the companies that were considered for this investigation. For which there was special care in the choice of the input and output variables. It was worked with an approach to outputs, and the performance of these was analyzed.

2.1. Variables considered in the study

Below, the variables considered in the study and their description are shown, this was established by the Superintendency of corporations.

2.1.1. Input Variables

- **Subtotal of inventories:** The inventory is associated with the goods and other objects belonging to a natural person, a community.
- **Total Current assets:** current assets are considered cash and all those other accounts which is expected to be converted, in turn, in cash, or that have been consumed during the normal cycle of operations.
- **Property, plant and equipment:** The property, plant and equipment are tangible assets owned by a company for its use in the production or supply of goods and services, productive purposes, administrative or for leasing to third parties and are expected to be used for more than one economic period.
- **Suppliers:** a supplier can be a person or a company that provides stock to other companies, which will be transformed to later sell or directly purchased for sale.

2.1.2. Output Variables

- **Operating Income:** Are all the income assets or reduction of liabilities in the studied period, which is manifested in the increase of the capital, other than to the contributions of the partners.

For the calculation and analysis of the results the software DEA Solver PRO was used, with which in a specific framework the input and output variables, previously established for each company or DMU, were analyzed, with that it was able to calculate the efficiencies for the population under study. Table 1 shows the values (magnitude) of the input and output variables for each of the companies considered in the study.

3.1. Implementation of DEA to BASC certified companies in Cali

The results of this research article make reference to: 1) the efficiency scores of the certified companies with BASC in the city of Cali, 2) the study of the correlation between the variables in the research, 3) the classification of the different organizations by types of efficiency, 4) as well as to the projection of improvement of the output, i.e. operating revenues, with the aim of improving the relationship of input/output with the purpose of making an inefficient firm, efficient. To finally analyze the relationship between the organizational efficiency of the sector and the standardization with the standard for secure commerce BASC in the city of Cali.

Initially the correlation between the variables of the study is presented, used to analyze the technical or administrative efficiency. As seen in Table 2. The data shows a high positive correlation between the input and output variables, allowing to analyze the causality between the items.

It can be seen that there is a high correlation of SUBTOTAL OF INVENTORY with suppliers (0.92), with OPERATING REVENUES (0.83); PROPERTY PLANT AND EQUIPMENT with OPERATING REVENUES (0.88) and SUPPLIERS with OPERATING REVENUES (0.82), on the other hand, the input variable with less correlation with output variables is PROPERTY PLANT AND EQUIPMENT. What evidence the relevance and correspondence between the selected variables.

It is important to emphasize that there is a high correlation between the internal variables of the organizations with the generation of operational income. This is consistent with the fact that the processes of standardization BASC, have as intentionality, the generation of efficiency and operational effectiveness, which requires a series of domestic conditions and availability of current assets, property plant and equipment; and resources available for the improvement of the logistical processes of organizations where it's deployed.

After evaluating the efficiency of the 42 companies certified with BASC in Cali, the CCR-O efficiency scores for each organization were obtained, as shown in Table 3. It is important to remember that a DMU is efficient if the score of efficiency is equal to 1 and has no gaps (the clearance in all the variables is equal to 0), in this case of study all the DMU's whose score of efficiency is one (1) did not show gaps in its variables, therefore to determine if a company is efficient, it is enough to observe that the efficiency score is

Table 1.

Magnitude of the variables of input and output of the certified companies in BASC Cali for research

Social Reason	(I) Subtotal Inventories	(I) Total Current Assets	(I) Properties Plant And Equipment	(I) Suppliers	Operating Revenues (Annex 1)
Comestibles Aldor S.A.	15735248	59829143	41939120	11850003	144126848
Ocupar Temporales S.A.	0	7747440	1430622	0	82560111
Coral Visión Ltda Sociedad de Intermediación Aduanera	0	2044341	1318353	0	3051359
Sociedad de Intermediación Aduanera S.A.	150	2647620	34254	48741	1718922
Adhesivos Internacionales S.A.S.	3134704	8894265	679159	930013	11729859
Agraf Industrial S.A.	1176103	5434996	4131348	1604733	18923849
Acción del Cauca S.A.	0	1922135	11894	10353	8837435
Globalog S. A.	5957	6744931	351766	291832	14738411
Cristar S.A.S.	20157597	55367914	22124669	9538784	137649408
Grupo Empresarial Apparel Solutions Ltda.	0	841464	47914	218862	9272880
Colombina del Cauca S.A.	15652690	19606379	73092614	30438228	201035291
Compañía Internacional de Alimentos S.A.S.	6795480	15557945	27273920	21994199	85027721
Genfar S.A.	35784211	126132875	19352200	24934928	218536987
Centro de Mecanizados del Cauca S.A.	16513209	20657011	9616235	4573507	24479846
El Dorado Air Cargo S. A. S.	0	2137374	63328	215611	1196616
Bridgestone Firestone Colombiana S.A.S.	15463446	68971111	298494	13683810	111008747
Ups Scs Colombia Ltda.	0	12705721	835319	7639635	64009165
Carvajal S.A.	20932689	261383285	40006818	18435183	96679792
Laboratorios Baxter S.A.	47606227	377710341	96518604	65142887	547374636
Cartón de Colombia S.A.	88488051	324882231	207791189	76291274	744890873
Colgate Palmolive Compañía	74137276	262135200	129876446	66562102	297597049
Cadbury Adams Colombia S.A.	26474647	136894534	64762107	45548440	299497308
Transportes Centro Valle Ltda.	266065	4118866	3652921	449430	13272315
Transportes Rodríguez – Gonzalo	0	3093086	438191	0	4207245
Industrias del Maiz S.A. Corn Products Andina	60751990	181578693	131520887	69345592	514873966
Eternit Pacífico S.A.	6655875	31276766	8663135	4476552	55991207
Colombina S.A.	85070792	223013032	188298976	100756237	680199335
Laboratorios Recamier Ltda.	14381724	63178247	8634996	14151229	93873979
Plásticos Especiales S.A.	23827540	52920803	24940992	12017258	83682925
Industria de Aluminio India Ltda.	2194308	7181389	7314909	548434	11764797
Acción S.A.	0	50983172	5059449	577489	353981531
Agecolda S. A.	0	261005	1571691	38199	696598
Empresa Andina de Herramientas S. A. S.	5180509	19147114	3160241	3006869	37666715
Protécnica Ingeniería S.A.	5859945	16632620	5131548	5062520	28577498
Productos Yupi Limitada	6423558	36847430	3890446	12893016	149427490
Vallecilla B Vallecilla M & Cia S.C.A. Carval de Colombia	17675742	57182386	19310832	12631017	77840169
Carvajal Internacional S.A.	0	355560627	0	104	95392210
Ingenio del Cauca S. A.	31065259	174262708	293212697	23972807	615026427
Ingenio Providencia S.A.	19918212	70094014	261713216	20442431	454716865
Harinera del Valle S.A.	50603928	314483704	57155350	14750735	361445218
Ingenio Pichichi S.A.	12031159	46547728	51224738	16507605	182952698
Riopaila Industrial S.A.	47706264	244755640	226582396	41303315	676090232

Source: The authors.

Table 2.

Correlation between the variables

Social Reason	(I) Subtotal Inventories	(I) Total Current Assets	(I) Properties Plant And Equipment	(I) Suppliers	Operating Revenues (Annex 1)
Subtotal Inventories	1				
Total Current Assets	0,75	1			
Properties Plant And Equipment	0,70	0,55	1		
Suppliers	0,92	0,67	0,68	1	
Operating Revenues	0,83	0,71	0,88	0,82	1

Source: The authors.

Table 3.

Efficiency scores CCR – O model

No.	DMU	Score	1/Score	No.	DMU	Score	1/Score
1	Comestibles Aldor S.A.	0,22	4,53	22	Cadbury Adams Colombia S.A.	0,20	5,04
2	Ocupar Temporales S.A.	1	1	23	Transportes Centro Valle Ltda.	0,30	3,35
3	Coral Vision Ltda. Sociedad de Intermediación Aduanera	0,14	7,13	24	Transportes Rodríguez - Gonzalo	0,17	6,06
4	Sociedad de Intermediación Aduanera S.A.	0,12	7,8	25	Industrias del Maíz S.A. Corn Products Andina	0,26	3,89
5	Adhesivos Internacionales S.A.S.	0,14	6,7	26	Eternit Pacífico S.A.	0,16	6,06
6	Agraf Industrial S.A.	0,31	3,16	27	Colombina S.A.	0,29	3,49
7	Acción del Cauca S.A.	1	1	28	Laboratorios Recamier Ltda.	0,14	7,38
8	Globalog S. A.	0,31	3,14	29	Plásticos Especiales S.A.	0,14	6,94
9	Cristar S.A.S.	0,22	4,38	30	Industria de Aluminio India Ltda.	0,15	6,57
10	Grupo Empresarial Apparel Solutions Ltda.	1	1	31	Acción S.A.	1	1
11	Colombiana del Cauca S.A.	0,93	1,07	32	Agecolda S. A.	0,25	4,07
12	Compañía Internacional de Alimentos S. A.S.	0,49	2,02	33	Empresa Andina de Herramientas S. A. S	0,18	5,53
13	Genfar S.A.	0,15	6,31	34	Protécnica Ingeniería S.A.	0,16	6,41
14	Centro de Mecanizados del Cauca S.A.	0,1	9,25	35	Productos Yupi Limitada	0,37	2,72
15	El Dorado Air Cargo S. A. S.	0,07	12,78	36	Vallecilla B Vallecilla M & Cía. S.C.A. Carval De Colombia	0,12	8,06
16	Bridgestone Firestone Colombiana S.A.S.	0,48	2,05	37	Carvajal Internacional S. A.	1	1
17	Ups Scs Colombia Ltda.	0,49	2,02	38	Ingenio del Cauca S A	0,33	3,02
18	Carvajal S.A.	3,00E-02	29,08	39	Ingenio Providencia S.A.	0,59	1,70
19	Laboratorios Baxter S.A.	0,13	7,52	40	Harinera del Valle S.A.	0,11	9,33
20	Cartón de Colombia S.A.	0,21	4,65	41	Ingenio Pichichi S.A.	0,36	2,80
21	Colgate Palmolive Compañía	0,1	9,70	42	Riopaila Industrial S.A.	0,26	3,86

Source: The authors.

equal to one (1). It was found that 5 of 42 companies are efficient, this leads to see that 11% of the total number of companies assessed are efficient.

To the results of efficiency of the model used there was a classification in efficient enterprises (efficiency = 1 and zero slack), companies with high efficiency ($1 > \text{efficiency} = 0.80$), companies with average efficiency ($0.80 > \text{efficiency} = 0.70$) and companies with low efficiency ($\text{efficiency} < 0.70$).

According to this classification Table 4 was built.

For each inefficient Company, DEA suggests the combination of inputs and outputs that are necessary to achieve efficiency (projections of the inefficient DMU on the efficient frontier), in the case of the output variables, for an efficient DMU, the magnitude of these should improve (increase). The magnitude of the increase in the magnitude of each output variable for each company is presented in Table 5.

Table 4.

Classification of companies according to their degree of efficiency

Eficcient	High Average Efficiency	Average Efficiency	Low Average Efficiency
Ocupar Temporales S.A.	Colombina del Cauca S.A.		Comestibles Aldor S.A.
Acción del Cauca S.A.			Coral Visión Ltda. Sociedad De Intermediación Aduanera
Grupo Empresarial Apparel Solutions Ltda.			Sociedad de Intermediación Aduanera S.A.
Acción S.A.			Adhesivos Internacionales S.A.S
Carvajal Internacional S. A.			Agraf Industrial S.A.
			Globalog S.A.
			Cristar S.A.S.
			Compañía Internacional de Alimentos S. A.S.
			Genfar S.A.
			Centro de Mecanizados del Cauca S.A.
			El Dorado Air Cargo S.A.S.
			Bridgestone Firestone Colombiana S.A.S.
			Ups Scs Colombia Ltda.
			Carvajal S.A.
			Laboratorios Baxter S.A.
			Cartón de Colombia S.A.
			Colgate Palmolive Compañía
			Cadbury Adams Colombia S.A.
			Transportes Centro Valle Ltda.
			Transportes Rodríguez – Gonzalo
			Industrias del Maíz S.A. Corn Products Andina
			Eternit Pacífico S.A.
			Colombina S.A.
			Laboratorios Recamier Ltda.
			Plásticos Especiales S.A.
			Industria de Aluminio India Ltda.
			Agecolda S.A.
			Empresa Andina de Herramientas S. A. S.
			Protécnica Ingeniería S.A.
			Vallecilla B Vallecilla M & Cía. S.C.A. Carval de Colombia
			Ingenio del Cauca S A
			Ingenio Providencia S.A.
			Harinera del Valle S.A.
			Ingenio Pichichi S.A.
			Riopaila Industrial S.A.

Source: The authors.

Table 5.

Necessary increase in the magnitude of the output variables to achieve the efficiency.

No.	DMU	Score	Increase In Operating Revenues
1	Comestibles Aldor S.A.	0,22	654126542
3	Coral Visión Ltda. Sociedad de Intermediación Aduanera	0,14	21785393
4	Sociedad de Intermediación Aduanera S.A.	0,13	13421919
5	Adhesivos Internacionales S.A.S.	0,15	78603562
6	Agraf Industrial S.A.	0,32	59893312
8	Globalog S.A.	0,32	46393477
9	Cristar S.A.S.	0,23	603355680
11	Colombina del Cauca S.A.	0,93	216061055
12	Compañía Internacional de Alimentos S.A.S.	0,50	171447569
13	Genfar S.A.	0,16	1378975007
14	Centro de Mecanizados del Cauca S.A.	0,11	226521870
15	El Dorado Air Cargo S. A. S.	0,08	15298622
16	Bridgestone Firestone Colombiana S.A.S.	0,49	227348114
17	Ups Scs Colombia Ltda.	0,50	129225103
18	Carvajal S.A.	0,03	2811178790
19	Laboratorios Baxter S.A.	0,13	4116087338
20	Cartón de Colombia S.A.	0,22	3462087225
21	Colgate Palmolive Compañía	0,10	2886451510
22	Cadbury Adams Colombia S.A.	0,20	1508569097
23	Transportes Centro Valle Ltda.	0,30	44520541
24	Transportes Rodríguez - Gonzalo	0,17	25481239
25	Industrias del Maíz S.A. Corn Products Andina	0,26	2000985700
26	Eternit Pacífico S.A.	0,16	339555124
27	Colombina S.A.	0,29	2376524462
28	Laboratorios Recamier Ltda.	0,14	693032147
29	Plásticos Especiales S.A.	0,14	580741997
30	Industria de Aluminio India Ltda.	0,15	77294489
32	Agecolda S.A.	0,25	2834769
33	Empresa Andina de Herramientas S.A.S	0,18	208242285
34	Protécnica Ingeniería S.A.	0,16	183290419
35	Productos Yupi Limitada	0,37	406056345
36	Vallecilla B Vallecilla M & Cia S.C.A. Carval De Colombia	0,12	627013051
38	Ingenio del Cauca S. A .	0,33	1857019676
39	Ingenio Providencia S.A.	0,59	772431596
40	Harinera del Valle S.A.	0,11	3371890866
41	Ingenio Pichichi S.A.	0,36	512953015
42	Riopaila Industrial S.A.	0,26	2608223207

Source: The authors.

It was considered only the outputs variables taking into account that the CCR – O model was used, and this model determines which outputs would be the ideal to optimize the efficiency of the DMU.

The company Grupo Empresarial Apparel Solutions LTDA. was used 30 times as a reference parameter for assessing other organizations. Followed by the companies Ocupar Temporales S.A. with 26, Acción del Cauca S.A. with 6, Carvajal Internacional S.A. with 2 and Acción S.A. with 1 organization as pair evaluators, for other companies under research.

4. Conclusion

In this research work, the efficiency of the certified companies with BASC in Cali, Colombia were assessed. For this it was discussed how efficient organizations are when it is considered as entries the total inventory, current assets, property plant and equipment and the resources of suppliers and how this is reflected in the operating revenues of the organizations under study. The foregoing, using the model that assumes constant returns to scale (CRS) with a focus on outputs (CCR - O), proving efficient 5 of the 42 companies surveyed in the study.

It was able to analyze that in spite of the fact that there is a group of companies that presented an optimal efficiency, there is also a group of inefficient companies that require improving its internal processes in order to be able to increase its operating revenues. The following values are the projections generated by the model of DEA CCR-O used to achieve the efficiency of the inefficient organizations: Comestibles Aldor S.A. (654.126.541), Coral Visión Ltda. Sociedad de Intermediación Aduanera (21.785.393), Sociedad de Intermediación Aduanera S.A. (13.421.918), Adhesivos Internacionales S.A.S. (78.603.561), Agraf Industrial S.A. (59.893.311), Globalog S.A. (46.393.476), Cristar S.A.S. (603.355.679), Compañía Internacional de Alimentos S.A.S. (171.447.568), Genfar S.A. (138.975.006), Centro de Mecanizados del Cauca S.A. (226.521.869), El Dorado Air Cargo S.A.S. (15.298.622), Bridgestone Firestone Colombiana S.A.S. (227.348.113), Ups Scs Colombia Ltda. (129.225.103), Carvajal S.A. (2.811.178.790), Laboratorios Baxter S.A. (4.116.087.337), Cartón de Colombia S.A. (3.462.087.225), Colgate Palmolive Compañía (2.886.451.510), Cadbury Adams Colombia S.A. (1.508.569.096), Transportes Centro Valle Ltda (44.520.540), Transportes Rodríguez – Gonzalo (25.481.238), Industrias del Maíz S.A. Corn Products Andina (2.000.985.699), Eternit Pacifico S.A. (339.555.124), Colombina S.A. (2.376.524.461), Laboratorios Recamier Ltda. (693.032.147), Plásticos Especiales S.A. (580.741.996), Industria de Aluminio India

Ltda. (77.294.488), Agecolda S.A. (2.834.768), Empresa Andina de Herramientas S.A.S. (208.242.285), Protécnica Ingeniería S.A. (183.290.419), Productos Yupi Limitada (406.056.345), Vallecilla B Vallecilla M & Cia S.C.A. Carval De Colombia (627.013.050), Ingenio del Cauca S.A. (1.857.019.675), Ingenio Providencia S.A. (772.431.596), Harinera del Valle S.A. (3.371.890.866), Ingenio Pichichí S.A. (512.953.015), Riopaila Industrial S.A. (2.608.223.207). From the research work carried out it can also be concluded that the average of the BASC certified organizations in Cali - Colombia was 33.95 %. From the 42 companies under investigation only five presented an optimal efficiency. It can be inferred that in spite of the fact that some companies certified in BASC of the city of Cali presented a financial efficiency of 1, it is not significant for the whole sector. Also, with the input and output variables analyzed through the DEA model, it can be concluded that the BASC certification does not generate a causality for the improvement of the efficiency for companies subject to this research by the foregoing there is an invitation to the researchers to continue analyzing the efficiency of the BASC certified companies, selecting and evaluating other variables of input and output that can be used to analyze the correlation and causality of the standardization processes used with the operational and financial efficiency, in order to facilitate the decision making process to achieve productivity and competitiveness of the organizations of the sector that implement this type of international standards. ■■■

Conflict of interests

The authors have no conflicts of interest to declare.

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