3. ENHANCING THE EFFICIENCY OF THE BENCHMARKING LEARNING MAP MODEL: THE INTEGRATED FRA PERSPECTIVE

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Abstract

Financial Ratio Analysis (FRA) has been used for the evaluation of firm's operating performance. However, these individual performance values calculated from FRA have their own different managerial deficiencies. The original Data Envelopment Analysis (DEA) may fill this gap and may be used to calculate efficiency values. This study integrates the DEA with Slacks-Based Measure Model (SBM) to enhance the evaluation efficiency of firms' operating performance. The analysis used financial data of 46 textile firms (that trade in the Taiwan stock market) before the 2007 financial crisis. From this total, 8 textile firms were categorized as an efficient operating group and the other 38 firms were categorized inefficient. This study employed the slack-based measure and the analysis model as a benchmark management tool to offer some improvements for the inefficient firms.

Keywords: financial ratio, performance evaluation, Slacks-Based Measure Model (SBM), benchmarking management, BCG matrix

JEL Classification: G21, C33

1. Introduction

Benchmarking is a process of steps designed to deliver performance improvement emulating the good quality practice by striving to have the best performance (Beadle and Searstone, 1995). It is a relatively new term prevailing across various areas such as: service and manufacturing industries. Benchmarking has revitalized the concept of performance comparisons. This concept was originally associated with the Xerox

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Corporation (Camp, 1989a), in the late 1970s. Its adoption as a performance measure tool attracted additional large corporations such as Motorola (Fritsch, 1993), Texas Instruments (Baker, 1995). Financial statements are a summary of the operating, financing, and investing activities of a firm over a period of time. Financial statements analysis is performed in order to contain enough information to:

- Help investors and creditors make an informed decision about investing or lending money to a firm.
- Help management make decisions about the firm in an informed manner.
- Develop and use a set of ratios to highlight the relative performance of a firm as compared to its industry.

The ratio analysis is an integral part of financial statement analysis. It helps to show whether the firm's position has been improving or deteriorating relative to its own past or in relation to other firms in the industry or industry averages. By benchmarking the firm's financial ratios against its own peers' or industry averages, management can identify the relative strengths and weaknesses of the firm and plan better for the future. In this paper, we illustrate the use of Data Envelopment Analysis (DEA), an operations research technique used to analyze financial statements of firms by benchmarking the financial ratios of a firm against its peers as well as against the industry averages. This study uses the textile industry in Taiwan as an example; demonstrating the advantages of DEA in benchmarking a firm. DEA lays out the areas in which a firm needs improvement relative to its peers; how much and in which areas.

The textile industry in Taiwan exists for a long time. Once, the amount of textiles exported from Taiwan was very important to Taiwan's economy. However, with changes in the structure of the industrial production in Taiwan and the increase in international competition, the export volume of textiles declined and so did the industry's share. The year 2008 was a hard one; the global economy was down due to the global recession. Luxury goods consumption was down-sized. This paper studies the performance of entire firms by integrating DEA techniques with traditional financial ratios. The DEA results could be used as a benchmarking map for poorly managed corporations. The empirical analysis is based on competitive firms in the textile industry; we use 46 firms listed in the stock market of Taiwan during the period of 2007 to evaluate their operating performance. The study:

1. Conducts a relative efficiency model analysis using the DEA technique in order to provide a corporation's input in learning the use of benchmarking models.
2. Evaluates the textile industry's operations performance through an integrated model.
3. Identify the areas in which a firm needs improvement relative to its peers.

The next section of the paper describes benchmarking learning and reviews the textile industry's operating performance. The following section presents the methodology and definition of variables. Next, there is an illustration of the application of DEA to the textile industry in Taiwan. The last section includes conclusions and recommendations.

2. Literature Review

This section discusses benchmarking learning and provides a brief review of the Taiwanese textile industry, followed by a performance evaluation literature review of the textile industry.

2.1. Benchmarking Learning and a Brief Review of the Taiwan Textile Industry

The benchmarking literature identifies three types of benchmarking: internal, competitive and generic/functional. Internal benchmarking refers to a company's effort to examine the best practices within its strategic business units or functions and to try to transplant them to other parts of the company. Competitive benchmarking involves examining competitors' business practices and transplanting them to one's own company. Generic/functional benchmarking refers to benchmarking practices comparing a firm's performance to that of the best practices of non-competitors in the industry and even outside of the firm's industry.

The period of the 1960s to 1980s was the golden era of Taiwan's textile industry. The value of exports and the number of employees in the textile industry were large. However, in recent years the textile industry export value and quantities declined every year. In 2005, the export value was 11,840.1 million USD, and it declined to 11,543.7 million USD in 2008. The growth rate from January to August 2009 declined by 1.9 percents, which was the same as last year. Table 2.1 indicates that Taiwan's textile industry is facing a decline of exports due to international competition. Therefore, it is very important to review the performance and provide an evaluation in order to determine what needs to be changed in order for the industry to survive.

Table 2.1

Contribution of Taiwan's Textile Industry's Exports

Export Goods						
Unit: Millions of USD						
	2005	2006	2007	2008	2009 (January to August)	Annual Growth Rate
Textile	11,840.1	11,788.8	11,622.6	11,543.7	7,569.3	-1.9

Source: Statistic Affairs (2009), Finance Bureau, "Import and Export Trade Statistics."

2.2 Performance Evaluation Literature for the Textile Industry

Historically, it was a textile industry review carried out by Lin (2001), who used profitability ratios, Return on Asset (ROA), Return on Equity (ROE), and Earnings per Share (EPS) for the listed companies in the textile industry. His work was from 1995 to 1999 and focused on their differences during the study period. The main reason for this research is to determine whether or not the performance of financial instruments in the textile industry was affected by the Asian financial crisis.

Lin (2003) studied the subject further by: 1. Comparing the results from different combinations of inputs and outputs; the optimal results can be selected using factor analysis; 2. Developing an efficiency index of the 50 textile companies, including

overall efficiency, technical efficiency, and scale efficiency; 3. Dividing the companies to obtain a decision evaluation. Based on scale efficiency values obtained from DEA, a decision evaluation division of the 50 companies was created and categorized into 3 groups: high performance, medium performance, and low performance.

Chan (2003) uses logit model, T-TEST, and ANOVA regression analysis to find key financial ratios of 10 of the Taiwan Corporate Credit Risk Index and 12 of other selected financial ratios/values that are related to corporate governance, long-term investment and inter-companies transactions, etc. This analysis distinguishes operational performance between regular and default companies, and listed vs. OTC (Over the Counter) companies. Huang (2003) used DEA methodology to evaluate business efficiency of textile enterprises in Taiwan. The data used is 2002 and 2003 financial statements. He chose the average current assets, average investments, long-term loans, average fixed assets, operating cost, operating expense and non-operating expense as input items. The total operating income and non-operating income were chosen as output items as well. The CCR model found the business productive efficiency through input-orientation efficiency. The BCC model obtained technical efficiency and scale efficiency, including the reasons of inefficiency. He used slack analysis to advise the entrepreneurs on how to improve their efficiency. Finally, he discussed the changes of relative efficiency and relative revenue during 2002 and 2003 by a BCG matrix. He recommended that the textile enterprises in Taiwan develop a business strategy, choose a benchmark enterprise and collect information for benchmarking of textiles.

There is a scarcity of academic research on benchmarking in performance evaluation. One reason might be the lack of robust methodologies and measurement tools that would help managers identify areas that need improvement, as well as the magnitude of the improvement needed. A quantitative benchmarking tool should be able to analyze multiple inputs and outputs, and provide feedbacks concerning the areas of improvement needed. The DEA literature review indicates that the DEA method was applied in many aspects of performance evaluation. Although the DEA technique was applied in the textile industry, this paper presents some observations that are generic: when the input or output data of a firm are of negative value (such as net income or earnings), we cannot use CCR and BCC models. When input and output data is with different units, we cannot use CCR and BCC models. This paper abandons the traditional way of using CCR and BCC models. We use a Slack-Based Measure (SBM) model to modify the previous research's shortcomings. Thus, this paper attempts to integrate traditional financial ratio analysis to evaluate the performance of the textile industry in Taiwan.

3. Methodology

3.1. The Meaning of Financial Ratio

In the stock market, financial ratios are usually partitioned into some categories, because accountants believe that the financial ratios in one category are partially similar. Thus, the financial ratios of textiles are initially divided into five categories according to their related patterns. We reviewed financial ratios of domestic textiles in

Taiwan and present them. The classification in this paper is based on the Securities and Futures Institution (SFI) classifications in Taiwan. The financial ratio analysis of SFI classifications is the following:

1. Financial structure
2. Solvency
3. Operating performance analysis
4. Profitability
5. Cash flows

Because the financial ratio must include the above five dimensions for measurement performance, this study combines financial and non-financial variables as the input and output variables for DEA. According to Golony and Roll (1989)'s rule of thumb, they show that the number of DMUs which are compared should be twofold higher than the sum of inputs and outputs, it still has statistical meanings. The input and output data of the paper are shown below (Chen, 2000; Lin, 2001; Chan, 2002; Huang, 2003; Lin, 2003; Chou, 2006) in Tables 3.1 and 3.2:

Table 3.1

Input Items from Selected Financial Ratios

Ratio item	Definition	Meaning
Net Profit to Sales	Net Profit/Net Sales	Evaluate a firm's net income after tax through sales revenue. The bigger the ratio, the better the income.
Current Assets	Cash, short-term investment, and other current assets that are expected/can change into cash or run out	A higher number is better. It shows a firm's greater abilities to deal with the crisis of short-term lack of capital.
Net Sales	Sales-Sales Return-Sales Discount	A higher number is better for firm's revenue.
Cost of Goods Sold	Beginning Inventory + purchase – Ending Inventory	A higher number stands for higher sales.
Operating Cash Inflow	Cash received from firm's production, selling, receivables, etc.	A higher number represents a better firm's short-term debt-paying ability.

Source: Palepu et al. (2004), Business Analysis and Valuation using Financial Statements: Text and cases, 3rd Edition, Southwestern.

Table 3.2

Output Items from Selected Financial Ratios

Ratio Item	Definition	Meaning
Time Interest Earned Ratio	Earnings before Taxation and Interests/Total Interests Expenses	A measurement of how much a firm's profits can decline and still meet its interest obligation
Return on Assets	Profit after taxation/Total Assets	A measurement of return on total investment in a firm. Larger is usually better.

Ratio Item	Definition	Meaning
Return on Equity	Profit After Tax/Total Stockholders' Equity	A measurement of return on total equity investment in a firm. Larger is usually better.
Accounts Receivable Turnover	Annual Credits Sales/Accounts Receivable	A measure of the average time it takes a firm to collect on credit sales.
Total Sales	Sales Amounts	A measurement of a firm's sales. Larger is better.

Source: Palepu et al. (2004), Business Analysis and Valuation using Financial Statements: Text and cases, 3rd Edition, Southwestern.

3.2 Data Envelopment Analysis

Charnes, Cooper, and Rhodes (1978) were the first to propose the DEA methodology as an evaluation tool for Decision Making Units (DMUs). DEA is a non-parametric approach for evaluating the relative efficiency of DMUs using multiple inputs to produce multiple outputs. Only DEA methodology could solve single indicator of financial ratio, to employ various inputs and to provide a variety of services (outputs).

There are four models in the DEA analysis: CCR, BCC, Additive, and Slacks-Based Measure (SBM). We employ the SBM model to measure the textile industry operations' performance. SBM models could yield the same efficiency values, whether variables are measured in dollars or percent or have the following important properties: the measure is invariant with respect to the unit of measurement of each input and output item, and the measure is monotone decreasing in each input and output slack. Tone (2001) has proposed an SBM, which is non-radial and deals with input/output slacks directly. The SBM returns an efficiency measure between 0 and 1, and gives a unit value if, and only if, the DMU concerned is on the frontier of the production possibility set with no input/output slacks. In order to estimate the efficiency of a DMU (x_0, y_0), he formulated the following fractional program (1) in λ, s^-, and s^+.

$$\begin{aligned}
\text{Minimize} \quad & \rho = \frac{1 - 1/m \sum_{i=1}^{m} s_i^- / x_{i_o}}{1 + 1/s \sum_{r=1}^{s} s_r^+ / y_{r_o}} \\
\text{subject to} \quad & \sum_{j=1}^{n} \lambda_j x_{ij} + s_i^- = x_{i_o}, \; i = 1, \ldots, m, \\
& \sum_{j=1}^{n} \lambda_j y_{rj} - s_r^+ = y_{r_o}, \; r = 1, \ldots, s, \\
& \lambda_j \geqslant 0, \; j = 1, \ldots, n, s_i^- \geqslant 0, \; i = 1, \ldots, m, \\
& s_r^+ \geqslant 0, r = 1, \ldots, s.
\end{aligned} \tag{1}$$

where: s^- and s^+ are the input slacks and the output slacks, respectively, m is the number of inputs x_{io}, s is the number of outputs y_{ro}. In this model, the SBM efficiency

score is normalized between 0 and 1, and we have that if, and only if, ρ^* = 1, then it is efficient, because ρ^* =1 implies that all slacks are zero and the DMU locates on the efficient frontier. The slack-based score is units invariant.

In this section, we introduce such a measure for additive models in the form of a single scalar called "SBM," (Slacks-Based Measure), which has the following important properties:

1. The measure is invariant with respect to the unit of measurement of each input and output item (units invariant)
2. The measure is monotone decreasing in each input and output slack (monotone).

SBM can be transformed into the program below by introducing a positive scalar variable *t*.

$$(SBMt)\ \min\ \tau = t - \frac{1}{m}\sum_{i=1}^{m} ts_i^- / x_{io}$$

$$\text{Subject to } 1 = t + \frac{1}{s}\sum_{r=1}^{s} ts_s^+ / y_{ro}$$

$$x_o = X\lambda + s^-$$

$$y_o = Y\lambda - s^+$$

$$\lambda \geq 0,\ s^- \geq 0,\ s^+ \geq 0,\ t > 0 \qquad (2)$$

Now let us define

$$S^- = ts^-, S^+ = ts^+, and\ \Lambda = t\lambda$$

Then (SBM*t*) becomes the following linear program in $t, S^-, S^+, and\ \Lambda$:

$$(LP)\ \min\ \tau = t - \frac{1}{m}\sum_{i=1}^{m} S_i^- / x_{io}$$

$$\text{Subject to } 1 = t + \frac{1}{s}\sum_{r=1}^{s} S_s^+ / y_{ro}$$

$$tx_o = X\Lambda + s^-$$

$$ty_o = Y\Lambda - s^+$$

$$\Lambda \geq 0,\ S^- \geq 0,\ S^+ \geq 0,\ t > 0 \qquad (3)$$

Note that the choice $t > 0$ means that the transformation is reversible. Thus, let an optimal solution of (*LP*) be

$$(\tau^*, t^*, \Lambda^*, S^{-*}, S^{+*}).$$

We then have an optimal solution of (*SBM*) defined by,

$$\rho^* = \tau^*,\ \lambda^* = \Lambda^* / t^*,\ s^{-*} = S^{-*} / t^*,\ s^{+*} = S^{+*} / t^*.$$

From this optimal solution, we can decide whether a DMU is *SBM*-efficient.

4. Empirical Results

4.1 The Efficiency Value and Rank in the Textile Industry

After DMUs (Decision Making Units) are selected, input and output data in 2007 are chosen, and SBM model of DEA is selected. The chosen variables are subject to normalization processing by using DEA-Solver software; which it can avoid the outlier problem. The score and rank is shown in Table 4.1. There are 8 firms that are at the efficient operating level; i.e., their score is 1.

Table 4.1

The DEA Scores of 46 Textile Industry Firms in 2007

DMU	Company	Score	Rank	DMU	Company	Score	Rank
1402	FETL	0.206	33	1452	HONG YI	1	1
1409	SSFC	0.107	42	1453	TA JIANG	1	1
1410	NYDF	1	1	1454	TTF	0.368	20
1413	H.C.	0.252	27	1455	ZIG SHENG	0.203	34
1414	TUNG HO	0.213	32	1456	I-HWA	0.149	40
1416	KFIC	0.438	16	1457	YI JINN	0.187	37
1417	CARNIVAL	0.343	23	1459	LAN FA	0.195	36
1418	TONG-HWA	0.110	41	1460	EVEREST	0.152	39
1419	SHINKO.TEXTILE	0.368	21	1463	CS	0.554	14
1423	REWARD WOOL	0.692	10	1464	DE LICACY	0.408	18
1432	TAROKO	1	1	1465	WISHER	0.794	8
1434	F.T.C	0.217	30	1466	ACELON	0.447	15
1438	YU FOONG	1	1	1467	TEX-RAY	0.214	31
1439	CWT	0.776	9	1468	CHANG HO	0.275	26
1440	TAINAN SPINNING	0.088	43	1469	LILONTEX	0.566	13
1441	TAH TONG	0.361	22	1470	EVERTEX	1	1
1443	LILYTEXTILE	0.238	29	1472	TRI OCEAN	0.570	11
1444	LEALEA	0.072	44	1473	TAINAN	0.430	17
1445	UNIVERSAL	0.290	25	1474	HONMYUE	0.245	28
1446	HONG HO	1	1	1475	SUMAGH	0.570	12
1447	LP	0.072	45	1476	ECLAT	0.293	24
1449	CHIA HER	0.068	46	1477	MAKALOT	1	1
1451	NIEN HSING	0.165	38	4414	ROO HSING	0.201	35

That means that all the input resources for these firms are used; the outcomes of the output data are shown as well allocated. If the score is not 1, the firm probably wastes some resource or inappropriately allocates resources. There are 38 companies in that situation. All firms' classifications are shown in Table 4.2.

Table 4.2

Classifications of Every Decision-Making Unit

Classification	DMUs (open-market code)
Efficient (eight firms)	1410,1432, 1438, 1446, 1452, 1453, 1470, 1477
Inefficient (38 firms)	1402, 1409, 1413, 1414, 1416, 1417, 1418, 1419, 1423, 1434, 1439, 1440, 1441, 1443, 1444, 1445, 1447, 1449, 1451, 1454, 1455, 1456, 1457, 1459, 1460, 1463, 1464, 1465, 1466, 1467, 1468, 1469, 1472, 1473, 1474, 1475, 1476, 4414

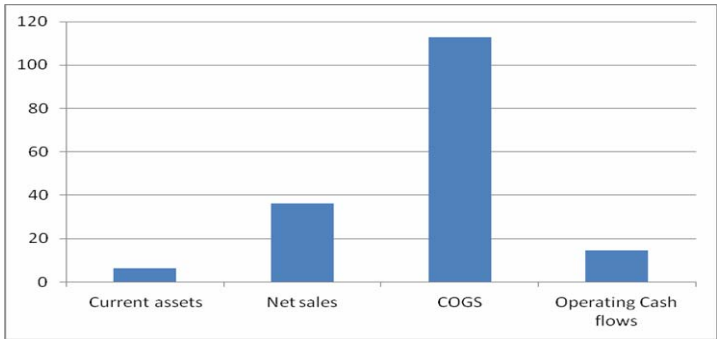
Before the financial crisis of 2008, there were 38 firms[3] classified as inefficient. This paper uses benchmarking management to help inefficient firms improve their performance. The DEA technique could use slack analysis to provide advice and construct benchmarking blueprints.

4.2 Slacks Analysis

The input variables of all the inefficient firms exceed the allocating input resources, as shown in Figure 1.

Figure 1

Outcome of Slack Analysis in Excess Input Units for FETL (Million Dollars)



For example, 1402 FETL current assets are high, equal to 6.41 million dollars, the liabilities are 36.13 million dollars, the assets 112.94 million dollars, and the fixed

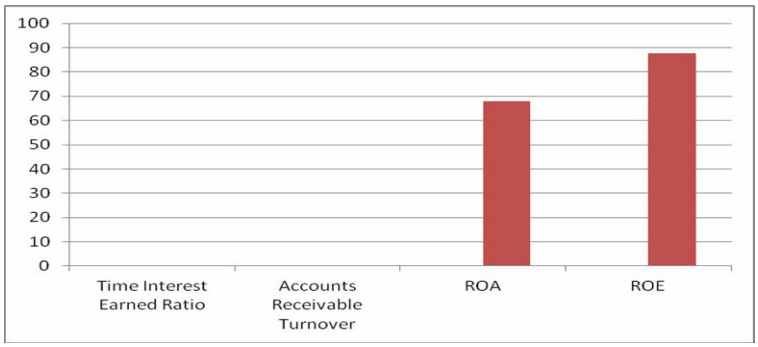
[3] *1402 FETL, 1409 SSFC, 1413 H.C., 1414 TUNG HO, 1416 KFIC, 1417 CARNIVAL, 1418 TONG-HWA, 1419 SHINKO.TEXTILE, 1423 REWARD WOO, 1434 F.T.C, 1439 CWT, 1440 TAINAN SPINNING, 1441 TAH TONG, 1443 LILYTEXTILE, 1444 LEALEA, 1445 UNIVERSAL, 1447 LP, 1449 CHIA HER, 1451 NIEN HSING, 1454 TTF, 1455 ZIG SHENG, 1456 I-HWA, 1457 YI JINN, 1459 LAN FA, 1460 EVEREST, 1463 CS, 1464 DE LICACY, 1465 WISHER, 1466 ACELON, 1467 TEX-RAY, 1468 CHANG HO, 1469 LILONTEX, 1472 TRI OCEAN, 1473 TAINAN, 1474 HONMYUE, 1475 SUMAGH, 1476 ECLAT, and 4414 ROO HSING..*

assets are 14.49 million dollars. If the 1402 FETL firm reduced the excess inputs resources, it would become an efficient firm. Although the corporation could invest in fixed assets to increase revenue, more assets do not create operating revenue. The corporation could not utilize its strength to increase its debt-paying ability; more excess liabilities may cause shortcoming solvency and financial crisis. For the inefficiency units, the corporation with more assets and liabilities, depending on benchmarking management, can improve efficiency.

Similarly, Figure 2 shows the outcome and the shortage in output items through slack analysis of the DEA technique. For example, 1402 FETL cannot create higher return on investment (return on asset, ROA and return on equity, ROE) through operating cash flow usage. This situation could imply that the ROA does not increase if operating revenue and cash flows are not used sufficiently. Firms do not obtain the benefit of financial leverage and cause the unfavorable debt to rise. Managers could discuss the management implications through financial ratios analysis to obtain the financial leverage index and apply the benchmarking management to analyze it.

Figure 2

Slack Analysis in Shortage Outputs for 1402 FETL



4.3 Benchmarking Management

Being a leading textile firm in today's highly competitive industrial environment is a challenging task. The industry is volatile and, until fairly recently, was not overly sophisticated in terms of leadership and management, nor was it aggressive in identifying industry-leading practices. In recent years, however, the industry has become more aware of its need to identify, implement, and sustain performance improvements more systematically; benchmarking has become more commonly discussed as a tool that can be used to identify successful textile companies and the reasons for their success.

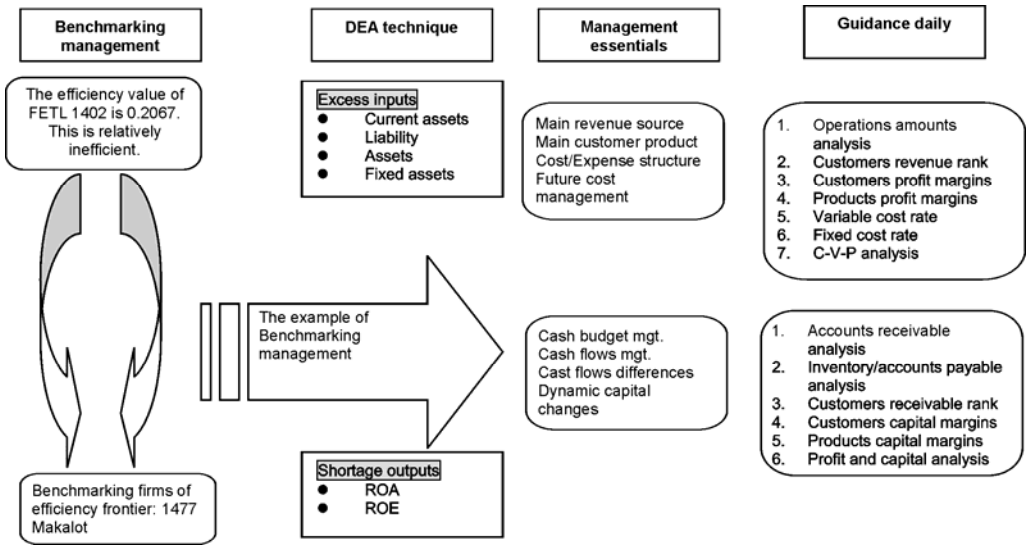
This paper evaluated the performance through the DEA technique for the textile industry in Taiwan. Evaluation performance assists firms in identifying where the efficiency frontier is located, and provides them with a reference target to improve their performance and efficiency. Efficiency could increase profitability and performance through the utilization of benchmarking management. This paper provides the essentials and guidance to construct a benchmarking management model according

to Hershberger *et al.* (2001). We use the 1402 FETL example of benchmarking management using experts' interviews (include industry analyst, senior manager and security/stock analyst). The excess/shortage of input/output items of slack variable (Figures 1 and 2) could provide the management with the essentials and guidance for benchmarking. For example, the benchmarking management for 1402 FETL is shown in Figure 3. Their improvement of excess resources includes:

1. Operations amounts analysis: List every operation amount charge and the increase/decrease percentage changes.
2. Customer's revenue rank: Re-list the customer revenue contribution rank and, thereby, look for a targeted customers group. The target customers' group focus is the increase in contribution of operating profit.
3. Customer's profit margins: Profit margins could be realized from the breakeven point which was obtained from customers.
4. Products profit margins: Profit margins could be realized from the breakeven point obtained from the products.
5. Variable cost rate: Enterprises must implement cost analysis carefully, especially variable cost which will increase sales volume. The lower the variable costs, the higher the marginal contribution.
6. Fixed cost rate: Fixed cost rate will decrease gradually with the increase in sales volumes. If fixed cost increases, the breakeven point will increase. This situation will increase the operating leverage and will cause difficulties for management.
7. C-V-P analysis: Cost-Volume-Profit analysis could help management obtain a breakeven point analysis and profitability analysis.

Figure 3

An Example of Benchmarking Management Methodology for 1402 FETL



The increase in output (ROA and ROE) will take place via set goals for: cash budget management, cash flows management, cash flows differences analysis and dynamic capital changes. These set goals are obtained from ordinary activity, including:

1. Accounts receivable analysis: obtained from accounts receivable turnovers
2. Inventory/accounts payable analysis: obtained from inventory turnovers
3. Customer's receivable rank: customers with good credit will increase the marginal contribution.
4. Customer's capital margins: it relates operating cash flows and dynamic capital changes.
5. Products capital margins: The products customers are interested in relate the use of operating cash flows and dynamic capital changes.
6. Profit and capital analysis: obtained from ROA and ROE

Benchmarking management of 1402 FETL in Figure 3 provides the manager with a choice identified in the benchmarking learning unit. For example, 1402 FETL and 1477 Makalot are two firms with similar product and capital. Thus, 1402 FETL can choose 1477 Makalot as a benchmarking unit. A firm's cost performance may improve, for example, but the schedule performance could decline.
A firm might want to address various issues such as:

How can one determine whether this trade-off is truly desirable?
Is the overall performance of the firm better or worse?
Could corporate management determine what the main source of revenue is?
What is the main product for customer demand?
Is the cost/expense structure rational?
Do firms compile cash budgeting information for management on a regular basis?
What is the cash flow management?
What is the cash flow difference analysis?
What is the main product the customers are interested in?
Is the cost-expense structure reasonable?
Does the enterprise implement the cash budget management regularly?

The companies could seek effective benefits through daily guidance that would elaborate on management essentials. If a company wants to attain the product-profit contribution through customer revenue ranking, it could create a system of high net income and low payable amount on credit that would lead to improvements in profitability and cash flow. Benchmarking could reduce inventory overstocking through inventory analysis and change the inventory turnovers to get a higher ROA. This would be a company's ROE goal if it were financed entirely with equity. Spread is another incremental economic effect by introducing debt into the capital structure. This economic effect of borrowing is positive as long as the return on operating assets is greater than the cost of borrowing.

5. Conclusions

`This study illustrates the use of DEA technique to analyze the financial statements of firms. We compared the relative performance of 46 textile companies using financial ratios. On one hand, we used current assets, liability, assets and fixed assets as input

variables and, on the other hand, we use operating revenue, operating cash flows, ROA and ROE as output variables. The DEA methodology benchmarks best-performing companies against worst-performing companies. Using the DEA methodology, we obtained an efficiency score for the 46 companies on a scale of 0.1 to 1. We found that eight companies are efficient with a score of 1 and 38 companies scored below 1 and, therefore, are inefficient. By computing slack variables, we determine the areas in which inefficient firms need to improve. There are two key factors in this benchmarking management model: profit and capital. Hershberger *et al.* (2001) present two benchmarking perspectives (management essentials and guidance daily) to improve the inefficiency units. Vorhiesh and Morgan (2005) indicated the need to introduce the benchmarking management concept. When managers were introduced to the benchmarking study, they always confuse the direction of the target. This study fills this gap by developing benchmarking management and applying the DEA technique.

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