SURVIVAL-ABILITY OF FIRM: EMPIRICAL EVIDENCE FROM MALAYSIA

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ABSTRACT

Malaysia like many other Asian countries was affected by the 1997 Financial Crisis. During this Financial Crisis, many companies succumbed. Pomerleano (1998) found that leverage of the companies if unchecked can be detrimental to the health of the company. He concluded that excess leverage at the micro level and also poor profitability resulted in the 1997 East Asian crisis. The aim of this study is to analyze the survival-ability of a sample of Malaysian public listed companies (PLCs) by analyzing the impact of financing decision of the sample firms. Both financing and operatig leverage, along with the performance of the companies is evaluated. This study adopts a non-parametric approach to measure the company's survival-ability in terms of their financing decision for their production process. In order to achieve this main objective, the study attempts (i) to identify, using Data Envelopment Analysis (DEA), the survivors among the PLCs based on their financing decisions and (ii) to analyze the effects of leverage on the survival of the PLCs. This article contributes to current literature in two areas, namely; the evaluation of the survival-ability of the PLCs via their financing decisions. Secondly, the use of financial and operating liability leverage in evaluating survival-ability of the companies.

JEL: D320, D920, G320

INTRODUCTION

Like many other countries Asia, Malaysia was also the victim of the 1997 Financial Crisis. Those times witnessed the fall of many corporations. A number of companies listed on the Malaysia Exchange known as Bursa Malaysia, were put under the PN4 category. Following the 1997 crisis, Bursa Malaysia issued the Practice Note in 2001. According to the note, companies that are categorized as PN4 are companies that face some financial problems and are no longer able to continue to form part of the original sector. This means that companies which used to appear in a particular business sector, for example the "consumer sector" would be removed from its original business sector and be placed in the new PN4 sector. However, once the PN4 companies have implemented their regularization plan and no longer fit the criteria of PN4 companies, they will be removed from the PN4 sector and be placed back in their appropriate business sectors. Hence, the motivation of the study is to find out what has caused some of the public listed companies (PLCs) to succumb to the crisis while others survived. However, some of those companies that had managed to overcome the crisis finally succumbed too when the global crisis hit the world in 2001. This is evident by the increasing number of PLCs that were either put under the PN4 category or has ceased to exist.

According to Pomerleano (1998), leverage if unchecked can be detrimental to the health of the firm. He concluded that it was excess leverage at the micro level and also poor profitability that have caused the 1997 East Asian crisis. Hence, this study uses leverage to analyze the survival-ability of a sample of public listed companies (PLCs) in Malaysia by analyzing the financing decision. Through leverage, both the financing and operating leverage, the performance of these companies is analyzed. Survival-ability of the PLCs is related to the ability of the PLCs to efficiently make decisions about financing of its production activities.

The main objective of this study is to analyze the survival-ability of the PLCs through the utilization of their financing decisions. In order to achieve this main objective, the study attempts (i) to identify, using Data Envelopment Analysis (DEA), the survival-ability of the PLCs based on their financing decisions and (ii) to analyze the effects of leverage on the survival-ability of the PLCs. The study adopts a non-parametric approach to measure the company's survival-ability. The data cover the period from 1996, 1998–2000, which is a period of four years. The period is divided into three phases of analysis: 1996, which is prior to the 1997 crisis; 1998, which is in the aftermath of the crisis; and 1999–2000, the post-crisis period. This approach allows us to conduct a before and after crisis analysis.

The variables selected for the study are based on their relevance and usefulness in analyzing the survival-ability of the company. PLCs that survived based on their leverage would be located on the efficiency frontier. The study will then analyze the impact of their leverage on the performance of the companies. This article contributes to current literature in two aspects, namely; the evaluation of the survival-ability of the PLCs through their financing decisions and in evaluating the survival-ability of the companies via through leverage.

The remaining part of the paper is structured as follows. Section 2 reviews the relevant literature while section 3 provides an overview of the manufacturing sector in Malaysia. The following section 4 describes the methodology used and the empirical analyses and results will be presented in section 5. Section 6 concludes the discussion.

LITERATURE REVIEW

Efficiency is a crucial factor for the survival of firms. According to Bain (1969), survival is the only test of the ability of a firm to cope with problems such as buying inputs, finding customers, introducing new products and techniques and so on. Hence, efficiency is defined as survival-ability. Literatures on the survival of the firm have its basis in the earlier work of Schumpeter (1934) in which his creative destruction theory expounded the idea that inefficient firms will not be able to survive in a competitive environment. Hence, it is important to stress the importance of efficiency in order to ensure the survival-ability of the firm. Zingales (1998) in his assessment of the effects of financing choices on the survival of firms concluded that if leverage affects the performance of the firm, then the financing decision of the firm will have to be taken into account. According to him, it is not only the fittest of the firm which is translated in the form of economic efficiency of the firm, but also the fattest of the firm which is translated in the form of the financial resources which are important ingredients for the survival of firms.

According to Carlson (1975), there are three major financial decisions that help to determine the efficiency of the operations of a firm. The investment decision focuses on (i) working capital management, which determines the cash, inventory, and receivable levels, and (ii) allocation of capital to long-term purposes. The financing decision focuses on (i) long-term funds such as term loans, conditional sales contracts, and leases, and (ii) short-term funds such as trade credit, commercial paper, receivables and inventories. The dividend decision focuses on (i) active and (ii) passive or residual dividend. Stiglitz (1974) includes both the investment and dividend decisions as financing decisions. This study, however, considers both the investment and financing decisions as one financing decision, since both require financing instruments in order to finance them. This will give rise to both financial and operating liability leverage.

The financing decisions that are found to be related to the leverage of the firm in the past have been viewed as arising from funding activities. That is, a firm borrows in order to obtain funds for its operations. According to Nissim and Penman (2003), there are two sources of a firm's leverage, funding activities (e.g. bank loans, and bond issuance) and operating activities (e.g. trade payables, deferred revenues and pension, etc). Both of these activities determine the sources of leverage namely, financial leverage and operating liability leverage. Leverage is measured by dividing total liabilities by equity.

In measuring efficiency, Ramanathan (2003) used Data Envelopment Analysis (DEA). He tried to evaluate how well a decision making unit (DMU) performed when compared with its peers. Thus, the efficiency of each firm is computed in the relative sense and not absolute. It is relative to the best performing DMU (or DMUs if there is more than one best-performing DMU). The best-performing DMU is assigned an efficiency score of unity or 100 per cent, and the performance of other DMUs varies between 0 and 100 per cent relative to this best performance. Hence, the performance of firm could be used as an indicator of efficiency.

The literature in the area of survival-ability of firms is limited. Many of these studies are focused on survival-ability of manufacturing firms and looked at the utilization of physical inputs used in the production of goods and services. In terms of financial and operating leverage, no study has been undertaken.

METHODOLOGY

The target population in this study is comprised of the PLCs that were registered in the states of Selangor and Kuala Lumpur. These companies are mainly involved in the manufacturing of consumer, industrial and technology related products. Manufactured products contribute to about half of export revenues, oil about 30%, and other commodities about 20%. Overall, the manufacturing sector in Malaysia contributes approximately 35% of the country's gross domestic product, accounting for 80% of total exports (Economic Report, 2001). This indicates that there was an efficient utilization and management of resources, materials and inputs necessary for the production of goods and services (www.npc.org.my.).

The study uses financial data, which were obtained from the Annual Companies handbook. Due to the unavailability of data, this study divides the analysis into 3 phases, which are 1996, 1998 and 1999–2000. This period is sufficient to analyze the survival-ability of the financial decision-making of the companies. It also allows the evaluation of performance before the crisis of 1997 and in the post-crisis period.

The literature of DEA does not propose any specific criteria for the selection of inputs and outputs; hence, no specific rule is made in determining the procedure for selection of inputs and outputs. Since the focus on the performance of PLCs via the financing decision, therefore, the variables are selected based on their relevancy to the study. The independent variables were selected based on their ability to affect the financing decisions of the company. Following Nissim and Penman (2003), financing decisions include both financial leverage and operating liabilities leverage. Both will affect the company's performance and hence, its survival-ability. If usage of such instruments enables a company to performance efficiently, then it can be concluded that the company will survive. However, a company's performance may also be affected by other factors, such as the efficiency of physical inputs and the managerial capability of the company. Since the focus of this study is on the effects of the financing decisions on firms' survival-ability, other factors are assumed constant.

Therefore, the variables that affect the financing decision of firms are namely; one, financial leverage which measures the degree to which a company depends on debt financing to finance its production activity. The debt ratio = (LT Financial Debt + ST Financial Debt)/Total Assets indicates the financial leverage. Two, operating liability leverage, which according to Nissim and Penman (2003), measures the degree to which other liabilities such as trade payables, deferred revenues, and pension liabilities are used in running the production operations of the company. Operating liability leverage = Operating Liabilities/Net Operating Assets. Operating liabilities comprise trade payables, pension and amount of credit sales. However, only trade payables, which are accounts payable for goods received from suppliers, are available in the report; hence, it is used to indicate part of the financing decisions of the companies.

In order to evaluate the survival-ability of the company, a DEA model is used to rank the companies in terms of their financial performance. The DEA model used is based on the BCC model in ratio form with variable returns to scale, and the radial input-oriented approach where the inputs are minimized while the outputs are kept at their current level. By considering *o* PLCs of which each is producing *s* different outputs using *m* different inputs, each of the PLCs becomes a focal PLC when its survival-ability score is computed. The survival-ability of the PLC can be measured by calculating an index of survival-ability, where represents the financing performance index for a group of peer PLCs, called a survival-ability Index (*SI*).

$$SI_o = \frac{\sum_{r=1}^{s} u_r y_{ro} + u_{io}}{\sum_{i=1}^{m} v_i x_{io}} \tag{1}$$

where,

$\boldsymbol{y_{ro}}$	=	the quantity of the *r*th output produced by the *o*th PLC during the period under observation.
$\boldsymbol{x_{io}}$	=	the quantity of the *i*th input used by the *o*th PLC during the period under observation.
$\boldsymbol{u_r}$	=	the output weight which will be determined by solving the model.
$\boldsymbol{v_i}$	=	the input weight which will be determined by the solving the model.
$\boldsymbol{u_o}$	=	variable that efficiently allows variable returns to scale in the PLC under evaluation and is determined from solving the model.
i	=	unit for the input from 1 to *m*.
r	=	unit for output from 1 to *s*.
o	=	a focal PLC that take a value from 1 ,…., *n*

The SI_o ratio is maximized subject to the following:

$$\frac{\sum_{r-1}^{s} u_r y_{ro} + u_o}{\sum_{i=1}^{m} v_i x_{io}} \leq 1 \tag{2}$$

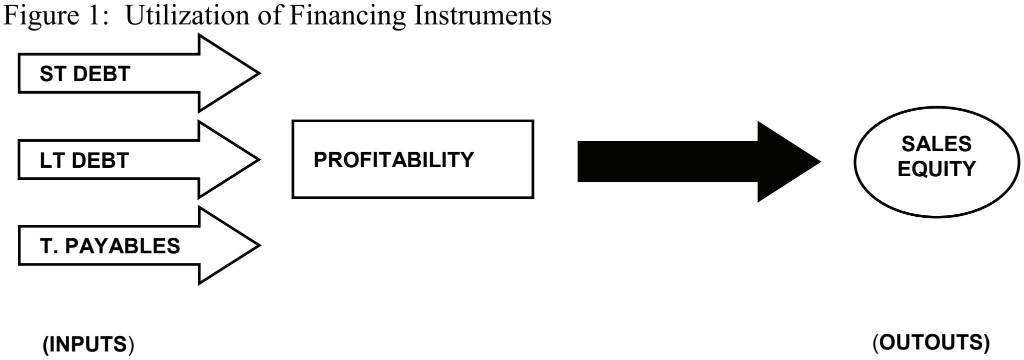
$$\frac{u_r}{\sum_{i=1}^{m} v_i x_{io}} \geq 0 \tag{3}$$

$$\frac{v_r}{\sum_{i=1}^{m} v_i x_{io}} \geq \varepsilon \tag{4}$$

The input and output values as well as all inputs are assumed to be greater than or equal to 1. The weights u_r for each PLC maximize the PLC's survival-ability indices. The DEA program identifies a group of optimally performing PLCs that are defined as DMUs with perfect *SI*, and assigns them a score of one. These perfect *SI* PLCs are then used to create a frontier, against which all other PLCs are compared. If a PLC is classified as a non-frontier PLC, it means that one or more ratios of that PLC might be deficient with respect to the PLCs on the frontier. Perfect *SI* PLCs are identified by their ability to utilize the same level of inputs and produce the same level or higher outputs. In economics, these PLCs define the revealed best-practice frontier. DEA then uses a mathematical method to calculate a performance measure for each PLC relative to all other PLCs, based on the requirement that all observations lie on or below the frontier (Ramanathan, 2000).

In the process of utilizing the financing resources, the BCC model in ratio form is used to compute the survival-ability index (*SI*). The inputs are Long Term Debt, Short-term Debt and Trade Payables while the outputs are Sales and Equity. Long-term debt, short-term debt and trade payables are considered as inputs, as they are used as the medium of financing the production activities of the companies. Sales and equity are considered as outputs, since they are the final outputs of the whole production process (Feroz et al., 2001; Zhu, 2000 and Zhu; 2004). Equity shows the value of a company and can be viewed as collateral in order to obtain funding in the future. All the variables listed are measured in Ringgit Malaysia, as the monetary term is a better indicator of the quantity of high tech products rather than the physical term.

Figure 1: Utilization of Financing Instruments



Adopted with modification from Zhu (2004) and Chong (2006)

Figure 1 above depicts the whole process of the utilization of the financing instruments in the production process of the firm. Thus, in order for a company to be able to survive, *SI* must be equal to 1. Hence, in the evaluation of the performance of companies, all these inputs are used to obtain the outputs that enable the PLCs to be located on the survival-ability frontier.

The issue of dimensionality relates to the number of variables (inputs and outputs) and sample size (Hughes and Yaisawarng, 2004). They studied the dimensionality effect from varying numbers of variables for a fixed sample size. According to them, the number of variables in relation to sample size may overstate the number of survivors among the PLCs; hence, there is a need to test the effect of dimensions on the model. A model selection technique based on a multivariate statistical analysis was proposed by Serrano Cinca and Mar Molinero (2001). They have developed various models based on a dataset for Chinese cities. According to them, it is possible to find out why a particular DMU performed better under some models and not under other models. According to Mar Molinero (2006), a PROperty-FITting (ProFit) technique which was developed by D. Carrol and Chang in 1968 could be used in order to assess this phenomenon. It provides external analysis of a configuration by a set of property ratings or rankings in row-conditional format by a scalar products (vector) model using either a linear or a continuity transformation of the data. A "property" is a characteristic of each data point in the representation. In trying to resolve the dimensionality issue, this study adopted a similar approach to that used by Serrano Cinca and Mar Molinero (2001) to select the best model in order to distinguish the most survival-abled company in the sample. Another issue is sensitivity, in which case the DEA performance index can also be sensitive to the choice of (i) sample size, (ii) number of variables and (iii) association among variables used in the model (Galagedera and Silvapulle, 2004). According to Zhu (2004), calculated frontiers of DEA models are stable if the frontier DMUs that determine the DEA frontier remain on the frontier after particular data perturbations are made. He provides a super-efficiency model to compute a stability region in which a particular PLC remains efficient and hence, continues to survive. According to Zhu (2001), using the super-efficiency model to analyze the sensitivity of DEA efficiency classification can be easily achieved and the results are stable.

For this study, various models were designed by varying the variables and sample size in order to come up with a suitable model. A super-efficiency test was used to chose the model for determining its stability. A survival-ability rate of one indicates that the company is on the survival-ability frontier. This indicates that the company is efficient, hence, it should be able to survive. Companies that achieve less than one indicate that they lie below the survival-ability frontier. This indicates that they are less efficient, however, they may be to less able to survive if they are not able to improve their performance. The software called the Efficiency Measurement System (EMS) is used to calculate the survival-ability of the financing instruments. The software is free for academic users available at the web address (http://www.wiso.uni-dortmund.de/lsfg/or/scheel/ems/#feat).

In order to identify the survival-abled PLCs, one model of survival-ability is required. Researchers in DEA acknowledged that the use of DEA in calculating DEA efficiency ranking can be affected by the different combination of inputs and outputs. Hence, many researchers such as Zhu (1998), Serrano Cinca and Mar Molinero (2003) have come up with various means of dealing with the problem. Therefore, in order to choose a suitable model, this study takes similar approach by these earlier researchers where various different models are developed and later analyzed from combinations of various inputs and outputs. The approach enables different models with different combination of inputs and outputs to enable the PLCs to attain efficient level to ensure their survival-ability. However, due to time constraints and the complexity involved in massive datasets involving multiple inputs and outputs combinations, this study settled for combinations of three inputs and two outputs.

Table 1: Inputs and Outputs for DEA Model of Survival-Ability

Inputs:		**Symbol**
Long-Term Debts	X_1	a
Short-Term Debts	X_2	b
Total Payables	X_3	c
Outputs:		**Symbol**
Sales	Y_1	1
Total Assets	Y_2	2
Equity	Y_3	3

Table 1 shows the various inputs and outputs for DEA model of survival-ability. The long-term debts (X_1), short-term debts (X_2), and total payables (X_3) are a, b and c respectively.

The outputs such as sales (Y_1), total assets (Y_2) and equity (Y_3) are 1, 2 and 3 respectively. The twenty seven models developed for each of the respective stages of production together with their factor loadings are shown in Table 3. Factor loading refers to a coefficient that appears in a factor pattern matrix or a factor structure matrix. On orthogonal analysis, factor loadings are equivalent to bivariate correlations between the observed variables and its components (Hatcher and Stepanski (2004).

In order to select the suitable model, Principal Components Analysis (PCA) is used. This decision is further supported by the work of Zhu (1998), Premachandra (2001) and Serrano Cinca and Mar Molinero (2001a, 2003), in which PCA has been proven to be a good support for DEA in the evaluation of the performance of DMUs. PCA is used as a data reduction technique and can be used as a measure to address the dimensionality issue. It is a method for producing the small number of constructed variables desired from the larger number of variables that were originally collected. It is carried out to determine which survival-ability model accounts for a larger portion of the total variance in the original set of the models. A factor analysis is then conducted for the two underlying factors, which explains the relative positions of the various survival-ability models.

A Property Fitting (ProFit) procedure is used in order to determine the fit of the model. A multiple regression method is used to perform the analysis. With the combination of this method and PCA the suitable model is selected. Using DEA, this selected model is then used to evaluate the survival-ability of the PLCs. The principal component extracted is the linear combination of optimally weighted models. The component scores are then plotted onto a graph, showing the similarities and differences between the various models. The ProFit procedure is used to plot the PCA graph on the survival-ability models. Here a similar approach to that taken by Serrano Cinca and Mar Molinero (2001a) is adopted, whereby models are treated as variables while the survival-ability rating is treated as observation.

Table 2: Principal Component Scores

Component	Eigenvalue	Proportion	Cumulative
1	16.31	0.61	0.61
2	5.29	0.20	0.80
3	1.80	0.07	0.87
4	1.51	0.06	0.92

An eigenvalue greater than 1 means it has accounted for a greater amount of variance that has been contributed by one variable

Table 2 shows the principal component scores for the financing process whereby only four components are retained. A component that has eigenvalue of more than 1 is retained and interpreted. This is because each of the observed variables in the component contributes one unit of variance to the total variance in the data set. Hence, a component that has eigenvalue greater than 1 means it has accounted for a greater amount of variance that has been contributed by one variable. This component accounts for a considerable meaningful amount of variance that is worthy of being retained (Hatcher and Stephanski, 2004). The next step is to look at the loadings of these models, which determine the performance ranking of the model.

Table 3 shows the models and their factor loadings. Models with an asterisk indicate that they include all the three leverages as the inputs. Factor loading is the weight given to a variable in the construction of a principal component. It also represents the correlation between an original value and its factor. The first component extracted accounts for a maximal amount of total variance in the observed variables. The total variance refers to the sum of the variances of the observed variables. Since the purpose of the study is to evaluate the survival-ability of the financing decisions, it is appropriate that the three components of leverage should be present in the model of survival-ability. The minimum acceptable cut off for a factor loading is 30. For a sample size of less than 100, the lowest factor loading to be considered significant is ± 30 (Hair et al., 1998).

Table 3: Factor Loadings

Models	PC1	PC2	Models	PC1	PC2
A123	14	48	AC13	91	34
AB123	33	75	AC123	88	2
ABC12*	24	87	B123	77	23
ABC13*	24	87	BC12	25	89
ABC23*	89	5	BC13	25	91
ABC123*	91	34	BC23	29	79
AC12	92	18	BC123	21	90

** include all the three leverage as the inputs.*

Figure 2: Principal Components of the Efficiency Model

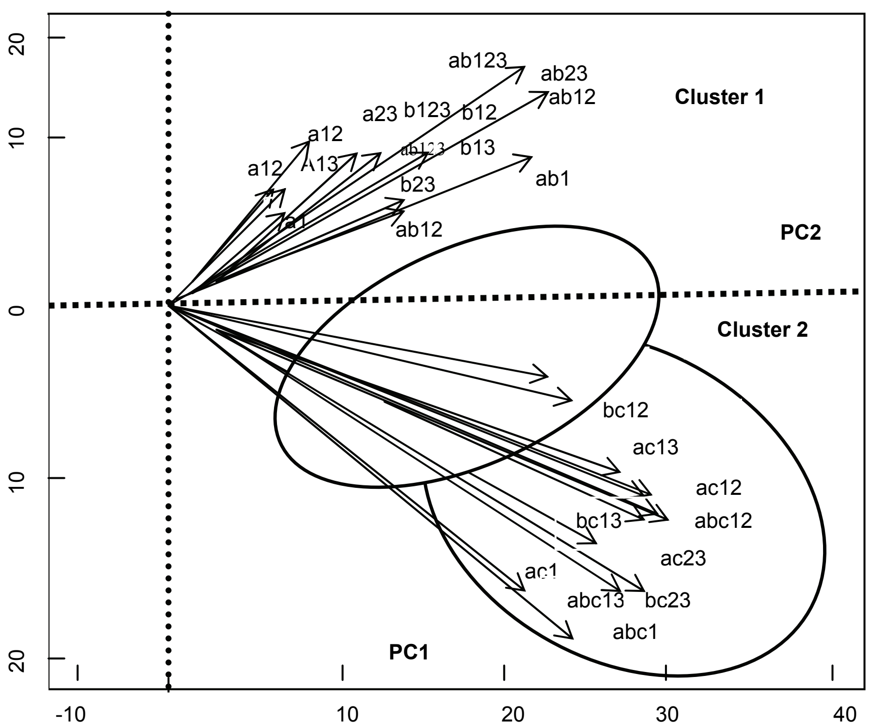


Figure 2 shows there are only two distinct clusters of models. Each model in a cluster has some similarities; hence, it makes no difference to choose one over the others. Since the three funding instruments have to be present in the model, the appropriate models would be those that have all the three instruments present. Such models are abc1, abc12, abc13 and abc123. These models all have higher factor loadings; with abc13 having the highest, abc12 and abc123 each with a score of 91, and abc1 is having 89. Hence, it is appropriate to choose abc13 over the others, since it contains output such as sales and equity. Total assets are considered inappropriate, as it is considered as the outcome of higher revenues from sales.

ANALYSIS

Table 4 shows the descriptive statistics for the 96 PLCs in the sample. The data analyzed are taken from period before the crisis, that is 1996 and period after the crisis, which is 2000.

Table 4: Descriptive Statistics for PLCs

Variable	N	2000 (Post Crisis Period)				1996 (Pre Crisis Period)			
		Min	Max	Mean	SD	Min	Max	Mean	SD
LTDEBT	96	0	3,188,490	123,164	381,843	0	2,563,149	114,019	336,272
STDEBT	96	0	7,216,780	217,337	775,415	0	3,435,521	125,876	378,014
TPAYABLE	96	680	2,413,339	167,681	384,873	0	750,666	61,698	131,392
EQUITY	96	7,559	5,062,161	377,817	669,834	8550	2,898,952	314,349	507,592
SALES	96	23,727	5,271,390	665,969	1,151,206	24181	23,044,929	992,248	2,648,375

Descriptive statistics for the 96 PLCs, 1996 as before-crisis period, and 2000 as after-crisis period

Leverage in terms of long-term, short-term and trade payables that these PLCs have acquired and utilized before the crisis ranges from a minimum of 0 to a maximum of RM2,563,149.00, a minimum of 0 to a maximum of RM3,435,521.00, and a minimum of 0 to a maximum of RM750,666.00, respectively. On the average PLCs acquired and utilized RM114,019.00, RM125,876.00 and RM61,698.00 of long-term debt, short-term debt and trade payables respectively. However, after the crisis leverage of firms ranges from a minimum of 0 to a maximum of RM3,188,490.00, a minimum of 0 to a maximum of RM7,216,780.00, and a minimum of RM680 to a maximum of RM2,413,339.00, respectively. On the average PLCs acquired and utilized RM123,164.00, RM775,414.00 and RM167,681.00 of long-term debt, short-term debt and trade payables respectively. The outputs that PLCs on the average produced before the crisis were sales RM992,248.00 and equity RM314,349.00 respectively. However, after the crisis the sales for PLCs on the average dropped to RM665,969.00. However, equity increased to RM377,817.00.

Figure 3: PCA Analysis on the Performance of PLCs based on Financing Decisions

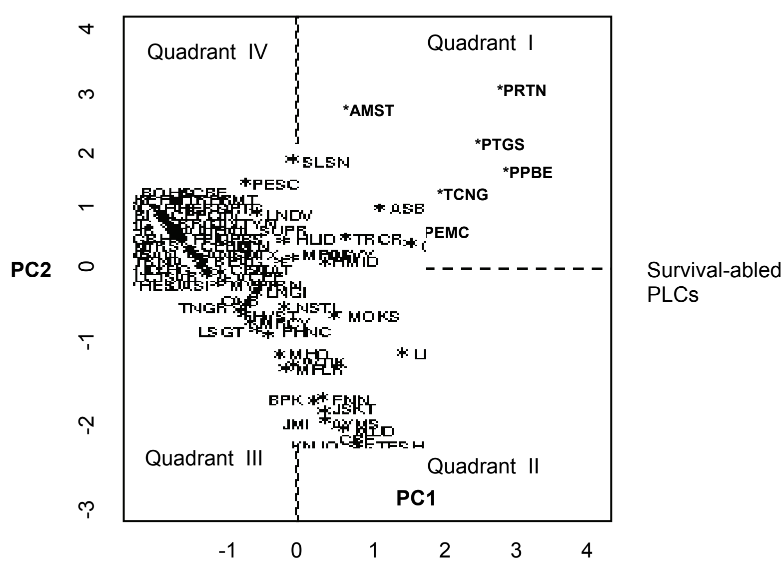


Figure 3 shows three quadrants; each related to the survival-ability of the PLCs. On the right-hand side of Figure 3, quadrant I contains PLCs that have higher survival-ability rate while quadrant II contains a lower survival-ability rate. On the left-hand side, quadrant III contains PLCs that have higher survival-inability rate, and quadrant IV contains PLCs that have lower survival-ability rate.

In term of performance of PLCs, Figure 3 shows that during the process of utilizing the financial and operating leverage, PLCs such as PRTN, PPBE, PEMC AMST, ADPG and PTGS are found clustered on the upper right-hand side of Figure 3; hence they are termed as survival-abled PLCs. This indicates that in these PLCs have the highest survival-ability rate and they shared some similarities in terms of their financing decisions. This means that in terms of the mixture of leverage utilized to produce the output were about same. PLCs located on the lower right part of Figure 3 have a lower survival-ability rate while those that are located closer to the lower left of Figure 3 have a higher survival-inability rate. It means they are least able to survive in the long run if they do not increase their performance. These are the PLCs that have the highest probability of falling into the PN4 category if they do not improve their performance. These PLCs may be highly leveraged and hence unable to finance large investments; thus, they may not be able to compete and be forced to liquidate. For survival-inabled PLCs, such as CIHG, FCBI, UNZ, GBH and KSM clustered on upper left-hand side of the Figure 3, indicates that these PLCs have a lower survival-inability rate. They are termed as survival-inabled PLCs. This also indicates that they have some similarities in terms of the mixture of leverage that they utilized in their production activities.

CONCLUSION

In this study, we found that the mixture of financing leverage and operating leverage that the PLCs used, determine the survival-ability of PLCs. The issue of dimensionality was resolved by creating dimensions of model that were used to evaluate the performance of the financing decisions, while the issue of the sensitivity of the models was resolved by performing sensitivity tests on the models. The EMS used in this study has an avenue for sensitivity testing in the form of a super-efficiency technique. The result shows that PLCs that are already on the frontier do not exhibit changes when the test is performed. This goes to show that the models used are stable to evaluate the survival-ability of the PLCs. The PLCs remained stable when sensitivity test are performed on all the models that were used in the computation of the efficiency of the financing process.

During the period before and after the crisis, it was found that PLCs such as PRTN, PPBE, PEMC AMST, ADPG and PTGS shared some similarities in terms of their financing decisions. The mixture of leverage that were utilized to produce the output were about the same for this companies. They are considered as survival-abled PLCs. Survival-inabled PLCs, or firms with lower survival rate, have to be cautious in term of their financing decisions. As if they are highly leveraged and they are not able to improve their performance, they will be put under the category of PN4 category.

This study only studies PLC involved in the manufacturing sector. Future research may need to cover a wider range of PLCs across industries. Even though, this study has some limitations, in term of the coverage of the sample understudy, Its contributions to the current literature in areas such as the evaluation of survival-ability of PLCs in Malaysia via the financial leverage and operating liability leverage.

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