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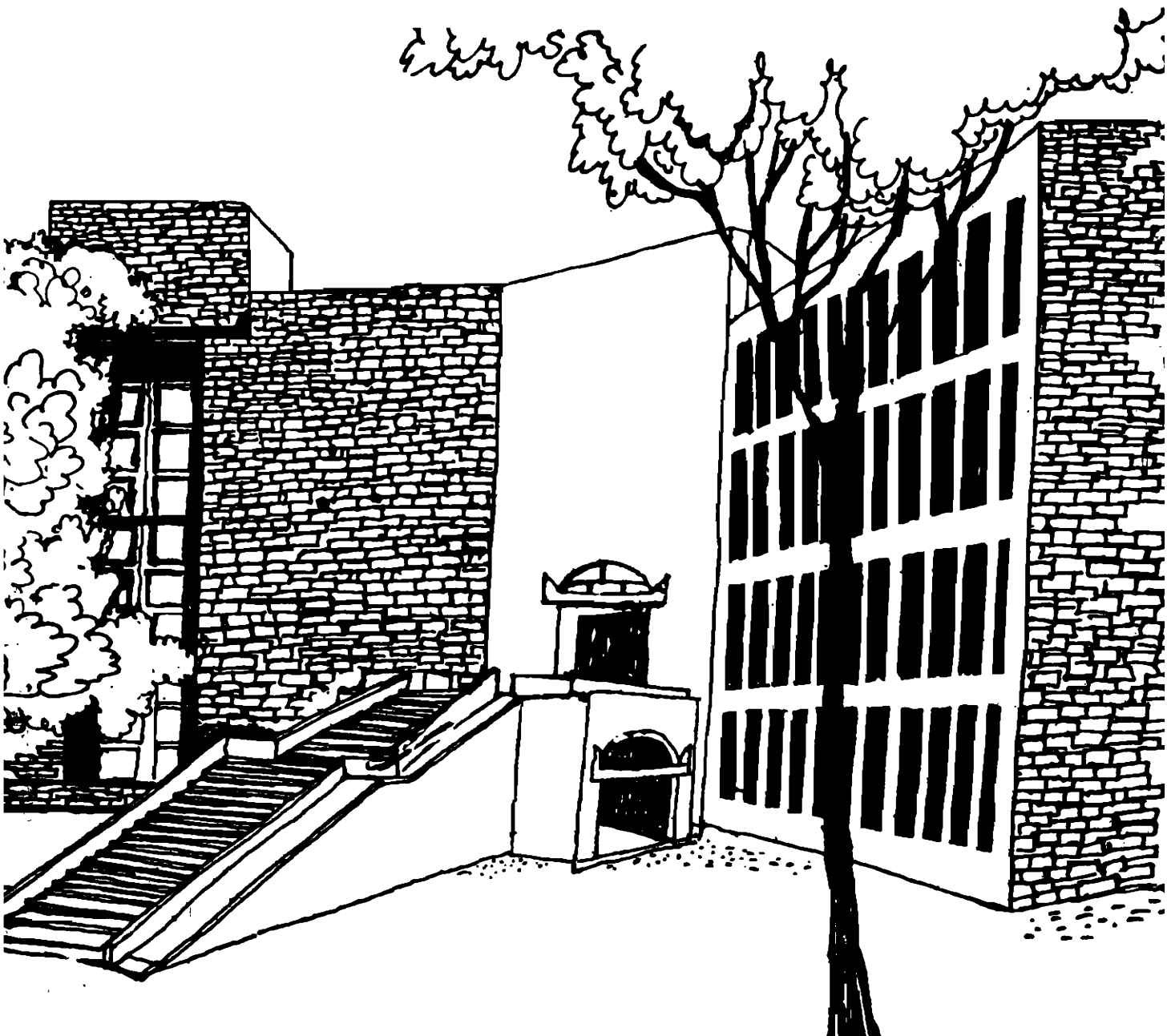

CORPORATE TAKEOVERS IN MALAYSIA: DISCRIMINANT ANALYSIS FOR BIDDER AND TARGET FIRMS

By

Ruhani Ali
G.S. Gupta

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INDIAN INSTITUTE OF MANAGEMENT
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Abstract

Mergers, acquisitions and takeovers are world wide phenomenon and Malaysia is no exception. The first wave of these took off in late 1970s and early 1980s and it is a buzz word under the current economic trouble. One of the issues to be settled here is which firms act as the bidders and which ones as the targets. The discriminant analysis provides a useful tool for explaining this classification.

The paper looks into 144 non-financial firms in Malaysia for period 1980-1993, which includes bidders, targets, control bidders and control targets. A set of five economic/financial variables has been identified to discriminate between the firm's groupings using publicly available time series data. The empirical findings suggest that the a) five predictive variables account for about 90% of the firms' groupings, b) financial leverage is the most powerful discriminatory variable followed by profit, risk, size, and growth, in that order, c) bidder firms have higher profit and growth, and lower leverage, risk and size, than the target firms, and accordingly provide some support that, d) the takeover was motivated by the bidder firms' desire for reaping the fruits of economies of scale in order to maintain the tempo of high profit and high growth and/or for displacement of inefficient managers of target firms. These results are corroborated by the logistic regression model.

Corporate takeovers in Malaysia: Discriminant Analysis for Bidder and Target firms

Introduction

Mergers, acquisitions and takeovers are worldwide phenomenon and Malaysia is no exception. The first wave of these occurred in the late Seventies and early Eighties, and it is a buzz word under current economic turmoil. The purpose of this study is to provide an explanatory model for the takeover selection process in Malaysia. The paper develops a discriminant model for delineating the bidder and target firms of the Malaysian successfull non-financial takeover firms. As a prelude to this, sample characteristics of the two groups of the firms are analysed on the univariate basis to assess the differences in the two groups and to examine if the bidder firms were more efficient than the target firms.

The paper is organized as follows: Section II reviews the related literature on the characteristics and the motivations of the participating firms in the takeover process. Section III explains the methodology, sample profile, and the data. Section IV presents the results of the univariate analysis, discriminant analysis, holdout sample and the sensitivity analysis using the logistic regression. Finally, Section V provides the summary and conclusions.

II. Literature review

Most studies that incorporate a range of firm characteristics are conducted on targets, mainly with the aim of predicting potential targets. However, early accounting data studies on bidders such as Singh (1971), Weston and Mansinghka (1971), Lev and

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Mendelker (1972), Meeks (1977) and Kumar (1984) look at the performance effects of takeovers by comparing pre- and post- takeover performances. The bidders were generally found to be more profitable before the takeovers than after the takeovers compared to their industry or control groups, thus witnessing the absence of efficiency gains.

The study by Singh (1975) looked at the characteristics and efficiency diffferences (as measured by the economic and financial variables) between bidder and target firms to explain the U.K. takeover selection process of the late 1960s. The discriminant analysis was used to discriminate between the bidder and the target firms using seven financial variables of : profitability, change in profitability, growth, liquidity, gearing, retention ratio and size. The results from the discriminant analysis indicate that the discriminant function was able to correctly classify 83% of the firms. The most important discriminator between the bidder and target firms was: size, followed by change in profitability, and profit level. The study provides support for the managerial discipline theory that managers concentrate more on increasing size than profitability and give little empirical support for the neoclassical theory of profit maximization. The takeover threats thus cannot be relied to lead firms to improve profitability, instead they may have encouraged unprofitable large firms to enhance their relative size.

Most studies, especially those using the categorical classification methods of logit, probit, or discriminant analysis, are mostly used for predicting the targets. The prediction of targets in advance of market is done with the objective of developing investment strategies to earn abnormal returns, for studies of price movements around the takeover announcements have found that the targets capture most of the gains of takeovers. Dodd and Ruback (1977), and Asquith (1983), among others, have found that price movements' signalling occur 30 to 40 days before the announcements, thus predictive accuracy in advance of the market would allow abnormal returns to be earned.

The study by Simkowitz and Monroe (1971) uses operational and financial information to identify firms with a high probability of being taken over by conglomerate

firms. Stepwise multiple discriminant analysis was used to discriminate target and non-target firms. They found that firms have a high probability of being acquired under any of the following situations: low price earnings ratio, low dividend payout ratio, low growth rate, low sales, existence of loss carry over, and high market activity. Of the sample firms, 82.6% of the targets and 72% of the non-targets were correctly classified. For the holdout sample, the model correctly predicted 64% of the targets and 61% of the non-targets. The t-test results indicated high predictive power for both the analysis group and the holdout sample.

Harris, Stewart, Gulkey and Carleton (1982) used probit models on financial and product market variables to study the likelihood of a firm being a target. The sample was constructed keeping the ratio of target and non-target firms in proportion to the population of major U.S. corporations. Their results show the price earnings ratio and size having the strong negative effects on the probability of acquisition.

Another popular prediction model is the logit model. Target prediction studies using this model include Detrich and Sorenson (1984) and Palepu (1986). Detrich et al. used a sample of 30 targets and matched pair of 60 non-target firms in five year period of 1969 to 1973 from four industries. The significant variables found were the: payout ratio, asset turnover, market value of equity and trading volume. The likelihood ratio statistics was 66.96 (significant at 99% confidence level) and 93% of the target firms were correctly predicted. The predictive power of the model was confirmed using a holdout sample with 90% of the targets being correctly predicted.

Palepu (1986) used the logit procedure to predict target firms. Palepu et al. showed that the predictive accuracies of the previous target prediction studies were inconsistent and biased because of the methodological flaws. The flaws were overcome by selecting samples (target and non-target firms) in the same proportion as in the population from which the sample was drawn and through using an optimal cutoff probability instead of an arbitrary cutoff probability of 0.5 (as in other studies). Palepu developed four models using different combinations of the nine variables: CAR, return on

equity, growth, liquidity, leverage, industry dummy, size, market-to-book ratio and price earnings ratio. These variables were selected based on the six hypotheses of mergers. The estimated model was found to be statistically significant but the explanatory power was small (likelihood ratio index of 0.1245 for the best model). The 80% of the targets and only 44.7% of the non-targets firms were correctly classified. The 55.3% of non-targets that were misclassified as targets were overlooked by previous studies and thus, prediction accuracies reported in the earlier studies were overstated. Palepu et al. (1986) concluded that the model failed to accomplish the basic objective of developing investment strategies to earn abnormal returns, and it was not superior to that of the stock market as it was not able to identify targets long before the takeover announcements.

Mat-Nor and S. Hussin (1997) employed the logit model using variables similar to Palepu to predict Malaysian target firms. Seven explanatory variables of : size, return on equity, average sales growth, price earnings ratio, dividend payout, leverage and liquidity were used on a sample of 34 target firms and 30 randomly selected non-target firms. The results indicated that a firm is likely to be a target when growth, leverage, liquidity, size and return on equity are low, and dividend payout and P/E are high. However, only the size variable (negative) was found to be significant, indicating the smaller the size, the more likely it will be a target. The likelihood ratio index, which measures the model's explanatory power, stood at 75.89 and the model was able to correctly predict target firms with about 94% accuracy. The holdout sample consisting of 3 targets and 15 non-targets, was correctly predicted at 83.3%.

III. Methodology and Data

Based on the literature and scrutiny of the data, five economic/financial variables were identified as the basis of distinction between the bidder and the target firms in the takeover process. These include size (measured by asset), growth rate (in assets), profitability (measured alternatively as the ratio of operating profit to total assets, and the ratio of earnings after tax to net worth), risk (measured alternatively as the coefficient of variation in operating profit and that in earnings after tax), and leverage (measured by the

ratio of total liability to total assets). The data on the relevent variables for all firms was compiled as the average of the three year data prior to the takeover.

The purpose of using the discriminant analysis is to develop an explanatory model for the takeover process. The use of this multivariate technique allows for the causal variables to be taken simultaneously. The linear multiple discriminant function hypothesized is the following:

$$D = a + b\,S + c\,G + d\,P + e\,R + f\,L$$

where: D = 0 for bidder and D = 1 for target firms

S = asset size (RM billion)

G = growth rate (fraction)

P = profitability rate (P1 for operating profit to asset and P2 for earnings after tax to net worth (fraction))

R = risk (R1 for coefficient of variation in operating profit and R2 for coefficient of variation in earnings after tax (fraction))

L = leverage (ratio)

a,b,c,d,e,f = coefficients of the discriminant function

Alternative formulations of this model, based on the different combinations of P1, P2, R1, and R2 together with the three other variables, were estimated and the version that produced the highest percentage of correct classification was choosen for further analysis.

In order to compare the classification accuracy of the results from the discriminant model, a logistic regression procedure was also used. The logistic function was used as a methodological alternative as it requires less restrictive assumptions regarding the distribution of the sample data. A comparison of the results of the two alternative approaches would enable us to highlight the shortcomings of our methodology, if any.

No definite prior hypothesis is advanced in terms of the signs of the coefficients or the relative significance of the various arguments in the discriminant function. However, it would be expected that the bidder firms would have larger size, higher growth rate, and higher profitability, and lower risk and lower leverage rate than the target firms, implying negative values for the coefficients b, c, and d, and positive values for the coefficients e and f. The univariate analysis in terms of the mean and standard deviation was also carried out on the raw data to assess their prior significance. A correlation matrix among the pairs of all the independent variables was obtained to guard against multicollinearity.

The data for the study are drawn from all the publicly listed non-financial firms in Malaysia which participated in successful takeovers during 1980 through 1993. Successful takeovers refer to the acquisition bids that received all the necessary approvals from the various regulatory bodies and that the parties involved did not rescind or withraw the bid. The initial list of population of takeover firms for this period were checked in KLSE library company files for announcement dates and outcome dates. The sample thus comprises of 78 such firms with 37 bidders and 41 target firms, and 19 involved in horizontal and 59 in conglomerate takeovers. These represent seven industrial sectors and their asset sizes ranges from RM 7,066 million to RM 7,835 billion in the takeover year.

For testing the discriminating power of the model outside the sample firms, matched control bidder and target firms were identified on the basis of comparable industrial classification and the asset size in the year of takeover. These consist of 35 controlled bidder and 31 controlled target firms.

The financial statement data on various firms for the study were taken from the PACAP database of the PACAP Research Center of University of Rhode Island and from the KLSE Companies Handbook. The Statistical Package for the Social Sciences (SPSS) Release 6, was used to estimate the discriminant and logistic functions.

IV Results and Analysis

The results of the univariate analysis on the determinants of the firms' groupings are provided in Table 1. A careful scrutiny of these results reveal that the bidder firms enjoy higher asset size and growth rate but lower profitability and leverage (the difference in risk is ambigous as it is incompatible on the two alternative measures) than

Table 1: Mean, Standard Deviation and T-values

Variable	Mean		Standard deviation		T-value	Significant level
	Bidder	Target	Bidder	Target		
Asset size	584	425	1188	1013	0.64	0.57
Growth	1.44	0.55	3.66	1.26	1.40	0.17
Profit 1	0.07	0.11	0.08	0.09	2.46	0.02
Profit 2	0.06	0.20	0.10	0.34	2.45	0.02
Risk 1	0.76	0.51	2.89	2.07	0.44	0.66
Risk 2	0.56	0.70	0.85	1.40	0.50	0.62
Leverage	0.44	0.46	0.30	0.21	0.46	0.65

do the target firms. The t-test on these differences, which combines standard deviation and means to indicate significance or otherwise of these differences, indicates that of these differences, only the differences on profitability were significant at a reasonable level of significance (5% or less). Thus, the findings indicate that the only significant difference was in term of the profitability rate, which was higher among the target firms than the bidder firms. This finding contradicts the findings of the Western studies. This could be due to institutional differences and/or the period of takeovers. The conclusion that emerges from this is that the takeover was motivated by the desire to enhance the market share and thereby reap economies of scale, and that it was initiated by the larger but low profit making firms and facilitated by a relatively high profit rate and high leverage of the target firms.

The simple correlation coefficients among the pairs of independent variables in the discriminant function (as shown in Table 2), clearly rule out the presence of any serious multicollinearity. Surprisingly, the correlation between the two measures of profit is just two-thirds and that between the two measures of risk is not only about one-half but is negative as well. As will be noted latter, the selected discriminant function has only one of the two measures for each of these variables, and hence these relatively high correlations do not threaten the findings of this paper.

Table 2: Simple Correlation Coefficients

	Size	Growth	P 1	P 2	R 1	R 2	Leverage
Size	1						
Growth	0.01	1					
P 1	-0.11	-0.21	1				
P 2	-0.02	-0.08	0.67	1			
R 1	-0.15	0.08	-0.002	0.004	1		
R 2	0.05	0.16	0.10	0.05	-0.55	1	
Leverage	-0.02	0.13	0.17	0.65	-0.12	0.14	1

The estimation results of the discriminant function as provided in Table 3 include the results of the five alternative formulations, and both for the original units of measurement of independent variables (unstandardized function) as well as for the standard measure (mean of zero and standard deviation of unity) of these variables (standardized function). In terms of the model's overall performance, as measured by its predictive ability, formulation 5 provides the best results. However, while the difference in this performance is only marginal, this model suffers from some degree of multicollinearity, which is absent from all other variants. Accordingly, formulations 2 and 4 are preferred to this one. These two alternative models are basically the same barring the magnitude of the coefficient of the growth variable, which plays the lowest role

Table 3 : Estimates of the Discriminant Function

Discriminant variables	Coefficient of									
	Unstandardized function					Standardized function				
	1	**2**	3	4	5	1	**2**	3	4	5
Size	1.39E 0-4	**1.46E 0-4**	1.20E 0-4	1.20E 0-4	1.79E 0-4	0.16	**0.17**	0.14	0.14	0.21
Growth	0.01	**-0.03**	0.04	-9.71	6.23	0.03	**-0.08**	0.12	-0.003	0.18
Profit 1	-6.63		-5.8		6.24	-0.58		-0.50		0.54
Profit 2		**-5.45**		-5.17	-7.46		**-1.11**		-1.06	-1.53
Risk 1	0.10	**0.11**			0.05	0.26	**0.29**			0.14
Risk 2			-0.1	-0.09	-0.08			-0.37	-0.32	-0.29
Leverage	3.01	**4.42**	2.9	4.27	4.91	0.89	**1.30**	0.86	1.26	1.45
Constant	-0.39	**-0.71**	-0.39	-0.65	-1.19					
Group means										
D_0	0.65	**0.94**	0.68	0.95	1.02					
D_1	-0.54	**-0.79**	-0.56	-0.79	-0.85					
D^+	0.06	**0.08**	0.06	0.08	0.09					
% correctly predicted										
Bidder	63.3	**76.7**	66.7	76.7	80					
Target	94.4	**100**	94.4	100	100					
Total	80.3	**89.4***	81.8	89.4	90.9					

Note: D^+ is the arithmetic mean of D_0 and D_1
* denote significance at the 1% level

in either formulation in terms of the relative significance. Between these alternatives, function 2 is preferred on the ground of the stability of the coefficients across the

alternative formulations. Thus, formulation 2 is the selected empirical discriminant function.

For discriminating between these two categorical groups, the bidder takes the value of zero (D = 0) and the target takes the value of one (D = 1). The chosen function has positive coefficients for size, risk and leverage variables, and negative for the growth and profit variables. Thus, the results indicate that the bidder firms have higher growth and profit, and lower size, risk and leverage than do the target firms. Barring for the asset variable, this finding appears consistent with the a priori theory of the firm behaviour as well as with the empirical literature. Low growth and low profitability become the cause of a firm being taken over by others which are relatively stronger on these counts.

The coefficients of the standard function indicate the relative significance of the independent variables in delineating one group of firms from the other. Thus, leverage comes out to be the most important discriminator, followed by profitability, risk, size and growth, in the descending order of importance (vide standard function 2 in Table 3 and Table 4). High leverage firms become the targets for takeovers by the low leverage firms. This is quite consistent with the theory of organization behaviour. Also, the finding fairly tallies with that of Singh et al. (1975) whose discriminant model with 83% correct classification, found size, followed by profitability, as the most importantdiscriminator between the bidder and target firms. Singh et al.'s model too indicates that the bidders have higher profit than the target firms.

Table 4: Relative rank and sign of variables

Rank	Variable	Sign
1	Leverage	+
2	Profit	-
3	Risk	+
4	Size	+
5	Growth	-

The empirical evidence that the bidder firms have lower size, are lower leveraged, have higher profit rate, and are less exposed to variations in profit rate, provide support that takeovers are undertaken to increase the size for managerial discipline and/or to preserve/enhance the market share.

The selected model has high predictive power at least for the sample firms. It correctly classifies 77% of the bidder firms and 100% of the target firms with an overall performance of 90%. This proportion compares rather favourably with the literature and thus adds to the model's credibility. The Wilks' Lambda for the selected model is 0.57 and is significant at the 1% level, thus the null hypothesis that the observations come from the same population is rejected.

To test the performance of the model for outside the sample, a group of 35 controlled bidder and 31 controlled target firms were selected on the basis of the comparable size and industrial classification in the year of takeover. The characteristics of these controlled firms in terms of the mean values and standard deviations of the various discriminatory variables are presented in Table 5. A comparison of these data with the corresponding data in Table 1 would reveal that the controlled firms have low values for size, growth and risk than do the corresponding original group of firms, while no unambigous differences exist with regard to the remaining two discriminatory variables.

Table 5 : Characteristics of Controlled Bidder and Controlled Target firms

Variable	Mean		Standard deviation	
	Controlled		Controlled	
	Bidder	Target	Bidder	Target
Asset size	549	390	877	648
Growth	0.19	0.16	0.29	0.16
Profit 1	0.08	0.10	0.09	0.08
Profit 2	0.11	0.08	0.21	0.06
Risk 1	0.08	0.40	1.33	0.43
Risk 2	0.15	0.22	0.69	1.05
Leverage	0.46	0.37	0.19	0.20

The estimates of the selected unstandardized function 2 were applied to the data on the controlled bidder and controlled target firms to yield the values of the discriminant function D for each of the firms under the two controlled groups. The so obtained values for D were then compared with the mean value of D_o and D_1 via D^+ to classify them into the bidder and target groups. Thus, if the computed value for a firm fell below 0.08, it would be classified as the bidder firm and if above this value, the target firm.

Table 6: Prediction Results for Non-Sample Firms.

Group of firms	Total number	Number (Percent)	
		Correct	Incorrect
Controlled bidder	35	9(26%)	26(74%)
Controlled target	31	10(32%)	21(68%)
All	66	19(29%)	47(71%)

The results as in Table 6, indicates that of the 35 controlled bidder, only 9 (26%) were classified to be the bidder, and the rest as the target. Similarly, of the 31 controlled target, only 10 (32%) qualify as the target and the rest as the bidder. Thus, on the whole, the model correcly predicts only 29% of the controlled groups. This is an appropriate finding, for if a large proportion of the firms were correctly dichotomized then they should have joined the takeover movement. The fact that none of the controlled firms participated in the takeover move only enhances the credibility of our model. It is instructive to note that the separate discriminant function, using the same five independent variables, fitted to the bidder and controlled bidder firms, and to the target and controlled target firms produced 67% and 86% correct predictions of the firms' groupings, respectively.

For the linear discriminant model to provide a classification rule that minimizes the probability of misclassification, the main assumption is that the sample data comes from a

multivariate normally distributed population. As pointed out by Eisenbeis (1977), most normality tests are available for univariate and not for testing multivariate normality. Even if the variables are univariate normal, the joint distribution may not neccessarilly be multivariate normal. The discriminant analysis however has been shown to perform well and is robust in a variety of situations (Klecka (1980)). To reinforce the classification accuracy of the discriminant model, the logistic regression procedure, which requires less restrictive assumptions about the distribution of the data, was also run onto the pre-takeover bidder and target groups.

Logistic regression is used to estimate the probability of the takeover event occuring. In logistic regression, the parameters are estimated using the maximum likelihood method, where the coefficients that make the results most "likely" are selected. The results using the four combinations of profit and risk variables and ALL the variables together are shown in Table 7.

The logistic regression estimate results for all the five formulations are statistically significant at the 1% level. The explanatory power of the function is high with a range of 84.9% - 97%. As under the estimation of the discriminant function, (as in Table 3), formulation 2 (using P2 and R1) gives the best results with 97% overall correct prediction, a higher chi-square value (66.5) and higher (compared to formulation 4) goodness-of fit (707.9). Both the profit rate and the leverage are statistically significant (at 1% level) in this model. In the discriminant analysis (Table 4), both these variables were found to be the most important discriminatory variables.

Overall, the results for the logistic regression model and the discriminant model are similar in that the formulation 2 is picked up by both the models. Under both the models, this formulation provides the highest explanatory power and 100% accurate prediction of the target firms. Also, the same two variables (leverage and profit) are found to be the most important contributor to the groupings. Given that the logistic regression requires less stringent assumptions and that it has produced similar results as the discriminant function, the general conclusions derived from the discriminant function holds.

Table 7 : Estimates of Logistic Regressions

Variables	Formulation				
	1	**2**	3	4	5
Size	5.6E-05	**1.17E-04**	6.8E-05	2.54E-04	2.48E-04
Growth	0.10	**0.71**	0.05	0.67	0.72
Profit 1	15.03 *		13.94 *		5.54
Profit 2		**32.71***		32.5 *	31.5 *
Risk 1	-0.11	**-0.22**			-0.11
Risk 2			0.25	0.14	0.10
Leverage	-8.43 *	**-33.2***	-8.1*	-32.8*	-33.3*
Constant	0.71	**2.36**	0.66	2.09	1.79
-2 log likelihood	60.82	**24.43**	59.5	24.48	24.09
Goodness of fit	836.8	**707.91**	601.69	606.95	641.94
Chi-square	30.13	**66.5**	31.45	66.5	66.9
df	5 *	**5***	5*	5*	5*
% correctly predicted					
Bidder	76.7	**93.3**	73.3	93.3	93.3
Target	94.4	**100**	94.4	100	100
Total	86.4	**97**	84.9	97	97

* denote statistical significance at 1% level

V. Summary and conclusions

The asset size, growth, profitability, risk, and leverage serve as the good predictive variables for discriminating the bidder firms from the target firms in the case of Malaysia's takeover movement during 1980 through 1993. They together account for about 90% of the firm's groupings. The discriminant explanatory model for takeover natural selection process is shown to have a high degree of classification accuracy and it is supported by the logistic regression model. Further, when applied to a holdout sample of controlled firms, it produced consistent results. The signs and ranks of the coefficients from the discriminant function indicate that the higher profit and lower growth bidder firms take over the lower profit target firms. This suggests some degree of market discpline for the less profitable target firms through the threat of a takeover or displacement of inefficient managers. This could also be due to the desire of the bidder firms to increase their market share (size) for managerial self-interest. Also, takeovers could have been to gain synergy through economies of scale/scope in order to maintain the high profit and to boost their growth. It is also found that the high leveraged firms become the targets, indicating that the takeovers are not in search for an increase in the debt capacity.

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