UNIVERSITI PUTRA MALAYSIA

DETERMINATION OF CAPITAL STRUCTURE AND PREDICTION OF CORPORATE FINANCIAL DISTRESS

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DETERMINATION OF CAPITAL STRUCTURE

AND PREDICTION OF CORPORATE FINANCIAL DISTRESS

By

MOHMAD ISA HUSSAIN

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Doctor of Philosophy

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DEDICATION

Bismillahirrahmanirrahiim,

In the name of Allah s.w.t. the Beneficent and Merciful,

Praise be to Allah s.w.t. the Lord of the Worlds,

And Muhammad s.a.w is His messenger,

By Grace of Allah s.w.t. finally this thesis is accomplished,

Alhamdullilahirrabiralamin.

This work is specially dedicated,

To my beloved wife, Khaironnisak Hj Johod,

To all my wonderful children, Amar, Khairon Hamizah, Khairon Hazimah, Amin, Azlan and Aiman,

May pursuit of education and quest of knowledge be their most affectionate endeavour in life. Most importantly, may the short message below would inspired them at all time.

Allah says: *Those who know and those who don't,*

will they ever be equal? (Qur'an 39:9).

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DETERMINATION OF CAPITAL STRUCTURE AND PREDICTION OF CORPORATE FINANCIAL DISTRESS

By

MOHMAD ISA BIN HUSSAIN

April 2005

Chairman: **Professor Annuar Md. Nassir, PhD**

Faculty: **Economics and Management**

This study examines the determinants of capital structure of 182 Malaysian listed firms utilizing panel data from 1986-2001. To enhance the capital structure model, this study incorporated macroeconomics variables together with the traditional financial ratios in determining the capital structure choice. Besides, this study also employs the dynamic capital structure model, using panel data analysis, to estimate the parameters of interest and the speed of adjustment of Malaysian listed firms towards target level of leverage. In fact, this is the pioneer attempts in the application of the dynamic analysis to capital structure model and utilization of large data set of Malaysian listed firms. Thus the results would be of great contribution especially in the context of the emerging market.

Empirical results show the following. First, the results of the static capital structure model using the pooled OLS estimation and Fixed Effects (FE) models were analyzed and compared. Of these static models, after correcting for heteroscedasticity and autocorrelation problems, the Generalised Least Square (GLS) method is the best static model because it has the higher goodness of fit of 90.94% compared to 57.52% (i.e. comparison between the Lev6 of market value model of GLS estimation and the Lev6 of market value model estimated by Transformed Regression Model). Second, the dynamic capital structure model was estimated using a must stronger estimation technique, Generalised Method of Moments (GMM). Under the GMM estimation, this study deploys a consistent estimation method as suggested by Anderson and Hsiao (1982) and Arellano and Bond (1991). For comparison purposes, pooled OLS estimates were also obtained. After comparing the results, this study concluded that Arellano and Bond's method is the most appropriate for the dynamic model because the performance of its estimators results in smaller variances than those associated with Anderson and Hsiao's approach.

The final dynamic capital structure model reveals that 13 variables were significantly related with the level of leverage and eight variables were not significant. In addition to firm-specific characteristics, this study found that macroeconomics variables are also important factor in determining the financing decision. These empirical findings support the study hypothesis that

macroeconomics factors were also important and would affect capital structure choice. The three most significant determinants are, (i) lagged leverage, (ii) non-debt tax shield, and (iii) money supply. The sign of these relations suggest that both the pecking order theory and the trade off theory are at work in explaining the capital structure. The results also show that Malaysian firms adjust toward target leverage but the speed of adjustment of 0.47 is slower compared to 0.57[1] for developed countries such as United States and United Kingdom. Besides, it seems that the cost of deviating from the target leverage is not generally large enough to motivate costly external capital market transaction.

It was observed that the capital structure model reported in the literature especially for Malaysian has only been short-term in nature because they are based on a static *snapshot* framework. The empirical evidence of this study clearly indicates that the findings from such studies were found to be seriously underestimating the impact of the explanatory variables in the long-term equilibrium. This long-term outlook and its finding is a new contribution to the issue in the Malaysian context.

In the second part, two corporate financial distress models were constructed for Malaysian listed firms. Eight independent variables were used for the capital structure prediction model (**CS-prediction model**), while nine selected literature based variables were deployed for literature based prediction model (**L-prediction**

[1] This is an average speed of adjustment for United States and United Kingdom.

model) and observed the models' accuracy. The in-sample overall accuracy of the CS-prediction model is 71.1% and the L-prediction model is 85.2%. The Nagelkerke R^2 of the CS-prediction is 45.50% while L-prediction model is 62.40%, which implies that relatively the literature based predictors of the model significantly explained the contribution to the financial distress.

Further, the predictive power of both models was tested using the holdout samples. Comparatively, for the first three years period prior to distress, this study found that the L-model consistently outperformed the CS-model. In fact, the results of L-model demonstrated excellent *Type I accuracy*[2] of 100%, *Type II accuracy*[3] of 90% and overall accuracy of 95.00% one year prior to distress. It was also observed that the overall accuracy remained high for the second year (94.99%) and the third year (84.99%).

The estimation results of L-prediction model confirmed all the expectations. The model indicates that declining profit margin on sales (T_1) and operating efficiency (T_9) contributes significantly towards the firm becoming financially distressed, while the total debt ratio (T_6) and current liabilities to total assets ratio (T_7) are shown to have direct contribution to the financial distress. Of these significant variables, the total debt ratio (T_6) and current liabilities to total assets ratio (T_7) were found to be the two most significant factors in determining the outcomes of

[2] Correctly classify a financially distressed firm as distressed firm.
[3] Correctly classify a healthy firm as healthy.

financial distress with the largest elasticity value of 14.1600 and 10.3480 respectively. In general, these results are consistent with the trade-off theory which predicts that highly leveraged firm is vulnerable to financial distress. The results also shed some light on the factors that caused financial distress to many Malaysian listed companies. Following these results, the study concluded that firm with less profit margin on sales (T_1) and operating efficiency (T_9) and high in total debt ratio (T_6) and current liabilities to total assets ratio (T_7) would have higher financial distress prospect in Malaysia. In sum, the L-prediction model is the preferred corporate financial distress prediction model and is capable of providing effective early warnings information of financial distress especially three years period prior to distress.

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PENENTUAN STRUKTUR MODAL
DAN PERAMALAN KESEMPITAN KEWANGAN KORPORAT

Oleh

MOHMAD ISA BIN HUSSAIN

April 2005

Pengerusi: **Profesor Annuar Md. Nassir, PhD**

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Kajian ini memeriksa penentuan struktur modal bagi 182 buah syarikat Malaysia yang disenaraikan di Bursa Malaysia mengguna data panel dari tahun 1986-2001. Untuk memperkasakan model struktur modal, kajian ini menggambilkira variabel makroekonomi bersama-sama dengan variabel lazim nisbah kewangan dalam penentuan pemilihan struktur modal. Disamping itu, melalui analisis data panel, kajian ini juga mengguna model struktur modal dinamik untuk menganggarkan parameter pilihan dan kadar kelajuan ubahsuai ke arah paras struktur modal sasaran oleh syarikat Malaysia yang disenaraikan. Sesungguhnya, kajian ini merupakan salah satu percubaan perintis dalam aplikasi analisis dinamik ke atas model struktur modal dan penggunaan data panel yang bersaiz besar melibatkan syarikat Malaysia

yang disenaraikan. Oleh hal demikian, hasil kajian ini akan memberi sumbangan besar terutamanya dalam konteks negara sedang membangun.

Keputusan empirikal menunjukkan perkara-perkara berikut. Pertama, keputusan dari model struktur modal statik yang menggunakan penganggaran *pooled OLS* dan model *Fixed Effects* dianalisis dan dibuat perbandingan. Daripada kedua-dua model statik ini, selepas diselaraskan masalah heteroskedastisiti serta autokorelasi, penganggaran *Generalised Least Squares* (GLS) didapati merupakan kaedah terbaik untuk model statik kerana ianya menghasilkan nilai pekali penentuan diubahsuai, $\overline{R}^2$ yang lebih tinggi iaitu 90.94% berbanding dengan 57.52% (i.e. perbandingan diantara model nilai pasaran Lev6 untuk GLS dengan model nilai pasaran Lev6 untuk Model Regresi Diubahsuai). Kedua, model struktur modal dinamik dianggar menggunakan teknik penggangaran yang lebih berkesan, iaitu *Generalised Method of Moments (GMM)*. Melalui penganggaran GMM, kajian ini mengunapakai kaedah penganggaran kosisten seperti disyorkan oleh Anderson dan Hsiao (1982) dan Arellano dan Bond (1991). Untuk tujuan perbandingan, anggaran melalui *pooled OLS* juga diperolehi. Selepas membandingkan kesemua keputusan, kajian ini membuat kesimpulan bahawa kaedah Arellano dan Bond adalah yang paling sesuai untuk model dinamik kerana prestasi penganggarnya menjanakan sisihan lebih kecil berbanding dengan pendekatan Anderson dan Hsiao.

Model struktur modal dinamik muktahir menunjukkan bahawa 13 variabel ada hubungan signifikan dengan paras pengumpilan manakala lapan variabel tidak

signifikan. Selain daripada ciri khusus firma, kajian ini mendapati variabel makroekonomi juga merupakan faktor penting menentukan keputusan pinjaman. Hasil kajian ini menyokong hipotesis kajian bahawa faktor makroekonomi juga penting dan mempengaruhi pilihan struktur modal. Tiga faktor paling signifikan ialah (i) keumpilan lat 1 (ii) lindung cukai bukan hutang, dan (iii) penawaran wang. Tanda arah korelasi mengesyorkan bahawa kedua-dua teori iaitu teori susunan patukan dan *trade-off theory* beroperasi dan mampu menjelaskan struktur modal. Keputusan kajian juga menunjukkan bahawa syarikat di Malaysia melaksanakan pengubahsuaian ke arah paras pengumpilan sasaran tetapi kadar ubahsuai sebanyak 0.47 adalah lebih perlahan berbanding dengan kadar 0.57[1] di negara maju seperti di Amerika Syarikat dan United Kingdom. Disamping itu, diperhatikan bahawa kos ketidakseimbangan daripada paras pengumpilan sasaran tidak mencukupi untuk mendorong syarikat mengambil modal luar kerana transaksi pasaran modal yang mahal.

Diperhatikan bahawa model struktur modal yang dilaporkan dalam karya kewangan terutamanya di Malaysia biasanya bersifat jangka pendek kerana model kajian berkenaan berlandaskan kerangka statik. Bukti empirikal kajian ini jelas menunjukkan bahawa penemuan daripada kajian sedemikian telah memperkecilkan impak variabel bebas dalam keseimbangan jangka panjang. Dalam konteks Malaysia, perspektif jangka panjang kajian ini serta hasilnya merupakan sumbangan baru kepada isu ini.

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[1] Ini adalah kadar kelajuan ubahsuai purata bagi Negara Amerika Syarikat dan United Kingdom.

Di bahagian kedua, kajian ini membina model peramalan kesempitan kewangan korporat untuk syarikat Malaysia yang disenaraikan. Lapan variabel bebas digunakan untuk membangunkan model peramalan berasaskan variabel struktur modal (**model peramalan-CS**) sementara sembilan variabel bebas berdasarkan karya kewangan digunakan untuk membina model peramalan karya (**model peramalan-L**) dan seterusnya menganalisis ketepatan peramalan model-model berkenaan. Ketepatan menyeluruh sampel untuk model peramalan-CS ialah 71.1% dan model peramalan-L ialah 85.2%. Nilai Nagelkerke R^2 model peramalan-CS ialah 45.5% sementara model peramalan-L ialah 62.4%. Ini bermakna secara relatif, variabel bebas dari model berdasarkan karya kewangan menerangkan dengan signifikan akan variasi kesempitan kewangan korporat.

Seterusnya, keupayaan peramalan kedua-dua model diuji menggunakan sampel berasingan. Secara perbandingan, bagi tiga tahun pertama sebelum kesempitan kewangan, keputusan prestasi peramalan dari model-L sentiasa mengatasi model-CS. Keputusan model-L menunjukkan ketepatan yang begitu tinggi dimana ketepatan *Jenis I*[2] sebanyak 100%, ketepatan *Jenis II*[3] 90% dan ketepatan keseluruhan sebanyak 95%. Adalah juga diperhatikan bahawa ketepatan keseluruhan model berkenaan mencapai peratusan yang tinggi untuk tahun kedua (94.99%) dan tahun ketiga (84.99%).

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[2] Berjaya megenalpasti syarikat yang kesempitan kewangan sebagai syarikat yang menghadapi kesempitan.

[3] Berjaya megenalpasti syarikat yang bukan dalam kesempitan kewangan sebagai syarikat yang kukuh.

Keputusan penganggaran model peramalan-L mengesahkan semua jangkaan. Model ini menunjukkan bahawa penurunan margin keuntungan ke atas jualan (T_1) dan kecekapan operasi (T_9) menyumbang dengan signifikan ke atas kebarangkalian syarikat menghadapi kesempitan kewangan, sementara nisbah jumlah hutang (T_6) dan nisbah liabiliti semasa ke atas jumlah aset (T_7) memberi sumbangan langsung kepada kesempitan kewangan. Daripada kalangan variabel yang signifikan ini, nisbah jumlah hutang (T_6) dan nisbah liabiliti semasa ke atas jumlah aset (T_7) didapati merupakan dua faktor terpenting dalam menentukan kemungkinan kesempitan kewangan kerana kedua variabel berkenaan memiliki nilai keanjalan tertinggi sebanyak 14.1600 dan 10.3480 masing-masing. Secara umumnya, hasil kajian adalah konsisten dengan *trade-off theory* yang menyatakan bahawa syarikat berkeumpilan tinggi akan lebih terdedah kepada masalah kesempitan kewangan. Keputusan kajian ini juga memberi petunjuk mengenai faktor yang menyebabkan kesempitan kewangan kepada syarikat Malaysia yang disenaraikan. Berdasarkan keputusan berkenaan, kajian ini menyimpulkan bahawa syarikat yang kurang margin keuntungan ke atas jualan (T_1) dan kecekapan operasi (T_9) serta tinggi pada nisbah jumlah hutang (T_6) dan nisbah liabiliti semasa ke atas jumlah aset (T_7) akan berpotensi tinggi untuk menghadapi kesempitan kewangan di Malaysia. Akhir sekali, model peramalan-L adalah model kesempitan kewangn korporat pilihan kerana model ini berkeupayaan untuk menyediakan informasi amaran awal yang berkesan mengenai kesempitan kewangan korporat terutamanya tiga tahun sebelum syarikat dilanda kesempitan.

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