Determinants of Capital Structure
for Listed Construction Companies in Malaysia

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Abstract

Some studies have determined the impact of financial factors on the failure of firms; such as bad financial management and lack of capital which are the main determinants of failure. The construction industry is generally also facing these problems to some extent. Where the Malaysian scene is concerned, the failure rate of construction companies is quite high. This study examines the debt and equity structure for the construction companies listed in the Bursa Malaysia market during a seven-year period from 2001 to 2007. This sample data derived from financial statements of 42 companies with a number of observations totalling 294. The dependent variable used is debt ratio and expressed by total debt divided by total assets while the independent variables are profitability, size, growth and assets tangibility. Using panel data method, the results show that the profitability

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of the construction companies is significant negatively relations to debt ratio while size, growth and assets tangibility are positively significant in relations to total debt. The results of the study suggest that construction companies depend heavily on debt financing compared to equity financing for expansion and growth. The findings also indicate that profit is reduced when the companies are using more debt.

1   Introduction

Capital structure decisions have the underlying aim towards maximizing the value of a firm. Any event that could accumulate unnecessary costs such as financial distress, liquidation and bankruptcy would deviate companies from attaining this objective. The ultimate consequences lay ahead may be worst if any major misjudgment occurred following financing decisions of the firm's activity. Firm needs to efficiently allocate its source of capital that will finally reduce its cost through lowering its weighted cost of capital. The results will be increased in net economic return and eventually its value. Thus, in today's financial management, regardless whether it is property or construction or any other sectors, achieving the best capital structure is crucial. A study by Yin [18] finds that most contractors do not have sufficient capital, enough fixed assets and they usually own construction equipment rather than lands or buildings to finance their undertakings. The banks do not accept these moving assets as acceptable collateral for loans. Without bank financing, contractors will obviously find it more difficult to undertake their projects.

Financial problems faced by contractors are also due to low profit margins from projects. Although the structure is the best way to ensure the completion of any project at the lowest price, it is the most difficult obstacle any contractor would be forced to hurdle in this very competitive world. Study by Wan Mansor and Rozimah [10] found that the developers in Malaysia are larger and more profitable compared to contractors and their study suggests that the contractors are heavily burdened with debt and the need to service the debt is very high.

The first and foremost purpose of the present study is to determine capital structure of construction companies in Malaysia. Specifically, we clarify the extent of optimal debt and equity used in financing of construction firms' activities in emerging markets such as Malaysia. We hope that the present study will lead the way for the financial manager in determining the right choices in capital structure's policy in the future.

2   Literature Review

2.1 Theories of Capital Structure

Many studies were conducted on investigating into the determinants of the capital structure of the firm since the work was pioneered by Modigliani and Miller [12]. The static trade-off theory suggests that the optimal capital structure does exist. This theory holds that a significant positive relationship should exist between profitability, asset tangibility and size towards financial leverage.

The agency cost theory states that an optimal capital structure will be determined by minimising the costs arising from conflicts between the parties involved. Jensen and Meckling [8] argued that the agency's cost play an important role in financing decisions due to the conflict that may exist between shareholders and debt holders.

Meanwhile the pecking order theory proposed by Myers [13] suggests that

firms prefer to finance new investment, first internally with retained earnings, then with debt and finally with an issue of new equity. That means, the more profitable firms should hold less debt, because the high levels of profits provide a high level of internal funds [16]. For the pecking order theory, there is a significantly negative relationship between profitability and debt ratio. Meanwhile for tangibility and growth variables, the pecking order theory expects a positive relationship with the debt ratio.

2.2 International Evidence

Buferna et. al. [1] when conducted a research on the capital structure of Libyan companies have also concentrated on these four key variables; growth, asset tangibility, profitability and size as identified by Rajan and Zingales [16]. They concluded that there is a positive relationship between profitability, size and asset tangibility towards leverage. Meanwhile, there is a negative relationship between leverage and growth. The result also shows that both the static trade-off theory and the agency cost theory are pertinent theories to the Libyan companies' capital structure.

An empirical study done by Salwani et. al. [17] on selected 20 companies of the property sector in the Malaysian market used five independent variables: property asset intensity, size, growth, profitability and interest rate. They suggested that property asset intensity and profitability are significant determinants of capital structure while on the other hand, size and growth rate do not appear to have any significant effect on the capital structure.

In Pakistan, Mashar and Nasr [11] suggest that asset tangibility, profitability and ROA are negatively correlated with debt. Whereas size, growth rate and tax rate is positively related with leverage.

In a broad study that focuses on U.S. capital markets, Frank and Vidhan's [4] empirical report supports the tradeoff theory. Furthermore, there exists a positive

correlation between leverage and the size of the company, expected inflation, industry median and the tangibility of assets. Positive signs towards profitability lead to an increase in equity and decrease in debt. Since firms do not adjust capital structures immediately after the signs are noticeable due to transaction costs, and therefore a negative correlation can be detected between profitability and leverage.

As examined by Huat [7] in his study regarding capital structure, the impact of managed float on the overall leverage ratios of Malaysian companies during the period July 1999 –July 2007 was the leverage ratio of Malaysian companies and is mainly driven by four factors, namely the profitability, company size, liquidity, and growth.

Studies by Faulkender and Peterson [3] reported that capital availability only depends on firm characteristics. They look into firms that have access to public bond market, which measured by having debt ratio, usually have a large amount of leverage. Also, market frictions that make the capital structure relevant may also be associated with the firms' source of capital.

Huang and Song [6] in their study on 1,000 publicly listed companies in China from 1994 to 2000, concluded that the leverage increases with firm's size, tangibility and volatility of profitability, and institutional shareholdings, while seeing a decrease with profitability and non-debt tax shields. They also suggested that the static trade-off theory is better than the pecking order theory in explaining the features of capital structure for Chinese listed companies.

However, a re-examining studies done by Qian et. al. [15] on the data for 650 publicly listed Chinese companies over the period of 1999-2004, revealed that size, tangibility, and ownership structure are positively associated with the firm's leverage ratio, while profitability, non-debt tax shields, growth and volatility are negatively related to the firm's leverage ratio.

Results from Chen and Strange [2] from their study on Chinese Listed Companies shows that profitability is negatively related to capital structure at a

high significant level. Meanwhile the size and risk of the firms are positively related to the debt ratio. They measured that tax is not a factor in influencing debt ratio. Ownership structure has a negative effect on the capital structure. They conclude that firms with higher institutional shareholdings tend to avoid using debt financing, a behavior that can be explained by entrenchment effects.

Wahyu and Abdul Ghafar [14] in their investigation on "Islamic Bank Performance and Capital Structure", consider the choice between debt and equity financing that has been directed to seek the optimal capital structure. A high leverage tends to have an optimal capital structure under the agency costs hypothesis and it is proven by Modigliani-Miller theorem that it has no effect on the value of the firm therefore leading to a good performance. Their findings show that the higher leverage or a lower equity capital ratio is associated with higher profit efficiency.

Rajan and Zingales [16] in the investigation on the determinants of capital structure of G7 countries (US, Japan, Germany, France, Italy, U.K, and Canada) find a significant relationship between firms' leverage and variables measuring the firms' size, profitability, assets tangibility and growth prospects. They suggest that there is a positive relationship between leverage and size and asset tangibility. Meanwhile there is a negative relationship for profitability and growth.

3   Methodology

The sample data used in the study is for a seven year period from 2001 through 2007. They are obtained from the financial statement of listed Malaysian firms derived from datastream database. Altogether, 42 companies are listed under construction sector in the 2001 Bursa Malaysia Main Board. After considering missing data, only 22 companies with 154 numbers of observations are available and used for further analysis.

3.1 Descriptive statistics

The application of STATA enables the researcher to generate the figures of descriptive statistics. In descriptive statistics, summary statistics are used to summarize a set of observations, in order to communicate inferences regarding the amounts as simply as possible. The measure of central tendency to be used is the arithmetic mean. The measures of statistical dispersion are the likes of standard deviation, variance and coefficient of variation. It will show how far the dispersion between the ranges of the data is. The more the dispersion, the more volatile the stock indices are. Levine et. al., [9] contends that for the investors, an increase in standard deviation (a measure of total risk) is to be considered in relationship to the mean return. From the investor's perspective, one can look at the increase in volatility by computing the mean return for unit of risk (also known as the Coefficient of Variation to investors) or the Sharpe ratio.

3.2 Test of Correlation

The first objective of this study requires the researcher to work out a correlation statistic which describes the degree of relationship between two variables. In this case, a Spearman rank correlation coefficient matrix will be generated through the STATA program which will show the cross-relationship between all of the variables.

Spearman's rank correlation coefficient or Spearman's rho, denoted by the Greek letter ρ (rho) or as r_s, is a non-parametric measure of statistical dependence between two variables. If there are no repeated data values, a perfect Spearman correlation of +1 or a perfect negative Spearman correlation of −1 occurs when each of the variables is a perfect monotone function of the other.

Significance test is also conducted on the correlations to determine the probability that the correlation is a real one and not a chance occurrence. A correlation coefficient is said to be statistically significant when their respective

p-value is less than 0.05, or vice versa. Two-tailed tests will be used for some variables that the researcher does not have a strong prior theory on as to whether the relationships are going to be positive or negative, while one-tailed test will be used on those that the relationships are already known. The degree of freedom $(N - 2)$ is simply 118 while the alpha value (significance level) is 0.05.

3.3 Generalized Least Squares

The properties of OLS or Ordinary Least-Squares regressions are sensitive to these underlying assumptions: normality, homoscedasticity, and independence. But, those assumptions are frequently violated in the real world.   Thus, in order to determine the validity of an OLS regression, the researcher is tested whether the residuals are normally distributed homoscedastic, and not autocorrelated.   The model where one can generalize the assumptions regarding the variance-covariance matrix and residual distribution is called Generalized Least-Squares (GLS) and can overcome these violations of the OLS assumptions.

On one hand, the t-test, or the z-value is the mean by which the researcher interprets for individual significance. On the other hand, the Chi^2 value from the GLS regression results is the indicators of collective significance of all the variables chosen. These indicators are the alternatives of the t- and F-test which are traditionally used for significance testing process due to the fact that such indicators cannot be generated by the GLS procedure.

3.4 Test of Normality

When using OLS, a number of assumptions are typically made. One of these is that the error term has a constant variance. Heteroscedasticity complicates analysis because many methods in regression analysis are based on an assumption of equal variance (homoscedasticity).

Heteroscedasticity does not cause OLS coefficient estimates to be biased nor inconsistent, but it can cause the variance (and thus, standard errors) of the coefficients to be underestimated. Thus, a regression analysis using heteroscedastic data will still provide the best estimate for the relationship between the predictor variable and the outcome, but it may judge the relationship to be statistically significant when it is actually too weak. In other words, it is easier for the researcher to accept the variables as significant due to the too-small standard errors which leads to t-values being too-large.

To pin-point this statistical problem, a measure of the shape of the distribution like skewness or kurtosis will be presented via charts and figures. The Jarque-Bera test of normality will be employed to detect the presence of heteroscedasticity. 5% significant level (95% confidence interval) will be used for the test, upon which the null hypothesis of 'no presence of heteroscedasticity in the model' will be tested.

If present, the problem is going to be treated using the Generalized Least Squares method which helps to realize the most accurate figures while eliminating the statistical problems at the same time.

3.5 Test of Multicollinearity

According to Gujarati and Porter [5], one of the assumptions under the Classical Linear Regression Model is stipulated that there is no multicollinearity among regressors (independent variables). Multicollinearity is the condition where the regressors are linearly related to each other. The presence of multicollinearity would render the regression coefficients to be misleading and inefficient, thus providing us with the false representations of the model.

The researcher can detect the problem simply by comparing the t-stats and R^2 values. Multicollinearity is said to be present should the t-values are insignificant or only few are significant but at the same time, the R^2 is very high. It signifies

that the variables could collectively well explain the variance in dependent variable, but the variables individually could not do so.

There are several remedies to this problem, but the researcher opts to perform the easiest measure, which is by using logarithmic transformation of the variables. In addition to that, this problem is also not expected to occur within this model since the researcher is using panel data which in generally accepted as multicollinearity-free.

4   Result and Discussion

4.1 Descriptive Statistics

Table 1 presents the descriptive statistics related to debt ratio with the determinants of capital structure. For the coefficient of variation (CV), the higher the number indicates the larger the dispersion of the variable, and the lower the number of CV, the smaller the dispersion of the variable (Levine et. al., [9]).

Table 1: Descriptive statistics

Variables	Mean	Variance	Standard Deviation	Coefficient of Variation
tdr	25.35309	343.2869	18.528	0.7307985
lsize	13.34455	1.553465	1.246381	0.0934
lpft	10.09059	2.900333	1.703037	0.1687747
gth	11.17426	559.073	23.64473	2.115999
tgb	0.2770188	0.024203	0.1555738	0.5616

From the result, it was shown that size has the smallest value of CV, which is 0.0934. This means that size has less variability, higher consistency and stability. Meanwhile, growth with CV 2.115999 indicates that it has higher variability, less consistency and stability.

4.2 Test of Normality

Table 2: Jarque-Bera statistics

Variable	Obs	Skewness / Kurtosis tests for Normality		joint	
		Pr (Skewness)	Pr (Kurtosis)	Adj chi^2(2)	Prob > chi^2
u1	119	0.002	0.954	8.61	0.0135

Table 2 shows that asymptotically the Jargue-Bera statistics follows the Chi-square distribution with 2 degree of freedom (df). Since the computed p-value is close to zero (or below 0.05 for $\alpha = 5\%$), the null hypothesis of 'there is no heteroscedasticity' could be comfortably rejected. In other words, the presence of heteroscedasticity is successfully detected here. This is a violation to the OLS assumption which could distort the regressions to be made.

To overcome this weakness, the study opted to transform the data into logarithmic form which helps to reduce the inconsistency of the residual term. Generalized Least Square method will be employed later to overcome this statistical-anomaly.

4.3 Multiple Regression Results

The Breusch and Pagan Lagrangian multiplier test is conducted to test whether to

employ pool OLS or panel regression. With a null hypothesis of 'perform pool regression', the following results were obtained in Table 3.

Table 3: Breusch and Pagan Lagrangian Multiplier Test

tdr[code,t] = Xb + u[code] + e[code,t]		
Estimated Results:		
	Var	$sd = \sqrt{Var}$
tdr	349.0256	18.68223
e	41.82044	6.466872
u	207.9791	14.42148
Test: Var (u) = 0		
	$Chi^2 (1) = 161.18$	
	$Prob > Chi^2 = 0.0000$	

Based on the Chi^2 p-value from the result above, it is apparent that the model is significant, thus supporting the rejection of the null hypothesis. This study should choose the panel regression. After the Breusch and Pagan Lagrangian multiplier test, the researcher performed a Hausman Fixed Test which compares between the random and fixed effect estimations and came up with a value of Chi^2 which will signify the appropriateness of employing either random or fixed panel regression.

The result, as illustrated in Table 4, indicates that the model fails to meet asymptotic assumption of the Hausman fixed Test. Meaning that, there is heteroscedasticity problem within the dataset. The null hypothesis cannot be rejected, meaning that the differences between the fixed and random effect coefficients are not systematic. The coefficients for random model is efficient, but

not for the fixed model. Hence, the researcher had to turn to a random regression as a remedy to heteroscedasticity (the Generalized Least Square-GLS method) instead.

Table 4: Hausman Fixed Test

	Coefficients			
	(b)	(B)	(b-B)	$\sqrt{\text{diag}(V_b - V_B)}$
	fixed	.	Difference	S.E.
lsize	15.94457	13.24683	2.697748	1.214349
lpft	-3.339012	-2.938827	-.4001849	.7525775
gth	.0626735	.0720842	-.0094107	.0047839
tgb	24.70867	26.88877	-2.180098	2.165841

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

$$\text{Chi}^2 (4) = (b - B)'(V_b - V_B)^{-1}(b - B) = 5.13$$

$$\text{Prob} > \text{chi}^2 = 0.2746$$

The results obtained for Random Effect GLS Regression is as follows in Table 5.

The results suggest that profitability is indeed, inversely related, whereas the size, growth and assets tangibility variables are directly related to the dependent variable. It can be said that an increase in profitability would decrease the level of

debt ratio, while an opposite effect will happen when the values for size, growth and assets tangibility are increased.

Table 5: Random Effect GLS Regression

Random effects u_i ~ Gaussian Corr. $(u_i, x) = 0$ (assumed)		R-sq = 0.3872 Wald chi^2(5) = 103.72 Prob. > chi^2 = 0.0000 [95% Conf. Interval]		
tdr	coef.	Std. Err.	z	P > l z l
lsize	13.24683	2.051801	6.46	0.000
lpft	-2.938827	1.165652	-2.52	0.012
gth	0.720842	0.316623	2.28	0.023
tgb	26.88877	8.006849	3.36	0.001
_cons	-131.5081	22.48841	-5.85	0.000

Judging from the p-values of the z-test, the respective null hypotheses involving all variables; size, profitability, growth and assets tangibility, are well-rejected. Therefore, based on the significance of the variables, all variables showed a strong explanatory power onto the debt ratio. Collective significance, as represented by the Chi^2 p-value was also looking favorable. In other words, all the variables chosen are efficient in explaining the variation in the debt ratio.

The coefficient of determination (R^2) is recorded at 0.3872 which means that only 38.72% of the debt ratio was explained by the variables chosen. We can say that most of the variation in debt ratio is not quite well explained by size, profitability, growth and assets tangibility. There are other important variables that are not considered in the equation in this study.

Specifically, a model developed on the partial slope coefficients could be

stated in a log-linear form as follows:

$$TDR_{i,t} = -131.5081 + 13.2468SIZE_{i,t} - 2.9388PFT_{i,t} + 0.7208GTH_{i,t} + 26.8888TGB_{i,t} + \varepsilon_{i,t} \tag{1}$$

If all other variables are held stationary, on average, an increase in profitability by 1% will reduce the debt ratio by 2.9388 points respectively. Meanwhile, increase in size, growth and assets tangibility by 1% will respectively lead to the debt ratio appreciating by 13.2468, 0.7208 and 26.8888 points.

Based on the result, the size, measured by the sales figure is positively related to total debt, suggesting that larger firms depend more on leverage financing for expanion compared to smaller firms, thereby exposing themselve into financial risk during economic downturn.

5   Conclusion

The main objective of the study is to determine the capital structure of construction companies in Malaysia. Since the financial condition of construction companies are very sensitive with the economic cycle, the decision to finance the company with internal or external source is very crucial. The results of the study show that large firms rely heavily on the debt financing. We also discovers that asset tangibility has influence the most on the debt. The rationale behind this situation is that, when the company has more assets tangibility, the demand for debt in financing the assets is also increased.

In conclusion, we can safely suggest that when the construction becomes bigger in terms of size and total assets, the company rely more on debt compared to equity financing. The findings should enhance further financial institutions as well capital providers to better stimulate the construction financial needs for its future development and country growth .

As discussed   previously, only 38.72% of the debt ratio is explained by the

independent variable of size, profitability, growth and assets tangibility. Some other important variables such as market perception, liquidity, interest rate, institutional shareholdings and non-debt tax shields should also be included in the equation. In addition, future study should increase the length of the research period of the study to ensure that there is no biasness in drawing conclusions. Perhaps by covering a longer time period, it will be more meaningful in explaining dependent variable.

Lastly, through this study, it is hoped that major players such as developers, constructors and policy maker will have better understanding about the factors which may influence the capital structure of the construction companies in Malaysia.

References

[1] F. Buferna, F. Bangassa, and L. Hodgkinson, Determinants of Capital Structure Evidence from Libya, *Research Paper Series*, University of Liverpool, (2008).

[2] J. Chen, and R. Strange, The Determinants of Capital Structure: Evidence from Chinese Listed Compnies, *Journal of Economic Change and Restructuring*, **38**, (2005), 11–35.

[3] M. Faulkender and M.A. Petersen, Does the Source of Capital Affect Capital Structure?, *The Review of Financial Studies Journal*, **19**(1), (2006), 45–79.

[4] M.Z. Frank and K.G.Vidhan, Capital Structure Decisions. Which Factors are Reliably Important?, *Journal of Financial Management*, **38**, (2009), 1–37.

[5] D.N. Gujarati and D.C. Porter, *Basic Econometrics,* Fifth edition, McGraw-Hill, New York, 2009.

[6] S. Huang and F. Song, The Determinants of Capital Structure: Evidence from China, *Working Paper, University of Hong Kong*, (2002).

[7] T.Y. Huat, *Managed Float Regime and Capital Structure Determinants: Evidence from Malaysia*, Faculty of Accountancy, Universiti Malaysia, (2008).

[8] M.C. Jensen, and W.H. Meckling, Theory of the firm: Managerial behavior, agency costs and ownership structure, *Journal of Financial Economics*, **3**(4), (1976), 305–360.

[9] M. D. Levine, L.M. Berenson and D. Stphan, *Statistic For Managers: Using Microsoft Excel*, Second edition, USA, Prentice Hall, 1999.

[10] Wan Mahmood Wan Mansor and Zakaria Rozimah, Profitability and Capital Structure of The Property and Construction Sectors in Malaysia, *Pacific Rim Property Research Journal*, **13**(1), (2009), 92–105.

[11] A. Mazhar and M. Nasr, Determinants of Capital Structure Decisions Case of Pakistani Government Owned and Private Firms, *International Review of Business Research Papers*, **6**, (2010), 40–46.

[12] F. Modigliani and M. Miller, The cost of capital, corporate finance, and the theory of investment, *American Economic Review*, **48**, (1958), 261–296.

[13] S.C. Myers, Capital structure puzzle, *Journal of Finance*, **39**(3), (1984), 575–592.

[14] Wahyu Ario Pratomo and Abdul Ghafar Ismail, Islamic Bank Performance and Capital Structure, MPRA *Paper*, (2006).

[15] Y. Qian, Y. Tian and T. Wirjanto, Capital-Structure Determinants of Publicly Listed Chinese Companies, *Research Paper, University of Zhejian*, (2008).

[16] R. Rajan, and L. Zingales, What Do We Know about Capital Structure? Some Evidence from International Data, *Journal of Finance*, **50**, (1995), 1421 – 1460.

[17] Affandi Salwani, Wan Mahmood Wan Mansor and Atiqah Rashidah Abu Samah, A Study on the Determinants of Capital Structure in Property Companies: Malaysian Evidence, *Proceeding of the 1st Terengganu International Business and Economic Conference*, *Malaysia*, (2007).

[18] K.Y. Yin, How to Become a Competent Contractor. The Monthly Bulletin of The Institution of Engineers, *Journal of Jurutera, Malaysia*, **2**, (2006), 38–39.