

CHAPTER 4

RESEARCH RESULTS

4.1 Introduction

This chapter discuss outcome from data simulation carried out for the research. Secondary data was used for analysis and was analyzed using econometrics specification with Eviews 6.

4.2 Summary Statistic

The sample consists of Malaysia PLC years observation on Data Stream from 1997 to 2008. The primary test are based on a sample of 1200 firm-year observation comprising of 100 firms. Test that requires cash flow (lagged cash flow) data reduce the sample to 791 (786) observations. Further analysis on short term debt (lagged short term debt) is based on a sample of 768 (766) firm-year observations. Sample sizes for analyzing that require contemporaneous and lagged managerial equity ownership are based on 791 (790) firm year observations. Table 4.1 presents the descriptive analysis of input data.

Table 4.1

Descriptive Statistic

	Mean	Median	Maximum	Minimum	Std. Dev.
<i>VALUE</i>	0.39	-0.21	19.11	-1.03	2.08
<i>INT</i>	0.01	0.01	0.21	0.00	0.02
<i>EARN</i>	0.07	0.07	11.50	-4.65	0.43
<i>RD</i>	0.00	0.00	0.07	0.00	0.00
<i>DIV</i>	0.02	0.01	0.73	0.00	0.06
<i>CAPEX</i>	0.04	0.03	0.46	0.00	0.05
<i>SIZE</i>	5.29	5.21	7.18	0.00	0.67
<i>RATE</i>	0.12	0.06	11.18	0.00	0.57
<i>CFO</i>	0.06	0.06	0.65	-0.73	0.11
<i>STD</i>	0.57	0.60	1.00	0.00	0.32
<i>ALIGN</i>	0.16	0.20	0.82	-0.33	0.16
<i>AGE</i>	9.18	9.00	12.00	3.00	2.80
<i>FORECAST_3</i>	30.36	24.25	366.35	-85.08	81.69
<i>IND_GROWTH</i>	1.99	1.90	4.50	0.30	1.08

4.3 Analyses of Measures

4.3.1 OLS Specification

This section present results of the OLS regression of market value (*VALUE*) on contemporaneous interest (*INT*). Previous study has found that there is a negative relation between firm value and contemporaneous interest. Analysis for this study shows similar results, which contemporaneous interest has a negative relation with firm value. The result is summarized in Table 4.2 (OLS Specification).

Table 4.2:

Relation between Firm Value and Debt; OLS vs Two-Stage Least Square (2SLS) estimation

	OLS Specification		Hausman (1978) test		2SLS specification	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Intercept	-0.35	-4.47	-0.37	-3.90	-1.89	-4.36
INT	-8.75	4.07	15.62	3.38		
ERROR			-2.77	-0.39		
INT_2SLS					6.33	3.56
EARN	0.31	1.13	0.35	1.14	0.22	0.73
RD	175.55	15.34	176.60	15.25	162.65	13.68
DIV	21.50	23.55	20.87	22.26	20.17	21.36
CAPEX					3.00	2.85
SIZE					0.27	3.26
Adjusted R2	0.51		0.52		0.52	
Observations	871		791		791	

The regression for OLS specification can be generating as follow:

$$VALUE = -0.35 - 8.75INT + 0.31EARN + 175.55R\&D + 21.50DIV$$

$R^2 = 51\%$ of the variation in firm value is explained collectively by the variable in the model. Overall test shows significant relationship between dependent and independent variable. Only *EARN* is insignificant coefficients in the primary equations. The coefficient for *INT* is -8.75 and insignificant with t-stat of 4.07.

Therefore the OLS specification conducted has shown that there is a negative insignificant relationship between firm value and contemporaneous interest once controlling variables such as *EARN*, *R&D* and *DIV* is applied. This result consistent

with what was summarized in previous research by Fama & French (1998). Thus it is not consistent with MM theorem which emphasized that there is a positive relation between firm value and debt.

4.3.2 Hausman (1978) Test of endogeneity

Hausman (1978) test is conducted to test endogeneity of contemporaneous debt (*INT*) in the primary equation. The test is done in two stages. In stage one the suspected endogenous variable is regressed on an instrument and the other exogenous variables from the primary equation. In this research the suspected endogenous variable is contemporaneous interest. Following prior research by Rajan & Zingales (1995) and Frank & Goyal (2004), lagged interest expense is used as the instrument. Lagged value from interest expense act as a good exogenous instrument because today's firm value cannot influence yesterday's interest, thereby avoiding simultaneity. Since firm value is the present value of future cash flows, lagged values of interest are unlikely to be correlated with the error. Furthermore (Welch, 2004) argue that lagged interest is highly correlated with contemporaneous interest, indicating that it is a good instrument. The first stage of Hausman (1978) test is as stipulated in Table 4.3.

Table 4.3:

First Stage Regression for Hausman Test

Dependent Variable: INT				
Method: Panel Two-Stage Least Squares				
Date: 04/22/10 Time: 23:52				
Sample (adjusted): 1998 2008				
Periods included: 11				
Cross-sections included: 33				
Total panel (unbalanced) observations: 220				
Instrument list: C L_INT EARN RD DIV				
	Coefficient	Std. Error	t-Statistic	Prob.
L_INT	0.94	0.03	32.52	0.00
EARN	-0.04	0.00	-11.18	0.00
RD	0.05	0.05	0.96	0.34
DIV	0.05	0.01	3.08	0.00
C	0.00	0.00	2.88	0.00
R-squared	0.881475	Mean dependent var		0.013875
Adjusted R-squared	0.87927	S.D. dependent var		0.018157
S.E. of regression	0.006309	Sum squared resid		0.008557
F-statistic	399.7424	Durbin-Watson stat		1.807838
Prob(F-statistic)	0.0000	Second-Stage SSR		0.008557
Instrument rank	5			

In the first stage regression as shown in Table 4.3, the result for lagged interest (*L_INT*) coefficient is positive (0.94) and highly correlated with contemporaneous interest which consistent with (Welch, 2004) argument. From the regression specification, estimation on residual (*ERROR*) and predicted interest (*INT_2SLS*) is gather.

ERROR is then incorporated into firm value OLS specification to ascertain the endogeneity of contemporaneous interest. Table 4.2 (Hausman (1978) test) shows the results of OLS specification with incorporation of *ERROR*. The estimated residual (*ERROR*) is negative (-2.77) and statistically significant ($t=-0.39$), which suggest that *INT* is endogenous and should be instrumented by *INT_2SLS*.

4.4 Testing of Hypotheses

4.4.1 Two-Stage Least Square (2SLS) specification

In the two-stage least square estimation, the predicted value (*INT_2SLS*) from 4.3.2 is used to replace the endogenous variable (*INT*). As mentioned in 3.2.3, inadequate controls for future profitability could affect the relation between firm value and debt. Therefore, to address this situation, additional control variables are introduced; capital expenditure (*CAPEX*) is added to better control for the firm's future profitability and firm size (*SIZE*), defined as log sales to control for other firm-level factors.

The estimation result is as shown in Table 4.2 (2SLS specification). The outcome shows that once endogeneity of contemporaneous debt is corrected, there is a positive significant relation between firm value and debt. The coefficient of *INT_2SLS* is 6.33 with a t-stat of 3.56. The specification can then be generated as follows:

$$VALUE = -1.89 + 6.33INT_2SLS + 0.22EARN + 162.65R\&D + 20.17DIV + 3.00CAPEX + 0.27SIZE$$

$R^2 = 51\%$ of the variation in firm value is explained collectively by the variables in the model. Overall, the test shows a significant relationship between the dependent and independent variables. Only *EARN* has insignificant coefficients. This result supports Hypothesis 1, which states that:

H₁: There is a positive relation between firm value and debt, once endogeneity of contemporaneous debt is corrected using a two-stage least squares estimation.

4.4.2 Alternate Interpretation

This section presented alternate theories (based on agency and signaling hypotheses), that might be consistent with the positive relation between firm value and debt.

4.4.2.1 Free Cash Flow Theory

Jensen & Meckling (1976) argues that debt reduces the agency costs of free cash flows by reducing cash flows that is available for spending at the discretion of managers. As a results, the reduction in agency costs leads to an increase in firm value. To discriminate between the tax theory and agency theory, the relation between firm value and debt is analyze with additional controls for the firm's cash flow from operation (CFO).

Table 4.4:

Distinguishing between the tax and agency explanations of debt – Free cash flows

	Contemporaneous Cash Flow (CFO)		Lagged Cash Flow (L_CFO)	
	Coeff.	t-stat	Coeff.	t-stat
<i>Intercept</i>	-1.80	-4.15	-1.88	-4.33
<i>INT_2SLS</i>	4.81	3.21	8.56	3.64
<i>CFO</i>	1.66	2.64		
<i>L_CFO</i>			2.14	3.64
<i>EARN</i>	0.15	0.50	0.25	0.79
<i>RD</i>	161.68	13.64	159.29	13.42
<i>DIV</i>	18.77	17.39	18.38	17.55
<i>CAPEX</i>	2.34	2.16	2.43	2.28
<i>SIZE</i>	0.25	2.99	0.24	3.00
<i>Adjusted R2</i>	0.52		0.53	
<i>Observations</i>	791		786	

Table 4.4 presents the results of the regression of *VALUE* on *INT_2SLS* controlling for contemporaneous cash flows (*CFO*). From the specification, the coefficient of *INT_2SLS* is 4.81 and the t-stat is 3.21 with a significant coefficient of *CFO*. The result shows that there is a positive relation between firm value and debt after controlling for the level of cash flow. The regression specification for *CFO* can be summarized as follows:

$$VALUE = -1.8 + 4.81INT_2SLS + 1.66CFO + 0.15EARN + 161.68R\&D + 18.77DIV + 2.34CAPEX + 0.25SIZE + \varepsilon$$

To ensure that the analysis is not influenced by the possible endogeneity of contemporaneous cash flows, second analysis is conducted based on lagged cash flow (*L_CFO*). The results in Table 4.4 shows similar results, with the coefficient of *INT_2SLS* is positive (8.56) and significant (t=3.64) after controlling for *L_CFO*. The regression specification for *L_CFO* can be summarized as follows:

$$VALUE = -1.88 + 8.56INT_2SLS + 2.14L_CFO + 0.25EARN + 159.29R\&D + 18.38DIV + 2.43CAPEX + 0.24SIZE + \varepsilon$$

Both results from the regression specification support hypotheses 1a, which is:

H_{1a}: There is a positive relation between firm value and debt even after controlling for the level of free cash flows.

4.4.2.2 Debt Signaling Hypotheses

To distinguish between the signaling and the tax hypotheses, the role of short term debt is incorporated. In this analysis the ratio of short term debt to total debt (*STD*) is include as additional control in the primary regression to test this alternate interpretation. Table 4.5 present the results of regression specification of *VALUE* on *INT_2SLS* with an additional control for contemporaneous short term debt (*STD*).

Table 4.5:

Distinguishing between the tax and signaling hypotheses of debt – Short term debt

	Contemporaneous short term debt (<i>STD</i>)		Lagged short term debt (<i>L_STD</i>)	
	Coeff.	t-stat	Coeff.	t-stat
<i>Intercept</i>	-1.73	-3.69	-1.79	-3.77
<i>INT_2SLS</i>	6.26	3.44	10.65	3.91
<i>STD</i>	-0.17	-0.96		
<i>L_STD</i>			-0.18	-1.05
<i>EARN</i>	0.19	0.62	0.38	1.20
<i>RD</i>	162.31	13.46	162.93	13.52
<i>DIV</i>	20.05	20.63	19.84	20.20
<i>CAPEX</i>	2.80	2.59	3.02	2.81
<i>SIZE</i>	0.26	3.06	0.26	3.02
<i>Adjusted R2</i>	0.52		0.52	
<i>Observations</i>	768		766	

The results shows coefficient of *INT_2SLS* is 6.26 and significant with t-stat 3.44. This shows that there is a positive relation between firm value and debt after controlling for *STD*. Further to that, *STD* coefficient is negative (-0.17) which is not consistent with the theory of Flannery (1986) which suggested that firms issuing short term debt are of a higher quality. The regression specification for *STD* can be summarized as follows:

$$VALUE = -1.73 + 6.26INT_2SLS - 0.17STD + 0.19EARN + 162.31R\&D + 20.05DIV + 2.80CAPEX + 0.26SIZE + \varepsilon$$

To ensure that the analysis is not influenced by the possible endogeneity of contemporaneous short term debt, second analysis is conducted based on lagged short term debt (L_STD). The results in Table 4.5 for lagged short term debt shows similar results with the coefficient of INT_2SLS is positive (10.65) and significant (t=3.91) after controlling for L_STD . The regression specification for STD can be summarized as follows:

$$VALUE = \alpha_0 + 10.65INT_2SLS - 0.18L_STD + 0.38EARN + 162.93R\&D + 19.84DIV + 3.02CAPEX + 0.26SIZE + \varepsilon$$

Both results from the regression specification support hypotheses 1b, which says that:

H_{1b}: There is a positive relation between firm value and debt even after controlling for STD

4.5 Role of managerial alignment in the relation between firm value and debt

This section explores how the level of managerial alignment influences the relation between firm value and debt. Following Berger, Ofek, & Yermack (1977), the proxy of managerial alignment is based on level of stock and option based compensation. To evaluate the impact of managerial alignment on the relation between firm value and

debt, *INT_2SLS* is interact with *ALIGN* (*INT_2SLS*ALIGN*). Table 4.6 presents the results of regression specification using contemporaneous *ALIGN*.

Table 4.6:

Role of managerial alignment in the relation between firm value and debt

	Contemporaneous alignment (<i>ALIGN</i>)		Lagged alignment (<i>L_ALIGN</i>)	
	Coeff.	t-stat	Coeff.	t-stat
<i>Intercept</i>	-1.85	-4.25	-1.90	-4.40
<i>INT_2SLS</i>	10.44	4.23	11.42	4.55
<i>INT_2SLS*ALIGN</i>	-33.51	-2.74		
<i>ALIGN</i>	1.73	3.36		
<i>INT_2SLS*L_ALIGN</i>			-41.11	-4.29
<i>L_ALIGN</i>			2.43	4.93
<i>EARN</i>	0.28	0.92	0.18	0.59
<i>RD</i>	157.19	13.17	154.09	13.00
<i>DIV</i>	19.77	20.86	19.78	21.14
<i>CAPEX</i>	2.73	2.60	2.67	2.56
<i>SIZE</i>	0.22	2.65	0.22	2.66
<i>Adjusted R2</i>	0.53		0.54	
<i>Observations</i>	791		790	

The result shows coefficient of *INT_2SLS*ALIGN* is negative (-33.51) as expected and significant with t-stat -2.74. Further to that, the standalone *INT_2SLS* is positive (10.44) and significant with t-stat 4.23, which indicate that with no managerial alignment, there is a positive relation between firm value and debt. This shows that more aligned manager's issues more debt which would reduce the equilibrium relation between firm value and debt.

To ensure that the analysis is not influenced by the possible endogeneity of contemporaneous alignment, second analysis is conducted based on lagged alignment

(*L_ALIGN*). The results in for lagged alignment in Table 4.6 are similar with the coefficient of *INT_2SLS*L_ALIGN* is negative (-41.11) and significant (t=-4.29) after controlling for *L_ALIGN*.

Both analyses from the regression specification support hypotheses 1c, which is:

H_{1c}: The positive relation between firm value and debt is decreasing in the level of managerial alignment.

4.6 Robustness Test

4.6.1 Alternate empirical specification.

This section examine if the results are being driven by outliers. While all variables have been truncated at the 0.5 and 99.5 percentile annually, robust regression is employ to control the influence of outliers. Robust regression results for alternate empirical specification is as shown in Table 4.7.

Table 4.7:

Alternate empirical specifications

	Robust Regression		Cross-Sectional	
	Coeff.	t-stat	Coeff.	t-stat
<i>Intercept</i>	-3.17	-1.49	-1.91	-3.18
<i>INT_2SLS</i>	7.35	2.36	3.51	1.85
<i>EARN</i>	0.25	0.69	0.07	0.18
<i>RD</i>	106.24	3.25	160.00	3.75
<i>DIV</i>	-4.67	-0.76	20.27	6.25
<i>CAPEX</i>	0.16	0.15	2.94	2.28
<i>SIZE</i>	0.62	1.59	0.28	2.58
<i>Observations</i>	791		100	

The coefficient of *INT_2SLS* is 7.35 and significant with t-stat 2.36. This indicates that the relation between firm value and debt is not sensitive to outliers.

In the cross sectional (between-firm) regression the sample size reduce to 100 due to the number of firms in the sample. Table 4.7 (Cross-sectional) shows a positive *INT_2SLS* at 3.51 and significant with t-stat 1.85. The positive relation between firm value and debt appear to be robust to alternate empirical specifications.

4.6.2 Additional firm and industry level controls

It is possible that correlated omitted firm level factors contribute to the positive relation between firm value and debt. While all regression includes firm fixed effects, the fixed effects might not capturing time-varying firm factors. To control for possible time-varying omitted variables, an additional control variable AGE is introduce to the primary regression. The specification results are as shown in Table 4.8.

Table 4.8:

Additional controls for firm and industry level factors

	AGE		FORECAST_3		IND_GROWTH	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Intercept	-4.03	-5.46	-4.38	-3.92	-1.37	-2.96
INT_2SLS	7.12	5.97	5.91	8.00	5.70	3.44
EARN	0.43	1.64	2.06	2.30	0.23	0.76
RD	402.44	6.46	-335.08	-1.49	158.28	13.29
DIV	13.63	11.69	11.47	8.31	20.44	21.68
CAPEX	-0.10	-0.04	5.51	1.37	2.36	2.21
SIZE	0.54	3.83	0.62	3.02	0.25	3.04
AGE	0.03	0.93				
FORECAST_3			0.01	0.85		
IND_GROWTH					0.20	3.13
Adjusted R2	0.81		0.94		0.53	
Observations	100		636		791	

From Table 4.8, when applying *AGE* as the control variable, the coefficient for *INT_2SLS* is positive (7.12) and significant with t-stat 5.97. This shows that the relation between firm value and debt does not being influences by omitted time-varying firm factors.

Next analysis is to include three years forecast of future earnings (*FORECAST_3*) as an additional control for the firm's future profitability. Table 4.8 shows that the positive relation between *VALUE* and *INT_2SLS* remains significant when applying additional control for future profitability. The coefficient of *INT_2SLS* is 5.91 with t-stat of 8.00. Further to that, *FORECAST_3* is positive (0.01) and significant with t-stat of 0.85.

Finally in assessing the robustness of the results is to apply control for industry factors. An additional control variable is introduced which is the industry growth opportunities (*IND_GROWTH*). The results are presented in Table 4.8. The coefficient of *INT_2SLS* is positive at 5.70 and significant with t-stat of 3.44 when applying industry growth as additional control variable. *IND_GROWTH* is positive (0.20) and significant (t=3.13).

4.6.3 Other robustness tests.

There are possibilities that the control variables used in the regression are also endogenous. The relation between *VALUE* and *INT_2SLS* then regress using lagged values for all the control variables. The results are as shown in Table 4.9.

Table 4.9:

Robustness tests – All lagged control variables

	Pooled		Robust	
	Coeff.	t-stat	Coeff.	t-stat
<i>Intercept</i>	-2.23	-3.64	0.09	0.10
<i>INT_2SLS</i>	1.72	2.87	1.47	2.72
<i>L_EARN</i>	0.60	1.41	0.38	0.92
<i>L_RD</i>	133.33	3.77	20.54	0.55
<i>L_DIV</i>	21.58	7.98	2.77	0.66
<i>L_CAPEX</i>	2.44	2.18	-1.03	-1.06
<i>L_SIZE</i>	0.33	2.98	0.01	0.07
<i>Observations</i>	779		779	

The results show that there is a positive relation between firm value and interest in a specification that uses lagged controls. The coefficient of *INT_2SLS* is positive at 1.72

and 1.47 and the t-stat is 2.87 and 2.72 in the pooled and robust regression respectively.

4.7 Summary of Research Results

This study found that from the primary equation regression specification, the outcome result is not consistent with MM theorem. The similar results were also discovered in previous research. The outcome from the primary analysis would shows that contemporaneous interest expense is a suspected endogenous variable. Therefore Hausman (1978) test is conducted to proof that interest expense is indeed endogenous and gather the information on predicted interest expense value in two stage least square specification.

The Hausman test proof that interest expense which instrumented by lagged interest is indeed endogenous and should be replacing with the predicted interest expense. The regression specification then shown that there is positive relation between firm value and debt once endogeneity of contemporaneous debt is corrected using two stage least square method with additional controlling on firm future profitability and firm size.

Controlling for future cash flows and short term debt does not have a significant influence on the relation between firm value and debt. With these controlling variables, the relation between firm value and debt is positive. The analysis also found that the coefficient of short term debt is negative, which does not consistent with Flannery (1986) theory that firms issuing short term debt are of a higher quality. This

concludes that low quality firms would be willing to issue short term debt to signal their high type to the market. High quality firms, on the other hand would be prefer to treat as average type and issue long term debt.

Managerial alignment shows a significant influence in the relation between firm value and debt. The results shows that more aligned manager intends to issue more debt. This proof that managers who act in the interest of the shareholders would take on more debt and hence the positive relation between firm value and debt would be lower for these firms.

Further to that, the standalone coefficient of *INT_2SLS* is positive (10.44) and significant ($t=4.23$) which indicate positive relation between firm value and debt for firms with no managerial alignment. Although the coefficient of 10.44 for *INT_2SLS* is high, the median interest to debt ratio (*RATE*) from Table 4.1 for this sample is 0.06, which amount to tax benefit of 63 cents per ringgit of debt. Hence firms with no managerial alignment have higher tax benefits of debt of (63 cents) than the average firm in the sample which is 38 cents (Table 4.2).