Faculty of Business and Law

SCHOOL OF ACCOUNTING, ECONOMICS AND FINANCE

School Working Paper - Accounting/Finance Series 2007

SWP 2007/03

OWNERSHIP STRUCTURE AND CORPORATE PERFORMANCE: AUSTRALIAN EVIDENCE

Julian Fishman

Gerard Gannon*

Russell Vinning

Department of Accounting, Economics and Finance
Faculty of Business and Law
Deakin University
Victoria, 3125
Australia
Email: gerard@deakin.edu.au
Fax: (61 3) 92446283
Phone: (61 3) 92446243

OWNERSHIP STRUCTURE AND CORPORATE PERFORMANCE: AUSTRALIAN EVIDENCE

Julian Fishman
Gerard Gannon*
Russell Vinning

Department of Accounting, Economics and Finance
Faculty of Business and Law
Deakin University
Victoria, 3125
Australia
Email: gerard@deakin.edu.au
Fax: (61 3) 92446283
Phone: (61 3) 92446243

Abstract

This paper seeks to analyse the relationship between ownership structure and corporate performance for fifty firms listed on the Australian Stock Exchange during 2002-2003. The study initially tests a two equation model similar to that in the existing literature, but is distinguished from prior literature by subsequently reclassifying leverage. By categorising leverage as an endogenous variable, an examination of the relationship between ownership and performance is undertaken through ordinary least squares and two stage least squares analysis of a three equation econometric model. Interestingly, empirical results illustrate the fact that managerial ownership impacts negatively on firm performance which is consistent with the management entrenchment hypothesis.

* Corresponding Author

DRAFT: January 2005
KEY WORDS: Ownership Structure, Corporate Performance, Endogenous Leverage
JEL Classification: G31, G32

1. INTRODUCTION

The relationship between ownership structure and corporate performance has been debated significantly within finance literature. However, despite the attention this issue has received, there has been no consensus reached regarding the nature of this relationship. As Demsetz and Villalonga (2001) highlighted, the differences in results over the previous two decades could have been due to the fundamental disparity in methodology between papers as seen in Appendix 1. Recent research conducted in this area has had a high degree of incongruence due to the fact that estimation procedures, the measurement of variables and the classification of ownership have been inconsistent between studies. Consequently, it is not surprising that the research in this area has yielded conflicting results.

The relationship between ownership and performance is intriguing. Despite the fact that authors such as Morck, Schleifer and Vishny (1988) and McConnell and Servaes (1990) have found that ownership and performance are related, Demsetz and Villalonga (2001) posit that no particular ownership structure appears to generate enhanced performance. The further development of research within this area of study will have widespread implications as it will evaluate the importance of managerial ownership in determining performance. In an ever increasing manner, management is being compelled to have a financial stake in the firm through the introduction of compensation policies such as stock grants and option plans. Where research illustrates that director ownership does not heighten performance, the importance investors and corporations place on this issue may be misguided.

The present study revisits the work of previous authors and seeks to build-on the limited evidence regarding ownership and corporate performance within the Australian context. The current paper distinguishes itself from prior research conducted in the USA and Australia by questioning the classification of leverage as a pre-determined variable. By categorising leverage as an endogenous variable, a 3 equation model is developed to better understand the relationship between ownership and performance. The subsequent results have been compared with previous studies to assess their consistency with prior literature.

The following section summarises and examines the previous research that has been conducted within this area. Section 3 provides the theoretical framework underpinning the model specifications which have been applied to the data outlined in section 4. Section 5 describes and explains the regression results, whilst also discussing their robustness based on alternative performance measures. Section 6 summarises the results of the current study, whilst also highlighting limitations and areas for future research.

2. LITERATURE REVIEW

Berle and Means (1932) were among the first authors to look at the relationship between ownership structure and corporate performance. They assert that as ownership becomes increasingly dispersed, shareholders become powerless to control professional managers as they cannot effectively carry-out monitoring of management. Thus, they suggest that the diffuseness of ownership and performance should have a negative relationship.

This hypothesis was reinforced by Jensen and Meckling (1976) who asserted that managers have incentives to pursue their own activities, to the detriment of shareholders.

Where managerial ownership falls, agency costs intensify as management can benefit from the consumption of non-pecuniary benefits without incurring the cost. They put forth the convergence-of-interest hypothesis which suggests that with increased managerial ownership, corporate performance will strengthen as the interests of management and stockholders will be aligned.

However, this was refuted by Demsetz (1983), as he identified offsetting costs of insider ownership. This lead him to posit that "no single ownership structure is suitable for all situations if the value of the corporation's assets is to be maximised" (Welch, (2003) p.289). Consequently, this gave rise to the belief that the ownership structure of the firm was an endogenous variable. That is, the optimal ownership structure depends on the individual characteristics of the organisation.

However, it is interesting to note that since this study, several important papers in the area have failed to take this endogeneity into account when estimating the effect of ownership on corporate performance. The seminal papers that have overlooked this important feature of ownership structure are Morck, Schleifer and Vishny (1988), McConnell and Servaes (1990), and most importantly Craswell, Taylor and Saywell (1997) in the Australian context.

Demsetz and Lehn (1985), in a sample of 511 firms find no evidence of a linear relationship between ownership concentration and an entity's performance. However, the methodology adopted in this study was questioned by Morck, et. al. (1988) due to the fact that the relationship was only tested for a linear association. To capture the possibility that the relationship between ownership structure and corporate performance is non-linear, Morck et. al. (1988) adopt a piecewise regression. Their results indicate that

performance increases when management ownership is between 0-5% of outstanding stock due to incentive alignment between management and shareholders. However, when management ownership comes within the 5-25% range of outstanding stock, performance declines due to the management entrenchment hypothesis. As ownership of a substantial blockholding of stock acts as a deterrent to hostile acquirers, inefficient management teams can therefore remain in control of the firm, which negatively effects performance. However, once management ownership exceeds 25%, an unfriendly bid is virtually impossible and thus entrenchment is complete. Consequently, as insider ownership rises beyond this point, performance increases thereafter at a declining rate.

McConnell and Servaes (1990) analyse two significant samples of US corporations in 1976 and 1986. They contend that the relationship between insider ownership and performance is curvilinear, and could not replicate the findings of Morck et. al (1988). McConnell and Servaes (1990) assert that at lower levels of insider ownership a 10% increase in ownership results in a 30% improvement in performance. However, the positive relationship between insider ownership and performance inflects at 37.6% and performance diminishes thereafter. Kole (1995) relates the differences in results for McConnell and Servaes (1990) and Morck et. al. (1988) to the variation in size of the firms used in the respective studies.

Hermalin and Weisbach (1991) utilise Tobin's Q as the performance measure and the stock ownership levels of the present CEO and former CEOs still maintaining a position on the board. Undertaking a piecewise regression approach, they found no relationship between corporate performance and the composition of the board, However, like Morck et. al. (1988), they found a significant non-monotonic relationship between managerial

ownership and performance. This relationship was positive between managerial ownership levels of 0% and 1%, declining between 1% and 5%, increasing between 5% and 20% and decreasing with managerial ownership in excess of 20%.

Loderer and Martin (1997) attempt to capture the relationship between performance, as measured by Tobin's Q, and insider holdings through a simultaneous equations framework. After classifying both performance and ownership as endogenous, they found that insider ownership fails to predict performance, but performance is a negative predictor of insider ownership. However, it appears as though this relationship may be spurious as their 3-system equation appears to be under-identified. This under-identification arises as the authors have added a binary variable to the model to overcome the lack of exogenous variables in the system. However, for a variable to be classed as pre-determined under the order condition, it must be a non-zero variable, thereby excluding binary variables (see Kmenta, p.542).

Cho (1998) replicated the study undertaken by Morck et al (1988) and found a comparable non-monotonic relation between Tobin's Q and managerial holdings. After categorising insider ownership and performance as endogenous, Cho estimates 3 equations and concludes that Tobin's Q affects the ownership structure of an entity, but not vice-versa.

Himmelberg, Hubbard & Palia (1999) use Tobin's Q as the measure of performance and shareholdings by insiders as the ownership variable. Where ownership is classified as an exogenous variable, the authors assert that changes in ownership have no significant impact on performance. However, after controlling for the endogeneity of corporate

ownership structures using instrumental variables, they found ownership structure to have a quadratic relationship with performance.

Holderness, Kroszner, and Sheehan (1999) undertook a similar study to Morck et. al (1988). Like the previous research paper, the authors found a significant positive relationship between performance and insider holdings between 0% to 5%. However, unlike Morck et. al. (1988), the empirical evidence uncovered in this study yielded no statistically significant results beyond 5% managerial holdings.

Demsetz and Villalonga (2001) highlight the need to model ownership structure as a multi-dimensional variable, that separately reflects the fraction of shares owned by management, and the proportion of equity owned by outsiders. When conducting ordinary least squares regression analysis, and a subsequent two-stage least squares test, they highlight the fact that "ownership structure is chosen so as to maximise firm performance, and that greater diffuseness in ownership, although it makes the agency problem more severe, conveys compensating advantages" (Welch, p.289). As a result, the ownership composition of an entity should have no systematic relationship with firm performance, and is the result of the "interplay of market forces" (Demsetz and Villalonga, p.212).

With regard to the Australian context, Craswell, Taylor, and Saywell (1997) were the first researchers to document the relationship between ownership structure and performance. After undertaking three tests – a linear, curvilinear and piecewise regression – they found a weak curvilinear relationship. However, despite Demsetz positing the fact that ownership structure was endogenous in 1983, these authors have failed to take this into account.

Consequently, Welch (2003) examined the Australian environment by replicating the US study of Demsetz and Villalonga (2001). Welch initially undertook ordinary least squares and two stage least squares regression analysis to determine whether the relationship between ownership structure and performance exhibited a linear relationship. After accounting for the endogeneity of ownership, Welch's 2-stage least squares regression highlighted that ownership structure is not significant in explaining corporate performance. Furthermore, to assess whether ownership and performance within the Australian context displayed a non-linear relationship, a general non-linear model was developed based on the previous study of Morck et. al (1988). However, results illustrated limited evidence of a non-linear relationship between ownership and corporate performance.

3. METHODOLOGY

The methodology in this research paper will build on the foundations put forward by Demsetz and Villalonga (2001), and Welch (2003) in the Australian environment. To ensure ease of comparison between the current study and Welch's 2003 paper, a similar definition of terms will be used.

Two ownership variables are considered, the five largest shareholders (TOP5) and director stockholdings (MDO). The terms 'management' and 'director' are used interchangeably throughout this paper with respect to insider ownership. It is important to distinguish between the TOP5 and MDO because these respective groups have potentially divergent interests. The TOP5 illustrates the ability of outside shareholders to control the Board of Directors, and within the Australian context essentially consists of

superannuation funds and fund managers. MDO reveals the ability of the management team to ignore other shareholder's wishes. For example, Hutchison Telecommunications, an Australian firm included within this data set, has 84.61% of outstanding stock concentrated within the largest five shareholders. In contrast, management only comprise 12.72% of stockholdings within this organisation. Consequently, within the context of this corporation, management is in no position to ignore shareholder wishes due to the fact that their positions on the board of directors may come under scrutiny as a result.

These two ownership measures appear as explanatory variables in the corporate performance equation as they significantly influence the monitoring function within the firm. Where ownership accrues to outside investors, management behaviour would generally be monitored more thoroughly as in the case of Hutchison Telecommunications. However, where ownership concentration is in the hands of the management team, performance may enhance due to incentive alignment as hypothesised by Jensen and Meckling (1976). However, with increased management ownership, corporate performance may also diminish based on the entrenchment hypothesis, whereby inefficient management remain in control due to their ability to thwart potential acquirors. The central motive for including these ownership variables within the equation modelling performance is to discover whether these variables systematically influence a entity's operations.

Two measures of performance are used: Tobin's Q and average accounting profit rate (PROFIT). Using Tobin's Q and PROFIT strengthens the study because the performance measures are derived from different variables. Tobin's Q is a market based assessment of performance because it factors the market value of equity into calculations. Conversely,

PROFIT is an accounting based performance measure which is constrained by the standards set by the accounting profession. Tobin's Q is a forward looking performance measure which considers investor psychology and forecasts. In contrast, PROFIT provides a historical analysis of performance and is relatively unaffected by market psychology. Consequently, the adoption of a market based and accounting based assessment of performance is likely to yield more accurate results.

These two measures of performance are also included as explanatory variables within the equation modelling management stock ownership. This is due to the fact that compensation plans, insider trading possibilities and corporate acquisitions suggest that performance may influence managerial holdings. Generally, where a firm has professional management and a diffuse set of stockholders, the agency problem is exacerbated due to the ineffective execution of the monitoring function. However, where this ownership structure brings compensating advantages that are sufficient to offset the adverse effects, there should be no systematic relationship between managerial ownership and corporate performance.

However, due to insider information and performance based compensation plans, firm performance may have a substantial impact on director's interests. This is due to the fact that management have incentives to vary their stockholdings in accordance with future performance in an effort to maximise their wealth. Consequently, there is also a reverse causation effect whereby performance affects managerial ownership.

Within the two-equation framework, it is also important to control for firm-specific characteristics. The control variables used in this instance are similar to those employed

by Demsetz and Villalonga (2001) and Welch (2003). The factors that are necessary to control for include:

(A) *Intangible assets*

This may favourably distort Tobin's Q values because the book value of assets may not include all intangibles. Consequently, the denominator in the Tobin's Q calculations will be understated resulting in the appearance of enhanced performance. As a result, the ratio of research and development (R&D) expenditure to sales is used to control for intangibles.

However, given the fact that many of the corporations within the sample do not report any R&D spending, the inclusion of a dummy variable is necessary. Through adding a binary variable, spurious bias will be mitigated as entities will be separated into reporting and non-reporting classes. This ensures that the regression results will be conditional on the reporting of R&D spending. The coefficient estimates within a regression are generated by the deviations from the mean of the independent variable in both numerator (the covariance between independent and dependent variable) and denominator (the variance of the independent variable). As the mean for the independent variable will be shifted toward zero due to entities with unobservable R&D expenditures recording zero for this variable and entities reporting continuous measures, spurious estimates and probability values may result. The problem is further complicated because of interactions between deviations from the mean within the independent variable set. However, no specific conclusions have been determined with regard to the direction or significance of the bias introduced. The important point to grasp from this issue is the fact that the

introduction of a dummy variable will minimise the misstatement within the current model. This has been tested and found to be a necessary refinement for this model.

(B) *Leverage*

Leverage may have a positive relationship with performance. The pecking order theory of financing developed by Myers (1984) suggests that as retained earnings increases with good performance, management will choose to fund new projects with internally generated funds opposed to debt or equity financing. This implies that leverage and performance have a negative relationship. However, contrary to the pecking order theory, leverage and performance may have a positive relationship due to the tax shields offered by debt. As interest payments reduce a firm's tax liability, an incentive is created to reduce taxation by funding projects which incur an interest expense. Consequently, leverage and performance may have a positive relationship.

(C) *Firm-Specific and Market Risk*

Firm-specific and market-risk account for the fact that there are different levels of risk associated with investing in different companies. With greater levels of risk, there is a greater prospect of management profiting from inside information. Consequently, there is a stronger causation effect in high-risk firms between variations in managerial holdings and corporate performance.

(D) *Firm Size*

Firm size has been incorporated into the study to account for the possibility that performance and ownership are related to the size of the entity. It is anticipated that a corporation's size will have a negative relationship with director ownership. This is due

to the fact that as market capitalisation increases, greater funds will be needed to achieve a desired level of ownership relative to a small firm.

(E) Industry Specific Dummy variables

To control for spurious correlation between ownership structure and corporate performance that stems from industry effects, a series of binary variables have been included. Dummy variables for the utility and finance industries are necessary to control for the relative advantage accruing to large blockholders caused by regulation within a particular industry which may dictate how a firm's shareholders manage the entity's assets. As the finance and utility industries are heavily regulated, the inclusion of dummy variables to account for these industry specifics will ensure that erroneous results do not ensue.

Furthermore, an additional dummy variable to account for firms within the media industry has been included. The inclusion of this variable is necessary to explain the 'amenity potential', or investor utility above and beyond that generated by profitability with respect to media companies. As substantial shareholders in media firms are often in the public spotlight, it is expected that ownership within these firms will be more concentrated.

3.1 Simple Two Equation Model

The two equation econometric model that has been developed in this study is outlined below. Calculations illustrating the fact that this model satisfies the order condition for identification can be seen in Appendix 2. However, this order condition only provides evidence of identification or over-identification of variables in each separate equation.

$$Q = \beta_0 + \beta_1 MDO + \beta_2 TOP5 + \beta_3 RDSALE + \beta_4 RDDUM + \beta_5 LEV + \beta_6 UTIL + \beta_7 MED + \beta_8 FIN \quad (1)$$

$$MDO = \alpha_0 + \alpha_1 LEV + \alpha_2 UTIL + \alpha_3 MED + \alpha_4 FIN + \alpha_5 MKTRISK + \alpha_6 FIRMRISK + \alpha_7 SALES + \alpha_8 Q \quad (2)$$

where:

Q = The average annual Tobin's Q values for 2002 and 2003. Annual Tobin's Q's are calculated as [(year-end book value of debt + year-end market value of equity) / year end book value of assets]. Return on capital is also adopted as an alternative accounting based performance measure. Accounting profit is calculated as (net income / capital employed) x 100;

MDO = Log_e[RAWMDO / (100 – RAWMDO)], where RAWMDO is the average year-end percentage of ordinary shares owned by the board of directors calculated over 2002 and 2003;

TOP5 = Log_e[RAWTOP5 / (100 – RAWTOP5)], where RAWTOP5 is the percentage of ordinary shares owned by the five largest shareholders of the firm;

RDSALE = The average annual ratio of research and development expenditure to total sales over 2002 and 2003;

RDDUM = A dummy variable indicating whether research and development expenditure was reported in the company's annual reports. Where research

and development was reported, this variable is equal to 0, and where no research and development expenditure is reported, this variable is set to 1;

LEV = The average ratio of year-end debt to the year-end book value of assets calculated over 2002 and 2003;

UTIL = A dummy variable to indicate whether the firm is a utility company. This variable equals 0 where the firm does not operate within the utility industry, and 1 if it's operations fall within this industry classification;

MED = A dummy variable to indicate whether the firm is a media company. This variable equals 0 where the firm does not operate within the media industry, and 1 if its operations fall within this industry classification; and

FIN = A dummy variable to indicate whether the firm is a finance company. This variable equals 0 where the firm does not operate within the finance industry, and 1 if its operations fall within this industry classification;

MKTRISK = The raw beta coefficient obtained from a regression of weekly stock returns using stock price data from January 2000 to December 2003 inclusive;

FIRMRISK = The standard error obtained from the regression used to estimate MKTRISK;

SALES = A proxy for firm size measured as the average annual sales or turnover during 2002 and 2003; and

When analysing the relationship between ownership structure and corporate performance within the two equation model, the maximum likelihood estimates of the coefficients

have been obtained though the use of ordinary least squares (OLS), biased ordinary least squares and two stage least squares regression analysis. Biased ordinary least squares differ from ordinary least squares due to the fact that the endogenous variables are included in the regression and treated as exogenous variables in the former but excluded from the equations for OLS estimation. However, as endogenous right-hand side variables are explained by the dependent variable, this may lead to bias being introduced, resulting in spuriously higher levels of significance. Consequently, the biased ordinary least squares regression does not test for the endogeneity of ownership structure and firm performance, although the basic variant of this test does incorporate this differing classification. The two stage least squares estimator employs the fitted value(s) of endogenous variables in the other endogenous variable equation. The two stage least squares estimator tends to underestimate standard errors relative the biased ordinary least squares estimator because the fitted values are too smooth relative to original raw variables so that variability in the inverse of the X matrix is reduced. This latter issue is well documented in the econometrics literature. It follows that the competing sets of results should be viewed and interpreted as a whole.

3.2 Three Equation Model

However, the 2 equation model may lead to specious results as leverage is classified as strictly endogenous. The current study is extended further by questioning the classification of leverage as exogenous. However, several studies into capital structure theory (Panno, 2003 & Kayhan & Titman, 2003) cast doubt on the exogeneity of

leverage. This endogeneity of leverage is further alluded to in Loderer and Martin's (1997) study.

Pursuant to Panno (2003) and Kayhan and Titman (2003), leverage is dependent on profitability. As an entity's profitability is also determined by leverage pursuant to equation 1, it is clear that leverage would be classified as an endogenous variable where average accounting profit rate is used as the performance measure. Whether the classification could be argued as weakly exogenous (as in the two-equation system), weakly endogenous (as in a recursive third equation for leverage in a three equation system), or strictly endogenous (as in a full three equation simultaneous system) is an issue. If Tobin's Q does incorporate measures of expectation because it factors in market value of equity whilst leverage does not then the issue becomes an empirical question. This is a very important econometric issue as expectations are incorporated within the data and models in a cross section of data. This issue is quite separate from models of expectations developed within the econometric literature when employing time series data. In this paper both two-equation and three-equation structures are estimated and reported that do account for this classification issue

Furthermore, where Tobin's Q is the used as the performance measure, there is sufficient interrelation to query the classification of leverage as a pre-determined variable. Tobin's Q is a quasi debt to asset ratio modified to account for the market value of equity. As a result of the fact that Tobin's Q has a leverage ratio incorporated into it, there may be interdependence between leverage and performance, and thus, the exogeneity of this variable is further questioned.

The variables that influence the extent of leverage within an entity include:

(I) *Firm Size*

This variable is adopted to account for the size of the firm impacting the level of debt in a corporation's capital structure. Panno (2003) suggests that there is a positive relationship between firm size and leverage, highlighting that larger entities can better support higher debt ratios. The relative ease at which larger organisations can source funds from financial markets further supports the inclusion of this variable.

(II) *Risk*

Leverage and risk appear to have a negative correlation. Riskier firms tend to issue equity rather than debt as the high uncertainty makes fixed interest commitments perilous. As payments to shareholders are flexible compared with the fixed interest obligations of debt financing, where a firm has relative uncertainty with regard to cash flows, non-debt financing alternatives will be favoured.

(III) *Liquidity*

It is predicted that liquidity will have a positive effect on a corporations borrowing decisions. This is consistent with the notion that a firm's ability to meet it's short-term payments is of the utmost importance. Where an organisation has strong liquidity, it has a greater capacity to meet it's financial commitments. Consequently, a positive relationship between leverage and liquidity is predicted.

(IV) *Profit*

Contrary to the pecking order theory, profit is anticipated to have a positive relationship with leverage. Pursuant to the Traditional theory and Modigliani-Miller theory, this may be due to the tax shields offered by debt. As a firm's tax liability increases with profitability, so too will the incentive to reduce tax payable through debt tax shields (for

further information on capital structure theory, see Panno p.104). Consequently, profitability and leverage are predicted to have a positive relationship.

(V) *Payout Ratio*

It is also anticipated that a positive relationship exists between a company's payout ratio and leverage. This is consistent with the view that increased dividend costs and a sticky dividend policy will act as a disincentive to issue equity.

(VI) *Market Timing*

Firms tend to issue equity following stock price increases as they can raise funds on more favourable terms. As a result, corporations are more likely to raise further equity capital in a bull market compared with a bear market. Consequently, leverage has a predicted negative relationship with the company's price to earnings ratio.

(VII) *Payout and Market Timing Dummy*

It is necessary to include a dummy variable within the leverage equation to account for the fact that the data set is incomplete. As some firms reported negative earnings per share for the two year period ending 31st December 2003, it is impossible to generate a payout ratio or P/E ratio. Similar to the R&D dummy variable, the inclusion of another binary variable in this instance will re-classify corporations into those that reported payout and price to earnings ratios and those that did not.

(VIII) *Retained Profits*

Myers (1984) highlighted that firms prefer to fund their investments primarily through retained earnings. Debt financing is the next best alternative due to tax shields and the comparatively significant transaction costs associated with capital raising. Consequently. retained profits should impact negatively on the level of debt finance.

One aspect of capital structure determination that this study overlooks is the clientele effect of debt. The magnitude of leverage within a particular entity's capital structure may be influenced by the type of investors holding stock. As individual investors have differing taxation affairs, an analysis of every organisation's shareholder register would be necessary to examine the taxation incentives for incorporating debt into the capital structure. As this information is problematic and onerous to collate, the clientele effect of debt is outside the scope of this study.

Thus, the 3 equation econometric model is an extended version of the two equation system earlier elucidated. The model is specified by the addition of a third equation for leverage and where equations 1 and 2 are identical to those outlined earlier within the previous simplified model:

Equation 3

$$LEV = \gamma_0 + \gamma_1 SALES + \gamma_2 MKTRISK + \gamma_3 FIRMRISK + \gamma_4 LIQ + \gamma_5 Q + \gamma_6 PAYOUT + \gamma_7 P/E + \gamma_8 PAYPEDUM + \gamma_9 RETPROFIT \quad (3)$$

where:

SALES, MKRISK, FIRMRISK, and Q are as defined in the two-equation system and

LIQ = For non-financial sector firms, LIQ is measured as the average annual current ratio during 2002 and 2003. The current ratio is defined as current assets / current liabilities. However, as banks and insurance companies do not differentiate between short-term and long-terms items in the balance sheet, several proxies have been used to gauge liquidity. An appropriate

test of liquidity for insurance companies is premiums / claims, whilst a proxy for liquidity within the banking industry is loans / deposits. These are suitable indicators of liquidity as they are the measures typically used within the industry;

PAYOUT = The payout ratio is calculated as (annual total dividends paid to ordinary stockholders / total annual net income) x 100;

P/E = P/E is a measure of market timing and can be calculated as stock price / EPS;

PAYPEDUM = As corporation's reporting negative net income or EPS do not record a payout ratio or P/E ratio, a dummy variable has been included. This equals 0 where the firm does report results, and 1 if they do not.

RETPROFIT = The average annual balance of retained earnings during 2002 and 2003. Retained profits include accumulated earnings, earned surplus, or unappropriated profit that have been retained by the company. It also includes legal reserves and the current year's net profit.

The classification of leverage greatly affects the construction of the model developed in this paper. To account for the fact that leverage may not be a pre-determined variable, this study will utilise a two stage least squares approach within a 3 equation model. To check that this system of equations satisfies the order condition, a test for identification has been undertaken. From Appendix 3, it is shown that the current econometric model satisfies the order condition. However, this order condition only provides evidence of identification or over-identification of variables in each separate equation. Satisfying the

matrix rank condition for the system guarantees exact identification of all variables and equations in the system.

However, satisfying the matrix rank condition is more complex. The classical normalized or non-normalized martrix rank conditions are not defined for the current model or models in this existing literature. Consequently, it will be necessary to derive an alternative specialised matrix rank condition employing the methods outlined in Hsiao (1983), Magnus and Neudecker (1988) and Gannon (1994). This is an area for future research in this literature.

4. DATA

The sample utilised in this study comprises a randomly selected sample of 50 Australian publicly listed companies that were trading on the ASX between 2002 and 2003 inclusive. Bloomberg has been the primary source of information. However, where additional information was needed, Connect4 has been used. In particular, Connect4 was employed to gather equity ownership with respect to the board of directors and the largest five shareholders. Furthermore, it was additionally utilised to verify questionable data. Summary statistics relating to the data can be found in Table 1.

The descriptive statistics in Table 1 highlight some salient information about the data set analysed in this study. Where a study relies on a small sample size, as is the case in this instance, the assumption of normality is crucial in obtaining robust results. However, when perusing the descriptive statistics in Panel B of Table 1, it is clear that some of the data is of a non-normal nature. Where data is normally distributed, skewness, kurtosis and the Jacque-Bera statistic should be approximately 0,3 and 0 respectively. It is clear

that many of the variables, particularly Tobin's Q, payout ratio and retained profits are somewhat positively skewed. This highlights that the probability distribution of the variables are of an asymmetrical nature.

TABLE 1
Summary Descriptive Statistics for Variables Used in Modelling Ownership Structure with Firm Performance

PANEL A - FIRM SIZE

< 200m	200m-500m	$500m - $1.5b	$1.5b - $3b	$3b - $5b	$5b-$10b	> $10b
6	6	10	14	4	5	5

PANEL B -DESCRIPTIVE STATISTICS

Variable	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jacque-Bera	Count
Q	1.290	1.137	9.397	0.2125	1.258	5.643	36.64	2622	50
PROFIT	4.211	7.630	49.97	-48.68	14.27	-0.9260	5.315	18.31	50
RAWMDO	10.55	1.044	81.79	0.0194	17.14	2.210	5.463	53.36	50
MDO	-4.242	-4.553	1.502	-8.545	2.824	0.0729	-1.267	37.98	50
RAWTOP5	50.02	48.87	84.61	21.90	15.07	0.2574	-0.289	23.09	50
TOP5	0.0074	-0.0452	1.704	-1.272	0.6630	0.3539	0.1404	18.08	50
RDSALE	4.705	0.0022	49.65	0.0000	12.31	2.999	8.588	140.0	26
LEV	26.85	25.39	86.91	0.034	16.69	1.197	2.838	6.241	50
MKTRISK	0.8168	0.7400	2.710	-0.070	0.5478	1.361	2.746	15.56	50
FIRMRISK	0.2006	0.1800	0.5500	0.070	0.1033	1.607	2.698	21.71	50
SALES ($M)	3578	1183	29463	49.30	6325	2.816	8.036	118.9	50
LIQ	1.500	1.463	6.704	0.2729	0.9886	3.181	15.32	400.7	50
PAYOUT	102.4	71.95	900.7	0.0000	146.9	5.025	27.44	1018	35
P/E	27.74	19.67	180.4	4.878	32.19	3.974	16.68	364.9	35
RETPROFIT ($M)	718.3	111.0	12995	-661.01	2366	4.573	21.02	851.1	50

The notation used in the above table is as follows: Q is the average of annual Tobin's Q values for 2002 and 2003. Annual Tobin's Q is calculated as [(year-end book value of debt + year-end market value of equity) / year end book value of assets]; PROFIT is the average annual return on capital for 2002 and 2003. Annual profit rates are calculated as [(net income / capital employed) x 100]; RAWMDO is the average year-end percentage of ordinary stock owned by directors calculated over 2002 and 2003; MDO is the natural log of [RAWMDO / (100-RAWMDO)]; RAWTOP5 is the percentage of ordinary stock owned by the five largest shareholders during 2003; TOP5 is the natural log of [RAWTOP5 / (100-RAWTOP5)]; RDSALE is the average ratio of annual R&D expenditure to annual sales, and is the average of the 2002 and 2003 ratios; LEV is the average ratio of debt to the book value of assets, and is calculated as the average of the 2002 and 2003 ratios; MKTRISK is the β coefficient obtained from a weekly regression of stock returns on weekly market returns; FIRMRISK is the standard error of the β estimate obtained to measure MKTRISK; SALES is the average annual sales results obtained in 2002 and 2003; LIQ relates to the average year-end current ratio in 2002 and 2003, where current ratio is calculated as (Current Assets / Current Liabilities). With regard to banking institutions, LIQ is calculated as (loans / deposits). For insurance companies, LIQ is determined by (Premiums / Claims); PAYOUT is the average annual payout ratio over 2002 and 2003 as is calculated as [(annual dividends paid to ordinary shareholders / total annual net income) x 100]; P/E is a measure of market timing and is calculated as (stock price / EPS) and averaged over 2002 and 2003; and, RETPROFIT is the average annual balance of retained earnings over 2002 and 2003 including legal reserves and the current year's net profit.

Kurtosis refers to the shape of the probability distribution of a given variable. Essentially, it measures the height of the peak and the size of the tails. As a normally distributed

variable should have kurtosis of 3, some variables in this data set display non - normality. Of particular concern are the variables: Tobin's Q, liquidity, payout ratio, P/E ratio and retained profits. The non-normality observed in Tobin's Q could be of particular concern as it is one of two competing endogenous measures of firm performance. Non-normality of some remaining exogenous variables may be mitigated via a suitable transformation, however, that was not undertaken here to maintain similarities with this existing literature. The important principle to be appreciated from these descriptive statistics is the fact that with some non-normal variables results may differ across competing models.

5. RESULTS AND DISCUSSION

5.1 Two Equation Model

5.1A OLS Results

Initially, a 2 equation model comparable to that of Welch (2003) has been tested. Leverage has not been classified as an endogenous variable in either the ordinary least squares or two stage least squares analysis. As illustrated by results contained in Table 2A the ordinary least squares regression yielded insignificant results with regard to the variables explaining performance, as measured by Tobin's Q.

As illustrated by results contained in Tables 2A, the ordinary least squares regression yielded insignificant results with regard to the variables explaining performance, as measured by Tobin's Q . Neither the basic nor biased ordinary least squares tests uncovered any variables exhibiting significant results. As these results may have been flawed by the inclusion of imperfect data, a regression with the exclusion of research and development expenditure to sales has also been executed. However, the subsequent

results also gave no insight into the determination of performance and have not been included in the analysis.

Interestingly, where Tobin's Q is the performance measure, performance and ownership structure do not exhibit a significant relationship. However, when profit is employed as the performance measure (as seen in Table 2B), managerial ownership is a significantly negative predictor of corporate performance. Although this appears contrary to the incentive alignment hypothesis put forward by Jensen and Meckling (1976), this may support the management entrenchment concept advanced by Morck et. al (1988). As previously explained, the management entrenchment theory supports the notion that managerial ownership may adversely impact on performance by frustrating takeover bids thereby preserving incumbent management's inefficient administration. Additionally, profit was not significant in explaining insider ownership.

The ordinary least squares regression did produce more significant results regarding explanation of management ownership. Pursuant to the results in Table 2A and Table 2B, market risk, sales and the media and finance industry dummy variables were all significant in explaining ownership level. The positive coefficient for the media industry is consistent with the notion that this industry exudes amenity potential above and beyond that generated by profitability (see Demsetz and Lehn (1985)). Consequently, management ownership is more concentrated within this industry.

In contrast, the negative coefficient for firms within the finance industry supports the view that excessive regulation within this industry imposes unwanted constraint upon shareholders. As noted in Demsetz and Villalonga (2001,p.222)"regulation severely

circumscribes what management and outside investors can do with the assets owned by these firms".

TABLE 2A

Regression Results for Two Equation Model Where Performance is Measured by Average Annual Tobin's Q

Performance				Ownership			
		BIASED				BIASED	
Variable	OLS	OLS	2SLS	Variable	OLS	OLS	2SLS
INTERCEPT	1.628	1.247	1.646	INTERCEPT	-5.557	-4.686	-1.638
	(3.598***)	(2.157**)	(2.221**)		-6.232***	-4.606***	-0.6925
MDO	-	-0.0821	0.0039	LEV	0.0045	0.0004	-0.0199
	-	(-1.055)	(0.0316)		0.2396	0.0227	-0.8640
TOP5	-0.0239	0.0589	-0.0267	MEDIA	2.552	2.314	1.577
	(-0.0757)	(0.1814)	(-0.0806)		2.295**	2.107**	1.298
RDSALE	0.0228	0.0222	0.0227	FINANCE	-1.423	-1.836	-3.520
	(0.9902)	(0.9668)	(0.9586)		-1.352	-1.731*	-2.253**
RDDUM	-0.2256	-0.0879	-0.2288	UTILITY	-0.4327	-0.5824	-1.207
	(-0.549)	(-0.2041)	(-0.5349)		-0.3992	-0.5466	-1.056
LEV	-0.0055	-0.0059	-0.0055	MKTRISK	3.145	3.240	3.063
	(-0.4304)	(-0.4634)	(-0.4264)		3.315***	3.481***	3.307***
MEDIA	-0.3825	-0.2082	-0.3921	FIRMRISK	-2.636	-3.588	-2.126
	(-0.5763)	(-0.3048)	(-0.5320)		-0.5663	-0.7807	-0.4674
FINANCE	-0.7381	-1.003	-0.7282	SALES	-2.559	-2.68E-10	-2.63E-10
	(-1.11)	(1.413)	(-0.9807)		-4.126***	-4.375***	-4.337***
UTILITY	-0.2589	-0.3884	-0.2536	Q	-	-0.4075	-2.239
	(-0.3827)	(-0.5656)	(0.7048)		-	(-1.668)	(-1.78*)
R^2	0.1178	0.1411	0.1178	R^2	0.5363	0.5658	0.5696
Adjusted R^2	-0.0292	-0.0264	-0.0543	Adjusted R^2	0.4591	0.4811	0.4857

Note: T-statistics are reported below the coefficient estimates and documented within ( ). * denotes significant to 10% level; ** denotes significant to the 5% level; and, *** denotes significant to the 1% level. The notation used in the above table is as follows: Tobin's Q is the average of annual Tobin's Q values for 2002 and 2003. Annual Tobin's Q is calculated as [(year-end book value of debt + year-end market value of equity) / year end book value of assets]; MDO is the natural log of [RAWMDO / (100-RAWMDO)]; TOP5 is the natural log of [RAWTOP5 / (100-RAWTOP5)]; RDSALE is the average ratio of annual R&D expenditure to annual sales, and is the average of the 2002 and 2003 ratios; RDDUM is a dummy variable equalling 0 where the firm reports R&D expenditure and 1 where is fails to; LEV is the average ratio of debt to the book value of assets, and is calculated as the average of the 2002 and 2003 ratios; MEDIA is a dummy variable equalling 1 where the firm operates in the media industry and 0 where it operates elsewhere; FINANCE is a dummy variable equalling 1 where the firm operates in the finance industry and 0 where it operates elsewhere; UTILITY is a dummy variable equalling 1 where the firm operates in the utility industry and 0 where it operates elsewhere MKTRISK is the β coefficient obtained from a weekly regression of stock returns on weekly market returns; FIRMRISK is the standard error of the β estimate obtained to measure MKTRISK; and, SALES is the average annual sales results obtained in 2002 and 2003.

TABLE 2B

Regression Results for Two Equation Model Where Performance is Measured by Average Accounting Profit

	Performance				Ownership		
Variable	**OLS**	**BIASED OLS**	**2SLS**	**Variable**	**OLS**	**BIASED OLS**	**2SLS**
INTERCEPT	7.126	-0.3523	-6.299	**INTERCEPT**	-5.558	-4.358	-3.853
	(1.343)	(-0.0533)	(-0.7614)		(-6.233***)	(-3.467***)	(-2.993***)
MDO	-	-1.614	-2.823	**LEV**	0.0045	0.0030	-0.0118
	-	(-1.813*)	(-2.064**)		(0.2396)	(0.1603)	(-0.5732)
TOP5	-2.678	-1.051	-0.6287	**MEDIA**	2.552	2.305	2.727
	(-0.7239)	(-0.2831)	(-0.1700)		(2.296**)	(2.065**)	(2.507**)
RDSALE	0.0473	0.0362	0.1404	**FINANCE**	-1.424	-1.818	-2.043
	(0.1753)	(0.1378)	(0.5323)		(-1.352)	(-1.678)	(-1.887*)
RDDUM	-5.423	-2.716	-3.126	**UTILITY**	-0.4327	-0.4184	0.1940
	(-1.125)	(-0.5516)	(-0.6548)		(-0.3992)	(-0.3897)	(0.1744)
LEV	-0.0446	-0.0528	-0.0254	**MKTRISK**	3.145	3.305	2.748
	(-0.2979)	(-0.3619)	(-0.1755)		(3.316***)	(3.489***)	(2.891***)
MEDIA	2.559	5.985	9.540	**FIRMRISK**	-2.637	-7.546	-3.311
	(0.3288)	(0.7662)	(1.16)		(-0.5663)	(-1.282)	(-0.7271)
FINANCE	0.1954	-5.014	-7.045	**SALES**	-2.559	-2.75E-10	-2.53E-10
	(0.0251)	(-0.6178)	(-0.8501)		(-4.127***)	(-4.362***)	(-4.192***)
UTILITY	5.148	2.604	1.294	**PROFIT**	-	-0.0411	-0.198
	(0.6489)	(0.3317)	(0.1644)		-	(-1.342)	(-1.795*)
R^2	0.0574	0.1274	0.1461	**R^2**	0.5363	0.5559	0.5701
Adjusted R^2	-0.0997	-0.0429	-0.0205	**Adjusted R^2**	0.4591	0.4692	0.4862

Note: T-statistics are reported below the coefficient estimates and documented within ( ). * denotes significant to 10% level; ** denotes significant to the 5% level; and, *** denotes significant to the 1% level. The notation used in the above table is as follows: PROFIT is the average of annual return on capital values for 2002 and 2003. Return on capital is calculated as [(net income / capital employed) x 100]; MDO is the natural log of [RAWMDO / (100-RAWMDO)]; TOP5 is the natural log of [RAWTOP5 / (100-RAWTOP5)]; RDSALE is the average ratio of annual R&D expenditure to annual sales, and is the average of the 2002 and 2003 ratios; RDDUM is a dummy variable equalling 0 where the firm reports R&D expenditure and 1 where is fails to; LEV is the average ratio of debt to the book value of assets, and is calculated as the average of the 2002 and 2003 ratios; MEDIA is a dummy variable equalling 1 where the firm operates in the media industry and 0 where it operates elsewhere; FINANCE is a dummy variable equalling 1 where the firm operates in the finance industry and 0 where it operates elsewhere; UTILITY is a dummy variable equalling 1 where the firm operates in the utility industry and 0 where it operates elsewhere MKTRISK is the β coefficient obtained from a weekly regression of stock returns on weekly market returns; FIRMRISK is the standard error of the β estimate obtained to measure MKTRISK; and, SALES is the average annual sales results obtained in 2002 and 2003.

An entity's size, as measured by sales, is a negative predictor of ownership regardless of the performance measure engaged. This result is consistent with Demsetz and Villalonga (2001) and seeks to highlight that as a corporation grows in size, a larger investment is

required by shareholders to own a given percentage of stock when compared with a smaller firm.

Lastly, market risk is a strong positive forecaster of management ownership, although firm-specific risk produced insignificant results. This is consistent with the results of Demsetz and Villalonga (2001) who also reported market risk as a significantly positive influence on management stockholdings. Although this appears contrary to market pragmatism, two theories are elucidated in this study. One possible cause of the positive coefficient reported for market risk may be the fact that as risk increases, management tie their funds up in businesses where they have an acute understanding. Additionally, firms exhibiting higher levels of risk may insist on their management team purchasing stock to ensure incentive alignment.

5.1B Two Stage Least Squares Results

In addition to the ordinary least squares analysis, a two-stage least squares regression has also been conducted to account for the endogeneity of ownership. Although results for these tests yielded similar results to the ordinary least squares approach, there were some subtle distinctions. Once again, the variables explaining performance, as measured by Tobin's Q, did not produce significant results. This is consistent with the findings of Demsetz and Villalonga (2001) and highlights that the ownership structure of an entity is unique to the individual corporation. Although a dispersed group of shareholders intensifies the agency problem, it also generates compensating advantages.

However, where accounting profit is used as the performance indicator, management stock ownership is a more highly significant and negative predictor of performance

compared with the ordinary least squares approach. Once again, this is consistent with the management entrenchment hypothesis put forth by Morck et. al. (1988) and reinforced by Hermalin and Weisbach (1991), but challenges the theory of incentive alignment advanced by Jensen and Meckling (1976).

With regard to the determinants of managerial ownership, it appears as though both measures of performance have a negative impact on director's interests within an entity. Although this is contrary to the notion that impressive performance would lead management to acquire more stock, perhaps they choose to sell stock during periods of prosperity "in the expectation that today's good performance will be followed by poorer performance" (Demsetz and Villalonga, p.228). This is also reinforced by the findings of Loderer and Martin (1997) who assert that managers of organisations with impressive Tobin's Q results will choose to liquidate part of their stockholdings to diversify their wealth.

The only other notable disparity between ordinary least squares and the two-stage least squares regression was the fact that the media dummy variable was no longer significant where Tobin's Q was employed as the performance measure. However, where profit is utilised as the performance gauge, firms within the media industry continue to display ownership characteristics consistent with this 'amenity potential' concept previously expounded.

5.2 Three Equation Model

5.2A OLS Results

The ordinary least squares results for the three equation model yielded similar results to those obtained under the two equation system. Again, we summarise the results from employing profit as an alternative to Tobin's Q. The variables employed to explain performance were all insignificant where Tobin's Q indicates performance. However, in a similar manner to the two equation framework, managerial ownership continues to negatively effect on profitability in a significant manner. Additionally, market risk, firm size and the media dummy variable continued to impact on the level of managerial ownership in the same fashion as occurred under the two equation model. The only element that differed within the three equation framework was the fact that the finance industry dummy variable was no longer a significant negative predictor of ownership concentration.

Ordinary least squares presented some intriguing results for the equation explaining leverage. Of the nine variables engaged, only liquidity was significant in describing the extent of a corporation's leverage. Results indicate that liquidity is a negative predictor of leverage within an entity which appears confounding. It was anticipated that liquidity would positively impact on a firm's leverage due to the fact that it would facilitate the payment of short-term interest as it falls due. However, the negative coefficient reported for liquidity challenges this idea. The only plausible reason for liquidity impacting negatively on a firm's debt to asset ratio is the fact that it is generally firms with funding shortages that choose to lever upwards. However, as debt financing generally relates to long-term funding requirements, opposed to present cash flow issues, this hypothesis is not robust. These results highlight the need for further research into the determinants of leverage within an organisation's capital structure.

TABLE 3A

OLS Results for Three Equation Model Where Performance is Measured by Average Annual Tobin's Q

Performance			Ownership			Leverage		
Variable	**OLS**	**BIASED OLS**	**Variable**	**OLS**	**BIASED OLS**	**Variable**	**OLS**	**BIASED OLS**
INTERCEPT	1.476	1.247	**INTERCEPT**	-5.454	-4.686	**INTERCEPT**	42.77	45.16
	(5.250***)	(2.157**)		(-7.067***)	(-4.606***)		(5.756***)	(5.689***)
MDO	-	-0.0821	**LEV**	-	0.0004	**SALES**	-7.62E-10	-8.08E-10
	-	(-1.055)		-	(0.0227)		(-1.147)	(-1.209)
TOP5	-0.0572	0.0589	**MEDIA**	2.571	2.314	**MKTRISK**	2.883	2.659
	(-0.1888)	(0.1814)		(2.344**)	(2.107**)		(0.3978)	(0.3656)
RDSALE	0.0266	0.0222	**FINANCE**	-1.431	-1.836	**FIRMRISK**	-23.42	-23.60
	(1.262)	(0.9668)		(-1.375)	(-1.731*)		(-0.5919)	(-0.5946)
RDDUM	-0.227	-0.0879	**UTILITY**	-0.3540	-0.5824	**LIQ**	-6.17	-6.031
	(-0.5577)	(-0.2041)		(-0.3465)	(-0.5466)		(-2.46**)	(-2.392**)
LEV	-	-0.0059	**MKTRISK**	3.132	3.24	**Q**	-	-1.698
	-	(-0.4634)		(3.344***)	(3.481***)		-	(-0.8754)
MEDIA	-0.3558	-0.2082	**FIRMRISK**	-2.541	-3.588	**PAYOUT**	-0.0116	-0.0213
	(-0.5436)	(-0.3048)		(-0.5539)	(-0.7807)		(-0.28)	(-0.4953)
FINANCE	-0.7132	-1.003	**SALES**	-2.56E-10	-2.68E-10	**PAYPEDUM**	3.97	3.426
	(-1.087)	(1.413)		(-4.169***)	(-4.375***)		(0.5572)	(0.4776)
UTILITY	-0.3533	-0.3884	**Q**	-	-0.4075	**P/E**	-0.1272	-0.0868
	(-0.5575)	(-0.5656)		-	(-1.668)		(-0.6754)	(-0.4467)
						RETPROFIT	7.19E-10	7.75E-10
							(0.5212)	(0.5595)
R^2	0.1139	0.1411	R^2	0.5357	0.5658	R^2	0.2378	0.2521
Adjusted R^2	-0.0097	-0.0264	Adjusted R^2	0.4709	0.4811	Adjusted R^2	0.0891	0.0839

Note: T-statistics are reported below the coefficient estimates and documented within ( ). * denotes significant to 10% level; ** denotes significant to the 5% level; and, *** denotes significant to the 1% level. The notation used in the above table is as follows: Q is the average of annual Tobin's Q values for 2002 and 2003. Annual Tobin's Q is calculated as [(year-end book value of debt + year-end market value of equity) / year end book value of assets]; MDO is the natural log of [RAWMDO / (100-RAWMDO)]; TOP5 is the natural log of [RAWTOP5 / (100-RAWTOP5)]; RDSALE is the average ratio of annual R&D expenditure to annual sales, and is the average of the 2002 and 2003 ratios; RDDUM is a dummy variable equalling 0 where the firm reports R&D expenditure and 1 where is fails to; LEV is the average ratio of debt to the book value of assets, and is calculated as the average of the 2002 and 2003 ratios; MEDIA is a dummy variable equalling 1 where the firm operates in the media industry and 0 where it operates elsewhere; FINANCE is a dummy variable equalling 1 where the firm operates in the finance industry and 0 where it operates elsewhere; UTILITY is a dummy variable equalling 1 where the firm operates in the utility industry and 0 where it operates elsewhere MKTRISK is the β coefficient obtained from a weekly regression of stock returns on weekly market returns; FIRMRISK is the standard error of the β estimate obtained to measure MKTRISK; SALES is the average annual sales results obtained in 2002 and 2003; LIQ relates to the average year-end current ratio in 2002 and 2003, where current ratio is calculated as (Current Assets / Current Liabilities). With regard to banking institutions, LIQ is calculated as (loans / deposits). For insurance companies, LIQ is determined by (Premiums / Claims); PAYOUT is the average annual payout ratio over 2002 and 2003 as is calculated as [(annual dividends paid to ordinary shareholders / total annual net income) x 100]; PAYPEDUM is a dummy variable equalling 1 if the firm had negative EPS, or 0 where EPS was positive; P/E is a measure of market timing and is calculated as (stock price / EPS) and averaged over 2002 and 2003; and, RETPROFIT is the average annual balance of retained earnings over 2002 and 2003 including legal reserves and the current year's net profit.

TABLE 3B

OLS Results for Three Equation Model Where Performance is Measured by Average Accounting Profit

Performance			Ownership			Leverage		
Variable	**OLS**	**BIASED OLS**	**Variable**	**OLS**	**BIASED OLS**	**Variable**	**OLS**	**BIASED OLS**
INTERCEPT	5.895	-0.3523	**INTERCEPT**	-5.454	-4.358	**INTERCEPT**	42.77	43.08
	(1.790*)	(-0.0533)		(-7.067***)	(-3.467***)		(5.756***)	(4.305***)
MDO	-	-1.614	**LEV**	-	0.0030	**SALES**	-7.62E-10	-7.65E-10
	-	(-1.813*)		-	(0.1603)		(-1.147)	(-1.131)
TOP5	-2.948	-1.051	**MEDIA**	2.571	2.305	**MKTRISK**	2.883	2.856
	(-0.831)	(-0.2831)		(2.345**)	(2.065**)		(0.3978)	(0.3880)
RDSALE	0.0780	0.0362	**FINANCE**	-1.431	-1.818	**FIRMRISK**	-23.42	-24.50
	(0.3164)	(0.1378)		(-1.375)	(-1.678)		(-0.5919)	(-0.5307)
RDDUM	-5.434	-2.716	**UTILITY**	-0.3540	-0.4184	**LIQ**	-6.171	-6.151
	(-1.140)	(-0.5516)		(-0.3465)	(-0.3897)		(-2.46**)	(-2.390**)
LEV	-	-0.0528	**MKTRISK**	3.133	3.305	**PROFIT**	-	-0.0128
	-	(-0.3619)		(3.344***)	(3.489***)		-	(-0.0473)
MEDIA	2.777	5.985	**FIRMRISK**	-2.541	-7.546	**PAYOUT**	-0.0116	-0.0125
	(0.3622)	(0.7662)		(-0.5539)	(-1.282)		(-0.2799)	(-0.2712)
FINANCE	0.3976	-5.014	**SALES**	-2.56E-10	-2.75E-10	**PAYPEDUM**	3.970	3.876
	(0.0518)	(-0.6178)		(-4.169***)	(-4.362***)		(0.5572)	(0.5178)
UTILITY	4.381	2.604	**PROFIT**	-	-0.0411	**P/E**	-0.1272	-0.1242
	(0.5902)	(0.3317)		-	(-1.342)		(-0.6754)	(-0.6172)
						RESERVES	7.19E-10	7.20E-10
							(0.5212)	(0.5151)
R^2	0.05542	0.1274	R^2	0.5357	0.5559	R^2	0.2378	0.2378
Adjusted R^2	-0.07638	-0.0429	Adjusted R^2	0.4709	0.4692	Adjusted R^2	0.0891	0.0664

Note: T-statistics are reported below the coefficient estimates and documented within ( ). * denotes significant to 10% level; ** denotes significant to the 5% level; and, *** denotes significant to the 1% level. The notation used in the above table is as follows: The notation used in the above table is as follows: PROFIT is the average of annual return on capital values for 2002 and 2003. Return on capital is calculated as [(net income / capital employed) x 100]; MDO is the natural log of [RAWMDO / (100-RAWMDO)]; TOP5 is the natural log of [RAWTOP5 / (100-RAWTOP5)]; RDSALE is the average ratio of annual R&D expenditure to annual sales, and is the average of the 2002 and 2003 ratios; RDDUM is a dummy variable equalling 0 where the firm reports R&D expenditure and 1 where is fails to; LEV is the average ratio of debt to the book value of assets, and is calculated as the average of the 2002 and 2003 ratios; MEDIA is a dummy variable equalling 1 where the firm operates in the media industry and 0 where it operates elsewhere; FINANCE is a dummy variable equalling 1 where the firm operates in the finance industry and 0 where it operates elsewhere; UTILITY is a dummy variable equalling 1 where the firm operates in the utility industry and 0 where it operates elsewhere MKTRISK is the β coefficient obtained from a weekly regression of stock returns on weekly market returns; FIRMRISK is the standard error of the β estimate obtained to measure MKTRISK; SALES is the average annual sales results obtained in 2002 and 2003; LIQ relates to the average year-end current ratio in 2002 and 2003, where current ratio is calculated as (Current Assets / Current Liabilities). With regard to banking institutions, LIQ is calculated as (loans / deposits). For insurance companies, LIQ is determined by (Premiums / Claims); PAYOUT is the average annual payout ratio over 2002 and 2003 as is calculated as [(annual dividends paid to ordinary shareholders / total annual net income) x 100]; PAYPEDUM is a dummy variable equalling 1 if the firm had negative EPS, or 0 where EPS was positive; P/E is a measure of market timing and is calculated as (stock price / EPS) and averaged over 2002 and 2003; and, RETPROFIT is the average annual balance of retained earnings over 2002 and 2003 including legal reserves and the current year's net profit.

Thus, where leverage is incorporated as an endogenous variable, ordinary least squares highlights that ownership structure only impacts on performance where profitability is the performance gauge, whilst performance has little effect on managerial ownership.

5.2B Two Stage Least Squares Results

Tables 4A and 4B illustrate that results for the two-stage least squares analysis were comparable to that reported for the two equation system. Once again, none of the variables seeking to explain performance, as measured by Q, were significant. However, in a similar manner to the previous two stage tests, managerial ownership had a statistically significant and negative influence on performance where profit was engaged as the performance measure. Additionally, market risk, firm size and the finance industry dummy variable were significant in predicting director's interests within an organisation which is consistent with the two-stage least squares results reported previously. However, where both performance measures were significant in explaining ownership under the two equation framework, they remain negative but insignificant results within a three equation system. This seeks to illustrate that once the endogeneity of leverage is taken into account, performance is not significant in the prediction of ownership.

TABLE 4A

2SLS Results for Three Equation Model Where Performance is Measured by Average Annual Tobin's Q

Performance		Ownership		Leverage	
Variable	**2SLS**	**Variable**	**2SLS**	**Variable**	**2SLS**
INTERCEPT	1.058	**INTERCEPT**	-2.931	**INTERCEPT**	53.84
	(1.072)		(-1.070)		(6.243***)
MDO	-0.0007	**LEV**	-0.0030	**SALES**	-6.78E-10
	(-0.0059)		(-0.0618)		(-1.070)
TOP5	-0.0957	**MEDIA**	1.800	**MKTRISK**	-3.450
	(-0.2912)		(1.502)		(-0.4624)
RDSALE	0.0329	**FINANCE**	-2.919	**FIRMRISK**	9.816

	(1.338)		(-2.003*)		(0.2423)
RDDUM	-0.2424	**UTILITY**	-1.207	**LIQ**	-1.783
	(-0.5667)		(-1.046)		(-0.5781)
LEV	0.0155	**MKTRISK**	3.106	**Q**	-15.97
	(0.5647)		(3.188***)		(-2.253**)
MEDIA	-0.3202	**FIRMRISK**	-2.449	**PAYOUT**	-0.0243
	(-0.4348)		(-0.5083)		(-0.6084)
FINANCE	-0.7168	**SALES**	-2.61E-10	**PAYPEDUM**	3.404
	(-0.9682)		(-4.278***)		(0.5005)
UTILITY	-0.4716	**Q**	-1.634	**P/E**	-0.0295
	(-0.6756)		(-1.334)		(-0.1598)
				RESERVES	1.19E-09
					(0.8964)
R^2	0.1208	R^2	0.5618	R^2	0.3237
Adjusted R^2	-0.0508	Adjusted R^2	0.4763	Adjusted R^2	0.1715

Note: T-statistics are reported below the coefficient estimates and documented within ( ). * denotes significant to 10% level; ** denotes significant to the 5% level; and, *** denotes significant to the 1% level. The notation used in the above table is as follows: Q is the average of annual Tobin's Q values for 2002 and 2003. Annual Tobin's Q is calculated as [(year-end book value of debt + year-end market value of equity) / year end book value of assets]; MDO is the natural log of [RAWMDO / (100-RAWMDO)]; TOP5 is the natural log of [RAWTOP5 / (100-RAWTOP5)]; RDSALE is the average ratio of annual R&D expenditure to annual sales, and is the average of the 2002 and 2003 ratios; RDDUM is a dummy variable equalling 0 where the firm reports R&D expenditure and 1 where is fails to; LEV is the average ratio of debt to the book value of assets, and is calculated as the average of the 2002 and 2003 ratios; MEDIA is a dummy variable equalling 1 where the firm operates in the media industry and 0 where it operates elsewhere; FINANCE is a dummy variable equalling 1 where the firm operates in the finance industry and 0 where it operates elsewhere; UTILITY is a dummy variable equalling 1 where the firm operates in the utility industry and 0 where it operates elsewhere MKTRISK is the β coefficient obtained from a weekly regression of stock returns on weekly market returns; FIRMRISK is the standard error of the β estimate obtained to measure MKTRISK; SALES is the average annual sales results obtained in 2002 and 2003; LIQ relates to the average year-end current ratio in 2002 and 2003, where current ratio is calculated as (Current Assets / Current Liabilities). With regard to banking institutions, LIQ is calculated as (loans / deposits). For insurance companies, LIQ is determined by (Premiums / Claims); PAYOUT is the average annual payout ratio over 2002 and 2003 as is calculated as [(annual dividends paid to ordinary shareholders / total annual net income) x 100]; PAYPEDUM is a dummy variable equalling 1 if the firm had negative EPS, or 0 where EPS was positive; P/E is a measure of market timing and is calculated as (stock price / EPS) and averaged over 2002 and 2003; and, RETPROFIT is the average annual balance of retained earnings over 2002 and 2003 including legal reserves and the current year's net profit.

TABLE 4B

2SLS Results for Three Equation Model Where Performance is Measured by Average Accounting Profit

Performance		Ownership		Leverage	
Variable	**2SLS**	**Variable**	**2SLS**	**Variable**	**2SLS**
NTERCEPT	-2.326	**INTERCEPT**	-4.436	**INTERCEPT**	43.31
	(-0.2117)		(-2.776***)		(5.151***)
MDO	-2.814	**LEV**	0.0082	**SALES**	-7.65E-10
	(-2.067**)		(0.1939)		(-1.137)
TOP5	-0.4251	**MEDIA**	2.655	**MKTRISK**	2.540
	(-0.1162)		(2.398**)		(0.3295)
RDSALE	0.0959	**FINANCE**	-1.986	**FIRMRISK**	-23.35
	(0.3504)		(-1.862*)		(-0.5831)
RDDUM	-2.957	**UTILITY**	-0.1110	**LIQ**	-6.063
	(-0.6207)		(-0.1026)		(-2.293**)
LEV	-0.1744	**MKTRISK**	2.821	**PROFIT**	-0.1186
	(-0.5701)		(2.833***)		(-0.1452)

MEDIA	9.352	**FIRMRISK**	-3.540	**PAYOUT**	-0.0107
	(1.140)		(-0.7555)		(-0.2528)
FINANCE	-6.875	**SALES**	-2.55E-10	**PAYPEDUM**	4.012
	(-0.8338)		(-4.225***)		(0.5558)
UTILITY	2.195	**PROFIT**	-0.1806	**P/E**	-0.1286
	(0.2824)		(-1.669)		(-0.6741)
				RETPROFIT	7.51E-10
					(0.5313)
R^2	0.1526	R^2	0.5719		0.2382
Adjusted R^2	-0.0127	Adjusted R^2	0.4884		0.0668

Note: T-statistics are reported below the coefficient estimates and documented within ( ). * denotes significant to 10% level; ** denotes significant to the 5% level; and, *** denotes significant to the 1% level. The notation used in the above table is as follows: The notation used in the above table is as follows: PROFIT is the average of annual return on capital values for 2002 and 2003. Return on capital is calculated as [(net income / capital employed) x 100];; MDO is the natural log of [RAWMDO / (100-RAWMDO)]; TOP5 is the natural log of [RAWTOP5 / (100-RAWTOP5)]; RDSALE is the average ratio of annual R&D expenditure to annual sales, and is the average of the 2002 and 2003 ratios; RDDUM is a dummy variable equalling 0 where the firm reports R&D expenditure and 1 where is fails to; LEV is the average ratio of debt to the book value of assets, and is calculated as the average of the 2002 and 2003 ratios; MEDIA is a dummy variable equalling 1 where the firm operates in the media industry and 0 where it operates elsewhere; FINANCE is a dummy variable equalling 1 where the firm operates in the finance industry and 0 where it operates elsewhere; UTILITY is a dummy variable equalling 1 where the firm operates in the utility industry and 0 where it operates elsewhere MKTRISK is the β coefficient obtained from a weekly regression of stock returns on weekly market returns; FIRMRISK is the standard error of the β estimate obtained to measure MKTRISK; SALES is the average annual sales results obtained in 2002 and 2003; LIQ relates to the average year-end current ratio in 2002 and 2003, where current ratio is calculated as (Current Assets / Current Liabilities). With regard to banking institutions, LIQ is calculated as (loans / deposits). For insurance companies, LIQ is determined by (Premiums / Claims); PAYOUT is the average annual payout ratio over 2002 and 2003 as is calculated as [(annual dividends paid to ordinary shareholders / total annual net income) x 100]; PAYPEDUM is a dummy variable equalling 1 if the firm had negative EPS, or 0 where EPS was positive; P/E is a measure of market timing and is calculated as (stock price / EPS) and averaged over 2002 and 2003; and, RETPROFIT is the average annual balance of retained earnings over 2002 and 2003 including legal reserves and the current year's net profit.

Interestingly, with regard to the two-stage least squares analysis of leverage, liquidity is only significant in explaining a corporation's borrowing decisions where accounting profit is used as the performance measure. Where return on capital is used to gauge a firm's performance, liquidity remains a significantly negative predictor of leverage.

In contrast, where Tobin's Q is employed, it is a statistically negative forecaster for a firm's borrowing requirements. Once again, this result appears to contradict the original predictions for performance. It was anticipated that an entity's performance would impact positively on leverage due to the tax shields offered by debt. However, the negative impact that performance has on leverage is consistent with the pecking order theory of financing outlined by Myers (1984), whereby firms prefer to fund operations through retained earnings rather than debt or equity. Based on this theory, the coefficient for

retained earnings should also be negative. This is due to the fact that as a corporation's reserves expand, the entity will become less reliant on debt financing. As retained profits reported a positive and statistically insignificant relationship with leverage, this justification is not robust. The confounding results with regard to the factors affecting leverage warrants further research. Perhaps there are elements overlooked within this current study that have high explanatory power with regard to the level of debt undertaken by firms.

The results highlighted in this section offer important implications for the management of corporations. Particularly, the main finding that was consistent through the initial two equation model and subsequent three equation system was the fact that director ownership impacts negatively on profitability. This may influence the manner in which executive remuneration is administered within Australian corporations, and indeed other market-based economies throughout the world. These results highlight that stock ownership may not be an efficient tool to induce management to undertake value-maximising initiatives. Consequently, this paper casts doubt on several widespread practices used to enhance corporate governance. Particularly, the justification regarding the increasing use of executive stock and option plans is based on the assumption that performance will increase due to the incentive alignment theory. The empirical evidence within this paper, and reinforced by Cho (1998), suggests that compensation schemes such as these may have an adverse effect on performance. Furthermore, a similar situation may occur within those companies which compel incumbent management to purchase stock in the firm.

6. CONCLUSION

This paper has attempted to ascertain the relationship between ownership structure and firm performance. Many previous studies have classified ownership as an endogenous variable when seeking to explain performance. Consequently, a two equation system has been established to assess the nature of this relationship. The research documented within the current investigation distinguishes itself from prior examinations due to the fact that leverage is also classified as endogenous. Consequently, a three equation econometric model has been developed and empirically investigated using a sample of fifty companies listed on the ASX over the period 2002-2003. Ordinary least squares and a two stage least squares analysis have been undertaken to establish whether ownership and performance are linearly related.

With regard to the initial two equation system, ordinary least squares results indicate that ownership structure and performance, as measured by Tobin's Q, have a statistically insignificant relationship. Where a two stage least squares analysis is employed, Tobin's Q has a significantly negative impact on the level of managerial ownership.

Where profit is utilised as the performance measure, managerial ownership is a significantly negative predictor of performance under ordinary least squares and two stage least squares analysis. These findings are congruent to those expounded by Morck et. al (1988) with regard to the management entrenchment hypothesis. Interestingly, in contrast to the ordinary least squares analysis, profitability, like Tobin's Q, has a significantly negative effect on director's interests. This seeks to illustrate the fact that management may wish to liquidate part of their stockholding during prosperous periods to diversify their wealth.

To further investigate the relationship between ownership structure and corporate performance, a reclassification of variables has been undertaken. Specifically, a three equation model was developed based on the notion that leverage is endogenous to the system. Where Tobin's Q was engaged as the performance measure, ordinary least squares and two stage least squares examinations yielded insignificant results.

Management ownership continued to negatively affect performance, as measured by profitability. Finally, where both performance measures were significant in explaining ownership structure under the two equation model, they are statistically insignificant when leverage is reclassified. This seeks to illustrate that once the endogeneity of leverage is accounted for, performance is not significant in predicting ownership.

Whether there is an improvement when systems of equations are estimated and tested against each other in a FIML framework has not been undertaken within this literature. In this framework it is possible to artificially nest two and three equation systems within a comprehensive model. Then leverage can be treated as exogenously, recursively or simultaneously determined. It is also possible to specify a system that is exactly identified by a variation of the matrix rank condition. This is an area for future research.

Bibliography

Berle, A. & Means, G. 1932, *The Modern Corporation and Private Property*, The Macmillan Company, New York.

Cho, M-H. 1998, 'Ownership structure, investment and the corporate value: An empirical analysis', *Journal of Financial Economics*, vol.47, pp.103-21

Core, J., Guay, W. & Larcker, D. 2003, 'Executive equity compensation and incentives: A survey', *FRBNY Economic Policy Review*, April, pp.27-50

Craswell, A., Taylor, S. & Saywell, R. 1997, 'Ownership structure and corporate performance: Australian evidence', *Pacific-Basin Finance Journal*, vol.5, pp.301-23

Demsetz, H. 1983, 'The structure of ownership and the theory of the firm', *Journal of Law and Economics*, vol.26, pp.375-90

Demsetz, H. & Lehn, K. 1985, 'The structure of corporate ownership: Causes and consequences', *Journal of Political Economy*, vol.93, pp.1155-77

Demsetz, H. & Villalonga, B. 2001, 'Ownership structure and corporate performance', *Journal of Corporate Finance*, vol.7, pp.209-33

Faccio, M. & Lasfer, M.A. 1999, 'Managerial ownership, board structure and firm value: The UK evidence.', *Working Paper Series*, Cass Business School and Vanderbilt University

Hermalin, B. & Weisbach, M. 1991, 'The effects of board composition and direct incentives on firm performance', *Financial Management*, vol.20, pp.101-12

Hillegeist, S. & Penalva, F. 2003, 'Stock option incentives and firm performance', *Working Paper Series*, Kellogg School of Management and IESE Business School

Himmelberg, C., Hubbard, R. & Palia, D. 1999, 'Understanding the determinants of managerial ownership and the link between ownership and performance', *Journal of Financial Economics*, vol.53, pp.353-84

Holderness, C., Kroszner, R. & Sheehan, D. 1999, 'Were the good old days that good? Evolution of managerial stock ownership and corporate governance since the great depression', *Journal of Finance*, vol.54, pp.45-69

Hsiao, C. 1983, '*Identification'*, Handbook of Econometrics, vol.1, Ch.4, Eds. Griliches, Z. & Intriligator, MD., North-Holland

Hutchinson, M. & Gul, F. 2004, 'Investment opportunity set, corporate governance practices and firm performance', *Journal of Corporate Finance*, vol.10, pp.595-614

Jensen, MC. & Meckling, WH. 1976, 'Theory of the firm: Managerial behaviour, agency costs and ownership structure', *Journal of Financial Economics 3, pp.*305-360

Jones, D., Kalmi, P. & Mygind, P. 2003, 'Choice of ownership structure and firm performance: Evidence from Estonia', *Working Paper Series*, William Davidson Institute

Kayhan, A. & Titman, S. 2003, 'Firms' histories and their capital structure', *Working Paper Series*, National Bureau of Economic Research

Kmenta, J. 1971, '*Elements of econometrics*', Macmillan Publishing, New York

Kole, S. 1995, 'Measuring managerial equity ownership: A comparison of sources of ownership data', *Journal of Corporate Finance 1*, pp.413-435

Loderer, C. & Martin, K. 1997, 'Executive stock ownership and performance: Tracking faint traces', *Journal of Financial Economics*, vol.45, pp.223-55

Magnus, JR. & Neudecker, H. 1988, '*Matrix differential calculus with applications in statistics and econometrics*', John Wiley & Sons, New York

McConnell, J. & Servaes, H. 1990, 'Additional evidence on equity ownership and corporate value', *Journal of Financial Economics*, vol.27, pp.595-612

Morck, R., Schleifer A. & Vishny, R. 1988, 'Management ownership and market valuation: An empirical analysis', *Journal of Financial Economics*, vol.20, pp.293-315

Myers, S. 1984, 'The capital structure puzzle', *The Journal of Finance*, vol.39, pp.575-92

Myers, S. & Majluf, N. 1984, 'Corporate financing and investment decisions when firms have information investors do not have', *Journal of Financial Economics*, vol.13, pp.187-221

Panno, A. 2003, 'An empirical investigation on the determinants of capital structure: the UK and Italian experience', *Applied Financial Economics*, vol.13, pp.97-112

Simoneti, M. & Gregoric, A. 2004, 'Managerial ownership and corporate performance in Slovenian post-privatization period', *Working Paper Series*, European Corporate Governance Institute

Welch, E. 2003, 'The relationship between ownership structure and performance in listed Australian companies', *Australian Journal of Management*, vol.28, pp.287-305

Zhou, X. 2001, 'Understanding the determination of managerial ownership and its relationship to firm performance: Comment', *Journal of Financial Economics*, vol.62, pp.559-71

APPENDIX 1

Summary of Previous Studies

Authors	Ownership Measures	Performance Measures	Methodology	Results
Demsetz & Lehn (1985)	1. % of stock held by top 5 shareholders 2. % of stock held by top 20 shareholders 3. Herfindahl measure of ownership concentration 4. % of shares controlled by 5 largest individuals / families 5. % of stock controlled by institutional investors	Post-Tax Accounting Profit / Book Value of Equity	OLS	No significant relationship
Morck, Schleifer & Vishny (1988)	% of stock held by directors	1. Tobin's Q 2. Accounting Profit	Piecewise Linear Regression	Significant non-monotonic relationship
McConnell & Servaes (1990)	1. % of shares held by insiders 2. % of shares held by blockholders 3. % of shares held by institutions	Tobin's Q	OLS	Significant Curvilinear Relationship
Hermalin & Weisbach (1991)	% of stock held by incumbent CEO and former CEOs still on BOD	Tobin's Q	Piecewise Linear Regression	Significant non-monotonic relationship
Loderer & Martin (1997)	% of stock held by officers and directors	Tobin's Q	Simultaneous Equations	Ownership fails to predict performance, but performance is a negative predictor of ownership
Craswell, Taylor & Saywell 1997	1. % of shares held by directors 2. % of shares held by institutional investors	Proxy Q (MV Equity / BV of Net Assets)	1. Linear Regression 2. Curvilinear Regression 3. Piecewise Regression	Weak curvilinear Relationship
Cho (1998)	% of stock held by directors	Tobin's Q	1. Piecewise Linear Regression 2. 2SLS 3. 3SLS	Performance affects ownership, but ownership fails to predict performance

Himmelberg, Hubbard & Palia (1999)	% of stock held by insiders, managers and directors	Tobin's Q	1. Piece Linear Regression 2. Piecewise Quadratic Regression	Quadratic form ownership influence on corporate performance
Holderness, Kroszner & Sheehan (1999)	% of stock held by officers and directors	Tobin's Q	Piecewise Linear Regression	Significant non-monotonic relationship
Demsetz & Villalonga (2001)	% of stock held by CEO, top management and directors	1. Tobin's Q 2. Accounting Profit	1. OLS 2. 2SLS	No significant relationship
Welch (2003)	1. % of stock held by management and directors 2. % of stock owned by 5 largest shareholders	1. Tobin's Q 2. Accounting Profit	1. OLS 2. 2SLS 3. General Non-Linear Model	No significant relationship

APPENDIX 2

Order Condition Calculations for 2 Equation System

Let:
G^{Δ} = Number of non-zero endogenous variables in the g^{th} equation
G = Number of non-zero endogenous variables in the system of equations
K^{*} = Number of non-zero pre-determined variables in the g^{th} equation
K = Number of non-zero pre-determined variables in the system of equation
K** = Number of non-zero pre-determined variables not appearing in the g^{th} equation

From Kmenta (1971) the order condition is expressed as:

$K^{**} \geq G^{\Delta} - 1$, where $K^{**} = K - K^{*}$

For equation 1:
G^{Δ} = 2, as there are two endogenous non-zero variables within this equation (Q, MDO)
K** = 3, as there are six pre-determined variables within the system and only three pre-determined variables within equation 1 (TOP5, RDSALE, LEV)

Therefore:
$K^{**} \geq G^{\Delta} - 1$
$= 3 \geq 1$, highlighting that equation 1 satisfies the order condition.

For equation 2:
G^{Δ} = 2, as there are two endogenous non-zero variables within this equation (Q, MDO)
K** = 2, as there are six pre-determined variables within the system and only four pre-determined variables within equation 2 (LEV, MKTRISK, FIRMRISK & SALES)

Therefore:
$K^{**} \geq G^{\Delta} - 1$
$= 2 \geq 1$, highlighting that equation 2 satisfies the order condition.

APPENDIX 3

Order Condition Calculations for 3 Equation System

Let:
G^{Δ} = Number of non-zero endogenous variables in the g^{th} equation
G = Number of non-zero endogenous variables in the system of equations
K^{*} = Number of non-zero pre-determined variables in the g^{th} equation
K = Number of non-zero pre-determined variables in the system of equation
K** = Number of non-zero pre-determined variables not appearing in the g^{th} equation

From Kmenta (1971) the order condition is expressed as:

$K^{**} \geq G^{\Delta} - 1$, where $K^{**} = K - K^{*}$

For equation 1:
G^{Δ} = 3, as there are three endogenous non-zero variables within this equation (Q, MDO & LEV)
K** = 7, as there are nine pre-determined variables within the system and only two pre-determined variables within equation 1 (TOP5 &RDSALE)

Therefore:
$K^{**} \geq G^{\Delta} - 1$
$= 7 \geq 2$, highlighting that equation 1 satisfies the order condition.

For equation 2:
G^{Δ} = 3, as there are three endogenous non-zero variables within this equation (Q, MDO & LEV)
K** = 6, as there are nine pre-determined variables within the system and only three pre-determined variables within equation 2 (MKTRISK, FIRMRISK & SALES)

Therefore:
$K^{**} \geq G^{\Delta} - 1$
$= 6 \geq 2$, highlighting that equation 2 satisfies the order condition.

For equation 3:
G^{Δ} = 2, as there are two endogenous non-zero variables (Q & LEV)
K** = 2, as there are nine pre-determined variables within the system and seven pre-determined variables within equation 1 (SALES, MKTRISK, FIRMRISK, LIQ, PAYOUT, P/E & RETPROFIT)

Therefore:
$K^{**} \geq G^{\Delta} - 1$
$= 2 \geq 2$, highlighting that equation 3 satisfies the order condition.

APPENDIX 4

List of Firms from the Final Sample

Firm Name	ASX Code
Altium	ALU.
AMP	AMP
Ansell	ANN
APN News & Media	APN
Axon Instruments	AXN
Austereo Group	AEO
Australian Gas & Light Co.	AGL
BHP Billiton	BHP
Billabong International	BBG
Brandrill	BDL
Burns Philp & Co.	BPC
Burswood	BIR
Centro Properties	CEP
Cochlear	COH
Collection House	CLH
Commonwealth Bank of Australia	CBA
Computershare	CPU
Crane Group	CRG
David Jones	DJS
Energy Developments	ENE
Envestra	ENV
Foodland Associated	FOA
Fosters Group	FGL
Futuris Corp.	FCL
Harvey Norman Holdings	HVN
Hutchison Telecommunications Australia	HTA
Intellect Holdings	IHG

James Hardie Industries NV	JHX
Jupiters	JUP
Lihir Gold	LHG
Macquarie Bank	MBL
Mayne Group	MAY
Mirvac Group	MGR
National Foods	NFD
Newcrest Mining	NCM
News Corporation	NCP
Novus Petroleum	NVS
Orica	ORI
Patrick Corporation	PRK
Powertel	PWT
Publishing and Broadcasting	PBL
QANTAS	QAN
QBE Insurance Group	QBE
Rio Tinto	RIO
Santos	STO
Seven Network	SEV
Sims Group	SMS
Southcorp	SRP
Stockland	SGP
Toll Holdings	TOL