The Association Between Firm Characteristics and the Use of a Comprehensive Corporate Hedging Strategy: An Ordered Probit Analysis

Hue Hwa Au Yong[1]

Robert Faff[2]

Hoa Nguyen[3]

Abstract

We investigate the potential factors that influence the corporate decision to collectively use foreign currency; interest rate; and commodity derivatives and foreign debt. Our Australian results show that firm size ('scale economies' hypothesis); leverage ('financial distress cost' hypothesis); and block holdings are positively associated with the comprehensive hedging decision, while executive shareholdings has a negative association. However, we do not find any support for the underinvestment or managerial risk aversion hypotheses.

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[1] Monash University, Department of Accounting and Finance, Monash University, PO Box 197 Caulfield East, Victoria 3145, Australia; Email: HueHwa.AuYong@BusEco.monash.edu.au

[2] University of Queensland, UQ Business School, University of Queensland, 4072 Queensland, Australia;
Email: r.faff@business.uq.edu.au

[3] Deakin University, School of Accounting Economics and Finance, Deakin University, 221 Burwood Highway, Burwood Victoria 3125, Australia; Email: hoa.nguyen@deakin.edu.au

1 – Introduction

One of the greatest challenges facing companies today is to survive through the volatile financial environment. In their day-to-day operations, companies are exposed to adverse changes over relatively short time horizons in interest rates, foreign currency values, commodity and equity prices [Fatemi and Luft (2002)]. This makes the companies' earnings very uncertain and sometimes these uncertainties translate into losses in shareholder value. As hedging instruments become more sophisticated and readily available, companies are now expected to engage in a more comprehensive corporate hedging strategy rather than using just one or two hedging instruments to effectively hedge a variety of financial risks.

There are two major hypotheses in the theoretical literature underlying the corporate hedging decision: (a) the 'value enhancing' hypothesis [Smith and Stulz (1985); Froot, Scharfstein and Stein (1993)] and (b) the 'managerial risk aversion' hypothesis [Stulz (1984); Smith and Stulz (1985)]. These hypotheses have been tested in a wide variety of recent papers investigating the determinants of corporate use of derivatives or foreign debt as hedging instruments. However, typically this has been achieved by focusing on aggregate derivative use [e.g. Nance, Smith and Smithson (1993)], or on foreign debt issuance [e.g. Kedia and Mozumdar (2003)]. The usual methodology employed in these papers is based on logit modelling. However, logic suggests that companies in reality apply a comprehensive hedging strategy across all potential hedging instruments to hedge various financial risks. A review of the empirical literature suggests that little, if anything, has been done investigating the use of individual derivatives and the use of foreign debt in a 'combined' way. Accordingly, the primary objective of this paper is to investigate the potential firm-specific characteristics that are associated with a 'corporate hedging strategy' (as reflected by the 'co-ordinated' decision to use different types of derivatives and/or foreign debt). We achieve this goal by analysing a sample of Australian listed companies.

2 - Research Method

The sample dataset is constructed by examining the Notes to the Financial Reports of the 500 largest Australian companies, listed on the Australian Stock Exchange (ASX) for the financial years 1999 and 2000.[1] These financial reports are extracted from the Connect4 Database. A firm enters the sample if it has thorough derivative disclosure in the notes including the type of derivatives used. These notes are then analysed to determine whether a particular company uses derivatives and which derivatives are used. Similarly, information is gathered regarding each company's use of foreign debt. A firm is considered a derivative and/or foreign debt user if it uses any of the following: swaps, futures/forwards, options or foreign debt. We classify this data into four separate categories: (a) foreign currency derivatives (FCD); (b) interest rate derivatives (IRD); (c) commodity derivatives (CD) and (d) foreign debt (FD). From this process we obtained 239 firms in 1999 and 230 firms in 2000, resulting in a total sample of 469 firm/year observations.[2]

The ordered probit method is used to estimate a regression containing a categorical and ordinal dependent variable (Greene, 1992), of the following form:

$$Y^* = \beta' x + \varepsilon_i \tag{1}$$

where Y^* is the unobserved latent variable (that determines Y). We assume that a 'count' of the number of different types of derivatives and foreign debt used (i.e. FCD; IRD; CD and FD) in the dependent variable is a meaningful proxy of the application of a 'co-ordinated' corporate hedging strategy ie. the more instruments used, the more focussed it is on a coordinated hedging

[1] We augment the dataset of Nguyen and Faff (2002) in terms of disaggregated data on the corporate usage of individual derivative instruments and foreign debt. Banks are excluded from the sample because they play the role as market makers and dealers in the derivative market. We also choose to focus on the 1999- 2000 period as prior to this date the reporting of financial derivatives in Australia are rather incomplete and inconsistent. Not until the introduction of accounting standard AASB 1033 – "Presentation and Disclosure of Financial Instruments" in 1999 were financial derivatives reported consistently in the Notes to financial statements.

[2] There is a legitimate concern that by pooling the data over these two years, the standard errors will be affected, thereby leading to potentially unreliable inferences. To address this concern, we re-estimate the ordered probit model for each year separately. The results will be discussed later in the paper. We thank an anonymous referee for bringing this issue to our attention.

strategy. The model assumes that the observed number of instruments used, y , is determined from y^* as:

$$y = \begin{cases} 0 & \text{if } y_i^* \le \gamma_1 \\ 1 & \text{if } \gamma_1 < y_i^* \le \gamma_2 \\ 2 & \text{if } \gamma_2 < y_i^* \le \gamma_3 \\ \vdots & \vdots \\ \text{J} & \text{if } \gamma_M < y_i^* \end{cases}$$

The γ 's are unknown parameters to be estimated with β and the probability of observing each value of y is as follows (where F is the cumulative distribution function of ε):

$$\Pr(y_i = 0 \mid x_{i,}\beta,\gamma) = F(\gamma_1 - x_i\beta)$$
$$\Pr(y_i = 1 \mid x_{i,}\beta,\gamma) = F(\gamma_2 - x_i\beta) - F(\gamma_1 - x_i\beta)$$
$$\Pr(y_i = 2 \mid x_{i,}\beta,\gamma) = F(\gamma_3 - x_i\beta) - F(\gamma_2 - x_i\beta)$$
$$\Pr(y_i = 3 \mid x_{i,}\beta,\gamma) = F(\gamma_4 - x_i\beta) - F(\gamma_3 - x_i\beta)$$
$$\Pr(y_i = 4 \mid x_{i,}\beta,\gamma) = 1 - F(\gamma_4 - x_i\beta)$$

Following Nguyen and Faff (2002), the independent variable set developed to proxy various corporate motives for hedging are: firm size, leverage, market to book value of equity ratio (MTBV), liquidity, current ratio, dividend yield, executive shareholding, executive option holdings, block holdings and a share dummy. The definition of these variables is provided in Table 1.

Many of these variables are used to test the 'value maximising hypothesis'. The firm size (natural log of market value of equity plus total debt) and leverage (sum of short term and long term debt, scaled by firm size) variables are used to proxy for the 'financial distress cost' hypothesis, that is, a firm hedges to reduce the expected cost of financial distress. Ang, Chua and McConnell (1982) for example, suggested that smaller firms would have greater incentive to hedge to reduce the probability of encountering financial distress. However, a 'scale economies' hypothesis predicts a positive relationship [Nance, Smith and Smithson (1993)]. As a result, the predicted relationship between the degree of hedging undertaken by a firm and firm size remains an empirical issue.

Table 1: Variable description

Variable	Predicted sign	Description
Firm Size	?	The natural log of the sum of market value of equity and the book value of debt
Leverage	+	The sum of short term and long term debt, scaled by firm size (expressed as a percentage)
MTBV	+	The ratio of the market value to the book value of the firm
Liquidity	-	The ratio of cash and cash equivalents (i.e. marketable securities) scaled by firm size (expressed as a percentage)
Current ratio	-	The ratio of short term assets over short term liabilities
Dividend Yield	+	The ratio of cash dividend per share over price per share (expressed as a percentage)
Executive Shares	+	The percentage of shares held by directors and executive officers
Executive Options	-	The percentage of options held by directors and executive officers
Block Holding	-	The number of investors other than directors and executive officers who own more than 5% of the shares outstanding
Share Dummy		A dummy variable equal to unity if the largest non-manager shareholder owns more than 15% of the total shares outstanding and zero otherwise

A positive relationship is predicted between this variable and comprehensive hedging since firms with more growth prospects are more likely to suffer from the underinvestment problem [Froot, Scharfstein and Stein (1993)]. To proxy for the availability of internal funding, the liquidity and current ratio variables are used. In this case, a negative relationship is predicted – a firm which has sufficient financial slack to undertake all positive NPV projects will be less inclined to use derivatives. Nance, Smith and Smithson (1993) suggest that there are alternatives to hedging that a firm can use to manage risk. To capture the substitute for hedging effect, we followed Nguyen and Faff (2002) by using dividend yield. A positive relationship is predicted between dividend yield and comprehensive hedging based on the logic that a firm which chooses a high dividend payout policy, will effectively be under liquidity constraints and thus is likely to hedge more.

An alternative hypothesis of corporate hedging is managerial risk aversion. We use two variables to test for this hypothesis, namely, managerial stock holdings and managerial options. A positive relationship is predicted between managerial stock holdings and derivative use since risk averse managers having large proportions of shares in a company have the incentive to hedge more to protect their personal interest in the firm. As for executive option holdings, a negative relationship is predicted with respect to comprehensive hedging because an increase in the number of executive options tends to increase the convexity of the overall payoffs facing managers [e.g. Tufano (1996)].

To capture the potential effect coming from other contracting parties in the company, we also measure outside block holdings (the number of investors other than directors and officers who own more than 5% of the shares outstanding) and a share dummy (taking the value of unity if the largest non-manager shareholder owns more than 15% of the total shares outstanding and zero otherwise). A negative relationship is predicted between these two variables and comprehensive hedging. The prediction is based on the argument advanced by Tufano (1996) that managers hedge to reduce the risk they are exposed to as a result of having a poorly diversified human capital stake and wealth invested in the firm. Block holders, other than directors and officers, on the other hand tend to be better diversified institutional investors and, as such, are less likely to have a demand for more hedging.

3 – Findings

Initially, we run univariate tests by dividing our sample into five groups in terms of the number of instruments used: 'non-users', users of 1 hedging technique, users of 2 hedging techniques, users of 3 hedging techniques and users of 4 hedging techniques. The hedging instruments examined here are foreign currency derivatives, interest rate derivatives, commodity derivatives and foreign debt. Table 2 presents the financial characteristics of these five groups of companies and the result of the ANOVA test. This test was run on the null hypothesis that these five groups are not different from one another in terms of the ten financial characteristics (independent variables) examined, namely, firm size, leverage, MTBV, liquidity, current ratio, dividend yield, executive shares, executive options, block holdings and share dummy.

The p-value shows that the five groups of companies are statistically different from one another with respect to firm size, leverage, dividend yield and executive shareholding at the 1 % level of significance. In addition, liquidity is significant at the 5% level. It was found that the mean for firm size is monotonically larger for firms using more hedging instruments. This is consistent with the view that larger firms have the ability to set up hedging programs and achieve economies of scale and as a result tend to use more hedging techniques. Moreover, larger firms have greater access to foreign financial markets to issue foreign debt for hedging purposes. It was also found that firms using more hedging instruments, monotonically have a higher mean financial leverage. A possible explanation for this is that highly levered firms have a higher probability of encountering financial distress and therefore have more incentive to hedge to reduce financial distress costs [Fok, Carroll and Chiou (1997)]. It is also expected that firms that issue foreign debt are associated with a higher level of leverage since foreign debt, while credibly viewed as a hedging tool, is also a financing instrument.

On the other hand, a non-uniform pattern is found for liquidity. At a general level, we found that non-users have higher liquidity as compared to all users as a group (ignoring the 'level' of usage as proxied by the count of the number of hedging instruments used). This supports the investment opportunities hypothesis that companies with low liquidity tend to rely extensively on external financing and, hence, there is a need for them to use more hedging instruments to mitigate the effect of adverse price movements. However, a comparison of the mean liquidity across user groups produces a puzzling result. Specifically, contrary to predictions, we found that liquidity

Table 2: Univariate test of means for firms using different number of hedging instruments

Variable	Predicted Sign	Non-Users	Users of 1	Users of 2	Users of 3	Users of 4	ANOVA F-Stat	All Users	t-test
No. of Firms		138	159	103	54	15		331	
Firm Size	+	12.6966	13.1458	13.5780	14.5948	15.8628	35.8761***	13.6398	-6.4638***
		(1.2847)	(1.1117)	(1.5548)	(1.4701)	(1.2903)		(1.4998)	
Leverage	+	10.3824	22.5634	29.8092	31.2928	33.1314	23.1433***	26.7212	-8.6244***
		(15.6829)	(17.9179)	(20.7737)	(20.2672)	(23.2321)		(19.8132)	
MTBV	+	8.4623	3.1018	3.5621	4.2541	3.5613	1.5900	3.4539	2.5013**
		(22.7633)	(8.1749)	(10.5714)	(41.0359)	(2.6792)		(18.3702)	
Liquidity	-	9.6010	4.3004	6.3488	7.1560	6.0716	3.2042**	5.4840	3.1699***
		(18.7192)	(7.1876)	(9.9975)	(12.7573)	(9.5676)		(9.3291)	
Current Ratio	-	3.6435	2.2884	1.6332	2.3008	1.9974	1.5721	2.0733	2.3693**
		(6.7668)	(8.7067)	(1.6587)	(4.9355)	(2.9616)		(6.4437)	
Dividend Yield	+	2.5047	5.3191	4.8582	4.1071	3.1062	3.6348***	4.8777	-3.4817***
		(2.8930)	(10.2443)	(5.1734)	(3.0928)	(1.9568)		(7.7815)	
Executive Shares	+	17.7302	7.5473	12.3170	4.0441	0.9167	7.2123***	8.1595	4.5193***
		(29.4856)	(13.4125)	(21.8721)	(8.6509)	(3.2716)		(16.0375)	
Executive Options	-	2.1446	0.4986	3.3370	0.6288	0.1241	1.4828	1.3861	0.7255
		(6.2525)	(0.9010)	(20.6669)	(1.3221)	(0.2086)		(11.5941)	
Block Holding	-	2.6522	2.9748	2.9417	3.1667	3.2667	1.7799	3.0091	-2.3994**
		(1.5784)	(1.4753)	(1.3345)	(1.5016)	(1.0998)		(1.4195)	
Share Dummy	-	0.5797	0.5031	0.5631	0.5185	0.2667	1.6237	0.5136	1.3074
		(0.4954)	(0.5016)	(0.4984)	(0.5043)	(0.4577)		(0.5006)	

Note: This table details the result of the ANOVA test on the independent variables. The test is run on the null hypothesis that the mean of all five groups are not statistically different from one another. The hedging instruments examined are foreign currency derivatives, interest rate derivatives, commodity derivatives and foreign debt. If a firm does not use any of these hedging instruments, it will be classified as a non-user. Firms using just one of these hedging instruments are regarded as users of 1, firms using any two of these are regarded as users of 2 and so on. The mean of each variable for each category are reported in the table with standard deviation reported in parentheses. For comparison purposes, a t-test is also run on the null hypothesis that the mean of non-user and all users (including users of 1, 2, 3 and 4 hedging instruments) are not statistically different from each other. The t-test results are reported in the final column. *, ** and *** denotes significance at the 10%, 5% and 1 % level, respectively.

increases as more hedging instruments are utilised. Liquidity only decreases when it reaches users of four hedging instruments.

Similarly, we also found a non-uniform pattern for dividend yield. At a general level, when non-users are compared to all users as a group (ignoring the 'level' of usage), the all users group has a higher dividend yield than non-users. This finding supports the prediction that if a company has a higher dividend yield, it will be under liquidity constraints and thus hedge more. Nevertheless, when we compare among user groups, the mean dividend yielddecreases monotonically as firms use more hedging instruments. This might be due to an industry effect. Industrial companies which tend to engage in a lower level of hedging activities, typically pay higher dividends as compared to Mining/Resources companies which tend to engage in a higher level of hedging activities. As such, our results show that users of more hedging instruments (mostly Mining/Resources companies) have lower dividend yields. To mitigate any such 'industry' effect on dividend yield, we subtracted the median industry dividend yield from the individual firms' dividend yield data according to industry. After such adjustment, dividend yield becomes insignificant at the 10% level.

Executive shareholding is also significant at the 1% level but the sign is contrary to the theoretical prediction. It was found that in general, the non-user group has a higher mean of executive shareholdings as compared to the user groups. When more than one hedging instrument is used, the percentage of executive shareholdings decreases. This shows that there is a negative relationship between executive shareholdings and the number of hedging instruments used. Therefore, based on this preliminary analysis, the managerial risk aversion hypothesis of corporate hedging is not supported. The findings also show that there is no significant difference at the 10% level among user groups for MTBV, current ratio, executive options, block holdings and the share dummy. There is no clear pattern for these variables among the user groups.

Table 3 presents the results of the ordered probit regression to investigate the determinants of companies engaging in a comprehensive corporate hedging strategy. The ordered probit regression is run on the ordered categorical dependent variable, ranging in integer values from 0 to 4, which represents a count of the number of hedging techniques employed by each firm. As indicated by the p-value, firm size, leverage and block holding are significant determinants for companies to engage in greater corporate hedging activity at the 5% significance level. Dividend yield is also found to be significant (10% level).

Table 3: Ordered probit analysis of the determinants to engage in a corporate hedging strategy

Ordered probit analysis					
Variable	**Predicted sign**	**Coefficient**	**Std error**	**z-statistic**	**P-value**
Firm Size	+	**0.3775*** **	**0.0392**	**9.6399**	**0.0000**
Leverage	+	**0.0201*** **	**0.0027**	**7.3836**	**0.0000**
MTBV	+	- 0.0042	0.0026	-1.6256	0.1040
Liquidity	-	0.0018	0.0045	0.3997	0.6894
Current Ratio	-	-0.0081	0.0083	-0.9819	0.3261
Dividend Yield	+	**0.0139***	**0.0075**	**1.8676**	**0.0618**
Executive Shares	+	**-0.0065** **	**0.0028**	**-2.3385**	**0.0194**
Executive Options	-	-0.0058	0.0048	-1.2086	0.2268
Block Holding	**-**	**0.0866** **	**0.0359**	**2.4142**	**0.0158**
Share Dummy	-	-0.0013	0.1040	-0.0126	0.9899

Summary statistics for ordered probit regression			
Akaike info Criterion	2.4644	Schwarz criterion	2.5883
Log likelihood	-563.8970	Hannan-Quinn criterion	2.5131
Restricted log likelihood	-655.3129	Avg. log likelihood	-1.2023
LR statistic (10 df)	202.8319	LR index (Pseudo-R2)	0.1524
Probability (LR stat)	0.0000		

Note: This table presents results of the ordered probit regression where the dependent variable indicates the number of corporate hedging techniques used, ranging from 0 to 4. The sample consists of Australian companies listed on the Australian stock Exchange (ASX) drawn from the Connect4 Database for the financial year 1999 and 2000. *, ** and *** denotes significance at the 10%, 5% and 1 %, respectively.

The estimated coefficients show that larger firms with a higher level of leverage are likely to employ more hedging instruments. This is consistent with the literature that larger firms have economies of scale in setting up a comprehensive hedging program and that firms with more debt tend to hedge to reduce the probability of financial distress. Additionally, companies that pay more dividends also employ more hedging instruments. Moreover, when dividend yield is adjusted for the relevant industry median, the industry adjusted dividend yield appears to be even more significant (at the 5% level).

Contrary to theory where outside block holding is expected to lead to lower derivative use, we found that block holding is positively associated with the use of more types of derivatives and/or foreign debt. Even though higher executive shareholdings is expected to increase the use of hedging instruments due to managerial risk aversion, we found that companies with more executive shareholding use less hedging instruments. Again, this result indicates a rejection of the managerial risk aversion hypothesis. Our Table 3 results also indicate that current ratio, executive options, liquidity, MTBV and the share dummy are not significantly associated with companies' propensity to engage in a more comprehensive corporate hedging strategy.

As is evident from a comparison of Tables 2 and 3, the ordered probit regression results (Table 3) are largely consistent with the univariate tests (Table 2). In both instances, firm size and leverage are found to have important associations with a comprehensive hedging strategy. Executive shareholdings also appear to impact corporate hedging strategies although not in a manner consistent with the managerial aversion hypothesis. We found that larger executive shareholding is associated with a lower level of hedging activities. Most plausibly, substantial executive shareholdings are observed in smaller firms which are less likely to be comprehensive hedgers due to their lack of economies of scale. The overall evidence in relation to hedging as a response to a demand for liquidity is not strong. Although comprehensive hedgers are shown to have higher dividend yields, no direct relationship can be documented for hedging and liquidity in the ordered probit results.

4 - Robustness test

To address the concern that pooling the data over two years might lead to unreliable inferences, we also run the model for each year separately. The result of this analysis is reported in Table 4. In these separate year regressions, firm size, leverage and block holding are still consistently found

Table 4: Ordered probit analysis of the determinants to engage in a corporate hedging strategy by year

Panel A: Ordered probit analysis for year 1999 sample firms					
Variable	**Predicted sign**	**Coefficient**	**Std error**	**z-statistic**	**P-value**
Firm Size	+	**0.3698*** **	**0.0568**	**6.5060**	**0.0000**
Leverage	+	**0.0143*** **	**0.0043**	**3.3552**	**0.0008**
MTBV	+	**-0.0225*** **	**0.0069**	**-3.2754**	**0.0011**
Liquidity	-	-0.0072	0.0071	-1.0069	0.3140
Current Ratio	-	-0.0155	0.0284	-0.5444	0.5862
Dividend Yield	+	0.0224	0.0254	0.8847	0.3763
Executive Shares	+	-0.0035	0.0037	-0.9443	0.3450
Executive Options	-	-0.0092	0.0092	-1.0017	0.3165
Block Holding	**-**	**0.1065** **	**0.0507**	**2.0990**	**0.0358**
Share Dummy	-	-0.1286	0.1486	-0.8651	0.3870

Summary statistics for ordered probit regression			
Akaike info Criterion	2.4947	Schwarz criterion	2.6983
Log likelihood	-287.115	Hannan-Quinn criterion	2.5767
Restricted log likelihood	-338.565	Avg. log likelihood	-1.1888
LR statistic (10 df)	108.901	LR index (Pseudo-R^2)	0.1608
Probability (LR stat)	0.0000		

Table 4 (continued)

Panel B: Ordered probit analysis for year 2000 sample firms					
Variable	**Predicted sign**	**Coefficient**	**Std error**	**z-statistic**	**P-value**
Firm Size	+	**0.4307*** **	**0.0572**	**7.5359**	**0.0000**
Leverage	+	**0.0234*** **	**0.0038**	**6.1374**	**0.0000**
MTBV	+	0.0016	0.0032	0.4982	0.6183
Liquidity	**-**	**0.0151** **	**0.0066**	**2.2927**	**0.0219**
Current Ratio	-	-0.0098	0.0091	-1.0775	0.2813
Dividend Yield	+	0.0112	0.0080	1.4125	0.1578
Executive Shares	+	**-0.0118*** **	**0.0046**	**-2.5926**	**0.0095**
Executive Options	-	-0.0033	0.0058	-0.5638	0.5729
Block Holding	**-**	**0.1029***	**0.0527**	**1.9525**	**0.0509**
Share Dummy	-	0.1751	0.1514	1.1569	0.2473

Summary statistics for ordered probit regression			
Akaike info Criterion	2.4367	Schwarz criterion	2.6459
Log likelihood	-266.215	Hannan-Quinn criterion	2.5211
Restricted log likelihood	-326.215	Avg. log likelihood	-1.1575
LR statistic (10 df)	119.9988	LR index (Pseudo-R^2)	0.1839
Probability (LR stat)	0.0000		

Note: This table presents results of the ordered probit regression where the dependent variable indicates the number of corporate hedging techniques used, ranging from 0 to 4. The sample consists of Australian companies listed on the Australian Stock Exchange (ASX) drawn from the Connect4 Database for the financial year 1999 and 2000. Panel A (Panel B) reports the regression results for year 1999 (2000).*, ** and *** denotes significance at the 10%, 5% and 1 %, respectively.

to be significant determinants for comprehensive hedging strategies. However, there is a substantive change to our documented results – the significance of the estimated coefficient on the dividend yield variable in the main regression reported in Table 3 falls away. This mixed finding is, perhaps, not surprising given the non-uniform pattern for dividend yield documented in the univariate analysis earlier. In addition, the significance of the executive shares variable seems to be driven by Year 2000 sample firms. As such, the roles of dividends and executive shares in affecting companies' comprehensive hedging strategies need to be treated with caution.

Since there is potential correlation between liquidity and current ratio, as well as block holding and share dummy, the regressions were re-estimated by omitting one of these variables at a time. The results of these robustness tests are reported in Table 5. The liquidity and current ratio variable are excluded in Model (1) and Model (2), respectively, while, share dummy and block holding are omitted in Model (3) and Model (4), respectively. In all models, the significance of firm size, leverage, dividend yield, executive shares and block holdings remain robust in comparison to the main analysis as reported in Table 3.

5 – Conclusions

The objective of this paper is to examine the association between firm characteristics and the use of a comprehensive corporate hedging strategy. We used a sample consisting of Australian companies listed on the Australian Securities Exchange for the financial years 1999 and 2000. Using an ordered probit model, our findings show that firm size, leverage, and block holdings have a positive impact on 'comprehensive' hedging, while executive shares has a negative impact (although it has a positive predicted sign). The significance of the leverage variable supports the financial distress cost hypothesis as an incentive for Australian firms to pursue a comprehensive hedging strategy. However, we do not find any general support for the underinvestment hypothesis. Similar to Nguyen and Faff (2002), in the context of a co-ordinated hedging policy as examined in the current paper, we fail to identify pervasive managerial influences behind the derivatives and/or foreign debt decision, as greater executive shareholding does not lead to a higher level of hedging. In short, our findings lend further support to the view that derivative and foreign debt use are value enhancing activities, and in the current context, as part of a comprehensive corporate hedging strategy.

Table 5: Robustness test of the ordered probit analysis of the determinants to engage in a corporate hedging strategy

		Ordered probit analysis			
Variable	**Predicted sign**	**Model (1)**	**Model (2)**	**Model (3)**	**Model (4)**
Firm Size	+	0.3736***	0.3765***	0.3775***	0.3761***
Leverage	+	0.0203***	0.0203***	0.0201***	0.0210***
MTBV	+	- 0.0042	-0.0042	- 0.0043	- 0.0035
Liquidity	-		0.0008	0.0018	0.0017
Current Ratio	-	- 0.0074		- 0.0081	- 0.0076
Dividend Yield	+	0.0140*	0.0144*	0.0139*	0.0124*
Executive Shares	+	- 0.0065**	-0.00673**	- 0.0065**	- 0.0057**
Executive Options	-	- 0.0058	-0.0058	- 0.0058	- 0.0064
Block Holding	-	0.0865**	0.0857**	0.0866**	
Share Dummy	-	0.0010	-0.0041		0.0095
LR Index (Pseudo-R^2)		0.1523	0.1517	0.1524	0.1480

Note: This table presents robustness test results of the ordered probit regression where the dependent variable indicates the number of corporate hedging techniques used, ranging from 0 to 4. The liquidity and current ratio variable was omitted in Model (1) and Model (2), respectively, while, share dummy and block holding were omitted in Model (3) and Model (4), respectively. *, ** and *** denotes significance at the 10%, 5% and 1 %, respectively.

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