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On The Determinants of Derivative Usage by Australian Companies

by
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Abstract:

This paper provides an examination of the determinants of derivative use by Australian corporations. We analysed the characteristics of a sample of 469 firm/year observations drawn from the largest Australian publicly listed companies in 1999 and 2000 to address two issues: the decision to use financial derivatives and the extent to which they are used. Logit analysis suggests that a firm's leverage (distress proxy), size (financial distress and setup costs) and liquidity (financial constraints proxy) are important factors associated with the decision to use derivatives. These findings support the financial distress hypothesis while the evidence on the underinvestment hypothesis is mixed. Additionally, setup costs appear to be important, as larger firms are more likely to use derivatives. Tobit results, on the other hand, show that once the decision to use derivatives has been made, a firm uses more derivatives as its leverage increases and as it pays out more dividends (hedging substitute proxy). The overall results indicate that Australian companies use derivatives with a view to enhancing the firms' value rather than to maximizing managerial wealth. In particular, corporations' derivative policies are mostly concerned with reducing the expected cost of financial distress and managing cash flows. Our inability to identify managerial influences behind the derivative decision suggests a competitive Australian managerial labor market.

Keywords:

DERIVATIVE USAGE; FIRM VALUE; HEDGING;RISK MANAGEMENT.

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1. Introduction

In a competitive financial environment, financial derivative instruments such as options, swaps, futures and forwards are more and more widely used by corporations to alleviate exposure from fluctuations in interest rates, currency and commodity prices. As corporate risk management practices become more sophisticated, the design of these instruments also shows visible signs of creativity and flexibility. What is more impressive, however, is a huge increase in the value of transactions and the increasingly important role in managing risk that derivatives have demonstrated in financial markets in the last decade. In 1994, the total notional value of derivative contracts outstanding worldwide was reported at USD 18 trillions, which was more than the total value of the shares listed on the New York Stock Exchange and the Tokyo Stock Exchange combined (McAnally 1996). By 1998, however, this figure had increased significantly to USD 70 trillions (Wilson & Rasch 1998). This phenomenon underscores the need to understand how derivatives are used, why corporations are using them and more importantly what it is that determines the use of derivatives.

The Modigliani and Miller (1958) paradigm predicts that the use of derivatives can not add value if markets are perfect. However, modern finance theories indicate that there are certain circumstances under which a hedging program using derivatives can be value enhancing. According to Nance, Smith and Smithson (1993) and Geczy, Minton and Schrand (1997), in the presence of progressive tax codes, financial distress, underinvestment costs and agency costs, hedging is generally a value enhancing exercise. Despite the recent derivative disasters that have focused public scrutiny upon corporations' use of derivatives,[1] available empirical evidence shows that the use of derivatives can bring significant risk management benefits to a company provided that they are used in a rational manner.

At the other end of the spectrum, the use of derivatives may be influenced by various parties who are unable to fully diversify the risk relating to the claims they have on the firm. Of these parties, managers are most likely to have an impact. This is so for two reasons: (1) they have a large and non-diversifiable stake in the firm; and (2) they are the ones who make the decision regarding financial derivative use. In a simple two-period model, Smith and Stultz (1985) predict that if managers' wealth is a concave (or a linear) function of the firm's value then it is optimal for them to completely hedge the value of the firm. Conversely, if the function were convex, a minimal hedging strategy would be best for them.[2] Tufano (1996) and Berkman and Bradbury (1996) show that in US gold mining firms and New Zealand firms respectively, there is a systematic consistency between the pattern of hedging and the amount of options/stock held by managers. However the evidence in the US oil and gas industry is mixed. Specifically, while Rajgopal and Shevlin (2000) find an inverse relationship between the extent of hedging and management's option holding, Haushalter (2000) found no evidence with regard to managerial stock holding and mixed evidence related to managerial option holding.

The existing body of knowledge regarding the determinants of derivative use and hedging activities can be usefully partitioned from two additional, different

1. For details, see Beder, 1996.
2. Managerial stock holding has a payoff that is a linear function of the firm's value. Option holding, on the other hand, provides a convex payoff.

perspectives. On the one hand, the literature can be sub-divided into two main streams based on the scope of analysis. First, there are studies that have a broad scope—that is, they use industrial cross sectional data to draw conclusions about characteristics that distinguish between derivative users and non-users (e.g. Nance, Smith & Smithson 1993). A slight variation in this stream is the study of corporate use of a specific derivative instrument, for example, foreign currency derivatives (Geczy, Minton & Schrand 1997) or interest rate futures and options (Block & Gallagher 1986). Second, there are studies that have a narrow scope—that is, they use data from companies belonging to a specific industry to provide insights into hedging behaviour of that particular industry. For example, Sinkey and Carter (1994) look at the commercial bank industry, Tufano (1996) studies the North American gold mining industry, Koski and Pontiff (1999) use data from the mutual fund industry in the United States. Similarly, Haushalter (2000) and Rajgopal & Shevlin (2000) examine the oil and gas industry while Hardwick and Adams (1999) and Colquitt and Hoyt (1997) look at the life insurance industry in the United Kingdom and the United States, respectively.

An alternative view of the literature allows us to partition studies into those that investigate the decision to use derivatives, as opposed to those studies that analyse the extent of derivative use. Notable examples of the former group include Block and Gallagher (1986), Nance, Smith and Smithson (1993), Mian (1996) and Geczy, Minton and Schrand (1997); while key examples of the latter group include Tufano (1996) and Haulthauser (2000). A brief summary of the main findings in these studies is presented in table 1. Perhaps what is most evident from the table is that the findings across this literature are quite mixed in their support for various determinants of the decision to use derivatives and the extent of derivative use.

The primary focus of the current paper is to investigate the factors that determine the use of derivatives by Australian corporations—a relatively under explored area in the literature. In so doing, we contribute to the existing body of knowledge in two ways. First, we provide empirical evidence on the relative importance of factors that induce Australian corporations to use derivatives. The data will be tested and analysed to see whether the results are consistent with theories and evidence found in the existing literature. Second, we attempt to distinguish the determinants of the decision to use derivative instruments from the determinants of the extent to which these instruments are used.

The paper continues as follows. In the next section, we present the sample and variables. Section 3 discusses empirical results. Section 4 concludes the paper.

2. Sample and Variables Description

Our sample is constructed by examining the Notes to the financial reports of the 500 largest Australian companies that are listed on the Australian Stock Exchange for the financial years of 1999 and 2000. These audited financial reports are available from the Connect4 database. A firm enters the sample if it has thorough derivative disclosure in the Notes to its financial report, which details the types of

Table 1

Summary of a Selection of Previous Findings

This table presents a summary of the main findings in a representative selection of previous studies. '√' indicates that supporting empirical evidence is found with regard to a particular variable, 'x' indicates that the variable is considered without finding supporting evidence or the evidence is mixed while '–' indicates that the variable is not included in the study.

	NSS (1993)[1]	GMS (1997)[2]	Tufano (1996)[3]	Haushalter (2000)[4]	Mian (1996)[5]	B&G (1986)[6]
Panel A: Decision to Use Derivatives						
A Firm is More Likely to Use Derivatives if:						
Tax Function is Convex	√	x	–	–	x	x
More Highly Levered	√	x	–	–	x	√
Larger	√	√	–	–	√	√
More Growth Options	√	√	–	–	x	–
Higher Dividend	√	x	–	–	–	–
Less Liquid	√	√	–	–	–	–
Less Executive Option Holdings	–	x	–	–	–	–
More Executive Shareholdings	–	x	–	–	–	–
Panel B: Extent of Derivative Usage						
A Firm uses Derivatives More Extensively if:						
Tax Function is Convex	–	–	x	√	–	–
More Highly Levered	–	–	x	√	–	–
Larger	–	–	x	x	–	–
More Growth Options	–	–	–	–	–	–
Higher Dividend	–	–	–	x	–	–
More Liquid	–	–	√	√	–	–
Less Executive Option Holdings	–	–	√	√	–	–
More Executive Shareholdings	–	–	√	x	–	–

Note: 1. = Nance, Smith & Smithson (1993)—hedging instruments of 169 Fortune 500 firms;
2. = Geczy, Minton & Schrand (1997)—foreign currency derivatives of 372 Fortune 500 firms;
3. = Tufano (1996)—derivative instruments of 48 firms over a period of three years, in the US gold mining industry;
4. = Haushalter (2000)—hedging policy of 100 oil and gas producers for 1992 to 1994;
5. = Mian (1996)—derivative instruments of 3022 US firms in 1992; and
6. = Block & Gallagher (1986)—Interest rate futures by 193 Fortune 500 firms.

derivatives and the notional amounts of the derivative contract used,[3] and is also in the equity list of Datastream. Following this procedure we obtain 239 firms in 1999 and 230 in 2000 resulting in a final sample of 469 firm/year observations.

A firm is classified as a 'derivative user' (hereafter referred to as a 'user') if it uses any of the following derivative instruments—swaps, futures/forwards and options (as reported in the firm's notes to the financial statements). It should be noted that this procedure might lead to an underestimation of the true extent to which a firm engages in derivative/hedging activities. Many firms use financial instruments that have features of a derivative that is never reported as a derivative instrument, for example, many European firms issue debt with interest rates contingent on the price of a commodity. Since the cost of debt is derived from the price of the commodity, it is theoretically a derivative. Additionally, for hedging purposes, a firm can also use internal hedging techniques such as matching positive and negative exposures. These internal hedging strategies lessen the need to use derivatives.

Since this study intends to investigate the nature of derivative usage by Australian firms specifically, all foreign firms were excluded from the sample. Furthermore, consistent with most studies in this area, firms belonging to the banking sector were removed from the sample due to the specific nature of their business that often lead them to use derivatives for trading purposes or for performing dealer activities for their clients. As table 2 shows, the sample spreads across 23 industries and is most heavily represented by the Miscellaneous Industrials (50), Property Trusts (48), Gold (38) and Retail (32) industries. While the sample is not necessarily representative of all firms in each industry, the available statistics show that the use of derivatives is most prevalent among the Other Metals, Diversified Resources, Alcohol and Tobacco, Transport, Insurance and Diversified Industrials industries. Conversely, the use of derivatives is least prevalent in the Telecommunication industry where less than 50% of the sample firms use derivatives.

As shown by panel A of table 3a, of the 469 firm/year observations, 348 use derivatives (74.2%). It is also observed that swaps and futures/forwards are the two most popular derivative instruments, being used by around 75 % of those firms who have derivatives in their financial structure. When decomposed by their underlying exposures, 83.62% of the derivative users use foreign currency derivatives followed by interest rate derivatives (68.68%) while only 35.63% of the firms make use of commodity derivatives.

2.1 Dependent Variables

We conduct three levels of analysis. First, some basic univariate tests are applied to see how derivative users are different from non-users as a group in terms of the mean statistics. Second, a Logit model is used to examine the partial effects of the independent variables on the firm's decision to use derivatives. Third, a Tobit model is employed to investigate the partial impact of the same set of independent variables on the decision of how much to use derivatives. Logit and Tobit models

3. For the case of commodity derivative contracts, where contract values were not available, the notional amounts were calculated as the product of the quantities and the contracting prices.

Table 2
Sample Classification by Industry

Industry	Number of Firms		Total	% Use Derivatives
	1999	2000		
Gold	19	18	37	89.47
Other Metals	11	9	20	100.00
Diversified Resources	3	2	5	100.00
Energy	15	13	28	60.71
Infrastructure and Utility	8	9	17	58.82
Developers and Contractors	8	8	16	68.75
Building Materials	8	7	15	73.33
Alcohol and Tobacco	5	4	9	100.00
Food and Household Goods	6	6	12	83.33
Chemicals	3	3	6	66.67
Engineering	4	3	7	71.43
Paper and Packaging	4	4	8	75.00
Retail	15	17	32	78.75
Transport	4	4	8	100.00
Media	14	14	28	85.71
Bank	0	0	0	0.00
Insurance	3	3	6	100.00
Telecommunication	11	13	24	41.67
Investment and Financial Services	16	15	31	51.61
Property Trusts	26	22	48	85.42
Healthcare and Biological Index	13	14	27	59.26
Miscellaneous Industrials	25	25	50	60.00
Diversified Industrials	11	11	22	100.00
Tourism and Leisure	7	6	13	92.30
Total	239	230	469	

are widely used in the literature to accommodate the limited nature of the dependent variables.

In the Logit regression, the dependent variable is binary, taking on the value of either unity or zero to indicate, respectively, that a firm either uses derivatives or that it does not. In the Tobit model, the dependent variable is the extent of derivative use which is defined as the total notional amount of derivative contracts scaled by the firm size for a user and zero for a firm that does not use derivatives (hereafter referred to as a 'non-user'). Since the extent of derivative use is censored at zero for a number of observations in the sample, the application of the Tobit model is most appropriate.

Table 3a
Descriptive Statistics for Derivative Users and Non Users

Panel A: Derivative Use by Type of Instruments

	Absolute Value	Percentage
Total Sample	469	100.00
Derivative Users	348	74.20
Non Users	121	25.80
Derivative Users	348	100.00
Interest Rate Derivative Users	239	68.68
Foreign Currency Derivative Users	291	83.62
Commodity Derivative Users	124	35.63
Swap Users	263	75.57
Option Users	127	36.50
Futures/Forward Users	264	75.86

Panel B: Extent of Derivative Use (%)

	All Firms	Derivative Users
Number of Observations	469	348
Mean	20.9464	28.2294
Median	6.1479	13.7981
Minimum	0.0000	0.0000
Maximum	100.00	100.00
Standard Deviation	31.5395	33.6960

Notes: Extent of derivative use is calculated as the total derivative contract value scaled by firm size. Where the ratio exceeds 100% (which happens most often to gold and mining companies), the value is restricted to 100%. The minimum value of 0% applicable to derivative users indicates the fact that the firm does use derivatives in the course of business but as of reporting date there is no contract outstanding.

The use of notional value as a measure of the extent of derivative usage is not a perfect construct since notional value does not indicate the direction of a transaction; that is, it does not indicate whether a firm is holding a long or a short position. Moreover, a firm that holds two offsetting positions (e.g. a swap contract on which it pays a fixed rate and another swap of the same face value on which it pays a variable rate), although having a large notional derivative holding, effectively has no exposure.[4]

Nevertheless, we choose to use notional value for at least three reasons. First, as argued by Hentschel and Kothari (2001, p. 96) 'except for options and leveraged swaps, it is not unreasonable to assume a general proportionality between contract size and exposure'. For non-financial firms (that exclusively comprise our sample)

4. We gratefully acknowledge an anonymous referee for drawing this issue to our attention.

who take a net position in the derivative market to hedge an existing exposure, there is no obvious reason why they would hold an offsetting position. Therefore, while it is possible for a (non-financial) firm to have an existing swap and later enter a reverse swap with a different financial institution from the original swap (thereby doubling the notional principal amount while the exposure is effectively zero), the probability of such a circumstance happening in reality is small. Second, despite the various problems that might arise from the use of notional value, it is undeniable that such a measure is widely used in the literature. For example, see Allayannis and Ofek (2001), Henschel and Kothari (2001), Hardwick and Adams (1999), and Berkman and Bradbury (1996). Third, a readily available alternative construct that is clearly superior to notional value simply does not exist.

2.2 Independent Variables

2.2.1 Financial Distress Cost Hedging may enhance value by reducing the expected cost of financial distress. Hedging reduces cash flow volatility and the variance of value; hence it minimizes the number of states in which the hedging firm experiences financial difficulty. Moreover, when financial distress does occur, Mayers and Smith (1987) and Bessembinder (1991) show that hedging can also reduce the expected cost of financial distress by minimizing opportunistic behaviour that equity holders can pursue against bondholders.

To proxy for financial distress cost we use two variables: firm size and leverage. Leverage is calculated as the sum of short term and long term debt, scaled by firm size where firm size is equal to the market value of equity plus total debt. Other things being equal, a high leverage ratio increases the probability a firm will encounter financial distress. As a result, highly levered firms have more incentive to use derivatives to reduce the distress cost. As pointed out by Ang, Chua & McConnell (1982) financial distress costs increase less than proportionately as firm size increases. Therefore, smaller firms would have greater incentive to hedge to reduce the probability of encountering financial distress, which would be more costly for them as opposed to larger firms. However, if the hedging decision is driven by the cost of setting up a hedging program then a positive relationship between derivative use and size will result. We predict a positive relationship between size and the decision to use derivatives and a negative relationship between size and the extent of derivative usage.

2.2.2 Investment Opportunities Hedging may add value by reducing underinvestment costs when firms forego positive NPV projects. The role of derivatives in an 'underinvestment' scenario is manifested in the Froot, Scharfstein and Stein's (1993) framework for analysing corporate risk management in the presence of costly external financing. In this setting a hedging program can add value if two conditions exist. First, the firm must have an available growth option set and second, the firm must be constrained financially to undertake them. Within this framework, hedging through the use of derivatives adds value by insuring that the generation of internal funds is not disrupted by external factors, such as adverse movements in exchange rates, interest rates or commodity prices. The importance of derivatives, hence, is to maintain an adequate level of financial slack and/or reducing reliance on costly external financing.

Two variables are developed to capture the essence of the two conditions underlying the underinvestment hypothesis. The ratio of market to book value (MTBV) is used to proxy for the investment opportunities available to the firm. The rationale for using MTBV as the proxy for growth options is that the market value reflects market participants' valuation of the firm value as made up of assets in place and growth prospects. Since the book value of the firm records the level of assets in place, MTBV provides a relative measure of a firm's investment opportunities. The more growth options a firm has, the lower the probability that they will all be undertaken. Consequently, a firm with more growth prospects tends to suffer from a greater extent of underinvestment—as such, it is argued that such firms are more inclined to use derivatives to hedge. Accordingly, a positive relationship is predicted between derivative use and MTBV.

The hedging decision is also driven, in part, by the risk of not being able to convert those growth options into assets in place due to short-term financial constraints (Froot, Scharfstein & Stein 1993). We use two variables to proxy for the availability of internal funding—liquidity which is calculated as the ratio of cash and cash equivalents (i.e. marketable securities) over firm size and the current ratio (calculated as the ratio of short term assets over short term liabilities). If a firm has sufficient financial slack that allows them to finance all available positive NPV projects, there will be minimal benefit to be achieved from a hedging program, thus it is less likely to use derivatives. Accordingly, a negative relationship is predicted between derivative use and the liquidity/current ratio.

2.2.3 Substitute for Hedging As argued by Nance, Smith and Smithson (1993), there are alternatives to hedging that a firm can use to manage risk. While hedging involves the use of off balance sheet instruments to reduce the volatility of the firm's value, a firm can effectively control the risk level on the balance sheet by altering the capital structure and maintain debt at a low level. However, in reality, altering capital structure is rarely undertaken with a view to managing risk. Replacing debt with equity normally incurs significant transaction costs and also results in a loss of interest tax shields—although the importance of the tax shields has significantly lessened following the introduction of the imputation tax system in Australia.

A more prevalent practice is likely to be the use of convertible debt and preferred stock as substitutes to a hedging program. Indeed, these measures were used widely in previous studies (e.g. Nance, Smith & Smithson 1993; Geczy, Minton & Schrand 1997). However, due to data restrictions, we will use dividend yield to capture the substitute for hedging effect. It is argued that if a firm chooses a high dividend payout policy (relative to other firms in the same industry), it will effectively be under liquidity constraints and thus is predicted to hedge more. The hypothesized relationship between derivative use and dividend is therefore positive. The empirical proxy we use for dividend yield is the average of quarterly dividend yield measured in percentage terms.[5]

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5. Studies concerning dividend policy and cash flow uncertainty suggest that firms with high cash flow volatility tend to adopt a low dividend policy because a high dividend payout renders managers more likely to announce a dividend cut when times are bad, which invariably impacts negatively on shareholders' wealth (Bradley, Capozza & Seguin 1998). Conversely, firms with large free cash flows and low volatility are more likely to pay a high dividend. This suggests a possible countervailing effect from the liquidity effect. We thank an anonymous referee for alerting us to this alternative view.

2.2.4 Managerial Risk Aversion The decision to use derivatives may be influenced by managers who prefer to reduce the risk that they are exposed to due to them having a poorly diversified human capital stake and wealth invested in the firm (Smith & Stulz 1985). Given risk aversion, it is expected that the larger the proportion of shares that managers, as a group, have in the company the more incentive they have to hedge. To measure managerial stockholding we use the number of shares held by directors and officers scaled by the total number of shares on issue. A positive relationship is predicted between managerial stock holdings and derivative use.

The relationship between the hedging decision and executive option holding is best analysed if the convexity of the portfolio of options is known. Options provide convex payoffs as a function of stock prices, thus the convexity of the portfolio indicates the expected utility accruing to managers when stock price is volatile. However, due to data unavailability concerning the exercise price and maturity date of the options, we use the number of options held by directors and officers as a measure of managerial option holding. We believe that the number of executive options outstanding is a reasonable proxy for the extent of option ownership because an increase in the number of executive options outstanding tends to increase the convexity of the overall payoffs facing managers (Tufano 1996). For comparability, the number of options held is also scaled by the total number of shares on issue. We predict a negative relationship between executive option holdings and derivative use.

2.2.5 Other Contracting Parties If risk management is influenced by poorly diversified managers trying to maximize their utility then it is expected that other investors who are better diversified would impose less pressure on the firm to hedge. Tufano (1996) argued that block holders other than directors and officers tend to be better diversified institutional investors and as such are less likely to act like risk averse, poorly diversified, managers. To capture this effect we develop two measures; the number of outside block holders defined as the number of investors other than directors and officers who own more than 5% of the shares outstanding. We also use a dummy variable set equal to unity if the largest non-manager shareholder owns more than 15% of the total shares outstanding. A negative relationship is predicted between derivative use and these two variables.

3. Empirical Results

3.1 Univariate Test Results

Panel A of table 3b shows the descriptive statistics for derivative users and non-users as a group. As indicated by the *p*–values, users are statistically different from non-users with respect to leverage, current ratio, dividend yield, liquidity, executive shares (two tailed test at 1% significance level), size, market to book value and substantial shareholding dummy (at 5% significance level). Consistent with theoretical predictions, derivative users are larger, more highly levered, under more financial constraints (as indicated by a lower level of liquidity and a lower current ratio) and pay a significantly higher level of dividend. Although the difference between derivative users and non-users in terms of the growth prospects

Table 3b

Descriptive Statistics for Derivative Users and Non Users Continued

Panel A: Univariate Statistics for Derivative Users and Non-Users

Variables	Theoretical Relationship	Derivative Users (n = 348) Mean	SD	Non-Users (n = 121) Mean	SD	H_0: Users = Non-Users t–statistic	p–value
Leverage	H>NH	0.2579	0.2057	0.1148	0.1646	6.9196	0.0000
Size	Undetermined	3127.81	11169.62	675.83	987.03	2.4098	0.0163
MTBV	H>NH	3.6996	18.0495	8.4593	24.1028	2.2798	0.0231
Current ratio	H<NH	2.0749	6.2965	3.8596	7.1720	2.5886	0.0099
Dividend	H>NH	4.7604	7.6262	2.5087	2.9448	3.1649	0.0017
Liquidity	H<NH	0.0559	0.0928	0.0993	0.1975	3.2139	0.0014
Executive Options	H<NH	1.3366	11.3096	2.3936	6.6638	0.9712	0.3320
Executive Shares	H>NH	8.5206	16.4069	18.0364	30.4643	4.3058	0.0000
Block Holdings	H<NH	2.9211	1.4644	2.7686	1.5042	1.1729	0.2414
Share Dummy	H<NH	0.5029	0.5007	0.6198	0.4874	2.2284	0.0263

(as measured by market to book value) and executive share holding is significant, the result is inconsistent with hedging theory. It is expected that a firm with more growth opportunities would face a greater extent of underinvestment and thus have more incentive to hedge. Nevertheless, the data set shows that user firms have a much lower market to book value ratio (mean = 3.70) compared to non-users (mean = 8.46).[6] Hedging theory also predicts that higher executive shareholding will result in a higher level of risk management. However, directors and senior managers of user firms own only 8.52% of the total shares outstanding as opposed to 18.04% owned by directors and managers in non-user firms. It is also revealed that a non-user is more likely to have a substantial non-manager shareholder whereas there is no statistical difference between a user and a non-user in terms of executive option holdings and the number of the equity block holders.

3.2 Determinants of the Decision to Use Derivatives—Logit Results

Logit regression estimates the relationship between the likelihood that a firm uses derivatives and the incentives to use derivatives as proxied by the independent variables. Table 4 presents the results of the logistic regression on the binary dependant variable. As shown in table 5, there is no serious correlation between the independent variables.

In panel A of table 4, the coefficient estimates show the direction of influence that the independent variables have on the decision to use derivatives.

6 We return to investigate and discuss this puzzling finding in more detail later.

Table 4

Logistic Regression Analysis of the Likelihood of Using Derivatives

Panel A: Logistic Regression Estimates

Variable	Predicted Sign	Coefficient	SE	ΔProb.	*z*–stat	*p*–value
Constant	–	0.6468	0.3231	0.1913	2.0023	0.0453
Leverage	+	3.4260	0.7569	1.0140	4.5262	0.0000
Size	?	8.16E–08	2.74E–08	2.42E–09	2.9777	0.0029
MTBV	+	–0.0064	0.0052	–0.0019	–1.2227	0.2215
Current Ratio	–	–0.0149	0.0169	–0.0044	–0.8846	0.3764
Dividend	+	0.0380	0.0336	0.0112	1.1296	0.2586
Liquidity	–	–2.5239	0.8839	–0.7470	–2.8555	0.0043
Executive Options	–	–0.0152	0.0101	–0.0045	–1.5173	0.1292
Executive Shares	+	–0.0128	0.0053	–0.0037	–2.4046	0.0162
Block Holdings	–	0.0828	0.0798	0.0112	1.0374	0.2995
Share Dummy	–	–0.2626	0.22396	–0.0848	–1.0961	0.2730

Panel B: Summary Statistics for Logistic Regression

Prediction Evaluation (Success Cutoff = 0.5)	Dep = 0	Dep = 1	Total
% Correct Prediction	25.62	97.70	79.10
% Incorrect Prediction	74.38	2.30	20.90

Mean Dependant Variable	0.7420	Restricted Log Likelihood	–267.7756
SE of Regression	0.3931	LR Statistic	100.3347
Sum Squared Residuals	70.7658	Prob. (LR Statistic)	0.0000
Log Likelihood	–217.6082	McFadden *R*–Squared	0.1873

Note: ΔProb. is the marginal effect of the explanatory variables on the probability of using derivatives and is calculated as $\partial Y/\partial x_i = f(-x'\beta)\beta_i$ where Y is the binary dependent variable, x_i is the ith independent variable, f is the logistic cumulative distribution function and β is the vector of coefficients.

Log likelihood is the maximized value of the log function l_0 . Restricted log likelihood is the maximized log likelihood l_1 when all slope coefficients except the constant are restricted to zero. The LR test statistic tests the joint null hypothesis that all slope coefficients except the constant are zero and is computed as $-2(l_1 - l_0)$. This is the analog of the *F*–statistic in the linear regression model and tests the overall significance of the model. Probability (LR statistic) is the *p*–value of the LR test statistic. Under the null hypothesis, the LR test statistic is asymptotically distributed as a Chi-square variable, with 6 degrees of freedom. McFadden *R*–squared is the likelihood ratio index computed as $1-l_0/l_1$. This is an analog to the R^2 reported in linear regression models. It has the property of lying between 0 and 1.

Table 5

Correlation Matrix

	BLHD	CR	DIV	EXEOP	EXESH	LEV	LIQ	MTBV	SHDM	SIZE
BLHD	1.00									
CR	0.0285	1.00								
DIV	–0.0849	–0.0845	1.00							
EXEOP	–0.0198	0.0025	–0.0501	1.00						
EXESH	0.1188	0.0829	–0.0204	0.0338	1.00					
LEV	0.1144	–0.0762	0.0757	0.0933	–0.1093	1.00				
LIQ	0.0052	0.0352	–0.0944	0.0138	0.0231	0.1004	1.00			
MTBV	0.1017	0.0091	–0.0263	0.0024	0.0357	–0.0329	–0.0206	1.00		
SHDM	0.0696	–0.0418	0.0263	–0.0289	0.1858	–0.0234	0.0181	0.0538	1.00	
SIZE	0.0040	–0.0330	–0.0512	–0.0206	–0.0799	0.0225	–0.0569	0.0046	–0.0765	1.00

Note: Correlation coefficients larger than 0.125 (0.150) are statistically different from zero at the 90% (95%) confidence level.

According to the results, (at the 1% level of significance) leverage and size are 'incentive' factors for a firm to use derivatives—larger firms with higher levels of leverage are more likely to use derivatives. Liquidity (at the 1% level) and executive equity shareholdings (at the 5% level), on the other hand, are found to be 'disincentive' factors to the derivative decision, in the sense that these variables have a negative role in the Logit regression. The empirical evidence regarding executive share and option holding indicates that the decision to use derivatives, contrary to predictions, is not influenced by risk averse, poorly diversified managers who have incentives to engage in risk management to maximize their personal utility. Although the coefficient on executive shareholding is statistically significant, its direction of influence is not consistent with utility maximization theory. Furthermore, while the coefficient on executive shareholding is statistically significant, economically it is not important. Specifically, as indicated by the marginal contribution of executive shareholding on the likelihood of derivative usage, for a one percentage increase in executive shareholding, the probability that the firm will use derivatives decreases by a mere 0.0037%.

The z statistics further show that in our sample a higher dividend yield and a lower current ratio are not associated with a higher likelihood of derivative usage. The failure of the dividend yield variable may simply reflect the countervailing phenomenon outlined earlier (see footnote 5). The failure of the current ratio may reflect a poor empirical proxy. Although commonly used as an indicator of a firm's ability to meet short-term commitments, the current ratio might not be the best measure of the extent of financial slack that is available to the firm for investment purposes. Certain current assets items such as debtors and inventories might not be easily converted into cash.

The findings regarding leverage, firm size and liquidity are consistent with theoretical predictions. The use of debt increases the likelihood that a firm will use derivatives, thus supporting the view that firms hedge to reduce the probability of financial distress. Indeed, since about 75 % of the sample firms use swaps, most of which are interest rate swaps, this result is not unexpected. Nevertheless, since leverage is a choice variable, there is some uncertainty with respect to what is the 'cause' and what is the 'effect'. In other words, we cannot be certain whether the use of debt leads to an increase in the likelihood of derivative use or whether the decisions to employ debt and derivatives are made simultaneously. Similarly, consistent with the notion that larger firms have economies of scale in setting up a hedging program, we find a positive relationship between firm size and the likelihood of derivative usage. The result regarding liquidity suggests that the more liquid is a firm, as indicated by a higher ratio of cash and cash equivalents divided by firm size, the less likely it will use derivatives. This finding is as predicted from the underinvestment hypothesis.

Panel A of table 4 also reports the marginal contribution of each independent variable (in percentage) to the likelihood of using derivatives (column under ΔProb. heading). The results suggest that, of the independent variables, leverage has the greatest influence on the use of derivatives. For a 1% increase in leverage, the probability that the firm will use derivatives increases by around 1%. Similarly, for a 1% increase in liquidity, the probability of using derivatives decreases by about 0.75%. This supports the Froot, Scharfstein and Stein (1993) proposition that the existence of growth opportunities does not (of itself) necessarily induce a firm to use derivatives, but rather it is the risk of not being able to undertake that opportunity due to financial constraints that matters. It follows that hedging is much more valuable when the firm faces liquidity constraints. The overall results point to the fact that Australian companies use derivatives with a view to enhancing firms' value. In particular, there is strong evidence supporting the proposition that derivatives are used to reduce the probability of financial distress and to address liquidity problems that can potentially undermine a firm's ability to invest in positive NPV projects. Managerial discretion appears to have no impact on the decision to use derivatives in such a way that is consistent with hedging theory.

Panel B of table 4 reports some summary statistics for the regression. Overall, of the 469 observations, the model correctly predicts 79.1% of the binary responses. Related to this case, 97.7% of the derivative users are correctly classified in contrast to 25.62% of non-users who are correctly classified. This latter statistic does point to a legitimate concern over the Logit model—it is poor at correctly classifying non-users of derivatives in our sample.

3.3 Determinants of the Extent of Derivative Usage—Tobit results

Now consider the use of a Tobit regression to examine the effect of the independent variables on the extent of derivative usage. The dependent variable in this model is the 'extent of derivative usage', calculated as the total notional amount of derivative contracts divided by firm size. The observed dependent variable is censored in two ways: first, it is left censored at 0 to account for the fact that there are firms that choose not to use derivatives to reduce financial exposure. Second, because we restricted the extent of derivative use to take a maximum value of 100% for those firms that have a greater statistic, the data is also right censored at the value of 100%.[7] The Tobit model regresses the extent of derivative use on the same set of independent variables that we used in the logistic regression.

Table 6 reports descriptive statistics for the sample in which each company has been classified as either a non user if the firm does not use derivatives, a moderate user if the firm has a positive extent of usage of less than 40% or as an extensive user if the firm has an extent of derivative usage greater than 40%.

As can be seen from the table, non-users, moderate users and extensive users are statistically different from each other (at the 1% level) in terms of leverage, size, MTBV, dividend, liquidity and executive shares; and the share dummy (at the 5% level). Extensive users demonstrate a higher degree of leverage which is consistent with the prediction that highly levered firms tend to hedge more to reduce the probability of financial distress. The group mean difference in size indicates that moderate users are the largest. They are larger than non-users who, in turn, are smaller than extensive users—suggesting a concave relationship between size and the extent of derivative usage. This is consistent with the view that once

7. In some observations the total amount of the derivative contracts is in excess of the firm size which results in the extent of derivative use being greater than 100%. In these cases, the observations are restricted to 100% indicating that these firms use derivatives at a maximum level. This restriction, overall, affects 47 observations. We return to investigate the potential impact of this data censoring later.

Table 6

Descriptive Statistics for Non-Users, Moderate Users and Extensive Users of Derivative Instruments as Classified by the Extent of Derivative Usage

	Non users ($\Delta = 0$) $n = 144$		Moderate Users ($0\% < \Delta < 40\%$) $n = 244$		Extensive Users $40\% < \Delta < 100\%$) $n = 81$		H0: Non-Users = Mod. Users = Ext. Users	
	Mean	SD	Mean	SD	Mean	SD	*F*–Stat	*p*–Value
Leverage	0.1125	0.1614	0.2476	0.1859	0.3335	0.2439	38.8959	0.0000
Size	790.06	1341.83	3824.96	13204.90	1520.92	2214.50	5.0206	0.0070
MTBV	8.2194	22.3152	4.8015	20.1362	–0.5449	11.7617	5.1420	0.0062
Current Ratio	3.5624	6.6411	2.1858	7.3510	1.7624	2.6159	2.6827	0.0694
Dividend	2.5060	2.8779	4.5392	3.6403	6.0710	14.3822	8.0587	0.0004
Liquidity	0.0963	0.1863	0.0464	0.0709	0.0775	0.1328	7.2524	0.0008
Executive Options	2.09108	6.1265	1.6589	13.4793	0.6036	1.3101	0.5440	0.5808
Executive Shares	17.1366	29.0389	8.4703	15.1710	7.5698	18.8594	9.0225	0.0001
Block Holdings	2.6806	1.5718	2.9836	1.4458	3.0617	1.3541	2.4853	0.0844
Share Dummy	0.5764	0.4959	0.4836	0.5008	0.6049	0.4919	2.5945	0.0458

Note: The symbol 'Δ' denotes the extent of derivative use measured as notional value scaled by size. The *F*-test tests the joint null hypothesis that the mean statistic of non-users is equal to that of moderate users and extensive derivative users. The number of non-users reported here is different from that in panel A of table 3b since while a number of companies report a continuous use of derivatives, as at the reporting date there is no derivative contract outstanding. As a result, these companies are classified as a derivative user in panel C of table 2 but are classified as a non-user in this case because based on the financial statement data the extent of usage is effectively zero.

the decision to use derivatives has been made, smaller firms benefit more from hedging.[8] MTBV is also a statistically significant factor that distinguishes between the three groups of derivative users. Non-users have the highest market to book ratio and the ratio diminishes as firms engage in the use of more derivatives signalling the fact that extensive users are those that have the least growth opportunities. Moreover, the negative mean MTBV statistic relating to the case of extensive users may capture the effect of financial distress. That is, the negative MTBV statistic indicates that extensive users, as a group, have a negative book value which occurs when the value of tangible assets are less than the value of the firm's total liabilities. Therefore, the extensive use of derivatives by firms may be in response to the financial difficulties they are experiencing.[9] The statistic regarding liquidity is also significant—extensive users are less liquid than non-users (but more liquid than moderate users). It also appears that extensive users pay the highest dividend and have the lowest amount of executive share holding. Finally, it is clear that non-users, moderate users and extensive users are statistically indistinguishable from each other (at the 5% significance level) with respect to the current ratio, executive option holdings and outside block holdings.

Tobit results are reported in table 7. Generally, the results show that leverage is the most important factor (based on the size of the *z*–stat) in determining the extent of derivative use. Specifically, we found that once the 'hedging' decision has been made, firms tend to use more derivatives the more debt they have in the capital structure. This finding supports the hypothesis that a hedging program reduces the probability of encountering financial distress. Further, we see from the table that dividend is the next most important factor in explaining the extent of derivative usage. Thus, while a high dividend payout policy does not statistically impact the likelihood that firms use derivatives (as indicated in the logistic results), for those companies that are users, dividend does seem to be positively related the more extensive use of derivatives.

The negative relationship between MTBV and the extent of derivative usage (with a *p*–value of 0.078) is an interesting empirical finding—particularly given the negative role documented for MTBV in the preceding univariate analysis (table 6). Despite the belief that, other things being equal, a firm with more growth prospects is more likely to face potential underinvestment costs and as such is more likely to hedge, the empirical evidence tends to support the opposing view. That is, in our sample a firm with more growth prospects (as proxied by MTBV) uses a lower notional value of derivatives. One possible explanation is that the asset portfolio of rapidly growing companies comprises largely of intangible assets (such as trademark, goodwill and patents) and, therefore, they tend to employ a conservative level of leverage in their capital structure to minimize the risk of (costly) financial distress. If reducing the probability of financial distress is a more important factor in inducing the use of derivatives than ensuring internal fund availability, a negative relationship between growth prospects and the use of derivatives may be

8. See Ang, Chua and McConnell (1982) for a detailed discussion of why smaller firms face higher expected cost of financial distress and thus tend to hedge more extensively.
9. A recent topical case that illustrates this point is that of HIH Insurance. Specifically, HIH Insurance, which went bankrupt in early 2001, had an MTBV of –0.78 in 2000. However, as a counter example One.Tel Ltd, who later also went bankrupt, had an MTBV of 3.23 in 2000.

Table 7

Tobit Regression Analysis for the Extent of Derivative Use

Panel A: Tobit Regression Estimates

Variable	Predicted Sign	Coefficient	SE	z–Stat	p–Value
Constant	–	–18.0646	6.1533	–2.9358	0.0033
Leverage	+	79.8603	11.1995	7.1307	0.0000
Size	?	1.94E–08	2.09E–07	0.0928	0.9261
MTBV	+	–0.2015	0.1144	–1.7616	0.0781
Current Ratio	–	–0.0762	0.3405	–0.2238	0.8229
Dividend	+	1.0722	0.3781	2.8354	0.0046
Liquidity	–	–14.1799	18.5126	–0.7660	0.4437
Executive Options	–	–0.2046	0.2021	–1.0121	0.3115
Executive Shares	+	–0.33364	0.1221	–2.7552	0.0059
Block Holdings	–	3.6889	1.5142	2.4363	0.0148
Share Dummy	–	5.4716	4.3826	1.2485	0.2119

Panel B: Summary Statistics for Tobit Regression

Left Censored Observations:	144	Uncensored Observations:	278
Right Censored Observations:	47	Total Observations:	469
Mean Dependant Variable	20.9464	LR Stat	74.2548
SE of Regression	29.8402	Prob (LR Stat)	0.0000
Sum Squared Residuals	406930.4	R Squared	0.1259
Log Likelihood	–1599.14		

Note: Log likelihood is the maximized value of the log function l_0. The LR test statistic tests the joint null hypothesis that all slope coefficients except the constant are zero and is computed as $-2(l_1 - l_0)$. This is the analog of the F–statistic in the linear regression model and tests the overall significance of the model. Probability (LR statistic) is the p–value of the LR test statistic. Under the null hypothesis, the LR test statistic is asymptotically distributed as a Chi-square variable, with 6 degrees of freedom.

observed. Furthermore, as observed in the financial markets, high growth firms, more often than not, tend to adopt a low or even zero dividend policy. This policy allows for internal fund flexibility and keeps external-funding requirements at a minimum level, thus resulting in a minimal need to use derivatives.

Existing empirical evidence regarding the 'underinvestment hypothesis' is mixed. Nance, Smith and Smithson (1993) and Geczy, Minton and Schrand (1997), using R&D expenses as a measure of growth opportunities, find supportive evidence. In particular, they find that firms with higher growth prospects as measured by R&D expenses are more likely to use some form of derivative instruments. Berkman and Bradbury (1996), on the other hand, find an ambiguous relationship between the use of derivatives and the existence of growth opportunities in their New Zealand sample. In their study, the price earnings ratio and the ratio of changes in net tangible assets to changes in net income are used to proxy long-term and short-term growth prospects, respectively. The most prominent findings regarding the 'underinvestment hypothesis', however, are those of Gay and Nam (1998). Gay and Nam attempt to document the relationship between the use of derivatives and growth options by using five growth measures: R&D expenditure, price earnings ratio (PER), cumulative abnormal return (CAR), market to book value (MTBV) and Tobin's q. Interestingly enough, in the univariate analysis, they find two significant positive differences in means (CAR and R&D) out of four positive differences while the difference in MTBV is negative. Similarly, Mian (1996) finds a negative relationship between market to book value and derivative use which, as argued by the author, could be explained by the 'constraints imposed by mandated reporting requirements on hedging of anticipated exposures' (Mian 1996, p. 427). However, these compulsory reporting requirements do not necessarily explain a negative relationship. This puzzling outcome, therefore, raises the question of whether MTBV truly measures a firm's growth prospects or does it really measure something else?

As previously argued, the rationale behind the use of MTBV as a measure of growth is that market value reflects the valuation of market participants over the firm's value as made up of assets in place and intangible growth options. Since net tangible assets is an indicator of assets in place, the MTBV ratio must capture the growth aspect. Nevertheless, this argument only holds for the cases where MTBV is greater than unity. When MTBV is less than unity, the value that market participants place on the firm is less than the value of its assets in place. This is most likely to happen when a firm is experiencing financial difficulties. To this end, MTBV can also capture the probability of a firm encountering financial distress. In light of this interpretation, the negative relationship that we found between MTBV and the use of derivatives lends support to the financial distress argument. Specifically, when a firm experiences financial distress as indicated by a low MTBV, it is more likely to use derivatives. However, financial distress may not be the only explanation for a low MTBV. For example, a low MTBV may indicate that assets are being used inefficiently or that a number of assets are yet to be written down.

The Tobit results further suggest that the managerial utility maximization notions underlying the hedging decision, although theoretically sound, have little power in explaining the extent of derivative usage in our sample. We observe an insignificant relationship between the extent of derivative use and executive option holdings. Moreover, contrary to managerial incentive theoretical predictions, namely that having a larger equity stake in the firm would give managers an incentive to endorse an extensive hedging program; we find a negative relationship between executive shareholdings and the extent of derivative use.

Our inability to identify managerial influences behind the derivative decision suggests that the managerial labor market in Australia is quite competitive, such that the risk of being a poor performer far outweighs the return derived from altering the use of derivatives/hedging program. It further indicates that the risk-return payoff in the Australian managerial market might be different from that in the US where managerial compensation may have an impact on the overall hedging policy of the company.

Finally, the Tobit regression produces mixed results with regard to the two control variables: number of block holdings and share dummy. While there is no observable relationship between the share dummy variable and the extent of derivative use, the block holding variable suggests (contrary to theory) that a firm which has more substantial outside shareholders has a greater likelihood of 'hedging' more extensively.

3.4 Robustness Checks[10]

3.4.1 The Impact of Outliers The general concern about the potential impact of outliers on regression results is (justifiably) pervasive throughout the empirical literature. In the current setting there are two cases that we wish to highlight and comment upon, namely: (1) the notional value of derivative use; and (2) the measure of managerial shareholdings.

With regard to the proxy that we use to measure the extent of derivative use, recall that for 47 observations across our sample; the notional amount of the derivative contracts is in excess of the firm size. In these cases, the observations were restricted to 100% indicating that these firms use derivatives at a maximum level. A concern relates to whether this censoring has an undue bearing on our empirical analysis.[11] We have investigated this issue by removing these outliers from our sample and the rerun regression shows that the thrust of our reported results above is qualitatively unchanged. In particular, leverage and dividend yield still appear to be the most important factors in determining how extensive firms use derivatives. We further find that, in the absence of the outliers, liquidity is negatively related to the extent of derivative use.

With regard to managerial shareholding, recall the puzzling negative relationship between the extent of derivative use and executive stock holdings (table 7). Notably, Haushalter (2000) also finds a similar negative relationship—a result that he attributes to the impact of outliers. In our sample, extensive derivative users also tend to be those who have low managerial stock ownership. One indication of this is as follows—out of the 47 firms in our sample whose measure of the extent of derivative use exceeds 100%, around two-thirds have less than 1% of managerial equity ownership—which is considerably less than the average executive holding across our sample of 11%. To formally address this issue further (in unreported results) we reran our Tobit regression that included two interactive dummy variables on the executive shareholding factor. One dummy variable captured the non-user firms while the second captured firms with a notional value of 100% or more. In this supplementary analysis, the same basic negative relationship continued to be observed. Hence, while this negative relationship is robust, it remains a puzzle that is worthy of future research effort.

3.4.2 The Impact of Property Trusts In the Tobit analysis of table 7, there is a concern that the inclusion of property trusts may confound the results regarding the significantly positive role of the dividend variable since, more often than not, property trusts pay out all their earnings, after management fees, as dividends.[12] To

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10. This section outlines and discusses an extensive range of robustness checking that we conducted. To conserve space we do not report details of the results but such details are available upon request.
11. We gratefully acknowledge an anonymous referee for drawing this issue to our attention.
12. We gratefully acknowledge an anonymous referee for drawing this issue to our attention.

address this concern we excluded property trust companies from the sample and reran the regression. The results of this sensitivity analysis (not reported here), however, are qualitatively the same as those reported in table 7. Therefore, we are confident that our findings are not affected by the inclusion of property trust companies.

3.4.3 The Use of an Alternative Growth Proxy The negative role for MTBV relating to the extent of derivative use by firms has already drawn considerable discussion above. Among other things, this puzzling outcome raises legitimate concerns that MTBV is a flawed proxy for corporate growth options. In a supplementary analysis to address this concern, we have also used the Price Earnings Ratio (PER) as an alternative measure of growth options.[13] Interestingly, the rerun Tobit regression results produce an insignificant relationship between the extent of derivative use and the new growth proxy (PER). While this suggests that MTBV may well capture an element of the 'financial distress' effect, it confirms (at least for our sample) that the 'underinvestment' hypothesis (as manifested in growth options) is not supported.

3.4.4 Allowing for Industry Effects One of the characteristics pertaining to samples taken from the Australian market is that there is a relatively high proportion of companies who belong to the mining or resources sector of the economy. It is believed that companies in different industry sectors are likely to engage in different hedging practices and thus utilize different levels of derivative instruments.[14] For example, gold mining companies are normally perceived as 'riskier' compared to industrial firms and thus tend to hedge more extensively. For this reason, there are several studies that focus on a single industry with a view to identifying the specific hedging behaviour peculiar to that industry. Tufano (1996), for example, looks at the US gold mining industry, whereas Haushalter (2000) studies the oil and gas industry.

As a further robustness check—this time to determine whether hedging practices (as reflected by derivative use) of resource companies differ from that of industrial firms—we incorporate a dummy variable specification into our analysis. Specifically, we define a dummy variable equal to unity if the firm belongs to the resource sector and zero otherwise and then apply it interactively with all variables in the Logit and Tobit analyses.[15] Our results (not reported) show that for our sample, as far as the decision to use derivatives is concerned, resources and industrials firms do not portray any significant differences (at the 5% level). In other words, the variables carry similar strength in determining whether a firm uses derivatives or not across the two broadly defined industry sectors. However, when it comes to the extent of derivative usage, there are differences in the role of dividends, executive options and block holdings.

First, the results regarding dividends show that dividend yield is not a significant factor in determining the extent of derivative usage in the resources sector and, therefore, that the overall result is driven by industrial sector firms.

13. The choice of PER as an alternative growth proxy follows others in the literature—for example, Berkman and Bradbury (1996) and Gay and Nam (1998).
14. We gratefully acknowledge an anonymous referee for drawing this issue to our attention.
15. Providing a detailed examination of each individual industry is beyond the scope of this paper—in part due to small sample constraints.

Second, it is suggested that executive option holdings is significantly positively related to the extent of derivative usage in industrial firms (contrary to theory) and that the overall insignificance pertaining to this variable reported earlier, largely reflects the weak relationship between executive option holding and the extent of derivative usage in the resource sector. Third, similar to the case of dividends, the block holding factor does not have a significant role in determining the extent of derivative usage in the resources sector and, therefore, the overall significantly positive result for this variable (table 7) is also driven by industrial sector firms.

3.4.5 Allowing for Differential Year Effects Our main set of results are based on a pooled cross-sectional analysis involving two separate years—1999 and 2000. As there is no guarantee that the assumption of intertemporal stability is warranted, we conduct a final robustness check of this issue. Specifically, (similar to the previous section) we incorporate a dummy variable specification into our analysis as follows—we define a dummy variable equal to unity if the observation belongs to 2000 and zero otherwise and then apply it interactively with all variables in the Logit and Tobit analyses. In doing so, we discover that generally, the role of the dependent variables in determining the use and extent of usage of derivatives remains consistent over the two-year period. Two exceptions—the role of MTBV and executive stock holdings—relate to the Tobit analysis of explaining the extent of derivative usage. First, we find that the negative relationship between market to book value and derivative usage in the results of the pooled regression is driven by the 1999 data.[16] Second, we find that the negative role of executive stock holdings observed in the pooled analysis is driven by the 2000 data. In both cases these yearly fluctuations would lead us to discount their statistical significance as a statistical artefact.

4. Conclusions

The primary focus of this paper is to ascertain what factors are important: (a) in inducing the decision to use derivatives; and (b) in determining the extent to which derivatives will be used. Specifically, these research questions are investigated for a pooled sample of Australian companies over two separate years—1999 and 2000. The results show that leverage (proxying the role of financial distress costs), firm size (financial distress and setup costs) and liquidity (proxying the role of financial constraints in the underinvestment hypothesis) are the most important factors in influencing the likelihood that a firm will use derivatives. Similarly, leverage proves to be the most powerful determinant of the extent to which a firm will use derivatives followed by the dividend payout ratio (proxying hedging substitutes). Further, we fail to identify pervasive managerial influences behind the derivative decision.

The overall results strongly support the firm value maximization hypotheses. It appears that derivatives are most often used to reduce the expected cost of financial distress and to minimize periodic cash flow variations. Our findings also support the role of the dividend decision as a substitute for corporate hedging. The regression results with respect to the market to book value variable, however, show

16. We thank an anonymous referee for alerting us to this possible explanation of the puzzling role of the MTBV variable in our analysis.

an apparent contradiction with theory. Specifically, instead of being an incentive to the derivative use decision, the presence of growth opportunities as captured by the market to book value, based on the pooled analysis, has a negative effect on the extent of derivative use. However, in a robustness check it is found that the negative relationship is being driven by the 1999 data. In a range of additional sensitivity analysis we find that the thrust of the conclusions stated above are robust.

If hedging is costless and executing a corporate hedging program to accommodate the poorly diversified nature of managerial wealth does not impose any cost on the firm then it would not make a difference whether derivatives are used with a view to maximising shareholders' value or maximising managerial utility. Nevertheless, hedging is in fact costly in terms of both the direct transaction costs and the higher level of risk the firm would be exposed to should derivatives be used for reasons other than to hedge an existing exposure. As a result, risk management programs set up to reduce private managerial risks are undesirable from the shareholders' point of view. What drives managers away from the temptation to use the firm account to hedge their personal risk is most likely the competitiveness of the executive market. Such competition ensures that behaviour resulting in a reduction in shareholders' value is minimal. Our findings suggest that in the Australian context, managers do act in the best interest of the shareholders' and, as reflected by the derivative decision, engage in hedging programs that are value enhancing.

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