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Abstract

This paper investigates the relationship between the use of financial derivatives and firm value in the Australian setting. Contrary to expectations, we find that the use of derivatives in general, and the use of interest rate derivatives in particular, are negatively related to firm value (as proxied by Tobin's Q). The existence of this derivative user 'discount', combined with strong prior evidence that corporations are primarily motivated by value-enhancing goals, suggests a need for managers to focus serious efforts into explaining their value-driven strategies to the financial market and to do so in a timely manner.

1. Introduction

The literature over the last few decades, surrounding the role of risk management as an important arm of corporate policy, suggests that the use of financial derivatives can be a value enhancing activity. Several studies have provided evidence that risk management programs undertaken by corporations are generally not influenced by managerial motives to maximize their personal wealth through the firm's hedging activities, but are guided by value enhancing motives. In the Australian context, see for example, Nguyen and Faff (2002), Berkman, Bradbury, Hancock and Innes (2002) and Heaney and Winata (2005). While substantial research effort has been devoted to ascertaining whether firm hedging behaviour is consistent with one hedging theory or another, little research outside of the US has been undertaken to document the direct relationship, if any, between firm value and the use of financial derivatives.

Accordingly, in this paper we extend the literature by testing the hypothesis of whether the use of financial derivatives by Australian firms is rewarded by a higher market value. This research question is of particular interest as on the one hand, some recent authors suggest that corporate use of derivatives may not be sufficient to achieve economic importance (Guay and Kothari, 2003), while on the other hand a value premium has been associated with the corporate use of these instruments (Allayannis and Weston 2001, Carter, Rogers and Simkins 2006). Using a simple measure of Tobin's Q as a proxy for (relative) firm value, we thus provide a thorough examination of the impact of the use of financial derivatives and the extent of such usage on firm value for a sample of Australian publicly listed companies over the period of 1999 – 2000.

We choose to examine this important research question in the context of Australian corporations for a range of reasons. First, there has been an increasingly prevalent use of financial derivatives in Australia over recent times. While figures on over-the-counter transactions are not available, the volume of contracts being traded on the Sydney Futures Exchange has recorded a continuous growth in the last few years.[1] Second, unlike most other developed nations, Australia has a strong resources corporate sector which explains a large dollar value of commodity derivative contracts. The differing pattern in the types of derivative instruments that are used may very likely have an impact on the relationship between firm value and derivative usage.

Third, the US Financial Accounting Standards Board has made significant progress in devising accounting standards that govern the disclosure of derivative information. In particular, FASB 133 – Accounting for Derivative Instruments and Hedging Activities was first issued in June 1998 in the US and required US corporations to recognize all financial derivatives including embedded financial derivatives in the balance sheet. In contrast, up to 2006, the presentation and disclosure of derivative usage in Australia, as governed by AASB 1033, only require derivatives holding to be reported in the Notes to the Financial Statements if the amounts are material.[2] There is also a certain degree of inconsistency in the nature of the reported derivative information. For example, some Australian corporations report the gross value of derivative contracts while some others only report the fair value of their derivative positions. Additionally, the reported figures reflect the balance at the time of reporting and inferences cannot be made about derivative positions that are undertaken during the year and subsequently closed out before the reporting date. This relatively poor reporting practice makes it difficult for users of financial statements to assess the overall risk profile of the reporting entity.[3] As a result, during our sampling period, Australian investors appear to

[1] According to the Sydney Futures Exchange Annual Volume Report (2005), the total number of contracts being traded increased by 5% in 2000, 14.6% in 2001, 1.1% in 2002, 23.5% in 2003, 20.4% in 2004 and 18.1% in 2005.

[2] In line with development of global accounting standard governing firms' disclosure of derivative holdings, the Australian Accounting Standard Board (AASB) introduced ASSB139 in 2004 for adoption in 2005. AASB139 provides a framework for derivative instruments to be recognized and measured. In particular, all derivatives instruments are recognized as assets or liabilities at fair value.

[3] However, this problem is not exclusive to Australia. Derivative holdings are reported at year end and as such they are a stationary rather than a dynamic measure.

face a higher degree of information asymmetry with regard to corporate use of financial derivatives as opposed to their US counterparts. As such, lessons can be drawn from the Australian case that will be relevant and applicable in other similar settings around the world. Finally, due to the small size of the domestic financial markets, Australian corporations are more reliant on foreign currency denominated debt as a source of financing which exposes such companies to foreign exchange rate risk that is an obvious target for hedging with financial derivatives.[4]

In direct contrast to the prediction that the use of derivatives is associated with a 'hedging premium', our findings suggest that if anything financial markets that are more prone to information asymmetry impose a 'discount' on derivative users. Specifically, as a group, derivatives users appear to have a lower Tobin's Q, compared to their non-user counterparts. When partitioning aggregate derivative use into interest rate, foreign currency and commodity derivatives, we find that the hedging discount is mostly related to the use of interest rate derivatives (IRD). Both the incidence and the extent of IRD usage are associated with a lower firm value. The results relating to commodity derivatives (CD), on the other hand, are not robust to the inclusion of the control variables. Notably, the use of foreign currency derivatives is not found to have any discernable impact on firm value, although there is some suggestion that an increase in the extent of foreign currency derivative usage is related to a lower Tobin's Q.

We also investigate the robustness of our findings by analysing particular sub-samples of firms that are more likely to have significant exposures to: (a) exchange rates (firms with foreign sales); (b) interest rates (firms with long-term debt); and (c) commodity prices (resources firms). Our results are quite robust in that the use of IRD is generally not value

[4] Nguyen and Faff (2006) reported that 18.71% of their Australian sample has foreign currency denominated debt in the capital structure and 90 % of this debt is denominated in USD. Furthermore, while a majority of US firms (70%) has a foreign debt to total debt ratio of less than 20% (Kedia and Mozumdar, 2003), the comparable figure for Australian firms is 55% with a foreign debt ratio less than 20% (Nguyen and Faff, 2006).

enhancing. However, we do find some evidence that the use of commodity derivatives by resources firms is viewed favourably by the market, although its economic significance is questionable. Nevertheless, this finding is important for a resource-based economy like Australia.

Our limited success in establishing a relationship between the use of foreign currency derivatives and firm value, contrasts Allayannis and Weston (2001) who reported that the use of these instruments among a sample of 720 large US non-financial firms has a positive impact on firm value.[5] They documented a hedging premium of 4.87% of firm value for firms with positive foreign sales. Our finding of a hedging discount seems even more paradoxical given the background of prior Australian evidence that corporations are primarily motivated by value-enhancing goals. Nevertheless, the value enhancing property of financial derivatives is still an empirical debate as more recent research have suggested that the potential relationship can be either insignificant (Lookman 2004; Jin and Jorion 2006) or negative (Callahan 2002).

One plausible explanation of the negative relationship between derivative usage and firm value is that Australian investors predominantly face a certain degree of information asymmetry with regard to corporate usage of financial derivatives. Corporate hedging is potentially an indicator of information asymmetry due to the firm specific nature of the hedging program. First, each firm has a unique exposure profile which is a function of their underlying operating and financing activities, and second different hedging techniques are available to manage different types of risks. Information concerning the amount and timing of exposure are privileged to the firm in most cases. Additionally, details regarding one firm's hedging program has little informational value to investors in an attempt to evaluate another firm's hedging program. For example, knowledge regarding Coles Myer's usage of IRDs

[5] It is uncertain, however, whether the use of interest rate and commodity derivatives by US corporations would lead to an increment in firm value as Allayannis and Weston (2001) only consider the use of foreign currency derivatives in their study.

provides little insight into the risk management program of its close competitor David Jones. On the one hand, David Jones may choose to finance its business differently, thereby exposing itself to a different type and degree of interest rate risk. On the other hand, it may choose techniques other than IRDs to hedge interest rates. Consequently, unless firms clearly communicate to market participants the nature and extent of their underlying exposures, the timing and magnitude of their derivative positions, investors are likely to face a certain degree of information asymmetry.

Notably, the current Australian reporting standards provide limited information about firms' underlying exposures and no information about the timing of derivative positions. As such, it seems that Australian investors are unable to make an informed judgement of whether firms (in principle and/or actuality) truly use derivatives for hedging purposes. They, therefore, place a discount on the value of derivative users although from a corporate viewpoint, these risk management strategies may aim at delivering an increment in shareholders' value. Accordingly, there is an important implication of our results to corporate management, namely, to seriously consider better 'selling' and credibly explaining derivative strategies so that their shareholders and investors generally fully appreciate the potential value add of such actions. Of course, many firms will intentionally wish to suppress such information in order to minimise advantage being given to their competitors. To the extent that this is of concern, our evidence gives some measure of the 'opportunity cost' attached to remaining 'secretive' about derivative activity.

The remainder of this paper is structured as follows. In the next section, we provide a brief literature review on risk management and the use of financial derivatives. Section 3 describes our data and outlines the variables employed. Section 4 reports and discusses the results. Finally, a conclusion is offered in Section 5.

2. Review of the Literature

Although the empirical evidence has generally been mixed, prior research provides a reasonably good understanding of the reasons underlying the use of financial derivatives. Nance, Smith and Smithson (1993) and Graham and Smith (1999), for example, provide evidence in support of the tax incentives to hedge. The stance that firms hedge in response to the threat of financial distress is also widely supported. Dolde (1995), Haushalter (2000), Berkman and Bradbury (1996) and Tufano (1996) all find some evidence that firm leverage is associated with a greater likelihood that a firm will make use of derivative instruments and/or a higher intensity of usage. As far as the underinvestment hypothesis is concerned, empirical results regarding the relationship between hedging and liquidity appears to be more consistent than any other hypothesis. Apart from Berkman and Bradbury (1996) who fail to document such a relationship, all major studies report that high liquidity is significantly related to a lower incidence of derivative usage and/or more gentle usage intensity. The relationship between the use of derivatives and the existence of growth options, on the other hand, is controversial. While Geczy, Minton and Schrand (1997) and Dolde (1995) find a positive relationship between growth and the likelihood of hedging, Mian (1996) and Marsden and Prevost (2005) report the converse relationship.

However, the most striking characteristic of corporate hedging, as documented in many existing studies, is an underlying value enhancing motive.[6] With the exception of Berkman and Bradbury (1996) and Tufano (1996) who provide some evidence that corporate risk management is influenced by poorly diversified managers who hedge on the firm account to maximize their personal wealth, numerous studies suggest that such managerial behaviour is generally non-existent (Geczy, Minton and Schrand 1997, Haushalter 2000). In Australia, Nguyen and Faff (2002) find no evidence of managerial risk aversion influencing the decision

[6] It can be argued that there are certain costs associated with hedging. However, for the purpose of analysing the value enhancing property of financial derivatives, we assume that hedging costs remain constant.

to use financial derivatives. Studies undertaken using UK data also suggest that corporate usage of derivatives is to offset risk (Hardwick and Adam, 1999) and to minimize the impact of foreign exchange fluctuations on cash flow from operations (Joseph and Hewins, 1997; Mallin, Ow Yong and Reynolds, 2001).

The potential value-enhancing role of financial derivatives is also supported by other studies that reach a consensus that the corporate use of financial derivatives is for hedging purposes. Allayannis and Ofek (2001) report that exchange rate exposure is significantly reduced via the use of foreign currency derivatives in a sample of US firms. Crabb (2002) also concludes that corporate hedging successfully mitigates exchange rate exposure. By looking at the risk level resulting from the use of financial derivatives, Guay (1999) and Hentschel and Kothari (2001) lend further support to the argument that firms use derivatives to hedge. They provide evidence that such usage does not appear to expose firms to an excessive level of risk, which is likely to result from speculative activities.

To our knowledge, in the first published paper that investigates a direct relationship between firm value and the use of financial derivatives, Allayannis and Weston (2001) report that the use of derivatives is indeed value enhancing as foreign currency derivative users in their sample enjoy a hedging premium of around 4.87% of firm value. In a more recent paper that focuses on the airline industry, Carter, Rogers and Simkins (2006) support the finding of Allayannis and Weston (2001) and report a hedging premium associated with fuel hedging of 14%. Nevertheless, Lookman (2004) and Jin and Jorion (2006) examine the risk management practices of U.S. oil and gas producers and fail to find a significant relationship between commodity derivatives and firm value. Additionally, Callahan (2002) investigated a sample of North American gold mining firms and reported that there is a negative correlation between the extent of gold hedging and the performance of firm stock price.

In the current paper, we aim to provide an out of sample extension by testing the cross-country generalisability of Allayannis and Weston's (2001) result using a sample of Australian firms. Moreover, we extend the literature by including tests beyond a foreign currency derivatives (FCD) focus, namely to also separately investigate interest rate derivatives (IRD), commodity derivatives (CD), as well as an aggregate measure of all derivatives instruments.

3. Data and Methodology

3.1 Data

Our sample is selected from the Connect4 database that covers the 500 largest Australian firms listed on the Australian Stock Exchange (ASX). Consistent with many previous studies that establish the role of financial firms as the market makers/dealers in the derivative market, we choose to focus on analysing firm market value of non-financial firms only. Property Trusts and Investment and Financial Services providers are however included in the sample as they tend to be end users of derivative products. As an initial step, we study the Notes to Financial Statements of each individual firm to classify a company as either a derivative user or non-user.[7] In cases where there is no reference to derivative activities, the firm will be classified as a non-user. For every derivative user, the total notional value of all derivative contracts is used to proxy how active that user is in the derivative market. On average, sample firms have an extent of all derivative usage of 45.29%, FCD usage of 9.84%, IRD usage of 8.90% and CD usage of 20.67%.[8]

[7] The accounting standards governing the disclosure of financial derivatives during the sampling period require that public companies disclose off-balance-sheet financial instruments in their Notes to the Financial Statements. As a result, a company can be identified as a derivative user if it reports the use of any of the following instruments: options, swaps and futures/forwards.
[8] Although being used by approximately 18% of all derivative users, commodity contracts show a huge contracting value, representing almost 83% of the value of total derivative holdings by the sample firms. This explains a high average usage of commodity derivatives and represents a distinct characteristic of our sample compared to US studies.

The sample obtained from Connect4 was then articulated with the Datastream database to obtain data on the market value of equity. This procedure produces a final sample that consists of 428 firm/year observations, of which 217 observations relate to 1999 and the remainder to 2000.

3.2 Variables

3.2.1 Dependent Variable

Our dependent variable is firm market value, as proxied by a simple type of Tobin’s Q measure. Specifically, this simple Tobin’s Q measure is calculated as the sum of total liabilities and market value of equity divided by total book assets. Market value of equity is obtained from Datastream while the book value of assets and liabilities are taken from firm financial reports as recorded by Connect4. In undertaking this exercise we assume that the market value of liabilities is equal to the book value. We choose to use a simple Tobin’s Q as opposed to a more complex Tobin’s Q (for example, as measured in a fashion described by Lewellen and Badrinath, 1997, and/or Perfect and Wiles, 1994) for two main reasons. First, simple Tobin’s Q has been shown to be highly correlated with more complex Tobin’s Q proxies, the measurement of which requires an estimation of the replacement costs of assets. Allayannis and Weston (2001), for example, report that the correlation coefficient between simple Tobin’s Q and complex Tobin’s Q is 0.93, while Daines (2001) suggests that similar results are obtained using a simple Tobin’s Q and one constructed using the Perfect and Wiles (1994) approach. Second, simple Tobin’s Q does not require a large data input and has been used widely as an effective measure of firm value (Lemmons and Lins 2003; Daines, 2001). Moreover, replacement cost data is not available for Australian firms making the calculation of Tobin’s Q impossible. As a result, simple Tobin’s Q has been a popular measure used to proxy for firm value in previous Australian studies (Farrer and Ramsey 1998).

3.2.2 Independent variables

The main independent variables that we use in our tests are measures of whether a firm uses financial derivatives or not and in the case of a user, the extent to which derivatives are used. To proxy for the incidence of derivative usage, we use a dummy variable which equals unity if a firm uses at least one form of financial derivative and zero otherwise. The extent of usage is calculated as the total notional value of derivative contracts scaled by firm size where firm size is defined as total book assets. We also partition the aggregate use of financial derivatives into FCD, IRD and CD usage and develop a dummy variable for each type of derivative. The extent of FCD, IRD and CD usage is defined as the total notional amount of FCD, IRD and CD contracts outstanding, respectively, scaled by total assets.

3.2.3 Control Variables

To identify the impact of financial derivatives on firm value, we consider a number of factors that have been documented in the literature. These control variables are described below:

a. Firm Size: Although the relationship between firm size and firm value is ambiguous, it is a common practice to include firm size as a control variable (Daines, 2001; Carter, Simkins and Simpson, 2003; Lang and Stulz, 1994). There is some evidence indicating that firm size is negatively related to firm value (Daines, 2001; Allayannis and Weston, 2001). To proxy for firm size, we use the log of total assets.

b. Leverage: Titman and Wessels (1988) suggest that capital structure may have an impact on firm value. An excessive level of debt will increase the threat of financial distress and thus lead to a decline in firm value. Similarly, Rees (1997) reports a negative relationship between total debt and value in a UK sample. To account for the effect of leverage, we use the ratio of long term debt to total assets.

c. Liquidity: Hedging theories predict that firms with ample internal funds can avoid the cost of raising external funds to undertake positive NPV projects. As a result, liquidity is expected to be positively associated with firm value. We use the ratio of corporate cash and cash equivalents holding to total assets as a proxy for a firm's liquidity.

d. Profitability: Following Allayannis and Weston (2001), we control for profitability by including the return on assets (ROA) variable. ROA is calculated as the ratio of net profit after tax and before abnormal items to total assets.

e. Growth: Prior research (Smith and Watts, 1992; Yermack; 1996; Sougiannis; 1994; Green, Stark and Thomas; 1996) suggests that firm market value is a positive function of a company's future investment opportunities. Following the procedure adopted in Yermack (1996), we use capital expenditure as a measure of the availability of investment opportunities. For consistency, we scale capital expenditure by total assets.

f. Industrial Diversification: To control for any 'diversification effect', we include in our regressions an 'industry segment' variable. This variable indicates the number of industrial segments in which the firm operates. In our sample, 63.08% of firms operate in no more than one industrial segment. On the other hand, only 7.24% of firms operate in more than five industrial segments.

g. Geographical Diversification: In contrast to industrial diversification, geographical diversification has been argued by Carter, Panzalis and Simkins (2001) to be value enhancing. Generally, firms with a widespread network across countries are more capable of setting up operational hedges to manage long-term economic exposure. We measure the degree of geographical diversification among our sample firms by the ratio of foreign sales to total sales (FSTS). Approximately 37.6% of our sample firms have positive foreign sales.

h. Managerial Ownership: According to Morck, Shleifer and Vishny (1988), firm value, as measured by Tobin's Q, is positively related to managerial ownership. We measure managerial ownership as the percentage of shares held by directors and executive officers.

A summary of the variables being used in our study is provided in Table 1.

4. Findings

4.1 Basic Regression Results

A potentially important issue that may impact our chosen research design is the possible endogeneity across our variables. That is, a number of control variables can be thought of as potentially jointly determined with various types of derivative usage. We have a two-pronged attack regarding this endogeneity issue. Our first response is more indirect and basically recognises that in the event of a number of control variables being jointly determined with various types of derivative use, a multicollinearity problem is induced since all these variables are explanatory variables. To test for the potential impact of multicollinearity, we run the basic regression model with derivative usage and extent of usage as the only explanatory variables:

$$TobinQ_i = a_1 + a_2 DevUse_i + u_i \quad (1)$$

$$TobinQ_i = b_1 + b_2 ExtentUsage_i + \pi_i \quad (2)$$

where *TobinQ* is the proxy for firm value and calculated as the sum of total liabilities and market value of equity divided by total assets; *DevUse* is a dummy variable equal to unity if a firm uses financial derivatives and zero otherwise; and *ExtentUsage* is the ratio of the notional value of derivative contracts to firm size.

We then include the control variables to explain the variations in Tobin's Q that can not be explained by the derivatives variables. In particular, we estimate the following general equations:[9]

$$TobinQ_i = \alpha_1 + \alpha_2 DevUse_i + \sum_{i=1}^{n} \alpha_{i+2} \mathrm{X}_i + \delta_i \tag{3}$$

$$TobinQ_i = \beta_1 + \beta_2 ExtentUsage_i + \sum_{i=1}^{n} \beta_{i+2} \mathrm{X}_i + \theta_i \tag{4}$$

where X_i is a vector of the control variables. The control variables include: firm size, liquidity, leverage, ROA, growth, industry segments, FSTS, managerial ownership. The definitions of these variables can be found in Table 1.

Returning to the issue of endogeneity, we engage the second arm of our response in the context of these more fulsome models. Specifically, to address the potential problem of endogeneity where there is reverse causality between Tobin's Q and the control variables we conducted a Hausman (1978) test. In particular, we regressed the suspected endogenous variable on its lag and the residuals from this regression are used in the main regression to detect endogeneity. Since it is not obvious which control variable would suffer from endogeneity, in unreported results we conduct the test for all control variables. Most notably, the results show that in all instances, the coefficients associating with the residual variables are not statistically significant. We can therefore confidently conclude that the results of our regression models (3) and (4) are not affected by endogeneity.[10]

We also test for the potential impact of the use of each type of financial derivative on firm value by replacing the aggregate derivative dummy with dummy variables representing

[9] In the context of linear information dynamics, if financial derivatives are employed to alter the risk profile of a firm, pooling the data across users and non users can cause a model mis-specification by forcing the coefficients to be equal when, in fact, they are not (Ohlson, 1989). Accordingly, we investigated this issue by estimating versions of our model that include a full set of interactive dummy variable terms to distinguish users from non-users. Notably, very few of these terms were found to be statistically significant and, where they were, no distinct pattern was evident – consistent with spurious significance. As such, this justifies the use of the parsimonious version of our model as reported in the paper.

[10] Details, while suppressed to conserve space, are available from the authors upon request.

the use of individual derivatives, namely FCD, IRD and CD. The results of all these regressions are presented in Panels A and B of Table 2.

The most important finding evident from Panel A of Table 2 is that, instead of having a positive impact on firm value, the use of financial derivatives in our sample firms is associated with a statistically significant reduction in firm value. In contrast to many empirical findings that support the value-enhancing role of financial derivatives, our results show that the market has a negative perception towards firms that use derivatives and discount the value of the firm accordingly. Nevertheless, a more detailed examination reveals that the hedging discount is related to the use of IRD and CD while the use of FCD appear to bear little statistical relationship to firm value.

It should also be noted that the hedging discounts reported for IRD, CD and aggregate users are not only statistically significant but also economically important. On average, a derivative user has a Tobin's Q which is lower than that of non-user by a magnitude of 0.39 while a IRD user (CD user) show a lower Tobin's Q of the magnitude of 0.35 (0.21). Although this result does not suggest that the use of derivatives *leads* to a 39% reduction of firm value, it indicates that derivative users have a firm value which is approximately 25% lower than that of derivative users (based on an average Tobin's Q across our sample of around 1.5). In the presence of control variables the results, as reported in Panel B of Table 2, show that the value destroying relationship between aggregate users and IRD users remain, however, with a lower degree of economic significance. The use of derivatives is associated with a lower Tobin's Q of the magnitude of 0.271 which is equivalent to 18% hedging discount (again relative to an average Tobin's Q of 1.5). Additionally, we notice that the value harming property of financial derivatives appears to be mostly attributable to IRD, as the coefficients on the FCD and CD variables are not statistically significant. It appears that our evidence of a hedging discount is robust and that the degree of information asymmetry faced by derivative users is severe.

The results relating to the control variables as shown in Columns (1), (3), (5) and (7) of Panel B reveal that firm value is a positive function of firm size. This finding, while consistent with Yermack (1996), is in contrast to Allayannis and Weston (2001) who report that a larger firm is associated with a lower Tobin's Q. In contrast to our expectation of a positive relationship between liquidity and firm value, we find a thread of evidence that liquidity is negatively related to firm value. Despite a small coefficient, this result suggests that the market is concerned with possible managerial adverse actions driven by an agency motive in highly liquid firms. To lend further support to the role of financial leverage in affecting firm value, we find that leverage is negatively related to firm value. Intuitively, the market perceives a firm to be less valuable when it has more debt, possibly due to the threat of financial distress. Our finding, while qualitatively similar to Allayannis and Weston (2001), is more economically persuasive.[11] In contrast to our prediction that growth opportunities are associated with a higher firm market value, our regression results show that firms which spend more on capital expenditure have an inferior Tobin's Q. In a manner consistent with Lang and Stulz (1994), Panel A of Table 2 further suggests that the degree of industrial diversification appears to be hurting firm value while geographical diversification (proxied by foreign sales) has no impact on firm value. Finally, the positive association between managerial ownership and firm value suggests that managerial ownership is effective in aligning managerial interests to that of shareholders.

Interestingly, we fail to document a relationship between Tobin's Q and firm profitability (ROA). The independence of firm value from its profitability seemingly contradicts many US and UK studies that provide supporting evidence of a positive

[11] Allayannis and Weston (2001) found that the debt to equity ratio has a statistically significant impact on TobinQ in the pooled regression. However, the coefficient estimate of 0.000 suggests that in terms of economic significance, an increase or decrease in the leverage ratio hardly has any impact on firm value.

relationship. However, a closer examination of the data reveals that the lack of a significant relationship between firm value and ROA is mainly due to a small subset of the sample that consists of unprofitable firms. In particular, when the regressions are run on the sub-sample with positive ROA, the results show a strong positive relationship between firm value and ROA. For firms that are not profitable, Tobin's Q hardly improves when there is a marginal improvement in the relative negativity of ROA.[12]

Consistent with some UK studies that do not include a size variable in cross sectional regressions to explain firm value (Rees, 1997; Green, Stark and Thomas, 1996; Sougiannis 1994) we test the robustness of our results by excluding the size variable in our regressions. As can be seen from Columns (2), (4), (6) and (8) of Panel B, this model specification reduces the statistical significance of the results. However, our results are robust to the extent that the use and the extent of IRD usage are still found to be associated with lower market value. Generally, our results are quite robust across different settings. This suggests that market participants are largely consistent in the assessment of firm value after taking into account corporate use of financial derivatives.

In Panels C and D of Table 2, we extend the analysis by examining the potential relationship between the *extent* of derivative usage and firm value. The results, as presented in Panels C and D, are essentially similar to that of Panels A and B. Specifically, the extent of derivatives employed by firms is found to be value destroying especially in the case of IRD. Once again the coefficient on the extent of IRD usage variable is not only statistically but also economically significant. The relationships between Tobin's Q and the control variables remain qualitatively unchanged. In general, we find strong evidence that both the use and the intensity of usage of financial derivatives, especially IRD, have a negative impact on firm

[12] The results of these regressions are not reported to conserve space but are available from the authors upon request.

value. In short, the derivative user discount is a strong finding emanating from this stage of our analysis.

4.2 Extended Analysis

In this section, we continue to explore the relationship between derivative use and firm value by examining specific groups that are more likely to have significant exposure to particular financial risks than others. Specifically, we hypothesize that the use of derivatives is more likely to be value enhancing if firms use derivatives in a manner aligned to the type of exposure that they have. Consistent with this line of reasoning, we rerun Equation (1), allowing for the FSTS variable to be applied interactively with variables proxying for corporate use of FCD. Firms that have greater sales denominated in foreign currencies are expected to have a more inherent economic exposure to fluctuations in exchange rates. Assuming a hedging motive, the use of FCD should therefore be value enhancing for these firms. Specifically, we run the following regressions:

$$TobinQ_i = \alpha_1 + \alpha_2 FCDUse_i + \alpha_3 FCDUse_i * FSTS_i + \sum_{i=1}^{n} \alpha_{i+3} \mathrm{X}_i + \delta_i \qquad (5)$$

$$TobinQ_i = \beta_1 + \beta_2 ExtentFCD_i + \beta_3 ExtentFCD_i * FSTS_i + \sum_{i=1}^{n} \beta_{i+3} \mathrm{X}_i + \theta_i \qquad (6)$$

Definitions of variables are the same as in earlier models except that the control variables no longer include FSTS. We hypothesize that the coefficients on the interactive variables are positive.

Similarly, we test the hypothesis that the use of IRD is value enhancing for those firms that have greater inherent interest rate exposure. The interactive variables in this case are *IRDUse*Leverage* and *ExtentIRD*Leverage*. Finally, for the case of commodity derivatives, we use an interactive dummy variable that equals unity if a firm is a resources firm and zero otherwise. It is expected that resources firms are more exposed to fluctuations in commodity prices in the course of their business dealings and therefore, the use of CD should add value for these firms.

The outcome of these additional analyses is reported in Table 3 (noting that, to conserve space we do not report the coefficients on the control variables). According to the results presented in Panel A, the use of FCD continues to exhibit no statistical relationship with firm value. The coefficient on the interactive variable is neither statistically nor economically significant. The essence of this finding remains largely unchanged when we use a continuous variable, i.e. when *ExtentFCD* is used. These results reinforce our earlier findings that the use of FCD by Australian firms has no consequence for firm value.

Panel B reports results relating to the case of IRD. Generally, with the introduction of the interactive variable, we are able to show that the negative relationship remains robust. Moreover, the act of using IRD (but not the intensity of use) among firms with higher financial leverage seems to bring an extra valuation penalty. As such, we fail to find any evidence that the use of IRD leads to an increase in firm value for those firms that are believed to have a greater inherent exposure to interest rates. These findings strongly defy the value-enhancing role of IRD and suggest that firms are either using IRD in a non-productive way or that the market makes a mistake in under-valuing these risk management strategies.

Finally, in Panel C, we report the findings relating to the case of CD usage by resources and industrial firms. Our main finding is that for industrial firms both the use of CD and the extent to which CDs are used, is associated with an erosion of firm value. In contrast, the use and extent of usage of CD among resources firms has a neutral effect on firm value as the negative impact of the base variables are offset by the positive impact of the interactive variable. As such, while the use of CD by the subset of resources firms would have a very marginal impact on firm value, at least they seem not to erode value.

4.3 Robustness Check: Portfolio Analysis

In this section we aim to shed further light on the behaviour of Tobin's Q in response to changes in the extent of derivatives that corporations use by undertaking a portfolio analysis. Basically, portfolio analysis allows one to make conclusions regarding the firm value of each portfolio relative to a base case. For this reason, we also refer to our portfolio regression as 'fixed effects model' regression.

This econometric approach involves portfolio dummy variables which are constructed based on the intensity of derivative usage. Specifically, all derivative users are partitioned into decile portfolios according to their level of derivative use while all non-users are grouped into Portfolio 0. By construction, Portfolio 1 comprises the least intensive derivative users while Portfolio 10 captures the most intensive users. Table 4 presents the financial characteristics corresponding to the portfolios.

Most notably, we find that non-derivative users is the group that have the highest Tobin's Q. Portfolio 2 firms have the second highest Q and this measure generally declines as firms use more and more derivatives (Portfolios 2 to 10) to a minimum of 1.19 for the most intensive derivative users (Portfolio 10). While this declining pattern is not monotonic, our general observation is that firms are not rewarded with a higher market value as they use more and more financial derivatives. Additionally, the firms that belong to Portfolio 0 are the smallest, have the lowest degree of leverage, are least profitable, operate in the least segments but are the second most liquid and have the highest ratio of managerial ownership.

In Table 5, we present the results of our fixed effects regression (noting that, to conserve space we do not report the coefficients on the control variables).[13] Specifically, we estimate the following regression:

[13] The relationship between Tobin's Q and the control variables remain consistent throughout our empirical analyses. In essence, firm size and the degree of managerial ownership are value enhancing while liquidity, leverage, growth and industrial diversification all have a detrimental impact on firm value.

$$TobinQ_i = c + \sum_{j=1}^{10} \chi_j P_{i,j} + \sum_{i=1}^{n} \phi_i \mathrm{X}_i + \delta_i \tag{7}$$

where $P_{i,j}$ is a dummy variable taking the value of unity if firm *i* belongs to Portfolio *j* and zero otherwise; X_i is a vector of the control variables. These control variables include: firm size, liquidity, leverage, ROA, growth, industry segment, FSTS and managerial ownership.

In Table 5, we report the coefficient estimates and t-statistics for the case where the benchmark portfolio is Portfolio 0. The coefficient estimates of Portfolio 1 to 10 allow conclusions to be made regarding the marginal impact of further derivative use on firm value after taking into account the control variables. In other words, Tobin's Q of each portfolio is benchmarked against that of the base case portfolio being Portfolio 0. As can be gauged from the results, while being a low derivative using firm (Portfolios 1 and 2) does not seem to have a value impact, further derivative use is generally value destructive. In particular, there is evidence that firms belonging to Portfolios 3 to 10 have a Tobin's Q that is statistically lower than that of Portfolio 0 firms. Initially, the discount seems to generally rise with the extent of usage, reaching a peak of 0.6 units of Tobin's Q for Portfolio 6 (mean derivative usage of 19.3%). Beyond that the discount falls somewhat, down to around 0.35 units for Portfolio 10 (the highest derivative users in our sample), but notably remains statistically and economically important.

5. Conclusion

In this paper, we address the question of whether the use of financial derivatives among a cross section of Australian firms delivers a positive increment in firm value. In doing so, we investigate both the relationship between an aggregate measure of derivatives and firm value as well as the impact that individual types of derivatives potentially have on firm market value, as proxied by Tobin's Q.

Although many prior studies have suggested that the use of financial derivatives is value enhancing by taking advantage of many market frictions, we fail to find such a positive relationship between derivative use and firm value. Rather, our results strongly indicate that the use of derivatives in general and the use of interest rate derivatives in particular lead to a reduction in firm value or a ‘derivative user’ discount. The existence of such a discount appears to be robust to many alternative specifications including an analysis of the subsets of firms that are more likely to have inherent economic exposures to exchange rates, interest rates and commodity prices, respectively. Our portfolio analysis further shows that firms with a medium to high level of derivative usage tend to trade at a discount compared to firms that use a modest level of (or no) financial derivatives.

Our evidence suggests that Australian investors, possibly due to information asymmetry, are unable to make an informed judgement of whether firms (in principle and/or actuality) truly use derivatives for hedging purposes. As such, they place a discount on the value of derivative users although from a corporate viewpoint, these risk management strategies may aim at delivering an increment in shareholders’ value. Indeed, paradoxically, previous evidence provides strong support for the value-enhancing hypothesis. Accordingly, there is an important implication of our results to Australian corporate management, namely, to seriously consider ways in which they can better ‘sell’ and credibly explain derivative strategies (while maintaining any commercial sensitivities) so that their shareholders and investors generally fully appreciate how and to what extent such actions create shareholder wealth.

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Table 1
Variables Summary

Variable Name	Definition
TobinQ	The sum of total liabilities and market value of equity divided by total assets
Extent of Derivative usage	The total notional value of all derivative contracts scaled by total assets
Extent of FCD usage	The total notional value of all FCD contracts scaled by total assets
Extent of IRD usage	The total notional value of all IRD contracts scaled by total assets
Extent of CD usage	The total notional value of all CD contracts scaled by total assets
Size	Natural log of total assets
Liquidity	The ratio of cash and cash equivalents scaled by total assets
Leverage	Long term debt scaled by total assets
ROA	Profit after tax before abnormal items divided by total assets
Growth	Capital expenditure scaled by total assets
Industry Segments	The number of industry segments in which the firm operates
Foreign sales (FSTS)	The ratio of foreign sales to total sales
Managerial Ownership	The number of shares held by directors and executive officers scaled by the total number of shares outstanding

Table 2
Derivative Use and Firm Value

Panels A and C report the results of the following regressions, respectively:

$$TobinQ_i = a_1 + a_2 DevUse_i + u_i \quad (1)$$

$$TobinQ_i = b_1 + b_2 ExtentUsage_i + \pi_i \quad (2)$$

Panels B and D report the results of the following regressions, respectively:

$$TobinQ_i = \alpha_1 + \alpha_2 DevUse_i + \sum_{i=1}^{n} \alpha_{i+2} X_i + \delta_i \quad (3)$$

$$TobinQ_i = \beta_1 + \beta_2 ExtentUsage_i + \sum_{i=1}^{n} \beta_{i+2} X_i + \theta_i \quad (4)$$

Tobin's Q is the sum of total liabilities and market value of equity divided by total assets. DevUse is a dummy variable equalling unity if a firm uses derivatives and zero otherwise. ExtentUsage is the extent of derivative usage calculated as the total notional value of all derivative contracts scaled by firm size. X_i is a vector of the control variables: firm size, liquidity, leverage, ROA, growth, industry segment, FSTS and managerial ownership (defined in Table 1). Columns (2) to (4) in Panel A and Columns (3), (5) and (7) in Panel B report the results of Equations (1) and (3) with Derivative Use being replaced with a dummy variable equal to unity if a firm uses FCD, IRD or CD, respectively. Columns (2) to (4) in Panel C and Columns (3), (5) and (7) in Panel D report the results of Equation (2) and (4) with the Extent of derivative usage being replaced with the extent of FCD, IRD and CD usage, respectively. Columns (2), (4), (6) and (8) in Panels B and D report the results of Equations (3) and (4) with the size variable being excluded.

Panel A: Derivative Use and Firm Value

	Predicted Sign	(1)	(2)	(3)	(4)
Constant		1.8109[a]	1.5319[a]	1.6873[a]	1.5528[a]
Derivative Usage	+	-0.3883[a]			
FCD Usage	+		-0.0402		
IRD Usage	+			-0.3547[a]	
CD Usage	+				-0.2088[b]
R-squared		0.0341	0.0005	0.0397	0.0085

Panel B: Derivative Use and Firm Value with Control Variables

	Predicted Sign	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant		0.2197	2.4154[a]	0.1047	2.2692[a]	-0.1562	2.3234[a]	0.0548	2.264[a]
Derivative Usage	+	-0.2709[c]	-0.2070						
FCD Usage	+			-0.0634	-0.0110				
IRD Usage	+					-0.3117[a]	-0.1687[b]		
CD Usage	+							-0.0895	0.0085
Size	?	0.1718[a]		0.1675[a]		0.1938[a]		0.1698[a]	
Liquidity	+	-0.0051[c]	-0.0096[a]	-0.0038	-0.0084[b]	-0.0047[c]	-0.0094[a]	-0.0033	-0.0084[a]
Leverage	-	-0.0210[a]	-0.0194[a]	-0.0219[a]	-0.0202[a]	-0.0198[a]	-0.0189[a]	-0.0218[a]	-0.0202
ROA	+	-0.0013	-0.0013	-0.0032	-0.0004	-0.0018	0.0007	-0.0032	-0.0006
Growth	+	-0.0134[a]	-0.0188[a]	-0.0139[a]	-0.0192[a]	-0.0156[a]	-0.0205[a]	-0.0132[a]	-0.0193[a]
Industry Segment	-	-0.0647[b]	-0.0130	-0.0594[b]	-0.0115	-0.0609[b]	-0.0071	-0.0619[b]	-0.0121
Foreign Sales	+	-0.0004	0.0001	-0.0008	-0.0003	-0.0012	-0.0004	-0.0009	-0.0002
Man. Ownership	+	0.0055[c]	0.0028	0.0061[b]	0.0034	0.0061[b]	0.0031	0.0061[b]	0.0035
R-squared		0.4130	0.3478	0.4029	0.3411	0.4273	0.3491	0.4034	0.3411

Table 2 (cont.)

Panel C: Extent of Derivative Use and Firm Value

	Predicted Sign	(1)	(2)	(3)	(4)
Constant		1.5601[a]	1.5491[a]	1.5691[a]	1.5299[a]
Extent Der Usage	+	-0.0010[a]			
Extent of FCD	+		-0.0034[a]		
Extent of IRD	+			-0.0059[b]	
Extent of CD	+				-0.0007[a]
R-squared		0.0187	0.0156	0.0275	0.0058

Panel D: Extent of Derivative Use and Firm Value with Control Variables

	Predicted Sign	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant		0.1521	2.2443[a]	0.1194	2.2671[a]	0.1716	2.2887[a]	0.1398	2.2699[a]
Extent Der Usage	+	-0.0003[c]	-0.0005[b]						
Extent of FCD	+			-0.0003	-0.0005				
Extent of IRD	+					-0.0064[a]	-0.0072[a]		
Extent of CD	+							-0.0003	-0.0004
Size	?	0.1624[a]		0.1645[a]		0.1620[a]		0.1631[a]	
Liquidity	+	-0.0035	-0.0080[b]	-0.0037	-0.0084[b]	-0.0045	-0.0092[a]	-0.0034	-0.0079[b]
Leverage	-	-0.0219[a]	-0.0202[a]	-0.0219[a]	-0.0201[a]	-0.0200[a]	-0.0181[a]	-0.0220[a]	-0.0204[a]
ROA	+	-0.0035	-0.0006	-0.0036	-0.0006	-0.0027	0.0004	-0.0035	-0.0006
Growth	+	-0.0130[a]	-0.0174[a]	-0.0138[a]	-0.0187[a]	-0.0154[a]	-0.0206[a]	-0.0134[a]	-0.0180[a]
Industry Segment	-	-0.0605[b]	-0.0120	-0.0612[b]	-0.0120	-0.0584[b]	-0.0097	-0.0608[b]	-0.0121
Foreign Sales	+	-0.0009	-0.0003	-0.0009	-0.0002	-0.0012	-0.0006	-0.0009	-0.0003
Man. Ownership	+	0.0061[b]	0.0034	0.0061[b]	0.0033	0.0056[b]	0.0028	0.0062[b]	0.0035
R-squared		0.4035	0.345	0.4019	0.3415	0.4094	0.3509	0.4027	0.3471

[a] significant at 1% level
[b] significant at 5% level
[c] significant at 10% level

Table 3
Additional Analyses of the Relation between Derivative Use and Firm Value

Panel A reports the results of the following regressions:

$$TobinQ_i = \alpha_1 + \alpha_2 FCDUse_i + \alpha_3 FCDUse_i * FSTS_i + \sum_{i=1}^{n} \alpha_{i+3} X_i + \delta_i \quad (5)$$

$$TobinQ_i = \beta_1 + \beta_2 ExtentFCD_i + \beta_3 ExtentFCD_i * FSTS_i + \sum_{i=1}^{n} \beta_{i+3} X_i + \theta_i \quad (6)$$

Tobin's Q is the sum of total liabilities and market value of equity divided by total assets. FCDUse is a dummy variable equalling unity if a firm uses FCD and zero otherwise. ExtentFCD is the extent of FCD usage calculated as the total notional value of all derivative contracts scaled by firm size. FSTS is the ratio foreign sales to total sales. X_i is a vector of the control variables: firm size, liquidity, leverage, ROA, growth, industry segment and managerial ownership. Panel B focuses on IRDUse and ExtentIRD using Leverage as the interaction variable, while Panel C focuses on CDUse and ExtentCD using a Resources dummy variable as the interaction term. The coefficients on the control variables are suppressed to conserve space.

	Predicted Sign	Coefficient	t-stat	Coefficient	t-stat
Panel A: Foreign Currency Derivatives					
Constant		0.1043	0.2385	0.1608	0.3620
FCDUse	+	-0.0318	-0.3553		
FCDUse* FSTS	+	-0.0019	-1.3076		
ExtentFCD	+			-0.0008	-0.9294
ExtentFCD*FSTS	+			0.0000	0.9392
R-squared		0.4041		0.4023	
Panel B: Interest Rate Derivatives					
Constant		0.0207	0.0430	0.4103	0.8292
IRDUse	+	-0.0342	-0.2499		
IRDUse*Leverage	+	-0.0157[a]	-6.2101		
ExtentIRD	+			-0.0156[a]	-2.6911
ExtentIRD*Leverage	+			-0.0001	-0.8242
R-squared		0.3074		0.2484	
Panel C: Commodity Derivatives					
Constant		-0.0361	-0.0802	0.0679	0.1543
CDUse	+	-0.2319[b]	-2.0603		
CDUse*Resources	+	0.2220[c]	1.8884		
ExtentCD	+			-0.0043[a]	-2.9808
ExtentCD*Resources	+			0.0041[a]	2.8164
R-squared		0.4065		0.4064	

[a] significant at 1% level
[b] significant at 5% level
[c] significant at 10% level

Table 4
Portfolio Analysis – Financial Characteristics

This table reports the financial characteristics of portfolios constructed based on the extent of derivative usage. Portfolio 0 consists of non-derivative users while derivative users are divided into decile portfolios. By construction, Portfolio 1 is made up of the least intensive derivative users while Portfolio 10 comprises the most intensive derivative users. The F-stat is for an equality test between the means of the portfolios.

Portfolio	*n*	*Average Usage*	*TobinQ*	*Size*	*Liquidity*	*Leverage*	*ROA*	*Growth*	*Ind Seg*	*FSTS*	*ManOwn*
0	120	0.0000	1.8450	12.6440	11.2295	12.9857	2.2121	6.5099	1.5833	9.3826	14.9459
1	30	0.3563	1.7421	13.0309	5.2575	18.1506	4.4027	5.2711	1.9000	12.0587	7.2744
2	30	2.6726	1.7613	14.1333	5.9920	19.8168	6.6467	5.6331	1.8667	13.7806	11.2895
3	30	5.7116	1.6998	14.1180	5.5668	19.4847	3.9310	6.0404	2.4000	16.8788	13.4597
4	30	9.7425	1.4398	13.6425	2.5647	25.4727	5.2053	5.2708	1.6333	15.9583	6.5574
5	30	13.8754	1.4068	13.6991	3.4955	23.9778	5.7171	8.0893	1.8000	11.9836	4.3935
6	30	19.2750	1.1897	13.7176	3.8325	29.8863	4.6706	5.5982	1.8000	18.7328	6.1340
7	30	26.2763	1.1345	13.6775	4.7921	35.2444	4.5913	5.7207	2.0000	9.0456	8.6075
8	30	38.5304	1.1241	13.5919	6.1494	42.2148	4.7171	7.6465	2.4000	20.5537	6.2161
9	30	76.9158	1.1974	13.5707	5.2531	33.6257	4.1602	11.2985	1.9000	14.7747	6.4393
10	38	98.4357	1.1952	13.0378	11.4362	30.4752	4.3774	14.3972	1.6316	14.1669	6.1749
F-stat			5.1113	5.7533	2.6394	11.0206	0.9951	3.4577	1.3741	1.0527	2.2577
p-value			0.0000	0.0000	0.0040	0.0000	0.4468	0.0003	0.1896	0.3981	0.0141

Table 5
Derivative Use and Firm Value - A Fixed Effects Model

This table reports the result of estimating the following regression model:

$$TobinQ_i = c + \sum_{j=1}^{10} \chi_j P_{i,j} + \sum_{i=1}^{n} \phi_i X_i + \delta_i \quad (7)$$

where Tobin's Q is the sum of total liabilities and market value of equity divided by total assets; $P_{i,j}$ is a dummy variable taking the value of unity if firm *i* belongs to Portfolio *j* and zero otherwise and X_i is a vector of the control variables. These control variables include: firm size, liquidity, leverage, ROA, growth, industry segment, FSTS and managerial ownership. The coefficients on the control variables are suppressed to conserve space.

Variable	Predicted Sign	Benchmark Portfolio = 0	
		Coefficient	t-stat
Constant		0.0231	0.0544
Portfolio1	+	-0.0540	-0.2651
Portfolio2	+	-0.3402	-1.5700
Portfolio3	+	-0.4823[b]	-2.5897
Portfolio4	+	-0.4586[b]	-2.4512
Portfolio5	+	-0.4850[a]	-3.1736
Portfolio6	+	-0.6257[a]	-4.4886
Portfolio7	+	-0.5944[a]	-3.8692
Portfolio8	+	-0.3723[a]	-2.7687
Portfolio9	+	-0.4329[a]	-2.8820
Portfolio10	+	-0.3469[b]	-2.5116
R-squared		0.4532	

[a] significant at 1% level
[b] significant at 5% level
[c] significant at 10% level