Derivative use and investment: An Empirical Analysis of New Zealand Listed Companies.[1]

Murray Reynolds*
Department of Finance and Quantitative Analysis
University of Otago

Glenn Boyle
NZ Institute for the Study of Competition and Regulation
Victoria University of Wellington

First Draft: 15 December 2005

[1] We are grateful to seminar participants at the University of Otago for useful comments. Any remaining areas or ambiguities are solely the responsibility of the authors.
*Corresponding author: mreynolds@business.otago.ac.nz

Abstract: The primary objective of this research is to examine on the link between the investment motive and firms' decisions to use financial derivative instruments. Using a cross-sectional sample of non-financial New Zealand firms in 1999, our primary findings do not support the hypothesis that New Zealand firms use derivative instruments to smooth their cash flows to mitigate the under-investment problems as proposed by Froot et al. (1993). Among the control variables typically used in most empirical research, firm size capital structure and liquidity are significantly related to financial derivative usage. This research also finds that the use of financial derivatives by New Zealand firms has increased from 1994 to 1999, and this increased use is across many different industry sectors.

1. Introduction

The past two decades have seen a dramatic increase in firms' use of financial derivative instruments for risk management. This increase in derivatives usage has coincided with an increase in the volume of theoretical and empirical risk management literature. The empirical literature attempts to examine the cross-sectional behaviour of firms and the determinants of derivative usage for risk management. Theory suggests that risk management can add value to a firm. Survey data for the US, New Zealand and other countries provides anecdotal evidence of the motivations behind a firm's decision to use derivative instruments. In general, the empirical and survey literature findings are consistent with the theoretical justifications for using financial derivative instruments for risk management.

Modigliani and Miller (1958) argue that a financial contract cannot alter firm value, while portfolio theory implies that, as long as financial instruments are fairly priced, the use of derivatives does not benefit investors. However, other theoretical studies argue that using financial derivatives as insurance (hedging) can increase firm value if there are certain market imperfections. These market imperfections are financial distress costs (Meyers and Smith, 1982; Smith and Stultz, 1985; and Berkman and Bradbury, 1996), convexity in the tax function (Mayers and Smith, 1982; Smith and Stultz, 1985; Berkman and Bradbury, 1996; and Chan and Gunasekarage, 2001), agency costs (Bessembinder, 1991) and imperfect access to external markets (Froot, Scharfstein and Stein, 1993).

What do firms seek to achieve by hedging with derivatives? According to Prevost, Rose and Miller's (2000) survey of 175 New Zealand firms, 47.1% of firms indicate that the single most important reason they hedge with derivatives is to minimise fluctuations in real cash flows. However, the survey does not answer the question, why do firms want to minimize fluctuation in cash flows?

Primarily, a firm aims to minimize fluctuations in its internally generated funds in order to promote firm growth (Froot et al., 1993). Movements in external factors like

exchange rates, interest rates and commodity prices can disrupt a firm's internally generated cash flow. This cash flow is critical to the success of a firm's investment strategy. Bessembinder (1991) shows that a firm can reduce the incentives for equity holders to under-invest by hedging with derivatives. This is because as hedging transforms some of the individual future default states to non-default states, the number of states in which equity holders are the residual claimholders is increased. This reduces the number of states in which debt holders will not be paid and investment becomes less sensitive to debt. Shareholders are more willing to provide funds for positive NPV projects as they will gain from further investment. In this situation, shareholders have more to lose if they engage in risky projects and the risk-shifting problem will be reduced. The net effect of hedging is that fixed claim holders require a lower rate of return, which adds additional value to a firm.

Froot et al. (1993) and Mello and Parsons (2000) claim that firms hedge in order to mitigate the under-investment problem of Myers and Majluf (1984), by ensuring that a company has enough internally-generated cash available to make value-enhancing investments. They establish a theoretical connection between hedging, financial constraints and investment and show that a firm can reduce the volatility of its internally generated funds through the use of derivatives. This then leads to a reduction in the reliance of costlier external financing and thus reduces the volatility of a firm's investment.

DeMarzo and Duffie (1991) argue that hedging with derivatives can benefit equity holders when managers have private information about the risks of a firm's expected payoffs.[2] Equity holders support managers hedging because it reduces the noise concerning the variability of the firm's payoffs associated with the uninformed equity holder's information set. This reduced noise allows equity holders to make better optimisation decisions concerning their portfolios. In equilibrium, DeMarzo and Duffie show hedging to be optimal when the costs of hedging are less than the benefits of reduced noise in investors' information about the risks of the firm. According to this model, equity holders of firms with greater informational asymmetry and with greater under-investment potential should obtain the largest benefit if the firm uses derivatives.

Gay and Nam (1998) investigate the hypothesis that firms with enhanced investment opportunities concurrent with low levels of cash stock will make greater use

[2] DeMarzo and Duffie (1995) also argue that the informational effect of a manager's hedging activity depends on the disclosure requirements and accounting information made available to shareholders.

of derivatives than similar firms with high cash stocks.[3] Using a sub-sample of firms with high-growth opportunities (higher than average), they split the sub-sample into two groups: low cash stocks and high cash stocks. Their expectation is that derivatives use will be higher for firms with low cash stocks. Gay and Nam's findings are in line with their expectations, as firms with enhanced investment opportunities use derivatives more when they also have relatively lower levels of cash. Allayannis and Mozumdar (2000) examine whether the use of foreign currency derivatives by firms that have significant exposure to exchange-rate risk enables them to reduce their dependence on internally generated cash flow for making investments.[4] They follow the methodology of Fazzari, Hubbard and Peterson (1988), and they split their sample by classifying firms that use currency derivatives (hedgers) and firms that do not (non-hedgers), finding similar sensitivities of investment to net cash flow for firms classified as hedgers and non-hedgers. However, they find that the sensitivity to pre-hedged cash flow is significantly lower for hedging firms than non-hedgers.

This research adds to the existing empirical literature on a firm's risk management policies by examining the associations between a firm's investments and the use of financial derivative contracts by New Zealand firms. Its findings are globally applicable, as business risks arise from universal sources and the motivations to manage these risks appear to be universal across countries and different regulatory and operational environments. New Zealand is of interest as it is a relatively small and deregulated economy that has few trade barriers and a high reliance on export revenues. An effect of this small open economy is that New Zealand is exposed to relatively high volatility in interest and exchange rates compared to larger economies such as the US and Japan.[5] For these reasons, one may expect that the motivations for financial derivative instrument usage in New Zealand are primarily different than the motivations in larger capital markets such as the US and Japan. There is an increasing body of empirical research which examines the motivations for the use of financial derivative instruments for risk management (hedging) in US and non-US firms.[6] In general, this literature demonstrates that there is little difference in the motivations for financial

[3] Gay and Nam use a sample of 476 non-financial firms from the listing of Business Week 1000 firms.
[4] Allayannis and Mozumdar (2000) use a sample of S&P 500 non-financial firms between 1993 and 1995 that have exposure to foreign currency risk.
[5] Ang (1991) argues that research in Pacific Basin countries is important for testing whether US-based theories and empirical evidence can be applied across different capital markets.
[6] See He and Ng, (1998), for Japanese firms; Nguyen and Faff, (2002), for Australian firms; Berkman and Bradbury, (1996), Chan and Gunasekarage, (2001) and Marsden and Prevost, (2005) for New Zealand firms.

derivative instrument usage across different countries and different business environments.[7] Prevost, Rose and Miller (2000) surveyed 175 New Zealand firms in 1997 and found that New Zealand firms had increased their use of derivatives and that a large number of medium and small-sized New Zealand firms use financial derivative instruments compared to firms in larger capital market countries.

The primary objective of this research is to cast some light on the link between the investment motive and a firms' decisions to use financial derivative instruments. Using a cross-sectional sample of non-financial New Zealand firms in 1999, the results do not support the hypothesis that New Zealand firms use derivative instruments to smooth their cash flows to mitigate the under-investment problems as proposed by Froot et al. (1993). Among the control variables typically used in most empirical research, firm size capital structure and liquidity are significantly related to the use of financial derivative usage. This research also finds that use of financial derivatives by New Zealand firms has increased and this increased use is across many different industry sectors.

The remainder of the paper is structured as follows: Section 2 discusses the research design, data and the variables used to measure and explain financial derivative usage. Section 3 presents the empirical results on the motivations of financial derivative use by New Zealand firms, and Section 4 concludes the paper.

2. Data, Empirical Methodology and Hypotheses.

2.1 Data

Data for the cross-sectional study was obtained for a sample of 206 firms listed on the New Zealand Stock Exchange in 1999.[8] Foreign firms are omitted as they are not subject to the same financial disclosure rules as domestic firms. Firms in the financial service sector are also excluded because their financial characteristics and use of financial derivative instruments are very different from non-financial firms. This gives a total of 125 firms.

Of this complete data is available for 105 New Zealand domestic non-financial firms in 1999 (84 percent of all domestic firms in 1999).[9] Financial data is obtained

[7] The factors that explain derivative use are the size of the firm, the amount of debt in the firm, the liquidity of the firm and the presence of tax-losses.
[8] Source: The New Zealand Stock Exchange Fact Book for the year to March 1999.
[9] There is data available for 117 firms (93.6% of all domestic firms in 1999), however, 12 firms did report that they used derivative instruments but did not have any outstanding at balance date. Therefore, these

from individual firm's annual reports for 1999 and from *Datex Investor Services*. In contrast to several US and European studies that analyse within-industry derivative usage, we analyse the majority of all companies listed on the New Zealand Stock Exchange.[10]

2.2 Methodology

In this section we use multivariate Tobit and logit regression models to test the influence of the explanatory variables on the decision to use derivatives. The Tobit analysis estimates the level of derivative use given that a firm chooses to use derivatives, while a logit analysis evaluates the binary yes/no decision to use derivatives. The decision to use derivative contracts may involve two steps: first, management decides whether to use derivatives and the second decision is the level of derivative use given the initial 'yes' decision.[11] The logit model is utilized to examine the first step for the results of the decision to use derivatives.[12] The Tobit model examines the second step on the extent of derivative use as a truncated regression. We estimate the following models:

$$y_i^* = \beta x_i + \varepsilon_i$$
$$y_i = y_i^* \text{ if } y_i^* > 0 \text{ and}$$
$$y_i = 0 \text{ otherwise} \qquad (1)$$

For the Tobit model, the y_i in Equation (1) is the level of firm i derivative usage, taking the value y_i^* if firm i has derivative contracts outstanding at balance date, and zero otherwise. Derivative use is measured in two ways: the fair value of the contracts outstanding at balance date, and the nominal or principal amount of contracts outstanding at balance date, both scaled by firm value. For the logit model, y_i in equation (1) is one if a firm reports the use of derivative instruments and zero otherwise. β is a vector of unknown parameters, x_i is the vector of independent variables, and ε_i are residuals that are independently and normally distributed, with mean zero and variance σ_ε^2. A full representation of the regression model is:

---

firms are eliminated from the study as there are no fair values or contract values for their derivative positions. Multivariate analysis was undertaken with the firms included and the results are similar.

[10] 'By construction, industry-specific studies diminish cross-sectional variation in companies' risk exposure, but they do so at the expense of cross-sectional variation in the potential incentives to hedge.' Geczy, Minton and Shrand (1997, p. 1325)

[11] Recent research has highlighted that the Tobit approach explicitly models the decision to use derivatives in this manner (Graham and Rogers, 2000; and Haushalter, 2000).

[12] For a more detailed explanation on the logit model see Green (1997), Chapter 19.

$$y_i = \beta_0 + \beta_1 Q + \beta_2 \text{asset growth} + \beta_3 \text{tax} + \beta_4 \text{int.cover} + \beta_4 \text{leverage} + \beta_6 \text{firm value} \quad (2)$$
$$+ \beta_7 \text{ownership} + \beta_8 \text{alt.cap.} + \beta_9 \text{liquidity} + \beta_{10} \text{dividend} + \beta_{11} \text{overseas assets} + \beta_{12} \text{goods} +$$
$$\beta_{13} \text{info} + \beta_{14} \text{primary} + \beta_{15} \text{service} + \varepsilon_i$$

2.2.1. Dependent Variables

The Tobit model uses the fair value and contract value of derivative contracts outstanding at balance date scaled by the market value of the firm to represent the level of derivative use.[13] According to the New Zealand Accounting Standard issued by the Institute of Chartered Accountants of New Zealand (ICANZ), Financial Reporting Standard 31: Disclosure of Information about Financial Instruments (FRS-31),[14] firms are required to disclose the nature and extent of their activities with respect to financial instruments for both on-balance sheet and off-balance sheet instruments. A firm must therefore disclose the fair value and contract (notional) value amounts of derivative contracts outstanding at the balance sheet date in the "Notes to the Accounts" of its annual report.

The fair value variable is defined in the New Zealand Accounting Standard's FRS-31, Definitions 4.7, as the amount for which an asset could be exchanged, or a liability settled between knowledgeable, willing parties, in an arm's length transaction. The fair value measure uses the current market price of derivative contracts and is a record of the unrealized gain or loss on a derivative contract. It does not take into account realized gains or losses for the contracts closed out during the fiscal year. The fair value is measured as the absolute value of the net gain or loss on all derivatives (forwards, futures, swaps, and options) outstanding at balance date, scaled by the market value of the firm. The contract value is measured as the sum (outstanding at balance date) of the original contract price of all derivatives scaled by the market value of the firm.

The logit model requires the use of a binary dependent, which is set equal to one if the firm uses derivatives and zero otherwise. Firms are classified as using derivatives if they meet either of the two following criteria: 1) a firm discloses outstanding derivative contracts, 2) a firm reports in its "Statement of accounting policies" that it

[13] The market value of the firm is defined in the independent variable section.
[14] FRS-31 came into effect for the fiscal year ending 31 December 1993.

uses derivative financial instruments with off-balance sheet exposure, and it reports outstanding derivative contracts in its annual report for the 1998 financial year.[15]

2.2.2. Independent variable

To proxy for a firm's investment opportunity set, two variables are employed. The first variable Tobin's *q*-ratio represents the long-term growth prospects of a firm.[16] Tobin's *q* (hereafter 'Q') is the ratio of the market value of a firm's equity and debt to the current total of its assets. This ratio is similar to the market-to-book ratio, but has several important differences. The first of these differences is the numerator, with Q including all of the firm's debt and equity securities in the numerator, not only its common equity. The denominator is the representation of the replacement cost of all of the firm's assets. It is expected that firms that use derivatives have higher values of Q than non-derivative using firms. Q is calculated using the Chung and Pruitt (1994) approximation method:

$$Q = (\text{MVE} + \text{PS} + \text{DEBT} + \text{WC}) / \text{TA} \quad (3)$$

Where MVE is the market value of equity calculated as the product of the firm's share price and the number of outstanding common shares, PS is the liquidating value of the firm's outstanding preferred stock, DEBT is the book value of the firm's long-term debt, WC is the value of the firm's short-term liabilities net of its short-term assets and TA is the book value of the firm's total assets. Chung and Pruitt (1994) demonstrate that this approximation method Q explains 97% of the variation in theoretical *q*, computed using the more precise Lindenberg and Ross (1981) algorithm.

---

[15] The fair value and contract amount are used to represent the level of derivative use by a firm. Firms are classified as derivative users if they report these variables in their financial statements. This classification may cause a selection bias of the dependent variables, which occurs because some firms are classified as not using derivatives when they may actually use them. As mentioned briefly, the reason for this is that a firm may use derivatives during the financial year but have no outstanding contracts at balance date. Misclassification results, as a firm will match its derivative use with its obligations. Therefore, if a firm has no obligation that it needs to hedge around its balance date, it may have no outstanding contracts to report. If a firm's balance date does not correspond to its seasonal business requirements, it may not need to use derivative instruments at balance date. Another reason for bias relates to reporting accounting information; a firm may want to "window dress" its financial reports. Window dressing refers to a firm altering or hiding its risk characteristics by changing the value of contracts in its financial statements. Therefore, a firm may relinquish some or all of its derivative contracts before its balance date. Both of these reasons would lead to the misclassification of a firm and thus affect results. The logic model will account for this misclassification.

[16] One of the most common proxies that has been employed to represent a firm's investment opportunity is normalized R&D expenditure. This proxy is not tested as there is no reporting requirement for R&D by New Zealand firms. Consequently, firms do not report this information.

Froot et al. (1993) argue that risk management should have more of a short-term focus. They suggest that the volatility of future cash flow can be problematic to the extent that it can unexpectedly decrease levels of internally generated cash, thus compromising the firm's capacity to make value-enhancing investments. They argue that it is not the existence of the growth options per se that is the issue but the risk of not being able to convert the growth options into assets in place.

The second investment variable relates to this view, that derivative use should have a single goal to ensure that a company has enough internally-generated cash available to make value-increasing investments. An asset growth to cash flow variable is used to represent the firm's ability to generate enough cash to finance current short-term growth, an. Thus, if firms use derivative instruments to smooth earnings in the short-term they are more likely to have enough internally-generated cash to finance short-term asset growth. These firms should be able to invest when they want to. Therefore, holding leverage constant, there should be a positive relationship between derivative use and the short-term growth variable. The asset growth to cash flow variable is measured as the log of the ratio of the current year's change in net tangible assets plus depreciation to the net income plus depreciation.[17]

2.2.3. Control Variables

Progressive tax schedules – Nance, Smith and Smithson (1993) and Smith and Stulz (1985) argue that a value-maximizing firm can use derivatives for reasons related to reducing expected taxes. New Zealand's corporate tax rate is fixed at 33%. New Zealand firms do not have a progressive corporate tax schedule and there are no tax concessions such as investment tax credits. However, New Zealand firms do have tax preference items such as tax-loss carry forwards. If a firm has tax preference items, it is better off if it smoothes its earnings. This can be achieved with the use of derivative financial instruments. Firms with tax-loss carry forwards face an effective tax schedule that is convex. Based on hedging theory, these firms are more likely to use derivative instruments to minimise the present value of the tax loss and reduce the variance in their taxable income. Due to the short-term nature of the commitments that are hedged with derivatives, firms will only use derivatives to reduce the volatility of next year's assessable income, regardless of the total value of tax losses available. While hedging

[17] If the change in tangible assets plus depreciation is negative it is set equal to zero. If net income plus depreciation is negative it is set equal to one. It is unknown why Berkman and Bradbury used the log of this ratio.

with derivatives for periods greater than one year might reduce the volatility of future taxable income, it is likely to increase liquidity risk. However, in New Zealand, financial instruments are marked-to-market every year for tax purposes, so using derivatives to hedge for terms longer than one year might result in unwanted increases in the variability of after-tax cash flows. In conclusion, a positive relationship is expected between tax-loss carry forwards, and the use of financial derivatives. To represent tax-loss carry forwards, a dummy variable that equals one for firms with tax-loss carry forwards and zero otherwise is employed. [18]

Financial distress costs – Smith and Stulz (1985) state that using financial derivatives can reduce the variance of firm value and reduce the expected cost of financial distress. Therefore, two variables are employed to represent the expected cost of financial distress; leverage and the interest cover ratio. The greater the proportion of debt in a firm's capital structure the higher the probability of financial distress. Therefore, it is expected that firms with higher leverage use derivative instruments to reduce the volatility of cash flows more often than firms with lower leverage. [19] Bankruptcy models support the use of the interest coverage ratio as an indicator of the probability of financial distress. To avoid default, firms must make regular interest payments. The interest coverage ratio is representative of the ability of a firm to cover interest commitments from its earnings. Therefore, to help meet their interest commitments firms with a lower interest coverage ratio are expected to use derivatives more frequently than firms with higher interest coverage ratios. The leverage variable is measured as the book value of debt divided by the market value of the firm. The interest coverage is defined as the log of earnings before interest and tax divided by the interest expense.[20]

Firm size – the size of a firm may play a role in determining the use of derivative instruments. Small firms have a greater need to hedge with derivatives than

[18] Nance et al. (1993) use the value of tax-loss carry forwards available to offset taxes payable in subsequent years. They indicate that the appropriate scaling factor is the firm's expected taxable income. However, accounting literature suggests that earnings are non-stationary, and average earnings are undefined. Nance et al. scale by the value of the firm's equity and find no significance between users and non-users of derivatives.

[19] Leverage can affect the under-investment problem. Firms with higher leverage are expected to use more derivatives; therefore it is uncertain whether leverage proxies for costs of financial distress or for investment.

[20] Earnings before interest and taxes are set equal to one if it is negative and interest is set equal to one if a firm has no debt. Setting the interest coverage ratio to one if the firm has negative earnings indicates that a firm has paid its interest commitment. There are 21 firms in this sample with negative earnings. All of the firms that had long-term debt outstanding paid interest.

large firms, as their cash flows have greater volatility. However, virtually all empirical research (e.g. Nance et al., 1993; Berkman and Bradbury, 1996; Geczy, Minton and Shrand, 1997; Graham and Rogers, 2000; Berkman, Bradbury, Hancock and Innes., 2002; and Marsden and Prevost, 2005) reports a positive relationship between firm size and derivative use. Therefore, derivative use is due to economies of scale and the high fixed cost of expertise needed to manage a derivatives program. Thus, large firms are expected to have a greater use of derivatives. Size is defined as the market value of the firm, calculated as the log of the sum of the market value of equity, book values of debt, and preference capital.

Managerial risk aversion - the proportion of equity held by directors is used to proxy for the managerial ownership structure of the firm. The expectation is that directors who hold a greater proportion of shares are less diversified and are therefore more concerned about the variability of firm value and are more likely to use derivatives. Managerial ownership is measured as the proportion of shares beneficially held by directors and by associated persons of the director as recorded in a firm's annual report.[21]

Nature of operations - the New Zealand economy relies heavily on imports and exports and this means that firms may have a considerably large exposure to foreign currency fluctuations.[22] The nature of a firm's operation is indicative of the extent it is exposed to foreign currency fluctuations and this may influence its need to hedge with derivatives. The overseas assets variable is measured as the proportion of overseas assets to total assets and is obtained from geographical segment data in financial reports.[23]

Firms can lower their need for derivative instruments by reorganizing their financial structure. This reorganization of a firm's financial structure can be used to

[21] This is consistent with the ownership variables employed by Morck, Shleifer and Visnhy (1998), Short and Keasey (1999) and Bhabra and Maling (2000).

[22] For the year ended December 1999, imports into New Zealand accounted for 34.9% of the gross domestic product (GDP), while exports from New Zealand accounted for 35.7% of GDP (*Sources: Statistics New Zealand*).

[23] The proportion of overseas assets may not be an appropriate variable to represent the nature of a firm's operation. As firms with overseas operations may have their revenue and expenses in the currency of the country where they operate, they may have no need to convert these revenues into New Zealand dollars. Furthermore, the proportion of overseas assets does not take into account importers or exporters. These importers and exporters may have no overseas assets but need to use derivative instruments. For these reasons foreign sales as proportion of total sales are also tested as a representation of a firm's overseas activity. This is because derivative use should correlate more closely with the amount of overseas sales a firm converts back into New Zealand dollars. This variable is highly correlated to the overseas assets variable and it gives a similar relationship to derivative use as overseas assets.

substitute for the use of derivatives. To control for these derivative substitutes, three variables are employed: alternative capital instruments, liquidity and the dividend payout ratio.

A firm can reduce its agency cost to stakeholders by restructuring its balance sheet through issuing preferred stock or convertible debt rather than using financial derivatives. Using convertible debt gives bondholders the choice to convert the debt into equity. The greater the proportion of alternative capital instruments in a firm's capital structure, the less need the firm has for derivative instruments. The use of alternative instruments in the capital structure is measured as the value of convertible bonds plus preferred stock as a percentage of firm value.

Nance et al. (1993) and Geczy et al. (1997) argue that firms can alleviate agency and financial distress costs associated with leverage by maintaining greater short-term liquidity. Thus, the greater the liquidity of a firm, the greater is its ability to cover liabilities and investments, leading to a lower need for financial derivative instruments. Liquidity is defined as the log of current assets minus inventory over current liabilities.

The dividend policy of a firm will influence the need for derivatives. Nance et al. (1993) claim that dividend restrictions allow funds to be available for investment, for coverage of liabilities and they also lower the need to change dividend policies in years when income is low. This leads to less dependence on the use of derivatives for hedging. Dividend payout is calculated as dividend per share divided by earnings per share.

Finally, Marsden and Prevost (2005) found that New Zealand firms in the goods sector are more likely to be derivative users than any other sectors. Therefore, to control for any differences in the level of derivative use by firms across industry sectors, industry dummy variables are employed. The industry sector dummy variables are goods, info, primary, service and property (in the multivariate analysis property is the omitted variable). The dummy variable is equal to one if the firm is in the goods, information technology, primary, service or property industry sectors, respectively, and zero otherwise.

3. Empirical Results

3.1 Extent of Derivative Usage

Table 1 presents a breakdown of derivative use for the 1999 sample. The percentage of firms using derivative contracts is 67.6%.[24] The fair values for the sample range from 0 to 3.8% of the market value of the firm, with a mean of 0.34% for the entire sample and a mean of 0.05% for the sample of derivative users. The contract values range from 0 to 95% of firm value, with a mean of 18% for the entire sample and a mean of 27.3% for the sample of derivative users.

Trends in derivative use by industry for the years 1994, 1997 and 1999 are illustrated in Table 2.[25] The sample is divided into five industry categories, based around the broad industry classification used by the New Zealand Stock Exchange to construct industry price index series. The industry groups are information technology (computer and telecom firms), primary sector (agriculture, fishing, mining, forestry and building firms), goods (energy, food, durables, textiles and apparels), property (including finance and investment firms) and service (transport, port, leisure, consumer and media firms). Panel A, of Table 2 details interest rate derivative use by industry sector for the years 1994, 1997 and 1999. In 1999, 50.5% of all firms in the sample used interest rate derivatives compared to 18.1 % and 24.2% in 1994 and 1997, respectfully. Interest rate derivative use for 1999 increased substantially across all industry sectors except in the information technology sector, where the same number of firms used derivatives but the number of firms classified in this industry increased. In the goods and services industries, over 50% of firms used interest rate derivatives in 1999 compared to no industry using over 50% in 1994. The largest increase in interest rate derivative use between 1994 (9.1%) and 1999 (52.8%) was in the service industry.[26] Panel B, of Table 2 details foreign exchange derivative use by industry sector and year. In 1999, 52.4% of all firms in the sample used foreign exchange derivatives compared to 37.2 % and 34.1% in 1994 and 1997 respectfully. Foreign exchange derivatives use in 1999 increased across most industry sectors except in the property sector and the information technology sector. In the property sector, the number of firms using foreign

[24] This supports the finding of Prevost et al. (2000), as Marsden and Prevost's (2005) study finds 45% and 40% of firms used derivatives in 1994 and 1997, respectively, and Berkman and Bradbury (1996) report 47% of firms used derivatives in 1994.

[25] Data for 1994 and 1997 is obtained from Marsden and Prevost (2005).

[26] Part of the rise in interest rate derivative use can be explained by the change in operations of monetary policy by the Reserve Bank of New Zealand. In 1997 the Reserve Bank of New Zealand changed its monetary policy from exchange rate targeting to interest rate targeting.

exchange derivatives declined from 23.1% in 1994 to 6.7% in 1999. The number of firms using foreign exchange derivatives in the information technology sector did not increase from 1994 to 1999 but the number of firms classified in this sector did increase.

3.2 Univariate Analysis

Table 3 contains the descriptive statistics for the independent variables used in this study. Panel A provides the descriptive statistics of the variables for all firms in the sample. The mean (median) value of Q is 1.28 (1.00) and for the asset growth to cash flow variable is -0.46 (0.00). Thirty-six firms (31%) have tax-loss carry forwards in 1999; this is fewer than the 44 firms (38%) in Berkman and Bradbury (1996) and the 88 firms (47.5%) of the two-year sample of Marsden and Prevost (2005). Leverage and the interest coverage ratio represent the expected cost of financial distress. The mean (median) interest coverage ratio for 1999 is 1.27 (1.15) and the mean (median) values for the leverage variable is 0.24 (0.18) for 1999. The mean (medium) value for firm size is 18.48 (18.35).[27] The variable for managerial ownership has a mean (median) value of 27% (20%). This is lower than the 31% (24%) found by Berkman and Bradbury (1996) and the 29% (23%) found by Marsden and Prevost (2005) for the same variable.[28] Alternative capital instruments, liquidity and dividend payout are the variables that represent the substitutes for hedging with derivatives. The mean (median) value for alternative capital instruments is 0.02 (0.00), the mean (median) value for liquidity is -0.02 (-0.03), and the typical payout ratio for a firm is 79%, with a significant amount of dispersion between minimum and maximum observations. The proportion of overseas assets has a mean (median) value of 0.11 (0.00).

Panel B reports the descriptive statistics for the sample of firms classified as derivative users, while Panel C reports the descriptive statistics of the sample of firms classified as non-derivative users. Firms that use derivatives have less investment opportunities on average as they display a smaller Q and a smaller asset growth to cash flow ratio than non-derivative using firms. However, firms that do not use derivatives display a greater range for Q, with a minimum value of zero and a maximum value of 7.866 compared to 0.304 to 4.479 for firms that use derivatives. Firms that use derivatives are less likely to have tax-loss carry forwards (29.6% of firms that use derivatives have tax-loss carry forwards compared to 32.35% of firms that do not use

[27] This equals a mean value of $104 million.
[28] The decrease in managerial ownership may be the result of the increase in firm size, as firms may have issued additional equity.

derivatives). On average, firms that use derivatives have a greater ability to make their interest payments, as their interest coverage ratio is 1.54 compared to 0.68 for firms that do not use derivatives. This corresponds with derivative-using firms having more debt in their capital structure, they are larger in size (firm value), and they also have less managerial ownership, less liquidity, a higher dividend payout ratio than the non-derivatives users. Both groups of firms make similar use of alternative capital instruments, and have reported similar proportions of overseas assets to total assets.

Table 4 reports the results of the univariate tests for the differences in the median values between derivative-using firms and firms that do not use derivatives. There are mixed results between the derivative-using and non-derivative using firms for the Q proxy. The mean value of Q for the firms that use derivatives is higher while the median value is lower. However, neither of these is significantly different. Firms that use derivatives on average have a lower asset growth to cash flow ratio than non-using firms. Like Q, this is not significant. It is difficult to assess exactly what the asset growth to cash flow variable indicates. It may indicate that a firm is financially constrained or, alternatively, it is a short-term growth proxy that indicates the ability of a firm to fund its short-term growth. Thirty-two firms (31%) had tax-loss carry forwards in 1999. Tax-loss carry forwards appear less important as an incentive to use derivatives as there is no significant difference between firms that use derivatives and firms that do not. In total, 30% of derivative-using firms have tax-loss carry forwards compared to 32% of firms that do not use derivatives. This means that neither users nor non-users of derivatives are more likely to have tax-loss carry forwards.[29] Table 4 indicates that derivative-using firms have a significantly higher interest coverage ratio, leverage and are larger in size. The interest coverage ratio is significantly different, at a 5% level of significance, between the two groups, with derivative users having a mean (median) of 1.55 (1.32) compared to the non-derivative users mean (median) 0.68 (0.00), but its relationship is contrary to expectation. Firms that use derivatives have significantly greater leverage than firms that do not use derivatives (at a 1% level of significance), with a mean (median) value of 0.29 (0.27) compared to a mean (median) value of 0.13 (0.04) for firms that do not use derivatives. The size variable, firm value, is also significantly larger, at a 1% level of significance, for the derivative user group with the

[29] This differs from Berkman and Bradbury (1996) and Marsden and Prevost (2005) who found that derivative users are more likely to have tax-loss carry forwards, but are supportive of Chan and Gunasekarage (2001).

mean (median) value of 19.27 (19) compared to the mean (median) level 16.85 (16.92) for the non-derivative using firms. These findings for leverage and size are similar to Berkman and Bradbury (1996), Chan and Gunasekarage (2001) and Marsden and Prevost (2005). There is no significant difference between derivative users and non-derivative users for the variables that represent managerial ownership, proportion of overseas assets, liquidity and alternative capital instruments. New Zealand firms that use derivatives have significantly (at a 1% level of significance) higher dividend payout ratios compared to firms that do not use derivatives. In conclusion, derivative-using firms are larger, they have higher interest coverage ratios, more debt, less growth prospects and higher dividend payout ratios than firms that do not use derivatives.

3.3 Multivariate Analysis

Table 5 presents the results of the Tobit and logit regressions. Contrary to the prediction of Froot et al. (1993) but consistent with the findings of Berkman and Bradbury (1996) and Marsden and Prevost (2005), higher growth New Zealand firms are less likely to use derivative contracts in the multivariate setting. The coefficient on the variable Q is significantly negative at the 5% level of significance in the logit model and at the 10% level of significance in the contract value Tobit model. It is negative but not significant in the fair value Tobit model.[30] The coefficient for the asset growth to cash flow variable is also contrary to the prediction in Tobit models, fair value and contract value, and in the logit model. It is significant at a 10% level in the Tobit model using the contract value.

The coefficient for the tax-loss variables is contrary to expectations in the Tobit models using the fair values, but is not significant in any of the three models.[31] This result is consistent with Chan and Gunasekarage (2001) and Marsden and Prevost (2005), who find that the tax-loss carry-forwards do not explain the extent of derivative usage.

The first of the variables that represent the cost of financial distress, interest cover, has its coefficient in the opposite direction to that expected in all three models but it is not significant. However, the second variable, leverage, is in the direction

[30] This is similar to the results for the Q variable for 1994 in Marsden and Prevost (2005). However, their Q variable for the 1997 year is negative but not significant. Chan and Gunasekarage (2001) report their proxy for growth opportunities in 1997, market to book ratio, is not significantly different between derivative users and non-derivative users.

[31] The value of tax losses to New Zealand resident investors were significantly reduced following the introduction of a dividend imputation system in New Zealand in 1988 and a foreign investor tax credit regime in 1996 (see Cliffe and Marsden (1992) for an overview of New Zealand's dividend imputation system).

expected in all three models. The decision to use debt is positively related to derivative use and significant at a 5% level in the logit model and the Tobit model using the fair value measure. It is significant at a 1% level in the Tobit model using the contract value measure.

The remaining control variables, the size variable is a highly significant (at the 1% level of significance in both of the Tobit models and the logit model) determinate of derivative use by New Zealand firms. This is consistent with virtually all existing empirical work that larger firms are more likely to be users of derivative contracts. With respect to the ownership structure variable, the coefficient has the wrong directional sign for both the Tobit models and the logit model while none of the coefficients are significant.[32] Firms that use derivatives are less likely to make use of alternative capital instruments in their capital structures. The coefficients that represent the use of alternative capital instruments (preferred stock and convertible debt) are all negative in all the multivariate models and are significant, at the 10% level, in the Tobit model using the fair value measure and in the logit model. The coefficient for the variable liquidity is positive in the Tobit model using the contract value and the logit model. These results are contrary to the prediction and significant at a 5% level in the logit model. This indicates that firms that use derivatives are more liquid than firms that do not use derivatives, which is contrary to the findings of Berkman and Bradbury (1996) and Marsden and Prevost (2005). There are also mixed results for the dividend payout variable. It has the opposite sign to the predicted sign in both the Tobit models while the logit model coefficient is in the predicted direction. However, none of these coefficients are significant. The variable that represents a firm's nature of operation is the proportion of overseas assets of the firm. The coefficient for this variable is negative in all multivariable models, contrary to the predicted sign. However, again none of the coefficients are significant.

The results for the industry sector dummies indicate that derivative use is significant across industry sectors and that derivative use has increased in New Zealand. All of the industry sector dummy variables are positive, with the coefficient for the goods variable being significant at the 10% level in the Tobit model using the fair value and at the 1% level in the Tobit model using the contract value and the logit model. This result is similar to those of Marsden and Prevost (2005). There is strong evidence that

[32] This result differs from Berkman and Bradbury (1996), who report their coefficients for inside ownership to be positive. However, none of these coefficients were significant.

firms in other sectors are likely to use financial derivative instruments, which is different to the findings of Marsden and Prevost (2005), as the coefficients for the service dummy is significant at a 5% level in the logit model. The coefficient for the information technology dummy is significant at a 5% level in the Tobit model using the contract value and the logit model. The coefficient for the primary dummy is significant at a 5% level in the Tobit model, using the contract value, and at a 10% level in the logit model.

4. Conclusion

The object of this research is to evaluate the link between investment and the firms' decisions to use financial derivative instruments. Using a cross-sectional sample of non-financial New Zealand firms in 1999, the results do not support the hypothesis that New Zealand firms use derivative instruments to smooth their cash flows to mitigate the under-investment problems as proposed by Froot et al. (1993). This lack of support for the investment motive could be due to endogeneity problems with the variables. In the previous analysis, the independent variables that represent the various derivative use motivations are expected to be exogenous; that is they are expected to vary autonomously and independently of each other. For example, leverage and derivative use are both endogenous policy choices, which can reflect two offsetting effects. If higher leverage raises the probability of financial distress, given a firm's investment opportunities, it also raises the demand for derivatives. However, Smith and Watts (1992) show that firms with high leverage tend to have fewer growth options. If fewer growth options reduce the demand for derivatives, then little correlation would be observed between derivative use and leverage. Other endogeniety problems involve taxes and the expected costs of financial distress, as well as size and the expected cost of financial distress. Therefore, the lack of support for the investment motive could be driven by a firm's inability to generate sufficient cash for investment as it may be financially constrained (earlier research has shown that on average derivative-using firms have higher leverage and are less liquid than non-derivative using firms). This research also finds an increase in the number of non-financial firms using derivatives in New Zealand and this increase in use is across all industries. As with previous New Zealand and US-based empirical risk management literature, this research finds that the size of the firm, its capital structure and liquidity, relate significantly to derivative use

among New Zealand firms. There is also support for the increased use of financial derivative contracts by firms and across industry sectors.

5. References

Allayannis, G. and A. Mozumdar, 2000, *"Cash flow, investment and hedging."* Working Paper, Darden School of Business, University of Virginia, Charlottesville, VA, (September).

Ang, J. S., 1991, *"Agenda in Pacific-basin Finance."* In S. G. Rhee, and R. P. Chang (eds.), Pacific-Basin Markets Research, Volume II (Elsevier Science Publishers BV, Amsterdam), 201-210.

Berkman, H. and M. Bradbury, 1996, *"Empirical evidence on the corporate use of derivatives."* Financial Management, 25, pp. 5-13.

Berkman, H. and M. Bradbury, 1998, *"The influence of ownership structure on risk management: Evidence from New Zealand State Owned Enterprises."* Journal of International Financial Management and Accounting, 9, (2, June), 117-131.

Berkman, H., M. Bradbury and S. Magan, 1997, *"An international comparison of derivatives use."* Financial Management 26 (4, Winter), pp. 69-73.

Berkman, H., M. Bradbury, P. Hancock and C. Innes, 2002, *"Derivative financial instrument use in Australia."* Accounting and Finance, 42, pp. 97-109.

Bessembinder, H., 1991, *"Forward contracts and firm value: Investment incentives and contracting effects."* Journal of Financial and Qualitative Analysis, 26, (4, December), 519-532.

Bhabra, G. S. and H. Maling, 2000, *"Managerial Ownership and Firm Value: Evidence from New Zealand."* Working Paper, University of Otago.

Chan, K. and A. Gunasekarage, 2001, *"Motivations behind the corporate use of derivatives in an imputation taxation system."* International Quarterly Journal of Finance, 1, 119-134.

Chung, K. H. and S. W. Pruitt, 1994, *"A simple approximation of Tobin's q."* Financial Management, 23, 70-74.

Cliffe, C. and A. Marsden, 1992, *"The effects of dividend imputation on company financing decisions and the cost of capital in New Zealand."* Pacific Accounting Review, 4, 1-30.

DeMarzo, P. and D. Duffie, 1991, *"Corporate financial hedging with proprietary information."* Journal of Economic Theory, 53, 261-286.

DeMarzo, P. and D. Duffie, 1995, *"Corporate incentives for hedging and hedge accounting."* The Review of Financial Studies, 8, (3, fall), 743-771.

Fazzari, S. M., R. G. Hubbard, and B. C. Peterson, 1988, *"Financing constraints and corporate investment."* Brooking Papers on Economic Activity, 1, 141-195.

Froot, K. A., D. S. Scharfstein, and J. C. Stein, 1993, *"Risk management coordinating corporate investment and financing policies."* Journal of Finance 48 (5, December), 1629-1658.

Gay, G. D., and J. Nam, 1998, *"The underinvestment problem and corporate derivative use."* Financial Management 27(4, Winter), 53-69.

Geczy, C., B. A. Minton, and C. Schrand, 1997, *"Why firms use currency derivatives."* Journal of Finance 52 (4), 1323-1354

Graham, J. R., and D. A. Rogers, 2000, *"Is corporate hedging consistent with value maximization? An empirical analysis"* Working paper, Fuqua School of Business, Duke University, Durham, NC.

Greene, W. H., 1997, *"Econometrics Analysis."* 3rd Ed., Prentice Hall, New Jersey.

Haushalter, G. D., 2000, "Financing policy, basis risk, and corporate hedging: Evidence from oil and gas producers." Journal of Finance 55, 107-152.

He, J. and L. Ng, 1998, *"The foreign exchange exposure of Japanese multinational corporations."* Journal of Finance, 53, 733-753.

Mayers, D. and C. Smith, 1982, *"On the corporate demand for insurance."* Journal of Finance, 55, (2, April), 281-296.

Marsden, A. and A. K. Prevost, 2005, *"Derivative use, corporate governance, and legislative change: An empirical analysis of New Zealand listed companies."* Journal of Business finance and Accounting, 32 (January/March), 255-295.

Mello, A., and J. Parsons, 2000, *"Hedging and liquidity."* Review of Financial Studies, 13, 127-153.

Modigliani, F. and M. H. Miller, 1958, *"The cost of capital, corporate finance and the theory of investment."* American Economic review, 48 (June), 261-297.

Morck, R., A. Shleifer, and R. W. Vishny, 1998, *"Managerial ownership and market valuation: An empirical analysis."* Journal of Financial Economics, 20, 293-316.

Myers, S. C., 1977, *"The determinants of corporate borrowing,"* Journal of Financial Economics, 5, (2), 147-175.

Nance, D., C. Smith, and C. Smithson, 1993, *"On the determinants of corporate hedging."* Journal of Finance, 48, (1, March) 267-284.

Nguyen, H. and F. Faff, 2002, *"On the determinants of derivative usage by Australian companies."* Australian Journal of Management, 27, 1-24.

Prevost, A., L. Rose, and G. Millar, 2000, *"Derivative usage and financial risk management in large and small economies. A comparative analysis."* Journal of Business Finance & Accounting, 27, (5/6, Jun/Jul) 733-759.

Short, H. and K. Keasey, 1999, *"Managerial ownership and the performance of firms: Evidence from the U.K."* Journal of Corporate Finance, 5, 79-101.

Smith, C. W., and R. M. Stulz, 1985, *"The determinants of firms' hedging policies."* Journal of Financial and Qualitative Analysis, 20, (4, December), 391-406.

Smith, C. W., and R. L. Watts, 1992, "*The investment opportunity set and corporate financing, dividend, and compensation policies."* Journal of Financial Economics, Amsterdam, 32, (3, Dec), 263-292

Stulz, R. M., 1984, *"Optimal hedging policies."* Journal of Finance and Qualitative Analysis, 19, 127-140.

Stulz, R. M., 1996, *"Rethinking risk management."* Journal of Applied Corporate Finance 9 (3), 8-24.

Table 1. Descriptive Statistics of the use of derivatives

The table contains descriptive statistics of the fair value and contract value for the financial derivative instruments held at a firm's balance date. Panel A contains the descriptive statistics for all firms in the sample. Panel B contains descriptive statistics for firms with derivative contracts only.

Panel A.

All Sample Firms for financial year 1999 (N = 105)	Mean	Std. Dev.	Min.	Max.
Fair Value $000	4,782	18,678	0	149,000
Scaled by firm size	0.0034	0.0072	0.0000	0.0379
Contract Value $000	176,772	467,189	0	3,104,000
Scaled by firm size	0.1817	0.2315	0.0000	0.9511

Panel B.

Firms with Derivative Instruments 1999 financial year (N=71)	Mean	Std. Dev.	Min.	Max.
Fair Value $000	7,071	22,403	0	149,000
Scaled by firm size	0.0050	0.0083	0.0000	0.0379
Contract Value $000	261,424	549,394	0	3,104,000
Scaled by firm size	0.2726	0.2359	0.0007	0.9511

Table 2: Trends in Derivative Usage by Industry

This table compares, by industry, the number of firms that reported using derivative instruments in 1994, 1997 and 1999. The firms are divided into five industry groups, based on the industry classifications used by the NZSX. The industry groups are information technology (computer and telecom firms), primary sector (agriculture, fishing, mining, forestry and building firms), goods (energy, food, durables, textiles and apparels), property (including finance and investment firms) and service (transport, port, leisure, consumer and media firms). The figures for 1994 and 1997 are from Table 2, Marsden and Prevost (2005).

	1994			1997			1999		
	N	Derivative User	% Derivative User	N	Derivative User	% Derivative User	N	Derivative User	% Derivative User
Panel A: Interest Rate Derivative Usage									
Information Technology	3	1	33.3%	2	1	50.0%	4	1	25.0%
Primary Sector	24	3	12.5%	21	6	28.6%	22	8	36.4%
Good	43	10	23.3%	32	8	25.0%	28	18	64.3%
Property	13	2	15.4%	17	2	11.8%	15	7	46.7%
Services	11	1	9.1%	19	5	26.3%	36	19	52.8%
Total	94	17	18.1%	91	22	24.2%	105	53	50.5%
Panel B: Exchange Rate Derivative Usage									
Information Technology	3	1	33.3%	2	2	100.0%	4	2	50.0%
Primary Sector	24	8	33.3%	21	7	33.3%	22	11	50.0%
Good	43	19	44.2%	32	16	50.0%	28	24	85.7%
Property	13	3	23.1%	17	1	5.9%	15	1	6.7%
Services	11	4	36.4%	19	5	26.3%	36	17	47.2%
Total	94	35	37.2%	91	31	34.1%	105	55	52.4%

Table 3. Descriptive Statistics of Independent Variables

Panel A of this table provides the descriptive statistics for all firms in the sample. The sample contains 105 NZ non-financial firms listed on the NZSE in 1999. Panel B provides the descriptive statistics for the sample of 71 firms classified as derivative users. Panel C provides the descriptive statistics for the sample of 34 firms classified as non-derivatives users. Q represents Tobin's q which is measured as the ratio of the market value of outstanding financial claims on a firm to the firm's current total assets. The asset growth to cash flow variable is measured as the log of the ratio of the current year's change in net tangible assets plus depreciation to net income plus depreciation. The tax-loss variable equals 1 if firms have tax-loss carry forwards and 0 otherwise. Interest coverage is defined as the log of earnings before interest and tax over interest expense. Leverage is measured as the as the book value of debt over firm value. Firm value is measured as the log of the sum of the market value of the firm's equity, book value of debt and preference capital. Managerial share ownership is measured as the proportion of shares beneficially held by directors and by associated persons of the director. Alternative capital instruments are defined as the proportion of convertible bonds plus preferred equity of firm value. Liquidity is defined as the log of current assets minus inventory over current liabilities. Dividend payout is calculated as dividend per share divided by earnings per share. The proportion of overseas assets is measured as overseas assets to total assets.

Panel A: All Sample Firms for financial year 1999 (N = 105)	Mean	Std. Dev.	Median	Min.	Max.
Q	1.2780	1.0542	1.0024	0.1159	7.8664
Asset Growth/Cash flow	-0.4601	1.2982	0.0000	-5.3420	1.8921
Tax loss	0.3048	0.3048	0.0000	0.0000	1.0000
Interest Cover	1.2680	1.7776	1.1499	-8.0064	8.5049
Leverage	0.2347	0.2254	0.1762	0.0000	0.8908
Firm Value	18.482	1.9680	18.353	14.250	23.616
Managerial Share Ownership	0.2725	0.2676	0.2044	0.0000	0.9228
Alternative Capital Instruments	0.0158	0.0593	0.0000	0.0000	0.4310
Liquidity	-0.0177	1.4238	-0.0329	-4.3698	4.5851
Dividend Payout	0.7893	1.0479	0.5635	0.0000	5.4339
Proportion of Overseas Assets	0.1051	0.2484	0.0000	0.0000	0.9979

Panel B: Firms classified as derivative users for financial year 1999 (N = 71)	Mean	Std. Dev.	Median	Min.	Max.
Q	1.222	0.8156	1.002	0.304	4.479
Asset Growth/Cash flow	-0.550	1.3298	0.000	-5.152	1.892
Tax loss	0.296	0.4596	0.000	0.000	1.000
Interest Cover	1.548	1.4908	1.323	-0.892	8.505
Leverage	0.286	0.2304	0.269	0.000	0.891
Firm Value	19.265	1.6128	19.006	15.868	23.616
Managerial Share Ownership	0.260	0.2593	0.204	0.000	0.923
Alternative Capital Instruments	0.017	0.0668	0.000	0.000	0.431
Liquidity	-0.059	1.0941	-0.064	-2.668	4.585
Dividend Payout	0.918	1.0240	0.730	0.000	4.718
Proportion of Overseas Assets	0.108	0.2334	0.000	0.000	0.931

Panel C: Firms classified as non-derivative users for financial year 1999 (N = 34)	Mean	Std. Dev.	Median	Min.	Max.
Q	1.368	1.4585	0.917	0.000	7.866
Asset Growth/Cash flow	-0.2715	1.2272	0.0000	-5.342	1.526
Tax loss	0.3235	0.4749	0.0000	0.000	1.000
Interest Cover	0.6832	2.1732	0.0000	-8.006	5.378
Leverage	0.1272	0.1731	0.0421	0.000	0.673
Firm Value	16.846	1.6156	16.920	14.250	20.095
Managerial Share Ownership	0.2986	0.2865	0.2236	0.000	0.840
Alternative Capital Instruments	0.0139	0.0401	0.0000	0.000	0.156
Liquidity	0.0681	1.9593	0.0272	-4.370	4.138
Dividend Payout	0.5208	1.0613	0.0000	0.000	5.434
Proportion of Overseas Assets	0.0998	0.2809	0.0000	0.000	0.998

Table 4. Results of Univariate Nonparametric Tests for Independent Variables

This table provides the descriptive statistics for the two groups, users and non-users of derivatives. The sample contains 105 NZ non-financial firms listed on the NZSE in 1999. Of these firms, 71 held derivative financial instruments at balance date. The Z-statistic is the non-parametric Mann-Whitney U test statistic for the difference between the two groups of firms, users and non-users of derivatives (users classified by having outstanding contracts for the firm according to their 1999 Annual Reports).

Firms for financial year 1999	Firms with Derivatives (N=71)		Firms without Derivatives (N=34)			
	Mean	Median	Mean	Median	Z-statistic	p-value
Q	1.222	1.002	1.368	0.917	-0.425	0.671
Asset Growth/Cash flow	-0.5503	0.0000	-0.2715	0.0000	-1.649*	0.099
Tax loss	0.2958	0.0000	0.3235	0.0000	-0.288	0.774
Interest Cover	1.5480	1.3235	0.6832	0.0000	2.500**	0.012
Leverage	0.2861	0.2687	0.1272	0.0421	3.520***	0.000
Firm Value	19.265	19.006	16.846	16.920	5.944***	0.000
Managerial Share Ownership	0.2600	0.2044	0.2986	0.2236	-0.445	0.657
Alternative Capital Instruments	0.0167	0.0000	0.0139	0.0000	0.883	0.377
Liquidity	-0.0587	-0.0640	0.0681	0.0272	-0.014	0.989
Dividend Payout	0.9179	0.7302	0.5208	0.0000	3.100***	0.002
Proportion of Overseas Assets	0.1076	0.0000	0.0998	0.0000	1.365	0.172

*** significant at 1% level
** significant at 5% level
* significant at 10% level

Table 5. Tobit Regression for the Determinants of Corporate Use of Derivatives

This table reports the results of the multivariate analysis. Tobit regression models for a sample of 117 NZ non-financial firms listed on the NZSE in 1999. The first model uses the fair value calculated as the absolute value of the net gain or loss on derivative positions. The second model uses the contract values at balance date. The contract value is the total notional gross value of all derivative contracts outstanding at balance date. Both the fair value and contract values are scaled by the value of the firm (calculated as the market value of equity plus the book values of debt and preference capital). The third models (logit) uses a binary dependant variable that is assigned the value of one if a firm uses derivatives or zero otherwise. Firms are classified as derivative or non-derivative users by information in their "Notes to Financial Statements' of their 1999 Annual Report. Q is Tobin's q, it is measured as the ratio of the market value of outstanding financial claims on a firm to the firm's current total assets. The asset growth to cash flow variable is measured as the log of the ratio of the current year's change in net tangible assets plus depreciation to net income plus depreciation. The tax-loss variable equals 1 if firms have tax-loss carry forwards and 0 otherwise. Interest coverage is defined as the log of earnings before interest and tax over interest expense. Leverage is measured as the as the book value of debt over firm value. Firm value is measured as the log of the sum of the market value of the firm's equity, book value of debt and preference capital. Managerial share ownership is measured as the proportion of shares beneficially held by directors and by associated persons of the director. Alternative capital instruments are defined as the proportion of convertible bonds plus preferred equity of firm value. Liquidity is defined as the log of current assets minus inventory over current liabilities. Dividend payout is calculated as dividend per share divided by earnings per share. The proportion of overseas assets is measured as overseas assets to total assets.

Variables		**Tobit** (Dep Var = Fair Value)			**Tobit** (Dep Var = Contract Value)			**Logit**		
	Pred Sign	Coefficient Estimate	t-value	P-value	Coefficient Estimate	t-value	P-value	Coefficient Estimate	t-value	P-value
Intercept		-0.0541	-3.55***	0.0004	-1.2842	-4.04***	0.0000	-30.9073	-4.11***	0.0000
Q	+	-0.0003	-0.20	0.8386	-0.0579	-1.67*	0.0951	-0.0956	-2.38**	0.0175
Asset Growth/Cash flow	+	-0.0002	-0.23	0.8195	-0.0407	-1.85*	0.0643	-0.2187	-0.83	0.4092
Tax loss	+	-0.0022	-0.71	0.4808	0.0026	0.04	0.9669	0.6352	0.85	0.3980
Interest Cover	-	0.0000	0.01	0.9893	0.0119	0.58	0.5645	0.3731	1.31	0.1919
Leverage	+	0.0173	2.30**	0.0215	0.5082	3.07***	0.0021	4.8367	2.18**	0.0289
Firm Value	+	0.0025	3.01***	0.0027	0.0637	3.58***	0.0003	1.6267	3.92***	0.0000
Managerial Share Ownership	+	-0.0011	-0.24	0.8099	-0.0936	-0.92	0.3589	-0.0316	-0.21	0.8316
Alternative Capital Instruments	-	-0.0457	-1.66*	0.0962	-0.0852	-0.18	0.8604	-10.569	-1.77*	0.0763
Liquidity	-	-0.0001	-0.05	0.9595	0.0150	0.64	0.5254	0.4649	1.98**	0.0477
Dividend Payout	+	-0.0008	-0.64	0.5218	-0.0102	-0.38	0.7053	0.0552	0.18	0.8594
Proportion of Overseas Assets	+	-0.0019	-0.34	0.7331	-0.1238	-0.38	0.7053	-1.4218	-0.81	0.4166
Goods	+	0.0083	1.81*	0.0698	0.2820	2.95***	0.0032	4.4365	3.30***	0.0010
Service	?	0.0003	0.07	0.9453	0.1228	1.32	0.1863	2.5592	2.55**	0.0106
Info	?	0.0054	0.68	0.4965	0.3980	2.36**	0.0181	6.2606	2.24**	0.0252
Primary	?	0.0024	0.49	0.6250	0.1987	1.96**	0.0496	2.2808	1.83*	0.0676
Log Likelihood		131.1216			-18.7419			-30.3557		
McKelvey-Zavonia R^2								0.9392		

* signifanct at a 10% level
** signifanct at a 5% level
*** signifanct at a 1% level