The Determinants of Foreign Currency Hedging by UK Non-Financial Firms

Amrit Judge*
Economics Group, Middlesex University
The Burroughs, Hendon
London NW4 4BT
Tel: 020 8411 6344
Fax: 020 8411 4739
A.judge@mdx.ac.uk

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ABSTRACT

This paper empirically tests the determinants of foreign currency hedging using a large sample of UK non-financial firms. I find, unlike similar studies using US data, strong evidence of a relationship between expected financial distress costs and the foreign currency hedging decision and more significantly the foreign currency only hedging decision. This contrast in the findings between this study and US studies might be due to the fact that several of the latter include other hedging firms in their non-hedging sample, which might bias the results against the a priori expectations. However, it might also be due to a country specific institutional factor, that is, UK firms face higher expected costs of financial distress due to differences in the bankruptcy codes in the two countries.

JEL Classification: F30; G32; G33.

Keywords: Corporate hedging, Foreign currency hedging, Derivatives, Financial distress, Foreign currency debt, Bankruptcy codes.

1. Introduction

The theories of optimal hedging in general have provided explanations for the costs associated with cash flow variability arising from volatility in exchange rates, interest rates and commodity prices. These hedging theories do not make specific predictions about the type of exposures hedged. In common with several previous studies this paper recognises that different factors might be important for each type of hedging. Therefore, the empirical tests in this paper examine whether sample firms that report they hedge foreign currency exposure exhibit characteristics that are consistent with the predictions of hedging theories.

Several studies have examined which theory of optimal hedging is consistent with the use of foreign currency derivatives (Wysocki (1995), Mian (1996), Géczy, Minton and Schrand (1997), Howton and Perfect (1998), Graham and Rogers (2000) and Allyannis and Ofek (2001)). Some of these studies recognise that foreign currency denominated debt and currency derivatives can act as substitutes for foreign currency hedging (Géczy et al. (1997) and Allyannis and Ofek (2001)) however, none incorporate both methods into the definition of foreign currency hedging.[1] In Allayannis and Ofek (2001) and Graham and Rogers (2000) the sample of non-users of foreign currency derivatives might include firms that use foreign currency debt. If foreign currency debt is used for hedging purposes then this misclassification of hedging firms might impair the ability to detect differences between foreign currency

[1] Géczy, Minton and Scrand (1997) use foreign currency debt as an exogenous variable in their model of foreign currency derivatives use and Allayanis and Ofek (2001) investigate separately the use of foreign currency derivatives and the use of foreign currency debt

hedgers and non-foreign currency hedgers.[2] This study avoids this problem by allowing for both methods when classifying foreign currency hedging firms.[3]

This study also identifies another potential problem in the composition of the non-foreign currency hedging sample of several previous foreign currency hedging studies (see Wysocki (1995), Mian (1996) Géczy et al. (1997), Howton and Perfect (1998), Graham and Rogers (2000) and Allayannis and Ofek (2001)). In these studies the non-hedging sample includes non-foreign currency hedging firms that might be hedging interest rate and/or commodity price exposure. The inclusion of these "other" hedging firms in the non-hedging sample might make it more difficult to identify differences in financial and operating characteristics between foreign currency hedging and non-foreign currency hedging groups.[4] Given that the majority of these "other" hedgers are interest rate hedgers, this might explain why previous empirical studies have not been able to detect a relationship between foreign currency hedging and various proxies for the expected costs of financial distress. This study controls for this by excluding these "other" hedging firms from the non-foreign currency hedging sample. The tests show that the removal of these firms results in a stronger relationship between several exogenous variables and the foreign currency hedging decision.

The third contribution of this paper is the recognition that the sample of firms that hedge both foreign currency and interest rate exposure could be exerting undue

[2] Allayanis and Ofek's (2001) results suggest that firms use foreign currency derivatives and foreign currency debt as a means to hedge. Kedia and Mozumdar (2002) also find evidence to support the notion that firms issue foreign debt for hedging purposes.

[3] The importance of considering the range of risk management activities has been highlighted in recent research by Guay and Kothari (2002). They find that derivatives usage by many US non-financial firms is too small relative to their risk exposures. They suggest that this result is potentially consistent with firms "using derivatives to "fine tune" their overall risk-management program that likely includes other means of hedging." If correct, they argue "it emphasizes the importance of considering corporate derivatives use within the context of a much larger hedging program in empirical studies of corporate risk management."

[4] Allayannis and Weston (2001) make a similar point and show the existence of a bias in their tests.

influence on the relationship between foreign currency hedging and factors that are potentially more important for interest rate hedgers, such as the level of debt and debt servicing, which are used as proxies for the expected costs of financial distress. In order to control for this the study estimates specifications of the empirical model for a sample of foreign currency only hedgers. The empirical tests show that several proxies for financial distress are significantly related to the likelihood of foreign currency only hedging.

The paper proceeds as follows. Section 2 presents an overview of foreign currency hedging studies and summarises this paper's contribution to the existing literature on the determinants of foreign currency hedging. Section 3 describes theories of optimal hedging and develops our hypothesis. Section 4 describes our sample. Section 5 presents tests on the determinants of foreign currency hedging and section 6 concludes.

2. Overview of Hedging Studies

It is well understood that capital market imperfections create an environment in which cash flow volatility due to exposure to financial prices might adversely affect shareholder wealth. The theories of hedging that model how these imperfections provide an incentive to hedge do not identify the source of the financial exposure. In view of this most of the early studies on the determinants of hedging investigate the firm's decision to hedge any type of financial price exposure, that is, interest rate, foreign currency or commodity price exposure (see Francis and Stephan (1993), Nance, Smith and Smithson (1993), Dolde (1993, 1995), Wysocki (1996), Berkman and Bradbury (1996) and Fok, Carroll and Chiou (1997)).[5]

[5] A recent study by Graham and Rogers (2002) investigates whether tax incentives affect the extent of corporate hedging with derivatives. They use the sum of net interest rate and foreign currency derivative positions as their measure of derivatives hedging.

Recent studies have focused on the type of exposure hedged, with a view to demonstrating that different factors may be important for each type of hedging. Two studies investigate the use of foreign currency hedging instruments (Géczy, Minton and Schrand (1997) and Allayannis and Ofek (2001)). Three studies examine separately the determinants of interest rate and foreign currency hedging (Mian (1996), Howton and Perfect (1998) and Graham and Rogers (2000)). A further two investigate commodity price hedging in the gold mining, and the oil and gas industries, respectively (Tufano (1996) and Haushalter (2000)).

A hitherto unrecognised problem for these types of empirical studies is the inclusion of firms hedging other exposures in the sample of non-hedgers.[6] This is because the existence of "other" hedging firms in the non-hedging sample might blur the distinction between the two groups of firms and hence reduce the power of any empirical tests to detect a significant relation between foreign currency hedging and the various independent variables.

Table 1 shows that six previous studies investigating foreign currency hedging include in their sample of non-hedgers firms hedging other exposures. For example, Mian's (1996) foreign currency sample comprises 426 foreign currency hedgers which is 309 less than the sample of all hedgers and 2373 non-foreign currency hedgers which is 309 more than the sample of non-hedgers. This implies that the non-foreign currency hedging sample includes 309 interest rate and/or commodity price hedging firms.[7] Géczy et al. (1997) investigate the use of foreign currency derivatives

[6] Allayannis and Weston (2001) also mention this problem in their study of the impact of foreign currency derivatives use by US firms on firm value. They obtain data on the usage of interest rate derivatives and foreign debt for a subsample of firms and find that the bias only has a minor effect on their results.

[7] Mian (1996) finds, using difference in means t-tests, that currency hedgers have lower gearing than non-foreign currency hedgers. The non-foreign currency hedgers include firms hedging interest rate and or commodity price exposure. An inspection of Table 5, page 435 in Mian's paper clearly demonstrates that the inclusion of these firms in the non-foreign currency hedging sample increases the mean value of gearing for this group. The inclusion of foreign currency hedgers in the non-interest rate

by 372 large US firms and report that 220 firms (59.1 percent) use any category of derivative of which 154 firms (41.4 percent) use currency derivatives. In their empirical tests, the characteristics of the sample of currency derivative users (154 firms) are compared with those of the non-users of currency derivatives (218 firms), which include 66 firms that use derivatives other than currency derivatives or 30.3 percent of the non-user sample. Graham and Rogers (2000) identify 242 firms with ex ante foreign currency exposure, 138 of these use some kind of derivative of which 105 use currency derivatives. Non users of currency derivatives total 137 firms of which 33 firms use derivatives other than currency derivatives, which equates to 24.1 percent of the non-user sample.

Most surveys of derivative use tend to show that foreign currency and interest rate derivatives are the most popular categories of derivatives used whereas the use of commodity price derivatives lags behind in third place. This is usually because only a small proportion of the sample surveyed face commodity price exposure.[8] This suggests that the majority of "other" hedgers in the non-foreign currency hedging samples of the foreign currency studies cited above are likely to be interest rate hedgers. Therefore the existence of interest rate hedgers in the non-hedging sample might explain why none of these studies have found statistically significant links between foreign currency hedging and factors that are important to interest rate hedgers, such as variables indicating debt levels and debt servicing ability.[9] Since these variables usually act as proxies for the expected costs of financial distress this might also explain why none of the foreign currency studies cited in Table 1 find

hedging sample decreases the mean value of gearing for this group. Similar results are shown for the debt maturity variable.

[8] Phillips (1995) reports that of those firms with less than $250 million in sales, 86% face interest rate risk, 73% face foreign exchange risk, and 30% face commodity price risk. Among large firms, he reports that 97% face interest rate risk, 91% face foreign exchange rate risk and 63% face commodity price risk.

evidence in support of this hypothesis. This study controls for this and demonstrates that the inclusion of other hedging firms has an adverse effect on the ability to detect a link between foreign currency hedging and proxies for the expected costs of financial distress.[10]

The empirical analysis in this paper then develops this further by recognising that a sample of foreign currency hedgers that includes firms also hedging interest rate exposure engenders bias. This is because tests that investigate links between foreign currency hedging and factors that are potentially more relevant to interest rate hedgers, such as gearing, might be driven by the sample of foreign currency hedgers that also hedge interest rate exposure. This bias could be avoided by excluding these firms as well as those that also hedge commodity price exposure leaving a sample of foreign currency only hedgers.

3. Empirical Implications of Theories of Corporate Hedging

The foundation of our understanding of corporate financial policy is the Modigliani and Miller (1958) proposition. They demonstrated that given the firm' s investment policy, with no taxes and no contracting costs, the firm' s choice of financial policy does not affect the current market value of the firm. An equivalent statement of this proposition is that if financial policy in general - or hedging

[9] Graham and Rogers (2002) note that financial gearing is a possible source of interest rate risk.

[10] Haushalter (2000) finds that the debt ratio is significantly related to commodity price hedging in tests that use a continuous measure of hedging but is not statistically significant in probit regressions. Haushalter argues that this indicates a test using a binary measure as a proxy for hedging may not detect variables associated with the extent of hedging and suggests that differences in results between his study and previous empirical studies could be attributed to differences in the way hedging is measured. Clearly a continuous measure of hedging contains more information than a simple binary variable and therefore might facilitate the detection of significant relationships that could otherwise go undetected. Graham and Rogers (2000) seem to find support for this argument. For example, while the debt ratio has a strong positive relationship with foreign currency hedging when they use their continuous measure (Tobit and Truncated regressions), it is not statistically significant in their probit regression. However, for their interest rate hedging sample they find that the use of interest rate derivatives is significantly positively related to gearing in both their probit and truncated regressions.

specifically[11] - is to affect firm value, then it must do so through changes in tax liabilities, through changes in stakeholder contracting costs, or through interdependencies between the choice of financial policy and future real investment decisions. This implies that hedging can increase firm value by simultaneously reducing external claims to the cash flow stream flowing from the firm's assets. Such claims include taxes paid to government by the firm; bankruptcy costs (both direct and indirect) paid to accountants, lawyers and the firm's non-investor stakeholders; and/or agency costs to align managerial interests with the interests of capital suppliers. Each has the potential to provide an explanation for the corporate demand for hedging.[12]

3.1 Corporate Tax Structure

Smith and Stulz (1985) and Graham and Smith (1999) show that in the presence of a convex corporate tax function the firm's expected tax liability can be reduced by hedging. The more convex the tax schedule the greater the incentive to hedge. The factors that cause convexity in the effective tax function are progressivity in the statutory tax code and tax preference items such as tax loss carry-forwards, investment tax credits and foreign tax credits.

The range of progressivity in the UK corporate tax structure is relatively small since tax rates are progressive between profit levels of £0 and £1.5m and constant beyond £1.5m. The majority of listed firms have pre-tax profits beyond the

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These results would seem to suggest that Haushalter's assertion although partially valid is not a complete explanation.

[11]Smith and Stulz (1985) develop a positive theory of hedging by value-maximising firms in which hedging is part of overall corporate financing policy.

[12] Due to non-availability of data this study does not control for managerial motive explanations of hedging.

progressive region which suggests they face a linear effective tax function.[13] This implies that for UK firms this tax based motive for hedging is potentially rather weak. Therefore, this aspect of a firm's tax function is not measured. Many UK firms do, however, report the existence of tax loss carry forwards in the notes to their accounts. Following several previous studies this study employs a dummy variable equal to 1 if the firm has tax loss carry forwards.[14] This data is obtained from a search of notes to the accounts contained in annual reports.

3.2 Costs of Financial Distress

Firms with greater variability of cash flows are more likely to find themselves in financial distress, ceteris paribus. Smith and Stulz (1985) argue that the transaction costs of financial distress can induce firms to hedge financial price risks since the probability of incurring the costs is reduced. The savings in expected costs will vary directly with the probability of financial distress if the firm does not hedge and with the cost of financial distress. Most studies use the gearing ratio as an indicator of the likelihood of financial distress to measure expected costs of distress. This study adopts a similar approach and uses three additional measures as proxies for a firm's probability of financial distress. These are the interest coverage ratio, credit rating and a dummy variable indicating whether a firm has net interest payable or receivable. The higher the firm's gearing, the lower its interest cover ratio, the lower its credit

[13] Mian (1996) investigates hedging practices across a sample of 3022 US firms and recognises that progressivity in the tax structure applies to a very narrow range of pre-tax income. Wysocki (1996) writes, "Although the progressivity in the tax schedule applies over a small range of taxable income, generous provisions for tax loss carry forwards and investment tax credits reinforce convexities over a larger range of taxable income." (pg. 6) Gay and Nam (1998) note that most public firms in the US have pre-tax income far in excess of the progressive region and hence use the availability of tax preference items to measure convexity in the tax schedule. Brown (2001) concludes that the probability of HDG's pre-tax income being in the convex region of the tax code is negligible.

[14] Graham and Rogers (2002) suggest that tax loss variables are inappropriate for capturing 'incentives that result from the shape of the tax function" (p. 818). Furthermore, this variable may proxy for firms that have recently suffered from or are currently experiencing financial distress.

rating and if it is paying net interest, the greater the probability of financial distress. A higher probability of financial distress implies higher expected costs of financial distress, assuming that exogenous bankruptcy costs are constant across firms. However, this assumption fails to consider the possibility that exogenous bankruptcy costs might affect the firm's capital structure choice.[15] This study attempts to control for this by assuming firms within specific industries have a common exposure to financial distress and therefore uses an industry-adjusted gearing ratio.[16] The industry-adjusted gearing ratio is calculated by scaling a firm's gearing ratio by its industry average. Firms with gearing above (below) the average for their industry will have an industry adjusted gearing ratio greater (less) than 1. Finally, it is important, in the UK context, to include short-term loans and overdrafts in the definition of debt, as many short-term debts are rolled over continuously to provide long-term finance.

3.3 Underinvestment Costs

Myers (1977) observes that when firms are likely to go bankrupt in the near future, shareholders may have no incentive to contribute new capital even to invest in positive net present value projects.[17] The is because shareholders bear the entire cost of the investment, but the returns from the investment accrue to the debtholders such that the shareholders will be worse off than if the investment had not been made. A high probability of financial distress can induce shareholders to forgo investments that in a low probability environment would be undertaken.[18] Bessembinder (1991) argues that since hedging reduces the probability of financial

[15] Géczy et al. (1997) make a similar point.
[16] Firms are classified into industries using Datastream industry classifications.
[17] Myers (1977) argues that managers acting in the interests of shareholders have an incentive to forego positive NPV investments if (most of) the benefits accrue to debtholders (see also Bessembinder (1991)).

distress it effectively shifts individual future states from default to non-default outcomes. The number of future states in which shareholders are the residual claimants increases and consequently they are more willing to provide funds for investment. Furthermore, the hedging firm can effectively commit to meet obligations in states where it otherwise could not and so negotiate better contract terms in the form of lower borrowing costs. Therefore risk management effectively expands the firm' s "debt capacity".

Froot, Scharfstein, and Stein (1993) present an analysis in which they suggest that variability in internal cash flow will result in either variability in the amount raised externally, or variability in the amount of investment. Variability in investment will be undesirable, to the extent that there are diminishing marginal returns to investment. In the presence of capital market imperfections, such as informational asymmetries, the marginal cost of funds increases with the amount raised externally. A shortfall in cash may be met with some increase in costly outside financing, but also some decrease in investment. Therefore cash flow variability now disturbs both investment and financing plans in a way that decreases firm value. This is because by decreasing planned investment the firm is foregoing positive net present value projects and also since it has insufficient internal funds the firm is forced to raise costly external finance. According to Froot et al. hedging helps ensure the firm has sufficient internal funds which enables the firm to avoid unnecessary fluctuations in either investment spending or external financing and so increases firm value.

In both the Bessembinder (1991) and Froot et al. (1993) analysis the costs of underinvestment will be greater for those firms with more growth options in their

[18]Myers (1977) refers to the existence of risky debt giving rise to these adverse incentives. The debt is risky because the firm faces a high probability of financial distress.

investment opportunity set. Firms with more positive net present value investments will lose more value if these projects are forgone. In the Bessembinder (1991) framework the incentive to forego value enhancing projects increases as the probability of financial distress increases, which is determined by the level of debt and the variability of cash flows. Therefore, firms with high levels of debt and where growth opportunities constitute a larger proportion of firm value are more likely to undertake a hedging programme. The Froot et al. (1993) argument suggests that capital market imperfections, such as asymmetric information, make external finance costly. There is likely to be more asymmetric information about the quality of new projects for firms with high growth opportunities and small firms. Therefore, the Froot et al. model predicts that hedging is more likely for firms with higher expected growth and for small firms.[19] This study measures underinvestment costs using four proxies for growth options in the firm's investment opportunity set. These are research and development expenditure deflated by total sales, capital expenditure deflated by total sales, the price earnings ratio and the market-to-book value of equity. Firm size is measured using the natural log of total assets.

3.4 Foreign Currency Exposure

Firms with greater variation in cash flows or accounting earnings resulting from exposure to exchange rate risk have greater potential benefits of foreign currency hedging. For example, the probability of encountering financial distress is directly related to the firm's cash flow volatility (Smith and Stulz (1985)). The degree to which a firm's cash flows are affected by exchange rate changes should depend on the nature of its activities, such as the level of export and import activity,

[19] The growth options argument for hedging assumes that all firms face similar correlations between unhedged cash flow and investment opportunities. However, this may not be the case and thus tests should ideally control for correlations of cash flow with investment opportunities.

its involvement in foreign operations, its competitors currencies, and the competitiveness of its input and output markets. Unfortunately, data on firms' competitors' currencies and the market structure of their markets is not publicly available, however, data on foreign sales and imports and exports exists. Cash flow models of exposure suggest that the exposure should be related to net foreign currency revenues (total revenues minus costs). However, firms only report foreign currency revenues and not costs and so we are forced to employ this unrefined proxy for foreign currency exposure.[20] Therefore, in this study the level of the firm's cash flow exposure to foreign exchange rate changes is proxied using the ratio of overseas sales to total sales and a dummy variable denoting the existence of import and export activity.[21] This data is sourced from a firm's annual report.

3.5 Other Motives

We have shown that hedging can mitigate the agency problem of underinvestment. An alternative way to reduce this conflict between shareholders and bondholders is for the firm to reduce the level of debt in its capital structure (Myers (1977)). However, lowering the firm's debt leads to a fall in the interest tax shield and reduces firm value. Nance et al. (1993) argue that firms can maintain the tax benefits of debt and control the aforementioned agency problems by issuing convertible debt as opposed to straight debt. Thus, convertible debt reduces the

[20] Allayannis and Ofek (2001) suggest that the foreign sales ratio is an accurate proxy of the percentage of net foreign revenues out of total net revenues, if foreign profit margins are similar to domestic margins.

[21] Géczy et al. (1997) use the ratio of pre-tax foreign income (from the firm's foreign operations) to sales, the ratio of identifiable foreign assets to total assets and the ratio of foreign sales plus export sales to sales. Mian (1996) uses annual 1992 foreign sales as a percentage of total sales. Howton and Perfect (1998) use a dummy variable equal to one if firms report foreign income, and zero otherwise. They recognise that this variable is less sophisticated than those used in Berkman and Bradbury (1996) and Géczy et al. (1997), however, they find it identifies a similar number of firms facing foreign currency exposure.

incentive to hedge.[22] However, Géczy et al. (1997) predict a positive relation between hedging and convertible debt on the assumption that convertible debt reflects additional gearing, which constrains a firm's access to external financing. In this study the use of convertible debt is measured by the ratio of book value of convertible debt to total assets.

Notwithstanding the tax implications, Nance et al. (1993) suggest that firms can lower the probability of financial distress by issuing preference capital instead of debt.[23] A dividend payment due on preference capital can be postponed without any threat of insolvency, whereas non-payment of interest on debt can trigger insolvency. In this study the use of preference capital is measured by the ratio of book value of preference capital to total assets.

A firm could lower the likelihood of financial distress by possessing more liquid assets ensuring that funds will be available to pay debt claims. Also firms with higher levels of liquidity will have less need to access costly external financing to fund their investment programme. Although most studies employ an indicator for liquidity there is variation in how liquidity is measured. A few studies measure liquidity as current assets over current liabilities usually referred to as the current ratio (Nance et al. (1993), Mian (1996), and Fok et al. (1997)). In other studies the quick ratio is preferred (Berkman and Bradbury (1996), Tufano (1996), Géczy et al. (1997), Howton and Perfect (1998) and Graham and Rogers (2000)). In an UK context the numerator of the quick ratio includes trade debtors which incorporates accounts receivable after one year. Therefore, this study employs the cash ratio defined as cash

[22] Nance et al. (1993) say, "convertible debt includes an embedded option on the firm's assets which makes this liability more sensitive to firm-value changes and thereby reduces the sensitivity of equity value to firm-value changes." Pg. 270.

[23] Géczy et al. (1997) argue that preference capital more closely mimics the properties of debt rather than equity and therefore assume that it increases the firm's effective debt and consequently limits the

and current investments over current liabilities. We believe the cash ratio is more closely aligned with a firm's ability to meet its short-term obligations out of its readily realisable assets.

Another method of reducing the probability of financial distress could include imposing dividend restrictions (Nance et al. (1993)). Although competing arguments suggest that companies facing liquidity constraints might pay little or no dividends (Haushalter (2000)). Therefore, low dividends might imply liquidity constraints and more hedging indicating a negative association between dividend payout and hedging. This study uses the ratio of the gross dividend per share over share price to proxy for a firm's dividend behaviour.

All empirical studies examine the relationship between firm size and hedging. There are, however, competing arguments for either a positive or negative relation between firm size and hedging activity. The negative relationship between firm size and direct bankruptcy costs suggests that small firms have a greater incentive to hedge. Small firms are also faced with greater information asymmetries and higher financing transaction costs which are likely to make external financing more expensive for smaller firms and therefore hedging more likely. Conversely, hedging activity exhibits significant information and transaction cost scale economies implying that larger firms are more likely to hedge.[24] In this study we use the natural log of total assets to proxy for firm size.

availability of internal funds. Thus, they predict a positive relationship between hedging and the existence of preference capital.

[24] Mian (1996) reports that hedging exposures that are less than market amounts of $5 or $10 million is not very cost-effective.

4. Sample Description and Sources of Data on Foreign Currency Hedging

4.1 Sample Construction

This study analyses the foreign currency hedging practices of non-financial firms in the top 500 of UK firms ranked by market value as of year-end 1995. The sample consists of 441 non-financial firms. This study sources information on foreign currency hedging practices from annual reports. The majority of US studies on corporate hedging use annual reports to collect information on hedging activity. In the US financial statement information is filed electronically in various databases.[25] This facilitates the use of electronic searches to identify hedging firms and the collection of data on hedging practices. Unfortunately, in the UK such facilities do not exist. Therefore, information on hedging practices is collected by hand from annual reports published in 1995. The annual reports of 412 firms out of the initial sample of 441 firms were obtained.

4.2 Identification of Ex Ante Exchange Rate Exposure

Following Géczy et al. (1997) and Graham and Rogers (2002) this study excludes firms that do not face foreign currency exposure. Therefore in our sample a non-hedging firm has decided not to hedge its exchange rate exposure which is different to that of a firm not hedging because it has no exposure to exchange rate risk. I use the following as indicators of foreign currency exposure:[26]

1. Reporting foreign sales in the notes to the accounts.
2. Disclosure of foreign taxes in the notes to the accounts.

[25] Graham and Rogers (2002) obtain information about US firms' derivatives use from 10-K forms filed electronically in the EDGAR database.

[26] Géczy et al. (1997) and Graham and Rogers (2002) employ similar measures of foreign currency exposure. Firms with purely domestic operations (i.e. no foreign sales or imports) may be exposed to exchange rates through domestic or foreign competitors who import or export. Due to non-availability of public data this aspect of a firm's foreign currency exposure profile is not accounted for.

3. Qualitative discussion of the existence of import or export activity or foreign operations in the annual report.

The final sample comprises 366 firms that have at least one of the above sources of foreign currency exposure. None of the 46 firms eliminated through this process are foreign currency hedgers or foreign currency derivative users.

4.3 Defining Foreign Currency Hedging Firms

A feature of this study that distinguishes it from previous empirical tests of foreign currency hedging is how it defines foreign currency hedging. Most previous studies conduct electronic searches using keywords to identify foreign currency derivative users and ignore firms adopting other foreign currency hedging strategies.[27] However, this approach fails to distinguish between foreign currency derivative use and foreign currency risk management. For example, two firms may manage their foreign currency exposure arising from foreign assets, one firm using a currency swap to create a liability in the required currency, and the other using foreign denominated debt to act as a natural hedge of foreign revenues. Therefore, by equating "foreign currency hedger" with "foreign currency derivative user," the former would be characterised as a "hedger" and the latter a "non-hedger". [28] This approach would make it far more difficult to identify differences between foreign currency hedgers and foreign currency non-hedgers. Therefore, in this study foreign currency hedging firms are defined as those that provide a qualitative discussion of any foreign currency hedging activity in their annual report not just foreign currency derivative use. For

[27] For example, Graham and Rogers (2000) use an electronic keyword search and focus their investigation on the use of derivatives on the grounds that derivative holdings are disclosed in financial statements, while other strategies are more difficult to observe. See, also, Wysocki (1995), Géczy et al. (1997),

[28] Tufano (1996) makes a similar point when investigating risk management activities in the US gold mining industry.

example, firms indicating they issue foreign currency borrowings to hedge foreign assets are categorised as hedging firms.[29]

4.4 Annual Report Disclosures of Foreign Currency Hedging Practices

This section presents an analysis of the annual report disclosures on the foreign currency hedging practices of UK non-financial firms. Firms were placed into three categories; firms hedging foreign currency exposure, firms not hedging foreign currency exposure and firms providing no disclosure on foreign currency hedging. Panel A of Table 2 shows 79.2 percent of firms disclosed that they hedged foreign currency exposure, 0.6 percent stated that they did not hedge foreign currency exposure and 20.2 percent had no discussion of foreign currency hedging. In this study non-hedgers and firms with no discussion of hedging were combined to form one group of "non-hedgers of foreign currency exposure".

Foreign exchange hedging firms were also hedging other exposures such as interest rate and commodity price risks. Panel B of Table 2 shows that 44.1 percent of foreign exchange hedgers only hedge this exposure whilst 55.9 percent hedge at least one other type of exposure. Amongst this latter group the most frequent combination is that of foreign exchange and interest rate hedging.

The sample of foreign exchange non-hedgers consists of both non-hedging firms and firms hedging other exposures. The inclusion of these hedgers in the non-hedging sample might bias the empirical results against the a priori expectations. Panel C of Table 2 shows that 15.8 percent of foreign exchange non-hedgers are other hedgers of which nearly all are interest rate only hedgers. This proportion of

[29] Wysocki (1995), Graham and Rogers (2000) and Allayannis and Ofek (2001) take no account of the use of debt in their studies of the determinants of foreign currency hedging. Although, Allayannis and Ofek (2001) investigate separately the determinants of the level of foreign debt. Géczy et al. (1997)

other hedgers is smaller than that observed in Géczy et al. (1997) and Graham and Rogers (2000), 30.3 and 24.1 percent, respectively. The descriptive statistics for the independent variables used in the univariate and multivariate analysis are presented in Table 3.

4.5 The Use of Derivatives and Foreign Currency Debt by Foreign Currency Hedging Firms

Table 4 shows that 52.2 percent of firms disclose the use foreign currency derivatives for hedging. Table 5 shows that this figure is slightly higher than that reported in three US studies (Géczy et al. (1997), Howton and Perfect (1998), Allayannis and Ofek (2001)) which also investigated foreign currency derivatives use by large firms (i.e., S&P/Fortune 500 firms). The other three studies in the table (Wysocki (1995), Mian (1996) and Graham and Rogers (2002)) draw their sample of firms from a much larger population and hence include a larger proportion of smaller firms. This might explain why both Wysocki and Mian report a lower level of derivatives use. However, Graham and Rogers focus on firms with ex ante foreign currency exposure and hence their reported level of foreign currency derivatives usage is similar to that found in samples of large firms.

In addition to using foreign currency derivatives for hedging purposes foreign currency hedging firms might also employ foreign currency debt.[30] Table 4 shows that 54.4 percent of firms indicated that they used foreign currency debt for hedging. This figure is more than double the level of foreign currency debt usage by US firms reported in Allayannis and Ofek (2001), 21.8 percent, and Kedia and

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employ a foreign currency debt variable on the right hand side of their model of the determinants of the use of foreign currency derivatives.

[30] British Gas writes, "… exposure to foreign exchange risk is minimised by the use of financial instruments and by raising overseas finance to hedge against overseas assets." (pg. 21)

Mozumdar (2002), 22 percent, and less than that found for Finnish firms by Hakkarainen, Kasanen and Puttonen (1997), 65 percent. Table 4 also shows that the use of foreign currency debt as a hedging tool is slightly more popular than foreign currency derivatives with 77.2 percent of foreign currency hedgers hedging with foreign currency debt. This is similar to the findings of Berkman, Bradbury and Magan (1997), who report that over 70 percent of New Zealand hedgers use foreign debt financing as a financial hedge.

5. Empirical Analysis of Foreign Currency Hedging

This section employs univariate and multivariate tests to examine the determinants of the foreign currency hedging decision.

5.1 Univariate Tests

Table 6 shows the results of comparisons between foreign currency hedgers and foreign currency non-hedgers using both parametric (t-test) and non-parametric (Wilcoxon rank sum test) tests. The number of observations may differ for the various comparisons due to data availability.

The results show that foreign currency hedging firms are more likely to have tax losses carried forward. Foreign currency hedging firms also have significantly higher levels of gearing, higher credit ratings and lower interest coverage relative to non-foreign currency hedgers. These findings provide strong support for the financial distress and financial contracting costs hypothesis. Foreign currency hedging firms are significantly larger and employ significantly more treasury qualified personnel than non-hedging firms. The t-tests show that foreign currency hedgers do not possess higher levels of investment growth opportunities. In all cases

the observed relationship between the groups is opposite to that predicted. However, in the rank sum test the market to book ratio is significantly higher for foreign currency hedgers.

The tests for differences between hedgers and non-hedgers indicates that foreign currency hedgers have significantly lower levels of liquidity relative to non-hedgers. The cash over current liabilities ratio and current ratio are significantly lower at the 5 level respectively whereas the quick assets ratio is not significantly lower. Foreign currency hedging firms also have significantly higher dividend yields, convertible debt and preferred equity (rank sum test only). The observed relationship for convertible debt and preference capital is opposite to that predicted by the underinvestment and financial distress cost hypotheses, respectively. As expected foreign currency hedging firms have significantly greater exposure to foreign currency risk than non-foreign currency hedgers, as measured by foreign sales, foreign tax ratio, the existence of foreign operations and the incidence of import/export activity.

5.2 Multivariate Tests

Univariate tests described above tend to be weak since they do not allow for interactions among the independent variables. Therefore this section presents the results of multivariate tests which examine the effects of the independent variables on the firm's foreign currency hedging decision. The regressions employ a binary measure of foreign currency hedging. Firms that hedge foreign currency exposure are assigned a value of one for the binary variable, and all other firms are assigned a value of zero. Given the dichotomous nature of the dependent variable I estimate a logit regression to investigate the factors that affect the foreign currency hedging

decision. In these regressions, the binary foreign currency hedging variable is regressed on variables that measure tax function convexity, expected costs of financial distress, firm growth, foreign currency exposure, transaction cost economies of scales and control variables for hedging substitutes. The coefficients for the variables measuring firm growth, dividend yield, convertible debt usage and preference capital usage are not statistically significant in these regressions and therefore are ignored in subsequent multivariate regressions. The conclusions are not affected by excluding these variables.

The results from fitting the logit model are presented in Table 7 models 1 through to 6. The table reports both the estimated coefficient and elasticity for each variable. The elasticity measures the importance of a variable in the model, where more important variables have larger elasticity values.[31] The elasticities show that firm size is ranked as the most important explanatory variable in the model. The second most important variable is the foreign currency transactions dummy, followed by the proxies for the expected costs of financial distress, the tax loss dummy and the cash ratio. These results provide support for the information and transaction cost economies of scale hypothesis, the foreign currency exposure hypothesis, the financial distress cost hypothesis, the substitutes for hedging hypothesis and the costs of external finance hypothesis.

To my knowledge this is the only study to find using logit or probit regression methodology a significant relationship between foreign currency hedging and a proxy for financial distress costs.[32] In particular, the results show that the decision to

[31] See Theodossiou, Kahya, Saidi and Philippatos (1996) for a good discussion on elasticity of logit coefficients.

[32] Géczy et al. (1997) use the long-term debt ratio, an industry adjusted debt ratio and S&P credit ratings and find no evidence in support of the financial distress cost hypothesis. Furthermore, they present mixed evidence for proxies measuring underinvestment costs, which can be used to measure expected distress costs (see Graham and Rogers (2002)). Graham and Rogers (2000) find using a probit model

hedge foreign currency exposure is significantly negatively related to the level of interest cover, a firm's credit rating and if it is in receipt of net interest. These findings are consistent with Mayers and Smith (1982), Smith and Stulz (1985), Mayers and Smith (1987), Bessembinder (1991) and Froot et al. (1993) who argue that hedging facilitates a reduction in financial contracting costs. However, the three measures of gearing employed in this study, gross gearing, industry adjusted gross gearing and net gearing, are not significantly related to the foreign currency hedging decision.

The results show that financing constraints measured by firm liquidity provide incentives for hedging. A higher cash ratio implies a significantly lower probability of foreign currency hedging.[33] This result is consistent with the Froot et al. prediction that hedging activity is beneficial because it secures the availability of internal funds. It also supports the Nance et al. prediction that the existence of negative debt (i.e., cash) reduces a firm's relative need to hedge because the agency costs of debt and the expected costs of financial distress are lower.[34]

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no significant relation between foreign currency hedging and measures for financial distress costs, such as debt ratio, debt ratio times market-to-book ratio, firm profitability, tax losses and credit ratings. Allayannis and Ofek (2001) use debt ratio, return on assets, Altman's z-score and liquidity in a probit model and find that the debt ratio is significantly negatively related to foreign currency hedging (opposite to that predicted by theory) and the other measures are not significantly related to foreign currency hedging. Howton and Perfect (1998) find using a tobit model that the interest coverage ratio is positively related, the debt ratio negatively related and cash holdings positively related to foreign currency hedging (all results opposite to theory). Wysocki (1995) does not include financial distress variables in his foreign currency hedging model. Mian's (1996) logit model does not include any debt based measures of financial distress.

[33] Géczy et al. (1997), Howton and Perfect (1998) and Graham and Rogers (2000) all use the quick ratio. Mian (1996) uses the current ratio and Allayannis and Ofek (2001) use cash over total assets as their measures of liquidity. Wysocki (1995) does not include a measure for liquidity in his tests.

[34] Géczy et al. (1997) also report a negative association between a firm's decision to use foreign currency derivatives and short-term liquidity. However, the significant results (10% level) pertain to their restricted R&D sample only. Allayannis and Ofek (2001) find no evidence of a relationship between liquidity and the decision to use foreign currency derivatives. Mian (1996) and Graham and Rogers (2000) use measures of liquidity, the current ratio and quick ratio respectively, in univariate tests only.

The empirical tests provide evidence that a firm's foreign currency exposure factors are significantly and positively related to hedging.[35] Finally, the positive firm size effect may indicate that there is a significant fixed cost component to implementing a foreign currency hedging program, and small firms are less likely to achieve sufficient benefits to offset this cost. This finding is inconsistent with the notion that small firms face substantial informational asymmetry costs and therefore are more likely to hedge.

[INSERT TABLE 7 ABOUT HERE]

5.3 Excluding Other Hedgers from the Non-Foreign Currency Hedging Group

The tests in the previous section investigated the determinants of foreign currency hedging using samples of foreign currency hedgers versus non-hedgers of foreign currency exposure. As noted earlier this approach is followed by many previous studies investigating the determinants of foreign currency hedging (or foreign currency derivatives use). Table 2 shows that the group of non-foreign currency hedgers includes firms hedging interest rate and/or commodity price exposure. This paper argues that the inclusion of these firms, referred to as "other" hedging firms, in the non-hedging sample might potentially bias the results against finding particular hypothesised relationships. Since the majority of other hedgers are interest rate hedgers this might make it difficult to detect a relationship between foreign currency hedging and those factors of greater relevance to interest rate hedgers such as levels of debt and the ability to service debt. The results for models 1 to 6 in Table 7 bear this out to some extent. Although interest cover, credit rating and net interest receivable are significantly related to the foreign currency hedging

[35] This finding is consistent with the results of Wysocki (1995), Géczy et al. (1997), Howton and Perfect (1998), Graham and Rogers (2000) and Allayannis and Ofek (2001).

decision gearing, in its various forms, is not. To investigate whether the insignificant gearing results might be due to the inclusion of other hedgers, models in Table 7 are refitted excluding other hedging firms from the non- foreign currency hedging sample. These results are shown in Table 8. They show that all three measures of gearing are now significantly positively related to foreign currency hedging and that the coefficients for the other distress cost proxies have increased slightly.[36] Overall, all six proxies for financial distress are statistically significant after the exclusion of "other" hedging firms, whereas only three were prior to the removal of these firms.

These findings seem to demonstrate that the inclusion of other hedgers in the non-foreign currency hedging sample adversely affects the ability to detect a relationship between foreign currency hedging and some proxies for the expected costs of financial distress. This is the case despite the fact that the non-foreign currency hedging sample contains only 15.8 percent of other hedgers. As mentioned previously a common feature of six previous studies cited in Table 1 is the inclusion of other hedging firms in their non-foreign currency hedging sample. For example, Géczy et al.'s (1997) and Graham and Rogers (2000) samples of non-foreign currency derivative users contain 30 percent and 24 percent, respectively, of firms that are using other derivatives. Since these proportions are greater than that for the sample employed in this study, it is conceivable that the bias in their samples could be greater. Their results would seem to bear this out since neither reported a link between expected costs of financial distress and the decision to hedge foreign currency exposure. Furthermore, none of the other foreign currency hedging studies found a significant relationship either[37] and only two studies report a significant relationship

[36] Graham and Rogers (2002) find evidence supporting the notion that capital structure and hedging decisions may be made simultaneously. Therefore, it is conceivable that the findings on the gearing variables in this study may suffer from a simultaneity bias.
[37] Wysocki (1995) does not test the financial distress cost hypothesis in his study.

between hedging and liquidity.[38] The evidence presented here suggests that the aforementioned bias might explain why previous studies have failed to detect a relationship between foreign currency hedging and measures for expected costs of financial distress.

[INSERT TABLE 8 ABOUT HERE]

5.4 Multivariate Tests for Foreign Currency Only Hedgers

The empirical results in the previous sections indicate that tax loss carry forwards, proxies for financial distress costs, measures of foreign currency exposure, liquidity and firm size significantly affect the likelihood of foreign currency hedging. It was also noted that these relationships prevailed despite the existence of "other" hedgers in the non-foreign currency hedging sample. Given that most of these "other" hedgers are interest rate hedgers it is somewhat surprising that the results show a strong relationship between foreign currency hedging and variables employed to proxy for the expected costs of financial distress, such as interest cover and credit rating. This evidence would seem to suggest that financial distress costs are an important factor in determining the decision to hedge foreign currency exposure. However, the validity of the strength of this link can be called into question because of the structure of the foreign currency hedging sample.

Closer inspection of the foreign currency hedging sample reveals a few interesting characteristics. Table 2 shows that 44.1 percent of foreign currency hedgers are foreign currency only hedgers and 53.4 percent of foreign currency hedgers also hedge interest rate exposure. It follows that since over half the sample of foreign currency hedgers are also interest rate hedgers it is quite possible that this

[38] Géczy et al. (1997) report that hedging is significantly negatively related to the level of liquidity at the 10% level in only their restricted sample (i.e. firms with R&D data). Howton and Perfect (1998)

group of firms is driving the results with respect to those variables that are potentially of greater relevance to interest rate hedging firms such as the level of debt and the firm's ability to service its debt.

The empirical tests in this section examine this by investigating the determinants of foreign currency only hedging (i.e., firms that only hedge foreign currency exposure). The results of this analysis are presented in Tables 9 and 10. The models in Table 9 include "other" hedging firms in their non-foreign currency hedging samples whereas the models in Table 10 exclude these firms. These results are generally consistent with the earlier findings. Although, the foreign currency transactions dummy is now the most important explanatory variable in determining the likelihood of foreign currency only hedging, whereas firm size is no longer significant. However, a more far-reaching implication of these empirical results is that they show that the finding of a significant relationship between foreign currency hedging and several proxies for the expected costs of financial distress is not driven by the fact that foreign currency hedging firms are also hedging interest rate exposure. This demonstrates empirically, to my knowledge for the first time, an unequivocal link between the foreign currency hedging decision and the expected costs of financial distress.

[INSERT TABLES 9 AND 10 ABOUT HERE]

5.5 Robustness Tests

To facilitate comparisons with studies that investigate foreign currency derivatives use I estimate a logit regression in which foreign currency derivative users are assigned a value of 1 and non-users a value of 0 for the binary dependent

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find a significant relationship in only one of four models estimated.

variable.[39] This generates 215 foreign currency derivative users and 151 non-users. Non users include 75 firms that hedge foreign currency exposure but do not mention the use of derivatives and 11 firms that only hedge interest rate exposure. Unreported results show that tax loss carry forwards, import/export activity and firm size are important factors in determining the use of foreign currency derivatives. Of the six proxies employed for financial distress costs only the estimated coefficient for the credit rating variable is significant and consistent with this hypothesis.[40] Gross gearing and net gearing are both significantly negatively related to foreign currency derivatives use and the cash ratio is insignificant in all of the specifications estimated.[41] I then remove from the sample the 75 firms that hedge foreign currency exposure but do not use derivatives. This leaves a sample composed of 215 foreign currency derivative users and 76 non-foreign currency hedgers. Unreported analysis shows a slight improvement in the relationship between the proxies for financial distress and the use of foreign currency derivatives. Two of these proxies are statistically significant (interest cover and credit rating). Furthermore, the cash ratio is significant in all specifications. Finally, other hedging firms (mainly interest rate only hedgers) are excluded from the sample of non-foreign currency hedgers. This leads to a significant improvement for variables proxying for financial distress costs. Four financial distress proxies are significant (interest cover, credit rating, net interest receivable and gearing). These findings clearly demonstrate the effects of a bias resulting from the inclusion of hedging firms in the non foreign currency derivative

[39] Wysocki (1995), Géczy et al. (1997), Graham and Rogers (2000) and Allayannis and Ofek (2001) employ this dichotomous dependent variable.

[40] Géczy et al. (1997), Graham and Rogers (2000) and Allayannis and Ofek (2001) find no evidence in support of the financial distress cost hypothesis. Howton and Perfect (1998) use a tobit model and find that the extent of foreign currency hedging is not related to the expected costs of financial distress.

[41] Géczy et al. (1997), Howton and Perfect (1998) and Allayannis and Ofek (2001) also report a negative coefficient for the debt ratio, which in the latter study is also significant. Graham and Rogers (2002) suggest that there could be a negative relationship between debt and foreign currency derivatives if foreign currency debt is a substitute for foreign currency derivatives hedging.

user sample and potentially provide an explanation for the lack of evidence in support of the financial distress cost hypothesis in previous foreign currency hedging studies.

6. Conclusions

The empirical tests in this paper examine the determinants of foreign currency hedging for a sample of UK non-financial firms. Unlike similar earlier studies, the empirical tests in this paper provide strong evidence of a link between foreign currency hedging and various proxies for the expected costs of financial distress. A firm's liquidity is also a significant determinant of foreign currency hedging which is consistent with the Nance et al. (1993) proposition that hedging and other financial policies, such as liquidity, are substitutes. The empirical analysis demonstrates that a firm's currency exposure is a very important factor that prompts firms to hedge. The evidence also shows that the size of the firm is positively related to the foreign currency hedging decision, indicating that larger firms are more likely to hedge than smaller firms. This result is consistent with significant information and transaction cost scale economies of hedging discouraging smaller companies from hedging.

The empirical analysis in this paper recognises the existence of a potential bias created by including in the foreign currency hedging sample firms that hedge both foreign currency and interest rate exposure. This biases the results in favour of finding a significant relationship between foreign currency hedging and factors that might be more important to interest rate hedgers, such as gearing. The tests in this paper eliminate this bias by selecting foreign currency hedging firms that only hedge foreign currency exposure. The results show that several proxies for expected financial distress costs are important determinants of the likelihood of foreign currency hedging for this subsample of foreign currency hedgers. Therefore this study finds, to my

knowledge for the first time, an unambiguous relationship between the decision to hedge foreign currency exposure and the expected costs of financial distress.

Overall, the results presented in this paper seem to be more supportive of a financial distress motive to hedge than those found in earlier, mainly US, empirical studies. One potential explanation is the suggestion that the tests in several US studies are possibly biased against finding a significant relationship between foreign currency hedging and the expected costs of financial distress because in these foreign currency hedging studies the non-hedging sample includes "other" hedging firms. These firms could be those that hedge interest rate and/or commodity price exposure but not foreign currency exposure or firms that hedge foreign currency exposure with non-derivative methods such as foreign debt. These "other" hedgers might be hedging because of financial distress reasons (especially the interest rate hedgers) which potentially blurs the distinction between the two groups making it far more difficult to detect a relationship between foreign currency hedging and expected financial distress costs. Allayannis and Weston (2001) also recognise the existence of this bias in their study of the impact foreign currency derivatives use has on the value of US firms. They find that their results are unchanged when they classify interest rate only hedgers and firms that use foreign debt but not foreign currency derivatives as hedgers. This result might imply that the bias in other studies, which employ samples that are not too dissimilar to that of Allayannis and Weston, is also small.

An alternative explanation for this apparent difference in the importance of financial distress as a motive for hedging between US and UK firms is the possibility that expected financial distress costs are higher in the UK than they are in the US. This might be because of differences in the bankruptcy code between these countries (Judge 2003)). The bankruptcy code in the US is regarded as shareholder friendly

because it places greater emphasis on the shareholder retaining control in the event of default. On the other hand, the code in the UK is perceived as debtholder friendly because it confers greater rights to creditors when reorganising a bankrupt company's affairs. If the UK rules make liquidation more likely for firms in financial distress, then UK firms potentially face higher expected costs of financial distress than firms in the US. This would suggest UK firms have a greater incentive to hedge in order to lower the expected value of these costs. Furthermore, theoretical research (Ross (1997) and Leland (1998)) argues that the reduction in expected distress costs as a result of hedging is less important than the interest tax shield from increased debt due to hedging for US firms. Recent empirical research finds evidence in support of this (Graham and Rogers (2002)).

REFERENCES

Allayannis, George, and Eli Ofek, (2001), Exchange-Rate Exposure, Hedging and the Use of Foreign Currency Derivatives, *Journal of International Money and Finance*, Vol. 20, pp. 273-296.

Allayannis, George, and James P. Weston, (2001), The Use of Foreign Currency Derivatives and Firm Market Value, *Review of Financial Studies*, Vol. 14, No. 1, pp. 243-276.

Berkman, Henk, and Michael E. Bradbury, (1996), Empirical Evidence on the Corporate Use of Derivatives, *Financial Management*, Vol. 25, No. 2, (Summer), pp. 5-13.

Berkman, Henk, Michael E. Bradbury, and Stephan Magan, (1997), An International Comparison of Derivatives Use, *Financial Management*, Vol. 26, No. 4, (Winter), pp. 69-73.

Bessembinder, Hendrik, (1991), Forward Contracts and Firm Value: Investment Incentive and Contracting Effects, *Journal of Financial and Quantitative Analysis*, Vol. 26, pp. 519-532.

British Gas, (1995), Annual Report.

Brown, Gregory, (2001), Managing Foreign Exchange Risk with Derivatives, *Journal of Financial Economics*, Vol. 60, pp. 401-448.

Dolde, Walter, (1993), The Trajectory of Corporate Financial Risk Management, *Journal of Applied Corporate Finance,* Vol. 6, pp. 33-41.

Dolde, Walter, (1995), Hedging, Leverage, and Primitive Risk, *The Journal of Financial Engineering,* Vol. 4, No. 2, pp. 187-216.

Fok, Robert C.W., Carolyn Carroll and Ming C. Chiou, (1997), Determinants of Corporate Hedging and Derivatives: A Revisit, *Journal of Economics and Business*, Vol. 49, pp. 569-585.

Francis, J. and J. Stephan, (1993), Characteristics of Hedging Firms: An Empirical Investigation, in *Robert J. Schwartz and Clifford W. Smith, Jr., eds., Advanced Strategies in Financial Risk Management,* (New York Institute of Finance), pp. 615-635.

Froot, Kenneth A., David S. Scharfstein, and Jeremy C. Stein, (1993), Risk Management: Coordinating Corporate Investment and Financing Policies, *Journal of Finance*, Vol. 48, No. 5, pp. 1629-1658.

Géczy, Christopher, Bernadette A. Minton, and Catherine Schrand, (1997), Why Firms Use Currency Derivatives, *Journal of Finance*, Vol. 52, No. 4, pp. 1323-1354.

Graham, John R., and Daniel A., Rogers, (2000), Is Corporate Hedging Consistent with Value-Maximization? An Empirical Analysis. Working paper, Fuqua School of Business, Duke University, January 2000.

Graham, John R., and Daniel A. Rogers, (2002), Do Firms Hedge in Response to Tax Incentives? *Journal of Finance*, Vol. 57, No. 2, pp. 815-839.

Graham, John R. and Clifford W. Smith, Jr., (1999), Tax Incentives to Hedge, *Journal of Finance*, Vol. 54, pp. 2241-2262.

Guay, W., and S.P. Kothari, (2002). "How Much do Firms Hedge With Derivatives?" *Journal of Financial Economics forthcoming*.

Hakkarainen, Antti, Eero Kasanen and Vesa Puttonen, (1997), Foreign Exchange Risk Management: Evidence from Finland, *Managerial Finance*, Vol. 23, No. 7, pp. 25-44.

Haushalter, G. David, (2000), Financing Policy, Basis Risk, and Corporate Hedging: Evidence from Oil and Gas Producers, *The Journal of Finance,* Vol. 55, No. 1, pp. 107-152.

Howton, Shawn D., and Steven B. Perfect, (1998), Currency and Interest-Rate Derivatives Use in U.S. Firms, *Financial Management*, Vol. 27, No. 4, pp. 111-121.

Judge, Amrit P., (2003), Hedging and The Use of Derivatives: Evidence From UK Non-financial Firms, Discussion Paper, Middlesex University Business School.

Kedia, Simi and Abon Mozumdar, (2002), Foreign Currency Denominated Debt: An Empirical Investigation, Working Paper, Harvard Business School.

Leland, Hayne E., (1998), Agency Costs, Risk Management, and Capital Structure, *Journal of Finance*, Vol. 53, No. 4, pp. 1213-1243.

Mayers, David and Clifford W. Smith, Jr., (1982), On the Corporate Demand for Insurance, *Journal of Business*, Vol. 55, No. 2, pp. 281-296.

Mayers, David and Clifford W. Smith, Jr., (1987), Corporate Insurance and the Underinvestment Decision, *Journal of Risk and Insurance*, Vol. 54, pp. 45-54.

Mian, Shehzad L., (1996), Evidence on Corporate Hedging Policy, *Journal of Financial and Quantitative Analysis*, Vol. 31, No. 3, pp. 419-439.

Modigliani, Franco, and Merton H. Miller, (1958), The cost of capital, corporate finance and the theory of investment, *American Economic Review*, Vol. 48, No. 3, pp. 261-197.

Myers, S.C., (1977) Determinants of Corporate Borrowing, *Journal of Financial Economics*, Vol. 5, pp. 147-175.

Nance, Deana R., Clifford W. Smith, Jr., and Charles W. Smithson, (1993), On the Determinants of Corporate Hedging, *The Journal of Finance*, Vol. 48, No. 1, pp. 267-284.

Phillips, Aaron L., (1995), 1995 Derivatives Practices and Instruments Survey, *Financial Management*, Vol. 24, No. 2, pp. 115-125.

Ross, Michael P., (1996), Corporate Hedging: What, Why and How, Working paper, University of California, Berkeley, March 1996.

Smith, Clifford W. Jr., and René M. Stulz, (1985), The Determinants of Firms' Hedging Policies, *Journal of Financial and Quantitative Analysis*, Vol. 20, No. 4, pp. 391-405.

Theodossiou, Panayiotis, Emel Kahya. Reza Saidi and George Philappatos, (1996), Financial Distress and Corporate Acquisitions: Further Empirical Evidence, *Journal of Business Finance & Accounting*, Vol. 23, No. 5, pp. 699-719.

Tufano, Peter, (1996), Who Manages Risk? An Empirical Examination of Risk Management Practices in the Gold Mining Industry, *Journal of Finance*, Vol. 51, No. 4, pp. 1097-1137.

Wysocki, Peter, (1995), Determinants of Foreign Exchange Derivatives Use by U.S. Corporations: An Empirical Investigation, Working paper, Simon School of Business, University of Rochester.

Wysocki, Peter, (1996), Managerial Motives and Corporate Use of Derivatives: Some Evidence, Working paper, Simon School of Business, University of Rochester.

Table 1. Composition of Non-hedging Samples in Previous Empirical Studies Investigating Foreign Currency Hedging

Author(s) of Study	Date	Area of Study	Non-hedger sample includes hedgers	Proportion of other hedgers in non-hedger sample (%)
Wysocki	1995	Foreign exchange hedgers	Yes	Not available
Mian	1996	All hedgers, foreign exchange & interest rate hedgers	Yes	13.02
Géczy, Minton & Schrand	1997	Foreign exchange hedgers	Yes	30.30
Howton & Perfect	1998	All hedgers, foreign exchange & interest rate hedgers	Yes	Not available
Graham & Rogers	2000	Foreign exchange & interest rate hedgers	Yes	24.10
Allayannis & Ofek	2001	Foreign exchange hedgers	Yes	Not available

Table 2. Foreign Exchange Hedging Activity Disclosures by UK Firms

Table 2 presents data on the number of foreign exchange hedgers amongst the sample of 366 firms that are deemed to have foreign currency exposure as of year-end 1995. Panel A provides data on the number of foreign currency hedging firms. A firm is defined as a foreign exchange hedger if it provides a qualitative disclosure of any foreign currency hedging activity in its annual report. Firms using foreign currency derivatives or foreign currency debt or internal techniques for hedging purposes are classified as foreign currency hedgers. Panel B presents data on combinations of exposures hedged by foreign currency hedgers and panel C gives details of other exposures hedged by firms not hedging foreign currency exposure.

Panel A: Foreign Exchange Hedging Activity	No.	%
Hedging foreign currency exposure	290	79.2
Not hedging foreign currency exposure	2	0.6
No disclosure on foreign currency hedging	74	20.2
Total	**366**	**100**

Panel B: Foreign Exchange Hedgers Hedging Other Exposures	No.	%
Foreign exchange hedging only	128	44.1
Foreign exchange & interest rate hedging	137	47.2
Foreign exchange & commodity price hedging	7	2.4
Foreign exchange & interest rate & commodity price hedging	18	6.2
Total	**290**	**100**

Panel C: Foreign Exchange Non-Hedgers Hedging Other Exposures	No.	%
Not hedging any category of exposure	64	84.2
Interest rate hedging	11	14.5
Commodity price hedging	1	1.3
Total	**76**	**100**

Table 3. Explanatory Variables – Summary Statistics

Table 3 provides summary information for the independent variables used in the analysis.

Independent Variable	N	Mean	Median	Std. Dev.	Min.	Max.
1. Tax Function Convexity						
Tax loss carry forwards dummy	366	0.383	0	0.487	0	1
2. Expected Costs of Financial Distress						
Gross gearing	328	0.191	0.155	0.149	0	0.853
Industry adjusted gross gearing	328	1.049	0.976	0.702	0	3.477
Net gearing	333	0.084	0.07	0.165	-0.567	0.777
Interest cover	359	15.702	6.588	24.897	-20.632	100
Credit rating	350	68.783	69	18.362	0	96
Net interest dummy	330	0.254	0	0.373	0	1
3. Costs of Underinvestment: Firm Growth Options						
Capital expenditure-to-sales	285	0.082	0.043	0.170	0.001	2.332
Market-to-book ratio	329	4.284	2.477	11.585	-9.447	164.333
Price-earnings ratio	324	25.868	18.517	50.322	6.867	791.300
R&D expenditure-to-sales	178	3.553	0.977	16.612	0.029	194.267
4. Sources of Cash Flow Volatility: Measures of Foreign Currency Exposure						
Foreign sales by destination	357	40.223	41.2	31.085	0	96
Foreign sales by origin	341	32.885	28.8	28.020	0	92.2
Overseas tax ratio	320	0.310	0.217	0.413	0	5.13
Import/export dummy	366	0.727	1	0.446	0	1
Foreign operations dummy	366	0.863	1	0.344	0	1
5. Hedging Substitutes						
Cash ratio	358	0.472	0.307	0.661	0	6.877
Quick assets ratio	358	1.091	0.97	0.730	0.15	7.35
Current ratio	358	1.528	1.378	0.867	0.3	8.535
Convertible debt-to-total assets	358	0.007	0	0.021	0	0.135
Preference capital-to-total assets	358	0.028	0	0.121	0	1.957
Dividend yield	330	3.583	3.538	1.659	0	8.653
6. Information and Transaction Cost Economies of Scale						
Market value of equity (Natural log)	362	6.409	6.013	1.317	4.170	10.363
Total assets (Natural log)	358	5.710	5.365	1.547	2.428	10.266
Treasury employees dummy	366	0.516	0	0.500	0	1

Table 4. Firms Using Derivatives and Foreign Currency Debt For Foreign Currency Hedging

Method of Hedging	No.	(%)[a]	(%)[b]	(%)[c]
Foreign Currency Derivatives	215	52.2	58.7	74.1
Foreign Currency Debt	224	54.4	61.2	77.2

[a]Proportion of full sample (i.e., 412 firms). [b]Proportion of firms with foreign currency exposure (366 firms). [c]Proportion of foreign currency hedgers (i.e., 290 firms).

Table 5. Proportion of Foreign Currency Hedgers/Derivative Users in Samples of 6 Empirical Studies

Author(s) of Study	Year	Sample size	No. of Hedgers	No. of Non-Hedgers	% of FX Hedgers
Wysocki	1995	807	234	573	29.0
Mian	1996	3022 firms	440	2582	14.9
Géczy et al.	1997	372 Fortune 500	154	218	41.4
Howton & Perfect[a]	1998	451 Fortune 500/S&P 500			45.0
Allayannis & Ofek	2001	724 firm years (S&P500)			43.9
Graham & Rogers	2002	242 from 3232 firms	105	137	43.4

[a]Howton and Perfect report that 14.29% of firms in a random sample use currency derivatives.

Table 6. Differences Between Foreign Currency Hedgers and Non-Foreign Currency Hedgers Using Two Sample T-Test and Wilcoxon Rank Sum Test

Table 6 presents the results of tests of differences across a range of independent variables between foreign currency hedgers and non-foreign currency hedgers. Panel A presents the results for tests of the equality of means between foreign currency hedgers and non-foreign currency hedgers and panel B presents the results of Wilcoxon rank sum tests. T-tests assume equal variances unless the null hypothesis of equal variances is rejected at a 5% significance level.

	Panel A: Difference of means							Panel B: Wilcoxon rank sum test		
	N	Foreign Currency Hedgers	N	Non-hedgers	Mean diff.	t-stat	P-value	Hedgers vs Non-hedgers	z-stat	P-value
1. Tax Function Convexity										
Tax loss carry forwards dummy	290	0.417	76	0.238	0.180	3.712	0.000	H > NH	-3.453	0.001
2. Expected Costs of Financial Distress										
Gross gearing	264	20.299	64	14.447	5.852	3.374	0.001	H > NH	-4.743	0.000
Industry adjusted gross gearing	264	1.123	64	0.685	0.438	5.563	0.000	H > NH	-5.579	0.000
Net gearing	267	9.386	66	6.002	3.384	1.768	0.078	H > NH	-2.842	0.004
Interest cover	285	11.664	74	29.675	-18.011	-5.097	0.000	H < NH	-4.764	0.000
Credit rating	280	66.947	70	77.629	-10.682	-5.234	0.000	H < NH	-5.439	0.000
Net interest dummy	263	0.212	67	0.367	-0.155	-3.313	0.001	H < NH	-3.276	0.001
3. Costs of Underinvestment - Firm Growth Options										
Capital expenditure	232	0.073	53	0.113	-0.040	-1.894	0.060	H < NH	-2.182	0.029
Market-to-book ratio	262	3.453	67	5.940	-2.487	-1.288	0.201	H > NH	-1.900	0.057
Price-earnings ratio	260	26.092	64	30.470	-4.378	-0.608	0.544	H < NH	-0.139	0.890
R&D expenditure	150	1.799	28	11.708	-9.909	-1.414	0.168	H > NH	-0.938	0.348
4. Sources of Cash Flow Volatility - Measures of Foreign Currency Exposure										
Foreign sales by destination	282	45.424	75	12.811	32.612	11.607	0.000	H > NH	-10.431	0.000
Foreign sales by origin	268	37.840	73	9.015	28.825	12.090	0.000	H > NH	-10.358	0.000
Overseas tax	255	0.362	65	0.066	0.296	9.632	0.000	H > NH	-8.797	0.000
Import/export dummy	290	0.793	76	0.295	0.498	10.414	0.000	H > NH	-9.637	0.000
Foreign operations dummy	290	0.934	76	0.369	0.566	12.239	0.000	H > NH	-12.384	0.000

Table 6. Differences Between Foreign Currency Hedgers and Non-Foreign Currency Hedgers Using Two Sample T-Test and Wilcoxon Rank Sum Test

Table 6 presents the results of tests of differences across a range of independent variables between foreign currency hedgers and non-foreign currency hedgers. Panel A presents the results for tests of the equality of means between foreign currency hedgers and non-foreign currency hedgers and panel B presents the results of Wilcoxon rank sum tests. T-tests assume equal variances unless the null hypothesis of equal variances is rejected at a 5% significance level.

	Panel A: Difference of means							Panel B: Wilcoxon rank sum test		
	N	Foreign Currency Hedgers	N	Non-hedgers	Mean diff.	t-stat	P-value	Hedgers vs Non-hedgers	z-stat	P-value
5. Hedging Substitutes										
Cash ratio	284	0.410	74	0.650	-0.241	-2.539	0.012	H < NH	-0.681	0.496
Quick assets ratio	284	1.034	74	1.178	-0.143	-1.392	0.166	H > NH	-1.139	0.255
Current ratio	284	1.477	74	1.770	-0.293	-2.146	0.034	H > NH	-0.223	0.824
Convertible debt-to-total assets	284	0.008	74	0.005	0.003	1.674	0.095	H > NH	-2.093	0.036
Preference capital-to-total assets	284	0.024	74	0.027	-0.003	-0.256	0.798	H > NH	-2.949	0.003
Dividend yield	263	3.703	67	3.271	0.431	2.293	0.022	H > NH	-2.324	0.020
6. Information and Transaction Cost Economies of Scale										
Market value of equity (Natural log)	287	6.556	75	5.856	0.700	5.892	0.000	H > NH	-4.825	0.000
Total assets (Natural log)	284	5.906	74	5.063	0.843	5.552	0.000	H > NH	-4.941	0.000
Treasury employees dummy	290	0.579	76	0.254	0.325	6.625	0.000	H > NH	-6.024	0.000

Table 7. Logistic Regression Results of the Likelihood of Foreign Currency Hedging

Table 7 shows logit regression estimates of the relation between the likelihood that a firm hedges foreign currency exposure and proxies for incentives to hedge. Models 1 through to 6 investigate foreign currency hedgers versus foreign currency non-hedgers. The latter include interest rate and/or commodity price hedgers. The cash ratio is dropped from models 3 and 6 because the level of cash holdings is a key component of net interest and net gearing. The data are presented as log of odds (Coeff.) and elasticities (Elast.). The elasticity measures the percentage change in the probability of hedging for a 1 percent change in the independent variable and effectively measures the importance of the variable in the model. More important variables have larger elasticity values. Unlike the logit coefficients, the elasticity is independent of measurement units for the variables. Elasticities are measured at the mean of the independent variables. The final column of the table reports the average ranking for each variable's elasticity across the 6 models. The six financial distress variables are given one ranking. A variable in a model is ranked according to the absolute size of its elasticity where the highest value is accorded a rank of 1. Only statistically significant elasticities are ranked. P-values are in parentheses and are calculated using heteroskedasticity-robust standard errors. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Independent Variables	**Model 1**		**Model 2**		**Model 3**		**Model 4**		**Model 5**		**Model 6**		**Elasticiy**
	Coeff.	**Elast.**	**Coeff.**	**Elast.**	**Coeff.**	**Elast.**	**Coeff.**	**Elast.**	**Coeff.**	**Elast.**	**Coeff.**	**Elast.**	**Ranking**
Tax loss carry forwards dummy	0.715**	0.041**	0.658**	0.035**	0.872***	0.048**	0.879**	0.047**	0.881**	0.046**	0.804**	0.045**	4
	(0.031)	(0.033)	(0.042)	(0.048)	(0.008)	(0.012)	(0.011)	(0.014)	(0.012)	(0.015)	(0.015)	(0.018)	
Interest cover	-0.018***	-0.042***											
	(0.001)	(0.003)											
Credit rating			-0.027***	-0.261***									
			(0.006)	(0.004)									
Net interest receivable dummy					-1.127***	-0.041***							
					(0.007)	(0.010)							
Gross gearing							0.013	0.033					
							(0.475)	(0.473)					
Industry adjusted gearing									0.414	0.059			
									(0.161)	(0.161)			
Net gearing											0.978	0.012	3
											(0.464)	(0.467)	
Foreign currency transactions dummy	1.744***	0.189***	1.681***	0.171***	1.734***	0.186***	1.604***	0.165***	1.583***	0.160***	1.607***	0.176***	2
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
Cash ratio	-0.546***	-0.038***	-0.450**	-0.029**			-0.576**	-0.037**	-0.529**	-0.034**			5
	(0.004)	(0.004)	(0.021)	(0.023)			(0.032)	(0.042)	(0.039)	(0.049)			
Natural log of Total Assets	0.403***	0.341***	0.572***	0.451***	0.497***	0.410***	0.508***	0.403***	0.491***	0.383***	0.518***	0.439***	1
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
No. of Observations	358		351		327		325		325		330		
No. of foreign currency hedgers	284		279		260		261		261		264		
No. of non-foreign currency hedgers	74		72		67		64		64		66		
-2 Log Likelihood Ratio (Chi-squared)	82.51		78.178		68.054		66.378		67.79		56.79		
Pseudo R^2	0.2262		0.2195		0.2052		0.2310		0.2102		0.1720		

Table 8. Logistic Regression Results of the Likelihood of Foreign Currency Hedging

Table 8 shows logit regression estimates of the relation between the likelihood that a firm hedges foreign currency exposure and proxies for incentives to hedge. Models 1 through to 6 investigate foreign currency hedgers versus non-hedgers. The latter exclude all hedging firms. The cash ratio is dropped from models 3 and 6 because the level of cash holdings is a key component of net interest and net gearing. The data are presented as log of odds (Coeff.) and elasticities (Elast.). The elasticity measures the percentage change in the probability of hedging for a 1 percent change in the independent variable and effectively measures the importance of the variable in the model. More important variables have larger elasticity values. Unlike the logit coefficients, the elasticity is independent of measurement units for the variables. Elasticities are measured at the mean of the independent variables. The final column of the table reports the average ranking for each variable's elasticity across the 6 models. The six financial distress variables are given one ranking. A variable in a model is ranked according to the absolute size of its elasticity where the highest value is accorded a rank of 1. Only statistically significant elasticities are ranked. P-values are in parentheses and are calculated using heteroskedasticity-robust standard errors. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Independent Variables	**Model 1**		**Model 2**		**Model 3**		**Model 4**		**Model 5**		**Model 6**		**Elasticiy**
	Coeff.	**Elast.**	**Coeff.**	**Elast.**	**Coeff.**	**Elast.**	**Coeff.**	**Elast.**	**Coeff.**	**Elast.**	**Coeff.**	**Elast.**	**Ranking**
Tax loss carry forwards dummy	1.011***	0.043***	0.938**	0.036**	1.164***	0.049***	1.149***	0.040***	1.219**	0.046***	1.058***	0.043***	4
	(0.007)	(0.009)	(0.012)	(0.018)	(0.001)	(0.004)	(0.006)	(0.010)	(0.012)	(0.004)	(0.004)	(0.008)	
Interest cover	-0.019***	-0.035***											
	(0.001)	(0.003)											
Credit rating			-0.030***	-0.208***									
			(0.002)	(0.002)									
Net interest receivable dummy					-1.297***	-0.037***							
					(0.004)	(0.009)							
Gross gearing							0.063***	0.107***					
							(0.002)	(0.001)					
Industry adjusted gearing									0.838**	0.086**			
									(0.028)	(0.028)			
Net gearing											3.384**	0.028**	3
											(0.021)	(0.029)	
Foreign currency transactions dummy	1.510***	0.128***	1.440***	0.111***	1.515***	0.128***	1.542***	0.107***	1.406***	0.106***	1.468***	0.122***	2
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)	
Cash ratio	-0.532***	-0.028***	-0.438**	-0.021**			-0.646**	-0.027*	-0.522**	-0.024*			5
	(0.004)	(0.006)	(0.030)	(0.034)			(0.045)	(0.055)	(0.045)	(0.058)			
Natural log of Total Assets	0.518***	0.333***	0.717***	0.415***	0.578***	0.368***	0.428***	0.225***	0.516***	0.293***	0.539***	0.337***	1
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)	(0.006)	(0.001)	(0.001)	(0.000)	(0.000)	
No. of Observations	346		339		317		316		316		320		
No. of foreign currency hedgers	284		279		260		261		261		264		
No. of non-foreign currency hedgers	62		60		57		55		55		56		
-2 Log Likelihood Ratio (Chi-squared)	82.226		77.04		68.426		77.596		72.328		62.804		
Pseudo R^2	0.2527		0.2434		0.2291		0.2656		0.2476		0.2116		

Table 9. Logistic Regression Results of the Likelihood of Foreign Currency Only Hedging

Table 9 shows logit regression estimates of the relation between the likelihood that a firm only hedges foreign currency exposure and proxies for incentives to hedge. Models 1 through to 6 investigate foreign currency only hedgers versus foreign currency non-hedgers. The latter include interest rate and/or commodity price hedgers. The cash ratio is dropped from models 3 and 6 because the level of cash holdings is a key component of net interest and net gearing. The data are presented as log of odds (Coeff.) and elasticities (Elast.). The elasticity measures the percentage change in the probability of hedging for a 1 percent change in the independent variable and effectively measures the importance of the variable in the model. More important variables have larger elasticity values. Unlike the logit coefficients, the elasticity is independent of measurement units for the variables. Elasticities are measured at the mean of the independent variables. The final column of the table reports the average ranking for each variable's elasticity across the 6 models. The six financial distress variables are given one ranking. A variable in a model is ranked according to the absolute size of its elasticity where the highest value is accorded a rank of 1. Only statistically significant elasticities are ranked. P-values are in parentheses and are calculated using heteroskedasticity-robust standard errors. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Independent Variables	**Model 1**		**Model 2**		**Model 3**		**Model 4**		**Model 5**		**Model 6**		**Elasticity**
	Coeff.	**Elast.**	**Coeff.**	**Elast.**	**Coeff.**	**Elast.**	**Coeff.**	**Elast.**	**Coeff.**	**Elast.**	**Coeff.**	**Elast.**	**Ranking**
Tax loss carry forwards dummy	0.677*	0.083*	0.663*	0.081*	0.976***	0.120**	0.987***	0.122**	0.964**	0.118**	0.825**	0.102**	3
	(0.058)	(0.064)	(0.062)	(0.070)	(0.007)	(0.011)	(0.010)	(0.011)	(0.011)	(0.014)	(0.022)	(0.025)	
Interest cover	-0.020***	-0.142***											
	(0.002)	(0.004)											
Credit rating			-0.022**	-0.541**									
			(0.043)	(0.040)									
Net interest receivable dummy					-1.558***	-0.172***							
					(0.001)	(0.001)							
Gross gearing							0.011	0.061					
							(0.481)	(0.481)					
Industry adjusted gearing									0.547*	0.170*			
									(0.057)	(0.062)			
Net gearing											1.409	0.026	2
											(0.283)	(0.283)	
Foreign currency transactions dummy	1.836***	0.449***	1.719***	0.413***	2.014***	0.503***	1.824***	0.452***	1.846***	0.452***	1.759***	0.443***	1
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
Cash ratio	-0.569***	-0.101***	-0.539***	-0.094**			-0.631**	-0.110**	-0.570**	-0.098**			4
	(0.002)	(0.002)	(0.009)	(0.011)			(0.034)	(0.043)	(0.041)	(0.048)			
Natural log of Total Assets	0.006	0.010	0.163	0.277	0.051	0.087	0.097	0.164	0.037	0.062	0.100	0.174	5
	(0.969)	(0.969)	(0.276)	(0.276)	(0.737)	(0.738)	(0.571)	(0.572)	(0.818)	(0.818)	(0.536)	(0.538)	
No. of Observations	199		195		179		175		175		179	179	
No. of foreign currency hedgers	125		123		112		111		111		113	113	
No. of non-foreign currency hedgers	74		72		67		64		64		66	66	
-2 Log Likelihood Ratio (Chi-squared)	51.918		43.374		41.972		37.354		40.452		28.688	28.688	
Pseudo R^2	0.1977		0.1689		0.1773		0.1625		0.1760		0.1217	0.1217	

Table 10. Logistic Regression Results of the Likelihood of Foreign Currency Only Hedging

Table 10 shows logit regression estimates of the relation between the likelihood that a firm only hedges foreign currency exposure and proxies for incentives to hedge. Models 1 through to 6 investigate foreign currency only hedgers versus non-hedgers. The latter exclude all hedging firms. The cash ratio is dropped from models 3 and 6 because the level of cash holdings is a key component of net interest and net gearing. The data are presented as log of odds (Coeff.) and elasticities (Elast.). The elasticity measures the percentage change in the probability of hedging for a 1 percent change in the independent variable and effectively measures the importance of the variable in the model. More important variables have larger elasticity values. Unlike the logit coefficients, the elasticity is independent of measurement units for the variables. Elasticities are measured at the mean of the independent variables. The final column of the table reports the average ranking for each variable's elasticity across the 6 models. The six financial distress variables are given one ranking. A variable in a model is ranked according to the absolute size of its elasticity where the highest value is accorded a rank of 1. Only statistically significant elasticities are ranked. P-values are in parentheses and are calculated using heteroskedasticity-robust standard errors. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Independent Variables	**Model 1**		**Model 2**		**Model 3**		**Model 4**		**Model 5**		**Model 6**		**Elasticity**
	Coeff.	**Elast.**	**Coeff.**	**Elast.**	**Coeff.**	**Elast.**	**Coeff.**	**Elast.**	**Coeff.**	**Elast.**	**Coeff.**	**Elast.**	**Ranking**
Tax loss carry forwards dummy	0.931**	0.095**	0.917**	0.091**	1.234***	0.127***	1.177***	0.115***	1.247***	0.123***	1.061***	0.108***	3
	(0.019)	(0.020)	(0.021)	(0.025)	(0.002)	(0.003)	(0.007)	(0.007)	(0.004)	(0.004)	(0.008)	(0.009)	
Interest cover	-0.021***	-0.134***											
	(0.001)	(0.004)											
Credit rating			-0.026**	-0.517**									
			(0.018)	(0.018)									
Net interest receivable dummy					-1.738***	-0.169***							
					(0.001)	(0.001)							
Gross gearing							0.061***	0.239***					
							(0.002)	(0.003)					
Industry adjusted gearing									0.868***	0.217***			
									(0.009)	(0.010)			
Net gearing											4.352**	0.048**	2
											(0.017)	(0.020)	
Foreign currency transactions dummy	1.639***	0.358***	1.506***	0.318***	1.819***	0.406***	1.710***	0.357***	1.662***	0.352***	1.672***	0.370***	1
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
Cash ratio	-0.565***	-0.084***	-0.526***	-0.075**			-0.593**	-0.083**	-0.560**	-0.079**			4
	(0.001)	(0.002)	(0.009)	(0.012)			(0.039)	(0.045)	(0.041)	(0.050)			
Natural log of Total Assets	0.163	0.237	0.361**	0.504**	0.164	0.237	0.052	0.071	0.131	0.181	0.164	0.238	5
	(0.338)	(0.338)	(0.037)	(0.036)	(0.327)	(0.341)	(0.778)	(0.778)	(0.453)	(0.456)	(0.344)	(0.351)	
No. of Observations	187		183		169		166		166		169		
No. of foreign currency hedgers	125		123		112		111		111		113		
No. of non-foreign currency hedgers	62		60		57		55		55		56		
-2 Log Likelihood Ratio (Chi-squared)	48.194		39.368		40.128		43.604		41.984		33.194		
Pseudo R^2	0.2028		0.1700		0.1857		0.2068		0.1991		0.1546		