Are the Debt Capacity Effects of Foreign Currency Hedging Real or Illusory?

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Abstract

We use UK data to examine the relationship between foreign currency (FC) hedging and debt capacity. To eliminate the potential bias induced by interest rate hedging, we focus on firms that hedge FC exposure only. In the hedging sample we include firms that use FC debt to hedge FC exposure in order to avoid the misclassification problem that arises when FC debt hedgers are included in the sample of non-FC hedgers. We then distinguish between three different hedging strategies: FC derivatives only, FC debt only and a combination of the two. Our results suggest that FC hedging does not increase debt capacity but access to, and use of, FC debt, whether or not it is used for hedging, does.

Keywords: Corporate hedging; foreign currency hedging; derivatives; financial distress; foreign currency debt.

JEL classification: F30, G32, G33

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1. Introduction

The purpose of this paper is to investigate the relationship between debt capacity and corporate hedging of foreign currency (FC) exposure. The relationship is important because corporate hedging of foreign currency exposure has become common practice for importing and exporting firms and those with foreign operations.[1] However, the conception and implementation of a FC hedging strategy requires a commitment of financial, physical and human resources that can represent significant costs for the firm. According to the positive theory of corporate hedging developed by Smith and Stulz (1985), these costs can be justified only if imperfect capital markets create conditions where corporate hedging reduces exposure and adds value to the firm. Debt capacity enhancement figures prominently in the literature as a rationale for corporate hedging (Stulz. 1996; Ross 1997; Leland 1998). The argument is that hedging lowers the firm's cash flow volatility. This reduces the likelihood of financial distress and hence facilitates higher leverage, which in turn generates greater tax benefits. If firms add leverage in response to greater debt capacity the increase in interest deductions reduces tax liabilities and increases firm value.

The empirical evidence on whether hedging FC exposure increases debt capacity is still relatively sparse and results are mixed. Using a hedging dummy dependent variable for a sample of US firms both Géczy *et al.* (1997) and Graham and Rogers (2002) find that leverage is not affected by FC hedging. Bartram *et al.* (2004)

[1] This is well documented in the corporate hedging literature. For US firms, there are studies such as Wysocki (1995), Géczy *et al.* (1997), Goldberg *et al.* (1998), Howton and Perfect (1998), Graham & Rogers (2000), Allayannis and Ofek (2001) and Bartram *et al.* (2004). Studies of non-US firms include Berkman and Bradbury (1996) on New Zealand firms, Hagelin (2003) on Swedish firms and Pramborg (2005) on Swedish and Korean firms, Nguyen and Faff (2002) on Australian firms, Bartram *et al.* (2004) on firms of 48 different countries, and Heaney and Winata (2005) on Australian firms. The International Swaps and Derivatives Association (ISDA) 2003 derivative usage survey reports that today 92% of the world's 500 largest companies representing a wide range of geographic regions and industry sectors use derivatives for risk management on a regular basis (http://www.isda.org/statistics/surveynewsrelease030903v2.html).

employ a sample of close to 5000 firms from around the world. They find that hedging is associated with an increase in leverage ranging from 3% for FC derivative users, 9% for all derivative users, 11% for IR derivative users and 15% for commodity derivative users. These translate into a mean increase in value of 0.32% for currency derivative users, 0.82% for general derivative users, 1.28% for interest rate derivative users and 1.71% for commodity price derivative users. The larger debt capacity effect for commodity price hedging is curious, given that the link between interest rate hedging, debt capacity and leverage is a more obvious relation than commodity price hedging, debt capacity and leverage.

In this paper we argue that the evidence on the significance of the debt capacity of FC hedging may be misleading for several reasons. First of all, samples of FC hedgers might include firms that are also interest rate hedgers and therefore it is quite possible that this group of firms is driving the debt capacity results. This is because leverage is potentially of greater relevance to interest rate hedging firms, firstly because it is a source of interest rate exposure and secondly lenders might agree to providing debt finance if firms commit to hedging the resulting interest rate exposure. The Bartram *et al*. analysis suffers from this problem since they include all FC derivative users, which incorporates firms that use both interest rate and FC derivative users. Secondly, there is a misclassification problem related to the widespread use of FC debt as a hedging instrument[2] because most studies equate the use of FC derivatives with FC hedging due to the fact that other FC hedging strategies are difficult to observe.[3] Thus, firms that use FC debt to hedge their FC exposure but do

[2] Allayannis and Ofek (2001), Keloharju and Niskanen (2001), Kedia and Mozumdar (2003) Elliot et al. (2003) and Bartram et al. (2004) find strong evidence for the use of FC debt as a hedge for foreign currency exposure.

[3] 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

not use derivatives are misclassified as non-hedgers.[4] This makes it far more difficult to identify differences between FC hedgers and FC non-hedgers.[5] The Géczy *et al.* (1997) and Graham and Rogers (2002) studies suffer from this problem.

The third reason stems from the recent literature on the role of FC debt in the firm's corporate financing policy, which shows that access to FC debt plays a key role in the financing decisions and debt levels of multinational corporations around the world. For example, in a study of East Asian firms Allayannis, Brown and Klapper (2003) find that FC debt users possess more than twice as much debt as non users. Their multivariate tests show that firms with FC debt have a debt to value ratio 0.115 greater than firms without FC debt. They argue that there is a link between leverage capacity and access to the foreign currency debt markets, such that firms with access to FC debt have higher leverage capacity than those that don't. This link is analogous to the link between leverage capacity and access to public bond markets that allows US firms with access to public bond markets to increase their leverage above that of firms without this access (e.g. Faulkender and Petersen, 2006). It follows that the observed link between FC debt and leverage means that it is possible that for firms using foreign debt, the higher leverage has nothing to do with the debt capacity effects of FC hedging. A positive debt capacity effect could be simply because the FC hedging sample includes foreign debt users who have more debt as a result of access advantages and not because their hedging has lowered financial distress and so

statements, while other strategies are more difficult to observe. See, also, Wysocki (1995), Géczy *et al.* (1997).

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

[5] Another potential source of bias in studies of FC hedging is the inclusion of interest rate and commodity derivative users in the sample of non-FC hedgers.

facilitated more debt.[6] Therefore the debt capacity effects of FC hedging could be driven by FC debt users.

In this paper we use UK data from 1995 to test the relationship between debt capacity and corporate hedging of foreign currency (FC) risk. The UK data for this period is well adapted to the testing we propose for several reasons. Firstly, the year 1995 is at the midpoint of the years included in the studies cited above and, thus, serves as a good point of comparison. Secondly, at the time the UK had (and still has) a large number of firms with foreign operations. These firms were facing continuous currency risk because the pound had been floating since its withdrawal from the European currency mechanism in 1992. The economy was highly industrialized and open with developed, generally unrestricted capital markets and trading partners that were predominantly in the same conditions. Thus, the financing and hedging decisions by the firms in our sample are likely to reflect economic and financial criteria rather than the result of constraints imposed by shallow domestic capital markets, bureaucratic controls and the like.

This paper incorporates several innovations. First of all, to exclude the possibility that the debt capacity results are driven by interest rate hedgers we utilise a sample of FC only hedgers. Second, to investigate whether debt capacity is a result of FC hedging or simply due to FC debt use, we partition the sample into FC debt hedgers only, FC derivatives hedgers only and FC debt and FC derivatives hedgers. Our contribution is that we show that in our sample debt capacity is related to FC debt use and not FC hedging in general. Thus, we present strong evidence that the

[6] Several studies report a positive link between FC debt and leverage (Allayannis & Ofek (2001), Gelos (2003), Kedia and Mozumdar (2003), Elliott, Huffman and Makar (2003), Pramborg (2005), Aabo (2006)).

relationship between debt capacity (or leverage) and FC hedging is potentially illusory.

The paper proceeds as follows. Section 2 describes our sample. Section 3 presents tests on the determinants of FC hedging and section 4 concludes.

2. Sample description and sources of data on foreign currency hedging

2.1 *Sample construction*

This study investigates the debt capacity effects of FC hedging for a sample of non-financial firms in the top 500 of UK firms ranked by market value as of year-end 1995. The initial sample consists of 441 non-financial firms. Data on FC hedging and FC debt use is collected manually from annual reports published in 1995. The annual reports of 412 firms out of the initial sample of 441 firms were obtained. Following Géczy *et al*. (1997) and Graham and Rogers (2002) this study excludes firms that do not face FC exposure. We use the reporting of foreign sales, foreign taxes and the mention of import or export activity in the annual report as indicators of FC exposure. The final sample comprises 366 firms that have at least one of the above sources of FC exposure. None of the 46 firms eliminated through this process are FC hedgers or FC derivative users.

2.2 *Annual report disclosures of foreign currency hedging practices*

Based on qualitative disclosures in annual reports our sample firms are placed into two categories; firms hedging FC exposure and firms not hedging FC exposure, which includes firms providing no disclosure on FC hedging. We drop from our sample all firms that hedge interest rate and/or commodity price exposure leaving a sample composed of 128 FC only hedgers and 64 non-hedgers. Panel B of table 1

partitions the sample of FC only hedgers by choice of hedging technique distinguishing between FC derivatives hedging and FC debt hedging. The sample of 128 FC only hedgers consists of 63 firms (49.2 percent) using both FC derivatives and FC debt for hedging, 33 firms (25.8%) using only FC debt and 32 firms (25%) using only FC derivatives for FC hedging. The latter did not use FC debt for funding or speculative purposes either.

[INSERT TABLE 1 HERE]

2.3 *Descriptive statistics and univariate analysis*

A list and the definitions of the independent variables that figure in the univariate and multivariate analyses that follow are provided in the appendix. Descriptive statistics for these variables are presented in table 2. In this paper we employ both a book and market value measure of leverage. Table 3 provides correlations between the leverage variables used and the use of FC debt. Consistent with the findings of Allayannis *et al*. (2003) table 3 shows that FC debt usage is significantly positively correlated with all of our leverage measures.

[INSERT TABLES 2 AND 3 HERE]

Table 4 reports t-tests of differences of means, medians and Wilcoxon rank sum tests between FC only hedgers partitioned by method of hedging and non-FC hedgers (excluding interest rate or commodity price only hedgers) and between FC debt users and non-users. The sample of FC only hedgers are partitioned into firms that use both FC derivatives and FC debt, firms that use only FC debt and firms that only use FC derivatives.

Of the 192 firms examined in this study, 51.6 percent use FC denominated debt. Of those firms defined as FC only hedgers (128 firms) 75 percent use FC debt

for hedging. Two thirds of these FC debt users also use FC derivatives for hedging and the remainder use only FC debt. Whichever way we measure leverage, we find that firms using FC debt have significantly greater leverage than non-users. Table 4 shows that firms using FC debt for hedging either combined with FC derivatives (col. 2) or in isolation (col. 3) have significantly higher levels of leverage than non-hedgers. Using our MV measure of leverage, firms hedging with only FC debt have a leverage ratio that is more than 10 percentage points higher than non-hedgers (20.30% versus 9.38%). When we use our BV leverage measure the difference between these firms is nearly twice as much (30.96% versus 12.05%). Furthermore, firms using only FC debt for FC hedging have higher levels of leverage than firms using both FC debt and derivatives, although the difference is not statistically significant. Interestingly, however, FC debt only hedgers have higher levels of leverage than FC derivatives only hedgers and the difference is statistically significant.[7] In contrast, the leverage differences between firms that only use FC derivatives and non-hedgers are insignificant. When we distinguish between FC debt users and non-users (col. 5 and 6) we also find that FC debt users possess significantly greater leverage. For example, firms using FC debt have a MV leverage ratio that is 6.8 percentage points higher than non-users (17.25% versus 10.45%) and a BV leverage ratio that is 13.3 percentage points higher (28.07% versus 15.04%)[8]. This univariate evidence is consistent with the notion that the leverage differences between FC hedgers and non-hedgers might be driven by the inclusion of FC hedging firms that use FC debt for hedging. This, we suggest, calls into question results in previous studies that show a link between FC hedging, debt capacity and leverage.

[7] Results for tests of differences between hedgers are not reported but are available upon request.
[8] Allayannis et al. (2003) report a leverage ratio of 34.5% for East Asian FC debt users and a ratio of 14.6% for non-users, this difference is statistically significant.

As a robustness check on this conclusion, we identify 15 firms in the original sample of 366 firms for whom FC debt use increased their FC risk. Column 7 of table 4 shows that these firms possessed significantly higher leverage than non-hedging firms. In unreported tests these FC debt users also had more leverage than non-users of FC debt. So it would seem that irrespective of whether the FC debt is used for hedging or non-hedging purposes we find that FC debt users have higher leverage. This is consistent with Allayannis *et al.* (2003) who also report significantly higher total debt levels for FC debt users (34.5% versus 14.6%) where the FC debt creates exposure to exchange rate fluctuations.

[INSERT TABLE 4 HERE]

3. The Debt Capacity (Value) Effects of FC Only Hedging

To estimate the value effects from enhanced debt capacity due to FC hedging we follow Graham and Rogers (2002) and estimate the determinants of the capital structure and FC hedging decisions simultaneously with a two-stage estimation technique. In the first stage, we use a probit regression to obtain predicted probabilities of FC hedging.[9] In the second stage, we use the Rajan and Zingales (1995) model for the capital structure decision and add the predicted hedging probabilities obtained from the probit regression as an instrument to measure the sensitivity of leverage to FC hedging (equation (1)). This approach provides consistent coefficients and the correct standard errors.

$$Leverage(Firm\ i) = \delta_0 + \delta_1 \text{Asset tangibility}_{\ i} + \delta_2 \text{R \& D}_i + \delta_3 \text{Firm size} + \delta_4 \text{Profitability}_{\ i} + \delta_5 \text{Hedging}^* + \varepsilon_i \quad (1)$$

[9] The first stage in IV estimation is to estimate the endogenous variables (whether the firm hedges) as a function of the exogenous variables in the second stage plus additional instruments. The instruments capture the variation as to which firms hedge. We do not report the first stage results but they are available upon request.

In equation (1), *Hedging** is the predicted probability of FC only hedging obtained from the first-stage probit estimation of the FC hedging decision.

We report the second stage leverage equation results in table 5. We initially estimate stages one and two of the simultaneous equations system with our full sample of FC only hedgers that include FC hedgers using FC debt and FC derivatives, FC debt only and FC derivatives only. In the second stage leverage regression column 1 of table 5 shows that the predicted probability of FC only hedging is positively related to leverage and statistically significant. This suggests that FC hedging by UK firms increases their debt capacity. In fact, the estimated coefficient from the second-stage leverage regression suggests that foreign currency only hedging is associated with a 0.0501 increase in the leverage ratio.[10]

However, as noted previously, it is possible that the debt capacity effect is driven by the inclusion of FC debt using firms. To control for this we partition the sample of FC only hedgers into firms that use both FC derivatives and FC debt, firms that only use FC debt and firms that only use FC derivatives. We then re-estimate both stages of the simultaneous equations system separately for each of these groups of FC hedgers. The results are presented in columns 2, 3 and 4 of Table 5. They show that the predicted probability of foreign currency hedging is a significant and positive factor in determining leverage only for the samples that include FC debt users. It is not positive or significant for FC derivative only users. Furthermore, the leverage effect is more pronounced for firms using only FC debt for FC hedging, with an estimated coefficient of 0.0471 on the hedging variable. In table 6 we conduct robustness tests using book value and industry adjusted measures of leverage. The

[10] The results pertaining to some of the other variables in table 5 are consistent with the extant work on leverage. For example, we find that both asset tangibility and firm size increase the firm's leverage ratio. There is also some evidence that more profitable firms (ROCE) have lower leverage.

results are qualitatively similar to those in table 5. Clearly, it is FC debt that is driving these results and unless there is some hedging advantage associated with FC debt, we can conclude that FC hedging does not increase debt capacity. In column 5 of table 5 we examine whether there is a debt capacity effect when FC debt is not used for hedging but actually increases firms FC risk. For the 13 firms in the original sample that use FC debt but not to hedge we find a positive coefficient although it is marginally insignificant (p-value=0.16).[11] In table 6 (column 5) the coefficients using alternative leverage measures for this group of FC debt users are also positive but remain insignificant.

[INSERT TABLES 5 AND 6 HERE]

4. Conclusions

In this paper we examine the relationship between foreign currency (FC) hedging and debt capacity measured as leverage. Given the relationship between leverage and interest rate risk that could confuse the relationship between FC hedging and leverage, we focus on firms that hedge FC exposure only. In the hedging sample we include firms that use FC debt to hedge FC exposure in order to avoid the misclassification problem that arises when FC debt hedgers are included in the sample of non-FC hedgers. We then distinguish between three different hedging strategies: FC derivatives only, FC debt only and a combination of the two. We also examine the case of FC debt that is not used for hedging. The results show that debt capacity effects are significant only with respect to samples that include FC debt users, and in the case of the univariate tests regardless of whether FC debt is used for hedging or non-hedging purposes. The debt capacity effects are not significant with respect to a

[11] Two firms are dropped from the specification due to missing observations.

sample of FC derivative users only. This is evidence that FC hedging does not increase debt capacity but access to, and use of, FC debt does.

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Appendix: Variable definitions

This appendix presents the variables for the analysis of FC hedging by UK non-financial firms. It provides the variable's definition and the source of data for the variable. All variables are computed as three-year averages upto one year prior to the 1995 year -end, unless stated otherwise.

Independent Variable	Variable Description (Source)
Market value (MV) leverage	Book value of total debt and preference capital as a proportion of the book value of total debt plus the market value of equity. (Datastream)
Book value (BV) leverage	Book value of total debt and preference capital as a proportion of the book value of total debt plus the book value of equity. (Datastream)
Industry adjusted MV (BV) leverage	The MV (BV) leverage for a firm divided by average MV (BV) leverage for the industry. Firms with leverage above (below) the average for their industry will have an industry adjusted leverage ratio greater (less) than 1. Industry classifications sourced from Datastream.
Interest cover ratio	Profit before interest and tax divided by interest payments. (Datastream)
Asset tangibility	Total assets less current assets divided by total assets.
Return on capital employed	Pre-tax profit (incl interest) divided by total capital employed plus debt repayable in 1 yr. (Datastream)
Research and development expenditure	Research and development expenditure divided by total sales. (R&D Scoreboard compiled by Company Reporting Ltd.)
Tax loss carry forwards	A dummy variable equal to 1 if the firm has tax loss carry forwards for the year ended 1995. (Annual report)
Foreign sales ratio	Foreign sales divided by total sales for the year ended 1994. (Annual report)
Cash ratio	Total cash and cash equivalents divided by total current liabilities. (Datastream)
Firm size	Natural logarithm of the book value of total assets. (Datastream)

Table 1
Foreign exchange hedging activity disclosures by UK firms

This table presents data on the number of foreign exchange only hedgers and their methods of foreign currency hedging 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 only hedging firms and non-hedging firms. Panel B presents data on the methods of hedging used by foreign currency only hedgers distinguishing between the use of foreign currency derivatives and foreign currency debt.

Panel A: FC Only Hedgers and Non-Hedging Firms	**No.**	**%**
Foreign exchange hedging only	128	66.7
Non-hedging	64	33.3
Total	**192**	**100**

Panel B: Methods of FC hedging by FC Only Hedgers	**No.**	**%**
1. FC derivatives and FC debt	63	49.2
2. FC debt only	33	25.8
3. FC derivatives only	32	25.0
Total	**128**	**100**

Table 2
Variables: summary statistics

This table provides summary information for the variables used in the analysis. Variables are defined in detail in the Appendix.

Independent Variable	N	Mean	Median	Std. Dev.	Min.	Max.
Book value (BV) leverage	187	0.2166	0.2253	0.3429	0	0.9802
Industry adjusted BV leverage	185	0.9040	0.8995	0.5670	0	3.4015
Market value (MV) leverage	168	0.1393	0.1133	0.1227	0	0.6367
Industry adjusted MV leverage	168	0.8764	0.7181	0.7221	0	3.3795
Interest cover	187	21.5075	8.5163	29.7215	-20.6320	100
Return on capital employed (ROCE)	163	18.5266	13.7167	26.1044	-42.2130	228.9370
R&D expenditure-to-sales (%)	192	1.2985	0	5.6872	0	76.4604
Asset tangibility	166	0.4136	0.3900	0.1884	0.0400	0.9500
Tax loss carry forwards dummy	192	0.3385	0	0.4745	0	1
Foreign sales by destination (%)	192	38.3288	36.35	31.2395	0	96
Cash ratio	187	0.4966	0.31	0.8051	0	6.8767
Total assets (Natural log)	187	4.8757	4.7454	1.1366	2.4277	8.3399

Table 3
Pearson correlation coefficients

This table reports Pearson correlation coefficients between three different measures of leverage and a dummy variable denoting the use of FC debt. ***, ** denotes significance at the 1% and 5% level, respectively

	(1) FC debt user (MV leverage)	(2) FC debt user (BV leverage)
Leverage	0.3111^{***}	0.1914^{***}
Industry adjusted leverage	0.2729^{***}	0.2664^{***}

Table 4

Differences between foreign currency only hedgers (FC debt users) and non-hedgers (non-FC debt users) using two sample t-test, Wilcoxon rank sum test and difference in median test

This table presents the results of tests of differences between FC only hedgers (columns 2, 3 and 4) and non-hedgers (column 1), between FC debt users (column 6) and non-FC debt users (column 5) and FC debt use increasing FC risk (column 7) and non-hedgers (column 1) using a two sample t-test, a Wilcoxon rank sum test and a median test. T-tests assume equal variances unless the null hypothesis of equal variances is rejected at a 5% significance level. The table reports mean values for the t-tests, followed by z-scores for the Wilcoxon rank sum test and below that is the continuity corrected Pearson chi-squared statistic for the test for difference in medians. Bold text denotes a value statistically different from non-hedgers/non-users at the 5% level or better.

	Non-hedgers		**FC only hedgers**				**FC Debt users/non-users**				**FC Debt use increases FC risk**
	Col. 1		Col. 2	Col. 3	Col. 4		Col. 5	Col. 6			Col. 7
	N	Non-hedgers	N	FC Derivs & FC Debt	N	FC Debt only	N	FC Derivs only	N	Non FC Debt users	N	FC Debt users	N	FC Debt use increases FC risk
MV Leverage *T-test*	55	0.0938	58	**0.1577**	28	**0.2030**	27	0.1262	82	0.1045	86	**0.1725**	14	**0.2905**
Rank sum test				**-3.537**		**-4.028**		-1.101				**-4.599**		**-4.225**
Median test				**4.696**		**6.9286**		0.0240				**10.5507**		**7.5910**
Industry adjusted MV leverage *T-test*	55	0.6115	58	**1.0018**	28	**1.0911**	27	0.9239	82	0.7143	86	**1.0309**	14	**1.4763**
Rank sum test				**-3.421**		**-3.122**		-1.140				**-4.086**		**-3.434**
Median test				**4.696**		**4.6997**		0.0000				**9.5360**		**7.5910**
BV Leverage *T-test*	62	0.1205	62	**0.2654**	33	**0.3096**	30	0.2123	92	0.1504	95	**0.2807**	15	**0.4273**
Rank sum test				**-4.363**		**-4.581**		-1.333				**-5.074**		**-4.476**
Median test				**11.645**		**15.632**		0.0495				**21.2584**		**16.6855**
Industry adjusted BV leverage *T-test*	61	0.7099	61	**1.0321**	33	**1.0628**	30	0.8637	91	0.7606	94	**1.0429**	15	**1.3985**
Rank sum test				**-3.536**		**-3.018**		-1.106				**-3.811**		**-3.909**
Median test				**6.426**		**4.6696**		1.4127				**7.4164**		**16.2798**

Table 5
Determinants of Leverage – second stage leverage (instrumental variables) regression

This table reports second stage regression results examining the relationship between the likelihood of hedging with the leverage ratio. The dependent variable is the market value (MV) leverage ratio defined as book value of total debt and preference capital as a proportion of the book value of total debt plus the market value of equity. The variables used are the predicted probability of FC hedging from a first stage probit regression (FC hedging*), return on capital employed (ROCE), R&D divided by sales, asset tangibility and the natural log of total assets. Figures in parentheses are corrected standard errors. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	Col. 1	Col. 2	Col. 3	Col. 4	Col. 5
	FC Only Hedgers	FC Only Hedgers: FC Derivatives & FC Debt	FC Only Hedgers: FC Debt only	FC Only Hedgers: FC Derivatives only	FC debt users (but not for hedging purposes)
FC hedging*	0.0501***	0.0226***	0.0471**	-0.0016	0.0198
	(0.0126)	(0.0068)	(0.0215)	(0.0105)	(0.0144)
ROCE	-0.0004	-0.0003	0.0001	-0.0006*	0.0001
	(0.0003)	(0.0002)	(0.0006)	(0.0003)	(0.0010)
R&D/sales	-0.0019	-0.0045	0.0007	-0.0083	-0.0037
	(0.0042)	(0.0033)	(0.0086)	(0.0056)	(0.0074)
Asset tangibility	0.0870*	0.0836*	0.0246	0.0162	0.0406
	(0.0486)	(0.0468)	(0.0641)	(0.0533)	(0.0615)
Total assets	0.0260***	0.0269***	0.0175	0.0268***	0.0206*
	(0.0080)	(0.0080)	(0.0124)	(0.0087)	(0.0122)
Number of observations	155	106	76	77	64
Number of hedgers	107	57	27	18	13
Adj R-Sq	0.3105	0.2885	0.2992	0.1913	0.4018

Table 6
Second stage leverage (instrumental variables) regression: Alternative measures of leverage

This table presents second-stage results for the leverage regression employing alternative measures of leverage. Only the coefficient on the hedging variable is reported. Book value leverage is defined as the book value of debt plus preference capital as a proportion of the book value of debt plus the book value of equity. Industry adjusted leverage is defined as the leverage for a firm divided by average leverage for the industry. Firms with leverage above (below) the average for their industry will have an industry adjusted leverage ratio greater (less) than 1. Figures in parentheses are corrected standard errors. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	Col. 1	Col. 2	Col. 3	Col. 4	Col. 5
Estimated coefficient on FC hedging in 2nd stage leverage regression	All FC Only Hedgers	FC Derivatives & FC Debt	FC Debt only	FC Derivatives only	FC debt users (but not for hedging purposes)
MV leverage regression (from Table 5)	0.0501*** (0.0126)	0.0226*** (0.0068)	0.0471** (0.0215)	-0.0016 (0.0105)	0.0198 (0.0144)
Industry adjusted MV leverage regression	0.2929*** (0.0805)	0.1357*** (0.0451)	0.2675** (0.1249)	0.1155 (0.1015)	0.1222 (0.0879)
BV leverage regression	0.0875*** (0.0224)	0.0405*** (0.0137)	0.0907** (0.0401)	0.0155 (0.0191)	0.0468 (0.0330)
Industry adjusted BV leverage regression	0.2632*** (0.0727)	0.1057** (0.0413)	0.2505** (0.1161)	0.0501 (0.0658)	0.1267 (0.0906)