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

Amrit Judge and Ephraim Clark

Department of Economics and Statistics
Middlesex University Business School

Swiss National Bank and CEPR Conference
23rd September 2008

Motivation

- Several studies have examined the determinants of hedging.
- Why Hedge? Geczy et al. (1997), Judge (2006).
- Key question for shareholders is whether hedging increases firm value.
- One channel via which hedging can increase value is through its impact on firm leverage (debt capacity).
- Empirical research on the debt capacity effects of hedging is relatively recent and the results rather mixed.
- We use UK data to present empirical evidence on the debt capacity effects of FC hedging.

Debt Capacity Effects of (FC) Hedging

- Stulz (1996), Ross (1997), and Leland (1998) show that by reducing the probability of financial distress, hedging increases debt capacity.
- If firms add leverage in response to greater debt capacity – the increase in interest deductions reduces tax liabilities and increases firm value.
- Leland (1998) argues that hedging increases value through two different channels related to debt usage.
- The principal gain comes from "the fact that lower average volatility allows higher leverage with consequently greater tax benefits."
- A secondary hedging gain comes from "lower expected default rates" and distress costs, resulting from unused debt capacity.

Previous Empirical Evidence on Debt Capacity Effects of Hedging

- Using a binary FC hedging variable for a sample of US firms Geczy et al. (1997) and Graham and Rogers (2002) find no evidence that FC hedging increases debt capacity.
- G&R (2002) suggest that it is not the yes/no decision of whether to hedge, but how much a firm hedges that increases debt capacity.
- Bartram et al (2004) 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.
- The larger debt capacity effect for commodity price hedging is curious???

Table 1: Summary of Studies Examining Debt Capacity Effects of Hedging

Author(s)	Area of Study	Country	Period	Sample size (# of firms)	Hedging measure	Debt Measure	Hedging coefficient in 2nd stage leverage equation
Géczy, Minton & Schrand (1997)	Foreign currency derivatives	US	1990	372	Dummy	LT debt/MVE+BV LT debt+ BV pref stock	Not significant
Graham & Rogers (2000)	IR and FC derivatives	US	1995	442	Continuous	Total debt/BV assets	IR=0.3185 (1%) FC=0.7977 (1%)
Graham & Rogers (2002)	All derivatives	US	1995	442	Continuous	Total debt/BV assets Total debt/MV assets	All=0.3218 (5%)
Bartram, Brown and Fehle (2004)	All derivatives, foreign currency, interest rate & commodity derivatives	48 countries worldwide	2000,2001	7,263	Dummy	Total debt/MVE+total debt+pref stock	All=0.09 (1%) FC=0.03 (1%) IR=0.11 (1%) CP=0.15 (1%)
Dionne & Triki (2004)	Gold derivatives	US & Canada	1991-1998	11 US 25 Canada	Continuous	BV LT debt/MV of firm	0.5234 (1%)
Clark, Judge & Ngai (2006)	All derivatives	Hong Kong & China	2002	167 HK 60 China	Dummy	BV Total debt/MV of equity + Total debt	HK=0.3213 (1%) China=0.2105 (1%)
Belghitar, Clark & Judge (2007)	All IR and FC hedgers (derivative + non-derivative) IR and FC derivative users	UK	1995	412	Dummy	BV Total debt/MV of equity + Total debt	All IR=0.5067 (1%) IR dev=0.7469 (1%) All FC=0.1867 (1%) FC dev=0.0938 (1%) FC&IR=0.2365 (1%)
Berrospide, Purnanandam & Rajan (2008)	Foreign currency derivatives	Brazil	1997-2004	167	Dummy	Foreign debt/Total assets	0.0487 (5%)
Fazillah, Azizan & Hui (2008)	All derivatives	Malaysia	2001-2005	101	Continuous	Total debt/Total assets	15.3506 (1%)
Purnanandam (2008)	Foreign currency and Commodity derivatives	USA	1996-1997	more than 2000	Dummy, Continuous	Total debt/ BV of Assets	Not reported

Evidence on the significance of the debt capacity of FC hedging

- Evidence may be misleading for several reasons.
- Samples of FC hedgers might include firms that are also IR hedgers and therefore it is quite possible that this group of firms is driving the debt capacity results for FC hedgers.
- This is because leverage is potentially of greater relevance to IR hedging firms: because it is a source of IR exposure and secondly lenders might agree to providing debt finance if firms commit to hedging IR 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.

Evidence on the significance of the debt capacity of FC hedging

- Secondly, there is a misclassification problem related to the widespread use of FC debt as a hedging instrument.
- 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.

Evidence on the significance of the debt capacity of FC hedging

- Most studies equate the use of FC derivatives with FC hedging due to the fact that other FC hedging strategies are difficult to observe.
- Thus, firms that use FC debt to hedge their FC exposure but do not use derivatives are misclassified as non-hedgers.
- This makes it far more difficult to identify differences between FC hedgers and FC non-hedgers.
- The Géczy *et al.* (1997) and Graham and Rogers (2002) studies suffer from this problem.

The Link Between FC debt and Leverage

- 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.
- 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.

The Link Between FC debt and Leverage

- 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.
- It follows that the observed link between FC debt and leverage means that it is possible that for FC hedging firms using foreign debt, the higher leverage has nothing to do with the debt capacity effects of FC hedging.

The Link Between FC debt and Leverage

- A positive debt capacity effect could be simply because the FC hedging sample includes FC debt users who have more debt as a result of access advantages and not because their FC hedging has lowered financial distress and so facilitated more debt.
- 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)).
- **Therefore the debt capacity effects of FC hedging could be driven by FC debt users.**
- If FC debt is used for hedging can we measure a debt capacity effect?

Table 1
Proportion of foreign currency debt users in samples of empirical studies

Author(s) of study	Publication year	Country & sample size	% of FC debt users (year of data collection)
Edelshain	1995	UK – 189	60.0 (1990)
Geczy, Minton & Schrand	1997	US – 372	NA (1990)
Berkman, Bradbury & Magan[a]	1997	NZ – 116	70.0 (1994)
Hakkarainen, Kasanen & Puttonen	1997	Finland – 84	84.1 (1994)
Keloharju & Niskanen[b]	2001	Finland – 44	54.9 (1985-91)
Graham & Harvey[c]	2001	US - 392	31.0 (1999)
Allayannis & Ofek	2001	US – 724 firm years	21.8 (1993)
Allayannis, Brown & Klapper	2003	EA – 327	61.8 (1996)
Kedia & Mozumdar	2003	US – 523	22.0 (1996)
Elliott, Huffman & Makar	2003	US – 88 or 262 firms years	100.0 (1994-97)
Hagelin	2003	Sweden – 101	53.0 (1997)
Bartram, Brown & Fehle	2004	US – 2207	65.5 (2000 & 2001)
		UK – 886	85.6
		Germany – 412	86.7
		France – 163	88.3
		Europe – 2520	88.1
		Asia & Pacific – 1731	90.7
		Africa & M.East – 125	84.0
		Latin Amer/Carib – 88	95.5

[a]Berkman *et al.* report the use foreign debt financing as a financial hedge amongst New Zealand hedgers.
[b]Foreign currency debt is long-term debt.
[c]Graham and Harvey's (2001) figure reports firms that seriously considered issuing debt in foreign markets. This figure therefore overstates the proportion of firms that might actually be using foreign debt.

international trade is lower in the US than in many other countries, thereby suggesting that FC debt usage, which might be used to finance foreign trade activity, may also be relatively less important for US firms. For example, Bodnar *et al.* (2003) note that the Dutch economy is much more open to international influences than the US economy.[11]

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

Sample Description and Sources of Data on Corporate Hedging Activity

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.

- Data on hedging is sourced from Annual reports.

- The annual reports of 412 firms out of the initial sample of 441 firms were obtained.

Foreign exchange hedging activity disclosures by UK firms

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**

Pearson correlation coefficients

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

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

	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**

Estimating Debt Capacity Effects of FC Hedging for UK firms

- To estimate the valuation effects of 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.

- 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.

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

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

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

	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

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

	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)

Determinants of Leverage – OLS regression

Dep var = MV leverage	
FC Derivs & FC debt	0.0333*
	(0.0193)
FC Debt only	0.0485**
	(0.0241)
FC Derivs only	0.0301
	(0.0229)
ROCE	-0.0011*
	(0.0006)
R&D/sales	-0.0009
	(0.0041)
Asset tangibility	0.0031
	(0.0461)
Total assets	0.0250***
	(0.0080)
Market-to-book ratio	-0.0078*
	(0.0041)
Average tax ratio	-0.0299
	(0.0564)
Debt mat >5 years	0.0085
	(0.0395)
Debt mat <1 year	-0.0856**
	(0.0338)
Number of observations	149
Adj R-Sq	0.3171

Summary & Conclusions

- We 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 of FC hedging 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 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.