CORPORATE HEDGING WITH FOREIGN CURRENCY DERIVATIVES AND FIRM VALUE

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ABSTRACT

In this paper, we use a sample of 176 of the largest French non financial firms over the period 2003-2005 to investigate the relationship between firm value, currency risk and corporate hedging with foreign currency (FC) derivatives for the year 2004, the transitional year for the application of the International Accounting Standards 32 and 39 that require disclosure on hedging practices and derivatives use. We find that FC derivative use is neither a significant determinant of corporate exposure to FC risk nor a significant determinant of firm value as measured by Tobin's Q. In fact, we find a negative relationship between leverage and FC derivative use, which suggests a lower tax shield and a loss of firm value. These results are robust with respect to a battery of control factors and to alternative measures of hedging activity and are evidence that French firms are using derivatives inefficiently, and/or, contrary to what they announce in their reports, using them to speculate as well as to hedge.

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Keywords: Risk management; Foreign currency exposure; Foreign currency derivatives use; Hedging; Firm value.

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1. INTRODUCTION

The purpose of this paper is to investigate the relationship between firm value, exchange rate fluctuations and corporate hedging with foreign currency derivatives. The relationship is important because corporate use of derivatives to hedge foreign currency (FC) exposure has become standard practice for firms with foreign operations or commercial interests.[1] The conception and implementation of an 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. Many studies have examined what these conditions are and why firms might be using derivatives for hedging. The key question for shareholders, however, is whether hedging does, in fact, reduce exposure and add value to the firm. Given the complex relationships between exchange rates and other economic factors, such as relative prices, income, expenditure, interest rates, supply and demand, to mention only a few, anticipating the overall consequences of FC hedging is difficult, at best. Our study is motivated by the possibility that corporate use of FC derivatives might be ineffective by failing to reduce exposure and add value, or even counterproductive by increasing exposure and destroying value.

[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 Hagelin (2003) on Swedish firms and Pramborg (2005) on Swedish and Korean firms, Berkman and Bradbury (1996) on New Zealand 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).

Indeed, when the theory and practice of corporate hedging of foreign currency (FC) exposure meets the empirical evidence, the results are mixed at best and often contradictory. For example, exchange rate fluctuations have long been recognized as an important source of macroeconomic uncertainty that can have a significant impact on firm value.[2] There is also a substantial literature on the foundations of currency risk exposure analyzing the parameters and transmission mechanisms that determine a firm's sensitivity to exchange rate movements.[3] However, most studies, such as Jorion (1990), Bodner and Gentry (1993), Amihud (1994), Choi and Prasad (1995), He and Ng (1998) Miller and Reuer (1998), Hagelin and Prambourg (2004), to mention only a few,[4] find that only a small percentage of their sample firms show significant exchange rate exposure and, surprisingly, there doesn't seem to be much difference in significant exposure rates between hedgers and non-hedgers.[5] Furthermore, preliminary evidence from Allayannis and Ofek (2001) and Hagelin and Prambourg (2004) suggests that FC hedging, although often negative and significant, has only a marginal effect on FC exposure.[6]

The evidence is also mixed where value creation is concerned. For example, in a study that measures the effect of derivatives use on Tobin's Q as a proxy for firm value, Bartram et al. (2004) find a significant positive value effect for all derivative users taken together but perversely only for firms without any financial price exposure. When broken down according to hedging type, no value effects are found for FC derivative users. Allayannis and Weston (2001), Allaynnis, Ihrig and Weston (2001), Nain (2004), and Kim, Mathur

[2] Exchange rate fluctuations and the balance of payments figured prominently in the international economics literature of the 1950s and 60s. For some of the original work see: Meade (1951), Alexander (1952 and 1959), Pearce (1961), Tsiang (1961), Gerakis (1964) and Caves and Johnson (1968).

[3] See, for example, Shapiro (1975), Dumas (1978), Hodder (1982), Flood and Lessard (1986), Booth and Rottenberg (1990), Levy (1994), Marston (2001), Allayannis and Ihrig (2001) and Bodner et al. (2002).

[4] See Muller and Vershoor (2006) for a comprehensive review of the literature.

[5] Kiymaz (2003) is an exception . In his sample of 109 Turkish firms from 1991 to 1998, close to 50% are exposed to exchange rate movements.

[6] In Allayannis and Ofec (2001) hedging explains less than 9% of exposure at most while in Hagelin and Prambourg (2004) the inclusion of hedging variables increases the R^2 by less than 2% at most.

and Nam (2006) find evidence that FC derivative hedging does add to firm value. However, Allayannis, Lel and Miller (2004) find that the FC hedging premium is statistically significant and economically large only for firms that have strong internal and external corporate governance.

Results are also mixed when the value added from hedging is associated with a specific explanation of why firms hedge. This literature revolves around the debt capacity benefits of hedging developed by Stulz (1996), Ross (1997), and Leland (1998), who show that by reducing the probability of financial distress, hedging increases debt capacity. In this framework, hedging increases a firm's ability to take on more debt (i.e., debt capacity). If firms respond by adding to their leverage, this will lead to an increase in interest deductions, which in turn generates incremental tax shield benefits that can increase firm value. Three studies investigate the debt capacity effects due to FC hedging with mixed results. 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. On the other hand, Bartram *et al*. (2004) find that hedging is associated with a small increase in leverage of about 3% for FC derivative users, which translates into a mean increase in value of 0.32%.

In this paper we use a sample of 176 of the largest French non financial firms over the period 2003-2005 to investigate the relationship between firm value, exchange rate fluctuations and corporate hedging with FC derivatives for the year 2004. In 2004, the transitional year for the application of the International Accounting Standards 32 and 39 that require disclosure on hedging practices and derivatives use, most French firms began compliance by making formerly unreported information available.[7] The French data for this period is well adapted to the value testing we propose. France has a large number of firms with substantial foreign operations. The economy is highly industrialized and open with developed, generally unrestricted capital markets and trading partners that are 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.

We start by testing the relationship between firm value and foreign currency risk. Besides the Jorion (1990) procedure for estimating currency risk, we also propose an innovative, alternative procedure that orthogonalizes the currency risk factor and takes account of the potentially imperfect integration of international stock markets. We also use a series of robustness tests to control for a number of arguments in the literature that might explain the low rate of significant exposure coefficients. To control for exchange rate proxy problems, we separate the USD component from the rest of the weighted euro-index and test the two as separate risk factors.[8] We use a one period lag in the currency risk

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[7] Disclosure requirements of IAS32 include: risk management and hedging policies; hedge accounting policies and practices, and gains and losses from hedges; terms and conditions of, and accounting policies for, all financial instruments; information about exposure to interest rate risk and credit risk; fair values of all financial assets and financial liabilities, except those for which a reliable measure of fair value is not available. IAS39 requires that all financial assets and financial liabilities, including all derivatives and certain embedded derivatives, must be recognised on the balance sheet.

[8] In the empirical literature, the exchange risk factor can be a trade weighted exchange rate or a bilateral exchange rate under the assumption of a dominant trading currency that affects all or most firms in the sample. In this paper we use a trade weighted rate. Williamson (2001) points out, however, that tests using a trade weighted basket of currencies may lack power if a firm is mostly exposed to only a few currencies within the basket and Miller and Reuer (1998) argue that a trade weighted index disregards the problem of low and negative correlations among exchange rates. By isolating the EUR/USD exchange rate, which we find accounts for 80% of changes in the total index, we capture the effects of the dominant trading currency and let the residual index account for the remaining effects.

factor to account for the learning curve effect suggested by Bartov and Bodnar (1994)[9] and a squared risk factor to account for potential non-linearities discussed by Booth (1996). Finally, we separate the currency risk factor into two variables, one for up moves and one for down moves, to control for the possibility that positive exchange rate shocks have a different impact on firm value than negative ones as tested by Choi and Prasad (1995), Krishnamoorthy (2001) and Koutmos and Martin (2003). We find that controlling for these factors generally reduces the rate of significant exposure coefficients. Interestingly and contrary to intuition, currency exposure, measured as the absolute value of the coefficient on the currency factor,[10] is higher on average for firms that hedge than for those that do not and the rate of significant coefficients is 2.4 times higher. A possible explanation for higher exposure coefficients for FC hedgers is that they have higher inherent risk to begin with. However, the relatively high rate of significant coefficients with respect to non-hedgers weakens this argument because, as Bartov and Bodner (1994) have argued, effective hedging should reduce the rate of significant exposure. Indeed, when we test for the determinants of currency exposure, we find that FC derivative hedging is not significant and the explanatory power of the models is close to zero with most adjusted R^2 in the negative range. These results are robust with respect to the control factors presented above and to alternative measures of hedging activity and are evidence that firms are using derivatives inefficiently, and/or, contrary to what they announce in their reports, using them to speculate as well as to hedge.[11]

[9] As an instrumental variable, this also controls for the possible endogeneity between exchange risk and returns.
[10] The absolute value measures the magnitude of the exposure, which is the focus of this paper.
[11] Geczy et al., (2006) find that US firms that readily admit to speculating in an anonymous survey do not report these activities in their financial reports. In the majority of cases annual report disclosures contradict the survey responses.

In the Tobin's Q tests we find that derivative hedging is not significant and sometimes enters the equation with a negative sign. These results are consistent with the exposure tests and are more evidence that French corporate currency derivative use is ineffective, speculative, or both. When we test the effect of FC derivative hedging on debt capacity, we find a negative relationship that is barely insignificant at the 10% level (p-value = 11%). This suggests that rather than reducing risk and increasing debt capacity and firm value through the tax shield, FC derivative hedging actually has the opposite effect. We interpret this in the context of the bondholders' wealth expropriation hypothesis where shareholders are using FC derivatives as a speculative tool to increase the riskiness of equity at the expense of debt holders as evidence that there is a strong speculative component in French FC derivative use. These results are robust to the measure of FC derivative use as a notional amount or as a dummy variable.

The contribution of this paper takes several directions. There are few published studies on French FC derivative hedging[12] and none that we know of that use data based on the new International Accounting Standards that require detailed reporting of derivatives use. More importantly, we show that the currency exposure of individual firms is a significant determinant of firm value for a relatively small proportion of our sample, which is in line with the vast majority of the outstanding literature cited above. Moreover, cross sectional analysis provides strong evidence that FC derivative use is not a significant determinant of corporate exposure to FC risk. In an important innovation we show this is true even after accounting for the imperfect integration of capital markets and country specific FC risk as well as for proxy problems due to the use of an index rather than individual exchange rates, a potential learning lag and/or endogeneity between currency risk and returns, non linearity

[12] One exception is an interesting paper by Nguyen et al. (2004) that compares French corporate hedging practices before and after the introduction of the euro.

and asymmetric reaction to positive and negative moves in the exchange rate. We also provide strong evidence that FC derivative hedging is not a significant determinant of firm value as measured by Tobin's Q (in fact, it sometimes enters the regression with a negative coefficient). This is confirmed by the negative relationship between leverage and FC derivative use, which rules out the tax shield argument of increased firm value through hedging generated leverage and suggests that there is a strong speculative element in French corporate use of FC derivatives.

The rest of the paper is organized as follows. Section 2 describes the sample. Section 3 presents the methodology and results for estimating the exposure coefficients. Section 4 presents the cross sectional analysis for the determinants of currency exposure. Section 5 uses Tobin's Q and leverage to analyse the effect of hedging on firm value. Section 6 concludes.

2. SAMPLE DESCRIPTION

This study investigates the FC hedging practices of a sample of the top 240 French non-financial firms. Data on FC exposure, FC risk management and derivatives use was collected manually from annual reports published in 2004. We excluded 25 firms that reported no FC exposure and 39 firms were also excluded due to the lack of accounting and financial information reported by Thomson One Banker. This approach left us with 176 firms in our final sample. The stock return data are from Datastream.

Table 1 provides summary statistics for the sample. Panel A presents an industry classification of the firms in the sample using the Campbell (1996) classification. The sample spans 11 industries. Services and consumer durables have the highest representation comprising 22.16% and 20.45% of the sample respectively while petroleum (1.14%), transportation (2.27%), and construction (3.41%) have the lowest. Panel B provides the descriptive statistics of the key characteristics of the firms in the sample. Book value of total long term debt averages about EUR 1117.51 million and ranges from zero to EUR 41175 million. The firms have average total assets of EUR 4986.22 million, ranging from EUR 4.632 million to EUR 89207 million. Finally, the firms have average turnover of EUR 4264.60 million with a minimum of EUR 2.51 million and a maximum of EUR 122700 million. Average net income is about EUR 143.90 million. Long term debt/total assets is a measure of leverage. Tobin's Q, calculated as the book value of total assets minus the book value of equity plus the market value of equity divided by the book value of total assets, is a measure of firm value. The ratio of foreign sales to total sales is a measure of foreign operations.

Table 2 presents the statistics on the use of FC derivatives for the firms in the sample. Panel A shows 58.52% of firms disclose that they use FC derivatives and 41.48% are classified as non-users of FC derivatives. Panel B provides descriptive statistics of the extent of derivatives use represented by the total FC derivative notional value deflated by total assets (HEDGE). The average of HEDGE is 0.0632 for all firms in our sample. For the sub-sample of FC derivatives users, HEDGE averages 0.1079 and ranges from 0.00005 to 1.0111.

Table 1: sample description

This table presents characteristics of 176 firms in the sample. The sample consists of non-financial firms exposed to currency risk as reported in their 2004 annual report. Financial data is for consolidated firms, procured from Thomson One Banker and Firms' Annual Reports. All data are as of the end of fiscal year, 2004.

Values in millions of euro

Panel A: Industry classification of the sample firms using Campbell (1996) classification			
Industry	SIC codes	Number of firms	Percentage of total
Petroleum	13, 29	2	1.14
Consumer durables	25, 30, 36, 37, 50, 55, 57	36	20.45
Basic industry	10, 12, 14, 24, 26, 28, 33	21	11.93
Food and tobacco	1, 2, 9, 20, 21, 54	9	5.11
Construction	15, 16, 17, 32, 52	6	3.41
Capital goods	34, 35, 38	20	11.36
Transportation	40, 41, 42, 44, 45, 47	4	2.27
Utilities	46, 48, 49	11	6.25
Textiles and trade	22, 23, 31, 51, 53, 56, 59	12	6.82
Services	72, 73, 75, 76, 80, 82, 87, 89	39	22.16
Leisure	27, 58, 70, 78, 79	15	8.52
Total		176	100.00

Values in millions of euro

Panel B: Descriptive statistics of the sample						
Variable	Min	Q1	Median	Mean	Q3	Max
Total LT Debt	0	3.63475	28.4545	1 117.51162	196.42175	41 175
Total Assets	4.632	83.19125	325.753	4 986.2168	1 409.91864	89 207
Sales	2.514	87.7275	349.8905	4 264.60215	1 460.250	122 700
Net Income	-3 610	0.69175	8.336	143.89849	43.85025	9 612
Long-term Debt/Total Assets	0.000000	0.03502	0.144993	0.117106	0.210709	0.836261
TOBIN Q	0.617306	1.08927	0.520332	1.278728	1.60404	8.036998
Foreign Sales/Total Sales	0	0.2213	0,43305	0,446	0,674535	1

Table 2: Foreign Currency Derivative Use

This table describes the use of FC derivatives for the sample of 176 firms that are deemed to have FC exposure as of year-end 2004. Panel A provides data on the number of FC hedging firms and non FC hedging firms. Panel B reports statistics for the extent of derivatives use by firm. The extent of derivative use is calculated as the total derivative notional value deflated by total assets.

Panel A : Number of derivatives users and non users		
	Number of firms	Percentage of total
Total Sample	176	100,00
Derivative Users	103	58,52
Non Users	73	41,48

Panel B: Extent of Derivative use: Notional Amount/Total Assets		
	All Firms	Derivative Users
Number of Observations	176	103
Minimum	0	4.96127E-05
q1	0	0.0216
Mean	0.0632	0.1079
Median	0.0137	0.0471
q3	0.0535	0.1057
Maximum	1.0111	1.0111
Standard Deviation	0.1379	0.1666

3. EMPIRICAL METHODOLOGY

Following Allayannis and Ofek (2001) and Nguyen and Faff (2003), we use a two stage empirical framework to examine the effect of foreign derivative use on the exchange rate exposure. In the first stage, we estimate the stock exposure of each firm in our 2004 sample over three years from January 2003 to December 2005. In the second stage, we examine the relationship between exchange rate exposure already estimated and the foreign currency derivative use. Allayannis and Ofek (2001) argue that this technique is appropriate to measure the contemporaneous impact of foreign currency derivatives on a firm's exchange rate exposure.[13]

3.1 Time series analysis: Stock Price Exposure

Dumas (1978), Adler and Dumas (1980), and Hodder (1982) define currency risk exposure as the effect of unanticipated exchange rate fluctuations on firm value. Thus, foreign currency exposure can be measured through a simple model with the change in firm value as the dependent variable and the exchange rate changes as the regressor. Jorion (1990), conscious that other macroeconomic variables can co-vary simultaneously with the currency rate, proposes measuring the firm-specific exchange rate exposure by estimating a two-factor model:

$$R_{it} = \beta_{i0} + \beta_{im} R_{mt} + \beta_{ix} R_{xt} + \varepsilon_{it} \quad t = 1 \ldots T \quad (1)$$

Where R_{it} is the rate of return on the *ith'* firm's common stock, R_{mt} is the rate of market return and R_{xt} is the rate of change in exchange rate i for period t. Many studies in the literature use trade-weighted exchange rate indices instead of separate currencies (see, for

[13] There were no major events or structural changes in the French economy and/or its tax structure during the period January 2003 to December 2005 that would have widespread effects on exchange rate exposure through changes in profit margins, demand elasticities, the opportunity cost of capital or tax rates.

example, Jorion, 1990; Bodnar and Gentry, 1993; He and Ng, 1998; Allayannis and Ofek, 2001; Ng and Nguyen, 2003). In the spirit of these studies, we use a trade-weighted exchange rate index, the Euro effective index.[14] This index measures the value of one unit of EUR in foreign currency.

In equation (1), choice of the market risk factor will impact on the value and significance of the estimated exposure coefficients. He and Ng (1998), Allayannis and Ofek (2001), Ng and Nguyen (2003) assume that markets are segmented and use the local country index. There is, however, strong reason to believe that the French stock market is at least partially, if not totally, integrated internationally. We address this issue through a four-stage approach.

Step 1: Using monthly returns, we regress the return rate of the French market portfolio, represented by SBF250, on the $R_t(MSCI)$ to isolate the non-systematic risk of the SBF250. MSCI is a global market index.[15]

$$R_t(SBF250) = \alpha_0 + \alpha_1 R_t(MSCI) + E_t^{SBF} \quad (2.a)$$

E_t^{SBF} are the residuals of the regression (2.a) and represent the non-systematic risk of the $R_t(SBF250)$. The results in Table 3 are strong evidence that the French stock market is highly integrated in the international system. The international market factor is significant at the 0% level and the equation explains almost 78% of SBF250 returns.

[14] The trade weighted Euro effective exchange covers 22 currencies: in order of weighting they are Great Britain, USA, Japan, Switzerland, Sweden, China, Hong Kong, Taiwan, Denmark, South Korea, Poland, Singapore, Czech Republic, Russia, Turkey, Hungary, Malaysia, India, Norway, Canada, Thailand and Brazil. This group of countries covers almost 97% of all foreign trade between the Euro area and the rest of the world. The weights adopted are those calculated by the OECD, after a double weighting that takes into account not only direct foreign trade between two counties but also of the presence other competing third party countries. (This definition is given by Datastream's staff)

[15] "The **MSCI World Index**[SM] is a free float-adjusted market capitalization index that is designed to measure global developed market equity performance. As of June 2006 the **MSCI World Index** consisted of the following 23 developed market country indices: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hong Kong, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, the United Kingdom and the United States" (This definition is given by Morgan Stanley Capital International).

Table 3. Regression Results of the SBF250 on the MSCI

This table provides parameter estimates for the following regression using OLS:

$R_t(SBF250) = \alpha_0 + \alpha_1 R_t(MSCI) + E_t^{SBF}$

$R_t(SBF250)$ is the return rate of the French market index : SBF250.

$R_t(MSCI)$ is the rate of return of MSCI world index.

The p-values are based on the White's *heteroscedasticity-consistent* robust standard errors.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.001124	0.003262	-0.344457	0.7326
R(MSCI)	1.250603	0.116797	10.70749	0.0000
R-squared		0.778396		
Adjusted R-squared		0.771879		
F-statistic		119.4270		
Prob(F-statistic)		0.000000		

Step 2: We regress the exchange rate index' return R_{Xt} on the $R_t(MSCI)$. This step gives the non-systematic risk of the exchange rate EURO index (X_t).

$$R_{Xt} = b_0 + b_1 R_t(MSCI) + X_t \quad (2.b)$$

where X_t is the non-systematic risk of the exchange rate. The results reported in Table 4 suggest that there is no systematic risk associated with returns on the Euro-Index.

Table 4. Regression Results of the Euro-Index on the MSCI

This table provides parameter estimates for the following regression using OLS:

$R_{Xt} = b_0 + b_1 R_t(MSCI) + X_t$

R_{Xt} is the movement in exchange rate Euro-index in period t

$R_t(MSCI)$ is the rate of return of MSCI world index.

The p-values are based on the White's *heteroscedasticity-consistent* robust standard errors.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000881	0.002913	0.302555	0.7641
R(MSCI)	0.033774	0.094390	0.357819	0.7227
R-squared		0.003483		
Adjusted R-squared		-0.025826		
F-statistic		0.118844		
Prob(F-statistic)		0.732415		

Step 3: Regress the residuals of Step 1 (E_t^{SBF}) on the non-systematic return of the exchange rate index (X_t). This isolates the non systematic risk of the market index SBF250 net of exchange rate effects $E_t^{SBF\ hedg}$

$$E_t^{SBF} = \lambda_0 + \lambda_1 X_t + E_t^{SBF\ hedg} \quad (2.c)$$

The results in table 5 show that the exchange rate has a large, significant effect on French equity returns. The coefficient on exchange rate returns is significant at the 0% level and the equation explains almost 38% of stock market returns. The negative sign signifies that an appreciation in the value of the euro has a negative impact on firm value.

Table 5. Regression Results

This table provides parameter estimates for the following regression using OLS:

$E_t^{SBF} = \lambda_0 + \lambda_1 R_{Xt} + E_t^{SBF\ hedg}$

R_{Xt} is the movement in exchange rate index on period t

The p-values are based on the White's *heteroscedasticity-consistent* robust standard errors.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000936	0.002331	0.401540	0.6905
Rxt	-0.717531	0.148391	-4.835399	0.0000
R-squared		0.378670		
Adjusted R-squared		0.360395		
F-statistic		20.72130		
Prob(F-statistic)		0.000065		

Step4: In the last step, we estimate the firm-specific exchange rate exposure using a regression relating a firm's return to three factors: the international systematic risk, the country specific market risk and the pure exchange risk:

$$R_{it} = \beta_0 + \beta_{im} R_t(MSCI) + \beta_{ic} E_t^{SBFhedg} + \beta_{ix} X_t + \varepsilon_{it} \quad (3)$$

Table 6 gives the descriptive statistics of the exposure coefficients estimated for the 176 firms in our sample.[16] Panel A shows that 22% of exposure coefficients are significant at the 10% level, which is small but similar to other studies.[17] Panel B shows that, contrary to what is implied by theory, FC derivative hedgers have higher exposure and a higher rate of significant exposure. This suggests either that hedging is ineffective or that derivatives are being used to speculate, thereby creating more exposure. In panel C we see that a higher proportion of larger firms (85%) use FC derivatives than medium (53%) and small (39%) firms, which is consistent with the argument that hedging activity benefits from significant information and transaction cost scale economies, implying that larger firms are more likely to hedge. However, the largest firms also have the highest rate of significant exposure coefficients and their average exposure is higher than medium sized firms and almost as high as the smallest firms. Their median exposure level is the highest of the three groups. This result stands in contrast to Hagelin and Prambourg (2004), who find lower exposure levels for larger firms.

[16] As a robustness check, we also estimate the exposure coefficients using equation 1, where the returns on SBF represent the market factor. The results from this estimation, available on request, are much weaker with a substantially lower rate of significant coefficients.

[17] The seminal empirical research of Jorion (1990) shows that only 5.2% of his sample exhibit significant exchange rate exposure. Choi and Prasad (1995) document that only 15% of their sample experience significant exchange risk sensitivity. He and Ng (1998) report that about 25% of their sample have significant exchange rate exposure. For French firms, Nguyen et al. (2004) find 32% significant exposure rates in the pre-euro year of 1996 and 11% in the post euro year of 2000.

Table 6: Exchange rate exposure

This table reports descriptive statistics of β_{ix}, the FC exposure coefficient, estimated from the following equation for the period January 2003 to December 2005 :

$$R_{it} = \beta_0 + \beta_{im} R_t(MSCI) + \beta_{ic} E_t^{SBFhedg} + \beta_{ix} X_t + \varepsilon_{it}$$

Panel A: Descriptive statistics of exchange rate exposure coefficients

	All cases	Positive cases	Negative cases
Median	-0.63168	0.62810	-0.99536
Mean	-0.67653	0.69988	-1.14935
Minimum	-3.83150	0.00475	-3.83150
Maximum	1.99200	1.99200	-0.00768
Standard deviation	1.12078	0.53452	0.84451
Number	176	45	131
No. of significant cases	39	0	39
% of significant cases (at 10%)	22	0	29.77

Panel B: Exchange rate exposure coefficients for FCD users and non users

	All firms	FCD users	Non users
Mean	-0.63168	-0.713681	-0.62412
Median	-0.67653	-0.68777	-0.60668
Standard deviation	1.12078	1.02417	1,249970
Minimum	-3.83150	-3.6694	-3.83150
Maximum	1.99200	1.5447	1.99200
No. of observations	176	103	73
No. of positive cases	45	26	19
No. of negative cases	131	77	54
No. of significant cases	39	30	9
% of significant cases (at 10%)	22	29.13	12.33

In this panel, the observations are divided to three almost equal groups based on he book value f total asses

Panel C : Descriptive statistics for absolute value of beta

	All firms Mean TA = 4 986 million euros	Large Mean TA= 14 695 million euros	Medium Mean TA= 372.076 million euros	Small Mean TA= 55.859 million euros
Mean	1.03443	1.09510	0.86625	1.14296
Median	0.86098	1.08855	0.68967	0.9786
Standard deviation	0.80019	0.77050	0.69671	0.90481
Minimum	0.004753	0.00475	0.12231	0.00767
Maximum	3.8315	3,0711	3,0848	3,8315
No. of observations	176	58	59	59
No. of significant cases	39	22	9	8
FCD users	103	49	31	23

3.2 Robustness Tests

We perform several additional tests on firm returns to examine the robustness of our results. First, we examine whether our results can be partly attributed to an imprecise specification of the currency risk factor due to the use of an index rather than individual exchange rates. We therefore regress the Euro-Index on the bilateral EUR/USD and save the residuals, which represent the risk due to currencies other than the USD. In results not reported here we find that returns on the EUR/USD bilateral exchange rate is significant at 0% and accounts for 80% of returns on the total index (adjusted $R^2 = 0.80$) and, thus, is the major source of fluctuations in the index. We then proceed as in steps 1-4 above with two currency risk factors (the bilateral EUR/USD exchange rate and the vector of residuals) instead of one. In Panel A of table 7 we can see that the rate of significant exposure coefficients is still relatively small for both risk factors, although it is higher for the residual index (28%) than for the bilateral EUR/USD rate (15%).

Next, we examine whether our results are robust with respect to asymmetric reactions to positive and negative moves in the exchange rate. Again, we estimate equation 3 with two FC risk factors. The first includes positive moves in the index and zeroes everywhere else. The second includes negative moves in the exchange rate and zeroes everywhere else. In Panel B of table 7 we can see in the means and medians of the absolute values of the coefficients that there is evidence of asymmetric reactions to positive and negative moves in the exchange rate but the rate of significant exposure coefficients is still relatively low (25% for negative moves and 13.64% for positive moves).

We also re-estimate equation 3 with the risk factor squared to account for potential non-linearity and with the risk factor lagged one period to capture a potential learning lag or, alternatively, as an instrumental variable to account for potential endogeneity. Panels C and D of table 7 show that neither the lagged nor the squared risk factor improve the rate of significant exposure coefficients.

Table 7: This table reports descriptive statistics of the foreign exchange exposure estimated from the following equation for the period January 2003 to December 2005 :

Panel A:

$$R_{it} = \beta_0 + \beta_m R_t(MSCI) + \beta_c E_t^{SBF\ hedg} + \beta_{ieurusd} R_t(EUROUSD) + \beta_{ipurindex} R_t(PURINDEX) + \xi_{it}$$

Panel B: $R_{it} = \beta_0 + \beta_{im} R_t(MSCI) + \beta_{ic} E_t^{SBFhedg} + \beta_{ixN} X_t^N + \beta_{ixP} X_t^p + \varepsilon_{it}$

Panel C: $R_{it} = \beta_0 + \beta_{im} R_t(MSCI) + \beta_{ic} E_t^{SBFhedg} + \beta_{ixL} X_t + \beta_{ixNL} X_t^2 + \varepsilon_{it}$

Panel D: $R_{it} = \beta_0 + \beta_{im} R_t(MSCI) + \beta_{ic} E_t^{SBFhedg} + \beta_{ix0} X_t + \beta_{ix(-1)} X_{t-1} + \varepsilon_{it}$

N (P) signifies negative (positive) moves in X, L (NL) signifies linear X (non-linear X) and 0 (-1) signifies no lag in X (one period lag in X)

Dependent variable	**Panel A**		**Panel B**		**Panel C**		**Panel D**	
	$\hat{\beta}_{ieurusd}$	$\hat{\beta}_{ipurindex}$	$\hat{\beta}_{ixN}$	$\hat{\beta}_{ixP}$	$\hat{\beta}_{ixL}$	$\hat{\beta}_{ixNL}$	$\hat{\beta}_{ix0}$	$\hat{\beta}_{ix(-1)}$
Median	-0.134695	-2.00445	-1.3394	0.23228	-0.4437	24.216	-0.62501	0.11893
Mean	-0.101152	-2.598113	-1.67868	0.55709	-0.50544	32.241	-0.66617	0.14417
Minimum	-1.5368	-12.142	-9.8046	-6.8862	-3.7233	-130.28	-3.5719	-6.126
Maximum	1.6107	6.4567	4.2048	15.657	3.9166	435.02	1.7061	4.5985
Standard deviation	0.59234	3.08699	2.08545	2.77244	1.2177	67.501	1.10637	1.2927
No. of observations	176	176	176	176	176	176	176	176
No. of significant positive cases	3	2	3	14	2	29	0	14
No. of significant negative cases	24	48	41	10	29	4	38	7
No. of significant cases	27	50	44	24	32	33	38	21
% of significant cases (at 10%)	15.34	28.41	25	13.64	18.18	18;75	21.59	11.93

4. FC DERIVATIVE USE AND EXPOSURE: CROSS SECTIONAL ANALYSIS

Earlier studies (He and Ng, 1998; Nydahl, 1999; Wong, 2000, Allayannis and Ofek, 2001, Nguyen and Faff, 2003 and Hagelin and Prambourg, 2004) investigate the effectiveness of the hedging activities by examining the determinants of the currency exposure in a cross sectional regression with the exposure coefficient as the dependent variable

$$\hat{\beta}_{ix} = \alpha_{0i} + \sum_{j=1}^{n} \alpha_{ji} Z_{ji} + \eta_i \qquad (4)$$

where the Z_{ji} are the explanatory variables.

Following Allayannis and Ofek (2001) and Nguyen and Faff (2003), we first consider the percentage of sales in foreign currency, a proxy for foreign operations, and the use of FC derivatives as the main determinants of foreign exchange exposure along with dummy variables to account for differences across industries. Model 1 in column 2 of table 8 presents the results where FSTS is the ratio of foreign sales to total sales and HEDGE is the notional amount of foreign currency derivatives divided by total assets.[18] To account for differences across industries, we use industry dummies which take the value of 1 if the firm belongs to the industry i and 0 otherwise. Neither HEDGE nor FSTS are significant at any acceptable level and the adjusted R^2 is negative. Model 1 has seems to have no explanatory value. These results are supported by unreported analysis using the exposure coefficients estimated in the robustness testing above. When exposure coefficients are measured with the EUR/USD exchange rate, the residual index (PURINDEX), positive and negative exchange rate changes, and linear and squared exchange rate changes, neither HEDGE nor FSTS are ever significant and the adjusted R^2 is always negative. Only the lagged exposure coefficient shows HEDGE as a significant explanatory variable with an adjusted R^2 for the whole model equal to 0.0068. To account for the possibility that whether or not the exposure coefficient is significant might affect the model, we run a probit model with the same explanatory variables where the exposure coefficient takes a value of 1 if it is significant and 0 otherwise. The

[18] Allayannis and Ofek (2001) and Nguyen and Faff (2003) don't include Currency swaps in the aggregate measure of foreign currency derivatives because they are used by firms in conjunction with foreign debt. In our case, all firms specify that currency swaps were used for hedging currency risk. In our sample, only 13% of firms use currency swaps. When we calculate the variable HEDGE after ignoring notional amount of currency swaps, the results, available on request, remain unchanged.

results are unchanged. HEDGE is never significant and the model has low explanatory power.[19]

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. Indeed, firms exposed to foreign currency risk can use foreign debt in order to create a liability in the required currency. There is, however, the possibility that in the absence of an offsetting foreign currency asset, foreign currency debt can increase FC exposure. In both cases, the use of foreign currency debt might be an important determinant of FC exposure. Model 2 of table 8 shows the results when we include the use of foreign currency debt as an explanatory variable. Interestingly, including FC debt adds little to the explanatory power of the model or the significance of the other variables. FDEBT is not significant but it is positive, suggesting that if it does affect FC exposure, it increases it. Both HEDGE and FSTS are negative and not significant and the adjusted R^2 is negative. Again these results are confirmed by tests (not reported here) on the alternative exposure coefficients estimated in the robustness tests and a probit model that gives a value of 1 to the exposure coefficient if it is significant and 0 otherwise.

Table 6 showed that larger firms are more likely to hedge than the medium and small firms but that their median level of exposure is considerably higher than the other two groups as is their rate of significant coefficients. Thus, firm size may play a role in the relationship between hedging and exposure levels. We therefore include firm size as an explanatory variable, measured as the natural logarithm of firm total assets and denoted as SIZE. The

[19] To address the problem that currency exposures are estimated with a varying degree of precision as measured by the standard deviation, we also tested a "response surface" model with the explanatory variables of model 1, where the t-statistics estimated in equation 3 are the dependent variable. Unreported results do not demonstrate a significant response surface relationship.

results, presented in model 3 of table 8, suggest that firm size is not a significant explanatory variable and adds nothing to the overall model. None of the variables are significant and the adjusted R^2 is lower than in models 1 and 2. As above, these results are confirmed by tests (not reported here) on the alternative exposure coefficients estimated in the robustness tests and a probit model that gives a value of 1 to the exposure coefficient if it is significant and 0 otherwise.

Table 8: FX exposure and derivatives use

This table provides parameter estimates for the following regression using OLS:

$$\left|\hat{\beta}_{ix}\right| = \alpha_{0i} + \sum_{j=1}^{n} \alpha_{ji} Z_{ji} + \eta_i$$

The sample consists of 176 French non-financial firms. Financial data and data on derivatives use are as of the end of 2004 fiscal year. The p-values, based on White's *heteroscedasticity-consistent* robust standard errors, are between parentheses. HEDGE is defined as the notional amount of FCD divided by total assets. FSTS is the ratio of foreign sales to total assets. FDEBT is a dummy variable that takes the value of one if the firm uses foreign currency debt and zero otherwise. SIZE is the natural logarithm of market value to proxy for firm size. We include 10 industry dummies D_{ij} (j varies from 1 to 10) to account for differences across the industries. D_{ij} is equal to 1 if the firm i belongs to industry j and 0 otherwise.

Dependent variable = $\left\|\hat{\beta}_{xi}\right\|$	**Model 1**	**Model 2**	**Model 3**
Observations	176	176	176
INTERCEPT	1.312247	1.201961	1.323459
	(0.0000)	(0.0000)	(0.0582)
FSTS	-0.097833	-0.140024	-0.133885
	(0.6549)	(0.5331)	(0.5558)
HEDGE	-0.354598	-0.399000	-0.372476
	(0.3219)	(0.2714)	(0.3118)
FDEBT		0.162367	0.170166
		(0.2977)	(0.2994)
SIZE			-0.006517
			(0.8471)
Industry dummies	YES	YES	YES
R squared	0.044893	0.051253	0.051480
Adjusted R squared	-0.025422	-0.024881	-0.031000

The foregoing results suggest FC derivative hedging has no significant effect on currency exposure. It is possible, however, that FC exposure is sensitive to the hedging strategies of the individual firms. To control for this, we follow Hagelin and Pramborg (2004) and classify firms into four groups, using three dummy variables: CDFD, CD, and FD. CDFD is set to one if the firm uses both currency derivatives and foreign debt and zero otherwise.[20] CD is equal to one if the firm uses only currency derivatives but not foreign debt and zero otherwise. FD is set to one if the firm uses foreign debt but not FC derivatives and zero otherwise. The results in table 9 confirm the results of the preceding tables. FC derivative hedging has no significant effect on FC exposure levels when used alone or in conjunction with foreign debt and the overall explanatory power of the model is very low as evidenced by the negative adjusted R^2. These results are generally supported by tests on the alternative exposure coefficients estimated in the robustness tests above. However, some comments are in order. All three dummy coefficients are insignificant and the adjusted R^2 is negative for exposure levels measured with the EUR/USD exchange rate, the lagged index, the linear and squared index, and the negative change index. However, for exposure levels estimated with the residual index (PURINDEX) and with positive changes in the index, both CD and CDFD are negative and significant. Furthermore, the adjusted R^2 are positive, although they are low (0.0315 for the PURINDEX and 0.0228 for the positive changes). This is weak evidence that different strategies might have a significant, although marginal (given the low adjusted R^2), effect on exposure levels.

[20] Firms do not have to report if they use foreign debt for hedging.

Table 9: Controlling for hedging strategies

This table provides parameter estimates for the following regression using OLS:

$$\left|\hat{\beta}_{xi}\right| = \delta_0 + \delta_1 FSTS_i + \delta_2 CDFD_i + \delta_3 CD_i + \delta_4 FD_i + \delta_5 size_i + \sum_{j=1}^{10} \kappa_J D_i^j + \xi_i$$

The sample consists of 176 French non-financial firms. Financial data and data on derivatives used are as of the end of 2004 fiscal year. The p-values, based on the White's *heteroscedasticity-consistent* robust standard errors, are between parentheses. FSTS is the ratio of foreign sales to total assets CDFD is set to one if the firm uses both currency derivatives and foreign debt and zero otherwise. CD is equal to one if the firm uses only currency derivatives but not foreign debt and zero otherwise. FD is set to one if the firm uses only foreign debt and zero otherwise. SIZE is the natural logarithm of market value to proxy for firm size. We include 10 industry dummies D_{ij} (j varies from 1 to 10) to account for differences across the industries. D_{ij} is equal to 1 if the firm i belongs to industry j and 0 otherwise.

Dependent variable	$\left\|\hat{\beta}_{xi}\right\|$
Observations	176
INTERCEPT	1.403483 (0.0609)
FSTS	-0.154499 (0.5033)
CDFD	0.125421 (0.5877)
CD	-0.00606 (0.9787)
FD	0.197654 (0.3849)
SIZE	-0.010697 (0.7681)
Industry dummies	YES
R squared	0.048864
Adjusted R squared	-0.040305

The evidence up to now is that FC derivative hedging by French firms has little or no effect on exposure levels. If this is the case and FC derivative hedging is costly for the firm, their use will have a negative effect on firm value. We test this proposition in the next section.

5. VALUE EFFECTS OF FC DERIVATIVE USE

In this section we investigate whether FC derivative hedging affects firm value. We start with a Tobin's Q analysis and then with a leverage analysis.

5.1 Firm value and FC derivatives use: A Tobin's Q analysis

In this study we employ Tobin's Q as a proxy for firm value. As in Pramborg (2003), Allayannis and Weston (2001) and others, we define Tobin's Q as the book value of total assets minus the book value of equity plus the market value of equity divided by the book value of total assets. The numerator approximates the market value of the firm and the denominator approximates the replacement cost of assets. The distribution of Tobin's Q in our sample is skewed, since the median value of 1.27873 is smaller than its mean of 1.52033. To correct for this we use the natural log of Q. Using the natural log has the additional advantage that changes in this variable can be interpreted as percent changes in firm value.[21]

We employ a multivariate approach to investigate the value effects of FC derivative hedging on Tobin's Q. To account for factors other than FC derivative hedging that can effect firm value, we follow Allayannis and Weston (2001) and control for size, profitability, leverage, investment opportunities, ability to access financial markets, liquidity and industry. The rationale for including these variables is as follows:

Size: There is ambiguous evidence for firms as to whether size leads to higher profitability. However, prior studies, such as Nance et al., (1993), Mian, (1996), and Géczy et al., (1997), have found that large firms are more likely to use derivatives due to the high start-up costs necessary to develop a hedging program. Thus, we include the natural logarithm of total assets, denoted as SIZE, to proxy for firm size.

Profitability: Because the marketplace is likely to reward more profitable firms, highly profitable firms are expected to have higher values of Tobin.s Q. We include return on assets

[21] As a robustness check, we also do the tests using the level of Tobin's Q.

(ROA), the ratio of Earnings Before Interest And Taxes to Total assets, as the proxy for profitability.

Leverage: A firm's capital structure may also be positively related to its value through the tax shield on the one hand and negatively related through a higher probability of financial distress on the other (see, for example, Haushalter, 2000; and Graham and Rogers, 2002). We use the ratio of long-term debt to total assets, denoted as LEVERAGE, to proxy for leverage.

Investment opportunities: Firms with greater investment opportunities are likely to be valued higher by the market. Froot et al. (1993) and Géczy et al. (1997) argue that firms that hedge are more likely to have more investment opportunities. We use the ratio of capital expenditures to sales, denoted CAPEX, as a proxy for investment opportunities. Allayannis and Weston (2001) find weak evidence of a positive relation between this variable and firm value.

Access to financial markets: Firms paying dividends are less likely to be capital constrained (for example, see Fazzari, Hubbard, and Petersen, 1988) and thus may overinvest by accepting negative net present value projects. On the other hand, dividends may be seen as a positive signal from management (especially in an industry that has experienced a significant number of bankruptcy filings). Additionally, the initiation or increase (elimination/reduction) of a dividend is likely to be seen as positive (negative) by the market (Jin and Jorion, 2006). To proxy for a firm's ability to access financial markets, we use the dividend yield, denoted as DY.

Liquidity: Firms that are cash constrained may have higher Tobin's Qs because they are more likely to invest in predominantly positive NPV projects. This follows from the free cash flow argument of Jensen (1986) that firms with excess free cash flow are more likely to invest in projects with negative NPV. We use the Quick Ratio, denoted as QUICK, that measures the ratio of cash accounts and marketable securities to short term liabilities, to proxy for liquidity.

Industry effects: To account for value effects due to conditions specific to individual industries, we use 10 dummy variable denoted D_{ij} (j=1..10) using the Campbell (1996) classification. D_{ij} takes the value of one if the firm i belongs to the industry j and 0 otherwise.

We employ two measures of FC derivative hedging. The first measure, denoted as HEDGE and defined above as the notional amount of FC derivatives divided by total assets. The second measure is a dummy variable, denoted as HEDHEDUMMY, which is equal to one if the firm uses derivatives and zero otherwise. To account for potential outliers in the dependent variable we also use three specifications of Tobin's Q. The first specification in models 1 and 2 makes no adjustment for potential outliers and uses the full, unadjusted sample. The second specification in models 3 and 4 uses the winsorization method at the 98^{th} percentile. This method involves reducing all the values above those of the 98^{th} percentile to the value of the 98^{th} percentile. The third specification in models 5 and 6 uses the trimming method at the 5% level. This method involves eliminating the 5% highest values and the 5% lowest values. Results are presented in table 10.

Overall, models 1, 3 and 5 that use HEDGE to measure FC derivative use give better results than models 2, 4 and 6 that use HEDGEDUMMY. The adjusted R^2 are higher and there are more significant explanatory variables. More importantly, the coefficients for the HEDGE variable are all positive and their p-values are much lower, although they are never significant.

These results suggest that hedging with FC derivatives is not a significant determinant of firm value for French firms. This is a confirmation of the cross sectional results, which find that FC derivative hedging is not a significant determinant of currency exposure. However, the p-values of the coefficients of the FC derivative hedging variable in models 1, 3 and 5, are fairly low even though they are above 0.10 and only one of the six hedging coefficients is negative (model 6). [22] We interpret this as evidence that, overall, FC derivatives use is either not effective or it is speculative and that speculation is not value enhancing.[23] In the following section we pursue this insight with respect to leverage.

[22] Some of the p-values are low enough where we must be wary of type II errors. In the leverage analysis that follows, we will have more to say on this subject.

[23] This result stands in contrast to Bartram and Brown (2006) who use a sample of over 6000 firms from 47 countries (not including France) and find evidence that derivative users exhibit significantly lower levels of net financial price exposure (such as FC exposure), which is consistent with firms using derivatives for hedging purposes.

TABLE 10 Multivariate Analysis of Value Effects of Foreign Currency Derivative Hedging

The regression is run using the OLS specification. The sample consists of 176 French non-financial firms. Financial data and data on derivatives used are as of the end of fiscal year 2004. The p-values, based on the White's *heteroscedasticity-consistent* robust standard errors, are between parentheses. The dependant variable is natural logarithm of Tobin's Q defined as the market value of assets deflated by the replacement cost of assets evaluated at the end of the 2004 for each firm. The market value is equal to the book value of total assets minus book value of equity plus market value of equity and the replacement cost of assets is proxied by the book value of total assets. CAPEX is the ratio of total capital expenditure to total assets. LEVERAGE is the ratio of Book value of long term debts to Total assets. DY is the dividend per share divided by the share price. The Quick Ratio is measured as the ratio of cash plus marketable securities to short term liabilities. ROA is the ratio of Earnings Before Interest And Taxes to Total assets. Size is the natural logarithm of the firm's total assets. HEDGE is defined as the notional amount of FCD divided by total assets. HEDHEDUMMY is equal to one if the firm uses derivatives and zero otherwise.We include 10 industry dummies D_{ij} (j varies from 1 to 10) to account for differences across the industries. D_{ij} is equal to 1 if the firm i belongs to industry j and 0 otherwise.

Dependent variable	**LN(Tobin Q)**		**LN(Tobin Q winsorized at 98%)**		**LN(Tobin Q trimmed)**	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
INTERCEPT	0.825999 (0.0121)	0.673963 (0.0810)	0.830120 (0.0073)	0.722881 (0.0319)	0.974255 (0.0000)	0.843125 (0.0004)
CAPEX	-0.000213 (0.9135)	-0.000720 (0.7066)	-0.000185 (0.9263)	-0.000609 (0.7544)	-0.00160 (0.3405)	-0.001577 (0.3700)
LEVERAGE	-0.097815 (0.6788)	-0.113689 (0.6326)	-0.116057 (0.6120)	-0.126949 (0.5811)	-0.084907 (0.6552)	-0.116273 (0.5332)
DY	0.000727 (0.3201)	0.000511 (0.5152)	0.000780 (0.2710)	0.000608 (0.4097)	0.000977 (0.0773)	0.000959 (0.1060)
QUICK	-0.00028 (0.0538)	-0.000247 (0.0765)	-0.000279 (0.0557)	-0.000248 (0.0779)	-0.000139 (0.2729)	-0.000166 (0.1900)
ROA	-0.042918 (0.9099)	-0.109504 (0.7716)	-0.019045 (0.9598)	-0.072688 (0.8448)	0.267619 (0.5541)	0.266529 (0.5409)
SIZE	-0.028932 (0.0783)	-0.020376 (0.3118)	-0.028811 (0.0592)	-0.022838 (0.1866)	-0.033877 (0.0013)	-0.025584 (0.0214)
HEDGE	0.576206 (0.1311)		0.447875 (0.1042)		0.197537 (0.1646)	
HEDHEDUMMY		0.060183 (0.3777)		0.055173 (0.4075)		-0.055963 (0.2841)
Industry dummies	YES	YES	YES	YES	YES	YES
R-squared	0.170831	0.142824	0.177463	0.159895	0.206065	0.205424
Adjusted R-squared	0.081616	0.050596	0.088962	0.069504	0.109659	0.108939

5.2 Firm value and FC derivatives use: A leverage analysis

In this section we test the effect of FC derivative use on firm value through its effect on leverage. Stulz (1996), Ross (1997), and Leland (1998) have shown that by reducing the probability of financial distress, hedging increases debt capacity. If firms respond by adding to their leverage, this will lead to an increase in interest deductions, which in turn generates incremental tax shield benefits that can increase firm value. Increased leverage raises the probability of default, which increases the need to hedge. Thus, leverage and hedging are endogenous. To account for this endogeneity and estimate the valuation effects from enhanced debt capacity and leverage due to hedging, we follow Graham and Rogers (2002) and estimate the determinants of the capital structure and FC derivative hedging decisions simultaneously with a two-stage estimation technique. In the first stage, two separate regressions are performed using the hedge ratio (HEDGE) and the leverage ratio (LEVERAGE) respectively, as dependent variables.[24] In the second stage, structural equations are estimated using the predicted values from the first-stage regressions as explanatory variables. The sign and significance of HEDGE in the second stage structural regression on LEVERAGE allow us to infer the effect of FC derivative use on firm value. A positive and significant coefficient indicates that hedging increases firm value. A negative, significant coefficient indicates that hedging decreases firm value, while an insignificant coefficient indicates no effect.

The academic debate on the merits of hedging has identified a number of theoretical rationales for corporate hedging that include the desire to reduce the expected costs of financial distress, to reduce the costs of underinvestment arising from conflicts of interest between shareholders and bondholders as well as from the lack of co-ordination between financing and investment policy, to maximise the value of the manager's wealth portfolio and to minimise corporate tax liability. Other motives for hedging are related to the availability of hedging substitutes, the level of exposure to financial price risks, mitigation of informational asymmetries that exist between managers and shareholders and whether the benefits of hedging exceed the fixed costs of undertaking hedging transactions. The various theories provide useful insights and predictions as to a firm's hedging decision. In particular, the

[24] As a robustness check, we also run the two stage tests where HEDGEDUMMY replaces HEDGE as the dependent variable. The tests are qualitatively the same.

theories imply that the benefits of hedging to firms' shareholders or managers are likely to differ across firms in ways that depend on various firm-level financial and operating characteristics.

To test theories of hedging related to financial distress costs we use the leverage ratio (LEVERAGE) as the proxy for a firm's probability of financial distress. We use the ratio of capital expenditure to total expenditure (CAPEX) and the market-to-book value of equity ratio (MB) as proxies for growth options in the firm's investment opportunity set. We employ the quick ratio (QUICK) and dividend yield (DY) to proxy for hedging substitutes. To control for foreign currency exposure factors, we use the ratio of foreign sales to total sales (FSTS). Finally, we use the natural logarithm of total assets to proxy for firm size (SIZE). We do not test for tax convexity because the range of progressivity in the French corporate tax structure is relatively small and the vast majority of listed firms in our sample have pre-tax profits beyond the progressive region, which suggests they face a linear effective tax function.[25]

For the determinants of LEVERAGE we use the Rajan and Zingales (1995) model for the capital structure decision augmented by DY to capture access to financial markets and add HEDGE* to measure the sensitivity of Leverage to hedging.

The structural equations are given in equations 5 and 6 as follows:

$$HEDGE_i = \alpha_0 + \alpha_1 FSTS_i + \alpha_2 SIZE_i + \alpha_3 CAPEX_i + \alpha_4 MB_i + \alpha_5 DY_i + \alpha_6 QUICK_i + \alpha_7 LEVERAGE^*_i + \sum_{j=1}^{10} \alpha_i D_{ij} + \eta_{it} \quad (5)$$

[25] 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.

$$LEVERAGE_i = \theta_0 + \theta_1 SIZE_i + \theta_2 INTANG_i + \theta_3 MB_i + \theta_4 DY_i + \theta_5 ROA_i + \theta_6 HEDGE*_i + \sum \theta_i D_{ij} + \zeta_{it} \quad (6)$$

The variables HEDGE, FSTS, SIZE, CAPEX, DY, QUICK, LEVERAGE, ROA and D_{ij} are as defined above. MB is the market to book equity ratio and INTANG is the ratio of intangible assets to total assets. LEVERAGE* and HEDGE* are the predicted valus of LEVERAGE and HEDGE obtained from the first-stage estimation. The results are reported in Table 11.

Table 11 The Determinants of FC Derivative Hedging and Leverage

A Tobit specification is used for the dependant variable HEDGE, defined as the notional amount of derivatives outstanding at fiscal year-end deflated by the total assets of the firm. For the dependent variable LEVERAGE OLS is used. Size is the natural logarithm of the firm's total assets. Leverage equals to Book value of long term debts/ Market value. Capex equals to total capital expenditures/total assets. DY is the dividend per share/share price. Quick Ratio equals to Cash accounts and short term investments/Short term liabilities. 10 dummy variables are included, Dij (j=1 to 10). Dij equals to 1 if the firm belongs to the sector j and zero otherwise.

	Determinants of FC Derivative Use: Equation (5)	Determinants of LEVERAGE: equation(6)
C	-1.0054 (0.0000)	-0.396661 (0.0903)
FSTS	0.15411 (0.0186)	
CAPEX	0.00078 (0.6193)	
QUICK	-0.03097 (0.3748)	
DY	-0.00061 (0.1445)	-0.000342 (0.0828)
SIZE	0.06145 (0.0013)	0.032211 (0.0828)
MB	-0.01272 (0.1999)	-0.00815 (0.1170)
INTANG		0.098269 (0.1202)
ROA		-0.116760 (0.1727)
HEDGE*		-0.56888 (0.2853)
LEVERAGE*	-1.373272 (0.0971)	
Industry variables	YES	YES
R-squared	0.179686	0.280257
Adjusted R-squared	0.085637	0.207830

For the determinants of FC derivative use FSTS, SIZE and LEVERAGE* are significant. However, contrary to the financial distress cost rationale for hedging, the LEVERAGE* coefficient is negative.[26] One explanation for a negative coefficient on LEVERAGE* is that FC derivatives and leverage are substitutes in the context of the bondholder wealth expropriation hypothesis. In this scenario, the firm (shareholders) is using FC derivatives as a speculative tool to increase the overall riskiness of the firm. Since equity can be viewed as a call option on the firms assets (see: Black and Scholes, 1973), an increase in the firm's overall riskiness increases the value of equity at the expense of debt. This would also go some way to explaining the results in the Tobin's Q analysis that weakly suggest a positive relationship between firm value and FC derivative use in the sense that some p-values are low enough to make type II errors a real threat. Remember that in the bondholder wealth expropriation hypothesis, gains to the market value of equity come at the expense of losses to market value of debt. The numerator in the Tobin's Q measure uses the book value of debt and does not take account of the market value of debt. Thus, in the Tobin's Q numerator, the gains accruing to the market value of equity due to the increased risk through FC derivatives use are not offset by the losses to the market value of debt. This introduces a positive bias in the relationship between FC derivatives use and Tobin's Q. This bias is confirmed by a regression of the determinants of equity value where HEDGE is positive and significant. The bias, of course, was not strong enough to offset the other negative effects of FC derivative use and thus the hedging variable was not significant.

The results for the determinants of LEVERAGE* confirm the negative relationship between the two variables. HEDGE* is negative but not significant, which suggests that

[26] In unreported results, the HEDGE regression in equation 5a with LEVERAGE and not LEVERAGE* gives results that are similar but weaker with only SIZE and QUICK significant and a lower adjusted R^2. LEVERAGE remains negative but insignificant with a p-value of 0.92.

hedging does not increase leverage and may even decrease it. A halt or reduction in the supply of credit would be the logical reaction of lenders to an increase in the speculative use of FC derivatives that detracts from the creditor's position. In fact, many debt covenants limit the firm's freedom of action. Speculative use of FC derivatives dressed up as a hedging operation would be one way around these limits. A counterargument to the speculative use of FC derivatives in this way, however, is that managers with a large portion of their wealth dependant on the perennity of the company and its operations would have no incentive to use derivatives in a way that could endanger the firm's survival. This argument is weakened by the fact that managerial compensation is increasingly tied to equity value through long-term incentive plans, stock options and performance criteria. Furthermore, French corporate governance is characterized by shareholder concentration, family control, financial pyramids (control of the firm by a single shareholder through the intermediary of at least one other listed firm) and the like (see, for example, Caby, 2003). If this shareholder concentration translates into more hands-on decision making, it would be difficult for management to resist a policy of speculative use of FC derivatives deemed favourable to equity value through the bondholders' wealth expropriation hypothesis.

Thus, the foregoing leverage analysis confirms the earlier evidence from the exposure testing that FC derivative use is inefficient, that it is used for speculation, or both. In fact, the significant, negative relation between HEDGE and LEVERAGE that indicates a trade-off between the two is consistent with the notion that speculation is playing a significant role. The leverage analysis also sheds light on the results in the Tobin's Q analysis, which suggest a positive and marginally insignificant effect of FC derivative use on firm value. If FC derivatives are being used for speculative purposes to increase the value of equity at the expense of debt holders, Tobin's Q will reflect the equity gain but not the debtors' loss, which will send a false signal of positive correlation because the numerator in the Tobin's Q measure uses the book value of debt and does not take account of the market value of debt.

6. CONCLUSION

In this paper we use a sample of 176 of the largest French non financial firms over the period 2003-2005 to re-investigate the relationship between firm value, exchange rate fluctuations and corporate use of FC derivatives for the year 2004, the transitional year for the application of the International Accounting Standards that require disclosure on hedging practices and derivatives use. We find that the currency exposure of individual firms is a significant determinant of firm value for a relatively small proportion of our sample. We also provide strong evidence that FC derivative use is not a significant determinant of corporate exposure to FC risk. In an important innovation we show this is true even after accounting for the imperfect integration of capital markets and country specific FC risk as well as for proxy problems due to the use of an index rather than individual exchange rates, a potential learning lag and/or endogeneity between currency risk and returns, non linearity and asymmetric reaction to positive and negative moves in the exchange rate.

We also provide evidence that FC derivative hedging is not a significant determinant of firm value as measured by Tobin's Q. These results are consistent with the exposure tests and are more evidence that French corporate FC derivative use is ineffective, speculative, or both. When we test the effect of FC derivative use on debt capacity, we find a significant, negative relationship. This suggests that rather than reducing risk and increasing debt capacity and firm value through the tax shield, FC derivative use actually has the opposite effect, which is further evidence that FC derivatives use by French corporates is inefficient and/or speculative. When we test the effect of leverage on FC derivative use, we find that increased leverage actually reduces the use of FC derivatives. We interpret these results in the context of the bondholders' wealth expropriation hypothesis where shareholders are using FC derivatives as a speculative tool to increase the riskiness of equity at the expense of debt holders as evidence that there is a strong speculative component in French FC derivative use.

Based on the foregoing evidence, we can make two tentative conclusions. First, speculation and/or inefficiency play a prominent role in French corporate use of FC derivatives. This would explain why derivative users seem to have higher exposure and higher significant exposure rates. Second, the low percentage of significant exposure coefficients in the determination of firm value could be due to the fact that lenders react to speculative use of FC derivatives by reducing the supply of credit as reflected in equation 6. In this scenario, the equity gains through the bond holders' wealth expropriation hypothesis would be offset by the tax shield losses due to reduced leverage.

REFERENCES

Adler, M., Dumas, B., 1984. Exposure to currency risk: definition and measurement. *Financial Management*, Summer, 41–50.

Alexander, S. S., 1952. Effects of devaluation on a trade balance, *IMF Staff Papers*, vol. 2, no. 2, pp. 263-278.

Alexander, S. S.,1959. Effects of a devaluation: a simplified synthesis of elasticities and absorption approaches. *American Economic Review*, vol. 49, pp 22-42.

Allayannis, G., Ihrig, J., 2001. Exposure and markups. *Review of Financial Studies* 14, 805–835.

Allayannis, G., Ihrig, J., Weston, J.P., 2001. Exchange rate hedging: financial versus operating strategies. American Economic Review Papers and Proceedings 91, 391–395.

Allayannis, G., Lel, U., Miller, D., 2004, Corporate governance and the hedging premium around the world. Working paper, University of Virginia.

Allayannis, G., Ofek, E., 2001. Exchange rate exposure, hedging and the use of foreign currency derivatives. Journal of International Money and Finance 20, 273–296.

Allayannis, G., Weston, J.P., 2001. The use of foreign currency derivatives and firm market value. *Review of Financial Studies*, 14, 243–276.

Amihud, Y., 1994. Exchange rates and the valuation of equity shares. In: Amihud, Y., Levich, R.M. (Eds.), Exchange rates and corporate performance. Irwin, New York, pp. 49–59.

Bartov, E., Bodnar, G.M., 1994. Firm valuation, earnings expectations, and the exchange rate exposure effect. *Journal of Finance* 49, 1755–1785.

Bartram, S., Brown, G.W., Fehle, F.R., 2004. International evidence on financial derivative usage.Working Paper, Lancaster University.

Bartram, Sohnke M. and Gregory W. Brown, 2006. Corporate Hedging and Speculation with Derivatives, working paper.

Berkman, H., Bradbury, M.E.,1996. Empirical Evidence on the Corporate Use of Derivatives. *Financial Management*. Vol. 25,N°. 2, p. 5-13.

Bodnar, G.M., Gentry, W.M., 1993. Exchange-rate exposure and industry characteristics: Evidence from Canada, Japan and the U.S. *Journal of International Money and Finance* 12, 29–45.

Bodnar, G.M., Dumas, B., Marston, R.C., 2002. Pass-through and exposure. *Journal of Finance*, 57, 199–231.

Booth, L., 1996. On the nature of foreign exchange exposure. *Journal of Multinational Financial Management*, 6, 1–24.

Booth, L., Rotenberg, W., 1990. Assessing foreign exchange exposure: theory and application using Canadian firms. *Journal of International Financial Management and Accounting* 2, 1-22.

Brown, G., 2001. Managing foreign exchange risk with derivatives', *Journal of Financial Economics*, Vol. 60, 401-448.

Campbell J., 1996. Understanding risk and return. *Journal of Political Economy*, 104, 298-345.

Caves, R. E. and H. G. Johnson, (eds), 1968. *Readings in International Economics*, (Homewood, Illinois: Irwin).

Choi, J.J., Prasad, A.M., 1995. Exchange risk sensitivity and its determinants: a firm and industry analysis of US multinationals. *Financial Management*, 24, 77–88.

Caves, R. E., Johnson, H.G. (eds), 1968, *Readings in International Economics*, (Homewood, Illinois: Irwin).

Dumas, B., 1978. The theory of the trading firm revisited. *Journal of Finance*, 33, 1019–1029.

Elliott, W.B, Huffman, S.P., Makar, S.D., 2003. Foreign denominated debt and foreign currency derivatives: Complements or substitutes in hedging foreign currency risk. *Journal of Multinational Financial Management*, Vol. 13, N°. 2, 123-139.

Fazzari S., Hubbard G., Petersen B., 1988. Financing Constraints and Corporate Investment, Brookings Papers on Economic Activity 1, 141-195

Flood, E.Jr., Lessard, D.R., 1986. On the measurement of operating exposure to exchange rates: a conceptual approach. *Financial Management*, 25–37.

Froot, K.A., Scharfstein, D.S., Stein, J.C., 1993. Risk management: Coordinating corporate investment and financing policies', *Journal of Finance*, Vol.48, N°5, 629-1658.

Gay, G.D., Nam, J., 1998. The underinvestment problem and corporate derivatives use. *Financial Management*, Vol. 27, 53-69.

Géczy, C., Minton, B.A., Schrand, C., 1997. Why firms use currency derivatives. *Journal of Finance*, 52, 1323–1354.

Gerakis, A. S., 1964. Recession in the Initial Phase of a Stabilization Program: The Experience of Finland, *IMF Staff Papers*, vol. 11, no. 1, pp. 434-445.

Goldberg, S.R., Godwin, J.H., Kim, M.S., Tritschler, C.A., 1998. On the determinants of corporate usage of financial derivatives", *Journal of International Financial Management and Accounting*, 9, 132-166.

Gerakis, A. S., 1964. Recession in the Initial Phase of a Stabilization Program: The Experience of Finland, *IMF Staff Papers*, Vol. 11, N°.1, 434-445.

Graham, J., Rogers, D., 2002. Do firms hedge in response to tax incentives?. *Journal of Finance* 57, 815–839.

Hagelin, N., 2003. Why firms hedge with currency derivatives: An examination of transaction and translation exposure. *Applied Financial Economics* 13, 55–69.

Hagelin, N., Prambourg, B., 2004. Hedging Foreign Exchange Exposure: Risk Reduction from Transaction and Translation Exposure. *Journal of International Financial Management and Accounting*, Vol.15, N°.1, 1-20.

Haushalter, D.G., 2000. Financing policy, basis risk, and corporate hedging: evidence from oil and gas producers. *The Journal of Finance*, Vol. 55, N°. 1, 107-152.

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

Heaney, R. A., Winata, H., 2005. Use of Derivatives by Australian Companies. *Pacific-Basin Finance Journal*, 13, 4, 411-430.

Hodder, J.E., 1982. Exposure to exchange rate movements. *Journal of International Economics* 13, 375–386.

Howton, S.D., Perfect, S.B., 1998. Currency and interest derivatives use in US firms. *Financial Management* 27, 111–121.

Jin, Y., Jorion, P., 2006. Firm value and hedging: evidence from U.S. oil and gas producers. *Journal of Finance*, Vol. 61, N°2, 893-919

Jensen, M.C., 1986. Agency Costs of free cash flow, Corporate Finance, and Takeovers, *American Economic Review*, Vol.76, N°2, 323-329
.
Jorion, P., 1990. The exchange rate exposure of U.S. multinationals. *Journal of Business* 63, 331–345.

Kedia, S., Mozumdar, A., 2003. Foreign currency denominated debt: An empirical examination. *Journal of Business*, Vol. 76, N°4, 521-546.

Keloharju, M., Niskanen, M., 2001. Why do firms raise foreign currency denominated debt? Evidence from Finland, *European Financial Management*, Vol. 7, N°4, 481-496.

Kim, Y.S., Mathur, I., Nam, J., 2006. Is operational hedging a substitute for or a complement to financial hedging? Journal of Corporate Finance 12, 834-853

Kiymaz, H., 2003. Estimation of foreign exchange exposure: an emerging market application. *Journal of Multinational Financial Management* 13, 71–84.

Koutmos, G., Martin, A. D., 2003. Asymmetric Exchange Rate Exposure: Theory and Evidence, *Journal of International Money and Finance,* Vol. 22, 365-383.

Leland, H., 1998. Agency costs, risk management, and capital structure. *Journal of Finance* 53, 1213–1243.

Krishnamoorthy, A., 2001. Industrial structure and the exchange rate exposure of industry portfolio returns. *Global Finance Journal* 12, 285–297.

Levi, M.D., 1994. Exchange rates and the valuation of firms. In: Amihud, Y., Levich, R.M. (Eds.), Exchange Rates and Corporate Performance. Irwin, New York, 37–48.

Marston, R.C., 2001. The effects of industry structure on economic exposure. *Journal of International Money and Finance* 20, 149–164.

Meade, J., 1951, *The Theory of International Economic Policy*, Vol.1, *The Balance of Payments*, (London: Oxford University Press).

Mian, S.L., 1996. Evidence on corporate hedging policy. *Journal of Financial and Quantitative Analysis,* Vol. 31, 1996, N°. 3, 419-439.

Miller, K.D., Reuer, J.J., 1998. Firm strategy and economic exposure to foreign exchange rate movements. *Journal of International Business Studies* 29, 493–514.

Muller, A., Verschoor, W.F.C., 2006. Foreign exchange risk exposure: Survey and suggestions. *Journal of Multinational Financial Management* 16, 385–410

Nain, A. 2004. The Strategic Motives for Corporate Risk Management. Working paper Available at SSRN: http://ssrn.com/abstract=558587

Nance, D.R., Smith, Jr.C.W. Smithson, C.W., 1993. On the determinants of corporate hedging. *The Journal of Finance,* Vol. 48, N°. 1,267-284.

Nguyen, H., Faff, R., 2003. Can the use of foreign currency derivatives explain variations in foreign exchange exposure? Evidence from Australian companies. *Journal of Multinational Financial Management* 13, 193–215.

Nguyen, H., Faff, R.W., Marshall, A.P., 2004. Exchange Rate Exposure, Foreign Currency Derivatives and the Introduction of the Euro: French Evidence. Working paper, Available at SSRN: http://ssrn.com/abstract=499462

Pearce, I. F., 1961. The Problem of the balance of payments. *International Economic Review*, Vol. 2, N° 1,1-28.

Pramborg, B., 2005. Foreign exchange risk management by Swedish and Korean non-financial firms: A comparative survey. *Pacific Basin Finance Journal*, Vol.13, 343–366.

Rajan, R., Zingales, L., 1995. Is There an Optimal Capital Structure? Some Evidence from International Data. *Journal of Finance*, Vol. 50, 1421-1460.

Ross, M., 1997. Dynamic optimal risk management and dividend policy under optimal capital structure and maturity, Working Paper, University of California, Berkeley.

Shapiro, A.C., 1975. Exchange rate changes, inflation and the value of multinational corporations. *Journal of Finance* 30, 485–502.

Smith, C. W. J., Stulz, R. M., 1985. The Determinants of firms' hedging policies. *Journal of Financial and Quantitative Analysis*, Vol. 20, N°. 4, 391-405.

Stulz, R. 1996. Rethinking risk management. *Journal of Applied CorporateFinance* 9, 3, 8–24.

Tsiang, S. C., 1961. The Role of money in trade balance stability: synthesis of the elasticity and absorption approaches, *American Economic Review*, Vol.51, 912-936.

Williamson, R.G., 2001. Exchange rate exposure and competition: evidence from the automotive industry. Journal of Financial Economics 59, 441–475.

Wong, F.M.H., 2000. The association between SFAS No. 119 derivatives disclosures and the foreign exchange risk exposure of manufacturing firms. *Journal of Accounting Research* 38, 387–417.

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