

CORPORATE GOVERNANCE AND CORPORATE HEDGING: FRENCH EVIDENCE



KARIM BEN KHEDIRI*
Assistant Professor
CEROS,
Université
Paris Ouest
Nanterre
La Défense
& FSEG Nabeul



DIDIER FOLUS**
Professor
CEROS,
Université
Paris Ouest
Nanterre
La Défense

In a classical Modigliani-Miller world (1985), the firm value is independent of its financial policy. In other words, capital structure, dividend policy, risk management, among others, are irrelevant to firms. This world with perfect capital markets is unrealistic. In real financial markets, firms face a variety of frictions, such as financial distress and bankruptcy costs, taxes, costly external financing, incomplete contracting and asymmetric information. By relaxing the assumptions of a perfect market, Smith and Stulz (1985), and Froot *et al.* (1993) show that hedging policy can affect the firm value. This theoretical motivation for hedging is based on maximising the firm value under the implicit assumption that managers act in the best interest of shareholders. This ignores the agency problem between managers and shareholders and the process of decision making in the firm. Indeed, managers can make the corporate hedging decisions that maximise their utility, but not those of shareholders.

In this paper, we incorporate the managers-shareholders conflicts in our analysis and examine whether the corporate hedging decisions benefit the shareholders or the managers. We also focus on how firm-level governance mechanisms affect corporate hedging decisions. Thus, we provide new evidence on the determinants of corporate hedging by examining the effect of managers risk aversion, stock options compensation, ownership structure and board of directors.

This study contributes to the existing literature in a number of ways. First, it refers to the corporate governance theory to explain the corporate hedging decisions. It examines the relationship between the corporate governance and the likelihood of corporate hedging (using a probit model) as well as the relationship between the corporate governance and the extent of derivatives use (using a tobit model). Second, it analyses derivatives use by type of derivatives (foreign currency and interest rate

derivatives), which differs from some prior researches that focus on general derivatives or on one type of derivatives. Third, it is the first paper to specifically target the French firms to examine the effect of corporate governance on corporate hedging.

The organisation of the paper is as follows. Section I presents the hypothesis and the variables employed. Section II presents the data and the methodology. Section III presents the empirical results. The last section concludes.

I. HYPOTHESES AND VARIABLES

Corporate hedging is beneficial to shareholders because it can mitigate costs associated with market imperfections (taxes, bankruptcy costs, asymmetric information). These incentives to hedge based on maximising firm value assume that management and shareholders interests are congruent. In other words, managers always act in the best interest of shareholders. However, according to agency theory (Jensen and Meckling, 1976), the conflict of interests between managers and shareholders may have an effect on the corporate hedging decision (Tufano, 1998). In practice, competing objectives which are incompatible with the shareholder wealth-maximising may also be pursued. Corporate hedging for managerial self-interests is more likely to occur in weakly governed firms because managers in such firms have more discretion to pursue their own interests. Thus, we examine the effect of managerial risk aversion, stock options compensation, ownership structure and board of directors on corporate hedging.

1.1. MANAGERIAL RISK AVERSION

Stulz (1984) argues that corporate hedging is directly influenced by the risk aversion of managers. According to Smith and Stulz (1985), whether the managers' wealth is a concave function of firm value, it is optimal for them to hedge the firm completely. They argue that because of their relatively undiversified financial and human capital tied to their firms' well-being, risk-averse managers have

* benkhedirikarim@yahoo.com

** didier.folus@u-paris10.fr

The authors would like to thank anonymous referees and participants at the 2006 French Finance Association meeting for their helpful comments and suggestions. Remaining errors are our responsibility.

incentives to lower firm risk through corporate hedging. Accordingly, there could be a positive relation between management share holdings and corporate hedging. Tufano (1996) find evidence that hedging increase with managerial shareholdings. Thus, we formulate our hypothesis as follows:

H1: The corporate hedging is positively related to managerial ownership

We measure managerial ownership by the percentage of shares held by management (MO).

1.2. STOCK OPTIONS

Stock options are used to resolve agency conflicts between managers and shareholders. According to Smith and Stulz (1985), a manager will hedge less as long as his expected utility is a convex function of the firm value, even if his expected utility is a concave function of his personal wealth. Hence, managers holding more stock options will seek more risk because the value of option is an increasing function of the firm value volatility. This prediction is confirmed by results documented in Tufano (1996) and Haushalter (2000). In contrary, Géczy *et al.* (1997), Gay and Nam (1998), Knopf *et al.* (2002) and Bartram *et al.* (2009) find a positive relationship between stock options and corporate hedging. With the above argument, the hypothesis is as follows:

H2: The corporate hedging is negatively related to stock options.

As in Bartram *et al.* (2009), we use a dummy variable that equals one if the managers hold stock options (SO), and zero otherwise.

1.3. OWNERSHIP STRUCTURE

Ownership structure is considered as an internal mechanism of corporate governance. Internal mechanisms are prevalent in countries following civil law, such as France. However, external mechanisms, for example the market for corporate control, are prevalent in countries following Anglo-Saxon law, such as the United States and the United Kingdom.

In French context, ownership structure is highly concentrated, in opposition to widely held owned firms in the US. Faccio and Lang (2002) find that 70.92% of nonfinancial French firm, are controlled by a family (including an individual) or a firm that is unlisted on any stock exchange. Concentrated shareholders have strong incentives to monitor managers and decrease agency costs (Demsetz and Lehn, 1985). This incentive should be particularly strong in France since large shareholders usually have invested most of their private wealth in the company and are not well-diversified. Therefore, shareholder risk averse is more likely to affect corporate hedging decisions (Bartram, 2009). Accordingly, we expect the ownership concentration to be positively related to corporate hedging.

While families or individuals have more incentive to hedge at the firm level, institutional investors have less incentive to hedge at the firm level. Tufano (1996) argues that institutional investors are well-diversified investors,

and therefore, they are unlikely to act like risk-averse poorly diversified investors. Therefore, we expect a negative relationship between institutional ownership and corporate hedging.

Borokhovich *et al.* (2004), Marsden and Prevost (2005) and Bartram *et al.* (2009) examine the effect of ownership concentration on the corporate hedging, and do not find a significant relationship. Tufano (1996) and Haushalter (2000)¹ document that the outside block holdings negatively influence the derivatives use in the United States. Dionne and Triki (2004, 2005) find a negative and significant relationship between institutional ownership and derivatives use on a sample of 45 North American gold mining companies. However, Knopf *et al.* (2002) find no significant relationship between the derivatives usage and the percentage of stock held by outside blockholders on a sample of S&P500 non-financial firms. They also run tests using the percentage of stock held by institutions instead of outside blockholders and find the same results. It is important to note that outside blockholders in the United States are primarily well-diversified institutional investors² (Tufano, 1996) and, therefore, they might find useless to hedge risks at the firm level.

Based on these arguments we propose the following hypothesis:

H3: The corporate hedging is positively related to ownership concentration

H4: The corporate hedging is negatively related to institutional ownership.

The ownership concentration is measured by the percentage of shares held by the five largest shareholders of the firm (OC). The institutional ownership (IO) is measured by the percentage of shares held by institutional investors.

1.4. BOARD OF DIRECTORS

Fama and Jensen (1983) show that the board of directors is regarded as an elementary channel for shareholders to exercise control over management. Lipton and Lorsh (1992) and Jensen (1993) argue that large boards are less effective than small boards because it may be easily dominated by the managers. Yermack (1996) argues that larger board can hide mechanisms of managerial entrenchment. Yermack (1996) and Eisenberg *et al.* (1998) report evidence that firm performance is enhanced by smaller boards.

Fama and Jensen (1983) argue that outside directors increase the effectiveness of the board of directors to monitor management. These independent directors have incentives to effectively undertake a close monitoring role to protect their own reputation and, therefore, the value of their human capital (Fama, 1980). Consequently, the independent directors make corporate hedging decisions that benefit shareholders.

Borokhovich *et al.* (2004) report no evidence suggesting that board size affect the use of interest rate derivatives on a sample of non financial firms in the S&P 500 in 1995. Whidbee and Wohor (1999) document

that outside directors positively influence the probability of derivatives usage in the US banking sector. Borokhovich *et al.* (2004) also find a positive relation between the relative influence of outside directors and the use of interest rate derivatives. They suggest that corporate derivative use, on average, benefits shareholders. On the contrary, Dionne and Triki (2004, 2005) and Marsden and Prevost (2005) report no evidence suggesting that outside directors affect corporate hedging. Dionne and Triki (2005) show that only financially educated members of the board positively affect corporate hedging.

With the above argument, the hypothesis is as follows:

H5: The firms with larger (smaller) boards make corporate hedging decisions in the interest of the management (shareholders).

H6: The firms with larger (smaller) proportions of independent directors make corporate hedging decisions in the interest of the shareholders (management).

We measure the board size (BS) by the number of directors on the board. We also use the percentage of independent members in the board of directors (ID) as a proxy for the board independence. A director is defined as independent if he is not affiliated with the firm and free from any interest and any business or relationship that could be perceived to affect its ability to act at the best interests of the firm.

1.5. OTHER INCENTIVES TO HEDGE

To identify the effect of corporate governance on corporate hedging, we consider a number of factors that have been documented in the literature, such as financial distress, underinvestment, liquidity, size, and exchange risk exposure. If financial distress is costly, Smith and Stulz (1985) argue that hedging can increase firm value by reducing the probability of financial distress. To measure the financial distress, we use leverage (LEV), defined as the long-term debt divided by the market value of firm. Firms with higher leverage are expected to hedge more. Froot *et al.* (1993) show that hedging can reduce the underinvestment problem resulting from the deadweight costs associated with external financing. Since the underinvestment problem might be more severe for firms with significant growth and investment opportunities, we use the capital expenditures, scaled by the market value of firm (CAPEX) as a proxy of underinvestment costs. A positive sign is expected. Nance *et al.* (1993) show that holding sufficient liquidity can reduce the need for hedging. We use the quick ratio, defined as current assets minus inventory divided by current liabilities, as a proxy for liquidity (LIQ). A negative sign is expected. Most prior studies find that larger firms are more likely to hedge. This positive size effect can be attributed to significant economies of scale in information and transaction costs

Table 1. Description of variables

Variable	Notation	Definition
Derivatives use	<i>DU</i>	Binary variable equal to 1 if firm uses derivatives, 0 otherwise
	<i>NVD</i>	Total notional value of derivatives/market value of firm
Managerial ownership	<i>MO</i>	Percentage of shares held by management
Ownership concentration	<i>OC</i>	Percentage of shares held by the five largest shareholders
Institutional ownership	<i>IO</i>	Percentage of shares held by institutional investors
Stock options	<i>SO</i>	Dummy variable with value 1 if stock options exist, 0 otherwise
Board size	<i>BS</i>	Number of directors on the board
Independent directors	<i>ID</i>	Number of independent directors/total directors
leverage	<i>LEV</i>	Long-term debt/market value of firm
Capital expenditures	<i>CAPEX</i>	Capital expenditures/market value of firm
Quick ratio	<i>LIQ</i>	(current assets – inventory)/ current liabilities
Foreign sales	<i>FS</i>	Foreign sales/total sales
Firm size	<i>SIZE</i>	Logarithm of the sum of market value of equity and book value of debt

Table 2. Derivatives usage rate

	Number	Percentage
All firms	320	100
users of all derivatives	191	59,68
users of foreign exchange-rate derivatives	155	48,43
users of interest rate derivatives	138	43,12

Table 3. Type of foreign currency derivatives

Swaps	Futures	options
20%	69,67%	28,38%

Table 4. Type of interest rate derivatives

Swaps	Caps	Floors	Collars	Swap options	FRA
76,08%	41,30%	5,79%	10,86%	0,72%	9,42%

of hedging. We measure firm size (SIZE) as the natural logarithm of the market value of firm. We also use the foreign sales divided by total sales (FS), as a measure of the extent of foreign currency exposure. A positive sign is expected. We provide the definitions for all variables used in the tests in Table 1.

II. DATA AND METHODOLOGY

First, we conduct some univariate tests to see whether there are any significant differences between hedgers and non-hedgers. Then, we use multivariate regressions to examine the effect of corporate governance on corporate hedging. The analysis is based on Probit and Tobit models.

We consider all publicly traded French firms with a market capitalisation higher than 30 million euros. We focus on the largest firms because large companies are more likely to use derivatives and disclose information on risk management than small firms. Consistent with many previous studies that establish the role of financial firms as the market makers/dealers in the derivative market, we exclude firms in financial services industry (banks, insurances, etc.) because they use derivatives both for hedging and trading purposes. The final sample consists of 320 firms.

The data used in this study are obtained from the Worldscope database, Dafsaliens, Dafsaliens des sociétés, Dafsaliens des administrateurs and from the annual reports for the year 2001. To examine the hedging policy, we distinguish the companies according to the use of the derivatives. Firms are classified as hedgers if their annual reports explicitly mention the use of derivatives. In this paper, we suppose that derivatives are used only for hedging purposes. Moreover, all the firms of our sample disclose in their annual reports that derivatives are used only for hedging and not for trading purposes.

Table 2 reports the percentage of firms that use derivatives of different types. Across the entire sample of 320 firms, more than half (59.68%) use some type of derivative. Most common is the use of foreign currency derivatives (48.43%), followed by interest rate derivatives (43.12%).

Table 3 reports the usage rate by the type of instrument for the subsample of firms using foreign currency derivatives.

Table 4 reports the usage rate by the type of instrument for the subsample of firms using interest rate derivatives.

Table 5 presents the number and the percentage of firms that use derivatives by industry using the main four-digit standard industrial classification. The percentage of firms using derivatives varies across industries, suggesting industry characteristics play a role in determining derivatives usage.

Table 6 reports descriptive statistics for independent variables used in the analysis. As shown, managerial ownership ranges from 0% to 93% and has a mean value of 21.4%. Compared to the more dispersed US and UK firms, ownership concentration is relatively high. It ranges from 0% to 99.7% with a mean value of 57.5%. Institutional ownership ranges from 0% to 99.8% with a mean value of 9.7%. Almost 67% of the sample uses stock options. Board size ranges from 3 directors to 21 with a mean value of 8.4. Independent directors range from 0% to 90% with mean value of 27%. The firms have average leverage of 11.2%, average CAPEX of 5%, average quick ratio of 1.27 and average foreign sales of 27.5%. Finally, the firms have average (logged) market value of EUR 6.4 million.

III. RESULTS

III.1. UNIVARIATE ANALYSIS

Table 7 presents summary statistics for the main independent variables for hedgers and non-hedgers, and some statistical tests. The last two columns in Table 7 report the p-values corresponding to the t-test of the differences in means between the groups, and the significance level of the non parametric Wilcoxon rank sum test for differences between the median of the groups. The univariate results suggest that hedgers are statistically different from non-hedgers with respect to all variables. Hedgers have significantly less managerial ownership, institutional ownership and ownership concentration than non-hedgers. We also find that hedgers are more likely

Table 5. Derivatives use by industry

Industrie	SIC Code	Number of firms	Derivatives usage (%)
Food and Tobacco	0100 & 2000-2199	4	75
Mining	1000-1499	4	50
Construction	1500-1999	7	85,7
Manufacturing	2200-3999	134	61,9
Transportation	4000-4799	9	55,5
Communication	4800-4899	9	66,6
Utility	4900-4999	8	50,0
Wholesale	5000-5199	29	68,9
Retail	5200-5999	32	68,7
Service	7000-9000	84	47,61
Total		320	59,68

Table 6. Descriptive statistics

Variable	Mean	Std. Dev.	Min	Q1	Median	Q3	Max
MO	0.214	0.261	0	0	0.060	0.419	0.93
OC	0.575	0.230	0	0.426	0.592	0.751	0.997
IO	0.097	0.206	0	0	0	0.076	0.998
SO	0.668	0.471	0	0	1	11	11
BS	8.475	3.826	3	6	8	11	21
ID	0.270	0.211	0	0.125	0.25	0.4	0.9
LEV	0.112	0.109	0	0.024	0.085	0.168	0.784
CAPEX	0.050	0.212	0	0.001	0.009	0.038	2.745
LIQ	1.270	1.389	0.190	0.714	0.972	1.391	15.507
FS	0.275	0.234	0	0.041	0.25	0.46	0.99
SIZE	6.404	2.017	3.386	4.861	5.903	7.566	11.992

Table 7. Univariate Tests

Variable	Hedgers		Non-hedgers		t-test	Wilcoxon
	Mean	Median	Mean	Median	p-value	p-value
MO	0.185	0.024	0.260	0.159	0.001	0.002
OC	0.527	0.545	0.645	0.675	0.000	0.000
IO	0.077	0	0.128	0	0.042	0.055
SO	0.785	1	0.496	0	0.000	0.000
BS	9.56	9	6.868	6	0.000	0.000
ID	0.288	0.250	0.242	0.250	0.051	0.093

to use stock options and have larger board of directors and higher percentage of independent directors than non-hedgers.

Table 8 shows the correlation matrix for the sample used here. Results indicate that derivatives use is positively correlated with stock options, board size, independent directors, leverage, capital expenditures, foreign sales, and firm size. We also find that derivatives use is negatively correlated with managerial ownership, ownership concentration, institutional ownership, and liquidity. Furthermore, we use the Variance Inflation Factor (VIF) to check whether the independent variables have multicollinearity problems. The results show that the VIF value of each variable is smaller than 3. This indicates that there are no serious multicollinearity problems.

III.2. MULTIVARIATE ANALYSIS

To test the relation between corporate hedging and corporate governance, we estimate two types of models. The decision to use derivatives is evaluated using a Probit model, while the extent of derivative use is analysed using a Tobit model

A. Probit Results

To examine the relation between corporate governance and the likelihood of derivatives use, we estimate regressions using a Probit model. More specifically the dependent variable is defined as:

$$y_i = 1 \quad \text{if } y_i^* > 0$$

$$y_i = 0 \quad \text{otherwise}$$

$$y_i^* = x_i \beta + \varepsilon_i$$

Table 8. Correlation matrix

	DU	MO	OC	IO	SO	BS	ID	LEV	CAPEX	LIQ	FS
MO	-0.22	1									
OC	-0.25	0.24	1								
IO	-0.13	-0.27	0.17	1							
SO	0.30	-0.13	-0.35	-0.001	1						
BS	0.34	-0.35	-0.29	0.006	0.19	1					
ID	0.10	-0.10	-0.20	-0.02	0.12	0.19	1				
LEV	0.25	-0.08	-0.13	0.10	0.08	0.23	0.02	1			
CAPEX	0.04	-0.008	-0.003	0.01	-0.14	0.02	0.01	0.29	1		
LIQ	-0.26	0.08	-0.05	-0.04	0.02	-0.14	0.12	-0.25	-0.20	1	
FS	0.29	-0.18	-0.21	0.12	0.20	0.12	0.10	0.01	-0.08	-0.01	1
SIZE	0.47	-0.35	-0.32	-0.09	0.27	0.63	0.02	0.20	-0.03	-0.23	0.27

y_i is the hedging activity of firm i , β is a vector of unknown parameters, x_i is the vector of independent variables and ε_i are residuals that are independently and normally distributed, with mean zero and variance σ^2 .

The model we estimate is as follows:

$$DU = \beta_0 + \beta_1 MO + \beta_2 OC + \beta_3 IO + \beta_4 SO + \beta_5 BS + \beta_6 ID + \beta_7 LEV + \beta_8 CAPEX + \beta_9 LIQ + \beta_{10} FS + \beta_{11} SIZE + \varepsilon$$

The dependent variable is set to one if the firm uses any types of derivatives and zero otherwise. Similarly, the dependent variable is set to one if the firm is a foreign currency derivative user (model 2) or interest rate derivative user (model 3) and zero otherwise.

Before running these regressions, we test the endogeneity of stock-options. This type of compensation is used by shareholders to align the managers' interests with their own. For most French firms, ownership tends to be more concentrated with large shareholders, mainly a family (Faccio and Lang, 2002). Such concentration of ownership reduces the agency problem. Therefore, the more the ownership is concentrated, the more the agency costs are reduced, and the less the stock-option is granted. We test the endogeneity of stock-options, using the Nakamura and Nakamura test (1998)³, and find that stock-options are not statistically endogenous.

The results for regressions are presented in Table 9. Each column reports the estimated coefficients and the p -values. For general derivatives use, the results indicate that the coefficient on the managerial ownership is insignificant. This result does not support the hypothesis that managerial risk aversion affects corporate hedging. Our finding is similar to Géczy *et al.* (1997), Gay and Nam (1998), Haushalter (2000) and Knopf *et al.* (2002).

We also find no significant association between the ownership concentration and the corporate hedging. This result does not support the hypothesis that more concentrated shareholders have more incentives to hedge at the firm level. This result is consistent with the empirical evidence documented in Borokhovich *et al.* (2004), Marsden and Prevost (2005) and Bartram *et al.* (2009).

The results indicate that the institutional ownership has a negative and statistically significant relation with corporate hedging. This result supports the hypothesis that institutional investors, who are well diversified, do not have incentives to hedge at the firm level. This finding confirms the results reported in Tufano (1996), Haushalter (2000) and Dionne and Triki (2004, 2005).

The regressions provide some evidence that the corporate hedging is positively associated with stock options, not as expected. This finding supports the argument of Carpenter (2000) that option compensation does not automatically lead to more risk seeking. If these options are deeply in-the-money, they incite managers to hedge more in order to avoid a drop in the stock price. This result is consistent with empirical evidence documented in Géczy *et al.* (1997), Gay and Nam (1998), Knopf *et al.* (2002) and Bartram *et al.* (2009). As discussed by Guay (1999) and Haushalter (2000), this positive correlation may be explained by the low sensitivities of stock options to a change in the price of the underlying stock (delta) and to a change in the standard deviation of the underlying stock (vega). The Vega captures the convex effect stock options compensation has on the relation between the manager's wealth and the firm's value. For example, all else equal, the wealth of a manager whose stock options holdings are deep in the money is not as sensitive to a change in the underlying risk of firm as one whose stock options holdings are out of the money.

Table 9. Probit regression results

Variable	Model 1 General derivatives		Model 2 Foreign currency derivatives		Model 3 Interest rate derivatives	
	Coeff.	P-value	Coeff.	P-value	Coeff.	P-value
Intercept	-0.811	[0.230]	-1.366	[0.030]	-1.973	[0.016]
MO	-0.432	[0.180]	-0.562	[0.110]	-0.116	[0.853]
OC	-0.668	[0.160]	-0.265	[0.512]	-0.013	[0.384]
IO	-0.925	[0.025]	-0.851	[0.037]	-0.779	[0.167]
SO	0.465	[0.023]	0.535	[0.006]	0.258	[0.130]
BS	0.018	[0.952]	-0.013	[0.630]	0.011	[0.913]
ID	0.363	[0.381]	0.099	[0.808]	0.187	[0.639]
LEV	1.305	[0.163]	-0.343	[0.669]	3.470	[0.000]
CAPEX	-0.005	[0.767]	0.025	[0.212]	-5.556	[0.354]
LIQ	-0.628	[0.000]	-0.529	[0.001]	-0.575	[0.001]
FS	1.658	[0.000]	2.255	[0.000]	0.276	[0.373]
SIZE	0.240	[0.000]	0.213	[0.000]	0.266	[0.000]
Log L	-143.11		-151.81		-147.29	
Wald $\chi^2(11)$	97.07		98.25		105.56	
P > $\chi^2(17)$	0.000		0.000		0.000	
Pseudo R ²	0.336		0.315		0.326	
Observations	320		320		320	

In this study, we were unable to measure the delta and the vega, because of data limitations. Indeed, to calculate the Delta and Vega, we need detailed information about the value and the number of options already granted by the firm as well as the characteristics of the options granted during the considered year. Therefore, we assumed that all stock options held by managers provide the same incentive effects.

The coefficients on board size and board independence are insignificant. These results do not support the hypothesis that the board of directors affects corporate hedging. These results are consistent with the empirical evidence documented in Borokhovich *et al.* (2004), Dionne and Triki (2004) and Marsden and Prevost (2005). These authors suggest a passive role for outside directors in the decision to hedge because they lack the information and expertise needed to understand the firm's risk management activities. This argument is supported by the findings of Buckley and Van Der Nat (2003) who report a disturbing level of ignorance concerning risk management activities among independent directors.

Results also show that the corporate hedging is significantly related to some financial characteristics of firms. The coefficient on the quick ratio is negative and signi-

ficant, indicating that corporate hedging and liquidity holding are substitutes. We find that the derivatives use is positively associated with the firm size. This result is consistent with fixed costs limiting hedging by small firms. The foreign sales to total sales ratio is also positive and significant, supporting the firm's exposures as a rationale for corporate hedging. However, the coefficients on the capital expenditures and the leverage are insignificant. These results do not support the hypothesis of financial distress costs and underinvestment costs.

For foreign currency derivatives use (model 2), the results are quite similar to those suggested by the model 1.

For interest rate derivatives use (model 3), only the coefficients on the leverage, the quick ratio, and the firm size are statistically significant. These results indicate that more leveraged firms, larger firms and those holding less liquid assets are more likely to use more interest rate derivatives for corporate hedging.

B. Tobit Results

To examine the relation between corporate governance and the extent of derivatives use, we estimate regressions using a Tobit model. This model is used because there

are a large number of firms do not use derivatives, and therefore, a significant number of zero observations for the notional value of derivatives contracts. This model implies that the observed value of the dependent variable is censored at zero. More specifically the dependent variable is defined as:

$$\begin{aligned} y_i &= y_i^* && \text{if } y_i^* > 0 \\ y_i &= 0 && \text{otherwise} \\ y_i^* &= x_i \beta + \varepsilon_i \end{aligned}$$

y_i is the hedging activity of firm i , β is a vector of unknown parameters, x_i is the vector of independent variables and ε_i are residuals that are independently and normally distributed, with mean zero and variance σ^2 .

The model we estimate is as follows:

$$\begin{aligned} NVD &= \beta_0 + \beta_1 MO + \beta_2 OC + \beta_3 IO + \beta_4 SO + \beta_5 BS \\ &+ \beta_6 ID + \beta_7 LEV + \beta_8 CAPEX + \beta_9 LIQ + \beta_{10} FS \\ &+ \beta_{11} SIZE + \varepsilon \end{aligned}$$

The dependent variable is the total notional gross value of all derivative contracts scaled by the market value of firm if the firm uses derivatives and zero otherwise. Similarly, the dependent variable is the total notional gross value of foreign currency derivative contracts scaled by the market

value of firm (model 2) or the total notional gross value of interest rate derivative contracts scaled by the market value of firm (model 3) and zero otherwise.

The results for regressions are presented in Table 10. Each column reports the estimated coefficients and the p -values. For general derivatives use, the results indicate that the coefficient on the managerial ownership is insignificant. This result does not support the hypothesis that managerial risk aversion affects the extent of derivatives use. This result is consistent with the empirical evidence documented in Géczy *et al.* (1997), Gay and Nam (1998), Haushalter (2000) and Knopf *et al.* (2002).

Results also show that the ownership concentration is insignificant. This result does not support the hypothesis that more concentrated shareholders are more likely to use more derivatives for corporate hedging. This finding confirms the results reported in Borokhovich *et al.* (2004), Marsden and Prevost (2005) and Bartram *et al.* (2009).

We find a negative and statistically significant relation between the institutional ownership and the level of derivatives use as expected. This result supports the hypothesis that institutional investors are less likely to use more derivatives for corporate hedging. This result is consistent with the empirical evidence documented in

Table 10. Tobit regression results

Variable	Model 1 General derivatives		Model 2 Foreign currency derivatives		Model 3 Interest rate derivatives	
	Coeff.	P-value	Coeff.	P-value	Coeff.	P-value
Intercept	-0.555	[0.007]	-0.357	[0.002]	-0.571	[0.003]
MO	-0.048	[0.661]	-0.057	[0.378]	0.022	[0.820]
OC	-0.041	[0.750]	-0.011	[0.873]	-0.031	[0.782]
IO	-0.375	[0.010]	-0.160	[0.049]	-0.327	[0.022]
SO	0.109	[0.087]	0.075	[0.049]	0.107	[0.070]
BS	0.008	[0.351]	0.006	[0.244]	0.002	[0.761]
ID	0.078	[0.537]	-0.073	[0.318]	0.164	[0.150]
LEV	0.351	[0.159]	-0.114	[0.453]	0.658	[0.003]
CAPEX	-0.003	[0.625]	0.002	[0.580]	-0.002	[0.703]
LIQ	-0.134	[0.011]	-0.040	[0.139]	-0.197	[0.001]
FS	0.396	[0.002]	0.414	[0.000]	0.060	[0.599]
SIZE	0.058	[0.001]	0.020	[0.050]	0.065	[0.000]
Log L	-146.98		-58.38		-101.36	
LR $\chi^2(11)$	108.22		97.40		120.11	
$P > \chi^2(17)$	0.000		0.000		0.000	
Pseudo R^2	0.269		0.454		0.372	
observations	320		320		320	

Tufano (1996), Haushalter (2000) and Dionne and Triki (2004, 2005).

The coefficient on the stock-options is positive and statistically significant. This result supports the hypothesis of Carpenter (2000) that as the stock price decreases the payoffs from stock options decrease. Therefore, managers have incentive to hedge in order to avoid that the stock options will be out of the money. This finding confirms the results reported in Géczy *et al.* (1997), Gay and Nam (1998), Knopf *et al.* (2002) and Bartram *et al.* (2009).

The coefficients on the board size and on the independent directors are insignificant. These results do not support the hypothesis that the board of directors affects the extent of derivatives use. These results are consistent with the empirical evidence documented in Borokhovich *et al.* (2004), Dionne and Triki (2004) and Marsden and Prevost (2005).

Results also show that the extent of derivatives use for corporate hedging is significantly related to some financial characteristics of firms. The coefficient on the quick ratio is negative and statistically significant as predicted. Results also indicate that the extent of corporate hedging is positively related to firm size and foreign sales.

We also find no significant relation between the extent of corporate hedging and the leverage. This result do not support the financial distress costs hypothesis, indicating that more leveraged firms are more likely to use more derivatives for corporate hedging. The coefficient on the capital expenditures is also insignificant. This result does not support the underinvestment hypothesis.

For foreign currency derivatives use (model 2), the results are quite similar to those suggested by the model 1, except that the coefficient on the quick ratio is no longer significant.

For interest rate derivatives use (model 3), the results are similar to those suggested by the model 1, except that the coefficient on the foreign sales is no longer significant. However, the coefficient on the leverage is statistically significant, suggesting that the leverage affect positively the extent of interest rate derivatives use. This result supports the financial distress costs hypothesis.

■ IV. CONCLUSION

This paper examines the relationship between corporate governance and corporate hedging on a sample of 320 listed French non-financial firms. In particular, it examines the effect of managerial risk aversion, stock options compensation, ownership structure, board of directors and financial characteristics of firms on the likelihood and the extent of corporate hedging.

We document a negative relationship between the institutional ownership and corporate hedging. This result is consistent with the hypothesis that institutional investors are well diversified investors, and therefore, have less incentive to hedge at the firm level. Contrary to expectation, we find a positive relation between stock options and corporate hedging. This result supports the proposition of Carpenter (2000) suggesting that option compensation does not automatically lead to more risk seeking. Results also indicate that corporate hedging is significantly related to financial characteristics of firm such as leverage, liquidity, firm size and foreign sales.

However, we do not find a significant relationship between the board of directors and the corporate hedging. We also do not provide evidence that managerial ownership and ownership concentration affect the derivatives use. Therefore, there is non evidence that managers benefit from corporate hedging at shareholders expenses. On the contrary, derivatives use seems to be linked to value-enhancing motives. ■

- 1 Haushalter (2000) uses the number of outside blockholders and finds a negative and statistically significant relationship in truncated models. But, the results from tobit and probit regressions are insignificant.
- 2 Tufano (1996) indicates that outside blockholders include mutual funds, hedge funds and private investors.
- 3 We first perform regression of the endogenous variable (stock options) on the exogenous variables of the model and instrument variable for stock options. Then, we calculate the residuals from this equation and include them as an additional regressor in the original estimation equation (the hedging equation). The results indicate that the residual is not significantly different from zero. So, there is no endogeneity problem for the stock-options.

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