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MANAGERIAL COMPENSATION AND OPTIMAL CORPORATE HEDGING

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Abstract

This study examines whether the design of managerial compensation contracts affects a firm's hedging policy. More specifically, a recently developed empirical methodology is used to quantify the sensitivity of a firm's value to the interaction of its internal funds and the price changes in exogenous hedgeable risks. This approach permits an examination of the relation between managerial compensation and corporate hedging activities. The results suggest that differences in the risk exposure of the sample firms is related to the levels of stock options and deferred compensation used by the firms.

INTRODUCTION

This study examines the hypothesis that compensation contract design influences a firm's hedging policy by changing its management's attitude about risk and value maximization. There are presently conflicting views about how different compensation components affect hedging. Firms that rely heavily on contingent compensation, for instance, may be less likely to hedge than firms that rely heavily on salary and other non-contingent methods of payment. Alternatively, the use of contingent claims in compensation contracts may promote more cost conscious behavior on the part of managers resulting in efficient and optimal usage of hedging instruments.

The interaction between hedging and compensation is examined in this study by applying an empirical methodology that assesses the sensitivity of a firm's value to the interaction of its internal funds and the price shocks to exogenous hedgeable risks. This study is different than previous studies on the relation bewteen management compensation and hedging which use firm derivative use as a hedging proxy in that a different approach to the measurement of firm hedging activity is employed.

The remainder of the paper is organized as follows. First, a background discussion is presented in the following section. Section two describes the data and empirical methodology. Results are presented in section three, and concluding comments are provided in section four.

BACKGROUND

Corporate hedging may be optimal for the reasons discussed by Smith and Stulz [16]. These include tax reduction, bankruptcy cost reduction and managerial risk-aversion. Hedging may also be appropriate for other reasons. Froot, Scharfstein and Stein [3], for instance, develop a theoretical framework that incorporates a non-zero cost for obtaining outside equity. They demonstrate that hedging is beneficial when the quantity of internal funds generated by the firm is correlated with some hedgeable risk factor (the price of oil, for instance). Firms will, therefore, attempt to hedge more when the quantity of internal cash flow generated is more highly correlated with exogenous risks.

Extending this development, Froot, Scharfstein and Stein (FSS) develop an empirical methodology that examines the interaction between firm cashflow and exogenous risks. In essence, their approach quantifies the sensitivity of firm value to the interaction of the firms internal funds and risks that can be easily hedged. Since internally generated funds are a cheaper source of investment capital than external funds, firm value is affected if exogenous

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price shocks impact the generation of cashflow. The empirical methodology of FSS is used in this study to measure the interaction of compensation and hedging.

The potential interaction of hedging and managerial compensation policy generates several testable hypotheses. Hedging, for instance, may be used less in firms that reward risk taking through the use of higher levels of contingent compensation. Contingent compensation is usually given in the form of options and/or stock appreciation rights. These compensation packages may offset the natural tendency of risk-averse managers to use hedging instruments to reduce the firm's cashflow variability. This, in turn, reduces the probability of insolvency and loss of income.

Alternatively, the granting of options and other contingent compensation may motivate efforts to maximize firm value through cost reduction. With respect to other compensation components, hedging activities may be greater in firms that utilize high levels of deferred compensation if management assumes a long-term view of their compensation and acts to reduce the probability of firm insolvency. If, on the other hand, deferred compensation is relatively ineffective in motivating management, firms may adopt a less than optimal hedging policy.

The interaction between compensation and hedging is a highly topical question in corporate finance because complex financial securities that are intended to reduce risk are being used more frequently. Often, however, hedging activities have led to increased firm risk as managers overhedge (or speculate) with financial securities that have their value tied to risks present in the general economy. It is plausible that this excessive behavior is related to the sub-optimal design of the firm's compensation contracts.

Another compelling justification for this research is the often-heard argument that top corporate management is "over-paid." While some have argued that executive pay is excessive, it remains to be determined whether the use of certain types of compensation reduces shareholder wealth. If compensation contracts increase the incentives to invest optimally, then they may, in the long-term, lead to greater shareholder wealth, greater productivity and more efficient allocation of economic resources.

In addition to the theoretical and emiprical evidence that suggests derivatives use is on the rise, the financial press routinely reports that options, futures contracts, derivatives and other financial securities are being increasingly used by private firms and municipalities. Many firms and municipalities, however, have experienced difficulties in these markets. The experiences of Barings, Dell Computer, Gibson Greetings, Proctor and Gamble, Orange County and others are prime examples.[1] Thus, it is important that a clear understanding of the reward mechanism that influences the use (and possible abuse) of potentially risky hedging instruments be developed. As the use of derivatives and other sophisticated financial securities continues to increase, the ability to direct corporate officers in their efforts to maximize shareholder wealth will become increasingly dependent upon these relationships.

Several recent studies have examined the determinants of derivatives use and hedging. Geczy, Minton and Schrand [5] and Berkman and Bradbury [1] examine the relation between derivatives use and mangerial compensation by regressing derivatives use on several variables including compensation measures. These studies find managerial motivations are not related to derivative usage. Tufano [17] uses a similar approach but his dependent variable is a measure of the proportion of gold whose price a firm hedges. His sample consists of only gold mining firms. Tufano finds that managerial motives dominate other hedging determinants in contrast to other studies. His study encompasses only one industry, but one advantage his methodology enjoys is that he measures hedging while other studies use derivative use a proxy for hedging.[2]

The current study extends previous research by examining hedging from an external prospective. Instead of using a firm's level of derivate use as a proxy for firm hedging we use the correlation between firm cash flows and external prices to proxy for hedging activity. This aproach allows us to avoid problems associated with using derivatives use as a proxy for hedging. These problems include nominal value reporting, non-hedging related uses of derivatives and non–reporting of derivatives use prior to 1993. Due to the lack of agreement in previous research as to the importance of managerial incentives in the hedging decision, it is important to extend this line of questioning.

DATA AND EMPIRICAL METHODOLOGY

Data

The sample selected for this study consists of 260 executives employed by fifty-nine companies during the period 1980 to 1986. The fifty-nine firms were selected from a random sample of companies included in the COMPUSTAT Version 88.0 Industrial Database that have December 31 as their fiscal year-end, and for which daily stock returns, and relatively complete compensation and accounting data was available for the seven year period

1980-1986.[3] Relatively complete compensation and accounting data implies that an uninterrupted series of at least five proxy and 10K statements was available.[4]

Proxy statements contain relatively complete remuneration information regarding the five highest-ranked executives of the firm. An executive was included in the final sample if he appeared in at least five consecutive proxy statements, the proxy data for the individual represented a full year's remuneration, the individual was an officer, chairman or vice-chairman of the board of directors, and data for the corporate employer was complete. The compensation data for each executive in this study are comprised of payments for salary, bonus, incentive compensation, warrants/options, deferred compensation, savings plans and any other compensation identified in the proxy statement. Pension benefit data were not collected. These benefits are usually linked to salary or are fixed, and thus the incentive effects are assumed to be captured by salary. Table 1 presents the definitions of the collected compensation components. The value of each component was calculated according to Murphy [10].

TABLE 1
Definitions of Compensation Variables

This table presents the definitions for each of the compensation variables in available compensation contracts for the top five executives in the 59 sample firms. Data is gathered from the sample firms' proxies and 10K statements for the seven year period from 1980 to 1986.

Compensation Variable	Definition
Salary	Base Salary
Bonus	Bonus + Incentive Pay
Deferred	Deferred Pay + Restricted Stock Issuances + Phantom Shares + Performance Shares + Dividend Units
Options	Option Value
Other	Any compensation component identified in the proxy, but not included in a previous definition–savings contributions, for example.
Total	The aggregate of all components of compensation identified in proxy statements.

The cashflows generated by the sample firms were collected from the Version 91.0 Quarterly COMPUSTAT Database for all quarters from January 1981 through December 1987. Cashflow is proxied with income after interest and taxes plus all non-cash deductions (principally depreciation allowances and amortization). The information necessary to calculate total market values, market values of equity and debt-to-assets ratios was also collected. Quarterly equity returns for the 59 sample firms were calculated using daily returns from the Center for Research in Security Prices (CRSP) Daily Files.

The price and rate series of several spot commodities including Treasury bills, Treasury bonds, Japanese Yen, German marks, gasoline, crude oil, gold, silver and plywood are used as proxies for exogenous risks. Quarterly prices (rates) for these assets were collected from the *Chicago Board of Trade Annuals*, *Chicago Mercantile Exchange Yearbooks*, *Commodity Research Board Yearbooks* and the *Wall Street Journal*. These data series are complete from the first quarter of 1981 through the fourth quarter of 1987. Quarterly changes in the price series were calculated for use in the empirical analysis.

Summary statistics of the exogenous risk series are provided in Table 2. The high variability of these risk factors is clearly illustrated in the minimum, maximum and standard deviation columns. The Treasury bill rate, for instance, varied from 5.21% to 14.34% over our sample period.

TABLE 2
Descriptive Statistics for Hedgeable Exogenous Risks

This table contains descriptive statistics for the 9 hedgeable risks examined in the study. The data are quarterly price series for the period from January 1981 through December 1987. Values are expressed in dollars per unit of commodity except for the two interest rate instruments which are presented in annualized percentages.

Variable	Mean	Median	Max	Min	Std Dev
90-day T-bills (rate)	8.66	8.04	14.34	5.21	2.74
20-year T-bonds (rate)	10.88	10.97	14.34	7.76	1.88
German Mark ($/100 DM)	42.70	41.28	63.63	31.68	7.82
Japanese Yen ($/10,000 Y)	49.43	43.58	82.44	37.24	12.01
Oil ($/barrel)	21.44	23.92	30.00	10.71	6.00
Gasoline ($/barrel)	40.01	42.49	54.45	20.35	10.62
Gold ($/troy ounce)	389.74	396.75	513.75	308.25	55.65
Silver ($/troy ounce)	7.77	7.33	11.85	5.10	2.06
Plywood ($/1,000 sq. ft.)	18.89	19.12	22.00	15.06	1.69

Empirical Methodology

The empirical methodology used in this study was developed by FSS to examine the sensitivity of the firm's supply of internal funds to hedgeable risks. More specifically, firms should use hedging to reduce the variability of their internal funds which may result in a lower corporate cost of capital since internally generated funds are a cheaper source of equity than equity raised externally. The values of firms hedging optimally should, therefore, exhibit low sensitivity to the interaction of their internal funds and any exogenous, hedgeable risks. FSS's empirical approach requires the estimation of a cross-sectional time-series regression of the following form:

Equation 1

$$R_{i,t} = \alpha_0 + CF_{i,t}(\alpha_1 + \alpha_2 S_t) + \alpha_3 S_t + \varepsilon_{i,t}$$

where R is the change in equity value, CF is the amount of internally generated cash flow, S is some exogenous risk that can be hedged and ε is random error. The firm and time period are denoted by i and t, respectively. The α's are the estimated regression coefficients. The above regression is estimated using the quarterly equity returns as the dependent variable, R. The independent cashflow variable, CF, is proxied with the quarterly cashflow generated by the firm, and the independent risk variable, S, is estimated as the change in the price (rate) of commodities (interest rate instruments) with exchange traded futures contracts. The cashflow variable, CF, is divided by the estimated replacement cost of the firm's assets.[5]

The coefficient of interest in this study is α_2. When this coefficient differs significantly from zero, it suggests that the internal funds (CF) of the firm interact with the external risk (S) in a way that influences firm value (R). This result is interpreted as an unexploited hedging opportunity. In other words, the firm is not hedged to its fullest potential.

This methodology has been applied by other researchers in the examination of different issues. Gertler and Hubbard [4], for example, estimate a regression of this form in their analysis of corporate investment.[6] In their study, firms are segmented by the retention ratio of retained earnings and regressions are estimated for each sub-sample. A similar approach is employed in the present analysis of managerial compensation design. More specifically, the sample firms are segmented on the ratio of options to total compensation and on the ratio of deferred compensation to total compensation. The regression described in equation (1) is then estimated for each compensation class. The estimated values of the α_2 coefficients are then compared across the various compensation classes.

EMPIRICAL RESULTS

Managerial Compensation

Table 3 provides summary statistics of our sample firms. It is apparent from the table that the sample firms differ significantly as measured by size and debt ratios. Stratifying these firms on the median usage of options or deferred compensation yields either 29 or 30 firms in each class. Data for the sample firms is complete for all 28 quarters from January 1981 through December 1987.

TABLE 3
Sample Firm Attributes

This table contains the descriptive statistics for the 59 sample firms for the fiscal year ending December 31, 1980. Data collected from the 1991 Quarterly COMPUSTAT Database. Total market values and equity values are expressed in millions of dollars.

Variable	Mean	Median	Max	Min	Std Dev
Market Value	1,642.00	866.65	12,088.77	63.28	2,335.34
Equity Value	799.91	455.78	5,957.35	25.00	1,040.86
Debt/Assets	0.2089	0.1865	0.7022	0.0000	0.1541

Compensation data for the sample firms and executives is described in Table 4. Panel A presents the “per executive” summary statistics for the compensation schemes represented in the study. During the sample period, average annual pay was $458,119, with a range from $57,997 to $3,610,578.

Of particular interest in the present study, however, is the relative use of options and deferred compensation within the sample firms. Panel B presents the use of these pay components by the firms. Options, for instance, made up approximately 11% of the average total compensation paid from 1980 to 1986. This figure obviously comes from a highly skewed distribution as the median option usage was a mere 3.48%. The use of options by the firms also differs considerably as seen by the standard deviation of 14.14%. Perhaps more demonstrative of the variability in option compensation is the maximum of 73.29% and minimum of 0%. Some firms, therefore, use options as a major component in their managerial contracts, while other firms avoid the usage of options altogether.

The use of deferred compensation by the sample firms is also highly varied and skewed. While deferred compensation often contributes a smaller percentage of total compensation (5.94%) versus options, several of the firms use deferred compensation in significantly different ways. Roughly half the firms paid *no* deferred compensation during the sample period. During one year of the sample period, however, one firm paid out 73.29% of its total remuneration as deferred compensation.

Regression Results

In the following analysis, firms are classified as “low option” firms if the percentage of options in their total compensation is at or below the median option usage for all sample firms. Similarly, “high option” firms are those firms paying out option compensation above the sample firm median. In a manner similar to that used for options, firms are classified as “low deferred” firms if the percentage of deferred compensation in their total compensation is at or below the firm median. Alternatively, “high deferred” firms are those firms paying out deferred compensation above the median.

According to the theory proposed by FSS, the sensitivity of firm returns to the interaction of cashflow and exogenous risks is an indication of hedgeable exposure. In several cases, returns and the cashflow-risk interaction correlations are significant. Specifically, five of nine correlations for low option firms are significant at the 10% level, and seven of nine correlations are significant at this level for high option firms. Significant correlations between returns and the interaction effects are also evident when the firms are segmented by deferred compensation, i.e., five of nine correlations for the "low deferred" firms and six of nine correlations for the "high deferred" firms are significant at the 10% significance level.

TABLE 4
Descriptive Statistics on Sample Firm Executive Compensation

This table contains summary statistics of the available compensation contracts for the top five executives in the 59 sample firms. Data is gathered from the sample firms' proxies and 10K statements for the seven year period from 1980 to 1986. Panel A presents the statistics on a per executive basis while Panel B provides data summarized by firm.

Panel A: Compensation paid to individual executives (n=1,585)

Variable*	Mean	Median	Max	Min	Std Dev
TOTAL	458,119	349,154	3,610,578	57,997	378,719
OPTIONS	70,325	10,057	1,657,192	0	147,578
DEFERRED	46,648	0	1,652,860	0	161,128
OPTIONS/TOTAL	0.1138	0.0272	0.8036	0.0000	0.1468
DEFERRED/TOTAL	0.0584	0.0000	0.8515	0.0000	0.1340

Panel B: Overall compensation paid by firms (n=413)

Variable	Mean	Median	Max	Min	Std Dev
OPTIONS/TOTAL	0.1100	0.0348	0.7329	0.0000	0.1414
DEFERRED/TOTAL	0.0594	0.0000	0.7341	0.0000	0.1308

* DEFERRED = present value of deferred compensation payments;
OPTIONS = present value of managerial option issuances;
TOTAL = sum of salary, bonus, deferred compensation, options and other.

If equity returns are correlated with the interactions between cashflow and hedgeable risks, the firm is apparently foregoing available hedging opportunities. The magnitude of this relationship can be examined with a cross-sectional time-series regression approach. Intuitively, the magnitude of the coefficient on the interaction term indicates the potential gain from additional hedging. It is also hypothesized that the magnitude of this coefficient will be influenced by differences in managerial compensation policies.

Whether or not differences in the design of compensation packages are related to risk exposure is the major question addressed in this study. Tables 5 and 6 contain the regression results generated by a series of regressions that address this question. The regression coefficients reported in these tables are estimated with cross-sectional time-series regressions that allow first-order autoregressive errors within cross sections and contemporaneous correlation between cross sections.

The impact of different option usage levels in total compensation is evaluated in Table 5. While maintaining the classification of sample firms as "low" or "high" option firms defined previously, independent pooled cross-sectional time-series regressions are estimated for both classes. These regressions estimate the sensitivity of firm equity value changes to internal cashflow generation, changes in the price of some exogenous risk and the *interaction* of the cashflow and risk changes.

Panel A of Table 5 reports the results for regressions in which Treasury bill rate changes are the exogenous risk. Both low and high option use firms have equity values that are sensitive to the interaction of cashflow and T-bill rate changes. Low option firms, for instance, generate a coefficient of -364,996.83 for the interaction variable which is significant at the 1% level. Similarly, the high option firms' regression yields a coefficient estimate of -60,716.55 which is significant at the 5% level. In each case, the firms have apparently failed to exploit all available hedging opportunities.

TABLE 5
Return Regressions for Firms Segmented by Usage of Options

Pooled cross-sectional time-series regression estimates utilizing quarterly data for 59 NYSE and AMEX firms from 1981 through 1987. The estimated regressions are of the following form:

$$R_{i,t} = \alpha_0 + CF_{i,t}(\alpha_1 + \alpha_2 S_t) + \alpha_3 S_t + \varepsilon_{i,t}$$

where R is the equity return, CF is the internally generated cashflow, S is the price change of a hedgeable exogenous risk and ε is random error. The firm and time period are denoted by i and t, respectively. Firms are segmented on their option usage. Low option firms have options-to-total pay ratios at or below the median of our sample firms. High option firms use more than the median. The last column provides a test of equality of the absolute value of the coefficients on the interaction between changes in exogenous risk and firm cashflow. Positive values signify that low option firm values are more sensitive to the interaction than high option firm values.[a]

	Independent Variable				t-test & p-value of INTERACTION Difference
	INTERCEPT	CASHFLOW	RISKCHG	INTERACTION	
Panel A: Treasury bills					
Low Options	0.0027 (0.9999)	77714.7207 (0.1335)	-0.0031 (0.0948)	-364996.8300 (0.0001)	
High Options	0.0707 (0.0000)	-492248.7700 (0.0000)	-0.0093 (0.0000)	-60716.5490 (0.0238)	236.51 (0.0000)
Panel B: Treasury bonds					
Low Options	0.0884 (0.0000)	-60741.9690 (0.0290)	0.0109 (0.0000)	-1991580.9000 (0.0000)	
High Options	0.0720 (0.0000)	-449876.3000 (0.0000)	-0.0361 (0.0000)	-583141.5200 (0.0000)	1067.41 (0.0000)
Panel C: Japanese yen					
Low Options	0.0864 (0.0000)	-28267.3670 (0.0001)	-0.0047 (0.0001)	100254.6910 (0.0001)	
High Options	0.0721 (0.0001)	-137359.1000 (0.0000)	0.0003 (0.1118)	-130891.8700 (0.0000)	-122.14 (0.0000)
Panel D: German marks					
Low Options	0.0884 (0.0000)	-69245.7710 (0.0000)	-0.0064 (0.0000)	79045.7601 (0.0000)	
High Options	0.0747 (0.0001)	-446670.6500 (0.0000)	-0.0068 (0.0000)	-95036.7980 (0.0000)	-47.01 (0.0000)
Panel E: Oil					
Low Options	0.0845 (0.0000)	-62272.1050 (0.0000)	0.0191 (0.0000)	-729373.5000 (0.0000)	
High Options	0.0729 (0.0001)	-432556.8600 (0.0000)	0.0028 (0.0000)	126818.8770 (0.0000)	907.34 (0.0000)

a. p-values are in parentheses.

TABLE 5
Return Regressions for Firms Segmented by Usage of Options
(Cont'd)

	Independent Variable				**t-test & p-value of INTERACTION Difference**
	INTERCEPT	**CASHFLOW**	**RISKCHG**	**INTERACTION**	
Panel F: Gasoline					
Low Options	0.0900 (0.0000)	-254888.2100 (0.0000)	0.0076 (0.0000)	-404009.6900 (0.0000)	
High Options	0.0700 (0.0000)	-181193.6100 (0.0000)	-0.0046 (0.0000)	126135.8670 (0.0000)	978.50 (0.0000)
Panel G: Gold					
Low Options	0.0830 (0.0000)	221923.5500 (0.0000)	0.0008 (0.0000)	-17677.6580 (0.0000)	
High Options	0.0749 (0.0000)	-377627.2700 (0.0000)	0.0004 (0.0000)	-5095.2691 (0.0000)	462.95 (0.0000)
Panel H: Silver					
Low Options	0.0248 (0.9990)	27883.7449 (0.6707)	0.0468 (0.0000)	-869043.3100 (0.0000)	
High Options	0.0853 (0.0000)	-216587.3400 (0.0000)	0.0256 (0.0000)	-248312.7900 (0.0000)	435.11 (0.0000)
Panel I: Plywood					
Low Options	0.0382 (0.9999)	253074.1150 (0.0000)	0.0104 (0.0000)	793846.5610 (0.0000)	
High Options	0.0738 (0.0000)	-79997.8780 (0.0000)	0.0370 (0.0000)	17466.1854 (0.0001)	2408.61 (0.0000)

The significance of these coefficients suggests that the sensitivity of internal funds to hedgeable risks results in unnecessary firm value variability. The impact on firm value arises from the need to raise external capital when internal cashflow is impacted by exogenous risks. Because external capital is more costly, firm values can be increased by undertaking available hedging opportunities that reduce the expected costs of capital generation.

The main issue of concern in the study is addressed in the far right column of Table 5. In this column, the equality of the estimated interaction coefficient magnitudes for the two firm types is tested. The absolute values are tested in these t-tests since the magnitude of the interaction effect is the main concern. Results from Panel A indicate that the magnitude of the interaction effect for low option firms is significantly greater than that for firms using a higher percentage of options (t=236.51, p=0.0001). This finding suggests that firms compensating their managers with a higher level of options are more likely to exploit available hedging opportunities than their low option paying counterparts.

Panels B through I present results from similar regression pairs using other hedgeable risks as independent variables. In seven of nine cases, firms paying higher ratios of options to total pay have significantly lower interaction coefficients. This result can be interpreted as above; higher option usage leads to more optimally hedged corporate cashflows.

TABLE 6
Return Regressions for Firms Segmented by Usage of Deferred Compensation

Pooled cross-sectional time-series regression estimates utilizing quarterly data for 59 NYSE and AMEX firms from 1981 through 1987. The estimated regressions are of the following form:

$$R_{i,t} = \alpha_0 + CF_{i,t}(\alpha_1 + \alpha_2 S_t) + \alpha_3 S_t + \varepsilon_{i,t}$$

where *R* is the equity return, *CF* is the internally generated cashflow, *S* is the price change of a hedgeable exogenous risk and ε is random error. The firm and time period are denoted by i and t, respectively. Firms are segmented on their deferred compensation usage. Low deferred firms have deferred-to-total pay ratios at or below the median of our sample firms. High deferred firms use more than the median. The last column provides a test of equality of the absolute value of the coefficients on the interaction between changes in exogenous risk and firm cashflow. Positive values signify that low deferred firm values are more sensitive to the interaction than high deferred firm values.[a]

	Independent Variable				t-test & p-value of INTERACTION Difference
	INTERCEPT	**CASHFLOW**	**RISKCHG**	**INTERACTION**	
Panel A: Treasury bills					
Low Deferred	0.0571 (0.9999)	601109.4350 (0.000)	-0.0059 (0.0062)	174592.8300 (0.0000)	
High Deferred	0.0236 (0.9999)	-935649.9500 (0.0000)	-0.0019 (0.0001)	-674172.7900 (0.0000)	-491.72 (0.0000)
Panel B: Treasury bonds					
Low Deferred	0.0520 (0.3641)	615820.1180 (0.0000)	-0.0244 (0.0000)	-739137.4400 (0.0000)	
High Deferred	0.1137 (0.0000)	-1073820.8000 (0.0000)	-0.0012 (0.0038)	-2006514.8000 (0.0000)	-862.60 (0.0000)
Panel C: Japanese yen					
Low Deferred	0.0462 (0.4394)	632957.5090 (0.0000)	-0.0013 (0.0002)	-87834.9940 (0.0000)	
High Deferred	0.0236 (0.9999)	-1078422.1000 (0.0000)	-0.0041 (0.0000)	129372.0910 (0.0000)	-299.39 (0.0000)
Panel D: German marks					
Low Deferred	0.0200 (0.9999)	504575.3170 (0.0000)	-0.0050 (0.0000)	-173836.2500 (0.0000)	
High Deferred	0.1237 (0.0000)	-1347156.5000 (0.0000)	-0.0115 (0.0000)	256585.3590 (0.0000)	-407.11 (0.0000)
Panel E: Oil					
Low Deferred	0.0393 (0.5153)	488047.0180 (0.0000)	0.0081 (0.0000)	-129274.4000 (0.0000)	
High Deferred	0.1101 (0.0000)	-818578.0500 (0.0000)	0.0127 (0.0000)	-491746.4100 (0.0000)	-481.57 (0.0000)

a. p-values are in parentheses.

TABLE 6
Return Regressions for Firms Segmented by Usage of Deferred Compensation (Cont'd)

	Independent Variable				t-test & p-value of INTERACTION Difference
	INTERCEPT	**CASHFLOW**	**RISKCHG**	**INTERACTION**	
Panel F: Gasoline					
Low Deferred	0.0617 (0.999)	513383.1860 (0.0000)	0.0006 (0.0248)	-78068.2170 (0.0000)	
High Deferred	0.1102 (0.0000)	-925669.3800 (0.0000)	0.0115 (0.0000)	-210404.37001 (0.0000)	-592.08 (0.0000)
Panel G: Gold					
Low Deferred	0.0733 (0.1994	363740.2570 (0.0000)	0.0006 (0.0000)	-20163.5860 (0.0000)	
High Deferred	0.1036 (0.0000)	-509494.5500 (0.0000)	0.0005 (0.0000)	-4619.6483 (0.0000)	360.89 (0.0000)
Panel H: Silver					
Low Deferred	0.0837 (0.1312)	401419.8420 (0.0000)	0.0304 (0.0000)	-302882.8800 (0.0000)	
High Deferred	0.1069 (0.0000)	-336012.9200 (0.0000)	0.0366 (0.0000)	-637477.1700 (0.0000)	-287.37 (0.0000)
Panel I: Plywood					
Low Deferred	0.0494 (0.3660)	747598.4460 (0.0000)	0.0333 (0.0000)	48666.1465 (0.0000)	
High Deferred	0.0979 (0.0000)	-551760.8400 (0.0000)	0.0182 (0.0000)	562033.9510 (0.0000)	-1001.48 (0.0000)

Table 6 presents regression results for firms segmented on the usage of deferred compensation. High and low deferred firms are identified as in the previous section. Surprisingly, deferred compensation has a different effect on hedging versus that attributed to option usage in Table 5. Specifically, in eight of the nine cases examined, firms paying higher ratios of deferred compensation to total pay exhibit significantly *higher* interaction coefficients.

Referring to Panel A of Table 6, for instance, the coefficient on the interaction of Treasury bill rate changes and cashflow is 174,592.83 for low deferred firms. This coefficient is much smaller in magnitude than the corresponding coefficient for high deferred firms (-674,172.79). The magnitudes of these coefficients, in fact, differ at well beyond the 1% significance level. Similar results are found for Treasury bonds, Japanese yen, German marks, oil, gasoline, silver and plywood.

Results indicate that firms paying high levels of deferred compensation frequently have hedging opportunities that exceed those of low deferred compensation firms. This result suggests that heavy usage of deferred compensation reduces the incentive of corporate officers to actively search for and undertake available hedging opportunities. Option usage, on the other hand, tended to motivate the exploitation of hedging opportunities. This behavior is consistent with cost consciousness as managers hedge in a way that reduces the need to raise external capital. This ultimately reduces the firm's flotation costs and other costs of raising capital.

CONCLUSIONS

This study investigates the influence of managerial compensation composition on corporate hedging. The necessity of risk-taking in financial management combined with the inherent risk-aversion of corporate decision makers generates potential conflicts. Examples include underinvestment in risky assets and the use of unjustifiably conservative financial policy. Specialized contractual arrangements that constrain the actions of corporate officers can often alleviate some of these problems. Some risks, however, are relatively easy to control with futures contracts and other derivative securities. Use of these derivative securities can often complement the use of certain managerial pay schemes. The interaction of compensation design and hedging, however, remains largely ignored.

Using an empirical methodology suggested by Froot, Scharfstein, and Stein [3], the risk exposure of firms using different levels of options and deferred compensation in their pay plans is compared. Of particular interest is the sensitivity of firm returns to cashflow changes that are correlated with hedgeable exogenous risks. For a large number of these risks, significant differences exist in the sensitivity of firms that use a relatively high percentage of options in their compensation packages and those that use a lower percentage. High option usage, therefore, appears to accompany a reduced exposure to exogenous risks.

In addition, the level of deferred compensation employed by the sample firms has a significant impact on the sensitivity of firm value to the cashflow-risk interaction. Specifically, firms remunerating their corporate officers with high levels of deferred compensation have significantly *higher* exposure to the cashflow-risk interaction variable. Because this type of risk can be hedged rather easily, these results suggest that deferred compensation does little to motivate managers to hedge optimally. Interestingly, this effect differs from the effect of options which tend to encourage hedging.

Reports of excessive involvement in derivative markets have recently flooded the financial press. Tremendous monetary losses and lawsuits have followed. In this study, it is shown that a firm's risk exposure is influenced by the design of management compensation contracts. This work provides a foundation for future research that will undoubtedly concentrate on specific data concerning off-balance sheet derivative exposure. Until this data becomes available, however, the present study reveals some initial thought-provoking results.

ENDNOTES

1. Shirreff [15] recently chronicled several of these events. Overdahl and Schachter [12] discuss Gibson Greetings' interest rate swap excursions in great detail.

2. Several other studies examine the determinants of hedging including Howton and Perfect [6], Nam and Thornton [11], Mian [8], Dolde [2], and Nance, Smith and Smithson [12]. These studies have conflicting results concerning the importance of managerial motives in hedging decisions.

3. Inclusion of only those firms for which complete information exists for seven years may introduce a bias toward relatively successful corporations. There is, however, considerable variation in performance, compensation and hedging activities across firms within the sample. It is not expected, therefore, that the selection criteria will significantly bias the results of the analysis. The calendar year fiscal period is necessary to insure that accounting data are temporally matched for all firms.

4. If a company's proxy statement for a particular year was missing, then the 10K was examined to determine if compensation data were included. If the data were not included, then the company was omitted.

5. Replacement costs of the sample firms are estimated with the approach of Lindenberg and Ross [8] as modified by Perfect and Wiles [14].

6. Kashyap, Lamont and Stein [7] also implement this type of regression in a study of firm inventories and credit availability.

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