The Role of Performance-Based Compensation in Reducing the Underinvestment Problem

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This paper seeks to determine under what conditions of growth and cash flow increasing pay-performance sensitivity is associated with improved firm performance. Firms with abundant growth opportunities will suffer from an underinvestment problem to the extent that their managers do not choose to invest in available growth opportunities. This study explores growth firms' cash flow environments and identifies conditions where increasing performance-based incentives are associated with higher firm performance. We find that firms with abundant growth opportunities benefit from increased long-term pay-performance sensitivity. Further, our results suggest that the need for strengthening performance-based compensation becomes less significant in growth firms when such firms are able to reduce their free cash flow by increasing interest or dividend payouts, which is consistent with the free cash flow hypothesis.

INTRODUCTION

Firms' growth opportunities and cash flow environments affect their investment decisions. Jensen (1986) provides the well-known free cash flow problem as a classic example: managers of low growth, high cash flow firms prefer to invest the free cash flow in unprofitable ways that directly or indirectly may benefit themselves, rather than payout the cash flows to shareholders. He suggests that when conditions of free cash flow are present, the use of incentive pay becomes more important as an internal control mechanism. Pay for performance reduces the need for monitoring by more closely aligning the interests of managers and shareholders.

High growth firms, like high cash flow firms, may suffer from monitoring problems because less of their value comes from easier-to-monitor assets in place. Smith and Watts (1992) suggest that pay for performance is more important in these firms. As in low

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growth firms suffering from the free cash flow problem, cash flows affect the severity of agency and monitoring problems in high growth firms. This study examines the underinvestment problem in high growth firms and determines under what conditions of growth and cash flow increasing pay-performance sensitivity is associated with improved firm performance.

Firms with abundant growth opportunities will suffer from an underinvestment problem to the extent that their managers do not choose to invest in the positive net present value (NPV) growth opportunities available. Possible reasons for underinvesting in growth opportunities are managerial risk aversion, lack of effort, perquisite consumption, or insufficient internally generated cash flows coupled with an aversion to raising external capital. Growth firms with low levels of internally generated funds may be especially susceptible to the underinvestment problem due to a growth-resource mismatch. Abundant growth opportunities may exacerbate stockholder-manager conflicts due to the wider latitude managers in investment decisions. These decisions are especially difficult for shareholders to monitor and increase the need for internal control systems. Pay for performance is an important feature of firms' internal control systems and may reduce the agency conflicts associated with underinvestment in growth firms.

This study tests the growth incentive hypothesis which states that without proper incentives, managers of firms with abundant growth opportunities and low cash flow will underinvest. We explore growth firms' cash flow environments and identify conditions where increasing pay-performance sensitivity is associated with higher firm performance. We find that firms with abundant growth opportunities benefit from increased long-term pay-performance sensitivity. Correcting for the self-selection bias that arises when firms choose their level of cash flow, we observe that the need for pay-for-performance incentives becomes less significant for growth firms. These firms, however, would benefit if their free cash flows were lower which is consistent with Jensen (1986). Our results suggest that the need for strengthening performance-based compensation becomes less significant in growth firms when they are able to reduce their free cash flow by increasing interest or dividend payouts.

GROWTH OPPORTUNITIES, FREE CASH FLOW, AND INCENTIVES

Smith and Watts (1992) analyze how the presence of growth opportunities affects CEO incentive compensation.[1] The principal-agent literature predicts that, in investment decisions in large firms where the managers are better informed than the shareholders, the managers (agents) will not necessarily choose to invest in all the available positive NPV projects because shareholders (principals) are assumed to be diversified and, therefore, risk-neutral with respect to any firm. Managers, on the other hand, cannot diversify firm-specific risk (and, therefore, the risk of their compensation) and are risk-averse. Without proper incentives, managers will not invest in projects they deem too risky or whose payoffs are too distant, even if the projects have positive NPVs. If the shareholders cannot monitor the managers' actions, they should give the managers a share in the outcome of

[1] Smith and Watts (1992) consider growth ("investment opportunity set") to be a factor capable of explaining cross-sectional differences in firm policies. Growth opportunities derive from specialized investments in human and physical capital. Thus, they should serve to explain differences among firms.

their actions in order to induce the managers to take more risk or extend their investment horizon (Gaver and Gaver, 1995) through higher expected compensation. Smith and Watts (1992) note that the problem is worse in firms with greater growth opportunities because of shareholders' difficulties in observing the growth options and whether the managers invest in them. In firms with few growth options, i.e., when more of the value derives from assets in place, it is easier to monitor how executives manage those assets, and there are fewer good investment opportunities to monitor. Therefore, fewer incentives should be required because the potential principal-agent conflict is less severe. The authors predict that firms with greater growth options will employ more incentive compensation to mitigate the problem. Consistent with this hypothesis, they provide evidence that the presence of stock option plans is positively related to growth opportunities.

Gaver and Gaver (1995) expand Smith and Watts' (1992) analysis of the relationship between growth opportunities and compensation policies using 1992 compensation data. They assume that there is a relatively high degree of information asymmetry between the shareholders and managers of growth firms because the managers have more private information regarding the values of the future projects. The environment of asymmetric information makes it more difficult for shareholders to monitor managers. Thus, they hypothesize that growth firms will emphasize long-term incentive compensation to motivate managers to make the desired growth investments. Consistent with this theory, they find that CEOs of growth firms receive more of their compensation in the form of long-term incentives, such as performance awards, restricted stock grants, and stock option grants. They observe, however, that the proportion of stock-based compensation to total compensation among growth firms is no different from the proportion found among non-growth firms. This finding is similar to Bizjak *et al.* (1992) who report that growth firms' compensation plans are less sensitive to stock returns. They point out that measurement difficulties regarding compensation from stock option grants may explain their "anomalous" observation and suggest that the result be interpreted with caution.[2]

The presence of free cash flow can affect investment decisions (and, therefore, a firm's performance) differently in different growth environments. Lang *et al.* (1991) test the free cash flow hypothesis in the context of firms' growth opportunities. They hypothesize that firms with good investment opportunities are more likely to invest their free cash flow in positive NPV projects than firms with poor investment opportunities. Measuring investment opportunities using Tobin's q, they hypothesize that firms with high free cash flow and poor investment opportunities ($q < 1$) are more likely to make acquisitions that do not benefit shareholders. They find that firms with high cash flow and low q have the lowest abnormal returns associated with the announcements of tender offers. They also show that bidders' returns decline as cash flow rises for low q firms but not for high q firms. Their results suggest that firms with high growth opportunities ($q > 1$) do have positive NPV projects available.

[2] Bizjak *et al.* (1992) hypothesize that firms with high information asymmetries between managers and shareholders should use incentives less sensitive to short-term stock price performance because stock prices in the short run may not accurately reflect what managers are doing, especially if they are investing for growth over longer time horizons. Using Jensen and Murphy's (1990b) pay-performance sensitivities, they find that the salary and bonus and total pay-performance sensitivities are negatively related to information asymmetries.

Zantout and Tsetsekos (1994) and Szewczyk *et al.* (1996) test both the investment opportunities hypothesis and the free cash flow hypothesis using stock price reactions to the announcements of R&D expenditures in high and low q and high and low cash flow firms. The investment opportunities hypothesis suggests that R&D investments in growth firms ($q > 1$) are beneficial. The free cash flow hypothesis predicts that low free cash flow/high q firms experience positive abnormal returns and high free cash flow/low q firms will experience negative abnormal returns. Their results support the investment opportunities hypothesis. They observe positive abnormal returns for R&D expenditures in high q firms and insignificant returns in low q firms, regardless of the cash flow level. They do find, however, that the difference between high and low q firms is significant for those with low cash flow. Jensen (1986), recognizing that competition in product and factor markets motivates managers toward efficiency in order to increase the probability that their firms will survive, nevertheless notes that these disciplining forces are less effective when new activities or activities providing rents and quasirents are involved. These activities often are associated with growth (investment) opportunities as well as free cash flow. He states that firms' internal control systems and the market for corporate control are more important in these situations due to the difficulty of monitoring managers' investment decisions. Thus, strengthening firms' internal control systems through increased pay-performance sensitivity may be especially beneficial in growth firms.

To summarize, studies of growth opportunities suggest that agency problems can arise in high growth environments. The evidence that more incentive compensation is used in growth firms is consistent with the theory that this will provide incentives for managers to invest in available growth opportunities, thereby reducing the stockholder-manager conflict. No studies, however, have examined under what conditions increasing incentive compensation will improve the performance of high growth firms. Abundant cash flow, or lack of it, may affect the investment decisions of the managers of growth firms. Though Lang *et al.* (1991) present evidence that managers of growth firms invest in positive NPV projects, there has been no examination regarding the lack of cash flow on growth firms' performance. In other words, the growth incentive hypothesis has not been tested.

HYPOTHESIS AND DATA

This paper seeks to determine under what conditions of growth and cash flow increasing pay-performance sensitivity is associated with improved firm performance. We consider pay-performance sensitivity to be a firm-level policy, one influenced by its environmental factors such as size, growth opportunities, leverage, and cash flow. This is consistent with Smith and Watts (1992), who find incentive pay endogenous to the firm and related to growth opportunities. Lippert and Moore (1994) also take this view; they find that CEO tenure is not a significant determinant of Jensen and Murphy's (1990b) pay-performance sensitivities. McConaughy and Mishra (1996) also find that these sensitivities are not affected by CEO characteristics such as CEO tenure, age, and family control.

Firms with abundant growth opportunities may suffer from underinvestment in positive NPV projects due to agency conflicts, which is affected by their cash flow environ-

ment. In this section we discuss the growth incentive hypothesis, testable propositions, and the variables used in the tests.

THE GROWTH INCENTIVE HYPOTHESIS

Smith and Watts (1992) argue that growth opportunities arise from specialized investments in human and physical capital. These specialized investments cause variation in firms' investment opportunity sets and thus affect future performance. To realize their benefits, managers must invest in growth opportunities. Managers' investment decisions depend on their incentives and the resources available to them. Excessive managerial risk aversion, perquisite consumption, or lack of effort may cause the managers of growth firms to reject (underinvest in) positive NPV projects available to them. Increasing incentive compensation should serve to motivate managers to invest more in available growth opportunities and thus improve firm performance in more difficult to monitor growth firms. Firms with few growth opportunities may not benefit as much from increased pay-for-performance incentives, however; their managers have only restricted investment opportunities, and it is easier for shareholders to monitor how managers utilize assets in place. The following hypothesis states the conditions of growth such that increasing pay-performance sensitivity is associated with higher firm performance.

Hypothesis: Increasing pay-performance sensitivity in firms with abundant growth opportunities is associated with higher firm performance.

The level of internally generated cash flow also will affect the underinvestment problem in growth firms. Low cash flow firms, with lower level of agency conflicts, will not suffer as much from the underinvestment problem. An examination of the impact of increasing pay-performance sensitivity in growth firms must take into account the effect of their cash flow environment.

DATA

Our sample consists of 430 large public firms comes from Jensen and Murphy (1990b). They report these firms' pay-performance sensitivity as the dollar change in CEO pay per $1000 change in shareholder wealth. Because investment decisions depend on a longer-term managerial orientation, we subdivide the Jensen and Murphy sensitivities into long-term and short-term compensation. This allows us to test for the efficacy of incentives based on short-term performance and incentives based on long-term performance. Short-term pay-performance sensitivity includes both salary and bonus pay, which tend to reward short-term performance. Long-term pay-performance sensitivity equals total sensitivity minus sensitivity with salary and bonus minus dismissal sensitivity.[3] Long-term pay-performance sensitivity is stock based and should reward longer term firm performance. Jensen and Murphy calculate these sensitivities for 430 large firms for the

[3] Jensen and Murphy (1990b) describe how they compute these sensitivities. They report sensitivities for various types of incentives: salary and bonus, other pay, dismissal, stock options, and inside stock; the sum of which is "Total Incentives." We include other pay in long-term pay-performance sensitivity because it can include long-term accounting-based compensation plans and deferred compensation. We also used an alternative definition of long-term pay-performance sensitivity that includes only equity-based incentives such as stocks and stock options. The results are similar to those presented in this paper.

1974-1988 period using the 1975-1989 Forbes executive compensation surveys.[4] The control period is 1974 to 1988. The test period used to determine the effects of increasing the stock-based incentives spans 1989 to 1993. We obtain fiscal year accounting and stock market data from Compustat. We compute the industry medians (growth and cash flow variables) using one digit SIC groups and delete industry groups with fewer than ten firms,[5] which gives us 395 firms in our sample. Due to the missing data in some of the Compustat variables, the regressions can use only 280 observations.

We employ abnormal stock returns to measure performance because factors outside the managers' control, such as industry and market effects, can affect total returns. Abnormal returns control for many such effects and provide a better measure of corporate and managerial performance than do total shareholder returns. We risk-adjust the test period performance by computing abnormal returns as the difference between the firm's total return and the expected return from a two parameter market model. The data are drawn from the CRSP daily stock return file, and the parameters of the market model are estimated over 250 days prior to the test period (1989-1993).

Growth/investment opportunities cannot be observed directly. Myers (1977) suggests that firms' investment opportunities cause their market values to be greater than the values of their assets in place. Thus, many studies use some form of a market-to-book ratio as a proxy: total market value-to-book value of assets (Smith and Watts, 1992; Bizjak *et al.*, 1992; Kole, 1994) or market-to-book equity (Lewellen *et al.*, 1987; Collins and Kothari, 1989; Chung and Charoenwong, 1991). Growth firms, or firms with abundant investment opportunities, are assumed to have high market-to-book ratios. We measure growth opportunities with market-to-book equity. Following Lang *et al.* (1991) and Lehn and Poulsen (1989), we measure cash flow as operating income before depreciation minus interest expense, taxes, preferred dividends, and common dividends.

EMPIRICAL TESTS

Agency theory suggests that firms whose CEOs have more sensitive pay-performance contracts, other things equal, should perform better—in Murphy's (1992, p. 3) words, "CEOs with high rankings in this survey have better incentives to maximize shareholder value than CEOs with lower rankings." Though Jensen and Murphy (1990a) present evidence that compensation is performance based, they present little evidence on the efficacy of performance-based incentives. Using their estimates of pay-performance sensitivity, we seek to determine whether higher levels of sensitivity, given size, pay-performance sensitivity, and growth opportunities, are associated with higher future risk-adjusted performance in growth firms under conditions of high and low cash flow.

MODEL SPECIFICATION

We specify the following performance model in order to estimate the effects of changes in pay-performance sensitivity on future performance:

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[4] Jensen and Murphy do not control for CEO turnover in calculating pay-performance sensitivities. The estimated pay-performance sensitivities may have captured a change in pay that is associated with a change in CEO. We are grateful to one of the referees who pointed out this potential bias as a limitation of our study.

[5] We use ten as an arbitrary lower bound. We also computed two digit SIC industry medians of growth and free cash flow variables using all the firms in Compustat.

(1) $E[p_{jt+1} \mid g_{jt}, q_{jt}, x_{jt}] = d_0 + d_1 x_{jt} + d_2 q_{jt} + d_3 g_{jt} + d_4 D(g_{jt} - m_{jt}) q_{jt}$

where:

p_{jt} = The performance of firm j in period t;
g_{jt} = The growth opportunity of firm j in period t;
m_{jt} = The median of the g_{jt} over firms in the same industry within the sample for the t^{th} period,
q_{jt} = The pay-performance sensitivity for firm j in period t (obtained from Jensen and Murphy's (1990b) compensation equations);
$D(g_{jt} - m_{jt})$ = 1 if $g_{jt} \geq m_{jt}$; 0 otherwise; and
x_{jt} = The size (logarithm of sales) of firm j in period t.

This model examines the impact of increasing pay-performance sensitivity upon firm performance, given growth opportunities. In order to more closely examine the interaction of growth and pay-performance sensitivity, we divide firms by their choice of cash flow, whether above or below the sample median. $D(g_{jt} - m_{jt})$ refers to firms that have growth above their industry medians: $D(g_{jt} - m_{jt})q_{jt}$ is an interaction product of growth and the level of pay-performance sensitivity that measures the impact of increasing pay-performance sensitivity in high growth firms. When the growth opportunity is above median, then an increase in pay-performance sensitivity provides superior incentives for higher firm performance. Thus, we expect d_4 to be positive.

RESULTS (TABLE 1)

Consistent with the hypothesis, we observe that increasing long-term pay-performance sensitivity is associated with higher performance in high growth firms independent of the level of cash flows. The improvements are statistically significant in both high and low cash flow firms. We did a F-test to check whether the coefficients between the high and low cash flow groups differ significantly. The F-statistics, in both long-term and short-term compensations, are insignificant, indicating that the coefficients on the interaction product of growth and the level of pay-performance sensitivity are not different between the low and high cash flow firms. These results support that increasing long-term pay-performance sensitivity is associated with higher performance in both high and low cash flow firms.[6]

CORRECTING FOR SAMPLE SELECTION BIAS DUE TO THE CHOICE OF CASH FLOW

The choice of cash flow is endogenous to the firm. Thus, the previously specified model, in which firms are divided nonrandomly by cash flow, may be biased. The ability of the CEO to select cash flow and affect future performance can bias the OLS results obtained above. Thus, we want to endogenously control the firm's cash flow environment

[6] The two regressions can be pooled. We present them separately to compare Table 3 with Table 1. In Table 1, firms are divided nonrandomly by cash flow, which can cause sample selection bias. In Table 3, this bias is corrected by making cash flow an endogenous variable, and the results show that the need for adjusting pay-performance sensitivity becomes less significant when free cash flow can be controlled in growth firms.

Table 1—The Effect of Increasing Pay-Performance Sensitivity on Risk-Adjusted Firm Performance

Least square estimates of the regression coefficients, estimating the conditional expectation of risk-adjusted firm performance given the prior period size, free cash flow, and growth opportunity of the firm. White's T-statistics are given in parentheses

	Long-Term Compensation		Short-Term Compensation	
Independent Variables	Free Cash Flow Below Median	Free Cash Flow Above Median	Free Cash Flow Below Median	Free Cash Flow Above Median
Intercept	-0.0594	-0.0265	-0.0657	-0.0309
	(-0.12)	(-0.02)	(-0.13)	(-0.25)
Size	-0.0386	-0.1101	-0.0421	-0.0813
	(-0.64)	(-0.89)	(-0.67)	(-0.61)
Sensitivity	-0.0182	-0.0024	-0.1777	-0.2417
	(-1.32)	(-1.16)	(-0.28)	(-0.46)
Growth Opportunity	0.2946	0.6444	0.3114	0.7027
	(3.55)**	(2.22)**	(3.78)**	(2.34)**
D(Growth Opportunity ≥ Median)*Sensitivity	0.0223	0.0156	0.4017	0.1979
	(2.51)**	(1.68)*	(0.64)	(0.29)
R^2	0.11	0.09	0.08	0.09
Number of Firms	169	111	169	111

* Significant at 10 percent level
** Significant at 5 percent level

Size is the logarithm of sales. Long-term compensation is the total CEO compensation minus salary and bonus minus dismissal sensitivity. Short-term compensation is the CEO's salary and bonus. Risk-adjusted performance is the excess return calculated as the difference between the firm's total return and the expected return from a two parameter market model, where the parameters of the market model are estimated over 250 days prior to the test period. Growth opportunity is measured by the ratio of market value of equity to the book value of equity. Free cash flow is measured by operating income before depreciation minus interest expense, taxes, preferred dividends, and common dividends. Growth opportunity, free cash flow, size, and sensitivities are median values calculated over the control (1974-1988) period. Sensitivities are Jensen and Murphy's (1990b) estimates of pay-performance sensitivities computed from their compensation equation, the change in CEO's compensation corresponding to each $1000 change in shareholder wealth. D(Growth Opportunity ≥ Median) is a dummy variable when the given conditions hold

and then examine the impact of increasing pay-performance sensitivity on firm performance. If performance-based compensation and free cash flow adjustment are alternative mechanisms to ameliorate the potential underinvestment problem, we expect to see the need of performance-based compensation in growth firms become less significant when these firms can control their cash flow environment by increasing dividend and interest payouts.

FIRST STAGE PROBIT MODEL: THE CASH FLOW DECISION (TABLE 2)

Sample-selection bias can cause OLS regression models to yield inconsistent and inefficient estimates. The level of cash flows is an endogenous firm characteristic. Managers have some choice regarding the level of cash flows their firms have available, e.g., by their control over dividend and leverage policies. Thus, separating firms by their choice of above or below median cash flow can bias a regression analysis that uses firms divided by their cash flow choice. To overcome the sample-selection bias inherent in assigning firms to sets based on cash flow choice, we employ a two stage switching regression methodology devised by Heckman (1979) and McConaughy and Mishra (1996). The first stage utilizes a binomial probit selection model that employs variables for pre-

Table 2—First Stage Probit Model: Free Cash Flow Decision

Maximum likelihood estimates of the binomial probit regression coefficients for the 1974-1988 period. Dependent variable is one for above median free cash flow and zero otherwise. T-statistics are in parentheses

Independent Variables	Dependent Variable
Intercept	3.6717
	(6.79)**
Growth Opportunity	-1.1728
	(-6.33)**
Dividend Yield	-13.6030
	(-3.01)**
Leverage	-1.0004
	(-4.54)**
Long-Term Pay-Performance Sensitivity	-0.0048
	(-1.67)*
Short-Term Pay-Performance Sensitivity	-0.0106
	(-0.03)
Chi-square (p-value)	82.6150
	(0.00)**
Number of Firms	280

* Significant at 10 percent level
** Significant at 5 percent level

Size is the logarithm of sales. Growth opportunity is measured by the ratio of market value of equity to the book value of equity. Long-term compensation is the total CEO compensation minus salary and bonus minus dismissal sensitivity. Short-term compensation is the CEO's salary and bonus. Leverage is measured by one plus debt-to-equity ratio. Dividend yield is the ratio of dividend paid to the fiscal year-end share price in a given year. Dividend yield, leverage, size, and growth opportunity are median values calculated over the control (1974-1988) period. Sensitivities are Jensen and Murphy's (1990b) estimates of pay-performance sensitivities computed from their compensation equation, the change in CEO's compensation corresponding to each $1000 change in shareholder wealth

dicting whether the firm chooses above or below median cash flow: growth opportunity, long-term and short-term pay-performance sensitivity, dividend yield, and leverage. This model provides the partial effects that these factors have with respect to the choice of cash flow. Cash flow is defined to be operating income before depreciation minus interest expense, taxes, preferred dividends, and common dividends. Because cash flow depends on leverage and dividend policies under the control of the managers, the level of cash flow is endogenous to the firm due to managerial choice. Smith and Watts (1992) view leverage and dividend policies this way because all firms have access to the same contracting technology. Thus, controlling for the selection process is appropriate.

Table 2 reveals that all of these factors except the short-term pay-performance sensitivity are significant in predicting whether a firm chooses above or below median cash flow. Further, the model has strong predictive ability regarding the level of the choice of cash flow (chi-square = 80.5, p-value < .01). Therefore, the error terms from the probit model of the cash flow decision can be used in the inverse Mill's ratio to construct a selectivity variable. This variable controls for unobservable factors that jointly affect future performance and the choice of cash flow which may bias the previous OLS analysis.

Table 3—Second Stage Performance Equation: The Effect of Increasing Pay-Performance Sensitivity on Risk-Adjusted Firm Performance, Corrected for the Endogeneity of Cash Flow Choice

Second stage least square estimates of the regression coefficients, estimating the conditional expectation of risk-adjusted firm performance, given the prior period size, free cash flow, and growth opportunity of the firm, after correcting the sample-selection bias for free cash flow. T-statistics are in parentheses

Independent Variables	Long-Term Compensation		Short-Term Compensation	
	Free Cash Flow Below Median	Free Cash Flow Above Median	Free Cash Flow Below Median	Free Cash Flow Above Median
Intercept	-0.0573	0.2421	-0.0208	0.1348
	(-0.10)	(0.25)	(-0.04)	(0.14)
Size	-0.0364	-0.1042	-0.0445	-0.0829
	(-0.48)	(-0.95)	(-0.59)	(-0.75)
Sensitivity	-0.0194	-0.0002	-0.4247	-0.0032
	(-1.43)	(-0.04)	(-0.83)	(-0.01)
Growth Opportunity	0.2871	1.3577	0.2909	1.3186
	(3.18)**	(4.50)**	(3.23)**	(4.15)**
D(Growth Opportunity ≥ Median)*Sensitivity	0.0233	0.0055	0.6331	0.5901
	(1.73)*	(0.25)	(1.17)	(0.75)
Free Cash Flow Selectivity Variable	-0.0654	-1.5423	-0.0997	-1.5816
	(-0.32)	(-3.76)**	(-0.47)	(-3.84)**
R^2	0.11	0.23	0.09	0.21
Number of Firms	169	111	169	111

* Significant at 10 percent level
** Significant at 5 percent level

Size is the logarithm of sales. Long-term compensation is the total CEO compensation minus salary and bonus minus dismissal sensitivity. Short-term compensation is the CEO's salary and bonus. Risk-adjusted performance is the excess return calculated as the difference between the firm's total return and the expected return from a two parameter market model, where the parameters of the market model are estimated over 250 days prior to the test period. Growth opportunity is measured by the ratio of market value of equity to the book value of equity. Free cash flow is measured by operating income before depreciation minus interest expense, taxes, preferred dividends, and common dividends. Growth opportunity, free cash flow, size, and sensitivities are median values calculated over the control (1974-1988) period. Sensitivities are Jensen and Murphy's (1990b) estimates of pay-performance sensitivities computed from their compensation equation, the change in CEO's compensation corresponding to each $1000 change in shareholder wealth. D(Growth Opportunity ≥ Median) is a dummy variable when the given conditions hold

MODEL CORRECTED FOR SAMPLE SELECTION BIAS (TABLE 3)

We employ the following regression model from equation (1) corrected for sample selection bias:

$$(2)\ E[p_{jt+1} \mid g_{jt}, q_{jt}, x_{jt}] = d_0 + d_1 x_{jt} + d_2 q_{jt} + d_3 g_{jt} + d_4 D(g_{jt} - m_{jt}) q_{jt} + d_5 Sel_{jt}.$$

Sel_{jt} is the inverse Mill's ratio computed for firm j during the control period. The rest of the variables are the same as those used in equation (1). The expectation for d_4 is the same as above.

Correcting for sample-selection bias makes the coefficients on the interaction terms (Table 1) for growth firms insignificant,[7] indicating that if we can control for the free

[7] Only one coefficient, the one on high growth and low cash flow firms, is marginally significant. When we employ two digit SIC industry medians computed using all the firms in Compustat, the t-statistic on that coefficient drops to 1.29. We also checked a different specification for the interaction term to be a product of continuous growth opportunity variable (instead of a dummy variable) and pay-performance sensitivity variable, the significance remains marginal.

cash flow problem, the need for adjusting pay-performance sensitivity becomes less. For firms that chose high cash flows, the selectivity variable is significantly negative, suggesting that the choice of lower free cash flow would have been optimal. In other words, high levels of free cash flow are associated with lower firm performance, i.e., the free cash flow problem described by Jensen (1986).

DISCUSSION

Investment decisions are influenced by growth opportunities and free cash flow environments that, in some situations, may exacerbate the shareholder-manager conflict. Our results suggest that CEOs' pay-for-performance incentives are related to their investment decisions (future performance). The availability of growth/investment options does not guarantee that they will be chosen due to risk aversion, aversion to raising outside capital, investments in pet projects with lower or negative NPVs (perquisite consumption), or the increased efforts required to manage the growth opportunities. Increasing pay-performance sensitivity is associated with higher firm performance in both low and high cash flow firms. When the level of cash flow is controlled in high cash flow firms, we observe that increasing sensitivity has less effect.

The incentives with the most impact on the underinvestment problem are based on longer-term stock market performance. We observe that short-term incentives based on salary and bonus are unrelated to future performance. This is not surprising as salary and bonus are based on short-term accounting measures of performance and, therefore, focus managerial attention on short-term performance. Long-term incentives include stock and stock options that work to better align managers' incentives with those of the shareholders (Jensen and Meckling (1976), Smith and Watts (1992), Bizjak *et al.* (1992), Gaver and Gaver (1993, 1995) with respect to capitalizing on growth options.

Our results also support Jensen's (1986) free cash flow hypothesis. In Table 3, the significantly negative coefficients on the free cash flow selectivity variables suggest that lower free cash flow would be associated with higher future performance. This agrees with Vogt's (1994) observation that managers of cash flow rich firms should increase their dividend payouts[8] as a way to improve the efficiency of their capital spending. Our results suggest that changing long-term incentives and cash flow levels can be alternative control mechanisms. In Table 2, we observe that they are negatively related. Comparing Table 3 to Table 1, we observe that long-term pay-performance sensitivity loses its impact in high free cash flow firms when cash flows are controlled.

To summarize, CEO pay for performance provides powerful incentives to induce investments in growth firms. We observe that when incentives are long-term, they ameliorate the potential underinvestment problem in firms with abundant growth options, although we observe that increasing incentives has little effect when the level of cash flow is controlled in high cash flow firms.

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