

Executive Compensation & Companies' Soft and Hard Investment

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ABSTRACT

Executive Compensation is a critical issue today, since executives' decisions, motivated by compensation incentives, critically affect firms' value and stakeholders' interest. Consistent with prior literature, we have documented a positive (negative) relationship between Vega (Delta) from executive option holding and firm's R&D spending, which is a proxy for risk-taking. This paper incrementally documents that Vega will not only incentivize R&D, but also it will increase firm's capital expenditure on a relative weaker scale, because investment with more tangibility will be less risky. Moreover, the results denoted that top management team's (excluding CEO) compensation incentives contribute to the corporate decision in the same manner as CEO's incentive does. Lastly, the results for post-2006 period are qualitatively the same as pre-2006 period.

Keywords: executive compensation, managerial decision, risk taking behavior, corporate strategy

I. INTRODUCTION

This essay studies the relationship between corporate policy implementation and executive compensation incentives, namely Delta and Vega from stock option holdings. Executive Compensation is important for accounting, finance and economic research, because executives' decisions, motivated by their compensation incentives, critically affect firms' value and stakeholders' interest. Firms' value directly relates to investors' protection, which is vital to facilitate capital market functioning. Moreover, stakeholders' interest also has close tie to everyone, since we all act as firm's stakeholders in various capacities, such as employee, bondholder, beneficiary, and other roles.

Part II of this paper, building up from prior findings, studied the relationship between compensation incentives and R&D spending. In general, the literature has concluded that R&D is positively (negatively) associated with Vega (Delta), because Vega is regard as an incentive factor for the managers to take risk, while Delta serves as the contrary role.

Part III of this essay has further discussed the relationship between compensation incentives and capital expenditure and discussed the incentive alignment role for Delta in detail. In contrast to Coles et al. (2006), this paper has documented a positive relationship between Vega and CAPX, and such correlation will fit both into the risk story proposed in Coles' hypothesis I and into reasoning in this paper.

Moreover, the results have reported a positive correlation between Delta and CAPX, because firm's investment decisions are driven by two fundamental factors embedded in Delta --- number of performance unit grant and profitability. Higher profitability will lead up to greater number of performance unit grant, and eventually both will increase Total-Delta in a product manner. To be concise, firms should only invest when there are good fundamentals, and a positive coefficient between Delta and CPAX is reasonably expected during the shareholder-value creation process. Lastly, part IV will discuss the sample data and regression variables.

II. COMPENSATION INCENTIVES AND R&D

A. Literature review

Prior literature documented the higher the compensation package's sensitivity to stock prices, the weaker will be the manager's appetite for risk (Knopf, Nam, and Thornton, 2002). The Delta sensitivity is high when the price to strike ratio is also high for an executive portfolio. Therefore, when an executive's option portfolio is high in the money, he/she is unlike to take additional risk to prevent turn south of the option portfolio. In contrast, when the compensation package's sensitivity to stock return volatility (Vega) is high, the manager will have strong incentive to engage in risk-taking behaviors (Knopf, Nam, and Thornton, 2002; Coles, Daniel, and Naveen 2006). Vega measures the option portfolio's sensitivity to the underline stock

return volatility. The higher the option volatility, the greater the chance the options finishes in the money before they expires (Anderson and Core, 2011 working paper); hence, a high Vega sensitivity will grant strong incentive for executives to take on risky projects. In general, R&D activities are categorized with high level of uncertainty and low probability of payoff. Even in the conventional accounting treatment, R&D spending is immediately expensed in recognition of its risky nature. Consequently, it is reasonable to expect that Vega encourages firms conduct R&D activity, while Delta is negatively correlated with firms' R&D spending. Since high level of Total-Delta is positively associated with both the amount and extend of option in the money, executives with such a large amount of options in the money are reluctant to take additional risk to exchange for higher reward, risk such as making R&D investment.

B. Hypothesis

H1a: CEO and top management team with Higher Vega spend more on R&D, as Vega promotes executive risk-taking behavior;

H1b: CEO and top management team with Higher Delta spend less on R&D, since Delta discourages executive risk-taking behavior;

C. Result analysis

"Table I" reports the result for sensitivity on R&D: through Model 1-5 Vega have significant positive coefficients and Delta carries negative significant coefficients. They are consistent with the prediction and prior literature. The regression results for R&D from Coles et al. (2006) are comparable to our results. Model 1 and 2 are performed for comparison by exactly adopting Coles's regression specification. However, the two R-squares, for regressions on Coles et al. (2006) paper, differ significantly and unexpectedly from each other. Model 3 introduces three additional control variables: "Z score", a proxy for bankruptcy; "prof_a", profitability (OIBDP / Total Assets); and "tang_a", tangibility (PP&E / Total Assets). With the three additional relevant control variables, the R square has increased dramatically from 25% to 41%. Lack of control of relevant variable may misattribute credits for each independent variable. Model 4 includes the top-management-team's Delta and Vega, and the coefficients are consistent with the prediction for top-management-team as well. Model 5 requires firms have at least 4 reported top executives in Execucomp database, and these firms are larger and have higher mean sales figure. The result becomes stronger as the coefficients are not only in the direction of predictions but also of larger magnitudes. Model 6 ignores CEO and non-CEO and simply ranks executive based on their Delta and Vega. The results are robust across top four executives regardless of the rank for performance

sensitivity. In conclusion, all the models and specification have pointed out that Vega has a strong incentive and significant impact on firm's risk-taking behavior (R&D as a proxy), while Delta behaves the opposite.

TABLE I. REGRESSION ANALYSIS: R&D AND INCENTIVES BETWEEN 1992 AND 2002

	Industry FE	Firm FE	Firm FE	Firm FE	Firm FE	Firm FE	Firm FE	Firm FE	Firm FE
totalvega	0.1077 ***	0.1075 ***	0.0919 ***	0.0637 ***	0.0887 ***	totalvega_1	0.0543 ***		
totaldelta	-0.0048 ***	-0.0048 ***	-0.0041 ***	-0.0032 ***	-0.0038 ***	totaldelta_1	-0.0034 ***		
Tenure	.000	.000	0.0003 ***	0.0002 **	0.0001	Cashcomp_1	0.0073 ***		
Cashcomp.	0.0078 ***	0.0078 ***	0.0066 ***	-0.0013 ***	0.0048 ***	totalvega_2	0.0208		
totalvega_topmngt				0.0329 ***	0.0325 ***	totaldelta_2	-0.0138 ***		
totaldelta_topmngt				-0.0127 ***	-0.0172 ***	Cashcomp_2	-0.0018		
Cashcompensation_t				0.0058 ***	0.0036 ***	totalvega_3	0.0109		
logsale	0.0015 ***	0.0015 ***	0.0075 ***	0.0068 ***	0.0062 ***	totaldelta_3	-0.038 ***		
mk2bk	0.0078 ***	0.0078 ***	0.0099 ***	0.0126 ***	0.0144 ***	Cashcomp_3	0.0065 ***		
bl	-0.0338 ***	-0.0338 ***	-0.0574 ***	-0.053 ***	-0.0466 ***	totalvega_4	0.284 ***		
Surpluscash	-0.0419 ***	-0.0419 ***	-0.0227 ***	-0.0164 ***	-0.0092	totaldelta_4	-0.0454 ***		
Salesgrowth	-0.0016 *	-0.0015 *	-0.002 ***	-0.0012 *	0.0007	Cashcomp_4	0.0057 **		
Stockreturn	-0.0073 ***	-0.0074 ***	-0.0037 ***	-0.0032 ***	-0.004 ***	logsale	0.0067 ***		
zscore			-0.0067 ***	-0.006 ***	-0.0059 ***	mk2bk	0.0159 ***		
prof_a			-0.1985 ***	-0.1949 ***	-0.1948 ***	bl	-0.0498 ***		
tang_a			-0.026 ***	-0.0281 ***	-0.0311 ***	Surpluscash	-0.0027		
						Salesgrowth	0.0005		
						Stockreturn	-0.0035 ***		
						zscore	-0.0088 ***		
						prof_a	-0.1838 ***		
						tang_a	-0.032 ***		
N	8812	8833	8833	8718	5587		5328		
R^2	0.25	0.25	0.41	0.46	0.49		0.5		
Firmfix		Yes	Yes	Yes	Yes		Yes		
Sich 2 digit Control	Yes								

D. Robustness check

In addition, extending sample period until 2006 provides same quality result. Since the Delta and Vega are computed differently using "full information" comparing to Core and Guay (2002) OA proxy method, the paper runs the post 2006 results separately for both robustness check and verification of the validity of OA method. Further examination on the result for period between 2006 and 2011 makes no difference on the conclusion. These results are available upon request.

III. COMPENSATION INCENTIVES AND CAPITAL INVESTMENT

A. Literature review

Similar to R&D, Investments in capital expenditure is also risky, therefore it is reasonable to expect the same story would hold for Investment. The higher the Vega the greater amount of capital expenditure the firms commit. However, Coles et al. (2006) documented a negative relationship for investment with Vega and a positive relationship with Delta. The results in Coles et al. (2006) are telling somewhat different stories between R&D and investment. It is not evident that CAPX is so riskless that Vega will discourage firms from making capital expenditure. Consistent with Guay (1999), this paper also find that Vega is positively

associated with investment expenditures (Guay (1999) includes both capital expenditure and acquisition expenditure). More to speak, such effect should have greater impact on R&D than capital investment, as R&D inherits greater amount of risk and uncertainty than capital expenditures. The capital expenditure is less risky, because it has greater extend of tangibility and hence the liquidation value is higher. As more often it appears, R&D has no liquidation value when firms go into bankruptcy. In comparison, the expectation is that a positive relationship holds between Vega and capital expenditure, and the magnitude of the correlation coefficient is smaller for investment than for R&D.

B. Hypothesis

H2a: CEO and top management team with Higher Vega spend more on Investment /CAPX since Vega promotes executive risk-taking behavior;

Equity compensation aligns executive interest with shareholder (Jensen and Meckling, 1976; Murphy, 1985; Abowd, 1990, Jensen and Murphy, 1990a, 1990b; Murphy, 1999). On one side, Smith and Watts (1992) and Gaver and Gaver (1993) have both demonstrated that firms with the most needs for incentive alignment, grant their executives significantly more stock options to cope with the high investment opportunities. Conversely, the managers could totally waste investor's money and making poor judgment on

the firm's operation decision. If investment opportunity is better aligned with equity compensation, we would expect a positive relationship between capital investment and portfolio Delta sensitivity, as successful project firms are granted managers who deliver optimistic results (proxy by high price to strike ratios) with greater amount of performance shares. The following points will calibrate on the previous reasoning: First, the strike prices are supposed to be set at the beginning of the project; and the stock price measure the market current assessment of company's performance. The ratio of these two — the price to strike ratio — measures how well the firm does from the investors' perspective during the granting period. Second, Delta rises as either managerial performance (price to strike ratio) enhances or as performance granting unites increases. Hence, if the first and best scenario holds, Delta and investment should maintain a positive relationship along the corporate growth and development path. Third, Risk aversion is less of a concern for capital investments, since capital expenditure investment is less risky than R&D and managers perceive high Delta grant as signal sent by board for making long-term investment and building up shareholder value. In conclusion, if both performance share grant is aimed for sound investment projects, we should observe only high Delta firms are making large amount of capital investment. Consequently, hypothesis "H2b" predicts a positive sign on Delta, when either CAPX or Investment serves as dependent variable.

H2b: CEO and top management team with Higher Delta spend more on Investment /CAPX, since higher Delta proxy for higher investment opportunity and better align executive incentive through performance unit grant.

C. Result analysis

"Table II" and "Table III" show the results for sensitivity on CAPX and Investment: through "Table II", Model 1-5 Vega has significant positive coefficients, because Vega has strong incentive for risk-taking (Capital Expenditure, CAPX), and Delta also carries positive significant coefficients in that Delta is an essential instrument to align managers and shareholders' interests. The signs for coefficients are consistent with the prediction and prior literature (Guay, 1999). "Table II", Model 1 and 2 exactly adopt Coles's regression specification for comparability and found their results are contrary to ours. Unexpectedly, the two R-squares, in Coles's regressions on the original paper, differ significantly from each other. Model 3 introduces three additional control variables: "Z score", a proxy for bankruptcy; "prof_a", profitability (OIBDP /Total Assets); and "tang_a", tangibility (PP&E/ Total Assets). With the three additional relevant control variables, the R square has increased dramatically from 0% to 37% for "Table II" and from 9 to 16% for "Table

III". Lack of control of relevant variable may misattribute credits for each independent variable. Model 4 includes the top-management-team's Delta and Vega, and the coefficients are consistent with the prediction for top-management-team as well. Model 5 requires firm have at least 4 reported top executives in Execucomp database, and these firms are larger and have higher mean sales figure. The result becomes stronger as the coefficients are not only in the direction of predictions but also of larger magnitudes. Model 6 ignores CEO and non-CEO and simple rank executive based on their Delta and Vega. Some coefficients, if significant, are consistent with the prediction, and others are lack of significance due to high multicollinearity among the pay for performance sensitivities across executives.

TABLE II. REGRESSION ANALYSIS: CAPX (CAPITAL EXPENDITURE) AND INCENTIVES BETWEEN 1992 AND 2002

	Model1	Model2	Model3	Model4	Model5	Model6
	Industry FE	Firm FE	Firm FE	Firm FE	Firm FE	Firm FE
totalvega	-0.001	-0.0013	0.0113 ***	0.0137 ***	0.0225 ***	0.0135
totaldelta	0.0012 ***	0.0012 ***	0.0008 **	0.0006 *	0.0005	totaldelta_1 0.0014 ***
Tenure	0.0004 ***	0.0004 ***	0.0002 **	0.0002 **	0.0002 *	Cashcomp_1 0
Cashcomp.	0.0023 ***	0.0023 ***	0.0014 ***	-0.0003	-0.0002	totalvega_2 -0.0295
totalvega_topmngt				-0.0065 *	-0.0082 *	totaldelta_2 -0.0014
totaldelta_topmngt				0.0004	0.0019 **	Cashcomp_2 0.0028 **
Cashcompensation_t				0.0013 ***	0.0014 ***	totalvega_3 -0.027
logsale	0.0054 ***	0.0054 ***	0.0003 **	0.0003	0.0005 **	totaldelta_3 0.0136
mk2bk	0.003 ***	0.003 ***	0.0025 ***	0.0023 ***	0.0016 ***	Cashcomp_3 0.0016
bl	0.0089 ***	0.0089 ***	-0.0286 ***	-0.028 ***	-0.0268 ***	totalvega_4 0.0791 **
Surpluscash	0.0132 ***	0.0136 ***	0.0147 ***	0.0145 ***	0.016 ***	totaldelta_4 -0.0133
Salesgrowth	-0.0015 **	-0.0016 **	-0.0004	-0.0002	0.0003	Cashcomp_4 -0.0008
Stockreturn	-0.0008	-0.0008	-0.0023 ***	-0.0022 ***	-0.0033 ***	logsale 0.0006 ***
zscore			-0.0013 ***	-0.0013 ***	-0.0016 ***	mk2bk 0.0025 ***
prof_a			0.0592 ***	0.0637 ***	0.0647 ***	bl -0.0264 ***
tang_a			0.1728 ***	0.1722 ***	0.1632 ***	Surpluscash 0.0164 ***
						Salesgrowth 0.0002
						Stockreturn -0.0038 ***
						zscore -0.0017 ***
						prof_a 0.0616 ***
						tang_a 0.1619 ***
N	8702	8702	8702	8702	5550	5403
R^2	0	0	0.37	0.38	0.37	0.36
Firmfix		Yes	Yes	Yes	Yes	Yes
Sich 2 digit Control	Yes					

Since the Delta and Vega are computed differently using "full information" comparing to Core and Guay (2002) OA proxy method, the paper investigated the post 2006 results separately for robustness check.

Again, either extending the sample period until 2006 or using another sample period between 2006 and 2011 do not change the conclusion, as these results are consistent and robust.

TABLE III. REGRESSION ANALYSIS: INVESTMENT AND INCENTIVES BETWEEN 1992 AND 2002

	Model1	Model2	Model3	Model4	Model5	Model6
	Industry FE	Firm FE	Firm FE	Firm FE	Firm FE	Firm FE
totalvega	0.0057	0.0061	0.0206 **	0.0245 **	0.0384 ***	totalvega_1 0.0137
totaldelta	0.0033 ***	0.0033 ***	0.0028 ***	0.0022 ***	0.0026 ***	totaldelta_1 0.0033 ***
Tenure	0.001 ***	0.001 ***	0.0008 ***	0.0008 ***	0.0008 ***	Cashcomp_1 -0.0034 **
Cashcomp.	0.0003	0.0003	0.0008 *	-0.0003	-0.0033 **	totalvega_2 0.0072
totalvega_topmngt				-0.0092	0.0019	totaldelta_2 -0.0046
totaldelta_topmngt				0.0035 ***	0.0053 ***	Cashcomp_2 0.0063 **
Cashcompensation_t				0.0007	0.0021 ***	totalvega_3 0.0956
logsale	0.0026 ***	0.0026 ***	-0.003 ***	-0.0029 ***	-0.0028 ***	totaldelta_3 0.0166
mk2bk	0.0066 ***	0.0066 ***	0.0049 ***	0.0039 ***	0.0029 ***	Cashcomp_3 0.0005
bl	0.0288 ***	0.0288 ***	0.0326 ***	0.0327 ***	0.0315 ***	totalvega_4 -0.0258
Surpluscash	-0.2342 ***	-0.2341 ***	-0.247 ***	-0.2488 ***	-0.2548 ***	totaldelta_4 0.0292
Salesgrowth	-0.0008	-0.0008	-0.0004	-0.0003	-0.0012	Cashcomp_4 -0.0012
Stockreturn	0.0064 ***	0.0063 ***	0.0034 **	0.0035 **	0.0046 **	logsale -0.0029 ***
zscore			0.0032 ***	0.003 ***	0.0037 ***	mk2bk 0.004 ***
prof_a			0.1661 ***	0.1724 ***	0.1313 ***	bl 0.0389 ***
tang_a			0.07 ***	0.0694 ***	0.069 ***	Surpluscash -0.2678 ***
						Salesgrowth -0.001
						Stockreturn 0.0038 *
						zscore 0.0068 ***
						prof_a 0.1041 ***
						tang_a 0.0702 ***
N	8682	8702	8702	8702	5560	5328
R^2	0.09	0.09	0.16	0.16	0.17	0.18
Firmfix		Yes	Yes	Yes	Yes	Yes
Sich 2 digit Control	Yes					

IV. DATA AND METHODOLOGY

The paper uses Execucomp database to collect executive compensation information. All the firms from the S&P 500, S&P Midcap 400, and S&P Smallcap 600 are included in initial sample. The pre-2006 period uses Core and Guay's OA proxy method in estimating Delta and Vega, and the calculation is significant different from the post 2006 period, during which full information is available for inputs to Black-Scholes Model. Since the comparability is an important issue, a full examination of post-2006 results has performed and reaches the same conclusion. The new format under FAS123R provides complete information for Delta and Vega calculation. All the Delta, Vega, and cash compensation are expressed in 2002 constant dollar for comparison with Coles et al. (2006). To be consistent with prior literature, financial variables are deflated by total assets. All the descriptive statistics are comparable to Coles et al. (2006) and do not contain any serious statistical problem. Investigation on variable correlation did not find serious problem for multicollinearity.

A. *Dependent variables*

R&D is defined as research and development expenditures scaled by book value of assets. Investment is calculated based on different SCF format. General approach follows Frank and Goyal (2003). CAPX is net capital expenditures (capital expenditures less sales of property, plant, and equipment) scaled by assets.

B. *Control variables*

Regression models have included the following control variables: Firm size (log (Sales)), Market-to-Book (Market value /Book value), Sales Growth (log (Sales t /Sales $t-1$)), Stock Return, Surplus Cash, Profitability (OIBDP /Book value of assets), Tangibility (PP&E /Book value of assets), and Z score.

V. CONCLUSION

This paper contributes to the academic fields between managerial accounting and cooperate strategy in the following dimensions. First of all, we have incrementally discovered that Vega can incentivize both capital expenditure and investment spending, and such finding is truly consistent with the conventional risk-based story proposed in prior literature, in which did not find such evidence. Second, the paper documented that Vega has a weaker incentive effect to capital expenditure as to R&D (evidence by the magnitude of regression coefficients), because fix assets investment has higher tangibility and inherent less risk. Third, the results have shown that the top management team (excluding CEO) compensation incentive contributes to the corporate decision in the same manner as CEO's

incentive does. In addition, each top management team member, ranked by total Delta and Vega incentive holdings, incrementally affects corporate decision in the conventional manner.

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