Executive stock options, stock price volatility, and agency costs in the Philippine setting

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Abstract

Firms compensate management with executive stock option plans to mitigate the agency problem arising from conflicts of interest between shareholders and managers. However, due to the nature of stock options, the value to the option holder increases when the volatility of the underlying stock rises. Unfortunately, the decisions that affect the expected future cash flows of the firm still remain under the control of executives. Using a pooled least squares regression on a sample of 30 PHISIX firms from the period 1998 to 2001, we find that the presence of executive stock option plans significantly affects the volatility of the firm's stock return.

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1. Introduction

Corporate finance literature suggests that firms should compensate their executives in a way that their goals become congruent to those of their shareholders – that is to maximize shareholders' wealth. However, a study by Jensen and Murphy [1989] finds that the value of an executive's stock options changes by only 15¢ per US$1,000 increase in shareholders' wealth. Thus, we ask the question whether executive stock options (ESOs) really mitigate agency problems or whether they even exacerbate them[1]. If an ESO does not mitigate agency cost, we wonder why it is suggested as a solution even in the most basic of finance literatures. Intuitively, the nature of ESOs as call options on a firm's stock would increase its value due to several factors, including an increase in the volatility of the underlying asset. As Stulz [1999] argues, "the one-sided payoff from stock options effectively rewards management for taking bets and so increasing volatility". There have been studies

[1] Agency theory studies the costs arising from conflicts of interest between shareholders and managers (Jensen and Meckling [1976]).

recently on ESOs and risk. Carpenter [2000] finds that ESOs that are deep out of the money seem to provide incentives for excessive risk-taking. Hall and Murphy [2000] suggest that ESOs that have a high probability of expiring out of the money provide weak incentives for risk-averse executives. In their work, Brookfield and Ormrod [1999] assert that in analyzing out-of-the-money options, executives have an incentive to take risk-increasing project decisions because they do not have any option-based wealth to personally risk.

In this paper, we attempt to find a direct relationship between the ESO of Philippine firms and risk, using panel data covering 30 firms from 1998 to 2001. Our study attempts to test whether the presence of executive stock option plans (ESOP) significantly affects stock price volatility. This paper is organized as follows: Section two discusses the methodology used in our study. The third section will present the results of our regression, and the final section will contain our conclusions and recommendations.

2. Methodology

Some authors that have done research on ESOPs in other countries are Carpenter [2000] and Hall and Murphy [1999] in the United States, and Brookfield and Ormrod [1999] in the United Kingdom. The study of Carpenter would require data on strike prices, grant dates and detailed volume information by each firm to arrive at the relationship between management's appetite for risk and the value of the ESO. Carpenter's paper finds that only in way out-of-the-money options does the executive have an incentive to take on more risk. She offers this as the reason why firms reset the strike prices of compensatory options after poor stock price performance has put them out of the money. Hall and Murphy's study requires the percentage of the executive's wealth tied in to the firm to generate data on the value of the ESO. They conclude their paper by offering an economic rationale for the practice of adopting similar option terms, which is that pay-to-performance incentives for risk-averse, undiversified executives are typically maximized by setting price at (or near) the grant-date market price. In Brookfield and Ormrod's study, grant date and strike price information are used to determine the implications of managerial compensation and volatility. The study concludes that even though the company has faced declining fortunes with executives holding out-of-the-money options, the continued existence of ESOP induced executives to increase the risk profile of their investment decisions even further.

The types of data used in the preceding studies are not available for Philippine firms. Based on the presence or absence of ESOP in firms, we constructed a dummy variable to be used in a stock volatility regression of the form:

$$SD = \beta_0 + \beta_1 \times PHISIX + \beta_2 \times DA + \beta_3 \times OPINC + \beta_4 LNREV + \beta_5 DIV + \beta_6 ESOP \qquad (1)$$

The variables that we selected are proxies for market return volatility, profitability, firm size, dividends, and executive compensation, which collectively contribute to stock volatility.

We use the standard deviation of the daily returns of the PHISIX per year as proxy for market return volatility ("PHISIX"). Based on asset pricing models, market return volatility has a positive impact on stock volatility. Total Debt-to-Asset Ratio ("DA") is used to represent leverage in our model. Empirical data on optimal capital structure are inconclusive, thus leverage may have varying effects on volatility. Operating Income ("OPINC") measures the profitability of the firm. In general, profitable firms are more stable. In order to measure the effects of firm size, we use the natural logarithm of revenues ("LNREV") as a proxy. The larger the firm, the more difficult it is to observe executives' activities, which results in higher monitoring costs (Jensen and Meckling [1976]). A study by Aquino [2002] found that dividend history is a major indicator of idiosyncratic risk. We use a dummy variable ("DIV") to signify if firms paid out dividends for that particular period ("1") or not ("0").

Intuitively, having ESOP would provide an incentive to management to take on additional risk in an effort to increase the value of their options. In order to test this hypothesis, we use a dummy variable ("ESOP") to indicate whether the firm has an ESOP in place ("1" or zero, otherwise) during the specific period.

We use the volatility of the daily stock returns of each of the 30 PHISIX firms for the period 1998 to 2001 as the measure of risk for our dependent variable. Our measure for risk is computed as follows:

$$SD_i = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \overline{x})^2}{n-1}} \tag{2}$$

where: SD_i = annual standard deviation of daily returns of stock i

x_i = daily return of stock i

$\overline{x}$ = mean daily return for one-year of stock i

n = number of observations per year.

The daily stock returns of the firms[2] (x_i) are computed using the following formula:

$$x_i = (P_t - P_{t-1})/P_{t-1} \tag{3}$$

where: P_t = stock price of security i on day t

P_{t-1} = stock price of security i on day t-1

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[2] For firms with multiple classes of traded shares, we used the Class A shares to calculate the daily returns.

3. Data and empirical results

Our sample consisted of 30 Philippine Stock Exchange Composite Index (PHISIX) firms[3] for the period 1998 to 2001. We gathered daily stock price returns of the 30 firms and the PHISIX from the Philippine Stock Exchange (PSE) for the above period. We obtained all the financial statement data of the PHISIX firms used in our study from the October 2002 *Philippine Corporate Handbook.*

Due to the scope of our sample, we appropriately used the pooled least squares method of regression. We also took into account the fixed effects of stacking cross-sectional time-series data in order for our inference to be restricted to the behavior of these 30 firms. To mitigate the estimation problem of heteroskedasticity, we used the White heteroskedasticity-consistent standard errors and covariances.

The pooled least squares regression results are shown in Table 1. Among the independent variables, LNREV and DIV are not statistically significant at the 95% confidence level. All other variables have the expected sign, and are statistically significant at the 95% confidence level[4].

From the econometric evidence presented in Table 1, it can be seen that, firm size, as represented by LNREV, is not a factor that significantly affects volatility. Although DIV, as a proxy for dividends, does carry the expected sign, the effects of dividends on the volatility of stock prices remain unresolved in theory and practice[5].

Overall, the regression results show that the other independent variables are robust, in terms of their effect on volatility, aside from ESOP. Moreover, the model provides a reasonable fit of the relationship between the independent factors and the volatility of stock price returns.

4. Conclusion

The empirical evidence is congruent with our hypothesis that the adoption of ESOP by firms significantly affects volatility. This shows an increase in the propensity of management to take on additional risk when compensation is tied to stock options. Since the detailed study of Carpenter [2000] breaks down the tendency of management to take on more risk depending on the state of the option[6], she suggests that only in out-of-the-money options are there signs that management's risk appetite

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[3] There are 33 stocks that comprise the PHISIX. However, three firms have both their Class A and Class B shares in the index.

[4] Dropping the insignificant variables (see Table 2) did not change the results significantly.

[5] Thus, it is not surprising that our regression results for DIV differs from the statistically significant output as documented by Aquino [2002].

[6] Options can either be in the money, at the money, or out of the money. Carpenter [2000] states that when options are out of the money, there is a tendency for management to take on additional risk and she suggests this as the logic behind the need for the repricing of out-of-the-money ESO.

Table 1. Pooled least squares estimates accounting for fixed effects

Variable	Coefficient	t-Statistic
PHISIX	1.029350	3.5412
DA	-0.062378	-2.1629
OPINC	-0.000000*	-2.8083
LN REV	0.000870	0.1350
DIV	-0.003960	-1.0812
ESOP	0.071504	3.1623

Fixed effects				
AEV	0.055280	JGS	0.032416
ABS	-0.043843	JFC	-0.025945
AC	-0.023701	LTDI	0.012652
ALI	-0.018399	LC	-0.040107
BPI	0.015005	MER	-0.026740
BEL	-0.015768	MEG	0.085713
BPC	-0.002312	MPC	-0.051386
DGTL	-0.011869	MBT	0.036385
DMC	0.072856	MUSX	-0.060065
EBC	0.065246	PCOR	-0.005095
FLI	0.033207	TEL	0.005575
FPH	-0.011756	PNB	0.081896
GLO	0.027170	SMC	-0.032463
ICT	0.005166	SMPH	0.045983
ION	0.081734	UCC	0.072245

$\bar{R}^2$	0.690609
F-statistic	8.461783

Note: *OPINC coefficient value is -0.00000000198

Included observations: 4
Number of cross-sections used: 30
Total panel (unbalanced) observations: 118
Sample period: 1998 to 2001

Table 2. Pooled least squares estimates accounting for fixed effects

Variable	Coefficient	t-Statistic		
PHISIX	1.030987	3.627416		
DA	-0.057019	-2.313315		
OPINC	-0.000000*	-3.250288		
ESOP	0.068182	3.125375		
Fixed effects				
AEV	0.064648	JGS	0.041111	
ABS	-0.033402	JFC	-0.014248	
AC	-0.013069	LTDI	0.024042	
ALI	-0.007292	LC	-0.029281	
BPI	0.0238	MER	-0.013974	
BEL	-0.003886	MEG	0.095099	
BPC	0.009116	MPC	-0.0363	
DGTL	0.001112	MBT	0.043701	
DMC	0.08113	MUSX	-0.047226	
EBC	0.071333	PCOR	0.009063	
FLI	0.043257	TEL	0.014633	
FPH	0.000097	PNB	0.090543	
GLO	0.040865	SMC	-0.020928	
ICT	0.017304	SMPH	0.05353	
ION	0.08966	UCC	0.083144	
$\overline{R}^2$	0.695571			
F-statistic	8.461783			

Note: *OPINC coefficient value is -0.00000000183

Included observations: 4

Number of cross-sections used: 30

Total panel (unbalanced) observations: 118

Sample period: 1998 to 2001

has increased. Although, our study is not inconsistent with her findings, we present a more holistic view of the presence of ESO rather than providing detailed results at varying option states. The asymmetric payoff structure of stock options is shown formally in equation 4:

$$C = \max\left[S_0 - Ke^{-rT}, 0 \right] \tag{4}$$

where: C = Value of an American call option

       S_0 = Spot price of the underlying asset

       K = Strike price of the option

       r = Risk-free rate (continuously compounded)

       T = time to maturity of the option

The payoff structure of an ESO is similar to that of an American call option. The two main differences between an American call option and that of an executive stock option is the time to maturity and the holding period to sell the stock when the option is exercised. With adequate disclosure of information regarding grant dates, strike prices, time to maturity, and holding periods, it is possible to create a valuation model showing the impact of ESOP on volatility in a more precise manner. Nonetheless, with the limited data, we can say that via the nature of the stock option, its value to the holder, in this case the executive, increases when the volatility of the stock price increases. Since stock prices are the present value of expected future cash flows, executives can influence the variability of these future cash flows through investment decisions that are within their control. The real investment opportunities that are undertaken may not be to the best interest of the firm, and may not increase shareholder's wealth. All this would do is to increase the variability of the cash flows, and consequently the volatility of the stock price and its return. Thus, this shows that ESOPs do not mitigate agency costs but, in reality, their presence even exacerbates it. Since stock options are a common solution suggested in finance literature to deal with agency costs, we have to look into other solutions that would align management's goals to that of the shareholders. We suggest the use of a performance measure that would be consistent with increasing shareholders' wealth, and this can be achieved through a modified form of economic profit. We believe that a capital charge should be taken against the profit of the company in order to benchmark the performance of executives. Only by taking into account the cost of capital will the benchmarking measure be consistent with the positive net present value criterion of undertaking investment decisions. There have been several suggestions that have been offered, such as the use of Economic Profit and EVA® by some consulting firms[7]. These suggestions would need more detailed studies and should be tested in practice before adoption should be considered. For now, we have to be careful with respect to advocating the use of ESOPs to mitigate agency cost in Philippine firms.

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[7] Economic Profit is used by McKinsey & Company, while EVA® is promoted by Stern Stewart (Brealey and Myers [2000: 327-328]).

References:

Aquino, R. [2002] "Determinants of cross sectional stock returns variation, part 2 – systematic and idiosyncratic risks". Discussion Paper No. 0208 (October) College of Business Administration, University of the Philippines.

Baltagi, B. [1995] *Econometric analysis of panel data*. New York: Wiley.

Bautista, C. [2003] "Stock market volatility in the Philippines", *Applied Economics Letters* 10: 315-318.

Black, F. and M. Scholes [1973] "The pricing of options and corporate liabilities", *The Journal of Political Economy* 33(May-June): 637-654.

Brealey, R. and S. Myers [2000] *Principles of corporate finance*. Sixth Edition. Boston: Irwin/McGraw-Hill.

Brookfield, D. and P. Ormrod [1999] "Executive stock options: volatility, managerial decisions, and agency costs". Paper presented at the 12th annual Australian Finance and Banking Conference, Sydney, Australia, held 16-17 December 1999.

Carpenter, J. [2000] "Does option compensation increase managerial risk appetite?", *The Journal of Finance* 55(October): 2311-2331.

Hall, B. and J. Murphy [2000] "Optimal exercise prices for executive stock options", *American Economic Review* 90(2): 209-214.

Hull, J. [2003] *Options, futures, and other derivatives*. Fifth Edition. Upper Saddle River, NJ: Prentice-Hall.

Jensen, M. and W. Meckling [1976] "Theory of the firm: managerial behavior, agency costs, and ownership structure", *Journal of Financial Economics* 3(October): 305-360.

Jensen, M. and K. Murphy [1990] "CEO incentives - it's not how much you pay, but how", *Harvard Business Review* 3(May-June): 138-153.

Pasternak, D. [2002] "Factors driving stock option grants - empirical evidence from Finland". Working paper 470, Swedish School of Economics and Business Administration.

Philippine Stock Exchange [2002] *Philippine corporate handbook*. Hong Kong: CEIC.

Scholes, M. and M. Wolfson [1989] "Employee stock ownership plans and corporate restructuring: myths and realities". NBER Working Paper No. 3094, National Bureau of Economic Research.

Stulz, R. [1996] "Rethinking risk management", *Journal of Applied Corporate Finance* 9(3): 8-24.