Senior Project
Department of Economics

"An Examination of the Impact of Executive Stock Options on Sub-Optimal Firm Risk-Taking"

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May 2012

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Abstract

This study examines whether executive stock options (ESOs) influence sub-optimal firm risk-taking in S&P 500 firms. I utilize an ordinary least squares (OLS) model to estimate a firm's optimal leverage ratio. From the output of the OLS model I use the corresponding residuals to separate the data into three sub-samples. Lastly, I utilize a fixed effects model to estimate a firm's security issue decision, given their leverage ratio. As a result, I will find whether a firm who's CEO is granted a greater value of stock options relative to their total compensation in a given year, subsequently takes on sub-optimal risk by increasing leverage even when the firm is already over-leveraged. The data examined in this study was collected from Standard & Poor's COMPUSTAT and ExecuComp databases, and includes firms that comprise the S&P 500 from the years 2007-2011. [1]

1 I would like to thank Dr. Francesco Renna and Dr. John Goodell for their valuable suggestions and guidance to this research project.

Do Executive Stock Options Promote Sub-optimal Firm Risk-Taking?

I. Introduction

Chief Executive Officer's (CEOs) have witnessed drastic changes in the composition of their compensation packages throughout the past thirty years due to an increase in the use of executive stock options (ESOs). In 2009, a presentation given by Kevin Hallock and Joseph R. Rich of Cornell's IRL School, finds that stock options as of 2008 represent about 28% of the total compensation of CEOs in S&P 500 companies.[2] Studies such as Frydman and Saks (2008) have presented similar findings of increased usage of stock options in executive compensation packages. Figure (1) separates the three main components of total CEO compensation into three curves, (1) salary+bonus, (2) salary+bonus+long-term pay, and (3) salary+bonus+long-term pay+options granted. The separation of curve (3) from (2), depicted by the red arrow, displays the increase in the use of stock options witnessed in the last decade. Furthermore, figure (2) depicts the increase in the percent of executives granted stock options since the 1940's. Even though the grants have leveled off in the past couple decades, it is apparent that stock options play a much larger role today than in the 1940s-1970's.

Over the past thirty years research has been conducted to analyze what influences companies to compensate their executives in the form of stock options. Academic studies, such as Jensen and Meckling (1976), conclude that the economic justification for stock

2 April 20, 2009 Cornell University presentation on Recent Developments in Executive Pay: Policy and Practice.

options is that equity ownership can be used to align the interests between managers and stockholders to mitigate the potential principal-agency problems. Stock options represent the incentive mechanism for aligning their interests to increase the share price. However, several hypotheses can be drawn regarding the unintended consequences that ESOs have on firm risk-taking.

Prior research has suggested that firms issue stock options to CEOs to encourage risk-taking in value-increasing projects that otherwise may be forgone. Managers tend to be risk-averse due to their firm-specific human capital and wealth portfolios that are undiversified, and as a result could pass on projects with a positive net present value (NPV) (Dong et al., 2010). Although it seems counterintuitive to pass on any project with a positive NPV, a CEO who is not provided the proper incentives to take on risky projects could be likely to do so. The expected utility hypothesis, states that investments with higher expected value would be those preferred. However, some CEOs could be risk averse to the point that they would only prefer investments that have a guaranteed payout, even if it has a lower expected value. It is evident why this creates principal-agent problems, as the stockholder would be more likely to want to take on the risky project with the higher expected value. However, as the CEO is the leader of the firm, he will always bear the total social costs of a failed project even when he is not compensated fully for the successful projects. Prior research has concluded that stock options are the proper incentive to motivate CEOs to take on greater risk, as stock options increase in value when the volatility of the underlying stock increases. Conflicts can further arise between stockholders and CEOs because the CEOs hold less than 100% of the equity claim, meaning that they do not completely own the firm. As a result the CEOs do not benefit entirely from increases in the value of the firm, however, do bear substantial costs. Subsequently, CEOs may invest less effort into maximizing the value of the firm and instead transfer resources of the firm to maximize his or her benefit without the potential for bearing costs associated with a risky project failing. Increasing the fraction of equity ownership in the firm can mitigate these incentive problems (Harris and Raviv, 1991).

Although the issuance of stock options to CEOs alleviates potential principal-agent problems, and creates the proper incentives to motivate CEOs to take on greater risk, they could also induce too much risk. Studies have concluded that the sensitivity of an executive's wealth to firm performance has significantly increased since the 1980's (Frydman and Saks, 2008). This is due to the use of alternative forms of compensation such as the granting of stock and stock options. The issuance of these alternative forms of compensation could encourage CEOs to take on too much risk as a greater portion of their income is tied to the firm's stock price and return volatility. The risk-return tradeoff principal states that potential return rises with an increase in risk. In relation to CEO compensation, a CEO that holds stock options will only observe higher returns if the level of risk a firm has taken on has also rose. Several studies have observed evidence that CEOs with higher ESOs do in fact take more risks (Duan and Wie, 2005; Coles et al., 2006; Dong et al., 2010). Furthermore, because ESOs increase a CEOs wealth sensitivity to firm performance, self-interested managerial decision making can induce sub-optimal firm risk-taking. As a result, a CEO that takes risks beyond what is optimal for the firm simply creates new principal-agency problems.

Understanding the principals of stock options is crucial to the examination of the incentive effects they create for a CEO. There are two types of stock options, call and put options. This study will focus on put options as all executive stock options are of this type. Put options can take three forms as their value increases or decreases: In-the-money (ITM), Out-of-the-money (OTM), and At-the-money (ATM). Stock options are generally issued to CEOs At-the-money meaning that the strike price of the option equals the market price of the underlying security (stock price). However, after this initial date of issuance, the market price of the underlying security can increase putting the option In-the-money, or decrease putting the option Out-of-the-money. Below is the general form equation for determining the intrinsic value of a stock option:

Intrinsic value of Put Option = Strike Price - Current Price of the underlying

Volatility is also crucial to examining the incentive effects of stock options to CEOs. The volatility measure that is used in stock options pricing formulas such as the Black-Sholes Model is expressed as the potential to which the return of the underlying security (stock price) will increase or decrease between the current date and the expiration date. Volatility can be measured several ways; however, it is generally expressed by the standard deviation or variance between the returns of the underlying security and a corresponding market index such as the S&P 500 index. A higher volatility can mean that the range of returns can be spread out over greater values; however, it also means the option is riskier. This study will present the linkage between a CEOs decision to issue debt rather than equity in their company due to the effect on volatility. Increasing volatility through the issuance of debt consequently increases the potential return to the CEO. Subsequently, the CEO can be incentivized to increase his or her firm's debt level, even when greater debt issuance is not in the best interest of the stockholders.

The purpose of this study is to expand on previous studies that examine the effects of ESOs on firm risk-taking. Acknowledging the potential negative consequences that stock options in CEO compensation packages incur to stockholders can have future policy implications. Even though it may be economically justifiable to use stock options to align stockholders and CEOs interests, it may incur too much risk to the firm and stockholders. Furthermore, previous studies have found that ESOs can incentivize a CEO to take on a greater amount of risk than that which is in the best interest of stockholders. However, these studies only include data as recent as 2007, prior to the financial crisis. It is evident that the recent financial crisis has altered both stockholders and their firm's views on debt. As such re-examining whether firms who's CEOs' have been granted a greater value of ESOs relative to their total compensation in a given year are more likely to issue debt than equity is crucial to future policy implementations. Subsequently, this study will present empirical evidence if firms are still taking on too much risk, even in an environment where the availability of debt financing has shrunk.

II. Literature Review

The comprehensive study conducted by Jensen and Murphy (1990) led to changes in CEO compensation packages and effectively increased compensation related risk-taking. The study examined the pay-for-performance of 2,505 CEOs in 1,400 publicly traded companies from 1974 through 1988. They concluded that the compensation of top executives was "virtually independent" of performance. The way CEOs were being compensated did not create proper incentives to act in a firm value-maximizing fashion. This study is one of the first to explicitly suggest that the biggest issue with CEO compensation is how CEOs are paid and not how excessive their pay may seem to be (Jensen and Murphy, 1990). Since the 1990's, many studies have also begun to examine why firms choose to utilize stock options as a form of CEO compensation. Jensen and Meckling (1976) were the first to conclude that the economic justification for stock options is that equity ownership can be used to align the interests between managers and shareholders to mitigate the potential principal-agency problems.

However, other studies have found that executive stock and stock option holdings can cause excessive risk-taking by CEOs and subsequently negatively affect the firm and stockholders. For example, Rajgopal and Shevlin (2002), examines whether executive stock options (ESOs) provide managers with incentives to invest in risky projects. They found that previous studies presented little direct empirical evidence on whether ESOs affect managers' decisions on undertaking risky projects that have a positive net present value making them firm-value-increasing projects. The study specifically investigates the influence that ESO risk incentives have on the actions of CEOs of oil and gas firms to manage the risk of uncertain success in exploring new oil and gas reserves, which they call "exploration risk." A model developed by Sunder (1976) is used to estimate the coefficient of variation in expected future cash flows arising from exploration, which they use to proxy for exploration risk. Sunder (1976) estimates a simultaneous equations model to examine the relationship between exploration risk and ESO incentives. The dollar magnitude of the ESO incentives is modeled by taking the partial derivative of the Black-Scholes option pricing function with respect to stock return volatility (Guay, 1999). To control for the endogeneity of ESO risk incentives they estimate a second equation to model ESO risk incentives as a function of exploration risk, investment opportunity set (IOS), CEO sensitivity of wealth to stock price (vega), cash balances, cash compensation, firm size, and a set of year dummies. They combine data from four sources to construct their models. Consistent with their hypothesis, the results indicate a significant positive relationship between ESO risk incentives and the level of exploration risk undertaken by the firm. The estimated coefficient on leverage is also positive and significant suggesting that highly leveraged firms appear to take on more exploration risk. Also the IOS factor is positive and significant which is consistent with the claim that firms that have greater investment opportunities appear to take on more risk. There is also no evidence that exploration risk in period (t+1) has a positive relationship with ESO risk incentives. The ESO risk incentives also have a positive relationship with the sensitivity of CEO's wealth to stock price, as well as cash compensation. This suggests that firms pay CEO's greater cash compensation if they impose greater risk incentives on them.

Dong, Wang, and Xie (2010) estimate a fixed effects model to examine firms' optimal leverage ratios in their sample. After examining the output from the fixed effects regressions, they split the observations into two subsamples. Their subsamples contained: (1) firms that were under-leveraged relative to their optimal capital structure, (2) firms that were over-leveraged relative to their optimal capital structure. They hypothesized that managers were more likely to use debt than equity as a capital-raising vehicle when their wealth is more sensitive to stock return volatility. They constructed the variable CEO vega, which captures the sensitivity of a CEOs wealth to stock return volatility. It is computed as a change in the dollar value of a CEO's entire stock and stock option portfolio per 1% increase in their firm's annualized stock return volatility. They found that CEOs with a higher vega are more aggressive in increasing leverage, even in firms that appear over-leveraged compared to their optimal debt ratios. The data on all common equity and straight debt offerings by US public companies during the period from 1993-2007 was gathered from the SDC New Issues Database. They used this data to examine the correlation between a firm's security issue decision and CEO vega in observations from the full sample, the under-leveraged sample, and the over-leveraged sample. The regression analysis closely resembled that of Jung (1996). Firms in the utility, financial, or public administration industries were not included. The regression output presented a negative and significant coefficient on CEO vega, which was consistent with their hypothesis that CEOs with a higher vega tend to avoid equity in favor of debt as a financing vehicle. This was consistent throughout all of the regression models that they ran. In conclusion, they find that executive stock options can lead to actions that do not appear to be in the best interest of stockholders. CEOs whose wealth is more sensitive to stock return volatility, those with a higher vega, tend to favor debt over equity to raise capital. Evidence from the over-leveraged subsample suggests that managers do take on too much risk in response to the convex payoff structure of stock options.

Cohen, Hall, and Viceira (2000) find similar results to Dong, Wang, and Xie (2010); Rajgopal and Shevlin (2002), as they conclude that managers respond to the incentives created by stock options. In regards to the principal agency problem they state that stock options holdings can have both a positive and negative effect on shareholder value. First, managers could choose to maximize their own utility by reducing firm volatility and protecting their undiversified assets and human capital that are tied to the company's performance. Second, they could be incentivized to take on projects that have a negative NPV, but do increase stock price volatility subsequently increasing their stock option value. They find a statistically significant relationship between increases in firm risk-taking and the amount of option holdings by a manager. Furthermore, they find that increasing leverage is the optimal way to increase firm risk-taking and stock price volatility, which subsequently increases the value of their options holdings. However, unlike some previous studies they find that the effect on risk-taking is not large or damaging to shareholders. Even though the risk-taking incentives lead to modest increases in firm risk, they do not impose additional costs to the shareholder. They also find that stock options generate large increases in firm performance, furthermore suggesting that the effects are not damaging.

Similarly, Coles, Daniel, and Naveen (2006) find that there is strong causal relation between managerial compensation, firm risk, and debt policy. The advantage to the study done by Coles, Daniel, and Naveen was the use of the 3SLS. The utilization of the 3SLS model enabled the examination of the causality in the magnitude and direction of the effects. They find that after controlling for a firm's financial status that CEOs with a higher sensitivity of wealth to stock return as measured by a CEO's vega in fact leads to riskier policy decisions. Furthermore, they find that the riskier policy choices in turn led to compensation policies being constructed that increased CEOs vega's. Stock return volatility also had a positive effect on a CEO's vega, meaning that CEOs that are able to effectively increase volatility can experience higher returns to their stock option portfolio. This study finds that there is a domino effect, in that the granting of stock options increases the sensitivity of a CEOs wealth to stock return. Subsequently, prompting a CEO to utilize debt policy such as increasing his or her firm's leverage to in fact stimulate an increase in volatility and potential stock return. As a result of the risk-taking by the CEO, he is then more likely to receive a compensation structure that provides him or her even more risk-taking incentives due to stock options.

Although the types of estimation utilized throughout the previous literature are different, it is evident that many of the authors suggest that ESOs create risk-taking incentives that can be damaging to the firm and stockholders. This study will attempt to expand upon these conclusions and add to the understanding of how executive compensation policy can affect the way a firm operates.

III. Data and Variable Specifications

The data in this study was collected from the COMPUSTAT database. This database contains financial, statistical, and market information on active and inactive global companies. The sample collected for this study includes only S&P 500 firms that are actively profitable from 2007-2011. The variables below are the same that were utilized in the model constructed by Dong, Wang, and Xie (2010). However, the construction of the dependent and independent variable of interest have changed, as to better capture a CEOs security issuance decision. Also, the inclusion of the more recent years is important to examine the continuity of the conclusions that have been made in previous studies. Re-examining whether firms whose CEOs have been provided sub-optimal risk-taking incentives in S&P 500 firms from 2007-2011 will present empirical evidence on whether or not firms are still taking on too much risk, specifically firms that are taking on more debt financing even when they are already over-leveraged. A summary of the variables including their description and expected sign is displayed in Table 1 in the appendix.

The descriptive statistics of the variables utilized in the regression models are important to examine, because they give one an idea on the range and mean of the observations as a whole. For example, the mean of firms' total assets in our sample is $48,611,360, and can range from a minimum of $617,946 to $2,187,631,000. The descriptive statistics is also utilized to examine how many observations are usable in the regression model. As you can see the variables Assets_Total and logTA have 2,345 usable observations, TobinQ has 2,335, ROA has 2,272, TB has 2,260, LEV the dependent variable has 2,197, SGAR has 1,831, and RDR has 1,831 usable observations.

IV. Empirical Model Development

4.1. Pooled OLS Model: Multivariate optimal-leverage regression

Multiple regression models are utilized to examine how executive stock options affect firm's risk-taking. The initial pooled OLS model below, derived from a study conducted by Dong, Wang, and Xie (2010), is used to determine each firm's optimal leverage ratio, where subscript (i,t) represents firm (i) in period (t). The pooled OLS regression on firms actual leverage ratios grants the examination of a firm's deviation from their optimal leverage ratio. To derive a firm's leverage deviation and subsequently determine if a firm is over-leveraged or under-leveraged I examine the residuals from the regression output. The negative residuals will represent firms that are under-leveraged compared to their optimal leverage ratio, while the positive residuals will represent firms that are over-leveraged. Determining a firm's leverage deviation is important to the analysis of why a firm may choose to issue more debt or equity to fund future projects.

(1) Pooled OLS model:

$$LEV_{i,t} = \beta_0 + \beta_1 LOG(TA)_{i,t} + \beta_2 ROA_{i,t} + \beta_3 TOBINQ_{i,t} + \beta_4 TB_{i,t} + \beta_5\ SGAR_{i,t} + \varepsilon_{i,t}$$

The dependent variable in the model in equation 1, LEV, represents the book value of long-term and short-term debt divided by the market value of assets of firm (*i*) in period (*t*). *LOG(TA)* represents the logarithmic transformation of the total assets, *ROA* represents earnings before interest, tax, depreciation, and amortization (EBITA), *TOBINQ* represents the market value of assets (Tobin's Q) of firm, *TB* represents the net book value of plant, property, and equipment divided by the book value of total assets (tangibility), *SGAR* represents the selling, general, and administrative expense divided by net sales (SG&A ratio).

(2) Fixed Effects model:

(2.1) Full Sample

$$SI_{i,t} = \beta_0 + \beta_1 ESOVAL_{i,t} + \beta_2 LOG(TA)_{i,t} + \beta_3 ROA_{i,t} + \beta_4 TOBINQ_{i,t} + \beta_5 TB_{i,t} + \beta_6 VOL_{i,t} + \beta_7 VOLSQ_{i,t} + \beta_8 LEV_{i,t} + \beta_9 RF_{i,t} + \varepsilon_{i,t}$$

(2.2) Under-leveraged and Over-leveraged Samples

$$SI_{i,t} = \beta_0 + \beta_1 ESOVAL_{i,t} + \beta_2 LOG(TA)_{i,t} + \beta_3 ROA_{i,t} + \beta_4 TOBINQ_{i,t} + \beta_5 TB_{i,t} + \beta_6 VOL_{i,t} + \beta_7 VOLSQ_{i,t} + \beta_8 RDL_{i,t} + \beta_9 RF_{i,t} + \varepsilon_{i,t}$$

Where *ESOVAL* represents the grant date fair value of options granted (as valued by company) divided by total compensation (salary+bonus+other annual+restricted stock grants+LTIP payouts+all other+value of options granted), *LOG(TA)* represents the logarithmic transformation of total assets, *ROA* represents earnings before interest, tax, depreciation, and amortization (EBITA), *TOBINQ* represents the market value of assets (Tobin's Q) of a firm, *TB* represents the net book value of plant, property, and equipment divided by the book value of total assets (tangibility), *VOL* represents the monthly stock return volatility over the past 60 months, *VOLSQ* represents the square of variable *VOL*, *LEV* represents the book value of long-term and short-term debt divided by the market value of assets, *RDL* represents a firm's deviation from their optimal capital structure, and *RF* represents the long-term debt due in one-year divided by the book value of total assets.

The variables ESOVAL, *LOG(TA)*, *TB*, VOL, and RF are expected to have positive coefficients. In comparison, TobinQ, ROA, RDR, SGAR, VOLSQ are all expected to have negative coefficients. The variable RDL is expected to have a positive sign if the firm is under-leveraged, and a negative sign if the firm is over-leveraged. It is expected that RDL will be positive in the full sample as most of the firms in the sample are under-leveraged.

V. Analysis of Results

5.1 Pooled OLS model: multivariate optimal-leverage regression

This study tests the effect of ESOs on sub-optimal firm risk-taking. The results for the multivariate optimal-leverage regression can be found in Table (3). The model utilized 1,686 S&P 500 firm observations from the years 2007-2011. The adjusted R^2 value for the OLS model is 0.3176. This indicates that the model can explain over 31% of the variance in the data. It is also important to point out that the model has an F value of 131.73, which is statistically significant at the 99% significance level. This means that the regression model fits the data well, and has predictive power. The variables ROA, TobinQ, TB, and SGAR are all statistically significant at the 99% significance level. The signs on the parameter estimations are all as expected and correspond to the direction of signs observed in previous studies. The values of the parameter estimates are also extremely close to those observed in Dong, Wang, and Xie (2010). Although I am interested in the validity and significance of the parameter estimates, it is important to note that when observing the output of the optimal-leverage regression there is no variable of significant interest. However, the outputted residuals are important, as they will be used in the construction of the second regression equation. The residuals explain how over-leveraged (positive residual) or under-leveraged (negative residual) a firm is given their debt ratios at the end of the year, compared to the sample. After observing the residuals a new variable is created, which is used as an independent variable in the second regression equation on security issue decision. It will be important to include the residual variable in the second regression equation to control for firm's that change their debt level due to the fact that they are rational and know that they are under-leveraged or over-leveraged, which prompts a move towards their optimal capital structure.

5.2 Fixed effects model: multivariate security-issue decision regression

After estimating the OLS regression on firms' optimal-leverage ratios, a fixed effects model was utilized to examine firms' security-issue decisions. Three samples are constructed from the residuals observed in the OLS model: full, over-leveraged, and under-leveraged subsamples. These regressions also include the new variable, which was created from the observed residuals and represents a firm's leverage deviation. Prior research has concluded that this variable will have a significant effect on a firm's security issue decision, as it is expected firms' that have a negative leveraged deviation (under-leveraged) will tend to issue more debt to move towards optimality. Similarly, firms that have a positive leverage deviation will not issue more debt and will favor the issuance of equity as taking on more debt could be damaging to the firm and shareholder value. The inclusion of this variable will help to control for movements in security issuance related to their current and optimal capital structure. When examining the output of the fixed effects model it is evident that the variables LogTA, and TobinQ, which were controls for a firm's financial state, are statistically significant across all three samples. Similarly, the variables VOL and TB are statistically significant in the full and under-leveraged sample. As noted previously, controlling for the firm's leverage ratio in the full sample and leveraged deviation in the under-leveraged and over-leveraged samples was crucial to the examination of the dependent variable. The leverage ratio variable, LEV, was statistically significant and highly economically significant in the full sample. Similarly, the leverage deviation variable, RDL, was statistically significant and highly economically significant in the over-leveraged and under-leveraged samples. The variables RF, ROA, and VOLSQ seem to be uncorrelated with the dependent variables and do not properly control for a firm's security issue decision. The results of the fixed effects model suggest that ESOs have the greatest magnitude of effect on a firm's security issue decision in the over-leveraged sample, which is consistent with previous literature. However, the independent variable of interest ESOVAL was statistically insignificant in all three samples, meaning that there is no correlation between a CEOs risk-taking incentive due to stock options and actual risk-acting actions. The assumption could be made that firms are rational and have learned from their mistakes prior to the financial crisis in relation to executive compensation policy; however, further research would have to be done to make this conclusion valid. The insignificance of the ESOVAL variable could also be due to the choice of construction of the variable itself. Previous literature has used different forms of construction by measuring the CEOs wealth sensitivity to a firm's stock return as measured by stock return volatility. However, the ESOVAL variable was constructed to better capture how sensitive a CEO is to his to her stock option holdings in comparison to their total compensation.

VI. Conclusion

This study aimed to examine the effect that ESOs have on firm risk-taking. Prior literature on the topic suggests that stock options can induce CEOs to take on too much risk. This study included 2,345 observations from 2007-2011 in S&P 500 firms that were actively profitable. The first pooled OLS regression equation that was estimated was found to be statistically significant and had predictive power. After estimating the first regression equation the residuals from the regression output were saved and used to create a new variable called RDL, which is a firm's deviation from optimal capital structure or leveraged deviation. The second fixed effects model was estimated and was also found to have predictive power. The independent variable of interest, ESOVAL, was statistically insignificant in all three samples, meaning that there is no correlation between a CEOs risk-taking incentive due to stock options and actual risk-acting actions. As a result, a conclusion cannot be drawn that the stock options granted to a CEO have an effect on firm sub-optimal risk-taking.

VII. Limitations of Study

The limitations of this study begin with the sample that was chosen to examine the research question. Choosing a larger sample and not limiting the data to S&P 500 companies may increase the number of observations in the over-leveraged sub-sample regression analysis. Due to the decrease in observations from the 2,345 prior to the initial OLS regression to the 318 utilized in the over-leveraged sample of the fixed effects model, the sample may not be random. The use of a two-way fixed effects model may also increase the validity of the regression analysis. In this study an ID for the CEO receiving the stock options was utilized in a one-way fixed effects model. Although this controls for important CEO specific characteristics, controlling for the CEO's company specific or industry specific characteristics may make the results more robust. Additionally, as previously utilized in Coles, Daniel, Naveen (2006), the 2SLS or 3SLS regression could be used on more recent data such as in this study to examine the direction and magnitude of the effects of ESOs on a firms security issuance decision.

VIII. References

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VIV. Appendix

Figure (1): Structure of Total Compensation, 1936-2005

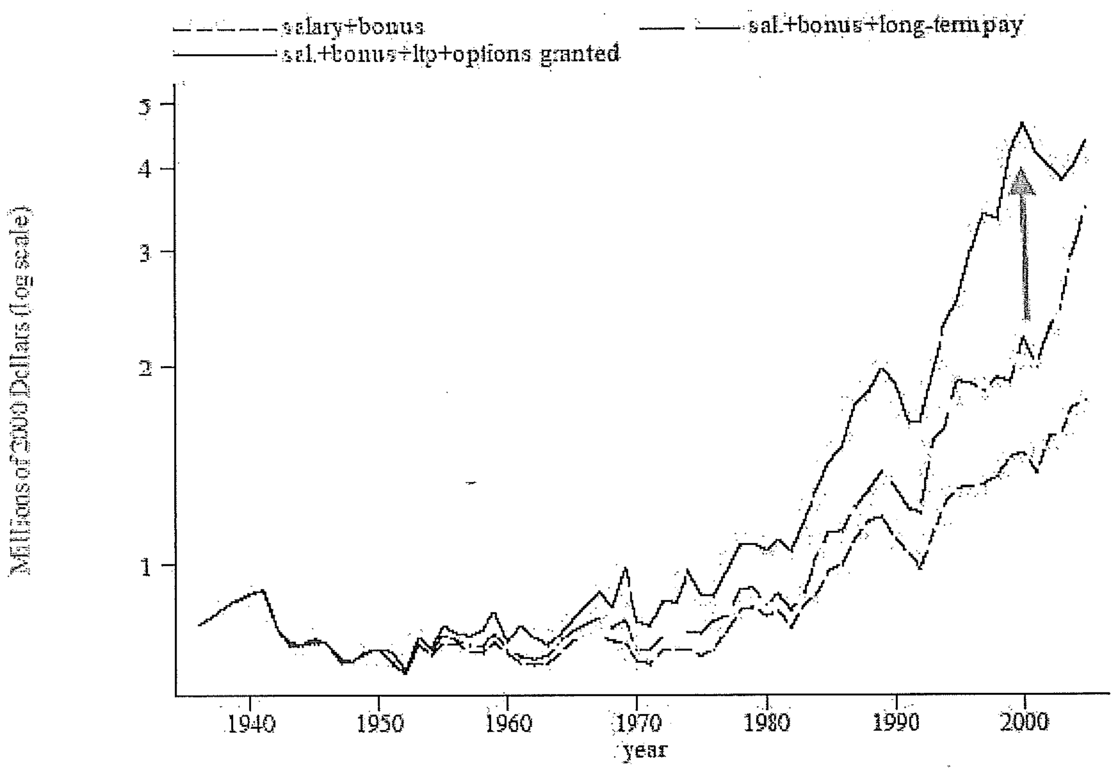

Figure (2): Percent of Executives Granted Stock Options, 1936-2005

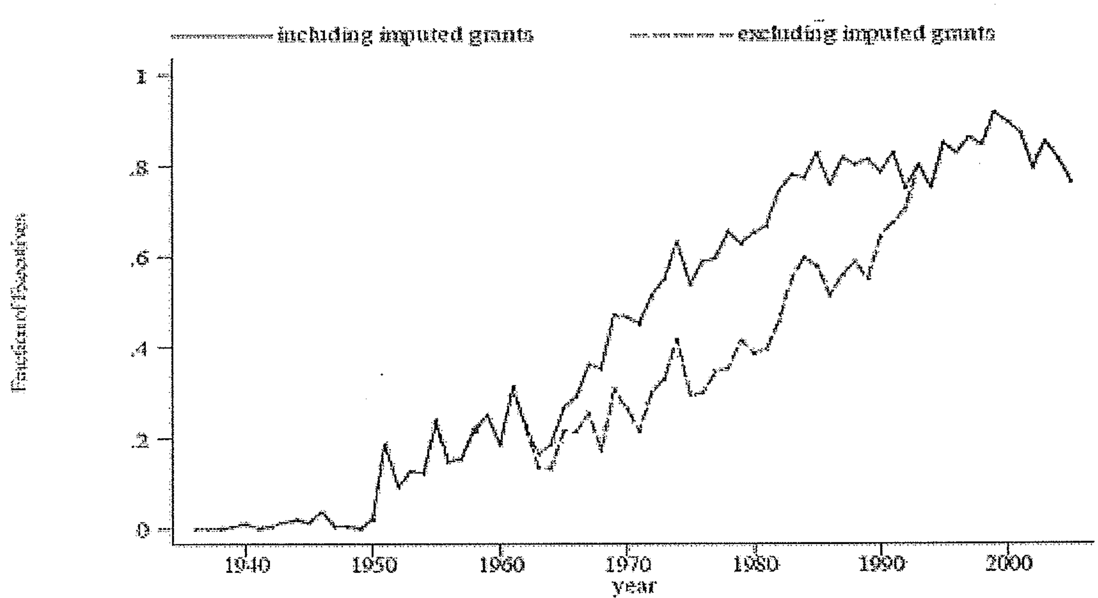

Table (1) - Summary of Variables

Variable	Description	Expected Sign
Assets_Total	Book value of total assets	+
logTA	Percentage change in the book value of total assets	+
TobinQ	Market value of assets	–
ROA	Earnings before interest, tax, depreciation, and amortization (EBITA)	+
LEV	Book value of long-term and short-term debt divided by the market value of assets, which is equal to the book value of assets minus the book value of common equity plus the market value of common equity	N/A
SI	Issuance of long-term debt divided by the issuance of long term debt plus the issuance of common/preferred stock	N/A
TB	Net book value of plant, property, and equipment divided by the book value of total assets	+
RDR	R&D expenses divided by net sales	–
SGAR	Selling, general, and administrative expense divided by net sales	–
TS	Tax payment divided by the book value of total assets	–
VOL	Monthly stock return volatility over the past 60 months	+
VOLSQ	The square of the variable VOL	–
RF	Long-term debt due in one-year divided by the book value of total assets	+
RDL	The deviation (residual) of firm's actual leverage observations from their expected value	+,-
ESOVAL	Grant date fair value of options granted (as valued by company) divided by total compensation (salary+bonus+other annual+restricted stock grants+LTIP payouts+all other+value of options granted)	+

Table (2) - Descriptive Statistics

Variable	N	Mean	Std Dev	Minimum	Maximum
Assets_Total	2345	48611.36	167009.84	617.946	2187631
logTA	2345	9.5493773	1.3593169	6.4264011	14.5983
TobinQ	2335	1.8837283	1.1149255	0.7661730	15.5067
ROA	2272	0.1453179	0.0874567	-0.3209505	0.6545
LEV	2197	0.1481443	0.1222007	0	0.8102
TB	2260	0.2616440	0.2406245	0.0013821	0.9395
RDR	1264	0.0567092	0.0790287	0	1.1846
SGAR	1831	0.2337292	0.1477529	0.0070197	0.8094

Table (3) – Optimal-leverage regression coefficient estimations

Variable	Parameter Estimate	t Value
Intercept	0.13093	5.76***
LogTA	0.00986	4.67***
ROA	-0.36956	-9.39***
TobinQ	-0.01900	-7.12***
TB	0.09571	6.00***
RDR	-0.12970	-4.06***
Year1	-0.02706	-3.43***
Year3	-0.01264	-1.65*
Year4	-0.02045	-2.67***
Year5	-0.01822	-2.38**
N= 1178	R^2= 0.3175	F Value= 61.84***
***99% Significance Level	**95% Significance Level	*90% Significance Level

The sample used to estimate a firm's optimal-leverage ratio consists of 1,178 usable firm year observations from 2007-2011 collected from the COMPUSTAT database. Observations also consist of only S&P 500 companies that are actively profitable. The dependent variable, leverage ratio, and independent variables are defined in Table (1) above.

Table (4) - Descriptive Statistics (Over-leveraged Sub-sample)

Variable	N	Mean	Std Dev	Minimum	Maximum
SI	441	0.6799042	0.3982518	0	1.0000000
ESOVAL	373	0.1805607	0.1920782	0	1.0000000
logTA	482	9.1662796	1.1552500	6.4264011	13.5895744
TS	482	386.8082365	923.6113206	-3247.00	13405.00
Tobin Q	482	2.1179936	1.5621076	0.7802728	15.5067341
ROA	482	0.1658775	0.0896037	-0.1118242	0.6545399
VOL	456	1.5446959	1.7848992	0.0716500	26.2175300
VOLSQ	456	5.5649641	34.6464561	0.0051337	687.3588793
LEV	482	0.1925302	0.1064167	0	0.5545405
TB	482	0.2203786	0.1640957	0.0204136	0.7571948
RF	482	0.0234931	0.0363626	0	0.2740408

Table (5) – Fixed-effects Security-issue decision coefficient estimations

	Full Sample N= 1498	Under-leveraged N= 1066	Over-leveraged N= 318
Variable	**Parameter Estimate**	**Parameter Estimate**	**Parameter Estimate**
Intercept	-0.1371643 (0.253)	-0.200434 (0.132)	0.0653547 (0.776)
ESOVAL	0.0404041 (0.388)	0.066292 (0.109)	0.1496298 (0.138)
LogTA	0.0533525 (<0.0001)***	0.058189 (<0.0001)***	0.0555052 (0.010)***
TobinQ	-0.030534 (0.044)**	-0.037907 (0.0506)*	-0.0851858 (0.003)***
ROA	0.033874 (0.841)	-0.067123 (0.7333)	0.2659759 (0.469)
VOL	0.0207686 (0.080)*	0.036246 (0.0166)**	0.0103099 (0.698)
VOLSQ	-0.0006461 (0.248)	-0.001401 (0.1349)	0.0001099 (0.923)
RDL		1.427195 (<0.0001)***	0.7236857 (0.020)**
TB	0.1727513 (0.002)***	0.237574 (<0.0001)***	0.0783575 (0.567)
RF	0.086364 (0.803)	0.072929 (0.8738)	0.7912691 (0.200)
LEV	1.315458 (<0.0001)***		

The sample used to estimate the Fixed Effects model on a firm's security-issue decision was comprised of a full sample, an under-leveraged sub-sample, and an over-leveraged sub-sample. The samples have 1,498 (full sample), 1,066 (under-leveraged), and 318 (over-leveraged) usable firm year observations from 2007-2011 collected from the COMPUSTAT and ExecuComp database. Observations also consist of only S&P 500 companies that are actively profitable. The dependent variable, security-issue decision, and independent variables are defined in Table (4) above. Year fixed-effects are included.