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Transparency, Risk, and Managerial Actions

Gwendolyn Pennywell

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The author of this dissertation is:

Gwendolyn Pennywell
1180 Young St
Mt. Vernon, AL 36560

The director of this dissertation is:

Dr. Jayant Kale
Department of Finance
Robinson College of Business
Georgia State University
P.O. Box 3989
Atlanta, GA 30302

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Transparency, Risk and Managerial Actions

BY

Gwendolyn Perkins Pennywell

A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree
of
Doctor of Philosophy
in the Robinson College of Business
of
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ACCEPTANCE

This dissertation was prepared under the direction of the candidate's Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctor in Philosophy in Business Administration in the Robinson College of Business of Georgia State University.

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Dean
Robinson College of Business

Dissertation Committee:

____Dr. Jayant Kale__________
____Dr. Omesh Kini__________
_____Dr. Martin Grace_______
____Dr. Roy Arthur Wiggins___
____

ABSTRACT

Transparency, Risk, and Managerial Actions

By

Gwendolyn Perkins Pennywell

May 15, 2009

Committee Chair: Dr. Jayant R. Kale

Major Department: Finance

I investigate the relation between firm risk and firm transparency over the period 1992-2006 and find that the level of firm transparency and the level of firm risk are negatively related. I also find that higher CEO pay-performance sensitivity (delta) works to mitigate this inverse relationship. This result is consistent with Hermalin and Weisbach (2007) who suggest that managers reduce risk to protect their pay and performance evaluations under higher levels of firm transparency. I further find that firms in high technology industries are more likely to increase risk relative to firms in other industries when transparency is high. Finally, I develop an additional proxy for transparency based on the Standard and Poor's Transparency and Disclosure Score. Results using this proxy are generally consistent with my findings that there is an inverse relationship between risk and transparency and that CEO pay-performance sensitivity lessens this relationship.

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This version: May 2009

Abstract

I investigate the relation between firm risk and firm transparency over the period 1992-2006 and find that the level of firm transparency and the level of firm risk are negatively related. I also find that higher CEO pay-performance sensitivity (delta) works to mitigate this inverse relationship. This result is consistent with Hermalin and Weisbach (2007) who suggest that managers reduce risk to protect their pay and performance evaluations under higher levels of firm transparency. I further find that firms in high technology industries are more likely to increase risk relative to firms in other industries when transparency is high. Finally, I develop an additional proxy for transparency based on the Standard and Poor's Transparency and Disclosure Score. Results using this proxy are generally consistent with my findings that there is an inverse relationship between risk and transparency and that CEO pay-performance sensitivity lessens this relationship.

JEL Classification: G31; G32; G34; J33

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Finance Department, Mitchell College of Business, University of South Alabama, Mobile AL 36688-0002. E-mail: gpennywell@usouthal.edu. Tel: (251) 651-1560. I am grateful to Jayant Kale, Stephen Smith, Omesh Kini, Martin Grace, Chip Wiggins, Otgontsetseg Erhemjamts, Anand Venkateswaran, Pamela Brown, Kaysia Campbell, Jocelyn Evans, Linley Hall, and Costanza Meneghetti for many useful comments. All remaining errors are mine.

1. Introduction

Recent laws indicate that regulators believe that transparency is beneficial because it acts as a mechanism to discipline the manager and keep him honest. For example, the Sarbanes-Oxley Act (SOX) was originally argued for on the grounds that it would increase managerial accountability through corporate transparency.[1] While there are theoretical models that explore the relationship between firm transparency and managerial actions, empirical evidence is sparse. Much of the empirical attention focuses on other benefits of transparency and typically weighs them against the commonly addressed costs of transparency which include the direct costs of disclosure, and the costs of releasing useful information to product-market rivals.[2] I define "Transparency" as the ability of outsiders to determine the cash flows of a publicly traded company. This definition is in the spirit of Ang and Ciccone's (2003) definition which is "more easily understood financially." Thus, while transparency involves providing information to reflect a comprehensive picture of the firm's financial performance, it need not mandate that the firm should release information that may negate its competitive advantage.

In this study, I explore the relation between transparency and managerial decisions. I provide empirical evidence of a strong causal relation between the level of transparency in the firm and the level of risk taken by the manager. Specifically I find that higher levels of transparency are associated with lower levels of risk. Thus, transparency may not necessarily "discipline" the manager, but it does work to make him more cautious. Furthermore, I show that the manager's compensation package impacts this relationship. Holding the level of transparency constant and increasing the pay-performance sensitivity of the CEO lead to a reduction in firm

[1] The Sarbanes-Oxley Act was originally referred to as the "Corporate and Auditing Accountability, Responsibility, and Transparency Act" or "CAARTA" when put before the House of Representatives on April 25, 2002.
[2] Leuz and Wysocki (2006) provide a survey of recent disclosure literature.

risk. This evidence supports the importance of managerial career concerns and is consistent with the model derived by Hermalin and Weisbach (2007).

I also test importance of non-manager career concerns, via the effect of human capital costs, on the relation between the manager's choice of risk and the level of firm transparency. Almazan, Suarez, and Titman (2004) suggest that higher levels of transparency should be linked with lower levels of risk to protect the level of the reservation wage paid to employees. Their suggestion is based on the premise that employees require higher compensation to remain at companies associated with bad news. Transparency makes it difficult for the firm to curtail bad news so firms reduce risk to minimize the probability that such news will be bad. If true, the negative relationship should be strongest for firms with the highest human capital costs.

I use technology to proxy for human capital costs. The level of technology is based on the firm's three-digit SIC code and the characterization of high technology follows Kwon (2002). High technology industries should have the lowest levels of risk according to Almazan, Suarez, and Titman (2004). I find that firms in high technology industries actually choose higher levels of firm risk relative to firms in industries with lower technology levels when transparency is held constant. This result is consistent with firms exploiting the benefits of transparency. For example, transparency reduces the cost of capital. Since human capital is more difficult to value, than fixed assets, high technology firms should benefit most from the reduction in cost of capital. As a result, they have a higher capacity for increasing risk before negating the benefits derived from transparency.

Finally, I analyze the viability of using firm characteristics to design a model that predicts the *Transparency and Disclosure Score (T&D Score)* developed by Standard and Poor's (S&P) in 2001. I predict this score because S&P published their *T&D Score* for only one year and only for the five hundred firms they tracked. I then use my predictive model to generate a *Predicted T&D Score* for all firms and all years (1992-2006) in my sample. Since the scores are whole numbers ranging from one to ten, I transform the score using the natural log to create a variable with more continuous properties. Consistent with my other measures of transparency, I find a negative relationship between the *Predicted T&D Score* and *Risk*. While not as significant, I continue to find evidence that the compensation package of the manager can lessen this relationship. However, the correlation between my proxy and the other proxies for transparency is thirty percent at its highest.

The rest of this study is organized into seven sections. Section 2 presents a brief literature review and a discussion of the hypotheses. Section 3 describes the sample and variables used. Section 4 provides detailed results of the relation between *Transparency* and *Risk* as well as explains the econometric method used to deal with endogeneity. Section 5 presents the results of the explanations of the relationship between *Risk* and *Transparency* based on career concerns for managers and non-managers. Section 6 examines the model that predicts *T&D Scores* and discusses the results. Section 7 summarizes my conclusions.

2. Literature review, hypothesis, and contribution

2.1 Previous Literature

Most existing work on transparency focuses on its various benefits. For example, Muscarella and Vetsuypens (1989) and Ang and Brau (2002) find that transparency reduces asymmetric information. Verrecchia (1990), Subrahmanyam and Titman (1999) and Botosan and Plumlee (2002) find that transparency reduces cost of capital. Datar, Naik, and Radcliffe (1998) find that transparency increases liquidity. In these studies, the benefits from transparency arise naturally and are not based on specific managerial actions such as project choices, perquisite consumption, etc. My study differs from these studies since I focus on how transparency influences managerial decisions. Particularly, I am interested in how transparency impacts the risk decisions of the manager.

There are models and arguments that suggest that the benefits of transparency arise from its impact on managerial behavior. For example, the premise of SOX is that transparency limits the manager's incentive to "misbehave." This argument does not predict a specific direction in the relationship between risk and transparency. For example, if the manager is behaving appropriately, there is no expectation of an adjustment in risk if the level firm transparency increases. However, if the manager is not acting in the best interest of the shareholder and chooses too much risk (too little risk); transparency will give him the incentive to reduce (increase) the level of risk in the firm.

Another example that focuses on managerial behavior is John, Litov, and Yeung (2008). They model transparency as an incentive alignment mechanism. In their model, the manager must make two decisions: the amount of managerial perquisites (perks) to consume and the amount of risk to take in investment decisions. Since the perks are, as the authors explain, "skimmed off the top," they are similar to holding a priority claim on the company's cash flow. This implicit claim effectively aligns the manager's incentives with those of the debt holders. As a result, it provides incentives for the manager to forego risky investments that would be value enhancing to the shareholders. Instead the manager would accept less risky projects that would protect the fixed payments due to the bondholders.

Increased investor protection, via government laws that protect shareholder rights and/or strong governance mechanisms through board construction, increases the expected costs of perk consumption and results in the manager choosing a lower level of those perks. The authors equate this to reducing the manager's "senior debt," which in turn diminishes his sub-optimal conservatism and measure transparency in the context of corporate governance. Thus, they model investor protection as the alignment mechanism. John and Litov's (2005) study implies that risk should be positively correlated with transparency as measured by investor protection. Empirically, they find support for this argument. However, it should be noted that their study looks across countries and not at individual firms.

Almazan, Suarez and Titman (2004) also model the importance of transparency on managerial decisions. However, their study is not based on incentive alignment, but on the importance of human capital costs. In their model, the inverse relationship between risk and transparency is driven by the notion that employees derive non-monetary benefits such as training, quality experience, and prestige by working for strong companies. Poor performance would decrease the value of these benefits leading to higher costs of retaining workers through higher compensatory wages. The theory of risk aversion is heavily influenced by the costs of retaining workers, which is associated with the difficulty of replacing an employee with an employee of equivalent or higher ability. These costs are highest when the firm relies heavily on employees' expertise, experience, and/or intellectual properties.

Almazan, Suarez and Titman (2004) further explain that employees are more concerned with bad news than good news. They respond to bad news by increasing their reservation wage. However, good news is not associated with a corresponding reduction in the reservation wage. Consequently, on average it is in the firm's best interest to limit the amount of news. An alternative to limiting the amount of news is limiting the probability that any released news will be bad. This can be done by making conservative decisions. Since higher transparency means more revelations and reducing risk decreases the probability of a negative state. It is in the firm's/manager's best interest to reduce risk under increased transparency. All else equal, this model predicts an inverse relationship between risk and transparency.

2.2 Hypotheses

John, Litov, and Yeung (2008) predict a positive relationship between risk and transparency; on the other hand, Almazan, Suarez, and Titman predict a negative relationship between risk and transparency. Thus, as a first step in my study, I test the hypothesis that there is a relationship between risk and transparency. According to these studies, there is support for the relationship to go in either direction. Additionally, these predictions of the relationships are not mutually exclusive.

However, these models do not account for the difference in risk tolerance between the shareholders and the managers when firms are transparent. Amihud and Lev (1981) propose that a difference in risk preferences exists between managers and shareholders. The preferences are different because managers have reason to be more risk averse at the firm level than shareholders. This difference is driven by the fact that shareholders can diversify and manage risk at the portfolio level in the stock market, but the manager is limited to controlling his human capital risk at the firm level. The manager's lack of diversification options leads to a higher aversion to firm risk than that of the shareholders. As the primary decision maker for the firm, aversion could lead the manager to make personally biased corporate decisions that differ from decisions shareholders would prefer he make. We must then ask if this difference in risk preference has any bearing on the level of firm risk the manager is willing to take under increased transparency. Current literature suggests that it does.

One such study is by Hermalin and Weisbach (2007) who argue that managerial incentives are a factor in the relationship between risk and transparency. Hermalin and Weisbach

(2007) argue that increased transparency can impose costs on the firm in the form of higher executive compensation. In their model, the manager's compensation is based on the public perception of his ability. This perception is derived from the weighted average of the prior estimate of his ability and the signal provided by the firm's performance. The prior estimate is fixed while the performance-based signal is random. Since the manager is risk averse, he prefers that more weight be placed on the fixed component when the signal is noisier.

The CEO prefers a noisier signal since this forces a heavier weight to be placed on the prior estimate. However, a more transparent firm reduces the noisiness of the signal, resulting in more weight being placed on the random signal making the risk averse CEO worse off. As a result, he requires higher compensation to offset the increased uncertainty driven by the random signal. Hermalin and Weisbach (2007) further argue that in the absence of a change in the compensation package, the manager may elect to reduce firm risk to help minimize the noise of the random signal.

Moreover, previous studies have analyzed the relationship between compensation and risk. For example, Jensen and Meckling (1976), Guay (1999), Coles, Daniel, and Naveen (2006), and others have argued that convex compensation schemes can provide incentives for managers to take on risky projects.[3] Based on these studies, I expect that higher compensation should work to mitigate the relationship between risk and transparency. This mitigation is because the expectation of higher performance based pay works in the opposite direction of job security concerns under increased transparency.

While no theoretical model exists, intuition and various empirical studies support the argument that the manager (who maximizes his utility) may have career incentives to increase risk in transparent firms. Fee and Hadlock (2002) find that increased performance leads to a good

[3] See Fields and Keys (2003) for a brief survey.

reputation and increased human capital value as evidenced by the connection between good performance and voluntary CEO job changes. These changes are linked to higher pay and large signing bonuses.

Since increased transparency provides the market and shareholders with a clearer picture of the firm’s performance and cash flows, a manager may have incentive to invest in risky positive NPV projects he would otherwise forgo in an effort to maximize firm performance and by extension his human capital value. When the firm is transparent, the argument follows from the idea that the market is in a better position to more accurately evaluate the performance and risk of the projects and will not penalize the manager for bad performance which is beyond his control. This is consistent with studies such as Warner, Watts, and Wruck (1988), Morck, Shleifer, and Vishny (1989), and Barro and Barro (1990). Additionally, Gibbons and Murphy (1990) find evidence that both market-wide shocks and industry shocks are filtered from stock price performance for the CEO’s dismissal decision. These studies infer that transparency would lower the probability that a bad outcome due to the riskiness of the project would be attributed to poor managerial ability, especially if the shareholders approved the project before initiation. Thus, these studies support the conclusion that managers have incentives to increase risk in transparent firms in an effort to maximize their career potential.

My second hypothesis tests whether the manager’s risk tolerance impacts the relationship between risk and transparency. Hermalin and Weisbach (2007) suggest that transparency leads to increased compensation costs due to managerial risk aversion. Alternatively, transparency could induce the manager to accept riskier projects if he is confident that he will not bear the cost of risks that should be attributed to the project.

The third hypothesis is based on the importance non-managerial career concerns and is driven by the retention costs of qualified workers. As previously outlined in Almazan, Suarez, and Titman's (2004) argument, the benefits of minimizing reservation wages are highest when those costs are substantial. Examples would be industries in which the competition for skilled workers is considerably strong. In such cases, the firm has incentive to hold on to skilled employees. One method could be by reducing the probability of negative news being released since this news could scare off frighten away current workers and make it more difficult to attract new ones. Increased transparency makes it more difficult to contain such negative information. As a result, the firm may reduce the probability of negative news being released by reducing firm risk. This leads to the expectation that industries with the highest retention costs should reduce risk under high levels of transparency. Thus, I expect the negative relationship should be strongest for these industries.

2.3 Contributions to the literature

There are two empirical studies that examine the relationship between risk and transparency at the firm level. First, Ciccone (2003) models the determinants of transparency and finds that transparency, as measured by the dispersion of analysts' earning forecasts, is correlated with lower risk. Risk is measured using the firm's beta. However, his study does not control for potential endogeneity issues or address causality. Secondly, Cheng, Collins, and Huang (2003) find that stronger corporate governance, as measured by S&P Transparency and disclosure rankings, reduces firm risk as measured by beta. Unfortunately, the S&P Transparency and Disclosure rankings are only available for 2001 and are limited to the 500 firms followed by Standard and Poor's. These studies show that there is a relationship between risk and transparency, but does not explore reasons for this relationship.

I add to the literature in that I econometrically address the limitations of the previous studies by controlling for endogeneity and I also show causality. I attempt to expand the utility of the *S&P Transparency and Disclosure Score* with a similar predicted score that covers all firms in Compustat from 1992-2006. Consistent with Ciccone (2003) and Cheng et al., I find a negative relationship between firm risk and firm transparency using both traditional and my newly created proxy for transparency.

I further explore reasons for the negative relationship between risk and transparency. I analyze the importance of career concern from two perspectives—managerial compensation and the cost of retaining other valuable employees. I interact delta with my measures of transparency to test the effect of managerial compensation and find that the interaction mitigates the negative relationship between risk and transparency. I also interact an *HT dummy*[4] with my measures of transparency to test the effect of human capital costs. I find mixed result for the human capital cost argument.

3. Data sources, variable construction, and sample description

3.1 Data Sources

The primary data sources for this study include the *Institutional Brokers' Estimate System* **(**IBES**)**, the *Center for Research in Security Prices* (CRSP)/Compustat merged, and *ExecuComp*. Sample period is from 1992 to 2006. All analyst information is obtained from IBES and includes mean annual earnings per share (EPS) forecasts, actual annual EPS, and standard deviations for these measures. Compensation data pertain to the active CEO for the relevant year as identified by ExecuComp. Firm characteristics are obtained from the CRSP/Compustat merged database through WRDS.

3.2 Measures of Transparency

[4] *HT Dummy* is a Dummy variable set to one for firms in high tech industries as identified by Kwon (2002) and zero otherwise.

The first proxy for transparency is a measure of information asymmetry that is based on the extent of disagreement in analysts' earnings forecasts. Krishnaswami and Subramaniam (1999), argue that this measure captures the analysts' inability to understand the firm. I measure this level of asymmetry (dispersion) as the standard deviation of a firm's earnings per share estimates (EPS_i) as of the last reporting month prior to the release of the actual earnings per share, normalized by the firm's share price. The variable *DISPERSE* is then defined as follows;

$$DISPERSE = \frac{\left[\sum_{i=1}^{n} (EPS_i - \overline{EPS}_{FOR})^2 / N \right]^{0.5}}{Price}$$

where N is the number of reporting analysts, EPS_i is the actual earnings per share for the i^{th} firm, and $\overline{EPS}_{FOR}$ is the last average earnings per share released prior to the release of the actual earnings. As defined, *DISPERSE* is positively correlated with informational asymmetry or opaqueness. To capture *Transparency*, I use the negative value of *DISPERSE*:

$$Analyst\ Dispersion = -\ DISPERSE$$

Although several other studies also use analyst dispersion as a proxy for information risk, some argue that this measure merely captures differences of opinion among analysts. For example, all analysts could have incorrect, overly optimistic views of a firm, which would lead to low dispersion and a false interpretation of low transparency.[5] Therefore, I also look at a second variable for transparency which is defined as the accuracy of analyst estimates as suggested by Elton, Gruber and Gultekin (1984), Christie (1987), Dadalt, Gay and Nam (2001), and Atiase and Bamber (1994). All these studies show a positive correlation between firms with

[5] Barry and Brown (1981) and Givoly and Lakonishok (1984), among others, argue that analyst dispersion is a valid proxy for information risk, while Diether, Malloy and Scherbina (2002) and others consider it a proxy for differences of opinion among analysts.

higher forecast errors and those with higher levels of information asymmetry between managers and market participants regarding a firm's cash flows. The resultant variable *ACCUR*, which is used in these studies as well as this one, is:

$$ACCUR = \text{ABS}\left[\frac{\overline{EPS}_{FOR} - EPS_{ACT}}{Price}\right]$$

where, $\overline{EPS}_{\text{FOR}}$ is the last average earnings per share released prior to the release of the actual earnings and EPS_{ACT} is the actual earnings per share firm. The earnings data is obtained from IBES and the prices are obtained from CRSP. *ACCUR* captures opaqueness since it increases in deviation from the actual earnings. For ease of interpretation, I create an accuracy variable which is:

$$Accuracy = -ACCUR$$

Thus, both proxies are designed to capture the ability of the market to understand the cash flows of the firm.

3.3 Measure of Risk

Risk is calculated as the daily volatility of stock returns for the 365 days prior to the release of the actual EPS, as defined in ExecuComp. The variable *Risk* is winsorized at five percent. Thus values below the 5^{th} percentile (above the 95^{th} percentile) take on the values at the 5^{th} (95^{th}) percentile. This minimizes the likelihood that the results are driven by an abnormally high or low volatility calculation. Additionally, the stock must have at least ten months of data to be included in the analysis.

I also measure risk as the volatility of returns for the sixty months prior to the applicable earnings' forecast. I use this measure for consistency with current research. However I do not use it in my main regressions because of the time overlap limitations. Since I argue that *Transparency* is an independent variable that helps to explain risk, the fact that the sixty month calculation precedes the independent variable presents an econometric issue and leads to difficulty in interpreting the results.

3.4 Measures of Human Capital

Ranft and Lord (2002) highlight the importance of human capital in certain industries through a study of mergers and acquisitions. Those industries are computer hardware and software, electronics, telecommunications, biotechnology, and pharmaceuticals. They show that many of these mergers and acquisitions are designed with the goal of acquiring technical expertise and that the acquirers are willing to pay handsomely to attain and retain that human capital. Therefore, I use high technology industries as a proxy for human capital.

I use a measure based on Kwon (2002), who classifies firms as high technology and low technology firms based on their three-digit SIC code, to capture human capital. The variable is a dummy variable set to 1 if the firm is in an industry classified as high technology and 0 otherwise. The expectation is that highly technical firms rely more on specialized skill and intellectual expertise, so the pool of available candidates is expected to be smaller which drives up replacement and retention costs. High tech firms exhibiting a stronger relationship between transparency and risk would be consistent with the argument that human capital costs provide an incentive for managers to adjust firm risk. Appendix C provides the list of firms coded as 1. Any industry not listed is coded as 0.

3.5 Compensation

The sensitivity of CEO option grants to stock volatility (*Vega*) and stock price changes (*Delta*) are added to the regression to capture the risk taking behavior of the managerial compensation scheme. *Vega* and *Delta* are calculated using the method used by Coles, Daniel and Naveen (2006) and is outlined in Appendix A. According to Hermalin and Weisbach

(2007) the increasing Delta should have a mitigating effect on the relationship between risk and transparency. This result should hold even after controlling for the manager's incentives to take risks (vega).

3.6 Measures of Controls

The controls used in the specification used for *Risk* follow Coles, Daniel and Naveen (2006) and include both firm and CEO characteristics such as *Market-to-Book*, *Size*, *CEO Tenure*, Tobin's *Q*, and *Leverage*. I measure *Size* as the natural log of total assets or sales. Since both measures for *Size* give similar results, I report only results based on using *Ln (Sales)*. Similarly, I calculate *Leverage* as both book leverage and market leverage. Once again, the results are similar, so I only report the regressions that use book leverage. *Firm Age* is defined as the number of years the firm has appeared in the Compustat database. Finally, I define *Distress Dummy* as an indicator variable equal to one if the firm's earnings are negative, and zero otherwise.

3.7 Sample Description

I present summary statistics in table 1. The mean (median) value for *Risk* is 0.45% (0.36%). The mean (median) value for *Analyst Dispersion* is -0.0025 (0.0009). The mean (median) value for *Accuracy* is -0.008 (-0.012). The median firm in my sample has been present in the Compustat database for 19 years. The mean (median) value for *CEO Tenure* is 6.03 (4) years. The mean value for *Delta*, the sensitivity of the CEO's total option holdings at the beginning of the year is $602,000. This indicates that for a unit change in the stock price, the mean value for the change in a CEO's option holdings is $602,000. Similarly, for a unit change in the mean volatility by 1%, this will change the CEO's option holdings by about $64,000, as indicated by *Vega*. The summary statistics for the remaining variables are largely consistent with the extant literature. Table 2 describes the correlation among main variables. *Analyst Dispersion* is negatively correlated with *Risk* at a level of 0.13, while *Accuracy* is negatively correlated with *Risk* at a level of 0.13. Both correlations are significant at the one percent level. Younger and smaller firms are also positively correlated with *Risk*. Additionally, *Delta* is negatively correlated with *Risk* while *Vega* is positively correlated with *Risk*. The coefficient for *Delta* is significant at one percent while the coefficient for *Vega* is significant at five percent.

4. Transparency and Risk

I begin the analysis with an OLS regression using *Risk* as the dependent variable. The independent variables include the proxies for *Transparency* as well as controls for *Risk* and is designed to determine if there is a relationship between *Risk* and *Transparency*. The resultant model is:

$$\text{Risk}_{i,t} = \alpha_{,t} + \beta_1\text{Transparency}_{i,t-1} + \beta_2\text{CEO Tenure}_{i,t} + \beta_3\text{Firm Age}_{i,t} + \beta_4\text{Size}_{i,t} + \beta_5\text{Market-to-Book}_{i,t} + \beta_6\text{Book Leverage}_{i,t} + \beta_7\text{Delta}_{i,t-1} + \beta_8\text{Vega}_{i,t-1} + \beta_9\text{Distress Dummy}_{i,t} + \text{Fixed Effects}_{i,t}$$

4.1 Analyst Dispersion

Table 3 presents the result of the OLS regressions on *Risk*, using two measures of transparency. The first model uses *Analyst Dispersion* and the second model uses *Accuracy* as the proxy for transparency.

The first model indicates that the relationship between transparency and risk is negative and statistically significant using *Analyst Dispersion* as the proxy for transparency. The coefficient for *Analyst Dispersion* is -2.62 and is significant at the one percent level. This is consistent with the hypothesis that higher transparency levels result in lower firm risk. Other variables in the model are generally consistent with the extant literature. Smaller, younger, distressed, and more leveraged firms are riskier. I also find that *Vega* is positively related to *Risk* while *Delta* is negatively related to *Risk*. The coefficient for *Delta* is statistically significant at one percent. The expected sign for *Delta* can be either positive since higher delta increases the incentive to shift risk to debt holders. It can also be negative since managers could choose less risky projects to offset the fact that higher delta exposes the manager to more risk (see Coles, Daniel, and Naveen (2006) for a detailed explanation). Additionally, the coefficient for *Vega* is positive as predicted, and significant at one percent. As in Coles, Daniel, and Naveen (2006), I use the lagged values for *Vega* and *Delta* in the specifications. My findings are consistent with theirs.

The two variables that do not have significant coefficients are *CEO Tenure* and the *HT dummy*. The coefficient for *HT dummy* is negative as expected, but not significant. The coefficient for the tenure of the CEO is also negative. However, there is no clear consensus on the expected direction. One the one hand, CEOs with longer tenure are closer to retirement and may want to minimize the risk of their future compensation and consequently reduce firm risk, since a larger component of their total compensation is likely tied to the firm's output. Alternatively, CEOs with higher tenure are more entrenched in the firm than those with shorter tenures and thus are not as concerned about employment risk; inducing them to take on riskier projects since they are not as sensitive to the negative effects of bad outcomes. The relation between *CEO Tenure* and *Risk* therefore will depend on the relative strengths of these opposing effects.

4.2 Accuracy

The second model in Table 3 measures the impact of transparency on risk using *Accuracy* as the measure of transparency. Consistent with the standard deviation of analyst forecasts, I observe a negative relationship between *Accuracy* and *Risk* suggesting that managers respond to higher levels of transparency with lower levels of risk. The coefficient is -0.3694 and is significant at one percent. Results for all other variables are similar to those in column 1. For example, smaller, younger, leveraged, distressed, firms tend to be riskier. These variables are significant at one percent level. Additionally, *Vega* is positively related to *Risk* with a coefficient of 0.0003 and is significant at one percent. Consistent with previous studies, higher sensitivity of CEO wealth to stock volatility induces managers to choose riskier strategies. The coefficient for *Delta* is negative and statistically significant at one percent. As observed in the previous model, the coefficients for *CEO Tenure* and *HT dummy* are not found to be significant in the model. The coefficient for *HT dummy* is negative as predicted.

4.3 Endogeneity

Since the manager makes decisions that affect both firm risk and firm transparency levels, it is likely that several managerial characteristics, observable and unobservable affect the dependent variable (*Risk*) as well as the main independent variable (*Transparency*). While I have included certain observable characteristics such as tenure and incentives, there are unobservable variables such as managerial ability which may come into play. For instance, higher ability managers may arguably undertake riskier projects and perhaps confidently make their firms more transparent. Further, managerial ability could change over time. To address the potential endogeneity arising out of time variant unobservable variables, I use a two-stage least squares (2SLS) approach, where the second stage models firm risk as a function of transparency and various controls as in the case of the OLS regressions.

In the first stage, I estimate transparency as a function of the variables used to model risk and additional variables used as instrument variables. The first model in Table 4 presents the results from the two stage regression with *Transparency* as the main endogenous variable. The main instruments I use in this specification are *Industry Dispersion* and *Earnings Dummy*. *Industry Transparency* is the negative of the average dispersion based on industry as defined by its SIC. There is no economic reason to expect that *Risk* is correlated with this measure. However, since it is the industry average, it is related to *Transparency*.

Earnings Dummy is set to one if earnings decreased from the previous period. Ciccone (2003) find it to be an explanatory variable for transparency as do I. This makes sense based on the premise that a decline in earnings is negative news and it is more likely to be released in a transparent firm as opposed to an opaque firm since release of strong performance is good news for the company and manager while the release of poor performance is not. However, it is also conceivable that a decline in earnings makes a firm riskier. Thus, I test the validity of the instruments.

The F-statistic in the first stage of 25.76 indicates that the instruments are jointly relevant. Further, both instruments are statistically significant in the first stage regression presented in the second column. The Hansen – J statistic (value = 0.16) is unable to reject the null that the instruments are exogenous to the residuals, indicating that they exhibit valid instrument properties. As shown in the second stage regression in Table 4, *Analyst Dispersion* is negatively related to firm *Risk*. This relationship is statistically significant at the one percent level with a coefficient of -5.38 (t-value = 3.48). This implies that higher levels of transparency are offset with less risk. Thus my results are robust to corrections for endogeneity.

Furthermore, distressed and smaller firms are also found to have more risk. The coefficient for *Distress Dummy* (distressed firms) is 0.010 and significant at one percent. The coefficient for *Size* is also negative at -0.015 and is significant at ten percent.

The first stage transparency regression utilizes the methodology of Ciccone (2003). His study of analyst dispersion properties highlights the need for the following controls: *Size*, *Book Leverage*, *Distress Dummy* (set to one when the actual earnings in year t are less than zero and zero otherwise), and *Earnings Dummy* (set to one when actual earnings in year t are less than those in year t-1 and zero otherwise).

I also conduct the endogeneity tests with *Accuracy* as the measure of transparency, and present results in Table 4. A similar endogeneity concern holds for the relation between *Risk* and *Accuracy*. As before, I address this concern econometrically using instrumental variables.

Industry Accuracy is the mean industry average of the negative of the absolute difference of the average forecasted EPS and the actual EPS based on the SIC code. Analysis indicates that *Industry Accuracy* and *Earnings Dummy* act as relevant and valid instruments. Both are significant in the first stage, and Hansen J tests indicate validity, as shown in Column 2 of Table 4. The results are generally similar to the results using *Analyst Dispersion*.

The results of the 2-stage regressions are consistent with the OLS regressions. There is a significant inverse relationship between *Accuracy* and *Risk* in the second stage. Additionally, smaller, younger, more leveraged firms with higher vegas tend to be riskier. On average, the variables maintain their directional relationship, but do not maintain significance. For example, S*ize* is significant at ten percent and the *Distress Dummy* variable is significant at five percent. *Vega* maintains significance at the one percent level, but the *HT dummy* is no longer significant.

Overall, the results indicate a negative relationship between transparency and risk. These results hold for both proxies of transparency. Additionally, both are robust to econometric adjustments for endogeneity. These results are consistent with the argument that managers prefer lower risk when transparency is high. The following tables further explain the relationship and test the impact of the compensation scheme and human capital costs.

5. Career Concerns for Managers and Non-managers

Based on theoretical models presented in this study, two factors can interact with the risk and transparency relationship. One model is based on managerial career concerns and the other is based on non-manager career concerns, or the cost of retaining quality employees. The distinction between the two models is important since career concern is a private managerial incentive and can adversely affect the value of the firm if these incentives drive the manager to reduce risk below optimal levels from a shareholder point of view. On the other hand, the argument based on the cost of retaining quality employees, is a shareholder wealth based argument and works in the shareholders' best interest. The results heretofore do not clearly distinguish between the two incentives. Therefore, I add interaction terms to model incentives based on managerial career concerns (as captured by managerial compensation) and human capital concerns (as captured by the level of firm technology).

5.1 Non-manager Career Concerns

I control for the level of technology using Kwon's (2002) technology classifications, which are based on the 3-digit SIC codes to capture human capital costs. According to Kwon (2002), firms can either be high technology (high human capital, such as specializing in research and testing services) or low technology (low human capital, such as a grocery store). I create a dummy variable set to one if the industry is considered high technology as defined in Kwon (2002) and set to zero otherwise. Appendix 3 identifies the high technology firms as identified by its three-digit SIC code.

The human capital costs argument is based on the costs of retaining workers. Those costs are highest in industries that require specialized skill or those for which the pool of qualified candidates is smallest. High tech firms as defined by Kwon (2002) would fall into this category. This group includes technology, research, electronics, and other industries. Managers in these firms have incentives to make special efforts to retain the qualified employees they employ. This includes suppressing negative firm information that might convince these employees to seek employment elsewhere. In a transparent firm, reducing risk is one method that can be employed. Reducing risk is of greatest benefit to firms that have the highest human capital costs. This suggests that the inverse relationship between risk and transparency should be strongest for high tech firms. Therefore, I then create an interaction term by multiplying the *HT Dummy* variable with the measures for transparency. A negative coefficient would be supportive of this theory.

Table 5 reports results from the relationship between *Transparency* and *Risk* for models including interaction terms. The coefficient for the high technology interaction term is positive and significant for transparency as measured by analyst dispersion. The positive coefficient suggests that highly technical firms partially mitigate the effects transparency which is negative. On average, this result is not consistent with the study by Almazan, Suarez, and Titman (2004) which suggests that human capital costs should induce lower risk when transparency is high. A possible explanation for the opposite finding based on the fact that high technology firms are usually riskier than low technology firms. Therefore high technology firms benefit more from the positive influence of transparency (i.e. reduced cost of capital, increased liquidity, etc) and can thus chooses a higher degree of risk relative to lower technology firms.

5.2 Compensation

Compensation has previously been shown as a factor in determining risk. To determine whether or not it is also conditional on transparency, I add an interaction terms to the model in Table 5. I find that the interaction term using *Delta* is significant for *Analyst Dispersion* as shown in column 1. The coefficient for the interaction term is significant at one percent level. The positive value of the interaction of *Delta* and *Transparency* provides strong evidence that the level of managerial wealth reduces the impact of transparency on risk. This is consistent with the argument that managers require additional pay to bear increased risk when firms are more transparent. In essence, managers require higher pay for transparent firms when risk is high. This is in line with the argument of Hermalin and Weisbach (2007). I also find that the same explanation holds for transparency when *Accuracy* is the proxy for transparency as listed in column 2. The only difference is that the interaction term with *Delta* is now significant at ten percent. The control variables are generally consistent with predictions. The exception is *Book Leverage*. However, the coefficient is not statistically significant. This result is consistent with the hypothesis that the compensation structure has a mitigating effect on the relationship between risk and transparency.

5.3 Endogeneity

Endogeneity remains a concern with the addition of the interaction terms. To the extent that *Transparency* is endogenous, it is plausible that each interaction term is also endogenous. Thus I instrument the interaction terms using measures based on the mean of transparency. Additionally, I use *Earnings dummy* as an instrument, which exhibited strength in the models without interaction terms. I also test a geographical based dummy that is one for firms located in New York, Illinois, or California. The reason is based on the supposition that those states house a concentration of large analysts firms and the proximity may provide an information gathering edge.

Table 6 lists the results of the model using interaction terms based on the mean of the industry and earnings to instrument for *Transparency*. The coefficient for the interaction term utilizing technology is negative as expected, but is not significant. The direction indicates that high technology firms amplify the effect of the relationship between transparency and risk similar to the OLS regressions.

The coefficient for the interaction term based on the managers' compensation structure is significant at ten percent. Additionally, it is positive as expected. I also continue to find that distressed, smaller firms exhibit higher risk. The F-statistics range from 12.78 to 24.83. Additionally, the coefficient for the Anderson-Rubin is significant while the Hansen-J is not.

Table 6 also contains the model for the regression using *Accuracy*. This model uses instruments based on compensation and level of technology. As with the interaction terms the model in the model using *Analyst Dispersion*, not all are significant. The only significant coefficient is associated with the interaction term comprised of *Accuracy* and *Delta*. The interaction term utilizing *Delta* (*Accuracy*Lag of Delta*) is significant at five percent. The coefficient is positive and thus mitigates the effects of transparency on risk as expected. Once again, the result is consistent with the explanation that managers require increased compensation to maintain risk under increased transparency.

The results suggest support for the explanation of managerial career incentives as modeled by Hermalin and Weisbach (2007). This is true for both the OLS regressions and the 2SLS regressions. However, results are not consistent with the explanation that increased human capital costs provide incentives for the manager to reduce risk when transparency is high.

6. Proxy based on Standard and Poor's Transparency and Disclosure Score

A third measure of transparency is based on the *S&P Transparency and Disclosure Rankings*, which were released on October 15, 2002. Standard & Poor's released the ranking of Transparency and disclosure (T&D) scores for the S&P 500 firms. The rankings are a qualitative measure of the disclosures contained in the firms' annual reports and regulatory filings and consist of three subcategories of disclosure that S&P asserts are relevant in assessing firms' corporate governance mechanisms: ownership structure and investor rights, financial transparency and information disclosure, and board and management structure and process. These are also aggregated into an overall score.[6]

In this assessment of governance and disclosure practices by S&P, a higher ranking indicates more disclosure. However, S&P calculated the rankings only for those firms on the S&P 500 in 2001, so the utility of the event study is limited. [7] I use individual firm characteristics and the S&P score to model a predicted *T&D score*.

6.1 Actual T&D Score

Table 7, column 1 presents results of the OLS regressions based on the *Ln(T&D score)* as published by Standard and Poor's in 2002 for their 2001 firms. Since the score exists for one year, I adjust the test sample forward by one year. The *Ln(T&D)* is calculated for 2001. It should be a lagged variable in the OLS regressions. Thus, all other variables, with the exception of *Delt*a and *Vega*, are calculated using 2002 data. The coefficient for the log of the S&P's T&D score is -0.07 and significant at one percent indicating that higher transparency is associated with lower levels of risk. As with previous results, smaller, younger, financially distressed firms are

[6] See Dallas and Patel (2002) for a detailed explanation of how the scores are determined.

[7] While the S&P contains 500 firms, due to data availability, only 460 received scores. See Patel, S. A. and G. S. Dallas (2002). *Transparency and Disclosure: Overview of Methodology and Study Results - United States*, SSRN for a complete list.

riskier. Compensation also behaves in a matter as expected based on previous literature. *Vega* increases with risk while *Delta* decreases. Both are significant at one percent. As shown in column 2, the interaction terms are not significant. However, the direction for the high tech interaction terms has the expected direction.

Table 8 report results from 2SLS regressions. The first column uses the natural log of the 2001 Standard and Poor's Transparency and Disclosure Score without interaction terms. Since *Risk* and *Transparency* are endogenously determined, I do not adjust the dataset forward. I find a negative relationship between *Risk* and *Transparency* at a level of one percent. Additionally, the coefficient for *Delta* is negative as expected and significant at one percent. These results are consistent with the previous models and highlight the existence of the relationship between risk and transparency.

An analysis of the interaction terms in column two is not consistent with the importance of the manager's compensation package. The coefficient is positive as and significant at the ten percent level. However, it is difficult to interpret this as strong evidence against the compensation argument since it is only one year and a tumultuous year at that. The score was developed in 2002 using 2001 data. This is also the time period when numerous firm scandals came to light (such as Enron) and regulators were meeting to discuss various courses of action. It is possible that the manager's were reacting to the market uproar and during this time, the uncertain future superseded the potential gains from performance based compensation. The coefficient for the high tech interaction term is negative as expected, but is insignificant.

6.2 Predicted Model

The description of the methodology I use to predict a Transparency and Disclosure is explained in the rest of this section. However, the strongest correlation between the predicted score and actual score that I obtain is .30.

First, I create multiple linear models based on the following firm characteristics: number of employees, 60 month volatility of stock returns, Delta, Vega, Capital Expenditures, R&D expenses, Advertising costs, Book Leverage, Market Leverage, Market to Book, Size of Assets, Size of Sales, Tobin's Q, Value of Net Property Plant and Equipment, Sale of Property Plant and Equipment, the Altman Z Score, the Amount of Surplus Cash, the Amount of Collateral, the Amount of Deficit for the Firm, the Amount of Common Equity, the Amount of Convertible Debt, Net Income, Operating Cash Flow, the Number of Analysts, the Dispersion of the Volatility of Returns, the Change in Earnings, Earnings Dummy, Distress Dummy, the Age of the Firm, the Age of the CEO, the Geographical Location of the Firm (State), the Financing Deficit, the Firm's Return on Assets, the Industry's Return on Assets, the Sales Growth of the Firm, and the Change in Tangibles for the Firm. Additionally, I use the log and the lag of the variables where appropriate. The variables are obtained from Compustat. These characteristics are used since they provide information about the cash flows of the firm, about the characteristics of the firm, or about the characteristics of the manager and as such may be related to the transparency of the firm. Additionally, I limited the variables by available data. While Compustat contains numerous variables, not all are fully populated. Since I have such a small dataset, I only include variables with at least 75% availability. Each variable is classified in either the cash flow group, firm characteristic group, or manager characteristic group.

The dataset is limited by the number of observations (460) used in the original S&P study. The number of observations in turn limits the number of variables that can be used and still maintains the ability to create an econometrically viable matrix for regression purposes. Therefore, I create a basic model using groups outlined above and proxies for transparency. The generalized model is:

$$\text{Predicted Score}_{i,t} = \alpha_{,t} + \beta_1\text{Transparency}_{i,t} + \beta_2\text{Cash Flow Measure}_{i,t} + \beta_3\text{Firm Characteristic Measure}_{i,t} + \beta_4\text{Manager Characteristic Measure}_{i,t} + E_{i,t}$$

Since the goal is to find as additional proxy for transparency, I add transparency to the model with the expectation that the predicted score should be correlated with proxies for transparency currently in use. However, when testing the various models, I did test them with and without currently available transparency proxies. I create a set of generic models using the characteristics obtained from Compustat and described above. I limit the models to two proxies per measure for parsimony. Since the Scores are bounded between 1 and 10, I create the models transforming the score using the natural log of the score.

The specific regressions are created by separating the 460 firms that received S&P scores into two groups to create an out of sample list for testing purposes. I randomly extract 260 Firms from the sample to create a test group, which leaves 200 firms for the out of sample group. While the sample drawn is random, there is a certain amount of homogeneity among the firms since all meet the criteria to be listed in the S&P 500.

I create the regression models using the *Transparency and Disclosure Score* based on the characteristics of Standard and Poor's score using the 260 firms in the test group. The dependent variable is created using the log transformation of the *S&P Transparency and Disclosure Score* as the dependent variable. I create predicted scores for each regression model using the out of sample group. I then calculate the Root Mean Squared Error of the Predicted Score from the model and the Actual Score for the out of sample group. I repeat the process with the next generic model. I keep the regression with the lowest Root Mean Squared error (MSE). The predictive model based on minimizing the Root Mean Squared Error that emerges is:

$$Ln(Score)=1.972-5.47782*Accuracy_{t-1}+0.24907*Market\ Leverage+0.207031*Surplus\ Cash.$$

This model results in the lowest overall Root MSE of 0.064.[8] The *Predicted Transparency Score* has *Accuracy*$_{t-1}$, and *Market Leverage* as explanatory variables.

These explanatory variables are consistent with expectations for firm transparency. For example, *Market Leverage* is consistent with Easterbrook (1984) who argues that when firms are forced to pay out a higher fraction of their cash flow, they are subject to greater scrutiny because of their need to access external capital. Such scrutiny benefits those firms by reducing agency problems between shareholders and managers. The model by Almazan, Suarez, and Titman suggest the suitability of using leverage as a proxy for transparency. The appropriateness of *Accuracy* follows from the argument that both *Accuracy* and the *S&P Transparency and Disclosure Score* are proxies for firm transparency. Finally, *Surplus Cash* as an asset is easily valued and as such, should be positively correlated with transparency.

6.3 Results with Predicted T&D Score

The results with the predicted T&D score are consistent the models using other proxies for transparency as shown in Table 9. The coefficient for the *Ln(Predicted TD)* is negative and significant at one percent. Additionally, all control variables are in line with current literature and the other proxies for transparency. Smaller, distressed, more highly leveraged, younger firms are riskier. The coefficient for *Vega* is positive while *Delta* is negative. Results continue to confirm a negative relationship between the level firm risk and the level of firm transparency.

6.4 Human Capital and Compensation

[8] The strongest model that did not involve a transformation of the score had a root mean squared error of 0.46. This non-transformed model is used as a robustness check with similar results.

The second column in Table 9 includes interaction terms based on managerial compensation and human capital. The interaction using *Delta* continues to be significant. The coefficient is positive and significant at one percent. The direction of the coefficient suggests *Delta* softens the relationship between risk and transparency. Thus, holding transparency constant, managers require increased compensation to maintain the firm's level of risk. This is consistent with the argument that transparency is associated with higher compensation costs. Once again, results follow Hermalin and Weisbach (2007).

The coefficient for the interaction with the *HT Dummy* and *Transparency* is positive as in the previous models. It is significant at a level of five percent. Once again, evidence does not support the argument that managers reduce firm risk in an effort to minimize human capital costs. Instead, managers seem to take advantage of the benefits of transparency.

6.5 Endogeneity

The negative relationship between *Risk* and *Transparency* is robust to econometric adjustments for endogeneity as highlighted in the first column of Table 10. The coefficient for *Ln(Predicted TD)* is negative and significant at the five percent level. Additionally, distressed firms are riskier and *Vega* increases in firm risk.

When the interaction terms are included, they maintain the expected sign, but are not significant. It is also important to note that the instrument variables do not maintain all the necessary properties. For example, while the other endogenous variables have F-statistics above 10, the F-statistic for *Ln(Predicted TD)*HT Dummy* is 3.67. Thus, I am unable to make interpretations based on this model. I also adjust the errors using the technique of bootstrapping to determine significance for both the predicted and actual Transparency and Disclosure Scores. The tests were run with the default of 50 iterations and then again with 100 iterations. In all cases, results were consistent. For example interaction coefficients in Table 10 column 2 remain insignificant. Additionally, the Sargan statistics for the models are listed in table 10. The Sargan statistic is 1.665 and the p-value is 0.1970 for the model that includes the interaction terms. The Sargan statistics reflect the models based on 100 iterations.

7. Conclusion

This study analyzes the impact of the degree of firm transparency on a manager's risk taking behavior. Risk is measured as the overall firm risk based on the volatility of stock returns. Transparency is measured using analyst forecast measures. I find a negative relationship between firm risk and firm transparency. This result holds while controlling for endogeneity, through the use of lagged variable and 2SLS. The result continues to hold for transparency as measured by *Analyst Dispersion*, *Accuracy* and my *Predicted Transparency and Disclosure Score*. Therefore, I interpret this as evidence that managers have on average incentives to reduce risk under higher levels of transparency. This finding is consistent with Hermalin and Weisbach (2007) and Almazan, Suarez, and Titman (2004), but not with John, Litov, and Yeung (2008). Since the tests are not mutually exclusive, it possible that the firm has incentive to increase risk, but that the incentive does not dominate the incentive to decrease risk.

I also test two theories that suggest an influence on the relationship between risk and transparency. One theory is based on the manager's desire to protect his personal career and compensation and the other theory is based on the firm's desire to manage employee reservation wages. Understanding managers' motivations with regard to his career concerns versus those of other employees is essential because they have different implications for shareholders. A manager who keeps valuable employees while minimizing the reservation wage is making decisions in the best interest of the shareholders. However, a manager who makes decisions to protect his personal job may lead to additional costs for the shareholders.

While I find that human capital costs are a factor in the relationship between risk and transparency in many of the regressions, results of the directional impact are mixed. For example, the coefficient is positive and significant in some models while negative and insignificant in others. I find, in some instances, that firms in high technology industries offset the negative correlation between risk and transparency. One explanation could be that since these firms are riskier by nature, they derive a larger benefit from the positive aspects of transparency. These benefits include the reduction of asymmetric information, the reduction of the cost of capital, and an increase in liquidity. These benefits are stronger than the cost of retaining workers leading to these firms increasing risk when transparency is high. In other cases, I find that firms in high technology industries magnify the negative relationship between risk and transparency. These findings are consistent with Almazan, Suarez, and Titman (2004).

I find strong support for the argument that the level of firm transparency impacts the amount of risk the manager is willing to take and that the manager's compensation factors into his decision. In line with Hermalin and Weisbach (2007), my findings indicate that compensation sensitivity partially mitigates the negative relationship between risk and transparency. This is a very important issue since the current corporate environment seems to prefer greater transparency.

Furthermore, managerial compensation is a current topic of interest and area of concern. Determining the level of transparency and managerial compensation independent of each other can lead to the manager choosing a suboptimal level of risk or unanticipated costs being leveled against the shareholders. Thus the interaction between transparency and the manager's compensation package has implications for any group involved in setting firm transparency and/or the manager's compensation package. This includes the managers, the shareholders, and regulators.

Appendix A: Calculation of *Vega* and *Delta* Measures

This appendix explains how the *Delta* and *Vega* measures used in this paper have been calculated. I follow the methodology discussed in Core and Guay (2002) and Guay (1999). The explanation is from Coles, Daniel, and Naveen (2006).

Value and sensitivities for a single option

I calculate the option value based on Black-Scholes formula (Black and Scholes, 1973) for valuing European call options, as modified by Merton (1973) to account for dividend payouts.

Option value = $Se^{-dt}N(Z) - Xe^{-rt}N(Z-\sigma T^{(1/2)})$

where $Z = [\ln(S/X) + T(r-d+\sigma^2/2)]/\sigma T^{(1/2)}$

S = price of the underlying stock

X = exercise price of the option

T = time to maturity of the option in years

r = log of risk-free interest rate

σ = expected stock-return volatility over the life of the option

N( ) = cumulative probability function for the normal distribution

Delta = the sensitivity of the option value with respect to a 1% change in stock price

= $e^{-dt}N(Z)*(price/100)$

Vega = the sensitivity of the option value with respect to a 0.01 change in stock volatility

= $e^{-dt}N'(Z)*ST^{(1/2)}*0.01$

where N′(Z) is the normal density function. I multiply the sensitivity and delta by the number of options to obtain the total dollar values of the change in CEO's wealth that will result from a 1% change in stock price and 0.01 change in stock volatility.

Value and sensitivities for portfolio of options

I compute fiscal year end value and sensitivities of executives' option portfolios using the Core and Guay (2002) approximation method. I use ExecuComp data, which gives the realizable value (the potential gains from exercising all options on the fiscal year end price) and the number of options separately for both exercisable and unexercisable options and details of the current year's option grant.

1. For the current year's grant, I compute the Black-Scholes value and sensitivities using the above formulae.

2. For previously granted options, I compute the Black-Scholes value and sensitivities separately for exercisable and unexercisable options.
    a. I compute the average exercise price separately for the portfolio of exercisable options and unexercisable options. This is done in two steps. First, I divide the realizable value by the number of options, which gives the average of (stock price – exercise price). Second, I subtract this number from the stock price to arrive at the average exercise price.

b. For exercisable options, I set the time to maturity as three years less than the time to maturity of the current year's options grants, or six years if no grant was made in the current year.
c. For unexercisable options, I set the time to maturity equal to one year less than the time to maturity of the current year's options grants, or nine years if no grant was made in the current year.
d. I then compute the Black-Scholes option value, delta, and vega using the average exercise price and time to maturity.

3. I calculate the delta of the manager's portfolio of stocks and options by adding the delta of restricted stock and shares held by the CEO to the delta of his options portfolio. The delta of stock = the fractional shareholding * 0.01 * stock price. The vega of the manager's portfolio of stock and options = vega of new options granted + vega of all exercisable options held + vega of all unexercisable options held. I do not estimate separately the vega of restricted stock and shares as Guay (1999) finds that this value is insignificant compared to the vega from options.

Appendix B: Variable Definitions

Dependent Variables	**Source**	**Definition**
Risk	CRSP	Variance of the daily stock returns calculated over the current year.
Independent Variables	**Source**	**Definition**
Analyst Dispersion	IBES	The negative of the standard deviation of the current fiscal year EPS forecasts, scaled by the stock price.
Transparency Score	S&P website	S&P Transparency and Disclosure Rankings released on 10/15/2002.
Accuracy	IBES	The negative of the ABS[(EPS_{for}-EPS_{act}) / Price].
CEO Age	ExecuComp	The age of the CEO. When missing, the average CEO age for the current year is used.
CEO Tenure	ExecuComp	The tenure of the CEO. When missing, the average CEO tenure for the current year is used.
Book Leverage	Compustat	Total debt divided by book value of assets.
Market Leverage	Compustat	Total debt divided by market value of assets.
Market-to-Book	Compustat	(Number of shares outstanding times share price at fiscal year-end, minus book value of common equity plus book value of total assets) to the book value of total assets.
Size	Compustat	Calculated as natural logarithm of total assets or natural logarithm of total sales.
Distress Dummy	Compustat	Dummy set to one if earnings are less than zero
Tobin's Q	Compustat	Sum of the market value of equity, liquidating value of the firm's outstanding preferred stock, value of the firm's short term liabilities net of its short term assets, and book value of the firm's long-term debt divided by the total assets of the firm.
ROA	Compustat	Ratio of earnings before interest and taxes (#178) to total assets (#6) multiplied by 100 and adjusted by the industry median (using 3-digit SIC codes).
Industry Accuracy	IBES	Industry median of Accuracy based on the 3-digit SIC codes.
Industry Transparency	IBES	Industry median of Analyst Dispersion based on the 3-digit SIC codes

Independent Variables	**Source**	**Definition**
Earnings Dummy	Compustat	Dummy variable set to 1 if earnings decrease from the previous year and 0 otherwise
Ln(Predicted TD)	Compustat	Prediction of the Ln(Transparency and Disclosure Score)
Delta	ExecuComp	See Appendix A
Vega	ExecuComp	See Appendix A
Sales Growth	Compustat	Relative change in net sales (#12) from the previous period.
Financing Deficit	Compustat	The sum of cash dividends, investments, changes in working capital, internal cash flow. Computed using the exact Frank and Goyal (2003) specification.
Change in Tangibles	Compustat	Change in the ratio of property, plants, and equipment (item #8) to the book value of total assets (item #6).
Change in ROA	Compustat	Percentage change in firm-level earnings before interest and taxes over total assets.
Industry ROA	Compustat	Ratio of earnings before interest and taxes (#13) to total assets (#6), multiplied by 100. Measured at industry median, based on 3-digit SIC codes.
Industry Market-to-Book	Compustat	Industry median ratio of MKTVAL, firm market value (item #25, number of shares outstanding time item #199, share price at fiscal year-end, minus item #60, book value of common equity, plus item #6, book value of total assets) to the book value of total assets (item #6).
Industry Sales Growth		Relative change in net sales (#12) from the previous period. Measured at industry median, based on 3-digit SIC codes.
Geography	Compustat	Dummy variables for firm location in the state of New York, Illinois and California.

Appendix C1: Three-Digit SIC Codes of High-Tech Sample

Three-Digit SIC Codes	Industry
272	Periodicals
283	Drugs
355	Special industry machinery
357	Computer and office equipment
360	Electronic and other electric equipment
361	Electric distribution equipment
362	Electrical industrial apparatus
363	Household appliances
364	Electric lighting and wiring equipment
365	Household audio and video equipment
366	Communications equipment
367	Electronic components and accessories
369	Miscellaneous electrical equipment and supplies
381	Search and navigation equipment
382	Measuring and controlling devices
481	Telephone communications
484	Cable and other pay TV services
489	Communications services, NEC
573	Radio, TV and electronics stores
737	Computer and data processing services
873	Research and testing services

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TABLE 1

Descriptive Statistics

Variable	Mean	Std Dev	Median	Lower Quartile	Upper Quartile
Dependent Variable					
Risk	0.4518	0.1944	0.3585	0.2667	0.4930
Transparency					
Analyst Dispersion	-0.0025	0.0077	-0.0009	-0.0051	-0.0004
Accuracy	-0.0079	0.0381	-0.012	-0.0133	-0.0003
Firm Characteristics					
Firm Age (yrs)	22.2300	14.80	19	9	33
Sales ($000s)	4796	12904	1263	451	3957
Book Leverage	0.2336	.1880	0.2191	0.0806	0.3407
Market-to-Book	2.0768	2.3489	1.5131	1.1633	2.2229
HT Dummy	0.2600	0.4387	0	0	1
Distress Dummy	0.3281	0.4695	0	0	1
CEO Characteristics					
Vega ($000s)	64	109	54	12	84
Delta ($000s)	602	1003	188	69	573
CEO Tenure (yrs)	6.0391	6.5901	4	1	9
Instrument Variables					
Earnings Dummy	0.0695	0.2543	0	0	0
Industry Transparency	0.0025	0.0018	0.0023	0.0016	0.0031
Industry Accuracy	0.0079	0.0084	0.0062	0.0036	0.0105

This table presents descriptive statistics. Accounting data are obtained from Compustat for 1992-2006 period and the analyst forecast data are obtained from IBES. *Risk* is the daily volatility of stock returns. *Analyst Dispersion* is the negative of the standard deviation of analyst forecasts divided by the fiscal year end price. *Accuracy* is the negative of the ABS[(EPS_{for}—EPS_{act}) / Price]. *Delta* is the dollar sensitivity of the option value with respect to a 1% change in stock price. *Vega* is the dollar sensitivity of the option value with respect to a 0.01 change in stock volatility. *HT Dummy* is a Dummy variable set to one for firms in high tech industries as identified by Kwon (2002) and zero otherwise. *Sales* are the total sales. *Book Leverage* is total debt divided by book value of assets. *Market-to-Book* is the number of shares outstanding times share price at fiscal year-end, minus book value of common equity plus book value of total assets to the book value of total assets. *CEO Tenure* is the tenure of the CEO. When missing, the average CEO tenure for the current year is used. *Firm Age* is the number of years the firm is listed in the Compustat. *Distress Dummy* takes a value of one if earnings are negative and zero otherwise. Industry Dispersion is the industry mean of analyst dispersion. Industry Accuracy is the mean of Accuracy. Earnings Dummy is set to one if $earnings_t$ are less than $earnings_{t-1}$ and zero otherwise. *t*-statistics based on robust standard errors are within parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

TABLE 2
Correlation Matrix

	Risk	*Analyst Dispersion*	*Accuracy*	*Size*	*Book Leverage*	*Market-to-Book*	*CEO Tenure*	*Firm Age*	*Delta$_{t-1}$*	*Vega$_{t-1}$*	*HT Dummy*	*Distress Dummy*
Risk	1.00000											
Analyst Dispersion	-0.1273*	1.00000										
	0.00000											
Accuracy	-0.1347*	0.4737*	1.00000									
	0.00000	0.00000										
Size	-0.3994*	0.0842*	0.0430*	1.00000								
	0.00000	0.00000	0.00000									
Book Leverage	0.1565*	0.1138*	0.0749*	-0.1725*	1.00000							
	0.00000	0.00000	0.00000	0.00000								
Market-to-Book	-0.2431*	-0.0978*	-0.0715*	0.1709*	-0.1381*	1.00000						
	0.00000	0.00000	0.00000	0.00000	0.00000							
CEO Tenure	0.0167*	0.0308*	0.0316*	-0.0347*	0.0169*	-0.00850	1.00000					
	0.04630	0.00290	0.00220	0.00000	0.03530	0.28750						
Firm Age	-0.3833*	0.0224*	0.0179*	0.4969*	-0.1587*	0.1470*	-0.0530*	1.00000				
	0.00000	0.03020	0.08250	0.00000	0.00000	0.00000	0.00000					

Continued…

Table 2 (Continued)

	Risk	*Analyst Dispersion*	*Accuracy*	*Size*	*Book Leverage*	*Market-to-Book*	*CEO Tenure*	*Firm Age*	*Delta*	*Vega*	*HT Dummy*	*Distress Dummy*
Delta$_{t-1}$	-0.3660*	-0.0262*	-0.01240	0.2197*	-0.1649*	0.1578*	-0.1359*	0.3574*	1.00000			
	0.00000	0.01110	0.22790	0.00000	0.00000	0.00000	0.00000	0.00000				
Vega$_{t-1}$	0.01160*	0.00340	0.00230	0.01120	-0.00630	0.00170	-0.00760	-0.01230	0.01060	1.00000		
	0.03400	0.77570	0.84830	0.23020	0.49870	0.85490	0.41630	0.18720	0.25630			
HT Dummy	0.3924*	-0.0293*	-0.01640	-0.2319*	0.1904*	-0.2313*	0.00550	-0.1694*	-0.2375*	-0.00550	1.00000	
	0.00000	0.00450	0.11240	0.00000	0.00000	0.00000	0.49080	0.00000	0.00000	0.55650		
Distress Dummy	0.1141*	-0.1634*	-0.1790*	-0.0651*	-0.0895*	0.1199*	-0.0366*	-0.00660	0.0834*	-0.00790	0.0202*	1.00000
	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00040	0.52070	0.00000	0.50620	0.04890	

The correlations among the variables for the period 1992-2006 are presented in this table. Accounting data are obtained from Compustat for 1992-2006 period and the analyst forecast data are obtained from IBES. *Risk* is the daily volatility of stock returns. *Analyst Dispersion* is the negative of the standard deviation of analyst forecasts divided by the fiscal year end price. *Accuracy* is the negative of the ABS[(EPS_{for}—EPS_{act}) / Price]. *Delta* is the dollar sensitivity of the option value with respect to a 1% change in stock price. *Vega* is the dollar sensitivity of the option value with respect to a 0.01 change in stock volatility. *HT Dummy* is a Dummy variable set to one for firms in high tech industries as identified by Kwon (2002) and zero otherwise. *Sales* are the total sales. *Book Leverage* is total debt divided by book value of assets. *Market-to-Book* is the number of shares outstanding times share price at fiscal year-end, minus book value of common equity plus book value of total assets to the book value of total assets. *CEO Tenure* is the tenure of the CEO. When missing, the average CEO tenure for the current year is used. *Firm Age* is the number of years the firm is listed in the Compustat. *Distress Dummy* takes a value of one if earnings are negative and zero otherwise. The p-values are in parenthesis. * indicate significance at 10% or less.

TABLE 3
OLS Regressions of Risk on Analyst Dispersion and Accuracy

Variable	Predicted Sign	Risk		Risk	
Constant		0.4297	***	0.3193	***
		(6.30)		(6.23)	
Year Dummies		Yes		Yes	
Analyst Dispersion$_{t-1}$	+/-	-2.6211	***		
		(-6.23)			
Accuracy$_{t-1}$	+/-			-0.3694	***
				(-4.45)	
Size	-	-0.0275	***	-0.0283	***
		(-11.68)		(-12.08)	
Book Leverage	+	0.0507	***	0.0471	***
		(3.52)		(3.28)	
Market-to-Book	-	-0.0046	***	-0.0045	***
		(-3.13)		(-3.12)	
CEO Tenure	+/-	-0.0002		-0.0002	
		(-0.55)		(-0.64)	
Firm Age	-	-0.0023	***	-0.0022	***
		(-9.24)		(-9.06)	
Delta$_{t-1}$	+/-	-0.2052	***	-0.2062	***
		(-7.73)		(-7.76)	
Vega$_{t-1}$	+	0.0003	***	0.0003	***
		(7.10)		(6.6)	
HT Dummy	-	-0.0064		-0.0063	
		(-0.57)		(-0.52)	
Distress Dummy	+	0.0180	***	0.0181	***
		(5.4)		(5.41)	
Observations		8049		8048	
R-Squared		0.41		0.40	

This table presents fixed effects regression models with the daily volatility of stock returns *(Risk)* for firm *i* for fiscal year *t* as the dependent variable for a sample of firm-year observations made over the period 1992-2006. *Analyst Dispersion* is the negative of the standard deviation of analyst forecasts divided by the fiscal year end price. *Accuracy* is the negative of the ABS[(EPS_{for}—EPS_{act}) / Price]. *Delta* is the dollar sensitivity of the option value with respect to a 1% change in stock price. *Vega* is the dollar sensitivity of the option value with respect to a 0.01 change in stock volatility. *HT Dummy* is a Dummy variable set to one for firms in high tech industries as identified by Kwon (2002) and zero otherwise. Control variables are described in Appendix B. The t-values are in parentheses and reflect standard errors that are heteroskedasticity robust and corrected for the cluster sample problem arising from multiple observation for each firm. Subscripts (excluding those indicating lags) have been dropped in the table above for ease of presentation. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

TABLE 4

2SLS Regressions of Risk on Analyst Dispersion and Accuracy

Variable	Predicted Sign	Risk		Risk	
Constant		0.1391	***	0.2075	***
		(15.90)		(3.09)	
Year Dummies		Yes		Yes	
Analyst Dispersion	+/-	-5.3789	***		
		(-3.48)			
Accuracy	+/-			-0.8679	***
				(-3.49)	
Size	-	-0.0151	*	-0.0146	*
		(-1.96)		(-1.79)	
Book Leverage	+	0.0412		0.0251	
		(1.55)		(1.05)	
Market-to-Book	-	-0.0035		-0.0028	
		(-1.61)		(-1.36)	
CEO Tenure	+/-	-0.0004		-0.0005	
		(-1.26)		(-1.41)	
Firm Age	-	0.0050		0.0047	
		(0.53)		(0.49)	
$Delta_{t-1}$	+/-	-0.0267		-0.0262	
		(-1.02)		(-0.99)	
$Vega_{t-1}$	+	0.0006	***	0.0005	***
		(7.43)		(7.1)	
HT Dummy	-	0.0189	*	0.0175	
		(1.79)		(1.64)	
Distress Dummy	+	0.0103	***	0.0085	**
		(2.92)		(2.32)	
Observations		9734		9733	
R-Squared		0.49		0.49	
Tests for Relevance and Validity of Instruments					
F-Stat Analyst Dispersion		25.76	***		
F-Stat Accuracy				20.60	***
Anderson-Rubin		11.02	***	10.39	***
		(0.0000)		(0.000)	

Continued…

Table 4 (Continued)

Hansen J	0.16	1.13
	(0.6917)	(0.2871)
Instruments Used:	Industry Dispersion	Industry Accuracy
	Earnings Dummy	Earnings Dummy

This table presents fixed effects regression models with the daily volatility of stock returns *(Risk)* for firm *i* for fiscal year *t* as the dependent variable for a sample of firm-year observations made over the period 1992-2006. *Analyst Dispersion* is the negative of the standard deviation of analyst forecasts divided by the fiscal year end price. *Accuracy* is the negative of the ABS[(EPS_{for}—EPS_{act}) / Price]. *Delta* is the dollar sensitivity of the option value with respect to a 1% change in stock price. *Vega* is the dollar sensitivity of the option value with respect to a 0.01 change in stock volatility. *HT Dummy* is a Dummy variable set to one for firms in high tech industries as identified by Kwon (2002) and zero otherwise. Control and instrument variables are described in Appendix B. The t-values are in parentheses and reflect standard errors that are heteroskedasticity robust and corrected for the cluster sample problem arising from multiple observation for each firm. Subscripts (excluding those indicating lags) have been dropped in the table above for ease of presentation. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

TABLE 5

OLS Regressions of Risk on Analyst Dispersion and Accuracy with the Interaction of Compensation and Human Capital costs

Variable	Predicted Sign	Risk		Risk	
Constant		0.4025	***	0.4261	***
		(5.73)		(5.98)	
Year Dummies		Yes		Yes	
Analyst Dispersion$_{t-1}$	+/-	-15.299	***		
		(-3.27)			
*Analyst Dispersion$_{t-1}$*Delta$_{t-1}$*	+	20.1269	***		
		(2.96)			
*Analyst Dispersion$_{t-1}$*HT Dummy*	-	3.6362	**		
		(2.15)			
Accuracy$_{t-1}$	+/-			-2.4861	*
				(-1.94)	
*Accuracy$_{t-1}$*Delta$_{t-1}$*	+			3.5275	*
				(1.82)	
*Accuracy$_{t-1}$*HT Dummy*	-			0.6144	*
				(1.71)	
Size	-	-0.0171	*	-0.0178	
		(-1.55)		(-1.57)	
Book Leverage	+	-0.0131		-0.0145	
		(-0.48)		(-0.38)	
Market-to-Book	-	-0.0009		-0.0009	
		(-0.37)		(-0.38)	
CEO Tenure	+/-	-0.0004		-0.0004	
		(-0.92)		(-1.05)	
Firm Age	-	-0.0024		-0.0023	
		(-1.69)		(-1.62)	
Delta$_{t-1}$	+/-	-0.0755	**	-0.0511	
		(-2.09)		(-1.42)	
Vega$_{t-1}$	+	0.0005	***	0.0005	***
		(5.82)		(5.76)	
HT Dummy	-	-0.0019		-0.0025	
		(-0.20)		(-0.27)	
Distress Dummy		0.0112	***	0.0109	***
		(3.14)		(3.01)	
Observations		8049		8048	
R-Squared		0.50		0.50	

This table presents fixed effects regression models with the daily volatility of stock returns *(Risk)* for firm *i* for fiscal year *t* as the dependent variable for a sample of firm-year observations made over the period 1992-2006. *Analyst Dispersion* is the negative of the standard deviation of analyst forecasts divided by the fiscal year end price. *Accuracy* is the negative of the ABS[(EPS_{for}—EPS_{act}) / Price]. *Delta* is the dollar sensitivity of the option value with respect to a 1% change in stock price. *Vega* is the dollar sensitivity of the option value with respect to a 0.01 change in stock volatility. *HT Dummy* is a Dummy variable set to one for firms in high tech industries as identified by Kwon (2002) and zero otherwise. Control variables are described in Appendix B. The t-values are in parentheses and reflect standard errors that are heteroskedasticity robust and corrected for the cluster sample problem arising from multiple observation for each firm. Subscripts (excluding those indicating lags) have been dropped in the table above for ease of presentation. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

TABLE 6

2SLS Regressions of Risk on Analyst Dispersion and Accuracy with the Interaction of Compensation and Human Capital costs

Variable	Predicted Sign	Risk		Risk	
Constant		0.0406	***	0.2103	***
		(3.69)		(3.50)	
Year Dummies		Yes		Yes	
Analyst Dispersion	+/-	-17.6172	**		
		(-2.5)			
*Analyst Dispersion*Delta$_{t-1}$*	+	23.5483	*		
		(1.85)			
*Analyst Dispersion*HT Dummy*	-	-0.1226			
		(-0.84)			
Accuracy	+/-			-4.0324	***
				(-2.77)	
*Accuracy*Delta$_{t-1}$*	+			5.0725	**
				(2.26)	
*Accuracy*HT Dummy*	-			-2.4453	
				(-0.84)	
Size	-	-0.0206	**	-0.0171	*
		(-2.49)		(-1.95)	
Book Leverage	+	-0.0316		-0.0168	
		(-1.24)		(-0.69)	
Market-to-Book	-	0.0037		0.0019	
		(1.51)		(0.93)	
CEO Tenure	+/-	-0.0004		0.0019	
		(-1.02)		(0.93)	
Firm Age	-	0.0049		-0.0003	
		(0.49)		(-0.81)	
Delta$_{t-1}$	+/-	0.0151		-0.0003	
		(0.43)		(-0.81)	
Vega$_{t-1}$	+	0.0004	**	0.0077	
		(2.38)		(0.77)	
HT Dummy	-	0.0211	*	0.0085	
		(1.96)		(0.29)	
Distress Dummy	+	0.0092	**	0.0005	***
		(1.98)		(6.82)	
Observations		9213		9212	
R-Squared		0.51		0.50	

Continued…

Table 6 (Continued)

Tests for Relevance and Validity of Instruments				
F-Stat Analyst Dispersion	24.83	***		
*F-Stat Analyst Dispersion*Delta$_{t-1}$*	22.58	***		
*F-Stat Analyst Dispersion*HT Dummy*	12.78	***		
F-Stat Accuracy			17.11	***
*F-Stat Accuracy*Delta$_{t-1}$*			18.25	***
*F-Stat Accuracy*HT Dummy*			30.80	***
Anderson-Rubin	6.96	***	6.9000	***
	(0.0000)		(0.0000)	
Hansen J	4.48		0.29	
	(0.11)		(0.86)	
Instruments Used:	Earnings Dummy		Earnings Dummy	
	Industry Dispersion		Industry Accuracy	
	Industry Dispersion*Deltat-1		Industry Accuracy*Deltat-1	
	Earnings Dummy*Deltat-1		Earnings Dummy*HT Dummy	
	Industry Dispersion*HT Dummy		Industry Accuracy*HT Dummy	

This table presents fixed effects regression models with the daily volatility of stock returns *(Risk)* for firm ***i*** for fiscal year ***t*** as the dependent variable for a sample of firm-year observations made over the period 1992-2006. *Analyst Dispersion* is the negative of the standard deviation of analyst forecasts divided by the fiscal year end price. *Accuracy* is the negative of the ABS[(EPS_{for}—EPS_{act}) / Price]. *Delta* is the dollar sensitivity of the option value with respect to a 1% change in stock price. *Vega* is the dollar sensitivity of the option value with respect to a 0.01 change in stock volatility. *HT Dummy* is a Dummy variable set to one for firms in high tech industries as identified by Kwon (2002) and zero otherwise. Control and instrument variables are described in Appendix B. The t-values are in parentheses and reflect standard errors that are heteroskedasticity robust and corrected for the cluster sample problem arising from multiple observation for each firm. Subscripts (excluding those indicating lags) have been dropped in the table above for ease of presentation. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

TABLE 7

OLS Regressions of Risk on the Natural Log of the S&P Transparency and Disclosure Score with and without the Interaction of Compensation and Human Capital Costs for 2002

Variable	Predicted Sign	Risk		Risk	
Constant		0.5554	***	-1.6161	***
		(14.5)		(-3.90)	
Year Dummies		No		No	
Ln(TD)$_{t-1}$	+/-	-0.0696	***	0.9225	
		(-4.66)		(1.04)	
Ln(TD)$_{t-1}$**Delta*$_{t-1}$	+			-1.7353	
				(-1.24)	
Ln(TD)$_{t-1}$**HT Dummy*	-			-0.4901	
				(-0.93)	
Size	-	-0.0287	***	-0.0207	*
		(-12.56)		(-1.91)	
Book Leverage	+	0.0390	***	0.1261	*
		(2.79)		(1.81)	
Market-to-Book	-	-0.0046	***	-0.0176	**
		(-3.22)		(-2.06)	
CEO Tenure	+/-	-0.0003		-0.0014	
		(-0.94)		(-0.92)	
Firm Age	-	-0.0022	***	-0.0028	***
		(-9.05)		(-3.47)	
Delta$_{t-1}$	-	-0.2122	***	-4.2967	
		(-8.3)		(-1.52)	
Vega$_{t-1}$	+	0.0004	***	0.0015	***
		(7.54)		(5.24)	
HT Dummy	+	-0.0075		1.0042	
		(-0.64)		(0.92)	
Distress Dummy	+	0.0490	**	0.0516	***
		(2.56)		(2.72)	
Observations		416		416	
R-Squared		0.44		0.44	

This table presents fixed effects regression models with the daily volatility of stock returns *(Risk)* for firm *i* for fiscal year *t* as the dependent variable for a sample of firm-year observations made for 2002. *Analyst Dispersion* is the negative of the standard deviation of analyst forecasts divided by the fiscal year end price. *Accuracy* is the negative of the ABS[(EPS_{for}—EPS_{act}) / Price]. *Delta* is the dollar sensitivity of the option value with respect to a 1% change in stock price. *Vega* is the dollar sensitivity of the option value with respect to a 0.01 change in stock volatility. *HT Dummy* is a Dummy variable set to one for firms in high tech industries as identified by Kwon (2002) and zero otherwise. Control variables are described in Appendix B. The t-values are in parentheses and reflect standard errors that are heteroskedasticity robust and corrected for the cluster sample problem arising from multiple observation for each firm. Subscripts (excluding those indicating lags) have been dropped in the table above for ease of presentation. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

TABLE 8

2SLS Regressions of Risk on the Natural Log of the S&P Transparency and Disclosure Score with and without the Interaction of Compensation and Human Capital Costs for 2001

Variable	Predicted Sign	Risk		Risk	
Constant		5.6037	***	-20.2881	
		(2.87)		(-1.56)	
Year Dummies		No		No	
Ln(TD)	+/-	-2.6538	***	10.2155	
		(-2.64)		(1.58)	
*Ln(TD)*Delta*$_{t-1}$	+			-19.9864	*
				(-1.81)	
*Ln(TD)*HT Dummy*	-			-0.0838	
				(-1.08)	
Size	-	-0.0228		-0.0201	
		(-1.29)		(-0.94)	
Book Leverage	+	0.1459		0.0884	
		(0.94)		(0.42)	
Market-to-Book	-	-0.0010		0.0043	
		(-0.07)		(0.2)	
CEO Tenure	+/-	-0.0014		-0.0046	
		(-0.55)		(-1.03)	
Firm Age	-	0.0003		-0.0004	
		(0.17)		(-0.23)	
Delta$_{t-1}$	-	-0.7257	***	-40.8919	*
		(-3.38)		(-1.84)	
Vega$_{t-1}$	+	0.0012	**	0.0011	*
		(2.59)		(1.74)	
HT Dummy	+	-0.0874		-0.0195	
		(-1.52)		(-0.25)	
Distress Dummy	+	0.0404		0.0676	
		(1.21)		(1.55)	
Observations		416		416	
R-Squared		-0.2434		-0.8024	
Tests for Relevance and Validity of Instruments					
F-Stat Ln(TD)		9.88	***	20.19	***
*F-Stat Ln(TD)*Delta*$_{t-1}$				20.52	***
*F-Stat Ln(TD)*HT Dummy*				34.75	***
Anderson-Rubin		23.83	***	35.66	***
		(0.0000)		(0.0000)	
Hansen J		1.49		0.35	
		(0.2225)		(0.5535)	
Instruments Used:		Industry Accuracy Earnings Dummy		Industry Accuracy Earnings Dummy Industry Accuracy*Delta$_{t-1}$ Industry Accuracy*HT Dummy	

This table presents fixed effects regression models with the daily volatility of stock returns *(Risk)* for firm *i* for fiscal year *t* as the dependent variable for a sample of firm-year observations in 2001. *Analyst Dispersion* is the negative of the standard deviation of analyst forecasts divided by the fiscal year end price. *Accuracy* is the negative of the ABS[(EPS_{for}—EPS_{act}) / Price]. *Delta* is the dollar sensitivity of the option value with respect to a 1% change in stock price. *Vega* is the dollar sensitivity of the option value with respect to a 0.01 change in stock volatility. *HT Dummy* is a Dummy variable set to one for firms in high tech industries as identified by Kwon (2002) and zero otherwise. Control and instrument variables are described in Appendix B. The t-values are in parentheses and reflect standard errors that are heteroskedasticity robust and corrected for the cluster sample problem arising from multiple observation for each firm. Subscripts (excluding those indicating lags) have been dropped in the table above for ease of presentation. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

TABLE 9

OLS Regressions of Risk on the Natural Log of the Predicted S&P Transparency and Disclosure Score with and without the Interaction of Compensation and Human Capital Costs

Variable	Predicted Sign	Risk		Risk	
Constant		0.5554	***	0.8605	***
		(14.5)		(4.3)	
Year Dummies		Yes		Yes	
Ln(Predicted TD)$_{t-1}$	+/-	-0.0696	***	-0.2428	**
		(-4.66)		(-2.45)	
Ln(Predicted TD)$_{t-1}$ Delta$_{t-1}$*	+			0.2879	**
				(2.15)	
*Ln(Predicted TD)$_{t-1}$*HT Dummy*	-			0.0809	**
				(2.16)	
Size	-	-0.0287	***	-0.0082	
		(-12.56)		(-1.06)	
Book Leverage	+	0.0390	***	0.0080	
		(2.79)		(0.41)	
Market-to-Book	-	-0.0046	***	-0.0042	***
		(-3.22)		(-2.7)	
CEO Tenure	+/-	-0.0003		-0.0002	
		(-0.94)		(-0.52)	
Firm Age	-	-0.0022	***	-0.0029	***
		(-9.05)		(-2.61)	
Delta$_{t-1}$	+/-	-0.2122	***	0.5883	**
		(-8.3)		(2.18)	
Vega$_{t-1}$	+	0.0004	***	0.0004	***
		(7.54)		(5.31)	
HT Dummy	+	-0.0075		0.0059	
		(-0.64)		(0.71)	
Distress Dummy	+	0.0196	***	0.0211	***
		(6.16)		(3.29)	
Observations		8048		8048	
R-Squared		0.49		0.49	

This table presents fixed effects regression models with the daily volatility of stock returns *(Risk)* for firm *i* for fiscal year *t* as the dependent variable for a sample of firm-year observations made over the period 1992-2006. *Analyst Dispersion* is the negative of the standard deviation of analyst forecasts divided by the fiscal year end price. *Accuracy* is the negative of the ABS[(EPS_{for}—EPS_{act}) / Price]. *Delta* is the dollar sensitivity of the option value with respect to a 1% change in stock price. *Vega* is the dollar sensitivity of the option value with respect to a 0.01 change in stock volatility. *HT Dummy* is a Dummy variable set to one for firms in high tech industries as identified by Kwon (2002) and zero otherwise. Control variables are described in Appendix B. The t-values are in parentheses and reflect standard errors that are heteroskedasticity robust and corrected for the cluster sample problem arising from multiple observation for each firm. Additionally, the standard errors were bootstrapped using 100 iterations. Subscripts (excluding those indicating lags) have been dropped in the table above for ease of presentation. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

TABLE 10

2SLS Regressions of Risk on the Natural Log of the Predicted S&P Transparency and Disclosure Score with and without the Interaction of Compensation and Human Capital Costs

Variable	Predicted Sign	Risk		Risk	
Constant		0.2045	***	0.1014	***
		(4.92)		(3.23)	
Year Dummies		Yes		Yes	
Ln(Predicted TD)	+/-	-0.2244	**	-0.0726	
		(-2.36)		(-0.57)	
*Ln(Predicted TD)*Delta$_{t-1}$*	+			0.8598	
				(1.08)	
*Ln(Predicted TD)*HT Dummy*	-			-2.8341	
				(-1.09)	
Size	-	-0.0123		0.0055	
		(-1.54)		(0.21)	
Book Leverage	+	0.0025		0.0105	
		(0.11)		(0.29)	
Market-to-Book	-	-0.0024		0.0030	
		(-1.15)		(0.66)	
CEO Tenure	+/-	-0.0004		-0.0008	
		(-1.1)		(-1.2)	
Firm Age	-	0.0045		0.0245	
		(0.47)		(1.23)	
Delta$_{t-1}$	+/-	-0.0031		-1.7620	
		(-0.11)		(-1.08)	
Vega$_{t-1}$	+	0.0006	***	0.0007	***
		(7.43)		(3.6)	
HT Dummy	+	0.0154		0.0312	
		(1.46)		(1.49)	
Distress Dummy	+	0.0174	***	0.0262	***
		(5.59)		(3.05)	
Observations		9733		9212	
R-Squared		0.41		0.41	
Tests for Relevance and Validity of Instruments					
F-Stat Ln(Predicted TD)		11.45	***	13.26	***
*F-Stat Ln(Predicted TD)*Delta$_{t-1}$*				46.27	***
*F-Stat Ln(Predicted TD)*HT Dummy*				12.99	**
Anderson-Rubin		3.45	**	3.67	***
		(0.0321)		(0.0056)	
Sargan statistic		55.345	***	1.665	
		(0.0000)		(0.1970)	
Hansen J		0.16		0.02	
		(0.6858)		(0.8974)	
Instruments Used:		Industry Accuracy Earnings Dummy		Industry Accuracy Earnings Dummy Industry Accuracy*Delta$_{t-1}$ Industry Accuracy*HT Dummy	

This table presents fixed effects regression models with the daily volatility of stock returns *(Risk)* for firm *i* for fiscal year *t* as the dependent variable for a sample of firm-year observations made over the period 1992-2006. *Analyst Dispersion* is the negative of the standard deviation of analyst forecasts divided by the fiscal year end price. *Accuracy* is the negative of the ABS[(EPS_{for}—EPS_{act}) / Price]. *Delta* is the dollar sensitivity of the option value with respect to a 1% change in stock price. *Vega* is the dollar sensitivity of the option value with respect to a 0.01 change in stock volatility. *HT Dummy* is a Dummy variable set to one for firms in high tech industries as identified by Kwon (2002) and zero otherwise. Control and instrument variables are described in Appendix B. The t-values are in parentheses and reflect standard errors that are heteroskedasticity robust and corrected for the cluster sample problem arising from multiple observation for each firm. Additionally, the standard errors were bootstrapped using 100 iterations. Subscripts (excluding those indicating lags) have been dropped in the table above for ease of presentation. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.