CEO compensation and credit risk

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Abstract

We examine the empirical relationship between executive compensation and credit risk. For each of the three major components of CEO compensation – salary, bonus, and stock option awards – we derive estimates of "unexplained" compensation as pay that deviates substantially from expected pay based on firm size, past performance, and other variables. We then relate these measures of unexplained compensation to the risk of default and large rating downgrades between 1993 and 2003. After controlling for a variety of firm characteristics, including industry effects and long-term ratings, we find that large, positive, unexplained bonus and option awards are predictive of both default and large rating downgrades. Variations in salaries, however, do not appear to be predictive of credit risk.

JEL Codes: G14, G33, G34

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1. Introduction

Controversy continues to exist concerning the effects of executive compensation structure and magnitude and how they affect firm performance. Previous empirical research has focused on average stock behavior and average earnings behavior related to incentives created by option grants. This paper examines the empirical relationship between the size of a CEO's salary, bonus, and option grants – compared to its expected value as determined by a simple compensation prediction model – and credit risk, as measured by default rates and the frequency of large rating downgrades. We find that higher than expected bonus payouts and higher than expected option grants are associated with increased levels of credit risk.

To our knowledge, this is the first empirical research to focus on compensation and realized credit risk, although there is an extensive theoretical literature relating compensation to managerial incentives and a large empirical literature relating stock-based compensation to realized equity returns, equity valuation, and earnings. Further, we examine all three major components of compensation, salary, bonus, and stock-based incentives, and find that both the bonus and stock-based incentives contain information predictive of future firm performance.

CEO compensation schemes are designed to provide incentives to induce superior managerial performance, consistent with shareholder objectives. Although base salaries tend to be fairly insensitive to firm performance, bonus payments are often tied directly to operating performance through specific formulas, and option grants reward strong expected future operating performance that leads to higher stock prices. Large

compensation packages may be a signal, however, that a CEO has undue influence over his or her board of directors. As a result, the expected incentive effects of the compensation package may be ineffective because the CEO can obtain high compensation despite mediocre performance. Evidence that compensation is larger than expected may, therefore, be predictive of poor performance, from the perspective of both equity holders and debt holders.

It is also possible that equity holders and debt holders may view large levels of incentive-based bonus and options differently. Stockholders generally want firm managers to pursue all positive expected value projects – even if they are risky – because stockholders benefit from limited liability, a residual claim on the firm's assets, and can diversify their holdings across firms. Debt holders generally prefer managers to pursue less risky strategies. Since incentive compensation is intended to align manager incentives with stockholder interests, it is reasonable to expect that higher levels of incentive pay (at least based on shareholder-oriented metrics) would be correlated with greater credit risk.

Compensation that is highly sensitive to short-term financial performance may also create incentives for CEOs to manipulate short-term measures of firm's performance – even if such manipulation adversely affects the firm's long-term performance. For example, if the CEO's bonus depends entirely on operating income, the individual has an incentive to adopt aggressive accounting practices to maximize short-term financial results, even if in so doing, long-term financial performance is compromised. It is also possible that managers alter actual operations in ways that hurt the firm in the long term or increase event risk. Examples of this could include cutbacks, by a utility with nuclear

power plants or by an airline, of the ordinary maintenance and repair budget to the bone, or bank cutbacks on internal audit. Larger than expected compensation may also be correlated with higher levels of credit risk if it signals weak oversight from the board of directors. Strong board oversight may be an important safeguard against the risk that management will pursue uneconomic projects that might endanger the firm's future.

We use a model to predict salary, bonus, and stock option incentives for each CEO based on firm sales, market capitalization, operating income, tenure, and several control variables for the period from 1993 to 2002. Unlike previous models that explained the natural logarithm of compensation, our model includes all observations of zero compensation such as a CEO not receiving a bonus because she did not reach her bonus targets. Our model also compensates for the correlation between salary, bonus, and stock option grants. The residuals from this model are a measure of unexpected compensation. The main result from the paper is that firms with the highest levels of unexplained bonus compensation or unexplained stock option grants are much more likely to experience a bankruptcy or a severe downgrade of three rating notches or more.

The implications from our results for bondholders are clear. Unless other factors are more significant, investors should demand a higher cost of capital for firms with the highest levels of unexplained compensation. The implications for stockholders, though, are not as clear. It difficult to determine whether the results indicate unduly strong CEO control of the board of directors, financial fraud, or simply that the CEOs have the incentive to increase the overall riskiness of the firm. It is also quite possible that the accounting fraud comes about due to managers attempts to cover up randomly bad results from good but risky projects.

The paper proceeds as follows: Section 2 conducts a literature review, Section 3 discusses the data used, Section 4 describes the compensation model, Section 5 presents the main results for the paper, and Section 6 concludes.

2. Literature Review

There is very little research so far examining the relationship between corporate governance and credit risk and even less directly examining the relationship between executive compensation and credit risk. Such studies generally find that better governance leads to lower cost of debt capital and higher ratings. Bhojraj and Sengupta (2003) examine the relationship between institutional ownership and the independence of the board of directors, finding that more independence and larger and more diversified institutional ownership is correlated with lower corporate bond yields and higher ratings. Ashbaugh, Collins, and LaFond (2004) find that ratings are related lower for firms with concentrated ownership and higher for firms with fewer defenses against hostile takeovers, better financial transparency, and more independence on the board of directors. Klock, Mansi, and Maxwell (2005) find that firms with more defenses against hostile takeovers require yields on their corporate bonds. These papers measure only the perception of risk held by ratings analysts and investors, not realized risk. Contrary to the previous research, Mann (2004) shows that, controlling for other factors, firms with more defenses against hostile takeovers is associated with a higher probability of a negative credit event.

Another strand of literature examines the relationship between corporate governance and other forms of rare negative events fundamentally affecting firm livelihood. For example, Burns and Kedia (2006) show that the sensistivity of a CEO's

compensation package to stock price movements is positively correlated with aggressive earnings management as measured by the occurance of forced accounting restatements. Accounting restatements are frequently followed by severe negative credit events such as bankruptcy. Johnson, Ryan, and Tian (2003) and Erickson, Hanlon, and Maydew (2004) find a positive relationship between the percentage of a CEO's compensation paid in executive stock options and the occurance of fraud as reported by the Securities and Exchange Commission (SEC). Denis, Hanouna, and Sarin (2005) find that larger stock option grants are associated with higher probabilities of class action lawsuits. Our study differs from each of these in that these studies conducted relative compensation between troubled firms and non-troubled firms. We developed a model to isolate outliers and then examined whether these outliers had higher levels of credit risk.

The majority of empirical research on the relation between executive compensation and firm performance has focused on executive stock option compensation, stock price performance, and earnings performance. Some studies find that higher levels of compensation led to positive firm performance. Mehran (1995) finds that higher percentages of stock options in executve pay packages is associated with higher Tobin's Q and higher returns on assets (ROA). Hanlon, Rajgopal, and Shevlin (2002) find that large stock option grants are associated with higher operating income. Hillegeist and Panalva (2003) find that unexpectedly high levels of executive stock options are associated with higher stock returns, higher ROA, higher Tobin's Q, and higher forecasted growth. Morgan and Poulson (2001) find that firms that adopt equity-linked compensation plans experience average increases in their stock prices and selected accounting ratios during the year after adoption.

A few studies find that higher levels of compensation are associated with higher risk or greater agency problems. Rajgopal and Shevlin (2002) find that executive stock options are associated with reduction in hedging behavior in the oil industry. Coles, Daniel, and Naveen (2005) measure the sensitivity of CEO compensation to stock volatility (vega) and show that CEOs with higher vegas implement riskier policies, invest more in research and development, less in plants and equipment, and have higher leverage. Core, Holthausen, and Larcker (1999) show that higher compensation is associated with firms with greater agency problems and that such firms actually perform worse over time. Whether having more stock options are associated with better or worse performance from a stock holder's viewpoint, it is still an unsettled issue as to whether they are beneficial to debt holders.

Compared to the research on stock-based incentives, there has been scarce research into the relationship between annual bonuses and firm performance. Healy (1985) finds that managers adjust firm goals to more closely match their bonus schemes. Bruce, Skovoroda, Fatturosa, and Buck (2005) show that more transparent bonus schemes are associated with higher earnings per share.

Despite the lack of formal or conclusive evidence associating executive compensation with credit risk, all three major rating agencies have published statements on the subject and have incorporated analysis of compensation in their rating assignment methodologies. See, for example, Fitch Ratings (2004), Bertsch and Watson (2003), and Standard and Poors (2002). The agencies generally expect executive compensation to be similar in magnitude relative to peers, aligned with the long term goals of the firm, and not heavily reliant on stock-based incentives. Deviations from this formulation are

considered to be red flags requiring more in depth analysis. This investment of time and money by the agencies is strong evidence that there exists at least a perception, if not a public belief, that executive compensation is related to credit risk.

3. Data

Compensation data is from ExecuComp, the ratings, default, and migration data is from Moody's data research service (DRS) product, and accounting information is from Compustat.[1] We focus exclusively on non-financial corporations in the United States with senior unsecured bond ratings or corporate family ratings of B3 or higher, from 1993 through 2002.

Each observation includes the dollar amount of the three major components of the prior year's CEO compensation – salary, bonus, and stock-based incentive compensation. Stock-based compensation includes both restricted stock grants and executive stock options. We use the value of the stock options calculated by Execucomp using the Black-Scholes-Merton equation. Due to the preponderance of options versus stocks within our sample period, we refer to this stock-based compensation as "option" compensation throughout the paper. The compensation data is scrubbed for those instances where the CEO owns more than 5% to minimize the potentially non-linear effects due to the relationship between ownership and credit risk. Observations pertaining to CEOs with tenures of less than one year were removed from the sample because firms in distress often pay larger amounts to new CEOs as an incentive to turn the firms around. If we had included these observations in the sample, we might have concluded that high compensation predicted credit risk, when the relevant compensation for predicting credit

[1] The mapping between Moody's DRS product and Compustat was provided by Moody's.

risk was really the package received by the prior CEO. Moody's measures defaults as having occurred when firms announce a missed principle or interest payment, an intent to enter bankruptcy proceedings, or a 'distressed exchange' in which they force their creditors to exchange their bonds for less valuable instruments. We use Moody's defaults and announcement dates for firms with long term debt outstanding, where long term is defined as having at least a one-year maturity at issuance.

Despite the predominance of research into predicting default, the majority of outstanding corporate bond debt outstanding is rated Baa (BBB) or higher indicating that it has negligible short-term default risk. During the sample period, there were only 45 companies out of 3,879 possible that defaulted within a year of having an investment grade default. Migration risk, though, is relatively more common and can have a large impact on pricing. We measure migration risk as the event of a three-notch or greater downgrade during the course of a year. A three-notch downgrade over the course of the year is large enough to represent a significant change in the fundamental credit quality of the company and occurs over a short enough time period that the event can be considered to be unforeseen. The event date is the date of the downgrade that causes the three-notch boundary to be crossed. For example, a company downgraded from Aa2 to A2 in three steps over the course of a year is labeled as a large downgrade and the event date is the date of the last downgrade.

One additional adjustment is made to the ratings migration data due to the specific method that Moody's uses to calculate senior ratings when companies do not have senior unsecured debt. The senior ratings are intended to portray the senior unsecured rating for a company if it exists but Moody's also estimates senior unsecured rating for companies

without senior unsecured debt using a standard notching table applied to other debt types. There are cases where the senior ratings data shows a rating change when none of the underlying ratings for the company actually change. This occurs when either debt is maturing or new debt is being issued causing the reference rating type to change. We exclude all such rating changes from our calculations.

Selecting the timing relationships between the explanatory and dependent variables requires some care. Once executive compensation data are made publicly available, in most cases the actual compensation decisions have been set for over a year. For example, the most recent proxy statement for Moody's Corporation was publicly released on March 23, 2005, and reported CEO salary, option grant, and bonus data for 2004. The salary was determined based on fiscal year 2003 performance and was paid out over fiscal year 2004. The option grant was also based on fiscal year 2003 performance and was awarded in February of 2004. The targets for the 2004 bonus were set in light of the fiscal year 2003's performance, but the actual payout was based on fiscal year 2004's performance. Our models for salaries and options are, therefore, based on data lagged by one year; however, our model for determining bonuses requires data spanning two years – the year for which the targets were set and the year over which performance was measured.[2] This will likely bias the results of our studies against finding any results because we will be predicting performance over the forecast period

[2] There are complications here, for example that in many cases the bonus award will be based less on a pre-set formula and more on subjective determinants. There are other variations from the standard pattern assumed here, creating some noise around the results. However, we believe our timing assumptions are true for most companies included in the study. The likely effect of firms using different timing patterns on our results will be to create a bias against finding any relationship between pay and credit risk.

using year-old data.[3] For simplicity, the fiscal year immediately prior to the proxy report will be called the "current" year and the year prior to that will be called "previous" year. The timing is presented in Figure 1.

[Insert Figure 1 here]

Table 1 provides summary information for the data sample. Panel A provides the number of observations at each step in the filter. We start with 20,818 observations that have no missing data. After matching the data to Moody's database and filtering out short tenured CEOs and CEOs with large ownership, we have 6,958 observations. Financial companies are also removed at this step using Moody's broad industry identifiers. Of these, only 3,976 observations have outstanding ratings. An additional 24 observations do not have complete financial data from the previous year. Altogether, we have 3,952 annual observations for a total of 869 unique firms, with an average of 4.5 annual observations for each firm.

Panel B shows that, among these firms, 39 or 1.0% defaulted during the sample period, and 181 or 4.6% incurred "large downgrades" Firms can and experience more than one large rating change within the twelve-year sample period but only one per issuer-year is reported here. There were a total of 219 large downgrades in the data sample. Breaking the data down by rating category, one can see that defaults becomes progressively more important as one goes down the rating scale and that migration events can help to measure risk for the less risky rating categories (Aaa – Baa). Further, the

[3] The variables for the second year are measured as the positive increase over the previous year because we envision that firms do not set negative bonus targets. CEOs that do not create a positive performance in the second year are expected to get no bonus.

majority of the data resides in the A through Ba rating categories. The low data counts for Aaa – Aa and B make statistical significance difficult to achieve.

Panel C presents median compensation and financial information by rating category. All variables increase monotonically with rating category. Smaller firms typically have the lowest ratings and pay the least. Option grants are the largest component of pay for all but the lowest rated firms followed by salary. Total compensation is, in all cases, larger than the sum of the four components. This is partly due to additional perk but is mostly due to negative correlation between the components. Median CEO tenure is also reported in Panel C and is seen to decrease with improving credit quality.

[Insert Table 1 here]

4. Modeling Compensation

To determine unexplained compensation, we develop a model that predicts expected salary, expected bonus, and expected option grants based on firm size, past operating performance, CEO tenure, and industry – variables selected from the academic literature on CEO compensation. This formulation relies heavily on the survey by Murphy (1998). Attempts were made to include variables from the option incentive prediction models by Core and Guay (1999) and Hillegeist and Panalva (2003) such as book-to-market and working capital. These variables were not found to be statistically significant or economically important, probably because the universe of rated companies is relatively large. Some studies examined the sensistivity of compensation to stock price (delta) and stock return volatility (vega) as being related to firm performance. We do not do so because this would focus the research on the option portion of compensation.

Further, our main hypothesis for this study is that large, unexplained compensation might be related to credit risk. We also include annual dummies to account for the fact that compensation levels rose steadily through the sample period. We include industry dummies as well as dummies for broad rating categories.[4] Previous year rating actions are also included. They provide another measure of past performance as well as modify the ratings dummies [see Cantor and Hamilton (2004) for a discussion of the non-Markovian properties of ratings.]

We estimate three related regression models – one for each of the three major components of compensation. However, we use a regression technique that takes into account the fact that the determinants (both included in and excluded from the model) of compensation are likely to be correlated across the components. In particular, we obtain our coefficient estimates results using a seemingly unrelated regression ("SUR") model that adjusts for correlation between the variables. The appropriateness of the SUR approach is confirmed by the correlation matrix of the residuals from the first-stage regression which indicated positive correlations – salaries and bonuses at 27.4%, salaries and options at 6.1%, and bonuses and options at 5.8%. The regressions are estimated on a weighted basis, where the reciprocal of the natural log of revenues is used as the weight, because compensation shocks to firms with large revenues are likely to be larger than those to other firms. The regressions are run as panels. Since the standard t-statistics associated with panel regression coefficient estimates are likely to be biased

[4] This is partially intended to account for endogeneity in the study. We expect that ratings during the period of our study are neutral to compensation because Moody's did not include compensation in its methodology until late in 2003. It is possible that compensation, though, is related to default risk. See, See Bhagat and Jefferis (2002), for a discussion of endogeneity.

upward due to persistent shocks to individual firms, we calculate the t-statistics reported in Table 2 by using the regression residuals for each year separately to derive annual t-statistics and averaging them across the years. Calculating the t-statistics in this way is more likely to be biased downward.

Table 2 presents the estimated empirical determinants of the components of compensation. The estimates are consistent with our expectations. Larger firms – measured either by revenues or market capitalization – pay more. Firms with higher operating income pay more. CEOs with longer tenures receive more pay. Variations in CEO salaries are well explained by our model, as evidenced by the high adjusted-R^2 of 47.2%. Firms tend to be less uniform in their methods for assigning bonuses (adjusted-R^2 of 19.2%) and even less predictable with their assignment of stock option grants (adjusted-R^2 of 4.9%). While the model may not perform well in predicting any individual firm's assignment of options for a given year, the model does appear to correctly flag companies whose option payouts exceed expectations based on firm size, past performance, and industry.

[Insert Table 2 here]

CEO salaries are typically benchmarked to the logarithm of firm size, usually measured by sales. Bonuses and stock incentives are typically benchmarked to salary and other performance measures. In our model, the logarithm of sales is highly significant for salary, slightly significant for bonus incentives but it is not statistically significant option incentives. The negative coefficient for option incentives might indicate that many smaller firms issue large amounts of options.

Market capitalization is statistically and economically significant for salaries and stock-based incentives. The positive result for salaries may indicate that some firms use the stock market in their assessment of firm size. The size of the coefficient for options is many times larger for stock-based incentives than it is for salaries and bonuses. Firms that issue executive relatively more stock options may focus more on stock performance and therefore have high market capitalizations for their revenue size.

Last year's operating income is statistically and economically significant for all compensation components. While firms that have performed well may give their employees large one-time bonuses, they will often also reset overall levels of future compensation. This is demonstrated by the increase in salaries and the very large increase in stock option grants.

We also consider other potential explanatory variables, such as leverage, total assets, cash, the quick ratio, net income, return on assets, and different measures of working capital. The book-to-market ratio is also not significant and the sign is opposite to that found by Core and Guay (1999).

With a model now in hand that explains variations in CEO compensation, it is possible to identify the gap between actual compensation and predicted compensation as "unexplained" compensation (which, when negative, should be interpreted as "unexpectedly" low compensation). Because this is a model-based measure of unexplained compensation, many of the compensation packages identified as unexplained can presumably be explained in a straightforward manner by analysts who are well acquainted with the circumstances. Nevertheless, we believe that these models are

successful in identifying many true cases of unusually large and unusually low levels of executive compensation.

Examples of firms caught by the model that ultimately defaulted include Covanta Energy and Enron, both of which defaulted in 2001. Covanta Energy was marked by the model as having high unexplained compensation in six of the seven years prior to its default. Enron was also marked as providing high unexplained compensation in six of the seven years prior to its default.

While a higher number of firms with larger than expected compensation experienced a credit event than would otherwise have been expected, not every firm with larger than expected compensation is necessarily a higher credit risk. The vast majority of these firms never experienced a default or a large downgrade during our sample period. Instead, using compensation as a signal judiciously with other factors may help to highlight the effectiveness of a firm's governance practices.

5. Results

5.1 Default Rates and, Downgrade Rates by Unexplained Compensation

In order to compare the degree of deviations from expectation across firms, we normalize unexplained compensation by its predicted value; i.e., unexplained compensation is expressed as a percentage deviation from the predicted level of compensation. In order to ensure that the excess compensation measured on a percentage makes economic sense even when the model-derived measure of expected compensation is negative and or positive but close to zero, we truncate expected compensation used in the denominator of this measure at a small but positive number. In particular, we assume in these cases that the denominator takes the value of compensation observed by the

highest earning CEO within the bottom decile of the population, i.e., $400,000, $200,000, and $400,000 for salaries, bonuses, and stock-based incentives, respectively. We then measure annual default rates and downgrade rates for various subgroups of the population.[5]

The results for various percentile stratifications of the compensation distributions for the full dataset (including both investment-grade and speculative-grade firms) are presented in Table 3. To determine a firm's position in the distribution of unexplained compensation, the firms are sorted by the appropriate unexplained compensation each year and their position is marked. This is done for all three compensation variables. The sorting is done each year so as to avoid a situation where all of the outliers fall into one year. This maximizes the model's ability to determine whether it is possible to differentiate between firms in any given year.

[Insert Table 3 here]

We separate the sample into three groups based on their position within the unexplained compensation distribution. The bottom 20% includes the lowest paid individuals including those that did not receive the appropriate type of compensation. The range from 20% to 90% includes all firms that make up the control group for our study. These are individuals whose compensation does not lie in the extremes of the

[5] Although not reported, we also correlated excess compensation with upgrade rates and generally found no systematic relationship. This finding is unsurprising because upgrades for improved financial performance are normally gradual over time, with at most two rating notch increases per year. Large rating upgrades typically occur when a weaker company is acquired by a stronger company, which often follow (ironically) from deterioration in weaker company's stand-alone credit risk.

distribution. The choice of using the top 10% of the distribution was chosen to ensure there were enough observations for statistical significance.[6]

Interestingly, companies that paid their CEOs the least in bonus compensation (the bottom 20%) experienced the highest default and downgrade rates. This perhaps initially surprising result is easily explained by reverse causality: poor prior performance probably led to low bonus compensation, rather than the reverse. To determine the truth of this hypothesis, we looked at the historical sales growth and the historical operating income growth for the overall sample and for the firms in the lowest unexplained bonus quintile. In the previous fiscal year, the low bonus companies experienced an average decrease in operating income of 20% compared to an average increase of 8.8% per year for the overall sample. The average decrease in the current year was 38%. The poor operating income performance for these companies indicates that these companies would have already been considered to be in distress and the CEO compensation information was likely to provide little additional information.

There appears to be no consitent pattern within the middle quintiles but the firms with the highest unexplained bonuses and the highest unexplained option grants experience dramatically higher default rates and dramatically higher downgrade rates than do the middle 70% of the distribution. The firms in the upper tail experienced operating income growth of 3.0% in the previous year and 13.1% in the current year. A superficial analysis would not likely flag these companies as being in trouble and yet

[6] We also examined using the top 5% of the distribution as the tail. The results were somewhat stronger. Consistent with our methods throughout this study, we decided to present conservative results where possible.

their default rates were between two and four times higher than the middle ranked firms. Downgrade rates were almost two times higher.

Defaults rates broken down by broad rating category and position in the unexplained compensation distribution are presented in Table 4. For each compensation component, there are two columns, one representing the control group and one representing high unexplained compensation individuals. The hypothesis being examined is, for companies with the same credit risk as measured by the fundamentals examined by ratings analysts, whether companies that pay much more than expected have higher risk. There is no noticable pattern for unexplained salary. In the bonus column though, the difference between default rates is dramatic, especially for investment grade companies. Overall, the firms that paid the highest bonuses defaulted four times as often as the other companies. The same general result hold for option compensation but it is not as strong and it is not statistically significant. Breaking the universe into broad rating categories, the only category that does not show increased default risk for high unexpected bonuses and options is the B category where there are very few observations.[7]

[Insert Table 4 here]

Table 5 provides the downgrade rates by unexplained compensation and rating category. High levels of unexplained bonus and unplained option compensation are again correlated with higher credit risk. Again, more of the power resides in the investment grade realm though the two rating categories with the fewest observations, Aaa and B, appear to have inconsistent behavior. Overall, firms with high levels of compensation are 50% to 75% more likely to suffer a severe credit-related event.

[7] It is also possible that there is a selection bias. Discussions with Execucomp indicate that they focused mainly on larger, more interesting companies, especially during the earlier years.

[Insert Table 5 here]

5.2 Probit Regressions Show Bonus to be Relatively More Significant

Table 6 shows the results of two probit regressions. The first predicts default and the second large downgrades. The purpose of the regression is to determine whether the results presented in the previous tables could be due to industry effects. It will also help answer the question of whether bonuses or option grants are more important for determining credit risk. Specifically, it is possible that one or the other drives the results but that correlation between the two makes it seem that each is important when looked at individually. The equation used in a probit regression is:

$$P(credit\ event) = \Phi(\alpha + \beta' x)$$

In other words, the probability of a credit event is equal to the normal distribution of a constant and a series of factors. In this case, the constant and the factors are listed in the first column of exhibit 5. These models are often used for credit event prediction because the predicted probability is always constrained to be between zero and one. Unlike a standard linear regression, though, it is more difficult to interpret the resulting coefficients as probit coefficients are measured in standard deviations instead of slopes. For example, in the default regression, if a company is listed as having high unexplained bonus, then $\alpha + \beta' x$ is increased by 0.47 standard deviations. The measure of goodness of such a regression is the 'percent concordant' or, equivalently, the percentage of companies correctly flagged as defaulting or not defaulting.

Recent downgrade rates are highly significant and important predictors in both regressions and have the expected signs.[8] It is well known that defaults often follow downgrades. It is less well known that rating migrations often follow previous migrations. This effect is called rating momentum and has been attributed to many causes.

As expected, firms with low bonuses were more likely to experience downgrades and/or defaults. Surprisingly, though, this did not hold for firms with low option payouts. The coefficients on the dummies for low option payouts are very close to zero, both economically and statistically.

High bonus payouts are significantly related to the probability of downgrade and/or default. The results for option payouts are weaker but significant. This could either reflect the older data used to predict option payouts versus that used to predict bonus payouts or it could indicate that bonuses are simply more important for determining the performance of a company.

[Insert Table 6 here]

[8] Downgrade rates take a value of one if there was a downgrade in the past year, negative one if there was an upgrade, and zero if there were no rating changes or if there was both an upgrade and a downgrade.

6. Conclusion

This study provides evidence that a connection exists between CEO compensation and overall credit risk. Firms where CEO pay is substantially greater than expected based on firm size, past performance, and other variables experience higher default rates and more frequent large downgrades than do other similarly rated companies.

The research presented here does not, however, explain why higher compensation may be associated with higher credit risk. At least three possible explanations can be inferred from the literature. One, excessive compensation may be indicative of weak management oversight. Two, large pay packages that are highly sensitive to stock price and/or operating performance may induce greater risk taking by managers, perhaps consistent with stockholders' objectives, but not necessarily bondholders' objectives. Three, large incentive-pay packages may lead managers to focus on accounting results, which may, at best, divert management attention from the underlying business or, at worst, create an environment that ultimately leads to fraud.

The correlation we have observed between unexplained compensation and credit risk is based on historical data and may not be constant over time. Developments in the areas of CEO compensation and board oversight may be altering both the time horizon and the risk-return characteristics of management incentives along with the behaviors that they encourage. For example, the use of option grants grew from almost nothing to become the primary method for compensation. More recently, awards of performance shares and restricted stock have gained prominence. Firms will likely continue to experiment with new vehicles intended to induce superior managerial performance. Also, firms often argue that weak industry conditions accentuate the need to retain and

motivate capable managers through retention awards and related vehicles and that this is intended to serve both shareholder and bondholder interests. Therefore, even though the model could provide valuable early-warning information in terms of assessing potential credit problems, analysts should also evaluate the relationship between CEO compensation and expected credit risk on a case-by-case basis.

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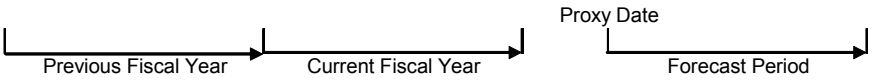

Figure 1. The compensation information released via the proxy statement (Def. 14) on the proxy date is regressed against accounting data from the current and previous fiscal years. The residuals from those regressions are used to predict defaults and large downgrades during the forecast period.

Table 1
Summary statistics

Panel A: Number of Observations

Stage of the Filter	Observations	Unique Issuers
Execucomp CEO data	20,818	2,375
- with Moody's identifier	16,273	1,707
- CEO owns <= 5% of company	9,095	1,366
- CEO tenure > 2 years at proxy date	6,958	1,266
Long-term Moody's Debt Rating Exists	3,976	873
Matched to Compustat	3,952	869

Panel B: Statistics by Rating Category

A default is recorded by Moody's on the date of announcement for missed interest or principle payments, intent to declare bankruptcy for cases that end in bankruptcy, and distressed exchanges. Large downgrades are recorded on the date of a downgrade that causes the cumulative downgrade over the past year to be three or more rating notches. The number of unique issuers by rating category sums to more than 869 due to rating migration.

Rating	Observations	Unique Issuers	Defaults	Large Downgrades
Overall	3,952	869	39	181
Aaa – Aa	295	57	0	6
A	1,096	256	0	33
Baa	1,283	356	6	67
Ba	863	312	12	50
B	415	188	21	25

Panel C: Median Financials by Rating Category

Execucomp reports the compensation as listed in the proxy report (DEF-14) filed with the Securities & Exchange Commission (SEC) and is defined as that part of compensation delivered during the fiscal year prior to the proxy date, defined in this report as the current year. Some components such as the bonus are often delivered after the end of the current fiscal year and the proxy date.

	Aaa – Aa	A	Baa	Ba	B
Compensation ($Million)					
Total Compensation	5.35	3.54	2.85	1.98	1.74
Salary	1.00	0.80	0.73	0.56	0.55
Bonus	0.98	0.69	0.50	0.34	0.20
Option Grants	1.79	1.08	0.78	0.57	0.40
Stock Grants	0.00	0.00	0.00	0.00	0.00
Financials ($Billion)					
Revenues	13.3	4.7	2.5	1.2	0.8
Market Cap	293.5	52.5	22.8	8.7	4.6
Operating Income after Depreciation	2.17	0.53	0.23	0.10	0.05
Book-to-Market	0.22	0.38	0.50	0.53	0.63
CEO Tenure (Years)	6.3	5.9	6.2	6.8	6.7

Table 2
Determinants of CEO Compensation

The dependent variables are the levels of salary, bonus, and stock-option grants. The sample consists of S&P 1,500 firms over the period from 1993 to 2002. The regression was estimated using a weighted seemingly unrelated regression (SUR) model with the weights set to the inverse of firm revenues. Absolute t-statistics in parentheses are conservative indicators of the significance of estimated coefficients for the panel data created by averaging across annual t-statistic estimates derived using the residuals from the SUR for each annual cohort. Dummy variables for year, industries, broad rating categories, and previous year rating migrations are also in the regression but not reported.

	Salary	Bonus	Options
From the Previous Year:			
Log of Sales	84.86	102.44	-236.14
	(4.65)	(1.70)	(-0.56)
Log of Market Capitalization	36.26	62.96	1,100.06
	(2.25)	(1.16)	(2.86)
Operating Income	0.08	0.24	1.87
	(6.64)	(6.00)	(6.27)
From the Current Year:			
Log of Sales		133.76	
		(0.44)	
Log of Market Capitalization		221.79	
		(1.05)	
Operating Income		0.52	
		(3.61)	
Tenure	4.26	3.37	13.13
	(2.10)	(0.51)	(0.29)
Univariate Adjusted - R^2	47.2%	19.2%	4.9%

Table 3
Variation in Annual Default and Downgrade Rates Across the Compensation Distribution

Residuals from the compensation prediction regression are divided by their predicted values to create unexpected compensation as a percentage of predicted compensation. For the purpose of this normalization, predicted compensation is constrained to be at least $400,000 in salary, $200,00 in bonus, and $400,000 in stock-option grants, corresponding to the bottom decile of all observations. Companies are then ranked in each year by each component of their unexplained compensation. The default and downgrade rates are the total number of events divided by the total number of observations. Significance refers to the entry immediately above the current. *** indicates the 1% level, ** indicates the 5% level, and * indicates the 10% level.

	Default Rates			Downgrade Rates		
Position in the Unexplained Compensation Distribution	Salary	Bonus	Options	Salary	Bonus	Options
0% - 20%	1.0%	2.2%	1.1%	3.8%	9.9%	4.9%
20% - 90%	1.0%	0.5%***	0.9%	4.7% *	3.0%***	4.2%
90% -100%	1.0%	2.0%**	1.5%	5.0%	5.5%**	6.8%**
0% - 20%	1.0%	2.2%	1.1%	3.8%	9.9%	4.9%
20% - 40%	0.6%	1.1%	0.6%	5.7% *	4.6%***	4.0%
40% - 60%	1.1%	0.3%**	0.8%	4.2%	2.5%**	3.3%
60% - 80%	1.0%	0.3%	0.9%	4.2%	2.0%	4.5%
80% -100%	1.1%	1.1%**	1.5%	5.0%	3.8%**	6.0%
Full sample		1.0%			4.6%	

Table 4

Annual Default Rates by Rating and Position within the Unexplained Compensation Distribution

Residuals from the compensation prediction regression are divided by their predicted values to create unexpected compensation as a percentage of predicted compensation. For the purpose of this normalization, predicted compensation is constrained to be at least $400,000 in salary, $200,00 in bonus, and $400,000 in stock-option grants, corresponding to the bottom decile of all observations. Companies are then ranked in each year by broad rating category and by each component of their unexplained compensation. The default rates are the total number of default or bankruptcy events divided by the total number of observations. Significance refers to difference between the normal firms (20% - 90%) and the highly compensated firms (90% - 100%). *** indicates the 1% level, ** indicates the 5% level, and * indicates the 10% level.

	Salary		Bonus		Options	
	20% - 90%	90% - 100%	20% - 90%	90% - 100%	20% - 90%	90% - 100%
Aaa - Baa	0.3%	0.4%	0.1%	1.5% *	0.2%	0.4%
Ba - B	2.7%	2.0%	1.5%	3.1%	2.5%	3.1%
Overall	1.0%	1.0%	0.5%	2.0%**	0.9%	1.5%
Aaa-Aa	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
A	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Baa	0.5%	0.7%	0.1%	2.6% *	0.3%	0.9%
Ba	1.8%	1.0%	0.5%	3.1%	2.5%	3.1%
B	4.6%	4.3%	3.7%	3.1%	5.1%	3.9%

Table 5

Annual Large Downgrade Rates by Rating and Position within the Unexplained Compensation Distribution

Residuals from the compensation prediction regression are divided by their predicted values to create unexpected compensation as a percentage of predicted compensation. For the purpose of this normalization, predicted compensation is constrained to be at least $400,000 in salary, $200,00 in bonus, and $400,000 in stock-option grants, corresponding to the bottom decile of all observations. Companies are then ranked in each year by broad rating category and by each component of their unexplained compensation. The default rates are the total number of large downgrade events divided by the total number of observations. Significance refers to difference between the normal firms (20% - 90%) and the highly compensated firms (90% - 100%). *** indicates the 1% level, ** indicates the 5% level, and * indicates the 10% level.

	Salary		Bonus		Options	
	20% - 90%	90% - 100%	20% - 90%	90% - 100%	20% - 90%	90% - 100%
Aaa - Baa	4.1%	4.8%	2.2%	5.2%**	3.5%	7.2%**
Ba - B	6.3%	5.3%	4.6%	5.5%	5.6%	6.2%
All Firms	4.7%	5.0%	3.0%	5.3%**	4.2%	6.8%**
Aaa-Aa	2.6%	2.1%	5.6%	1.7%	3.7%	1.9%
A	3.0%	6.4%	1.5%	6.9%**	2.8%	5.1%
Baa	5.4%	4.8%	3.1%	4.6%	4.6%	10.7%**
Ba	6.6%	4.8%	4.5%	5.2%	5.5%	7.1%
B	5.7%	6.4%	4.9%	6.3%	5.9%	5.2%

Table 6
Probit Regression Results

The dependent variable in the probit is either a default / bankruptcy event (left column) or a large downgrade of three or more notches in a year (right column). Dummies indicate whether compensation was very low (bottom 20%) or very high (top 10%) for each type of compensation. The regression includes dummies for broad rating category, year, and industry. The recent downgrade rate if there was a downgrade in the previous year and negative-one if there was an upgrade and zero if both occurred. The marginal effect of a coefficient of 0.500 is to multiply the probability of an event occurring by a factor of two to six. The marginal effect of a coefficient of 0.100 is a factor of 1.10 to 1.80.

	Defaults	Large Downgrades
Intercept	-6.84	-2.67***
Recent Downgrade Rate	0.63***	0.67***
Salary		
Bottom 20%	-0.02	-0.20 *
Top 10%	-0.22	-0.11
Bonus		
Bottom 20%	0.47***	0.50***
Top 10%	0.63***	0.33***
Option Grants		
Bottom 20%	0.08	0.07
Top 10%	0.16	0.12
Percent Concordant	87.7	81.5