The Impact of Earnings on the Pricing of Credit Default Swaps

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ABSTRACT

This study evaluates empirically the impact of earnings on credit risk in the multi-trillion dollar Credit Default Swap (CDS) market. In contrast to bonds and secondary loans, CDSs are almost "pure" credit risk instruments being relatively free of covenants, guarantees, imbedded options and coupons. We find that earnings (cash flows, accruals) of reference firms are negatively and significantly correlated with the level of CDS premia, consistent with earnings (cash flows, accruals) conveying information about default risk. We also find that (i) CDS premia are more highly correlated with below-median earnings than with above-median earnings and (ii) CDS premia are more highly correlated with the earnings of low rated firms than with the earnings of high rated firms. Both results are compatible with a nonlinear payoff function for debt holders. Many but not all level analysis results are shown to hold using a quarterly changes methodology. We also find some evidence that short-window earnings surprises are negatively and significantly correlated with CDS premia changes in the three-day window surrounding the preliminary earnings announcement, although the impact is concentrated in the shorter maturities.

1. Introduction

This study investigates the impact of earnings, including the accrual and cash flow components of earnings, on firm credit risk as reflected in Credit Default Swaps (CDS). The CDS is essentially a "pure credit" default instrument and provides a far less noisy measure of credit risk by comparison to other debt instruments. Moreover, the credit derivative market, which is dominated by CDS contracts, is a *multi-trillion* dollar market (notional value) that has roughly doubled in size each year for the past five years. To gain some perspective, the global credit derivatives market is currently estimated to be more than four times the size of the investment-grade global corporate bond market. The very existence of the CDS market and its burgeoning growth are prima facie evidence that other debt markets are unable to provide adequate solutions for the trading of credit risk. Thus, it is our contention that the CDS market is the best venue within which to investigate the extent to which earnings and its components are determinants of credit risk, and far superior to the heterogeneous corporate bond and secondary loan markets.[1]

Two other studies investigate the impact of earnings on CDS rates with conflicting results. In regressions that include two earnings regressors, earnings normalized by sales and the coverage ratio (earnings normalized by interest expense), Benkert (2004) finds that both earnings variables are *positively* and significantly associated with increased credit risk.[2] In a study contemporaneous with ours, Batta

[1]CDS rates are superior *a fortiori* to credit ratings which tend to be sticky, making it difficult to ascertain the impact of accounting information on short-window changes in credit risk from ratings data. The stickiness of ratings in the cases of Enron, Worldcom and Parmalat despite deteriorating financials is telling. See Daniels and Jensen (2005) who show empirically that credit rating changes are anticipated both by the bond market and the CDS market, with the bond market lagging the CDS market. A number of papers have examined the impact of credit rating changes, as measures of default risk changes, on equity returns including Dichev and Piotroski (2001), Vassalou and Xing (2004), and Jorion and Zhang (2005).

[2] These regressions include various controls including credit ratings.

(2006) obtains the result that the coverage ratio is negatively and significantly associated with increased credit risk, primarily for low coverage ratio levels. These contradictory results could be due to a number of factors that we explore in the analysis that follows. Two factors that come immediately to mind are the issue of scaling and sample size. Scaling earnings by interest expense could induce a negative association with CDS spreads that is totally unrelated to earnings and is entirely driven by the denominator – the interest expense. Consider, for example, what happens when interest rates decline or interest payments fall because the firm retired some of its debt. The interest coverage increases if earnings remain constant, whereas CDS spreads should decrease because the default risk is lower. Thus, the negative relationship obtained by Batta (2006) can be expected simply because coverage mixes in the effects of both interest rate risk and leverage.[3] In addition, as described below, Benkert's sample is far larger than Batta's.

The contradictory results between Benkert (2004) and Batta (2006) call for a more comprehensive analysis of the role of earnings in pricing CDS instruments. Specifically, in addition to scaling, this study addresses five issues not dealt with by either Benkert (2004) or Batta (2006) as follows:

1. Benkert (2004) and Batta (2006) focus almost solely on panel data levels regressions whose results may be size-driven and are susceptible to potential correlated omitted variables bias.[4] Equally importantly, statistical tests reported below show that levels of CDS premia are uniformly non-stationary for all maturities and restructuring clauses,

[3] The positive coefficient on coverage obtained by Benkert (2004) may be due collinearity between his earnings to sales and coverage ratios.

[4] Benkert (2004) focuses solely on levels. Batta (2006) focuses almost solely on levels but in one of his tables (VII), he reports a changes analysis. However, it appears that he regresses the change in CDS premia on the level of the independent variables, instead of on the changes in the independent variables. In any case, he fails to report coefficient estimates and their statistical significance.

whereas stationarity can often not be rejected for changes in CDS premia. Regressions of non-stationary panel data yield biased coefficient estimates and biased standard errors. Therefore, to mitigate the size effect, potential correlated omitted variables, and non-stationary data, this study employs quarterly changes and short-window event study methodologies in addition to levels regressions.

2. Neither Benkert (20004) nor Batta (2006) test for the potential asymmetry (nonlinearity) of CDS spreads to good news versus bad news, for example earnings changes for high credit rating firms vs. low credit rating firms or earnings changes for highly profitable firms vs. less profitable firms, which could explain the contradictory results obtained by them.[5] This issue is also of interest to accounting and finance researchers for its own sake since prior research found conflicting evidence of asymmetry in the bond prices to good news versus bad news [Datta and Dhillon (1993), Easton et al. (2007)].

3. Both aforementioned studies suffer from potential correlated omitted variables bias since they fail to control for restructuring clauses that have been shown to be highly significant determinants of CDS premia both theoretically and empirically.[6]

4. In contrast to this study, neither study address the impact of the cash flow/accruals breakdown on the pricing of CDS instruments nor do they test for the potential asymmetric impact of accruals versus cash flows on CDS rates.

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[5] Batta (2006) does allow for nonlinearities in the coverage ratio and noise in bond credit spreads. However, nonlinearities in the coverage ratio may be due to the denominator effect (interest expense) rather than earnings. Furthermore, Batta does not report changes analysis asymmetry results.

[6] See Packer and Zhu (2005), Berndt, Jarrow, and Kang (2006) and the discussion below regarding restructuring differences.

5. Benkert (20004) and Batta (2006) focus solely on 5-year CDS contracts and, therefore, cannot address the issue, as we do, of how term to maturity, earnings and CDS premia are interrelated.

We use three methodologies to examine the relation between CDS premia and earnings: a levels analysis, a changes (returns) analysis and a short-window event study analysis. The levels analysis indicates that CDS premia are inversely related to quarterly earnings implying that higher profits signal lower default risk. Decomposing earnings into cash flows and accrual earnings components, we show that both accruals and cash flows are significantly and inversely related to CDS premia, and that the impact of a one percent change in accruals or cash flows on CDS premium is similar to the impact of earnings on the premium. We also find, as predicted, that the relations between CDS premia and each of earnings, cash flows and accruals are significant for short to medium terms CDS but are not significant for maturities in excess of 5 years. In addition, the relations are (by and large) monotonic in the CDS maturity; the absolute value of the impact of each of earnings, cash flows, and accruals on CDS premia decrease with almost all CDS maturities. Furthermore, the levels analysis provides evidence consistent with nonlinear asymmetric payoff functions for debt holders. Specifically, CDS premia are shown to respond asymmetrically to earnings in two ways. CDS premia are more highly correlated with below-median earnings than with above-median earnings and CDS premia are more highly correlated with the earnings of low rated firms (BBB and below) than the earnings of high rated firms.

Regarding the changes analysis, we show that *changes* in CDS premia over the quarter are inversely related to earnings *changes* over the quarter for almost all CDS maturities. Similarly, *changes* in CDS premia over the quarter are significantly and inversely related to *changes* in cash flows and accrual earnings.[7] The inverse relation between CDS premia and each of earnings, cash flows and accruals appears to hold for most CDS maturities but, unlike the levels analysis, the relation does not appear to be monotonic in maturity. Although the results are weaker than for the levels analysis, *changes* in CDS premia respond asymmetrically to above and below median earnings. Similarly, we find that earnings changes convey value-relevant CDS pricing information primarily for firms with lower credit ratings. Both of the latter results are consistent once again with a nonlinear payoff functions for debt holders.

Our analysis also indicates that earnings have economically significant impact on CDS premium. Using the levels (changes) analysis we find that a one percent change in ROA would change CDS premia by close to 4.5 (2.8) basis points. Given that the median CDS premia of our sample is 52 basis points, these results imply that a one percent change in ROA would change CDS premia by about 9% (5%). Similarly, we find that the impact of one percent change in cash flows scaled by total assets would change CDS premia by 3.3 to 4.6 basis points, or 6% to 9%, whereas a similar change in accruals scaled by total assets would change the premium by 2.7 to 4.2 basis points, or 5% to 8%.

The analysis of CDS premia over the three-day short window surrounding preliminary earnings announcements indicates that CDS premia are inversely and significantly related to earnings surprises. CDS premia are also found to be significantly related to the non-earnings information contained in cumulative equity returns over the

[7] The coefficient for changes in cash flows is greater than the coefficient for changes in accruals in absolute value. The difference is not significant at conventional levels using Rogers clustered standard errors but is significant using conventional (robust) standard errors.

three day window. Again, short-window earnings changes are found to convey CDS value relevant information primarily for firms with lower credit ratings.

In what follows, Section 2 briefly describes the CDS market and indicates the reasons that the CDS market is a superior to the corporate bond and the secondary loan markets for determining the relation between earnings and credit risk. Section 3 surveys the relevant CDS literature. Section 4 develops the hypotheses to be tested. Section 5 describes the sample. Section 6 presents the empirical analysis. Section 7 describes the robustness checks. Section 8 concludes.

2. The CDS Market

2.1 The Basics

Financial innovation has led to the creation of credit derivatives to manage credit risk. Surveys indicate that the outstanding notional amount of credit derivatives globally reached $8.4 trillion by the end of 2004, more than four times the size of the investment-grade bond market of $2.0 trillion and double the size of the total equity derivatives market of $4.15 trillion at the same date. The growth in credit derivatives can be attributed to four market participants. The largest group in the credit derivatives market is comprised of large commercial banks, who are net buyers of credit derivative protection.[8] Traditionally, a bank's business involves credit risk if only because of corporate loan originations. Unlike securitizations, credit derivatives offer banks an attractive way to transfer credit risk without removing the loans from their balance sheets and without directly involving borrowers. In addition, credit derivative contracts allow banks to

[8]See Minton et al. (2006).

diversify their portfolios, which often are concentrated in certain industries or geographic areas. Insurance companies comprise the second largest group. Insurance companies are increasingly becoming dominant participants in the credit derivative market as they attempt to enhance investment yields by diversifying their exposure to risks that are uncorrelated with the existing insurance business. Globally, insurance companies have net sold positions in the credit derivative market since they primarily sell insurance protection. Global hedge funds have also become large players in the credit derivative market operating both as protection buyers and sellers in an effort to carry out complex arbitrage strategies across various financial markets. Other miscellaneous participants include financial guarantors, who are net protection sellers and pension funds.

The most common credit derivative is the single-name credit default swap (CDS). The CDS market has grown rapidly in no small part due to the standardization of CDS contract definitions in 1998 by the International Swaps and Derivatives Association, since amended a number of times. A CDS is an over-the-counter contract between two parties that provides protection against credit risk. Not unlike a common insurance contract, the protection buyer pays a fixed premium, the spread, to the protection seller for a period of time. If a certain pre-specified credit event occurs to a specific company, called the reference entity, the protection seller pays compensation to the protection buyer. The reference entity is not a party to the contract, and it is not necessary for the buyer or seller to obtain the reference entity's consent to enter into a CDS. Credit events in CDS contracts often include failure to pay, bankruptcy, and restructuring of the reference entity. Technical default, such as violation of a bond covenant, by contrast is rarely defined to be a credit event. If the protection buyer does not hold the reference bond, then compensation is in the form of a lump sum payment equal to the difference between the value of the reference entity's bond and its face value. Alternatively, if the protection buyer holds the bond, the compensation can be either in the form of a lump-sum payment or the protection buyer can deliver the reference entity's bond to the protection seller for its face value. If no credit event occurs during the term of the swap, the protection buyer continues to pay the swap premium until maturity.

The premium paid by the protection buyer to the seller is quoted in basis points per annum of the contract's notional value--typically $10 million--and is usually paid quarterly. For example, suppose that the CDS spread for a five-year $10 million contract on British Airways is 125 basis points and the credit event is defined to be default of British Airway's bonds. This means that the protection buyer pays $31,250 (1.25/4 percent of $10M) per quarter to the protection seller for 5 years or until British Air defaults on its bonds. In the event that British Air defaults on its bonds, the protection buyer, in turn, has the right to sell British Air's bonds to the protection seller for their face value of $10 million. Maturities typically range from one to ten years, with the five-year maturity being the most common.

A number of institutional differences between corporate bonds (and secondary loans) and the CDS market have also contributed to the phenomenal growth in CDS trading. A CDS does not require initial funding, which allows for leveraged positions. A CDS transaction can be entered into even if a cash bond of the reference entity at a particular maturity is not available. Finally, by entering a CDS contract as a protection seller, an investor can easily create a short position in the reference entity's credit.

2.2 CDS Instruments versus Corporate Bonds and Secondary Loans

The credit risk profile of a CDS appears to be similar to that of a corporate bond of the reference entity. In fact, in the absence of (i) arbitrage opportunities, (ii) contractual features such as embedded options, covenants, and guarantees and (iii) market frictions, the CDS premia and the corporate bond yield spread are necessarily identical for a floating rate corporate bond.[9] Nevertheless, it is well-recognized by the finance literature that CDS premia offer many advantages over corporate bond yield spreads and secondary loan spreads for analyzing the pricing determinants of credit risk and, we maintain the relationship between earnings and credit risk. The most important advantages are as follows:[10]

1. As shown by Elton et al. (2001), as much as 85 per cent of corporate bond yield spreads can be explained as a reward for bearing systematic risk unrelated to default. Huang and Huang (2002) conclude that less than 25% of the credit spread in corporate bonds is attributable to credit risk. Similarly, Longstaff et al. (2005) find a significant non-default related component in the corporate bond spread correlated with illiquidity proxies. Importantly, Erricson et al. (2006) also find a significant illiquidity component for corporate bonds *but not* for CDS instruments.[11]

2. Interest risk *drives* fixed-rate corporate bond yields and secondary market loan rates quite independently of credit risk. Even floating corporate rate bonds and secondary loans are often subject to interest rate risk because changes in the floating rate often kick in with a lag. A positive relation between earnings and bond prices could well be due to

[9] See Duffie (1999), for example. Also, see Duffie (1999) for conditions ensuring the equality of the swap rate and the corporate bond yield spread when the corporate bond is fixed rate.

[10] The corporate bond yield spread is usually defined as the yield differential between the corporate bond yield and an AAA or US Treasury Bond of similar maturity.

[11] In contrast, Vassalou and King (2004) find that a large portion of default risk is systematic.

changes in interest rates, if say risk-free interest rates decreases cause firm earnings to increase over time, rather than to credit risk

Interest rate risk can affect CDS rates as well, but only as a secondary effect and only to the extent that it is affected by credit risk.[12] Indeed, the impact of interest rate risk on CDS is in opposite direction to corporate bonds and secondary loans. For example, an unanticipated increase in the risk-free rate will reduce corporate bond prices and increase yields, making the bondholder worse off. By contrast, an unanticipated increase in the risk-free rate has a positive wealth effect (see the discussion below) on the CDS premium, lowering the probability of a credit event and making the protection seller (the equivalent of the bondholder) better off.[13]

3. In contrast to CDS instruments, corporate bonds and secondary market loans are replete with embedded options, guarantees, and covenants. Heterogeneity in these features potentially distorts the relationship between earnings and credit risk in cross-sectional studies. Even more problematic is that they may generate a spurious relation between earnings and credit risk. For example, the positive relation between earnings and corporate bond prices could be driven by earnings-based covenants rather than credit risk per se. With lower earnings, earnings-based covenants are more likely to be binding, increasing the probability of technical bankruptcy and concomitant expected transactions (renegotiation) costs and, thereby, leading to reduced bond prices. In contrast, except for rare cases, technical default (called obligation acceleration or obligation default in the

[12]Corporate bonds react to (unanticipated) own yield changes whatever their source whereas CDS rates react only to (unanticipated) changes in risk-free rates, a secondary effect.

[13]Although current CDS rates fall, the protection buyer has committed to pay the same insurance premium for lower credit risk and so he is worse off. Note that the inverse relation between risk-free interest rates and credit risk (due to wealth effects) has been proved analytically in the CDS structural modeling literature described below.

CDS market) is not defined to be a credit event in CDS contracts. (Our sample has no such contracts.) Since technical default is not a credit event, earnings-based covenants in the underlying reference bond have no impact on CDS rates.

4. The available empirical evidence indicates the credit risk price discovery takes place first in the CDS market and only later in the bond market.[14] The bond markets lagged reaction potentially distorts empirical studies relating earnings to bond prices.

5. Unlike corporate bond yield spreads, no benchmark risk-free rate need be specified for CDS premia minimizing potential misspecification of the appropriate risk-free rate proxy. Again, misspecification of the correct risk-free rate induces noise and potentially distorts empirical studies relating earnings to corporate bond spreads.[15]

6. CDS rates are closely related to the par value of the reference bond whereas corporate bonds values (including their taxability characteristics) are affected by coupons. Heterogeneity in coupon rates potentially distorts the relationship between earnings and credit risk in cross-sectional studies.

CDS instruments are also superior to credit ratings for evaluating the determinants of credit risk. In fact, there is quite a variation in CDS spreads that are observed for firms with a given credit rating. In addition, unlike credit ratings which tend to be "sticky" and are a function of many factors other than credit risk, CDS rates tend to lead changes to

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[14]See Blanco et al. (2005), Zhu (2004) and Daniels and Jensen (2005) for evidence that price discovery of credit risk first takes in the CDS market, and that the bond market lags by comparison. Longstaff et al. (2005) justify their approach by reference to the Blanco et al. (2005) study.

[15]See Houweling and Vost (2003) on this issue. Another disadvantage of bond yield spreads includes the tax differentials in bond pricing. Elton et al. (2001) document a tax premium of 29 to 73 percent of the corporate bond spread, depending on the rating. See Longstaff et al. (2005) for other potential disadvantages of bond spreads as measures of credit risk relative to CDS premia.

the credit profile of the reference entity and reflect only the credit risk of the reference entity.[16]

3. CDS Literature Survey

The finance literature proposes three model types to explain the pricing of credit derivates, structural models, reduced form models and hybrid models. Structural models are based upon the seminal paper by Merton (1974). The structural modeling approach links the prices of credit risky instruments directly to the economic determinants of financial distress and loss given default, conditional on knowing the firm's asset value process.[17] These models imply that the main determinants of the likelihood and severity of default are financial leverage, the volatility of the firm's assets, and the risk-free rate of interest. Despite the intuitive appeal of structural models and their strong theoretical underpinnings, the direct use of structural models to price credit derivatives typically yields poor results, probably because the parameters of the firm's asset value process are difficult to observe.[18] Moreover, because structural models assume that (i) investors observe the reference entity's assets directly and (ii) the reference entity's asset structure behaves according to a known stochastic process, neither earnings nor other accounting information play a role in the pricing of CDS in these models. Thus, from the perspective

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[16]See Hull et al. (2004) and Daniels and Jensen (2005) regarding the relationship between credit rating changes, CDS premia and bond prices. A related active area of research is the relationship between equity returns and credit risk as reflected in credit derivative prices. See most recently Chan-Lau (2006). Our analysis below also sheds some light on this issue.

[17] See for example Black and Cox (1976), Leland and Toft (1996), Longstaff and Schwartz (1995) and Collin-Dufresne and Goldstein (2001).

[18] See, for example, Eom, Helwege and Huang (2004).

of these models, the null hypothesis that earnings play no part in the pricing of credit risk (as reflected in CDS premia) is quite credible.

Reduced form models such as those by Das (1995), Das and Sundaram (1998) and Hull and White (2000a, 2000b) do a better job at directly pricing credit derivatives. Nevertheless, like structural models of CDS pricing, reduced form models leave no room for earnings as determinant of credit risk. In the latter, the firm's asset value process is abandoned. Instead, reduced form models exogenously postulate the dynamics of default probabilities. Thus, reduced form models tend to be "black boxes" that are silent about the underlying determinants of the price of credit risky instruments.

Far better economic insights are provided by the hybrid model of Duffie and Lando (2001).[19] Their model is a first passage of time model where the rate at which default occurs is a function of the firm's asset value and capital structure. Unlike standard structural models, they assume that investors cannot observe the asset structure of the firm directly. Instead, investors receive periodic accounting reports that provide imperfect information about the true financial condition of the firm (e.g., the distance of asset values from the bankruptcy boundary). Accounting information in the Duffie and Lando model is quite abstract. Except for the notion of noisy accounting information about the firm's asset structure, also referred to by the authors as accounting information transparency, no specific accounting variables are specified in the model. However, as they point out in the generalization section of their paper, their model can be readily extended to accommodate other types of accounting information, including accounting ratios and peer performance measures. Therefore, besides the standard structural model

[19] See also Buhler and Thabe (2007).

variables of conventional structural models, the hybrid model of Duffie and Lando also rationalizes accounting information transparency, earnings, cash flows and accruals, as well as accounting information generally, as determinants of CDS pricing.

Rather then trying to directly price credit derivatives using a structural or hybrid model, we follow the regression approach of Collin-Dufresne, Goldstein, and Martin (2001) (CGM).[20] They "borrow" from the structural approach to identify the theoretical determinants of credit risk. These determinants are then used as independent variables to explain corporate credit spreads, rather than inputs to a particular structural model. Although CGM themselves estimate bond yield spreads, a similar approach using CDS premia is taken by Cossin and Hricko (2001), Aunon-Nerin et al (2002), Benkert (2004), Abid and Naifar (2005), Ericsson et al (2005) and Batta (2006).

Based on a sample of 393 multi-country CDS transactions, Cossin and Hricko (2001) and Aunon-Nerin et al. (2002) estimate levels regressions to examine whether leverage, credit ratings, US and other national risk-free interest rates, the slope of the (US) yield curve, stock prices, time to maturity, stock volatility, market capitalization (liquidity), and country stock index returns explain CDS spreads. Depending upon the specific levels regression,[21] they find that a number of these factors significantly explain CDS spreads in the hypothesized direction, most crucially credit ratings, leverage, stock prices and the slope of the yield curve.

Using a sample of 207 multi-country CDS transactions, Abid and Naifar (2005) analyze the relation between CDS spreads and credit rating, time to maturity, the riskless interest rate, the slope of the yield curve, and the volatility of equities. In a series of

[20] One can think of the linear regressions in this paper as a first-order approximation to a structural model.
[21] Interestingly, they do not regress CDS premia on all of the explanatory variables simultaneously, possibly because of multicollinearity concerns.

(essentially bivariate) levels regressions involving credit ratings and one other determinant, they find that most of the determinants that they investigate are significant.

Erricson et al. (2005) employ a far more comprehensive sample of approximately 10,000 daily bid and offer quotes on US corporations with an approximate five-year maturity to analyze the relation between credit spreads and its determinants. Various (panel data and time series) levels and difference regressions are estimated with explanatory variables including leverage, long and short term risk-free interest rates, the slope of the yield curve, the smirk slope, stock volatility, and the S&P index return. Separate regressions are run for high and low rating firms and for bid and offer quotes. Not surprisingly they find that the levels regressions are far more significant than the difference regressions. Overall, they find that leverage, stock volatility and the interest rate are significant and of the hypothesized sign.

It bears emphasizing that none of the above empirical papers investigate the impact of earnings on credit swap spreads, probably because these studies base their empirical work on structural models and, to repeat, earnings are not a determinant of CDS prices in structural models. Nevertheless, two empirical studies investigate the pricing implications of earnings (actually a ratio involving earnings) on CDS prices, on what appears to be purely empirical grounds.

From a sample of 26,478 CDS quotes for 120 international borrowers, Benkert (2004) regresses (using panel data fixed effects) the level of 5-year CDS premia on leverage, credit rating, historical volatility, implied volatility the risk-free rate, slope of the yield curve, earnings to sales and earnings to interest, as well as on combinations of these regressors.[22] Overall, he finds that credit rating, leverage, historical volatility and implied volatility (risk-free rate) are significantly and positively (negatively) related to CDS premia. More germane to our study, Benkert also obtains the ostensibly counterintuitive result that, controlling for credit ratings, the earnings variables are significantly and *positively* related to CDS premia. This implies that positive earnings are associated with increased credit risk.[23]

Using a far smaller sample of 818 firm-quarter CDS prices, Batta (2006) regresses (using panel data fixed effects) levels of 5-year CDS premia on the bond spread, interest coverage ratios (earnings plus interest expense divided by interest expense), leverage, size, equity returns, ratings and an equity based model of CDS pricing, as well as combinations of these variables. Batta further allows for nonlinearity in his interest coverage variable and, in addition, includes interactions between the independent variables of his regression with a proxy for noise in bond spreads. Overall, he finds that leverage, bond spreads, the equity based model of CDS prices and size (equity returns, ratings) are significantly and positively (negatively) related to CDS premia. Moreover, in contrast to Benkert (2004), Batta finds that interest coverage, which includes earnings in the numerator, is significant and negatively related to CDS premia, primarily when the coverage ratio is non-positive.[24]

[22] Benkert (2004) argues on intuitive grounds that parameter uncertainty rationalizes variables such as earnings as determinants of CDS prices. He does not refer to Duffie and Lando (2001).

[23] We find a significant and negative relation between earnings and CDS premia for our sample even after controlling for ratings in the same fashion as Benkert (2004).

[24] In a tangential analysis, Berndt, Jarrow, and Kang (2006) regress the restructuring premium--the CDS premium with modified restructuring over the CDS premium without restructuring for a paired CDS sample—on the CDS premium without restructuring and on a number of market and accounting variables, including the earnings to debt ratio. The latter ratio is significant and positive. Although the positive sign on the ratio is consistent with our results, their analysis is not comparable to our study or the others cited below.

4. Hypotheses Development

The hybrid model of Duffie and Lando (2001) motivates (at least partially) the hypotheses of this study. As in structural models, the price of a CDS instrument in their model is a function of the likelihood and severity of financial distress (the credit event). In the Duffie-Lando model, these in turn are a function of (i) the factors that explain CDS pricing in standard structural models and (ii) the imperfect information available to the CDS market about the firm's asset dynamics from periodic corporate financial reports.

Although accounting information in the Duffie-Lando model is completely generic, we focus on earnings for two reasons. First, earnings are (arguably) the most important information variable used by investors to evaluate firm performance and, hence, future firm wealth, a major determinant of credit risk. Second, earnings can be used by investors to estimate the reference entity's true asset dynamics and hence its credit risk. More specifically, increased profitability of the reference entity, as measured by current accounting earnings, should reduce its credit risk since, with increased profitability, the reference entity is wealthier and, therefore, is less likely to go bankrupt or to default on a bond payment. Furthermore, accounting studies have shown that current earnings are a good predictor of future earnings (Finger 1994, Nissim and Penman 2001), future cash flows (Dechow et al. 1998, Barth et al. 2001), and firm equity performance (Dechow 1994). In other words, an increase in earnings portends an increase in operating and equity performance and, hence, a reduced probability of bankruptcy. Also, earnings comprise a significant portion of the short term change in firm assets (via clean surplus) and therefore provide direct information about the firm's asset dynamics directly. In particular, the larger the increase in firm earnings, the larger are the firm's assets currently, all else equal, and the larger future assets are likely to be. Thus, from both perspectives, increased earnings reduce credit risk and hence CDS rates.

Furthermore, the shorter the maturity of the CDS contract at initiation, the more likely is an increase (decrease) in profitability to provide positive (negative) information about the reference entity's ability to repay bondholders within the maturity period. Contrariwise, longer term (initial) maturities are less likely to be affected by current earnings. What matters for longer maturities is the firms' ability to pay bondholders in the long run and short-term earnings are less informative about long-term performance than short-term performance.

These considerations yield the following set of hypotheses stated in the alternative:

H1: The quarter-end CDS premium is inversely related to the reference entities' quarterly earnings. The relation between the CDS premium and the reference entities' earnings is a decreasing function of CDS maturity.

H2: The percent change in the CDS premium over the quarter is inversely related to the *change* in the reference entities' quarterly earnings. The relation between the percent change in the CDS premium and the change in the reference entities' earnings over the quarter is a decreasing function of CDS maturity.

H3: The percent change in the CDS premium in the short window centered on the preliminary earnings announcement is inversely related to the reference entities' earnings surprise. The relation between the percent change in the CDS premium around the preliminary earnings announcement and the reference entities' earnings surprise is a decreasing function of CDS maturity.

All three hypotheses are similar but expressed at different levels of timing aggregation. H1 refers to the relation between the level of the CDS premium and the level of the reference entity's quarterly earnings. H2 refers to the relation between the change in the CDS premium and the change in the reference entity's earnings over the quarter. H3 refers to the short-window relation between the CDS premium and preliminary earnings announcements.

There appears to be a consensus among accounting scholars that both accruals and cash flows are value relevant in equity markets. In particular, a large number of studies find that both accruals and cash flows are contemporaneously related to equity returns and current accruals and current cash flows can be used to predict future equity prices.[25] This suggests that similar to earnings, accruals and cash flows convey information about the reference entity's future wealth and about its true asset dynamics and hence its credit risk. However, unlike cash flows, accruals are subject to manipulation, suggesting that accruals are less predictive of firm wealth than cash flows. Moreover, higher accruals may reflect higher credit risk because there may be less cash to satisfy the claims of creditors for a given level of earnings. Hence, accruals are either negatively related to credit risk, but less so than cash flows, or accruals are positively related to credit risk.

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[25] See Dechow (1994), Subramanyam (1996), Sloan (1996), Pfeiffer and Elgers (1999), Barth et al. (1999), Callen and Segal (2004) and Xie (2001).

H4a: The (change in the) CDS premium is inversely related to the (change in the) reference entities' cash flows. The (change in the) cash flows have (has) a greater negative association with credit risk than accruals.

As we argued above, earnings may convey credit risk relevant information both because earnings inform about the current wealth of the firm, the future operating and equity performance of the firm and the dynamics of the asset structure. Viewing the equity of the firm as an option on the firm's assets suggests that debt holders in turn will have a nonlinear payoff function, namely, they will react more to information that presages potential bankruptcy than information that presages additional profits. One possible means of testing for this nonlinearity is to see whether there is an asymmetry in the response of CDS premia to losses versus profits. Extant evidence of such nonlinearities in the corporate bond market is mixed. Datta and Dhillon (1993) find that corporate bond yields do *not* react more to (unexpected) losses than to (unexpected) profits whereas Easton et al. (2007) find just such an asymmetry. Since CDS reference firms are typically quite large, and relatively rarely incur losses, we examine whether CDS spreads react more to earnings of firms with below the 3-digits industry median profitability than to earnings of firms with above industry-median profitability.

Another means of testing for nonlinearity in CDS premia is through credit ratings. Specifically, earnings should be more highly associated with CDS premia for those firms for which the likelihood of bankruptcy is greater, as measured by credit ratings. To proxy for the likelihood of bankruptcy, we divide firms into two groups based on credit ratings.[26] Firms with credit ratings BBB and below are assumed to be more likely to go bankrupt ex ante than firms with higher ratings. The BBB ratings cutoff essentially divides the sample observations in half. This classification is also consistent with the CDS literature that maintains that CDS prices are nonlinear in the reference entities' credit ratings.[27] These considerations lead to our last two hypotheses.

H5: The relation between (changes in) each of earnings, accruals, and cash flows and (percentage changes in) CDS premia is greater in absolute value for firms with low credit ratings than for firms with high credit ratings.

H6: The relation between (changes in) each of earnings, accruals, cash flows and (percentage changes in) CDS premia is greater for firms with below median earnings than for firms with above median earnings.

5. Data

CDS data for 2002 through 2005 are provided by Lombard Risk.[28] For a given date and reference firm, the database reports a composite at-market CDS rate for the initial maturity. This composite rate is derived from the mid-market quotes contributed by up to 25 investment banks and default-swap brokers. All quotes are for the initial

[26] To proxy closeness to default, Berndt, Jarrow and Kang (2006) use Merton's (1974) "distance to default" measure defined roughly, as the number of standard deviations of asset growth by which a firm's market value of assets exceeds a liability measure. Unfortunately, this measure is highly correlated with stock return volatility, an important variable in our analysis. We use high/low credit ratings instead as a proxy of closeness to default.
[27] See Aunon-Nerin et al. (2002), for example.
[28] http://www.lombardrisk.com/

maturity only. Besides quotes, the database includes, for each date, the referenced firm identifier (primarily ticker symbol), the seniority (senior or subordinated), the currency of the underlying debt, the initial maturity of the CDS contract (1, 3, 5, 7, or 10 years), the standard deviation of the mid-market quotes, and the restructuring clause applied in the contract.[29, 30] Also reported is the average, across sources, recovery rate used by the quote providers. The frequency of observations has increased over time. The database contains biweekly information from January 2002 to June 2002, weekly data from July 2002 to May 2003, and daily quotes starting May 15, 2003. The initial sample comprises 2,127,526 CDS contracts for 798 firms.

Using the Preliminary Compustat database available to us through Charter Oak (and now available also on WRDS), we identify for each firm on Compustat the quarterly preliminary earnings release date. In addition, we obtain SEC filing dates for our sample firms from S&P's Compustat (but not through the regular Compustat database).

We use ticker symbols to merge the data with the preliminary earnings release and financial statement dates together with the CDS dataset. Requiring CDS data around the preliminary earnings release date or around the financial statement filing date, results in a sample of 598 (4,890) firms (firm-quarters) and 46,602 CDS contracts.[31] To enhance the homogeneity of the sample, we eliminate contracts with non-seniority clauses (1,127 contracts), contracts with Modified-Modified Restructuring clauses (1,024 contracts), and

[29]Unfortunately, the data in CDS studies typically do not include counterparty details making it impossible to control for counterparty risk.

[30] For example, on Nov. 30, 2004, the data include quotes on 16 CDS contracts of Bristol Myers Sqibb (ticker = BMY), the reference firm. These contracts differ in their maturity, restructuring clause, and currency.

[31] The matching is done by using the historical ticker symbols available to us through the Charter Oak Point In Time database.

contracts not denominated in $US (7,382 contracts).[32] These restrictions reduce the sample size to 37,069 contracts for 577 firms (4,837 firm-quarters). We further require that each observation has sufficient data to compute either the change in CDS premium around the preliminary earnings release date (for the event study) or the change in CDS premium in the most recent quarter or the CDS premium one day after the financial statement filing date, resulting in a sample of 21,839 contracts for 536 firms (3,089 firm-quarters). Merging this sample with Compustat and CRSP and requiring non-missing earnings, market value of equity greater than 100 million and positive book value of equity, results in a final sample of 20,328 contracts for 508 firms (2,800 firm-quarters). Table 1 describes the data and sample filters. Except for Benkert (2004), this sample is significantly larger than those of the prior CDS studies referenced above.

(Insert Table 1 about here)

Table 2 presents descriptive statistics for our sample observations. The firms covered in the database are large; the mean (median) firm has a market value of $13.09 (6.70) billion. Thus, the results reported in this study are unlikely to generalize to smaller firms. The percentage change of the CDS premium in the 3-day window centered on the preliminary earnings announcement date has a mean of 0.7% and a median of 0.0%. The percentage change in the CDS premium from one day after the SEC filing date of the previous quarter through one day after the SEC filing date of the current quarter, CDS_QTR, has a mean (median) of 0.0% (-7%), suggesting that the median CDS premium tends to decrease with the additional information learned throughout the quarter. The log of the CDS premium on the first day after the financial statement filing

[32] We eliminate CDS contracts with non-seniority and MMR restructuring clauses because there are relatively few contracts of these types in our sample.

date, CDS_PRM, has an average (median) value of 4.08 (3.95), representing a premium of 59 (52) basis points.

(Insert Table 2 about here)

The mean (median) quarterly return on assets (ROA), which is income before extraordinary items and discontinued operations scaled by total assets at the end of the quarter, is 1.2% (1.1%), which is reasonable considering the large firm bias in the sample. The change in ROA from the previous quarter has a mean (median) of 0.2% (0.1%), indicating that most firms had positive earnings growth, which is consistent with the negative percentage change in the median CDS premium over the quarter. Leverage, estimated as total debt divided by market value of assets (computed as market value of equity plus total liabilities) at quarter end, has a mean (median) of 0.45 (0.43). The change in leverage over the quarter has a mean of -0.006, indicating a slight decrease in leverage. The quarterly net operating cash flow (accrual) scaled by total assets at the previous quarter-end has a mean (median) of 2.4% (-1.2%), which is in line with prior studies. The S&P senior debt rating for the sample observations (RATE) shows considerable variation with ratings of AAA (code 2) through B- (Code 18) with a median rating of BBB (code 11). The earnings surprise (EAR_SUR) is computed as actual earnings per share reported on IBES minus the most recent median forecast, scaled by share price. The table shows that the mean earnings surprise for our sample firms is 0.001. Other variables that are important in determining CDS premia (the volatility of returns and the risk-free interest rate) show considerable variation during our sample period. Finally, untabulated results show that 17%, 22%, 23%, 20%, and 18% of the sample CDS contracts have initial maturities of 1, 3, 5, 7 and 10 years, respectively.

6. Empirical Results

6.1 Control Variables

The empirical testing of the hypotheses in this paper is based primarily upon cross-sectional analysis. Thus, it is crucial to control for factors other than earnings that are known to affect swap spreads. The structural and hybrid modeling approaches link the prices of credit risky instruments directly to the economic determinants of financial distress and to the severity of loss given default. The main firm-level determinants of the likelihood and severity of default in structural and hybrid models are financial leverage, the volatility of the firm's assets, the riskless rate of interest and the (initial) maturity of the contact. More specifically, the higher the leverage and the more volatile the assets of the reference entity, the higher is the probability of a credit event and so the higher is the swap premium. In contrast, the higher the riskless rate of interest, the lower is the swap premium. Intuitively, a higher rate of interest increases the drift rate for the firm's assets, thereby increasing the firm's wealth and making bankruptcy less likely. The swap premium increases with the initial maturity of the contract since the longer the contract maturity the greater is the probability that a credit event will occur.

In addition, we control for credit ratings and the restructuring provisions of the CDS contract.[33] Additional controls (untabulated) are described later in the sensitivity analysis section of the paper. Credit ratings provide a noisy measure of credit risk and are

[33] According to the 2003 ISDA Credit Derivatives Definitions, a restructuring credit event occurs if there is: (i) a reduction in the interest rate or in the amount of principal, (ii) a postponement or other deferral of dates for the payment of interest, principal, or premium, (iii) a change in the ranking in priority of payment of any obligation that causes subordination of it to other obligations, and (iv) any change in the currency or composition of any payment of interest or principal.

employed in all the empirical CDS papers referenced above. We expect that the lower the credit rating of the reference entity, the higher is the swap premium.

We control for restructuring clauses since recent empirical and theoretical work by Packer and Zhu (2005) and Berndt, Jarrow, and Kang (2006) indicate that restructuring clauses are important determinants of CDS pricing. All else equal, the CDS premium for contracts that define restructuring as a credit event is greater than if restructuring is not a credit event. Indeed, Berndt, Jarrow and Kang (2006) find that the average premium for restructuring risk represents 6% to 8% of the swap rate without restructuring. In addition, even where restructuring is a credit event, different restructuring clauses allow for different payment instruments in the event of a restructuring credit event and subsequent physical delivery of the bond by the protection buyer to the seller. Of the two types in our sample, "full restructuring" allows delivery of any reference entity bond by the protection holder with a maturity up to 30 years whereas "modified restructuring" restricts the bond to have a maturity within 30 months of the CDS contract's maturity. All else equal, the CDS premia for full restructuring should be greater than for modified restructuring.

Our tests involve panel data regressions where the dependent variables are either levels or (percentage) changes in CDS premia and the independent variables are (changes in) earnings, and other model-driven and control variables specified above that are potentially important in explaining CDS premia. Since the data involve both time series and cross-sectional data, panel data techniques are used. In particular, the regressions are estimated using firm random effects with year fixed effects.[34] Also, since the data include

[34] Breusch-Pagan Lagrange Multiplier tests reject firm fixed effects in favor of firm random effects in all regressions.

various CDS contracts for the same firm, significance of the coefficients is based on firm clustered (Rogers) standard errors following Petersen (2006). To reduce potential multicollinearity induced by interaction terms, we demean all continuous *independent* variables [Aiken and West, 1991].

6.2 Levels Analysis

(Insert Table 3 about here)

The levels analysis (Hypothesis H1) is described in Table 3. The BASE column of Table 3, Panel A provides the base line regression derived from structural models of CDS pricing. Except for the restructuring controls, CUMR and EXR (defined below), this regression is common to virtually all of the CDS papers cited above. In the BASE regression, the log of the level of CDS premia one day after the SEC filing date is regressed on leverage (LEV), the risk-free rate of interest (SPOT), the volatility of returns (SD_RET), and the S&P credit rating (RATE). The dummy variables CUMR and EXR denote full restructuring and no restructuring, respectively. Inter alia, the intercept captures modified restructuring. The dummy variables D_3 through D_10 denote CDS maturities of 3 through 10 years. Thus, the intercept captures CDS of 1 year maturity as well.

The highly significant BASE levels regression yields results that are consistent with the underlying theory of structural models. The coefficients for leverage and the volatility of returns are positive and highly significant ($p<0.000$, two-tailed). The coefficient for the risk-free rate of interest is negative and highly significant ($p<0.000$, two-tailed). The credit rating—the higher is the RATE variable the lower the credit rating—is positive and significant ($p=0.025$, two-tailed). As expected, CDS contracts without restructuring clauses (EXR) have significantly lower CDS premia than CDS contracts with restructuring clauses ($p<0.000$, two-tailed). The insignificance of the CUMR coefficient indicates that there is no significant difference between full and modified restructuring clauses. Furthermore, CDS premia increase significantly and monotonically with (initial) contract maturity ($p<0.000$, two-tailed), consistent with the option pricing theory underlying CDS contracts.

The ROA column includes earnings normalized by total assets (ROA) and firm size (SIZE) in addition to the structural model variables and rating. Size is a proxy for accounting information certainty/ transparency. The larger the firm, the less uncertain/ more transparent is the accounting information. The inclusion of these latter variables is rationalized by the hybrid model of Duffie and Lando (2001).[35] Consistent with theory, both the earnings and size coefficients are negative and highly significant ($p<0.00$, two-tailed). The remaining coefficients are qualitatively similar to those of the BASE regression.

The CF_ACC column replaces ROA after decomposing earnings into its accrual/cash flow components. These components are scaled by total assets. Consistent with H4, both the accruals and cash flow components are negative and highly significant ($p<0.02$ and $p<0.00$, respectively, two-tailed). Although the accruals coefficient is smaller in absolute value than the cash flow coefficient, suggesting that accrual earnings are less credible to investors than cash flows, the difference is not significant. Again, the remaining coefficients are qualitatively similar to those obtained in the BASE and ROA regressions.

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[35] Initially, we also included the standard deviation of earnings as an additional measure of accounting information certainty/ transparency, but it proved to be insignificant in all regressions.

The impact of earnings on CDS premia may depend upon the (initial) maturity of the CDS contract—the shorter the maturity, the greater should be the impact of earnings on CDS premia. Panel B of Table 3 replicates the ROA and CF_ACC levels regressions of Panel A after interacting earnings, accruals and cash flows with the maturity dummies, respectively. ROA_i represents the *incremental* effect of earnings on the CDS premium of the i'th maturity contract relative to the one year maturity (ROA) contract, i=3,5,7,10. (Similar notation is used for cash flows and accruals.) The ROA column regression in Panel B shows that increased earnings reduces CDS premia significantly for one year maturities ($p<0.000$, two-tailed). The *marginal* interaction coefficients are positive and significant (with the exception of the 3 year maturity) and increase monotonically with maturity as predicted, indicating weaker association as maturity increases. Similar monotonic relationships hold for both cash flows and accruals in the CF_ACC column. All other coefficients are qualitatively similar to those of the Panel A regressions.

The maturity interaction coefficients in Panel B only indicate the marginal effects for different maturities. Panel C shows the total effects which are computed by adding the marginal coefficient to the base one year coefficient. The ROA column of Panel C indicates an almost *monotonic* inverse relation between earnings and CDS premia. The relation is significant for all but the 7 and 10 year maturities. The same near monotonic relation holds for both cash flows and accruals. Similar to ROA, the relations are significant for all maturities except for the 7 and 10 year maturities.

We also estimate the economic impact of ROA, accruals and cash flows, for the different maturities. Specifically, we find that the impact of a one percent change in ROA would change the CDS premium by between 5 to 6 basis points irrespective of the contract maturity. We find similar patterns for cash flows and accruals. One percent change in cash flows scaled by total assets (accruals scaled by total assets) would change the CDS premium by between 5 to 6 (4 to 5) basis points irrespective of the maturity.[36]

Overall, the results in Table 3 are consistent with Hypotheses 1 and 4. Earnings are significantly and inversely related to CDS premia for all but the longest CDS maturities. Also, consistent with Hypothesis 1, the coefficients on earnings decline almost monotonically with maturity. The same patterns hold for accruals and cash flows, consistent with H4, although the hypothesized difference between the cash flow and accrual earnings coefficients is not significant at conventional levels using robust clustered standard errors. However, using conventional standard errors or even robust (but not clustered) standard errors, we would reject the hypothesis that cash flows and accruals are equally informative. Also, generally the results are consistent with the predictions of structural and hybrid models regarding the other determinants of CDS pricing.

6.3 Changes Analysis

The panel data levels analysis assumes inter alia that CDS premia are stationary. If CDS premia are non-stationary then levels regressions will generally yield biased coefficient estimates and biased standard errors. To test for stationarity, we use the KPSS

[36] We obtain the economic significance using a slightly different specification of the dependent variable. Specifically, we measure the dependent variable as percent (number of basis points divided by 100). This specification is more convenient for estimating the economic impact because the coefficients of the independent variables represent the impact of one percent change in the variables on CDS premia (in basis points).

test statistic for (unbalanced) panel data developed by Hadri and Larsson (2005).[37] This test statistic is distributed asymptotically N(0,1) for *finite* time periods under the null of stationarity. We test for stationarity both around a deterministic intercept and around a deterministic trend. We find that stationarity for CDS premia levels can be *uniformly* rejected for all maturities and for all restructuring clauses. In contrast, stationarity can often not be rejected for changes in CDS premia. In particular, (trend) stationarity cannot be rejected for changes in five year maturity contracts for all restructuring clauses.[38] Five year contracts, it should be remembered, are precisely the contracts upon which Benkert's (2004) and Batta (2006) panel data levels analysis is based. Thus, in addition to concerns about the levels analysis being size driven and subject to omitted correlated variables, the levels analysis may be biased by non-stationary data. To mitigate these concerns, we now investigate the relation between earnings and CDS rates using a changes analysis.[39]

Table 4 tests Hypothesis H2 regarding quarterly changes in CDS premia. Since CDS instruments trade in an over-the-counter market, it is not possible to see how CDS rates change over time for the same contract. Instead, we measures quarterly changes by comparing two different contracts with the same contractual features for the same reference entity. Since the data incorporate multiple contracts from the same reference

[37]The KPSS statistic for time series data (but not for panel data) was developed by Kwiatkowski, et al. (1992). The Hadri and Larsson (2005) test statistic for panel data is robust to unbalanced panels and hetreoscedastic errors.
[38] For example, focusing on 5 year contracts with full restructuring, the test statistic equals 711 ($p<0.000$) for CDS premia levels and 1.31 ($p=0.2$) for CDS premia changes. Besides maintaining comparability, controlling for restructuring is important because it efficiently eliminates multiple contracts on the same reference firm, thereby mitigating cross-sectional correlation in the residuals prior to computing the test statistic. In the same vein, we also controlled for industry prior to computing the residuals.
[39]Despite these concerns, we also do a levels analysis if only to compare our results with the extant literature.

entity such an analysis is possible. To the extent that this induces noise into the dependent variable, it should bias the case against finding meaningful results.[40]

The dependent variable is the quarterly percentage change in the CDS premium as computed from one day after the prior quarter's SEC filing date to one day after the current quarter's SEC filing date.[41] This window is chosen because all quarterly financial statement information becomes available to the market on the SEC filing date. Except for the dummy variables, the independent variables in Table 4 are the quarterly changes in the independent variables of the levels analysis (Table 3). Because positive changes in ratings have different implications for credit risk than negative changes, we elected to separate ratings changes into positive and negative components.[42]

(Insert Table 4 about here)

The Base column in Panel A of Table 4 provides coefficient estimates for the baseline changes model. The change in the CDS premium is positively and significantly related to the change in leverage (p=0.022, two-tailed). As expected, the change in the CDS premium is positively (negatively) and significantly related to the change in the volatility of returns (the risk-free rate) at less than 1% two-tailed level. The change in the CDS premium is also positively and significantly related to decreases in the credit rating (p=0.004, two-tailed), and negatively related to increases in the credit rating, but not significantly so (p=0.674, two tailed). Further, the change in the CDS premium is monotonically related to maturity, but the relation is significant only for higher

[40]Some noise is inevitable since no data are available regarding the parties to the transactions beyond the same reference entity. Thus, the contracts whose rates are compared may involve different contracting parties, and consequently different counterparty risk..

[41]Similar results obtain when the dependent variables is measured as the change in CDS premia.

[42] Ratings in general are sticky, so for the vast majority of our sample there was no change in the rating. Furthermore, an insignificant coefficient obtains from not separating the change in rating into positive and negative changes since positive and negative changes in rating have opposite effects on CDS premia.

maturities. Finally, changes in CDS premia are unrelated to restructuring clauses. This probably reflects the fact that restructuring clauses for our sample are sticky over time.[43]

The ROA column in Panel A of Table 4 includes changes in ROA *and* the equity stock return in addition to the BASE regression explanatory variables. The change in ROA coefficient is negative and significant (p=0.023, two-tailed) consistent with Hypothesis 2. The equity return variable is also negative and significant (p<0.000, two-tailed). These results indicate that earnings convey information about firm credit risk beyond the information contained in equity returns. Except for leverage which remains positive but insignificant at conventional levels, the remaining coefficients are qualitatively similar to the BASE regression.

The CF_ACC column breaks down the change in earnings into changes in accruals and cash flows. Both the changes in accruals (p=0.042, two-tailed) and cash flows (p=0.024, two-tailed) are significant and negative. Again, the accruals changes coefficient is smaller in absolute value than the cash flow changes coefficient suggesting that accrual earnings are less credible to investors than cash flows. However, once again the *difference* between the cash flow and accrual earnings coefficients is not significant at conventional levels. As in the levels regression, we cannot reject the hypothesis that cash flows have greater impact on CDS than accruals because of the use of the robust clustered standard error. Using conventional or robust standard error we reject the hypothesis. Further, the coefficient on the change in leverage would be significant. The remaining coefficients are qualitatively similar to those obtained in the BASE and ROA regressions.

[43] See also Berndt, Jarrow, and Kang (2006) on this point.

Panel B of Table 4 replicates Panel A, inclusive of interaction terms where maturity is interacted with changes in ROA, accruals and cash flows. Although negatively related to changes in CDS premia, and almost monotonically decreasing in absolute value with maturity, as expected, none of the *marginal* interaction terms are significant in the ROA column.[44] Similarly, although negative, with one exception, none of the cash flow or accrual changes interaction terms are significant. Similar to ROA, the cash flow interaction terms are almost monotonically decreasing in absolute value in maturity. The remaining coefficients are qualitatively similar to those obtained in the BASE regression.

Panel C lists the total (as opposed to marginal) coefficients for all maturities. The change in the CDS premium is negatively related to changes in ROA, and significantly so for all but the 1 year maturity. Similarly, the change in the CDS premium is negatively related to changes in accruals and cash flows and significantly so except for the 1 year accruals maturity. We cannot explain why the 1 year maturity should differ from the other maturities. When we replicate the same regressions for only the 1 year maturity (untabulated), earnings, accruals and cash flows we still find that the coefficients on earnings (p=0.15, two-tailed) and accruals (p=0.3, two-tailed) are not significant while the coefficient on cash flows is significant at less than 5%. Thus, the insignificance of the change in earnings appears to be driven by the lack of significance of accruals, which tend to reverse within one year.

The economic impact of ROA, accruals and cash flows is fairly similar across different maturities. Specifically, a one percent change in ROA would change the CDS

[44] The insignificance of the marginal interaction terms does not mean that the total coefficients are insignificant. In fact, they are significant, as can be seen in Panel C.

premium by between 3.5 and 4.5 basis points. Repeating the analysis for accruals and cash flows, we find that a one percent change in cash flows scaled by total assets (accruals scaled by total assets) would change the CDS premium by about 5 (4),basis points irrespective of contract maturity.[45]

Not surprisingly, the adjusted R-squared's of the changes analysis are smaller, and the regressions are less significant, by comparison to the levels analysis. Yet, overall, the message is similar. Both earnings levels and earnings changes are significantly and inversely related to changes in CDS premia. Similar relations are found for both cash flows and accruals earnings changes. The one major difference is that in the levels regression the coefficients on earnings (accruals, cash flows) decline in absolute value (fairly) monotonically with maturity, which is not the case in the changes regression. Interestingly, earnings, accruals and cash flows provide information about credit risk beyond the information contained in security returns despite the well-known result that equity returns incorporate information contained in earnings changes (e.g. Ball and Brown (1968) and many other studies). Furthermore, the results are fairly consistent with the predictions of structural and hybrid models regarding the other determinants of CDS pricing.

6.4 Event Study Analysis

Table 5 tests Hypothesis H3, the relation between short-window changes in CDS premia around preliminary earnings announcements. Again, these changes are measured by comparing two different contracts with the same contractual features for the same

[45] As with the levels analysis we obtain the economic significance using a slightly different specification of the dependent variable. Specifically, we measure the dependent variable as the change in CDS premia in basis points divided by 100.. This specification is more convenient for estimating the economic impact because the coefficients of the independent variables represent the impact of one percent change in the variables on CDS premia (in basis points).

reference entity over the short window. The window is measured over three days centered on the preliminary earnings announcement. Panel A of Table 5 regresses the percentage change of the CDS premium during the short window on the earnings surprise, controlling for restructuring clauses and contract maturity. The first column of Panel A shows the base regression, controlling for restructuring clauses and maturity. Consistent with H3, there is a significant inverse relation between the earnings surprise and the changes in the CDS premium over this short window (p= 0.017, two-tailed). Neither the restructuring controls nor the maturity controls are significant.

Following Ball and Brown (1968), a large literature indicates that security returns incorporate the information conveyed by earnings. Thus, it is possible that earnings per se will not provide the CDS market with credit default information beyond that contained in equity markets. Column (2) of Panel A controls for cumulative equity returns over the three-day window. The earnings surprise coefficient remains negative but only marginally significant (p=0.091, two-tailed). The equity return is negative and highly significant (p<0.000, two-tailed).

Column (3) of Panel A includes interaction terms of earnings with maturity (denoted by EAR_SUR for the 1 year maturity and EAR_SUR_i for maturities i=3,5,7 and 10). The results indicate that marginal impact of earnings is negative and significant (p=0.013, two-tailed) for the 1 year maturity CDS instruments. Together with Panel B, which shows total earnings coefficients, we see that the information conveyed by earnings alone (beyond the earnings information contained in equity returns) is concentrated in shorter term maturities (one and three years).

(Insert Table 5 about here)

Although it may be that earnings conveys little credit risk information beyond equity returns, this does not mean that earnings in total have a marginal impact on CDS pricing since, after all, cumulative equity returns around earnings announcements are primarily driven by earnings information.[46] To see the extent to which earnings per se convey credit risk information over the short window, whether directly or indirectly through equity prices, we regress cumulative equity returns over the short window on earnings. The residual of this regression (denoted RES_RET) measures the information contained in equity prices *other than earnings*. Column (4) of Table 5 regresses CDS rates on the earnings surprise and on the information conveyed in equity returns other than earnings. Both the earnings surprise and the information conveyed in equity returns other than earnings are negative and highly significant (p=0.00, two-tailed). Column (5) repeats this regression after interacting the earnings surprise with the different CDS contract maturities. Panel B shows that once earnings is defined all-inclusively to include the earnings information about credit risk conveyed by equity prices, earnings provides significant credit risk information for all CDS maturities.

Tables 6 and 7 test for the nonlinearity of debt holder payoff functions in CDS markets. Table 6 shows the levels, quarterly changes, and short window results when the firms are divided into high and low ratings firms with a rating of BBB and below defined as low. This cutoff essentially divides the sample evenly.[47] Panel A shows the levels regression. The column labeled ROA regresses CDS premia on earnings decomposed into earnings for high and low ratings firms. The coefficient for low ratings firms is negative and highly significant (p=0.005, two tailed) whereas the coefficient for high ratings firms

[46] See Callen, Livnat and Segal (2006). They show that although both risk and earnings drive security returns around short-window preliminary earnings announcements, earnings are by far the primary driver.
[47] This is important for econometric reasons.

is negative and only significant at the one-tailed level (p=0.132, two-tailed). Moreover, the low rating coefficient is larger in absolute value than the high rating coefficient although the difference is not statistically different at conventional levels.[48] The column labeled CF_ACC decomposes earnings into cash flows and accruals for high/low ratings firms. Coefficients other than cash flow high ratings are negative and significant at conventional two-tailed levels. The coefficient for cash flow high ratings firms is negative and only significant at the one-tailed level. Again, the low ratings coefficients are larger than the high rating coefficients in absolute values for both cash flows and accruals but the differences are not significant at conventional levels. Note that the cash flow low rating coefficient is larger in absolute value than the accrual low rating coefficient (p-value=0.09, two-tailed) consistent with accruals conveying less information about credit risk than cash flows.

The non-linearity is also apparent when examining the economic impact of earnings, cash flows and accruals for high/low rating firms. Earnings information has much greater economic impact on CDS for low rating firms. Specifically, a one percent change in ROA, cash flows or accruals of low rating firms would change CDS premium by close to 10 basis points (approximately 20%) whereas a similar change in any of the variables for high rating firms has almost no economically or statistically significant impact on CDS premium.

(Insert Table 6 about here)

Panel B shows the quarterly changes regression. The column labeled ROA shows the regression of the quarterly change in CDS premia on the change in earnings decomposed into changes in earnings for high and low ratings firms. The low ratings

[48] Again, using a conventional or robust standard error we would reject the hypothesis.

earnings coefficient is significant and negative (p-value=0.096, two-tailed). The high ratings earnings coefficient is significant and negative only at the one-tailed level. The further breakdown of earnings into accrual cash flows yields negative coefficients but none are significant. Similarly, there is no significant difference in the economic impact of earnings and its components between high/low rating firms for the changes analysis.

Column 1 in Panel C shows the short window analysis with the earnings surprise decomposed into high and low rating firms controlling for stock returns. The high ratings earnings surprise coefficient is not significant whereas the low rating RSUE coefficient is negative and significant (p=0.091, two-tailed). The equity return is negative and highly significant. Column 2 shows the results when we replace equity return with the residual from the regression of stock return on earnings surprise. The results are virtually identical – the earnings surprise coefficient is significant for low credit rating firms only.

Overall, consistent with a nonlinear payoff function for debt holders, Table 6 shows that earnings (and to a lesser extent accruals and cash flows) convey credit risk information primarily for low rating firms which ex ante are closer to bankruptcy.

(Insert Table 7 about here)

Table 7, Panel A shows the levels regression for firms with ROA above and below the industry median. We define a dummy variable (DUM) equal to one if earnings are below the median and zero otherwise. In addition to the separate regressors ROA and DUM, the independent variables also include their interaction (DUM*ROA). The column labeled ROA shows that DUM is positive and highly significant (p=0.006, two-tailed) consistent with CDS premia being higher for below median earnings firms. More importantly, although the above median earnings coefficients is not significant, Panel B indicates that the below median earnings coefficient of -3.119 (=1.234-4.353) is negative and significant (p=0.062, two-tailed). The asymmetric reaction of CDS premia to earnings is consistent with debt holders being more concerned with poor earnings. The column labeled CF_ACC in Panel A and the analysis in Panel B show similar results for cash flows and accruals. More specifically, the cash flow coefficient of -3.453 (=0.978--4.431) is negative and significant (p=0.051, two-tailed) for below median earnings firms and insignificant for above median earnings firms. The accruals coefficient is negative significant only at the one-tailed level for above median earnings firms (p=0.111, two-tailed). As with high/low rating firms we find that the economic impact of ROA, cash flows and accruals is economically and statistically significant for firms with earnings below the median. A one percent change in ROA, cash flows or accruals for firms that have ROA below the median would change the CDS premium by 7, 7.2, and 6.5, basis points, respectively. The economic impact of a change in either variable for firms with ROA above the median is not economically or statistically different from zero.

Panels C and D (of Table 7) show a similar but stronger pattern of results for the changes regression. Specifically, we find that the change in ROA (accruals, cash flow) is significantly and negatively related to the change in CDS premia only for firms with ROA (accruals, cash flow) below the median. Consistent with the levels analysis, the changes analysis also indicates that changes in ROA, cash flows and accruals have a significant economic impact on CDS premiums only for firms with ROA below the median. For these firms, a one percent change in ROA, cash flows or accruals would change CDS premium by 4.4, 6, and 4, basis points, respectively.

Again, consistent with a nonlinear payoff function for debt holders, Table 7 shows that earnings and earnings changes convey credit risk information primarily for firms with below median earnings. However, untabulated results indicate that the short-window event study analysis does not confirm the asymmetry finding of the levels and changes analyses, consistent with the findings of Datta and Dhillon (1993) and in contradiction to those of Easton et al. (2007) in the corporate bond market.

7. Robustness Tests

In order to test the robustness of our results, we undertook the following (untabulated) analyses:

1. We examine throughout whether the results are sensitive to the inclusion of the standard deviation of ROA and the market-to-book ratio. These variables may affect characteristics of the reported earnings and hence also affect the relation between earnings and CDS premia. We find that these variables are not significant in any of the regressions. Further, the results are very similar to those reported.
2. In the levels analysis, we include stock returns and the return on the S&P500 index as proxies for changes in the economic condition of the company and the economy in general. In addition, we also control for the slope of the yield curve--defined as the difference between the 10 year and 1 year Treasury Bill rates--which serves as a proxy for expectations about future interest rate changes. None of the findings regarding earnings and the cash flows-accruals breakdown change.

3. In the changes regression of Table 3, we include the return on the S&P500 and the level of earnings among the independent variables. The results remain qualitatively unchanged. The reported results also do not change if we control for size.
4. Interacting equity returns and all other control variables with maturities does not affect the results qualitatively.
5. The results remain robust to redefining leverage to be long term debt to total assets and redefining the earnings surprise to be standardized unexpected earnings (or its rank), estimated as earnings for quarter t minus earnings for quarter t-4 less a drift term scaled by the standard deviation of earnings surprises in the previous eight quarters.

8. Conclusion

This study uses panel data regression techniques to evaluate the impact of earnings on short- and long-window changes on Credit Default Swaps (CDS). In addition to including CDS pricing determinants from structural and hybrid models in the regressions, we also control for such factors as credit ratings, equity returns and restructuring clauses. Using levels and quarterly changes methodologies, we find that earnings levels (changes) are significantly and negatively correlated with the level of (changes in) CDS premia consistent with earnings conveying information about default risk. The impact of earnings on CDS premia is economically significant; a one percent increase in earnings (normalized by total assets) reduces the CDS premium by 5% to 9% (between 2.8 and 4.5 basis points). Other determinants of CDS premia are also found to be significant by and large and in the direction predicted by the theory. We also decompose earnings into accrual and cash flow components. The levels and changes results reported for earnings continue to hold for both accrual and cash flow components, although the impact of cash flows on CDS premia appears to be greater than the impact of accruals. The economic impact of accruals and cash flows is also significant. A one percent change in cash flows changes CDS premia from 3.3 to 4.6 basis points, or 6% to 9%, whereas a similar change in accruals scaled by total assets would change the premium from 2.7 to 4.2 basis points, or 5% to 8%.

We also provide evidence to support the nonlinearity of debt holder payoff functions using credit ratings. Decomposing reference firms into high and low ratings (BBB and below), we find that earnings is primarily correlated with CDS premia of low rated firms. We present further evidence regarding the nonlinearity of debt holder payoff functions in the levels and changes analyses by stratifying firms into above and below industry-median profitability. Earnings for firms with above median profitability were found to be an insignificant determinant of CDS premia but negative and significant for firms with below median profitability. The asymmetric response of CDS premia to above and below median profitability is particular to the levels analysis and the quarterly changes analysis but could not be replicated in the short-window analysis.

Using an event study methodology, we find that earnings surprises are negatively and significantly correlated with CDS premia changes in the three-day window surrounding the preliminary earnings announcement. However, after controlling for cumulative equity returns in the short-window, the impact of earnings beyond equity prices is smaller and concentrated in the shorter CDS maturities. We further decompose equity returns into two orthogonal components, the information conveyed by earnings and the information conveyed in equity returns other than earnings. Regressing CDS rates on the earnings surprise and on the information conveyed in equity returns other than earnings, yields coefficient estimates that are negative and highly significant. This evidence further indicates the importance of earnings in the pricing of credit risk.

References

Abid, F. and N. Naifar. 2005. "The Determinants of Credit Default Swap Rates: An Explanatory Study" Working Paper, May, University of Sfax, Tunisia

Aiken LS and West SG. 1991. *Multiple Regression*. Beverly Hills, CA: Sage Publishing.

Aunon-Nerin, D., D. Cossin, T. Hricko and Z. Huang. 2002. "Exploring for the Determinants of Credit Risk in Credit Default Swap Transaction Data: Is Fixed-Income Markets Information Sufficient to Evaluate Credit risk?" Research Paper No. 65, December, FAME, Geneva, Switzerland.

Bajlum, C. and P.T. Larsen. 2007. "Accounting Transparency and the Term Structure of Credit Default Swap Spreads," Working Paper. University of Aarhus, Denmark.

Ball, R. and P. Brown. 1968. "An Empirical Evaluation of Accounting Income Numbers," *Journal of Accounting Research* 6: 159-178.

Ball, R., R. Bushman and F. Vasvari. 2007. "The Debt-Contracting Value of Accounting Information and Loan Syndicate Structure," Working Paper. University of North-Carolina.

Barth, M. E., W. R. Landsman and R. J. Rendleman, Jr. 1998. "Option Pricing-Based Bond Value Estimates and a Fundamental Components Approach to Account for Corporate Debt," *Accounting Review* 73: 73-102.

Barth, M. E., W. E. Beaver, J. R. M. Hand and W. R. Landsman. 1999. "Accruals, Cash Flows, and Equity Values," *Review of Accounting Studies* 4: 205-229.

Barth, M.E., D. Cram, and K. Nelson. 2001. "Accruals and the Prediction of Future Cash Flows," *The Accounting Review* 76: 27-58.

Batta, G. 2006. "Credit Derivatives and Financial Information," Working Paper, September, University of Southern California.

Beneish, M. and E. Press. 1993. "Costs of Technical Violation of Accounting-Based Debt Covenants," *Accounting Review* 68: 233-257.

Benkert, C. 2004. "Explaining Credit Default Swap Premia," *Journal of Futures Market* 24: 71-92.

Berndt, A. R. A. Jarrow, and C. Kang. 2006. "Restructuring Risk in Credit Default Swaps: An Empirical Analysis," Working Paper, Cornell University.

Black, F. and J.C. Cox. 1976. "Valuing Corporate Securities: Some Effects of Bond Indenture Provisions," *Journal of Finance* 31: 351-367.

Blanco, R., S. Brennan and I. W. Marsh. 2005. "An Empirical Analysis of the Dynamic Relation Between Investment-Grade Bonds and Credit Default Swaps," *Journal of Finance* 60: 2255-2281.

Buhler, W. and T. Thabe. 2007. "The Interplay of Credit and Liquidity Risk under Incomplete Accounting Information," Working Paper. September, University of Mannheim.

Callen, J.L., J. Livnat and D. Segal. 2006. "The Value Relevance and Information Environment of SEC Filings: A Variance Decomposition Analysis," *Accounting Review* 81:1017-1043.

Callen, J.L. and D. Segal. 2004. "Do Accruals Drive Firm-level Stock Returns?" *Journal of Accounting Research* 42: 527-560.

Chan-Lau, J.A. 2006. "Is Systematic Default Risk Priced in Equity returns? A Cross-Sectional Analysis Using Credit Derivatives," IMF Working Paper, June.

Collin-Dufresne, P. and R.S. Goldstein. 2001. "Do Credit Spreads Reflect Stationary Leverage Ratios?," *Journal of Finance* 56: 1929-1957.

Collin-Dufresne, P., R.S. Goldstein, and S. Martin. 2001. "The Determinants of Credit Spread Changes," *Journal of Finance* 56: 2177-2207.

Cossin, D. and T. Hricko. 2001. "Exploring for the Determinants of Credit Risk in Credit Default Swap Transaction Data," Working Paper, May, HEC, University of Lausanne.

Daniels, K. N. and M. S. Jensen. 2005. "The Effect of Credit Ratings on Credit Default Swap Spreads and Credit Spreads," *Journal of Fixed Income* 15: 16-33.

Das, S. R. 1995. "Credit Risk Derivatives," *The Journal of Derivatives* 2: 7-23.

Das, S. R. and R. Sundaram. 1998. "A Direct Approach to Arbitrage-free Pricing of Credit Derivatives," NBER working paper no. 6635.

Datta, S. and U. S. Dhillon. 1993. "Bond and Stock Market Response to Unexpected Earnings Announcements," *Journal of Financial and Quantitative Analysis* 28: 565-577.

Dechow, P. 1994. "Accounting Earnings and Cash Flows as Measures of Firm Performance: The Role of Accounting Accruals," *Journal of Accounting and Economics* 18: 3-42.

Dechow, P. and I. Dichev. 2002. "The Quality of Accrual and Earnings: The Role of Accrual Estimation Errors," *The Accounting Review* 77(Supplement): 35-59.

Dechow, P., S. Kothari, and R. Watts. 1998. “The Relation between Earnings and Cash Flows,” *Journal of Accounting and Economics* 25: 133-168.

DeFond, M. and J. Jiambalvo. 1994. “Debt Covenant Violation and Manipulation of Accruals,” *Journal of Accounting and Economics* 17: 145-176.

Dichev, I.D. and J.D. Piotroski. 2001. "The Long-Run Stock Returns Following Bond Ratings Changes," *Journal of Finance* 56: 183-203.

Duffie, D. 1999. "Credit Swap Valuation," *Financial Analyst Journal* 55: 73-87.

Duffie, D. and D. Lando. 2001. “Term Structures of Credit Spreads with Incomplete Accounting Information,” *Econometrica* 69: 633-644.

Finger, C. 1994. “The Ability of Earnings to Predict Earnings and Cash Flows,” *Journal of Accounting Research* 32: 210-223.

Easton, P.D., S.J. Monahan, and F. Vasvari. 2007. “Some Initial Evidence on the Role of Accounting Earnings in the Bond Market,” Working Paper, June, Notre Dame University.

Elton, E. J., M. J. Gruber, D. Agrawal and C. Mann. 2001. "Explaining the Rate of Spread on Corporate Bonds," *Journal of Finance* 56: 247-277.

Eom, Y. H., J. Helwege, and J. Huang. 2004, “Structural Models of Corporate Bond Pricing: An Empirical Analysis,” *Review of Financial Studies* 17: 499—544.

Ericsson, J., K. Jacobs and R. Oviedo. 2005. “The Determinants of Credit Default Swap Premia,” Working Paper, January, Faculty of Management, McGill University.

Ericsson, J., J. Reneby and H. Wang. 2006. “Can Structural Models Price Default Risk? Evidence from the Bond and Credit Derivative Markets,” Working Paper, McGill University and the University of Stockholm.

Hadri, K. and R. Larsson. 2005. “Testing for Stationarity in Heterogeneous Panel Data Where the Time Dimension is Finite” *Econometrics Journal* 8: 55–69.

Holthausen, R. 1981. “Evidence on the Effect of Bond Covenants and Management Compensation Contracts on the Choice of Accounting Techniques,” *Journal of Accounting and Economics* 3: 73-109.

Holthausen, R. W. and R. L. Watts. 2001. "The Relevance of The Value-Relevance Literature for Financial Accounting Standard Setting," J*ournal of Accounting and Economics* 31: 3-75.

Houweling, P. and T. Vorst. 2005. “Pricing Default Swaps: Empirical Evidence," *Journal of International Money and Finance* 24: 1200-1225.

Huang, M. and J. Huang. 2002. How Much of the Corporate-treasury Yield Spread is due to credit risk? Working paper, Stanford University.

Hull, J., M. Predescu and A. White. 2004. "Relationship Between Credit Default Swap Spreads, Bond Yields, and Credit Rating Announcements," *Journal of Banking and Finance* 28: 2789-2811

Hull, J. and A. White. 2000a. “Valuing Credit Default Swaps I: No Counterparty Default Risk,” *Journal of Derivatives* 8: 29—40.

Hull, J. and A. White. 2000b. “Valuing Credit Default Swaps II: Including Counterparty Default Risk,” *Journal of Derivatives* 8: 29—40.

Jorion P. and G. Zhang. 2005. “Nonlinear Effects of Bond Rate Changes,” Working Paper, March, University of California at Irvine.

Kwiatkowski, D., P. C. B. Phillips, P. Schmidt and Y. Shin 1992. Testing the Null Hypothesis of Stationarity against the Alternative of a Unit Root. *Journal of Econometrics 54*, 91–115.

Leland, H. E. and K.B. Toft. 1996. "Optimal Capital Structure, Endogenous Bankruptcy, and the Term Structure of Credit Spreads," *Journal of Finance* 51: 987-1019.

Longstaff, F. A. and E.S. Schwartz. 1995. "A Simple Approach to Valuing Risky Fixed and Floating Rate Debt," *Journal of Finance* 50: 789-819.

Longstaff, F. A., S. Mithal and E. Neis. 2005. "Corporate Yield Spreads: Default Risk or Liquidity? New Evidence from the Credit Default Swap Market," *Journal of Finance* 60: 2213-2253.

Mengle, D. 2007. “Credit Derivatives: An Overview,” Paper delivered at the 2007 Financial Markets Conference, Federal Reserve Bank of Atlanta May 15, 2007.

Merton, R. C. 1974. “On the Pricing of Corporate Debt: The Risk Structure of Interest Rates,” *Journal of Finance* 29: 449—470.

Minton, B.A., R. Stultz, and R. Williamson. 2006. How Much Do Banks Use Credit Derivatives to Reduce Risk,” Working Paper, The Ohio State University.

Nissim, D. and S. Penman. 2001. “Ratio Analysis and Equity Valuation: From Research to Practice,” *Review of Accounting Studies* 6: 109-154.

Packer, F. and H. Zhu. 2005. "Contractual Terms and CDS Pricing," *BIS Quarterly Review* March: 89-99.

Peterson, M. A. 2006. "Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches," Working Paper, Northwestern University.

Pfeiffer, R. J. Jr. and P. T. Elgers. 1999. "Controlling for Lagged Stock Price Responses in Pricing Regressions: An Application to the Pricing of Cash Flows and Accruals," *Journal of Accounting Research* 37: 239-248.

Sloan, R. G. 1996. "Do Stock Prices Fully Reflect Information in Accruals and Cash Flows about Future Earnings?" *Accounting Review* 71: 289-315.

Subramanyam, K. R. 1996. "The Pricing of Discretionary Accruals," *Journal of Accounting and Economics* 22: 249-281.

Vassalou, M. and Y. Xing. 2004. "Default Risk in Equity Returns," *Journal of Finance* 54: 831-868..

Vasvari, F. 2006. Managerial Incentive Structures, Conservatism and the Pricing of Syndicated Loans, PhD Dissertation Rotman School of Management, University of Toronto.

Wittenberg-Moerman, R., 2006a. "The Role of Information Asymmetry and Financial Reporting Quality in Debt Contracting: Evidence from the Secondary Loan Market," Working paper, University of Chicago.

Xie, H. 2001. "The Mispricing of Abnormal Accruals," *Accounting Review* 76: 357-373.

Yu, F. 2005. "Accounting Transparency and the Term Structure of Credit Spreads," *Journal of Financial Economics* 75: 53–84

Zhu, H. 2004. "An Empirical Comparison of Credit Spreads between the Bond Market and the Credit Default Swap Market," Working Paper, BIS.

Table 1: Data Filters

Number of observations in the CDS daily dataset with non-missing maturity and premium (2002-2005)	2,127,526 daily observations of 798 firms
Interaction of CDS daily dataset and the Preliminary Compustat data (note that each firm quarter usually contains a number of CDS contracts that differ in their maturity, restructuring clauses, etc.)	46,602 CDS contracts, 4,890 firm-quarters of 598 firms
Excluding Subordinated CDS contracts	45,475 CDS contracts, 4,854 firm-quarters of 582 firms
Excluding CDS contracts with XMMR restructuring clause	44,451 CDS contracts, 4,847 firm-quarters of 580 firms
Excluding CDS contracts denominated in currency other than $US	37,069 CDS contracts, 4,837 firm-quarters of 577 firms
Requiring that each observation has either CDS premium a day after the filing date, or CDS premium around the preliminary earnings release date	21,839 CDS contracts, 3,089 firm-quarters of 536 firms
Merging the data with the Compustat database for 2002-2005	21,022 CDS contracts, 2,905 firm-quarters of 526 firms
Eliminating firms with MV below $100 million and negative book value of equity	20,328 CDS contracts, 2,800 firm-quarters of 508 firms

Table 2: Descriptive Statistics

Variable	N	MEAN	SD	Q1	MEDIAN	Q3
MV	20328	13,088	22,900	3,098	6,696	14,083
DEL_CDS_PRL	14044	0.007	0.144	-0.030	0.000	0.022
DEL_CDS_QTR	10992	0.000	0.448	-0.239	-0.070	0.117
CDS_PRM	18222	4.080	1.046	3.360	3.951	4.723
ROA	20328	0.012	0.023	0.004	0.011	0.021
DEL_ROA	20310	0.002	0.029	-0.002	0.001	0.005
LEV	20328	0.446	0.203	0.295	0.425	0.576
DEL_LEV	20328	-0.006	0.039	-0.026	-0.007	0.013
ACC	19828	-0.012	0.030	-0.022	-0.011	-0.001
OCF	19839	0.024	0.027	0.010	0.022	0.037
RATE	14936	10.395	3.006	9.000	11.000	12.000
EAR_SUR	19601	0.001	0.009	0.000	0.000	0.002
SD_RET	20318	0.018	0.009	0.013	0.016	0.022
SPOT	20328	2.285	0.910	1.270	2.120	3.320

This table provides descriptive statistics of the main variables used in the paper. MV is market value (in $MM) of equity at the end of fiscal quarter. DEL_CDS_PRL is the change in CDS premium in the three-day window centered on the preliminary earnings release date. It is computed as the CDS premium on the last day of the window divided by the CDS premium on the first day of the window minus one. DEL_CDS_QTR is the change in the CDS premium during the quarter; it is computed as the premium on the first day after the SEC filing date of the current period divided by the premium on the first day after the SEC filing date of the previous quarter minus one. CDS_PRM is the log of the CDS premium (in basis points) on the first day after the SEC filing date. ROA is the return on assets, computed as quarterly net income before extraordinary items divided by total assets. DEL_ROA is the change in ROA and it is computed as ROA for current quarter minus ROA in the same quarter of the previous year. LEV is leverage, computed as long term debt scaled by the value of assets (market value of equity + book value total liabilities). DEL_LEV is change in leverage. ACC (OCF) is total quarterly accruals (operating cash flows) scaled by total assets in the previous quarter. Accruals are net income before extraordinary items minus net operating cash flows. RATE is the S&P’s short term credit rating. EAR_SUR is earnings surprise; it is calculated as actual IBES earnings minus the median analysts’ forecast, scaled by price at quarter-end. SD_RET is the standard deviation of daily returns during the firm’s current fiscal quarter. SPOT is the one year t-bill rate.

Table 3: Levels Regression

Panel A: Regressions of CDS Premium on Earnings, and Cash Flow and Accruals

	BASE	ROA	CF_ACC
INTERCEPT	2.863***	6.261***	6.299***
	(0.000)	(0.000)	(0.000)
ROA		-3.242***	
		(0.005)	
OCF			-3.605***
			(0.002)
ACC			-2.921**
			(0.017)
LEV	2.343***	1.155***	1.136***
	(0.000)	(0.000)	(0.000)
SPOT	-0.134***	-0.118***	-0.116***
	(0.000)	(0.000)	(0.000)
SD_RET	16.067***	15.768***	15.708***
	(0.000)	(0.000)	(0.000)
RATE	0.046**	0.037**	0.037**
	(0.025)	(0.050)	(0.049)
CUMR	0.008	0.005	0.005
	(0.510)	(0.681)	(0.689)
EXR	-0.079***	-0.076***	-0.076***
	(0.000)	(0.000)	(0.000)
D_3	0.261***	0.261***	0.261***
	(0.000)	(0.000)	(0.000)
D_5	0.466***	0.467***	0.467***
	(0.000)	(0.000)	(0.000)
D_7	0.564***	0.565***	0.565***
	(0.000)	(0.000)	(0.000)
D_10	0.682***	0.682***	0.682***
	(0.000)	(0.000)	(0.000)
SIZE		-0.328***	-0.331***
		(0.000)	(0.000)
Adj_R2	0.471	0.530	0.530
Chi Square	2,409***	2,586***	2,607***
N	12,242 contracts		423 firms

Panel A of this table shows the panel data regressions results of CDS premia on earnings, and on cash flows and accruals. The dependent variable is the (log of) CDS premium one day after the SEC filing date. CUMR (EXR) is a dummy with 1 if the CDS contract has full restructuring clause (exclude restructuring) and zero otherwise. D_i is a dummy variable with 1 if the maturity of the contract equals i and zero otherwise, where i=3,5,7,10. SIZE is the log of market value. All other variables are defined in the notes of Table 2. The regressions are estimated using firm random effects with year fixed effects (suppressed). We use robust standard errors clustered by firm. N is the number of observations (CDS contracts and firms). The p-values of the coefficients are in parentheses. *, **, *** indicates statistical significance at the 10%, 5%, and 1% level, respectively.

Panel B: Levels Regressions with Maturity Interaction

	ROA	CF_ACC
INTERCEPT	6.234***	6.263***
	(0.000)	(0.000)
ROA	-5.265***	
	(0.000)	
ROA _3	-0.387	
	(0.604)	
ROA _5	1.688*	
	(0.088)	
ROA _7	3.785***	
	(0.001)	
ROA _10	6.210***	
	(0.000)	
OCF		-5.361***
		(0.000)
OCF_3		-0.633
		(0.383)
OCF_5		1.344
		(0.168)
OCF_7		3.423***
		(0.002)
OCF_10		6.023***
		(0.000)
ACC		-5.685***
		(0.001)
ACC_3		-0.047
		(0.960)
ACC_5		2.675**
		(0.034)
ACC_7		5.037***
		(0.000)
ACC_10		7.415***
		(0.000)
LEV	1.153***	1.135***
	(0.000)	(0.000)
SPOT	-0.120***	-0.118***
	(0.000)	(0.000)
SD_RET	15.811***	15.752***
	(0.000)	(0.000)
RATE	0.037**	0.037**
	(0.049)	(0.048)
CUMR	0.005	0.005
	(0.683)	(0.692)
EXR	-0.075***	-0.075***
	(0.000)	(0.000)
D_3	0.263***	0.264***
	(0.000)	(0.000)
D_5	0.469***	0.469***
	(0.000)	(0.000)
D_7	0.566***	0.567***

	(0.000)	(0.000)
D_10	0.685***	0.685***
	(0.000)	(0.000)
SIZE	-0.330***	-0.333***
	(0.000)	(0.000)
Adj_R2	0.531	0.531
Chi Square	3,230***	3,289***
N	12,242 contracts	423 firms

Panel C: Tests for Earnings, Accruals and Cash Flows across Maturities:

	ROA	ACCRUALS	CASH FLOWS
1 – Year CDS	-5.265***	-5.685***	-5.361***
	(0.000)	(0.000)	(0.000)
3 – Year CDS	-5.651***	-5.733***	-5.994***
	(0.000)	(0.000)	(0.000)
5 – Year CDS	-3.577***	-3.010**	-4.017***
	(0.000)	(0.012)	(0.000)
7 – Year CDS	-1.480	-0.648	-1.938
	(0.212)	(0.600)	(0.105)
10 – Year CDS	0.945	1.730	0.663
	(0.424)	(0.163)	(0.580)

Panel B extends the results of the regressions in Panel A above by interacting earnings (ROA), and accruals and cash flows with the maturity dummies. The ROA coefficients with suffix i (i=3,5,7,10) represent the interaction of ROA with D_i, a dummy equal to i if the CDS contract maturity is i years and zero otherwise (i=3,5,7,10). Thus, ROA_i represents the *incremental* effect of ROA on the premium of the CDS contract with maturity i over the impact of ROA on the premium of the CDS contract with 1 year to maturity. The CF_ACC column shows the results when we replace ROA with accruals and cash flows, respectively. To avoid potential multicollinearity and to be able to interpret the interactions correctly, ROA, ACC and OCF are demeaned prior to creating the interaction variables. The regressions are estimated using firm random effects with year fixed effects (suppressed). We use robust standard errors clustered by firm. N is the number of observations (CDS contracts and firms).

Panel C shows the overall coefficients for ROA, ACC, and OCF for the different maturities. For example, the ROA coefficient on the 3-year CDS is equal to the ROA coefficient plus the ROA_3 coefficient from Panel B.

The p-values of the coefficients are in parentheses. *, **, *** indicates statistical significance at the 10%, 5%, 1% level, respectively.

Table 4: Regressions of the Changes in Quarterly CDS Premiums

Panel A: The Change in Quarterly CDS Premium and the Change in Earnings, Cash Flows and Accruals

	BASE	ROA	CF_ACC
INTERCEPT	-0.015	-0.023	-0.023
	(0.813)	(0.717)	(0.705)
DEL_ROA		-1.693**	
		(0.023)	
DEL_OCF			-2.088**
			(0.024)
DEL_ACC			-1.539**
			(0.042)
DEL_LEV	0.813**	0.407	0.381
	(0.022)	(0.235)	(0.258)
DEL_SPOT	-0.329***	-0.329***	-0.328***
	(0.001)	(0.000)	(0.000)
DEL_SDRET	7.483***	7.195***	7.307***
	(0.000)	(0.000)	(0.000)
POS_DRATE	-0.027	-0.037	-0.038
	(0.674)	(0.490)	(0.485)
NEG_DRATE	0.212***	0.177***	0.177***
	(0.004)	(0.004)	(0.004)
CUMR	-0.012	-0.004	-0.004
	(0.425)	(0.776)	(0.777)
EXR	-0.008	-0.009	-0.009
	(0.391)	(0.338)	(0.341)
D_3	-0.004	-0.006	-0.006
	(0.662)	(0.527)	(0.546)
D_5	0.014	0.011	0.012
	(0.188)	(0.279)	(0.266)
D_7	0.019*	0.014	0.014
	(0.098)	(0.196)	(0.190)
D_10	0.024**	0.020*	0.020*
	(0.040)	(0.082)	(0.080)
EQ_RET		-0.669***	-0.668***
		(0.000)	(0.000)
Adj_R2	0.29	0.332	0.333
Chi Square	358***	406***	408***
N	7,225 contracts	362 firms	

Panel A shows the regression results of the quarterly change in CDS premia on the change in earnings and the change in accruals and cash flows. The dependent variable is the change in CDS premium during the quarter (CDS_QTR). DEL_ACC (DEL_OCF) is the change in accruals (cash flows). DEL_SPOT is the change in the one year T-bill rate. DEL_SDRET is the change in the standard deviation of the firm's stock return during the quarter from the previous quarter. NEG_DRATE (POS_DRATE) is a dummy equal 1 if the firm experienced a decrease (increase) in credit rating, and zero otherwise. EQ_RET is the firm's stock return from the first day after the previous SEC filing date to the first day after the current quarter SEC filing date. All other variables are as defined in previous tables. The regressions are estimated using firm random effects with year fixed effects (suppressed). We use robust standard errors clustered by firm. N is the number of observations (CDS contracts and firms). The two-tailed p-values of the coefficients are in parentheses. *, **, *** indicates statistical significance at the 10%, 5%, 1% level, respectively.

Panel B: Changes Regressions with Maturity Interaction

	ROA	CF_ACC
INTERCEPT	-0.027	-0.027
	(0.660)	(0.657)
DEL_ROA	-1.152	
	(0.269)	
DEL_ROA_3	-0.757	
	(0.193)	
DEL_ROA_5	-0.613	
	(0.379)	
DEL_ROA_7	-0.796	
	(0.309)	
DEL_ROA_10	-0.342	
	(0.674)	
DEL_OCF		-2.142*
		(0.087)
DEL_OCF_3		-0.189
		(0.788)
DEL_OCF_5		0.169
		(0.837)
DEL_OCF_7		-0.133
		(0.880)
DEL_OCF_10		0.439
		(0.631)
DEL_ACC		-0.833
		(0.434)
DEL_ACC_3		-0.815
		(0.192)
DEL_ACC_5		-0.796
		(0.272)
DEL_ACC_7		-0.994
		(0.220)
DEL_ACC_10		-0.651
		(0.447)
DEL_LEV	0.406	0.384
	(0.236)	(0.252)
DEL_SPOT	-0.329***	-0.330***
	(0.000)	(0.000)
DEL_SDRET	7.203***	7.299***
	(0.000)	(0.000)
POS_DRATE	-0.037	-0.037
	(0.493)	(0.487)
NEG_DRATE	0.177***	0.176***
	(0.004)	(0.004)
CUMR	-0.004	-0.004
	(0.770)	(0.789)
EXR	-0.009	-0.009
	(0.335)	(0.347)
D_2	-0.006	-0.006
	(0.519)	(0.553)

D_3	0.011	0.012
	(0.277)	(0.254)
D_4	0.014	0.015
	(0.194)	(0.177)
D_5	0.020*	0.021*
	(0.082)	(0.072)
EQ_RET	-0.669***	-0.665***
	(0.000)	(0.000)
Adj_R2	0.329	0.330
Chi Square	419***	466***
N	7,225contracts	362 firms

Panel C: Tests for Change in Earnings, Accruals and Cash Flows across Maturities:

	DEL_ROA	**DEL_ACC**	**DEL_OCF**
1 – Year CDS	-1.152	-0.833	-2.142*
	(0.269)	(0.434)	(0.087)
3 – Year CDS	-1.909**	-1.649*	-2.331**
	(0.028)	(0.066)	(0.023)
5 – Year CDS	-1.765**	-1.630**	-1.973**
	(0.013)	(0.024)	(0.024)
7 – Year CDS	-1.948**	-1.827**	-2.275**
	(0.012)	(0.017)	(0.018)
10 – Year CDS	-1.494**	-1.485**	-1.703*
	(0.050)	(0.050)	(0.073)

Panel B shows the results of the regressions in Panel A above when interacting DEL_ROA, DEL_ACC and DEL_OCF with the maturity dummies. The DEL_ROA coefficients with suffix i (i=3,5,7,10) represent the interaction of DEL_ROA with D_i, a dummy equal to 1 if the CDS contract maturity is i and 0 otherwise. Thus, DEL_ROA_i represents the *incremental* effect of DEL_ROA on the premium of the CDS contract with maturity i over the impact of DEL_ROA on the premium of the CDS contract with 1 year to maturity. The CF_ACC column replaces DEL_ROA with DEL_ACC and DEL_OCF. To avoid potential multicollinearity and to be able to interpret interactions correctly, DEL_ROA, DEL_ACC and DEL_OCF are demeaned prior to creating the interaction variables. The control variables are defined in Table 4, Panel A. The regressions are estimated using firm random effects with year fixed effects (suppressed). We use robust standard errors clustered by firm. N is the number of observations (CDS contracts and firms).

Panel C shows the overall coefficients for DEL_ROA, DEL_ACC, and DEL_OCF for the different maturities. For example, the DEL_ROA coefficient on the 3-year CDS equals the DEL_ROA coefficient plus the DEL_ROA_3 coefficient from Panel B.

The p-values of the coefficients are in parentheses. *, **, *** indicates statistical significance at the 10%, 5%, 1% level, respectively.

Table 5: Changes in CDS Premiums around Preliminary Earnings Release Date

Panel A: Regression of the Change in CDS Premium on Earnings Surprise

	(1)	(2)	(3)	(4)	(5)
INTERCEPT	-0.007	-0.004	-0.005	-0.005	-0.006
	(0.484)	(0.688)	(0.647)	(0.642)	(0.570)
EQ_RET		-0.313***	-0.313***		
		(0.000)	(0.000)		
RES_RET				-0.313***	-0.313***
				(0.000)	(0.000)
EAR_SUR	-1.400**	-0.811*	-1.265**	-1.412***	-1.865***
	(0.017)	(0.091)	(0.013)	(0.002)	(0.000)
EAR_SUR_3			0.302		0.302
			(0.700)		(0.700)
EAR_SUR_5			0.642		0.642
			(0.418)		(0.418)
EAR_SUR_7			0.722		0.722
			(0.414)		(0.414)
EAR_SUR_10			0.445		0.445
			(0.595)		(0.595)
CUMR	0.002	0.002	0.002	0.002	0.002
	(0.558)	(0.644)	(0.648)	(0.644)	(0.648)
EXR	0.002	0.002	0.002	0.002	0.002
	(0.336)	(0.443)	(0.441)	(0.443)	(0.441)
D_3	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.913)	(0.873)	(0.861)	(0.873)	(0.861)
D_5	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.924)	(0.930)	(0.924)	(0.930)	(0.924)
D_7	0.002	0.002	0.002	0.002	0.002
	(0.484)	(0.501)	(0.505)	(0.501)	(0.505)
D_10	0.003	0.003	0.003	0.003	0.003
	(0.256)	(0.279)	(0.284)	(0.279)	(0.284)
Adj_R2	0.009	0.043	0.043	0.043	0.043
Chi Square	12.39	62***	74***	62***	74***
N		9,109 contracts		383 firms	

Panel B: Tests for Earnings Surprise across Maturities:

	EQ_RET	RES_RET
1 – Year CDS	-1.265**	-1.865***
	(0.013)	(0.000)
3 – Year CDS	-0.963*	-1.563***
	(0.066)	(0.002)
5 – Year CDS	-0.623	-1.224**
	(0.234)	(0.014)
7 – Year CDS	-0.543	-1.144*
	(0.620)	(0.054)
10 – Year CDS	-0820	-1.421***
	(0.156)	(0.01)

Panel A shows the results of the analysis of the change in CDS premiums in the three-day window around the preliminary earnings release date. The dependent variable is the change in CDS premium over the three days centered on the preliminary earnings release date. EAR_SUR is the earnings surprise (see exact definition in the notes to Table 2). EQ_RET is the equity return during the 3-day preliminary earnings window. RES_RET is the residual from the regression of EQ_RET on EAR_SUR. The EAR_SUR coefficients with suffix i (i=3,5,7,10) represent the interaction of EAR_SUR with D_i, a dummy equal 1 if the CDS contract maturity is i and 0 otherwise. Thus, EAR_SUR_i represents the *incremental* effect of EAR_SUR on the premium of the CDS contract with maturity i over the impact of EAR_SUR on the premium of the CDS contract with 1 year to maturity. To avoid potential multicollinearity and to be able to interpret interactions correctly, EAR_SUR is demeaned prior to creating the interaction variables. The other control variables are defined in previous tables. The regressions are estimated using firm random effects with year fixed effects (suppressed). We use robust standard errors clustered by firm. N is the number of sample CDS contracts and firms.

Panel B shows the overall coefficients for EAR_SUR for the different maturities. For example, the EAR_SUR coefficient on the 3-year CDS equals to the EAR_SUR coefficient plus the EAR_SUR _3 coefficient from Panel B.

The p-values of the coefficients are in parentheses. *, **, *** indicates statistical significance at the 10%, 5%, 1% level, respectively.

Table 6 – Nonlinearity of the CDS Premia and Earnings Relation by High/Low Credit Ratings

Panel A: Levels Analysis

	ROA	**CF_ACC**
INTERCEPT	6.238***	6.227***
	(0.000)	(0.000)
ROA_HI	-2.261	
	(0.132)	
ROA_LOW	-4.240***	
	(0.005)	
OCF_HI		-2.416
		(0.105)
OCF_LOW		-4.590***
		(0.003)
ACC_HI		-2.581*
		(0.098)
ACC_LO		-3.264*
		(0.050)
LEV	1.146***	1.139***
	(0.000)	(0.000)
SPOT	-0.117***	-0.114***
	(0.000)	(0.000)
SD_RET	15.808***	15.857***
	(0.000)	(0.000)
RATE	0.039**	0.042**
	(0.041)	(0.032)
CUMR	0.004	0.005
	(0.706)	(0.640)
EXR	-0.075***	-0.075***
	(0.000)	(0.000)
D_3	0.261***	0.261***
	(0.000)	(0.000)
D_5	0.467***	0.467***
	(0.000)	(0.000)
D_7	0.565***	0.565***
	(0.000)	(0.000)
D_10	0.682***	0.682***
	(0.000)	(0.000)
SIZE	-0.328***	-0.330***
	(0.000)	(0.000)
Adj_R2	0.529	0.529
Chi-Square	2670***	2740***
N	12,220 contracts	423 firms

Panel B: Changes in Quarterly CDS Premiums

	ROA	CF_ACC
INTERCEPT	-0.014	-0.014
	(0.829)	(0.818)
DEL_ROA_HI	-2.342	
	(0.160)	
DEL_ROA_LO	-1.203*	
	(0.096)	
DEL_OCF_HI		-2.496
		(0.143)
DEL_OCF_LO		-1.598
		(0.159)
DEL_ACC_HI		-2.271
		(0.194)
DEL_ACC_LO		-0.972
		(0.177)
DEL_LEV	0.306	0.287
	(0.388)	(0.412)
DEL_SPOT	-0.304***	-0.303***
	(0.001)	(0.001)
DEL_SDRET	6.628***	6.733***
	(0.000)	(0.000)
NEG_DRATE	-0.031	-0.031
	(0.565)	(0.571)
POS_DRATE	0.178***	0.178***
	(0.003)	(0.003)
CUMR	-0.007	-0.007
	(0.651)	(0.632)
EXR	-0.011	-0.011
	(0.243)	(0.249)
D_2	-0.006	-0.006
	(0.520)	(0.537)
D_3	0.011	0.012
	(0.278)	(0.270)
D_4	0.014	0.014
	(0.204)	(0.198)
D_5	0.020*	0.020*
	(0.097)	(0.095)
EQ_RET	-0.697***	-0.695***
	(0.000)	(0.000)
Adj_R2	0.333	0.333
Chi Square	410***	427***
N	7,102 contracts	350 firms

Panel C: Changes in CDS Premia around Preliminary Earnings Announcements

	1	2
INTERCEPT	-0.004	-0.004
	(0.685)	(0.639)
EQRET	-0.314***	
	(0.000)	
RES_RET		-0.314***
		(0.000)
EAR_SUR_LO	-0.847*	-1.450***
	(0.093)	(0.002)
EAR_SUR_HI	-0.178	-0.781
	(0.919)	(0.652)
CUMR	0.002	0.002
	(0.639)	(0.639)
EXR	0.002	0.002
	(0.434)	(0.434)
D_3	-0.000	-0.000
	(0.876)	(0.876)
D_5	-0.000	-0.000
	(0.933)	(0.933)
D_7	0.002	0.002
	(0.501)	(0.501)
D_10	0.003	0.003
	(0.278)	(0.278)
Adj_R2	0.043	0.043
Chi Square	62***	62**
N	9,109 contacts 383 firms	

Table 6 shows the results of the analysis of the impact of earnings on CDS premia conditioned on high/low credit rating. We define high rating as BBB+ (Code 10) and up, and low rating as BBB (Code 11) and below. Panel A shows the levels analysis. ROA_HI (ROA_LO) equals ROA if credit rating is high (low) and zero otherwise. OCF_HI (OCF_LO) and ACC_HI (ACC_LO) are defined similarly. All other variables are defined in the notes to Table 3.

Panel B shows the quarterly regression analysis. DEL_ROA_HI (DEL_ROA_LO) equals DEL_ROA if credit rating is high (low) and zero otherwise. DEL_OCF_HI (DEL_OCF_LO) and DEL_ACC_HI (DEL_ACC_LO) are defined similarly. All other variables are defined in the notes to Table 4.

Panel C shows the analysis of the change in CDS premiums in the 3-day window around the preliminary earnings release date. EAR_SUR_HI (EAR_SUR_LO) equals EAR_SUR if credit rating is high (low). All other variables are defined in the notes to Table 5.

The regressions are estimated using firm random effects with year fixed effects (suppressed). We use robust standard errors clustered by firm. N is the number of observations.

The p-values of the coefficients are in parentheses. *, **, *** indicates statistical significance at the 10%, 5%, 1% level, respectively.

Table 7 – Nonlinearity of the CDS Premia and Earnings Relation by ROA Over/Below the Industry Median

Panel A: Levels Analysis

	ROA	**CF_ACC**
INTERCEPT	6.177***	6.192***
	(0.000)	(0.000)
DUM	0.150***	0.151***
	(0.006)	(0.005)
ROA	1.234	
	(0.528)	
DUM*ROA	-4.353	
	(0.104)	
OCF		0.978
		(0.611)
DUM*OCF		-4.431
		(0.107)
ACC		1.792
		(0.402)
DUM*ACC		-4.403
		(0.110)
LEV	1.103***	1.094***
	(0.000)	(0.000)
SPOT	-0.116***	-0.113***
	(0.000)	(0.000)
SD_RET	15.965***	15.906***
	(0.000)	(0.000)
RATE	0.037*	0.037**
	(0.050)	(0.048)
CUMR	0.005	0.005
	(0.651)	(0.643)
EXR	-0.075***	-0.075***
	(0.000)	(0.000)
D_3	0.261***	0.261***
	(0.000)	(0.000)
D_5	0.467***	0.467***
	(0.000)	(0.000)
D_7	0.565***	0.565***
	(0.000)	(0.000)
D_10	0.683***	0.683***
	(0.000)	(0.000)
SIZE	-0.331***	-0.331***
	(0.000)	(0.000)
Adj_R2	0.534	0.534
Chi-Square	2626***	2659***
N	12,220 contracts	423 firms

Panel B: Tests for Earnings below the Median:

DEL_ROA+DUM*DEL_ROA	-3.119* (0.062)	
DEL_OCF+DUM*DEL_OCF		-3.453* (0.051)
DEL_ACC+DUM*DEL_ACC		-2.611* (0.111)

Panel C: Changes in Quarterly CDS Premiums

	ROA	**CF_ACC**
INTERCEPT	-0.033	-0.035
	(0.595)	(0.564)
DUM	0.019	0.021
	(0.520)	(0.469)
DEL_ROA	-0.576	
	(0.683)	
DUM*DEL_ROA	-1.459	
	(0.379)	
DEL_OCF		-0.638
		(0.664)
DUM*DEL_OCF		-2.356
		(0.224)
DEL_ACC		-0.496
		(0.743)
DUM*DEL_ACC		-1.300
		(0.456)
DEL_LEV	0.399	0.374
	(0.243)	(0.259)
DEL_SPOT	-0.331***	-0.325***
	(0.000)	(0.000)
DEL_SDRET	7.282***	7.369***
	(0.000)	(0.000)
POS_DRATE	-0.041	-0.042
	(0.447)	(0.441)
NEG_DRATE	0.178***	0.177***
	(0.004)	(0.004)
CUMR	-0.005	-0.005
	(0.747)	(0.728)
EXR	-0.008	-0.008
	(0.352)	(0.384)
D_3	-0.006	-0.005
	(0.546)	(0.572)
D_5	0.012	0.012
	(0.270)	(0.255)
D_7	0.014	0.015
	(0.197)	(0.187)
D_10	0.020*	0.020*
	(0.085)	(0.081)
EQRET	-0.669***	-0.662***
	(0.000)	(0.000)
Adj_R2	0.334	0.335
Chi Square	409***	412***
N	7,225 contracts 362 firms	

Panel D: Tests for Earnings below the Median:

DEL_ROA+DUM*DEL_ROA	-2.036** (0.017)	
DEL_OCF+DUM*DEL_OCF		-2.994** (0.026)
DEL_ACC+DUM*DEL_ACC		-1.796** (0.034)

Table 7, Panel A shows the results of the analysis of the impact of earnings on CDS premia conditioned on ROA below/above the 3-digit industry median ROA. DUM is a dummy variable with 1 if ROA is below the industry median ROA and zero otherwise. DUM*ROA, DUM*ACC, and DUM*OCF are the interaction variables of DUM with ROA, ACC and OCF, respectively. All other variables are defined in the notes to Table 3.

Panel B shows the overall coefficients for ROA, ACC and OCF for low ROA firms. For example, the coefficient on ROA below the median equals the ROA coefficient plus the DUM*ROA coefficient.

Panel C shows the results of the analysis of the impact of earnings changes on changes in CDS premia conditioned on ROA below/above the 3-digits industry median ROA. DUM is a dummy variable with 1 if ROA is less than the median ROA and zero otherwise. DUM*DEL_ROA, DUM*DEL_ACC, and DUM*DEL_OCF are the interaction variables of DUM with DEL_ROA, DEL_ACC, and DEL_OCF, respectively. All other variables are defined in the notes to Table 4.

Panel D shows the overall coefficients for DEL_ROA, DEL_ACC and DEL_OCF for low ROA firms. For example, the coefficient on DEL_ROA below the median equals the DEL_ROA coefficient plus the DUM*DEL_ROA coefficient.

The regressions are estimated using firm random effects with year fixed effects (suppressed). We use robust standard errors clustered by firm. N is the number of observations.

The p-values of the coefficients are in parentheses. *, **, *** indicates statistical significance at the 10%, 5%, 1% level, respectively.