# Corporate Leverage, Debt Maturity and Credit Default Swaps: The Role of Credit Supply*

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**Abstract**

Does the ability of suppliers of debt to hedge risk through credit default swap (CDS) contracts impact firms' capital structures? This paper uses CDS markets as a proxy for a relaxation of firms' credit supply constraints and tests whether supply frictions impact capital structure and debt maturity. We find that firms with traded CDS contracts on their debt are able to maintain higher leverage ratios and longer debt maturities. This is especially true during periods in which credit constraints become binding.

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Does the ability of suppliers of debt to hedge risk through credit default swap (CDS) contracts impact firms' capital structures?[1] This paper uses the existence of CDS markets as a proxy for a relaxation of firms' credit supply constraints and tests whether supply frictions impact firms' leverage and debt maturity choices. Theoretically, CDS markets can improve risk sharing and reduce market imperfections associated with the inability to trade credit risk. This can improve credit terms for firms (for example, see the recent discussion in Jarrow (2010)). Contrary to this basic idea, Ashcraft & Santos (2009) find that the onset of CDS trading does not lower the cost of capital for the average firm. While somewhat surprising, it is important to note that there are several ways in which the ability of investors to hedge risk might impact credit provision. We depart from price space to examine two additional dimensions in which CDS markets might impact capital supply: quantity and maturity of debt. Our results lend support to the general idea that derivatives markets can be beneficial when markets are incomplete.[2] In particular, we find that, after controlling for factors that are known to impact demand for leverage and debt maturity, firms with traded CDS contracts on their debt are able to maintain higher leverage ratios and longer debt maturities. We find that this is especially true during periods in which credit constraints become more binding.

A growing number of empirical studies call into question the assumption of frictionless capital supply that is widely used in the empirical capital structure literature (e.g., Faulkender & Petersen (2006); Lemmon & Roberts (2010); Massa, Yasuda & Zhang (2009); Sufi (2009); Leary (2009); Duchin, Ozbas & Sensoy (2010); Choi, Getmansky, Henderson & Tookes (2010)). While these findings make it clear that supply frictions can be important, the exact channels through which capital supply constraints impact credit provision are still not well-understood. Our analysis of the impact of CDS markets, which provide debt investors with the ability to hedge risk, sheds light on one potential mechanism. Corporate financial policy includes a choice not only about the level of debt, but also its maturity structure. Ours is the only paper to our knowledge to document the impact of supply frictions on debt maturity choice.

There are several ways in which the ability to hedge is expected to relax supply con-

[1] A credit default swap is essentially an insurance contract on a firm's debt, in which the seller gives the buyer a fixed payment in the event of default. The buyer pays the seller a premium for this protection. These can be useful for hedging or to speculate on credit risk.

[2] Of course, market participants may be able to hedge risk through bilateral contracts that are not traded. Our goal is to identify firms for which there exist CDS contracts with substantial trading activity and about which there is sufficiently broad dissemination of information that a supplier of debt capital can easily find a counterparty to hedge their credit exposure. Moreover, the supplier of debt capital has a benchmark quote regarding the cost of insurance.

straints. First, if treasuries are in short supply, the existence of CDS markets can make holding corporate debt more attractive to a broad group of potential investors. Second, financial institutions such as banks and insurance companies are frequent providers of corporate debt capital. Holding single name CDSs can provide these buyers the opportunity to reduce regulatory capital requirements, thereby increasing their willingness to supply debt capital to firms.[3] Of course, this relies on the assumption that there is a separation between those willing to hold credit risk versus those with capital that they would like to lend. Anecdotal evidence regarding the existence of binding regulatory capital constraints is consistent with this assumption. For example, AIG states in its Annual Report that in 2008 it had $125B in notional CDS outstanding (written), which it wrote to provide regulatory capital relief to financial institutions for their corporate loans. In addition, CDSs enable banks to provide loans for the purpose of maintaining client relationships, while limiting credit risk exposure. The British Banker's Association estimates that in 2006 20% of purchasers of credit protection were banks making these purchases to hedge their loan portfolios (British Bankers Association CDS Report (2006)). Along these lines, in its Annual Report, JP Morgan reported $91 billion in notional CDSs held for the purpose of hedging its loan portfolio in 2008. Finally, a liquid secondary market for credit risk provides a resale option and may make holding credit risk more attractive.

We analyze the impact of CDS markets on leverage and maturity choices using a sample of non-financial firms in the S&P500 index during 2002-2008. Although S&P firms are expected to be less financially constrained than non S&P500 firms, supply of capital is not likely to be frictionless. For example, supply is likely to vary with information asymmetries at the firm level as well as changes in macro variables over time. Our analysis exploits both the cross-sectional and time series dimensions of the data to identify the role of CDSs in credit provision. Because firms may make leverage and maturity decisions jointly, we follow Johnson (2003) and estimate the leverage and maturity equations simultaneously. Unlike most prior debt maturity studies, we measure actual debt maturity, in years. A supplemental contribution of this paper is that our maturity measure is more precise than the Compustat-based measures used in the literature and provides straightforward interpretation, as it allows us to generate estimates of the impact of CDS (in years) on debt maturity.

There are two main findings. First, the introduction of CDS markets increases leverage and extends debt maturity. These increases are both statistically and economically significant. Depending on the definition of leverage (i.e., market or book leverage) in the empirical

[3] "[G]uarantees issued by or protection provided by entities with a lower risk weight than the counterparty exposure is assigned the risk weight of the guarantor or protection provider." (Basel II, page 49, Article 141)

specification, the estimated increase in debt ratios due to CDS is between 0.037 and 0.067 (i.e., between 25 and 28 percent of mean leverage). The estimated increase in debt maturity is approximately 1.6 years (i.e., 18% of mean debt maturity). Second, when we analyze time series variation in the impact of CDS, we find that the impact of CDS on leverage and maturity is greatest in the years in which credit supply constraints are most binding, such as during the credit crisis of 2007-2009. This suggests CDS contracts are an important tool that investors can use to relax credit constraints and provide investment financing to firms during downturns. This finding may provide some insight into the mechanisms driving the cross-sectional differences in the extent to which the recent credit crisis spread to firms.

A potential concern with any study of the impact of CDS markets on financing choice is the possibility that CDS firms are different from non-CDS firms based on unobservable variables that are systematically related to leverage and maturity choice. Our empirical approach is designed to mitigate this concern. We exploit variation in the timing of the introduction of CDS markets to make our inferences. To do so, we follow Ashcraft & Santos (2009) and include two CDS variables in the main regressions: *CDS Traded*, a dummy equal to one if there is a CDS market for the firm's debt at any time during the 2002-2008 sample period; and *CDS Trading*, a dummy variable equal to one if there is a traded CDS on its debt during year t. *CDS Traded* controls for unobservable differences between CDS and non-CDS firms. *CDS Trading* is the main variable of interest and captures the impact of CDS on leverage and maturity in the years following CDS introduction.[4] In robustness analysis, we avoid concerns about selection altogether by looking *within* the sample of CDS firms to test whether the effects that we observe are stronger for firms with more liquid CDS markets. Of course, CDSs trade over the counter, making proxies for market liquidity difficult to capture. We identify two very coarse measures of liquidity: the number of daily CDS quotes and average bid-ask spreads on Bloomberg during year t. Based on these measures, we find evidence (albeit weaker than in the main analysis) consistent with the main finding that CDSs enable firms to maintain higher leverage and longer maturities.

The main empirical approach is useful in that it allows us to measure the effect of the onset of CDS trading; however, it also assumes that the timing of CDS introduction is exogenous. To address the potential concern that the emergence of CDS markets is simultaneously determined, we take a second approach to the analysis. We allow for the endogeneity of the introduction of a CDS market by implementing a system of three simultaneous equations. In addition to the leverage and maturity equations, we allow for the endogeneity of CDS

[4]In addition to the empirical design, it is also important to note problems associated with selection are likely to be lower for our sample since we focus only on firms in the S&P 500 index, which are all large and likely to have access to public debt markets.

and estimate a third equation using a probit regression model. This allows us to estimate the probability that a CDS market on a firm's debt will exist during year t. We expect that more investors will want to trade CDSs when the firm has large amounts of bond debt outstanding. The identification for whether a firm has traded CDS on its debt comes from whether the size of the firm's bond debt is sufficient for inclusion in the Lehman Brothers Corporate Bond Index.

Finally, because the main analysis uses the entire post-CDS introduction period to estimate the impact of CDS markets, we introduce a third approach to the analysis in which we isolate the CDS introduction event. We employ a difference in differences approach and examine the changes in leverage and maturity from the end of year t–1 to the end of years t and t+1 relative to CDS introduction, compared with the changes in a matched sample of non CDS firms. Matched firms are identified based on the propensity score method in Rosenbaum & Rubin (1983). The regression results indicate an increase in debt maturity of 11 months and an increase in leverage of between 0.004 and 0.022 (increase of between 2.7 and 8.5 percent of mean leverage, depending on the leverage definition used in estimation). Importantly, we find that our main results remain qualitatively unchanged under all of the alternative approaches to the analysis.

In interpreting the main results, it is useful to ask whether greater leverage and debt maturity are "good" for firms. Recent evidence from the 2007-2009 financial crisis suggests that this is indeed the case. For example, Almieda, Campello, Laranjeira & Weisbenner (2009) find that firms with debt coming due during the 2007-2008 period cut back on investment relative to firms without maturing debt. Similarly, Duchin, Ozbas & Sensoy (2010) find declines in non-financial firms' investment as a result of the credit crisis, with the greatest declines for financially constrained firms and those dependent on external finance. Ivashina & Sharfstein (2010) find that firms with expired lines of credit cut down on investment activity in order to increase cash holdings. These firms decreased investment more than firms whose credit lines were not expiring. Survey evidence is consistent with the findings in these studies. Campello, Graham & Harvey (2010) report that 86% of CFOs in financially constrained firms curtailed investment in attractive projects during the financial crisis. Overall, the evidence suggests that relaxing credit constraints and extending debt maturities would improve real investment.

The recent credit crisis has brought an intense policy debate regarding the impact of financial innovation and derivatives, particularly credit default swaps. Stout (2009) identifies Congress's passage of the Commodity Futures Modernization Act in 2000, which made derivatives contracts legally enforceable, as the root of the recent financial crisis. In the popular press, the Basel II treatment of CDS has also been criticized. A recent Bloomberg article reports that Commodity Futures Trading Commission Chairman, Gary Gensler has argued that, "Bank capital regulation should be modified to make the use of CDS for capital reduction more restrictive." [5] On the other hand, Stulz (2009) argues that despite the popular claim that CDS markets facilitated the crisis, much of the crisis stemmed from the declines housing market, not from CDSs. The evidence presented in this paper is consistent with Stulz's view, and even suggests a beneficial role for CDS markets for firms during the crisis in that firms with traded CDS were able to maintain longer debt maturities and were therefore less likely to have large amounts of maturing debt.

Theoretically, derivatives can either positively or negatively impact markets. Given the policy debate regarding the role of CDS markets and the size of the market, it is crucial to identify and quantify as many of the potential effects as possible.[6] For example, an often cited benefit of CDSs is that they can be valuable hedging tools and promote more efficient risk sharing. This can increase the willingness of suppliers of debt capital to extend credit to corporations. In secondary markets, traded CDSs can also provide informed traders with incentives to trade credit risk, facilitating price discovery. This revelation of information about firms could also increase suppliers' willingness to extend credit. There are potential costs as well. For example, secondary market prices may become less informative if the CDS market expands informed traders' strategy sets, making it more difficult for market makers to learn from their trades (as in Biais & Hillion (1994)).[7] It is clear that there are both costs and benefits associated with CDS; however, despite being crucial to informed policy-making, their magnitudes are generally unknown. Our analysis focuses on one potential channel through which CDSs might matter: primary markets for firms' debt.

The remainder of the paper is organized as follows. Section 2 describes the literature on capital supply constraints, debt maturity and credit default swaps. Section 3 describes the data and presents the main empirical specification. Section 4 presents results of the analysis of the impact of suppliers' ability to hedge on leverage and maturity. Section 5 concludes.

[5]See: "Bank Capital Relief From CDS Should Be Restricted, Gensler Says," Bloomberg, 3/9/2010.

[6]The amount of CDSs outstanding has declined from a peak of $62.2 trillion notional in the second half of 2007, but the market has far from disappeared. The International Swaps and Derivatives Association (ISDA) reports that the notional amount of outstanding CDSs during the first half of 2010 was $26.3 trillion, similar to the size of the market in 2006, and far greater than the $5.4 trillion and $12.4 trillion seen during the first half of 2004 and 2005, respectively. See: http://www.isda.org/statistics/pdf/ISDA-Market-Survey-results1987-present.xls

[7]Boehmer, Chava & Tookes (2010) examine the impact of CDS markets on secondary markets. They examine the impact of traded CDSs on equity market quality and find that CDS markets are associated with reduced equity market liquidity and price efficiency.

# 1. Supply Constraints, Capital Structure and Debt Maturity

Our paper contributes to three main strands of literature: recent papers that measure the role of capital supply constraints in firms' financing and investment decisions; the research that focuses on debt maturity choice; and the recent work on the implications of CDS contracts for firms.

## *1.1. The Role of Capital Supply Constraints in Firms' Financing Decisions*

The idea that supply frictions can impact capital structure and investment patterns has been the subject of a number of recent papers. Faulkender & Petersen (2006) find that firms with access to public debt markets (i.e., a credit rating) have substantially more debt in their capital structures. Sufi (2009) shows that firms with a loan rating use more debt after the introduction of syndicated bank loan ratings, which increase the supply of debt financing for these firms. Lemmon & Roberts (2010) and Leary (2009) use events to show how shocks to the supply of credit impact financing and investment. Massa, Yasuda & Zhang (2009) find that capital supply uncertainty has a negative impact on leverage and also affects firms' maturity choices. Choi et al. (2010) find strong links between convertible bond issuance and a variety of measures of supply of capital from convertible bond arbitrage hedge funds (such as fund flows). All of these papers link capital supply to firms' capital structures or to investment decisions and suggest that supply constraints are important. One of our main goals is to understand one of the mechanisms by which these constraints can become more and less binding: variation in the ease with which suppliers of capital can hedge their positions.

The financial crisis of 2007-2009 has also provided strong anecdotal evidence that capital supply constraints matter to firms. Recent empirical findings in Duchin, Ozbas & Sensoy (2010) and Almieda et al. (2009) support this view. Almieda et al. (2009) exploit pre-crisis variation in maturing debt to analyze the investment implications of debt coming due during the crisis. They find that firms with maturing long term debt significantly cut investment. Importantly, they present evidence from placebo tests that indicate that maturity composition has no effect on investment during non-crisis periods. We also exploit time series variation in our data to examine changes in the estimated impact of CDS on leverage and debt maturity as constraints begin to bind.

On the theoretical side, Morellec (2010) models dynamic corporate investment and financing decisions when firms have uncertain access to credit. Credit supply is crucial to the determination of equilibrium capital structure. Therefore, observed debt levels can deviate from the level of debt demanded. The model also predicts time series variation in investment, particularly a decline in investment during adverse credit supply shocks (even for firms with sufficient internal cash to fund current investment). These predictions are in line with the empirical findings given above.

The growing literature on the role of supply conditions makes obvious the need for an improved understanding of the precise role of supply. Our focus on the impact of CDS markets, a proxy for a relaxation of credit supply constraints due to suppliers' ability to hedge risk, provides an initial step.

### *1.2. Corporate Debt Maturity*

Despite a vast empirical literature on the debt versus equity choice (see e.g., Parsons & Titman (2008) for a recent survey), there are only a handful of empirical studies on the determinants of firms' debt maturity decisions. Barclay & Smith (1995) find that low growth options firms and large firms choose more long term debt. They do not find evidence of a tax effect on the maturity structure of debt. Stohs & Mauer (1996) find that: (1) large, less risky firms with long asset maturity have longer term debt; (2) firms with more earnings surprises have more short term debt; (3) a non monotonic relationship between debt rating and maturity, with very high and low rated firms having short term debt. We rely on these findings in choosing explanatory variables in the debt maturity equation.

Rather than examining the maturity structure of existing debt, Guedes & Opler (1996) focus on incremental debt maturity. They examine the maturity of new issues of bonds. Consistent with the predictions of Diamond (1991), they find that large, high quality firms borrow at both the short and long ends of the maturity spectrum, while speculative credit rating firms borrow in the middle. One benefit of analyzing bond issues is that the authors do not have to rely on Compustat, which aggregates all debt with maturities greater than five years, to calculate maturities of incremental debt. The average maturity of the bonds in the Guedes & Opler (1996) sample is approximately 12 years, consistent with what we observe. The limitation is that they are limited to examining bonds, leaving out other potentially important sources of debt.

Johnson (2003) is the first to explicitly account for the potential simultaneity between leverage and maturity. Subsequent debt maturity papers (e.g., Datta, Iskandar-Datta & Raman (2005); Aivazianm, Ge & Qiu (2005) and Billett, King & Mauer (2007) also use two-stage regression methodology. We also follow Johnson (2003) and estimate leverage and maturity jointly.

Our data on debt maturity are much finer than the Compustat data used in most of the prior maturity studies (with the exception of Stohs & Mauer (1996)). We use Capital IQ data, which are extracted from firm 10Ks, to measure maturity in years. Measuring maturity in years allows us to provide economically meaningful interpretations of our estimates. It also allows us to capture more cross sectional variation in the maturity structure of debt than the Compustat categories allow. Our paper is also the first to examine the role of CDS on firms' debt maturity decisions.

*1.3. Credit Default Swaps*

CDSs allow suppliers of capital to reduce credit risk exposure. This can be beneficial to financial institutions in that it can slacken regulatory capital constraints. It can also allow banks to maintain relationships with important clients by providing them with loans, while at the same time, limiting their credit risk exposure. [8] If treasuries are in short supply, CDS contracts can also attract would-be treasury investors to the corporate bond market, increasing supply to corporations. An example of the potential substitutability between corporate bonds and treasuries is Greenwood, Hanson & Stein (2010), in which the authors develop and test a theory in which market substitution between treasuries and corporate bonds drives corporations' issuance and maturity patterns.

The two most closely related empirical papers on the implications of CDS contracts for firms are Ashcraft & Santos (2009) and Hirtle (2009). Contrary to this intuition, Ashcraft & Santos (2009) fail to find evidence that, over the years from 2001 through 2005, CDS lowers the cost of capital for the average borrower. It is possible that, holding spreads constant, benefits from CDS are manifested in quantities or in the debt maturity dimension. We take as given the findings in Ashcraft & Santos (2009) that the cost of corporate debt is unaltered by the existence of CDS contracts and test whether CDS contracts have economically meaningful effects on firms' ability to raise debt, based on these two variables. Our analysis complements Ashcraft & Santos (2009) in our focus on quantity space. In a somewhat different setting, Petersen & Rajan (1994) find that relaxation of small business loan supply constraints result in increased quantities of credit, rather than a price outcome. They argue that this can occur if the market for credit supply is not perfectly competitive. We find that the average borrower with a CDS market for its debt is able to maintain higher leverage and longer debt maturity. Given evidence in Ashcraft & Santos (2009) that firms with CDS do

[8] Financial institutions are also large sellers of credit default swaps. Selling institutions may find exposure to credit risk of individual names to be attractive, depending on the other components of their portfolios.

not pay higher spreads, we interpret these results to be consistent with a beneficial role for CDS contracts in corporate debt provision.

Hirtle (2009) uses proprietary bank data to examine derivatives use by banks and credit provision, at the bank portfolio level. She finds that greater use of derivatives leads banks to increase credit. Like our paper, she examines more than one dimension of credit provision. Unlike our analysis, Hirtle (2009) examines total derivatives use by the banks, not CDSs on individual names of firms. The emphasis in Hirtle (2009) is on aggregate bank supply of business loans while we focus on the entire capital structures of individual firms.

We also add to the CDS literature in that we provide an examination of time series variation in the role of CDSs, based on the idea that they may become more important when credit constraints bind. We do not, however, examine other potential factors associated with CDS contracts such as information/price discovery.[9]

## 2. Data and Empirical Specification

### *2.1. Data*

The analysis draws from three main data sources: Compustat, Bloomberg and Capital IQ. We begin with all non-financial firms in the S&P 500 index during the years 2002-2008, as reported by Compustat.[10] We use Compustat for all firm-level financial information and require all firms to have non-missing data for all variables of interest. We obtain CDS quotes from Bloomberg.[11] Bloomberg contains company Cusips, which we use to match to the Compustat data. We assign a dummy variable equal to 1 if the firm has a CDS quote on Bloomberg during year t. The Bloomberg quote data allow us to identify firms for which there exist CDS contracts with substantial trading activity and about which there is sufficiently broad dissemination of information that a supplier of debt capital can easily find a counterparty to hedge his credit exposure.

We are interested in the impact of CDS on both leverage and debt maturity; however

[9]Credit default swaps can be used to speculate on credit risk, potentially revealing information about the firm to markets. Purchasing credit protection is often easier to do than shorting the underlying bond. Prior studies (e.g., Berndt & Ostrovnaya (2007); Acharya & Johnson (2007); Acharya & Johnson (2010)) have found evidence of informed trading in CDS markets.

[10]We focus our analysis on large-capitalization firms (presumably the most important firms in the economy); however, we acknowledge that small firms are underweighted in the analysis. On the other hand, many previous studies of debt maturity use cross-sectional Compustat data and overweight smaller firms.

[11]The sample begins in 2002 because that is the first year for which we have CDS quote data from Bloomberg.

precise maturity information is not available in standard datasets. We use Capital IQ capital structure detail data to calculate debt maturities. This information is taken from firms' 10K filings. The Capital IQ information are hand-assembled (the debt maturity information on Capital IQ is machine readable; however it is necessary to perform separate queries for each firm-year observation). For each firm, we use the Capital IQ lookup tool to locate the firm, based on ticker. We then confirm that the company name in Capital IQ matches the company name in Compustat. If there is no ticker match, we perform the search based on company name. Wherever there is uncertainty, which can occur especially in firms undergoing restructuring (for example, the historical documents under the name "Sears Holding Company" are Kmart 10Ks; "Sears Roebuck" historical documents are Sears 10Ks), we examine the underlying source document to confirm that the maturity data being extracted are for the correct firm.

Capital IQ lists each component of debt in the firms' capital structures, including principal, maturity and type of debt (i.e., bond, commercial paper, loan, revolver, lease, trust preferred and other). Occasionally, maturity information is missing. When this is the case, we assume that the maturity of the debt component is the same as the average maturity of the firm's other debt of the same type. If the firm does not have other debt of the type of interest, we use the sample average maturity for that type of debt during year t, similar to the approach in Stohs & Mauer (1996). In this way, we are able to exploit additional information based on security type. There are also occasions in which maturity ranges are given in the data (e.g., debt of a given type maturing in years $t$ through $t+k$ are aggregated). In these cases, as long as the stated range is less than 10 years, we take the midpoint of the stated range.[12] An example of a Capital IQ screen from which we extracted data is included in the Appendix.[13] Outside of Stohs & Mauer (1996) ours is the only paper to our knowledge to analyze actual maturities of firm debt in a large sample. As in Stohs & Mauer (1996), we define *Debt Maturity* as the principal weighted maturity of all components of the firm's capital structure. We require non-missing information on debt maturity for inclusion

[12]If the stated range for a given component of the firm's debt is greater than 10 years, the observation is treated as missing order to reduce noise in the debt maturity measure. We have also run the analysis without pre-filtering the data on wide maturity ranges and the main results hold.

[13]When month and year maturity information are given, we assume that the debt matures at the end of the stated month. When only year is given, we assume that the debt matures on June 30 of the stated year. In addition to the maturity of debt, we are able to observe the type of debt. We set all commercial paper maturities to 30 days, regardless of the maturity reported in Captial IQ. We set a uniform maturity for commercial paper due to apparent reporting of commercial paper program maturities rather than outstanding commercial paper for many firms. The GE 10K states: "We rely on the availability of the commercial paper markets to refinance maturing short-term commercial paper debt throughout the year" but GE's commercial paper is reported in Capital IQ as maturing at the end of year t+1. We assume 30 days because this is the average maturity of commercial paper according the the Federal Reserve.

in the final sample.[14] Because maturity is undefined for firms with zero debt, we exclude zero debt firms. If we included these firms by coding both leverage and maturity as zero, the estimated impact of CDS would become even larger. However, the interpretation becomes less clear for zero debt firms.

Table 1 presents summary statistics for the full sample of non-financial firms in the S&P 500 index, as well as separate summary statistics for firms with and without CDS contracts on their debt during year t.[15] All variables are winsorized at the 1st and 99th percentiles for the year. There are several important observations from the table. First, average leverage is substantial, with mean book leverage of 0.24 and market leverage of 0.15. The leverage variables also exhibit substantial cross-sectional variation, with standard deviations of 0.14 and 0.11, respectively. Second, debt maturity is quite long, with mean (median) debt maturity of 8.72 (7.13) years. This is substantially longer than the average maturity of 3.4 years reported in Stohs & Mauer (1996) for 323 manufacturing firms over the 1980-1989 period. This suggests that debt maturities of large firms have increased significantly over the past two decades. Datta, Iskandar-Datta & Raman (2005) also report evidence that firms have increased their debt maturities in recent years: they report that 61% of the debt for their sample of firms matures in greater than 3 years, in contrast to 46% in the earlier sample of Johnson (2003). This suggests that Compustat data, which only provides information on debt maturing over 1, 2, 3, 4, and 5 year horizons may not allow researchers to accurately measure variation in debt maturity in recent years. Third, the debt decomposition shows that bonds make up the vast majority of debt for firms in the sample, with a mean ratio of bonds and notes to total debt of 0.76. Term loans, revolving lines of credit and commercial paper are much smaller, comprising 0.05 to 0.06 of total debt on average.

Comparing the CDS and non-CDS samples provides additional insights. CDS firms have higher average leverage and longer debt maturities relative to non CDS firms. Importantly, CDS and non-CDS firms have similar credit ratings (the mean ratings of 9.33 and 9.64 for the CDS and non CDS firms, respectively, both correspond to S&P ratings of A-), suggesting that *CDS Trading*) is not a proxy for credit risk. At the same time, CDS firms are larger, with lower market to book ratios and have slightly more bond and note debt and less debt from term loans and revolvers in their capital structures. When CDS firms obtain bond and note debt, the average maturity on this debt is more than two years longer than that of non CDS firms. Regression analysis will shed more concrete light on these patterns.

[14]The impact of initial filtering on the sample is as follows: approximately 77 percent of the sample of S&P500 firms are industrial; 94 percent of those firms have debt information available on Capital IQ.

[15]The fraction of sample firms with CDS climbs steadily over the sample period, from 19.1% in 2002 to 61.8% in 2008.

*2.2. Empirical Specification*

There are two main goals of the analysis. The first is to examine the impact of supply constraints on leverage and maturity decisions. We use the CDS market as a proxy for suppliers' ability to hedge, which is expected to relax credit supply constraints. The second goal is to exploit the time series dimensions of the data to see whether the impact of CDS on leverage and maturity choice varies as supply conditions change. This part of the analysis may help explain cross-sectional variation in how the recent crisis spread to the corporate sector.

The dependent variables of interest are leverage and debt maturity. Leverage is defined as either book leverage (*Book Leverage*) or market leverage (*Market Leverage*). *Book Leverage* is defined as total debt (long term debt plus debt in current liabilities), divided by the book value of assets. *Market Leverage* is defined as total debt divided by firm value, where firm value is defined as the book value of assets, minus the book value of common equity, plus the market value of equity and deferred taxes. We include both of these leverage variables in all of the empirical analyses, for robustness. *Debt Maturity* is defined as the principal-weighted maturity of all debt (in years), as reported in Capital IQ.

We follow Johnson (2003) and estimate the leverage and debt maturity equations simultaneously. This is because the choice of leverage and debt maturity is likely to occur jointly (see e.g., Barclay, Marx & Smith (2003)). As in Ashcraft & Santos (2009), we include two credit default swap variables in the empirical specifications. *CDS Trading* is a dummy variable equal to 1 if the firm has quoted CDS contracts on its debt during year t. *CDS Traded* is a dummy variable equal to 1 if the firm has a traded CDS contract on its debt at any time during the 2002-2008 sample period. *CDS Traded* captures unobservable differences between CDS and non CDS firms. The main goal of this paper is to determine the role of capital supply, in particular, the ability of suppliers of capital to hedge risk, on leverage and maturity. By including both the *CDS Trading* and *CDS Traded* indicator variables, we are able to exploit differences in timing of CDS introduction across CDS firms to estimate the impact of having a CDS contract on leverage and debt maturity. The main coefficient of interest in both the leverage and maturity equations is that on the *CDS Trading* indicator variable.

The other explanatory variables are primarily from Johnson (2003) and reflect general findings from the capital structure literature. In the leverage equation, we include *Debt Maturity* based on the idea that, if firms face liquidity/rollover risk, firms with shorter maturity debt are expected to choose less leverage (see for example, the findings in Massa, Yasuda & Zhang (2009)). We also include an *Industry Leverage* control since firms in the same industries have common characteristics that might impact leverage ratios.[16] *Industry Leverage* is defined as the median leverage of all firms in the 3-digit SIC code.[17] *Market to Book,* the firm's market to book ratio, is defined as the market value of assets (equity market capitalization plus the book value of other liabilities), divided by the book value of assets. This variable is included since firms with high growth opportunities are expected to use low leverage to mitigate underinvestment incentives (Myers (1977)). *Fixed Assets,* defined as net PPE divided by the book value of assets, is a proxy for the firm's tangible assets and reflect the idea in Williamson (1988) that high collateral value increases firms' debt capacities. *Profitability*, defined as earnings before interest and taxes, divided by the book value of assets is included as a control variable. Theoretically, the predicted sign on this variable is ambiguous. According to the free cash flow hypothesis (e.g., Jensen (1986)), firms with high profitability will take on greater leverage since interest payments discipline wasteful spending incentives. On the other hand, Myers (1984) argues that firms have a pecking order, first using internal funds. High profit firms would therefore be expected to have less leverage. The theoretical sign on *Size*, defined as the natural log of net sales, is also ambiguous. *Size* is included because larger firms are likely to be more diversified than smaller ones, thereby increasing their debt capacity (Lewellen (1971)). At the same time, large firms have more access to public equity markets, decreasing their reliance on debt. *Volatility* is defined as the standard deviation of annual changes in earnings, divided by book value of assets, over years t–1 through t–4. Increased earnings volatility increases default probabilities and is expected to decrease debt capacity. *Tax Credit* and *Loss Carry Forward* are dummy variables equal to 1 if the firm has an investment tax credit or loss carry forward, respectively. Both of these are alternative tax shields and are expected to decrease the value of leverage to firms. If there is a signaling effect associated with leverage choice as in Ross (1977), then leverage will be positively related to abnormal earnings (*Abnormal Earnings*), defined as the change in operating earnings per share from year t–1 to year t, divided by share price. *Rated* is a dummy variable equal to one if the firm has a credit rating. *Rated* firms are more likely to have access to public debt markets (see Faulkender & Petersen (2006) ). Finally, *Investment Grade* is a dummy equal to one if the firm has an investment grade credit rating (i.e., BBB or higher). Given survey findings in Association (2006) that the majority of single name CDSs are on firms with investment grade debt, we want to be sure that any observed impact of CDS is not due to a difference in credit quality.

[16] Johnson (2003) does not include this industry control. However, Leary & Roberts (2010) find that industry leverage is an important determinant of firms' capital structures.

[17] If there are fewer than 15 firms in the 3-digit SIC group we compute the industry median based on all firms in the 2-digit SIC code.

The specification of the *Debt Maturity* equation also follows Johnson (2003). *Leverage* is included due to the potential rollover risk. Firms with high leverage are expected to choose longer maturity debt to avoid excessive liquidation of their assets. *Market to Book* captures the idea that firms with high growth opportunities will choose short maturity debt so that debt is due before options to invest expire, thereby mitigating underinvestment problems. Diamond (1991) predicts an increasing and then decreasing relationship between debt maturity and credit quality/liquidity risk. This is captured by *Size* and *CP* (a dummy equal to one if the firm has a commercial paper program at the beginning of year t), respectively. Barclay & Smith (1995) and Barclay, Marx & Smith (2003) also use this *CP* dummy variable and, consistent with Diamond (1991), they find that firms with commercial paper programs have shorter maturity debt, on average. [18] *Volatility* increases default probabilities and is expected to decrease optimal maturity. Alternative tax shields (*Tax Credit* and *Loss Carry Forward*) are expected reduce the value of long term debt and shorten debt maturity (e.g., Brick & Ravid (1985) in which an upward sloping yield curve makes long term debt more valuable). *Abnormal Earnings* is included to capture signaling effects. If good firms signal via the choice of short maturity debt (as in Flannery (1986) and Diamond (1991)) then debt maturity will be negatively related to abnormal earnings. *Asset Maturity* is defined as the weighted sum of gross PPE divided by depreciation expense and current assets divided by the cost of goods sold. It is included based on the idea that matching the maturities of assets and liabilities can reduce underinvestment problems (as in Myers (1977)). *Rated* firms are expected to find it easier to borrow longer term debt since they have greater access to public bond markets. As in the *Leverage* regression, *Investment Grade* is included as a control variable to ensure that inference about the impact of CDS is not due to differences in credit quality (most CDSs are written on investment grade firms).[19]

For the simultaneous equations model to be identified, the exclusion restriction must be satisfied. Notice that *Industry Leverage, Fixed Asset Ratio* and *Profitability* are in the leverage equation but are excluded from the *Debt Maturity* equation. There is no theoretical reason why the amount of debt held by firms in the industry should impact debt maturity. We also do not expect asset tangibility, which tells us nothing about asset maturity, or one-period profit to have a direct impact on debt maturity (except through its impact on leverage). Similarly, *Asset Maturity* is not directly related to a firm's debt capacity, nor is whether a firm has a commercial paper program in place. These variables are excluded from

[18] Johnson (2003) uses size-squared to capture this non-monotonic relationship; however, this variable does not have explanatory power in our sample. Results are not sensitive to including it.

[19] Johnson (2003) also includes a Regulated dummy variable for firms in SIC codes 4900 to 4939. We include industry fixed effects in all regressions, based on the Fama-French 12 industry groupings. Regulated maps to the utility industry fixed effect.

the leverage equation. This identification in the simultaneous equations model is similar to the identification in Johnson (2003). [20]

In extended analysis, we allow for potential endogeneity of having a CDS market by estimating a three-equation simultaneous equations model in which the probability of having a CDS market is estimated in a probit regression. We also conduct a separate test, similar to that in Ashcraft & Santos (2009), in which we use a propensity score matching technique (Rosenbaum & Rubin (1983)) to pair CDS firms with a matched sample of non CDS firms in year t–1 relative to the year of CDS introduction, with the closest propensity scores. We then compare changes in leverage and debt maturity across the CDS and non-CDS firms.

Table 2 provides a summary of all variables in the leverage and maturity equation specifications, along with their predicted signs. All regressions are estimated with year and industry (based on the Fama-French 12 groupings) fixed effects and also allow for clustering of standard errors at the firm level.

# 3. Results

### *3.1. Main Results*

Tables 3 and 4 show the ordinary least squares (OLS) and second stage two-stage (2SLS) least squares results of estimating the leverage and maturity equations, respectively. We show both sets of results throughout, but follow the recent debt maturity literature and rely on the 2SLS analysis in the interpretation. The findings in Tables 3 and 4 are the main results in our analysis. In both tables, Columns (1) and (2) measure debt using book leverage and Columns (3) and (4) measure debt using market leverage. As described in the previous section , the regression specifications are based on Johnson (2003), with *CDS Traded* and *CDS Trading*, *Industry Leverage*, *Investment Grade*, and *CP* as the only additional explanatory variables.

The most important observation from *Leverage* equation results in Table 3 is the positive and statistically significant coefficient on the *CDS Trading* dummy variable in all specifications. The magnitudes of the coefficients are also economically significant. With all

[20] There are only two differences between our identification and that in Johnson (2003). First, *Rated* is an additional identifying variable in the *Debt Maturity* equation in Johnson (2003). However, we also include it in the leverage equation due to Faulkender & Petersen (2006), who examine the impact of credit supply frictions on leverage. They use having a credit rating as a proxy for access to public debt markets and find support for the hypothesis that this variable impacts debt ratios. Second, *Industry Leverage* is an additional identifying variable in the *Leverage* equation (see Leary & Roberts (2010).

variables at their mean levels, the 2SLS coefficients imply that the introduction of CDS trading implies an increase in book leverage of 28 percent (increase of 0.067 from a mean of 0.24) and an increase in market leverage of 25 percent (increase of 0.037 from a mean of 0.15).[21] One potential concern is that equity returns of CDS firms are lower than non-CDS firms; however, the consistency of results across both the book leverage and market leverage specifications shows that equity performance is driving the results.

The *CDS Traded* coefficients in Table 3 are statistically insignificant in the regressions. While this variable is used as a control, so that the *CDS Trading* variable captures the effect of the introduction of a CDS contract, the coefficients are interesting in that they do not show an average difference in leverage across CDS and non-CDS firms after controlling for other characteristics. The other variables that are statistically significant in the leverage equation are *Industry Leverage*, *Fixed Asset*, *Size*, and *Rated*. The signs of the estimated coefficients on these variables are largely consistent with the predictions described in Section 3.2 and in Table 2. The estimated coefficients on the alternative tax shield variables are inconsistent with the predictions, and either have statistically insignificant coefficients or coefficients of the opposite sign. While positive coefficients on alternative tax shields are somewhat puzzling, note that Johnson (2003) finds similar results for net loss carry forwards in the leverage equation.[22] Interestingly, after we control for *CDS Trading*, debt maturity is not a significant determinant of leverage. We find this in both the OLS and 2SLS specifications. The estimated impact of ability of suppliers of capital to hedge is more important than rollover risk for our sample of firms.

The results from the *Debt Maturity* regression are presented in Table 4. Similar to our findings in Table 3, we find strong evidence that the ability of suppliers of capital to hedge impacts firms' capital structures. We find positive and statistically significant coefficients on the *CDS Trading* coefficients in all specifications. As in Table 3, the magnitudes are also economically significant. With all variables at their mean levels, the introduction of credit default swap contracts increase debt maturity by approximately 1.6 years. Unlike Table 3, the coefficients on *CDS Traded* in Table 4 are marginally significant, suggesting that the firms that eventually have CDS contracts on their debt tend to start with longer debt maturities. These maturities are further increased once CDSs are introduced.

[21]Separate from the direct hedging effects of CDSs, Bolton & Oehmke (2010) show that they can improve firms' debt capacities by providing ex ante commitment of creditors to be "tough" in debt renegotiations. Ex ante, CDS improves creditors' bargaining power and decreases strategic default of firms, which increases debt capacity. Our finding of greater leverage of CDS firms is consistent with this prediction.

[22]In untabulated tests, we add the Johnson (2003) maturity measure (i.e., the fraction of debt maturing in less than three years) to the leverage equation and find qualitatively similar results for the role of CDS. We also find that both maturity variables have marginal explanatory power.

The estimated coefficients on *Asset Maturity* in Table 4 are consistent with maturity matching (Myers (1977)). Since both debt maturity and asset maturity are measured in years, the interpretation of the coefficients is straightforward: a one year increase in asset maturity increases debt maturity by approximately 0.21 years (2.5 months).[23] After controlling for asset maturity and CDS, *Market to Book*, *Tax Credit* and *Commercial Paper* are the other estimated coefficients that are consistently significant. With the exception of *Tax Credit*, the signs on these coefficients are consistent with the predictions given in Table 2. Similar to the leverage regression, we do not find evidence that leverage is a significant determinant of maturity.

*3.2. Year-by-year Analysis and Credit Supply Tightening*

In interpreting the results in Tables 3 and 4, it is useful to ask whether the supply effect becomes more important during times in which credit constraints bind. We re-estimate the regressions in Tables 3 and 4 except that instead of using year fixed effects, we estimate the regressions separately by year.[24] The main goal of this exercise is to exploit some of the time series properties of the data to shed light on the question of whether the supply effects documented in the previous section vary over time. Of particular interest is the role of CDSs when credit constraints become more and less binding. Given the financial crisis of 2007-2009, we would expect the effects to be greatest near the end of the sample, when credit constraints bind. Figure 1 shows the time series patterns of the estimated impact of CDS on leverage and maturity. The coefficients in the Figure 1 are positive in all years. More interestingly the magnitudes of the impact of CDS on leverage exhibit somewhat of a U-shaped pattern over the sample period, with CDSs having greatest importance during the first and last years of the sample. The effect of CDS on book leverage hits its lowest values in 2003 and 2005 and it peaks in 2008. The impact of CDS on market leverage also peaks in 2008, with a low in 2003. The results of year-by-year estimation of the impact of CDS on *Debt Maturity* are also in Figure 1 and show a striking U-shaped pattern. The effect of CDS on debt maturity is positive in all years in the regressions using both book and market leverage. The impact of CDS on maturity, peaks in 2002 and 2008, and a trough in 2005.

To shed further light on the extent to which the patterns shown in Figure 1 map to constraints in U.S. credit markets, we look to the Federal Reserve's Senior Loan Officer

[23] In untabulated analysis, we interacted the *Asset Maturity* variable with *CDS Traded* and find that much of the maturity matching result comes from CDS firms. We interpret this as evidence that the increased supply of credit to these firms allows them to maturity match.

[24] In the year-by-year analysis, we are only able to include the *CDS Trading* dummy variable since estimating coefficients on both *CDS Trading* and *CDS Traded* requires time series variation in the CDS status of firms.

Opinion Survey, which provides indicators of credit supply tightening.[25] If CDSs matter more when credit constraints bind then we would expect to observe similar shapes in the survey data for the 2002 through 2008 time period. Figure 2 shows the net percentage of respondents reporting commercial and industrial loan tightening to large and medium sized firms over the sample period. The data reflect a U-shaped pattern that is remarkably similar to the observed coefficients on the *CDS Trading* dummy variable, especially in the *Debt Maturity* equation (in Figure 1). The credit tightening early years of the sample followed the recession of 2001 as well as large corporate governance scandals of 2001-2002 such as those that took place at Enron, WorldCom and Tyco. The tightening in the later years coincides with the first years of the credit crisis of 2007-2009. Recent empirical findings are also consistent with the Fed survey data: Cornett, McNutt, Strahan & Tehranian (2010) find that lines of credit and loans both declined during the 2001 recession, although the decline was not as steep as in 2008.

To test formally the hypothesis that CDS markets become more important when credit constraints begin to bind, we repeat the regression analysis shown in Tables 3 and 4, but instead of including time fixed effects, we include *Supply Tighten*, defined as the net fraction of respondents reporting loan tightening at the beginning of year t, and an interaction of the *CDS Trading* dummy variable with *Supply Tighten*. The main hypothesis is that the coefficient on the interaction variable is positive. That is, when credit constraints begin to bind, CDS firms are able to maintain higher leverage and longer debt maturities. Results for leverage and debt maturity are shown in Tables 5 and 6, respectively. Consistent with our hypothesis, we observe positive and statistically significant coefficients on the *CDS Trading* × *Supply Tighten* interaction variable in all specifications. The other estimated coefficients are similar to those in Tables 3 and 4. The main *Supply Tighten* effect is statistically insignificant in the maturity regressions. However, in the leverage regressions, the main *Supply Tighten* effect is positive and statistically significant. The latter observation is somewhat puzzling, but may reflect a contraction of credit supply after firms have attained high levels of debt. This raises the question of what happens to incremental debt issuance (as opposed to levels). If CDSs help firms maintain high leverage ratios, we might also expect CDSs to be associated with increased debt issuance. In untabulated analysis of corporate bond issuance, we find that CDS firms issue more frequently than non-CDS firms. [26]

[25]The Federal Reserve conducts quarterly survey interviews with senior loan officers of domestic and foreign large commercial banks. The purpose of the survey is to collect information on credit availability, credit demand, and loan practices. One of the data fields collected and reported by the Federal reserve is the net percentage of respondents tightening standards for commercial and industrial loans. Details about the survey can be found at http://www.federalreserve.gov/boarddocs/snloansurvey/about.htm.

[26]We focus our main analysis on levels rather than issuance because capital structure theory provides

Along with our main results, we interpret the results in Tables 5 and 6 and in Figures 1 and 2 as evidence that the ability of suppliers of capital to hedge credit risk has a significant impact on leverage and maturity, especially during times in which credit constraints bind.

### *3.3. CDS Firms versus Non-CDS Firms*

One potential concern with any study of the impact of CDS markets on financing choice is the possibility that CDS firms are different from non-CDS firms in ways that are systematically related to leverage and maturity choice. Our main empirical approach, in which we follow Ashcraft & Santos (2009) and include as a control variable a dummy equal to one if there is a CDS market for the firm's debt at any time during the 2002-2008 sample period, is designed to mitigate this concern; however, the approach assumes that the timing of CDS introduction is exogenous. We address this problem in two ways. First, we allow for potential endogeneity of CDS markets by implementing a system of three simultaneous equations, in which, relative to our base analysis, we add a probit model for CDS trading as the third equation.[27] Second, we study the impact of CDS introduction by employing a difference in differences approach and examine the changes in leverage and debt maturity from the end of year t–1 to the end of years t and t+1 relative to CDS introduction, compared with the changes in a matched sample of non CDS firms.

#### *3.3.1. Potential Endogeneity of CDS Contracts: Three Equation System*

The main analysis assumes that the timing of CDS introduction is exogenous. We allow for the potential endogeneity of CDS markets by implementing a simultaneous three equation system.[28] In addition to the leverage and maturity equations, we introduce a probit model for CDS. The identification for whether a firm has traded CDS on its debt comes *Bond Lehman*, an indicator variable equal to one if the dollar value of the firm's bond and note debt outstanding is large enough for inclusion in the Lehman Brothers Corporate Bond Index.[29] We would expect that firms with sufficient bond debt outstanding to be included in the Lehman index to be more more likely to have some investors that would like to hedge their positions in that debt. At the same time, we do not expect eligibility for inclusion in the index to drive leverage or maturity decisions directly. This instrument is

sharp predictions regarding the determinants of leverage and maturity of debt. The theory guiding issuance patterns is less clear (for example, these decisions are likely to depend on the amount of maturing debt, other debt-like obligations within the firms' capital structures).

[27] In the leverage and maturity equation we eliminate the *CDS Traded* variable.

[28] Billett, King & Mauer (2007) also estimate a three equation system; however, their focus is different from ours in that they are interested in the role of debt covenants in firms' bond issuance decisions.

[29] The history of cutoff values for the index comes from Barclays Capital Index Products US Corporate Index (9/24/2010).

similar to that in Faulkender & Petersen (2006) except that our Capital IQ data allow us to specifically identify outstanding bond and note debt, so we are able to use this value, rather than total debt in defining *Bond Lehman*. We also include *Size*, *Market to Book*, *Rated* and *Investment Grade* as exogenous explanatory variables in the CDS equation. We expect that market participants are more likely to trade CDS (for either hedging or speculative reasons) in bigger, rated firms with investment grade ratings. *Market to Book* is included as a control varlable, but its expected sign is ambiguous. Growth opportunities increase firm volatility, which could be attractive to CDS traders. At the same time, a low market to book value indicates financial distress, which is also attractive to these market participants.

Regression results are given in Table 7. The leverage and debt maturity results in Panels A and B are largely consistent with the main regressions and the estimated effect of CDS is substantial, even after controlling for potential endogeneity. From Panel A, the estimated coefficients on *CDS* (the probability of having a traded CDS contract, which is 0.47 for the full sample) suggest that moving from the mean probability to a probability of 1 would imply an increase in book leverage of 0.062 and an increase in market leverage of 0.058 (from means of 0.24 for book leverage and 0.15 for market leverage). The estimated coefficients on *CDS* in Panel B suggest that this would increase debt maturity by 2.1 to 2.9 years. The estimated coefficients of the other variables in Panels A and B of Table 7 are similar to the main results given in Tables 3 and 4, respectively. Panel C of Table 7 presents the second stage results of the CDS equation. The pseudo R-squares of the regressions are substantial, at approximately 0.29 and the estimated coefficients on the identifying variable *Bond Lehman* is statistically significant, suggesting that the system is well-specified.[30]

*3.3.2. Event Analysis Using Matched Firms*

The approach that we have adopted thus far captures the impact of CDS over long horizons (i.e., estimates of the coefficients on *CDS Trading* capture the change in leverage and maturity in all of the years following CDS introduction). As an alternative, we isolate firms near CDS introduction and measure changes in leverage and maturity from the year t–1 through the end of year t and year t+1 relative to CDS introduction. We begin by matching all CDS firms to non CDS firms using the Compustat universe. For the year t–1, we require that the matched firm be in the S&P 500 index. We use the estimated coefficients from the CDS regression shown in Table 7, panel C to estimate each firm's CDS propensity

[30]In untabulated analysis, we used an alternative instrumental variable for CDS, equal to the (log) dollar volume of trading activity in the firm's bond market, as reported on the TRACE system. All results are qualitatively similar. We chose the *Bond Lehman* instrument in part because it has been used in the literature and, more importantly, because comprehensive dissemination of bond trading information on TRACE did not begin until 2004, causing us to lose two years of data.

in year t-1. For each CDS firm, we choose the non-CDS firm that is the closet match, based on this propensity score. We obtain matches for 112 firms in the sample with CDS market introductions during the sample period.[31] Identification comes from the assumption that, conditional on the matching based on variables in Table 7, CDS outcomes are random.

In Tables 8 and 9, we show results from regressions in which we repeat the analysis in Tables 3 and 4, using data on only CDS firms and their matched firms in the regressions. Table 8 provides univariate analysis of the difference in differences (change in leverage and maturity of CDS firms minus the change for matching firms). We observe increases in leverage ratios of 0.029 and 0.023 from year t–1 through year t+1, and of 0.042 and 0.027 from year t–1 through year t+1 for book and market leverage respectively. We also observe increases in debt maturity of 0.427 from t–1 through t and of 1.040 from t–1 through t+1 relative to CDS introduction.

Table 9 shows results from the regression analysis in which we repeat the regressions in Tables 3 and 4, using data on only CDS firms and their matched firms. Rather than examining levels, we transform all variables to differences, reflecting the change from year t–1 to year t of the CDS introduction, as well as from year t–1 through year t+1. Results from the leverage and maturity equations are presented in Table 9, Panels A and B, respectively. While less statistically significant than the main results (due in part to the smaller sample size), we observe a positive role for credit default swaps. The coefficient on *CDS Trading* suggests that, all else equal, the introduction of a CDS increases leverage ratios by between 0.004 and 0.022 and increases maturity by approximately 11 months by the end of the year following CDS introduction. Note that the maturity results do not become significant until year t+1 relative to the CDS introduction, implying that it takes some time for the supply effect to impact financing decisions.

*3.3.3. CDS Market Liquidity Proxies*

The main regression specification includes the *CDS Trading* variable to control for differences between CDS and non-CDS firms. As a final test of the impact of CDS, we instead study only the 1,150 observations for which *CDS Trading* equals one and focus on variation in CDS market liquidity, which captures variation in the ability of suppliers of debt capital to hedge. By examining only firms with CDS trading, we are able to completely avoid concerns

[31] The number of possible CDS firms is reduced by the fact that we cannot include firms for which CDS started trading in 2002 and in 2008 and firms that are not in the S&P 500 in the years before and after the introduction of CDS. We do not currently have data to measure maturity during year 2001 and 2009. The total number of firms that have CDS trading in our sample is 280, of those 154 start trading between 2003 through 2007. 39 of those enter the S&P500 sample in the same year that the CDS is introduced, and 3 exit the sample the year after the introduction, leaving us with a sample of 112 firms.

about selection of CDS firms (relative to non CDS firms). The drawback is that CDSs trade over-the-counter, which leads to substantial noise in the liquidity proxies. Ideally, we would observe daily trading activity for CDSs, as we do for equities that trade on exchanges. Because these data are largely unavailable for CDSs, we calculate two somewhat coarse proxies of market liquidity: (1) the natural log of the number of daily Bloomberg CDS quotes that we observe for the firm during year t and (2) the average bid-ask spreads for the firm's CDSs during year t. The Bloomberg bid and ask quotes are very limited in that they are based only on information from contributing dealers, however, we do not expect potential noise from sampling a small group of dealers to be systematically related to leverage or maturity decisions.

Table 10 reports results from regressions in which we replace the *CDS Trading* and *CDS Traded* with the liquidity proxies. Panel A is analogous to the leverage regression in Table 3, and Panel B is analogous to the maturity regression in Table 4. We find evidence, albeit weaker than in the main analysis, that firms with more liquid CDS markets (lower quoted spreads and greater number of CDS quotes) are able to maintain higher leverage ratios and longer debt maturities. The estimated signs on all of the coefficients are consistent with the main findings; however, the significance of the estimated coefficients is lower than in the main analysis. Three of the four estimated coefficients are statistically significant in the regressions using CDS quotes and two of four are significant in the regressions using a count of the number of quotes. This may be due to noise in the liquidity proxies.

Taken together, all of the results from Tables 3 through 10 suggest an important role for insurance contracts (CDSs) in both leverage and debt maturity.

# 4. Conclusions

Consistent with the idea that borrowers benefit from a relaxation of credit constraints due to the ability of suppliers of debt capital to hedge their risk, we find a strong role for CDSs in both leverage and debt maturity. We take three approaches in the empirical analysis. The first is based on the estimation of a system of two simultaneous equations for leverage and debt maturity, and focuses on the entire sample of non-financial firms in the S&P500 index and exploits variation in whether firms have traded CDS contracts and in the timing of the adoption of CDS trading. In the second approach, we allow for the potential endogeneity of the existence of a CDS market for a firm's debt by introducing a third simultaneous equation for CDS trading. Finally, we focus on the CDS adoption event and use a matched sample of firms with no CDS but that have similar characteristics, based on a propensity score research design. We measure changes in leverage and maturity near CDS introduction. All three empirical approaches lead to similar conclusions: CDS markets allow firms to maintain higher leverage and longer debt maturities (both in the time series and the cross section).

Our analysis complements Ashcraft & Santos (2009), in which the authors study one channel through which CDS might matter: spreads. Their finding of no difference in the cost of loans to the average CDS firm is somewhat surprising and suggests CDS may instead impact other dimensions of capital supply. Our examination of quantities and maturities reveals that this is indeed the case. Moreover, we exploit the time series properties of the data and find that the role for CDS becomes stronger as credit constraints bind, suggesting important time series variation in the impact of capital supply on firm capital structure.

# Appendix

**Alcoa, Inc. (NYSE:AA) > Financials > Capital Structure Details**

[<< Return to Capital Structure Summary]

Key Stats | Income Statement | Balance Sheet | Cash Flow | Multiples | **Cap. Structure** | Ratios | Supplemental | Industry Specific | Pension/OPEB | Segments

**Source:** A 2008 filed Feb-17-2009

**Currency:** Reported Currency **Conversion:** Historical Go [More Options >>]

*Principal Due in Millions of the reported currency.*

**FY 2008 Capital Structure As Reported Details**

| Description | Type | Principal Due (USD) | Coupon Rate | Maturity | Seniority | Secured | Convertible | Repayment Currency |
|---|---|---|---|---|---|---|---|---|
| 5.375% Notes, due 2013 | Bonds and Notes | 600.0 | 5.375% | 2013 | Senior | No | No | USD |
| 5.55% Notes, due 2017 | Bonds and Notes | 750.0 | 5.550% | Feb-01-2017 | Senior | No | No | USD |
| 5.72% Notes, due 2019 | Bonds and Notes | 750.0 | 5.720% | 2019 | Senior | No | No | USD |
| 5.87% Notes, due 2022 | Bonds and Notes | 627.0 | 5.870% | 2022 | Senior | No | No | USD |
| 5.9% Notes, due 2027 | Bonds and Notes | 625.0 | 5.900% | 2027 | Senior | No | No | USD |
| 5.95% Notes due 2037 | Bonds and Notes | 625.0 | 5.950% | 2037 | Senior | No | No | USD |
| 6% Notes, due 2012 | Bonds and Notes | 517.0 | 6.000% | 2012 | Senior | No | No | USD |
| 6% Notes, due 2013 | Bonds and Notes | 750.0 | 6.000% | 2013 | Senior | No | No | USD |
| 6.5% Bonds, due 2018 | Bonds and Notes | 250.0 | 6.500% | 2018 | Senior | No | No | USD |
| 6.5% Notes, due 2011 | Bonds and Notes | 584.0 | 6.500% | 2011 | Senior | No | No | USD |
| 6.625% Notes, due 2008 | Bonds and Notes | - | 6.625% | 2008 | Senior | No | No | USD |
| 6.75% Bonds, due 2028 | Bonds and Notes | 300.0 | 6.750% | 2028 | Senior | No | No | USD |
| 6.75% Notes, due 2018 | Bonds and Notes | 750.0 | 6.750% | 2018 | Senior | No | No | USD |
| 7.375% Notes, due 2010 | Bonds and Notes | 511.0 | 7.375% | 2010 | Senior | No | No | USD |
| Alcoa Alumnio S.A. 7.5% Export Notes, due 2008 | Bonds and Notes | - | 7.500% | 2008 | Senior | Yes | No | USD |
| Commercial Paper | Commercial Paper | 1,535.0 | 4.000% | Dec-31-2009 | Senior | No | No | USD |
| Loans - BNDES | Term Loans | 100.0 | NA | Sep-01-2029 | Senior | Yes | No | USD |
| Medium-Term Notes, due 2009-2013 | Bonds and Notes | 23.0 | 7.100% | 2009 - 2013 | Senior | No | No | USD |
| Other Debt | Other Borrowings | 189.0 | NA | - | Senior | No | No | USD |
| Project Loans - BNDES | Term Loans | 196.0 | NA | Apr-01-2015 | Senior | Yes | No | USD |
| Project Loans - BNDES | Term Loans | 250.0 | NA | Apr-01-2015 | Senior | Yes | No | USD |
| Short-Term Accounts Payable Settlement Arrangements with Certain Vendors and Third-party Intermediaries | Other Borrowings | 236.0 | NA | Dec-31-2008 | Senior | No | No | USD |
| Short-Term Borrowings | Other Borrowings | 242.0 | NA | Dec-31-2008 | Senior | No | No | USD |

**FY 2007 Capital Structure As Reported Details**

| Description | Type | Principal Due (USD) | Coupon Rate | Maturity | Seniority | Secured | Convertible | Repayment Currency |
|---|---|---|---|---|---|---|---|---|
| 5.375% Notes, due 2013 | Bonds and Notes | 600.0 | 5.375% | 2013 | Senior | No | No | USD |
| 5.55% Notes, due 2017 | Bonds and Notes | 750.0 | 5.550% | Feb-01-2017 | Senior | No | No | USD |
| 5.72% Notes, due 2019 | Bonds and Notes | 750.0 | 5.720% | 2019 | Senior | No | No | USD |
| 5.87% Notes, due 2022 | Bonds and Notes | 627.0 | 5.870% | 2022 | Senior | No | No | USD |
| 5.9% Notes, due 2027 | Bonds and Notes | 625.0 | 5.900% | 2027 | Senior | No | No | USD |
| 5.95% Notes due 2037 | Bonds and Notes | 625.0 | 5.950% | 2037 | Senior | No | No | USD |
| 6% Notes, due 2012 | Bonds and Notes | 517.0 | 6.000% | 2012 | Senior | No | No | USD |
| 6% Notes, due 2013 | Bonds and Notes | - | 6.000% | 2013 | Senior | No | No | USD |
| 6.5% Bonds, due 2018 | Bonds and Notes | 250.0 | 6.500% | 2018 | Senior | No | No | USD |
| 6.5% Notes, due 2011 | Bonds and Notes | 584.0 | 6.500% | 2011 | Senior | No | No | USD |
| 6.625% Notes, due 2008 | Bonds and Notes | 150.0 | 6.625% | 2008 | Senior | No | No | USD |
| 6.75% Bonds, due 2028 | Bonds and Notes | 300.0 | 6.750% | 2028 | Senior | No | No | USD |
| 6.75% Notes, due 2018 | Bonds and Notes | - | 6.750% | 2018 | Senior | No | No | USD |
| 7.375% Notes, due 2010 | Bonds and Notes | 511.0 | 7.375% | 2010 | Senior | No | No | USD |
| Alcoa Alumnio S.A. 7.5% Export Notes, due 2008 | Bonds and Notes | 21.0 | 7.500% | 2008 | Senior | Yes | No | USD |
| Commercial Paper | Commercial Paper | 856.0 | 5.400% | Dec-31-2008 | Senior | No | No | USD |
| Medium-Term Notes, due 2009-2013 | Bonds and Notes | 43.0 | 7.100% | 2009 - 2013 | Senior | No | No | USD |
| Other Debt | Other Borrowings | 200.0 | NA | - | Senior | No | No | USD |
| Short-Term Accounts Payable Settlement Arrangements with Certain Vendors and Third-party Intermediaries | Other Borrowings | 314.0 | NA | Dec-31-2008 | Senior | No | No | USD |
| Short-Term Borrowings | Other Borrowings | 249.0 | NA | Dec-31-2008 | Senior | No | No | USD |

Financial data provided by Capital IQ A Standard & Poor's Business

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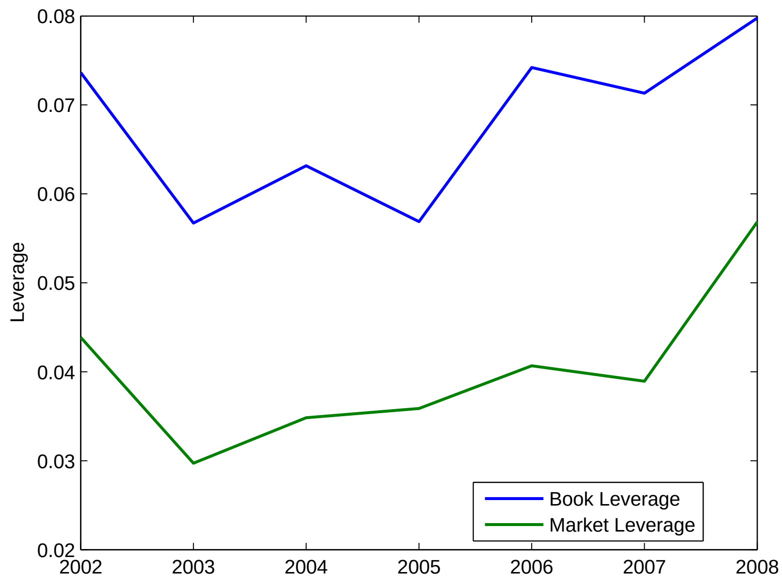
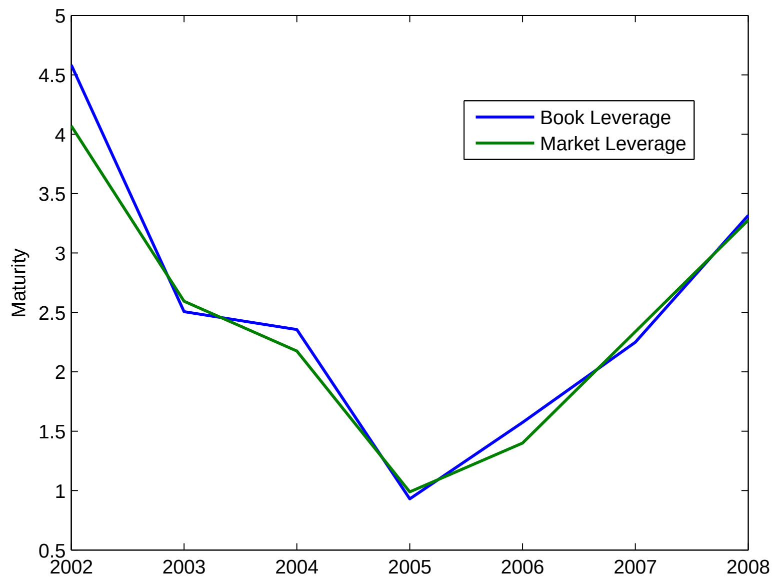
## Figure 1: Impact of CDS Trading, by Year

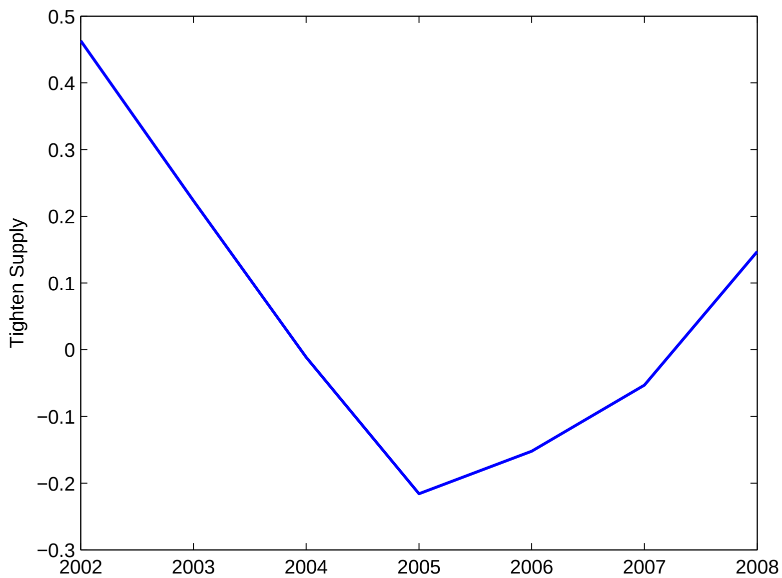
This figure shows the time series of estimated coefficients of the CDS Trading dummy variable in the Book Leverage, Market Leverage and Debt Maturity regressions. The "book leverage" lines show the time series of estimated coefficients from the regressions using book leverage. The "market leverage" lines show the coefficients from the regressions using market leverage.



## Figure 2: Net Tightening of Credit Supply, by Year

This figure shows the net percentage of senior loan officers reporting commercial and industrial loan tightening to large and medium sized firms over the 2002-2008 sample period. Higher values indicate tightening of credit supply. Data are from the Federal Reserve's Senior Loan Officer Opinion Survey.



# Table 1: Summary Statistics

This table presents summary statistics for the sample of non-financial firms in the S&P500 index during the 2002-2008 period. Book Leverage is book leverage, defined as total debt (long term debt plus debt in current liabilities), divided by the book value of assets. Market Leverage is market leverage, defined as total debt, divided by firm value, where firm value is defined as the book value of assets, minus the book value of common equity, plus the market value of equity, plus the book value of deferred taxes. Debt Maturity is debt maturity in years, defined as the principal-weighted maturity of all debt, as reported in Capital IQ. Asset Maturity is the weighted maturity of the firm's assets, defined as: (gross PPE divided by depreciation expense, times gross PPE divided by total assets) plus (current assets divided by cost of goods sold, times current asses divided by total assets). Bond/Debt is the fraction of total debt that are bonds and notes. Bond Maturity is the maturity of the firms bonds and notes, in years. Lease/Debt is the fraction of total debt that are lease obligations. Lease Maturity is the maturity of lease obligations, in years. Loan/Debt is the fraction of total debt that are term loans. Loan maturity is the maturity of term loan obligations, in years. Revolver/Debt is the sum of all outstanding revolver loans, divided by total debt. Revolver Maturity is the maturity of revolver obligations. CP/Debt is the fraction of commercial paper in total debt. CP Maturity is set equal to one month (1/12 of a year). TP/Debt is the fraction of trust preferred obligations in total debt. TP Maturity is defined as the maturity of trust preferred obligations, in years. Other/Debt is the fraction of other obligations in total debt. Other Maturity is defined as the maturity of other obligations. Profitability is defined as earnings before interest and taxes, divided by the book value of assets. Volatility is defined as the standard deviation of annual changes in earnings over years t-1 through t-4, divided by average book value of assets over the same period. Market to Book is the firm's market to book ratio, defined as the market value of assets (equity market capitalization plus the book value of other liabilities), divided by the book value of assets. Size is the natural logarithm of total sales, in $millions. Rating is the S&P credit rating of the firm, where the value 1 corresponds to an S&P rating of AAA+; 2 corresponds to AAA; 3 corresponds to AAA-, and so on. "S&P 500 and CDS" indicates that the firm is in the S&P500 sample and has traded CDS contracts on its debt (CDS quoted in Bloomberg) during year t. "S&P and no CDS" indicates that the firm does not have traded CDS on its debt.

| | S&P 500 | | | | | S&P 500 and CDS Trading | | | | | S&P 500 and no CDS Trading | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | Median | Stdev | Min | Max | Mean | Median | Stdev | Min | Max | Mean | Median | Stdev | Min | Max |
| Book Leverage | 0.24 | 0.23 | 0.14 | 0.00 | 0.69 | 0.27 | 0.25 | 0.13 | 0.02 | 0.74 | 0.21 | 0.19 | 0.14 | 0.00 | 0.74 |
| Market Leverage | 0.15 | 0.13 | 0.11 | 0.00 | 0.54 | 0.18 | 0.15 | 0.11 | 0.01 | 0.54 | 0.12 | 0.10 | 0.11 | 0.00 | 0.55 |
| Debt Maturity | 8.72 | 7.13 | 6.35 | 0.08 | 38.46 | 9.79 | 8.48 | 6.61 | 0.15 | 39.39 | 7.68 | 6.06 | 6.05 | 0.08 | 37.35 |
| Asset Maturity | 6.22 | 4.11 | 5.45 | 0.86 | 28.51 | 6.80 | 4.89 | 5.46 | 0.71 | 28.39 | 5.63 | 3.60 | 5.40 | 1.08 | 31.02 |
| Bond/Debt | 0.76 | 0.84 | 0.26 | 0.00 | 1.00 | 0.79 | 0.85 | 0.21 | 0.00 | 1.00 | 0.72 | 0.82 | 0.30 | 0.00 | 1.00 |
| Bond Maturity | 10.09 | 8.43 | 7.19 | 0.50 | 47.74 | 11.12 | 9.46 | 7.67 | 0.74 | 52.49 | 8.98 | 7.17 | 6.50 | 0.41 | 40.30 |
| Lease/Debt | 0.02 | 0.00 | 0.09 | 0.00 | 1.00 | 0.01 | 0.00 | 0.03 | 0.00 | 0.26 | 0.03 | 0.00 | 0.13 | 0.00 | 1.00 |
| Lease Maturity | 10.57 | 5.00 | 14.49 | 0.00 | 87.50 | 11.54 | 5.97 | 13.92 | 0.08 | 86.50 | 9.63 | 4.50 | 15.08 | 0.00 | 87.50 |
| Loan/Debt | 0.05 | 0.00 | 0.13 | 0.00 | 0.93 | 0.04 | 0.00 | 0.10 | 0.00 | 0.65 | 0.06 | 0.00 | 0.16 | 0.00 | 0.97 |
| Loan Maturity | 3.71 | 2.50 | 4.29 | 0.00 | 28.73 | 3.49 | 2.00 | 4.45 | 0.00 | 30.99 | 4.01 | 3.08 | 4.28 | 0.00 | 28.91 |
| Revolver/Debt | 0.06 | 0.00 | 0.16 | 0.00 | 1.00 | 0.04 | 0.00 | 0.09 | 0.00 | 0.62 | 0.09 | 0.00 | 0.20 | 0.00 | 1.00 |
| Revolver Maturity | 2.44 | 2.00 | 1.62 | 0.00 | 10.51 | 2.31 | 2.00 | 1.66 | 0.01 | 13.19 | 2.58 | 2.10 | 1.66 | 0.00 | 7.70 |
| CP/Debt | 0.05 | 0.00 | 0.11 | 0.00 | 0.60 | 0.05 | 0.00 | 0.09 | 0.00 | 0.59 | 0.06 | 0.00 | 0.13 | 0.00 | 0.84 |
| CP Maturity | 0.08 | 0.08 | 0.00 | 0.08 | 0.08 | 0.08 | 0.08 | 0.00 | 0.08 | 0.08 | 0.08 | 0.08 | 0.00 | 0.08 | 0.08 |
| TP/Debt | 0.01 | 0.00 | 0.03 | 0.00 | 0.26 | 0.01 | 0.00 | 0.04 | 0.00 | 0.34 | 0.00 | 0.00 | 0.02 | 0.00 | 0.23 |
| TP Maturity | 25.57 | 27.26 | 11.52 | 0.58 | 55.66 | 26.83 | 29.33 | 10.27 | 0.58 | 54.50 | 22.82 | 21.33 | 13.60 | 3.00 | 55.66 |
| Other/Debt | 0.05 | 0.00 | 0.13 | 0.00 | 0.92 | 0.06 | 0.01 | 0.14 | 0.00 | 0.95 | 0.03 | 0.00 | 0.10 | 0.00 | 0.94 |
| Other Maturity | 4.48 | 2.00 | 5.90 | 0.00 | 37.46 | 5.02 | 2.00 | 6.72 | 0.00 | 40.86 | 3.55 | 2.00 | 4.26 | 0.00 | 26.50 |
| Profitability | 0.15 | 0.14 | 0.08 | -0.19 | 0.51 | 0.14 | 0.14 | 0.07 | -0.25 | 0.33 | 0.16 | 0.15 | 0.08 | -0.06 | 0.55 |
| Volatility | 0.03 | 0.02 | 0.03 | 0.00 | 0.28 | 0.03 | 0.02 | 0.03 | 0.00 | 0.19 | 0.03 | 0.02 | 0.04 | 0.00 | 0.30 |
| Market to Book | 1.97 | 1.68 | 0.94 | 0.72 | 7.44 | 1.74 | 1.56 | 0.68 | 0.66 | 5.36 | 2.20 | 1.87 | 1.12 | 0.83 | 8.32 |
| Size | 9.03 | 8.99 | 1.12 | 5.64 | 12.30 | 9.56 | 9.43 | 0.97 | 7.35 | 12.34 | 8.49 | 8.45 | 0.99 | 5.53 | 11.54 |
| Rating | 9.47 | 10.00 | 3.13 | 1.00 | 27.00 | 9.33 | 9.00 | 2.85 | 1.00 | 27.00 | 9.64 | 10.00 | 3.43 | 1.00 | 27.00 |

# Table 2: Predicted Signs

This table presents predicted signs of the coefficients in the simultaneous equations model of leverage and maturity.

| Variable | Leverage Equation Sign | Leverage Equation Explanation | Maturity Equation Sign | Maturity Equation Explanation |
|---|---|---|---|---|
| CDS Trading | + | CDSs allow suppliers of capital to hedge risk and increase their willingness to extend credit. | + | CDSs allow suppliers of capital to hedge risk and increase their willingness to extend longer maturity credit. |
| CDS Traded | +/− | This variable controls for unobservable differences between firms that eventually have CDS versus non-CDS firms. | +/− | This variable controls for unobservable differences between firms that eventually have CDS versus non-CDS firms. |
| Leverage | | | + | Firms face liquidity risk when they roll over short term debt. Firms with high leverage choose more long maturity debt to avoid excessive liquidation. |
| Debt Maturity | + | Firms face liquidity risk when they roll over short term debt. Firms with short maturity debt will therefore choose less leverage. | | |
| Industry Leverage | + | Firms in the same industries have common characteristics that might impact leverage ratios. | | |
| Market to Book | – | Firms with high growth opportunities should use low leverage to mitigate underinvestment incentives (Meyers, 1977). | – | Firms with high growth opportunities will choose short maturity debt so that debt is due before options to invest expire, thereby mitigating underinvestment problems. |
| Fixed Assets | + | Tangible assets have high collateral values, increasing firms' debt capacity. | | |
| Profitability | +/− | The free cash flow hypothesis (e.g., Jensen (1986)) predicts that firms with high profitability will take on greater leverage since interest payments discipline wasteful spending incentives. On the other hand, Meyers (1984) argues that firms have a pecking order, first using internal funds. High profit firms would therefore have less leverage. | | |
| Size | +/− | Larger firms are more diversified, so may have greater debt capacity (Lewellen, 1971). Larger firms also have fewer asymmetric information problems so will have greater access to equity markets, decreasing debt. | + | Diamond (1991) predicts an increasing and then decreasing relationship between debt maturity and credit quality/liquidity risk. |
| CP | | | – | Diamond (1991) predicts an increasing and then decreasing relationship between debt maturity and credit quality/liquidity risk. |
| Volatility | – | Increased earnings volatility increases default probabilities, decreasing debt capacity. | – | Increased earnings volatility increases default probabilities, decreasing optimal maturity. |
| Tax Credit | – | Alternative tax shields can reduce the value of long term debt. | – | Alternative tax shields can reduce the value of long term debt (e.g., Brick and Raviv (1995) in which upward sloping yield curve makes long term debt more valuable). |

| Variable | Leverage Equation Sign | Leverage Equation Explanation | Maturity Equation Sign | Maturity Equation Explanation |
|---|---|---|---|---|
| Loss Carry Forward | – | Alternative tax shields can reduce the value of long term debt. | – | Alternative tax shields can reduce the value of long term debt. |
| Abnormal Earnings | + | If there is a signaling effect associated with leverage choice (Ross, 1977), leverage will be positively related to abnormal earnings. | – | If there is a signaling effect associated with maturity choice (as in Diamond (1991) and Flannery (1986)), maturity will be negatively related to abnormal earnings. |
| Asset Maturity | | | + | Maturity matching of assets and liabilities can reduce underinvestment problems Myers (1977). |
| Rated | + | Rated firms are expected to have higher leverage due to access to public debt markets (as in Faulkender and Petersen (2006)). | + | Unrated firms have lower credit quality and may find it more difficult to borrow longer term debt. |
| Investment Grade | +/– | Control variable. The assets underlying CDSs tend to be investment grade. We include this dummy variable to ensure that our inferences about the impact of CDS are not due to differences in credit rating. | +/– | Control variable. The assets underlying CDSs tend to be investment grade. We include this dummy variable to ensure that our inferences about the impact of CDS are not due to differences in credit rating. |

# Table 3: Leverage Regression

This table presents ordinary least square (OLS) and two-stage least squares (2SLS) regression results of annual leverage on the explanatory variables from Johnson (2003), plus two credit default swap variables, an industry leverage control, and debt rating dummies. CDS Trading is a dummy variable equal to 1 if the firm has quoted CDS contracts on its debt during year t. We also add CDS Traded, a dummy variable equal to 1 if the firm has a traded CDS during the 2002-2008 sample period. The other explanatory variables not already defined in Table 1 are: Industry Leverage, Fixed Assets, Tax Credit, Loss Carry Forward, Abnormal Earnings, and Rated. Industry Leverage is the mean leverage of all firms in the 2-digit SIC code. Industry Leverage is based on industry book leverage in the Book Leverage regressions and on industry market leverage in the Market Leverage regressions. Fixed Assets is defined as net PPE, divided by the book value of total assets. Tax credit is a dummy equal to 1 if the firm has an investment tax credit. Loss carry forward is a dummy variable equal to 1 if the firm has net operating loss carry forwards. Abnormal Earnings is defined as the change in operating earnings per share from year t-1 to year t, divided by share price. Rated is a dummy variable equal to 1 if the firm has an S&P credit rating. Investment Grade is a dummy equal to one if the firm has an investment grade credit rating (i.e., BBB or higher). All other variables are defined in Table 1. Both leverage and maturity are treated as endogenous variables and their equations are estimated simultaneously using two stage least squares. Year and industry fixed effects are included in all regressions. All standard errors are clustered at the firm level.

| | Book Leverage | | Market Leverage | |
|---|---|---|---|---|
| | OLS | 2SLS | OLS | 2SLS |
| | (1) | (2) | (3) | (4) |
| Constant | 0.329 | 0.382 | 0.234 | 0.250 |
| | (6.34) | (6.51) | (6.90) | (6.59) |
| Debt Maturity | 0.000 | -0.006 | -0.000 | -0.002 |
| | (0.36) | (-1.74) | (-0.50) | (-0.86) |
| Industry Leverage | 0.368 | 0.337 | 0.344 | 0.330 |
| | (5.07) | (4.33) | (6.45) | (5.51) |
| Market to Book | -0.005 | -0.006 | -0.033 | -0.033 |
| | (-0.65) | (-0.89) | (-8.24) | (-8.02) |
| Fixed Asset | 0.079 | 0.110 | 0.043 | 0.053 |
| | (2.41) | (3.02) | (2.03) | (2.18) |
| Profitability | -0.015 | -0.044 | -0.162 | -0.171 |
| | (-0.20) | (-0.55) | (-3.17) | (-3.29) |
| Size | -0.021 | -0.022 | -0.006 | -0.006 |
| | (-3.74) | (-3.90) | (-1.62) | (-1.69) |
| Volatility | -0.290 | -0.347 | -0.104 | -0.121 |
| | (-2.52) | (-2.88) | (-1.39) | (-1.59) |
| Abnormal Earnings | 0.020 | 0.020 | 0.005 | 0.005 |
| | (1.76) | (1.79) | (0.38) | (0.38) |
| Tax Credit | 0.034 | 0.038 | 0.024 | 0.025 |
| | (3.41) | (3.75) | (3.49) | (3.61) |
| Loss Carryforward | 0.012 | 0.012 | 0.007 | 0.007 |
| | (1.28) | (1.30) | (1.14) | (1.15) |
| Rated | 0.077 | 0.079 | 0.053 | 0.053 |
| | (3.44) | (3.49) | (4.07) | (4.10) |
| Investment Grade | -0.068 | -0.068 | -0.063 | -0.064 |
| | (-5.86) | (-5.94) | (-7.46) | (-7.49) |
| CDS Traded | 0.001 | 0.009 | 0.003 | 0.006 |
| | (0.11) | (0.66) | (0.38) | (0.62) |
| CDS Trading | 0.059 | 0.067 | 0.034 | 0.037 |
| | (5.49) | (5.79) | (4.94) | (4.82) |
| Time Fixed Effects | X | X | X | X |
| Industry Fixed Effects | X | X | X | X |
| Clustered SE | X | X | X | X |
| Adj-$R^2$ | 0.332 | 0.334 | 0.541 | 0.541 |
| Obs | 2467 | 2467 | 2467 | 2467 |
| CDS Obs | 1150 | 1150 | 1150 | 1150 |

# Table 4: Maturity Regression

This table presents ordinary least squares (OLS) and two-stage least squares (2SLS) regression results of annual debt maturities on the explanatory variables from Johnson (2003), plus two credit default swap variables, a control for firms with commercial paper programs and an investment grade credit rating dummy. CDS Trading is a dummy variable equal to 1 if the firm has quoted CDS contracts on its debt during year t. We also add CDS Traded, a dummy variable equal to 1 if the firm has a traded CDS during the 2002-2008 sample period. The other explanatory variables not already defined in Tables 1 and 2 are: Asset Maturity and CP. Asset maturity is defined as the weighted sum of (i) gross PPE, divided by depreciation expense and (ii) current assets divided by the cost of goods sold. CP is a dummy equal to one if the firm has commercial paper at the beginning of year t. All other variables are defined in Tables 1 and 3. Both leverage and maturity are treated as endogenous variables and their equations are estimated simultaneously using two stage least squares. Year and industry fixed effects are included in all regressions. All standard errors are clustered at the firm level.

| | Book Leverage | | Market Leverage | |
|---|---|---|---|---|
| | OLS | 2SLS | OLS | 2SLS |
| | (1) | (2) | (3) | (4) |
| Constant | 5.536 | 8.591 | 6.308 | 8.609 |
| | (2.01) | (1.65) | (2.36) | (2.04) |
| Leverage | 0.645 | -6.475 | -1.686 | -9.636 |
| | (0.34) | (-0.69) | (-0.71) | (-0.94) |
| Asset Maturity | 0.186 | 0.215 | 0.192 | 0.213 |
| | (2.12) | (2.36) | (2.22) | (2.41) |
| Market to Book | -0.333 | -0.415 | -0.420 | -0.797 |
| | (-1.53) | (-1.77) | (-1.77) | (-1.54) |
| Size | 0.022 | -0.141 | -0.004 | -0.048 |
| | (0.07) | (-0.36) | (-0.01) | (-0.16) |
| CP | -2.059 | -1.905 | -2.034 | -1.982 |
| | (-4.28) | (-3.63) | (-4.26) | (-4.06) |
| Volatility | -5.620 | -7.360 | -5.855 | -6.193 |
| | (-1.05) | (-1.25) | (-1.10) | (-1.15) |
| Abnormal Earnings | 0.103 | 0.199 | 0.111 | 0.076 |
| | (0.21) | (0.39) | (0.23) | (0.15) |
| Tax Credit | 0.599 | 0.819 | 0.651 | 0.803 |
| | (1.11) | (1.36) | (1.20) | (1.43) |
| Loss Carryforward | 0.093 | 0.175 | 0.113 | 0.178 |
| | (0.20) | (0.37) | (0.24) | (0.38) |
| Rated | -0.111 | 0.521 | 0.044 | 0.503 |
| | (-0.12) | (0.42) | (0.05) | (0.46) |
| Investment Grade | 0.684 | 0.103 | 0.509 | -0.083 |
| | (1.06) | (0.10) | (0.77) | (-0.08) |
| CDS Traded | 1.102 | 1.142 | 1.109 | 1.111 |
| | (1.64) | (1.69) | (1.65) | (1.66) |
| CDS Trading | 1.144 | 1.577 | 1.247 | 1.550 |
| | (1.93) | (1.95) | (2.13) | (2.26) |
| Time Fixed Effects | X | X | X | X |
| Industry Fixed Effects | X | X | X | X |
| Clustered SE | X | X | X | X |
| Adj-$R^2$ | 0.108 | 0.109 | 0.109 | 0.110 |
| Obs | 2467 | 2467 | 2467 | 2467 |
| CDS Obs | 1150 | 1150 | 1150 | 1150 |

## Table 5: Leverage Regression — CDS Trading and Net Tightening of Credit Supply

This table presents ordinary least squares (OLS) and two-stage least squares (2SLS) regression results of leverage on the explanatory variables in Table 3, plus a credit market supply variable. Tighten Supply is the credit market supply variable, defined as the net fraction of commercial loan officers reporting that they have tightened lending standards at the beginning of year t. Data are from the Federal Reserve Board's Senior Loan Officer Opinion Survey. Tighten Supply × CDS Trading is the credit supply and CDS Trading interaction variable. All other variables are defined in Tables 1 and 3. Industry fixed effects are included in all regressions. Because Tighten Supply is a market wide measure that varies over time, there are no year fixed effects. Standard errors are clustered at the firm level.

| | Book Leverage | | Market Leverage | |
|---|---|---|---|---|
| | OLS | 2SLS | OLS | 2SLS |
| | (1) | (2) | (3) | (4) |
| Constant | 0.290 | 0.334 | 0.211 | 0.218 |
| | (5.67) | (5.87) | (6.35) | (6.05) |
| Debt Maturity | 0.000 | -0.005 | -0.000 | -0.001 |
| | (0.56) | (-1.51) | (-0.29) | (-0.45) |
| Industry Leverage | 0.377 | 0.351 | 0.351 | 0.344 |
| | (5.12) | (4.47) | (6.85) | (5.97) |
| Market to Book | -0.006 | -0.007 | -0.035 | -0.036 |
| | (-0.86) | (-1.01) | (-9.34) | (-9.10) |
| Fixed Asset | 0.071 | 0.099 | 0.035 | 0.040 |
| | (2.19) | (2.69) | (1.69) | (1.66) |
| Profitability | 0.007 | -0.030 | -0.130 | -0.136 |
| | (0.09) | (-0.37) | (-2.72) | (-2.71) |
| Size | -0.021 | -0.022 | -0.006 | -0.007 |
| | (-3.81) | (-3.99) | (-1.73) | (-1.79) |
| Volatility | -0.336 | -0.375 | -0.151 | -0.157 |
| | (-2.93) | (-3.17) | (-2.04) | (-2.11) |
| Abnormal Earnings | 0.019 | 0.021 | 0.003 | 0.003 |
| | (1.87) | (2.04) | (0.24) | (0.25) |
| Tax Credit | 0.037 | 0.040 | 0.026 | 0.026 |
| | (3.68) | (3.95) | (3.87) | (3.91) |
| Loss Carryforward | 0.010 | 0.010 | 0.006 | 0.006 |
| | (1.14) | (1.12) | (0.98) | (0.98) |
| Rated | 0.100 | 0.100 | 0.072 | 0.072 |
| | (4.34) | (4.31) | (5.21) | (5.20) |
| Investment Grade | -0.086 | -0.083 | -0.080 | -0.079 |
| | (-6.70) | (-6.35) | (-8.09) | (-7.87) |
| CDS Traded | 0.004 | 0.011 | 0.004 | 0.005 |
| | (0.30) | (0.84) | (0.52) | (0.64) |
| CDS Trading | 0.053 | 0.058 | 0.030 | 0.031 |
| | (5.19) | (5.47) | (4.65) | (4.53) |
| Tighten Supply | 0.060 | 0.060 | 0.037 | 0.037 |
| | (4.46) | (4.49) | (4.04) | (4.04) |
| Tighten Supply × CDS Trading | 0.026 | 0.040 | 0.043 | 0.046 |
| | (1.37) | (1.86) | (3.32) | (3.04) |
| Industry Fixed Effects | X | X | X | X |
| Clustered SE | X | X | X | X |
| Adj-$R^2$ | 0.344 | 0.345 | 0.554 | 0.554 |
| Obs | 2467 | 2467 | 2467 | 2467 |
| CDS Obs | 1150 | 1150 | 1150 | 1150 |

# Table 6: Maturity Regression — CDS Trading and Net Tightening of Credit Supply

This table presents ordinary least squares (OLS) and two-stage least squares (2SLS) regression results of leverage on the explanatory variables in Table 4, plus a credit market supply variable. Tighten Supply is the credit market supply variable, defined as the net fraction of commercial loan officers reporting that they have tightened lending standards at the beginning of year t. Data are from the Federal Reserve Board's Senior Loan Officer Opinion Survey. Tighten Supply × CDS Trading is the credit supply and CDS Trading interaction variable. All other variables are defined in Tables 1 and 3. Industry fixed effects are included in all regressions. Because Tighten Supply is a market wide measure that varies over time, there are no year fixed effects. Standard errors are clustered at the firm level.

| | Book Leverage | | Market Leverage | |
|---|---|---|---|---|
| | OLS | 2SLS | OLS | 2SLS |
| | (1) | (2) | (3) | (4) |
| Constant | 4.714 | 7.482 | 5.435 | 7.586 |
| | (1.71) | (1.55) | (2.03) | (1.89) |
| Leverage | 0.933 | -6.317 | -1.422 | -9.945 |
| | (0.49) | (-0.68) | (-0.58) | (-0.94) |
| Asset Maturity | 0.193 | 0.221 | 0.199 | 0.219 |
| | (2.21) | (2.45) | (2.31) | (2.51) |
| Market to Book | -0.293 | -0.380 | -0.373 | -0.785 |
| | (-1.40) | (-1.67) | (-1.59) | (-1.46) |
| Size | 0.026 | -0.139 | -0.004 | -0.051 |
| | (0.09) | (-0.36) | (-0.01) | (-0.17) |
| CP | -2.082 | -1.953 | -2.060 | -2.035 |
| | (-4.38) | (-3.86) | (-4.38) | (-4.29) |
| Volatility | -3.354 | -5.495 | -3.772 | -4.634 |
| | (-0.62) | (-0.89) | (-0.71) | (-0.84) |
| Abnormal Earnings | 0.330 | 0.428 | 0.340 | 0.288 |
| | (0.73) | (0.91) | (0.75) | (0.63) |
| Tax Credit | 0.508 | 0.747 | 0.569 | 0.750 |
| | (0.95) | (1.23) | (1.07) | (1.33) |
| Loss Carryforward | 0.031 | 0.100 | 0.048 | 0.104 |
| | (0.07) | (0.21) | (0.10) | (0.22) |
| Rated | -0.338 | 0.477 | -0.122 | 0.556 |
| | (-0.36) | (0.34) | (-0.13) | (0.43) |
| Investment Grade | 1.073 | 0.365 | 0.859 | 0.085 |
| | (1.69) | (0.33) | (1.30) | (0.07) |
| CDS Traded | 1.196 | 1.256 | 1.208 | 1.223 |
| | (1.83) | (1.90) | (1.85) | (1.88) |
| CDS Trading | 0.873 | 1.264 | 0.969 | 1.247 |
| | (1.62) | (1.75) | (1.82) | (2.04) |
| Tighten Supply | 0.229 | 0.820 | 0.393 | 0.943 |
| | (0.33) | (0.82) | (0.56) | (1.01) |
| Tighten Supply × CDS Trading | 2.186 | 2.356 | 2.276 | 2.653 |
| | (1.97) | (2.07) | (2.04) | (2.12) |
| Industry Fixed Effects | X | X | X | X |
| Clustered SE | X | X | X | X |
| Adj-$R^2$ | 0.111 | 0.111 | 0.111 | 0.112 |
| Obs | 2467 | 2467 | 2467 | 2467 |
| CDS Obs | 1150 | 1150 | 1150 | 1150 |

# Table 7: Three Equation System Estimation

Panels A and B present both OLS and second stage 2SLS regression results of regressing leverage and maturity on the explanatory variables in Tables 3 and 4, respectively. All variables are defined in Tables 1, 3 and 4. Leverage, Maturity, and CDS Trading are all treated as endogenous variables and their equations are estimated simultaneously using two stage least squares. Panel A presents results of the leverage regression; Panel B presents results of the maturity regression; Panel C presents the results of the CDS Trading regression, which is estimated via a probit model. The instrument for CDS is a dummy variable equal to 1 if the dollar value of the firm's bond and note debt outstanding is at least as large as that required for inclusion in the Lehman Corporate Bond Index during year t. Time and industry fixed effects are included in all regressions. Standard errors are clustered at the firm level.

**Panel A: Leverage Regression**

| | Book Leverage | | Market Leverage | |
|---|---|---|---|---|
| | OLS | 2SLS | OLS | 2SLS |
| | (1) | (2) | (3) | (4) |
| Constant | 0.330 | 0.326 | 0.233 | 0.295 |
| | (6.41) | (3.69) | (6.94) | (5.59) |
| Debt Maturity | 0.000 | 0.013 | -0.000 | 0.004 |
| | (0.23) | (3.78) | (-0.69) | (1.91) |
| Industry Leverage | 0.368 | 0.417 | 0.344 | 0.371 |
| | (5.07) | (5.31) | (6.45) | (6.49) |
| Market to Book | -0.005 | 0.003 | -0.033 | -0.028 |
| | (-0.66) | (0.47) | (-8.34) | (-6.71) |
| Fixed Asset | 0.080 | 0.005 | 0.044 | 0.005 |
| | (2.43) | (0.14) | (2.06) | (0.21) |
| Profitability | -0.015 | 0.090 | -0.160 | -0.085 |
| | (-0.19) | (1.04) | (-3.14) | (-1.54) |
| Size | -0.021 | -0.034 | -0.006 | -0.020 |
| | (-3.80) | (-3.71) | (-1.60) | (-3.34) |
| Volatility | -0.290 | -0.210 | -0.104 | -0.094 |
| | (-2.52) | (-1.63) | (-1.40) | (-1.17) |
| Abnormal Earnings | 0.020 | 0.019 | 0.005 | 0.005 |
| | (1.77) | (1.74) | (0.38) | (0.47) |
| Tax Credit | 0.034 | 0.033 | 0.024 | 0.028 |
| | (3.41) | (3.13) | (3.48) | (3.98) |
| Loss Carryforward | 0.012 | 0.018 | 0.007 | 0.013 |
| | (1.29) | (1.77) | (1.16) | (1.96) |
| Rated | 0.078 | 0.057 | 0.054 | 0.038 |
| | (3.53) | (2.50) | (4.20) | (3.00) |
| Investment Grade | -0.068 | -0.077 | -0.063 | -0.072 |
| | (-5.88) | (-6.32) | (-7.49) | (-8.13) |
| CDS Trading | 0.059 | 0.123 | 0.036 | 0.112 |
| | (5.94) | (2.70) | (5.29) | (3.89) |
| Time Fixed Effects | X | X | X | X |
| Industry Fixed Effects | X | X | X | X |
| Clustered SE | X | X | X | X |
| Adj-$R^2$ | 0.332 | 0.325 | 0.541 | 0.536 |
| Obs | 2467 | 2467 | 2467 | 2467 |
| CDS Obs | 1150 | 1150 | 1150 | 1150 |

**Panel B: Maturity Regression**

| | Book Leverage | | Market Leverage | |
|---|---|---|---|---|
| | OLS | 2SLS | OLS | 2SLS |
| | (1) | (2) | (3) | (4) |
| Constant | 5.603 | 5.821 | 6.322 | 10.487 |
| | (2.04) | (1.35) | (2.37) | (2.17) |
| Leverage | 0.469 | 7.886 | -1.780 | 0.289 |
| | (0.26) | (1.36) | (-0.76) | (0.03) |
| Asset Maturity | 0.180 | 0.135 | 0.187 | 0.161 |
| | (2.05) | (1.52) | (2.15) | (1.81) |
| Market to Book | -0.357 | -0.047 | -0.447 | -0.031 |
| | (-1.62) | (-0.19) | (-1.86) | (-0.07) |
| Size | 0.050 | -0.256 | 0.028 | -0.626 |
| | (0.17) | (-0.62) | (0.10) | (-1.54) |
| Volatility | -5.178 | -4.820 | -5.372 | -7.364 |
| | (-0.96) | (-0.85) | (-1.00) | (-1.34) |
| CP | -1.721 | -1.821 | -1.693 | -1.597 |
| | (-3.75) | (-3.84) | (-3.73) | (-3.38) |
| Abnormal Earnings | 0.021 | -0.054 | 0.022 | 0.113 |
| | (0.04) | (-0.10) | (0.04) | (0.20) |
| Tax Credit | 0.583 | 0.559 | 0.631 | 0.882 |
| | (1.07) | (0.89) | (1.16) | (1.41) |
| Loss Carryforward | 0.151 | 0.266 | 0.171 | 0.432 |
| | (0.32) | (0.54) | (0.36) | (0.88) |
| Rated | 0.290 | -0.827 | 0.436 | -0.325 |
| | (0.33) | (-0.77) | (0.49) | (-0.30) |
| Investment Grade | 0.568 | 0.908 | 0.397 | 0.196 |
| | (0.87) | (1.10) | (0.59) | (0.19) |
| CDS Trading | 1.796 | 4.119 | 1.894 | 5.750 |
| | (3.39) | (2.24) | (3.65) | (2.88) |
| Time Fixed Effects | X | X | X | X |
| Industry Fixed Effects | X | X | X | X |
| Clustered SE | X | X | X | X |
| Adj-$R^2$ | 0.100 | 0.095 | 0.100 | 0.093 |
| Obs | 2467 | 2467 | 2467 | 2467 |
| CDS Obs | 1150 | 1150 | 1150 | 1150 |

**Panel C: CDS Trading Regression**

| | Book Leverage | | Market Leverage | |
|---|---|---|---|---|
| | OLS | 2SLS | OLS | 2SLS |
| | (1) | (2) | (3) | (4) |
| Constant | -9.018 | -8.213 | -8.897 | -8.406 |
| | (-15.68) | (-13.31) | (-15.38) | (-13.45) |
| Leverage | 2.390 | 0.543 | 2.833 | 1.403 |
| | (9.38) | (0.68) | (7.86) | (1.33) |
| Debt Maturity | 0.024 | 0.043 | 0.025 | 0.048 |
| | (5.17) | (1.65) | (5.40) | (1.88) |
| Market to Book | -0.284 | -0.296 | -0.148 | -0.231 |
| | (-6.75) | (-6.64) | (-3.19) | (-3.37) |
| Size | 0.603 | 0.554 | 0.568 | 0.547 |
| | (17.06) | (15.55) | (16.45) | (16.23) |
| Bond Lehman | 0.265 | 0.424 | 0.373 | 0.397 |
| | (1.78) | (2.21) | (2.58) | (2.29) |
| Rated | 1.959 | 2.095 | 1.952 | 2.060 |
| | (4.46) | (4.73) | (4.39) | (4.64) |
| Investment Grade | 0.418 | 0.279 | 0.439 | 0.333 |
| | (5.62) | (3.26) | (5.80) | (3.41) |
| Time Fixed Effects | X | X | X | X |
| Industry Fixed Effects | X | X | X | X |
| Adj-$R^2$ | 0.319 | 0.286 | 0.311 | 0.286 |
| Obs | 2467 | 2467 | 2467 | 2467 |
| CDS Obs | 1150 | 1150 | 1150 | 1150 |

## Table 8: Changes in Leverage and Debt Maturity around CDS Introduction — CDS Firms versus Matched Sample, Univariate Difference in Difference Analysis

This table presents univariate analysis of changes in leverage and maturity during the year of CDS introduction (year t) relative to year t-1 and from year t–1 to t+1. The matched sample of non-CDS firms is chosen based on year t-1 propensity scores based on the regression coefficients given in Panel C of Table 7. All variables are expressed in changes relative to a matched firm (variable definitions are in Table 1).

| | Year t–1 to t | Year t–1 to t+1 |
|---|---|---|
| Δ Book Leverage | 0.022 | 0.035 |
| | (2.77) | (3.33) |
| Δ Market Leverage | 0.019 | 0.015 |
| | (2.92) | (1.78) |
| Δ Debt Maturity | 0.210 | 0.924 |
| | (0.57) | (1.97) |
| Obs | 112 | 112 |

## Table 9: Changes in Leverage and Debt Maturity around CDS Introduction — CDS Firms versus Matched Sample, Multivariate Analysis

This table presents regression results of changes in leverage and maturity on changes in the explanatory variables defined in Tables 3 and 4. The matched sample of non-CDS firms is chosen based on year t-1 propensity scores based on the regression coefficients given in Panel C of Table 7. All variables are expressed in changes relative to a matched firm (variable definitions are in Tables 1, 3, and 4). Industry and year fixed effects are in all regressions.

**Panel A: Leverage Regression**

| | Book Leverage | | Market Leverage | |
|---|---|---|---|---|
| | Year t–1 to t | Year t–1 to t+1 | Year t–1 to t | Year t–1 to t+1 |
| Constant | -0.018 | -0.038 | -0.012 | -0.021 |
| | (-1.68) | (-2.22) | (-1.40) | (-1.57) |
| Δ Debt Maturity | 0.003 | -0.001 | 0.002 | -0.001 |
| | (1.84) | (-0.44) | (1.54) | (-0.88) |
| Δ Industry Leverage | 0.221 | 0.133 | 0.377 | 0.383 |
| | (1.52) | (0.85) | (2.37) | (3.08) |
| Δ Market to Book | 0.001 | 0.001 | 0.000 | 0.000 |
| | (1.74) | (1.25) | (1.32) | (1.59) |
| Δ Fixed Asset | 0.033 | 0.338 | 0.006 | 0.084 |
| | (0.30) | (2.77) | (0.07) | (1.07) |
| Δ Profitability | -0.238 | -0.182 | -0.184 | -0.244 |
| | (-1.89) | (-1.26) | (-1.74) | (-2.17) |
| Δ Size | 0.034 | 0.022 | 0.023 | 0.007 |
| | (2.14) | (1.31) | (1.78) | (0.37) |
| Δ Volatility | 0.047 | 0.499 | 0.352 | 0.031 |
| | (0.12) | (1.83) | (1.42) | (0.14) |
| Δ Tax Credit | 0.003 | 0.008 | -0.014 | 0.000 |
| | (0.26) | (0.55) | (-2.85) | (0.04) |
| Δ Loss Carryforward | 0.004 | 0.001 | 0.006 | -0.002 |
| | (0.22) | (0.07) | (0.50) | (-0.19) |
| Δ Abnormal Earnings | 0.006 | -0.013 | 0.007 | 0.000 |
| | (1.00) | (-1.14) | (0.72) | (0.05) |
| Δ Investment Grade | 0.009 | -0.030 | 0.018 | -0.017 |
| | (0.51) | (-1.70) | (1.30) | (-1.37) |
| CDS Trading | 0.013 | 0.022 | 0.010 | 0.004 |
| | (1.73) | (2.14) | (1.64) | (0.51) |
| Time Fixed Effects | X | X | X | X |
| Industry Fixed Effects | X | X | X | X |
| Adj-$R^2$ | 0.177 | 0.252 | 0.268 | 0.409 |
| Obs | 224 | 224 | 224 | 224 |

**Panel B: Maturity Regression**

| | Book Leverage | | Market Leverage | |
|---|---|---|---|---|
| | Year | Year | Year | Year |
| | t–1 to t | t–1 to t+1 | t–1 to t | t–1 to t+1 |
| Constant | -0.668 | -1.909 | -0.621 | -1.990 |
| | (-1.14) | (-2.80) | (-1.06) | (-2.89) |
| Δ Leverage | 2.361 | -4.524 | 3.224 | -3.735 |
| | (0.69) | (-1.33) | (0.81) | (-0.96) |
| Δ Asset Maturity | 0.160 | -0.028 | 0.157 | -0.043 |
| | (1.06) | (-0.19) | (1.04) | (-0.30) |
| Δ Market to Book | -0.011 | 0.031 | -0.010 | 0.030 |
| | (-0.72) | (1.93) | (-0.69) | (1.91) |
| Δ Size | 1.025 | -0.005 | 0.962 | 0.041 |
| | (1.45) | (-0.00) | (1.31) | (0.04) |
| Δ Volatility | -11.676 | -16.383 | -11.100 | -17.519 |
| | (-0.89) | (-1.70) | (-0.85) | (-1.85) |
| Δ Tax Credit | -0.259 | 0.864 | -0.221 | 0.805 |
| | (-0.50) | (1.01) | (-0.43) | (0.93) |
| Δ Loss Carryforward | -0.414 | 0.107 | -0.410 | 0.103 |
| | (-0.70) | (0.23) | (-0.69) | (0.23) |
| Δ Abnormal earnings | 0.168 | 0.026 | 0.178 | 0.036 |
| | (1.94) | (0.19) | (2.01) | (0.26) |
| Δ Investment Grade | 0.259 | 0.546 | 0.174 | 0.551 |
| | (0.45) | (0.79) | (0.30) | (0.80) |
| CDS Trading | 0.352 | 0.911 | 0.349 | 0.923 |
| | (1.00) | (2.18) | (1.00) | (2.20) |
| Time Fixed Effects | X | X | X | X |
| Industry Fixed Effects | X | X | X | X |
| Adj-$R^2$ | 0.039 | 0.100 | 0.039 | 0.093 |
| Obs | 224 | 224 | 224 | 224 |

# Table 10: CDS Liquidity Proxies

This table presents two-stage least squares (2SLS) regression results of leverage and maturity on the explanatory variables in Tables 3 and 4, plus CDS market liquidity proxies for the sub-sample of firms for which CDS Trading equals one. CDS Count is defined as the log number of daily CDS quotes on Bloomberg during year t (across all maturities). Bid-Ask Spread is defined as the average daily bid-ask spread for CDSs on the firms debt, as disseminated on Bloomberg, during year t. All other variables are defined in Tables 1 and 3. Year and industry fixed effects are included in all regressions.

**Panel A: Leverage Regression**

| | Book Leverage | | Market Leverage | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Constant | 0.581 | 0.581 | 0.446 | 0.446 |
| | (6.66) | (6.79) | (7.33) | (7.43) |
| Debt Maturity | -0.012 | -0.011 | -0.006 | -0.005 |
| | (-2.66) | (-2.47) | (-1.81) | (-1.65) |
| Industry Leverage | 0.301 | 0.285 | 0.275 | 0.272 |
| | (2.99) | (2.85) | (3.59) | (3.56) |
| Market to Book | -0.002 | 0.006 | -0.049 | -0.045 |
| | (-0.16) | (0.39) | (-5.46) | (-5.10) |
| Fixed Asset | 0.136 | 0.132 | 0.060 | 0.057 |
| | (2.79) | (2.77) | (1.84) | (1.77) |
| Profitability | -0.027 | -0.011 | -0.138 | -0.130 |
| | (-0.26) | (-0.10) | (-1.91) | (-1.81) |
| Size | -0.019 | -0.018 | -0.010 | -0.009 |
| | (-2.36) | (-2.29) | (-1.67) | (-1.63) |
| Volatility | -0.135 | -0.216 | -0.014 | -0.053 |
| | (-0.69) | (-1.13) | (-0.10) | (-0.39) |
| Abnormal Earnings | 0.014 | 0.006 | -0.008 | -0.012 |
| | (0.86) | (0.33) | (-0.53) | (-0.79) |
| Tax Credit | 0.022 | 0.022 | 0.016 | 0.016 |
| | (1.43) | (1.46) | (1.50) | (1.54) |
| Loss Carryforward | 0.018 | 0.016 | 0.009 | 0.008 |
| | (1.36) | (1.26) | (0.96) | (0.90) |
| Investment Grade | -0.051 | -0.043 | -0.049 | -0.046 |
| | (-3.38) | (-2.87) | (-4.31) | (-3.99) |
| CDS Count | 0.011 | | 0.004 | |
| | (1.89) | | (1.03) | |
| CDS Bid-Ask Spread | | -0.271 | | -0.131 |
| | | (-4.51) | | (-3.34) |
| Time Fixed Effects | X | X | X | X |
| Industry Fixed Effects | X | X | X | X |
| Clustered SE | X | X | X | X |
| Adj-$R^2$ | 0.104 | 0.107 | 0.105 | 0.107 |
| Obs | 1150 | 1149 | 1150 | 1149 |

**Panel B: Maturity Regression**

| | Book Leverage (1) | Book Leverage (2) | Market Leverage (3) | Market Leverage (4) |
|---|---|---|---|---|
| Constant | 7.996 | 7.901 | 10.520 | 10.663 |
| | (0.89) | (0.85) | (1.17) | (1.16) |
| Leverage | -2.548 | -2.406 | -8.509 | -8.778 |
| | (-0.22) | (-0.20) | (-0.58) | (-0.59) |
| Asset Maturity | 0.232 | 0.232 | 0.230 | 0.230 |
| | (1.95) | (1.93) | (1.92) | (1.90) |
| Market to Book | -0.056 | 0.077 | -0.571 | -0.435 |
| | (-0.14) | (0.18) | (-0.58) | (-0.46) |
| Size | 0.239 | 0.291 | 0.198 | 0.245 |
| | (0.44) | (0.54) | (0.42) | (0.52) |
| Volatility | -5.055 | -7.103 | -4.145 | -6.337 |
| | (-0.48) | (-0.66) | (-0.38) | (-0.59) |
| Abnormal Earnings | 0.028 | -0.182 | -0.128 | -0.350 |
| | (0.03) | (-0.18) | (-0.12) | (-0.33) |
| Tax Credit | -0.261 | -0.284 | -0.188 | -0.198 |
| | (-0.26) | (-0.28) | (-0.20) | (-0.21) |
| Loss Carryforward | 0.014 | -0.036 | 0.049 | 0.003 |
| | (0.02) | (-0.05) | (0.07) | (0.00) |
| Investment Grade | 0.322 | 0.549 | -0.002 | 0.213 |
| | (0.26) | (0.46) | (-0.00) | (0.16) |
| CP | -2.185 | -2.249 | -2.152 | -2.215 |
| | (-2.98) | (-3.11) | (-3.08) | (-3.18) |
| CDS Counts | 0.375 | | 0.372 | |
| | (1.54) | | (1.60) | |
| CDS Bid-Ask | | -5.251 | | -5.767 |
| | | (-1.26) | | (-1.67) |
| Time Fixed Effects | X | X | X | X |
| Industry Fixed Effects | X | X | X | X |
| Clustered SE | X | X | X | X |
| Adj-$R^2$ | 0.305 | 0.319 | 0.516 | 0.521 |
| Obs | 1150 | 1150 | 1150 | 1150 |