Credit Default Swaps and Corporate Cash Holdings*

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ABSTRACT

Firms obtain improved access to credit supply after their debt is referenced by credit default swaps (CDS). However, CDS-referenced firms also face tougher creditors and greater refinancing risk. In this context, we examine how firms manage their liquidity in response to the introduction of CDS trading on their debt. We find that firms hold significantly more cash after the inception of CDS trading. This finding is robust to the endogeneity of CDS trading, using instrumental variables and propensity score matching. The increase in cash holding by CDS firms is more pronounced for firms with lines of credit, suggesting that banks with CDS protection impose greater discipline on firms, causing them to take a more conservative risk management approach.

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I. Introduction

Credit default swaps (CDS), the main construct of the multi-trillion dollar credit derivative market, have attracted widespread attention since the 2007-2009 global financial crisis. CDS are insurance-like derivative instruments that offer buyers protection against default by a reference entity. While they were once labeled “financial weapons of mass destruction,” CDS remain a robust and effective financial tool for hedging risk or taking on exposure. Banks’ use of CDS has even increased after the global financial crisis. Therefore, it is important to understand the real effects of CDS trading on corporate financial decisions. In this study, we examine whether firms’ liquidity management, especially cash holding, is affected by CDS trading on their debt.

Why should CDS trading on a corporation affect its cash holdings? Cash holdings are widely used as a liquidity management tool by corporations. CDS can affect corporate cash holdings in several ways, by influencing the availability of external financing (see, for example, Saretto and Tookes (2013) and Bolton and Oehmke (2011)). First, the introduction of CDS trading on a firm’s debt increases the supply of credit from potential creditors, due to the availability of an effective tool for credit risk transfer. Second, given their CDS positions, the creditors’ bargaining power is also enhanced, which, in turn, reduces the firm’s incentive for strategic default, and raises its holding of pledgeable assets. Both these effects cause the firm’s financial constraints to be relaxed after the inception of CDS trading on its debt. Consequently, it may hold less cash and rely more on the financial market to manage its liquidity needs.

Third, on the other hand, the increased creditor power after CDS introduction may also induce relatively high cash holdings. Powerful banks tend to persuade firms to hold more cash (Pinkowitz and Williamson (2001)). In addition, CDS can change the incentives of creditors vis-à-vis the firm. Due to the nature of CDS trading, lenders can insure or even over-insure their credit exposure to the firm, so that when the firm is in financial distress, CDS-protected creditors may be tougher in renegotiation. In an extreme scenario, they may even push the firm into bankruptcy so as to obtain a payoff from their CDS position. Therefore, after the introduction of CDS trading, it may be harder for firms to obtain capital from creditors when liquidity is most needed, in situations of stress. Anticipating the tougher CDS-protected creditors, firms may increase their cash holdings, ex ante, in order to manage their potential liquidity needs in such an eventuality.

Furthermore, CDS can affect corporate cash holdings through feedback effects from CDS
trading to cash holdings. The CDS spread is used extensively by market participants as a measure of credit quality. When corporate liquidity declines, the CDS market responds with a rising CDS spread. A sharp decline in cash holdings, resulting in a spike in the spread, could undermine market confidence in the firm, and reinforce the negative view about the corporation.\(^1\) Therefore, it may be judicious for a firm to keep more cash on hand, especially after the introduction of CDS trading on its debt, since the CDS spread is sensitive to changes in its liquidity status. These potential channels suggest that CDS trading may affect corporate liquidity policy and, in particular, the firms’ cash holdings. However, given the variety of the aforementioned influences of CDS trading on the cash holdings of firms, the direction and magnitude of this impact are ambiguous.

We use a comprehensive CDS transaction dataset for North American names to study the impact of CDS on cash holdings. Given the over-the-counter nature of the CDS market, it is hard to pin down the exact date of the introduction of CDS trading on a firm. Therefore, we rely on multiple data sources to identify the CDS launch date for a firm, including GFI Inc., the largest global interdealer broker with the most extensive records of CDS trades and quotes, CreditTrade, a major intermediary, especially in the early stages of the CDS market, and Markit, a data disseminator and vendor, which provides daily quotes from major institutions. In our final sample, there are 901 CDS introductions from 1997 to 2009. We match these against the corporate cash holdings data from the Compustat database.

We analyze the level of cash holdings to identify the effect of CDS trading. However, the endogeneity of the effect of CDS introduction complicates the interpretation of this effect, since firms may be selected for CDS trading based on the impending increases in their cash holdings. CDS firms may be fundamentally different from non-CDS firms regarding their decisions about cash holdings. Besides using fixed effects controls, we address the endogeneity concern through three alternative approaches: a difference-in-difference comparison, a propensity score matching (PSM) analysis, and an instrumental variable (IV) approach. In addition, we employ a continuous measure of corporate CDS exposure, using the notional amount of the CDS contracts relative to debt outstanding, which is less affected by the selection problem, rather than a binary measure that merely indicates whether or not CDS are traded on a firm. We find

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\(^1\)Anecdotal evidence indicates that a high CDS spread is associated with a dip in corporate cash holdings. For example, the CDS spread for Nokia soared to a record of 435 basis points in the first quarter of 2012, after its net cash dropped to 4.9 billion euros from 5.6 billion euros at the end of 2011. While Nokia was still rated by credit rating agencies at an investment grade rating of Baa2, the soaring CDS spread in fact implied a speculative grade rating of Ba2. This threatened the company’s credit rating, which could potentially have been downgraded to junk. In response to this development, Nokia vowed to take “significant structural actions if and when necessary”, including asset sales. (See “Nokia Swaps Trade Like Junk as Cash Dwindles: Corporate Finance”, Bloomberg, April 12, 2012.)
that the introduction of CDS trading on a firm leads to an increase in its cash holdings, after controlling for variables suggested by models of firms’ demand for cash. This effect of CDS trading is both statistically significant and economically large. For our sample of CDS firms, the cash-to-assets ratio increases from 8.2% to 10.2%, once the CDS starts trading, a 24.4% increase. This positive relationship is significant, even after controlling for the endogeneity of CDS trading.

Having established the main finding that cash holdings increase after CDS trading begins, we next link firm characteristics to the CDS effect. We find that the CDS effect is stronger for firms with larger notional amounts of CDS in relation to debt outstanding. We further find that the cash holdings of unrated firms, and firms with non-investment grade ratings, are more affected by CDS trading. This finding may relate to the implications of financial constraints for cash holdings that can be captured by credit ratings. Unrated and non-investment grade firms generally have less access to financial markets (more constrained), compared with investment grade firms. The financially constrained firms have fewer alternatives when their major debtors become tough CDS-protected creditors. Therefore, their precautionary motives of cash holdings are higher than other less constrained firms. Furthermore, given the reputational concerns of relationship lenders, firms with stronger lending relationships may be less affected by CDS trading. In addition, firms relying on lines of credit may be even more affected by the CDS introduction, since lines of credit are less reliable in the presence of tougher CDS-protected creditors.

Overall, we find that CDS trading can increase corporate cash holdings, an important corporate decision variable. Our paper contributes to provide a new perspective on the real effects of the CDS market. Previous work has identified the impact of CDS on credit supply, the creditors’ monitoring incentive, the reference entities’ borrowing costs and default risk (Bolton and Oehmke (2011), Parlour and Winton (2012), Ashcraft and Santos (2009), Saretto and Tookes (2013), and Subrahmanyam, Tang, and Wang (2014)). We complement this previous research by showing that CDS can affect the strategic actions of corporations.

Our study helps understand the increasing trend of cash holding for U.S. firms (Bates, Kahle, and Stulz (2009)). Our finding is consistent with Harford, Klasa, and Maxwell (2013) that firms hold more cash when their refinancing risk is higher. Moreover, our empirical results support theories of corporate risk management such as Bolton, Chen, and Wang (2011). As firms become riskier after CDS trading, they rely on cash more than lines of credit for liquidity management (Acharya, Almeida, and Campello (2013)).

The outline of the paper is as follows. Section II presents the related literature and the
development of our hypotheses. In Section III, we describe our sample and empirical methods. Section IV presents our main empirical results about the effect of CDS on cash holdings. Additional findings about the impact of firm characteristics and a discussion regarding alternative mechanisms for the effects of CDS trading are presented in section V. Section VI concludes.

II. Relevant Literature and Hypothesis Development

In the aftermath of the financial crisis during which CDS were alleged to have played a role in destabilizing markets, several researchers have studied the real effects of CDS trading. In particular, they show that CDS contracts can affect the relationship between creditors and firms by changing the behavior of the creditors. On the one hand, CDS provide an effective tool for credit risk transfer (Minton, Stulz, and Williamson (2009)). Due to this risk mitigation effect for creditors, CDS can relax the market’s credit supply constraints (Saretto and Tookes (2013)). On the other hand, as a result of hedging their credit exposure with CDS, the creditors’ monitoring incentive is weakened, which may further affect the debt costs. Furthermore, CDS may create an “empty creditors” problem whereby CDS permit some creditors to retain an economic interest in the firm’s cash flow but with no risk alignment with the other creditors who do not have such credit protection, as argued by Hu and Black (2008). Empty creditors tend to be tougher in the process of renegotiation due to the potential gain from their CDS position in the event of default. They even have an incentive to push a firm into inefficient default, or even bankruptcy, so as to obtain compensation from the payoff on their CDS holdings consequent to default.

Our paper is also closely related to the growing literature on corporate cash holdings. Bates, Kahle, and Stulz (2009) identify four motives for corporate cash holdings and classify

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2For example, Acharya and Johnson (2007) show that the CDS market provides a venue for insider trading by creditors.

3Ashcraft and Santos (2009) argue that such reduced monitoring may ultimately lead to a higher cost of debt. Che and Sethi (2012) model the impact of “naked” CDS positions on economic fundamentals. They argue that CDS can crowd out debt investors, reduce the firm’s debt capacity, and increase its cost of debt.

4Bolton and Oehmke (2011) formally model the empty creditor problem. Consistent with this theoretical prediction, a number of papers empirically investigate the impact of CDS on a firm’s probability of restructuring/bankruptcy (Danis (2012), Bedendo, Cathcart, and El-Jahel (2012), Peristiani and Savino (2011), and Subrahmanyam, Tang, and Wang (2014)).

the literature examining corporate cash holdings accordingly: (1) the transaction motive, (2) the precautionary motive, (3) the agency motive, and (4) the tax motive. Many recent papers focus on the precautionary motive for holding cash, which stems from expected financial constraints in the future, when access to capital markets becomes costly. Firms tend to build up their cash holdings to protect themselves against negative financial shocks in the future. Previous papers such as Opler, Pinkowitz, Stultz, and Williamson (1999), followed by many others, have found evidence in support of the precautionary motive for corporate cash holdings. While the precautionary motive is of crucial importance in determining firms’ cash holdings, a number of other recent papers provide evidence in favor of the agency theoretic explanation. Gao, Harford, and Li (2013) provide further insights into this stream of arguments by comparing the cash holdings of public and private firms. In addition, taxes may play a role in determining a firm’s cash holdings. Foley, Hartzell, Titman, and Twite (2007) find that firms with foreign operating subsidiaries have higher cash holdings overseas, due to the tax costs associated with repatriating foreign income into the United States.

In contrast to the previous CDS literature, which focuses on the behavior of creditors and the outcome for credit risk, this paper investigates the impact of CDS on the strategic actions of the managers of the reference firms in formulating their cash holding strategy. CDS trading can affect corporate cash holdings through its impact on the availability of external financing. On the one hand, CDS trading relaxes credit supply constraints due to its risk mitigation effect, thereby inducing lower precautionary cash holdings. On the other hand, when the firm is in distress, CDS-protected creditors tend to be excessively tough in renegotiations, and will accept a restructuring offer from the equity holders of the firm only if the terms are sufficiently attractive. In such circumstances, it is harder for firms to obtain financing when it is most needed. Considering the potential effect of tougher creditors, firms rely more on cash holdings to manage their potential liquidity needs. Moreover, the increase in corporate cash holdings may also relate to the change in the power of the bank. Powerful banks tend to persuade

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6The transaction motive argues that large firms tend to hold proportionately less cash due to economies of scale. This explanation for corporate cash holdings may be less important today, given the increasing efficiency of markets in dealing with transactions for converting liquid assets into cash, as argued by Bates, Kahle, and Stultz (2009). Other motives for corporate cash holdings include their real effects, such as those on the firms’ product market performance (Fresard (2010)).


8The agency motive for holding cash argues that entrenched managers in companies with poor investment opportunities tend to build excess cash holdings, as evidenced in Dittmar, Mahrt-Smith, and Servaes (2003), Dittmar and Mahrt-Smith (2007), and Harford, Mansi, and Maxwell (2008).

9However, Bates, Kahle, and Stultz (2009) do not find the tax effect to be significant in a sample covering a longer time period.
firms to hold more cash (Pinkowitz and Williamson (2001)). Therefore, the increased bank power after CDS introduction may further induce relatively high cash holdings. If the **tougher creditors effect** and the **bank power effect** outweigh the **risk mitigation** benefit, then we expect firms to hold more cash after CDS trading has been introduced:

**Hypothesis 1:** The cash holdings of a firm increase following the introduction of trading in CDS contracts referencing its default.

The effect of CDS trading on the size of a firm’s cash holdings may vary with its other characteristics, such as the amount of CDS contracts outstanding, its credit rating and the extent of relationship lending. The notional amount of CDS outstanding relative to the firm’s debt outstanding can be used as a proxy for the CDS exposure of its creditors. Thus, we expect the effect of CDS trading to be larger for a firm with a greater CDS exposure. The credit rating is a conventional **ex ante** measure of a firm’s financial constraints. Unrated firms and firms’ with non-investment grade ratings generally have less access to the financial market. As a result, they have fewer financing alternatives, especially when their major creditors are tougher CDS-protected creditors. The creditor relationship of the companies may affect the effect of CDS on cash holdings. Firms use only one bank in the syndicated loan market tend to have stronger lending relationships than those relying on multiple banks (Carvalho, Ferreira, and Matos, 2013). Relationship lenders may chose not to become tough empty creditors due to their reputation concern. Then the cash holdings of firms with strong lending relationships (smaller number of banks relationship) are less affected by the CDS. Therefore, we expect:

**Hypothesis 2:** The increase in the cash holdings of a firm after the introduction of CDS trading is more significant for firms (a) with larger amounts of CDS to debt outstanding, (b) that are unrated or have non-investment grade ratings and (c) with a greater number of lenders.

A firm can create a cushion for future contingencies when there is an adverse shock to operating cash flow in two ways, either by maintaining a cash buffer or by negotiating a line of credit, which may or may not actually be available when required. While holding cash has an opportunity cost in terms of foregone investment opportunities in real or financial assets, the line of credit involves a commitment fee that must be paid even if it is not tapped. In addition, the line of credit may not be available in some states in the future, if the free cash flow turns out to be extremely poor and the covenants attached to the line of credit are breached. Moreover, a line of credit may generate additional rollover risk, since many credit lines are short term. The availability of liquidity from a line of credit also depends on the
bank’s ability and willingness to supply funds. Therefore, while the firm may wish to reduce its reliance on cash due to the opportunity costs involved, it may at the same time wish to moderate its reliance on a line of credit so as to reduce the cost of the commitment fee, and more importantly the risk of non-availability of the line of credit when the firm is squeezed financially.

The impact of CDS trading will be accentuated when the firm has a line of credit, since its non-availability in the future may cause additional stress. As discussed above, lines of credit, which are not unconditional sources of finance, may become less reliable after the inception of CDS trading, especially if bank lenders become tougher CDS-protected creditors. Therefore, we hypothesize that the impact of CDS is more significant for firms with lines of credit:

Hypothesis 3: The increase in the cash holdings of a firm after the introduction of CDS trading is more significant for firms with bank lines of credit.

III. Data and Empirical Specification

A. Data

We use CDS transaction data to identify a sample of firms with CDS contracts referencing their debt. Our CDS transaction data are from CreditTrade and the GFI Group. In contrast to the CDS quote data used in the previous literature, our data contain actual trading records with complete contractual information. Given the over-the-counter nature of CDS contracts, we use the first CDS trading date in our sample as the CDS introduction date, and compare the changes in corporate cash holdings upon the onset of CDS trading. We further cross-check this CDS sample against the Markit database, which provides end-of-day valuations based on a survey of broker-dealers. In our later analysis, we also utilize more detailed transaction

10 Demiroglu and James (2011) document the limitations of the use of credit lines to manage firm liquidity. Besides financial covenants, rollover risk, and the banks ability and willingness to lend, material adverse change (MAC) clauses and borrowing base formulae also affect the availability of credit lines, especially under conditions of stress.

11 A number of studies investigate firms’ liquidity management strategies. Acharya, Almeida, and Campello (2012) find that a firm’s exposure to aggregate risk affects its choice between cash and lines of credit. Lins, Servaes, and Tufano (2010) investigate whether firms use lines of credit and cash to hedge different types of risks. They find that lines of credit are often used to explore future business opportunities in good times. On the other hand, firms use non-operational cash flows to hedge future cash flow shocks in bad times.

12 See Subrahmanyam, Tang, and Wang (2014) for a detailed discussion of the data set. Similar, but much less extensive, data sources are used in Acharya and Johnson (2007), Blanco, Brennan, and Marsh (2005), and Nashikkar, Subrahmanyam, and Mahanti (2011).
information, and construct continuous measures of CDS exposures. The combined sample covers the period from June 1997 to April 2009 and includes 901 North American corporates that have CDS initiated on them at some time during the sample period. The industry coverage of the CDS firms in our sample is quite diversified. Most are in the manufacturing (SIC 2,3), transportation, communications, and utilities (SIC 4), and finance, insurance, and real estate (SIC 6) sectors.\textsuperscript{13}

Our data on corporate cash holdings and firm characteristics are from the Compustat database. Following Bates, Kahle, and Stulz (2009), we measure the cash holdings by the ratio of cash and marketable securities to total assets.\textsuperscript{14} We obtain credit rating data from Compustat and FISD and line of credit data from Dealscan.\textsuperscript{15}

Table I presents the year-wise summary of CDS trading and cash ratios, from 1997-2009, for all firms in the Compustat database: the number of Compustat firms (column 2), the number of firms on which CDS are traded (CDS firms) (columns 3 and 4), and cash ratios for firms without and with CDS trading (columns 5 and 6). As the fourth column of the table shows, CDS trading was initiated on the most new firms during the period from 2000 to 2003. As shown in the fifth and sixth columns, similar to the finding in Bates, Kahle, and Stulz (2009), there is an increasing trend over time in the cash ratios for both non-CDS and CDS firms in our sample, but the increase is larger for CDS firms: The average cash ratio for non-CDS firms in 2009 is 116\% of the ratio in 1997, while the corresponding comparison is 143\% for CDS firms. Moreover, the average cash ratio for non-CDS firms more than doubled over the period from 1997 to 2009, compared with that of CDS firms. This partly stems from the size effect: As we will show later, CDS firms are relatively large firms, compared to their non-CDS counterparts. Large firms generally hold less cash due to economies of scale—they incur lower transaction costs per unit in converting fixed assets into liquid assets (Baumol (1952)).

\textsuperscript{13}In our main analysis, we do not exclude financial firms. However, we drop financial firms from the sample as a robustness check. The results are quite similar in all cases and therefore we report our results only for the full sample.

\textsuperscript{14}While the ratio of cash and marketable securities to assets is the most conventional measure of cash holdings, we also checked alternative measures of the cash ratio. See footnote 25 below for further discussion.

\textsuperscript{15}Line of credit data have been used by several researchers including, most recently, Acharya, Almeida, and Campello (2012).
B. Empirical Specification

We employ a model along the lines of Opler, Pinkowitz, Stultz and Williamson (1999) and Bates, Kahle, and Stulz (2009) to investigate the effect of CDS on corporate cash holdings.\footnote{This model for the level of cash holdings has been used extensively in the literature, for example by Kim, Mauer, and Sherman (1998), Dittmar and Mahrt-Smith (2007), Foley, Hartzell, Titman, and Twite (2007), and Harford, Mansi, and Maxwell (2008).} We assume that corporate cash holdings are determined by:

\begin{equation}
Cash = \beta X + \gamma_1 CDS\, Trading + \delta Y + \epsilon
\end{equation}

where \(Cash\) is the cash ratio measured as the ratio of cash and marketable securities to total assets, \(X\) is a vector of determinants of cash holdings, and \(Y\) is a vector of other controls such as firm fixed effects. The regression controls in our empirical specification are motivated by the transaction and precautionary explanations for cash holdings, presented in the previous section. We include a set of fundamental determinants of the firm’s cash holdings, including the industry cash flow risk (\textit{Industry Sigma}), the ratio of cash flow to total assets (\textit{Cash Flow/Assets}), a measure of the investment opportunities (\textit{Market to Book}), the logarithm of total assets (\textit{Size}), the working capital ratio (\textit{Net Working Capital/Assets}), the capital expenditure (\textit{Capital Expenditure}), the leverage (\textit{Leverage}), the ratio of research and development to sales (\textit{R&D/Sales}), the dividend payment (\textit{Dividend Dummy}), and the ratio of acquisitions to total assets (\textit{Acquisition Activity}).

We estimate the impact of CDS trading on the corporate cash holdings using an indicator variable in the model specification, similar to Ashcraft and Santos (2009), Saretto and Tookes (2013), and Subrahmanyam, Tang, and Wang (2014). \textit{CDS Trading} is a dummy variable that equals one, for a CDS firm, after the inception of the firm’s CDS trading, and zero before that. Therefore, the coefficient of interest is that of \textit{CDS Trading}, which captures the impact of CDS on cash holdings, following the inception of CDS trading.

The regression analysis is conducted on the sample including CDS firms and non-CDS firms. Given the unobservable differences between firms, we control for firm fixed effects in our panel data analysis. Our main challenge in establishing the relationship between CDS trading and corporate cash holdings is the potential endogeneity of CDS trading. It is possible that there is a third (unobservable) factor affecting both the introduction of CDS trading and corporate cash holdings. In that case, the observed effects might not be caused by the CDS
contracts, but rather the impact of this third factor. We use three methods to address this endogeneity concern: difference-in-difference estimation, PSM analysis, and an IV approach, as well as the use of continuous CDS exposure measures that are less affected by the selection issue rather than the dummy variable CDS Trading. We expect firms with a larger CDS exposure to be more likely to be affected by CDS trading and, therefore, to have a greater precautionary motive for holding cash. In addition, to assess whether the increase in cash holdings is related to firm characteristics such as credit ratings, we divide the sample firms into three groups of credit quality: unrated, rated/non-investment grade, and investment grade. We also control for the direct effect of the availability of lines of credit, and investigate the effect of CDS trading on changes in the firms’ cash holdings.

IV. CDS Trading and Cash Holdings: Empirical Results

In this section, we first report the baseline results regarding the effects of CDS on cash holdings, with fixed effects in the sample of CDS firms, and with all non-CDS firms in the Compustat database as a control group. We then investigate whether the effects are robust to controlling for the endogeneity of CDS trading.

A. Changes in Cash Ratios around CDS Introduction

The summary statistics in Table I illustrate that there is an increase in the cash ratio for both CDS and non-CDS firms. To illustrate that CDS firms experience a more significant increase in this ratio, we focus on the changes in the cash ratio around the inception of CDS trading (defined as date 0). Figure 1 shows the changes in the cash ratios for CDS and non-CDS firms, from one year before the inception of CDS trading to zero (-1,0), one (-1,1), two (-1,2) or three (-1,3) years after its inception. Non-CDS matching firms are selected from a sample of firms that do not have CDS trading at any time during the whole sample period. For each CDS firm, we find a non-CDS matching firm that is in the same industry (measured by the 4-digit SIC code) and with the closest size (measured by total assets) to that of the CDS firm. The average cash ratio increases for both CDS and non-CDS firms, but the increase is more pronounced for the CDS firms. We observe a 6% increase in the cash ratio, for both CDS firms and non-CDS matching firms, from year -1 to year 0. However, from year -1 to year +3, the increase in cash holdings for CDS firms is 0.7% more than that of the non-CDS matching firms. Given the mean cash ratio of 8% across the CDS firms and their non-CDS matching
firms, the 0.7% additional increase in the cash ratio is economically significant. Therefore, from this figure, we obtain a preliminary indication that the increase in cash ratios is greater for CDS firms across years, subsequent to the initiation of CDS trading, compared to their non-CDS counterparts.

B. Impact of CDS on Cash Holdings: Baseline Results

We next estimate the CDS effects on cash holdings with appropriate control variables. The baseline analysis is conducted on the sample of both CDS and non-CDS firms, using quarterly observations. We control for time and firm fixed effects in all our regressions. The variable of interest is \textit{CDS Trading}, which equals one after the introduction of CDS trading on the firm’s debt, and zero prior to that date. Therefore, the coefficient of \textit{CDS Trading} captures the effect of CDS introduction on corporate cash holdings.

The baseline regression results are reported in Panel A of Table II, which presents the evidence for the level of cash holdings. The first column in Panel A lists the independent variables in the model specifications. The dependent variable for all specifications is the cash ratio, measured as the ratio of cash and marketable securities to total assets.\footnote{Although the most traditional measure of cash holdings is the ratio of cash and marketable securities to total assets, alternative measures include the ratio of cash and marketable securities to net assets, where net assets are measured as total assets minus cash, the ratio of cash and marketable securities to sales, and the ratio of cash and marketable assets to bonds outstanding. As a robustness check (in unreported results), we tried all these alternative definitions of the cash ratio, and found that the qualitative nature of our results is not affected by the different definitions. Many papers also use non-operational cash (excess cash). Lins, Servaes, and Tufano (2010) show that the correlation between the excess cash and the total cash is high, at about 0.75. Their findings are also quite similar when they use total cash.}

\begin{table}[h]
\centering
\begin{tabular}{lcc}
\hline
\textbf{Specification 1} & \textbf{Coefficient} & \textbf{Standard Error} \\
\hline
\textit{CDS Trading} & 0.017 & 0.005 \\
\hline
\end{tabular}
\caption{Baseline Regression Results}
\end{table}

\textit{CDS Trading} has a positive coefficient in Specification 1, suggesting that the presence of CDS contracts leads to higher cash ratios. Moreover, the effect of \textit{CDS Trading} is significant at the 1\% level. The economic magnitude is also large: compared to the sample mean cash ratio of 8.2\% for CDS firms, the 1.7\% addition to the cash ratio after CDS introduction in...
Specification 1 represents a 20.7% increase in the sample mean cash ratio. Specifications 2 and 3, controlling for more firm characteristics, yield similar results, with the magnitude of the coefficient for CDS Trading being even higher. Since firms can have different unobservable characteristics that may affect their corporate cash holding policies, we control for firm fixed effects in all model specifications. CDS firms can be different from non-CDS firms on various dimensions. As a robustness check, instead of using firm fixed effects, we also add CDS Firm as an additional control. Similar to in Ashcraft and Santos (2009), Saretto and Tookes (2013), and Subrahmanyam, Tang, and Wang (2014), CDS Firm is a dummy variable that equals one for firms with CDS trading at any point during our sample period. Hence, CDS Firm can be used to control for the unobservable differences between CDS and non-CDS firms. Since firms in different industries can vary from one another on many dimensions we also control for industry fixed effects in all model specifications that include the CDS Firm dummy.

The coefficients of the control variables are consistent with prior findings. Firms with high cash flow risk, as measured by Industry Sigma, hold more precautionary cash. The coefficient of Cash Flow/Assets is not significant in Specification 1. However, it is positive and significant in all other model specifications, i.e., firms with higher cash flows accumulate greater cash holdings. The Market to Book ratio has positive and significant coefficients, indicating that firms with greater investment opportunities have higher costs of being financially constrained and therefore tend to hold more cash. The negative sign of the coefficient of Size relates to the economies of scale in holding cash: large firms hold proportionately less cash. Net Working Capital/Assets decreases cash holdings, since the numerator represents assets that substitute for cash. The coefficient of Capital Expenditure is negative and significant, because capital expenditure creates assets that can be used as collateral for future borrowing, thus reducing the precautionary demand for cash holdings. The sign of the coefficient of Leverage is negative since firms may use cash to reduce leverage. R&D/Sales is another measure of future growth opportunities. Firms with higher R&D have a greater cost of being financially constrained, since they need to plan for future investment opportunities, and therefore hold more cash. The coefficient of Acquisition Activity has the same sign as Capital Expenditure, which is as expected since acquisitions and capital expenditure are likely to be substitutes for each other.

A related question is whether the 1.7% change in the cash ratio is enough for the firm to tackle the liquidity needs potentially generated by the tougher CDS-protected creditors. Unfortunately, it is difficult to measure this potential liquidity need directly due to data limitations: we do not have detailed information on the individual portfolios of the creditors. An indirect approach is to use the amount of debt due in one year, in relation to the notional amount of CDS outstanding, as a proxy.

In Specifications 2 and 3, the presence of CDS trading increases corporate cash holdings by 2.4% and 2%, respectively.

Our results are not materially affected by replacing firm fixed effects with CDS Firm and industry fixed effects, and so we do not report them here in the interests of conserving space.
The only coefficient that differs from our expectation is that of the Dividend Dummy. Firms with dividend payments would be expected to hold less cash, because they are likely to be less risky and less financially constrained. However, in our sample, we find a positive sign for this coefficient. This may be due to the changes in the relationship between cash holdings and firm characteristics over time, as discussed in Bates, Kahle, and Stulz (2009).

We now turn to the analysis of the change in cash holdings, (Δ Cash/Assets), which we report in Panel B of Table II. Following Almeida, Campello, and Weisbach (2004) and Bates, Kahle, and Stulz (2009), we estimate a model of the annual change in cash. In addition to the variables in the baseline model, we also include the lagged cash ratio to allow for partial adjustment of the cash ratio to its optimal level. Similar to the baseline results in Panel A, Specification 1 in Panel B includes only cash flow-related variables, while Specifications 2 and 3 include more firm characteristics related to cash holdings. The coefficient of CDS Trading is positive and significant in all model specifications. These results indicate that, in a given year, firms with CDS trading on their debt augment their cash reserves by more than non-CDS firms. Moreover, an increase in the lagged cash ratio leads to a decrease in the change in cash holdings. Similar to the findings in the prior literature, Δ Size is positively related to changes in cash holdings. The coefficients of the other factors are generally consistent with the baseline model for the level of cash reported in Panel A.

Multinational firms may hold more cash for a variety of reasons, including the ability to reduce taxes by postponing the repatriation of overseas profits (as pointed out by Pinkowitz, Stulz, and Williamson (2013)). In Panel C of Table II, we include additional controls for multinational firms. We follow Pinkowitz, Stulz, and Williamson (2013) and define multinational firms as those making 25% of their sales abroad according to the Compustat Historical Segment data. Besides the dummy variable for multinational firms, we also directly include the ratio of Foreign Sales/Total Sales in our estimations. The results from Specifications 1 and 2 presented in Panel C of Table II show some evidence that multinational firms hold more cash. However, the coefficients for Foreign Sales/Total Sales and Multinational are not significant after including other firm characteristics as controls. CDS Trading continues to be a significant determinant of cash holdings.

In summary, Table II presents our baseline analysis of the determinants of corporate cash holdings. Consistent with our expectation, the results indicate that corporate cash holdings

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22It is difficult to model changes in cash with quarterly data due to seasonality effects.
23Bates, Kahle, and Stulz (2009) obtain a similar result. It is possible that these proxies for multinational operations are not sufficiently granular to discern the true drivers of additional cash held overseas. Further investigation of this issue is warranted.
increase after CDS introduction. However, to establish the causal relationship between CDS trading and cash holdings, it is critical to appropriately control for the endogeneity of the former. In the following subsections, we formally address the endogeneity issue, using three alternative econometric approaches.

C. Propensity for the Introduction of CDS Trading

The endogeneity of CDS trading complicates the interpretation of the impact of CDS trading on cash holdings. It is possible that investors may anticipate the increase in cash holdings for a firm, and thus initiate CDS trading on it. If this selection effect were valid, our baseline finding may be contaminated by the endogeneity of CDS trading. Of course, we control for firm fixed effects in all model specifications, which accounts for the time-invariant differences in characteristics between CDS and non-CDS firms, and may partially address this issue. However, it is still necessary to address the endogeneity directly. To that end, we implement alternative econometric methodologies suggested by Li and Prabhala (2007) and Roberts and Whited (2012) to control for endogeneity by including instrumental variables. We use difference-in-difference estimation, PSM, and the IV approach, using two-stage least squares (2SLS) regression to re-estimate the CDS effect, after controlling for the selection of firms into the CDS sample.\(^{24}\)

To implement these approaches, we first need to estimate a model for the selection of firms for CDS trading. Following Ashcraft and Santos (2009), Saretto and Tookes (2013) and Subrahmanyam, Tang, and Wang (2014), the prediction is estimated using a probit model with a dependent variable that equals one after the introduction of CDS trading, and zero otherwise. We use data from 1997 until the first month of CDS trading for CDS firms, and all observations for non-CDS firms, to predict the introduction of CDS trading for a firm.

We employ two instrumental variables: FX hedging activities by banks and underwriters, Lender FX Usage, and the Tier One capital ratio of the lenders, Lender Tier 1 Capital.\(^{25}\) Both IVs relate to the lenders’ hedging interest, but are not expected to affect the firms’ liquidity policy directly. Specifically, lenders with a larger FX hedging position are more likely, in general, to trade the CDS of their borrowers; banks with lower capital ratios have a greater need to hedge the credit risk of their borrowers via CDS. To construct the IVs, we first identify lenders and bond underwriters for our sample firms based on DealScan (for lenders)

\(^{24}\)Our approach is similar to those of Ashcraft and Santos (2009), Saretto and Tookes (2013), and Subrahmanyam, Tang, and Wang (2014), who address similar endogeneity concerns in the context of the introduction of CDS trading.

\(^{25}\)Saretto and Tookes (2013) also use the first of these, Lender FX Usage.
and FISD (for bond underwriters) data. We then obtain, from Federal Reserve call reports, data on the foreign exchange derivatives positions of these lenders and bond underwriters. For each firm in each quarter, Lender FX Usage is constructed as the average amount of foreign exchange derivatives usage for hedging purposes relative to its total assets, for banks that have either served as a lender or a bond underwriter to the firm, over the previous five years. To construct the instrument, Lender Tier 1 Capital, we further link the identities of the lenders and bond underwriters with the Compustat Bank file, which contains the lenders' Tier One capital ratio data. For each firm in each quarter, the Lender Tier 1 Capital ratio is defined as the average of the Tier One capital ratios across all banks that have either served as lenders or bond underwriters to this firm, over the previous five years. Besides these IVs, we include other firm characteristics such as size, leverage and other controls in the CDS prediction models. Furthermore, we use lender size and lender’s total credit derivatives position as the other explanatory variables that determine CDS trading.

The CDS trading prediction results are reported in Table A1. First, we confirm that larger firms are more likely to have CDS contracts trading on them. In addition to size, CDS trading is more likely for firms with high leverage, but with investment grade ratings. Also, unrated firms are less likely to have CDS trading. Firms with high profitability, tangibility, and working capital are more likely to have CDS trading on them. Overall, it appears that firms typically have relatively high credit quality and visibility (a stronger balance sheet and larger size) at the time of CDS inception. The presence of CDS contracts for firms also relates to lenders’ characteristics. Large lenders and lenders with more credit derivative trading activities are more likely to trade the CDS of their borrowers. Furthermore, the results indicate that our IVs, Lender FX Usage and Lender Tier 1 Capital, appear to be relevant, as they jointly predict CDS trading, even after controlling for other variables.

Table A1 shows that CDS trading can be explained reasonably well by the explanatory variables, with a pseudo-$R^2$ of around 38.9%. In the following analysis, we will use these CDS trading prediction models to conduct our difference-in-difference analyses, PSM analysis, and IV approach estimation, to re-examine the relationship between CDS trading and cash holdings. Specifically, we first construct our PSM sample based on the CDS prediction model: for each CDS firm, we find one non-CDS matching firm with a similar propensity score for CDS trading. We use the PSM sample in two different ways. First, after constructing the sample, we conduct a difference-in-difference analysis to identify the treatment effect, i.e., the effect of the introduction of CDS trading. Second, we run the cash holding analysis, along the lines discussed in the previous section, on this matched sample. In constructing our PSM sample, we use all three prediction models in Table A1 for CDS trading as robustness checks.
Additionally, we use three different PSM criteria to choose matching firms: (1) the one non-CDS firm nearest, in terms of propensity score, to the CDS firm; (2) the one firm with the nearest propensity score, but within a difference of 1%; and (3) the two firms with propensity scores closest to the CDS firm. Furthermore, we implement the IV approach based on the CDS trading prediction model.

D. Difference-in-Difference Analysis

In this analysis, we compare the changes in the ratio of cash and marketable assets to total assets, a traditional measure of cash holdings, before and after the introduction of CDS trading, for CDS firms against their propensity-score-matched non-CDS firms. The results are shown in Table III. They indicate that the difference-in-difference estimates of the cash ratio are both statistically and economically significant for the $(t - 1, t + 1)$ and $(t - 1, t + 2)$ event windows, using all three model specifications, with one or two matching firms. For example, when we use Model 3 to choose the “nearest-one propensity-score-matched firm, the cash ratio is 1.7% higher after CDS introduction, relative to the non-CDS matching firm in the $(t - 1, t + 2)$ event window, a substantial increase over the cash ratio of the average CDS firm of 8.2%. While indicative of the effect of CDS trading on the cash holdings of firms, the results have to be interpreted with caution, since the event itself, CDS introduction, may be endogenous. We address this issue directly in the sub-sections below.

E. Propensity Score Matching

As distinguished from the baseline model that uses all non-CDS firms in the Compustat sample as the control group, firms in the restricted PSM sample are more comparable with each other. Table IV presents the regression results. In all specifications, the coefficient estimates for \textit{CDS Trading} are significantly positive. This indicates that corporate cash holdings increase after CDS trading has been introduced. The economic magnitudes are also large: For example, compared to the sample mean cash ratio of 8% for this restricted sample, the 2.6% change in cash after CDS introduction in the results using “nearest one” matching represents a 32.5% increase in the mean cash ratio.

However, the PSM approach is only effective in controlling for the \textit{observable} differences in firm characteristics between the treatment and control groups. It is possible that there is an

\textsuperscript{26}We use all three alternative PSM criteria discussed in the previous section to assess the robustness of our PSM results. However, only CDS prediction Model 3 in Table A1 is used to calculate the propensity scores in the results reported in Table IV.
unobservable variable that drives both the introduction of CDS trading and corporate cash holdings. If this were true, then PSM would not be able to effectively address the endogeneity in this setting. In the next section, we use the IV approach to address the endogeneity issue to alleviate this concern.

F. The Instrumental Variable Approach

Since it is possible that firms with greater future cash holdings are selected for CDS trading, there could also be unobserved omitted variables that drive both the selection of firms for CDS trading and cash holdings. To allow for the possibility of time-varying unobserved heterogeneity across firms, we estimate a 2SLS model with IVs, where the indicator variable, CDS Trading, is treated as endogenous. Specifically, the cash holdings and the CDS contract status of a firm can be modeled as follows:

\[
\begin{align*}
\text{Cash} &= \beta X + \gamma_1 \text{CDS Trading} + \delta Y + \epsilon, \\
\text{CDS Trading}^* &= \lambda Z + \omega, \\
\text{CDS Trading} &= 1, \text{if } \text{CDS Trading}^* > 0; \text{CDS Trading} = 0, \text{otherwise}.
\end{align*}
\]

Similar to the baseline model, the dependent variable here is the cash ratio, measured by the ratio of cash and marketable securities to total assets. \(X\) is a vector of determinants of cash holdings, and \(Y\) is a vector of other controls such as firm fixed effects. The coefficient of interest is \(\gamma_1\), which captures the impact of CDS on corporate cash holdings. The variable CDS Trading* represents the latent propensity of a firm to have CDS trading initiated on its debt. In the above specification, CDS Trading is allowed to be endogenous, due to \(\text{corr}(\epsilon, \omega) \neq 0\). For identification, we include IVs that affect a firm’s propensity for CDS introduction but do not affect its cash holdings directly, other than through the impact of CDS introduction. Therefore, \(Z\) in equation (2) includes the IVs.

Our choice of IVs is motivated by both econometric and economic considerations. In this analysis, we use both Lender FX Usage and Lender Tier 1 Capital as instruments. Econometrically, the instruments need to satisfy the relevance and exclusion restrictions. The relevance condition is met as the results in Table A1 show that CDS trading is significantly associated with lender FX hedging and the Tier One capital ratio. The instruments we use are economically sound, because they are associated with the overall hedging interest of the lenders or credit suppliers. Specifically, lenders with a larger hedging position are more likely,
in general, to trade the CDS of their borrowers. Moreover, banks with lower capital ratios have a greater need to hedge the credit risk of their borrowers via CDS. It is worth noting that the instruments we use are not weak: From Table A1, we find that the Sargan $F$-test statistics are above 10 for both IVs.

The fitted value of $CDS \text{ Trading}$ is included in the second-stage analysis of the determinants of cash holdings. Table V presents the results of the second-stage estimation. We find that $Instrumented \ CDS \text{ Trading}$ has a positive and significant coefficient estimate. In other words, the result that firms hold more cash after the introduction of CDS trading is confirmed, even after ensuring that the variable is identified.

The results, so far, suggest that there are economically and statistically significant effects of CDS trading on corporate cash holdings. The CDS effect is robust to controlling for the endogeneity of CDS trading using a variety of econometric approaches, including the difference-in-difference analysis, PSM and IV approaches. In the next section, we examine this issue further by constructing a continuous economic measure of CDS exposure, which is less affected by the selection concern. We also investigate further the cross-sectional differences in the CDS effect on cash holdings.

V. Channels and Mechanisms for the CDS-Cash Relationship

The effect of CDS trading on corporate cash holdings may vary with firm characteristics. In this section, we investigate whether the CDS impact is greater for firms with larger amounts of CDS outstanding, those with unrated/non-investment grade ratings, and entities with bank lines of credit. We also discuss the implications of these results for the validity of alternative mechanisms for the impact on cash holdings.

A. Outstanding CDS Positions

Instead of using the regime variable, $CDS \text{ Trading}$, which equals one after the introduction of CDS trading, we utilize detailed information about the notional amount of CDS contracts outstanding to construct a continuous measure of CDS exposure. Continuous economic variables also help further address the self-selection concern in analyzing the effect of CDS trading. As pointed out by Li and Prabhala (2007), the magnitude of the selection variable (for CDS trading) introduces an independent source of variation and aids the identification of the treat-
ment effect, while ameliorating the self-selection concern. In addition, the continuous CDS outstanding measure is also a proxy for the severity of the CDS effect: The larger is the amount of CDS outstanding, the greater will be the benefits to the CDS-protected creditors, and therefore the tougher the empty creditors are likely to be in the process of re-negotiation. Moreover, the amount of CDS outstanding is a proxy for CDS market liquidity; hence, the CDS spread for firms with more CDS outstanding and, hence, with a more liquid CDS market, will be more sensitive to new information, such as the firm’s credit and liquidity status. Therefore, the feedback effect from the CDS market to the bond market will be more severe for firms with larger amounts of CDS outstanding. Thus, both the tougher creditor mechanism and the CDS feedback mechanism predict that firms have a greater incentive to hold cash reserves when there are proportionately more CDS contracts outstanding on their debt.

We measure the level of corporate CDS outstanding by the ratio of the notional dollar amount of CDS contracts outstanding to the total dollar amount of debt outstanding at the same time, **CDS Notional Outstanding/Total Debt**. We scale the CDS position by total debt in order to relate the dollar amount of CDS outstanding to the potential total demand of the creditors. We conjecture that firms with greater relative proportions of CDS outstanding are likely to be more vulnerable to the CDS effect. Firms’ CDS exposure measure might be endogenous, since market participants choose the amount of CDS to trade. We model **CDS Notional Outstanding/Total Debt**, and use **Instrumented CDS Notional Outstanding/Total Debt** in the cash holdings analysis.\(^{27}\)

Our estimation results are presented in Table VI. Specification 1 uses **CDS Notional Outstanding/Total Debt** as the measure of CDS exposure. The positive and significant coefficient of this variable indicates that CDS trading increases cash holdings. Specification 2 uses **Instrumented CDS Notional Outstanding/Total Debt**. Again, we find a significant positive coefficient. These findings suggest that, the greater is the CDS exposure, the higher are the corporate cash holdings. The effect is robust after controlling for the potential endogeneity of the amount of CDS outstanding.

**B. Credit Ratings and CDS Effect**

The effect of CDS on corporate cash holdings may vary with the credit rating of the issuing firm. Almeida, Campello, and Weisbach (2004) find that firms facing greater capital market frictions, i.e., financially constrained firms, are more likely to retain more cash from their free

\(^{27}\) The prediction model used for **CDS Notional Outstanding/Total Debt** is similar to that used in Table A1. **Lender FX Usage** and **Lender Tier 1 Capital Ratio** are again used as IVs.
cash flows. Similarly, financially constrained firms have fewer alternative external financing options when their lenders become tougher CDS-protected creditors. Consequently, they tend to build greater cash holdings after the introduction of CDS trading on their debt. Therefore, we expect the cash holdings of financially constrained firms to be more affected by CDS trading. This prediction is also consistent with the argument regarding the tougher creditor mechanism.

Table VII examines the impact of CDS trading on cash holdings, conditional on firm characteristics. Following the previous literature, credit ratings are used as the measure of the tightness of financial constraints. Specification 1 includes Unrated and CDS Trading*Unrated as explanatory variables. Firms are divided into unrated and rated categories, based on their rating status during the current quarter. Unrated firms are expected to be more financially constrained. The variable of interest is CDS Trading*Unrated, which captures the CDS trading impact, conditional on the firms’ rating status. The results indicate that the impact of CDS trading on the cash holdings of firms is even more significant for firms without a credit rating. Moreover, CDS Trading continues to be significant after controlling for the firms’ rating status. Specification 2 divides firms into non-investment grade and investment grade categories. Non-investment grade firms tend to be more financially constrained. Similar to the results in Specification 1, CDS Trading* Non-investment Grade is positive and significant. As a robustness check, Specification 3 employs both Unrated and Non-investment Grade as proxies for the financial constraints on firms. In sum, the results in this table suggest that the cash holdings of financially constrained firms, as defined by their credit rating status, are more affected by CDS trading.

C. Creditor Relationship and Cash Holdings

The creditor relationship of the companies may affect the effect of CDS on cash holdings. Firms with multiple creditor relationships may have better access to financial market. As a result, they may tend to hold less cash and rely more on external financing to manage their liquidity need. However, the number of creditor relationships may also represent the extent of relationship lending. Firms use only one bank in the syndicated loan market tend to have stronger lending relationships than those relying on multiple banks (Carvalho, Ferreira, and Matos, 2013). Relationship lenders may chose not to become tough empty creditors due to

For firms without credit ratings, the CDS spread provides valuable information about the firm’s credit quality. Consequently, it is even more valuable for these firms to maintain liquidity, so as to maintain a reasonable CDS spread. Thus, the CDS feedback effect argument also predicts that unrated firms are more affected by CDS trading.
their reputation concerns. Therefore, we expect the cash holdings of firms with strong lending relationships (albeit a smaller number of banking relationships) are less affected by presence of CDS.

The overall creditor relationship is represented in our analysis by the number of bank relationships, obtained from Dealscan LPC. For each firm in a given quarter, we examine the prior five year period for any syndicated loan facilities for this firm. Summing over all such active facilities, we compute the number of unique banks. Then we re-estimate the baseline cash holding model by adding this bank relationship information. The estimation results are presented in Table VIII. Specification 1 shows the baseline results for reference. In specification 2, Number of Banks is included as an additional control. As expected, the negative and significant sign for Number of Banks shows that firms with more bank relationships hold less cash. However, the effect of CDS on cash holdings is more significant for firms with more bank relationship (less relationship lending), as evidenced by the significant positive coefficient for CDS Trading*Number of Banks. In addition, CDS Trading continues to be significant determinant of cash holdings.

D. Lines of Credit and CDS Trading

Firms’ access to bank lines of credit may complicate the interpretation of the effect of CDS on cash holdings. A firm’s use of its lines of credit is related to the level of its cash flows. For firms with high cash flows, credit lines are a good liquidity substitute for cash. This is because the high cash flows allow them to reduce the likelihood of financial covenant violations that are usually defined in terms of cash flows. For firms with low cash flows, the line of credit may not be available when it is most needed, due to the possibility of a financial covenant violation. Hence, there may be a substitution effect between cash holdings and lines of credit, and the effect of CDS trading on cash holdings may be muted.

In measuring the impact of CDS trading on cash holdings, a valid concern, therefore, is that firms may substitute lines of credit for cash. As a consequence, the predicted increase in cash holdings due to CDS trading may not occur. To address this possibility, we re-estimate the model of the determinants of cash, after controlling for the direct effect of lines of credit. Line of Credit is a dummy that equals one if the firm has a line of credit. The results from this estimation are reported in Table IX. Specification 1 lists the baseline cash results from Table II for comparison. Specification 2 includes Line of Credit as an additional control.

30Lins, Servaes, and Tufano (2010) and Acharya, Almeida, and Campello (2012) also focus on a firm’s tradeoff between cash and lines of credit.
the cash ratio regression. As expected, Line of Credit has a negative and significant sign. This indicates that firms with a line of credit rely less on cash to manage their liquidity needs. However, the coefficients of other variables are similar to those from Specification 1. In particular, CDS Trading continues to be a significant determinant of cash holdings. The positive and significant sign of its coefficient in Specification 2 indicates that CDS trading causes an increase in corporate cash holdings, even after controlling for the direct effect of lines of credit. In addition, CDS trading may affect corporate cash holdings by affecting the reliability of the lines of credit. To account for this, Specification 3 includes the cross-term of CDS Trading and Line of Credit. The positive and significant sign for CDS Trading*Line of Credit indicates that the effect of CDS trading on cash holdings is more significant for firms with a line of credit. Moreover, after adding the cross-term, CDS Trading is not significant. The results indicate that the effect of CDS trading on cash holdings may operate primarily through its impact on the reliability of lines of credit. These findings are again consistent with the tougher creditor mechanism, i.e., showing that bank lines of credit are less reliable when bank lenders protect themselves with CDS.

E. Discussion of Alternative Mechanisms

CDS trading may exacerbate the capital market frictions faced by firms. Specifically, the effect of CDS may arise from alternative mechanisms, such as the credit supply, tougher creditors and the CDS feedback effect. However, the credit supply mechanism predicts a decrease in cash holdings after the introduction of CDS trading. Given the increase in cash holdings after CDS introduction, the tougher creditor and CDS feedback effect mechanisms tend to dominate.

In addition, CDS can affect corporate cash holdings specifically through its impact on lines of credit. The access to bank credit lines may be state-contingent. Covenant violation, MAC clauses, and even a lender’s willingness/ability to supply funds can limit firms’ access to credit lines, especially in periods of financial stress. Moreover, the short-term nature of credit lines exposes firms to rollover risk. Lines of credit may become less reliable after the introduction of CDS, especially if bank lenders become tougher CDS-protected creditors as a result. Thus, firms rely more on cash to manage corporate liquidity, in anticipation of this

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31 As argued by Demiroglu and James (2011), bank credit lines are typically short-term; for example, during the 1996-2009 period, about 21% of new credit lines had a stated maturity of less than 365 days.

32 Sufi (2009) shows that “cash flow and leverage ratios are the most common component of financial covenants, and they are also the most powerful predictors of covenant violations.” Moreover, when the firm violates its debt covenants, the reduction in the availability of lines of credit is significant. Given the increase in leverage (as documented by Saretto and Tookes (2013) and Subrahmanyam, Tang, and Wang (2014))
eventuality.

Firms can also issue new debt to satisfy their liquidity needs. However, the debt terms offered to them may be less favorable after the introduction of CDS. For instance, Ashcraft and Santos (2009) find that the cost of debt increases for risky firms. Moreover, other banks may anticipate the firm’s liquidity needs and buy CDS contracts to hedge in the first instance. When the firm tries to obtain additional liquidity by issuing new debt, the terms of this debt will need to be attractive enough for CDS-protected investors.

VI. Conclusion

This paper investigates the impact of CDS on corporate cash holdings. We find evidence that CDS trading on firms’ debt increases corporate cash holdings. To estimate the CDS effect, we use a comprehensive data set of North American corporate CDS introductions between 1997 and 2009. First, we estimate the cash holding model in a sample of CDS firms, using all non-CDS firms in Compustat as the control group. The cash ratios for firms with CDS traded on them increase by 2%, on average, after the introduction of CDS trading. Given the mean cash ratio of 8.2% for CDS firms, this increase is economically significant. We then control for the endogeneity of CDS introduction using three different econometric methods: the difference-in-difference, propensity score matching and instrumental variable approaches. We further construct a continuous CDS exposure measure, which is less affected by the selection issue. Moreover, the impact of CDS on cash holdings is greater for firms with limited access to the financial market and for firms with bank lines of credit. The empirical results are consistent with the predictions of a model motivated by tougher CDS-protected creditors: Creditors tend to be excessively tough after the introduction of CDS trading (as argued by Hu and Black (2008) and Bolton and Oehmke (2011)). Anticipating the potential actions of these tougher creditors, firms hold more cash \textit{ex ante} to manage their liquidity needs.

Our research contributes to the ongoing debate about the real effects of CDS. In contrast to the redundant security argument that is the basis of derivatives pricing, growing empirical evidence suggests that CDS increase the credit supply, and the reference firms’ leverage, borrowing costs, and bankruptcy risk (Ashcroft and Santos (2009), Saretto and Tookes (2013), after CDS introduction, CDS firms might be more likely to violate existing covenants. In contrast to this prediction, Shan and Tang (2013) find that firms’ debt covenants are loosened after CDS trading, since their CDS positions partially alleviate creditors’ concerns regarding their conflict of interests with shareholders. However, CDS can still affect the availability of credit lines through rollover risk, banks willingness to lend etc.
and Subrahmanyam, Tang, and Wang (2014)). In contrast to this earlier research, we delve further into the *firms’* responses to the increase in credit risk by showing that CDS affect corporate liquidity policies. These findings have implications for the discussion of the welfare effects of CDS markets. Indeed, CDS can increase the credit supply and the reference firms’ leverage. The increase will be welfare-enhancing if the additional funding is used to finance valuable new investment projects. However, firms could simply keep the funds raised in the form of corporate cash reserves to satisfy their precautionary motive. In that case, the increased borrowing capacity may not translate into higher welfare benefits for the economy. In addition, by identifying the channel of the CDS effect on corporate cash holdings, market regulators could develop relevant policies to improve the efficiency of capital usage. Future work might investigate the demand for cash reserves and the impact of CDS on corporate investment.

\[33\] For example, in the current context in industrialized economies, the motives for additional cash holdings could further complicate government efforts to stimulate the economy by lowering corporate borrowing costs through fiscal and monetary measures. It is often argued that firms tend to postpone valuable investments, not because of the higher cost of borrowing, but because of the need to satisfy their precautionary motives.
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Figure 1: Changes in Cash Ratios Around the Introduction of Credit Default Swaps. This figure plots the changes in cash ratios for firms with credit default swaps (CDS) and their corresponding matching firms, from one year before the inception of CDS trading to zero, one, two or three years after the inception of CDS trading. Matching firms are selected based on industry and size. The cash ratio is measured as the ratio of cash and marketable securities to total assets. The CDS data come from CreditTrade and the GFI Group. There are 901 firms in our sample that have CDS traded at some point during the sample period of June 1997 to April 2009.
Table I
Credit Default Swaps Trading and Cash Ratios by Year

This table reports the distribution of firms in our sample, including those with credit default swaps (CDS) traded, and their average cash ratios, by year, between 1997 and 2009. The overall sample of firms is taken from Compustat, and includes all companies in that database during 1997-2009. The CDS data are taken from CreditTrade and the GFI Group. There are 901 firms in the sample that have CDS traded at some point during the sample period of June 1997 to April 2009. We measure the cash ratio as cash and marketable securities divided by total assets. The first column in the table is the year. The second column shows the total number of U.S. companies included in the Compustat database. The third column reports the number of firms for which CDS trading was initiated during that year. The fourth column presents the number of firms with active CDS trading during each year. The last two columns report average cash ratios for non-CDS and CDS firms respectively. († from June 1997, † until April 2009)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total # of Firms</th>
<th># of New CDS Firms</th>
<th># of Active CDS Firms</th>
<th>Non-CDS Firm Cash Ratio</th>
<th>CDS Firm Cash Ratio</th>
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</thead>
<tbody>
<tr>
<td>1997</td>
<td>9366</td>
<td>22</td>
<td>22</td>
<td>0.187</td>
<td>0.072</td>
</tr>
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<td>9546</td>
<td>58</td>
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<td>0.202</td>
<td>0.068</td>
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This table presents estimates of the effect of credit default swaps (CDS) on corporate cash holdings. Panel A models the level of cash. Panel B models the change in cash. Panel C adds a control for firms with foreign sales/multinational firms. Foreign Sales/Total Sales is the ratio of export sales to total sales. Following Pinkowitz, Stulz, and Williamson (2013), we define Multinational as a dummy variable that equals one if the firm makes 25% of its sales abroad. Foreign sales data are drawn from the Compustat historical segment file. Industry Sigma is the industry cash flow risk, measured by the mean cash flow volatility across two-digit SIC codes. Cash Flow/Assets is the ratio of cash flow to total assets, where cash flow is defined as the earnings after interest and related expenses, income taxes, and dividends. Market to Book is the book value of assets minus the book value of equity plus the market value of equity, all divided by the book value of assets. Size is the logarithm of total assets. Net Working Capital/Assets is measured as net working capital minus cash, divided by total assets. Capital Expenditure is the ratio of capital expenditures to total assets. Leverage is measured as the book value of the long-term debt plus debt in current liabilities, divided by total assets. R&D/Sales is the ratio of R&D to sales. Dividend Dummy is a dummy variable that equals one if the firm pays a common dividend. Acquisition Activity is the ratio of acquisitions to total assets. To estimate the impact of CDS trading on the corporate cash holdings, we include CDS variables in the model specifications. CDS Trading is a dummy variable that equals one if the firm has CDS traded on its debt, one year before month t. The coefficient of interest is that of CDS Trading, which captures the impact of CDS trading on cash holdings after the inception of CDS trading. The sample period is from 1997 to 2009, based on quarterly observations. The overall sample of firms is drawn from Compustat, and includes all companies in that database during 1997-2009. The CDS data come from CreditTrade and the GFI Group. There are 901 firms in the sample that have CDS traded at some point during the sample period of June 1997 to April 2009. (*** significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level. The numbers in parentheses are standard errors.)

### Panel A: Level of Cash Ratio and CDS Effect (Baseline Model)

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Panel B: Change in Cash Ratio and CDS Effect

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## Panel C: Multinational Firms and CDS Effect

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Table III
Changes in Cash Holdings Around the Introduction of Credit Default Swaps: Difference-in-Difference Analysis

This table presents a univariate analysis of the changes in firm cash holdings due to the inception of credit default swaps (CDS) trading, i.e., from one year before the inception of CDS trading to one or two years after its inception. The changes in the cash holdings of CDS trading firms are compared with those of matching firms. Matching firms are selected based on propensity scores estimated from the model of probability of CDS trading presented in Table A1. The change in the cash ratio is defined as the change in the ratio of cash and marketable securities to total assets. The overall sample of firms is drawn from Compustat, and includes all companies in that database during 1997-2009. The CDS data come from CreditTrade and the GFI Group. There are 901 firms in the sample that have CDS traded at some point during the sample period of June 1997 to April 2009. (** significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level.)

<table>
<thead>
<tr>
<th>Year</th>
<th>Nearest One</th>
<th>Nearest Two</th>
<th>Nearest One</th>
<th>Nearest Two</th>
</tr>
</thead>
<tbody>
<tr>
<td>t-1 to t+1</td>
<td>0.010***</td>
<td>0.010***</td>
<td>0.009**</td>
<td>0.010***</td>
</tr>
<tr>
<td></td>
<td>0.012***</td>
<td>0.013***</td>
<td>0.013***</td>
<td>0.013***</td>
</tr>
</tbody>
</table>

CDS Prediction Model 1

<table>
<thead>
<tr>
<th>Year</th>
<th>Nearest One</th>
<th>Nearest Two</th>
<th>Nearest One</th>
<th>Nearest Two</th>
</tr>
</thead>
<tbody>
<tr>
<td>t-1 to t+2</td>
<td>0.013***</td>
<td>0.013***</td>
<td>0.013***</td>
<td>0.013***</td>
</tr>
<tr>
<td></td>
<td>0.013***</td>
<td>0.013***</td>
<td>0.013***</td>
<td>0.013***</td>
</tr>
</tbody>
</table>

CDS Prediction Model 2

<table>
<thead>
<tr>
<th>Year</th>
<th>Nearest One</th>
<th>Nearest Two</th>
<th>Nearest One</th>
<th>Nearest Two</th>
</tr>
</thead>
<tbody>
<tr>
<td>t-1 to t+2</td>
<td>0.016***</td>
<td>0.016***</td>
<td>0.016***</td>
<td>0.016***</td>
</tr>
<tr>
<td></td>
<td>0.017***</td>
<td>0.017***</td>
<td>0.011**</td>
<td>0.017***</td>
</tr>
</tbody>
</table>

CDS Prediction Model 3

<table>
<thead>
<tr>
<th>Year</th>
<th>Nearest One</th>
<th>Nearest Two</th>
<th>Nearest One</th>
<th>Nearest Two</th>
</tr>
</thead>
<tbody>
<tr>
<td>t-1 to t+2</td>
<td>0.013***</td>
<td>0.013***</td>
<td>0.013***</td>
<td>0.013***</td>
</tr>
</tbody>
</table>
Table IV  
Credit Default Swaps Trading and Cash Holdings: Propensity Score Matching

This table presents the estimates of the effect of credit default swaps (CDS) on corporate cash holdings in a sample including firms with CDS and non-CDS propensity score-matched firms. Propensity score-matched firms are selected based on propensity scores estimated from model 3 of the probability of CDS trading presented in Table A1. Industry Sigma is the industry cash flow risk, measured by the mean cash flow volatility across two-digit SIC codes. Cash Flow/Assets is the ratio of cash flow to total assets, where cash flow is defined as the earnings after interest and related expenses, income taxes, and dividends. Market to Book is the book value of assets minus the book value of equity plus the market value of equity, all divided by the book value of assets. Size is the logarithm of total assets. Net Working Capital/Assets is measured as net working capital minus cash, divided by total assets. Capital Expenditure is the ratio of capital expenditures to total assets. Leverage is measured as the book value of the long-term debt plus debt in current liabilities, divided by total assets. R&D/Sales is the ratio of R&D to sales. Dividend Dummy is a dummy variable that equals one if the firm pays a common dividend. Acquisition Activity is the ratio of acquisitions to total assets. To estimate the impact of CDS trading on the corporate cash holdings, we include CDS variables in the model specifications. CDS Trading is a dummy variable that equals one if the firm has CDS traded on its debt one year before month t. The coefficient of interest is that of CDS Trading, which captures the impact of the inception of CDS trading on cash holdings. The sample period is 1997-2009, based on quarterly observations. The CDS data come from CreditTrade and the GFI Group. There are 901 firms in the sample that have CDS traded at some point during the sample period of June 1997 to April 2009. (** significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level. The numbers in parentheses are standard errors.)

<table>
<thead>
<tr>
<th>Cash/Assets</th>
<th>Nearest One Matching</th>
<th>Nearest One PS Diff&lt;1%</th>
<th>Nearest Two Matching</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDS Trading</td>
<td>0.026***</td>
<td>0.026***</td>
<td>0.027***</td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
<td>(0.006)</td>
<td>(0.006)</td>
</tr>
<tr>
<td>Industry Sigma</td>
<td>0.072</td>
<td>0.066</td>
<td>0.101*</td>
</tr>
<tr>
<td></td>
<td>(0.046)</td>
<td>(0.041)</td>
<td>(0.054)</td>
</tr>
<tr>
<td>Cash Flow/Assets</td>
<td>−0.001</td>
<td>−0.038</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>(0.077)</td>
<td>(0.069)</td>
<td>(0.088)</td>
</tr>
<tr>
<td>Market to Book</td>
<td>−0.000</td>
<td>−0.001</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
</tr>
<tr>
<td>Size</td>
<td>−0.026***</td>
<td>−0.022***</td>
<td>−0.027***</td>
</tr>
<tr>
<td></td>
<td>(0.007)</td>
<td>(0.006)</td>
<td>(0.008)</td>
</tr>
<tr>
<td>Net Working Capital/Assets</td>
<td>−0.056</td>
<td>−0.052</td>
<td>−0.042</td>
</tr>
<tr>
<td></td>
<td>(0.057)</td>
<td>(0.051)</td>
<td>(0.063)</td>
</tr>
<tr>
<td>Capital Expenditure</td>
<td>−0.173***</td>
<td>−0.177***</td>
<td>−0.182***</td>
</tr>
<tr>
<td></td>
<td>(0.026)</td>
<td>(0.027)</td>
<td>(0.031)</td>
</tr>
<tr>
<td>Leverage</td>
<td>−0.043</td>
<td>−0.057</td>
<td>−0.049</td>
</tr>
<tr>
<td></td>
<td>(0.039)</td>
<td>(0.036)</td>
<td>(0.049)</td>
</tr>
<tr>
<td>R&amp;D/Sales</td>
<td>0.225*</td>
<td>0.235**</td>
<td>0.217</td>
</tr>
<tr>
<td></td>
<td>(0.123)</td>
<td>(0.119)</td>
<td>(0.146)</td>
</tr>
<tr>
<td>Dividend Dummy</td>
<td>−0.021</td>
<td>−0.023</td>
<td>−0.024</td>
</tr>
<tr>
<td></td>
<td>(0.022)</td>
<td>(0.024)</td>
<td>(0.024)</td>
</tr>
<tr>
<td>Acquisition Activity</td>
<td>−0.177***</td>
<td>−0.147***</td>
<td>−0.184***</td>
</tr>
<tr>
<td></td>
<td>(0.059)</td>
<td>(0.056)</td>
<td>(0.069)</td>
</tr>
<tr>
<td>Time Fixed Effect</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Firm Fixed Effect</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Clustered Standard Error</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>40668</td>
<td>36426</td>
<td>57684</td>
</tr>
<tr>
<td>R²</td>
<td>74.94%</td>
<td>74.38%</td>
<td>73.21%</td>
</tr>
</tbody>
</table>
This table presents the second-stage estimation of the two-stage IV estimation results. The second-stage analysis looks at the impact of credit default swaps (CDS) on corporate cash holdings in a sample including firms with CDS and all non-CDS firms. Lender FX Usage and Lender Tier 1 Capital are instruments. Lender FX Usage is a measure of the FX hedging activities carried out by the firm’s lending banks and underwriters. Lender Tier 1 Capital is the Tier One capital ratio of the bank lenders. The coefficient of interest is that of Instrumented CDS Trading, which captures the impact of the inception of CDS trading on cash holdings. Industry Sigma is the industry cash flow risk, measured by the mean cash flow volatility across two-digit SIC codes. Cash Flow/Assets is the ratio of cash flow to total assets, where cash flow is defined as the earnings after interest and related expenses, income taxes, and dividends. Market to Book is the book value of assets minus the book value of equity plus the market value of equity, all divided by the book value of assets. Size is the logarithm of total assets. Net Working Capital/Assets is measured as net working capital minus cash, divided by total assets. Capital Expenditure is the ratio of capital expenditures to total assets. Leverage is measured as the book value of the long-term debt plus debt in current liabilities, divided by total assets. R&D/Sales is the ratio of R&D to sales. Dividend Dummy is a dummy variable that equals one if the firm pays a common dividend. Acquisition Activity is the ratio of acquisitions to total assets. The sample period is 1997-2009, based on quarterly observations. The overall sample of firms is taken from Compustat, and includes all companies in that database during 1997-2009. The CDS data come from CreditTrade and the GFI Group. There are 901 firms in the sample that have CDS traded at some point during the sample period of June 1997-April 2009. (*** significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level. The numbers in parentheses are standard errors.)

<table>
<thead>
<tr>
<th>Instrumented CDS Trading</th>
<th>0.045**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(0.019)</td>
</tr>
<tr>
<td>Industry Sigma</td>
<td>0.075***</td>
</tr>
<tr>
<td></td>
<td>(0.016)</td>
</tr>
<tr>
<td>Cash Flow/Assets</td>
<td>0.068***</td>
</tr>
<tr>
<td></td>
<td>(0.009)</td>
</tr>
<tr>
<td>Market to Book</td>
<td>0.008***</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
</tr>
<tr>
<td>Size</td>
<td>-0.010***</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
</tr>
<tr>
<td>Net Working Capital/Assets</td>
<td>-0.046***</td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
</tr>
<tr>
<td>Capital Expenditure</td>
<td>-0.208***</td>
</tr>
<tr>
<td></td>
<td>(0.012)</td>
</tr>
<tr>
<td>Leverage</td>
<td>-0.084***</td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
</tr>
<tr>
<td>R&amp;D/Sales</td>
<td>0.194***</td>
</tr>
<tr>
<td></td>
<td>(0.015)</td>
</tr>
<tr>
<td>Dividend Dummy</td>
<td>0.007***</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
</tr>
<tr>
<td>Acquisition Activity</td>
<td>-0.192***</td>
</tr>
<tr>
<td></td>
<td>(0.013)</td>
</tr>
<tr>
<td>Time Fixed Effect</td>
<td>Yes</td>
</tr>
<tr>
<td>Firm Fixed Effect</td>
<td>Yes</td>
</tr>
<tr>
<td>Clustered Standard Error</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Table VI

Active Credit Default Swaps Outstanding and the CDS Effect

This table presents the estimates of the effect of credit default swaps (CDS) on corporate cash holdings, in a sample including firms with CDS and all non-CDS firms. The CDS impact is measured as the total notional CDS outstanding, scaled by the book value of the total debt ($CDS \text{ Notional Outstanding}/\text{Total Debt}$) or the Instrumented $CDS \text{ Notional Outstanding}/\text{Total Debt}$. Industry Sigma is the industry cash flow risk, measured by the mean cash flow volatility across two-digit SIC codes. Cash Flow/Assets is the ratio of cash flow to total assets, where cash flow is defined as the earnings after interest and related expenses, income taxes, and dividends. Market to Book is the book value of assets minus the book value of equity plus the market value of equity, all divided by the book value of assets. Size is the logarithm of total assets. Net Working Capital/Assets is measured as net working capital minus cash, divided by total assets. Capital Expenditure is the ratio of capital expenditure to total assets. Leverage is measured as the book value of the long-term debt plus debt in current liabilities, divided by total assets. R&D/Sales is the ratio of R&D to sales. Dividend Dummy is a dummy variable that equals one if the firm pays a common dividend. Acquisition Activity is the ratio of acquisitions to total assets. The sample period is 1997-2009, based on quarterly observations. The overall sample of firms is drawn from Compustat, and includes all companies in that database during 1997-2009. The CDS data are taken from CreditTrade and the GFI Group. There are 901 firms in the sample that have CDS traded at some point during the sample period of June 1997 to April 2009. (** significant at the 1% level, *** significant at the 5% level, and * significant at the 10% level. The numbers in parentheses are standard errors.)

<table>
<thead>
<tr>
<th>Cash/Assets</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDS Notional Outstanding/Total Debt</td>
<td>0.006***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>0.205***</td>
</tr>
<tr>
<td>Instrumented CDS Notional Outstanding/Total Debt</td>
<td></td>
<td>(0.019)</td>
</tr>
<tr>
<td>Industry Sigma</td>
<td>0.053***</td>
<td>0.060***</td>
</tr>
<tr>
<td></td>
<td>(0.015)</td>
<td>(0.019)</td>
</tr>
<tr>
<td>Cash Flow/Assets</td>
<td>0.055***</td>
<td>0.035***</td>
</tr>
<tr>
<td></td>
<td>(0.009)</td>
<td>(0.013)</td>
</tr>
<tr>
<td>Market to Book</td>
<td>0.007***</td>
<td>0.008***</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Size</td>
<td>−0.006***</td>
<td>−0.008***</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.002)</td>
</tr>
<tr>
<td>Net Working Capital/Assets</td>
<td>−0.039***</td>
<td>−0.073***</td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td>(0.007)</td>
</tr>
<tr>
<td>Capital Expenditure</td>
<td>−0.149***</td>
<td>−0.158***</td>
</tr>
<tr>
<td></td>
<td>(0.011)</td>
<td>(0.013)</td>
</tr>
<tr>
<td>Leverage</td>
<td>−0.050***</td>
<td>−0.084***</td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td>(0.007)</td>
</tr>
<tr>
<td>R&amp;D/Sales</td>
<td>0.198***</td>
<td>0.243***</td>
</tr>
<tr>
<td></td>
<td>(0.016)</td>
<td>(0.027)</td>
</tr>
<tr>
<td>Dividend Dummy</td>
<td>0.009***</td>
<td>−0.011</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.007)</td>
</tr>
<tr>
<td>Acquisition Activity</td>
<td>−0.129***</td>
<td>−0.140***</td>
</tr>
<tr>
<td></td>
<td>(0.012)</td>
<td>(0.015)</td>
</tr>
<tr>
<td>Time Fixed Effect</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Firm Fixed Effect</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Clustered Standard Error</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>308510</td>
<td>308510</td>
</tr>
<tr>
<td>$R^2$</td>
<td>73.92%</td>
<td>74.09%</td>
</tr>
</tbody>
</table>
Table VII
Credit Ratings and the CDS Effect
This table investigates credit ratings and the effect of credit default swaps (CDS) on corporate cash holdings. *Unrated* equals one if there is no credit rating on the firm. *Non-investment Grade* equals one if the firm’s credit rating is of non-investment grade. *Industry Sigma* is the industry cash flow risk, measured by the mean cash flow volatility across two-digit SIC codes. *Cash Flow/Assets* is the ratio of cash flow to total assets, where cash flow is defined as the earnings after interest and related expenses, income taxes, and dividends. *Market to Book* is the book value of assets minus the book value of equity plus the market value of equity, all divided by the book value of assets. *Size* is the logarithm of total assets. *Leverage* is measured as the book value of the long-term debt plus debt in current liabilities, divided by total assets. *Net Working Capital/Assets* is the ratio of capital expenditures to total assets. *Market to Book* is the book value of assets minus the book value of equity plus the market value of equity, all divided by the book value of assets. *Cash Flow/Assets* is measured as the book value of the long-term debt plus debt in current liabilities, divided by total assets. *Capital Expenditure* is the ratio of capital expenditures to total assets. *Leverage* is measured as the book value of the long-term debt plus debt in current liabilities, divided by total assets. *R&D/Sales* is the ratio of R&D to sales. *Dividend Dummy* is a dummy variable that equals one if the firm pays a common dividend. *Acquisition Activity* is the ratio of acquisitions to total assets. To estimate the impact of CDS trading on the corporate cash holdings, we include CDS variables in the model specification. *CDS Trading* is a dummy variable that equals one if the firm has CDS traded on its debt one year before month t. The coefficients of interest are those of *CDS Trading, CDS Trading* *Unrated*, and *CDS Trading* *Non-investment Grade*, which capture the impact of the inception of CDS trading on cash holdings. The sample period is 1997-2009, based on quarterly observations. The overall sample of firms is drawn from Compustat, and includes all companies in that database during 1997-2009. The CDS data are taken from CreditTrade and the GFI Group. There are 901 firms in the sample that have CDS traded at some point during the sample period of June 1997 to April 2009. (** significant at the 5% level, *** significant at the 1% level, significant at the 10% level. The numbers in parentheses are standard errors.)

<table>
<thead>
<tr>
<th>Cash/Assets</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDS Trading</td>
<td>0.018***</td>
<td>0.015***</td>
<td>0.016***</td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>Unrated</td>
<td>0.004</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.003)</td>
<td></td>
</tr>
<tr>
<td>CDS Trading*Unrated</td>
<td>0.017***</td>
<td>0.014***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td>(0.005)</td>
<td></td>
</tr>
<tr>
<td>Non-investment Grade</td>
<td></td>
<td>0.011***</td>
<td>0.009***</td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.003)</td>
<td></td>
</tr>
<tr>
<td>CDS Trading* Non-investment Grade</td>
<td>0.007**</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.004)</td>
<td></td>
</tr>
<tr>
<td>Industry Sigma</td>
<td>0.076***</td>
<td>0.076***</td>
<td>0.076***</td>
</tr>
<tr>
<td></td>
<td>(0.016)</td>
<td>(0.016)</td>
<td>(0.016)</td>
</tr>
<tr>
<td>Cash Flow/Assets</td>
<td>0.066***</td>
<td>0.067***</td>
<td>0.067***</td>
</tr>
<tr>
<td></td>
<td>(0.009)</td>
<td>(0.009)</td>
<td>(0.009)</td>
</tr>
<tr>
<td>Market to Book</td>
<td>0.008***</td>
<td>0.008***</td>
<td>0.008***</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Size</td>
<td>−0.009***</td>
<td>−0.009***</td>
<td>−0.009***</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Net Working Capital/Assets</td>
<td>−0.046***</td>
<td>−0.046***</td>
<td>−0.046***</td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td>(0.004)</td>
<td>(0.004)</td>
</tr>
<tr>
<td>Capital Expenditure</td>
<td>−0.211***</td>
<td>−0.211***</td>
<td>−0.211***</td>
</tr>
<tr>
<td></td>
<td>(0.012)</td>
<td>(0.012)</td>
<td>(0.012)</td>
</tr>
<tr>
<td>Leverage</td>
<td>−0.083***</td>
<td>−0.084***</td>
<td>−0.083***</td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
<td>(0.005)</td>
<td>(0.005)</td>
</tr>
<tr>
<td>R&amp;D/Sales</td>
<td>0.194***</td>
<td>0.194***</td>
<td>0.194***</td>
</tr>
<tr>
<td></td>
<td>(0.015)</td>
<td>(0.015)</td>
<td>(0.015)</td>
</tr>
<tr>
<td>Dividend Dummy</td>
<td>0.008***</td>
<td>0.007***</td>
<td>0.008***</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
</tr>
<tr>
<td>Acquisition Activity</td>
<td>−0.197***</td>
<td>−0.195***</td>
<td>−0.196***</td>
</tr>
<tr>
<td></td>
<td>(0.013)</td>
<td>(0.013)</td>
<td>(0.013)</td>
</tr>
<tr>
<td>Time Fixed Effect</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Firm Fixed Effect</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Clustered Standard Error</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>308510</td>
<td>308510</td>
<td>308510</td>
</tr>
<tr>
<td>$R^2$</td>
<td>75.05%</td>
<td>75.05%</td>
<td>75.05%</td>
</tr>
</tbody>
</table>
Table VIII

Bank Relationships and the CDS Effect

This table investigates bank relationship and the effect of credit default swaps (CDS) on corporate cash holdings. The bank relationships are from Dealscan LPC. For each firm on a given date, we look back five years for any syndicated loan facilities extended to this firm. Summing over all such active facilities, we compute, on each date, the number of unique bank relationships. *Industry Sigma* is the industry cash flow risk, measured by the mean cash flow volatility across two-digit SIC codes. *Cash Flow/Assets* is the ratio of cash flow to total assets, where cash flow is defined as the earnings after interest and related expenses, income taxes, and dividends. *Market to Book* is the book value of assets minus book value of equity plus the market value of equity divided by the book value of assets. *Size* is the logarithm of total assets. *Net Working Capital/Assets* is measured as net working capital minus cash divided by total assets. *Capital Expenditure* is the ratio of capital expenditures to total assets. *Leverage* is measured as the book value of the long-term debt plus debt in current liabilities divided by total assets. *R&D/Sales* is the ratio of R&D to sales. *Dividend Dummy* is a dummy variable that equals one if the firm pays a common dividend. *Acquisition Activity* is the ratio of acquisitions to total assets. To estimate the impact of CDS trading on the corporate cash holdings, we include credit default swaps variables in the model specifications. *CDS Trading* is a dummy variable that equals one if the firm has CDS traded on its debt, one year before month t. The coefficients of interest are that of *CDS Trading* and *CDS Trading* × *Number of Banks*, which capture the impact of CDS trading on cash holdings after the inception of CDS trading. The sample period is from 1997-2009, based on quarterly observations. The overall sample of firms is from the Compustat, which includes all companies in the database during 1997-2009. The CDS data are from CreditTrade and the GFI Group. There are 901 firms in the sample that have CDS traded at some point during the June 1997-April 2009 sample period. (** Significant at 1% level, *** significant at 5% level, and * significant at 10% level. The numbers in parentheses are standard errors.**)

<table>
<thead>
<tr>
<th>Cash/Assets</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CDS Trading</strong></td>
<td>0.020***</td>
<td>0.013***</td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.004)</td>
</tr>
<tr>
<td><strong>Number of Banks</strong></td>
<td>−0.011***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td></td>
</tr>
<tr>
<td><strong>CDS Trading</strong> × <strong>Number of Banks</strong></td>
<td>0.002**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td></td>
</tr>
<tr>
<td><strong>Industry Sigma</strong></td>
<td>0.076***</td>
<td>0.078***</td>
</tr>
<tr>
<td></td>
<td>(0.016)</td>
<td>(0.016)</td>
</tr>
<tr>
<td><strong>Cash Flow/Assets</strong></td>
<td>0.066***</td>
<td>0.067***</td>
</tr>
<tr>
<td></td>
<td>(0.009)</td>
<td>(0.009)</td>
</tr>
<tr>
<td><strong>Market to Book</strong></td>
<td>0.008***</td>
<td>0.008***</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
<tr>
<td><strong>Size</strong></td>
<td>−0.009***</td>
<td>−0.009***</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
<tr>
<td><strong>Net Working Capital/Assets</strong></td>
<td>−0.046***</td>
<td>−0.044***</td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td>(0.004)</td>
</tr>
<tr>
<td><strong>Capital Expenditure</strong></td>
<td>−0.211***</td>
<td>−0.206***</td>
</tr>
<tr>
<td></td>
<td>(0.012)</td>
<td>(0.012)</td>
</tr>
<tr>
<td><strong>Leverage</strong></td>
<td>−0.084***</td>
<td>−0.082***</td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
<td>(0.005)</td>
</tr>
<tr>
<td><strong>R&amp;D/Sales</strong></td>
<td>0.194***</td>
<td>0.194***</td>
</tr>
<tr>
<td></td>
<td>(0.015)</td>
<td>(0.015)</td>
</tr>
<tr>
<td><strong>Dividend Dummy</strong></td>
<td>0.007***</td>
<td>0.008***</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.002)</td>
</tr>
<tr>
<td><strong>Acquisition Activity</strong></td>
<td>−0.197***</td>
<td>−0.191***</td>
</tr>
<tr>
<td></td>
<td>(0.013)</td>
<td>(0.013)</td>
</tr>
<tr>
<td><strong>Year Fixed Effect</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Firm Fixed Effect</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>308510</td>
<td>308510</td>
</tr>
<tr>
<td><strong>R²</strong></td>
<td>75.04%</td>
<td>75.10%</td>
</tr>
</tbody>
</table>
Table IX
Lines of Credit and the CDS Effect

This table presents the estimates of the effect of credit default swaps (CDS) on corporate cash holdings after controlling for the line of credit. Line of credit data are drawn from Dealscan. Line of Credit is a dummy equal to one if the firm has a line of credit. Industry Sigma is the industry cash flow risk, measured by the mean cash flow volatility across two-digit SIC codes. Cash Flow/Assets is the ratio of cash flow to total assets, where cash flow is defined as the earnings after interest and related expenses, income taxes, and dividends. Market to Book is the book value of assets minus the book value of equity plus the market value of equity, all divided by the book value of assets. Size is the logarithm of total assets. Net Working Capital/Assets is measured as net working capital minus cash, divided by total assets. Capital Expenditure is the ratio of capital expenditure to total assets. Leverage is measured as the book value of the long-term debt plus debt in current liabilities, divided by total assets. R& D/Sales is the ratio of R&D to sales. Dividend Dummy is a dummy variable that equals one if the firm pays a common dividend. Acquisition Activity is the ratio of acquisitions to total assets. To estimate the impact of CDS trading on the corporate cash holdings, we include CDS variables in the model specification. CDS Trading is a dummy variable that equals one if the firm has CDS traded on its debt one year before month t. The coefficients of interest are those of CDS Trading*Line of Credit, which captures the impact of the inception of CDS trading on cash holdings. The sample period is 1997-2009, based on quarterly observations. The overall sample of firms is drawn from Compustat, and includes all companies in the database during 1997-2009. The CDS data are taken from CreditTrade and the GFI Group. There are 901 firms in the sample that have CDS traded at some point during the sample period of June 1997 to April 2009. (** significant at the 1% level, * significant at the 5% level, and * significant at the 10% level. The numbers in parentheses are standard errors.)

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cash/Assets</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CDS Trading</td>
<td>0.020***</td>
<td>0.021***</td>
<td>0.008</td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.006)</td>
</tr>
<tr>
<td>Line of Credit</td>
<td>−0.026***</td>
<td>−0.027***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.002)</td>
<td></td>
</tr>
<tr>
<td>CDS Trading*Line of Credit</td>
<td></td>
<td></td>
<td>0.014***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.005)</td>
</tr>
<tr>
<td>Industry Sigma</td>
<td>0.076***</td>
<td>0.077***</td>
<td>0.077***</td>
</tr>
<tr>
<td></td>
<td>(0.016)</td>
<td>(0.016)</td>
<td>(0.016)</td>
</tr>
<tr>
<td>Cash Flow/Assets</td>
<td>0.066***</td>
<td>0.065***</td>
<td>0.065***</td>
</tr>
<tr>
<td></td>
<td>(0.009)</td>
<td>(0.009)</td>
<td>(0.009)</td>
</tr>
<tr>
<td>Market to Book</td>
<td>0.008***</td>
<td>0.008***</td>
<td>0.008***</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Size</td>
<td>−0.009***</td>
<td>−0.009***</td>
<td>−0.009***</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Net Working Capital/Assets</td>
<td>−0.046***</td>
<td>−0.045***</td>
<td>−0.045***</td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td>(0.004)</td>
<td>(0.004)</td>
</tr>
<tr>
<td>Capital Expenditure</td>
<td>−0.211***</td>
<td>−0.211***</td>
<td>−0.211***</td>
</tr>
<tr>
<td></td>
<td>(0.012)</td>
<td>(0.012)</td>
<td>(0.012)</td>
</tr>
<tr>
<td>Leverage</td>
<td>−0.084***</td>
<td>−0.081***</td>
<td>−0.081***</td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
<td>(0.005)</td>
<td>(0.005)</td>
</tr>
<tr>
<td>R&amp;D/Sales</td>
<td>0.194***</td>
<td>0.193***</td>
<td>0.193***</td>
</tr>
<tr>
<td></td>
<td>(0.015)</td>
<td>(0.015)</td>
<td>(0.015)</td>
</tr>
<tr>
<td>Dividend Dummy</td>
<td>0.007***</td>
<td>0.008***</td>
<td>0.008***</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
</tr>
<tr>
<td>Acquisition Activity</td>
<td>−0.197***</td>
<td>−0.191***</td>
<td>−0.191***</td>
</tr>
<tr>
<td></td>
<td>(0.013)</td>
<td>(0.013)</td>
<td>(0.013)</td>
</tr>
<tr>
<td>Year Fixed Effect</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Firm Fixed Effect</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Clustered Standard Error</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>308510</td>
<td>308510</td>
<td>308510</td>
</tr>
<tr>
<td>$R^2$</td>
<td>75.04%</td>
<td>75.14%</td>
<td>75.14%</td>
</tr>
</tbody>
</table>
Table A1

Probability of Credit Default Swaps Trading

This table presents the estimates of the probability of credit default swaps (CDS) trading, obtained using a probit model. Propensity scores are estimated based on the model parameters. $\ln(\text{Assets})$ is the logarithm of the firm’s total asset value. Leverage is defined as the ratio of book debt to the sum of book debt and market equity, where book debt is the sum of short-term debt and 50% of long-term debt, and market equity is the measure of the number of common shares outstanding multiplied by the stock price. ROA is the firm's return on assets. $r_{it-1} - r_{mt-1}$ is the firm’s excess return over the past year. Equity Volatility is the firm’s annualized equity volatility. PPENT/Total Asset is the ratio of property, plant and equipment to total assets. Sales/Total Asset is the ratio of sales to total assets. EBIT/Total Asset is the ratio of earnings before interest and tax to total assets. WCAP/Total Asset is the ratio of working capital to total assets. RE/Total Asset is the ratio of retained earnings to total assets. Cash/Total Asset is the ratio of cash to total assets. EBIT/Total Asset is the ratio of capital expenditure to total assets. Rated is a dummy variable that equals one if the firm is rated. Senior Unsecured Debt is the ratio of senior unsecured debt to total debt. Lender Size is a measure of the size of the lending banks and underwriters. Lender Credit Derivatives measures the credit derivative activities of the lenders. Lender FX Usage is a measure of the FX hedging activities of the lending banks and underwriters, and Lender Tier 1 Capital is the Tier One capital ratio of the lenders. The sample period is 1997-2009. (** significant at the 5% level, * significant at the 10% level. The numbers in parentheses are standard errors.)
<table>
<thead>
<tr>
<th>Probability of CDS Trading</th>
<th>CDS Prediction Model 1</th>
<th>CDS Prediction Model 2</th>
<th>CDS Prediction Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ln(Assets)</strong></td>
<td>0.790***</td>
<td>0.804***</td>
<td>0.797***</td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
<td>(0.006)</td>
<td>(0.006)</td>
</tr>
<tr>
<td><strong>Leverage</strong></td>
<td>0.429***</td>
<td>0.440***</td>
<td>0.431***</td>
</tr>
<tr>
<td></td>
<td>(0.025)</td>
<td>(0.025)</td>
<td>(0.026)</td>
</tr>
<tr>
<td><strong>ROA</strong></td>
<td>−0.001</td>
<td>−0.001</td>
<td>−0.001</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
<tr>
<td><strong>rt−1 − rmt−1</strong></td>
<td>−0.104***</td>
<td>−0.104***</td>
<td>−0.104***</td>
</tr>
<tr>
<td></td>
<td>(0.011)</td>
<td>(0.011)</td>
<td>(0.011)</td>
</tr>
<tr>
<td><strong>Equity Volatility</strong></td>
<td>0.063***</td>
<td>0.069***</td>
<td>0.067***</td>
</tr>
<tr>
<td></td>
<td>(0.017)</td>
<td>(0.017)</td>
<td>(0.017)</td>
</tr>
<tr>
<td><strong>PPENT/Total Asset</strong></td>
<td>0.306***</td>
<td>0.321***</td>
<td>0.307***</td>
</tr>
<tr>
<td></td>
<td>(0.031)</td>
<td>(0.031)</td>
<td>(0.031)</td>
</tr>
<tr>
<td><strong>Sales/Total Asset</strong></td>
<td>−0.026***</td>
<td>−0.027***</td>
<td>−0.026***</td>
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<tr>
<td></td>
<td>(0.009)</td>
<td>(0.003)</td>
<td>(0.003)</td>
</tr>
<tr>
<td><strong>EBIT/Total Asset</strong></td>
<td>0.315***</td>
<td>0.375***</td>
<td>0.338***</td>
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<tr>
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<td>(0.064)</td>
<td>(0.064)</td>
<td>(0.064)</td>
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<tr>
<td><strong>WCAP/Total Asset</strong></td>
<td>0.142***</td>
<td>0.145***</td>
<td>0.143***</td>
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<tr>
<td></td>
<td>(0.024)</td>
<td>(0.024)</td>
<td>(0.024)</td>
</tr>
<tr>
<td><strong>RE/Total Asset</strong></td>
<td>0.022***</td>
<td>0.023***</td>
<td>0.024***</td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
<td>(0.005)</td>
<td>(0.005)</td>
</tr>
<tr>
<td><strong>Cash/Total Asset</strong></td>
<td>0.290***</td>
<td>0.302***</td>
<td>0.294***</td>
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<tr>
<td></td>
<td>(0.023)</td>
<td>(0.023)</td>
<td>(0.023)</td>
</tr>
<tr>
<td><strong>CAPX/Total Asset</strong></td>
<td>−1.611***</td>
<td>−1.677***</td>
<td>−1.604***</td>
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<tr>
<td></td>
<td>(0.122)</td>
<td>(0.122)</td>
<td>(0.122)</td>
</tr>
<tr>
<td><strong>Rated</strong></td>
<td>0.667***</td>
<td>0.645***</td>
<td>0.638***</td>
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<td></td>
<td>(0.203)</td>
<td>(0.205)</td>
<td>(0.205)</td>
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<tr>
<td><strong>Senior Unsecured Debt</strong></td>
<td>0.375***</td>
<td>0.377***</td>
<td>0.375***</td>
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<tr>
<td></td>
<td>(0.014)</td>
<td>(0.014)</td>
<td>(0.014)</td>
</tr>
<tr>
<td><strong>Lender Size</strong></td>
<td>0.369***</td>
<td>0.378***</td>
<td>0.385***</td>
</tr>
<tr>
<td></td>
<td>(0.011)</td>
<td>(0.011)</td>
<td>(0.011)</td>
</tr>
<tr>
<td><strong>Lender Credit Derivatives</strong></td>
<td>1.006***</td>
<td>1.013***</td>
<td>1.019***</td>
</tr>
<tr>
<td></td>
<td>(0.024)</td>
<td>(0.024)</td>
<td>(0.025)</td>
</tr>
<tr>
<td><strong>Lender FX Usage</strong></td>
<td>8.979***</td>
<td>9.104***</td>
<td>8.789***</td>
</tr>
<tr>
<td></td>
<td>(0.788)</td>
<td>(0.789)</td>
<td>(0.789)</td>
</tr>
<tr>
<td><strong>Lender Tier 1 Capital</strong></td>
<td></td>
<td>−3.865***</td>
<td>−4.000***</td>
</tr>
<tr>
<td></td>
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<td>(0.756)</td>
<td>(0.757)</td>
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<td><strong>F-statistic (instruments)</strong></td>
<td>129.89</td>
<td>26.13</td>
<td>159.74</td>
</tr>
<tr>
<td><strong>p-value (F-statistic)</strong></td>
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<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td><strong>Credit Rating Controls</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Time Fixed Effects</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Industry Fixed Effects</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Clustered Standard Error</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Pseudo R²</strong></td>
<td>38.96%</td>
<td>38.79%</td>
<td>38.99%</td>
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<td><strong>N</strong></td>
<td>690111</td>
<td>690111</td>
<td>690111</td>
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