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Active CDS Trading and Managers' Voluntary Disclosure

Abstract

We investigate how the development of the credit default swap (CDS) market affects firms' voluntary disclosure choices. The CDS market has been criticized, inter alia, for (i) its vulnerability to insider trading by informed lenders who trade on borrowers' private information, and (ii) the reduction in lenders' monitoring efficiency due to their ability to shed credit risk exposure via CDSs. Consistent with voluntary disclosure theory, we predict that informed trading by lenders and the consequent threat of private information revelation in the spreads of actively traded CDSs will pressure managers to enhance their voluntary disclosures to mitigate the risks associated with non-disclosure. Further, the reduction in lender monitoring will lead shareholders to intensify their own monitoring efforts and demand increased voluntary disclosures from managers. Consistent with these predictions, we find that managers are more likely to issue earnings forecasts and to forecast more frequently when their firms have actively traded CDSs. Our results also suggest that liquid CDSs discipline managers to disclose bad news earnings forecasts, despite their career- and wealth-related incentives to withhold adverse information. In addition to disclosure via management forecasts, we document that liquid CDSs also enhance disclosure via firm-initiated press releases. Our findings suggest that the allegedly negative attributes of the CDS market could result in a positive externality for capital markets by eliciting enhanced voluntary disclosures and thus contribute to a richer information environment.

1. Introduction

This study investigates the effect of a significant institutional environment change of the last two decades – the development of the credit default swap (CDS) market – on firms' voluntary disclosure choices.[1] The CDS market has enabled financial institutions to distribute credit risk to parties who are more willing and able to bear it, thereby enhancing liquidity and flexibility in the financial system (Greenspan, 2004). However, many have criticized CDSs for significantly exacerbating the recent financial crisis (e.g., Bank of England, 2008, and Stanton and Wallace, 2011) and decreasing lender monitoring efficiency (e.g., Hu and Black, 2008, Ashcraft and Santos, 2009, and Martin and Roychowdhury, 2014). Another major criticism of the CDS market is that it is vulnerable to insider trading, as large financial institutions, the common counterparties in CDS contracts, often trade on inside information about CDS reference entities obtained in their capacity as private lenders (e.g., The Financial Times, 2005, Acharya and Johnson, 2007, Qiu and Yu, 2013, and Standard and Poor's, 2007). We propose that the allegedly negative attributes of the CDS market result in a positive externality for capital markets by eliciting enhanced voluntary disclosure from CDS reference entities.

An active CDS market can positively impact firms' voluntary disclosure practices primarily through two channels: (i) by lowering managers' threshold for voluntary disclosure due to the threat of private information revelation in CDS spreads via informed trading by lenders, and (ii) by reducing the intensity of lenders' monitoring due to their ability to shed credit risk via CDSs, prompting a compensatory demand from shareholders for increased voluntary disclosure.

The first channel builds directly on the insights from Dye's (1985) model of partial voluntary disclosure when investors are unsure whether managers have private information. If

[1] A CDS protects the buyer of the contract against default risk in return for a periodic payment (the CDS spread) over the term of the contract. The buyer is compensated if the reference entity and/or its credit instruments experience a "credit event" specified in the contract, such as default, certain types of restructuring, and bankruptcy.

managers do not disclose information, investors cannot distinguish whether their silence indicates negative information or managers' unawareness of the information. Dye (1985) shows that firm value will decrease if managers disclose no information when investors have come to believe that they have private information. Therefore, as the probability that investors know that managers have private information increases, more information will be disclosed. In our setting, large financial institutions trade in the CDS market to satisfy their hedging and speculative needs. They also serve as dealers in this market, often supplying CDS spread quotes for firms to which they have loan exposure. Because these institutions typically do not have perfect Chinese walls between their lending and trading activities, material non-public information obtained through their lending activities is frequently traded on in the CDS market. Trading by informed lenders thus often results in the revelation of a substantial amount of private information through CDS pricing (Glantz, 2003, Acharya and Johnson, 2007, Qiu and Yu, 2012, and Whitehead, 2012). In the Dye (1985) framework, lenders' informed trading in the CDS market will reduce investors' uncertainty about managers' possession of private information, resulting in more voluntary disclosures by managers, particularly bad news disclosures.[2]

In addition to the valuation implications of non-disclosure, because CDS trading can inform investors that managers have private information that is not disclosed to the public, managers are also likely to face increased exposure to the litigation risk associated with non-disclosure. While SEC's Rule 10b-5 does not impose a general duty on managers to disclose their private information, legal scholars assert that the SEC guidance and case law impose an

[2] Anecdotal evidence supports the notion that CEOs and CFOs regularly monitor movements in their firms' CDS spreads and are concerned about the revelation of private information through trading in the CDS market. For example, in a 2006 survey of CFOs conducted by CFO.com, more than 40 percent of the respondents expressed concern about potential conflicts of interest, such as banks using credit derivatives (http://ww2.cfo.com/banking-capital-markets/2006/10/are-your-secrets-safe/). Consistent with CDS trading imposing pressure on firms to disclose, managers are frequently asked by market participants to comment on sizable changes in their firm's CDS spreads when they are unaccompanied by public disclosure (Bloomberg, 2006, and The Wall Street Journal, 2006).

affirmative disclosure obligation when a previous disclosure becomes inaccurate, incomplete, or misleading (Skinner 1997). To the extent that CDS spreads convey new information that may call for an updating of previous disclosures, we expect the heightened litigation risk exposure to further motivate managers to enhance their voluntary disclosures.

While there is evidence that lenders trade on their borrowers' private information in the equity market, we expect lenders' insider trading in the CDS market to be of significant importance in shaping voluntary disclosure practices. First, unlike informed trading in the CDS market, only non-bank institutional lenders, such as mutual and hedge funds, tend to trade on a borrower's private information in the equity market, with no evidence of banks engaging in such behavior (e.g., Bushman et al., 2010, Ivashina and Sun, 2011, and Massoud et al., 2011). Second, the CDS market is considerably less regulated and, until recently, was subject to less stringent SEC scrutiny relative to the bond and stock markets (e.g., ISDA, 2003, Bloomberg, 2006, The Wall Street Journal, 2006, 2007, and Yadav, 2013).[3] Third, CDS spreads often reflect private information ahead of public disclosures and price discovery in other markets, including equity, bond and equity option markets (e.g., Glantz, 2003, Berndt and Ostrovnaya, 2007, Blanco et al., 2005, Standard and Poor's, 2007, and Whitehead, 2012). Acharya and Johnson (2007) and Qiu and Yu (2012) also show that the CDS market leads the equity market in price discovery, particularly when a CDS reference entity has a high number of ongoing banking relationships.

With respect to the second channel through which the CDS market can lead to enhanced voluntary disclosure, we build on Vashishtha (2014), who links lenders' monitoring intensity and voluntary disclosure. He shows that increased lender monitoring intensity following debt

[3] In particular, over our sample period, CDSs were largely exempted from the restrictions of SEC's Rule 10b-5 because swaps are excluded from the definition of "securities" by the Commodity Futures Modernization Act of 2000. In fact, until recently, there was ambiguity as to whether the SEC, the CFTC, or both had regulatory authority over the CDS market (e.g., Bloomberg, 2006).

covenant violations leads to greater demand from lenders for firm-specific information. Consequently, because equity holders to some extent delegate firm monitoring to private lenders, they will reduce their demand for firm-specific information, leading to decreased voluntary disclosure. Reversing the direction of this prediction, we propose that a reduction in lender monitoring due to their ability to reduce credit risk exposure via CDS contracts (e.g., Ashcraft and Santos, 2009, and Martin and Roychowdhury, 2014) leads shareholders to intensify their own monitoring efforts and demand enhanced public disclosure.[4]

We expect the CDS market to have a pronounced effect on managers' disclosure choices mainly when CDS contracts are actively traded. Prior literature shows that liquidity enhances price discovery in the stock market due to the timely incorporation of information into prices (e.g., Subrahmanyam and Titman, 2001, Khanna and Sonti, 2004, and Chordia et al., 2006). Supporting the importance of liquidity in enhancing the information content of CDS spreads, Qiu and Yu (2012) find that the most liquid firms in the CDS market are associated with the highest level of informed trading. Similarly, because liquid CDS contracts are easier and less costly to trade (Saretto, and Tookes, 2013), the reduction in lender monitoring and its effect on disclosure are likely to be more pronounced for actively traded CDSs. We follow Qiu and Yu (2012) and measure CDS liquidity by the annual CDS market depth, proxied by the average number of distinct dealers providing a firm's daily CDS spread quotes over a given year.[5]

To examine the effect of liquid CDSs on voluntary disclosure, we focus on the management decision to issue earnings forecasts, which represents one of the most important voluntary disclosure choices (Beyer et al., 2010). Consistent with our prediction, we find that

[4] Our prediction relies on the plausible assumption that stockholders, unlike private lenders, cannot request firms to provide them with private information for monitoring purposes and accordingly have to rely on public disclosures.

[5] Because CDSs trade over the counter, liquidity measures based on trading activity and bid-ask spreads are unavailable for a comprehensive sample of CDS contracts. We find robust results when we employ an alternative liquidity measure based on the number of distinct maturities of traded CDS contracts for a firm.

firms with actively traded CDS contracts are more likely to issue a management forecast relative to non-CDS firms or firms with less liquid CDS contacts. Economically, having liquid CDS contracts increases the likelihood of a management forecast by 14.0%. We reaffirm this finding and show that active CDS trading is strongly associated with the number of management forecasts issued; the management forecasts of firms with liquid CDSs are 1.49 times more frequent relative to those issued by other sample firms. While these findings are consistent with our predictions, it is possible that firms with liquid CDS contracts are different from other sample firms in ways that are systematically related to their voluntary disclosure choices. We conduct several tests to mitigate endogeneity concerns.

First, we compare the sample of liquid CDS firms with a matched-firm control sample constructed using the propensity score matching methodology and continue to find that liquid CDSs have a significant effect on voluntary disclosures. Second, to further address endogeneity concerns in general and reverse causality in particular, we perform a number of tests that examine how an *increase* in CDS liquidity affects disclosure. We find that voluntary disclosure is significantly enhanced when a firm's CDS liquidity switches from low to high. Third, we employ an instrumental variables (IV) approach, where our instruments capture bond investors' hedging and speculative demand in the CDS market (e.g., Oehmke and Zawadowski, 2013, and Boehmer et al., 2014), which is not expected to be directly related to voluntary disclosure. Although we cannot be certain that our instruments are truly exogenous, the results of IV tests also suggest that firms with liquid CDSs are more likely to voluntarily disclose earnings news.

We next examine the effect of liquid CDSs on the voluntary disclosure of negative earnings news. The theoretical findings of Dye (1985), coupled with the fact that the information revelation of bad news is especially timely in the CDS market (Acharya and Johnson, 2007, and

Qiu and Yu, 2012), suggest that active CDS trading should motivate managers to disclose adverse information. Litigation threat is also more pertinent when managers delay the disclosure of negative news (e.g., Skinner, 1994, 1997, and Baginski et al., 2002). Additionally, shareholders' concerns with respect to the reduction in lender monitoring are likely to be greater if the firm experiences an inferior performance. We focus on the sample of forecasting firms (i.e., firm-year observations with at least one management forecast) and find that liquid CDSs are associated with a significantly higher frequency of bad news forecasts, both in absolute terms and relative to the total number of management forecasts in a given year. We also find that the effect of liquid CDSs on bad news disclosures strengthens with negative credit news, as measured by an increase in abnormal CDS spreads, further suggesting that unobservable firm characteristics correlated with CDS liquidity are unlikely to drive forecasting behavior.

Next, we validate that the enhanced bad news forecast disclosure is indeed driven by liquid CDSs and not by firm characteristics that are potentially associated with negative news. We repeat the analyses for the sample of liquid CDS firms with negative news in the forecast year and control firms without liquid CDSs matched on the magnitude of negative news, when negative news is measured by a negative earnings surprise or an increase in abnormal CDS spreads. We find that, conditional on negative news, firms with liquid CDSs have a significantly higher frequency of bad news earnings forecasts relative to their matched firms. Thus, liquid CDSs pressure managers to disclose bad news, despite their career- and wealth-related incentives for delaying the revelation of adverse information (Graham et al., 2005, and Kothari et al., 2009).

To provide further support for the disciplining effect of liquid CDSs on bad news forecast disclosure, we also examine how CDSs affect the frequency of unbundled bad news forecasts (forecasts that are not bundled with earnings announcements). While most earnings forecasts are

issued in conjunction with earnings announcements in recent years (Anilowski et al., 2007, and Rogers and Van Buskirk, 2009), unbundled forecasts are more salient and provide more timely information to investors (e.g., Atiase et al., 2005, and Baginski et al., 2012). We find that liquid CDSs induce the timely updating of earnings expectations via unbundled bad news forecasts, consistent with liquid CDSs pressuring managers to promptly disclose adverse information.

In our final set of analyses, we explore the association between liquid CDSs and voluntary disclosure via press releases. Because identifying voluntary disclosure through press releases and determining the tone of press release news is challenging (see the discussion in Section 4.6), we view the press release tests as supplemental to our earnings forecast analyses. We find that firms with liquid CDSs issue a higher number of press releases and exhibit a higher frequency of negative press releases. Our findings suggest that, in response to actively traded CDSs, managers enhance disclosures not only through earnings forecasts but also via other disclosure channels.

Our study contributes to the literature along several dimensions. First, we contribute to prior research on the impact of new securities markets on firms' information environment (e.g., Skinner 1989, 1990) by examining a recent financial innovation – credit default derivatives. While some studies show the role of CDSs in improving financial flexibility (e.g., Saretto and Tookes, 2013), others indicate substantial negative consequences of CDS trading on firms' credit risk, lender monitoring and insider trading (Subrahmanyam et al., 2012, Bolton and Oehmke, 2011, and Martin and Roychowdhury, 2014). We extend this literature by highlighting a positive externality of CDS trading. Our results suggest that, by eliciting enhanced voluntary disclosures, active CDS trading contributes to a richer information environment in capital markets.

Second, we contribute to the extensive research on voluntary disclosure. Prior studies have identified securities litigation, information uncertainty, institutional ownership, proprietary costs,

and investor sentiment as important drivers of disclosure choices (e.g., Verrecchia, 1983, Bergman and Roychowdhury, 2008, Kwak et al., 2012, and Bozanic et al., 2013). However, with the exception of Lo (2014), who examines disclosure changes following the emerging market financial crisis of the late 1990s, little is known about how changes in the institutional environment affect managers' incentives to disclose voluntarily (Beyer et al., 2010). Our paper addresses this void by shedding light on how the development of the CDS market induces managers to enhance their disclosure practices. In particular, our evidence suggests that active CDS trading plays a disciplining role by eliciting the voluntary disclosure of bad news.

Finally, we extend the growing research on the consequences of lenders' exploitation of their access to private information through lending relationships (Ivashina and Sun, 2011, and Massoud et al., 2011). Bushman et al. (2010) find that non-bank institutional lenders trade on private information in the secondary loan and equity markets, but that this informed trading has a positive effect on price discovery in both markets. Our contribution is to further highlight a potential positive externality of lenders' access to a borrower's private information. We suggest that the revelation of private information in CDS spreads, induced by informed lenders' trading, can lead to positive capital market effects by enhancing firms' voluntary disclosures.

The next section presents our hypotheses development. Section 3 describes the sample and data. Section 4 reports our main results and Section 5 concludes the paper.

2. Motivation, Related Literature and Hypotheses Development

2.1 Information flows in the CDS market

The CDS market has grown from an exotic niche market in the 1990s to become the largest credit risk trading venue, with a total notional CDS amount outstanding of $27 trillion in June 2012, following a peak of $62.2 trillion outstanding in the second half of 2007, prior to the

financial crisis.[6] The dominant players in the CDS market are major banks and financial institutions that have access to material non-public information about CDS reference entities through their lending activities. This confidential information usually includes timely financial disclosures, covenant compliance information, amendment and waiver requests, financial projections, and plans for acquisitions or dispositions and is typically provided to lenders well in advance of its public release (Standard and Poor's, 2007).[7] In addition to trading in the CDS market to satisfy their hedging and speculative needs, informed lenders often serve as dealers in this market. While guidance from the International Swaps and Derivatives Association suggests that "…banks must not use private knowledge about corporate clients to trade instruments such as credit default swaps," absent effective Chinese walls between loan officers and bank trading desks, material non-public information frequently gets traded on in the lightly regulated CDS market (e.g., The Economist, 2003, Financial Times, 2005, and Standard and Poor's, 2007).

In addition, hedge funds have lately intensified their CDS trading, further fuelling insider trading concerns. Hedge funds often gain access to private information through participation in syndicated loans (e.g., Bushman et al., 2010, Ivashina and Sun, 2011, and Massoud et al., 2011) and tight connections with large financial institutions (e.g., The Wall Street Journal, 2006, The New York Times, 2007, and Financial Times, 2009). In its first CDS "insider" trading case, the SEC recently charged a hedge fund with insider trading in CDSs on the basis of private information learned from a major investment bank (Financial Times, 2009, and Yadav, 2013).[8]

[6] CDS contracts are mostly standardized according to the guidance of the International Swaps and Derivatives Association (ISDA). The contracts have a variety of standard terms, ranging from six months to thirty years, although CDS contracts with a five year maturity are the most actively traded.

[7] Reg FD exempts the private communication of information to lenders conditional on lenders adhering to the confidentiality provisions in loan agreements (LSTA, 2007a, 2007b, and Li et al., 2013). According to the Loan Syndication and Trading Association (LSTA), if lenders breach these provisions, as in the case of trading on private information, the selective disclosure to lenders may no longer qualify as Reg FD compliant.

[8] The SEC alleged that Jon-Paul Rorech from Deutsche Bank Securities Inc. tipped off Renato Negrin, a portfolio manager at Millennium Partners L.P., about a contemplated change to the bond structure of VNU N.V., and that

Because CDS spreads often reflect a substantial amount of private information transmitted via informed lender trading, changes in CDS pricing typically provide more timely feedback on a firm's performance than the pricing of its public debt or equity securities (Glantz, 2003, and Whitehead, 2012). [9] Significant movement in credit derivatives prices without any corresponding news usually serves as an indication to investors that private lenders have received information that is not yet public (Standard and Poor's, 2007). Prior empirical research also demonstrates that the CDS market often leads other securities markets in price discovery, including equity, equity options and bond markets (Blanco et al., 2005, Acharya and Johnson, 2007, Berndt and Ostrovnaya, 2007, and Qiu and Yu, 2012).[10] Blanco et al. (2005) highlight that price discovery is more likely to occur in the market in which informed traders transact the most. The micro-structure of the CDS market, its synthetic nature, and liquidity provision from different credit holders seeking to hedge their exposure make it the primary forum for trading credit risk, thus leading to faster price discovery. Lenders trading on a borrowers' private information and the consequent prompt reflection of such information in CDS spreads should make the firms' withholding of information evident to investors.

We predict that the frequent revelation of private information in the CDS market, which often leads public information disclosures and price discovery in other markets, affects managers' incentives to voluntarily disclose information to investors. Information disclosure

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Negrin purchased a CDS contract on VNU N.V for the Millennium hedge fund. The District Judge in the Southern District of New York, in a judgment of the case, extended the reach of Rule 10b-5 insider trading provisions to the CDS markets. However, legal scholars continue to argue that traditional insider trading laws applied to the CDS market pose serious challenges as the law must accommodate the distinctive features of trading in credit derivatives (e.g., Levene, 2012, and Yadav, 2013).

[9] For example, in a number of acquisition transactions (e.g., First Data, HCA Inc., Harrah's Entertainment Inc., and Anadarko Petroleum Corp), CDS spreads reflected information about upcoming deals weeks ahead of the deals' public announcements and price movements in the equity and bond markets (The Wall Street Journal, 2006, 2007, Bloomberg, 2006, and The New York Times, 2007).

[10] Longstaff et al. (2005) and Norden and Weber (2007) also suggest that the CDS market plays an important role in equity and bond price discovery.

theory sheds light on why voluntary disclosures will increase when an alternate information source, such as the CDS market, reveals managers' private information. Theoretical research on disclosure supports the full voluntary disclosure of managers' private information using adverse-selection-based arguments; non-disclosure will increase investor skepticism and decrease firm value, which in turn encourages managers to disclose (e.g., Grossman and Hart, 1980, and Grossman, 1981). Dye (1985) (and subsequently Jung and Kwon, 1988) show the possibility of partial disclosure when investors are unsure whether managers have private information. In the Dye (1985) model, if managers do not disclose, investors cannot distinguish whether the non-disclosure is due to the adverse content of the information or because managers are unaware of the information. Consequently, if managers do not disclose when investors have come to believe that they are informed, firm value will be adversely affected. As a result, when the probability of investors knowing that managers have received private information increases, more information will be disclosed, particularly adverse information.[11] In our setting, if private information is revealed through CDS prices, the probability that investors know that managers have private information increases, resulting in more voluntary disclosure.

In addition to the valuation implications of non-disclosure, managers may be concerned about an increased litigation threat if an alternate information source, such as the CDS market, reveals that managers have private information that is not disclosed to the public. Skinner (1997) discusses the legal ramifications of the non-disclosure of private information, in particular the non-disclosure of bad news. Clause (2) of SEC Rule 10b-5 makes it unlawful for managers "to omit to state a material fact necessary in order to make the statements made, in light of circumstances in which they were made, not misleading". While legal scholars concur that this rule does not impose a general duty to disclose, most agree that managers have an affirmative

[11] See Sletten (2012) for the empirical implications of Dye (1985) in an equity market setting.

disclosure obligation when a previous disclosure becomes inaccurate, incomplete, or misleading. Many earnings-related lawsuits allege that managers had an obligation to disclose private information in a timely manner if subsequent events rendered the company's statements in its previous public filings or press releases misleading. Further, in Sec. Act Rel. 6084, 17 SEC Dock. 1048, 1054 (1979), the SEC has stated that "there is a duty to correct statements made in any filing... if the statements have become inaccurate by virtue of subsequent events. ..." Thus, because CDS spreads often convey new information that may indicate that previous disclosures need to be updated, it is likely that the threat of litigation associated with non-disclosure will also induce managers to enhance their voluntary disclosure practices.

The theoretical implications of Dye (1985) and the litigation threat argument lead us to predict that the threat of CDS spreads revealing private information will have a significant effect on the voluntary disclosure of *bad* news. While a number of studies show that firms tend to preempt large negative earnings surprises (e.g., Skinner, 1994, 1997, and Kasznik and Lev, 1995), Kothari et al. (2009) argue that career concerns and managers' wealth tied to firm performance can induce managers to withhold the disclosure of bad news in the hope that subsequent favorable outcomes will obviate the need to disclose it. Survey evidence in Graham et al. (2005) also suggests that managers have strong incentives to withhold bad news. Because the information revelation of bad news is especially timely in the CDS market (Acharya and Johnson, 2007, and Qiu and Yu, 2012), managers' withholding of bad news should become evident to investors. Accordingly, managers will inform investors via public disclosures to mitigate adverse effects on firm value. Also, litigation concerns are greater when managers delay the disclosure of negative news (e.g., Skinner, 1994, 1997, and Baginski et al., 2002). Plaintiffs in class-action lawsuits typically claim large losses due to significant security price declines

caused by managers not disclosing adverse information promptly. Therefore, we expect the threat of lenders engaging in informed trading on negative private information in the CDS market to overshadow managers' career- and wealth-related incentives for delaying bad news and lead to its prompt disclosure.

Due to the threat that lenders may engage in informed trading in the CDS market, managers may be compelled to inform investors at the same time that they convey information to lenders, thus providing public disclosures prior to or simultaneous with information revelation through CDS spreads. However, managers may also choose to respond to informed trading by lenders, thus providing public disclosures subsequent to informing lenders and the consequent private information revelation through CDS spreads. Because our main focus is to examine whether CDS trading elicits enhanced voluntary disclosures and because the exact timing of the information provision from managers to lenders is unobservable, our predictions relate to overall disclosure intensity, without differentiating between these two potential disclosure strategies.

2.2 Change in lender monitoring intensity

An extensive literature in financial economics has studied the relationship between lender monitoring and credit-risk transfer mechanisms. Pennacchi (1988) and Gorton and Pennacchi (1995) examine credit risk transfer in the context of loan sales and demonstrate the significant dilution of the loan originator's monitoring incentives after a loan or a portion of the loan is sold on the secondary market. This moral hazard issue is more pronounced when credit risk is transferred via CDSs, because, unlike loan sales, where the control (or monitoring) rights are transferred to a buyer who has an incentive to continue monitoring (albeit with an inferior information set relative to the original lender's), a CDS contract does not transfer control or monitoring rights to the CDS counterparty (Marsh, 2009, Stulz, 2010, and Parlour and Winton

2013). Ashcraft and Santos (2009) and Roychowdhury and Martin (2014) provide consistent evidence, suggesting lower monitoring intensity when borrowers have traded CDS contracts.

We expect that the stockholders of the borrowing firm will step in to fill the monitoring vacuum caused by the lenders' weakened monitoring incentives. This prediction is motivated by Vashishtha (2014), who shows that there is a trade-off between monitoring by private lenders and shareholders. More specifically, he finds that, following debt covenant violations, an increase in monitoring intensity by lenders leads to an increase in lenders' demand for borrower-specific information. As a result, stockholders, who typically delegate some of the firm's monitoring to lenders, decrease their demand for information, leading to a reduction in the borrower's voluntary disclosures. Consistent with these arguments, we expect that a firm's stockholders will be cognizant of the lower intensity of lenders' monitoring in the presence of traded CDS contracts. Because, unlike lenders, stockholders cannot increase their monitoring by accessing borrowers' private information, we expect them to demand more public disclosures.

The reduction in lender monitoring also supports our prediction that CDS trading will discipline managers to disclose adverse information. Lenders tightly monitor underperforming borrowers via private communication, such as covenant compliance reports and frequent performance updates and projections. We therefore expect that the reduction in lender monitoring in the presence of CDS trading will be of particular concern to shareholders in these circumstances, leading them to pressure managers to publicly disclose bad news.

2.3 The importance of CDS liquidity and empirical predictions

We expect that via both channels – CDS spreads revealing private information and lenders reducing their monitoring intensity – CDSs affect managers' voluntary disclosure practices primarily when CDS contracts are actively traded, i.e., when CDS contracts are highly liquid.

With respect to the first channel, while there is little evidence on the role of liquidity in price discovery in the CDS market, prior research shows that liquidity enhances price discovery in the stock market. Subrahmanyam and Titman (2001) and Khanna and Sonti (2004) show that liquidity stimulates trading by informed investors, thus making stock prices more informative. Liquid prices reflect information on a more timely basis, increase the incorporation of private information, enhance the convergence of stock prices to fundamentals, and are more informative about a firm's future performance (e.g., Chordia et al., 2006, Sadka and Scherbina, 2006, Fang et al., 2009, and Kerr et al., 2013). The high involvement of informed financial institutions in liquidity provision in the CDS market further supports the importance of liquidity in enhancing the information content of CDS spreads. Qiu and Yu (2012) show that the number of dealers providing CDS spread quotes is determined to a large extent by the number of banking relationships of the CDS reference entity and that the reference entities that are traded most actively in the CDS market are associated with the highest level of informed trading. The authors infer that liquidity in the CDS market is provided by informed financial institutions.

The importance of CDS liquidity in our empirical predictions also extends to the second channel – enhanced disclosures as a result of reduced lender monitoring. Lenders are more likely to hedge their credit exposure using CDSs when they are able to enter CDS positions more easily, i.e., in the presence of actively traded CDS contracts (Saretto, and Tookes, 2013). Therefore, the reduction in a lender's monitoring efficiency will be most acute when CDSs are highly liquid. This, in turn, will lead to increased shareholder monitoring and the consequent increase in shareholder demand for enhanced voluntary disclosures.

To examine our hypotheses, we focus on one of the most important voluntary disclosure choices – management's decision to issue earnings forecasts. Beyer et al. (2010) show that, for

the average firm, earnings forecasts account for 15.67% of the quarterly return variance and represent the main accounting-based information disclosure. Particular to our setting, earnings information has a significant importance to CDS market participants as well as to lenders. Shivakumar et al. (2011) find that earnings forecasts represent an important information event in the CDS market. In addition, private lenders frequently get management updates about expected earnings via private financial disclosures, covenant compliance reports, and amendment and waiver requests, mainly because of the widespread use of earnings-based covenants in loan contracts. We thus expect managers to increase disclosure in the form of earnings forecasts in response to the threat that upcoming earnings news will be revealed in CDS spreads and/or in response to the increased shareholder demand for information following reduced lender monitoring. Specifically, we predict that firms with liquid CDSs are more likely to inform investors via earnings forecasts relative to non-CDS firms or firms with low liquidity CDSs.

Given that managers may inform investors through additional disclosures, we supplement our analyses by examining another voluntary disclosure channel – firm-initiated press releases. We predict that firms with liquid CDS contracts have higher press release intensity relative to other sample firms. Across earnings forecasts and press release disclosures, we expect liquid CDS trading to have a pronounced effect on the voluntary disclosure of bad news.

3. Sample, Data and Descriptive Statistics

3.1 Data sources and sample selection

We employ the First Call database to obtain management forecast characteristics.[12] The data on traded CDS contracts, including contract existence, the number of dealers and CDS

[12] Chuck et al. (2013) demonstrate that the First Call database does not incorporate all management forecasts (relative to a sample of forecasts hand-collected through a search of firm press releases). Because our sample period starts in 2002, this issue is mitigated for our study, as Chuck et al. (2013) show that First Call's coverage is more comprehensive after 1997.

spreads are from the Markit database, which covers the traded CDS contracts of U.S. firms starting in 2002. Data on firms' lending relationships is retrieved from the DealScan database provided by the Thomson Reuters Loan Pricing Corporation. Bond trading data is obtained from the TRACE (Trade Reporting and Compliance Engine) database and data on outstanding principal amounts and bond ratings are obtained from the Mergent Fixed Income Securities database. Data on firm-initiated press releases is from RavenPack News Analytics, which covers all news disseminated via Dow Jones Newswires. Data on firm characteristics is obtained from COMPUSTAT and CRSP. We obtain data on analyst coverage, equity issuances and institutional ownership from the I/B/E/S, Security Data Corporation's Global News Issues and Thomson-Reuters Institutional Holdings (13F) databases, respectively.

Table 1 summarizes the sample selection process. To align the availability of data from our two primary data sources, the First Call and Markit databases, we focus on the 2002-2010 period. For this period, First Call covers 8,702 firms, representing 57,396 firm-year observations. Requiring COMPUSTAT data on firm characteristics restricts our sample to 5,034 firms, representing 25,130 firm-year observations. After matching this final sample used in our tests with Markit, we obtain 775 firms with traded CDS contracts over the sample period, representing 4,517 firm-year observations.

3.2 Descriptive statistics

Table 2 provides the descriptive statistics for our primary variables of interest. Our main CDS liquidity measure is estimated based on the number of distinct dealers providing CDS spread quotes for the firm on a given day and serves as a proxy for market depth (following Qiu and Yu, 2012). We focus our analyses on CDS contracts with a five-year maturity, which represents the most commonly traded CDS contract maturity and the only one for which Markit

reports the number of distinct dealers providing CDS spread quotes.[13] We estimate the annual average of the number of distinct dealers providing daily quotes for each firm in our sample (*Depth*). CDS quotes are provided, on average, by six dealers, with a standard deviation of 4.4 and an interquartile range of 5.9, suggesting substantial variation in market depth across firms. To account for the inter-temporal evolution in the number of dealers providing spread quotes in the CDS market over our sample period, we define the *Liquid CDS* variable as equal to one if the firm's annual *Depth* measure in a given year is above the sample median depth in that year, zero otherwise (all variables are described in detail in the Appendix). The mean value of *Liquid CDS* indicates that 9% of firm-year observations in our sample have liquid CDS contracts (note that 18% of our firm-year observations have traded CDS contracts).

We define the variable, *Forecast*, to be equal to one if the firm issues at least one annual or quarterly forecast in a given year, zero otherwise. The mean value of *Forecast* is 0.43, which indicates that a considerable number of firm-year observations in our sample have management forecast activity.[14] *Number of Forecasts* is estimated as the number of annual and quarterly forecasts in a given year and has a sample mean of 2.05.[15] Sample firms are relatively large, as reflected by the mean and median values of total assets (*Firm Size*). The mean market-to-book ratio *(Market to Book)* is 3.063. The mean ratio of earnings before extraordinary items to total assets (*ROA*) is -0.003. As reflected by the standard deviation of *Return Volatility*, there is considerable variation in riskiness across sample firms. Sample firms have substantial institutional ownership and analyst following. A relatively small proportion (9.2%) of firm-year

[13] We focus on MR (Modified Restructuring) clause, which represents one of the most common contract types in North America (Levin, 2005, and Berndt, 2007).

[14] Kwak et al. (2012) report similar descriptive statistics for their 1997-2009 sample period.

[15] Following previous studies (e.g., Ajinkya et al. 2005, and Houston et al., 2010), we exclude earnings forecasts issued between the fiscal-period end and the earnings announcement date, i.e., pre-announcements, because these forecasts are considered a part of the management's earnings announcement strategy rather than voluntary disclosure activity. Our inferences remain the same when we include these pre-announcements in the measurement of forecast issuance and frequency (untabulated).

observations has equity issuances (*Equity Issuance*) and 32.7% of firm-year observations belong to high litigation industries (*High Litigation Industry)*.

4. Empirical Results

4.1 The impact of liquid CDS trading on management forecasts

We begin our analyses by testing the relation between earnings forecast activity and the existence of liquid CDS contracts for the firm, controlling for other firm characteristics that are likely to be associated with forecasting activity. We estimate the following model:

$$Forecast\ Activity = \beta_0 + \beta_1 Liquid\ CDS + \sum \beta_i Firm\ Control_i + \varepsilon \quad (1)$$

where *Forecast Activity* is one of the following two earnings forecast characteristics. *Forecast* is an indicator variable reflecting whether a firm has issued at least one earnings forecast in a given year. *Number of Forecasts* is the number of management forecasts issued within the year. Our main variable of interest, *Liquid CDS*, captures the existence of liquid CDS contracts for a firm, as measured in the year preceding the forecast year. We control for firm size, the market-to-book ratio, profitability, return volatility, institutional ownership, analyst following, equity issuance and membership in a high litigation industry (e.g., Baginski et al., 2002, Ajinkya, 2005, Bergman and Roychowdhury, 2008, Rogers and Van Buskirk, 2009, and Kwak et al., 2012).[16] Following prior research, except for profitability, return volatility and equity issuance, all of which relate to the forecast year, other determinants of *Forecast* are measured in the year preceding the forecast year. In all analyses, standard errors are clustered at the firm level. We estimate model 1 as a Probit (Poisson) regression when the dependent variable is *Forecast* (*Number of Forecasts*).

[16] In light of Greene's (2004) criticism relating to the inclusion of fixed effects in non-linear models, we do not incorporate year and industry fixed effects into the model. However, in untabulated robustness tests, when we add these fixed effects to the estimation, our findings and inferences are unchanged.

We present our findings in Table 3, Panel A. Consistent with our predictions, a significant and positive coefficient on *Liquid CDS* in column 1 indicates that the likelihood of an earnings forecast is positively associated with the existence of a firm's liquid CDS contracts. This result is also economically significant – the existence of liquid CDS contracts increases the likelihood of a forecast by 14.0%. For comparison, a one standard deviation change in institutional ownership and analyst following increases this likelihood by 8.6% and 12.7%, respectively. We also find that *Liquid CDS* is significantly associated with the number of management forecasts (column 2). The economic magnitude of this effect is sizable – the coefficient estimate of 0.395 on *Liquid CDS* corresponds to an incidence rate ratio of 1.49, suggesting that forecasts of firms with liquid CDSs are 1.49 times more frequent relative to forecasts issued by other sample firms.[17]

The coefficient estimates on control variables are generally consistent with prior studies.[18] Firms with higher profitability are more likely to voluntarily disclose earnings forecasts and issue a higher number of forecasts, while firms with a higher market-to-book ratio and higher stock return volatility are less likely to issue forecasts and forecast less frequently. Forecast activity is also increasing in institutional ownership and analyst following and is higher for firms belonging to high litigation industries, but is negatively associated with equity issuances.[19]

In Panel B of Table 3, we replicate our tests with an alternative liquidity measure based on the number of distinct maturities (terms) of a firm's CDS contracts traded on a given day. We

[17] In untabulated robustness tests, we exclude the crisis years of 2008 and 2009 due to low CDS market liquidity in these years. Our findings with respect to both forecast likelihood and frequency remain unchanged.

[18] While earnings forecast activity is expected to increase with firm size, we obtain a *negative* coefficient on the *Log(Total Assets)* variable. We find that this result is potentially due to the non-linearity in the relation between voluntary disclosure and firm size. In untabulated analyses, we include a squared term of the firm size measure and find a positive coefficient on firm size and a negative coefficient on the squared term. It is also possible that a negative coefficient on the *Log(Total Assets)* is driven by the high correlation between the *Log(Total Assets)* and *Analyst Following*. When the latter is excluded from the model, we observe a positive coefficient on *Log(Total Assets)*. Note that the relation between disclosure measures and our main variable of interest, *Liquid CDS*, is unaffected by these changes to the model specification.

[19] Our results are unchanged if the firms are assigned to a high litigation industry based on the measure developed by Kim and Skinner (2012) instead of the SIC-code-based measure used in our primary analyses. The results are also robust when we control for analyst forecast dispersion and firm leverage.

acknowledge that this measure is a noisy proxy for market depth, as it is likely to be affected by a firm's debt maturity structure and by differences in investors' hedging demand for different debt terms. Hence, we view this analysis as a robustness check with respect to the tests presented in Panel A.[20] We measure the annual average of the number of distinct terms for each firm in our sample. Sample firms have, on average, 7.6 distinct CDS contract terms. We set the term-count-based *Liquid CDS* variable to be equal to one if the firm's annual average term count measure in a given year is above the sample median term count in that year, zero otherwise. We continue to find that liquid CDSs are strongly positively associated with earnings forecast disclosures. The economic significance of the term-count-based liquid CDS measure is similar to that observed in our primary tests. The existence of liquid CDS contracts increases the likelihood of a management forecast by 13.7% and the incidence rate ratio for the management forecasts of firms with liquid CDS contracts relative to that of other sample firms is 1.47.

Overall, the results presented in Table 3 are consistent with our hypothesis that actively traded CDSs enhance managers' voluntary disclosure activity. However, an important potential concern is the possibility that firms with liquid CDS contracts are different from non-CDS firms or from firms with low liquidity CDS contracts in ways that are systematically related to voluntary disclosure choices. To examine whether endogeneity is likely to affect our findings, we employ three additional sets of tests, discussed in the next section: 1) propensity score matching, 2) liquidity change analyses, and 3) an instrumental variables approach.

4.2 Propensity score matching (PSM)

4.2.1 Determinants of liquid CDS trading

To conduct PSM, we compare the disclosure choices of liquid CDS firms with a matched

[20] Saretto and Tookes (2013) use the daily number of CDS quotes as their primary liquidity measure, which represents a combination of distinct term counts provided by different dealers. While this measure is not provided by the Markit database, it is similar in spirit to our term-count-based measure.

sample of non-CDS or non-liquid CDS firms. We construct a matched sample using PSM, as in Rosenbaum and Rubin (1983). PSM allows us to efficiently address the possibility that forecasting behavior is correlated with observable firm characteristics that are substantially different for high CDS liquidity firms relative to other sample firms (e.g., Dehejia and Wahba, 2002, and Li and Prabhala, 2007). We estimate the following liquid CDS Probit model:

$$\begin{aligned} \textit{Liquid CDS} = {} & \beta_0 + \beta_1 \textit{Asset Maturity} + \beta_2 \textit{Leverage} + \beta_3 \textit{Market-to-Book} + \beta_4 \textit{ROA} + \\ & \beta_5 \textit{Tangibility} + \beta_6 \textit{Firm Size} + \beta_7 \textit{Earnings Volatility} + \beta_8 \textit{Number of} \\ & \textit{Lenders} + \beta_9 \textit{Industry Peers' Bond Trading Volume} + \varepsilon \end{aligned} \quad (2)$$

Prior literature suggests that asset maturity, leverage, the market-to-book ratio, profitability, tangibility, asset size and earnings volatility are associated with the existence of CDS trading in general and CDS liquidity in particular (e.g., Ashcraft and Santos, 2009, Saretto and Tookes, 2013, Boehmer et al., 2014, and Martin and Roychowdhury, 2014). Following Qiu and Yu (2012), who find a strong positive relation between the number of distinct dealers providing CDS quotes and the number of firm lenders, we also control for the number of distinct lenders involved in a firm's outstanding syndicated loan contracts (*Number of Lenders*).

In addition, consistent with Oehmke and Zawadowski (2013) and Boehmer et al. (2014), we include a proxy for bond investors' hedging and speculative demand in the CDS market. We focus on the ease with which investors can accomplish their hedging and speculative objectives in the bond market without the need to trade in the CDS market. Oehmke and Zawadowski (2013) show that CDS markets are larger when it is more difficult to trade in the underlying bond securities. In other words, investors prefer the CDS market as the trading venue for their credit hedging and speculative needs when the bond market is characterized by trading frictions and low liquidity. Following Boehmer et al. (2014), we use the average bond trading volume of a firm's two-digit SIC industry peers to proxy for CDS trading demand. If investors need to trade

the credit risk of firms with a particular type of underlying asset (i.e., firms in a particular industry), the industry bond tradability is expected to impact the firm's CDS liquidity. Therefore, we expect a *negative* relation between the firm's CDS liquidity and its industry peers' bond trading volume (*Industry Peers' Bond Trading Volume*), as higher bond market liquidity should be associated with lower CDS trading needs.

We find that CDS liquidity is positively related to asset maturity, market-to-book ratio and asset size (Table 4, Panel A). The coefficient on *Number of Lenders* is positive and significant, consistent with the positive relation between CDS liquidity and the extent of lenders' informed trading (Qiu and Yu, 2012). As predicted, the coefficient on *Industry Peers' Bond Trading Volume* is negative and significant, in line with lower demand for a liquid CDS market when the bond market is more liquid (Oehmke and Zawadowski, 2013, and Boehmer et al., 2014).

4.2.2 Propensity score matching test

We present the PSM estimation in Table 4, Panels B and C. We match treatment observations (i.e., firm-year observations with liquid CDSs) with control observations (firm-year observations without CDSs or with non-liquid CDSs) based on the probability (i.e., the "propensity score") of *Liquid CDS*, as estimated in Panel A. We employ the commonly used "nearest neighbor matching" approach, with the further restriction that the absolute difference in the propensity scores of matched observations be below a pre-specified threshold (i.e., "caliper distance"). More specifically, we match without replacement and, to ensure appropriately matched samples, if no untreated observations have propensity scores within the specified caliper distance, the treated observation is left unmatched and is excluded from the matched sample. We successfully match 1,005 liquid CDS observations with the control group, yielding 2,010 firm-year observations for our analyses. We also test the matched samples for covariate balancing.

The differences in variable means between the high CDS liquidity sample and the control sample are insignificant for all firm characteristics employed in the liquid CDS Probit model (Panel B).

We present the regression analysis for the matched samples in Panel C of Table 4. Despite a substantially smaller sample size relative to the one employed in our primary tests, we find a statistically significant effect of *Liquid CDS* on earnings forecasts disclosure. This result holds for both the likelihood of issuing a management forecast and the number of management forecasts issued. In untabulated robustness analyses, we employ coarser caliper distances that yield slightly unbalanced but larger samples and find that our inferences are unchanged.

4.3 A change in CDS liquidity and voluntary disclosure

While the PSM analyses suggest that systematic differences between firms with liquid CDSs and other sample firms are unlikely to explain our main findings, we realize that it is always challenging to rule out endogeneity concerns. In particular, because prior literature shows that higher disclosure quality leads to more liquid equity trading due to reduced information asymmetry (e.g., Diamond and Verrecchia, 1991, and Leuz and Verrecchia, 2000), there is a concern of reverse causality, i.e., that voluntary disclosure could also affect liquidity in the CDS market. We would like to emphasize that in the CDS market, liquidity is provided primarily by informed financial institutions with access to a firm's private information (Qiu and Yu, 2012). Therefore, it is unlikely that a firm's public disclosures would affect the liquidity provision by these institutions. However, to rigorously address the potential reverse causality issues and further mitigate the endogeneity concerns associated with the characteristics of liquid CDS firms, we perform a number of tests to examine how an increase in CDS liquidity affects disclosure.[21]

[21] In untabulated analyses, we also examine the impact of CDS initiation on the propensity and frequency of management forecasts and find consistent results (i.e., CDS initiations increase voluntary disclosure). However, we do not pursue this line of inquiry because the main focus of our study is on liquid CDSs, and therefore a change from low to high CDS liquidity is the most relevant shock for our setting.

4.3.1 Management forecast activity following a switch to high CDS liquidity

In the first set of our analyses, we examine whether a firm's voluntary disclosure is more extensive following a switch from low to high CDS liquidity. We begin by identifying a sub-sample of firms that experienced an increase in CDS liquidity. For each firm, we isolate the year in which CDS liquidity changed from low to high for the first time during the sample period (year *t*) and then compare managers' voluntary disclosure in the pre- and post-change periods. We focus on the three-year period starting with the year of the CDS liquidity change (years *t* to *t+2)* versus the three-year period prior to the change (years *t-3* to *t-1*). Note that CDS liquidity remains stable after the switch to high liquidity, i.e., the vast majority of firms do not revert back to low liquidity in subsequent years. We estimate the following model:

$$Forecast\ Activity = \beta_0 + \beta_1 CDS\ Liquidity\ Switch + \sum \beta_i Firm\ Control_i + \varepsilon \quad (3)$$

where *Forecast Activity* is one of the two earning forecast variables, *Forecast* and *Number of Forecasts*, as defined in previous analyses. Our main variable of interest, *CDS Liquidity Switch*, captures the switch from low to high CDS liquidity. This indicator variable takes the value of one in the post-change period (years *t* to *t+2)* and zero in the pre-change period (years *t-3* to *t-1*). We include the same controls as in our primary tests.

We present the results of estimating model 3 in columns 1 and 2 of Table 5, Panel A. Consistent with our expectations, we find that the management forecast activity is significantly more intensive following a switch to high CDS liquidity (Table 5, Panel A). Economically, the likelihood of a management forecast is higher by 5.3%. The incidence rate ratio for management forecasts following a switch to high liquidity, relative to that of the previous period, is 1.54.

We acknowledge that the increase in CDS liquidity from the low to high category may be driven by changes in firm fundamentals and that the increase in voluntary disclosure could be

caused by these changes in fundamentals as well. If an increase in CDS liquidity is driven primarily by changes in firm fundamentals, we expect that these changes would also significantly increase liquidity in the equity market. Accordingly, we exclude firms that, in addition to an increase in CDS liquidity, also experience an increase in stock market liquidity in the same year (year *t*) and re-run our tests. An additional benefit of these analyses is that they further help to address the reverse causality concern. If an increase in management forecast activity is the primary driver of an increase in CDS liquidity, it will also likely increase the liquidity of a firm's equity (e.g., Diamond and Verrecchia, 1991, and Leuz and Verrecchia, 2000). Therefore, by focusing on firms that do not experience an increase in stock market liquidity simultaneously with an increase in CDS liquidity, it is more likely that our results are capturing the effect of an increase in CDS liquidity on voluntary disclosure activity, rather than the other way around.

We measure stock market liquidity by equity trading volume. We classify firms as having an increase in stock market liquidity if their annual average stock trading volume in year *t* is above the sample median in that year, while it was below the sample median in the previous year (consistent with our median-based cut off for measuring the change from low to high CDS liquidity). We present the results of this estimation in columns 3 and 4 of Panel A. We find that restricting our sample to firms that experience an increase in CDS liquidity but no simultaneous increase in equity market liquidity does not affect our findings. The coefficient estimates on *Liquid CDS Switch* are similar in both statistical and economic significance to those presented in columns 1 and 2. In unreported robustness tests, we measure equity market liquidity based on the firms' equity bid-ask spreads and find very similar results.

4.3.2 Changes analyses

To further mitigate endogeneity concerns, we estimate a changes specification, where we

relate changes in forecast activity to the change in CDS liquidity. Because it is challenging to define the change in forecast activity based on *Forecast*, which is an indicator variable, we focus on the change in the number of management forecasts in these analyses. We examine the same sample of firms that experience an increase in CDS liquidity that we employ in Panel A and estimate the following model:

$$\Delta \text{ Number of Forecasts} = \beta_0 + \beta_1 \Delta \text{ Liquid CDS} + \sum \beta_i \Delta \text{ Firm Control}_i + \varepsilon \quad (4)$$

where *Δ Number of Forecasts* is the change in the number of forecasts relative to the previous year. Our main variable of interest, *Δ Liquid CDS*, takes a value of 1 in the year of CDS liquidity increase (year *t*), zero otherwise. We include changes in all the control variables used in the previous tests. For each control variable, the change is measured relative to the previous year.

We present the results in column 1 of Table 5, Panel B. We find that the coefficient on *Δ Liquid CDS* is positive and highly significant. Economically, an increase in CDS liquidity from low to high increases the number of earnings forecasts by 0.47, which represents 22.8% of the sample mean. Although our changes specification controls for changes in firm characteristics, in column 2, we repeat the estimation after excluding firms that experience a simultaneous increase in stock market liquidity. The coefficient estimate on *Δ Liquid CDS* remains significant.

4.4 Instrumental variables approach

Our instrumental variables approach is based on the simultaneous estimation of the management forecast activity model (equation 1) and the CDS liquidity model (equation 2). To instrument CDS liquidity, we rely on the *Industry Peers' Bond Trading Volume* variable, which captures bond investors' hedging and speculative demand in the CDS market. The bond trading volume of industry peers should not directly affect a firm's voluntary disclosure choices. While it is possible that some disclosure patterns may be similar for firms in the same industry (e.g.,

Rogers et al., 2014), there is no obvious reason to expect a strong association between a firm's voluntary disclosure and its industry peers' bond trading volume. To further alleviate a concern that our instrument proxies for industry-specific disclosure trends, in untabulated robustness tests, we control for *Industry*×*Year* fixed effects and find similar results. Also note that even if some omitted correlated factors can contribute to both a firm's enhanced disclosure and higher industry peers' bond market liquidity, a *negative* relation between the liquidity in the bond and CDS markets indicates that these factors cannot simultaneously explain the *positive* effect of CDS liquidity on voluntary disclosure.

For firms with credit rating data on bonds outstanding, we also utilize a bond-rating-based measure as an alternative instrument that reflects bond investors' trading demand in the CDS market.[22] Qiu and Yu (2012) show an inverse U-shaped relation between CDS liquidity and credit rating, with bond investors' hedging demand in the CDS market being the strongest for bonds on the investment grade/speculative grade frontier. While bonds with very high credit quality have little hedging demand because bond investors are not interested in insuring them, as credit quality declines, bond investors become more interested in purchasing credit protection. However, when the credit rating falls below investment grade, credit protection becomes too expensive and bond investors may prefer to bear the risk instead of buying CDS contracts. In addition, many portfolio managers are forced to sell bonds when they reach speculative grade due to rating-based investment restrictions, further diminishing CDS hedging demand for speculative grade bonds.[23] We create an indicator variable, *Investment/Speculative Grade*

[22] We do not conduct the PSM analysis where the CDS liquidity model includes the *Investment/Speculative Grade Frontier* variable because the substantially smaller number of firms with available credit ratings results in very small matched samples.

[23] Qiu and Yu (2012) suggest that the lower CDS liquidity of risky firms may also be driven by the supply side. Dealers should be less willing to provide quotes for risky CDS reference entities, as these quotes are essentially open limit orders.

Frontier, which is equal to 1 if a firm's bonds outstanding in a given year have an average credit rating of BBB+, BBB, or BBB-, and zero otherwise. In untabulated analyses, we re-run the CDS liquidity Probit model with *Investment/Speculative Grade Frontier* to proxy for bond investors' trading demand and, as expected, find a positive and significant coefficient on this variable.

We do not expect this measure to be directly related to a firm's voluntary disclosure choices. To the best of our knowledge, there is no evidence in the extensive disclosure literature that voluntary disclosure varies with credit rating in general, or that it peaks at the investment grade/speculative grade boundary in particular. Although some may argue that firms with credit ratings at the investment/speculative grade boundary may have greater incentives to disclose, we do not observe this relation empirically. For the general COMPUSTAT population, we find that the likelihood and frequency of management forecasts are indeed insignificantly impacted by whether a firm's rating is at the investment/speculative grade frontier (untabulated).

We evaluate the incremental explanatory power of the instruments with a Wald Chi^2 test. The Chi^2 test statistic is highly significant in both specifications: 12.05 with a p-value of <0.001 when we use *Industry Peers' Bond Trading Volume* and 5.94 with a p-value of 0.015 when we use *Investment Grade/Speculative Grade Frontier*. This evidence suggests strong instruments. Although the Stock and Yogo (2005) thresholds for F-statistics are typically used to evaluate the strength of the instruments, these thresholds are relevant only for the standard two-stage least squares estimation with a linear first-stage model. To the best of our knowledge, similar benchmarks are not available for estimations with the first-stage Probit model, as in our case.

We present our findings in Table 6. The first two columns report the results of the estimation where the CDS liquidity model is based on *Industry Peers' Bond Trading Volume*, while the third and fourth columns report results based on *Investment/Speculative Grade*

Frontier. In all four specifications, we continue to find a significant and positive coefficient on *Liquid CDS*.[24] Note that the magnitudes of the coefficients on *Liquid CDS* in the IV estimations are not comparable to those in our primary analyses (Table 3) due to the way STATA conducts the simultaneous estimation of the first and the second stages when the second stage is a non-linear model.[25] While the results of the instrumental variables approach further support our proposition that managers of firms with liquid CDSs are more likely to voluntarily disclose earnings news, we acknowledge that we cannot be certain that our instrumental variables are truly exogenous.

4.5 Liquid CDSs and bad news management forecasts

4.5.1. The disciplining effect of liquid CDSs on bad news disclosure

Having reported results suggesting that liquid CDSs are associated with the manager's decision to issue earnings forecasts, we next explore whether liquid CDSs affect the voluntary disclosure of bad news. We expect the disciplining effect of liquid CDS trading to pressure managers to enhance the voluntary disclosure of bad news, despite managers' career- and wealth-related incentives for delaying the revelation of adverse information. To test our prediction, we limit our sample to forecasting firms (firm-year observations with at least one management forecast) and examine the frequency of bad news management forecasts. We estimate the following model:

$$Bad\ News\ Forecast\ Frequency\ Measure = \beta_0 + \beta_1 Liquid\ CDS + \sum \beta_i Firm\ Control_i + \varepsilon \quad (5)$$

[24] The IV estimation is also not sensitive to using the quintile and quartile rank measures of *Industry Peers' Bond Trading Volume* instead of the decile-based measures used in the tabulated tests (untabulated).

[25] To simultaneously estimate the first stage CDS liquidity model and the second-stage disclosure model, we use the "ivprobit" and "ivpoisson" functions in STATA. While this simultaneous approach yields correct standard errors that do not overestimate the statistical significance, the first stage is estimated as an OLS regression, yielding coefficients that are not comparable to our main estimation. To shed more light on the comparison of the coefficients, we estimate the IV model using a "manual" two-stage approach, in which the predicted value of the first-stage Probit model is used in the second stage. We obtain coefficient estimates that are similar in magnitude to those reported in Table 3. We do not tabulate this manual approach as it may overstate the statistical significance.

where *Bad News Forecast Frequency Measure* is one of the following two variables: *Bad News Forecast Frequency* and *Relative Bad News Forecast Frequency*, reflecting the number of bad news management forecasts within a given year and the proportion of bad news forecasts to the total number of forecasts within a given year, respectively. We identify bad news earnings forecasts by comparing the management forecast with the most recent consensus analyst forecast (e.g., Anilowski et al., 2007), after adjusting for bundled forecasts following the procedure in Rogers and Van Buskirk (2013). On average, the forecasting firms in our sample issue 1.77 bad news forecasts per year; the relative frequency of bad news forecasts to total forecasts is 37.3%. As in previous analyses, *Liquid CDS* reflects whether a firm has liquid CDS trading. We include the same set of firm-level controls as in our other tests.

We find strong support for our predictions: the coefficient on *Liquid CDS* is positive and significant when estimating both the absolute and relative frequency of bad news forecasts (Table 7, Panel A, columns 1 and 2). Economically, the incidence rate ratio of bad news forecasts for firms with liquid CDSs relative to that of other sample firms is 1.19. The proportion of bad news forecasts is higher by 5.1% for high CDS liquidity firms, which represents 13.6% of the mean bad news relative frequency for the sample firms. These results are consistent with liquid CDSs disciplining managers to voluntarily disclose negative earnings news.

In columns 3 and 4, we seek to provide further support for this inference by testing whether the effect of liquid CDSs on the frequency of bad news earnings forecasts is stronger when there is more negative credit news, i.e., when CDS spread changes are high. Because the revelation of private information through CDS spreads is especially timely when credit news is negative (Acharya and Johnson, 2007) and because shareholders are likely to impose significant pressure on managers to disclose when they observe meaningful increases in CDS spreads, we expect the

effect of liquid CDSs on bad news earnings forecasts to be stronger when CDS spread changes are high.[26] To conduct these tests, we employ our bad news forecast frequency model (model 5) and substitute *Liquid CDS* with two variables: *Liquid CDS High Spread Change* and *Liquid CDS Low Spread Change*. *Liquid CDS High Spread Change* (*Liquid CDS Low Spread Change*) is an indicator variable taking the value of one if a firm with liquid CDSs experiences an annual CDS spread change that falls into the top tercile (bottom two terciles) of the CDS spread changes in a given forecast year, zero otherwise. To capture firm specific news, we base the CDS spread change measure on a firm's abnormal CDS spread change relative to the average CDS spread change of all firms in the firm's credit rating category (we use four common credit rating categories: AAA to AA-, A+ to BBB+, BBB to BB and BB- to D).[27]

For both the absolute and relative frequency of bad news forecasts, we find that the effect of liquid CDSs on the frequency of bad news disclosure is substantially stronger when firms experience high CDS spread changes (an F-test indicates that the coefficients on *Liquid CDS High Spread Change* are significantly higher relative to those on *Liquid CDS Low Spread Change*). We view these CDS-spread-based results as further supporting the disciplining role of liquid CDS trading. The amplifying effect of high CDS spread changes on the impact of liquid CDSs on earnings forecasts also highlights that enhanced forecast disclosure is unlikely to be explained by the systematically different characteristics of firms with liquid CDSs.[28]

[26] Our tests presume that high CDS spread changes convey negative news to both debt and equity investors. While it is possible that what debt holders consider negative news, as estimated by CDS spreads, may represent positive news to equity holders, this possibility is most likely to occur around events associated with debt-equity conflicts of interest, such as mergers and acquisitions, debt issuances, share repurchases, or dividend payments (e.g., De Franco et al., 2013). It is less likely to occur with respect to earnings news.

[27] In untabulated robustness tests, we obtain similar results when we base *Liquid CDS High Spread Change (Liquid CDS Low Spread Change)* on the median value of abnormal CDS returns in a given year.

[28] In untabulated analysis, we substitute high CDS spread changes with an informed trading measure by adapting the approach in Acharya and Johnson (2007). Specifically, we regress the daily equity returns on five lags of the daily CDS spread changes and measure the degree of informed trading by the extent of the equity returns predicted by the lagged changes in CDS spreads, where negative predicted values indicate high informed trading in the CDS market.

4.5.2. The effect of CDS liquidity, conditional on the extent of negative news

To further validate that enhanced bad news forecast disclosure is a result of liquid CDSs and is not merely affected by firm characteristics correlated with negative news, we conduct our analyses for the sub-samples of firms that experience negative news of similar magnitude. The ideal experiment would be to compare two firms with the same level of negative news that is known to insiders, such as managers and private lenders, but unobservable to outsiders, with only one of the firms having actively traded CDSs. Then, controlling for other determinants of forecast disclosure, if the firm with liquid CDSs is found to have stronger bad news forecast activity than the firm without liquid CDSs, we would infer that active CDS trading indeed encourages managers to disclose bad earnings news. Absent an opportunity to perform this ideal experiment, we focus on realized negative news, relying on the plausible presumption that this news is known to insiders before its release to outside investors.

We employ a matching approach to identify a control firm for each sample firm with liquid CDSs that experiences negative news in the forecast year. We match each of these treatment firms with a firm without liquid CDSs based on the *magnitude* of negative news. We measure negative news by two proxies: a negative earnings surprise and an increase in abnormal CDS spreads in the year in which we measure management forecast activity. The advantage of the first measure is that it is strongly related to management forecast activity and is available for all firms in the sample. Our second proxy, the abnormal CDS spread change, precisely measures the extent of negative credit news, but is available only for firms with traded CDS contracts, which results in the control firms being sampled out from this population only.[29]

We find that the impact of liquid CDSs on voluntary disclosure is enhanced in the presence of high informed trading in the CDS market.

[29] We measure an earnings surprise as the difference between the actual EPS minus the mean analyst consensus forecast, deflated by the beginning stock price. The mean analyst consensus is based on the first summary forecast

We re-estimate model 5 for the matched samples and present the results of our analyses in Table 7, Panel B. In columns 1 and 2 (3 and 4), we use a negative earnings surprise (abnormal CDS spread change) to proxy for negative news. Supporting the disciplining role of liquid CDSs in the voluntary disclosure of bad earnings news, we find positive and significant coefficient estimates on *Liquid CDS* in all four specifications, suggesting that active CDS trading significantly increases both the absolute and relative frequency of bad news forecasts. For specifications based on a negative earnings surprise, we find that the incidence rate ratio of bad news forecasts for firms with liquid CDSs relative to that of the control sample firms is 1.50. The proportion of bad news forecasts is higher by 8.3% for firms with liquid CDSs, which represents 20.6% of the mean relative frequency of bad news for the firms employed in this analysis. The economic significance is similar when we proxy for negative news by the abnormal CDS spread change in columns 3 and 4. The incidence rate ratio of bad news forecasts for firms with liquid CDSs relative to that of the control sample firms is 1.34, while the proportion of bad news forecasts for firms with liquid CDSs is higher by 7.1%.

4.5.3. Liquid CDSs and the frequency of unbundled bad news management forecasts

To provide further support for the disciplining effect of liquid CDSs on bad news forecast disclosure, in the next set of analyses, we focus on the frequency of unbundled bad news earnings forecasts (forecasts that are not bundled with earnings announcements). Although issuing earnings forecasts in conjunction with earnings announcements has become a common practice in recent years (Anilowski et al., 2007, and Rogers and Van Buskirk, 2009), unbundled forecasts are typically more salient and likely to provide more timely earnings expectation updates to investors (e.g., Atiase et al., 2005, and Baginski et al., 2012). Consequently, if active

following the date of the previous year's earnings announcement. We measure the abnormal CDS spread change relative to the average CDS spread change of all firms in the firm's credit rating category (we use four common credit rating categories: AAA to AA-, A+ to BBB+, BBB to BB and BB- to D).

CDS trading pressures managers to promptly disclose adverse information, we predict that firms with liquid CDSs have a higher frequency of unbundled bad news earnings forecasts.

We estimate model 5 above by using the number of unbundled bad news management forecasts – *Unbundled Bad News Forecast Frequency* and *Relative Unbundled Bad News Forecast Frequency* – as the dependent variables. The results reported in Table 8 reveal a positive and significant relation between *Liquid CDS* and the frequency of unbundled bad news earnings forecasts. In terms of economic significance, the incidence rate ratio of unbundled bad news forecasts for firms with liquid CDSs, relative to that of other firms, is 1.19 and the proportion of unbundled bad news forecasts is higher by 5.5% for liquid CDS firms. This evidence that liquid CDSs induce the timely updating of earnings expectations via unbundled forecast disclosure further supports the disciplining role of active CDS trading. [30]

4.6 Liquid CDSs and firm-initiated press releases as an additional disclosure channel

While earnings forecasts are a firm's primary voluntary disclosure device (Beyer et al., 2010), managers may also convey information to investors via other channels. To provide a more complete picture of the effect of active CDS trading on disclosure, we next examine the relation between a firm's liquid CDSs and its disclosures via press releases. We acknowledge that quantifying voluntary disclosure via press release is challenging for two reasons. First, some press releases may accompany mandatory SEC filings, but, short of reading all the press releases issued by the sample firms, we cannot distinguish such releases from the voluntary ones. Second, the estimation of the tone of the press release news is mainly qualitative and relies on linguistic analyses, resulting in a less precise news measure than earnings forecast news. We therefore

[30] In untabulated tests, we examine two additional aspects of managers' forecast choices, forecast precision and accuracy. We do not find a significant relation between these forecast characteristics and liquid CDSs. With respect to precision, 96.4% of our sample firms issue point or range forecasts (versus open-ended or qualitative forecasts), which can explain, at least partially, the lack of power in our precision tests.

view our press release tests as largely supplementary to our earnings forecast analyses.

We obtain press release data from RavenPack, which reports press releases disseminated via Dow Jones Newswires and employs a variety of advanced textual analysis techniques to create a news sentiment score for each release. To ensure that we are capturing firm-initiated press releases, we only include those releases with a relevance score of 90 or greater. This score indicates how strongly the firm is related to the underlying news story; press releases with a relevance score below 90 often relate to cases where the firm is mentioned in press releases of other firms. To measure whether a press release conveys positive or negative news, we employ RavenPack's Composite Sentiment Score (CSS), which reflects the strength of the news sentiment in a press release. CSS scores range from 0 to 100, with 50 indicating the cutoff between positive and negative news. To create a sharper differentiation between negative and positive press releases, we allow for a neutral news range. We define press releases with a score above 51 as indicating positive news, press releases with a score below 49 as indicating negative news and press releases with a score between 49 and 51 as indicating neutral news. Our findings and inferences are robust to alternative cutoffs for the neutral news range (untabulated).[31]

After matching our sample to RavenPack, we identify press release data for the vast majority of the sample firms (23,555 firm-year observations). Untabulated descriptive statistics suggest that the mean (median) value of the number of press releases issued by the sample firms during a given year is 43.5 (34). We begin by investigating the effect of liquid CDSs on the

[31] CSS combines 5 sentiment scores, while ensuring that there is no sentiment disagreement amongst these scores. The PEQ score represents the news sentiment of a given news item according to the PEQ classifier, which identifies positive and negative words and phrases in articles about firms with publicly traded equity. The BEE score represents the news sentiment of a given story according to the BEE classifier, which identifies sentiment in news stories about earnings evaluations. The BMQ score represents the news sentiment of a given story according to the BMQ classifier, which specializes in short commentary and editorials on global equity markets. The BCA score represents the news sentiment of a given news story according to the BCA classifier, which specializes in reports on corporate action announcements. The BAM score represents the news sentiment of a given story according to the BAM classifier, which specializes in news stories about mergers, acquisitions and takeovers. The PEQ and BEE are dictionary-based measures, while the BMQ, BCA and BAM are based on the Bayesian learning approach.

number of press releases during a given year (because all the firms in our sample have at least one press release per year, we do not estimate the likelihood of a press release). We estimate model 1 with the *Number of Press Releases* as the dependent variable. We present the results of this estimation in column 1 of Table 9. We find a positive and significant coefficient estimate on *Liquid CDS*, suggesting that firms with actively traded CDS contracts issue a higher number of press releases. This effect is also economically significant – the incidence rate ratio for press releases issued by firms with liquid CDSs, relative to that of other sample firms, is 1.30.

We next examine whether active CDS trading disciplines managers to voluntarily disclose negative press releases. Untabulated descriptive statistics reveal that managers tend to communicate primarily positive and neutral news via press releases. Sample firms issue, on average, 20.36 and 19.88 positive and neutral press releases per year, respectively, while issuing only 2.95 negative press releases per year. We employ model 5 above to estimate the frequency of negative press releases. We employ two frequency measures: *Bad News Press Release Frequency* and *Relative Bad News Press Release Frequency*, reflecting the number of bad news press releases within a given year and the proportion of bad news press releases to the total number of press releases within a given year, respectively. We present the results in columns 2 and 3 of Table 9. The coefficient estimates on *Liquid CDS* are positive and significant in both columns. The incidence rate ratio of bad news press releases issued by firms with liquid CDSs relative to that of other sample firms is 1.36. In terms of relative frequency, the proportion of bad news press releases is higher by 1.0% for firms with high CDS liquidity. While this effect may seem to be modest, given the extremely low frequency of bad news press releases, it represents 15.8% of the average annual bad news press release frequency for the sample firms.

Overall, our tests of firm-initiated press releases supplement earnings forecast analyses and

provide further support for the role of liquid CDSs in determining voluntary disclosure. These tests also suggest that liquid CDSs induce voluntary disclosures through multiple channels.

5. Conclusion

The development of the CDS market is perhaps one of the most significant innovations in the financial institutional environment. The CDS market has grown rapidly in the last two decades, transacting trillions of dollars in notional amounts. However, the CDS market has its critics. A frequently expressed criticism is the market's susceptibility to insider trading, given that large financial institutions, the biggest participant group in the market, often have access to privileged information about CDS reference entities through their lending relationships. CDS spreads reflect a substantial amount of private information transmitted via lenders' informed trading, with changes in CDS pricing providing more timely feedback on a firm's performance than its bond or equity pricing does (e.g., Acharya and Johnson, 2007, Qiu and Yu, 2012, and Whitehead, 2012). Another concern often raised is that CDS trading leads to a reduction in lender monitoring of CDS reference entities, since lenders can shed their credit risk via CDSs (e.g., Hu and Black, 2008, Ashcraft and Santos, 2009, and Martin and Roychowdhury, 2014).

We propose that these aspects of the CDS market provide two channels through which CDSs enhance the voluntary disclosures of the reference entities. First, the threat of lenders trading on private information in the CDS market and the consequent prompt reflection of such information in CDS spreads will pressure managers to enhance their voluntary disclosures in order to mitigate the risks associated with non-disclosure. Second, managers will provide more voluntary disclosures to satisfy shareholders' demand for more information to compensate for the reduction in lender monitoring that follows CDS trading. We expect these effects on managers' voluntary disclosure to be evident mostly for firms with liquid CDSs because a liquid

market will lead to greater information revelation and also facilitate risk shedding by lenders.

Consistent with our hypothesis, we find that firms with actively traded CDS contracts are more likely to inform investors via earnings forecasts. We further find that these firms exhibit a higher frequency of bad news management forecasts and of unbundled bad news forecasts in particular. In addition to eliciting management forecasts, we also find that liquid CDSs prompt enhanced disclosures via firm-initiated press releases. Overall, our evidence suggests that active CDS trading plays a disciplining role by pressuring managers into promptly revealing their private information, thus enriching the information environment in capital markets.

Our paper sheds light on how changes in the institutional environment affect changes in managerial disclosure behavior. The advent of CDSs on the financial landscape has introduced an alternate information source that reveals private information before it is impounded in equity and bond prices. CDSs have also substantially altered lenders' monitoring dynamics by providing them with an opportunity to decrease credit risk exposure. Our findings suggest that informed trading by lenders in the CDS market and the reduction in lender monitoring intensity, although a cause for concern, result in a positive externality for capital markets. They help to alleviate managers' reluctance to issue management forecasts, particularly bad news forecasts, and encourage prompt disclosure of material price-sensitive information to market participants.

Specifically in relation to informed trading in the CDS market, prior research questions whether there is a case for the current regulatory response to curb insider trading in the CDS market (Acharya and Johnson, 2007). Our evidence suggests one potential unintended consequence of such regulatory action. Restricting informed trading in the CDS market may adversely impact the information environment in capital markets by displacing an effective incentive for managers' voluntary disclosure.

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APPENDIX
Variable Definitions

Variable		Definition
Analyst Following	=	Analyst coverage at the end of the fiscal year, calculated as log (1 + the number of I/B/E/S analysts who issue annual earnings forecasts for the firm).
Asset Maturity	=	Weighted maturity of the firm's assets, defined as (gross PPE divided by depreciation expense × gross PPE divided by total assets) + (current assets divided by cost of goods sold × current assets divided by total assets).
Bad News Forecast Frequency	=	The number of bad news management forecasts issued during the year.
Bad News Press Release Frequency	=	The number of bad news press releases issued during the year, estimated by the press releases covered by the RavenPack database, with a relevance score of 90 or greater. Bad news press releases are defined as those with RavenPack's Composite Sentiment Score (CSS) below 49.
Equity Issuance	=	An indicator variable equal to one if the firm issues equity during the forecast year, zero otherwise.
Forecast	=	An indicator variable equal to one if the firm issues at least one earnings forecast during the year, zero otherwise.
High Litigation Industry	=	An indicator variable that equals one for high litigation industries (SIC codes: 2844-2836, 3570-3577, 7370-7374, 3600-3674, 5200-5961, and 8731-8734), zero otherwise.
Industry Peers' Bond Trading Volume	=	This measure is based on the decile rank measure of the average annual bond trading volume for a firm's two-digit SIC industry peers. This measure is constructed as follow. For each firm in our sample, we use TRACE to retrieve the bond trading volume for all firms in the same two-digit SIC industry. We also obtain the face value of each bond on the issue date from the Mergent database. To account for size differences, we deflate the dollar volume of principal traded on a given day by the face value of the bond on the issue date. We then estimate the annual average bond trading volume of a firm's industry peers. We convert this measure into a decile rank bond trading volume measure to better reflect variation in bond market liquidity.
Institutional Ownership	=	Institutional ownership (%) at the end of a given fiscal year, measured as the fraction of total shares outstanding held by institutional investors.
Investment /Speculative Grade Frontier	=	This measure is an indicator variable equal to 1 if a firm's bonds outstanding in a given year have an average credit rating of BBB-, BBB, or BBB+, zero otherwise. We use the Mergent database to retrieve the credit ratings of a firm's bonds outstanding in a given year. If a firm has more than one bond outstanding, we average the credit ratings across all bonds.

APPENDIX A (continued)

Variable		Definition
Leverage	=	Total debt plus debt in current liabilities divided by total assets.
Liquid CDS	=	An indicator variable equal to one if the firm's annual *Depth* measure in a given year is above the sample median depth in that year, zero otherwise. *Depth* is the number of distinct dealers providing CDS spread quotes for the firm on a given day, averaged over the year. For the analyses in Table 3, Panel B, this indicator variable is equal to one if the firm's annual *Term Count* measure in a given year is above the sample median term count in that year, zero otherwise. *Term Count* is the count of distinct maturities (terms) of a firm's CDS contracts traded on a given day, averaged over the year.
Δ Liquid CDS	=	An indicator variable that takes the value of one in a year when CDS liquidity increases from low to high, zero otherwise.
Liquid CDS Switch	=	An indicator variable that takes the value of one in the post-CDS liquidity switch period (i.e., the year in which a firm's CDS liquidity switches from low to high and the following two years) and zero in the pre-switch period (i.e., three years prior to the year in which a firm's CDS liquidity switches from low to high).
Liquid CDS High Spread Change (Liquid CDS Low Spread Change)	=	An indicator variable equal to one if a firm with liquid CDSs experiences an annual CDS spread change that falls in the top tercile (bottom two terciles) of the CDS spread changes in a given forecast year, zero otherwise. To capture firm specific news, the CDS spread change measure is based on a firm's abnormal CDS spread change relative to the average CDS spread change of all firms in the firm's credit rating category (we use four common credit rating categories: AAA to AA-, A+ to BBB+, BBB to BB, and BB- to D).
Log (Total Assets)	=	The natural logarithm of total assets at the end of a fiscal year.
Market to Book	=	The ratio of the market value to the book value of equity at the fiscal year end.
Number of Forecasts	=	Number of management earnings forecasts issued during the year.
Δ Number of Forecasts	=	The annual change in the number of earnings forecasts issued.
Number of Lenders	=	The decile rank measure of the number of unique lenders involved in a firm's outstanding syndicated loans in a given year, identified using the DealScan database.
Number of Press Releases	=	The number of press releases issued by a firm during a given year, estimated by the press releases covered by the RavenPack database, with a relevance score of 90 or greater.
Relative Bad News Forecast Frequency	=	The relative frequency of bad news management earnings forecasts issued during the year, defined as the number of bad news forecasts divided by the total number of forecasts.
Relative Bad News Press Release Frequency	=	The relative frequency of bad news press releases issued during the year, defined as the number of bad news press releases divided by the total number of press releases.
Relative Unbundled Bad News Forecast Frequency	=	The relative frequency of unbundled bad news management earnings forecasts issued during the year, defined as the number of unbundled bad news forecasts divided by the total number of forecasts.
Return Volatility	=	The standard deviation of the firm's daily stock returns measured over the forecast year (multiplied by 100 for scaling purposes).

APPENDIX A (continued)

Variable		Definition
ROA	=	The return on assets, calculated as income before extraordinary items divided by total assets.
Tangibility	=	Net PPE divided by total assets.
Unbundled Bad News Forecast Frequency	=	The number of unbundled bad news management forecasts issued during the year. Unbundled forecasts are defined as management forecasts that are not bundled with earnings announcements (i.e., forecasts issued outside of the two day window around an earnings announcement).
Volatility of Earnings	=	The standard deviation of annual changes in earnings divided by total assets calculated over five years prior to the forecast measurement.

TABLE 1
Sample Selection and Composition

This table presents the sample selection process.

	# of firms	# of firm-years
(1) Observations with First Call coverage from 2002 to 2010	8,702	57,396
(2) Sample after eliminating observations with missing data	5,034	25,130
Of these, observations with traded CDS contracts	775	4,517

TABLE 2
Descriptive Statistics

This table provides descriptive statistics (see Table 1 for the sample selection procedure). Variables are defined in the Appendix.

Variable	N	Mean	Std Dev	Q1	Median	Q3
Depth	4,517	6.045	4.405	2.644	4.568	8.596
Liquid CDS	25,130	0.090	0.286	0	0	0
Forecast	25,130	0.425	0.494	0	0	1
Number of Forecasts	25,130	2.050	3.009	0	0	4
Log (Total Assets)	25,130	7.091	1.888	5.703	6.957	8.275
Market to Book	25,130	3.063	3.092	1.411	2.135	3.470
ROA	25,130	-0.003	0.172	0.000	0.031	0.073
Return Volatility	25,130	3.039	1.651	1.865	2.605	3.754
Institutional Ownership (%)	25,130	51.313	34.246	19.934	56.679	81.016
Analyst Following	25,130	1.956	0.621	1.386	1.946	2.398
Equity Issuance	25,130	0.092	0.288	0	0	0
High Litigation Industry	25,130	0.327	0.469	0	0	1

TABLE 3
The Relation between Active CDS Trading and Management Forecasts

This table presents the analyses of the association between liquid CDS trading and management forecasting behavior. The analyses in Panel A utilize our primary CDS liquidity measure based on the *Depth* of a firm's traded CDS contracts. The analyses in Panel B utilize an alternative CDS liquidity measure based on the *Term Count* of a firm's traded CDS contracts. In both panels, specification 1 presents a Probit regression of the likelihood of a firm issuing at least one earnings forecast during the year, while specification 2 presents a Poisson regression of the count of the number of management forecasts within the year. Robust z-statistics are in brackets and are clustered by firm.

Panel A: Liquid CDSs and the Likelihood and Number of Management Forecasts

	Forecast	*Number of Forecasts*
	(1)	(2)
Liquid CDS	**0.359*** **	**0.395*** **
	[5.39]	**[6.80]**
Log (Total Assets)	-0.132***	-0.092***
	[-11.71]	[-7.14]
Market to Book	-0.018***	-0.009*
	[-3.77]	[-1.73]
ROA	1.093***	1.771***
	[12.11]	[13.94]
Institutional Ownership	0.006***	0.008***
	[13.33]	[13.11]
Analyst Following	0.524***	0.506***
	[16.79]	[15.65]
Return Volatility	-0.090***	-0.113***
	[-11.87]	[-12.28]
Equity Issuance	-0.204***	-0.191***
	[-5.61]	[-4.23]
High Litigation Industry	0.201***	0.219***
	[5.09]	[5.48]
Number of obs.	25,130	25,130
Pseudo R^2	0.118	0.138

(continued)

TABLE 3 (continued)
The Relation between Active CDS Trading and Management Forecasts

Panel B: Alternative Measure of CDS Liquidity		
	Forecast	*Number of Forecasts*
	(1)	(2)
Liquid CDS	**0.353*** **	**0.387*** **
	[5.48]	**[6.90]**
Log (Total Assets)	-0.132***	-0.090***
	[-11.76]	[-7.01]
Market to Book	-0.018***	-0.008
	[-3.72]	[-1.62]
ROA	1.097***	1.783***
	[12.13]	[13.99]
Institutional Ownership	0.006***	0.008***
	[13.31]	[13.13]
Analyst Following	0.527***	0.510***
	[16.90]	[15.81]
Return Volatility	-0.091***	-0.114***
	[-11.97]	[-12.37]
Equity Issuance	-0.206***	-0.195***
	[-5.68]	[-4.31]
High Litigation Industry	0.201***	0.220***
	[5.10]	[5.50]
Number of obs.	25,130	25,130
Pseudo R^2	0.118	0.138

TABLE 4

Propensity Score Matching

This table presents the propensity score matching (PSM) analyses. Panel A presents the first stage Probit model of liquid CDS trading, with *Liquid CDS* as the dependent variable. Panel B reports the differences in means for explanatory variables between the liquid CDS sample and the matched-firm sample to provide evidence of covariate balancing in the PSM estimation. Panel C presents the PSM model estimation. Specification (1) presents a Probit regression of the likelihood of a firm issuing at least one earnings forecast during the year, while specification (2) presents a Poisson regression of the count of the number of management forecasts within the year. Robust z-statistics are in brackets and are clustered by firm.

Panel A: CDS Liquidity Probit Model

	Liquid CDS
	(1)
Asset Maturity	0.010*
	[1.74]
Leverage	0.329
	[1.44]
MTB	0.026***
	[2.81]
ROA	0.033
	[0.09]
Tangibility	-0.409
	[-1.55]
Log (Total Assets)	0.643***
	[21.14]
Volatility of Earnings	-0.74
	[-1.54]
Number of Lenders	0.180***
	[9.67]
Industry Peers' Bond Trading Volume	-0.042***
	[-3.47]
Number of obs.	19,340
Pseudo R^2	0.467

(continued)

TABLE 4 (continued)
Propensity Score Matching

Panel B: Covariate Balancing

	Means		Difference in means
	Liquid CDS =1	*Liquid CDS =0*	[t-stats]
Asset Maturity	11.58	12.19	-0.61
			[1.32]
Leverage	0.28	0.28	-0.01
			[0.98]
MTB	3.17	3.18	-0.01
			[0.05]
ROA	0.05	0.05	0.00
			[0.11]
Tangibility	0.35	0.36	-0.02
			[1.57]
Log (Total Assets)	9.06	9.10	-0.04
			[0.79]
Volatility of Earnings	0.04	0.04	0.00
			[0.72]
Number of Lenders	8.36	8.23	0.14
			[-1.42]
Industry Peers' Bond Trading Volume	6.19	6.20	0.00
			[0.01]
Number of obs.	1,005	1,005	

TABLE 4 (continued)
Propensity Score Matching

Panel C: Propensity Score Matching		
	Forecast	*Number of Forecasts*
	(1)	(2)
Liquid CDS	**0.326*** **	**0.304*** **
	[3.28]	**[3.77]**
Log (Total Assets)	-0.199***	-0.110***
	[-4.24]	[-2.84]
Market to Book	-0.010	0.008
	[-0.67]	[0.67]
ROA	-0.731	0.048
	[-1.40]	[0.12]
Institutional Ownership	0.008***	0.007***
	[5.11]	[4.41]
Analyst Following	0.410***	0.390***
	[4.86]	[5.59]
Return Volatility	-0.190***	-0.183***
	[-6.73]	[-7.18]
Equity Issuance	-0.148	-0.197
	[-1.03]	[-1.47]
High Litigation Industry	0.105	0.066
	[0.96]	[0.78]
Number of obs.	2,010	2,010
Pseudo R^2	0.150	0.122

(continued)

TABLE 5
Change in CDS Liquidity

This table presents analyses of CDS liquidity changes. The sample period is restricted to the three-year period prior to the year of the liquidity change and the three-year period starting with the year of the liquidity change. Panel A presents analyses of the switch in CDS liquidity from the low to high category. Columns (1) and (2) present the analyses for all firms that experience a switch in liquidity over our sample period. In Columns (3) and (4), the sample is restricted to those firms that do not experience an *increase* in stock market liquidity in a year when CDS liquidity increases. Specifications (1) and (3) present Probit regressions of the likelihood of a firm issuing at least one earnings forecast during the year, while specifications (2) and (4) present Poisson regressions of the number of management forecasts within the year. Panel B presents changes specification using OLS, where we relate *changes* in forecast activity to the change in CDS liquidity. Column (1) presents the analyses for all firms that experience an increase in liquidity over our sample period. In column (2), the sample is restricted to firms that do not experience an increase in stock market liquidity in a year when CDS liquidity increases. Robust z-statistics (t-statistics) are in brackets and are clustered by firm.

Panel A: Liquidity Switch Analyses

	Increased liquidity sample		*Increased liquidity sample, excluding firms with a concurrent increase in stock liquidity*	
	Forecast	*Number of Forecasts*	*Forecast*	*Number of Forecasts*
	(1)	(2)	(3)	(4)
Liquid CDS Switch	**0.140****	**0.433*****	**0.140****	**0.437*****
	[2.42]	**[8.15]**	**[2.31]**	**[7.97]**
Log (Total Assets)	-0.077*	-0.055	-0.062	-0.039
	[-1.69]	[-1.39]	[-1.30]	[-0.94]
Market to Book	0.046***	0.034***	0.049***	0.037***
	[2.94]	[4.23]	[2.93]	[4.36]
ROA	-0.523	0.522	-0.844	0.239
	[-0.87]	[1.13]	[-1.28]	[0.50]
Institutional Ownership	0.004**	0.002	0.004**	0.002
	[2.32]	[1.50]	[2.25]	[1.53]
Analyst Following	0.216**	0.105	0.163	0.083
	[1.97]	[1.26]	[1.43]	[0.93]
Return Volatility	-0.022	-0.074**	-0.022	-0.073**
	[-0.63]	[-2.37]	[-0.56]	[-2.24]
Equity Issuance	-0.292**	-0.198*	-0.293**	-0.188
	[-2.52]	[-1.68]	[-2.41]	[-1.50]
High Litigation Industry	0.147	0.222**	0.108	0.191**
	[1.15]	[2.43]	[0.80]	[1.98]
Number of obs.	2,292	2,292	2,083	2,083
Pseudo R^2	0.034	0.054	0.0300	0.0509

TABLE 5 (continued)

Change in CDS Liquidity

Panel B: Changes Analyses

	Increased liquidity sample	*Increased liquidity sample, excluding firms with a concurrent increase in stock liquidity*
	Δ Number of Forecasts	*Δ Number of Forecasts*
	(1)	(2)
Δ Liquid CDS	**0.467*** **	**0.447*** **
	[2.97]	**[2.78]**
Δ Log (Total Assets)	0.929***	0.865***
	[3.50]	[3.11]
Δ Market to Book	0.095***	0.093***
	[3.18]	[2.92]
Δ ROA	1.068	0.689
	[1.33]	[0.72]
Δ Institutional Ownership	0.003	0.003
	[1.02]	[1.02]
Δ Analyst Following	-0.153	-0.202
	[-0.72]	[-0.88]
Δ Return Volatility	0.05	0.023
	[0.83]	[0.34]
Δ Equity Issuance	0.053	0.028
	[0.33]	[0.16]
Number of obs.	2,073	1,885
Adjusted R^2	0.0154	0.0130

TABLE 6
Instrumental Variable Analyses

This table presents the second-stage estimation of the instrumental variable (IV) analyses, estimated simultaneously with the first-stage CDS liquidity model. Specifications (1) and (2) are based on the *Liquid CDS* model with the *Bond Investors' Demand* measure to proxy for bond investors hedging and speculative demand in the CDS market, while specifications (3) and (4) are based on the *Liquid CDS* model with the *Investment/Speculative Grade Frontier* measure. Specifications (1) and (3) present a Probit regression of the likelihood of a firm issuing at least one earnings forecast during the year and specifications (2) and (4) present a Poisson regression of the count of the number of management forecasts within the year. Robust z-statistics are in brackets and are clustered by firm.

	Instrument = Bond Investors' Demand		*Instrument = Investment/Speculative Grade Frontier*	
	Forecast	*Number of Forecasts*	*Forecast*	*Number of Forecasts*
	(1)	(2)	(3)	(4)
Liquid CDS	**2.303*** **	**2.614*** **	**1.585*** **	**1.689*** **
	[6.52]	**[5.12]**	**[4.53]**	**[4.06]**
Log (Total Assets)	-0.227***	-0.239***	-0.290***	-0.325***
	[-8.50]	[-5.61]	[-5.52]	[-4.38]
Market to Book	-0.030***	-0.030***	-0.013**	-0.006
	[-8.27]	[-4.40]	[-2.12]	[-0.54]
ROA	1.149***	1.759***	-0.217	0.257
	[14.37]	[11.48]	[-0.95]	[0.72]
Institutional Ownership	0.006***	0.007***	0.003***	0.003***
	[14.95]	[11.36]	[3.37]	[2.88]
Analyst Following	0.289***	0.463***	0.058	0.244**
	[11.36]	[9.47]	[0.86]	[2.56]
Return Volatility	-0.097***	-0.112***	-0.180***	-0.180***
	[-11.47]	[-8.06]	[-11.93]	[-8.17]
Equity Issuance	-0.150***	-0.111*	-0.249***	-0.245***
	[-4.16]	[-1.91]	[-4.32]	[-2.65]
High Litigation Industry	0.153***	0.153***	0.123***	0.104
	[8.50]	[3.10]	[3.12]	[1.25]
Number of obs.	19,340	19,340	5,507	5,507

TABLE 7
Active CDS Trading and the Frequency of Bad News Management Forecasts

This table presents the analyses of the relation between liquid CDS trading and the frequency of bad news earnings forecasts. The analyses are restricted to forecasting firms (i.e., firm-year observations with at least one management forecast). Columns (1) and (2) of Panel A present the analyses of the frequency of bad news earnings forecasts, while columns (3) and (4) present the analyses of the frequency of bad news earnings forecasts, conditional on credit news (measured by the magnitude of the abnormal annual CDS spread change). Specifications (1) and (3) present Poisson regressions of the frequency of bad news management forecasts, while specifications (2) and (4) present Tobit regressions of the relative frequency of bad news earnings forecasts (i.e., the ratio of bad news to the total number of management forecasts). Panel B presents analyses for the sample of liquid CDS firms with negative news in the forecast year and their matched control firms. For each sample firm with liquid CDSs that experiences negative news we match a firm without liquid CDSs based on the magnitude of negative news. In Columns (1) and (2) we match firms based on the magnitude of a negative earnings surprise. In columns (3) and (4), we match firms based on the magnitude of the increase in abnormal CDS spread. Robust z-statistics are in brackets and are clustered by firm.

Panel A: Liquid CDSs and the Frequency of Bad News Management Forecasts

	Bad News Forecast Frequency	*Relative Bad News Forecast Frequency*	*Bad News Forecast Frequency*	*Relative Bad News Forecast Frequency*
	(1)	(2)	(3)	(4)
Liquid CDS	**0.177*** **	**0.051** **		
	[3.31]	**[2.35]**		
Liquid CDS Low Spread Change			**0.119** **	**0.032**
			[1.97]	**[1.37]**
Liquid CDS High Spread Change			**0.276*** **	**0.084*** **
			[4.67]	**[3.28]**
Log (Total Assets)	-0.017	-0.029***	-0.016	-0.029***
	[-1.32]	[-4.93]	[-1.29]	[-4.92]
Market to Book	-0.010**	-0.009***	-0.010**	-0.009***
	[-2.16]	[-4.37]	[-2.14]	[-4.36]
ROA	0.151	-0.343***	0.154	-0.342***
	[1.42]	[-5.78]	[1.45]	[-5.78]
Institutional Ownership	0.004***	0.001***	0.004***	0.001***
	[7.69]	[4.84]	[7.71]	[4.84]
Analyst Following	0.024	-0.044***	0.024	-0.044***
	[0.78]	[-3.14]	[0.79]	[-3.14]
Return Volatility	-0.006	0.004	-0.006	0.003
	[-0.58]	[0.69]	[-0.63]	[0.66]
Equity Issuance	0.005	0.03	0.004	0.03
	[0.13]	[1.39]	[0.11]	[1.38]
High Litigation Industry	-0.017	-0.060***	-0.016	-0.060***
	[-0.47]	[-4.12]	[-0.46]	[-4.12]
F-test: *Liquid CDS High Spread Change* vs. *Liquid CDS Low Spread Change [p-value]*			0.157	0.051
			[0.006]	[0.034]
Number of obs.	10,692	10,692	10,692	10,692
Pseudo R^2	0.009	0.018	0.009	0.018

TABLE 7 (continued)
Active CDS Trading and the Frequency of Bad News Management Forecasts

Panel B: Negative news sample

Negative news measure =	*Negative earnings surprise*		*Increase in abnormal CDS spread*	
	Bad News Forecast Frequency	*Relative Bad News Forecast Frequency*	*Bad News Forecast Frequency*	*Relative Bad News Forecast Frequency*
	(1)	(2)	(3)	(4)
Liquid CDS	**0.407*** **	**0.083***	**0.290*** **	**0.071** **
	[4.54]	**[1.79]**	**[3.69]**	**[2.19]**
Log (Total Assets)	-0.078***	-0.050***	-0.071*	-0.037**
	[-2.94]	[-3.30]	[-1.83]	[-2.11]
Market to Book	-0.008	-0.011**	-0.023*	-0.006
	[-0.86]	[-2.28]	[-1.71]	[-1.24]
ROA	0.581*	-0.095	0.233	-0.561*
	[1.88]	[-0.54]	[0.40]	[-1.74]
Institutional Ownership	0.002*	0.001*	0.003*	0.001**
	[1.83]	[1.80]	[1.73]	[2.10]
Analyst Following	-0.015	-0.055	0.031	-0.038
	[-0.23]	[-1.45]	[0.39]	[-1.04]
Return Volatility	0.003	-0.004	0.013	-0.002
	[0.12]	[-0.34]	[0.40]	[-0.11]
Equity Issuance	-0.157	-0.049	-0.153	0.068
	[-1.31]	[-0.74]	[-1.22]	[1.08]
High Litigation Industry	0.111*	-0.009	-0.124	-0.091***
	[1.67]	[-0.26]	[-1.33]	[-2.64]
Number of obs.	1,150	1,150	1,122	1,122
Pseudo R^2	0.0160	0.0251	0.0158	0.0305

TABLE 8
Active CDS Trading and the Frequency of *Unbundled* Bad News Management Forecasts

This table presents the analyses of the relation between liquid CDS trading and the frequency of *unbundled* bad news earnings forecasts (i.e., forecasts that are not issued in conjunction with earnings announcements). Specification (1) presents a Poisson regression of the frequency of bad news management forecasts, while specification (2) presents a Tobit regression of the relative frequency of bad news earnings forecasts (i.e., the ratio of bad news to the total number of management forecasts). Robust z-statistics are in brackets and are clustered by firm.

	Unbundled Bad News Forecast Frequency (1)	*Relative Unbundled Bad News Forecast Frequency* (2)
Liquid CDS	**0.177*** **	**0.055** **
	[2.74]	**[2.36]**
Log (Total Assets)	0.032**	-0.005
	[2.12]	[-0.77]
Market to Book	0.007	-0.000
	[1.22]	[-0.01]
ROA	0.401**	-0.135**
	[2.46]	[-2.14]
Institutional Ownership	0.003***	0.000**
	[4.43]	[2.01]
Analyst Following	-0.043	-0.058***
	[-1.08]	[-3.91]
Return Volatility	-0.039***	-0.010*
	[-2.80]	[-1.89]
Equity Issuance	-0.210***	-0.063**
	[-3.43]	[-2.57]
High Litigation Industry	0.034	-0.012
	[0.77]	[-0.79]
Number of obs.	10,692	10,692
Pseudo R^2	0.009	0.004

TABLE 9
Active CDS Trading and Voluntary Disclosure via Press Releases

This table presents the analyses of the association between liquid CDS trading and voluntary disclosure via press releases. Column (1) presents the Poisson regression analysis of the number of press releases. Column (2) presents a Poisson regression of the frequency of negative press releases. Column (3) presents a Tobit regression of the relative frequency of negative press releases (the ratio of negative press releases to the total number of press releases). Robust z-statistics are in brackets and are clustered by firm.

	Number of Press Releases	*Bad News Press Release Frequency*	*Relative Bad News Press Release Frequency*
	(1)	(2)	(3)
Liquid CDS	**0.264*** **	**0.307*** **	**0.010*** **
	[7.79]	**[6.86]**	**[2.62]**
Log (Total Assets)	0.179***	0.296***	0.018***
	[22.11]	[28.93]	[20.05]
Market to Book	0.019***	0.007	-0.001
	[6.22]	[1.34]	[-1.60]
ROA	-0.282***	-0.509***	-0.045***
	[-7.42]	[-6.48]	[-7.05]
Institutional Ownership	0.001*	0.001**	0.000
	[1.89]	[2.36]	[0.81]
Analyst Following	0.205***	0.102***	-0.007***
	[10.93]	[3.33]	[-2.70]
Return Volatility	0.015***	0.090***	0.009***
	[4.35]	[14.60]	[12.81]
Equity Issuance	0.098***	0.144***	0.006*
	[5.82]	[4.50]	[1.91]
High Litigation Industry	0.247***	0.203***	0.006**
	[10.41]	[5.05]	[2.07]
Number of obs.	23,555	23,555	23,555
Pseudo R^2	0.344	0.182	0.178