Mandatory XBRL Adoption and Credit Default Swap Spreads

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SYNPOSIS: This paper documents a negative relation between CDS spreads and the SEC's mandate for registrants to file financial statements using eXtensible Business Reporting Language (XBRL). For financial statement users and others, this result means that post-XBRL-adoption CDS spreads dropped on average by 103–137 basis points, depending on the estimation model. We further confirm this relation by showing that CDS spreads decreased more for firms with lower accrual quality and greater organizational complexity in the pre-adoption period, and with more standardized official XBRL elements in the post-adoption period. These results conform to the incomplete accounting information model of Duffie and Lando (2001) and imply that the drop in CDS spreads following mandatory XBRL derives from (i) a reduction in firm default risk from better outside monitoring and (ii) an increase in the quality of information about firm default risk from lower information cost.

Keywords: XBRL mandate; CDS market; credit spread; financial statement comparability; SEC regulation.

We thank Jap Efendi, Blake Phillips, James Thompson, Vernon Richardson, participants, discussants, and reviewers at the 2014 American Accounting Association (AAA), the 2014 Conference on Financial Economics and Accounting, the 2015 AAA Midyear AIS Conference, and seminar participants at the City University of Hong Kong, Fudan University, McGill University, Rutgers University, the University of California, Riverside, and the University of Sydney. J.H. Lim acknowledges funding by SSHRC (435-2015-0630), UW-SSHRC, and CGA/CAAA research grant awards, as well as PwC professorships at the University of Waterloo. An earlier version of this paper won the KPMG Foundation *Best Paper Award* at the 2015 Mid-Year Meeting of the Accounting Information Systems Section of the AAA.

INTRODUCTION

In 2009, SEC Release 33-9002 mandated that U.S. publicly listed firms begin preparing their financial reports using the eXtensible Business Reporting Language (XBRL), which is an electronic platform to standardize the format of financial information. With standardized financial information, XBRL potentially lowers investors' information search, acquisition, and processing costs, thus allowing them to consider more firm-specific information in evaluating securities (Dong et al. 2013). A change in investors' information costs also incentivizes and, potentially, changes managers' disclosure and investment decisions (Blankespoor 2012). Given these potential changes, several studies (see the section on related research) predict and show results consistent with the view that XBRL adoption associates with certain capital market behaviors. These include an increase in the breadth of ownership, analyst coverage, stock volatility, and heightened investor reliance on firm-specific information (e.g., an increase in stock return synchronicity). The prior studies, however, examine the effects of XBRL adoption in an equity market setting and, thus, ignore other settings. A study of the expected effects of XBRL adoption in the credit default swap (CDS) market is one such other setting. As discussed below, we contend that pricing behavior in the CDS market offers an interesting and important way to understand the effects of the SEC mandate.

This importance lies in the SEC's intended benefit of XBRL, which is to reduce firm risk by making public financial information better and cheaper for market participants. The notion of risk reduction links directly with the purpose of the CDS market, which is an arrangement for the efficient pricing and the transfer of credit risk. Protection buyers (e.g., banks and other lenders) transfer this risk to protection sellers (e.g., insurance companies) in the advent of a credit event (loan default or bankruptcy) by the firm (i.e., the reference entity) referenced in the CDS contract.[1]

[1] CDS prices or spreads also offer relatively pure assessments of credit risk relative to other credit instruments such as bonds and loans (Callen, Livnat, and Segal 2009; European Central Bank 2009). Unlike corporate bonds and secondary

The theory of CDS pricing adds further insight regarding the effects of XBRL by identifying two components of credit risk or spread for analysis, namely (i) firm default risk and (ii) the quality of information about firm default risk. The following predictions of a relation between XBRL and CDS pricing draw on these two components.

First, the goal of mandatory XBRL is to "promote efficient and transparent capital markets" (SEC 2009, p.6). By providing financial statements using standardized taxonomies, XBRL-formatted reports increase financial statement comparability over time and across firms and reduce information processing costs to users of financial reports. As a result, firms with XBRL reports are subject to more effective and less costly monitoring by outside investors. One can expect this XBRL-induced improvement in external monitoring to make it costlier for managers to withhold bad news or poor performance about their suboptimal behavior.[2] Moreover, improved monitoring could occur in the absence of relevant disclosure in that by generating comparable information about the firm's peers at lower cost, XBRL offers a better way to understand a firm's performance (De Franco et al. 2011; Kim et al. 2016). We predict that CDS investors will recognize this potential of XBRL to curb suboptimal behavior. This is one mechanism whereby XBRL adoption lowers firm default risk, whose pricing effect is a drop in CDS spread.

A second mechanism relates to the quality of the information about firm default risk. Duffie and Lando (2001) show that incomplete accounting information induces investors to predict a different shape of the term structure of credit spreads. This implies that firms with perfect financial reports have zero credit spreads as maturity tends to zero, whereas firms with noisy financial reports have positive credit spreads under the same condition, although the impact of noisy financial

loans markets, CDSs are relatively free of features such as covenants, guarantees, imbedded options, and coupons, which can also influence spread but may not relate to credit risk.

[2] For example, Chen et al. (2013) show that XBRL adoption discourages managers from engaging in empire building, risk shifting from shareholders to creditors (e.g., Chen et al. 2013) and opportunistic earnings management (Kim et al. 2014).

information on spreads diminishes for longer maturities. By providing more accessible and timely firm data at a lower cost, XBRL increases information quality by expanding the information set. XBRL also increases information quality by improving financial statement comparability with peer firms through the use of standardized taxonomies.[3] This occurs directly because the lower cost means that investors have better information about the reference entity itself and indirectly because investors have more timely and less costly data about the firm's peers. As modeled by Duffie and Lando (2001), and shown by Yu (2005) and Kim, Kraft, and Ryan (2013), this results in a reduction in information risk whose pricing effect is also a drop in CDS spread.

Since both kinds of risk could be influential for CDS pricing, as our main hypothesis, we first test for an overall negative relation between XBRL adoption and CDS spreads. We then conduct separate tests to understand whether and how the two mechanisms described above might explain the potential drop in CDS spreads following XBRL adoption.

The importance of examining XBRL in a CDS market setting also relates to cost and efficiency considerations, as CDS prices are set in competitive over-the-counter markets by large institutions (dealers, protection buyers, protection sellers) that use CDS contracts to manage risk. Compared to other sets of investors (e.g., non-professionals), these institutions should be among the first to capture the benefits of new platforms to lower information processing costs and increase efficiency (Willis and Saegesser (2003), in the United States; Esser (2012), in the Netherlands). Large financial institutions not only have the resources and data systems in place to analyze the entire population of all XBRL disclosures, essential for comparability and CDS pricing in their role as dealers, but they may also be strongly motivated to develop superior diagnostics (or acquire them from third party experts, e.g., Moody's Analytics (www.mkmv.com) and AxiomSL

[3] The use of a standardized taxonomy applied to an individual firm filing adds no new information to that filing, however, as per SEC Release 33-9002, which states: "The new interactive data requirements will not change disclosure requirements under the federal securities laws and regulations, but will add a requirement to include financial statements in a new interactive data format as an exhibit." (SEC 2009, p. 9).

(www.axiomsl.com)) to compete in the risk management marketplace.[4] Additionally, some regulators require that large financial institutions use XBRL to file their reports on credit risk exposure, for example, the 2012 CCAR-DFAST directive in the United States and the 2014 COREP-FINREP directive in Europe. These directives may further motivate large financial institutions to capture the benefits of lower information processing costs from XBRL.[5] Large financial institutions also tend to be the first to use information technology to lower information processing costs. These future benefits could be substantial. Relatedly, McKinsey Global Institute (2017) predicts that "half of today's work activities could be automated by 2055…" and that the sectors with the highest potential for automation will involve finance and insurance (p. 7).

Our analysis of the effects of mandatory XBRL adoption on CDS spreads generates the following findings. First, we find a significant and negative relation between mandatory XBRL adoption and CDS spreads (in brief, a negative XBRL–CDS relation). This result is economically important as well, translating into an average decrease in CDS spreads of 103–137 basis points from the pre-XBRL- to the post-XBRL-adoption period depending on the estimation model. Additional tests show that these results hold (i) after controlling for firm-specific and economy-wide factors expected to influence CDS spreads in the absence of XBRL adoption, (ii) using a difference-in-differences research design, and (iii) in placebo tests. Taken together, these results suggest a reliable link between mandatory XBRL adoption and a drop in CDS spreads.

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[4] As a proxy for the size of the risk management marketplace, the aggregate notional value of the CDSs held by U.S. banks and security firms as buyer or seller counterparties as of June 2009 (the date of Tier 1 adoption) was $11.11 trillion (Bank for International Settlements 2013), or almost double the size of the U.S. corporate debt market of $5.93 trillion as of the same year (Securities Industry and Financial Markets Association 2013).

[5] Anecdotal evidence also suggests the use of XBRL to manage credit risk exposure. For example, "[XBRL] would reduce both the credit risk and the operational risk," said Philip Walenga, assistant director in the insurance division of the FDIC. "With XML, it's easier to reuse data, so there's potential for banks to see other benefits." He further said: "It's not an issue of changing regulations … It's a matter of making information requirements clearer and potentially more accurate." (available at http://www.banktech.com/core-systems/xbrl-standard-bearer-of-financial-reporting/d/d-id/1288760). Also, Ivan Schneider writes: "Harm Jan van Burg of the Netherlands Government Treasury announced that two major banks in the Netherlands, ABN-AMRO and Rabobank, have signed on to the project to evaluate credit risk using XBRL data. The project is expected to lower the cost of borrowing for small businesses in Holland. Van Burg anticipates 10,000 filings by July [of 2008]." (available at http://www.accountingweb.com/technology/accounting-software/xbrl-comes-of-age).

Second, we conduct cross-sectional tests to see if the baseline negative relation between XBRL and CDS spreads differs systematically for firms with high and low information uncertainty and/or high and low default risk in the pre-XBRL adoption period. We show four results consistent with our predictions: (1) The negative XBRL–CDS relation strengthens for firms with lower levels of pre-adoption accrual quality and higher levels of pre-adoption organizational complexity. This occurs because firms with lower accrual quality and more complex organizational structures have less efficient monitoring by outside stakeholders (and thus higher default risk) and more information uncertainty (and thus higher information risk). (2) The negative XBRL–CDS relation strengthens for firms with investment-grade debt and a longer distance to default, in part because the effect is less anticipated. This comports with the view that safer firms' CDS spread reductions from XBRL adoption are more responsive to a decrease in default risk.[6] (3) The drop in credit spread following XBRL adoption declines for longer maturity instruments. This is consistent with the Duffie and Lando (2001) prediction that the further out on the spread curve the lower the information risk. (4) The negative XBRL–CDS relation strengthens for firms with a higher number of standardized official XBRL elements relative to customized extension elements. This last result underscores the idea that CDS investors attribute a negative connotation to firm managers' potential overuse of customized XBRL elements by interpreting such overuse as a strategy to make their financial statements less comparable, thus reflecting higher information risk.

The next section discusses the related research and the empirical predictions. The third describes the sample selection and defines the variables. The fourth outlines the research design, the fifth summarizes the test results, and the sixth concludes.

[6] Safer firms' CDSs are also less equity-like, suggesting that any potential reduction in spreads from XBRL adoption is not simply explainable by equity market variables. Such variables have been the focus of much prior research (discussed in the next section).

RELATED RESEARCH AND HYPOTHESES

Background

The SEC formally voted to require XBRL disclosure for SEC registrants on December 17, 2008, and later issued Release 33-9002 as of January 30, 2009 (SEC 2009). Release 33-9002 mandates that corporate registrants (with some exceptions) file their regular HTML (or ASCII)-based financial reports and schedules in a XBRL format as a supplementary exhibit (Exhibit 101) to their regular filings.[7] Among other filings, the SEC release requires firms to file standardized, dynamic financial reports by tagging their primary financial statements, company identification information, schedules, and footnote disclosures using the most recent standardized official XBRL taxonomies. The SEC also allows the official taxonomies to be "extensible" so that filers can customize their XBRL reports (i.e., use customized extension elements) by supplementing or substituting for the official elements.[8]

As a fundamental rationale, Release 33-9002 contends that XBRL disclosure will generate significant economic benefits for all interested parties. These parties include (i) financial statement users, by allowing them to retrieve and analyze more accurate, timely, and comparable financial information at lower cost; (ii) financial statement preparers, by lowering the cost of filing regulatory reports and business information processing more generally; and (iii) regulators, by ensuring more accurate and timely information for policy analysis, compliance, and enforcement. In a broader context, the SEC mandate should also provide macro benefits by helping the public better understand the risks in a market economy. Moreover, given the scale of information transformation from static HTML/ASCII to dynamic XBRL and the network effects of widespread adoption at the

[7] Release 33-9002 covers "all companies that report either in U.S. GAAP, including smaller reporting companies and foreign private issuers that report in U.S. GAAP or, in the case of foreign private issuers, in accordance with IFRS as issued by the IASB" (SEC 2009, p. 43).

[8] Although with approximately 15,000 standardized official elements in the U.S. GAAP taxonomy, there will also be some level of customization that firms will desire to use for their communications with investors and other stakeholders.

macro level, such benefits should be economically consequential for those affected and for market behavior in general.[9]

To implement XBRL, the SEC mandate established a timetable for the phase-in of XBRL – over three years beginning in 2009 for three Tiers of registrants based on firm size. The first group, Tier 1 filers, began filing XBRL exhibits for the quarter ended on or after June 15, 2009. The SEC identified this first group as large accelerated filers with over $5 billion of public float as of June 15, 2009. The second group, Tier 2 filers, included all other large accelerated filers with a common equity float of over $700 million. They began filing XBRL exhibits on or after June 15, 2010, quarter. The third group, Tier 3 filers, included accelerated, non-accelerated and smaller reporting firms. They began filing XBRL exhibits for the first time on or after June 15, 2011.[10] Given that our study period extends to December 2012, our examination of the relation between credit spreads and mandatory XBRL potentially covers up to four post-adoption years for Tier 1 filers, up to three for Tier 2 filers, and up to two for Tier 3 filers. The fact of different timing dates for separate sets of firms helps our research design by reducing the chances that potentially unknown common factors might explain the results. The effects of common factors can be a concern when a quasi-exogenous event such as a law or regulation creates a parallel trend or affects all firms at once.

Literature

As one of the most far-reaching financial reporting regulation changes in the United States, mandatory XBRL adoption has engendered controversy. Proponents of XBRL adoption argue that XBRL produces benefits because it eliminates costly manual collection, facilitates processing of

[9] SEC Release 33-9002, for example, states that it believes that XBRL data "may reduce some of the information barriers that make it costly for companies to find appropriate sources of external finance, thus *lowering their cost of capital* [emphasis added] and increasing the efficiency of capital formation." (SEC 2009, p. 147).

[10] XBRL would have become optional for small Tier 3 filers (gross revenues less than $250 million) under Title 7 of H. R. 37, Promoting Job Creation and Reducing Small Business Burdens Act, 114th Congress, 2015. While this passed in the House as of January 14, 2015 (available at www.congress.gov/bill/114th-congress/house-bill/37), it was eventually defeated in the Senate. Our study period does not include this proposed legislation.

financial information, improves the timeliness in data analysis, and enhances the comparability of financial data (e.g., Eccles et al. 2001; Hoffman and Strand 2001; Hodge et al. 2004; Cox 2006; Pinsker and Li 2008; Vasarhelyi et al. 2012). However, the literature has mostly tested hypotheses on how XBRL adoption relates to equity market behavior. For example, Kim et al. (2012) find that XBRL reduces information asymmetry; Efendi et al. (2014) find that XBRL enhances information efficiency; Liu et al. (2014) and Li and Nwaeze (2017) find that XBRL improves analyst earnings forecast quality; Kim et al. (2014) find that XBRL increases breadth of stock ownership by making it more attractive to individual investors compared to institutional investors; and Dong et al. (2013) find that XBRL increases the amount of firm-specific information capitalized into stock price, which reduces stock price synchronicity. A related strand of research focuses on the incentive effects of XBRL adoption on firm behavior. Blankespoor (2012) finds that equity investors' reduction in information costs increases firm disclosure; Kim et al. (2015) document a decrease in discretionary accruals following XBRL adoption; and Amin et al. (2017) find timelier audit reports in the post-XBRL-adoption period, consistent with improved information quality.

Other studies cast doubt on the benefits of mandatory XBRL adoption for investors, with many questioning the quality of XBRL information. Some examine inaccuracies in the early XBRL filings, in particular, the frequency of inconsistencies between HTML and XBRL filings (e.g., Bartley et al. 2010; Debreceny, Farewell, et al. 2010; Weirich and Harrast 2010). Others discuss whether XBRL filings might be audited to reduce such inconsistencies (Boritz and No 2009; Plumlee and Plumlee 2008; Srivastava and Kogan 2010).[11] Also, Blankespoor et al. (2014) find that bid-ask spreads increase and stock liquidity decreases around 10-K filing dates for XBRL adopters.

[11] For instance, based on a sample of Tier 1 filers, Debreceny et al. (2010) find a significant number of errors, such as the inappropriate use of XBRL elements and reporting incorrect negative values where positive values should have been entered, thus raising some doubt about the quality of XBRL disclosure, at least for some firms. For example, Harris and Morsfield (2012) document users' concerns over the cost and quality of XBRL filings, although feedback on the SEC's XBRL initiative suggests that they agree on the potential benefits of XBRL.

Hypotheses

Does XBRL Matter for CDS Pricing?

Compared to the evidence on the consequences of mandatory XBRL adoption for equity market behavior, little is known about whether and how XBRL adoption influences credit market behavior. Also, the findings on equity market behavior may not generalize to the credit market, in that credit market participants are primarily concerned with downside risk and the loss of principal, whereas equity investors have more interested in upside potential and return.

XBRL matters for CDS pricing, primarily because the benefits of XBRL in the credit market equate to improved assessments of firm default risk and information quality, which can lower CDS spreads. CDS spread refers to the spread associated with credit derivative contracts. This allows credit investors to transfer risk in the CDS market. CDS spread can also be viewed as an insurance premium that protection buyers (e.g., banks or other credit suppliers) pay to protection sellers (e.g., insurance companies) for the protection of credit risk. Additionally, credit spread is considered a less noisy measure of firm credit risk (Callen et al. 2009; European Central Bank 2009). In short, we predict that to the extent that XBRL adoption improves the transparency, timeliness, and comparability of accounting reports, it will reduce information processing costs to credit investors and enhance the efficiency of credit investors' monitoring of firms referenced in the CDS contracts. This implies that XBRL adoption will lower CDS spreads in the post-XBRL period.

However, unlike the equity market where retail investors play an important role in setting prices, large and well-resourced institutional investors with superior information processing skills, such as banks, insurance companies, and hedge funds, dominate the CDS market. These investors typically have privileged access to inside information and may engage in private information gathering activities and acquire credit risk-related information via alternative channels rather than public accounting reports, irrespective of whether the reports are XBRL-formatted or not (Acharya and Johnson 2007). As such, mandatory XBRL adoption may not directly impact CDS pricing through a reduction in default risk. However, there could still be an indirect impact on CDS pricing through a reduction in information processing costs or an increase in comparability, either from regulation (e.g., the 2012 CCAR-DFAST directive in the United States and the 2014 COREP-FINREP directive in Europe) or from market competition. XBRL adoption under this scenario would have a smaller impact on CDS spreads. To provide systematic evidence on this issue, we state our first hypothesis in the alternative form as:

H1: CDS spreads decrease from the pre-XBRL to post-XBRL-adoption periods versus the null that CDS spreads do not decrease from the pre-XBRL to post-XBRL-adoption periods.

H2: Does Pre-XBRL Information Uncertainty Matter?

To strengthen confidence in H1, we next explore whether the negative relation between mandatory XBRL adoption and CDS spreads varies by firm characteristic or information environment. Evidence shows that investors' reaction to financial statement information varies with the level of information uncertainty. For example, Lang (1991) develops a model in which corporate earnings releases are more informative when there is greater uncertainty about the future prospects of the firm. Sengupta (1998) provides empirical evidence that the negative relation observed between corporate disclosure quality and the cost of public debt (or bond yield spread) is more pronounced for firms with higher information uncertainty. In the context of the CDS market, Shivakumar et al. (2011) find that credit investors in the CDS market respond more to voluntary forward-looking disclosures in periods of high information uncertainty.

Drawing on these studies, we predict that the reduction in CDS spreads from XBRL adoption will be more prominent when the firms referenced in the CDS contract reflect greater information uncertainty prior to XBRL adoption. Reduced information processing costs from XBRL should then enable credit investors to monitor managerial opportunism more effectively. More effective monitoring by credit investors as a result of XBRL adoption should also discourage managers from using suboptimal practices, such as the extraction of private control benefits. This further reduces the credit risk of the reference entity in the CDS contract and allows CDS trades to reflect lower CDS spreads. Consequently, we expect a greater reduction in credit spread from XBRL adoption for firms with higher pre-adoption information uncertainty. To operationalize this prediction, we focus on two important firm characteristics that differ across firms and relate directly to the information uncertainty faced by credit investors in the CDS market, namely, accrual quality and operational complexity.

We first argue that XBRL adoption improves CDS investors' ability to analyze and compare a firm's financial report in a timelier manner, thus enabling them to better understand the credit risk implications of lower accrual quality. Lower accrual quality could encourage less efficient monitoring by outside stakeholders, thereby leading to higher default risk and higher information uncertainty. Second, we contend that firms with a complex organizational structure could allow controlling insiders or managers to engage more aggressively in the extraction of private control benefits and in opportunistic managerial reporting (Bertrand et al. 2000; Bae et al. 2002; Kim and Yi 2006). This behavior also increases default risk and information uncertainty. Hence, to the extent that XBRL improves monitoring efficiency (and, thus, reduces default risk) and improves transparency and comparability (and, thus, reduces information uncertainty), we predict that XBRL adoption will mitigate the impact of default risk and information risk on CDS spreads to a greater degree for firms with lower accrual quality and a more complex organizational structure in the pre-XBRL-adoption period. We, therefore, propose and test the following hypotheses stated in the alternative form:

H2a: The negative relation between XBRL adoption and CDS spreads, as hypothesized in H1, strengthens for firms with a lower level of accrual quality prior to XBRL adoption.

H2b: The negative relation between XBRL adoption and CDS spreads, as hypothesized in H1, strengthens for firms with a more complex organizational structure prior to XBRL adoption.

H3: Use of Standardized Official Elements

The SEC's XBRL mandate requires registrants to tag all quantitative financial statement data using about 15,000 agreed-upon taxonomies known as standardized official elements. The use of standardized official elements improves financial statement comparability and, thus, reduces investors' information acquisition costs, to a greater extent, than the use of customized extension elements (Kim et al. 2015; Hoffman and Strand 2001; XBRL US 2009; SEC 2010a). However, the SEC allows for the use of customized extension elements under certain conditions, especially when a data item is not covered by standardized official elements. Still, if customized extensions are used too extensively, XBRL-induced comparability could be impaired. Therefore, the beneficial effect of XBRL adoption such as the improved transparency or the decreased information opaqueness from enhanced comparability could decrease. To test this idea, we predict that the negative relation between XBRL adoption and CDS spread decreases with the firm's use of customized extension elements in its XBRL-formatted 10-K filings. We, therefore, test the following hypothesis stated in the alternative form:

H3: The decrease in CDS spreads from the pre-XBRL to post-XBRL-adoption periods varies negatively with the firm's use of customized extension elements in its XBRL-formatted 10-K filings.

SAMPLE SELECTION, VARIABLES, AND REGRESSION EQUATIONS

Sample Selection

We draw our sample of XBRL adopters (Tier 1, Tier 2, and Tier 3) from SEC EDGAR[12] and extract the requisite data from the Markit CDS Composites Pricing database, CSRP, and Compustat. Panel A of Table 1 summarizes the sample selection process. After applying several selection criteria to the Markit population (e.g., we limit the CDS data to senior tier, dollar-denominated contracts with modified restructuring clauses), we arrive at a sample of 213,145 firm-month spread observations relating to firms that initially filed their XBRL financial statements as Tier 1, Tier 2, or Tier 3 adopters during 2007 to 2012. The two biggest reductions in the CDS population are CDS contracts with clauses other than modified restructuring (913,802 observations) and firms subject to XBRL that voluntarily filed their initial XBRL statements prior to mandatory adoption (132,818 observations). Panel B shows that the sample sizes are reasonably stable each year. Panel C shows a broad distribution of firms across the twelve Global Industry Classification Standard (GICS) industry sectors, with consumer goods and financial firms having most representation, and telecommunications and government services firms having the least representation (similar to the Compustat population in general).

Variables

We measure CDS spread (*CDS_SPREAD*) as the natural logarithm of the CDS spread for instruments of maturity of *K* years (Markit's *RATING'K'Y* variable) at the end of month *t* (and if more than one instrument of *K* years, then the natural logarithm of the average spread). We also include *BOND_SPREAD*, *TREAS_SPREAD,* and *SPOT* in the regressions as controls for key macro factors.[13] *BOND_SPREAD* is the difference between the average AAA corporate bond yield and average BAA corporate bond yield at the end of a month, estimated as of the month before loan

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[12] See http://www.sec.gov/Archives/edgar/monthly.

[13] Data from http://www.federalreserve.gov/releases/h15/data.htm

initiation. We view this bond spread variable as a proxy for the average default risk in all securities as of a given month. If CDS spreads change for common reasons other than the effects of XBRL, these variables will capture much of this time-series variation. *TREAS_SPREAD* is the difference between ten-year and two-year Treasury-bill yields at the end of the month, which we view as a proxy for the slope of the Treasury yield curve. This, too, changes over time and relates negatively to *CDS_SPREAD* (Collin-Dufresne et al. 2001). *SPOT* is the riskless rate of interest and could also vary negatively with *CDS_SPREAD*.

Table 2 presents summary statistics for the main variables used in the paper. Consistent with the predicted effects of XBRL disclosure on comparability, average *CDS_SPREAD* decreases from the pre- to the post-XBRL periods. We use the other variables as control variables in cross-sectional regressions of *CDS_SPREAD* on the expected determinants of credit spread (other than factors that condition XBRL), which we select based on conceptual grounds (e.g., Collin-Dufresne et al. 2001) and prior empirical research (e.g., Callen et al. 2009). These determinants are: financial leverage (*LEV*) (increases spread), volatility of assets (*SD_RET*) (increases spread), S&P credit rating (*RATE*) (increases spread), firm size (*SIZE*) (decreases spread), bond premium of average BAA yield minus average AAA yield (*BOND_SPREAD*) (increases spread), and a proxy for the Treasury yield curve slope (*TREAS_SPREAD*) (decreases spread).

Table 2 reports the means, medians, and standard deviations of the variables and tests of differences between the pre- and post-XBRL adoption periods. These data mostly reflect general changes in economic activity during 2007 to 2012, although they are not relative to a common calendar date, as the XBRL adoption dates differ for Tier 1, Tier 2, and Tier 3 firms. For instance, Table 2 shows that over the pre–post XBRL period the one-year Treasury-bill rate (*SPOT*) decreases from 220 basis points (bps) in the pre-XBRL period to 32 bps in the post-XBRL period. This also, potentially, explains the increase in the average ten-year minus two-year Treasury spread, from 145 bps to 205. In addition, the mean S&P credit rating for the sample worsens by about one letter grade (*RATE*),[14] and the excess of yield on BAA bonds over AAA bonds increases from 119 bps to 153 bps. Both variables reflect a general increase in credit default risk from the pre- to the post-XBRL period. On the other hand, mean *CDS_SPREAD* declines by approximately 16 percent from pre- to post-XBRL, potentially reflecting an effect of the XBRL mandate absent controls.[15] The control variables also exhibit reasonable cross-sectional variation in the pre- and post-XBRL periods, which advantages our design based on cross-sectional regressions.

Regression Equation

H1 tests for a negative relation between mandatory XBRL adoption and CDS spreads, using the different timing of XBRL adoption by Tier 1, Tier 2, and Tier 3 firms as a source of quasi-exogenous variation in a regulation. Specifically, we add the adoption of XBRL as a dummy variable in the following model. We use monthly CDS spread observations over 2007–2012 to estimate the model.

$$CDS\_SPREAD_{jt} = \alpha + \beta XBRL_t + \delta_K XBRL_{jt} \text{ x } D\_K_{jt} + \Sigma_{\square} \gamma_k CONTROLS_{jtk} + \varepsilon_{jt} \qquad (1)$$

where *j* indexes firms and *t* indexes months. *CDS_SPREAD* is the dependent variable, *XBRL* equals 1 for the post-XBRL adoption months and 0 otherwise, and D_K_{jt} is a dummy variable equal to one if CDS maturity equals *K* years and zero otherwise, where *K* equals 3, 5, 7, 10, 20, and 30 years. The remaining variables represent *k* controls ($CONTROLS_{jtk}$) that potentially explain *CDS_SPREAD* but for and in lieu of the effects of *XBRL* and *D_K* on *CDS_SPREAD*. As firm controls, we select LEV_{jt} (long term debt scaled by the value of firm assets at the end of a fiscal quarter); SD_RATE_{jt} (standard deviation of daily stock returns during the firm's current fiscal quarter), and $SIZE_{jt}$ (the natural logarithm of the market value in \$millions of the common equity at the end of a fiscal quarter). As macro controls, we select $SPOT_t$ (one year Treasury-bill yield at

14 We define *RATE* numerically, from 1 (AAA rating) to 17 (CCC+ rating).
15 This amount, based on logarithmic transformations, converts to a 103 basis point reduction in mean CDS spread from the pre- to the post-XBRL period. We also label this as the raw change in mean spread in Figure 2.

the end of month *t*), *BOND_SPREAD*$_t$ (the difference between an AAA corporate bond yield and a BAA corporate bond yield at end of month t and estimated in the month prior to loan initiation), and *TREAS_SPREAD*$_t$ (the 10-year minus the 2-year Treasury-bill yields at end of month *t*, also measured in the month prior to loan initiation). We also include eleven industry dummies as fixed-effect controls (one minus the 12 industry sectors listed in Panel C of Table 2). Hypothesis H1 is supported if the coefficient on XBRL is significantly negative.

In keeping with the theory and evidence on CDS pricing, we predict the following signs of the coefficients. *LEV* (positive: increases credit risk, Callen et al. 2009), *SD_RATE* (positive: increases spread, Collin-Dufresne, et al. 2001), *SIZE* (negative: decreases spread, Callen et al. 2009), *SPOT* (negative: decreases spread, Longstaff and Schwartz 1995), *BOND_SPREAD* (positive: increases spread), and *TREAS_SPREAD* (negative: decreases spread, Litterman and Scheinkman 1991). We also predict positive coefficients for *XBRL* x *D_K*, based on the notion that, independent of the quality of the firm's debt, including information risk, the probability of a default event should logically increase in the number of years from initiation to maturity.

MAIN RESULTS

Overall Effect of XBRL on Credit Spread: Test of H1

Table 3 summarizes the estimation of Eq. (1). We show five regressions in columns (1)–(5), where the dependent variable is *CDS_SPREAD* at the end of each month. First, the regressions comport well with structural models of credit spread and existing empirical studies, in that we show positive and significant coefficients for *LEV*, *SD_RET*, *RATE,* and *BOND_SPREAD* (that increase spread) and negative coefficients for *SIZE, SPOT*, and *TREAS_SPREAD* (that decrease spread). Second, Panel A shows that, for all specifications of Eq. (1), the coefficient for *XBRL* is significantly negative, at least at $p < 0.05$, after extracting the combined influence of the control variables. These findings, therefore, support our main hypothesis (H1) that CDS spreads decrease from the pre-XBRL to post-XBRL-adoption periods. In a later section, we discuss the economic significance of this result under different specifications of Eq. (1).

Consistent with prior work (Callen et al. 2009), Panel A of Table 3 also shows that *CDS_SPREAD* increases in CDS maturity (*D-K*). For example, column (5) of Panel A shows that the most negative and significant effects of XBRL on credit spread occur for CDSs with shorter maturities. Specifically, the net *XBRL* coefficient for three-year CDSs of -0.0764 is calculated as the overall *XBRL* coefficient of -0.2053 plus the *XBRL* x *D_3* coefficient of 0.1289.

We also estimate separate regressions using only the observations in each *D_K* maturity partition as a second way to estimate the *XBRL* coefficients by CDS maturity. Panel B of Table 3 summarizes the results and shows an *XBRL* coefficient for *D_1* of -0.2020, significant at $p < 0.01$ (similar to column (5) of Panel A), followed by significant but less negative XBRL coefficients for *D_3* (coefficient = -0.0839, $p < 0.05$) and *D_5* (coefficient = -0.0040, $p < 0.10$).

Figure 1 plots the sum of the *XBRL* and *XBRL* x *D_K* coefficients from Panel A and the *XBRL* coefficients from Panel B as two ways to illustrate the maturity effect. Given that the Panel A coefficients derive from a joint estimation of the maturity effects, whereas the Panel B coefficients are from individual regressions, we expect similar but non-identical estimates. Figure 1 shows significantly negative *XBRL* coefficients for the shorter maturities (*K*=1, 3, and 5) and insignificant coefficients for the longer maturities ($K > 5$), for both sets of estimates. This result comports with Duffie and Lando (2001), who predict that the information risk component of credit spread diminishes as maturity increases, since at the longer maturities, information quality matters less in the long term compared to the underlying probability of a credit event. For example, the bias or noise from accounting accruals matters less in the long run as earnings more closely approximate operating cash flows. The results in Panels A and B of Table 3 are consistent with this view. This result does not mean, though, that the effects of XBRL on default risk would be weaker for CDSs with shorter versus longer maturities, as the stronger negative XBRL–CDS relation at the shorter intervals could also relate to the XBRL effects on CDS spread from a change in default risk. We return to a discussion of whether the negative XBRL–CDS relation at the shorter CDS maturities relates to default risk or information risk (or both) in a later section.

Difference-in-Differences Test of H1

As an alternative way to test for a negative XBRL–CDS relation, we use a difference-in-differences (DiD) design. This takes advantage of the phase-in XBRL adoption[16] by comparing changes in CDS spreads from the pre- to the post-adoption period for XBRL adopters (treatment group) with changes in spreads over the same period for a sample of non-adopters (control group). A DiD design also helps us control for the impact of parallel trends or market-wide non-XBRL related factors that might have occurred during the phase-in period but are not accounted for through the inclusion of the specified controls. To implement the DiD design, we use Tier 1 filers as the treatment group and non-adopting firms from January 2007 to June 2010 as the non-treatment or control group, which includes the Tier 1 adoption period from June 2009 to June 2010.[17] To reduce the effect of bias related to firm size or industry, we match each Tier 1 treatment firm with a non-adopting control firm of similar size (based on the market value of common equity) and in the same industry (using the two-digit SIC code). We estimate the following regression model.

$$CDS\_SPREAD_{jt} = \alpha + \varphi TREAT_{jt} + \beta XBRL_{t} + \delta TREAT_{jt} \text{ x } XBRL_{jt} + \Sigma \gamma_k CONTROLS_{jtk} + \varepsilon_{jt} \qquad (2)$$

where j indexes treatment and non-treatment firms, t indexes months, and the other variables are defined as before. Eq. (2) defines *TREAT* as an indicator variable equal to one for firms in the treatment group (Tier 1 filers) and zero for non-XBRL adopter firms in the control group. As

[16] As mentioned earlier, SEC Release 33-9002 mandated Tier 1 (large cap.), Tier 2 (medium cap.), and Tier 3 (small cap) firms to adopt XBRL on or after June 15, 2009, 2010, and 2011, respectively.

[17] Some claim that a DiD design can help draw stronger inferences about the effect of a regulatory change on asset returns (Armstrong et al. 2012). Others express concern about the approach's ability to discern real effects (Brewer et al. 2013). This could be an issue for XBRL, as we select the non-treatment group from a set of non-adopters during January 2007 to June 2010 that later became adopters, rather than a contemporaneous sample of otherwise equivalent non-adopters.

defined earlier in Eq. (1), *XBRL* equals 1 for the post-XBRL adoption months and 0 otherwise. The δ coefficient for the interaction of *TREAT* x *XBRL* captures the incremental effect on CDS spreads of XBRL adoption over and above the equivalent effect for control firms from the pre- to the post-XBRL period.

Table 4 summarizes the results and shows a significantly negative coefficient for δ (coefficient = -0.0642, $p < 0.05$). This implies that credit spreads decrease for XBRL-adopting firms incremental to non-adopting firms from the pre- to the post-XBRL period. This result supports our main prediction that XBRL adoption relates negatively to CDS spread (H1). Stated another way, our DiD results buttress the view that the negative impact of XBRL adoption on CDS spreads observed in Panel A of Table 3 is unlikely to be driven by omitted parallel factors that affect both the treatment and control samples over the same period.

Placebo Test of H1

As a further check on our results, we test whether we observe a similar negative XBRL–CDS relation for reasons other than XBRL adoption, for example, from common trends in CDS spreads due to factors not in Eq. (1). To mitigate this concern, we assign firms' XBRL adoption dates to random months over the sample period. This random assignment should not produce a negative XBRL coefficient related to XBRL. As shown in Table 5, we find that the *XBRL* coefficient is insignificantly different from zero, suggesting that unknown trends inherent in the period that we examine do not drive our main result. An otherwise equivalent model (column (4) of Table 3) also shows no major changes in the control variable coefficients.

Role of Information Uncertainty

Does Accrual Quality Matter? Test of H2a

While H1 tests for a baseline relation between mandatory XBRL adoption and CDS spreads, H2a and H2b focus on the role of pre-XBRL-adoption information uncertainty in shaping this baseline relation. To test H2a, we use accrual quality to proxy for pre-adoption information uncertainty.[18] Specifically, we define *ACCRUAL* as the standard deviation of residuals of the Dechow and Dichev (2002) model in the five-year pre-adoption period from *t*-5 to *t*-1. To test H2a, we then partition our total sample into two subsamples based on the sample median *ACCRUAL*: (i) the low accrual quality firms with above median *ACCRUAL*; and (ii) the high accrual quality firms with below median *ACCRUAL*. Though not tabulated for brevity, we also estimate a regression that combines both groups and includes the interaction of *XBRL* x *ACCRUAL* in Eq. (1), where *ACCRUAL* = 1 if *ACCRUAL* does not exceed the sample median (higher quality), otherwise zero (lower quality). Hypothesis H2a is supported if we observe a more negative *XBRL* coefficient for the lower accrual quality group.

As shown in Table 6, we find a significantly negative coefficient for *XBRL* for the low quality group (coefficient = -0.1167, $p < 0.01$) but not for the high quality group. The result of test for the difference in regression coefficients between low- and high-accrual groups reveals that the difference is significant (absolute coefficient difference = 0.1262, $p < 0.01$). Untabulated results show that the estimated coefficient on the interaction term, *XBRL* x *ACCRUAL*, is significantly positive ($p < 0.01$). The results of both tests, thus, suggest a more (less) negative XBRL–CDS relation for firms with lower (higher) pre-adoption accrual quality. These findings support H2a, suggesting that firms with lower pre-adoption quality accruals benefit more from XBRL adoption. One way this could occur is if XBRL-formatted disclosures discourage managers from making suboptimal accounting choices, which lowers both default risk and information risk, thereby decreasing CDS spread.

[18] Kim et al. (2015) find that managers curbed their use of discretionary accruals from the pre- to the post-XBRL period, ostensibly induced by better outside monitoring.

Does Organizational Complexity Matter? Test of H2b

To empirically test H2b, we use the complexity of an organization's structure to proxy for pre-adoption information uncertainty. Following Bushman et al. (2004), we measure organizational complexity as the number of reportable business segments in the pre-XBRL-adoption period (*CMPLX*) and test H2b by splitting the sample into high and low *CMPLX* based on the sample median *CMPLX*. Table 7 reports the results of our baseline regression in Eq. (1) for each of the two subsamples. Though not tabulated for brevity, we also estimate a regression that combines both subsamples and includes the interaction of *XBRL* x *CMPLX* in Eq. (1), where *CMPLX* = 1 if the number of business segments exceeds the sample median (high complexity), otherwise zero (low complexity). As shown in Table 7, the coefficient on XBRL is significantly negative for the high complexity subsample (coefficient = -0.0617, $p < 0.10$), but it is insignificant for the low-complexity subsample. The test for coefficient difference between high- and low-complexity groups reveals that the difference is significant (coefficient difference = -0.0354, $p < 0.10$). Untabulated results show that the interaction of *XBRL* and *CMPLX* is also significantly negative ($p < 0.10$). The above findings are, thus, consistent with H2b, suggesting that firms with high organizational complexity in the pre-adoption period benefit more from XBRL adoption. Such complex firms are more vulnerable for managerial rent seeking (which increases default risk) and information uncertainty (which increases information risk). Stated differently, these results suggest that XBRL-formatted disclosures enable managers to better assess credit risk (i.e., default risk and information risk), as the impact of XBRL adoption on reducing CDS spread is more pronounced for the high complexity subsample than for the low complexity subsample.

Do Standardized Official versus Customized Extension Elements Matter: Test of H3

We are also interested in examining whether CDS spreads recognize managers' differential use of standardized official versus customized extension elements to convert their financial statements to a dynamic XBRL format. For this test, we define *OFFE* as the ratio of official elements to the sum of the number of standardized official elements and the number of customized extension elements in each firm's XBRL filing. We then estimate Eq. (1) after replacing the *XBRL* dummy with *OFFE*, using observations in the post-XBRL adoption period.

As shown in Table 8, we find a significantly negative coefficient for *OFFE* (coefficient = -0.5169, $p < 0.01$). This is consistent with the view that relatively more use of standardized elements (and less use of customized extension elements) decreases information risk, which CDS investors reflect in lower spreads. So, even though some firms might perceive that the use of customized element increases information quality for external investors, the opposite appears to be the case in general. Credit investors, apparently, attribute a negative connotation to managers' greater use of customized extension elements and increase CDS spreads as a penalty for what they see as suboptimal financial reporting.

Additional Test of the Role of Default Risk

This section further investigates whether the negative relation between XBRL adoption and CDS spread (i.e., the baseline relation in Table 3) varies depending on investors' assessment of default risk. To this end, we measure default risk using: (i) the credit rating of a reference entity and (ii) the probability of default. We premise this test on the expectation that investment-grade firms (firms with a Markit CDS implied credit rating above BAA) and those with a low probability of default (relative to the sample median score from the Merton (1973) distance-to-default (DTD) model) reflect less information risk than less safe speculative-grade firms, which have a higher probability of default. If default risk drives the CDS response to XBRL, we should observe a more negative response for the former group (firms with investment grade or with a low probability of default). These firms are more sensitive to default risk information. By contrast, if information risk drives the CDS response to XBRL, we should observe a more negative response for the latter group (firms with speculative grade or with a high probability of default). As high default risk firms, CDS spreads more likely already reflect this factor compared to information uncertainty.[19]

Table 9 shows more negative XBRL coefficients for investment grade firms and those with greater distance to default. Both coefficients are significant at $p < 0.01$. The difference in the coefficients between the high and low credit rating groups is also significant (the coefficient difference = -0.2002, $p < 0.01$), as is the difference in the coefficients between the high and low distance to default groups (the coefficient difference = -0.0833, $p < 0.10$). These results, therefore, supplement the prior results by favoring the view that CDS spreads change more in response to XBRL adoption for reasons associated with XBRL-induced changes in default risk than for reasons associated with XBRL-induced changes in information risk.

Sensitivity Tests: Impact of the Credit Crisis

Given the study period of 2007–2012, it is important to test whether our results might be explained by the credit crisis of 2008–2009. Because of the crisis, spreads increased significantly for a short period, so that spreads after this short period would logically be lower; although Markit's index of CDS spreads shows a mostly positive overall trend from early 2007 to 2012, and the credit crisis affected lending institutions as reference entities more than non-financial firms (which are the focus of this study). To illustrate the trend, Markit's CDX_IG index (based on 125 reference entities not including lending institutions) stood at around 50 bps in early 2007, increased briefly in March 2008 (Bear Stearns) to 150 bps, peaked for a few days in March 2009 at over 300 bps (Lehman Brothers), and then stabilized later that year at around 100 bps, remaining approximately at that level through 2012 (TF Market Advisors 2013). Notwithstanding these events, we re-

[19] The latter group is also more equity-like, which might further amplify the response to XBRL adoption.

estimate Eq. (1) with the addition of a control variable for credit crisis (*CRISIS*), which we set equal to one for months of March 2008 to September 2009, otherwise zero.[20]

Table 10 summarizes the regression and shows that while *CRISIS* is positive and significant ($p < 0.01$), indicating that CDS spreads increased significantly during March 2008 to September 2009, we continue to observe a negative coefficient for *XBRL* (coefficient = -0.0319, $p < 0.10$). Our main result is, thus, robust to the financial crisis. Note that Eq. (1), on which we base our main result, also includes controls for *SPOT*, *BOND_SPREAD*, and *TREAS_SPREAD*, which also capture CDS spreads' response to the financial crisis of 2008–2009.

We also conducted several other sensitivity tests, which we summarize but do not tabulate for brevity. These tests produced results qualitatively similar to those in Table 3. For example, our results are robust to: (i) the exclusion of CDS contracts of composite depth of less than three, which are generally considered less liquid, (ii) the inclusion of an estimate of the Merton (1973) physical probability of default (*DTD*) in Eq. (1), and (iii) the inclusion of an index credit default swap in Eq. (1), namely, Markit's *CDX-IG* for five year maturities as the proxy variable, which is the broadest index CDS for U.S. corporate reference entities and trades regularly on an intraday basis.

In addition, untabulated analysis shows that a measure of financial statement comparability based on De Franco et al. (2011) increased from the pre- to the post-XBRL-adoption period, consistent with one of the expected benefits of the XBRL mandate, although financial statement comparability could have changed for other reasons as well.[21] Based on these sensitivity tests, we are reasonably confident that the XBRL effects we observe relate to XBRL rather than to unknown correlated factors.

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[20] We selected this period based on our inspection of unusual patterns in the five-year maturity *CDX-IG* index over the study period.

[21] De Franco et al. (2011) also find positive relations between their comparability measure and the cost of acquiring information, which aligns well with one of the expected outcomes of XBRL, that is, to lower investors' information costs.

Economic Significance

The results so far derive from regressions of the natural logarithm of CDS spread on XBRL and other variables. To demonstrate economic significance, we convert the XBRL regression coefficients to effects on spread in basis points using an exponential transformation of those coefficients. Figure 2 summarizes the results of this analysis by showing the average decrease in CDS spread in excess of the effect of the control variables from the pre-XBRL to the post-XBRL period. Given the different timing of the Tier 1, Tier 2, and Tier 3 adoptions, the number of months in pre- and post-periods differs for each phase of mandatory adoption.

As shown in Figure 2, CDS spreads decreased in the range of 102.72 bps to 137.14 bps around mandatory XBRL adoption, with perhaps the most conservative research approach (difference-in-differences) showing a spread reduction of 106.63 bps. Given the substantial size of the CDS market at the time of XBRL adoption, a 100-plus basis point reduction in spread is highly economically significant. For example, based on the notional value of CDSs of $11.11 trillion outstanding as of June 2009 (Bank for International Settlements 2013), the market-wide annual cost savings in the price of CDS protection from a 106.63 bps reduction could be as high as $100 billion using the June 2009 notional value of $11.11 trillion, as the annual cost of CDS protection is typically calculated as the present value of the spread times the notional value of the protected security times 1-hazard rate.

CONCLUSION

This study confirms our main prediction of a negative relation between the mandatory adoption of XBRL and CDS spreads, suggesting that the reduction in information processing costs and increase in comparability from XBRL improves credit quality and decreases credit risk. These results imply that the negative XBRL–CDS relation occurs because XBRL provides better and cheaper information for CDS investors. In cross-sectional tests, we also show that XBRL adoption reduces CDS spread, to a greater extent, for firms with (i) a lower quality of pre-XBRL adoption accruals, (ii) a more complex organizational structure, and (iii) greater use of official XBRL extensions. These cross-sectional results confirm that the negative XBRL–CDS relation occurs because XBRL enables better outside monitoring (reduces default risk) and improves transparency (reduces information risk). The negative XBRL–CDS relation also strengthens for higher-quality credit instruments, which, given their higher quality, should be less affected by information risk compared to default risk. Our results are also economically significant, as the average firm in our sample experiences a reduction in CDS spread of 103–137 basis points from XBRL adoption. This economic impact is a clear indication of the benefits of mandatory XBRL to financial statement users and credit professionals.

In conclusion, we learn from this study that the mandatory XBRL adoption had a significantly positive effect on the pricing of credit market risk consistent with the predictions of financial theory. This positive effect on credit pricing has direct relevance to finance professionals because credit markets are by far a more important source of external funds than the equity market. We also contribute to the literature on the market effects of XBRL more generally because CDS markets respond to differently (i.e., more asymmetrically) to default risk and information risk compared to equity markets.

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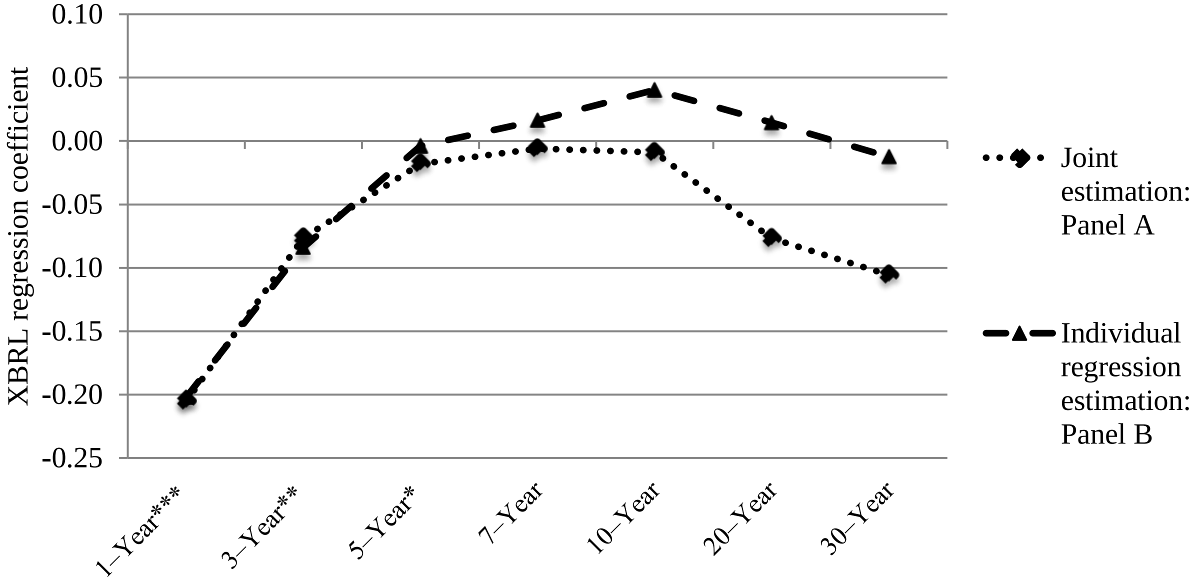
APPENDIX

Regression Variable Definitions

Symbol	Definition
ACCRUALS	Ex ante accrual quality is measured in the pre-XBRL adoption period and defined as the standard deviation of the firm residuals from the Dechow and Dichev (2002) model during the years t-5 to t-1 times minus one.
BOND_SPREAD	The difference between an AAA corporate bond yield and a BAA corporate bond yield at end of month obtained from the Federal Reserve Board of Governors and estimated in the month prior to loan initiation.
CDS_SPREAD	Natural logarithm of the CDS spread in basis points at end of month for *K*-year CDS maturity.
CMPLX	A dummy variable with one if the number of firms' business segments is greater than the sample median, and zero otherwise.
CRISIS	A dummy variable equal to one for months March 2008 to September 2009, otherwise zero.
D_K	A dummy variable equal to one if the maturity of the contract equals *K* and zero otherwise, where *K* equals 3, 5, 7, 10, 20, and 30 years.
DTD	Probability implied by the Merton (1973) distance-to-default model. Specifically, the expected default frequency is $$DTD_t = N\left(-\left(\frac{\ln\left(\frac{V}{F}\right)+(-0.5\sigma_V^2)}{\sigma_V\sqrt{T}}\right)\right) = N(-DD),$$ where V is the total value of the firm, μ is an estimate of the expected annual return of the firm's assets, σ_V is the volatility of firm value, T is a time-to-maturity, N() denotes the normal distribution, and F is the face value of the firm's debt.
LEV	Long term debt scaled by the value of assets (market value of equity + book value of total liabilities at end of fiscal quarter).
OFFE	The ratio of official elements to the sum of the number of standardized official elements and the number of customized extension elements in each firm's XBRL filing.
RATE	S&P's short term credit rating at end of month stated numerically, where AAA = 1 and CCC+ = 17.
SD_RET	Standard deviation of daily stock returns during the firm's current fiscal quarter.
SIZE	Natural logarithm of the market value (in $millions) of common equity at the end of fiscal quarter.
SPOT	One year Treasury-bill yield at end of month.
TREAS_SPREAD	The difference between the 10-year and the 2-year Treasury-bill yields at end of month obtained from the Federal Reserve Board of Governors and measured in the month prior to loan initiation.
TREAT	A dummy variable equal to one for the firms belonging to the treatment group (Tier 1 filers) and zero for the control group, which matches Tier 1 firms to non-adopting firms based on size and industry (e.g., two-digit SIC codes) over the Tier 1 adoption period.
XBRL	A dummy variable equal to one if the observation belongs to the XBRL filing period and zero otherwise.

FIGURE 1

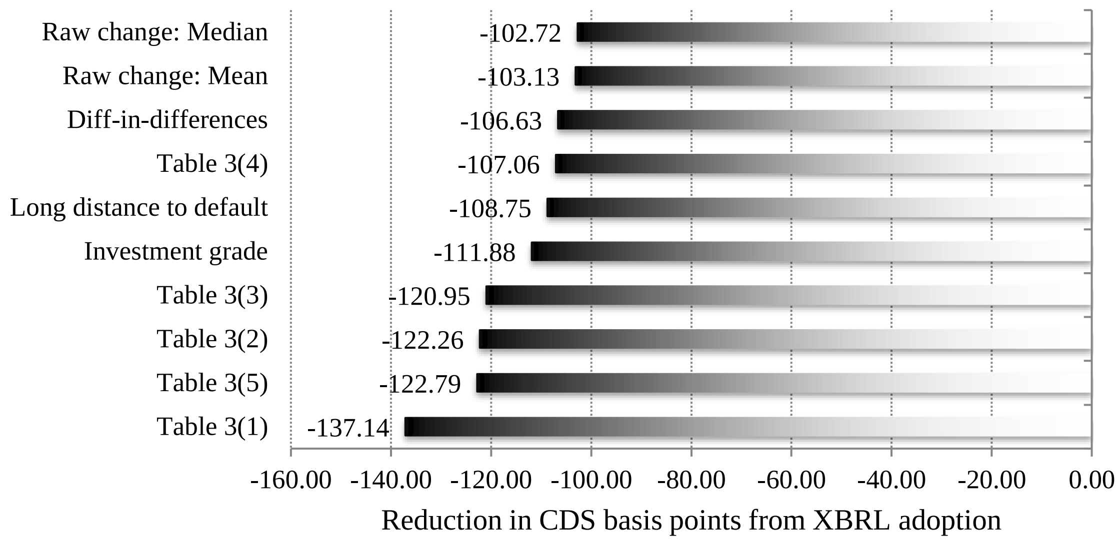
Plot of *XBRL* Regression Coefficients in Table 3 by CDS Maturity



This figure is derived from the *XBRL* coefficients in Panels A and B of Table 3. The Panel A coefficients are calculated as *XBRL* minus *XBRL* x *D_K* (the incremental effect of K-year maturity CDSs). The *XBRL* coefficients in Panel B are from the individual regressions for each CDS maturity. ***, **, and * represent two-tailed p-value significance levels of 0.01, 0.05, and 0.1, respectively, of the *XBRL* coefficients based on robust *t*-statistics with clustering by firm and year.

FIGURE 2

Economic Significance of the Change in CDS Spread from XBRL Adoption



This figure converts the *XBRL* coefficients in Table 2 (raw CDS change), Table 3 (excess CDS change), Table 4 (Diff.-in-differences excess CDS change), and Table 9 (Investment grade and Long *DTD*) to an average reduction in CDS basis points from the pre-XBRL period to the post XBRL period. The pre- and post- XBRL periods differ for Tier 1, 2, and 3 XBRL adopting firms. The numbers in parentheses beside the Table 3 label refers to a column number in Table 3.

TABLE 1
Sample Selection and Distribution

Panel A: Sample Selection

	CDS obs.
Number of observations in the CDS monthly dataset (in $US currency) with non-missing maturity and spreads (2007–2012)	1,391,261
Excluding CDS contracts with clauses other than modified restructuring	913,802
Excluding subordinated CDS contracts	73,962
Excluding loans that did not match to firms that initially filed XBRL-tagged financial statements from 2007 to 2012	31,086
Excluding loans to firms that voluntarily filed XBRL-tagged financial statements prior to mandatory adoption	132,818
Excluding observations with missing data for control variables	26,448
Subtotal	1,178,116
Total observations	213,145

Panel B: Sample Distribution by Year

Year	Frequency	Percent
2007	36,257	17.01
2008	37,374	17.53
2009	35,123	16.48
2010	35,222	16.52
2011	34,309	16.10
2012	34,860	16.36
Total	213,145	100.00

Panel C: Sample Distribution by Industry

Industry	Frequency	Percent
1 Basic Materials	16,078	7.54
2 Consumer Goods	35,075	16.46
3 Consumer Services	31,654	14.85
4 Energy	21,627	10.15
5 Financials	34,512	16.19
6 Government	115	0.05
7 Healthcare	17,240	8.09
8 Industrials	31,583	14.82
9 Technology	13,664	6.41
10 Telecommunications manufacturing	3,430	1.61
11 Telecommunications services	1,890	0.89
12 Utilities	6,277	2.94
Total	213,145	100.00

TABLE 2
Descriptive Statistics of Regression Variables

	Pre–XBRL				Post–XBRL				Tests for mean and median differences.	
	N	Mean	Median	Std. dev.	N	Mean	Median	Std. dev.	t-stat	z-stat
CDS_SPREAD	104,591	0.1946	0.1810	1.1505	108,554	0.1638	0.1542	0.9194	6.79***	9.23***
LEV	104,591	0.2173	0.1794	0.1573	108,554	0.1915	0.1600	0.1301	40.92***	27.38***
SD_RET	104,591	0.0294	0.0240	0.0179	108,554	0.0201	0.0175	0.0104	46.24***	45.99***
RATE	104,591	4.0785	4.0000	2.8302	108,554	4.2224	5.0000	2.6481	-12.12***	1.21
SIZE	104,591	8.6386	8.5141	1.3321	108,554	9.2553	9.2507	1.2890	-107.50***	-107.07***
SPOT	104,591	2.2011	1.7800	1.7392	108,554	0.3273	0.2000	0.5618	337.20***	355.97***
BOND_SPREAD	104,591	1.1899	1.1400	0.3411	108,554	1.5295	1.2900	0.7622	133.61***	69.32***
TREAS_SPREAD	104,591	1.4599	1.5000	0.9153	108,554	2.0478	2.0300	0.5620	179.39***	138.46***

All variables are defined in the Appendix. *** indicates a two-tailed level of significance level of $p<0.01$ based on two-sample t-test (difference in the mean) and two-sample z-test (difference in the median).

TABLE 3

Regression of *CDS_SPREAD* on XBRL, Firm Controls, CDS Maturity, and Macro Factors

Panel A: Joint Regression Based on all CDS Maturities

Variable	Pred. sign	(1)	(2)	(3)	(4)	(5)
XBRL	–	-0.3158***	-0.2010***	-0.1902***	-0.0682**	-0.2053**
		(-9.00)	(-6.15)	(-6.36)	(-2.18)	(-2.62)
*XBRL*D_3*	+					0.1289***
						(2.89)
*XBRL*D_5*	+					0.1873***
						(2.66)
*XBRL*D_7*	+					0.1993**
						(2.37)
*XBRL*D_10*	+					0.1963**
						(2.04)
*XBRL*D_20*	+					0.1285
						(1.26)
*XBRL*D_30*	+					0.0996
						(0.97)
Firm controls:						
LEV	+	2.7485***	2.7348***	2.6839***	2.0716***	2.0714***
		(12.66)	(12.94)	(11.11)	(8.31)	-8.31
SD_RET	+	0.4138***	0.4208***	0.4169***	0.3621***	0.3621***
		(22.36)	(22.23)	(22.42)	(20.14)	(20.16)
RATE	+	0.0093**	0.0102***	0.0097**	-0.0067*	-0.0067*
		(2.39)	(2.69)	(2.62)	(-1.94)	(-1.93)
SIZE	–				-0.2526***	0.4888***
					(-14.05)	(10.78)
D_3	+	0.5567***	0.5568***	0.5566***	0.5568***	0.7803***
		(19.21)	(19.17)	(19.19)	(19.07)	(10.78)
D_5	+	0.8787***	0.8790***	0.8791***	0.8789***	0.8796***
		(19.66)	(19.65)	(19.68)	(19.55)	(10.12)
D_7	+	0.9833***	0.9832***	0.9834***	0.9849***	0.9682***
		(18.60)	(18.57)	(18.58)	(18.53)	(9.61)
D_10	+	1.0701***	1.0699***	1.0702***	1.0719***	1.1109***
		(17.96)	(17.93)	(17.94)	(17.91)	(10.45)
D_20	+	1.1733***	1.1695***	1.1705***	1.1789***	1.1532***
		(18.68)	(18.57)	(18.66)	(18.69)	(10.82)
D_30	+	1.1997***	1.1969***	1.1982***	1.2053***	-0.2526***
		(19.37)	(19.31)	(19.44)	(19.48)	(-14.05)
Macro factors:						
SPOT	–	-0.2399***	-0.2343***	-0.2281***	-0.1935***	-0.1936***
		(-11.02)	(-8.25)	(-9.05)	(-8.16)	(-8.14)
BOND_SPREAD	+		0.1777***	0.1877***	0.2461***	0.2461***
			(11.12)	(13.49)	(17.98)	-17.99
TREAS_SPREAD	_		-0.0743**	-0.0663**	-0.0260	-0.0260
			(-2.00)	(-2.47)	(-1.03)	(-1.03)
INTERCEPT	+/–	-1.2186***	-1.3996***	-1.3341***	-1.1322***	-1.0601***
		(-12.56)	(-9.48)	(-10.03)	(-8.89)	(-7.63)
Industry dummies		No	No	Yes	Yes	Yes
Adjusted R^2		0.60	0.61	0.62	0.64	0.65
No. of observations		213,145	213,145	213,145	213,145	213,145

Table 3 continued on next page.

TABLE 3, CONTD.

Panel B: Individual Regressions Based on Each Maturity Sub-sample

	Pred. sign	1–Year CDS	3–Year CDS	5–Year CDS	7–Year CDS	10–Year CDS	20–Year CDS	30–Year CDS
XBRL	–	-0.2020***	-0.0839**	-0.0040*	0.0163	0.0403	0.0144	-0.0125
t-statistic		(-4.00)	(-2.10)	(-1.91)	(0.53)	(1.36)	(0.53)	(-0.45)
Firm controls		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro factors		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2		0.63	0.63	0.61	0.61	0.59	0.62	0.61
No. of observations		31,405	32,728	33,936	32,695	32,579	25,083	24,719

Panel A summarizes the regressions of *CDS_SPREAD* on *XBRL* after controlling for firm and macro risk factors. Panel B summarizes regressions of *CDS_SPREAD* on *XBRL* and controls for each maturity sub-sample. The *p*-values, in parentheses, are estimated by using the robust *t*-statistics based on standard errors clustered by firm and year. ***, **, and * represent two-tailed p-value significance levels of 0.01, 0.05, and 0.1, respectively. All variables are defined in the Appendix.

TABLE 4

Regression of *CDS_SPREAD* on XBRL: Difference-in-Differences

Variable	Pred. sign	Estimates
TREAT	+/–	0.0207
		(1.44)
XBRL	–	-0.2432***
		(-11.29)
TREAT XBRL*	–	-0.0642**
		(-2.57)
Firm controls:		
LEV	+	-0.4534
		(-1.30)
SD_RET	–	0.0981***
		(6.20)
RATE	+	-0.0467***
		(-3.52)
SIZE	+	-0.1153***
		(-6.82)
D_3	+	0.4684***
		(6.87)
D_5	+	0.7536***
		(6.70)
D_7	+	0.8449***
		(6.07)
D_10	+	0.9261***
		(5.71)
D_20	+	1.0593***
		(5.83)
D_30	+	1.0862***
		(5.71)
Macro factors:		
SPOT	–	-0.2103*
		(-1.99)
BOND_SPREAD	+	0.2846***
		(4.05)
TREAS_SPREAD	–	-0.208
		(-1.06)
INTERCEPT	+/–	-0.9689*
		(-1.71)
Industry dummies		Yes
Adjusted R^2		0.59
No. of observations		106,099

This table reports the results of a difference-in-differences analysis. We use Tier 1 filers as the treatment group and non-adopting firms as the control group during January 2007 to June 2010, which is the Tier 1 adoption period. To reduce the effect of bias related to firm size, we match Tier 1 treatment firms to control firms based on size and industry (e.g., two-digit SIC codes). The variable *TREAT* is a dummy variable equal to one for firms in the treatment group, zero otherwise. The variable *XBRL* is a dummy variable equal to one if the observation belongs to the XBRL filing period and zero otherwise. *TREAT*POST* is the interaction term of *TREAT* and *POST*. The *p*-values, in parenthesis, are estimated by using robust *t*-statistics based on standard errors clustered by firm and year. ***, **, and * represent two-tailed p-value significance levels of 0.01, 0.05, and 0.1, respectively. All variables are defined in the Appendix.

TABLE 5
Regression of *CDS_SPREAD* on Random Assignment of XBRL Adoption Dates

Variable	Pred. sign	Random assignment	Table 3 (Col. 4)
XBRL	–	-0.0095	-0.0682**
		(-1.50)	(-2.18)
Firm controls:			
LEV	+	1.9745***	2.0716***
		(8.12)	(8.31)
SD_RET	+	0.3459***	0.3621***
		(19.83)	-20.14
RATE	–	-0.0093**	-0.0067*
		(-2.63)	(-1.94)
SIZE	–	-0.1896***	-0.2526***
		(-14.53)	(-14.05)
D_3	+	0.5567***	0.5568***
		(19.10)	(19.07)
D_5	+	0.8790***	0.8789***
		(19.59)	(19.55)
D_7	+	0.9847***	0.9849***
		(18.54)	(18.53)
D_10	+	1.0717***	1.0719***
		(17.92)	(17.91)
D_20	+	1.1802***	1.1789***
		(18.64)	-18.69
D_30	+	1.2065***	1.2053***
		(19.48)	(19.48)
Macro factors:			
SPOT	–	-0.1767***	-0.1935***
		(-9.96)	(-8.16)
BOND_SPREAD	+	0.2300***	0.2461***
		(19.82)	(17.98)
TREAS_SPREAD	–	-0.0266	-0.026
		(-1.15)	(-1.03)
INTERCEPT	+/–	0.3889**	-1.1322***
		(2.11)	(-8.89)
Industry dummies		Yes	Yes
Adjusted R^2		0.65	0.64
No. of observations		213,145	213,145

This table presents the results from a pseudo-event analysis where the XBRL adoption dates are randomly assigned in our sample. Industry fixed effects are based on the Fama-French 48 industry classification. The p-values, in parentheses, are estimated by using the robust t-statistics based on the standard errors clustered by firm and year. ***, **, and * represent two-tailed p-value significance levels of 0.01, 0.05, and 0.1 respectively. All variables are defined in the Appendix.

TABLE 6
Regression of *CDS_SPREAD* on XBRL Adoption: Effects of Accrual Quality

		Accrual Quality	
Variable	Pred. sign	Low	High
XBRL	-	-0.1167***	0.0095
		(-3.43)	(0.26)
Test of coefficient difference	+	0.1262***	
		(2.96)	
Firm controls:			
LEV	+	2.7673***	1.6081***
		(20.22)	(9.39)
SD_RET	+	0.3440***	0.3176***
		(20.76)	(18.49)
RATE	–	-0.0034	-0.0153***
		(-0.85)	(-3.59)
SIZE	–	-0.1681***	-0.2357***
		(-11.65)	(-16.45)
D_3	+	0.5776***	0.5504***
		(64.96)	(59.60)
D_5	+	0.8986***	0.8795***
		(69.07)	(65.68)
D_7	+	1.0122***	0.9863***
		(68.49)	(62.89)
D_10	+	1.1006***	1.0783***
		(66.86)	(61.66)
D_20	+	1.2038***	1.2067***
		(68.13)	(62.95)
D_30	+	1.2272***	1.2321***
		(70.14)	(64.05)
Macro factors:			
SPOT	–	-0.1897***	-0.1833***
		(-11.24)	(-9.53)
BOND_SPREAD	+	0.1616***	0.2296***
		(8.48)	(11.10)
TREAS_SPREAD	_	-0.0634***	-0.0179
		(-2.85)	(-0.68)
INTERCEPT	+/–	0.2516	0.0276
		(1.47)	(0.09)
Industry dummies		Yes	Yes
Adjusted R^2		0.7	0.63
No. of observations		85,377	85,158

This table summarizes cross-sectional regressions of *CDS_SPREAD* on *XBRL* with controls for firm and macro factors conditional on the ex ante accrual quality. Ex ante accrual quality is measured in the pre-XBRL adoption period and defined as the standard deviation of the firm residuals from the Dechow and Dichev (2002) model during the years t-5 to t-1. The model regresses working capital accruals on lagged, current, and future cash flows plus the change in revenue and property, plant and equipment. All variables are scaled by average total assets. The p-values, in parentheses, are estimated by using the robust t-statistics based on the standard errors clustered by firm and year. ***, **, and * represent two-tailed p-value significance levels of 0.01, 0.05, and 0.1, respectively. All variables are defined in the Appendix.

TABLE 7
Regression of *CDS_SPREAD* on XBRL Adoption: Effects of Organizational Complexity

		Organizational Complexity	
Variable	Pred. sign	Low	High
XBRL	–	-0.0263	-0.0617*
		(-0.80)	(-1.84)
Test of coefficient difference		-0.0354*	
	+	(-1.68)	
Firm controls:			
LEV	+	1.5003***	2.3954***
		(12.86)	(17.03)
SD_RET	+	0.3410***	0.3464***
		(19.06)	(21.51)
RATE	–	-0.0081**	-0.0161***
		(-2.01)	(-4.27)
SIZE	–	-0.2430***	-0.1562***
		(-16.41)	(-12.68)
D_3	+	0.5494***	0.5513***
		(64.60)	(65.08)
D_5	+	0.8609***	0.8772***
		(68.20)	(71.56)
D_7	+	0.9640***	0.9824***
		(65.80)	(69.04)
D_10	+	1.0412***	1.0741***
		(63.68)	(67.65)
D_20	+	1.1405***	1.1881***
		(63.36)	(68.06)
D_30	+	1.1614***	1.2153***
		(64.29)	(69.60)
Macro factors:			
SPOT	–	-0.2044***	-0.1710***
		(-11.87)	(-10.60)
BOND_SPREAD	+	0.1937***	0.2269***
		(10.77)	(12.48)
TREAS_SPREAD	–	-0.0464**	-0.0268
		(-2.00)	(-1.20)
INTERCEPT	+/–	0.9811***	0.0696
		(5.25)	(0.45)
Industry dummies		Yes	Yes
Adjusted R^2		0.65	0.67
No. of observations		98,148	96,294

This table summarizes cross-sectional regressions of *CDS_SPREAD* on *XBRL* with controls for firm and macro factors conditional on organizational complexity (*CMPLX*) defined as a dummy variable equal to one if the number of firms' business segments is greater than the sample median, and zero otherwise. The p-values, in parentheses, are estimated by using the robust t-statistics based on the standard errors clustered by firm and year. ***, **, and * represent two-tailed p-value significance levels of 0.01, 0.05, and 0.1, respectively. All variables are defined in the Appendix.

TABLE 8
Effect of Standardized Official Elements Versus Customized Extension Elements

Variable	Pred. sign	Estimates
OFFE	-	-0.5169***
		(-6.30)
Firm controls:		
LEV	+	1.8021***
		(14.95)
SD_RET	+	0.3406***
		(24.18)
RATE	–	0.0082**
		(2.55)
SIZE	–	-0.1987***
		(-17.84)
D_3	+	0.6185***
		(87.26)
D_5	+	0.9701***
		(96.17)
D_7	+	1.0834***
		(94.80)
D_10	+	1.1699***
		(94.63)
D_20	+	1.2571***
		(94.31)
D_30	+	1.2695***
		(97.08)
Macro factors:		
SPOT	–	-0.1429***
		(-5.91)
BOND_SPREAD	+	0.3327***
		(12.19)
TREAS_SPREAD	–	-0.0255
		(-1.32)
INTERCEPT	+/–	0.7342***
		(4.09)
Industry dummies		Yes
Adjusted R^2		0.68
No. of observations		99,828

This table summarizes the cross-sectional regression of *CDS_SPREAD* on *OFFE*, defined as the ratio of official elements to the sum of the number of standardized official elements and the number of customized extension elements in each firm's XBRL filing, with controls for firm and macro factors. The p-values, in parentheses, are estimated by using the robust t-statistics based on the standard errors clustered by firm and year. ***, **, and * represent two-tailed p-value significance levels of 0.01, 0.05, and 0.1, respectively. All variables are defined in the Appendix.

TABLE 9
Regression of *CDS_SPREAD* on XBRL: Effects of Probability of Default

Variable	Pred. sign	CDS implied credit rating: Investment grade	CDS implied credit rating: Speculative grade	Distance-to-default: Long *DTD*	Distance-to-default: Short *DTD*
XBRL	–	-0.1123***	-0.0879**	-0.0839***	-0.0006
		(-3.02)	-2.09	(-2.71)	(-0.01)
Test of coefficient difference	–	-0.2002***		-0.0833*	
		(-8.89)		(-1.74)	
Firm controls:					
LEV	+	2.0263***	1.8887***	1.7863***	2.0624***
		(8.00)	(7.01)	(4.75)	(7.81)
SD_RET	+	0.3542***	0.3656***	0.2380***	0.4116***
		(17.80)	(16.40)	(8.91)	(15.71)
RATE	–	-0.0124***	0.0379***	-0.0016	-0.0186***
		(-2.86)	-2.81	(-0.37)	(-3.74)
SIZE	–	-0.2627***	-0.2660***	-0.2755***	-0.2098***
		(-13.90)	(-9.52)	(-11.90)	(-6.98)
D_3	+	0.5918***	0.5574***	0.6350***	0.4005***
		(19.48)	(21.91)	(24.71)	(12.80)
D_5	+	0.9315***	0.8541***	1.0282***	0.6241***
		(19.40)	(24.07)	(25.31)	(13.72)
D_7	+	1.0511***	0.9372***	1.1715***	0.6773***
		(17.80)	(23.67)	(23.03)	(13.22)
D_10	+	1.1471***	1.0025***	1.3007***	0.7193***
		(17.11)	(23.81)	(22.00)	(13.10)
D_20	+	1.2438***	1.0807***	1.4407***	0.8071***
		(17.86)	(24.33)	(22.29)	(14.25)
D_30	+	1.2727***	1.0958***	1.4740***	0.8341***
		(18.38)	(25.70)	(22.93)	(15.12)
Macro factors:					
SPOT		-0.1844***	-0.2845***	-0.2697***	-0.1924***
		(-7.89)	(-9.70)	(-12.83)	(-6.05)
BOND_SPREAD	+	0.2780***	0.2294***	0.1422***	0.1938***
		(17.51)	(12.19)	(4.88)	(8.71)
TREAS_SPREAD	_	-0.0037	-0.1638***	-0.1666***	-0.1056***
		(-0.14)	(-6.12)	(-5.08)	(-2.86)
INTERCEPT	+/–	-1.2262***	-1.0114***	-0.7489***	-0.6693***
		(-9.38)	(-6.35)	(-3.81)	(-4.54)
Industry dummies		Yes	Yes	Yes	Yes
Adjusted R^2		0.67	0.68	0.65	0.52
No. of observations		179,319	33,826	80,270	79,031

This table summarizes the regressions of *CDS_SPREAD* on *XBRL* adoption after controlling for firm and macro risk factors for sub-samples based on low and high probability of default. The *p*-values, in parentheses, are estimated by using the robust *t*-statistics based on standard errors clustered by firm and year. ***, **, and * represent two-tailed p-value significance levels of 0.01, 0.05, and 0.1, respectively. Distance to default is based on the Merton (1973) default model. All variables are defined in the Appendix.

TABLE 10
Regression of *CDS_SPREAD* on XBRL Adoption Controlling for the Financial Crisis

Variable	Pred. sign	Estimate
XBRL	-	-0.0319*
		(-1.95)
Firm controls:		
LEV	+	2.0716***
		-8.95
SD_RET	+	0.3753***
		(20.50)
RATE	–	-0.0079**
		(-2.29)
SIZE	–	-0.2672***
		(-15.30)
D_3	+	0.5491***
		(18.94)
D_5	+	0.8665***
		(19.41)
D_7	+	0.9718***
		(18.45)
D_10	+	1.0560***
		(17.80)
D_20	+	1.1601***
		(18.54)
D_30	+	1.1836***
		(19.24)
Macros factors:		
CRISIS	+	0.1339***
		(4.97)
SPOT	–	-0.2086***
		(-8.45)
BOND_SPREAD	+	0.2312***
		(17.38)
TREAS_SPREAD	–	-0.0317
		(-1.23)
INTERCEPT	+/–	-1.0988***
		(-8.59)
Industry dummies		Yes
Adjusted R^2		0.65
No. of observations		213,145

This table summarizes the cross-sectional regression of *CDS_SPREAD* on *XBRL* with controls for firm and macro factors and a dummy variable for the 2008–2009 financial crisis, defined as equal to one for months March 2008 to September 2009, otherwise zero. Industry fixed effects are based on the Fama-French 48 industry classification. The *p*-values, in parenthesis, are estimated by using the robust *t*-statistics based on the standard errors clustered by firm and year. ***, **, and * represent two-tailed p-value significance levels of 0.01, 0.05, and 0.1 respectively. All variables are defined in the Appendix.