

Information Efficiency of the U.S. Credit Default Swap Market: Evidence from Earnings Surprises

Abstract

The Credit Default Swap (CDS) market attracted much debate during the 2008 financial crisis. Opponents of CDS argue that CDS could lead to financial instability as it allows speculators to bet against companies and make the crisis worse. Proponents of CDS believe that CDS could increase market competition and benefit hedging activities. Moreover, an efficient CDS market can serve as a barometer to regulators and investors regarding the credit health of the underlying reference entity. We investigate information efficiency of the U.S. CDS market using evidence from earnings surprises. Our findings confirm that negative earnings surprises are well anticipated in the CDS market in the month prior to the announcement, with both economically and statistically stronger reactions for speculative-grade firms than for investment-grade firms. On the announcement day, for both positive and negative earnings surprises, the CDS spread for speculative-grade firms presents abnormal changes. Moreover, there is no post-earnings announcement drift in the CDS market, which is in direct contrast to the well-documented post-earnings drift in the stock market. Our evidence supports the efficiency of the CDS market.

1. INTRODUCTION

A credit default swap (CDS) is a credit derivative contract where the buyer makes periodic payments (CDS spread) in exchange for protection against default or other credit events of the underlying corporate or sovereign entity specified in the contract. The CDS market started to grow in the late 1990s, more than doubled in size each year, and, by the end of 2007, the CDS market had a notional value of \$62.2 trillion (ISDA, 2010). However, the CDS market attracted considerable concern from regulators after the collapse of several large financial institutions during the 2008 financial crisis.

Opponents of CDS argue that CDS could lead to financial instability as it allows speculators to bet against companies or countries and may make the crisis worse.¹ For example, CDS was blamed as a cause of Bear Stearns' collapse as the surge in its CDS spread indicated the weakness of the bank thereby restricting its access to the wholesale capital market, leading to its forced sale to JP Morgan in March 2008. The rescue of Fannie Mae and Freddie Mac in September 2008 and the bankruptcy of Lehman Brothers triggered billions of dollars of payables to the buyers of the CDS protection, leading to huge losses by insurance companies who sold CDS contracts on these financial institutions. In particular, the insurance giant, American International Group (AIG), had been excessively selling CDS protection, exposing itself to potential losses over \$100 billion. The federal bailout of AIG made regulators concerned about the role of CDS in financial stability. They began to consider ways to reduce the risk involved in CDS transactions.

Alternatively, proponents of CDS believe that CDS could increase market competition and benefit hedging activities, while helping banks to reduce the concentration of credit risk. For

¹ For example, see George Soros (March 24, 2009), "Opinion: One Way to Stop Bear Raids," Wall Street Journal, and Stevenson Jacobs, (March 10, 2010), "Greek Debt Crisis Is At The Center Of The Credit Default Swap Debate," Huffington Post.

example, during the 2000-2001 market crash, U.S. banks suffered limited damage from the burst of the dotcom bubble and telecommunication bubble since credit risk was diversified to the insurance industry in Europe and America.² The CDS contract per se should not be blamed for the financial crisis. The major problem for large financial institutions was that they underestimated the risk exposure of operating in the CDS market where illiquidity, counterparty risk, and systemic risks could be substantial. For example, AIG underestimated the default probabilities of the reference entities that it sold extensively to collect CDS premiums. In addition, the minimum Basel capital ratio was not required for banks operating in the credit derivatives market due to its off balance nature. Greater regulation should increase capitalization requirements and market transparency in order to reduce potential risk of the credit derivatives market.³

Moreover, proponents of CDS hold that an efficient CDS market can serve as a barometer to regulators and investors regarding the credit health of a company.⁴ In the case of Bear Stearns, the widening of their CDS spread was a symptom rather than a cause of its collapse as investors sought to hedge their exposure to the bank or speculate on its collapse.

² Wagner and Marsh (2006) find that the incentive of banks to transfer credit risk is aligned with the regulatory objective of improving financial stability. As such, the development of credit derivative instruments should be welcomed. They also find the transfer of credit risk from banks to non-banks to be more beneficial than credit risk transfer within the banking sector.

³ See "E.U. Derivatives Ban Won't Work, U.S. Says," New York Times, March 17, 2010. Duca et al. (2010) argue that lessons from the crisis include recognizing the importance of financial innovation and improving regulation. Cukierman (2011) suggests that one of the major problems leading to the current financial crisis is the growth of a poorly regulated shadow financial system. The Dodd-Frank Act that was passed in 2010 pointed out two problems encountered in the 2007-2009 crises with the credit derivative market. The first is that the regulatory capital requirements for banks did not reflect the risk exposure of operating in the credit derivatives. Another problem was the opacity of exposure in OTC derivatives. It was proposed that credit derivative should be traded in centralized trading platforms where margin and transparency requirements would be imposed by the platforms (Krainer, 2011).

⁴ Litan, Robert E. (April 7, 2010), "The Derivatives Dealers' Club and Derivatives Markets Reform: A Guide for Policy Makers, Citizens and Other Interested Parties," (PDF) Brookings Institution.

Indeed, anecdotal evidence suggests that the CDS demonstrates dramatic spread widening in anticipation of adverse credit events in the years prior to the 2008 financial crisis.⁵ The changing CDS spread reflects the dynamic risk profile of the underlying entity and its debt instrument. Existing studies find that CDS spread plays a leading role in responding to changes in credit conditions, such as future rating events (Hull et al., 2004; Norden and Weber, 2004), and adverse credit events such as M&A, SEC probe or accounting irregularities, and leverage buyouts (Zhang, 2009). The leading role of the CDS market may be due to the absence of funding and short-sale restrictions in the derivatives market and large institutional investors with privileged information (Acharya and Johnson, 2007).

In this paper, we provide further evidence regarding the information efficiency of the U.S. CDS market around earnings news. An earnings announcement is the most fundamental news regarding a firm's value. We conduct a systematic study on whether the U.S. CDS market could incorporate earnings announcements in a timely fashion. Specifically, does the CDS market anticipate subsequent earnings surprises? Does the market response vary across firms with different credit risks and vary across positive and negative earnings? Is there post-earnings drift in the credit market, as in the equity market?

First, should earnings news be incorporated in CDS prices? If so, what type of earnings news elicits stronger market reactions? What type of firm is more likely to be affected? Analogous to bond yield spread, CDS spread is a function of the debt-to-firm value ratio, or leverage, term to maturity and volatility. An unexpected change in earnings will result in an unexpected change in future cash flow and, as such, the firm value, leading to a change in the

⁵ For example, the CDS price for First Data mysteriously rose by 62% in two weeks just before its board announced that the firm was acquired by KKR on April 2, 2007 (Scheer, 2007). The Wall Street Journal (WSJ) article (October 4, 2006), "Trading in Harrah's Contracts Surges Before LBO Disclosure," reported that CDS spreads of Harrah experienced a dramatic spike two days prior to the announcement, whereas the stock market was much slower to respond.

leverage ratio. Therefore, we would expect the CDS spread to increase in the case of negative earnings surprises and to decrease for positive earnings news. Given limited upside potential, but substantial downside risk for bondholders, negative earnings surprises should have a stronger effect on the CDS spread than positive ones. Moreover, simulation results from Merton (1974) indicate that there is a convex relation between risk premium and leverage ratio.⁶ Given a monotonic correlation between leverage and credit ratings (Standard and Poor's, 2003), we expect that speculative-grade firms are more severely affected by earnings surprises than investment-grade firms.

Additionally, can the CDS market anticipate earnings surprises? The CDS market is an unregulated OTC market for institutional investors and dominated by large banks, insurance companies, and hedge funds. They usually have information advantages due to greater research resources or simply by possessing insider information. Given informed market participants, embedded leverage, and its market opacity, the CDS market may be a preferred channel for informed trading. Since banks and other sophisticated investors may have information advantages with respect to earnings numbers, CDS spreads may respond ahead of actual earnings announcements, particularly in the case of negative earnings surprises and for speculative-grade firms.

Moreover, if the CDS market is efficient, we should not observe post-earnings drift. It has been well documented that stock market reactions drift post earnings announcement (Ball and Brown, 1968). One explanation is that this is largely driven by noisy trading by uninformed investors. Different from the stock market where there are both informed and uninformed

⁶ As demonstrated in Table 1 and Figure 1 in Merton (1974), on the far right end, when debt-to-firm-value ratio rises to an extremely high level, the curve turns concave. However, it is likely the case when firms go bankrupt and, as such, not empirically observable.

investors, the CDS market is dominated by informed investors who may interpret information more accurately. Thus, post-earnings drift is less likely to exist in the CDS market.

Using a sample of 6,236 earnings surprises observations on 633 firms from the IBES database. We find an asymmetric impact of earnings surprises on CDS spreads. Specifically, there is a significant impact on CDS spreads in the $[-1, 1]$ event window for speculative-grade firms, but not for investment-grade firms. For speculative-grade firms, CDS spreads increase by 2.5 basis points (bp) for negative earnings surprises and decline by 2.6bp for positive surprises around earnings announcements. The results suggest that the credit market views earnings surprises as an important element in the pricing of speculative-grade firms, which are closer to the default boundary, but not for investment-grade firms.

Additionally, we find that the CDS market only anticipates one type of earnings surprises, the negative ones. Specifically, negative earnings surprises are associated with a dramatic 10.5bp widening of the CDS spread in the one-month window of $(-30, -2)$ leading up to the announcement day, but no significant CDS spread change is detected for positive earnings surprises before the earnings announcement. The pre-event asymmetric response is consistent with the finding in Acharya and Johnson (2007) that information leakage (likely due to insider trading) in the CDS market happens to negative credit news only.

More importantly, we find there is no post-earnings announcement drift for the full sample in the CDS market, supporting the efficiency of the CDS market. This is in direct contrast to the well documented post-announcement drift in the stock market. We attribute this finding to the fact that the players in this market are sophisticated financial institutions with an information advantage.

Furthermore, we examine how CDS spreads are related to earnings surprises after controlling for market, firm, and security-specific characteristics in a multivariate regression. We find that for each percentage increase in positive earnings surprise, the CDS spread for speculative-grade firms will decrease by 2.9bp during the [-1,1] window.

This research contributes to several streams of literature. First, this study provides evidence of information efficiency of the CDS market around the earnings announcement. Therefore, we support the view that the CDS market is an efficient indicator of a company's creditworthiness.⁷ Additionally, it extends the earnings surprise literature (Datta and Dhillion, 1993) in a new credit derivatives market setting, and demonstrates asymmetric effects for investment-grade firms and speculative-grade firms. Moreover, our analysis indicates the importance of incorporating a firm's fundamental information into the pricing of speculative-grade CDS. Prior studies regarding the pricing of CDS (Hull and White, 2000; Chen and Sopranzetti, 2002) largely ignore the effects of accounting information.

The remainder of the paper is organized as follows. Section 2 introduces the CDS market. Section 3 reviews the literature and develops hypotheses. Section 4 presents the data, method, and the results, while Section 5 provides our conclusions.

2. BACKGROUND INFORMATION ON CREDIT DEFAULT SWAP

Credit default swap (CDS) is an important innovation in the credit derivative market and is used to manage credit risk. The underlying security of a CDS contract can be a corporate bond or a sovereign or municipal bond. The buyer of a CDS contract makes annual payments to the seller and is compensated in full when there is a default or another credit event. This annual

⁷ As pointed out by Cao et al. (2010, 2011) and Berndt and Ostrovnaya (2008), the information content of an equity option could also be a timely signal of firm volatility and credit risk to sophisticated institutional investors.

payment, quoted in basis points on an annual basis with a notional contract value of \$10 million, is called the CDS spread. For example, the five-year CDS spread for Countrywide Financial Corporation on August 16, 2007, is 571 basis points. This indicates that the CDS buyer will pay \$571,000 every year over the next five years to the seller in order to enjoy protection on his or her Countrywide bonds with a \$10 million face value. Essentially, the CDS market allows the seller to provide an insurance policy to the buyer and helps to diversify credit risk among different financial institutions.

The credit derivatives market has experienced a phenomenal growth since 1996. By the end of 1996, the CDS market size was only around \$40 billion in nominal value. However, by the end of 2007, the nominal value of all outstanding CDS contracts had reached \$62.2 trillion. According to a news report in Bloomberg, credit default swaps had become the “dominant instrument” in the global derivatives market (about 12% of the notional amount of all derivatives) and accounted for 88% of the total credit derivatives by the end of 2007.⁸ After the financial crisis in 2008, the outstanding CDS notional amount shrank to \$31.22 trillion as of mid-2009 due to market consolidation (ISDA, 2010). The most active participants in the credit derivatives market include banks, insurance companies, pension funds, hedge funds, and other asset managers. According to Fitch Ratings (2006), banks and broker-dealers accounted for the vast majority of the outstanding credit derivative protection. Protection buying is dominated by large sophisticated banks to manage exposure concentrations and transfer credit risk. Insurance firms and financial guarantors are major contract writers in this market. Fitch (2006) estimates hedge funds account for up to 30% of the credit derivative trading volume.

Our CDS data are obtained from the Markit Group Ltd., whose comprehensive database

⁸ “Global Derivatives Market Expands to \$516 Trillion” by Kabir Chibber. Bloomberg LLP (November 22, 2007).

covers over 1,000 American publicly traded corporations.⁹ CDS contracts have different maturities, ranging from three months to 30 years with the most liquid five-year contract accounting for 85% of the CDS market. We use five-year CDS spreads to isolate the maturity issue and minimize liquidity noise. To maintain uniformity in contracts, we only keep CDS quotations for senior unsecured debt with a modified restructuring (MR) clause, denominated in U.S. dollars.¹⁰

Prior studies indicate that the CDS market leads the bond market in incorporating the default risk of underlying credit. Blanco et al. (2005) and Zhu (2006) provide empirical evidence that the CDS market leads the bond market in terms of price discovery. CDS spread is a good measure of credit spread, free from the liquidity, taxation, and risk free rate mismatch problems in empirical bond data (Hull et al. 2004), while bond prices may include liquidity components since bonds are not as actively traded as CDS contracts due to short-selling restrictions and the nature of market participants.¹¹

In addition, existing studies demonstrate that the CDS market is complementary to the stock market as it provides incremental information beyond the stock price. Acharya and Johnson (2007) examine the information content of CDSs by using the stock market as a benchmark for public information. They find that due to insider information owned by informed banks about the credit conditions of the underlying entity, there is information flow from the CDS market to the equity market, especially for negative news. Fung et al. (2008) study the relationship between the stock and CDS markets and find that there is valuable information

⁹ This dataset has been widely used in finance studies of the CDS market, most prominently by Zhu (2006), Cao et al. (2010), Jorion and Zhang (2007, 2009), and Kapadia and Pu (2010).

¹⁰ The Modified Restructuring clause was introduced in the ISDA standard contract in 2001. This limits the scope of opportunistic behavior by sellers in the event of a restructuring agreement to deliverable obligations with a maturity of 30 months or less. This clause applies to the majority of quoted CDS for North American entities.

¹¹ Chen et al. (2006) find that the cross-section of yield spreads is strongly related to liquidity indicators such as bond bid-ask spreads.

content in the CDS spreads that can benefit stock market participants. Kapadia and Pu (2010) report that there are common pricing discrepancies across firms' equity and CDS prices arising from impediments to arbitrage.

Our paper is closely related to the strand of literature that examines the information efficiency of the CDS market. Hull et al. (2004) find that CDS levels and spread changes anticipate negative rating events. Norden and Weber (2004) confirm that CDS and stock markets anticipate the rating downgrades, but the CDS market reacts earlier than the stock market in the case of reviews for downgrades. Zhang (2009) investigates CDS price reactions to a variety of credit events including news of economic distress, financial distress, M&A, SEC probes or accounting irregularities, and leverage buyouts (LBO). The CDS spread indicates a large spike of 37%-96% depending upon the event type on a single day and stays fairly flat the month after, supporting the efficiency of the CDS market. We attempt to examine the efficiency of the CDS market based on earnings surprise, the most fundamental news regarding a firm's value.

3. LITERATURE ON EARNINGS SURPRISES AND HYPOTHESES DEVELOPMENT

3.1. Literature on Earnings Announcements

Prior studies have explored stock market reactions to earnings announcements. Studies, such as Ball and Brown (1968), Brown (1978), and Aharony and Swary (1980), demonstrate that the stock market does anticipate most of the reported earnings. It is the earnings surprises that provide new information and move stock prices around announcements. Bartov et al. (2002) find that around the earnings announcement window, firms with positive earnings surprises experience a higher stock return than firms with negative earnings surprises. However, research

regarding the impact of earnings surprises on the cost of debt is limited. One notable exception is Datta and Dhillion (1993). They investigate bond price reactions to unexpected quarterly earnings announcements demonstrating that bond prices react positively to *large* positive earnings surprises and negatively to *large* negative earnings surprises.

Our investigation is related to that of Datta and Dhillion (1993) that examined bond price reactions to earnings surprises, but differs in several ways. First, the use of continuous the daily CDS spread enables us to do a cleaner event study and effectively control confounding events. We can do a short-event window test and effectively control confounding events such as rating changes, capital structure changes, and new bond offerings. All CDS quotes in our study are uniformly based on a five-year contract term. Thus, our study controls the impact of maturity by design. From the discussion in the previous section, the use of CDS spread has several advantages over bond spread.

Additionally, they explore bond price reactions to *large* earnings surprises only restricting their study to a small sample of 250 earnings announcements for 135 firms. This is due to inactive trading in the corporate bond market and the exclusion of small earnings surprises. They explore the bond price reactions to *large* earnings surprises only, while we use all earnings surprises regardless of size. Our sample includes 6,236 firm-quarter earnings surprises from 633 firms. Also, the corporate CDS market has a wider range of names, enabling us to conduct a thorough study conditional on the credit quality of firms and the nature and magnitude of earnings surprises. Instead of eliminating all small earnings surprises, we investigate the impact of the magnitude of earnings surprise based on the *full* sample within a multivariate regression framework with additional control of market volatility, firm leverage, and macroeconomic factors.

Most importantly, their study only examines bond reaction for the earnings announcement day, but our study focuses on the efficiency of the CDS market by examining pre-, at-, and post- announcement periods.

3.2. Hypothesis Development

Our first hypothesis concerns CDS spread reactions around earnings announcements. Several papers have explored the determinants of CDS spreads, but the role of earnings is absent in these studies. Though unexpected earnings surprise is not a factor in the structural model, unexpected earnings drive the market value of equity resulting in unexpected leverage shifts, which impact bond prices. Therefore, we expect that the CDS spread will decrease in reaction to positive earnings surprises, but rise in reaction to negative earnings surprises around earnings announcements.

Since bondholders will receive the larger of the face value of the bond and the firm's value, there is limited upward potential for bondholders when unexpected good earnings news hits the market. In addition, these unexpected good earnings should benefit firms closer to the default boundary, which are usually speculative-grade firms (since leverage ratio and credit rating are highly correlated, see Jorion et al., 2007 and Kaplan and Urwitz, 1979) more so than investment-grade firms.¹² If there is actually negative unexpected earnings news, downside risk will increase. This effect should be more pronounced for firms closer to the default boundary. This leads to our first hypothesis:

¹² Such intuition is consistent with the convex relation between credit spread ($R - r$) and leverage d from Merton's (1974) simulation when maturity and asset volatility are held constant. We can use the leverage as a proxy for credit rating given their high correlation.

H1. The CDS spread around the [-1, 1] event window should decrease for positive earnings surprises and increase for negative earnings surprises. This response should be stronger for speculative-grade firms than for investment-grade firms.

The above hypothesis can be summarized in the following figure:

	Investment-grade Firm	Speculative-grade Firm
Positive earnings surprise	-/0	-
Negative earnings surprise	+/0	+

Figure 1: Hypothesis on CDS Spread Changes Around the [-1, 1] Event Window

Our second hypothesis concerns CDS spread reactions prior to earnings announcements. The first hypothesis assumes market efficiency with no information leakage. However, if the earnings news is symmetrically anticipated by the market, the pre-announcement CDS spread should narrow for positive earnings surprises and widen for negative earnings surprises. Such effect should be stronger for speculative-grade firms that are closer to boundary of default. Moreover, the pre-announcement effect could be stronger than the effect on the announcement day due to the anticipation effect. In other words, earlier market reactions could dampen the CDS market reactions on the announcement day.

The information leakage in the CDS market may arise due to the structure of its market participants. The CDS market is unique in that its market participants are large sophisticated institutional investors with information advantages. Some participants, such as commercial or

investment banks, use CDS to transfer their corporate loan risk and, at the same time, have constant access to inside information due to their lending or advising relationships. While there are clear reporting requirements for corporate insider trading in the equity market, such requirements are lacking for CDS trading. The CDS market is largely an unregulated over-the-counter market on a global scale and information about the identities of trading parties is hard to collect. According to Credit Derivative Research, for 57 buy-out transactions in 2006, their CDS spreads experienced unusual upward shifts before the announcements of these deals. One case in point is First Data, whose CDS spread experienced a 250% increase from December 1, 2006 (when KKR started secret talks with First Data) to March 23, 2007 (when the deal was finally publicly announced).¹³

The anecdotal evidence is further confirmed by a recent study of Acharya and Johnson (2007). Their results can be explained by bank hedging activity. Banks have privileged access to their client firms' information and use the CDS market to hedge against their lending exposure against forthcoming bad news. Therefore, the CDS market is more likely to anticipate negative earnings surprises, but not positive earnings surprises. In addition, since insiders should be more alert and have a stronger incentive to hedge when firms are closer to default, information leakage through the CDS market will be stronger for firms with lower ratings. Thus, our second hypothesis is:

H2. If there is information leakage for a negative earnings announcement, the CDS spread within the pre-announcement event window of [-30,-2] should increase for negative earnings surprises, but not for positive earnings surprises.

¹³ See "Secrets to Keep: Insider Trading Hits Golden Age" by D. Berman. Source: Wall Street Journal, June 19, 2007 and "Insider Traders Concealed by Swaps, Options Boesky Never Used" by B. Drummond. Source: Bloomberg.com, June 20, 2007.

This effect should be more pronounced for speculative-grade firms than for investment-grade firms. Moreover, the pre-announcement effect should be stronger than the [-1, 1] event window due to the anticipation effect.

The above hypothesis can be summarized in the following figure:

	Investment-grade Firm	Speculative-grade Firm
Positive earnings surprise	0	0
Negative earnings surprise	0	+

Figure 2: Hypothesis on CDS spread changes around the [-30, -2] event window

Next, we develop our third hypothesis regarding CDS spread after the earnings announcement. Due to the unique features of the CDS market as discussed above, we expect that the CDS market is efficient in reflecting all publicly available information, such as earnings surprises. Most CDS market participants are large and sophisticated investors who are privy to the same information, so the market should timely and accurately interpret information embedded in the earnings news. No one will have the ability to out-profit others. Therefore, we expect no overreaction or under reaction in the CDS market in the wake of earnings news, unlike the stock market where post-earnings drift may arise from noisy trading of uninformed investors. This leads to our third hypothesis:

H3. The CDS spread within the post-earnings announcement window of [+2, +10] should show no abnormal changes.

A large positive earnings surprise suggests that the default risk of a firm is greatly reduced leading to a larger CDS spread change, especially for a speculative-grade firms. Datta and Dhillon (1993) find that bond prices increase in response to large *positive* earnings surprises and decrease for large *negative* earnings surprises. We will examine how CDS spread changes are associated with the magnitude of earnings surprises. A large sample with both large and small earnings surprises will provide variations for this purpose. Furthermore, CDS spreads for speculative-grade firms should have greater sensitivity to the level of earnings surprises because they are closer to default and have substantial downside risks. This is summarized in our fourth hypothesis:

H4. For positive earnings surprises, the CDS spread changes in the [-1, 1] window should be negatively associated with the magnitude of earnings surprise, holding all else constant, and this effect should be stronger for speculative-grade firms than for investment-grade firms.

4. DATA, METHODS, AND RESULTS

4.1. Sample

We obtain our daily credit default swap quotes from the Markit Company, a prominent information provider in the credit derivative industry. The database includes daily CDS spreads, the maturity of the related CDS contract, the number of dealers contributing to the quote, an estimated recovery rate, and the firm's composite rating from Moody's, Standard & Poor's and Fitch. The data spans the time period from 2001 to 2005. We extract earnings data from I/B/E/S

and various accounting information from COMPUSTAT. We also use Factiva news service to exclude observations that experience confounding credit events during a period of 30 days prior to and 10 days after the earnings announcement. These events include credit rating changes, capital structure changes, mergers and acquisitions, spin-offs, seasoned equity offerings, new bank loans and new bond offerings, and changes in dividends. Our final sample size is 6,236 firm-quarter pairs of observations for 633 firms.

Table 1-A presents the frequency of observations across years, with the number of observations gradually increasing over the years. Table 1-B details the distribution of observations across industries based on the two-digit SIC code. The sample is evenly distributed over 60 industries.

[Insert Table 1]

We construct the major variable of interest, Earnings Surprise, following the approach used by Doyle et al. (2006) and Kasznik and McNichols (2002). The variable $\text{Earnings-Surprise}_{i,t}$ is firm i 's difference between the I/B/E/S actual earnings per share for quarter t and the most recent I/B/E/S consensus forecast earnings per share before the earnings announcement, deflated by the market price per share one month prior to the end of quarter t .¹⁴ If the actual quarterly earnings per share is larger than the I/B/E/S consensus forecast, then that firm-quarter observation is defined as a “positive earnings surprise” observation. If the actual quarterly earnings per share are smaller than the I/B/E/S consensus forecast, then that firm-quarter observation is defined as a “negative earnings surprise” observation.

¹⁴ We also performed this calculation with total assets per share from the previous quarter as the deflator and obtained similar results. The results are available upon request.

4.2. Results

4.2.1. CDS Spread Changes Around Earnings Announcement

Our main results are presented in Table 2. Panel A and B report CDS spread reactions around earnings announcements for negative earnings surprises and positive earnings surprises, respectively. In the upper section of each panel, we report results for the subsamples of firms falling into five broad rating categories (AAA and AA, A, BBB, BB, B and CCC). In the lower section of the panel, we report results for the full sample as well as the investment-grade subsample and the speculative-grade subsample. The last line presents the mean difference in CDS spread changes between a speculative-grade subsample and an investment-grade one. The mean and t-statistics of cumulative spread changes are reported over the [-30, -2] and [-1, 1] event windows for each case.

[Insert Table 2]

As demonstrated in Table 2, for the entire sample, CDS spreads increase by 0.81 basis points (bp) for the three-day window for negative earnings surprise, and decrease by 0.66bp for positive earnings surprise. However, when we partition the sample to speculative-grade and investment-grade firms, the impact of earnings surprise is more pronounced for the speculative-grade group. For negative earnings surprise, the three-day effect for the speculative-grade group is an increase of 2.53bp ($t=2.54$). Relative to the average CDS level in the sample, the 2.53bp effect for the speculative-grade group can be translated into an increase of CDS spread by 0.48%, which seems economically modest.¹⁵ This effect is dampened, however, to the extent that the

¹⁵ This 2.53bp spread increase is comparable to the level of CDS spread change reported in other event studies using CDS spread to gauge credit risk. For example, Jorion and Zhang (2007) find that the industry competitors suffer an

earnings surprise is anticipated. In terms of investment-grade firms, there is an insignificant increase of 0.13bp. The mean difference of 2.4bp in CDS spread changes between the speculative-grade and investment-grade firms is significant.

A similar pattern is found for positive earnings surprise. The three-day effect for the speculative-grade group is a narrowing of the CDS spread of 2.64bp ($t=3.26$) or a decrease by 1.05% relative to the CDS spread before the earnings announcement. The effect for the investment-grade group is negative, but insignificant. Here, the difference of 2.48bp between the speculative-grade and investment-grade groups is significant at the 1% level. Overall, the results in Table 2 are consistent with our first hypothesis.

4.2.2. CDS Spread Changes Prior to Earnings Announcement

To test our second hypothesis, whether the CDS market anticipates negative earnings news, we focus our attention on the [-30, -2] event window in Table 2. Panel A indicates that CDS change increases by 3.76bp ($t=3.76$) for the entire sample of negative earnings surprises. This suggests that the CDS market anticipates negative earnings shocks and responds in advance. If we break down the sample into the speculative and investment-grade subsamples, the difference in reaction is pronounced. On average, investment-grade firms suffer a 1.24bp increase (which is marginally significant statistically). Speculative-grade firms suffer a 10.49bp hike in CDS spread, on average, during the [-30, -2] event window and it is significant at the 1% level. This represents a 1.99% increase in CDS spread, which is economically significant. The mean test also demonstrates that the CDS change for speculative-grade firms is significantly greater than that of investment-grade firms.

increase of 1.84bp in CDS spread during the [-1, 1] event window when a firm files for Chapter 11 bankruptcy. Jorion and Zhang (2009) report that the CDS spread of creditors increase by 2.11bp for the three-day event window when its borrower files for Chapter 11 bankruptcy.

In sharp contrast to the anticipation effect around negative earnings shocks in the CDS market, there is muted response in the market prior to positive earnings shocks. As shown in the left column in Panel B, there is no significant CDS change in the [-30, -2] window for the full sample or any subsamples. These uni-variate results are consistent with our second hypothesis.

To provide further evidence that the CDS market anticipates negative earnings surprise (H2), we perform a logistic regression to examine whether changes in the CDS spread in the [-30,-2] window are useful for predicting a negative earnings surprise. The model is provided below:

$$P = 1 / (1 + e^{-a-bx})$$

Here, x is the CDS spread change in the pre-announcement window [-30,-2] and P is the probability of a negative earnings surprise event in the [-1, 1] window. We assign one to the dependent variable if a negative earnings surprise is observed and zero for a positive one. We estimate coefficients a and b with the maximum likelihood algorithm.

Table 3 reports results for the entire sample and the investment/speculative subsamples. For the whole sample, the CDS spread changes before earnings announcements appear to be a good predictor of the direction of earnings surprises. The coefficient on the CDS change variable, b , is positive and significant at the 0.001 level. This suggests that an increase in CDS spread change is positively associated with the likelihood that the earnings surprise is a negative one. When we separate observations into investment-grade and speculative subsamples based on firm credit ratings, the coefficients on the CDS change variable for both subsamples are still significant.

[Insert Table 3]

In sum, evidence from both the event study and the logistic regression supports our second hypothesis. It indicates that the CDS market seems to anticipate negative earnings surprises well before such bad news is announced publicly. This corresponds to anecdotal evidence in the financial press about information leakage in the CDS market. It also provides independent evidence in support of insider trading in the CDS market as documented by Acharya and Johnson (2007).

4.2.3. CDS Spread Changes Post Earnings Announcement

Finally, the CDS spread change in the [2, 10] window displays no significant reaction for negative earnings surprises across all rating levels and for the whole sample, the investment-grade subsample, and the speculative subsample. It suggests that the CDS market is indeed efficient with respect to negative earnings news. When we compare that with the [2, 10] event window result for positive earnings surprises in Table 2-B, we find similar results. Therefore, for both the investment-grade subsample and the speculative subsample, and for both types of earnings surprises, there is no significant post-earnings-announcement drift. That's in sharp contrast with the well documented post-earnings announcement drift in the equity market, which was first reported by Ball and Brown (1968). The information efficiency of the CDS market may arise from the absence of funding and short-sale restrictions in the credit derivatives market and the fact that the CDS market is dominated by sophisticated and well informed banks and institutional investors. Thus, it might be less subject to noise from naïve traders.

4.2.4. The Sensitivity of CDS Spread Changes Around Earnings Announcement to Earnings Surprises

In this section, we further explore the correlation between the level of earnings surprises and the magnitude of CDS spread changes around earnings announcements. To this end, we conduct a multivariate regression with the $[-1, 1]$ CDS spread changes as the dependent variable, and the level of earnings surprises as an explanatory variable, controlling for market and firm characteristics. To test whether the CDS spread of speculative-grade firms has a different sensitivity to earnings surprises from that of investment-grade firms, we create an interaction term by multiplying the earnings surprise with a dummy variable, which is equal to one for a speculative-grade firm and zero otherwise.

The choice of control variables is based on Merton (1974) and prior studies on determinants of CDS spread (Cao et al., 2010; Ericsson et al., 2009).

Market risk variables are:

Treasury Rate is the 10-year U.S. Treasury constant maturity yield obtained from the Federal Reserve Bank in St. Louis.

Yield Curve Slope is the difference between a 10-year and two-year U.S. Treasury yield.

Market Implied Volatility is the implied volatility for S&P 500 index options (VIX) extracted from CBOT.

Firm characteristics are:

Volatility change over the [-1, 1] window is calculated using 250-day historical daily stock returns for both the -1 date and also the +1 date.¹⁶

Leverage is the total liabilities of firm i for the preceding quarter divided by the sum of its total liabilities and the market value at $t-1$.¹⁷

Equity return is the stock return over the event window [-1, 1].

Table 4 reports the descriptive statistics of all variables for the speculative-grade and investment-grade subsamples. Our final regression sample consists of 6,236 firm-quarters in total (4,005 with positive earnings surprises and 2,231 with negative earnings surprises). The average negative earnings surprise scaled by market price is -0.003, with a lowest value of -0.158. The average positive earnings surprise is 0.002, with a highest value of 0.09. For the positive earnings subsample, we find that the CDS spread changes have a significant correlation of -0.075 with the level of earnings surprise and a correlation of -0.081 with the speculative-grade dummy.¹⁸ This provides partial support for our fourth hypothesis. However, for the negative earnings surprises subsample, we only find a significant positive correlation of 0.072 with the dummy variable, but no correlations with earnings surprise. This may be due to weak market reaction during the three-day window around negative earnings news. Next, we turn to multivariate regressions for more rigorous evidence.

[Insert Table 4]

¹⁶ We adhere to Cao et al. (2010) and use 250-day daily stock returns to calculate volatility changes. We also tested alternative measures of historical stock volatility based on 90-day stock returns and 180-day stock returns. Regression results are similar; thus, we do not report these variables and their results in our tables.

¹⁷ We finally decide to follow Cao et al. (2010) and keep only equity return in our regression model. We also try an accounting-based leverage ratio, such as the total liabilities-total assets ratio or the liability-equity ratio and get similar results.

¹⁸ Correlation matrix is not reported to save space, but is available upon request.

The multiple regression model is below:

$$\begin{aligned} \text{CDS Change}_{i,t} = & \alpha_1 + \alpha_2 \text{ Earnings Surprise}_{i,t} + \alpha_3 \text{ Earnings Surprise}_{i,t} * \text{Speculative Dum} \\ & + \alpha_4 \text{ Treasury Rate}_t + \alpha_5 \text{ Yield Curve Slope}_t + \alpha_6 \text{ Market Implied Volatility}_{1,t} + \alpha_7 \\ & \text{Volatility change}_{i,t} + \alpha_8 \text{ Leverage}_{i,t} + \alpha_9 \text{ Equity return}_{i,t} + \alpha_{10} \text{ to } \alpha_{13} \text{ Year dummies} \\ & + \varepsilon \end{aligned}$$

Since the dataset contains both time-series and cross-sectional observations, there are two types of correlations that may affect the statistical inference. First, observations from the same firm appear several times in our dataset and, as such, should not be treated as independent as in a typical OLS. Additionally, the same macroeconomic conditions affect all firms in the same year. Therefore, it is important to control for the time effect, as well. Following Peterson (2009), we estimate the equation using the panel regression adjusted for firm clustering effect, and introducing year dummies to account for the time effect.

The regression results are presented in Table 5. For the positive earnings surprise subsample, the coefficient on Earnings Surprise is not significant, but the speculative dummy variable is significant at the 5% level. The impact of positive earnings surprise on the CDS spreads of speculative-grade firms is -291.79 ($-477.22 + 185.43$) and is statistically significant at the 5% level. This implies that for every 1% increase (deflated by the stock price per share) in positive earnings surprise, the CDS spread for speculative-grade firms will drop by 2.9bp. In summary, investment-grade firms and speculative-grade firms do react differently to positive earnings surprises, consistent with H4. Results for the positive earnings surprise subsample

confirm our findings in the uni-variate test. There is no significant reaction to positive earnings surprise for the investment-grade firms, since they are far from financial distress. Good earnings news has little incremental impact on credit risk. However, for speculative-grade firms, better than expected earnings increase expected future cash inflow and reduce the risk of a covenant violation with immediate relief for bondholders. We also separate observations into two groups, investment-grade firms and speculative-grade firms, and run two separate regressions and reach the same conclusion.

[Insert Table 5]

Consistent with our expectation, the regression for the negative earnings surprise subsample reports no significant relationship between earnings surprise and the CDS spread change in the [-1, 1] event window. This is likely due to information leakage prior to the announcement.

4.2.5. The Sensitivity of CDS Spread Changes Prior to Earnings Announcement to Market and Firm Characteristics

Given the relatively limited CDS spread changes around the event window, it is interesting to investigate how the CDS run-ups before the earnings announcement are related to cross-sectional differences in firm characteristics.¹⁹ We construct a multivariate regression, where the dependent variable is the CDS spread changes during the [-30, -2] event window. The independent variables are similarly constructed as in Section 4.2.4., with the additional variable of the equity bid-ask spread to proxy for information asymmetry of firms announcing earnings

¹⁹ We thank a referee for their suggestion to investigate this issue.

news. Bid-ask spread is the average of stock bid-ask spreads scaled by the middle prices during the [-30, -2] event window.

Prior theoretical work suggests that higher information asymmetry is associated with wider credit spreads (Duffie and Lando, 2001; Cetin et al., 2004). This has been supported by a number of empirical works, such as Bhojraj and Sengupta (2003) and Wang and Zhang (2009). Therefore, we expect that higher information asymmetry is positively associated with CDS spread changes prior the earnings announcement, holding other things constant.

Table 6 reports the regression results. Several points are noteworthy. First, the coefficient for bid-ask spread is positive and significant at the 5% (10%) level for the positive (negative) earnings surprise subsample after controlling for other market and firm characteristics. Overall, for the entire sample, the greater bid-ask spread is significantly related to a higher CDS spread change during the [-30, -2] event window, as expected. This indicates that information asymmetry presented in the equity market is useful in explaining CDS spread changes prior to earnings announcements.

Additionally, volatility change and equity return during the [-30, -2] event window are important variables to explain pre-announcement CDS spread changes. The magnitude of earnings surprises is not significant in regressions of both subsamples suggesting that the CDS market is unable to predict the exact extent of earnings surprises. The interaction variable between earnings surprises and the speculative dummy is not significant. In terms of market variables, the pre-announcement CDS spread is sensitive to the Treasury Rate and to the Yield Curve Slope.

Moreover, the adjusted R-squares are 15% and 17% for positive and negative earnings surprise subsamples, respectively. This is much larger than the explanatory power (with the adjusted R-squares of 2%) for the regression of the [-1, 1] CDS spread changes in Table 5.

[Insert Table 6]

5. CONCLUSION

Although credit default swaps have been criticized by some for their role in the recent financial crisis, it is also held by others that CDS is a useful hedging device and a market barometer to reflect credit risk. Using earnings surprises, the most fundamental news concerning firms' value, we provide strong empirical evidence supporting the information efficiency of the CDS market.

Our study finds that negative earnings surprises lead to an increase in the CDS spread as early as one month prior the announcement for all firms, but the CDS spread for the speculative-grade subsample tends to increase more. We also confirm that positive earnings surprises do help to reduce the CDS spread when the news is released to the public, but this holds for speculative-grade firms only. Our results suggest that earnings news is more important for the CDS pricing of firms with low credit quality, consistent with the nature of the CDS contract. Moreover, we find there is no post-earnings announcement drift that was documented for the equity market in the CDS market, suggesting greater information efficiency of the CDS market.

This study extends research on the information efficiency of the CDS market by examining the market reaction to earnings news. The CDS market, with more active trades and relatively high liquidity, overcomes several limitations found in bond studies of price reaction to

earnings surprises. The results contrast with conclusions from earnings research in the equity market and single out the asymmetrical pattern of response in the CDS market between investment-grade firms and speculative-grade firms. Overall, our evidence supports the role of the CDS market in timely reflecting credit risk of the underlying reference entities, which should play an active role in increasing financial stability if properly used and regulated.

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Table 1. Descriptive Statistics of Earnings Observations

This table breaks down earnings observations by year in Panel A and by industries (2-digit SIC code) in Panel B.

Panel A. Frequency of Observations across Years

Year	Number	Percent
2001	478	7.6%
2002	958	15.4%
2003	1,198	19.2%
2004	1,717	27.5%
2005	1,885	30.2%
	6,236	100%

Panel B Frequency of Observations Across Industries

2-Digit SIC Code	Industry	Number	Percent
1	Agricultural Production	5	0.1%
7	Agricultural Services	16	0.3%
10	Metal Mining	38	0.6%
12	Coal Mining	9	0.1%
13	Oil and Gas Extraction	306	4.9%
14	Nonmetallic Minerals	20	0.3%
15	General Building Contractors	97	1.6%
16	Heavy Construction Excluding Building	18	0.3%
20	Food and Kindred Products	263	4.2%
21	Tobacco Products	30	0.5%
22	Textile Mill Products	15	0.2%
23	Apparel and Other Textile Products	72	1.2%
24	Lumber and Wood Products	49	0.8%
25	Furniture and Fixtures	40	0.6%
26	Paper and Allied Products	204	3.3%
27	Printing and Publishing	110	1.8%
28	Chemical and Allied Products	590	9.5%
29	Petroleum and Coal Products	99	1.6%
30	Rubber and Miscellaneous Plastics Products	92	1.5%
32	Stone, Clay, and Glass Products	21	0.3%
33	Primary Metal Industries	143	2.3%
34	Fabricated Metal Products	80	1.3%
35	Industrial Machinery and Equipment	297	4.8%
36	Electronic & Other Electric Equipment	228	3.7%
37	Transportation Equipment	271	4.3%
38	Instruments and Related Products	176	2.8%
39	Miscellaneous Manufacturing Industries	45	0.7%

40	Railroad Transportation	87	1.4%
42	Trucking and Warehousing	29	0.5%
44	Water Transportation	2	0.0%
45	Transportation by Air	51	0.8%
46	Pipelines, Except Natural Gas	5	0.1%
47	Transportation Services	5	0.1%
48	Communications	324	5.2%
49	Electric, Gas, and Sanitary Services	483	7.7%
50	Wholesale Trade-Durable Goods	60	1.0%
51	Wholesale Trade-Nondurable Goods	57	0.9%
52	Building Materials & Garden Supplies	35	0.6%
53	General Merchandise Stores	128	2.1%
54	Food Stores	72	1.2%
55	Automotive Dealers & Service Stations	29	0.5%
56	Apparel and Accessory Stores	51	0.8%
57	Furniture and Homefurnishings Stores	30	0.5%
58	Eating and Drinking Places	72	1.2%
59	Miscellaneous Retail	81	1.3%
60	Depository Institutions	120	1.9%
61	Non-depository Institutions	42	0.7%
62	Security and Commodity Brokers	139	2.2%
63	Insurance Carriers	330	5.3%
64	Insurance Agents, Brokers, & Service	23	0.4%
67	Holding and Other Investment Offices	117	1.9%
70	Hotels and Other Lodging Places	44	0.7%
72	Personal Services	18	0.3%
73	Business Services	227	3.6%
75	Auto Repair, Services, and Parking	19	0.3%
78	Motion Pictures	9	0.1%
79	Amusement & Recreation Services	79	1.3%
80	Health Services	90	1.4%
87	Engineering & Management Services	11	0.2%
99	Non-classifiable Establishments	33	0.5%
		6,236	100.0%

Table 2. CDS Spread Changes around Earnings Surprises

This table presents the mean changes in CDS spread for three event windows, [-30, -2], [-1, 1] and [2, 10] around negative earnings surprises in Panel A and around positive earnings surprises in Panel B. The mean changes are reported for five rating categories, AAA, A, BBB, BB, B/CCC, for investment-grade and speculative-grade firms, respectively, and for the full sample. The differences and mean test of differences in CDS spread changes between investment-grade and speculative-grade firms are presented.

Panel A. Mean Changes in CDS Spread around Negative Earnings Surprises

	No. of Firm Quarters	[-30,-2]	t-value	[-1,1]	t-value	[2,10]	t-value
1 AAA	108	-0.24	-0.32	0.05	0.25	-0.28	-0.49
2 A	527	1.09	1.29	0.53	1.38	0.03	0.08
3 BBB	967	1.49	1.34	-0.08	-0.27	-0.41	-0.82
4 BB	379	10.5*	2.43	3.01*	2.54	-2.19	-1.27
5 B/CCC	250	10.48 Δ	1.66	1.81	1.03	1.38	0.31
All	2231	3.76***	3.37	0.81	2.57	-0.4	-0.64
Investment-Grade	1602	1.24 Δ	1.71	0.13	0.68	-0.25	0.44
Speculative-Grade	629	10.49**	2.92	2.53*	2.54	-0.77	0.7
Mean Test Between Investment and Speculative Grade		9.25*	2.52	2.40*	2.32	-0.52	-0.25

Panel B. Mean Changes in CDS Spread around Positive Earnings Surprises

	No. of Firm Quarters	[-30,-2]	t-value	[-1,1]	t-value	[2,10]	t-value
1 AAA	195	-0.22	-0.38	0.18	1.56	-0.22	-0.93
2 A	1172	-0.47	-1.06	-0.15	-0.98	-0.54*	-2.48
3 BBB	1844	-0.5	-0.74	-0.21	-1.09	0.1	0.2
4 BB	536	-2.01	-0.76	-2.44**	-2.59	-2.42 Δ	-1.77
5 B/CCC	258	-0.62	-0.12	-3.07*	-1.98	2.43	0.57
All	4005	-0.68	-1.18	-0.66***	-3.46	-0.29	-0.7
Investment-Grade	3211	-1.56	-0.64	-0.16	-1.32	-0.15	-0.49
Speculative-Grade	794	-0.47	-1.11	-2.64**	-3.26	-0.84	-0.5
Mean Test Between Investment and Speculative Grade		-1.09	-0.44	-2.48**	-3.02	-0.69	-0.40

*** Significant at the 0.001 level

** Significant at the 0.01 level

* Significant at the 0.05 level

Δ Significant at the 0.10 level

Table 3. CDS Change in the [-30,-2] as a Predictor of Negative Earnings Surprises

This table presents the regression results of the following logistic regression model:

$$P=1/(1+e^{-a-bx}).$$

Where x is the change in CDS spread for the time period [-30, -2] and P is the probability of a negative earnings surprise in the [-1, 1] event time period. We also report McFadden LRI, the McFadden's likelihood ratio index (McFadden R-square), that is used to gauge the model's overall fit in the logistic regression.

	All		Investment-Grade		Speculative-Grade	
a	-0.3689	***	-0.4321	***	-0.1534	***
b	0.0015	***	0.0016	*	0.0013	**
McFadden's LRI	0.0019		0.0008		0.0045	
Chi-Square Statistic	14.7	***	4.56	*	8.19	**
Firm-Quarter Observations	6,021		4,697		1,324	

*** Significant at the 0.001 level

** Significant at the 0.01 level

* Significant at the 0.05 level

Δ Significant at the 0.10 level

Table 4. Summary Statistics for Regression Variables

This table reports the summary statistics for major variables used in multivariate regressions for the negative earnings surprise sample in Panel A and the positive earnings surprise sample in Panel B.

Panel A. Negative Earnings Surprise Sample

Variables	N	Mean	Std Dev	Median	Min.	Max.
CDS Change	2231	0.809	14.847	0	-120	243.635
EarningsSurprise	2231	-0.003	0.007	-0.001	-0.158	0
SpeculativeDum	2231	0.283	0.15	0	0	1
Trate(%)	2231	4.386	0.387	4.3	3.18	5.52
Slope	2231	1.586	0.798	1.85	0.05	2.75
VIX for S&P 500	2231	19.601	7.009	17.14	10.23	45.08
Volatility Change(x10 ⁻⁵)	2231	4.491	8.097	1.867	-1,200	1,300
Leverage	2231	0.002	0.004	0.001	0	0.075
Equity Return	2231	-0.011	0.065	-0.009	-0.408	0.58

Panel B. Positive Earnings Surprise Sample

Variables	N	Mean	Std Dev	Median	Min.	Max.
CDS Change	4005	-0.656	12.016	0	-227.366	173.133
EarningsSurprise	4005	0.002	0.004	0.001	0	0.09
SpeculativeDum	4005	0.198	0.399	0	0	1
Trate(%)	4005	4.361	0.336	4.29	3.18	5.52
Slope	4005	1.538	0.821	1.82	-0.01	2.75
VIX for S&P 500	4005	18.516	6.85	16.43	10.23	45.08
Volatility Change(x10 ⁻⁵)	4005	1.534	79.43	1.534	-1,500	800
Leverage	4005	0.002	0.005	0.001	0	0.139
Equity Return	4005	0.018	0.178	0.014	-0.259	10.643

Variable Definitions

1. CDS Change: the change in CDS spread within the event window of [-1,1], from Markit.
2. EarningsSurprise: the difference between I/B/E/S actual earnings per share for firm *i* in quarter *t* and the most recent I/B/E/S mean forecast earnings per share. It is scaled by the market price per share at the end of the quarter *t*. All information is from I/B/E/S.
3. SpeculativeDum: the dummy variable for speculative grade firms. If firm *i* has a speculative grade credit rating for quarter *t*, then the dummy variable is one. The credit rating information is from Markit.
4. Treasury Rate: the 10-year U.S. Treasury constant maturity yield on *t-2* day (two days before the earnings announcement day). It is from Federal Reserve Bank, St. Louis.
5. Yield Curve Slope: the difference between 10-year and two-year U.S. Treasury yield. It is from Federal Reserve Bank, St. Louis.
6. VIX for S&P 500: the implied volatility on the *t-2* day for the S&P 500 index, from CBOT.
7. Volatility change: the change in historical volatility over the event window [-1, 1] for firm *i*. It is difference between the 250-day historical volatility on *t+2* day and *t-2* day, based on daily stock returns from CRSP. Here, *t* is the earnings announcement date.
8. Leverage: the total liabilities of firm *i* for quarter *t-1* divided by the sum of its total liabilities and the market value two days before the earnings release.
9. Equity return: the stock buy-and-hold return over the event window [-1, 1] for firm *i*.

Table 5. Multivariate Regression of [-1, 1] CDS Spread Changes

This table reports regression results for the following model:

$$\text{CDS Change}_{i,t} [-1, 1] = \alpha_1 + \alpha_2 \text{Earnings Surprise}_{i,t} + \alpha_3 \text{Earnings Surprise}_{i,t} * \text{Speculative Dum} \\ + \alpha_4 \text{Treasury Rate}_t + \alpha_5 \text{Yield Curve Slope}_t + \alpha_6 \text{Market Implied Volatility}_{i,t} + \alpha_7 \text{Volatility change}_{i,t} + \alpha_8 \\ \text{Leverage}_{i,t} + \alpha_9 \text{Equity return}_{i,t} + \alpha_{10} \text{ to } \alpha_{13} \text{Year dummies} + \varepsilon$$

The dependent variable is the CDS spread change around the [-1, 1] event window. We estimate OLS regressions, where the t-statistics for the regression coefficients are based on robust standard errors adjusted for firm clustering.

Independent Variables	Positive Earnings Surprises		Negative Earnings Surprises		Full Sample	
	Estimate	t-value	Estimate	t-value	Estimate	t-value
Intercept	-1.81	-0.31	-6.37	-0.76	-4.55	-0.94
Earnings Surprise	119.20	0.99	270.09	1.58	-13.58	-0.20
Earnings Surprise *Speculative Dum	-406.19 *	-1.98	-248.21	-1.42	-114.38	-0.89
Macroeconomic variables:						
Treasury Rate	-0.58	-0.57	-0.49	-0.37	-0.45	-0.56
Yield Curve Slope	0.96	1.82	2.84 **	2.68	1.70 ***	3.36
Market Implied Volatility	0.14 *	2.05	0.15	1.49	0.16 **	2.67
Firm characteristics:						
Volatility change	46.48	0.10	-358.63	-0.45	119.57	0.27
Leverage	-153.84	-1.05	76.04	1.12	-71.20	-0.69
Equity return	-0.83	-0.30	-25.28 **	-2.80	-3.63	-0.97
Year dummies	Yes		Yes		Yes	
N	4,005		2,231		6,236	
Adj R-square	0.02		0.02		0.02	

*** Significant at the 0.001 level

** Significant at the 0.01 level

* Significant at the 0.05 level

Δ Significant at the 0.10 level

Variable definitions:

1. CDS Change: the change in CDS spread within the event window of [-1, 1], from Markit.
2. Earnings Surprise: the difference between I/B/E/S actual earnings per share for firm *i* in quarter *t* and the most recent I/B/E/S mean forecast earnings per share. It is scaled by the market price per share at the end of quarter *t*. All information is from I/B/E/S.
3. Speculative Dum: the dummy variable for speculative grade firms. If firm *i* has a speculative grade credit rating for quarter *t*, then the dummy variable is one. The credit rating information is from Markit.
4. Treasury Rate: the 10-year U.S. Treasury constant maturity yield on *t*-2 day (two days before the earnings announcement day). It is from Federal Reserve Bank, St. Louis.
5. Yield Curve Slope: the difference between 10-year and two-year U.S. Treasury yield. It is from Federal Reserve Bank, St. Louis.
6. VIX for S&P 500: the implied volatility on the *t*-2 day for the S&P 500 index, from CBOT.

7. Volatility change: the change in historical volatility over the event window $[-1, 1]$ for firm i . It is difference between the 250-day historical volatility on $t+2$ day and $t-2$ day, based on daily stock returns from CRSP. Here, t is the earnings announcement date.
8. Leverage: the total liabilities of firm i for quarter $t-1$ divided by the sum of its total liabilities and the market value two days before the earnings release.
9. Equity return: the stock buy-and-hold return over the event window $[-1, 1]$ for firm i .

Table 6. Multivariate Regression of [-30, -2] CDS Spread Changes

This table reports regression results for the following model:

$$\text{CDS Change}_{i,t}[-30, -2] = \alpha_1 + \alpha_2 \text{Earnings Surprise}_{i,t} + \alpha_3 \text{Earnings Surprise}_{i,t} * \text{Speculative Dum} + \alpha_4 \text{Treasury Rate}_t + \alpha_5 \text{Yield Curve Slope}_t + \alpha_6 \text{Market Implied Volatility}_{i,t} + \alpha_7 \text{Volatility change}_{i,t} + \alpha_8 \text{Leverage}_{i,t} + \alpha_9 \text{Equity return}_{i,t} + \alpha_{10} \text{ to } \alpha_{13} \text{Year dummies} + \varepsilon$$

The dependent variable is the CDS spread change around the [-30, -2] event window. We estimate OLS regressions, where the t-statistics for the regression coefficients are based on robust standard errors adjusted for firm clustering.

Independent Variables	Positive Earnings Surprises		Negative Earnings Surprises			Full Sample	
	Estimate	t-value	Estimate	t-value	Estimate	t-value	
Intercept	53.62 **	2.71	34.49	0.88	54.11	2.72 *	
Earnings Surprise	-435.72	-0.78	-430.44	-0.61	-359.48	-0.97	
Earnings Surprise *Speculative Dum	-27.08	-0.04	-184.26	-0.24	-147.04	-0.29	
Macroeconomic variables:							
Treasury Rate	-12.82 ***	-3.84	-11.44 *	-2.09	-13.28 ***	-4.22	
Yield Curve Slope	10.14 ***	5.60	11.67 **	3.17	10.75 ***	6.40	
Market Implied Volatility	0.08	0.40	0.68	1.36	0.21	0.85	
Firm characteristics:							
Volatility change	34.33 **	2.88	43.78 **	3.03	39.15 ***	4.20	
Leverage	589.92 *	2.12	443.63	0.78	569.41 *	2.25	
Equity return	-110.08 ***	-5.77	-139.98 ***	-4.38	-123.44 ***	-6.67	
Bid-ask spread	707.81 *	1.97	574.38 Δ	1.71	683.38 *	2.47	
Year dummies	Yes		Yes		Yes		
N	3,790		2,038		5,828		
Adj R-square	0.15		0.19		0.17		

*** Significant at the 0.001 level

** Significant at the 0.01 level

* Significant at the 0.05 level

Δ Significant at the 0.10 level

Variable definitions:

1. CDS Change: the change in CDS spread within the event window of [-30,-2], from Markit.
2. Earnings Surprise: the difference between I/B/E/S actual earnings per share for firm *i* in quarter *t* and the most recent I/B/E/S mean forecast earnings per share. It is scaled by the market price per share at the end of quarter *t*. All information is from I/B/E/S.
3. Speculative Dum: the dummy variable for speculative grade firms. If firm *i* has a speculative grade credit rating for quarter *t*, then the dummy variable is one. The credit rating information is from Markit.
4. Treasury Rate: the 10-year U.S. Treasury constant maturity yield on *t*-2 day (two days before the earnings announcement day). It is from Federal Reserve Bank, St. Louis.
5. Yield Curve Slope: the difference between 10-year and two-year U.S. Treasury yield. It is from Federal Reserve Bank, St. Louis.

6. VIX for S&P 500: the implied volatility on the $t-30$ day for the S&P 500 index, from CBOT.
7. Volatility change: the change in historical volatility over the event window $[-30, -2]$ for firm i , where t is the earnings announcement date.
8. Leverage: the total liabilities of firm i for quarter $t-1$ divided by the sum of its total liabilities and the market value 30 days before the earnings release.
9. Equity return: the stock buy-and-hold return over the event window $[-30, -2]$ for firm i .
10. Bid-ask spread: the average of stock bid-ask spreads scaled by the middle prices during the $[-30, -2]$ event window.