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Article

Aggregate default and illiquidity of credit default swap spreads☆

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ABSTRACT

This paper focuses primarily on aggregate default and illiquidity in the credit default swap (CDS) market. We examine how changes in aggregate default and illiquidity are related to changes in spreads of CDS portfolios sorted by credit quality and maturity. We document that aggregate default and liquidity are important determinants of CDS spreads. The default and illiquidity CDS betas across credit quality portfolios and maturities are positive and statistically significant. Low credit rating CDS spreads are highly sensitive to aggregate default and illiquidity shocks relative to high credit quality CDS spreads.

1. Introduction

There has been a growing interest in studying liquidity of CDS spreads in addition to default. In efficient markets, spreads of CDS contracts should account for default risk of companies that they reference. However, if markets are not efficient, market frictions give rise to illiquidity. The empirical evidence supports the existence of market frictions in CDS markets (see, for instance, Acharya and Johnson, 2007; Brunnermeier and Pedersen, 2009). Furthermore, the concerns over the default and illiquidity of CDS spreads have become especially relevant after the financial crisis of 2007 when both default and illiquidity skyrocketed jointly.

The main objective of this paper is to analyze the sensitivity of aggregate CDS spreads to market-wide default and illiquidity shocks. The key results of this work are as follows. We show that aggregate liquidity and default spreads are powerful determinants of CDS spreads. There is a consistently positive and significant relationship between CDS spreads and aggregate illiquidity and default spread changes across all maturities and credit qualities. These results suggest that CDS spreads cannot be regarded as a pure measure of creditworthiness of underlying companies as previously reviewed in the CDS literature.[1] We also document a monotonic relationship between the sensitivity of both liquidity and credit ratings to market-wide changes, particularly for high-yield underlyings. Our proposed factors on average explain 60% of the variation in aggregate CDS spreads. To the best of our knowledge, this is the first study to address empirically the importance of both default and illiquidity of CDS spreads at an aggregate level.

We conduct the empirical analysis at an aggregate level for two reasons. First, there have been studies finding evidence for commonality in liquidity in bond markets.[2] Because CDS markets reference bond markets, CDS markets can also be exposed to market-wide movements in default and illiquidity. Second, we can obtain more precise estimates if we conduct the empirical analysis at an aggregate, rather than individual, level. To sum up, the aggregation is done at a CDS portfolio level sorted by credit quality and maturity. Credit ratings provide a real-world measure of default

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[1] Some earlier papers have considered CDS as a pure measure of default. For instance, Blanco et al. (2005) find that CDS spreads are a cleaner indicator of credit risk than bond spreads. They also find that CDS prices lead bond markets in the price discovery process. In a similar fashion, Longstaff et al. (2005) extract default and non-default components from bond spreads assuming CDS spreads are a pure measure of default risk.

[2] See Bao et al. (2011), Lin et al. (2011), and Acharya et al. (2013), among others.

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for underlying CDS companies. On the other hand, if the maturity of CDS contracts is correlated with the volume of CDS trades, the CDS maturity proxies the true unobserved CDS illiquidity.[3] Hence, conducting our empirical analyses for credit-quality-sorted portfolios for different maturities can allow us to differentiate the effect of aggregate default on CDS spreads, from the effect of aggregate illiquidity on CDS spreads. We further choose and/or calculate market-wide factors that in theory should explain aggregate CDS spreads in addition to aggregate default and illiquidity. We employ monthly observations of 284 US corporate default swap names from 2004 to 2011. We then perform several regression analyses to study the relative contribution of the market-wide illiquidity and default spread changes to CDS portfolio changes. To guarantee the robustness of our results, we set different controls for credit and macroeconomic risks. In addition, we remove potentially confounding credit risk exposure from the CDS bid-ask spreads.

This work closely follows several studies focusing on liquidity of CDS spreads. Particularly, our empirical results support and complement the analysis of Tang and Yan (2008), Bongaerts et al. (2011), and Buhler and Trapp (2009). Tang and Yan (2008) construct several liquidity proxies to capture various facets of CDS liquidity. They find that liquidity premium and liquidity risk are priced in CDS spreads. Rather than conducting the empirical analysis for a set of individual CDS assets, we complement Tang and Yan (2008) and carry out our analysis for CDS portfolios sorted by credit quality and maturity. Bongaerts et al. (2011) build on the CAPM model of Acharya and Pedersen (2005) and derive an equilibrium asset pricing model that incorporates liquidity risk and short-selling due to hedging of non-traded risk. They estimate their asset pricing model for the credit default swap market and find that expected CDS returns contain significant compensation for both expected liquidity and liquidity risk. To note, both Tang and Yan (2008) and Bongaerts et al. (2011) rely on 5-year CDS spreads for their analysis. Furthermore, they consider the time period before March 2006 and December 2008, respectively. We employ CDS spreads with five different maturities in our empirical analysis and consider the time period up to April 2011, which includes major sovereign credit events since the collapse of Lehman Brothers in September 2008. Buhler and Trapp (2009) develop a reduced form model, which allows them to decompose bond and CDS spreads into a credit risk component, a liquidity component, and a component that measures the relationship between credit risk and liquidity in both bond and CDS markets. Our paper also acknowledges the fact that illiquidity dries up when credit risk increases. Hence, in our empirical analysis we work with a residual measure of illiquidity that is net of default exposure.

Overall, this article analyzes the relevance of market-wide illiquidity and default for aggregate CDS spreads. The paper is organized as follows. Section 2 describes the data employed in the empirical analysis and the methodology for constructing the CDS portfolios. Section 3 provides the empirical results by analyzing the sensitivity of the portfolio CDS spread (sorted by maturity and credit quality) to market-wide illiquidity and default shocks. Section 4 concludes.

2. Data, dependent, and explanatory variables

We collect our sample of CDS spreads from Market. We employ the CDS contracts from North America for which we can obtain the CDS spreads with maturities of either 1, 3, 5, 7, or 10 years from January 2004 to April 2011. We further restrict our sample to

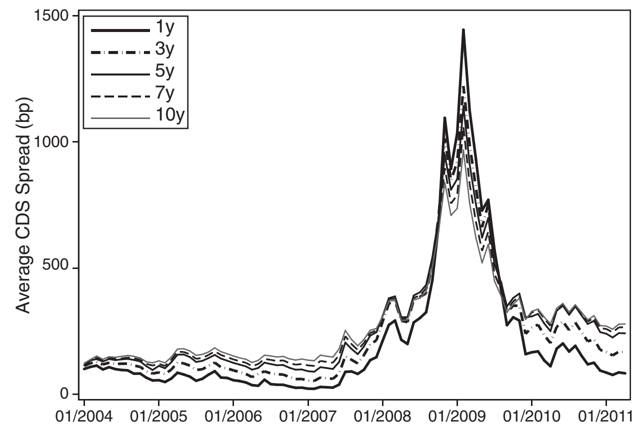

Fig. 1. Time series of sample mean CDS spreads. This graph plots the monthly time series of CDS spreads by maturity. The time series of monthly CDS spreads for each maturity is constructed by taking the cross-sectional average of CDS spreads for each month and maturity. The time period of our sample extends from January 2004 to April 2011.

corporate CDS names. In addition, we consider CDS contracts that are denominated in US dollars, are written on senior unsecured debt of underlying companies, and include the modified restructuring as a credit event. To obtain the time series of monthly CDS spreads of a given CDS name, we take the last daily CDS spreads for each month and maturity. In total, we have 284 CDS contracts in our sample.

Table 1 provides the distribution of CDS names in our sample by sector and rating group. The reported rating is the resulting average of the Moody's and S&P ratings, adjusted to the seniority of the instrument and rounded so as not to include the plus and minus levels. Markit uses 10-sector ICB classification and adds one additional category for Government. Those sectors are Financial, Oil & Gas, Basic Materials, Industrial, Consumer Goods, Consumer Services, Health Care, Telecommunications, Utilities, Technology and Government. Nearly 52% of the CDS contracts in our database are written on the debt of investment grade companies, while the remaining share of CDS contracts (48%) are written on the debt of high-yield companies. There are four industries individually represented by more than 10% of the total number of contracts. These CDS contracts are written on the debt of companies from the Consumer Services, Financial, Consumer Goods, and Industrial sectors. These four sectors constitute approximately 65% of our sample.

Fig. 1 displays the time series of the aggregate monthly CDS spreads by maturity. These series are calculated by taking the cross-sectional average of the individual CDS spreads for each month and maturity. We observe that the CDS spreads of all maturities are relatively stable before mid-2007. After this point, there is a sharp increase in CDS spreads until the beginning of 2009. The dramatic increase in mid-2007 is associated with the housing bubble burst in the US and the associated losses on subprime mortgage asset-backed securities, collateralized bond obligations, and CDSs on the asset-backed holdings. When these financial securities lost value due to the housing market crash, the financial institutions utilizing these products had insufficient capital to respond to the enormous realized losses. Specifically, the upward-sloping trend of CDS spread time series is followed by a series of significant credit events such as the collapse of Lehman Brothers, the bailout of AIG and the federal takeover of Fannie Mae and Freddie Mac in September 2008.[4] The slope of the term structure of the CDS spreads is mostly

[3] Due to the OTC nature of CDS market, the volume of CDS trades is not available. However, many empirical papers consider CDS contract with 5 year maturity to be the most actively traded, while the evidence for liquidity in CDS contracts with other maturities is mixed.

[4] See Jarrow (2011) for an overall discussion on the CDS market and the website of Federal Reserve of St. Louis for a detailed timeline of the credit events associated with the subprime financial crisis (http://timeline.stlouisfed.org).