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Risk protection from risky collateral: Evidence from the euro bond market

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ABSTRACT

This paper studies empirically how collateral protects the market value of defaultable bonds from changes in risk. We construct a measure of the risk protection from collateral, and estimate it under different economic conditions. Using yields from the euro bond market, we find that the risk protection from collateral is conditional, significantly stronger in both general and issuer-specific bad states. However, the collateral is risky, and a fall in the collateral value clearly lowers the risk protection. Consequently, the correlation between the bad state and the collateral value is crucial when assessing the risk reducing properties of collateral.

1. Introduction

Collateral insures against risk. It has an essential role in the current financial markets, above all sparked by the subprime-crisis and the euro sovereign debt crisis. In this paper we empirically study to what extent collateral protects the market value of defaultable bonds from changes in risk. We examine risk in *secured*, covered bonds compared to *unsecured*, senior bonds of the same issuer. To this end, we construct a novel measure of the risk protection from collateral, and estimate it under different economic conditions. Indeed, we find collateral to protect the market value of defaultable bonds, but there is considerable variation in the risk reduction under different economic conditions. The risk reduction varies both cross-sectionally and over time. Growing demand for collateral has forced market participants to adjust by broadening the range of assets accepted as collateral.[1] This paper empirically documents the properties of risky collateral.

We employ a new and extensive data set based on daily observations of individual bonds underlying the Markit iBoxx EUR Index. The sample covers the period 1999–2012, and includes bonds from 46 banks in 16 countries. Bond yields at a disaggregate, issuer level take full account of firm heterogeneity in credit risk as opposed to using yields of corporate bond indexes or average yields within rating grades. The sample contains several episodes of economic and financial distress with substantial changes in the risk levels. We observe yields on government bonds, agency bonds, and three classes of bank bonds: covered, senior, and subordinated bonds. We use the yields on these bond classes to identify the effect of collateral.

Credit risk is determined by the likelihood of default and the loss, given default. Fama and French (1993) find that the likelihood of default is one of three common risk factors in bond returns. Using a reduced-form model and assuming CDS spreads are a measure of credit risk only, Longstaff et al. (2005) find that this default component explains about 50% of the yield spreads between Aaa/Aa-rated bonds and Treasuries. For all rating categories, the majority of the corporate bond spread is due to default risk. In a parallel study based on structural credit risk models, Huang and Huang (2012) find that for investment-grade bonds, credit risk accounts for only a small fraction of the yield spread, typically around 20%.

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[1] As an example, in line with its statute, the Eurosystem provides credit to banks only on a collateralized basis. Assets that are pledged must be eligible, i.e. fulfil certain criteria. These criteria have been eased on several occasions. See www.ecb.europa.eu/paym/coll/html/index.en.html for more information.

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While collateral may have a small impact on the likelihood of default, it increases the recovery rate in case of default. Recovery rates on *defaulted* bonds are well studied in empirical literature, see Altman (2008) and Mora (2012) for a review of the literature. Risk reduction from collateral is also important for *defaultable* claims. For instance, financial market participants are governed by mark-to-market principles when it comes to valuation, accounting, and regulation. Falling market values of financial assets can lead to breaches of loan covenants, non-compliance with regulatory requirements, or require large cash outflows due to margin requirements. Such events can set off a negative spiral of financial distress, see e.g., Shleifer and Vishny (2011) and Brunnermeier (2009). We therefore find it relevant to study collaterals' influence on more risk factors than just credit risk. Particularly interesting in this respect is liquidity risk, as credit and liquidity risks are usually positively correlated, see Ericsson and Renault (2006) and Kalimipalli and Nayak (2012). Existing literature finds that the impact of credit and liquidity shocks on asset market values is stronger in bad economic times, see Acharya and Pedersen (2005) and Acharya et al. (2013). We disentangle credit and liquidity risk and study the risk protection from collateral conditional on adverse economic states.

The literature on disentangling of credit and liquidity risk can be divided into two strands. Our paper is related to the first strand which seeks to disentangle credit and liquidity effects by directly controlling for one of them. In its most constricted form, it involves comparing bonds with the same credit quality but with different liquidity, or vice versa. Warga (1992) uses the yield spread between off- and on-the-run US Treasury securities as a liquidity measure, while Longstaff (2004) uses the yield spread between securities issued by the US Treasury and the US agency Refcorp as a liquidity measure. Reinhart and Sack (2002) disentangle movements in Treasury, agency, swap, and senior corporate bond yields into several risk factors. Our paper is motivated by their approach, but it differs in that our attention is on how risk factors influence the pricing of the different bond *classes*. Thus, our attention is not on the absolute risk level *per se*, but on relative risk between secured and unsecured bonds. We estimate the yields' sensitivities, the factor loadings, to the risk factors. The factor loadings for covered bonds, compared to the loadings for the senior bonds, give us easy to interpret estimates of the risk reduction from collateral.

The second strand of literature uses proxies for credit quality and liquidity to explain the movements in yield spreads. We compare our empirical findings to two often-used proxies for credit and liquidity risk (rating and bid-ask spreads). These two proxies capture the development of relative risk as measured by our model. However, time and cross-sectional variables matter in measuring relative credit and liquidity risk, even after controlling for credit ratings or bid-ask spreads. Thus, credit rating is not a sufficient measure of relative credit risk, and bid-ask spreads are not a sufficient measure of relative liquidity risk.

Most of the literature on liquidity risk studies the unconditional effect of liquidity risk, that is, averaged over time, see e.g. Lin et al. (2011) and de Jong and Driessen (2012). However, Acharya and Pedersen (2005) find that liquidity risk may matter more in periods of illiquidity crises. Acharya et al. (2013) show that the response of corporate bond prices to liquidity shocks varies systematically between two regimes characterized as "normal" and "stress". We find that the risk protection from collateral is conditional on the economic conditions. The risk reduction is affected differently dependent on the risk being idiosyncratic or systematic in nature, or whether the risk is tied to the issuer or the collateral. As house loans are the typical collateral for covered bonds, we use house prices as proxy for the collateral value and find a significant reduction in risk protection from collateral against both credit and liquidity risk when house prices fall.

Our empirical study finds a resemblance in the pattern of relative liquidity risk and relative credit risk between covered and senior bonds. Ericsson and Renault (2006) develop a structural bond valuation model to simultaneously capture liquidity and credit risk. As default becomes more likely, the components of bond yield spreads attributable to illiquidity increase. Studying US corporate bond data, they find empirical support for their model's prediction. From a structural model that interacts liquidity and default risk, Chen et al. (2014) estimate that this interaction accounts for 25–40% of observed credit spreads, and up to 55% of the credit spread changes over the business cycle.

Our paper gives particular insight into covered bond risk. The view on covered bond risk is divergent. One strand of literature considers covered bonds to be without credit risk, see e.g., Kempf et al. (2012) who interpret the yield spread as a liquidity premium. Similar assumption is taken by Koziol and Sauerbier (2007) as they examine the effects of liquidity on bond prices. Another strand of literature finds credit risk as a determinant of covered bond yield spreads. Prokopczuk et al. (2013) show that not only liquidity, but also issuer-specific effects, especially the quality of the cover pool, are relevant drivers for yield spreads between covered bonds and German government bonds. They find that the yield spread between individual covered bonds is mainly driven by their relative liquidity and whether they are covered public-sector or mortgage loans. Studying the European covered bond market, Prokopczuk and Vonhoff (2012) show that country-specific differences exist and developments in the real estate market explain a major fraction of covered bond asset swap spreads during the financial crisis. The cited literature on covered bond risk studies the yield spread between covered bonds and governments bonds, or, covered bonds and interest rate swaps.

We are, to the best of our knowledge, the first to use the yield on senior and covered bonds to analyze the risk reduction from having collateral. Understanding the nature of collateral and related risks under varying economic states is relevant to investors, rating agencies, and regulators alike. Investors should consider the empirical findings when assessing the risk of secured investments or exposures, for example when performing stress tests. Policy makers should consider the findings in financial market regulations, for example in matters like collateral eligibility requirements and systemic risk. Just as an example, covered bonds within a given rating class are currently treated as a homogeneous debt class in many regulatory matters. Yet, the empirical findings in this paper show that risk sensitivities of covered bonds are clearly heterogeneous. To academics, evidence on the protection collateral offers to defaultable bonds can help explain investors' preferences for collateral. This insight can be used to further investigate the causes of secured financing.

2. Model construction

2.1. Bond market yields

The model is based on bond yields of five bond classes:

1. Yield on bonds issued by central **governments** (y_{gov}).
2. Yield on **agency bonds** (y_{agency}). Bonds issued by entities with a government guarantee.
3. Yield on **covered bonds** (y_{cov}) issued by banks. Bonds secured against specific assets or pools of assets.
4. Yield on **senior bonds** (y_{sen}) issued by banks. The bonds are unsecured and rank *pari-passu* with other senior debt.
5. Yield on **subordinated bonds** (y_{sub}) issued by banks. Unsecured debt with priority after senior debt.