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Debt market illiquidity and correlated default risk

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ABSTRACT

We empirically test the theoretical prediction of the impact of debt market liquidity on correlated default risk. Confirming the theory, our results indicate that the lower debt market liquidity, leads to an economically significant increase in the correlated default risk. Also consistent with theory, we show that this effect is more pronounced for short-term debt.

1. Introduction

A crucial issue for bond portfolios is the default correlation between different firms, which undermines diversification benefits. Thus, understanding the dynamics of correlated default risk is essential to fixed-income pricing and risk management and is of great interest to academicians and practitioners. The recent financial crisis in particular has sparked interest in understanding correlated default risk and the role played by liquidity and short-term debt. As pointed out by [Nickerson and Griffin \(2017\)](#), credit rating agencies made official statements expressing concerns about default correlation ([Moody's, 2010](#); [Standard and Poor's, 2013](#)). In their “Material Loss Reports”, the FDIC and OCC attribute the banking failure in the recent crisis to the interplay of liquidity and credit risk. Anecdotal evidence suggests that the failures of Lehman Brothers and Bear Sterns during the recent financial crisis was mainly due to their significant exposure to short-term debt ([Brunnermeier and Pedersen, 2009](#); [Krishnamurthy, 2010](#)). Our knowledge, however, about factors driving default correlation is limited. [Das et al. \(2007\)](#) and [Duffie et al. \(2009\)](#) show that commonly used observable variables have little power in explaining firms’ default correlation.

We use the insight of the theoretical model of [He and Xiong \(2012b\)](#) to examine the dynamics of correlated default risk. To understand the connection between rollover risk and credit risk, [He and Xiong \(2012b\)](#) develop a theoretical model; and one of the implications of their model is that debt market liquidity can be a common factor explaining firms’ correlated default risk and that this risk is more pronounced for short-term debt. Guided with this theory, our paper contributes to this debate by providing first empirical evidence on the dynamics of correlated default risk and its significant relationship with short-term debt and debt market liquidity.

Prior research in this area has focused predominantly on the credit spread puzzle ([Collin-Dufresne et al., 2001](#); [Eom et al., 2004](#); [Longstaff et al., 2005](#); [Chen et al., 2007](#); [Covitz and Downing, 2007](#); [Ericsson et al., 2009](#); [Huang and Huang, 2012](#)), on measuring bond liquidity and its pricing implications in the bond market ([Ericsson and Renault, 2006](#); [Lin et al., 2011](#); [Bao et al., 2011](#); [Dick-](#)

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Nielsen et al., 2012; de Jong and Driessen, 2012; Friewald et al., 2012; Acharya et al., 2013; Imbierowicz and Rauch, 2014; Pelizzon et al., 2016; Docherty and Easton, 2016; Bongaerts et al., 2017), and on measuring credit risk premium and its relative magnitude vis-à-vis liquidity premium (Gilchrist and Zakrajsek, 2012; Schwert, 2017; Schwarz, 2017; Berndt et al., 2018). Theoretical literature also investigates the interaction between liquidity and credit risk premium (Goldstein and Puzner, 2005; Ericsson and Renault, 2006; Wagner, 2007; Cai and Thakor, 2008; Gatev et al., 2009; Acharya et al., 2010; Acharya and Viswanathan, 2011; Gorton and Metrick, 2011; He and Xiong, 2012a,b; He and Milbradt, 2014). Our paper differs from these studies, as our research question is fundamentally different. We borrow from this literature and use developed measures of bond market liquidity and credit risk premium to investigate the dynamics of correlated default risk and test the predictions made in the theoretical literature. Therefore, the most notable difference between our paper and these studies is the use of a measure of correlated default risk (recently developed by Javadi et al., 2017) as the dependent variable instead of other traditional measures such as corporate bond yield spread, CDS spread, sovereign bond spreads, etc.

This article makes two key contributions. First, consistent with the theory, we find empirical support for the notion that lower debt market liquidity has a positive and economically significant effect on correlated default risk and that the effect is stronger for speculative issues and during the recent crisis. This result is consistent with He and Milbradt (2014) who develop and solve a theoretical model that endogenizes the bond market illiquidity in the He and Xiong (2012b) framework. It is also in line with the empirical findings of Gopalan et al. (2014) who show that firms with greater exposure to rollover risk have lower credit quality and that the effect is more pronounced for non-investment grade firms and during recessions. However, while their focus is on the impact of rollover risk on credit rating, we study the effect on correlated default risk of debt market liquidity. Second, also confirming the theory, we provide evidence that default correlation is significantly higher for short-term debt. Our results are consistent with those in Diamond and He (2014) in that they both show the negative aspect of short-term debt. However, our focus is on the correlated default risk whereas they study the effect of debt maturity on debt overhang and firm investment. Furthermore, this result is also consistent with the theoretical prediction in He and Xiong (2012a) and Morris and Shin (2016).¹

Overall, our empirical evidence, at the very least, shows the necessity of better understanding the dynamics of correlated default risk, highlights its complicated relationship with debt maturity and bond market liquidity, and calls for theoretical models to incorporate the interplay of these factors. These new models can guide empirical research, and together they have significant implications for all the stakeholders in the fixed income market including regulators and policy makers.

2. Theoretical framework

He and Xiong (2012b) develop a theoretical model that analyzes the interaction between bond market liquidity and credit risk premiums. In the presence of an illiquid debt market, to keep the firm alive, equity holders must absorb rollover losses when replacing maturing bonds with new bond issues. Debt market illiquidity depresses the price of newly issued bonds and leads to an increase in rollover losses to equity holders. Thus, absorbing rollover losses by equity holders is rational if the value of keeping the firm alive outweighs rollover losses. A key implication of the He and Xiong (2012b) model is that due to the rise in rollover costs, the deterioration in debt market liquidity can lead equity holders to choose to default at a higher threshold. Based on this key insight, they suggest that debt market liquidity can be a common factor explaining firms' default correlation.

Moreover, their model signifies the link between maturity risk and rollover risk. Consistent with Leland and Toft (1996) and He and Xiong (2012b) prove that the firm's default boundary increases as its debt maturity decreases and that a deterioration in debt market liquidity exacerbates this effect. Their model suggests that the effect of rollover risk is more pronounced for short-term debt since it exposes equity holders to larger rollover losses. Thus, firms with short-term debt due to their greater rollover losses have a higher default threshold and face greater default risk. Therefore, a deterioration in debt market liquidity that raises the default boundary across the board makes correlated defaults more probable for these firms. In other words, the theory predicts that correlated default risk is more pronounced for short-term debt.

A direct test of these predictions has been a challenge because it requires a reliable measure of correlated default risk, which was not previously available in the literature. In this paper, however, we use a measure of correlated default risk to empirically test these theoretical predictions. To the best of our knowledge, our paper is the first empirical study to shed more light on the relationship between correlated default risk, debt market liquidity, and maturity.

3. Data

Das et al. (2006, 2007) show that correlation in defaults primarily stems from the correlation in default probabilities. Using this insight and following Javadi et al. (2017), we construct a measure of default correlation using five-year credit default swap (CDS) spreads. The CDS spreads are from July 2002 to August 2013 and are obtained from MARKIT. It is a well-established fact that CDS contracts are extremely liquid and efficient. More specifically, CDS spreads reflect the changes in the credit risk of the reference entities faster than their corresponding fixed-income issues (Blanco et al., 2005; Ericsson et al., 2009). These characteristics make

¹ Our paper is different from two recent papers by Nickerson and Griffin (2017) and Phelan (2017). We are interested in the relationship between correlated default risk and debt market liquidity and debt maturity. However, the former paper develops a framework to estimate realized default correlation in structured securities and contrasts that to the assumptions used by credit rating agencies, whereas the latter develops a theoretical model that implies that correlated loan payoffs can give rise to financial intermediation. Our results also complement the findings in Pu and Zhao (2012), who find significant comovement in CDS spreads.

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