



Internal liquidity risk in corporate bond yield spreads

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ABSTRACT

The recent global financial crisis reveals the important role of internal liquidity risk in corporate credit risk. However, few existing studies investigate its effects on bond yield spreads. Panel data for the period from year 1993 through 2008 show that corporate internal liquidity risk significantly impacts bond yield spreads (and changes) when controlling for well-known bond yield determinant variables, traditional accounting measures of corporate debt servicing ability, cash flow volatility, credit ratings, and state variables. This finding indicates that internal liquidity risk should therefore be incorporated into bond yield spread modeling.

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1. Introduction

Because of the rapid growth of credit markets in the past decades, understanding the determinants of corporate bond yield spreads becomes increasingly important in credit risk management. Researchers have contributed considerable empirical results on this issue. Most studies on this topic are based upon structural credit models, and take into consideration the effects of macroeconomic conditions and firm specific features. Although most studies show that Merton-type structural credit models are capable of explaining yield spreads to some extent,¹ few studies conclude that Merton-type models can largely capture the cross-sectional behaviors or the dynamics of bond yield spreads. In addition, the recent global financial crisis, to a certain degree, is the result of the rampancy of liquidity crunches spreading from financial institutions to non-financial firms. It reveals the important role of “internal liquidity risk” in corporate credit risk. Chen et al. (forthcoming) delineate the credit risk due to liquidity crunch as a “flow-based” credit risk and contend that it is not fully captured by the “stock-based” Merton-type structural credit models. Different from trading liquidity (or external liquidity, indicating the ability that a security can be quickly traded

in large quantities at a low cost and without significantly moving the price), internal liquidity is an indicator of a firm's ability to fulfill its obligatory payments. Because neither the structural form nor the reduced form credit models consider internal liquidity in their settings, few existing studies explore its effects on bond yield spreads. To address the issue, this study investigates whether or not corporate internal liquidity risk significantly influences bond yield spreads and yield spread changes when controlling for well-known bond yield spread determinant variables such as leverage, equity volatility, maturity, coupon, issuance amount, rating, information uncertainty, and state variables, by employing a panel data sample of 9554 yearly bond observations from year 1993 through 2008.

Among existing studies, Collin-Dufresne et al. (2001) find that traditional credit models explain only about 25% of the variation in bond yield spreads. Eom et al. (2004) find that the predicted spreads of the original Merton model (1974) are too small, while other structural credit models over-predict spreads on average, such as Longstaff and Schwartz (1995) and Collin-Dufresne and Goldstein (2001). They also find that newer models still suffer from underestimation problems on yield spreads for safer bonds. Campbell and Taksler (2003) show that idiosyncratic equity volatility can explain as much cross-sectional variation in bond yield spreads as credit ratings can. Several recent studies emphasize the effects of non-default components (such as bond market liquidity and tax effects) on corporate bond yield spreads.² However, Longstaff

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¹ The determinants of bond yield spreads explored in the literature include information uncertainty and information asymmetry of a firm (Liao et al., 2009; Lu et al., 2010; Güntay and Hackbarth, 2010), accounting disclosure quality (Yu, 2005), equity volatility (Campbell and Taksler, 2003), tax effects of coupon rate (Elton et al., 2001; Qi et al., 2010), trading liquidity (Warga, 1992; Longstaff et al., 2005) and market condition (Tang and Yan, 2010).

² For example, studies related to tax effects of coupon rate include Elton et al. (2001) and Qi et al. (2010), and those related to trading liquidity include Warga (1992) and Longstaff et al. (2005).

et al. (2005) show that default components constitute the major portion of yield spreads. Additionally, Covitz and Downing (2007) use a simple financial ratio, the current ratio,³ to explain bond yield spreads. They show that the current ratio can explain very short-term spreads. Das et al. (2009) also demonstrate that both sources of accounting- and market-based information are complementary in pricing a corporate distress.

Corporate credit risk includes stock-based and flow-based credit risk. The stock-based credit risk concerns the net present value of a firm, and therefore depends mainly on the potential growth of a firm's future net worth. The flow-based credit risk concerns a firm's funding capability or liquidity reserve to meet its payment obligations, and therefore primarily relies upon a firm's capability in cash flow generating and financing externally. Previous researches show that Merton-type structural credit models tend to underestimate yield spreads, especially for short-term or safer bonds. This conforms to the settings of Merton-type models that credit events are triggered only when a firm's value drops below a default threshold. That is, Merton-type structural credit models deal primarily with stock-based credit risk. Note that even if a firm's asset value remains above its debt balance, insufficient liquidity can still lead to a default event.

Several factors dictate the importance of internal liquidity in corporate credit risk. The major reason why a firm should retain liquidity is to meet the needs of near-term expected and unexpected net cash outlays. Examples of unexpected cash outflows include unanticipated investment opportunities or unexpected expenses. Without sufficient liquidity reserves, a firm may have to forgo profitable investment projects, delay payments, sell assets, or obtain external finance at unfavorable terms. Because a liquidity crunch produces all these detrimental effects on corporate operations and therefore on credit conditions (Chen et al., forthcoming), it is reasonable to assume that internal liquidity risk is an important determinant of corporate bond yield spreads.

Extant studies on the determinants of bond yield spreads have two major types of research target: bond yield spreads and bond yield spread changes. Recent studies on bond yield spreads include Lu et al. (2010), Yu (2005), Longstaff et al. (2005), Campbell and Taksler (2003), and Elton et al. (2001). The most representative study on bond yield spread changes is Collin-Dufresne et al. (2001).

Following the literature, this study investigates the effects of corporate internal liquidity risk on both bond yield spreads and bond yield spread changes when controlling for well-known yield spread determinant variables stated in the literature by employing a panel data sample of 9554 yearly bond observations from year 1993 through 2008.

This study employs the internal liquidity measure developed in Chen et al. (forthcoming) in the empirical analyses. The measure, called the internal liquidity level (IL hereafter), is a natural log of the solvency ratio which is a firm's available liquidity to its net payment obligations in a given period of time. When a firm's solvency ratio is less than one, it is less likely to fulfill its payment obligations and is more likely to experience a liquidity crunch. This measure is able to incorporate the dynamics of corporate internal liquidity and provides a straightforward indication of a firm's internal liquidity risk. This study transforms this measure into two corporate internal liquidity risk measures used in later empirical analyses: the standardized internal liquidity level and the internal liquidity volatility. Internal liquidity risk negatively relates to standardized internal liquidity level and positively relates to its volatility. However, the effects of internal liquidity risk on bond yield spreads may become weaker when macroeconomic condition is prosperous. When the economy is in a booming period, the market liquidity is ample and a firm is easily to obtain necessary credit

from the market to fill up its liquidity gap. Under this circumstance, a firm with a higher internal liquidity risk (or lower internal liquidity level) may enjoy a credit improvement more for the alleviation of the probability of liquidity crunch. On the contrary, when the market is in a recession period, the financial market is fragile and a firm is difficult to gain external finance. In this case, the effects of internal liquidity risk on bond yield spreads are more significant.

Empirical results of this study show that corporate internal liquidity risk plays a significant role in explaining corporate bond yield spreads and yield spread changes when controlling for bond yield determinant variables well known in literature,⁴ traditional accounting measures of corporate debt servicing ability,⁵ cash flow volatility,⁶ credit ratings and state variables. In addition, the effects of internal liquidity risk are less important when the economy is thriving. The above results provide empirical supports for the significant role of flow-based credit risk in corporate bond yield spreads and indicate that internal liquidity risk should therefore be incorporated into bond yield spread modeling.

The remainder of this paper is organized as follows. Section 2 introduces the methodology of measuring corporate internal liquidity risk. Section 3 presents the hypotheses. Section 4 shows and discusses empirical results. The final section concludes the study.

2. Measuring internal liquidity

Corporate internal liquidity is essential in financial statement analysis, particularly for evaluating flow-based credit risk. Nevertheless, there is no consensus on what constitutes a good measure of internal liquidity. In the literature, many researchers criticize the static nature of balance sheet ratios such as current ratio and quick ratio. To incorporate the dynamics of corporate liquidity, this study employs the liquidity risk measure developed by Chen et al. (forthcoming) as the primary liquidity indicator to empirically investigate the effects of internal liquidity risk on bond yield spreads.

2.1. The definition of internal liquidity

Chen et al. (forthcoming) defines internal liquidity level as a natural log of the solvency ratio which is the ratio of a firm's available liquidity to its net payment obligations in a given period of time. The detailed definition of the solvency ratio is shown as Eq. (1):

$$SR_t = \frac{\text{Available Liquidity}_t}{\text{Payment Obligation}_t} = \frac{C_{t-1} + SI_{t-1} + OCIF_t + INCF_t + FNCF_t}{OCOF_t + Int_t + Tax_t + DA_t} \quad (1)$$

In Eq. (1), $OCOF_t$ indicates operating cash outflows; Int_t and Tax_t stand for interest expenses and income taxes paid during the t period, respectively; DA_t represents the amortization of debt principals in both short-term and long-term debts in the period t ; C_{t-1} and SI_{t-1} denote the beginning cash balance and short-term investments of period t , respectively; $INCF_t$ is the net investment cash

⁴ Well-known variables related to structural credit models include market leverage ratio and equity volatility; tax related variable is bond coupon; trading liquidity related variables include issuance amount, time to maturity and bond age; information uncertainty variables include accrual quality, number of analysts followed, dispersion in analyst forecasts, and firm age. Section 4 provides more details.

⁵ Traditional accounting measures of debt servicing ability including in this study are interest coverage ratio, debt service coverage ratio, quick ratio, and ratio of operating income to sales.

⁶ According to the flow-based corporate credit model developed by Chen et al. (forthcoming), cash flow volatility is one of the major causes for a firm's credit risk.

³ Current ratio is the ratio of a firm's current asset to its current liability.

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