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Information uncertainty, information asymmetry and corporate bond yield spreads

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ABSTRACT

This study examines the effects of information uncertainty and information asymmetry on corporate bond yield spreads using American data from 2001 to 2006. Empirical results of this study show that investors charge a significant risk premium for both information uncertainty and information asymmetry when controlling for variables well known in the literature. The results are robust even when controlling for credit ratings. Finally, information uncertainty and asymmetry help structural-form credit models explain the yield spreads of bonds with short maturities.

1. Introduction

Since the seminal work of Merton (1974), structural-form credit models have opened a new avenue for estimating a firm's default risk and corporate bond yield spreads. Merton-type structural-form credit models assume that firm value follows a diffusion process and default occurs when firm value falls below the default threshold. The models estimate a firm's asset value from its equity market value using the option-based theory of Black and Scholes (1973). Therefore, the determinants of an option value, such as asset volatility, firm leverage and others, influence corporate bond value.[1] Many empirical studies show that the traditional structural-form credit models explain only a minor portion of bond yield spreads. For example, Huang and Huang (2003) concluded that less than 25% of the yield spreads actually relate to default risk. Collin-Dufresne et al. (2001) produced similar results. Another line of study explores the constituents of bond yield spreads other than default risk. This body of research describes many factors that affect bond yield spreads. Elton et al. (2001) showed that bonds with a higher coupon rate are less attractive to investors due to the tax effect. Warga (1992) demonstrated that investors demand higher expected returns on illiquid bonds. Covitz and Downing (2007) claimed that a simple liquidity proxy, current ratio, accurately explains short-term bond yield spreads. Though several studies have been dedicated to uncovering the determinants of bond yield spreads, there is still a significant gap between theoretical and observed bond yield spreads.

Duffie and Lando (2001) proposed that incomplete accounting information contributes to an imprecise knowledge of firm value, leading to different predictions for the shape of the yield spread term structure. The proposed approach empirically improves the explanatory power of bond yield spreads, especially for bonds with a maturity of less than 3 years (Yu, 2005). However, incomplete accounting information may not be the only cause of uncertainty for firm value. Based on the two studies above, the current study explores other factors that also cause "uncertain information" for firm value and therefore affect bond yield spreads. Information uncertainty has many different causes, including unresolved dividend policies (Yee, 2006) or ambiguous implications of new information (Zhang, 2006). Many studies address the effects of information uncertainty for equity returns, but relatively few studies examine these effects on bond yield spreads.[2] Liao et al. (2009) demonstrated that information asymmetry plays a critical role in causing the differences between default probabilities implied by

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[1] Because a firm's equity holders can be regarded as owning a call option with the firm asset value as the underlying asset and debt balance as the exercise price, Merton (1974) showed that a firm's asset market value can be obtained by converting from its equity market value using the option theory developed by Black and Scholes (1973).

[2] Additionally, Autore et al. (2009) linked information uncertainty into auditor reputation.

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bank credit ratings and those estimated by Merton-type structural-form credit models.[3] Their results show that information asymmetry increases conflicts of interests between equity- and debt-holders. Wang and Zhang (2009) also explained the difference in the effects of different types of institutional equity investors on bond credit spreads from an information asymmetry perspective.[4] This study postulates that the conflicting interests of informed traders and uninformed traders make corporate bond investors take a more conservative view of a firm's future value distribution (such as a lower mean for firm value distribution or a higher volatility for value distribution, or both) and charge a risk premium on information asymmetry, which affects bond yield spreads. Therefore, information asymmetry differs from information uncertainty in economic content. However, similar to the literature in information uncertainty, most previous studies on this topic investigate the relationship between information asymmetry and equity returns rather than bond yield spreads.[5] Different from previous studies, the main purposes of the current study are to explore the effects of information uncertainty, information asymmetry, and both together on bond yield spreads and term structure of yield spreads, and to investigate their relationship with credit ratings.

To measure the degree of information uncertainty, this study uses four proxies commonly used in the literature, including accruals quality (AQ), firm age (AGE), number of analysts following (NANAL), and dispersion in analysts' forecasts (DISP). A better AQ indicates more transparent accounting reporting and therefore lower information uncertainty. An older firm has more historical performance records available to the market and, therefore, has less information uncertainty in its firm valuation. A firm followed by more financial analysts is theoretically more transparent in its future performance prospects, and is therefore less uncertain in its valuation (Brennan et al., 1993; Hong et al., 2000; Mansi et al., 2008). A wider dispersion of analysts' forecasts indicates less of a consensus among different market participants,[6] suggesting a higher degree of uncertainty in a firm's valuation.[7] This study also employs three well-known measures of information asymmetry, including the probability of information-based trading estimated by the original PIN model (Easley et al., 1996), the probability of information-based trading estimated by an extended PIN model (ADJPIN) (Duarte and Young, 2009), and the order imbalances (OI) presented by Lee and Ready (1991) and Chordia et al. (2002). Previous studies show that there is a positive relationship between information asymmetry and these three proxies, and a larger PIN, ADJPIN, or OI indicates more severe conflicts of interests between informed traders and uninformed traders. The current study investigates the relationship between these proxies and bond yield spreads while controlling for yield spread determinant variables well-known in the literature. Empirical results of this study show that both information uncertainty and information asymmetry play an important role in explaining bond yield spreads. The results are robust even when controlling for corporate credit ratings. Empirical results also reveal that non-accounting-related proxies of information uncertainty are more important determinants for bond yield spreads than an accounting-related proxy of information uncertainty (that is the accruals quality variable), which are also robust when controlling for credit rating.

Researchers have criticized structural-form credit models for underestimating default probability as the bond maturity approaches zero. To mitigate this problem, Duffie and Lando (2001) incorporated a noise element, resulting from imperfect information, into structural-form credit models. The noise element helps explain why a positive yield spread always appears when bonds approach maturity. To address this issue, this study also empirically examines Duffie and Lando's theory by investigating the relationship between information uncertainty, information asymmetry, and yield spreads for bonds near their maturities. Empirical results show that information uncertainty and information asymmetry have higher economic significance on short-maturity bonds than for longer-maturity bonds. These results support the assertions of Duffie and Lando (2001).

The remainder of this paper is organized as follows. Section 2 introduces the concept of information uncertainty and its proxies. Section 3 presents the concept of information asymmetry and its proxies, including those proposed by Easley et al. (1996) and Duarte and Young (2009), and the parameter estimations methods. Section 4 summarizes major variables used in the empirical examinations. Section 5 presents and analyzes empirical results. Finally, Section 6 offers concluding remarks.

2. Information uncertainty

Zhang (2006) defined information uncertainty as the ambiguity in implications of new information for a firm's value, which potentially stems from two sources: "the volatility of a firm's underlying fundamentals and poor information." This definition of information uncertainty corresponds closely with the concept proposed by Jiang et al. (2005), who defined information uncertainty as "value ambiguity or the degree to which a firm's value cannot be reasonably estimated by even the most knowledgeable investors." This study defines information uncertainty as investor uncertainty about true fundamental values of the firms in which they invest.

Within the framework of structural-form credit models, default is triggered when firm value falls below a particular threshold. If bond investors are uncertain about the true value of a firm, they will have trouble measuring this firm's real default risk, and may require a higher premium for its bonds. A testable inquiry is that a firm with greater information uncertainty regarding its firm value will exhibit higher yield spreads.

This study uses four proxies to measure information uncertainty, including accruals quality (AQ), firm age (AGE), analyst coverage (NANAL), and dispersion of analysts' earnings forecasts (DISP). The current work adopts the approach of Francis et al. (2005) for accruals quality by estimating the modified Dechow and Dichev (2002) model. Accruals quality is defined as the degree of mapping for a firm's working capital accruals for the past, current and future operating cash flows, controlling for changes in revenue and the level of gross property, plant and equipment. The better the mapping, the better the accruals quality. Eq. (1) presents the whole model (Dechow and Dichev, 2002). Each item in the equation is available in COMPUSTAT

$$\frac{\mathrm{TCA}_{j,t}}{\mathit{Asset}_{j,t-1}} = \beta_{0,j} + \beta_{1,j}\frac{\mathrm{CFO}_{j,t-1}}{\mathit{Asset}_{j,t-1}} + \beta_{2,j}\frac{\mathrm{CFO}_{j,t}}{\mathit{Asset}_{j,t-1}} + \beta_{3,j}\frac{\mathrm{CFO}_{j,t+1}}{\mathit{Asset}_{j,t-1}} + \beta_{4,j}\frac{\Delta\mathrm{REV}_{j,t}}{\mathit{Asset}_{j,t-1}} + \beta_{5,j}\frac{\mathrm{PPE}_{j,t}}{\mathit{Asset}_{j,t-1}} + \upsilon_{j,t}, \quad (1)$$

[3] The argument is based on the concept that the credit rating and Merton-type (1974) structural-form credit models assess a firm's credit risk from the viewpoints of debt- and equity-holders, respectively.

[4] They found when there is an increase in transient institutional investors who are sensitive to information asymmetry, credit spreads narrow. On the contrary, an increase in dedicated institutional investors causes an opposite result.

[5] See, for example, Easley et al. (1996), Easley and O'Hara (2004), Duarte and Young (2009), Brockman and Yan (2009), Autore and Kovacs (2010), and Jiang and Zaman (2010).

[6] See, for example, Zhang (2006) and Mansi et al. (2008). Among them, Mansi et al. (2008) suggested that analyst forecast characteristics carry information valuable to cost of debt, which, along with other studies, provide support for using dispersion in analyst forecasts as one of the proxies for information uncertainty.

[7] Dispersion in analyst forecasts (DISP) is also a widely used proxy for information asymmetry (Thomas, 2002). Therefore, this study uses DISP to represent both the level of information asymmetry and information uncertainty.