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Modeling loan commitments ☆

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Abstract

Loan commitments represent more than 82 percent of all commercial and industrial loans by domestic banks. This paper develops a valuation model for loan commitments incorporating early exercise, multiple fees, partial exercise and credit risk. The model is analytically tractable and easy to implement. Using a sample of commercial paper backup credit lines from the Dealscan database, we show that our model prices closely match loan commitment market prices.

JEL classification: G13; G21

Keywords: Loan commitments; Credit risk; Reduced form models; Commercial paper credit lines; Default intensity

1. Introduction

Loan commitments or credit lines are the most popular form of bank lending representing more than 82 percent[1] of all commercial and industrial loans by domestic banks. Loan commitments allow firms to borrow in the future at terms specified at the contract's origination.[2] They are used for commercial or industrial property purchases, construction and land development,

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[1] E-2: Survey of Terms of Business Lending, November 5–9, 2001

[2] Although loan commitments are typically used by banks and firms, they are more pervasive. The International Monetary Fund's contingent credit line to member countries is a loan commitment designed to augment foreign exchange reserves in times of crisis. The Federal Reserve's discount window is an implicit loan commitment contract that provides liquidity insurance to depository institutions.

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leveraged buy outs (LBOs), mergers and acquisitions, working capital, and to back-up commercial paper issuance. According to a federal survey in 2000, the amount of loan commitments outstanding was nearly $2 trillion with more than $1.2 trillion undrawn. Used and unused loan commitments are a significant proportion of the banks total assets and deposits (see Gatev and Strahan, 2002).

Various models exist in the literature for pricing loan commitments (see Bartter and Rendleman, 1979; Greenbaum and Venezia, 1985; Thakor et al., 1981; Thakor, 1982; Hawkins, 1982; Ho and Saunders, 1983; Chateau, 1990). However, the simplifying assumptions imposed in these papers make their practical usage problematic. In particular, these models imply that credit lines are never partially exercised, contradicting the empirical evidence.[3] These models also assume constant interest rates, an assumption inconsistent with market realities. And, they price loan commitments from the firm's perspective, and not the bank's. Banks and firms need not have the same information, and if the bank has less information, then loan commitment exercise could come as a complete surprise to the lending bank while still being perfectly anticipated by the firm (see Duffie and Lando, 2001; Cetin et al., 2004).

The purpose of this paper is to develop a simple, analytically tractable model that incorporates the critical features of loan commitments observed in practice—random interest rates, early exercise, and multiple commitment fees. In this regard, we use the reduced form credit risk approach of Jarrow and Turnbull (1995) and Duffie and Singleton (1997). A similar approach to ours can be found in Hughston and Turnbull (2001). Hughston and Turnbull (2001), however, do not empirically implement their model. Another recent paper, still using the structural approach, that considers both stochastic interest rates and the complexity of loan commitment contracts is Loukoianova et al. (2007).

Our modeling framework is especially suited for back up commercial paper (CP) credit lines. These loan commitments are used when a firm is unable to raise sufficient funds in the CP market[4] to meet current or anticipated obligations (see Saidenberg and Strahan, 1999; Gatev and Strahan, 2002). To illustrate the implementation of our model, we estimate the fair market value for a sample of 97 backup CP credit lines contained in the Dealscan database. In the process, we also estimate both the bond-implied probability of loan commitment exercise and the default probability. We show that our model prices closely match observed prices with a zero median and a -1.5% mean difference. This illustration motivates the need for a more exhaustive and in depth empirical investigation. This investigation, however, awaits subsequent research.

2. The pricing model

There are two approaches for modeling credit risk: the *structural approach* originating in Black and Scholes (1973) and Merton (1974), and the *reduced form approach* of Jarrow and Turnbull (1995), Jarrow et al. (1997), and Duffie and Singleton (1997). For pricing loan commitments, the existing literature almost exclusively[5] uses the structural approach. In contrast, we adopt the reduced form approach.

[3] Firms typically use only 65% of their credit line capacity and only around 20% of the firms ever reach their credit line limit (Ham and Melnik, 1987)

[4] Typically, only firms with strong credit standings can access the CP market. The market for commercial paper rated 'A-2' or lower is presently estimated to total $80 billion, compared with the approximately $1.4 trillion of 'A-1' and 'A-1+' paper outstanding.

[5] The one exception is Hughston and Turnbull (2001).