

# Optimal Default and Liquidation with Tangible Assets and Debt Renegotiation

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## Abstract

This paper proposes a new pricing model for corporate securities issued by a levered firm with the possibility of debt renegotiation. We take the structural approach that the firm's earnings follow a geometric Brownian motion with stochastic collaterals. While equity holders can default the firm for their own benefits when the earnings become insufficient to go on the firm, they may want to liquidate it by repaying the face value of debt to debt holders in order to get enough residuals, when the value of collaterals becomes sufficiently high. Unlike the existing theoretical models, the bivariate structure enables us to distinguish strategic default, liquidity default and the ordinary liquidation. It is shown that liquidity default and liquidation possibly occur without entering debt renegotiation, which makes the contribution of strategic debt service to credit spreads lower than that obtained in the previous models, irrespective of the equity holders' bargaining power. Our model resolves the inconsistency reported in recent empirical studies.

*Keywords:* Structural model; Debt renegotiation; Strategic debt service; Credit spread; Liquidity default; Strategic default; Liquidation; M&A

*JEL classifications:* D81; G32; G33; G35

## 1 Introduction

The purpose of this paper is to propose a new pricing model for corporate securities issued by a levered firm with the possibility of debt renegotiation. We take the structural approach that the firm's earnings follow a geometric Brownian motion (GBM for short) with stochastic collaterals. As in Leland (1994), equity holders can default the firm for their own benefits, when the earnings become insufficient to go on the firm. In addition, equity holders may want to liquidate the firm by repaying the face value of debt to debt holders in order to get enough residuals, when the value of collaterals becomes sufficiently high. Unlike the existing structural models, the bivariate structure of our model can not only capture realistic credit spreads observed in the market, but also explain many empirical findings reported in the literature.

There are two major approaches for the pricing of corporate securities in the finance literature. The first approach, called the structural approach,<sup>1</sup> considers a firm's asset value and defines default as occurring either at maturity (as in Merton, 1974) or when the underlying process reaches a default boundary for the first time (as in Black and Cox, 1976; Brennan and Schwartz, 1984).

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<sup>§</sup>The Full Paper is available from HUSCAP (Hokkaido University Collection of Scholarly and Academic Papers, <http://hdl.handle.net/2115/43303>).

<sup>1</sup>The other approach, called the reduced-form approach, assumes an exogenous hazard rate process as given, which represents the likelihood of unexpected default of the firm. Major advantages of this approach are its analytical tractability and ability of generating a flexible and realistic term structure of credit spreads. However, since default mechanism is not related to the firm value, we cannot examine the impact of firm-specific variables on the values of corporate securities.