

## A BANK LOAN PRICING MODEL BASED ON RECOVERY RATE DISTRIBUTION

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**ABSTRACT.** *In this paper, we propose a pricing model for a principal-equal-repayment loan that is common in Japan and present a tractable pricing formula for giving the loan an interest rate relevant to the default risk in consideration of the bank's risk tolerance. The pricing model is specified by the three important components of the term structure of default probability, the distribution of recovery rate at default, and the default risk premium that each bank can select independently. After discussion on adjustment of the assets on B/S, we compute the parameter named the B/S-adjusted asset-debt coverage ratio to specify the distribution of recovery rate. Moreover we present some numerical illustrations based on our model with real accounting data of Japanese non-listed companies.*

**Keywords:** Credit risk, Risk premium, Recovery at default

**1. Introduction.** For analyses of credit risk, especially for pricing corporate bonds that can be issued by relatively large firms, many models have been proposed and studied so far (see [1-2, 4-6]).

Corporate bonds are traded in the market, so it is not so difficult to examine whether such models can be fitted to the market data such as bond prices or credit spread. External credit rating can be also used as data for valuation of corporate bonds.

On the other hand, there have been few bank loan pricing models based on dynamic stochastic framework, especially for small and mid-sized enterprises (SME). Traditionally, pricing of the bank loan, or determination of the loan rate is based on qualitative assessment with accounting report rather than pure quantitative estimation. However, the loan rate is determined in a rational way for the bank's gaining the relevant profit and managing the credit risk.

In this paper, we propose a pricing model for a principal-equal-repayment loan that is common in Japan and present a tractable pricing formula for giving the loan interest rate relevant to the default risk in consideration of the bank's risk tolerance. As a consequence, the bank can use the model to know the rational level of the loan rate relevant to the default risk the bank will bear, even if the bank finally chooses a loan rate other than the one computed from the model.

The pricing model is specified by the three important components of the term structure of default probability, the distribution of recovery rate at default, and the default risk