

An Equilibrium Model for an OTC Derivative Market under a Counterparty Risk Constraint

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Abstract

In this article, we propose an equilibrium pricing model for an option contract with a counterparty risk, a collateral agreement, a counterparty risk constraint and the threshold. Since we consider the option market, we suppose that the buyer of option has only counterparty risk for seller's default. Also, we consider the model where the buyer is allowed to enter option contract within an allocated risk capital for counterparty risk and requires (cash) collateral to the seller if the exposure exceeds the threshold. We provide an equilibrium pricing rule and an equilibrium volume formula by solving static participants' utility maximization problems. In our model, the risk capital and the threshold affect on the equilibriums through amount of counterparty risk measured with credit valuation adjustment (CVA). Numerical implementations especially verify the effects of the risk capital and the threshold on the equilibrium price and volume for the option contract.

JEL Classification: G10, G12, G13

Keywords: equilibrium pricing, counterparty risk, counterparty risk constraint, collateralization, threshold

1 Introduction

In this article, we consider an equilibrium pricing for an over-the-counter (OTC) derivative contract with counterparty risk, collateralization and a counterparty risk constraint. Our study aims to verify the effect of collateralization on the OTC derivative contract. Except for the counterparty risk constraint, Takino (2015a) already has studied the impact of the collateralization on the OTC derivative contracts (i.e., option and swap). We construct the equilibrium pricing model adding the counterparty risk constraint to the model provided by Takino (2015a) and describe the formulation of OTC derivative market with the counterparty risk.

After the financial crisis in 2008, counterparty risks in OTC derivative contracts have been focused from many practitioners and researchers. Counterparty risk is known as a possibility to fail to meet the full payoff of derivative contract. In order to hedge or eliminate counterparty risk, collateral agreement is imposed among market participants in OTC derivatives market. The derivative pricing models including collateralization have recently been provided from several authors