

An Equilibrium Model for the OTC Derivatives Market with A Collateral Agreement*

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Abstract

In this paper, we consider the over the counter (OTC) derivatives market model with the counterparty risk and the collateral agreement. We then verify the effect of the collateral agreement on the derivative transaction by using the equilibrium analysis in Microeconomics. We first model the financial market as an incomplete market model which forces us to use the utility-based pricing approach. The option and swap contracts are considered in our study. The former and later correspond the unilateral and bilateral counterparty risk case, respectively. We next derive the demand/supply curves for both derivative contracts by agent's utility maximizations. This leads the equilibrium volumes and prices for the derivative contracts, and enables us to observe the influence of the collateral agreement on these. Our numerical results also verify how the market equilibriums for the derivatives change according to the change of the collateral amount through the demand/supply changes.

JEL Classification: G10, G12, G13

Keywords: OTC derivative market, counterparty risk (right-way risk, wrong-way risk), collateral, incomplete market, utility-based pricing, market equilibrium

1 Introduction

In this article, we propose a framework to analyze the derivative contracts in the over the counter (OTC) derivative markets with the counterparty risk and the collateral agreement. There are several ways to hedge the counterparty risk, for example, hedging of counterparty risk with the credit charge (called a credit valuation adjustment: CVA), posting the (cash) collateral and transferring of the OTC transactions to the central clearing counterparty (CCP) (c.f., Gregory (2010)). Many financial institutions have been trying to attack the counterparty risks with these materials.

The collateral agreement provides a sort of insurance to the counterparty who has positive exposure and will be a cost (i.e., default cost) for the counterparty with negative exposure when she/he defaults for the life of the financial contract. It is natural to think that the collateralization effects on the behaviors of the market participants, and eventually on the financial transactions

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