Catastrophe Risk Management and Credit Enhancement by Using Contingent Capital

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Abstract

Catastrophe risk comprises exposure to losses from man-made and natural disasters, and recently such disasters occur more frequently and with greater severity, which was faced with insufficient capital and close down by insurance industry. Catastrophe equity puts (hereafter referred to as CatEPuts) provide an additional pipeline to obtain funds, and insurance company can issue equity securities at the agreed price to obtain sufficient funds to cover its catastrophe losses when the catastrophe events occurred. This paper develops a structural framework to value CatEPut with counterparty risk, and utilize structure model to estimate default probability and credit improvement ratio of insurance company when using CatEPuts. In empirical analysis, we use hurricane losses and number available from the U.S. database on spatial hazard events and losses to estimate the parameters of the severity to find the goodness-of-fit distribution. In numerical analysis, we first price the CatEPut premium with/without counterparty risk, and then we investigate the impacts of the counterparty risk, catastrophe loss parameters on the CatEPuts premiums. Second, we further investigate the level of credit enhancement of the insurers when they use CatEPuts. Based on numerical analysis, we can find that scale parameter has the greatest influence on the CatEPuts premium. Furthermore, we find that CatEPuts premiums and counterparty risk have the higher impact on default probability and improvement ratio of the insurer.

Keywords: Contingent capital, catastrophe equity put, counterparty risk, default probability

使用或有資本工具管理巨災風險與信用增強

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摘要

　　巨災風險包含人為與自然的災難，近來巨災損失幅度與頻率提高而使得保險公司面臨資本不足、公司倒閉之情形。巨災權益賣權提供一種額外取得資金的管道，當巨災事件發生後保險公司可在約定價格下發行權益證券以取得足夠資金涵蓋巨災損失。本文在考量交易對手風險之下，運用結構框架對巨災權益賣權進行評價，並且利用結構式模型計算當保險公司使用巨災權益賣權之違約機率與違約改善率。在實證分析方面，本文使用來自美國SHELDUS資料庫的颶風損失與發生次數估計巨災損失頻率的參數並尋求最適的損失分配。在數值分析中，我們首先計算在有無考慮交易對手風險下之巨災權益賣權價格，並探討交易對手風險與巨災損失參數對巨災權益賣權價格的影響。第二，我們進一步探討保險公司利用巨災權益賣權增強信用評級。由數值分析結果得知，規模參數對巨災權益賣權價格影響最大。此外，我們發現巨災權益賣權價格與交易對手風險會影響保險公司的違約機率與改善率。

關鍵詞：或有資本、巨災權益賣權、交易對手風險、違約機率

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