考量非對稱雙指數跳躍與交易對手風險下抵押保險之定價

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摘要

次級房貸市場的崩盤導致抵押保險人的巨大損失，因而抵押保險評價的準確性更爲重要。本文假設房價服從非對稱雙指數跳躍以及考量保險人違約風險下，推導出抵押保險之公式解。再者，本文使用 1986 年至 2008 年的美國房價月資料估計與檢定非對稱雙指數跳躍擴散模型、對數常態分配跳躍擴散模型、Black-Scholes 模型。實證結果顯示非對稱雙指數跳躍模型爲美國房價資料最適的模型，亦及美國房價具有非對稱跳躍之特性。數值分析顯示房價正常的波動度、平均向下跳的大小、異常壞消息的發生頻率與保險人的資產與負債結構爲抵押保險保險費之遞增函數。特別是異常壞消息的發生頻率效果影響抵押保險保險費最大；亦即，抵押保險人發行抵押保險時，應該考量異常壞消息發生的頻率之效果。

關鍵詞：抵押保險、雙指數跳躍擴散過程、交易對手違約風險。

The Valuation of Mortgage Insurance Contracts with the Asymmetric Double Exponential Jump Risk and Counterparty Default Risk

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Abstract

The collapse of subprime mortgage market and the mortgage insurer's huge losses has drawn more attention to the precise valuation of mortgage insurance contracts. This study derives the pricing formula of mortgage insurance contracts with consideration of the asymmetric double exponential jump diffusion process and mortgage insurer's default risk. Furthermore, we use the US housing price data from January 1986 to October 2008 to estimate and test the asymmetric double exponential jump diffusion (DEJD) process, the log-normally distributed jump diffusion (LJD), and the Black-Scholes model (BSM). Using the quasi-Newton algorithm, Bayesian information criterion (BIC) and likelihood ratio test (LR test), the empirical results indicate that the asymmetric DEJD is the best model to fit the single family mortgage national average all homes prices in the US. This means that US housing price has the property of asymmetric jump risk. Finally, to investigate how the asymmetric jump risk of housing price and the default risk of the mortgage insurer affect the valuation of mortgage insurance premiums, sensitivity analysis shows the relationships among mortgage insurance premium, the normal volatility, the mean down-jump magnitudes, the shock frequency of the abnormal bad events, the asset-liability structure of the mortgage insurer. The sensitivity analysis results show that the mortgage insurance premium are increasing functions of the normal volatility, the mean down-jump magnitudes, the shock frequency of the abnormal bad events, the asset-liability structure of the mortgage insurer. Particularly, the shock frequency of the abnormal bad events has the largest effect of all parameters on the mortgage insurance premium. This implies that when the mortgage insurer writes a mortgage insurance contract that promises to compensate the lender only when the borrower defaults, the mortgage insurer must consider the impact of shock frequency of the abnormal bad events on pricing the mortgage insurance contracts.

Keywords: mortgage insurance contract, double exponential jump diffusion process, counterparty default risk

Contents

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