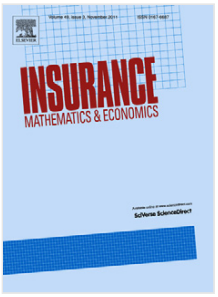
Accepted Manuscript



Robust optimal control for an insurer with reinsurance and investment under Heston's stochastic volatility model

Bo Yi, Zhongfei Li, Frederi G. Viens, Yan Zeng

PII: S0167-6687(13)00132-7
DOI: http://dx.doi.org/10.1016/j.insmatheco.2013.08.011
Reference: INSUMA 1851

To appear in: *Insurance: Mathematics and Economics*

Received date: February 2013
Revised date: August 2013
Accepted date: 27 August 2013

Please cite this article as: Yi, B., Li, Z., Viens, F.G., Zeng, Y., Robust optimal control for an insurer with reinsurance and investment under Heston's stochastic volatility model. *Insurance: Mathematics and Economics* (2013), http://dx.doi.org/10.1016/j.insmatheco.2013.08.011

Robust optimal control for an insurer with reinsurance and investment under Heston's stochastic volatility model[☆]

Bo Yi[a,c], Zhongfei Li[b,*], Frederi G. Viens[c], Yan Zeng[d]

[a]*School of Mathematics and Computational Science, Sun Yat-sen University, Guangzhou 510275, China*
[b]*Sun Yat-sen Business School, Sun Yat-sen University, Guangzhou 510275, China*
[c]*Department of Statistics, Purdue University, West Lafayette, IN 47907-2067, USA*
[d]*Lingnan (University) College, Sun Yat-sen University, Guangzhou 510275, China*

Abstract

This paper considers a robust optimal reinsurance and investment problem under Heston's Stochastic Volatility (SV) model for an Ambiguity-Averse Insurer (AAI), who worries about model misspecification and aims to find robust optimal strategies. The surplus process of the insurer is assumed to follow a Brownian motion with drift. The financial market consists of one risk-free asset and one risky asset whose price process satisfies Heston's SV model. By adopting the stochastic dynamic programming approach, closed-form expressions for the optimal strategies and the corresponding value functions are derived. Furthermore, a verification result and some technical conditions for a well-defined value function are provided. Finally, some of the model's economic implications are analyzed by using numerical examples and simulations. We find that ignoring model uncertainty leads to significant utility loss for the AAI. Moreover we propose an alternate model and associated investment strategy which can be considered more adequate under certain finance interpretations, and which leads to significant improvements in our numerical example.

Keywords: Reinsurance and investment strategy, Stochastic volatility, Robust optimal control, Utility maximization, Ambiguity-Averse Insurer.

[☆]This research is supported by grants from US NSF grant DMS (No. 0907321), National Natural Science Foundation of China (No. 71231008, 71201173), Humanity and Social Science Foundation of Ministry of Education of China (No. 12YJCZH267), Philosophy and Social Science Programming Foundation of Guangdong Province (No. GD11YYJ07), the Foundation for Distinguished Young Talents in Higher Education of Guangdong, China (2012WYM-001) and State Scholarship Fund of CSC (No. 201206380033).

[*]Corresponding author. Tel: +86 20 84111989; Fax: +86 20 84114823

Email addresses: yib@purdue.edu (Bo Yi), lnslzf@mail.sysu.edu.cn (Zhongfei Li), viens@stat.purdue.edu (Frederi G. Viens), zengyan1984@gmail.com (Yan Zeng)