应用数学学报
Acta Mathematicae Applicatae Sinica (Chinese Series)
ISSN 0254-3079
CN 11-2040/O1

应用数学学报 » 2012, Vol. » Issue (3): 385-395 DOI:

Markov 调制风险模型的轨道刻划和概率构造

莫晓云[1,2], 杨向群[1]

1. 湖南师范大学数学与计算机科学学院, 长沙 410081;
2. 湖南财政经济学院, 长沙 410205

Path-depict and Probabilistic Construction of the Markov-modulated Risk Model

MO Xiaoyun[1,2], YANG Xiangqun[1]

1. College of Mathematics and Computer Science, Hunan Normal University, Changsha 410081;
2. Hunan Financial and Economic College, Changsha 410205

摘要 用随机过程的轨道，严格地刻划了Markov调制风险模型$U=(Q,G,F;J,S,X)$，它是已有的Markov调制风险模型的一般化. 基于模型U，分别给出带保费率向量C和带税率向量γ的Markov 调制风险过程$R^{u}=\{R^{u}(t),\ t\geqslant 0\}$和$R^{u}(\gamma)=\{R^{u}(\gamma,t),\ t\geqslant 0\}$. 给定特征组$A=(Q,G,F)$，用概率方法构造了模型$U$. 从而为用随机过程理论和方法研究Markov调制风险模型和过程,奠定了严实的随机过程基础.

关键词： Markov链 Q矩阵 带税率的Markov调制风险过程 轨道 概率构造

Abstract： The Markov-modulated risk model $U=(Q,G,F;J,S,X)$ is precisely depicted by using paths of stochastic processes,the model is vague generalization of available Markov-modulated risk models now. Based on the model U the Markov-modulated risk processes with premium-rate vector C and tax-vector γ, $R^{u}=\{R^{u}(t),\ t\geqslant 0\}$ and $R^{u}(\gamma)=\{R^{u}(\gamma,t),\ t\geqslant 0\}$, are given respectively. Let a characteristic group $A=(Q,G,F)$ be given, the model U is constructed by using probabilistic method. It establishes a rigorous foundation of stochastic processes researching Markov-modulated risk models and Markov-modulated risk processes by using the theory and methods of stochastic processes.

Key words： Markov chain Q matrix Markov-modulated risk process with tax-vector trajectory probabilistic construction

收稿日期: 2011-07-16;

基金资助:国家自然科学基金(No:11171101)；高性能计算与随机信息处理省部共建教育部重点实验室(HPCSIP, 湖南师范大学)；教育部高校博士点基金(No: 20104306110001)；湖南省社科联基金(No:1011051B)资助项目.

通讯作者: 杨向群 E-mail: xqyang@hunnu.edu.cn

引用本文:

莫晓云,杨向群. Markov 调制风险模型的轨道刻划和概率构造 [J]. 应用数学学报, 2012, (3): 385-395.

MO Xiaoyun,YANG Xiangqun. Path-depict and Probabilistic Construction of the Markov-modulated Risk Model[J]. Acta Mathematicae Applicatae Sinica, 2012, (3): 385-395.

[1] Gerber H, Shiu E. On the Time Value of Ruin. *North American Actuarial Journal*, 1998, 2(1): 48-78

[2] Asmussen S. Risk Theory in a Markovian Environment. *Scandinavia Actuarial Journal*, 1989, 2(1): 69-100

[3] Albrecher H, Badescu A, Landriault D. On the Dual Risk Model with Tax Payment. *Insurance: Mathematics and Economics*, 2008, 42 (3): 1086-1094

[4] Albrecher H, Borst S, Boxmad O, Resing J. The Tax Identity in Risk Theory-a Simple Proof and an Extension. *Insur. Math. Econ.*, 2009, 44(2): 304-306

[5] Albrecher H, Hipp C. Lundberg's Risk Process with Tax. *Blatter der DGVFM*, 2007, 28(1): 13-28

[6] Albrecher H, Renaud J, Zhou X. A Levy Insurance Risk Process with Tax. *Journal of Applied Probability*, 2008, 45(2): 363-375

[7] Wei J, Yang H, Wang R. On the Markov-modulated Insurance Risk Model with Tax. *Blatter der DGVFM*, 2010, 31(1): 65-78

[8] Asmussen S. Ruin Probabilities. Singapore: World Scientific, 2000

[9] Andrew C, Yang H. On the Joint Distribution of Surplus Before and After Ruin under a Markovian Regime Switching Model. *Stochastic Processes and Their Applications*, 2006, 116(2): 244-266

[10] Zhang X. On the Ruin Problem in a Markov Modulated Risk Model. *Methodology and Computing in Applied Probability*, 2008, 10(2): 225-238

[11] 莫晓云. 用独立乘积空间构造相依随机变量的组装法. 湖南师范大学学报 自然科学版, 2010, 33(2): 3-6 (Mo X. Assembly Method Constructing Dependent Random Variables with Independent Product Space. *Journal of Natural Science of Hunan Normal University*, 2010, 33(2): 3-6)

[1] 余妙, 唐应辉, 付永红. 具有中途准入机制和多重休假的离散时间$GI/Geom^{(a,b)}/1/N$早到排队系统[J]. 应用数学学报, 2011, 34(5): 853-872.

[2] 高亚萍, 徐冰. Dhombres型函数方程的连续解[J]. 应用数学学报, 2010, 33(6): 1001-1010.

[3] 赵修文, 李一鸣, 舒级. 一类具非齐次项的非线性Schrödinger 方程驻波的稳定性[J]. 应用数学学报, 2010, 33(6): 1072-1077.

[4] 李成岳. 不满足Gordon-强力条件的奇异二阶周期Hamilton系统同宿轨道[J]. 应用数学学报, 2004, 27(2): 353-360.

[5] 张饴慈. 首达渗流中关于lim{(N_(on))/n}(n→∞)的一个结果[J]. 应用数学学报, 2002, 25(2): 289-294.

[6] 徐宗本, 聂赞坎, 张文修. 父代种群参与竞争遗传算法几乎必然收敛[J]. 应用数学学报, 2002, 25(1): 167-175.