

2nd International Workshop on Optimal (Re)insurance

第二届最优保险和再保险国际研讨会

July 12-14, 2018, Beijing

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中央财经大学

Central University of Finance and Economics



中国精算研究院
China Institute for Actuarial Science



教育部人文社科重点研究基地

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China Institute for Actuarial Science
Insurance Risk Analysis and Decision Making (111 Project B17050)
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Conference Host



The China Institute for Actuarial Science (CIAS) was established in 2003 to create a unique centre for research and advanced training in actuarial science and insurance at the Central University of Finance and Economics (CUFE), Beijing, China. Prior to establishing CIAS, the CUFE has a long history in promoting and advancing actuarial education in China. In 1992, the CUFE became the first university in China that adopted the professional actuarial syllabus of the Institute and Faculty of Actuaries (UK) in training Chinese actuarial students.

In 2004, the CIAS was formally recognized by the Ministry of Education (China) as the only key research institute in China in the fields of actuarial science and insurance. In 2017, the CIAS established the research center entitled “Insurance Risk Analysis and Decision Making”, as a result of the approval of a “111 Project” by the State Administration of Foreign Experts Affairs (China). In 2018, the actuarial program at CUFE became the first and the only (so far) Center of Actuarial Excellence (CAE) of the Society of Actuaries among the universities in mainland China. Currently the CIAS has 22 members who are active in research and teaching, and promotes collaboration and co-operation among its research and private sector partners through conferences, seminars, workshops and meetings.

Conference Agenda

Thursday July 12, 2018

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|-------------|---|
| 17:00-20:00 | Registration (Free Comfort Holiday Hotel Lobby) |
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Friday July 13, 2018

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|-------------------------------|----------------------------------|----------------------------|--|
| 08:00-12:00 | Registration (Conference Venue) | | |
| 08:30-08:40 | Opening Remarks | Room 706 | |
| | Professor Ming Zhou | Deputy Dean of CIAS | |
| Room 706 | Chair: Jun Cai | | |
| 08:40-09:30 | Keynote Speaker | Jianming Xia | Monotone solutions to the moral hazard problem |
| 09:30-10:10 | Invited Speaker | Phillip Yam | Systematic risks in non-zero-sum investment and reinsurance games |
| 10:10-10:50 | Photo and Coffee Break | | |
| Room 706 | Chair: Jingping Yang | | |
| 10:50-11:30 | Invited Speaker | Mario Ghossoub | Insurance demand with belief heterogeneity |
| 11:30-12:10 | Invited Speaker | Ka Chun Cheung | Risk-adjusted Bowley reinsurance under distorted probabilities |
| 12:20-13:30 | Lunch (Expert Hotel 专家宾馆) | | |
| Parallel Session 1 (Room 702) | Chair: Yichun Chi | | |
| 14:00-14:40 | Invited Speaker | Xiaoxuan Li | Uncertainties in reinsurance pricing models |
| 14:40-15:20 | Invited Speaker | Fangda Liu | Enhancing the insurer's expected return by reinsurance and financing |
| 15:20-15:50 | Coffee Break | | |
| Room 702 | Chair: Fangda Liu | | |
| 15:50-16:15 | Contributed Speaker | Lin He | Optimal control of DC pension plan manager under two incentive schemes |
| 16:15-16:40 | Contributed Speaker | Manman Li | Optimal threshold strategies with capital injections in a spectrally negative Levy risk model |
| 16:40-17:05 | Contributed Speaker | Xia Han | Optimal proportional reinsurance to minimize the probability of drawdown under thinning-dependence structure |
| 17:05-17:30 | Contributed Speaker | Yongxia Zhao | Equilibrium dividend strategies with the time value of ruin and a random time Horizon |

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| Parallel Session 2 (Room 706) | | Chair: Huiling Wu | |
| 14:00-14:40 | Invited Speaker | Wei Wei | Optimal insurance with background risk: An analysis of general dependence structures |
| 14:40-15:20 | Invited Speaker | Zhiyi Lu | Optimal insurance design under background risk with dependence |
| 15:20-15:50 Coffee Break | | | |
| Room 706 | | Chair: Wei Wei | |
| 15:50-16:30 | Invited Speaker | Shengchao Zhuang | Optimal insurance under rank-dependent utility and incentive compatibility |
| 16:30-17:00 | Contributed Speaker | Linxiao Wei | Capital allocation with multivariate risk measures: An axiomatic approach |
| 17:00-17:30 | Contributed Speaker | Huiling Wu | Equilibrium consumption and portfolio decisions with stochastic discount rate and time-varying utility functions |
| 17:30-17:45 | Contributed Speaker | Fan Du | Can blockchain increase the insurance trust? ---- A data simulation based on dynamic trust forecasting model |
| 18:00-20:00 Dinner (WUYEJIA 五爷家) | | | |

Saturday July 14, 2018

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|--------------------------|---|-------------------------|---|
| Room 706 | | Chair: Shengchao Zhuang | |
| 08:30-09:10 | Invited Speaker | Tim Boonen | Optimal reinsurance with multiple reinsurers: Competitive pricing and coalition stability |
| 09:10-09:50 | Invited Speaker | Haiyan Liu | Weighted risk sharing under heterogeneous beliefs |
| 09:50-10:30 | Invited Speaker | Ruodu Wang | Competitive equilibria in a comonotone market |
| 10:30-10:50 Coffee Break | | | |
| Room 706 | | Chair: Ruodu Wang | |
| 10:50-11:30 | Invited Speaker | Alfred Chong | Budget-constrained optimal reinsurance design under coherent risk measures |
| 11:30-12:10 | Invited Speaker | Ambrose Lo | Constrained and unconstrained optimal reinsurance |
| 12:10-12:20 | Closing ceremony (Fangda Liu) | | |
| 12:20-14:00 | Lunch (Free Comfort Holiday Hotel 康福瑞酒店) | | |

Speakers' Abstracts

Invited Speakers' Abstracts

1. Tim Boonen University of Amsterdam

Title: Optimal reinsurance with multiple reinsurers: competitive pricing and coalition stability

Abstract: In this talk, I study economic pricing of reinsurance contracts via competition of an insurer with multiple reinsurers. All firms are endowed with distortion risk measures or expected exponential utilities. Contracts are required to be Pareto optimal, individually rational, and satisfy a competition constraint that we call coalition stability. Indemnities are characterized by imposing Pareto optimality, as studied in the literature. Then, the corresponding premiums are characterized. There is a gain for the insurer due to the competition constraint. When the firms use distortion risk measures, this constraint yields stability for subcoalitions, which is a condition akin to the core in cooperative game theory. This gain for the insurer is shown in closed form. Also, the premium is represented by a distortion premium function. If the firms use expected exponential utilities, the premium is represented by an exponential premium. An illustrate this premium function with the Mean Conditional Value-at-Risk is provided.

Keywords: Reinsurance, multiple reinsurers, competition; premiums, Mean Conditional Value-at-Risk.

2. Ka Chun Cheung The University of Hong Kong

Title: Risk-adjusted Bowley Reinsurance under Distorted Probabilities

Abstract: In the seminal work of Chan and Gerber (1985), one of the earliest game theoretical approaches was proposed to model the interaction between the reinsurer and insurer; in particular, the optimal pricing density for the reinsurer and optimal ceded loss for the insurer were determined so that their corresponding expected utilities could be maximized. Over decades, their advocated Bowley solution concept of equilibrium reinsurance strategy has not been revisited in the modern risk management framework. In this article, we attempt to fill this gap by extending their work to the setting of general premium principle for the reinsurer and distortion risk measure for the insurer.

Keywords: Bowley solution; Equilibrium reinsurance strategy; Pricing density; General premium principle; Distortion risk measure; Value-at-Risk

3. Alfred Chong University of Illinois at Urbana-Champaign

Title: Budget-constrained optimal reinsurance design under coherent risk measures

Abstract: Reinsurance is a versatile risk management strategy commonly employed by insurers to optimize their risk profile. In this talk, we study an optimal reinsurance design problem minimizing a general law-invariant coherent risk measure of the net risk exposure of a generic insurer, in conjunction with a general law-invariant comonotonic additive convex reinsurance premium principle and a premium budget constraint. Due to its intrinsic generality, this contract design problem encompasses a wide body of optimal reinsurance models encountered in practice. A three-step solution scheme is presented. Firstly, the objective and constraint functions are exhibited in the so-called Kusuoka's integral representations. Secondly, the mini-max theorem for infinite dimensional spaces is applied to interchange the infimum on the space of indemnities and the supremum on the space of probability measures. Thirdly, the recently developed Neyman-Pearson methodology due to Lo (2017) is adopted to solve the resulting infimum problem. Analytic and transparent expressions for the optimal reinsurance policy are provided, followed by illustrative examples. This talk is based on a joint work with Ka Chun Cheung and Ambrose Lo.

Keywords: Budget constraint; Distortion; TVaR; Mini-max Theorem; Neyman-Pearson.

4. Mario Ghossoub University of Waterloo

Title: Insurance demand with belief heterogeneity

Abstract: We re-examine the problem of demand for insurance indemnification when the insured and the insurer disagree about the likelihoods associated with the realizations of the insurable loss. For ease of comparison with the classical literature, we adopt the original setting of Arrow, but allow for divergence in beliefs between the insurer and the insured. We do not impose the *no sabotage* condition on admissible indemnities, but we impose instead a *state-verification cost* that the insurer can incur in order to verify the loss severity, which rules out *ex post* moral hazard issues that could otherwise arise from possible misreporting of the loss by the insured. Moreover, we do not impose conditions on the type or level of disagreement about probabilities, unlike the existing literature. Rather, we characterize the optimal indemnity for any type or level of belief heterogeneity. We then introduce a measure of belief divergence and examine how the level of disagreement in beliefs affects the shape of the optimal indemnity. Finally, we show how our belief divergence measure leads to a belief divergence metric on the vector space of all probability measures defined on our initial measurable space. We study the topological properties of the hence defined metric space and their implications for our insurance problem.

Keywords: Optimal Insurance; Arrow's Theorem; Deductible; Heterogeneous Beliefs.

5. Xiaoxuan Li China Property & Casualty Reinsurance Company LTD

Title: Uncertainties in reinsurance pricing models

Abstract: Unlike a primary insurance contract, a reinsurance contract is not a standardized contract but always custom-tailored based on the characteristics of the cedant's risk. As a result, there are many special provisions and clauses existing in a reinsurance contract that bring about uncertainties into reinsurance pricing models. Some of those uncertainties problems are caused by the unknown of the nature, and some are raised by the behaviors of human beings, while others are created by the wording of reinsurance contracts. This presentation will introduce those uncertainties in reinsurance pricing models as well as the current approximate solutions to them in the actuarial practice. It has to be admitted that these approximate solutions are not the optimal ones to the problems and more insights need to be added in order to solve these problems in the future.

Keywords: Uncertainties; Reinsurance pricing models; Wording of a contract.

6. Fangda Liu Central University of Finance and Economics

Title: Enhancing the insurer's expected return by reinsurance and financing

Abstract: A reinsurance contract is an effective risk management tool for the insurer to reduce the risk level of the aggregate loss from policyholders. Another commonly used risk management method is raising external capital. However, the interaction effect of these two methods hasn't been discussed adequately in current literatures. In this project, we consider from the insurer's point of view how the optimal choice of the reinsurance contract is influenced by the external capital amount and cost, and also discuss the sensitivity of this change.

Keywords: External Capital, reinsurance, Value-at-Risk, Tail Value-at-Risk

7. Haiyan Liu Michigan State University

Title: Weighted risk sharing under heterogeneous beliefs

Abstract: We study a weighted risk sharing problem among multiple agents with distortion risk measures under heterogeneous beliefs. Characterization of optimal comonotonic allocations is given. In particular, when the distortion risk measure is Value-at-Risk or Expected Shortfall, an optimal allocation is generally of an upper limit form or an excess-of-loss form. We illustrate the effects of the heterogeneous beliefs and the weights by numerical examples.

Keywords: Distortion risk measure, Value-at-Risk, Expected Shortfall, comonotonic allocation, heterogeneous beliefs

8. Ambrose Lo University of Iowa

Title: Constrained and unconstrained optimal reinsurance

Abstract: This two-strand talk synthesizes various recent advances in the design of optimal reinsurance in a modern risk management framework. In the first strand, we provide full characterizations of the collection of risk-minimizing optimal reinsurance treaties and put the underlying cost-benefit considerations in perspective. Unlike conventional studies, our results address the issue of

(non-)uniqueness of optimal solutions and indicate that ceded loss functions beyond the traditional insurance layers can be optimal in some cases. In the second strand, we develop, on the basis of the no-constraint framework in the first strand, a variation of the Neyman–Pearson Lemma in statistical hypothesis testing theory to solve a wide class of constrained optimal reinsurance problems expeditiously. To illustrate the versatility and superiority of the proposed Neyman–Pearson formulation, we provide complete and explicit solutions of several specific constrained optimal reinsurance problems, many of which were only partially solved in the literature by substantially more difficult means and under extraneous technical assumptions.

Keywords: Distortion; 1-Lipschitz; Neyman–Pearson; Value-at-Risk; Pareto optimality.

9. Zhiyi Lu Tianjin University of Commerce

Title: Optimal insurance design under background risk with dependence

Abstract: In this paper, we revisit the problem of optimal insurance under a general criterion that preserves stop-loss order when the insured faces two mutually dependent risks: background risk and insurable risk. According to the locally monotonicity of conditional survival function, we derive the optimal contract forms in different types of interval. Because the conditional survival function reflects the dependence between background risk and insurable risk, the dependence structure between the two risks plays a critical role in the insured’s optimal insurance design. Furthermore, we obtain the optimal insurance forms explicitly under some special dependence structures. It is shown that deductible insurance is optimal and the Mossin’s Theorem is still valid when background risk is stochastically increasing in insurable risk, which generalizes the corresponding results in Lu et al. (2012). Moreover, we show that an individual will purchase no insurance when the sum of the two risks is stochastically decreasing in insurable risk.

Keywords: Optimal insurance, background risk, stop-loss order, expected indemnity

10. Ruodu Wang University of Waterloo

Title: Competitive equilibria in a comonotone market

Abstract: The notion of competitive equilibria has been a crucial consideration in risk sharing problems. A large literature is devoted to analyses of optimal risk sharing based on expected utilities in a complete market. In this work, we investigate the competitive equilibria in a special type of incomplete markets, referred to as a comonotone market, where agents can only trade such that their wealth allocation is comonotonic. The comonotone market is motivated by two seemingly unrelated observations. First, in a complete market, under mild conditions on the preferences, an equilibrium allocation is generally comonotonic. Second, in a standard insurance market, the allocation of risk among the insured, the insurer and the reinsurers is assumed to be comonotonic a priori to the risk-

exchange. Two popular classes of preferences in risk management and behavioural economics, dual utilities (DU) and rank-dependent expected utilities (RDU), are used to formulate agents' objectives. We focus on establishing a pair of an equilibrium wealth allocation and an equilibrium pricing measure. For DU-comonotone markets, we find the equilibrium in closed-form. We further propose an algorithm to numerically obtain competitive equilibria based on discretization, which works for both the DU-comonotone market and the RDU-comonotone market. Results illustrate the intriguing and possibly puzzling fact that the equilibrium pricing kernel may not be counter-comonotone with the aggregate risk, in sharp contrast to the case of a complete market.

Keywords: Competitive equilibria, comonotone market, dual utilities, rank-dependent utilities

11. Wei Wei University of Wisconsin-Milwaukee

Title: Optimal insurance with background risk: An analysis of general dependence structures

Abstract: When seeking for insurance, decision makers usually need to take multiple sources of risks into consideration. This raises the problem of how to design optimal insurance policy in the presence of background risk. In the study of this problem, the dependence structure between the insurable risk and background risk plays an important role and also brings the main challenge.

In the literature, most studies focus on the positive dependence and seldom consider other types of dependence structures. In this talk, we shall establish a sufficient and necessary condition to justify the optimality of an insurance strategy under any dependence structure. This result provides a big picture about the structure of an optimal insurance strategy. Then, we partition the dependence structure into three categories, namely, positive dependence, moderate negative dependence, and strong negative dependence; and find out the optimal insurance strategy under each category. Furthermore, we study the optimization problem under several mixed dependence structures. These studies provide insights to ultimately solve the optimal insurance problem under an arbitrary dependence structure. (This talk is based on joint work with Yichun Chi.)

Keywords: Optimal insurance; background risk; positive dependence; moderate negative dependence; strong negative dependence; partial stop-loss insurance.

12. Jianming Xia Chinese Academy of Sciences

Title: Monotone solutions to the moral hazard problem

Abstract: This paper investigates monotone solutions of the moral hazard problems without the monotone likelihood ratio property. The optimal monotone solutions are explicitly characterized by a concave envelope relaxation approach for a two-action model in which the principal is risk neutral or exhibits constant absolute risk aversion. This is a joint work with Hanqing Jin (Oxford).

Keywords: Moral hazard; Monotone solution; Concave envelope; Monotone likelihood ratio

13. Phillip Yam The Chinese University of Hong Kong

Title: Systematic risks in non-zero-sum investment and reinsurance games

Abstract: Recently, there have been numerous insightful applications of zero-sum stochastic differential games in insurance, while there could be some practical situations under which nonzero-sum game approach is more appropriate, the development of such approach within actuarial contexts remains rare in the existing literature.

In this talk, I shall introduce a class of nonzero-sum reinsurance-investment stochastic differential games between two competitive insurers subject to systematic risks described by a general compound Poisson risk model. Each insurer can purchase the excess-of-loss reinsurance to mitigate both systematic and idiosyncratic jump risks of the inter-arrival claims; and can invest in one risk-free asset and one risky asset whose price dynamics follows the famous Heston stochastic volatility model. The main objective of each insurer is to maximize the expected utility of his terminal surplus relative to that of his competitor. Dynamic programming principle for this class of nonzero-sum game problems leads to a non-canonical fixed-point problem of coupled non-linear integral-typed equations. Despite the complex structure, we establish the unique existence of the Nash equilibrium reinsurance-investment strategies and the corresponding value functions of the insurers in a representative example of the constant absolute risk aversion insurers under a mild, time-independent condition. Furthermore, Nash equilibrium strategies and value functions admit closed forms. Numerical studies will also be provided to illustrate the impact of the systematic risks on the Nash equilibrium strategies.

Keywords: Zero-sum stochastic differential games, reinsurance, systematic risk, Nash equilibrium

14. Shengchao Zhuang University of Nebraska-Lincoln

Title: Optimal insurance under rank-dependent utility and incentive compatibility

Abstract: Bernard et al. (2015) study an optimal insurance design problem where an individual's preference is of the rank-dependent utility (RDU) type, and show that in general an optimal contract covers both large and small losses. However, their results suffer from the unrealistic assumption that the random loss has no atom, as well as a problem of moral hazard that provides incentives for the insured to falsely report the actual loss. This paper addresses these setbacks by removing the non-atomic assumption, and by exogenously imposing the "incentive compatibility" constraint that both the indemnity function and the insured's retention function be increasing with respect to the loss. We characterize the optimal solutions via calculus of variations, and then apply the result to obtain explicitly expressed

contracts for problems with Yaari's dual criterion and general RDU. Finally, we use numerical examples to compare the results between ours and that of Bernard et al. (2015).

Keywords: Optimal insurance design, rank-dependent utility theory, probability weighting function, moral hazard, incentive compatibility, indemnity function, retention function, quantile formulation.

Contributed Speakers Abstracts

1. Fan Du Central University of Finance and Economics

Title: Can blockchain increase the insurance trust?---A data simulation based on dynamic trust forecasting model

Abstract: We introduce the dynamic trust forecasting model to quantize the trust values in insurance decisions and divide them into two independent parts. One is the direct trust value based on information interactions between the policyholders and the insurance companies. The other is the indirect trust value formed by the trust transfer mechanism between other people and insurance companies.

The blockchain technology would guarantee the authenticity, transparency and inmodifiability, which creates the authenticity information sharing network among policyholders and forms the indirect trust value among policyholders.

We hypothesize that blockchain would form an enormous trust-network among policyholders unfamiliar with each other and increase the trust values in insurance decisions under the condition of large amounts of participants.

This research exploits and runs blockchain mutual insurance platform. Then we compare the trust values with traditional insurance platform to test the hypothesis.

Keywords: Trust values in insurance decisions; blockchain technology; trust-network

2. Xia Han Nanjing Normal University

Title: Optimal proportional reinsurance to minimize the probability of drawdown under thinning-dependence structure

Abstract: In this paper, we consider the optimal proportional reinsurance problem in a risk model with the thinning-dependence structure, and the criterion is to minimize the probability that the value of the surplus process drops below some fixed proportion of its maximum value to date which is known as the probability of drawdown. The thinning dependence assumes that stochastic sources related to claim occurrences are classified into different groups, and that each group may cause a claim in each insurance class with a certain probability. By the technique of stochastic control theory and the corresponding Hamilton-Jacobi-Bellman equation, the optimal reinsurance strategy and the corresponding minimum probability of

drawdown are derived not only for the expected value principle but also for the variance premium principle. Finally, some numerical examples are presented to show the impact of model parameters on the optimal results. (This is a joint work with Zhibin Liang and Kam Chuen Yuen)

Keywords: Proportional reinsurance; Stochastic optimal control; Probability of drawdown; Thinning-dependence structure

3. Lin He Renmin University of China

Title: Optimal control of DC pension plan manager under two incentive schemes

Abstract: Performance fee arrangement has been approved for the managerial incentives in the DC pension plan management in the late 1990s to motivate the manager to make effort. However, the disputes have existed so far, that the managers may take undue risk to gamble for the larger performance fee and reduce the utility of the members. In this paper, we study the optimal risk taking policies of the DC pension fund manager under both the single management fee scheme and the mixed scheme with the lower management fee as well as the additional performance fee. The analytical solutions are derived by exploring the duality method and concavification techniques in the singular optimization problem. The results show the complex risk taking structures of the fund manager, and recognize the win-win situation of implementing the performance based incentives in the DC pension plan management. Under the settings of geometric Brownian motion asset price dynamics and the CRRA (Constant Relative Risk Aversion) utility, the optimal risky proportion has the peak-valley pattern under the mixed scheme. The manager gambles for the gain when the fund wealth is low and the time to maturity is small. Being different from the existing literature, the risk taking policy is more conservative when the fund wealth is relatively large. Furthermore, the utilities of the manager and the member could both be improved by appropriately choosing the performance fee rate.

Keywords: Management fee; Performance fee; Incentive scheme; Duality method; Concavification techniques; DC pension plan; CRRA utility.

4. Manman Li Chongqing University

Title: Optimal threshold strategies with capital injections in a spectrally negative Levy risk model

Abstract: This paper focuses on optimal threshold strategies for a spectrally negative Levy (SNL) risk process with capital injections and proportional transaction costs. Restricted to solvency constraint, our model requires the shareholders of dividends prevent ruin by injecting capitals. Value function of the firm is assumed to be an expected discounted total [dividends less discounted capital injection]. Under such a setup, we derive certain key identities in connection with value function of the firm of a maximum dividend rate. Under restricted dividend rates and capital

injection, we give analytical description of the maximum value function of the rm and the optimal threshold strategy explicitly.

Keywords: Spectrally negative Levy process, threshold strategy, capital injection, scale function, fluctuation theory.

5. Linxiao Wei Wuhan University of Technology

Title: Capital allocation with multivariate risk measures: an axiomatic approach

Abstract: In this talk, we will propose an axiom system for capital allocations with multivariate risk measures. We first recall the class of the positively homogeneous and subadditive multivariate risk measures, and provide the corresponding representation results. Then it is shown that for a given positively homogeneous and subadditive multivariate risk measure, there exists a capital allocation principle. Furthermore, the uniqueness of the capital allocation principle is characterized. Finally, examples are given to derive explicit capital allocation principles for multivariate risk measures based on mean and standard deviation, including multivariate mean-standard-deviation risk measures. This talk is based on a joint work with Professor Yijun Hu from Wuhan University.

Keywords: multivariate risk measure, positive homogeneity, subadditivity, (financial) portfolio, capital allocation principle

6. Huiling Wu Central University of Finance and Economics

Title: Equilibrium consumption and portfolio decisions with stochastic discount rate and time-varying utility functions

Abstract: This paper studies a multi-period investment–consumption optimization problem with a stochastic discount rate and a time-varying utility function, which are governed by a Markov-modulated regime-switching model. The investment is dynamically reallocated between one risk-free asset and one risky asset. The problem is time inconsistent due to the stochastic discount rate. An analytical equilibrium solution is established by resorting to a game theoretical framework. Numerous sensitivity analyses and numerical examples are provided to demonstrate the effects of the stochastic discount rate and time-varying utility coefficients on the decision-maker’s investment–consumption behavior. Our results show that many properties, which are satisfied in the classical models, do not hold any more due to either the stochastic discount rate or the time-varying utility function.

Keywords: Nash equilibrium · Stochastic discount rate · Investment–consumption · Regime switching

7. Yongxia Zhao Qufu Normal University

Title: Equilibrium dividend strategies with the time value of ruin and a random time horizon

Abstract: In the Cramer-Lundberg model and its diffusion approximation, this paper investigates the dividend problems with a mixture of exponential discount functions which gives rise to a time inconsistent control problem. We assume that the dividends can be only be paid at a bounded rate and that the surplus process is killed by an exponential random variable. Besides, we take the lifetime of the controlled process into account. We firstly give the equilibrium HJB-equation the associated verification theorem for the time inconsistent problems. Then we construct the time consistent equilibrium strategies and obtain the corresponding equilibrium value functions for both the diffusion model and the Cramer-Lundberg model with exponential claim sizes. Finally, numerical examples are studied to illustrate our results.

Keywords: Equilibrium dividend strategies, Time inconsistency, Diffusion model, Cramer-Lundberg model, Equilibrium HJB-equation.

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West Entrance

Campus Map

