

4TH FUDAN-ULM SYMPOSIUM ON INSURANCE AND FINANCE

CO-SPONSORED BY FUDAN UNIVERSITY AND ULM UNIVERSITY

ROOM 714, SCHOOL OF ECONOMICS, FUDAN UNIVERSITY
600 GUOQUAN ROAD, 200433, SHANGHAI

MONDAY, SEPTEMBER 04, 2017

9:00 - 9:05 am

Group photo

9:05 - 9:15 am

Welcome Remarks by Prof. Dr. Jun Zhang, dean of School of Economics, Fudan University

9:15 - 10:45 am

Moderator: Dr. Xian Xu, Fudan University

- **Tonuity: A novel individual-oriented retirement plan**
 - Dr. An Chen, Ulm University
- **Motives and Firm Performance: An empirical study of employee stock ownership plans in china**
 - Dr. Qing Yang, Fudan University
- **Liquidity of life insurance: what drives up policyholder's run?**
 - Nils Sørensen, Ulm University

15 min. Break

11 am - 12 pm

Moderator: Dr. Xian Xu, Fudan University

- **Currency risk management under equity-currency contagion**
 - Dr. Zhenzhen Fan, Nankai University
- **European versus Anglo-Saxon Credit View: Evidence from the Eurozone Sovereign Debt Crisis**
 - Marc Altdoerfer, Ulm University

12pm - 13:30 pm

Lunch

13:30 - 15:00 pm

Moderator: Dr. Zhenzhen Fan, Nankai University

- **Relational Contracting and Hold-up**
 - Dr. Sebastian Kranz, Ulm University
- **Sales, monetary policy and durable goods**
 - Dr. Wenbin Wu, Fudan University
- **A mortality model approach using crucial diseases**
 - Christian Dehm, Ulm University

15 Min. Break

15:15 – 16:45 pm

Moderator: Dr. Zhenzhen Fan, Nankai University

- **The Whittle estimation based on the integrated extremal periodogram**
 - Dr. Yuwei Zhao, Fudan University
- **Extensions of mean-variance portfolio selection**
 - Frank Bosserhoff, Ulm University
- **Mortality deceleration in China: biases or facts?**
 - Fangyuan Zhang, Fudan University

17:00 - 19:00 pm

Get Together & Ulm-Fudan Alumni Event: Coffee Bar, 2. Floor, School of Economics Building

TUESDAY, SEPTEMBER 05, 2017

9:00 - 10:30 am

Moderator: Dr. An Chen, Ulm University

- **Optimal investment under Var-Regulation and minimum insurance**
 - Dr. Mitja Stadje, Ulm University
- **Retirement plan in the presence of money illusion**
 - Dr. Jiguang Zheng, Fudan University
- **Funding life insurance contracts with guarantees: how to optimally respond to the policyholder's needs?**
 - Dr. Thai Nguyen, Ulm University

20 min. Break

10:50 – 11:50 am

Moderator: Dr. An Chen, Ulm University

- **Bridge between insurance industry and education**
 - Dr. Yan Wang, Hannover Reinsurance Cooperate
- **Earthquake and economic growth: an economic sector specific investigation**
 - Xian Xu, Fudan University

11:50 – 12 pm

Closing Remarks by Dr. Dan Li, Assistant Dean, School of Economics, Fudan University

PAPER ABSTRACTS

Dr. An Chen

Professor in Insurance,
head of Institute of
Insurance Science, Ulm
University

Tonuity: A novel individual-oriented retirement plan

For insurance companies in Europe, the introduction of Solvency II leads to a tightening of rules for solvency capital provision. In life insurance, this especially affects retirement products that contain a significant portfolio of longevity risk (for example conventional annuities). Insurance companies might react by price increases for those products, and, at the same time, might think of alternatives that shift longevity risk (at least partially) to policyholders. In the extreme case, this leads to so-called tontine products where the insurance company's role is merely administrative and longevity risk is shared within a pool of policyholders. From the policyholder's viewpoint, such products are, however, not desirable as they lead to a high uncertainty of retirement income at old ages. In this article, we alternatively suggest a so-called tonuity that combines the appealing features of tontine and conventional annuity. Until some fixed age (the switching time), a tonuity's payoff is tontine-like, afterwards the policyholder receives a secure payment of a (deferred) annuity. A tonuity is attractive for both the retiree (who benefits from a secure income at old ages) and the insurance company (whose capital requirements are reduced compared to conventional annuities). The tonuity is a possibility to offer tailor-made retirement products: using risk capital charges linked to Solvency II, we show that retirees with very low or very high risk aversion prefer a tontine or conventional annuity, respectively. Retirees with medium risk aversion, however, prefer a tonuity. In a utility-based framework, we therefore determine the optimal tonuity characterized by the critical switching time that maximizes the policyholder's lifetime utility.

Dr. Qing Yang

Professor in Finance,
School of Economics,
Fudan University

Motives and Firm Performance: An empirical study of employee stock ownership plans in China

Employee stock ownership plans are an increasing important component of compensation in Chinese firms. We examine five potential economic rationales for this practice by multivariate logit regressions of firms' adoption choices. The empirical results show that incentive factors and ownership structures are important determinants of these broad-based plans, while the financial constraint, sorting and retention theories are not. Using the event study methodology, we reveal that stock price positively reacts to announcements of employee stock ownership plan adoptions. Further analysis investigates the long-run effects by comparing the option (stock)-grant firms and similar non-grant matching firms. Difference-in-difference results suggest that employee stock ownership plans improve the long-run profitability and innovative activities, and these effects intensify in option plans targeting at a relatively small proportion of employees.

Nils Sørensen

Research Assistant,
Institute of Insurance
Science, Ulm University

Liquidity of life insurance: what drives up policyholder's run?

In life insurance literature, two behavioral effects are addressed to describe policyholders' lapse behaviors: correlation and contagion effect. The former effect is related to the fact that policyholders lapse their insurance contracts to pursue more profitable alternative investments. The latter effect delineates the phenomenon that a policyholder is more inclined to lapse her contract, observing others surrender their contracts. In the current paper, we analyze both effects and are particularly interested in finding out how policyholders' lapse behaviors influence each other. More specifically, we first consider a life insurance company consisting of one policyholder and one equity holder, in which a equity linked life insurance is issued to the policyholder. The surrender behavior of the policyholder is modeled as an American option. In a binomial model, we determine the optimal surrender time and the value of the surrender option. Apparently, this type of surrender behavior is caused by the correlation effect. We then add an additional

policyholder to the model, in which two policyholders play a simultaneous “surrender game” at each time point for a given realized asset evolution. Here, we mainly aim to figure out whether one policyholder’s surrender is contagious to the other. Under which circumstances will both policyholders surrender (and surrender earlier than in the one-policyholder case)? Furthermore, we investigate the driving factors behind the surrender behavior. We observe that in an unfavorable market environment a lapse amplifies the contagion effect due to a loss in surplus share for the remaining policyholder.

Dr. Zhenzhen Fang

Assistant Professor in
Finance, School of
Finance, Nankai
University

Currency risk management under equity-currency contagion

Investors are exposed to currency risks when they invest internationally. While there is a vast literature on equity risk management, the management of currency risk, however, has not gone beyond the universal hedging formula (that is, every investor has the same hedging ratio towards any foreign currency regardless of the investor's home currency in equilibrium) proposed by Black (1990, JF) 27 years ago. We propose a mutually exciting jump-diffusion model and characterize the "safe-haven" currencies by a small equity-currency excitor, indicating that a price plunge in the equity market is not likely to trigger a depreciation of that currency. The "investment" currency, on the other hand, is characterized by a large equity-currency excitor, indicating that a price plunge in the equity market is likely to trigger a substantial depreciation of that currency. We examine that in the long term when all investors hold the market equity portfolio, how they discriminate between safe haven currency risk and investment currency risk. We derive equilibrium currency hedging strategies in this economy and find that all else equal, investors hedge less safe-haven currency risk than investment currency risk, a result that challenges the classic Black (1990) universal hedging formula. Our results shed light on the currency risk management in the long term when equity risk and currency risk are contagious.

Marc Altdörfer

Research Assistant,
Institute of Strategic
Management and
Finance, Ulm University

European versus Anglo-Saxon Credit View: Evidence from the Eurozone Sovereign Debt Crisis

We analyse whether different levels of country ties to Europe among the rating agencies Moody's, S&P, and Fitch affect the assignment of sovereign credit ratings, using the Eurozone sovereign debt crisis of 2009-12 as a natural laboratory. We find that Fitch, the rating agency among the “Big Three” with significantly stronger ties to Europe compared to its two more US tied peers, assigned on average more favourable ratings to Eurozone issuers during the crisis. However, Fitch's better ratings for Eurozone issuers seem to be neglected by investors as they rather follow the rating actions of Moody's and S&P. Our results thus doubt the often proposed need for an independent European credit rating agency.

Dr. Sebastian Kranz

Professor in Economics,
Institute of Economics,
Ulm University

Relational Contracting and Hold-up

We study relational contracting and hold-up problems in long-run relationships modelled as discounted dynamic games. There are many relevant applications, ranging from labor relationships, international treaties or repeated interaction of business partners, e.g. an insurance company that has a long-run relationship with a reinsurance company. We illustrate how the common game-theoretic formulation of relational contracts as Pareto-optimal subgame perfect equilibria is in stark contrast to fundamental ideas of hold-up models. We propose a novel framework, in which relational contracts are repeatedly negotiated during relationships. It encompasses traditional relational contracting and hold-up formulations as opposite corner cases. Allowing for intermediate cases, our model yields very intuitive results and our examples cleanly illuminate the trade-offs between higher relationship efficiency and stronger bargaining positions. We establish a general existence

result and a tractable characterization for discounted dynamic games in which money can be transferred.

Dr. Wenbin Wu

Assistant Professor in
Finance, School of
Economics, Fudan
University

Sales, monetary policy and durable goods

Although sales occur very frequently in micro-data, macroeconomists often filter them out to argue that prices are sticky because sales do not have aggregate impact on the inflation. Using micro-data underlying CPI, I demonstrate that after sales, the price index of durables goes down gradually, and that the aggregation of sales of durable goods have a significant impact on the aggregate inflation. However, sales of nondurables – the focus of previous studies – do not show these results. To study the impact of sales, I then propose a two-sector menu-cost model with the feature of sales. The model is able to match the pattern of sales and moments in the micro data. By contrast, failing to account for temporary sales in a menu-cost model would increase the output effect by 73%, and the Calvo model calibrated to the frequency of regular price changes triples the output effect.

Christian Dehm

Research Assistant,
Institute of Insurance
Science, Ulm University

A mortality model approach using crucial diseases

This work provides a new mortality modeling approach focusing on the most influential (deadly) diseases. In the scientific literature there are various mortality models. These typically concern the future (total) mortality rates of a given population by projecting mortality rates from the past into the future. We suggest a causality based approach splitting the overall death probability into distinct death probabilities of the most influential diseases, using that the total number of deaths is the sum of the deaths in the distinct diseases. Following the ICD-10 classification, we observe that diseases of the circulatory system ('I00-I99') and neoplasms ('C00-D48') have the main impact on mortality in Germany. Furthermore, we model the diseases of the respiratory system ('J00-J99') and the remaining deaths causes. These diseases are modeled separately on a yearly basis, i.e., we state appropriate hazard rate models and estimate the parameters for these diseases every year. Assuming that for the distinctive joint mortality rates patterns in the future correspond to those observed in the past, we apply time series analysis. The corresponding time series allows for the estimations of future developments of the most influential diseases as well as the development of the overall death probability. We illustrate the approach using German health data.

Dr. Yuwei Zhao

Assistant Professor in
Mathematics, Shanghai
Center for Mathematical
Sciences, Fudan
University

The Whittle estimation based on the integrated extremal periodogram

We start with a short discussion on the definition of regular variation and the extremal periodogram and we are interested in the asymptotic properties of the integrated periodogram calculated from a sequence of indicator functions of dependent extremal events in a regularly varying sequence. An event in Euclidean space is extreme if it occurs far away from the origin. The functional central limit theorem for the integrated periodogram is proved, which is then used to construct the goodness-of-fit tests. At last, we propose the Whittle estimation procedure using the integrated extremal periodogram.

Frank Bosserhoff

Research Assistant,
Institute of Insurance
Science, Ulm University

Extensions of mean-variance portfolio selection

Investors are particularly concerned about downside risk, which is not properly reflected by classical mean-variance portfolio selection due to the symmetry of the second central moment. We therefore consider the following extension: Denoting by $V(T)$ the value of some portfolio consisting of a risky and a riskless asset at some time T , Itô's Representation

Theorem implies the existence of some predictable square integrable process $H^V = (H_t^V)_{0 \leq t \leq T}$ such that

$$V(T) = E(V(T)) + \int_0^T H_t^V dW(t)$$

i.e., the terminal time portfolio value can be represented by its expected value plus some stochastic integral w.r.t. a standard Brownian Motion W . The process H^V reflects the local volatility of the portfolio. Let $\pi = (\pi(t))_{0 \leq t \leq T}$ denote the absolute amount of risky assets held. We solve the following mean-local-volatility optimization problem:

$$\max_{\pi} E(V(T)) - \gamma \int_0^T g(H_t^V) dt,$$

where g is some penalty function satisfying certain conditions and $\gamma > 0$ a risk aversion parameter. As this optimization problem is time-inconsistent, Bellman's dynamic programming principle is not applicable. Our contribution is twofold: From a mathematical point of view, we solve this time-inconsistent stochastic optimal control problem in continuous time by solving its discrete-time analogue; in a second step, we describe the continuous-time optimal strategy as the limit of the discrete-time one in an appropriate sense. From an economic perspective, we present a mean-local-volatility optimal portfolio strategy in discrete and continuous-time.

Fangyuan Zhang

Fudan-Ulm Joint Degree Program, School of Economics, Fudan University

Mortality deceleration in China: biases or facts?

From the studies of mortality rates at old ages over the past 200 years, scholars have reached a consensus about mortality deceleration at extreme old ages or advanced ages, and population heterogeneity is now considered as the most common explanation of mortality deceleration phenomenon. However, in some recent studies it is believed that mortality deceleration at advanced ages is resulted from the downward biases in mortality estimates, such as the age exaggeration, the data heterogeneity, and the death probabilities instead of hazard rates. In this research, we incorporate mortality data quality issues and data homogeneity and heterogeneity into the five classical logistic-type models, and put forward a consistent hierarchical modeling framework in order to explain and quantify the gender differences, regional differences, and dynamic improvement of mortality at old ages, upon which investigations are based as to biases or facts in relation to the deceleration in the age pattern of old-age mortality rates in China. The results show that if data have high quality, the logistic model describing mortality deceleration has the best goodness-of-fit, which has the lowest sensitivity for the changes of mortality data quality. Therefore, we conclude the deceleration in the age pattern of old-age mortality rates in China is not a downward bias of mortality estimates, but a fact. Finally, we also provide some explanations for the downward biases in some recent studies.

Dr. Mitja Stadje

Professor in Finance, Institute of Insurance Science, Ulm University

Optimal investment under Var-Regulation and minimum insurance

We look at an optimal investment problem of a financial institution operating under a joint Value-at-Risk constraint and a portfolio insurance constraint. This analysis is particularly relevant for an insurance company operating under the Solvency II regulation which aims to maximize the expected utility of its shareholders, while at the same time being required to provide its policyholders a minimum guaranteed amount. Using static Lagrangian method, we solve the pointwise utility optimization problem to achieve the global maximum by carefully comparing the local maximizers with the jump point or the boundary. Our theoretical and numerical results show that contrary to a pure Value-at-Risk regulation, combining a VaR constraint with a portfolio insurance gives a comprehensive protection in

very bad market scenarios, while significantly reducing the regulatory costs of a pure portfolio insurance strategy.

Dr. Jiguang Zheng

PostDoc Researcher at
Financial Research
Center, Fudan University

Retirement plan in the presence of money illusion

This paper study the optimal retirement decision in an optimal consumption and asset allocation problem in the presence of money illusion, considering the effect of habit forming and diverse leisure preference in two different presuppositions, i.e., the money-illusioned individual is allowed to freely consume and invest or forced to annualize his wealth at retirement. It follows the real optimal consumption choice and habit level are decreasing in the price level respectively. Moreover, their response to money illusion are decreasing in inflation environment but increasing in deflation environment. The impact of money illusion on portfolio of risk assets and welfare incorporate indirect utility are given. Finally, numerical simulation show in both cases a money-illusioned individuals optimal retirement times are earlier than those of normal agent.

Dr. Thai Nguyen

PostDoc Researcher,
Institute of Insurance
Science, Ulm University

Funding life insurance contracts with guarantees: how to optimally respond to the policyholder's needs?

Due to the increasing solvency requirements for return guarantees and a general decrease in interest rate levels, the attractiveness of equity-linked life insurance contracts with guarantee has recently substantially decreased. To regain competitiveness for these products, insurance companies need to be more flexible in their contract design and think of tailor-made retirement products that still satisfy the policyholder's needs. One such possibility is to adapt the investment strategy of the premium pool according to the policyholder's preferences. In this article, we determine the investment strategy that maximizes the expected utility of the policyholder's insurance contract payoff. Taking into account that retirement products are usually tax-privileged, we find that fairly priced guarantee contracts that follow this optimal investment strategy lead to a higher expected utility than asset investments.

Dr. Yan Wang

Deputy General Manager
and Head of Non-life
Insurance, Hannover
Reinsurance SE Shanghai
Branch

Bridge between insurance industry and education

(Invited talk)

Dr. Xian Xu

Associate Professor in
Insurance, School of
Economics, Fudan
University

Earthquake and economic growth: an economic sector specific investigation

Natural disasters often lead to huge social and economic losses. However, the economic and financial impact of natural disasters might be negative in short-run, but positive in medium or long run. The rational is despite of the large scale of damages; it demolishes the obsolete production facilities and draws an influx of investment and advanced technologies for rebuilding. In this paper, we use the earthquake data from 31 provinces in China from year 1991 to 2014 to empirically examine the impacts of earthquakes on short-run and medium-run economic growth. Our results show that the economic growth rate dropped 0.1% in the event year. However, in the next five years, earthquakes actually have positive effects on the economic growth in the affected areas with an increased growth rate at 0.15% in general. We also find that manufacturing sector (secondary) is the most heavily affected by earthquakes when compared to other economic sectors such as the raw materials (primary) and services (tertiary) sectors.