

Research School of Finance, Actuarial Studies and Statistics
2019 Summer Research Camp

Tuesday, 3rd December

6.00 pm **Pre-Dinner Drinks (QT hotel)**
6.30 pm **Dinner (QT hotel)**

Wednesday, 4th December

9.00 am **Coffee/tea**
9.20 am **Welcome message (Westend Room)**

9.30 am **Keynote Session (Westend Room)**
[Christian Schlag](#) (*Goethe University*)
“(My) Topics in Asset Pricing”
Introductions by Antje Berndt

10.30 am **Morning tea**

11.00 am **Parallel Session 1**

Finance (Westend Room)
Chair: Xianming Zhou

[Yoshio Nozawa](#) (*HKUST*)
“In the Shadow of Shadow Banks: Estimating
Correlated Default Risk Premiums Using
Business Development Companies”
Discussant: Yichao Zhu

[Antje Berndt](#) (*ANU*)
“The Decline of Too Big to Fail”

Statistics (Eastend Room)
Chair: Michael Martin

[Peter Radchenko](#) (*University of Sydney*)
“Irrational Exuberance: Correcting Bias in
Probability Estimates”

[Munir Hiabu](#) (*University of Sydney*)
“Structured models in survival analysis via
empirical least squares backfitting”

Actuarial Studies (Walters Room)
Chair: Tim Higgins

[David Cullen](#) (*National Disability Insurance
Agency*)
“Long-term care insurance”

[Matthew Crane](#) (*EY*)
“How to make private health insurance
healthier”

12.30 pm **Lunch + Keynote Session** (*Westend Room*)
[Alexander Aue](#) (*University of California, Davis*)
“Functional data analysis, with a view on current time series methods”
Introductions by Hanlin Shang

2.00 pm **Parallel Session 2**

Finance (*Westend Room*)
PhD Session

Sayla Siddiqui Discussant: Chao Gao
Yufei Li Discussant: Qiaoqiao Zhu
Thao Hoang Discussant: Le Zhang

Statistics (*Eastend Room*)
Chair: Bronwyn Loong

[Aurore Delaige](#) (*University of Melbourne*)
“Estimating a covariance function from
fragments of functional data”

Actuarial Studies (*Walters Room*)
Chair: Adam Butt

[Gaurav Khemka](#) (*ANU*)
“How sub-optimal are age-based life-
cycle investment products?”

3.00 pm **Wine tour / hotel rest**
6.30 pm **Dinner (Monster Bar)**

Thursday, 5th December

9.00 am **Coffee/tea**

9.30 am **Parallel Session 3**

Finance (*Westend Room*)
Chair: Hua Deng

[Nhan Le](#) (*ANU*)
“Does Shareholder Litigation Risk Cause
Public Firms to Delist? Evidence from
Securities Class Action Lawsuits”
Discussant: Rawley Heimer

[Kentaro Asai](#) (*ANU*)
“Ownership Networks and Bid Rigging”
Discussant: Yoshio Nozawa

Statistics (*Eastend Room*)
Chair: Abhinav Mehta

[Jiguo Cao](#) (*Simon Fraser University*)
“Estimating Time-Varying Directed Networks”

[Liangliang Wang](#) (*Simon Fraser University*)
“An annealed sequential Monte Carlo method
and its applications”

Actuarial Studies (*Walters Room*)
Chair: Gaurav Khemka

[Jane Miao](#) (*Australian Government Actuary*)
“Retirement Income Risk”

[Yifu Tang](#) (*ANU*)
“What is the optimal level for the
Superannuation Guarantee”

11.00 am	Morning tea		
11.30 am	Parallel Session 4		
	Finance (<i>Westend Room</i>) Chair: Takeshi Yamada	Statistics (<i>Eastend Room</i>) Chair: Borek Puza	Actuarial Studies (<i>Walters Room</i>) Chair: Fei Huang
	Rawley Heimer (<i>Boston College</i>) "Uncertainty Shocks and Personal Investment: Evidence from a Global Brokerage" Discussant: Phong Ngo	Wenlin Dai (<i>Renmin University</i>) "Directional Outlyingness for Multivariate Functional Data"	Guy Thorburn (<i>Australian Government Actuary</i>) "Australian Life tables 2015-17 and other developments"
	Narayan Bulusu (<i>Bank of Canada</i>) "Measuring funding illiquidity in the overnight loan market" Discussant: Antje Berndt	Feng Chen (<i>UNSW</i>) "Modeling extreme negative returns using marked renewal Hawkes processes"	Vladimir Canudas Romo (<i>ANU</i>) "An alternative measure of longevity: Truncated cross-average length of life (TCAL)"
1.00 pm	Lunch + school-wide thanks		
2.30 pm	Parallel Session 5		
	Finance (<i>Westend Room</i>) Chair: Le Zhang	Statistics (<i>Eastend Room</i>) Chair: Priya Dev	Actuarial Studies (<i>Walters Room</i>) Chair: Tim Higgins
	Daruo Xie (<i>ANU</i>) "Managerial Efforts and the Nature of Skewness in Stock Returns" Discussant: Le Zhang	Ben Whale (<i>University of Wollongong</i>) "Crowd sourced quantification of new types of risk for decentralised financial products."	Jeremy Smith-Roberts (<i>PwC</i>) Louise Newey (<i>DSS</i>) "The Priority Investment Approach to Welfare: supporting Australians through smarter policy"
	Lin Hu, Kun Li, Phong Ngo (<i>ANU</i>) "Media Exposure and Stock Market Participation" Discussant: Narayan Bulusu		
4.00 pm	End		

PRESENTATION TITLES AND ABSTRACTS

FINANCE

(My) Topics in Asset Pricing

[Christian Schlag](#) (*Goethe University*)

In the Shadow of Shadow Banks: Estimating Correlated Default Risk Premiums Using Business Development Companies

[Yoshio Nozawa](#) (*HKUST*)

Discussant: Yichao Zhu (*ANU*)

Abstract: We build a benchmark for AAA-rated tranches of Collateralized Loan Obligations (CLOs) using Business Development Companies (BDCs), which hold a diversified portfolio of loans as CLOs do, while BDC's debt is not rated as AAA. BDCs are publicly listed, and their share price, equity volatility and borrowing cost are observable to researchers. Applying a structural credit risk model of Nagel and Purnanandam (2019) to BDCs, we extract market-implied, forward-looking measures of default correlation in the loan portfolio. By comparing the credit spreads on AAA tranches of CLOs with BDC-implied benchmark, we quantify the effect of reaching-for-yield behavior of CLO investors.

The Decline of Too Big to Fail

[Antje Berndt](#) (*ANU*)

For globally systemically important banks (G-SIBs) with U.S. headquarters, we find large post-Lehman reductions in market-implied probabilities of government bailout, along with big increases in debt financing costs for these banks after controlling for insolvency risk. The data are consistent with significant effectiveness for the official sector's post-Lehman G-SIB failure-resolution intentions, laws, and rules. G-SIB creditors now appear to expect to suffer much larger losses in the event that a G-SIB approaches insolvency. In this sense, we estimate a major decline of "too big to fail."

Does Shareholder Litigation Risk Cause Public Firms to Delist? Evidence from Securities Class Action Lawsuits

[Nhan Le](#) (*ANU*)

Discussant: Rawley Heimer (*Boston College*)

Abstract: The number of listed firms in the U.S. has fallen by half since the late 1990s. Our paper examines whether and to what extent the costs of shareholder litigation have contributed to this trend. We find that higher litigation threat induce firms to delist from stock exchanges. The effect remains robust to controlling for the endogeneity problem between litigation risk and delisting probability. The litigation effect exacerbates for firms with severe information asymmetry and lightens for firms with high capital requirements. We also show that reduced litigation threat, triggered by the Ninth Circuit Ruling event does not prompt excessive managerial engagement of earning management. Instead, we observe a positive stock price reaction to the event for firms with high institutional ownership. Taken together, our findings suggest that the pressure imposed by shareholder litigation may partially explain for the recent fading attractiveness of the US public stock market.

Ownership networks and bid rigging

[Kentaro Asai](#) (*ANU*)

Discussant: Yoshio Nozawa (*HKUST*)

Abstract: Using a dataset of public procurement auctions and registered shareholders of all participating firms in Singapore, we study the effects of suppliers' ownership connection on prices and efficiency in the product market. We find identical bidding in the same sealed-bid auction is prevalent and positively correlated with ownership connections among bidders. Moreover, the identical bidding attributable to ownership connections is positively associated with contract price when the lowest bidder wins. Structural estimates based on a model of first-price auctions show the removal of an ownership connection can improve a contractor's cost efficiency by more than it reduces contract price, highlighting how ownership networks hinder competition.

Uncertainty Shocks and Personal Investment: Evidence from a Global Brokerage

[Rawley Heimer](#) (*Boston College*)

Discussant: Phong Ngo (*ANU*)

We use novel data from a global retail brokerage to study how shocks to uncertainty affect personal investment around the world. We consider three empirical uncertainty shocks that have been proposed by the literature — terrorism, natural disasters, and large stock price jumps. We then consider how within-country uncertainty shocks affect investment and delegation in global assets on the brokerage. Importantly, the within-country uncertainty shocks (e.g., a natural disaster in Spain) are unlikely to affect world asset fundamentals (e.g., the SPX500). This allows us to isolate the effects of uncertainty shocks on personal risk aversion from their effects on asset fundamentals. We find that uncertainty shocks have scant effects on personal investing. They primarily affect delegation to asset managers on the brokerage, but that the direction of the effects depends on the type of uncertainty shock. Investors increase their delegation by 5% following terrorist activity and reduce delegation by 8% following positive and negative stock market jumps. These findings suggest that the exogenous uncertainty shocks proposed by the literature have heterogeneous effects on individual investment.

Measuring funding illiquidity in the overnight loan market

[Narayan Bulusu](#) (*Bank of Canada*)

Discussant: Antje Berndt (*ANU*)

Abstract: This paper proposes the probability of triggering central bank liquidity injection as a measure of aggregate funding liquidity conditions. We calculate this as the probability that the key funding rate - which is modelled as depending on the interest rates and volumes of important substitute sources of overnight loans - hits the central bank lending rate during the next day. Our measure quantifies funding illiquidity directly using information from the interbank market, and has the additional benefit of having an intuitive economic interpretation. Applying our method to data from Canada, we find that the resulting measure predicts the market liquidity of government bonds on the next day.

Managerial Efforts and the Nature of Skewness in Stock Returns

Daruo Xie (ANU)

Discussant: Le Zhang

Abstract: Firm-level stock returns are positively skewed. This paper presents new evidences to challenge existing explanations of this well-known stylized fact. This paper then provides a simple and entirely new explanation. I revert to the textbook assumption of a frictionless stock market with complete information, and my simple model suggests that stock returns exhibit positive skewness even in a perfectly efficient market. My model proposes a direct connection between managerial value-creation efforts and stock return skewness.

Media Exposure and Stock Market Participation

Lin Hu, Kun Li, Phong Ngo (ANU)

Discussant: Narayan Bulusu (*Bank of Canada*)

Abstract: We show that financial media exposure from cable television increases stock market participation by increasing awareness of and familiarity with the stock market for first-time investors which, in turn, lowers the psychological fixed-costs that normally prohibit participation. We use a novel instrument—the local lineup position of business channels—to break the simultaneity between participation and viewership and identify causal effects. Economically, a one-standard deviation reduction in the lineup position of business channels (approximately 18) increases viewership by 3.8% (Or 8.8 minutes more per week). Subsequently, the propensity to invest in the stock market increases by 8.1% for first-time investors induced into watching by variation in channel position.

STATISTICS

Irrational Exuberance: Correcting Bias in Probability Estimates

[Peter Radchenko](#) (*University of Sydney*)

Abstract: We consider the common setting where one observes probability estimates for a large number of events, such as default risks for numerous bonds. Unfortunately, even with unbiased estimates, selecting events corresponding to the most extreme probabilities can result in systematically underestimating the true level of uncertainty. We develop an empirical Bayes approach “Excess Certainty Adjusted Probabilities” (ECAP), using a variant of Tweedie’s formula, which updates probability estimates to correct for selection bias. ECAP is a flexible non-parametric method, which directly estimates the score function associated with the probability estimates, so it does not need to make any restrictive assumptions about the prior on the true probabilities. ECAP also works well in settings where the probability estimates are biased. We demonstrate through theoretical results, simulations, and an analysis of two real world data sets, that ECAP can provide significant improvements over the original probability estimates. Note: the talk is based on joint work with Gareth James and Bradley Rava, University of Southern California

Structured models in survival analysis via empirical least squares backfitting

[Munir Hiabu](#) (*University of Sydney*)

Abstract: Most nonparametric or machine learning solutions provide flexibility for fitting functions with a very general shape. The downside is that firstly, they need incredible amounts of data to achieve an accurate fit and secondly, interpretation of the entering covariates is lost. This talk is about a middle ground: structured models. Structured models are not as flexible as fully nonparametric approaches, but in contrast to fully nonparametric approaches their performance does not deteriorate exponentially with growing number of covariates. Additionally, the effect of individual covariates can be visualized and interpreted. Structured models are most often solved via the classical backfitting algorithm, see Buja, Hastie & Tibshirani (1989, Ann. Stat.). However, this classical backfitting algorithm is not derived from a feasible optimisation criteria/loss function and hence rather heuristic in nature. Only defined via an iteration, the estimator is not well understood. In this talk I will propose alternative estimators motivated from empirical least square criteria. Mathematical treatment is obtained from the theory of projections. Simulation studies show that the estimators seem to substantially outperform the classical backfitting estimator in most cases. As concrete structured models, I will concentrate on two survival models: i) proportional hazard model ii) extension of Aalen's additive model for two time scales.

Functional data analysis, with a view on current time series methods

[Alexander Aue](#) (*University of California, Davis*)

In this talk, I will trace the broader developments within the field of functional data analysis that have taken place during the past two or so decades, with attention focused on the case of dependent functional observations. I will discuss by way of examples the most important tools of statistical inference, such as dimension reduction techniques, for independent data, explain what issues arise under dependence and how these may be resolved. These general considerations will then be utilized to give an overview of more specialized prediction algorithms and estimation strategies for functional time series. The talk will conclude with some speculation about future research directions.

Estimating a covariance function from fragments of functional data

[Aurore Delaige](#) (*University of Melbourne*)

Functional data are often observed only partially, in the form of fragments. In that case, the standard approaches for estimating the covariance function do not work because entire parts of the domain are completely unobserved. In previous work, Delaige and Hall have suggested ways of estimating the covariance function, based, for example, on Markov assumptions. In this work we take a completely different approach which does not rely on such assumptions. We show that, using a tensor product approach, it is possible to reconstruct the covariance function using observations located only on the diagonal of its domain.

Estimating Time-Varying Directed Networks

[Jiguo Cao](#) (*Simon Fraser University*)

Abstract: The problem of modelling the dynamical regulation process within a gene network has been of great interest for a long time. We propose to model this dynamical system with a large number of nonlinear ordinary differential equations (ODEs), in which the regulation function is estimated directly from data without any parametric assumption. Most current research assumes the gene regulation network is static, but in reality, the connection and regulation function of the network may change with time or environment. This change is reflected in our dynamical model by allowing the regulation function varying with the gene expression and forcing this regulation function to be zero if no regulation happens. We introduce a statistical method called functional SCAD to estimate a time-varying sparse and directed gene regulation network, and simultaneously, to provide a smooth estimation of the regulation function and identify the interval in which no regulation effect exists. The finite sample performance of the proposed method is investigated in a Monte Carlo simulation study. Our method is demonstrated by estimating a time-varying directed gene regulation network of 20 genes involved in muscle development during the embryonic stage of *Drosophila melanogaster*.

An annealed sequential Monte Carlo method and its applications

[Liangliang Wang](#) (*Simon Fraser University*)

Abstract: In this talk, I will describe an "embarrassingly parallel" method for Bayesian inference, annealed Sequential Monte Carlo (SMC), based on recent advances in the Sequential Monte Carlo literature such as adaptive determination of annealing parameters. The algorithm provides an approximate posterior distribution as well as an unbiased estimator for the marginal likelihood. This unbiasedness property can be used to test the correctness of posterior simulation software. I will adapt the annealed SMC method to two nontrivial applications: 1) Bayesian inference of phylogenetic trees and evolutionary parameters from biological sequence data; 2) estimation of parameters in nonlinear differential equations. We illustrate our method by comparing it with other methods such as standard Markov chain Monte Carlo algorithms using simulation studies and real data analysis.

Directional Outlyingness for Multivariate Functional Data

[Wenlin Dai](#) (*Renmin University*)

Abstract: The direction of outlyingness is crucial to describing the centrality of multivariate functional data. Motivated by this idea, classical depth is generalized to directional outlyingness for functional data. Theoretical properties of functional directional outlyingness are investigated and the total outlyingness can be naturally decomposed into two parts: magnitude outlyingness and shape outlyingness which represent the centrality of a curve for magnitude and shape, respectively. This decomposition serves as a visualization tool for the centrality of curves. Furthermore, an outlier detection procedure is proposed based on functional directional outlyingness. This criterion applies to both univariate and multivariate curves and simulation studies show that it outperforms competing methods. Weather and electrocardiogram data demonstrate the practical application of our proposed framework.

Modeling extreme negative returns using marked renewal Hawkes processes

[Feng Chen](#) (*UNSW*)

Abstract: Extreme return financial time series are often challenging to model due to the presence of heavy temporal clustering of extremes and strong bursts of return volatility. One approach to model both these phenomena in extreme financial returns is the marked Hawkes self-exciting process. However, the Hawkes process restricts the arrival times of exogenously driven returns to follow a Poisson process and may fail to provide an adequate fit to data. In this work, we introduce a model for extreme financial returns, which provides added flexibility in the specification of the background arrival rate. Our model is a marked version of the recently proposed renewal Hawkes process, in which exogenously driven extreme returns arrive according to a renewal process rather than a Poisson process. We develop a procedure to evaluate the likelihood of the model, which can be optimized to obtain estimates of model parameters and their standard errors. We provide a method to assess the goodness-of-fit of the model based on the Rosenblatt residuals, as well as a procedure to simulate the model. We apply the proposed model to extreme negative returns for five stocks traded on the Australian Stock Exchange. The models identified for the stocks using in-sample data were found to be able to successfully forecast the out-of-sample risk measures such as the value at risk and provide a better quality of fit than the competing Hawkes model.

Crowd sourced quantification of new types of risk for decentralised financial products.

[Ben Whale](#) (*University of Wollongong*)

Abstract: A decentralised financial product is, loosely speaking, one which rests on a blockchain to support its associated financial processes. As a consequence these financial processes can vary markedly from those found in traditional banking. The result is new types of risk that investors must be aware of. An example is the statistical nature of settlement. This talk focuses on a risk arising from the pseudo-anonymous nature of blockchain transactions. In the current environment, there is no independent arbiter of quality or trust-worthy-ness of a decentralised financial product. In this talk I overview the ideas behind work being performed by Dr. Priya Dev, Prof. Michael Martin, Prof. Ross Maller and myself to crowd source an objective measure of "trust".

ACTUARIAL STUDIES

Long-term care insurance

David Cullen (*National Disability Insurance Agency*)

How to make private health insurance healthier

Matthew Crane (*EY*)

How sub-optimal are age-based life-cycle investment products?

Gaurav Khemka (*ANU*)

Abstract: We investigate the conditions under which life-cycle investment strategies based on age may be ‘near enough’ to optimal, focusing on the treatment of the pension account balance and assumptions about risk aversion. We show that dynamically adjusting the strategy in response to fluctuations in balance as well as age can lead to moderate improvements over product designs currently seen in the market; although most of the potential gains might be captured by specifying the glide path with reference to measures reflecting the projected balance over time. The risk aversion assumption emerges as a far more important consideration, with much greater utility losses arising from mismatches between the risk aversion of the investor and that underpinning the glide path design. Our analysis points towards possibilities for improving life-cycle or target date funds, and highlights the benefit of offering a suite of such funds that cater for members with differing risk aversion.

Retirement Income Risk

Jane Miao (*Australian Government Actuary*)

What is the optimal level for the Superannuation Guarantee?

Yifu Tang (*ANU*)

Abstract: We examine the impact of differing levels of the superannuation guarantee on the welfare of individual Australians over the whole life-cycle under existing superannuation, tax and pension eligibility rules. Our main focus is to identify how the optimal SG varies with income levels and objectives, with the latter captured by differing utility functions. The analysis also allows us to estimate the gains and losses from changing the SG to both various individuals and the government budget. We find that the optimal SG varies substantially across income levels and assumed objectives, with a lower SG than the current 9.5% rate indicated where the objective involves attaining a consumption target in the post-retirement phase. This finding arises because a lower SG often suffices to reach the target, especially in the presence of the aged pension and once the impact of contributing on pre-retirement consumption is taken into account. Our analysis suggests that raising the SG above 9.5% would likely impose a cost on more members than it helps.

Australian Life tables 2015-17 and other developments

Guy Thorburn (*Australian Government Actuary*)

An alternative measure of longevity: Truncated cross-average length of life (TCAL)

Vladimir Canudas Romo (*ANU*)

Abstract: Life expectancy is most commonly measured for a period (corresponding to mortality within a given year) or for a specific birth cohort. Although widely used, period and cohort life expectancy have limitations, and their time-trends often show disparities and can mask the historical mortality experience of all cohorts present at a given time. The Truncated Cross-average Length of Life, or *TCAL*, is a period measure including all available cohort mortality information, irrespective of whether all cohort members have died. It is particularly useful for comparing cohort mortality between populations. This study extends *TCAL* to disentangle causes of death contribution. The strength of the approach is that it allows identification of mortality differences in cohorts with members still alive, as well as to identify which ages and causes of death contribute to mortality differentials between populations. Application of the method to Japan shows that over the period 1950-2014 a major contributor to *TCAL* differences with other high longevity countries was its lower cardiovascular disease mortality.

The Priority Investment Approach to Welfare: supporting Australians through smarter policy

Jeremy Smith-Roberts (*PwC*), Louise Newey (*DSS*)