THE UNIVERSITY OF SYDNEY
Business School

Time Series and Forecasting Symposium

TSF2018

13-14 November 2018

The Refectory and Room 5050
Level 5, Abercrombie Building (H70)
Corner of Abercrombie Street and Codrington Street
The University of Sydney Business School

Map Parking Public Transport

THE UNIVERSITY OF SYDNEY
Business School

Sponsor:

Time Series and Forecasting Research Group

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Discipline of Business Analytics, The University of Sydney Business School

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Discipline of Finance, The University of Sydney Business School

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School of Economics, Faculty of Arts & Social Science

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Program

Tuesday 13 November 2018

Registration, morning tea, lunch and afternoon tea will be held on Level 5, Abercrombie Building H70.

8.45am-9.00am **Registration**

9.00am-10.30am	**Welcome and Keynote Address (Refectory)**
9.00am-9.15am	**Welcome –** **Prof Elizabeth Cowley** (Deputy Dean, Business School, The University of Sydney) **Prof Richard Gerlach** (The University of Sydney)
9.15am-10.30am	**Keynote Address -** 'Estimation and Inference for Large Panel Copula Models' **Prof Andrew J. Patton** (Duke University, USA)

10.30-11.00am **Morning Tea**

11.00am-12.15pm	**Session 1A – Extreme Events and Dependence (Refectory)** Session Chair: **Prof Artem Prokhorov** (The University of Sydney)	**Session 1B – Financial Market Trading and Tail Risk Forecasting (Room 5050)** Session Chair: **Dr Chao Wang** (The University of Sydney)
11.00am-11.45am	**Invited Talk -** 'Quantifying effects of extreme events with applications to financial crises' **Prof Stefan Trueck** (Macquarie University)	**Invited Talk -** 'Common and Market-Specific Information Flows in Multi-Market Trading' **Dr Jianxin Wang** (University of Technology, Sydney)
11.45am-12.15pm	**Contributed Talk -** 'Extremal Dependence in Australian Electricity Markets' **Lin Han** (Macquarie University)	**Contributed Talk -** 'Semi-parametric dynamic asymmetric Laplace models for tail risk forecasting, incorporating realized measures' **Prof Richard Gerlach** (The University of Sydney)

12.15pm-1.30pm **Lunch**

1.30pm-3.00pm	**Session 2A – Dependence Copulas and Tail Risk (Refectory)** Session Chair: **Prof Stefan Trueck** (Macquarie University)	**Session 2B – Applications (Room 5050)** Session Chair: **Dr Boris Choy** (The University of Sydney)
1.30pm-2.15pm	**Invited Talk -** 'Nonparametric estimation of copulas by finite mixtures' **Dr Mohamad Khaled** (University of Queensland)	**Invited Talk -** 'Joint compound discounted renewal sums with emphasis on the asymptotics of IBNR claims in the fractional Poisson process' **A/Prof Jae Kyung Woo** (University of New South Wales)
2.15pm-3:00pm	**Contributed Talk -** 'A new approach to credit ratings' **Prof Artem Prokhorov** (The University of Sydney)	**Invited Talk -** 'Periodic threshold-type dividend strategy in the compound Poisson risk model' **A/Prof Eric C.K. Cheung** (The University of New South Wales)

3.00pm-3.30pm - **Afternoon Tea**

3.30pm-4.45pm	**Session 3A – Jumps in Stochastic Processes (Refectory)** Session Chair: **Dr Simon Kwok** (The University of Sydney)	**Session 3B – Applications (Room 5050)** Session Chair: **Dr Henry Leung** (The University of Sydney)
3.30pm-4.15pm	**Invited Talk -** 'Volatility Estimation and Jump Detection for drift-diffusion Processes' **A/Prof Shuping Shi** (Macquarie University)	**Invited Talk -** 'Direct Likelihood Evaluation for the Renewal Hawkes Process' **Dr Feng Chen** (University of New South Wales)
4.15pm-4.45pm	**Contributed Talk -** 'A regime-switching stochastic volatility model for forecasting electricity prices' **Dr Peter Exterkate** (The University of Sydney)	**Contributed Talk -** 'The marginal effect of routine police activity on property and violent crime in NSW, Australia' **Dr Joanna Wang** (NSW Bureau of Crime Statistics and Research)

Wednesday, 14 November 2018

Registration, morning tea, lunch and afternoon tea will be held at Level 5, Abercrombie Building H70.

9.00am-9.15am - **Registration**

9.00am-10.50am	**Session 4 – PhD Session (Room 5050)** Session Co-chairs: **Prof Andrew J. Patton and A/Prof Jennifer Chan** (The University of Sydney)
9.00am-9.20am	**Contributed Talk -** 'Probabilistic Hierarchical Reconciliation via a Non-parametric Bootstrap approach' **Puwasala Gamakumara** (Monash University)
9.20am-9.40am	**Contributed Talk -** 'Local Polynomial M-estimation in Random Design Regression with Dependent Errors' **Yixuan Liu** (Macquarie University)
9.40am-10.00am	**Contributed Talk -** 'Estimating the number of factors in high dimensional constrained factor models' **Jingjie Xiang** (Huazhong University of Science and Technology)
10.00am-10.10am	**Short Break**
10.10am-10.30am	**Contributed Talk -** 'Electricity Price Volatility and Renewable Energy' **Alex Oh** (The University of Sydney)
10.30am-10.50am	**Contributed Talk -** 'The $90,000,000 pizza' **Andrew Phillip** (The University of Sydney)

10.50am-11.15am - **Morning Tea**

11.15am-12.30pm	**Session 5 – Financial Market Trading and Tail Risk Forecasting (Room 5050)** Session Chair: **Prof Richard Gerlach** (The University of Sydney)
11.15am-12.00pm	**Invited Talk -** 'Forecasting Multi-step Value-at-Risk via MIDAS Quantile Regression Model' **Dr Qian Chen** (Peking University)
12.00pm-12.30pm	**Contributed Talk -** 'Semi-parametric Realized Nonlinear Conditional Autoregressive Expectile and Expected Shortfall Models' **Dr Chao Wang** (The University of Sydney)

12.30pm-1.30pm - **Lunch**

1.30pm-3.00pm	**Session 6A – Time-series I (Refectory)** Session Chair: **Andrew Phillip** (The University of Sydney)	**Session 6B – Time-series II (Room 5050)** Session Chair: **Alex Oh** (The University of Sydney)
1.30pm-2.00pm	**Invited Talk -** 'Analyzing Multiple Vector Autoregressions through Matrix-variate Normal Distribution with Two Covariance Matrices' **Dr. Nuttanan Wichitaksorn** (Auckland University of Technology)	**Contributed Talk -** 'Understanding Regressions with Observations Collected at High Frequency over Long Span' **Dr. Ye Lu** (The University of Sydney)
2.00pm-2.30pm	**Contributed Talk -** 'Probabilistic Forecasts in Hierarchical Time Series' **Dr. Anastasios Panagiotelis** (Monash University)	**Contributed Talk -** 'Multivariate Financial Dependence Analysis of Asian Markets Using Vine Copulas' **Dr Abhay Kumar Singh** (Macquarie University)
2.30pm-3.00pm	**Contributed Talk -** 'A comparison of Hurst parameter estimators in long-range dependent curve time series' **A/Prof Hanlin Shang** (Australian National University)	**Contributed Talk -** 'Unobserved Components with Stochastic Volatility in U.S. Inflation: Estimation and Signal Extraction' **Dr. Mengheng Li** (University of Technology, Sydney)

3.00pm-3.30pm - **Afternoon Tea**

3.30pm-4.00pm - **PhD Best Presentation Award and Symposium Close (The Refectory)**

List of Abstracts

Keynote Address

Keynote Speaker: Andrew J. Patton, Duke University, USA
Title: **Estimation and Inference for Large Panel Copula Models**

Abstract:
We consider methods for modeling the copula of very large collections of random variables. Our asymptotic analysis is based on allowing both the number of variables and the length of each sample to diverge to infinity. We consider a class of factor copula models, with parameters estimated using the simulated method of moments type approach presented in Oh and Patton (2013, JASA). We provide conditions under which the estimated parameters are consistent and asymptotically normal. The factor loadings are assumed to be drawn randomly from a distribution whose parameters we estimate along with the other parameters of the model. We consider some measures of market-wide risk and show how to conduct inference on such measures. We apply the methods to monthly returns on 4,500 U.S. firms over the period 1926 to 2016.

Session 1A – Extreme Events and Dependence

Presenter: Stefan Trueck, Department of Actuarial Studies and Business Analytics, Macquarie University
Title: **Quantifying effects of extreme events with applications to financial crises**

Abstract:
This manuscript addresses the quantification of effects from an extreme outcome in an explanatory variable on a dependent variable. The effect is approximated with the so-called
asymptotic elasticity of a conditional quantile function, linking the dependent and explanatory variable. A closed form expression for this asymptotic elasticity is presented which is independent of the exact relation between explanatory and dependent variable. By interpreting the asymptotic elasticity as a spill-over measure for tail-risk, we detect statistically significant effects from Lehman Brothers to other financial institutions during the subprime mortgage crisis before Lehman Brothers was obviously in distress. Likewise, the effect from a credit default in case of Greece on the solvency of countries within the Euro-area is briefly studied.

Presenter: Lin Han, Department of Actuarial Studies and Business Analytics, Macquarie University
Title: **Extremal Dependence in Australian Electricity Markets**

Abstract:
Electricity markets are significantly more volatile than other comparable financial or commodity markets. Extreme price outcomes and their transmission between regions pose significant risks for market participants. We examine the dependence between extreme events in electricity spot prices across regional markets in the Australian National Electricity Market (NEM). We conduct both univariate and multivariate analyses based on the extremogram which is a flexible quantitative tool for measuring various types of extremal dependence in a stationary time series. We find that the extreme prices are more persistent in smaller and more concentrated markets. We also show significant transmission of extreme prices between regions. These transmission effects are typically more pronounced between physically interconnected markets and show asymmetric and time-varying patterns. Our results provide important information for risk management and hedging decisions of market participants, in particular for those operating in several regional markets simultaneously.

Session 1B – Financial Market Trading and Tail Risk Forecasting

Presenter: Jianxin Wang, Finance Discipline, UTS
Title: **Common and Market-Specific Information Flows in Multi-Market Trading**

Abstract:
When the same asset is simultaneously traded in multiple markets, it is important to measure each market's contribution to the price discovery process, i.e. the process that incorporates economic information into asset value. In market microstructure literature, it is commonly assumed that public information shocks are incorporated into asset value sequentially across multiple markets. This assumption becomes questionable as technology allows investors to send orders simultaneously to multiple markets. In this study, we allow all markets trading the same asset to simultaneously react to public information arrivals. We estimate the common and market-specific information flows embedded in the price movements of each market. Using high-frequency returns of Microsoft traded on NYSE, NASDAQ, and BATS (a high-frequency trading platform), we show that the common information flow accounts for over 90% of permanent price changes at 1 second time interval. It accounts for 85% of permanent price change at 0.1 second interval. Despite the increase in the number of trading venues, our evidence indicates that the US equity markets are highly integrated and pricing is dominated by common information shocks. The market-specific information shares have relatively large daily variations.

Presenter: Richard Gerlach, Discipline of Business Analytics, The University of Sydney
Title: **Semi-parametric dynamic asymmetric Laplace models for tail risk forecasting, incorporating realized measures**

Abstract:
The joint Value at Risk (VaR) and expected shortfall (ES) quantile regression model of Taylor (2016) is extended via incorporating a realized measure, to drive the tail risk dynamics, as a potentially more efficient driver than daily returns. Both a maximum likelihood and an adaptive Bayesian Markov Chain Monte Carlo method are employed for estimation, whose properties are assessed and compared via a simulation study; results favour the Bayesian approach, which is subsequently employed in a forecasting study of seven market indices. The proposed models are compared to a range of parametric, non-parametric and semi-parametric models, including GARCH, Realized-GARCH and the joint VaR and ES quantile regression models of Taylor (2016). The comparison is in terms of accuracy of one-day-ahead Value-at-Risk and Expected Shortfall forecasts, over a long forecast sample period that includes the global financial crisis in 2007-2008. The results favour the proposed models incorporating a realized measure, especially when employing the sub-sampled Realized Variance and the sub-sampled Realized Range.

Session 2A – Dependence Copulas and Tail Risk

Presenter: Mohamad Khaled, School of Economics, University of Queensland
Title: **Nonparametric estimation of copulas by finite mixtures**

Abstract:
Copulas are now frequently used to construct or estimate multivariate distributions because of their ability to take into account the multivariate dependence of the different variables while separately specifying marginal distributions. Copula based multivariate models can often also be more parsimonious than fitting a flexible multivariate model, such as a mixture of normals model, directly to the data. However, to be effective, it is imperative that the family of copula models considered is sufficiently flexible. Although finite mixtures of copulas have been used to construct flexible families of copulas, their approximation properties are not well understood and we show that natural candidates such as mixtures of elliptical copulas and mixtures of Archimedean copulas cannot approximate a general copula arbitrarily well. Our article develops fundamental tools for approximating a general copula arbitrarily well by a mixture and proposes a family of finite mixtures that can do so. One important point is that our approach is that our approximating distribution is itself a copula. We illustrate empirically on a financial data set that our approach for estimating a copula can be much more parsimonious and results in a better fit than approximating the copula by a mixture of normal copulas.

Presenter: Artem Prokhorov, Discipline of Business Analytics, The University of Sydney
Title: **A new approach to credit ratings**

Abstract:
Credit ratings are fundamental in assessing the credit risk of a security or debtor. Traditional credit ratings fail to provide a reliable risk assessment platform, which is evidenced, for example, by the failure of CDO ratings during the financial crisis of 2007-2008 and by the massive undervaluation of corporate risk leading up to the crisis. In this paper we reconsider the roots of the problems and present a new rating methodology based on the Buffered Probability of Exceedance (bPOE), which offers an improved and more conservative risk assessment.

Session 2B – Applications

Presenter: Jae Kyung Woo, School of Risk and Actuarial Studies, UNSW
Title: **Joint compound discounted renewal sums with emphasis on the asymptotics of IBNR claims in the fractional Poisson process**

Abstract:
In this talk, we study the joint moments of a compound discounted renewal process observed at different times with each arrival removed from the system after a random delay. This process can be used to describe the aggregate (discounted) Incurred But Not Reported (IBNR) claims in insurance and also the total number of customers in an infinite server queue. It is shown that the joint moments can be obtained recursively in terms of the renewal density, from which the covariance and correlation structures are derived. In particular, the fractional Poisson process defined via the renewal approach is also considered. Furthermore, the asymptotic behaviour of covariance and correlation coefficient of the aforementioned quantities is analyzed as the time horizon goes to infinity. Special attention is paid to the cases of exponential and Pareto delays. This is a joint work with E. Cheung, L. Rabehasaina, and R. Xu.

Presenter: Eric C.K. Cheung, School of Risk and Actuarial Studies, UNSW
Title: **Periodic threshold-type dividend strategy in the compound Poisson risk model**

Abstract:
In this talk, the (baseline) surplus process is described by the classical compound Poisson model. Inspired by the idea of periodic dividend decisions in Albrecher, Cheung and Thonhauser (2011), we suppose that at the sequence of time points which are the arrival times of an independent Erlang(n) renewal process, the insurance company observes the surplus level to decide on dividend payments. If the observed surplus level is larger than the maximum of a threshold b and the last observed (post-dividend) level, then a fraction of the excess amount is paid as a lump sum dividend. In this proposed strategy, the surplus process can still have an upward trend with a ruin probability of less than one (as opposed to the barrier strategy in Albrecher, Cheung and Thonhauser (2011)). We are interested in the analysis of the expected discounted dividends before ruin (denoted by V). For general claim size distribution, the solution of V can be derived using defective renewal equations. More explicit result for V is presented when the claim size density has rational Laplace transform. Some numerical results are provided to illustrate the effect of randomized observation times on V and the optimization of V with respect to b under the periodic threshold-type dividend strategy. In particular, the optimal barrier generally depends on the initial surplus level. Convergence to the traditional threshold strategy is also shown as the inter-observation times tend to zero. This is joint work with Zhimin Zhang.

Session 3A – Jumps in Stochastic Processes

Presenter: Shuping Shi, Department of Economics, Macquarie University
Title: **Volatility Estimation and Jump Detection for drift-diffusion Processes**

Abstract:
Logarithms of prices of financial assets are conventionally assumed to follow drift diffusion processes. While the drift term is typically ignored in the infill asymptotic theory and applications, the presence of a nonzero drift is an undeniable fact. The finite sample theory and extensive simulations provided in this paper reveal that the drift component has a nonnegligible impact on the estimation accuracy of volatility and leads to a dramatic power loss of a class of jump identification procedures. We propose an alternative construction of volatility estimators and jump tests and a observe significant improvement of both in the presence of nonnegligible drift. As an illustration, we apply the new volatility estimators and jump tests, along with their original versions, to 21 years of 5-minute log-returns of the NASDAQ stock price index.

Presenter: Peter Exterkate, School of Economics, The University of Sydney
Title: **A regime-switching stochastic volatility model for forecasting electricity prices**

Abstract:
This paper addresses three crucial challenges outstanding in the area of electricity price forecasting. Specifically, we show the importance of considering fundamental price drivers in modelling, develop new techniques for probabilistic (i.e. interval or density) forecasting of electricity prices, and introduce a universal technique for model comparison. We propose a new regime-switching stochastic volatility model with three regimes, which may be interpreted as negative jump or "drop", normal price or "base", and positive jump or "spike", respectively. The transition matrix between these regimes is allowed to depend on explanatory variables. Bayesian inference is employed in order to obtain predictive densities. The main focus of the paper is on short-term density forecasting in the Nord Pool intraday market. We show that the proposed model outperforms several benchmark models at this task. In particular, the incorporation of stochastic volatility, regime switching, information from the day-ahead market, and exogenous information from weather reports into the model are all shown to improve its predictive performance, without falling prey to curse of dimensionality problems.

Session 3B – Applications

Presenter: Feng Chen, School of Mathematics and Statistics, UNSW
Title: **Direct Likelihood Evaluation for the Renewal Hawkes Process**

Abstract:
An interesting extension of the widely applied Hawkes self-exiting point process, the renewal Hawkes (RHawkes) process, was recently proposed by Wheatley et al. (2016 CSDA), which has the potential to significantly widen the application domains of the self-exciting point processes. However, the authors claimed that computation of the likelihood of the RHawkes process requires exponential time and therefore is practically impossible. They proposed two Expectation-Maximization (EM) type algorithms to compute the maximum likelihood estimator (MLE) of the model parameters. Because of the fundamental role of likelihood in statistical inference, a practically feasible method for likelihood evaluation is highly desirable. In this talk we present an algorithm that evaluates the likelihood of the RHawkes process in quadratic time, a drastic improvement from the exponential time claimed by Wheatley et al. We demonstrate the superior performance of the resulting MLEs of the model relative to the EM estimators through simulations. We also present a computationally efficient procedure to calculate the Rosenblatt residuals of the process for goodness-of-fit assessment, and a simple yet efficient procedure for future event prediction. The proposed methodologies were applied on real data from seismology and finance. This talk is based on joint work with Tom Stindl. The R package implementing the proposed methodology is available on the CRAN: https://cran.r-project.org/web/packages/RHawkes/.

Presenter: Joanna Wang, NSW Bureau of Crime Statistics and Research
Title: **The marginal effect of routine police activity on property and violent crime in NSW, Australia**

Abstract:
The aim of the current study is to examine the marginal effect of routine police activities on levels of property and violent crime over the period 2001-2013. Two measures of routine police activities namely move-on directions and person searches are considered. Stationarity has been examined through second generation panel unit root test to account for cross-sectional dependence. Panel cointegration is tested using both residual-based cointegration test as well as test based on panel error-correction model. Long-run and causal linkages between police activities and crime are estimated by Fully Modified OLS (FMOLS), Dynamic OLS (DOLS), Mean Group (MG) and Pooled Mean Group (PMG) methodologies. The empirical results suggest the presence of a long-run cointegrated relationship between the measures of police activities and property and violent crimes. The causality analysis further confirms the presence of a long term equilibrium relation between police activities and crime.

Session 4 – PhD Session

Presenter: Puwasala Gamakumara, Department of Econometrics and Business Statistics, Monash Business School, Monash University
Title: **Probabilistic Hierarchical Reconciliation via a Non-parametric Bootstrap approach**

Abstract:
Forecast reconciliation for hierarchical time series involves adjusting forecasts to ensure coherence with aggregation constraints. This idea is now widely used in point forecast reconciliation, but there are few papers on probabilistic forecast reconciliation. We introduce a novel non-parametric reconciliation approach to produce hierarchical probabilistic forecasts. This method involves simulating future paths of the whole hierarchy using bootstrapped training errors followed by the reconciliation of these sample paths to assure the coherency of aggregation constraints. We use an extensive Monte-Carlo simulation to find an optimal reconciliation with respect to a proper multivariate scoring rule and show that it is similar to reconciling each sample path via the MinT approach (Wickramasuriya, Athanasopoulos, and Hyndman, 2018) used in point forecast reconciliation. An empirical application on forecasting Australian domestic tourist numbers shows that the proposed non-parametric bootstrap approach improves the accuracy of both point forecasts and probabilistic forecasts.

Presenter: Yixuan Liu, Department of Mathematics and Statistics, Macquarie University
Title: **Local Polynomial M-estimation in Random Design Regression with Dependent Errors**

Abstract:
The random design nonparametric regression model with short-range dependent and long-range dependent errors is investigated. The asymptotic behaviour of the robust local polynomial M-estimator is investigated under two conditions. Asymptotic results are established by decomposing the local polynomial estimator into two terms: a martingale term and a conditional expectation term. It is found that the local polynomial M-estimator is asymptotically normal when errors are short-range dependent. When the errors are long-range dependent, a more complex behaviour is observed that depends on the size of the bandwidth. If the bandwidth is small enough, the long-range dependent scenario is similar to the short-range dependent case. If the bandwidth is relatively large the asymptotic result is more intricate and the long-range dependent variables dominate. Moreover, the optimal bandwidth in the case of short-range dependence is determined.

Presenter: Jingjie Xiang, Huazhong University of Science and Technology
Title: **Estimating the number of factors in high dimensional constrained factor models**

Abstract:
Constrained factor model proposed in a seminal work by Tsai and Tsay (2010) is an effective way to incorporate prior knowledge into applications of factor models, thus potentially can be widely used in practice. Correctly determining the number of factors is a fundamental issue for the application of factor models. In this paper we tend to investigate the estimation of the number of factors in constrained factor models where the two dimensions, cross-section size (N) and time period (T) increase. Using similar information criteria as proposed by Bai and Ng (2002), we show that the number of factors can be consistently estimated using the criteria. We also propose a two-step method to estimate the numbers of factors in partially constrained factor models. We conduct Monte-Carlo simulation to investigate the finite sample properties of the proposed approach.

Presenter: Alex Oh, School of Economics, The University of Sydney
Title: **Electricity Price Volatility and Renewable Energy**

Abstract:
Electricity markets are a new frontier for time-series analysis. Owing to the relative infancy of deregulated electricity markets, spot-prices have not been extensively studied, with no consensus on 'best-practice' for modelling and forecasting their unique dynamics. Further complicating matters is the emergence of renewable energy technologies - wind, solar, and hydro-electric power as mainstream energy sources. These technologies do not benefit from the inherent stability of fossil-fuel power plants, and so are intermittent. A popular hypothesis is that these technologies have made electricity prices more volatile. I seek to test this hypothesis using data from Australia's National Electricity Market (NEM), using a simple stochastic volatility model, and while the results are consistent across regions, there are some surprising discrepancies in the results across different energy technologies.

Presenter: Andrew Phillip, Faculty of Science, The University of Sydney
Title: **The $90,000,000 pizza**

Abstract:
This talk discusses a time series model which has generalized long memory in the mean process with stochastic volatility errors and develops a new Bayesian posterior simulator that couples advanced posterior maximisation techniques, as well as traditional latent stochastic volatility estimation procedures. Our talk is guised through applications to various Cryptocurrencies, and how the newly proposed model is able to answer questions related to Cryptocurrencies in general.

Session 5 - Financial Market Trading and Tail Risk Forecasting

Presenter: Qian Chen, HSBC Business School, Peking University
Title: **Forecasting Multi-step Value-at-Risk via MIDAS Quantile Regression Model**

Abstract:
A Mixed-Data approach (MIDAS) quantile regression model and a extended volatilityfiltered MIDAS quantile regression model are proposed to forecast the multi-step ahead Value-at-Risk (VaR). These models directly investigate the effectiveness of forecasting low frequency VaR with higher frequency daily asset returns, without assuming the return time series follow the same parametric settings within the forecast steps. The methodology is applied to both the return series and the standardised errors for comparison. The proposed models and a number of competing models, parametric and non-parametric, are illustrated with ten real assets. The forecasts of 5- or 10-day ahead VaR at 95%, 97.5% and 99% risk levels are obtained, and used to backtest the models. The results shows that both proposed models outperform the historical simulated methods, as well as parametric model such as GARCH-t. Overall, the volatility-filtered MIDAS quantile regression model provides best VaR forecasts across different levels and steps.

Presenter: Chao Wang, Discipline of Business Analytics, The University of Sydney
Title: **Semi-parametric Realized Nonlinear Conditional Autoregressive Expectile and Expected Shortfall Models**

Abstract:
A joint conditional autoregressive expectile and Expected Shortfall framework is proposed. The framework is extended through incorporating a measurement equation which models the contemporaneous dependence between the realized measures and the latent conditional expectile. Nonlinear threshold specification is further incorporated into the proposed framework. An Bayesian Markov Chain Monte Carlo method is adapted for estimation, whose properties are assessed and compared with maximum likelihood via a simulation study. One-day-ahead VaR and ES forecasting studies, with seven market indices, provide empirical support to the proposed models.

Session 6A – Time-series I

Presenter: Nuttanan Wichitaksorn, School of Engineering, Computer and Mathematical Sciences, Auckland University of Technology
Title: **Analyzing Multiple Vector Autoregressions through Matrix-variate Normal Distribution with Two Covariance Matrices**

Abstract:
In this talk, I will present a new approach to analyze multiple vector autoregressive (VAR) models that render us a newly constructed matrix autoregressive (MtAR) model based on a matrix-variate normal distribution with two covariance matrices. The MtAR is a generalization of VAR models where the two covariance matrices allow the extension of MtAR to a structural MtAR analysis. The proposed MtAR can also incorporate different lag orders across VAR systems that provide more flexibility to the model. The estimation results from a simulation study and an empirical study on macroeconomic application show favorable performance of our proposed models and method.

Presenter: Anastasios Panagiotelis, Department of Econometrics and Business Statistics, Monash University
Title: **Probabilistic Forecasts in Hierarchical Time Series**

Abstract:
Forecast reconciliation involves adjusting forecasts to ensure coherence with aggregation constraints. We extend this concept from point forecasts to probabilistic forecasts by redefining forecast reconciliation in terms of linear functions in general, and projections more specifically. New theorems establish that the true predictive distribution can be recovered in the elliptical case by linear reconciliation, and general conditions are derived for when this is a projection. A geometric interpretation is also used to prove two new theoretical results for point forecasting; that reconciliation via projection both preserves unbiasedness and dominates unreconciled forecasts in a mean squared error sense. Strategies for forecast evaluation based on scoring rules are discussed, and it is shown that the popular log score is an improper scoring rule with respect to the class of unreconciled forecasts when the true predictive distribution coheres with aggregation constraints. Finally, evidence from a simulation study shows that reconciliation based on an oblique projection, derived from the MinT method of Wickramasuriya et al (2017) for point forecasting, outperforms both reconciled and unreconciled alternatives.

Presenter: Hanlin Shang, Research School of Finance, Actuarial Studies and Statistics, Australian National University
Title: **A comparison of Hurst parameter estimators in long-range dependent curve time series**

Abstract:
The Hurst parameter is the simplest numerical characteristic of self-similar long- range dependent stochastic process. Estimation of Hurst parameter in the long-range curve time series has been considered by Li, Robinson and Shang (2018, JASA). Their estimation method begins by constructing an estimation of long-run covariance function, which they use, via dynamic functional principal component analysis, in estimating the orthonormal eigen-functions spanning the dominant sub-space of the curve time series. From the first set of estimated principal component scores, Li, Robinson and Shang (2018) consider the R/S method. Via Monte-Carlo simulations, we compare a wider range of different Hurst parameter estimation methods, and single out the best performing method in terms of bias, variance and mean square error.

Session 6B – Time-series II

Presenter: Ye Lu, School of Economics, The University of Sydney
Title: **Understanding Regressions with Observations Collected at High Frequency over Long Span**

Abstract:
In this paper, we analyze regressions with observations collected at small time interval over long period of time. For the formal asymptotic analysis, we assume that samples are obtained from continuous time stochastic processes, and let the sampling interval shrink down to zero and the sample span T increase up to infinity. In this setup, we show that the standard Wald statistic diverges to infinity and the regression becomes spurious as long as Delta -> 0 sufficiently fast relative to T -> infinity. Such a phenomenon is indeed what is frequently observed in practice for the type of regressions considered in the paper. In contrast, our asymptotic theory predicts that the spuriousness disappears if we use the robust version of the Wald test with an appropriate longrun variance estimate. This is supported, strongly and unambiguously, by our empirical illustration.

Presenter: Abhay Kumar Singh, Department of Applied Finance, Macquarie University
Title: **Multivariate Financial Dependence Analysis of Asian Markets Using Vine Copulas**

Abstract:
Modelling financial dependence is one of the major areas of research in quantitative finance and econometrics. Efficient quantification of dependence is desirable for portfolio theory, hedging, valuation of assets and risk management in general. Quantification of co-movement or multivariate dependence between various international stock markets results in better diversification which benefits investors as it helps in profitable risk distribution. Due to their phenomenal growth in recent years, Asian stock markets have become important for global investors. The study of dependence among Asian stock markets has gained importance as these markets promise diversification benefits. In this paper we study the multivariate dependence structure of eleven Asian financial markets, including Thailand, Malaysia, Indonesia, Singapore, Philippines, Korea, Japan, China, Hong Kong, Taiwan, and India using sophisticated and recently developed model, Regular Vine (R-Vine) Copula. R-Vine Copulas constitute a flexible kind of multivariate dependence models which offer more flexibility than standard multivariate copulas. We also introduce the international markets of Australia, UK and US to the dependence analysis in order to study the influence of these international stock markets on the Asian markets.

Presenter: Mengheng Li, Department of Econometrics, Vrije Universiteit Amsterdam, The Netherlands
Title: **Unobserved Components with Stochastic Volatility in U.S. Inflation: Estimation and Signal Extraction**

Abstract:
Unobserved components models with stochastic volatility (UCSV) have gained much popularity in the literature of inflation modelling. Much focus has been on Bayesian estimation for this class of models, whereas studies on classical treatment such as maximum likelihood estimation are rare due to the lack of analytic likelihood function of UCSV models. In this paper, we fill the gap in literature by developing an easy-to-implement simulated maximum likelihood estimation method based on importance sampling and assess its performance in a Monte Carlo study. In our empirical application, we model US inflation via various UCSV models with different dimensionality and document successful implementations of the proposed estimation method.

List of Participants

Last name	First name	Affiliation	Email Address
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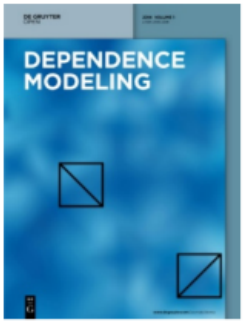

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