



**Workshop on
Mathematical Aspects of Behavioural
Economics and Finance**

13–14 November, 2015

**Schedule
&
Abstract Booklet**

Schedule

Friday 13th

10:00-10:15 Registration/coffee

10:15-10:30 **Introduction and opening: Laureate Professor Jon Borwein**

—SESSION ONE: **Mathematicians Against Fraudulent Financial and Investment Advice—**

10:30-11:15 **David Bailey** (University of California, Davis)

Backtesting and reproducibility in mathematical finance

11:15-12:00 **Jon Borwein** (CARMA, University of Newcastle)

Publishing Standards for Computational Science: "Setting the Default to Reproducible"

12:00-12:30 **Amir Salehipour** (CARMA, University of Newcastle)

New financial analysis tools at CARMA

12:30-1:00 **Break-out session #1**

1:00-2:00 Lunch

—SESSION TWO: **The "Cult of Statistical Significance" and Abuse of Statistical Methods—**

2:00-2:45 **Morris Altman** (Head of School of Business, University of Newcastle)

A More Scientific Approach to Applied Economics: Impoverished Mental Models, False Assumptions, Path Dependency, and Bad Science

2:45-3:30 **Stephen T. Ziliak** (College of Arts and Sciences, Roosevelt University)

(Title to be announced)

3:30-3:45 Coffee

3:45-5:00 **Break-out session #2**

7:00 Dinner (at Verde Luna, Hamilton)

Saturday 14th

9:00-9:30 Coffee

—SESSION THREE: **Good Data, Bad Data, and Ugly Data—**

9:30-10:15 **Andreas Ortmann** (School of Economics, University of NSW)

The deepening replication crises in the social sciences and what to do about it

10:15-11:00 **Jacek Krawczyk** (School of Economics and Finance, Victoria University of Wellington)

Viability Analysis in Fishery Management

11:00-11:45 **David Bailey** (University of California, Davis)

Big Data and its Sins!

11:45-12:15 **Andrew Mattingly** (IBM Australia)

Software Quality and Human Behaviour

12:15-12:45 **Break-out session #3**

12:45-1:15 Lunch

—SESSION FOUR: **Behavioural Approaches to Decision-Making—**

1:15-2:00 **Scott Brown** (Australian Research Fellow, School of Psychology, University of Newcastle)

Bringing together quantitative decision-making theories from economics and cognitive neuroscience

2:00-2:45 **James Juniper** (School of Business, University of Newcastle)

Fuzzy Concept Lattices and Framing of Decision-Making

2:45-3:15 **Break-out session #4**

3:15-3:30 Coffee

—SESSION FIVE: **Applications—**

3:30-4:15 **Marc Adam** (School of Design, Communication, and IT, University of Newcastle)

Using Heart Rate Measurements to Understand and Support Decision Making in Electronic Auctions

4:15-4:45 **Mike Meylan** (CARMA, University of Newcastle)

Modelling and Data, why one cannot live without the other

4:45-5:00 **Discussion and closing remarks**

Speaker: David Bailey

Backtesting and reproducibility in mathematical finance

In the field of mathematical finance, a "backtest" is the usage of historical market data to test the effectiveness of a proposed investment strategy or exchanged-traded fund. "Backtest overfitting" occurs when numerous variations of a proposed strategy or fund (for example by using parametric variations) are explored by computer to find one with optimal performance. We show that backtest overfitting is almost unavoidable if one uses traditional market datasets and explores even a modest number of variations. We also describe a new online demonstration of backtest overfitting, which is designed to show even to persons not expert in the field that this is a significant problem and must be dealt with appropriately.

Speaker: Jon Borwein

Publishing Standards for Computational Science: "Setting the Default to Reproducible"

Recent research scandals in Economics, Medicine, and Social Psychology all reinforce the point that "Secret science is bad science". I will discuss the rationale for, events and outcomes of a December 2012 workshop on Reproducibility in Computational and Experimental Mathematics held at the Institute for Research in Computational and Experimental Mathematics (ICERM) at Brown University. In particular, I will discuss the meeting's primary recommendations for a more accountable, reliable, and open practice of computational science.

Speaker: Amir Salehipour

New financial analysis tools at CARMA

Backtest overfitting is the practice of selecting the parameters that maximize a backtest's performance while ignoring the number of trials that have taken place. Backtest overfitting is now thought to be a primary reason why quantitative investment models and strategies that look good on paper often disappoint in practice. Two tools, the Backtest Overfitting Demonstration Tool (BODT) and the Tenure Maker Simulation Tool (TMST) have been developed in order to demonstrate that extracting a financial strategy based on the historical data (typically, the optimal strategy) may not be "optimal" in the future. Thus, situations when a model targets a specific behaviour than a general one should be avoided.

Speaker: Morris Altman

A More Scientific Approach to Applied Economics: Impoverished Mental Models, False Assumptions, Path Dependency, and Bad Science

There is an extensive literature on the many problems of focusing on statistical significance in ones analytical discourse across a wide-array of disciplines, including economics. Less so, in the domain of correlation analysis. One perspective, exemplified in the work of McCloskey and Ziliak, is that tests statistical significance should not be used since they provide little useful scientific information and

typically serve to generate misleading or even completely false analyses. In spite of substantive critiques of the application of tests of statistical significance, they remain pervasive in economics, across methodological and ideological perspectives. With regards to correlation analysis, it is used to determine causality, building in economics, on the methodological work of Milton Friedman, that what counts is analytical predictions. Assumptions don't matter. Statistical significance tests are used to affirm or refute the validity of correlation analysis in terms of analytical or substantive importance of ones results. I argue that given the culture of the quantitative profession (that statistical significance tests are a vital component of quantitative economic analysis) and some important scientific attributes of tests of statistical significance (error of estimates from a randomly drawn sample), it cannot be easily excluded from empirical analysis. Moreover, correlation analysis in and of itself is an important statistical tool. What is important, however, is to understand the severe limits of statistical significance tests and correlation analysis for scientific analyses. At best, when used correctly, tests of statistical significance provide information on the probability that one's results are a fluke (that there is an error in one's estimates). This would suggest possible issues with sample size and the need to repeat ones experiment. Therefore, tests of statistical significance should only form a small part of the analytical narrative; not dominate it. Scientific empirical research must go beyond tests of statistical significance and the reporting of signs. It is further important to understand the analytical modelling assumptions made when tests of statistical significance dominate the analytical discourse. The same is true for correlation analysis. These assumptions can generate substantive biases in model construction and causal analyses. I suggest a schema of how to structure statistical analysis and how statistical significance tests fit into this structure. Finally, I argue that mental models, path dependency, confirmation bias, loss aversion, status quo bias, power relationships, and herding, play an important role in explaining the persistent inappropriate use of these tests in the scientific community and acceptance of related misleading or false analysis by academic and non-academics alike.

Speaker: Stephen T. Ziliak

Title to be announced

Speaker: Andreas Ortmann

The deepening replication crises in the social sciences and what to do about it

The title of my talk is programmatic: Drawing on various blog entries on Core Economics Today and my recent related article for The Conversation, I shall detail why the replication crises in the social sciences are deepening and suggest what we can do about this development. I will take this latter part as an opportunity to briefly discuss some of my own recent work (e.g., how to make the Allais paradox appear, disappear, and reverse).

Speaker: Jacek Krawczyk

Viability Analysis in Fishery Management

Aspects of viability theory will be outlined and then illustrated using a fisheries management case-study. The presentation will also provide an overview of the interactive software module, Vikaasa (see <http://socsol.github.io/vikaasa/> and http://socsol.github.io/vikaasa/vikaasa_manual.pdf) focusing on how the software can be deployed in determining interventions that are viable (i.e. satisficing) rather than strictly optimal.

Speaker: David Bailey

Big Data and its Sins!

High-performance computing has emerged as a powerful and indispensable tool for numerous fields of applied mathematics, ranging from disciplines as diverse as physics, chemistry and climate modelling to biology and psychology. A wide range of phenomena can now be simulated, and very specific hypotheses can be reliably tested. However, many in the field are discovering that published studies are, in a distressingly large number of cases, simply not reproducible by other researchers. In part, this is due to lax standards in the field, which has developed very rapidly without a highly disciplined methodology of carefully recording all steps of a research project. But it is also due to pervasive numerical sensitivities, which are greatly exacerbated when computations are scaled up in size to run on systems with thousands of processors. This talk will describe one effective solution to such difficulties, namely the usage of high-precision arithmetic. When employed appropriately, even exceedingly sensitive computations can be reliably performed.

Speaker: Andrew Mattingly

Software Quality and Human Behaviour

As with Quantum Physics, the way software quality is measured influences outcomes and the behaviour of the people doing or managing the software development activity. Anecdotal and statistical evidence will be presented which suggests care must be taken in setting performance metrics for software quality to ensure they drive the right behaviours. IBM's mainframe software development will be explored as a case study.

Speaker: Scott Brown

Bringing together quantitative decision-making theories from economics and cognitive neuroscience

Speaker: James Juniper

Fuzzy Concept Lattices and Framing of Decision-Making

The presentation will provide an overview of Keynesian approaches to decision-making under uncertainty, which highlight the role of conventions and both sublime and regressive forms of the drive. An ontological rather than epistemological interpretation of uncertainty will be defended. Four frameworks for the application of these notions will then be reviewed: (i) bounded sub-additivity; (ii) fuzzy measure theory (via approximation algebras); (iii) concept lattices allied to the behavioural notion of "framing"; and, a potential model for option pricing based on Tsallis entropy (more specifically, a q-generalized binomial approximation to the Student-t distribution).

Speaker: Marc Adam

Using Heart Rate Measurements to Understand and Support Decision Making in Electronic Auctions

Abstract: Recent literature has shown that affective processes have a definite influence on bidding behavior. Building on results from a series of experiments with different auction formats, I show how heart rate measurements can be used to understand bidding behavior in different auction settings and to inform the design of electronic auctions. Moreover, building on the theory of emotion regulation, I discuss how heart rate measurements can be used to provide live-biofeedback to market participants and support them in their decision making.

Speaker: Mike Meylan

Modelling and Data, why one cannot live without the other

I will discuss the geophysical problem of understanding the role that waves play in determining the extent of sea ice in the frozen ocean. Models and data have been allowed to exist independently until a recent series of large scale projects funded by the US Navy. This has in turn required a reconnection between model and data and this process has been far from straight forward. I will discuss various aspects of this problem, including the role models have played in the analysis of data, the attraction of simple models which have not been validated, and the difficulty of implementing new paradigms in existing computation code.