Curriculum Vitae

Ilan Salbe

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CONTACT DETAILS

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EDUCATION

Tertiary

Bachelor of Arts, majoring in statistics and actuarial studies
Macquarie University, 1975-1978

Bachelor of Arts, Honours year in statistics, Pass II-1.
Macquarie University, 1978-1979

Major Subjects	Statistical Inference	Decision Theory
	Linear Programming	Distribution Theory
	Geometrical Probability	Experimental Design
	Contingency Table Analysis	

Honours Thesis Title: Risk Theory Application to Net Stop Loss and Excess of Loss Reinsurance

Open Channel Flow (one semester course)
Newcastle University 1997
Pass: High Distinction

WORK EXPERIENCE SUMMARY

Oct. 1998 – End 2012   **Senior Modeller**
Office of Water, Department of Trade and Investment, Regional Infrastructure and Services
(formerly DLWC, DSNR, DIPNR, DWE)

I was responsible for leading a team of up to three members in developing and running the Murrumbidgee Integrated Quantity Quality Model (IQQM). I applied the model to many areas including Murray-Darling Basin Cap auditing, NSW Water Sharing Plan rules derivation and evaluation, CRCCH development of software related to the economics of water entitlement trade, investigation of inter/intra-valley exchange rates, Living Murray increased environmental water allocation studies, MDBC Basin Salinity Management Strategy investigations, evaluation of market instruments for raising environmental water allocations and a CSIRO sustainable yield study that investigated the viability of the Basin under climate change.

I made numerous presentations to committees and user groups comprising irrigators, environmentalists, and representatives of various government agencies including the MDBC (now MDBA) and local governments.

In the technical realm, I was involved in code development (FORTRAN), calibrating and validating the Murrumbidgee IQQM and running rule change scenarios including those related to changes in the environmental flow rules.

A brief description of project areas is given below.

MDBC Cap Auditing

Cap auditing entailed building a configuration of the Murrumbidgee IQQM which predicted, for a given climate data record, the river diversions that would have occurred under 1993/94 level of development and operating rules. Subsequently, at the end of each water year, I was required to oversee that the Cap model was provided with validated climate time series data and the model was upgraded when necessary. If recorded diversions exceeded the predicted Cap model diversions then a Cap-breaching situation was indicated. I wrote reports on the diversion comparison for the DIPNR policy group responsible for reporting to the Cap Independent Audit Group.

Water Sharing Plan (WSP) Modelling

NSW had a process to derive a set of rules for the sharing of water between the environment and irrigation for a period of ten years. If government imposed rule changes within that period then affected parties could seek compensation. The process to derive the 10-year rules involved setting up committees made up of irrigators, environmentalists, aboriginal representatives and NSW government agency representatives for each river system in NSW. These WSP committees deliberated on water sharing rules. I was required to attend committee meetings where rule changes were discussed, to undertake modelling of any proposed rule changes and to present their impacts to the committee. After a number of cycles, the final WSP rules were implemented in July 2004, and thereafter I managed the WSP model so that WSP diversion limit auditing could be undertaken.

Support for Pratt Water "Water Efficiency Feasibility Study Project"

The Pratt Water project was co-funded by the NSW and Federal governments and focused on the Murrumbidgee valley. About 17 detailed technical reports were produced. I wrote reviews and attend review sessions on the loss study report and the aquifer storage and recovery report. I directly contributed a sub-report on the flow and salinity impacts of forestation. My work involved liaison with staff from CSIRO, ABARE, Pratt Water consultants and GHD consultants.

Modelling of Call Options to Raise Environmental Water

Call options contracts are market-based instruments for raising environmental water. They originate from financial markets. ABARE led a Murrumbidgee valley call options case study. In the study scenarios, call options provided an environmental manager with early spring access to irrigation water above a threshold allocation. I carried out modelling to into the viability of such contracts in terms of whether sufficient environmental water would be raised. I participated in presentations on the Murrumbidgee valley case study to MDBC staff and the Living Murray Board (minor role in the latter).

Living Murray Project

The Living Murray project was concerned with restoring the health of the Murray River system by reducing irrigation diversions in the Murray River and its tributaries by up to a total of 1500GL. The Murrumbidgee River, along with the Goulburn-Broken and the Murray River itself were the main targets for reduced diversions. I made presentations to representatives of the MDBC and the Victorian and South Australian governments explaining the main elements of the Murrumbidgee IQQM. I also carried out some preliminary model scenario runs, which quantified how reduced

crop areas and greater irrigation efficiency yielded reduced diversions and increased flows from the Murrumbidgee River into the Murray.

CRCCH Research

The Cooperative Research Centre for Catchment Hydrology (CRCCH) undertook research into the economics of irrigation water entitlement transfers. The transfers were both of an inter- and intra-valley nature and the entitlements both temporary and permanent. A central plank of CRCCH operations was that their research should yield software products. The Murrumbidgee was a focus catchment for the development of an economics software module, which could predict temporary trade and crop areas planted and could interface with the Murrumbidgee IQQM. Professor John Tisdell and Bofu Yu lead the project and my role was to advise on the requirements from an IQQM software perspective and to explain the inter/intra-valley drivers of Murrumbidgee trade.

Baseline Conditions Technical Committee of the Baseline Salinity Management Strategy

I served as the NSW representative on a committee reviewing the adequacy of state and MDBC salt transport models. I reviewed model reports and participated in technical discussions.

Related Papers

A. Davidson and I. Salbe, *Further Development of an Instream Salt Transport Model for IQQM*, MODSIM 2003.

R. Beecham, P. Arranz, J. Boddy, M. Burrell, R. Gilmore, A. Javam, J. Martin, R. O'Neill and I. Salbe, *Implementing Daily Salinity Models in the NSW Murray Darling Basin Tributaries*, MODSIM 2003.

B. Yu, J. Tisdell, G. Podger and I. Salbe, *A Hydrologic and Economic Model for Water Trading and Reallocation Using Linear Programming Techniques*, MODSIM 2003.

S. Schreider, I. Salbe and G. Codner, *Sensitivity Analysis of Integrated Systems for Water Allocation Modelling*, Upcoming Hydrology and Water Resources Symposium, 2003.

Beare, S., Hinde, R., Hillman, T., Heaney, A., Salbe, I. 2005, *Meeting environmental outcomes: a planning framework*, ABARE Conference Paper 05.27 to the OECD Workshop on Agriculture and Water: Sustainability, Markets and Policies, Adelaide and Barmera, 14-18 November.

Salbe, I. Roberts, S 2004, *IQQM Routing of downstream tributary flow and salt load changes due to forestation*, Appendix to Pratt Water Report on the Business of Saving Water

Dec. 1996 – Sep. 1998	**Mathematical Modeller** **Sydney Water** **(promoted to Experienced Modeller, April 1997)**

This position covered a number of tasks. The first was a review of twenty Hawkesbury-Nepean River HSPF water quality models with respect to consistency in their choice of processes modelled and selection of parameter values. The work involved liaison with the US HSPF

developers, AQUA-TERRA. My report recommended a more systematic methodology for calibration and included a manual detailing initial parameter selection and constraints on moving away from initial values.

A second element of the position was liaison with AQUA-TERRA on the addition of instream process to HSPF.

The final element involved setting up a Shoalhaven HSPF water quality model to inform Sydney Water's dealings with the Healthy Rivers Commission inquiry into the Shoalhaven River.

Mar. 1995- Nov. 1996   **Secondment - REALM Murray model project**
                                Victorian Department of Natural Resources and Environment

My role was to help complete the building of a Murray REALM Model that would emulate the operating rules embedded in the MDBC's MSM model.

The MDBC managed some of Queensland, NSW, Victoria and South Australia's water allocations. The Victorian Department of Natural Resources and Environment (DNRE) was involved in the process of allocating bulk entitlements to water users throughout Victoria, including those that were managed by the MDBC.

DNRE used the REALM model as its analytical simulation tool for this purpose and employed me to help meet their deadlines. I liaised with the MDBC to aid understanding of the MSM source code and with the DNRE REALM coders to instigate software modifications. In my last 6 months with DNRE I became the custodian of the REALM source code. DNRE also included me in some discussions with Melbourne Water on modelling issues related to defining bulk entitlements to the three retailers which they oversee.

Jan. 1981 – Feb. 1995   **Mathematician / Mathematical Modeller**
                                Sydney Water

My initial work involved the application of multivariate time series statistical procedures to stream data for the major river systems in Sydney Water's catchments. The emphasis was on the investigation of the implications of cross correlations on drought contingency modelling. This was later expanded to the study of other facets of drought planning including demand measurement and forecasting.

When the Bureau of Meteorology revised its probable maximum flood estimates upwards, I participated in probable maximum flood studies. This required skills in the assessment of available models, software installation, code modification and model calibration and verification.

When salinity problems arose in the Upper Nepean System, induced by low passing flows, I became a member of a team that assessed the likely impact of reservoir releases on salinity levels.

Concerns about water quality in the Hawkesbury Nepean system and the repercussions of urban development led to involvement in the field of water quality modelling of catchment and instream processes.

The need for a generic headworks model platform for Sydney Water's resources planning led me into the area of network flow programming simulation. I participated in the study of the optimisation of the operating rules for the Sydney headworks system using the multi-time series network linear programming option of the WATHNET software.

Jul. 1979 – Dec. 1980   **Full-Time Research Assistant / Tutor in Statistics**
                                Macquarie University

I applied statistical and economic procedures to find cost-effective sampling schemes for the detection of insect infestation at the point of delivery to major wheat silos. The project was sponsored by the Wheat Research Council and the team comprised: Dr B. Zehnwirth, Statistics Lecturer, Macquarie University; Dr J. Johnston, Economist NSW Department of Agriculture; and myself.

The position required computing, statistical and liaison skills.

The computing element consisted of writing FORTRAN language simulation models of Bulk Handling Authority sampling. This included building simple sub-routine modules of insect population growth, where temperature and chemical treatment are important factors.

The statistical element involved the design of "credibility estimators" which provide a means for the systematic reduction of the sampling of delivery trucks from farms that establish a good track record.

Liaison skills were required to communicate with entomologists and bulk authorities for the purpose of increasing the level of understanding of practical constraints for any developed sampling scheme.

Reference : E. Oakenfull, I. Salbe and B. Zehnwirth, *A note on the estimation of the mean intensity of insect infestation*, BIOMETRICS 40, Dec 1984.

The tutoring position involved a set number hours per week teaching 'Introduction to Statistics' and 'Monte Carlo Simulation'.

SYDNEY WATER MAJOR PROJECT AREAS
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Hydrological Modelling – Warragamba Catchment

Role: Assessed alternative event rainfall runoff models and installed RORB software on Sydney Water's mainframe. Modified software's theoretical constraints to meet multi-catchment needs of Warragamba modelling. Ported modified code to PC platform. Member of the Warragamba RORB calibration team.

Reference: A.R. Deen, R.W. Craig and I. Salbe, *Hawkesbury Nepean River Flood Mode*l, Hydrology and Water Resources Symposium, 1988.

HEADSYS – Headworks Simulation

Role: Maintained original mainframe version. Provided input to process to convert code to C language. Designed and installed a modified synthetic generator to incorporate a demand component which both reflects the relationship between demand and catchment inflows and the relationship between demand and average weekly earnings (which were assumed to increase over the planning horizon). Involved in the review of alternative augmentation schemes of the Sydney Water supply system.

Reference: I. Salbe, A.R. Deen and A. Marr, *Issues Involved in Determining the Augmentation Timing of the Sydney Water Supply System*, International Hydrology & Water Resources Symposium, 1991.

Flood Warning – Warragamba Sacramento Modelling

Role: Installed model on mainframe. Wrote into the code routines to enable graphing of various conceptual soil storage "buckets". Created a graphical user interface to aid running in operation mode. Changed code to allow variable time step transfer between the soil storages and the river

system. Member of the flood warning team during the period of remedial works to Warragamba dam.

NONLIN/RORB Inflow-Infiltration Modelling

Role: Involved in the conceptualisation of the original NONLIN model. Merged NONLIN & RORB to produce a multi sub-area twin concentrated storage model. Included a data interface to MOUSE.

Reference: A.R.Deen, I. Salbe and R.Craig, *Modelling of Stormwater Ingress into Foulwater Sewers*. International symposium on Urban Stormwater Management, 1991.

HSPF Water Quality Modelling of the Hawkesbury Nepean

Role: Installed HSPF/ANNIE software on DOS and ULTRIX computer systems. Liaised with consultants on the setting up of catchment models. Provided software support to CSIRO in their setting up of the HSPF management tool interface, SWAMP.

Reference: M. Rahman and I. Salbe, *Modelling effects on Water Quality of Urbanisation of the South Creek Catchment*, International Congress on Modelling and Simulation, 1993.

REALM – Simulation of Sydney Delivery System

Role: Attended REALM workshops. Installed REALM on PC and helped with installation on a workstation. Set up pilot REALM model of a simplified Sydney system.

WATHNET – Optimisation Study of the Sydney Headworks System

Role: In conjunction with SMEC consultants, set up a WATHENT simulation model of the Sydney Water headworks system. This involved a number of aspects including implementing a demand model generator, organising historical flow data, generating synthetic data, encoding network characteristics and calibration & verification of the model.

Then with Pavel Kozarovski of SMEC, conceptualised and implemented a trial methodology for using multi-step network linear programming to find better operating rules. This involved gathering a general understanding of the WATHNET code and then carrying out a large number of modifications and additions to it.

Reference: I. Salbe, P. Kozarovski, A. Deen and A. Marr, *Application of Network Linear Programming to the Sydney Water Supply Headworks System*, Water Down Under '94.