

Curriculum Vitae

Personal details

Name: Peter James THOMSON

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Present position: Statistician, Statistics Research Associates, New Zealand (from mid 1999).

Previous positions: Director, Statistics Research Associates, New Zealand (1999-2020).
Reader in Statistics, Victoria University, New Zealand (1987-1999).
Senior Lecturer in Statistics, Victoria University, New Zealand (1981-1986).
Senior Lecturer in Statistics, Massey University, New Zealand (1976-1980).
Lecturer in Statistics, University of Nottingham, England (1972-1976).

Nationality: New Zealand

Academic qualifications

BSc(Hons) (1st class in Mathematics), Otago University, 1968.
PhD (Statistics), Australian National University, 1972.

Honours/distinctions/professional memberships

Chartered Statistician of the Royal Statistical Society (1993-2019).
Accredited Statistician of the Statistical Society of Australia (1998-2018).
Member of the International Statistical Institute (1999-2019).
Professional member of the American Statistical Association (1980-2016), The Econometric Society (2008-2014), NZ Statistical Association (from 1977), Royal Statistical Society (1973-2019), Statistical Society of Australia (1980-2018).
Adjunct Professor, School of Economics and Finance, Victoria University, New Zealand (from 2005).
Member (2004-2005) and Chairman (2005) of the Elections Committee of the International Statistical Institute.
Member of the Advisory Board for the 21st Century COE Programme *Integrative Mathematical Sciences*, Keio University, Japan (2004-2008).
Editor of *Applied Stochastic Models in Business and Industry* (2002-2007).
Delivered 2005 Knibbs Lecture *Hidden Markov models: some examples of their application and reflections on their use* to the Statistical Society of Australia Canberra Branch.
ASA/NSF/Census Research Fellow at the US Census Bureau (for 6 months in 1993-1994).
President (1986-1988) and Treasurer (1983-1984) of the NZ Statistical Association.
Awards from the Prince and Princess of Wales Award Scheme (NZ Royal Society), British Council, Japanese Ministry of Education, UK Science and Engineering Research Council.

Visiting professorships, fellowships etc including: ANU Department of Statistics (Australia); CSIRO Mathematical and Information Sciences (Australia); ETH Seminar für Statistik (Switzerland); Institute of Statistical Mathematics (Japan); Keio University Department of Mathematics (Japan); London School of Economics (UK); National Institute of Water and Atmospheric Research (NZ); University of Auckland Department of Statistics (NZ); UWA Department of Accounting and Finance (Australia); VUW School of Economics and Finance (NZ).

Referee for a wide variety of international and national journals; reviewer for the US National Science Foundation, Australian Research Council, NZ Foundation for Research Science and Technology.

Research and professional specialities

Time series; forecasting; stochastic processes; seasonal adjustment; spectral analysis; signal processing; financial mathematics; applied probability and statistics.

Research and consulting experience

Extensive contract research, consulting and teaching experience in time series analysis, forecasting, stochastic modelling, seasonal adjustment, general applied statistics and statistical computing.

Over 75 research articles in time series analysis, stochastic processes, seasonal adjustment and forecasting, most of which have appeared in refereed publications.

Over 115 conference papers and over 50 consultancy reports, most of which are concerned with time series, forecasting and stochastic modelling.

Played a key role in setting up a contract research and education programme through the Victoria University Institute of Statistics and Operations Research. Inaugural director of this programme in 1991 and director from 1993 to 1996.

Played a key role in setting up the Victoria University Diploma Programme in Financial Mathematics (largely funded by the New Zealand insurance industry during its first 6 years of operation). Inaugural director 1988-1989.

Founded Statistics Research Associates Ltd with Dr Robert Davies (previously Director of the Applied Mathematics Division, New Zealand Department of Scientific and Industrial Research) and Professor David Vere-Jones (Victoria University, New Zealand). This company provides a flexible business framework for supporting statistics research and the application of statistical methods to scientific, social and economic problems. It aims to distinguish itself through the high quality of the work that it produces and its contributions to statistical research and to the statistical profession. Inaugural director 1999-2020.

Publications

- [1] Hannan, E.J. and Thomson, P.J. (1971) Spectral inference over narrow bands. *J. Appl. Prob.* **8**, 157-169.
- [2] Hannan, E.J. and Thomson, P.J. (1971) The estimation of coherence and group delay. *Biometrika* **58**, 469-481.
- [3] Hannan, E.J. and Thomson, P.J. (1973) Estimating group delay. *Biometrika* **60**, 241-253.
- [4] Hannan, E.J. and Thomson, P.J. (1974) Estimating echo times. *Technometrics*. **16**, 77-84.
- [5] Thomson, P.J. and Wilkinson, K.M. (1975) A note on Harris's condition for recurrence in random walk processes. *J. Appl. Prob.* **12**, 633-634.
- [6] Baldwin, A.J. and Thomson, P.J. (1978) Periodogram analysis of S Carinae. *Variable Star Section, Royal Astronomical Society of New Zealand* **6**, 31-38.
- [7] Thomson, P.J. (1979) Multivariate spectral estimation in the presence of frequency dependent time delays. *Massey University Occasional Publications in Mathematics* No. 6.
- [8] Pringle, R.M. and Thomson, P.J. (1979) Introductory Statistics. *Massey University Monitor* **1**, 7-11.

- [9] Brook, R.J., Pringle, R.M. and Thomson, P.J. (1981) PSI - a second look. *Massey University Occasional Publications in Mathematics* No. 10.
- [10] Brook, R.J., Pringle, R.M. and Thomson, P.J. (1981) Modifications to a large PSI course. *NZ J. Educational Studies* **16**, 198-199.
- [11] Hannan, E.J. and Thomson, P.J. (1981) Delay estimation and the estimation of coherence and phase. *IEEE Trans. Acoust., Speech, Signal Processing* **ASSP-29**, 485-490.
- [12] Thomson, P.J. (1981) Review of 'Time Series Data Analysis and Theory (Expanded Edition)' by D.R. Brillinger. *NZ Statistician* **16**, 44.
- [13] Brook, R.J. and Thomson, P.J. (1982) The evolution of a Keller plan service statistics course. *PLET* **19**, 135-138.
- [14] de Souza, P. and Thomson, P.J. (1982) LPC distance measures and statistical tests with particular reference to the likelihood ratio. *IEEE Trans., Acoust., Speech, Signal Processing* **ASSP-30**, 304-315.
- [15] Thomson, P.J. (1982) Signal estimation using an array of recorders. *Stoch. Proc. Appl.* **13**, 201-214.
- [16] Hannagan, G.M. and Thomson, P.J. (1983) A note on spectral estimation for ARMA processes. *J. Statist. Comput. Simul.* **18**, 87-92.
- [17] Vere-Jones, D. and Thomson, P.J. (1984) Some aspects of space-time modelling. Proceedings of the *XIIth International Biometric Conference*, Tokyo, Japan, 265-275.
- [18] Cameron, M.A. and Thomson, P.J. (1985) Measuring attenuation. In *Handbook of Statistics 5* 'Time Series in the Time Domain' (ed. E.J. Hannan et al.), North Holland, Amsterdam, 363-367.
- [19] Thomson, P.J. (1985) Forecasting visitor arrivals to New Zealand: an elementary analysis. In *The Fascination of Statistics* (ed. R.J. Brook et al.), Marcel Dekker, New York, 351-373.
- [20] Thomson, P.J. and de Souza, P. (1985) Speech recognition using LPC distance measures. In *Handbook of Statistics 5* 'Time Series in the Time Domain' (ed. E.J. Hannan et al.), North Holland, Amsterdam, 389-412.
- [21] Brownrigg, R.D., Dawkins, B.P. and Thomson, P.J. (1986) S: the answer to a NZ statistician's dreams? *NZ Statistician* **21**, 2, 18-23.
- [22] Thomson, P.J. (1986) Band-limited spectral estimation of autoregressive-moving-average processes. In *J. Appl. Prob.* **23A** 'Essays in Time Series and Allied Processes. Papers in honour of E.J. Hannan' (ed. J. Gani and M.B. Priestley), 143-155.
- [23] Thomson, P.J. (1986) Future directions for the NZ Statistical Association; a personal viewpoint. *NZ Statistician* **21**, No. 1, 43-45.
- [24] Granger, C.W.J. and Thomson, P.J. (1987) Predictive consequences of using causal variables. *Econometric Theory* **3**, 150-152.
- [25] Ozaki, T. and Thomson, P.J. (1987) Seasonal adjustment of overseas balance of payments series. *Mathematical Statistics Division Working Paper 1987/1*, No 23.042, Department of Statistics, Wellington, New Zealand.
- [26] Hannan, E.J. and Thomson, P.J. (1988) Time delay estimation. *J. Time Series Anal.* **9**, 21-33.
- [27] Moore, M.I., Thomson, P.J. and Shirtcliffe, T.G.L. (1988) Spectral analysis of ocean profiles from unequally spaced data. *J. Geophys. Res.* **93**, 655-664.
- [28] Dawkins, B.P. and Thomson, P.J. (1989) The number of jackpot weeks in Lotto. *NZ Statistician* **24**, No.1, 6-10.
- [29] Gray, A.G. and Thomson, P.J. (1990) Invited commentary on 'STL: a seasonal-trend decomposition procedure based on loess' by R.B. Cleveland et al. *Journal of Official Statistics* **6**, 1, 47-54.
- [30] Evans, L.T., Ho, W. and Thomson, P.J. (1991) Stochastic volatility option pricing models: a mean-variance efficient approach. *Money and Finance Association*, Discussion Paper No. 15, Victoria University of Wellington.
- [31] Moore, M.I. and Thomson, P.J. (1991) Impact of jittered sampling on conventional spectral estimates. *J. Geophys. Res.* **96**, 18519-18526.
- [32] Quinn, B.G. and Thomson, P.J. (1991) Estimating the frequency of a periodic function. *Biometrika* **78**, 65-74.

- [33] Thomson, P.J. (1992) Signal estimation using stochastic velocity models and irregular arrays. *Ann. Inst. Statist. Math.* **44**, 13-25.
- [34] Sansom, J. and Thomson, P.J. (1992) Rainfall classification using breakpoint pluviograph data. *J. Climate* **5**, 755-764.
- [35] Ozaki, T. and Thomson, P.J. (1993) A dynamical systems approach to X-11 type seasonal adjustment. *Institute of Statistical Mathematics Research Memorandum* No. 489, Tokyo, Japan.
- [36] Turner, T.R., Thomson, P.J. and Cameron, M.A. (1993) Statistical discriminant analysis of arrhythmias using intracardial electrograms. *IEEE Trans. Biomedical Engineering* **40**, 985-989.
- [37] Bruce, A.G., Jurke, S.R. and Thomson, P.J. (1994) Forecasting load duration curves. *J. Forecasting* **13**, 545-559.
- [38] Gray, A.G. and Thomson, P.J. (1994) Design of moving-average trend filters using fidelity and smoothness criteria. Proceedings of the *1994 American Statistical Association Conference*, Toronto, Canada, 157-162.
- [39] Ozaki, T. and Thomson, P.J. (1994) Seasonal adjustment through dynamical systems. Proceedings of the *1994 Japan Statistical Society Conference*, Tokyo, Japan, 30-31.
- [40] Gray, A.G. and Thomson, P.J. (1996) Design of moving-average trend filters using fidelity, smoothness and minimum revisions criteria. Research Report CENSUS/SRD/RR-96/1, Statistical Research Division, Bureau of the Census, Washington D.C. 20233-4200, 1-99.
- [41] Gray, A.G. and Thomson, P.J. (1996) Design of moving-average trend filters using fidelity and smoothness criteria. In *Lecture Notes in Statistics* **115** 'Athens Conference on Applied Probability and Time Series. Volume II: Time Series Analysis in Memory of E.J. Hannan' (ed. P.M. Robinson and M. Rosenblatt), 205-219.
- [42] Gray, A.G. and Thomson, P.J. (1996) On a family of moving-average trend filters for the ends of series. Invited paper. Proceedings of the *1996 American Statistical Association Conference*, Chicago, USA, 100-109.
- [43] Thomson, P.J. and Robinson, P.M. (1996) Estimation of second-order properties from jittered time series. *Ann. Inst. Statist. Math.* **48**, 29-48.
- [44] Dongfeng, L., Thomson, P.J. and Haywood, J. (1997) Dynamic seasonal models. Technical Report 44, Institute of Statistics and Operations Research, Victoria University of Wellington, New Zealand.
- [45] Sansom, J. and Thomson, P.J. (1998) Detecting components in censored and truncated meteorological data. *Environmetrics* **9**, 673-688.
- [46] Turner, T.R., Cameron, M.A. and Thomson, P.J. (1998) Hidden Markov chains in generalised linear models. *Canadian Journal of Statistics* **26**, 107-125.
- [47] Gray, A.G. and Thomson, P.J. (2000) Trend estimation at the ends of series using adaptive semi-parametric local dynamic models. Invited paper. Proceedings of the *International Conference on Establishment Surveys*, Buffalo, USA, 769-779.
- [48] Gray, A.G. and Thomson, P.J. (2000) Invited commentary on the session *Current Topics in Seasonal Adjustment* in the Proceedings of the *International Conference on Establishment Surveys*, Buffalo, USA, 765-767.
- [49] Sansom, J. and Thomson P.J. (2000) Fitting hidden semi-Markov models. NIWA Technical Report 77, National Institute of Water and Atmospheric Research, New Zealand.
- [50] Thomson, P.J. (2000) Invited commentary on 'Time series analysis of non-Gaussian observations based on state space models from both classical and Bayesian perspectives' by J.Durbin and S.J. Koopman. *J. R. Statist. Soc. B* **62**, 3-56.
- [51] Buckle, R.A., Haugh, D. and Thomson, P.J. (2001) Calm after the storm?: supply-side contributions to New Zealand's GDP volatility decline. Working Paper 01/33, New Zealand Treasury, Wellington, New Zealand.
- [52] Lally, M.T., Randal, J.A. and Thomson, P.J. (2001) Non-parametric volatility estimation. Invited paper. Proceedings of the *2nd International Symposium on Business and Industrial Statistics*, Yokohama, Japan, 201-210.
- [53] Sansom, J. and Thomson, P.J. (2001) Fitting hidden semi-Markov models to breakpoint rainfall data. *Journal of Applied Probability* **38A**, 152-167.

- [54] Buckle, R.A., Haugh, D. and Thomson, P.J. (2002) Growth and volatility regime switching models for New Zealand GDP data. Working Paper 02/08, New Zealand Treasury, Wellington, New Zealand.
- [55] Gray, A.G. and Thomson, P.J. (2002) On a family of moving-average trend filters for the ends of series. *Journal of Forecasting* **21**, 125-149.
- [56] Ozaki, T. and Thomson, P.J. (2002) A non-linear dynamic model for multiplicative seasonal-trend decomposition. *Journal of Forecasting* **21**, 107-124.
- [57] Thomson, P.J. and Ozaki, T. (2002) Transformation and trend-seasonal decomposition. Invited paper. Proceedings of the *3rd International Symposium on Frontiers of Time Series Modeling*, Tokyo, Japan, 197-212.
- [58] Buckle, R.A., Haugh, D. and Thomson, P.J. (2003) Calm after the storm?: Supply-side contributions to New Zealand's GDP volatility decline. *New Zealand Economic Papers* **37**, 217-243.
- [59] Buckle, R.A., Haugh, D. and Thomson, P.J. (2004) Markov switching models for GDP growth in a small open economy: the New Zealand experience. *Journal of Business Cycle Measurement and Analysis* **1**, 227-257.
- [60] Hall, V.B., Han, C., Plantier, L.C. and Thomson, P.J. (2004) NZESG celebrates Professor Clive Granger's Nobel award. *Econometric Theory* **20**, 431-435.
- [61] Randal, J.A. and Thomson, P.J. (2004) Maximum likelihood estimation for Tukey's three corners. *Computational Statistics and Data Analysis* **46**, 677-687.
- [62] Randal, J.A., Thomson, P.J. and Lally, M.T. (2004) Non-parametric estimation of historical volatility. *Quantitative Finance* **4**, 427-440.
- [63] Thompson, C.S., Thomson, P.J. and Zheng, X. (2006) A multisite rainfall generation model applied to New Zealand data. NIWA Technical Report 128, National Institute of Water and Atmospheric Research, New Zealand.
- [64] Keene, M. and Thomson, P.J. (2007) An analysis of tax revenue forecast errors. Working Paper 07/02, New Zealand Treasury, Wellington, New Zealand.
- [65] Thompson, C.S., Thomson, P.J. and Zheng, X. (2007) Fitting a multisite daily rainfall model to New Zealand data. *Journal of Hydrology* **340**, 25-39.
- [66] Sansom, J. and Thomson, P.J. (2007) On rainfall seasonality using a hidden semi-Markov model. *Journal of Geophysical Research* **112**, D15105, doi:10.1029/2006JD008342.
- [67] Sansom, J., Schönhuber, M., Thomson, P.J. and Randeu, W. (2008) Enhancing the physical significance of rainfall breakpoints through two-dimensional video distrometer data. *Journal of Geophysical Research* **113**, D18108, doi:10.1029/2007JD008656.
- [68] Ailliot, P., Thompson, C.S. and Thomson, P.J. (2009) Space-time modelling of precipitation using a hidden Markov model and censored Gaussian distributions. *Journal of the Royal Statistical Society, Series C* **58**, 405-426.
- [69] Thomson, P.J. (2009) Reflections on an econometrics Nobel laureate, personal friend, and a good friend of New Zealand and its econometrics community. *New Zealand Economic Papers* **43**, 229-231.
- [70] Sansom, J. and Thomson, P.J. (2010) A hidden seasonal switching model for high resolution breakpoint rainfall data. *Water Resources Research* **46**, W08510, doi:10.1029/2009WR008602.
- [71] Harte, D.S. and Thomson, P.J. (2010) Towards a robust statistical framework for the assessment of quality of supply by New Zealand electricity networks. Proceedings of the *4th Asia-Pacific International Symposium on Advanced Reliability and Maintenance Modeling* (ed. S. Chukova et al.), McGraw Hill, Taiwan, 672-679.
- [72] Ailliot, P., Thompson, C.S. and Thomson, P.J. (2011) Mixed methods for fitting the GEV distribution. *Water Resources Research* **47**, W05551, doi:10.1029/2010WR009417.
- [73] Sansom, J., Thomson, P.J. and Carey-Smith, T. (2013) Stochastic seasonality of rainfall in New Zealand. *Journal of Geophysical Research* **118**, doi:10.1002/jgrd.50178.
- [74] Carey-Smith, T., Sansom, J. and Thomson, P.J. (2014) A hidden seasonal switching model for multisite daily rainfall. *Water Resources Research* **50**, 1-16, doi:10.1002/2013WR014325.
- [75] Hall, V.B., Thomson, P.J. and McKelvie, S. (2016) On the robustness of stylised business cycle facts for contemporary New Zealand. *New Zealand Economic Papers*, doi: 10.1080/00779954.2016.1189956.

- [76] Sansom, J., Bulla, J., Carey-Smith, T. and Thomson, P.J. (2017) The impact of conventional space-time aggregation on the dynamics of continuous-time rainfall. *Water Resources Research* **53**, 1-18, doi:10.1002/2017WR021074.

Conference Papers

- [1] Narrow band spectral inference (1973). Nottingham-Manchester Time Series Conference.
- [2] The estimation of a signal's characteristics using an array of recorders (1975). Royal Statistical Society Conference on Process Analysis in Industry. (Abstracts published in *JRSS C*.)
- [3] The estimation of a signal's characteristics using an array of recorders (1977). XII New Zealand Mathematics Colloquium.
- [4] Computer reduction of variable star observations (1977) (with A.J. Baldwin). Royal Astronomical Society of New Zealand Conference.
- [5] On the estimation of harmonic components, with application to the variable star S Carinae (1978). 1st Australasian Mathematical Convention.
- [6] Multivariate spectral estimation in the presence of frequency dependent time delays (1978). Eighth Conference on Stochastic Processes and their Applications. (Abstracts published in *AAP*.)
- [7] The evolution of a Keller plan service course (1979). XIV New Zealand Mathematics Colloquium.
- [8] The evolution of a Keller plan service statistics course (1980). 20th Summer Research Institute of the Australian Mathematical Society.
- [9] An analysis of visitor arrivals to New Zealand (1982). Time Series Day organised by the Victoria University Institute of Statistics and Operations Research, DSIR Applied Mathematics and the New Zealand Statistical Association.
- [10] Speech recognition: an application of time series methodology (1982). 6th Australian Statistical Conference.
- [11] A time series analysis of pasture trials data (1983) (with R.M. Pringle). Ministry of Agriculture and Fisheries Biometrics Meeting.
- [12] Introduction to time series analysis (1983) (with R.B. Davies). Conference on Practical Time Series Analysis in Geophysics.
- [13] Further topics about frequency analysis (1983) (with R.B. Davies). Conference on Practical Time Series Analysis in Geophysics.
- [14] Time series and point process models for wave propagation (1984) (with D. Vere-Jones). Meeting on Time Series and Multivariate Analysis organised by the New Zealand Statistical Association.
- [15] Analysis of dispersion across arrays (1984). 7th Australian Statistical Conference.
- [16] Estimating the spectrum of a stationary process sampled at irregular time intervals with reference to oceanographic profiles (1984). Conference on Estimation Theory of Time Series and Related Processes, Kagoshima, Japan.
- [17] Signal estimation using stochastic velocity models and irregular arrays (1986). Time Series Conference; part of the 26th Summer Research Institute of the Australian Mathematical Society.
- [18] Spectral estimation of ARMA processes (1986). Meeting on Econometrics and Time Series Analysis organised by the NZ Association of Economists and the NZ Statistical Association.
- [19] Installing the S statistical package on Unix microcomputers (1986) (with R.D. Brownrigg and B.P. Dawkins). 3rd Annual Conference of the NZ Unix Systems Users Group.
- [20] S: the answer to a NZ statistician's dreams? (1986) (with R.D. Brownrigg and B.P. Dawkins). New Zealand Statistical Association Conference.
- [21] Irregular sampling of stationary processes with reference to oceanographic profiles (1987). New Zealand Mathematics Colloquium.
- [22] Seasonal adjustment of New Zealand's overseas balance of payments series: experiences with X11, SABL and BAYSEA (1987) (with A.G. Gray). New Zealand Statistical Association Conference.
- [23] The spectral analysis of jittered time series (1988). Australian Bicentennial National Mathematical Sciences Congress.

- [24] Comments on robust prediction and seasonal adjustment (1989). NZ Department of Statistics staff training week.
- [25] Transformation and seasonally adjusted trends (1989). Invited paper at the New Zealand Statistical Association Conference.
- [26] S software; past, present and future (1989) (with R.D. Brownrigg, A.G. Bruce and D.J. Donnell). New Zealand Statistical Association Conference.
- [27] On loess and sabl at the ends of series (1990). International S Software Workshop.
- [28] Option pricing: a time series perspective (1990). Guest speaker at a Financial Econometrics Workshop held at the University of Canterbury, New Zealand.
- [29] Option pricing: a time series perspective (1990). Second Pacific Statistical Congress.
- [30] Smoothing algorithms for time series (1991). Invited paper at Statcomp 91.
- [31] Forecasting electricity load duration curves (1991). Invited paper at the 11th national conference of the Australian Society for Operations Research.
- [32] Option pricing: a time series perspective (1991). 11th national conference of the Australian Society for Operations Research.
- [33] Seasonal adjustment: not an easy art (1991). Invited paper presented at the NZ Statistical Association session marking the retirement of the Government Statistician, Steve Kuzmicich.
- [34] Design of filters for seasonal adjustment (1992) (with A.G. Gray). International Workshop on Seasonal Adjustment Method and Diagnostics held at the US Bureau of the Census.
- [35] A dynamical system interpretation of the X-11 model for multiplicative time series (1992) (with T. Ozaki). International Workshop on Seasonal Adjustment Method and Diagnostics held at the US Bureau of the Census.
- [36] Spectral analysis of jittered time series (1992). Symposium on New Directions in Time Series Analysis held at Heidelberg, Germany.
- [37] Using S-PLUS for a large introductory statistics course (1992) (with P.J. Smith). Second International S Software Workshop held near Toulouse, France.
- [38] Transformation and seasonal adjustment (1992). Second International S Software Workshop held near Toulouse, France.
- [39] Seasonal adjustment through dynamical systems (1994) (with T. Ozaki). 62nd Annual Meeting of the Japan Statistical Society.
- [40] Design of moving-average trend filters using fidelity and smoothness criteria (1994) (with A.G. Gray). 154th Annual Meeting of the American Statistical Association.
- [41] Stochastic volatility models, option pricing and mean variance strategies (1994) (with B.J. Blair and L.T. Evans). Invited speaker at a meeting on Risk Theory held at the Mathematisches Forschungsinstitut, Oberwolfach, Germany.
- [42] Design of moving-average trend filters at the ends of series (1995) (with A.G. Gray). US Bureau of the Census Seasonal Adjustment Workshop.
- [43] Seasonal adjustment through dynamical systems (1995) (with T. Ozaki). US Bureau of the Census Seasonal Adjustment Workshop.
- [44] Design of finite moving-average trend filters within seasonal adjustment procedures (1995). Invited speaker at a Workshop on Recent Developments in Time Series Analysis held at the University of New South Wales, Sydney, Australia.
- [45] A comparative study of a new class of end filters within X-12-ARIMA (1995) (with D.F. Findley, A.G. Gray and B.C. Monsell). 50th Session of the International Statistical Institute.
- [46] Design of central moving-average trend filters (1995) (with A.G. Gray). A.C. Aitken Centenary Conference held in Dunedin, New Zealand.
- [47] Design of moving-average trend filters at the ends of series (1995) (with A.G. Gray). A.C. Aitken Centenary Conference held in Dunedin, New Zealand.
- [48] Spectral estimation for jittered time series (1996). Invited speaker at the Workshop on Recent Developments in Time Series and Chaos held in Canberra, Australia.

- [49] On the estimation of trend and seasonal patterns (1996). Invited speaker at the Sydney International Statistical Congress.
- [50] On a family of moving-average trend filters for the ends of series (1996) (with A.G. Gray). Sydney International Statistical Congress.
- [51] On a family of moving-average trend filters for the ends of series (1996) (with A.G. Gray). Invited speaker at the 156th Annual Meeting of the American Statistical Association.
- [52] On constant elasticity of variance (CEV) models and option pricing (1998) (with J.A. Randal and M.T. Lally). Invited speaker in the Financial Applications of Time Series Panel, 14th Australian Statistical Conference.
- [53] On CEV models and option pricing (1998). Invited speaker at a Financial Time Series Workshop, Tokyo.
- [54] On a family of moving-average trend filters for the ends of series (1998). Invited speaker at a Seminar on Seasonal Adjustment Methods, Tokyo.
- [55] A dynamic nonlinear model for multiplicative seasonal time series (1999) (with T. Ozaki). New Zealand Statistical Association 50th Anniversary Conference.
- [56] Fitting hidden semi-Markov models to rainfall precipitation data (2000) (with J. Sansom). Invited speaker at the 15th Australian Statistical Conference.
- [57] Modelling interest rate time series (2000) (with D.S. Upton and M.T. Lally). Invited speaker in a Special Session on Financial Modelling, 15th Australian Statistical Conference.
- [58] Transformation and trend-seasonal decomposition (2001). A Symposium in Honour of David Vere-Jones on the Occasion of his 65th Birthday.
- [59] Non-parametric volatility estimation (2001) (with J.A. Randal and M.T. Lally). Invited speaker at the 2nd International Symposium on Business and Industrial Statistics, Yokohama, Japan.
- [60] Transformation and trend-seasonal decomposition (2001). 53rd Session of the International Statistical Institute.
- [61] Transformation and trend-seasonal decomposition (2002) (with T. Ozaki). Invited speaker at the 3rd International Symposium on Frontiers of Time Series Modeling, Tokyo.
- [62] On business cycle and volatility regime switching models for New Zealand GDP data (2002) (with R.A. Buckle and D. Haugh). 8th New Zealand Econometrics Study Group Meeting.
- [63] On business cycle and volatility regime switching models for New Zealand GDP data (2002) (with R.A. Buckle and D. Haugh). Invited speaker at the 2nd International Conference on Financial Engineering and Statistical Finance, Hitotsubashi University, Tokyo.
- [64] On growth and volatility regime switching models for New Zealand GDP data (2002) (with R.A. Buckle and D. Haugh). 7th Australasian Macroeconomics Workshop.
- [65] Calm after the storm?: supply-side contributions to New Zealand's GDP volatility decline (2002) (with R.A. Buckle and D. Haugh). 7th Australasian Macroeconomics Workshop.
- [66] Growth and volatility regime switching models for New Zealand GDP data: a different look at New Zealand's recent GDP growth (2002) (with R.A. Buckle and D. Haugh). NZ Association of Economists' Conference.
- [67] On growth and volatility regime switching models for New Zealand GDP data (2002) (with R.A. Buckle and D. Haugh). Econometric Society Australasian Meeting.
- [68] Fitting jump diffusion processes using the EM algorithm (2002) (with J. Duncan). Invited speaker at the 16th Australian Statistical Conference.
- [69] Fitting jump diffusion processes using the EM algorithm (2002) (with J. Duncan). 10th New Zealand Econometrics Study Group Meeting.
- [70] Fitting jump diffusion processes using the EM algorithm (2003) (with J. Duncan). Invited speaker at the 3rd International Conference on Financial Engineering and Statistical Finance, Hitotsubashi University, Tokyo.
- [71] A simulation model for future youth justice residential needs (2003) (with A.G. Gray). New Zealand Statistical Association Conference.
- [72] Forecasting classical business cycle turning points at the ends of series using Markov switching models (2003) (with R.A. Buckle). 54th Session of the International Statistical Institute.

- [73] On growth and volatility regime switching models for New Zealand GDP data (2003) (with R.A. Buckle and D. Haugh). Workshop on Point Processes and Reliability Models, Victoria University of Wellington, New Zealand.
- [74] A simulation model for future youth justice residential needs (2003) (with A.G. Gray). 12th New Zealand Econometrics Study Group Meeting.
- [75] Fitting hidden semi-Markov models to breakpoint rainfall data (2003) (with J. Sansom). Invited speaker at the New Zealand Time Series Study Group Workshop, Canterbury University, New Zealand.
- [76] Forecasting classical business cycle turning points at the ends of series using Markov switching models (2004) (with R.A. Buckle). Invited speaker at the 4th International Conference on Financial Engineering and Statistical Finance, Hitotsubashi University, Tokyo.
- [77] Fitting hidden semi-Markov models to breakpoint rainfall data (2004) (with J. Sansom). Invited speaker at the Cherry Bud Workshop *Analysis of natural and social phenomena: data science and system reduction*, Yokohama, Japan.
- [78] Forecasting classical business cycle turning points at the ends of series using Markov switching models (2004) (with R.A. Buckle). Invited session on Financial Modelling, Forecasting, and Applications, 24th International Symposium on Forecasting.
- [79] A non-linear dynamic model for multiplicative seasonal-trend decomposition (2004) (with T. Ozaki). Invited speaker at the Australian Statistical Conference.
- [80] Forecasting classical business cycle turning points at the ends of series using Markov switching models (2004) (with R.A. Buckle). 13th New Zealand Econometrics Study Group Meeting.
- [81] A multisite daily rainfall generation model for New Zealand data (2004) (with C.S. Thompson and X. Zheng). Climate-related risks for energy supply and demand 2004 Workshop, National Institute of Water and Atmospheric Research, Wellington, New Zealand.
- [82] Stochastic models for hydro catchment inflows; an exploratory analysis (2005) (with D.S. Harte and M. Pickup). Invited speaker at the Cherry Bud Workshop 2005 *Quantitative Risk Management: Theory and Practice*, Yokohama, Japan.
- [83] A multisite rainfall generation model applied to New Zealand data (2005) (with C.S. Thompson and X. Zheng). 55th Session of the International Statistical Institute.
- [84] Forecasting exposure and risk from non-payment of washups (2005) (with B. Ward). Invited speaker at the 4th International Symposium on Business and Industrial Statistics, Queensland, Australia.
- [85] From HMM to HSMM: modelling sojourn times (2005). First workshop in the NZIMA Programme *Hidden Markov Models and Complex Systems*, Wanaka, New Zealand.
- [86] Stochastic models for hydro catchment inflows; an exploratory analysis (2005) (with D.S. Harte and M. Pickup). 15th New Zealand Econometrics Study Group Meeting.
- [87] Stochastic models for hydro catchment inflows; an exploratory analysis (2005) (with D.S. Harte and M. Pickup). Climate-related risks for energy supply and demand 2005 Workshop, National Institute of Water and Atmospheric Research, Wellington, New Zealand.
- [88] Hidden Markov models: some examples of their application and reflections on their use (2005). Second workshop in the NZIMA Programme *Hidden Markov Models and Complex Systems*, Wellington, New Zealand.
- [89] A multisite rainfall generation model applied to New Zealand data (2005) (with C.S. Thompson and X. Zheng). Second workshop in the NZIMA Programme *Hidden Markov Models and Complex Systems*, Wellington, New Zealand.
- [90] Hidden Markov models: some examples of their application and reflections on their use (2006). Invited speaker at the Keio University 21st Century COE programme annual conference.
- [91] A multisite rainfall generation model applied to New Zealand data (2006) (with C.S. Thompson and X. Zheng). Invited speaker at the Cherry Bud Workshop 2006 *Building Models from Data*, Yokohama, Japan.
- [92] Hidden Markov models: some examples of their application and reflections on their use (2006). 5th annual winter workshop of the Electric Power Optimization Centre, University of Auckland, New Zealand.

- [93] An analysis of tax revenue forecast errors (2007) (with M. Keene). Invited speaker at the Cherry Bud Workshop 2007 *Interaction through Data*, Yokohama, Japan.
- [94] An analysis of tax revenue forecast errors (2007) (with M. Keene). 17th New Zealand Econometrics Study Group Meeting.
- [95] An analysis of tax revenue forecast errors (2007) (with M. Keene). 56th Session of the International Statistical Institute.
- [96] Hidden Markov models: some examples of their application and reflections on their use (2007). Université de Bretagne Occidentale, France.
- [97] Hidden Markov models: some examples of their application and reflections on their use (2007). Wellington Statistics Group.
- [98] Hidden Markov models: some examples of their application and reflections on their use (2007). Invited speaker at the Workshop on Non-linear and Complex System Analysis (sponsored by NCER, FIRN and QUT), Brisbane, Australia.
- [99] Hidden Markov models for New Zealand hydro catchment inflows: a preliminary analysis (2008) (with D.S. Harte). Invited speaker at the Cherry Bud Workshop 2008 *Discovery through Data Science*, Yokohama, Japan.
- [100] Hidden Markov models for New Zealand hydro catchment inflows: a preliminary analysis (2008) (with D.S. Harte). Climate-related risks for energy supply and demand 2008 Workshop, National Institute of Water and Atmospheric Research, Wellington, New Zealand.
- [101] A hidden seasonal switching model for high resolution breakpoint rainfall data (2008) (with J. Sansom). Australian Statistical Conference.
- [102] Mixed methods for fitting the GEV distribution (2008) (with P. Ailliot and C.S. Thompson). Econometric Society Australasian Meeting.
- [103] A hidden seasonal switching model for high resolution breakpoint rainfall data (2008) (with J. Sansom). Workshop on Hidden Markov Models, Wellington, New Zealand.
- [104] Mixed methods for fitting the GEV distribution (2009) (with P. Ailliot and C.S. Thompson). Invited paper at the Australia-Japan Workshop on Data Science held at Keio University, Yokohama, Japan.
- [105] Space-time modelling of precipitation using hidden Markov models (2009) (with P. Ailliot and C.S. Thompson). 20th Annual Conference of the International Environmetrics Society, Bologna, Italy.
- [106] Fitting jump diffusion processes using the EM algorithm (2009) (with J. Duncan and J.A. Randal). Econometric Society Australasian Meeting.
- [107] Mixed methods for fitting the GEV distribution (2009) (with P. Ailliot and C.S. Thompson). New Zealand Statistical Association Conference.
- [108] Towards a robust statistical framework for the assessment of quality of supply by New Zealand electricity networks (2010) (with D.S. Harte). Invited paper at the Mini Workshop on Leading Edge Data Analysis held at Keio University, Yokohama, Japan.
- [109] A hidden seasonal switching model for high resolution breakpoint rainfall data (2010) (with J. Sansom). Invited paper in the *Semi-Markov chains and hidden models* session of the Fifth International Workshop on Applied Probability held at the Universidad Carlos III de Madrid, Spain.
- [110] Towards a robust statistical framework for the assessment of quality of supply by New Zealand electricity networks (2010) (with D.S. Harte). Fourth Asia-Pacific International Symposium on Advanced Reliability and Maintenance Modeling (APARM 2010), Wellington, New Zealand.
- [111] Using a mixture of estimation methods for fitting the GEV distribution (2011) (with P. Ailliot and C.S. Thompson). Invited paper at a Workshop on Asymptotic Methods in Data Science held at Keio University, Yokohama, Japan.
- [112] A hidden seasonal switching model for multisite daily rainfall (2012) (with T. Carey-Smith and J. Sansom). Invited paper at a Workshop on Stochastic Weather Generators, Roscoff, France.
- [113] A hidden seasonal switching model for multisite daily rainfall (2012) (with T. Carey-Smith and J. Sansom). New Zealand Statistical Association Conference.
- [114] Estimating the slope and standard error of a long-term linear trend fitted to adjusted annual temperatures (2014) (with B. Mullan and S. Stuart). Workshop on Stochastic Weather Generators, Avignon, France.

- [115] Estimating the slope and standard error of a long-term linear trend fitted to adjusted annual temperatures (2014) (with B. Mullan and S. Stuart). New Zealand Statistical Association Conference.
- [116] Estimating the slope and standard error of a long-term linear trend fitted to adjusted annual temperatures (2015) (with B. Mullan and S. Stuart). SEF Econometrics Workshop, Victoria University of Wellington, New Zealand.
- [117] Capturing inter-annual variability in downscaled precipitation using stochastic seasonality (2016) (with T. Carey Smith). *The 13th International Meeting on Statistical Climatology*, Canmore, Alberta.
- [118] An application of climate data science to New Zealand rainfall (2016) (with J. Bulla, T.Carey-Smith and J. Sansom). Invited paper at a special session on Data Science at the annual meeting of the Japan Statistical Society held at Kanazawa, Japan.

Consultancies and contract research reports

I have been consulted on statistical matters by a wide variety of people and organisations, both nationally and internationally. The latter include Alexander Consulting Group Ltd, Aon Consulting New Zealand Ltd, Australian Bureau of Statistics, Booz Allen Hamilton (New Zealand) Ltd, BP Oil NZ Ltd, Commonwealth Bank of Australia, CS First Boston, CSIRO Mathematical and Information Sciences, Electricity Corporation of NZ Ltd, HRL Morrison and Co Ltd, Integral Energy Australia, Invermay Research Centre, Jarden and Co Ltd, Marketplace Company Ltd, Meridian Energy, National Australia Bank, National Institute of Water and Atmospheric Research Ltd, NZ Accident Compensation Corporation, NZ Dairy Board, NZ Department of Child Youth and Family Services, NZ Department of Social Welfare, NZ Educational Institute, NZ Electricity Authority, NZ Electricity Commission, NZ Electricity Networks Association, NZ Institute for the Study of Competition and Regulation, NZ Lotteries Commission, NZ Meteorological Service, NZ Ministry of Housing, NZ Ministry of Social Development, NZ Ministry of Transport, NZ Treasury, NZ Wool Board, Pharmaceutical Management Agency of New Zealand, Russell McVeagh, Statistics New Zealand, Telecom NZ Ltd, Transpower NZ Ltd, Vector Ltd, Wakefield Radiology, W.D and H.O. Wills, and Woods Consulting Group. The basic areas involved in such consultations cover time series analysis, forecasting, financial time series, stochastic modelling, seasonal adjustment, general applied statistics and statistical computing.

I have also taught in-service training courses in time series and forecasting for Accident Compensation Corporation, CSIRO Mathematical and Information Sciences, GNS Science, NZ Treasury, Pharmaceutical Management Agency of New Zealand, Reserve Bank of New Zealand, Statistics NZ and Telecom NZ Ltd. I have taught a graduate time series course at Auckland University from 2000 until 2002, and graduate econometric time series at Victoria University from 1999 until 2005, both under contract. From 1998 to 2002 I supervised a Victoria University PhD student (J.A. Randal) and, between 2005 and 2008, I supervised two postdoctoral students (P. Ailliot and J. Bulla) under the auspices of the NZ Institute of Mathematics and its Applications (NZIMA) Hidden Markov Models and Complex Systems research programme.

My contract research reports include, but are not limited to, the following.

- [1] Analysis of pallet nailing data (1986). Report commissioned by the New Zealand Dairy Board.
- [2] Forecasting coal sales (1986) (with B.P. Dawkins). Report commissioned by Woods Consulting Group.
- [3] Comments on “Regression models of New Zealand Traffic Accident Data” (1987) (with D Vere-Jones). Report commissioned by the New Zealand Ministry of Transport.
- [4] Comments on the Brennan and Schwartz solution algorithm (1987). Report commissioned by Jarden and Co Ltd.
- [5] Number of jackpot weeks (1988) (with B.P. Dawkins). Report commissioned by the New Zealand Lotteries Commission.
- [6] Valuation of convertible bonds (1988). Computer program commissioned by Jarden and Co Ltd.
- [7] Forecasting oil industry sale volumes (1990). Report commissioned by BP Oil New Zealand Ltd.
- [8] Comments on Walker’s model for labour supply (1990) Report commissioned by the New Zealand Treasury.

- [9] Comments on Moffit’s paper “The econometrics of piecewise-linear budget constraints” (1990) (with L.T. Evans). Review commissioned by the New Zealand Treasury.
- [10] Forecasting load duration curves (1990) (with A.G. Bruce and S.R. Jurke). Report commissioned by the Electricity Corporation of New Zealand Ltd.
- [11] Forecasting load duration curves: Stage 2 (1991) (with A.G. Bruce and S.R. Jurke). Report commissioned by the Electricity Corporation of New Zealand Ltd.
- [12] Comments on forecasting procedures (1991). Report commissioned by W.D and H.O. Wills (New Zealand) Ltd.
- [13] Review of Department of Social Welfare benefit forecasting procedures (1991) (with G. Baker and G. Scott). Report commissioned by the New Zealand Department of Social Welfare.
- [14] Review of the Ministry of Education’s bulk funding formula for teachers’ salaries; a statistical perspective (1991). Report commissioned by the New Zealand Educational Institute.
- [15] Analysis of variance tables: model assumptions and methodology (1992) (with D. Vere-Jones). Report commissioned by The Alexander Consulting Group Ltd as part of their “Risk Adjuster” project for the New Zealand Health Reforms Directorate.
- [16] Stochastic processes and time series (1993–1994) (with D. Vere-Jones et al). A large research project funded by the NZ Foundation for Research, Science and Technology (FRST Contract VIC-93-36-039). Contributions to Objectives 1 and 3.
- [17] Review of cloud seeding research papers (1993) (with R.B Davies and D. Vere-Jones). Report commissioned by the Electricity Corporation of New Zealand Ltd.
- [18] Review of Department of Social Welfare benefit forecasting procedures (1993). Report commissioned by the New Zealand Department of Social Welfare.
- [19] Forecasting load duration curves: North and South Islands (1994) (with S.R. Jurke). Report commissioned by the Electricity Corporation of New Zealand Ltd.
- [20] Review of Department of Social Welfare forecasting methodologies (1994). Report commissioned by the New Zealand Department of Social Welfare.
- [21] Estimation of market risk premium (1994) (with L.T. Evans). Report commissioned by CS First Boston.
- [22] Review of the INFOSS system (1995) (with L.T. Evans). Preliminary report commissioned by the Electricity Corporation of New Zealand Ltd.
- [23] Review of the methods used by Statistics New Zealand for the seasonal adjustment of quarterly national accounts (1995) (with A.G. Gray). Report commissioned by Statistics New Zealand.
- [24] Investigation of load duration curve forecasting (1995) (with S.R. Jurke and J. Lermitt). Report commissioned by the Electricity Corporation of New Zealand Ltd and Trans Power NZ Ltd.
- [25] Review of Department of Social Welfare forecasting methodologies (1995). Report commissioned by the New Zealand Department of Social Welfare.
- [26] Comments on ‘The Treatment of Seasonal Commodities in the Consumers Price Index’ prepared by the New Zealand CPI Advisory Committee (1997) (with A.G. Gray). A review for Statistics New Zealand.
- [27] Statistical properties of *ADD* and *ADC* (1997) (with B.P. Dawkins). A review commissioned by the Pharmaceutical Management Agency Ltd (PHARMAC).
- [28] Comments on a trend analysis of petrol importer margins (1997) (with A.G. Gray). Report commissioned by BP Oil New Zealand Ltd.
- [29] Review of the ISM seasonal adjustment research project (1998). Report for the Institute of Statistical Mathematics, Tokyo, Japan.
- [30] Review of the CBA Credit Risk Engine/C-SPARQ II (1999) (with D. Lovell). A review commissioned by the Commonwealth Bank of Australia.
- [31] Review of NAB risk capital methodology (2002). A review commissioned by the National Australia Bank.
- [32] Comments on the TSO statistical methodology (2002) (with A.G. Gray). A commentary commissioned by Telecom New Zealand Ltd.

- [33] Forecasting exposure and risk resulting from non-payment of washups after cessation of trading (2003) (with B. Ward). Report commissioned by the Marketplace Company Ltd.
- [34] A simulation model for future youth justice residential needs (2003) (with A.G. Gray). Report commissioned by the New Zealand Department of Child Youth and Family Services.
- [35] Climate-related risks for energy supply and demand (from 2003) (with J.A. Renwick et al). NIWA research contract funded by the NZ Foundation for Research, Science and Technology (FRST Contract C01X0302). Contributions as subcontractor to Objective 1 *New Zealand rainfall simulation tools*.
- [36] Forecasting exposure and risk resulting from non-payment of washups after cessation of trading: reconfirmation and recalibration of the model (2003) (with B. Ward). Report commissioned by the Marketplace Company Ltd.
- [37] Values at risk for non-payment of washups: an analysis of one participant's washups to December 2003 (2004). Report commissioned by the Marketplace Company Ltd.
- [38] Stochastic models for hydro catchment inflows; an exploratory analysis (2004) (with D.S. Harte and M.L. Pickup). Report commissioned by the New Zealand Electricity Commission.
- [39] Review of NAB methodologies for constructing commodity futures curves (2005) (with Z. Zhu). A review commissioned by the National Australia Bank.
- [40] PHARMAC budget forecasting methodology (2006) (with A.G. Gray). A review commissioned by the Pharmaceutical Management Agency of New Zealand.
- [41] Development of stochastic models for hydro catchment inflows (2006) (with D.S. Harte). Report commissioned by the New Zealand Electricity Commission.
- [42] Hidden Markov models for New Zealand hydro catchment inflows: a preliminary analysis (2007) (with D.S. Harte). Report commissioned by the New Zealand Electricity Commission.
- [43] A review of an analysis of transformer failure rates (2008) (with R.B. Davies). Report commissioned by the New Zealand Electricity Commission.
- [44] Comments on Chapter 8 of the Commerce Commission Discussion Paper *Reset of Default Price-Quality Path for Electricity Distribution Businesses* (2009). Commentary commissioned by the New Zealand Electricity Networks Association.
- [45] Comments on Chapter 7 and Appendix C of the Commerce Commission Draft Decisions Paper *Initial Reset of the Default Price-Quality Path for Electricity Distribution Businesses* (2009). Commentary commissioned by the New Zealand Electricity Networks Association.
- [46] Towards a robust statistical framework for the assessment of quality of supply by New Zealand electricity networks (2009) (with D.S. Harte). Report commissioned by the New Zealand Electricity Networks Association.
- [47] A review of the methodology and models used by the New Zealand Electricity Commission for national electricity demand forecasting (2010). Report commissioned by the New Zealand Electricity Commission.
- [48] A statistical forecasting framework and models for the determination of starting-price adjustments for default price-quality paths (2010) (with T. van Zijl). Report commissioned by the New Zealand Electricity Networks Association.
- [49] An exploratory analysis of the relationship between electricity spot price and hydro storage in New Zealand (2013). Report commissioned by the New Zealand Electricity Authority.
- [50] A seasonal regime switching model for South Island hydro storage (2014). Report commissioned by the New Zealand Electricity Authority.
- [51] Updates of a regression model relating electricity spot price and hydro storage (PH Model) and a seasonal switching model for hydro storage (SH Model) (2018). Report commissioned by the New Zealand Electricity Authority.
- [52] A hidden Markov switching model for Wellington wind farm power generation (2019) (with A. Jiang). Report commissioned by the New Zealand Electricity Authority.