

DEPARTMENT OF STATISTICS Number 2
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CONFERENCE ISSUE

**the
NEW
ZEALAND
STATISTICIAN**



Published by **The New Zealand Statistical Assoc. Inc.**

THE NEW ZEALAND STATISTICIAN

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NOTICES

ANNUAL CONFERENCE

The twenty-sixth annual conference of the New Zealand Statistical Association will be held in the Shell Theatre, Shell House, The Terrace, Wellington on Tuesday & Wednesday, the 8th & 9th of July, 1975. The program and abstracts of the papers appear elsewhere in this issue. A statistics seminar is to be held on the 10th of July and the Demographic Society's conference on the 11th of July. Further details are given in *News & Announcements*.

ANNUAL GENERAL MEETING

This will be held in conjunction with the conference at 11.30 a.m. on Wednesday, 9th of July, in the Shell Theatre.

NOTICE TO CORPORATE MEMBERS

Corporate members of the Association are invited to send representatives to the 1975 Annual Conference. However any such representatives who are not ordinary members are not permitted to vote at the A.G.M. except in the election of the corporate representative on the Executive Committee. The Corporate representative, who must also be an ordinary member of the Association, is elected by the official representatives of the corporate members present (One representative per corporate member, the official representatives need not be ordinary members).

CALCULATOR DISPLAY, 1975

The annual display of electronic calculators will be held on Monday and Tuesday, 7th & 8th July, 1975, at the Hotel St George, Wellington. About 15 companies are expected to participate. Further companies interested in participating should contact the organizer, Mr H.S. Roberts, N.Z. Statistical Association, Box 1731, Wellington.

MODEL ANSWERS

The Association is not producing Model Answers this year. Back numbers for 1970, '72, '72, are still available for the T.C.A. examinations in the subjects: *Mathematics III; Elements of Statistics; Systems & Data Analysis; Applied Statistics II; Computer Methods*. Questions and answers are bound together and may be obtained from the Association (Box 1731, Wellington) or from local book stores for 25 cents each.

MEMBERSHIP OF THE ASSOCIATION

A membership application form is printed on the final page of this issue. The subscription rates for 1975-76 are expected to be —

- (i) Individuals — \$2 a year.
- (ii) Corporate (firm, organization, Government Dept.) — \$8 a year.

Libraries may subscribe to the *Statistician* for \$4 a year.

CHANGE OF ADDRESS

A change of address form also appears on the final page of this issue. Please notify the Association promptly of any change of address.

NEWS AND ANNOUNCEMENTS

Copy for this column should be sent to the Editor.

STATISTICS SEMINAR

Delegates to the Statistics Conference are invited to a mathematical statistics seminar, organized by the Applied Maths Division of D.S.I.R., to be held on Thursday, 10th July, in room 730 of the Rankine Brown Building, Victoria University of Wellington. The provisional program includes lectures by —

- B. Wickham (N.Z. Dairy Board) — Predicting future offspring milk production using field collected data.
- B. Weir (Maths Dept, Massey University) — A charge-state mutations model (a wandering distribution).
- S. Gallot (A.M.D., D.S.I.R.) — Some problems in Markov walks.
- C. Withers (A.M.D., D.S.I.R.) — Approximate power of Chernoff-Savage rank statistics for dependent random variables.

In addition, it is hoped that C.C. Heyde of C.S.I.R.O., Canberra, will be in New Zealand and willing to talk.

N.Z. DEMOGRAPHIC SOCIETY CONFERENCE

This will be held in the Shell Theatre on Friday, 11th of July. The following tentative program has been arranged:

- 8.45 am Welcome by the President
- 9.00 am M.A. Khawaja (Dept. of Statistics) — Cohort Fertility in New Zealand
- 10.45 am D. O'Neill (Dept. of Social Welfare) — Ex-nuptial Births — the Social Implications
- 1.00 pm C.P. Crothers (Dept. of Sociology, V.U.W.) — Limits to Growth
- 2.15 pm Annual General Meeting
- 5.00 pm Cocktails

On Saturday, 12th of July, a *Demographic Workshop* will be held in the conference room of the Easterfield building, V.U.W., starting at 9.00 am. Three subjects have been suggested (to be held concurrently): The economic consequences of slowing population growth; the impact of social welfare benefits on fertility; the pressure of population on resources—fact or fancy.

OPERATIONAL RESEARCH SOCIETY CONFERENCE

This will be held at Victoria University of Wellington on the 21st and 22nd of August, 1975. For further details contact the Secretary, Wellington Branch, N.Z.O.R. Society, Box 904, Wellington.

GROUP ON STRUCTURED SURVEY ANALYSIS

At the recent conference on Statistical Packages considerable dissatisfaction was expressed with the currently available computer programs for the analysis of survey data obtained from even only moderately complicated sampling schemes. A list of people interested in improving the situation is being set up. Anyone not already on the list who wishes to be involved should contact Mr J.H. Jowett, Ministry of Works & Development, Box 12041, Wellington. Mr Jowett is particularly interested in receiving details of experiences with the use of standard statistical packages with the analysis of structured surveys and details of any statistical packages which deal successfully with this problem.

STOP PRESS

The 1975 Calculator Display will be formally opened on Monday, 7th July, at 10.30am by His Excellency, Mr H. Tanaka, Ambassador of Japan.

TWENTY-SIXTH ANNUAL CONFERENCE

Shell Theatrette, The Terrace, Wellington

8-9th July, 1975.

PROGRAM

Tuesday, 8th July

- | | | | |
|----------|-----------------|---|---|
| 9.30 am | E.A. Harris | — | The Statistics Act, 1975. |
| 11.00 am | P.J. Maxwell | — | Technical Design Features of the N.Z. Household Survey, 1973-4. |
| 2.00 pm | D.M. Fergusson | — | The Prediction of Juvenile Offending from Data Collected at Age 10 Years. |
| 3.30 pm | B. Wickham | — | Sire Evaluation Using Selected Records. |
| 5.00 pm | Cocktail Party. | | |

Wednesday, 9th July

- | | | | |
|----------|------------------------|---|--|
| 9.00 am | D.C. Cook & J. Lermitt | | |
| | | — | Forecasting Electricity Consumption. |
| 10.30 am | D. Thompson | — | The Accuracy of Weather Forecasts. |
| 11.30 am | Annual General Meeting | | |
| 2.00 pm | J.H. Maindonald | — | Statistical Computing. |
| 3.30 pm | G.H. Jowett | — | Convenience v. Significance, the Search for a Model. |

ANNUAL GENERAL MEETING

11.30 am, July 9th, 1975.

Shell Theatrette

AGENDA

1. Apologies.
2. Confirmation of Minutes of 25th Annual General Meeting.
3. Matters arising therefrom.
4. Presidential Report.
5. Treasurer's Report.
6. Subscriptions.
7. Election of Officers (President, Secretary, Treasurer, 4 Committee Members, Corporate Representative and Auditor).
8. General.

ACKNOWLEDGEMENT

Once again the Committee wishes to thank Shell Oil (N.Z.) Ltd for allowing the Association free use of the Theatrette, Shell House, for the Annual Conference.

NEW ZEALAND STATISTICAL ASSOCIATION
PRESIDENT'S REPORT FOR THE YEAR ENDED 31 MARCH 1975

Membership

At 31 March 1975 there were 286 ordinary and 46 corporate members, as against 241 and 43 respectively at 31.3.74. There were also 11 library members subscribing to the "Statistician". We thank the corporate members for their continued support.

Committee

The committee met five times. Officers were:

President:	H.R. Thompson (D.S.I.R.)
Secretary:	L.W. Cook (Stats)
Treasurer:	C.W. Walker (Shell)
Committee:	R.L. Allen (Ag. & Fish.) J.E. Jensen (Soc. Welfare) J.H. Maindonald (V.U.W.) T.O.H. Papps (Stats)
Corporate Members Rep:	E.J. Jones (John Eriksen)
Hon. Editor:	R.B. Davies (D.S.I.R.)
Hon. Auditor:	B.W. Kerr

Conference

The 25th Annual Conference was held at the Shell Theatrette on July 9 and 10, 1974 and the Association is grateful to Shell Oil (NZ) Ltd for allowing us its use free of charge. Successful as the presentation of papers was, the highlight was undoubtedly the Anniversary Dinner at the James Cook Hotel. 68 statisticians and others enjoyed an excellent meal and two most entertaining addresses, largely reminiscent, by two foundation members and former Presidents, Professor J.T. Campbell proposing the toast of the Association and Mr I.D. Dick replying.

Calculator Display

The third display was held at the Hotel St George on July 1 and 2, 1974. Unfortunately it was not possible for it to coincide with the Conference, but in every other respect it was more successful than ever, 16 firms taking part and an estimated 2000 people attending on the two days. The display does appear to fill a real need, both for firms and for potential customers, and arrangements are under way to tap the market in Auckland. As at writing this the dates are not finalised, but a display will be organised there later this year in conjunction with the OR Society.

Educational Activities

Many things have happened under this general heading. The Association organised a showing, at the Shell Theatrette, of a film on statistical reliability which was widely publicised and aroused a good deal of interest. As opportunity arises (and suitable films become available) we hope to pursue this type of activity. Prizes for statistical entries at Science Fairs are being offered this year at Auckland, Hawkes Bay and Wellington. The prizes will

be for the best example of an application of elementary statistical (including graphical) methods. The Association is co-sponsoring a seminar on statistical computing to be held at Victoria University in May 1975, and a paper on the topic is being presented at this year's Conference.

"New Zealand Statistician"

As anticipated in my last report, two numbers only were produced in 1974-5, but three are planned for the coming year. It is hoped that statistical computing as a topic will provide a source for several papers. The thanks of the Committee go to Robert Davies for the excellent job he is doing as Editor.

Branch Activities

Although no provision has yet been made in the Constitution for branches, we see no reason not to consider the groups formed in regions other than Wellington as branches. We now have three such, in Hamilton, Christchurch and Dunedin, with varying degrees of activity and a standing offer of financial support from the Association's funds. To our local organisers, John Turner, Brian Easton and David Manley go our thanks for their interest and enthusiasm.

Royal Society

The Association, in response to a Royal Society request for nominations, put forward Steve Kuzmich for a vacancy on the National Committee for Mathematics in an effort to broaden its representation. I am glad to say this was successful. Through the Royal Society we hope to get support for our Secretary to attend the 40th Session of the International Statistical Institute at Warsaw in August. One of the attractions of attendance is an informal meeting of participating executive officers of various Statistical Associations, at which views and ideas will be exchanged about the mutual problem of how to run a statistical society.

Statistics Bill

The Association made a submission to the Minister in charge of the Department of Statistics on the above, and were successful in having a minor change made.

Finance

Cash reserves are up slightly this year, and we anticipate a healthy profit on the 1975 calculator displays. Therefore the committee recommends no change in the current subscription rates.

Acknowledgements

I thank Committee members for their support, and Diane Macaskill for standing in as Secretary. Special thanks are due to Stan Roberts for his untiring work on displays and Model Answers.

H.R. Thompson
President.

FINANCIAL STATEMENT FOR THE YEAR ENDED 31st MARCH 1975
STATEMENT OF RECEIPTS AND PAYMENTS

	Receipts 1974-75		Payments 1974-75
Balance at 1.4.74			(1973-74)
In hand	17.67		
In bank	<u>409.81</u>		
Subscriptions			
Individual	478.00		
Corporate	<u>320.00</u>		
		798.00	(602.00)
NZ Statistician			
Sundry	—		
Subscriptions	<u>40.00</u>		
		40.00	(57.00)
Annual Conference			
25th Anniv. Dinner		—	(36.82)
Calculator Display		490.00	(—)
Model Answers		1200.00	(703.00)
Sundry		124.17	(145.07)
Interest		.80	(—)
		19.09	(16.12)
			Balance at 31.3.75
		5.49	
		<u>565.06</u>	(427.48)
			In bank
		<u>\$3099.54</u>	(2028.23)
			In hand
		<u>\$3099.54</u>	(2028.23)

INCOME AND EXPENDITURE ACCOUNT

	Expenditure 1974-75	(1973-74)	Income 1974-75	(1973-74)
NZ Statistician	565.73	(795.30)	Subscriptions	798.00
Annual Conference	16.85	(78.14)	Calculator Display	566.11
Loss on Anniv. Dinner	156.85	(—)	Interest	19.09
Royal Society	41.78	(20.00)	Sundry	0.80
Model Answers			(Excess of Expenditure	
Sales of Answers	124.17		over Income)	(35.74)
Less Cost of Sales	<u>452.37</u>			
Loss on Answers	328.20	(161.93)		
General	91.52	(92.94)		
Excess of Income over Expenditure	<u>183.07</u>	(—)		
	<u>\$1384.00</u>	(1148.31)		<u>\$1384.00</u>
				<u>(1148.31)</u>

BALANCE SHEET
as at 31 March 1975

	(1973-74)	Assets 1974-75	(1973-74)
Accumulated Funds (1.4.75)	672.48	Cash at Bank and on hand	570.55
Excess of Income over Expenditure	183.07	Stock of Model Answers valued @ lower of cost or selling price	285.00
	<u>\$855.55</u>		<u>285.00</u>
	<u>(672.48)</u>		<u>(672.48)</u>

AUDITOR'S REPORT

To the Members of the New Zealand Statistical Association (Inc.) —
I have examined the Receipts and Payments Account and the Income and Expenditure Account for the year ended 31 March 1975 and the Balance Sheet as at that date. I have received all the explanations I have required and in my opinion proper books of account have been kept. The annual accounts and balance sheet, in my opinion give a true and fair view of the results for the year and of the financial position of the Association at the year end.

B.W. Kerr, A.C.A.N.Z.,
Auditor

ABSTRACTS OF PAPERS

THE STATISTICS ACT 1975

E. A. Harris, Government Statistician

The work of a ministerially established advisory committee and their investigations of overseas practices have contributed substantially to this new law governing official statistics. Much of what is new in the enactment is contained in the first part. It makes all official statistics subject to the Act irrespective of the department collecting; imposes a reporting system on all government departments as well as a system of approval by the Minister of Statistics for all statistical surveys; provides for periodical reviews, joint collections, and meetings of statisticians and users and generally makes effective the traditional co-ordinating role of the central statistical organisation.

The Minister, now with portfolio, once he has approved surveys to be carried out by the Statistician will by law guarantee the Statistician's independence, replacing a system of administrative arrangements that was calculated to achieve the same position.

Throughout the enactment, it is acknowledged that suppliers of information are the public and their institutions, that they are entitled to some protection from excessive demands of official information gatherers and as they are also users they are further entitled to expect an efficient statistical system that produces high quality statistics in a timely way with a lessening of demands.

In every developed country whose legislation has been examined, the central statistical office has a strong, effective co-ordinating role and it seemed that one of the main purposes of that role was to reduce the demands on suppliers, generally the private sector, for information. With the reduced numbers of surveys and the greater degree of integration of questionnaires, the results become more unified, nationwide standards tend to be adopted, and integrated statistics result, making them much more useful for policy recommendations and evaluations.

Since that first enactment of 1840, New Zealand's legislation governing official statistics has endeavoured to keep pace with the needs of our society. The new Act is in this tradition, replacing the 1955 based legislation which had clearly become inadequate, outdated and uncertain in effect when the implications for the collection and use of statistics, of the continuing information revolution were considered.

TECHNICAL DESIGN FEATURES OF THE NEW ZEALAND HOUSEHOLD SAMPLE SURVEY 1973-1974

P. J. Maxwell, Dept. of Statistics

The New Zealand Household Sample Survey was designed to meet three basic objectives in its first year of operation. These were:

(a) to provide as its primary aim expenditure information for use in the revision of current and future Consumer Price Indexes;

- (b) to provide as a secondary aim income and expenditure information for use in preparing the System of National Accounts; and
- (c) To provide in addition socio-economic information on households.

The survey was based on a geographically stratified, multi-staged sample of 4600 New Zealand households. The information was collected in personal interviews of household members and by expenditure diaries kept by the householders over a two week period.

The paper will cover those areas of the technical sample design and selection in which the author was involved. However, some description and discussion of the survey's objectives, organisation and methodology will be included.

THE PREDICTION OF JUVENILE OFFENDING FROM DATA COLLECTED AT AGE 10 YEARS

D.M. Fergusson, Dept. of Social Welfare

The paper discusses the results of an attempt to predict juvenile offending by the age of 16 years from data collected at age 10 years. A number of prediction methods are examined and the level of prediction achieved is shown to be low but statistically significant. The uses of the results are discussed and some brief consideration is given to the ethical problems of making statistical predictions of such behaviours as juvenile delinquency. It is concluded that when the power of a prediction instrument is low the instrument should be used to provide information about the prior risk of any child becoming an offender but should not be used for making strict predictions.

SIRE EVALUATION USING SELECTED RECORDS

B. Wickham, N.Z. Dairy Board

The daughters of a bull which have second lactations are a selected sample of those having first lactations. To some extent the selection is correlated both with first and second lactation production. The bias in a sire evaluation which assumes no selection is evaluated for an assumed selection model. These biases are estimated for a large data set consisting of 250,916 second lactations from the daughters of 1109 Holstein Bulls used through artificial insemination in the North Eastern United States.

Because selection is not intense the biases are small and it is concluded that they can safely be ignored in sire evaluation programs.

FORECASTING ELECTRICITY CONSUMPTION

D.C. Cook & R.J. Lermit, N.Z. Electricity Dept.

The methods used for electricity forecasting depend on the length of time over which forecasts are required. Thus, for a period of 10 years, for which forecasts are required for planning increases in system capacity, growth of electricity is related to the expected growth of the economy with the inclusion of some elements of market analysis to identify the changes taking place. For the very short term, looking forward a few hours for operational purposes, simple methods

capable of very rapid solution are preferred and these tend to be most successful when pro-
 vision is made for adaptive changes depending on the experience of the operator.

This paper describes a method of forecasting consumption on a weekly basis to give
 reasonably accurate forecasts for a few weeks ahead. It is this area which seems most
 amenable to rigorous statistical analysis. The method is designed to account for fluctuations
 due to seasonal changes, temperature variations and holidays. It has proved useful in
 producing forecasts used as guidelines for electric supply authority consumption, detecting
 meter and data recording errors and just as importantly gives an insight into the effect of
 external conditions such as weather and holidays.

The basis of the method is a linear regression model giving parameters for the various
 components. Currently there are ten Fourier components representing seasonal variation,
 six temperature correction terms and seven holiday terms in addition to constant and growth
 terms. There are also terms to allow for mandatory restrictions. A simple linear regression
 model has not proved satisfactory, since, in practice, the parameters vary slowly over time
 e.g. a swing toward electric heating can change the temperature coefficients markedly and an
 allowance must be made for this.

The form of the model is thus —

$$\log Z_t = \sum a_i(t) f_i(t) + E_t$$

where Z_t is the load at time t

E_t is the error

$[f_i(t)]$ a set of fitting functions

$[a_i(t)]$ a set of parameters varying with time.

The parameters must "adapt" to the changing model. This is done by adjusting the
 parameter sets according to the residual error. If there is a residual of E_t at time t this may
 be eliminated by adjusting the parameters to $a_i(t) + d_i(t)$

where $d_i(t) = f_i(t) E_t / \sum f_i^2(t)$

This choice of adjustment minimises $\sum [d_i(t)]^2$.

Since some of the error is random variation and some is a genuine change in the model the
 correction is of the form —

$$a_i(t+1) = a_i(t) + \theta_i f_i(t) E_t / \sum f_i^2(t)$$

This results in a non-linear optimisation problem, the method used to solve it, a variation of
 the Newton Gauss method, will be discussed.

THE ACCURACY OF WEATHER FORECASTS

D.C. Thompson, New Zealand Meteorological Service

Due to the basically unstable properties of the atmosphere it is inevitable that weather
 forecasts will not always prove correct. In addition to the incidence of meteorologically

incorrect forecasts, the value of a series of forecasts to an individual is strongly dependent on factors relating to that individual. These include the interpretation he is able to make of those aspects of the forecasts which concern him, the action he takes on these interpretations, and the benefits or losses resulting from the relation of these interpretations to the subsequent weather. It is therefore not possible to derive a simple measure of accuracy that is appropriate to all users, yet such a measure would be invaluable for such purposes as monitoring forecast quality, comparing different techniques, or comparing forecasts for different regions.

The paper will elaborate on these problems for various kinds of forecasts, and discuss various measures of accuracy that have been used. The results of actual analyses of weather forecasts will be described (bearing in mind the limitations) with special emphasis on a recent study of precipitation forecasting in New Zealand over a 19-year period.

STATISTICAL COMPUTING

J.H. Maindonald, Victoria University of Wellington

Different computer users, all with similar tasks to perform, ought to be able to co-operate in using the same programs. In that way the major part of the development and testing can be done thoroughly, once and for all, near the beginning of the life of each program. The argument makes, or ought to make, very good sense to the fortunate computer user whose problem is such that he can take advantage of the herculean efforts which have gone to producing a really good program. Such programs do perhaps exist! But how do first rate programs get written in the first place?

There are various ways in which provision can be made for the variety of user needs. One may provide a suite of programs, which the user can link together as he will, or alternatively there may be a suite of subprograms within one master program. In either case we have a *package*. A package of the first sort, which requires the user to provide his own string, will be known as *program library*, while a package which functions as a single program may be referred to as a *system*.

Muxworthy (1974) provides a convenient brief list of points relevant to the assessment of any statistical package.

These are:

Ease of use	Standard of maintenance
Accuracy	Cost of maintenance
Reliability	Ease of maintenance
User documentation	Availability on different computers
Data handling	Ease of implementation
Range of analyses	Ease of user support
Efficiency	

An attempt will be made to assess some currently available statistical packages in the light of such criteria. Attention will be drawn to some of the benefits and to some of the dangers which result from the widespread availability of packages with sophisticated statistical analysis capabilities. A final point concerns the interplay between developments in

methodology and their implementation in statistical programs and packages. It is in this connection that Yates (1966) has some very interesting comments to make regarding the use (or non-use) of log-linear models in the analysis of multiway tables of frequencies:

"This procedure is almost unknown. Failure to develop it is, I think, mainly due to the prohibitive computational labour on desk calculators; though perhaps obsession with the idea that the right way of handling multi-way tables of frequencies is by chi-squared is a contributory cause. The computational problem can easily be resolved on a computer. . . ."

Interestingly, this particular computational problem has only very recently (1974) been resolved in a thoroughly satisfactory way, with the first release of the GLIM General Linear Model system which has resulted from the efforts of a Royal Statistical Society Working Party under J.A. Nelder.

References:

- Muxworthy D.T. (1974). A Review of Some Statistical Packages. Bulletin of the Inst. Math. Appl. 10, 171-174.
Nelder, J.A. (1974). GLIM Manual, Release 1. RSS and Numerical Algorithms Group. (Order from NAG, 13 Banbury Rd, Oxford OX2, 6NN)
Yates, F. (1966). Computers: the second revolution in statistics. (The First Fisher Memorial Lecture.) Biometrics 22, pp 233-251.

CONVENIENCE v. SIGNIFICANCE – THE SEARCH FOR A MODEL

G.H. Jowett, Invermay Agricultural Research Centre

Sometimes models that are scientifically respectable are troublesome in the fitting either because of inconvenient structure (eg non-linearity) or because the models themselves are insufficiently complete. On the other hand, models that are convenient to fit or adequate as a description of data may have unwarranted implications and defy scientific interpretations. Similar remarks apply to the thought processes of the scientists involved. Illustrations of the dilemma will be drawn from situations involving the fitting of growth and response data in some medical and agricultural applications.

LIST OF NEW MEMBERS

ORDINARY MEMBERS

NAME	OCCUPATION	ADDRESS
M.E. Ball	Statistician	AMD, C/- D.S.I.R., P.O. Box 8030, WELLINGTON.
C. Bishop	Biometrician	26 Upton Terrace, WELLINGTON.
I.W. Black	Director/Engineering N.Z. Army	36A Kopara Grove, Stokes Valley, LOWER HUTT.
D. Brooke-Taylor		NZ Electricity Department, Private Bag, WELLINGTON.
P. Brown	Asst. Research Officer	8 Braithwaite Street, Karori, WELLINGTON.
P.E. Bull	Ph D Student	R.D. 3, HAMILTON.
A.J. Cooper	O/R Analyst	N.Z. Forest Products Ltd, Private Bag, TOKOROA.
J.D. Coulter	Meteorologist	C/- Meteorological Office, P.O. Box 722, WELLINGTON.
J.W. Davies	Teacher	10 Raglan Street, WYNDHAM.
D.J. Davey	Applied Economist	Wellington Polytechnic, WELLINGTON.
G.E. Dunn	Research Statistician	Flat 4A, Herbert Gardens, 186 The Terrace, WELLINGTON 1.
F.C. Durling	Senior Lecturer in Statistics	Department of Mathematics, University of Waikato, HAMILTON.
E. Emerson		C/- Research Section, Dept. of Social Welfare, Private Bag, WELLINGTON.
R.E. Fergusson	Operations Research	N.Z. Forest Products Ltd, Private Bag, TOKOROA.
K.A. Fisher		Fisheries Research Division, Ministry of Agriculture and Fisheries, P.O. Box 19.062, WELLINGTON.
C.R.N. Fisk		Dept. of Trade and Industry, Private Bag, WELLINGTON.
F.H. Foster	Chief Health Statistician	National Health Statistics Centre, P.O. Box 6314, WELLINGTON.

NAME	OCCUPATION	ADDRESS
A.D. Grey		Dept. of Statistics, Private Bag, WELLINGTON.
S. Gibbons	Asst. Research Officer	13 Hungerford Road, Lyall Bay, WELLINGTON.
D. Halpert	Asst. Research Statistician	30 Ranelagh Street, Karori, WELLINGTON.
D. Hannan		Dept. of Statistics, Private Bag, WELLINGTON.
J.A. Harrayay	University Lecturer	Mathematics Department, University of Otago, P.O. Box 56, DUNEDIN.
H.V. Henderson	Student	5 Awarua Crescent, HAVELOCK NORTH.
W.S.A. How	Computer Programmer	P.O. Box 4123, AUCKLAND 1.
D.S. Hunter	Senior Research Officer	33 Matatiro Street, Titahi Bay, PORIRUA.
I.D. Jackson	Technical Analyst	13 Lendic Avenue, Henderson, AUCKLAND 8.
C.E. Jeffcoat	Lecturer	Economics Department, Victoria University, Private Bag, WELLINGTON.
R.J.W. Jeffery	Mathematics Master	10 Spencer Street, WELLINGTON 4.
D.L. Johnson		Ruakura Animal Research Centre, Private Bag, HAMILTON.
J.A. Jordan	Administrator, Wellington Polytechnic	28 Dale Road, RAUMATI SOUTH.
M. Jorgensen	Biometrician	Ministry of Agriculture & Fishes, P.O. Box 1500, WELLINGTON.
G.A.M. King		Physics and Engineering Lab, D.S.I.R., Private Bag, GRACEFIELD.
H.J. Langer		Botany Department, University of Canterbury, CHRISTCHURCH.
R.J. Lewington	Statistician	9 Pembroke Road, Northland, WELLINGTON 5.
R.A. Litter	Lecturer in Mathematics	Department of Mathematics, University of Waikato, HAMILTON.

NAME	OCCUPATION	ADDRESS
H.A. Lucas	Student	7 Moor Avenue, Te Atatu, AUCKLAND 8.
R. McCammon	Geologist	New Zealand Geo. Sur. C/- Post Office, University of Canterbury, CHRISTCHURCH.
G.B. McRae	Lecturer	Economics Department, University of Waikato, HAMILTON.
A.M. Neilson	Economist	33 Powells Road, HAMILTON.
F. Nolan	Student	2A Gladstone Terrace, WELLINGTON.
B.A. Nordmark	Research Associate	NZ Co-op. Dairy Co. Ltd, P.Q Box 459, HAMILTON.
R.A. Palmer	Scientist	Chemistry Division, D.S.I.R., Private Bag, PETONE.
J.A. Pendleton	Food Technologist	11 Barfield Place, PALMERSTON NORTH.
I. Plunket	Biometrician	Levin Horticultural Research Centre, Ministry of Agricultural & Fisheries, Private Bag, LEVIN.
S. Pomeroy		59 Rhine Street, WELLINGTON 2.
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BOOK REVIEWS

COX, D.R. & D.V. HINKLEY. *Theoretical Statistics*, Chapman & Hall, 1974.

Standard statistical procedures are treated from a relatively advanced viewpoint. The coverage is remarkably complete, if one leaves aside multivariate methods and time series analysis, which get only passing mention. If you want information on the properties of and rationale for one or another commonly used estimate or test statistic—eg the Poisson index of dispersion, the Kolmogorov-Smirnov statistics, one or other rank test—then this is a good place to start looking. Detailed theoretical discussion is always preceded by a careful account of the practical considerations and the general background of ideas which have lain behind the theoretical formulations. Detailed bibliographic notes add further to the book's usefulness.

Four broad approaches to statistical theory are described, via sampling theory, via likelihood theory, via Bayesian theory, and via Decision theory. These are seen as complementary rather than as competing approaches. Speaking specifically of the form of Bayesian analysis which uses subjective probabilities based on betting behaviour, the authors say

For the initial stages of the careful interpretation of data, the approach is, in our opinion, inapplicable because it treats information derived from data as on exactly equal footing with probabilities derived from vague and unspecified sources. For the later stages of an analysis, and, more importantly, in situations where the amount of satisfactory data is small, the approach is likely to be sometimes valuable ...

The authors go on to make a comment which is further indicative of their outlook

At a more theoretical level it is always instructive to compare solutions of related problems obtained by different approaches or under somewhat different assumptions. From this point of view Bayesian theory is both interesting and valuable.

The carefully and simply written account of *Pure Significance Tests* should be read by anyone who, in an elementary course, intends to use that approach to inference. The accounts provided of other approaches are no less illuminating.

An appendix provides an admirable brief discussion on *Determination of Probability Distributions*. It is especially relevant to the research mathematician who finds himself working at a problem of this type for the first time.

DAHLQUIST, G. & A. BJORCK. *Numerical Methods*
(translated from the Swedish by Ned Anderson), 1974. Prentice-Hall.

The publisher's blurb described this as *An exciting and lucid presentation of the theories vital to the design and practical application of numerical algorithms, including many topics not treated in other books on the subject.*

Certainly this is an impressive book. The discussion is tied, in a way that gives it an unusual practical relevance, to actual Fortran and Algol algorithms, adapted for use on real live computers. For a statistician who wants to learn some numerical analysis it is vastly superior to any other numerical analysis text that I have seen. The account of numerical

linear algebra is as state-of-the-art as one would expect, and the book is unusual both in the adequacy of the discussion which it contains of methods for positive definite matrices and the description of the practical means whereby, in many instances, matrix inversion can, with advantage, be avoided.

Brief discussions of the use of splines, of the Fast Fourier transform, and of the Monte Carlo method and Simulation, are all of potential interest to the statistician. I suspect that other topics, on the adequacy of whose treatment I am not competent to judge, are equally well handled.

J.H. Maindonald.

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