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THE AUSTRALIAN NATIONAL UNIVERSITY

FACULTY OF ECONOMICS

DEPARTMENT OF STATISTICS

ANNUAL REPORT 1969

Staff:

- Professor - E.J.Hannan, B.Com.(Melb.), Ph.D.
- Readers - C.R.Heathcote, B.A.(W.Aust.), M.A.(Melb.), Ph.D.
C.C.Heyde, M.Sc.(Syd.), Ph.D.
- Senior Lecturers - S.John, B.Sc.(Trav.), M.Sc.(Kerala),
Ph.D. (Indian Stat. Inst.)
P.Winer, B.Sc.(Rand)
- Lecturers - J.H.T.Morgan, B.A.(Cantab.), M.Sc.(Case Inst.Tech.)
N.F.Nettheim, B.Ec.(Syd.), M.Ec.,Ph.D.(Stanford)
(to 23.6.69.)
E.Seneta, M.Sc.(Adel.), Ph.D.
R.D.Terrell, B.Ec.(Adel.)
- Wool Board Fellow - H.I.Toft, B.Com., B.Ec.(Qld.)
- Research Assistant - B.L.Allen, B.Sc.(W.Aust.) (from 10.2.69.)
- Research Assistant (Wool Board Funds) - D.M.Dancer, B.A. (to 1.8.69.)
J.J.Kelleher (from 28.7.69.)
- Temporary Senior Tutor - N.F.MacNally, B.Sc.(Lond.)

Introduction:

The Statistics Department is concerned with teaching and research in probability and statistics, including operational research. Thus it is concerned with the study of systems in whose behaviour chance plays a major part. Somewhat uniquely it is responsible for all teaching in the subject both to economists and to students in Arts and Science, those students coming from the two last named faculties including students whose interests are primarily mathematical.

Research has been substantially concerned with the theory and application of stochastic processes (systems whose behaviour through time is governed by chance laws). This research has included some very theoretical work but has also covered what is usually called time series analysis and some rather applied theories (for example stochastic processes associated

with road traffic problems). The theory of stochastic processes has a close association with the deepest parts of probability theory and also has a wide application in industry (queueing and renewal theory), in natural science (genetics, communication systems, control theory), in social science (analysis of economic time series) and has a profound mathematical content.

In addition research in econometrics, classical statistics (especially multivariate analysis) and operational research has been successfully carried out.

Teaching Programme 1969:

Details of examination results are given in a table on page 6. Failure rates for those students sitting for the final examination are given below.

Failure Rates, %

	Statistics I	Statistics II	Statistics III	Operational Research
1966	34	36	20	-
1967	33	29	0	-
1968	23	26	36	27
1969	18	25	6	9

As was pointed out in 1968 the failure rate in Statistics I fell in that year, probably because of the institution of a mid year examination. The publication of the results of that examination caused students to withdraw. In 1969 the rate of withdrawal fell, probably significantly, but the rate of failure of those attempting the final examination also fell. This last fall was not significant but might well have represented a real effect. There was certainly no intention to lower the examination standard and because of the lack of significance of the change we did not, therefore, feel entitled to raise the pass mark. The changes in the failure rates in Statistics III and Operational Research are for small classes (under 20) and are probably due to chance.

In 1969 both Statistics II and III were subdivided into separate pass and honours courses during much of the year. Because of requests from students some additional weight was given to assignments in Statistics III. The honours class in Statistics II was of high standard.

The department was supervising 8 graduate students at the thesis level during 1969 of whom 5 were proceeding to a Ph.D. and 3 to a Masters degree. 4 of these will have submitted theses by early 1970.

Staff and Student Participation in Departmental Affairs:

During the year a number of evening meetings were held with students, all students being given a chance to attend. About 5% to 10% did so. Of course a high proportion of students in the department are taking only Statistics I as a terminal unit and do not regard statistics as a main interest. In 1970 it is intended to appoint one staff member (Mr P.Winer) as "Ombudsman".

A system of regular meetings with staff was instituted, the first meeting being held in November. The future development of the department was discussed at length.

During the year Dr N.F.Nettheim resigned. So far he has not been replaced but in 1970 Mr M.Westcott (at present a Ph.D. student in the Department of Statistics at the Institute) will take his place.

Publications:

- Hannan, E.J. Least squares efficiency for vector time series. Journal of the Royal Statistical Society, 30, 1968, 490-498.
- Hannan, E.J. The identification of vector mixed autoregressive-moving average systems. Biometrika, 56, 1969, 223-225.
- Hannan, E.J. Fourier methods and random processes. Bulletin of the International Statistical Institute, 42, 1969, 475-494.
- Hannan, E.J. Fourier methods and linear models. Australian Journal of Science, 32, 1969, 171-175.
- Hannan, E.J. A note on an exact test for trend and serial correlation. Econometrica, 37, 1969, 485-489.
- Heathcote, C.R. An expansion related to the central limit theorem. Journal of the Australian Mathematical Society, 10, Parts 1,2, 1969, 219-230.
- Heathcote, C.R. and Winer, P.[‡] An approximation for the moments of waiting times. Operations Research, 17, No.1, 1969, 175-186.
- Heyde, C.C. On extremal factorization and recurrent events. Journal of the Royal Statistical Society, B, 31, 1969, 72-79.
- Heyde, C.C. A derivation of the ballot theorem from the Spitzer-Pollaczek identity. Proceedings of the Cambridge Philosophical Society, 65, 1969, 755-757.
- [‡] A member of the Department of Statistics, SGS.

- Heyde, C.C. Some properties of metrics in a study on convergence to normality. Z. Wahrscheinlichkeitstheorie, 11, 1969, 181-192.
- Heyde, C.C. On a fluctuation theorem for processes with independent increments. Annals of Mathematical Statistics, 40, 1969, 688-691.
- Heyde, C.C. On the maximum of sums of random variables and the supremum functional for stable processes. Journal of Applied Probability, 6, 1969, 419-429.
- Heyde, C.C. A note concerning behaviour of iterated logarithm type. Proceedings of the American Mathematical Society, 23, 1969, 85-90.
- Heyde, C.C. and Heyde, Elizabeth.[‡] A stochastic approach to a one substrate one enzyme reaction in the initial velocity phase. Journal of Theoretical Biology, 25, 1969, 159-172.
- John, S. A central tolerance region for the multivariate normal distribution. Journal of the Royal Statistical Society, B, 30, 1968, 599-601.
- John, S. On multivariate ratio and product estimators. Biometrika, 56, 1969, Part 3.
- John, S. and Kleinbaum, D.G.[‡] A table of percentage points of the smallest latent root of a 2×2 Wishart matrix. University of North Carolina Institute of Statistics, Mimeo Series No. 619.
- John, S. and Kleinbaum, D.G.[‡] A central tolerance region for the multivariate normal distribution II. University of North Carolina Institute of Statistics, Mimeo Series No. 620.

[‡] A member of the Department of Biochemistry, J.C.S.M.R.

[‡] Not a member of this University.

- Seneta, E. On asymptotic properties of subcritical branching processes. Journal of the Australian Mathematical Society, 8, 1968, 671-682.
- Seneta, E. On recent theorems concerning the supercritical Galton-Watson process. Annals of Mathematical Statistics, 39, 1968, 2098-2102.
- Seneta, E. The principle of truncations in applied probability. Commentationes Mathematicae Universitatis Carolinae, 9, 1968, 237-242.
- Seneta, E. Functional equations and the Galton-Watson process. Advances in Applied Probability, 1, No.1, 1969, 1-42.
- Seneta, E. Some second-order properties of the Galton-Watson extinction time distribution. Sankhya, A, 31, Part 1, 1969, 75-78.
- Seneta, E. On Koenigs' ratios for iterates of real functions. Journal of the Australian Mathematical Society, 10, Parts 1,2, 1969, 207-213.
- Anderssen, R.S.^{¶1} and Seneta, E. A new analysis of the geomagnetic D_{st} field of the magnetic storm on June 18-19, 1936. Journal of Geophysical Research, 74, 1969, 2768-2773.
- Mandl, P.⁺ and Seneta, E. The theory of non-negative matrices in a dynamic programming problem. Australian Journal of Statistics, 11, No.2, 1969, 85-96.
- Seneta, E. and Vere-Jones, D.^{¶2} On a problem of M. Jiřina concerning continuous state branching processes. Czechoslovak Mathematical Journal, 19, 1969, 277-283.

¶1 A member of the ANU Computer Centre.

¶2 A former member of the Department of Statistics, RSSS, IAS.

+ Visiting Research Worker.

THE AUSTRALIAN NATIONAL UNIVERSITY

DEPARTMENT OF STATISTICS ANALYSIS OF STUDENT PERFORMANCE

1 Subject or unit	2 Enrolled as at 30.6.69.	Percentage of Number Enrolled			6 High Distinction	Percentage of Number Sitting			10 Pass	11 Fail	
		3 Wastage (i.e. 2-5)	4 Wastage plus failure (i.e. 3+11)	5 Sitting		7 Distinction	8 Credit	9 Pass with Merit			
Stats I	No.	301	73	114	228*	1	5	8	31	141	41
	%	100	24	38	76	0.5	2	4	14	62	18
Stats II	No.	60	18	33	42	0	0	0	2	25	15
	%	100	30	55	70	0	0	0	5	60	36
Stats IIH	No.	17	0	0	17	2	5	2	0	8**	0
	%	100	0	0	100	12	29	12	0	47	0
Stats III	No.	19	5	6	14	0	0	0	3	10	1
	%	100	26	32	74	0	0	0	21	71	7
Stats IIIH	No.	5	0	0	5	0	2	0	0	3	0
	%	100	0	0	100	0	40	0	0	60	0
Operational Research	No.	24	1	0	23	0	3	3	6	9	2
	%	100	4	0	96	0	13	13	26	39	9

	Enrolled (as at 30 June 1969)	Sitting	Results
Final Honours	0	0	0
Masters Qualifying	2	2	2 fail.
Masters Degree	6	2	1 fail, 1 result to come, 1 withdrew.
Ph.D.	4	1	Result to come.

* One student of these 228 is to be further examined by a special examination in February.

** One of these students was recorded as having passed at the ordinary (and not honours) level.

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