ARTICLES AND PAPERS OF ACTUARIAL INTEREST

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The Lancet, Vol. 268, 1955, Part i, pp. 343, 395, 445, 499, 554

HEADY, J. A., DALY, C., MORRIS, J. AND STEVENS, C. F. *Social and Biological Factors in Infant Mortality.*

A series of articles reporting an inquiry into the stillbirths and infant deaths of 1949 and 1950 in England and Wales. This inquiry describes the contemporary range of mortality rates and uses the lowest to indicate a goal which can be achieved in the present state of medical knowledge. 'Vulnerable' groups with particularly unfavourable rates are defined in various biological and social terms—age, family size, social class, occupation of father—and the effects of each are separated as far as possible. The persistence of social class differences in mortality indicates that there is a time lag before the effect of social improvements is shown in lighter mortality.

Biometrika, Vol. 42, Parts 1 and 2, June 1955

DAVID, F. N. *Studies in the History of Probability and Statistics. I. Dicing and Gaming.*

This is the first of a series of articles dealing with the history of probability and statistics. It is concerned with dicing and gaming from the earliest times until about the middle of the seventeenth century. The contributions of Cardano and Galileo to probability theory are mentioned, and the author concludes that Huygens was the first to crystallize the ideas of mathematicians on this subject and thereby earned the right to be regarded as its father.

Population Studies, Vol. 8, No. 3, March 1955

BENJAMIN, B. *Quality of Response in Census Taking.*

The paper discusses sources and methods of evaluation of errors in census data and gives a preliminary account of the size and direction of errors so far revealed by analysis of the 1951 Census schedules, with special reference to the new topics introduced for the first time in 1951, e.g. school-leaving age and household arrangements. The value of pre-census sampling trials for testing concepts and definitions is stressed.

New Biology, No. 18, April 1955

COMFORT, ALEX. *The Biology of Old Age.*

This article is written in popular style but is nevertheless a serious discussion of the biological meaning of senescence and of the difference between the length of life and the quality of survival—a difference which

is of considerable economic importance. The removal of successive causes of death has not produced the increase in the average age at death which would be expected to follow. Most people who die late in life from a specific cause also exhibit several other disease processes which would probably have killed them very soon had they survived the actual cause of their death. This developmental problem has to be solved in achieving a general prolongation of active life.

The Review of Economic Studies, Vol. 22 (2), No. 58, 1954–55

SAUNDERS, C. T. *Some problems in the Estimation of Personal Savings and Investment.*

This paper represents a preliminary attempt to estimate various categories of personal savings and investment from the available statistics of transactions in financial assets.

The author explains carefully the meaning of the term 'personal sector' in the national accounts and the various categories of savings which make up the total of personal savings. The value of the assets acquired by personal savings is classified in several broad categories for which fairly reliable data are available. There is, however, a residue of unidentifiable assets the value of which in some years was relatively very large. The author discusses the types of assets which have not been identified, namely, securities, consumer credit, certain financial liabilities of unincorporated businesses, currency and loans from assurance companies, and an attempt is made to estimate the significance of each in relation to the total value of these assets.

Oxford Economic Papers, (New Series) Vol. 7, No. 1, February 1955

FROST, R. *Some Implications of the Growth of Investment by Institutions, 1938–53.*

Keynes's views, as expressed in the 'General Theory', on the behaviour of investors with regard to liquidity and to the valuation of shares and business assets, are examined in the light of the growth of institutional investment since the war. The article considers:

(1) the statistical evidence and the reasons for the increase in the amount of private savings represented by retained company profits, and by the increase in the invested funds of life assurance companies, pension funds and building societies;

(2) the role of liquidity preference in the investment behaviour of these institutions;

(3) the influence of their behaviour on the valuation of shares and business assets.

ROYAL STATISTICAL SOCIETY

Journal, Series A (General), Vol. 118, Part 1, 1955

BENJAMIN, B. AND OTHERS. *Current Population Problems.*

This paper is a symposium comprising the contributions to a discussion of world population problems especially in relation to their appraisal at the

United Nations World Population Conference in Rome, 1954. The main subjects treated in this symposium are: quality of demographic data; fertility trends; mortality trends; international migration; population projection; genetic influences.

MASON, J. I. AND SACHS, D. *Statistics Bearing on Financial Investment.*
The article summarizes the available material under the following four headings:

(1) General Indicators of Stock Exchange Investment Activity;
(2) Financial Analyses of an Industrial Character;
(3) Statistics of Individual Concerns or Special Groups;
(4) Broad Economic Data concerning Companies, Investment Holdings, Personal Savings, etc.

There is a fifth section which discusses gaps in the statistics and projected research, and finally there is a useful bibliography.

OPERATIONAL RESEARCH SOCIETY

Operational Research Quarterly, Vol. 5, No. 4, December 1954

TAYLOR, J. AND JACKSON, R. R. P. *Application of Birth and Death Process to Provision of Spare Machines.*

The paper is concerned with some of the problems connected with the operation of a fleet (or 'population') of machines, e.g. aircraft. Suppose that the active population consists of N machines and in addition there are n spare machines. Suppose further that the rate of becoming unserviceable is a random variable with mean f per unit time, that the servicing time is a random variable with mean k time units, and that the number of machines that can be serviced concurrently is r. Then the first problem is to obtain an expression for P_i, the probability of having i unserviceable machines when a steady state is reached, where $i = 0, 1, ..., n+1$ and $\sum_{i=0}^{n+1} P_i = 1$. P_i is a function of r, k and f. If $n+1$ machines become unserviceable at the same time it will not be possible to operate N machines, and hence the measure $E = 100 (1 - P_{n+1}) \%$ is termed the operational efficiency. For any given f, E will depend on k and r, and in any particular case the effects of varying k and r on such quantities as costs, average number of machines unserviceable, average number of machines being serviced, average number of machines waiting for service must be examined in order to decide the 'best' arrangement.

ECONOMETRIC SOCIETY

Econometrica, Vol. 23, No. 1, January 1955

WAUGH, F. V. AND BURROWS, G. L. *A Short Cut to Linear Programming.*
The problem involved in linear programming is stated, an example is given and the solution is obtained by a simple graphic method.

LLOYDS BANK LIMITED

Review. April 1955

DACEY, W. MANNING. *The Effectiveness of Bank Rate.*

The article discusses first the effects of the so-called new monetary policy. The author explains why the trend of bank deposits has been upwards since 1952.

Next he considers the relation between the supply of money and the total of money incomes. The ratio of the latter to the former is called the income velocity of money, and it is shown that for many countries the ratio in 1953 was much the same as it was in 1938, indicating a remarkable stability under normal economic conditions. Between these two years the ratio fell to an abnormally low level.

The author next discusses the Gibson Paradox—the high positive correlation that existed between the level of interest rates and the level of wholesale prices prior to the 1930's. Since 1932 the correlation has not been so high, and it is suggested that, since in a free economy a period of rising prices will also be a period of rising income velocities, it would be better to relate the latter to gilt-edged yields. The author compares the trend of the price of Consols with the trend of the inverse of income velocity and between 1947 and 1952 the two curves have moved in close harmony. Since 1952 there has been a marked divergence, the recovery in the price of Consols being accompanied by an increase in the rate of turnover of the stock of money. Reasons are given why income velocity alone cannot give a complete explanation of the behaviour of gilt-edged security prices.

THE PHILOSOPHY OF SCIENCE ASSOCIATION

Philosophy of Science, Vol. 22, No. 2, April 1955

BAR-HILLEL, Y. *An Examination of Information Theory.*

Sir Ronald Fisher introduced the concept 'amount of information' into statistical theory. It had a very special meaning concerned with a relation between a sample and the estimator used for estimating the value of a parameter.

The author of this paper is mainly concerned with the confusion that has arisen over the meaning or interpretation of this concept in the application of probability theory to various special sciences, particularly communication engineering. In this latter case sequences of signal transmissions are decoded into messages giving information, in the everyday meaning of this word, to the receiver. The engineer, however, uses the concept 'amount of information' in a special statistical sense, namely, a specified function of the relative frequency of a certain sequence of signals among the set of all possible signal sequences of the same length. Writers have confused matters by identifying 'amount of information' with 'amount of meaning'.

The author points out that the 'Statistical Theory of Signal Transmission' and the 'Theory of Semantical Content' (i.e. a Theory of Meaning) can be regarded as different interpretations of the same formal system, a system which may be termed the Calculus of Information. The interpretation of the symbols of this calculus, and hence the meaning of the function for the 'amount of information' differ according to the subject-matter of the special science in which the application is being made.

Articles and Papers of Actuarial Interest

Authors—several. *Growth and the Balance of Payments. A Symposium.*

An article *Retrospect and Prospect, The Economic Survey* 1954 by P. D. Henderson was published in the *Bulletin* for May and June 1954. In that article the author stated his views on some of the more important longer-term problems facing the British economy. His main contention was that the prime object of policy should be to promote a high rate of economic growth and at the same time find means of keeping the country solvent. The editors of the *Bulletin* invited several well-known economists to submit their comments on Mr Henderson's views, and these comments, together with a reply by Mr Henderson, are printed in this symposium.

Canadian Sickness Survey 1950-51. Nos. 1-4, Family Expenditure for Health Services. No. 5, Volume of Sickness—National Estimates. No. 6, Permanent Physical Disabilities—National Estimates. No. 7, Incidence and Prevalence of Illness—National Estimates.

The object of the Canadian Sickness Survey was to obtain estimates of the incidence and prevalence of illness and accidents of all kinds; the amount of medical, nursing and other health care received; the volume of family expenditures for the various types of health services; and the prevalence of permanent physical disabilities. The bulletins form a series intended to provide a means of releasing interim information on the more important of the results, pending the preparation of a comprehensive publication containing more detailed information together with a fuller description of the methods used.

The survey method consisted of personal visits by trained lay enumerators—to a sample of approximately 10,000 households distributed throughout the ten provinces in metropolitan, small urban, and rural areas.

All information, including particulars of income, housing and environment, was obtained by direct interview of a household informant, usually the housewife.

The bulletins discuss the definitions (of 'illness' etc.) employed and give distributions by sex and age of the amount and cost of illness.