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ABSTRACT

Sampling Design in Literacy Survey

by Chikio Hayashi

The Literacy Survey was performed under the direction of the Committee organized for this purpose. This short report is that of sampling design in this survey, a part of works done by the statistical committees. Under some restrictions, for example, time, expenses, or testers required, this design was made.

(i) The form of this Survey

The test materials having been constructed, the testees are to be made answer by filling in each entry of the test paper, instructions given in the same way as in a general intelligence test. In order to carry out the test as strictly as possible, the testees should be tested under the same condition. To do this, they are to be called to a certain place, where the test with its instructions is given within certain limits of time.

(ii) Sampling

Nest, making use of the results obtained from the pretests, we established a sampling design and a concrete plan for the survey. It is rather difficult to draw each individual with equal probability in such a large scale sampling. For this, it is very useful to divide the universe (the Japanese) into homogeneous groups. Then we have to consider the factors affecting the abilities. The factors which are taken into consideration, for the stratification are naturally assumed and known by the pretest.

These are followings.

(A) Japanese Area, (B) Urban and Rural Area. This reflects such characteristics as population size and density, economic-ecological

structure and degree of urbanization.

Thus the numbers of strata are 87 in urban area and 86 in rural. The sub-sampling method from these strata was adapted. The next step is to determine the number of testees to be sampled and to allocate to each test spot. In order to obtain the required precision, necessary sample size is 17,100. Including nonresponses which may not give any bias to the whole, the sample size was determined to be 21,003. Having fixed the sample size in this manner, we proceeded to allocate them. This sampling design, however, is intended for estimating the distribution of population in terms of scores. Allocation such as is optimum for a single label is considered to be improper in the survey consideration which is so complicated that the reading and writing abilities can be measured only by many criteria combined. Therefore, in view of the conveniences of the counting, the samples were allocated in proportion to the population in each stratum.

A Revise of the statistics of Rice Production for 1947 and 1948

by Yasuo Kondo

I. Estimated production of rice for 1947 by means of C. P. S. and population statistics for 1948.

- a) Multiplying the separate estimates of rice consumption for food per head for agricultural and non-agricultural population by corresponding number of population, I get the estimate of consumption of rice for food... 60,500,000 koku.
- b) Adding thereto the consumption of rice for fodder, seed, delivery to processing,

etc. and deducing therefrom the amount of import from abroad, I get the estimate of production for 1947....61,802,000 koku.

II. The estimation of rice production for 1947

by M. A. F. is under-estimated by,

- a) 2.85 % as regard to planted area, and
- b) 2.5 % as regard to yield per unit area, making total of 5.35 %.

The under-estimate of 5.35 % to the total production necessitates the published figure 58,305,040 koku for 1947 revised as 61,400,000 koku, which well coincides with the estimate, by I. viz. 61,802,000 koku.

Diffusion of Particles in a Scattering Medium (Probability Distribution of the Randomly Additive Quantities)

by Ryogo Kubo

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University of Tokyo

A general method is discussed for the treatment of the probability distribution functions of randomly additive quantities which are related to a certain Markoffian process. It is shown that the generating function method making use of the Laplace transformation gives a systematic way of treatment. Then the main problem is reduced to a certain Eigen-value problem, which has been proved very useful for some statistical-thermodynamical problems and some diffusion problems in physics.

The slowing down of neutrons in a scattering medium is discussed from this point of view, which is an interesting example of the stochastic problems. Though the results are almost the same as those described in Marshak's paper (*Rev. Mod. Phys.* 19, 185 (1947)), the discussions will throw light into the nature of the problem.

On the Convergent Infinite Convolutions

by Tatsuo Kawata

The object of the present paper is to discuss the convergence of a sequence of probability distributions and some properties of the limit law, mainly by means of Fourier analysis. We first prove a fundamental theorem on convergence of a sequence of distributions and then give some remarks about the Lévy continuity theorem and further using it, we shall give another proofs of known theorem. Next we consider the mean $m\{f\}$ of a characteristic function, f , prove some theorems on the mean of the products of characteristic functions and we give the applications of it, especially we discuss the continuity of an infinite convolution. Lastly we shall prove the pure theorem in weak sense.

Some Contribution to the Analytical Theory of Population

by S. Hishinuma

In this paper I take up some problems on the analytical theory of population which we meet with frequently in practice. Especially I feel regrettable that the value of life expectation is not available until the computation of a life table is finished. Usually it takes several years that the computation of a life table is finished under the preparation of population census figures. So I want to find a certain experimental formula about life expectation which can be estimated easily from the crude death rate at that time and formerly calculated life expectation.

I start from an assumption on mortality force, and get experimental formula. As the control of these formula, I adopt following method:

I calculate estimated values of life expecta-

ion by sex and selected ages, 1935 based on the figures of life expectation of the 5-th life table (based on 1930 census population) and crude death rates of 1930 and 1935.

Then I compare these estimated figures with the figures of life expectation of the 6-th life table. (based on 1935 census population) The result is satisfactory I think. Considerable broad age groups both male and female, there exist sufficient agreement between two.

Analysis of Vector Time Series

by Masami Ogawara

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Some groundworks in the analysis of vector time series and the method of stochastic extrapolation are developed here, utilizing the correlation matrix function and H. Wold's idea of one dimensional case. The following theorem is fundamental:

Theorem. Let $X(t)$ be a stationary vector stochastic sequence with the vanishing mean value, then it is uniquely decomposed in the form

$$X(t) = X^{(1)}(t) + X^{(2)}(t),$$

where $X^{(1)}(t)$ and $X^{(2)}(t)$ are mutually uncorrelated stationary stochastic sequence with mean value 0 and

- 1) $X^{(1)}(t)$ has a continuous spectral matrix function and is expressed in the form,

$$X^{(1)}(t) = Y(t) + B^{(1)}Y(t-1) + B^{(2)}Y(t-2) + \dots,$$

where $Y(t)$ is a non-autocorrelated stationary stochastic sequence and is uncorrelated with $X(t-i)$, ($i=1, 2, \dots$),

- 2) $X^{(2)}(t)$ is a singular stochastic sequence, i.e. it satisfies the finite difference equation with constant matrices $A^{(i)}$ as its coefficients

$$X^{(2)}(t) + A^{(1)}X^{(2)}(t-1) + A^{(2)}X^{(2)}(t-2) + \dots + A^{(h)}X^{(2)}(t-h) = 0, \quad h \leq \infty;$$

such stationary singular sequence is equivalent to the vector B_2 -sequence (components of which are mutually independent Slutsky's B_2 -sequence) except for random variables independent of time and has a discontinuous spectral matrix function.

An Example of Sequential Inspection Plan

(Without Rejection Region)

by Sigeiti Moriguti

Department of Applied Mathematics,
Faculty of Engineering, University
of Tokyo

As a rather expository article, an example of sequential inspection plan is dealt with. It is proposed to replace current double inspection plan for a kind of products. Some features of a special case of sequential test without rejection region are remarked. Some questions about practice of inspection are raised.

Estimates of Mean and Standard of a Normal Distribution from Linear Combinations of Some Chosen Order Statistics.

by Ziro Yamauti

Department of Technical Measurements,
First Faculty of Engineering, University
of Tokyo

The similar problems were dealt with by Frederick mosteller⁽¹⁾ in cases where equal weights are used. The present paper deals with the cases when the weights are so chosen as to give the most efficient estimates on using the given order statistics. The weights and the efficiency are calculated in general forms of rather simple construction. The present author shows the method to determine the spacing the order statistics with the given number of them

used, which gives the most efficient estimates for that given number.

Several simple numerical examples are shown and compared with those given by mosteller.

1) Frederick Mosteller *Annals of mathematical Statistics*, vol. 17, No. 4 (Dec. 1946) p. 377.

On a Proof of a SAKAMOTO-CRAIG's Theorem and Its Applications

by Yukiyooshi Kawada

Mathematical Institute, Tokyo Bunrika Daigaku

We shall give in this note a simple Proof of a SAKAMOTO-CRAIG's theorem concerning the independence of two statistics $q_1 = (xA, x)$ and $q_2 = (xB, x)$ ($A = A'$, $B = B'$), where x is an n -dimensional random vector with the normal distribution whose covariance matrix is V . Especially we prove here $AVB = 0$ is necessary if we assume

$$E(q_1^i q_2^j) = E(q_1^i) E(q_2^j), \quad i, j = 1, 2$$

On a Characterization of n -Dimensional Normal Distributins

by Yukiyooshi Kawada

Mathematical Institute, Tokyo Bunrika Daigaku

The abstract of this note will be published soon in Kôdai Mathematical Reports.

Two Examples of Small Sampling Statistics in Meteorology

by Kôichiro. Takahasi

The author proved that the correlation coefficients between some monthly mean meteorological elements changes as the years pass, which is known as the ineyion of correlation coefficient and be proved that unusual climate of a years is correleated with unusual showers of shootry stars.

..... 理學博士 増山元三郎著
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改訂増補し面目を一新するに當り、上質紙を用い「定本」として近日に發刊します。尙、直接注文の場合は送料弊社負担にさせていただきます。

理學博士 北川敏男 責任監修

統計科學論叢

最近、米英の進歩した統計學との交流が頻繁になり、わが進歩的學者達のたゆまぬ努力と相まつて、統計學の研究・應用・普及は目覚ましい。従つて、一般人の統計學に對する関心も高まりつゝある。しかるに、わかりやすい良書が少い。そこで、弊社は、九大教授北川敏男博士の責任監修のもとに、「統計科學論叢」刊行の企画を樹てた。

本書叢は、斯界の第一線研究者の獨創的力作を逐次、相當長年にわたつて刊行し、一般人の教養の糧となり、又、實際に統計學の研究・業務に携わる人々にもすぐ役に立つ見詰的なもの即ち、百萬人の統計學たらしめたいと思つてゐる。

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