Statistical Science
1986, Vol. 1, No. 1, 149–152

The First Issue of the Annals of Mathematical Statistics

Morris H. DeGroot

Abstract. This article is a review of the first issue of the *Annals of Mathematical Statistics*, Vol. 1, No. 1, February 1930. The reasons for the establishment of the *Annals* and its editorial goals are discussed. Each of the eight articles in the issue is summarized. A few of the similarities to, and the differences from, the first issue of *Statistical Science* are considered.

Key words and phrases: Journals, publication, editors, review.

1. A RETROSPECTIVE LOOK

The publicaton date of the first issue of the *Annals of Mathematical Statistics* was February 1930, exactly 56 years before the publication date of this first issue of *Statistical Science*. The appearance of *Statistical Science* thus seemed to be an auspicious occasion for a retrospective look at that first issue of the *Annals* from our present perspective, knowing what we now know about how the *Annals* has developed and multiplied (i.e., divided) and how it has influenced the field of statistics during the past 56 years. Since I have long been the owner of a copy of Vol. 1, No. 1, of the *Annals*, it was not inconvenient for me to take that look.

I obtained that copy in 1954 when I was a graduate student in statistics at the University of Chicago. While walking across the campus one day, I came upon a used-book sale being held by some student organization. There on a table full of books, very few of which were of a technical nature, was a copy of Vol. 1, No. 1, of the *Annals*. The date, November 26, 1954, had been stamped inside the back cover by the sponsors of the sale and, just above it, they had written the price: 10 cents.

The journal was in excellent condition. The cover had faded a bit and the pages had started to turn brown around the edges (like many of our current journals), but it looked as though it had never been read and perhaps had never even been opened (also like many of our current journals). There were no markings on it to indicate from whom or from where it had come.

The nature of the sale was such that if a book hadn't been sold by the end of the day, then its price was reduced the next day. Thus, I faced an optimal stopping problem, albeit a very easy one. Even for a poor graduate student in 1954, the price of 10 cents was *very* cheap. Furthermore, I knew that I had better buy that copy before any of my statistics professors or fellow graduate students discovered it. (We students all knew that the *Annals* was important and influential, even though we had difficulty reading it.) One other possibility crossed my mind: perhaps the sponsors of the sale had a large supply of copies of Vol. 1, No. 1, and each day they put one out on the table. I rejected this hypothesis as being highly unlikely. Thus, foregoing the possibility of obtaining any further reduction in price, I paid 10 cents and bought the copy.

Now, more than 30 years later, it has been opened on many occasions and much of it has even been read. Although the cover is a bit more faded and the pages are a bit more brown, it is still in excellent condition and has received tender care from my colleagues and me who understand that it represents the beginning of what became a major force in the field of statistics and probability.

But sometimes I wonder whether if I had held out for another day, I could have gotten it for a nickel.

2. GOALS AND CONTENTS

In 1930, the Institute of Mathematical Statistics did not exist. It is stated in Vol. 1, No. 1, that the *Annals* is a quarterly publication *sponsored* by the American Statistical Association but published (and lithoprinted) by Edwards Brothers of Ann Arbor, Michigan. The rates are presented in the front of the issue as "six dollars per annum." The Editorial Committee is listed as:

H. C. Carver, Editor
B. L. Shook, Assistant Editor
J. Shohat, Foreign Editor
J. W. Edwards, Business Manager

Morris H. DeGroot is the Executive Editor of Statistical Science.

The first issue contained the following 8 articles, covering 121 pages:

The Annals of Mathematical Statistics Willford I. King	(2 pages)
Remarks on Regression S. D. Wicksell	(11 pages)
Synopsis of Elementary Mathematical Statistics B. L. Shook	(28 pages)
Bayes' Theorem Joseph Berkson	(15 pages)
A Mathematical Theory of Seasonal Indices Statistical Department, Detroit Edison Company	(16 pages)
Stieltjes Integrals in Mathematical Statistics J. Shohat	(22 pages)
Simultaneous Treatment of Discrete and Continuous Probability by Use of Stieltjes Integrals William Dowell Baten	(6 pages)
Fundamentals of the Theory of Sampling Editorial	(21 pages)

At least two conclusions are clear from a glance at this list of contents: (1) The editors believed in writing for their own journal, and (2) the articles are of a much more rudimentary nature than those we became accustomed to seeing in the *Annals* in later years.

The opening article by King, who was Secretary of the American Statistical Association at the time, introduces the new journal in exactly four elegant paragraphs. In the first paragraph he points out that the membership of the American Statistical Association "is tending to become divided into two groups—those familiar with advanced mathematics and those who have not devoted themselves to this field." As a result, "The Editor of our Journal has, then, found it a puzzling problem to satisfy both classes of readers."

In the second paragraph, King continues, "Now a happy solution has appeared. The Association at this time has the pleasure of presenting to its mathematically inclined members the first issue of the *Annals of Mathematical Statistics*, edited by Prof. Harry C. Carver of the University of Michigan. This Journal will deal, not only with the mathematical technique of statistics, but also with the applications of such technique to the fields of astronomy, physics, psychology, biology, medicine, education, business, and economics." The editors seemed to be serious about the emphasis on applications because it was explicitly stated in the front of the journal that the *Annals* was to be "devoted to the theory and application of mathematical statistics."

In the third paragraph, King writes, "The editorial policy will be to select articles that will best meet the needs of the time. There can be no questioning the statement that at the present time there are in this country many more who need stimulation in the fundamentals of mathematical statistics than there are individuals whose prime interest is in the advancement of modern statistical theory. Therefore particular stress will be laid on articles of a fundamental nature during the first few years of the life of the *Annals*." He then goes on to state that "The officers, after due deliberation, have chosen a new method of printing in order to facilitate the composition of original articles and the obtaining of reprints. A photographic process is employed, which will permit the Association at any point in the future to furnish reprints or back numbers." To support this last point, the following statement was published in the front of the journal: *Reprints of any article in this issue may be obtained at any time from the Editor at the following rates, postage included*:

Number of copies	Cost per page
1–4	2 cents
5–24	1½ cents
25–49	1 cent
50 and over	¾ cent

In the final paragraph King emphasizes his certainty "that this new publication will be welcomed heartily, not only by the mathematically trained section of our membership, but also by the nonmathematical group, for the latter recognize that the more advanced phases of mathematics are rendering extremely valuable service in furthering the progress of statistical technique, thus aiding in the solution of problems of the greatest moment."

3. THE TECHNICAL ARTICLES

As already noted, the seven articles that follow King's introduction are rudimentary in nature. We shall now discuss each one briefly, following the order in which they appear in the journal.

Wicksell begins his paper on regression by bemoaning the fact that his two previous articles on regression and multiple correlation have been neglected by statisticians. He attributes this neglect "in part at least to the apparent (not actual) speciality of the assumptions made with regard to the mathematical expression for the correlation surface, and in part also to the rather repellent show of mathematics involved in the deductions." (The fact that one of his papers appeared in *Kungl. Svenska Velenskapsakademiens Handlinger* Bd. 58, Nr. 3, 1917, and the other in *Arkiv. for Matematik, Fysik och Astronomi.* Bd. 14, Nr. 10, 1919, could not have helped matters, but that's how things were

before there was an *Annals*.) He states that in this paper he will derive his results in a simpler way.

The paper is devoted to the consideration of a problem in which the regression of y on x is assumed to be a polynomial of fixed degree p and is to be fitted by least squares to N data points (x_i, y_i). Wicksell points out that the chief difficulty in carrying out this approach is that the higher sample moments of x that are needed have large standard deviations and are therefore "very little to be relied upon." His solution for overcoming this difficulty is to assume that the distribution of x is of one of the Pearson types or some related type, so that the higher moments of x can be expressed in terms of the parameters of that distribution.

Shook's synopsis of elementary mathematical statistics is devoted to the definition and calculation of the arithmetic mean, the standard deviation, the skewness, and other moments of a finite sample of numbers. (It is a bit surprising to find the arithmetic mean of N numbers being defined in the *Annals*!) The tabulation of a sample into a frequency distribution is described and the adjustment of the calculated standard deviation and skewness for grouped data is presented. A footnote to this article states that it is "An abstract of a series of lectures on elementary statistics given by the mathematical statistical staff at the University of Michigan," and more of the same was promised for the next issue.

Berkson's article on Bayes' theorem is devoted mainly to discussing the following classical problem: If we observe exactly r successes in $r + s$ Bernoulli trials, what is the probability of observing exactly m successes in $m + n$ further trials? Under the assumption of a uniform prior distribution for p, he derives the standard solution by the methods developed essentially by Laplace and Bayes.

In the final three pages, Berkson discusses the potential role of Bayes' theorem in the methodology of applied statistics. He indicates that the Bayesian approach "is useful in bringing out the inadequacy" of the standard methodology in which p is estimated from the first sample of size $r + s$ and then the distribution of future values is calculated as if this estimate were the true value. But he expresses the view that the uniform prior distribution for p cannot be appropriate in all problems and, since he does not know how to assign an appropriate nonuniform prior distribution, he feels that the standard methodology may sometimes yield a reasonable approximation. He reminds statisticians to examine the assumptions underlying the formulas that they use, and concludes as follows: "Where statistics run counter to what appears to be the general experience, it is a wise rule to re-examine the statistics rather than to indict forthwith the dependability of the experience. Such an attitude would modify considerably much that is found in current statistical literature and it would modify it in the direction of greater soundness."

The only authorship listed for the article on seasonal factors is the Statistical Department, Detroit Edison Company. The following time series model for monthly data y_x over a period of n years is studied:

$$y_x = f(x)c(x)s(x) + \varepsilon_x \quad \text{for} \quad x = 1, 2, \cdots, 12n,$$

where $f(x)$ is the secular trend, $c(x)$ is the cyclical factor, and $s(x)$ is the seasonal factor. Two different methods of estimating the seasonals are tried out on data that start out as a real data set but then get manipulated by the authors in an unusual way so that they become a data set for which the "true values" of the seasonal factors are known. No theoretical justification for the methods or the results is essayed.

An interesting feature of the next article is that the author's name is presented in the two different forms, "J. Shohat (Jacques Chokhate)." In this article Shohat states that by using Stieltjes integrals, "*the statistician is enabled to treat in a single formula a continuous, as well as a discontinuous distribution.*" (The italics, as well as the punctuation, are his.) He gives a standard presentation of Stieltjes integration, but expresses his belief that certain results in the paper, including his extension of the Hölder inequality to Stieltjes integrals, are new and "may prove useful in mathematical statistics." He goes on to consider Tchebycheff polynomials and their use in least squares interpolation, and concludes by showing how simple linear regression is a special case of this general theory.

This article by Shohat is followed by another one on Stieltjes integrals by Baten in which he establishes the Markoff and Tchebycheff inequalities, and related generalizations, for arbitrary distributions. Baten states that "This is the first time, as far as the writer knows, the discrete and continuous cases for these theorems have been included in a single proof."

Although the final article is presented as an "Editorial," it is actually a discussion of sampling theory no different in spirit or approach from the other technical articles just described. It begins with a consideration of sampling from a finite population, and presents detailed expressions for the first eight moments of the sum Z of the observations in the sample in terms of the corresponding population moments. After noting that the distribution of Z is nearly "normal" in a few numerical illustrations, the article motivates the limiting normal distribution of Z as both

the population size and the sample size approach infinity by deriving the appropriate limiting values of the moments of Z.

The final formula in the article (and in the issue) is

$$y = \frac{1}{\sqrt{2\pi}} e^{-t^2/2},$$

with the accompanying description that "we say that (it) is the equation of the Normal Curve." On this surprisingly elementary note we come to the end of what is a surprisingly elementary beginning of the *Annals of Mathematical Statistics.*

4. COMPARING THE *ANNALS* AND *STATISTICAL SCIENCE*

Today the topics treated in the first issue of the *Annals* seem mundane to us. Nevertheless, in at least one important respect, that issue of the *Annals* tried to accomplish what we are now trying again to accomplish with *Statistical Science*—it took topics that were believed to be of potential importance but were known to only a relatively small number of researchers, and tried to present them to a wider audience of statisticians. Indeed, the fact that these topics now seem mundane reflects, to some extent, the success of the *Annals* in this attempt.

As I look through the first issue of the *Annals*, I note one obvious respect in which it differs from the *Annals* of today and from this issue of *Statistical Science*. In that issue, *every* mathematical symbol (including a, b, x, and y) was handwritten by what had to be the steadiest, most elegant hand in Ann Arbor in 1930.

If *Statistical Science* achieves even a small fraction of the influence on the field of statistics that has been achieved by the *Annals*, then it will have to be regarded as a success. It should also be regarded as a success if 25 years from now, some graduate student strolling across a campus somewhere in the world discovers an opportunity to purchase the first issue of *Statistical Science* for the equivalent of 10 cents *and he or she is thrilled by the discovery.*

ACKNOWLEDGMENT

This work was supported in part by the National Science Foundation under Grant DMS-8320618.