

21. REFEREE'S REPORT ON THE
PAPER ENTITLED,
"ON THE INDEPENDENCE OF STATISTICS
OF QUADRATIC FORMS"

By :

Junjiro Ogawa

This paper is concerned with certain theorems on the independence of real symmetric quadratic forms in normally and independently distributed during or shortly after the war because the author is unaware, naturally enough, of certain publications in this country during that time. Such a state of affairs makes it difficult to judge the paper. On pages two and three of the manuscript, the author states five theorems. In the opinion of the referee, these theorems are equivalent to, or are implied by, theorems found in the papers "Note on the Independence of Certain Quadratic Forms" by A. T. Craig, Annals of Mathematical Statistics, June 1943; and "Note on a Matrix Theorem of A. T. Craig" by Harold Hotelling, Annals of Mathematical Statistics, December 1944. These two papers will be referred to as (A) and (B) respectively.

In preparation for the proofs of these theorems, the author gives five Lemmas. Lemma I., on pages four and five, essentially derives the characteristic function of the distribution of a real symmetric quadratic form. Lemmas II., and III., state, in terms of the characteristic functions, the necessary and sufficient conditions for the independence of these quadratic forms. Lemmas IV., and V., the referee believes, are implied by (A) and (B). The author's proof of Lemma V., is quite interesting. The proof of Lemma V., terminates on page ten and, in a sentence on page eleven, the author states that the proofs of the five theorems are straightforward. He refers to certain Japanese publications to substantiate this remark.

In his introduction, page one, the author asserts that he is attempting to simplify proofs from the standpoint of uniformity. Had the paper been submitted for publication as early as 1942, the referee believes it would have served an admirable purpose; at this date, he is not so sure.

The referee understands that Craig believes his name should not be connected with the Cochran theorem. (See middle of page one

and Theorem I., page two), Craig's 1938 paper on the subject was an expository paper, presented to the Institute at the invitation of the Program Committee. He had no part in the discovery of the theorem.

22 ON THE INDEPENDENCE OF STATISTICS OF QUADRATIC FORMS

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In 1934, W. G. Cochran⁽¹⁾ gave a criterion of independency of statistics of quadratic form, formed from a sample of size N taken independently from a univariate normal population, as the rank relation of their coefficient matrices. This is the so-called "Cochran's Theorem".⁽²⁾ Later, in 1938, A. T. Craig stated the same theorem and proved it algebraically. But his proof was very tedious. In practical use, however, it is not always easy to determine the rank of a matrix, so