



THE UNIVERSITY OF
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Department of Statistics

MASTER'S THESIS PRESENTATION

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Generalizations of Shepp's Property

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ABSTRACT

This paper is concerned with Shepp's property and its generalizations. The original Shepp's property is the following statement: Let X and Y be independent standard normal distributions, then $Z_1 = 2XY/\sqrt{X^2 + Y^2}$ and $Z_2 = (X^2 - Y^2)/\sqrt{X^2 + Y^2}$ are still independent normal. It is also known that Z_1 follows a normal distribution even for the case X and Y have different variance s^2 and t^2 , and this result can be generalized to n samples case. In this paper, we write simple proofs for the above statements and prove that $Z_1 = (s^{-1} + t^{-1})XY/\sqrt{X^2 + Y^2}$ and $Z_2 = \text{sgn}(X)|s^{-1}X^2 - t^{-1}Y^2|/\sqrt{X^2 + Y^2}$ are independent standard normal under unequal variance case. Moreover, more general Z_1 and Z_2 satisfying the independent normal condition is discussed.

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