and $r_1 = 2$, $\theta_1 = n(m_x^2 - 2\rho m_x m_y + m_y^2)/(1 - \rho^2)$ respectively. Accordingly, the non-negative form

$$\textstyle\sum_1^n [(x_i - \bar{x})^2 - 2\rho(x_i - \bar{x})(y_i - \bar{y}) + (y_i - \bar{y})^2]/(1 - \rho^2)$$

has a central χ^2 distribution with $2n - 2$ degrees of freedom.

REFERENCE

[1] Osmer Carpenter, "Note on the extension of Craig's theorem to noncentral variates," *Ann. Math. Stat.*, Vol. 21 (1950), p. 455.

A NOTE ON THE GENERATION OF RANDOM NORMAL DEVIATES[1]

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1. Introduction. Sampling experiments often require the generation of large numbers of random normal deviates. When an electronic computer is used it is desirable to arrange for the generation of such normal deviates within the machine itself rather than to rely on tables. Pseudo random numbers can be generated by a variety of methods within the machine and the purpose of this note is to give what is believed to be a new method for generating normal deviates from independent random numbers. This approach can be used on small as well as large scale computers. A detailed comparison of the utility of this approach with other known methods (such as: (1) the inverse Gaussian function of the uniform deviates, (2) Teichroew's approach, (3) a rational approximation such as that developed by Hastings, (4) the sum of a fixed number of uniform deviates and (5) rejection-type approach), has been made elsewhere [1] by one of the authors (M.M.). It is shown that the present approach not only gives higher accuracy than previous methods but also compares in speed very favourably with other methods.

2. Method. The following approach may be used to generate a pair of random deviates from the same normal distribution starting from a pair of random numbers.

Method: Let U_1, U_2 be independent random variables from the same rectangular density function on the interval (0, 1). Consider the random variables:

$$\begin{aligned} X_1 &= (-2 \log_e U_1)^{1/2} \cos 2\pi U_2 \\ X_2 &= (-2 \log_e U_1)^{1/2} \sin 2\pi U_2 \end{aligned} \tag{1}$$

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