DISTRIBUTION OF THE MEANS DIVIDED BY THE STANDARD DEVIATIONS OF SAMPLES FROM NON-HOMOGENEOUS POPULATIONS

By

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In a previous paper[1] the distributions of the means and variances, means squared and variances of samples of two drawn from a non-homogeneous population composed of two normal populations have been discussed. It is the purpose of this paper to discuss similarly the distribution of the means of samples of two measured from the mean of the population divided by the standard deviations of the samples for such parent populations and to present experimental results for samples of four.

CASE $n = 2$

Suppose that a population represented by

(1)

$$f(x) = \frac{N_1}{\sigma_1\sqrt{2\pi}} e^{-\frac{1}{2}\frac{(x+m_1)^2}{\sigma_1^2}} + \frac{N_2}{\sigma_2\sqrt{2\pi}} e^{-\frac{1}{2}\frac{(x-m_2)^2}{\sigma_2^2}}$$

$$-N_1 m_1 + N_2 m_2 = 0$$

is considered. If $n-s$ individuals come from the first component and s from the second in drawing samples of n and if $\bar{m}$ is the mean of the sample measured from the mean of the population and $\bar{\sigma}$ is the standard deviation of the sample,[2] then

(2)

$$\frac{\bar{m}}{\bar{\sigma}} = \frac{-(n-s)\bar{m}_1 + s\bar{m}_2}{\sqrt{n}\left[(n-s)\bar{\sigma}_1^2 + s\bar{\sigma}_2^2 + \frac{(n-s)s}{n}(\bar{m}_1 + \bar{m}_2)^2\right]^{\frac{1}{2}}}$$

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[1] *Annals of Mathematical Statistics,* Vol. 2, No. 3, Aug. 1931.

[2] "Random Sampling from Non-Homogeneous Populations"—*Metron,* Vol. 8, No. 3, p. 6.