THE
NORMAL
LAW OF ERROR
STANDS OUT IN THE
EXPERIENCE OF MANKIND
AS ONE OF THE BROADEST
GENERALIZATIONS OF NATURAL
PHILOSOPHY . IT SERVES AS THE
GUIDING INSTRUMENT IN RESEARCHES
IN THE PHYSICAL AND SOCIAL SCIENCES AND
IN MEDICINE AGRICULTURE AND ENGINEERING .
IT IS AN INDISPENSABLE TOOL FOR THE ANALYSIS AND THE
INTERPRETATION OF THE BASIC DATA OBTAINED BY OBSERVATION AND EXPERIMENT

The Normal Law of Error
Page 54, Figure 10
NBS Special Publication 672
Experimentation and Measurement
W.J. Youden
1984

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F - DISTRIBUTION

. RATIO OF INDEPENDENT MEAN SQUARES.

$V_1 \sim \chi^2(\nu_1)$, $V_2 \sim \chi^2(\nu_2)$,

V_1 & V_2 INDEP

$$\frac{V_1/\nu_1}{V_2/\nu_2} \sim F(\nu_1, \nu_2)$$

"F ON ν_1 OVER ν_2 D.F."

APPLICATION:

n_1 OBSERVATIONS . $IN(\mu_1, \sigma_1^2)$

n_2 .. $IN(\mu_2, \sigma_2^2)$

$$\Rightarrow \frac{(n_1-1)S_1^2}{\sigma_1^2} \sim \chi^2(n_1-1)$$

$$\frac{(n_2-1)S_2^2}{\sigma_2^2} \sim \chi^2(n_2-1)$$

$$\Rightarrow \quad \frac{S_1^2/S_2^2}{\theta} \sim F(n_1-1, n_2-1)$$

WHERE $\theta = \sigma_1^2/\sigma_2^2$

PIVOTAL QUANTITY!!

CI FOR θ:

$$\left(\frac{S_1^2/S_2^2}{F_{\alpha/2, n_1-1, n_2-1}} , \frac{S_1^2/S_2^2}{F_{1-\frac{\alpha}{2}, n_1-1, n_2-1}} \right)$$

TEST $H_0: \theta = \theta_0$

TEST STATISTIC $F_0 = \dfrac{S_1^2/S_2^2}{\theta_0}$

REF DIST: $F(n_1-1, n_2-1)$

[NOTE: $H_0: \sigma_1^2 = \sigma_2^2$ TESTED AS $H_0: \theta = 1$]