ELEVENTH LECTURE SUMMARY

ANALYSIS OF VARIANCE

TESTS WHETHER *k* POPULATIONS ALL HAVE THE SAME MEAN (THE NULL HYPOTHESIS) OR NOT (THE ALTERNATE HYPOTHESIS).

WE ASSUME (AT LEAST APPROXIMATELY) THAT THE POPULATIONS ARE NORMAL, AND THEIR STANDARD DEVIATIONS ARE IDENTICAL.

TO COMPUTE TEST STATISTIC IS NOW A LOT MORE ELABORATE. WE START BY COMPUTING

$$SS = \Sigma x^2 - \frac{(\Sigma x)^2}{n}$$

INDIVIDUALLY FOR EACH SAMPLE. THE SUM OF THESE IS CALLED SS_W (WITHIN OR ERROR SUM OF SQUARES).

THEN, WE POOL ALL k SAMPLES INTO ONE, AND FIND THE CORRESPONDING TOTAL SUM OF SQUARES

$$SS_{TOT} = \Sigma_{TOT} x^2 - \frac{(\Sigma_{TOT} x)^2}{N}$$

(N IS THE NUMBER OF ALL OBSERVATIONS)

FINALLY, $SS_{BET} = SS_{TOT} - SS_W$ OR EQUIVALENTLY:

$$SS_{BET} = \sum_{ALL\ SAMPLES} \frac{(\Sigma x)^2}{n} - \frac{(\Sigma_{TOT} x)^2}{N}$$

(THE BETWEEN OR FACTOR SUM OF SQUARES)

THE RESULTS ARE USUALLY SUMMARIZED IN THE FOLLOWING TABLE:

SOURCE	SS	D.F.	MS	F RATIO
BETWEEN	SS_{BET}	k - 1	$SS_{BET}/(k-1)$	MS_{BET}/MS_W
WITHIN	SS_W	N - k	$SS_W/(N-k)$	
TOTAL	SS_{TOT}	N - 1		

THE RESULTING TEST STATISTIC HAS, WHEN H_0 IS TRUE, THE SO CALLED F (FISHER) DISTRIBUTION.

ITS CRITICAL VALUES (THIS IS, ONE MORE TIME, ALWAYS A RIGHT-TAIL TEST) ARE FOUND IN TABLE 8.

THIS TIME, WE NEED TWO DEGREES OF FREEDOM, NUMERATOR (k - 1) AND DENOMINATOR (N - k).