Formula Sheet for Final Exam
POS 3713 Spring 2000

Note Xbar = mean of X
Ybar = mean of Y

Calculation of Pearson's *r* (Correlation)

1. Mean Deviation Method

$$r = \frac{\Sigma(X - Xbar)(Y - Ybar)}{\sqrt{[\Sigma(X - Xbar)^2][\Sigma(Y - Ybar)^2]}}$$

2. Raw score method

$$r = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{[N\Sigma X^2 - (\Sigma X)^2][N\Sigma Y^2 - (\Sigma Y)^2]}}$$

3. Test statistic for *r*
t (calculated) = $r * \sqrt{(N - 2)/(1 - r^2)}$

Regression

Bivariate Regression: $Y = a + bX + \varepsilon$

1. Calculating b, the slope coefficient:

$$b = \frac{\Sigma(X - Xbar)(Y - Ybar)}{\Sigma(X - Xbar)^2}$$

or

$$b = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{N\Sigma X^2 - (\Sigma X)^2}$$

2. Calculating a, the intercept

$$a = Ybar - b(Xbar)$$

3. Test statistic for b (slope)
t = b/s.e.
df = N - K - 1

where b = regression slope coefficient
s.e. = standard error (this will be given)
N = sample size
K = number of independent variables

4. $R^2 = \frac{\text{Explained Variation}}{\text{Total Variation}} = \frac{SSR}{SST} = \frac{\Sigma(Yhat - Ybar)^2}{\Sigma(Y - Ybar)^2}$
Yhat = predicted value of Y based on regression line

5. $F = \frac{R^2 / K}{(1 - R^2)/ (N - K - 1)}$
$n_1 = K$ (numerator degrees of freedom)
$n_2 = N - K - 1$ (denominator degrees of freedom)

where K = # of independent variables
N = sample size
R^2 = defined above in #4

Chi-Square

$$\chi^2 = \Sigma \frac{(f_o - f_e)^2}{f_e}$$

where f_o = the cell frequencies observed in the bivariate table
f_e = the cell frequencies that would be expected under the null hypothesis if the variables were independent

To calculate f_e = $\frac{\text{Row marginal (total) * Column marginal (total)}}{N}$

df = (r - 1)(c - 1) where r = the number of rows, c = the number of columns

Phi

$\phi = \sqrt{(\chi^2/N)}$

Gamma

$$\text{Gamma} = \frac{N_s - N_d}{N_s + N_d}$$

	1 (L)	2 (M)	3 (H)
X (L)			
Y (M)			
Z (H)			

N_s = X1*[Y2 + Y3 + Z2 + Z3] + X2*(Y3 + Z3) + Y1*(Z2 + Z3) + Y2*(Z3)
N_d = X3*[Y1 + Y2 + Z1 + Z2] + X2*(Y1 + Z1) + Y3*(Z1 + Z2) + Y2*(Z1)

Tau-b

$$\text{Tau-b} = \frac{N_s - N_d}{\sqrt{(N_s + N_d + T_y)(N_s + N_d + T_x)}}$$

T_y = X1*(X2 + X3) + X2*(X3) + Y1*(Y2 + Y3) + Y2*(Y3) + Z1*(Z2 + Z3) + Z2*(Z3)
T_x = X1*(Y1 + Z1) + Y1*(Z1) + X2