

Formula Sheet for Final Exam
POS 3713 Spring 2000

Note \bar{X} = mean of X
 \bar{Y} = mean of Y

Calculation of Pearson's r (Correlation)

1. Mean Deviation Method

$$r = \frac{\sum(X - \bar{X})(Y - \bar{Y})}{\sqrt{[\sum(X - \bar{X})^2][\sum(Y - \bar{Y})^2]}}$$

2. Raw score method

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

3. Test statistic for r

$$t \text{ (calculated)} = r * \sqrt{(N - 2)/(1 - r^2)}$$

Regression

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

1. Calculating b, the slope coefficient:

$$b = \frac{\sum(X - \bar{X})(Y - \bar{Y})}{\sum(X - \bar{X})^2}$$

or

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

2. Calculating a, the intercept

$$a = \bar{Y} - b(\bar{X})$$

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

$$4. R^2 = \frac{\text{Explained Variation}}{\text{Total Variation}} = \frac{SSR}{SST} = \frac{\sum(\hat{Y} - \bar{Y})^2}{\sum(Y - \bar{Y})^2}$$

\hat{Y} = 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
 R² = defined above in #4

Chi-Square

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

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

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

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

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

$$T_x = X1*(Y1 + Z1) + Y1*(Z1) + X2$$