

STA 441s24 Make-up Test Formulas and Printouts

$$y = \beta_0 + \beta_1 x_1 + \cdots + \beta_{p-1} x_{p-1} + \epsilon$$

$$SST = SSR + SSE$$

$$R^2 = \frac{SSR}{SST}$$

$$a = \frac{R_F^2 - R_R^2}{1 - R_R^2}$$

$$F = \left(\frac{n-p}{s} \right) \left(\frac{a}{1-a} \right)$$

$$a = \frac{sF}{n-p+sF}$$

If an overall test has s numerator degrees of freedom and critical value c , the critical value of a Scheffé follow-up test with r degrees of freedom is $\left(\frac{s}{r} \right) \cdot c$.

$$\ln \left(\frac{\pi}{1-\pi} \right) = \beta_0 + \beta_1 x_1 + \cdots + \beta_{p-1} x_{p-1} = L \quad \pi = \frac{e^L}{1+e^L}$$

$$\boldsymbol{\mu} = \begin{pmatrix} \mu_1 \\ \mu_2 \\ \vdots \\ \mu_k \end{pmatrix} = \begin{pmatrix} E[y_1|\mathbf{X}=\mathbf{x}] \\ E[y_2|\mathbf{X}=\mathbf{x}] \\ \vdots \\ E[y_k|\mathbf{X}=\mathbf{x}] \end{pmatrix} = \begin{pmatrix} \beta_{0,1} + \beta_{1,1}x_1 + \cdots + \beta_{p-1,1}x_{p-1} \\ \beta_{0,2} + \beta_{1,2}x_1 + \cdots + \beta_{p-1,2}x_{p-1} \\ \vdots \\ \beta_{0,k} + \beta_{1,k}x_1 + \cdots + \beta_{p-1,k}x_{p-1} \end{pmatrix}$$

Unknown
(type=un)

Compound Symmetry
(type=cs)

Autoregressive
(type=ar(1))

$$\begin{pmatrix} \sigma_1^2 & \sigma_{1,2} & \sigma_{1,3} & \sigma_{1,4} \\ \sigma_{1,2} & \sigma_2^2 & \sigma_{2,3} & \sigma_{2,4} \\ \sigma_{1,3} & \sigma_{2,3} & \sigma_3^2 & \sigma_{3,4} \\ \sigma_{1,4} & \sigma_{2,4} & \sigma_{3,4} & \sigma_4^2 \end{pmatrix} \quad \begin{pmatrix} \sigma^2 + \sigma_1^2 & \sigma_1^2 & \sigma_1^2 & \sigma_1^2 \\ \sigma_1^2 & \sigma^2 + \sigma_1^2 & \sigma_1^2 & \sigma_1^2 \\ \sigma_1^2 & \sigma_1^2 & \sigma^2 + \sigma_1^2 & \sigma_1^2 \\ \sigma_1^2 & \sigma_1^2 & \sigma_1^2 & \sigma^2 + \sigma_1^2 \end{pmatrix} \quad \sigma^2 \begin{pmatrix} 1 & \rho & \rho^2 & \rho^3 \\ \rho & 1 & \rho & \rho^2 \\ \rho^2 & \rho & 1 & \rho \\ \rho^3 & \rho^2 & \rho & 1 \end{pmatrix}$$

SAS Programs

There are two SAS programs, one for the Diet data and one for the Bird Keeping data.

```
/****** 441s24MakeupDiet.sas *****/
title 'STA441s24 Makeup Test: Diet Data';

proc import datafile="/home/u1407221/441s24/data/Diet.xlsx"
    out=diet dbms=xlsx replace;
    getnames=yes;

data hunger;
    set diet;
    if gender = "M" then g=0; else if gender = "F" then g = 1;
    if Diet=1 then d1=1;
        else if Diet=2 then d1=0;
        else if Diet=3 then d1=0;
    if Diet=2 then d2=1;
        else if Diet=1 then d2=0;
        else if Diet=3 then d2=0;

proc reg plots=none data=hunger;
    model weight6weeks = pre_weight g d1 d2;
    One: test d1=d2=0;
    Two: test d1=d2;

run;
quit;
```

```
/****** 441s24MakeupBirdlung.sas *****/
title 'STA441s24 Makeup Test: Bird Keeping Data';

proc format;
    value ynfmt 0 = "No" 1 = "Yes";
    value sexfmt 0 = "Male" 1 = "Female";
    value sesfmt 0 = "Low" 1 = "High";

data tweet;
    infile '/home/u1407221/441s24/data/birdlung.data.txt';
    input cancer sex ses birdkeep age yrsmoke cigday;
    format sex sexfmt.;
    format ses sesfmt.;
    format cancer birdkeep ynfmt.;

proc logistic data=tweet;
    model cancer (event='Yes') = sex ses age cigday;

run;
quit;
```

STA441s24 Makeup Test: Diet Data

The REG Procedure
Model: MODEL1
Dependent Variable: weight6weeks weight6weeks

Number of Observations Read	78
Number of Observations Used	76
Number of Observations with Missing Values	2

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	4465.38073	1116.34518	195.41	<.0001
Error	71	405.60598	5.71276		
Corrected Total	75	4870.98671			

Root MSE	2.39014	R-Square	0.9167
Dependent Mean	68.34342	Adj R-Sq	0.9120
Coeff Var	3.49725		

Parameter Estimates						
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	Intercept	1	-1.78275	3.72911	-0.48	0.6341
pre_weight	pre_weight	1	0.95136	0.05404	17.60	<.0001
g		1	0.48514	0.84959	0.57	0.5698
d1		1	1.82492	0.67110	2.72	0.0082
d2		1	1.71939	0.68690	2.50	0.0146

STA441s24 Makeup Test: Diet Data

The REG Procedure
Model: MODEL1

Test One Results for Dependent Variable weight6weeks				
Source	DF	Mean Square	F Value	Pr > F
Numerator	2	26.66105	4.67	0.0125
Denominator	71	5.71276		

STA441s24 Makeup Test: Diet Data

The REG Procedure
Model: MODEL1

Test Two Results for Dependent Variable weight6weeks				

Source	DF	Mean Square	F Value	Pr > F
Numerator	1	0.12962	0.02	0.8807
Denominator	71	5.71276		

STA441s24 Makeup Test: Bird Keeping Data

The LOGISTIC Procedure

Model Information	
Data Set	WORK.TWEET
Response Variable	cancer
Number of Response Levels	2
Model	binary logit
Optimization Technique	Fisher's scoring

Number of Observations Read	147
Number of Observations Used	147

Response Profile		
Ordered Value	cancer	Total Frequency
1	No	98
2	Yes	49

Probability modeled is cancer='Yes'.

Model Convergence Status
Convergence criterion (GCONV=1E-8) satisfied.

Model Fit Statistics		
Criterion	Intercept Only	Intercept and Covariates
AIC	189.135	188.071
SC	192.126	203.023
-2 Log L	187.135	178.071

Testing Global Null Hypothesis: BETA=0			
Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	9.0642	4	0.0595
Score	8.7682	4	0.0672
Wald	8.2172	4	0.0839

Analysis of Maximum Likelihood Estimates					
Parameter	DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	1	-1.5441	1.5546	0.9866	0.3206
sex	1	0.2814	0.4596	0.3751	0.5403
ses	1	-0.3839	0.4162	0.8507	0.3564
age	1	-0.00019	0.0257	0.0001	0.9940
cigday	1	0.0547	0.0204	7.2006	0.0073

Odds Ratio Estimates

Effect	Point Estimate	95% Wald Confidence Limits	
sex	1.325	0.538	3.261
ses	0.681	0.301	1.540
age	1.000	0.951	1.051
cigday	1.056	1.015	1.099

Association of Predicted Probabilities and Observed Responses			
Percent Concordant	65.4	Somers' D	0.313
Percent Discordant	34.1	Gamma	0.314
Percent Tied	0.5	Tau-a	0.140
Pairs	4802	c	0.656