

Categorical Data Analysis

Lab material #5-3

```
data job;
input M $ S $ W $ count;
cards;
bad low low 103
bad low high 87
bad high low 32
bad high high 42
good low low 59
good low high 109
good high low 78
good high high 205
;
run;

proc genmod data=job order=data;
class M S W;
model count = M|S|W / dist=poisson link=log;
output out=predict pred=pred;
run;
proc genmod data=job order=data;
class M S W;
model count = M|S M|W S|W / dist=poisson link=log;
output out=predict pred=pred;
run;
proc genmod data=job order=data;
class M S W;
model count = M|S M|W / dist=poisson link=log;
output out=predict pred=pred;
run;
proc genmod data=job order=data;
class M S W;
model count = M|S W / dist=poisson link=log;
output out=predict pred=pred;
run;
proc genmod data=job order=data;
class M S W;
model count = M S W / dist=poisson link=log;
output out=predict pred=pred;
run;
```

Output 1 Results

The GENMOD Procedure

Model Information

Data Set	WORK.JOB
Distribution	Poisson
Link Function	Log
Dependent Variable	count

Number of Observations Read	8
Number of Observations Used	8

Class Level Information

Class	Levels	Values
M	2	bad good
S	2	low high
W	2	low high

Criteria For Assessing Goodness Of Fit

Criterion	DF	Value	Value/DF
Deviance	0	0.0000	.
Scaled Deviance	0	0.0000	.
Pearson Chi-Square	.	0.0000	.
Scaled Pearson X2	.	0.0000	.
Log Likelihood		2601.7687	
Full Log Likelihood		-24.7378	
AIC (smaller is better)		65.4757	
AICC (smaller is better)		.	
BIC (smaller is better)		66.1112	

Algorithm converged.

Analysis Of Maximum Likelihood Parameter Estimates

Parameter		DF	Estimate	Standard Error	Wald 95% Confidence Limits		Wald Chi-Square	Pr > ChiSq
Intercept		1	5.3230	0.0698	5.1861	5.4599	5808.56	<.0001
M	bad	1	-1.5853	0.1694	-1.9173	-1.2534	87.61	<.0001
M	good	0	0.0000	0.0000	0.0000	0.0000	.	.
S	low	1	-0.6317	0.1185	-0.8640	-0.3993	28.39	<.0001
S	high	0	0.0000	0.0000	0.0000	0.0000	.	.
M*S	bad low	1	1.3599	0.2222	0.9245	1.7953	37.47	<.0001
M*S	bad high	0	0.0000	0.0000	0.0000	0.0000	.	.
M*S	good low	0	0.0000	0.0000	0.0000	0.0000	.	.
M*S	good high	0	0.0000	0.0000	0.0000	0.0000	.	.
W	low	1	-0.9663	0.1330	-1.2270	-0.7056	52.76	<.0001
W	high	0	0.0000	0.0000	0.0000	0.0000	.	.
M*W	bad low	1	0.6944	0.2697	0.1657	1.2230	6.63	0.0100
M*W	bad high	0	0.0000	0.0000	0.0000	0.0000	.	.
M*W	good low	0	0.0000	0.0000	0.0000	0.0000	.	.
M*W	good high	0	0.0000	0.0000	0.0000	0.0000	.	.
S*W	low low	1	0.3525	0.2093	-0.0578	0.7628	2.84	0.0922
S*W	low high	0	0.0000	0.0000	0.0000	0.0000	.	.
S*W	high low	0	0.0000	0.0000	0.0000	0.0000	.	.
S*W	high high	0	0.0000	0.0000	0.0000	0.0000	.	.
M*S*W	bad low low	1	0.0883	0.3465	-0.5909	0.7675	0.06	0.7990
M*S*W	bad low high	0	0.0000	0.0000	0.0000	0.0000	.	.
M*S*W	bad high low	0	0.0000	0.0000	0.0000	0.0000	.	.
M*S*W	bad high high	0	0.0000	0.0000	0.0000	0.0000	.	.
M*S*W	good low low	0	0.0000	0.0000	0.0000	0.0000	.	.
M*S*W	good low high	0	0.0000	0.0000	0.0000	0.0000	.	.
M*S*W	good high low	0	0.0000	0.0000	0.0000	0.0000	.	.
M*S*W	good high high	0	0.0000	0.0000	0.0000	0.0000	.	.
Scale		0	1.0000	0.0000	1.0000	1.0000		

NOTE: The scale parameter was held fixed.

The GENMOD Procedure

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Class Level Information

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Criteria For Assessing Goodness Of Fit

Criterion	DF	Value	Value/DF
Deviance	1	0.0649	0.0649
Scaled Deviance	1	0.0649	0.0649
Pearson Chi-Square	1	0.0649	0.0649
Scaled Pearson X2	1	0.0649	0.0649
Log Likelihood		2601.7363	
Full Log Likelihood		-24.7703	
AIC (smaller is better)		63.5406	
AICC (smaller is better)		.	
BIC (smaller is better)		64.0967	

Algorithm converged.

Analysis Of Maximum Likelihood Parameter Estimates

Parameter		DF	Estimate	Standard Error	Wald Chi-Square	95% Confidence Limits	Wald Chi-Square	Pr > ChiSq
Intercept		1	5.3266	0.0683	5.1928	5.4604	6084.25	<.0001
M	bad	1	-1.6066	0.1484	-1.8975	-1.3157	117.19	<.0001
M	good	0	0.0000	0.0000	0.0000	0.0000	.	.
S	low	1	-0.6420	0.1115	-0.8606	-0.4234	33.14	<.0001
S	high	0	0.0000	0.0000	0.0000	0.0000	.	.
M*S	bad low	1	1.3964	0.1705	1.0622	1.7306	67.06	<.0001
M*S	bad high	0	0.0000	0.0000	0.0000	0.0000	.	.
M*S	good low	0	0.0000	0.0000	0.0000	0.0000	.	.
M*S	good high	0	0.0000	0.0000	0.0000	0.0000	.	.
W	low	1	-0.9794	0.1231	-1.2207	-0.7381	63.29	<.0001
W	high	0	0.0000	0.0000	0.0000	0.0000	.	.
M*W	bad low	1	0.7479	0.1691	0.4165	1.0792	19.57	<.0001
M*W	bad high	0	0.0000	0.0000	0.0000	0.0000	.	.
M*W	good low	0	0.0000	0.0000	0.0000	0.0000	.	.

M*W	good	high	0	0.0000	0.0000	0.0000	0.0000	.	.
S*W	low	low	1	0.3847	0.1667	0.0581	0.7114	5.33	0.0210
S*W	low	high	0	0.0000	0.0000	0.0000	0.0000	.	.
S*W	high	low	0	0.0000	0.0000	0.0000	0.0000	.	.
S*W	high	high	0	0.0000	0.0000	0.0000	0.0000	.	.
Scale			0	1.0000	0.0000	1.0000	1.0000		

NOTE: The scale parameter was held fixed.

The GENMOD Procedure

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Number of Observations Used	8

Class Level Information

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Criteria For Assessing Goodness Of Fit

Criterion	DF	Value	Value/DF
Deviance	2	5.3871	2.6936
Scaled Deviance	2	5.3871	2.6936
Pearson Chi-Square	2	5.4104	2.7052
Scaled Pearson X2	2	5.4104	2.7052
Log Likelihood		2599.0752	
Full Log Likelihood		-27.4314	
AIC (smaller is better)		66.8628	
AICC (smaller is better)		150.8628	
BIC (smaller is better)		67.3395	

Algorithm converged.

Analysis Of Maximum Likelihood Parameter Estimates

Parameter	DF	Estimate	Standard Error	Wald 95% Confidence Limits	Wald Chi-Square	Pr > ChiSq
Intercept	1	5.2834	0.0671	5.1519 5.4149	6201.76	<.0001
M bad	1	-1.6954	0.1483	-1.9860 -1.4049	130.79	<.0001
M good	0	0.0000	0.0000	0.0000 0.0000	.	.
S low	1	-0.5215	0.0974	-0.7124 -0.3306	28.67	<.0001
S high	0	0.0000	0.0000	0.0000 0.0000	.	.

M*S	bad	low	1	1.4644	0.1681	1.1349	1.7939	75.88	<.0001
M*S	bad	high	0	0.0000	0.0000	0.0000	0.0000	.	.
M*S	good	low	0	0.0000	0.0000	0.0000	0.0000	.	.
M*S	good	high	0	0.0000	0.0000	0.0000	0.0000	.	.
W	low		1	-0.8294	0.1024	-1.0301	-0.6287	65.62	<.0001
W	high		0	0.0000	0.0000	0.0000	0.0000	.	.
M*W	bad	low	1	0.8749	0.1601	0.5610	1.1887	29.85	<.0001
M*W	bad	high	0	0.0000	0.0000	0.0000	0.0000	.	.
M*W	good	low	0	0.0000	0.0000	0.0000	0.0000	.	.
M*W	good	high	0	0.0000	0.0000	0.0000	0.0000	.	.
Scale			0	1.0000	0.0000	1.0000	1.0000		

NOTE: The scale parameter was held fixed.

The GENMOD Procedure

Model Information

Data Set	WORK.JOB
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Number of Observations Read	8
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Class Level Information

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Criteria For Assessing Goodness Of Fit

Criterion	DF	Value	Value/DF
Deviance	3	35.5967	11.8656
Scaled Deviance	3	35.5967	11.8656
Pearson Chi-Square	3	35.7191	11.9064
Scaled Pearson X2	3	35.7191	11.9064
Log Likelihood		2583.9704	
Full Log Likelihood		-42.5362	
AIC (smaller is better)		95.0724	
AICC (smaller is better)		125.0724	
BIC (smaller is better)		95.4696	

Algorithm converged.

Analysis Of Maximum Likelihood Parameter Estimates

Parameter	DF	Estimate	Standard Error	Wald 95% Confidence Limits	Wald Chi-Square	Pr > ChiSq
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Intercept			1	5.1667	0.0663	5.0368	5.2966	6077.71	<.0001
M	bad		1	-1.3414	0.1306	-1.5973	-1.0855	105.55	<.0001
M	good		0	0.0000	0.0000	0.0000	0.0000	.	.
S	low		1	-0.5215	0.0974	-0.7124	-0.3306	28.67	<.0001
S	high		0	0.0000	0.0000	0.0000	0.0000	.	.
M*S	bad	low	1	1.4644	0.1681	1.1349	1.7939	75.88	<.0001
M*S	bad	high	0	0.0000	0.0000	0.0000	0.0000	.	.
M*S	good	low	0	0.0000	0.0000	0.0000	0.0000	.	.
M*S	good	high	0	0.0000	0.0000	0.0000	0.0000	.	.
W	low		1	-0.4878	0.0770	-0.6387	-0.3368	40.10	<.0001
W	high		0	0.0000	0.0000	0.0000	0.0000	.	.
Scale			0	1.0000	0.0000	1.0000	1.0000		

NOTE: The scale parameter was held fixed.

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Criteria For Assessing Goodness Of Fit

Criterion	DF	Value	Value/DF
Deviance	4	117.9968	29.4992
Scaled Deviance	4	117.9968	29.4992
Pearson Chi-Square	4	128.0859	32.0215
Scaled Pearson X2	4	128.0859	32.0215
Log Likelihood		2542.7704	
Full Log Likelihood		-83.7362	
AIC (smaller is better)		175.4724	
AICC (smaller is better)		188.8058	
BIC (smaller is better)		175.7902	

Algorithm converged.

Analysis Of Maximum Likelihood Parameter Estimates

Parameter	DF	Estimate	Standard Error	Wald 95% Confidence Limits	Wald Chi-Square	Pr > ChiSq
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Intercept		1	4.9382	0.0669	4.8070	5.0694	5445.04	<.0001
M	bad	1	-0.5355	0.0775	-0.6874	-0.3836	47.76	<.0001
M	good	0	0.0000	0.0000	0.0000	0.0000	.	.
S	low	1	0.0028	0.0748	-0.1438	0.1494	0.00	0.9702
S	high	0	0.0000	0.0000	0.0000	0.0000	.	.
W	low	1	-0.4878	0.0770	-0.6387	-0.3368	40.10	<.0001
W	high	0	0.0000	0.0000	0.0000	0.0000	.	.
Scale		0	1.0000	0.0000	1.0000	1.0000		

NOTE: The scale parameter was held fixed.