

AB Final Exercise D: from Bradstreet Table 5, Part 4.

First GLM

```
*****  
*** Bradstreet Table 5 part 4. ***  
*****  
  
data one;  
  input sub gender$ seq pera auca cmaxa perb aucb cmaxb perc aucc cmaxc perd aucd cmaxd;  
datalines;  
(snip)  
;  
data two;  
  set one;  
  per=pera; auc=auca; cmax=cmaxa; dose=2.5; output;  
  per=perb; auc=aucb; cmax=cmaxb; dose=5; output;  
  per=perc; auc=aucc; cmax=cmaxc; dose=10; output;  
  per=perd; auc=aucd; cmax=cmaxd; dose=15; output;  
  drop auca aucb aucc aucd cmaxa cmaxb cmaxc cmaxd pera perb perc perd;  
proc sort data=two; by gender sub per;  
data three;  
  set two;  
  keep seq sub gender dose per auc cmax co coa cob coc;  
  co=lag(dose); if per=1 then co=0;  
  coa=0; cob=0; coc=0;  
  if co=2.5 then coa=1;  
  if co=5 then cob=1;  
  if co=10 then coc=1;  
  if co=15 then do; coa=-1; cob=-1; coc=-1; end;  
**Bradstreet Table 5, part 4 Multivariate COD;  
**First GLM;  
proc glm data=three;  
  class gender seq sub per dose co;  
  model auc cmax=gender seq gender*seq sub(gender seq) per dose co;  
  manova h=gender seq gender*seq e=sub(gender seq);  
  manova h=per dose co/printe printh;  
run;
```

The GLM Procedure Class Level Information

Class	Levels	Values
gender	2	F M
seq	4	1 2 3 4
sub	24	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
per	4	1 2 3 4
dose	4	2.5 5 10 15
co	5	0 2.5 5 10 15
Number of Observations Read		96
Number of Observations Used		96

Dependent Variable: auc

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	32	273378.3058	8543.0721	20.50	<.0001
Error	63	26259.5916	416.8189		
Corrected Total	95	299637.8974			

R-Square	Coeff Var	Root MSE	auc Mean
0.912362	28.83348	20.41614	70.80708

Source	DF	Type I SS	Mean Square	F Value	Pr > F
gender	1	7359.1028	7359.1028	17.66	<.0001
seq	3	1224.5993	408.1998	0.98	0.4082
gender*seq	3	7806.5824	2602.1941	6.24	0.0009
sub(gender*seq)	16	27310.9917	1706.9370	4.10	<.0001
per	3	150.7636	50.2545	0.12	0.9477
dose	3	229295.3819	76431.7940	183.37	<.0001
co	3	230.8840	76.9613	0.18	0.9065

Source	DF	Type III SS	Mean Square	F Value	Pr > F
gender	1	7359.1028	7359.1028	17.66	<.0001
seq	3	1225.5869	408.5290	0.98	0.4079
gender*seq	3	7806.5824	2602.1941	6.24	0.0009
sub(gender*seq)	16	27310.9917	1706.9370	4.10	<.0001
per	2	28.6673	14.3336	0.03	0.9662
dose	3	210655.2790	70218.4263	168.46	<.0001
co	3	230.8840	76.9613	0.18	0.9065

Dependent Variable: cmax

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	32	34348.32018	1073.38501	12.76	<.0001
Error	63	5299.31664	84.11614		
Corrected Total	95	39647.63682			

R-Square	Coeff Var	Root MSE	cmax Mean
0.866340	37.05105	9.171485	24.75365

Source	DF	Type I SS	Mean Square	F Value	Pr > F
gender	1	268.50315	268.50315	3.19	0.0788
seq	3	425.36237	141.78746	1.69	0.1791
gender*seq	3	474.72351	158.24117	1.88	0.1418
sub(gender*seq)	16	5604.79792	350.29987	4.16	<.0001
per	3	209.65184	69.88395	0.83	0.4819
dose	3	27253.39624	9084.46541	108.00	<.0001
co	3	111.88516	37.29505	0.44	0.7228

Source	DF	Type III SS	Mean Square	F Value	Pr > F
gender	1	268.50315	268.50315	3.19	0.0788
seq	3	333.84884	111.28295	1.32	0.2748
gender*seq	3	474.72351	158.24117	1.88	0.1418
sub(gender*seq)	16	5604.79792	350.29987	4.16	<.0001
per	2	204.29175	102.14588	1.21	0.3038
dose	3	24151.53069	8050.51023	95.71	<.0001
co	3	111.88516	37.29505	0.44	0.7228

The GLM Procedure
Multivariate Analysis of Variance

Characteristic Roots and Vectors of: E Inverse * H, where

H = Type III SSCP Matrix for gender

E = Type III SSCP Matrix for sub(gender*seq)

Characteristic Root	Percent	Characteristic Vector auc	V'EV=1 cmax
0.50828301	100.00	0.01193549	-0.01897641
0.00000000	0.00	-0.00385015	0.02015653

MANOVA Test Criteria and Exact F Statistics for the Hypothesis of No Overall gender Effect

H = Type III SSCP Matrix for gender

E = Type III SSCP Matrix for sub(gender*seq)

S=1 M=0 N=6.5

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.66300554	3.81	2	15	0.0459
Pillai's Trace	0.33699446	3.81	2	15	0.0459
Hotelling-Lawley Trace	0.50828301	3.81	2	15	0.0459
Roy's Greatest Root	0.50828301	3.81	2	15	0.0459

Characteristic Roots and Vectors of: E Inverse * H, where

H = Type III SSCP Matrix for seq

E = Type III SSCP Matrix for sub(gender*seq)

Characteristic Root	Percent	Characteristic Vector auc	V'EV=1 cmax
0.57629639	97.11	-0.01205620	0.02698896
0.01716170	2.89	0.00345364	0.00616329

MANOVA Test Criteria and F Approximations for the Hypothesis of No Overall seq Effect

H = Type III SSCP Matrix for seq

E = Type III SSCP Matrix for sub(gender*seq)

S=2 M=0 N=6.5

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.62369479	1.33	6	30	0.2742
Pillai's Trace	0.38247369	1.26	6	32	0.3027
Hotelling-Lawley Trace	0.59345809	1.44	6	18.326	0.2519
Roy's Greatest Root	0.57629639	3.07	3	16	0.0577

NOTE: F Statistic for Roy's Greatest Root is an upper bound.

NOTE: F Statistic for Wilks' Lambda is exact.

Characteristic Roots and Vectors of: E Inverse * H, where

H = Type III SSCP Matrix for gender*seq

E = Type III SSCP Matrix for sub(gender*seq)

Characteristic Root	Percent	Characteristic Vector auc	V'EV=1 cmax
0.71165748	90.18	-0.01246953	0.02268461
0.07748066	9.82	-0.00133803	0.01586816

MANOVA Test Criteria and F Approximations for the Hypothesis of No Overall gender*seq Effect

H = Type III SSCP Matrix for gender*seq

E = Type III SSCP Matrix for sub(gender*seq)

S=2 M=0 N=6.5

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.54221765	1.79	6	30	0.1349
Pillai's Trace	0.48768006	1.72	6	32	0.1484
Hotelling-Lawley Trace	0.78913814	1.92	6	18.326	0.1316
Roy's Greatest Root	0.71165748	3.80	3	16	0.0314

NOTE: F Statistic for Roy's Greatest Root is an upper bound.

NOTE: F Statistic for Wilks' Lambda is exact.

E = Error SSCP Matrix

	auc	cmax
auc	26259.591589	9095.3828742
cmax	9095.3828742	5299.31664

Partial Correlation Coefficients from the Error SSCP Matrix / Prob > |r|

DF = 63	auc	cmax
auc	1.000000	0.771023
		<.0001
cmax	0.771023	1.000000
	<.0001	

H = Type III SSCP Matrix for per

	auc	cmax
auc	28.667252778	52.169363889
cmax	52.169363889	204.29175278

Characteristic Roots and Vectors of: E Inverse * H, where

H = Type III SSCP Matrix for per

E = Error SSCP Matrix

Characteristic Root	Percent	Characteristic Vector auc	V'EV=1 cmax
0.08024662	99.14	-0.00701557	0.02151734
0.00069225	0.86	0.00668492	-0.00152853

MANOVA Test Criteria and F Approximations for the Hypothesis of No Overall per Effect

H = Type III SSCP Matrix for per

E = Error SSCP Matrix

S=2 M=-0.5 N=30

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.92507416	1.23	4	124	0.3012
Pillai's Trace	0.07497723	1.23	4	126	0.3028
Hotelling-Lawley Trace	0.08093887	1.25	4	73.373	0.2982
Roy's Greatest Root	0.08024662	2.53	2	63	0.0879

NOTE: F Statistic for Roy's Greatest Root is an upper bound.

NOTE: F Statistic for Wilks' Lambda is exact.

H = Type III SSCP Matrix for dose

	auc	cmax
auc	210655.27901	71291.813459
cmax	71291.813459	24151.530689

Characteristic Roots and Vectors of: E Inverse * H, where

H = Type III SSCP Matrix for dose

E = Error SSCP Matrix

Characteristic Root	Percent	Characteristic Vector auc	V'EV=1 cmax
8.02821322	99.86	0.00637610	-0.00059899
0.01131177	0.14	-0.00729738	0.02156325

MANOVA Test Criteria and F Approximations for the Hypothesis of No Overall dose Effect

H = Type III SSCP Matrix for dose

E = Error SSCP Matrix

S=2 M=0 N=30

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.10952497	41.78	6	124	<.0001
Pillai's Trace	0.90042136	17.20	6	126	<.0001
Hotelling-Lawley Trace	8.03952500	82.43	6	80.913	<.0001
Roy's Greatest Root	8.02821322	168.59	3	63	<.0001

NOTE: F Statistic for Roy's Greatest Root is an upper bound.

NOTE: F Statistic for Wilks' Lambda is exact.

H = Type III SSCP Matrix for co

	auc	cmax
auc	230.8840025	-140.64242
cmax	-140.64242	111.88516208

Characteristic Roots and Vectors of: E Inverse * H, where

H = Type III SSCP Matrix for co

E = Error SSCP Matrix

Characteristic Root	Percent	Characteristic Vector auc	V'EV=1 cmax
0.11817367	99.24	-0.00881622	0.02083372
0.00090754	0.76	0.00402251	0.00559360

MANOVA Test Criteria and F Approximations for the Hypothesis of No Overall co Effect

H = Type III SSCP Matrix for co

E = Error SSCP Matrix

S=2 M=0 N=30

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.89350456	1.20	6	124	0.3123
Pillai's Trace	0.10659126	1.18	6	126	0.3200
Hotelling-Lawley Trace	0.11908122	1.22	6	80.913	0.3042
Roy's Greatest Root	0.11817367	2.48	3	63	0.0690

NOTE: F Statistic for Roy's Greatest Root is an upper bound.

NOTE: F Statistic for Wilks' Lambda is exact.

Second GLM

```

**Second GLM;
proc glm data=three;
class gender seq sub per dose;
model auc cmax=gender seq gender*seq sub(gender seq) per dose coa cob coc;
contrast 'linear dose' dose -0.58585 -0.325472 0.1952834 0.716039;
contrast 'quadratic dose' dose 0.4959593 -0.280609 -0.678681 0.4633304;
contrast 'cubic dose' dose -0.401004 0.7518821 -0.501255 0.1503764;
manova h=gender seq gender*seq e=sub(gender seq);
manova h=per dose coa cob coc/printe printh;
run;

```

The GLM Procedure Class Level Information

Class	Levels	Values
gender	2	F M
seq	4	1 2 3 4
sub	24	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
per	4	1 2 3 4
dose	4	2.5 5 10 15
Number of Observations Read		96
Number of Observations Used		96

Dependent Variable: auc

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	32	273378.3058	8543.0721	20.50	<.0001

Error	63	26259.5916	416.8189		
Corrected Total	95	299637.8974			
	R-Square	Coeff Var	Root MSE	auc Mean	
	0.912362	28.83348	20.41614	70.80708	
Source	DF	Type I SS	Mean Square	F Value	Pr > F
gender	1	7359.1028	7359.1028	17.66	<.0001
seq	3	1224.5993	408.1998	0.98	0.4082
gender*seq	3	7806.5824	2602.1941	6.24	0.0009
sub(gender*seq)	16	27310.9917	1706.9370	4.10	<.0001
per	3	150.7636	50.2545	0.12	0.9477
dose	3	229295.3819	76431.7940	183.37	<.0001
coa	1	83.3583	83.3583	0.20	0.6563
cob	1	34.9347	34.9347	0.08	0.7731
coc	1	112.5909	112.5909	0.27	0.6051
Source	DF	Type III SS	Mean Square	F Value	Pr > F
gender	1	7359.1028	7359.1028	17.66	<.0001
seq	3	1225.5869	408.5290	0.98	0.4079
gender*seq	3	7806.5824	2602.1941	6.24	0.0009
sub(gender*seq)	16	27310.9917	1706.9370	4.10	<.0001
per	3	150.7636	50.2545	0.12	0.9477
dose	3	210655.2790	70218.4263	168.46	<.0001
coa	1	189.8307	189.8307	0.46	0.5022
cob	1	4.1435	4.1435	0.01	0.9209
coc	1	112.5909	112.5909	0.27	0.6051
Contrast	DF	Contrast SS	Mean Square	F Value	Pr > F
linear dose	1	209605.4509	209605.4509	502.87	<.0001
quadratic dose	1	1042.3924	1042.3924	2.50	0.1188
cubic dose	1	7.4413	7.4413	0.02	0.8941
Dependent Variable: cmax					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	32	34348.32018	1073.38501	12.76	<.0001
Error	63	5299.31664	84.11614		
Corrected Total	95	39647.63682			
	R-Square	Coeff Var	Root MSE	cmax Mean	
	0.866340	37.05105	9.171485	24.75365	
Source	DF	Type I SS	Mean Square	F Value	Pr > F
gender	1	268.50315	268.50315	3.19	0.0788
seq	3	425.36237	141.78746	1.69	0.1791
gender*seq	3	474.72351	158.24117	1.88	0.1418
sub(gender*seq)	16	5604.79792	350.29987	4.16	<.0001
per	3	209.65184	69.88395	0.83	0.4819
dose	3	27253.39624	9084.46541	108.00	<.0001
coa	1	77.30483	77.30483	0.92	0.3414
cob	1	26.66961	26.66961	0.32	0.5754
coc	1	7.91072	7.91072	0.09	0.7601
Source	DF	Type III SS	Mean Square	F Value	Pr > F
gender	1	268.50315	268.50315	3.19	0.0788
seq	3	333.84884	111.28295	1.32	0.2748
gender*seq	3	474.72351	158.24117	1.88	0.1418
sub(gender*seq)	16	5604.79792	350.29987	4.16	<.0001
per	3	209.65184	69.88395	0.83	0.4819
dose	3	24151.53069	8050.51023	95.71	<.0001

coa	1	111.32121	111.32121	1.32	0.2543
cob	1	15.45575	15.45575	0.18	0.6696
coc	1	7.91072	7.91072	0.09	0.7601
Contrast	DF	Contrast SS	Mean Square	F Value	Pr > F
linear dose	1	24030.66728	24030.66728	285.68	<.0001
quadratic dose	1	105.16129	105.16129	1.25	0.2678
cubic dose	1	15.70198	15.70198	0.19	0.6672

Multivariate Analysis of Variance

Characteristic Roots and Vectors of: E Inverse * H, where
H = Type III SSCP Matrix for gender
E = Type III SSCP Matrix for sub(gender*seq)

Characteristic Root	Percent	Characteristic Vector auc	V'EV=1 cmax
0.50828301	100.00	0.01193549	-0.01897641
0.00000000	0.00	-0.00385015	0.02015653

MANOVA Test Criteria and Exact F Statistics for the Hypothesis of No Overall gender Effect
H = Type III SSCP Matrix for gender
E = Type III SSCP Matrix for sub(gender*seq)

S=1 M=0 N=6.5

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.66300554	3.81	2	15	0.0459
Pillai's Trace	0.33699446	3.81	2	15	0.0459
Hotelling-Lawley Trace	0.50828301	3.81	2	15	0.0459
Roy's Greatest Root	0.50828301	3.81	2	15	0.0459

Characteristic Roots and Vectors of: E Inverse * H, where
H = Type III SSCP Matrix for seq
E = Type III SSCP Matrix for sub(gender*seq)

Characteristic Root	Percent	Characteristic Vector auc	V'EV=1 cmax
0.57629639	97.11	-0.01205620	0.02698896
0.01716170	2.89	0.00345364	0.00616329

Multivariate Analysis of Variance

MANOVA Test Criteria and F Approximations for the Hypothesis of No Overall seq Effect
H = Type III SSCP Matrix for seq
E = Type III SSCP Matrix for sub(gender*seq)

S=2 M=0 N=6.5

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.62369479	1.33	6	30	0.2742
Pillai's Trace	0.38247369	1.26	6	32	0.3027
Hotelling-Lawley Trace	0.59345809	1.44	6	18.326	0.2519
Roy's Greatest Root	0.57629639	3.07	3	16	0.0577

NOTE: F Statistic for Roy's Greatest Root is an upper bound.

NOTE: F Statistic for Wilks' Lambda is exact.

Characteristic Roots and Vectors of: E Inverse * H, where
H = Type III SSCP Matrix for gender*seq

E = Type III SSCP Matrix for sub(gender*seq)

Characteristic		Characteristic Vector	V'EV=1
Root	Percent	auc	cmax
0.71165748	90.18	-0.01246953	0.02268461
0.07748066	9.82	-0.00133803	0.01586816

MANOVA Test Criteria and F Approximations for the Hypothesis of No Overall gender*seq Effect

H = Type III SSCP Matrix for gender*seq

E = Type III SSCP Matrix for sub(gender*seq)

S=2 M=0 N=6.5

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.54221765	1.79	6	30	0.1349
Pillai's Trace	0.48768006	1.72	6	32	0.1484
Hotelling-Lawley Trace	0.78913814	1.92	6	18.326	0.1316
Roy's Greatest Root	0.71165748	3.80	3	16	0.0314

NOTE: F Statistic for Roy's Greatest Root is an upper bound.

NOTE: F Statistic for Wilks' Lambda is exact.

Multivariate Analysis of Variance

Characteristic Roots and Vectors of: E Inverse * H, where

H = Contrast SSCP Matrix for linear dose

E = Type III SSCP Matrix for sub(gender*seq)

Characteristic		Characteristic Vector	V'EV=1
Root	Percent	auc	cmax
8.21884417	100.00	0.00867362	-0.00712280
0.00000000	0.00	-0.00905803	0.02675174

MANOVA Test Criteria and Exact F Statistics for the

Hypothesis of No Overall linear dose Effect

H = Contrast SSCP Matrix for linear dose

E = Type III SSCP Matrix for sub(gender*seq)

S=1 M=0 N=6.5

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.10847347	61.64	2	15	<.0001
Pillai's Trace	0.89152653	61.64	2	15	<.0001
Hotelling-Lawley Trace	8.21884417	61.64	2	15	<.0001
Roy's Greatest Root	8.21884417	61.64	2	15	<.0001

Characteristic Roots and Vectors of: E Inverse * H, where

H = Contrast SSCP Matrix for quadratic dose

E = Type III SSCP Matrix for sub(gender*seq)

Characteristic		Characteristic Vector	V'EV=1
Root	Percent	auc	cmax
0.04317481	100.00	0.00943025	-0.00942783
0.00000000	0.00	-0.00826740	0.02602895

Multivariate Analysis of Variance

MANOVA Test Criteria and Exact F Statistics for the

Hypothesis of No Overall quadratic dose Effect

H = Contrast SSCP Matrix for quadratic dose
E = Type III SSCP Matrix for sub(gender*seq)

S=1 M=0 N=6.5

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.95861211	0.32	2	15	0.7283
Pillai's Trace	0.04138789	0.32	2	15	0.7283
Hotelling-Lawley Trace	0.04317481	0.32	2	15	0.7283
Roy's Greatest Root	0.04317481	0.32	2	15	0.7283

Characteristic Roots and Vectors of: E Inverse * H, where
H = Contrast SSCP Matrix for cubic dose
E = Type III SSCP Matrix for sub(gender*seq)

Characteristic Root	Percent	Characteristic Vector auc	V'EV=1 cmax
0.01977844	100.00	-0.01161902	0.02749240
0.00000000	0.00	0.00471995	0.00324926

MANOVA Test Criteria and Exact F Statistics for the
Hypothesis of No Overall cubic dose Effect
H = Contrast SSCP Matrix for cubic dose
E = Type III SSCP Matrix for sub(gender*seq)

S=1 M=0 N=6.5

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.98060516	0.15	2	15	0.8634
Pillai's Trace	0.01939484	0.15	2	15	0.8634
Hotelling-Lawley Trace	0.01977844	0.15	2	15	0.8634
Roy's Greatest Root	0.01977844	0.15	2	15	0.8634

Multivariate Analysis of Variance

E = Error SSCP Matrix

	auc	cmax
auc	26259.591589	9095.3828742
cmax	9095.3828742	5299.31664

Partial Correlation Coefficients from the Error SSCP Matrix / Prob > |r|

DF = 63	auc	cmax
auc	1.000000	0.771023
		<.0001
cmax	0.771023	1.000000
	<.0001	

Multivariate Analysis of Variance

H = Type III SSCP Matrix for per

	auc	cmax
auc	150.76360833	26.587208333
cmax	26.587208333	209.65183646

Characteristic Roots and Vectors of: E Inverse * H, where
H = Type III SSCP Matrix for per

E = Error SSCP Matrix

Characteristic Root	Percent	Characteristic Vector auc	V'EV=1 cmax
0.09753066	94.56	-0.00769570	0.02155668
0.00561444	5.44	0.00588920	0.00080132

MANOVA Test Criteria and F Approximations for the Hypothesis of No Overall per Effect
H = Type III SSCP Matrix for per
E = Error SSCP Matrix

S=2 M=0 N=30

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.90604932	1.05	6	124	0.3996
Pillai's Trace	0.09444682	1.04	6	126	0.4021
Hotelling-Lawley Trace	0.10314510	1.06	6	80.913	0.3949
Roy's Greatest Root	0.09753066	2.05	3	63	0.1161

NOTE: F Statistic for Roy's Greatest Root is an upper bound.

NOTE: F Statistic for Wilks' Lambda is exact.

H = Type III SSCP Matrix for dose

	auc	cmax
auc	210655.27901	71291.813459
cmax	71291.813459	24151.530689

Multivariate Analysis of Variance

Characteristic Roots and Vectors of: E Inverse * H, where
H = Type III SSCP Matrix for dose
E = Error SSCP Matrix

Characteristic Root	Percent	Characteristic Vector auc	V'EV=1 cmax
8.02821322	99.86	0.00637610	-0.00059899
0.01131177	0.14	-0.00729738	0.02156325

MANOVA Test Criteria and F Approximations for the Hypothesis of No Overall dose Effect
H = Type III SSCP Matrix for dose
E = Error SSCP Matrix

S=2 M=0 N=30

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.10952497	41.78	6	124	<.0001
Pillai's Trace	0.90042136	17.20	6	126	<.0001
Hotelling-Lawley Trace	8.03952500	82.43	6	80.913	<.0001
Roy's Greatest Root	8.02821322	168.59	3	63	<.0001

NOTE: F Statistic for Roy's Greatest Root is an upper bound.

NOTE: F Statistic for Wilks' Lambda is exact.

H = Type III SSCP Matrix for coa

	auc	cmax
auc	189.83068056	-145.3691208
cmax	-145.3691208	111.32121125

Multivariate Analysis of Variance

Characteristic Roots and Vectors of: E Inverse * H, where
H = Type III SSCP Matrix for coa
E = Error SSCP Matrix

Characteristic Root	Percent	Characteristic Vector auc	V'EV=1 cmax
0.11648727	100.00	-0.00877336	0.02089150
0.00000000	0.00	0.00411517	0.00537380

MANOVA Test Criteria and Exact F Statistics for the Hypothesis of No Overall coa Effect
H = Type III SSCP Matrix for coa
E = Error SSCP Matrix

S=1 M=0 N=30

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.89566628	3.61	2	62	0.0328
Pillai's Trace	0.10433372	3.61	2	62	0.0328
Hotelling-Lawley Trace	0.11648727	3.61	2	62	0.0328
Roy's Greatest Root	0.11648727	3.61	2	62	0.0328

H = Type III SSCP Matrix for cob

	auc	cmax
auc	4.1435338889	-8.002588611
cmax	-8.002588611	15.455750139

Characteristic Roots and Vectors of: E Inverse * H, where
H = Type III SSCP Matrix for cob
E = Error SSCP Matrix

Characteristic Root	Percent	Characteristic Vector auc	V'EV=1 cmax
0.01016079	100.00	-0.00818239	0.02140341
0.00000000	0.00	0.00519181	0.00268819

Multivariate Analysis of Variance

MANOVA Test Criteria and Exact F Statistics for the Hypothesis of No Overall cob Effect
H = Type III SSCP Matrix for cob
E = Error SSCP Matrix

S=1 M=0 N=30

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.98994141	0.31	2	62	0.7310
Pillai's Trace	0.01005859	0.31	2	62	0.7310
Hotelling-Lawley Trace	0.01016079	0.31	2	62	0.7310
Roy's Greatest Root	0.01016079	0.31	2	62	0.7310

H = Type III SSCP Matrix for coc

	auc	cmax
auc	112.59094222	-29.84419222
cmax	-29.84419222	7.9107234722

Characteristic Roots and Vectors of: E Inverse * H, where
H = Type III SSCP Matrix for coc
E = Error SSCP Matrix

Characteristic Root	Percent	Characteristic Vector auc	V'EV=1 cmax
0.02387437	100.00	-0.00938268	0.01953876
0.00000000	0.00	0.00242315	0.00914163

Multivariate Analysis of Variance

MANOVA Test Criteria and Exact F Statistics for the Hypothesis of No Overall coc Effect
H = Type III SSCP Matrix for coc
E = Error SSCP Matrix

S=1 M=0 N=30

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.97668232	0.74	2	62	0.4812
Pillai's Trace	0.02331768	0.74	2	62	0.4812
Hotelling-Lawley Trace	0.02387437	0.74	2	62	0.4812
Roy's Greatest Root	0.02387437	0.74	2	62	0.4812

H = Contrast SSCP Matrix for linear dose

	auc	cmax
auc	209605.45095	70971.535501
cmax	70971.535501	24030.667278

Characteristic Roots and Vectors of: E Inverse * H, where
H = Contrast SSCP Matrix for linear dose
E = Error SSCP Matrix

Characteristic Root	Percent	Characteristic Vector auc	V'EV=1 cmax
7.98793904	100.00	0.00637155	-0.00058557
0.00000000	0.00	-0.00730135	0.02156362

Multivariate Analysis of Variance

MANOVA Test Criteria and Exact F Statistics for the
Hypothesis of No Overall linear dose Effect
H = Contrast SSCP Matrix for linear dose
E = Error SSCP Matrix

S=1 M=0 N=30

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.11126021	247.63	2	62	<.0001
Pillai's Trace	0.88873979	247.63	2	62	<.0001
Hotelling-Lawley Trace	7.98793904	247.63	2	62	<.0001
Roy's Greatest Root	7.98793904	247.63	2	62	<.0001

H = Contrast SSCP Matrix for quadratic dose
auc cmax

auc	1042.3924348	331.08809791
cmax	331.08809791	105.16128564

Characteristic Roots and Vectors of: E Inverse * H, where
H = Contrast SSCP Matrix for quadratic dose
E = Error SSCP Matrix

Characteristic Root	Percent	Characteristic Vector auc	V'EV=1 cmax
0.04009636	100.00	0.00688699	-0.00215639
0.00000000	0.00	-0.00681731	0.02146351

Multivariate Analysis of Variance

MANOVA Test Criteria and Exact F Statistics for the
Hypothesis of No Overall quadratic dose Effect
H = Contrast SSCP Matrix for quadratic dose
E = Error SSCP Matrix

S=1 M=0 N=30

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.96144938	1.24	2	62	0.2956
Pillai's Trace	0.03855062	1.24	2	62	0.2956
Hotelling-Lawley Trace	0.04009636	1.24	2	62	0.2956
Roy's Greatest Root	0.04009636	1.24	2	62	0.2956

H = Contrast SSCP Matrix for cubic dose

	auc	cmax
auc	7.4412864321	-10.80939176
cmax	-10.80939176	15.701982623

Characteristic Roots and Vectors of: E Inverse * H, where
H = Contrast SSCP Matrix for cubic dose
E = Error SSCP Matrix

Characteristic Root	Percent	Characteristic Vector auc	V'EV=1 cmax
0.01148982	100.00	-0.00834803	0.02130389
0.00000000	0.00	0.00492106	0.00338770

Multivariate Analysis of Variance

MANOVA Test Criteria and Exact F Statistics for the
Hypothesis of No Overall cubic dose Effect
H = Contrast SSCP Matrix for cubic dose
E = Error SSCP Matrix

S=1 M=0 N=30

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.98864069	0.36	2	62	0.7018
Pillai's Trace	0.01135931	0.36	2	62	0.7018
Hotelling-Lawley Trace	0.01148982	0.36	2	62	0.7018
Roy's Greatest Root	0.01148982	0.36	2	62	0.7018

Third GLM

```
**Third GLM;  
proc glm data=three noprint;  
  class gender seq sub per;  
  model auc cmax=gender seq gender*seq sub(gender seq) per coa cob coc;  
  manova h=gender seq gender*seq e=sub(gender seq);  
  manova h=per coa cob coc/printe printh;  
  output out=four r=rauc rcmax;  
run;  
proc plot; plot (rauc rcmax)*dose; run;
```

