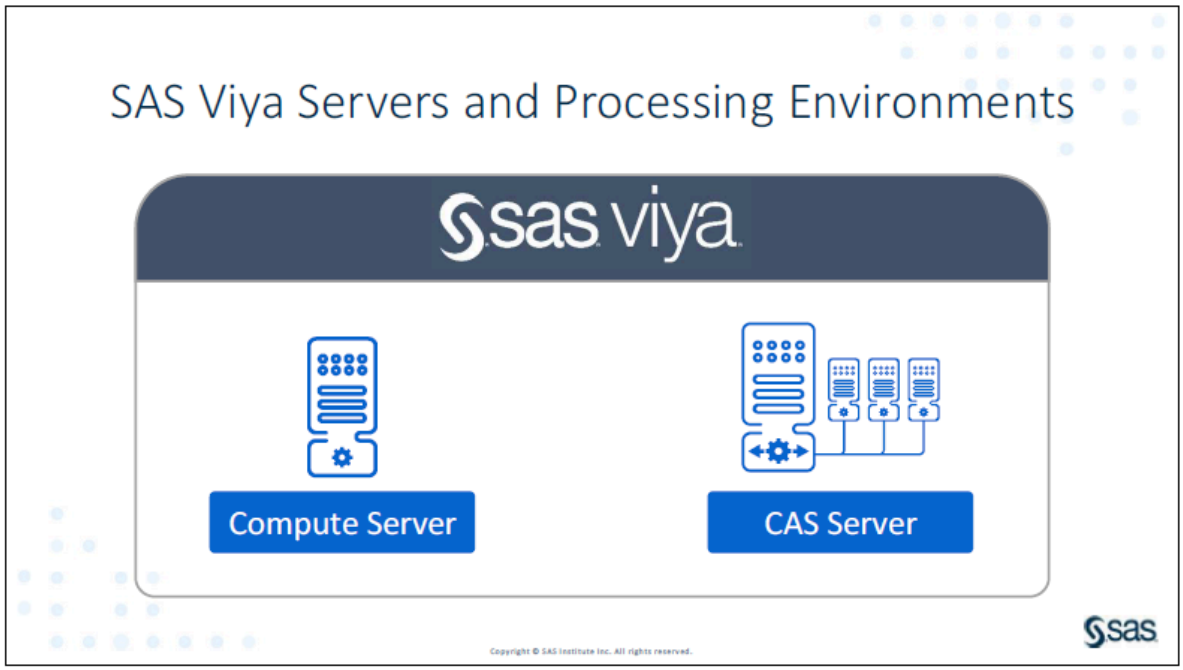
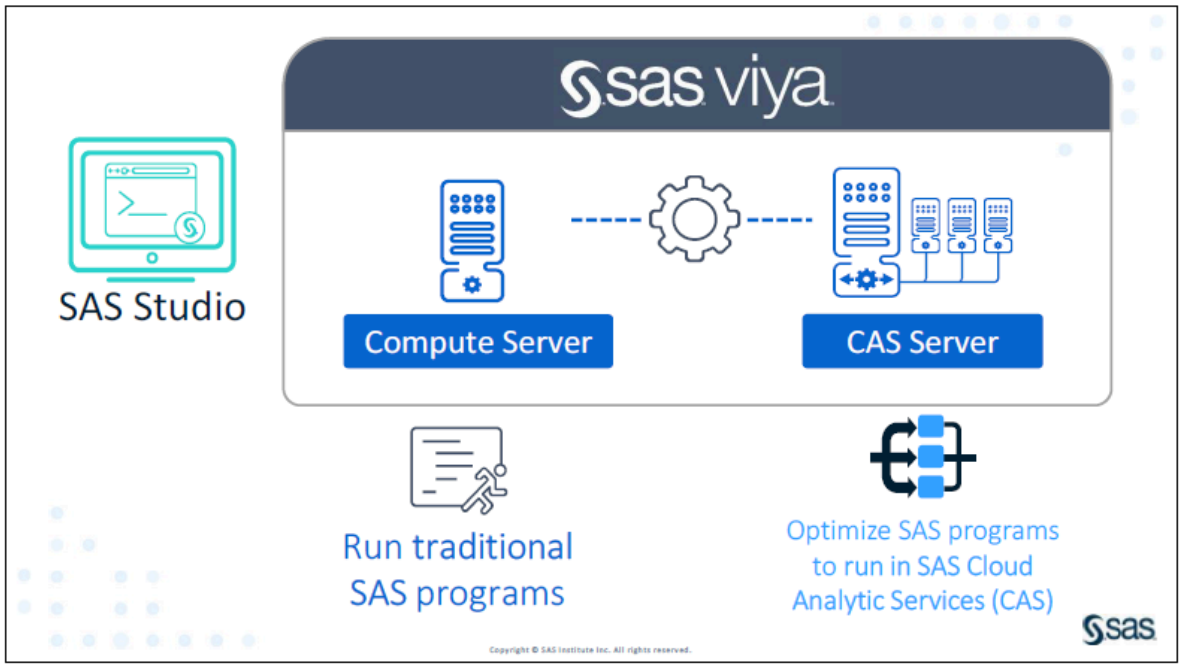
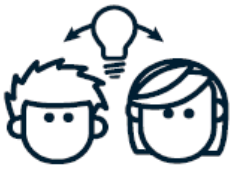
How to Modify SAS9 Programs to Run in SAS Viya







Considerations when running SAS®9 code on the Compute Server in SAS Viya

- Local paths will not work in your code.
- Have all existing SAS libraries set up in SAS Viya.
- SAS provides a content assessment tool.

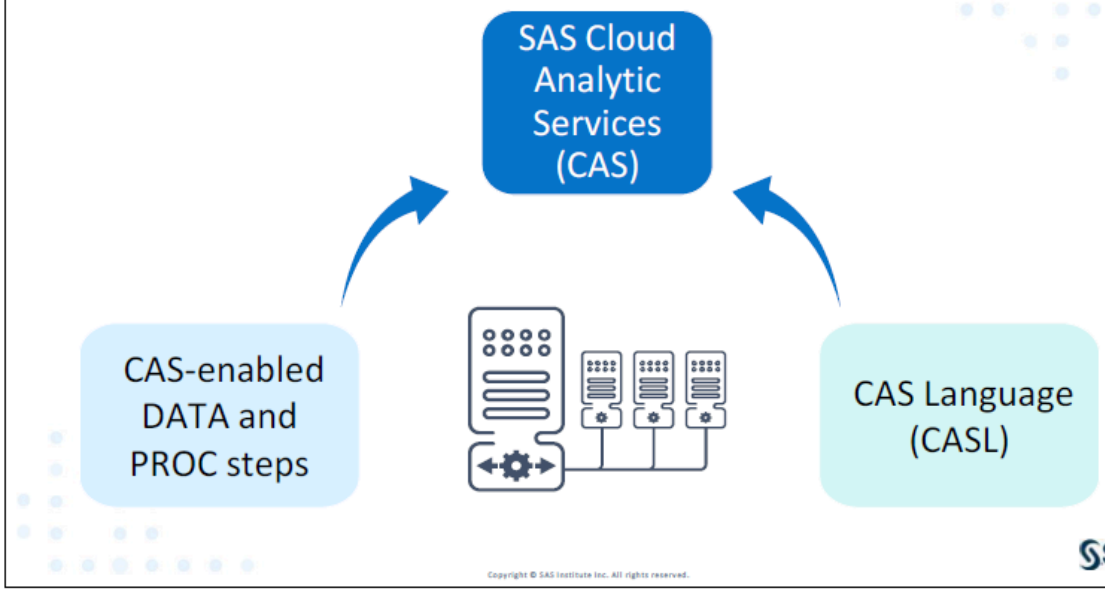
Advantages of Cloud Analytics Services (CAS)

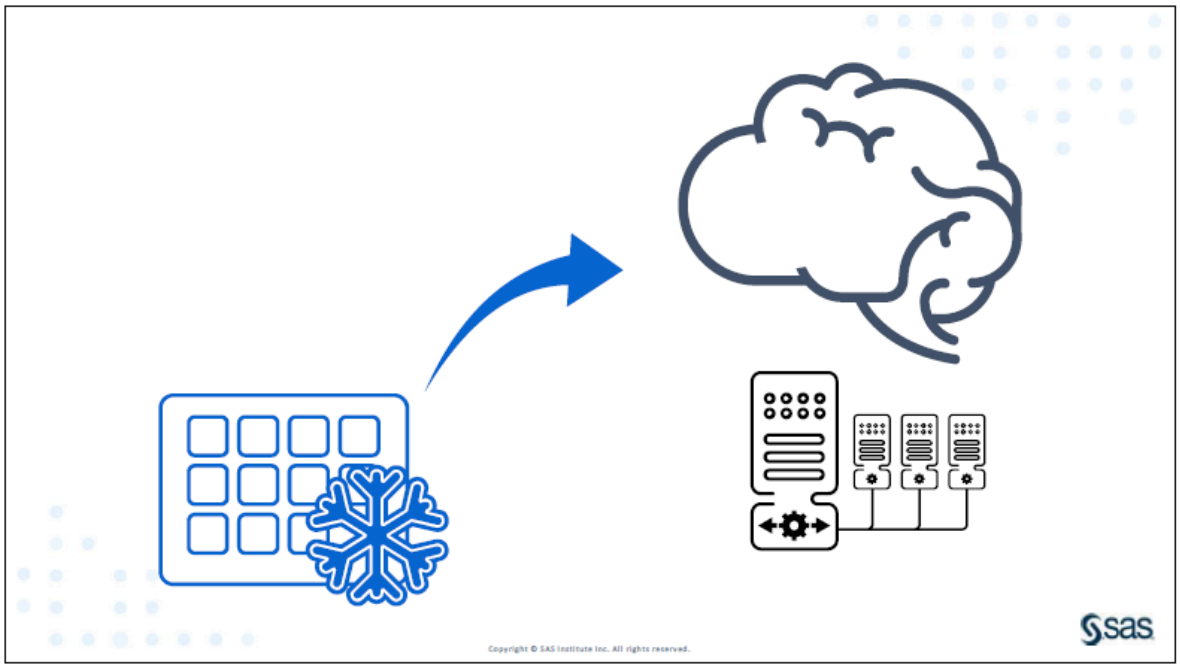
Need more processing power

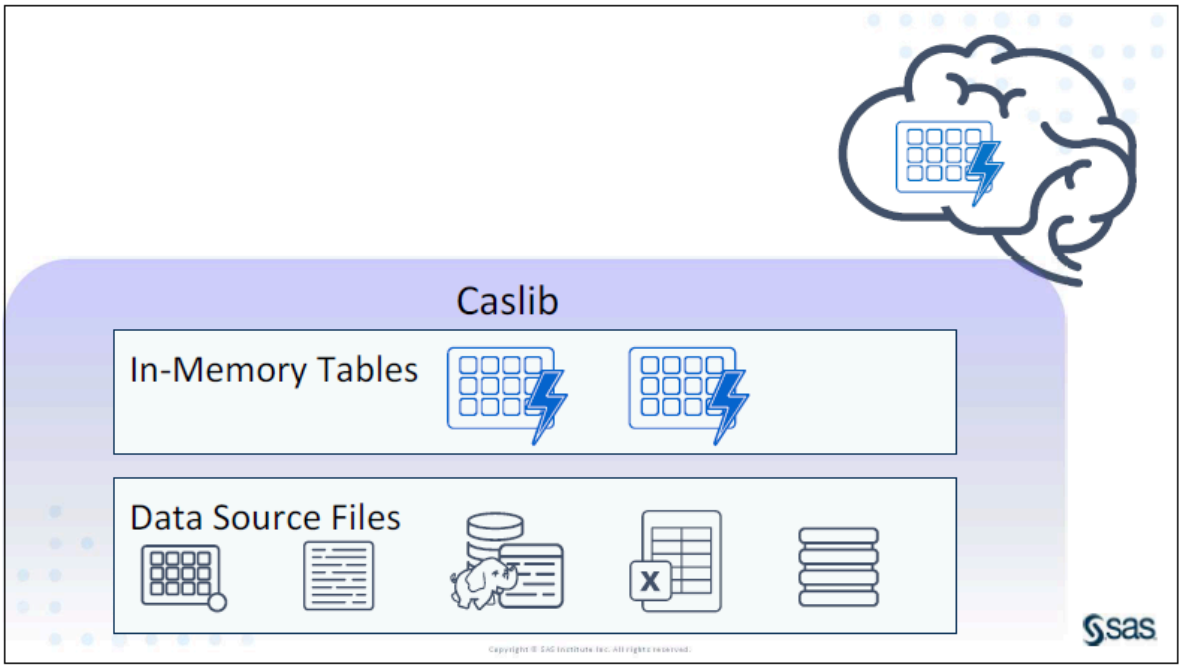
Data preparation for other apps

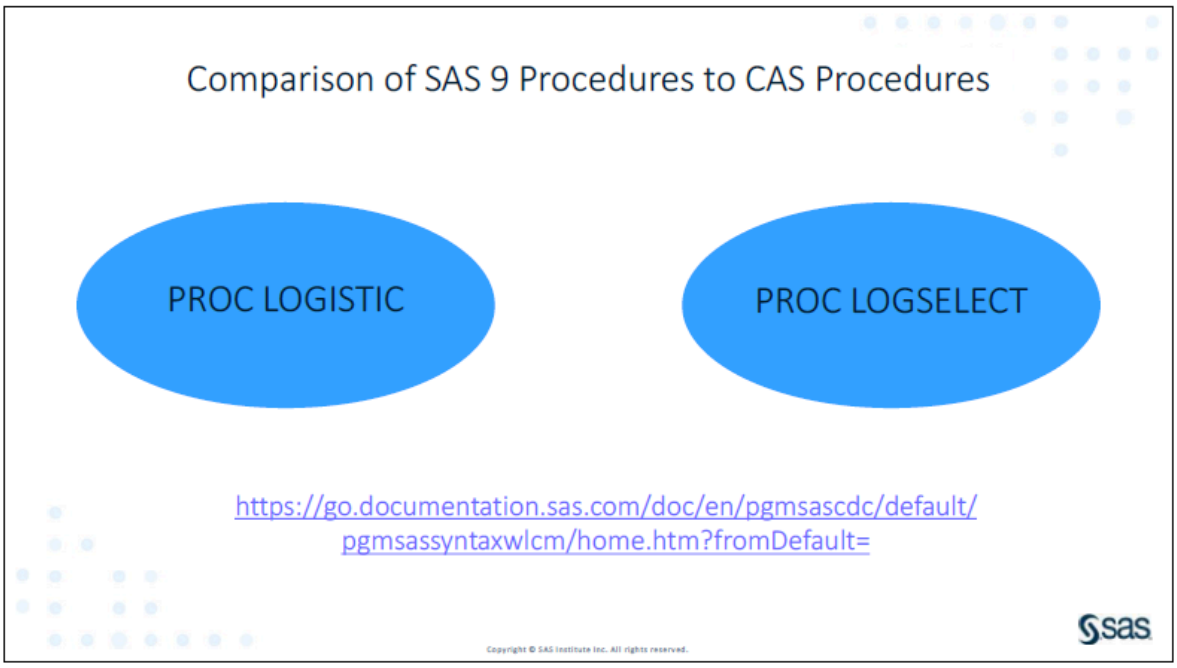
Avoid multiple reads of your data

Additional analytic capabilities




sas


Caslib
In-Memory Tables
Data Source Files
sas



Link to Comparison of PROCs to CAS Enabled PROCs

PROC LOGISTIC (SAS9)

In [1]:
```
title 'PROC LOGISTIC: Modeling with Categorical Predictors';

data Neuralgia;
   input Treatment $ Sex $ Age Duration Pain $ @@;
   datalines;
P  F  68   1  No   B  M  74  16  No  P  F  67  30  No
P  M  66  26  Yes  B  F  67  28  No  B  F  77  16  No
A  F  71  12  No   B  F  72  50  No  B  F  76   9  Yes
A  M  71  17  Yes  A  F  63  27  No  A  F  69  18  Yes
B  F  66  12  No   A  M  62  42  No  P  F  64   1  Yes
A  F  64  17  No   P  M  74   4  No  A  F  72  25  No
P  M  70   1  Yes  B  M  66  19  No  B  M  59  29  No
A  F  64  30  No   A  M  70  28  No  A  M  69   1  No
B  F  78   1  No   P  M  83   1  Yes B  F  69  42  No
B  M  75  30  Yes  P  M  77  29  Yes P  F  79  20  Yes
A  M  70  12  No   A  F  69  12  No  B  F  65  14  No
B  M  70   1  No   B  M  67  23  No  A  M  76  25  Yes
P  M  78  12  Yes  B  M  77   1  Yes B  F  69  24  No
P  M  66   4  Yes  P  F  65  29  No  P  M  60  26  Yes
A  M  78  15  Yes  B  M  75  21  Yes A  F  67  11  No
P  F  72  27  No   P  F  70  13  Yes A  M  75   6  Yes
B  F  65   7  No   P  F  68  27  Yes P  M  68  11  Yes
P  M  67  17  Yes  B  M  70  22  No  A  M  65  15  No
P  F  67   1  Yes  A  M  67  10  No  P  F  72  11  Yes
A  F  74   1  No   B  M  80  21  Yes A  F  69   3  No
;

proc logistic data=Neuralgia;
   class Treatment Sex;
   model Pain= Treatment Sex Treatment*Sex Age Duration / expb;
```

```
run;

proc logistic data=Neuralgia;
   class Treatment Sex;
   model Pain=Treatment|Sex@2 Age Duration
         /selection=forward expb;
run;

ods graphics on;
proc logistic data=Neuralgia plots(only)=(oddsratio(range=clip));
   class Treatment Sex /param=ref;
   model Pain= Treatment Sex Age / noor;
   oddsratio Treatment;
   oddsratio Sex;
   oddsratio Age;
   contrast 'Pairwise A vs P' Treatment 1  0 / estimate=exp;
   contrast 'Pairwise B vs P' Treatment 0  1 / estimate=exp;
   contrast 'Pairwise A vs B' Treatment 1 -1 / estimate=exp;
   contrast 'Female vs Male' Sex 1 / estimate=exp;
   effectplot / at(Sex=all) noobs;
   effectplot slicefit(sliceby=Sex plotby=Treatment) / noobs;
run;
```

```
SAS server started using Context SAS Studio compute context with SESSION_ID=6c4315b6-e06b-402f-a89c-eedd3e64d976-ses0000
```

PROC LOGISTIC: Modeling with Categorical Predictors

The LOGISTIC Procedure

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

Number of Observations Read	60
Number of Observations Used	60

Response Profile		
Ordered Value	Pain	Total Frequency
1	No	35
2	Yes	25

Probability modeled is Pain='No'.

Class Level Information			
Class	Value	Design Variables	
Treatment	A	1	0
	B	0	1
	P	-1	-1
Sex	F	1	
	M	-1	

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

Model Fit Statistics		
Criterion	Intercept Only	Intercept and Covariates
AIC	83.503	64.596
SC	85.598	81.351
-2 Log L	81.503	48.596

Testing Global Null Hypothesis: BETA=0			
Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	32.9074	7	<.0001
Score	25.6812	7	0.0006
Wald	14.2879	7	0.0463

Joint Tests			
Effect	DF	Wald Chi-Square	Pr > ChiSq
Treatment	2	11.9886	0.0025
Sex	1	5.3104	0.0212
Treatment*Sex	2	0.1412	0.9318
Age	1	7.2744	0.0070
Duration	1	0.0247	0.8752

Note: Under full-rank parameterizations, Type 3 effect tests are replaced by joint tests. The joint test for an effect is a test that all the parameters associated with that effect are zero. Such joint tests might not be equivalent to Type 3 effect tests under GLM parameterization.

Analysis of Maximum Likelihood Estimates								
Parameter			DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq	Exp(Est)
Intercept			1	19.2236	7.1315	7.2661	0.0070	2.232E8
Treatment	A		1	0.8483	0.5502	2.3773	0.1231	2.336
Treatment	B		1	1.4949	0.6622	5.0956	0.0240	4.459
Sex	F		1	0.9173	0.3981	5.3104	0.0212	2.503
Treatment*Sex	A	F	1	-0.2010	0.5568	0.1304	0.7180	0.818
Treatment*Sex	B	F	1	0.0487	0.5563	0.0077	0.9302	1.050
Age			1	-0.2688	0.0996	7.2744	0.0070	0.764
Duration			1	0.00523	0.0333	0.0247	0.8752	1.005

Odds Ratio Estimates			
Effect	Point Estimate	95% Wald Confidence Limits	
Age	0.764	0.629	0.929
Duration	1.005	0.942	1.073

Association of Predicted Probabilities and Observed Responses

Association of Predicted Probabilities and Observed Responses			
Percent Concordant	90.5	Somers' D	0.810
Percent Discordant	9.5	Gamma	0.810
Percent Tied	0.0	Tau-a	0.401
Pairs	875	c	0.905

PROC LOGISTIC: Modeling with Categorical Predictors

The LOGISTIC Procedure

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

Number of Observations Read	60
Number of Observations Used	60

Response Profile		
Ordered Value	Pain	Total Frequency
1	No	35
2	Yes	25

Probability modeled is Pain='No'.

Forward Selection Procedure

Class Level Information			
Class	Value	Design Variables	
Treatment	A	1	0
	B	0	1
	P	-1	-1
Sex	F	1	
	M	-1	

Step 0. Intercept entered:

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

-2 Log L	=	81.503

Residual Chi-Square Test		
Chi-Square	DF	Pr > ChiSq
25.6812	7	0.0006

Step 1. Effect Treatment entered:

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

Model Fit Statistics		
Criterion	Intercept Only	Intercept and Covariates
AIC	83.503	73.480
SC	85.598	79.763
-2 Log L	81.503	67.480

Testing Global Null Hypothesis: BETA=0			
Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	14.0230	2	0.0009
Score	13.7143	2	0.0011
Wald	12.0695	2	0.0024

Residual Chi-Square Test		
Chi-Square	DF	Pr > ChiSq
15.5126	5	0.0084

Step 2. Effect Age entered:

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

Model Fit Statistics		
Criterion	Intercept Only	Intercept and Covariates
AIC	83.503	63.044

Model Fit Statistics		
Criterion	Intercept Only	Intercept and Covariates
SC	85.598	71.421
-2 Log L	81.503	55.044

Testing Global Null Hypothesis: BETA=0			
Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	26.4591	3	<.0001
Score	21.8943	3	<.0001
Wald	14.1262	3	0.0027

Residual Chi-Square Test		
Chi-Square	DF	Pr > ChiSq
6.1267	4	0.1899

Step 3. Effect Sex entered:

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

Model Fit Statistics		
Criterion	Intercept Only	Intercept and Covariates
AIC	83.503	58.767
SC	85.598	69.239
-2 Log L	81.503	48.767

Testing Global Null Hypothesis: BETA=0			
Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	32.7358	4	<.0001
Score	25.6611	4	<.0001
Wald	14.5666	4	0.0057

Residual Chi-Square Test		
Chi-Square	DF	Pr > ChiSq
0.1734	3	0.9818

Note: No (additional) effects met the 0.05 significance level for entry into the model.

Summary of Forward Selection					
Step	Effect Entered	DF	Number In	Score Chi-Square	Pr > ChiSq
1	Treatment	2	1	13.7143	0.0011
2	Age	1	2	10.6038	0.0011
3	Sex	1	3	5.9959	0.0143

Type 3 Analysis of Effects			
Effect	DF	Wald Chi-Square	Pr > ChiSq
Treatment	2	12.6928	0.0018
Sex	1	5.3013	0.0213
Age	1	7.6314	0.0057

Analysis of Maximum Likelihood Estimates							
Parameter		DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq	Exp(Est)
Intercept		1	19.0804	6.7882	7.9007	0.0049	1.9343E8
Treatment	A	1	0.8772	0.5274	2.7662	0.0963	2.404
Treatment	B	1	1.4246	0.6036	5.5711	0.0183	4.156
Sex	F	1	0.9118	0.3960	5.3013	0.0213	2.489
Age		1	-0.2650	0.0959	7.6314	0.0057	0.767

Odds Ratio Estimates			
Effect	Point Estimate	95% Wald Confidence Limits	
Treatment A vs P	24.022	3.295	175.121
Treatment B vs P	41.528	4.500	383.262
Sex F vs M	6.194	1.312	29.248
Age	0.767	0.636	0.926

Association of Predicted Probabilities and Observed Responses			
Percent Concordant	90.3	Somers' D	0.811
Percent Discordant	9.1	Gamma	0.816
Percent Tied	0.6	Tau-a	0.401
Pairs	875	c	0.906

The LOGISTIC Procedure

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

Number of Observations Read	60
Number of Observations Used	60

Response Profile		
Ordered Value	Pain	Total Frequency
1	No	35
2	Yes	25

Probability modeled is Pain='No'.

Class Level Information			
Class	Value	Design Variables	
Treatment	A	1	0
	B	0	1
	P	0	0
Sex	F	1	
	M	0	

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

Model Fit Statistics		
Criterion	Intercept Only	Intercept and Covariates
AIC	83.503	58.767
SC	85.598	69.239
-2 Log L	81.503	48.767

Testing Global Null Hypothesis: BETA=0			
Test	Chi-Square	DF	Pr > ChiSq

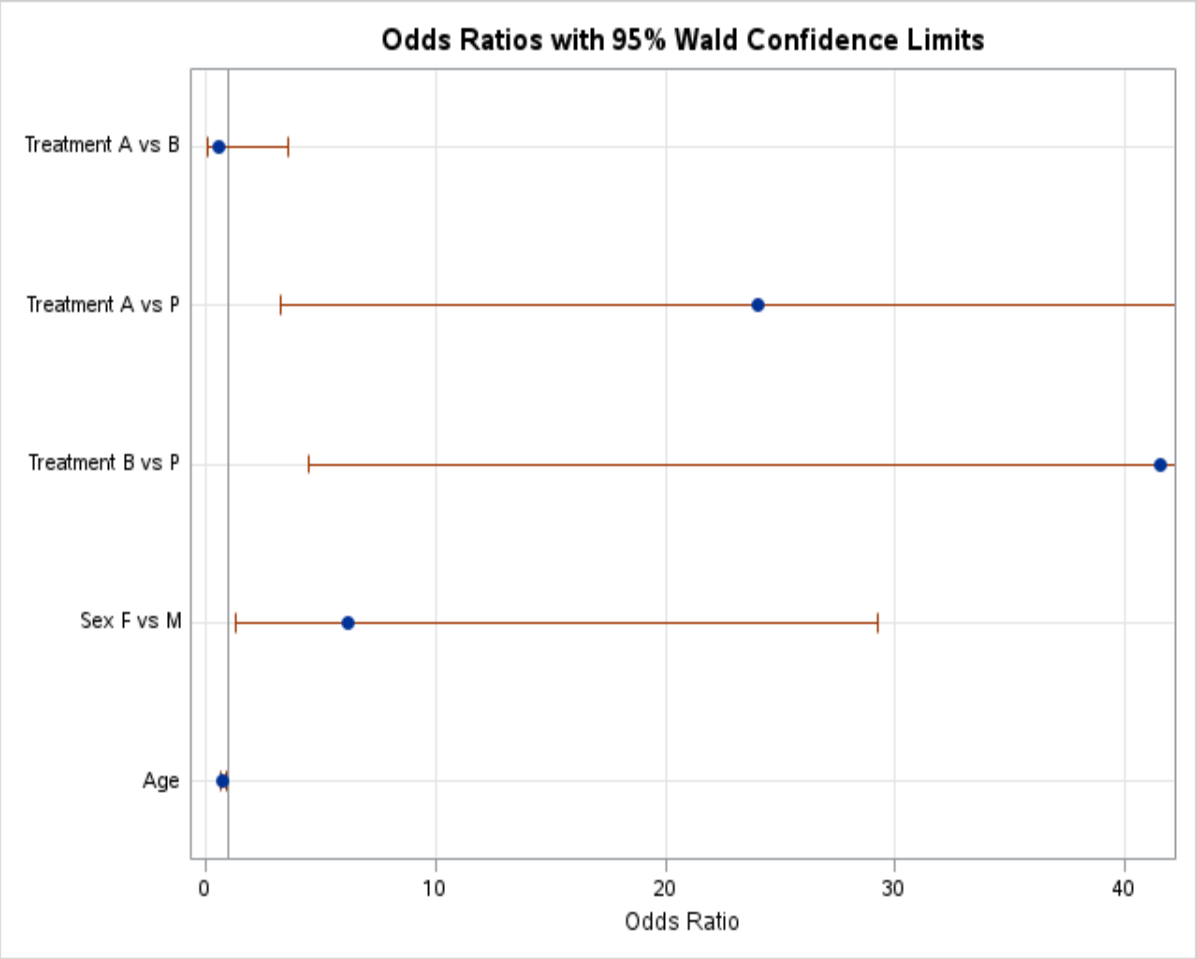
Testing Global Null Hypothesis: BETA=0			
Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	32.7358	4	<.0001
Score	25.6611	4	<.0001
Wald	14.5666	4	0.0057

Type 3 Analysis of Effects			
Effect	DF	Wald Chi-Square	Pr > ChiSq
Treatment	2	12.6928	0.0018
Sex	1	5.3013	0.0213
Age	1	7.6314	0.0057

Analysis of Maximum Likelihood Estimates						
Parameter		DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept		1	15.8669	6.4056	6.1357	0.0132
Treatment	A	1	3.1790	1.0135	9.8375	0.0017
Treatment	B	1	3.7264	1.1339	10.8006	0.0010
Sex	F	1	1.8235	0.7920	5.3013	0.0213
Age		1	-0.2650	0.0959	7.6314	0.0057

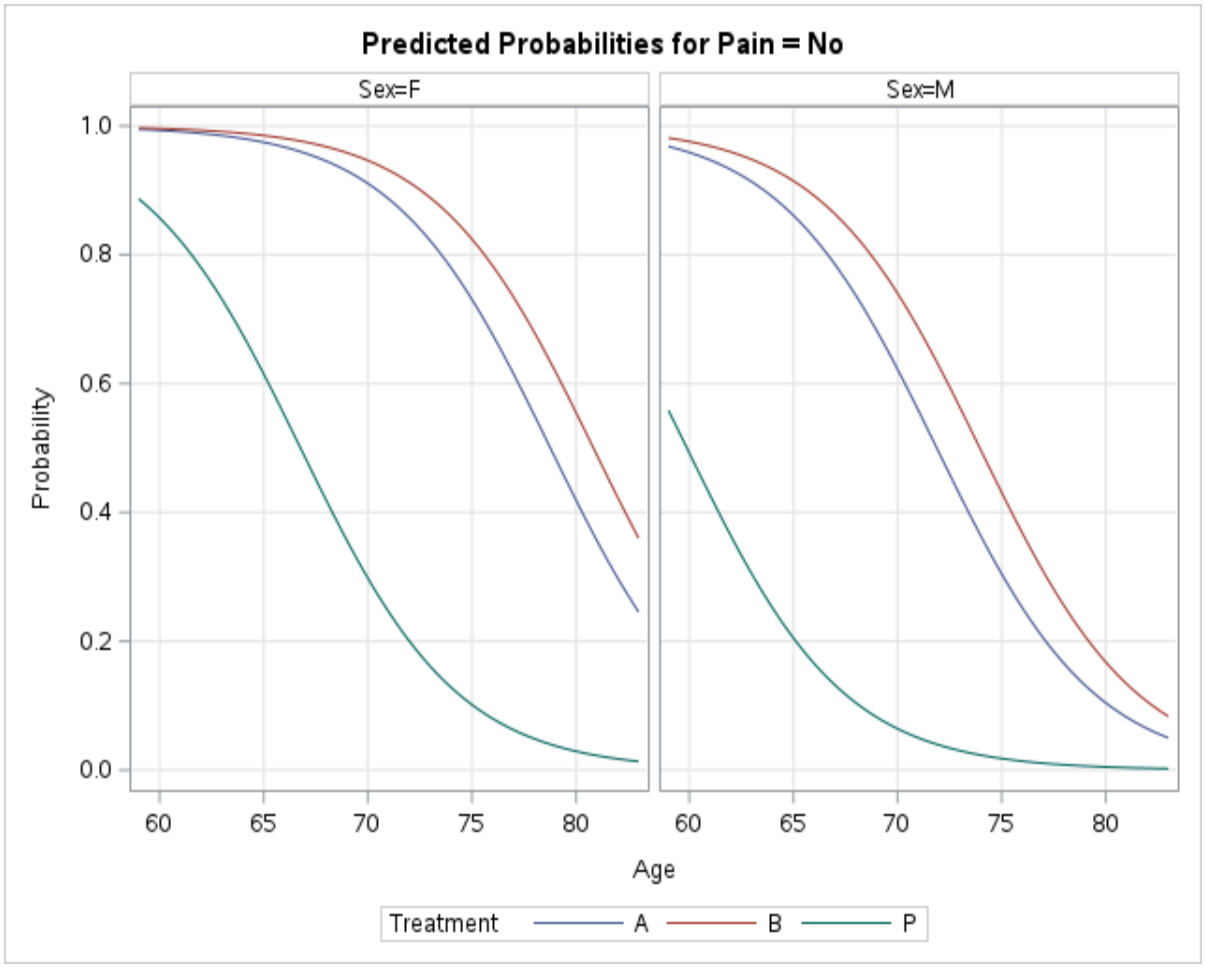
Association of Predicted Probabilities and Observed Responses			
Percent Concordant	90.3	Somers' D	0.811
Percent Discordant	9.1	Gamma	0.816
Percent Tied	0.6	Tau-a	0.401
Pairs	875	c	0.906

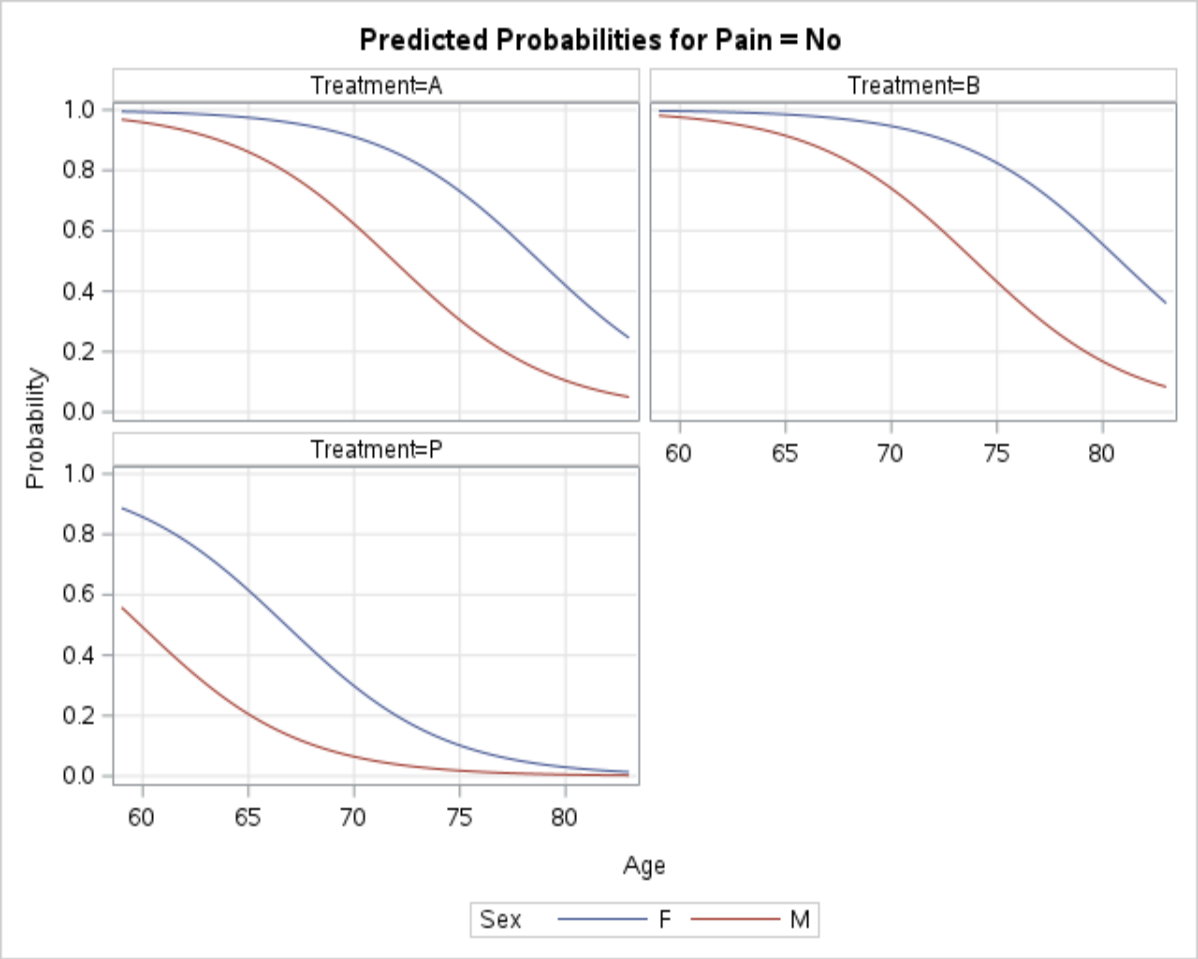
Odds Ratio Estimates and Wald Confidence Intervals			
Odds Ratio	Estimate	95% Confidence Limits	
Treatment A vs B	0.578	0.093	3.589
Treatment A vs P	24.022	3.295	175.121
Treatment B vs P	41.528	4.500	383.262
Sex F vs M	6.194	1.312	29.248
Age	0.767	0.636	0.926



Contrast Test Results			
Contrast	**DF**	**Wald Chi-Square**	**Pr > ChiSq**
Pairwise A vs P	1	9.8375	0.0017
Pairwise B vs P	1	10.8006	0.0010
Pairwise A vs B	1	0.3455	0.5567
Female vs Male	1	5.3013	0.0213

Contrast Estimation and Testing Results by Row									
Contrast	**Type**	**Row**	**Estimate**	**Standard Error**	**Alpha**	**Confidence Limits**		**Wald Chi-Square**	**Pr > ChiSq**
Pairwise A vs P	**EXP**	**1**	24.0218	24.3473	0.05	3.2951	175.1	9.8375	0.0017
Pairwise B vs P	**EXP**	**1**	41.5284	47.0877	0.05	4.4998	383.3	10.8006	0.0010
Pairwise A vs B	**EXP**	**1**	0.5784	0.5387	0.05	0.0932	3.5889	0.3455	0.5567
Female vs Male	**EXP**	**1**	6.1937	4.9053	0.05	1.3116	29.2476	5.3013	0.0213


Predicted Probabilities for Pain = No
Sex=F
Sex=M
Probability
1.0
0.8
0.6
0.4
0.2
0.0
60
65
70
75
80
Age
Treatment
A
B
P



PROC LOGSELECT (CAS enabled Procedure)

In [2]:
```
cas mySession sessopts=(caslib=casuser timeout=1800 locale="en_US");
libname casuser cas;
```

```
68   ods listing close;ods html5 (id=saspy_internal) options(bitmap_mode='inline') de
vice=svg style=HTMLBlue; ods graphics on /
68 ! outputfmt=png;
NOTE: Writing HTML5(SASPY_INTERNAL) Body file: sashtml1.htm
69
70   cas mySession sessopts=(caslib=casuser timeout=1800 locale="en_US");
NOTE: The session MYSESSION connected successfully to Cloud Analytic Services sas-cas
-server-default-client using port 5570. The
      UUID is 0825d864-e98d-4846-97ee-84ab0eda5f55. The user is danny.modlin@sas.com
and the active caslib is
      CASUSER(danny.modlin@sas.com).
NOTE: The SAS option SESSREF was updated with the value MYSESSION.
NOTE: The SAS macro _SESSREF_ was updated with the value MYSESSION.
NOTE: The session is using 0 workers.
NOTE: 'CASUSER(danny.modlin@sas.com)' is now the active caslib.
NOTE: The CAS statement request to update one or more session options for session MYS
ESSION completed.
71   libname casuser cas;
NOTE: Libref CASUSER was successfully assigned as follows:
      Engine:        CAS
      Physical Name: 0825d864-e98d-4846-97ee-84ab0eda5f55
72   ods html5 (id=saspy_internal) close;ods listing;
73
```

In [3]:

```
title 'PROC LOGSELECT: Modeling Binomial Data';

data Ingots;
   input Heat Soak r n @@;
   Obsnum= _n_;
   datalines;
7 1.0 0 10  14 1.0 0 31  27 1.0 1 56  51 1.0 3 13
7 1.7 0 17  14 1.7 0 43  27 1.7 4 44  51 1.7 0  1
7 2.2 0  7  14 2.2 2 33  27 2.2 0 21  51 2.2 0  1
7 2.8 0 12  14 2.8 0 31  27 2.8 1 22  51 4.0 0  1
7 4.0 0  9  14 4.0 0 19  27 4.0 1 16
;
data casuser.Ingots;
   set Ingots;
run;

proc logselect data=casuser.Ingots association ctable(out=casuser.Roc nocounts tpf fpf
   model r/n = Heat Soak Heat*Soak;
   output out=casuser.Out xbeta predicted=Pred copyvars=(Heat Soak);
run;

proc print data=casuser.Out;
   where Heat=14 & Soak=1.7;
run;

ods graphics on;
proc sgplot data=casuser.Roc aspect=1 noautolegend;
   title 'ROC Curve';
   xaxis values=(0 to 1 by 0.25) grid offsetmin=.05 offsetmax=.05;
   yaxis values=(0 to 1 by 0.25) grid offsetmin=.05 offsetmax=.05;
   lineparm x=0 y=0 slope=1 / lineattrs=(color=ligr);
```

```
   series x=FPF y=TPF;
   inset 'Area under the curve=0.7706' / position=bottomright;
run;

data casuser.Ingots2;
   set Ingots;
   a = n - r;
run;

proc logselect data=casuser.Ingots2 association ctable(out=casuser.Roc nocounts tpf fp
   model r/a = Heat Soak Heat*Soak;
   output out=casuser.Out xbeta predicted=Pred copyvars=(Heat Soak);
run;

data casuser.Ingots_binary;
   set Ingots;
   do i=1 to n;
     if i <= r then y=1; else y = 0;
     output;
   end;
run;

proc logselect data=casuser.Ingots_binary;
   model y(event='1') = Heat Soak Heat*Soak;
run;
```

The LOGSELECT Procedure

Model Information	
Data Source	INGOTS
Response Variable (Events)	r
Response Variable (Trials)	n
Distribution	Binomial
Link Function	Logit
Optimization Technique	Newton-Raphson with Ridging

Number of Observations Read	19
Number of Observations Used	19

Response Profile		
Ordered Value	Binary Outcome	Total Frequency
1	Event	12
2	Nonevent	375

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

Dimensions	
Columns in Design	4
Number of Effects	4
Max Effect Columns	1
Rank of Design	4
Parameters in Optimization	4

Testing Global Null Hypothesis: BETA=0			
Test	DF	Chi-Square	Pr > ChiSq
Likelihood Ratio	3	11.7663	0.0082

Fit Statistics	
-2 Log Likelihood	27.95689
AIC (smaller is better)	35.95689
AICC (smaller is better)	38.81403

Fit Statistics	
SBC (smaller is better)	39.73464

Parameter Estimates					
Parameter	DF	Estimate	Standard Error	Chi-Square	Pr > ChiSq
Intercept	1	-5.990191	1.666622	12.9183	0.0003
Heat	1	0.096339	0.047067	4.1896	0.0407
Soak	1	0.299574	0.755068	0.1574	0.6916
Heat * Soak	1	-0.008840	0.025319	0.1219	0.7270

Association of Predicted Probabilities and Observed Responses	
Concordance Index (AUC)	0.7706
Somers' D	0.5411
Gamma	0.5858
Tau-a	0.0326
Pairs	4500
Percent Concordant	73.2444
Percent Discordant	19.1333
Percent Tied	7.6222

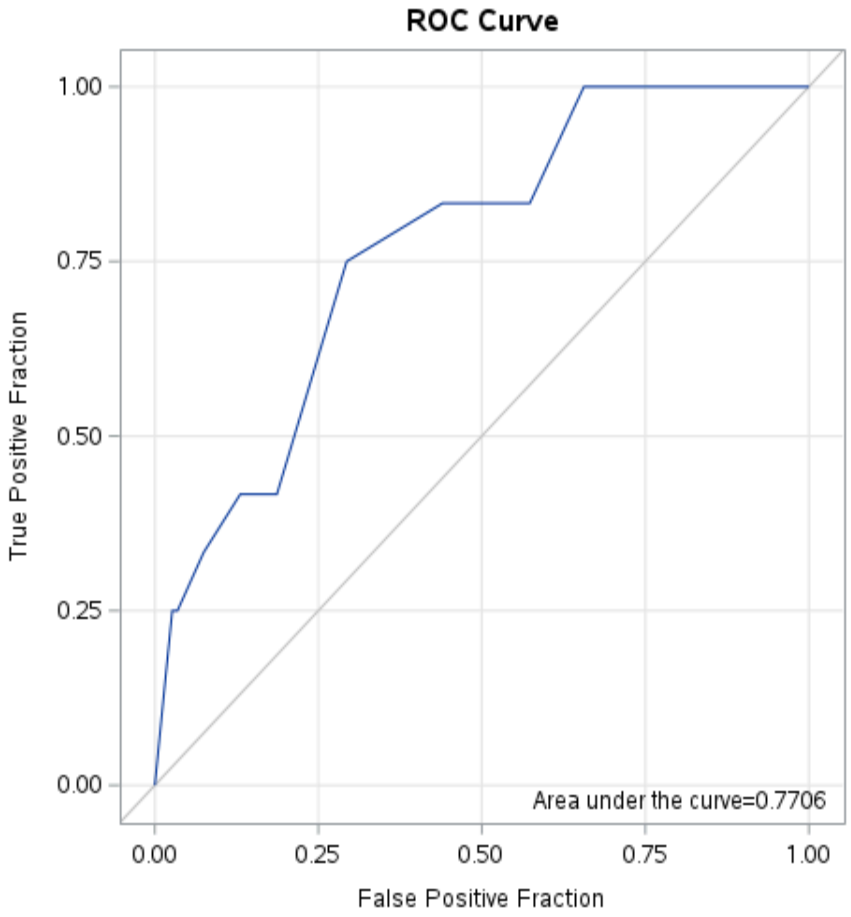
Task Timing		
Task	Seconds	Percent
Setup and Parsing	0.00	19.77%
Levelization	0.00	5.55%
Model Initialization	0.00	3.90%
SSCP Computation	0.00	4.80%
Model Fitting	0.01	50.19%
Creating Output Data	0.00	3.88%
Association and Classification	0.00	9.52%
Display	0.00	2.24%
Cleanup	0.00	2.18%
Total	0.02	100.00%

Output CAS Tables			
CAS Library	Name	Number of Rows	Number of Columns
CASUSER(danny.modlin@sas.com)	OUT	19	4

Output CAS Tables			
CAS Library	Name	Number of Rows	Number of Columns
CASUSER(danny.modlin@sas.com)	ROC	20	3

PROC LOGSELECT: Modeling Binomial Data

Obs	Pred	_XBETA_	Heat	Soak
1	0.012836	-4.34256	14	1.7



ROC Curve

The LOGSELECT Procedure

Model Information	
Data Source	INGOTS2

Model Information	
Response Variable (Events)	r
Response Variable (Trials)	a
Distribution	Binomial
Link Function	Logit
Optimization Technique	Newton-Raphson with Ridging

Number of Observations Read	19
Number of Observations Used	19

Response Profile		
Ordered Value	Binary Outcome	Total Frequency
1	Event	12
2	Nonevent	363

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

Dimensions	
Columns in Design	4
Number of Effects	4
Max Effect Columns	1
Rank of Design	4
Parameters in Optimization	4

Testing Global Null Hypothesis: BETA=0			
Test	DF	Chi-Square	Pr > ChiSq
Likelihood Ratio	3	13.3554	0.0039

Fit Statistics	
-2 Log Likelihood	28.64026
AIC (smaller is better)	36.64026
AICC (smaller is better)	39.49740
SBC (smaller is better)	40.41802

Parameter Estimates					
Parameter	DF	Estimate	Standard Error	Chi-Square	Pr > ChiSq

Parameter Estimates					
Parameter	DF	Estimate	Standard Error	Chi-Square	Pr > ChiSq
Intercept	1	-6.278612	1.678605	13.9904	0.0002
Heat	1	0.110619	0.048161	5.2757	0.0216
Soak	1	0.398510	0.750555	0.2819	0.5955
Heat * Soak	1	-0.013243	0.025440	0.2710	0.6027

Association of Predicted Probabilities and Observed Responses	
Concordance Index (AUC)	0.7795
Somers' D	0.5590
Gamma	0.6020
Tau-a	0.0347
Pairs	4356
Percent Concordant	74.3802
Percent Discordant	18.4803
Percent Tied	7.1396

Task Timing		
Task	Seconds	Percent
Setup and Parsing	0.00	19.40%
Levelization	0.00	6.29%
Model Initialization	0.00	3.78%
SSCP Computation	0.00	3.39%
Model Fitting	0.01	56.01%
Creating Output Data	0.00	4.29%
Association and Classification	0.00	4.51%
Display	0.00	2.18%
Cleanup	0.00	2.11%
Total	0.02	100.00%

Output CAS Tables			
CAS Library	Name	Number of Rows	Number of Columns
CASUSER(danny.modlin@sas.com)	OUT	19	4
CASUSER(danny.modlin@sas.com)	ROC	20	3

ROC Curve

The LOGSELECT Procedure

Model Information	
Data Source	INGOTS_BINARY
Response Variable	y
Distribution	Binary
Link Function	Logit
Optimization Technique	Newton-Raphson with Ridging

Number of Observations Read	387
Number of Observations Used	387

Response Profile		
Ordered Value	y	Total Frequency
1	0	375
2	1	12

Probability modeled is y = 1.

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

Dimensions	
Columns in Design	4
Number of Effects	4
Max Effect Columns	1
Rank of Design	4
Parameters in Optimization	4

Testing Global Null Hypothesis: BETA=0			
Test	DF	Chi-Square	Pr > ChiSq
Likelihood Ratio	3	11.7663	0.0082

Fit Statistics	
-2 Log Likelihood	95.22218
AIC (smaller is better)	103.22218
AICC (smaller is better)	103.32690

Fit Statistics	
SBC (smaller is better)	119.05588

Parameter Estimates					
Parameter	DF	Estimate	Standard Error	Chi-Square	Pr > ChiSq
Intercept	1	-5.990191	1.666622	12.9183	0.0003
Heat	1	0.096339	0.047067	4.1896	0.0407
Soak	1	0.299574	0.755068	0.1574	0.6916
Heat * Soak	1	-0.008840	0.025319	0.1219	0.7270

Task Timing		
Task	Seconds	Percent
Setup and Parsing	0.00	19.24%
Levelization	0.00	7.52%
Model Initialization	0.00	4.26%
SSCP Computation	0.00	4.25%
Model Fitting	0.01	64.65%
Display	0.00	0.06%
Cleanup	0.00	0.01%
Total	0.02	100.00%

Logistic Regression CAS Action

In [4]:
```
proc cas;
dataStep.runCode /
    code="
   data getStarted;
      nTotalObs=1000;
      drop c2 eta pr i rew nTotalObs nObsPerThread nExtras;
      call streaminit(1);
      nObsPerThread = int(nTotalObs/_nthreads_);
      nExtras       = mod(nTotalObs,_nthreads_);
      if _threadid_ <= nExtras then nObsPerThread = nObsPerThread + 1;
      do i=1 to nObsPerThread;
         id = (_threadid_ - 1) * nObsPerThread + i;
         if _threadid_ > nExtras then id = id + nExtras;
         rew = rand('rewind', id);
         x1=round(rand('normal')*5+10,.1); x2=round(7*rand('uniform'))/7;
         x3=round(rand('normal')*1+2,.1);  x4=round(50*rand('uniform'));
         x5=round(100*rand('uniform'));    x6=round(rand('normal')*.8+1.5,.1);
         x7=10*round(10*rand('uniform'));  x8=round(10*rand('uniform'))/10;
         x9=round(rand('normal')*3+5,.1);  x10=round(rand('normal')*2+3,.1);
```

```
        c2=rand('uniform');
        if      (c2<.1) then C='A'; else if (c2<.2) then C='B';
        else if (c2<.3) then C='C'; else if (c2<.4) then C='D';
        else if (c2<.5) then C='E'; else if (c2<.6) then C='F';
        else if (c2<.7) then C='G'; else if (c2<.8) then C='H';
        else if (c2<.9) then C='I'; else                 C='J';
        eta=1-x2-x8;
        pr= exp(eta)/(1+exp(eta));
        y=(rand('uniform') > pr);
        output;
      end;
   run;
   ",
    single="no";
run;

proc cas;
regression.logistic /
    class={"C"},
    model={depvar="y",
           effects={"C", "x1", "x2", "x3", "x4", "x5", "x6", "x7", "x8", "x9",
                    "x10"}},
    optimization={itHist="summary"},
    outputTables={names={parameterestimates="pe"}},
    table="getStarted";
run;

proc cas;
regression.logistic /
    class={"C"},
    display={traceNames="true"},
    model={depvar="y",
           effects={"C", "x1", "x2", "x3", "x4", "x5", "x6", "x7", "x8", "x9",
                    "x10"}},
    selection={details="all", method="forward"},
    table="getStarted";
run;
```

ROC Curve

Results from dataStep.runCode

Output CAS Tables			
CAS Library	Name	Number of Rows	Number of Columns
CASUSER(danny.modlin@sas.com)	getStarted	1000	13

ROC Curve

Results from regression.logistic

Model Information	
Data Source	GETSTARTED
Response Variable	y
Distribution	Binary
Link Function	Logit
Optimization Technique	Newton-Raphson with Ridging

Number of Observations Read	1000
Number of Observations Used	1000

Response Profile		
Ordered Value	y	Total Frequency
1	0	484
2	1	516

Probability modeled is y = 0.

Class Level Information		
Class	Levels	Values
C	10	A B C D E F G H I J

Iteration History				
Iteration	Evaluations	Objective Function	Change	Maximum Gradient
0	4	0.6613855981		0.20692
1	2	0.6583727872	0.00301281	0.01883

Iteration History				
Iteration	Evaluations	Objective Function	Change	Maximum Gradient
2	2	0.6583596409	0.00001315	0.000082
3	2	0.6583596407	0.00000000	1.23E-9

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

Dimensions	
Columns in Design	21
Number of Effects	12
Max Effect Columns	10
Rank of Design	20
Parameters in Optimization	20

Testing Global Null Hypothesis: BETA=0			
Test	DF	Chi-Square	Pr > ChiSq
Likelihood Ratio	19	68.5509	<.0001

Fit Statistics	
-2 Log Likelihood	1316.71928
AIC (smaller is better)	1356.71928
AICC (smaller is better)	1357.57730
SBC (smaller is better)	1454.87439

Parameter Estimates					
Parameter	DF	Estimate	Standard Error	Chi-Square	Pr > ChiSq
Intercept	1	0.091372	0.419472	0.0474	0.8276
C A	1	0.101855	0.295610	0.1187	0.7304
C B	1	0.313845	0.289155	1.1781	0.2778
C C	1	0.514901	0.288989	3.1746	0.0748
C D	1	0.190620	0.307220	0.3850	0.5350
C E	1	0.115930	0.285505	0.1649	0.6847
C F	1	0.488200	0.292348	2.7887	0.0949
C G	1	0.607139	0.290986	4.3534	0.0369
C H	1	0.422393	0.286422	2.1748	0.1403
C I	1	0.099037	0.284288	0.1214	0.7276

Parameter Estimates					
Parameter	DF	Estimate	Standard Error	Chi-Square	Pr > ChiSq
C J	0	0	.	.	.
x1	1	0.000629	0.013073	0.0023	0.9616
x2	1	-1.133344	0.228116	24.6838	<.0001
x3	1	0.077254	0.065331	1.3983	0.2370
x4	1	0.001466	0.004652	0.0993	0.7526
x5	1	0.003207	0.002301	1.9414	0.1635
x6	1	0.041222	0.083063	0.2463	0.6197
x7	1	-0.001533	0.002237	0.4694	0.4933
x8	1	-1.063694	0.232968	20.8469	<.0001
x9	1	0.015834	0.022353	0.5018	0.4787
x10	1	0.074454	0.033162	5.0408	0.0248

Task Timing		
Task	Seconds	Percent
Setup and Parsing	0.00	11.61%
Levelization	0.00	3.97%
Model Initialization	0.00	2.45%
SSCP Computation	0.02	51.86%
Model Fitting	0.01	30.06%
Display	0.00	0.03%
Cleanup	0.00	0.00%
Total	0.04	100.00%

Output CAS Tables			
CAS Library	Name	Number of Rows	Number of Columns
CASUSER(danny.modlin@sas.com)	pe	21	9

ROC Curve

Results from regression.logistic

Model Information	
Data Source	GETSTARTED

Model Information	
Response Variable	y
Distribution	Binary
Link Function	Logit
Optimization Technique	Newton-Raphson with Ridging

Number of Observations Read	1000
Number of Observations Used	1000

Response Profile		
Ordered Value	y	Total Frequency
1	0	484
2	1	516

Probability modeled is y = 0.

Class Level Information		
Class	Levels	Values
C	10	A B C D E F G H I J

Selection Information	
Selection Method	Forward
Select Criterion	SBC
Stop Criterion	SBC
Effect Hierarchy Enforced	None
Stop Horizon	3

Forward Selection: Step 0

Effects Included: Intercept

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

Dimensions	
Columns in Design	1
Number of Effects	1
Max Effect Columns	1
Rank of Design	1

Dimensions	
Parameters in Optimization	1

Fit Statistics	
-2 Log Likelihood	1385.27019
AIC (smaller is better)	1387.27019
AICC (smaller is better)	1387.27419
SBC (smaller is better)	1392.17794

Parameter Estimates					
Parameter	DF	Estimate	Standard Error	Chi-Square	Pr > ChiSq
Intercept	1	-0.064022	0.063278	1.0237	0.3117

Forward Selection: Step 1

Effect Entered: x2

Best 10 Entry Candidates		
Rank	Effect	SBC
1	x2	1370.7425
2	x8	1377.1766
3	x10	1393.3327
4	x3	1397.3647
5	x5	1398.2532
6	x6	1398.5991
7	x4	1398.6078
8	x9	1398.7225
9	x7	1398.9572
10	x1	1399.0848

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

Dimensions	
Columns in Design	2
Number of Effects	2
Max Effect Columns	1
Rank of Design	2

Dimensions	
Parameters in Optimization	2

Testing Global Null Hypothesis: BETA=0			
Test	DF	Chi-Square	Pr > ChiSq
Likelihood Ratio	1	28.6037	<.0001

Fit Statistics	
-2 Log Likelihood	1356.66647
AIC (smaller is better)	1360.66647
AICC (smaller is better)	1360.67850
SBC (smaller is better)	1370.48198

Parameter Estimates					
Parameter	DF	Estimate	Standard Error	Chi-Square	Pr > ChiSq
Intercept	1	0.500671	0.124439	16.1880	<.0001
x2	1	-1.167203	0.221219	27.8386	<.0001

Forward Selection: Step 2

Effect Entered: x8

Entry Candidates		
Rank	Effect	SBC
1	x8	1356.8279
2	x10	1371.5185
3	x5	1375.5402
4	x3	1375.9472
5	x6	1376.8625
6	x4	1376.9433
7	x9	1376.9659
8	x7	1377.2274
9	x1	1377.3851
10	C	1424.6438

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

Dimensions	

Dimensions	
Columns in Design	3
Number of Effects	3
Max Effect Columns	1
Rank of Design	3
Parameters in Optimization	3

Testing Global Null Hypothesis: BETA=0			
Test	DF	Chi-Square	Pr > ChiSq
Likelihood Ratio	2	49.2731	<.0001

Fit Statistics	
-2 Log Likelihood	1335.99712
AIC (smaller is better)	1341.99712
AICC (smaller is better)	1342.02122
SBC (smaller is better)	1356.72038

Parameter Estimates					
Parameter	DF	Estimate	Standard Error	Chi-Square	Pr > ChiSq
Intercept	1	1.004603	0.169966	34.9353	<.0001
x2	1	-1.151380	0.223567	26.5231	<.0001
x8	1	-1.030894	0.228869	20.2887	<.0001

Forward Selection: Step 3

Effect Entered: x10

Entry Candidates		
Rank	Effect	SBC
1	x10	1358.3616
2	x3	1361.8567
3	x5	1361.8575
4	x9	1363.2118
5	x7	1363.2442
6	x4	1363.3227
7	x6	1363.4113
8	x1	1363.6236

Entry Candidates		
Rank	Effect	SBC
9	C	1409.7123

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

Dimensions	
Columns in Design	4
Number of Effects	4
Max Effect Columns	1
Rank of Design	4
Parameters in Optimization	4

Testing Global Null Hypothesis: BETA=0			
Test	DF	Chi-Square	Pr > ChiSq
Likelihood Ratio	3	54.5533	<.0001

Fit Statistics	
-2 Log Likelihood	1330.71689
AIC (smaller is better)	1338.71689
AICC (smaller is better)	1338.75709
SBC (smaller is better)	1358.34791

Parameter Estimates					
Parameter	DF	Estimate	Standard Error	Chi-Square	Pr > ChiSq
Intercept	1	0.784663	0.194464	16.2812	<.0001
x2	1	-1.157751	0.224308	26.6404	<.0001
x8	1	-1.018780	0.229491	19.7074	<.0001
x10	1	0.075169	0.032835	5.2408	0.0221

Forward Selection: Step 4

Effect Entered: x3

Entry Candidates		
Rank	Effect	SBC
1	x3	1363.5113
2	x5	1363.6541

Entry Candidates		
Rank	Effect	SBC
3	x7	1364.8625
4	x9	1364.8968
5	x6	1364.9508
6	x4	1365.0212
7	x1	1365.2556
8	C	1411.3321

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

Dimensions	
Columns in Design	5
Number of Effects	5
Max Effect Columns	1
Rank of Design	5
Parameters in Optimization	5

Testing Global Null Hypothesis: BETA=0			
Test	DF	Chi-Square	Pr > ChiSq
Likelihood Ratio	4	56.3008	<.0001

Fit Statistics	
-2 Log Likelihood	1328.96942
AIC (smaller is better)	1338.96942
AICC (smaller is better)	1339.02978
SBC (smaller is better)	1363.50820

Parameter Estimates					
Parameter	DF	Estimate	Standard Error	Chi-Square	Pr > ChiSq
Intercept	1	0.617050	0.231782	7.0873	0.0078
x2	1	-1.153204	0.224562	26.3718	<.0001
x3	1	0.085143	0.064520	1.7415	0.1870
x8	1	-1.028170	0.229826	20.0139	<.0001
x10	1	0.075024	0.032855	5.2143	0.0224

Forward Selection: Step 5

Effect Entered: x5

Entry Candidates		
Rank	Effect	SBC
1	x5	1368.8719
2	x7	1370.0610
3	x9	1370.1250
4	x6	1370.1265
5	x4	1370.2100
6	x1	1370.4142
7	C	1416.6375

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

Dimensions	
Columns in Design	6
Number of Effects	6
Max Effect Columns	1
Rank of Design	6
Parameters in Optimization	6

Testing Global Null Hypothesis: BETA=0			
Test	DF	Chi-Square	Pr > ChiSq
Likelihood Ratio	5	57.8459	<.0001

Fit Statistics	
-2 Log Likelihood	1327.42429
AIC (smaller is better)	1339.42429
AICC (smaller is better)	1339.50888
SBC (smaller is better)	1368.87082

Parameter Estimates					
Parameter	DF	Estimate	Standard Error	Chi-Square	Pr > ChiSq
Intercept	1	0.494285	0.251895	3.8505	0.0497
x2	1	-1.178319	0.225848	27.2203	<.0001
x3	1	0.083813	0.064584	1.6841	0.1944
x5	1	0.002807	0.002260	1.5425	0.2142

Parameter Estimates					
Parameter	DF	Estimate	Standard Error	Chi-Square	Pr > ChiSq
x8	1	-1.027560	0.230033	19.9542	<.0001
x10	1	0.073986	0.032894	5.0591	0.0245

Selection Details

Selection Summary			
Step	Effect Entered	Number Effects In	SBC
0	Intercept	1	1392.1779
1	x2	2	1370.7425
2	x8	3	1356.8279*
3	x10	4	1358.3616
4	x3	5	1363.5113
5	x5	6	1368.8719
* Optimal Value Of Criterion			

Selection stopped at a local minimum of the STOP criterion.

The model at step 2 is selected.

Selected Effects:	Intercept x2 x8

Selected Model

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

Dimensions	
Columns in Design	3
Number of Effects	3
Max Effect Columns	1
Rank of Design	3
Parameters in Optimization	3

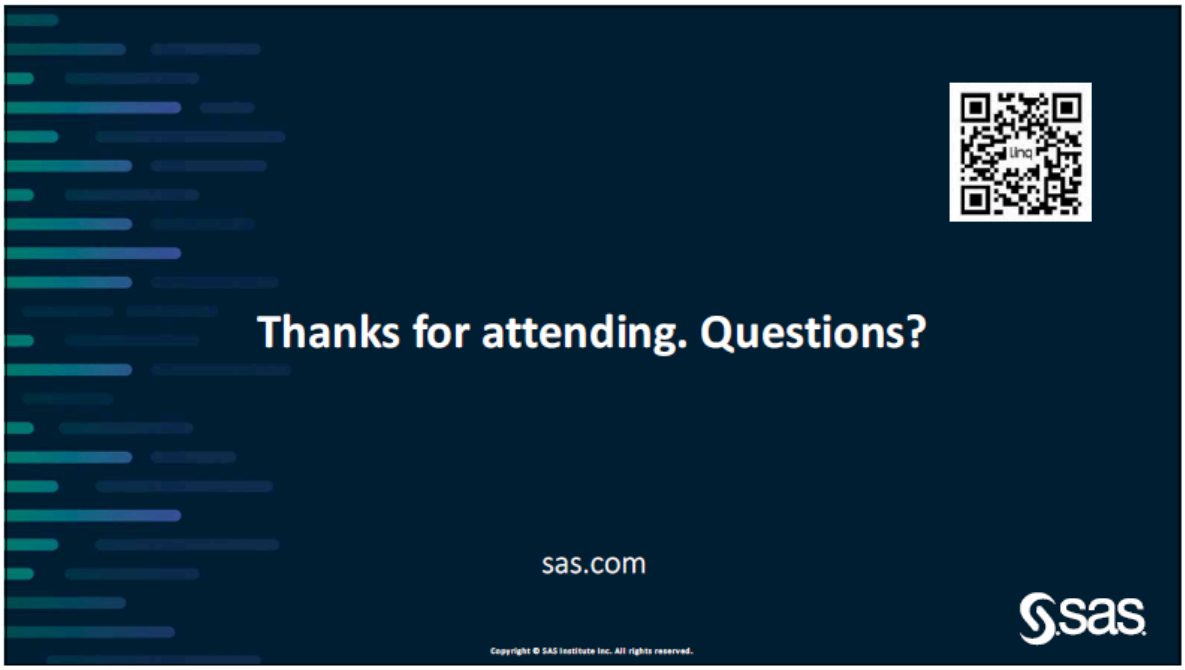
Testing Global Null Hypothesis: BETA=0			
Test	DF	Chi-Square	Pr > ChiSq

Testing Global Null Hypothesis: BETA=0			
Test	DF	Chi-Square	Pr > ChiSq
Likelihood Ratio	2	49.2731	<.0001

Fit Statistics	
-2 Log Likelihood	1335.99712
AIC (smaller is better)	1341.99712
AICC (smaller is better)	1342.02122
SBC (smaller is better)	1356.72038

Parameter Estimates					
Parameter	DF	Estimate	Standard Error	Chi-Square	Pr > ChiSq
Intercept	1	1.004603	0.169966	34.9353	<.0001
x2	1	-1.151380	0.223567	26.5231	<.0001
x8	1	-1.030894	0.228869	20.2887	<.0001

Task Timing		
Task	Seconds	Percent
Setup and Parsing	0.00	5.14%
Levelization	0.00	1.74%
Model Initialization	0.00	1.06%
SSCP Computation	0.01	9.60%
Model Selection	0.08	82.18%
Display	0.00	0.13%
Cleanup	0.00	0.00%
Total	0.10	100.00%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In [ ]: