

SOC 206

INTRODUCTION TO LOGITS

DATA

UNEMPLOYED YRS EDUCATION (UNEMP)	YRS EDUCATION (EDUC)				
.00	11.00	.00	14.00		
.00	11.00	.00	14.00		
1.00	7.00	.00	14.00		
1.00	7.00	.00	14.00		
1.00	7.00	.00	14.00		
1.00	7.00	1.00	14.00		
1.00	7.00	1.00	14.00		
1.00	7.00	1.00	14.00		
1.00	7.00	1.00	15.00		
.00	7.00	1.00	15.00		
1.00	7.00	1.00	15.00		
1.00	7.00	.00	15.00		
1.00	7.00	.00	15.00		
1.00	7.00	.00	15.00		
1.00	7.00	.00	15.00		
1.00	8.00	.00	15.00		
1.00	8.00	.00	15.00		
1.00	8.00	1.00	15.00		
1.00	8.00	1.00	15.00		
1.00	8.00	1.00	15.00		
1.00	8.00	1.00	16.00		
.00	8.00	1.00	16.00		
1.00	8.00	1.00	16.00		
1.00	8.00	.00	16.00		
1.00	8.00	.00	16.00		
1.00	8.00	.00	16.00		
1.00	8.00	.00	16.00		
1.00	9.00	.00	16.00		
1.00	9.00	1.00	16.00		
1.00	9.00	1.00	16.00		
1.00	9.00	1.00	16.00		
1.00	9.00	1.00	16.00		
1.00	9.00	1.00	17.00		
1.00	9.00	1.00	17.00		
1.00	9.00	.00	17.00		
.00	9.00	.00	17.00		
.00	9.00	.00	17.00		
1.00	9.00	.00	17.00		
1.00	10.00	.00	17.00		
1.00	10.00	.00	17.00		
1.00	10.00	1.00	17.00		
1.00	10.00	1.00	17.00		
1.00	10.00	1.00	17.00		
1.00	10.00	1.00	18.00		
1.00	10.00	1.00	18.00		
.00	10.00	.00	18.00		
.00	10.00	.00	18.00		
.00	10.00	.00	18.00		
1.00	10.00	.00	18.00		
1.00	11.00	.00	18.00		
1.00	11.00	1.00	18.00		
1.00	11.00	1.00	18.00		
1.00	11.00	1.00	18.00		
1.00	11.00	1.00	18.00		
1.00	11.00	.00	18.00		

Number of cases read: 140 Number of cases listed: 140

* * * * M U L T I P L E R E G R E S S I O N * * * *
 WITH DUMMY DEPENDENT VARIABLE

Listwise Deletion of Missing Data

Equation Number 1 Dependent Variable.. UNEMP

Block Number 1. Method: Enter

Variable(s) Entered on Step Number
 1.. EDUC

Multiple R .52674
 R Square .27746
 Adjusted R Square .27222
 Standard Error .42791

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	1	9.70314	9.70314
Residual	138	25.26829	.18310

F = 52.99261 Signif F = .0000

----- Variables in the Equation -----

Variable	B	SE B	Beta	T	Sig T
EDUC	-.082230	.011296	-.526744	-7.280	.0000
(Constant)	1.513589	.145757		10.384	.0000

End Block Number 1 All requested variables entered.

DISTRIBUTION OF THE DEPENDENT VARIABLE FOR EACH VALUE OF THE INDEPENDENT
VARIABLE

EDUC by UNEMP

Page 1 of 1

Count	UNEMP		Row	
	.00	1.00	Total	
7.00	1	9	10	7.1
8.00	1	9	10	7.1
9.00	2	8	10	7.1
10.00	3	7	10	7.1
11.00	4	6	10	7.1
12.00	9	11	20	14.3
13.00	11	9	20	14.3
14.00	7	3	10	7.1
15.00	8	2	10	7.1
16.00	9	1	10	7.1
17.00	8	2	10	7.1
18.00	9	1	10	7.1
Column	72	68	140	
Total	51.4	48.6	100.0	

Chi-Square	Value	DF	Significance
Pearson	40.31863	11	.00003
Likelihood Ratio	44.99022	11	.00000
Linear-by-Linear Association	38.56679	1	.00000
Minimum Expected Frequency -	4.857		
Cells with Expected Frequency < 5 -	10 of	24 (41.7%)	
Number of Missing Observations:	0		

CALCULATING LOG ODDS FOR EACH VALUE OF THE INDEPENDENT VARIABLE

$$\text{LOG}(P/(1-P))$$

SO FOR EDUC=7 P=9/10 OR .9 (THE PROBABILITY OF BEING UNEMPLOYED)

$$\text{ODDS} = .9/(1-.9) = .9/.1 = 9$$

$$\text{LOGODDS} = \text{LOG}(9) = \underline{2.1972} \quad (e^{2.1972} = 9)$$

.....

FOR EDUC=18 P=1/10 OR .1

$$\text{ODDS} = .1/(1-.1) = .1/.9 = .1111$$

$$\text{LOGODDS} = \text{LOG}(.1111) = \underline{-2.1972}$$

LOGUN

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	-2.1972	20	14.3	14.3	14.3
	-1.3863	20	14.3	14.3	28.6
	-.8473	10	7.1	7.1	35.7
	-.2007	20	14.3	14.3	50.0
	.2007	20	14.3	14.3	64.3
	.4055	10	7.1	7.1	71.4
	.8473	10	7.1	7.1	78.6
	1.3863	10	7.1	7.1	85.7
	2.1972	20	14.3	14.3	100.0
	Total	140	100.0	100.0	

Valid cases 140 Missing cases 0

A PARTIAL LIST OF THE CASES FROM THE MIDDLE OF THE DATA SET

UNEMP (observed)	LOGUN (logodds)	EDUC (education)	1.00	.2007	12.00
			.00	.2007	12.00
1.00	1.3863	9.00	.00	.2007	12.00
1.00	.8473	10.00	.00	.2007	12.00
1.00	.8473	10.00	.00	.2007	12.00
1.00	.8473	10.00	.00	.2007	12.00
1.00	.8473	10.00	1.00	.2007	12.00
1.00	.8473	10.00	1.00	.2007	12.00
1.00	.8473	10.00	1.00	.2007	12.00
.00	.8473	10.00	1.00	.2007	12.00
.00	.8473	10.00	1.00	.2007	12.00
.00	.8473	10.00	.00	.2007	12.00
1.00	.8473	10.00	.00	.2007	12.00
1.00	.4055	11.00	.00	.2007	12.00
1.00	.4055	11.00	.00	.2007	12.00
1.00	.4055	11.00	1.00	.2007	12.00
1.00	.4055	11.00	1.00	-.2007	13.00
1.00	.4055	11.00	1.00	-.2007	13.00
1.00	.4055	11.00	1.00	-.2007	13.00
.00	.4055	11.00	1.00	-.2007	13.00
.00	.4055	11.00	.00	-.2007	13.00
.00	.4055	11.00	.00	-.2007	13.00
.00	.4055	11.00	.00	-.2007	13.00
1.00	.2007	12.00	.00	-.2007	13.00
1.00	.2007	12.00	.00	-.2007	13.00
1.00	.2007	12.00	.00	-.2007	13.00
1.00	.2007	12.00	.00	-.2007	13.00

Number of cases listed: 51

* * * * * M U L T I P L E R E G R E S S I O N * * * * *
 USING THE CALCULATED LOGODDS AS THE DEPENDENT VARIABLE

Listwise Deletion of Missing Data

Equation Number 1 Dependent Variable.. LOGUN

Block Number 1. Method: Enter

Variable(s) Entered on Step Number

1.. EDUC

Multiple R .97940
 R Square .95922
 Adjusted R Square .95893
 Standard Error .28124

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	1	256.77655	256.77655
Residual	138	10.91552	.07910

F = 3246.30901 Signif F = .0000

----- Variables in the Equation -----

Variable	B	SE B	Beta	T	Sig T
EDUC	-.423011	.007424	-.979400	-56.976	.0000
(Constant)	5.217579	.095800		54.463	.0000

LIMDEP

```
--> RESET
--> read; nrec=140; nvar=4; file=s206log.asc; format=(4f8.2);
      names(x1=unemp, x2=educ, x3=age, x4=sex)$
--> open; output=s206log.out$
--> dstat; rhs=educ, age, sex$
```

Reading in the data
Opening output file
Descriptive STATistics

Descriptive Statistics

All results based on nonmissing observations.

Variable	Mean	Std.Dev.	Minimum	Maximum	Cases
EDUC	12.5000000	3.21305789	7.00000000	18.0000000	140
AGE	38.1285714	11.1386571	19.0000000	60.0000000	140
SEX	.478571429	.501334294	.000000000	1.00000000	140

```
--> regress; lhs=unemp; rhs=one, educ$
```

OLS Regression;
LHS=Left Hand Side=Dep.var
RHS=Right Hand Side=Indep. Var(s)
ONE tells LIMDEP that you want to estimate the constant
YOU WILL ALWAYS! START RHS WITH ONE!

```
-----+-----
Ordinary least squares regression
Model was estimated Feb 04, 2011 at 05:56:17PM
LHS=UNEMP      Mean          =   .4857143
                Standard deviation =   .5015905
WTS=none      Number of observs. =    140
Model size    Parameters       =     2
                Degrees of freedom =    138
Residuals    Sum of squares    =  25.26829
                Standard error of e =   .4279060
Fit          R-squared         =   .2774590
                Adjusted R-squared =   .2722231
Model test   F[ 1, 138] (prob) = 52.99 (.0000)
Diagnostic   Log likelihood    = -78.80495
                Restricted(b=0)   = -101.5536
                Chi-sq [ 1] (prob) = 45.50 (.0000)
Info criter. LogAmemiya Prd. Crt. = -1.683519
                Akaike Info. Criter. = -1.683521
Autocorrel   Durbin-Watson Stat. = 1.1305773
                Rho = cor[e,e(-1)] = .4347113
-----+-----
```

Variable	Coefficient	Standard Error	t-ratio	P[T >t]	Mean of X
Constant	1.51358885	.14575705	10.384	.0000	
EDUC	-.08222997	.01129594	-7.280	.0000	12.5000000

SPSS				
Multiple R	.52674			
R Square	.27746			
Adjusted R Square	.27222			
Standard Error	.42791			
Analysis of Variance				
	DF	Sum of Squares	Mean Square	
Regression	1	9.70314	9.70314	
Residual	138	25.26829	.18310	
F =	52.99261	Signif F = .0000		
----- Variables in the Equation -----				
Variable	B	SE B	Beta	T Sig T
EDUC	-.082230	.011296	-.526744	-7.280 .0000
(Constant)	1.513589	.145757		10.384 .0000

--> logit; lhs=unemp; rhs=one, educ\$

Estimating LOGIT follows that same command structure as regression

Normal exit from iterations. Exit status=0.

This says that the iterations went normally. If they did not your results are likely to be useless garbage.

Description of the model

```

+-----+
| Binary Logit Model for Binary Choice
| Maximum Likelihood Estimates
| Model estimated: Feb 04, 2011 at 05:56:18PM.
| Dependent variable          UNEMP
| Weighting variable         None
| Number of observations      140
| Iterations completed        5
| Log likelihood function     -75.19258
| Number of parameters        2
| Info. Criterion: AIC =     1.10275
|   Finite Sample: AIC =    1.10338
| Info. Criterion: BIC =     1.14477
| Info. Criterion:HQIC =     1.11983
| Restricted log likelihood   -96.98345
| McFadden Pseudo R-squared  .2246865
| Chi squared                 43.58174
| Degrees of freedom          1
| Prob[ChiSqD > value] =    .0000000
| Hosmer-Lemeshow chi-squared = 6.41830
| P-value= .60048 with deg.fr. = 8
+-----+
  
```

The new probability as log

The old probability as log

$$2*(-75.19258)-(-96.98345)=43.58174$$

One new coefficient (for EDUC)

The improvement in the probabilities is highly significant

$$\text{McFadden Pseudo R-squared} = \frac{[-75.19258 - (-96.98345)]}{(-96.98345)} = .2246865$$

Variable	Coefficient	Standard Error	b/St.Er.	P[Z >z]	Mean of X
Characteristics in numerator of Prob[Y = 1]					
Constant	5.189900943	.97532156	5.321	.0000	
EDUC	-.4215465191	.76937813E-01	-5.479	.0000	12.500000

Log odds of being unemployed with 0 years of education. It is a Probability of .99446
 $e^{5.189900943} = 179.4508 = \text{odds}$
 $179.4508 / (1 + 179.4508) = .99446$

For each year of education the log odds of being unemployed decreases by .4215465191
 This effect is statistically highly Significant.

$$\text{Model: Predicted Log odds(Unemp)} = 5.189900943 - .4215465191 * \text{EDUC}$$

```

+-----+
| Fit Measures for Binomial Choice Model
| Logit model for variable UNEMP
+-----+
| Proportions P0= .514286   P1= .485714
| N = 140  N0= 72  N1= 68
| LogL= -75.193  LogL0= -96.983
| Estrella = 1 - (L/L0)^(-2L0/n) = .29713
+-----+
| Efron   McFadden   Sen./Lerman
| .28235  .22469      .64096
| Cramer  Veall/Zim.   Rsqrd ML
| .28133  .40874      .26750
+-----+
| Information Akaike I.C. Schwarz I.C.
| Criteria    1.10275    1.14477
+-----+
  
```

$$1 - (-75.193 / -96.983)^{[-2*(-96.983) / 140]} = 1 - .77531^{1.38547} = 1 - .702864 = .297136 = \text{Estrella}$$

Notice that Estrella is different from McFadden only in the exponent of L/L0. For McFadden the exponent is ^1 for Estrella ^(-2L0/n).

Efron is a residual based measure like R-square: $1 - \text{SSReg} / \text{TSS}$ where $\text{SSReg} = \sum (y_i - \hat{\pi}_i)^2$ y_i takes 1 if Unemployed, 0 if not, $\hat{\pi}_i$ is the predicted probability
 Note: SSReg compares discrete observed values with continuous Probabilities.

$$\text{Efron} = 1 - .1806 / .2516 = .282 \text{ (small rounding error)}$$

$$\text{The numbers for Efron are from p.10. } \text{SSReg} = .424920^2 = .1806 \quad \text{TSS} = .501590^2 = .2516$$

Predictions for Binary Choice Model. Predicted value is 1 when probability is greater than .500000, 0 otherwise. Note, column or row total percentages may not sum to 100% because of rounding. Percentages are of full sample.

Actual Value	Predicted Value		Total Actual
	0	1	
0	52 (37.1%)	20 (14.3%)	72 (51.4%)
1	18 (12.9%)	50 (35.7%)	68 (48.6%)
Total	70 (50.0%)	70 (50.0%)	140 (100.0%)

Correct predictions. (RULE: if predicted probability $\hat{\Pi}_i > .5$ prediction:1 otherwise prediction:0)

=====
 Analysis of Binary Choice Model Predictions Based on Threshold = .5000
 =====

Prediction Success

Sensitivity = actual 1s correctly predicted	73.529%	=50/68	*100
Specificity = actual 0s correctly predicted	72.222%	=52/72	*100
Positive predictive value = predicted 1s that were actual 1s	71.429%	=50/70	*100
Negative predictive value = predicted 0s that were actual 0s	74.286%	=52/70	*100
Correct prediction = actual 1s and 0s correctly predicted	72.857%	=(50+52)/140	*100

Prediction Failure

False pos. for true neg. = actual 0s predicted as 1s	27.778%
False neg. for true pos. = actual 1s predicted as 0s	26.471%
False pos. for predicted pos. = predicted 1s actual 0s	28.571%
False neg. for predicted neg. = predicted 0s actual 1s	25.714%
False predictions = actual 1s and 0s incorrectly predicted	27.143%

```
--> NAMELIST; X=ONE,EDUC$
--> CALC; K=COL(X)$
--> MATRIX; B1=B(1:K)$
--> CREATE; P0=1/(1+EXP(X'B1));
      P1=1-P0$
--> LIST; P0, P1, UNEMP, EDUC$
```

This calculates the predicted probabilities

P0 is the probability of NOT being unemployed, P1 is the probability of being unemployed. (P0+P1=1).

Listing of raw data (Current sample)

Line	Observ.	P0	P1	UNEMP	EDUC
1	1	.96296E-01	.90370	1.0000	7.0000
2	2	.96296E-01	.90370	1.0000	7.0000
3	3	.96296E-01	.90370	1.0000	7.0000
4	4	.96296E-01	.90370	1.0000	7.0000
5	5	.96296E-01	.90370	1.0000	7.0000
6	6	.96296E-01	.90370	0.0000	7.0000
7	7	.96296E-01	.90370	1.0000	7.0000
8	8	.96296E-01	.90370	1.0000	7.0000
9	9	.96296E-01	.90370	1.0000	7.0000
10	10	.96296E-01	.90370	1.0000	7.0000
11	11	.13973	.86027	1.0000	8.0000
12	12	.13973	.86027	1.0000	8.0000
13	13	.13973	.86027	1.0000	8.0000
14	14	.13973	.86027	1.0000	8.0000
15	15	.13973	.86027	1.0000	8.0000
16	16	.13973	.86027	.00000	8.0000
17	17	.13973	.86027	1.0000	8.0000
18	18	.13973	.86027	1.0000	8.0000
19	19	.13973	.86027	1.0000	8.0000
20	20	.13973	.86027	1.0000	8.0000
21	21	.19845	.80155	1.0000	9.0000
22	22	.19845	.80155	1.0000	9.0000
23	23	.19845	.80155	1.0000	9.0000
24	24	.19845	.80155	1.0000	9.0000
25	25	.19845	.80155	1.0000	9.0000
26	26	.19845	.80155	1.0000	9.0000
27	27	.19845	.80155	1.0000	9.0000
28	28	.19845	.80155	.00000	9.0000
29	29	.19845	.80155	.00000	9.0000
30	30	.19845	.80155	1.0000	9.0000
31	31	.27400	.72600	1.0000	10.000
32	32	.27400	.72600	1.0000	10.000
33	33	.27400	.72600	1.0000	10.000

This case is counted as a correct prediction

Incorrect prediction.

For instance: a person with 9 years of education will have a .19845 probability of avoiding unemployment and a .80155 probability of becoming unemployed.

34	34	.27400	.72600	1.0000	10.000
35	35	.27400	.72600	1.0000	10.000
36	36	.27400	.72600	1.0000	10.000
37	37	.27400	.72600	.00000	10.000
38	38	.27400	.72600	.00000	10.000
39	39	.27400	.72600	.00000	10.000
40	40	.27400	.72600	1.0000	10.000
41	41	.36519	.63481	1.0000	11.000
42	42	.36519	.63481	1.0000	11.000
43	43	.36519	.63481	1.0000	11.000
44	44	.36519	.63481	1.0000	11.000
45	45	.36519	.63481	1.0000	11.000
46	46	.36519	.63481	1.0000	11.000
47	47	.36519	.63481	.00000	11.000
48	48	.36519	.63481	.00000	11.000
49	49	.36519	.63481	.00000	11.000
50	50	.36519	.63481	.00000	11.000
51	51	.46721	.53279	1.0000	12.000
52	52	.46721	.53279	1.0000	12.000
53	53	.46721	.53279	1.0000	12.000
54	54	.46721	.53279	1.0000	12.000
55	55	.46721	.53279	1.0000	12.000
56	56	.46721	.53279	.00000	12.000
57	57	.46721	.53279	.00000	12.000
58	58	.46721	.53279	.00000	12.000
59	59	.46721	.53279	.00000	12.000
60	60	.46721	.53279	.00000	12.000
61	61	.46721	.53279	1.0000	12.000
62	62	.46721	.53279	1.0000	12.000
63	63	.46721	.53279	1.0000	12.000
64	64	.46721	.53279	1.0000	12.000
65	65	.46721	.53279	1.0000	12.000
66	66	.46721	.53279	.00000	12.000
67	67	.46721	.53279	.00000	12.000
68	68	.46721	.53279	.00000	12.000
69	69	.46721	.53279	.00000	12.000
70	70	.46721	.53279	1.0000	12.000
71	71	.57205	.42795	1.0000	13.000
72	72	.57205	.42795	1.0000	13.000
73	73	.57205	.42795	1.0000	13.000
74	74	.57205	.42795	1.0000	13.000
75	75	.57205	.42795	.00000	13.000
76	76	.57205	.42795	.00000	13.000
77	77	.57205	.42795	.00000	13.000
78	78	.57205	.42795	.00000	13.000
79	79	.57205	.42795	.00000	13.000
80	80	.57205	.42795	.00000	13.000
81	81	.57205	.42795	1.0000	13.000
82	82	.57205	.42795	1.0000	13.000
83	83	.57205	.42795	1.0000	13.000
84	84	.57205	.42795	1.0000	13.000
85	85	.57205	.42795	.00000	13.000
86	86	.57205	.42795	.00000	13.000
87	87	.57205	.42795	.00000	13.000
88	88	.57205	.42795	.00000	13.000
89	89	.57205	.42795	.00000	13.000
90	90	.57205	.42795	1.0000	13.000
91	91	.67079	.32921	1.0000	14.000
92	92	.67079	.32921	1.0000	14.000
93	93	.67079	.32921	1.0000	14.000
94	94	.67079	.32921	.00000	14.000
95	95	.67079	.32921	.00000	14.000
96	96	.67079	.32921	.00000	14.000
97	97	.67079	.32921	.00000	14.000
98	98	.67079	.32921	.00000	14.000
99	99	.67079	.32921	.00000	14.000
100	100	.67079	.32921	.00000	14.000
101	101	.75645	.24355	1.0000	15.000
102	102	.75645	.24355	1.0000	15.000
103	103	.75645	.24355	.00000	15.000
104	104	.75645	.24355	.00000	15.000
105	105	.75645	.24355	.00000	15.000
106	106	.75645	.24355	.00000	15.000
107	107	.75645	.24355	.00000	15.000
108	108	.75645	.24355	.00000	15.000
109	109	.75645	.24355	.00000	15.000

Correct prediction.
Incorrect prediction.

Correct prediction.

```

110 110 .75645 .24355 .00000 15.000
111 111 .82561 .17439 1.00000 16.000
112 112 .82561 .17439 .00000 16.000
113 113 .82561 .17439 .00000 16.000
114 114 .82561 .17439 .00000 16.000
115 115 .82561 .17439 .00000 16.000
116 116 .82561 .17439 .00000 16.000
117 117 .82561 .17439 .00000 16.000
118 118 .82561 .17439 .00000 16.000
119 119 .82561 .17439 .00000 16.000
120 120 .82561 .17439 .00000 16.000
121 121 .87830 .12170 1.00000 17.000
122 122 .87830 .12170 .00000 17.000
123 123 .87830 .12170 .00000 17.000
124 124 .87830 .12170 .00000 17.000
125 125 .87830 .12170 .00000 17.000
126 126 .87830 .12170 .00000 17.000
127 127 .87830 .12170 .00000 17.000
128 128 .87830 .12170 .00000 17.000
129 129 .87830 .12170 .00000 17.000
130 130 .87830 .12170 1.00000 17.000
131 131 .91667 .83330E-01 .00000 18.000
132 132 .91667 .83330E-01 .00000 18.000
133 133 .91667 .83330E-01 .00000 18.000
134 134 .91667 .83330E-01 .00000 18.000
135 135 .91667 .83330E-01 .00000 18.000
136 136 .91667 .83330E-01 .00000 18.000
137 137 .91667 .83330E-01 .00000 18.000
138 138 .91667 .83330E-01 .00000 18.000
139 139 .91667 .83330E-01 .00000 18.000
140 140 .91667 .83330E-01 1.00000 18.000

```

```
--> create; Resid1=unemp-P1$ ←----- This calculates the residuals for Efron.
```

```
--> DSTAT; rhs=resid1, unemp$
```

```
Descriptive Statistics
```

```
All results based on nonmissing observations.
```

```
=====
```

Variable	Mean	Std.Dev.	Minimum	Maximum	Cases	Missing

All observations in current sample						
RESID1	-.116324E-08	.424920	-.903704	.916670	140	0
UNEMP	.485714	.501590	.000000	1.00000	140	0

```
-----
```


Cramer	Veall/Zim.	Rsqr ML
.32478	.45041	.29832
Information Criteria	Akaike I.C.	Schwarz I.C.
	1.07406	1.13709

Predictions for Binary Choice Model. Predicted value is 1 when probability is greater than .500000, 0 otherwise. Note, column or row total percentages may not sum to 100% because of rounding. Percentages are of full sample.

Actual Value	Predicted Value		Total Actual
	0	1	
0	52 (37.1%)	20 (14.3%)	72 (51.4%)
1	13 (9.3%)	55 (39.3%)	68 (48.6%)
Total	65 (46.4%)	75 (53.6%)	140 (100.0%)

Compare it with the previous model (with EDUC only). Now you predict 107 (52+55) of the 140 correctly as opposed to 102.

=====
Analysis of Binary Choice Model Predictions Based on Threshold = .5000
=====

Prediction Success

Sensitivity = actual 1s correctly predicted 80.882%
 Specificity = actual 0s correctly predicted 72.222%
 Positive predictive value = predicted 1s that were actual 1s 73.333%
 Negative predictive value = predicted 0s that were actual 0s 80.000%
 Correct prediction = actual 1s and 0s correctly predicted 76.429%

Prediction Failure

False pos. for true neg. = actual 0s predicted as 1s 27.778%
 False neg. for true pos. = actual 1s predicted as 0s 19.118%
 False pos. for predicted pos. = predicted 1s actual 0s 26.667%
 False neg. for predicted neg. = predicted 0s actual 1s 20.000%
 False predictions = actual 1s and 0s incorrectly predicted 23.571%

ADDING SEX.

```
--> logit; lhs=unemp; rhs=one, educ, age, sex$
Normal exit from iterations. Exit status=0.
```

```
-----+-----
Binary Logit Model for Binary Choice
Maximum Likelihood Estimates
Model estimated: Feb 05, 2011 at 01:42:23AM.
Dependent variable          UNEMP
Weighting variable          None
Number of observations       140
Iterations completed        6
Log likelihood function      -71.73040
Number of parameters         4
Info. Criterion: AIC =      1.08186
Finite Sample: AIC =       1.08398
Info. Criterion: BIC =      1.16591
Info. Criterion:HQIC =     1.11602
Restricted log likelihood    -96.98345
McFadden Pseudo R-squared   .2603851
Chi squared                  50.50610
Degrees of freedom           3
Prob[ChiSqd > value] =     .0000000
Hosmer-Lemeshow chi-squared = 6.60844
P-value= .57941 with deg.fr. = 8
-----+-----
```

Variable	Coefficient	Standard Error	b/St.Er.	P[Z >z]	Mean of X
Characteristics in numerator of Prob[Y = 1]					
Constant	3.255362664	1.1840758	2.749	.0060	
EDUC	-.4289155655	.81549752E-01	-5.260	.0000	12.500000
AGE	.4747241073E-01	.18965377E-01	2.503	.0123	38.128571
SEX	.4140691478	.44006940	.941	.3467	.47857143

Fit Measures for Binomial Choice Model		
Logit model for variable UNEMP		
Proportions P0=	.514286	P1= .485714
N =	140	N0= 72
		N1= 68
LogL=	-71.730	LogL0= -96.983
Estrella =	1-(L/L0)^(-2L0/n) = .34157	
Efron	McFadden	Ben./Lerman
.34187	.26039	.66614
Cramer	Veall/Zim.	Rsqr ML
.33174	.45647	.30285
Information Criteria	Akaike I.C.	Schwarz I.C.
	1.08186	1.16591

Predictions for Binary Choice Model. Predicted value is 1 when probability is greater than .500000, 0 otherwise. Note, column or row total percentages may not sum to 100% because of rounding. Percentages are of full sample.

Actual Value	Predicted Value		Total Actual
	0	1	
0	54 (38.6%)	18 (12.9%)	72 (51.4%)
1	16 (11.4%)	52 (37.1%)	68 (48.6%)
Total	70 (50.0%)	70 (50.0%)	140 (100.0%)

=====
Analysis of Binary Choice Model Predictions Based on Threshold = .5000
 =====

Prediction Success

Sensitivity = actual 1s correctly predicted	76.471%
Specificity = actual 0s correctly predicted	75.000%
Positive predictive value = predicted 1s that were actual 1s	74.286%
Negative predictive value = predicted 0s that were actual 0s	77.143%
Correct prediction = actual 1s and 0s correctly predicted	75.714%

=====
Prediction Failure

False pos. for true neg. = actual 0s predicted as 1s	25.000%
False neg. for true pos. = actual 1s predicted as 0s	23.529%
False pos. for predicted pos. = predicted 1s actual 0s	25.714%
False neg. for predicted neg. = predicted 0s actual 1s	22.857%
False predictions = actual 1s and 0s incorrectly predicted	24.286%

=====