

Due on 2/1/2007

The REG Procedure
 Model: MODEL1
 Dependent Variable: y body fat

Number of Observations Read 20
 Number of Observations Used 20

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	396.98461	132.32820	21.52	<.0001
Error	16	98.40489	6.15031		
Corrected Total	19	495.38950			

Root MSE 2.47998 R-Square 0.8014
 Dependent Mean 20.19500 Adj R-Sq 0.7641
 Coeff Var 12.28017

Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	Intercept	1	117.08469	99.78240	1.17	0.2578
x1	tricept	1	4.33409	3.01551	1.44	0.1699
x2	thigh	1	-2.85685	2.58202	-1.11	0.2849
x3	midarm	1	-2.18606	1.59550	-1.37	0.1896

① Test that none of the predictors are helpful in the full model, that is, all of the predictors x_1, x_2, x_3 are not helpful. ($\alpha = .05$)

$H_0: \beta_1 = \beta_2 = \beta_3 = 0$ $F = \underline{21.52}$ $p = \underline{< 0.0001}$

$H_a: \underline{\text{Not } H_0}$

Decision: Reject H_0 Do not reject H_0 (circle one)

Conclusion: There (is), is not) evidence to suggest that at least one of the variables x_1, x_2, x_3 are helpful in the full model.

The REG Procedure
Model: MODEL2
Dependent Variable: y body fat

Number of Observations Read 20
Number of Observations Used 20

$$F(.99, 2, 16) = 3.63$$

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	352.26980	352.26980	44.30	<.0001
Error	18	143.11970	7.95109		
Corrected Total	19	495.38950			

Root MSE 2.81977 R-Square 0.7111
Dependent Mean 20.19500 Adj R-Sq 0.6950
Coeff Var 13.96271

Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	Intercept	1	-1.49610	3.31923	-0.45	0.6576
x1	trcept	1	0.85719	0.12878	6.66	<.0001

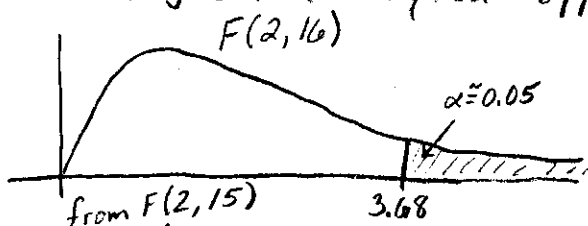
① Test $H_0: \beta_2 = \beta_3 = 0$ (in full model)

H_A : Not H_0

$$A) F = \frac{(396.98461 - 352.26980)}{3-1} / 6.15031 = 3.63516717$$

B) df numerator = 2 df denominator = 16

C) Sketch rejection region approx critical value $\alpha = 0.05$



D) Decision: (Reject H_0 , Do not reject H_0)

E) Conclusion: There is not sufficient evidence to suggest that

at least one of the predictors of X_2 and X_3 is helpful in a model with X_1 .

The REG Procedure
 Model: MODEL3
 Dependent Variable: y body fat

Number of Observations Read 20
 Number of Observations Used 20

$F(1, 16) = 4.50$

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	385.43871	192.71935	29.80	<.0001
Error	17	109.95079	6.46769		
Corrected Total	19	495.38950			

Root MSE 2.54317 R-Square 0.7781
 Dependent Mean 20.19500 Adj R-Sq 0.7519
 Coeff Var 12.59305

Parameter Estimates

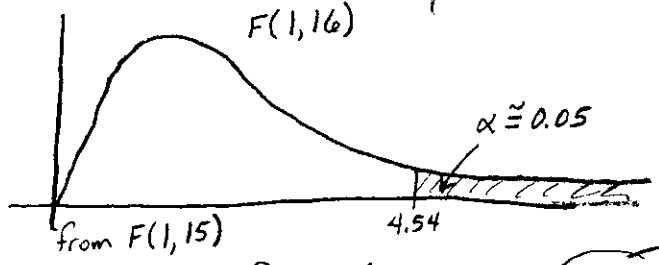
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	Intercept	1	-19.17425	8.36064	-2.29	0.0348
x1	tricept	1	0.22235	0.30344	0.73	0.4737
x2	thigh	1	0.65942	0.29119	2.26	0.0369

③ (in full model)

$H_0: \beta_3 = 0$ ② $F = \frac{(396.98461 - 385.43871)}{3-2} / 6.15031 = 1.877287486$

$H_A: \text{Not } H_0$ ⑥ df numerator = 1 df denominator = 16

④ Sketch rejection region approx critical value $\alpha = .05$



④ Decision Reject H_0 (Do not reject H_0)

⑥ Conclusion: There is not sufficient evidence to suggest that X_3 is helpful in the model with X_1 and X_2 already in the model.

The REG Procedure
 Model: MODEL4
 Dependent Variable: y body fat

Number of Observations Read 20
 Number of Observations Used 20

$F(0.95, 2, 16) = 3.63$

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	381.96582	381.96582	60.62	<.0001
Error	18	113.42368	6.30132		
Corrected Total	19	495.38950			

Root MSE 2.51024 R-Square 0.7710
 Dependent Mean 20.19500 Adj R-Sq 0.7583
 Coeff Var 12.43002

Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	Intercept	1	-23.63449	5.65741	-4.18	0.0006
x2	thigh	1	0.85655	0.11002	7.79	<.0001

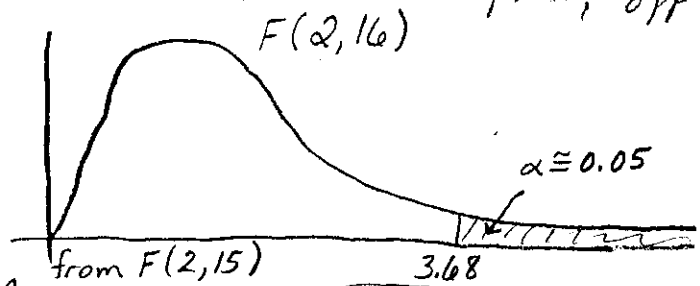
$H_0: \beta_1 = \beta_3 = 0$ in full model

$H_A: \text{Not } H_0$

(a) $F = \frac{(396.98461 - 381.96582)}{3-1} / 6.15031 = 1.220978292$

(b) df numerator = 2 df denominator = 16

(c) sketch rejection region, approx critical value $\alpha = .05$



(d) Reject H_0 Do not reject H_0

(e) Conclusion: There is not sufficient evidence to suggest that at least one of the predictors of X_1 and X_3 is helpful in a model with X_2 .


```
data bodyfat;
input  x1 x2 x3 y;
label y = 'body fat'
      x1 = 'tricept' x2 = 'thigh' x3 = 'midarm';

cards;
19.5 43.1 29.1 11.9
 24.7 49.8 28.2 22.8
 30.7 51.9 37.0 18.7
 29.8 54.3 31.1 20.1
 19.1 42.2 30.9 12.9
 25.6 53.9 23.7 21.7
 31.4 58.5 27.6 27.1
 27.9 52.1 30.6 25.4
 22.1 49.9 23.2 21.3
 25.5 53.5 24.8 19.3
 31.1 56.6 30.0 25.4
 30.4 56.7 28.3 27.2
 18.7 46.5 23.0 11.7
 19.7 44.2 28.6 17.8
 14.6 42.7 21.3 12.8
 29.5 54.4 30.1 23.9
 27.7 55.3 25.7 22.6
 30.2 58.6 24.6 25.4
 22.7 48.2 27.1 14.8
 25.2 51.0 27.5 21.1
;
run;
proc reg data=bodyfat ;
  model1 y = x1 x2 x3;
  model2 y = x1 ;
  model3 y = x1 x2;
  model4 y = x2 ;
run;quit;
```

