

## Forward Stepwise Multiple Regression

Multiple regression procedures attempt to establish a linear relationship between a dependent variable and one or more independent variables. In the forward method, each variable is assessed for its contribution to the proportion of the dependent variable variance, typically by its correlation or partial correlation with the dependent variable.

To explore this procedure, we will use the Longley.LAZ file. This file is a particularly “mean” file because of the large size of the variables, the high degree of correlation among the variables, the violation of normality assumptions and the nearly singular inverse matrix (see <http://www.itl.nist.gov>). It is often used to test program capabilities.

Here then is the dialog form and the output of the analysis:

Forward Stepwise Multiple Regression

Available Variables: [Empty]

Variables to be Analyzed: x1, x2, x3, x4, x5, x6

Dependent Variable: y

Minimum Probability to Enter: 0.05

Minimum Probability to Retain: 0.10

Options:

- ☐ Show Cross-Products Matrix
- ☐ Show Variance-covariance Matrix
- ☒ Show Inter correlations Matrix
- ☒ Show Means
- ☐ Show Variances
- ☒ Show Standard Deviations
- ☐ Get Data from a Matrix File
- ☐ Save the Correlation Matrix
- ☐ Predictions, residuals, C.I.'s to Grid

Buttons: Reset, Cancel, Compute, Return

Stepwise Multiple Regression by Bill Miller

Product-Moment Correlations Matrix with 16 cases.

Variables		x1	x2	x3	x4
x5					
	x1	1.000	0.992	0.621	0.465
0.979	x2	0.992	1.000	0.604	0.446
0.991	x3	0.621	0.604	1.000	-0.177
0.687					

	x4	0.465	0.446	-0.177	1.000
0.364	x5	0.979	0.991	0.687	0.364
1.000	x6	0.991	0.995	0.668	0.417
0.994	y	0.971	0.984	0.502	0.457
0.960					

Variables

	x6	y
x1	0.991	0.971
x2	0.995	0.984
x3	0.668	0.502
x4	0.417	0.457
x5	0.994	0.960
x6	1.000	0.971
y	0.971	1.000

Means with 16 valid cases.

Variables	x1	x2	x3	x4
x5	101.681	387698.438	3193.313	2606.688
117424.000				

Variables	x6	y
	1954.500	65317.000

Standard Deviations with 16 valid cases.

Variables	x1	x2	x3	x4
x5	10.792	99394.938	934.464	695.920
6956.102				

Variables	x6	y
	4.761	3511.968

Stepwise Multiple Regression by Bill Miller

----- STEP 1 -----						
SOURCE	DF	SS	MS	F	Prob.>F	
Regression	1	178972685.834	178972685.834	415.103	0.000	
Residual	14	6036140.166	431152.869			
Total	15	185008826.000				

Dependent Variable: y

R	R2	F	Prob.>F	DF1	DF2
0.984	0.967	415.103	0.000	1	14
Adjusted R Squared = 0.965					

Std. Error of Estimate = 656.622

Variable	Beta	B	Std.Error	t	Prob.>t	VIF
TOL						
x2	0.984	0.035	0.002	20.374	0.000	1.000

Constant = 51843.590

Candidates for entry in next step.

Candidate	Partial F	Statistic	Prob.	DF1	DF2
SOURCE	DF	SS	MS	F	Prob.>F
Regression	2	179184630.824	89592315.412	199.976	0.000
Residual	13	5824195.176	448015.014		
Total	15	185008826.000			

x1	0.1874	0.4731	0.5037	1	13
SOURCE	DF	SS	MS	F	Prob.>F
Regression	2	181429761.031	90714880.515	329.498	0.000
Residual	13	3579064.969	275312.690		
Total	15	185008826.000			

x3	0.6380	8.9247	0.0105	1	13
SOURCE	DF	SS	MS	F	Prob.>F
Regression	2	179049338.216	89524669.108	195.289	0.000
Residual	13	5959487.784	458422.137		
Total	15	185008826.000			

x4	0.1127	0.1672	0.6893	1	13
SOURCE	DF	SS	MS	F	Prob.>F
Regression	2	181134464.533	90567232.267	303.889	0.000
Residual	13	3874361.467	298027.805		
Total	15	185008826.000			

x5	0.5984	7.2536	0.0184	1	13
SOURCE	DF	SS	MS	F	Prob.>F
Regression	2	180097882.100	90048941.050	238.373	0.000
Residual	13	4910943.900	377764.915		
Total	15	185008826.000			

x6	0.4318	2.9786	0.1080	1	13
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Variable x3 will be added

----- STEP 2 -----

SOURCE	DF	SS	MS	F	Prob.>F
Regression	2	181429761.031	90714880.515	329.498	0.000
Residual	13	3579064.969	275312.690		
Total	15	185008826.000			

Dependent Variable: y

R	R2	F	Prob.>F	DF1	DF2
0.990	0.981	329.498	0.000	2	13

Adjusted R Squared = 0.978

Std. Error of Estimate = 524.702

Variable	Beta	B	Std.Error	t	Prob.>t	VIF
TOL						
x2	1.071	0.038	0.002	22.120	0.000	1.575
0.635						
x3	-0.145	-0.544	0.182	-2.987	0.010	1.575
0.635						

Constant = 52382.167

Candidates for entry in next step.

Candidate	Partial	F	Statistic	Prob.	DF1	DF2
SOURCE	DF	SS	MS	F		Prob.>F
Regression	3	181448601.933	60482867.311	203.862		0.000
Residual	12	3560224.067	296685.339			
Total	15	185008826.000				

x1	0.0726	0.0635	0.8053	1	12	
SOURCE	DF	SS	MS	F		Prob.>F
Regression	3	182252114.311	60750704.770	264.449		0.000
Residual	12	2756711.689	229725.974			
Total	15	185008826.000				

x4	0.4793	3.5797	0.0829	1	12	
SOURCE	DF	SS	MS	F		Prob.>F
Regression	3	181526583.883	60508861.294	208.517		0.000
Residual	12	3482242.117	290186.843			
Total	15	185008826.000				

x5	0.1645	0.3337	0.5742	1	12	
SOURCE	DF	SS	MS	F		Prob.>F
Regression	3	181769558.386	60589852.795	224.458		0.000
Residual	12	3239267.614	269938.968			
Total	15	185008826.000				

x6	0.3081	1.2588	0.2838	1	12	
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No further steps meet criterion for entry.

-----FINAL STEP-----

SOURCE	DF	SS	MS	F	Prob.>F
Regression	2	181429761.031	90714880.515	329.498	0.000
Residual	13	3579064.969	275312.690		
Total	15	185008826.000			

Dependent Variable: y

R	R2	F	Prob.>F	DF1	DF2
0.990	0.981	329.498	0.000	2	13

Adjusted R Squared = 0.978

Std. Error of Estimate = 524.702

Variable	Beta	B	Std.Error	t	Prob.>t	VIF
TOL						
x2	1.071	0.038	0.002	22.120	0.000	1.575
0.635						

	x3	-0.145	-0.544	0.182	-2.987	0.010	1.575
0.635							
Constant =		52382.167					