

Multivariate
Regression

DATA C; INFILE homes FIRSTOBS=3;
INPUT home price footage land rooms baths;
PROC PRINT;
PROC REG;
MODEL price = footage land rooms baths / XPX I;
RUN;

asks for the matrix $(X^T X)^{-1}$
asks for $(X^T X)^{-1}$

$p-1 = 4$ predictors

Response

Obs	home	price	footage	land	rooms	baths
1	1	179000	3060	0.7500	8	2.0
2	2	126500	1600	0.2600	8	1.5
3	3	134500	2000	0.7000	8	1.0
4	4	125000	1300	0.6500	5	1.0

} Data

The REG Procedure

Model Crossproducts $X^T X$ $X^T Y$ $Y^T Y$

Variable	Intercept	footage	land	rooms	baths	price
Intercept	149	271830	147.1521	1080	285	22843256
footage	271830	547281406	291118.2872	2079488	567776	44221525040
land	147.1521	291118.2872	708.21780849	1081.7646	311.847	28341164.25
rooms	1080	2079488	1081.7646	8164	2170	170893748
baths	285	567776	311.847	2170	620	46590190
price	22843256	44221525040	28341164.25	170893748	46590190	3.755274E12

$\sum_{i=1}^n X_i X_i^T$

} $X^T Y$

Number of Observations Read 150
Number of Observations Used 149
Number of Observations with Missing Values 1

$Y^T Y$

$X^T X$

$$(X^T X)^{-1}$$

X'X Inverse, Parameter Estimates, and SSE

Variable	Intercept	footage	land	rooms	baths	price
Intercept	0.1842932787	0.0000391793	-0.002247295	-0.033112733	-0.003569677	53664.375468
footage	0.0000391793	8.9792995E-8	-1.528842E-6	-0.000020268	-0.000028532	29.432598777
land	-0.002247295	-1.528842E-6	0.0018551891	0.0006053889	-0.000618887	8258.0550804
rooms	-0.033112733	-0.000020268	0.0006053889	0.0098556114	-0.001017169	1344.5862531
baths	-0.003569677	-0.000028532	-0.000618887	-0.001017169	0.0332541747	14664.061156
price	53664.375468	29.432598777	8258.0550804	1344.5862531	14664.061156	80824871495

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	1.723394E11	43084862498	76.76	<.0001
Error	144	80824871495	561283830		
Corrected Total	148	2.531643E11			

Root MSE 23691 R-Square 0.6807
 Dependent Mean 153310 Adj R-Sq 0.6719
 Coeff Var 15.45324

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	53664	10171	5.28	<.0001
footage	1	29.43260	7.09925	4.15	<.0001
land	1	8258.05508	1020.43502	8.09	<.0001
rooms	1	1344.58625	2351.97689	0.57	0.5684
baths	1	14664	4320.30445	3.39	0.0009

SSE