

SIMULTANEOUS EQUATION MODELS : 2SLS Example 2

Consider the following system:

$$Y_{1t} = \beta_{10} + \beta_{11}Y_{2t} + \gamma_{11}X_{1t} + \gamma_{12}X_{2t} + u_{1t}$$

$$Y_{2t} = \beta_{20} + \beta_{21}Y_{1t} + u_{2t}$$

with Y_1 (Income) and Y_2 (Stock of money) endogenous and X_1 (Investment) and X_2 (Government expenditure) exogenous variables.

(a) Identification

Order condition:

Equation 1: $K-k = 2-2 = 0$; $m-1 = 2-1 = 1$; thus equation not identified

Equation 2: $K-k = 2-0 = 2$; $m-1 = 2-1 = 1$; thus equation is overidentified

Rank condition: Equation 2: $A = \begin{pmatrix} -\gamma_{11} & -\gamma_{12} \end{pmatrix}$ having at least one non zero determinant of dimension 1×1 .

(b) Estimate the system using 2SLS.

The REG Procedure
Model: MODEL1
Dependent Variable: Y1

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	66688105	33344053	2560.94	<.0001
Error	27	351546	13020		
Corrected Total	29	67039651			

Root MSE	114.10624	R-Square	0.9948
Dependent Mean	5794.51667	Adj R-Sq	0.9944
Coeff Var	1.96921		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	2587.35143	72.00106	35.93	<.0001
X1	1	1.67073	0.16462	10.15	<.0001
X2	1	1.96933	0.09837	20.02	<.0001

The REG Procedure
Model: MODEL1
Dependent Variable: Y2

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	41788588	41788588	1159.42	<.0001
Error	28	1009198	36043		
Corrected Total	29	42797786			

Root MSE	189.84939	R-Square	0.9764
Dependent Mean	2388.63000	Adj R-Sq	0.9756
Coeff Var	7.94805		

Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value
Intercept	Intercept	1	-2198.29750	139.09857	-15.80
y1p	Predicted Value of Y1	1	0.79160	0.02325	34.05

The estimated structural form of the Money supply function is:

$$\hat{Y}_{2t} = -2198.2975 + 0.7916 \hat{Y}_{1t}$$

$$se = (139.0986) \quad (0.0233)$$

$$t = (-15.8038) \quad (34.0502)$$