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// T11simReg5.sce
// MULTIVARIATE REGRESSION MODEL AND LS ESTIMATION
// Experiments
// - change parameters of the model
// - change the input signal
// - try to increase the model order to 2
// -----
exec("ScIntro.sce",-1), mode(0)

// PARAMETERS // 1
nd=100; // length of data // 2
a1S=[.8 .2 // 3
     .1 .6]; // parameters at y(t-1) // 4
b0S=[1 -.5]'; // parameters at u(t) // 5
b1S=[.5 .1]'; // parameters at u(t-1) // 6
kS=[-5 3]'; // constant (model absolute term) // 7
sS=.1*eye(2,2); // noise std // 8
ny=max(size(a1S)); // number of y-variables // 9
// 10
y(1,:)= [1 -1]; // initial conditions for output // 11
u=signal(nd,1,.1); // input // 12
// 13
// TIME LOOP // 14

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thS=[b0S a1S b1S kS]';           // matrix of parameters           // 15
V=zeros(7,7);                     // initial statistics           // 16
ka=0;                              // 17
for t=2:nd                          // 18
    ps=[u(t) y(t-1,:) u(t-1) 1]'; // regression vector           // 19
    y(t,:)=thS'*ps+sS*rand(2,1,'n'); // simulation                   // 20
    Y(t,:)=y(t,:);                 // collection of Y              // 21
    X(t,:)=ps;                     // collection of X              // 22
end                                  // 23
thE=inv(X'*X)*X'*Y;                // parameter estimates          // 24
                                    // 25
// RESULTS                           // 26
set(gcf(),'position',[700 100 600 500]) // 27
subplot(211),plot(1:nd,u),title('Input') // 28
subplot(212),plot(1:nd,y),title('Output') // 29
disp('The simulated and estimated parameters are',[thS,thE]) // 30

```

## Description of the program

- Rows 3–8 set parameters of the model
- Row 11 sets the initial conditions
- Row 12 generates input signal

- Row 16–17 are initial statistics (no prior information)
- Rows 18–23 perform the time loop
  - 19: construction of regression vector
  - 20: simulation
  - 21–22: construction of  $X$  and  $Y$  for least squares
- Row 19 performs point estimates of parameters