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clear all;

%these are my home and office directories
%cd 'C:\WINDOWS\Desktop\203c';
cd 'C:\Documents and Settings\econhist\Desktop\203c';

%loading data;
load ps5q4_text.txt;
%data set saved as tab delimited text file;

y=ps5q4_text(:,1);
x=ps5q4_text(:,2:6);
z=[x x(:,2:5).^2];

[n K1]=size(x);
[n K2]=size(z);

s=ones(n,1);
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%GMM%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%case 1: 1st set of moments and V=I

beta_gmm1=inv(x'*x)*x'*y

for i=1:n
    w1(:, :, i)=(x(i, :)'*(y(i)-x(i, :)*beta_gmm1))*(x(i, :)'*(y(i)-x(i, :)*beta_gmm1));
end

w1=1/n*sum(w1,3);

cov1=n*inv((x'*x)*(x'*x)')*(x'*x)*w1*(x'*x)'\*inv((x'*x)*(x'*x)')

se1=sqrt(diag(cov1))

%case 2: 1st set of moments and V=V_optimal
%note: I already know that in this just identified case, the weight matrix won't affect
the estimates,
%but i'll estimate them anyway to show this.

beta_gmm2=inv((x'*x)*inv(w1)*(x'*x))*(x'*x)*inv(w1)*(x'*y)

cov2=n*inv((x'*x)*inv(w1)*(x'*x))

se2=sqrt(diag(cov2))

%case 3: 2nd set of moments and V=I
beta_gmm3=inv((x'*z)*(z'*x))*(x'*z)*(z'*y)

for i=1:n
    w2(:, :, i)=(z(i, :)'*(y(i)-x(i, :)*beta_gmm3))*(z(i, :)'*(y(i)-x(i, :)*beta_gmm3));
end

w2=1/n*sum(w2,3);

cov3=n*inv((x'*z)*(z'*x))*(x'*z)*w2*(z'*x)*inv((x'*z)*(z'*x))

se3=sqrt(diag(cov3))

%case 4: 2nd set of moments and V=V_optimal
beta_gmm4=inv((x'*z)*inv(w2)*(z'*x))*(x'*z)*inv(w2)*(z'*y)

for i=1:n
    v4(:, :, i)=(z(i, :)'*(y(i)-x(i, :)*beta_gmm4))*(z(i, :)'*(y(i)-x(i, :)*beta_gmm4));

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end

v4=1/n*sum(v4,3);

cov4=n*inv((x'*z)*inv(v4)*(z'*x))

se4=sqrt(diag(cov4))

%%%question 5, Wald Test%%%

%using first set of moments
tril=2*[0 beta_gmm1(2) -beta_gmm1(3) beta_gmm1(4) -beta_gmm1(5)];
wald1=((beta_gmm1(2)^2)+(beta_gmm1(4)^2)-(beta_gmm1(3)^2)-(beta_gmm1(5)^2))^2/(tril*cov1
*tril')

%using second set of moments, case 4, optimal weight matrix
tri2=2*[0 beta_gmm4(2) -beta_gmm4(3) beta_gmm4(4) -beta_gmm4(5)];
wald2=((beta_gmm4(2)^2)+(beta_gmm4(4)^2)-(beta_gmm4(3)^2)-(beta_gmm4(5)^2))^2/(tri2*cov4
*tri2')

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