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%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% Multivariate normal regression model via Bayesian estimation
%  with independent priors
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

clear;

% Set random number generator, start stop watch, open output file
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
rand('state',37); % set arbitrary seed for uniform draws
randn('state',37); % set arbitrary seed for normal draws

tic;  % start stop watch


% Generate & prepare data
%%%%%%%%%%%%%%%%%%%%%%%%%
% generate data
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
n=10000; % set sample size
x1=ones(n,1);
x2= -1.4+randn(n,1);
x3= 3+2*randn(n,1);

X=[x1 x2 x3];
k=size(X,2);
btrue=[1.2 0.4 -0.8]'; % "true" coefficients

sig2true=2.44; %"true" error variance
eps=sqrt(sig2true)*randn(n,1);
y=X*btrue+eps;

save c:\klaus\AAEC6564\mlab\worksp\mod2_sim_data;

% Estimation
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% starting values, priors, and tuners
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% general elements
r1=5000; % burn-in
r2=10000; % keepers
R=r1+r2;

% generic OLS
bols=inv(X'*X)*X'*y;
res=y-X*bols;
s2=(res'*res)/(n-k);

% elements for beta
mu0=zeros(k,1); %diffuse prior for mean of betas
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V0=eye(k)*100; % diffuse prior for varcov of beta
betadraw=bols; %use OLS values as starting draws for Gibbs Sampler

% elements for sig2
sig2draw=s2; % use OLS variance as starting draw for Gibbs Sampler
v0=1/2;
tau0=1/2; % diffuse prior shape and scale

[betamat,sig2mat]=...
    gs_normal_independent(X,y,n,k,r1,r2,mu0,V0,betadraw,v0,tau0,sig2draw);

'GS done'

[fid]=fopen('c:\klaus\AAEC6564\mlab\logs\mod2s1a.txt','w');
if fid==-1;
   warning('File could not be opened');
   return
else;
   disp('File opened successfully');
end;

% put all draws together & run diagnostics
allmat=[betamat;sig2mat];
kdiag=klausdiagnostics_greater0(allmat);

fprintf(fid,'total number of iterations =\t%6.0f \n',R);
fprintf(fid,'burn-in iterations =\t%6.0f \n',r1);
fprintf(fid,'\n');

fprintf(fid,'true betas \t%6.3f\n',btrue);
fprintf(fid,'true sig2 \t%6.3f\n',sig2true);
fprintf(fid,'\n');
fprintf(fid,'\n');

% beta stuff
out=kdiag(1:k,:)';
fprintf(fid,'Output table for betas \n\n');
fprintf(fid,'mean\t\tstd\t\tp>0\t\tnse\t\tIEF\t\tm*\t\tcd\n\n');
fprintf(fid,'%6.3f\t%6.3f\t%6.3f\t%6.3f\t%6.3f\t%6.3f\t%6.3f\n',out);
fprintf(fid,'\n');

%sig2 stuff
out=kdiag(k+1,:)';
fprintf(fid,'Output table for sig2 \n\n');
fprintf(fid,'mean\t\tstd\t\tp>0\t\tnse\t\tIEF\t\tm*\t\tcd\n\n');
fprintf(fid,'%6.3f\t%6.3f\t%6.3f\t%6.3f\t%6.3f\t%6.3f\t%6.3f\n',out);
fprintf(fid,'\n');


save c:\klaus\AAEC6564\mlab\worksp\mod2s1a betamat sig2mat;

finish = toc/60;
fprintf(fid,'Time elapsed in minutes \n\n');
fprintf(fid,'%6.3f\n',finish);
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```
st=fclose(fid);
if st==0;
   disp('File closed successfully');
else;
   warning('Problem with closing file');
end;
```

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