Homework 6

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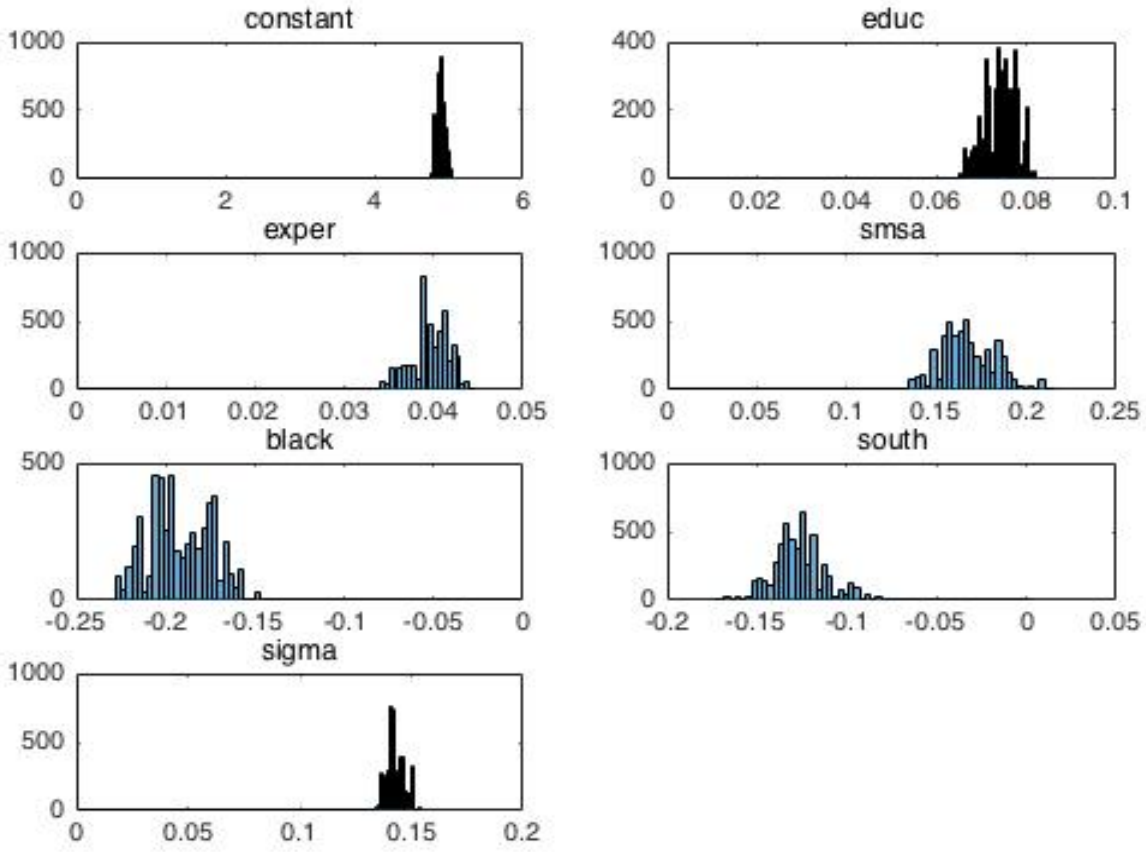
Question 1

First we run the OLS regression of log wages on education, experience, dummy variables for SMSA status, race and region. Find the estimates for coefficients $\hat{\beta}$ and standard errors, also the estimate of the standard deviation of the residuals $\hat{\sigma}_\epsilon$.

The coefficients for the above variables are 4.91, 0.07, 0.03, 0.16, -0.18 and -0.13 respectively. Also we can calculate the sigma square and standard deviation of redisuals using the estimated form $\hat{\sigma_\epsilon}^2 = \frac{e'e}{n-k}$, where e is the error term.

Question 2

For the first part, using a flat prior for all parameters and plot the histogram:



For the second part, using a prior for education, and get the histogram:

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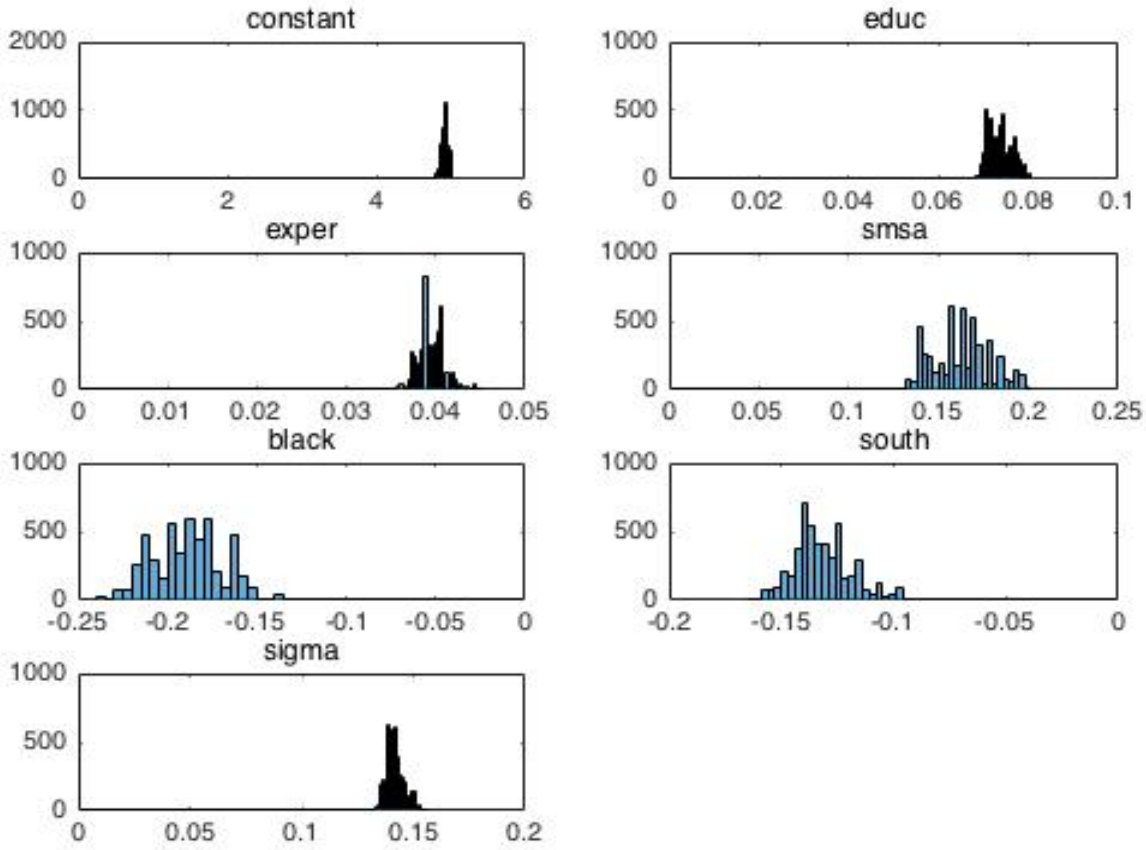

Question 3

In question 2 we get results of interval estimations, while those high frequest estimations are close to the result we got from question 1. And the results are closer when there is no prior.(???not sure)

Matlab codes

```
close all;
clear;
clc;

%%%%%%%READ DATA%%%%%
load matlab.mat;
Y=log(wage);
X=[ones(length(Y),1),educ,exper,smsa,black,south];
[n,k]=size(X);
```

```
%%%%%%ESTIMATION%%%%
beta=inv(X'*X)*X'*Y;
residual=Y-X*beta;
sigma_sq=sum((residual-mean(residual)).^2)/(length(Y)-k);
covb=inv(X'*X)*sigma_sq;
varb=diag(covb);
varsig=2/(length(Y)-k)*sigma_sq^2;
var=[varb;varsig];
beta_mh=[beta;sigma_sq];
r=zeros(length(beta_mh),5000);

%%%%%%part 1 flat prior%%%%%
l=normpdf(Y-X*beta,0,sqrt(sigma_sq));
l=sum(log(l));
acc=0;
for i= 2:5000
betanew=beta_mh+mvnrnd(zeros(size(beta_mh)),diag(var))';
lnew=normpdf(Y-X*betanew(1:6),0,sqrt(betanew(7)));
lnew=sum(log(lnew));
c=rand;
if exp(lnew-l)>=c
acc=acc+1;
l=lnew;
beta_mh=betanew;
else
end;
r(:,i)=beta_mh;
end
str={'constant','educ','exper','smsa','black','south','sigma'};
figure
for j=1:7
subplot(4,2,j)
histogram(r(j,:))
title(str{j})
end

%%%%using education prior%%%%
conf=[0.035,0.085];
a=norminv(0.975);
b=norminv(0.025);
edu=0.06;
s=(conf(2)-edu)/a;
beta_mh=[beta;sigma_sq];
r=zeros(length(beta_mh),5000);
l=normpdf(Y-X*beta,0,sqrt(sigma_sq));
```

```
l=sum(log(l))+log(normpdf(beta_mh(2)-edu,0,s));
acc=0;
for i= 2:5000
betanew=beta_mh+mvnrnd(zeros(size(beta_mh)),diag(var))';
lnew=normpdf(Y-X*betanew(1:6),0,sqrt(betanew(7)));
lnew=sum(log(lnew))+log(normpdf(betanew(2)-edu,0,s));
c=rand;
if exp(lnew-l)>=c
acc=acc+1;
l=lnew;
beta_mh=betanew;
else
end;
r(:,i)=beta_mh;
end
str={'constant','educ','exper','smsa','black','south','sigma'};
figure
for j=1:7
subplot(4,2,j)
histogram(r(j,:))
title(str{j})
end
```