clear all; close all;

load('lawschooldata.mat');

% Q1

a1=datasample(X,15);

mean(a1);

corr(a1);

B=[25 50 100 200 500 1000 2000];

for j=1:7

for i=1:B(j)

sample=datasample(a1,15);

mx(i)=mean(sample(:,1));

my(i)=mean(sample(:,2));

rho(i)=corr(sample(:,1), sample(:,2));

end

mxse(j)=std(mx);

myse(j)=std(my);

rhose(j)=std(rho);

end

subplot(2,2,1),plot(B,mxse);title('SE of LSAT');

subplot(2,2,2),plot(B,myse);title('SE of GPA');

subplot(2,2,3),plot(B,rhose);title('SE of Correlation');

close all;

for i=1:2000

sample=datasample(X,15);

rhopop(i)=corr(sample(:,1), sample(:,2));

end

subplot(121),hist(rho, 60);title('histogram of BS Corr (B=2000)');xlim([0,1]);

subplot(122),hist(rhopop, 60);title('histogram of POP Corr (B=2000)');xlim([0,1]);

%rhotrue=corr(X(:,1),X(:,2));

%std(rho)

%std(rhopop)

%Q2

close all; clear all;

dat2=[1 2 3.5 4 7 7.3 8.6 12.4 13.8 18.1];

B=[25 100 200 500 1000 2000];

for j=1:6

for i=1:B(j)

sample=sort(datasample(dat2,10));

tm(i)=mean(sample(3:8));

end

se(j)=std(tm);

end

close all; clear all;

dat2=[1 2 3.5 4 7 7.3 8.6 12.4 13.8 18.1];

B=[2,20,100,200,300,500,750,1000,1300,1600,2000];

for j=1:length(B)

for r=1:20

for i=1:B(j)

sample=sort(datasample(dat2,10));

tm(i,r)=mean(sample(3:8));

end

end

finalse(:,j)=std(tm);

end

scatter(reshape(repmat(B, 20,1), length(B)\*20,1),reshape(finalse,length(B)\*20,1),15,'filled');

title('Bootstrap SE estimates');xlabel('Bootstrap repeats');ylabel('Estimated SE of trimed mean');

%Q3

clear all;close all;

n=10;

dat3=normrnd(0,1,n,1);

theta=mean(dat3);

%Calculate BS estimate

B=1000;

for i=1:B

bsdat=datasample(dat3,n);

bstheta(i)=median(bsdat);

end

bias=theta-mean(bstheta);

bias2=theta-median(dat3);