HW 4

```
close all; clear all
```

Problem 1

```
D = load('DevonBdot.txt');
dist = D(:,1);
bdot = D(:,2);
figure(1);clf;
clear D2 D4
plot(dist, bdot);
D1 = D(1:100,:);
D2 = D(101:200,:);
D3 = D(201:300,:);
D4 = D(301:400,:);
D1_mu = mean(D1);
D2_mu = mean(D2);
D3_mu = mean(D3);
D4_mu = mean(D4);
D1_sig = std(D1);
D2_sig = std(D2);
D3_sig = std(D3);
D4_sig = std(D4);
%calculate vairance for rates
D1_var = var(D1);
D2_var = var(D2);
D3_var = var(D3);
D4_var = var(D4);
```

plot relative density plots

```
figure(1); clf
subplot(2,2,1);
x0 = 15; %define number of bins ;
[distr, xbins]= hist(D1(:,2), x0);
dx = xbins(2) -xbins(1); %bin width by subtracting bin centers (xbins)
distr_area = sum(distr*dx);
norm =distr/distr_area;
bar(xbins, norm); hold on  %plot the relative  density histrogram problem

% kernal density histrogram
h = 1;
xm = D1_mu(2)-10*D1_sig(2):D1_sig(2)/10:D1_mu(2)+10*D1_sig(2);
for n=1:length(xm)

    dist = D1(:,2)-xm(n); %distance from x0 to all other data
    Ix = find(abs(dist)<h) % finding data within window h
    w =15/16*(1-dist(Ix)/h).^2
    f1(n) = sum(w); %store the estiamte for each position in our array
end
dw = D1_sig(2)/10; %width of bins
```

```
f1 = 1/sum(f1.*dw)*f1 ;%normalizes the pdf

plot(xm, f1, 'r', 'linewidth', 2)
title( '0m-200m')
% section2
subplot(2,2,2);
x0 = 15; %define number of bins ;
[distr, xbins]= hist(D2(:,2), x0);
dx = xbins(2) -xbins(1); %bin width by subtracting bin centers (xbins)
distr_area = sum(distr*dx);
norm =distr/distr_area;
bar(xbins, norm); hold on  %plot the relative  density histrogram problem

% kernal density histrogram
h = 1;
xm = D2_mu(2)-10*D2_sig(2):D2_sig(2)/10:D2_mu(2)+10*D2_sig(2);
for n=1:length(xm)

    dist = D2(:,2)-xm(n); %distance from x0 to all other data
    Ix = find(abs(dist)<h) % finding data within window h
    w =15/16*(1-dist(Ix)/h).^2
    f1(n) = sum(w); %store the estiamte for each position in our array
end
dw = D2_sig(2)/10; %width of bins
f1 = 1/sum(f1.*dw)*f1 ;%normalizes the pdf

plot(xm, f1, 'r', 'linewidth', 2)
title( '200m-400m')
%Section 3
subplot(2,2,3);
x0 = 15; %define number of bins ;
[distr, xbins]= hist(D3(:,2), x0);
dx = xbins(2) -xbins(1); %bin width by subtracting bin centers (xbins)
distr_area = sum(distr*dx);
norm =distr/distr_area;
bar(xbins, norm); hold on  %plot the relative  density histrogram problem

% kernal density histrogram
h = 1;
xm = D3_mu(2)-10*D3_sig(2):D3_sig(2)/10:D3_mu(2)+10*D3_sig(2);
for n=1:length(xm)

    dist = D3(:,2)-xm(n); %distance from x0 to all other data
    Ix = find(abs(dist)<h) % finding data within window h
    w =15/16*(1-dist(Ix)/h).^2
    f1(n) = sum(w); %store the estiamte for each position in our array
end
dw = D3_sig(2)/10; %width of bins
f1 = 1/sum(f1.*dw)*f1 ;%normalizes the pdf

plot(xm, f1, 'r', 'linewidth', 2)
title( '400m-600m')
%Section4
subplot(2,2,4);
```

```
x0 = 15; %define number of bins ;
[distr, xbins]= hist(D4(:,2), x0);
dx = xbins(2) -xbins(1); %bin width by subtracting bin centers (xbins)
distr_area = sum(distr*dx);
norm =distr/distr_area;
bar(xbins, norm); hold on  %plot the relative  density histrogram problem

% kernal density histrogram
h = 1;
xm = D4_mu(2)-10*D4_sig(2):D4_sig(2)/10:D4_mu(2)+10*D4_sig(2);
for n=1:length(xm)

    dist = D4(:,2)-xm(n); %distance from x0 to all other data
    Ix = find(abs(dist)<h) % finding data within window h
    w =15/16*(1-dist(Ix)/h).^2
    f1(n) = sum(w); %store the estiamte for each position in our array
end
dw = D4_sig(2)/10; %width of bins
f1 = 1/sum(f1.*dw)*f1 ;%normalizes the pdf

plot(xm, f1, 'r', 'linewidth', 2)
title( '600m-800m')
```

Problem 2

the answers to the questions are that the mean for the acumulation rates is fairly constant but the the variance is not constant

Problem 3 ? calculate semivariance

```
clear dist ;
dist = D(:,1);
bdot = D(:,2);
[h,V,c] = semivariogram(dist, bdot);
figure(2); clf;
plot(h,V,'o');hold on
title('Semivariance and Covariance plots')%plots semivariance
plot(h,c, 'o'); %plots covariance
% plot autocorrelation

figure(3); clf
autocorr(bdot, 'NumLags', 399);
```

problem 4

```
 [h,V,npairs] = semivariogram_mc(dist, bdot, 10);
 clear figure(3);
 figure(3); hold on
 plot(h, V, 'k'); hold on
 [h,V,npairs] = semivariogram_mc(dist, bdot, 50);
  plot(h, V, 'r'); hold on
 [h,V,npairs] = semivariogram_mc(dist, bdot, 100);
  plot(h, V, 'b'); hold on
```

```
 legend('npair =10', 'npair=50', 'npair = 100')

 figure(4); hold on; clf
    plot(h, npairs); hold on
```

Problem 5 Plot semivariance for 4 seperate sections

```
[h,V,c] = semivariogram(D1(:,1), D1(:,2));
figure(5); clf;
plot(h,V,'o', 'LineWidth', 2);hold on
title('Semivariance plots')%plots semivariance

[h,V,c] = semivariogram(D2(:,1), D2(:,2));
plot(h,V,'o', 'LineWidth', 2);hold on
title('Semivariance plots')%plots semivariance

[h,V,c] = semivariogram(D3(:,1), D3(:,2));
plot(h,V,'o', 'LineWidth', 2);hold on
title('Semivariance plots')%plots semivariance

[h,V,c] = semivariogram(D4(:,1), D4(:,2));plot(h,V,'o','LineWidth', 2);hold on
title('Semivariance plots')%plots semivariance
legend('Section 1', 'Section 2', 'Section 3', 'Section 4')
```

Answer to Question

Yes, semivariance relies on the lag. The sill is the range of the measured semivariance value which depeneds on the square of the standard deviations and the standard deviation is the range of error you can expect for a given value. The standard deviation is used to determine the semivariance therfore making the semivarience dependenent on that range of error or lag.

Problem 6 finding best vaarigram parameters

```
a = 1:60 ; %range of a values
c = 30:60 ; %range of sill values
for p =1:length(a) %loop through values of bdot
    for q=1:length(c) %loop through values of A
     rmse(p,q)= model_variogram(h,V,c(q),a(p),'L');
    end
end
figure(3); clf
imagesc(c,a,rmse);
colorbar
% V = model_variogram(h,c,a,n,type)
```

Problem 7 repeat above using fminsearch

```
fh = @(p) model_variogram(h,V,p(1), p(2), 'L');
[pbest, fval] = fminsearch(fh,[30,60]);
figure(3); hold on
plot(pbest(1), pbest(2), 'wo', 'markersize', 8, 'linewidth', 2)
```

Probelm 8

```
fh = @(p) model_variogram(h,V,p(1), p(2), 'S');
[pbest, fval] = fminsearch(fh,[30,60]);
figure(3); hold on
plot(pbest(1), pbest(2), 'wo', 'markersize', 8, 'linewidth', 2)
```