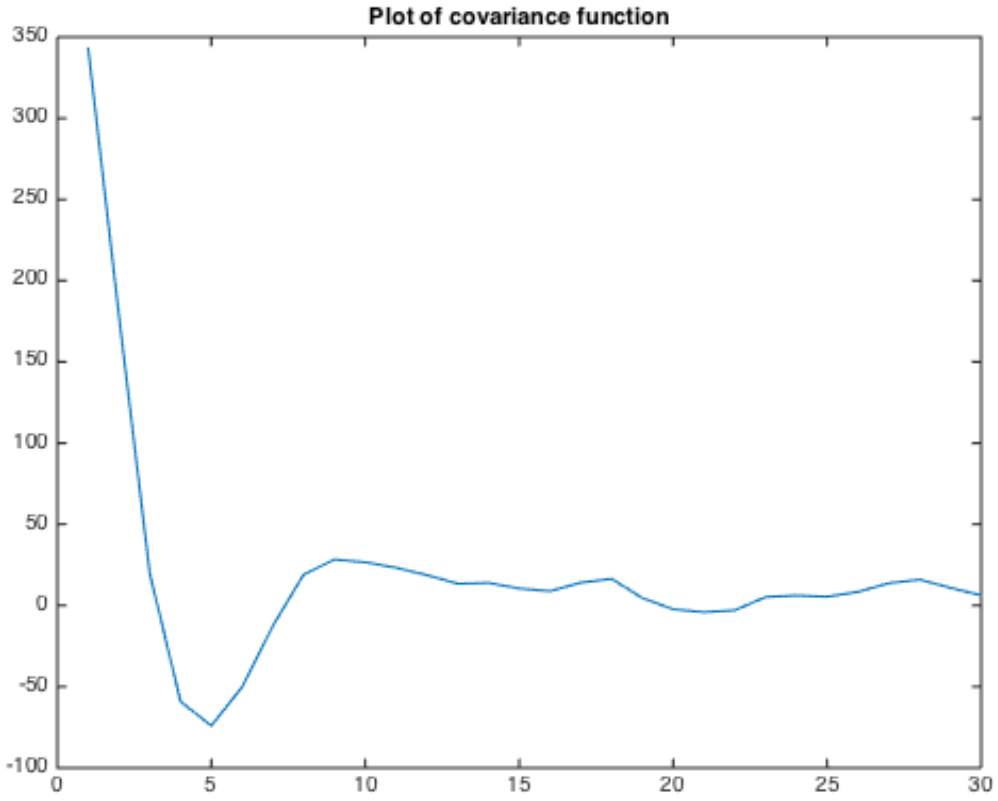
Contents

- Part A
- Part B
- Part C

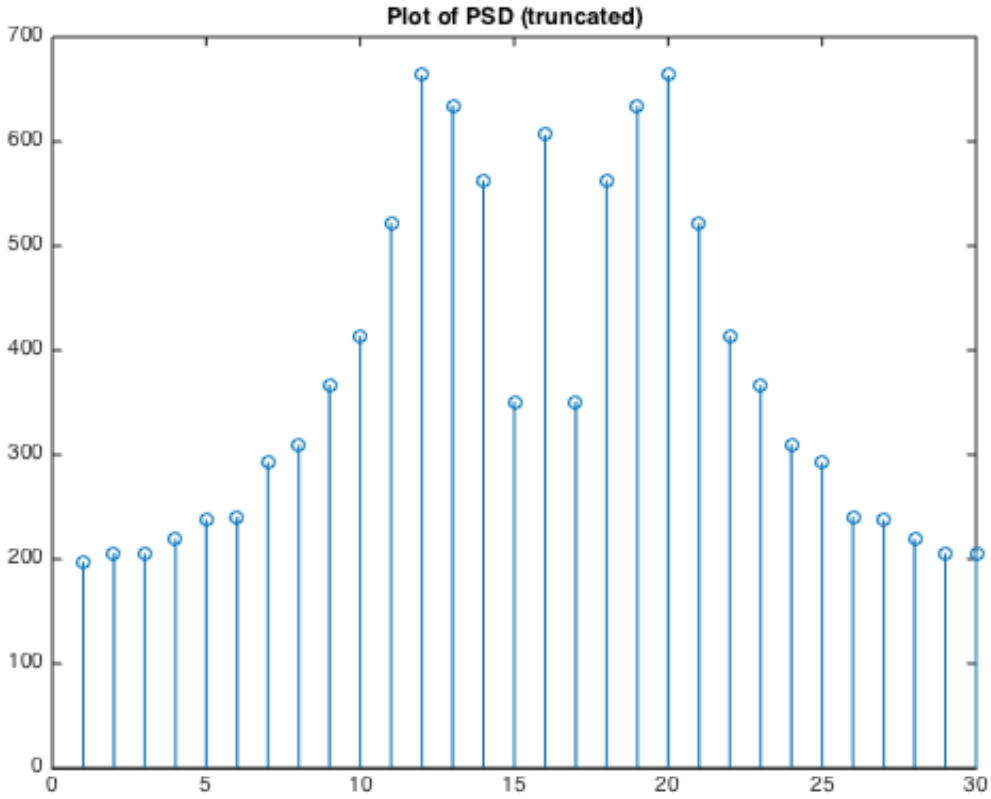
Part A

```
clear; close all;
load('hw8_data');

Kx = zeros(1,length(olr1));
meanOlr = mean(olr1);
for m = 0:length(olr1)-1
   for i = 0:length(olr1)-m-1
       Kx(m+1) = Kx(m+1) + (olr1(i+1)-meanOlr)*(olr1(i+1+m)-meanOlr);
   end
   Kx(m+1) = Kx(m+1)/(length(olr1)-m);
end
figure;
plot(Kx(1:30));
title('Plot of covariance function');

% We can see some periodic behavior from the covariance function. If we
% look around the point where m=5, we see that at around a time step of 5
% the values of the two end points will be negative of each other. This
% means that on average, throughout the signal, if we look at the value at
% some t then at t+5 that value will be negative of the value at time t.
% This exactly shows cyclic behaviour. We can say that the MJO roughly has
% a period of 5.
```



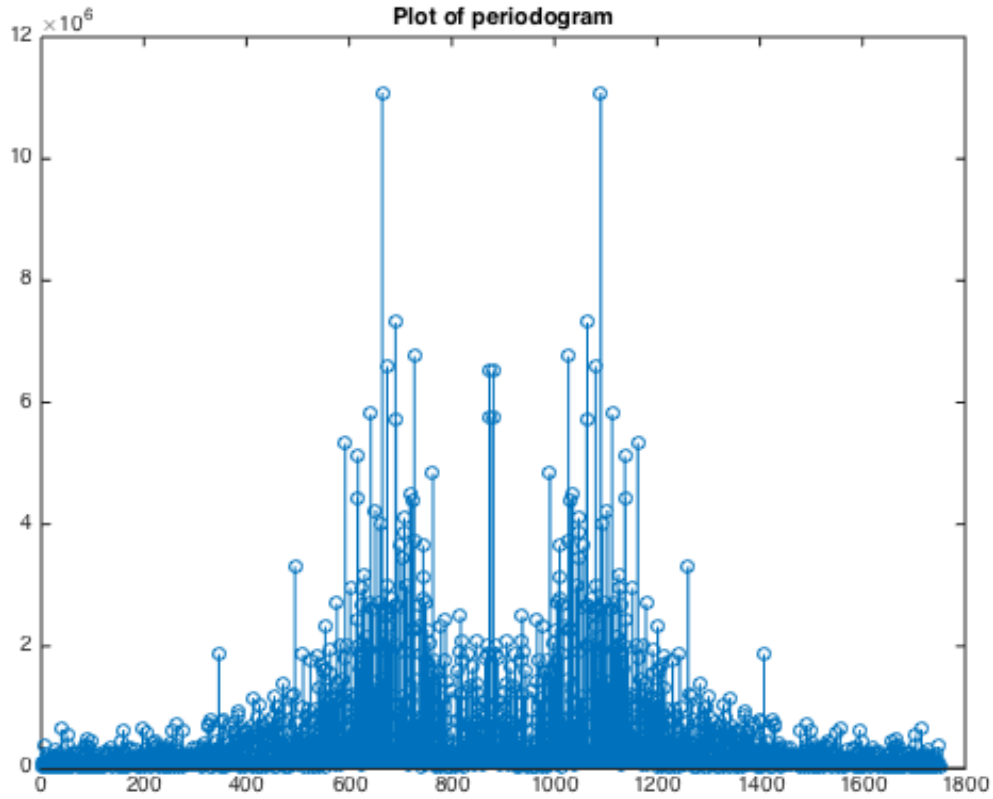
Part B

```
psd = fftshift(abs(fft(Kx(1:30))));
figure;stem(psd);
title('Plot of PSD (truncated)');

% Yes we can see that there is a peak in the psd around 0.7675 rad/s which
% which is "roughly" like a cosine which would correspond to cyclic
% behaviour in the time domain. This directly agrees with the cyclic
% behavoiur we see in part a.
```



Part C

```
periodogram = fftshift(abs(fft(olr1)).^2);
figure;
stem(periodogram);
title('Plot of periodogram');
N = length(olr1);
[maxval, maxindex] = max(periodogram(N/2:end));
radial = maxindex/(N/2)*pi;

% Again there is a peak in the periodogram of the whole sample path around
% the radial frequency of 0.7711. This shows that only looking at a block
% of the sample path (truncated part of sample path) can give a pretty good
% approximation to the data. Overall, it has a very similar shape to the
% PSD we calculated in b) and also has simiar key characteristics. Yes this
% roughly agrees with our derivation in 5) which shows that as T->infinity
% the periodogram converges to the PSD.
```



Published with MATLAB® R2014b