```
% gda14_07
% This script makes synthetic data for the example for
% "Methods Summary 5, Bootstrap Confidence Intervals"

% Note, if you want to actually write the file, you must
% change dowrite to 1, below.

clear all;
dowrite=0;

Nt = 16; % must be even
Dt = 0.01;
t = Dt*[0:Nt-1]';
Nf = Nt/2 + 1;
fny = 1/(2*Dt);
Df = fny/(Nt/2);
f = Df*[0:Nf-1,-(Nf-2:-1:1)]';

% construct two pulses

tstar1 = 0.01;
p1t = exp(-pi*abs(f)*tstar1);
p1true = ifft(p1t)/Dt;
p1true = circshift(p1true,Nt/2);
sigmap = 1;
p1obs = p1true+random('Normal',0,sigmap,Nt,1);

tstar2 = 0.03;
p2t = exp(-pi*abs(f)*tstar2);
p2true = ifft(p2t)/Dt;
p2true = circshift(p2true,Nt/2);
p2obs = p2true+random('Normal',0,sigmap,Nt,1);

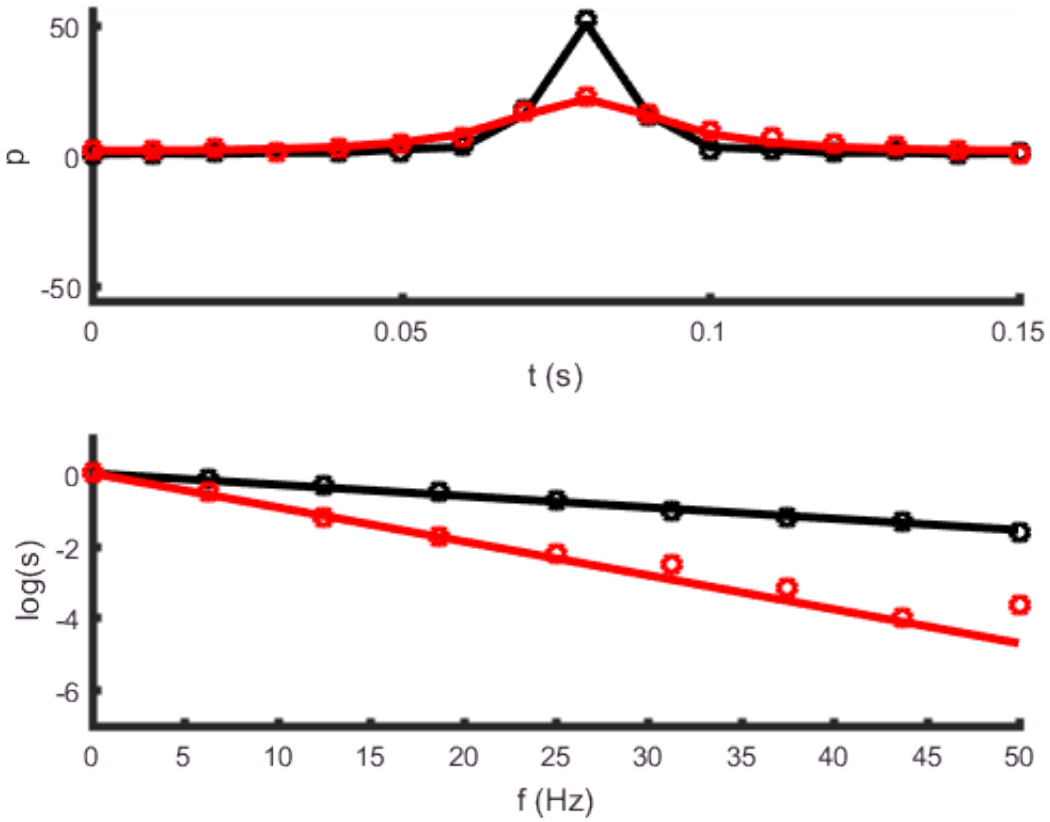
figure(1);
clf;

% plot time series
subplot(2,1,1);
hold on;
set(gca,'LineWidth',3);
pmax = max(abs(p1true));
axis( [t(1), t(end), -1.1*pmax, 1.1*pmax] );
plot( t, p1true, 'k-', 'LineWidth', 3 );
plot( t, p1obs, 'ko', 'LineWidth', 2 );
plot( t, p2true, 'r-', 'LineWidth', 3 );
plot( t, p2obs, 'ro', 'LineWidth', 2 );
xlabel('t (s)');
ylabel('p');

s1true = Dt*fft(p1true);
logs1true = log(abs(s1true(1:Nf)));
s1obs = Dt*fft(p1obs);
logs1obs = log(abs(s1obs(1:Nf)));
s2true = Dt*fft(p2true);
logs2true = log(abs(s2true(1:Nf)));
s2obs = Dt*fft(p2obs);
logs2obs = log(abs(s2obs(1:Nf)));

% plot log amplitude spectra of time series
```

```
subplot(2,1,2);
hold on;
set(gca,'LineWidth',3);
smax = max(logs1true);
axis( [0, fny, smax-7, smax+1] );
plot( f(1:Nf), logs1true, 'k-', 'LineWidth', 3 );
plot( f(1:Nf), logs1obs, 'ko', 'LineWidth', 2 );
plot( f(1:Nf), logs2true, 'r-', 'LineWidth', 3 );
plot( f(1:Nf), logs2obs, 'ro', 'LineWidth', 2 );
xlabel('f (Hz)');
ylabel('log(s)');
```

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% Figure 1.  (Top) Two pulses p1(t) (black curve) and p2(t) (red curve) as a
% function of time t, together with noisy observations (circles). The pulse p2(t)
% is the more attenuated (wider) of the two, corresponding to a higher
% tstar varlue. (Bottom) The log amplitude spectra s1(f) and s2(f) of the
% true pulses (lines) and the of the noisy obserations (circles). The
% the error of the noisy data increases with frequency (especially apparent
% in the s2(f) (red) case.

% I do not want to overwrite the data, which is randomly generated, because
% then the figure will not match the one in the book.
if( dowrite )
    dlmwrite('../data/pulses.txt', [f(1:Nf), logs1obs, logs2obs], 'delimiter', '\t');
    dlmwrite('pulses.txt', [f(1:Nf), logs1obs, logs2obs], 'delimiter', '\t');
end
```