Below are graphs from the six data sets. We were not told which ones were from a time series with a bifurcation. It was a blind test of the Detrended Fluctuation Analysis algorithm (as described in the paper by Thomson and Sieber, 2010). It seems that the DFA algorithm passed the test. As simple a method as DFA is, it still succesfully picked out the one data series (dataset6) as different from the rest. This was the only one where there was not a linearly increasing trend in the the graph of the AR(1) coefficients.
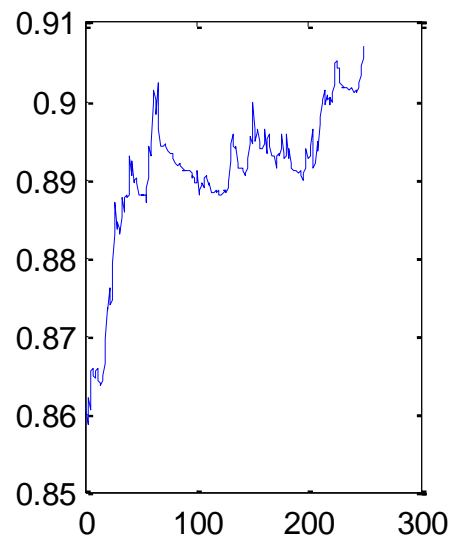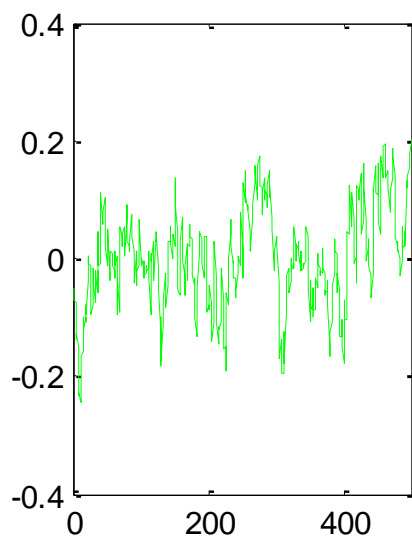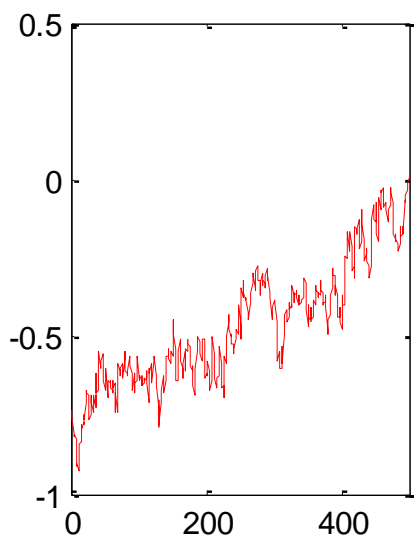
I include below two versions of the analysis. One with a bandwidth of 50 and a window size of 250. Another with a bandwidth of 15 and window size of 250.
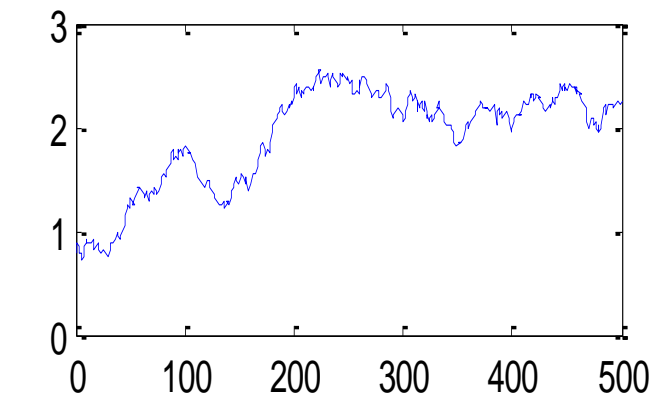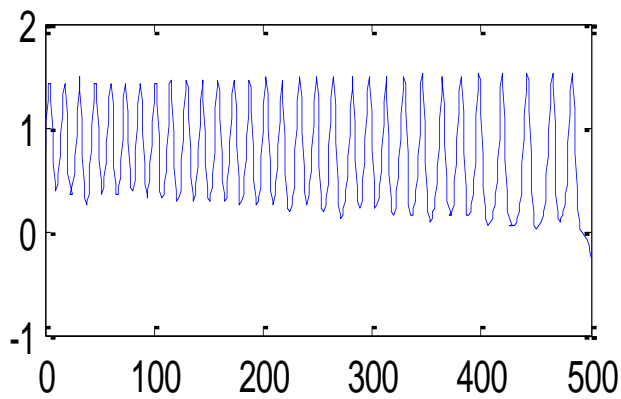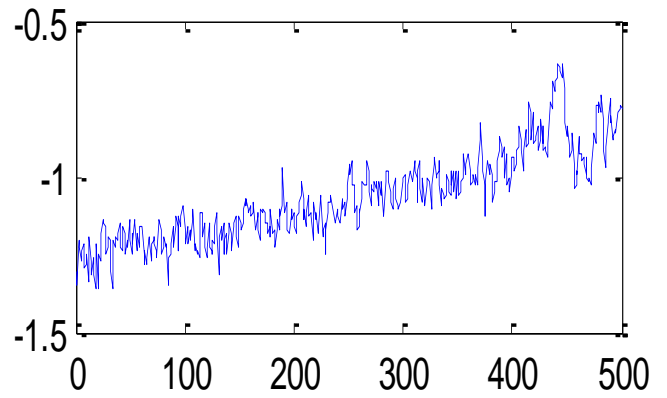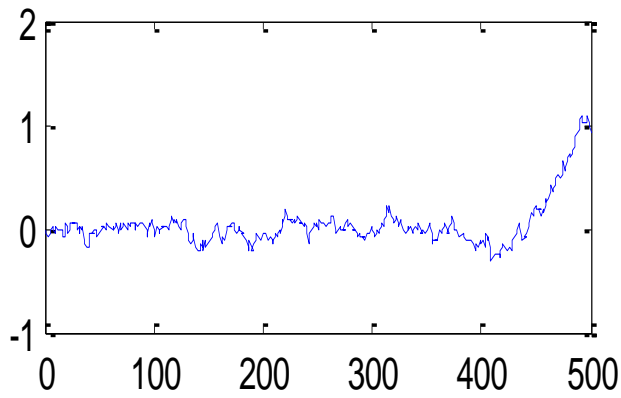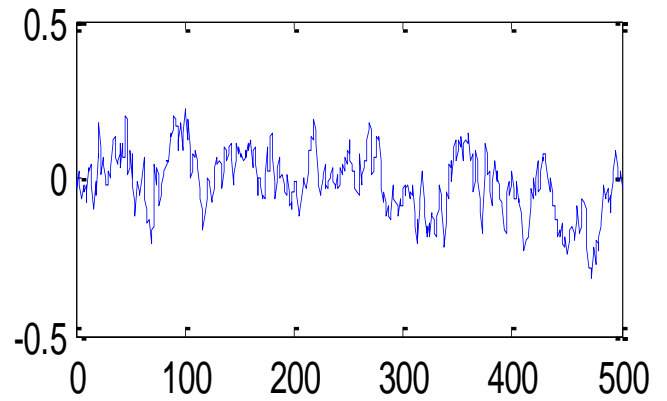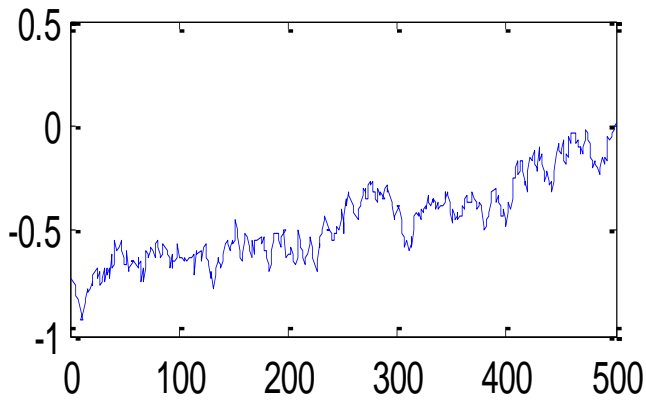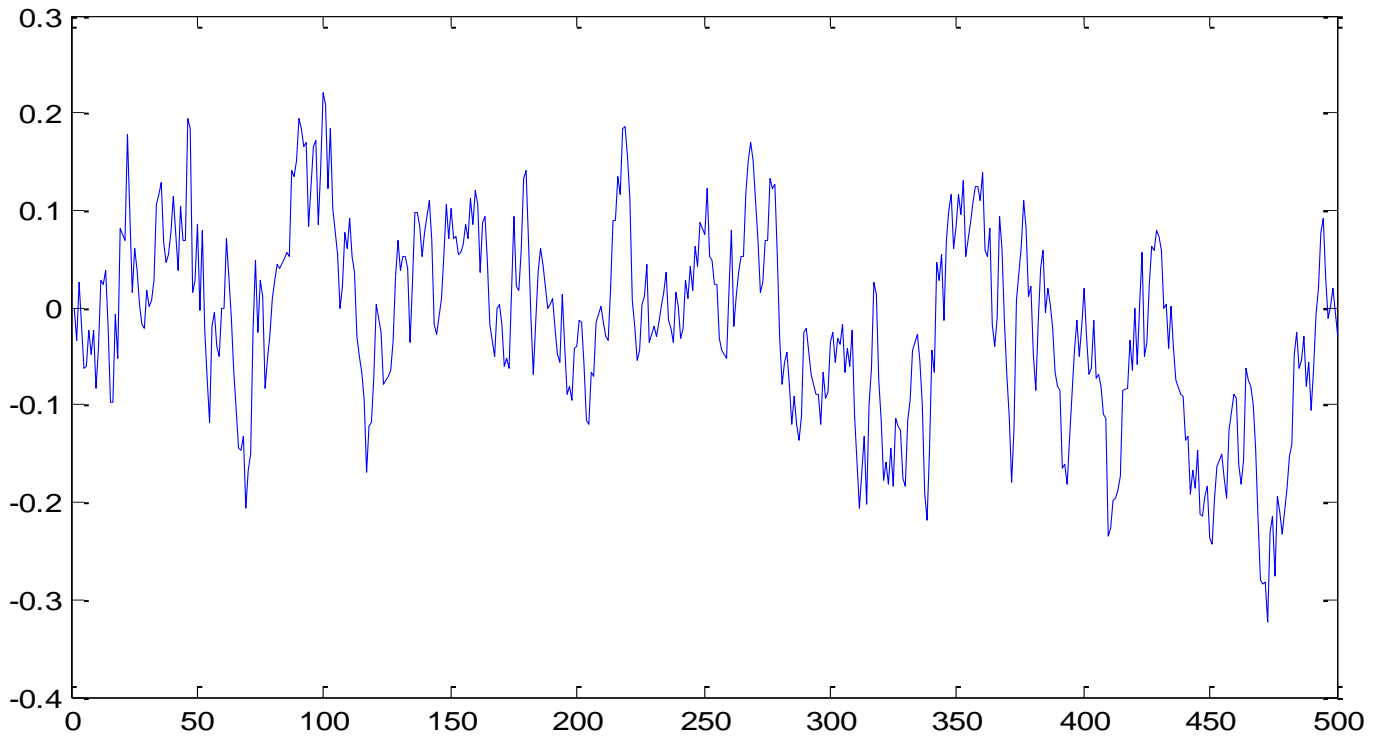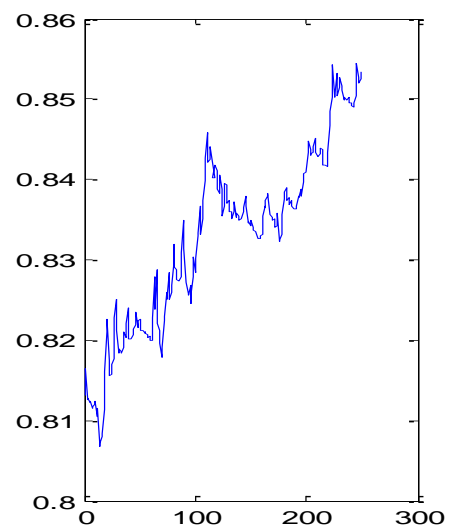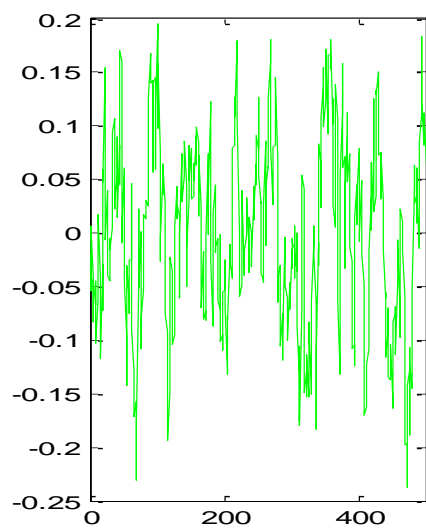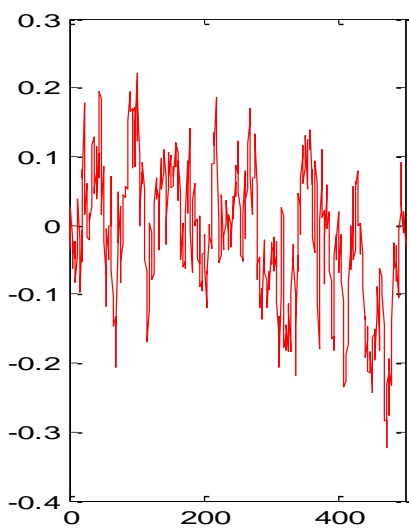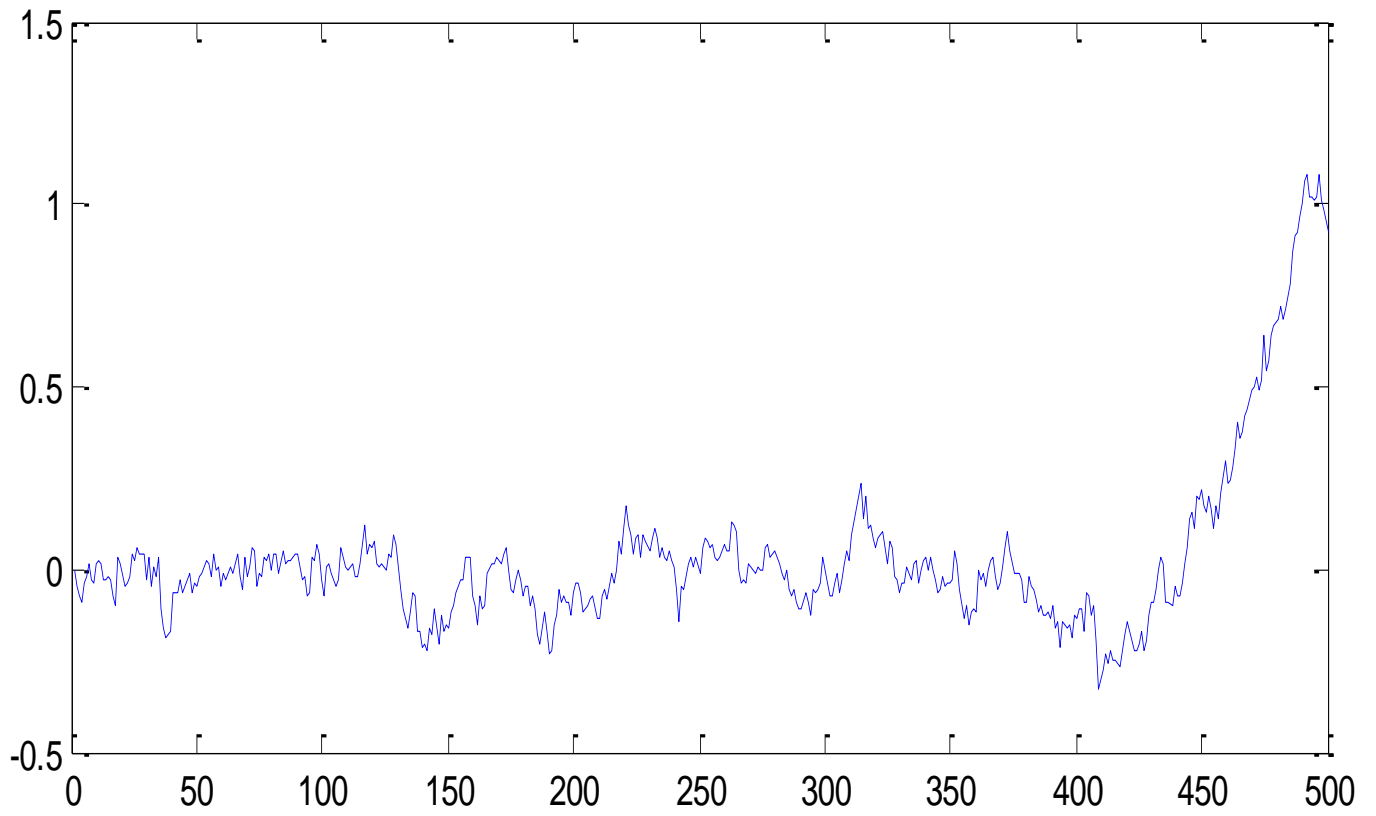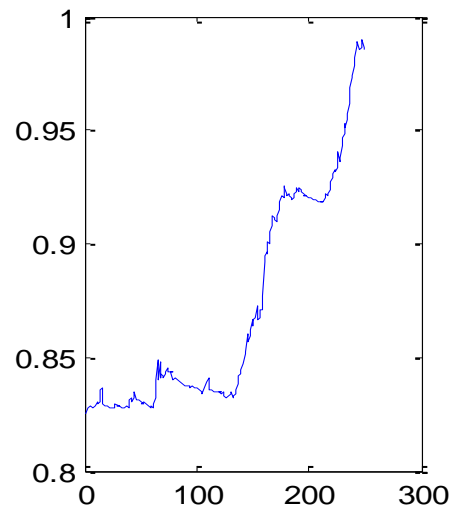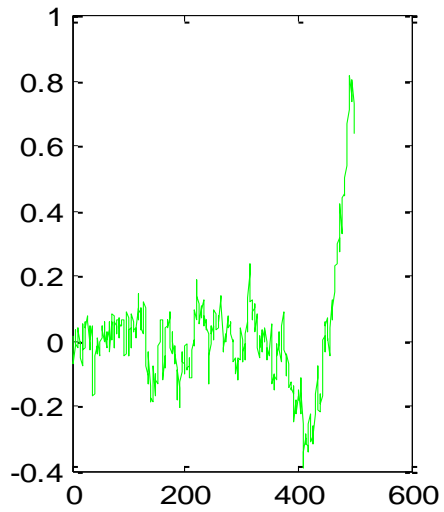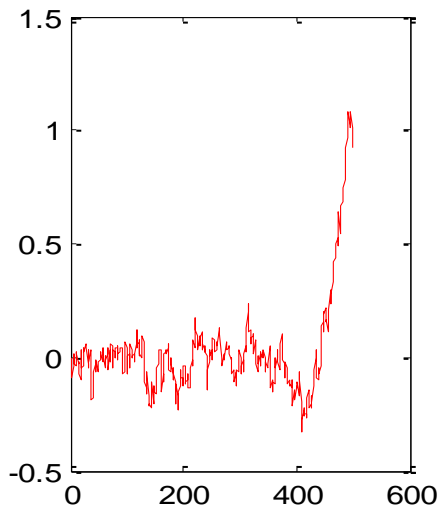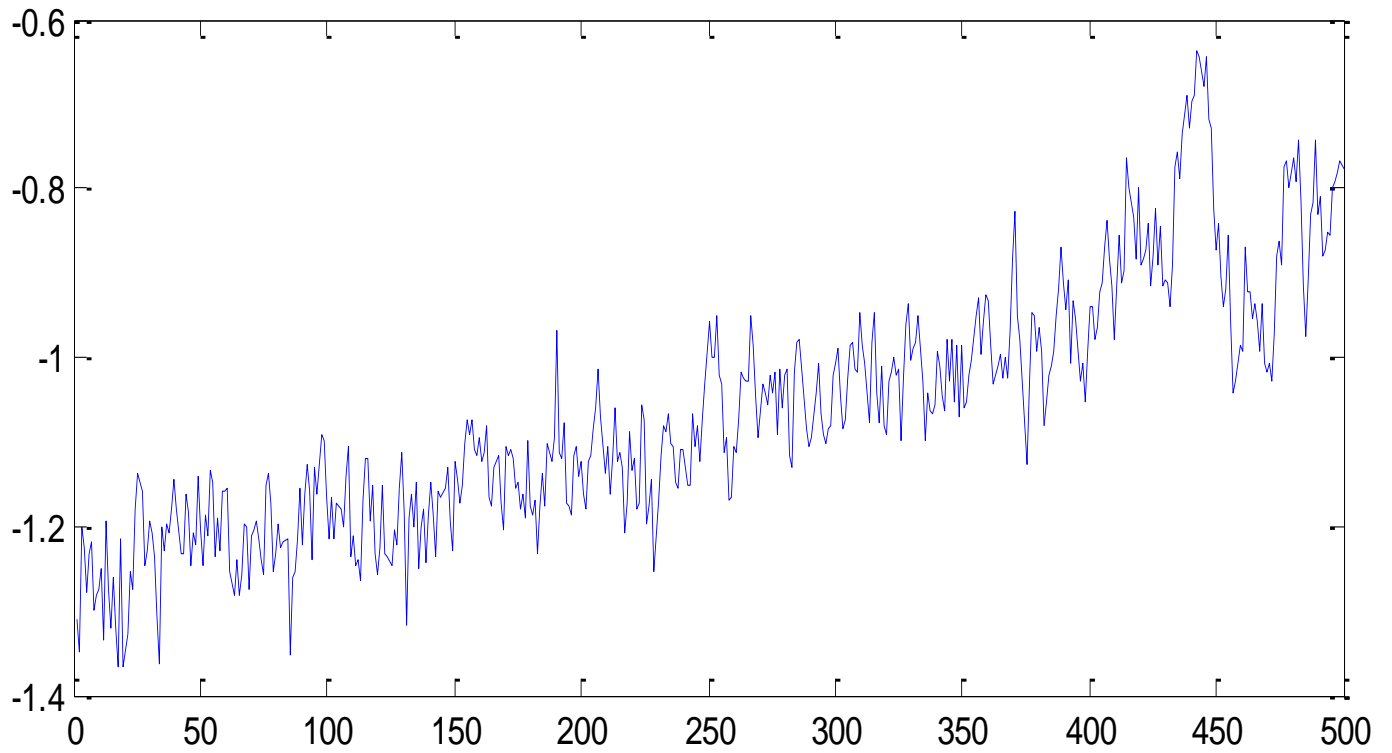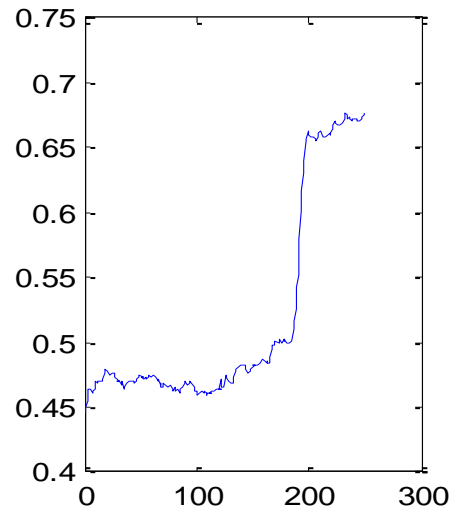
DATA SET 1
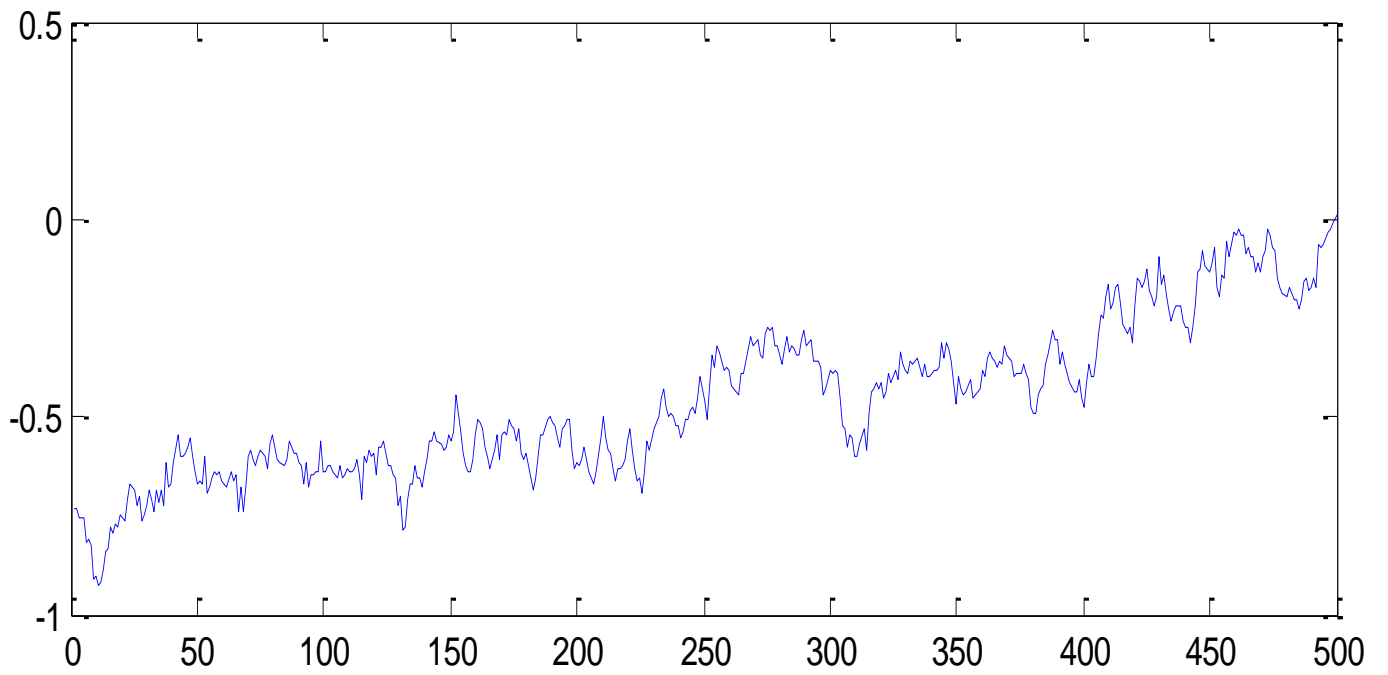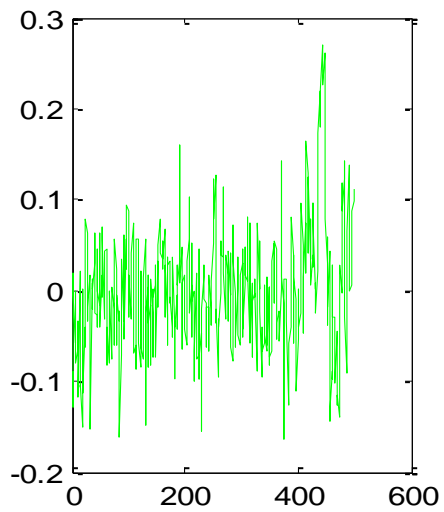

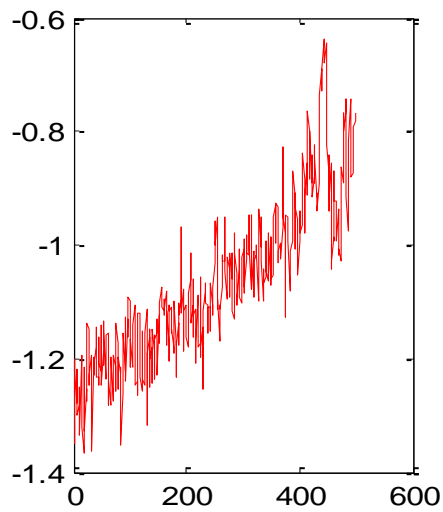DFA(dataset1(:,2),50,250);
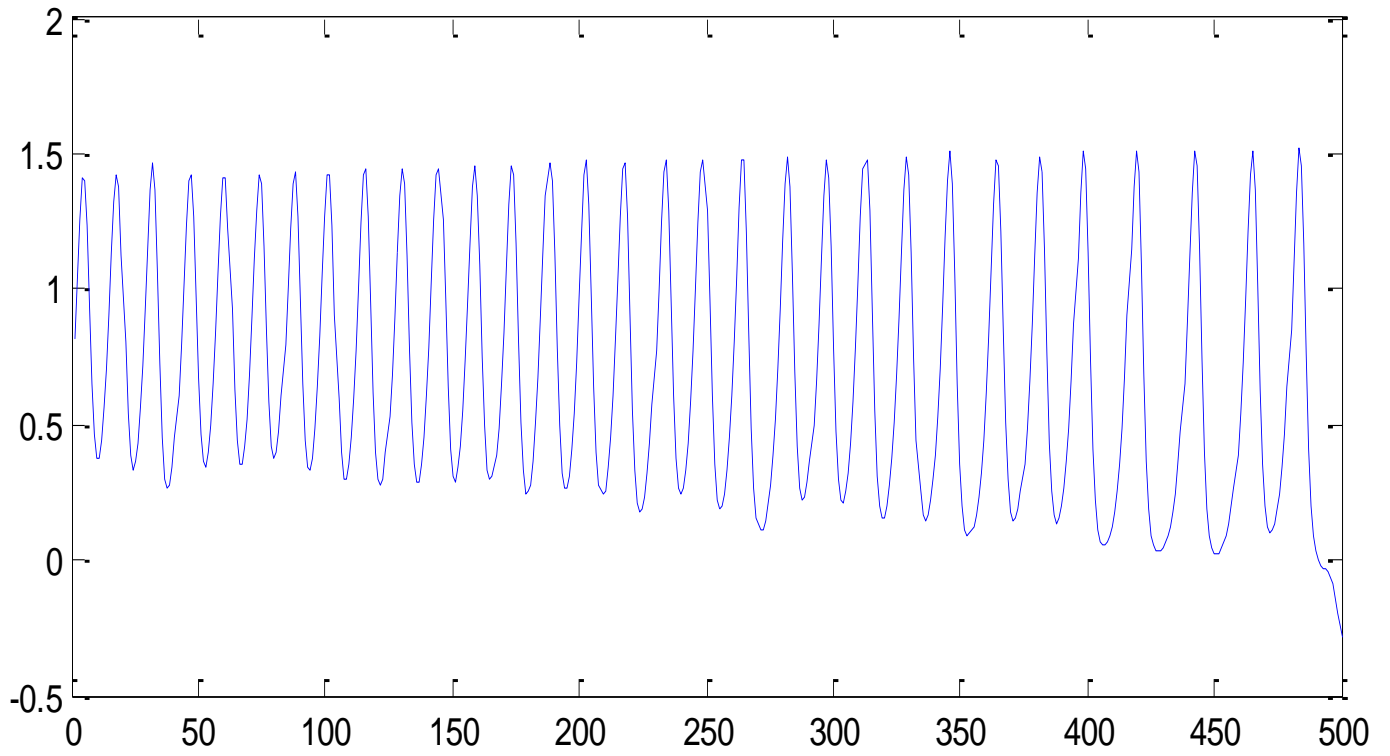
DATA SET 2

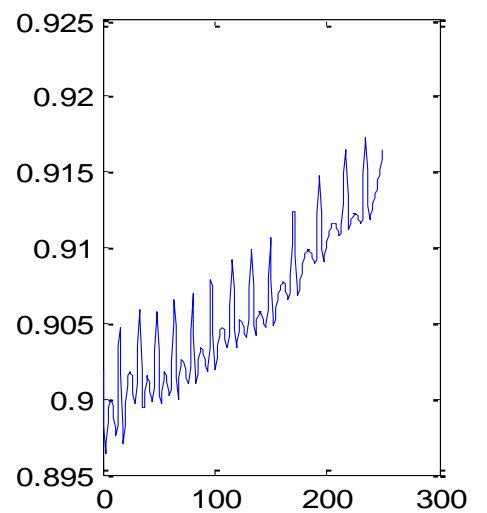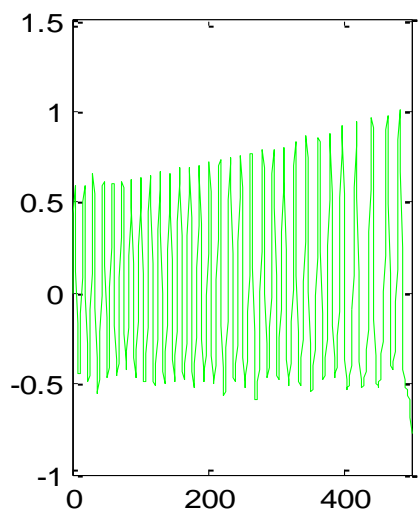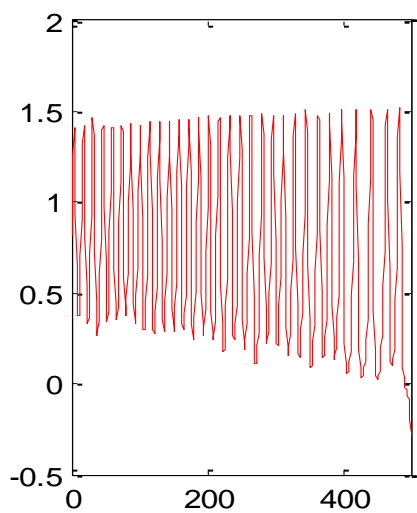DFA(dataset2(:,2),50,250);

DATA SET 3
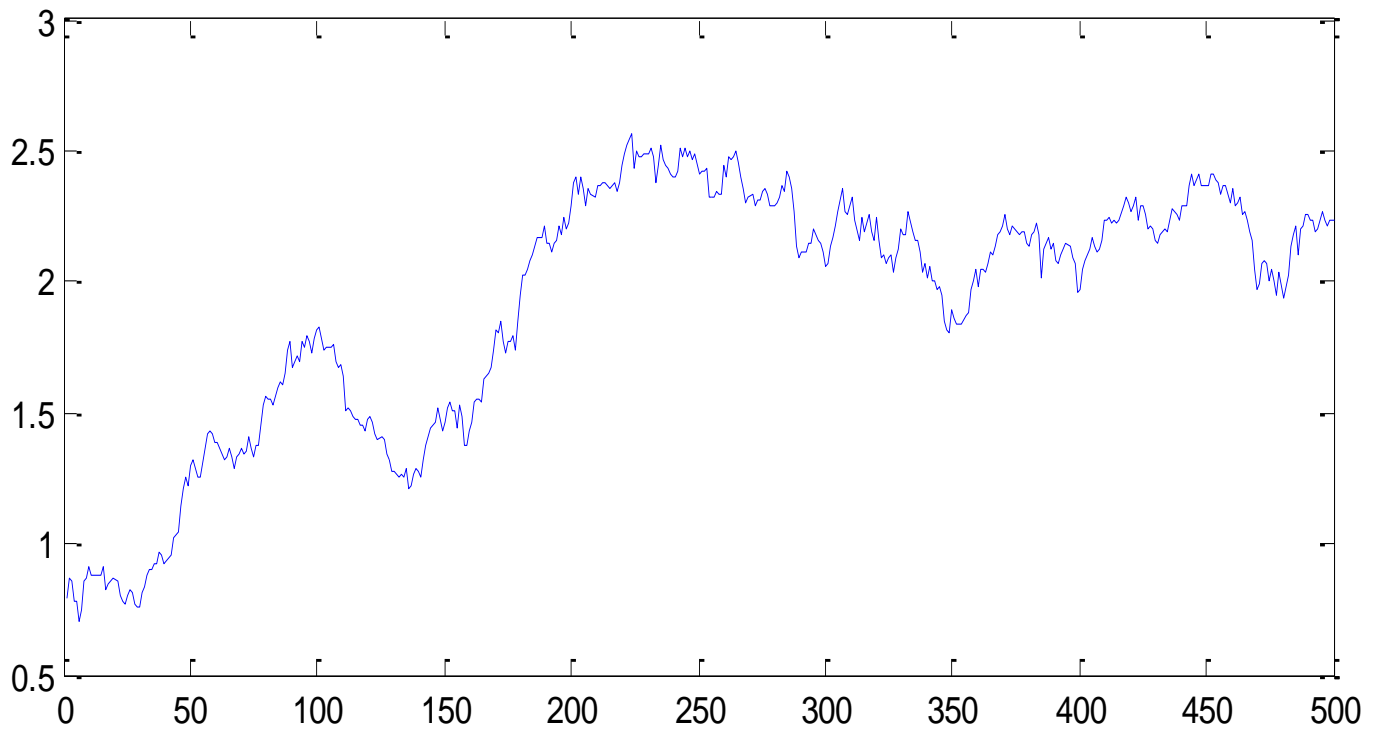

DFA(dataset3(:,2),50,250);
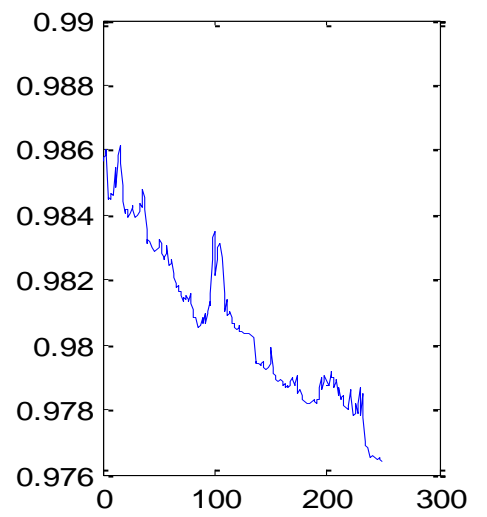
DATA SET 4

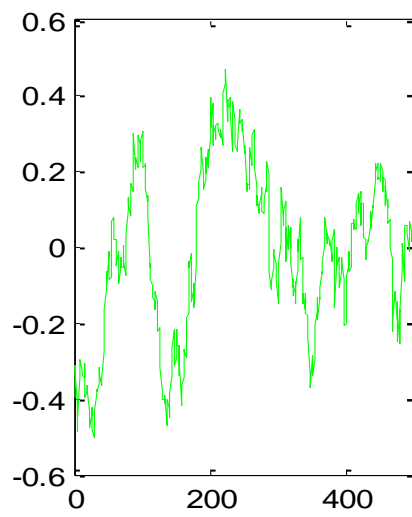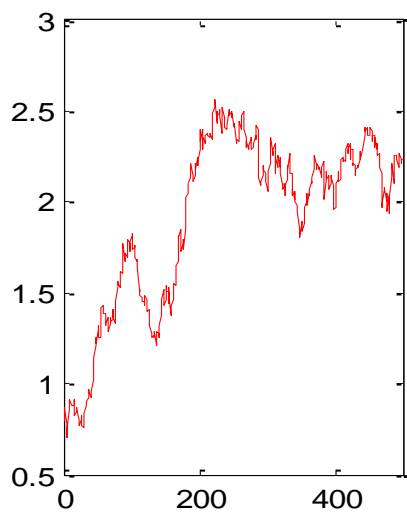DFA(dataset4(:,2),50,250);

DATA SET 5

DFA(dataset5(:,2),50,250);

DATA SET 6

DFA(dataset6(:,2),50,250);

It is odd that the autocorrelation goes down linearly for dataset 6. This suggests that if we ran the time series backward the analysis would then show a linearly increasing autocorrelation, signaling an approaching bifurcation which is not there.

Perhaps we can fine tuning the bandwidth or window parameters so that we get a more flat line on the autocorrelation coefficients.   After playing with the parameters, I found that the best, in terms of making the AR(1) graph look most like it has a slope of zero, was 15 for the bandwidth and 250 for the window size.
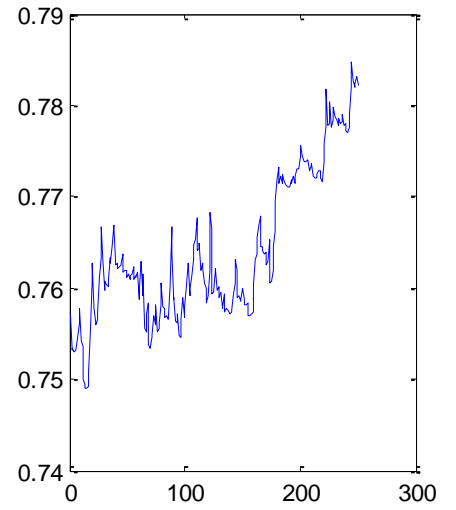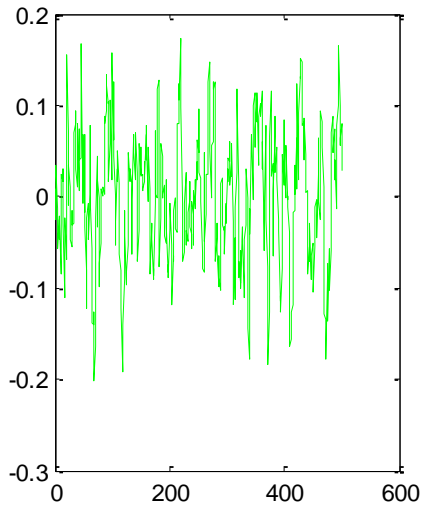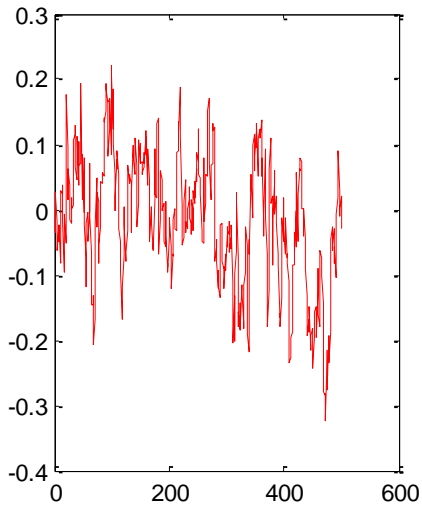
DFA(dataset6(:,2),15,250);
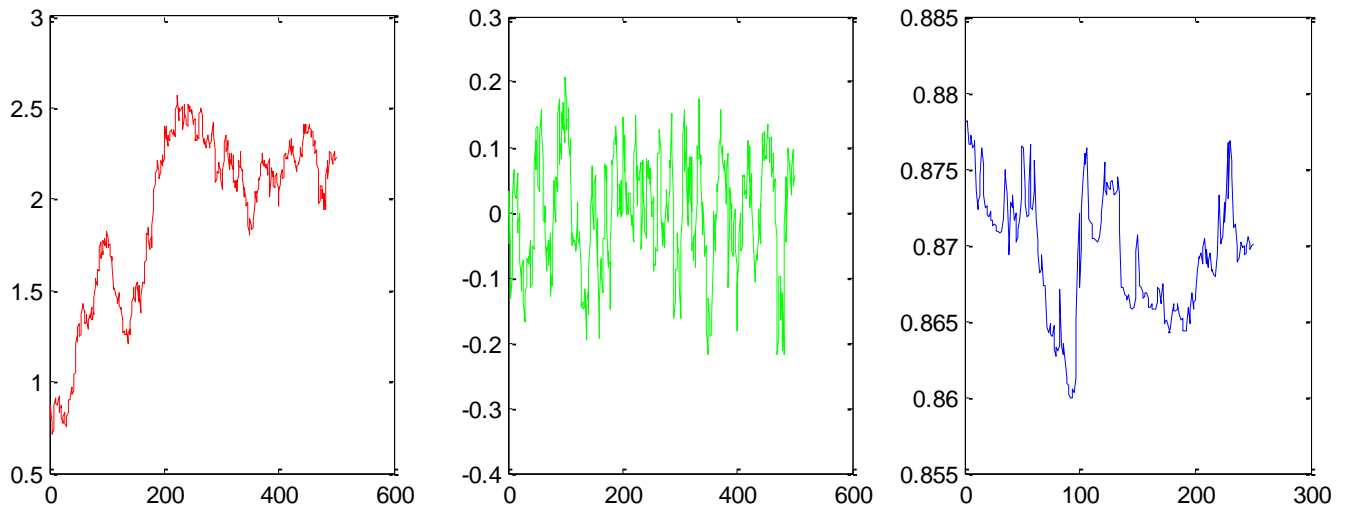
Then, running the test on the other five datasets where there were bifurcations, we see that the test still picks up a linear trend in the AR(1) coefficients.
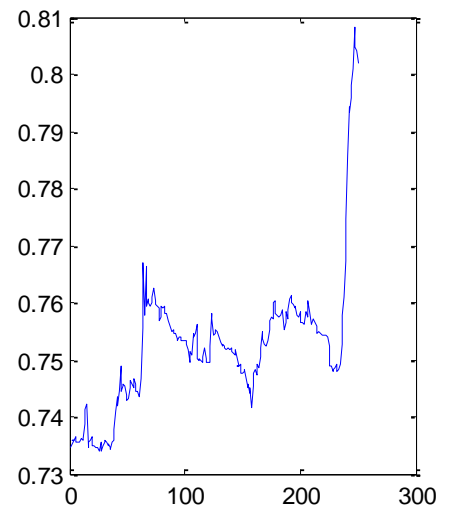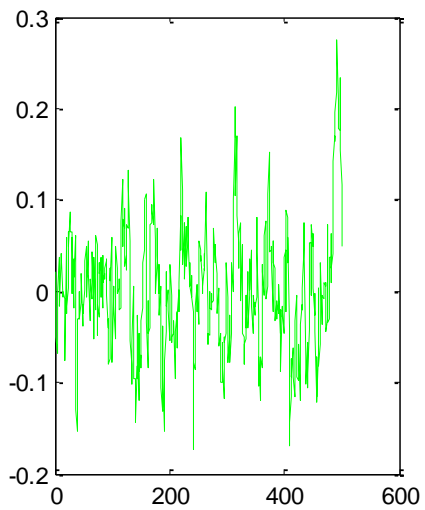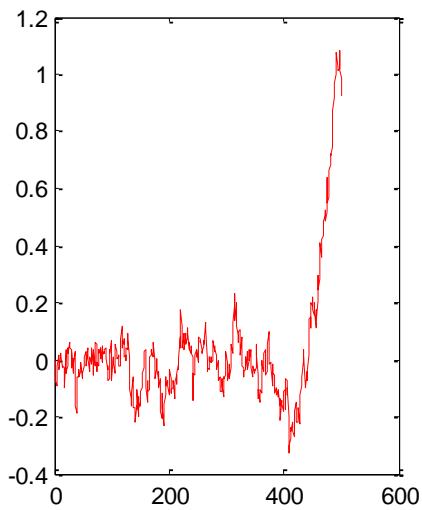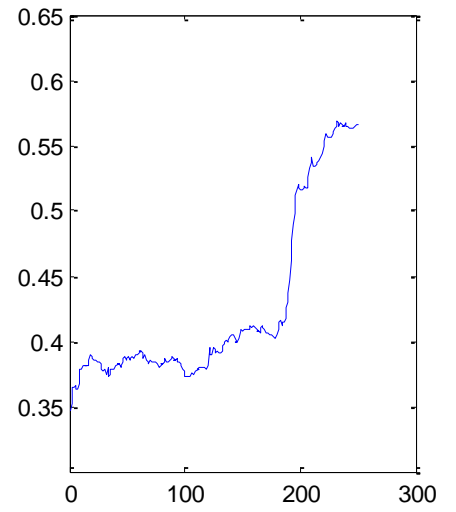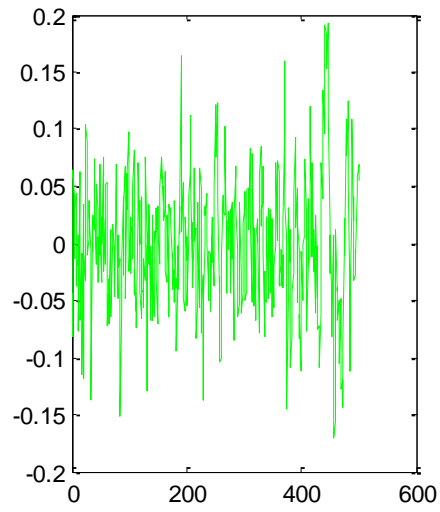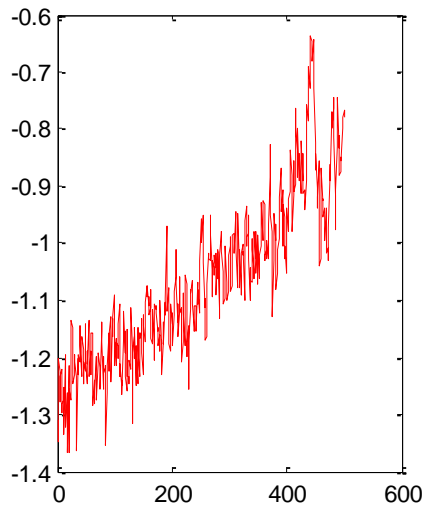
DFA(dataset1(:,2),15,250);
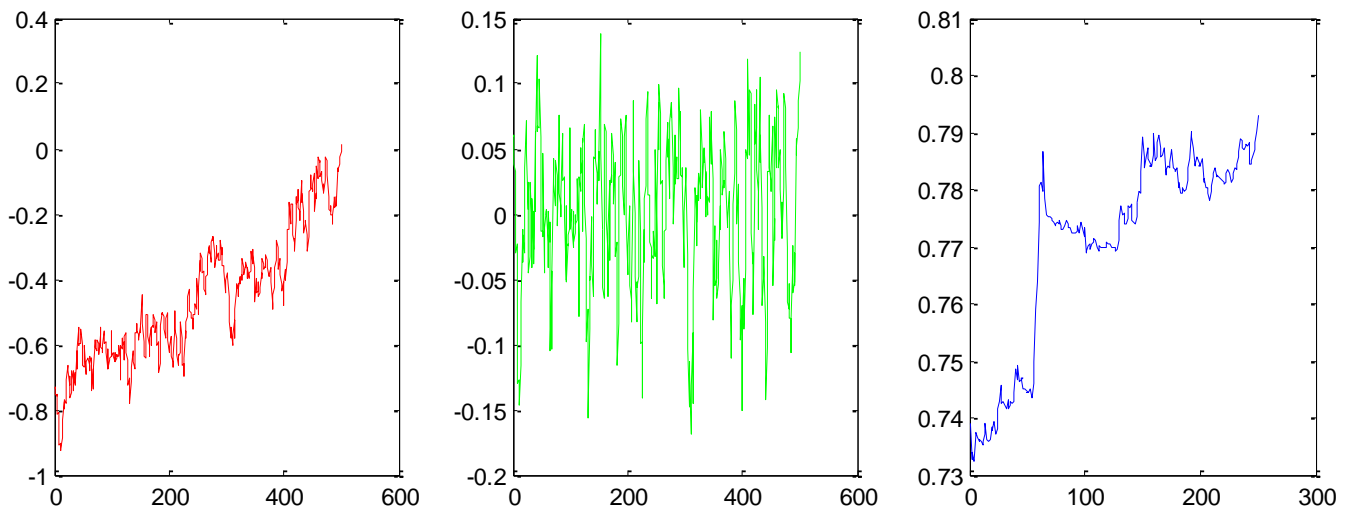
DFA(dataset2(:,2),15,250);

DFA(dataset3(:,2),15,250);

DFA(dataset4(:,2),15,250);

DFA(dataset5(:,2),15,250);