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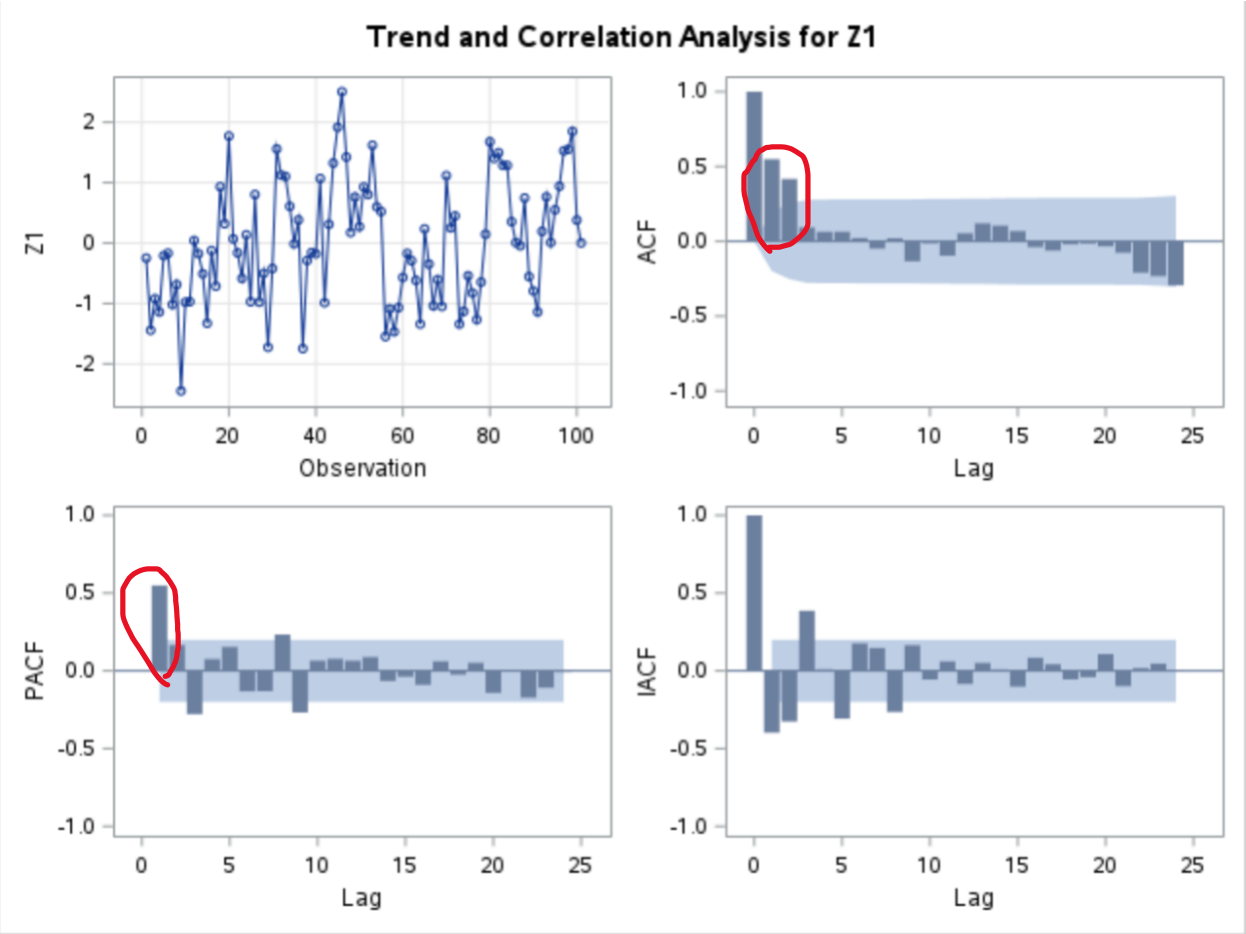
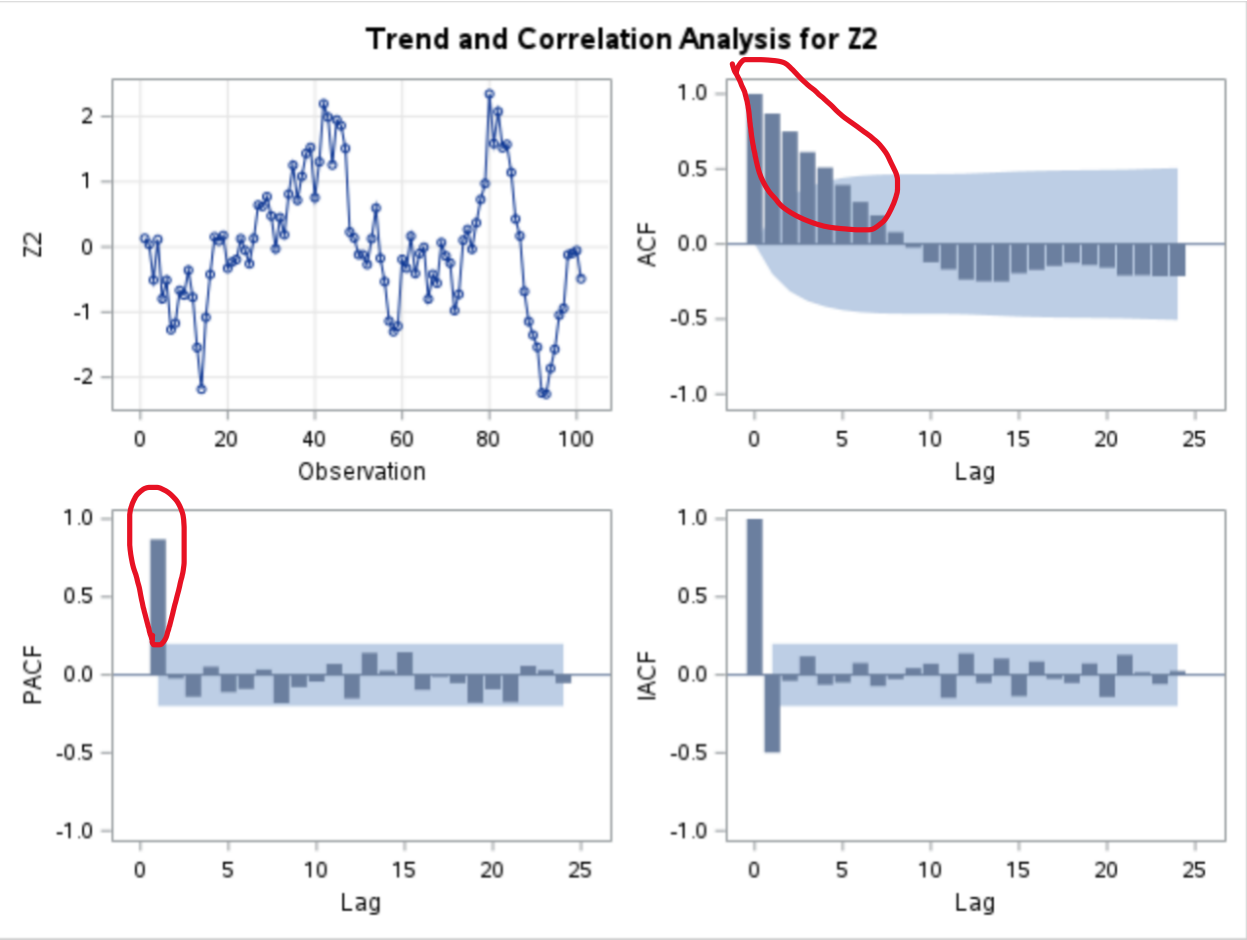
STA 4853

Problem 1



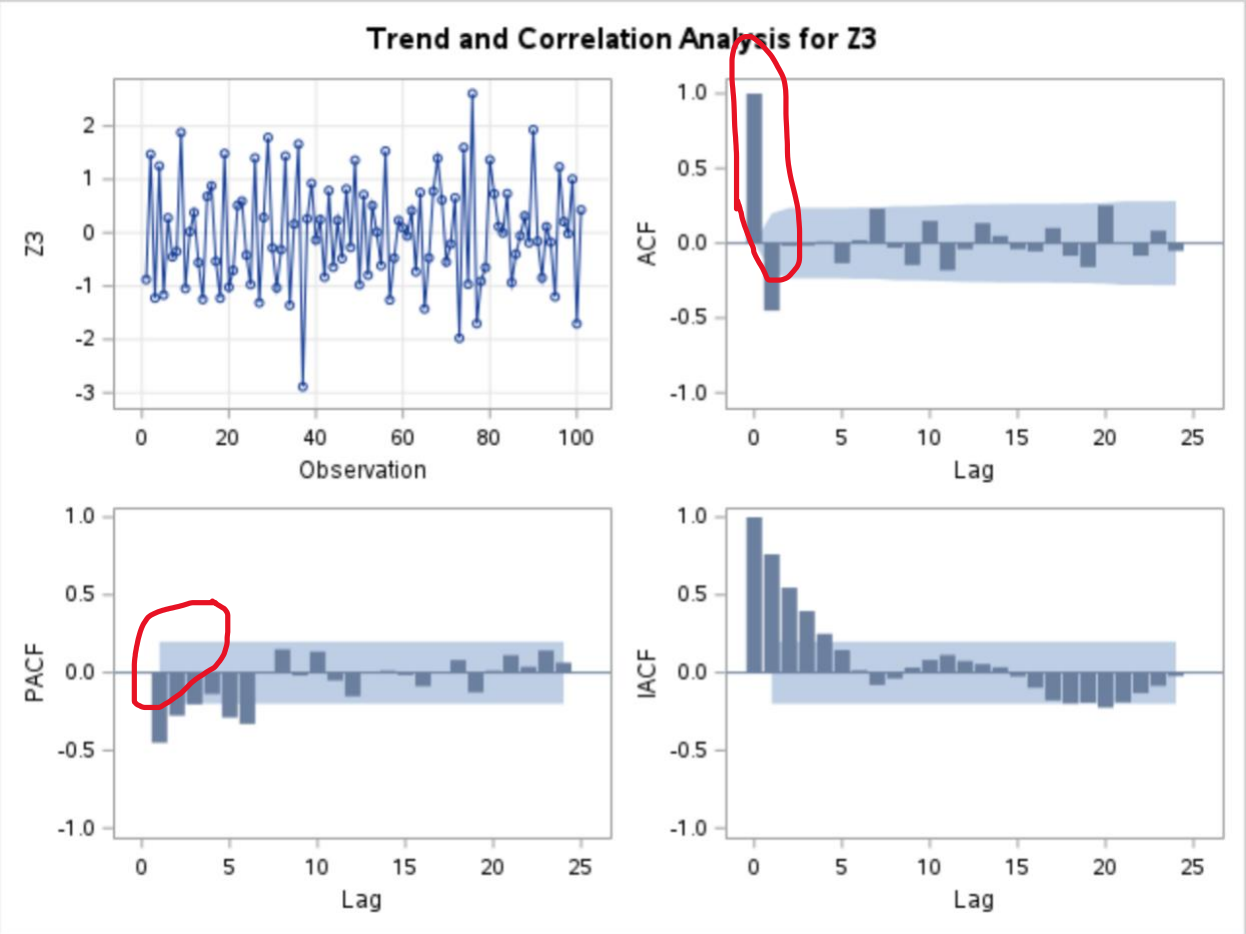
Looking at the ACF and PACF of series Z1 I believe it to be the ARMA(1,1) process. Looking at the ACF it spikes first at lag 1 which is where I get MA(1) and then looking at the PACF it spikes at lag one and cuts off which gives me AR(1) and that's how I determined it to be ARMA (1,1).

Problem 2



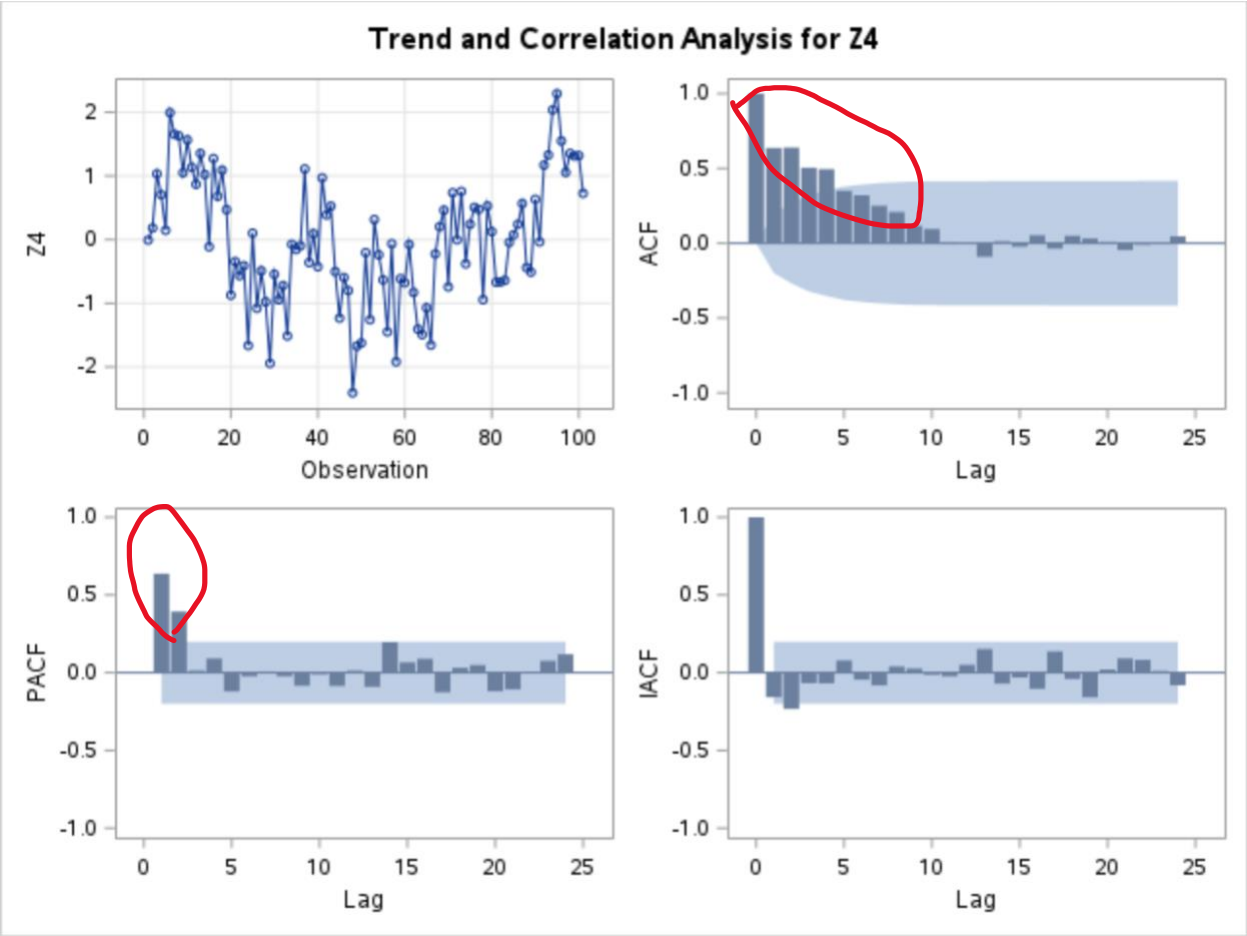
Looking at Series Z2 the ACF tails-off till about lag 4 which tells me it's an AR process then looking at the PACF it spikes and cuts-off at lag 1 which then tells me It's the AR(1) process.

Problem 3



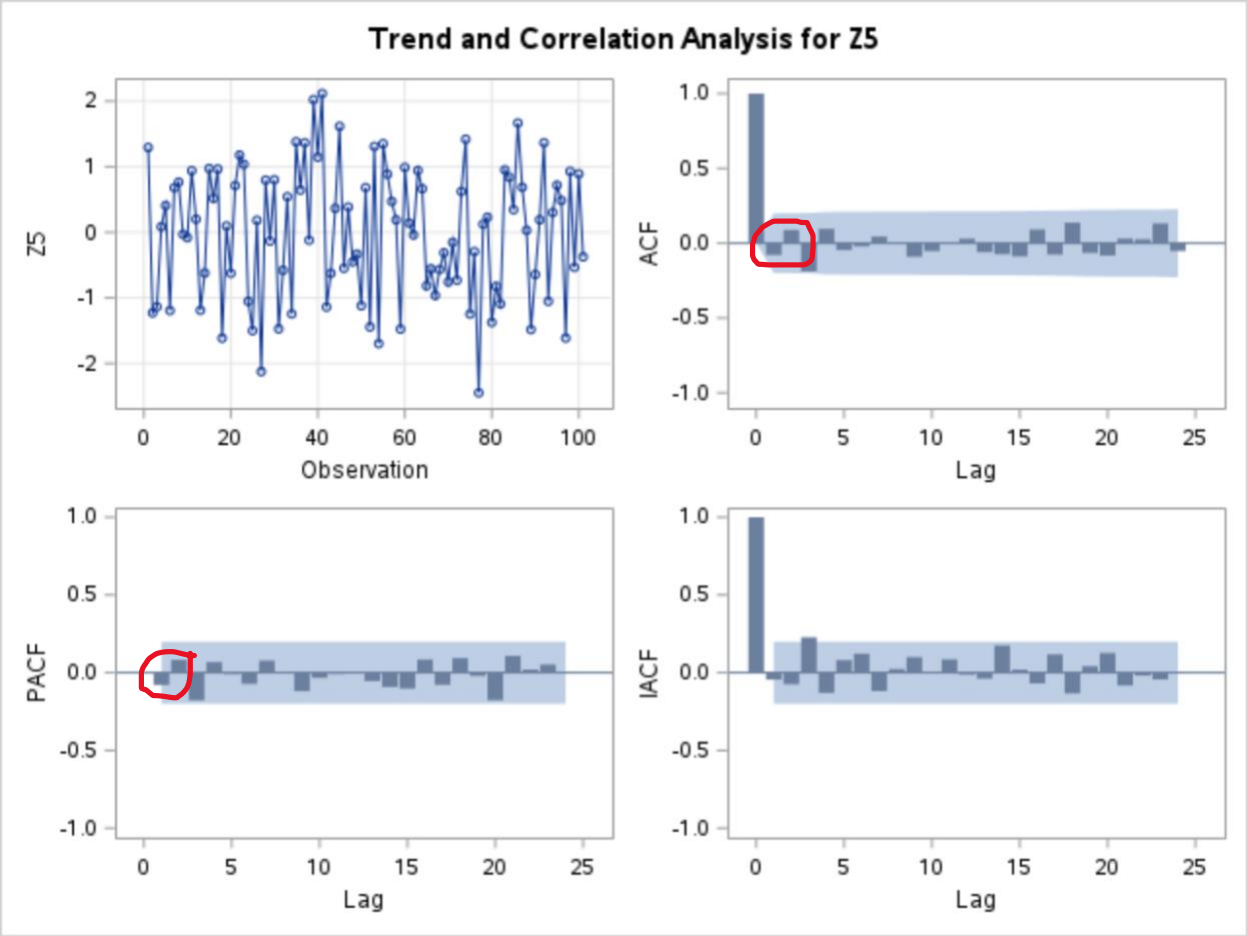
Looking at Series Z3 The PACF tails-off which tells me that it's a MA process then looking at the ACF it cuts-off at lag 2 which tells me that it's MA(1) process.

Problem 4



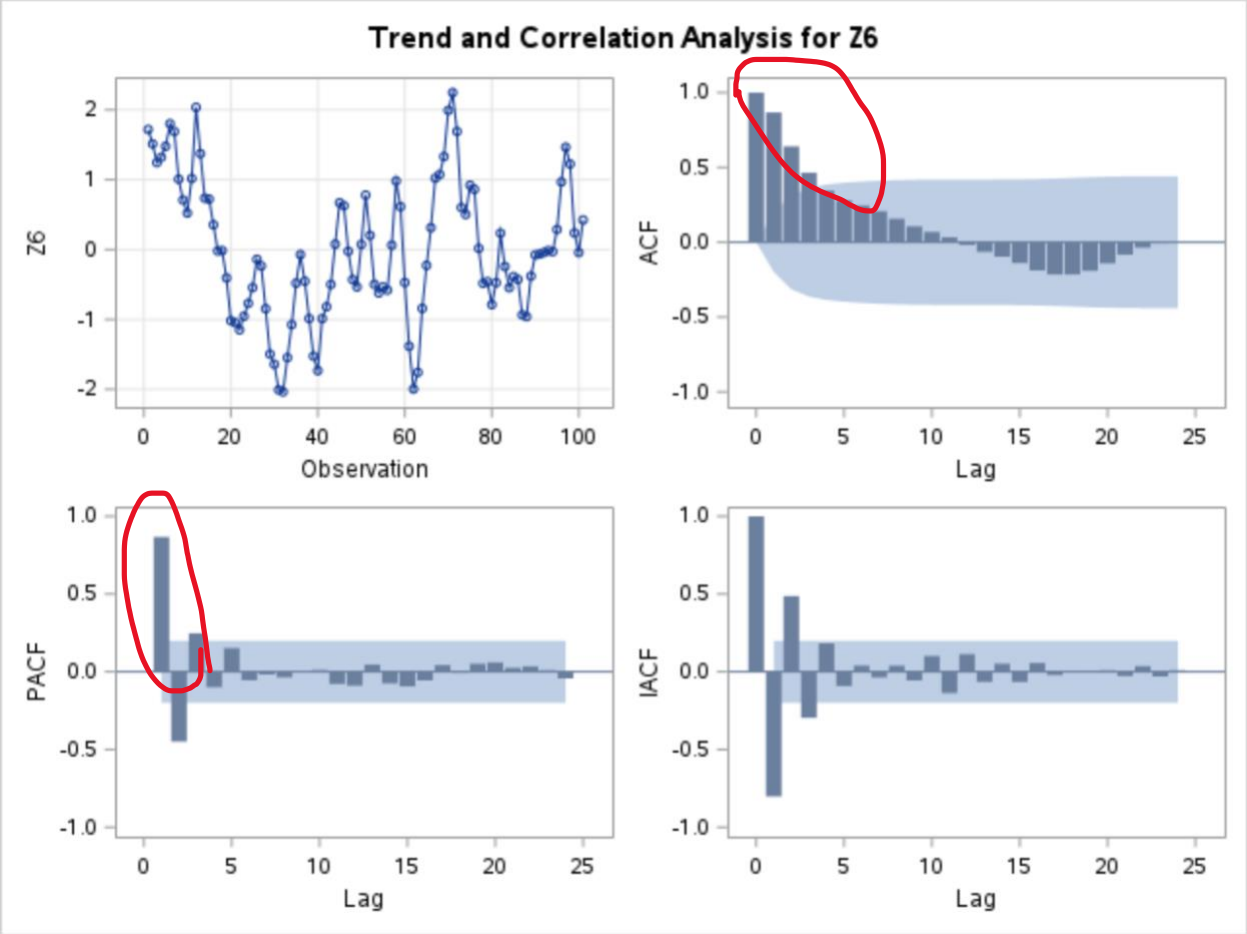
Looking at the PACF for series Z4 it tails-off at lag 2 and then looking at the ACF the lag is below the threshold at lag 2 which makes it an MA(2) process.

Problem 5



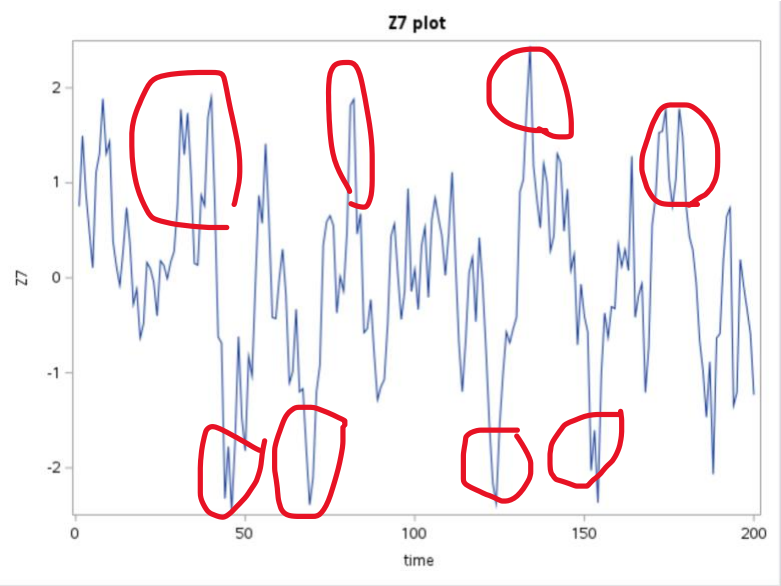
Series Z5 is random shocks because it doesn't have any lags that go above or below the threshold in both the ACF and PACF, besides the initial lag that always occurs at lag 0 in the ACF.

Problem 6



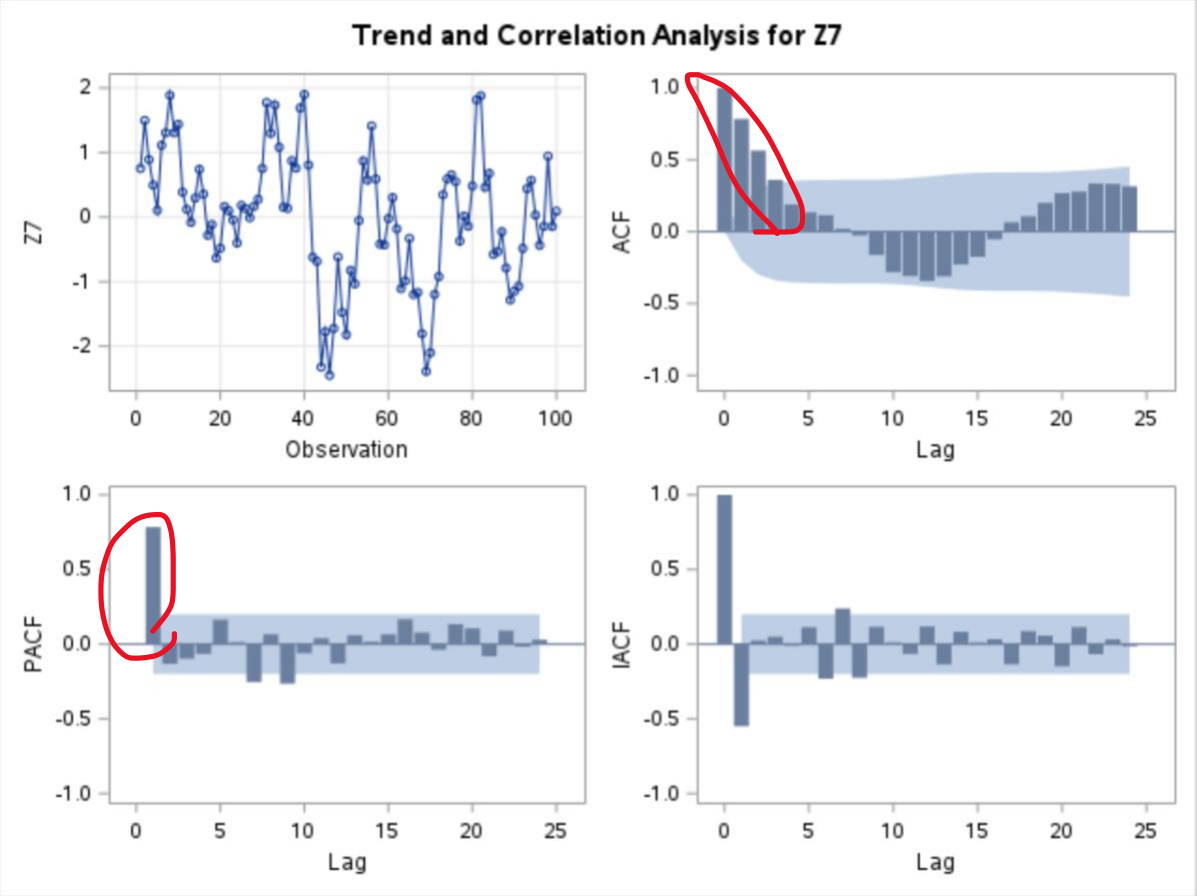
Looking at Series Z6 the ACF has a tail-off which makes it an AR process then looking at the PACF it cuts-off after lag 2 which makes it an AR(2) process.

Problem 7



(Timeseries plot of series Z7)

The timeseries graph in the first half begins high and has two high points and two low points, then the second half also has two high points and two low points and then end low.



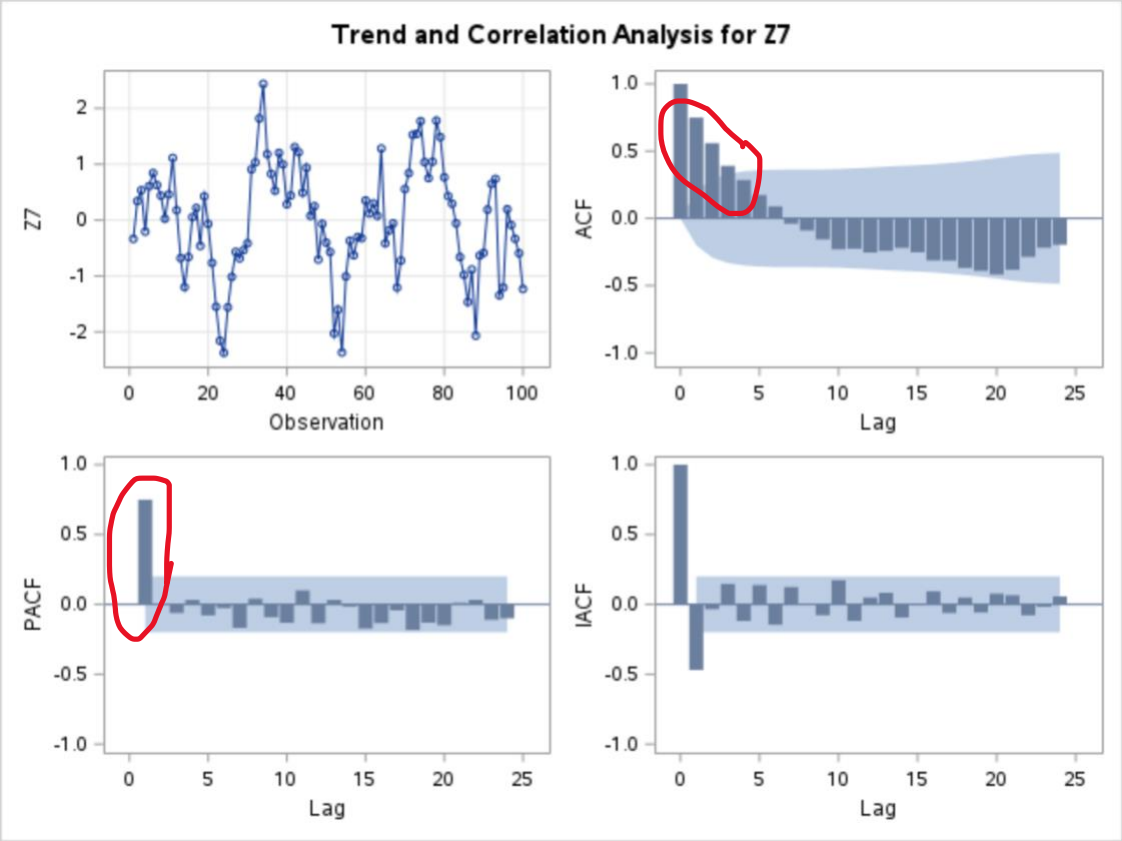
(ACF for first half of Z7 series observation 1-100)

Z7 first half

The ARIMA Procedure

Name of Variable = Z7	
Mean of Working Series	0.008447
Standard Deviation	1.006491
Number of Observations	100

(Mean and standard deviation for the first half of series Z7)



(ACF for Second half of observation of Z7 series 101-200)

Z7 second half

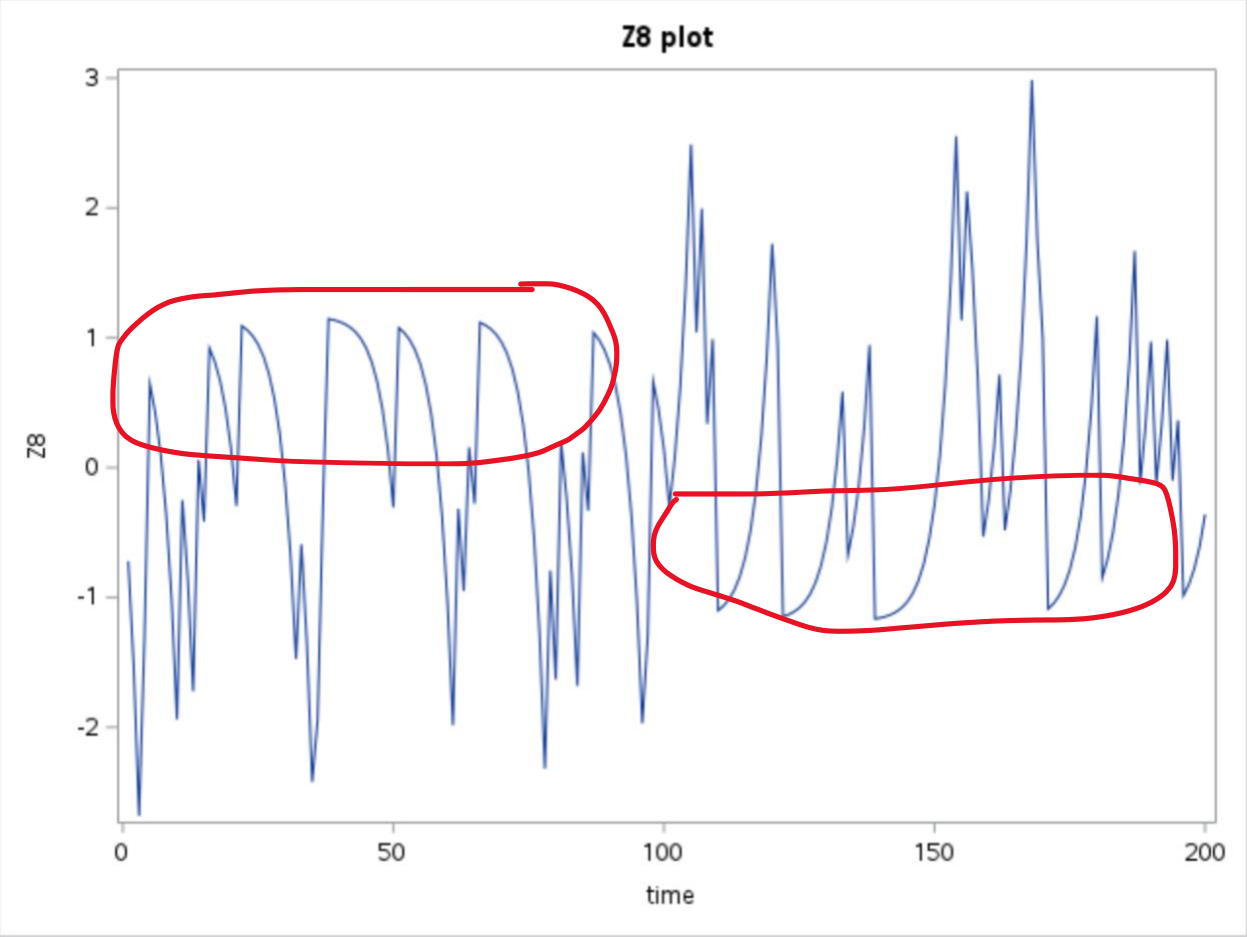
The ARIMA Procedure

Name of Variable = Z7	
Mean of Working Series	-0.00845
Standard Deviation	0.988352
Number of Observations	100

(Mean and standard deviation of the second half of series Z7)

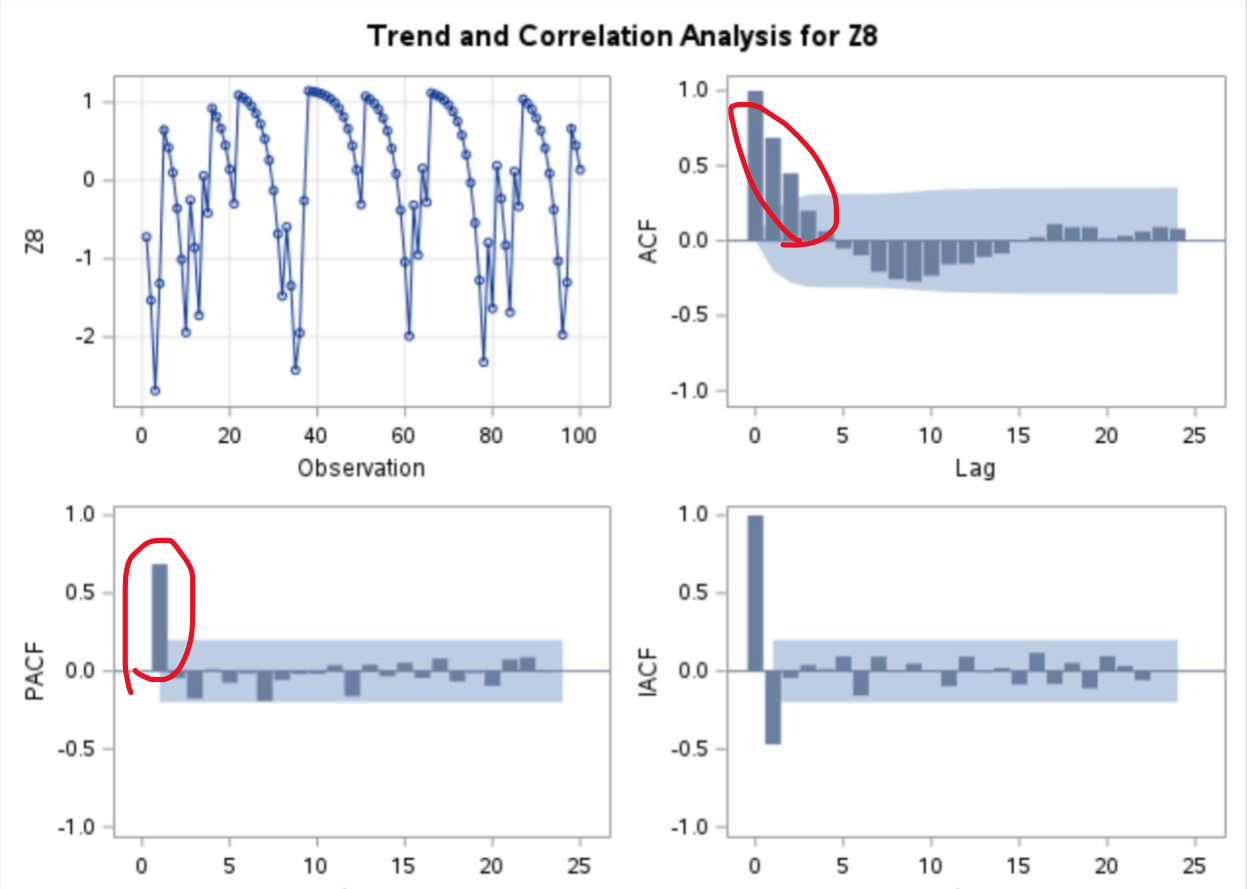
First by looking at the time series plot it was difficult to tell which process was being used, then looking at the ACF of the first and second half you get very closely related ACF graphs and PACF graphs. You also have very closely related means .0084 and -.0084 and closely related standard deviations 1.00 and .988. I then went back and looked at the timeseries plot and you see that the graph has the same number of peaks and valleys in the first half of the graph vs the second half. So, series Z7 is strictly stationary.

Problem 8



(Time series plot for Z8 series)

The time series plot was referenced in my write up by comparing the circled points which are rounded peaks, going from high in the first half to low in the second half. It also has low pointy spikes in the first half and high spikes in the second half.



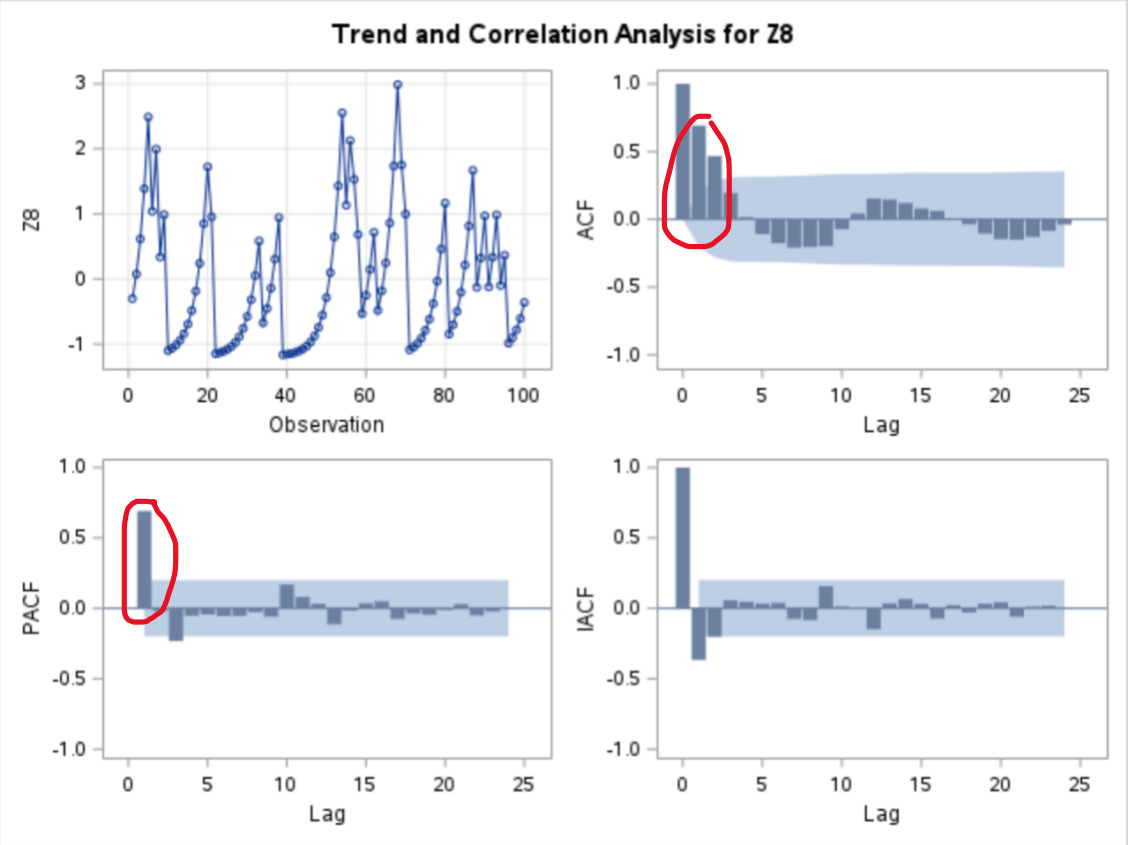
(First half of Z8 observations 1-100)

Z8 first half

The ARIMA Procedure

Name of Variable = Z8	
Mean of Working Series	0.001466
Standard Deviation	0.995563
Number of Observations	100

(Mean and standard deviation for first half of Z8 series)



(Second half of Z8 observations from 101-200)

Z8 second half

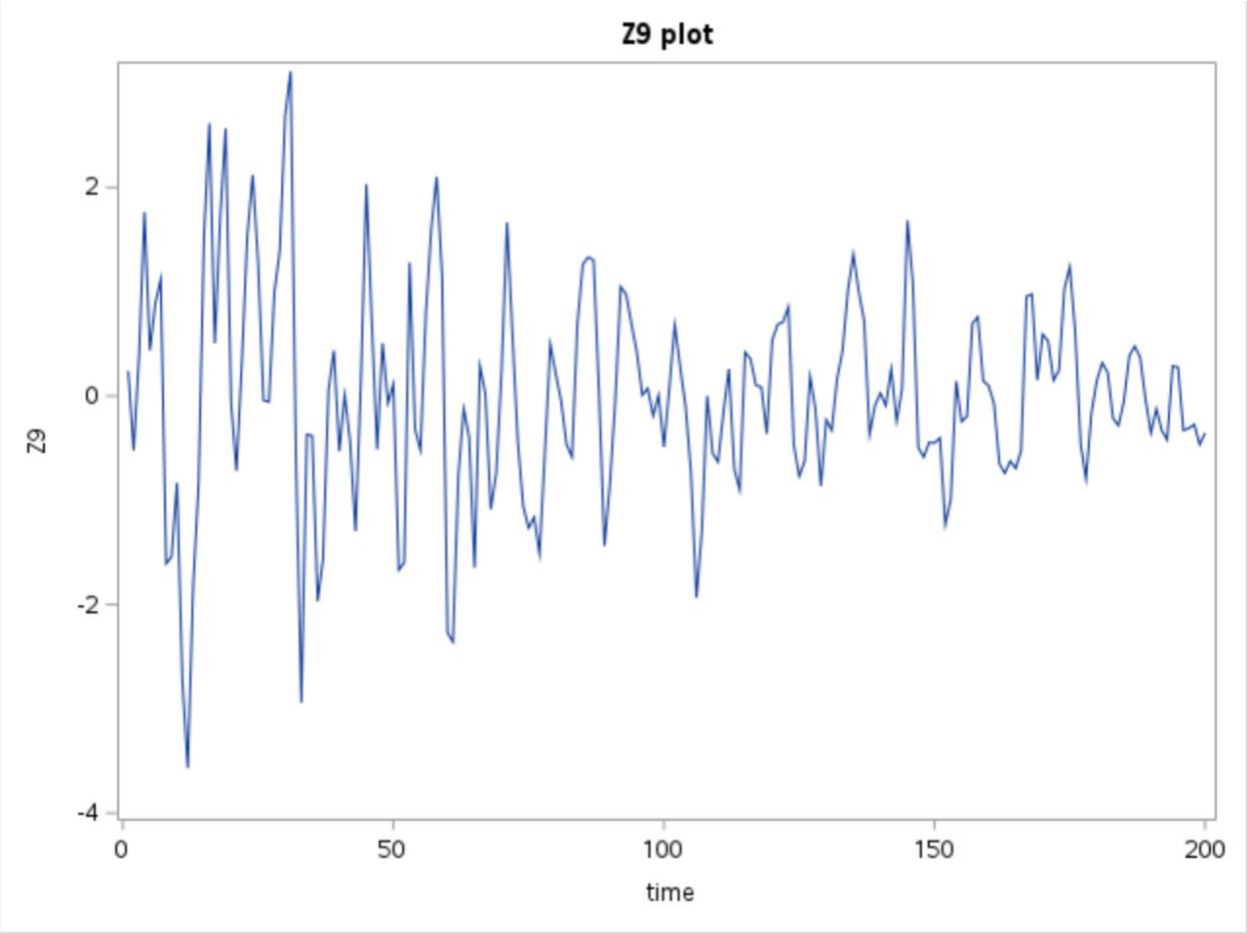
The ARIMA Procedure

Name of Variable = Z8	
Mean of Working Series	-0.00147
Standard Deviation	0.99943
Number of Observations	100

((Mean and standard deviation for second half of Z8 series)

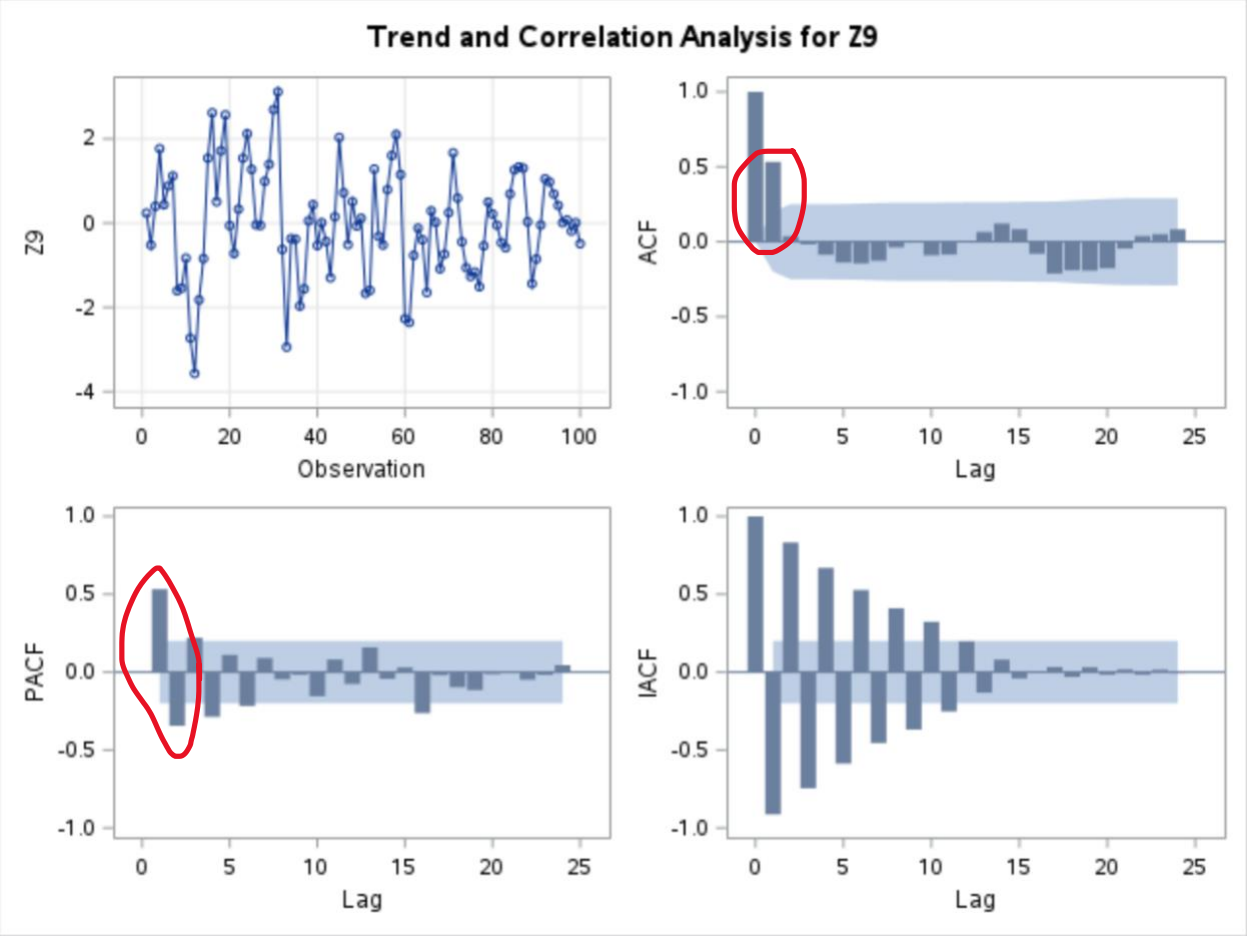
When looking at the ACF graphs for the first and second half the graphs look very similar with a cutoff at lag 2, and in the PACFs they both have a cutoff at lag 1. Then looking at the means of the first half and second half they are the same at 0.0014 and 0.0014 and have the same standard deviation at .99. You would think that with the same mean and standard deviation that it would be stationary but when you look at the timeseries plots you see that in the first half the sharp points are low and the rounded peaks are up high and in the second half it switches and the peaks are low and the points are up high. The Z8 seires is weakly stationary,but not strictly stationary.

Problem 9



(Time series plot of series Z9)

The time series plot was referenced in my write up because of the way the plot narrows as the graph goes from left to right.



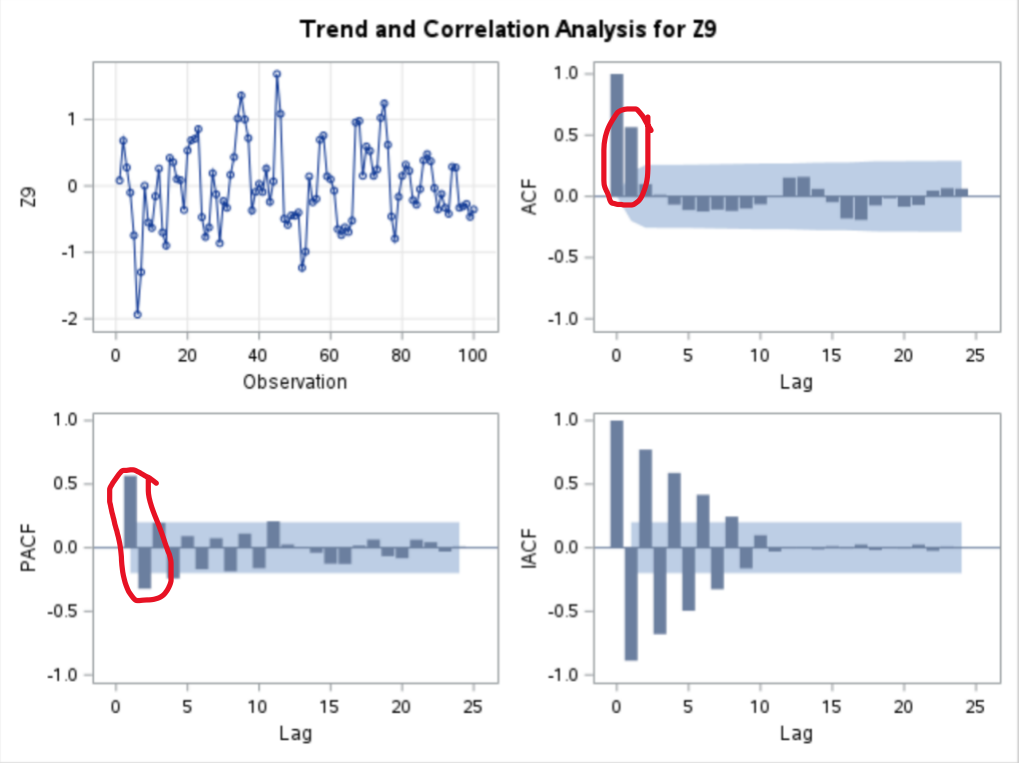
(first half of Z9 observations from 1-100)

Z9 first half

The ARIMA Procedure

Name of Variable = Z9	
Mean of Working Series	0.009814
Standard Deviation	1.270423
Number of Observations	100

(Mean and standard deviation of the first half of Z9)



(Second half of Z9 observations from 101-200)

Z9 second half

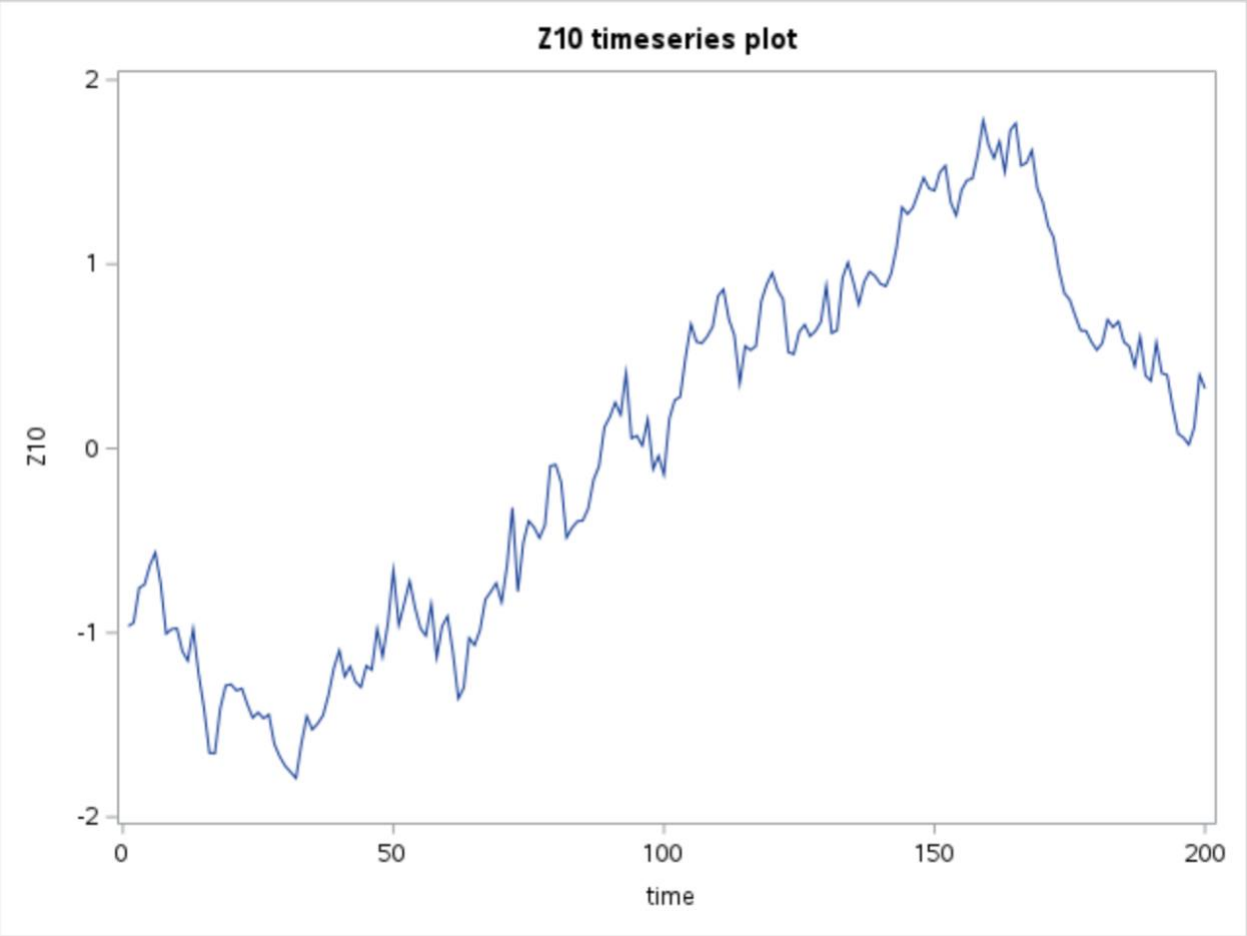
The ARIMA Procedure

Name of Variable = Z9	
Mean of Working Series	-0.00981
Standard Deviation	0.613053
Number of Observations	100

(Mean and standard deviation of the second half of Z9)

Looking at the ACF graphs for both the first and second half there is a cutoff at lag 1 and in both PACFs there is a lag in the positive direction at one and a cutoff at lag 2 which goes in the negative direction. Then looking at the mean both halves have a mean of .0098, but the standard deviation in the first half is 1.27 and in the second half it's .61. The standard deviation of the half is double that of the second half standard deviation. This can be shown in the timeseries plot because the first half starts out going up and down with long points and gradually get smaller, and then in the second half the plot continues to narrow, and the waves get smaller which shows a change in standard deviation. This change in standard deviation shows a change in variance between the first and second half of the ACF graphs. Series Z9 does not have a constant variance.

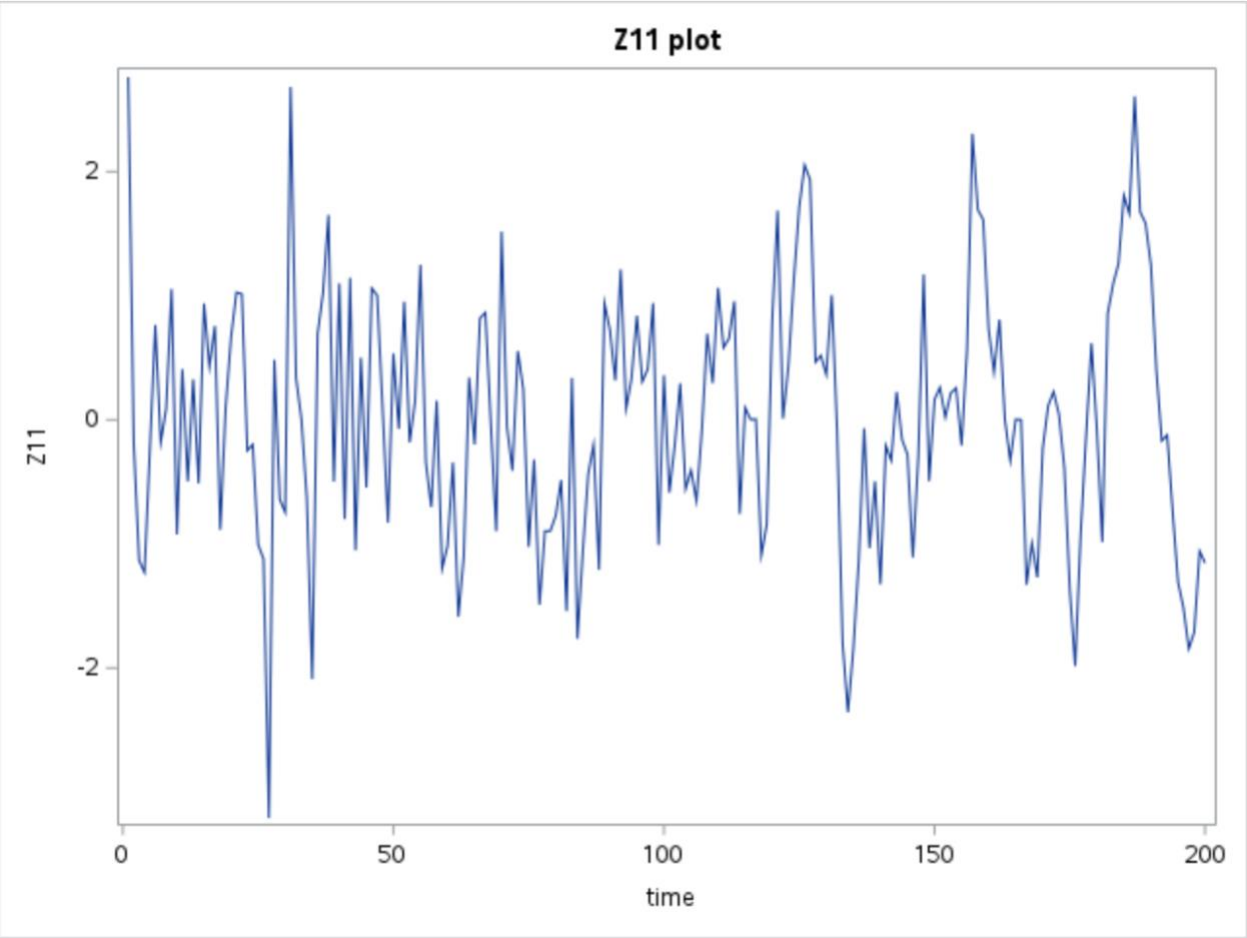
Problem 10



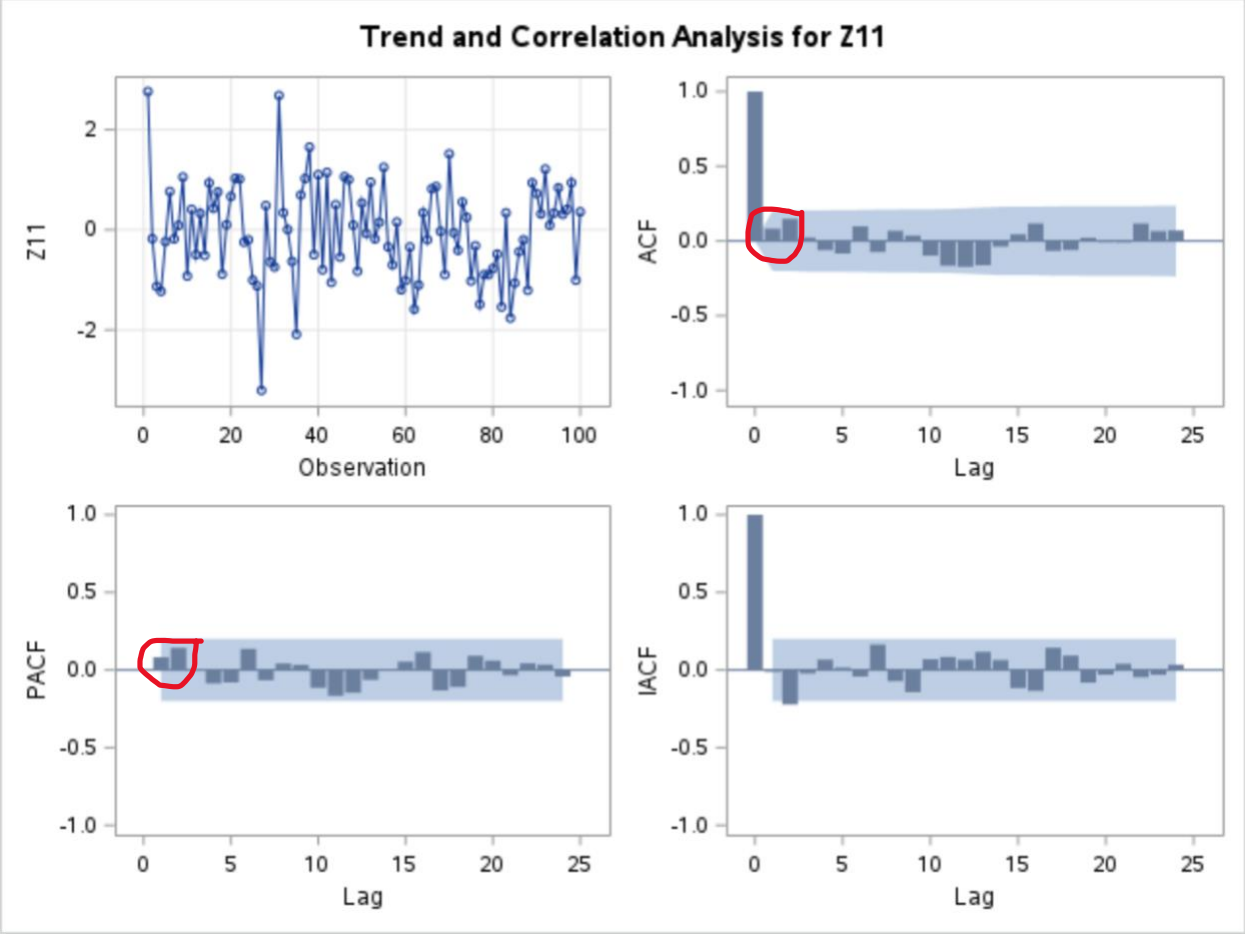
(Timeseries plot of series Z10)

By looking at the time series plot of series Z10 you can conclude that this series does not have a constant mean because of its going from low to high across the graph and not settling into one specific area, and therefore there is no need to look at the ARIMA plots.

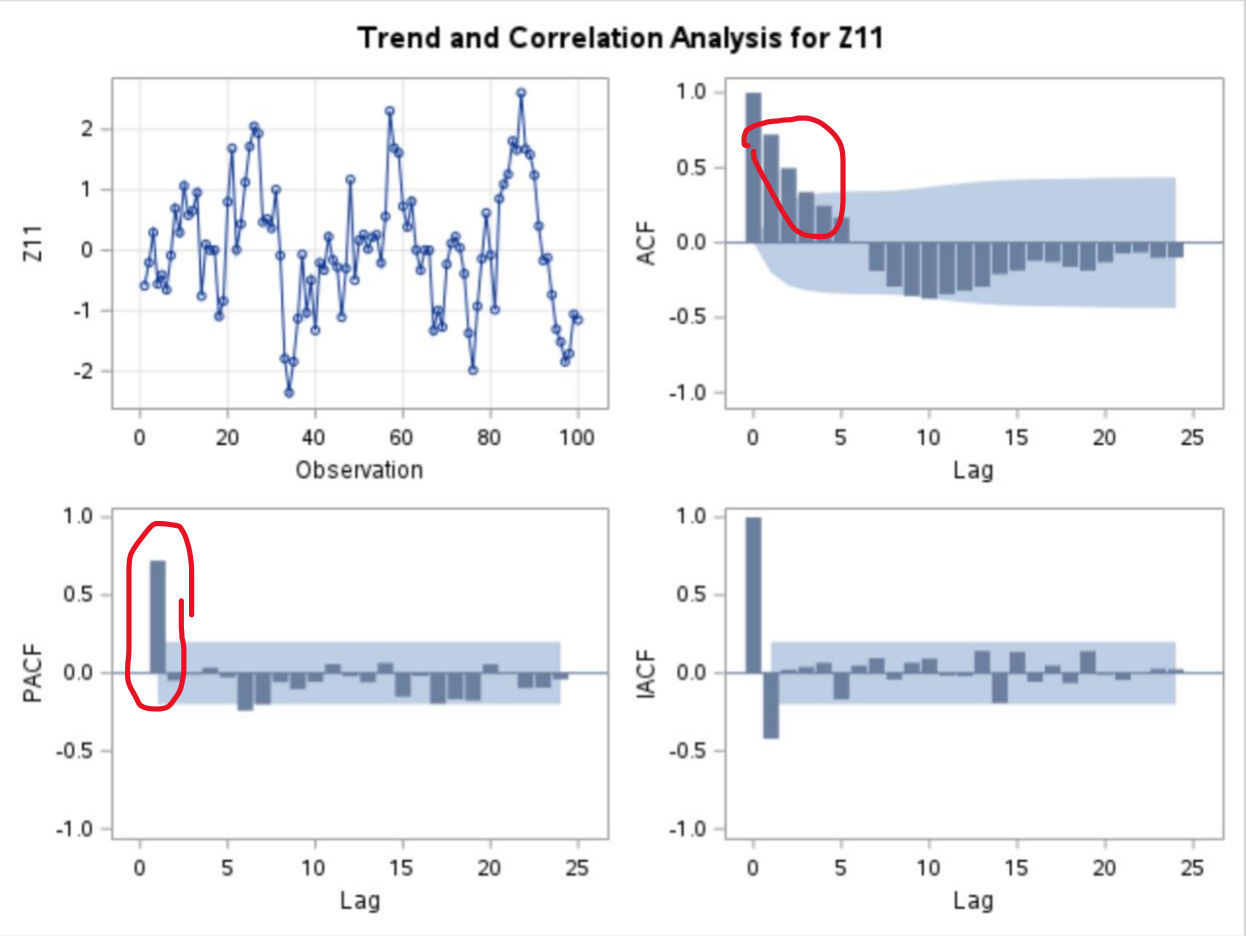
Problem 11



In the first part of the graph, it's closer together and has a high and low peak and in the second half the line spreads out more and is more swooping.



(First half of Z11 observations from 1-100)



(Second half of Z11 observations from 101-200)

Looking at the first half ACF vs the second half ACF you see by visual inspection that the first half ACF is not moving much and does not have any large lags in the graph with no lag outside of the threshold. In the Second half ACF we see three values outside the threshold showing a cutoff at lag three which shows more movement in the second half of the graph than the first, so the first half has small closer movement, and the second half has larger peaks. Also looking at the PACF in each graph you see there is no spike in the first half while in the second half there is a spike at lag 1. By visual observation of the ACF graphs I would say series Z11 does not have a constant ACF.

SAS Code

```
/*used to read in data for part 1*/
filename Hw2p1 "~/my_shared_file_links/huffer/hw2p1_data.txt" ;
data pt1 ;
infile Hw2p1 ;
input Z1 Z2 Z3 Z4 Z5 Z6 ;
run ;

/*code for problems 1-6*/
proc arima data=pt1;       /*process used to form problems 1-6*?
identify var=Z1;          /*used to make the ACF and PACF graph for series Z1*/
identify var=Z2;          /*used to make the ACF and PACF graph for series Z2*/
identify var=Z3;          /*used to make the ACF and PACF graph for series Z3*/
identify var=Z4;          /*used to make the ACF and PACF graph for series Z4*/
identify var=Z5;          /*used to make the ACF and PACF graph for series Z5*/
identify var=Z6;          /*used to make the ACF and PACF graph for series Z6*/
run;

/*problems 7-11*/
/*used to read in data for part 2*/
filename Hw2p2 "~/my_shared_file_links/huffer/hw2p2_data.txt" ;
data pt2 ;
infile Hw2p2 ;
time = _n_ ;
input Z7 Z8 Z9 Z10 Z11 ;
run ;

/*Code for problem 7*/

/*timeseries plot for series Z7*/
title "Z7 plot" ;              /*title of timeseries plot for series Z7*/
proc sgplot data=pt2;
series x=time y=Z7;
run;
/*Arima for series Z7*/
title "Z7 first half" ;
```

```
proc arima data= pt2(firstobs=1 obs=100) ; /*looking at observations 1-100 in
series Z7*/
identify var=Z7 ;
run ;
title "Z7 second half" ;
proc arima data= pt2(firstobs=101 obs=200) ; /*looking at observation 101-200
in series Z7*/
identify var=Z7 ;
run ;

/*Code for problem 8*/

/*Timeseries plot for series Z8*/
title "Z8 plot" ;
proc sgplot data=pt2;
series x=time y=Z8;
run;
/*Arima for series z8*/
title "Z8 first half" ;
proc arima data= pt2(firstobs=1 obs=100) ; /*looking at observations 1-100 in
series Z8*/
identify var=Z8 ;
run ;
title "Z8 second half" ;
proc arima data= pt2(firstobs=101 obs=200) ; /*looking at observations 1-100 in
series Z8*/
identify var=Z8 ;
run ;

/*Code for problem 9*/

/*timeseries plot for series Z9*/
title "Z9 plot" ;
proc sgplot data=pt2;
series x=time y=Z9;
run;
/*Arima for series z9*/
```

```
title "Z9 first half" ;
proc arima data= pt2(firstobs=1 obs=100) ; /*looking at observations 1-100 in
series Z9*/
identify var=Z9 ;
run ;
title "Z9 second half" ;
proc arima data= pt2(firstobs=101 obs=200) ; /*looking at observations 1-100 in
series Z9*/
identify var=Z9 ;
run ;

/*Code for problem 10*/

/*Timeseries plot for Z10*/
title "Z10 timeseries plot" ;
proc sgplot data=pt2;
series x=time y=Z10;
run;

/*Code for problem 11*/

/*Timeseries plot for series Z11*/
title "Z11 plot" ;
proc sgplot data=pt2;
series x=time y=Z11;
run;
/*Arima for series z11*/
title "Z11 first half" ;
proc arima data= pt2(firstobs=1 obs=100) ;
identify var=Z11 ;
run ;
title "Z11 second half" ;
proc arima data= pt2(firstobs=101 obs=200) ;
identify var=Z11 ;
run ;
```