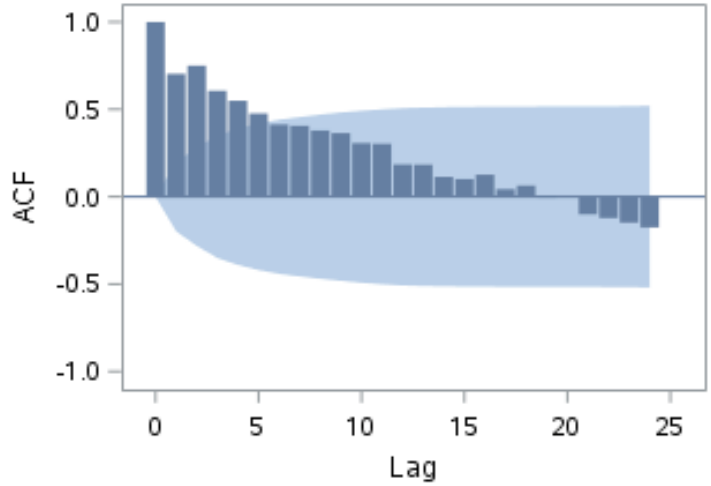
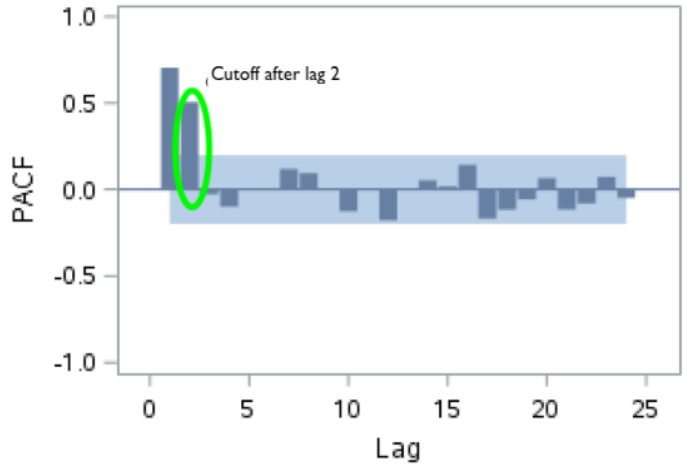
STA4853

Homework 2

PROBLEM 1)

Autocorrelation Check for White Noise									
To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	225.32	6	<.0001	0.703	0.750	0.607	0.549	0.476	0.413
12	299.96	12	<.0001	0.406	0.379	0.364	0.307	0.303	0.185
18	309.40	18	<.0001	0.184	0.114	0.101	0.126	0.043	0.064
24	319.78	24	<.0001	-0.006	0.002	-0.101	-0.122	-0.148	-0.176

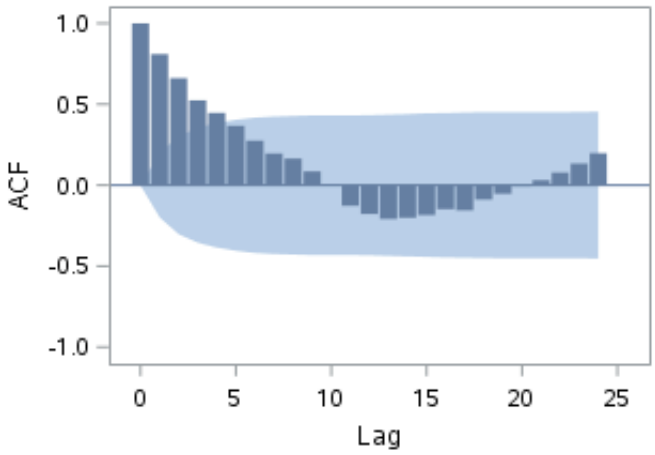


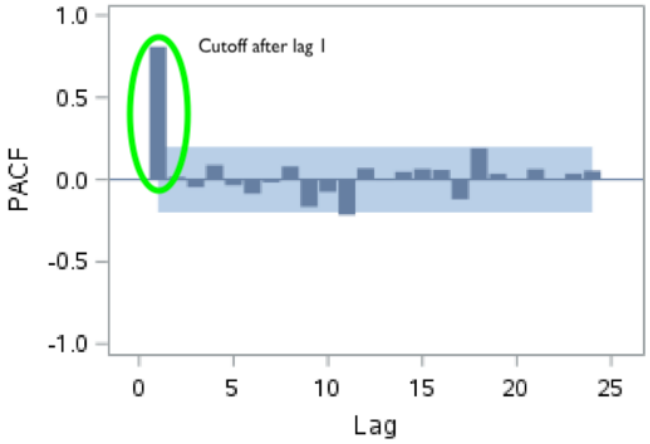


This series was generated by an **AR(2)** process because the ACF seems to decay exponentially to zero and the PACF has a cutoff after lag 2.

PROBLEM 2)

Autocorrelation Check for White Noise									
To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	187.68	6	<.0001	0.810	0.661	0.525	0.447	0.367	0.275
12	201.34	12	<.0001	0.196	0.164	0.085	0.007	-0.127	-0.178
18	222.08	18	<.0001	-0.208	-0.201	-0.184	-0.148	-0.155	-0.089
24	231.02	24	<.0001	-0.053	-0.007	0.031	0.078	0.133	0.198

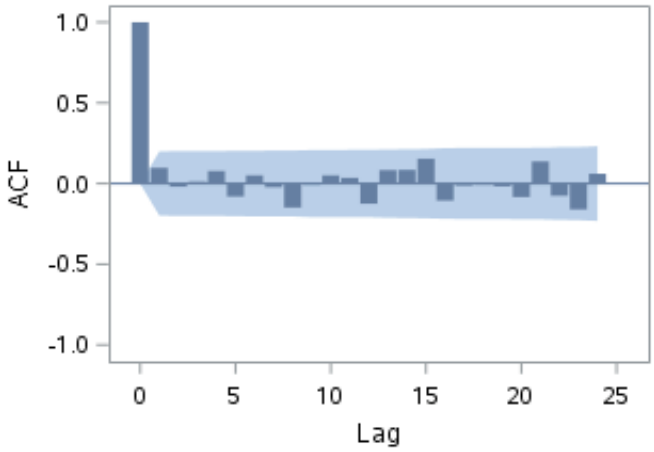


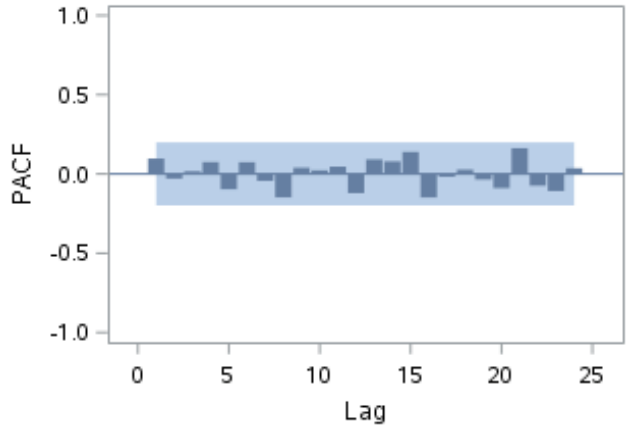


This series was generated by an **AR(1)** process because the ACF seems to decay exponentially to zero and the PACF has a cutoff after lag 1.

PROBLEM 3)

Autocorrelation Check for White Noise									
To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	2.66	6	0.8498	0.097	-0.019	0.012	0.078	-0.080	0.051
12	7.46	12	0.8260	-0.023	-0.149	-0.008	0.051	0.035	-0.125
18	13.38	18	0.7684	0.083	0.084	0.154	-0.105	-0.013	-0.008
24	21.44	24	0.6126	-0.017	-0.084	0.137	-0.076	-0.160	0.061

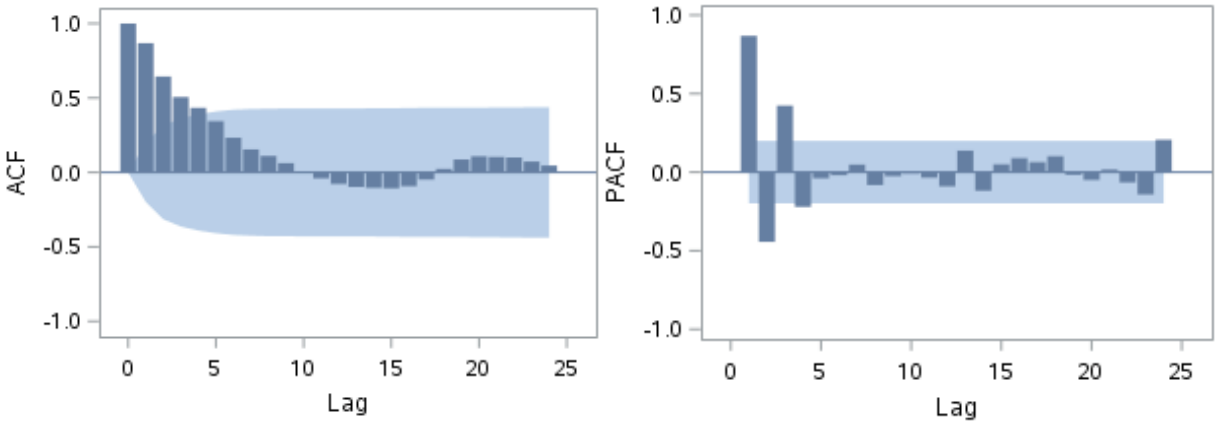




This series was generated by **random shocks**. By looking at the PACF and ACF, it is difficult to define which process was used. However, when we check the Autocorrelation Check for White Noise chart, we can observe that all the p-values are above 0.05 meaning that all this series was generated by random shocks.

PROBLEM 4)

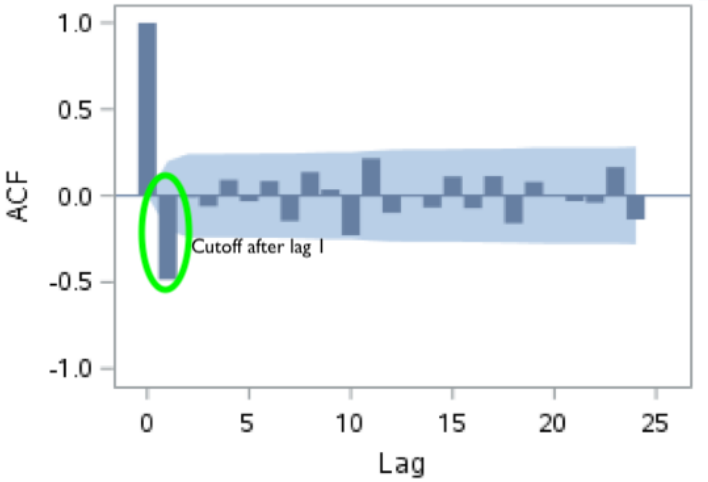
Autocorrelation Check for White Noise									
To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	188.16	6	<.0001	0.868	0.644	0.506	0.434	0.344	0.233
12	193.48	12	<.0001	0.154	0.110	0.062	0.005	-0.040	-0.078
18	198.69	18	<.0001	-0.098	-0.104	-0.107	-0.093	-0.048	0.023
24	204.85	24	<.0001	0.087	0.108	0.104	0.100	0.073	0.046

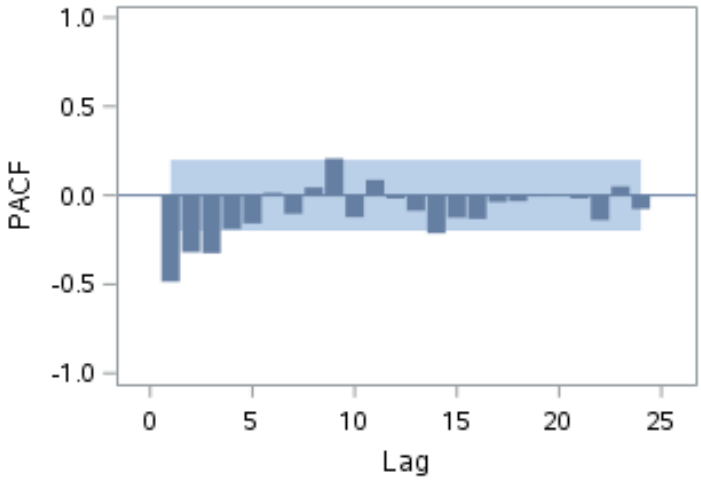


Both graphs(ACF and PACF) appear to be exponentially decaying to zero with the PACF graph alternating between positive and negative numbers. I classify this series as being generated by an **ARMA(1,1)** process.

PROBLEM 5)

Autocorrelation Check for White Noise									
To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	26.76	6	0.0002	-0.486	-0.009	-0.062	0.092	-0.032	0.085
12	43.88	12	<.0001	-0.146	0.136	0.035	-0.230	0.215	-0.099
18	51.37	18	<.0001	0.004	-0.069	0.111	-0.073	0.113	-0.160
24	58.71	24	<.0001	0.080	-0.002	-0.032	-0.040	0.165	-0.137

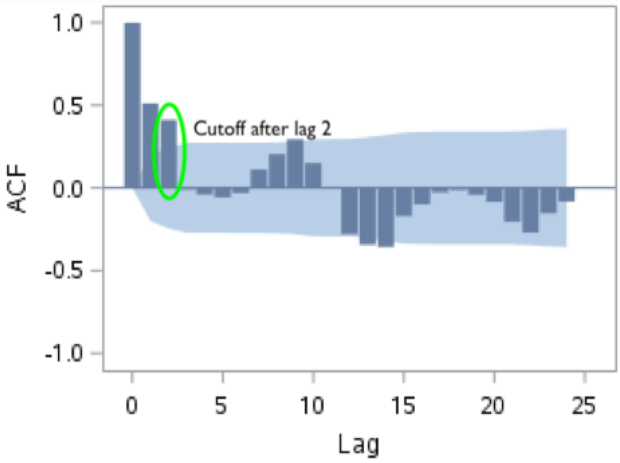


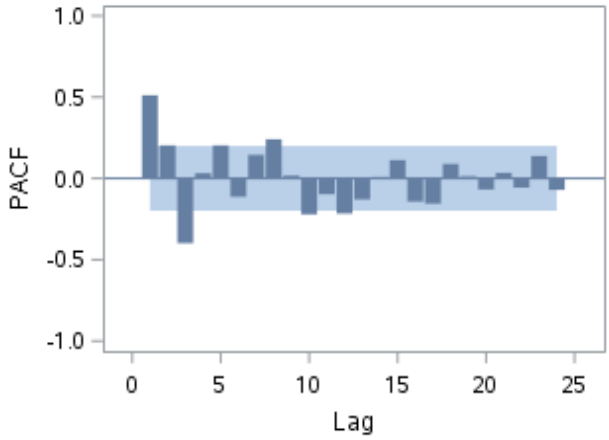


This series was generated by a **MA(1)** because the ACF has a cutoff after lag 1 and the PACF seems to decay exponentially to zero.

PROBLEM 6)

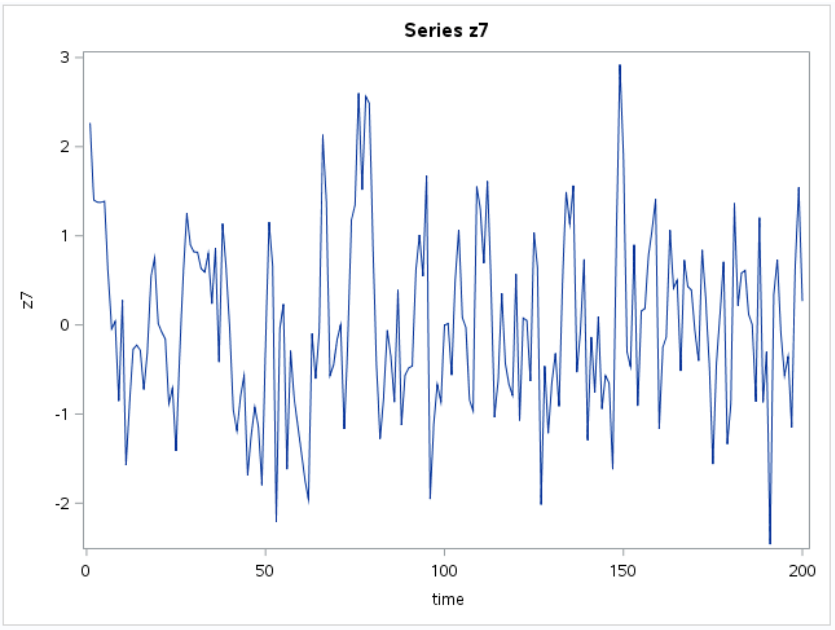
Autocorrelation Check for White Noise									
To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	45.68	6	<.0001	0.512	0.412	-0.010	-0.039	-0.057	-0.030
12	73.20	12	<.0001	0.112	0.204	0.294	0.151	-0.006	-0.279
18	107.24	18	<.0001	-0.343	-0.358	-0.170	-0.100	-0.026	-0.012
24	127.51	24	<.0001	-0.042	-0.085	-0.205	-0.270	-0.153	-0.083



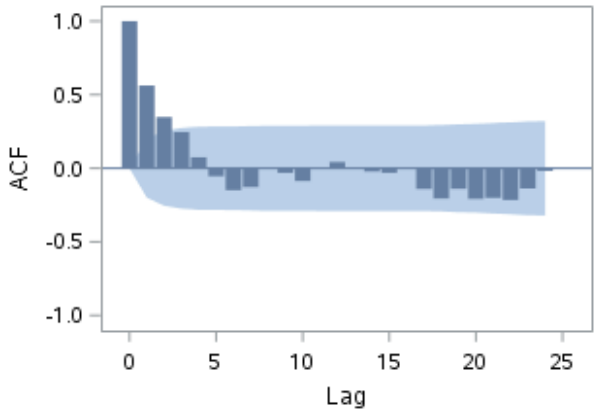


This series was generated by a **MA(2)** because the ACF has a cutoff at lag 2 and the PACF seems decay exponentially to zero alternating between positive and negative numbers

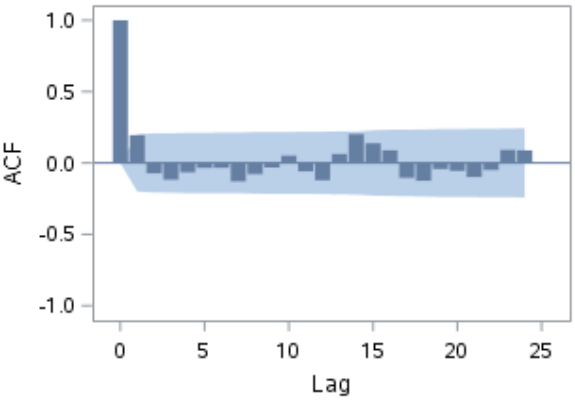
PROBLEM 7)



ACF for first half of the observations(1-100)



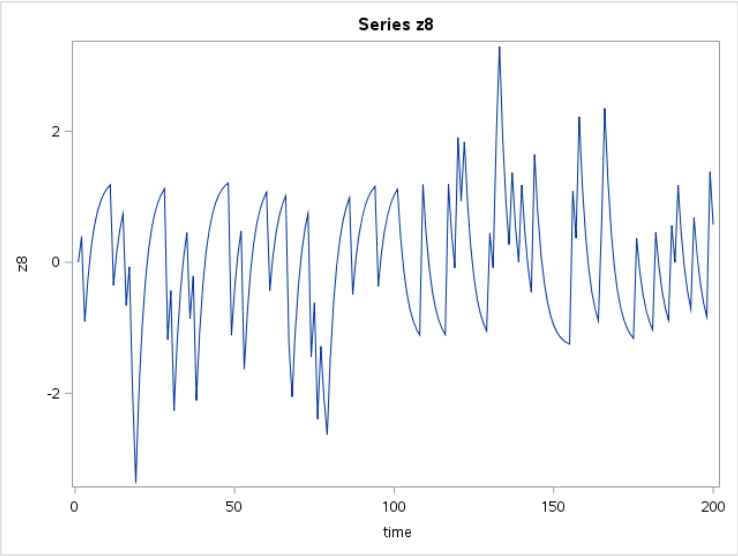
ACF for second half of the observations(101-200)



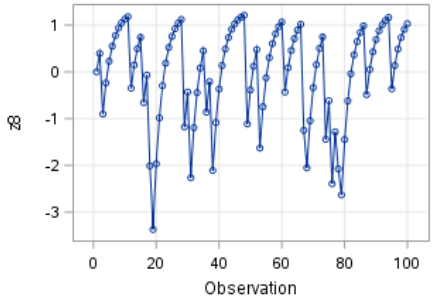
(d) Does not have a constant ACF.

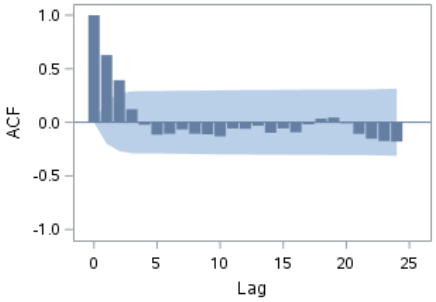
The graph seems to indicate a constant mean and variance but we can observe that the ACF for the first half of the series(observations 1-100) is different from the ACF from the other half of the series(observations101-200 indicating the ACF is not constant throughout this series

PROBLEM 8)



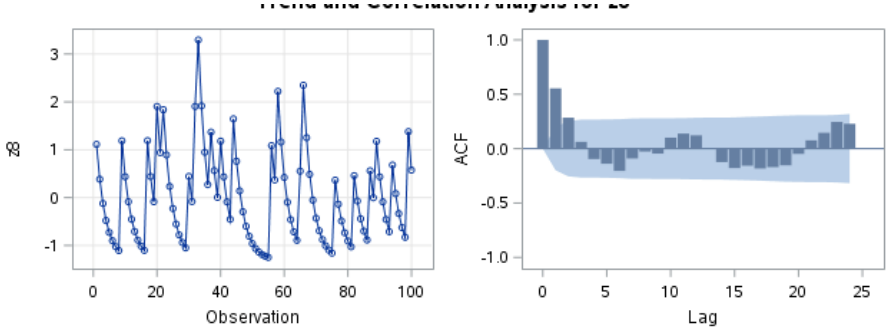
First half of times series z8(observations 1-100):





Name of Variable = z8	
Mean of Working Series	-0.03689
Standard Deviation	1.031988
Number of Observations	100

Second half of times series z8(observations 101-200):

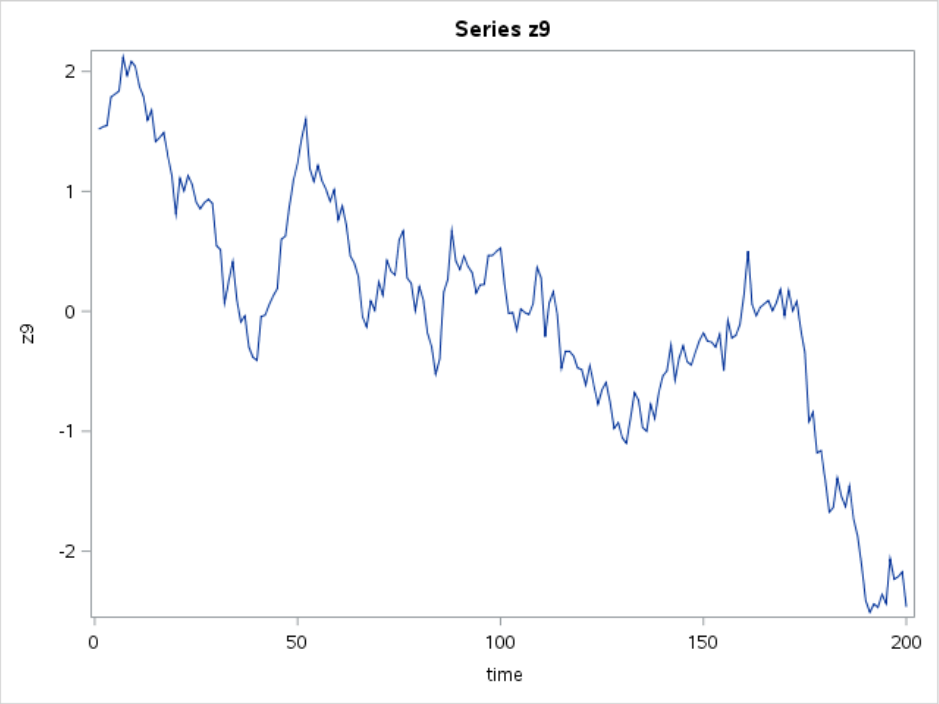


Name of Variable = z8	
Mean of Working Series	0.036886
Standard Deviation	0.96035
Number of Observations	100

(e) Is weakly stationary, but not strictly stationary

We can observe that this graph seems to have a constant variance, mean and ACF in both halves of the series but the behavior seems different on both halves so it is weakly stationary.

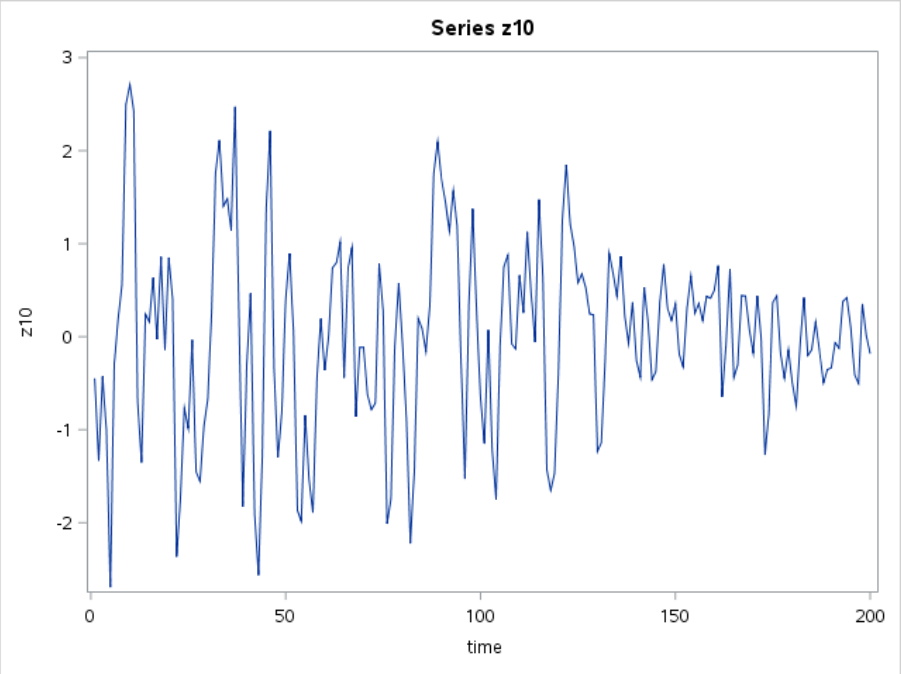
PROBLEM 9)



(b)Does not have a constant mean.

The graph does not seem to have a spread around 0 with values decreasing over time meaning the mean is not constant throughout the series.

PROBLEM 10)

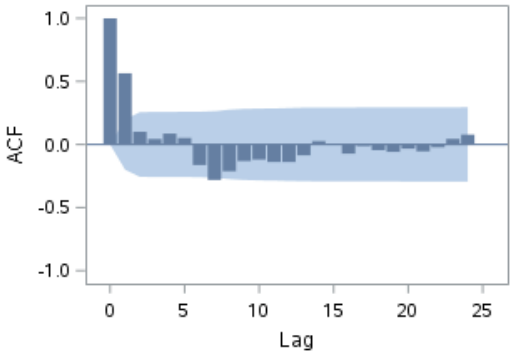


First half of series(observations 1 to 100):

Series z10, observations 1 to 100

The ARIMA Procedure

Name of Variable = z10	
Mean of Working Series	-0.05642
Standard Deviation	1.244017
Number of Observations	100

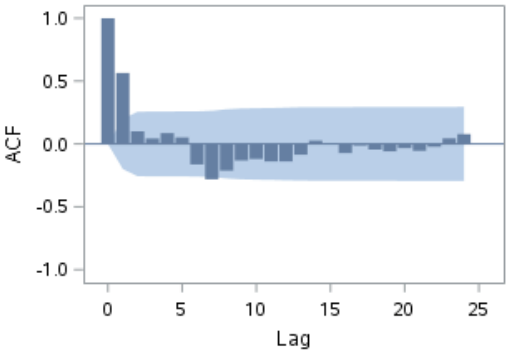


Second half of series(observations 101 to 200):

Series z10, observations 101 to 200

The ARIMA Procedure

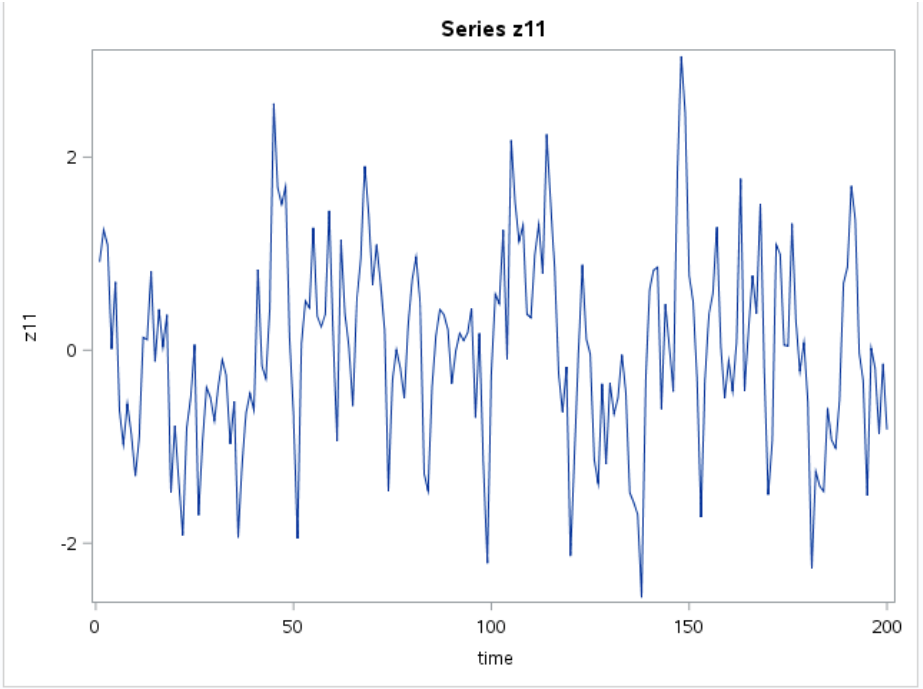
Name of Variable = z10	
Mean of Working Series	0.056416
Standard Deviation	0.660357
Number of Observations	100

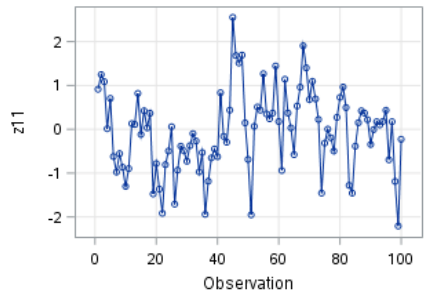


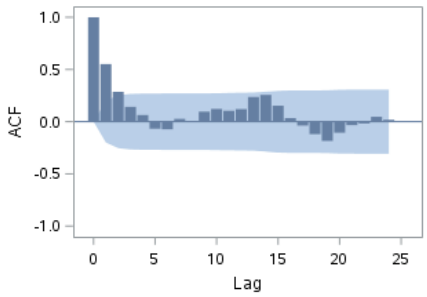
(c) Does not have a constant variance.

The mean and ACF seems to be constant and the time series graph display a spread around 0 throughout the entire series. However, the trend indicates that the variance gets smaller over time. Using the standard deviation from both halves, we can observe that the second half has a variance ½ times smaller than the first half which is in accordance with what the graph displays therefore the variance is not constant.

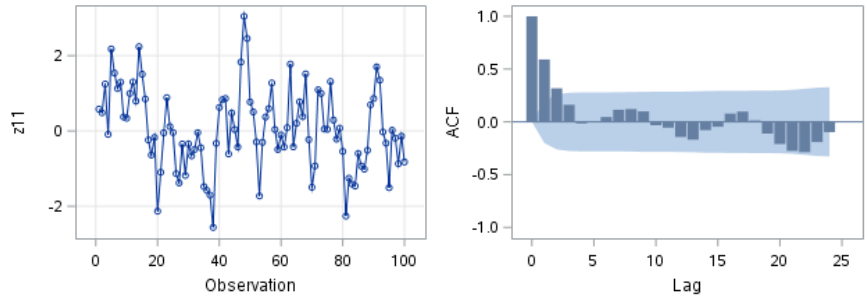
PROBLEM 11)







Name of Variable = z11	
Mean of Working Series	-0.05025
Standard Deviation	0.911515
Number of Observations	100



Name of Variable = z11	
Mean of Working Series	0.050241
Standard Deviation	1.074281
Number of Observations	100

(a) Stationary

The mean, ACF and variance are constant and the behavior seems to be the same on throughout all the so this series is stationary.

SAS Code

```
/* Problems 1-6 */
filename what "/home/eff100/my_courses/huffer/hw2p1_data.txt";
data hw2p1;
infile what;
input z1-z6;
run;

/* The following code will produce the usual items
   used to "identify" an ARMA model for a time series.
   This will be done for each of the series z1 to z6.  */

proc arima data=hw2p1;
identify var=z1; /* Problem 1 */
identify var=z2; /* Problem 2 */
identify var=z3; /* Problem 3 */
identify var=z4; /* Problem 4 */
identify var=z5; /* Problem 5 */
identify var=z6; /* Problem 6 */
run;

/* Problems 7-11 */
filename what "/home/eff100/my_courses/huffer/hw2p2_data.txt";

data look;
infile what;
time=_n_;
input z7-z11;
run;
/* Problem 7 */
/* Creating time series plots for z7 to z11. */
title "Series z7";
proc sgplot data=look;
series x=time y=z7;
run;

/* Splitting series z7 into half */
title "Series z7, observations 1 to 100";
proc arima data=look(firstobs=1 obs=100);
identify var=z7;
run;

title "Series z7, observations 101 to 200";
proc arima data=look(firstobs=101 obs=200);
identify var=z7;
run;

/* Problem 8 */
title "Series z8";
proc sgplot data=look;
series x=time y=z8;
run;

/* Splitting series z8 into half */
title "Series z8, observations 1 to 100";
proc arima data=look(firstobs=1 obs=100);
identify var=z8;
run;
```

```
title "Series z8, observations 101 to 200";
proc arima data=look(firstobs=101 obs=200);
identify var=z8;
run;

/* Problem 9 */
title "Series z9";
proc sgplot data=look;
series x=time y=z9;
run;

/* Problem 10 */
title "Series z10";
proc sgplot data=look;
series x=time y=z10;
run;

/* Splitting series z10 into half */
title "Series z10, observations 1 to 100";
proc arima data=look(firstobs=1 obs=100);
identify var=z10;
run;

title "Series z10, observations 101 to 200";
proc arima data=look(firstobs=101 obs=200);
identify var=z10;
run;

/* Problem 11 */
title "Series z11";
proc sgplot data=look;
series x=time y=z11;
run;

/* Splitting series z11 into half */
title "Series z11, observations 1 to 100";
proc arima data=look(firstobs=1 obs=100);
identify var=z11;
run;

title "Series z11, observations 101 to 200";
proc arima data=look(firstobs=101 obs=200);
identify var=z11;
run;
```