STAT 463: Homework 10

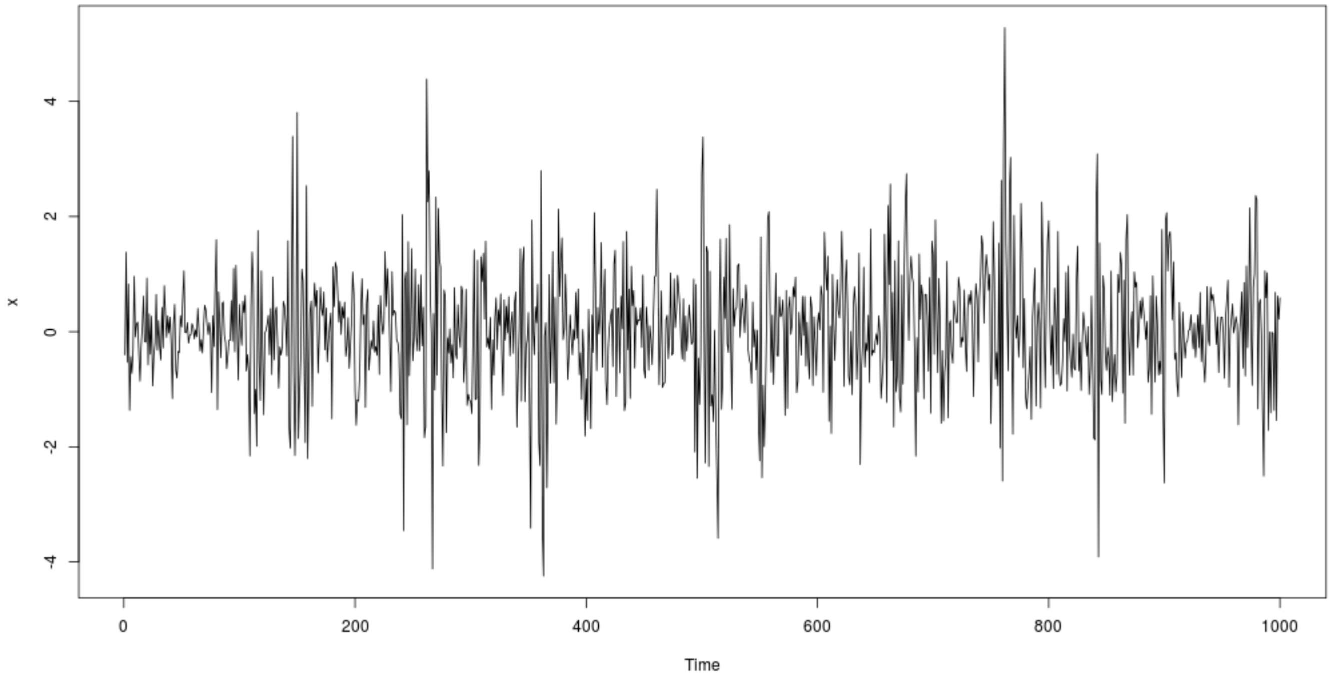
Name: Kyle Salitrik | ***ID#:*** *997543474* | ***PSU ID:*** *kps168*

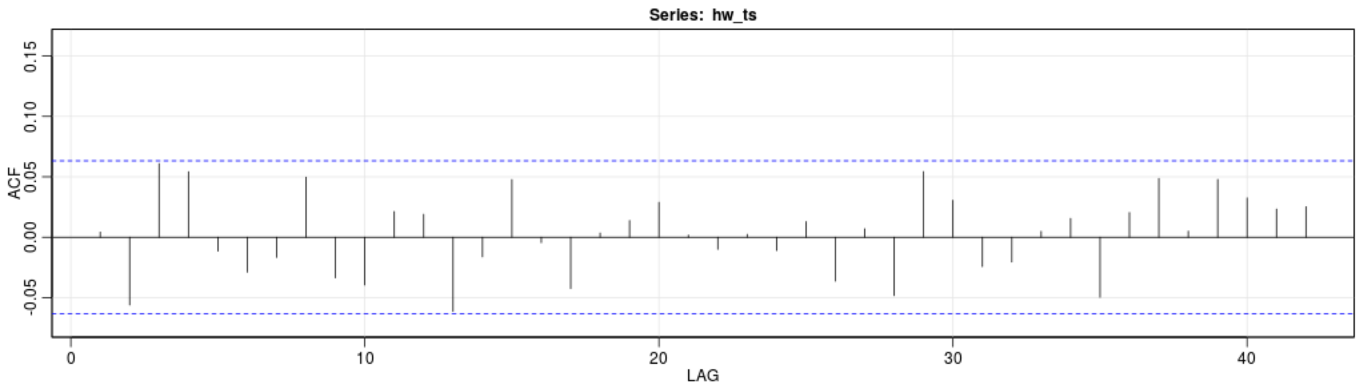
April 25, 2018

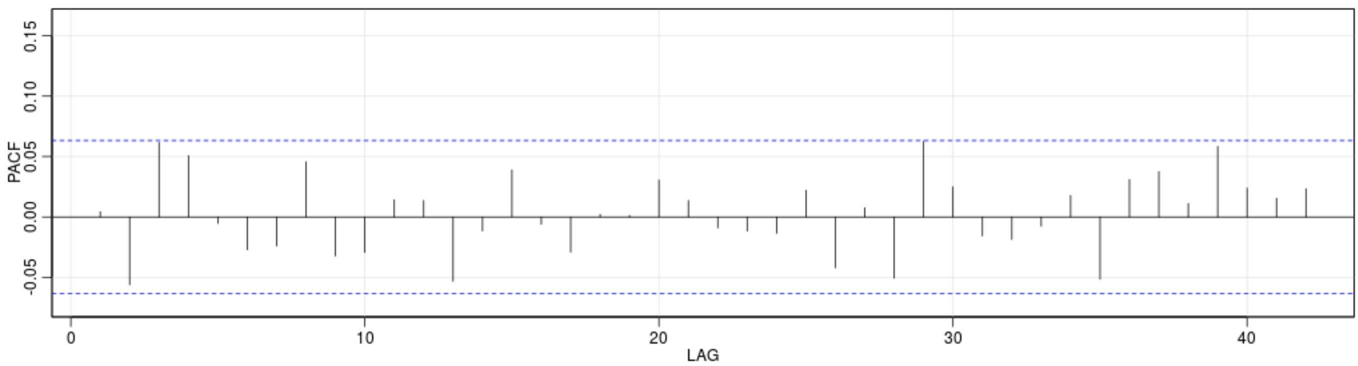
PROBLEM 1

a)

Based on the time series and both the ACF and PACF plots, it appears that the entire time series is random noise.

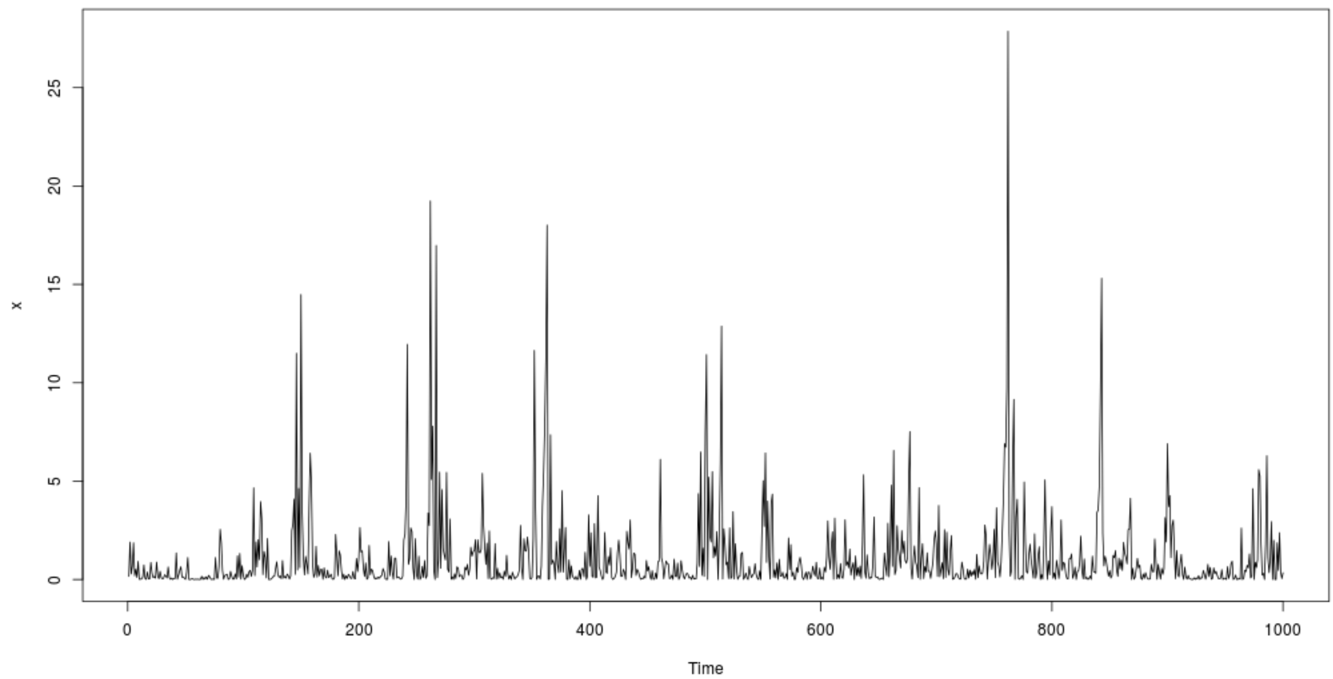


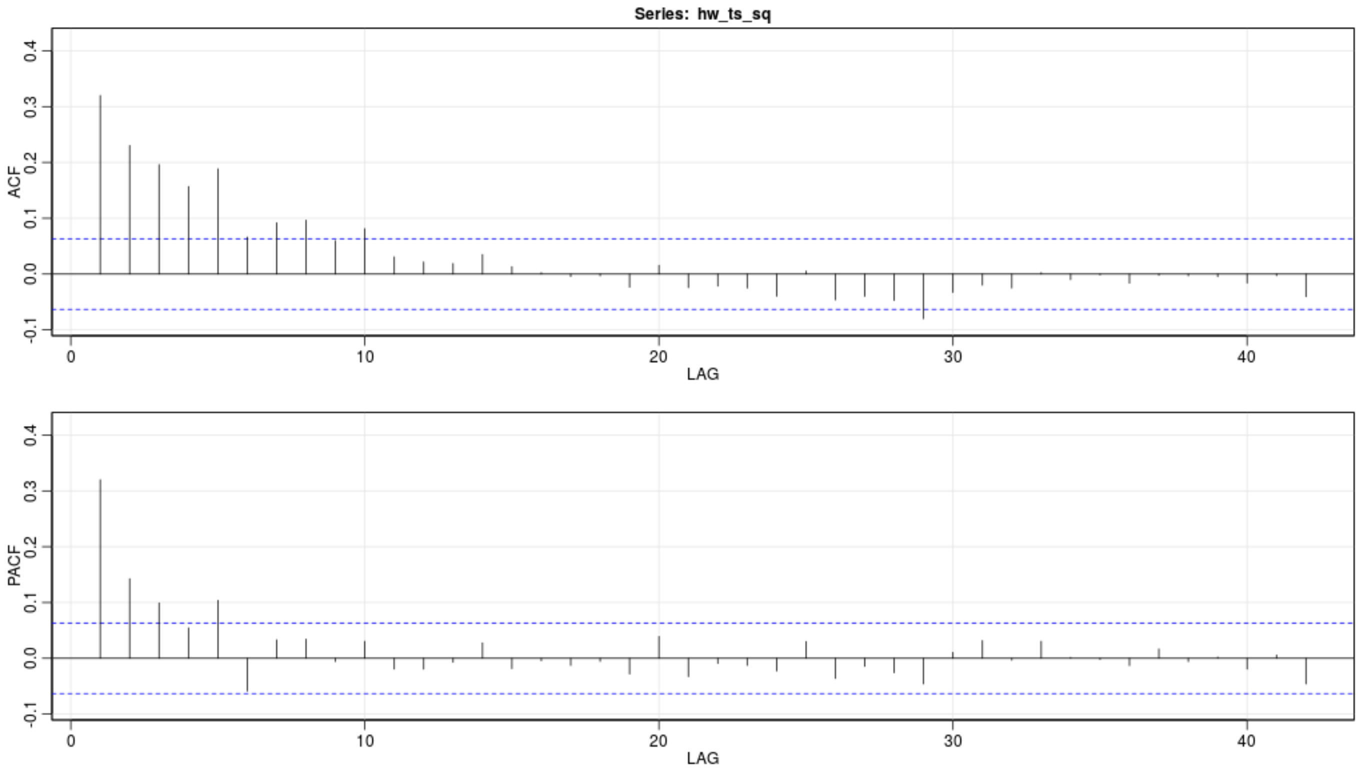




b)

Using the squared series values, the ACF and PACF Possibly suggest an AR(1) or ARMA(1,1).





c)

Based on the ARCH and GARCH models, the GARCH had a lower AIC, BIC, SIC, and HQIC. Normality tests show that the residuals have a normal distribution

```
Standardised Residuals Tests:
                                    Statistic p-Value
 Jarque-Bera Test   R    Chi^2   1.822259  0.4020699
 Shapiro-Wilk Test  R    W       0.9985522 0.5890539
```

Ljung–Box Test	R	Q(10)	10.24976	0.4188616
Ljung–Box Test	R	Q(15)	14.32952	0.5006984
Ljung–Box Test	R	Q(20)	17.56494	0.6160438
Ljung–Box Test	R^2	Q(10)	3.469898	0.9681106
Ljung–Box Test	R^2	Q(15)	10.28095	0.801705
Ljung–Box Test	R^2	Q(20)	11.20095	0.9408438
LM Arch Test	R	TR^2	5.638083	0.9332166

Information Criterion Statistics:

AIC	BIC	SIC	HQIC
2.673371	2.688095	2.673353	2.67896

d)

$y = \sigma_t \epsilon_t$

$\sigma_t = sqrt 0.09622 + 0.31894 y_{t-1}^2 + 0.60802 \sigma_{t-1}^2$

$\epsilon \overset{iid}{\sim} N(0,1)$

e)

	meanForecast	meanError	standardDeviation
1	0	0.8140121	0.8140121
2	0	0.8428764	0.8428764
3	0	0.8687765	0.8687765
4	0	0.8921136	0.8921136
5	0	0.9132138	0.9132138
6	0	0.9323465	0.9323465
7	0	0.9497377	0.9497377
8	0	0.9655789	0.9655789
9	0	0.9800345	0.9800345
10	0	0.9932465	0.9932465

Problem 2

a)

Looking at the 'none', 'both', 'trend', and 'constant' models, the 'none' produced the highest adjusted R^2 values for all models. These are the resulting models:

$\hat{B}_t = 1.05330 B_{t-1} - 0.30720 M_{t-1} + 0.24882 K_{t-1}$

$\hat{M}_t = 0.14485 B_{t-1} + 0.56676 M_{t-1} + 0.27974 K_{t-1}$

$\hat{K}_t = 0.2423 B_{t-1} - 0.4384 M_{t-1} + 1.1886 K_{t-1}$

b)

Again, for the VAR(2) models, including neither the intercept or constant produced the best model based on adjusted R^2 value.

$\hat{K}_t = -0.09426 t - 0.19763 B_{t-1} + 0.59703 M_{t-1} + 0.81700 K_{t-1} + 1.13432 B_{t-2} - 1.67339 M_{t-2} + 0.33416 K_{t-2}$

c)

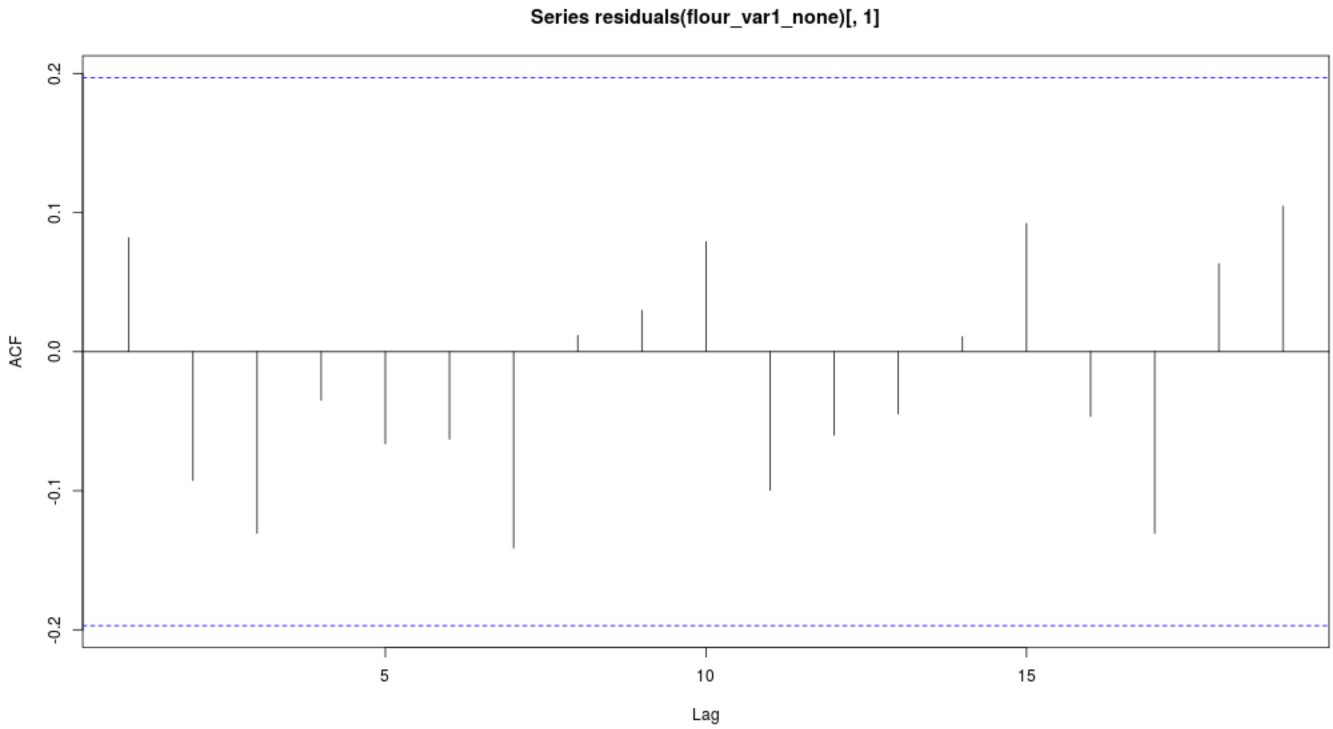
The BIC values are as follows:

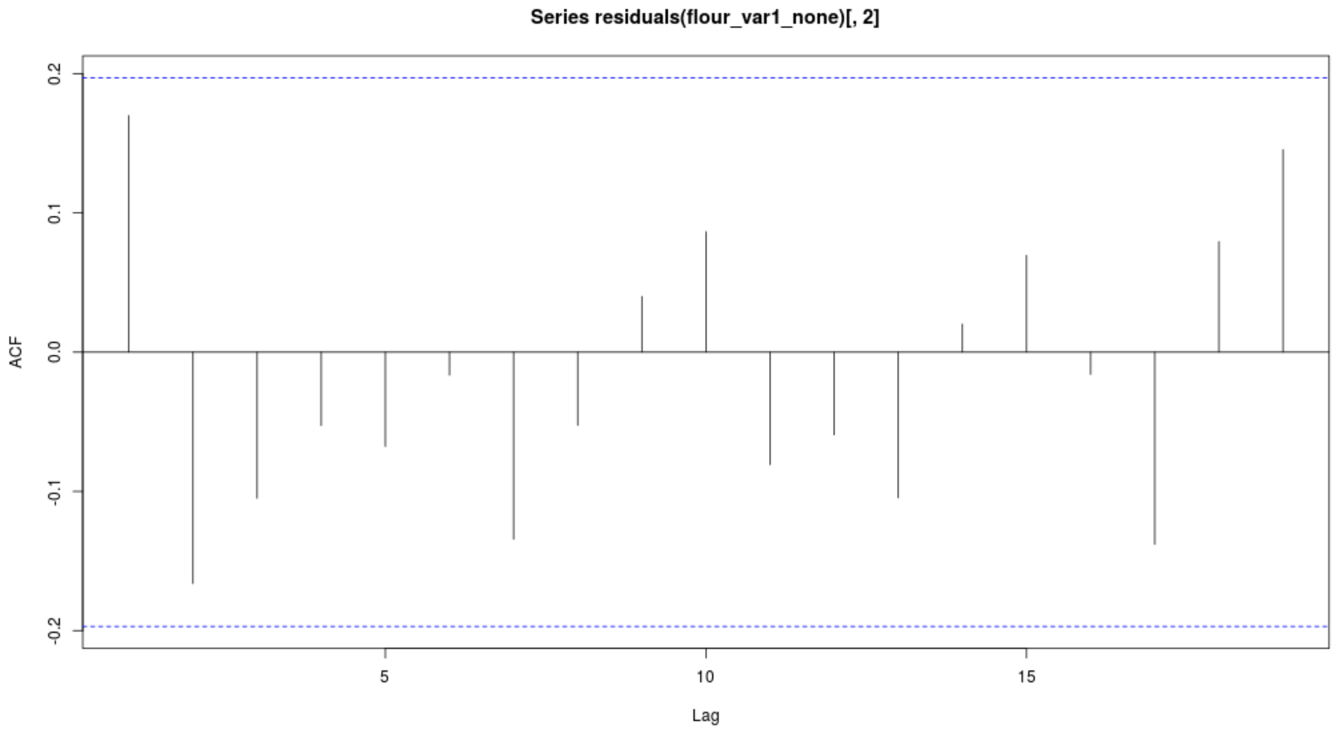
- BIC1: 8.417481
- BIC2: 8.492818

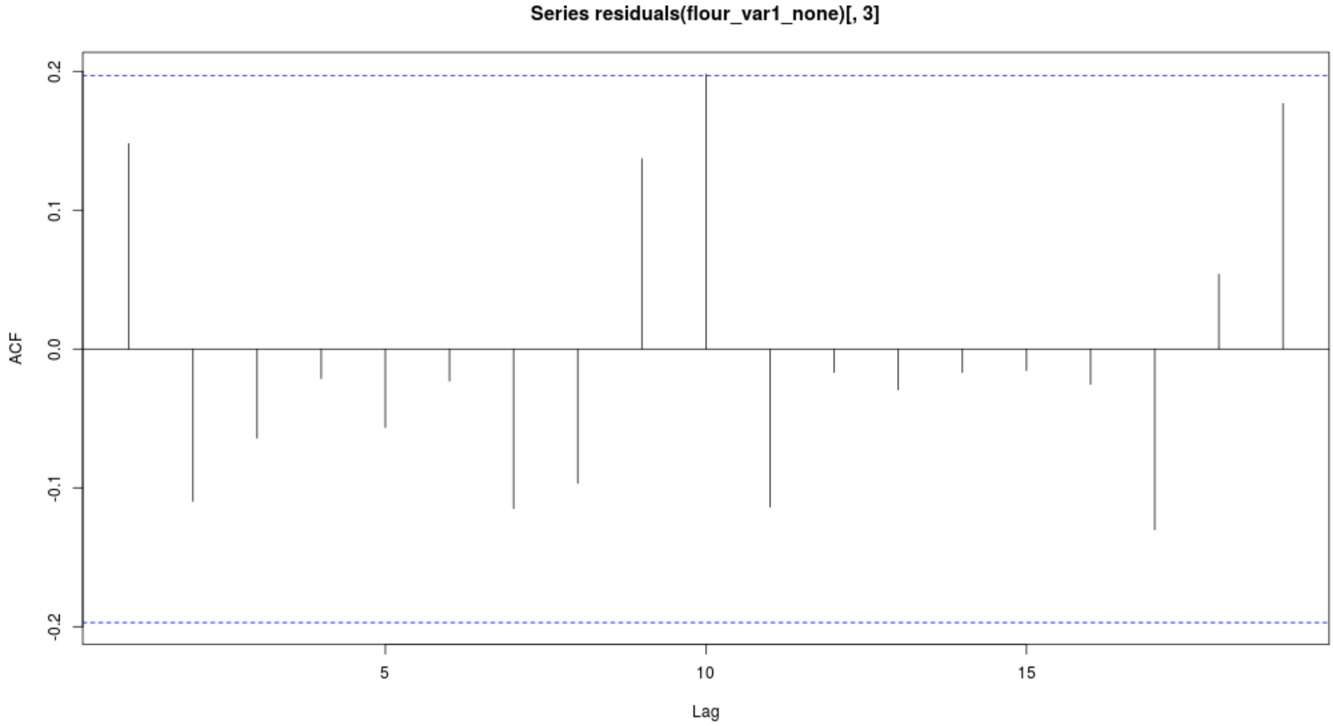
Based on these values the BIC for the VAR(1) model indicates that it is the better option.

d)

Based on the ACF of the residuals for the 3 cities, all values are within the lines of significance.







Series residuals(flour_var1_none)[, 3]
ACF
0.2
0.1
0.0
-0.1
-0.2
5
10
15
Lag