Assignment-9

Abheek Ghosh
140123047

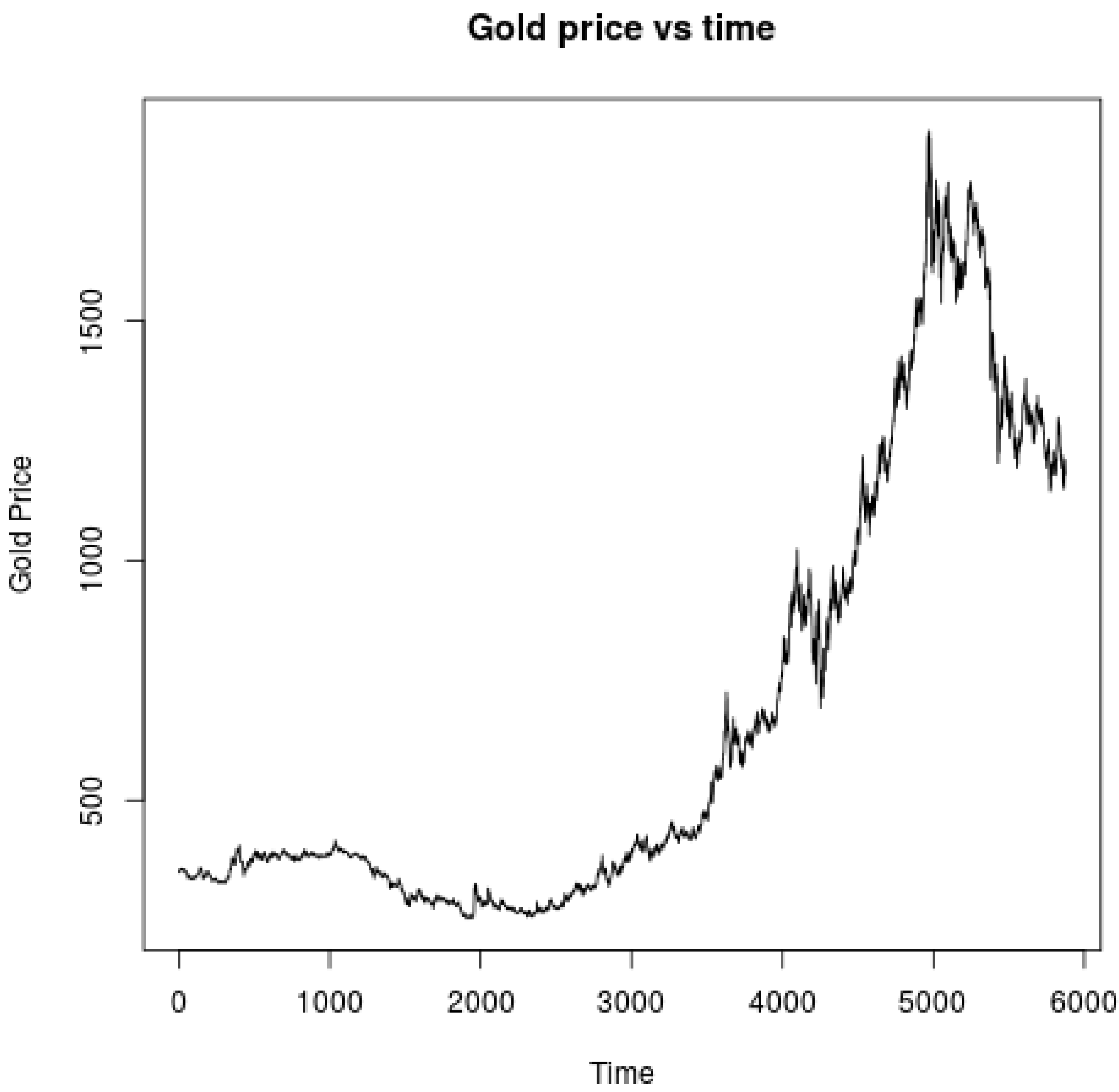
November 13, 2017

Question 1

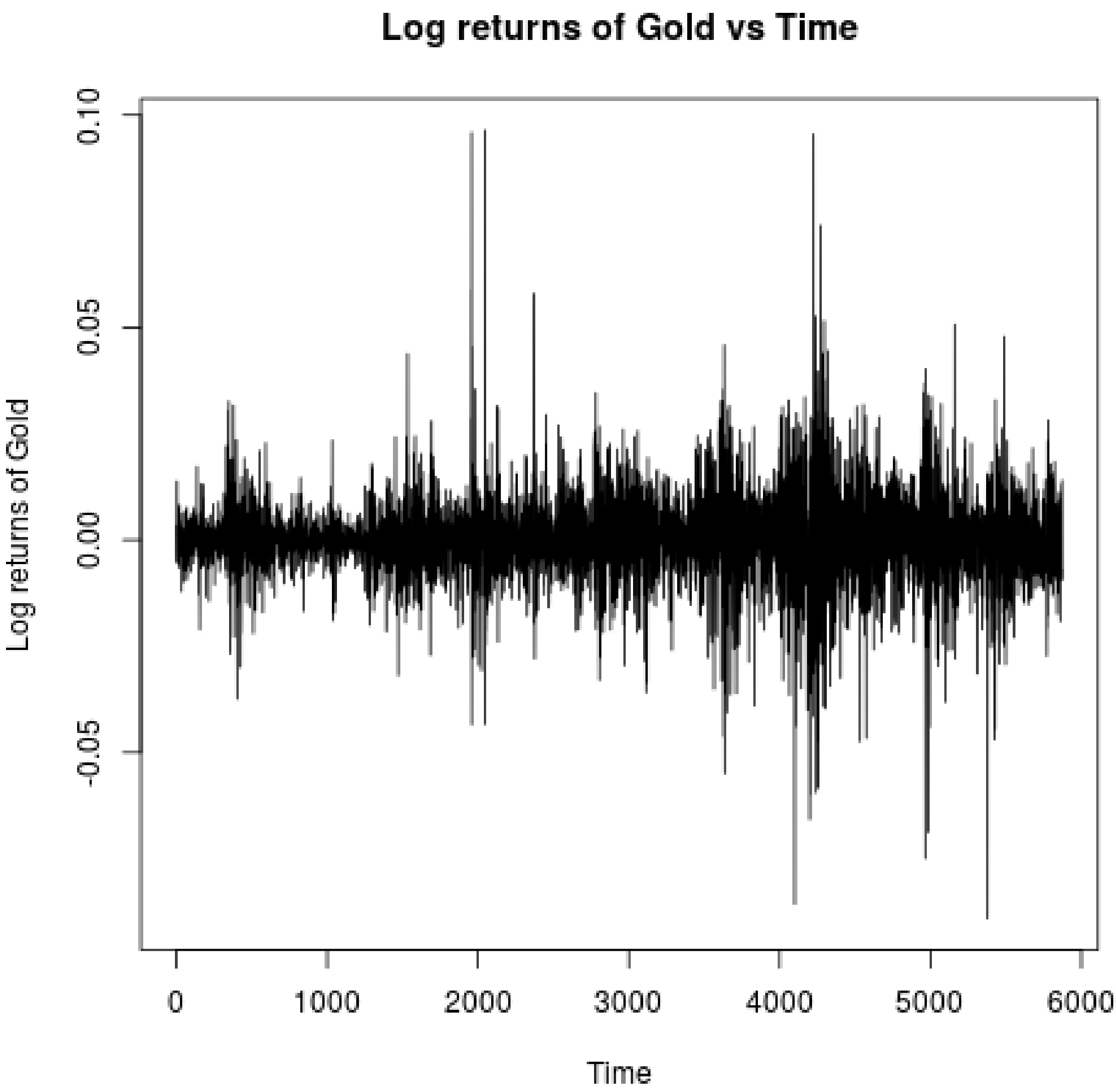
Code for R

```
rm(list = ls())

d = read.csv('Data_gold.txt', header = FALSE);
d = d[, 'V4'];
# print(d)

# a
d = ts(d);
plot.ts(d, ylab = 'Gold Price', main = 'Gold price vs time');
dev.copy(png, "plots/plot1_a.png")
dev.off ()

# b
X = log(d[-1]) - log(d[-length(d)]);
X_ts = ts(X);
plot.ts(X_ts, ylab="Log returns of Gold", main = "Log returns of Gold vs Time");
dev.copy(png, "plots/plot1_b.png");
dev.off ();

# c
acf(X);
dev.copy(png, "plots/plot1_c.png"); dev.off ();
pacf(X)
dev.copy(png, "plots/plot1_d.png"); dev.off ();

# d
X_ar = ar(X);
print(X_ar);

# e
```

```
pred = predict(X_ar, n.ahead = 3);
print(pred);
plot(pred$pred, ylab = "Log returns", main = "3-step Prediction of Log returns");
dev.copy(png, "plots/plot1_e.png"); dev.off();
```

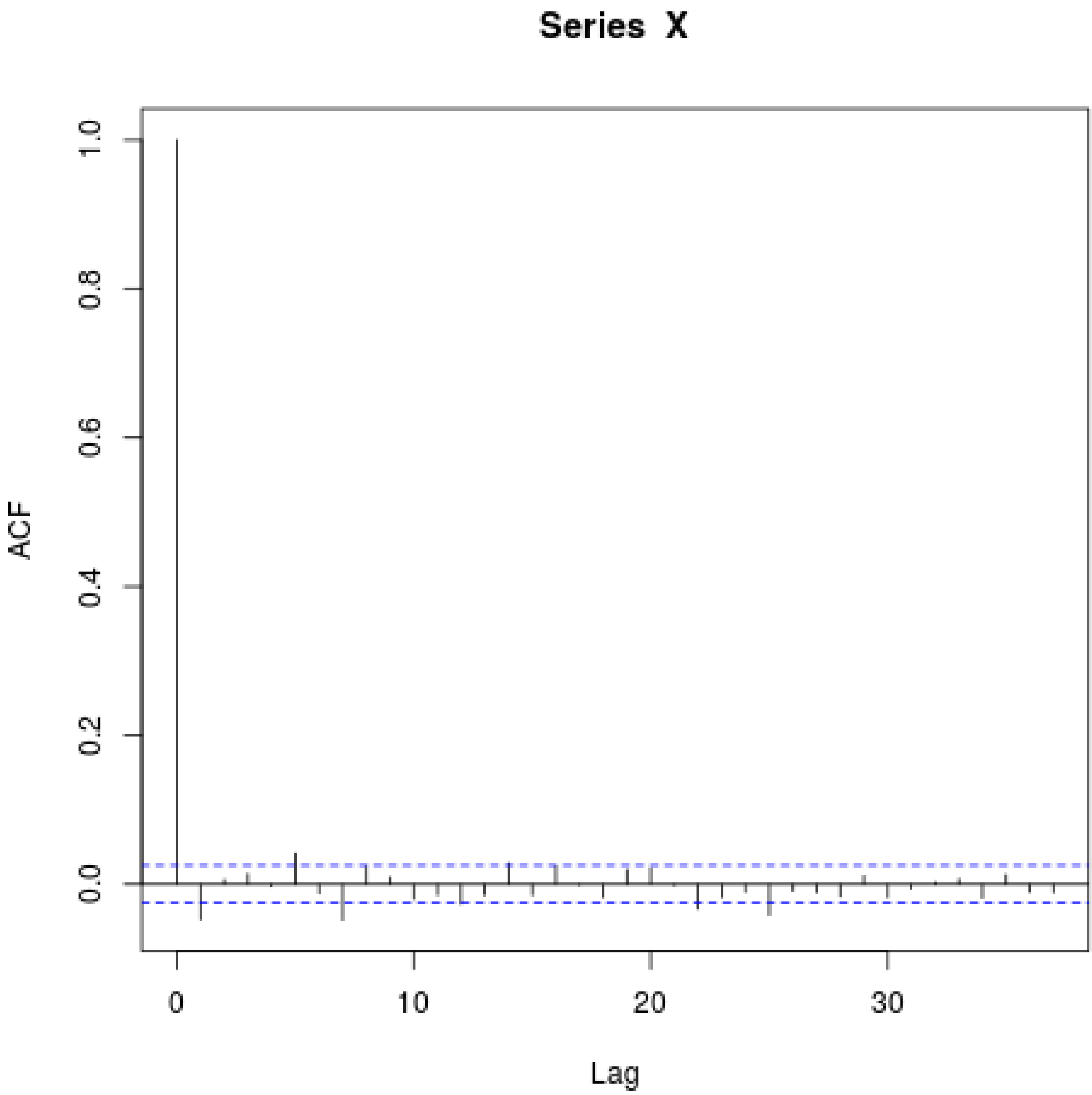


(a)


Log returns of Gold vs Time
Log returns of Gold
0.10
0.05
0.00
-0.05
0
1000
2000
3000
4000
5000
6000
Time

(b)

(c) Yes, there are serial autocorrelations in the r series, as visible from plot.

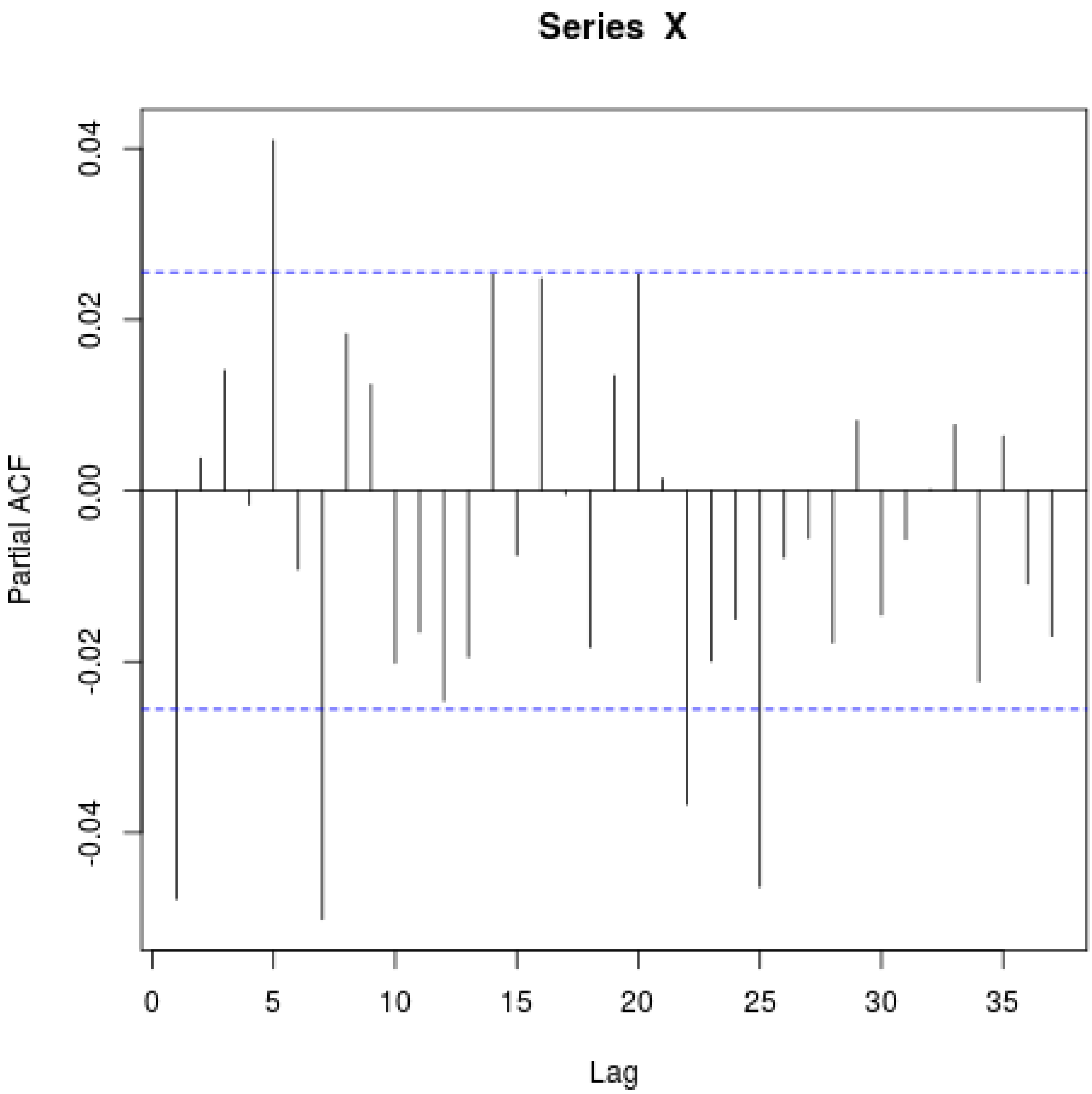


(d) We create the ar model with p = 25. It is correct because the PACF goes to 0 after lag 25.

Call: ar(x = X)

Coefficients: 1 2 3 4 5 6 7 8 -0.0488 0.0066 0.0121 0.0011 0.0406 -0.0118 -0.0473 0.0210 9 10 11 12 13 14 15 16 0.0138 -0.0204 -0.0206 -0.0279 -0.0180 0.0243 -0.0091 0.0241 17 18 19 20 21 22 23 24 -0.0002 -0.0194 0.0151 0.0277 0.0001 -0.0369 -0.0203 -0.0173 25 -0.0463

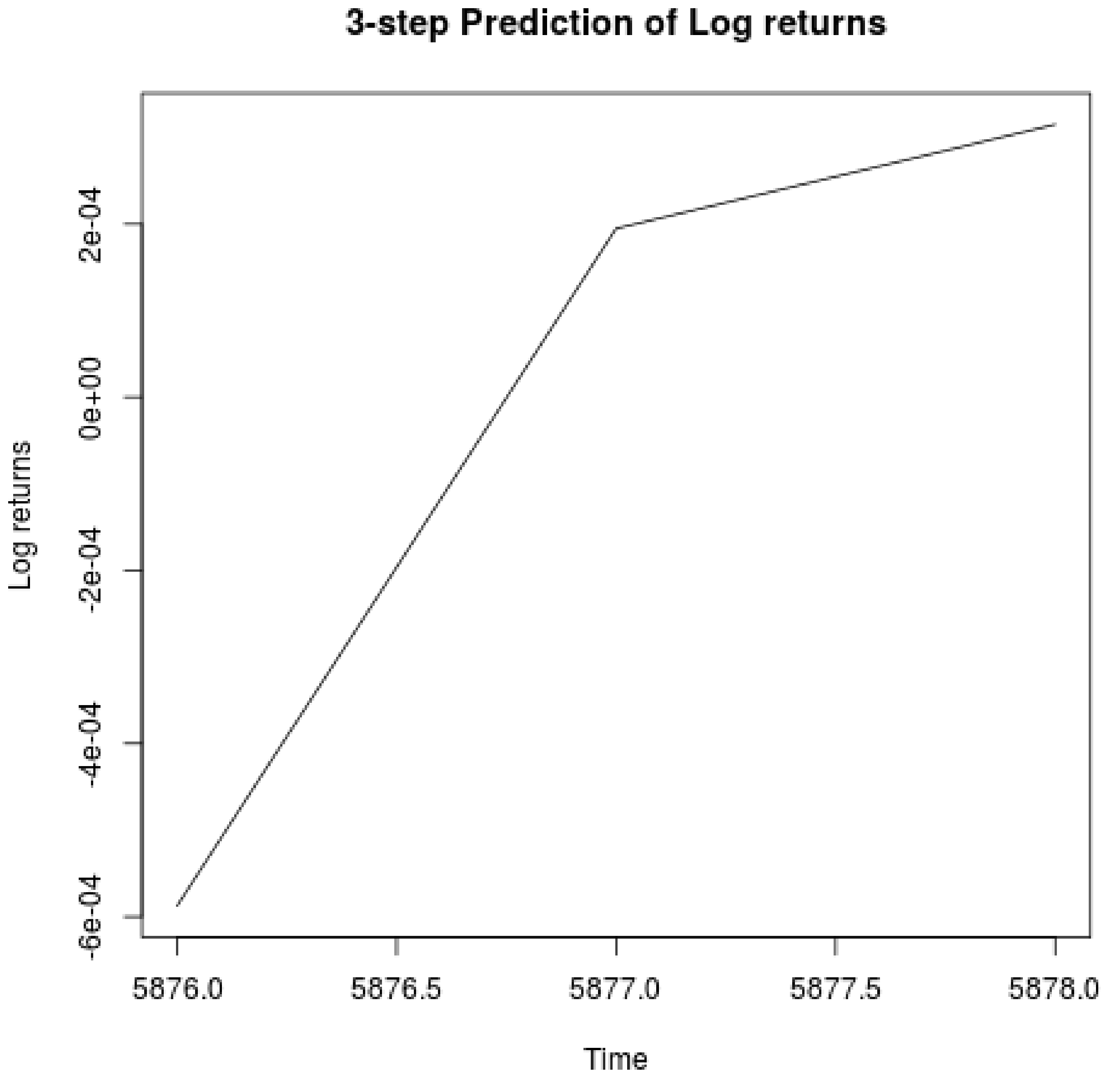
Order selected 25 sigma$\hat{2}$ estimated as 0.0001093



(e) Prediction

pred Time Series: Start = 5876 End = 5878 Frequency = 1 [1] -0.0005876651 0.0001947626 0.0003147521

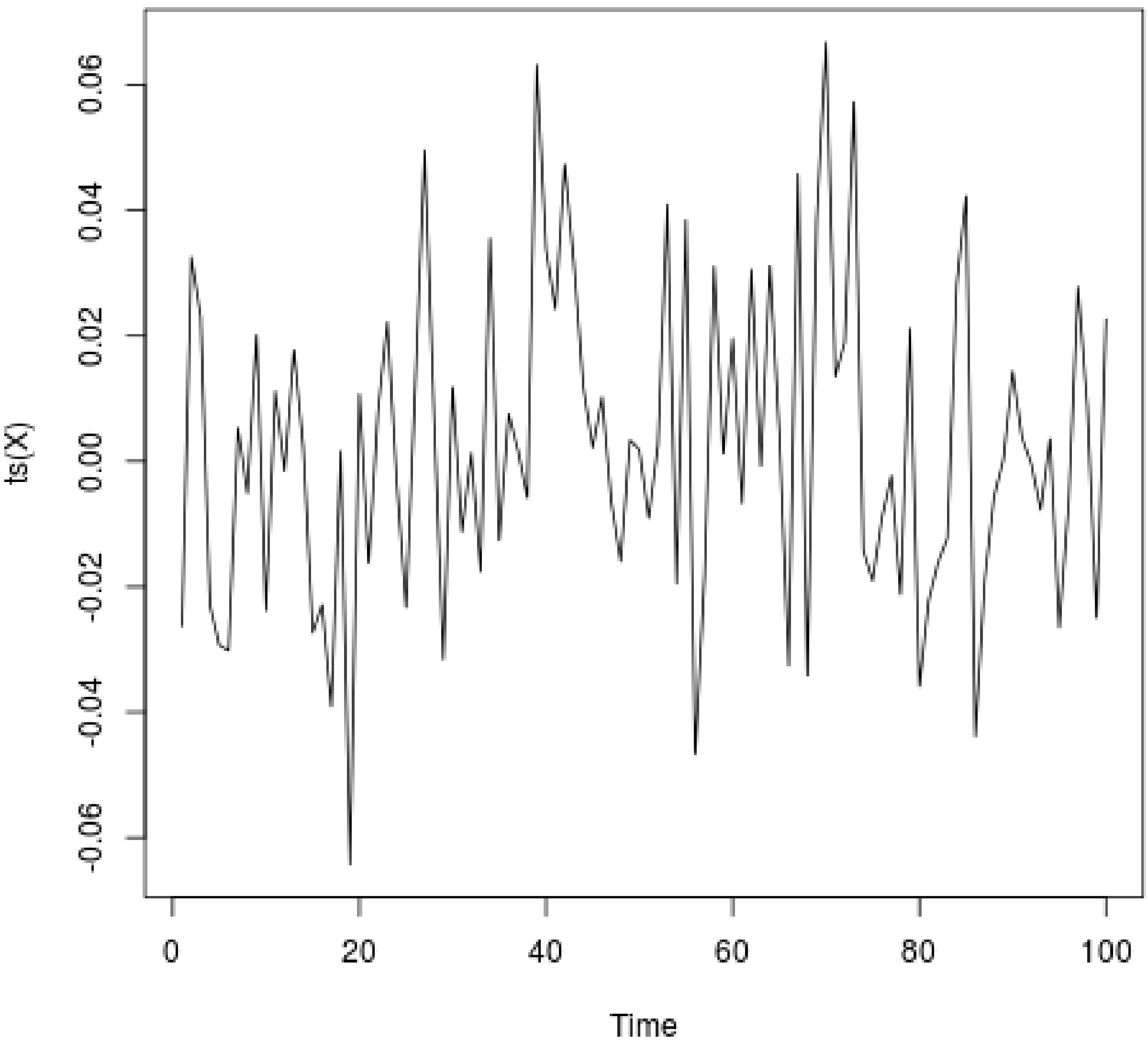
se Time Series: Start = 5876 End = 5878 Frequency = 1 [1] 0.01045254 0.01046498 0.01046541



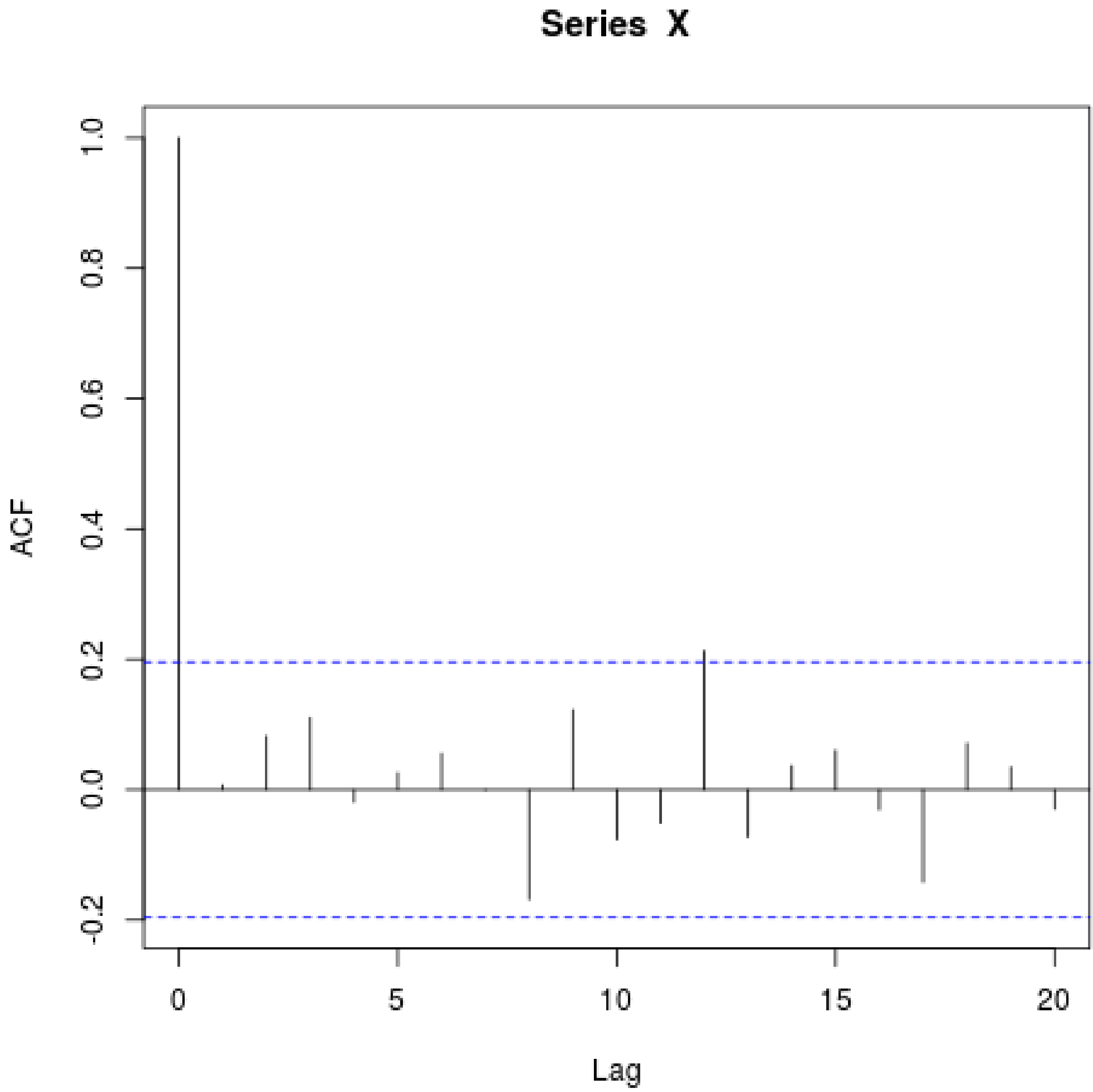
Question 2

Code for R

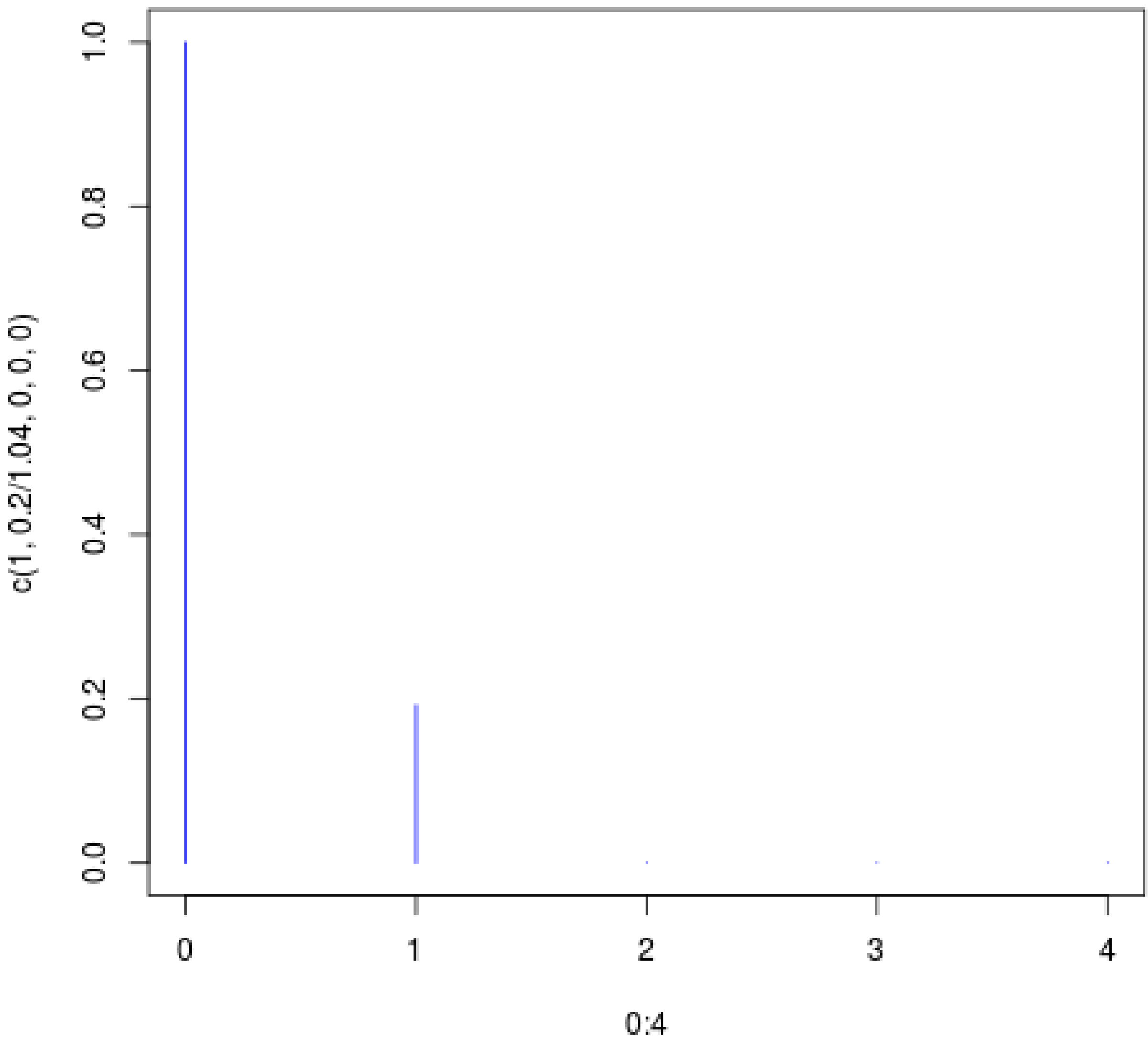
```
rm(list = ls())

sig = 0.025;
alp = 0.2;

# a
n = 100;
A = rnorm(n = n+1, mean = 0, sd = sig);
X = A[-1] + alp*A[-(n+1)];

# b
acf(X);
dev.copy(png, "plots/plot2_a.png"); dev.off();

# c
plot(0:4, c(1, 0.2/1.04, 0, 0, 0), type="h", col = "blue");
dev.copy(png, "plots/plot2_b.png"); dev.off();
```



(a)



(b)



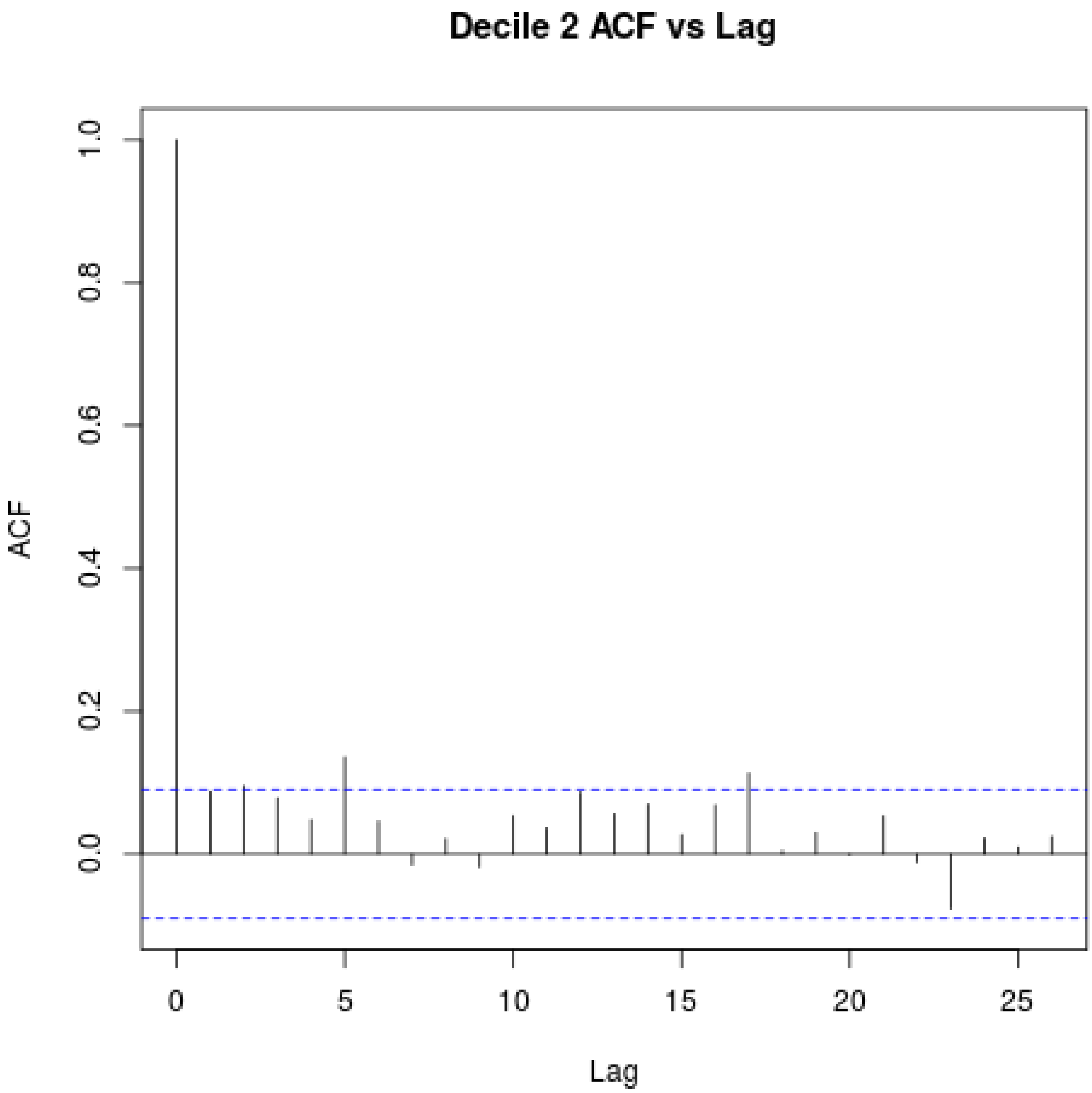
(c)

Question 3

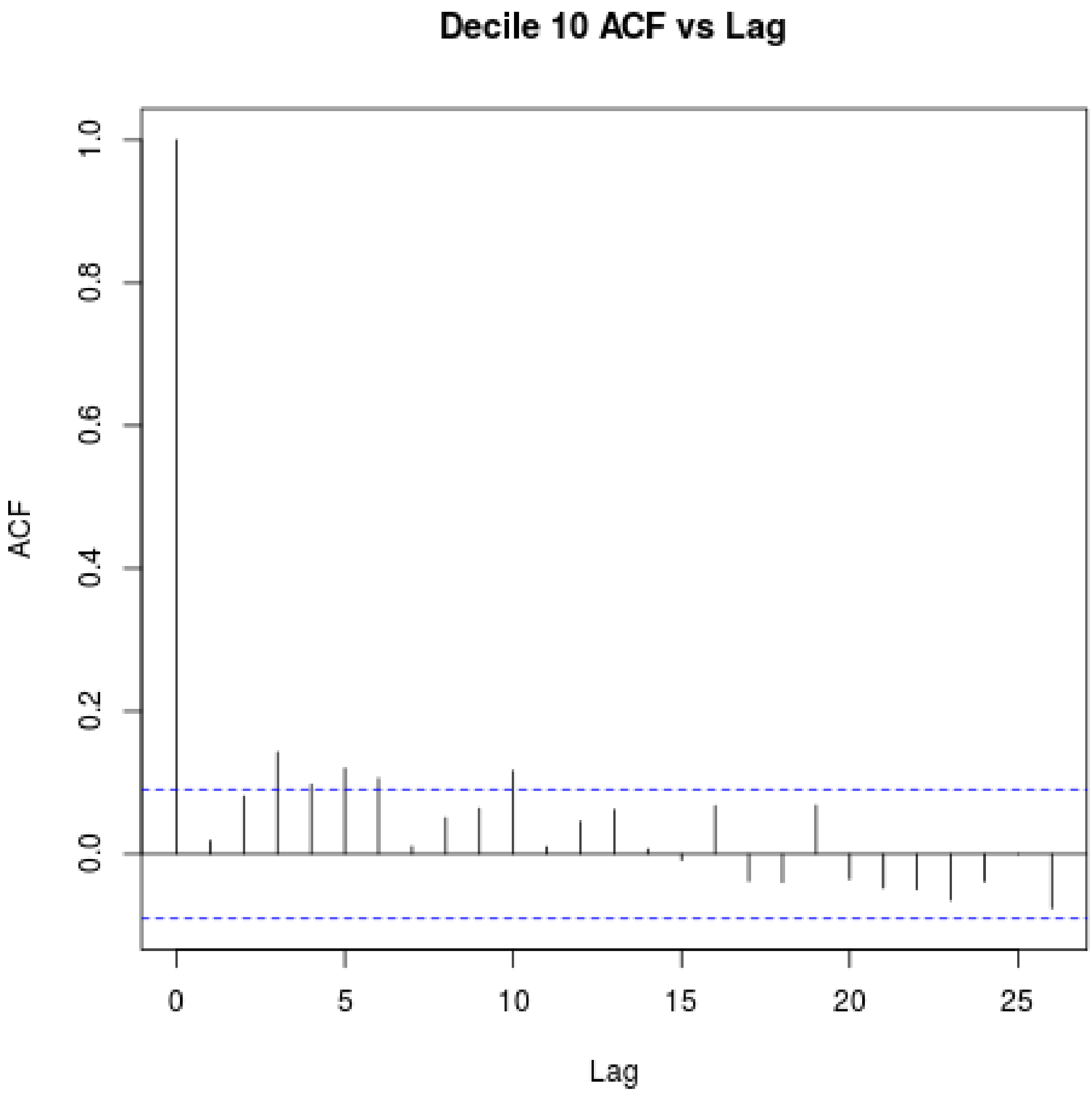
Code for R

```
rm(list = ls())

d = read.table('deciles08.txt');
# print(d)
d2 = d[,3];
d10 = d[,5];

# a
acf(d2, main = "Decile 2 ACF vs Lag");
dev.copy(png, "plots/plot3_a.png"); dev.off ();
acf(d10, main = "Decile 10 ACF vs Lag");
dev.copy(png, "plots/plot3_b.png"); dev.off ();

# b
d2_arma = arima(d2, order = c(5, 1, 5));
print(d2_arma)

#3c
arma_forecast = predict(d2_arma, n.ahead = 12);
print(arma_forecast)
plot(arma_forecast$pred, ylab = "Forecasted values")
dev.copy(png, "plots/plot3_c.png"); dev.off ();
```

(a) Decile 2. The hypothesis is false. The ACF does not go to zero after lag 12 at 5% confidence level.



Decile 10. The hypothesis is true. The ACF goes to zero after lag 12 at 5% confidence level.



(b)

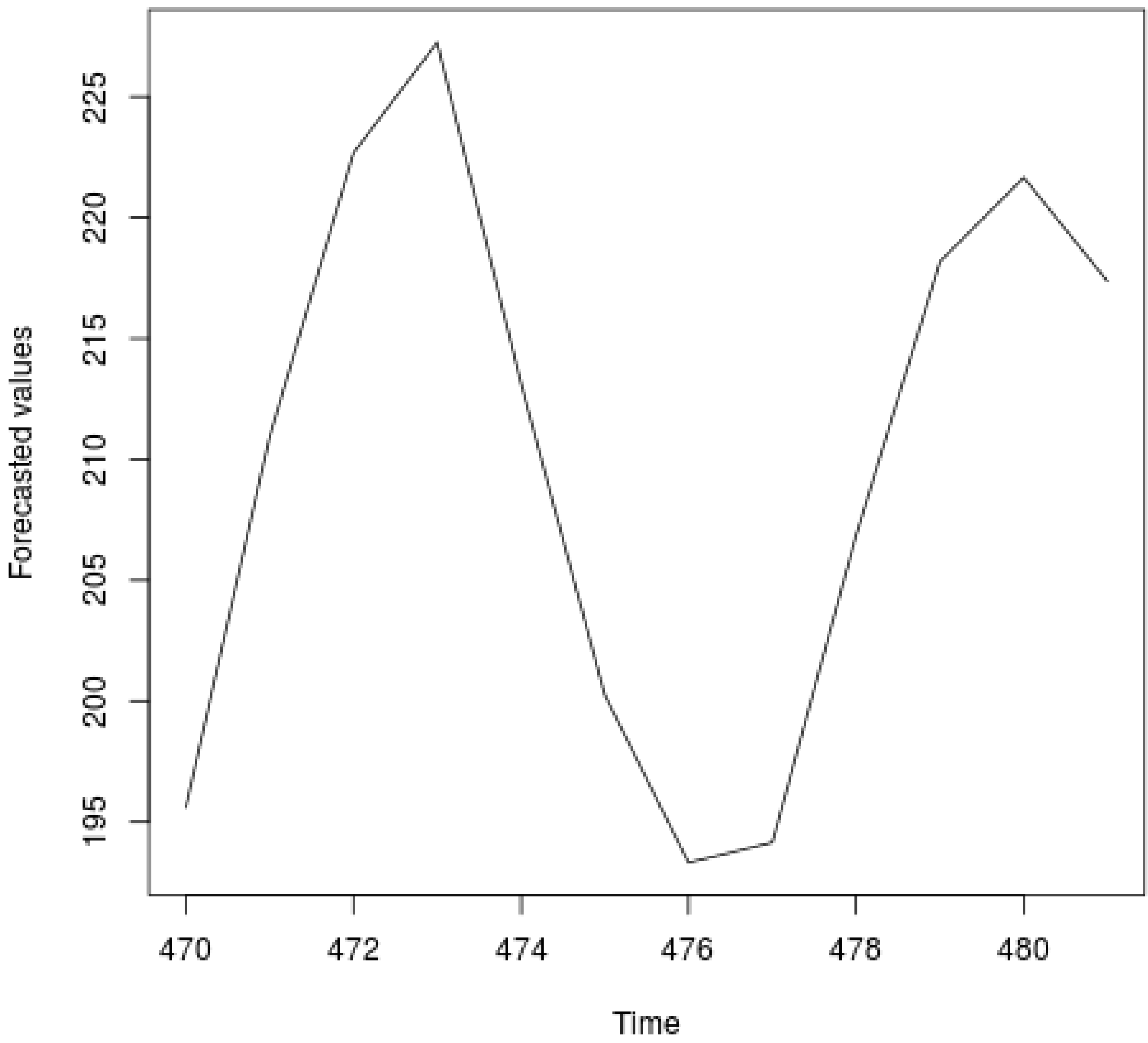
Call: arima(x = d2, order = c(5, 1, 5))

Coefficients: ar1 ar2 ar3 ar4 ar5 ma1 ma2 ma3 0.3634 -0.2544 -0.1020 -0.6196 0.1252 -1.3056 0.6177 -0.1623 s.e. 0.3187 0.2969 0.2526 0.2686 0.0489 0.3205 0.5783 0.5255 ma4 ma5 0.4981 -0.6144 s.e. 0.4631 0.2673

sigma$\hat{2}$ estimated as 17391: log likelihood = -2950.69, aic = 5923.38

(c) pred Time Series: Start = 470 End = 481 Frequency = 1 [1] 195.6041 210.9150 222.6653 227.2416 213.1335 200.2408 193.3154 194.1547 [9] 206.8511 218.1788 221.6556 217.3543

se Time Series: Start = 470 End = 481 Frequency = 1 [1] 131.8760 132.0959 132.5031 132.7527 132.7932 133.5586 133.5814 133.6028 [9] 133.6035 133.6492 133.6960 133.9558


Forecasted values
225
220
215
210
205
200
195
470
472
474
476
478
480
Time