Q6_ARCH_EFFECT

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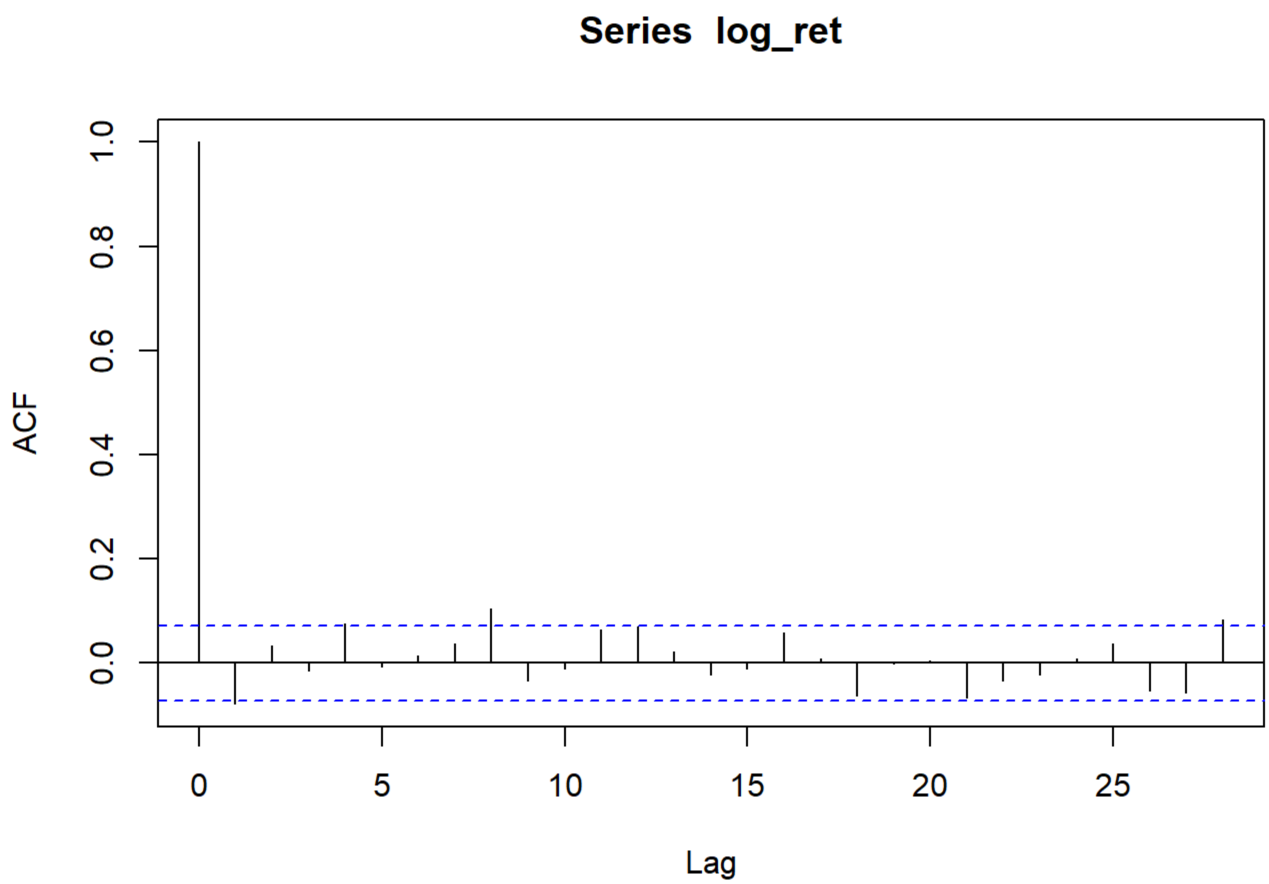
Read data

```
data = read.csv("m-mrk4608.txt", sep="")
```

Q.a Based on the results from the autocorrelation, we do not observe any serial correlation from the log returns. => As this is a linear relation, the blue line is ok to be used.

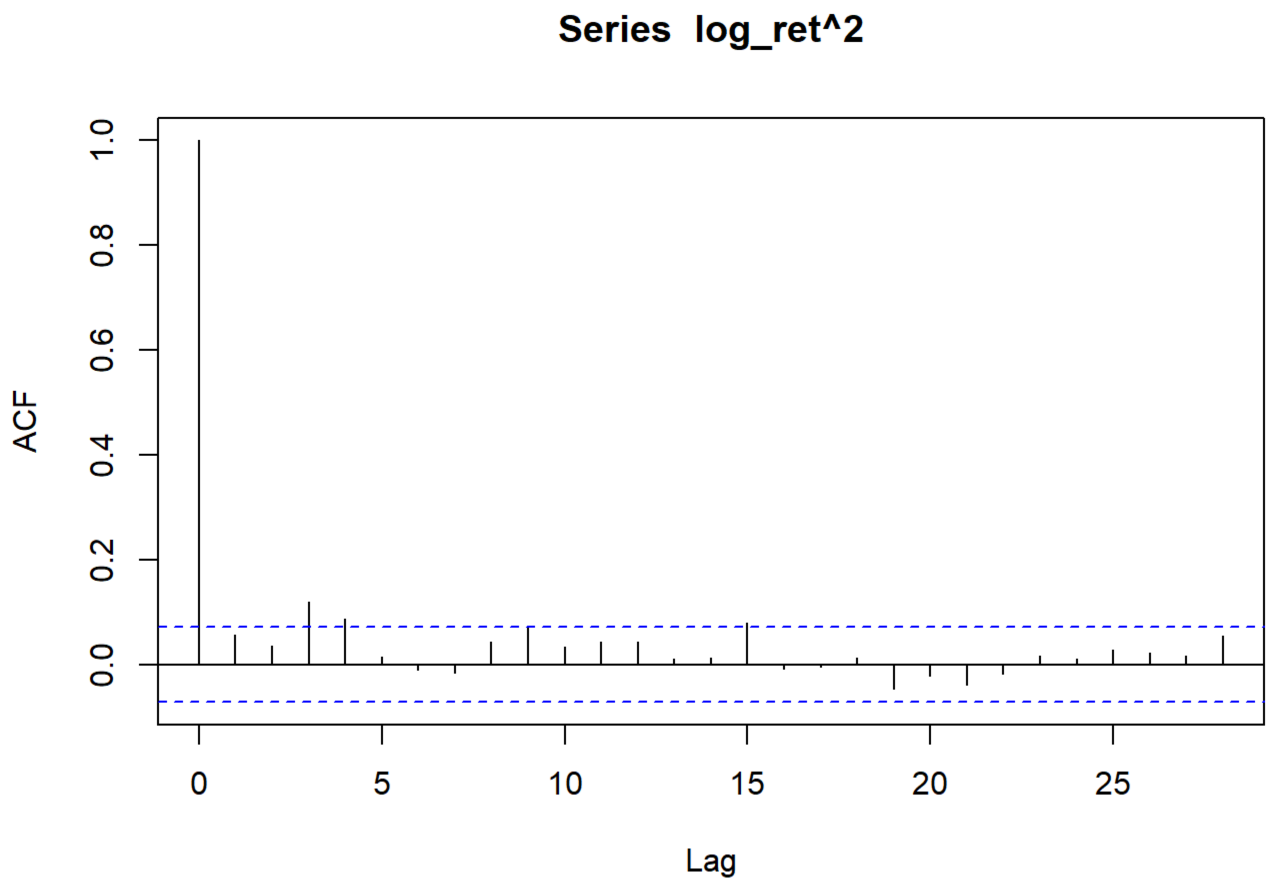


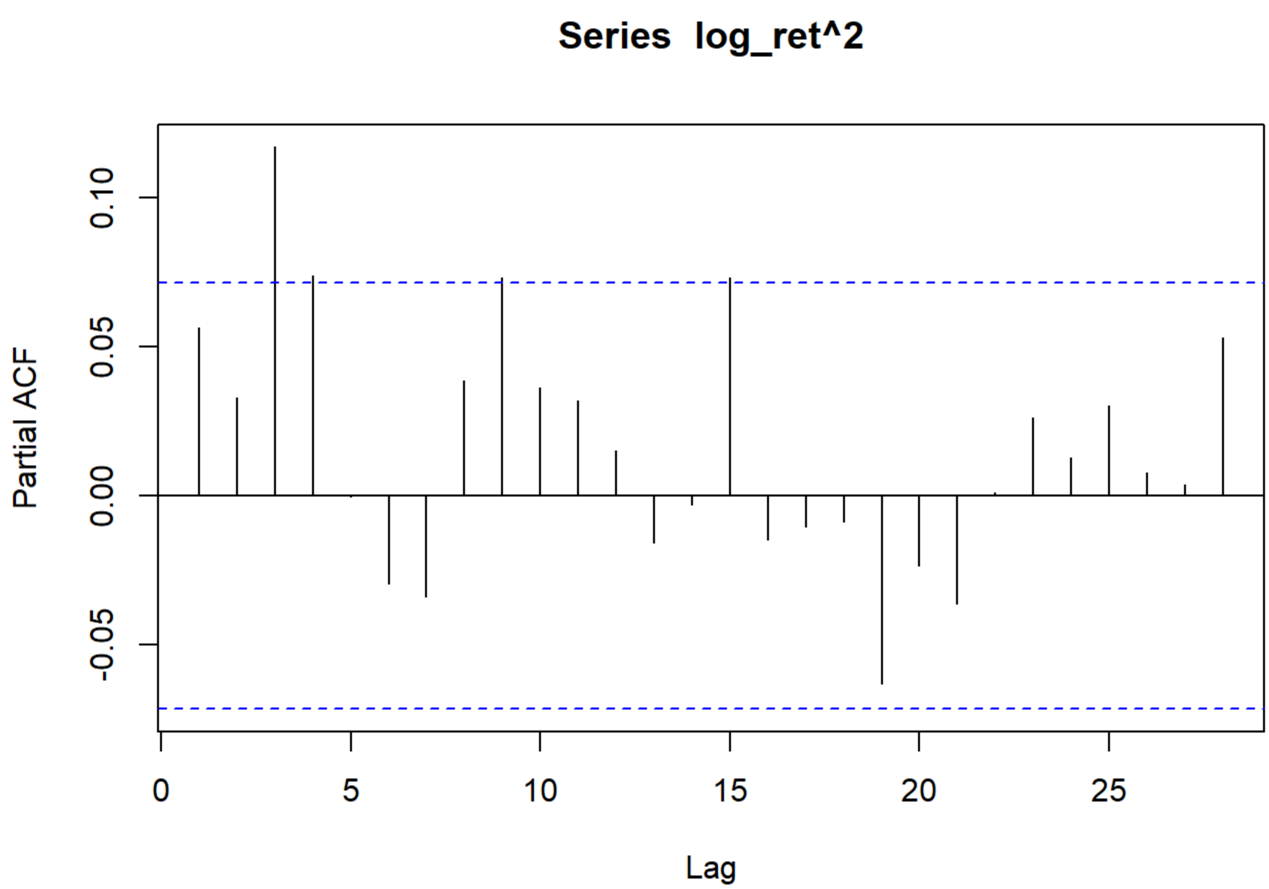
Q.b As we accept the alternative hypothesis for both 6 and 12 lags, this indicates ARCH effects in the log return sequence.

```
##
##  Box-Ljung test
##
## data:  log_ret^2
## X-squared = 20.227, df = 6, p-value = 0.002523
```

```
##
##  Box-Ljung test
##
## data:  log_ret^2
## X-squared = 29.207, df = 12, p-value = 0.003671
```

Q.c Based on PACF => we try lag-3 as the blue line is not completely trustworthy, and see significance at lag 3.


Series log_ret^2
ACF
1.0
0.8
0.6
0.4
0.2
0.0
0
5
10
15
20
25
Lag


Series log_ret^2
Partial ACF
0.10
0.05
0.00
-0.05
0
5
10
15
20
25
Lag

```
##
## Title:
##  GARCH Modelling
##
## Call:
##  garchFit(formula = ~garch(3, 0), data = log_ret, cond.dist = "norm",
##     trace = FALSE)
##
## Mean and Variance Equation:
##  data ~ garch(3, 0)
## <environment: 0x00000160f2685008>
##  [data = log_ret]
##
## Conditional Distribution:
##  norm
##
## Coefficient(s):
##        mu      omega     alpha1     alpha2     alpha3
## 0.0120045  0.0040637  0.0296632  0.0695166  0.0841470
##
## Std. Errors:
##  based on Hessian
##
## Error Analysis:
##         Estimate  Std. Error  t value Pr(>|t|)
## mu     0.0120045   0.0025505    4.707 2.52e-06 ***
## omega  0.0040637   0.0003279   12.393  < 2e-16 ***
## alpha1 0.0296632   0.0391997    0.757   0.4492
## alpha2 0.0695166   0.0372270    1.867   0.0618 .
## alpha3 0.0841470   0.0391451    2.150   0.0316 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Log Likelihood:
##  931.7081    normalized:  1.240623
##
## Description:
##  Tue Sep 24 00:37:48 2024 by user: kamin
##
##
## Standardised Residuals Tests:
##                                  Statistic      p-Value
##  Jarque-Bera Test   R    Chi^2  24.8436530 4.029668e-06
##  Shapiro-Wilk Test  R    W       0.9943764 6.934101e-03
##  Ljung-Box Test     R    Q(10)  19.1842173 3.798428e-02
##  Ljung-Box Test     R    Q(15)  28.5644060 1.829154e-02
##  Ljung-Box Test     R    Q(20)  34.9071114 2.060461e-02
##  Ljung-Box Test     R^2  Q(10)   9.8894011 4.502496e-01
##  Ljung-Box Test     R^2  Q(15)  15.5050283 4.156873e-01
##  Ljung-Box Test     R^2  Q(20)  17.0503117 6.497043e-01
##  LM Arch Test       R    TR^2   12.2695096 4.242850e-01
##
```

```
## Information Criterion Statistics:
##       AIC       BIC       SIC      HQIC
## -2.467931 -2.437163 -2.468019 -2.456076
```