Home-Work-for-BDIF

Homework 4

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Q1

```
library(rjson)
json_file = "http://crix.hu-berlin.de/data/crix.json"
json_data = fromJSON(file=json_file)
crix_data_frame <- as.data.frame(json_data)
w=crix_data_frame
dim(w)
n=dim(w)
a=seq(1,n[2],2)
b=seq(2,n[2],2)
data=t(w[1,a])
price=t(w[1,b])
#figure3
ts.plot(price)
#figure4
ret=diff(log(price))
ts.plot(ret)
```

```
#figure5
hist(ret, col = "grey", breaks = 40, freq = FALSE)
lines(density(ret), lwd = 2)
par(mfrow = c(1, 2))
# histogram of returns
hist(ret, col = "grey", breaks = 20, freq = FALSE, ylim =
c(0, 25), xlab = NA)
lines(density(ret), lwd = 2)
mu = mean(ret)
sigma = sd(ret)
x = seq(-4, 4, length = 100)
curve(dnorm(x, mean = mean(ret), sd = sd(ret)), add =
TRUE, col = "red",
      lwd = 2)
# qq-plot
qqnorm(ret)
qqline(ret, col = "blue", lwd = 3)
#figure6
library(forecast)
library(tseries)
Acf(ret)
```

Q1-Figures

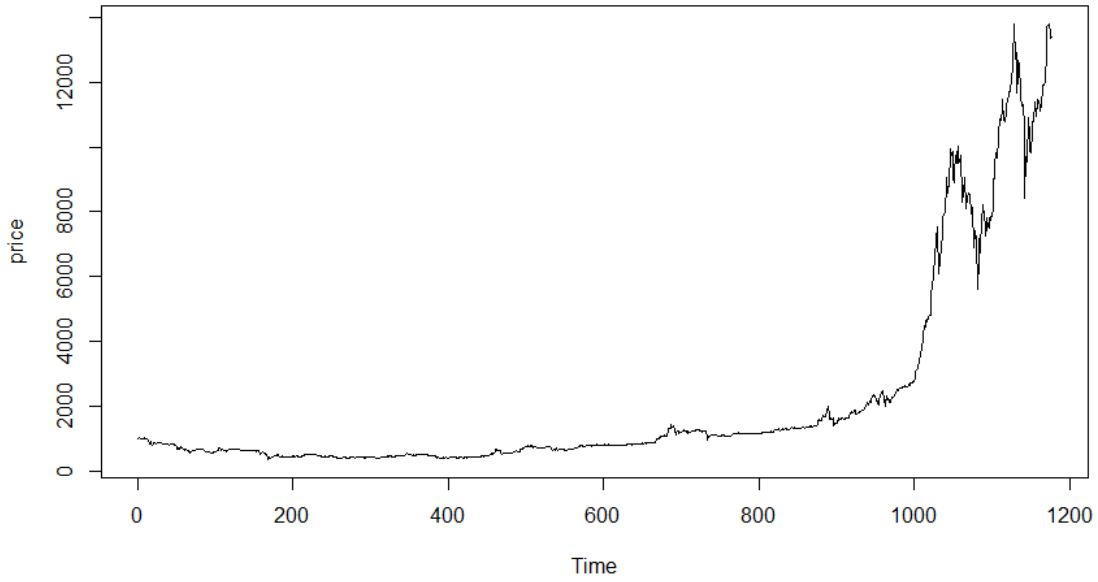

Figure 3

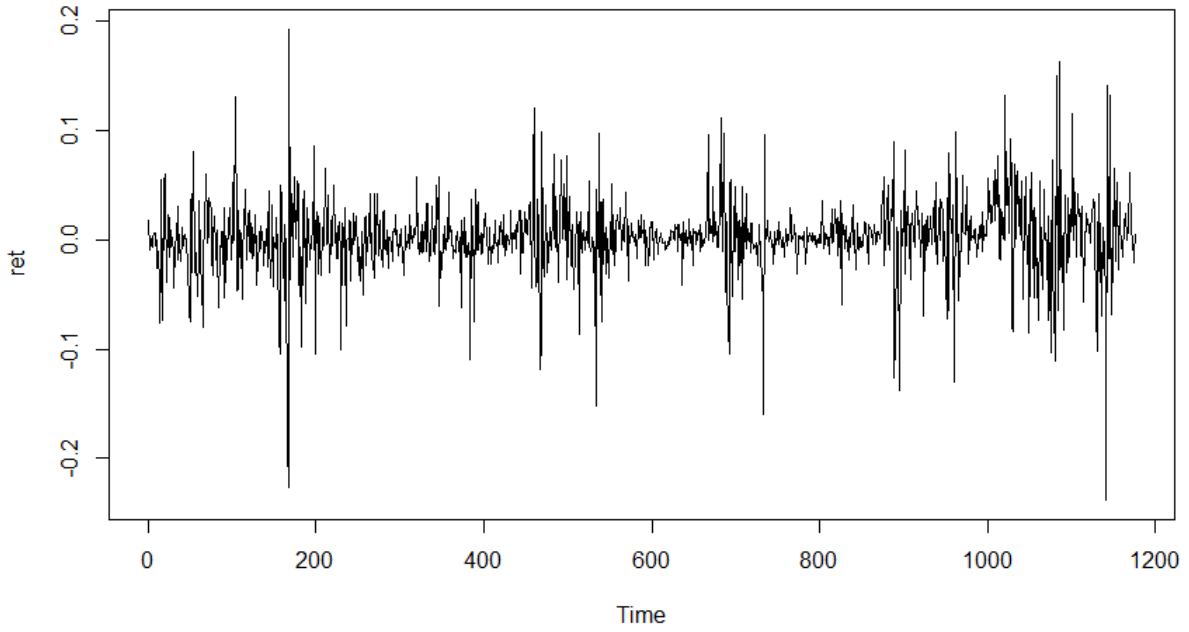

Figure 4

Q1-Figures

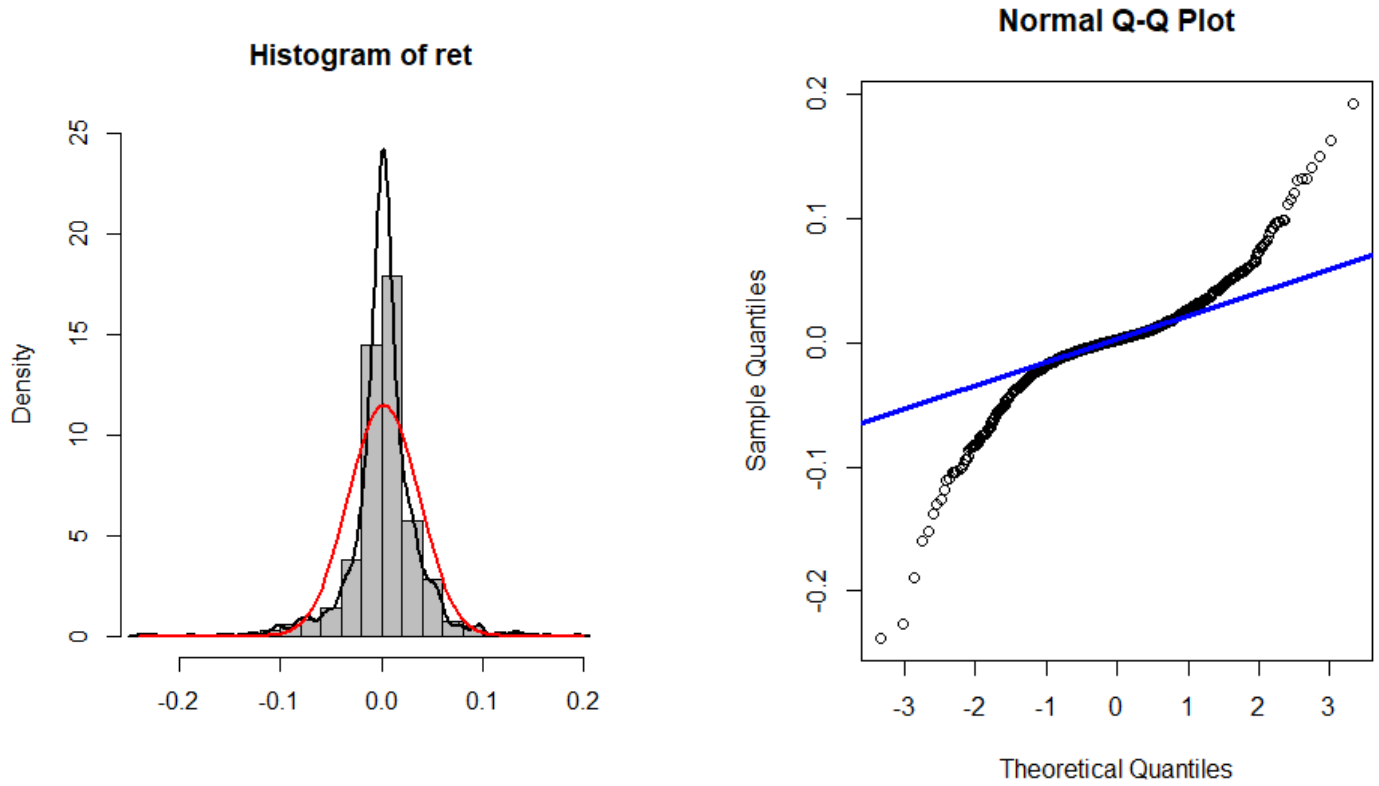

Figure 5

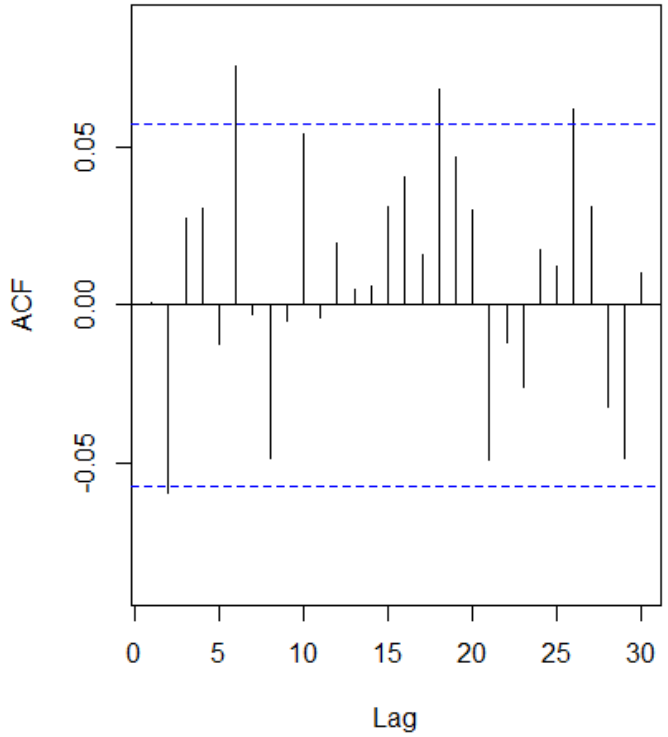

Figure 6

Q2

```
# install and load packages
libraries = c("zoo", "tseries")
lapply(libraries, function(x) if (!(x %in%
installed.packages())) {
  install.packages(x)
})
lapply(libraries, library, quietly = TRUE,
character.only = TRUE)
# d order
Box.test(ret, type = "Ljung-Box", lag = 20)
# stationary test
adf.test(ret, alternative = "stationary")
kpss.test(ret, null = "Trend")
par(mfrow = c(1, 2))
```

```
# acf plot
autocorr = acf(ret, lag.max = 20, ylab = "Sample
Autocorrelation", main = NA,
               lwd = 2, ylim = c(-0.3, 1))
# LB test of linear dependence
print(cbind(autocorr$lag, autocorr$acf))
Box.test(ret, type = "Ljung-Box", lag = 1, fitdf = 0)
Box.test(autocorr$acf, type = "Ljung-Box")
# plot of pacf
autopcorr = pacf(ret, lag.max = 20, ylab = "Sample
Partial Autocorrelation",
                 main = NA, ylim = c(-0.3, 0.3), lwd = 2)
print(cbind(autopcorr$lag, autopcorr$acf))
```

Q2

```
# arima model
par(mfrow = c(1, 1))
auto.arima(ret)
fit1 = arima(ret, order = c(1, 0, 1))
tsdiag(fit1)
Box.test(fit1$residuals, lag = 1)
# aic
aic = matrix(NA, 6, 6)
for (p in 0:4) {
  for (q in 0:3) {
    a.p.q = arima(ret, order = c(p, 0, q))
    aic.p.q = a.p.q$aic
    aic[p + 1, q + 1] = aic.p.q
  }
}
aic
```

```
# bic
bic = matrix(NA, 6, 6)
for (p in 0:4) {
  for (q in 0:3) {
    b.p.q = arima(ret, order = c(p, 0, q))
    bic.p.q = AIC(b.p.q, k = log(length(ret)))
    bic[p + 1, q + 1] = bic.p.q
  }
}
bic
# select p and q order of ARIMA model
fit4 = arima(ret, order = c(2, 0, 3))
tsdiag(fit4)
Box.test(fit4$residuals, lag = 1)

fitr4 = arima(ret, order = c(2, 1, 3))
tsdiag(fitr4)
Box.test(fitr4$residuals, lag = 1)
```

Q2

```
# to conclude, 202 is better than 213
fit202 = arima(ret, order = c(2, 0, 2))
tsdiag(fit202)
tsdiag(fit4)
tsdiag(fitr4)

AIC(fit202, k = log(length(ret)))
AIC(fit4, k = log(length(ret)))
AIC(fitr4, k = log(length(ret)))
fit202$aic
fit4$aic
fitr4$aic
```

```
# arima202 predict
fit202 = arima(ret, order = c(2, 0, 2))
crpre = predict(fit202, n.ahead = 30)

dates = seq(as.Date("02/08/2014", format =
"%d/%m/%Y"), by = "days", length = length(ret))

plot(ret, type = "l", xlim = c(0, 1200), ylab = "log return",
xlab = "days",
     lwd = 1.5)
lines(crpre$pred, col = "red", lwd = 3)
lines(crpre$pred + 2 * crpre$se, col = "red", lty = 3, lwd
= 3)
lines(crpre$pred - 2 * crpre$se, col = "red", lty = 3, lwd =
3)
```

Q2-figure

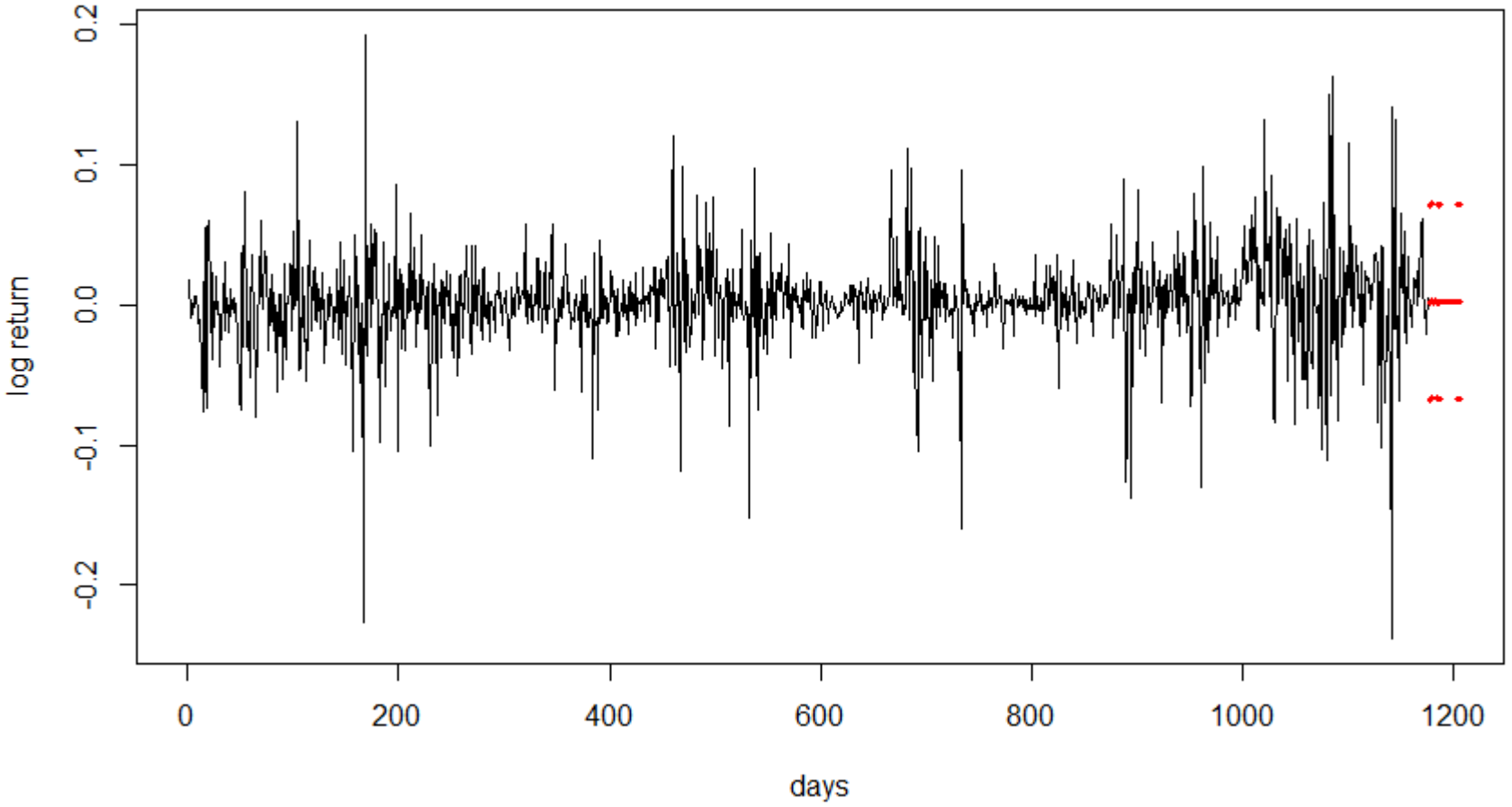

Figure 7

THANKS FOR WATCHING