HW 4

October 21, 2017

```
In [1]: library('rjson')
```

```
In [2]: json_file = "http://crix.hu-berlin.de/data/crix.json"
        json_data = fromJSON(file=json_file)
        crix_data_frame=as.data.frame(json_data)
```

```
In [3]: x=crix_data_frame
        dim(x)
```

1. 1 2. 2356

```
In [4]: n=dim(x)
        a=seq(1,n[2],2)
        b=seq(2,n[2],2)
```

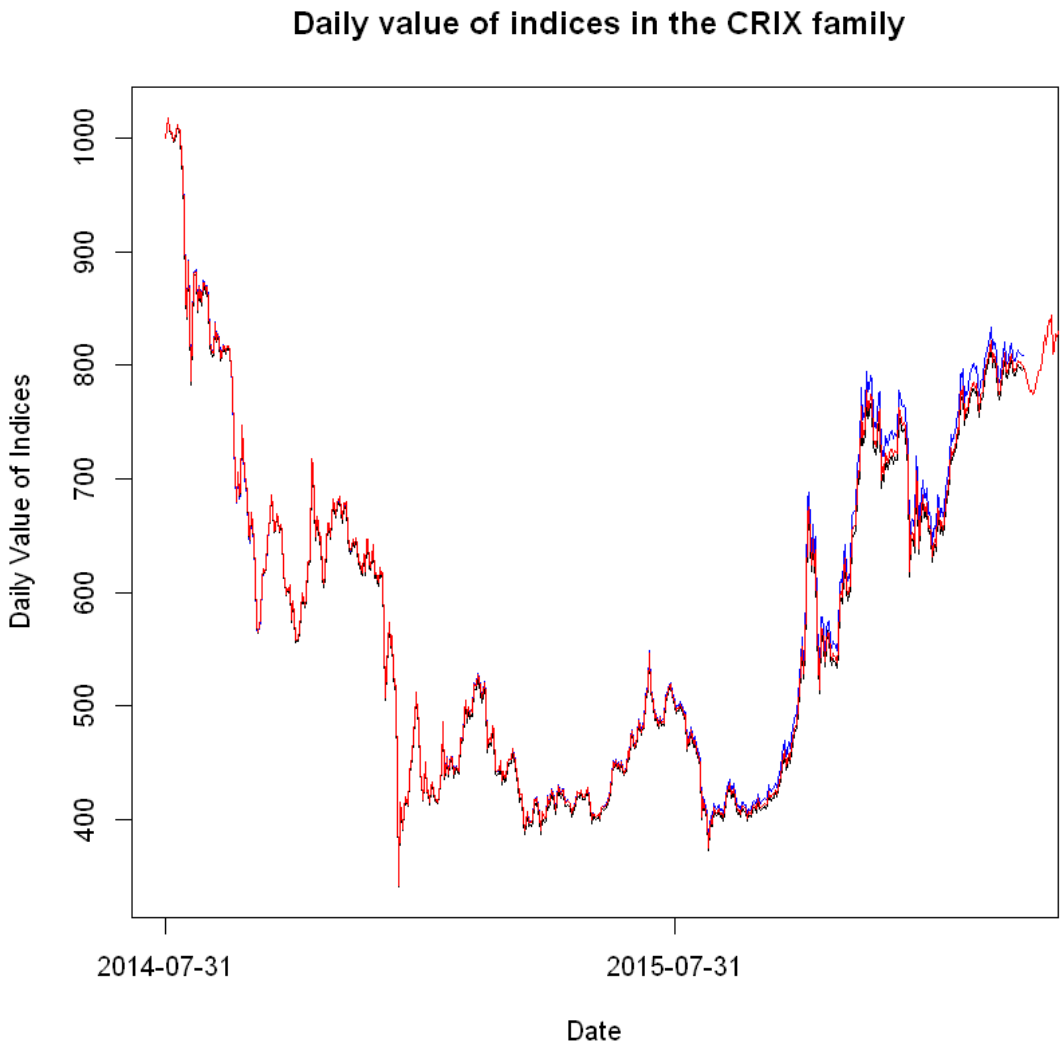
```
In [5]: date=t(x[1,a])
        price=t(x[1,b])
```

```
In [6]: crix=data.frame(date,price)
```

```
In [7]: load("ecrix.RData")
        load("efcrix.RData")
```

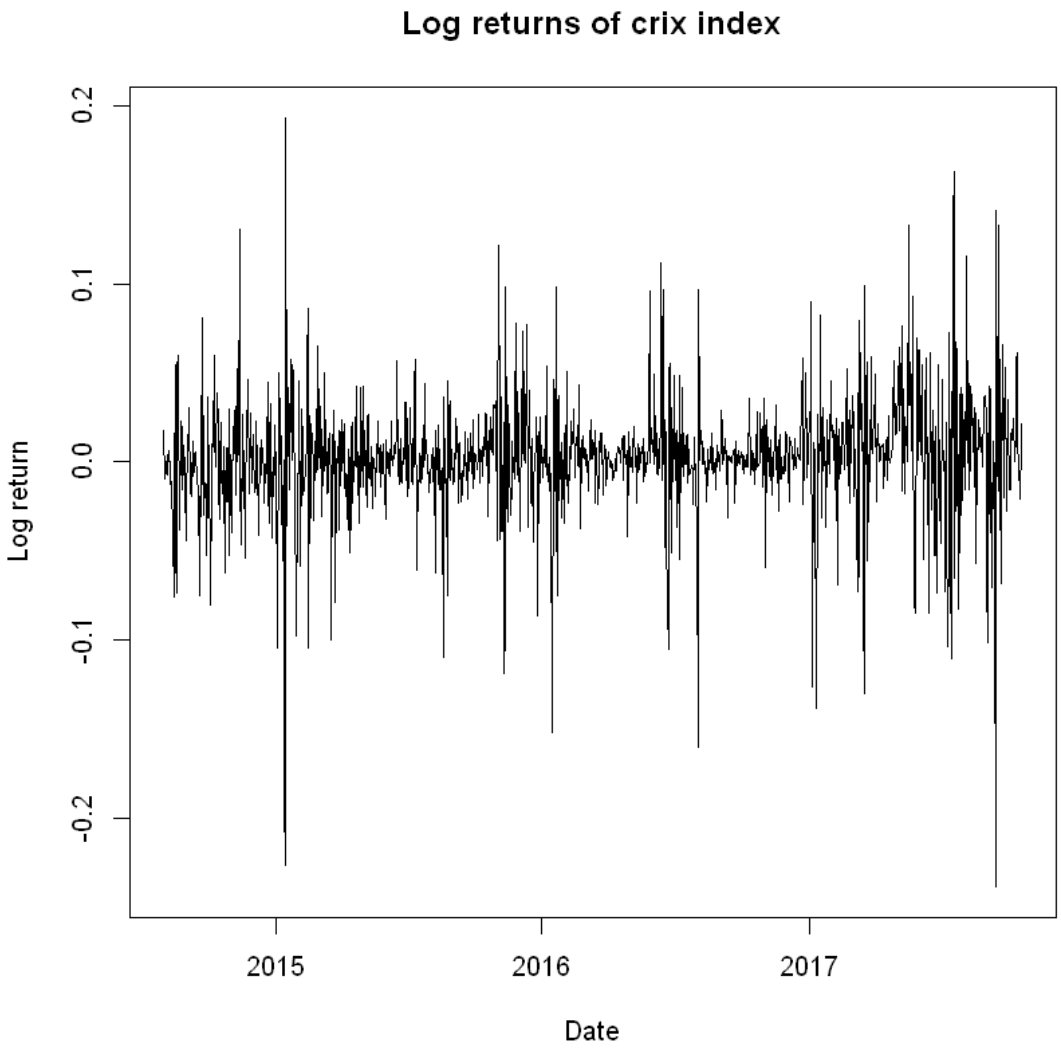
0.1 Figure3: Daily value of indices in the CRIX family

```
In [8]: plot(ecrix, type = "l", col = "blue", xaxt = "n",main = " Daily value of indices in th
        lines(efcrix, col = "black")
        lines(price, col = "red")
        lab=seq(1,n[2],365)
        axis(1, at = lab, label = names(ecrix)[lab])
```



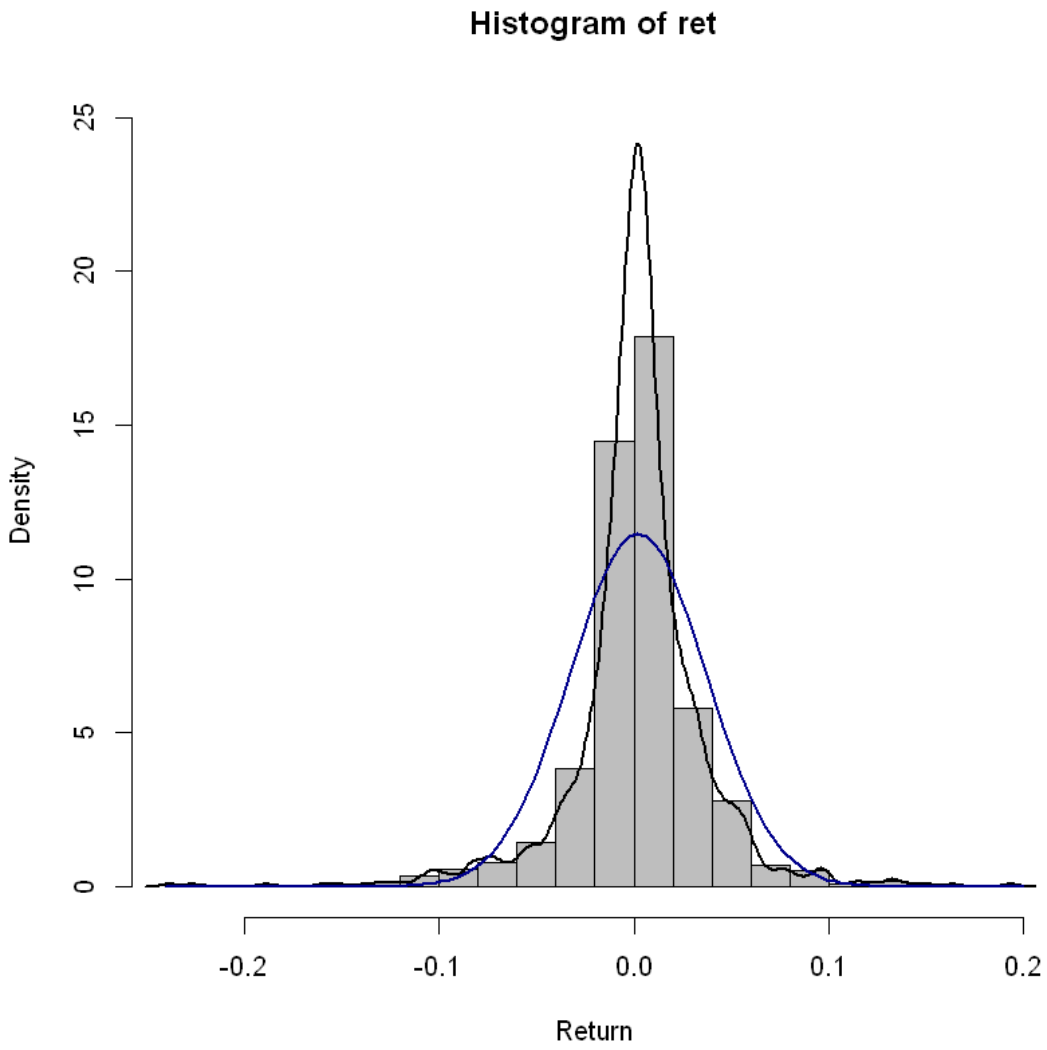
0.2 Figure 4: The log returns of CRIX index

```
In [9]: ret=diff(log(price))
        plot(ret~as.Date(date[-1]), type="l", col="black", xlab="Date", ylab="Log return", mai
```

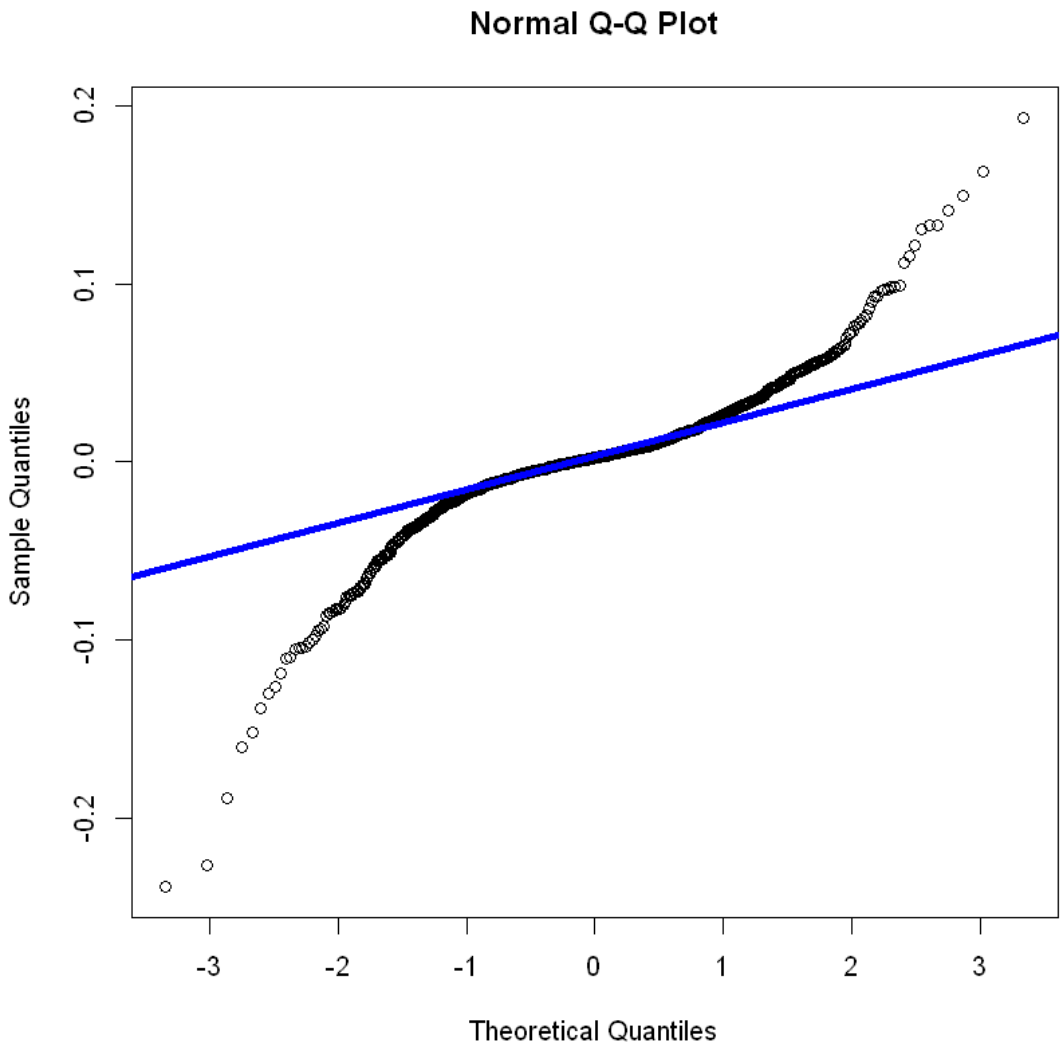


0.3 Figure 5: Histogram and QQ plot of CRIX returns

```
In [10]: hist(ret, col = "grey", breaks = 20, freq = FALSE, ylim = c(0, 25), xlab = "Return")
         lines(density(ret), lwd = 2)
         x = seq(-4, 4, length = 100)
         curve(dnorm(x, mean = mean(ret), sd = sd(ret)), add=TRUE, col = "darkblue", lwd = 2)
```

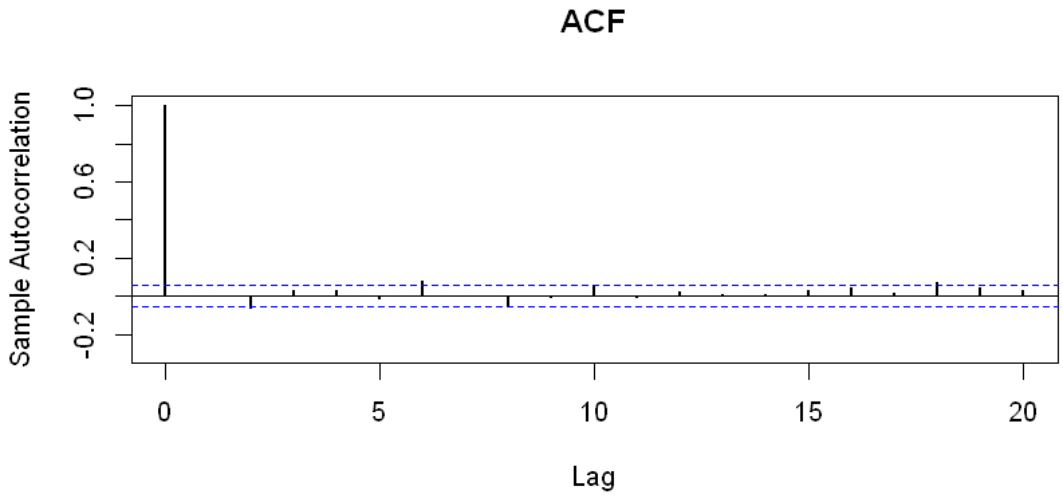


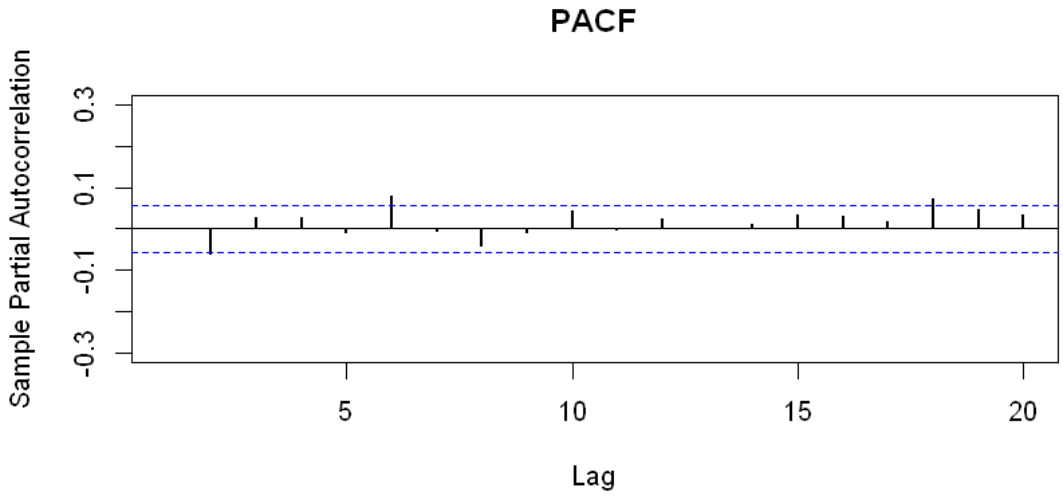

```
In [11]: qqnorm(ret)
         qqline(ret, col = "blue", lwd = 4)
```



0.4 Figure 6: The sample ACF and PACF of CRIX returns

```
In [13]: par(mfrow = c(2, 1))
         libraries = c("zoo", "tseries")
         autocorr = acf(ret, lag.max = 20, ylab = "Sample Autocorrelation",
                        main = "ACF" ,
                        lwd = 2, ylim = c(-0.3, 1))
         autopcorr = pacf(ret, lag.max = 20, ylab = "Sample Partial Autocorrelation",
                          main = "PACF" ,
                          ylim = c(-0.3, 0.3), lwd = 2)
```



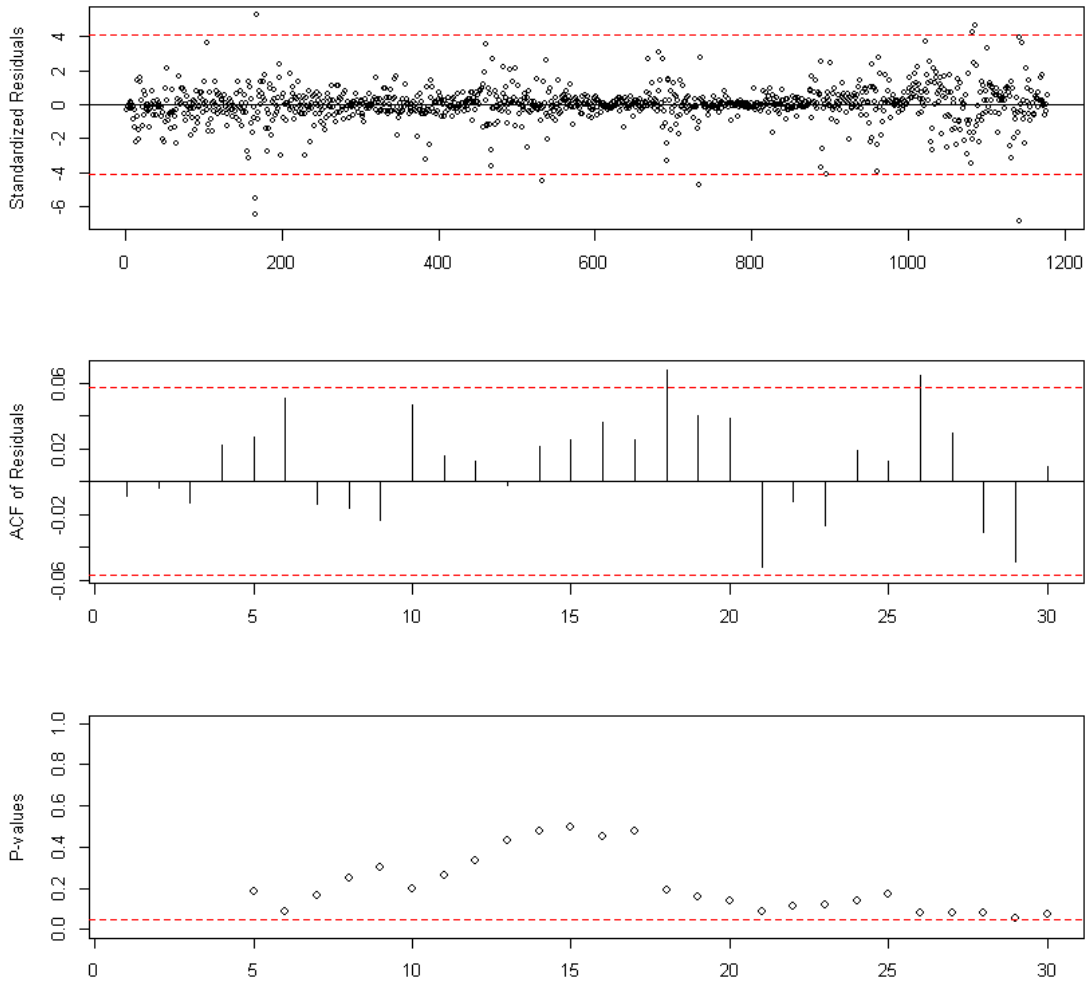


0.5 Figure 7:Diagnostic Checking

```
In [15]: library(TTR)
         library(TSA)
         library(caschrono)
         library(forecast)

In [16]: auto.arima(ret)

Series: ret
ARIMA(1,1,0) with drift

Coefficients:
```

```
          ar1  drift
      -0.4695  0e+00
s.e.   0.0257  9e-04

sigma^2 estimated as 0.001881:  log likelihood=2022.35
AIC=-4038.7   AICc=-4038.68   BIC=-4023.49
```

```
In [17]: fit = arima(ret, order = c(2, 0, 2))
         tsdiag(fit)
```




```
In [18]: par(mfrow = c(2, 1))
         crix_pre = predict(fit, n.ahead = 30)
```

```
#dates = seq(as.Date("31/07/2014", format = "%d/%m/%Y"), by = "days", length = length
plot(ret, type = "l", ylab = "Log return", xlab = "Date",
     lwd = 1, main = "CRIX returns and predicted values")
lines(crix_pre$pred, col = "red", lwd = 1)
lines(crix_pre$pred + 2 * crix_pre$se, col = "red", lty = 3, lwd = 1)
lines(crix_pre$pred - 2 * crix_pre$se, col = "red", lty = 3, lwd = 1)
```