Final

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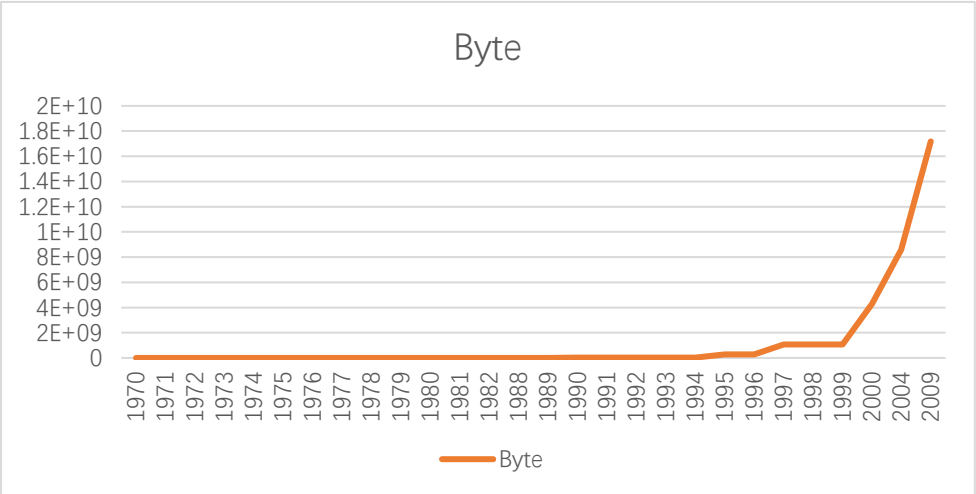
HW Unit 1

Q1. Calculate the i**ncrea**se of memory of PCs over the last 30 years and check whether the FMRI analysis could have been done 20 years ago.

year	Byte
1970	262144
1971	262144
1972	262144
1973	262144
1974	262144
1975	262144
1976	262144
1977	262144
1978	262144
1979	262144
1980	262144
1981	262144
1982	262144
1988	2097152
1989	2097152
1990	2097152
1991	16777216
1992	16777216
1993	16777216
1994	16777216
1995	16777216
1996	2.68E+08
1997	2.68E+08
1998	1.07E+09
1999	1.07E+09
2000	1.07E+09
2004	4.29E+09
2009	8.59E+09
2014	1.72E+10



2. prepare 2-5 slides explaining logistic regression

Logistic regression

Logistic regression is a regression model where the dependent variable (DV) is categorical, where a categorical variable is a variable that can take on one of a limited, and usually fixed, number of possible values,

Logistic regression VS multiple linear regression

- There are many similarities between logistic regression and multiple linear regression, the biggest difference is that their dependent variables are different, and the others are almost the same.
- If the dependent variable is continuous, that is, multiple linear regression, if it is the two distribution, that is the logistic regression.

3. I have done that and my account is Bingren Sun026.

HW Unit 2

1. memory.df = read.csv("byte.csv",header = TRUE)

plot(memory.df$Byte~memory.df$year,type="o",main="The development of internal memory")

2. splines.reg.l1 = smooth.spline(x = memory.df$year, y = memory.df$Byte, spar = 0.2)

splines.reg.l2 = smooth.spline(x = memory.df$year, y = memory.df$Byte, spar = 1)

splines.reg.l3= smooth.spline(x = memory.df$year, y = memory.df$Byte, spar = 2)

lines(splines.reg.l1, col = "green", lwd = 2)

lines(splines.reg.l2, col = "pink", lwd = 2)

lines(splines.reg.l3, col = "blue", lwd = 2)

3. lambda=4

x=6

dpois(x,lambda)

lambda=5

x=0

dpois(x,lambda)

HW Unit 3

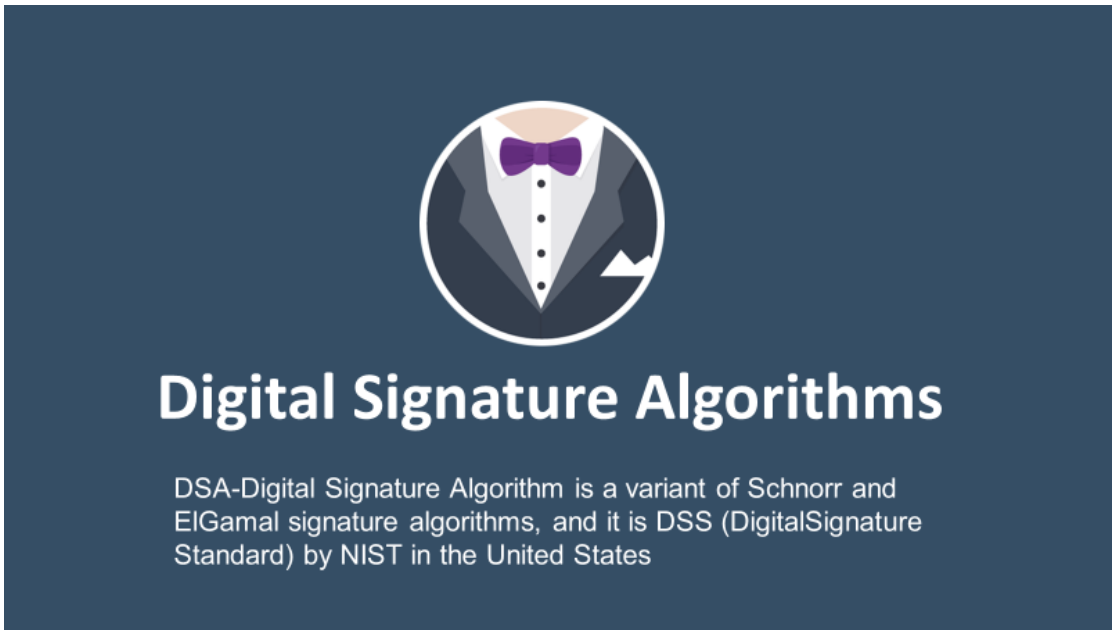
1. #install.packages("digest",repos='http://cran.us.r-project.org')

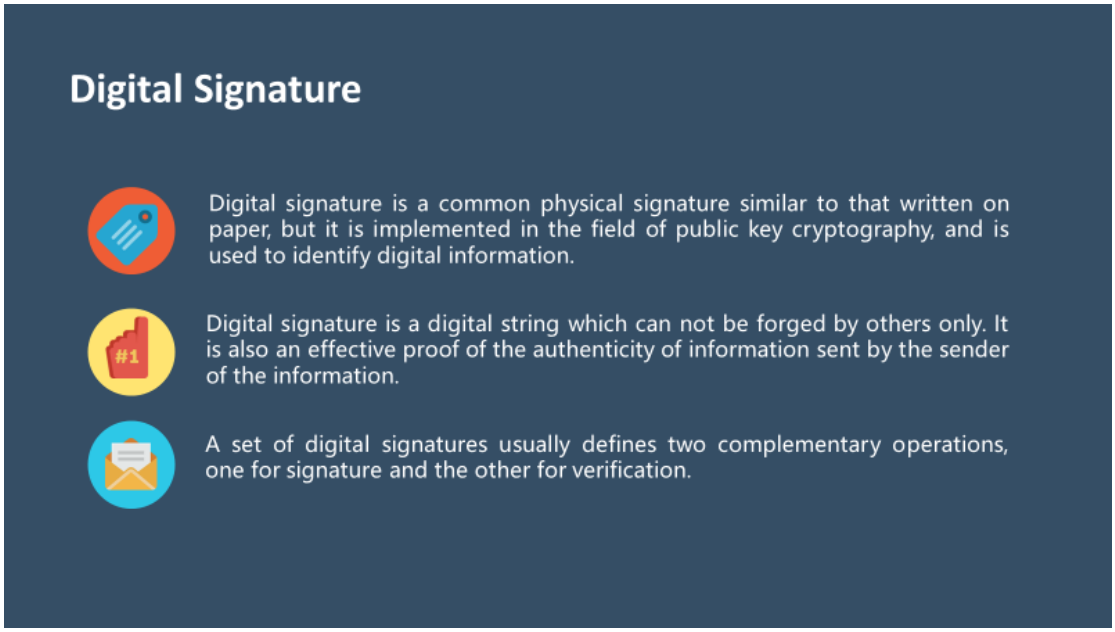
library(digest)

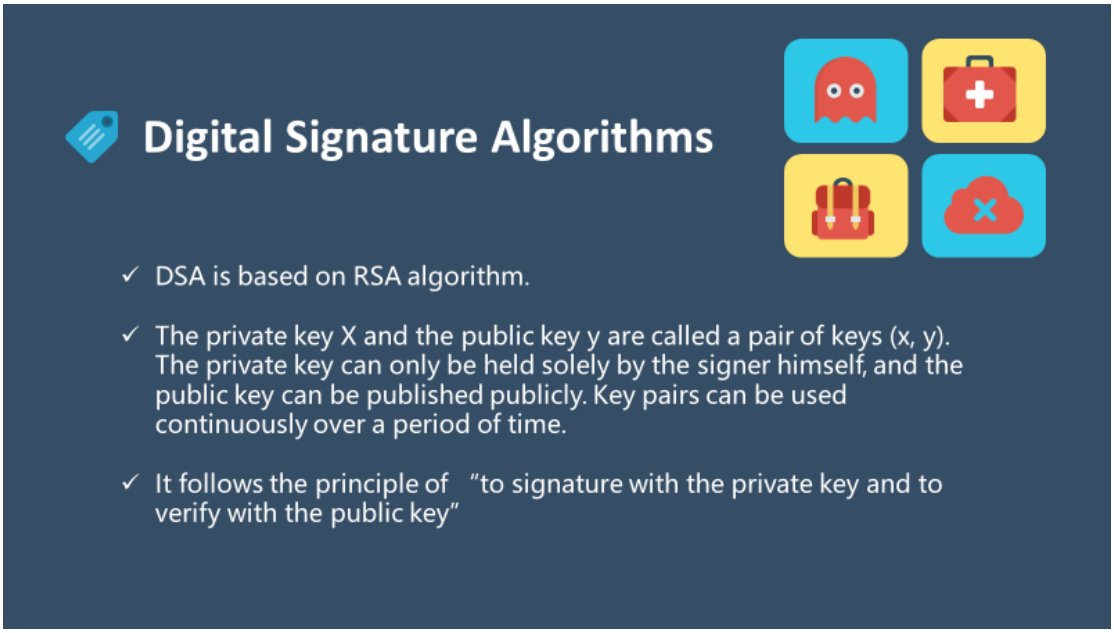
digest("I learn a lot from this class when I am proper listening to the professor","sha256")

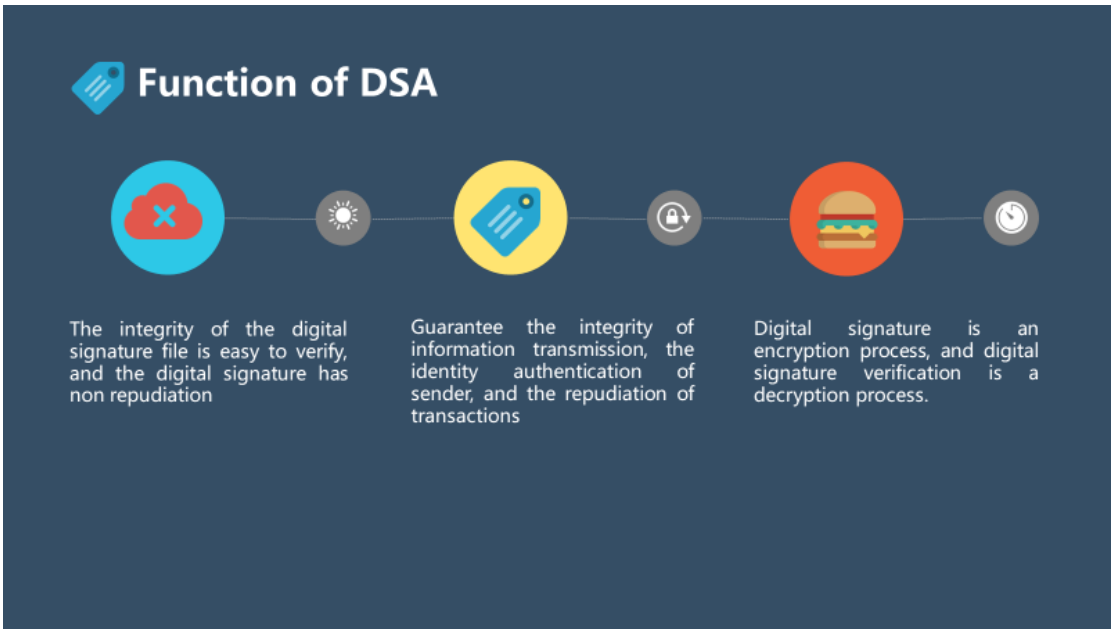
digest("I do not learn a lot from this class when I am absent and playing on my Iphone","sha256")

2. Make 3-5 slides (in PPTX) on the DSA (Digital Signature Algorithms)









3. library(rjson)

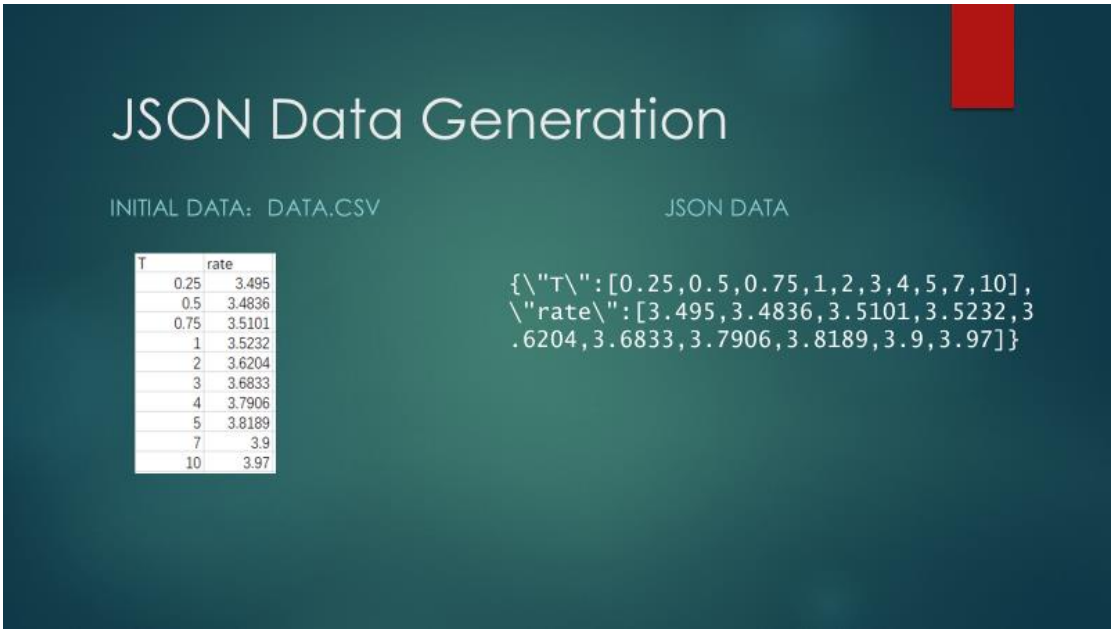
   library(readr)

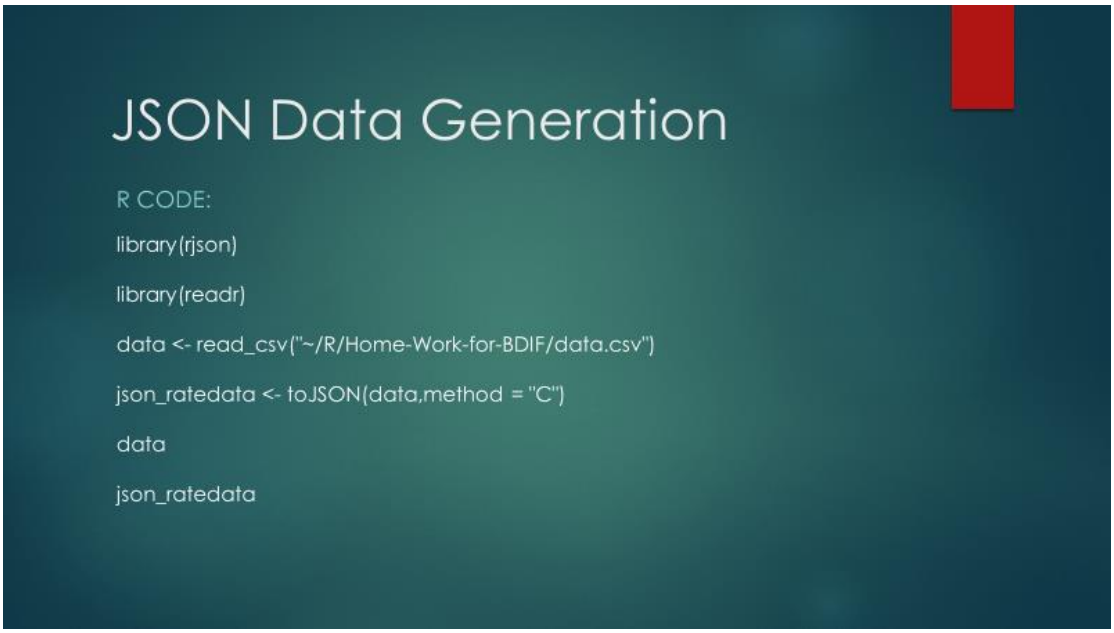
   data <- read_csv("~/R/Home-Work-for-BDIF/data.csv")

   json_ratedata <- toJSON(data,method = "C")

   data

   json_ratedata





4. #install.packages("rjson", repos="http://cran.us.r-project.org")

   library(rjson)

   json_file = "http://crix.hu-berlin.de/data/crix.json"

   json_data = fromJSON(file=json_file)

   crix <- Reduce(rbind,json_data)

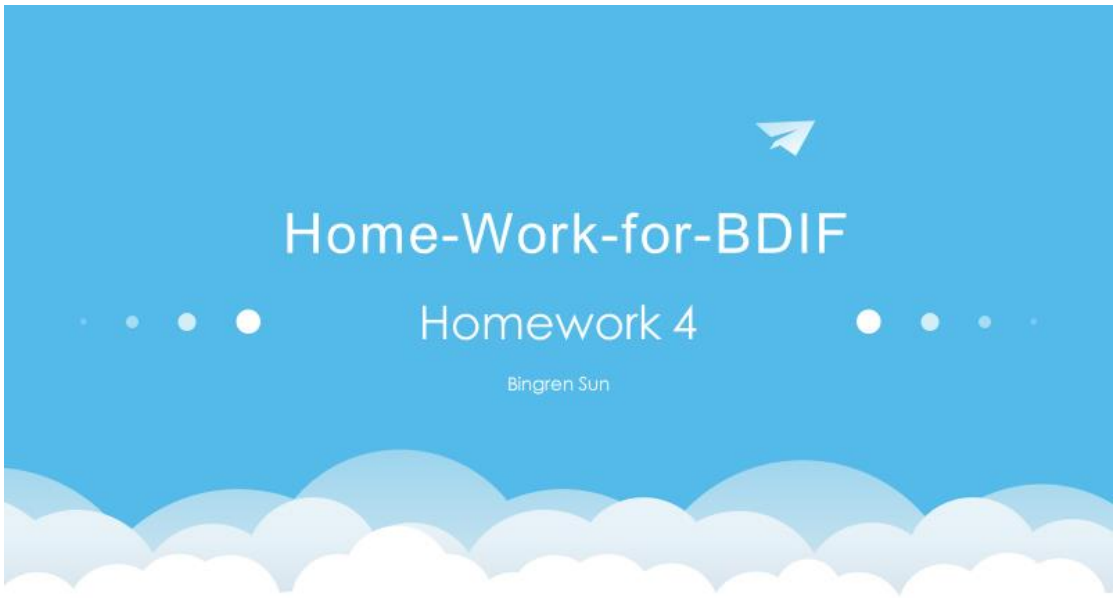
   crix_data_frame <- as.data.frame(crix)

   lst <- lapply(json_data,function(x){

   df<-data.frame(date=x$date,price=x$price)

```
return(df)
        })
 crix_data_frame <- Reduce(rbind,lst)
 plot(crix_data_frame$date,crix_data_frame$price)
 #library(forecast)
 #library(tseries)
 plot(crix_data_frame)
```

HW Unit 4



Q1-Figures

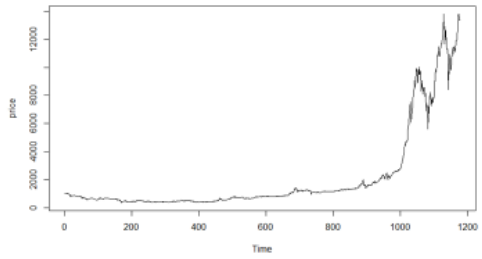


Figure 3

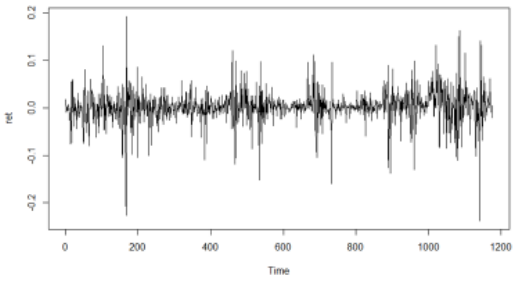
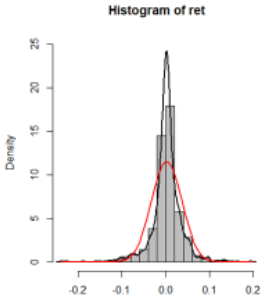


Figure 4

Q1-Figures



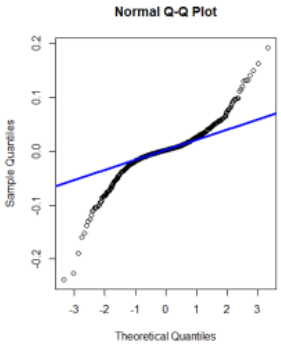


Figure 5

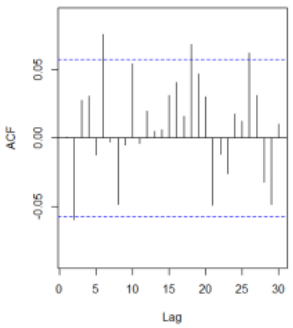


Figure 6

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

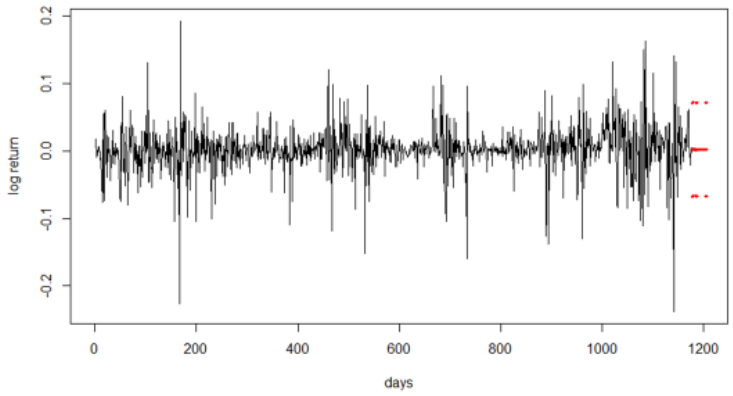
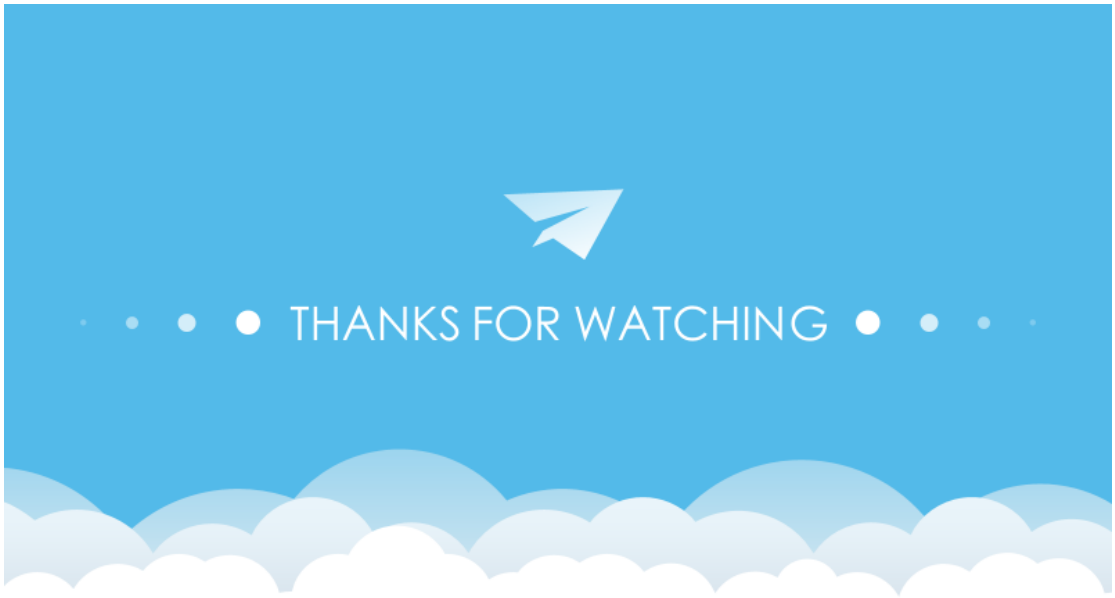


Figure 7



Question1

```
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)

      Question2
      #rm(list = ls(all = TRUE))
      #graphics.off()
      # 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$acf))
# arima model
par(mfrow = c(1, 1))
auto.arima(ret)
fit1 = arima(ret, order = c(1, 0, 1))
tsdiag(fit1)
Box.test(fit1$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)
# 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)
```

HW5

Q1

```
rm(list = ls())
#install.packages("RCurl")
#install.packages("XML")
library(RCurl)
library(XML)
url1  =
"http://shakespeare.mit.edu/romeo_juliet/full.ht
ml"
url2  =
"http://shakespeare.mit.edu/julius_caesar/full.ht
ml"
url3  =
"http://shakespeare.mit.edu/hamlet/full.html"
html1 = readLines(url1, encoding = "UTF-8")
html2 = readLines(url2, encoding = "UTF-8")
html3 = readLines(url3, encoding = "UTF-8")
html1 = htmlParse(html1, encoding = "UTF-8")
html2 = htmlParse(html2, encoding = "UTF-8")
html3 = htmlParse(html3, encoding = "UTF-8")
```

```
#install.packages("bitops")
#install.packages("stringr")
library(bitops)
library(stringr)
abs1   = lapply(url1, FUN = function(x) htmlParse(x,
encoding = "Latin-1"))
abs2   = lapply(url2, FUN = function(x) htmlParse(x,
encoding = "Latin-1"))
abs3   = lapply(url3, FUN = function(x) htmlParse(x,
encoding = "Latin-1"))
clean_txt = function(x) {
 cleantxt = xpathApply(x, "//body//text()
            [not(ancestor :: script)][ not(ancestor ::
style)]
            [not(ancestor :: noscript)] " ,xmlValue)
 cleantxt = paste(cleantxt, collapse="\n")
 cleantxt = str_replace_all(cleantxt, "\n", " ")
 cleantxt = str_replace_all(cleantxt, "\r", "")
 cleantxt = str_replace_all(cleantxt, "\t", "")
 cleantxt = str_replace_all(cleantxt, "<br>", "")
 return(cleantxt)
}
```

Q1

```
cleantxt1 = lapply(abs1,clean_txt)
cleantxt2 = lapply(abs2,clean_txt)
cleantxt3 = lapply(abs3,clean_txt)
vec_abs1 = unlist(cleantxt1)
vec_abs2 = unlist(cleantxt2)
vec_abs3 = unlist(cleantxt3)

###Text Mining
install.packages("tm")
install.packages("SnowballC")
library(tm)
library(SnowballC)
abs1     = Corpus(VectorSource(vec_abs1))
abs2     = Corpus(VectorSource(vec_abs2))
abs3     = Corpus(VectorSource(vec_abs3))
```

```
abs_dtm1  = DocumentTermMatrix(abs1, control = list(
 stemming = TRUE, stopwords = TRUE, minWordLength
= 3,
 removeNumbers = TRUE, removePunctuation = TRUE))
abs_dtm2  = DocumentTermMatrix(abs2, control = list(
 stemming = TRUE, stopwords = TRUE, minWordLength
= 3,
 removeNumbers = TRUE, removePunctuation = TRUE))
abs_dtm3  = DocumentTermMatrix(abs3, control = list(
 stemming = TRUE, stopwords = TRUE, minWordLength
= 3,
 removeNumbers = TRUE, removePunctuation = TRUE))
##WordCloud
instal.packages("ggplot2")
install.packages("wordcloud")
library(ggplot2)
library(wordcloud)
freq1 = colSums(as.matrix(abs_dtm1))
freq2 = colSums(as.matrix(abs_dtm2))
freq3 = colSums(as.matrix(abs_dtm3))
wf1   = data.frame(word=names(freq1), freq=freq1)
wf2   = data.frame(word=names(freq2), freq=freq2)
wf3   = data.frame(word=names(freq3), freq=freq3)
```

Q1

```
#Romeo and Juliet
plot1 = ggplot(subset(wf1, freq>15), aes(word, freq1))
plot1 = plot1 + geom_bar(stat="identity")
plot1 = plot1 +
theme(axis.text.x=element_text(angle=45, hjust=1))
plot1
freq1  = colSums(as.matrix(abs_dtm1))
dark2_1 = brewer.pal(6, "Dark2")
wordcloud(names(freq1), freq1, max.words=100, rot.per=0.2, colors=dark2_1)
#Julius Caeser
plot2 = ggplot(subset(wf2, freq>15), aes(word, freq2))
plot2 = plot2 + geom_bar(stat="identity")
plot2 = plot2 +
theme(axis.text.x=element_text(angle=45, hjust=1))
plot2
freq2  = colSums(as.matrix(abs_dtm2))
dark2_2 = brewer.pal(6, "Dark2")
wordcloud(names(freq2), freq2, max.words=100, rot.per=0.2, colors=dark2_2)
#Hamlet
plot3 = ggplot(subset(wf3, freq>15), aes(word, freq3))
plot3 = plot3 + geom_bar(stat="identity")
plot3 = plot3 +
theme(axis.text.x=element_text(angle=45, hjust=1))
plot3
freq3  = colSums(as.matrix(abs_dtm3))
dark2_3 = brewer.pal(6, "Dark2")
wordcloud(names(freq3), freq3, max.words=100, rot.per=0.2, colors=dark2_3)
```

Q1-Figures

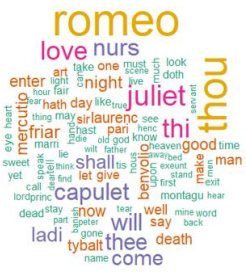


Figure 1

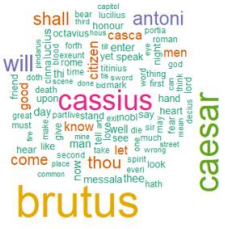


Figure 2

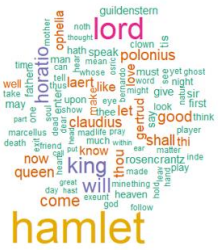


Figure 3

Q2

```
#Romeo and Juliet
wf1 <- wf1[order(-wf1$freq),]
wf1 <- wf1[c(1:20),]
p1 = ggplot(subset(wf1, freq > 15), aes(word, freq))
p1 = p1 + geom_bar(stat = "identity")
p1 = p1 + theme(axis.text.x = element_text(angle
= 45, hjust = 1))
p1
#Julius Caeser
wf2 <- wf2[order(-wf2$freq),]
wf2 <- wf2[c(1:20),]
p2 = ggplot(subset(wf2, freq > 15), aes(word, freq))
p2 = p2 + geom_bar(stat = "identity")
p2 = p2 + theme(axis.text.x = element_text(angle
= 45, hjust = 1))
p2
```

```
#Hamlet
wf3 <- wf3[order(-wf3$freq),]
wf3 <- wf3[c(1:20),]
p3 = ggplot(subset(wf3, freq > 15), aes(word, freq))
p3 = p3 + geom_bar(stat = "identity")
p3 = p3 + theme(axis.text.x = element_text(angle = 45,
hjust = 1))
p3
```

Q2-Figures

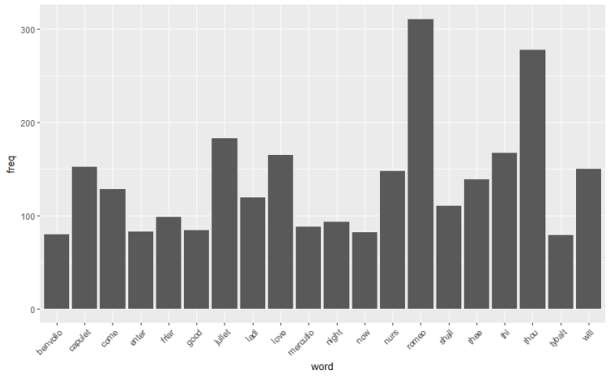


Figure 4

Q2-figure

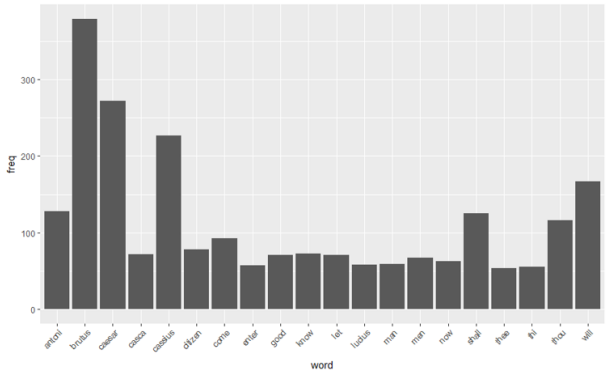


Figure 5

Q2-figure

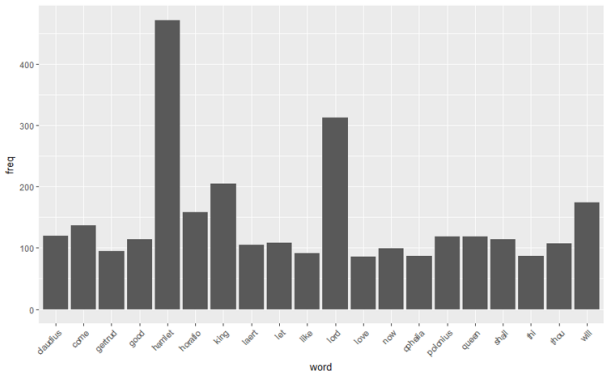


Figure 6


THANKS FOR WATCHING