Assignment 1

QUESTION 1

Calculate continuous daily excess returns of SP500 ("^GSPC") for the period from 1/1/2014 until 12/31/2014 using overnight Fed Funds rates as risk-free rates.

```
data <- read.csv(file='SP500_NB2014.csv')
#head(data)
Excess.return <- ((data$SP500Returns - data$RIFSPFF_N.B) / 360 / 100)
head(Excess.return)
```

```
## [1] -2.231473e-06 -2.292081e-06 -1.776018e-06 -1.950340e-06 -1.934771e-06
## [6] -1.880444e-06
```

QUESTION 2

Calculate daily log returns of both exchange rates

```
library(quantmod)
```

```
## Loading required package: xts
```

```
## Loading required package: zoo
```

```
##
## Attaching package: 'zoo'
```

```
## The following objects are masked from 'package:base':
##
##     as.Date, as.Date.numeric
```

```
## Loading required package: TTR
```

```
## Registered S3 method overwritten by 'quantmod':
##   method            from
##   as.zoo.data.frame zoo
```

```
library(xts)
library(zoo)

getFX("USD/JPY", src="oanda")
```

```
## [1] "USD/JPY"
```

```r
getFX("GBP/USD", src="oanda")
```

```
## [1] "GBP/USD"
```

```r
head(USDJPY, 15)
```

```
##             USD.JPY
## 2021-07-25 110.5486
## 2021-07-26 110.3337
## 2021-07-27 109.9763
## 2021-07-28 109.9497
## 2021-07-29 109.6742
## 2021-07-30 109.6321
## 2021-07-31 109.6935
## 2021-08-01 109.6956
## 2021-08-02 109.4889
## 2021-08-03 109.1262
## 2021-08-04 109.2294
## 2021-08-05 109.6726
## 2021-08-06 110.0171
## 2021-08-07 110.2365
## 2021-08-08 110.2392
```

```r
head(GBPUSD, 15)
```

```
##             GBP.USD
## 2021-07-25 1.375358
## 2021-07-26 1.378898
## 2021-07-27 1.383807
## 2021-07-28 1.388290
## 2021-07-29 1.395064
## 2021-07-30 1.393455
## 2021-07-31 1.390170
## 2021-08-01 1.390130
## 2021-08-02 1.389882
## 2021-08-03 1.390786
## 2021-08-04 1.391539
## 2021-08-05 1.391496
## 2021-08-06 1.389879
## 2021-08-07 1.387290
## 2021-08-08 1.387261
```

```r
USDJPY.rtn <- diff(log(USDJPY$USD.JPY)) # Compute log returns USDJPY
head(USDJPY.rtn)
```

```
##                  USD.JPY
## 2021-07-25            NA
## 2021-07-26 -0.0019459055
## 2021-07-27 -0.0032447945
## 2021-07-28 -0.0002412811
## 2021-07-29 -0.0025091538
## 2021-07-30 -0.0003837828
```

```
GBPUSD.rtn <- diff(log(GBPUSD$GBP.USD)) # Compute log returns GBPUSD
head(GBPUSD.rtn)
```

```
##                 GBP.USD
## 2021-07-25           NA
## 2021-07-26  0.002570569
## 2021-07-27  0.003553767
## 2021-07-28  0.003234377
## 2021-07-29  0.004867518
## 2021-07-30 -0.001154018
```

Calculate sample min, mean, sd, skewness, kurtosis, max of log returns for both exchange rates

```
library (fBasics)
```

```
## Loading required package: timeDate
```

```
## Loading required package: timeSeries
```

```
##
## Attaching package: 'timeSeries'
```

```
## The following object is masked from 'package:zoo':
##
##     time<-
```

```
##
## Attaching package: 'fBasics'
```

```
## The following object is masked from 'package:TTR':
##
##     volatility
```

```
library(timeDate)
library(timeSeries)
dataPath <- "~/UChicago/Q2/Financial_Analytics/"
data1 <- read.table(paste(dataPath,'USDJPY.csv',sep = '/'), header=TRUE)
data2 <- read.table(paste(dataPath,'GBPUSD.csv',sep = '/'), header=TRUE)
#head(data1)
#head(data2)

dat1 <- data1$X..USD.JPY. <- as.numeric(gsub(",","",data1$X..USD.JPY.))
#head(data1)
dat2 <- data2$X..GBP.USD. <- as.numeric(gsub(",","",data2$X..GBP.USD.))
#head(data2)

basicStats(dat1)
```

```
##                     dat1
## nobs          179.000000
```

```
## NAs             0.000000
## Minimum       108.460250
## Maximum       117.684000
## 1. Quartile   111.142022
## 3. Quartile   113.698852
## Mean          112.403838
## Median        112.220245
## Sum         20120.287085
## SE Mean         0.147323
## LCL Mean      112.113115
## UCL Mean      112.694562
## Variance        3.885004
## Stdev           1.971041
## Skewness        0.362620
## Kurtosis       -0.181865
```

```
basicStats(dat2)
```

```
##                   dat2
## nobs        179.000000
## NAs           0.000000
## Minimum       1.205040
## Maximum       1.303520
## 1. Quartile   1.240425
## 3. Quartile   1.280980
## Mean          1.258194
## Median        1.252550
## Sum         225.216690
## SE Mean       0.001887
## LCL Mean      1.254470
## UCL Mean      1.261918
## Variance      0.000637
## Stdev         0.025248
## Skewness      0.065878
## Kurtosis     -1.152987
```

Test hypothesis H0:=0 against alternative H0:0

```
t.test(dat1)
```

```
##
##  One Sample t-test
##
## data:  dat1
## t = 762.98, df = 178, p-value < 2.2e-16
## alternative hypothesis: true mean is not equal to 0
## 95 percent confidence interval:
##  112.1131 112.6946
## sample estimates:
## mean of x
##  112.4038
```

```
t.test(dat2)
```

```
##
##  One Sample t-test
##
## data:  dat2
## t = 666.73, df = 178, p-value < 2.2e-16
## alternative hypothesis: true mean is not equal to 0
## 95 percent confidence interval:
##  1.254470 1.261918
## sample estimates:
## mean of x
##  1.258194
```

Since pvalue $< 5\%$ for both USDJPY (dat1) and GBPUSD (dat2) we reject the null hypothesis that there's no difference between the means and conclude that a significant difference does exist