THE UNIVERSITY OF CHICAGO
Graduate School of Business
Business 41202, Spring Quarter 2007, Mr. Ruey S. Tsay

Solutions to Homework Assignment #1

Answers to Assignment:

1. I used R to perform the analysis. The commands used are given below:

```
> setwd("C:/teaching/bs41202")
> library(fSeries)
> da=read.table("d-cmesp0406.txt")
> cme1=da[,2]*100  <== Compute percentage simple returns
> cme2=log(da[,2]+1)*100 <== Compute percentage log returns
> basicStats(cme1)
nobs                    755.000
Minimum                 -10.723
Maximum                  12.897
Mean                      0.285
LCL Mean                  0.130
UCL Mean                  0.440
Stdev                     2.171
Skewness                  0.354
Kurtosis                  3.556
> basicStats(cme2)
nobs                    755.000
Minimum                 -11.343
Maximum                  12.131
Mean                      0.261
LCL Mean                  0.107
UCL Mean                  0.416
Stdev                     2.160
Skewness                  0.178
Kurtosis                  3.518
> x=da[,2]-da[,3] <== Compute excess return of CME over SP500 index
> basicStats(x)
nobs                    755.000
Minimum                  -0.114
Maximum                   0.130
Mean                      0.003
LCL Mean                  0.001
UCL Mean                  0.004
Stdev                     0.020
Skewness                  0.488
Kurtosis                  5.437
```

- From the basic statistics, we obtain the following summaries:

rtn	mean	s.d.	skewness	ex. kurt.	min.	max.
simple	0.29	2.17	0.35	3.56	-10.72	12.90
log	0.26	2.16	0.18	3.52	-11.34	12.13

- Since the 95% confidence interval for the sample mean does not contain zero, the mean is significantly greater than zero at the 5% level.
- To answer this question, we can consider the *excess return* of CME over the S&P 500 index. The 95% confidence interval of this excess return does not contain zero. Consequently, the mean of CME simple return exceeds that of S&P 500 index at the 5% level.

2. The commands used are given below. The output is edited to simplify the handout.

```
> da=read.table("m-aigvwewsp8006.txt")
> aig=log(da[,2]+1)*100
> vw=log(da[,3]+1)*100
> ew=log(da[,4]+1)*100
> sp=log(da[,5]+1)*100
> basicStats(aig)

nobs                   324.000
Minimum                -26.272
Maximum                 21.409
Mean                     1.267
Stdev                    6.630
Skewness                -0.317
Kurtosis                 1.023
> basicStats(vw)
Minimum                -25.533
Maximum                 12.087
Mean                     1.011
Stdev                    4.440
Skewness                -1.075
Kurtosis                 4.213
> basicStats(ew)
Minimum                -31.780
Maximum                 20.292
Mean                     1.135
Stdev                    5.333
Skewness                -1.028
Kurtosis                 5.380
> basicStats(sp)
Minimum                -24.543
Maximum                 12.378
```

```
Mean                      0.795
Stdev                     4.326
Skewness                 -0.899
Kurtosis                  3.721
```

3. The commands used are

```
> da=read.table("w-tb3ms07.txt")
> y=da[,4]
> basicStats(y)
nobs                   2776.000
Minimum                   0.580
Maximum                  16.760
Mean                      5.175
Stdev                     2.806
Skewness                  1.104
Kurtosis                  1.826
> x=diff(y)                  <== Change series
> basicStats(x)
Mean                      0.0013
Stdev                     0.1999
Skewness                 -0.6802
Kurtosis                 22.7336
> m1=density(x)
> plot(m1$x,m1$y,type='l')  <== Plot the density.
> t=-0.68/sqrt(6/2775)   <== Skewness test
> t
[1] -14.62395 <== Compare with N(0,1) distribution, this is highly significant.
```

4. The results are given below:

```
> tt=0.18/sqrt(6/755) <== Test statistic for skewness
> tt
[1] 2.019158
> p=(1-pnorm(tt))*2 <== Compute p-value
> p
[1] 0.04347078
> tk=3.56/sqrt(24/755) <== Test statistics for kurtosis
> tk
[1] 19.96723  <== Highly significant
> jbTest(cme2)

Title:
 Jarque - Bera Normality Test
```

```
Test Results:
  PARAMETER:
    Sample Size: 755
  STATISTIC:
    LM: 397.094
    ALM: 406.809
  P VALUE:
    LM p-value: < 2.2e-16
    ALM p-value: < 2.2e-16
    Asymptotic: < 2.2e-16
```

Based on the above results, we reject the null hypothesis at the 5% level for each test.

5. Again, the results are given below

```
> da=read.table("d-exjpus.txt")
> jp=da[,4]
> da=read.table("d-exuseu.txt")
> eu=da[,4]

> jp=log(jp)
> eu=log(eu)
> jp1=diff(jp)  <== Compute log return
> eu1=diff(eu)

> basicStats(jp1)
nobs                   2064.000
Minimum                  -0.029
Maximum                   0.032
Mean                      0.000
Stdev                     0.006
Skewness                 -0.236
Kurtosis                  2.029
> basicStats(eu1)
Minimum                  -0.025
Maximum                   0.027
Mean                      0.000
Stdev                     0.006
Skewness                  0.022
Kurtosis                  0.766

> cor(jp1,eu1)
[1] -0.3644574   <== Correlation is -0.36.
```