Trading with R

Feb 21, 2017 - Dan Ross-Li

1. Interned Trading Electricity

2. Started as Runner for Ags Options

3. Moved to Interest Rates, Futures

4. Transferred to ETF Options

5. Recently Energy and Interest Rate Complex

Time Series Analysis vs. Statistical Analysis

Trading vs. Investing

Arbitrage vs. Value

What we'll cover

The good stuff

1. Why R is awesome

2. How R relates to Trading

3. What you can do with R

4. and much much more…!

What we won't cover

Sorry

1. Specific Strategies

2. Options

3. Thoughts on Markets

4. Financials and other Finance Stuff

However….

- Give it a shot

- Ask others

- Apply and try

- **NO FREE LUNCH**

Source: Wikipedia

Why R is Awesome

1. Free

2. Flexible

3. Powerful

Other common statistical software: Matlab, Stata, Eviews, and Excel

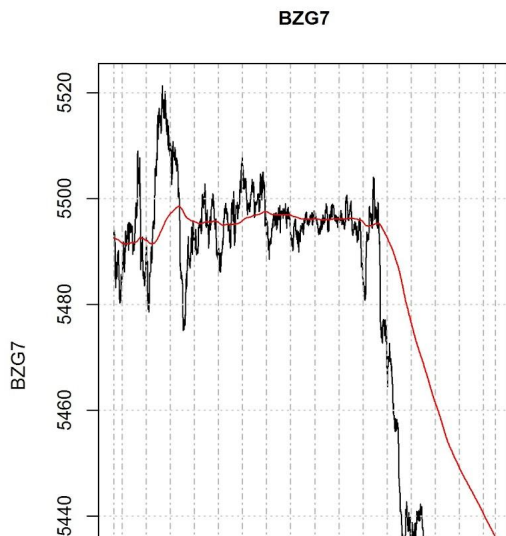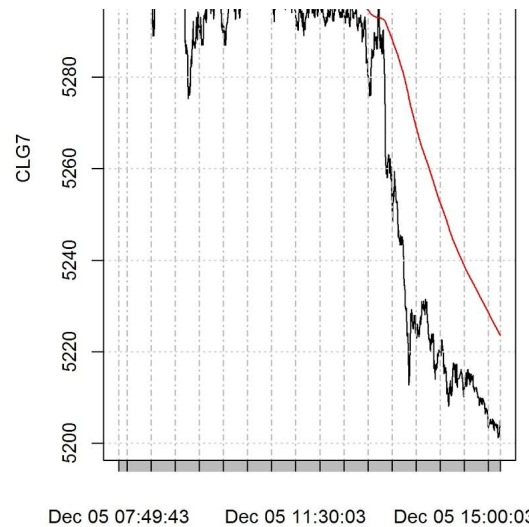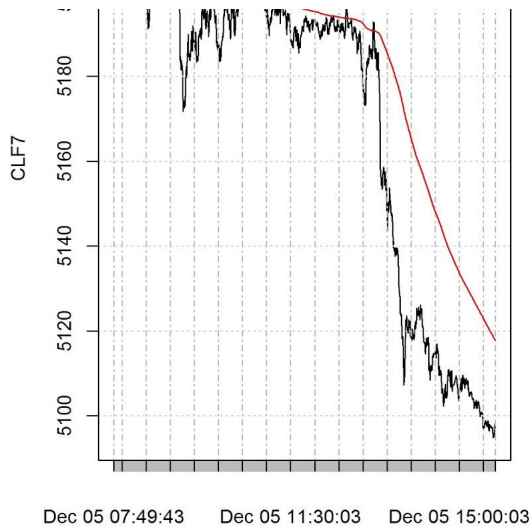# How R Relates to Trading

1. Data Storage
   a. Typically Clean
   b. Sometimes SQL, but usually time series software

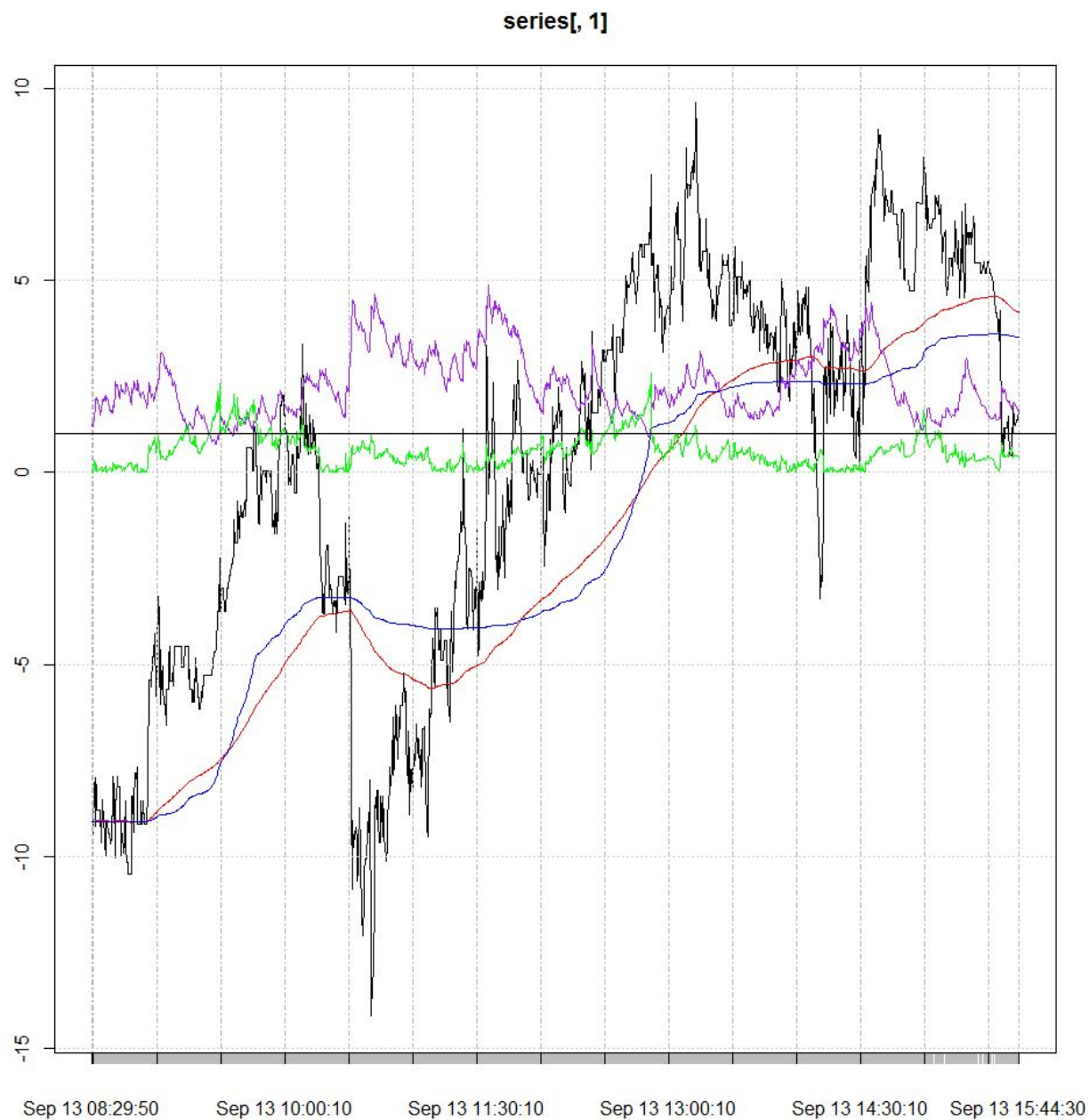2. Processing - R

3. Execution - Usually proprietary software
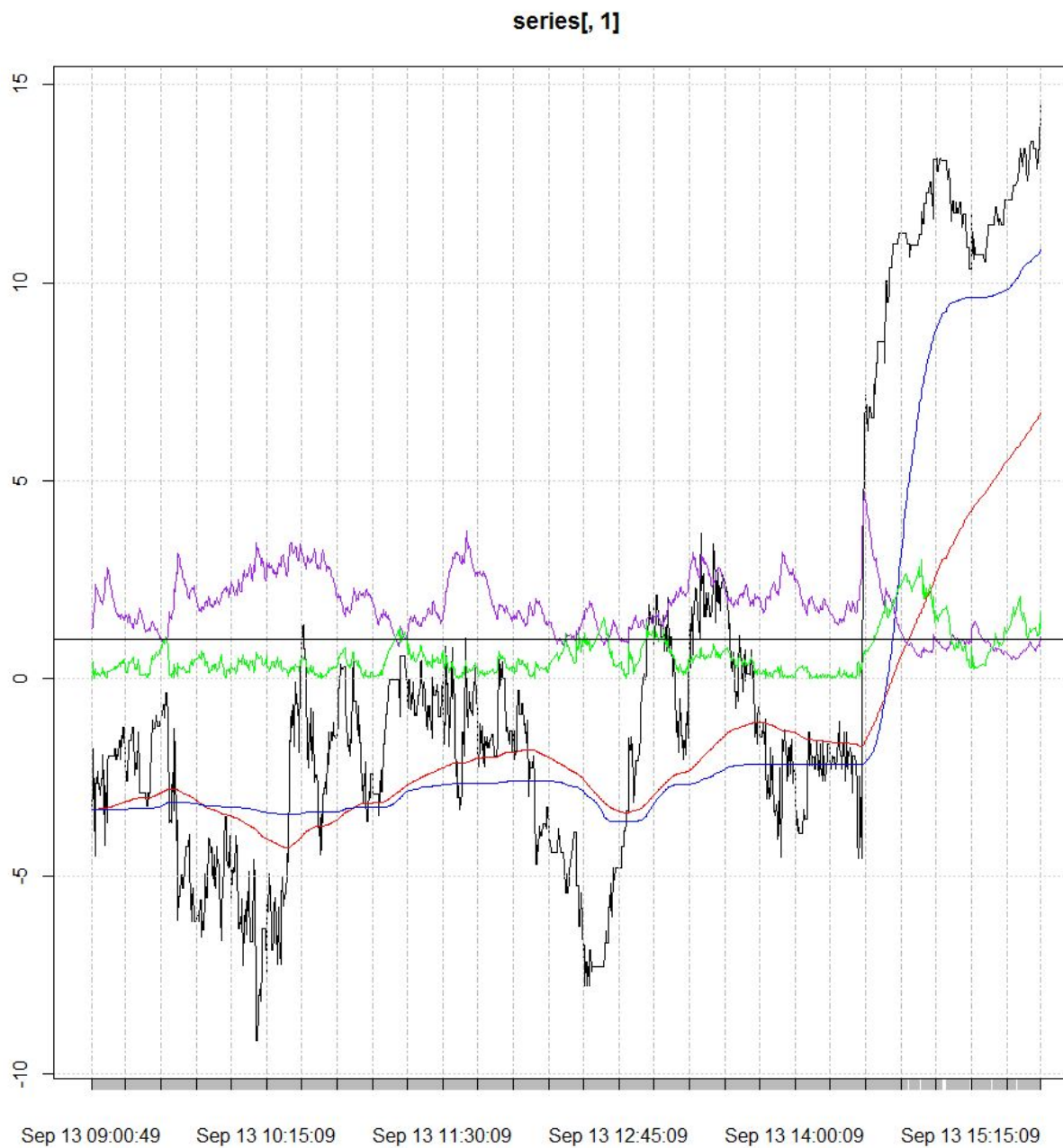
What you can do with R

- Time Series are typically correlated
- How do we separate out the common and uncommon movements?

series[, 1]

Dynamic Volatility

Some Code

1. xts - Easy time series

2. RMySQL - Interacting with MySQL databases

3. ggplot2/lattice - Graphics

4. plyr/dplyr - Data manipulation

5. quantmod - Functions for finance and portfolio optimization

```
startdate = '20161203'
splitdate = '20161205'
enddate =   '20161205'
starttime = '7:30:00'
endtime =   '15:45:00'

product = 'CL'
prodtype = 'S'
numcon = 5
skipcon = 2
timeperiod = 3
pc.scale = FALSE    ## For computing PCA using Correlation
use.diff = TRUE    ## use 1st Difference for stocastic drift
# moving average parameters
ewma = .05
ewma2 = .1
# list of contracts
contract <- c('CLF7', 'CLG7', 'BZF7', 'BZG7')
```

```
currdate.str <- format(Sys.Date(), '%Y%m%d')
file.loc.root <-
paste('C:/Users/Main/Dropbox/Trading/Analysis/', currdate.str,
'/', sep = "")
dir.create(file.loc.root, showWarnings = TRUE)

file.loc.root <-
paste('C:/Users/Main/Dropbox/Trading/Analysis/',currdate.str,'
/', product, '/', sep = "")
dir.create(file.loc.root, showWarnings = TRUE)

file.loc <- paste(file.loc.root, product, '_', '.txt', sep="")

conn <- dbConnect(dbDriver("MySQL"), dbname='trading',
user='dli', password='####', host = 'localhost')

data.test <- getcondays(conn, starttime, endtime, startdate,
enddate, contract)
```

Processing Data

```r
pca <- prcomp(data, scale. = pc.scale)
pca.v2 <- prcomp(data.v2, scale. = pc.scale)
pca.ewma <- prcomp(data.ewma.z, scale. = pc.scale)
pca.ewma.diff <- prcomp(diff(data.ewma.z)[-1,],
                              scale. = pc.scale)
EV <- pca$sdev ^ 2
ResiEV <- sum( EV[4:length(EV)] )
ResiPC <- sqrt((pca$rotation^2 %*% EV -
              pca$rotation[,1:3]^2 %*% EV[1:3]) / ResiEV)
```

```
write.table(testdata, file=pca.txt.loc, row.names = FALSE)??

result.xts.scale <- scale(result.xts, scale=FALSE)
data.ewma.scale <- scale(data.ewma, scale=FALSE)
pca.scores <- result.xts.scale %*% pca$rotation
pca.scores.ewma <- data.ewma.z %*% pca.ewma$rotation
EV.ewma <- pca.ewma$sdev^2
ResiEV.ewma <- sum(EV.ewma[4:length(EV.ewma)])
pca.scores.first <- data.first %*% pca$rotation
```

Saving Data

Saving Off the Results as Separate Files

```
file.loc = paste(file.loc.root, product, '_', currdate.str, '_EV.txt', sep = "")
write.table((pca$sdev)^2/sum(pca$sdev^2), file=file.loc, row.names = FALSE, sep = ",") #
Difference Data
write.table((pca.v2$sdev)^2/sum(pca.v2$sdev^2), file=file.loc, row.names = FALSE, sep = ",",
append = TRUE) # Norm Data Data
write.table(EV, file=file.loc, row.names = FALSE, sep = ",", append = TRUE) # EV
...
write.table(cov(data.first),file=file.loc, row.names = FALSE, sep = '\t', append = TRUE)
#Covariance
write.table(cor(data.first),file=file.loc, row.names = FALSE, sep = '\t', append = TRUE)
#Correlations
write.table("EWMA", file=file.loc, row.names = FALSE, sep = '\t', append = TRUE) #Resi
write.table(c(pca.ewma$sdev^2, sum(pca.ewma$sdev[4:length(pca.ewma$sdev)]^2)), file=file.loc,
row.names = FALSE, append = TRUE) # EV for inputs
write.table(pca.ewma$rotation, file=file.loc, row.names = FALSE, sep = '\t', append = TRUE)
#PCAs
write.table(sqrt((pca.ewma$rotation^2%*%(pca.ewma$sdev^2)-pca.ewma$rotation[,1:3]^2%*%(EV.ewm
a[1:3]))/ResiEV.ewma), file=file.loc, row.names = FALSE, sep = '\t', append = TRUE) #Resi
write.table("EWMA DIFF", file=file.loc, row.names = FALSE, sep = '\t', append = TRUE) #Resi
write.table(c(pca.ewma.diff$sdev^2, sum(pca.ewma.diff$sdev[4:length(pca.ewma.diff$sdev)]^2)),
file=file.loc, row.names = FALSE, col.names = FALSE, append = TRUE) # EV for inputs
```