Asset pricing data in R

For purposes of asset pricing, the typical data is monthly returns and interest rates.

To do analysis typically calculate the *excess* return (return above the risk free rate).

Calculating individual stock returns directly from market data
To do this, the steps are:

- ▶ Download asset (stocks, indices, ...) prices.
- ▶ For each asset, calculate monthly returns (for example using the `quantmod` package).
- ▶ Align the series along the time dimension.

Example

- ▶ gathers monthly return of three large US IT companies (Microsoft, Apple and Alphabet (Google)) from Yahoo Finance.
- ▶ calculates an eqully weighted portfolio of the three

```
library(quantmod)
first_date <- as.Date("2010-01-01")
microsoft <- getSymbols("MSFT",auto.assign=FALSE,from=first
apple     <- getSymbols("AAPL",auto.assign=FALSE,from=first
alphabet  <- getSymbols("GOOG",auto.assign=FALSE,from=first

microsoft_daily_prices <- microsoft$MSFT.Adjusted
microsoft_monthly_returns <- monthlyReturn(microsoft_daily_
index(microsoft_monthly_returns) <- as.yearmon(index(micros
names(microsoft_monthly_returns) <- "MicroSoft"
```

```
apple_daily_prices <- apple$AAPL.Adjusted
apple_monthly_returns <- monthlyReturn(apple_daily_prices)
index(apple_monthly_returns) <- as.yearmon(index(apple_mont
names(apple_monthly_returns) <- "Apple"

alphabet_daily_prices <- alphabet$GOOG.Adjusted
alphabet_monthly_returns <- monthlyReturn(alphabet_daily_pr
index(alphabet_monthly_returns) <- as.yearmon(index(alphabe
names(alphabet_monthly_returns) <- "Alphabet"
```

```
stock_returns <- merge(microsoft_monthly_returns,
                       apple_monthly_returns,
                       alphabet_monthly_returns,
                       all=FALSE)
ew <- (1/3) * (stock_returns$MicroSoft + stock_returns$Appl
names(ew) <- "ew"
```

Risk free rate

Getting the risk free interest rate right needs care
Careful about the risk free rate. If you get risk free rates by
looking at current quotes, be aware that is the forward looking
interest rate.

For example, the current 1 month interest rate quote is the interest
rate implied in buying a one-month bond *now*, and getting the
principal back in one month.

The risk free interest rate over a month is therefore the quoted one
month interest rate at the last date of the previous month.

Some sources (such as the Ken French data) has taken care of
this, the risk free rate is matched to the other returns. Other
sources may give the forward-looking interest rates, in which case
lagging the interest rate is necessary.

Risk free rate

For the previous example, use the US 1 month constant maturity treasury rate, to construct excess returns.

```
library(quantmod)
source ("read_stocks.R")
                                     # daily observations of 1-month
treas_1m <- getSymbols("DGS1MO", src="FRED", auto.assign=FALSE)
names(treas_1m) <- "treas_1m"
treas_1m <- na.omit(treas_1m)

                                     #create monthly observations
Rf <- treas_1m[endpoints(treas_1m,"month"),]
names(Rf) <- "Rf"
Rf <- Rf/100                         # don't want percentage interes
                                     # pick last observation in a gi
index(Rf) <- as.yearmon(index(Rf))
                                     # that last observation should
Rf <- na.omit(lag(Rf,1))
                                     # take intersection, all dates
data <- merge(apple_monthly_returns,Rf,all=FALSE)
excess_monthly_returns_apple <- data$Apple-data$Rf
```