

# Assignment 3

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The following pairs AAPL & GOOG, IBM & SPY, DIA & SPY are used to reproduce the examples in the paper with Ordinary Least Squared and Total Least Squared.

```
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

## Registered S3 method overwritten by 'xts':
##   method      from
##   as.zoo.xts zoo

## Loading required package: TTR

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

## Version 0.4-0 included new data defaults. See ?getSymbols.

getCloses <- function(sym) {
  ohlc <- getSymbols(sym, from="2009-01-01", to="2011-01-01",
                     auto.assign=FALSE, return.class="zoo")
  Cl(ohlc)
}

olsHedgeRatio <- function(p, q) {
  m <- lm(p ~ q)
  coef(m)[2]
}

tlsHedgeRatio <- function(p, q) {
  r <- princomp( ~ p + q)
  r$loadings[1,1] / r$loadings[2,1]
}

closes <- merge(AAPL=getCloses("AAPL"),
               GOOG=getCloses("GOOG"), all=FALSE)

## 'getSymbols' currently uses auto.assign=TRUE by default, but will
## use auto.assign=FALSE in 0.5-0. You will still be able to use
## 'loadSymbols' to automatically load data. getOption("getSymbols.env")
## and getOption("getSymbols.auto.assign") will still be checked for
## alternate defaults.
##
```

```
## This message is shown once per session and may be disabled by setting
## options("getSymbols.warning4.0"=FALSE). See ?getSymbols for details.
```

```
with(closes, {
  cat("OLS for AAPL vs. GOOG =", olsHedgeRatio(AAPL,GOOG), "\n")
  cat("OLS for GOOG vs. AAPL =", olsHedgeRatio(GOOG,AAPL), "\n")
  cat("TLS for AAPLvs. GOOG =", tlsHedgeRatio(AAPL,GOOG), "\n")
  cat("TLS for GOOG vs. AAPL =", tlsHedgeRatio(GOOG,AAPL), "\n")
})
```

```
## OLS for AAPL vs. GOOG = 0.1798328
## OLS for GOOG vs. AAPL = 3.515559
## TLS for AAPLvs. GOOG = 0.1831689
## TLS for GOOG vs. AAPL = 5.459441
```

```
closes <- merge(IBM=getCloses("IBM"),
                SPY=getCloses("SPY"), all=FALSE)
with(closes, {
  cat("OLS for IBM vs. SPY =", olsHedgeRatio(IBM,SPY), "\n")
  cat("OLS for SPY vs. IBM =", olsHedgeRatio(SPY,IBM), "\n")
  cat("TLS for IBM vs. SPY =", tlsHedgeRatio(IBM,SPY), "\n")
  cat("TLS for SPY vs. IBM =", tlsHedgeRatio(SPY,IBM), "\n")
})
```

```
## OLS for IBM vs. SPY = 1.148701
## OLS for SPY vs. IBM = 0.8028219
## TLS for IBM vs. SPY = 1.204961
## TLS for SPY vs. IBM = 0.8299027
```

```
closes <- merge(DIA=getCloses("DIA"),
                SPY=getCloses("SPY"), all=FALSE)
with(closes, {
  cat("OLS for DIA vs. SPY =", olsHedgeRatio(DIA,SPY), "\n")
  cat("OLS for SPY vs. DIA =", olsHedgeRatio(SPY,DIA), "\n")
  cat("TLS for DIA vs. SPY =", tlsHedgeRatio(DIA,SPY), "\n")
  cat("TLS for SPY vs. DIA =", tlsHedgeRatio(SPY,DIA), "\n")
})
```

```
## OLS for DIA vs. SPY = 0.8963407
## OLS for SPY vs. DIA = 1.105912
## TLS for DIA vs. SPY = 0.8998637
## TLS for SPY vs. DIA = 1.111279
```