Data Analytics HW1_Jiaqi Li

Jiaqi Li

April 13, 2019

Problem Set 2

```
options(warn = -1)
library(data.table)
library(ggplot2)
library(dplyr)
```

```
##
## Attaching package: 'dplyr'
## The following objects are masked from 'package:data.table':
##
##     between, first, last
## The following objects are masked from 'package:stats':
##
##     filter, lag
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(haven)
library(gridExtra)
```

```
##
## Attaching package: 'gridExtra'
## The following object is masked from 'package:dplyr':
##
##     combine
```

```
library(lfe)
```

```
## Loading required package: Matrix
```

```
library(stargazer)
```

```
##
## Please cite as:
##  Hlavac, Marek (2018). stargazer: Well-Formatted Regression and Summary Statistics Tables.
##  R package version 5.2.2. https://CRAN.R-project.org/package=stargazer
```

Question 1

1.

```r
#-------------------------------part 1----------------------------#
data = read_dta("StockRetAcct_insample.dta") %>% as.data.table()
data[,ExRet:=exp(lnAnnRet)-exp(lnRf)]
setorder(data, FirmID, year)
time = unique(data$year)
p_ret = NULL
for(i in min(time):max(time)){
  temp = data[year == i,]
  temp_ret = lm(ExRet~lnInv, data = temp) %>% coef()
  p_ret = rbind(p_ret,temp_ret[2])
}
p_stat = list(mean_ret = mean(p_ret), std_ret = sd(p_ret),
              SR = mean(p_ret)/sd(p_ret),
              t_stat = sqrt(1+max(time)-min(time))*mean(p_ret)/sd(p_ret))
print(p_stat)
```

```
## $mean_ret
## [1] -0.08679146
##
## $std_ret
## [1] 0.1486441
##
## $SR
## [1] -0.5838877
##
## $t_stat
## [1] -3.454326
```

2

$$ExRet_{i,t} = \delta_{0,t} + \delta_{1,t} lnInv_{i,t-1}$$

$$lnInv_{i,t-1} = \begin{bmatrix} 1 & lnInv_{1,t-1} \\ . & . \\ . & . \\ . & . \\ 1 & lnInv_{N,t-1} \end{bmatrix}, ExRet_t = \begin{bmatrix} ExRet_{1,t-1} \\ . \\ . \\ . \\ ExRet_{N,t-1} \end{bmatrix}, \text{then} \begin{bmatrix} \delta_{0,t} \\ \delta_{1,t} \end{bmatrix} = (lnInv'_{t-1} lnInv_{t-1})^{-1} lnInv'_{t-1} ExRet_t$$

$$(lnInv'_{t-1} lnInv_{t-1})^{-1} = \frac{1}{N} \frac{1}{\frac{1}{N}\sum_{i=1}^N lnInv_{i,t-1}^2 - (\frac{1}{N}\sum_{i=1}^N lnInv_{i,t-1})^2} \begin{bmatrix} \frac{1}{N}\sum_{i=1}^N lnInv_{i,t-1}^2 & -\frac{1}{N}\sum_{i=1}^N lnInv_{i,t-1} \\ -\frac{1}{N}\sum_{i=1}^N lnInv_{i,t-1} & 1 \end{bmatrix}$$

$$E_N[lnInv_{i,t-1}] = \frac{1}{N}\sum_{i=1}^N lnInv_{i,t-1}, Var_N[lnInv_{i,t-1}] = \frac{1}{N}\sum_{i=1}^N lnInv_{i,t-1}^2 - (\frac{1}{N}\sum_{i=1}^N lnInv_{i,t-1})^2$$

$$(lnInv'_{t-1}lnInv_{t-1})^{-1} = \frac{1}{N}\frac{1}{Var_N[lnInv_{i,t-1}]}\begin{bmatrix} E_N[lnInv^2_{i,t-1}] & -E_N[lnInv_{i,t-1}] \\ -E_N[lnInv_{i,t-1}] & 1 \end{bmatrix}$$

$$(lnInv'_{t-1}lnInv_{t-1})^{-1}lnInv'_{t-1} = \frac{1}{N}\frac{1}{Var_N[lnInv_{i,t-1}]}\begin{bmatrix} E_N[lnInv^2_{i,t-1}] & -E_N[lnInv_{i,t-1}] \\ -E_N[lnInv_{i,t-1}] & 1 \end{bmatrix}\begin{bmatrix} 1 & ... & 1 \\ lnInv_{1,t-1} & ... & lnInv_{N,t-1} \end{bmatrix}$$

$\delta_{1,t} = \sum_{i=1}^{N} \frac{1}{N}\frac{lnInv_{i,t-1} - E_N[lnInv_{i,t-1}]}{Var_N[lnInv_{i,t-1}]}ExRet_{i,t}$

$weight_{i,t-1} = \frac{1}{N}\frac{lnInv_{i,t-1} - E_N[lnInv_{i,t-1}]}{Var_N[lnInv_{i,t-1}]}$ ****************
(then $\delta_{1,t} = \sum_{i=1}^{N} weight_{i,t-1}ExRet_{i,t}$)