ECON 334 Week 10 Assignment

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```
library(tidyverse)
library(lubridate)
library(vtable)
```

Question 1

Loop for loading multiple files, and reading them

```
nameList <- c("XBB","TSX","TRP","T90","RY","RCI","FTS","BLDP","BCE")

myData <- list()
for (i in nameList) {
    fname <- paste0(i, ".csv")
    myData[[i]] <- read_csv(fname)
    #print(summary(myData[[i]]))
}
```

Analysis :

- The data files do not cover the same period. Starting with T90 (1985-01-01), which exists the earliest, and XBB (2000-12-01) the latest.

Question 2

Loop join all data to one object by date

```
#create new data to ensure integrity
myData2 <- list()
for (i in nameList) {
    fname <- paste0(i, ".csv")
    myData2[[i]] <- read_csv(fname)
}

#Join all using full_join, replace NA by zero
combData <- select(myData2[[1]], Date)
for (i in myData2){
    combData <- full_join(i, combData, by="Date")%>% replace(is.na(.),0)
}
```

Question 3

Filter observations between 2001 and 2021

```
combData$year <- year(ymd(combData$Date))

stock0121 <- combData %>%
    filter(year>=2001, year <= 2021 )
```

Question 4

Sumtable

```
sumtable(stock0121)
```

Summary Statistics

Variable	N	Mean	Std. Dev.	Min	Pctl. 25	Pctl. 75	Max
BCE	252	0.673	4.652	-28.775	-1.614	3.294	15.893
BLDP	252	0.988	19.102	-52.451	-11.176	8.919	86.17
FTS	252	1.167	4.543	-9.674	-1.845	4.018	15.428
RCI	252	1.062	6.891	-23.077	-2.686	4.628	26.7
RY	252	1.09	4.948	-16.397	-1.815	4.138	18.952
T90	252	0.106	0.124	0	0.006	0.156	0.416
TRP	252	0.926	4.473	-10.592	-1.984	3.851	16.254
TSX	252	0.422	3.901	-17.735	-1.37	2.948	11.21
XBB	252	0.373	1.406	-3.348	-0.342	1.143	5.929
year	252	2011	6.067	2001	2006	2016	2021

Analysis:

- The highest average monthly return is 1.167 which is FTS.
- The lowest average monthly return is 0.106 which is T90.
- The security is the most volatile monthly returns is BLDP with a SD of 19.102.
- The security that is the least volatile monthly returns is T90 with a SD of 0.124.

Question 5

Security excess return

```
#filter out year date and treasury
stockXdate <- stock0121 %>%
    select(!year & !Date & !T90)

#assign only the treasury
stockXT90 <- stock0121 %>%  select(T90)

#tidy the data and calculate excess return
stockXdate2 <- stock0121%>%
    pivot_longer(cols = c("XBB","TSX","TRP","RY","RCI","FTS","BLDP","BCE"),
                 names_to = "Stocks Name",
                 values_to = "return")%>%
    mutate(excessRE = return -T90)

#tidy data to make it easier to read
ExcessReturn <- stockXdate2%>%
    select(!T90 & !year & !return)%>%
    pivot_wider(names_from = `Stocks Name`, values_from = excessRE)%>%
    relocate(TSX, .after = Date)

ExcessReturn
```

Date <date>	TSX <dbl>	XBB <dbl>	TRP <dbl>	RY <dbl>	RCI <dbl>	
2001-01-01	3.94201280	-0.592334699	-6.21723529	-5.614691306	10.466229507	-2.48
2001-02-01	-13.72967189	0.326381957	15.22395014	-2.549676300	-15.901295793	2.64
2001-03-01	-6.17476808	-0.498815175	2.37455260	0.356083427	-1.614183667	6.17
2001-04-01	4.13141296	-2.390712179	-4.46418453	-9.284844574	-14.891874127	-0.03
2001-05-01	2.41433231	-0.295000000	0.69289913	14.501740580	10.710527670	-2.25
2001-06-01	-5.50991365	-2.988973382	1.60550876	-1.052666964	1.821458424	-0.64
2001-07-01	-0.89030282	5.642053743	2.96269162	4.634060360	9.598563379	0.63
2001-08-01	-4.05111391	1.842037920	1.71307096	-2.233510414	-13.927977493	9.08
2001-09-01	-7.76816253	0.749940016	4.06256355	-3.134616281	-6.238153582	3.23
2001-10-01	0.52123887	3.190755923	1.78674597	-2.971265121	4.238483912	4.58

Question 6

Annualized Sharpe Ratio

```
#created a function for Sharpe Ratio
sharpeRatio  <- function(x){
    y = sqrt(12)*(mean(x)/sd(x))
    return(y)
}
```

```
sharpeRatio(ExcessReturn$XBB)
```

```
## [1] 0.6568648
```

```
sharpeRatio(ExcessReturn$TSX)
```

```
## [1] 0.2803761
```

```
sharpeRatio(ExcessReturn$TRP)
```

```
## [1] 0.6361477
```

```
sharpeRatio(ExcessReturn$RY)
```

```
## [1] 0.6884253
```

```
sharpeRatio(ExcessReturn$RCI)
```

```
## [1] 0.4810191
```

```
sharpeRatio(ExcessReturn$FTS)
```

```
## [1] 0.8104003
```

```
sharpeRatio(ExcessReturn$BLDP)
```

```
## [1] 0.1598084
```

```
sharpeRatio(ExcessReturn$BCE)
```

```
## [1] 0.4221553
```

Analysis:

- FTS has the highest risk-adjusted return.
- BLDP has the lowest risk-adjusted return.

Quesiton 7

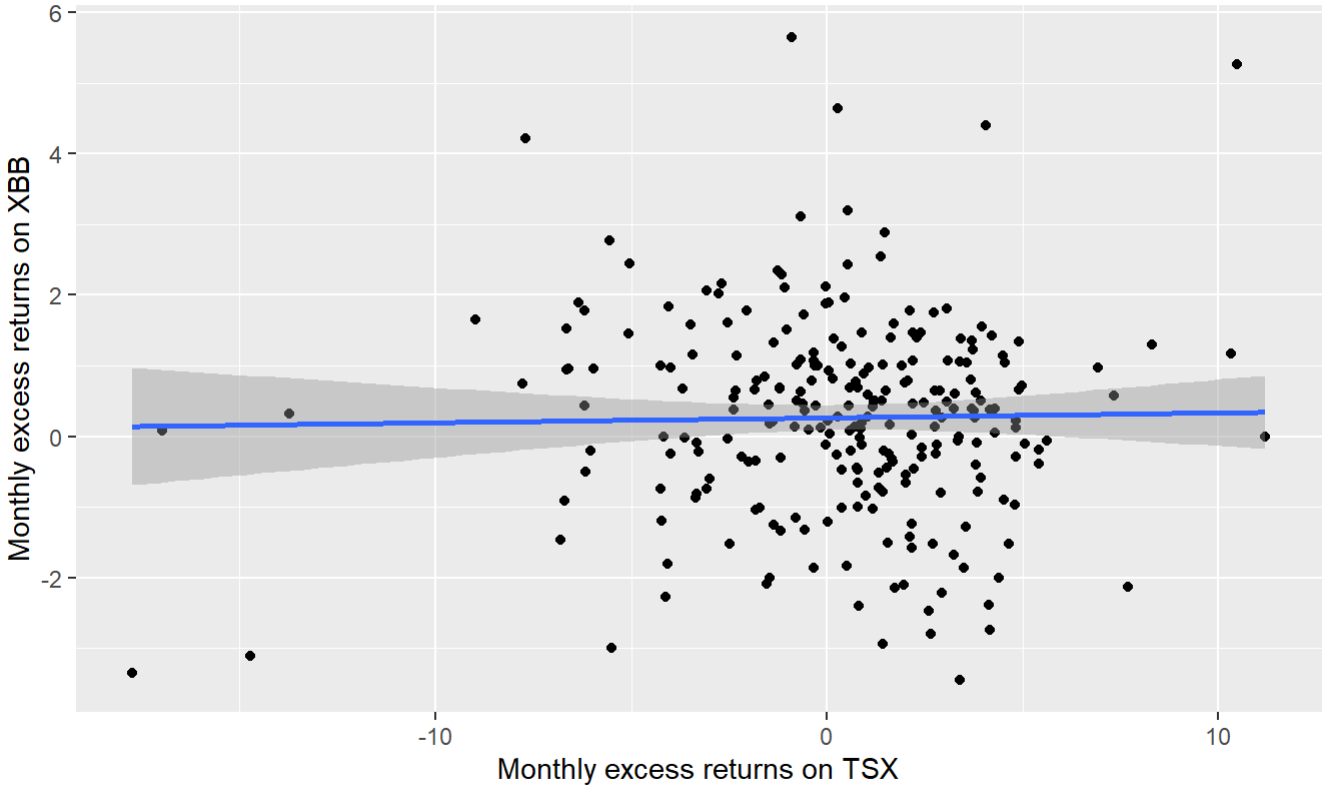
Loop for CAPM regressions, plots and reports

- $CAPM = \hat{Y}_{it} = \hat{\alpha} + \hat{\beta} X_{mt}$

```
#run regression for every column in R
test <- list()

for(i in colnames(ExcessReturn)[-1:-2]){
  test[[i]] <- summary(lm(get(i) ~ TSX, ExcessReturn))

  #plot
  plot <- ggplot(ExcessReturn, aes_string(x = ExcessReturn$TSX, y = i))+
    geom_point() + geom_smooth(formula = y~x, method = "lm") +
      labs(x="Monthly excess returns on TSX",
           y= paste0("Monthly excess returns on ", i ),
           title = "CAPM Regression",
           subtitle = paste0("Resgreesion on: ", i ," ~ TSX"),
           caption =paste0("Intercept (α) = ", round(test[[i]]$coefficients[1],3),
                           " Slope (β) = ", round(test[[i]]$coefficients[2],3),
                           " and R^2 = ", round(test[[i]]$r.squared,3), "\n", "Source = Toronto
Stock Exchange")

           )

  print(plot)

}
```

CAPM Regression

Resgreesion on: XBB ~ TSX



Intercept (α) = 0.265 Slope (β) = 0.007 and R^2 = 0
Source = Toronto Stock Exchange

CAPM Regression

Resgreesion on: TRP ~ TSX

Intercept (α) = 0.707 Slope (β) = 0.358 and R^2 = 0.098
Source = Toronto Stock Exchange

CAPM Regression

Resgreesion on: RY ~ TSX

Intercept (α) = 0.77 Slope (β) = 0.676 and R^2 = 0.284
Source = Toronto Stock Exchange

CAPM Regression

Resgreesion on: RCI ~ TSX

Intercept (α) = 0.732 Slope (β) = 0.708 and R^2 = 0.161
Source = Toronto Stock Exchange

CAPM Regression

Resgreesion on: FTS ~ TSX

Intercept (α) = 1.024 Slope (β) = 0.119 and R^2 = 0.01
Source = Toronto Stock Exchange

CAPM Regression

Resgreesion on: BLDP ~ TSX

Intercept (α) = 0.298 Slope (β) = 1.847 and R^2 = 0.142
Source = Toronto Stock Exchange


CAPM Regression
Resgreesion on: BCE ~ TSX
Monthly excess returns on BCE
10
0
-10
-20
-30
-10
0
10
Monthly excess returns on TSX
Intercept (α) = 0.445 Slope (β) = 0.386 and R^2 = 0.105
Source = Toronto Stock Exchange

```
test
```

```
## $XBB
##
## Call:
## lm(formula = get(i) ~ TSX, data = ExcessReturn)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.7432 -0.7370  0.0854  0.7582  5.3830
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 0.265249   0.089306   2.970  0.00327 **
## TSX         0.006994   0.022847   0.306  0.75976
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.413 on 250 degrees of freedom
## Multiple R-squared:  0.0003747,  Adjusted R-squared:  -0.003624
## F-statistic: 0.09371 on 1 and 250 DF,  p-value: 0.7598
##
##
## $TRP
##
## Call:
## lm(formula = get(i) ~ TSX, data = ExcessReturn)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -10.6342  -2.5714  -0.1674   2.8101  19.4354
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.70698    0.26861   2.632  0.00902 **
## TSX          0.35823    0.06872   5.213 3.89e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.25 on 250 degrees of freedom
## Multiple R-squared:  0.09805,    Adjusted R-squared:  0.09444
## F-statistic: 27.18 on 1 and 250 DF,  p-value: 3.892e-07
##
##
## $RY
##
## Call:
## lm(formula = get(i) ~ TSX, data = ExcessReturn)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -15.1065  -2.2966  -0.1848   2.3822  13.2040
##
## Coefficients:
```

```
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.77022    0.26524   2.904  0.00401 **
## TSX          0.67614    0.06786   9.964  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.197 on 250 degrees of freedom
## Multiple R-squared:  0.2843, Adjusted R-squared:  0.2814
## F-statistic: 99.29 on 1 and 250 DF,  p-value: < 2.2e-16
##
##
## $RCI
##
## Call:
## lm(formula = get(i) ~ TSX, data = ExcessReturn)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -19.2246  -3.7756  -0.4604   4.2113  25.1498
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   0.7322     0.3992   1.834   0.0679 .
## TSX           0.7080     0.1021   6.932 3.52e-11 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.317 on 250 degrees of freedom
## Multiple R-squared:  0.1612, Adjusted R-squared:  0.1579
## F-statistic: 48.05 on 1 and 250 DF,  p-value: 3.516e-11
##
##
## $FTS
##
## Call:
## lm(formula = get(i) ~ TSX, data = ExcessReturn)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -11.1790  -3.0064  -0.3979   2.9712  13.7679
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  1.02379    0.28579   3.582 0.000409 ***
## TSX          0.11881    0.07311   1.625 0.105432
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.522 on 250 degrees of freedom
## Multiple R-squared:  0.01045,    Adjusted R-squared:  0.006493
## F-statistic:  2.64 on 1 and 250 DF,  p-value: 0.1054
##
```

```
##
## $BLDP
##
## Call:
## lm(formula = get(i) ~ TSX, data = ExcessReturn)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -45.540 -11.557  -2.414   8.291  82.999
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   0.2980     1.1207   0.266    0.791
## TSX           1.8470     0.2867   6.442    6e-10 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 17.73 on 250 degrees of freedom
## Multiple R-squared:  0.1424, Adjusted R-squared:  0.1389
## F-statistic:  41.5 on 1 and 250 DF,  p-value: 6.004e-10
##
##
## $BCE
##
## Call:
## lm(formula = get(i) ~ TSX, data = ExcessReturn)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -27.2734  -2.3288   0.5239   2.2998  14.4690
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.44502    0.27878   1.596    0.112
## TSX          0.38638    0.07132   5.417 1.42e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.411 on 250 degrees of freedom
## Multiple R-squared:  0.1051, Adjusted R-squared:  0.1015
## F-statistic: 29.35 on 1 and 250 DF,  p-value: 1.42e-07
```