Bilal Hassan Task - 4

INTRODUCTION / DEFINING THE DATA SET

The assignment was divided into 2 parts and 2 different data sets were used. For the first part FRED.xlsx data set was used in order to investigate the Gold price against fear index, and dollar exchange rate. The variables that are defined for regression model are Gokd price as dependent variable but before we need to do the stationarity test. So, we move to RStudio and load the following libraries.

We need to download/install some libraries. After installing we can load those libraires with the following command.

```
library(tidyverse)
library(openxlsx)
library(tidyquant)
library(quantmod)
library(vars)
library(xts)
library(zoo)
library(tseries)
library(Quandl)
library(lubridate)
library(AER)
library(sandwich)
library(lmtest)
library(stargazer)
library(ggplot2)
```

In order to loading the excel file in RStudio following command is required.

```
data <- read.xlsx("FRED.xlsx")
```

Now, we'll have to do the stationarity test before proceeding with the regression. For stationaity test following command is required.

```
data$GOLDPM%>% na.omit()%>% adf.test(k=0)
data$EURUSD%>% na.omit()%>% adf.test(k=0)
data$VIX%>% na.omit()%>% adf.test(k=0)
```

Stationarity test results:

```
data$GOLDPM%>% na.omit()%>% adf.test(k=0)
       Augmented Dickey-Fuller Tes
data:  .
Dickey-Fuller = -1.4986, Lag order = 0, p-value = 0.7908
alternative hypothesis: stationary
data$EURUSD%>% na.omit()%>% adf.test(k=0)
       Augmented Dickey-Fuller Test
data:  .
Dickey-Fuller = -1.6765, Lag order = 0, p-value = 0.7154
alternative hypothesis: stationary
 data$VIX%>% na.omit()%>% adf.test(k=0
       Augmented Dickey-Fuller Test
data:  .
Dickey-Fuller = -8.8798, Lag order = 0, p-value = 0.01
alternative hypothesis: stationary
```

We first would have to transform our data with the following command.

```
#delta-Transformation
TGold <- Delt(data$GOLDPM)
TEurUSD <- Delt(data$EURUSD)
TGold %>% na.omit() %>% adf.test (k=0)
TEurUSD %>% na.omit() %>% adf.test(k=0)
```

Implementing regression model with the below mentioned command.

```
#Regression-model
model1 <- TGold ~ TEurUSD + VIX
lmmodel1 <- lm(model1, data = data)
```

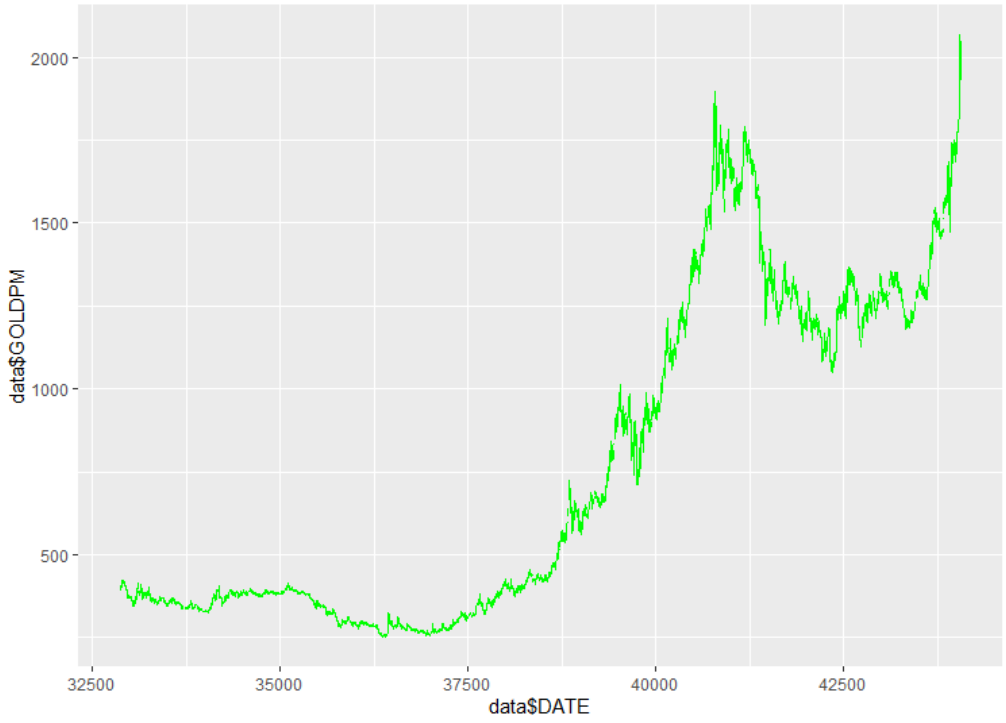
Here we will have to do test for autocorrelation and Heteroscadasticity which can be carried out with the following command and can use stargazer command along with it to get a chart that gives us better understanding of our findings.

```
###Test for Autocorrelation and Heteroscadasticity###

coeftest(lmmodel1, vcov= vcovHAC(lmmodel1, type = "HC1")) %>% stargazer(data=lmmodel1,
type="html", out = "CT.html")
```

	Dependent variable:	
	coefficient test (1)	TGold *OLS* (2)
TEurUSD	0.638***	0.638***
	(0.034)	(0.024)
VIX	0.00002	0.00002
	(0.00003)	(0.00002)
Constant	-0.00004	-0.00004
	(0.0005)	(0.0004)
Observations		4,978
R^2		0.125
Adjusted R^2		0.125
Residual Std. Error		0.010 (df = 4975)
F Statistic		355.865*** (df = 2; 4975)
Note:		*p<0.1; **p<0.05; ***p<0.01

We can also use ggplot2 command to make a chart that gives us visual interpritation of our data.

```
###Plotting the Graph###

data %>% ggplot(aes(x=data$DATE, y=data$GOLDPM)) + geom_line (color="green")
```



2nd PART

For our second question we will be working on a different data named Ratings.xlsx and no additional libraries are riquired.Variables AAA and BBB are the interest rates on corporate bond, VIX is the fear index, STOCK_RET is the return on the stock based on the inerest rates, UST1Y is the treasury rate for 1 year and UST10Y is for 10 years resplectively. In order to investigate the relationship between AAA and BBB are going to be set as dependent variables and 2 separate regression models will be made for each one of them, while the rest are the independent variables.

The new dataset can be loaded with the following command.

```
data2 <- read.xlsx("Ratings.xlsx" , sheet = 2)
```

Before we set our regression models we will have to do a stationarity test for the variables, which will be done with the following command.

```
###Stationary test###

data2$AAA%>% na.omit()%>% adf.test(k=0)

data2$BBB%>% na.omit()%>% adf.test(k=0)

data2$VIX%>% na.omit()%>% adf.test(k=0)

data2$STOCK_RET%>% na.omit()%>% adf.test(k=0)

data2$UST1Y%>% na.omit()%>% adf.test(k=0)
```

Results for the stationarity test are mentioned below:

```
data2$AAA%>% na.omit()%>% adf.test(k=0)

       Augmented Dickey-Fuller Tes

data:  .

Dickey-Fuller = -4.4728, Lag order = 0, p-value = 0.01

alternative hypothesis: stationary

data2$BBB%>% na.omit()%>% adf.test(k=0)

       Augmented Dickey-Fuller Test

data:  .

Dickey-Fuller = -2.9631, Lag order = 0, p-value = 0.1705

alternative hypothesis: stationary

data2$VIX%>% na.omit()%>% adf.test(k=0)

       Augmented Dickey-Fuller Test

data:  .

Dickey-Fuller = -7.4461, Lag order = 0, p-value = 0.01

alternative hypothesis: stationary

data2$STOCK_RET%>% na.omit()%>% adf.test(k=0
```

```
       Augmented Dickey-Fuller Tes

data:  .

Dickey-Fuller = -78.266, Lag order = 0, p-value = 0.01

alternative hypothesis: stationary

data2$UST1Y%>% na.omit()%>% adf.test(k=0)

       Augmented Dickey-Fuller Test

data:  .

Dickey-Fuller = -2.0319, Lag order = 0, p-value = 0.5648

alternative hypothesis: stationary
```

We first would have to transform our data with the following command.

```
#Delta2 Transformation

DeltaBBB<- Delt(data2$BBB)

deltaUST1Y <- Delt(data2$UST1Y)


DeltaBBB %>% na.omit() %>% adf.test (k=0)

deltaUST1Y %>% na.omit() %>% adf.test(k=0)
```

Now, we will impliment our regression model for AAA and BBB seperately with the following command.

```
#Regression-model2

model2a <- AAA ~ VIX + STOCK_RET + UST1Y

lmmodel2a <- lm(model2, data = data2)


model2b <- BBB ~ VIX + STOCK_RET + UST1Y

lmmodel2b <- lm(model2, data = data2)
```

Here we will do test for autocorrelation and Heteroscadasticity, which we have to calculate for AAA and BBB seperately and can be carried out with the following command.

```
###Test for Autocorrelation and Heteroscadasticity###

Test_1 <- coeftest(lmmodel2a, vcov= vcovHAC(lmmodel2a, type = "HC1"))


Test_2 <- coeftest(lmmodel2b, vcov= vcovHAC(lmmodel2b, type = "HC1"))
```

And Finally, we will use stargazer command to get a chart that gives us better understanding of our findings.

```
stargazer(Test_1,Test_2, lmmodel2a,lmmodel2b,  type="html", out = "CT.html")
```

	Dependent variable:			
			AAA	
	coefficient test		*OLS*	
	(1)	(2)	(3)	(4)
VIX	0.041***	0.041***	0.041***	0.041***
	(0.015)	(0.015)	(0.001)	(0.001)
STOCK_RET	-3.042***	-3.042***	-3.042***	-3.042***
	(0.795)	(0.795)	(1.044)	(1.044)
UST1Y	0.473***	0.473***	0.473***	0.473***
	(0.087)	(0.087)	(0.008)	(0.008)
Constant	3.180***	3.180***	3.180***	3.180***
	(0.303)	(0.303)	(0.036)	(0.036)
Observations			4,957	4,957
R^2			0.442	0.442
Adjusted R^2			0.442	0.442
Residual Std. Error (df = 4953)			0.917	0.917
F Statistic (df = 3; 4953)			1,309.154***	1,309.154***
Note:			*p<0.1; **p<0.05; ***p<0.01	