National College of Ireland

Configuration Manual

MSc Research Project
M.S.C Fintech

Chimdindu Akuegbu
Student ID: X19120036

School of Computing
National College of Ireland

Supervisor: Noel Cosgrave

National College of Ireland

MSc Project Submission Sheet

School of Computing

Student Name:	Chimdindu Akuegbu		
Student ID:	x19120036		
Programme:	Fintech	**Year:**	2020
Module:	Research Project		
Lecturer:	Noel Cosgrave		
Submission Due Date:	17/08/2020		
Project Title:	An investigative Analysis on the effect of a Pandemic on Stock Market Indexes on countries' Stock Market Indexes within Europe, using a case study of the Covid-19 pandemic.		
Word Count:	1388 **Page Count:** 8		

I hereby certify that the information contained in this (my submission) is information pertaining to research I conducted for this project. All information other than my own contribution will be fully referenced and listed in the relevant bibliography section at the rear of the project.
ALL internet material must be referenced in the bibliography section. Students are required to use the Referencing Standard specified in the report template. To use other author's written or electronic work is illegal (plagiarism) and may result in disciplinary action.

Signature: chimdindu

Date: 7/08/2020

PLEASE READ THE FOLLOWING INSTRUCTIONS AND CHECKLIST

Attach a completed copy of this sheet to each project (including multiple copies)	□
Attach a Moodle submission receipt of the online project submission, to each project (including multiple copies).	□
You must ensure that you retain a HARD COPY of the project, both for your own reference and in case a project is lost or mislaid. It is not sufficient to keep a copy on computer.	□

Assignments that are submitted to the Programme Coordinator Office must be placed into the assignment box located outside the office.

Office Use Only	
Signature:	
Date:	
Penalty Applied (if applicable):	

Configuration Manual

Chimdindu Akuegbu
x19120036@student.ncirl.ie

1 Introduction

This configuration manual aims at providing the detailed technical steps needed to conduct an analysis on a thesis titled: *An investigative Analysis on the effect of a Pandemic on Stock Market Indexes on countries' stock market indexes within Europe, using a case study of the Covid-19 pandemic.*

2 System Requirement

2.1 Hardware

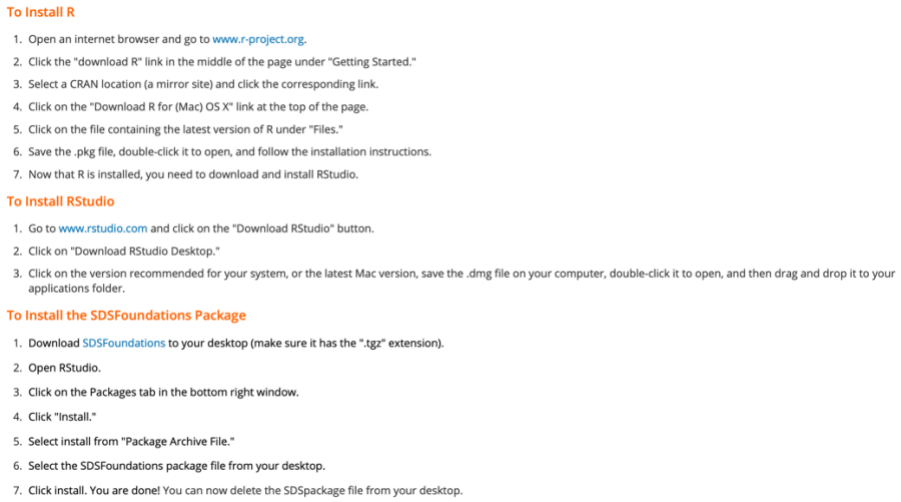
⇒ MacBook Pro 13-inch laptop
⇒ 1.4 GHz Quad – Core Intel Core i58gb Ram
⇒ Mac OS Catalina version 10.15.5 software

2.2 Software

⇒ R studio version- 1.3.959 – This was used to provide a detailed visualisation and statistical analysis.
⇒ Microsoft Word 2019 - was used to write report.
⇒ Microsoft Excel 2019 – This was used in complying the number of covid-19 cases.

2.3 Environment Set- Up (Rstudio)

The first step of setting up Rstudio on a Macbook is to download R from http://www.r-project.org/ and Rstudio from https://rstudio.com/products/rstudio/download/#download. All steps required for downloading Rstudio on windows can be gotten from the link below https://courses.edx.org/courses/UTAustinX/UT.7.01x/3T2014/56c5437b88fa43cf828bff5371c6a924/ , while figure 1 shows how to download it on Mac



To Install R

1. Open an internet browser and go to www.r-project.org.
2. Click the "download R" link in the middle of the page under "Getting Started."
3. Select a CRAN location (a mirror site) and click the corresponding link.
4. Click on the "Download R for (Mac) OS X" link at the top of the page.
5. Click on the file containing the latest version of R under "Files."
6. Save the .pkg file, double-click it to open, and follow the installation instructions.
7. Now that R is installed, you need to download and install RStudio.

To Install RStudio

1. Go to www.rstudio.com and click on the "Download RStudio" button.
2. Click on "Download RStudio Desktop."
3. Click on the version recommended for your system, or the latest Mac version, save the .dmg file on your computer, double-click it to open, and then drag and drop it to your applications folder.

To Install the SDSFoundations Package

1. Download SDSFoundations to your desktop (make sure it has the ".tgz" extension).
2. Open RStudio.
3. Click on the Packages tab in the bottom right window.
4. Click "Install."
5. Select install from "Package Archive File."
6. Select the SDSFoundations package file from your desktop.
7. Click install. You are done! You can now delete the SDSpackage file from your desktop.

Figure 1: Steps for the Installating of Rstudio on Mac

3 Methodology

Stock market indexes for four countries within Europe (Spain, U.K, Germany and France) were downloaded from yahoo finance for the time period from the time period 1st of January 2018 to the 17th of July 2020 to determine the trend in stock prices, We extracted the number of covid-19 cases from 1st February 2020 to the 17th of July 2020 was gotten from John Hopkins Database and the stock market indexes from 1st . The merged dataset was cleaned on R. We used panel regression analysis and the implementation would be explained in the section below.

4 Implementation

4.1 Installation of required packages on R

Package Name	Version	Use of Package
Quantmod	0.4.17	A financial modelling package that was used in importing the stock market indexes of the countries used for analysis.
Dplyr	1.0.0	For merging datasets together
Tidyverse	1.3.0	This was used for data manipulation
lubridate	1.7.9	The dmy () function under this package was used to choose a particular date format.
plm	2.2.3	This package was used for analysing the panel data using the lm () function.
Foreign	3.6.2	Used to compile already imported codes on R
Data.table	1.12.8	It gives a fast and effective way for arranging various datasets into a table.
lmtest	3.6.2	This is used for testing linear regression models.
Performance Analytics	2.0.4	This package is used for performing econometric analysis on datasets.
ggplot2	3.3.2	Was used to create graphs for

		visualisations
tseries	0.10-47	A time series analysis package used for computational finance.

4.2 Data Importation and Visualization

4.2.1 Data Importation and Visualization

The following steps were carried out for all four countries using their stock market indexes respectively: Spain-IBEX, U.K-FTSE, Germany-GDAXI, France-FCHI.

⇒ Importing dataset -

```
getSymbols ("^SMI",from=startdate, to=endDate)
```

⇒ Checking for missing values

```
summary (SMI)
```

⇒ Approximating the missing values

```
SMI = na. approx(SMI)
```

⇒ Obtaining closing price

```
SMI_close < as.data.frame(SMI$SMI.Close)
```

⇒ Checking for missing values

```
summary (SMI_close)
```

⇒ Adding country variable and the date variable

```
SMI_close$Country<- "Country Name"
```

⇒ Converting Country Variable into factor

```
SMI_close$Country<-as.Factor (SMI_close$Country)
```

⇒ Creating Date Variable

```
SMI_close$Date<-rownames (SMI_close)
```

⇒ Converting the date variable to date

```
SMI_close$Date<- as.Date(SMI_close$Date)
```

⇒ Inserting Columns name

```
colnames(Ibex_close)<-c("Close","Country","Date")
```

⇒ View the data

```
head (Ibex_close)
```

4.2.2 Merging all Indexes and Importing Covid-19 cases

⇒ Consolidating all indexes

```
S_close<- rbind (fchi_close, gdaxi_close, Ibex_close, ftse_close)
```

⇒ Converting country variable to factor

```
S_close$Country<- as. factor(S_close$Country)
```

⇒ Converting data variable to date format

```
S_close$Date<- as.Date(S_close$Date)
```

⇒ Importing Covid-19 dataset –

```
corona<-read.csv('Covid.csv',sep=",",header=TRUE,stringsAsFactors = FALSE)
```

⇒ Converting the country variable to factor format

```
corona2$Country <- as.factor(corona2$Country)
```

⇒ Converting date variable to date format

```
corona2$Date <- dmy(corona2$Date)
```

⇒ Filtering data from 02/02/2020 –

```
s_close_af<- filter (S_close,Date > as.Date("2020-02-02")
```

⇒ Filtering corona Cases starting from 2nd of February 2020

```
corona2<- filter(corona2, Date > as.Date("2020-02-02"))
```

Note that 'SMI' used in this configuration manual represents country's "Stock Market Index" as the steps above were repeated for all countries.

4.2.3 Exploratory Data Analysis and Visualisation

⇒ Exploratory Data Analysis for countries' closing prices

```
ggplot(SMI_close) +geom_point(mapping = aes(`Date`,Close),col="blue")
+labs(x='Date',y='Close',title=paste('Closing Stock Price – COUNTRY NAME'))+
theme(plot.title=element_text(hjust =0.5))
```

⇒ Graph showing all closing prices

```
ggplot(S_close) + geom_line(mapping = aes(`Date`,Close,color=Country),size=1.5, alpha=0.6)
```

⇒ Graph showing all closing prices from February 1st, 2020

```
ggplot(s_close_af) + geom_line(mapping = aes(`Date`,Close,color=Country),size=1.5, alpha=0.6)
```

⇒ Graph showing the increase of Covid-19 for all countries

```
Corona_spain<-filter(corona2,Country=="COUNTRY NAME")
ggplot(Corona_Country) + geom_point(mapping =aes(`Date`,Cases),col="blue") +
labs(x='Date',y='Cases',title=paste('Corona Cases - Country'))+ theme(plot.title=element_text(hjust =0.5))
```

⇒ Merging all countries' covid-19 cases on a plot

```
ggplot(corona2) + geom_line(mapping = aes(`Date`,Cases,color=Country),size=1.5, alpha=0.6)
```

⇒ Plot showing the closing price against corona cases for each respective country

```
merg_spain<- merge(SMI_close,Corona_spain, by=c("Date","Country") )
ggplot(merg_COUNTRY NAME) + geom_point(mapping = aes(Cases,Close),col="blue")
labs(x='Cases',y='Close',title=paste('Closing Price VS Cases'))+ theme(plot.title=element_text(hjust =0.5))
```

⇒ Merging of all variables used for analysis

```
merg_data<- merge(S_close,corona2, by=c("Date","Country") )ggplot(merg_data) + geom_point(mapping
= aes(Cases,Close),col="blue") +
labs(x='Cases',y='Close',title=paste('ClosingPriceVSCases'))+ theme(plot.title=element_text(hjust =0.5))
```

5 Implementation

5.1 Panel Data Analysis

⇒ Converting the dataset into a panel data

```
pdata2 <- pdata.frame(merg_data, index=c("Country","Date"))
```

⇒ Table showing the dataset

```
table.Stats(pdata2[,c(3,4)],digits = 1)
```

5.2 Testing Model Assumption

⇒ Testing for autocorrelation - Null hypothesis- No serial correlation

```
pdwtest(Close~Cases, data=pdata2)
```

⇒ Testing for Homoscedasticity - Null hypothesis- The Error term is homoscedastic

```
bptest(Close~Cases, data=pdata2, studentize = F)
```

⇒ Cross sectional dependence - Null hypothesis- There is no cross-sectional dependency

```
pcdtest(Close~Cases, data=pdata2)
```

5.3 Model Estimator

⇒ Poolability Test

```
pooltest(Close~Cases, data=pdata2, effects=c("individual","time"))
```

⇒ Pooled Ordinary Least Square – Null hypothesis- Panel data is poolable

```
Pooled_estimates<-plm (Close~Cases, data=pdata2, model="pooling")
```

5.3.1 Fixed and Random Estimators because of the Heteroscedasticity and autocorrelation in dataset

⇒ Fixed effect Model Estimator

```
fe_estimates<- plm(Close~Cases, data=pdata2, model="within")
summary(fe_estimates)
```

⇒ fixed effect constant for all countries

```
summary(fixef(fe_estimates))
```

⇒ Random effect Method

```
re_estimates<- plm(Close~Cases, data=pdata2, model="random")
summary(re_estimates)
```

5.3.2 Model Evaluation

⇒ Fixed effect test

```
pFtest(fe_estimates, Pooled_estimates)
```

⇒ Random effect test

```
plmtest(Pooled_estimates,type = "bp")
```

⇒ Hausman test

```
phtest(fe_estimates_fgls, re_estimates_fgls)
```

5.3.3 Controlling for Heteroscedasticity and Autocorrelation in the panel model

⇒ Controlling for Heteroscedasticity and Autocorrelation in the panel model

```
coeftest(re_estimates,vcovHC(re_estimates,method="arellano"))
```

5.4 Visualization and Output

Random effect estimate was the best fit according to the Hausman test presented below and from figure 2, we observed that the increase in cases had a negative significant effect on stock prices.

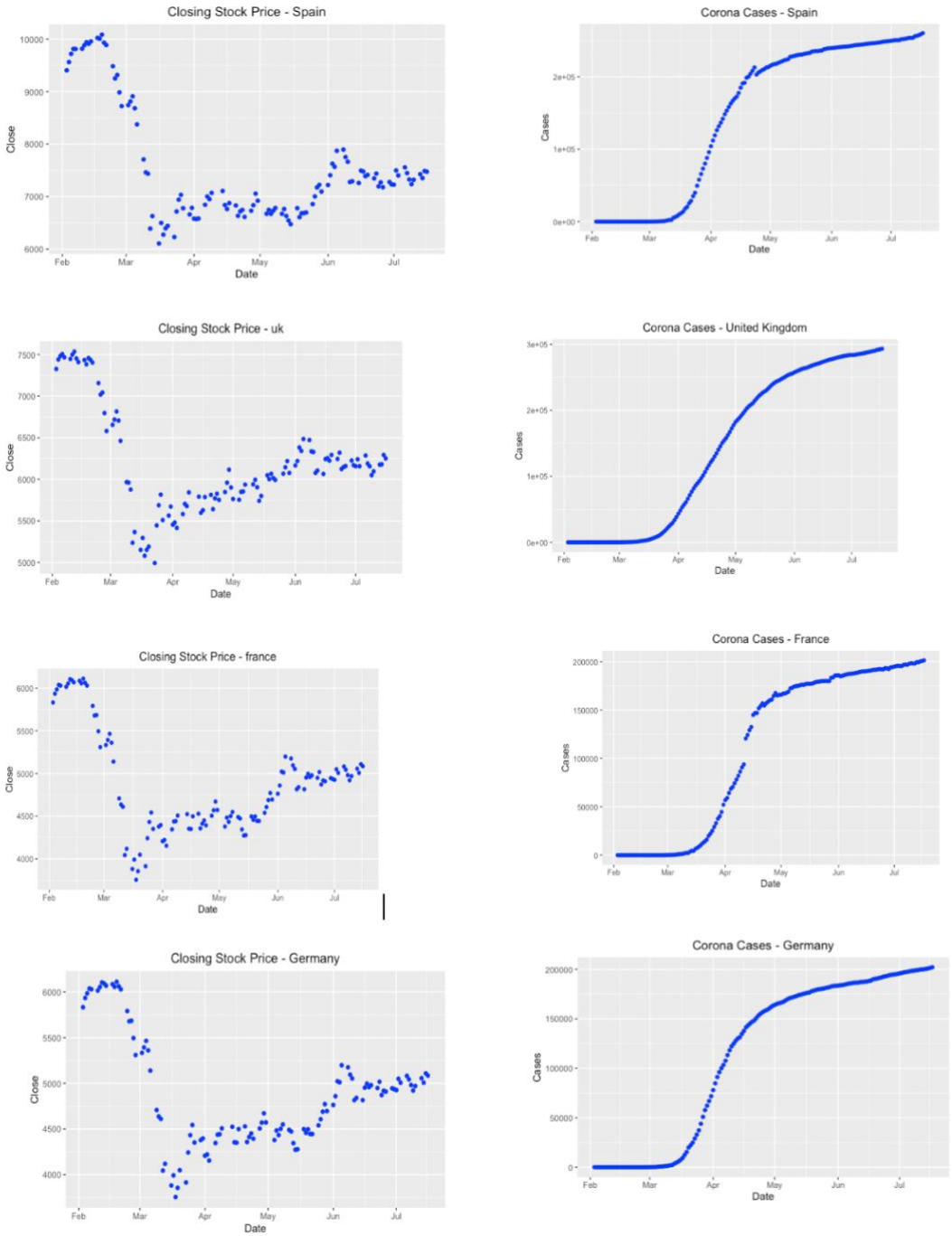


Figure 2: Exploratory Data Analysis of all Variables

Table 1 Hausman test for the best estimator

chisq	df	p-value
1.0075	1	0.3155

H_0=Random Effect Model is consistent

H1=Fixed Effect Model is consistent

The p-value is greater than the level of significance (at 5%). Therefore, the null hypothesis that the random effect model is consistent is not rejected. The variation across the closing price is assumed to be uncorrelated with the number of daily corona cases.

References

Download R and RStudio | UT.7.01x | edX [WWW Document], n.d. URL https://courses.edx.org/courses/UTAustinX/UT.7.01x/3T2014/56c5437b88fa43cf828bff5371c6a924/ (accessed 15.08.20).