National College of Ireland

Configuration Manual

MSc Research Project
M.Sc. FinTech

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MSc Project Submission Sheet

School of Computing

Student Name:	Cassandra Ezechukwu
Student ID:	X17161908
Programme:	M.Sc. FinTech **Year:** 2019
Module:	M.Sc. Research Project
Lecturer:	Victor Del Rosal
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Project Title:	Quantifying Financial Development: A Panel study on the Individual and Combined Effects of Remittances, Trade openness and Regulatory quality in Emerging Economies
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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.
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Configuration Manual

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1 Introduction

The aim of this user configuration manual is to detail the technical requirements and steps necessary to conduct the analysis under the thesis titled; *Quantifying Financial Development: A Panel study on the individual and combined effects of Remittances, Trade openness and Regulatory quality in Emerging Economies.*

2 System Requirements

2.1 Hardware

- ✓ Windows operating system version 10 – 64bit
- ✓ Processor: Intel(R) Core(TM) i5-8250U CPU @ 1.60GHz, 1800 Mhz, 4 Core(s), 8 Logical Processor(s)
- ✓ RAM: 8GB
- ✓ HDD: 916GB

2.2 Software

- ✓ Microsoft Excel 2016 – This was used to form the dataset and also conduct data cleaning
- ✓ R programming Language and R studio – Version 3.5.2 - This was used to conduct the analysis
- ✓ ExPanD – An R-Shiny web application used for panel data visualization
- ✓ Microsoft Word 2016 – This was used to write the report

3 Data

The data for each country was individually downloaded from *The Global Economy* for only the period from 1998- 2017. So for each country, data on remittance, trade openness, regulatory quality and credit to banking sector as % of GDP is downloaded. For the two broad measures of financial sector depth, they are downloaded from the IMF. The combination of all the derived data from the 50 sampled countries is carried out in Excel. The data was also cleaned in Excel.

4 Analysis

4.1 Step 1

Install the packages required to perform the analysis include;

- ✓ install.packages("plm")

- ✓ install.packages("lmtest")
- ✓ install.packages("tseries")

4.2 Step 2

Import the dataset using the read.csv function and specify the full file path of the saved Excel document in CSV format or set working directory in R;

```
panelone <- read.csv(file=  “qfdrtorqfifmt.csv”)
```

4.3 Step 3

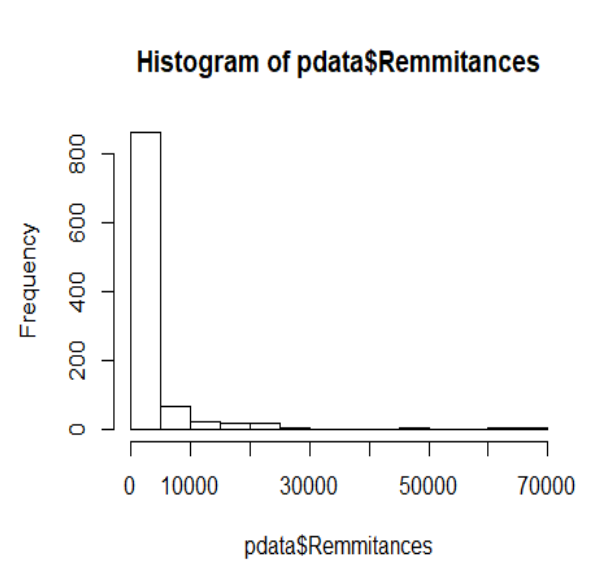
Set the imported data as panel data for R to recognise it as one and specify the cross sections and time series columns

```
pdata <- pdata.frame(panelone, index=c("Country", "Year"))
```

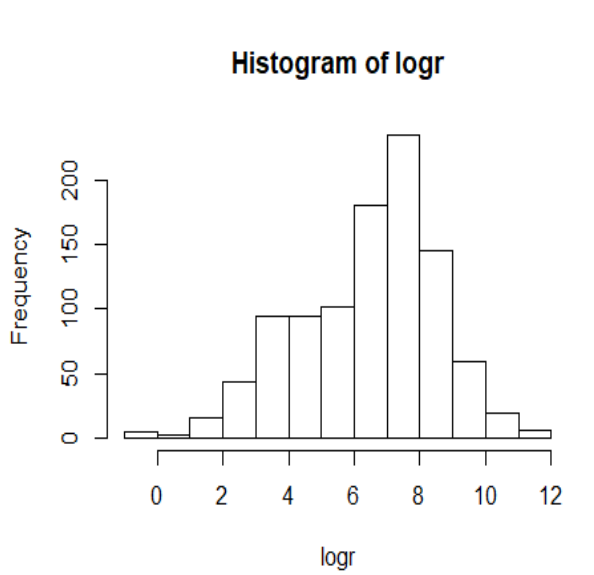
Panel Setting

4.4 Step 4

Run and analyse plots, histograms, distributions of the data for data understanding. Here it is found that remittance is skewed so it is converted to its Log version which was used throughout the analysis.



Before Applying Log



After applying Log

Note: run the r-based shiny app ExPanD (https://jgassen.shinyapps.io/expand/) and simply import the dataset for additional visualizations and plots of the data.

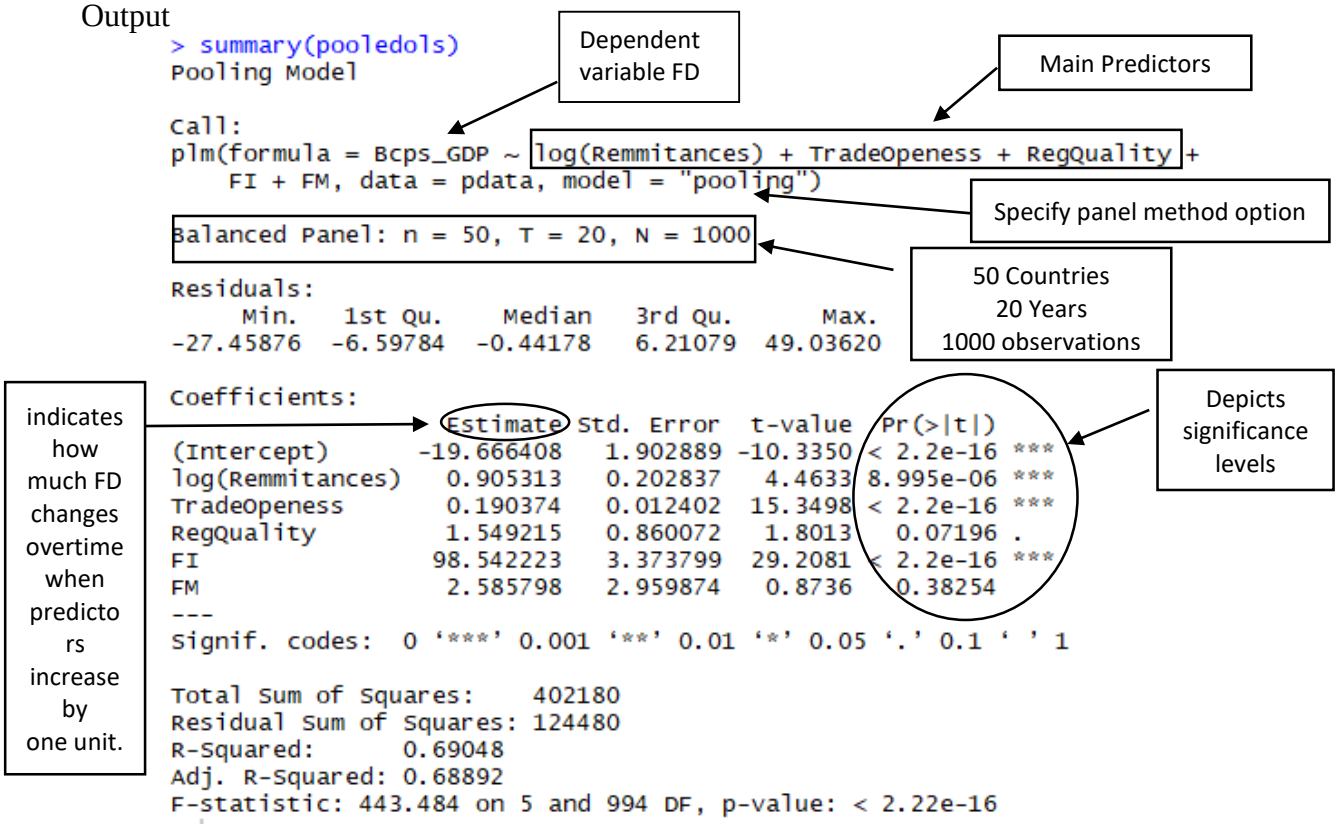
4.5 Step 5

Run the models

4.5.1 Pooled Ordinary Least Squares

```
pooledols <-  plm (Bcps_GDP~ log(Remmitances) + TradeOpeness + RegQuality + FI + FM, data = pdata,model = "pooling")
```

Output




```
> summary(pooledols)
Pooling Model

Call:
plm(formula = Bcps_GDP ~ log(Remmitances) + TradeOpeness + RegQuality +
    FI + FM, data = pdata, model = "pooling")

Balanced Panel: n = 50, T = 20, N = 1000

Residuals:
     Min.   1st Qu.    Median   3rd Qu.      Max.
-27.45876  -6.59784  -0.44178   6.21079  49.03620

Coefficients:
                 Estimate Std. Error  t-value  Pr(>|t|)
(Intercept)      -19.666408   1.902889 -10.3350 < 2.2e-16 ***
log(Remmitances)   0.905313   0.202837   4.4633 8.995e-06 ***
TradeOpeness       0.190374   0.012402  15.3498 < 2.2e-16 ***
RegQuality         1.549215   0.860072   1.8013  0.07196 .
FI                98.542223   3.373799  29.2081 < 2.2e-16 ***
FM                 2.585798   2.959874   0.8736  0.38254
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares:    402180
Residual Sum of Squares: 124480
R-Squared:      0.69048
Adj. R-Squared: 0.68892
F-statistic: 443.484 on 5 and 994 DF, p-value: < 2.22e-16
```

4.5.2 Fixed Effect

```
fixedef<-  plm(Bcps_GDP~ log(Remmitances) + TradeOpeness + RegQuality + FI + FM,
           data = pdata, effect = "time", model = "within")
```

Output

```
> summary(fixedef)
Oneway (individual) effect Within Model

Call:
plm(formula = Bcps_GDP ~ log(Remmitances) + TradeOpeness + RegQuality +
    FI + FM, data = pdata, model = "within")

Balanced Panel: n = 50, T = 20, N = 1000

Residuals:
     Min.   1st Qu.    Median   3rd Qu.      Max.
-20.22345  -3.59972  -0.19284   3.10340  49.28169

Coefficients:
                 Estimate Std. Error t-value  Pr(>|t|)
log(Remmitances)  -0.534717   0.346266 -1.5442  0.122866
TradeOpeness       0.066408   0.016883  3.9334 8.988e-05 ***
RegQuality         3.301866   0.888192  3.7175  0.000213 ***
FI               103.594938   4.316514 23.9997 < 2.2e-16 ***
FM                16.084300   5.205346  3.0900  0.002060 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares:    89818
Residual Sum of Squares: 44787
R-Squared:      0.50136
Adj. R-Squared: 0.47287
F-statistic: 190.031 on 5 and 945 DF, p-value: < 2.22e-16
```

4.5.3 Random Effect

```
randomef<-  plm(Bcps_GDP~ log(Remmitances) + TradeOpeness + RegQuality + FI + FM, data = pdata ,model = "random")
```

Output

```
> summary(randomef)
Oneway (individual) effect Random Effect Model
   (Swamy-Arora's transformation)

Call:
plm(formula = Bcps_GDP ~ log(Remmitances) + TradeOpeness + RegQuality +
    FI + FM, data = pdata, model = "random")

Balanced Panel: n = 50, T = 20, N = 1000

Effects:
                 var std.dev share
idiosyncratic 47.394   6.884 0.369
individual    80.986   8.999 0.631
theta: 0.8314

Residuals:
     Min.   1st Qu.    Median   3rd Qu.      Max.
-18.91849  -4.07065  -0.23227   3.22909  50.46258

Coefficients:
                   Estimate Std. Error z-value  Pr(>|z|)
(Intercept)       -5.346740   2.417649 -2.2115 0.0269981 *
log(Remmitances)  -0.420897   0.305687 -1.3769 0.1685461
TradeOpeness       0.083798   0.015716  5.3322 9.705e-08 ***
RegQuality         3.232508   0.861265  3.7532 0.0001746 ***
FI               102.410614   3.983135 25.7111 < 2.2e-16 ***
FM                11.957953   4.503558  2.6552 0.0079256 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares:    98698
Residual Sum of Squares: 47557
R-Squared:      0.51815
Adj. R-Squared: 0.51573
Chisq: 1068.9 on 5 DF, p-value: < 2.22e-16
```

4.6 Step 6

Evaluate the models

4.6.1 Fixed Effect

pFtest(fixedef, pooledols)

```
        F test for individual effects

data:  Bcps_GDP ~ log(Remmitances) + TradeOpeness + RegQuality + FI +  ...
F = 34.318, df1 = 49, df2 = 945, p-value < 2.2e-16
alternative hypothesis: significant effects
```

P value less than 0.05 means FE is appropriate

4.6.2 Random Effect

plmtest(pooledols)

```
        Lagrange Multiplier Test - (Honda) for balanced panels

data:  Bcps_GDP ~ log(Remmitances) + TradeOpeness + RegQuality + FI +  ...
normal = 56.971, p-value < 2.2e-16
alternative hypothesis: significant effects
```

P value less than 0.05 means RE is appropriate

4.6.3 Hausman Test

To select the more appropriate model
phtest(randomef, fixedef)

```
        Hausman Test

data:  Bcps_GDP ~ log(Remmitances) + TradeOpeness + RegQuality + FI +  ...
chisq = 16.877, df = 5, p-value = 0.004739
alternative hypothesis: one model is inconsistent

> |
```

p-value < 0.05 suggest FE model is better

4.7 Step 7

Extracting fixed effects with fixef()

```
> fixef(fixedef)
              Albania    Antigua and Barbuda             Argentina             Azerbaijan
          -11.9342864             -5.7035866           -25.0830966           -11.0488014
           Bangladesh                Belarus                Belize                 Benin
            9.0391062            -9.1038717             7.0487130            -9.1924100
              Bolivia Bosnia and Herzegovina                Brazil              Cambodia
           12.1589871              1.5508088           -20.3371157             4.8950726
             Cameroon             Cape Verde              Colombia            Costa rica
           -7.3514965              2.9796908           -13.6760272            -5.2755333
              Croatia       Dominic Republic              Dominica               Ecuador
          -10.4695854            -3.9623254            -2.7353896            -5.2351212
                Egypt           El Salvador               Georgia               Grenada
            7.6905932              8.6421646            -7.6826614             4.3955766
            Guatemala                 Guinea                Guyana                 Haiti
          -11.1473547            -8.8503248             0.3056791            -1.0837286
              Honduras                  India             Indonesia               Jamaica
            7.9572813              4.2306504            -9.6880042           -14.6375587
               Jordan                 Malawi                Mexico              Morrocco
           14.8847947            -8.1265856           -26.5456122             6.1785610
              Namibia               Nicaragua              Pakistan                Panama
          -23.7316839            -1.2263080            -7.4335585            14.8540104
             Paraguay                   Peru           Phillipines                Poland
            2.6688212            -5.7129891            -5.2938396           -24.1803017
         Sierra Leone              Sri Lanka                 Sudan               Tunisia
           -9.1307718            -3.8869128            -3.8133377             9.9121571
               Turkey                 Uganda
           -9.6655925            -7.6186681
```