

Nonparametric Statistics

Noé Debrois, Person Code 10949145, ID 242751

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Exercise 3

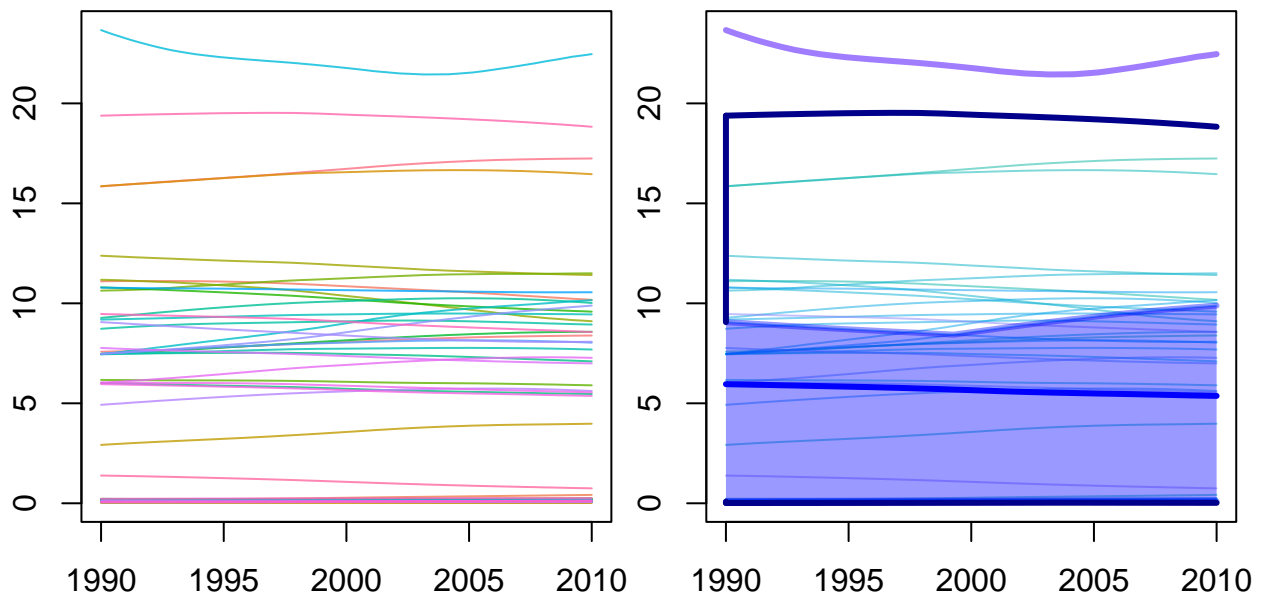
Question 3.1

Synthetic description of assumptions, methods, and algorithms

We will use functional data (using roahd package). Then if we defined well our functional data, we can just use `plot(f_data)`. After having plotted our functional boxplot, we can have access to the magnitude outliers using `$ID_outliers` argument.

Results and brief discussion

Magnitude outliers



```
## [1] 34
## CountryCode IncomeGroup C02, 1990 C02, 1990.2 C02, 1990.4 C02, 1990.61
## 34 LUX High income 23.66603 23.57398 23.48772 23.4066
## C02, 1990.81 C02, 1991.01 C02, 1991.21 C02, 1991.41 C02, 1991.62
## 34 23.33007 23.24952 23.17318 23.10107 23.03273
## C02, 1991.82 C02, 1992.02 C02, 1992.22 C02, 1992.42 C02, 1992.63
## 34 22.96776 22.90232 22.84017 22.781 22.72447
## C02, 1992.83 C02, 1993.03 C02, 1993.23 C02, 1993.43 C02, 1993.64
## 34 22.6706 22.6251 22.58149 22.53955 22.49909
## C02, 1993.84 C02, 1994.04 C02, 1994.24 C02, 1994.44 C02, 1994.65
```

```

## 34      22.46065      22.43      22.40026      22.3713      22.34304
##      C02, 1994.85 C02, 1995.05 C02, 1995.25 C02, 1995.45 C02, 1995.66
## 34      22.31606      22.29379      22.27187      22.25024      22.22883
##      C02, 1995.86 C02, 1996.06 C02, 1996.26 C02, 1996.46 C02, 1996.67
## 34      22.20798      22.18893      22.16995      22.151      22.13203
##      C02, 1996.87 C02, 1997.07 C02, 1997.27 C02, 1997.47 C02, 1997.68
## 34      22.11316      22.09476      22.07626      22.05762      22.03879
##      C02, 1997.88 C02, 1998.08 C02, 1998.28 C02, 1998.48 C02, 1998.69
## 34      22.01889      21.99679      21.97454      21.95209      21.92938
##      C02, 1998.89 C02, 1999.09 C02, 1999.29 C02, 1999.49 C02, 1999.7 C02, 1999.9
## 34      21.90612      21.88214      21.85785      21.83318      21.80808      21.78248
##      C02, 2000.1 C02, 2000.3 C02, 2000.51 C02, 2000.71 C02, 2000.91 C02, 2001.11
## 34      21.7563      21.72948      21.70193      21.67359      21.64435      21.61413
##      C02, 2001.31 C02, 2001.52 C02, 2001.72 C02, 2001.92 C02, 2002.12
## 34      21.59039      21.5698      21.54842      21.52617      21.50298
##      C02, 2002.32 C02, 2002.53 C02, 2002.73 C02, 2002.93 C02, 2003.13
## 34      21.48957      21.48003      21.46992      21.45922      21.44787
##      C02, 2003.33 C02, 2003.54 C02, 2003.74 C02, 2003.94 C02, 2004.14
## 34      21.44699      21.44945      21.45174      21.45386      21.45582
##      C02, 2004.34 C02, 2004.55 C02, 2004.75 C02, 2004.95 C02, 2005.15
## 34      21.47047      21.48858      21.5072      21.52638      21.54621
##      C02, 2005.35 C02, 2005.56 C02, 2005.76 C02, 2005.96 C02, 2006.16
## 34      21.57626      21.60904      21.64311      21.67861      21.71572
##      C02, 2006.36 C02, 2006.57 C02, 2006.77 C02, 2006.97 C02, 2007.17
## 34      21.75055      21.78648      21.82408      21.86352      21.90502
##      C02, 2007.37 C02, 2007.58 C02, 2007.78 C02, 2007.98 C02, 2008.18
## 34      21.94356      21.98381      22.02621      22.07099      22.11833
##      C02, 2008.38 C02, 2008.59 C02, 2008.79 C02, 2008.99 C02, 2009.19
## 34      22.15634      22.19652      22.23913      22.28443      22.33157
##      C02, 2009.39 C02, 2009.6 C02, 2009.8 C02, 2010
## 34      22.36165      22.39367      22.42786      22.46448

```

Question 3.2

Synthetic description of assumptions, methods, and algorithms

We use here the trim mean which is a robustified version of the classical mean.

Results and brief discussion

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```

## [1] 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000
## [9] 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000
## [17] 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000
## [25] 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 8.868284 8.872716
## [33] 8.876886 8.880824 8.884552 8.889045 8.893269 8.897213 8.900960 8.904532
## [41] 8.909659 8.914538 8.919184 8.923619 8.927915 8.933117 8.938087 8.942847
## [49] 8.947419 8.951853 8.956428 8.960830 8.965076 8.969183 8.973247 8.977659
## [57] 8.981931 8.986079 8.990117 8.994087

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Question 3.3

Synthetic description of assumptions, methods, and algorithms

abc

Results and brief discussion

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Question 3.4

Synthetic description of assumptions, methods, and algorithms

Assumptions : $X_{11}, \dots, X_{1n} \sim p_1$ $X_{21}, \dots, X_{2m} \sim p_2$ $H_0 : p_1 = p_2$, $H_1 : p_1 \neq p_2$ $T_0 = |X_{\text{trim_mean}1} - X_{\text{trim_mean}2}|$

Results and brief discussion

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