GDP Deflator Development 2000-2022

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The graph is used for the M-SD 1 7102: Development Economics at Hochschule Rhein-Waal. Therefore the project cannot be publicly on GitHub. If you want to re-run the code, please first download the Excel file: **historical_classification_by_income.xlsx** from the **repository**.

It aims to observe the differences in GDP deflation development grouped by income level in 2000. That is, freeze the development of the countries and observe only the GDP deflation development.

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Code with explanation

Load libraries

```
library(dplyr)
```

```
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(readr)
library(WDI)
library(tidyr)
library(ggplot2)
library(readxl)
library(cellranger)
library(simputation)
library(imputeTS)
```

```
## Registered S3 method overwritten by 'quantmod':
##   method            from
##   as.zoo.data.frame zoo
```

```
library(tinytex)
```

```
## Warning: package 'tinytex' was built under R version 4.3.3
```

```
library(pandoc)
```

Prepare income class 2000 classification

The classification data is taken out from Excel sheet provided by World Bank DataBank.

```
Inc2000 <- read_excel("historical_classification_by_income.xlsx", "Country Analytical History")
```

```
## New names:
## * `` -> `...1`
## * `` -> `...3`
## * `` -> `...4`
## * `` -> `...5`
## * `` -> `...6`
## * `` -> `...7`
## * `` -> `...8`
## * `` -> `...9`
## * `` -> `...10`
## * `` -> `...11`
## * `` -> `...12`
## * `` -> `...13`
## * `` -> `...14`
## * `` -> `...15`
## * `` -> `...16`
## * `` -> `...17`
## * `` -> `...18`
## * `` -> `...19`
## * `` -> `...20`
## * `` -> `...21`
## * `` -> `...22`
## * `` -> `...23`
## * `` -> `...24`
## * `` -> `...25`
## * `` -> `...26`
## * `` -> `...27`
## * `` -> `...28`
## * `` -> `...29`
## * `` -> `...30`
## * `` -> `...31`
## * `` -> `...32`
## * `` -> `...33`
## * `` -> `...34`
## * `` -> `...35`
## * `` -> `...36`
## * `` -> `...37`
```

```r
income2000 <- Inc2000[c(1,11:238),c(1,2,16)]

income2000 <- income2000 %>%
  rename(incomeold = ...16) %>%
  rename(iso3c = ...1) %>%
  filter(incomeold!="..")

income2000$incomeold <- factor(
  income2000$incomeold,
  levels = c("L", "LM", "UM", "H"),
  labels = c("Low income (2000)",
             "Lower middle income (2000)",
             "Upper middle income (2000)",
             "High income (2000)"))
```

Load data

Access to WDI databank for most updated data.

```r
if(!exists("WDI_df")) {
  WDI_df <- WDI(indicator = c("NY.GDP.DEFL.KD.ZG"),
                start = 2000,
                end = 2022,
                extra = TRUE)
}
```

Rename and only select needed attributes.

```r
gdpdfl_2000 <- WDI_df %>%
  rename(GDPdefl = NY.GDP.DEFL.KD.ZG) %>%
  select(country, iso3c, year, GDPdefl, income) %>%
  subset(income != "Aggregates" & !(iso3c == "COD" & year == "2000" ))
```

Data Processing

First will observe the missing value status of the dataset. Then decided how to filter out data then use linear regression to impute.

Filter out NA

```r
# income2000 is the data with the old income category
merge_gdpdefl <- merge(gdpdfl_2000, income2000, by="iso3c", all.x=FALSE)

# Check for missing values
statsNA(merge_gdpdefl$GDPdefl)
```

```
## [1] "Length of time series:"
## [1] 4645
## [1] "-------------------------"
```

```
## [1] "Number of Missing Values:"
## [1] 143
## [1] "-------------------------"
## [1] "Percentage of Missing Values:"
## [1] "3.08%"
## [1] "-------------------------"
## [1] "Number of Gaps:"
## [1] 55
## [1] "-------------------------"
## [1] "Average Gap Size:"
## [1] 2.6
## [1] "-------------------------"
## [1] "Stats for Bins"
## [1] "  Bin 1 (1162 values from 1 to 1162) :      42 NAs (3.61%)"
## [1] "  Bin 2 (1162 values from 1163 to 2324) :      25 NAs (2.15%)"
## [1] "  Bin 3 (1162 values from 2325 to 3486) :      35 NAs (3.01%)"
## [1] "  Bin 4 (1159 values from 3487 to 4645) :      41 NAs (3.54%)"
## [1] "-------------------------"
## [1] "Longest NA gap (series of consecutive NAs)"
## [1] "23 in a row"
## [1] "-------------------------"
## [1] "Most frequent gap size (series of consecutive NA series)"
## [1] "1 NA in a row (occurring 25 times)"
## [1] "-------------------------"
## [1] "Gap size accounting for most NAs"
## [1] "3 NA in a row (occurring 10 times, making up for overall 30 NAs)"
## [1] "-------------------------"
## [1] "Overview NA series"
## [1] "  1 NA in a row: 25 times"
## [1] "  2 NA in a row: 14 times"
## [1] "  3 NA in a row: 10 times"
## [1] "  4 NA in a row: 1 times"
## [1] "  6 NA in a row: 1 times"
## [1] "  7 NA in a row: 1 times"
## [1] "  8 NA in a row: 1 times"
## [1] "  12 NA in a row: 1 times"
## [1] "  23 NA in a row: 1 times"
```

```r
# Create group of countries only have 0 or 1 observations
many_na_countries_2000 <- merge_gdpdefl %>%
  filter(is.na(GDPdefl)) %>%
  group_by(country) %>%
  summarise(n()) %>%
  filter(`n()` >= 23)

# Filter out them from the main dataset
many_na_countries_list_2000 <- many_na_countries_2000$country

dataGDPdeflator_2000 <- merge_gdpdefl %>%
  mutate(drop = ifelse(country %in% many_na_countries_list_2000, T, F)) %>%
  filter(drop == F) %>%
  select(-drop)

statsNA(dataGDPdeflator_2000$GDPdefl)
```

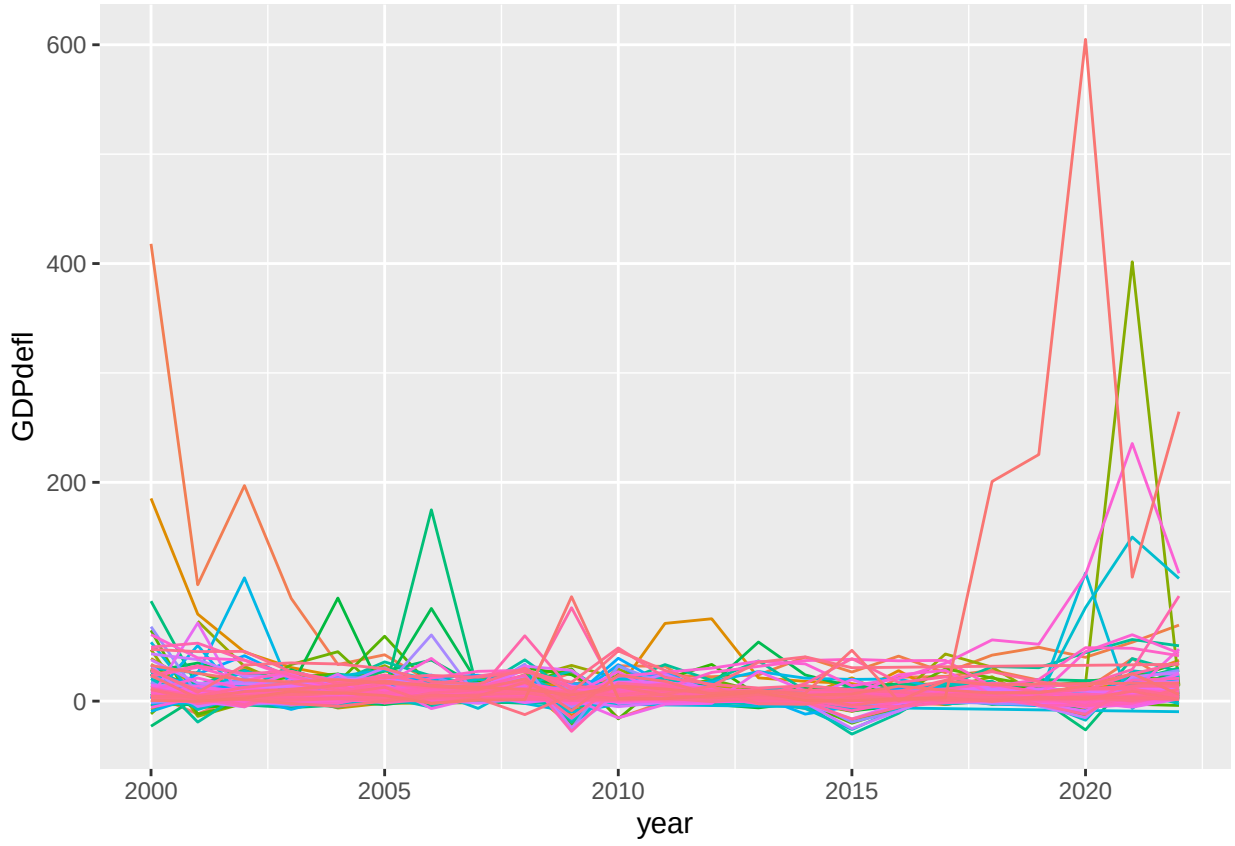
```
## [1] "Length of time series:"
## [1] 4622
## [1] "-------------------------"
## [1] "Number of Missing Values:"
## [1] 120
## [1] "-------------------------"
## [1] "Percentage of Missing Values:"
## [1] "2.6%"
## [1] "-------------------------"
## [1] "Number of Gaps:"
## [1] 54
## [1] "-------------------------"
## [1] "Average Gap Size:"
## [1] 2.222222
## [1] "-------------------------"
## [1] "Stats for Bins"
## [1] "  Bin 1 (1156 values from 1 to 1156) :      42 NAs (3.63%)"
## [1] "  Bin 2 (1156 values from 1157 to 2312) :      25 NAs (2.16%)"
## [1] "  Bin 3 (1156 values from 2313 to 3468) :      35 NAs (3.03%)"
## [1] "  Bin 4 (1154 values from 3469 to 4622) :      18 NAs (1.56%)"
## [1] "-------------------------"
## [1] "Longest NA gap (series of consecutive NAs)"
## [1] "12 in a row"
## [1] "-------------------------"
## [1] "Most frequent gap size (series of consecutive NA series)"
## [1] "1 NA in a row (occurring 25 times)"
## [1] "-------------------------"
## [1] "Gap size accounting for most NAs"
## [1] "3 NA in a row (occurring 10 times, making up for overall 30 NAs)"
## [1] "-------------------------"
## [1] "Overview NA series"
## [1] "  1 NA in a row: 25 times"
## [1] "  2 NA in a row: 14 times"
## [1] "  3 NA in a row: 10 times"
## [1] "  4 NA in a row: 1 times"
## [1] "  6 NA in a row: 1 times"
## [1] "  7 NA in a row: 1 times"
## [1] "  8 NA in a row: 1 times"
## [1] "  12 NA in a row: 1 times"
```

Imputation for NA

```
# Linear Regression approach

simpdataGDPdeflator_2000 <- impute_lm(dataGDPdeflator_2000, GDPdefl ~ year*country)

## After imputation
ggplot(simpdataGDPdeflator_2000, aes(x = year, y = GDPdefl, color = country)) +
   geom_line(stat = "identity", show.legend = F)
```




```
summary(simpdataGDPdeflator_2000)
```

```
##     iso3c              country                year         GDPdefl
##  Length:4622        Length:4622        Min.   :2000   Min.   :-30.200
##  Class :character   Class :character   1st Qu.:2005   1st Qu.:  1.472
##  Mode  :character   Mode  :character   Median :2011   Median :  3.721
##                                        Mean   :2011   Mean   :  6.910
##                                        3rd Qu.:2017   3rd Qu.:  8.004
##                                        Max.   :2022   Max.   :604.946
##     income           World Bank Analytical Classifications
##  Length:4622        Length:4622
##  Class :character   Class :character
##  Mode  :character   Mode  :character
##
##
##
##                        incomeold
##  Low income (2000)          :1402
##  Lower middle income (2000):1219
##  Upper middle income (2000): 828
##  High income (2000)         :1173
##
##
```

Visualisation

After process the dataset, first will transform by building mean then visualisa in the line graph.

```
## `summarise()` has grouped output by 'year'. You can override using the
## `.groups` argument.
```

```
## Warning: Using `size` aesthetic for lines was deprecated in ggplot2 3.4.0.
## i Please use `linewidth` instead.
## This warning is displayed once every 8 hours.
## Call `lifecycle::last_lifecycle_warnings()` to see where this warning was
## generated.
```