MortalityGaps R Package

Marius Pascariu

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This package contains source code for the Double-Gap model for forecasting life expectancy in human populations.

Description

Life expectancy is highly correlated over time among countries and between males and females. These associations can be used to improve forecasts. Here we have implemented a method for forecasting female life expectancy based on analysis of the gap between female life expectancy in a country compared with the record level of female life expectancy in the world. Second, to forecast male life expectancy, the gap between male life expectancy and female life expectancy in a country is analysed. We named this method the Double-Gap model. For a detailed description of the method see Pascariu et al. (2017).

Installation

1. Make sure you have the most recent version of R
2. Run the following code in your R console

```
install.packages("MortalityGaps")
```

Updating to the latest version of the package

You can track and contribute to the development of `MortalityGaps` on GitHub. To install it:

1. Install the release version of `devtools` from CRAN with `install.packages("devtools")`.
2. Make sure you have a working development environment.
   - **Windows**: Install Rtools.
   - **Mac**: Install `Xcode` from the Mac App Store.
   - **Linux**: Install a compiler and various development libraries (details vary across different flavors of Linux).
3. Install the development version of `MortalityGaps`.

```
R    devtools::install_github("mpascariu/MortalityGaps")
```

Help

All functions are documented in the standard way, which means that once you load the package using `library(MortalityGaps)` you can just type `?DoubleGap` to see the help file.

Examples

```
library(MortalityGaps)
```

```
##
## MortalityGaps: The Double-Gap Life Expectancy Forecasting Model
## Author       : Marius D. Pascariu
## Last Update  : June 20, 2018
```

Input data

```
# Collection of life expectancies for female populations
exF <- MortalityGaps.data$exF
# Life expectancy for male populations
exM <- MortalityGaps.data$exM

head(exF)
```

```
##   country Year Age    ex
## 1     AUS 1950   0 71.72
## 2     AUS 1950  65 14.74
## 3     AUS 1951   0 71.59
## 4     AUS 1951  65 14.66
## 5     AUS 1952   0 72.04
## 6     AUS 1952  65 14.89
```

Fit DG model at age 0 for Australia using data from 1950 to 2014

```
M0 <- DoubleGap(DF = exF,
                DM = exM,
                age = 0,
                country = "AUS",
                years = 1950:2014)
M0
```

```
## Double-Gap Model fit
##
## Country     :  AUS
## Age (x)     :  0
## Years in fit:  1950 - 2014
```

Summary results

```
summary(M0)
```

```
##
## Coefficients Double-Gap Model:
##
## M1: Best-Practice Life Expectancy Model
##               Estimate Std. Error t value  Pr(>|t|)
## (Intercept) 73.5182019  0.1190168  617.71 < 2.2e-16 ***
```

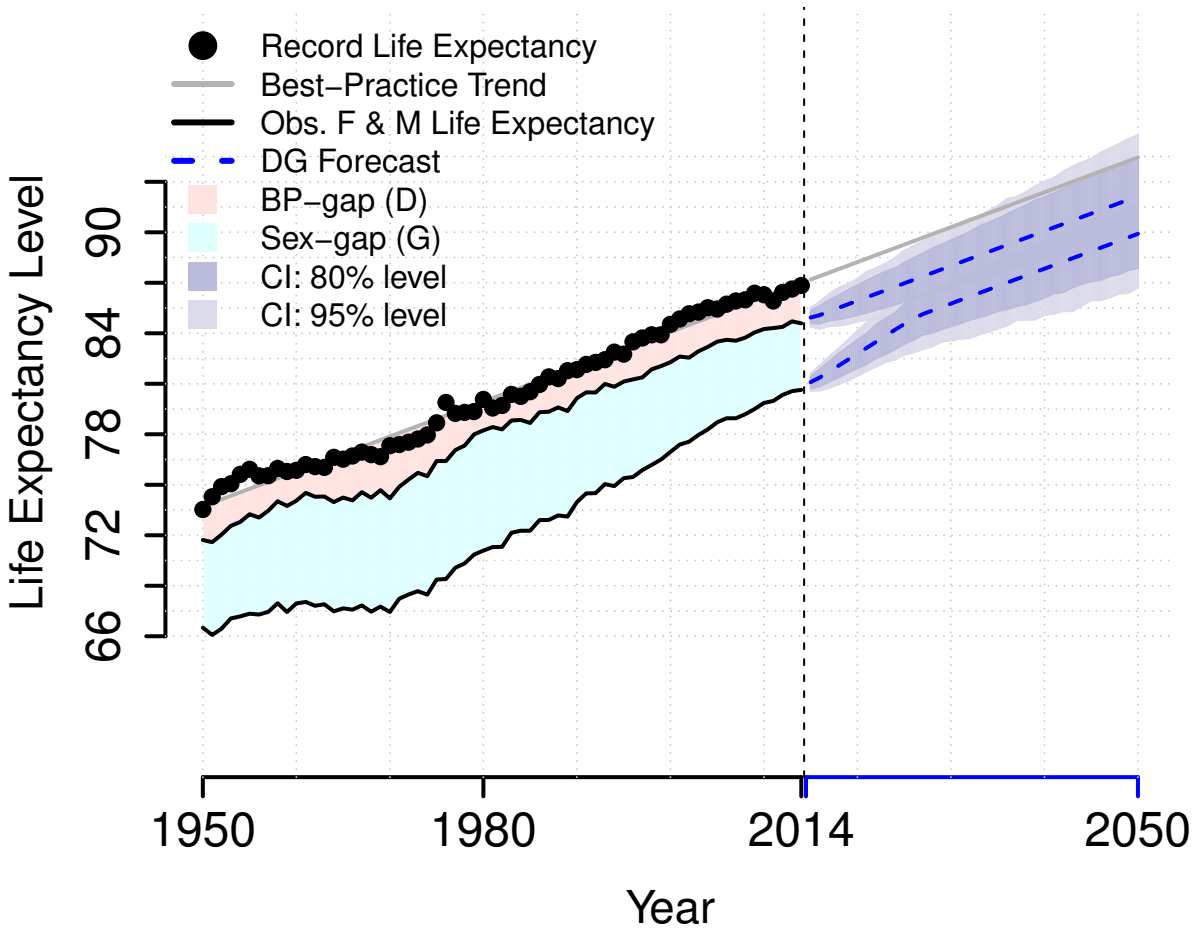
```
## year         0.2072107  0.0031353   66.09 < 2.2e-16 ***
##
## M2: Best-Practice Gap Model (ARIMA)
##        ar1
## -0.4255166
##
## M3: Sex-Gap Model
##                Estimate Std. Error  z value  Pr(>|z|)
## (Intercept)   0.1929436  0.0237540   8.1226 4.564e-16 ***
## sex_gap1      0.8315822  0.0210144  39.5720 < 2.2e-16 ***
## sex_gap2      0.1495723  0.0208707   7.1666 7.687e-13 ***
## narrow_level -0.0342501  0.0029929 -11.4439 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## tau = 77.28 | A = 87.52275 | L = 2.24 | U = 13.68
```

Forecast life expectancy in Australia until 2050

```
P0 <- predict(M0, h = 36)
```

Plot the results

```
plot(P0)
```


Record Life Expectancy
Best−Practice Trend
Obs. F & M Life Expectancy
DG Forecast
BP−gap (D)
Sex−gap (G)
CI: 80% level
CI: 95% level
Life Expectancy Level
66
72
78
84
90
1950
1980
2014
2050
Year