Eurostat R tools

This R package provides tools to access Eurostat database as part of the rOpenGov project.

For contact information and source code, see the github page

Available tools

Installation

Release version:

```
install.packages("eurostat")
```

Development version:

```
library(devtools)
install_github("ropengov/eurostat")
```

Overall, the eurostat package includes the following functions:

```
library(eurostat)
eurostat.functions <- sort(ls("package:eurostat"))
kable(as.data.frame(eurostat.functions))
```

eurostat.functions

candidate_countries
clean_eurostat_cache
dic_order

ea_countries
efta_countries
eu_countries
eurotime2date
eurotime2num
get_eurostat
get_eurostat_dic
getEurostatDictionary get_eurostat_json
get_eurostat_toc
getEurostatTOC
grepEurostatTOC
label_eurostat
label_eurostat_tables label_eurostat_vars
search_eurostat

Finding data

Function `get_eurostat_toc()` downloads a table of contents of eurostat datasets. The values in column 'code' should be used to download a selected dataset.

```
# Load the package
library(eurostat)
library(rvest)

# Get Eurostat data listing
toc <- get_eurostat_toc()

# Check the first items
library(knitr)
kable(head(toc))
```

title	code	type	last.update.of.data	last.table.structure
Database by themes	data	folder		
General and regional statistics	general	folder		
European and national indicators for short-term analysis	euroind	folder		
Business and consumer surveys (source: DG ECFIN)	ei_bcs	folder		
Consumer surveys (source: DG ECFIN)	ei_bcs_cs	folder		
Consumers - monthly data	ei_bsco_m	dataset	26.02.2016	26.02.2016

With `search_eurostat()` you can search the table of contents for particular patterns, e.g. all datasets related to *passenger transport*. The kable function to produces nice markdown output. Note that with the `type` argument of this function you could restrict the search to for instance datasets or tables.

```
# info about passengers
kable(head(search_eurostat("passenger transport")))
```

	title
5587	Volume of passenger transport relative to GDP
5588	Modal split of passenger transport
5627	Railway transport - Total annual passenger transport (1 000 pass., million pkm)

	title
5631	International railway passenger transport from the reporting country to the country of disembarkation (1 000 passen
5632	International railway passenger transport from the country of embarkation to the reporting country (1 000 passenge
5981	Air passenger transport by reporting country

Codes for the dataset can be searched also from the Eurostat database. The Eurostat database gives codes in the Data Navigation Tree after every dataset in parenthesis.

Downloading data

The package supports two of the Eurostats download methods: the bulk download facility and the Web Services' JSON API. The bulk download facility is the fastest method to download whole datasets. It is also often the only way as the JSON API has limitation of maximum 50 sub-indicators at a time and whole datasets usually exceeds that. To download only a small section of the dataset the JSON API is faster, as it allows to make a data selection before downloading.

A user does not usually have to bother with methods, as both are used via main function `get_eurostat()`. If only the table id is given, the whole table is downloaded from the bulk download facility. If also filters are defined the JSON API is used.

Here an example of indicator Modal split of passenger transport. This is the percentage share of each mode of transport in total inland transport, expressed in passenger-kilometres (pkm) based on transport by passenger cars, buses and coaches, and trains. All data should be based on movements on national territory, regardless of the nationality of the vehicle. However, the data collection is not harmonized at the EU level.

Pick and print the id of the data set to download:

```
id <- search_eurostat("Modal split of passenger transport",
                      type = "table")$code[1]
print(id)
```

[1] "tsdtr210"

Get the whole corresponding table. As the table is annual data, it is more convient to use a numeric time variable than use the default date format:

```
dat <- get_eurostat(id, time_format = "num")
```

Investigate the structure of the downloaded data set:

```
str(dat)
```

```
## 'data.frame':    2520 obs. of  5 variables:
##  $ unit   : Factor w/ 1 level "PC": 1 1 1 1 1 1 1 1 1 1 ...
##  $ vehicle: Factor w/ 3 levels "BUS_TOT","CAR",..: 1 1 1 1 1 1 1 1 1 1 ...
##  $ geo    : Factor w/ 35 levels "AT","BE","BG",..: 1 2 3 4 5 6 7 8 9 10 ...
##  $ time   : num  2013 2013 2013 2013 2013 ...
##  $ values : num  9.8 15.2 16.2 5.1 18.5 17.9 5.8 9.8 14.4 17.8 ...
```

```
kable(head(dat))
```

unit	vehicle	geo	time	values
PC	BUS_TOT	AT	2013	9.8
PC	BUS_TOT	BE	2013	15.2
PC	BUS_TOT	BG	2013	16.2
PC	BUS_TOT	CH	2013	5.1
PC	BUS_TOT	CY	2013	18.5
PC	BUS_TOT	CZ	2013	17.9

Or you can get only a part of the dataset by defining `filters` argument. It should be named list, where names corresponds to variable names (lower case) and values are vectors of codes corresponding desidered series (upper case). For time variable, in addition to a `time`, also a `sinceTimePeriod` and a `lastTimePeriod` can be used.

```
dat2 <- get_eurostat(id, filters = list(geo = c("EU28", "FI"), lastTimePeriod=1), time_format = "num")
kable(dat2)
```

unit	vehicle	geo	time	values
PC	BUS_TOT	EU28	2013	9.2
PC	BUS_TOT	FI	2013	9.8
PC	CAR	EU28	2013	83.2
PC	CAR	FI	2013	84.9
PC	TRN	EU28	2013	7.6
PC	TRN	FI	2013	5.3

Replacing codes with labels

By default variables are returned as Eurostat codes, but to get human-readable labels instead, use a `type = "label"` argument.

```
dat12 <- get_eurostat(id, filters = list(geo = c("EU28", "FI"),
                                         lastTimePeriod = 1),
                      type = "label", time_format = "num")
kable(head(dat12))
```

unit	vehicle	geo	time	values
Percentage	Motor coaches, buses and trolley buses	European Union (28 countries)	2013	9.2
Percentage	Motor coaches, buses and trolley buses	Finland	2013	9.8
Percentage	Passenger cars	European Union (28 countries)	2013	83.2
Percentage	Passenger cars	Finland	2013	84.9
Percentage	Trains	European Union (28 countries)	2013	7.6
Percentage	Trains	Finland	2013	5.3

Eurostat codes can be replaced also after downloadind with human-readable labels using a function `label_eurostat()`. It replaces the eurostat codes based on definitions from Eurostat dictionaries.

```
datl <- label_eurostat(dat)
kable(head(datl))
```

unit	vehicle	geo	time	values
Percentage	Motor coaches, buses and trolley buses	Austria	2013	9.8
Percentage	Motor coaches, buses and trolley buses	Belgium	2013	15.2
Percentage	Motor coaches, buses and trolley buses	Bulgaria	2013	16.2
Percentage	Motor coaches, buses and trolley buses	Switzerland	2013	5.1
Percentage	Motor coaches, buses and trolley buses	Cyprus	2013	18.5
Percentage	Motor coaches, buses and trolley buses	Czech Republic	2013	17.9

The `label_eurostat()` allows also conversion of individual variable vectors or variable names.

```
label_eurostat_vars(names(datl))
```

```
## [1] "Unit of measure"
## [2] "Vehicles"
## [3] "Geopolitical entity (reporting)"
## [4] "Period of time (a=annual, q=quarterly, m=monthly, d=daily, c=cumulated from January)"
```

Vehicle information has 3 levels. They are:

```
levels(datl$vehicle)
```

```
## [1] "Motor coaches, buses and trolley buses"
## [2] "Passenger cars"
## [3] "Trains"
```

Selecting and modifying data

EFTA, Eurozone, EU and EU candidate countries

To facilititate fast plotting of standard European geographic areas, the package provides ready-made lists of the country codes used in the eurostat database for EFTA (efta_countries), Euro area (ea_countries), EU (eu_countries) and EU candidate countries (candidate_countries). This helps to select specific groups of countries for closer investigation. For conversions with other standard country coding systems, see the countrycode R package. To retrieve the country code list for EFTA, for instance, use:

```
data(efta_countries)
kable(efta_countries)
```

code	name
IS	Iceland
LI	Liechtenstein
NO	Norway
CH	Switzerland

EU data from 2012 in all vehicles:

```
dat_eu12 <- subset(datl, geo == "European Union (28 countries)" & time == 2012)
kable(dat_eu12, row.names = FALSE)
```

unit	vehicle	geo	time	values
Percentage	Motor coaches, buses and trolley buses	European Union (28 countries)	2012	9.3
Percentage	Passenger cars	European Union (28 countries)	2012	83.0
Percentage	Trains	European Union (28 countries)	2012	7.6

EU data from 2000 - 2012 with vehicle types as variables:

Reshaping the data is best done with `spread()` in `tidyr`.

```
library("tidyr")
dat_eu_0012 <- subset(dat, geo == "EU28" & time %in% 2000:2012)
dat_eu_0012_wide <- spread(dat_eu_0012, vehicle, values)
kable(subset(dat_eu_0012_wide, select = -geo), row.names = FALSE)
```

unit	time	BUS_TOT	CAR	TRN
PC	2000	10.4	82.4	7.2
PC	2001	10.2	82.7	7.1
PC	2002	9.9	83.3	6.8
PC	2003	9.9	83.5	6.7
PC	2004	9.8	83.4	6.8
PC	2005	9.9	83.2	6.9
PC	2006	9.7	83.2	7.1
PC	2007	9.8	83.1	7.2
PC	2008	9.7	83.1	7.3
PC	2009	9.2	83.7	7.1
PC	2010	9.2	83.6	7.2
PC	2011	9.2	83.4	7.3
PC	2012	9.3	83.0	7.6

Train passengers for selected EU countries in 2000 - 2012

```
dat_trains <- subset(datl, geo %in% c("Austria", "Belgium", "Finland", "Sweden")
                     & time %in% 2000:2012
                     & vehicle == "Trains")

dat_trains_wide <- spread(dat_trains, geo, values)
kable(subset(dat_trains_wide, select = -vehicle), row.names = FALSE)
```

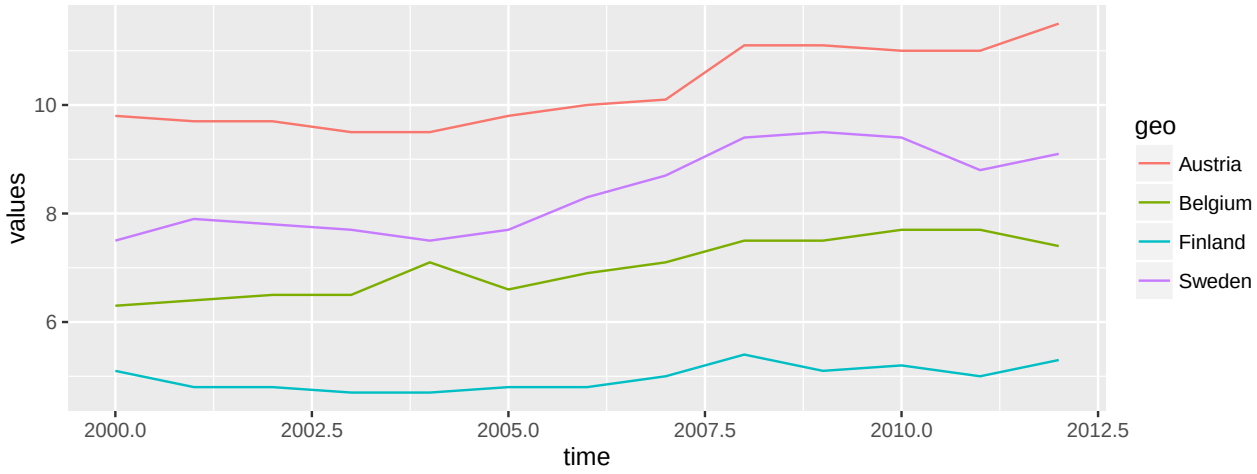
unit	time	Austria	Belgium	Finland	Sweden
Percentage	2000	9.8	6.3	5.1	7.5

unit	time	Austria	Belgium	Finland	Sweden
Percentage	2001	9.7	6.4	4.8	7.9
Percentage	2002	9.7	6.5	4.8	7.8
Percentage	2003	9.5	6.5	4.7	7.7
Percentage	2004	9.5	7.1	4.7	7.5
Percentage	2005	9.8	6.6	4.8	7.7
Percentage	2006	10.0	6.9	4.8	8.3
Percentage	2007	10.1	7.1	5.0	8.7
Percentage	2008	11.1	7.5	5.4	9.4
Percentage	2009	11.1	7.5	5.1	9.5
Percentage	2010	11.0	7.7	5.2	9.4
Percentage	2011	11.0	7.7	5.0	8.8
Percentage	2012	11.5	7.4	5.3	9.1

Visualization

Visualizing train passenger data with `ggplot2`:

```
library(ggplot2)
p <- ggplot(dat_trains, aes(x = time, y = values, colour = geo))
p <- p + geom_line()
print(p)
```



Triangle plot

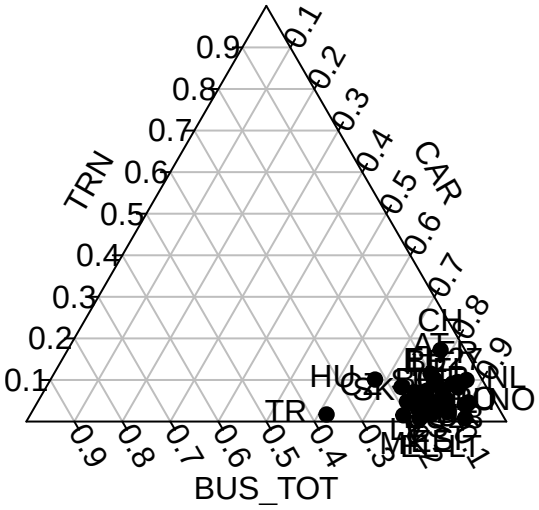
Triangle plot on passenger transport distributions with 2012 data for all countries with data.

```
library(tidyr)

transports <- spread(subset(dat, time == 2012, select = c(geo, vehicle, values)), vehicle, values)

transports <- na.omit(transports)

# triangle plot
library(plotrix)
triax.plot(transports[, -1], show.grid = TRUE,
           label.points = TRUE, point.labels = transports$geo,
           pch = 19)
```



For further examples, see also the blog post on the eurostat R package.

Citing the package

Citing the Data Kindly cite Eurostat.

Citing the R tools This work can be freely used, modified and distributed under the BSD-2-clause (modified FreeBSD) license:

```
citation("eurostat")
```

```
##
## Kindly cite the eurostat R package as follows:
##
##   (C) Leo Lahti, Janne Huovari, Markus Kainu, Przemyslaw Biecek
##   2014-2016. eurostat R package URL:
##   https://github.com/rOpenGov/eurostat
##
## A BibTeX entry for LaTeX users is
##
##   @Misc{,
##     title = {eurostat R package},
##     author = {Leo Lahti and Janne Huovari and Markus Kainu and Przemyslaw Biecek},
##     year = {2014},
##     url = {https://github.com/rOpenGov/eurostat},
##   }
```

Acknowledgements

We are grateful to all contributors and Eurostat open data portal! This rOpenGov R package is based on earlier CRAN packages statfi and smarterpoland. The datamart and reurostat packages seem to develop related Eurostat tools but at the time of writing this tutorial this package seems to be in an experimental stage. The quandl package may also provides access to some versions of eurostat data sets.

Session info

This tutorial was created with

```
sessionInfo()
```

```
## R version 3.2.2 (2015-08-14)
## Platform: x86_64-pc-linux-gnu (64-bit)
## Running under: Ubuntu 15.10
##
## locale:
##  [1] LC_CTYPE=en_US.UTF-8       LC_NUMERIC=C
##  [3] LC_TIME=en_US.UTF-8        LC_COLLATE=en_US.UTF-8
##  [5] LC_MONETARY=en_US.UTF-8    LC_MESSAGES=en_US.UTF-8
##  [7] LC_PAPER=en_US.UTF-8       LC_NAME=C
##  [9] LC_ADDRESS=C               LC_TELEPHONE=C
## [11] LC_MEASUREMENT=en_US.UTF-8 LC_IDENTIFICATION=C
##
## attached base packages:
## [1] stats     graphics  grDevices utils     datasets  methods   base
##
## other attached packages:
## [1] plotrix_3.6-1        ggplot2_2.0.0        tidyr_0.4.1
## [4] rvest_0.3.1          xml2_0.1.2           eurostat_1.2.13.9001
## [7] rmarkdown_0.9.4      knitr_1.12.3
##
## loaded via a namespace (and not attached):
##  [1] Rcpp_0.12.3      magrittr_1.5     munsell_0.4.3    colorspace_1.2-6
##  [5] R6_2.1.2         plyr_1.8.3       stringr_1.0.0    httr_1.1.0
##  [9] highr_0.5.1      dplyr_0.4.3      tools_3.2.2      parallel_3.2.2
## [13] grid_3.2.2       gtable_0.1.2     DBI_0.3.1        htmltools_0.3
## [17] digest_0.6.9     assertthat_0.1   formatR_1.2.1    curl_0.9.5
## [21] evaluate_0.8     labeling_0.3     stringi_1.0-1    scales_0.3.0
## [25] jsonlite_0.9.19
```