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thanks

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To: dbackus@stern.nyu.edu

Dear Professor Backus,

Just a quick thank you for posting R code on the Penn World Tables. I wanted to have a quick look at the Version 8.0 of the PWT just released and was able to use your code to great effect.

You will note that several variables were renamed since pwt71. As you can see below adapting your code was a breeze.

It looks like PWT has two versions of real gdp now (see brief note below).

Thanks,

Patrick.

http://pages.stern.nyu.edu/~dbackus/BCH/data/PWT/PWT_71.R

```
# PWT Real GDP Data
# Based on Backus (2012)
#
# rgdpe = Expenditure-side real GDP at chained PPPs (in mil. 2005US$)
# rgdpo = Output-side real GDP at chained PPPs (in mil. 2005US$)
# Reference:
# @Article{Nalewaik:2011
# , author = {Jeremy J. Nalewaik}
# , title = {The Income- and Expenditure-Side Estimates of U.S. Output Growth — An Update to 2011Q2}
# , journal = {Brookings Papers on Economic Activity}
# , year = {2011}
# , volume = {43}
# , number = {2 (Fall)}
# , pages = {385-411}
# }
```

```
### Define directories
if(.Platform$OS.type == "windows"){
currentdir <- "c:/R/pwt"
} else {
currentdir <- "~/R/pwt"}
setwd(currentdir)
```

```
# download and save data in current directory
# download.file("http://www.rug.nl/research/GGDC/data/pwt/V80/pwt80.xlsx", "pwt80.xlsx", mode="wb")
# binary mode "wb" needed
```

```

# convert and save the data sheet in csv format
# library(gdata)
# installXLSXsupport() # support for xlsx format
# DataSheet <- read.xls("pwt80.xlsx", sheet="Data") # load the Data sheet only
# write.csv(DataSheet, file=paste("pwt80", "csv", sep="."), row.names=FALSE)

# read pwt80.csv data stored in current directory
import_data <- function(directory) {
  read.csv(paste(directory, "pwt80.csv", sep="/"))
}

# create a table of countries and their codes
# col 1 = country name, col 2 = country code (3-letter abbrev)
country_index <- function(dataset) {
  unique(cbind(as.character(dataset$country), as.character(dataset$countrycode)))
}

# compute a capital stock series
delta = 0.06 # assumed depreciation rate
# algorithm adapted from Clementi's Stata code, itself based on Hall-Jones
capital <- function(dataframe, depreciation=delta) {
  # remove rows with missing observations
  dataframe <- dataframe[!is.na(dataframe$rgdpo) & !is.na(dataframe$pop) & !is.na(dataframe$ck),]

  # compute investment
  investment <- dataframe$rgdpo*(dataframe$ck/100)*(dataframe$pop*1000)

  # compute growth rates
  growth_gdp <- with(dataframe, (log(rgdpo[10]) - log(rgdpo[1]))/10)
  growth_pop <- with(dataframe, (log(pop[10]) - log(pop[1]))/10)

  # compute initial capital (k0)
  # Backus (2012), based on Hall and Jones (QJE, 1999)
  # Hall-Jones use growth rate of investment, Backus uses growth of GDP
  ck_bar <- mean(dataframe$ck[1:10])
  init_inv <- dataframe$rgdpo[1]*(ck_bar/100)*(dataframe$pop[1]*1000)
  init_cap <- init_inv/(exp(growth_gdp + growth_pop) - 1 + depreciation)

  # compute capital series according to the recurrence relation
  capital <- Reduce(
    function(k,t) {
      c(k, (1-depreciation)*k[t-1] + investment[t-1])
    },
    2:length(investment),
    init_cap
  )

  # add some metadata to allow for easy merging
  series <- cbind(capital, dataframe$year)
  colnames(series) <- c("cap", "year")

  return(series)
}

# add capital series to dataframe
add_to_df <- function(df) {

```

```

do.call(
rbind, lapply(
split(df, df$countrycode)
, function(dataframe) {
merge(dataframe, capital(dataframe), by = "year", all.x = TRUE)
}
)
)
}

# Execute functions
pwt80 <- import_data(currentdir)
names(pwt80)
head(pwt80)
tail(pwt80)
# country_index(pwt80)
# cap <- capital(pwt80)
pwt80 <- add_to_df(pwt80)

# use -subset- to get specific countries and variables.
countries <- c("USA", "DEU", "FRA", "ESP", "ITA")
variables <- c("country", "countrycode", "year", "rgdpo", "pop", "ck", "cap")
pwt <- subset(#
pwt80
, countrycode %in% countries
, select = variables
)#

# Plot GDP PER CAPITA with ggplot
library(ggplot2)
pwt$year<-as.Date(paste0(pwt$year,"-01-01"),format="%Y-%m-%d") # year as Date
ggp <- ggplot(pwt,aes(x=year,y=rgdpo/pop,color=as.factor(countrycode),group=countrycode)) +
geom_line()
ggp <- ggp +
xlab("") +
ylab("") +
ggtitle("Real GDP Per Capita (international $, 2005 prices, chain)") +
theme(legend.title = element_blank() ) +
coord_trans(y = "log10")
ggp
ggp <- ggp + coord_cartesian(xlim=as.Date(c("2000-01-01","2012-01-01")),ylim=c(22000,35000))
library(scales) # provides breaks/formatting functions, e.g. scale_x_date
ggp <- ggp + scale_x_date(breaks=date_breaks("2 years"),labels=date_format("%Y"))
ggp

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