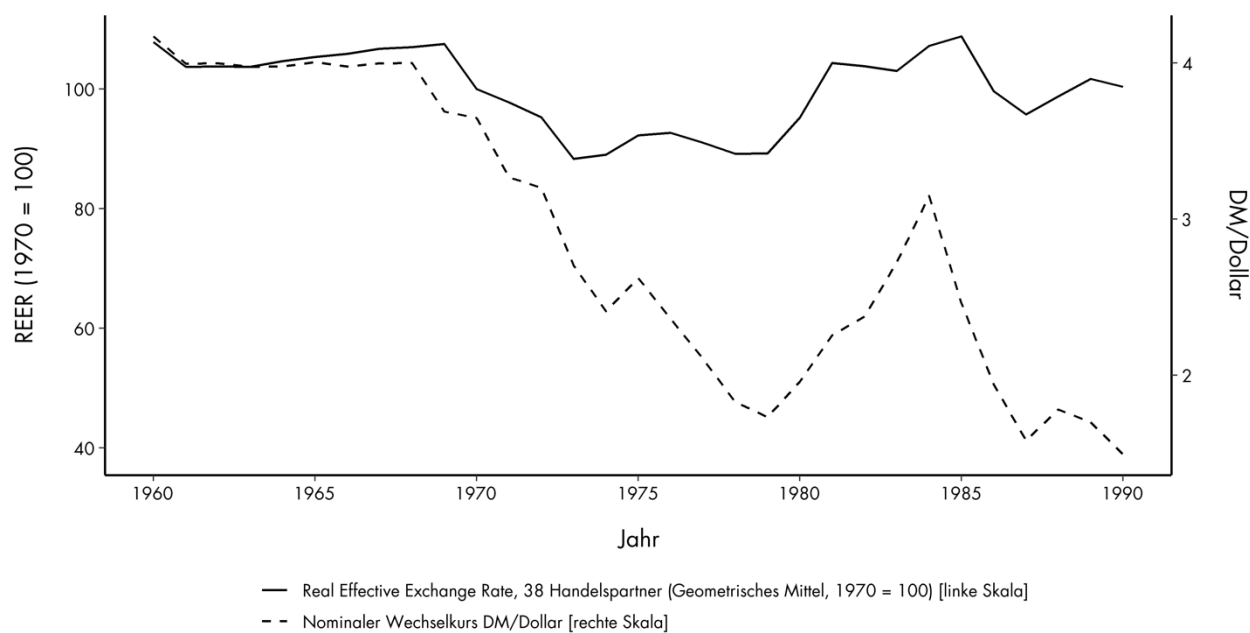# Graph 10: Nominal and real effective exchange rates for Germany 1960-1990 (Book page 215)

Explanations on the calculation method and references to the data sources

*Jan-Otmar Hesse (University of Bayareuth)[1]***

Real Effective Exchange Rate, 38 Handelspartner (Geometrisches Mittel, 1970 = 100) [linke Skala]
— — Nominaler Wechselkurs DM/Dollar [rechte Skala]

INTRODUCTION

For political economy and contemporary comparisons of countries (as well as for planning holiday trips) it is sufficient to calculate the value of a foreign currency, or the value of the home currency abroad, by using the standard "nominal exchange rate" that is fixed on international currency markets as an equilibrium price between supply and demand. For historical explorations, and in particular for periods with high and divergent speeds of national inflation, this "nominal exchange rate" is inappropriate. If e.g. the US-dollar "devalues" against the German Mark (i.e. German

exports become more expensive on the US-market), the effect of a nominal devaluation may be compensated by a higher inflation rate in the US currency area compared to the German currency area. When other competitive domestic products increase in prices (= domestic US inflation), the exported German goods also can increase in price. Only if the devaluation is larger than the different speeds of inflation in both countries, German exporter will suffer from competitive disadvantages.

A "**real exchange rate**" is achieved by adjusting changes in nominal exchange-rates for the inflation-rates of national currencies.

For a strong export country like Germany, more than just a single currency is relevant. The country has trade relations with a variety of different trading partners and the real exchange rate of one currency – e.g. the US-dollar – is only relevant for the proportion of trade between the two countries in relation to all trade flows. The relevance of the changes in the exchange rate of two currencies can be expressed as a share of trade values that are exchanged between the two currency areas.

A "**real effective exchange rate**" (**REER**) is an inflation adjusted exchange-rate, in that the currencies are weighted by the share of trade for the respective country.[2] The REER for the 38 most significant trading partners of West Germany is calculated based on the US-dollar, normalized for the year 1970. These countries accounted for between 82 and 91 percent of total German trade during the years 1957 to 2017 (see calculations below).

Most older calculations either give very rough figures with few currencies and trading partners included,[3] or – as is the case for more recent databases such as that of the Bruegel-Think-Tank in Brussels – data is included for years only after the Bretton Woods Crises, so that the REER-effect of the transformation to floating exchange rates is not visible.[4] We therefore calculated the REER for West Germany starting in 1960 ourselves. The data sources used are highlighted in the following.

---

[2] Reference to definition of REER-computation, either regular textbooks or German article (Monatsbericht Bundesbank 1994)

[3] Boltho, Andrea. „Convergence, competitiveness and the exchange rate". In Economic growth in Europe since 1945, herausgegeben von N. F. R. Crafts und Gianni Toniolo, 107–30. Cambridge ; New York: Cambridge University Press, 1996.

[4] https://www.bruegel.org/publications/datasets/real-effective-exchange-rates-for-178-countries-a-new-database/

As the graph shows, a relatively moderate inflation rate in Germany balanced most of the effects of the fast appreciation of the German mark after the final dissolution of the fixed exchange-rate system in March 1973. Only between 1968 and 1973 did the German export industry suffer from a real appreciation (of ca. 15%). Further compensation for the fast nominal devaluation of the US-dollar against the German Mark resulted from trade diversion (from US trade to European Trade)[5] as well as from offshoring production.[6]

CALCULATION METHODS

REER is calculated using a geometric average, trade weights that are not export-double-weighted, consumer price index values (average of period) and exchange rates (average of period) that are black market rates where appropriate.

All data can be downloaded here.

COMMENTS ON HOW TO USE THE R-FILES

reer.r: R File that collects, formats etc. the source data into the database.

Programming was mostly executed with tools from the tidyverse library (https://www.tidyverse.org/).

See http://r4ds.had.co.nz/ for an introduction to tidyverse tools.

Outputs: data.txt

reer2.r: R File that takes data.txt as its inputs and computes the variables needed to calculate 1) the REER for Germany from 1957 to 2017 and 2) additional variables of interest.

---

[5] Lindlar, Ludger, und Carl-Ludwig Holtfrerich. „Geography, exchange rates and trade structures: Germanys export performance since the 1950s". European Review of Economic History 1 (1997): 217–46.

[6] Hesse, Jan-Otmar. *Exportweltmeister. Geschichte einer deutschen Obsession*. Berlin: Suhrkamp, 2023. Hesse, Jan-Otmar. „The German textile puzzle. Selective protectionism and the silent globalisation of an industry". *Business History Review* 93, Nr. Summer (2019): 221–46.

This file also creates a number of figures.

Outputs: data2.txt

DATA COMPOSITION

General remarks: the database is formatted so as to be "tidy", which means that:

- Each variable must have its own column.
- Each observation must have its own row.
- Each value must have its own cell.

See http://www.jstatsoft.org/v59/i10/paper for the underlying theory.

The database includes the following countries:

Algeria, Argentina, Australia, Austria, Belgium, Belgium-Luxembourg, Brazil, Canada, China, Denmark, Finland, France, Greece, Hungary, India, Iran, Iraq, Ireland, Italy, Japan, Korea, Libya, Luxembourg, Netherlands, Nigeria, Norway, Poland, Portugal, Romania, Saudi Arabia, South Africa, Spain, Sweden, Switzerland, Taiwan, Turkey, United Kingdom, United States, Venezuela

Taken together, these countries comprised between 82 and 91 percent of total German trade during the years 1957 to 2017 (according to DOTS database trade data). The Soviet Union and successor states, as well as Yugoslavia and its successor states, were excluded due to the difficulty of obtaining data for successor states.

Individual REER for individual countries are displayed at the end of this file.

VARIABLES AND SOURCES FOUND IN data.txt:

conversion_rate: currency conversion rates for European countries that adopted the Euro from 1999 onwards.

- Data source: conversion rates from European Monetary Union (EMU) currencies to Euros from the World Bank (conversionrates.xls: https://datahelpdesk.worldbank.org/knowledgebase/articles/114964-what-are-the-conversion-rates-from-european-moneta).

country: country from the countries listed above.

cpi2010: consumer price index (base year= 2010) or proxies. The CPI is mostly the arithmetic average of monthly values.

- Data source: Consumer Price Statistics database of the Bank for International Settlements (cpi_bis.xls: national sources, BIS Consumer price series (http://www.bis.org/statistics/cp.htm.).

export: exports from Germany to Partner countries (FOB) in Millions of US Dollars.

- Data sources: DOTS database for all countries and years (export_import.xls: contains Direction of Trade Statistics by the IMF on Exports (FOB) from Germany to Partner countries in Millions of US Dollars from 1957 to 2017 in the Sheet 'Exports' and Imports to Germany from Partner countries (CIF) in Millions of US Dollars from 1957 to 2017 (http://data.imf.org/?sk=9D6028D4-F14A-464C-A2F2-59B2CD424B85).

germancpi2010: German Consumer Price Index (2010=100).

- Data source: Consumer Price Statistics database of the Bank for International Settlements (cpi_bis.xls: national sources, BIS Consumer price series (http://www.bis.org/statistics/cp.htm.).

germanexchange: German exchange rate in DM/$ (End of Period).

- Data source: IFS database (currency_us_dollar_avg.xls: currency (average of period)/US-Dollar data from International Financial Statistics database by the International Monetary Fund (accessed 27.06.2018).

germanexchange_avg: exchange rate of DM/$ (average of period).

import: imports to Germany from Partner countries (CIF) in Millions of US Dollars.

- Data sources: DOTS database for all countries and years (export_import.xls: the direction of trade statistics includes the value of exports and imports disaggregated by a country's primary trading partners. DOTS includes coverage of all IMF member states, as well as some nonmember states. Monthly and quarterly data is available from 1960 onwards, while annual data is available beginning in 1947 (https://data.imf.org/?sk=9d6028d4-f14a-464c-a2f2-59b2cd424b85).

percentgrowthcpi: year-on-year percent growth of cpi2010.

perdollar: exchange rate of foreign currency per dollar (End of Period).

- Data sources: IFS database   (currency_us_dollar_eop.xls: currency (end of period)/US-Dollar data from International Financial Statistics database by the International Monetary Fund (accessed 27.06.2018).

perdollar_avg: Exchange rate of foreign currency per dollar (average of period).

totaltrade: sum of import + export over all countries per year that trade with Germany from the DOTS database: the direction of trade statistics includes the value of exports and imports disaggregated by a country's primary trading partners. DOTS includes coverage of all IMF member states, as well as some non-member states. Monthly and quarterly data is available from 1960 onwards, while annual data is available beginning in 1947 (https://data.imf.org/?sk=9d6028d4-f14a-464c-a2f2-59b2cd424b85).

year: year of the observation.

ADDITIONAL SOURCES FOR VARIABLES, PER COUNTRY & YEAR IN data.txt:

perdollar, perdollar_avg, germanexchange, germanexchange_avg:

- Argentina (1957-1961): end-of-period data from the IMF IFS database.

- ○ currency_us_dollar_eop.xls: currency ((end of period)/US-Dollar data from International Financial Statistics database by the International Monetary Fund (accessed 27.06.2018).

- Hungary(1957-1967): Carmen Reinhart's blackmarket database (hungary_blackmarket_reinhart.xls). The rationale is that there is a 1000-400% black market premium compared to official exchange rates published by the Hungarian national bank (hungaryperdollar.xls).

  - ○ Carmen Reinhart's black market exchange rate database (http://www.carmenreinhart.com/data/browse-by-topic/topics/10/).

  - ○ hungaryperdollar.xls: exchange rate of Hungarian currency per dollar (1957-67). Source: Hungarian central bank: https://www.mnb.hu/en/arfolyam-lekerdezes.

- Iraq (1957-2015): IMF IFS period average values recorded in Carmen Reinhart's black market database (iraq_blackmarket_reinhart.xls) (due to the currency values in the IMF IFS database on the IMF website being inconsistent with eop values from IFS and period average values from IMF as recorded in Reinhart's database).

  - ○ Carmen Reinhart's black market exchange rate database (http://www.carmenreinhart.com/data/browse-by-topic/topics/10/).

- Poland(1957-1998): blackmarket rates recorded in Carmen Reinhart's black market database (poland_blackmarket_reinhart.xls) (The rationale is that official exchange rates extremely overvalued the local currency while conversion from banks was not guaranteed).

  - ○ Carmen Reinhart's black market exchange rate database (http://www.carmenreinhart.com/data/browse-by-topic/topics/10/).

- Romania (1957-1998): black market exchange rate from Carmen Reinhart's blackmarket database (romania_blackmarket_reinhart.xls). The rationale is that there were black market premiums of 300 to 500% before 1973.

    - Carmen Reinhart's black market exchange rate database (http://www.carmenreinhart.com/data/browse-by-topic/topics/10/).

- Turkey (1957-1998): black market exchange rate from Carmen Reinhart's blackmarket database (turkey_blackmarket_reinhart.xls). The rationale is that there were black market premiums of 300 to 500% before 1959.

    - Carmen Reinhart's black market exchange rate database (http://www.carmenreinhart.com/data/browse-by-topic/topics/10/).

- Venezuela (1957-1963): end-of-period data from the IMF IFS database (due to the currency (average of period) from the IMF IFS database being unrealistically high compared to the values that follow as well as in comparison to the currency (eop) values from the IMF IFS database).

    - currency_us_dollar_eop.xls: currency ((end of period)/US-Dollar data from International Financial Statistics database by the International Monetary Fund (accessed 27.06.2018).

cpi2010, germancpi2010:

- Algeria (1957-1959): estimated using the growth rate of CPI (percentgrowthcpi*)* of Algeria for the year 1960.

- Algeria (1960-1969): GDP deflator data of the "World Development indicator" database of the world bank (chinairaqcpi.xls).

    - chinairaqcpi.xls: yearly GDP deflators of a list of countries for 1960 to 2016. Used as a source for a CPI proxy for China (1960-1987), Iraq (1979) and Algeria (1960-1968). Source: World Development Indicators (21.05.2018, Worldbank).

- Algeria (1970-1994): IFS database of the IMF (cpi_imf.xls).

  - CPI_IMF.xls: CPI data from International Financial Statistics database by the International Monetary Fund (accessed 27.06.2018).

- Brazil (1957-1979): CPI of Sao Paulo (brazilcpi.xls), which closely mirrors the series of the CPI of Brazil for the years after 1979.

  - brazilcpi.xls: monthly percent growth of CPI of Sao Paulo (monthly data from 1939 to 2018). Used as a proxy for Brazil's CPI from 1957 to 1979. Source: Banco Central do Brazil Time Series database (193 - Consumer Price Index-S„o Paulo (IPC-Fipe) - Monthly % var.).

- China (1957-1959): estimated using the growth rate of CPI (percentgrowthcpi) of China for the year 1960.

- China (1960-1985): GDP deflator data of the "World Development Indicator" database of the world bank (chinairaqcpi.xls).

  - chinairaqcpi.xls: yearly GDP deflators of a list of countries for 1960 to 2016. Used as a source for a CPI proxy for China (1960-1987), Iraq (1979) and Algeria (1960-1968). Source: World Development Indicators (21.05.2018, Worldbank).

- China (1986-2017): IFS database of the IMF (cpi_imf.xls).

  - CPI_IMF.xls: CPI data from International Financial Statistics database by the International Monetary Fund (accessed 27.06.2018).

- Hungary (1957-1959): estimated using the growth rate of CPI (percentgrowthcpi) of Hungary for the year 1960.

- Hungary (1960-1971): CPI data from the Hungarian statistical office (hungarycpi.xls).

- hungarycpi.xls: CPI of Hungary (1960 to 1973), 1960=100 Source: Hungarian Statistical Office (https://www.ksh.hu/price_statistics).

- Iran (1957-2017): IFS database of the IMF (cpi_imf.xls).

  - CPI_IMF.xls: CPI data from International Financial Statistics database by the International Monetary Fund (accessed 27.06.2018).

- Iraq (1957-78, 1990-2017): IFS database of the IMF (cpi_imf.xls).

  - CPI_IMF.xls: CPI data from International Financial Statistics database by the International Monetary Fund (accessed 27.06.2018).

- Iraq (1979-1989): GDP deflator data of the "World Development indicator" database of the world bank(chinairaqcpi.xls).

  - chinairaqcpi.xls: yearly GDP deflators of a list of countries for 1960 to 2016. Used as a source for a CPI proxy for China (1960-1987), Iraq(1979) and Algeria(1960-1968). Source: World Development Indicators (21.05.2018, Worldbank).

- Libya (1957-63): estimated using the growth rate of CPI (percentgrowthcpi) of Libya for the year 1964.

- Libya (1964-2013): IFS database of the IMF (cpi_imf.xls).

  - CPI_IMF.xls: CPI data from International Financial Statistics database by the International Monetary Fund (accessed 27.06.2018).

- Libya (2014-2017): World Bank Data (libyacpi.xls).

  - libyacpi.xls: growth rates of CPI index in % for Libya (2012-2017). Source: International Monetary Fund, World Economic Outlook Database, April 2018.

- Nigeria (1957-2017): IFS database of the IMF (cpi_imf.xls).

- ○ CPI_IMF.xls: CPI data from International Financial Statistics database by the International Monetary Fund (accessed 27.06.2018).

- Romania (1957-1970): CPI data provided by Savoiu Gheorge: ÑTWO IMPORTANT TRADITIONAL PRICESí INDICES FOR THE MEASUREMENT OF INFLATION AND COST-OF-LIVING IN ROMANIA, DURING THE LAST CENTURYì,p.1-8, Scientific Bulletin ñ Economic Sciences, Vol. 8 (14) (romaniacpi2.xls).

  - ○ romaniacpi2.xls: CPI of Romania (1913=100) (1957-1970). Source: Savoiu Gheorge: ÑTWO IMPORTANT TRADITIONAL PRICESí INDICES FOR THE MEASUREMENT OF INFLATION AND COST-OF-LIVING IN ROMANIA, DURING THE LAST CENTURYì,p.1-8, Scientific Bulletin ñ Economic Sciences, Vol. 8 (14) (http://economic.upit.ro/repec/pdf/C1_Savoiu_Gheorghe.pdf).

- Romania (1971-1990): CPI data by the National Statistical Office of Romania (romaniacpi.xls).

  - ○ romaniacpi.xls: yearly growth rates in % of CPI of Romania (1971-1990). Source: National statistical office of Romania (http://www.insse.ro/cms/en/content/cpi-data-series).

- Poland (1957-1969): CPI DATA by the Statistical Agency of Poland (polandcpi.xls).

  - ○ polandcpi.xls: yearly growth rates (in % of price indices of consumer goods and service for Poland (1957 -1970). Source: Statistical Office Poland (https://stat.gov.pl/en/topics/prices-trade/price-indices/price-indices-of-consumer-goods-and-services/yearly-price-indices-of-consumer-goods-and-services-from-1950/).

- Saudi Arabia (1957-62): estimated using the growth rate of CPI (percentgrowthcpi) of Saudi Arabia for the year 1963.

- Taiwan (1957-58): estimated using the growth rate of CPI (percentgrowthcpi) of Taiwan for the year 1959.

- Taiwan (1959-2017): CPI data by the Taiwan statistical office (taiwancpi.xls).

  - taiwancpi.xls: CPI of Taiwan (2016=100) for 1959-2018. Source: Taiwan statistical office (https://eng.stat.gov.tw/ct.asp?xItem=12092&ctNode=1558&mp=5).

- Venezuela (1957-59): estimated using the growth rate of CPI (percentgrowthcpi) of Venezuela for the year 1960.

- Venezuela (1960-2008): "World Development Indicators" from the World Bank (venezuelacpi.xls).

  - venezuelacpi.xls: annual % change of consumer prices, several countries. Used for Venezuela's CPI (1960-2017), Source: World Development Indicators, World Bank, 21.05.2018.

- Venezuela (2008-2016): IFS database of the IMF (cpi_imf.xls).

  - CPI_IMF.xls: CPI data from International Financial Statistics database by the International Monetary Fund (accessed 27.06.2018).

- Venezuela (2017): IMF World Economic Outlook database (venezuelacpi2.xls).

  - venezuelacpi2.xls: Venezuela CPI growth rates for 1980 to 2017. Used for Venezuela's CPI for 2017. (source: IMF -World Economic Outlook, 2018).

VARIABLES AND SOURCES FOUND IN data2.txt:

abs_diff: absolute value of reer_diff.

averagecpi1970: the product of country's (cpi1970^tradeweights_withoutinflation) for each year (only for the set of countries with percentgrowthcpi < 100%).

constrealexchange: realexchange_avg of previous year.

consttradeweights: sharetotaltradeofdata of previous year.

country: country.

country2: country followed by sharetotaltradeofdatapercent.

countryconst: "Other countries" if rank < rank80; else, value for variable country.

cpi1970: cpi2010 such that 1970=100.

difftrade: sharetotaltradeofdata - sharetotaltrade

diffwithwithoutcountry: reer - reer_withoutcountry

dmpercurrency: germanexchange / perdollar

dmpercurrency_avg: germanexchange_avg / perdollar_avg

dmpercurrency1970: dmpercurrency such that 1970=100.

dmpercurrency1970_avg: dmpercurrency_avg such that 1970=100.

effectivecpi: product of country's ((foreigngermancpi1970*100)^sharetotaltradeofdata) for each year.

effectivecpi_nohighinflation: effectivecpi, but only for the set of countries with percentgrowthcpi < 100% and adjusting tradeweights accordingly.

excel_tradeweights: Trade weights of previous analysis in Excel.

- Data source: excel_tradeweights.xls

excel_dmforeign: DM/foreign currency from analysis in Excel.

- Data source: excel_dmforeign.xls

excel_foreigngermancpi: foreign CPI/German CPI (1970=100) from analysis in Excel.

- Data source: excel_foreigngermancpi.xls

exportimport: import + export

foreignpergermancpi1970: cpi1970 / germancpi1970

germancpi1970: germancpi2010 such that 1970=100

max_sharetotaltrade: maximum of sharetotaltrade for each country over all years.

max_sharetotaltradeofdata: maximum value of sharetotaltradeofdata for each country over all years.

neer: nominal effective exchange rate for each year: Product over each country's (dmpercurrency1970_avg ^ sharetotaltradeofdata) for each year.

neer_withouthighinflation: nominal effective exchange rate computed with tradeweights_withoutinflation (only for the set of countries with percentgrowthcpi < 100%).

rank: rank of countries in terms of size of sharetotaldiff.

rank80: how many countries does one need to reach 80% of sum_reer_diff if one sums up the sharetotaldiff for each country starting from the country with the biggest sharetotaldiff?

realexchange_avg: real exchange rate for each year and country: foreignpergermancpi1970 * dmpercurrency1970_avg.

realexchange_excel: real exchange rate computed using excel_dmforeign and excel_foreigngermancpi.

reer: REER for each year: Product over each country's (dmpercurrency1970_avg * foreignpergermancpi1970)^sharetotaltradeofdata) for each year.

reer_country_constant: REER calculated keeping country constant at values of previous year while adjusting trade weights such that sum of trade weights is 1.

reer_diff: reer - reer_country_constant

reer_europe: REER (only for the set of European countries).

reer_excel: REER computed using excel_tradeweights, excel_dmforeign, and excel_foreigngermancpi (as a geometric average).

reer_excel_withoutcountry: REER without the designated country for those countries in the Excel analysis (using adjusted trade weights).

reer_tw_const1967: REER computed using tradeweighsconst1967.

reer_withoutcountry: REER for each year but excluding the country and adjusting trade weights.

sharetotaldiff: abs_diff / sum_reer_diff

sharetotaltrade: exportimport / totaltrade

sharetotaltradeofdata: exportimport / totaltradeofdata

sharetotaltradeofdata_excel: exportimport / totaltradeofdata_excel for all the countries that are both in the Excel analysis and the new REER dataset.

shareoftotaltradeofdataeurope: exportimport / totaltradeofdataeurope (only for the set of European countries).

sharetotaltradeofdatapercent: sharetotaltradeofdata * 100

sum_reer_diff: sum of the absolute value of reer_diff over all countries for each year.

sumtradeshare: totaltradeofdata / totaltrade

sumtradeshareeurope: totaltradeofdata / totaltrade (only for the set of European countries).

totaltradeofdata: sum of exportimport over all countries for each year.

totaltradeofdata_excel: sum of exportimport over all the countries that are both in the Excel analysis and the new REER database.

totaltradeofdata_withoutinflation: totaltradeofdata (only for the set of countries with percentgrowthcpi < 100%).

totaltradeofdataeurope: totaltradeofdata (only for the set of European countries).

tradeweightsconst1967: sharetotaltradeofdata for year < 1967, and shareoftotaltradeofdata of year 1967 for year >= 1967.

tradeweights_withoutinflation: exportimport / totaltradeofdata_withoutinflation (only for the set of countries with percentgrowthcpi < 100%).

year: Year of the observation.

INDIVIDUAL REER FOR 38 COUNTRIES (1970=100)

Real exchange rates