1 Compilation, Revision and Updating of the GVAR Database (1979Q1-2013Q1)

2 Data sources

This version of the GVAR dataset revises and extends up to 2013Q1 the last available GVAR dataset (the '2011 Vintage') available at: https://sites.google.com/site/gvarmodelling/data. This updated dataset (1979Q1-2013Q1) will be referred to as the '2013 Vintage'.

The 2013 Vintage is obtained by extrapolating forward (using growth rates) the data of the 2011 Vintage from 2004Q1, unless otherwise specified. Therefore, data from 1979Q1 to 2003Q4 are typically the same in both the 2011 and the 2013 Vintages, while it may differ from 2004Q1 to 2011Q2. This strategy is adopted to be sure to include in the update possible data revisions and to have an overlapping window to evaluate the goodness of the update.

The construction of the 2013 Vintage, relies on the International Financial Statistics (IFS) database, the Inter-American Development Bank Latin Macro Watch database (IDB LMW hereafter),[1] and Bloomberg data. In previous versions of the GVAR database, Datastream was used instead of Bloomberg. Table 1 at the end of this section provides the Datastream codes corresponding to the Bloomberg series used.

2.1 Real GDP

For compiling the 2013 Vintage Real GDP countries are divided into three groups. First, those for which quarterly and seasonally adjusted data are available. Second, those for which quarterly data are available, but are not seasonally adjusted. Third, those for which only annual data are available.

For the first group, the IFS data were used (Concept: Gross Domestic Product, Real Index, Quarterly, 2005 = 100) for Australia, Canada, France, Germany, Italy, Japan, Netherlands, New Zealand, South Africa, Spain, Switzerland, United Kingdom, and United States.[2] The 2013 Vintage real GDP was extrapolated using quarterly growth rates of the IFS series from 2004Q1 to 2013Q1.

For the second group, the IFS data were used (Concept: Gross Domestic Product, Real Index, Quarterly, 2005 = 100) for Austria, Belgium[3], Finland, India, Indonesia, Korea, Malaysia, Singapore, Sweden, Thailand, and Turkey. When IFS data were not available, gaps were filled using Bloomberg data: India in 2011Q2 (Ticker: INQGGDPY Index) and Singapore in 2000Q2, 2000Q3 and 2011Q2 (Ticker: SGDPYOY Index). These series were seasonally adjusted using Eviews, applying the National Bureau's X12 program as described in Section 3.2. As in the first group, the dataset was extended with forward extrapolation of the 2011 Vintage using quarterly growth rates of the adjusted IFS series from 2004Q1 to 2013Q1.

For Saudi Arabia the annual seasonally unadjusted IFS data (Concept: Gross Domestic Product, Real index, Annually, 2005 = 100) were interpolated to obtain the quarterly values.[4] This series was then treated as the quarterly seasonally unadjusted data.

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[1]The IDB LMW data is publicly available beginning in 1990 and can be downloaded from http://www.iadb.org/Research/LatinMacroWatch/lmw.cfm, where more information about the data can be found.

[2]All series in the IMF IFS database have been reclassified. The concepts used here correspond to the ones used for the 2009 Vintage real GDP, namely 99BVRZF, 99BVPZF and BVPZF.

[3]The IFS data reports seasonal adjusted data for Belgium from 1999Q1 onward, thus no seasonal adjustment was made after all.

[4]Details on the interpolation procedure used can be found in the appendix of the user guide included in the download package of the GVAR Toolbox 2.0 available at https://sites.google.com/site/gvarmodelling/gvar-toolbox/download.

For the Latin American countries, namely for Argentina, Brazil, Chile, Mexico, and Peru, the IDB LMW data were used (Concept: GDP, Real Index SA) and the series were updated in the same manner described for the quarterly seasonally adjusted data. For Philippines, the quarterly rate of change of the seasonal adjusted real GDP index (Source: Bloomberg. Ticker: PHNAGDPS Index) was used to extrapolate forward the 2011 Vintage real GDP from 2004Q1 to 2013Q1. For Norway, the series from IFS continued to show evidence of seasonality after seasonal adjustment. The series from OECD (Ticker: GPSA, Concept: Growth rate compared to previous quarter, seasonally adjusted) was used instead, and the 2011 Vintage real GDP was extrapolated forward using this growth rate from 2004Q1 to 2013Q1.

As no institution publishes a quarterly real GDP Index for China, it has to be compiled from a nominal GDP series. The National Bureau of Statistics (NBS) of China releases quarterly nominal GDP series without seasonal adjustment.[5] Accordingly, a quarterly real GDP index for China was constructed as follows. First, the nominal GDP series from NBS was seasonally adjusted, as described in Section 3.2. Then, the following formula was used:

$$\log(RGDP_1) = \log\left(\frac{GDP_1}{CPI_1}\right) \qquad\qquad\qquad \text{for } t = 1$$
$$\log(RGDP_t) = \log(RGDP_{t-1}) + \log\left(\frac{GDP_t}{GDP_{t-1}}\right) - \log\left(\frac{CPI_t}{CPI_{t-1}}\right) \quad \text{for } t > 1$$

where CPI is defined in Section 2.2. The series was updated in the same manner as described for the quarterly seasonally adjusted data.

2.2 Consumer price index

In order to create the 2013 Vintage CPI, IFS data (Concept: Consumer Prices, All items, Quarterly, 2005 = 100) were collected for all countries with the exception of China.[6] For the series that did not need seasonal adjustment, the quarterly growth rates were used to extrapolate forward the 2011 Vintage from 2004Q1 to 2013Q1. Following the procedure in Section 3, the following countries were seasonally adjusted: Austria, Belgium, Canada, Chile[7], Finland, France, Germany, India, Indonesia, Italy, Japan, Korea, Mexico, Netherlands, New Zealand, South Africa, Spain, Sweden, Switzerland, Thailand, United Kingdom[8], United States. The quarterly rate of change of the adjusted IFS series was used to extrapolate forward the 2011 Vintage CPI from 2004Q1 to 2013Q1, in order to obtain the 2013 Vintage.

For China, Bloomberg data (Ticker: CNCPIYOY Index, quarterly rate of change of CPI index, NSA) were used. First, the quarterly rate of change was seasonally adjusted using Eviews, applying the National Bureau's X12 program. The Bloomberg rate of change was used to create a series in levels which was then seasonally adjusted following the procedure in Section 3.2. Then, the 2013 Vintage CPI for China was obtained by forward extrapolation of the 2011 Vintage using the rate of change of the adjusted Bloomberg series from 2004Q1 to 2013Q1.

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[5]For further information see: http://www.stats.gov.cn/english/statisticaldata/Quarterlydata/. The NBS series can be accessed from Datastream, ticker: CH GDP (DS CALCULATED) CURN.

[6]The series in the IMF IFS database have been reclassified. The concept used here corresponds to the IFS CPI 64zf (level) series, which is the one used in the 2009 Vintage CPI.

[7]For Chile the Quarterly 2009 = 100 index was used as it was the only available data.

[8]Note that the UK inflation series has changed since August 2011. Instead of "Retail Price Index", IMF has started to publish "the Consumer Price Index", which was previously published as "the Harmonized Consumer Price Index", as the official inflation series of UK.

2.3   Equity price index

Updated equity price series are from Bloomberg. A quarterly average of the MSCI Country Index in local currency was obtained for each of the following countries: Argentina, Australia, Austria, Belgium, Canada, Chile, Finland, France, Germany, India, Italy, Japan, Korea, Netherlands, Norway, New Zealand, Philippines, South Africa, Spain, Sweden, Switzerland, Thailand, United Kingdom, and United States.[9] For Malaysia, as the standard MSCI Index is not available, a local currency stock market index (Source: Bloomberg, Ticker: MXMY Index) was used instead. The quarterly average was computed based on the closing price of the last Wednesday of each month. That is, the last Wednesday was used for each month, then a simple average of these Wednesday prices was computed for the first three months of the year to obtain the first quarterly price index. Then an average of the Wednesday values for the next three months was computed to obtain the second quarterly price index and so on. Finally, the 2013 Vintage equity price index was obtained by forward extrapolation of the 2011 Vintage using the rate of change of the new series from 2004Q1 to 2013Q1.

2.4   Exchange rates

Exchange rate series are from Bloomberg. A quarterly average of the nominal bilateral exchange rates vis-a-vis the US dollar (units of foreign currency per US dollar) was obtained for each country.[10] The quarterly average was computed based on the closing value of the last Wednesday of each month, as described for the equity price index. The 2013 Vintage exchange rate was obtained by forward extrapolation of the 2011 Vintage using the rate of change of the new series from 2004Q1 to 2013Q1.

The exchange rate series of the euro economies refer to the pre-euro exchange rate (i.e. national currency per dollar). To denominate them in euro, the quarterly average of the euro exchange rate vis-a-vis the US dollar was used (Source: Bloomberg. Ticker: EUR Curncy). The 1999Q1 value of this series was then used as the base value, which was extrapolated backwards using the rate of change of the series denominated in national currency. From 1999Q1 to 2013Q1 the growth rates (and level) of the euro economies are the same and equal to the quarterly average of the euro exchange rate vis-a-vis the US dollar.

2.5   Short-term interest rates

IFS is the main source of data for the short term interest rates. Consistent with the 2009 Vintage, IFS data are used for Argentina, Chile, China, and Turkey (Concept: Interest Rates, Deposit Rate); for New Zealand and Peru (Concept: Interest Rates, Discount Rate); for Canada, Malaysia, Mexico, Philippines, South Africa, Sweden, UK and US (Concept: Interest Rates, Treasury Bill Rate); and for Australia, Brazil, Finland, Germany, Indonesia, Italy, Japan, Korea, Norway, Singapore, Spain,

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[9]To construct a MSCI Country Index, every listed security in the market is identified. Securities are free float adjusted, classified in accordance with the Global Industry Classification Standard (GICS), and screened by size, liquidity and minimum free at (Source: MSCI Barra, www.mscibarra.com).

[10]The list of Bloomberg tickers is as follows: ARS JPMQ Curncy, AUD BGN Curncy, ATS CMPN Curncy, BEF CMPN Curncy, BRL BGN Curncy, CAD BGN Curncy, CNY BGN Curncy, CLP BGN Curncy, COP BGN Curncy, FIM CMPN Curncy, FRF CMPN Curncy, DEM BGN Curncy, INR CMPN Curncy, IDR BGN Curncy, ITL BGN Curncy, JPY BGN Curncy, KRW BGN Curncy, MYR BGN Curncy, MXN BGN Curncy, NLG CMPN Curncy, NOK BGN Curncy, NZD BGN Curncy, PEN BGN Curncy, PHP BGN Curncy, ZAR BGN Curncy, SAR BGN Curncy, SGD BGN Curncy, ESP CMPN Curncy, SEK BGN Curncy, CHF BGN Curncy, THB BGN Curncy, TRY BGN Curncy, GBP BGN Curncy, VEF BGN Curncy.

Switzerland, and Thailand (Concept: Interest Rates, Money Market Rate).[11]

For Austria, Belgium, France, and the Netherlands no data are available for any of these series from 1999Q1 when the euro was introduced. The country specific IFS Money Market Rate was used from 1979Q1 to 1998Q4 and the series was completed to 2011Q2 using the corresponding data for Germany as the representative euro area interest rate. From 2012Q2 onward the IFS stopped publishing the German interest rate. The rest of the data were completed by extrapolating forward using the rate of change of the Euribor from Bloomberg (Ticker: EUR003M) from 2012Q3 to 2013Q1.

For India, quarterly averages of daily Bloomberg data (India Treasury Bill 3-Month Yield. Ticker: GINTB3MO Index) are constructed in the same way as the quarterly exchange rate series.[12] When IFS data were not available, gaps were filled using Bloomberg data: Norway in 2007Q1 and from 2009Q4 to 2011Q2 (Ticker: NKDRC CMPN Curncy), Philippines in 2003Q4, 2005Q4, 2006Q4 and 2008Q2 (Ticker: PH91AVG Index). The 2011 Vintage short term interest rates are extended with these series from 2004Q1 to 2013Q1.

2.6 Long-term interest tates

The IFS data (Concept: Interest Rates, Government Securities, Government Bonds) are used to extend the series for all 18 countries for which long-term interest rate data are available, namely Australia, Austria, Belgium, Canada, France, Germany, Italy, Japan, Korea, Netherlands, New Zealand, Norway, South Africa, Spain, Sweden, Switzerland, United Kingdom, and United States.[13] The 2011 Vintage long-term interest rates are extended with these series from 2004Q1 to 2013Q1.

2.7 Oil price index

For the oil price index a Brent crude oil price from Bloomberg was used (Series: Current pipeline export quality Brent blend. Ticker: CO1 Comdty). To construct the quarterly series, the average of daily closing prices was obtained for all trading days within the quarter. The quarterly rate of change of this new series was used to extrapolate forward the 2011 Vintage oil price index from 2004Q1 to 2013Q1.

2.8 Other commodities: Agricultural raw material and metals price indices

The agricultural raw material and metals price indices were both taken from the IMF's Primary Commodity Prices monthly data.[14] Because the IMF data starts in 1980, the series were extrapolated backwards to 1979 using the growth rate of the monthly price indices (2010 = 100) from the World Bank.[15] Monthly averages of the indices were taken for each quarter.

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[11] All series in the IMF IFS database have been reclassified. The concepts used here correspond to the ones used in the 2009 Vintage for the short term interest rates, namely the 60Lzf series, the 60Czf series, the 60Bzf series, and the 60zf series.

[12] This is an indicative Treasury Bill Rate polled daily by Bloomberg from various sources. The constructed series is not exactly equal to the original DdPS series, however it is very close.

[13] All series in the IMF IFS database have been reclassified. The concepts used here correspond to the ones used in the 2011 Vintage for the long term interest rates, namely the 61zf series.

[14] http://www.imf.org/external/np/res/commod/index.aspx.

[15] Prospects of commodity markets, "The Pink Sheet" historical data: http://go.worldbank.org/4ROCCIEQ50.

2.9 PPP - GDP data

The main source for construction of the country specific PPP-GDP weights is the World Development Indicator database of the World Bank. The GDP in Purchasing Power Parity terms in current international dollars (Ticker: NY.GDP.MKTP.PP.CD) was downloaded for all countries from 2009 to 2012.[16]

2.10 Trade matrix

To construct the trade matrices, the IMF Direction of Trade statistics was used. For all the countries considered the matrix of Exports and Imports (c.i.f.) was downloaded at the annual frequency. The data for 2011 and 2012 average of Exports and Imports are appended to the trade matrices associated with the 2011 Vintage.

Table 1: Bloomberg tickers and corresponding Datastream codes

Series	Bloomberg Name	Datastream Name	Code
Philippines Real GDP	PHNAGDPS Index	GDP Index, NSA	PHGDP...D
Equity Price Indices	CNT MSCI Index	Total Market Index	CNT TOTMK
Exchange Rates	CNT CURNCY	Exchange Rates	CNT GTIS US $
India Treasury Bill 3-Month	GINTB3MO Index	91 Day T-Bill Primary Middle Rate	INPTB91
Oil Price	CO1 Comdty	Brent Crude	LCRINDX

3 Seasonality

3.1 Assessing the joint significance of seasonal effects

To asses the joint significance of the seasonal components for real output, real consumption and the price level the following procedure was used:

1. Let S_1, S_2, S_3 and S_4 be the usual seasonal dummies, such that S_i, $i = 1, 2, 3, 4$, takes the value of 1 in the ith quarter and zero in the remaining three quarters.

2. Construct $S_{14} = S_1 - S_4$, $S_{24} = S_2 - S_4$, $S_{34} = S_3 - S_4$.

3. Run a regression of Δy (where the lower case denotes the natural logarithm of the corresponding variable) on an intercept and S_{14}, S_{24}, S_{34}. Denote the OLS estimates of S_{14}, S_{24} and S_{34} by a_1, a_2 and a_3.

4. Asses the joint significance of the seasonal components by testing the hypothesis that $a_1 = a_2 = a_3 = 0$ using the F-statistic.

5. In cases where the null hypothesis was rejected at the 10% level, seasonal adjustment was performed on the log-difference of the original series using the X-12 procedure as described below.

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[16]WDI data was not available for Argentina in 2011 and 2012. The growth rate of 2010 was used in both cases to fill the gaps.

3.2 Method of seasonal adjustment

To seasonally adjust the $log(GDP)$ series (assumed to be an I(1) process), first $\Delta \log(GDP)$ is seasonally adjusted using the X-12 quarterly seasonal adjustment method in Eviews under the additive option, to obtain $\Delta \log(GDP)_{SA}$. Then using the first observation of the raw series $log(GDP)$ (levels, not seasonally adjusted) the seasonally adjusted log changes, $\Delta \log(GDP)_{SA}$, are cumulated to obtain the log adjusted series $log(GDP)_{SA}$. Finally, the seasonal adjusted level series is obtained by taking the exponential of $log(GDP)_{SA}$.

Consider now the updating of seasonally adjusted series and suppose seasonally adjusted series from 1979Q1 to 2011Q2 are available, which one wishes to update to 2013Q1. The raw series are downloaded, for example from 2000Q1 to 2013Q1, and are first seasonally adjusted with the procedure described above. Then, the seasonally adjusted new series, in growth rates, are used to update the original seasonally adjusted series. To avoid possible abrupt changes in the updated series, two years of the original series were also overwritten for all variables. Specifically, all series were updated from 2004Q1 to 2013Q1.