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Database of Global Economic Indicators (DGEI): A Methodological Note [*]

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Abstract

The Database of Global Economic Indicators (DGEI) from the Federal Reserve Bank of Dallas is aimed at standardizing and disseminating world economic indicators for policy analysis and scholarly work on the role of globalization. The purpose of DGEI is to offer a broad perspective on how economic developments around the world influence the U.S. economy with a wide selection of indicators. DGEI is automated within an Excel-VBA and E-views framework for the processing and aggregation of multiple country time series. It includes a core sample of 40 countries with available indicators and broad coverage. Country groupings include rest of the world (ex. the U.S.) aggregates and subgroups of countries by development attainment and trade openness. The indicators currently tracked include real GDP, industrial production (IP), Purchasing Managers' Index (PMI), merchandise exports and imports, headline CPI, CPI (ex. food and energy), PPI/WPI inflation, nominal and real exchange rates, official/policy interest rates, and long-term interest rates. All series are monthly, with the exception of real GDP which is reported at a quarterly frequency. Aggregation is based on trade shares with the U.S. The Globalization and Monetary Policy Institute publishes the aggregate indicators as well as additional country detail on its website with an accompanying slideshow on Global Economic Conditions. This note provides a technical description of the methodology implemented to construct the DGEI.

JEL codes: C80, C82, E00, E66, F6

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Table of Contents

List of Tables

List of Figures

"Data! Data! Data!" he cried impatiently. "I can't make bricks without clay."
The Adventure of the Copper Beeches (1892),
in *The Adventures of Sherlock Homes,*
by Sir Arthur Conan Doyle (1859-1930).

1 Introduction: Aims and Scope

The Database of Global Economic Indicators (DGEI) is intended to deal with the problem of "not seeing the forest for the trees" in economic and policy analysis of international developments. In other words, it aims to provide a broad perspective on the world economy that is less subject to idiosyncratic country factors and more indicative of the global factors at play. The DGEI reflects a major effort of the Globalization and Monetary Policy Institute of the Federal Reserve Bank of Dallas. The DGEI aims to standardize and simplify data management processes to document the common features of the international data—by pre-processing the relevant time series across countries and automating the country aggregation to ensure timeliness and comparability across sources.

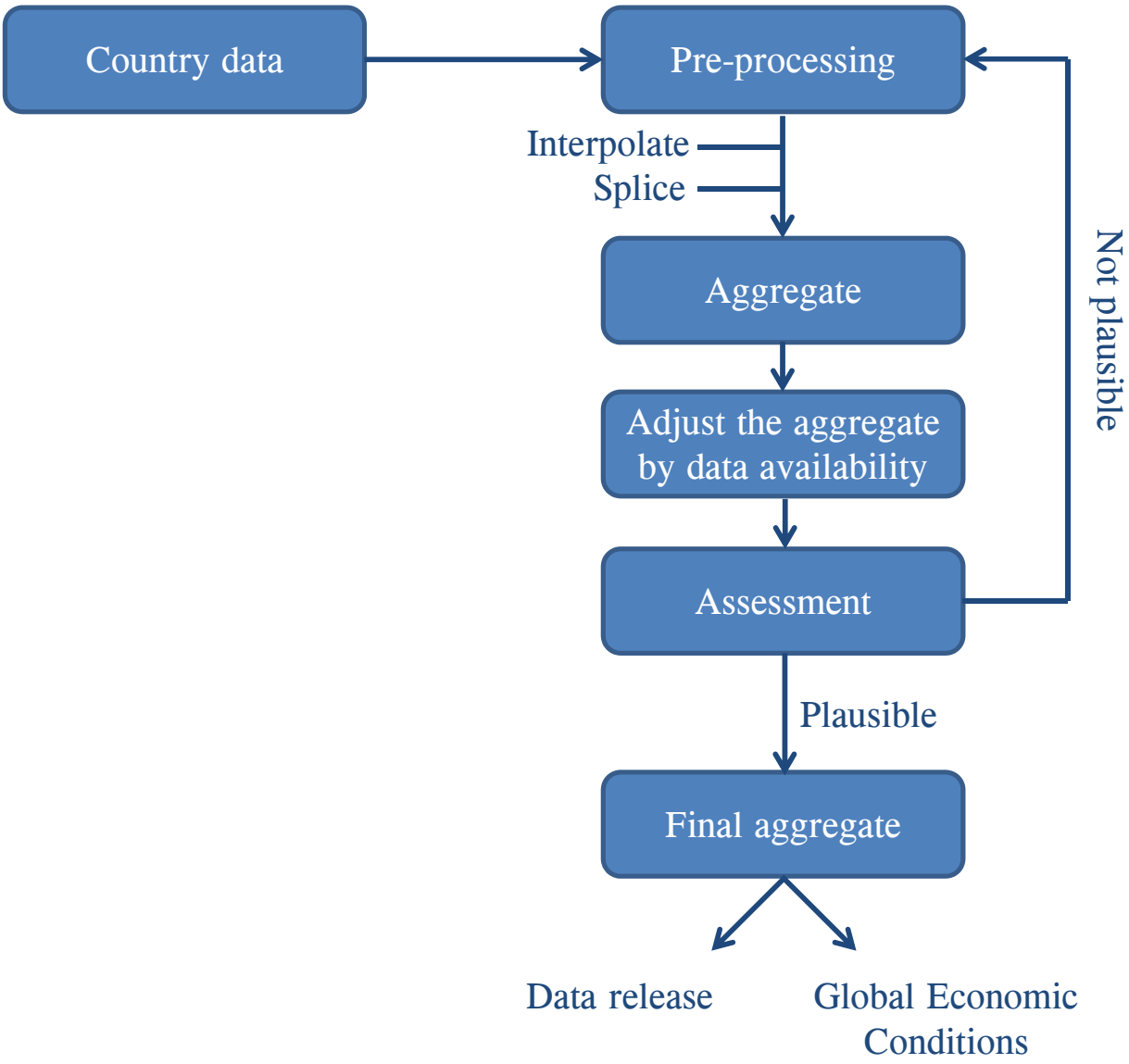
The DGEI system of data processing is described schematically in Figure 1 below. DGEI uses country data primarily from Haver Analytics for its current series. It channels a variety of historical data sources as well—going back to 1980 whenever possible—to extend the current series. The DGEI data management system is implemented within an Excel environment that integrates Visual Basic for Applications (VBA) code and E-views 8 code for the compilation of monthly and quarterly indicators at the country level and aggregation of the data.

We are mindful that the reliability and interpretability of the aggregate indicators we produce very much depends on the implementation process we detail here. DGEI depends crucially on the methodology described in this document, to explain what the indicators capture and what these aggregates can tell us about the global outlook.

The work we've done offers a new look at global economic developments and the global outlook (through Global Economic Conditions web updates and charts, and data releases) from a U.S. perspective. We hope that this resource will be regularly used to complement other available sources (such as the IMF database, the World Bank database, the United Nations datasets, etc.). With this initiative, the Federal Reserve Bank of Dallas wants to contribute to international macroeconomic research that deepens our understanding about the role of globalization and its effects on the U.S.

The paper is organized as follows: In Section 2 we describe our country classification taxonomy. Section 3 provides an overview of the selection criteria used to construct the DGEI database. It also has a detailed discussion on the methodology to obtain the time series of indicators we use, our aggregation approach, and the way we incorporate forecasts (whenever country forecasts differ in terms of growth definitions and frequency). Section 4 introduces the method for dating turning points of the global business cycle (see Grossman, Mack, and Martínez-García (2014)). Section 5 illustrates the DGEI indicators for the period 1999-2013, while Section 6 presents the country detail for the major world economies that complements our aggregate indicators.

Figure 1. DGEI: Schematic Outline



2 Taxonomy of the Database of Global Economic Indicators (DGEI)

2.1 Country Classification

2.1.1 By Income or Level of Development

The methodology for classifying countries by economic development varies among international organizations, as described in Nielsen (2011). The process used by the U.N. Development Programme (UNDP), the World Bank, and the International Monetary Fund (IMF differ in the development indicators they rely upon, and the absolute/relative nature of the thresholds underlying their classification. However, all seem to reach similar conclusions in their 'developed/advanced' and 'developing/emerging' country groupings.

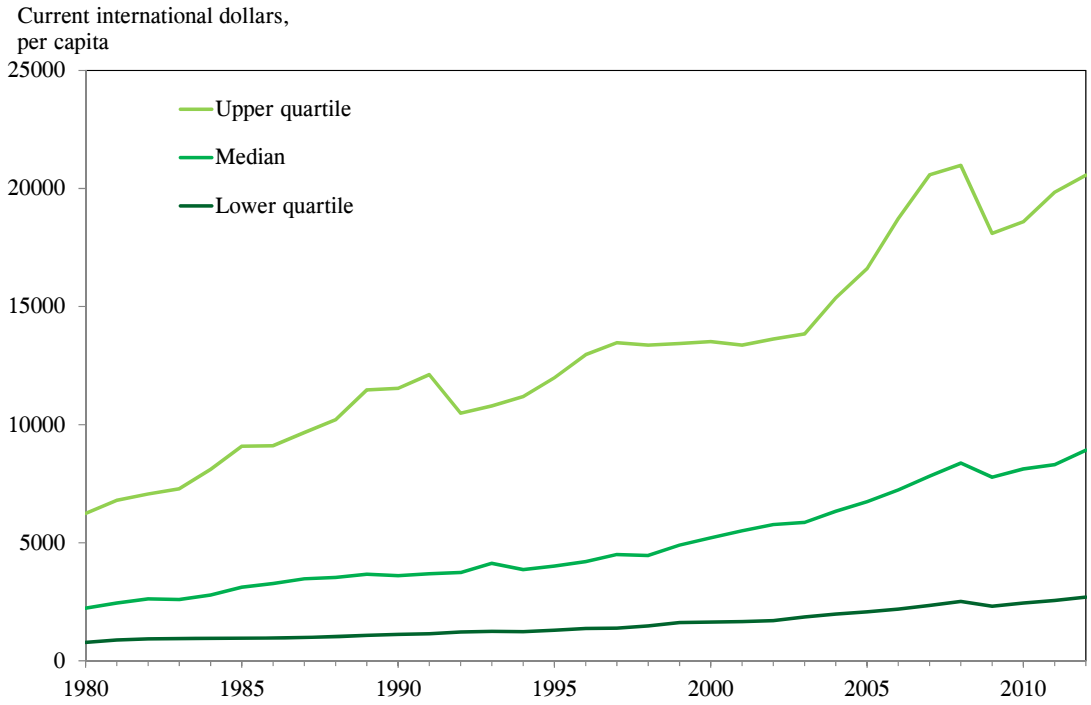
The World Bank sets development thresholds based on estimates of gross national income (GNI) per capita (see, e.g., World Bank (2013)). The UNDP uses the Human Development Index (HDI), which is a composite statistic of life expectancy, education, and income measures (see, e.g., UNDP (2013)). The IMF has no detailed discussion of its classification methodology—although its country classification appears to be highly correlated with measures of income (see, e.g., IMF (2013)).

The World Bank country classification has been kept fairly invariant in real terms—setting effectively an absolute development threshold. The IMF's implicit threshold is probably also based on an absolute level, according to Nielsen (2011). With an upward trending average world income, an absolute threshold for 'developed/advanced' countries could result in further expansion of this grouping. In turn, UNDP's development threshold is set in relative terms—determined by the upper quartile of the HDI distribution—to keep the composition of the grouping stable over time.

Our development classification for the DGEI is based on a relative income threshold. We classify countries as advanced or emerging based on PPP-adjusted real GDP per capita from the IMF World Economic Outlook (WEO), using annual data from 1980 until 2012 for 183 countries and overseas/dependent territories (see Appendix A. Country Definition for further details). Since GDP per capita trends upwards for most countries (Figure 2), the metric used to classify each country is not PPP-adjusted GDP per capita *per se* but the frequency with which the country's PPP-adjusted GDP per capita falls below the upper quartile of the cross-country distribution in each year over the period 1980-2012.

We set a relative threshold in order to account for changes in the distribution over time, ensuring only countries that persistently appear in the upper quartile of the distribution are considered for the 'advanced' group. Countries may surpass this relative development threshold for just a few years, and not be considered advanced. Countries that fell below the upper quartile at least 20 percent of the time since the 1980s are classified as emerging by their development attainment.

Figure 2. Distribution of PPP-adjusted GDP per Capita (1980-2012)



Source: IMF World Economic Outlook (WEO) database.

Advanced countries are high-income countries—but the classification is not entirely determined by income since a country's economic development classification is subject to two important adjustments:

(a) Any country whose economy is heavily dependent on oil production (irrespective of whether they are high-income or not) are re-classified as emerging to define a broader grouping of emerging and oil-producing countries. To determine a country's dependence on oil production, we use non-oil GDP, total GDP, and population data obtained from the IMF's April 2010 World Economic Outlook (WEO) (IMF (2010)). We measure the degree of oil dependence as the ratio of total GDP minus non-oil GDP over total GDP, both in real terms. Oil-producers are those whose oil-dependence ratio is consistently in the upper quartile of the distribution.

(b) Any country whose economy's share of world PPP-adjusted GDP does not reach 0.01 percent at least half of the time during the period 1980-2012 is also excluded from the advanced group.

Table 1 summarizes the country classification which includes a total of 36 advanced countries. The resulting classification is almost identical to the one the IMF uses in its 2013 World Economic Outlook (WEO) as seen in IMF (2013). For further details on alternative classification methods and country lists, see also the work of Nielsen (2011).

Table 1. Country Classification by Income or Level of Development

Advanced-Economy Grouping	
Australia	Japan
Austria	Luxembourg
Bahamas	Malta
Belgium	Netherlands
Canada	New Zealand
Cyprus	Norway
Czech Republic	Portugal
Denmark	Singapore
Estonia	Slovakia
Finland	Slovenia
France	South Korea
Germany	Spain
Greece	Sweden
Hong Kong	Switzerland
Iceland	Taiwan
Ireland	Trinidad and Tobago
Israel	U.K.
Italy	U.S.

Note: The IMF country classification includes 35 advanced economies (including the U.S.), which can be found in their October 2013 World Economic Outlook (WEO) database (http://www.imf.org/external/pubs/ft/weo/2013/02/). The IMF includes San Marino as an advanced economy, and we include Bahamas and Trinidad and Tobago in that category instead.

2.1.2 By Trade Openness

We also classify countries as open economies and closed economies to distinguish countries whose trade to GDP ratio is significantly higher than the rest. The closed-economy grouping includes all others. Hence, under the label of closed economies we include a large number of countries—including the U.S.—which are integral to world trade but are simply less geared towards trade.

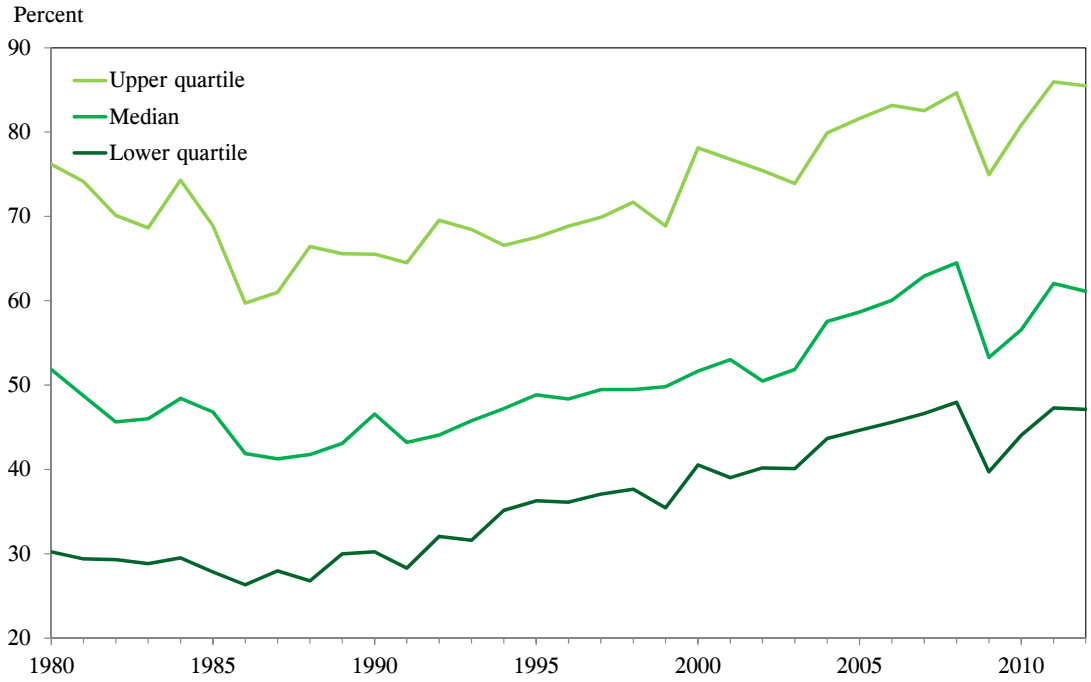
Economies that are more dependent on trade—labeled as open—are arguably more sensitive to global factors. We recognize, however, that economies labeled as closed may in fact have more of an impact on world trade and global developments through their sheer size or role in the global value-added chain (e.g., in the case of the U.S.) than those in the open-economy grouping. The distinction is primarily meant to illustrate differences in the global outlook depending on the degree of openness of an economy, but also to capture the differential impact from the point of view of the U.S. of developments across these two groupings.

The classification by trade openness is based on the annual ratio of nominal trade (exports plus imports) in U.S. dollars divided by the nominal GDP of the country expressed in U.S. dollars. All exports are valued free on board (f.o.b.). Imports are usually reported as cost including insurance and freight (c.i.f.), although a few countries report imports f.o.b. For our calculations, the import data reported f.o.b. are adjusted to a c.i.f. basis by applying an across-the-board 10 percent increase in all cases to account for the costs of insurance and freight. The annual data used comes from the IMF's International Financial Statistics (IFS) database and covers the same 183 countries reviewed for the classification by level of development.

Trade openness has varied significantly as the world has become more integrated (see, e.g., the changes in the quartiles since 1980 illustrated in Figure 3). To account for that fact, a relative threshold that controls for changes in the distribution over time is used in classifying these countries. The median of the distribution—which is a measure of central tendency and more robust in the presence of outliers than the mean—is computed for each year over the period 1980-2012. The median has trended upwards since the mid-1980s, so the frequency with which a given country has been below the median of the distribution for all years from 1980 until 2012 for which there is data determines its classification by degree of openness.

Countries are classified as closed economies whenever they appear to be above the median 5 percent of the time or less, and consequently all other countries are classified as open. Any country whose economy's share of world PPP-adjusted GDP does not reach 0.01 percent at least half of the time during the period 1980-2012 is automatically classified as open. Because their economy is so small, they are naturally dependent on trade with the rest of the world.

Figure 3. Distribution of the Ratio of Trade Openness (1980-2012)



Source: IMF International Financial Statistics (IFS) database.

Table 2 summarizes the country classification which includes a total of 42 closed-economy countries.

Table 2. Country Classification by Trade Openness

Closed-Economy Country Grouping	
Albania	Japan
Argentina	Kenya
Australia	Madagascar
Bangladesh	Mexico
Brazil	Namibia
Burkina Faso	Nepal
Burundi	Niger
Cameroon	Pakistan
Central African Republic	Panama
Colombia	Peru
Comoros	Rwanda
Dominican Republic	Sierra Leone
Egypt	Spain
Ethiopia	Sudan
France	Tanzania
Greece	Timor-Leste
Guatemala	Turkey
Guinea-Bissau	Uganda
India	U.K.
Iran	U.S.
Italy	Uruguay

Note: The country classification considers closed economies those that have experienced a low degree of openness to trade consistently since the 1980s, even if over time they have become more integrated.

3 Construction of the Database of Global Economic Indicators (DGEI)

3.1 Main Global Economic Indicators

The time series listed in Table 3 represent our current selection of indicators in the DGEI. This (non-exhaustive) list includes a number of the most relevant macro variables used to gauge real and nominal developments around the world and to take the pulse of the global economy.

Table 3. Main Reference Economic Indicators

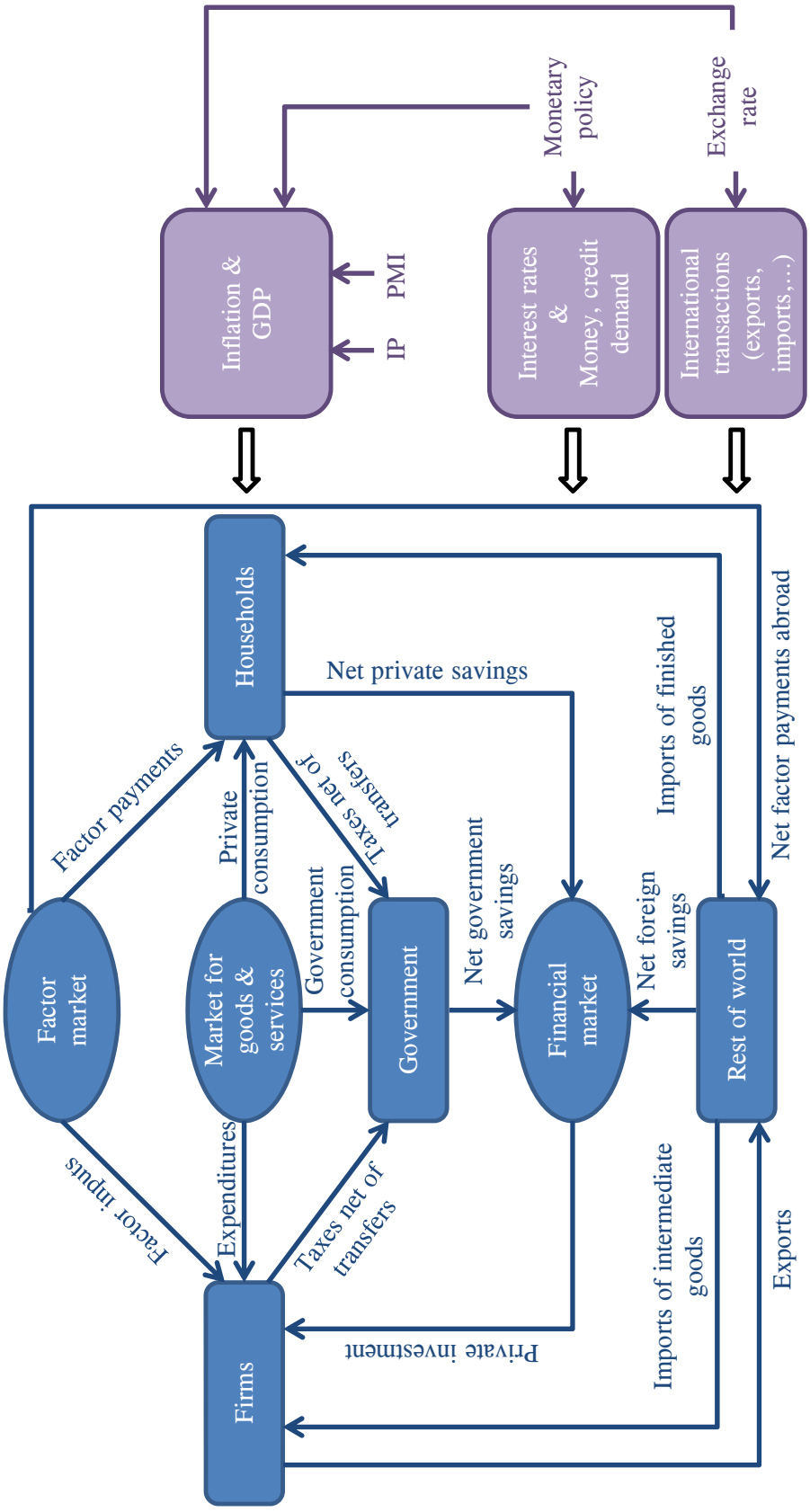
Variables	Frequency
Real Economic Activity Indicators	
GDP	Quarterly
Industrial Production	Monthly
Purchasing Managers' Index (PMI)	Monthly
Price Indicators	
Headline CPI Inflation	Monthly
PPI/WPI Inflation	Monthly
Core CPI Inflation	Monthly
Nominal Exchange Rates	Monthly
Real (CPI-based) Exchange Rates	Monthly
Real (PPI-based) Exchange Rates	Monthly
Trade Indicators	
Merchandise Exports to World	Monthly
Merchandise World Imports	Monthly
Financial Indicators	
Short-term Policy Rates	Monthly
Long-term Interest Rates	Monthly

Note: The GDP series is computed as an index, and expressed in levels in PPP-adjusted terms in international U.S.$. Among the 13 indicators listed in this table, nine of them are considered to be core indicators for which all countries in DGEI must have some data at least as far back as 2005. Of the four non-core indicators of reference, PPI/WPI inflation, real (PPI-based) exchange rates, and long-term interest rates have nearly complete country coverage in DGEI, and only the PMI series is subject to significant data limitations.

The external sector is critical to our understanding of an increasingly more integrated global economy. Different parts of the U.S. economy are inextricably linked to the rest of the world, so the DGEI indicators serve like a thermometer reading for developments abroad that could spill over to the U.S.

Figure 4 illustrates in blue a stylized representation of the circular flow model of an economy connected to the rest of the world. The same figure illustrates in purple the main linkages between the selected DGEI reference indicators and their relation to the circular flow representation. Foreign events captured by the indicators selected for DGEI can influence developments both abroad as well as in the U.S. and are important to track.

Figure 4. Circular Flow Model of the Economy and Economic Indicators



3.2 Country Composition

Building a representative panel of countries for the DGEI requires consistent selection criteria:

- Pre-screening for data availability: There is readily available data on all key macro indicators listed in Table 3 for at least 58 countries starting in 2005 or earlier, but the time series coverage is not complete for all 58 countries going back to 1980.[1]
    - All 58 countries are included in Table 4, classified as either emerging or advanced and ranked by the size of their economies in 2005 PPP-adjusted terms.

- Selection: Out of the 58 countries in Table 4, the main criteria used to refine the country sample were: (a) economic size, and (b) economic representativeness. The former criterion narrows the sample of countries to those with a significant weight in the global economy, while the latter criterion evaluates a country's significance within its assigned development country grouping. To be included, a country must account for at least 75 percent of the advanced (ex. the U.S.) or emerging shares of world PPP-adjusted GDP going back to 2005 or earlier. Economic representativeness aims to guarantee that the country sample is balanced (at least in regards to development attainment)
    - The 26 emerging countries listed in Table 4 represent 77.37 percent of the world output share accounted for by emerging economies. Some of the smaller countries with shorter time series and less reliable/timely data are not included to facilitate the data management of the DGEI—this brings down the number of emerging countries that we retain for the DGEI to 21, representing 75.34 percent of the emerging economies' total in 2005.
    - 32 out of the 36 advanced countries listed in Table 1 are included in the list of 58 countries reporting consistent data since 2005 or earlier—the smaller countries with a share of world output under 0.35 percent are excluded. Hong Kong and Norway are also excluded due to their particular circumstances—Hong Kong because of its special status as a Special Administrative Region of China and its role in China's trade with the rest of the world, and Norway because of the importance of oil to its economy. This reduces the number of advanced countries retained for the DGEI to 19 which still represent 94.55 percent of the advanced countries' share of world output in 2005.
    - G40 country sample: The resulting sample of 40 advanced and emerging countries (including the U.S.) remains somewhat skewed towards the advanced economies, but because of their importance for the global economy as well as for international trade and the financial linkages of the U.S., we do not attempt to correct for the overrepresentation of the advanced economies.

[1] The only exceptions to that rule are India, Indonesia, and China, which report core CPI data starting in 2006, 2007, and 2005 respectively but are sufficiently large that they cannot be excluded from the panel. PPI/WPI inflation, real (PPI-based) exchange rates, and long-term interest rates have nearly complete country coverage in DGEI. Not all countries in the database report data for the PMI either, but the coverage is not nearly as complete. Of the 40 countries (out of the 58 identified in Table 4) currently incorporated as part of the DGEI, Belgium and Portugal are the only advanced countries for which we do not have a PMI series. In turn, we lack PMI data for Indonesia (which started to report in 2011), Thailand, Argentina, Colombia, Malaysia, Venezuela, Philippines, Niger, Chile, Peru, Bulgaria, and Costa Rica.

Table 4. Data Availability for Countries with Coverage for Macro Variables of Interest

Advanced Countries	PPP-adj. GDP Shares (2005)		Emerging Countries	PPP-adj. GDP Shares (2005)	
	G58	G40		G58	G40
U.S.	22.16	22.16	China	9.42	9.42
Japan	6.83	6.83	India	4.26	4.26
Germany	4.38	4.38	Russia	2.98	2.98
U.K.	3.42	3.42	Brazil	2.78	2.78
France	3.27	3.27	Mexico	2.28	2.28
Italy	2.88	2.88	Turkey	1.31	1.31
Spain	2.08	2.08	Indonesia	1.24	1.24
Canada	2.04	2.04	Poland	0.91	0.91
S. Korea	1.93	1.93	Thailand	0.78	0.78
Australia	1.21	1.21	Argentina	0.74	0.74
Taiwan	1.07	1.07	S. Africa	0.71	0.71
Netherlands	1.00	1.00	Colombia	0.55	0.55
Belgium	0.59	0.59	Malaysia	0.55	0.55
Sweden	0.53	0.53	Venezuela	0.46	0.46
Austria	0.49	0.49	Philippines	0.46	0.46
Switzerland	0.48	0.48	Nigeria	0.43	0.43
Greece	0.48	0.48	Chile	0.36	0.36
Hong Kong	0.44	--	Romania	0.36	--
Norway	0.39	--	Peru	0.31	0.31
Portugal	0.38	0.38	Hungary	0.30	0.30
Czech Rep.	0.38	0.38	Kazakhstan	0.23	--
Singapore	0.34	--	Bulgaria	0.14	0.14
Denmark	0.32	--	Croatia	0.12	--
Israel	0.28	--	Lithuania	0.09	--
Finland	0.28	--	Costa Rica	0.07	0.07
Ireland	0.28	--	Jordan	0.04	--
New Zealand	0.18	--			
Slovakia	0.15	--			
Slovenia	0.08	--			
Cyprus	0.03	--			
Iceland	0.02	--			
Malta	0.02	--			
World share of G58/G40 groupings	*58.42*	*55.61*	***World share of G58/G40 groupings***	*31.87*	*31.03*
G58/G40 share of the total of G58/G40	*64.70*	*64.18*	***G58/G40 share of the total of G58/G40***	*35.30*	*35.82*
World share of each grouping	*58.81*	*58.81*	***World share of each grouping***	*41.19*	*41.19*

Note: PPP-adjusted GDP shares are from the IMF World Economic Outlook (WEO) database. We indicate the group of 40 countries included in the DGEI as G40 and all 58 countries with some data for our selection of economic indicators as G58.

Figure 5 and Figure 6 illustrate the country classifications by economic development and trade openness that we have adopted for the DGEI. The U.S. is an advanced and closed economy based on our classification, but our advanced and closed-economy aggregates (as well as the rest of the world) exclude the U.S. for contrast.

Figure 5. Country Classification by Income or Level of Development

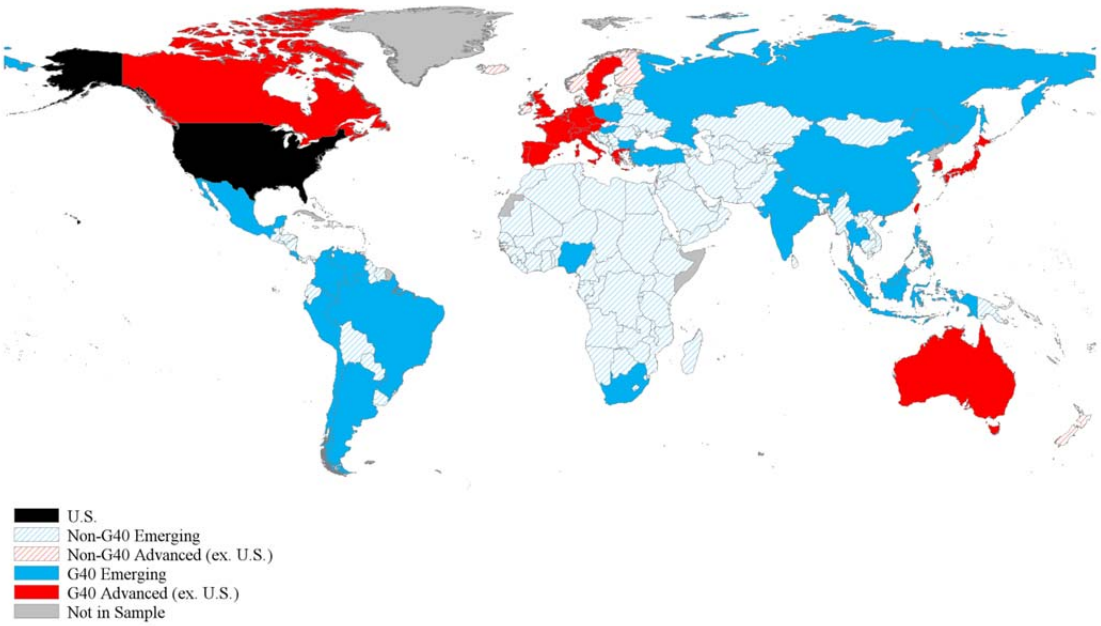
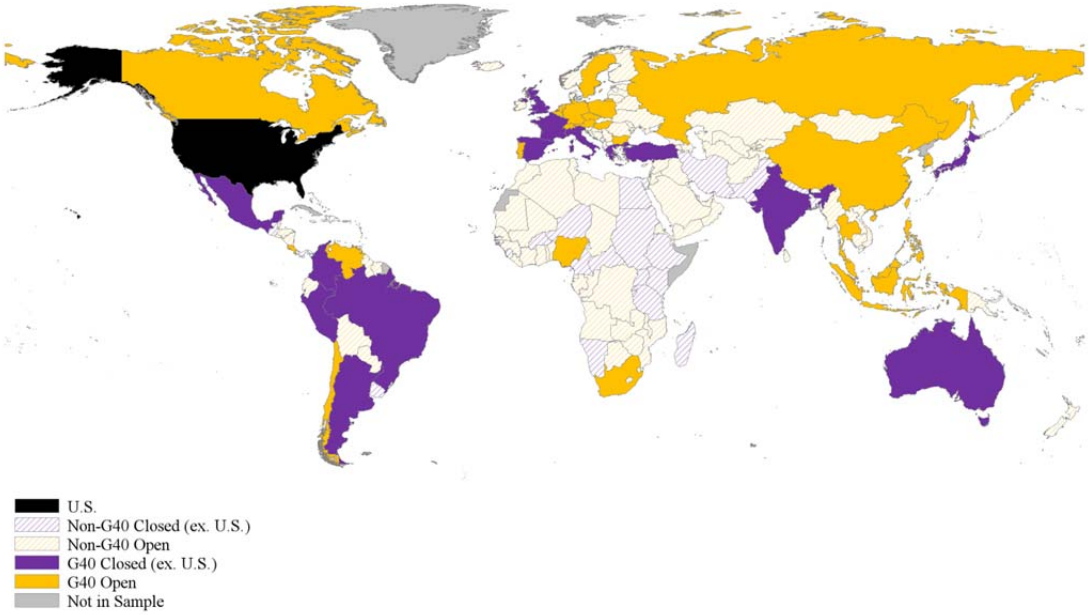


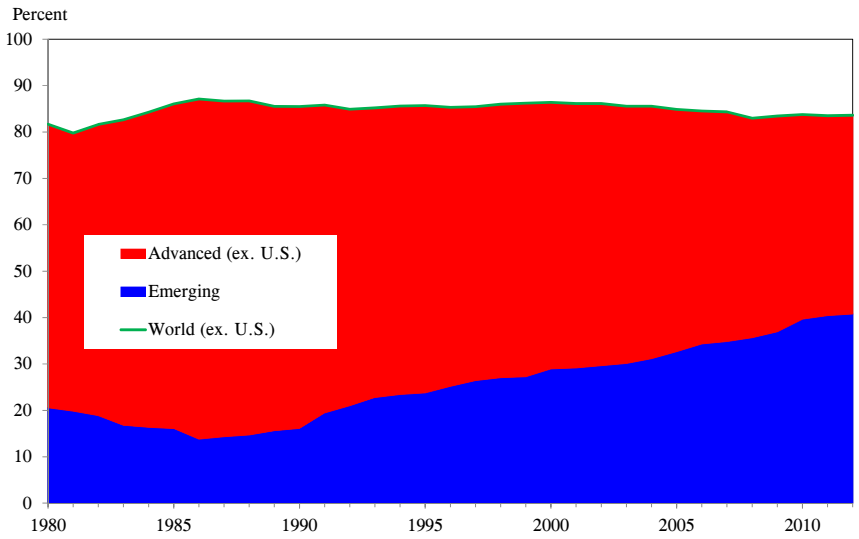
Figure 6. Country Classification by Trade Openness



The G40 country selection adopted for DGEI represents a fairly stable share of U.S. trade for the period of reference since 1980 (Figure 7), as well as a stable share of world GDP in PPP-adjusted terms (Figure 8). Moreover, the G40 sample also reflects two major structural changes that have occurred since the 1980s:

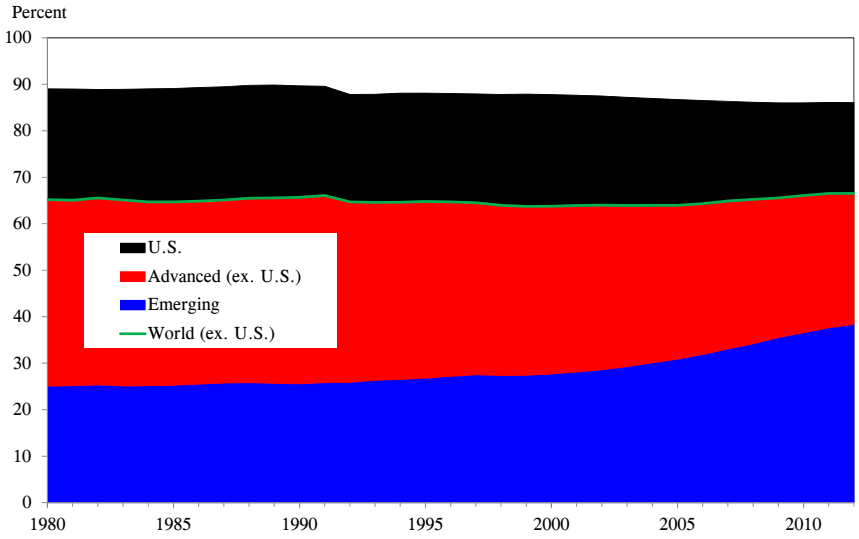
- The share of U.S. trade accounted for by emerging countries has more than doubled since 1987.
- The share of world GDP accounted for by emerging countries has significantly increased since 2000.

Figure 7. G40 Share of U.S. Trade (1980-2012)



Source: Trade data comes from the IMF Direction of Trade (DOT) database.

Figure 8. G40 Share of PPP-adjusted World GDP (1980-2012)



Source: PPP-adjusted GDP shares are from the IMF World Economic Outlook (WEO) database.

3.2.1 Alternative Approaches

An alternative approach to country selection/classification is used in the construction of the foreign exchange value of the dollar. See Loretan (2005) for details on the construction of that index by the Board of Governors (BoG).

- The country selection methodology explained in Loretan (2005) is based on the largest trading partners of the U.S., while country selection in DGEI is based on the economic size of the countries, as measured by their share of world GDP conditioned by data availability of the main reference indicators.
- DGEI includes a broader set of emerging countries than those of the BoG's index. We expect this feature to be important going forward, since the trends from the mid-1980s suggest that emerging economies represent an increasingly larger share of world output and since U.S. trade is increasingly shifting towards the emerging economies.
  - Euro-area countries included in the BoG index but not included in the DGEI sample are: Finland, Ireland, Luxembourg, Cyprus, Estonia, Malta, Slovakia, and Slovenia. Other countries included in the BoG index but not in the DGEI are: Hong Kong, Singapore, Israel, and Saudi Arabia. All these countries are considered advanced in DGEI (except Saudi Arabia which is classified as an oil-producer).
  - Countries included in the DGEI sample but not in the BoG: Turkey, South Africa, Costa Rica, Peru, Nigeria, Bulgaria, the Czech Republic, Hungary, and Poland. All these countries are considered emerging in DGEI (except the Czech Republic which is classified as advanced).
  - We classify South Korea and Taiwan as advanced for the DGEI, but these countries are considered emerging in the BoG's foreign exchange value of the dollar index.

3.3 Pre-processing the Data (at the Country Level)[2]

Our system of data management for the DGEI is based primarily on an Excel-VBA environment supplemented with E-views 8 code.

- Seasonal adjustment: The program that manages DGEI performs concurrent seasonal adjustment. It takes all the defaults of X12-ARIMA and uses a multiplicative model, unless the series has negative or zero values or is expressed in percent in which case it switches to the additive model.
- Missing data, frequency adjustments:
  - Linear interpolation for gaps in the series.
  - Temporal disaggregation to adjust the frequency of all the time series to monthly or (for real GDP) quarterly.
    - Quadratic-match average method for the indicators. Appendix B. An Assessment of the Quadratic-Match Method for Interpolation includes additional information on the quadratic-match method for data interpolation.
    - Constant interpolation for the annual weight data.
    - Linear interpolation for the forecasts.

[2] For more details on the country data, see Appendix C. Country Sources.

- Extending country series backwards (splicing), and other data adjustments:
  - DGEI uses the growth rates of the historical series to splice the current series backwards. In some cases, the historical series has to be temporally disaggregated and/or linearly interpolated before it can be spliced together with the most current series.

3.3.1 Real Economic Activity Indicators

Real GDP: If the current series does not extend back to the first quarter of 1980 and historical data are available, the two series are spliced together. This affects the series for Austria, Belgium, Italy, Sweden, Canada, Portugal, Spain, Colombia, Nigeria (only back to the first quarter of 1981), and China. All annual data is interpolated to a quarterly frequency—prior to splicing—using the quadratic-match average method.

Industrial Production (IP): Total industrial production excluding construction is our preferred IP series for the DGEI. This measure includes the mining, manufacturing, and utilities sector and has broad cross-country and time series coverage. We exclude the construction sector because it tends to display patterns that are different than those of the other sectors. If the preferred series is not available, manufacturing production is used as a proxy (or total IP if no other alternative is found).

- If the current series does not extend back to January of 1980 and historical data are available, the two series are spliced together. This is the case for Belgium, Canada, Greece, Chile, Colombia, Peru, Venezuela, Indonesia, Philippines, and Thailand.
- Current data for Switzerland, Australia, and Nigeria are reported at a quarterly frequency. Nigeria's series is also spliced with historical quarterly data to extend the series back to 1980. All quarterly data are interpolated to a monthly frequency—prior to splicing—using the quadratic-match average method.

Purchasing Managers' Index (PMI): The PMIs for most countries refer to the manufacturing sector—the exception being Canada, which is a composite of the manufacturing and service sectors. A manufacturing PMI series is available for Canada, but it does not start until October 2010.

- The PMI series for Australia is reported at a quarterly frequency until May of 2001. Quarterly data reported prior to this date is interpolated to a monthly frequency using the quadratic-match average method.
- Not all countries report PMI data. Those excluded from the aggregate due to lack of data or due to their very short time series are: Belgium, Portugal, Argentina, Chile, Colombia, Costa Rica, Peru, Venezuela, Indonesia (which began reporting in April 2011), Malaysia, Philippines, Thailand, Nigeria, and Bulgaria.[3] Each PMI aggregate is constructed as a diffusion index and computed as a weighted-average of the PMI indexes available for the G40 countries in DGEI.

[3] All countries included in DGEI that have PMI data have series starting by the cutoff year of 2005, except for Turkey, which starts in June 2005, Brazil, which starts in February 2006, and India, which starts in March 2005. These countries' data were included because of their importance to the global economy.

3.3.2 Price Indicators

Headline CPI Inflation: If the current series does not extend back to January of 1980 and historical data are available, the two series are spliced together. This affects the U.K. and India.

- Current data for Australia is reported at a quarterly frequency, which is interpolated to a monthly frequency using the quadratic-match average method.

Core CPI Inflation (Excluding Food and Energy): Core CPI is another price indicator that excludes items with volatile prices such as food and energy. Our preferred series when available is the once that excludes both items (food as well as energy). Country series spliced with historical data are those of the U.K., Austria, Belgium, France, Germany, Italy, Netherlands, Sweden, Switzerland, Canada, Greece (only back to January of 1989), Spain, Argentina (only back to January of 1993), India (only back to January of 2006), and Australia.

- Current data for Australia is also reported at a quarterly frequency. All quarterly data is interpolated to a monthly frequency—prior to splicing—using the quadratic-match average method.

Producer Price Index (PPI) / Wholesale Price Index (WPI) Inflation: The DGEI dataset mixes producer prices (PPI) and wholesale prices (WPI), as not all countries report them both. The WPI differs from the PPI because it includes domestically produced goods sold in the home market (also included in the PPI) and imported goods (which are excluded from the PPI). WPI excludes prices of exported goods (which are included in the PPI). WPI also measures purchasers' prices—including transportation costs, sales taxes, and VAT—while PPI measures sellers' prices at the factory. For further reference on the development of the PPI program, see IMF (2004).

- Countries spliced with historical data are France (only back to 1995), South Africa, and Philippines. Countries with incomplete data with no available historical series are Italy and Netherlands (starting in 1981), Turkey, Malaysia and Peru (1986), Portugal (1990), Brazil and Costa Rica (1991), Argentina (1993), Greece and Thailand (1995), Austria (1996), Venezuela (1998), Chile (2003), and Mexico (2003). Current data for Australia (starting in 1998) is reported at a quarterly frequency, which is interpolated to a monthly frequency using the quadratic-match average method. Countries in G40 with no data at all are just one: Nigeria.
- Composition mix of PPI and WPI series in the G40 country sample:
  - Countries that report WPI but not PPI are Brazil, Peru, Taiwan, India, and Indonesia.
  - If there is a total PPI measure for a country, we use that series; otherwise, we use manufacturing PPI. Countries that report only manufacturing PPI are the U.K., Netherlands, Japan, South Africa, Venezuela, Philippines, and the Czech Republic. For the U.S., we choose the PPI for finished goods.

Nominal Exchange Rates: All exchange rate data are expressed as US$/foreign currency. If the current series does not extend back to January of 1980 and historical data are available, the two series are spliced together. This splicing affects Brazil and Peru whose exchange rate is extended back to January of 1990 using historical series.

- For the euro area countries, the US$/euro exchange rate is used once a country becomes a member. Prior to the date the countries adopted the euro, the exchange rate of the legacy currency with the U.S. dollar is converted to euros using the irrevocable exchange rate.[4]

Real (CPI-based) Exchange Rates: Real exchange rate data is computed by multiplying a country's nominal exchange rate (US$/foreign currency) by the ratio of that country's headline CPI to the U.S. headline CPI. All CPI series are indexed to 2006=100. This CPI-based construction methodology is similar to that described by Loretan (2005) and more recently by Darvas (2012) among others.

Real (PPI-based) Exchange Rates: Real exchange rate data is computed by multiplying a country's nominal exchange rate (US$/foreign currency) by the ratio of that country's PPI/WPI to the U.S. PPI.[5] All PPI/WPI series are indexed to 2006=100. This PPI-based measure is constructed following the same approach as the real (CPI-based) exchange rate described before.

3.3.3 Trade Indicators

Merchandise Exports to World and Imports from World: Prior to 1997, trade data for Belgium and Luxembourg was reported jointly. To extract the Belgium portion of the combined trade series, the average ratio of Belgium's trade to the combined Belgium-Luxembourg trade is computed from 1997 to 2007. This ratio is used to estimate Belgium's portion of the combined trade for all years prior to 1997 for which data exclusively for Belgium is not available (prior to 1993). Similar to this, the average ratio of South Africa's imports and exports to total imports and exports for the Southern African Customs Union (SACU) from 1998-2007 is used to extract South Africa's trade share prior to 1998.

[4] Legacy currencies of the euro and their rate of conversion are: Austrian schilling (13.7603 since 1999), Belgian franc (40.3399 since 1999), Cypriot pound (0.585274 since 2008), German mark (1.95583 since 1999), Estonian kroon (15.6466 since 2011), Spanish peseta (166.386 since 1999), Finnish markka (5.94573 since 1999), French franc (6.55957 since 1999), Greek drachma (340.75 since 2001), Irish pound (0.787564 since 1999), Italian lira (1,936.27 since 1999), Luxembourgish franc (40.3399 since 1999), Latvian lats (0.702804 since 2014), Monegasque franc (6.55957 since 1999), Maltese lira (0.4293 since 2008), Dutch guilder (2.20371 since 1999), Portuguese escudo (200.482 since 1999), Slovenian tolar (239.64 since 2007), Slovak koruna (30.126 since 2009), Sammarinese lira (1,936.27 since 1999), and Vatican lira (1,936.27 since 1999).

[5] As noted in Loretan (2005): "(t)he set of internationally traded goods may not be well approximated by the baskets of goods purchased by consumers in various countries. In general, producer price indexes tend to be better measures of inflation for gauging changes in real international competitiveness. Unfortunately, producer price indexes are not as widely available as consumer price indexes." It is also the case that the coverage of PPI is less complete across time and across countries than the CPI. We argue, nonetheless, that our combination of WPI and PPI measures in DGEI allows the construction of a real exchange rate that is closer to capturing the real international competitiveness of the dollar than the standard CPI-based measures are.

3.3.4 Financial Indicators

Short-term Official/Policy Rates: There are four broad categories of policy or short-term interest rates that we consider for the database including target rates, discount rates, lending/deposit rates, and money market rates. DGEI gives preference to official policy rates in each country, but applies suitable alternatives whenever no official rate exists or the series is incomplete.

- The policy rates may have to be extended backwards, but the levels do not always exactly match with those of the historical series whenever different short-term rates are to be spliced together. We use growth rates of the historical series in that case to extend the policy rates backwards and avoid introducing a level effect in the spliced series.
- Countries that report target rates in DGEI: U.S. (which reports an average range), Switzerland (an upper range), Canada (spliced with money market rate in December of 1992), Japan, Brazil, Mexico (spliced with money market rate in January of 2008), Peru (spliced with the discount rate in September of 2003), and Thailand (spliced with discount rate in May of 2000).
  - For the euro area countries, the ECB policy rate is used once a country becomes a member adopting the euro. Prior to the date of the adoption of the euro, the policy rate represents the official rate set by the each country's central bank. The short-term deposit rate is used for France prior to January of 1999. While the policy rate for euro area countries from the ECB starts in 1999, Greece did not join the euro area until 2001, so its historical rate is used through the end of 2000.
  - When time series have missing observations, linear interpolation is used to fill in monthly values. This occurs in DGEI for Spain (April of 1984), Sweden (August of 1992), and Belgium (January to May of 1991).
- Countries that report central bank discount rates in DGEI: U.K., Sweden, Turkey (1-week repo rate spliced with overnight borrowing rate in May of 2010), Australia, South Africa, Argentina (spliced with money market rate in June of 2004), Chile, Colombia,[6] Costa Rica, Taiwan, India (repo rate spliced with discount rate in March of 2000), Indonesia, South Korea (spliced with overnight interbank rate in May of 1999), Malaysia (spliced with overnight interbank rate in April of 2004), Philippines, Nigeria, Bulgaria, Russia, Czech Republic, Hungary, and Poland.
- Countries that report lending rates in DGEI: China (1-yr lending rate), and Venezuela (spliced with discount rate in August of 1996).

Long-term Interest Rates: Our preferred series for long-term interest rates is the 10-year government bond yield. A few countries use data from different maturities: South Africa (3-5 years), Russia (365 days or more), and China (5 years). If the current series does not extend back to the first quarter of 1980 and historical data are available, the two series are spliced together. This affects the series for Turkey, Chile, Peru, Taiwan, the Philippines, Thailand, Bulgaria, and Poland. 5-year bond yields are used to extend the series backwards for Turkey and Bulgaria. Countries with data starting after Jan. 2006 are Brazil (November of 2006), Venezuela (June of 2006), Nigeria (July of 2007), Peru (March of 2006), and Turkey (December of 2006). Argentina, Costa Rica, and Indonesia are not included due to lack of data.

[6] Colombia series is extended back to April of 1995 using monthly data obtained from the central bank's website: http://www.banrep.gov.co/series-estadisticas/see_tas_intervencion.htm.

3.4 Aggregation Methods

The program that manages the DGEI performs all operations necessary to construct the aggregates and operates primarily through E-views 8. Broadly consistent with the practice of constructing National Accounts followed by most statistical offices and the OECD (2011)'s Economic Outlook methodology, all reported aggregate series are computed on the basis of time-varying, annual weights (this is the so-called chain-linked method). Moving weights are thought to better capture the structural changes that occur in the data over long periods of time (see Figure 6 and Figure 7 for evidence of such structural change).

The weighting schemes used would depend on the variable to be aggregated. Consistent with the standard guidelines adopted by the OECD (2011)'s Economic Outlook methodology, we consider two methods.[7]

- *Weighting scheme 1*: weights are applied to the variable in levels – to be preferred with diffusion indexes (PMIs) or rates of interest (the official/policy interest rates),

$$\sum_{i=1}^{N} Y_t^i w_t^i, \qquad time\ t,$$

  where w_t^i is the weight of country *i* in period *t* among the *N* countries to be combined, and Y_t^i is the variable to be aggregated.

- *Weighting scheme 2*:[8] weights are applied to the variable in growth rates – to be preferred with indexes (industrial production, core and headline price indexes) or variables expressed in absolute values (real GDP, exports and imports, nominal and real exchange rates),

$$\sum_{i=1}^{N} \left({Y_t^i}/{Y_{t-1}^i} - 1 \right) w_t^i, \qquad time\ t,$$

  where w_t^i is the weight of country *i* in period *t* among the *N* countries to be combined, and Y_t^i is the variable to be aggregated. After the weighted average growth rates have been calculated, the resulting series is transformed into an index with a base year of 2005=100.

[7] The use of these two aggregation schemes is consistent with the methodology of the OECD's Economic Outlook (http://www.oecd.org/eco/outlook/aggregationmethods.htm) and similar to the methodology followed by the IMF in its World Economic Outlook (http://www.imf.org/external/pubs/ft/weo/data/assump.htm, https://www.imf.org/external/pubs/ft/weo/2013/02/pdf/statapp.pdf).

[8] Aggregating variables in levels (weighting scheme 1), the level of the aggregate may change from one year to the next due to changes in the weights even if the country series remained invariant. Aggregating variables in growth rates (weighting scheme 2) does not have this less desirable property, as the aggregate remains invariant when the country series do not change given that the aggregated growth rate would stay at zero even if the weights themselves are changing over time.

The level of the aggregate series can be obtained as follows:

- National Income and Product Account series in levels (real GDP in our case) are PPP-adjusted for comparability and then aggregated for the corresponding base year to scale the index derived from the growth rates.
  - Select a base year (in our case, 2005). The 2005 quarterly observations for the nominal GDP series in local currency of each country are converted into PPP terms using the implied 2005 PPP conversion rates—obtained from the IMF World Economic Outlook (WEO) Database.
  - Aggregate PPP-adjusted real GDP for the base year for all countries in the group. The index series obtained from the aggregated growth rates is then rescaled with that measure.
- The rescaling factor for other variables computed as an index using weighted growth rates is obtained by adding up the levels of the variable across all countries in the corresponding grouping for the base year.

Consistency and representativeness of the aggregates is also a matter of concern in the construction of DGEI. We impose the rule that group aggregates are calculated (and reported) only if countries for which data is available represent 80 percent or more of the group weight. This rule is also used to determine when the most recent observations can be included in the time series.[9]

The underlying country data are released with varying lags and are subject to data revisions. One of our objectives is to make available the DGEI indicators each month/quarter in a timely fashion whenever data is available for countries representing 80 percent or more of those included in each grouping. Consequently, our aggregate series are calculated without observations for some countries which are reweighted out.

- In subsequent updates when these missing country observations become available, correcting the initial series becomes a source of revisions in DGEI.
- The country series themselves are systematically revised by the original reporting sources which becomes another source of revisions in DGEI.
- The weighting data is revised as well by the original reporting sources, affecting the DGEI indicators as well.

However, we notice that among all these sources of revisions, the ones from weight data tend to be less frequent and produce small changes on the aggregates than the other two.

[9] This is a slightly less strict rule than the one used by the IMF in its World Economic Outlook (WEO) where "country group composites represent calculations based on 90 percent or more of the weighted group data." For more details, see: http://www.imf.org/external/pubs/ft/weo/data/assump.htm

3.5 Exact Growth Rate Formulas

A convention that is sometimes useful is to compute log-differences, as those are approximations to the growth rates of the series which have the property of being additive—the log-difference between two periods must be equal to the sum of the log-differences between any number of sub-periods on which the time elapsed can be split.[10] However, unless otherwise noted, we always use the exact formula of the growth rates to compute average growth for aggregation purposes (as described in weighting scheme 2) and to report the growth rates of the aggregated series.

The exact growth rate formulas that we use are:

- The rate of growth of a variable Y_t^i for country *i* in period *t* over the preceding period *t-1* expressed in percentage terms is computed as follows,

$$100\left(Y_t^i/Y_{t-1}^i - 1\right),$$

  while the growth rate is reported in annualized terms using the following formula,

$$100\left(\left(Y_t^i/Y_{t-1}^i\right)^s - 1\right),$$

  where *s* defines the periodicity (s=4 for quarterly data, s=12 for monthly).

- The year-on-year growth of a variable Y_t^i for country *i* in period *t* over the preceding period *t-s* of the previous year expressed in percentage terms is computed as follows,

$$100\left(Y_t^i/Y_{t-s}^i - 1\right),$$

  where here again *s* defines the periodicity (s=4 for quarterly data, s=12 for monthly).

[10] The IMF uses, for instance, a combination of log-differences and exact growth rates in some cases (especially for emerging countries) as can be seen here: http://www.imf.org/external/pubs/ft/weo/faq.htm. While the OECD uses exact growth rates only: http://www.oecd.org/eco/outlook/growthratesineodb.htm.

3.6 Aggregation Weights

The choice of weights used for aggregation purposes depends on the particular nature of the variables to be aggregated and on the economic interpretation assigned to the aggregated series. The OECD, IMF, and other international organizations all apply different weights to their aggregates and use different approaches depending on whether the variables are reported as ratios, as diffusion indexes, in levels, etc. We give preference to trade weights with the U.S. in weighting the variables in DGEI, but allow for a number of automated alternative aggregation schemes in order to provide additional flexibility to the system of data management underlying the database.

We favor trade weights with the U.S. because of a number of economic reasons. First, because of the domestic spill-overs from global economic factors that come through trade (e.g., global slack hypothesis as in Martínez-García and Wynne (2010)). Second, because it is sensitive to differences in business cycle synchronization (see, e.g., Martínez-García and Søndergaard (2009)). When foreign countries experience high growth, the demand for imported goods from the home country increases, favoring positive business cycle correlations by stimulating domestic growth; in turn, if growth prospects are better abroad than at home, there is an incentive to invest overseas where capital is more efficient and reduce production at home which leads to negative business cycle correlations—which of these two effects dominates depends, among other things, on the degree of financial and trade openness.

An alternative approach to country weighting is based on the foreign exchange value of the dollar implemented by the Board of Governors (BoG). Loretan (2005) describes the construction of trade weights corrected by trade in undifferentiated goods and adjusted by competitiveness. The theoretical basis for the weights of the BoG's index is derived from a stylized model of international trade which suggests that only trade in differentiated products is affected by exchange rate fluctuations (see, e.g., McGuirk (1986)). This model implies that all international trade in undifferentiated goods (such as trade of primary commodities) should be excluded. While the BoG's index follows that recommendation to compute its foreign value of the dollar index, DGEI aggregates many other indicators for which there is no clear model prediction. We adopt a standard trade weight that does not correct for trade in primary commodities or undifferentiated goods, but we apply it consistently to all indicators included in the database.

The weights of the BoG's index are also corrected to give a large competitive weight-adjustment to a country if it is a large contributor of exports to other countries that also receive a large portion of U.S. exports. The BoG refers to this adjustment as the U.S. third-market competitiveness weight of economy *j*. "(I)t can be interpreted as a weighted average of *j*'s bilateral shares of the third-market economies' imports, where the weights are given by those economies' U.S. bilateral export shares," as indicated in Loretan (2005). We do not attempt a similar competitive weight correction at this stage. Instead, based on the implications of standard New Open Economy Macro models (see, e.g., Martínez-García and Søndergaard (2009)), we consider import shares as an alternative to trade weights or trade weights corrected by competitiveness.

i. Annual weights for trade-weighted aggregation

$$w_{t,k} = \frac{imports_{t,k} + exports_{t,k}}{\sum_{k=1}^{N}(imports_{t,k} + exports_{t,k})}, \qquad country\ k$$

Weights are calculated in nominal terms quoted in U.S. dollars. There are two variants: world trade shares and shares of trade with the U.S. Trade shares with the U.S. is our current default.

Trade weights put more emphasis on the role of trade competition, assigning a larger share to countries that are more engaged in trade with the U.S.

a. World and U.S. annual trade weights are from the IMF's Direction of Trade (DOT) database and represent annual exports and imports with the world/U.S. originally in millions of U.S. dollars. Weights are fixed throughout each year, but vary across years.
b. Adjustments to the data:
   - IMF's DOT does not report on Taiwan whose data come from the Ministry of Finance of the Republic of China.
   - Prior to 1997, Belgian values also include Luxembourg trade data. To extract the Belgium portion of the combined trade, the average ratio of Belgium's trade to the combined Belgium-Luxembourg trade is computed from 1997 to 2007. This ratio is used to estimate Belgium's portion of the combined trade for all years prior to 1997.
c. Missing observations:
   - World and U.S. trade shares: Bulgaria and Nigeria start in 1981, Russia starts in 1992, Czech Republic starts in 1993.

ii. Annual weights for the GDP-weighted aggregation

$$w_{t,k} = \frac{GDP_{t,k}}{\sum_{k=1}^{N} GDP_{t,k}}, \qquad country\ k$$

Weights are calculated in nominal terms quoted in U.S. dollars and in PPP-adjusted terms. As a result, there are two variants in DGEI based on PPP-adjusted GDP shares and nominal shares in U.S. dollars.

GDP weights put more emphasis on the economic size of a country, assigning a larger share to countries whose economy accounts for a larger fraction of world output.

a. Data for the PPP-adjusted GDP weights comes from the IMF's World Economic Outlook (WEO). Data for the nominal weights comes from the IMF's World Economic Outlook (WEO) as well, quoted in billions of U.S. dollars at market exchange rates (whenever available).
b. Missing observations on PPP-adjusted and nominal GDP shares: Russia starts in 1992, Czech Republic starts in 1995.

Adjustment for missing weight data: For years for which we do not have weight data, we compute the weights of the reporting countries with the available data and re-scale them to adjust for the weight of the missing countries. To do so, we multiply the series with the factor $\left(1 - \sum_{k=1}^{p} \overline{w}_{t,k}\right)$, where p are the countries without weight data prior to time t and $\overline{w}_{t,k}$ refers to the weight that any given of those countries $k=1,\ldots,p$ has whenever it enters for the first time into the sample in period t.

3.7 Unbalanced Datasets

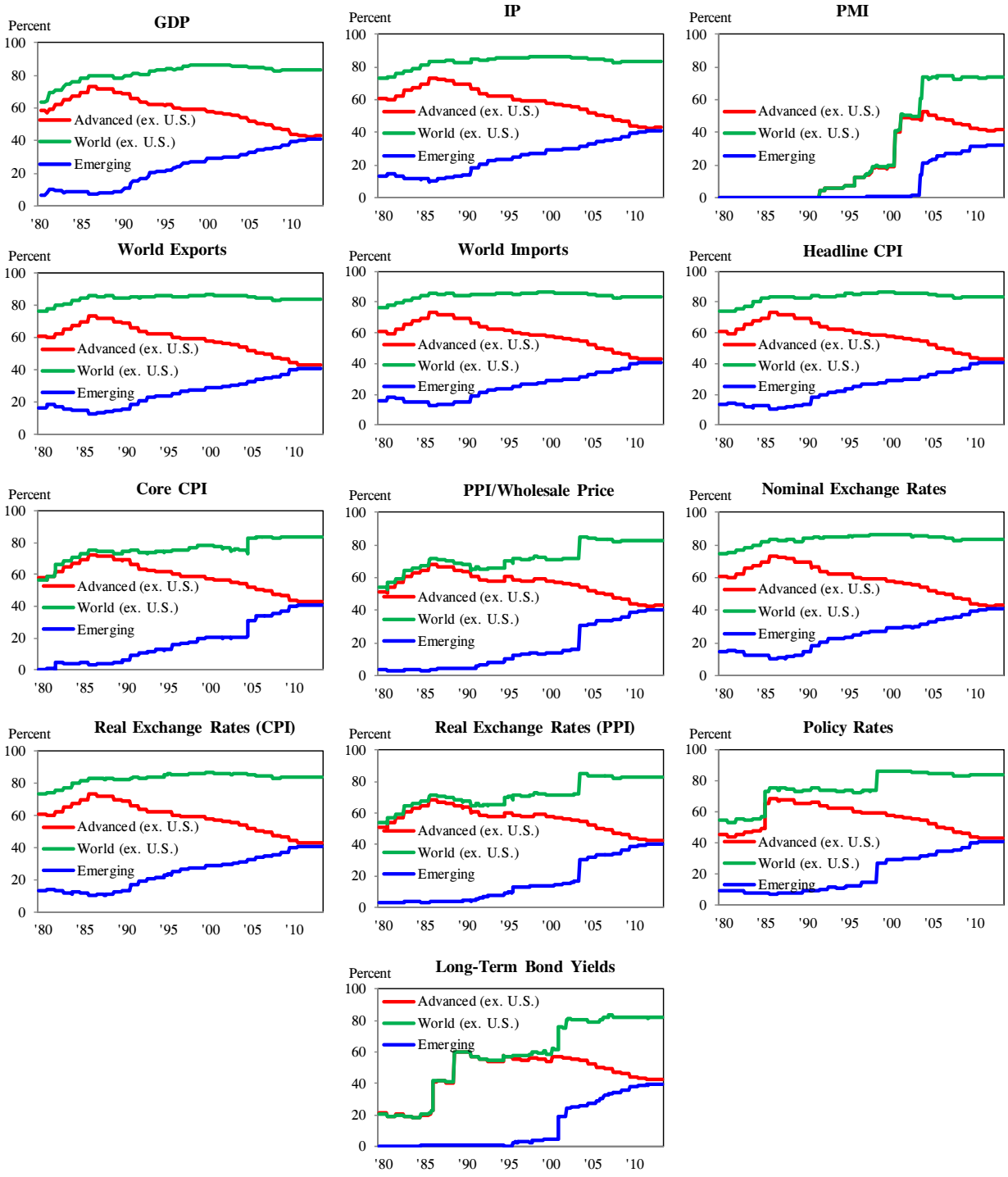
In spite of our attempts to standardize the time series for the DGEI and extend them back in time whenever possible, data availability remains an issue—especially in the 1980s and early 1990s—as illustrated in Figure 9 and Figure 10. The relative importance of the missing observations also varies depending on the variables of interest—with PMIs and official/policy rates being the ones with the largest data gaps, and long-term interest rates requiring the splicing of bond yields of somewhat varying long maturities to extend the short reported time series. In spite of that, the G40 country composition in DGEI still suffices to capture and incorporate in our aggregates the broad structural trends observed in the data since 1980. First, it accounts for the fact that the share of U.S. trade from emerging countries has increased substantially to a point where it has become "quite close" to the share from advanced countries (referring to advanced countries other than the U.S.). Secondly, it also incorporates the fact that the emerging economies' share of world GDP in PPP-adjusted terms has surpassed that of the advanced countries (excluding the U.S.).

The program that manages DGEI performs all operations necessary to splice the series to account for changes in the country composition over time based primarily on E-views 8 code. The system adjusts for shifts that occur due to changes in the country sample, as data for the G40 countries becomes available at different points in time. To correct for jumps that occur due to countries entering the sample, we follow this simple procedure: say country k enters into the sample at time t, then the aggregate series calculated without country k is spliced together with the aggregate series calculated with the country included at time t when the country enters into the sample for the first time.

The implementation of that correction in DGEI can be described in the following steps:

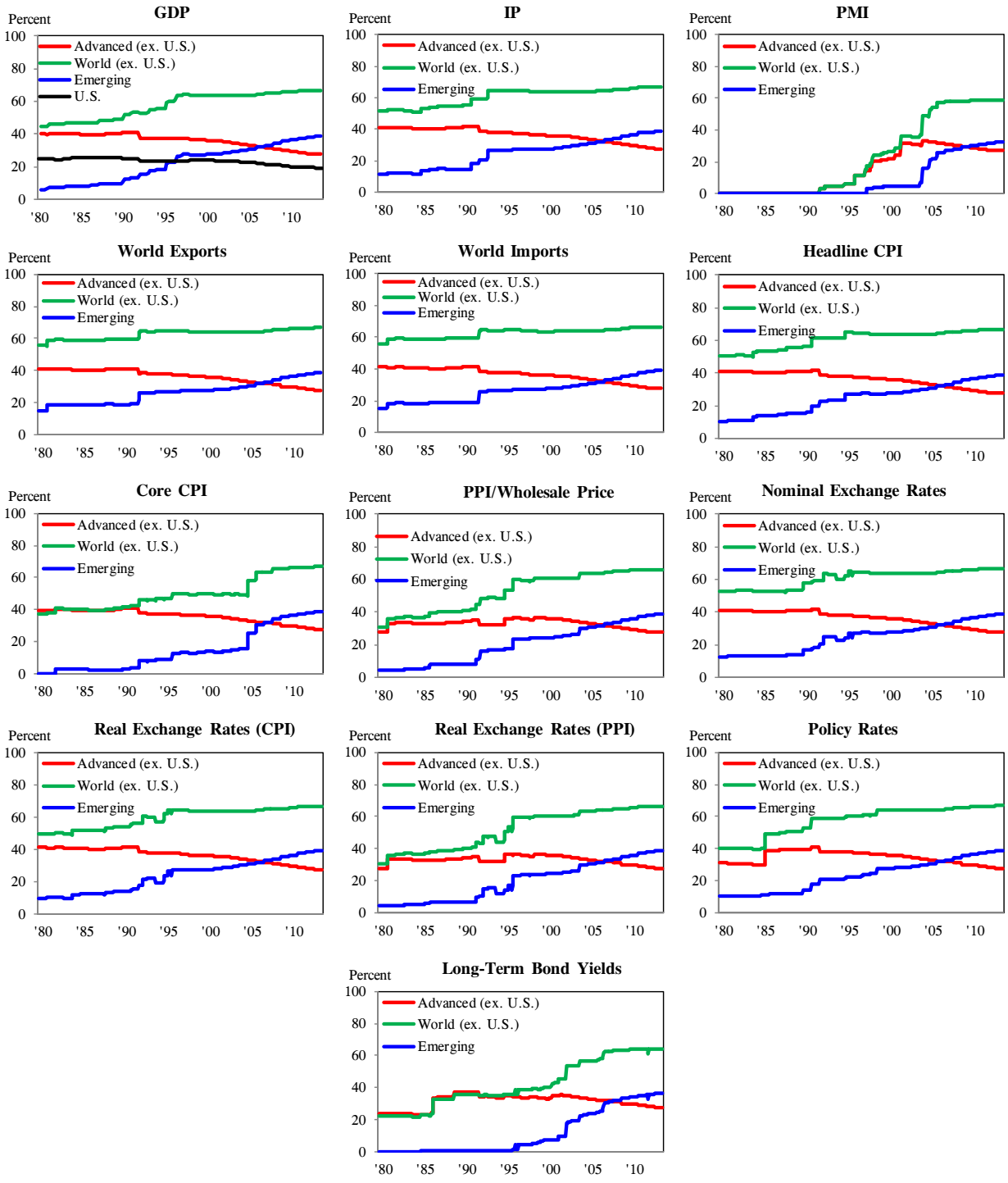
- Data becomes available for country k at time t.
- An aggregate is then calculated where country k is included from t onwards. Another aggregate is calculated where country k is excluded.
- The two aggregate series are spliced together using the growth rates of the aggregate excluding k to extend the aggregate including k backwards—in order to extend the aggregate with the largest country sample prior to time t.

Figure 9. U.S. Trade Shares Accounted for by G40 Countries (1980-2012)



Source: Trade data comes from the IMF Direction of Trade (DOT) database.

Figure 10. Shares of World GDP (PPP) Accounted for by G40 Countries (1980-2012)



Source: PPP-adjusted GDP shares are from the IMF World Economic Outlook (WEO) database.

3.8 Forecasts

The forecasts available for each country may be reported at different frequencies and with different growth definitions. In that case, the forecasts themselves need to be transformed in order to put them on a common footing before they can be aggregated for the countries in the DGEI sample. The Excel-VBA environment developed for DGEI handles the frequency and growth definition transformations of forecast data for each country to produce consistent aggregates whenever needed.

For most countries, we can obtain or produce quarterly forecasts of year-on-year real GDP growth and CPI inflation. For some countries, only annual forecasts may be available and, therefore, those forecasts require some form of temporal disaggregation. Generally, the annual forecasts on real GDP growth that we have to contend with are for annual growth; the annual forecasts for CPI inflation are often based on annual average levels, but there are cases where the forecasts are December-to-December changes (which we treat as end-of-quarter changes) as well.

The forecasts may also be based on data that is not seasonally adjusted. The procedure implemented in DGEI not only serves for temporal disaggregation, but also to smooth out the resulting series in order to remove seasonality effects as best as possible. A number of procedures have been used in major statistical agencies for the temporal disaggregation and smoothing of time series. DGEI implements a simple approach that performs well with the real GDP and headline CPI series that we track in the database.

The forecasts that we are most interested in cover the horizon over the next two years, but we do not have additional input sources to facilitate the temporal disaggregation of the data. Under these constraints, we adopt the first-difference smoothing method developed by Boot, Feibes, and Lisman (1967) for the DGEI over a range of three years—with the first year fully overlapping with current data. Apart from the obvious simplicity of the procedure, this technique has been used by the Bureau of Economic Analysis (BEA) and shown to work well when no other related series of higher frequency is available to interpolate observed annual data (see, e.g., Chen and Andrews (2008) on this particular point).

- Forecasts expressed in the form of annual growth rates are used to extend the current (non-seasonally-adjusted) GDP and CPI series forward. This produces a vector of three annual observations (i.e., Y_t, Y_{t+1}, Y_{t+2}), where *t* corresponds to the last full year of the current sample while *t+1* and *t+2* refer to the yearly values implied by the forecasts.
- The solution to the Boot, Feibes, and Lisman (1967) first-difference smoothing method when three years of annual data are involved (i.e., Y_t, Y_{t+1}, Y_{t+2}) produces 12 quarterly observations (i.e., $Y_{i,1}, Y_{i,2}, Y_{i,3}, Y_{i,4}$ for $i=t,t+1,t+2$) according to the following formula:

$$\begin{pmatrix} Y_{t,1} \\ Y_{t,2} \\ Y_{t,3} \\ Y_{t,4} \\ Y_{t+1,1} \\ Y_{t+1,2} \\ Y_{t+1,3} \\ Y_{t+1,4} \\ Y_{t+2,1} \\ Y_{t+2,2} \\ Y_{t+2,3} \\ Y_{t+2,4} \end{pmatrix} = \frac{1}{1836} \begin{bmatrix} 569 & -135 & 25 \\ 525 & -81 & 15 \\ 437 & 27 & -5 \\ 305 & 189 & -35 \\ 129 & 405 & -75 \\ 7 & 513 & -61 \\ -61 & 513 & 7 \\ -75 & 405 & 129 \\ -35 & 189 & 305 \\ -5 & 27 & 437 \\ 15 & -81 & 525 \\ 25 & -135 & 569 \end{bmatrix} \begin{pmatrix} Y_t \\ Y_{t+1} \\ Y_{t+2} \end{pmatrix}.$$

  Of these 12 observations, we discard the ones that overlap with currently available data. The temporal disaggregation implemented with this procedure assumes that the quarterly observations must add up to the annual value that is actually observed.
  - For CPI data in particular, we must adjust the procedure for some countries in order to recognize that the country series do not add up to the yearly value, but correspond to the average instead. Moreover, for a few others we also have to adjust the transformation in order to reflect that the yearly observations correspond to an end-of-period value. All quarterly observations are then linearly interpolated to monthly frequency by assigning the corresponding value of the series to the last month of the quarter (end-of-period).
- Aggregation is implemented for the quarters for which there is no actual data (just the forecasts) with the fixed weights corresponding to the last year of data available.

Observations on the implementation of the Boot, Feibes, and Lisman (1967) procedure: The procedure implicitly abstracts from the seasonality that may exist in the data and is, therefore, combined with seasonally-adjusted historical data. We do not attempt to adjust the series further when some new quarterly data becomes available if the forecasts remain unchanged—we merely replace the disaggregated forecast with the actual seasonally adjusted number.

4 Dating the Global Cycle

Classical business cycles were extensively analyzed by Arthur Burns and Wesley Mitchell in their classic 1946 book "Measuring Business Cycles." The key insight of their work is that many economic indicators co-move along the business cycle, so expansions and contractions are signaled and can be identified by their different impact on a cross-section of indicators. Burns and Mitchell defined a classical recession as a sustained period when a broad range of economic variables falls in the following terms,

> "Business cycles are a type of fluctuation found in the aggregate economic activity of nations that organize their work mainly in business enterprises: a cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions, and revivals which merge into the expansion phase of the next cycle; this sequence of changes is recurrent but not periodic; in duration business cycles vary from more than one year to ten or twelve years; they are not divisible into shorter cycles of similar character with amplitude approximately their own." Burns and Mitchell (1946).

We use a similar idea to describe global cycles in DGEI (see Grossman, Mack, and Martínez-García (2014)). Rather than using multiple indicators, we exploit the cross-section of one particular indicator that is available for a broad range of countries. We adopt in the DGEI an indicator of the cross-country occurrence of contractions in industrial production (IP) to date global cycles. The indicator is constructed applying the Bry and Boschan (1971) method—in the version of Harding and Pagan (2002)—to a sample of 84 countries representing more than 96 percent of world output (as of 2005).

- Recession dates for the referenced variable are estimated by the Bry-Boschan algorithm: Bry and Boschan (1971), Harding and Pagan (2002).
  - Censoring Rules:
    1. Turn-phase is 5 months on either side.
    2. The minimum length of phase is 4 months.
    3. The minimum length of a full cycle is 12 months.

- Dating of global recession is based on a weighted diffusion index
  - For each period, calculates a weighted percentage of the countries in recession
  - At least 60% of countries must be in recession
  - Applications of similar diffusion indexes found in Artis, Marcellino, and Proietti (2004), Crone (2006), Stock and Watson (2010).

$$D_t = \sum_{i=1}^{N} \omega_{it} S_{it} \quad \sum_{i=1}^{N} \omega_{it} = 1$$

  - Turning points for global recessions are defined as periods when IP contraction is widespread around the world. Effectively, we declare that a global recession has occured when the number of countries simultaneously experiencing an IP contraction represent at least 60 percent of world output as measured by PPP-adjusted GDP over at least three consecutive months.

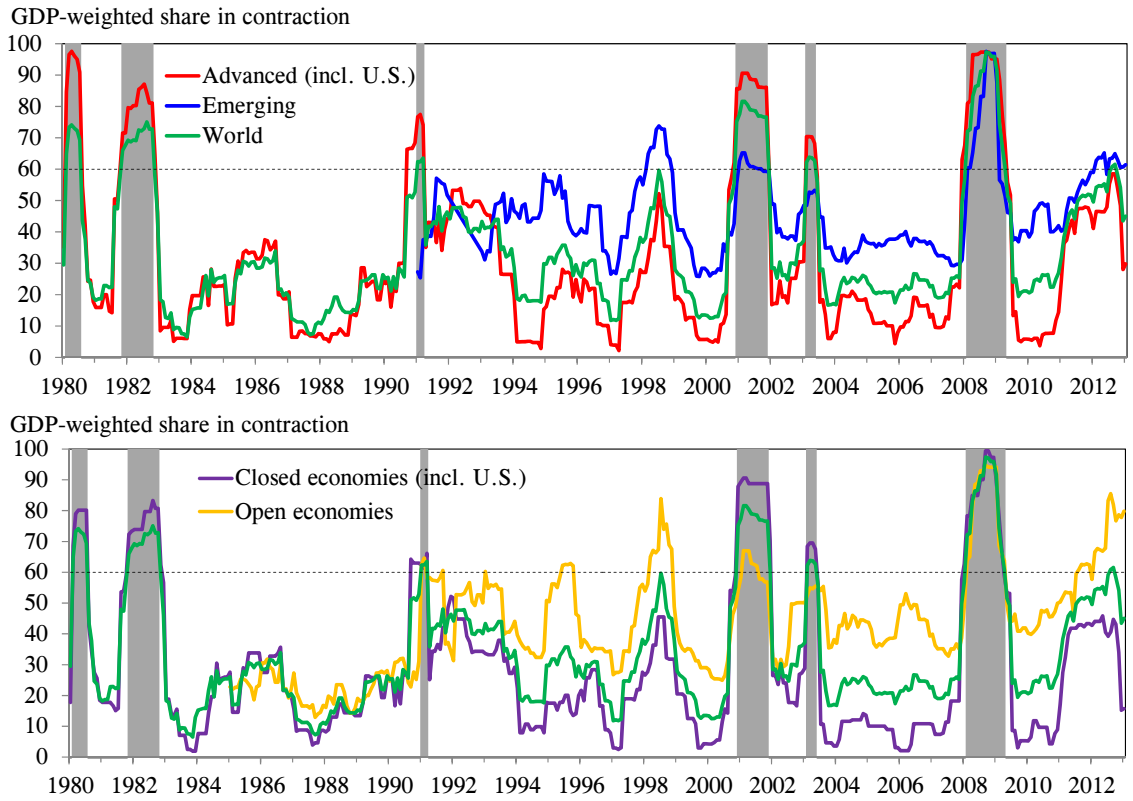
Dating turning points of the global business cycle is done from a global rather than a U.S. perspective. All countries in G40 are included for the determination of global cycles—although the country sample is further broadened in this particular case to incorporate as much information as possible. Country IP data is updated in our Excel-VBA environment, while the indicator of contractions to determine turning points is computed with Matlab code. An illustration of the indicator with our standard country groupings (advanced (ex. the U.S.) versus emerging, and open economies versus closed economies (ex. the U.S.)) can be found in Figure 11, while the implied global recession dates since 1980 are listed in Table 5 below.

Table 5. Global and U.S. Recessions (1980-2012)

	Global Recession	U.S. Recession (NBER)
1980s	February 1980(I)-July 1980(III)	January 1980(I)-July 1980(III)
	November 1981(IV)-October 1982(IV)	July 1981(III)-November 1982(IV)
1990s	January 1991(I)-March 1991(I)*	July 1990(III)-March 1991(I)
2000s	December 2000(IV)-November 2001(IV)	March 2001(I)-November 2001(IV)
	February 2003(I)-May 2003(II)*	
	February 2008(I)-April 2009(II)	December 2007(IV)-June 2009(II)

Note: The U.S. recessions are dated by the NBER. The global recessions are dated using an indicator of the incidence of IP contractions and data from the DGEI database - Haver Analytics (see Grossman, Mack, and Martínez-García (2014)). The asterisk denotes short-lived global recessions of at most four months which are ultimately not considered as recessions in Grossman, Mack, and Martínez-García (2014).

Figure 11. Date-stamping the Global Cycle (1980-2012)



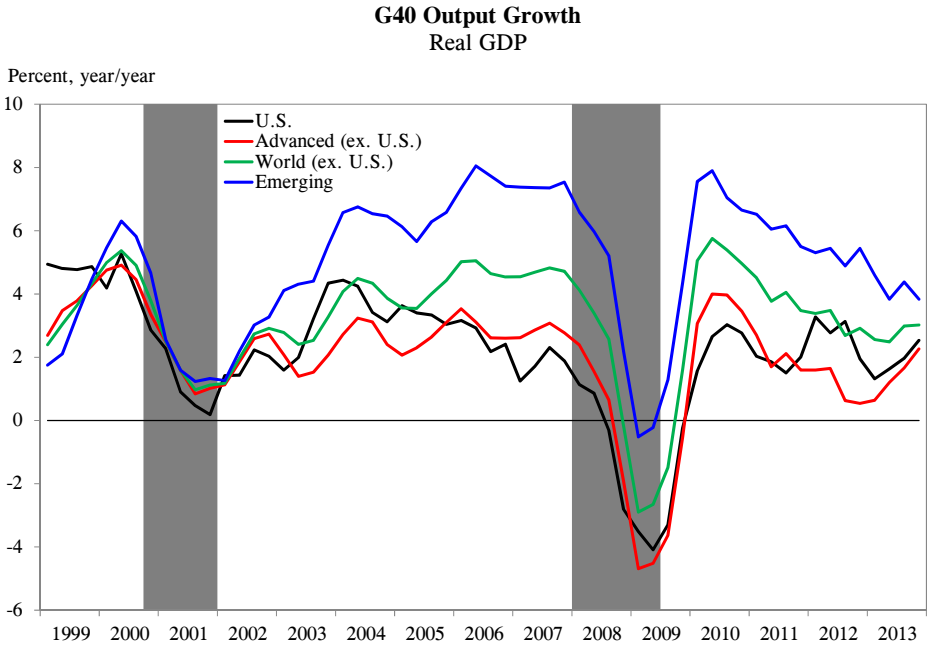
Note: The shaded areas represent global recessions. The indicator of contraction periods in industrial production (IP) is weighted with time-varying PPP-adjusted GDP shares.

5 The Database of Global Economic Indicators (DGEI): Summary

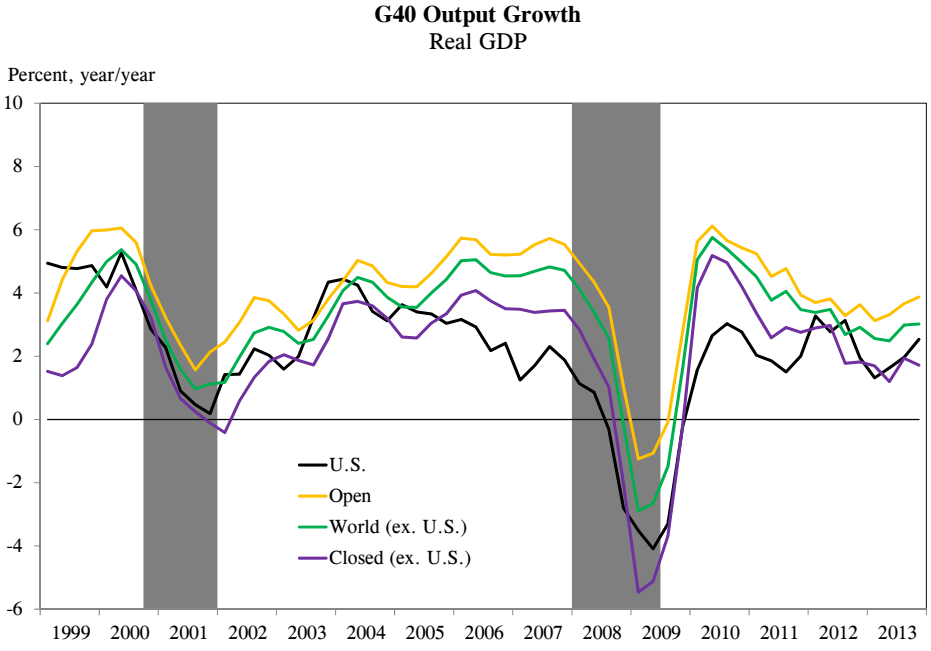
For illustration purposes, the following selection of figures—Figure 12 through Figure 25—covering the period from 1999 until 2013 show the series currently available under the DGEI system:

5.1 Real Economic Activity Indicators

Figure 12. Real GDP Growth



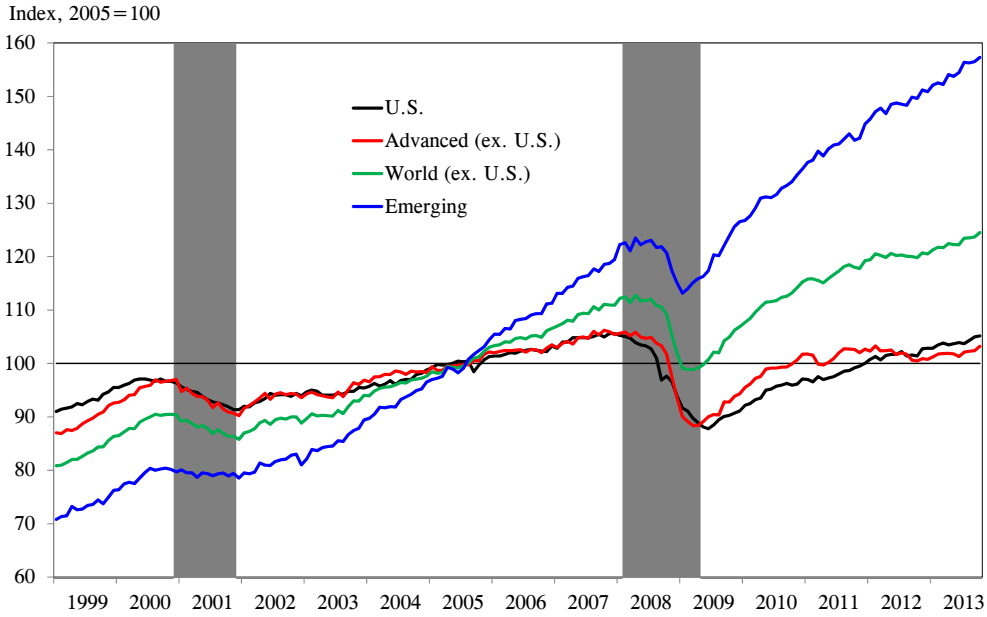
Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014).



Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014).

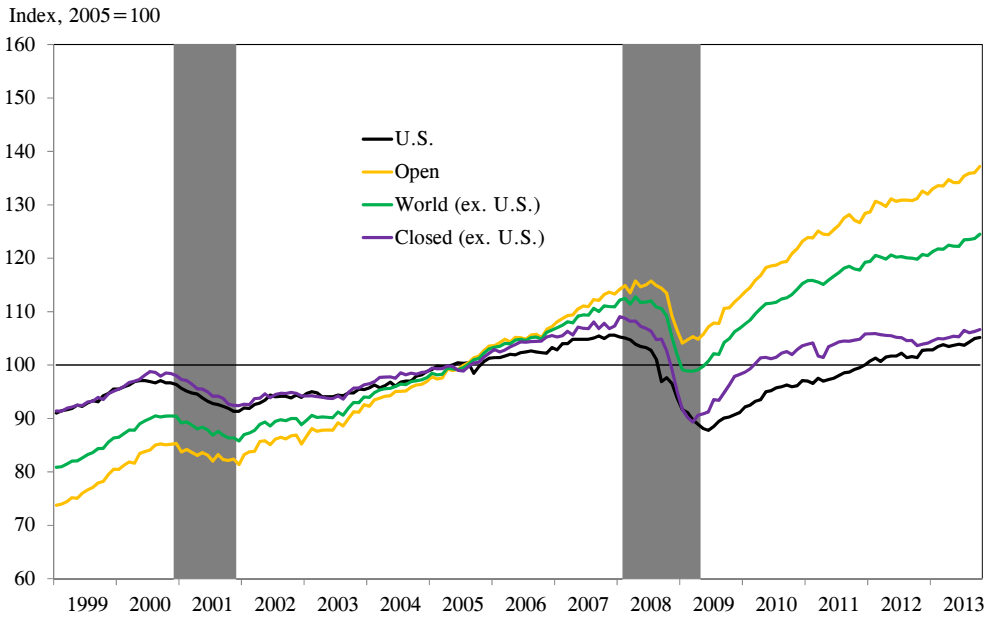
Figure 13. Industrial Production

G40 IP Index



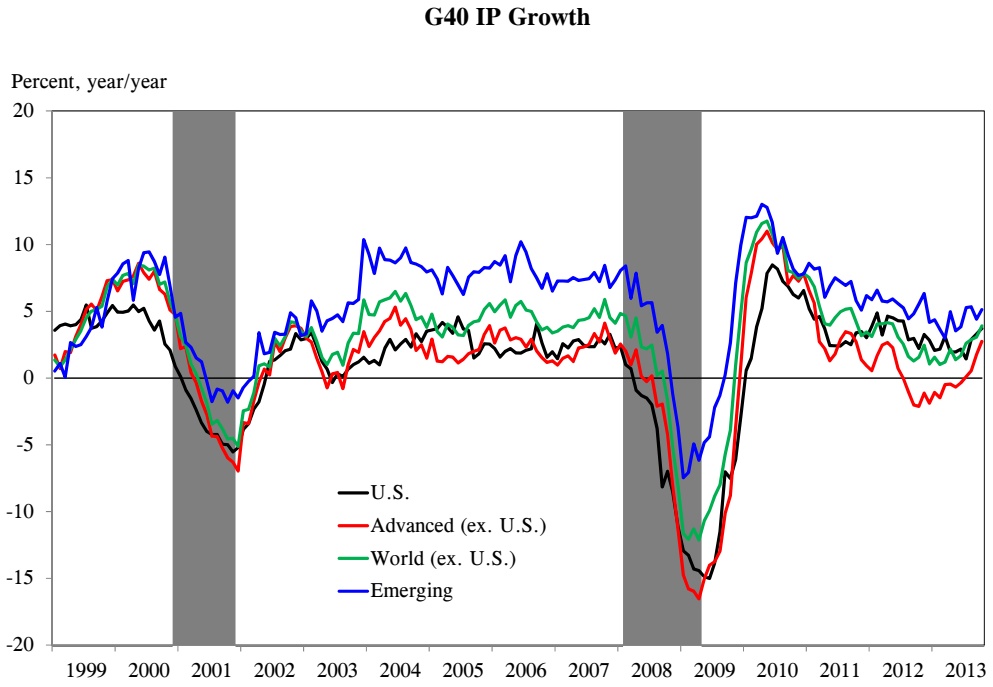
Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014).

G40 IP Index

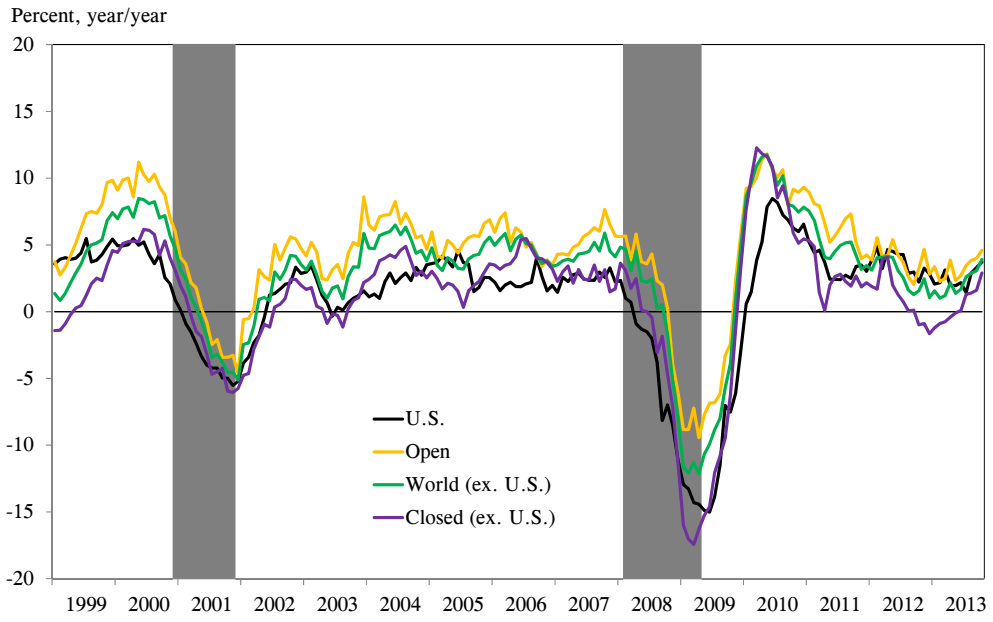


Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014).

Figure 14. Industrial Production Growth



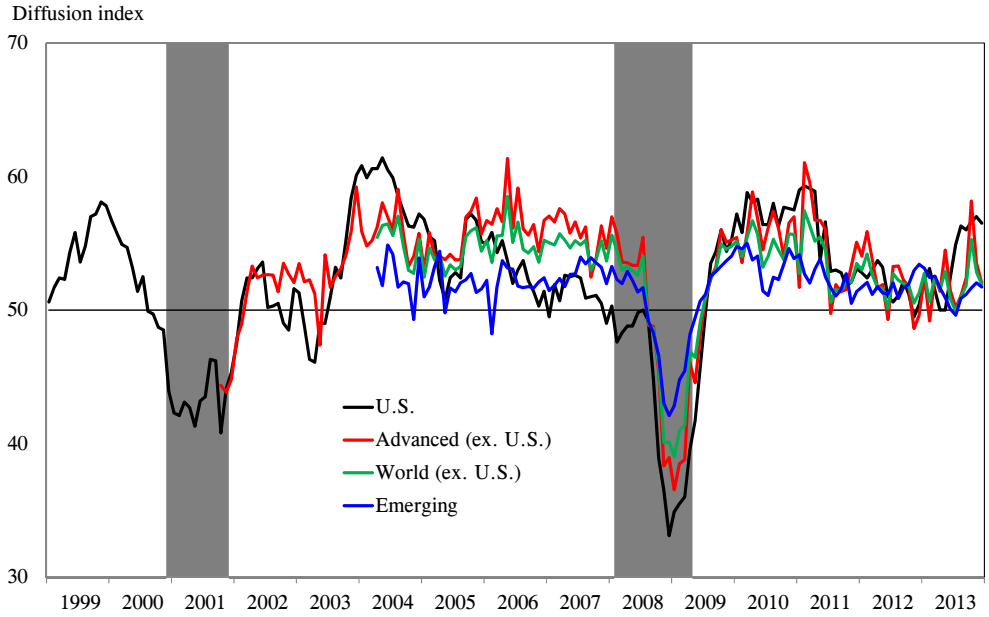
Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014).



Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014).

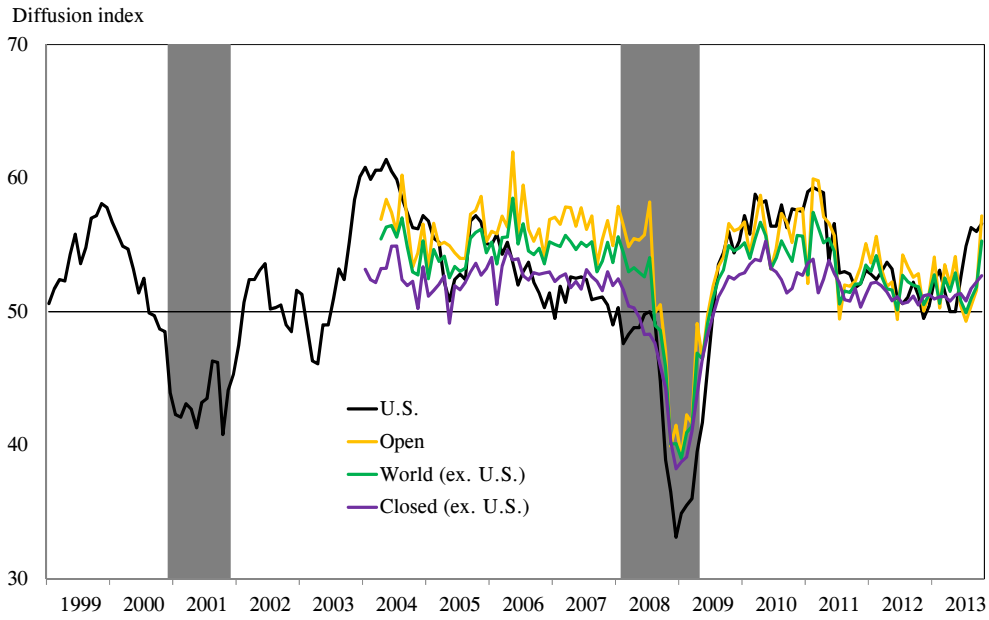
Figure 15. PMI Index

G40 PMI Index



Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014).

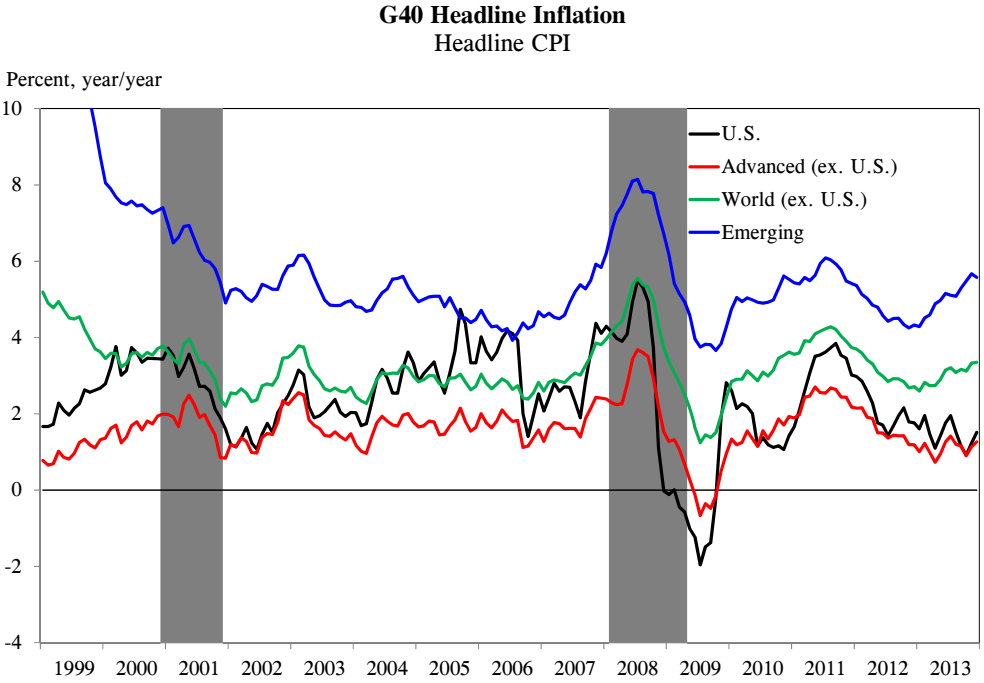
G40 PMI Index



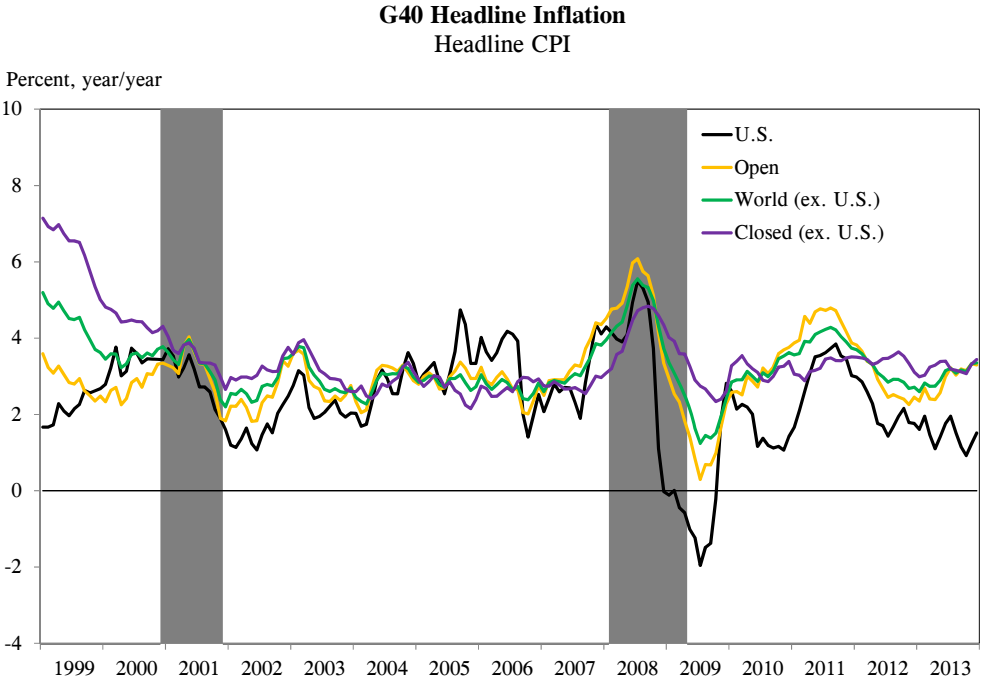
Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014).

5.2 Price Indicators

Figure 16. Headline CPI Inflation



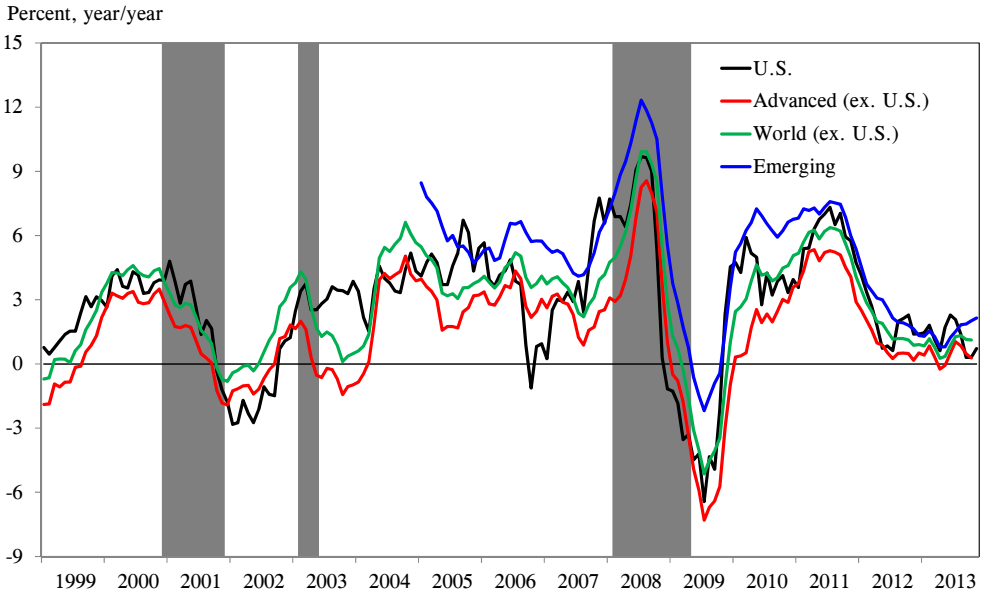
Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014).



Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014).

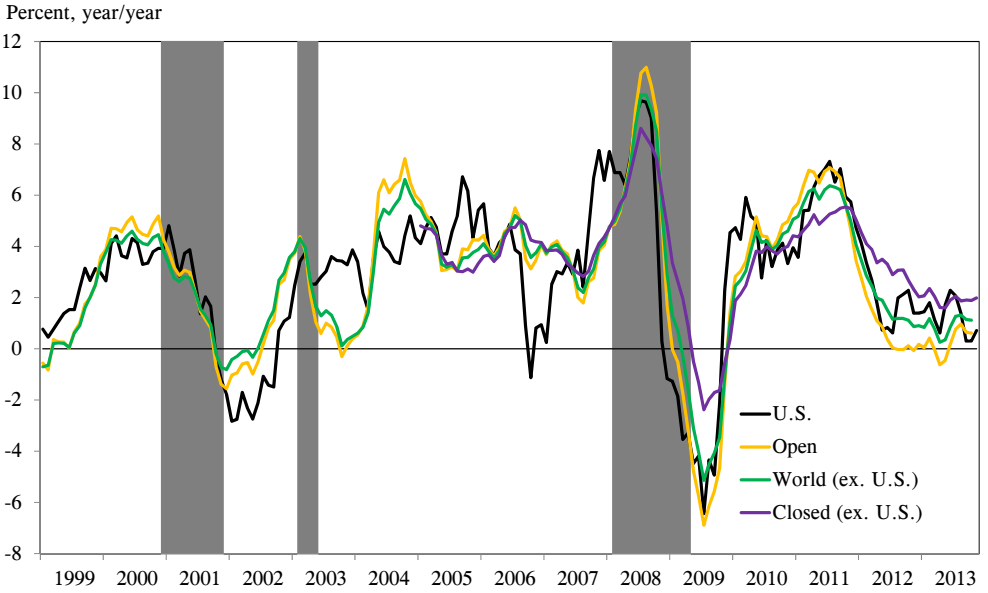
Figure 17. PPI/WPI Inflation

G40 PPI/WPI Inflation



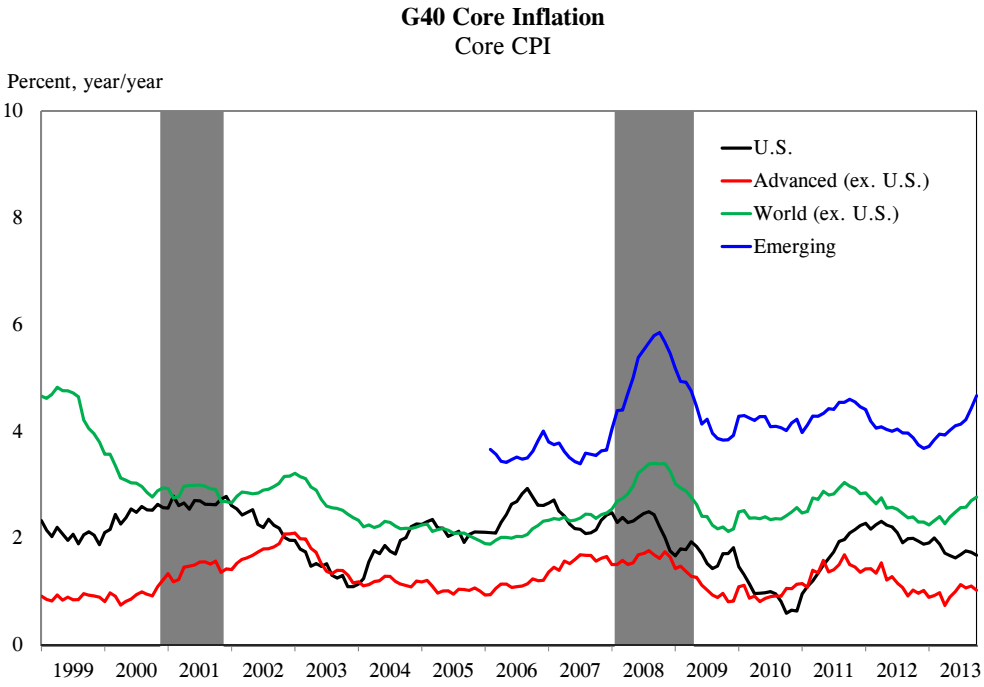
Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014). Nigeria is excluded due to lack of PPI data.

G40 PPI/WPI Inflation

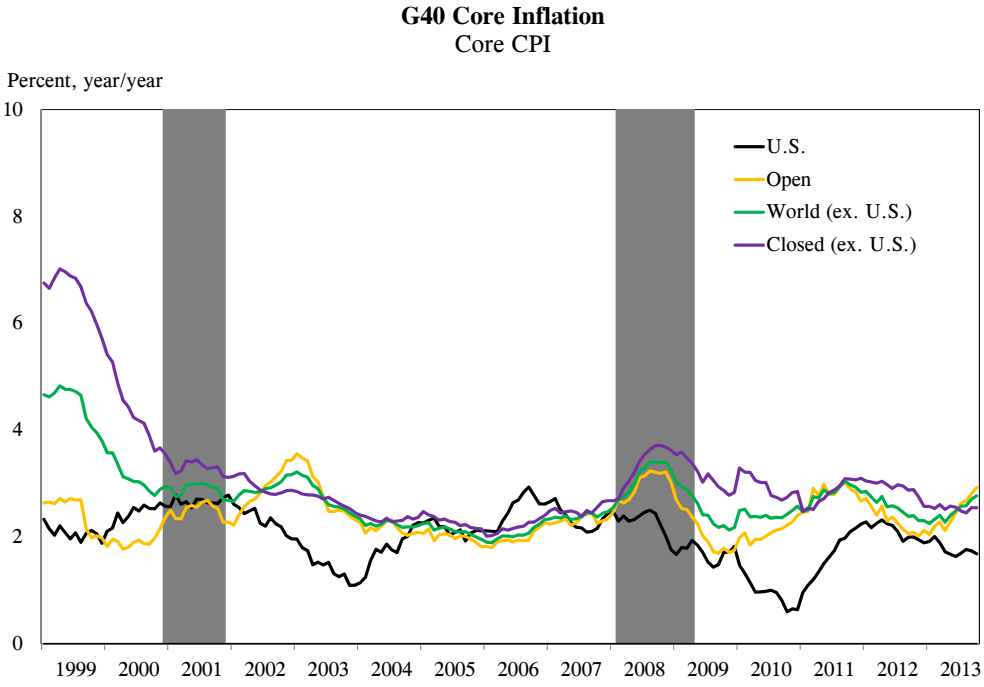


Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014). Nigeria is excluded due to lack of PPI data.

Figure 18. Core CPI Inflation (ex. Food and Energy)



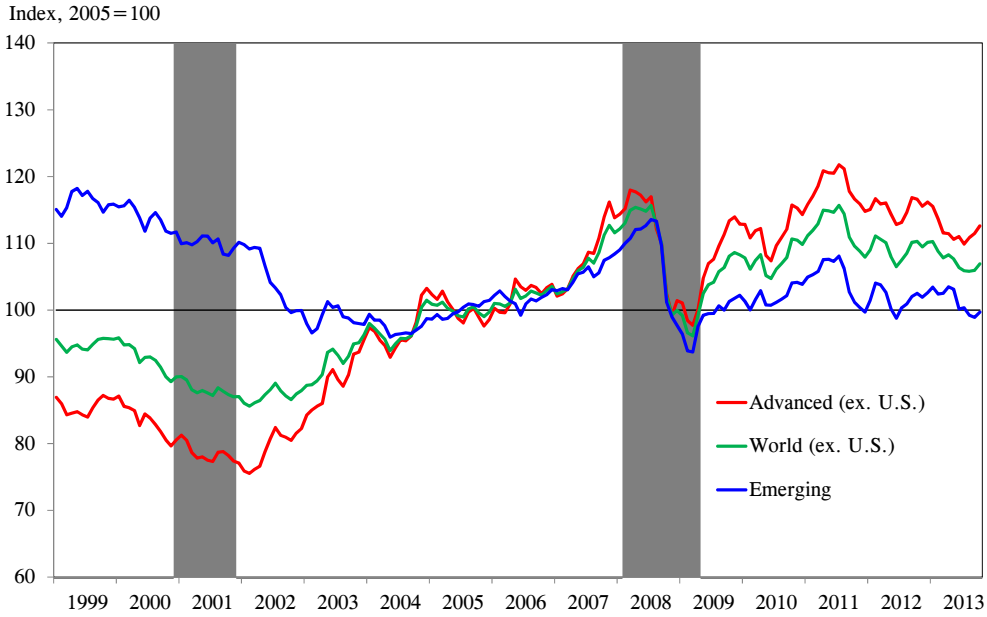
Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014).



Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014).

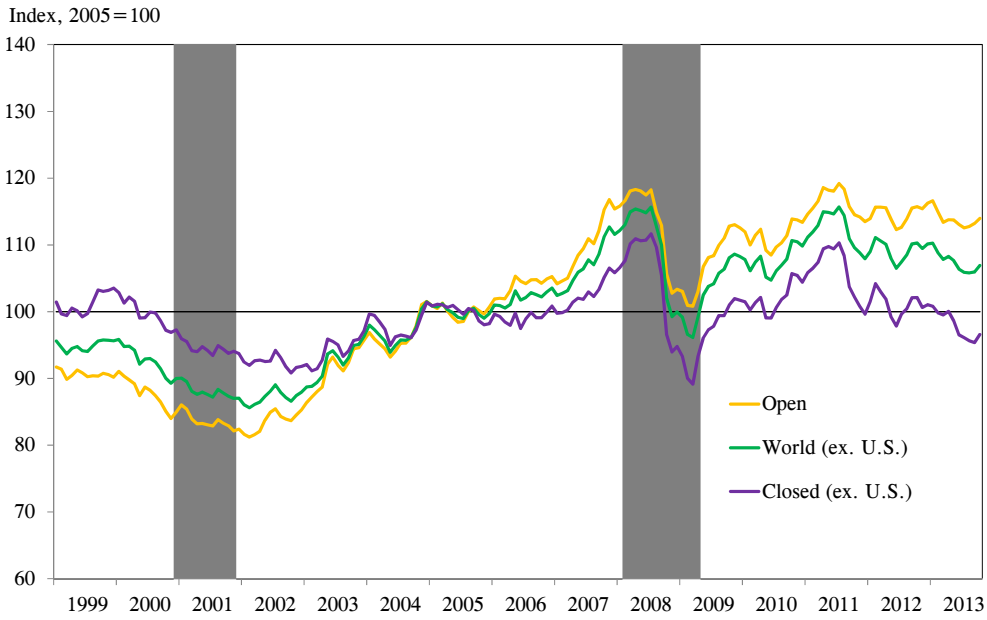
Figure 19. Nominal Exchange Rate

G40 Nominal Exchange Rates



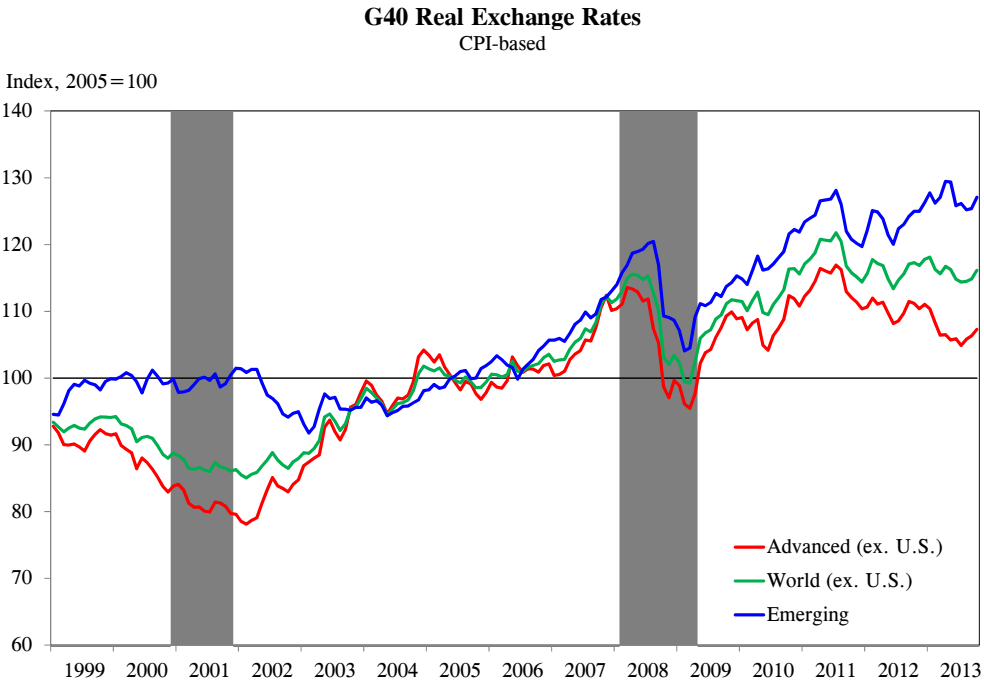
Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014).

G40 Nominal Exchange Rates

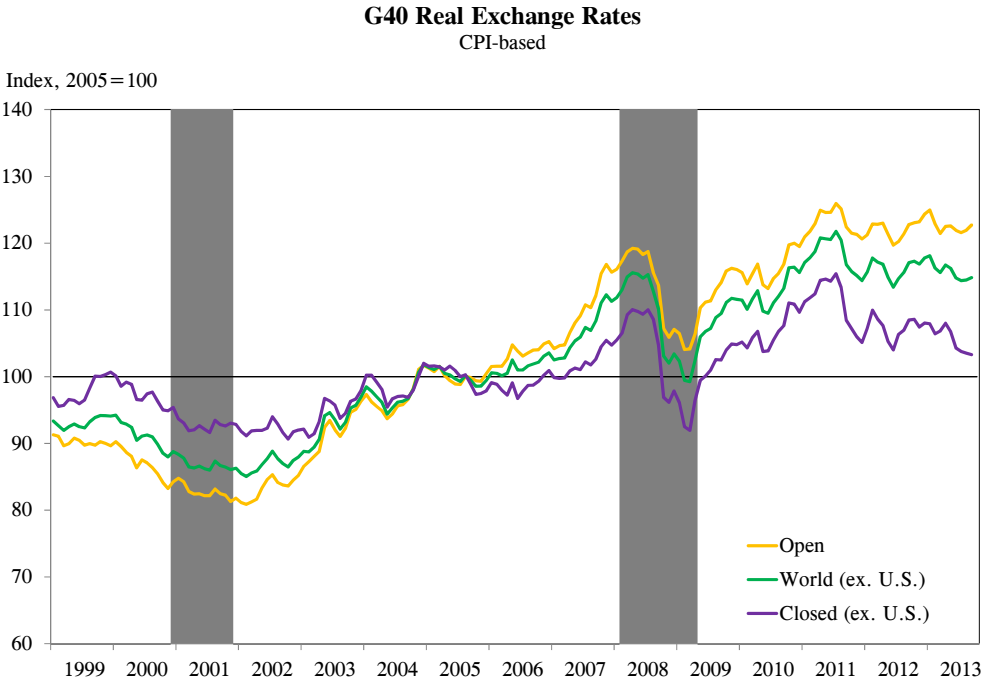


Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014).

Figure 20. CPI-based Real Exchange Rate

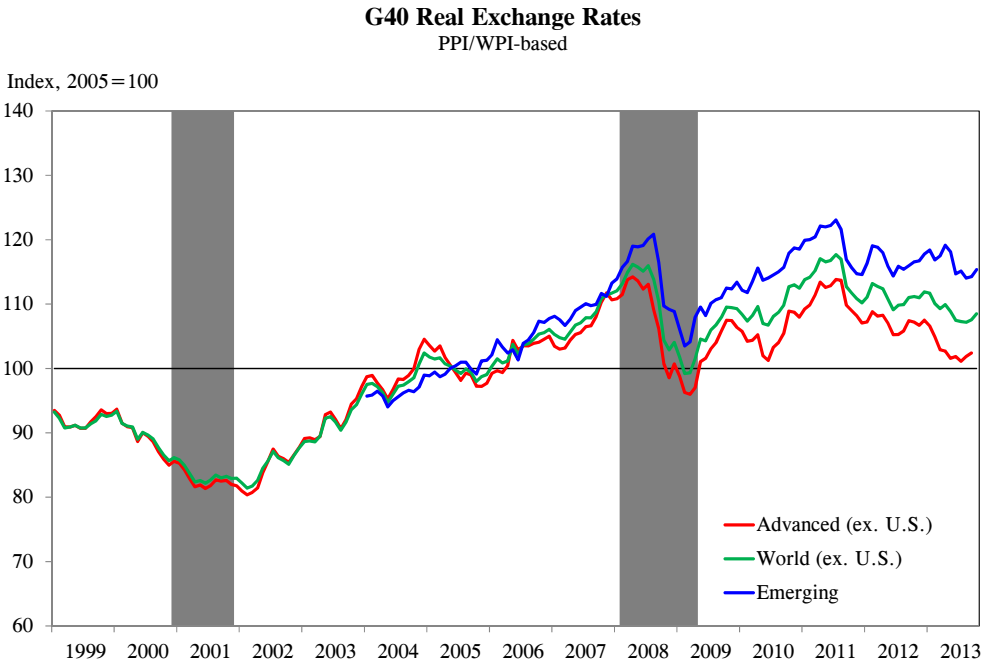


Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014).

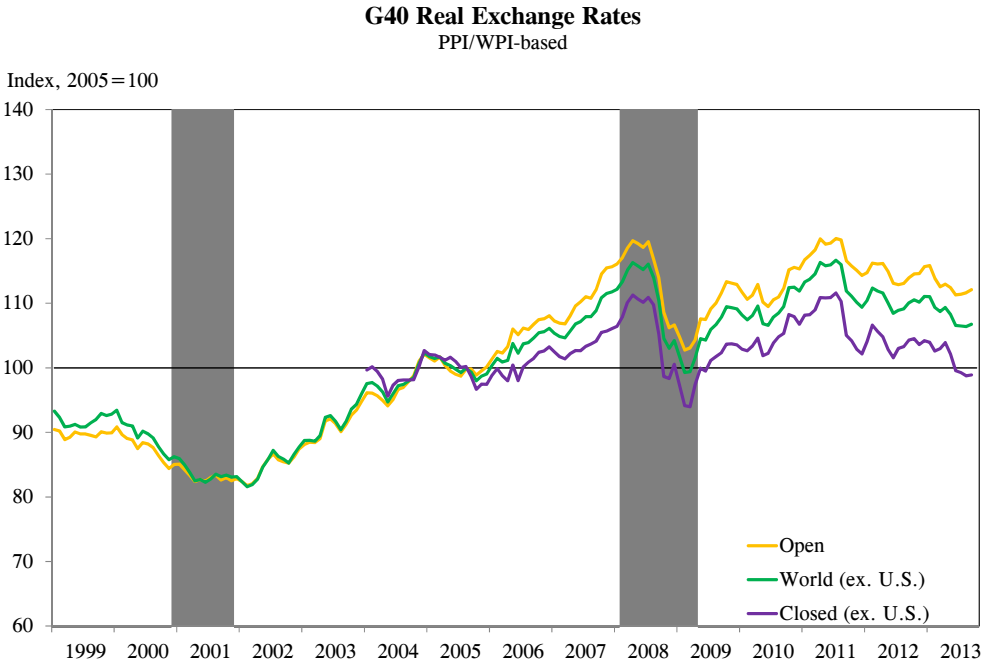


Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014).

Figure 21. PPI/WPI-based Real Exchange Rate



Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014). Nigeria is excluded due to lack of PPI data.

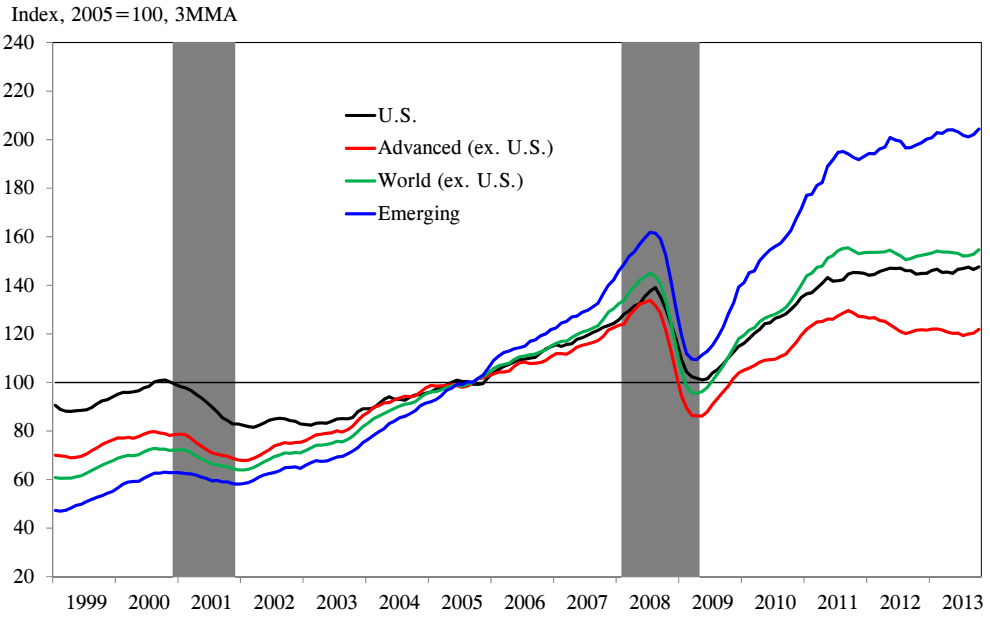


Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014). Nigeria is excluded due to lack of PPI data.

5.3 Trade Indicators

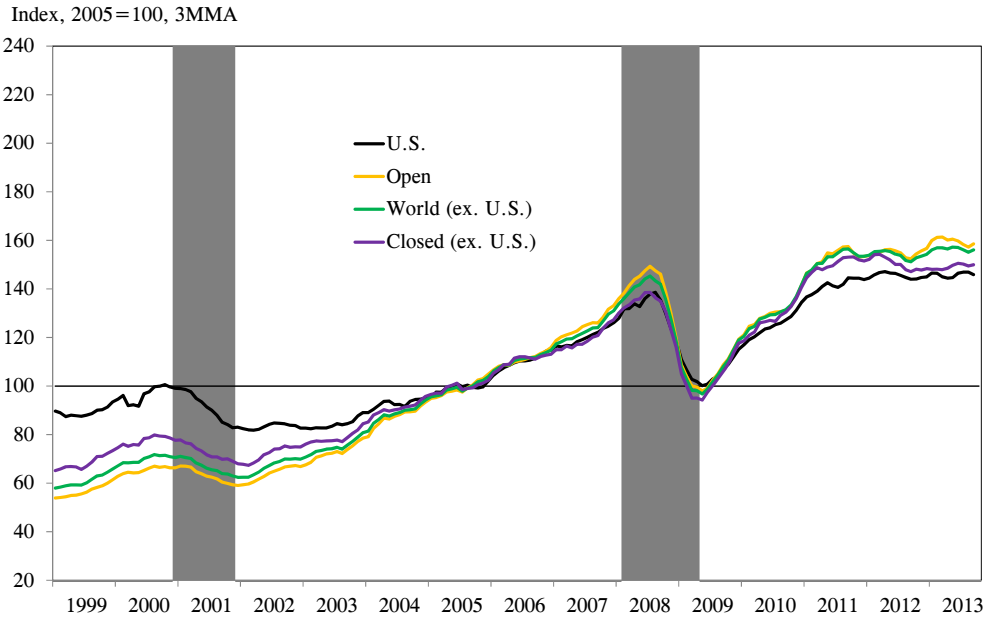
Figure 22. Merchandise Exports

G40 Export Index



Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014).

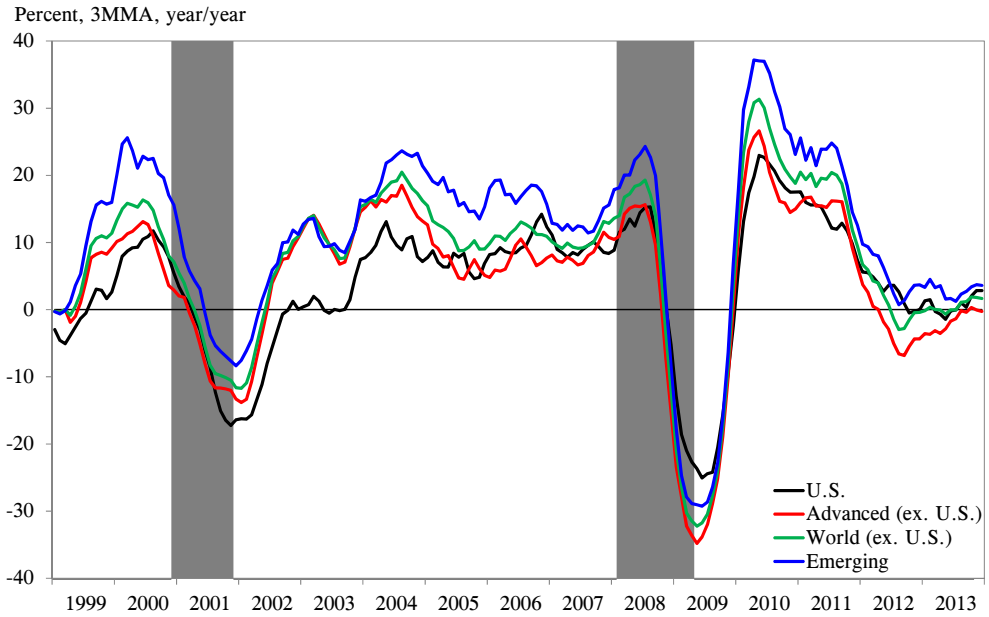
G40 Export Index



Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014).

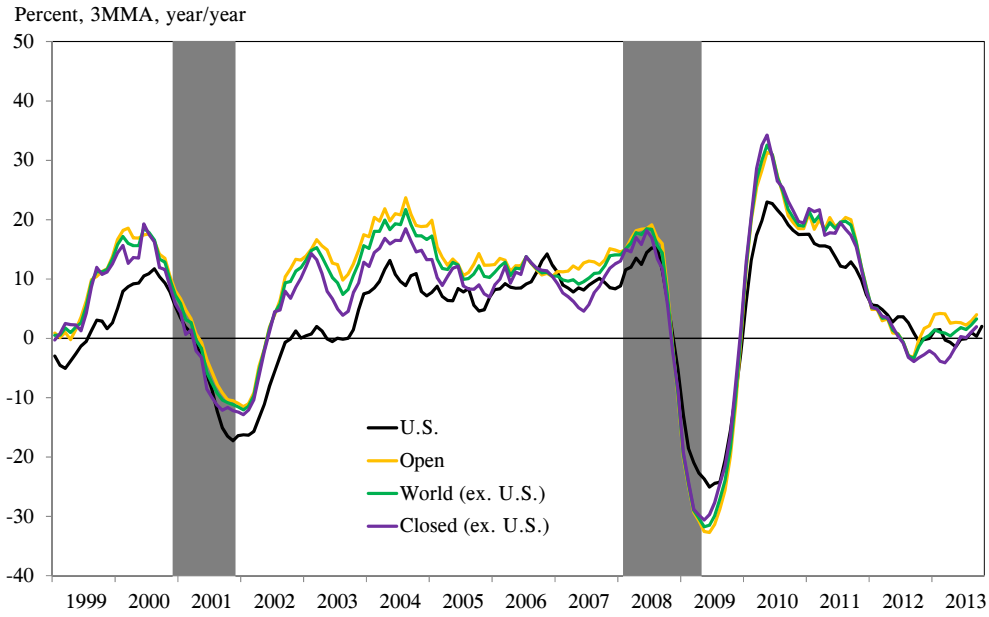
Figure 23. Merchandise Export Growth

G40 Export Growth



Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014).

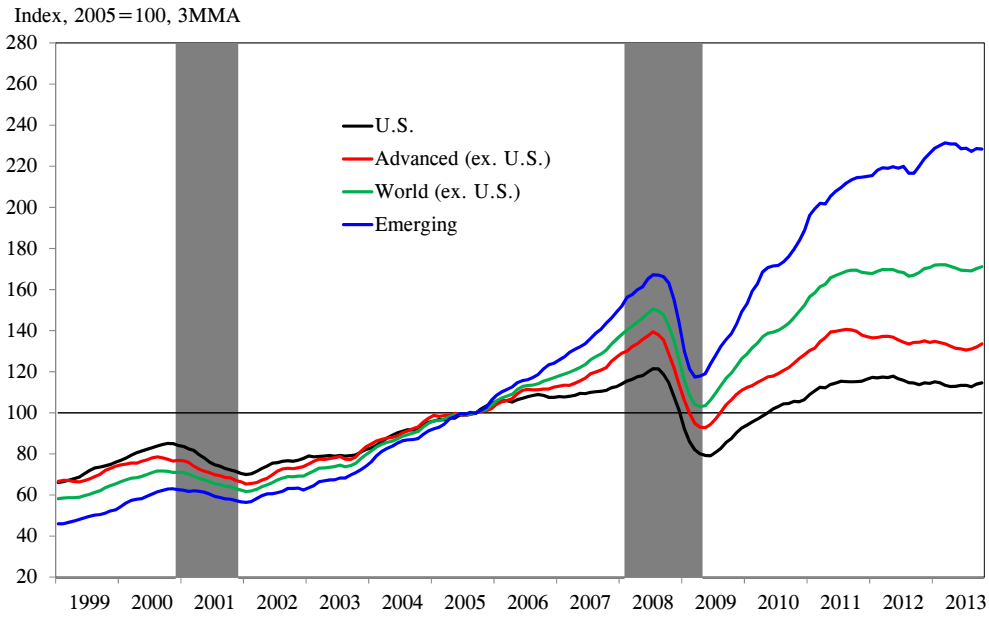
G40 Export Growth



Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014).

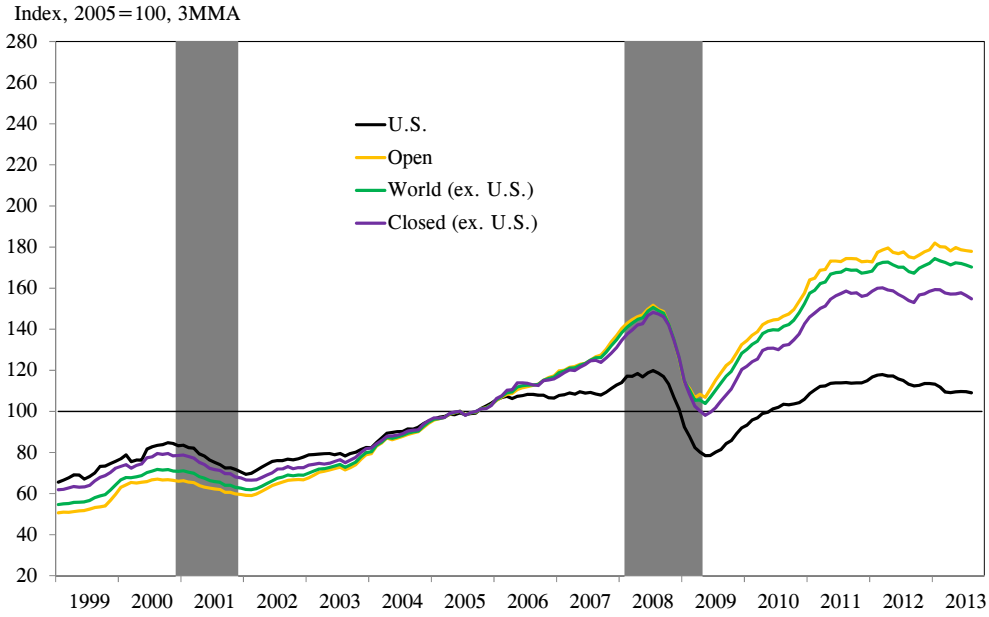
Figure 24. Merchandise Imports

G40 Import Growth



Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014).

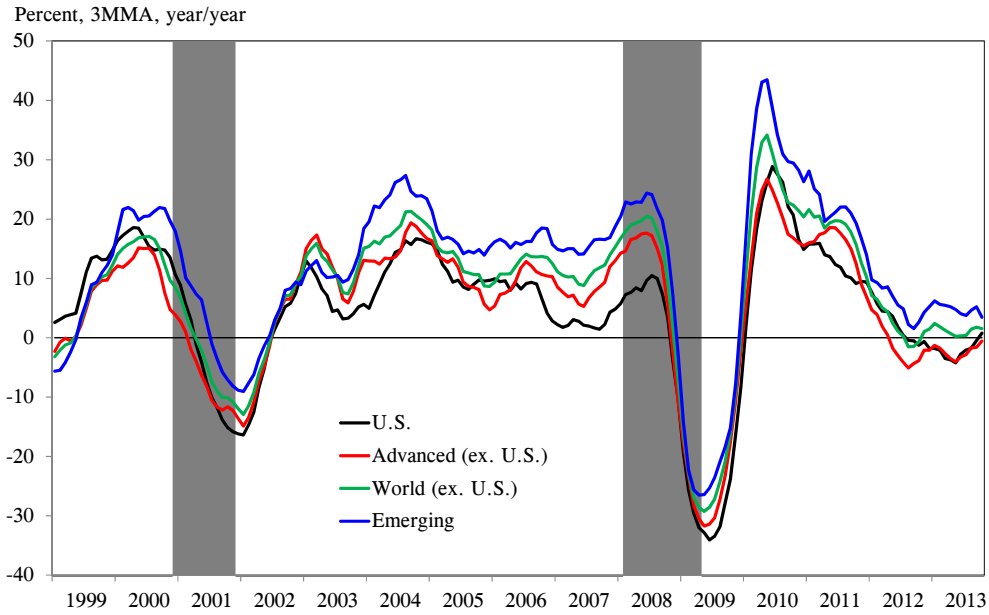
G40 Import Growth



Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014).

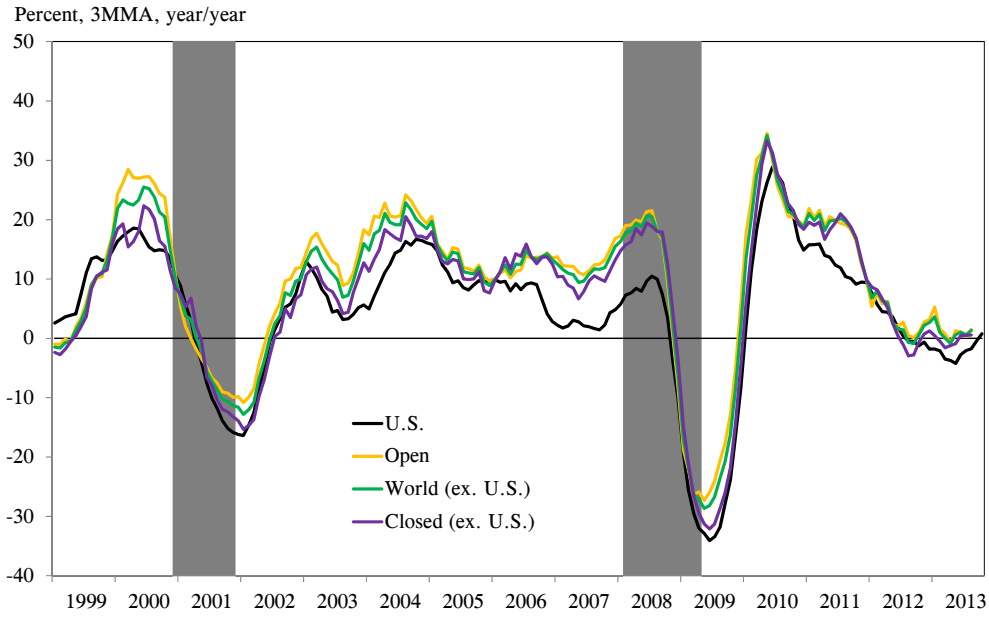
Figure 25. Merchandise Import Growth

G40 Import Growth



Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014).

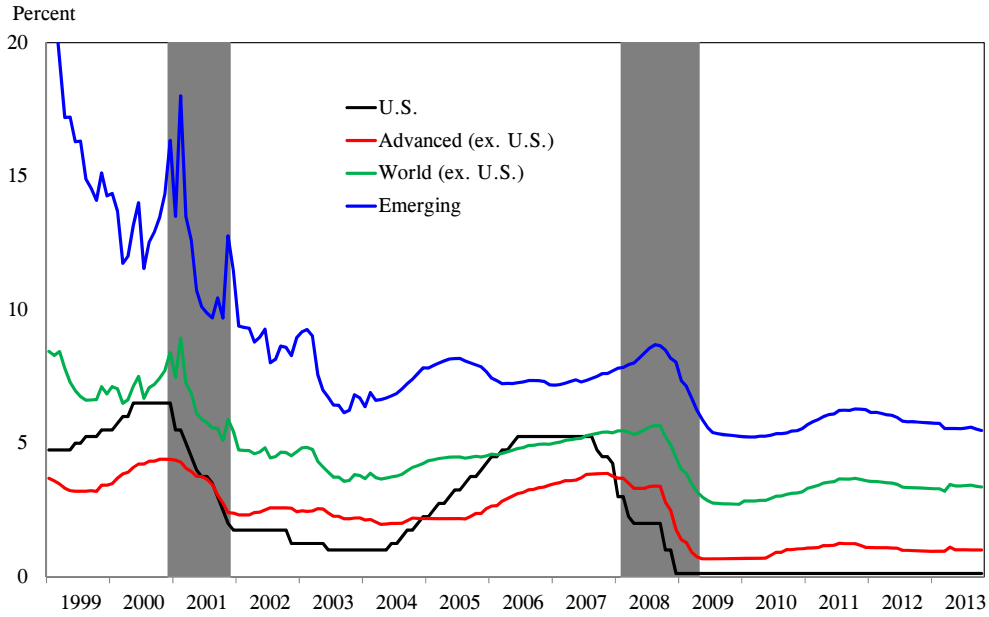
G40 Import Growth



Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014).

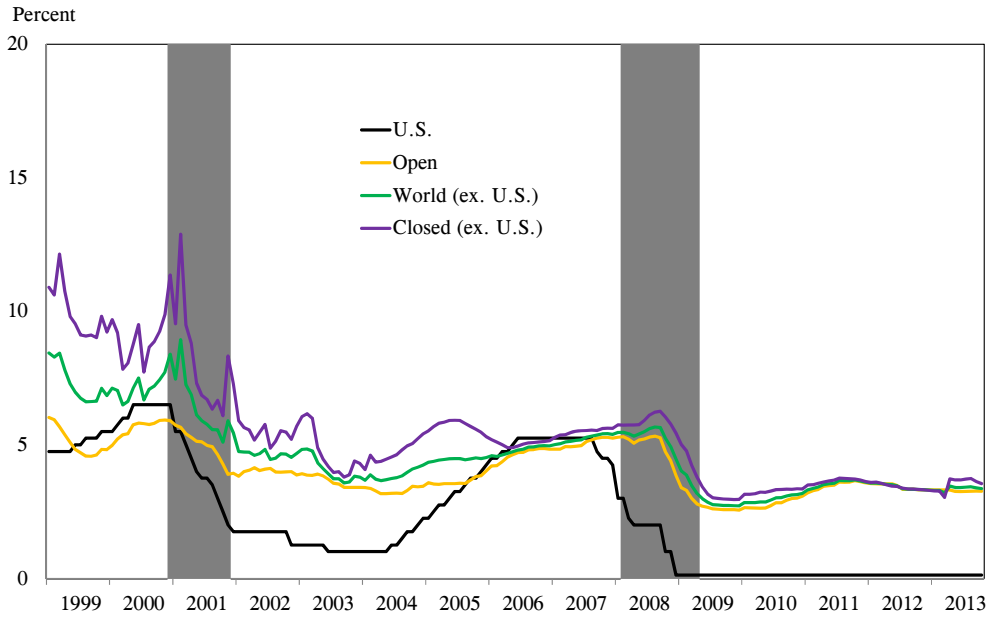
Figure 26. Official/Policy Rates

G40 Official/Policy Interest Rate



Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014).

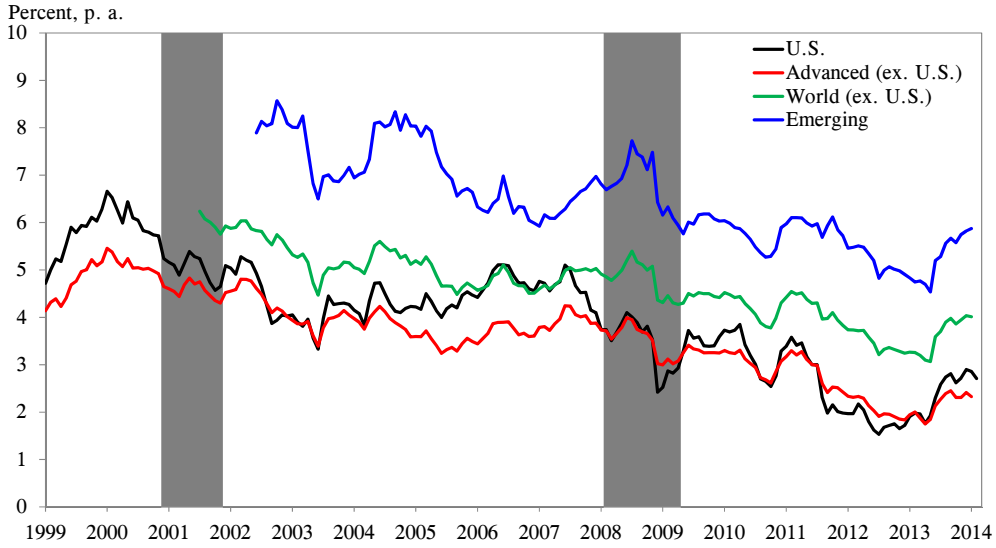
G40 Official/Policy Interest Rate



Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014).

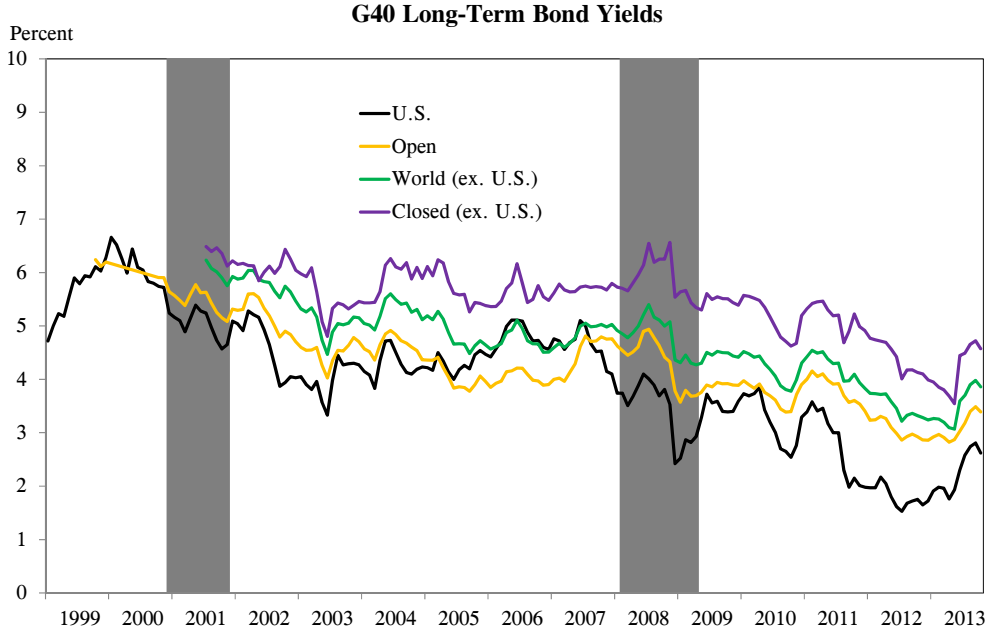
Figure 27. Long-Term Bond Yields

G40 Long-Term Bond Yields



Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014). Countries with data starting after Jan. 2006 are Brazil (Nov. 2006), Venezuela (June 2006), Nigeria (Jul. 2007), Peru (Mar. 2006) and Turkey (Oct. 2006). Argentina, Costa Rica and Indonesia are excluded due to lack of data.

G40 Long-Term Bond Yields



Note: Aggregated using U.S. trade weights. Shaded bars indicate global recessions (Grossman et al. 2014). Countries with data starting after Jan. 2006 are Brazil (Nov. 2006), Venezuela (June 2006), Nigeria (Jul. 2007), Peru (Mar. 2006) and Turkey (Oct. 2006). Argentina, Costa Rica and Indonesia are excluded due to lack of data.

6 The Database of Global Economic Indicators (DGEI): Country Detail

For a selected group of countries in DGEI, we provide country-level detail as well.
Country Coverage:

Includes most of the top-20 economies by share of world GDP in 2005 as can be seen from Table 6: Euro area, United Kingdom, Japan, Canada, Australia, the BRICS countries (Brazil, Russia, India, China, South Africa), and the MIST countries (Mexico, Indonesia, South Korea, and Turkey).

Variables per country (Figure 28 through Figure 32):

Real: Q/Q annualized and 4Q% change for real GDP, unemployment rate.

Nominal: year-over-year headline CPI, year-over-year core CPI (excluding food and energy), target range for monetary policy.

Table 6. U.S. and Top-20 Foreign Economies by Size in 2005

Country	% of World PPP-adj. GDP (2005)	% World Trade (2005)	Classification
U.S.	*(22.16)*	*(12.47)*	*Advanced*
Euro Area	16.18	29.11	Advanced
China	9.42	6.73	Emerging
Japan	6.83	5.25	Advanced
India	4.26	1.13	Emerging
U.K.	3.42	4.33	Advanced
Russia	2.98	1.59	Emerging
Brazil	2.78	0.94	Emerging
Mexico	2.28	2.17	Emerging
Canada	2.04	3.34	Advanced
S. Korea	1.93	2.58	Advanced
Turkey	1.31	0.90	Emerging
Indonesia	1.24	0.68	Emerging
Australia	1.21	1.12	Advanced
Iran	*(1.20)*	*(--)*	*Emerging*
Taiwan	*(1.07)*	*(--)*	*Advanced*
Poland	*(0.91)*	*(0.90)*	*Emerging*
Saudi Arabia	*(0.90)*	*(1.01)*	*Emerging*
Thailand	*(0.78)*	*(1.08)*	*Emerging*
Argentina	*(0.74)*	*(0.33)*	*Emerging*
South Africa	0.71	0.53	Emerging
TOTAL (incl. U.S.)	78.75	72.85	
of which			
Advanced Share	68.28 (58.81)	79.88 (70.10)	
Emerging Share	31.72 (41.19)	20.12 (29.90)	

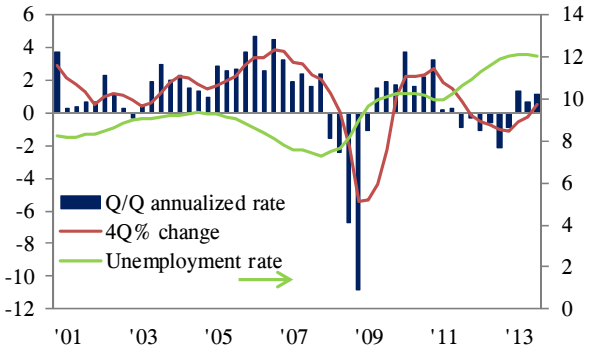
Note: Italics indicate the top-20 foreign economies and the U.S. for which country detail is not provided in DGEI. The totals are computed including only the countries in the current country detail plus the U.S. Trade data comes from the IMF Direction of Trade (DOT) database, while PPP-adjusted GDP shares are from the IMF World Economic Outlook (WEO).

Figure 28. Country Detail: Euro Area, United Kingdom, and Japan

Euro Area

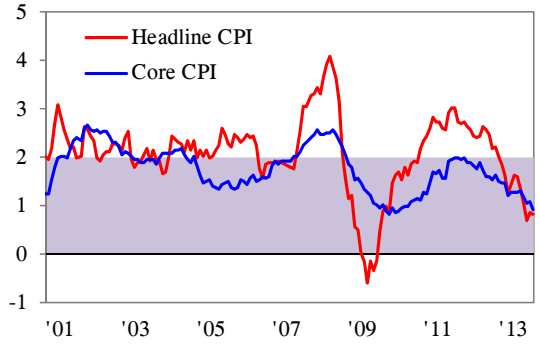
Real GDP Growth and Unemployment

Percent



Inflation

Year-over-Year Percent Change

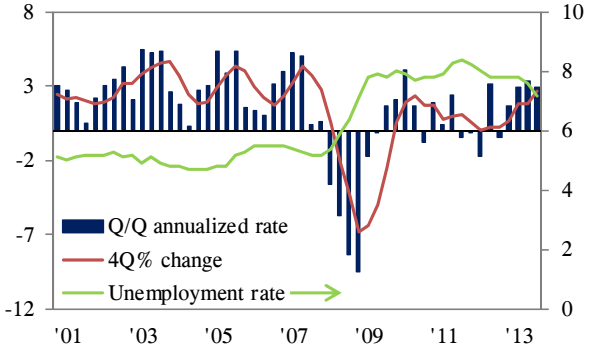


Note: The ECB's inflation target is "close to but below" 2% over the medium term.

United Kingdom

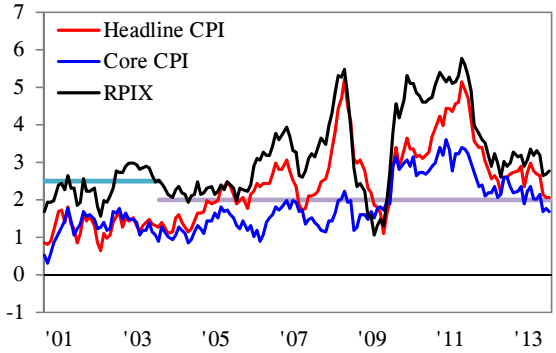
Real GDP Growth and Unemployment

Percent



Inflation

Year-over-Year Percent Change

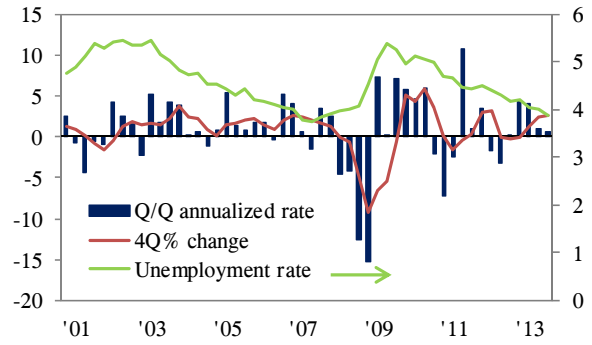


Note: The current inflation target is 2% for the Harmonized CPI. Prior to December 2003,the inflation target was 2.5% for the RPIX.

Japan

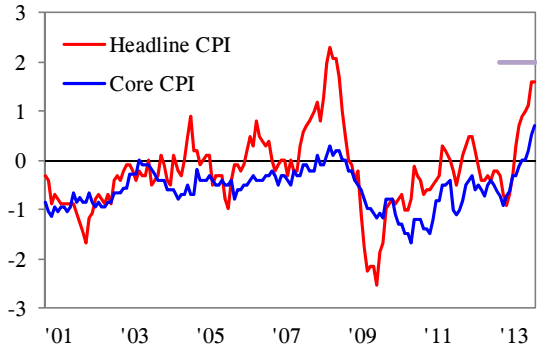
Real GDP Growth and Unemployment

Percent



Inflation

Year-over-Year Percent Change



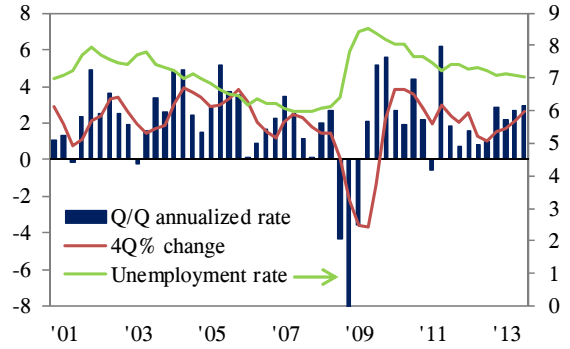
Note: An inflation target of 2% was implemented January 2013.

Figure 29. Country Detail: Canada, Australia, and Brazil

Canada

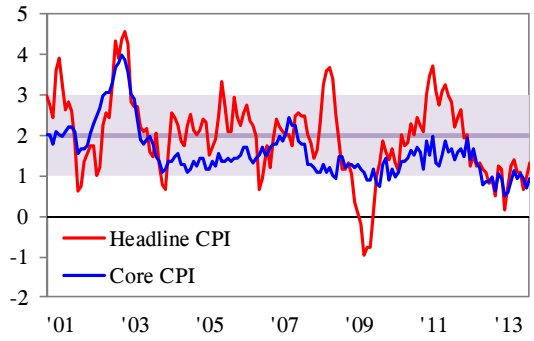
Real GDP Growth and Unemployment

Percent



Inflation

Year-over-Year Percent Change

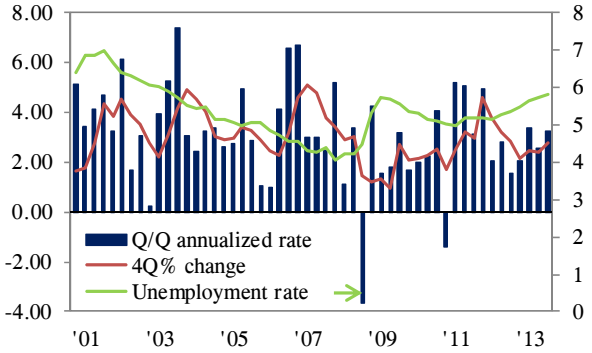


Note: The Bank of Canada's inflation target is 2 (±1)%.

Australia

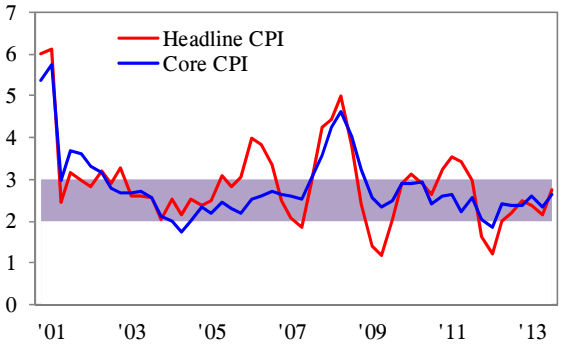
Real GDP Growth and Unemployment

Percent



Inflation

Year-over-Year Percent Change

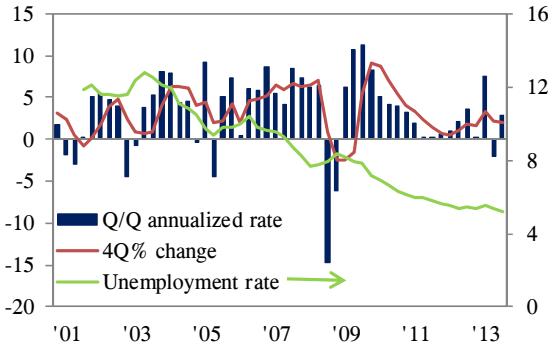


Note: The Reserve Bank of Australia's inflation target is 2-3%.

Brazil

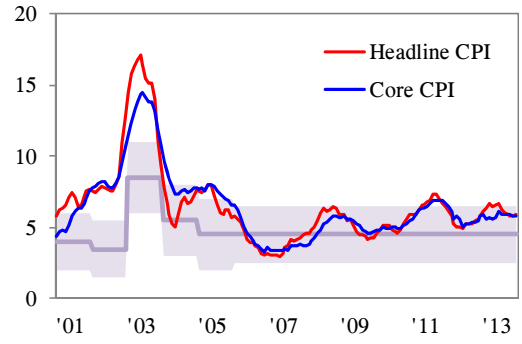
Real GDP Growth and Unemployment

Percent



Inflation

Year-over-Year Percent Change



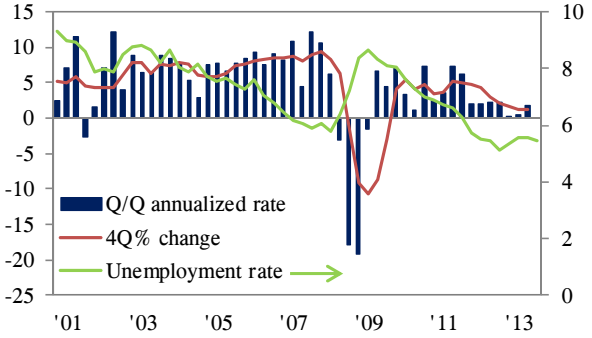
Note: The current inflation target is 4.5 (±2)%.

Figure 30. Country Detail: Russia, India, and China

Russia

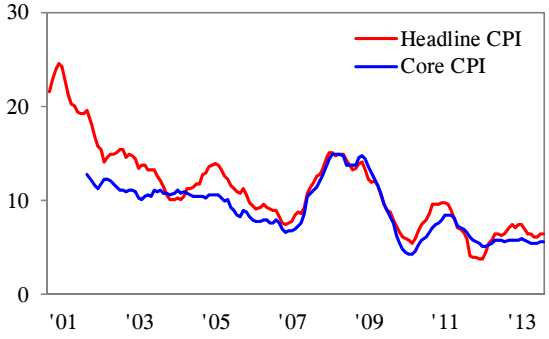
Real GDP Growth and Unemployment

Percent



Inflation

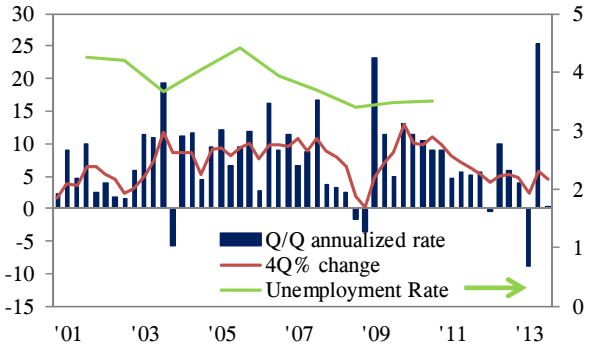
Year-over-Year Percent Change



India

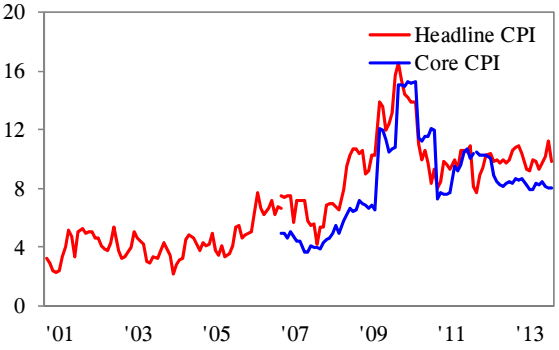
Real GDP Growth and Unemployment

Percent



Inflation

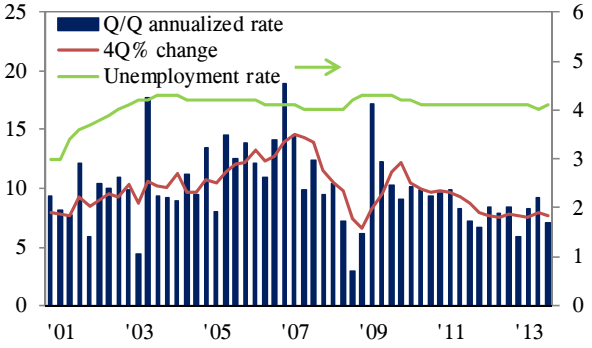
Year-over-Year Percent Change



China

Real GDP Growth and Unemployment

Percent



Inflation

Year-over-Year Percent Change

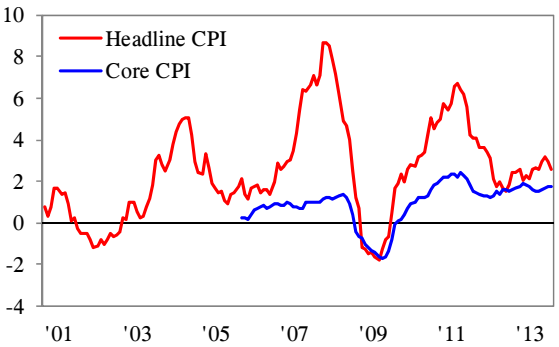
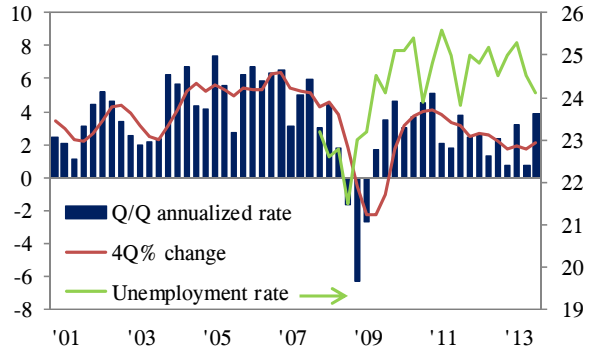


Figure 31. Country Detail: South Africa, Mexico, and Indonesia

South Africa

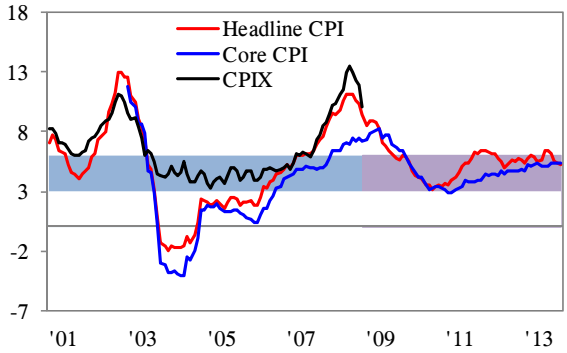
Real GDP Growth and Unemployment

Percent



Inflation

Year-over-Year Percent Change

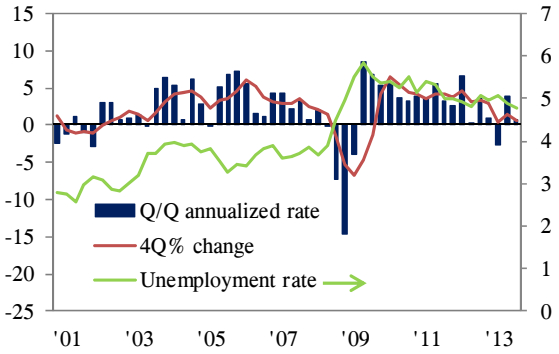


Note: The current inflation target is 3-6% for headline CPI. Prior to 2009, the CPIX (which excludes mortgage rates) was targeted at the same range.

Mexico

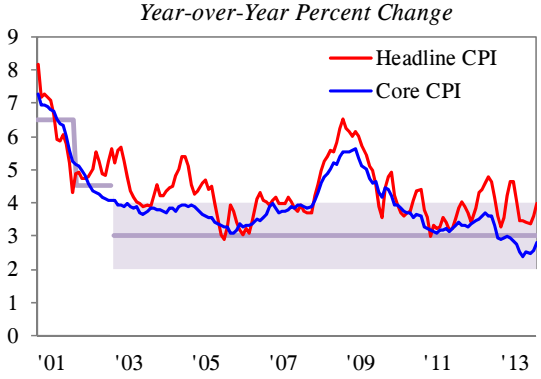
Real GDP Growth and Unemployment

Percent



Inflation

Year-over-Year Percent Change

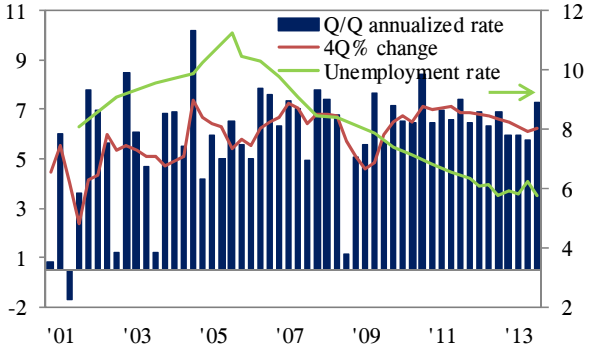


Note: The current inflation target is 3 (±1)%.

Indonesia

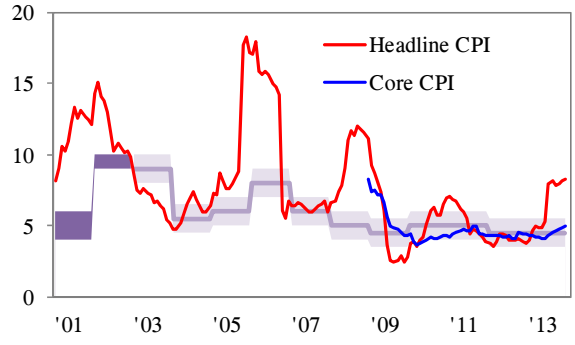
Real GDP Growth and Unemployment

Percent



Inflation

Year-over-Year Percent Change



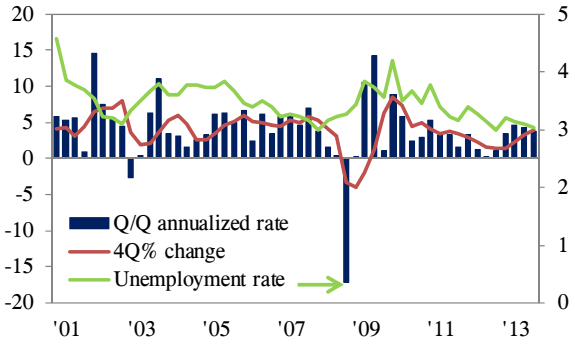
Note: The current inflation target is 4.5 (±1)%.

Figure 32. Country Detail: South Korea and Turkey

South Korea

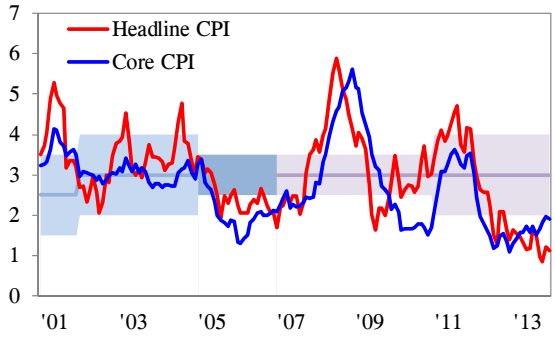
Real GDP Growth and Unemployment

Percent



Inflation

Year-over-Year Percent Change

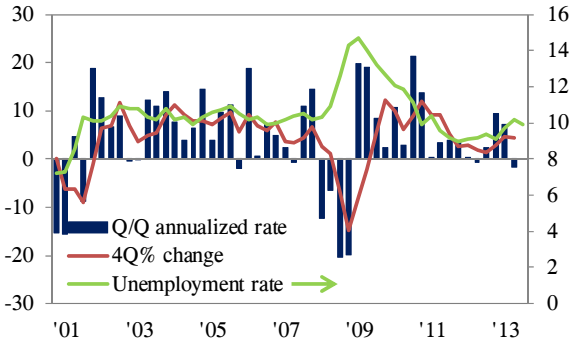


Note: The current inflation target is 2.5-3.5% for the headline CPI. Prior to 2007, the core CPI was targeted.

Turkey

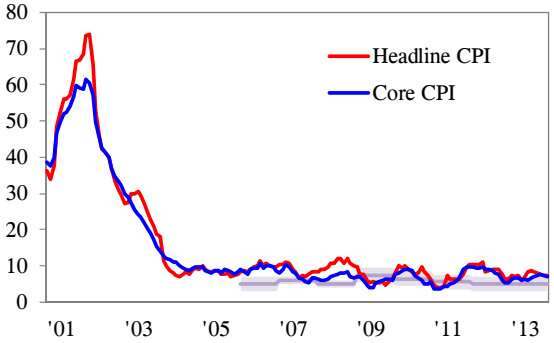
Real GDP Growth and Unemployment

Percent



Inflation

Year-over-Year Percent Change



Note: The current inflation target is 5 (±2)%.

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Appendix A. Country Definition

We define countries in DGEI by the boundaries of independent nation-states, but a few overseas territories and multi-country unions may have to be considered due to their economic relevance or because of their separate status in the reported data.

- DGEI treats countries individually—separately from the political, currency, and customs unions to which they belong or have belonged—but the data of these supranational entities may still be used on an occasional basis whenever a time series needs to be extended back in time further than what we find in the available country sources.
- DGEI defines countries by their internationally recognized boundaries, but in some cases the data reported by the countries themselves does not include some of the dependencies and overseas territories with special status. We do not attempt to correct for that.

The following list indicates the most substantive issues arising with the implementation of the independent nation-state definition of a country that we have adopted:

Political, Currency, and Customs Unions

1. Southern African Customs Union (SACU) is the oldest surviving customs union in the world—started in 1910. It currently includes Botswana, Lesotho, Namibia, South Africa, and Swaziland. Sometimes data may be available for SACU, but not for its member countries. Note: Namibia got its independence from South Africa in 1990 and only after that it joined SACU as a separate country.

2. Belgium and Luxembourg was the most enduring currency union in Europe (since the end of World War II) until these two countries joined an even larger currency union with the adoption of the euro. Most data prior to 1997 is reported for both countries jointly.

3. From the former Socialist Republic of Yugoslavia, Croatia, Macedonia, and Slovenia got their independence in 1991. Bosnia and Herzegovina declared its independence in 1992. Serbia and Montenegro formed the Federal Republic of Yugoslavia in 1992 after the effective dissolution of the Socialist Republic of Yugoslavia during the Yugoslav Wars in 1991-92. The Federal Republic of Yugoslavia was renamed Serbia and Montenegro in 2003. Montenegro became independent in 2006 ending its union with Serbia.

4. The dissolution of the Soviet Union (U.S.S.R.) in 1991 led to the formation of 15 newly-independent states: The Russian Federation, Ukraine, Belarus, Uzbekistan, Kazakhstan, Georgia, Azerbaijan, Lithuania, Moldavia, Latvia, Kyrgyzstan, Tajikistan, Armenia, Turkmenistan, and Estonia. The Russian Federation promoted the formation of the Commonwealth of Independent States (CIS) in 1993 of which 8 former Soviet Union republics are part: Armenia, Azerbaijan, Belarus, Kazakhstan, Kyrgyzstan, Moldavia, Russia, Tajikistan, and Uzbekistan.

Overseas Territories and Special Administrative Regions

1. Macao was a Portuguese overseas territory in China, similar to what Hong Kong was for Great Britain. Great Britain transferred sovereignty over Hong Kong to China in 1997 while Portugal transferred sovereignty over Macao in 1999. Since then both have become Special Administrative Regions. Data for both is reported nowadays separately from mainland China, and generally was excluded from the data reported by Portugal and Great Britain before the transfer of sovereignty.

2. Bermuda is the largest overseas territory of Great Britain. It has its own currency (the Bermudian dollar) separate from the British pound and its statistics are generally not included among those of Great Britain.

3. Aruba has been autonomous since 1986 as part of the extinct Netherlands Antilles (dissolved in 2010), and remains part of the Kingdom of the Netherlands to this day. The Netherlands Antilles included Aruba, Curacao, Saint Maarten, Bonaire, Saba, and Saint Eustatius. Aruba has a separate currency (the Aruban florin), and its statistics are generally not included among those of the Netherlands.

4. Greenland and the Faroe Islands are autonomous territories within the Kingdom of Denmark. Greenland has no separate currency—it uses the Danish krone—and the Faroe Islands use the Faroese krona under a fixed page with the Danish krone. Its statistics may not always be counted among those of Denmark.

5. New Caledonia is an overseas collectivity of France. It has its own currency, the CFP franc—pegged since the 1960s to the French franc and later the euro. French Guiana is the largest overseas department and region of France, and as an integral part of France used the French franc and later the euro as its currency. Often their data is reported separately from that of metropolitan France.

Appendix B. An Assessment of the Quadratic-Match Method for Interpolation

Interpolation methods are used for the conversion of low frequency to high frequency data—that is, for temporal disaggregation whenever no additional source of high frequency data is available to facilitate the conversion.[11] Interpolation can be defined as fitting a curve over measurements made at the sampled periods to infer unsampled quarters with which they must conform. Standard interpolating methods without related data include constant piecewise, linear, polynomial (quadratic, cubic,…), and spline, among others.

There are multiple interpolation methods which can be used for temporal disaggregation, but there is not necessarily one single method that is superior to the others. Different methods tend to emphasize different aspects of the data, so a given interpolation technique may turn out to be best in some applications but not in others depending on the features of the interpolated data that are deemed most important.

Our preferred choice for interpolation is to use the quadratic-match average (or the quadratic-match sum) method to interpolate the data to a monthly frequency (quarterly frequency for real GDP only). Interpolating with a quadratic function introduces a systematic source of serial correlation in the regressors because data points are related to each other by a quadratic polynomial. This must be taken into account when using time series with interpolated data for the purpose of statistical inference—that is, standard errors should be made robust to autocorrelation in hypothesis testing.

Therefore, it is important to discuss the merits of the implementation of the quadratic-match interpolation method that is used as the default for DGEI. To do so, we contrast explicitly the performance of the quadratic-match method against a conventional alternative based on cubic splines (see, e.g., Greville (1967)) along four key dimensions—local/global behavior of the procedure, smoothness/ruggedness of the series, shape-preservation/monotonicity/natural-shape features of the data, and accuracy-of-fit/parsimony. For a complementary assessment of the quadratic-match method along the same lines, see the discussion in Mack and Martínez-García (2011 (Revised December 2013)).

[11] Different econometric disaggregation techniques, such as the Denton (1971) and Chow and Lin (1971) approaches to cite just two of the most popular methods, can also be used for quarterization. These techniques interpolate the low frequency data at quarterly frequency using related indicator variables that are reported themselves at quarterly frequency. We generally do not have access to quarterly indicators that can be used with the available data for temporal disaggregation of the series in the DGEI.

Appendix B.1. Implementation of the Interpolating Methods

A. Quadratic-match method:

We employ a local quadratic method where the average (or the sum) is matched to the sourced low frequency data. The quadratic-match interpolation fits a local parabola to three points for each low frequency observation, then uses this polynomial to fill in all observations of the high frequency (quarterly) series associated with the data for the observed period. One point before and one point after the period being interpolated are used to provide the set of three points needed for the quadratic polynomial. For end points, both points must be taken from the side where data is available.

B. Cubic-spline method:

The cubic spline that we use for comparison assigns each observation of the low frequency time series to the last quarter associated with the low frequency period, then locates all intermediate points fitting a natural cubic spline connecting those observations. Each segment of the curve is represented by a cubic polynomial. Adjacent segments of the curve have the same level, first derivative, and second derivative at the point where they meet. We impose the additional condition that the second derivative of the curve at the two global end points is equal to zero (the cubic-spline under this condition is referred to as the "natural" spline).

C. Partial-sum cubic-spline method:

The partial-sum cubic spline method is a variant of the cubic spline method that is implemented on flow data that has been previously accumulated to construct a stock series. In order to recover the interpolated flow data after applying the cubic spline on the partial sum, the unobserved flows are recovered from the difference in the interpolated stock data.

Appendix B.2. Features of the Interpolation

We illustrate the performance of the quadratic-match method relative to the natural cubic-spline and the partial-sum natural cubic-spline interpolating methods with the U.S. data from the Real-Time Data Set for Macroeconomists from the Federal Reserve Bank of Philadelphia. We then compare the interpolated data against the actual U.S. series on a number of the indicators in DGEI, which in this case are also observable.

Local/global behavior: An important distinction between interpolation methods is that some are global (e.g., the cubic-spline and the partial-sum cubic-spline methods) while others are local (e.g., the quadratic-match method). Global methods take into consideration all low frequency observations so that changes in any one data point (or the addition of new data) to the observed series affect all interpolated data points. Global methods generally—but not always—create smooth surfaces, but can be very sensitive to the presence of outliers or breaks in the data. The influence of outliers on the fitted interpolating function will be felt on the entire surface. Local methods, in turn, only use a fixed number of observations within the neighborhood of the interpolated data point. Local methods usually yield less smooth surfaces, but are not as sensitive to outliers, breaks in the series, and preliminary data (or data subject to significant revisions) because their effects only affect localized regions of the interpolated curve. For those reasons, preference is given to local interpolation methods in DGEI.

Smoothness/ruggedness: Excessive undulations caused by large curvature changes should be avoided—since the fitting curve changes its curvature at inflection points, these should be kept to a minimum as well. To avoid excessive and frequent changes in the curvature of the interpolating function, a C^2 continuous curve can be desirable as it also implies continuous second-derivatives. The cubic-spline interpolation functions sometimes exhibit unnatural wiggles and bumps, but the proponents of the method often argue that its C^2 smoothness is nonetheless a desirable feature. In turn, C^2 smoothness does not occur with the partial-sum cubic-spline or the quadratic-match method.

Given that the frequency of the observed data cannot be changed, there are two ways to vary the degree of smoothness of the interpolated data: relaxing C^2 continuity to C^1 continuity; and using polynomial interpolating functions of different order. The quadratic interpolating function ensures only C^1 continuity, but this appears sufficient to interpolate the data in the applications we encounter in DGEI without smoothing out too much of the variability from quarter to quarter.

However, the interpolating curves are not constrained to be continuous at the boundaries between adjacent observed periods in the case of the quadratic-match method. The approach is better suited to situations where relatively few data points are being interpolated and the source data is fairly smooth. We find that this is the case in most of the applications we have in DGEI, so we expect this method to perform well. In turn, we find that the smoothness imposed by the cubic-spline method with continuous second-derivatives may be counterfactual.

Shape-preservation/monotonicity/natural-shape features: A trade-off arises between the degree of smoothness and the property of local monotonicity (or shape-preservation). The piecewise linear interpolating function is at one extreme of the possibilities because it is continuous—with jumps

in its first derivatives—and there is hardly any smoothness in the interpolation, but piecewise linear interpolation preserves the monotonicity of the data locally. It also preserves the shape of the data better because it avoids overshooting in the approximation, and the interpolated data is increasing, decreasing, or constant on the same intervals as the actual observed data. The infinite-order polynomial interpolating function is at the other extreme of the realm of possibilities. It is infinitely differentiable, but it generally fails to preserve the shape of the observed data. By using the quadratic-match method in DGEI, therefore, we favor the shape preservation property over greater smoothness relative to the standard cubic-spline method.[12]

Accuracy-of-fit/parsimony: Another one of our major goals is to strike a balance between accuracy and parsimony, which depends on the desired properties for the interpolated data (see, e.g., Baxter (1998) and Chamberlin (2010)). A third-degree (cubic) polynomial is a polynomial of the lowest degree that can display an inflection point, so it can be used (at least locally) to fit a curve that has inflection points.[13] In that case, interpolation imposes the accuracy of a third-order polynomial. Our preferred method—the quadratic-match method—requires, in turn, only the accuracy of a second-order polynomial.

Our analysis of the (partial-sum) cubic-spline and the quadratic-match method in suggests that in general the accuracy gains from adopting a higher-order polynomial are not large enough to justify an additional degree in the interpolating polynomial (from quadratic to cubic). The heat maps reported in Figure 33–Figure 38 have been constructed using data on some of the indicators covered by DGEI at all available vintages for the U.S. from the Real-Time Data Set for Macroeconomists from the Federal Reserve Bank of Philadelphia, using always a constant sample size that includes the last 18 years of each quarterly vintage and the last 12 years of each monthly vintage.[14] The accuracy of the interpolation methods is evaluated with the relative mean-squared error (RMSE), that is, the ratio of the mean-squared error with the quadratic-match method relative to that obtained with the (partial-sum) cubic spline. The errors are computed by comparing the actual data for the U.S. for each vintage with the interpolated data derived from the aggregates.

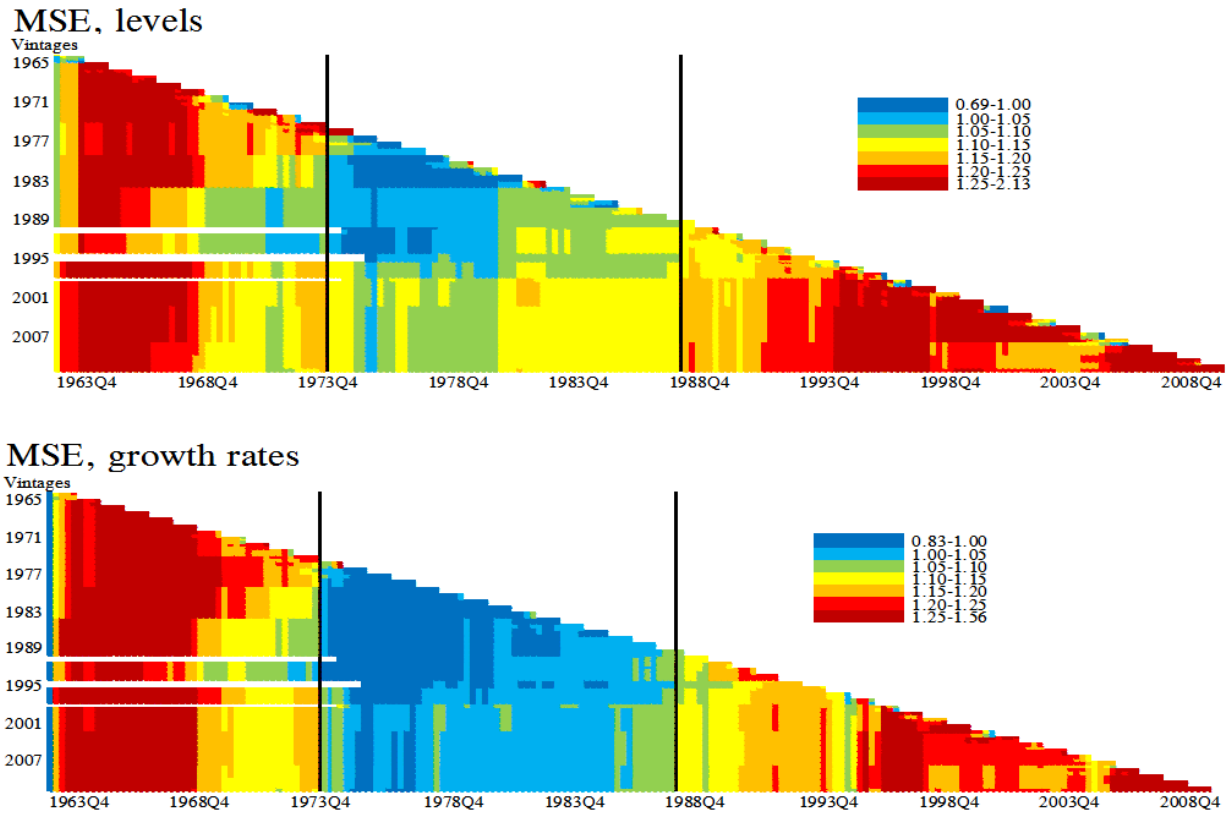
The evidence reported here suggests that the quadratic-match method has become increasingly more accurate in order to match the patterns of the data. It is interesting to observe that the pattern has undergone significant changes over time, but also that the results are robust to revisions within the three main periods that we detect in Figure 33–Figure 38 across different variables (prior to 1973, between 1973 and 1991, and since 1991). Moreover, the accuracy in levels and growth rates reported in the heat maps shows the quadratic-match method performance is not significantly different than that of the cubic spline approximation since the mid-1970s and beats that of the cubic spline since the early 1990s. In this regard, we can say not only that the method is fairly accurate for our purposes but also that the goodness-of-fit attained is largely robust to subsequent data revisions.

[12] The quadratic-match and cubic-spline methods do not guarantee that the curve fitted would satisfy non-negativity, though. In other words, while all data points observed are positive, it is possible that some of the interpolated data points may become negative.

[13] We say that an interpolation method has the accuracy of a polynomial function of degree *n* if the method accurately interpolates the data when it lies on a curve of a polynomial of degree *n* or smaller.

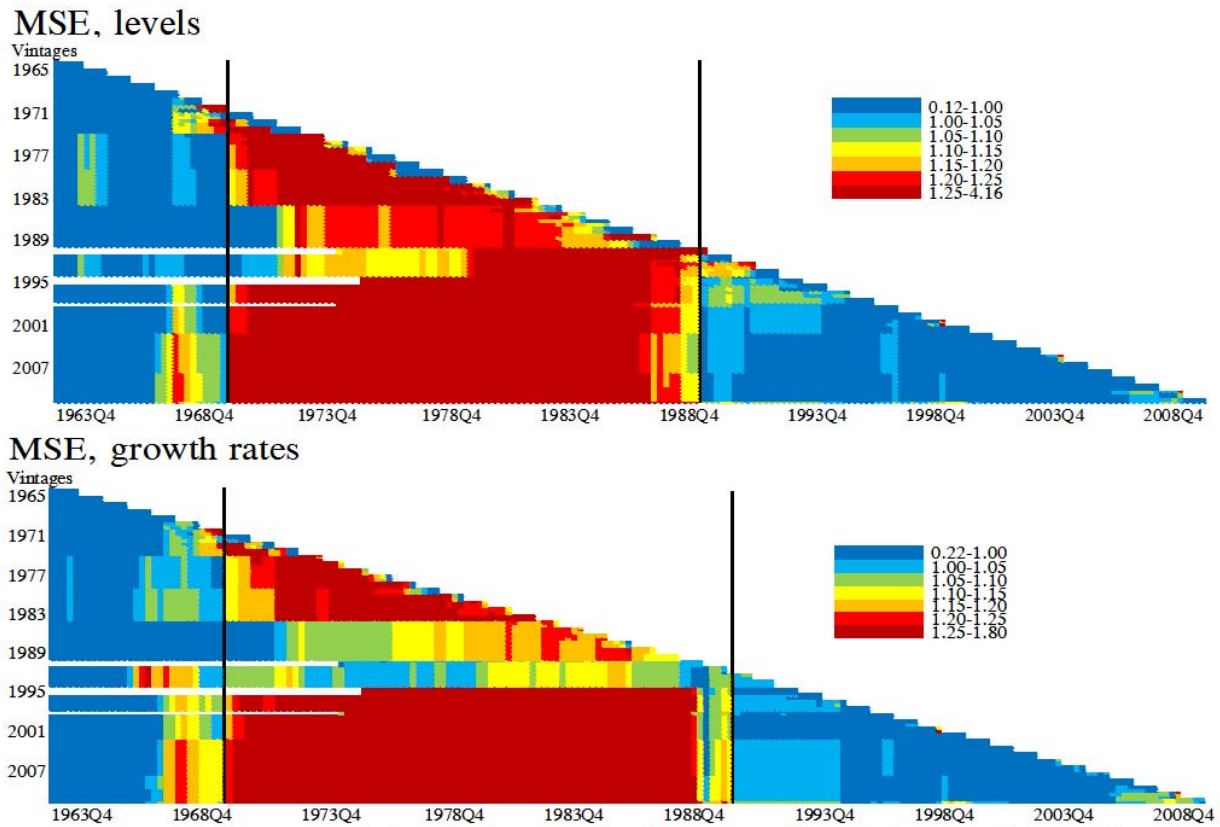
[14] Given that we apply the same procedure to the series in levels and in quarter-over-quarter growth rates, we do not consider the first four observations of the series in order to ensure that the sample size is the same in all cases.

Figure 33. Accuracy of the Quadratic-match Relative to the Partial-sum Cubic Spline with the U.S. GDP



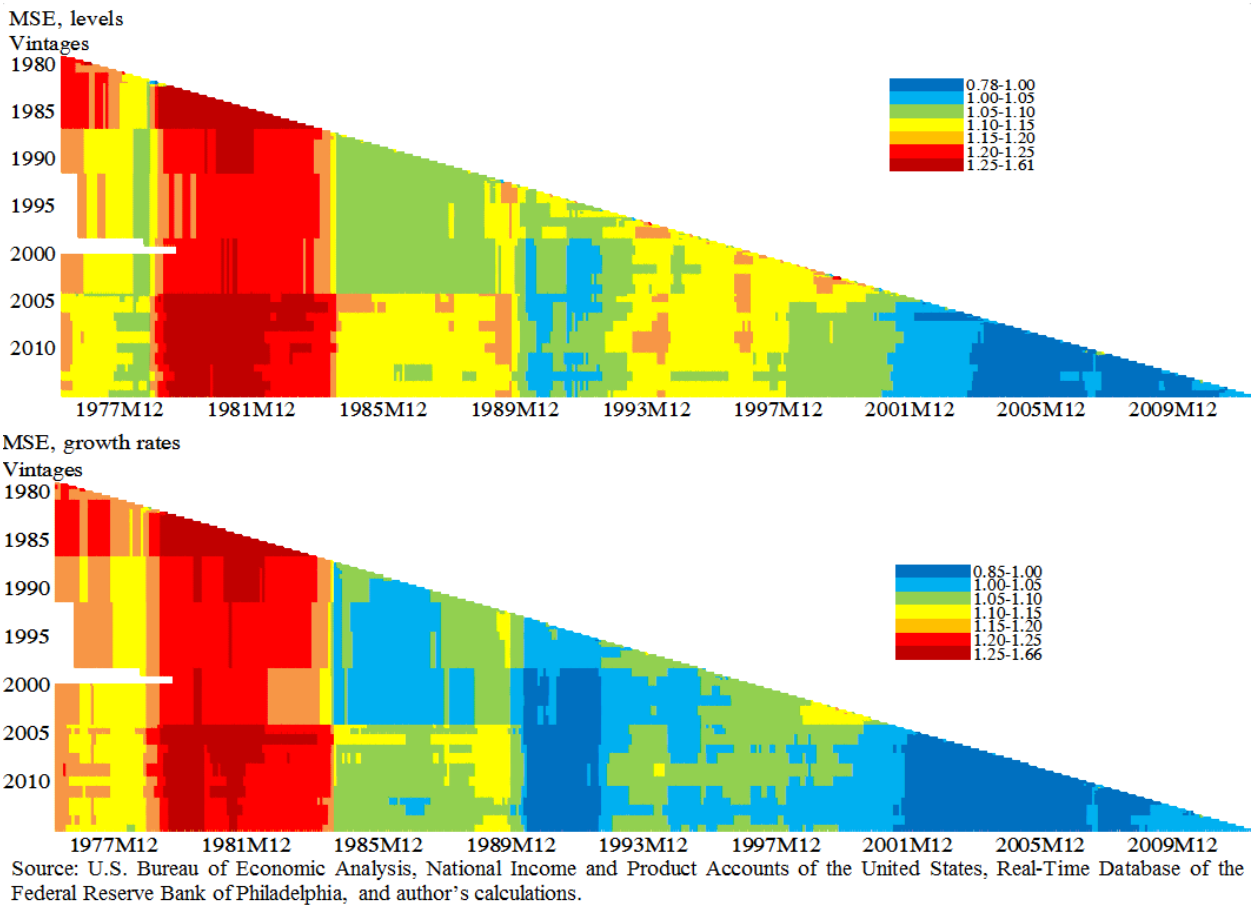
Source: U.S. Bureau of Economic Analysis, National Income and Product Accounts of the United States, Real-Time Database of the Federal Reserve Bank of Philadelphia, and author's calculations.

Figure 34. Accuracy of the Quadratic-match Relative to the Partial-sum Cubic Spline with the U.S. PCE



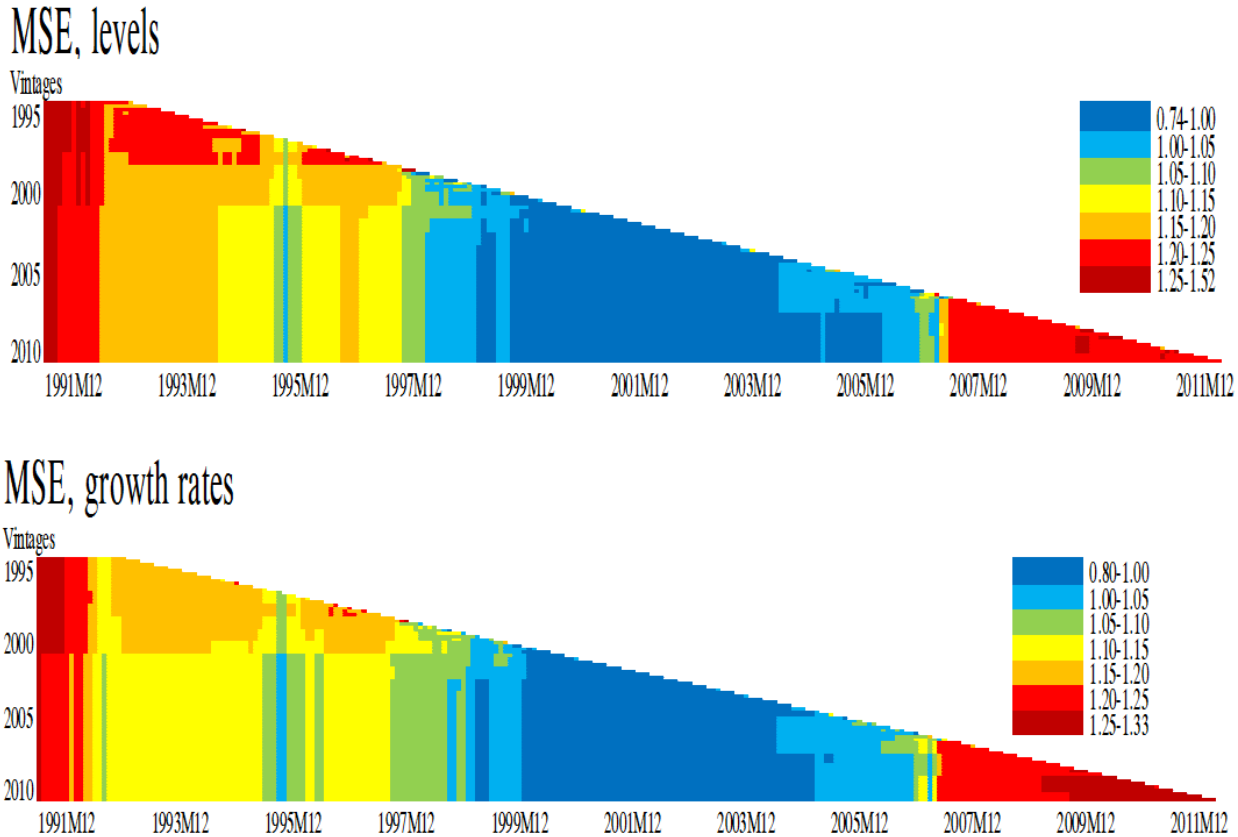
Source: U.S. Bureau of Economic Analysis, National Income and Product Accounts of the United States, Real-Time Database of the Federal Reserve Bank of Philadelphia, and author's calculations.

Figure 35. Accuracy of the Quadratic-match Relative to the Partial-sum Cubic Spline with the U.S. IP



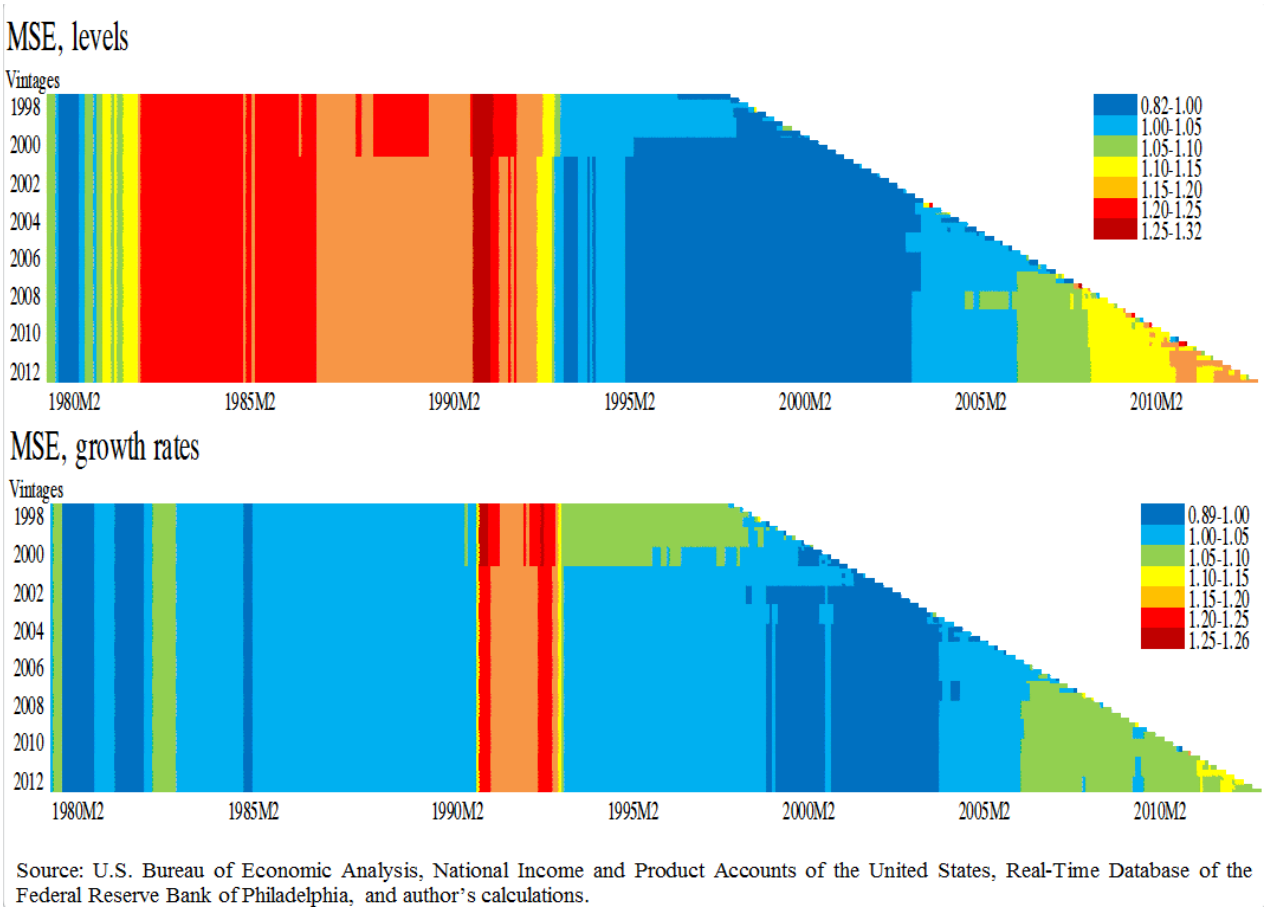
Source: U.S. Bureau of Economic Analysis, National Income and Product Accounts of the United States, Real-Time Database of the Federal Reserve Bank of Philadelphia, and author's calculations.

Figure 36. Accuracy of the Quadratic-match Relative to the Partial-sum Cubic Spline with the U.S. CPI



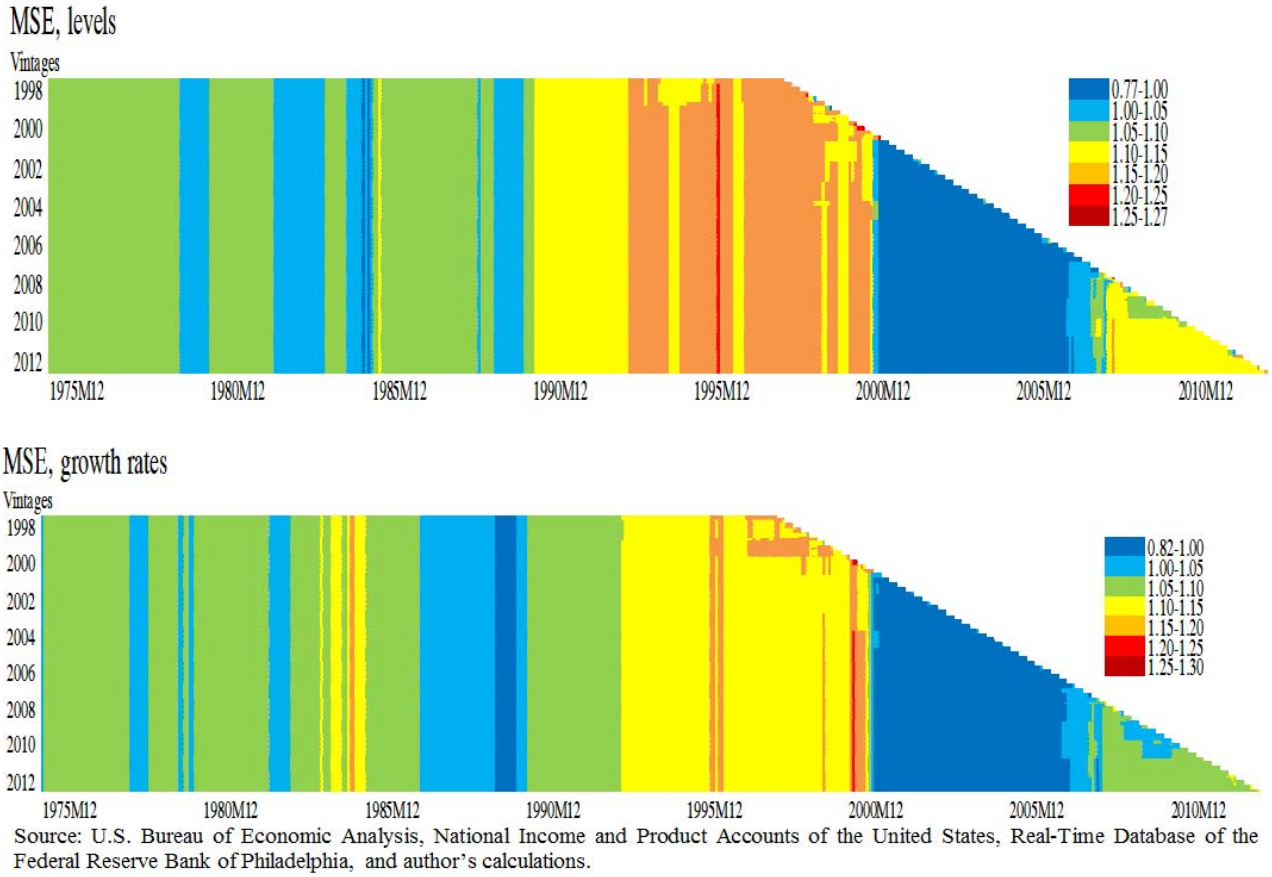
Source: U.S. Bureau of Economic Analysis, National Income and Product Accounts of the United States, Real-Time Database of the Federal Reserve Bank of Philadelphia, and author's calculations.

Figure 37. Accuracy of the Quadratic-match Relative to the Partial-sum Cubic Spline with the Core CPI



Source: U.S. Bureau of Economic Analysis, National Income and Product Accounts of the United States, Real-Time Database of the Federal Reserve Bank of Philadelphia, and author's calculations.

Figure 38. Accuracy of the Quadratic-match Relative to the Partial-sum Cubic Spline with the PPI



Source: U.S. Bureau of Economic Analysis, National Income and Product Accounts of the United States, Real-Time Database of the Federal Reserve Bank of Philadelphia, and author's calculations.

Appendix C. Country Sources

Table 7. Country Sources on Real Gross Domestic Product

Country	Data Description	Source	Start Date
United States	GDP in chained 2009 dollars	Bureau of Economic Analysis	Q1-1947
United Kingdom	GDP in chained 2010 pounds	Office for National Statistics	Q1-1955
Austria	GDP in chained 2005 euros	Austrian Institute of Economic Research/Statistik Austria	Q1-1988
	GDP in chained 2005 euros	OECD	Q1-1960
Belgium	GDP in chained 2011 euros	Banque Nationale de Belgique	Q1-1995
	GDP in chained 2009 euros	OECD	Q1-1960
France	GDP in chained 2005 euros	Institut National de la Statistique/Economique	Q1-1949
Germany	GDP in chained 2005 euros	Deutsche Bundesbank	Q1-1970
Italy	GDP in chained 2005 euros	Istituto Nazionale di Statistica	Q1-1981
	GDP in chained 2005 euros	OECD	Q1-1960
Netherlands	GDP in chained 2005 euros	Centraal Bureau voor de Statistiek	Q1-1977
Sweden	GDP in chained 2012 Swedish kronor	Statistiska Centralbyran	Q1-1993
	GDP in chained 2010 Swedish kronor	OECD	Q1-1960
Switzerland	GDP in chained 2005 francs	State Secretariat for Economic Affairs	Q1-1980
Canada	GDP in chained 2007 Canadian dollars	Statistics Canada	Q1-1981
	GDP in chained 2002 Canadian dollars	OECD	Q1-1960
Japan	GDP in chained 2005 yen	Cabinet Office of Japan	Q1-1980
Greece	GDP in chained 2005 euros	Statistical Office of the European Communities	Q1-1995
Portugal	GDP in chained 2006 euros	Instituto Nacional de Estatística	Q1-1995
	GDP in chained 2006 euros	OECD	Q1-1960
Spain	GDP in chained 2008 euros	Instituto Nacional de Estadística	Q1-1995
	GDP in chained 2008 euros	OECD	Q1-1960
Turkey	GDP in 1998 Turkish lira	Turkish Statistical Institute	Q1-1987
Australia	GDP in chained Q3:2011-Q2:2012 Australian dollars	Australian Bureau of Statistics	Q3-1959
South Africa	GDP in 2005 rand	South African Reserve Bank	Q1-1960
Argentina	GDP in 1993 pesos	Min de Economía y Obras y Servicios Públicos	Q1-1993
Brazil	GDP in chained 1995 reais	Instituto Brasileiro de Geografia e Estatística	Q1-1990
Chile	GDP in chained 2008 Chilean pesos	Banco Central de Chile	Q1-1986
Colombia	GDP in chained 2005 pesos	Departamento Administrativo Nacional de Estadísticas	Q1-2000
	GDP in 2005 pesos*	World Bank	1960
Costa Rica	GDP in 1991 colones	Banco Central de Costa Rica	Q1-1991
Mexico	GDP in 2008 new pesos	Instituto Nacional de Estadística Geografía e Informática	Q1-1980
Peru	GDP in 1994 new soles	Banco Central de Reserva del Perú	Q1-1980

Country	Data Description	Source	Start Date
Venezuela	GDP in 1997 bolivares	Banco Central de Venezuela	Q1-1997
Taiwan	GDP in 2006 new Taiwan dollars	Directorate-General of Budget Accounting & Stats	Q1-1981
India	GDP in FY 2004 rupees	Central Statistical Organization, India	Q2-1996
Indonesia	GDP in 2000 rupiahs	Biro Pusat Statistik	Q1-1983
South Korea	GDP in chained 2005 won	Bank of Korea	Q1-1970
Malaysia	GDP in 2005 ringgit	Department of Statistics, Malaysia	Q1-1991
Philippines	GDP in 2000 pesos	National Statistical Coordination Board	Q1-1981
Thailand	GDP in 1988 baht	National Economic and Social Development Board	Q1-1993
Nigeria	GDP in 1990 naira	National Bureau of Statistics, Nigeria	Q1-2007
	GDP at purchaser's prices in 1990 naira*	Nigeria Federal Office of Statistics/CBN	1981
Bulgaria	GDP in chained 2005 leva	National Statistical Institute	Q1-1997
Russia	GDP in chained 2008 rubles	Federal State Statistics Service	Q1-1995
China	GDP in 2000 yuan	China National Bureau of Statistics	Q1-1992
	GDP in 1990 yuan*	China National Bureau of Statistics	1978
Czech Republic	GDP in chained 2005 Czech koruna	Czech Statistical Office	Q1-1996
Hungary	GDP in chained 2005 forints	Central Statistical Office	Q1-1995
Poland	GDP in chained 2005 zloty	Central Statistical Office	Q2-1995

Note: * Annual data interpolated using quadratic-match average

Table 8. Country Sources on Industrial Production

Country	Data Description	Source	Start Date
United States	IP	Federal Reserve Board	Jan-1921
United Kingdom	IP excluding construction	Office for National Statistics	Jan-1968
Austria	IP: Industry excluding construction	Statistik Austria	Jan-1960
Belgium	IP: Industry excluding construction	Statistical Office of the European Communities	Jan-2000
	IP excluding construction	OECD	Jan-1960
France	IP excluding construction	Institut National de la Statistique/Economique	Jan-1970
Germany	IP: Total industry excluding construction	Deutsche Bundesbank	Jan-1952
Italy	IP: Total industry excluding construction	Istituto Nazionale di Statistica	Jan-1980
Netherlands	IP excluding construction	OECD	Jan-1960
Sweden	IP	OECD	Jan-1960
Switzerland	IP excluding construction, mining, and quarrying*	OECD	Q1-1960
Canada	IP: Manufacturing, mining, and utilities	Statistics Canada	Jan-1981
	IP	IMF	Jan-1957
Japan	IP: Mining and manufacturing	Ministry of Economy, Trade & Industry	Jan-1953
Greece	IP excluding construction	Hellenic Statistical Authority (ELSTAT)	Jan-1995
	IP: Total industry excluding construction	OECD	Jan-1962
Portugal	IP excluding construction	OECD	Jan-1960
Spain	IP excluding construction	OECD	Jan-1965
Turkey	IP: Total industry	Turkish Statistical Institute	Jan-1985
Australia	IP excluding construction*	Australian Bureau of Statistics	Q3-1974
South Africa	IP: Manufacturing	Statistics South Africa	Jan-1963
Argentina	IP	Fundación de Investigaciones Económicas Latinoamericanas	Jan-1993
Brazil	IP: Manufacturing	OECD	Jan-1975
Chile	IP	Instituto Nacional de Estadísticas	Jan-2009
	IP: Manufacturing	IMF	Jan-1958
Colombia	IP: Manufacturing	Departamento Administrativo Nacional de Estadísticas	Jan-1990
	IP: Manufacturing	IMF	Jan-1980
Costa Rica	Economic Activity: Manufacturing	Banco Central de Costa Rica	Jan-1991
Mexico	IP: Manufacturing	Instituto Nacional de Estadística Geografía e Informática	Jan-1980
Peru	IP: Manufacturing	Ministerio de la Producción	Jan-1990
	IP: Manufacturing	IMF	Jan-1979
Venezuela	IP: Manufacturing	Banco Central de Venezuela	Jan-1997
	IP: Crude petroleum	IMF	Jan-1957
Taiwan	IP: Manufacturing	Ministry of Economic Affairs	Jan-1960
India	IP	Central Statistical Organization, India	Jan-1971

Country	Data Description	Source	Start Date
Indonesia	IP: Manufacturing: Large and medium enterprises	Biro Pusat Statistik	Jan-1993
	IP: Manufacturing	OECD	Jan-1986
South Korea	IP: Total industry excluding construction	National Statistics Office	Jan-1970
Malaysia	IP: All divisions excluding construction	Department of Statistics, Malaysia	Jan-1971
Philippines	IP: Manufacturing	National Statistics Office	Jan-1998
	IP: Manufacturing	IMF	Jan-1981
Thailand	IP: Manufacturing	Office of Industrial Economics	Jan-2000
	IP: Manufacturing	Central Bank of Thailand	Jan-1995
	IP: Manufacturing	Central Bank of Thailand	Jan-1987
Nigeria	IP*	Central Bank of Nigeria	Q1-2006
	IP*	IMF	Q1-1970
Bulgaria	IP	National Statistical Institute	Jan-2000
Russia	IP	OECD	Jan-1993
China	Index of gross value added in 1990 prices	China National Bureau of Statistics	Jan-1997
	Real gross value added (year/year % change)	China National Bureau of Statistics	Jan-1992
Czech Republic	IP	Czech Statistical Office	Jan-2000
	IP including small enterprises	OECD	Jan-1990
Hungary	IP	Central Statistical Office	Jan-1993
	IP excluding construction	OECD	Jan-1980
Poland	IP excluding construction	OECD	Jan-1985

Note: * Quarterly data interpolated using quadratic-match average

Table 9. Country Sources on Purchasing Managers' Index

Country	Data Description	Source	Start Date
United States	Manufacturing PMI	Institute for Supply Management	Jan-1948
United Kingdom	Manufacturing PMI	CIPS/Markit	Jan-1992
Austria	Manufacturing PMI	Creditanstalt	Oct-1998
Belgium			
France	Manufacturing PMI	Markit/Comp des Dirigeants et Acheteurs France	Apr-1998
Germany	Manufacturing PMI	Markit	Apr-1996
Italy	Manufacturing PMI	Markit/Associazione Ital Acquisti e Supply Mgmt	Jun-1997
Netherlands	Manufacturing PMI	NEVI	Mar-2000
Sweden	Manufacturing PMI	Swedbank	Nov-1994
Switzerland	Manufacturing PMI	SVME/Credit Suisse/Markit	Jan-1995
Canada	Total Economy PMI	Richard Ivey School of Business/Univ W Ontario	Jan-2001
Japan	Manufacturing PMI	Markit/Japan Materials Management Association	Oct-2001
Greece	Manufacturing PMI	Markit	May-1999
Portugal			
Spain	Manufacturing PMI	Markit	Feb-1998
Turkey	Manufacturing PMI	HSBC/Markit	Jun-2005
Australia	Manufacturing PMI*	Australian Industry Group-PricewaterhouseCoopers	Sep-1992
South Africa	Manufacturing PMI	Investec/IPSA/Markit	Sep-1999
Argentina			
Brazil	Manufacturing PMI	HSBC/Markit	Feb-2006
Chile			
Colombia			
Costa Rica			
Mexico	Manufacturing PMI	Instituto Nacional de Estadística Geografía e Informática	Jan-2004
Peru			
Venezuela			
Taiwan	Manufacturing PMI	HSBC/Markit	Apr-2004
India	Manufacturing PMI	HSBC/Markit	Mar-2005
Indonesia			
South Korea	Manufacturing PMI	HSBC/Markit	Apr-2004
Malaysia			
Philippines			
Thailand			
Nigeria			
Bulgaria			
Russia	Manufacturing PMI	HSBC/Markit	Sep-1997
China	Manufacturing PMI	HSBC/Markit	Apr-2004
Czech Republic	Manufacturing PMI	HSBC/Markit	Jun-2001
Hungary	Manufacturing PMI	Hungary Assoc Logistics, Purchasing, Inventory	Sep-1995
Poland	Manufacturing PMI	HSBC/Markit	Jun-1998

Note: * Quarterly data interpolated using quadratic-match average from 1992 to 2001

Table 10. Country Sources on Headline Consumer Price Index

Country	Data Description	Source	Start Date
United States	CPI	Bureau of Labor Statistics	Jan-1947
United Kingdom	CPI	Office for National Statistics	Jan-1988
	CPI	OECD	Jan-1955
Austria	CPI	Statistik Austria	Jan-1967
Belgium	CPI	Banque Nationale de Belgique/Ministry of Economic Affairs	Jan-1947
France	CPI	Institut Nat de la Statistique et des Etudes Economiques	Jan-1951
Germany	CPI	Deutsche Bundesbank	Jun-1948
Italy	CPI	Istituto Nazionale di Statistica	Jan-1957
Netherlands	CPI	Centraal Bureau voor de Statistiek	Jan-1957
Sweden	CPI	Statistiska Centralbyran	Jan-1955
Switzerland	CPI	Swiss Federal Statistical Office	Jan-1921
Canada	CPI	Statistics Canada	Jan-1921
Japan	CPI	Ministry of Internal Affairs and Communications	Jan-1970
Greece	CPI	Hellenic Statistical Authority (ELSTAT)	Jan-1959
Portugal	CPI	Instituto Nacional de Estatística	Jan-1957
Spain	CPI	Instituto Nacional de Estadística	Jan-1961
Turkey	CPI	Turkish Statistical Institute	Jan-1969
Australia	CPI*	Australian Bureau of Statistics	Q3-1948
South Africa	Urban Areas: CPI	Statistics South Africa	Jan-1960
Argentina	CPI	Instituto Nacional de Estadística y Censos	Jun-1984
Brazil	CPI	Instituto Brasileiro de Geografia e Estatística	Jan-1995
Chile	CPI	Instituto Nacional de Estadísticas	Jan-1958
Colombia	CPI	Departamento Administrativo Nacional de Estadísticas	Jan-1954
Costa Rica	CPI	Instituto Nacional de Estadística y Censos	Jan-1976
Mexico	CPI	Instituto Nacional de Estadística Geografía e Informática	Jan-1969
Peru	CPI	Instituto Nacional de Estadística e Informática	Jan-1991
Venezuela	CPI	Banco Central de Venezuela	Jan-1950
Taiwan	CPI	Directorate-General of Budget Accounting & Stats	Jan-1959
India	CPI	Ministry of Statistics and Programme Implementation	Jan-2006
	CPI	OECD	Jan-1957
Indonesia	CPI	Biro Pusat Statistik	Jan-1968
South Korea	CPI	National Statistics Office	Jan-1955
Malaysia	CPI	Department of Statistics, Malaysia	Jan-1957
Philippines	CPI	National Statistics Office	Jan-1957
Thailand	CPI	Dept of Internal Trade, Ministry of Commerce	Jan-1965
Nigeria	CPI	National Bureau of Statistics, Nigeria	Apr-1962
Bulgaria	CPI	National Statistical Institute	May-1990
Russia	CPI	Federal State Statistics Service	Jan-1991
China	CPI	China National Bureau of Statistics	Jan-1984

Country	Data Description	Source	Start Date
Czech Republic	CPI	Czech Statistical Office	Jan-1991
Hungary	CPI	Central Statistical Office	Jan-1976
Poland	CPI	Central Statistical Office, Poland	Jan-1988

Note: * Quarterly data interpolated using quadratic-match average

Table 11. Country Sources on Core Consumer Price Index

Country	Data Description	Source	Start Date
United States	CPI: All items less food and energy	Bureau of Labor Statistics	Jan-1957
United Kingdom	HICP: Total excluding energy and unprocessed food	Statistical Office of the European Communities	Jan-1996
	CPI: All items excluding food and energy	OECD	Jan-1970
Austria	HICP: Total excluding energy and unprocessed food	Statistical Office of the European Communities	Jan-1990
	CPI: All items excluding food and energy	OECD	Jan-1966
Belgium	HICP: Total excluding energy and unprocessed food	Statistical Office of the European Communities	Jan-1991
	CPI: All items excluding food and energy	OECD	Jun-1976
France	HICP: Total excluding energy and unprocessed food	Statistical Office of the European Communities	Jan-1990
	CPI: All items excluding food and energy	OECD	Jan-1960
Germany	HICP: Total excluding energy and unprocessed food	Statistical Office of the European Communities	Jan-1995
	CPI: All items excluding food and energy	OECD	Jan-1962
Italy	HICP: Total excluding energy and unprocessed food	Statistical Office of the European Communities	Jan-1990
	CPI less food and energy	OECD	Jan-1960
Netherlands	HICP: Total excluding energy and unprocessed food	Statistical Office of the European Communities	Jan-1990
	CPI: All items excluding food and energy	OECD	Apr-1960
Sweden	HICP: Total excluding energy and unprocessed food	Statistical Office of the European Communities	Jan-1990
	CPI: All items excluding food and energy	OECD	Jan-1970
Switzerland	CPI excluding food, bev, tobacco, seasonal prods, and energy	Swiss Federal Statistical Office	May-1993
	CPI: All items excluding food and energy	OECD	Jan-1955
Canada	CPI: All items less food and energy	Statistics Canada	Jan-1992
	CPI: All items excluding food and energy	OECD	Jan-1961
Japan	CPI: All items excluding food and energy	Ministry of Internal Affairs and Communications	Jan-1970
Greece	HICP: Total excluding energy and unprocessed food	Statistical Office of the European Communities	Jan-1996
	CPI: All items less food and energy	OECD	Jan-1989
Portugal	HICP: Total excluding energy and unprocessed food	Statistical Office of the European Communities	Jan-1990
Spain	CPI excluding nonprocessed foods and energy products	Instituto Nacional de Estadística	Aug-1985
	CPI: All items excluding food and energy	OECD	Jan-1976
Turkey	CPI: All items less food less energy	OECD	Jan-1994
Australia	CPI: All groups excluding volatile items*	Australian Bureau of Statistics	Q3-1948
	CPI: All items excluding food and energy*	OECD	Q3-1976
South Africa	Urban Areas: CPI excluding food, NAB, petrol, and energy	Statistics South Africa	Jan-2002

Country	Data Description	Source	Start Date
Argentina	CPI: Nonseasonal/not price controlled goods and services	Instituto Nacional de Estadística y Censos	Dec-2002
	CPI excluding food and energy^	BIS	Q1-1993
Brazil	Brazil: National core CPI	Instituto Brasileiro de Geografia e Estatística	Dec-1995
Chile	Chile: CPI less food and energy	Instituto Nacional de Estadísticas	Jan-1979
Colombia	CPI less perishables, fuel, and utilities	Banco de la República	Dec-1998
Costa Rica	CPI: Core	Instituto Nacional de Estadística y Censos	Jan-1995
Mexico	CPI: Core	Instituto Nacional de Estadística Geografía e Informática	Jan-1982
Peru	CPI: Core	Instituto Nacional de Estadística e Informática	Dec-1990
Venezuela	CPI: Core (metro)	Banco Central de Venezuela	Jan-1999
Taiwan	CPI: General index excluding food and energy	Directorate-General of Budget Accounting & Stats	Jan-1981
India	CPI excluding food and energy	Ministry of Statistics and Programme Implementation	Jan-2011
	CPI excluding food and energy	Labour Bureau of India	Jan-2006
Indonesia	CPI: Excluding food products	Biro Pusat Statistik	Dec-2007
South Korea	CPI: All items excluding agricultural products and oil	National Statistics Office	Jan-1975
Malaysia	CPI excluding food and energy	Department of Statistics, Malaysia	Jan-2005
Philippines	Core CPI excluding food and energy	National Statistics Office	Jun-2003
Thailand	CPI excluding food and energy	Dept of Internal Trade, Ministry of Commerce	Jan-1990
Nigeria	CPI: All items less farm produce and energy	National Bureau of Statistics, Nigeria	Jan-2003
Bulgaria	HICP: Total excluding energy and unprocessed food	Statistical Office of the European Communities	Dec-1996
Russia	CPI: All items less food	OECD	Jan-1992
China	CPI excluding food and energy	China National Bureau of Statistics	Jan-2005
Czech Republic	Core CPI	Czech Statistical Office	Jan-1998
Hungary	Core CPI	Central Statistical Office	Jan-1995
Poland	HICP: Total excluding energy and unprocessed food	Statistical Office of the European Communities	Jan-1996

Notes: * Quarterly data interpolated using quadratic-match average. ^ Quarterly data interpolated using log linear interpolation.

Table 12. Country Sources on Producer Price Index/Wholesale Price Index

Country	Data Description	Source	Start Date
United States	PPI: Finished goods	Bureau of Labor Statistics	Apr-1947
United Kingdom	PPI: Manufactured products	Office for National Statistics	Jan-1974
Austria	PPI: Industry excluding construction	Statistical Office of the European Communities	Jan-1996
Belgium	PPI: Output prices	Banque Nationale de Belgique/Ministry of Economic Affairs	Jan-1980
France	PPI: Industry excluding construction	Institut Nat de la Statistique et des Etudes Economiques	Jan-1999
	PPI: Industry excluding construction	Statistical Office of the European Communities	Jan-1995
Germany	PPI: Total industry excluding construction	Deutsche Bundesbank	Jan-1949
Italy	PPI	Istituto Nazionale di Statistica	Jan-1981
Netherlands	PPI: Manufacturing	Centraal Bureau voor de Statistiek	Jan-1981
Sweden	PPI	Statistiska Centralbyran	Jan-1975
Switzerland	PPI	Swiss Federal Statistical Office	Jan-1926
Canada	PPI: All commodities	Statistics Canada	Jan-1956
Japan	PPI: Manufacturing	Bank of Japan	Jan-1975
Greece	PPI: Total industry	Hellenic Statistical Authority (ELSTAT)	Jan-1995
Portugal	PPI: Industry excluding construction	Statistical Office of the European Communities	Jan-1990
Spain	PPI: Total industry	Instituto Nacional de Estadística	Jan-1975
Turkey	PPI: General	Turkish Statistical Institute	Jan-1986
Australia	PPI by stage of processing: Final*	Australian Bureau of Statistics	Q3-1998
South Africa	PPI: Manufacturing	Statistics South Africa	Jan-2012
	PPI: Industry output	Statistics South Africa	Jan-1970
Argentina	PPI	Instituto Nacional de Estadística y Censos	Jan-1993
Brazil	WPI: Domestic Supply	Fundaçâo Getúlio Vargas	Aug-1991
Chile	PPI	Instituto Nacional de Estadísticas	Apr-2003
Colombia	PPI	Departamento Administrativo Nacional de Estadísticas	Jan-1970
Costa Rica	PPI	Banco Central de Costa Rica	Jan-1991
Mexico	PPI: Total production excluding oil	Instituto Nacional de Estadística Geografía e Informática	Dec-2003
Peru	WPI	Instituto Nacional de Estadística e Informática	Jan-1986
Venezuela	PPI: Private manufacturing	Banco Central de Venezuela	Jan-1998
Taiwan	WPI	Directorate-General of Budget Accounting & Stats	Jan-1952
India	WPI: All Items	Ministry of Commerce and Industry	Jan-1957
Indonesia	WPI	Biro Pusat Statistik	Jan-1971
South Korea	PPI: All items	National Statistics Office	Jan-1965
Malaysia	PPI: Domestic economy	Department of Statistics, Malaysia	Feb-1986
Philippines	PPI: Total manufacturing	National Statistics Office	Jan-2000
	WPI: All items	National Statistics Office	Jan-1983

Country	Data Description	Source	Start Date
Thailand	PPI	Dept of Internal Trade, Ministry of Commerce	Jan-1995
Nigeria			
Bulgaria	PPI	National Statistical Institute	Jan-2004
Russia	PPI: Total	Federal State Statistics Service	Feb-1992
China	PPI: All industry products	China National Bureau of Statistics	Jan-1996
Czech Republic	PPI: Manufacturing	Czech Statistical Office	Feb-1991
Hungary	PPI: Total industry	Central Statistical Office	Jan-1986
Poland	PPI	Central Statistical Office, Poland	Jun-1985

Note: * Quarterly data interpolated using quadratic-match average

Table 13. Country Sources on Merchandise Imports

Country	Data Description	Source	Start Date
United States	Imports of goods (customs value) in U.S.$	Bureau of the Census	Jan-1948
United Kingdom	Imports of goods in U.S.$	Office for National Statistics	Jan-1980
Austria	Merchandise imports in U.S.$	Statistik Austria	Jan-1970
Belgium	Imports in U.S.$	Banque Nationale de Belgique	Jan-1993
	Imports calculated using share of Bel-Lux imports	IMF	Jan-1980
France	Imports of goods in U.S.$	Dir Génl des Douanes et des Droits Indirects	Jan-1988
	Merchandise imports (cif) from world in U.S.$	IMF	Jan-1980
Germany	Imports of goods in U.S.$	Deutsche Bundesbank	Jan-1951
Italy	Imports of goods in U.S.$	Istituto Nazionale di Statistica	Jan-1993
	Merchandise imports (cif) from world in U.S.$	IMF	Jan-1980
Netherlands	Imports of goods in U.S.$	Centraal Bureau voor de Statistiek	Jan-1996
	Merchandise imports (cif) from world in U.S.$	IMF	Jan-1980
Sweden	Imports of goods in U.S.$	Statistiska Centralbyran	Jan-1975
Switzerland	Imports of goods excluding precious metals in U.S.$	Directorate General of Customs	Jan-1988
	Merchandise imports (cif) from world in U.S.$	IMF	Jan-1980
Canada	Imports of goods in U.S.$	Statistics Canada	Jan-1988
	Merchandise imports (cif) from world in U.S.$	IMF	Jan-1980
Japan	Imports of goods in U.S.$	Ministry of Finance/Japan Tariff Association	Jan-1969
Greece	Imports of goods including oil products SUSP in U.S.$	Hellenic Statistical Authority (ELSTAT)	Jun-2001
	Merchandise imports (cif) from world in U.S.$	IMF	Jan-1980
Portugal	Imports of goods in U.S.$	Instituto Nacional de Estatística	Jan-1993
	Merchandise imports (cif) from world in U.S.$	IMF	Jan-1980
Spain	Imports of goods in U.S.$	Banco de España	Jan-1970
Turkey	Total merchandise imports (cif) in U.S.$	Turkish Statistical Institute	Jan-1997
	Merchandise imports (cif) from world in U.S.$	IMF	Jan-1980
Australia	Imports in U.S.$	Australian Bureau of Statistics	Jan-1988
	Merchandise imports (cif) from world in U.S.$	IMF	Jan-1980
South Africa	Goods imports in U.S.$	South African Revenue Service	Jan-2010
	Merchandise imports (cif) from world in U.S.$	IMF	Jan-1998
	Imports pre-1998 calculated using share of SACU imports	IMF	Jan-1980
Argentina	Goods imports in U.S.$	Instituto Nacional de Estadística y Censos	Jan-1990
	Merchandise imports (cif) from world in U.S.$	IMF	Jan-1980
Brazil	Merchandise imports in U.S.$	Banco Central do Brasil	Jan-1959

Country	Data Description	Source	Start Date
Chile	Merchandise imports (cif) in U.S.$	Banco Central de Chile	Jan-2003
	Merchandise imports (cif) from world in U.S.$	IMF	Jan-1980
Colombia	Imports of goods (cif) in U.S.$	Departamento Administrativo Nacional de Estadísticas	Jan-1957
Costa Rica	Imports (cif) in U.S.$	Banco Central de Costa Rica	Jan-1994
	Merchandise imports (cif) from world in U.S.$	IMF	Jan-1980
Mexico	Imports (fob) in U.S.$	Instituto Nacional de Estadística y Geografía	Jan-1980
Peru	Merchandise imports (fob) in U.S.$	Banco Central de Reserva del Perú	Jan-1980
Venezuela	Merchandise imports in U.S.$	Instituto Nacional de Estadística Venezuela	Jan-1992
	Merchandise imports (cif) from world in U.S.$*	IMF	Jan-1980
Taiwan	Merchandise imports in U.S.$	Ministry of Finance, R.O.C.	Jan-1978
India	Merchandise imports in U.S.$	Ministry of Commerce and Industry	Jan-1968
Indonesia	Merchandise imports in U.S.$	Biro Pusat Statistik	Aug-1980
	Merchandise imports (cif) from world in U.S.$	IMF	Jan-1980
South Korea	Merchandise imports in U.S.$	Korea Customs Service	Jan-1967
Malaysia	Merchandise imports (fob) in U.S.$	Department of Statistics, Malaysia	Jul-1972
Philippines	Merchandise imports (fob) in U.S.$	National Statistics Office	Apr-1983
	Merchandise imports (cif) from world in U.S.$	IMF	Jan-1980
Thailand	Merchandise imports (cif) in U.S.$	Ministry of Commerce	Jan-1991
	Merchandise imports (cif) from world in U.S.$	IMF	Jan-1980
Nigeria	Imports (cif) in U.S.$	National Bureau of Statistics, Nigeria	Jan-2008
	Merchandise imports (cif) from world in U.S.$*	IMF	Jan-1980
Bulgaria	Merchandise imports (fob) in U.S.$	National Statistical Institute	Jan-1995
	Merchandise imports (cif) from world in U.S.$	IMF	Jan-1981
Russia	Imports of goods (fob) in U.S.$	Central Bank of the Russian Federation	Jan-1994
	Merchandise imports (cif) from world in U.S.$	IMF	Jan-1992
China	Merchandise imports (cif) in U.S.$	China Customs	Oct-1983
	Merchandise imports (cif) from world in U.S.$	IMF	Jan-1981
Czech Republic	Merchandise imports (fob) in U.S.$	Czech Statistical Office	Mar-1992
Hungary	Merchandise imports (cif) in U.S.$	Central Statistical Office	Jan-1990
	Merchandise imports (cif) from world in U.S.$*	IMF	Jan-1980
Poland	Total imports (cif) in U.S.$	Central Statistical Office, Poland	Jan-1986
	Merchandise imports (cif) from world in U.S.$	IMF	Jan-1981

Table 14. Country Sources on Merchandise Exports

Country	Data Description	Source	Start Date
United States	Exports of goods (f.a.s.) in U.S.$	Bureau of the Census	Jan-1948
United Kingdom	Exports of goods in U.S.$	Office for National Statistics	Jan-1998
	Merchandise exports to world in U.S.$	IMF	Jan-1980
Austria	Merchandise exports in U.S.$	Statistik Austria	Jan-1970
Belgium	Exports in U.S.$	Banque Nationale de Belgique	Jan-1993
	Exports calculated using share of Bel-Lux exports	IMF	Jan-1980
France	Exports of goods in U.S.$	Dir Génl des Douanes et des Droits Indirects	Jan-1988
	Merchandise exports to world in U.S.$	IMF	Jan-1980
Germany	Exports of goods in U.S.$	Deutsche Bundesbank	Jan-1951
Italy	Exports of goods in U.S.$	Istituto Nazionale di Statistica	Jan-1993
	Merchandise exports to world in U.S.$	IMF	Jan-1980
Netherlands	Exports of goods in U.S.$	Centraal Bureau voor de Statistiek	Jan-1996
	Merchandise exports to world in U.S.$	IMF	Jan-1980
Sweden	Exports of goods in U.S.$	Statistiska Centralbyran	Jan-1975
Switzerland	Exports of goods excluding precious metals in U.S.$	Directorate General of Customs	Jan-1988
	Merchandise exports to world in U.S.$	IMF	Jan-1980
Canada	Exports of goods in U.S.$	Statistics Canada	Jan-1988
	Merchandise exports to world in U.S.$	IMF	Jan-1980
Japan	Exports of goods in U.S.$	Ministry of Finance/Japan Tariff Association	Jan-1957
Greece	Exports of goods including oil products SUSP in U.S.$	Hellenic Statistical Authority (ELSTAT)	Jun-2001
	Merchandise exports to world in U.S.$	IMF	Jan-1980
Portugal	Exports of goods in U.S.$	Instituto Nacional de Estatística	Jan-1993
	Merchandise exports to world in U.S.$	IMF	Jan-1980
Spain	Exports of goods in U.S.$	Banco de España	Jan-1970
Turkey	Total merchandise exports (fob) in U.S.$	Turkish Statistical Institute	Jan-1997
	Merchandise exports to world in U.S.$	IMF	Jan-1980
Australia	Exports in U.S.$	Australian Bureau of Statistics	Jan-1988
	Merchandise exports to world in U.S.$	IMF	Jan-1980
South Africa	Goods exports in U.S.$	South African Revenue Service	Jan-2010
	Merchandise exports to world in U.S.$	IMF	Jan-1998
	Exports pre-1998 calculated using share of SACU exports	IMF	Jan-1980
Argentina	Goods exports in U.S.$	Instituto Nacional de Estadística y Censos	Jan-1990
	Merchandise exports to world in U.S.$	IMF	Jan-1980

Country	Data Description	Source	Start Date
Brazil	Merchandise exports in U.S.$	Banco Central do Brasil	Jan-1954
Chile	Merchandise exports (fob) in U.S.$	Banco Central de Chile	Jan-1987
	Merchandise exports to world in U.S.$	IMF	Jan-1980
Colombia	Exports of goods (fob) in U.S.$	Departamento Administrativo Nacional de Estadísticas	Jan-1958
Costa Rica	Exports (fob) in U.S.$	Banco Central de Costa Rica	Jan-1994
	Merchandise exports to world in U.S.$	IMF	Jan-1980
Mexico	Exports (fob) in U.S.$	Instituto Nacional de Estadística y Geografía	Jan-1980
Peru	Merchandise exports (fob) in U.S.$	Banco Central de Reserva del Perú	Jan-1980
Venezuela	Merchandise exports in U.S.$	Instituto Nacional de Estadística Venezuela	Jan-1992
	Merchandise exports to world in U.S.$*	IMF	Jan-1980
Taiwan	Merchandise exports in U.S.$	Ministry of Finance, R.O.C.	Jan-1978
India	Merchandise exports in U.S.$	Ministry of Commerce and Industry	Jan-1968
Indonesia	Merchandise exports in U.S.$	Biro Pusat Statistik	Jul-1979
South Korea	Merchandise exports in U.S.$	Korea Customs Service	Jan-1967
Malaysia	Merchandise exports (fob) in U.S.$	Department of Statistics, Malaysia	Jul-1972
Philippines	Merchandise exports (fob) in U.S.$	National Statistics Office	Apr-1983
	Merchandise exports to world in U.S.$	IMF	Jan-1980
Thailand	Merchandise exports (fob) in U.S.$	Ministry of Commerce	Jan-1991
	Merchandise exports to world in U.S.$	IMF	Jan-1980
Nigeria	Exports (fob) in U.S.$	National Bureau of Statistics, Nigeria	Jan-2008
	Merchandise exports to world in U.S.$*	IMF	Jan-1980
Bulgaria	Merchandise exports (fob) in U.S.$	National Statistical Institute	Jan-1995
	Merchandise exports to world in U.S.$	IMF	Jan-1981
Russia	Exports of goods (fob) in U.S.$	Central Bank of the Russian Federation	Jan-1994
	Merchandise exports to world in U.S.$	IMF	Jan-1992
China	Merchandise exports (fob) in U.S.$	China Customs	Oct-1983
	Merchandise exports to world in U.S.$	IMF	Jan-1981
Czech Republic	Merchandise exports (fob) in U.S.$	Czech Statistical Office	Mar-1992
Hungary	Merchandise exports (fob) in U.S.$	Central Statistical Office	Jan-1990
	Merchandise exports to world in U.S.$	IMF	Jan-1980
Poland	Total exports (fob) in U.S.$	Central Statistical Office, Poland	Jan-1986
	Merchandise exports to world in U.S.$	IMF	Jan-1981

Table 15. Country Sources on Nominal Exchange Rates

Country	Data Description	Source	Start Date
United States			
United Kingdom	US$/pound (average)	Federal Reserve Board	Jan-1947
Austria	US$/euro (average)	Federal Reserve Board	Jan-1999
	US$/schilling (average)	Federal Reserve Board	Jan-1957
Belgium	US$/euro (average)	Federal Reserve Board	Jan-1999
	US$/franc (average)	Federal Reserve Board	Jan-1947
France	US$/euro (average)	Federal Reserve Board	Jan-1999
	US$/franc (average)	Federal Reserve Board	Jan-1957
Germany	US$/euro (average)	Federal Reserve Board	Jan-1999
	US$/Deutsche Mark (average)	Federal Reserve Board	Jan-1957
Italy	US$/euro (average)	Federal Reserve Board	Jan-1999
	US$/lira (average)	Federal Reserve Board	Jan-1957
Netherlands	US$/euro (average)	Federal Reserve Board	Jan-1999
	US$/guilder (average)	Federal Reserve Board	Jan-1957
Sweden	US$/krona (average)	Wall Street Journal	Jan-1957
Switzerland	US$/franc (average)	Wall Street Journal	Jan-1957
Canada	US$/Canadian$ (average)	Wall Street Journal	Jan-1957
Japan	US$/yen (average)	Wall Street Journal	Jan-1957
Greece	US$/euro (average)*	Federal Reserve Board	Jan-1999
	US$/drachma (average)	Federal Reserve Board	Jan-1957
Portugal	US$/euro (average)	Federal Reserve Board	Jan-1999
	US$/escudo (average)	Federal Reserve Board	Jan-1957
Spain	US$/euro (average)	Federal Reserve Board	Jan-1999
	US$/peseta (average)	Federal Reserve Board	Jan-1957
Turkey	US$/lira (average)	Wall Street Journal	Dec-1994
Australia	US$/Australian$ (average)	Wall Street Journal	Jan-1957
South Africa	US$/rand (average)	Wall Street Journal	Jan-1957
Argentina	US$/peso (average)	Banco Central de la República Argentina	Apr-1991
Brazil	US$/real (average)	Federal Reserve Board	Jan-1995
	US$/real (average)	IMF	Jan-1990
Chile	US$/peso (average)	Wall Street Journal	Apr-1957
Colombia	US$/peso (average)	Wall Street Journal	Jan-1957
Costa Rica	US$/colon (average)	IMF	Jan-1957
Mexico	US$/new peso (average)	Wall Street Journal	Jan-1957
Peru	US$/new sol (average)	Banco Central de Reserva del Perú	Jan-1992
	US$/new sol (average)	IMF	Jan-1990
Venezuela	US$/bolívar (average)	Wall Street Journal	Jan-1957
Taiwan	US$/new Taiwan$ (average)	Central Bank of China	Jan-1979
India	US$/rupee (average)	Wall Street Journal	Jan-1957
Indonesia	US$/rupiah (average)	Wall Street Journal	Jan-1967

Country	Data Description	Source	Start Date
South Korea	US$/won (average)	Wall Street Journal	Jan-1957
Malaysia	US$/ringgit (average)	Wall Street Journal	Jan-1957
Philippines	US$/peso (average)	Wall Street Journal	Jan-1957
Thailand	US$/baht (average)	Wall Street Journal	Jan-1970
Nigeria	US$/naira (average)	Financial Times	Jan-1970
Bulgaria	US$/lev (average)	Bulgarian National Bank	Jan-1991
Russia	US$/ruble (average)	Wall Street Journal	Jun-1992
China	US$/yuan (average)	Wall Street Journal	Jan-1957
Czech Republic	US$/koruna (average)	Czech National Bank	Jan-1991
Hungary	US$/forint (average)	National Bank of Hungary	Jan-1968
Poland	US$/zloty (average)	National Bank of Poland	Jan-1957

Note: * Begin using euro data when Greece joined euro area in 2001

Table 16. Country Sources on Official/Policy Rates

Country	Data Description	Source	Start Date
United States	Fed funds target rate (EOP, %)	Federal Reserve Board	Sep-1982
	Federal funds effective rate (avg., %)	Federal Reserve Board	Jul-1954
United Kingdom	Bank of England official bank rate (EOP, %)	Bank of England	Jan-1921
Austria	ECB main refinancing rate (EOP, %)	European Central Bank	Jan-1999
	National bank discount rate (EOP, %)	IMF	Jan-1957
Belgium	ECB main refinancing rate (EOP, %)	European Central Bank	Jan-1999
	Discount rate (EOP, %)	IMF	Jan-1957
France	ECB main refinancing rate (EOP, %)	European Central Bank	Jan-1999
	Time, savings deposit, or short-term cash note rate (avg, %)	IMF	Jan-1966
Germany	ECB main refinancing rate (EOP, %)	European Central Bank	Jan-1999
	Discount rate (EOP, %)	IMF	Jan-1957
Italy	ECB main refinancing rate (EOP, %)	European Central Bank	Jan-1999
	Bank of Italy discount rate (EOP, %)	IMF	Jan-1964
Netherlands	ECB main refinancing rate (EOP, %)	European Central Bank	Jan-1999
	Money market rate on bankers' call loans (avg, %)*	IMF	Jan-1960
	Discount rate (EOP, %)	IMF	Jan-1964
Sweden	Riksbank repo rate (EOP, %)	Sveriges Riksbank	Apr-1987
Switzerland	SNB target range: upper limit (EOP, %)	Swiss National Bank	Jan-2000
	Discount rate (EOP, %)	IMF	Jan-1964
Canada	Target overnight money market financing rate (EOP, %)	Bank of Canada	Dec-1992
	Money market overnight financing rate (EOP, %)	IMF	Jan-1975
Japan	Target overnight call rate: Uncollateralized (EOP, %)	Bank of Japan	Sep-1998
Greece	ECB main refinancing rate (EOP, %)	European Central Bank	Jan-1999
	Bank of Greece bank rate (EOP, %)	IMF	Jan-1957
Portugal	ECB main refinancing rate (EOP, %)	European Central Bank	Jan-1999
	Discount rate (EOP, %)	IMF	Jan-1957
Spain	ECB main refinancing rate (EOP, %)	European Central Bank	Jan-1999
	Bank of Spain rate (EOP, %)	IMF	Jan-1964
Turkey	1-week repo rate (EOP, %)	Central Bank of the Republic of Turkey	May-2010
	Average overnight interest rate (average, % per annum)	Central Bank of the Republic of Turkey	Jan-1990
Australia	Official cash rate (EOP, %)	Reserve Bank of Australia	Jun-1959
South Africa	Repurchase rate (EOP, %)	South African Reserve Bank	Nov-1999
	Discount rate (EOP, %)	IMF	Jan-1957
Argentina	Reverse repo rate: 7 day (avg., %)	Banco Central de la República Argentina	Jun-2004
	Baibor: 1-day interbank offered rate in pesos (EOP, % per annum)	Banco Central de la República Argentina	Apr-1997
Brazil	Selic - target rate (EOP, %)	Banco Central do Brasil	Jan-1998
	Selic overnight rate (avg., % per annum)	IMF	Jan-1964

Country	Data Description	Source	Start Date
Chile	Monetary policy rate (EOP, %)	Banco Central de Chile	Jan-1986
Colombia	BDLR minimum liquidity expansion rate (EOP, %)	Banco de la República	Jan-2000
	Intervention rate (EOP, %)	Banco de la República	Apr-1995
Costa Rica	Monetary policy rate (EOP, %)	Banco Central de Costa Rica	Mar-2006
	Basic borrowing rate (EOP, %)	Banco Central de Costa Rica	Jan-1982
Mexico	Target rate (EOP, %)	Banco de México	Jan-2008
	Bank paper funding rate (weighted avg.) (EOP, %)	Banco de México	Nov-1998
Peru	Reference rate (EOP, %)	Banco Central de Reserva del Perú	Sep-2003
	Discount rate (EOP, %)	IMF	Jan-1957
Venezuela	Commercial bank 30-day deposit rate (avg., %)	Banco Central de Venezuela	Aug-1996
	Discount rate (EOP, %)	IMF	Jan-1964
Taiwan	Central Bank of China rediscount rate (EOP, % per annum)	Central Bank of China	Jul-1961
India	Repo rate (EOP, % per annum)	Reserve Bank of India	Mar-2000
	Bank rate (EOP, %)	IMF	Jan-1968
Indonesia	Bank Indonesia rate (EOP, %)	Bank Indonesia	Jan-1990
South Korea	Bank of Korea base rate (EOP, % per annum)	Bank of Korea	May-1999
	Direct interbank transactions call rate (avg., % per annum)	Bank of Korea	Jan-1991
Malaysia	Overnight policy rate (%, EOP)	Bank Negara Malaysia	Apr-2004
	Overnight interbank rate (EOP, % per annum)	Bank Negara Malaysia	Jan-1997
Philippines	Overnight reverse repo rate (EOP, % per annum)	Central Bank of the Philippines	Jan-2005
	Overnight reverse repo rate (avg., % per annum)	Central Bank of the Philippines	Jan-2000
	Central bank rediscount rate (avg., % per annum)	Central Bank of the Philippines	Jan-1964
Thailand	Policy target rate (EOP, %)	Bank of Thailand	May-2000
	Bank rate (EOP, % pa)	Bank of Thailand	Jan-1978
Nigeria	Monetary policy rate (EOP, % per annum)	Central Bank of Nigeria	Dec-2005
	Discount rate (EOP, %)	IMF	Jan-1964
Bulgaria	BNB base rate (EOP, % per annum)	Bulgarian National Bank	Feb-1991
Russia	Refinancing rate (EOP, %)	Central Bank of the Russian Federation	Jan-1991
China	Prime lending rate (EOP, % per annum)	China Statistical Information Center	Sep-1972
Czech Republic	Discount rate (EOP, %)	Czech National Bank	Jan-1993
Hungary	Base rate (EOP, %)	National Bank of Hungary	Oct-1990
	National Bank of Hungary discount rate (EOP, %)	IMF	Jan-1985
Poland	Reference rate (EOP, % per annum)	National Bank of Poland	Feb-1998

Note: * Growth rate used to fill in series between 1993 and 1999. ^ Series ends in December 1993. ~ Begin using ECB data when Greece joined euro area in 2001.

Table 17. Country Sources on Long-Term Bond Yields

Country	Data Description	Source	Start Date
United States	10-year Treasury bond yield at constant maturity (avg, %)	U.S. Treasury	Apr-1953
United Kingdom	Government bonds, 10-year nominal par yield (avg, %)	Bank of England	Jan-1957
Austria	10-year government bond yield (avg, %)	Oesterreichische Nationalbank	Jan-1985
Belgium	10-year government bond yield (avg, %)	Financial Times	Jan-1980
France	10-year benchmark government bond yield (avg, %)	Banque de France	Jan-1957
Germany	Fed govt securities w/ residual maturities of b/w 9-10 yrs (avg, %)	Deutsche Bundesbank	Jan-1957
Italy	Government bond yield: 10-year (avg, %)	Banca d'Italia	Jan-1958
Netherlands	10-year government bond yield (avg, %)	De Nederlandsche Bank	May-1986
Sweden	10-year government bond yield (avg, %)	Sveriges Riksbank	Jan-1987
Switzerland	10-year government bond yield (avg, %)	Swiss National Bank	Jan-1998
Canada	10-year benchmark bond yield (avg, %)	Bank of Canada	Jan-1989
Japan	10-year benchmark government bond yield (avg, %)	Ministry of Finance Japan	Jul-1986
Greece	10-year government bond yield (avg, %)	Bank of Greece	Sep-1992
Portugal	10-year government bond yield (avg, %)	Financial Times	Oct-2001
Spain	10-year government bond yield (avg, %)	Banco de España	Jan-1980
Turkey	10-year government bond yield (avg, %)	Reuters	Jan-2010
	5-year government bond yield (avg, %)	Reuters	Dec-2006
Australia	10-year Treasury bond yield (avg, %)	Reserve Bank of Australia	Jul-1969
South Africa	Government bond yields: 3 to 5 years (avg, %)	South African Reserve Bank	Jan-1985
Argentina			
Brazil	10-year government bond yield (avg,%)	Reuters	Nov-2006
Chile	10-year BCP government bond (avg, %)	Asociación de Bancos e Instituciones Financieras	Jan-2007
	Interest rates on BCCH instruments: BCP: 10-year (avg, %)	Banco Central de Chile	Jul-2004
Colombia	10-year government bond yield (avg, %)	Reuters	Sep-2002
Costa Rica			
Mexico	10-year fixed rate bonds (avg, %)	Banco de México	Jul-2001
Peru	10-year sovereign bond yield (avg, %)	Ministerio de Economía y Finanzas	Jan-2012
	10-year government bond (avg, %)*	Bloomberg	Mar-2006
Venezuela	10-year government bond yield (avg, %)	Reuters	Jun-2006
Taiwan	10-year government bond yield (avg, %)	Reuters	Jan-2000
	Government bond yield: 10-year (avg, %)	Central Bank of China	Jan-1995
India	10-year government bond yield (EOP, %)	Reserve Bank of India	May-1996
Indonesia			
South Korea	Treasury bond yields: 10-year (avg, %)	Bank of Korea	Oct-2000
Malaysia	Government bond yield: 10-year (avg, %)	Bank Negara Malaysia	Jan-1996

Country	Data Description	Source	Start Date
Philippines	10-year Treasury bond rate (avg, %)	Central Bank of the Philippines	Mar-2003
	10-year government bond yield (avg, %)	BIS	May-1998
Thailand	Government bond yield: 10-year (avg, %)	Bank of Thailand	Jan-2001
	10-year government bond yield (avg, %)	BIS	Oct-1999
Nigeria	10-year Treasury bond yield (avg, %)	Central Bank of Nigeria	Jul-2007
Bulgaria	10-year government bond yield: for LT convergence purposes (avg, %)	Bulgarian National Bank	Jan-2003
	5-year government bond yield: primary market (avg, %)	Bulgarian National Bank	Oct-2000
Russia	GKO-OFZ market rates: long-term rate: 365 days or more (avg, %)	Central Bank of the Russian Federation	Jan-2004
China	5-year government bond yield (avg, %)	Reuters	Jun-2002
Czech Republic	10-year government bond yield (avg, %)	Reuters	May-2000
Hungary	Yield on 10-year government debt securities (EOP, %)	National Bank of Hungary	Jan-1999
Poland	Long-term government bond yield (avg, %)	European Central Bank	Jan-2001
	10-year government bond yield (avg, %)*	BIS	May-1999

Note: * Data linearly interpolated to fill gaps.