A Data Appendix: Data Source & Data treatment

A.1 Data sources

This version of the GVAR dataset revises and extends up to 2009Q4 the dataset used in Pesaran, Schuermann, and Smith (2009b) (PSS hereinafter) which covers the period 1979Q1-2006Q4. Data were collected in June 2010 and we refer to the updated dataset as the "2009 Vintage".[34]

A.1.1 Real GDP

In order to compile the 2009 Vintage Real GDP, we used the International Financial Statistics (IFS) database and Inter-American Development Bank Latin Macro Watch Database (IDB LMW hereinafter).[35] Countries are divided into three groups. First, those for which quarterly and seasonally adjusted data are available. Second, those for which quarterly data are available, but they are not seasonally adjusted. Third, those for which only annual data are available.

For the first group, we used the IFS 99BVRZF series (GDP VOL) for Australia, Canada, France, Germany, Italy, Japan, Netherlands, New Zealand, South Africa, Spain, Switzerland, United Kingdom, and United States. We extrapolated the PSS data set using quarterly growth rates of the IFS series from 2004Q1 to 2009Q4.

For the second group, we used the IFS 99BVPZF series (GDP VOL) for Austria, Belgium, Finland, India, Indonesia, Korea, Malaysia, Norway, Singapore, Sweden, Thailand, and Turkey. These series were seasonally adjusted using Eviews, applying the National Bureau's X12 program.[36] As in the first group, the dataset was extended with forward extrapolation of PSS data, using quarterly growth rates of the adjusted IFS series from 2004Q1 to 2009Q4.

For Saudi Arabia the annual seasonally unadjusted IFS BVPZF GDP VOL series was interpolated to obtain the quarterly values.[37] This series was then treated as the quarterly seasonally unadjusted data. For Philippines, the quarterly rate of change of a seasonal adjusted real GDP index (Source: Bloomberg. Ticker: PHNAGDPS Index) was used to extrapolate forward PSS data from 2004Q1 to 2009Q4.

For Latin American countries, namely for Argentina, Brazil, Chile, Mexico, and Peru, IDB LMW data were used (Series: GDP, Real Index s.a.) and the series were updated in the same manner as described for quarterly seasonally adjusted data.

In PSS Chinese quarterly GDP was interpolated from IFS annual data, as for Saudi Arabia. Given the increasing importance of China in the world economy, the construction of a quarterly real GDP index from national sources may provide some value added. As no institution publishes a quarterly real GDP Index for China, it has to be compiled from a nominal GDP series. The National Bureau of Statistics (NBS) of China releases quarterly nominal GDP series without seasonal adjustments.[38] Accordingly, we constructed a quarterly real GDP index for China as follows. First, we seasonally adjusted (with the procedure described below in Section A.2) the nominal GDP from

[34] The Pesaran, Schuermann, and Smith (2009b) dataset is, in turn, an extension of the dataset used in Pesaran, Schuermann, and Smith (2009a) which covers the period 1979Q1-2005Q4.

[35] For further information see http://www.iadb.org/Research/LatinMacroWatch/lmw.cfm

[36] Seasonal adjustment was performed on the log difference of GDP using the additive option. Then, using the first observation of the un-adjusted log GDP series, we accumulate the adjusted log-changes. Finally, we obtained seasonally adjusted level series by taking the exponential of the log-adjusted series.

[37] The interpolation procedure is described in Supplement A of Dees, di Mauro, Pesaran, and Smith (2007).

[38] The NBS series can be assessed from Datastream, ticker: CH GDP (DS CALCULATED) CURN.

NBS. Then, we used the following formula

$$\begin{aligned} \log(RGDP_1) &= \log\left(\frac{GDP_1}{CPI_1}\right) && \text{for } t = 1 \\ \log(RGDP_t) &= \log(RGDP_{t-1}) + \log\left(\frac{GDP_t}{GDP_{t-1}}\right) - \log\left(\frac{CPI_t}{CPI_{t-1}}\right) && \text{for } t \geq 2 \end{aligned}$$

where CPI is defined in Section A.1.2. The series display noisy features in the first part of the sample and starts to show more plausible patterns from 1994Q1 onwards, providing a natural cut-off date. Therefore, we used the new series from 1994Q1 to 2009Q4 and we extrapolated backward to 1979Q1 using the quarterly rate of change of the China GDP series in PSS.[39]

A.1.2 Consumer Price Index

In order to create the 2009 Vintage CPI, IFS CPI 64zf (level) series were collected for all countries with the exception of China. For countries which do not need seasonal adjustment, the quarterly growth rates of these series were used to extrapolate forward the PSS data from 2001Q1 to 2009Q4. Consistently with the procedure in Section A.2.1, the CPI series for the following countries were seasonally adjusted: Austria, Belgium, Canada, Chile, Finland, France, Germany, India, Italy, Japan, Korea, Mexico, Netherlands, New Zealand, South Africa, Spain, Sweden, Switzerland, Thailand, United Kingdom, and United States.[40] The quarterly rate of change of the adjusted IFS series was used to extrapolate forward PSS data from 2000Q1 to 2009Q4, in order to obtain the 2009 CPI Vintage.

For China, Datastream data (Source: National Bureau of Statistics. Ticker: CHCONPR%F. YoY rate of change, NSA) was used. The Datastream rate of change was used to create a series in level which was then seasonally adjusted using Eviews, applying the National Bureau's X12 program.[41] The 2009 Vintage CPI for China was obtained by forward extrapolation of PSS data set using the rate of change of the adjusted Datastream series from 2000Q1 to 2009Q4.

A.1.3 Equity Price Index

Updated equity price series are from Bloomberg, while the PSS data set uses Datastream. We took a quarterly average of the MSCI Country Index in local currency for each of the following countries: Argentina, Australia, Austria, Belgium, Canada, Chile, Finland, France, Germany, India, Italy, Japan, Korea, Netherlands, Norway, New Zealand, Philippines, South Africa, Spain, Sweden, Switzerland, Thailand, United Kingdom, and United States.[42] For Malaysia, as the MSCI Index is not available, we took a quarterly average of the local composite index from Datastream (Ticker: KLPCOMP. Local currency). The quarterly average was computed based on close price of the last Wednesday of each month. That is, we used the last Wednesday for each month, then we took a simple average of these Wednesday prices for the first three months of the year to obtain

[39] Notice that the China GDP series is subject to major data revisions. For this reason, we updated the nominal China GDP series in April 2011 (after the most recent data revision) and used the updated series to construct our real GDP measure.

[40] Seasonal adjustment was performed with Eviews, using X12 program with the additive option. See also Section A.2 below.

[41] We used the same procedure here as for real GDP.

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

our first quarterly price index. Then we took average of the Wednesday values for the next three months to get the second quarterly price index and so on. Finally, the 2009 Vintage Equity Price Index was obtained by forward extrapolation of PSS data using the rate of change of the new series from 2004Q1 to 2009Q4.

A.1.4 Exchange Rates

Exchange rates series are from Bloomberg. We took a quarterly average of the nominal bilateral exchange rates *vis-a-vis* the US dollar (units of foreign currency per US dollar) for each country.[43] The quarterly average was computed based on close value of the last Wednesday of each month, as described for Equity Price Index. The 2009 Vintage Exchange Rate was obtained by forward extrapolation of the PSS data set using the rate of change of the new series from 2004Q1 to 2009Q4.

Notice that the exchange rate series of the euro economies refer to the pre-euro exchange rate (i.e. national currency per dollar). To denominate them in euro, we took the quarterly average of the euro exchange rate *vis-a-vis* the US dollar (Source: Bloomberg. Ticker: EUR Curncy). We then used the 1999Q1 value of this series as the base and extrapolate it backward and forward using the rate of change of the series denominated in national currencies.

A.1.5 Short-Term Interest Rates

IFS is the main source of data for short term interest rates. Consistently with PSS, the IFS Deposit Rate (60Lzf series) is used for Argentina, Chile, China, and Turkey. The IFS Discount Rate (60zf series) is used for New Zealand and Peru. The IFS Treasury Bill Rate (60Czf series) is used for Canada, Malaysia, Mexico, Philippines, South Africa, Sweden, UK and US. The IFS Money Market Rate (60Bzf series) is used for Australia, Brazil, Finland, Germany, Indonesia, Italy, Japan, Korea, Norway, Singapore, Spain, Switzerland, and Thailand. For Austria, Belgium, France, and the Netherlands no data is available for any of these series from 1999Q1 when the euro was introduced. We used the country-specific IFS Money Market Rate (60Bzf series) from 1979Q1 to 1998Q4 and completed the series to 2009Q4 using the corresponding data (60Bzf series) for Germany as the representative euro area interest rate.

For India, quarterly averages of daily Bloomberg data (India Treasury Bill 3-Month Yield.[44] Ticker: GINTB3MO Index) are constructed in the same way as the quarterly exchange rate series. When IFS data was not available, gaps were filled using Bloomberg data: Norway in 2007Q1 and 2009Q4 (Ticker: NKDRC CMPN Curncy), Philippines from 2008Q4 to 2009Q1 (Ticker: PH91AVG Index), Sweden from 2009Q2 to 2009Q4 (Ticker: GSGT3M Index). The PSS data series are extended with these series from 2004Q1 to 2009Q4.

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

[44] This is an indicative Treasury Bill Rate polled daily by Bloomberg from various sources. The constructed series is not exactly equal to the original DdPS series; however, they are very close (Corr: 99.63%).

A.1.6 Long-Term Interest Rates

The IFS Government Bond Yield (61zf series) is used to extend data for all 18 countries for which long term interest rate data is available, namely Australia, Austria, Belgium, Canada, France, Germany, Italy, Japan, Korea, Netherlands, New Zealand, Norway, South Africa, Spain, Sweden, Switzerland, United Kingdom, and United States. The PSS data series are extended with these series from 2004Q1 to 2009Q4.

A.1.7 Oil Price Index

For the Oil Price we used a Brent crude oil price from Bloomberg (Series: Current pipeline export quality Brent blend. Ticker: CO1 Comdty). To construct the quarterly series, we took average of daily close prices for all trading days within the quarter. The quarterly rate of change of this new series was used to extrapolate forward the PSS data set from 2004Q1 to 2009Q4.

A.1.8 PPP-GDP Weights

The main source for the country specific GDP weights is the World Development Indicator database of the World Bank. The GDP in Purchasing Power Parity terms in current international dollars (Ticker: NY.GDP.MKTP.PP.CD) was downloaded for all countries from 2006 to 2008.

A.1.9 Trade Matrices

To construct the trade matrices, we use the IMF Direction of Trade statistics. For all the countries considered we downloaded the matrix of Exports and Imports (c.i.f.) with annual frequency. The data for 2009 Exports and Imports is appended to the original PSS dataset. We use trade matrices for 1979–2009 for estimation in our paper.

A.2 Seasonality

A.2.1 Assessing the Joint Significance of Seasonal Effects

To assess the joint significance of the seasonal components for real output and inflation series we used the following procedure:

1. Let $S1$; $S2$; $S3$ and $S4$ be the usual seasonal dummies, such that Si, $i = 1, 2, 3, 4$, takes the value of 1 in the i^{th} quarter and zero in the other three quarters.
2. Construct $S14 = S1 - S4$, $S24 = S2 - S4$, $S34 = S3 - S4$.
3. Run a regression of Δy (where the lower case stands for the natural logarithm of the corresponding variable) on an intercept and $S14$; $S24$; $S34$: Denote the OLS estimates of $S14$; $S24$ and $S34$ by $a1$; $a2$ and $a3$.
4. Asses the joint significance of the seasonal components by testing the null hypothesis that $a1 = a2 = a3 = 0$ using the F-statistic.
5. In cases where the null hypothesis is rejected at the 10% level, seasonal adjustment was performed on the log-difference of the original series using the X-12 procedure as described below.

A.2.2 Method of Seasonality Adjustment

To seasonally adjust $log(GDP)$ series (assumed to be an I(1) process), we first seasonally adjust $\Delta log(GDP)$ using the X-12 quarterly seasonal adjustment method in Eviews with the additive option, to obtain $\Delta \log(GDP)_{SA}$. Then use the first observation of raw series $log(GDP)$ (levels, not seasonally adjusted) and the seasonally adjusted series of the changes, $\Delta\log(GDP)_{SA}$, to obtain the seasonally adjusted level series $log(GDP)_{SA}$.

Consider now the updating of seasonally adjusted series, and suppose we have seasonally adjusted series from 1979Q1 to 2006Q4, and we wish to update the series to 2009Q4. We download the raw series, for example from 2000Q1 to 2009Q4, and seasonally adjust with the procedure described above. We then use the seasonally adjusted new series in growth rates, to update the original seasonally adjusted series. To avoid possible abrupt changes in the updated series, we also overwrite two years of the original series for all variables except for inflation. In the case of inflation we overwrite six years of original series due to major data revisions in the inflation series. Specifically, we update all series (except inflation) from 2004Q1 to 2009Q4, and inflation series from 2000Q1 to 2009Q4.

B Technical Appendix: GVAR Solution and Bootstrapping

B.1 Solution of the GVAR with a Given Weight Matrix

We present detailed derivation of the solution of the GVAR with a given weight matrix in this appendix, and show that the estimated country specific models (from the first step) can be stacked and solved for any given trade weights, which we denote by $\mathbf{W}_i^0$. Let us also denote $\mathbf{W}_{NT}$ to be the set of all weight matrices, which we use to estimate the country specific models in the first step,

$$\mathbf{W}_{NT} = \{\mathbf{W}_{it}, i = 0, 1, ..., N;\ \ t = 1, 2, ..., T\}.$$

Then, the country-specific estimates of the VARX* in equation (4) can be denoted by $\hat{\mathbf{\Phi}}_i(\mathbf{W}_{NT})$, $\hat{\mathbf{\Lambda}}_{i0}(\mathbf{W}_{NT})$, and $\hat{\mathbf{\Lambda}}_{i1}(\mathbf{W}_{NT})$ and the associated residuals by $\hat{\mathbf{u}}_{it}(\mathbf{W}_{NT})$. Also, let $\hat{\boldsymbol{\theta}}_i(\mathbf{W}_{NT}) = (Vec(\hat{\mathbf{\Phi}}_i(\mathbf{W}_{NT}))', Vec(\hat{\mathbf{\Lambda}}_{i0}(\mathbf{W}_{NT}))', Vec(\hat{\mathbf{\Lambda}}_{i1}(\mathbf{W}_{NT}))')'$, and use the $k_i \times k$ selection matrix $\mathbf{S}_i$ such that

$$\mathbf{x}_{it} = \mathbf{S}_i\mathbf{x}_t.$$

Then

$$\begin{aligned}
\mathbf{S}_i\mathbf{x}_t &= \hat{\mathbf{\Phi}}_i(\mathbf{W}_{NT})\mathbf{S}_i\mathbf{x}_{t-1} + \hat{\mathbf{\Lambda}}_{i0}(\mathbf{W}_{NT})\mathbf{W}_i^0\mathbf{x}_t + \hat{\mathbf{\Lambda}}_{i1}(\mathbf{W}_{NT})\mathbf{W}_i^0\mathbf{x}_{t-1} + \tilde{\mathbf{u}}_{it}, \\
\left[\mathbf{S}_i - \hat{\mathbf{\Lambda}}_{i0}(\mathbf{W}_{NT})\mathbf{W}_i^0\right]\mathbf{x}_t &= \left[\hat{\mathbf{\Phi}}_i(\mathbf{W}_{NT})\mathbf{S}_i + \hat{\mathbf{\Lambda}}_{i1}(\mathbf{W}_{NT})\mathbf{W}_i^0\right]\mathbf{x}_{t-1} + \tilde{\mathbf{u}}_{it} \\
\mathbf{G}_i(\hat{\boldsymbol{\theta}}_i(\mathbf{W}_{NT}))\mathbf{x}_t &= \mathbf{H}_i(\hat{\boldsymbol{\theta}}_i(\mathbf{W}_{NT}))\mathbf{x}_{t-1} + \tilde{\mathbf{u}}_{it}, \qquad \text{(B.1)}
\end{aligned}$$

where

$$\begin{aligned}
\mathbf{G}_i(\hat{\boldsymbol{\theta}}_i(\mathbf{W}_{NT}), \mathbf{W}_i^0) &= \mathbf{S}_i - \hat{\mathbf{\Lambda}}_{i0}(\mathbf{W}_{NT})\mathbf{W}_i^0 \qquad \text{(B.2)} \\
\mathbf{H}_i(\hat{\boldsymbol{\theta}}_i(\mathbf{W}_{NT}), \mathbf{W}_i^0) &= \hat{\mathbf{\Phi}}_i(\mathbf{W}_{NT})\mathbf{S}_i + \hat{\mathbf{\Lambda}}_{i1}(\mathbf{W}_{NT})\mathbf{W}_i^0 \qquad \text{(B.3)}
\end{aligned}$$

Note that $\tilde{\mathbf{u}}_{it}$ will NOT be the same as $\hat{\mathbf{u}}_{it}(\mathbf{W}_{NT})$, unless at time t we have $\mathbf{W}_{i,\tau(t-1)} = \mathbf{W}_i^0$, which can only occur when the weights are fixed. Stacking (B.1) for $i = 0, 1, ..., N$ we have

$$\mathbf{G}\left(\hat{\boldsymbol{\theta}}(\mathbf{W}_{NT}), \mathbf{W}^0\right)\mathbf{x}_t = \mathbf{H}\left(\hat{\boldsymbol{\theta}}(\mathbf{W}_{NT}), \mathbf{W}^0\right)\mathbf{x}_{t-1} + \tilde{\mathbf{u}}_t,$$

where

$$\mathbf{G}\left(\hat{\boldsymbol{\theta}}(\mathbf{W}_{NT}),\mathbf{W}^0\right) = (\mathbf{G}_0'(\hat{\boldsymbol{\theta}}_0(\mathbf{W}_{NT}),\mathbf{W}_0^0),\mathbf{G}_1'(\hat{\boldsymbol{\theta}}_1(\mathbf{W}_{NT},\mathbf{W}_1^0)),...,\mathbf{G}_N'(\hat{\boldsymbol{\theta}}_N(\mathbf{W}_{NT},\mathbf{W}_N^0)))',$$
$$\mathbf{H}\left(\hat{\boldsymbol{\theta}}(\mathbf{W}_{NT}),\mathbf{W}^0\right) = (\mathbf{H}_0'(\hat{\boldsymbol{\theta}}_0(\mathbf{W}_{NT}),\mathbf{W}_0^0),\mathbf{H}_1'(\hat{\boldsymbol{\theta}}_1(\mathbf{W}_{NT}),\mathbf{W}_1^0),...,\mathbf{H}_N'(\hat{\boldsymbol{\theta}}_N(\mathbf{W}_{NT},\mathbf{W}_N^0))))',$$

$\hat{\boldsymbol{\theta}}(\mathbf{W}_{NT}) = (\hat{\boldsymbol{\theta}}_0'(\mathbf{W}_{NT}),\hat{\boldsymbol{\theta}}_1'(\mathbf{W}_{NT}),...,\hat{\boldsymbol{\theta}}_N'(\mathbf{W}_{NT}))'$, and $\mathbf{W}^0 = (\mathbf{W}_0^0,\mathbf{W}_1^0,...,\mathbf{W}_N^0)$.

Therefore,

$$\mathbf{x}_t = \mathcal{F}\left(\hat{\boldsymbol{\theta}}(\mathbf{W}_{NT}),\mathbf{W}^0\right)\mathbf{x}_{t-1} + \mathbf{G}^{-1}\left(\hat{\boldsymbol{\theta}}(\mathbf{W}_{NT}),\mathbf{W}^0\right)\tilde{\mathbf{u}}_t, \tag{B.4}$$

where

$$\mathcal{F}\left(\hat{\boldsymbol{\theta}}(\mathbf{W}_{NT}),\mathbf{W}^0\right) = \mathbf{G}^{-1}\left(\hat{\boldsymbol{\theta}}(\mathbf{W}_{NT}),\mathbf{W}^0\right)\mathbf{H}\left(\hat{\boldsymbol{\theta}}(\mathbf{W}_{NT}),\mathbf{W}^0\right). \tag{B.5}$$

If we abstract from parameter uncertainty and take the value of $\hat{\boldsymbol{\theta}}(\mathbf{W}_{NT})$ as given and "true", then n-step ahead forecasts are given by

$$E\left(\mathbf{x}_{t+n}\left|\mathfrak{I}_{t-1}\right.\right) = \left[\mathcal{F}\left(\hat{\boldsymbol{\theta}}(\mathbf{W}_{NT}),\mathbf{W}^0\right)\right]^{n+1}\mathbf{x}_{t-1}.$$

Similarly, the n-step ahead generalized impulse response of the effect of a unit shock to $\xi_t = \mathbf{a}'\mathbf{u}_t$ on the composite variable $q_t = \mathbf{b}'\mathbf{x}_t$, where $\mathbf{a}$ and $\mathbf{b}$ are $k \times 1$ selection vectors, is given by

$$g_q(n,\sigma_\xi) = \frac{\mathbf{b}'\left[\mathcal{F}\left(\hat{\boldsymbol{\theta}}(\mathbf{W}_{NT}),\mathbf{W}^0\right)\right]^n\mathbf{G}^{-1}\left(\hat{\boldsymbol{\theta}}(\mathbf{W}_{NT}),\mathbf{W}^0\right)\boldsymbol{\Sigma}_{\tilde{u}}\mathbf{a}}{\sqrt{\mathbf{a}'\boldsymbol{\Sigma}_{\tilde{u}}\mathbf{a}}}. \tag{B.6}$$

$\sigma_\xi = \sqrt{\mathbf{a}'\boldsymbol{\Sigma}_{\tilde{u}}\mathbf{a}}$ is the size of the unit shock to ξ_t. The error covariance matrix can be estimated using the residuals $\tilde{\mathbf{u}}_{it}$ defined by (B.1). One possible estimate is the sample moment matrix, $\hat{\boldsymbol{\Sigma}}_{\tilde{u}} = (T-1)^{-1}\sum_{t=2}^{T-1}\tilde{\mathbf{u}}_t\tilde{\mathbf{u}}_t'$, where $\tilde{\mathbf{u}}_t = (\tilde{\mathbf{u}}_{0t}',\tilde{\mathbf{u}}_{1t}',...,\tilde{\mathbf{u}}_{Nt}')'$. One could also use a shrinkage version of $\hat{\boldsymbol{\Sigma}}_{\tilde{u}}$. Since N is large relative to T we use a shrinkage estimator of $\hat{\boldsymbol{\Sigma}}_{\tilde{u}}$ defined by

$$\tilde{\boldsymbol{\Sigma}}_{\tilde{u}}(\lambda) = \lambda\hat{\boldsymbol{\Sigma}}_{\tilde{u}} + (1-\lambda)Diag(\hat{\boldsymbol{\Sigma}}_{\tilde{u}}), \tag{B.7}$$

where λ is the shrinkage parameter and $Diag(\hat{\boldsymbol{\Sigma}}_{\tilde{u}})$ is a diagonal matrix formed from the diagonal elements of $\hat{\boldsymbol{\Sigma}}_{\tilde{u}}$.

B.2 Bootstrapping the GVAR Model with Time-Varying Weights

To derive the empirical distribution of the structural stability tests and of the impulse response functions we use a non-parametric bootstrap procedure. The non-parametric bootstrap procedure aims at taking account of the sampling uncertainty associated with the estimates $\hat{\boldsymbol{\theta}}(\mathbf{W}_{NT})$, for given values of $\mathbf{W}_{NT}$ and $\mathbf{W}^0$. In this case the appropriate residuals for the purpose of drawing bootstrapped samples are $\tilde{\mathbf{u}}_{it}$, given by (B.1). This suggests generating the bootstrap samples, denoted by $\mathbf{x}_t^{(b)}$, $b = 1,...,B$, according to the process

$$\mathbf{x}_t^{(b)} = \mathcal{F}\left(\hat{\boldsymbol{\theta}}(\mathbf{W}_{NT}),\mathbf{W}^0\right)\mathbf{x}_{t-1}^{(b)} + \mathbf{G}^{-1}\left(\hat{\boldsymbol{\theta}}(\mathbf{W}_{NT}),\mathbf{W}^0\right)\tilde{\mathbf{u}}_t^{(b)} \tag{B.8}$$

for $t = 1, 2, ..., T$, where $\mathcal{F}\left(\hat{\boldsymbol{\theta}}(\mathbf{W}_{NT}), \mathbf{W}^0\right)$ is given by (B.4), $\mathbf{x}_0^{(b)} = \mathbf{x}_0$, ($\mathbf{x}_{-1}^{(b)} = \mathbf{x}_{-1}$ if a GVAR(2) is considered), and where $\mathbf{x}_0$ and $\mathbf{x}_{-1}$ are the realized initial data vectors. For each b, $\tilde{\mathbf{u}}_t^{(b)}$ is generated by random draws from $\tilde{\mathbf{u}}_t$ allowing for the fact that $\hat{\boldsymbol{\Sigma}}_{\tilde{u}}$ is non-diagonal and can be singular. This can be achieved using the Cholesky factor of $\hat{\boldsymbol{\Sigma}}_{\tilde{u}}$ (or a shrinkage version of it) along the lines proposed in the supplement to Dees, di Mauro, Pesaran, and Smith (2007).

To carry out the Cholesky factorization the estimated error variance covariance matrix must be non-singular, and we also use a shrinkage parameter defined by (B.7). In the applications reported in the paper $\tilde{\boldsymbol{\Sigma}}_{\tilde{u}}(\lambda)$ becomes non-singular for values of $\lambda \geq 0.8$, but to reduce the effects of the sampling errors in the Cholesky factorization of $\tilde{\boldsymbol{\Sigma}}_{\tilde{u}}(\lambda)$ we decided to set $\lambda = 0.5$, half way between the sample estimate and its diagonal version. For consistency between the point estimates and bootstrapped results, we also set $\lambda = 0.5$ for the point estimates. Finally, prior to any resampling, the residuals were recentered to ensure that their bootstrap population mean is zero.

For each bootstrap sample, b, the individual country models must be estimated with the same set of time varying weights, $\mathbf{W}_{NT}$, lag orders and cointegrating rank. Denote the parameter estimates based on the b^{th} bootstrap sample by $\hat{\boldsymbol{\theta}}^{(b)}(\mathbf{W}_{NT})$. Then the associated impulse response functions across the different bootstrapped replications are given by

$$g_q^{(b)}(h, \sigma_\xi) = \frac{\mathbf{b}' \left[\mathcal{F}\left(\hat{\boldsymbol{\theta}}^{(b)}(\mathbf{W}_{NT}), \mathbf{W}^0\right)\right]^h \mathbf{G}^{-1}\left(\hat{\boldsymbol{\theta}}^{(b)}(\mathbf{W}_{NT}), \mathbf{W}^0\right) \tilde{\boldsymbol{\Sigma}}_{\tilde{u}}^{(b)} \mathbf{a}}{\sqrt{\mathbf{a}' \tilde{\boldsymbol{\Sigma}}_{\tilde{u}}^{(b)} \mathbf{a}}}, \tag{B.9}$$

for $b = 1, 2, ..., B$. The bootstrap confidence bounds can now be computed for each h using the percentiles of $g_q^{(b)}(h, \sigma_\xi)$, over $b = 1, 2, ..., B$.

C Appendix: Additional Estimation Results and Bootstrapped GIRFs

In this section we present and discuss formal specification tests for key aspects of the model, namely, integration properties of the series, lag-length selection and cointegration rank, weak exogeneity of foreign variables, and parameter stability. In addition, we comment on some of the main estimation results such as impact elasticities, and pairwise cross-section correlation of variables and residuals. Finally, we present bootstrapped GIRFs to complement the results on the point estimates in the main body of the paper.

C.1 Unit Root Tests

The GVAR model can be specified in terms of either stationary or integrated variables. Nonetheless, here we follow Dees, di Mauro, Pesaran, and Smith (2007) and assume that the variables included in the country-specific models are integrated of order one (or $I(1)$). This permits us to distinguish between short-run and long-run relations and interpret the long-run relations as cointegrating.

To examine the integration properties of both the domestic and foreign variables we use unit root tests. Given the recognized poor performance of ADF tests in small samples, we consider unit root t-statistics based on weighted symmetric estimation of ADF type regressions introduced by Park and Fuller (1995) (WS hereafter).[45] The lag length employed in the WS unit root tests is selected by the Akaike Information Criterion (AIC) based on standard ADF regressions.

Results of the WS statistics for the level, first differences and second differences of the country-specific domestic and foreign variables are reported in Tables C.2 and C.3. This battery of tests generally supports the unit root hypothesis, with only a few exceptions. First, the null hypothesis of unit root for Mexico GDP is rejected by the test. Nonetheless, this is a borderline case, and if we look at a more standard ADF test we do not reject the unit root hypothesis. Second, the unit root hypothesis for long-term interest rates in most advanced economies and for the real exchange rate in Mexico and UK is also rejected. For the UK, Switzerland, China and some other developing countries, the unit root hypothesis for inflation is rejected. On inflation, since overdifferencing is likely to be less serious of a specification error than wrongly including an $I(2)$ variable, we opt for the inclusion of inflation as an $I(1)$ variable, as in Pesaran, Schuermann, and Weiner (2004). In fact, the order of integration of a variable is not in general a property of an economic variable but a convenient statistical approximation to distinguish between the short-run, medium-run, and long-run variations in the data. With the adoption of a medium-run perspective, which is consistent with the nonstationarity of most economic variables, treating inflation as a stationary variable is likely to invalidate the statistical analysis. For the remaining countries and variables, the test results generally support our working assumption that the variables included in the country-specific models can be treated as $I(1)$ variables.

C.2 Selecting Lag Orders and Cointegration Ranks

We select lag orders and cointegaration ranks of the country-specific cointegrating VARX* models under the assumptions that the included foreign variables are weakly exogeneous, and that the parameters of the individual models are stable over time. Evidence for these hypotheses will be discussed in the next two sub-sections.

We select the lag orders, p_i and q_i, of the individual country VARX*(p_i,q_i) models according to the Akaike information criterion under the constraints imposed by data limitations. Accordingly, the lag order of the foreign variables, q_i, is set equal to one in all countries; for the same reason, we constrain $p_i \leq 2$. Notice that, since we observed in preliminary analysis of the GIRFs very ragged responses for Argentina, Brazil, Chile, Peru, New Zealand, Indonesia, India, Norway and Sweden, we changed the orders of the VARX* models for these countries from VARX*$(2, 1)$ to VARX*$(1, 1)$.

We then proceed with the cointegration analysis, where the country specific models are estimated subject to reduced rank restrictions (Johansen, 1992). To this end, the error-correction forms of individual country equations are derived. The rank of the cointegrating space for each country was tested using Johansen's trace and maximal eigenvalue statistics as set out in Pesaran, Shin, and Smith (2000) for models with weakly exogenous $I(1)$ regressors, unrestricted intercepts and restricted trend coefficients.

[45] Dees, di Mauro, Pesaran, and Smith (2007) argue that the weighted symmetric ADF tests exploit the time reversibility of stationary autoregressive processes in order to increase their power performance. Leybourne, Kim, and Newbold (2005) and Pantula, Gonzalez-Farias, and Fuller (1994) provide evidence of superior performance of the weighted symmetric ADF test in comparison to the standard ADF test of the GLS-ADF test proposed by Elliott, Rothenberg, and Stock (1996). See also Chapter 4 of Microfit 5 Manual (Pesaran and Pesaran, 2009) for a detailed discussion.

Table C.1: Lag Orders of the Country-specific VARX*(p_i,q_i) Models and the Number of Cointegrating Relations

	p_i	q_i	CV		p_i	q_i	CV
China	1	1	1	Malaysia	1	1	1
Euro area	2	1	1	Philippines	2	1	1
Japan	2	1	1	Singapore	1	1	1
Argentina	1	1	1	Thailand	2	1	1
Brazil	1	1	1	India	1	1	1
Chile	1	1	2	S. Africa	2	1	1
Mexico	1	1	2	S. Arabia	2	1	1
Peru	1	1	1	Turkey	2	1	2
Australia	1	1	2	Norway	1	1	2
Canada	2	1	1	Sweden	1	1	1
N. Zealand	1	1	2	Switzerland	2	1	2
Indonesia	1	1	1	UK	2	1	1
Korea	2	1	1	US	2	1	2

The order of the VARX* models as well as the number of cointegration relationships are presented in Table C.1. Tables C.4 and C.5 report the trace test statistics and the 95% critical values for all the country-specific VARX* models, respectively. The critical values are taken from MacKinnon (1991). We chose the trace test because it has better small-sample properties compared to the maximal eigenvalue test.

To address the issue of possible overestimation of the number of cointegration relationships based on asymptotic critical values, and to assure the stability of the global model, we reduced the number of cointegration relations for a number of countries (see, for example, Dees, di Mauro, Pesaran, and Smith, 2007). Specifically, the following adjustments in the number of cointegration relations have been made from the results implied by the statistical tests: Argentina from 3 to 1, Peru from 3 to 1, Chile from 3 to 2, Mexico from 3 to 2, Australia from 4 to 2, Canada from 3 to 1, New Zealand from 3 to 2, Japan from 3 to 1, Korea from 5 to 1, Singapore from 3 to 1, Thailand from 2 to 1, Saudi Arabia from 2 to 1, Indonesia from 2 to 1, South Africa 2 from to 1, Philippines from 2 to 1, India from 2 to 1, euro area from 2 to 1, and UK from 3 to 1. This shrinkage in the number of cointegration relations proved necessary for arriving at convergent persistent profiles for the various cointegration relations. The persistence profiles refer to the time profiles of the effects of system or variable specific shocks on the cointegration relations in the GVAR model (see Pesaran and Shin, 1996). Note that the value of these profiles is unity on impact, while it should tend to zero as *n* (the horizon of the persistence profiles) tends to infinity, if the vector under investigation is indeed a cointegration vector. The persistence profiles of the system suggests that all cointegrating relationships return to their long run equilibrium within a ten year period after a shock to the system, see Figure C.1 for persistence profiles of the model solved using the 2009 trade matrix for a selection of cointegrating vectors.

C.3 Weak Exogeneity Tests

To test for weak exogeneity, we employ the procedure proposed by Johansen (1992) and Harbo, Johansen, Nielsen, and Rahbek (1998). This is a test on the joint significance of the estimated error correction terms in auxiliary equations for the country-specific foreign variables, $\mathbf{x}^*_{it}$. In particular, for each l^{th} element of $\mathbf{x}^*_{it}$ the following regression is estimated:

$$\Delta \mathbf{x}^*_{it,l} = \mu_{il} + \sum_{j=1}^{r_i} \gamma_{ij,l} ECM^j_{i,t-1} + \sum_{k=1}^{s_i} \varphi_{ik,l} \Delta \mathbf{x}_{i,t-k} + \sum_{m=1}^{n_i} \vartheta_{im,l} \Delta \tilde{\mathbf{x}}^*_{i,t-m} + \epsilon_{it,l}, \quad \text{(C.1)}$$

where $ECM^j_{i,t-1}$, $j = 1, 2, ..., r_i$ are the estimated error correction terms corresponding to the r_i cointegrating relations found for the i^{th} country model, and $\Delta \tilde{\mathbf{x}}^*_{it} = [\Delta \mathbf{x}'^*_{it}, \Delta(e^*_{it} - p^*_{it}), \Delta p^o_t]'$.[46] The weak exogeneity test is an F test of joint hypothesis that $\gamma_{ij,l} = 0$ for each $j = 1, 2, ..., r_i$. In this case, we take the lag orders s_i to be the same as the orders p_i of the underlying country-specific VARX* models and we set the lag order n_i to 2 for all countries, following Dees, di Mauro, Pesaran, and Smith (2007).

C.4 Parameter Stability Tests

To test for parameter stability, we perform a battery of tests following Dees, di Mauro, Pesaran, and Smith (2007), based on the residuals of the individual equations of the country-specific error correction models.[47] In particular, we consider the Ploberger and Kramer (1992) maximal OLS cumulative sum (CUSUM) statistic, denoted by PK_{sup} and its mean square variant PK_{msq}.[48] Also included are tests for parameter constancy against non-stationary alternatives proposed by Nyblom (1989), denoted by $\mathfrak{N}$, as well as sequential Wald type tests of a one-time structural change at an unknown change point. The latter include the Wald form of Quandt (1960) likelihood ratio statistic (QLR), the mean Wald statistic (MW) of Hansen (2002) and the Andrews and Ploberger (1994) Wald statistic based on the exponential average (APW). The heteroskedasticity-robust versions of the above tests is also reported.

The tests show that, once the individual equations are conditioned on the contemporaneous foreign variables, most regression coefficients are stable. Tables C.7 and C.8 summarize the results of these tests by variable at the 5% significance level. The critical values of the tests, computed under the null of parameter stability, are computed using the bootstrap samples obtained from the solution of the GVAR model. Similar to Dees, di Mauro, Pesaran, and Smith (2007), we note that the outcomes for $\mathfrak{N}$, QLR and APW tests very much depend on whether heteroskedasticity-robust versions of these tests are used. The non-robust version of the $\mathfrak{N}$, QLR and APW tests show a relatively large number of rejections, with the latter two tests leading to rejection of the joint null hypothesis of coefficient and error variance stability. Once possible changes in error variances are

[46] Note that in the case of the United States the variable $\Delta(e^*_{it} - p^*_{it})$ is implicitly included in $\Delta \mathbf{x}^*_{it}$.

[47] It is well known that these residuals only depend on the rank of the cointegrating vectors and do not depend on the way the cointegrating relations are exactly identified. In this way we render the structural stability tests of the short-run coefficients invariant to exact identification of the long-run relations.

[48] The PK_{sup} statistic is similar to the CUSUM test suggested by Brown, Durbin, and Evans (1975), although the latter is based on recursive rather than OLS residuals. The Ploberger and Kramer (1992) maximal OLS cumulative sum (CUSUM) statistic rejects the null hypothesis of parameter constancy whenever the maximum cumulated sum of OLS residuals becomes too large in absolute value.

allowed for, the parameter coefficients seem to have been reasonably more stable. By looking at the robust version of the tests performed, we can see that remaining instability is mainly confined to error variances without affecting most of the estimated coefficients. The problem of unstable error variances is dealt with by using robust standard errors when investigating the impact effects of the foreign variables and impulse responses. Nonetheless, some parameter instability remains even after accounting for heteroskedasticity in the error variances. Table C.8 presents the break dates with Quandt's Likelihood Ratio Statistics (QLR) at the 5% significance level.

C.5 Impact Effects and Time Profiles of Shocks

C.5.1 Contemporaneous Effects of Foreign Variables on their Domestic Counterparts

The estimation of the cointegrating VARX* models permits us to examine the impact of foreign variables on their domestic counterparts, by looking at the estimated coefficients corresponding to the contemporaneous foreign variables in the country specific models. These estimates can be viewed as impact elasticities, which measure the contemporaneous variation of a domestic variable due to a 1% change in its corresponding foreign-specific counterpart. In the GVAR framework, they are informative on the short term co-movements implied by the estimated model across different countries.

Table C.9 presents these impact elasticities with the corresponding t-ratios (in italics), computed based on the White's heteroskedasticity-consistent variance estimator. As in earlier work by Pesaran, Schuermann, and Weiner (2004) and Dees, di Mauro, Pesaran, and Smith (2007), there is substantial co-movement between the major advanced economies' output and their foreign counterparts. The same result holds -with larger magnitudes- for most of the East Asian countries in the sample. Inflation transmission in the above-mentioned economies is less pronounced but still positive and statistically significant. Contemporaneous elasticities for real equity prices are remarkably close to unity in the case of the euro area and Canada, reflecting their high degree of financial integration.

Focusing on the Latin American economies in our sample, these impact multipliers have the expected signs in most of cases: foreign output elasticities for Argentina, Brazil, Chile, and Mexico are positive and statistically significant. Notably, Argentina exhibits the largest output impact elasticity. In comparison, the results for inflation are very different, with all countries having coefficients close to zero with none of the foreign inflation impact effects being statistically significant.

For the two Latin American countries with data on equity prices, we do observe a statistically significant contemporaneous response to changes in their foreign counterparts. Argentina shows an overreaction coefficient of 1.26, while Chile reacts only partially, with a lower coefficient of 0.51. This may reflect the relative differences in capital account openness between these two countries during the sample period. Notably, short-term interest rates in Argentina exhibit an unusually high responsiveness to changes in their foreign counterparts. This is consistent with the low degree of monetary policy independence during the period of the currency board in Argentina (1991 to 2002), when the Argentine peso was pegged to the United States dollar. Different degrees of fixed exchange rate regimes were also in place before and after the period of currency board in Argentina.

C.5.2 Pairwise Cross-Section Correlations: Variables and Residuals

One of the basic assumption underlying the GVAR model is that the cross-dependence of the variable-specific innovations must be sufficiently small, so that

$$\frac{\sum_{j=1}^{N} \sigma_{ij,ls}}{N} \rightarrow 0 \ as \ N \rightarrow \infty \ \forall i, l, s \tag{C.2}$$

where $\sigma_{ij,ls} = cov(u_{ilt}, u_{jst})$ is the covariance of the variable l in country i with the variable s in country j. Technically, this requires that the country-specific shocks are cross-sectionally weakly correlated. Following Dees, di Mauro, Pesaran, and Smith (2007), we check this condition by calculating the average pairwise cross-section correlations of all the variables in the GVAR, both in levels and in differences, as well as those of associated residuals from the country specific VARX* models with foreign variables that we estimate in the first step of GVAR analysis. The number of cointegration relations and lag orders in the country specific VARX* models are given in Table C.1. We also compute average pairwise cross-section correlations of the residuals from the VAR models, obtained after re-estimating all the individual country-specific models over the same period *excluding* the foreign variables, including oil as an endogenous variable in all the country models. For each country VAR model we used the same lag order, as specified in Table C.1, and selected the number of cointegration relationships based on the Johansen's trace statistics computed for the individual VAR models excluding the foreign variables. The main rationale is that foreign variables could be considered as global factors for each of the countries considered in the GVAR model. Thus, the estimation of each country-specific model by conditioning on the foreign variables can take account of the common components, rendering the residuals cross-sectionally weakly correlated.

Tables C.10 and C.11 report the average pairwise cross sectional correlations for the domestic variables and the residuals of the VARX* models with foreign variables (column labeled VARX* Res.) and of the VAR models without foreign variables (column labeled VAR Res.). Although, these results do not constitute a formal statistical test of the importance of the foreign variables in the GVAR model, they do provide an important indication of their usefulness in modeling global interdependencies as the remaining correlation in the residuals is much lower than the one among the variables themselves. As illustrated by the differences between the two columns VARX* Res. and VAR Res., the results also show that once country-specific models are formulated conditional on foreign variables, the degree of correlations across the shocks from different countries is sharply reduced.

Figure C.1: Persistence Profiles for a Selection of Cointegrating Vectors (World economy and LAC5; Bootstrapped PPs, 2009)

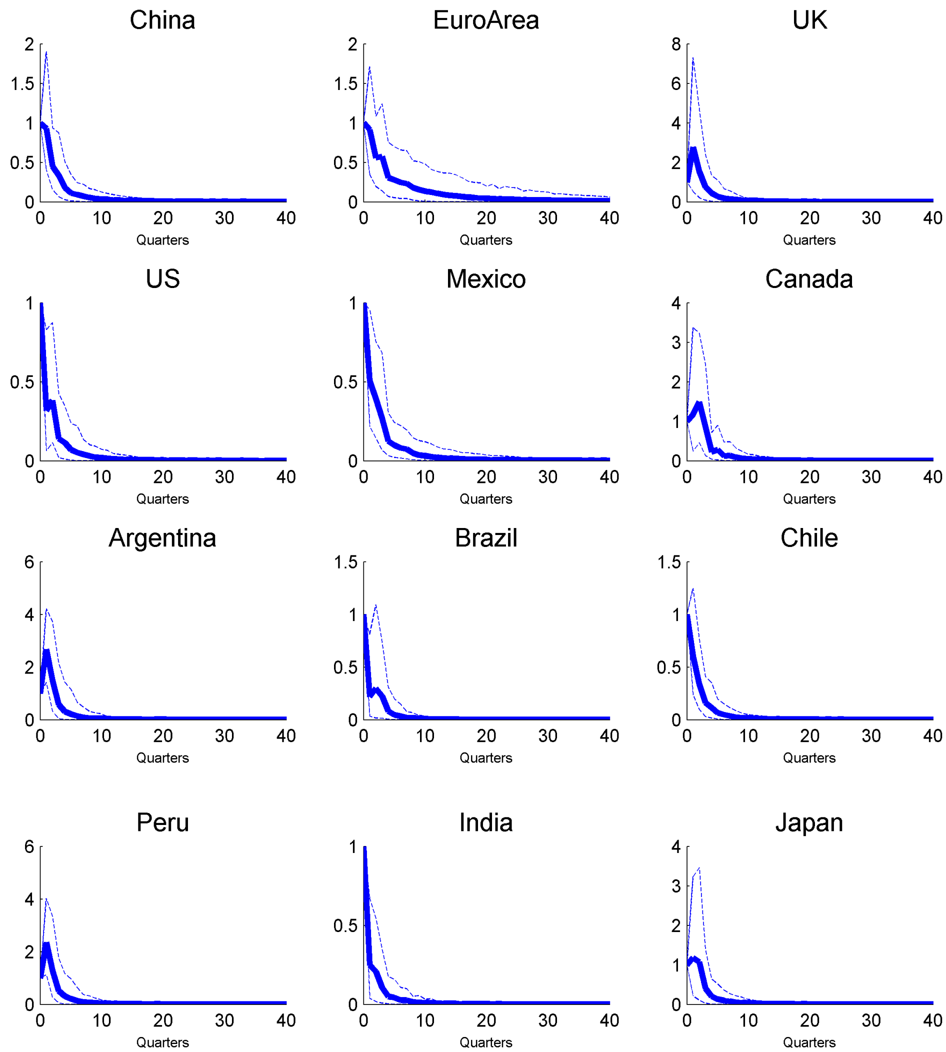


Table C.2: Unit Root Test Statistics for Domestic Variables (Based on Weighted Symmetric ADF Regressions)

	Crit. Val.	Arg	Austlia	Bra	Can	China	Chile	Euro	India	Indn	Jap	Kor	Mal	Mex
y (with trend)	-3.24	-2.20	-3.06	-2.39	-2.70	-2.04	-2.40	-1.18	-1.22	-1.80	-0.80	-1.10	-2.21	-3.34
y (no trend)	-2.55	-0.18	1.83	1.70	0.97	0.72	1.05	0.87	1.33	2.51	0.83	0.84	1.72	0.95
Dy	-2.55	-5.15	-6.47	-6.21	-4.92	-3.54	-6.16	-3.90	-7.92	-7.01	-3.94	-5.24	-5.45	-4.09
DDy	-2.55	-7.36	-9.10	-7.81	-7.31	-11.19	-9.68	-7.76	-10.44	-8.17	-7.19	-7.51	-7.94	-9.75
Dp (with trend)	-3.24	-3.70	-3.67	-2.71	-3.48	-3.04	-5.06	-2.01	-5.69	-5.84	-3.16	-2.86	-5.45	-3.80
Dp (no trend)	-2.55	-2.61	-2.42	-2.45	-1.21	-3.02	-1.87	-0.68	-5.39	-5.85	-1.53	-2.18	-5.11	-2.81
DDp	-2.55	-12.36	-9.80	-6.30	-7.61	-6.85	-7.05	-6.66	-9.00	-8.68	-7.57	-6.82	-8.91	-5.76
DDDp	-2.55	-14.91	-10.05	-8.86	-10.03	-8.78	-11.03	-8.89	-9.48	-8.68	-11.03	-8.46	-11.79	-14.88
eq (with trend)	-3.24	-3.26	-4.52	-	-2.86	-	-2.30	-2.45	-3.67	-	-1.85	-2.74	-3.02	-
eq (no trend)	-2.55	-2.77	-0.74	-	-0.76	-	-0.33	-0.93	-0.87	-	-1.67	-1.64	-1.90	-
Deq	-2.55	-6.76	-5.69	-	-6.21	-	-5.08	-6.76	-7.22	-	-5.06	-5.71	-6.15	-
DDeq	-2.55	-8.09	-8.34	-	-8.53	-	-7.43	-9.96	-9.16	-	-8.71	-13.13	-9.90	-
ep (with trend)	-3.24	-2.26	-2.62	-2.17	-1.78	-1.25	-2.33	-2.36	-1.22	-2.59	-2.05	-2.82	-2.20	-3.70
ep (no trend)	-2.55	-2.09	0.29	-1.00	1.14	-1.23	-1.18	-0.16	-0.26	-2.64	-0.30	-0.94	-0.87	-0.80
Dep	-2.55	-7.24	-7.88	-7.25	-7.46	-7.08	-6.91	-6.83	-5.65	-8.10	-5.24	-5.60	-7.25	-7.12
DDep	-2.55	-9.33	-9.18	-8.35	-7.70	-10.80	-10.73	-10.03	-12.13	-11.18	-7.47	-8.73	-8.91	-10.39
r (with trend)	-3.24	-2.71	-3.29	-2.79	-4.08	-1.63	-5.00	-3.04	-3.03	-4.10	-3.20	-2.59	-2.12	-2.03
r (no trend)	-2.55	-2.27	-1.95	-2.65	-1.17	-1.43	-1.04	-1.18	-2.70	-4.05	-1.80	-0.88	-1.99	-1.78
Dr	-2.55	-15.88	-7.47	-9.18	-5.86	-6.13	-6.76	-3.91	-6.66	-6.42	-4.94	-7.80	-6.87	-6.25
DDr	-2.55	-12.92	-11.01	-11.36	-9.28	-7.90	-8.51	-8.37	-8.59	-12.04	-5.33	-9.40	-8.58	-10.91
lr (with trend)	-3.24	-	-2.08	-	-3.54	-	-	-3.05	-	-	-2.50	-2.46	-	-
lr (no trend)	-2.55	-	-1.22	-	-1.28	-	-	-1.02	-	-	-0.85	-0.34	-	-
Dlr	-2.55	-	-5.64	-	-5.69	-	-	-5.14	-	-	-5.44	-6.73	-	-
DDlr	-2.55	-	-9.10	-	-8.58	-	-	-8.40	-	-	-7.99	-9.20	-	-
	Crit. Val.	**Nor**	**Nzld**	**Peru**	**Phlp**	**Safrca**	**Sarbia**	**Sing**	**Swe**	**Switz**	**Thai**	**Turk**	**UK**	**US**
y (with trend)	-3.24	-1.80	-1.76	-1.46	-2.18	-1.54	-0.56	-1.49	-2.44	-2.67	-1.36	-2.73	-2.80	-2.45
y (no trend)	-2.55	2.51	1.41	0.59	0.46	1.26	0.58	1.68	0.65	1.50	1.29	1.47	-0.87	1.23
Dy	-2.55	-6.39	-6.53	-7.63	-3.56	-5.05	-2.95	-6.11	-4.51	-5.19	-3.09	-7.75	-2.97	-4.74
DDy	-2.55	-10.83	-9.33	-9.10	-9.94	-7.87	-17.63	-8.57	-8.03	-8.17	-9.40	-9.14	-12.69	-7.66
Dp (with trend)	-3.24	-4.75	-3.81	-3.35	-5.17	-4.27	-4.47	-3.78	-3.69	-4.67	-3.07	-2.25	-2.65	-1.34
Dp (no trend)	-2.55	-2.03	-2.40	-3.13	-4.40	-2.80	-3.34	-3.43	-2.06	-3.52	-2.50	-1.57	-1.41	0.04
DDp	-2.55	-7.86	-7.49	-7.99	-6.86	-8.31	-8.79	-9.86	-6.84	-10.67	-7.78	-7.84	-8.25	-8.64
DDDp	-2.55	-9.71	-9.35	-10.13	-8.72	-9.11	-9.61	-9.44	-8.42	-9.42	-8.71	-10.41	-10.39	-9.43
eq (with trend)	-3.24	-4.05	-2.38	-	-1.75	-4.59	-	-3.83	-2.92	-2.11	-1.79	-	-1.77	-1.75
eq (no trend)	-2.55	-0.97	-1.69	-	-1.46	-0.29	-	-1.80	-0.38	-0.65	-1.57	-	-0.75	-0.61
Deq	-2.55	-7.83	-6.16	-	-4.51	-8.42	-	-6.39	-6.86	-6.57	-5.02	-	-7.13	-6.24
DDeq	-2.55	-14.26	-13.18	-	-13.07	-7.44	-	-10.17	-12.60	-12.27	-10.34	-	-7.40	-8.02
ep (with trend)	-3.24	-2.66	-2.85	-1.80	-2.13	-3.12	-1.97	-1.44	-2.53	-2.49	-2.47	-1.35	-3.29	-
ep (no trend)	-2.55	0.04	-0.39	0.38	-0.24	-2.00	-1.13	1.49	-1.11	-0.15	-0.70	-0.37	-0.10	-
Dep	-2.55	-7.24	-6.55	-8.61	-6.00	-4.79	-2.86	-6.37	-6.99	-7.48	-5.55	-5.97	-5.59	-
DDep	-2.55	-8.37	-7.92	-8.68	-7.47	-15.51	-11.04	-8.30	-8.14	-10.06	-8.99	-9.97	-8.86	-
r (with trend)	-3.24	-2.91	-3.12	-3.39	-3.37	-2.89	-	-3.11	-2.28	-2.20	-3.69	-1.48	-3.35	-3.76
r (no trend)	-2.55	-1.57	-1.95	-3.18	-2.51	-2.84	-	-1.48	-1.29	-2.08	-2.11	-1.49	-1.18	-1.65
Dr	-2.55	-8.36	-8.15	-4.45	-7.94	-5.93	-	-4.57	-7.95	-4.93	-6.29	-9.08	-6.63	-3.70
DDr	-2.55	-8.53	-9.45	-8.94	-9.74	-8.14	-	-8.16	-10.61	-8.42	-7.85	-9.07	-8.83	-7.24
lr (with trend)	-3.24	-1.43	-2.02	-	-	-0.69	-	-	-3.51	-2.58	-	-	-3.03	-3.98
lr (no trend)	-2.55	-1.28	-0.96	-	-	-1.50	-	-	-0.70	-1.70	-	-	-0.43	-1.51
Dlr	-2.55	-7.08	-7.58	-	-	-8.38	-	-	-6.92	-5.91	-	-	-7.98	-5.83
DDlr	-2.55	-7.73	-9.09	-	-	-8.30	-	-	-8.04	-7.72	-	-	-8.60	-7.73

Note: The WS statistics (Park and Fuller, 1995) for all level variables are based on regressions including a linear trend, except for the interest rate variables. The WS statistics for variables in first and second differences are based on regressions including an intercept and no linear trend. The 95% critical value of the WS statistics for regressions with trend is -3.24, and for regressions without trend -2.55.

Table C.3: Unit Root Test Statistics for Domestic Variables (Based on Weighted Symmetric ADF Regressions)

	Crit. Val.	Arg	Austlia	Bra	Can	China	Chile	Euro	India	Indn	Jap	Kor	Mal	Mex
y (with trend)	-3.24	-1.29	-1.52	-1.50	-3.38	-2.78	-1.49	-1.39	-1.68	-2.33	-0.69	-1.44	-2.64	-3.41
y (no trend)	-2.55	2.04	1.91	1.66	1.47	1.62	1.99	1.54	1.65	2.07	1.55	0.77	1.48	1.50
Dy	-2.55	-4.92	-4.53	-4.48	-4.73	-4.81	-3.86	-4.41	-4.31	-4.59	-4.65	-3.65	-5.03	-4.89
DDy	-2.55	-8.88	-11.01	-6.87	-7.29	-7.15	-10.78	-7.00	-10.41	-10.68	-9.39	-11.97	-9.22	-7.28
Dp (with trend)	-3.24	-2.88	-2.78	-3.54	-2.02	-3.61	-2.78	-3.51	-2.89	-3.08	-3.74	-3.42	-2.69	-3.41
Dp (no trend)	-2.55	-2.62	-1.13	-2.47	-0.17	-2.10	-2.23	-2.17	-1.20	-1.41	-0.87	-2.05	-1.42	-1.11
DDp	-2.55	-5.93	-6.79	-11.67	-8.34	-6.48	-7.97	-9.12	-7.36	-6.71	-6.98	-6.57	-7.00	-10.86
DDDp	-2.55	-13.87	-8.91	-10.12	-9.31	-8.65	-8.69	-8.43	-9.58	-9.06	-9.09	-8.40	-9.51	-8.93
eq (with trend)	-3.24	-2.54	-2.58	-3.14	-1.95	-2.68	-2.71	-2.48	-2.35	-2.39	-2.67	-2.36	-2.69	-1.95
eq (no trend)	-2.55	-0.47	-1.03	-0.81	-0.60	-0.94	-1.03	-0.57	-0.74	-0.98	-0.70	-0.79	-0.97	-0.62
Deq	-2.55	-6.88	-7.00	-7.41	-6.43	-7.04	-6.98	-6.97	-6.94	-7.13	-7.03	-6.98	-7.08	-6.40
DDeq	-2.55	-9.80	-12.03	-12.98	-7.99	-8.14	-12.61	-9.67	-9.84	-9.56	-7.98	-9.88	-9.47	-7.99
ep (with trend)	-3.24	-2.03	-2.80	-1.85	-2.86	-2.19	-3.01	-3.43	-1.63	-1.74	-1.71	-2.16	-1.84	-2.42
ep (no trend)	-2.55	-1.40	-0.14	-0.61	-0.71	-1.26	-2.12	-0.19	-0.50	1.40	0.00	1.07	-0.08	-2.48
Dep	-2.55	-3.72	-5.08	-7.87	-4.32	-3.97	-8.28	-7.73	-7.34	-8.74	-4.84	-7.79	-6.66	-4.06
DDep	-2.55	-12.00	-7.69	-12.00	-7.23	-14.65	-12.55	-8.08	-8.17	-7.99	-12.24	-12.28	-7.75	-13.43
r (with trend)	-3.24	-2.73	-3.09	-3.19	-3.68	-2.82	-2.44	-2.15	-2.34	-2.93	-2.78	-2.76	-3.49	-3.60
r (no trend)	-2.55	-2.58	-1.28	-1.42	-1.28	-1.58	-2.05	-1.31	-1.08	-1.52	-1.10	-1.13	-1.63	-1.48
Dr	-2.55	-10.15	-5.20	-14.37	-3.80	-5.82	-10.75	-10.53	-6.93	-4.64	-6.26	-5.91	-4.49	-5.60
DDr	-2.55	-10.94	-8.78	-12.19	-9.97	-10.57	-10.80	-10.61	-11.21	-8.94	-9.97	-10.00	-8.63	-9.83
lr (with trend)	-3.24	-2.72	-3.61	-2.85	-3.96	-3.20	-2.78	-3.73	-2.76	-3.44	-3.13	-3.33	-2.72	-3.86
lr (no trend)	-2.55	-0.92	-0.67	-0.94	-1.14	-1.21	-0.87	-0.77	-0.82	-0.89	-0.88	-0.94	-0.79	-1.12
Dlr	-2.55	-5.56	-5.57	-5.51	-5.73	-5.13	-5.56	-5.76	-5.62	-5.17	-5.68	-5.26	-5.35	-5.56
DDlr	-2.55	-8.10	-8.53	-8.15	-7.83	-8.48	-8.29	-8.19	-8.18	-8.24	-8.08	-8.29	-8.09	-7.93
	Crit. Val.	Nor	Nzld	Peru	Phlp	Safrca	Sarbia	Sing	Swe	Switz	Thai	Turk	UK	US
y (with trend)	-3.24	-3.02	-2.59	-1.69	-2.04	-2.04	-2.27	-2.46	-2.93	-2.59	-2.58	-2.59	-3.15	-1.78
y (no trend)	-2.55	0.63	0.70	1.94	0.99	0.53	0.79	1.77	1.33	1.07	1.71	1.43	1.43	1.56
Dy	-2.55	-4.30	-4.49	-4.61	-4.60	-3.72	-4.38	-4.96	-3.39	-4.56	-4.57	-4.42	-4.63	-4.26
DDy	-2.55	-7.38	-11.00	-10.67	-11.50	-11.86	-11.80	-7.26	-9.05	-8.49	-9.99	-7.16	-7.96	-9.84
Dp (with trend)	-3.24	-2.34	-2.47	-2.94	-3.14	-3.40	-3.03	-3.89	-2.47	-2.35	-2.68	-2.96	-2.32	-3.08
Dp (no trend)	-2.55	-0.63	-0.62	-2.39	-1.32	-1.47	-1.87	-1.03	-0.58	-0.50	-1.40	-1.65	-0.43	-1.01
DDp	-2.55	-6.71	-7.10	-9.14	-7.07	-6.61	-7.22	-7.57	-6.85	-7.00	-7.40	-6.61	-7.28	-9.58
DDDp	-2.55	-10.19	-9.24	-8.42	-8.70	-8.50	-8.89	-10.03	-8.33	-8.62	-9.12	-8.73	-8.64	-8.84
eq (with trend)	-3.24	-2.73	-2.85	-2.28	-2.29	-2.41	-2.42	-2.78	-2.56	-2.36	-2.60	-2.43	-2.64	-3.30
eq (no trend)	-2.55	-0.84	-0.85	-0.60	-0.97	-0.87	-0.89	-0.83	-0.82	-0.86	-0.87	-0.75	-0.73	-0.84
Deq	-2.55	-6.92	-6.94	-6.95	-6.98	-7.20	-7.16	-7.23	-6.96	-6.79	-7.07	-6.79	-6.96	-7.26
DDeq	-2.55	-12.74	-7.99	-12.33	-9.64	-10.00	-7.90	-9.59	-9.85	-9.91	-9.72	-9.96	-9.74	-8.12
ep (with trend)	-3.24	-2.40	-3.10	-2.23	-1.82	-2.73	-3.30	-1.54	-2.68	-2.54	-2.83	-2.60	-2.31	-2.09
ep (no trend)	-2.55	-0.10	-0.07	-1.08	0.51	-1.82	-3.26	-0.64	-0.17	-0.13	-1.67	-0.94	-0.13	1.01
Dep	-2.55	-6.86	-4.86	-4.43	-4.54	-4.63	-3.82	-4.67	-6.89	-6.81	-4.58	-7.28	-6.72	-7.11
DDep	-2.55	-8.17	-7.91	-13.06	-13.62	-7.28	-7.21	-12.18	-7.59	-9.96	-12.81	-7.71	-9.99	-7.67
r (with trend)	-3.24	-2.58	-3.18	-2.64	-2.75	-2.47	-2.37	-3.27	-2.39	-2.38	-2.57	-2.30	-2.30	-1.63
r (no trend)	-2.55	-1.00	-1.46	-2.14	-1.16	-1.26	-1.56	-1.45	-0.87	-0.97	-1.29	-1.04	-0.88	-1.01
Dr	-2.55	-5.09	-4.40	-11.58	-7.05	-6.17	-8.95	-4.98	-5.75	-5.45	-5.68	-9.04	-6.02	-11.46
DDr	-2.55	-8.76	-8.52	-10.43	-10.23	-10.05	-9.13	-7.45	-9.58	-9.78	-9.79	-9.75	-10.02	-11.21
lr (with trend)	-3.24	-2.72	-2.62	-3.80	-2.90	-2.76	-2.80	-2.68	-2.43	-2.52	-2.57	-2.53	-2.44	-3.23
lr (no trend)	-2.55	-0.64	-0.90	-0.91	-0.80	-0.82	-0.77	-0.82	-0.84	-0.88	-0.81	-0.91	-0.91	-0.93
Dlr	-2.55	-5.80	-5.52	-5.54	-5.48	-5.45	-5.37	-5.56	-5.61	-5.42	-5.28	-5.52	-5.58	-4.92
DDlr	-2.55	-8.32	-8.17	-8.19	-8.15	-8.34	-8.17	-8.15	-8.07	-7.78	-8.13	-8.20	-7.86	-8.47

Note: The WS statistics (Park and Fuller, 1995) for all level variables are based on regressions including a linear trend, except for the interest rate variables. The WS statistics for variables in first and second differences are based on regressions including an intercept and no linear trend. The 95% critical value of the WS statistics for regressions with trend is -3.24, and for regressions without trend -2.55.

Table C.4: Trace Statistic for Testing for Cointegration in Country Specific Models

	Arg	Austlia	Bra	Can	China	Chile	Euro	India	Indn	Jap	Kor	Mal	Mex
# End.	5	6	4	6	4	5	6	5	4	6	6	5	4
# For.	6	6	6	6	6	6	6	6	6	6	6	6	6
r=0	463.92	346.99	323.50	267.86	164.88	309.50	260.99	198.45	184.13	281.53	331.90	184.51	220.10
r=1	177.79	238.33	79.77	185.18	93.17	195.00	184.31	128.08	108.25	179.38	251.37	117.86	112.25
r=2	85.46	160.67	27.76	121.47	42.53	113.19	117.86	78.35	55.14	122.16	172.91	65.44	58.50
r=3	27.10	92.40	9.60	79.31	19.46	58.36	76.11	43.58	21.09	72.12	98.15	29.89	22.82
r=4	12.17	48.73		47.45		18.79	42.97	14.06		46.16	49.84	11.65	
r=5		17.66		18.49			14.93			21.45	21.30		

	Nor	Nzld	Peru	Phlp	Safrca	Sarbia	Sing	Swe	Switz	Thai	Turk	UK	US
# End.	6	6	4	5	6	3	5	6	6	5	4	6	6
# For.	6	6	6	6	6	6	6	6	6	6	6	6	4
r=0	324.61	372.98	324.37	235.27	256.73	132.99	221.21	242.69	263.17	201.07	148.50	299.36	273.46
r=1	193.59	258.27	136.16	144.09	172.69	70.50	137.33	153.24	178.68	129.14	92.88	175.62	185.14
r=2	116.41	162.13	66.59	68.04	114.65	23.82	89.46	99.14	115.50	73.32	46.23	120.40	105.22
r=3	72.90	80.70	16.03	30.48	62.03		52.21	60.61	70.20	43.06	15.67	77.74	66.76
r=4	30.75	44.49		7.42	35.16		17.91	33.79	37.04	18.39		37.70	29.77
r=5	9.58	21.82			15.23			12.74	13.01			15.61	11.81

Table C.5: Critical Values for Trace Statistic at the 5% Significance Level

	Arg	Austlia	Bra	Can	China	Chile	Euro	India	Indn	Jap	Kor	Mal	Mex
# End.	5	6	4	6	4	5	6	5	4	6	6	5	4
# For.	6	6	6	6	6	6	6	6	6	6	6	6	6
r=0	156.44	197.70	119.03	197.70	119.03	156.44	197.70	156.44	119.03	197.70	197.70	156.44	119.03
r=1	119.03	156.44	85.44	156.44	85.44	119.03	156.44	119.03	85.44	156.44	156.44	119.03	85.44
r=2	85.44	119.03	55.50	119.03	55.50	85.44	119.03	85.44	55.50	119.03	119.03	85.44	55.50
r=3	55.50	85.44	28.81	85.44	28.81	55.50	85.44	55.50	28.81	85.44	85.44	55.50	28.81
r=4	28.81	55.50		55.50		28.81	55.50	28.81		55.50	55.50	28.81	
r=5		28.81		28.81			28.81			28.81	28.81		

	Nor	Nzld	Peru	Phlp	Safrca	Sarbia	Sing	Swe	Switz	Thai	Turk	UK	US
# End.	6	6	4	5	6	3	5	6	6	5	4	6	6
# For.	6	6	6	6	6	6	6	6	6	6	6	6	4
r=0	197.70	197.70	119.03	156.44	197.70	85.44	156.44	197.70	197.70	156.44	119.03	197.70	171.33
r=1	156.44	156.44	85.44	119.03	156.44	55.50	119.03	156.44	156.44	119.03	85.44	156.44	134.16
r=2	119.03	119.03	55.50	85.44	119.03	28.81	85.44	119.03	119.03	85.44	55.50	119.03	100.96
r=3	85.44	85.44	28.81	55.50	85.44		55.50	85.44	85.44	55.50	28.81	85.44	71.56
r=4	55.50	55.50		28.81	55.50		28.81	55.50	55.50	28.81		55.50	45.90
r=5	28.81	28.81			28.81			28.81	28.81			28.81	23.63

Table C.6: F-Statistics for Testing the Weak Exogeneity of the Country-specific Foreign Variables and Oil Prices at 5% Significance Level

	F test	Crit. Val.	y^*	π^*	q^*	$(e^* - p^*)$	ρ^{S*}	ρ^{L*}	p^o
Argentina	F(1,99)	3.94	3.79	0.00	2.25	-	0.35	0.36	0.07
Australia	F(2,97)	3.09	0.27	0.13	0.67	-	0.41	0.56	0.36
Brazil	F(1,100)	3.94	0.07	0.78	0.04	-	0.11	0.11	4.74*
Canada	F(1,92)	3.94	0.12	0.50	0.26	-	2.08	0.18	0.03
China	F(1,100)	3.94	0.06	0.02	0.03	-	0.90	3.81	1.65
Chile	F(2,98)	3.09	0.79	1.07	0.17	-	1.34	0.80	0.41
Euro area	F(1,92)	3.94	0.48	1.26	0.24	-	0.02	2.72	2.31
India	F(1,99)	3.94	0.09	0.06	0.51	-	0.32	0.03	2.85
Indonesia	F(1,100)	3.94	0.16	0.20	1.87	-	0.07	0.80	0.11
Japan	F(1,92)	3.94	0.04	1.24	0.25	-	4.44*	5.67*	3.18
Korea	F(1,92)	3.94	0.02	1.07	2.38	-	0.03	0.13	1.19
Malaysia	F(1,99)	3.94	2.94	3.66	5.28*	-	1.74	0.02	3.41
Mexico	F(2,99)	3.09	3.44*	0.31	1.03	-	1.27	1.59	0.05
Norway	F(2,97)	3.09	0.83	3.73*	0.16	-	1.83	0.76	3.81*
N. Zealand	F(2,97)	3.09	2.29	1.54	0.16	-	0.09	0.15	1.08
Peru	F(1,100)	3.94	1.40	2.15	0.49	-	1.14	0.09	1.63
Philippines	F(1,94)	3.94	4.16*	1.80	1.43	-	0.00	0.25	4.01*
S. Africa	F(1,92)	3.94	1.15	0.60	0.65	-	0.42	2.66	0.14
S. Arabia	F(1,98)	3.94	0.09	0.66	0.84	-	0.20	0.04	0.03
Singapore	F(1,99)	3.94	0.53	0.09	0.72	-	0.05	2.53	0.00
Sweden	F(1,98)	3.94	0.24	0.36	0.58	-	0.99	0.04	0.06
Switzerland	F(2,91)	3.10	2.08	0.58	2.03	-	0.12	0.51	0.07
Thailand	F(1,94)	3.94	0.01	0.72	0.01	-	0.01	0.04	0.45
Turkey	F(2,95)	3.09	0.68	1.70	0.02	-	2.92	0.15	0.45
UK	F(1,98)	3.94	0.53	3.58	1.03	-	1.29	0.24	2.50
US	F(2,93)	3.09	0.65	0.06	3.12*	0.45	2.12	0.42	-

*Note: * denotes significance at the 5 percent significance level.*

Table C.7: Number of Rejections of the Null of Parameter Constancy per Variable Across the Country-specific Models at the 5 % Significance Level

Test	y	π	q	$(e-p)$	ρ^S	ρ^L	Total
PK_{sup}	10	5	4	2	4	1	26
PK_{msq}	9	3	1	2	2	1	18
$\mathfrak{N}$	5	3	5	10	3	4	30
robust-$\mathfrak{N}$	4	2	1	7	1	2	17
QLR	6	10	9	13	12	5	55
robust-QLR	2	5	4	8	1	4	24
MW	5	5	5	10	2	5	32
robust-MW	5	5	5	10	2	4	31
APW	6	9	9	12	12	6	54
robust-APW	3	5	4	9	2	5	28

Note: The test statistics PK_{sup} and PK_{msq} are based on the cumulative sums of OLS residuals, $\mathfrak{N}$ is the Nyblom test for time-varying parameters and QLR, MW and APW are the sequential Wald statistics for a single break at an unknown change point. Statistics with the prefix 'robust' denote the heteroskedasticity-robust version of the tests. All tests are implemented at the 5% significance level.

Table C.8: Break Dates Computed with the Quandt's Likelihood Ratio Statistic (QLR) at the 5% Significance Level

Variables	y	π	q	$(e-p)$	ρ^S	ρ^L	p^o
Argentina	1989Q3	1989Q3	1989Q4	1989Q2	1989Q3	-	-
Australia	1989Q1	1987Q3	1987Q4	2000Q1	1987Q1	1989Q1	-
Brazil	1990Q1	1989Q3	-	1999Q1	1989Q3	-	-
Canada	1987Q1	2001Q3	2000Q4	2001Q3	1987Q1	1997Q3	-
China	2002Q2	1988Q3	-	1991Q1	1990Q1	-	-
Chile	1987Q1	1987Q1	1987Q3	2000Q4	1987Q4	-	-
Euro area	1987Q4	1990Q1	1992Q3	1998Q4	1988Q3	1989Q2	-
India	1996Q2	1997Q3	1992Q2	2002Q1	1994Q4	-	-
Indonesia	1998Q1	1997Q4	-	1997Q2	1995Q1	-	-
Japan	1991Q1	1987Q1	1993Q1	1995Q2	1987Q3	1995Q4	-
Korea	1998Q2	1987Q3	1997Q2	1998Q1	1998Q3	1987Q1	-
Malaysia	1997Q3	2002Q2	1998Q3	1997Q2	1998Q2	-	-
Mexico	1988Q3	1988Q1	-	1995Q1	1988Q1	-	-
Norway	2001Q2	2000Q4	1990Q1	2002Q1	1998Q4	1990Q4	-
N. Zealand	1987Q2	1987Q1	1991Q2	2000Q3	1987Q2	1987Q2	-
Peru	1990Q1	1989Q4	-	1989Q4	1989Q4	-	-
Philippines	1987Q4	1987Q1	1987Q1	1987Q3	1987Q1	-	-
S. Africa	1987Q1	1994Q2	1988Q1	1989Q1	1997Q4	1989Q3	-
S. Arabia	1990Q2	1997Q3	-	1995Q2	-	-	-
Singapore	1997Q3	1989Q4	1991Q3	1997Q3	1995Q3	-	-
Sweden	1987Q1	1993Q2	1988Q1	2000Q1	1991Q1	1988Q1	-
Switzerland	1987Q1	1987Q3	1987Q4	1992Q4	1989Q2	2001Q3	-
Thailand	1993Q2	1992Q4	1990Q3	1997Q4	1994Q4	-	-
Turkey	1993Q4	1994Q2	-	2000Q4	1994Q2	-	-
UK	1987Q1	1990Q4	1987Q1	1988Q4	1987Q4	1987Q1	-
US	1987Q1	2000Q4	2000Q3	-	1987Q1	1988Q2	1998Q4

Table C.9: Contemporaneous Effects of Foreign Variables on Domestic Counterparts by Countries

	y	π	q	$(e-p)$	ρ^S	ρ^L
Argentina	0.83	-0.04	1.26	-	1.61	-
	(0.22)	*(2.36)*	*(0.40)*	-	*(2.40)*	-
Australia	0.34	0.77	0.81	-	0.45	0.89
	(0.12)	*(0.18)*	*(0.14)*	-	*(0.11)*	*(0.15)*
Brazil	0.59	3.30	-	-	0.46	-
	(0.23)	*(2.52)*	-	-	*(4.10)*	-
Canada	0.48	0.68	0.94	-	0.51	1.04
	(0.09)	*(0.11)*	*(0.05)*	-	*(0.17)*	*(0.07)*
China	0.71	0.64	-	-	0.02	-
	(0.22)	*(0.29)*	-	-	*(0.04)*	-
Chile	0.77	0.11	0.51	-	0.13	-
	(0.24)	*(0.07)*	*(0.12)*	-	*(0.07)*	-
Euro area	0.42	0.18	1.02	-	0.09	0.69
	(0.09)	*(0.08)*	*(0.04)*	-	*(0.02)*	*(0.08)*
India	0.06	0.68	0.78	-	-0.04	-
	(0.14)	*(0.33)*	*(0.14)*	-	*(0.07)*	-
Indonesia	0.99	0.86	-	-	0.98	-
	(0.41)	*(0.69)*	-	-	*(0.83)*	-
Japan	0.10	0.10	0.72	-	-0.05	0.50
	(0.16)	*(0.09)*	*(0.10)*	-	*(0.05)*	*(0.08)*
Korea	-0.08	0.70	0.94	-	-0.21	0.21
	(0.19)	*(0.29)*	*(0.17)*	-	*(0.13)*	*(0.32)*
Malaysia	1.26	0.61	1.11	-	0.00	-
	(0.34)	*(0.17)*	*(0.20)*	-	*(0.09)*	-
Mexico	0.63	0.77	-	-	0.01	-
	(0.17)	*(0.56)*	-	-	*(0.54)*	-
Norway	1.33	0.78	1.14	-	0.36	0.70
	(0.31)	*(0.20)*	*(0.09)*	-	*(0.20)*	*(0.15)*
N. Zealand	0.33	0.42	0.82	-	0.51	0.39
	(0.19)	*(0.18)*	*(0.11)*	-	*(0.28)*	*(0.22)*
Peru	0.15	-0.58	-	-	-2.38	-
	(0.43)	*(2.44)*	-	-	*(1.26)*	-
Philippines	0.03	-0.24	1.02	-	0.30	-
	(0.22)	*(0.52)*	*(0.20)*	-	*(0.32)*	-
S. Africa	0.16	0.15	0.90	-	0.01	0.44
	(0.14)	*(0.24)*	*(0.14)*	-	*(0.07)*	*(0.22)*
S. Arabia	0.42	0.11	-	-	-	-
	(0.37)	*(0.20)*	-	-	-	-
Singapore	0.86	0.32	1.27	-	0.27	-
	(0.25)	*(0.17)*	*(0.12)*	-	*(0.14)*	-
Sweden	1.36	1.31	1.23	-	0.40	0.94
	(0.28)	*(0.16)*	*(0.09)*	-	*(0.17)*	*(0.16)*
Switzerland	0.53	0.37	0.91	-	0.19	0.47
	(0.13)	*(0.10)*	*(0.06)*	-	*(0.08)*	*(0.08)*
Thailand	0.33	0.63	0.83	-	0.37	-
	(0.20)	*(0.32)*	*(0.12)*	-	*(0.27)*	-
Turkey	1.21	3.57	-	-	1.10	-
	(0.42)	*(1.26)*	-	-	*(0.77)*	-
UK	0.58	0.78	0.86	-	0.22	0.76
	(0.14)	*(0.12)*	*(0.06)*	-	*(0.12)*	*(0.12)*
US	0.45	0.50	-	-	0.01	-
	(0.12)	*(0.11)*	-	-	*(0.05)*	-

Note: White's heteroscedastic-robust standard errors are given in brackets.

Table C.10: Average Pairwise Cross-section Correlations of Real GDP, Inflation, and Equity Price and Associated Model's Residuals

	Real GDP					**Inflation**					**Equity Price**			
	Levels	First Diff.	VAR Res.	VARX* Res.		Levels	First Diff.	VAR Res.	VARX* Res.		Levels	First Diff.	VAR Res.	VARX* Res.
Argentina	0.89	0.08	0.03	0.01	Argentina	0.26	0.05	0.05	0.01	Argentina	0.45	0.21	0.17	0.00
Australia	0.97	0.16	0.12	0.02	Australia	0.34	0.08	0.05	-0.02	Australia	0.79	0.52	0.47	0.05
Brazil	0.96	0.15	0.10	0.01	Brazil	0.21	0.01	0.00	-0.05	Brazil	-	-	-	-
Canada	0.97	0.20	0.10	0.02	Canada	0.41	0.14	0.11	0.02	Canada	0.73	0.54	0.48	0.05
China	0.97	0.09	0.06	-0.02	China	0.10	0.07	0.06	0.00	China	-	-	-	-
Chile	0.96	0.16	0.09	0.02	Chile	0.39	0.05	-0.02	-0.01	Chile	0.78	0.29	0.28	0.06
Euro area	0.96	0.26	0.16	0.01	Euro area	0.46	0.16	0.13	0.03	Euro area	0.78	0.56	0.52	-0.10
India	0.97	-0.02	-0.01	-0.01	India	0.19	0.03	0.06	0.01	India	0.77	0.32	0.29	0.00
Indonesia	0.96	0.10	0.06	-0.01	Indonesia	0.01	0.04	0.07	0.02	Indonesia	-	-	-	-
Japan	0.90	0.16	0.06	-0.03	Japan	0.42	0.09	0.05	-0.01	Japan	0.43	0.44	0.32	-0.11
Korea	0.95	0.13	0.06	0.02	Korea	0.37	0.06	0.05	0.00	Korea	0.70	0.36	0.30	-0.02
Malaysia	0.96	0.21	0.13	0.02	Malaysia	0.27	0.11	0.09	0.01	Malaysia	0.60	0.39	0.38	0.06
Mexico	0.96	0.17	0.12	0.02	Mexico	0.19	0.01	0.02	0.00	Mexico	-	-	-	-
Norway	0.97	0.12	0.11	0.03	Norway	0.37	0.08	0.06	0.03	Norway	0.81	0.49	0.46	0.06
N. Zealand	0.96	0.18	0.10	0.06	N. Zealand	0.33	0.07	0.04	0.03	N. Zealand	0.54	0.40	0.37	0.02
Peru	0.85	0.06	0.06	0.01	Peru	0.23	-0.04	0.00	-0.03	Peru	-	-	-	-
Philippines	0.94	0.07	0.03	0.01	Philippines	0.21	0.03	0.03	0.00	Philippines	0.72	0.36	0.34	0.03
S. Africa	0.94	0.20	0.11	0.05	S. Africa	0.33	0.06	0.04	0.04	S. Africa	0.79	0.47	0.41	0.07
S. Arabia	0.89	0.03	0.05	-0.02	S. Arabia	0.05	0.00	0.06	0.03	S. Arabia	-	-	-	-
Singapore	0.96	0.20	0.14	0.00	Singapore	0.30	0.06	0.07	0.01	Singapore	0.73	0.53	0.49	0.01
Sweden	0.96	0.21	0.16	0.01	Sweden	0.46	0.10	0.11	0.01	Sweden	0.77	0.50	0.47	-0.02
Switzerland	0.96	0.20	0.11	0.00	Switzerland	0.39	0.09	0.07	0.02	Switzerland	0.79	0.53	0.51	0.01
Thailand	0.94	0.18	0.07	0.02	Thailand	0.31	0.06	0.02	-0.01	Thailand	0.64	0.39	0.36	0.06
Turkey	0.96	0.13	0.08	0.00	Turkey	0.14	0.00	0.04	-0.01	Turkey	-	-	-	-
UK	0.97	0.21	0.15	0.03	UK	0.45	0.11	0.12	0.02	UK	0.77	0.55	0.50	-0.05
US	0.97	0.22	0.11	-0.02	US	0.42	0.19	0.16	0.01	US	0.78	0.54	0.48	-0.02

Note: VARX Res (VARX* Residuals) refer to residuals from the country specific VARX* models with foreign variables, estimated in the first step of GVAR analysis. The number of cointegration relations and lag orders in the country specific VARX* models are given in Table C.1. VAR Res (VAR Residuals) are obtained after re-estimating all the individual country-specific models over the same period excluding the foreign variables, including oil as endogenous in all the country models. For each country VAR model we used the same lag order as specified in Table C.1 and selected the number of cointegration relationships based on the Johansen's trace statistics computed for the individual VAR models excluding the foreign variables.*

Table C.11: Average Pairwise Cross-section Correlations of Exchange Rate, Short-term and Long-term Interest Rate and Associated Model's Residuals

	Real Exchange Rate					Short-term Interest Rate					Long-term Interest Rate			
	Levels	First Diff.	VAR Res.	VARX* Res.		Levels	First Diff.	VAR Res.	VARX* Res.		Levels	First Diff.	VAR Res.	VARX* Res.
Argentina	0.42	0.09	0.07	0.07	Argentina	0.42	0.03	0.02	-0.02	Argentina	-	-	-	-
Australia	0.76	0.36	0.30	0.24	Australia	0.55	0.13	0.08	0.00	Australia	0.85	0.37	0.28	0.02
Brazil	0.70	0.18	0.13	0.11	Brazil	0.36	0.01	0.00	-0.07	Brazil	-	-	-	-
Canada	0.72	0.31	0.21	0.18	Canada	0.60	0.18	0.15	0.10	Canada	0.87	0.37	0.32	-0.01
China	0.19	0.08	0.03	0.02	China	0.49	0.07	0.05	0.02	China	-	-	-	-
Chile	0.64	0.27	0.21	0.16	Chile	0.57	0.02	-0.05	-0.04	Chile	-	-	-	-
Euro area	0.75	0.36	0.30	0.32	Euro area	0.61	0.18	0.10	0.05	Euro area	0.86	0.45	0.34	-0.05
India	0.33	0.24	0.21	0.17	India	0.34	0.10	0.05	0.04	India	-	-	-	-
Indonesia	0.05	0.22	0.14	0.12	Indonesia	0.15	0.08	0.07	0.04	Indonesia	-	-	-	-
Japan	0.64	0.17	0.14	0.16	Japan	0.57	0.05	0.02	0.00	Japan	0.83	0.28	0.23	-0.04
Korea	0.73	0.28	0.22	0.17	Korea	0.54	0.06	0.05	0.05	Korea	0.75	0.06	0.02	-0.05
Malaysia	0.62	0.29	0.23	0.21	Malaysia	0.43	0.06	0.02	0.05	Malaysia	-	-	-	-
Mexico	0.65	0.08	0.04	0.00	Mexico	0.43	0.03	0.02	0.04	Mexico	-	-	-	-
Norway	0.75	0.38	0.34	0.33	Norway	0.55	0.05	-0.02	-0.01	Norway	0.83	0.27	0.22	-0.01
N. Zealand	0.75	0.36	0.30	0.27	N. Zealand	0.49	0.06	0.05	0.01	N. Zealand	0.76	0.19	0.12	0.02
Peru	0.70	0.05	0.06	0.05	Peru	0.40	0.04	0.04	0.05	Peru	-	-	-	-
Philippines	0.73	0.18	0.18	0.16	Philippines	0.56	0.09	0.05	0.03	Philippines	-	-	-	-
S. Africa	0.64	0.30	0.25	0.24	S. Africa	0.39	0.11	0.06	0.04	S. Africa	0.53	0.19	0.13	0.00
S. Arabia	0.44	0.07	0.05	0.07	S. Arabia	-	-	-	-	S. Arabia	-	-	-	-
Singapore	0.74	0.37	0.30	0.26	Singapore	0.51	0.09	0.08	0.02	Singapore	-	-	-	-
Sweden	0.70	0.35	0.29	0.28	Sweden	0.64	0.10	0.07	0.02	Sweden	0.87	0.37	0.28	0.02
Switzerland	0.74	0.30	0.25	0.30	Switzerland	0.45	0.09	0.02	-0.02	Switzerland	0.74	0.37	0.21	0.01
Thailand	0.73	0.29	0.25	0.22	Thailand	0.56	0.12	0.08	0.04	Thailand	-	-	-	-
Turkey	0.73	0.19	0.13	0.07	Turkey	0.15	0.05	0.04	0.01	Turkey	-	-	-	-
UK	0.73	0.34	0.28	0.26	UK	0.61	0.15	0.09	0.04	UK	0.86	0.39	0.28	-0.04
US	-	-	-	-	US	0.52	0.11	0.08	0.03	US	0.83	0.40	0.30	-0.02

Note: VARX Res (VARX* Residuals) refer to residuals from the country specific VARX* models with foreign variables, estimated in the first step of GVAR analysis. The number of cointegration relations and lag orders in the country specific VARX* models are given in Table C.1. VAR Res (VAR Residuals) are obtained after re-estimating all the individual country-specific models over the same period excluding the foreign variables, including oil as endogenous in all the country models. For each country VAR model we used the same lag order as specified in Table C.1 and selected the number of cointegration relationships based on the Johansen's trace statistics computed for the individual VAR models excluding the foreign variables.*

Figure C.2: GIRFs for One Standard Deviation Increase in China GDP (World economy and LAC5; Bootstrapped GIRFs, 2009)

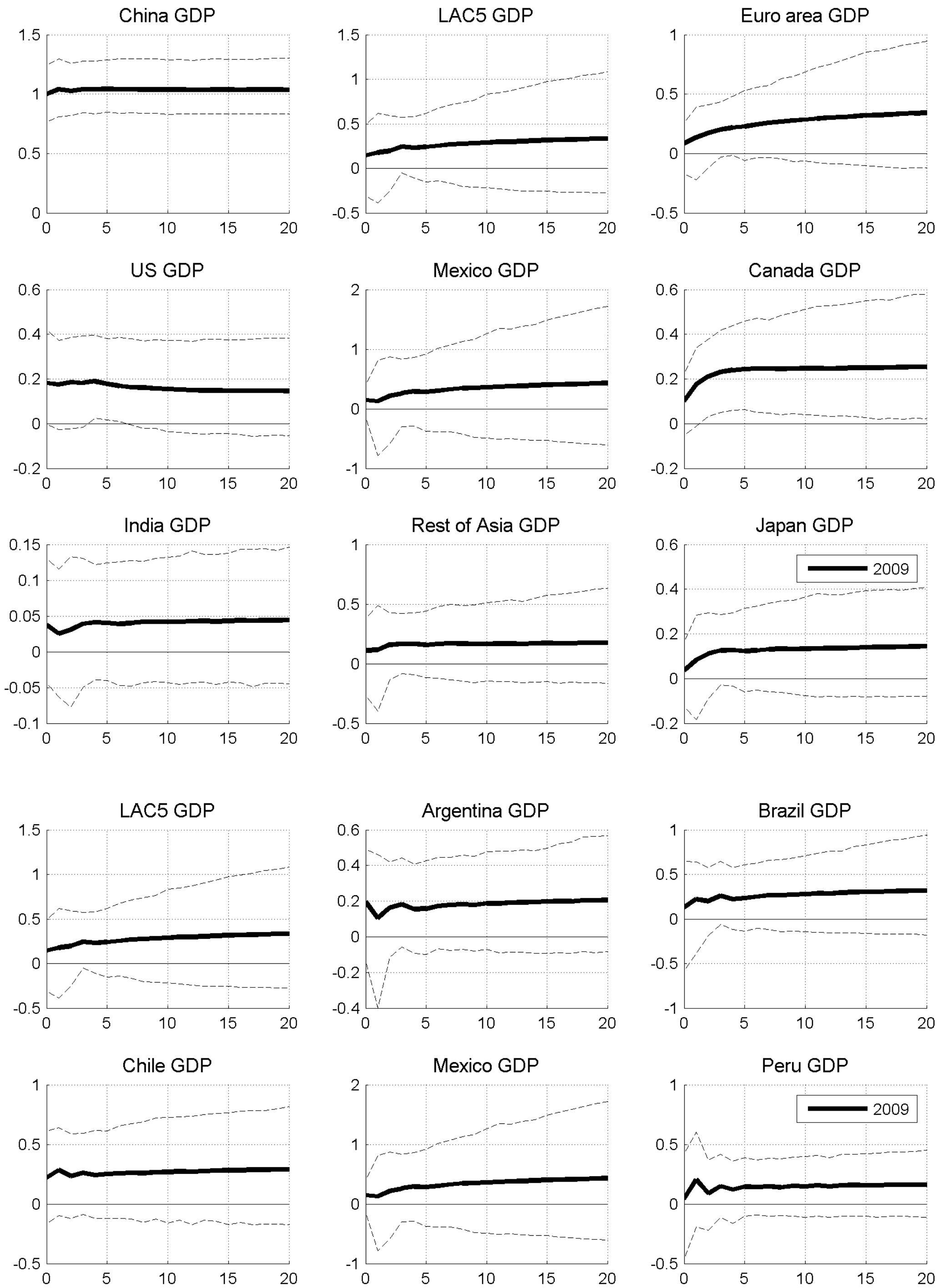


Figure C.3: GIRFs for One Standard Deviation Increase in China GDP (World economy and LAC5; Bootstrapped GIRFs, 1985)

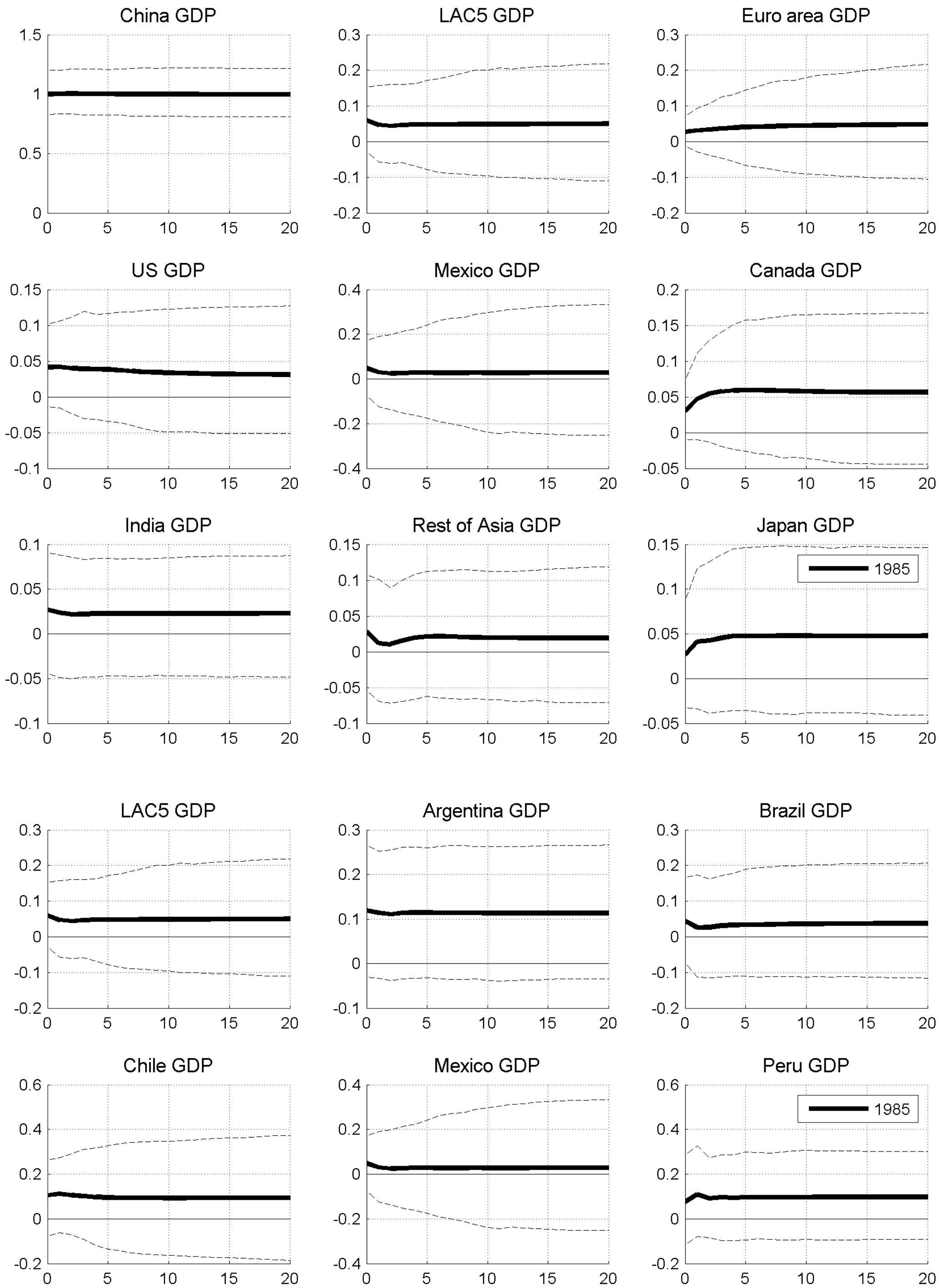


Figure C.4: GIRFs for One Standard Deviation Increase in US GDP (World economy and LAC5; Bootstrapped GIRFs, 2009)

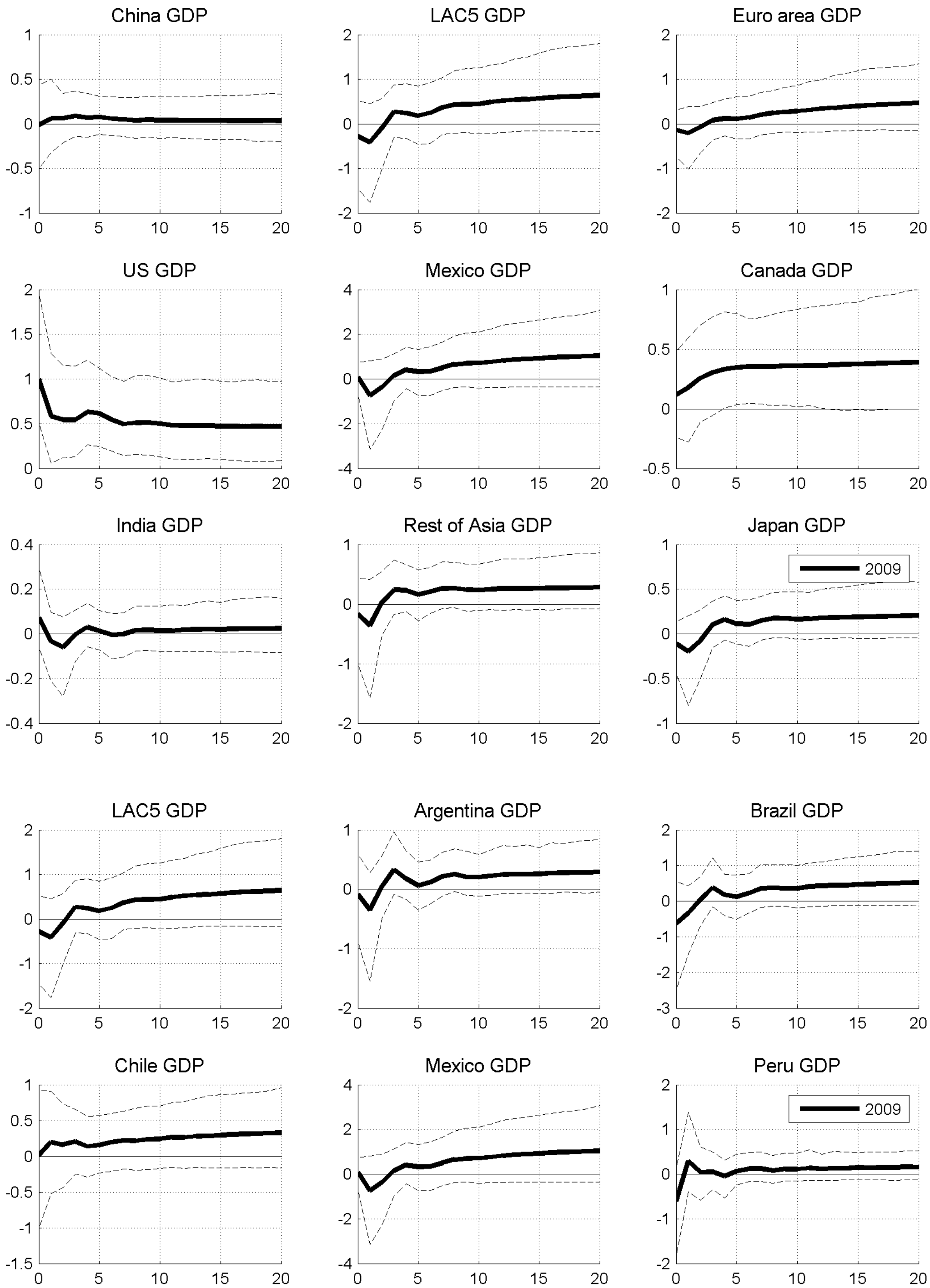


Figure C.5: GIRFs for One Standard Deviation Increase in US GDP (World economy and LAC5; Bootstrapped GIRFs, 1985)

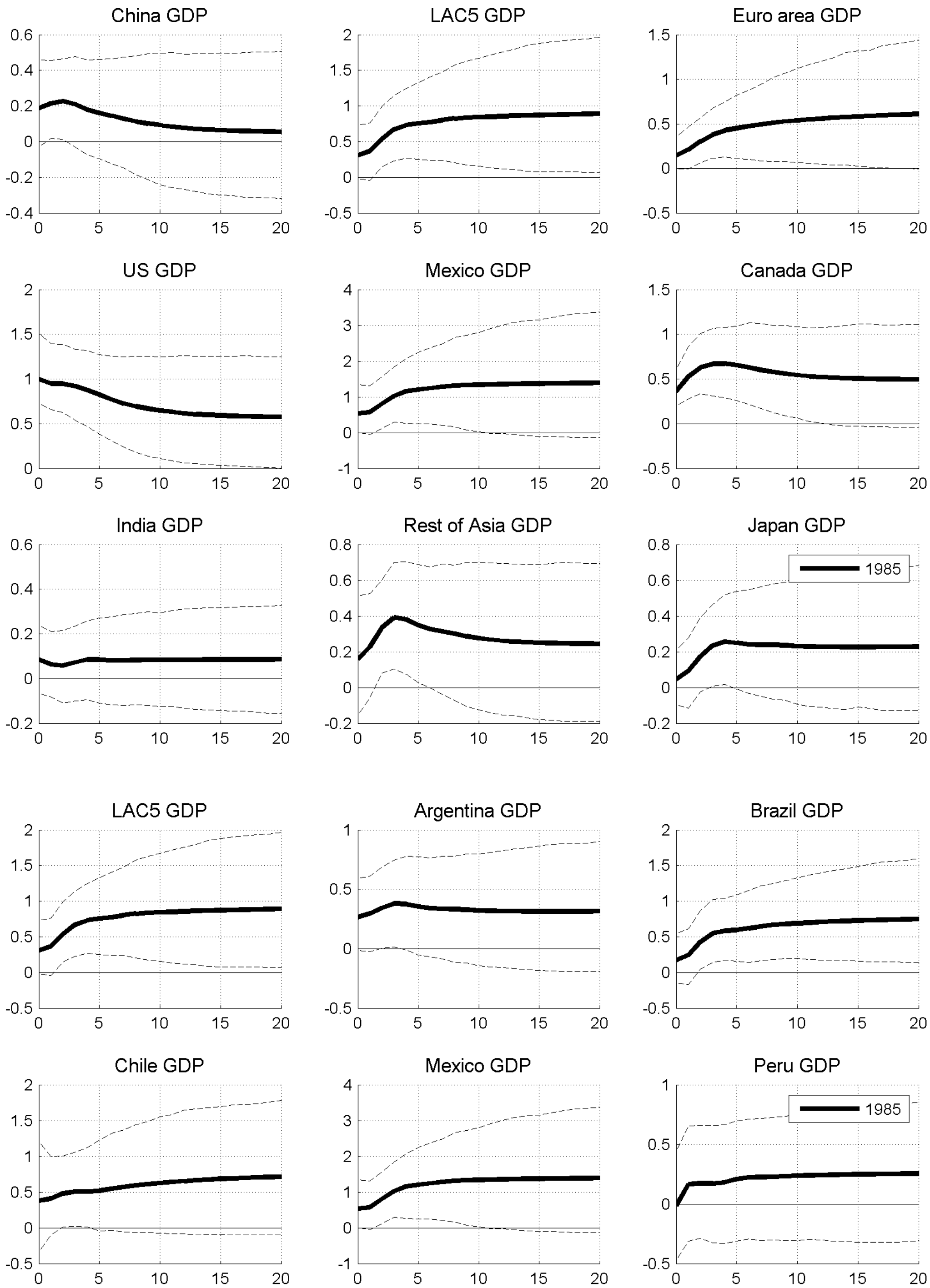


Figure C.6: GIRFs for One Standard Deviation Increase in LAC5 GDP (World economy and LAC5; Bootstrapped GIRFs, 2009)

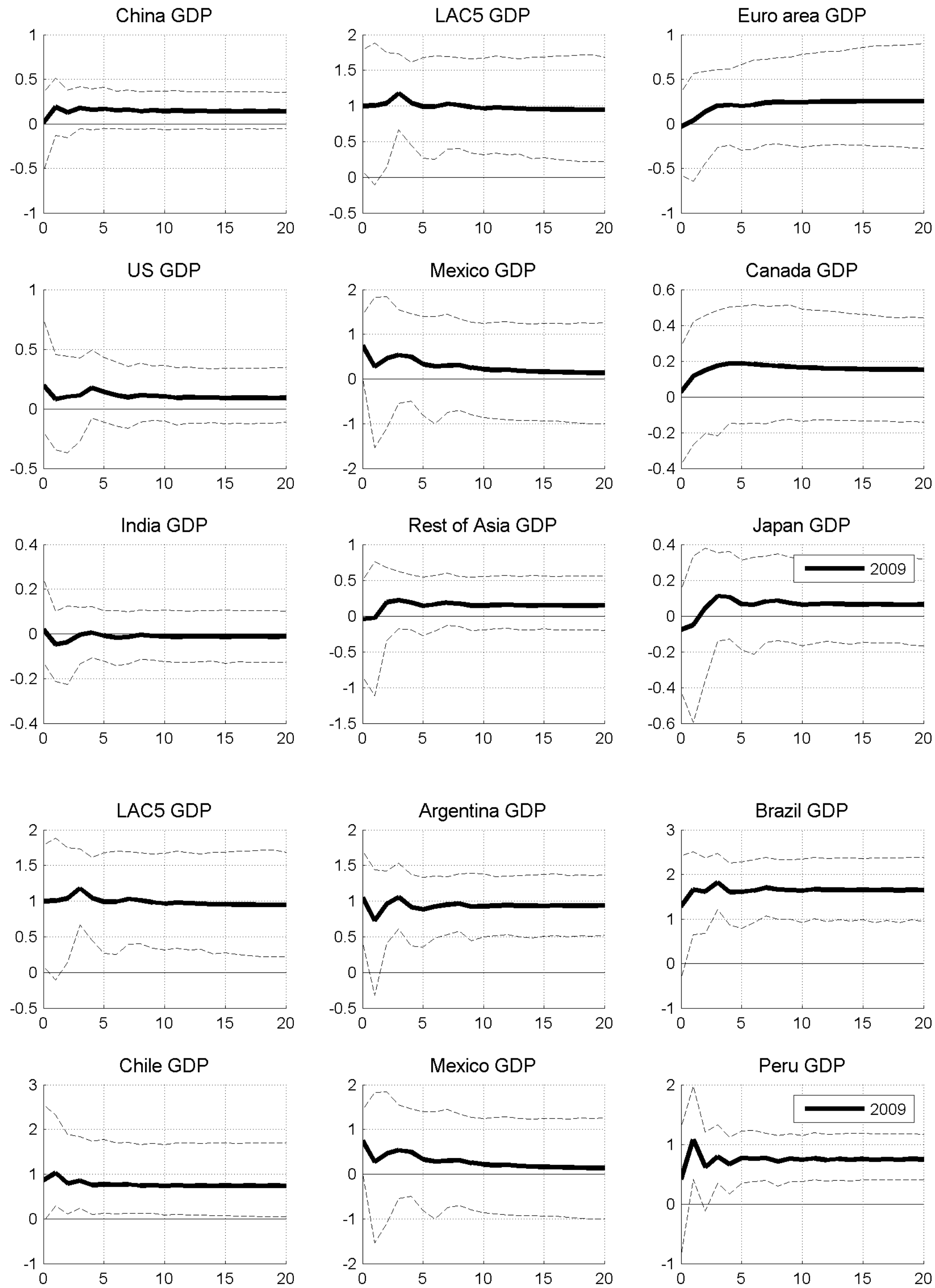


Figure C.7: GIRFs for One Standard Deviation Increase in LAC5 GDP (World economy and LAC5; Bootstrapped GIRFs, 1985)

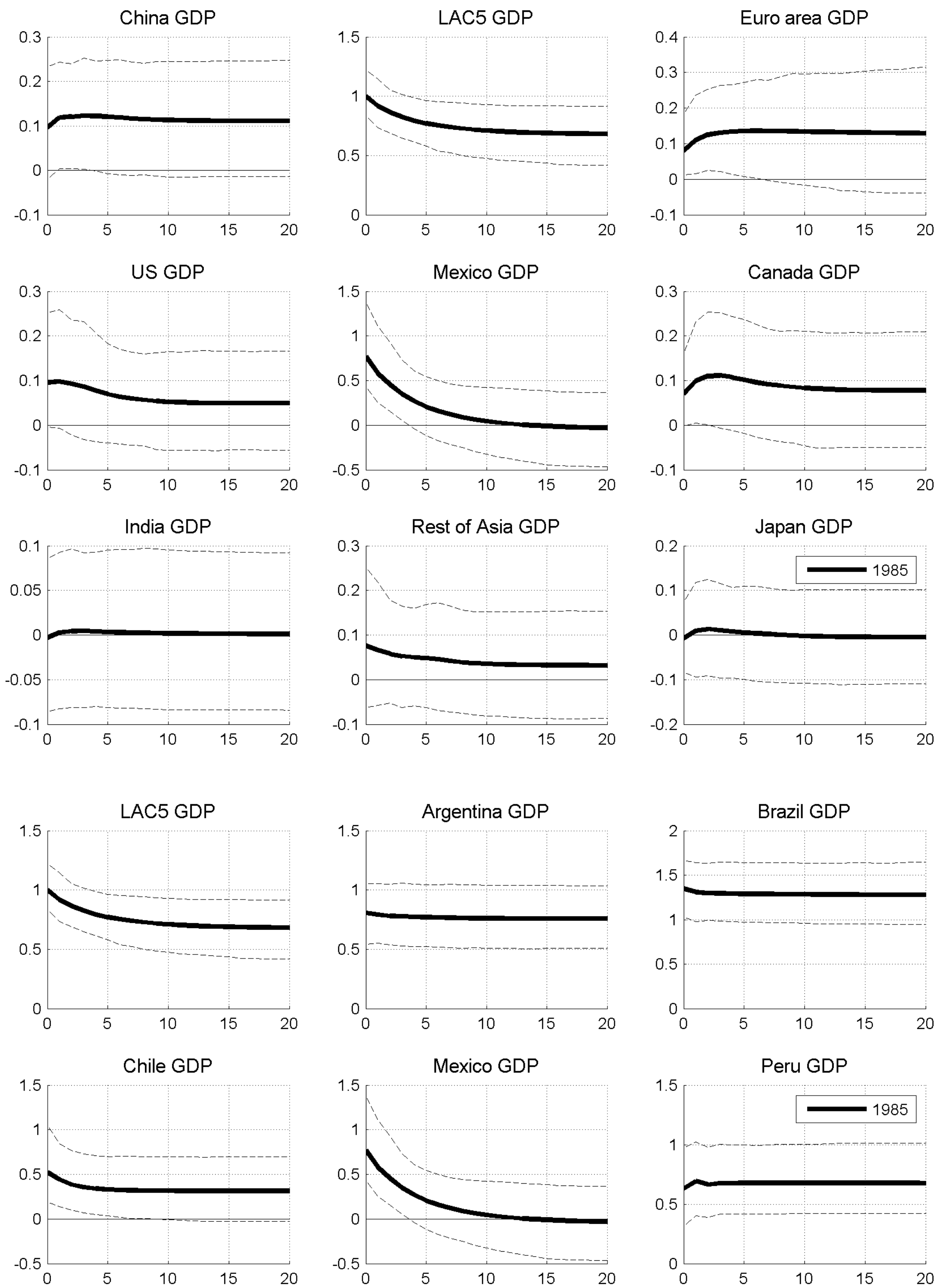


Figure C.8: GIRFs for One Standard Deviation Increase in rest of Asia GDP (World economy and LAC5; Bootstrapped GIRFs, 2009)

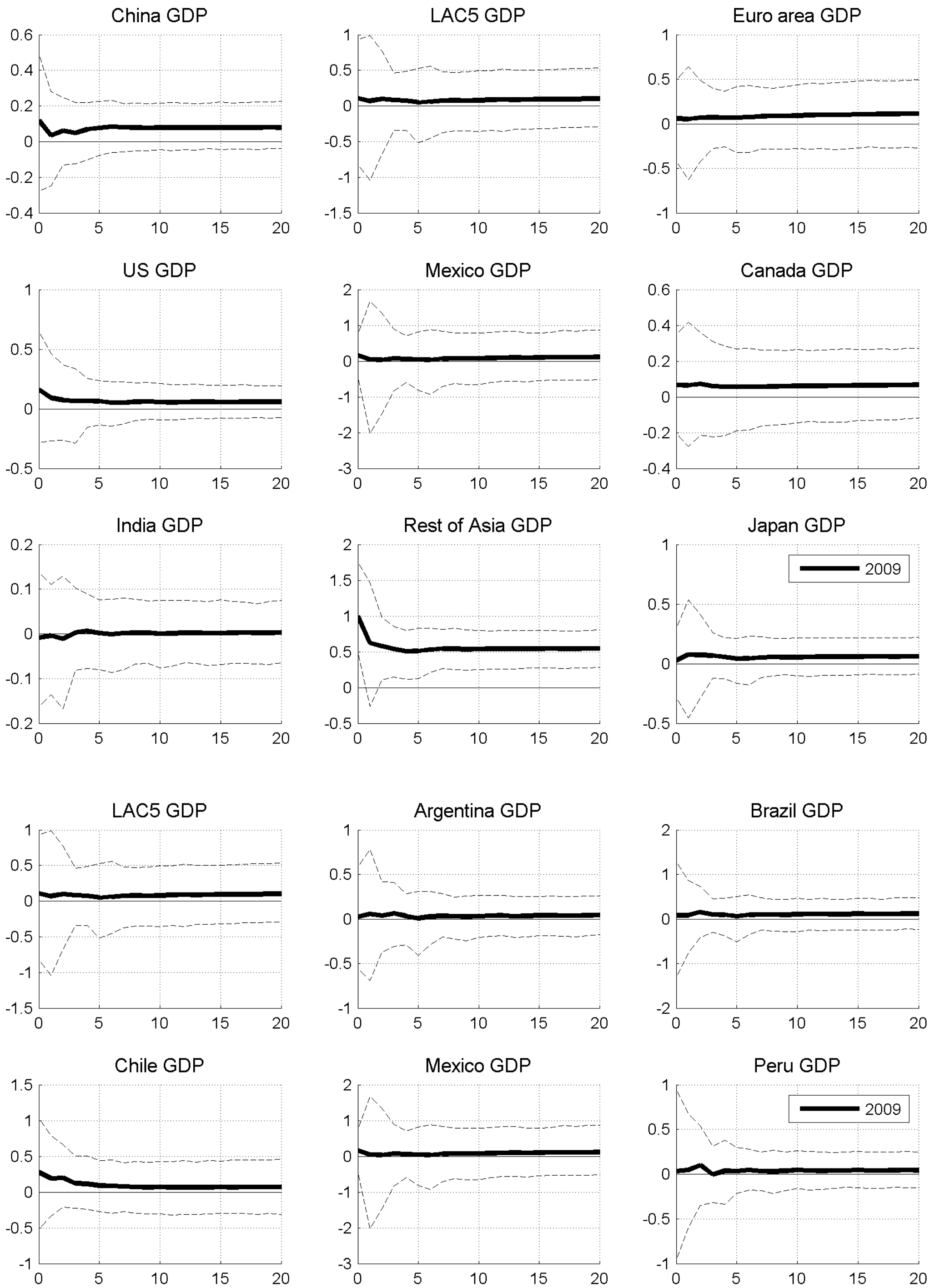
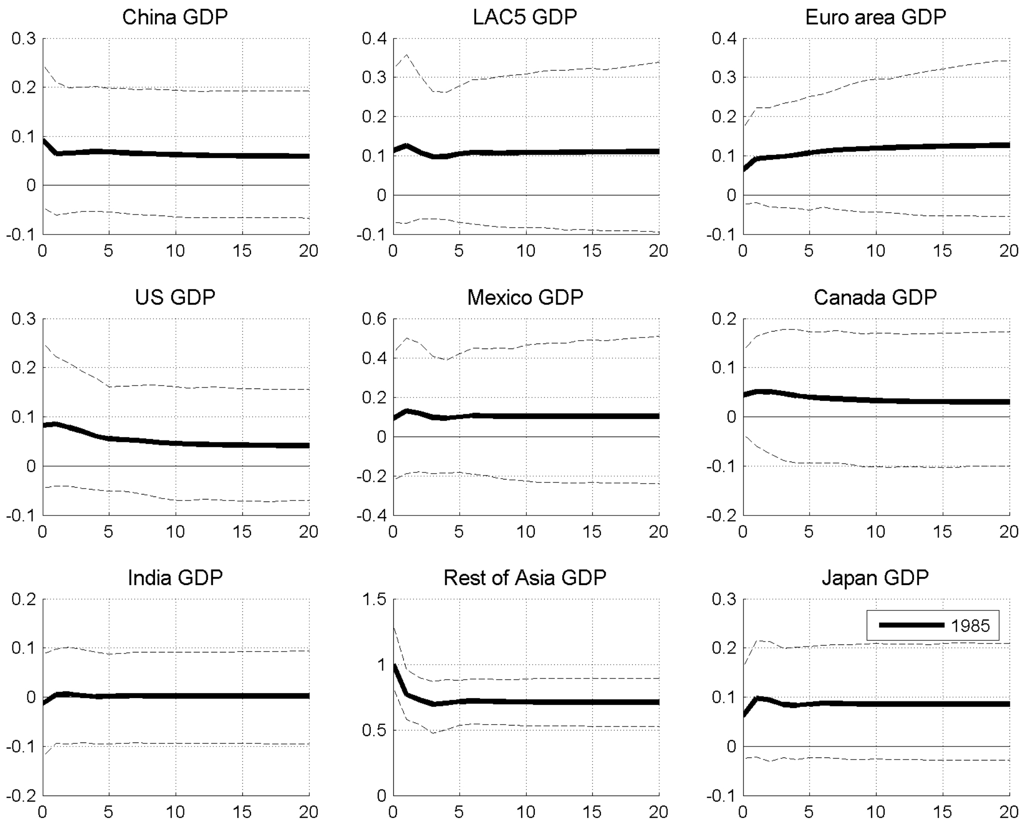
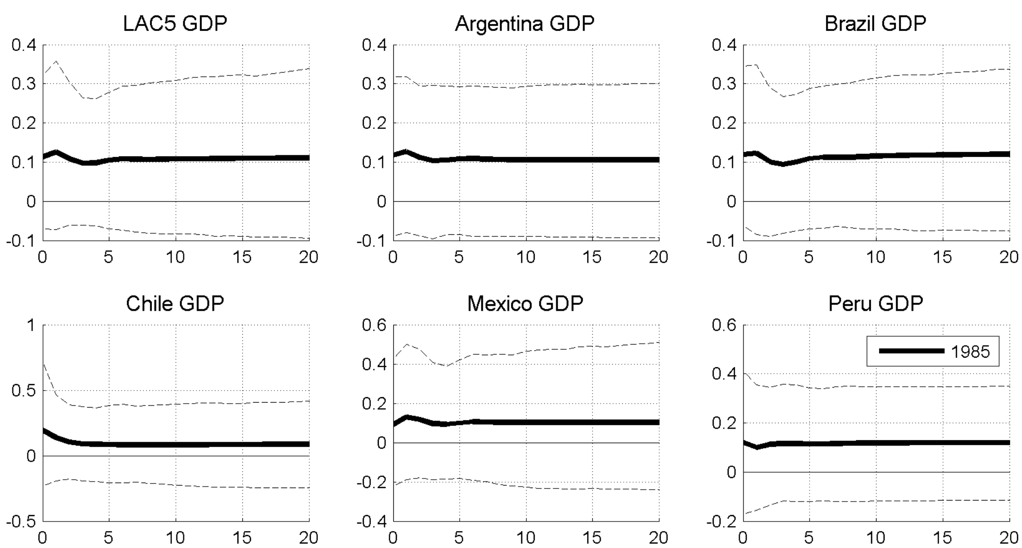


Figure C.9: GIRFs for One Standard Deviation Increase in rest of Asia GDP (World economy and LAC5; Bootstrapped GIRFs, 1985)





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