Transmission of Financial and Real Shocks in the Global Economy Using the GVAR

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Agenda

- An overview of the global VAR (GVAR) as a framework for the analysis of shocks and their transmission in the global economy.
- Developing a new GVAR_33 model for the analysis of the effects of shocks on individual.
- Evaluating the effects of oil and equity price shocks on real economies in the global system.
- Comparing the responses of euro and non-euro economies to shocks.

Global Dimensions of Economic Interactions

- Macroeconomic policy analysis and risk management require taking account of the increasing interdependencies that exist across markets and countries.
- National economic issues need to be considered from a global perspective.
- This invariably means that many different channels of transmission must be taken into account.
- We are presented with the task of modeling complex high dimensional systems.

Patterns of Global Economic and Financial Inter-linkages – An Overview

- There are major differences in cross country correlation of output growths, inflation, and interest rates. (See Tables that follow)
- Equity returns and long term interest rates are much more closely correlated across countries.
- US economy remains the dominant source of global economic interdependence.

Output Growth Correlations Across Selected Countries in the GVAR Model (1979-2006)

	China	Euro Area	Japan	Australia	Canada	UK	US
China	1.000	-0.097	-0.072	0.048	0.166	0.211	0.220
Euro Area	-0.097	1.000	0.253	0.034	0.226	0.342	0.252
Japan	-0.072	0.253	1.000	-0.088	-0.038	0.055	-0.008
Australia	0.048	0.034	-0.088	1.000	0.306	0.106	0.429
Canada	0.166	0.226	-0.038	0.306	1.000	0.225	0.582
UK	0.211	0.342	0.055	0.106	0.225	1.000	0.231
US	0.220	0.252	-0.008	0.429	0.582	0.231	1.000

Real Equity Return Correlations Across Selected Countries in the GVAR Model (1979-2006)

	Euro Area	Japan	Australia	Canada	UK	US
Euro Area	1.000	0.483	0.578	0.655	0.747	0.708
Japan	0.483	1.000	0.314	0.434	0.486	0.387
Australia	0.578	0.314	1.000	0.703	0.626	0.611
Canada	0.655	0.434	0.703	1.000	0.682	0.800
UK	0.747	0.486	0.626	0.682	1.000	0.772
US	0.708	0.387	0.611	0.800	0.772	1.000

Price Inflation Correlations Across Selected Countries in the GVAR Model (1979-2006)

	China	Euro Area	Japan	Australia	Canada	UK	US
China	1.000	-0.036	-0.007	0.059	-0.110	-0.009	-0.009
Euro Area	-0.036	1.000	0.709	0.603	0.806	0.711	0.761
Japan	-0.007	0.709	1.000	0.416	0.584	0.664	0.700
Australia	0.059	0.603	0.416	1.000	0.619	0.501	0.506
Canada	-0.110	0.806	0.584	0.619	1.000	0.606	0.757
UK	-0.009	0.711	0.664	0.501	0.606	1.000	0.739
US	-0.009	0.761	0.700	0.506	0.757	0.739	1.000

Correlation of Short Term Interests Across Selected Countries in the GVAR Model (1979-2006)

	China	Euro Area	Japan	Australia	Canada	UK	US
China	1.000	0.503	0.403	0.472	0.387	0.425	0.253
Euro Area	0.503	1.000	0.915	0.673	0.880	0.832	0.774
Japan	0.403	0.915	1.000	0.711	0.862	0.903	0.754
Australia	0.472	0.673	0.711	1.000	0.768	0.798	0.615
Canada	0.387	0.880	0.862	0.768	1.000	0.902	0.918
UK	0.425	0.832	0.903	0.798	0.902	1.000	0.814
US	0.253	0.774	0.754	0.615	0.918	0.814	1.000

Correlation of Long Term Interests Across Selected Countries in the GVAR Model (1979-2003)

	Euro Area	Japan	Australia	Canada	UK	US
Euro Area	1.000	0.942	0.886	0.973	0.951	0.934
Japan	0.942	1.000	0.854	0.926	0.943	0.901
Australia	0.886	0.854	1.000	0.921	0.865	0.879
Canada	0.973	0.926	0.921	1.000	0.948	0.968
UK	0.951	0.943	0.865	0.948	1.000	0.906
US	0.934	0.901	0.879	0.968	0.906	1.000

Economic Shocks and their Transmissions

- In economic systems agents acting in their self-interest tend to respond to shocks, particularly if they are adverse, in a similar manner but with differing degrees, as often seen in swarm behaviour.

- In the case of the swarms the shock initially affects the outer layer which is then transmitted very rapidly to the rest via neighbourhood effects.

- In economics the transmission of shocks is far more complex and takes place through a variety of channels:


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Channels of Transmission of Shocks in Economic Systems

- Common observed shocks (such as changes in oil prices)
- Common unobserved factors (such as the diffusion of technological progress)
- Specific national or sectoral shocks
- Residual interdependencies (after "common" factors are taken into account) due to social inter-actions or policy and trade spill-over effects

Genesis of the GVAR

- Dealing with economic relations in isolation and only for a single market or economy can be misleading, very much like considering the movement of a single wildebeest in isolation from the herd!
- Multi-layer panel data models provide an appropriate framework for the analysis of complex inter-related systems in economics.
- But their successful implementation face significant challenges; including data availability and data quality, heterogeneity, unobserved effects, and spatial (or network) interactions.
- The global VAR modelling approach represents an example of how these challenges can be addressed. Using infinite dimensional VARs Chudik and Pesaran (2008) provide a theoretical motivation.

Modelling Interactions Within and Between Euro Economies

- The GAVR developed in Dees et al. (2007, JAE) estimates a 26 country/region model with euro area as a single economy.
- Recently, with Vanessa Smith, I have constructed a new GVAR model where the main 8 euro economies (Austria, Belgium, France, Italy, Germany, Finland, Netherlands and Spain) are modeled as individual economies in a global context
- The estimation sample is also extended and covers the period 1979Q1-2006Q4 (as compared to 1979Q1-2003Q4 previously)

Theoretical Frameworks and Counterfactuals

- Before presenting the empirical results we begin with an overview of the GVAR model
- Details can be found in
- Pesaran, Schuermann and Weiner (2004, JBES),
- Dees et al. (2007, JAE), Pesaran and Chudik (2008)

- GVAR links individual country error correction models by means of foreign variables constructed using trade weights.

Country Specific VARX* Models

Suppose there are a set of $N+1$ countries indexed by $i = 0, 1, 2, ..., N$, with country 0, say the US, as the reference country. For country i, consider the VARX*$(2,1)$ specification

$$\mathbf{x}_{it} = \mathbf{h}_{i0} + \mathbf{h}_{i1}t + \mathbf{\Phi}_{i1}\mathbf{x}_{i,t-1} + \mathbf{\Phi}_{i2}\mathbf{x}_{i,t-2} + \mathbf{\Lambda}_{i0}\mathbf{x}^*_{it} + \mathbf{\Lambda}_{i1}\mathbf{x}^*_{i,t-1} + \mathbf{u}_{it}$$

where

$$\begin{aligned} \mathbf{x}_{it} &: k_i \times 1 \text{ vector of domestic variables} \\ \mathbf{x}^*_{it} &: k^*_i \times 1 \text{ vector of foreign variables} \end{aligned}$$

and $\mathbf{u}_{it}$ is a serially uncorrelated and cross sectionally weakly dependent.

$\mathbf{x}^*_{it}$ are defined as cross section averages

$$\mathbf{x}^*_{it} = \sum_{j=0}^{N} w_{ij}\mathbf{x}_{jt},$$

where w_{ij} are trade weights (could be time varying).

Error Correcting Country Specific Models

The error correction form of the VARX$^*(2,1)$ specification may be written as

$$\Delta \mathbf{x}_{it} = \mathbf{c}_{i0} - \boldsymbol{\alpha}_i \boldsymbol{\beta}_i' [\mathbf{z}_{i,t-1} - \boldsymbol{\gamma}_i (t-1)] + \boldsymbol{\Psi}_{i0} \Delta \mathbf{x}_{it}^* + \boldsymbol{\Gamma}_i \Delta \mathbf{z}_{i,t-1} + \mathbf{u}_{it}, \quad i = 1, 2, ..., N,$$

where $\mathbf{z}_{it} = (\mathbf{x}_{it}', \mathbf{x}_{it}^{*\prime})'$, $\boldsymbol{\alpha}_i$ is a $k_i \times r_i$ matrix of rank r_i and $\boldsymbol{\beta}_i$ is a $(k_i + k_i^*) \times r_i$ matrix of rank r_i.

- The VARX* model is estimated separately for each country conditional on $\mathbf{x}_{it}^*$, taking into account the possibility of cointegration both within $\mathbf{x}_{it}$ and across $\mathbf{x}_{it}$ and $\mathbf{x}_{it}^*$.
- For estimation, $\mathbf{x}_{it}^*$ are treated as $I(1)$ weakly exogenous, an assumption found acceptable when tested.
- Conditional on r_i cointegrating relations, the co-trending restrictions, $\boldsymbol{\beta}_i' \boldsymbol{\gamma}_i = \mathbf{0}$, and long-run restrictions on $\boldsymbol{\beta}_i$ can be tested.

Solving the GVAR

- Although estimation is done on a country by country basis, the GVAR model needs to be solved for the world as a whole.
- Start with the individual VARX* models (abstracting from deterministics)

$$\mathbf{x}_{it} = \mathbf{\Phi}_{i1}\mathbf{x}_{i,t-1} + \mathbf{\Phi}_{i2}\mathbf{x}_{i,t-2} + \mathbf{\Lambda}_{i0}\mathbf{x}^{*}_{it} + \mathbf{\Lambda}_{i1}\mathbf{x}^{*}_{i,t-1} + \mathbf{u}_{it}$$

and for each economy write

$$\mathbf{A}_{i0}\mathbf{z}_{it} = \mathbf{A}_{i1}\mathbf{z}_{it-1} + \mathbf{A}_{i,2}\mathbf{z}_{it-2} + \mathbf{u}_{it},$$

where $\mathbf{z}_{it}$

$$\mathbf{z}_{it} = \begin{pmatrix} \mathbf{x}_{it} \\ \mathbf{x}^{*}_{it} \end{pmatrix},$$

and

$$\mathbf{A}_{i0} = (\mathbf{I}_{k_i}, -\mathbf{\Lambda}_{i0}), \qquad \mathbf{A}_{i1} = (\mathbf{\Phi}_{i1}, \mathbf{\Lambda}_{i1}), \qquad \mathbf{A}_{i2} = (\mathbf{\Phi}_{i2}, \mathbf{0}_{k_i \times k^{*}_{i}}).$$

Solving the GVAR (Continued)

Let $\mathbf{x}_t = (\mathbf{x}'_{0t}, \mathbf{x}'_{1t}, ..., \mathbf{x}'_{Nt})'$ be the $k \times 1$ global vector of endogenous variables of the system with $k = \sum_{i=0}^{N} k_i$. The link between $\mathbf{x}_t$ and the variables in the i^{th} country model is given by the identity

$$\mathbf{z}_{it} = \mathbf{W}_i \mathbf{x}_t,$$

where $\mathbf{W}_i$ is a $(k_i + k_i^*) \times k$ 'link' matrix defined by the trade weights w_{ij}.

Using the above identity

$$\mathbf{A}_{i0}\mathbf{W}_i\mathbf{x}_t = \mathbf{A}_{i1}\mathbf{W}_i\mathbf{x}_{t-1} + \mathbf{A}_{i2}\mathbf{W}_i\mathbf{x}_{t-2} + \mathbf{u}_{it}, \;\; i = 0, 1, ..., N.$$

The N+1 individual country models are then stacked to yield the model for $\mathbf{x_t}$

$$\mathbf{G}\mathbf{x}_t = \mathbf{H}_1\mathbf{x}_{t-1} + \mathbf{H}_2\mathbf{x}_{t-2} + \mathbf{u}_t,$$

$$\mathbf{G} = \begin{pmatrix} \mathbf{A}_{00}\mathbf{W}_0 \\ \mathbf{A}_{10}\mathbf{W}_1 \\ \vdots \\ \mathbf{A}_{N0}\mathbf{W}_N \end{pmatrix}, \mathbf{H}_j = \begin{pmatrix} \mathbf{A}_{0j}\mathbf{W}_0 \\ \mathbf{A}_{1j}\mathbf{W}_1 \\ \vdots \\ \mathbf{A}_{Nj}\mathbf{W}_N \end{pmatrix}, \mathbf{h}_\ell = \begin{pmatrix} \mathbf{h}_{0\ell} \\ \mathbf{h}_{1\ell} \\ \vdots \\ \mathbf{h}_{N\ell} \end{pmatrix}, \; \mathbf{u}_t = \begin{pmatrix} \mathbf{u}_{0t} \\ \mathbf{u}_{1t} \\ \vdots \\ \mathbf{u}_{Nt} \end{pmatrix},$$

for $j = 1, 2$ and $\ell = 0, 1$.

Solving the GVAR (Continued)

Since $\mathbf{G}$ is a known non-singular matrix that depends on the trade weights and parameter estimates, we can obtain the GVAR

$$\mathbf{x}_t = \mathbf{F}_1\mathbf{x}_{t-1} + \mathbf{F}_2\mathbf{x}_{t-2} + \mathbf{v}_t,$$

where $\mathbf{F}_j = \mathbf{G}^{-1}\mathbf{H}_j$, $\mathbf{a}_\ell = \mathbf{G}^{-1}\mathbf{h}_\ell$ for $j = 1, 2$; $\ell = 0, 1$, $\mathbf{v}_t = \mathbf{G}^{-1}\mathbf{u}_t$. Also

$$\mathbf{\Sigma}_{\mathrm{v}} = \mathbf{E}(\mathbf{v}_t\mathbf{v}_t') = \mathbf{G}^{-1}\mathbf{\Sigma}_{\mathrm{u}}\mathbf{G}'^{-1},$$

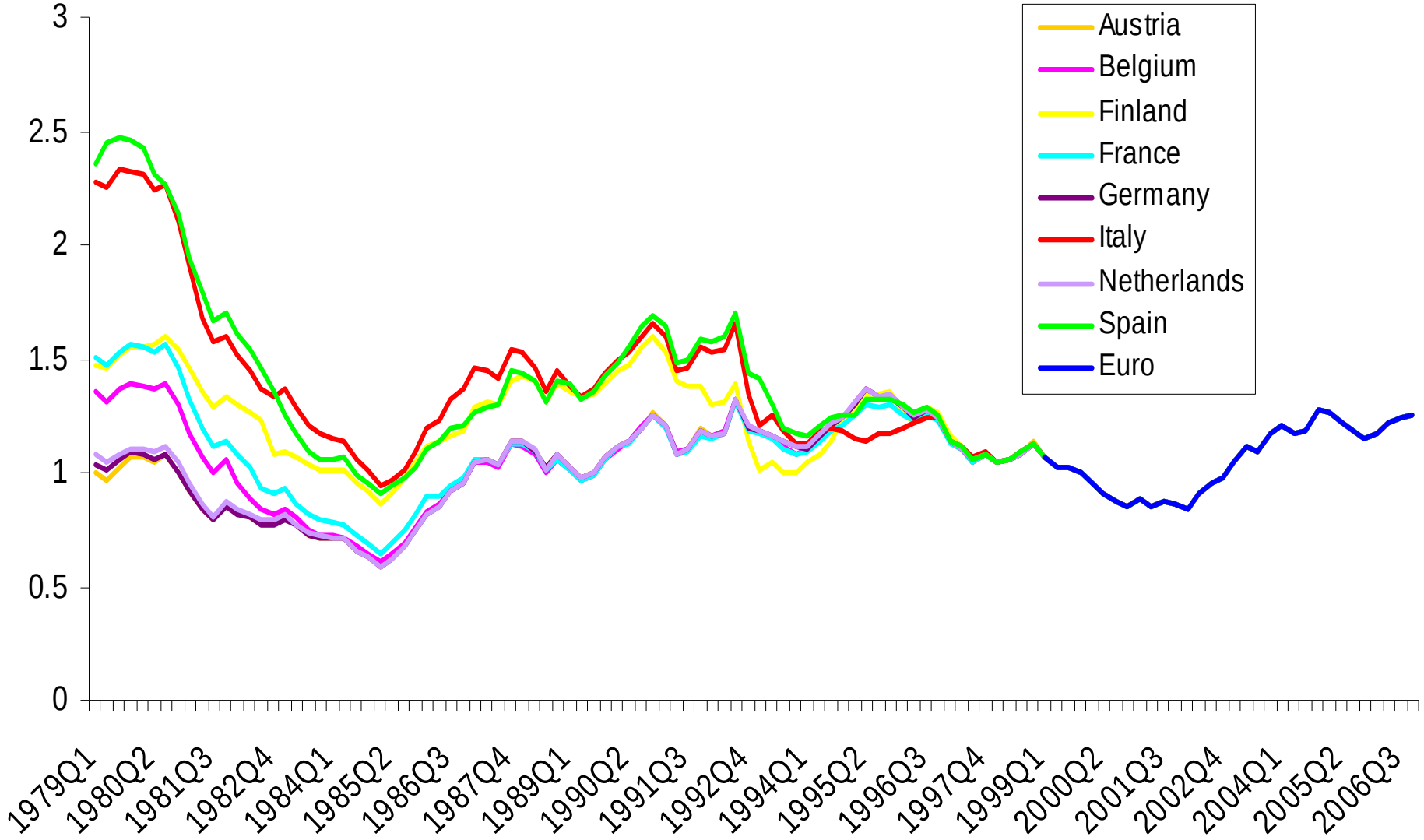
and $\mathbf{\Sigma}_{\mathrm{v}}$ can be estimated using country-specific estimates. In practice where the dimension of $\mathbf{\Sigma}_{\mathrm{v}}$, $k \times k$, is greater than T, the time dimension, an unconstrained estimation of $\mathbf{\Sigma}_{\mathrm{v}}$ will result in a singular matrix.

Empirical Results

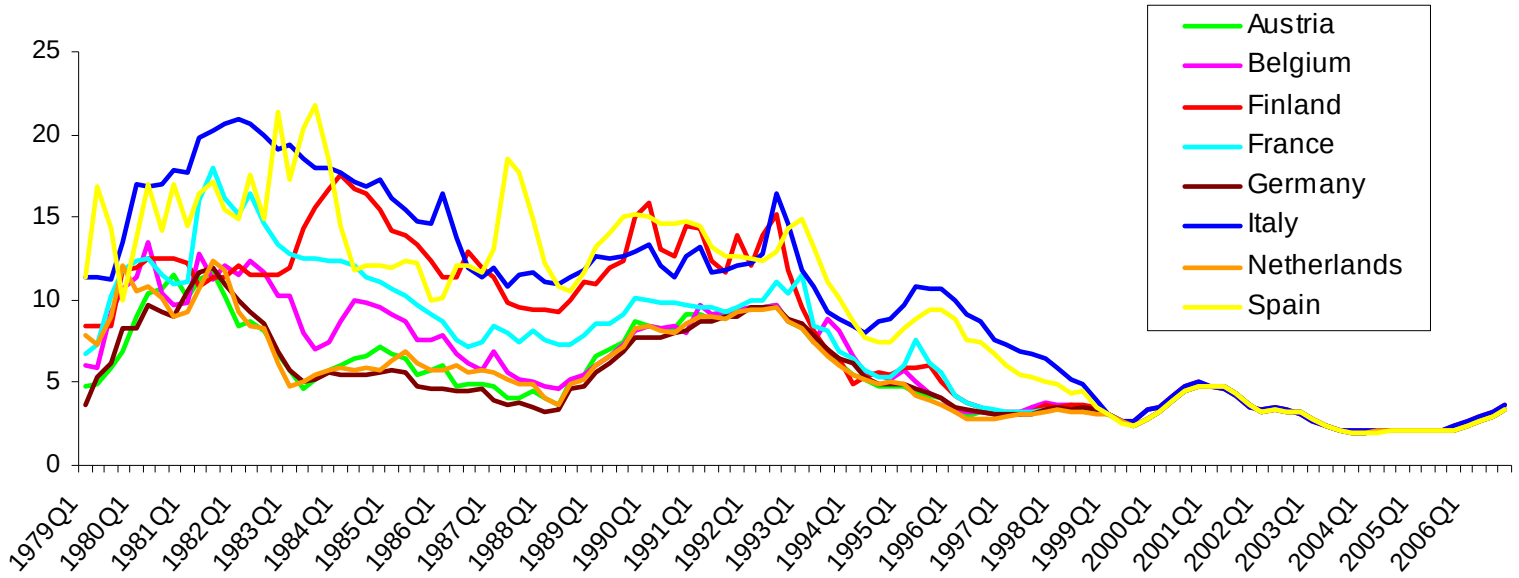
- We begin by examining the data on the euro economies and by comparing them to those prevailing in a group of reference economies: Australia, Canada, Japan, Norway, Sweden, Switzerland, UK and US.

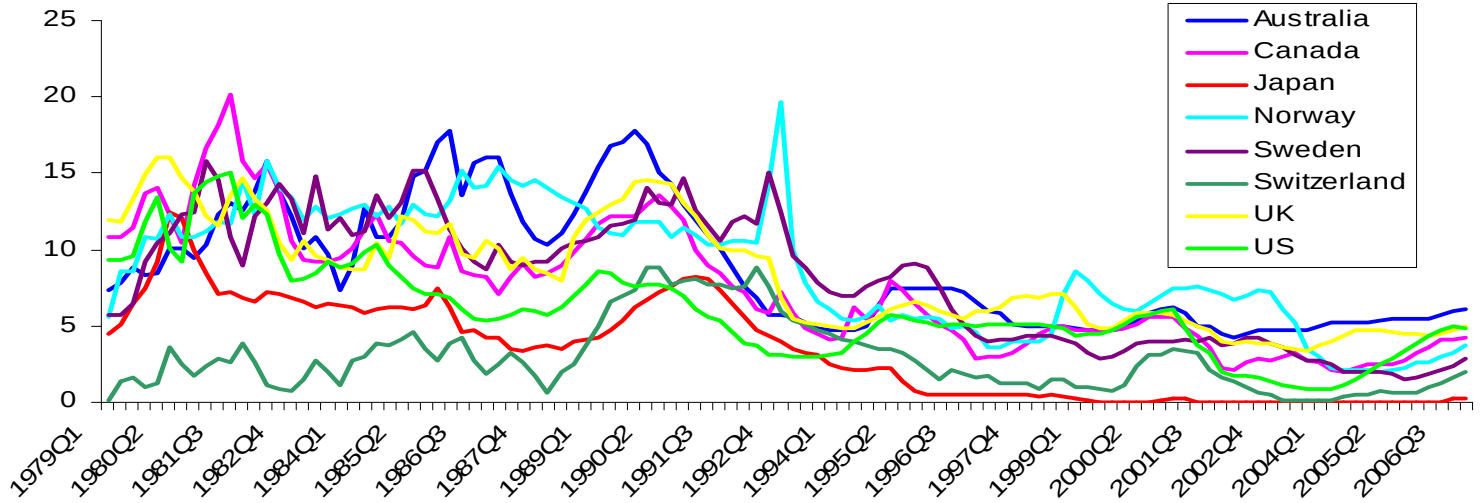
- Such a comparison allows us to shed light on the quantitative nature of the effects of the introduction of the euro on inflation and output growth across the countries in the euro area.

Euro Area Currencies

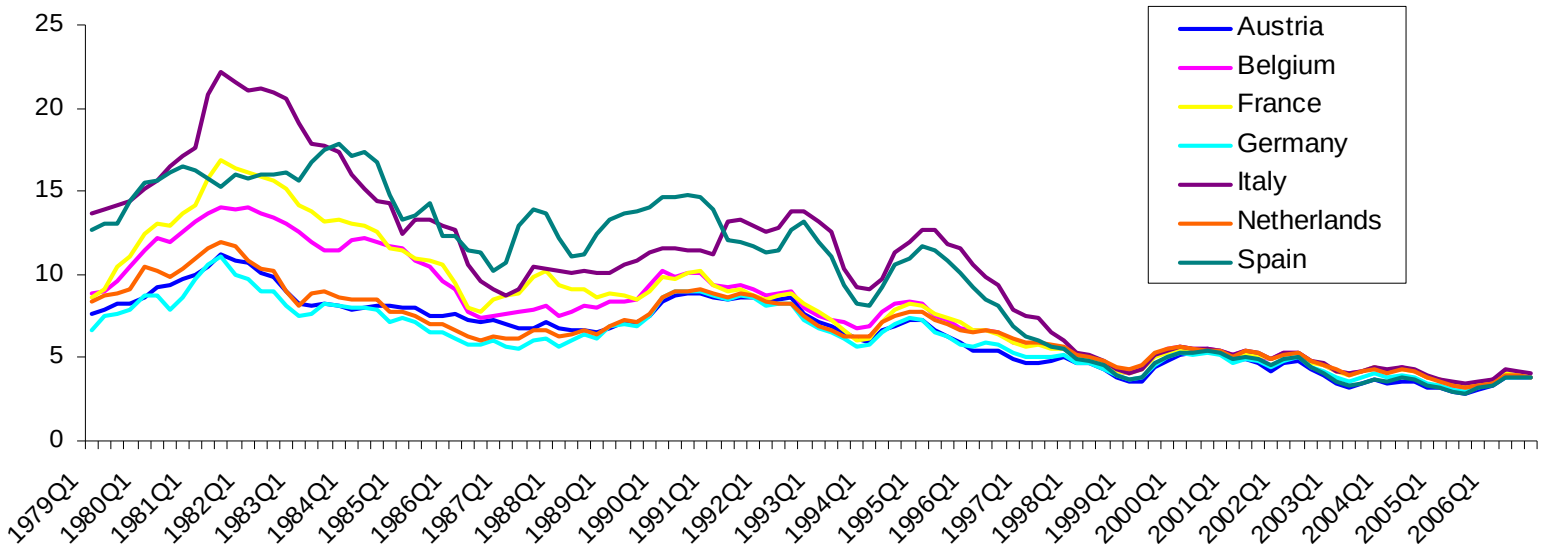


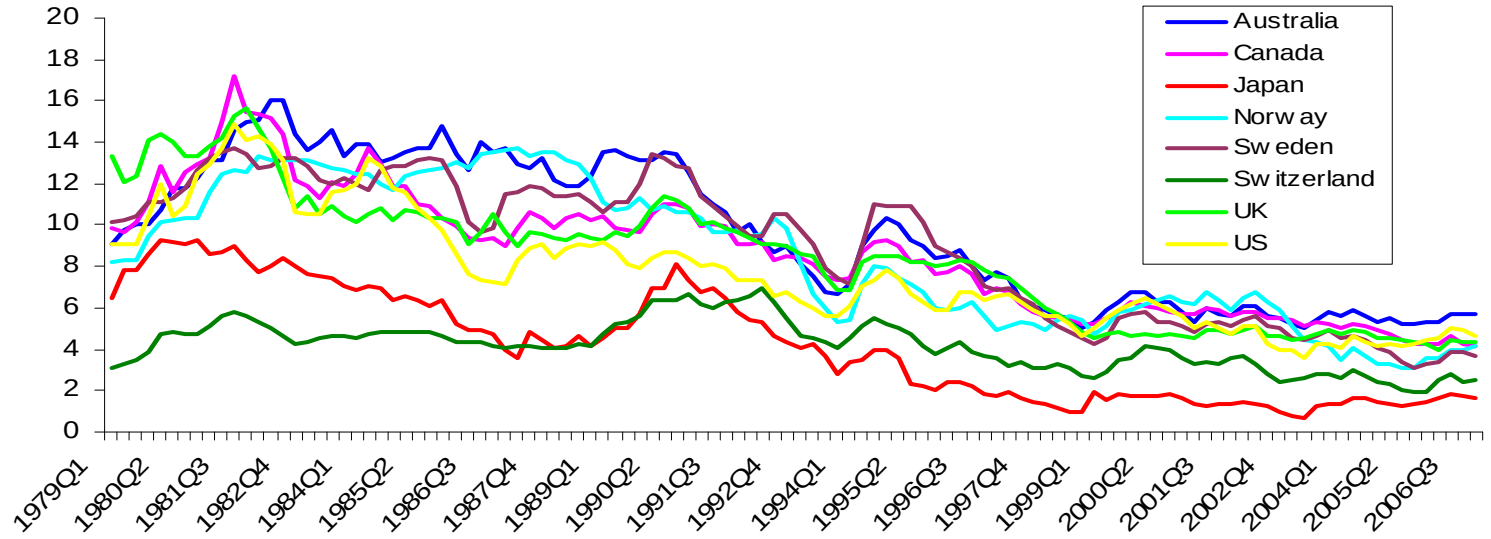
Short Term Rates



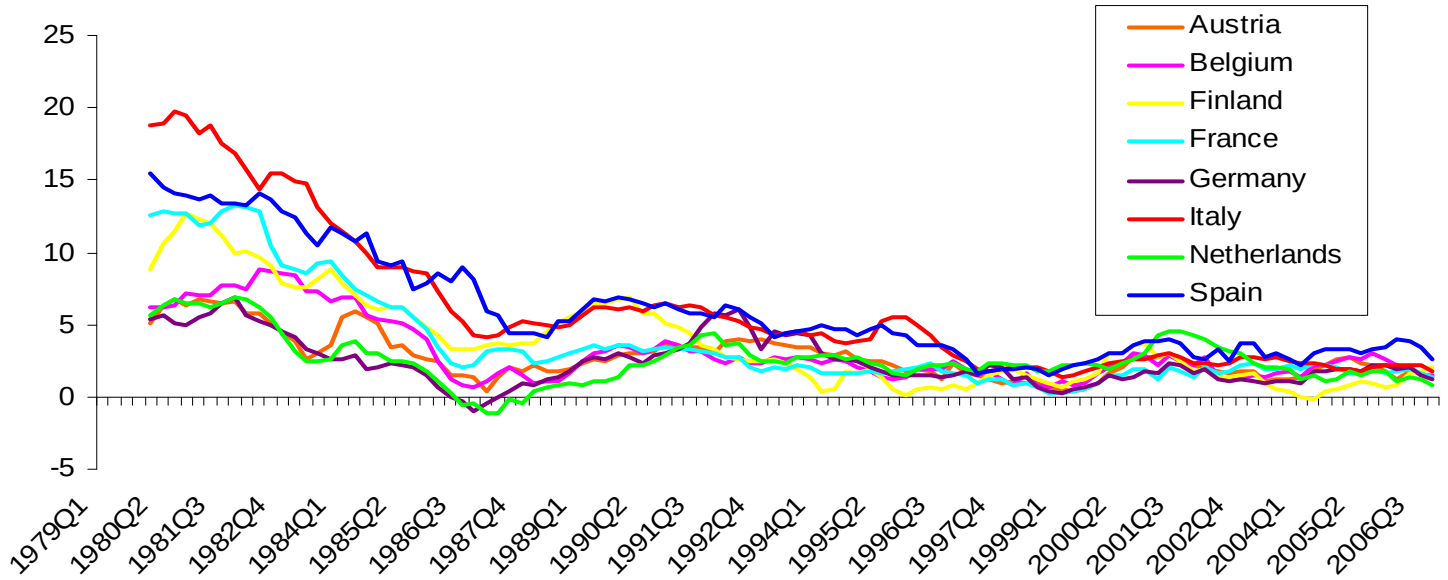


Long Term Rates





Inflation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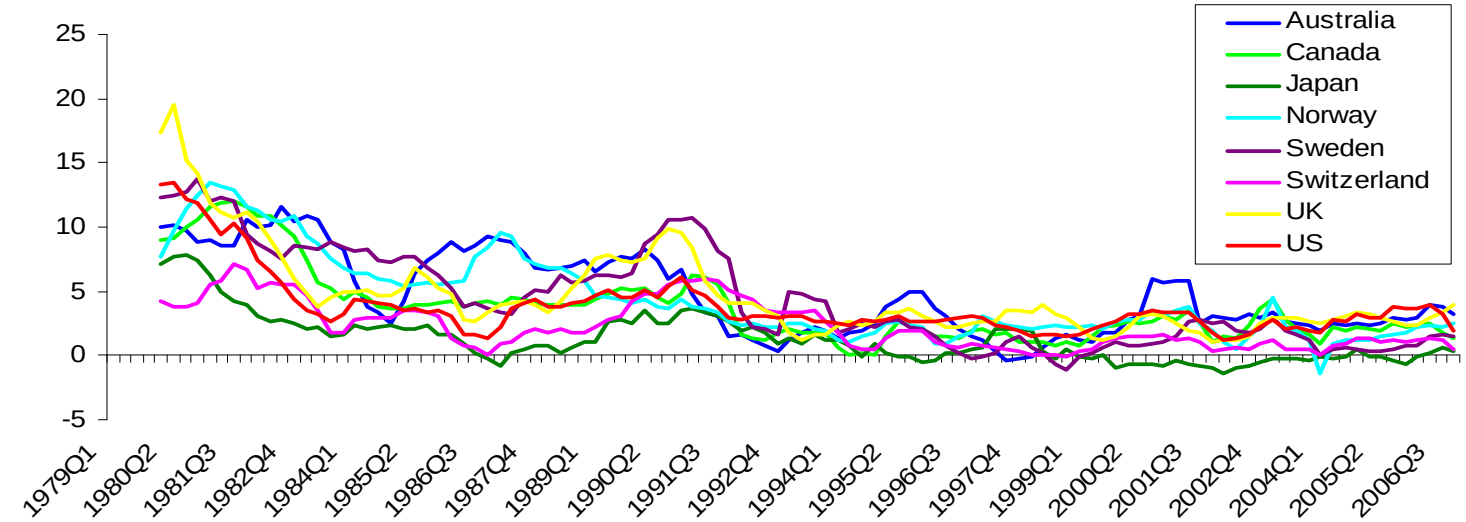
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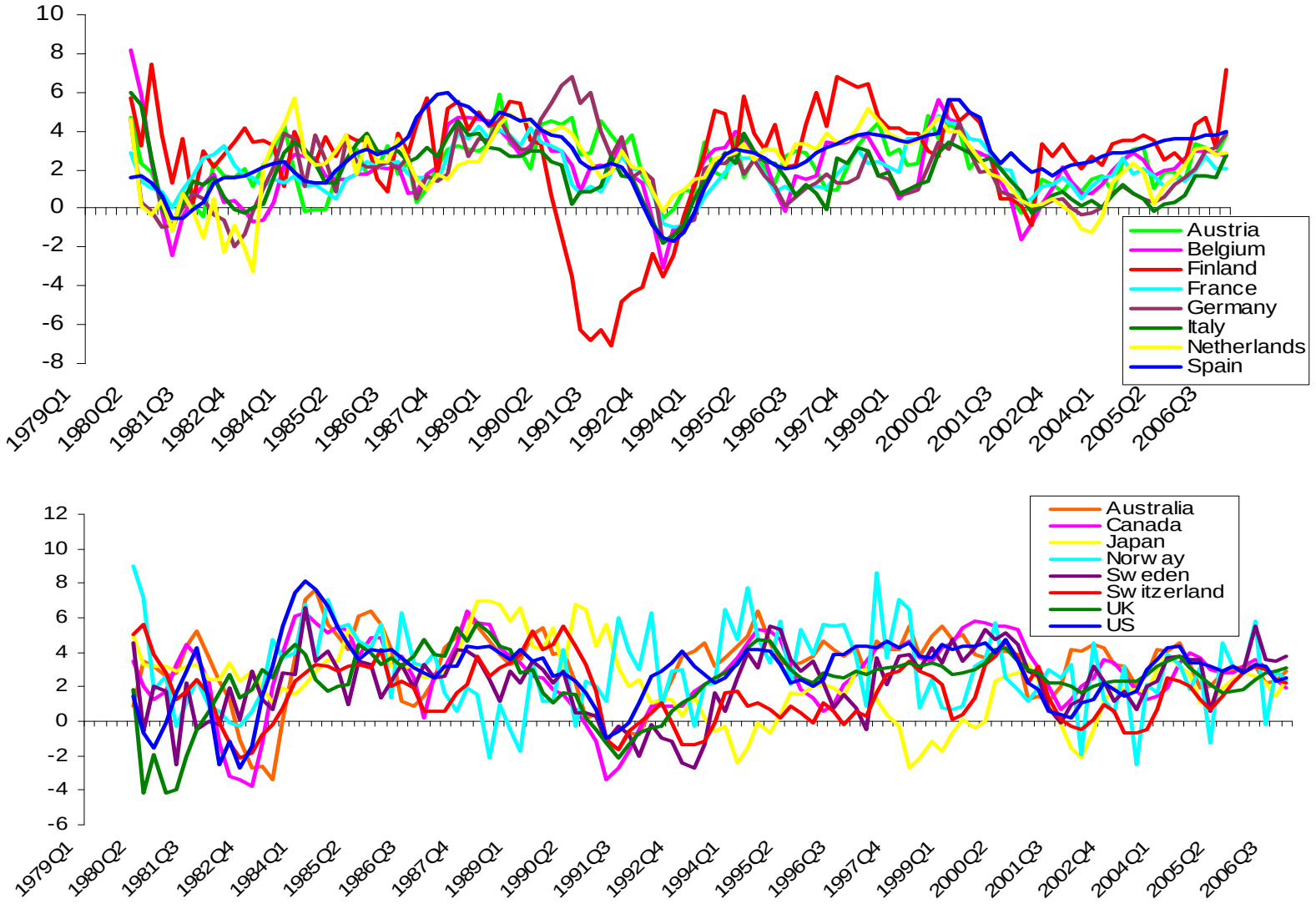
Output Growth



Countries and Regions in the GVAR_33 Model

Unites States	**Euro Area**	**Latin America**
China	Germany	Brazil
Japan	France	Mexico
United Kingdom	Italy	Argentina
Other Developed Economies	Spain	Chile
Canada	Netherlands	Peru
Australia	Belgium	
New Zealand	Austria	
	Finland	
Rest of Asia	**Rest of W.Europe**	**Rest of the World**
Korea	Sweden	India
Indonesia	Switzerland	South Africa
Thailand	Norway	Turkey
Philippines		Saudi Arabia
Malaysia		
Singapore		

Variables Included in the Individual Country Models

- Most country specific models include the following endogenous variables

$$y_{it} = \ln\left(GDP_{it}/CPI_{it}\right)$$
$$p_{it} = \ln(CPI_{it})$$
$$q_{it} = \ln(EQ_{it}/CPI_{it})$$
$$e_{it} = \ln(E_{it}),$$
$$\rho_{it}^{S} = 0.25 * \ln(1 + R_{it}^{S}/100)$$
$$\rho_{it}^{L} = 0.25 * \ln(1 + R_{it}^{L}/100)$$

Trade Weights used to Construct Foreign (Star) Variables

Country/ region	US	EA	China	Japan	UK	Rest of W. Europe Sweden	Switz.	Norway	Rest*
US	0.000	0.157	0.097	0.109	0.048	0.008	0.012	0.004	0.565
EA	0.218	0.000	0.074	0.066	0.233	0.055	0.088	0.031	0.235
China	0.222	0.166	0.000	0.236	0.026	0.007	0.006	0.003	0.333
Japan	0.286	0.127	0.171	0.000	0.029	0.006	0.008	0.003	0.370
UK	0.175	0.540	0.028	0.038	0.000	0.025	0.024	0.024	0.146
Sweden	0.105	0.527	0.026	0.029	0.105	0.000	0.016	0.105	0.086
Switz.	0.108	0.678	0.018	0.034	0.062	0.013	0.000	0.004	0.085
Norway	0.083	0.474	0.023	0.024	0.166	0.139	0.009	0.000	0.083

Domestic and Foreign Variables Included in Country-Specific Models

	All Countries Excluding US		US	
Variables	Endogenous	Foreign	Endogenous	Foreign
Real Output	y_{it}	y_{it}^{*}	$y_{us,t}$	$y_{us,t}^{*}$
Inflation	π_{it}	π_{it}^{*}	$\pi_{us,t}$	$\pi_{us,t}^{*}$
Real Exchange Rate	$e_{it} - p_{it}$	-	-	$e_{us,t}^{*} - p_{us,t}^{*}$
Real Equity Price	q_{it}	q_{it}^{*}	$q_{us,t}$	-
Short-Term Interest Rate	r_{it}^{S}	r_{it}^{*S}	$r_{us,t}^{S}$	-
Long-Term Interest Rate	r_{it}^{L}	r_{it}^{*L}	$r_{us,t}^{L}$	-
Oil Price	-	p_{t}^{o}	p_{t}^{o}	-

Properties of GVAR

- The model has 175 endogenous variables 99 stochastic trends and 76 long-run (cointegrating) relations.
- It is globally stable; all its roots either lie on or inside the unit circle.
- Although log-linear with a simple overall structure, GVAR is a large and complicated model which allows for a high degree of interdependence and dynamics.

Properties of GVAR (continued)

- Shocks to one country can have marked effects on other countries, depending on their size and the patterns of their trade.
- GVAR model is quite effective in dealing with the common factor interdependencies and international co-movements of business cycles.
- Unlike the very high cross section correlation of the core variables, the residuals from the GVAR are hardly correlated across countries, with the notable exception of exchange rates. See Table below.
- The failure of the GVAR to deal with the cross section correlation of exchange rates could be due to the dominant role that the US dollar plays in foreign exchange rate markets.

Average Pair-wise Cross Section Correlations

	Levels	1st diff.	VAR residuals	VARX* residuals
Real output				
US	0.96	0.15	0.04	-0.04
Euro area	0.96	0.14	0.11	-0.01
Inflation				
US	0.41	0.12	0.15	0.02
Euro area	0.40	0.11	0.13	0.00
Real equity prices				
US	0.59	0.39	0.34	-0.02
Euro area	0.58	0.42	0.39	-0.08
Real exchange rate				
	0.62	0.31	0.26	0.28
Short-term interest rates				
US	0.38	0.10	0.05	0.00
Euro area	0.49	0.16	0.08	0.03
Long-term interest rates				
US	0.75	0.40	0.31	-0.03
Euro area	0.78	0.45	0.34	-0.06

Uses of the GVAR Model

- Strategic Asset Management
- Credit Risk Analysis - It has been used successfully as a global economic engine in conditional credit risk modeling by Pesaran, Schuermann, Treutler, and Weiner, (2006,JMCB),and Pesaran, Schuermann and Treutler (2006, NBER Vol.)
- Short and Medium Term Forecasting
- Impulse Response (Counterfactual) Analysis
  - Direct and indirect trade linkages
  - Financial linkages, most notably through interest rates, stock prices and exchange rates, which have proved to be particularly relevant over the recent past.

Effects of Shocks to US Economy and Oil Prices

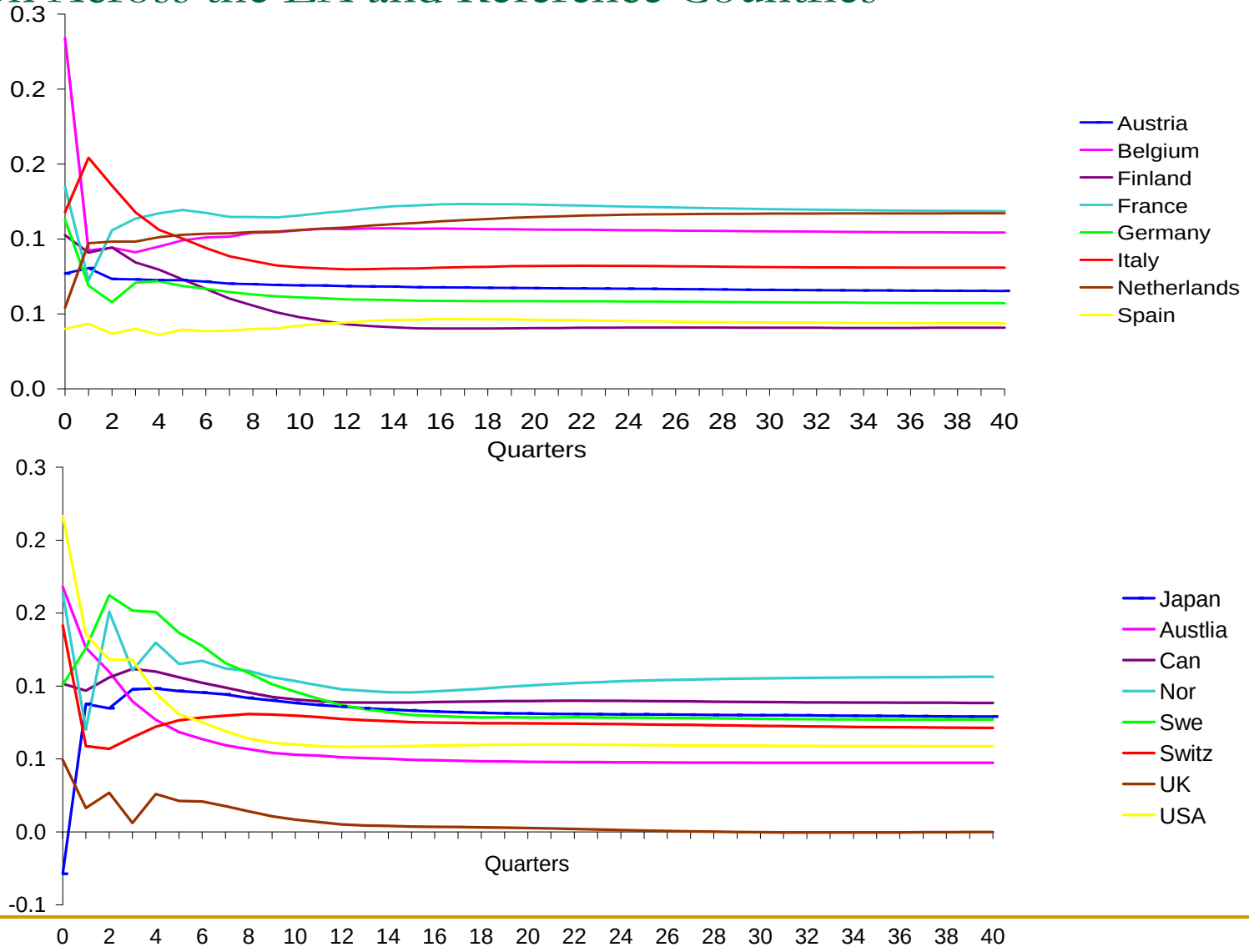
Three Types of shocks are considered as examples:

- A positive shock to oil prices
- A negative shock to US real output
- A negative shock to US real equity prices

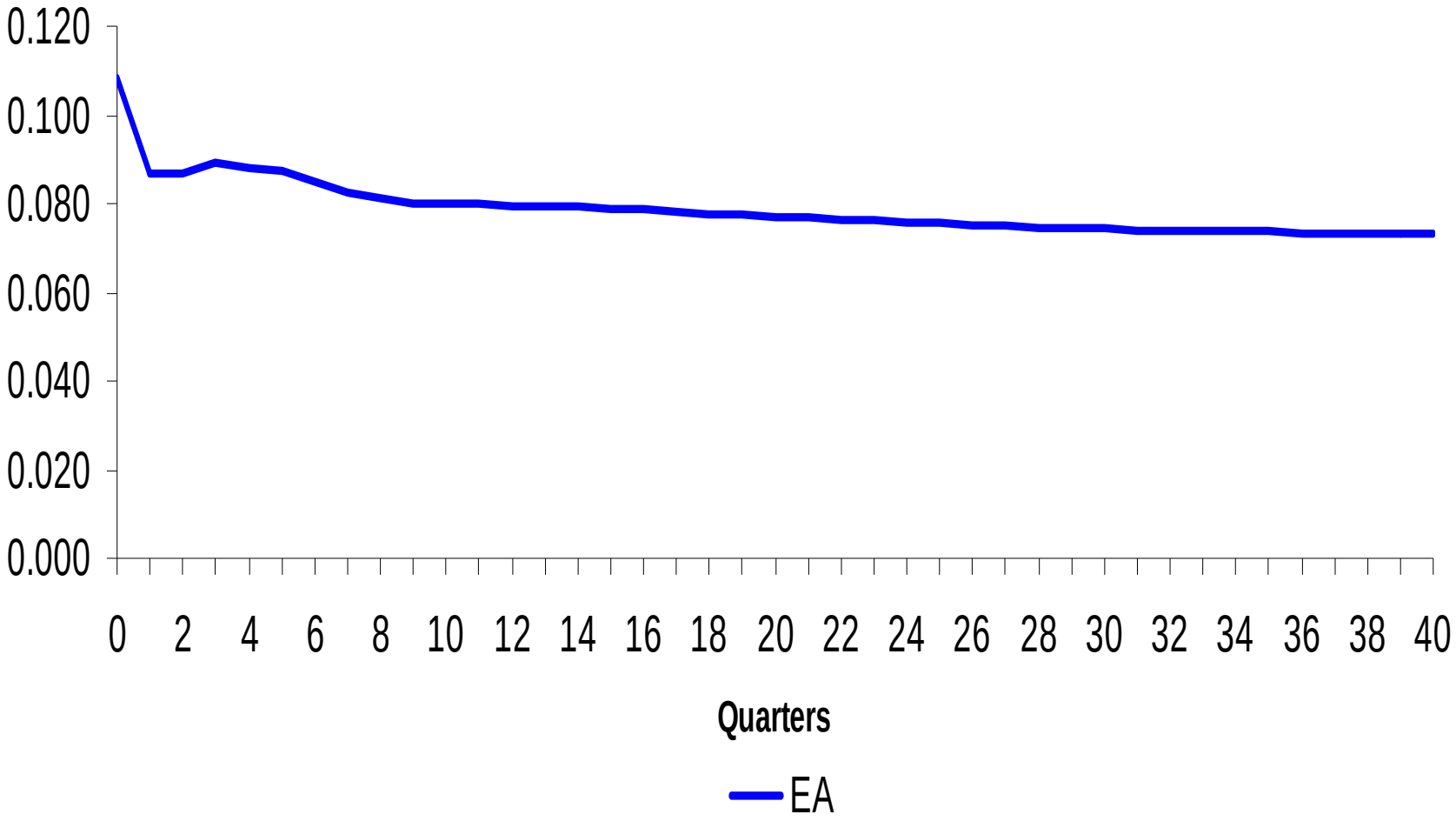
We show the impact on the US and the transmission of the shocks to the rest of the world economy

- Effects of a positive unit shock to oil prices.

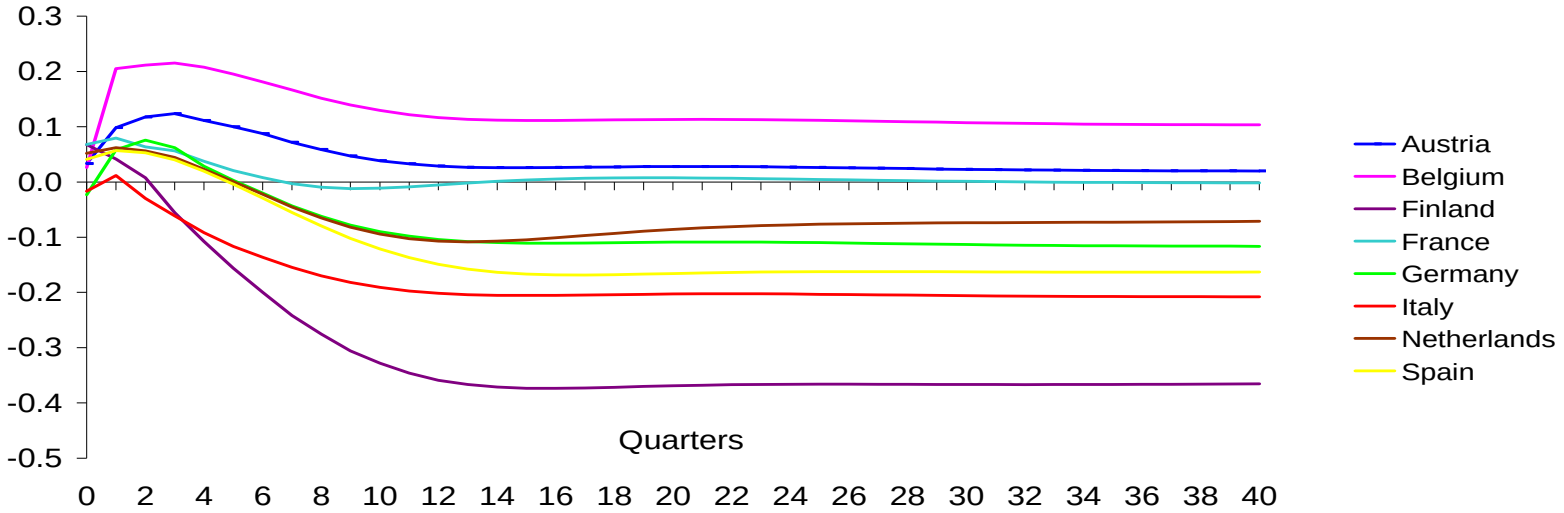
Impulse Response of a Positive Unit (+1σ) Shock to Oil Prices on Inflation Across the EA and Reference Countries

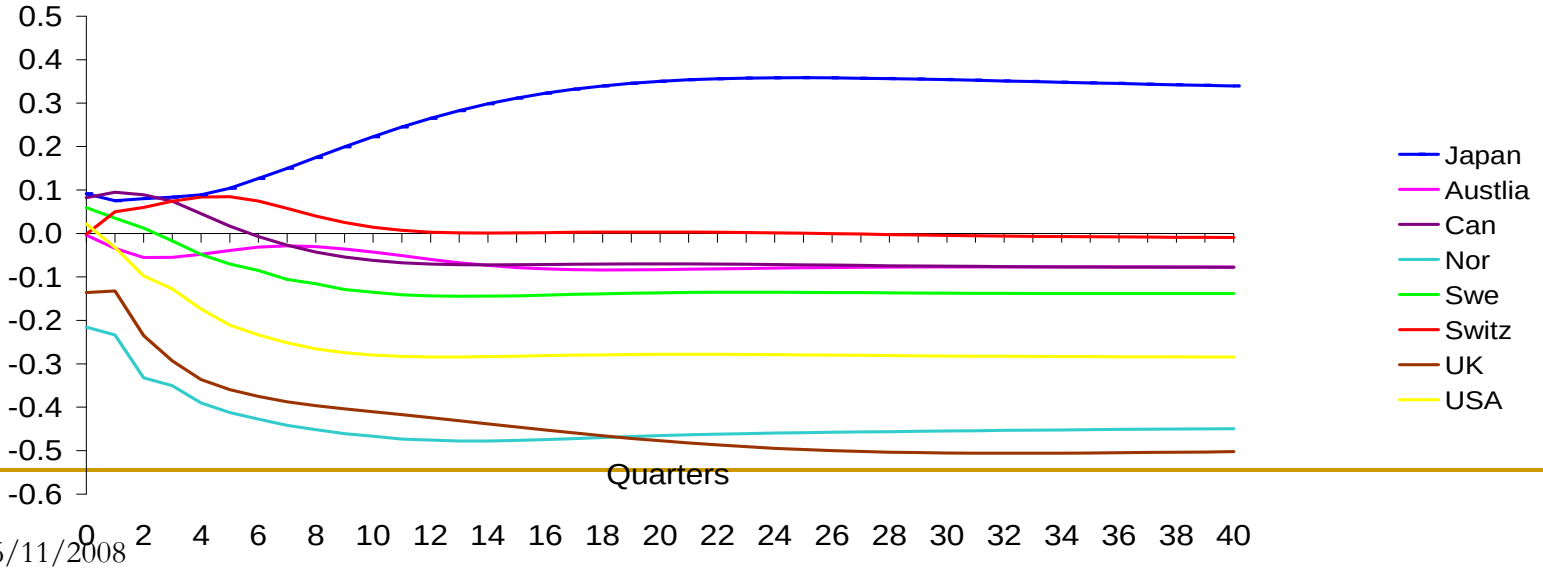


Impulse Response of a Positive Unit (+1σ) Shock to Oil Prices on Inflation in the EA

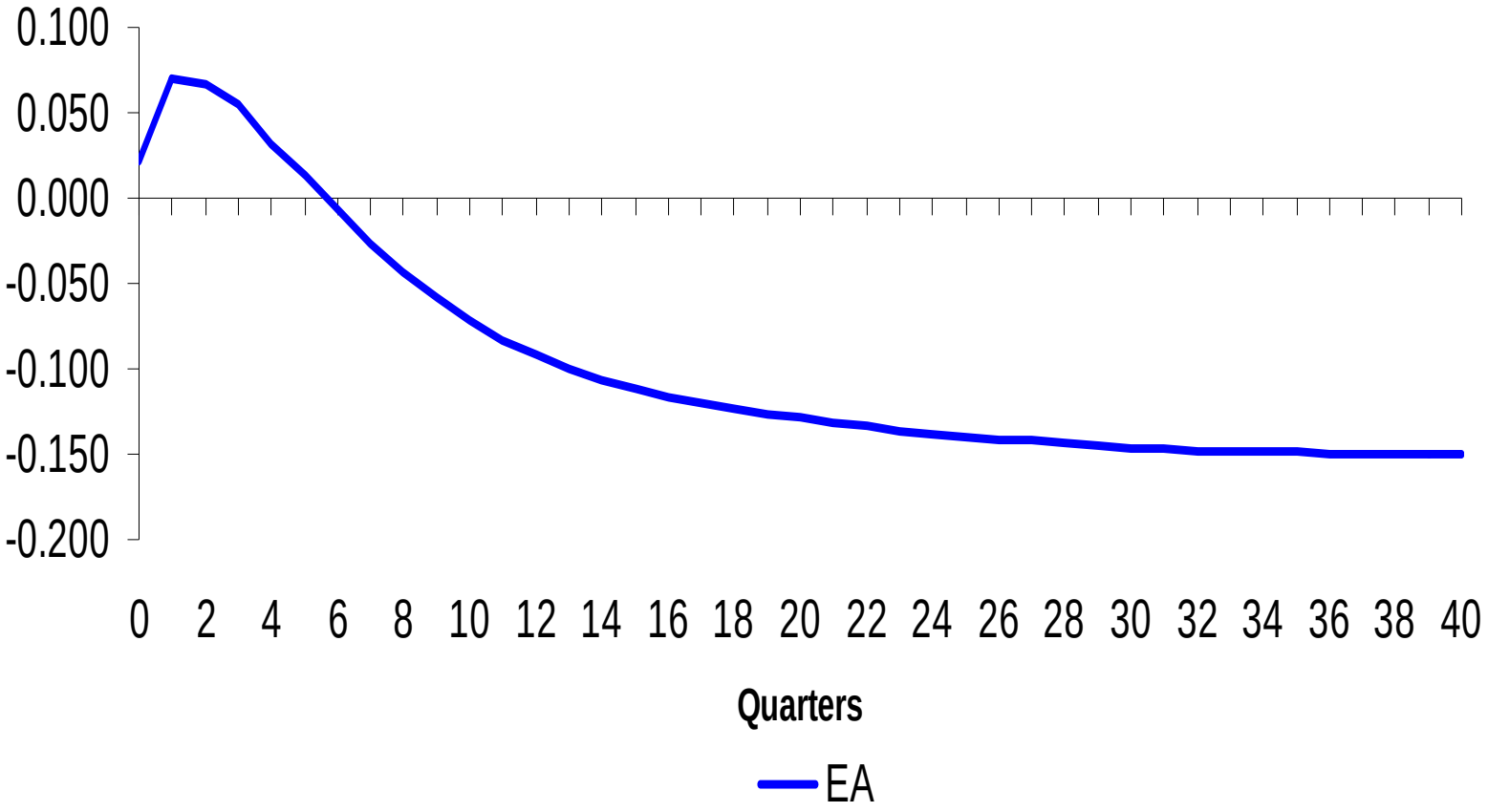


Impulse Response of a Positive Unit (+1σ) Shock to Oil Prices on Real Output Across the EA and Reference Countries

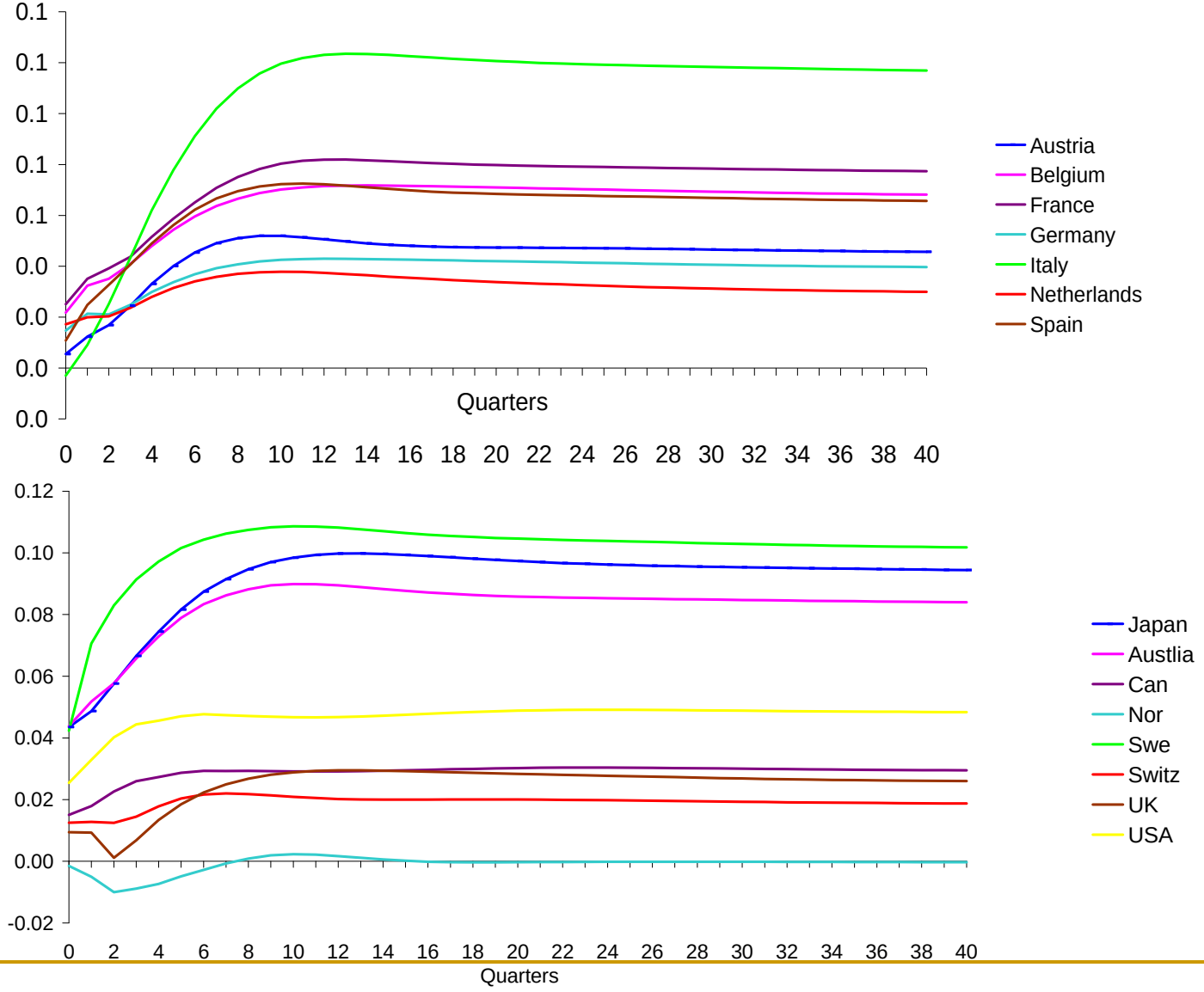




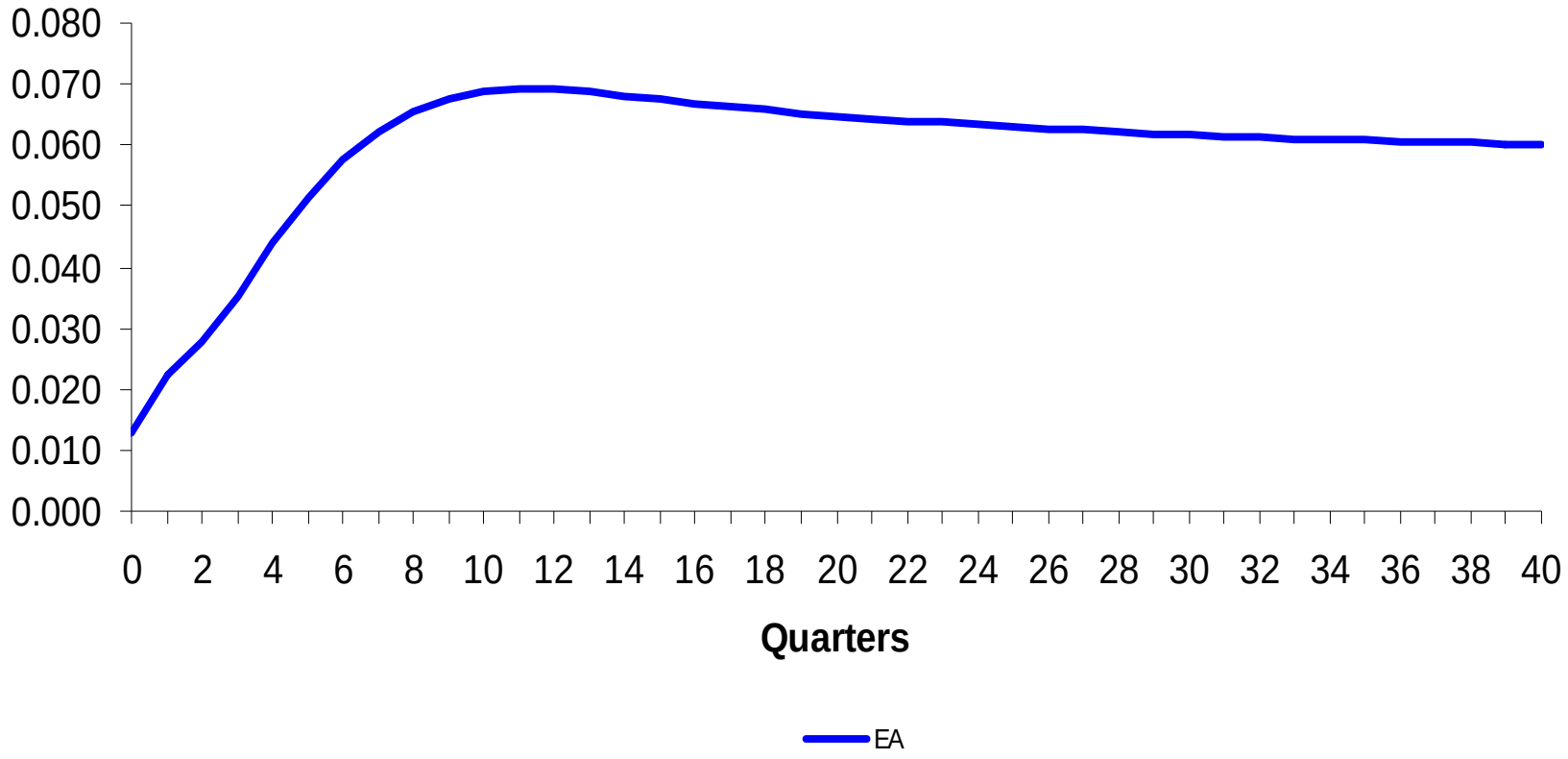
Impulse Response of a Positive Unit (+1σ) Shock to Oil Prices on Real Output in the EA



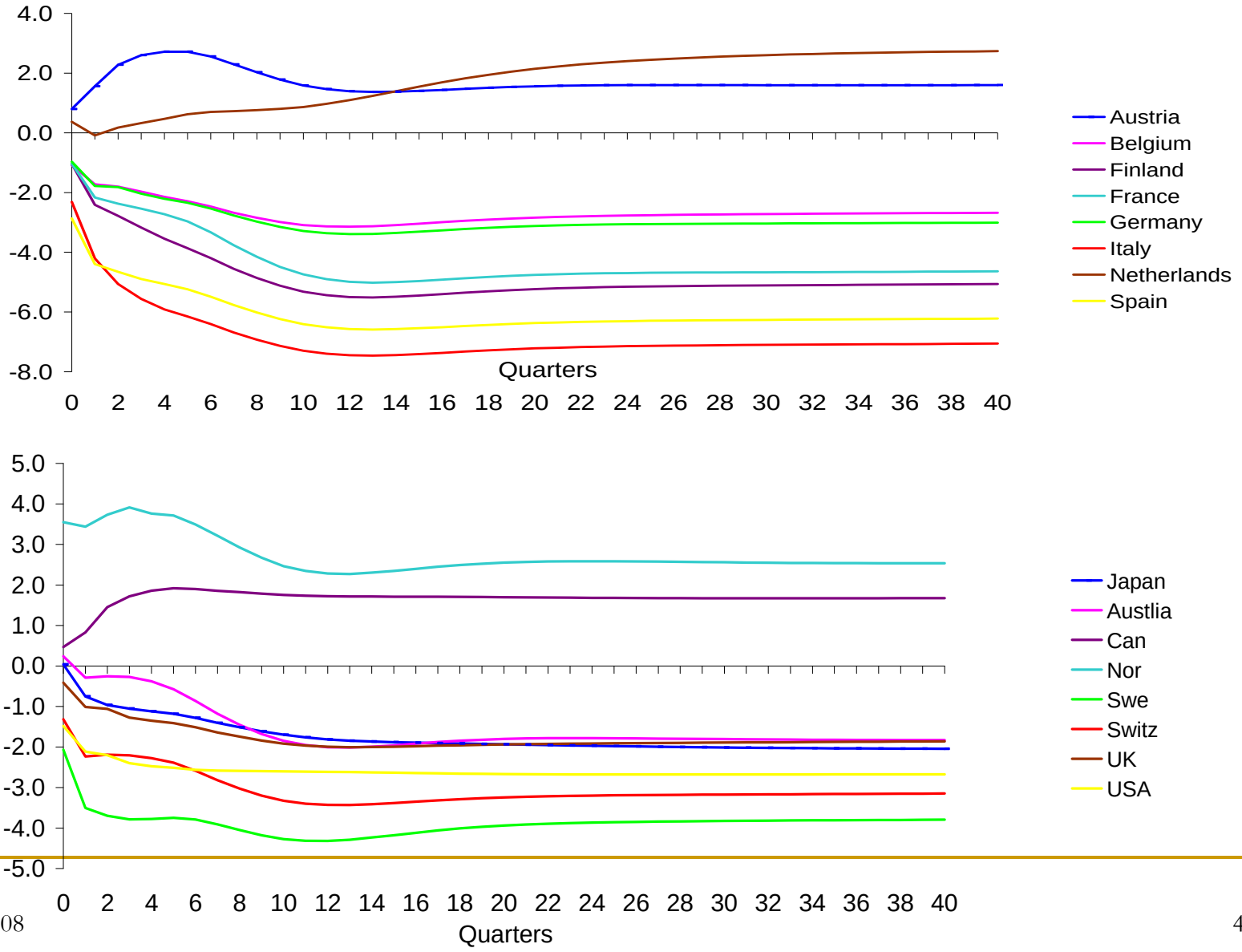
Impulse Response of a Positive Unit (+1σ) Shock to Oil Prices on Long Term Interest Rates Across the EA and Reference Countries



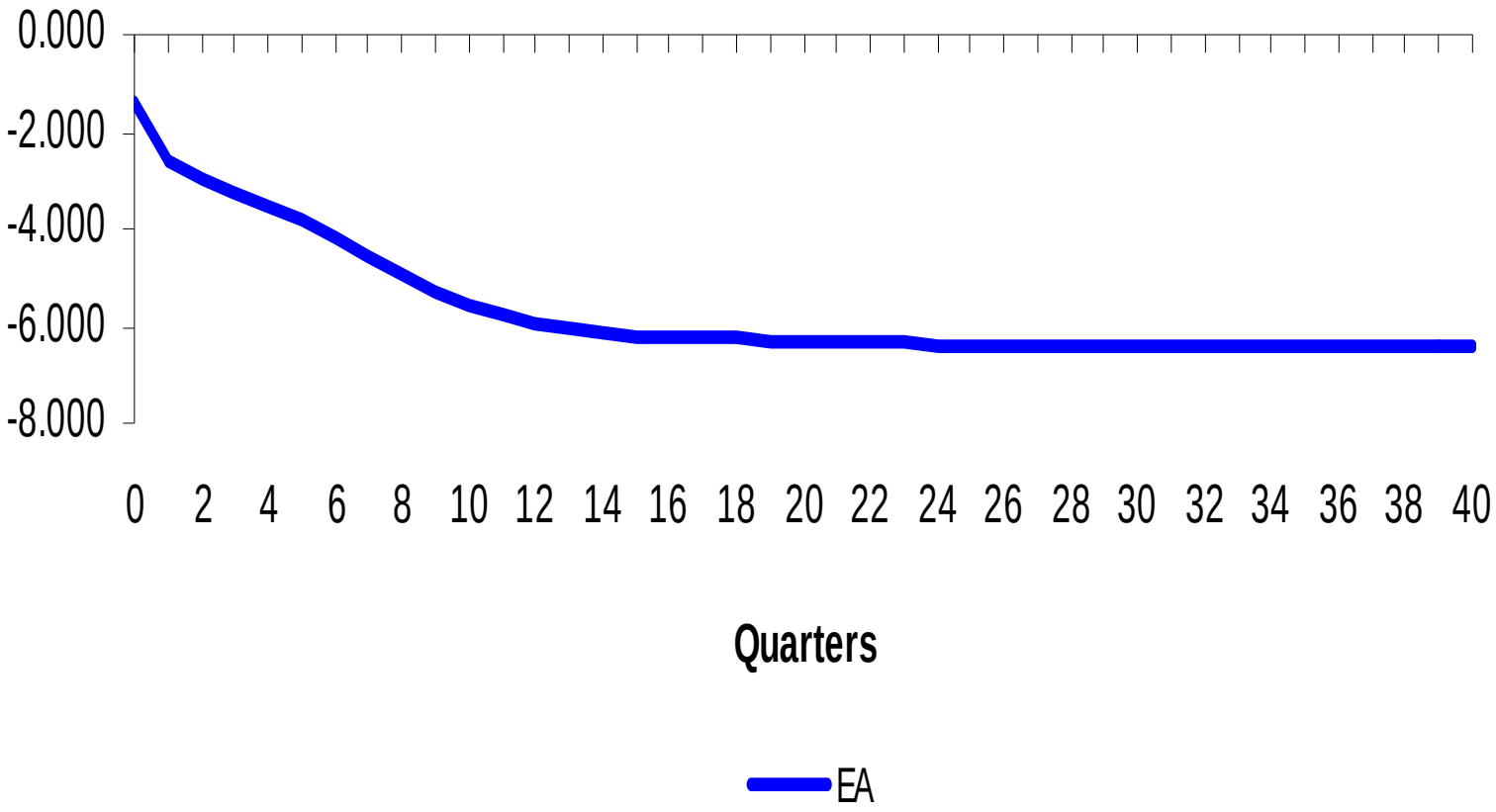
Impulse Response of a Positive Unit (+1σ) Shock to Oil Prices on Long Term Interest Rates in the EA



Impulse Response of a Positive Unit (+1σ) Shock to Oil Prices on Real Equity Prices Across the EA and Reference Countries

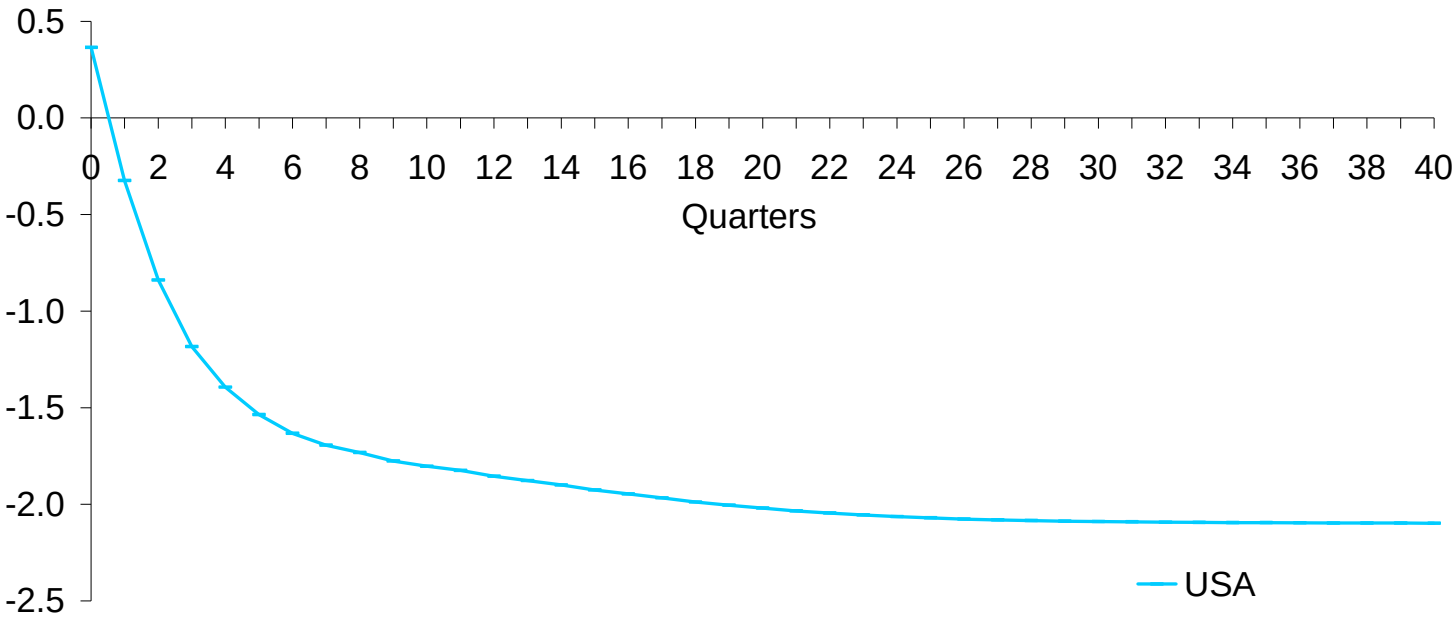


Impulse Response of a Positive Unit (+1σ) Shock to Oil Prices on Real Equity in the EA

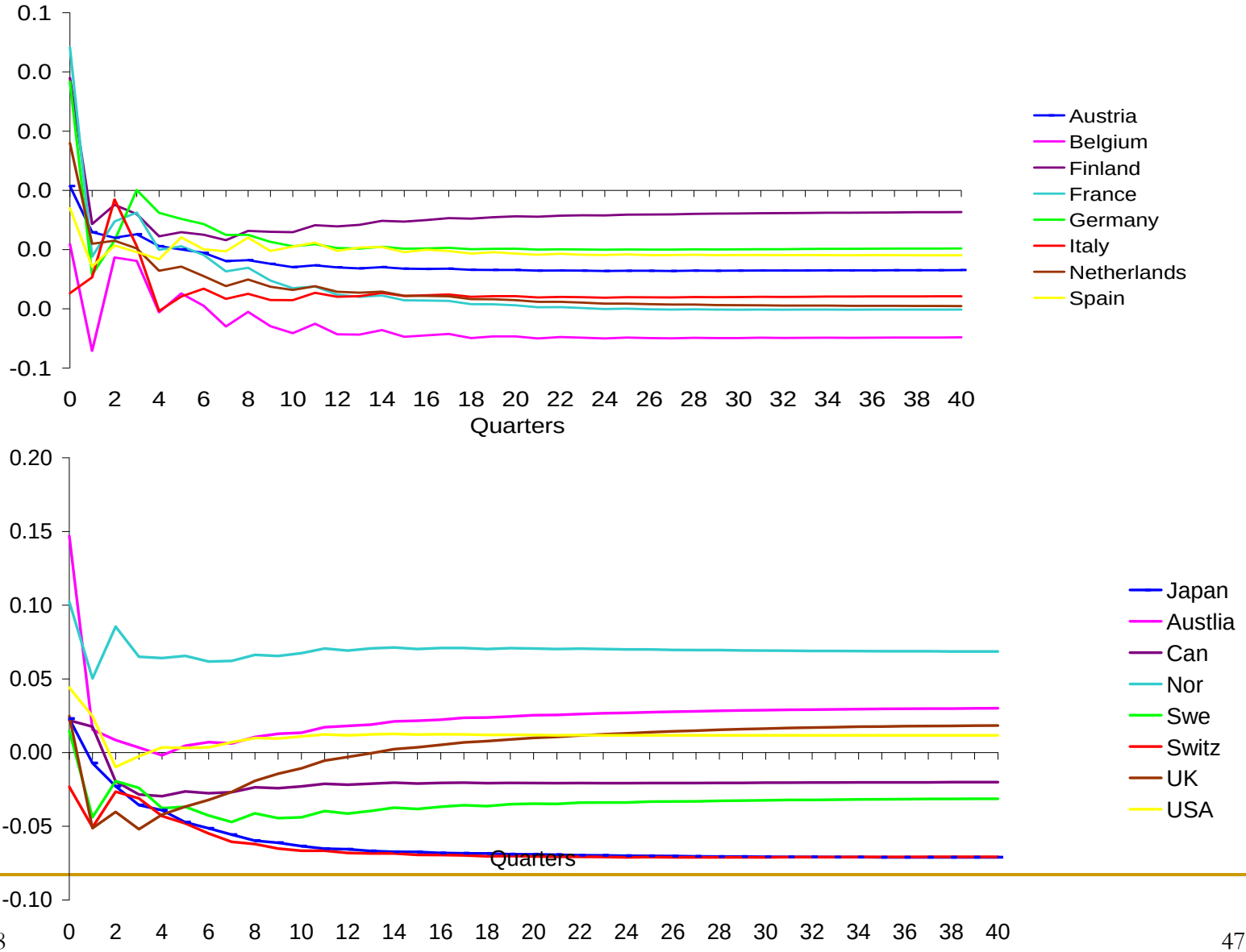


- Effects of a negative unit shock to US output

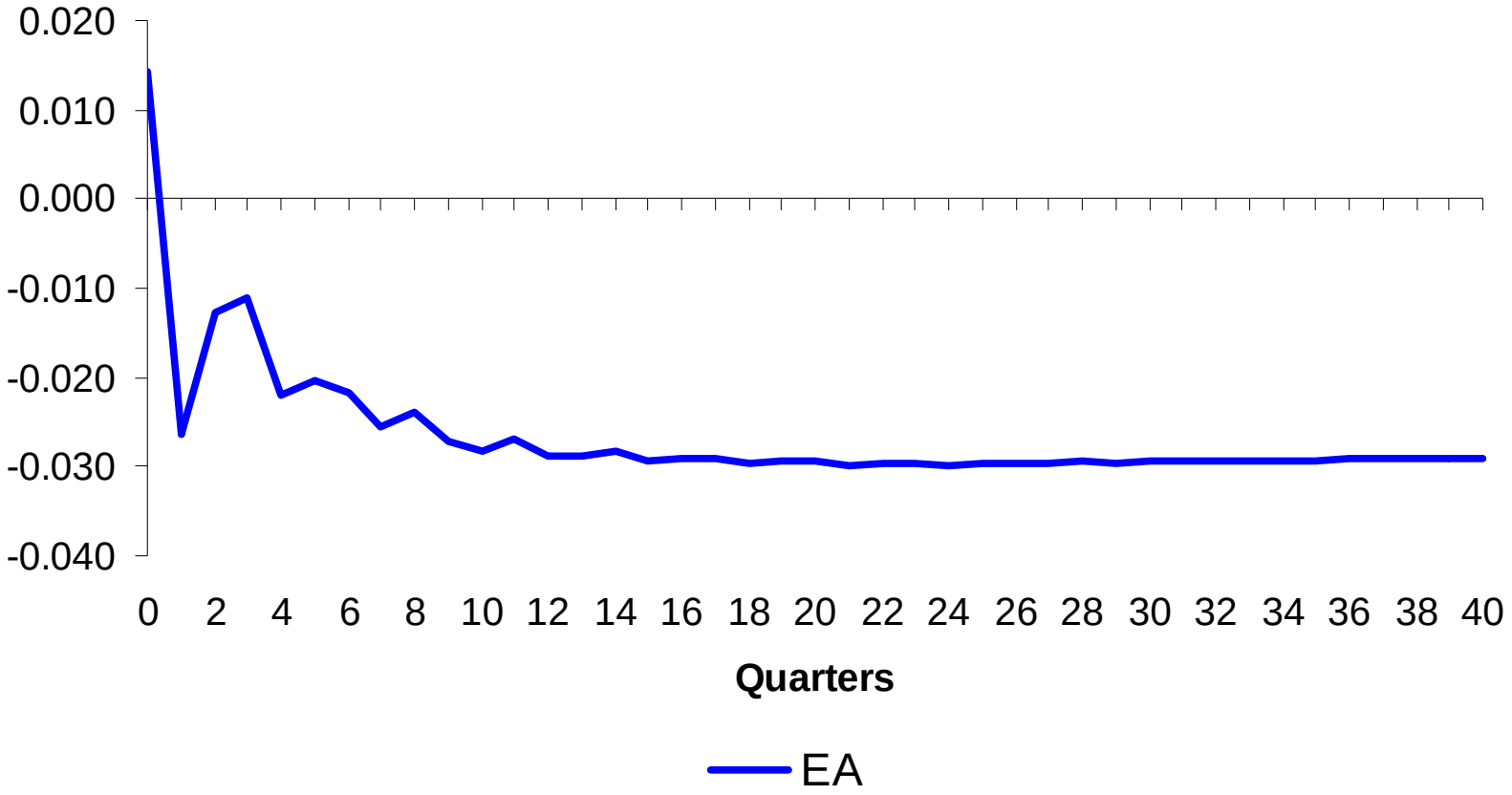
Impulse Response of a Negative Unit (-1σ) Shock to US Real Output on Oil Prices



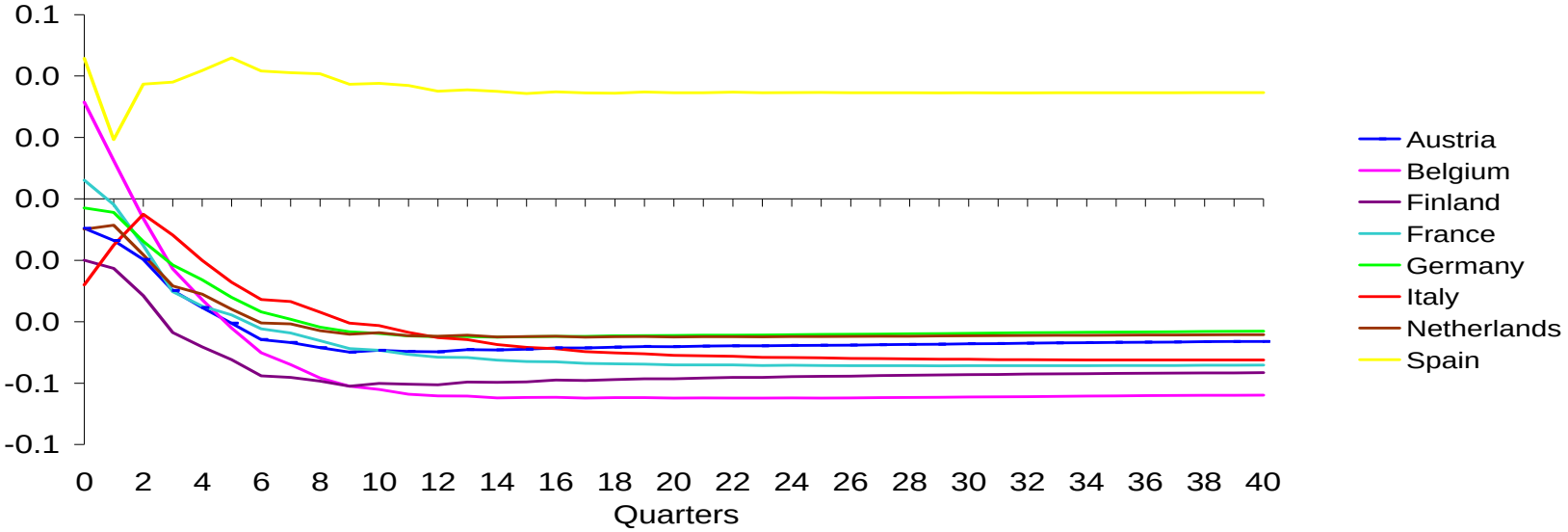
Impulse Response of a Negative Unit (-1σ) Shock to US Real Output on Inflation Across the EA and Reference Countries

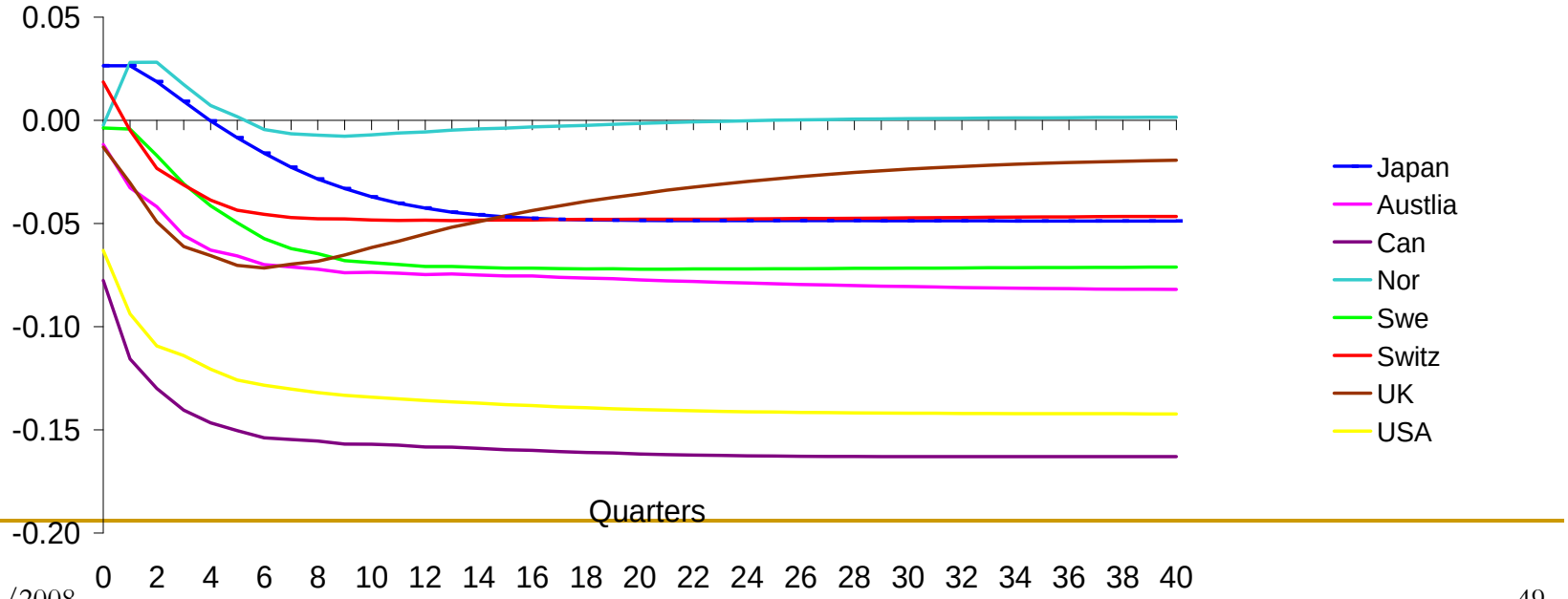


Impulse Response of a Negative Unit (-1σ) Shock to US Real Output on Inflation in the EA

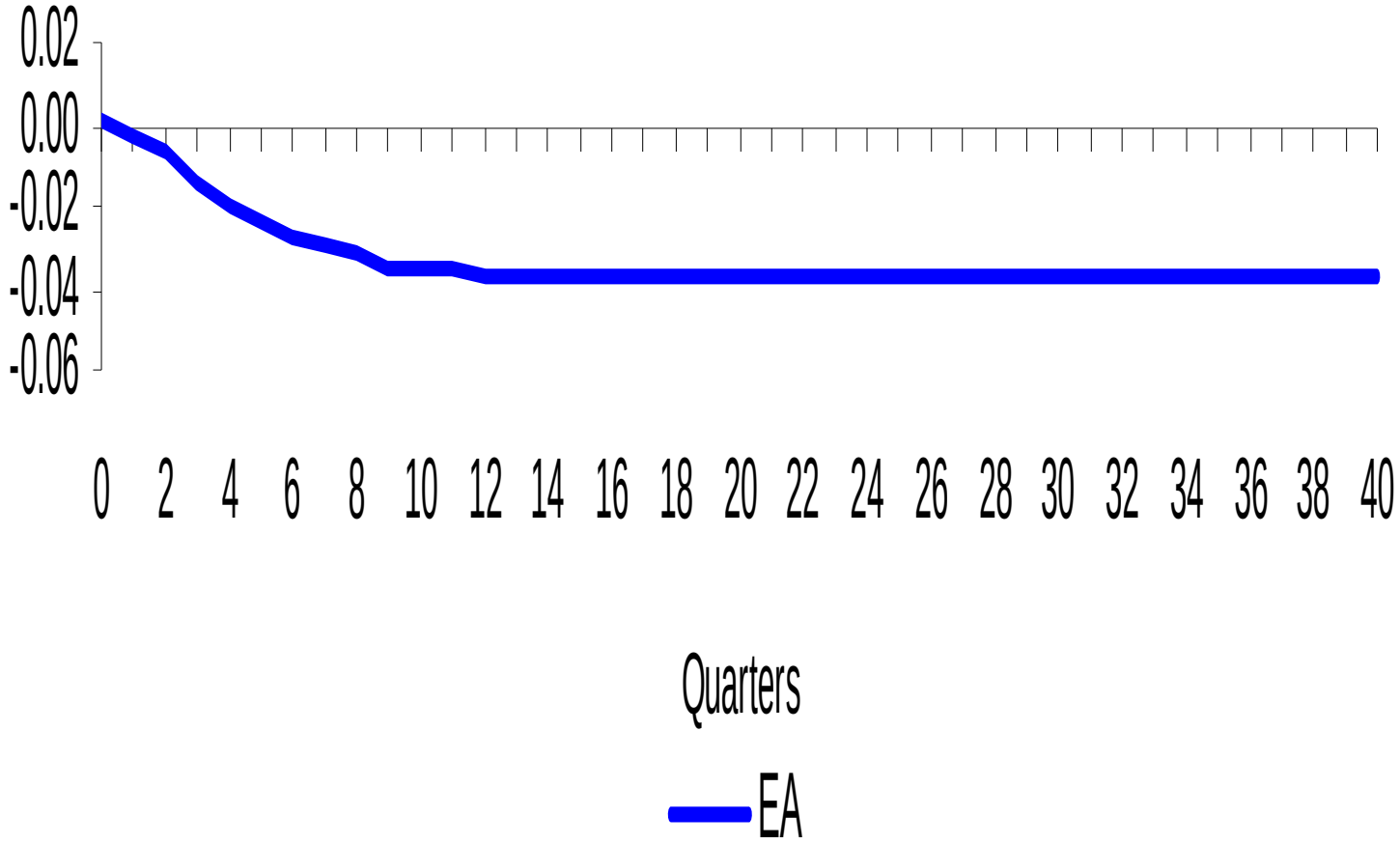


Impulse Response of a Negative Unit (-1σ) Shock to US Real Output on Short Term Interest Rates Across the EA and Reference Countries

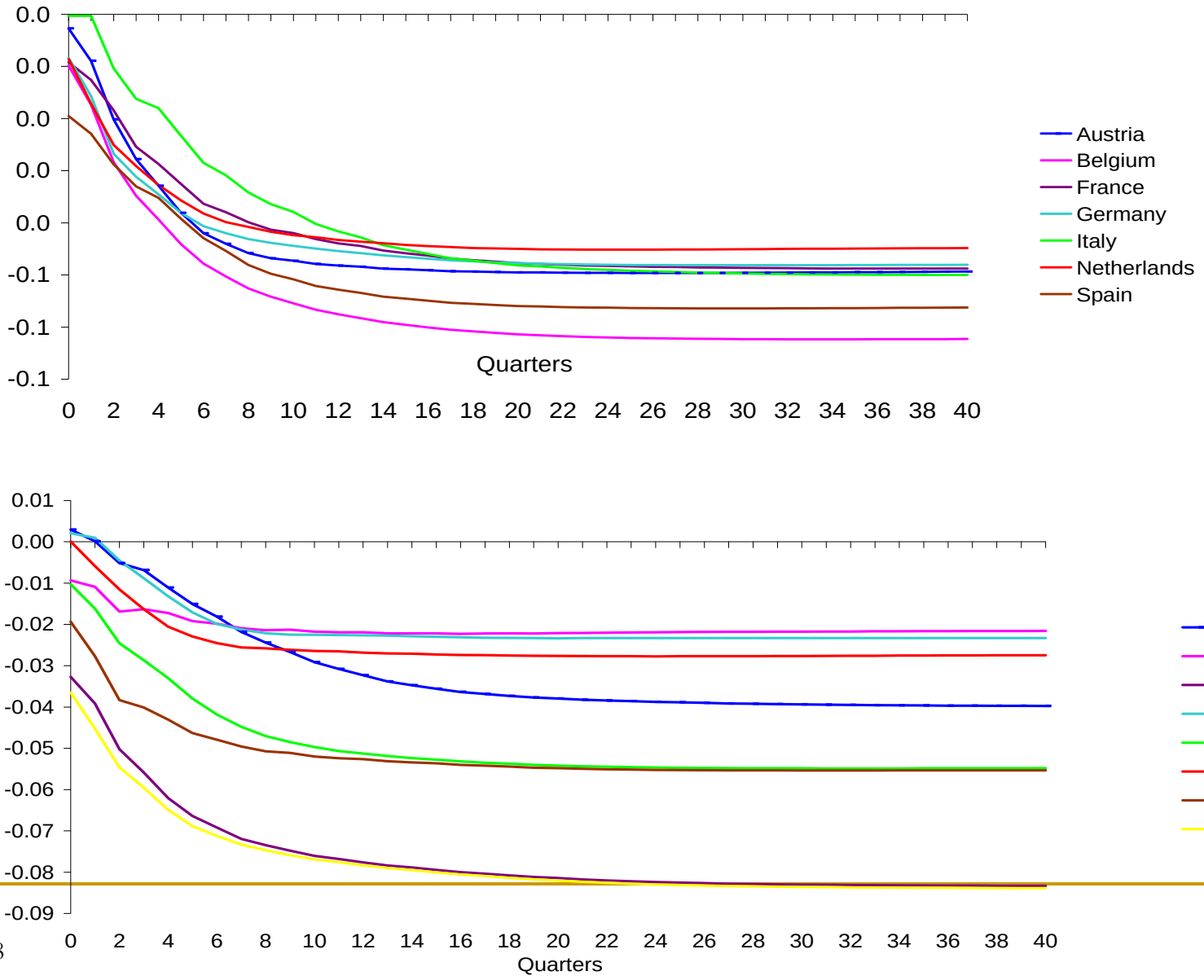




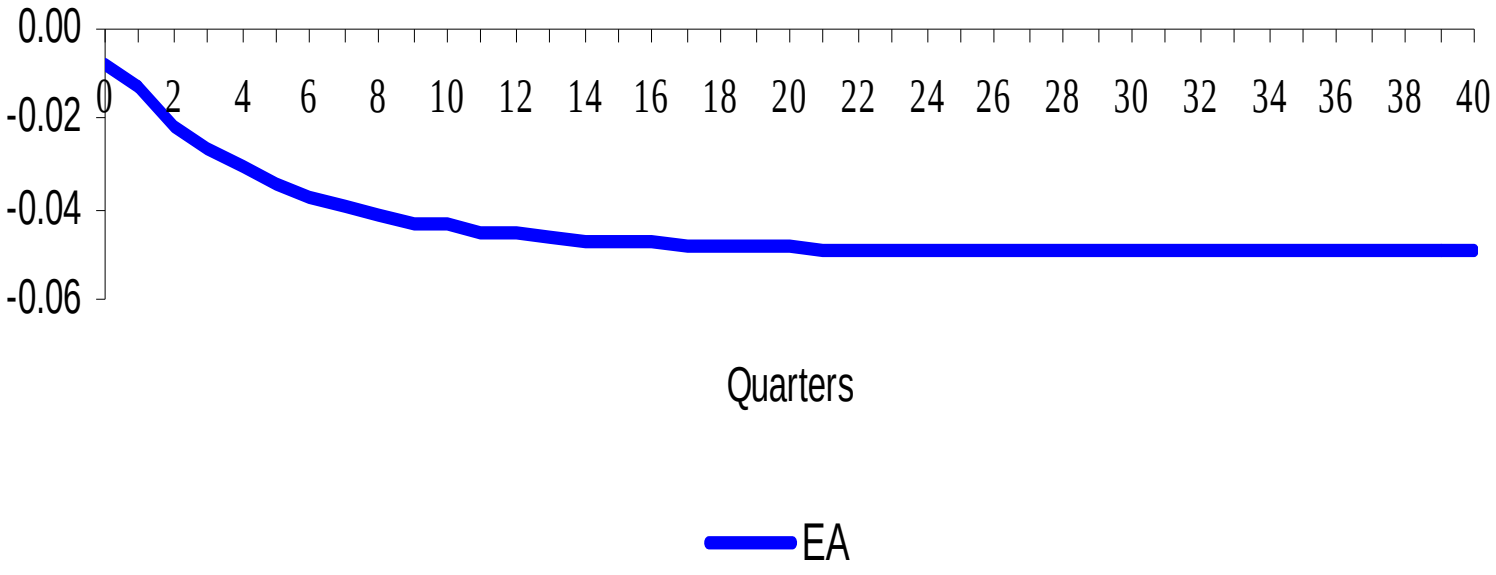
Impulse Response of a Negative Unit (-1σ) Shock to US Real Output on Short Term Interest Rates in the EA



Impulse Response of a Negative Unit (-1σ) Shock to US Real Output on Long Term Interest Rates Across the EA and Reference Countries

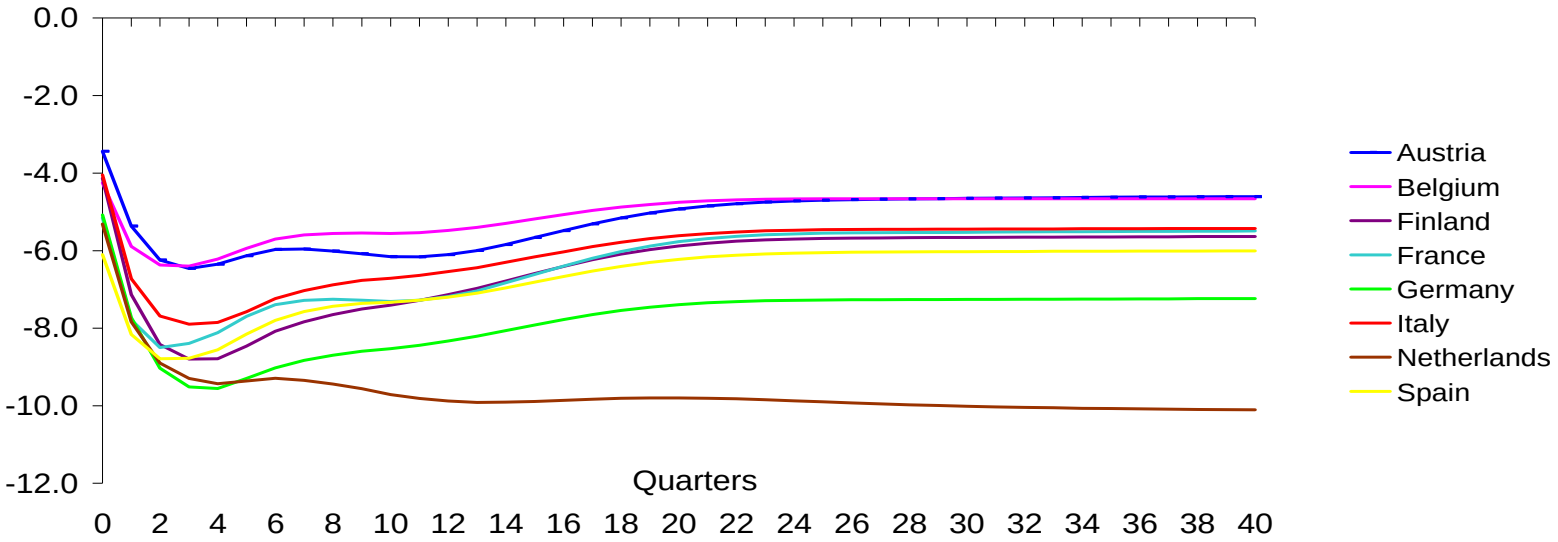


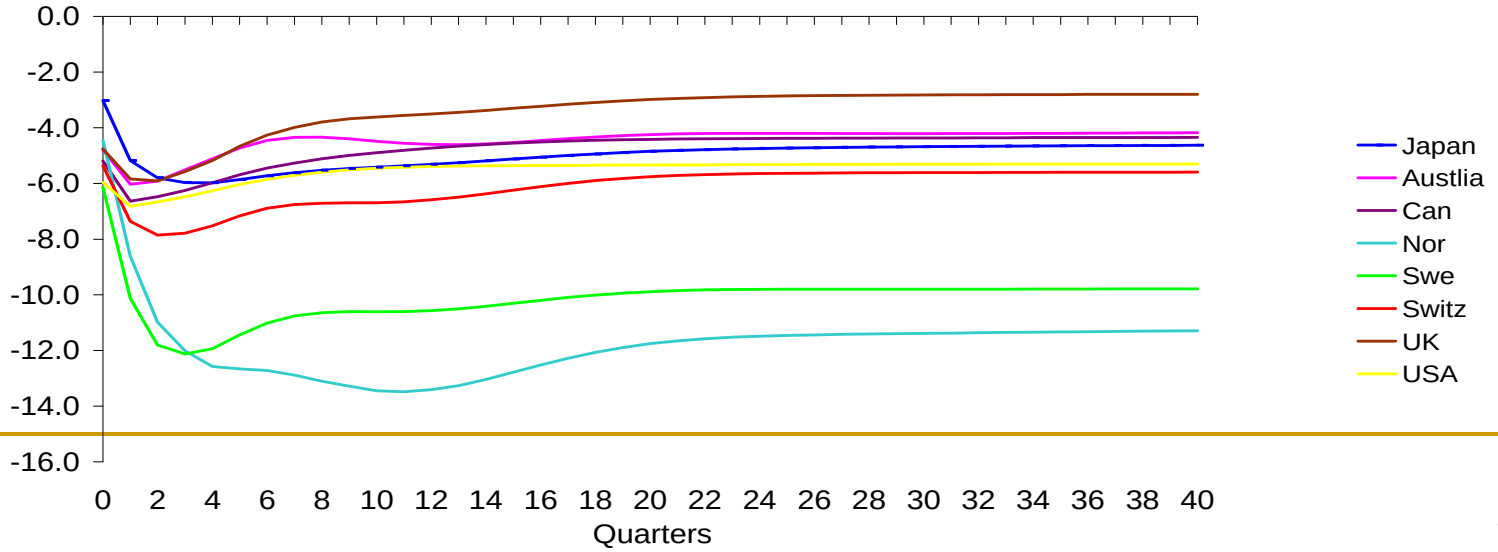
Impulse Response of a Negative Unit (-1σ) Shock to US Real Output on Long Term Interest Rates in the EA



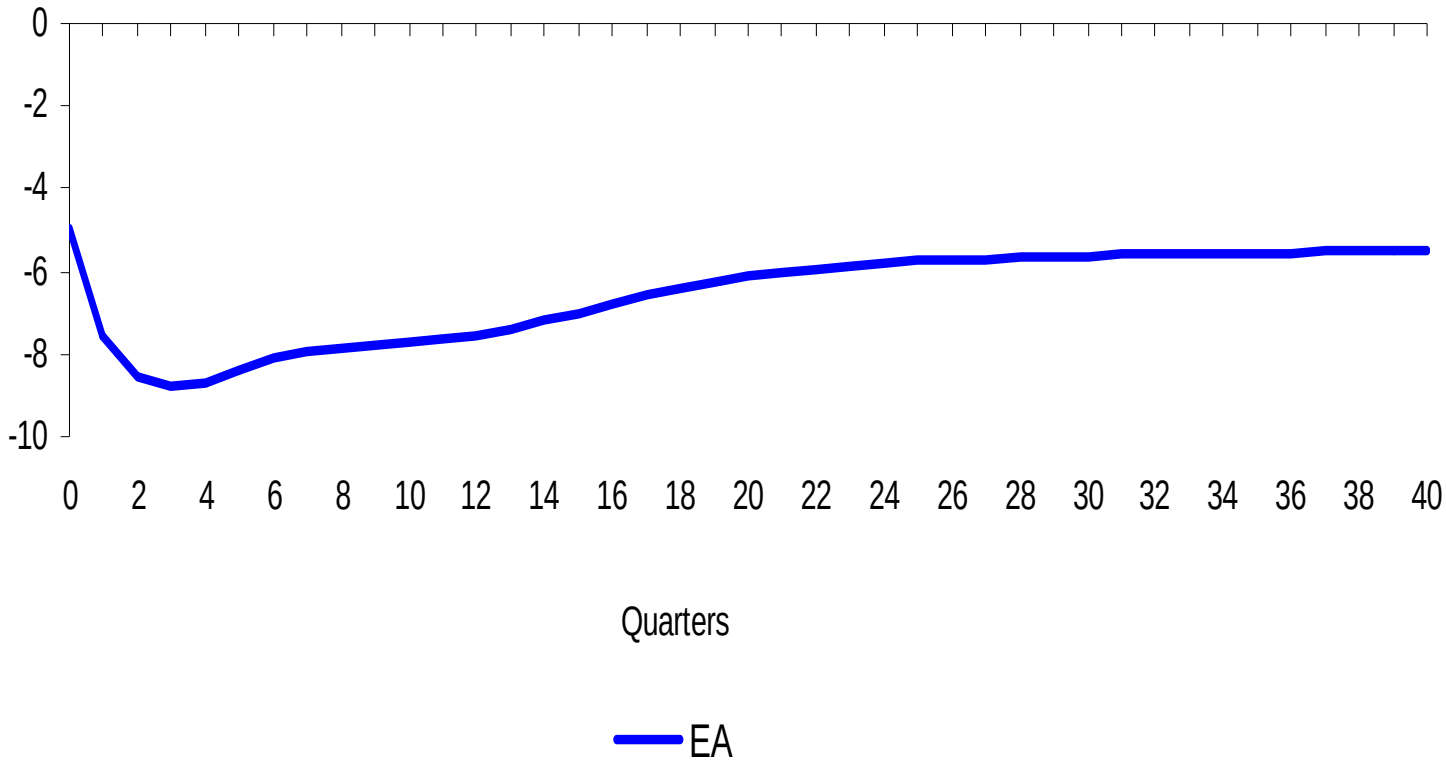
- Effects of a negative unit shock to US real equity prices

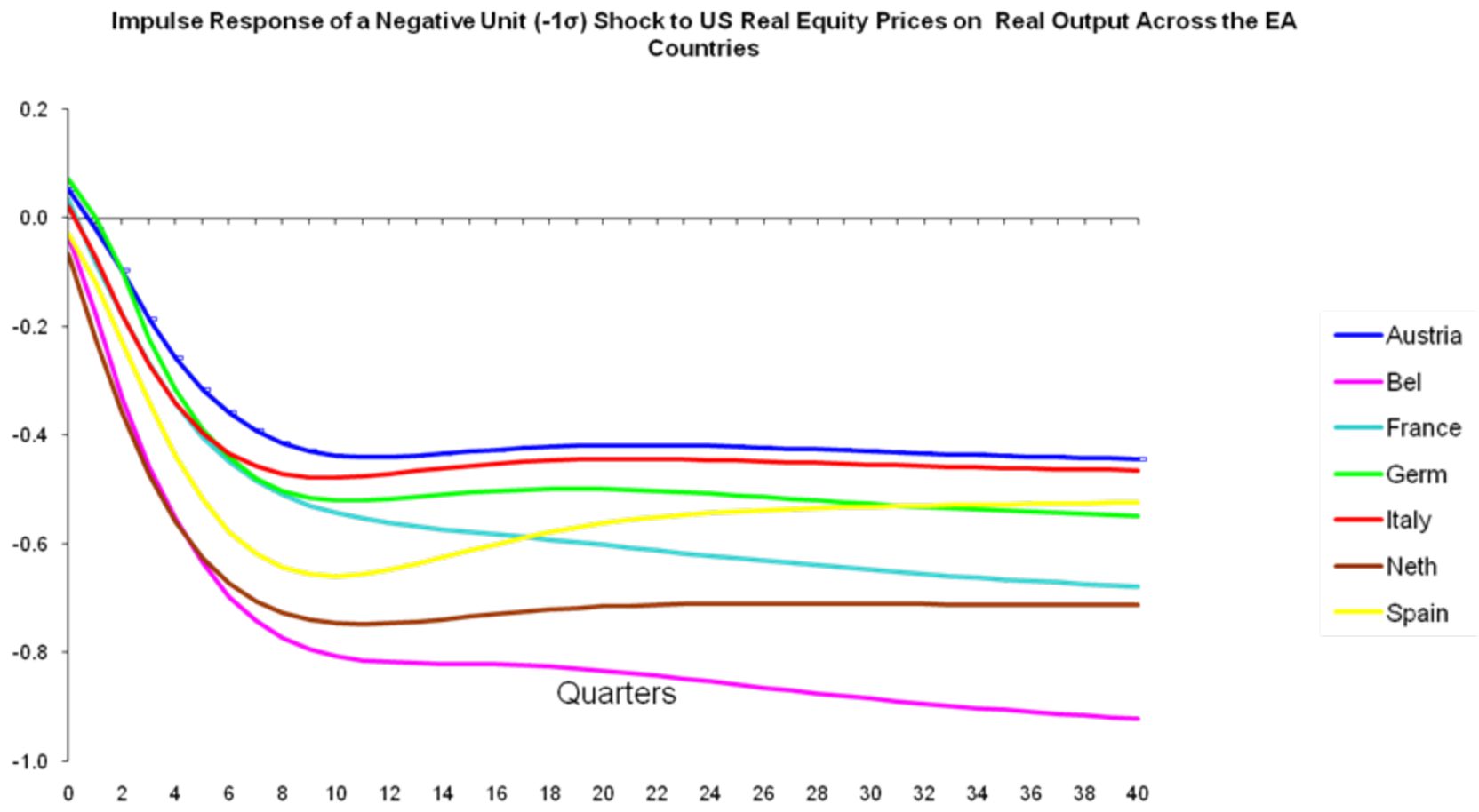
Impulse Response of a Negative Unit (-1σ) Shock to US Real Equity Prices on Real Equity Across the EA and Reference Countries

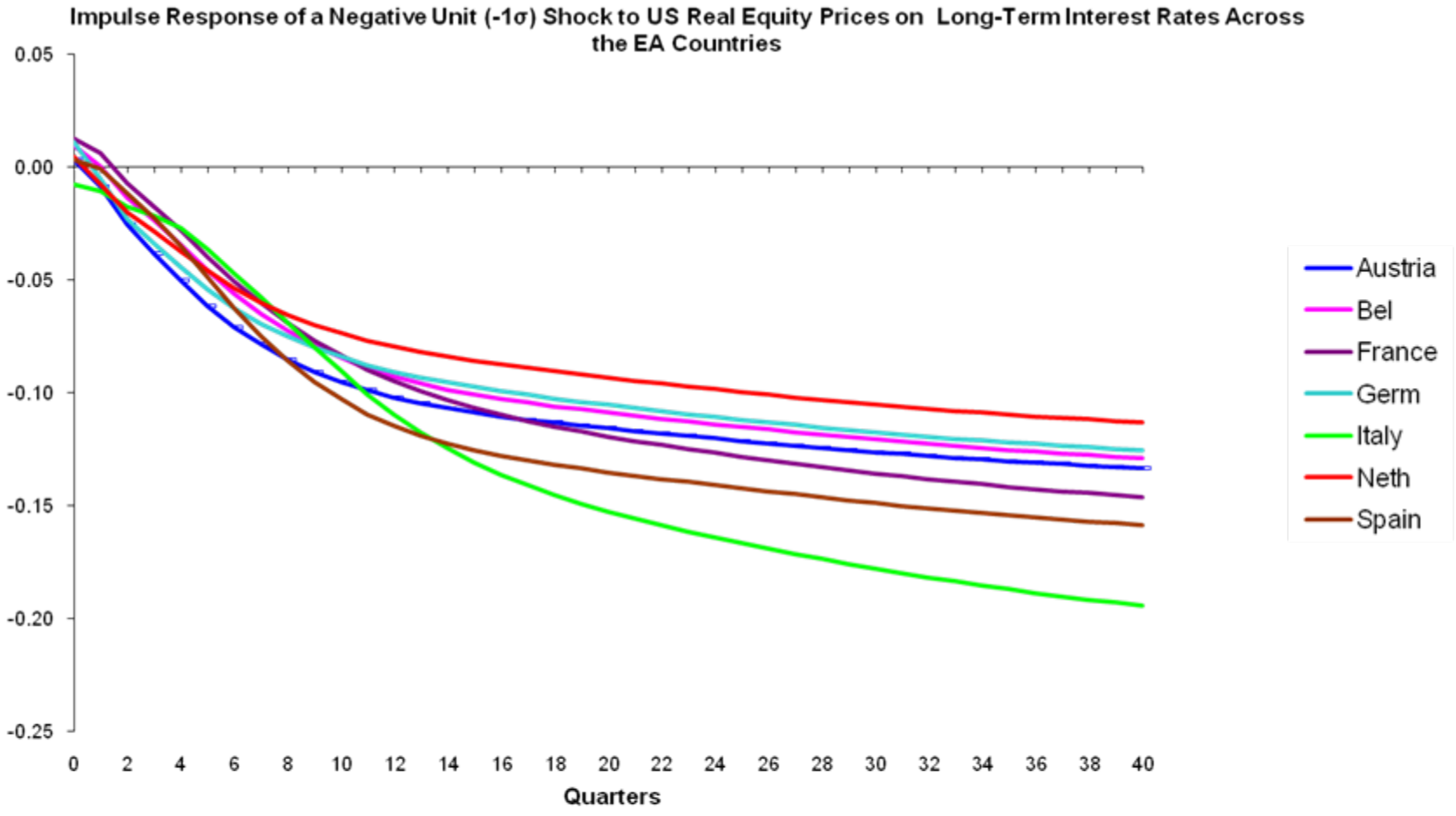


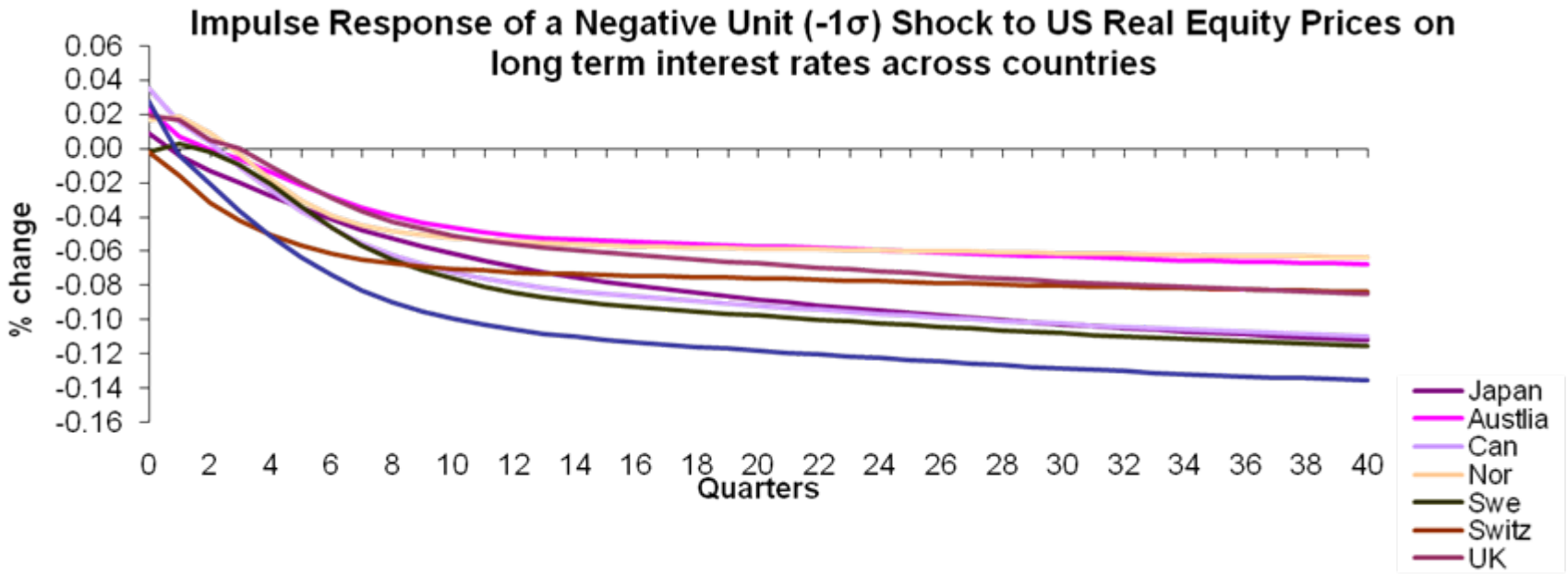


Impulse Response of a Negative Unit (-1σ) Shock to US Real Equity Prices on Real Equity in the EA




Impulse Response of a Negative Unit (-1σ) Shock to US Real Equity Prices on Real Output Across the EA Countries
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
Quarters
Austria
Bel
France
Germ
Italy
Neth
Spain


Impulse Response of a Negative Unit (-1σ) Shock to US Real Equity Prices on Long-Term Interest Rates Across the EA Countries
0.05
0.00
-0.05
-0.10
-0.15
-0.20
-0.25
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
Quarters
Austria
Bel
France
Germ
Italy
Neth
Spain


Impulse Response of a Negative Unit (-1σ) Shock to US Real Equity Prices on long term interest rates across countries
% change
0.06
0.04
0.02
0.00
-0.02
-0.04
-0.06
-0.08
-0.10
-0.12
-0.14
-0.16
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40
Quarters
Japan
Austlia
Can
Nor
Swe
Switz
UK

Conclusions

- GVAR provides a theoretically coherent framework for modelling the global interactions.
- The empirical analysis so far suggests that:
  - Financial shocks (equity and bond prices) tend to be transmitted much faster than shocks to real output and/or inflation.
  - Equity and bond markets seem to be far more synchronous as compared to the foreign exchange markets.
  - The effects of output shocks across countries is less synchronous than inflation shocks, which is still less synchronous than the effects of shocks to financial variables.

Conclusions (continued)

- Negative shocks to real equity prices in the US are transmitted rapidly to the rest of the world with unfavorable consequences for the real economy.
- A positive oil price shocks tend to increase inflation, reduce real output, and real equity prices, although the exact quantitative effects vary considerably across economies.
- Shocks generally take 3-4 years to have their full effects.

Conclusions (continued)

- Cross country comparisons often require quite complicated models that can allow for a variety of dynamic interactions, at national and global levels.
- Financial and real shocks transmit at very different rates.
- Financial shocks (equity and bond prices tend to be transmitted much faster than shocks to real output and/or inflation.
- Equity and bond markets seem to be far more synchronous as compared to the foreign exchange markets.

Conclusions (continued)

- Comparing the effects of the shocks on the euro area economy and the rest of Europe, results show striking similarities.
- Effects of oil price shocks tend to be accentuated by monetary policy responses – particularly led by the US

Thank You!

- **More details available on http://www.econ.cam.ac.uk/faculty/pesaran**