Is the exchange rate a shock absorber or source of shocks? New empirical evidence

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Motivation

- Is the exchange rate a shock absorber?
  - OCA-literature: loss of a stabiliser against asymmetric shocks
- Buiter (2000): The exchange rate is also an important source of shocks
- General: what shocks are driving the exchange rate?
- Empirical evidence: mixed
  - Mostly based on SVARs
  - Clarida and Gali (1994)
    - Exchange rate acts as a shock absorber
    - Confirmed by Funke (2000) and Chadha and Prasad (1997)
  - Artis and Ehrmann (2000) and Canzoneri et al. (1996)
    - Exchange rate is a source of shocks

Motivation

- An important aspect in SVAR-literature: identification
  - Clarida and Gali (1994): use a long-run triangular identification scheme based on a small open macro model in the spirit of Dornbusch (1976) and Obstfeld (1985)
    - Long-run restrictions are often criticized in the literature
      - Empirical point of view: Faust and Leeper (1997)
      - Theory: permanent effects of nominal shocks
  - Artis and Ehrmann (2000) use also short-run restrictions
    - There is no theoretical reason to justify these restrictions
- We challenge the evidence by using sign restrictions
  - Faust (1998), Uhlig (1999), Canova and De Nicoló (2002) and Peersman (2004)
  - No zero constraints are necessary
  - Qualitative restrictions are introduced

Overview

- The benchmark model of Clarida and Gali
- Derivation of sign restrictions
- Empirical results: comparison
  - 1974Q1 – 2002Q4
  - Euro area, UK, Japan and Canada versus the US
- Extended model

Benchmark model of Clarida and Gali

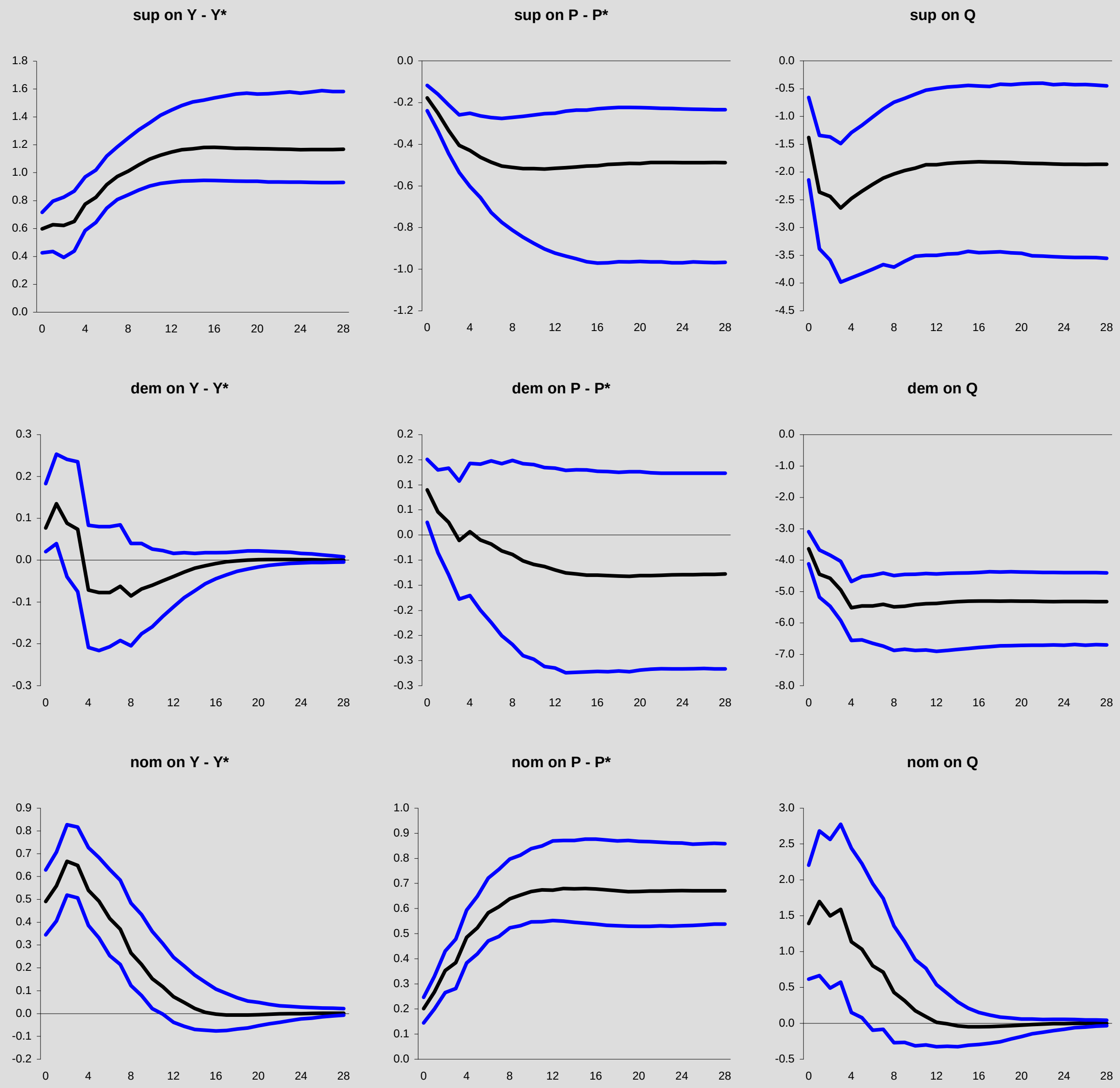
- Stochastic two-country open macro model based on Dornbusch (1976) and Obstfeld (1985) with sticky prices

$$
\begin{aligned}
y_t^d &= d_t + \eta q_t - \sigma \left[i_t - E_t \left(p_{t+1} - p_t \right) \right] \\
p_t &= \left(1 - \theta\right) E_{t-1} p_t^e + \theta p_t^e \\
m_t^s - p_t &= y_t - \lambda i_t \\
i_t &= E_t \left(s_{t+1} - s_t \right)
\end{aligned}
$$

- Introduction of three stochastic shocks and solved for long-run flexible price rational expectations equilibrium

$$
\begin{aligned}
y_t^e &= y_t^s \\
q_t^e &= \left(y_t^s - d_t \right) / \eta + \left[\eta \left(\eta + \sigma \right) \right]^{-1} \sigma \gamma \varepsilon_t^d \\
p_t^e &= m_t - y_t^s + \lambda \left(1 + \lambda\right)^{-1} \left(\eta + \sigma \right)^{-1} \gamma \varepsilon_t^d
\end{aligned}
$$

Benchmark model of Clarida and Gali



Benchmark model of Clarida and Gali

- Variance decompositions

	supply	demand	nominal
United Kingdom			
1 quarter	0.08	0.84	0.04
1 year	0.05	0.91	0.03
5 years	0.04	0.95	0.01
Euro area			
1 quarter	0.11	0.75	0.11
1 year	0.18	0.69	0.08
5 years	0.14	0.82	0.02
Japan			
1 quarter	0.07	0.80	0.08
1 year	0.10	0.75	0.09
5 years	0.22	0.74	0.03
Canada			
1 quarter	0.02	0.89	0.05
1 year	0.03	0.92	0.03
5 years	0.05	0.94	0.00

A model with sign restrictions

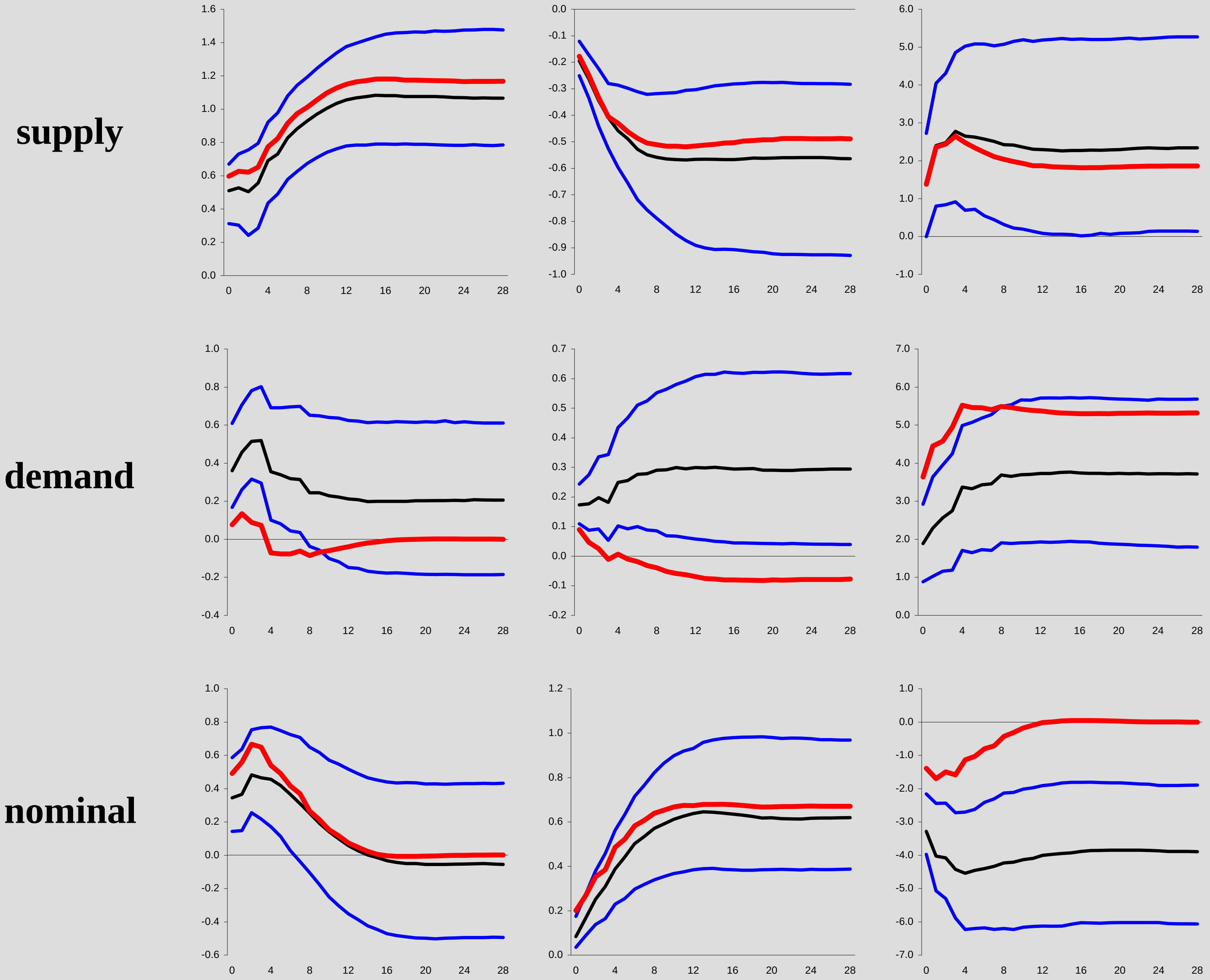
- Short-run deviations from equilibrium in Clarida and Gali

$$
\begin{aligned}
y_t &= y_t^e + (\eta + \sigma)\, v\, (1-\theta) \left(\varepsilon_t^n - \varepsilon_t^s + \alpha\gamma\varepsilon_t^d \right) \\
q_t &= q_t^e + v\, (1-\theta) \left(\varepsilon_t^n - \varepsilon_t^s + \alpha\gamma\varepsilon_t^d \right) \\
p_t &= p_t^e - (1-\theta) \left(\varepsilon_t^n - \varepsilon_t^s + \alpha\gamma\varepsilon_t^d \right)
\end{aligned}
$$

	y	p	q
supply	$\frac{\partial y_t}{\partial \varepsilon_t^s} \geqslant 0$	$\frac{\partial p_t}{\partial \varepsilon_t^s} \leqslant 0$	$\frac{\partial q_t}{\partial \varepsilon_t^s} ?0$
demand	$\frac{\partial y_t}{\partial \varepsilon_t^d} \geqslant 0$	$\frac{\partial p_t}{\partial \varepsilon_t^d} \geqslant 0$	$\frac{\partial q_t}{\partial \varepsilon_t^d} \leqslant 0$
nominal	$\frac{\partial y_t}{\partial \varepsilon_t^n} \geqslant 0$	$\frac{\partial p_t}{\partial \varepsilon_t^n} \geqslant 0$	$\frac{\partial q_t}{\partial \varepsilon_t^n} \geqslant 0$

- Clarida and Gali solution is part of distribution of all solutions

A model with sign restrictions



A model with sign restrictions

- Variance decompositions

	supply	demand	nominal	supply	demand	nominal
United Kingdom						
1 quarter	0.08	0.84	0.04	0.04	0.37	0.50
1 year	0.05	0.91	0.03	0.05	0.54	0.34
5 years	0.04	0.95	0.01	0.05	0.56	0.31
Euro area						
1 quarter	0.11	0.75	0.11	0.12	0.19	0.57
1 year	0.18	0.69	0.08	0.18	0.19	0.53
5 years	0.14	0.82	0.02	0.16	0.30	0.42
Japan						
1 quarter	0.07	0.80	0.08	0.03	0.28	0.62
1 year	0.10	0.75	0.09	0.03	0.24	0.67
5 years	0.22	0.74	0.03	0.09	0.27	0.57
Canada						
1 quarter	0.02	0.89	0.05	0.03	0.69	0.26
1 year	0.03	0.92	0.03	0.03	0.74	0.18
5 years	0.05	0.94	0.00	0.05	0.79	0.11

An extended model with sign restrictions

	y	p	s	q
supply	$\geqslant 0$	$\leqslant 0$	?	?
demand	$\geqslant 0$	$\geqslant 0$	$\geqslant 0$	$\leqslant 0$
monetary	$\geqslant 0$	$\geqslant 0$	$\leqslant 0$	$\geqslant 0$
exchange	$\geqslant 0$	$\geqslant 0$	$\geqslant 0$	$\geqslant 0$

An extended model with sign restrictions

- Variance decompositions

	sup	dem	nom	sup	dem	nom	sup	dem	mon	exh
United Kingdom										
1 quarter	0.08	0.84	0.04	0.04	0.37	0.50	0.03	0.40	0.04	0.40
1 year	0.05	0.91	0.03	0.05	0.54	0.34	0.05	0.60	0.08	0.15
5 years	0.04	0.95	0.01	0.05	0.56	0.31	0.05	0.62	0.10	0.08
Euro area										
1 quarter	0.11	0.75	0.11	0.12	0.19	0.57	0.19	0.24	0.13	0.25
1 year	0.18	0.69	0.08	0.18	0.19	0.53	0.28	0.23	0.15	0.17
5 years	0.14	0.82	0.02	0.16	0.30	0.42	0.26	0.34	0.12	0.10
Japan										
1 quarter	0.07	0.80	0.08	0.03	0.28	0.62	0.02	0.43	0.10	0.30
1 year	0.10	0.75	0.09	0.03	0.24	0.67	0.03	0.34	0.35	0.14
5 years	0.22	0.74	0.03	0.09	0.27	0.57	0.04	0.36	0.37	0.12
Canada										
1 quarter	0.02	0.89	0.05	0.03	0.69	0.26	0.02	0.71	0.01	0.20
1 year	0.03	0.92	0.03	0.03	0.74	0.18	0.03	0.79	0.03	0.08
5 years	0.05	0.94	0.00	0.05	0.79	0.11	0.05	0.78	0.04	0.05

Conclusions

- Identification strategy in SVARs matters
  - Using long-run and short-run zero restrictions can be misleading
  - When using a more general approach based on sign restrictions
    - Traditional restrictions are part of this general approach
    - Results can be significantly different
- We find an important role for the exchange rate as a source of shocks