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Comment Carlo A. Favero**Introduction**

Söderström (chapter 10, this volume) and DiCecio and Nelson (chapter 11, this volume) provide (different) counterfactual evidence on the effects of European Monetary Union (EMU) membership for Sweden and the United Kingdom based on small open economy dynamic stochastic general equilibrium (DSGE) models. Söderström estimates a small open economy model of the Swedish economy with twenty-seven variables (fifteen observables) and twenty-one exogenous shocks: one nonstationary technology shock common to foreign and domestic economies, nine shocks specific to the domestic economy (including a stationary technology shock), three foreign economy shocks, seven monetary and fiscal policy shocks, and a foreign exchange risk premium shock. DiCecio-Nelson use an Erceg, Gust, and Lopez-Salido (2007) model setup with twenty-five equations determining twenty-five endogenous variables and eleven shocks: two technology, two Investment and Saving equilibrium (IS) shocks, two wage markup shocks, two price markup shocks, one uncovered interest rate parity (UIP) shock, and two monetary policy shocks. The main results of the two exercises are that asymmetric shocks have been important for fluctuations in the Swedish economy, but the exchange rate has acted to destabilize rather than stabilize the economy; monetary union does not make a great difference for the United Kingdom, especially if UIP shocks are not zeroed but are transformed in additional demand shocks. Rather than concentrating on specific aspects of the two simulation exercises, I shall devote my discussion to the common general framework adopted here: small open economy DSGE models. In particular, I shall challenge such framework by estimating a small empirical model, a cointegrated vector autoregression (VAR), and by pointing out stark differences in the implications of cointegrated VAR and small open economy DSGE for the working of the economies with particular reference to the relative role of domestic and foreign shocks in explaining gross domestic product (GDP) fluctuations.

Challenging Small Open Economy DSGE Models

One of the main results in Söderström is that domestic shocks explain most of the forecasting variance of output at both short and long horizon. The first column of table 11C.1 reports the results in table 10.4 in (Söderström showing that domestic shocks explain 83.5 percent of the forecasting variance of Swedish GDP at the one-quarter horizon; this share declines

Table 11C.1 Fraction of GDP forecasting variance due to domestic shocks

Horizon	DSGE	SW GDP FEVD	EA GDP FEVD ^a	CAN GDP FEVD ^b
		Bivariate cointegrated VAR EA-SW	Bivariate cointegrated VAR US-EA	Monetary VAR US-CAN
1	83.5	70.1	65	100
4	66.2	41.5	38	26
20	45.8	20.8	8	25
40	59.4	14.4	4	—

^aGiannone, Lenza, and Reichlin (2008)^bCushman and Zha (2007)

with the horizon, but very slowly, to reach the value of about 60 percent at the ten-year horizon.

This is a rather common result in small open economy DSGE models (see, for example, Justiniano and Preston [2006]). We challenge this result by identifying domestic and foreign shocks in a much simpler framework. Following the empirical model of common fluctuations of U.S. and euro area GDP proposed by Giannone, Lenza, and Reichlin (chapter 4, this volume), we consider the following bivariate cointegrated VAR for euro area (log of) real GDP, y_t^{EA} , and Swedish real GDP, y_t^{SW} :

$$\Delta = A(L)\Delta z_{t-1} + \alpha\beta'z_{t-1} + \alpha\gamma t + Bu_t,$$

$$z_t = \begin{bmatrix} y_t^{EA} \\ y_t^{SW} \end{bmatrix} \alpha = \begin{bmatrix} 0.01 \\ (0.02) \\ -0.08 \\ (0.03) \end{bmatrix}$$

$$\beta' = \begin{bmatrix} 1-0.40 \\ (0.19) \end{bmatrix}.$$

The application of the Johansen (1995) procedure to the bivariate system produces the following results: (a) there is a single common stochastic trend between y_t^{EA} and y_t^{SW} (the null hypothesis of at most no cointegrating vector is rejected, while the null of at most one cointegrating vector cannot be rejected); and (b) y_t^{SW} is the only variable that reacts to disequilibria.

This evidence on the long-run behavior of the system leads to a natural identification of the two structural shocks hitting the system as a global (permanent) one and a local (temporary) one. The resulting forecasting error variance decomposition (FEVD) reported in column (2) of table 11C.1 leads to results very different from that of the small open economy DSGE model.

In fact, the local shock dominates over short horizon but gets progressively dominated by the global shock that eventually explains the entire FEVD of the Swedish output.

This pattern of variance decomposition for the small open economy is typical of empirical VARs. We report in column (3) the results in Giannone, Lenza, and Reichlin analyzing fluctuations of U.S. and euro area GDP, while column (4) reports the results of the joint analysis of the Canadian and U.S. GDP by Cushman and Zha (1997).

What Is Going On?

The stark contrast between the evidence based on empirical VARs—data consistent and driven by a very limited (and very sensible) set of identifying restrictions—and that produced by small open economy DSGE models raises an interesting question on the possible sources of such discrepancy. Justiniano and Preston (2006) evaluate whether an estimated, structural, small open economy model of the Canadian economy can account for the substantial influence of foreign-sourced disturbances identified in numerous reduced-form VAR studies. The analysis shows that the benchmark model implies cross-equation restrictions that are too stringent when confronted with the data, yielding implausible parameter estimates. Appropriate choice of ad hoc disturbances can relax these cross-equation restrictions and therefore capture certain properties of the data and yield plausible parameter estimates. This success is qualified by the model's inability to account for the transmission of foreign disturbances to the domestic economy: less than 1 percent of the variance of output is explained by foreign shocks.

If the inability to account for the transmission of foreign disturbances is a symptom of misspecification, what are the main dimensions along which the model can be misspecified?

We consider a number of potential sources of misspecification.

First is modeling of the exchange rate. In the Swedish model adopted by Söderström, the foreign economy is taken as exogenous and therefore modeled as a small independent VAR; therefore, the main source of transmission of shocks between the two economies is the exchange rate, S , which is modeled as follows:

$$E_t \Delta S_{t+1} = \frac{1}{(1-\phi)} (R_t - R_t^*) - \frac{1}{(1-\phi)} RP_t + \varepsilon_{rp,t}$$

$$RP_t = \phi \Delta S_t - \phi a_t, \quad (S)$$

a_t : net foreign asset position.

Unfortunately, $\varepsilon_{rp,t}$ turns out to be a near-unit root process. In fact, it has a persistence parameter of 0.93 in DiCecio-Nelson and in Adolfson et al. (2008). This implies that the residual term almost entirely explains

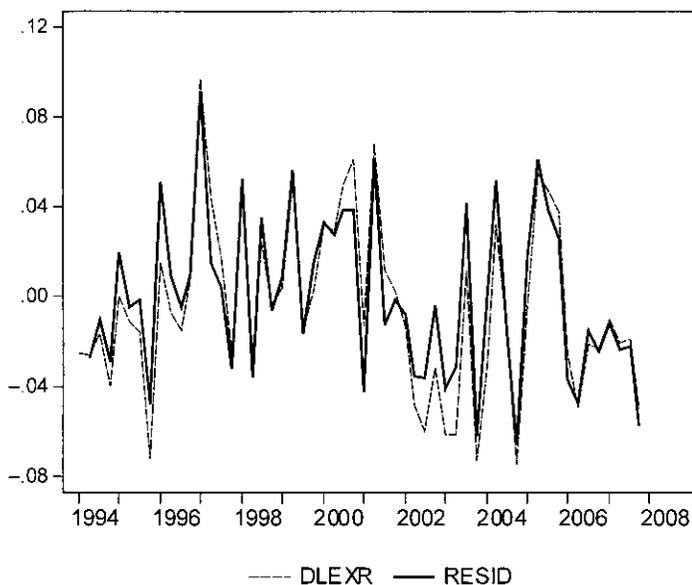


Fig. 11C.1 Actual values and residuals from the exchange rate equation

exchange rate fluctuations. We report in figure 11C.1 ΔS_{t+1} and $\varepsilon_{rp,t}$ for Swedish data.

Figure 11C.1 shows rather eloquently that the structural determinants of $E_t \Delta S_{t+1}$ play a rather minor role.

The second factor that can be missed by small economy DSGE models is comovement between asset prices (independent from exchange rate fluctuations). We report in figure 11C.2 comovements between GDP growth, bond markets, and stock markets in the euro area (EA), Sweden (SW), the United Kingdom (UK), and the United States (US; all variables defined in local currency).

The figure shows that international comovements in asset prices are at least as strong as comovement in real GDP growth; in fact, financial markets could be the sources of the common shocks driving common GDP fluctuations. Understanding the sources of common asset price fluctuations leads naturally to investigate a further factor invariably omitted, or at most taken as constant, in the DSGE model: the risk premium (see Rudebusch, Sack, and Swanson [2006]). To have a visual impression of the strength of the international comovement in this variable, we report in figure 11C.3 the time series of the spread between the yield to maturity of Italian and German ten-year government bonds (SP_ITBD) and the (rescaled to match mean) spread between ten-year fixed interest rates on swaps denominated in U.S. dollar and the yield to maturity of ten-year U.S. government bonds.

Figure 11C.3 clearly shows the presence of a comovement between the

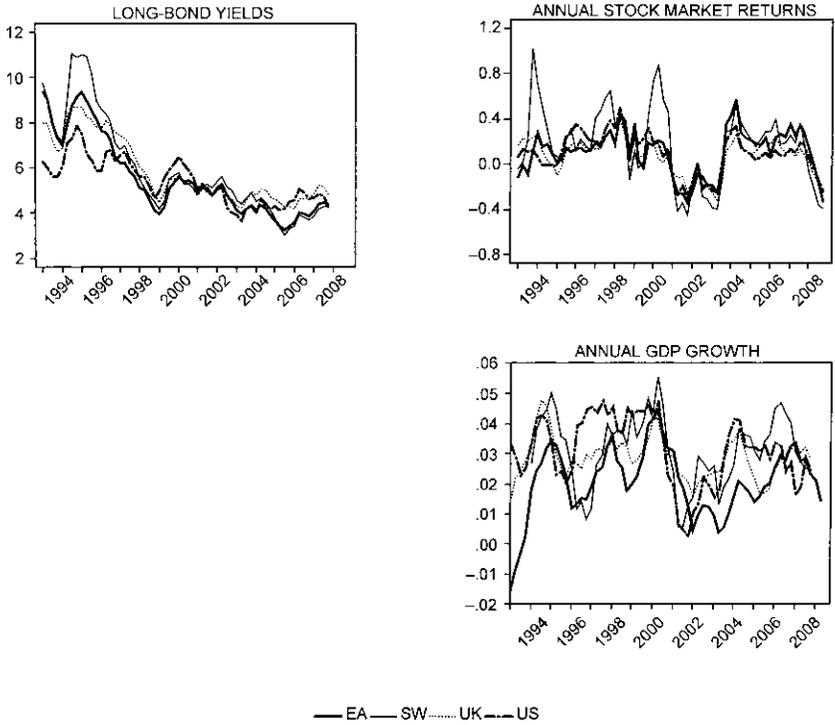


Fig. 11C.2 GDP growth, bond markets, and stock markets in the Euro Area (EA), Sweden (SW), United Kingdom (U.K.) and the United States (U.S.)

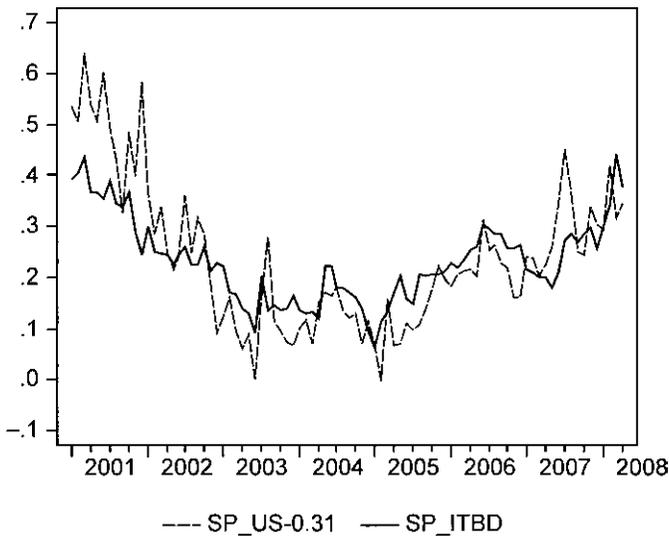


Fig. 11C.3 Spread between the yield to maturity of Italian and German ten-year government bonds (SP_ITBD) and the (rescaled to match mean) spread between ten-year fixed interest rates on swaps denominated in U.S. dollar and the yield to maturity of ten-year U.S. government bonds

relative perceived risk of Italian and German government sectors and the relative perceived risk of the U.S. banking sector and U.S. government sector that clearly calls for the insertion of a common time-varying world factor in the determination of global asset prices.

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