5 Shock Propagation Mechanisms and Business Cycle Convergence

By Atilim Seymen

This section provides an analysis of shock propagation mechanisms and international business cycles based on structural vector autoregression (SVAR) models. After providing a brief overview of the employed methodology and related literature, results from two different empirical models will be presented. The first empirical model includes the G7 countries, for which relatively long and reliable datasets can be obtained. We examine the properties of output cycles and changes in inflation rates, as well as how these variables are affected by common and structural (supply, demand and nominal) shocks. The second, simpler model covers a shorter sample period and is less theoretical in structure, but deals with more countries than the first model. It allows us to investigate whether gaps in terms of the aforementioned variables between the euro area and its twelve Member States are mainly due to common or country-specific shocks.

5.1 Structural Vector Autoregression Models

Structural vector autoregression (SVAR) models have gained in popularity in macroeconomic analysis since the 1980s. These models allow researchers to estimate structural shocks as well as their dynamic effects on macroeconomic variables by imposing a minimum number of theoretical restrictions on a statistical model. Moreover, SVAR models are not only empirical models; many theoretical models have a structural VAR representation, too. Based on an empirical or theoretical model, a SVAR representation can be employed for the analysis of business cycles. In particular, a structural VAR is well-suited to the modelling approach that views business cycles as a product of exogenous shocks. The propagation mechanisms of the shock thus determine the persistence and amplitude of the business cycle. SVARs allow researchers to examine various aspects of international business cycles:

1. Structural shocks in different countries can be compared.
2. Dynamic responses of macroeconomic variables to a one-standard-deviation structural shock can be compared.
3. Error variance decompositions can be computed for estimating shares of (common and country-specific) shocks in cyclical fluctuations.

In the following, we discuss these three aspects with some examples from the relevant literature and provide an outline of the empirical tools that we employ later for analysis.

5.1.1 Confronting the Estimated Structural Shocks

In a seminal study, Bayoumi and Eichengreen (1992) investigate the coherence of structural shocks across European countries and compare it with US regional data. They estimate bivariate VARs for the output and inflation rates of each European Community (EC) country and US region and identify “supply” and “demand” shocks by employing the identification scheme proposed by Blanchard and Quah (1989). The estimated historical supply and demand shocks for the EC and the United States are plotted and their movements are commented. Moreover, correlations between the anchor country/region (Germany for the European EC and the Mid-East Region for the United States) of these two groups with the other members are reported. Such a correlation analysis is simple and can be very insightful. However, care should be taken not to over interpret the conclusions, since the robustness of the results may not be given; that is, the robustness may change substantially with respect to the choice of the anchor country. The approach used by Bayoumi and Eichengreen also does not distinguish between symmetric and asymmetric (common and country-specific) components of structural shocks; see the critique in Chamie et al. (1994).

Bayoumi and Eichengreen (1992) also take the relative size of estimated shocks into account. Their argument for doing so rests on the postulation that “the larger the size of the underlying shocks, the more difficult it may be to maintain a fixed exchange rate, and the more compelling may be the case for an independent policy response”. However, although this argument could be right, it is not possible to compute relative shock sizes, since estimated orthogonal shocks and their dynamic multipliers are identified only up to a certain normalisation and their standard deviations can be changed arbitrarily in the empirical framework.

A simple way to check the convergence (or divergence) between estimated structural shocks is to discern whether the correlation between related shocks is higher (or lower) in later subsamples. A higher correlation in later subsamples may lead to business cycle convergence. Note, however, that strong business cycle synchronisation cannot be taken for granted, even when structural shocks in individual countries consist only of a common component, since it is possible that propagation mechanisms vary between countries due to differing institutions, political preferences or economic structures. We do not report the correlations among possible country pairs in our study due to the sheer abundance of them.23

23For twelve euro area members and the USA, 78 bilateral correlations can be computed.