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Macroeconomic idiosyncrasies and European monetary unification: A sceptical long run view☆

Marie-Estelle Binet [a], Jean-Sébastien Pentecôte [b,*]

[a] CREM–CNRS, University of Rennes 1, France
[b] CREM–CNRS, University of Caen, France

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ABSTRACT

This study questions the empirical assessment of asymmetries in currency areas based on structural vector auto-regressions that describe the price–output dynamics in reference to the Aggregate Supply–Aggregate Demand (AS–AD) diagram. Our contribution is both methodological and empirical. First, we propose a way to rotate the innovations resulting from the Bayoumi–Eichengreen (1992) decomposition of the VAR residuals to ensure that their properties remain identical to the properties of the well-known Blanchard–Quah (1989) factorization. In addition, we derive the slope coefficients of the AS–AD curves from the impulse responses to demand shocks and thereby reveal structural heterogeneities across countries. Second, we study fifteen euro and non-euro countries using quarterly data over 1960–2012. Bootstrap simulations reveal that: 1) the Bayoumi–Eichengreen decomposition yields the same conclusions as the Blanchard–Quah one in terms of shock sizes and asymmetry; 2) the long-run neutrality of demand shocks on output is often not decisive in assessing shock asymmetry; and 3) the estimated structural and stochastic asymmetries are imprecise, which has been often disregarded in the literature. Thus, one should be cautious about the empirical relevance of macroeconomic idiosyncrasies with regard to the suitability of a currency area.

1. Introduction

Disentangling the empirical properties of macroeconomic shocks striking a set of countries is a crucial issue in exchange rate economics. The stochastic dependencies exhibited among countries influence their choice to peg their currency to a foreign anchor or even to join a monetary union. Moreover, these dependencies help explain regional exchange rate agreements in Europe (Bayoumi and Eichengreen, 1992) and Asia (Lee and Koh, 2012), and they even shed light on the polarization of the international monetary system (Bayoumi and Taylor, 1995).

According to the literature on the optimum currency areas, sharing the same currency and committing to a common monetary policy critically depend on the nature and the size of the macroeconomic disturbances when there are no substitutes for exchange rate adjustments. Fixed exchange rates should be preferred when common (symmetric) shocks dominate the idiosyncratic ones and/or such shocks call for symmetric responses.

In a series of empirical works, Bayoumi and Eichengreen (1992, 1994) have popularized the core-periphery view of hard peg regimes. These authors rely on a graphical representation of the textbook Aggregate Supply–Aggregate Demand (AS–AD) model to show how supply and demand shocks at the macro-level can be extracted from the joint output growth-inflation dynamics; the latter is described by a finite-order vector autoregressive (VAR) process. Then, the structural shocks can be recovered from the VAR residuals by imposing identifying restrictions. Bayoumi and Eichengreen ('BE' henceforth) refer to Blanchard and Quah's ('BQ' elsewhere, 1989) methodology, as it is assumed that the real output is unaffected by nominal demand shocks in the long term.

In recent years, the monetary unification process in the enlarged European Union has revived the debate around the asymmetric functioning of the euro area itself. Following BE (1992, 1994), almost all of the empirical studies have resorted to a VAR identification based on long-run restrictions. These studies assess both the nature and the extent of stochastic asymmetries among a set of countries with a common currency and the foregoing monetary policy. Asymmetry between countries is usually gauged through correlations between their shocks and correlations between their adjustment processes in response to a given shock. The lower the correlations are, the higher the asymmetries are across countries.

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* Corresponding author at: CREM–UMR CNRS 6211, Faculty of Economics and Management, University of Caen, 19 Rue Claude Bloch, CS 5186, 14032 Caen Cedex, France. Tel.: +33 2 31 56 54 93.
E-mail address: jean-sebastien.pentecote@unicaen.fr (J.-S. Pentecôte).

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However, Bayoumi and Eichengreen (1992) consider a decomposition of the shocks of the VAR that departs from the more famous BQ approach. They are interested not only in the correlation between domestic and foreign disturbances but also in the relative sizes of the demand and supply shocks in each country. Indeed, it is critical to address the asymmetries arising from the importance of permanent shocks compared to transitory ones. However, such a departure in the identification scheme should be inconsequential, as "*These two normalizations gave almost identical paths for the shocks, except for a scaling factor, and hence are used interchangeably*" (BE, 1994, p. 816).

This finding may be one of the reasons why the BE procedure has not been strictly followed in the subsequent empirical literature. Indeed, almost all of these studies refer to the AS–AD model (e.g. BE, 1992) to justify a zero long-run restriction on the output response to demand shocks. However, the same studies use a set of identification constraints similar to BQ rather than BE to achieve permanent-transitory shock decompositions.

Our purpose is to question and extend Bayoumi and Eichengreen's (1992) approach based on structural vector auto-regressions describing the price–output dynamics at the country level. This extension is made in reference to the popular AS–AD diagram.

Our contribution is both methodological and empirical. First, we propose a way to rotate the innovations resulting from the Bayoumi–Eichengreen decomposition of the VAR residuals to ensure that their properties remain identical to those from the well-known Blanchard–Quah (1989) factorization. Furthermore, we develop a new approach to derive the slope coefficients of both the AS and the AD curves from the impulse responses to demand shocks, and thus, we reveal the structural heterogeneities between countries. Unlike Cover et al. (2006), we do not assume that the slope of the AD curve is equal to one. Second, we provide empirical evidence on fifteen euro and non-euro OECD countries using quarterly data over the period 1960–2012. Bootstrap simulations reveal that: 1) the Bayoumi–Eichengreen decomposition yields the same conclusions as the Blanchard–Quah one in terms of shock size and asymmetry; 2) the long-run neutrality of demand shocks on output is often not decisive in assessing shock asymmetry; and 3) the estimated structural and stochastic asymmetries are imprecise, and this problem has been disregarded by many studies. Thus, one should be cautious about the relevance of macroeconomic idiosyncrasies, especially if they are used to gauge the suitability of a currency area.

The discussion proceeds as follows. Section 2 compares the BE with the BQ decomposition into transitory and permanent shocks and introduces the rotation matrix and a new loss function. Section 3 discusses various ways of identifying the slopes of the aggregate supply and aggregate demand curves that are consistent with the AS–AD diagram. In Section 4, we provide empirical evidence on the degree of asymmetries from structural vector auto-regression. Moreover, we run bootstrap simulations to avoid possible small sample bias in building confidence intervals of parameters and test statistics. Section 5 concludes.

2. Permanent-transitory shock decompositions: correspondence and uniqueness issues

First, we give an overview of Blanchard and Quah's (BQ, 1989) factorization of shocks. Second, we detail (for the first time to our knowledge) Bayoumi and Eichengreen's (BE, 1992) identification strategy to see how it differs from the BQ method. We clarify the conditions under which the resulting BE and BQ series of permanent and transitory shocks may exhibit the same features in terms of size and correlation. This equivalence is a crucial issue when one is interested in analysing the stochastic asymmetries across countries.

2.1. The standard Blanchard and Quah (1989) approach

The reduced form of the price–output dynamics in a given country is given by the following p-order bivariate VAR process. If this process is invertible, it can be rendered in the VMA(∞) form:

$$\mathbf{z}_t = (\mathbf{I} - \mathbf{A}(L))^{-1}\boldsymbol{\varepsilon}_t. \tag{1}$$

$\mathbf{z}_t$ is the vector of the log-difference of the economic activity index Y_t ($g_t = (1-L)y_t$ where $y_t = \ln Y_t$) and the log-difference of the price index is P_t ($\pi_t = (1-L)p_t$ where $p_t = \ln P_t$) at any date t. In addition, $\mathbf{I}$ is the conformable identity matrix, $\mathbf{A}(L)$ is the lag polynomial of order p in its matrix form, and L is the lag operator. The vector of the VAR residuals $\boldsymbol{\varepsilon}_t$ follows a white noise process with symmetric covariance matrix $\Sigma_\varepsilon = \begin{pmatrix} \sigma_1^2 & \sigma_{12} \\ \sigma_{12} & \sigma_2^2 \end{pmatrix}$. All deterministic terms are removed without loss of generality.

Next, the identification procedure is used to derive the so-called structural innovations from the residuals after the VAR estimation for each country. Thus, four structural shocks are isolated; these shocks may be from the supply or demand side and either common to the currency area or specific to the other economy.

As a particular way to decompose the covariance matrix $\boldsymbol{\Sigma}_\varepsilon$, the VAR residuals $\boldsymbol{\varepsilon}_t$ are initially expressed as a linear combination of the structural innovations $\boldsymbol{\eta}_t$:

$$\boldsymbol{\varepsilon}_t = \mathbf{C}_{BQ}\boldsymbol{\eta}_{BQ,t}. \tag{2}$$

$\mathbf{C}_{BQ}$ is the lower-triangular matrix consistent with the Blanchard–Quah identification assumptions, and $\boldsymbol{\eta}_{BQ,t} = \begin{pmatrix} \eta^P_{BQ,t} \\ \eta^T_{BQ,t} \end{pmatrix}$ is the corresponding vector of permanent shocks (to the aggregate supply $\eta^P_{BQ,t}$) and transitory shocks (to the aggregate demand $\eta^T_{BQ,t}$) in a given country.

BQ's (1989) identification constraints lead to the following system:

$$\begin{cases} E\left(\boldsymbol{\eta}_{BQ,t}\boldsymbol{\eta}_{BQ,t}'\right) = \mathbf{I} \\ (\mathbf{I} - \mathbf{A}(1))^{-1}\mathbf{C}_{BQ} = \begin{pmatrix} \cdot & 0 \\ \cdot & \cdot \end{pmatrix} \end{cases} \tag{3}$$

whereas the first equation of system (3) leads to uncorrelated innovations with unit variance, and the second equation implies the lack of a permanent effect of demand shocks on output. Therefore, the long-run impact matrix $(\mathbf{I} - \mathbf{A}(\mathbf{1}))^{-1}\mathbf{C}_{BQ}$ must be lower-triangular.

Normalizing the variance of the innovations is a common practice in structural VAR analysis, and it constrains the variance ratio to unity. However, the shape of the impulse response functions from a bivariate VAR similar to (1) can be very sensitive to the relative sizes of the transitory and permanent shocks. This issue is also central to the empirical assessment of fixed exchange rate regimes. As stressed by BE (1992), what matters is the side from which asymmetries dominate and the relative sizes of the so-called supply and demand disturbances. Consequently, the procedure of VAR identification should allow one to compute the variance of the structural shocks in a given country. Despite the numerous empirical works since BE (1992), it remains unclear how the properties of shocks may be influenced by relaxing that normalization assumption. The following subsection will clarify this missing point.

2.2. Bayoumi and Eichengreen's decomposition and its link to the BQ factorization

We follow BE by assuming that the reduced form of the price–output dynamics in a country is described by an autoregressive process such as Eq. (1). As a main departure from BQ, BE decomposes the correlation matrix $\boldsymbol{\Gamma}_\varepsilon$ of VAR residuals instead of the covariance matrix $\boldsymbol{\Sigma}_\varepsilon$ itself.