Business Cycle Convergence in EMU: A Second Look at the Second Moment

Jesús Crespo-Cuaresma  
Vienna University of Economics and Business

Octavio Fernández-Amador  
Johannes Kepler University Linz
Business Cycle Convergence in EMU: A Second Look at the Second Moment

OUTLINE

- Motivation
- Contribution
- Shocks and business cycle estimation
- Analysis of synchronization
- Costs of inclusion
- Conclusions
MOTIVATION:

- Mundell (1961) and the costs of fixing the exchange rate:
  - Reacting to asymmetric shocks:
    - Exchange rate and interest rate policy
    - Wage flexibility and labour mobility
- OCA criteria
- A meta-criterion: *Symmetry of shocks or synchronization of business cycle* minimizes the cost of joining a currency area
- Common monetary policy in a currency area as a source of potential asymmetries: Symmetry in the transmission mechanism
Critiques to OCA theory:

- The effective participation in a monetary union could change the structure and economic relations among the countries joining it
- Endogeneity with trade integration, with financial integration
- There is some evidence of endogeneities (with trade integration):
  - Frankel and Rose (1998): (Empirically positive) relation between trade and business cycle

⇒ **Ex ante** < **Ex post** suitability to join a monetary union
Four main issues:

- Synchronization in EMU-12
- Core – periphery debate
- Enlargement of EMU
- European idiosyncrasy vs global cycle

Artis and Zhang (1997 and 1999) and Inklaar and De Haan (2001) controversy: evidence / no evidence of a systematic relationship between monetary integration (the ERM) and cycles homogeneity in Europe

Convergence period in EMU-12 since the 90s (Angeloni and Dedola, 1999, Massman and Mitchell, 2003, Darvas and Szápari, 2005, Afonso and Furceri, 2008)

Increase in EU heterogeneity during the 2000-2002 recession (Fidrmuc and Korhonen, 2004)
Evidence of a core group

Several new EU members showed highly synchronized cycles with the EMU-12 countries, especially Hungary, Poland, and Slovenia (Artis et al., 2004, Darvas and Szápari, 2005, Fidrmuc and Korhonen, 2004 and 2006, Afonso and Furceri, 2008)

Synchronization among new EU members has also decreased during the 2000-2002 recession (Fidrmuc and Korhonen, 2004)

The recent birth of a European business cycle is diluted within an international business cycle (Artis, 2003, Pérez et al., 2007)
Crespo-Cuaresma and Fernández-Amador (2010):

- A long period of sizeable and significant convergence took place in the 90s and finished with the inception of the monetary union in 1999, when a period of smooth divergence started
- A regime of more synchronization is obtained from 1996 onwards
- EMU core is more synchronized than EMU-12
- New members group has experienced a strong convergence since 1995 and thus, since 2004 is in a level of synchronization similar to that of the EMU-12
- A hypothetical EMU enlargement including the new EU members does not introduce distortion in synchronization after the crisis of 2001-2002, specially form 2004 onwards
- EMU-12 more synchronized than OCDE/Global specially since the beginning of the 90s (1992) until 2004, when dilution in a global cycle
We analyze the dynamics of dispersion of demand shocks and demand-GDP across countries in a group as a measure of cyclical synchronization (sigma-convergence).

Procedure:

- Estimation of demand shocks and cyclical (demand) component (SVAR Blanchard and Quah, 1989)
- Crespo-Cuaresma and Fernández-Amador (2010) approach:
  - Compute the (weighted) cross-standard deviation series
  - Test for significant changes in dispersion
  - Identify convergence/divergence periods
  - Compute cost of inclusion for countries considered

Groups considered: EMU-12, Core, New Members, EMU-22, International

Series: GDP, CPI; 36 countries
SVAR à la Blanchard and Quah (1989):

\[ y'_{2t} = (\Delta GDP, \text{inflation}) \]
\[ \omega'_{2t} = (\text{demand shock, supply shock}) \]

- **Stable VAR:**
  \[ y_{it} = K_{i1}y_{i-1} + K_{i2}y_{i-2} + \ldots + \varepsilon_t = \sum_{j=0}^{\infty} L^j K_j y_{i-j} + \varepsilon_t \]
  \[ C_{i0} = 0 \]
  \[ 0 = C_i - \sum C_{i-j} K_j \]

- **Wold-MA representation:**
  \[ y_{it} = \varepsilon_t + C_{i1} \varepsilon_{i-1} + C_{i2} \varepsilon_{i-2} + \ldots + \sum_{j=0}^{\infty} L^j C_j \varepsilon_{i-j} \quad \varepsilon_t \sim N(0, \Omega) \]
  \[ A \varepsilon_t = B \omega_t \]

- **Structural (shock) representation:**
  \[ y_{it} = B_{i0} \omega_t + B_{i1} \omega_{i-1} + B_{i2} \omega_{i-2} + \ldots + \sum_{j=0}^{\infty} L^j B_j \omega_{i-j} \quad \omega_t \sim N(0, I) \]
Therefore the long-run total impact matrix:

\[ \Xi_{\infty} = \sum_{j=0}^{\infty} C_j = (I - K_1 - \ldots - K_p)^{-1} A^{-1} B \]

Where we impose the long-run restriction: where \( A = I \)

\[ \Xi_{\infty} = \begin{bmatrix} 0 & \xi_{12} \\ \xi_{21} & \xi_{22} \end{bmatrix} \]

Finally we obtain \( \Xi_{\infty}, \omega_{2t} \)

We can analyze the impulse response functions to 1%\( std \) impulse to both shocks

And we can retrieve the supply component of GDP (adding a linear trend and an intercept term) and the demand component of GDP
SHOCKS AND BUSINESS CYCLES ESTIMATION

- Austria
- Belgium
- Germany
- Spain
- Finland
- France
- Greece
- Ireland
- Italy
- Luxembourg
- Netherlands
- Portugal
Shocks and business cycles estimation

Analysis of synchronization

Costs of inclusion

Conclusions
Motivation

Contribution

Shocks and business cycles estimation

Analysis of synchronization

Costs of inclusion

Conclusions

SHOCKS AND BUSINESS CYCLES ESTIMATION

Australia

Canada

Switzerland

Denmark

United Kingdom

Iceland

Japan

Rep. Korea

Mexico

Norway

New Zealand

Sweden

Turkey

USA
Business Cycle Convergence in EMU: A Second Look at the Second Moment

ANALYSIS OF SYNCHRONIZATION: Standard deviation series

- Motivation
- Contribution
- Shocks and business cycle estimation
- Analysis of synchronization
- Costs of inclusion
- Conclusions

ANALYSIS OF SYNCHRONIZATION: Standard deviation series

Demand shocks

Weighted standard deviation (EMU-12 demand shocks)
Weighted standard deviation trend (EMU-12 demand shocks)

Demand-GDP

Weighted standard deviation (EMU-12 demand-GDP)
Weighted standard deviation trend (EMU-12 demand-GDP)
Test for equality of variances:

\[ T_{2,t,\tau} = (N - 2.5) \log [1 + 0.25(\hat{\sigma}_t^2 - \hat{\sigma}_{t+\tau}^2)^2 / (\hat{\sigma}_t^2 \hat{\sigma}_{t+\tau}^2 - \hat{\sigma}_t^2)] \]

Distributed as a \( \chi^2(1) \) under the null of no change in the variances

Identification of convergence/divergence periods at different horizons:

\[ (\sigma_{t+\tau} - \sigma_t) I \left[ T_{2,t,\tau} > \chi^2_{0.95}(1) \right] \]
ANALYSIS OF SYNCHRONIZATION: Carree-Klomp (1997) test

- Demand shocks
- Demand-GDP

Significant changes 2 years (demand shocks)
Significant changes 4 years (demand shocks)
Significant changes 6 years (demand shocks)
Significant changes 8 years (demand shocks)

Significant changes 2 years (demand-GDP)
Significant changes 4 years (demand-GDP)
Significant changes 6 years (demand-GDP)
Significant changes 8 years (demand-GDP)
A parametric approach: Approximate the dynamics of the dispersion series with an AR(r) process and assess the existence of structural breaks using the Bai and Perron’s (1998 and 2003) methodology.

Given the specification:

\[ \hat{S}_t = \sum_{j=1}^{R} (\alpha_{0,j} + \alpha_{1,j} \hat{S}_{t-1} + \ldots + \alpha_{r,j} \hat{S}_{t-r}) I(T_{j-1} \leq t < T_j) + \varepsilon_t \]

Estimate the breakpoints as:

\[ \{\hat{T}_1, \ldots, \hat{T}_{R-1}\} = \arg\min \sum_{t=1}^{T_R} \hat{\varepsilon}(T_1, \ldots, T_{R-1})^2 \]

Testing problems:

- Lack of identification of the breakpoints under the null
- Simulate the \textit{sup-F} test under the null (Bai and Perron, 1998 and 2003)
How would the optimality of EMU with the inclusion of all the new members?

Consider the following groups:

- Core
- NEWs and EMU-22
- Global

How would each country contribute to the optimality of EMU?

Cost of inclusion of country j in period t
ANALYSIS OF SYNCHRONIZATION: Comparative core

Demand shocks

- Weighted standard deviation (Core demand shocks)
- Weighted standard deviation trend (Core demand shocks)
- Weighted standard deviation (EMU-12 demand shocks)
- Weighted standard deviation trend (EMU-12 demand shocks)

Demand-GDP

- Weighted standard deviation (Core demand-GDP)
- Weighted standard deviation trend (Core demand-GDP)
- Weighted standard deviation (EMU-12 demand-GDP)
- Weighted standard deviation trend (EMU-12 demand-GDP)
ANALYSIS OF SYNCHRONIZATION: Comparative enlargement

- Motivation
- Contribution
- Shocks and business cycle estimation
- Analysis of synchronization
- Costs of inclusion
- Conclusions

**Weighted standard deviation**
- (New members demand shocks)
- (New members demand-GDP)
- (EMU-12 demand shocks)
- (EMU-12 demand-GDP)
- (EMU-22 demand shocks)
- (EMU-22 demand-GDP)
ANALYSIS OF SYNCHRONIZATION: Comparative global

- Motivation
- Contribution
- Shocks and business cycle estimation
- Analysis of synchronization
- Costs of inclusion
- Conclusions
COSTS OF INCLUSION: EMU-12

Austria

Belgium

Germany

Spain

Finland

France

Greece

Ireland

Italy

Luxembourg

Netherlands

Portugal

Business Cycle Convergence in EMU: A Second Look at the Second Moment

- Motivation
- Contribution
- Shocks and business cycle estimation
- Analysis of synchronization
- Costs of inclusion
- Conclusions
Business Cycle Convergence in EMU: A Second Look at the Second Moment

COSTS OF INCLUSION: EMU-22

- Motivation
- Contribution
- Shocks and business cycle estimation
- Analysis of synchronization
- Costs of inclusion
- Conclusions
Eurozone converged to a stable lower level of dispersion in demand shocks from the late-80s and demand-GDP first-90s

This is supported by similarities in propagation mechanisms

Convergence diluted core differentials till 2005

The NEWs experienced strong convergence as a group till 2005, when dispersion increases.

The inclusion of NEWs does not imply any distortion in the optimality of EMU

Evidence of a European business cycle during the 90s, not diluted in a global cycle

In line with Crespo-Cuaresma and Fernández-Amador (2010)
Assessing the Euro adoption requires considering more criteria (determinants of business cycle synchronizazion): After the Euro adoption...

- Evidence on nominal convergence
- Trade and FDI promotion
- Financial integration enhancing
- Broad fiscal coordination preferred and only supply shocks induce to deviations from agreement, fiscal shocks-smoothing improved in enlarged EMU
- Enough labour markets flexibility in the new EU-members
Business Cycle Convergence in EMU: A Second Look at the Second Moment

Jesús Crespo-Cuaresma
Vienna University of Economics and Business

Octavio Fernández-Amador
Johannes Kepler University Linz