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

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• Motivation
• Contribution
• Shocks and business cycle estimation
• Analysis of synchronization
• Conclusions
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.

Two questions regarding Optimum Currency Areas (OCAs):

- How large could an OCA be?
- Are necessary prerequisites bounds to support the maintenance and performance of such an OCA?
• Different OCA criteria:

Prices and wages flexibility, mobility of factors of production, degree of economic openness, diversification in production, and consumption, financial market integration, similarity of inflation rates, fiscal policy coordination, political integration.

• A meta-criterion:

Symmetry of shocks and structural response to them, or synchronization of business cycle minimizes the cost of joining a currency area.
Critiques to OCA theory:

- The effective participation in a monetary union could change the structure and economic relations among the countries joining it.

- There is some evidence of endogeneities:
  - Frankel and Rose (1998): (Empirically positive) relation between trade and business cycle.

  \[ \Rightarrow Ex \text{ ante} < Ex \text{ post} \] suitability to join a monetary union.

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.

European convergence period since the 90s (Angeloni and Dedola, 1999, Massman and Mitchell, 2003, Darvas and Szápari, 2005).

Increase in EU heterogeneity 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).
• Several acceding countries showed highly synchronized cycles with the EU-15 countries, especially Hungary, Poland and Slovenia (Artis et al, 2004, Darvas and Szápari, 2005, Fidrmuc and Korhonen, 2004 and 2006).

• Homogeneity of acceding countries is lower than that of EU-15 and than that exhibited in past enlargements (Artis et al., 2004).

• Synchronization amongst new members has also decreased during the 2000-2002 recession (Fidrmuc and Korhonen, 2004).
Questions of business cycle synchronization literature:

- Performance of EMU as a CA.
- The existence of a core/periphery difference.
- The enlargement (comparison NEWs-periphery).
- European cycle VS global cycle.
• Crespo-Cuaresma and Fernández-Amador (2009):
  ▪ 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 1995 on.
  ▪ 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.
  ▪ Looking at the hypothetical EMU enlargement including the new countries, after the crisis of 2001-2002, specially since 2004 the enlargement does not introduce distortion in synchronization.
  ▪ EMU-12 more synchronized than OCDE/Global specially since the beginning of the 90s (1992) until 2004.
We analyse dispersion of the cycle and shocks across countries in a group as a measure of business cycle homogeneity (in spirit of sigma-convergence literature of economic growth).

Procedure:

– Estimation of shocks and cyclical (demand) component (SVAR Blanchard and Quah, 1989).

– Crespo-Cuaresma and Fernández-Amador (2009) approach:
  – Compute the (weighted) cross-standard deviation series of business cycles.
  – Test for significant changes in dispersion.
  – Identify convergence/divergence periods.
  – Compute cost of inclusion for countries considered.

• Groups considered: EMU-12, New Members, EMU-22, International.

• Series: GDP, CPI, Unemployment rate.
SVAR à la Blanchard and Quah (1989):

- **Stable VAR:**
  \[ y_{it} = K_{i1} y_{it-1} + K_{i2} y_{it-2} + ... + \varepsilon_t = \sum_{j=0}^{\infty} L^j K_j y_{it-j} + \varepsilon_t \]

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

- **Structural (shock) representation:**
  \[ y_{it} = B_{i0} \omega_t + B_{i1} \omega_{it-1} + B_{i2} \omega_{it-2} + ... = \sum_{j=0}^{\infty} L^j B_j \omega_{it-j} \]
  \[ \omega_t \sim N(0, I) \]
SVAR à la Blanchard and Quah (1989):

• 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 \( A = I \)

• Where we impose the long-run restriction:

\[ \Xi_\infty = \begin{bmatrix} 0 & \xi_{12} \\ \xi_{21} & \xi_{22} \end{bmatrix} \]
SVAR à la Blanchard and Quah (1989):

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

- Finally we obtain \( \mathbb{E}_\infty \omega_{2t} \).
- 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 demand component of GDP, too.
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SHOCKS AND BUSINESS CYCLE ESTIMATION: Results

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ANALYSIS OF SYNCHRONIZATION: Standard deviation series

wstdv_demandgdp

wstdv_demandshocks
Carree and Klomp (1997) test for equality of variances:

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

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

Identification of convergence/divergence periods at different horizons:

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

CKtest demand GDP

CKtest demand Shocks

-1.5 -1.0 -0.5 0.0 0.5 1.0 1.5

-3.0 -2.0 -1.0 0.0 1.0 2.0

65 70 75 80 85 90 95 00 05
**ANALYSIS OF SYNCHRONIZATION: Bai-Perron (2003) proc.**

- A parametric approach: Approximate the dynamics of the dispersion series with an AR(1) process (KPSS test) and assess the existence of structural breaks using the Bai and Perron’s (1998 and 2003) methodology.

- Given the specification:

\[
s_t = \sum_{j=1}^{R} (\alpha_{0,j} + \alpha_{1,j} s_{t-1}) I(T_{j-1} \leq t < T_j) + \varepsilon_t
\]

- 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 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
- OECD and Global

How would each country contribute to the optimality of EMU?

Measure of cohesion: refer to the difference of dispersion in EMU with and without a country j in period t.
ANALYSIS OF SYNCHRONIZATION: Results

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ANALYSIS OF SYNCHRONIZATION: Results

![Graphs showing synchronization analysis results](image)

- WFKSTDV_EMU_GDP
- WFKSTDV_CORE_GDP
- WFKSTDV_NEW_GDP
- WFKSTDV_BIGEMU_GDP
ANALYSIS OF SYNCHRONIZATION: Results

[Graphs showing synchronization of GDP fluctuations across different regions]

- WFKSTDV_EMU_GDP
- WFKSTDV_OECD_GDP
- WFKSTDV_NONEW_GDP
- WFKSTDV_GLOBAL_GDP
\[ \text{coi}_{t,j|\Omega} = \frac{(\sigma_{t,\Omega-j} - \sigma_{t,\Omega})}{\sigma_{t,\Omega}} \]

- \( \text{coi}_{t,j|\Omega} > 0 \): benefit of country \( j \).
- \( \text{coi}_{t,j|\Omega} < 0 \): cost of country \( j \).
ANALYSIS OF SYNCHRONIZATION: Cost-of-inclusion
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• Strong alternating periods of divergence/convergence till the 90s.
• A period of convergence since the late 80s is detected, and yields lower level of dispersion series since the 90s.
• Similar synchronization in shocks for all the groups considered.
• The core shows more synchronization.
• The NEWs experienced strong convergence as a group till 2005, when dispersion increases.
• But the inclusion of NEWs does not imply any distortion in the optimality of EMU from 2001 on.
• Evidence of a European business cycle during the 90s, not diluted in a global cycle.
• Propagation mechanism seems to underpin some of the differences.

• However, looking at 90s-2000s, which asymmetric shock were not present in the 90s, but started with the birth of the EMU?
  – For countries with highly synchronized cycles, trade effects decrease: Other factors have as strong an effect as trade (Inklaar, Jong-A-Pin and De Haan, 2008).
  – Observed differences in business cycle in Europe are due to variables under the control of the government (Christodoulakis et al., 1995).
  – Fiscal policy homogeneization as a robust determinant of business cycle synchronization (Darvas et al., 2005, Böwer and Guilleminneau, 2006, Akin, 2006).
  – Onorante (2004): Fiscal activism is increased after joining a currency union.

  – Fiscal policy constraints may be behind the European business cycle.
In line with Crespo-Cuaresma and Fernández-Amador (2009)!

Further research:

- Extension of SVAR.
- Determinants of business cycle synchronization.
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