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

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OUTLINE:

- **Motivation**
- **Contribution**
- **Shocks and business cycle estimation**
- **Analysis of synchronization**
- **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.

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?

MOTIVATION:

- 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.

MOTIVATION:

- 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:

    - European Commission (1990) / Krugman (1991) controversy.
    - Frankel and Rose (1998): (Empirically positive) relation between trade and business cycle.

  $\Rightarrow$ *Ex ante* < *Ex post* suitability to join a monetary union.

MOTIVATION: The empirics of business cycle correlation in EU

- Homogeneity in business cycles in Europe as much as in US (Agresti and Mojon, 2001, Wynne and Koo, 2000).
- 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).

MOTIVATION: The empirics of business cycle correlation in EU

- 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).

MOTIVATION: The empirics of business cycle correlation in EU

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.

MOTIVATION: The empirics of business cycle dispersion in EU

- Crespo-Cuaresma and Fernández-Amador (2009):
  - A long period of sizeable and signicant 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.

CONTRIBUTION: A continuous indicator of synchronization

- 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.

SHOCKS AND BUSINESS CYCLE ESTIMATION:

SVAR à la Blanchard and Quah (1989):

- **Stable VAR:**

$$y_{it} = K_{i1} y_{it-1} + K_{i2} y_{it-2} + ... + \varepsilon_t = \sum_{j=0}^{\infty} L^j K_j y_{it-j} + \varepsilon_t$$

$$C_{i0} = 0$$

$$0 = C_i - \sum C_{i-j} K_j$$

- **Wold-MA representation:**

$$y_{it} = \varepsilon_t + C_{i1}\varepsilon_{it-1} + C_{i2}\varepsilon_{it-2} + ... = \sum_{j=0}^{\infty} L^j C_j \varepsilon_{it-j} \Big/ \varepsilon_t \sim N(0, \Omega)$$

$$\mathrm{A}\varepsilon_t = \mathrm{B}\omega_t$$

- **Structural (shock) representation:**

$$y_{it} = \mathrm{B}_{i0}\omega_t + \mathrm{B}_{i1}\omega_{it-1} + \mathrm{B}_{i2}\omega_{it-2} + ... = \sum_{j=0}^{\infty} L^j \mathrm{B}_j \omega_{it-j} \Big/ \omega_t \sim N(0, \mathrm{I})$$

SVAR à la Blanchard and Quah (1989):

- Therefore the long-run total impact matrix:

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

$$\text{where } \mathrm{A} = \mathrm{I}$$

- Where we impose the long-run restriction:

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

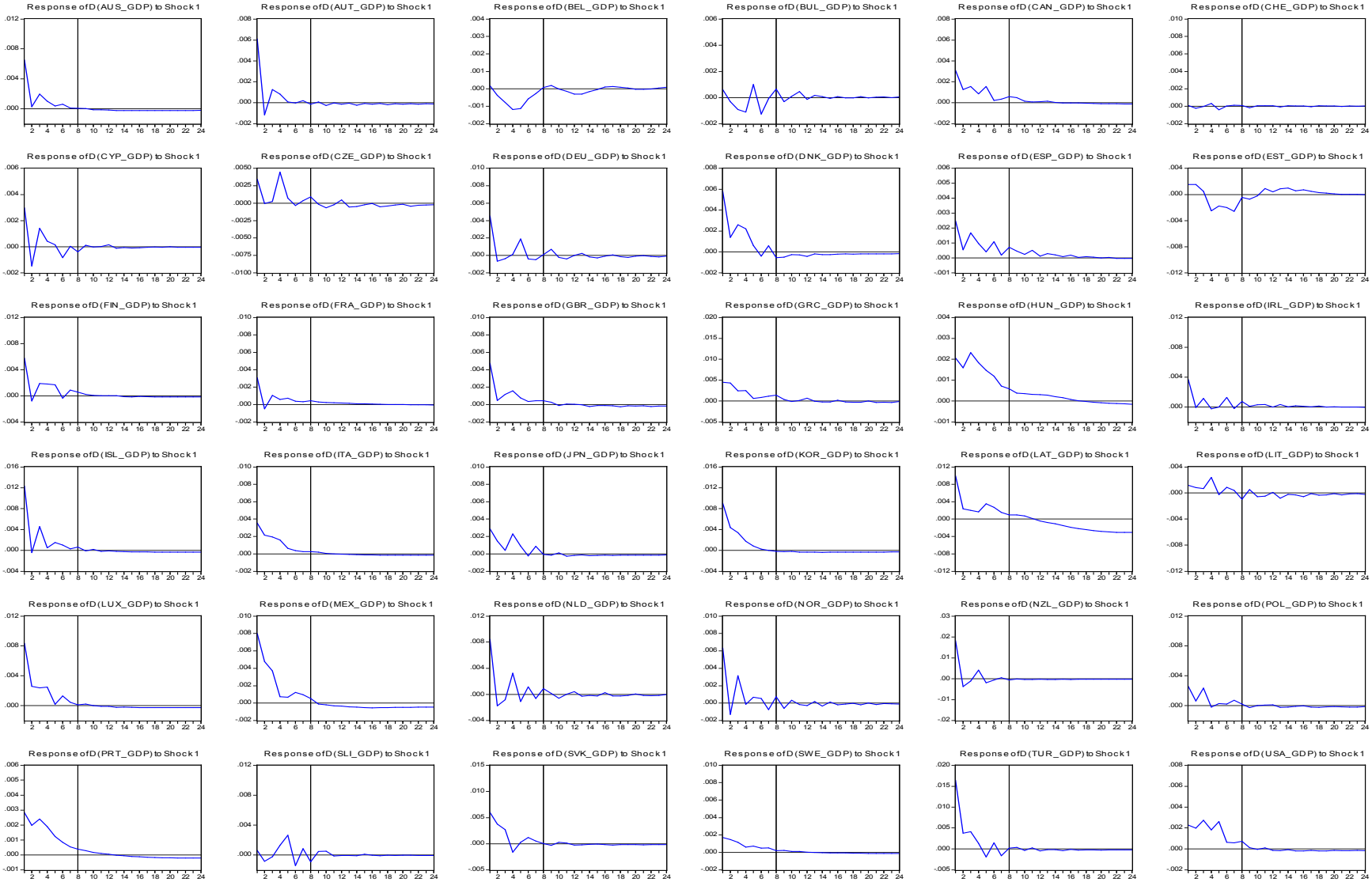
SHOCKS AND BUSINESS CYCLE ESTIMATION:

SVAR à la Blanchard and Quah (1989):

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

- Finally we obtain Ξ_∞, ω_{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.

SHOCKS AND BUSINESS CYCLE ESTIMATION: Results



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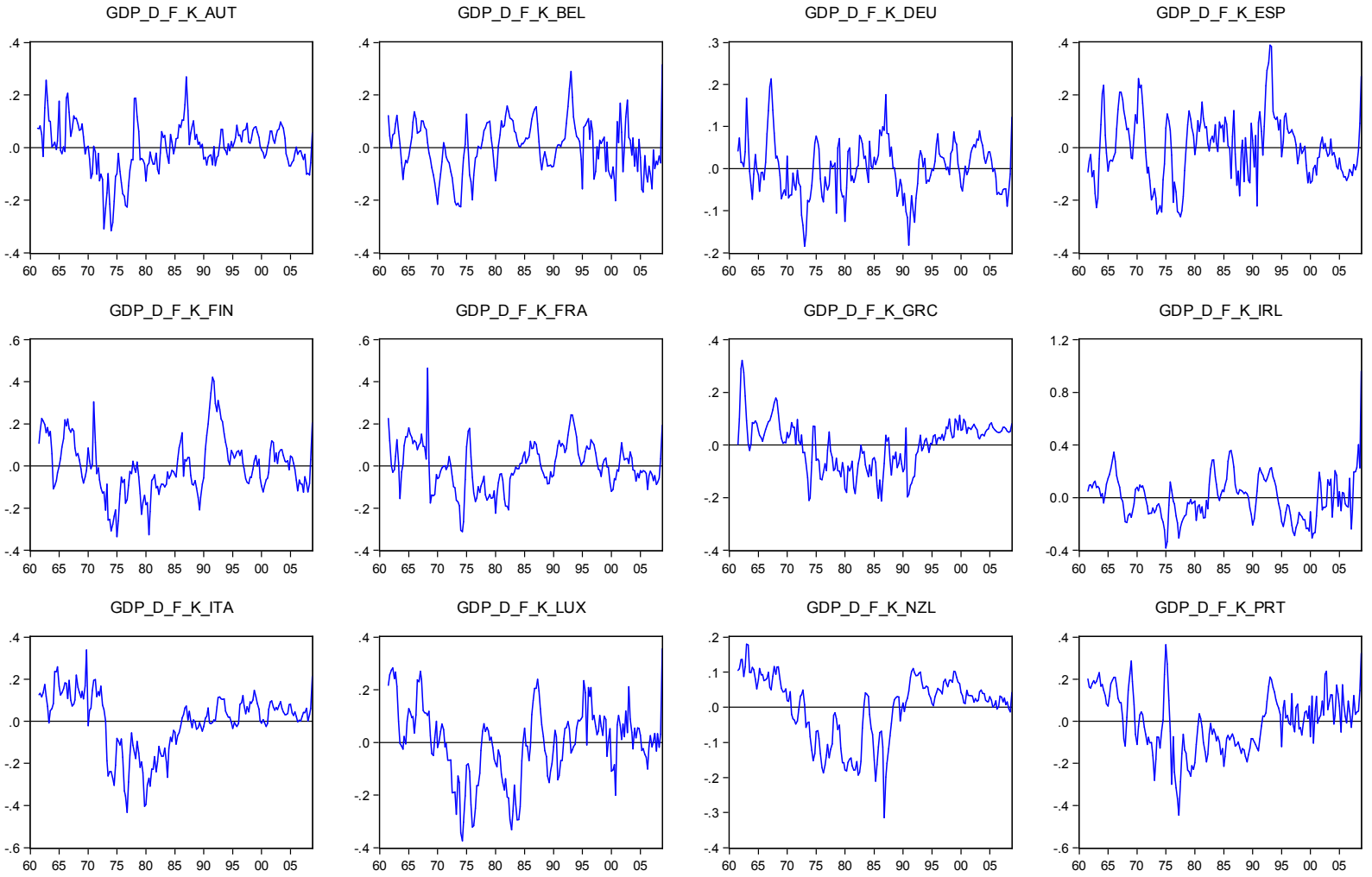

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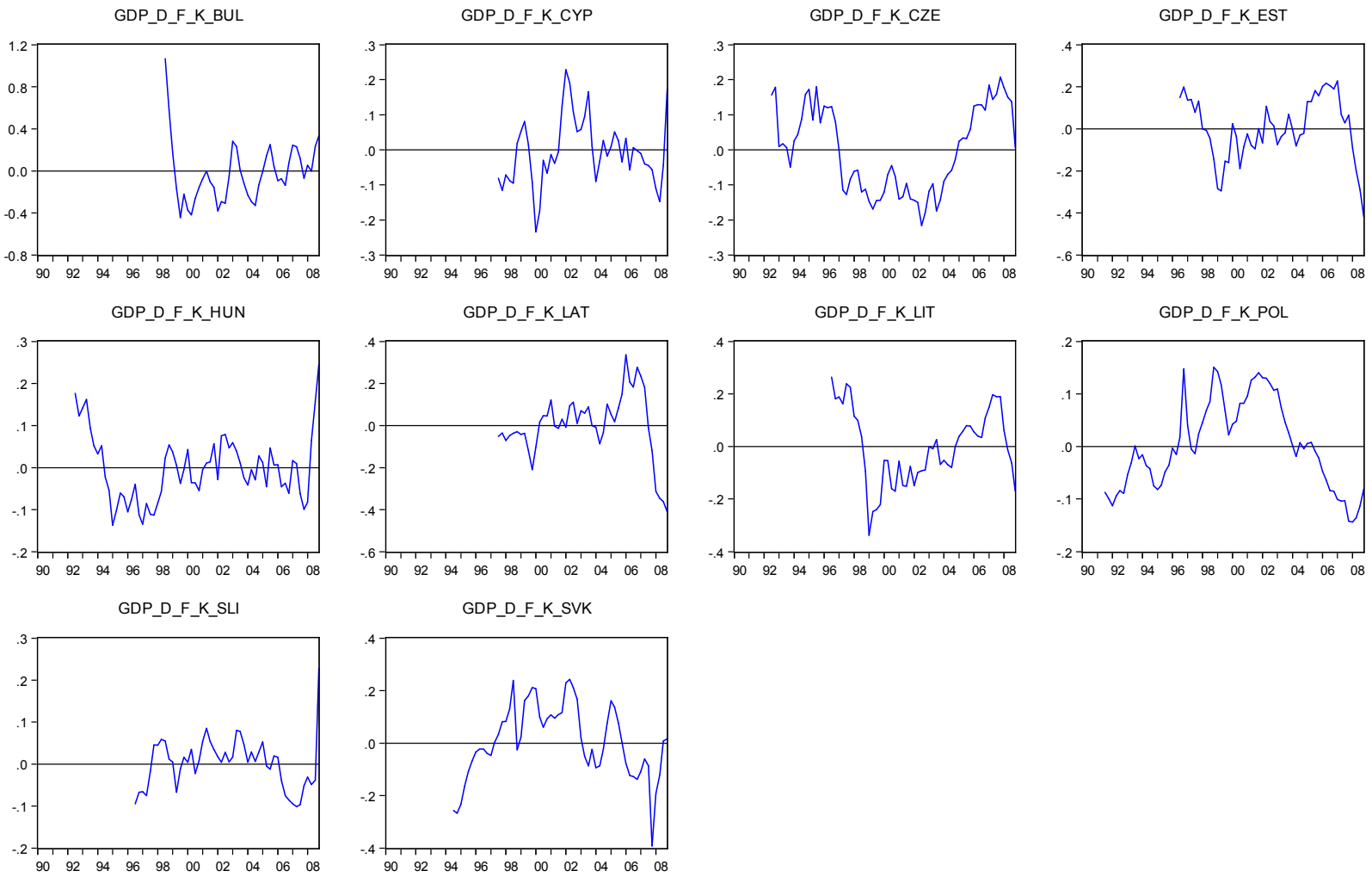

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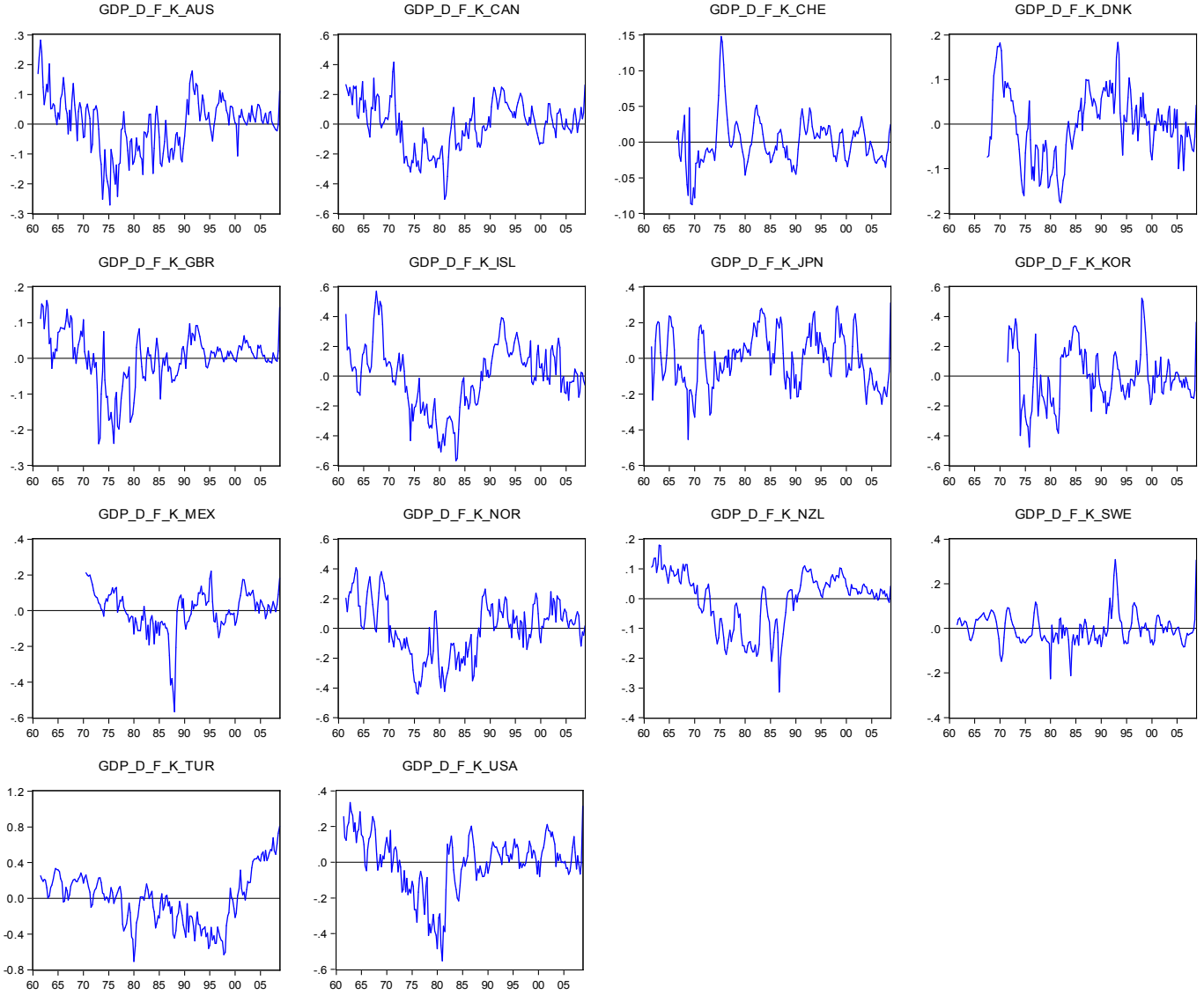
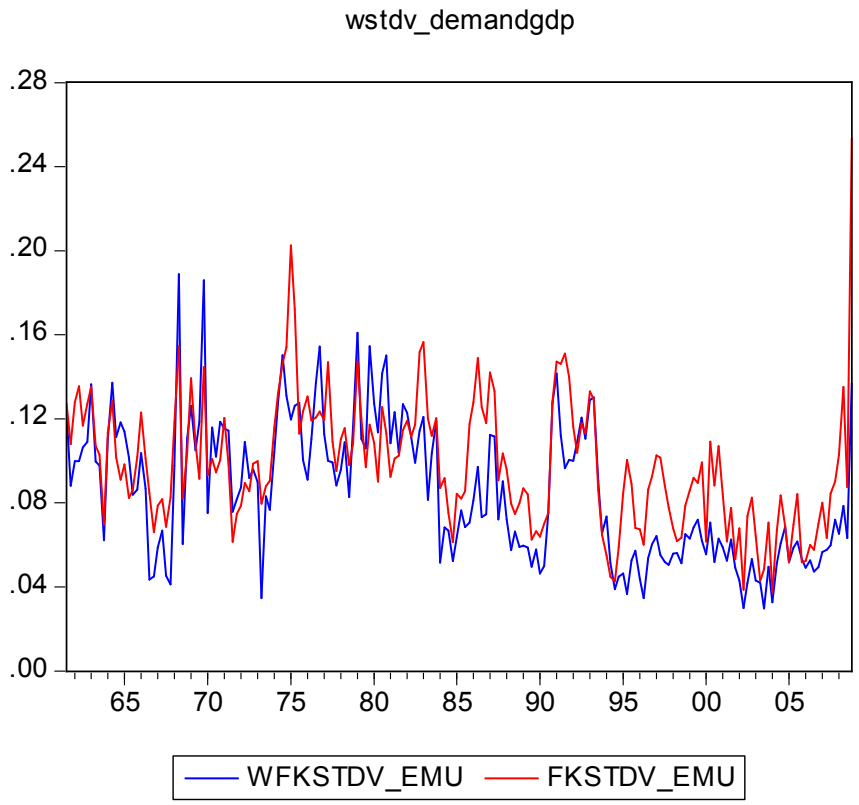
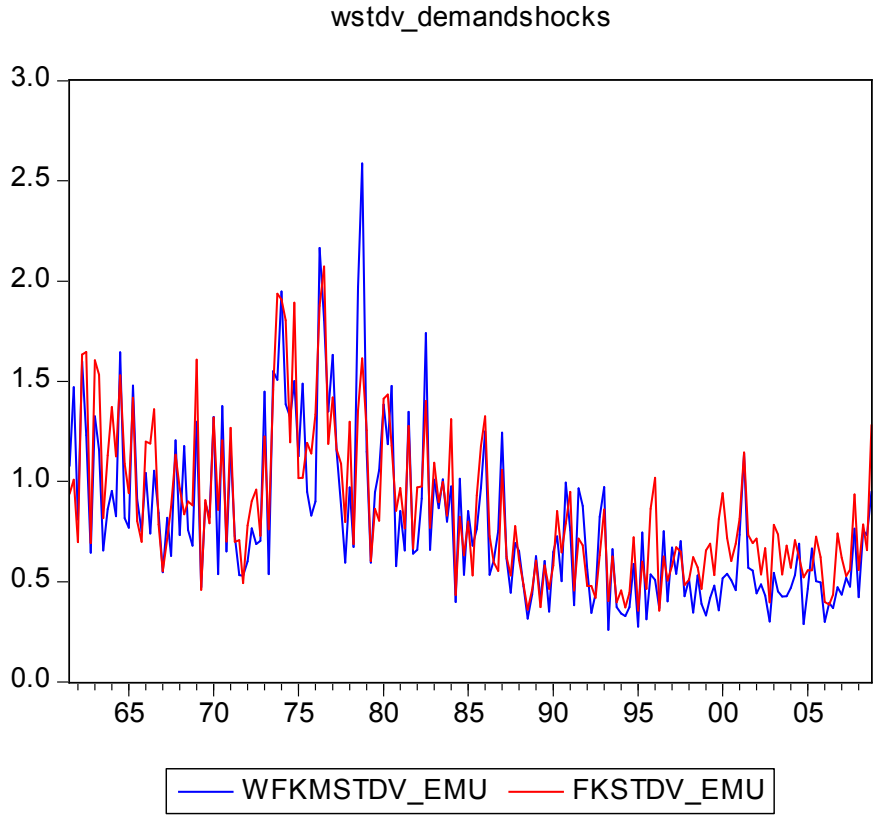


ANALYSIS OF SYNCHRONIZATION: Standard deviation series





ANALYSIS OF SYNCHRONIZATION: Carree-Klomp (1997) test

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

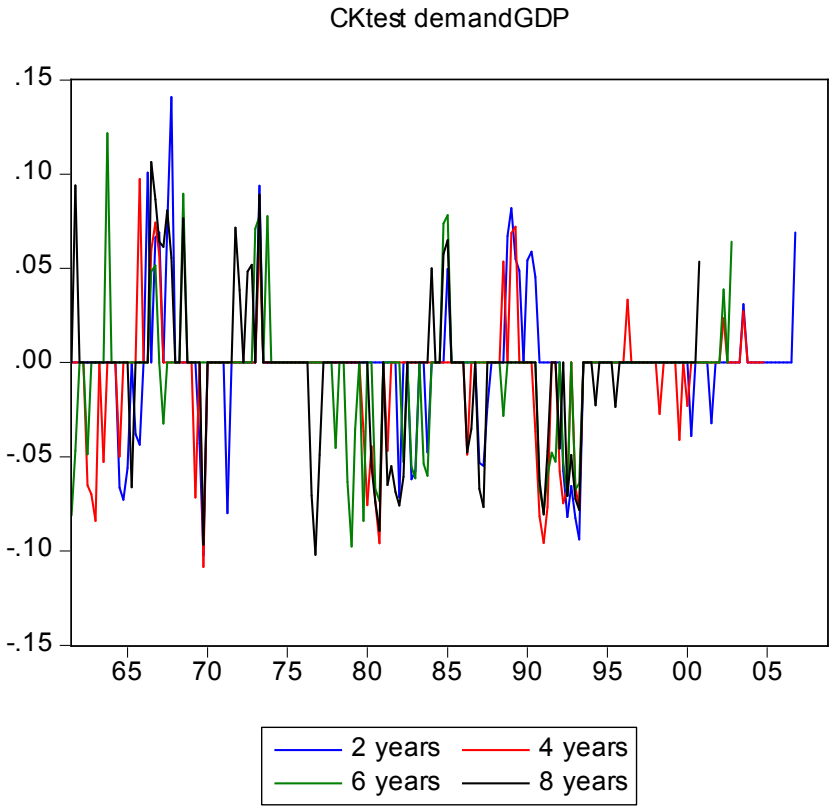
$$T_{2,t,\tau} = (N - 2.5)\log[1 + 0.25(\hat{\sigma}_t^2 - \hat{\sigma}_{t+\tau}^2)^2/(\hat{\sigma}_t^2\hat{\sigma}_{t+\tau}^2 - \hat{\sigma}_{t,t+\tau}^2)]$$

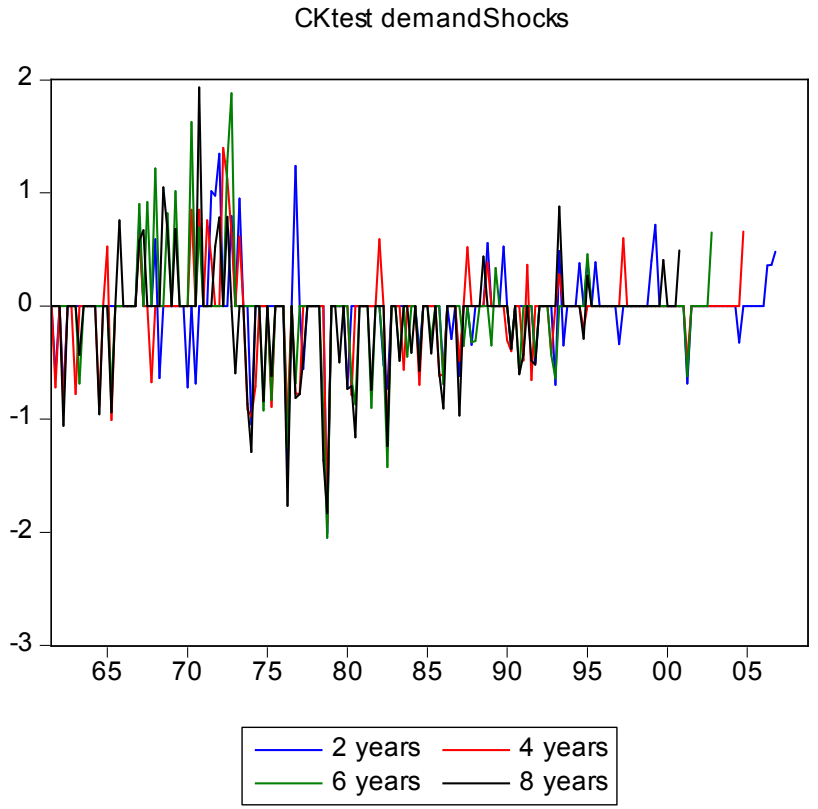
Distributed as a $\chi^2(1)$ under the null of no change in the variances.

- Identification of convergence/divergence periods at different horizons:

$$(\sigma_{t+\tau} - \sigma_t)I\left[T_{2,t,\tau} > \chi_{0.95}^2(1)\right]$$

ANALYSIS OF SYNCHRONIZATION: Carree-Klomp (1997) test





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:

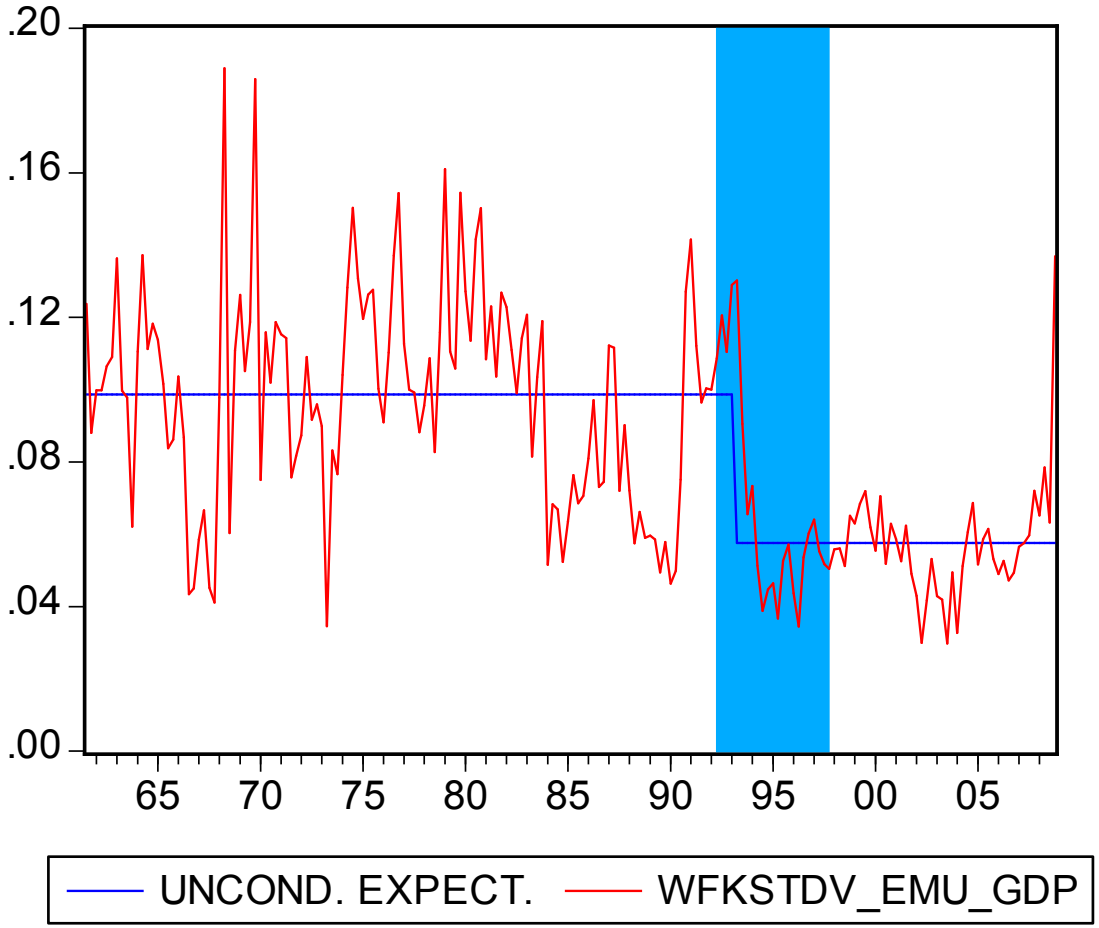
$$s_t = \sum_{j=1}^{R} (\alpha_{0,j} + \alpha_{1,j} s_{t-1}) I(T_{j-1} \leq t < T_j) + \varepsilon_t$$

- Estimate the breakpoints as:

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

- 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).

ANALYSIS OF SYNCHRONIZATION: Bai-Perron (2003) proc.



ANALYSIS OF SYNCHRONIZATION:

- How would the optimality of EMU with the inclusion of all the new members?

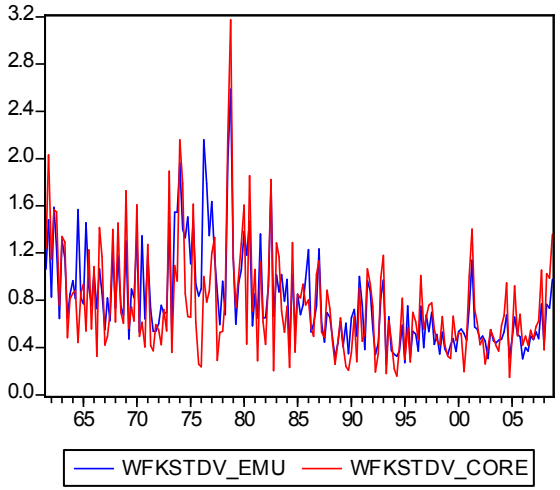
  Consider the following groups:

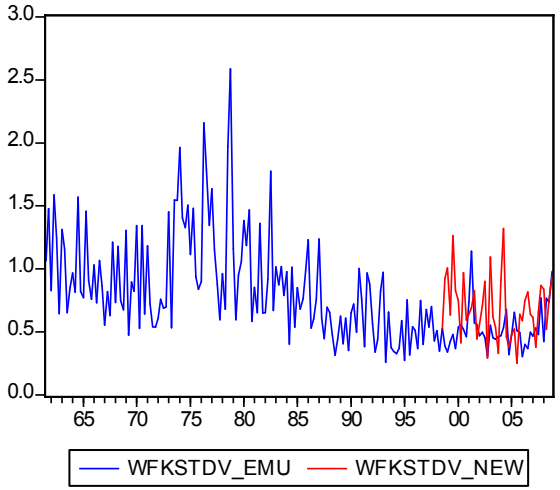
  - Core
  - NEWs and EMU-22
  - OECD and Global

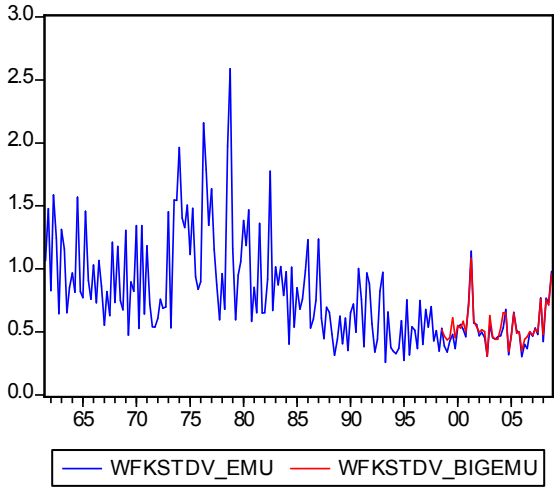
- How would each country contribute to the optimality of EMU?

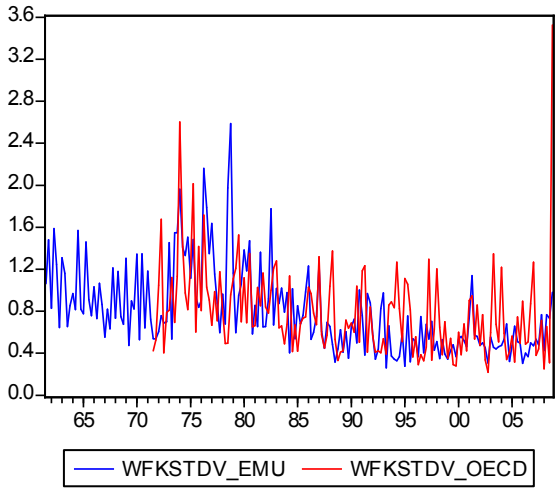
  Measure of cohesion: refer to the difference of dispersion in EMU with and without a country j in period t.

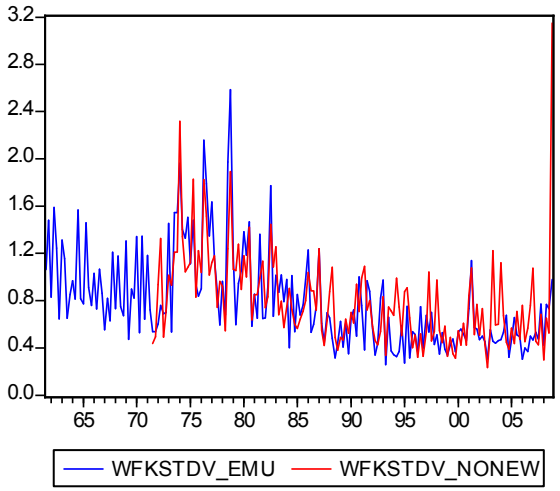
ANALYSIS OF SYNCHRONIZATION: Results

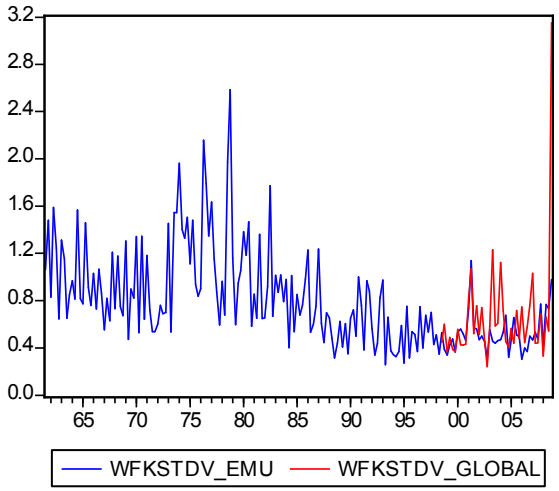












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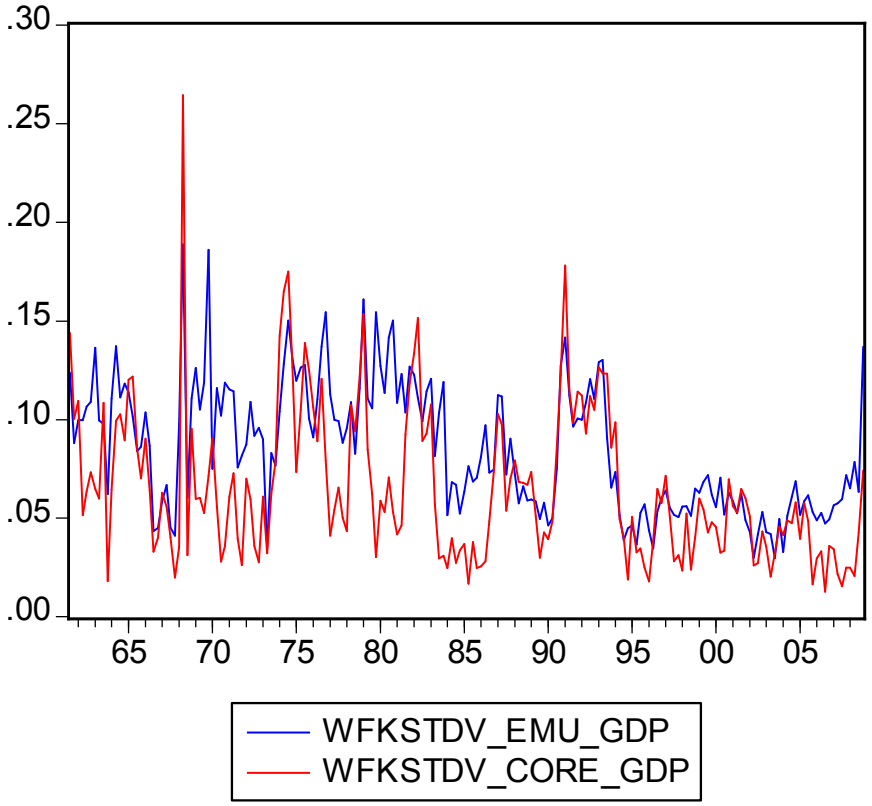

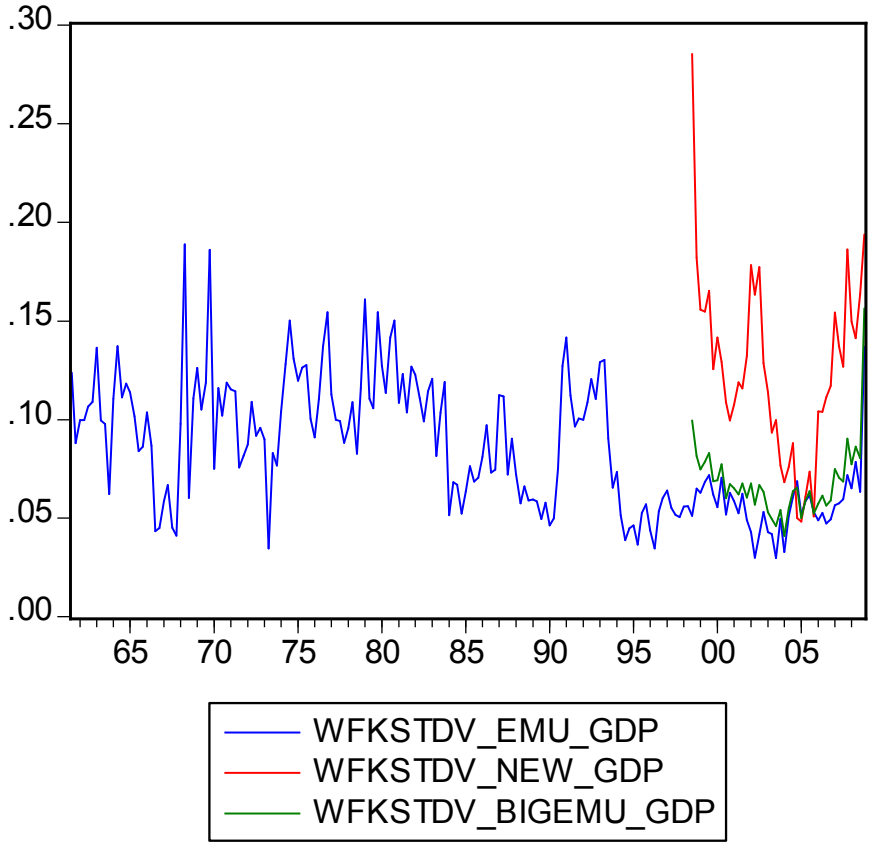

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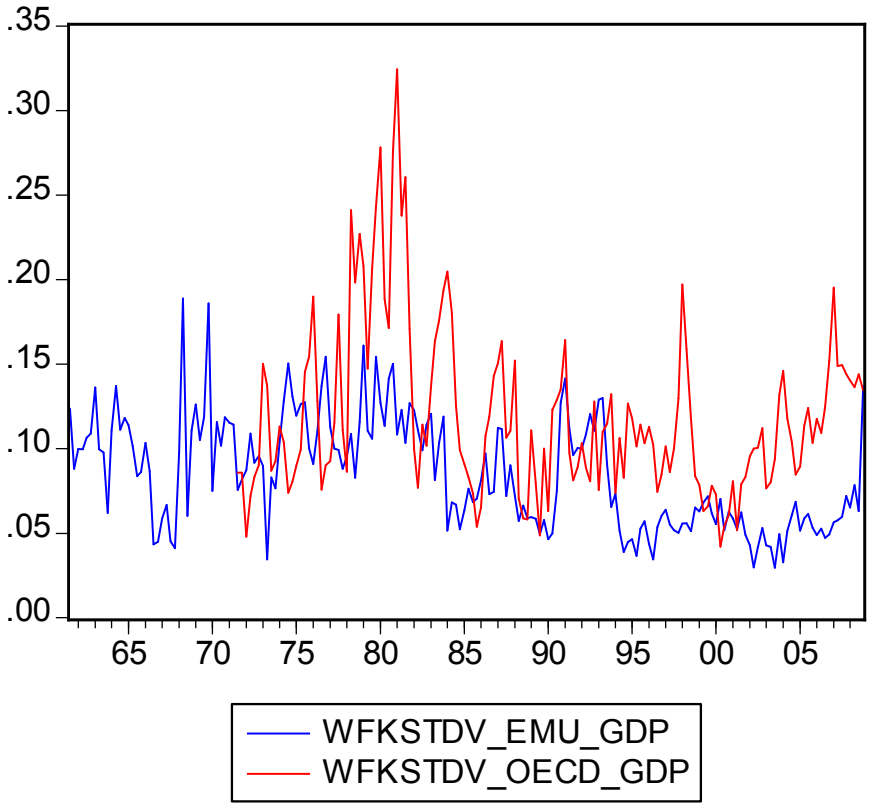
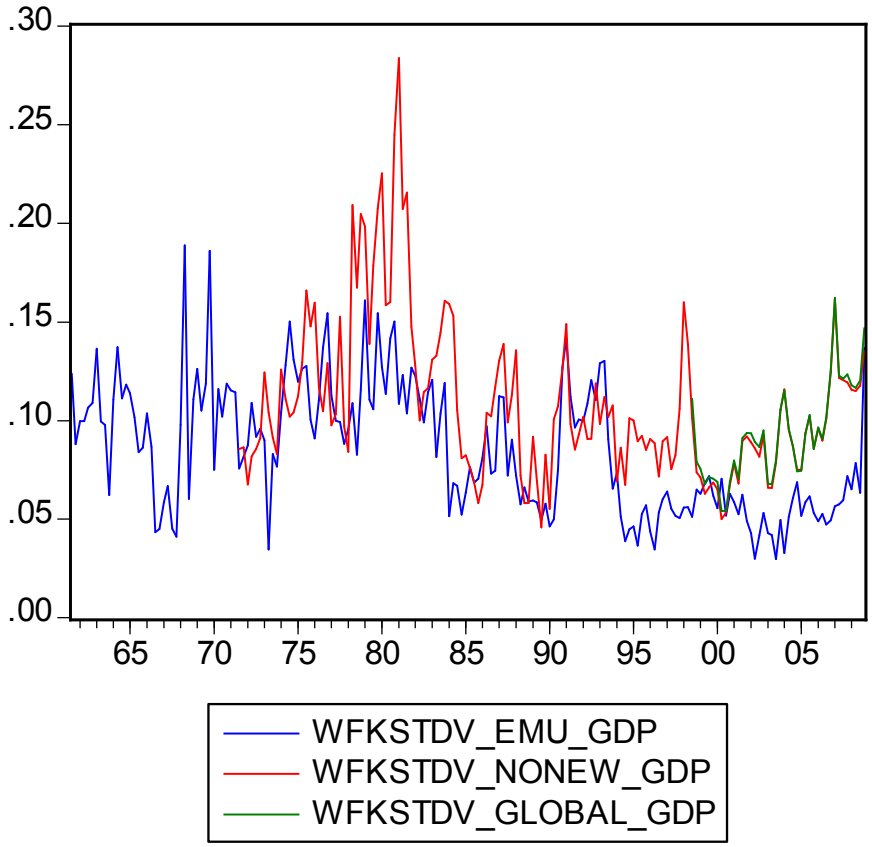




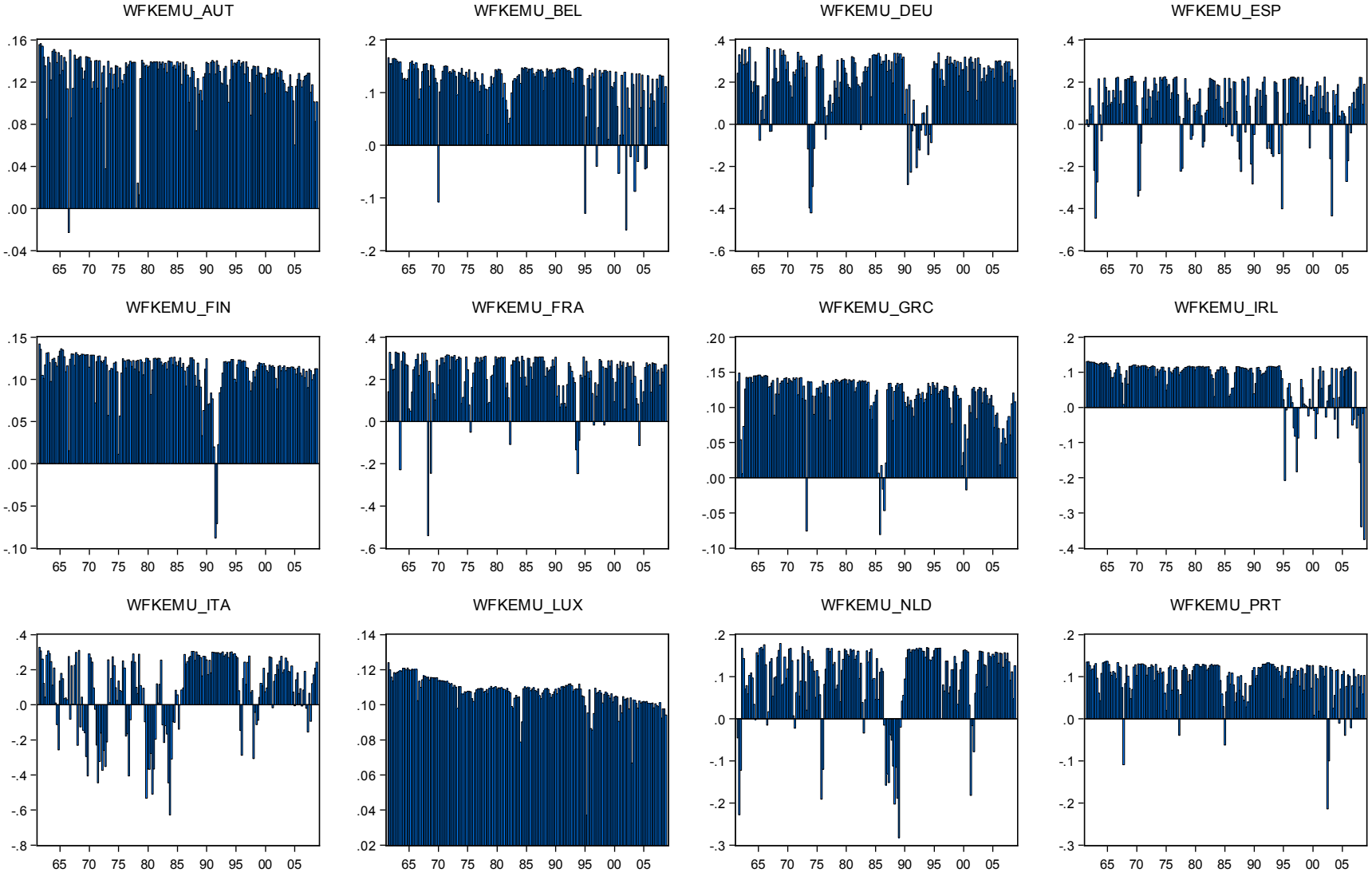
ANALYSIS OF SYNCHRONIZATION: Cost-of-inclusion

$$coi_{t,j|\Omega} = \frac{(\sigma_{t,\Omega-j} - \sigma_{t,\Omega})}{\sigma_{t,\Omega}}$$

$$coi_{t,j|\Omega} > 0 : \sigma_{t,\Omega-j} - \sigma_{t,\Omega} > 0 : \text{benefit of country j.}$$

$$coi_{t,j|\Omega} < 0 : \sigma_{t,\Omega-j} - \sigma_{t,\Omega} < 0 : \text{cost of country j.}$$

ANALYSIS OF SYNCHRONIZATION: Cost-of-inclusion



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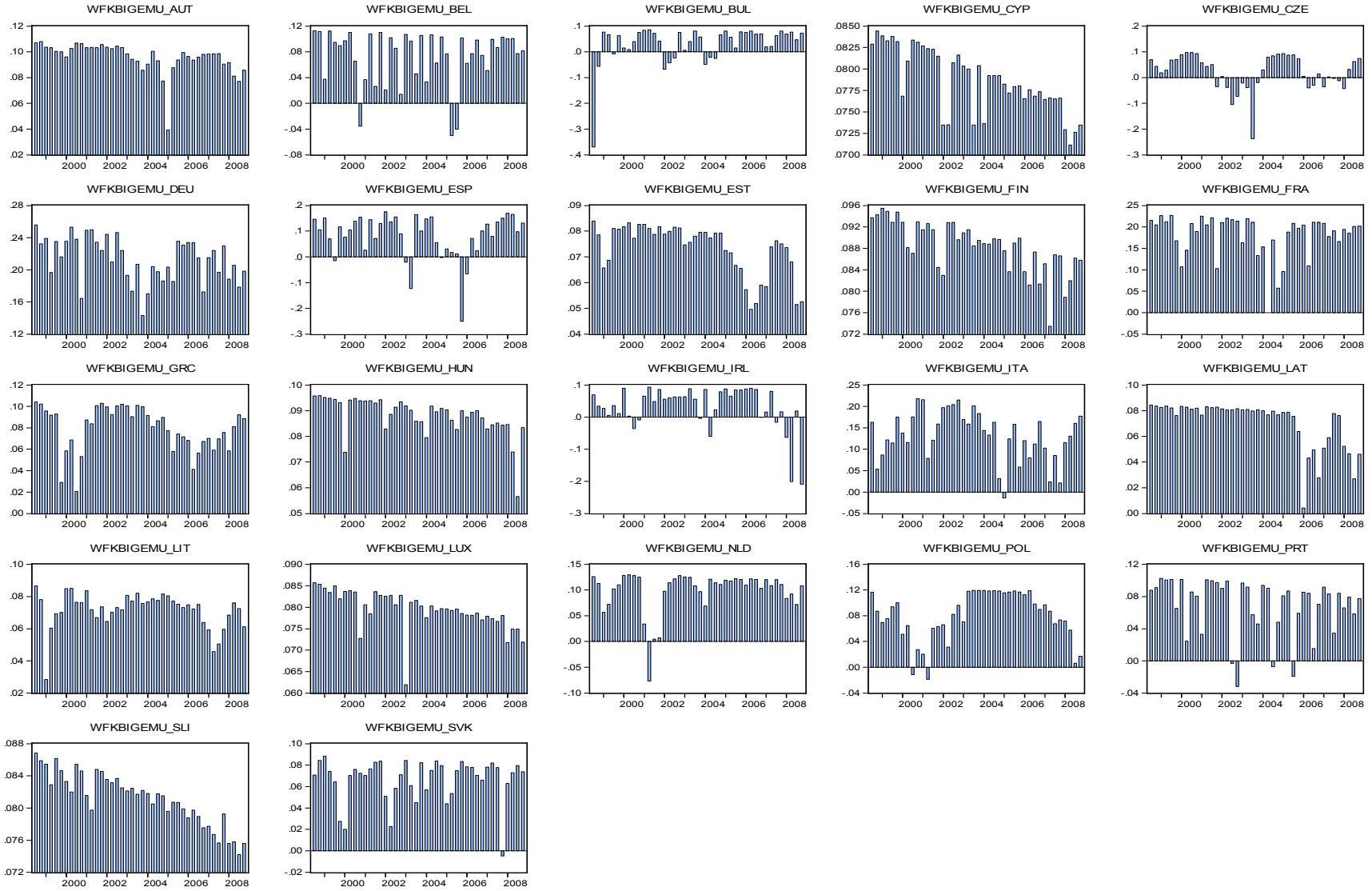

CONCLUSIONS:

- 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 distorsion in the optimality of EMU from 2001 on.
- Evidence of a European business cycle during the 90s, not diluted in a global cycle.

CONCLUSIONS:

- 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 Guillemineau, 2006, Akin, 2006).
  – Onorante (2004): Fiscal activism is increased after joining a currency union.

– Fiscal policy constraints may be behind the European business cycle.

CONCLUSIONS:

In line with Crespo-Cuaresma and Fernández-Amador (2009)!

Further research:

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

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