Business Cycles’ Characteristics of the Mediterranean Area Countries

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Abstract

In this paper we investigate the characteristics of business cycles fluctuations in the countries of the Mediterranean region by applying the Christiano-Fitzgerald bandpass filter to the output series of 12 Mediterranean countries over the period 1950-1998. The main properties of business cycle fluctuations (persistence, volatility, asymmetry and synchronization) are computed with reference to the deviation or growth cycle definition of the business cycle. Overall, the results of our analysis suggest, as expected, the existence of important differences in the characteristics of business cycle fluctuations among countries belonging to different economic level of development. Moreover, the average reduction of the degree of synchronization among Mediterranean countries seems to suggest a weakening of the economic links among Mediterranean countries, and thus a reduction of the economic importance of the links in this area in comparison to the European continental area.
1. Introduction


In our study we describe the business cycle characteristics of a group of 12 Mediterranean countries analyzing the main properties of the real GDP series, i.e. persistence, volatility, asymmetry and synchronization, over the period 1950-1998. The analysis describes the key features of business cycle fluctuations in the following countries: Algeria, Egypt, France, Greece, Israel, Italy, Jordan, Morocco, Spain, Syrian Arab Republic, Tunisia and Turkey. Our approach in this paper is a-theoretical: [1] in particular, the aim of our paper is to describe the empirical evidence on the differences and similarities among countries characterized by different levels of income, but belonging to a same geographical area.

The paper is as follows. After establishing business cycle chronology in section 2, section 3 analyzes persistence and volatility of business cycles output component. Section 4 and 5 provides evidence of business cycle asymmetry and synchronization, respectively. Section 6 concludes the paper.

2. Establishing business cycle chronology

Dating business cycles, i.e. identification of turning points, recession and expansion phases, may be obtained determining peaks and troughs in the level of a series, classical cycles, or in the level of a detrended series, growth cycles. In this paper the reference cycle chronologies for the 15 Mediterranean countries are established using the “growth
rate” cycle definition, which delineate periods of cyclical upswings and downswings around an underlying trend. Growth cycles are more useful for business cycle analysis in countries that experience sharp contractions and expansions in growth rates. In a growth cycle a recession is defined as a phase where output is below its trend, while an expansion is a phase where output is above its trend. The procedure used to identify peaks and troughs in the growth rate cycle are analogous to those used in identifying classical business cycle turning points, the only difference being that they are applied to growth rates of the same time series, rather than their levels (see Canova, 1994). Identified turning points are selected using a minimum amplitude rule which requires the amplitude from peak to trough and from trough to peak to be at least as large as one standard error of the cyclical component of output.

Growth cycles, and then countries’ business cycle characteristics, depend on the method used for the trend-cycle decomposition. In this paper we isolate fluctuations at business cycle frequencies using the Christiano and Fitzgerald’s (1999) least squares optimal approximation of the ideal band pass filter. The filter, after removing the drift in the raw series, allows the extraction of the component of the raw data with periodicity between 2 and 8 years, i.e. a typical business cycle frequency range with annual data (see Stock and Watson, 1998). The advantage of using such a filter in our case is linked to the reduced number of data that have to be dropped from the beginning and end of the filtered series in comparison to, for example, the Baxter and King’s (1999) filter.[2] We examine the business cycle properties of real GDP series for 12 Mediterranean countries using annual data at constant prices (million 1990 international Geary-Khamis dollars) over the period 1950-1998 (Maddison, 2001).

The peaks and troughs dates for all 15 GDP series are reported in Table 1. The information in Table 1 points to three major periods of international recession, during 1958-1960, 1973-1975, and 1993-1995, and three major periods of international expansion, 1956-1959, 1963-1965 and 1979-1981. In the time-span of our sample the countries have experienced from 6.5 to 11 cycles, which means that the typical or average cycle lasts from about 7.5 to 4.5 years.

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<th>ALG</th>
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</thead>
</table>
In Table 2 we present the number of cycles characterizing Mediterranean countries for the post-World War II period and for two sub-periods, before and after the first oil-shock. During the second half of the XXth century there are many differences among the countries of our sample, as we have countries which experience less than eight cycles (Algeria, Egypt, France, Israel and Italy and), between eight and ten cycles (Morocco, Spain, Syria and Turkey), and more than ten cycles (Greece, Jordan, and Tunisia). But when we halve the whole period, the comparison of the two sub-periods evidence that the number of cycles has changed significantly over time across countries. In particular, the countries with the highest number (and with the shortest length) of cycles, i.e.
Greece, Jordan and Tunisia, have reduced (increased) of about one third the number (average length) of cycles from the pre to the post first oil-shock period. And among the other countries Spain almost halved its number of cycles, while both Algeria and Syria reduced it of about one forth. In contrast, France, Italy and Turkey have experienced a slight increase in the number of cycles, while Morocco has doubled them from the first to the second sub-period.

<table>
<thead>
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<tbody>
<tr>
<td>1950</td>
<td>8</td>
<td>7.5</td>
<td>10</td>
<td>8.5</td>
<td>9.5</td>
<td>9.5</td>
<td>7.5</td>
<td>9</td>
<td>6.5</td>
<td>8</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>1974</td>
<td>3.5</td>
<td>3.5</td>
<td>6</td>
<td>5.5</td>
<td>4</td>
<td>5.5</td>
<td>3.5</td>
<td>3</td>
<td>3.5</td>
<td>4.5</td>
<td>6.5</td>
<td>6.5</td>
</tr>
<tr>
<td>1998</td>
<td>4.5</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>5.5</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>3</td>
<td>3.5</td>
<td>4.5</td>
<td>4.5</td>
</tr>
</tbody>
</table>


3. Persistence and volatility

In this section we briefly discuss the basic time-series properties of business cycles fluctuations across Mediterranean countries investigating output persistence and volatility. Output persistence can be measured in the time domain by the autocorrelation function (ACF), which computes the correlation of GDP with its own past previous time periods, while a simple measure of economic volatility for all countries may be represented by the standard deviation of the cyclical component of output. Recent studies of business cycle fluctuations in developing countries (Mendoza, 1995, and Agenor et al., 1999) provide evidence of higher output volatility than that typically observed in developed countries. Our sample reveals a similar picture. Indeed, for the whole sample the standard deviation of the cyclical component of output of the European countries is between 0.8 (France) and 1.76 (Greece), while that of the African and Asian Mediterranean countries ranges between 1.86 (Egypt) and 5.31 (Syria). Moreover, such a picture remains unchanged in relative terms even when we analyze the basic characteristics of business cycles across the pre and post first oil-shocks periods. But even with a relative picture unchanged, some interesting differences emerge as evidenced in Figures 1 and 2.
Indeed, there is evidence of stabilization of the Mediterranean economy from the mid-seventies as average output volatility decreases markedly from the pre-first oil-shock period and the post-first oil-shock period (from 3.28 to 2.01), as a consequence of the generalized reduction in countries’ output volatility [3] (the only exceptions are Jordan and Turkey, where it remains almost unchanged, and Morocco, where it increases markedly).

The analysis of persistence and volatility in figures 1 and 2 suggests some similarities and some interesting changes in the main time-series properties of Mediterranean countries through time. In particular, in the last quarter of the previous century, according to a sort of stage of development and/or geographical closeness clubs, similarities emerge among the European Western Mediterranean countries, i.e. France, Italy, and Spain, which are characterized by a combination of low persistence and low volatility; among Algeria, Greece and Israel, characterized by positive
persistence and high volatility (compared to the Western European Mediterranean
countries); and among Egypt and Tunisia, which are characterized by low or no
persistence and high (as before) volatility. As regards the other countries of the sample,
someone show high volatility and negative autocorrelation (Turkey), some others very
high volatility with positive (Jordan), low (Syria) or negative autocorrelation
(Morocco).

4. Asymmetry

The turning points define the two main phases of each cycle, recessions and expansions.
A recession is defined as the period between a peak and a trough in economic activity,
while an expansion is defined as the period between a trough and a peak. In this section
we compare some basic characteristics of recessions and expansions, such as duration,
amplitude, steepness and deepness [4] of business cycles phases across countries in
order to verify the hypothesis of business cycle asymmetry.

In order to derive descriptive statistics of business cycles asymmetry we define a
state variable \( S_t \), which equals one in recession phases, the year after a peak date to the
date of the trough, and zero in expansion phases. We define the length or duration of a
recession (expansion) as the number of years from peak to trough (trough to peak), so
the average duration of recessions and expansions are:

\[
DUR_{REC} = \frac{\sum_{t=1}^{T} S_t}{\sum_{t=1}^{T} (1 - S_{t+1}) S_t} \quad \text{and} \quad DUR_{EXP} = \frac{\sum_{t=1}^{T} (1 - S_t)}{\sum_{t=1}^{T} (1 - S_{t+1}) S_t}
\]

The amplitude is defined as the absolute value of the distance from peak to trough (or
vice versa), so that the average amplitude equals:

\[
AMP_{REC} = \frac{\sum_{t=1}^{T} S_t (PT_t)}{\sum_{t=1}^{T} (1 - S_{t+1}) S_t} \quad \text{and} \quad AMP_{EXP} = \frac{\sum_{t=1}^{T} (1 - S_t) (TP_t)}{\sum_{t=1}^{T} (1 - S_{t+1}) S_t}
\]

with \( PT_t \) and \( TP_t \) measuring the distance (in percentage terms) between the peak to
trough and the trough to peak values, respectively.
In thinking of a phase of a business cycle as a triangle with the amplitude as height and the duration as the base, we can measure the *steepness* as the ratio between the amplitude and the duration, *i.e.*

\[
\text{STEEPNESS}_{REC(\text{EXP})} = \frac{AMPLITUDE_{REC(\text{EXP})}}{DURATION_{REC(\text{EXP})}}
\]

Moreover, we can calculate *deepness* that pertains to relatives average levels of peaks and troughs and refers to the characteristics that troughs are further below trend than peaks are above.

The results of the analysis of business cycle asymmetry for Mediterranean countries are presented in Table 3. On average there is no evidence of *deepness*, as the level of peaks and troughs is identical (0.03), and no significant differences in the distance between peak to trough and from trough to peak (0.064 versus 0.066). But as expansions are longer than contractions (2.85 versus 2.45 years), there is evidence of business cycle asymmetry as contractions are steeper than expansions (0.038 versus 0.030). [5]

**Table 3 – Analysis of business cycles asymmetry**

<table>
<thead>
<tr>
<th></th>
<th>Deepness</th>
<th>Duration</th>
<th>Amplitude</th>
<th>Steepness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Recession</td>
<td>Expansion</td>
<td>Recession</td>
<td>Expansion</td>
</tr>
<tr>
<td>ALGERIA</td>
<td>-0.064</td>
<td>0.051</td>
<td>2.625</td>
<td>2.714</td>
</tr>
<tr>
<td>EGYPT</td>
<td>-0.026</td>
<td>0.025</td>
<td>2.833</td>
<td>3.286</td>
</tr>
<tr>
<td>FRANCE</td>
<td>-0.012</td>
<td>0.011</td>
<td>2.625</td>
<td>3.571</td>
</tr>
<tr>
<td>GREECE</td>
<td>-0.022</td>
<td>0.020</td>
<td>2.000</td>
<td>2.444</td>
</tr>
<tr>
<td>ISRAEL</td>
<td>-0.038</td>
<td>0.039</td>
<td>3.333</td>
<td>4.000</td>
</tr>
<tr>
<td>ITALY</td>
<td>-0.016</td>
<td>0.015</td>
<td>3.571</td>
<td>2.429</td>
</tr>
<tr>
<td>JORDAN</td>
<td>-0.043</td>
<td>0.046</td>
<td>2.300</td>
<td>2.000</td>
</tr>
<tr>
<td>MOROCCO</td>
<td>-0.025</td>
<td>0.029</td>
<td>1.800</td>
<td>2.667</td>
</tr>
<tr>
<td>SPAIN</td>
<td>-0.032</td>
<td>0.030</td>
<td>2.755</td>
<td>2.921</td>
</tr>
<tr>
<td>SYRIA</td>
<td>-0.067</td>
<td>0.077</td>
<td>2.333</td>
<td>2.667</td>
</tr>
<tr>
<td>TUNISIA</td>
<td>-0.024</td>
<td>0.030</td>
<td>1.500</td>
<td>2.875</td>
</tr>
<tr>
<td>TURKEY</td>
<td>-0.025</td>
<td>0.026</td>
<td>1.700</td>
<td>2.700</td>
</tr>
<tr>
<td>Average</td>
<td><strong>-0.033</strong></td>
<td><strong>0.033</strong></td>
<td><strong>2.448</strong></td>
<td><strong>2.856</strong></td>
</tr>
</tbody>
</table>

With the exception of duration statistics that refers to number of years, all measurement is made in terms of percentage changes.

But a deeper look at individual countries’ statistics reveals the existence of very large differences among the countries of our sample. In particular, for some countries (Jordan, Morocco, Syria and Tunisia) cycles exhibit deepness, as peaks are further above trend
than troughs are below (the opposite for Algeria). Moreover, the level of peaks and troughs for the countries of the sample goes from two to four times the values of France and Italy (the lowest values in our sample).

Cyclical amplitude of expansions and contractions is almost everywhere the same (main exceptions are Algeria, Israel, Syria and Tunisia), but with average absolute values which differ across countries ranging from 0.02 to 0.03 (France and Italy), from 0.04 to 0.06 (Egypt, Greece, Morocco, Spain, Tunisia and Turkey) and from 0.08 to 0.15 (Algeria, Israel, Jordan, and Syria). As regards duration no characteristic patterns seems to emerge among Mediterranean countries with the exception that expansions are everywhere longer than contractions (the only exceptions are Italy and Jordan). Consequently, contractions are everywhere steeper than expansions, with the degree of steepness going from 0.01 to 0.04 for Egypt, France, Greece, Israel, Italy, Spain and Turkey, and being greater than 0.04 for the other Mediterranean countries. Finally, as regards business cycle characteristics, empirical evidence from the Mediterranean countries seems to suggest an inverse relationship between the country’s development level and the amplitude and severity of business cycle fluctuations. Indeed, both business cycles’ amplitude and steepness of Mediterranean developing countries are above the average level of the sample (the opposite for the most developed Mediterranean countries).

5. Synchronization

Synchronization refers to the tendency of recessions and expansions in one country to occur at about the same time as in other countries. In this subsection we provide evidence in terms of linkage and synchronization of fluctuations in economic activity for the Mediterranean countries looking at the international nature of real GDP cyclical patterns across those countries.

The degree of synchronization between countries may be measured by the contemporaneous cross-correlation of the cyclical component of real GDP. Recently, Harding and Pagan (1999) has proposed the use of an index of concordance which measures the fraction of time spent in the same phase by two countries’ business cycles. The degree of concordance is defined as
\[ IC_{ij} = \frac{1}{T} \sum_{t=1}^{T} \left[ S_i^t S_j^t + (1 - S_i^t)(1 - S_j^t) \right] \]

- where indexes \( i \) and \( j \) refer to the countries for which business cycles.

**Table 4 – Index of concordance and contemporaneous cross-correlations**

<table>
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<tr>
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<th>ALG</th>
<th>TUN</th>
<th>JOR</th>
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</thead>
<tbody>
<tr>
<td><strong>FRA</strong></td>
<td>-</td>
<td>0.51</td>
<td>0.68</td>
<td>0.57</td>
<td>0.46</td>
<td>0.30</td>
<td>0.64</td>
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<td>0.38</td>
<td>0.56</td>
<td>0.38</td>
<td>0.52</td>
</tr>
<tr>
<td><strong>ITA</strong></td>
<td>0.21</td>
<td>-</td>
<td>0.41</td>
<td>0.57</td>
<td>0.46</td>
<td>0.53</td>
<td>0.40</td>
<td>0.67</td>
<td>0.40</td>
<td>0.50</td>
<td>0.50</td>
<td>0.63</td>
</tr>
<tr>
<td><strong>GRE</strong></td>
<td>0.29</td>
<td>-0.20</td>
<td>-</td>
<td>0.52</td>
<td>0.50</td>
<td>0.45</td>
<td>0.70</td>
<td>0.49</td>
<td>0.49</td>
<td>0.58</td>
<td>0.50</td>
<td>0.64</td>
</tr>
<tr>
<td><strong>SPA</strong></td>
<td>0.41*</td>
<td>0.33*</td>
<td>-0.06</td>
<td>-</td>
<td>0.43</td>
<td>0.50</td>
<td>0.38</td>
<td>0.51</td>
<td>0.59</td>
<td>0.39</td>
<td>0.43</td>
<td>0.52</td>
</tr>
<tr>
<td><strong>TUR</strong></td>
<td>-0.20</td>
<td>-0.06</td>
<td>0.03</td>
<td>0.01</td>
<td>-</td>
<td>0.55</td>
<td>0.56</td>
<td>0.49</td>
<td>0.53</td>
<td>0.41</td>
<td>0.50</td>
<td>0.42</td>
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<tr>
<td><strong>SYR</strong></td>
<td>-0.26</td>
<td>0.07</td>
<td>-0.18</td>
<td>0.11</td>
<td>0.08</td>
<td>-</td>
<td>0.44</td>
<td>0.57</td>
<td>0.53</td>
<td>0.37</td>
<td>0.50</td>
<td>0.60</td>
</tr>
<tr>
<td><strong>EGY</strong></td>
<td>0.30*</td>
<td>-0.43</td>
<td>0.41*</td>
<td>0.01</td>
<td>0.12</td>
<td>0.03</td>
<td>-</td>
<td>0.55</td>
<td>0.45</td>
<td>0.56</td>
<td>0.49</td>
<td>0.44</td>
</tr>
<tr>
<td><strong>MOR</strong></td>
<td>0.06</td>
<td>0.10</td>
<td>-0.01</td>
<td>0.04</td>
<td>-</td>
<td>0.25</td>
<td>0.07</td>
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<td>-</td>
<td>0.34</td>
<td>0.43</td>
<td>0.40</td>
</tr>
<tr>
<td><strong>ISR</strong></td>
<td>0.27</td>
<td>0.06</td>
<td>0.03</td>
<td>0.35*</td>
<td>-</td>
<td>0.14</td>
<td>-0.09</td>
<td>-</td>
<td>0.03</td>
<td>-</td>
<td>0.09</td>
<td>-</td>
</tr>
<tr>
<td><strong>ALG</strong></td>
<td>-0.03</td>
<td>-0.06</td>
<td>0.27</td>
<td>-0.34</td>
<td>0.04</td>
<td>-0.20</td>
<td>0.09</td>
<td>-</td>
<td>0.20</td>
<td>-</td>
<td>0.12</td>
<td>-</td>
</tr>
<tr>
<td><strong>TUN</strong></td>
<td>-0.33</td>
<td>-0.16</td>
<td>0.25</td>
<td>-0.10</td>
<td>0.20</td>
<td>0.08</td>
<td>0.08</td>
<td>-</td>
<td>0.18</td>
<td>0.09</td>
<td>0.36*</td>
<td>-</td>
</tr>
<tr>
<td><strong>JOR</strong></td>
<td>0.08</td>
<td>0.05</td>
<td>0.21</td>
<td>0.13</td>
<td>-</td>
<td>0.10</td>
<td>0.33*</td>
<td>-</td>
<td>0.02</td>
<td>-</td>
<td>0.11</td>
<td>0.20</td>
</tr>
</tbody>
</table>

In Table 4 we present the results for the index of concordance (in the upper triangle) and the contemporaneous cross-correlation coefficients (in the lower triangle) of real GDP among the business cycles of the Mediterranean countries for the whole sample. The values of the contemporaneous cross-correlations demonstrate the strength of the linkages among countries’ business cycles. The results suggest the existence of several links among the following countries:

- France and Spain, Italy and Spain;
- Egypt, France and Greece,
- Israel and Spain, Jordan and Syrian Arab Republic, Algeria and Tunisia.

**Table 5 – Index of concordance: average values**

<table>
<thead>
<tr>
<th></th>
<th>FRA</th>
<th>ITA</th>
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<th>JOR</th>
<th>AV</th>
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<tbody>
<tr>
<td><strong>1950-98</strong></td>
<td>0.50</td>
<td>0.51</td>
<td>0.53</td>
<td>0.49</td>
<td>0.49</td>
<td>0.51</td>
<td>0.50</td>
<td>0.49</td>
<td>0.48</td>
<td>0.48</td>
<td>0.50</td>
<td>0.53</td>
<td><strong>0.50</strong></td>
</tr>
<tr>
<td><strong>1950-74</strong></td>
<td>0.51</td>
<td>0.51</td>
<td>0.56</td>
<td>0.52</td>
<td>0.53</td>
<td>0.51</td>
<td>0.51</td>
<td>0.48</td>
<td>0.49</td>
<td>0.46</td>
<td>0.47</td>
<td>0.54</td>
<td><strong>0.51</strong></td>
</tr>
<tr>
<td><strong>1975-98</strong></td>
<td>0.47</td>
<td>0.51</td>
<td>0.51</td>
<td>0.46</td>
<td>0.43</td>
<td>0.45</td>
<td>0.49</td>
<td>0.50</td>
<td>0.45</td>
<td>0.50</td>
<td>0.50</td>
<td>0.52</td>
<td><strong>0.48</strong></td>
</tr>
</tbody>
</table>
Moreover, we examined whether synchronization between the cyclical components of output of all countries has changed over time calculating the average index of concordance for each county changed before and after the first oil-shock. The results show that the average concordance index decreases everywhere from the first to the second sub-period, with the only exceptions of Algeria, Morocco, Tunisia (increases), and Italy (unchanged) and the highest values of the concordance numbers recorded for Greece and Jordan, 0.56 and 0.54 respectively, before the mid seventies, and for Jordan in the last quarter of the XXth century.

Finally in order to examine the evolution of synchronization over time, we compute the contemporaneous cross-correlation coefficients using a 25-years rolling window. The main findings of the rolling regression analysis may be summarised according to the presence of a positive stable, increasing or decreasing relationships between countries. A positive stable relationship emerges among France, Egypt and Greece; Italy and Spain; Egypt, Morocco and Tunisia; Jordan and Syria. There is evidence of increased synchronization during the time span of our sample for France and Italy, for Algeria with France and Greece, for Israel and Jordan, and for Syria, Tunisia and Turkey. Evidence of decreasing synchronization emerges for Egypt and Greece, for Jordan vs. France, Greece and Spain, for Spain and Syria, for Algeria vs. Israel and Tunisia, and for Israel vs. Syria and Tunisia. To summarize, the predominant result emerging from the rolling regression analysis suggests that the links among the economies of countries characterized by different levels of economic development have not increased over time (the only exception seems to be Algeria). Moreover, some interesting results emerge for Greece and Turkey, that is the countries interested in participating to the European Monetary Union and the European Union respectively. In particular, Greece displays greater synchronization with Algeria, Egypt, and Tunisia than with European countries, while Turkey evidences a changing pattern of synchronization represented by a positive increasing relationships with some MENA countries, i.e. Egypt, Syria and Tunisia, and a decreasing relationships with all the European countries, France, Greece, Italy and Spain (see Figure 3).
Thus, the evidence presented about synchronization and its evolution over time show that there is a change in the synchronization pattern across Mediterranean countries that involves both a reduction in the coincidence of expansions and contractions over time, and a change in the synchronization links which may determine the emergence of clusters of countries characterized by similar levels of economic development.

6. Concluding remarks

In this paper we investigate the characteristics of business cycle fluctuations (persistence, volatility, asymmetry and synchronization) across 12 Mediterranean countries over 1950-1998. The main findings of the paper can be summarized as follows:

- Output volatility varies markedly across Mediterranean countries according to their stage of development. In the time span of our sample there is evidence of a generalized reduction in countries’ output volatility (the only exceptions are Jordan and Turkey,
where it remains almost unchanged, and Morocco, where it increases markedly) and the emergence of clubs of countries with similar characteristics based on their stage of development and/or geographical closeness;

- On average there is no evidence of deepness as the level of peaks and troughs is identical and no significant differences in the distance between peak to trough and from trough to peak (i.e. amplitude). But as expansions are longer than contractions there is evidence of business cycle asymmetry as contractions are steeper than expansions. Looking at individual countries’ statistics the empirical evidence from the Mediterranean countries seems to suggest an inverse relationship between the country’s development level and the amplitude and severity of business cycle fluctuations. Indeed, both business cycles’ amplitude and steepness of Mediterranean developing countries are above the average level of the sample (the opposite for the most developed Mediterranean countries)

- From the rolling regression analysis of countries’ cross-correlations and of the concordance statistics derived from the concordance index emerge some changes in the synchronization pattern across Mediterranean countries, as there is a reduction in the coincidence of expansions and contractions over time, and a change in the synchronization links among countries.

Overall, the results of our analysis suggest, as expected, the existence of important differences in the characteristics of business cycle fluctuations among countries belonging to different economic level of development. Moreover, the average reduction of the degree of synchronization among Mediterranean countries seems to suggest a weakening of the economic links among Mediterranean countries, and thus a reduction of the economic importance of the links in this area in comparison to the European continental area.
Notes

[1] A-theoretical in the sense that we do not use a theoretical framework, such as the RBC e.g., as a guideline for our research, or evaluate which model “fits better” the data; using a band-pass filter implies assuming a certain set of characteristics about the cause of growth and the business cycle and their decomposition. Moreover, as Canova, 1991, points out the band-pass filter methodology may alter measures of relative variability, persistence and comovements of the series. Previous studies (Fiorito and Kollintzas, 1994, Christodoulakis et al., 1995) show that alternative detrending procedures do not affect basic results.

[2] Christiano and Fitzgerald’s (1999) approximate filter requires dropping two years at the beginning and end of the filtered series against the three years required by the Baxter and King’s (1999) filter.

[3] These results are, at least partially, with recent empirical works on output volatility in developing countries (see Kose et al. 2002)


[5] Similar results have been obtained even in previous studies on European and G7 countries (see for example, Gallegati and Gallegati, 2001, 2003).
References


Gallegati Marco and Mauro Gallegati, 2001, “European Business Cycles”, *Quaderni del Dipartimento di Economia n.149,* Università di Ancona


