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# The myth of decoupling\*

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## Abstract

This paper casts light on the ongoing debate about whether emerging markets have decoupled from advanced economies. The proponents of the decoupling hypothesis argue that emerging markets have made significant progress in reducing external vulnerabilities, strengthening domestic policy frameworks, and achieving stronger domestic demand growth, thereby leading to lower business cycle comovements with advanced economies. This view runs against extensive empirical evidence showing that globalization, namely rising trade and financial integration, raises business cycle synchronisation. We find that decoupling is a myth: business cycle synchronicity between emerging markets and advanced economies has generally not declined in recent years.

*JEL Classification:* E32, F15, F36, F41, O47.

*Keywords:* Business cycle; synchronisation; globalization; decoupling; emerging markets.

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# 1 Introduction

As the old adage goes, “when the United States sneeze, the rest of the world catches a cold”. Is this still true? There has been an ongoing debate about whether emerging market economies have decoupled from advanced economies, in the sense that in recent years, the business cycle of emerging markets has become more (or fully) independent from the business cycle of advanced economies. The proponents of the decoupling view argue that emerging markets have made significant progress in reducing external vulnerabilities, strengthening domestic policy frameworks, and achieving stronger domestic demand growth, thereby leading to lower business cycle comovements with advanced economies. This view runs against the idea that globalisation enhances trade linkages and international financial integration, allowing for a stronger transmission of country-specific shocks across countries and hence, stronger business cycle comovements. The decoupling view is difficult to reconcile with the significant empirical evidence supporting the hypothesis that trade and financial integration lead to greater business cycle synchronisation.

Much of the current debate about the decoupling hypothesis relies on arguments. In contrast, this paper provides detailed empirical evidence on the degree of business cycle synchronicity between emerging market economies and four aggregate groups, respectively all advanced economies, the G7 club, the United States and the European Union. Business cycles are defined as output gaps, instead of growth rates as in some previous studies. Given the methodological shortcomings of correlation coefficients as a measure of business cycle synchronisation, we use instead the synchronicity measure proposed by Mink et al. (2007). We find that decoupling is largely a myth. Business cycle synchronicity has generally not declined in recent years and thus, emerging markets have not decoupled from advanced economies.

The remainder of this paper is organised as follows. Section 2 reviews the literature dealing with the links between globalization, economic integration and business cycles. Much of the discussion aims at motivating the methodology used in this paper, which allows for a precise definition and proper measurement of business cycle synchronicity. The

empirical approach is presented in section 3, while section 4 describes the data. Section 5 presents our results and section 6 concludes.

## 2 Review of the literature

Business cycle synchronisation arises from two types of shocks. On the one hand, common external shocks affect many countries simultaneously, though not necessarily to the same extent, e.g. oil price shocks. On the other hand, country-specific shocks are transmitted to other countries through trade and financial linkages. The literature on business cycle synchronisation focuses on the effects of both types of shocks and asks two main questions<sup>1</sup>. First, have business cycles become more similar across countries over time? Second, what are the determinants of the degree of business cycle synchronisation?

### 2.1 Assessing the degree of business cycle synchronisation

Synchronisation has been measured using different variables and methodologies, and various definitions of synchronisation have been proposed. The analysis always starts with the selection of a macroeconomic variable which can be used to produce a measure of the business cycle. Studies have used either monthly industrial production or quarterly or annual gross domestic product (GDP). Industrial production is available at a relatively high frequency, which is useful to compute various measures of synchronisation such as correlation coefficients. However, it is far from representing the whole economy, given the significant decline in the share of manufacturing in the economy. Consequently, it is usually agreed that gross domestic product is a more adequate variable. Quarterly GDP is typically thought of as being more appropriate to identify the business cycle. However, it is not available for a large number of countries, in particular emerging market economies, and for long time spans. Since we focus on a relatively large sample of emerging markets and advanced economies over a long period of time, we will therefore focus on annual GDP in our study.

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<sup>1</sup>See de Haan et al. (2008) for a survey of the literature, with particular reference to the euro area.

The usual approach to assessing the degree of business cycle synchronisation is to compute a correlation coefficient between the business cycle of an individual country or a group of countries, and the business cycle of another country or group of countries. The evolution of synchronisation over time can be studied by computing such correlation coefficients over different sub-samples of the data, or using rolling correlation coefficients<sup>2</sup>. Even though correlation coefficients have been widely used and remain easy to interpret, they suffer from several problems. The choice of sub-sample remains largely arbitrary and different sub-samples of the same data can yield different conclusions. For example, Artis and Zhang (1997, 1999) have concluded that participation in the Exchange Rate Mechanism of mutually fixed exchange rates raised business cycle synchronisation, while Inklaar and de Haan (2001) reached the opposite conclusion using the same dataset but splitting the sample in different sub-periods of time. Rolling correlation coefficients avoid the need for defining arbitrary sub-periods. Still, one must define a moving window over which correlations are calculated, and decide around which year this window is centered. Last but not least, overlapping windows lead to serial correlation by construction.

Correlation coefficients also face one important conceptual difficulty in that they mix two characteristics of the business cycle: synchronicity and amplitude. As noted by Mink et al. (2007), we think intuitively about synchronisation as occurring when two countries are in the same phase of the business cycle, whether an expansion or a slowdown/recession. The correlation coefficient contains more information than that. It will change when the amplitude of business cycles changes, even though synchronicity remains unchanged. We know that many countries have experienced a decrease in the volatility of their business cycles over the last twenty years (McConnell and Perez-Quiros, 2000; Dalsgaard et al., 2002), a phenomenon referred to as the Great Moderation. As a result, it is difficult to interpret changes in correlation coefficients purely as changes in the degree of synchronisation when volatility changes (Doyle and Faust, 2002; Forbes and Rigobon, 2002).

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<sup>2</sup>An increase in the correlation coefficient over time is very often interpreted as evidence of higher business cycle synchronisation. Surprisingly, however, very few studies actually test whether this increase is statistically significant. Doyle and Faust (2005) develop an appropriate test and conclude that there is very little evidence that correlations have increased significantly, in a statistical sense, over time.

Beyond simple correlation coefficients, one approach which is gaining importance is factor models. Kose et al. (2008) have used this approach to cast light on the decoupling debate. The idea is to decompose the rate of growth of real GDP into three factors: a global factor common to all countries, a factor common to different types of economies, and a country-specific factor<sup>3</sup>. There are three types of economies: advanced, emerging market, and developing economies. The evolution of business cycle similarities is assessed by estimating the factor model over different time periods. Kose et al. (2008) split their sample in two sub-samples, the pre-globalization period 1960-1984 and the post-globalization period 1985-2005. They find that national business cycles have not generally become more synchronized during the post-globalization period. Moreover, during this same period, the share of the variation in growth rates explained by the common factor has decreased, whereas the share explained by the economy-type factor has increased for both advanced and emerging market economies. Hence, it appears that there has been some decoupling between advanced economies and emerging markets, but stronger convergence in growth rates within types of economies. Hence, Kose et al. (2008) provide nuanced support for the decoupling hypothesis.

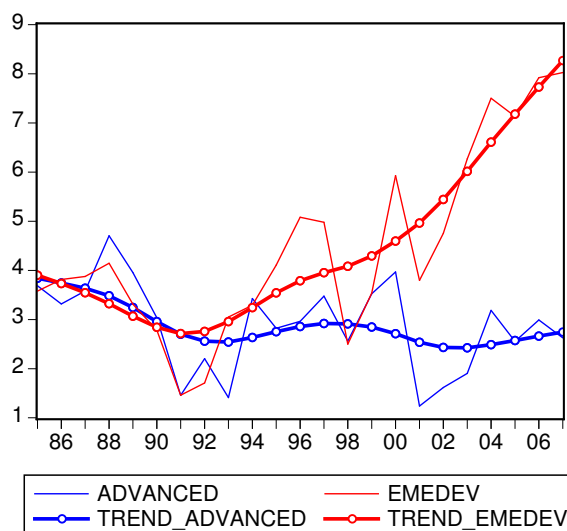
There is one major problem with this interpretation and it comes from the definition of the business cycle. Typically, the business cycle is obtained by filtering out the time-varying trend from macroeconomic time series on output. Looking at both the original series and the computed time trend, we can identify time periods during which output is above or below trend. Dividing this difference by trend GDP yields the output gap. In contrast, Kose et al. (2008) make use of output growth rates and call these business cycle fluctuations. We argue that defining the business cycle as output growth rates and choosing the mid-1980s as the cutting point to split the sample in two time periods could very likely produce the kind of results that they have obtained.

Why? Starting in the early 1990s, many emerging markets have experienced a take-off

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<sup>3</sup>Kose et al. (2008) employ a more sophisticated model by considering not only output but also investment and consumption. It is possible to extract variation from the data which is not only common to all countries, but also common to all countries and all variables. For the sake of the exposition, we focus solely on output.

Figure 1: Actual and trend growth rates for advanced economies and emerging market and developing countries



Source: IMF World Economic Outlook database, October 2008.

in economic growth. Output growth rates have become much higher in emerging markets than in advanced economies<sup>4</sup>. Moreover, the trend growth rate of emerging markets has also increased noticeably and diverged away from the trend growth rate of advanced economies (see Figure 1). This increased divergence has two important lessons. First, business cycle fluctuations, defined in the usual manner as an output gap, could remain highly similar even though actual and trend growth rates diverge significantly across regions. Even though both are rising, the difference between them could remain identical or even decrease. Second, it is no surprise that Kose et al. (2008) conclude that decoupling has taken place across regions, but not within regions. When growth rates become so different across regions, the share of the variation in growth rates explained by the common factor will decrease. Moreover, because growth rates were generally high throughout emerging markets, it is also no surprise that greater synchronisation should show up within

<sup>4</sup>Indeed, those economies which are now called emerging markets are those which have grown very fast and graduated from being developing economies.

regions. In general, we should really use output data and filters to describe business cycle fluctuations, not growth rates.

## **2.2 Determinants of business cycle synchronisation**

Business cycle synchronisation results from common external shocks as well as the transmission of country-specific shocks through various macroeconomic channels such as international trade in goods and financial assets. Theoretical predictions remain ambiguous and assessing the contribution of specific economic linkages to business cycle synchronisation remains ultimately an empirical question. In this section, we review the main theoretical background and empirical findings.

### **2.2.1 Trade integration**

Although international trade in goods is usually thought of as fostering business cycle synchronisation, its overall effects remain theoretically ambiguous. On the demand side, higher aggregate demand in one country will partially fall on imported goods, thereby raising the output and income of trading partners and inducing output comovements across countries. On the supply side, however, there are two opposite effects which relate to two different approaches to modeling international trade. Intra-industry models of trade consider economies with similar production structures and factor endowments. To the extent that trade occurs mostly within industries, an expansion in some industries will raise output comovements across countries. However, trade integration may also lead economies to specialize in the production of goods for which they have a comparative advantage, hence reducing comovements.

Frankel and Rose (1998) find strong evidence that closer trade linkages among advanced economies lead to an increase in the correlation of business cycles. Calderon et al. (2007) find similar evidence for developing countries, for which we could expect that specialization along the lines of comparative advantage is more important. Otto et al. (2001) and Bordo and Helbling (2004) conclude that international trade affects output comovements in a positive and significant way, although it does not explain very much. Baxter and Koupar-



itsas (2005) use the robustness approach of Leamer (1983) to detect robust determinants of business cycle synchronisation and conclude that bilateral trade has a robust effect. Imbs (2004) refines the analysis by estimating the respective contributions of intra-industry and inter-industry trade, and concludes that a sizable part of the impact of trade on bilateral correlations works through intra-industry trade, although there are some smaller but significant inter-industry effects. Overall, we conclude from the existing empirical evidence that stronger trade linkages lead to greater business cycle synchronisation.

### **2.2.2 Financial integration**

At a theoretical level, financial integration also carries an ambiguous impact on business cycle synchronisation. On the one hand, to the extent that equities of a given country are widely held internationally, a fall in that country's stock market will trigger a negative wealth effect for asset holders in the world, thereby affecting consumer demand and in turn leading to output comovements. On the other hand, international diversification of portfolios allows to smooth consumption patterns without having to diversify production, thereby leading to the possibility of greater specialization. The former effect would increase business cycle synchronisation, whereas the latter effect would tend to reduce comovements.

Imbs (2004, 2006), Inklaar et al. (2008) and Kose et al. (2003) show that financial integration impacts positively on business cycle comovements. Bordo and Helbling (2004) conclude that financial integration has no significant effect. Kalemli-Ozcan et al. (2001) show that capital market integration leads to greater specialisation in production structures and thus, other things equal, a lower degree of output comovements. Hence, there is a substantial body of evidence suggesting that financial globalization raises business cycle synchronisation. The ongoing global financial crisis is also showing us that financial linkages can transmit country-specific disturbances across countries very rapidly.

### **2.2.3 Other determinants**

At least three other determinants of business cycle synchronisation have received attention in the literature. We outline them briefly here. First, lower exchange rate volatility could

raise business cycle comovements by fostering trade integration and financial integration. Rose and Engel (2002) conclude that currency unions bring about higher business cycle synchronisation. Rose (2000), Glick and Rose (2002), Micco et al. (2003) and Baldwin (2006) estimate versions of gravity equations and find that currency unions raise bilateral trade across countries. Lane and Milesi-Ferretti (2007) and Cappiello et al. (2006) show that the introduction of the euro has also led to greater financial integration.

Second, fiscal convergence could also lead to greater business cycle synchronisation because of lower idiosyncratic fiscal shocks. Inklaar et al. (2008) and Darvas et al. (2005) find supporting evidence. Finally, several studies have assessed the role of similarities in the industrial structure of countries. Imbs (2004), Calderon et al. (2007) and Inklaar et al. (2008) provide evidence that more symmetric economic structures induce greater business cycle comovements.

### 3 Methodology

The review of the literature provides several insights which are helpful in choosing an appropriate methodology. Given that industrial production now represents a small share of the economy in many countries, and given that quarterly data on gross domestic product are not available for all countries in our sample, we focus on gross domestic product at the annual frequency. In order to avoid the problems associated with growth rates, we will compute output gaps as a measure of the business cycle. Finally, since correlation coefficients feature several drawbacks, we will instead use the nonparametric measure of synchronicity proposed by Mink et al. (2007).

The degree of synchronicity between the output gap of emerging market  $i$ , denoted as  $g_i(t)$ , and the output gap of a group of advanced economies  $a$ , written as  $g_a(t)$ , in a given year  $t$  is given by

$$\varphi_{ia}(t) = \frac{g_i(t)g_a(t)}{|g_i(t)g_a(t)|} \quad (1)$$

When the business cycles of country  $i$  and group  $a$  are in the same phase, that is

when both output gaps are positive or when both are negative, they are synchronous and the indicator is equal to 1. Otherwise, it is equal to -1. In contrast with factor models or correlation coefficients, this concordance measure has the advantage that it can be computed for every year on the basis of annual gross domestic product data. There is no need for higher frequency data and it is not necessary to define arbitrary sub-periods of the data. This synchronicity measure will remain unaffected by changes in the amplitude of business cycles. The only thing that matters is whether both countries experience output gaps of the same sign or not.

In this context, decoupling is easily defined. In the extreme version of the decoupling hypothesis, emerging markets will decouple from advanced economies when the concordance indicator converges to -1, that is when their output gaps do not coincide at all. In the milder, current version of the hypothesis, decoupling will occur when the concordance between the business cycles decreases over time, that is when the business cycles of emerging markets become less synchronised with those of advanced economies. Since the concordance indicator exhibits substantial time variation, the evolution of the degree of synchronicity over time is examined by extracting the time-varying trend across the full sample.

Synchronicity of business cycles can also be examined between a group of emerging market economies and a group of advanced economies. The more aggregate measure of synchronicity is taken again from Mink et al. (2007) and is given by

$$\varphi_{ra}(t) = \frac{1}{N} \sum_{i=1}^N \frac{g_i(t)g_a(t)}{|g_i(t)g_a(t)|} \quad (2)$$

where  $r$  denotes either a geographical region of emerging markets, or the whole group of emerging market economies, and  $N$  is the number of countries within this region.

## 4 Data

Data on gross domestic product for each country in our sample are retrieved from the October 2008 World Economic Outlook database provided by the IMF on its website.

These data series are available at the annual frequency from 1980 onwards. Gross domestic product is given at constant prices. We use the Hodrick-Prescott filter to extract the time-varying trend from the original data<sup>5</sup>. The output gap is computed as the difference between actual GDP and trend GDP, divided by trend GDP.

We consider a large sample of thirty-four emerging market countries from different regions of the world: eight Asian economies (China, India, Indonesia, Malaysia, Pakistan, Philippines, Thailand and Vietnam), nine Latin American countries (Argentina, Brazil, Chile, Colombia, Ecuador, Mexico, Peru, Uruguay and Venezuela), thirteen Eastern European economies (Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russia, Slovakia, Turkey and Ukraine), and four other nations (Egypt, Jordan, Morocco and South Africa). We will compute the synchronicity measure between the output gap of each emerging market economy and the output gap of four separate groups: advanced economies (Australia, Austria, Belgium, Canada, Cyprus, Denmark, Finland, France, Germany, Greece, Hong Kong, Iceland, Ireland, Israel, Italy, Japan, Korea, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, Taiwan, the United Kingdom and the United States), the G7 group (Canada, France, Germany, Italy, Japan, the United Kingdom and the United States), the United States alone, and a European group (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, Switzerland and the United Kingdom)<sup>6</sup>. We will also use equation (2) to compute the synchronicity measure for emerging market economies aggregated in regional groups, and in a single group, with respect to each of the four groups of advanced economies.

The time period for our estimations runs from 1980 to 2007. The proponents of the decoupling hypothesis argue that it is a recent phenomenon. It is therefore essential to use the most recent data available. Yet, we did not include data for 2008 because the global financial crisis has led to a global slowdown, with many countries entering into recession. It

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<sup>5</sup>We make use of a penalty parameter of 4 as suggested by Ravn and Uhlig (2002).

<sup>6</sup>We have calculated the output gap of aggregate groups of advanced economies using PPP GDP shares as weights.

is a well-established fact that business cycles are more synchronised during recessions than during normal times (Claessens et al., 2008). Including data for 2008 would therefore have worked against the decoupling hypothesis. The ongoing global crisis is a rather unusual event, so we did not want to draw conclusions based partly on extraordinary circumstances. Hence, our sample period stops at 2007.

## 5 Results

Have emerging markets decoupled from advanced economies, the United States, the G7 group, or Europe? In other words, has the degree of synchronicity of business cycles decreased over time, in particular during recent years? Figure 2 provides evidence for the group of all emerging markets on the one hand, and the four aggregate groups of advanced economies on the other hand. Synchronicity fluctuates over time; thus, we also report the long-run trend extracted using the Hodrick-Prescott filter. Despite significant time variation, it does not appear that synchronicity has decreased over time, and certainly not during recent years. Hence, the decoupling hypothesis is a myth when we consider all emerging markets together.

Despite the fact that the degree of synchronicity seems to have increased over time, we would not necessarily conclude that this increase is statistically significant. In the absence of a proper test for the null hypothesis that synchronicity has not changed and the alternative hypothesis that synchronicity has risen, we can only interpret the visible increase in synchronicity as evidence that at least, synchronicity has not decreased. Thus, the decoupling hypothesis can be rejected on the basis of our evidence. This being said, our evidence is consistent, in a qualitative sense, with the view that globalisation has contributed to stronger business cycle synchronicity.

It is useful to look at smaller groups of emerging markets to assess whether the overall picture hides significant differences across geographical regions. Figures 3 to 6 show the synchronicity indicator between, respectively, Asia, Latin America, Eastern Europe and the rest of the world, and the same four aggregate groups of advanced economies. The

degree of synchronicity fluctuates over time. In line with our results when all emerging markets are considered together, the decoupling hypothesis can be rejected for each of the four geographical regions. The synchronicity indicator does not decrease for any of them during recent years. Again, the decoupling hypothesis appears to be a myth.

Even geographical regions could hide differences across individual countries. Therefore, we compute the synchronicity measure for each individual emerging market economy on the one hand, and the same four aggregate groups of advanced economies on the other hand. Figures 7 to 10 focus on Asian countries. Interestingly, a couple of countries have experienced a modest decrease in business cycle synchronicity, in particular China with the United States. Again, it is difficult to judge whether China has really decoupled from the United States in a statistical sense. It is also worth noting that China has not decoupled from all groups of advanced economies: its degree of business cycle synchronicity with Europe has become stronger during recent years. The other big economy in the region, namely India, has not decoupled with respect to any of the four aggregate groups of advanced economies. Overall, none of the emerging markets in the Asian region can be said to have decoupled from advanced economies; for each country, there is always at least one group of advanced economies with respect to which synchronicity has not declined.

Figure 11 to 14 present the evidence for Latin America. Most countries exhibit increasing synchronicity during recent years. Even though Brazil seems slightly less synchronised with the group of all advanced economies together, its degree of synchronicity with the United States and with Europe has not declined in recent years. Peru is the only country in the Latin American region that reports a decline in synchronicity with each of the four aggregate groups of advanced economies. Figures 15 to 18 focus on the Eastern European region. Again, we cannot find a single country which exhibits lower synchronicity with all four aggregate groups of advanced economies during recent years. Russia has even become slightly more synchronised with the United States, despite small decreases with other advanced economies. Finally, figures 19 to 22 focus on the rest of the world. The conclusion is the same: the decoupling hypothesis can be rejected for all four emerging markets.

Overall, we find no supporting evidence for the decoupling hypothesis. A few emerging

market economies exhibit lower synchronicity with respect to some specific set of advanced economies during recent years. However, out of thirty-four emerging market economies, there is no country, except for Peru, which reports a decline in its degree of synchronicity with all four aggregate groups of advanced economies. In most cases, synchronicity has been rising during the last decade, until the very end of our sample period which finishes and includes the year 2007. Our results are consistent with the growing evidence showing that globalisation tends to foster business cycle synchronisation.

## 6 Concluding remarks

Much of the recent debate about the decoupling hypothesis relies on arguments rather than detailed empirical analysis. This paper reviews the literature on the measurement of business cycle synchronisation to motivate the empirical approach put forward by Mink et al. (2007). In particular, we explain carefully why combining GDP growth rates with factor models can produce the kind of results obtained by Kose et al. (2008), namely that emerging markets have decoupled from advanced economies. Using output gaps instead of growth rates, and focusing on a measure of business cycle synchronicity that remains invariant to changes in the amplitude of business cycles, we find that the decoupling hypothesis is largely a myth. Business cycle synchronicity between emerging markets and advanced economies has not generally decreased over time, and certainly not during recent years.

Our results do not imply that business cycle synchronicity will remain at its current level permanently, or that synchronicity will necessarily rise further in the future. We would expect synchronicity not to decline as long as the ongoing global recession continues, given the existing evidence showing that business cycles become more synchronised in such time periods. But our results show that the trend in the degree of business cycle synchronicity varies over time. In this paper, we really show that at least in recent years, decoupling has not occurred. We cannot infer from our results that decoupling cannot happen at some point in the future. Yet, the growing evidence showing a positive relationship between

globalisation and business cycle synchronicity would support the view that synchronicity will not decline systematically over the world, so long as globalisation does not recede.

The measure of synchronicity proposed by Mink et al. (2007) and used in this paper would also be suitable as a dependent variable in a regression specification focusing on the determinants of business cycle synchronicity across countries and over time. Since synchronicity is a binary variable, a probit model would be adequate. This contrasts with the difficulties inherent in the estimation of regression models using a correlation coefficient as the dependent variable. The correlation coefficient must be transformed since it is not normally distributed, making the interpretation of the estimated regression coefficients problematic. This problem does not occur when the dependent variable is binary. We leave the study of the determinants of business cycle synchronicity, using the measure put forward by Mink et al. (2007), for future research.



## References

- [1] Artis, M. and Zhang, W. (1997) International business cycles and the ERM: is there a European business cycle?, *International Journal of Finance and Economics* 2, 1-16.
- [2] Artis, M. and Zhang, W. (1999) Further evidence on the international business cycle and the ERM: is there a European business cycle?, *Oxford Economic Papers* 51, 120-132.
- [3] Baldwin, R. (2006) The euro's trade effects, ECB Working Paper 594.
- [4] Baxter, M. and Kouparitsas, M. (2005) Determinants of business cycle comovement: a robust analysis, *Journal of Monetary Economics* 52, 113-157.
- [5] Bordo, M. and Helbling, T. (2004) Have national business cycles become more synchronized?, in *Macroeconomic Policies in the World Economy* (Ed.) H. Siebert, Springer-Verlag, Berlin, 3-39.
- [6] Calderon, C., Chong, A. and Stein, E. (2007) Trade intensity and business cycle synchronization: are developing countries any different?, *Journal of International Economics* 71, 2-21.
- [7] Cappiello, L., Hördahl, P., Kadareja, A. and Manganelli, S. (2006) The impact of the euro on financial markets, ECB Working Paper 598.
- [8] Claessens, S., Kose, A. and Terrones, M. (2008) What happens during recessions, crunches and busts?, IMF Working Paper 274.
- [9] Dalsgaard, T., Elmeskov, J. and Park, C. (2002) Ongoing changes in the business cycle, evidence and causes, OECD Working Paper 315.
- [10] Darvas, Z., Rose, A. and Szapary, G. (2005) Fiscal divergence and business cycle synchronization: irresponsibility is idiosyncratic, NBER Working Paper 11580.

- [11] De Haan, J., Inklaar, R. and Jong-A-Pin, R. (2008) Will business cycles in the euro area converge? A critical survey of empirical research, *Journal of Economic Surveys* 22, 234-273.
- [12] Doyle, B. and Faust, J. (2002) An investigation of comovements among the growth rates of the G7 countries, *Federal Reserve Bulletin*, October issue, 427-437.
- [13] Doyle, B. and Faust, J. (2005) Breaks in the variability and comovement of G-7 economic growth, *Review of Economics and Statistics* 87, 721-740.
- [14] Forbes, K. and Rigobon, R. (2002) No contagion, only interdependence: measuring stock market comovements, *Journal of Finance* LVII, 2223-2261.
- [15] Frankel, J. and Rose, A. (1998) The endogeneity of the optimum currency area criteria, *The Economic Journal* 108, 1009-1025.
- [16] Glick, R. and Rose, A. (2002) Does a currency union affect trade? The time-series evidence, *European Economic Review* 46, 1125-1151.
- [17] Imbs, J. (2004) Trade, finance, specialization, and synchronization, *Review of Economics and Statistics* 86, 723-734.
- [18] Imbs, J. (2006) The real effects of financial integration, *Journal of International Economics* 68, 296-324.
- [19] Inklaar, R. and de Haan, J. (2001) Is there really a European business cycle? A comment, *Oxford Economic Papers* 53, 215-220.
- [20] Inklaar, R., Jong-A-Pin, R. and de Haan, J. (2008) Trade and business cycle synchronization in OECD countries, a re-examination, *European Economic Review* 52, 646-666.
- [21] Kalemli-Ozcan, S., Sorensen, B. and Yosha, O. (2001) Economic integration, industrial specialization, and the asymmetry of macroeconomic fluctuations, *Journal of International Economics* 55, 107-137.

- [22] Kose, M., Prasad, E. and Terrones, M. (2003) How does globalization affect the synchronization of business cycles?, *American Economic Review* 93, 57-62.
- [23] Kose, A., Otrok, C. and Prasad, E. (2008) Global business cycles: convergence or decoupling?, NBER Working Paper 14292.
- [24] Lane, P. and Milesi-Ferretti G.M. (2007) The international equity holdings of euro area investors, in *The Importance of the External Dimension for the Euro Area: Trade, Capital Flows, and International Macroeconomic Linkages* (Eds) R. Anderton and F. di Mauro, Cambridge University Press, 95-117.
- [25] Leamer, E. (1983) Let's take the con out of econometrics, *American Economic Review* 73, 31-43.
- [26] McConnell, M. and Perez-Quiros, G. (2000) Output fluctuations in the United States: what has changed since the early 1980's, *American Economic Review* 90, 1464-1476.
- [27] Micco, A., Stein, E. and Ordóñez, G. (2003) The currency union effect on trade: early evidence from EMU, *Economic Policy* 37, 315-356.
- [28] Mink, M., Jacobs, J. and de Haan, J. (2007) Measuring synchronicity and comovement of business cycles with an application to the euro area, CESifo Working Paper 2112.
- [29] Otto, G., Voss, G. and Willard, L. (2001) Understanding OECD output correlations, Research Discussion Paper 05, Reserve Bank of Australia.
- [30] Ravn, M. and Uhlig, H. (2002) On adjusting the Hodrick-Prescott filter for the frequency of observations, *Review of Economics and Statistics* 84, 371-375.
- [31] Rose, A. (2000) One money, one market: the effect of common currencies on trade, *Economic Policy* 30, 7-46.
- [32] Rose, A. and Engel, C. (2002) Currency unions and international integration, *Journal of Money, Credit and Banking* 34, 1067-1089.

Figure 2: Synchronicity: all emerging markets and four advanced groups

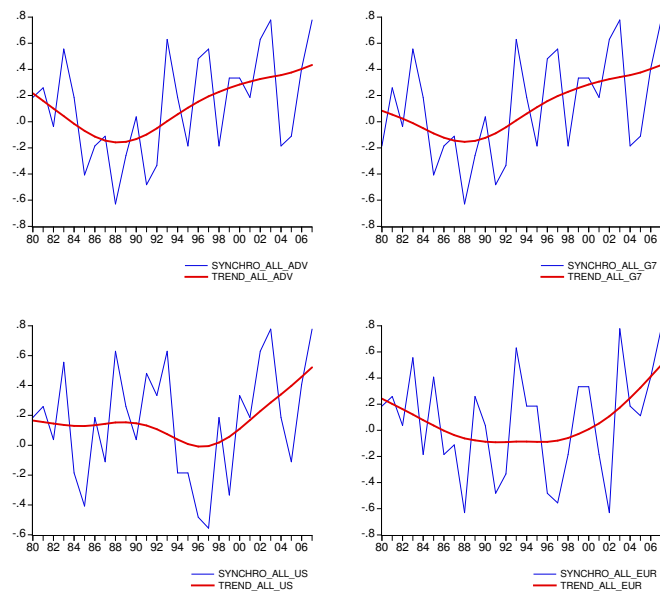


Figure 3: Synchronicity: Asia and four advanced groups

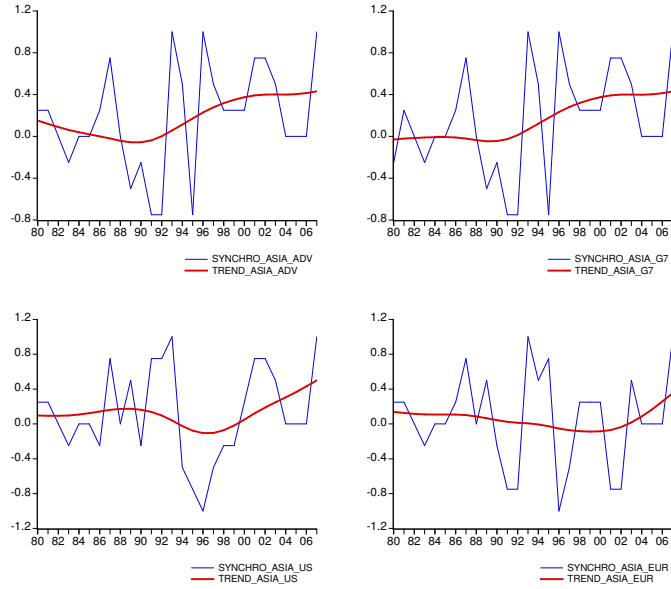


Figure 4: Synchronicity: Latin America and four advanced groups

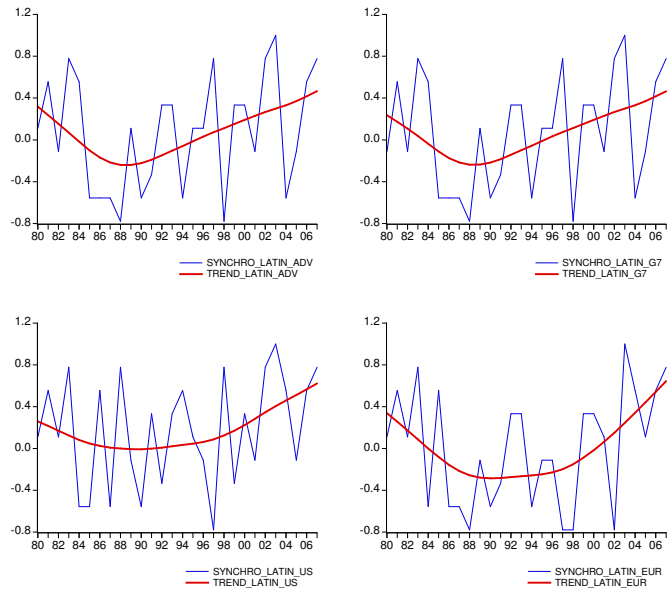


Figure 5: Synchronicity: Eastern Europe and four advanced groups

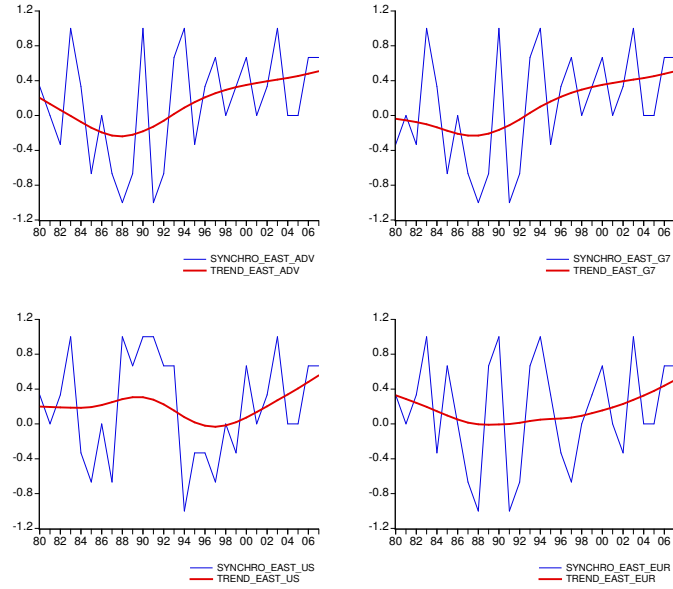


Figure 6: Synchronicity: Rest of the world and four advanced groups

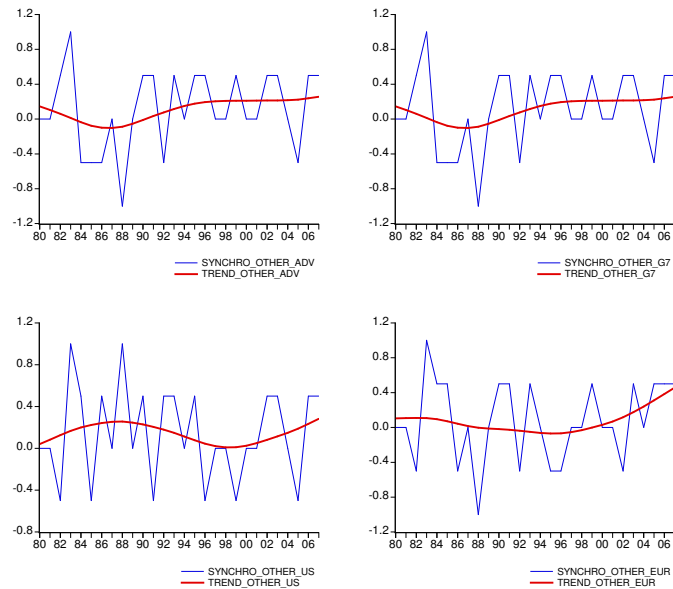


Figure 7: Synchronicity: Asian countries and advanced economies

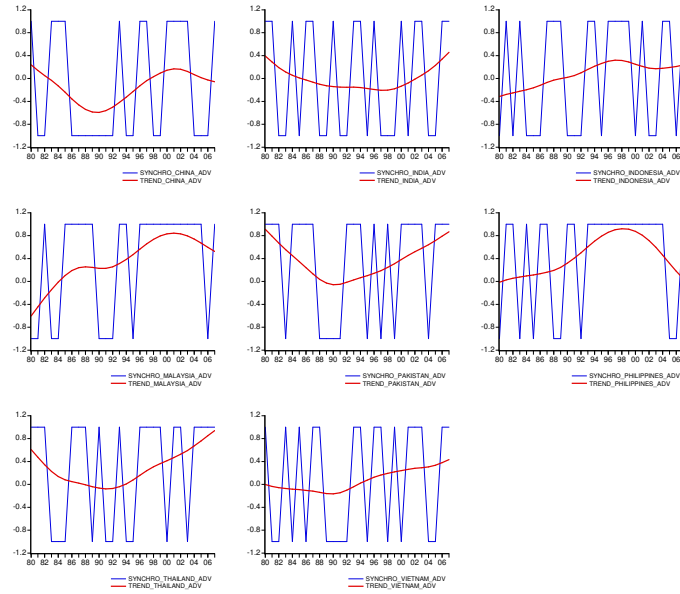


Figure 8: Synchronicity: Asian countries and the United States

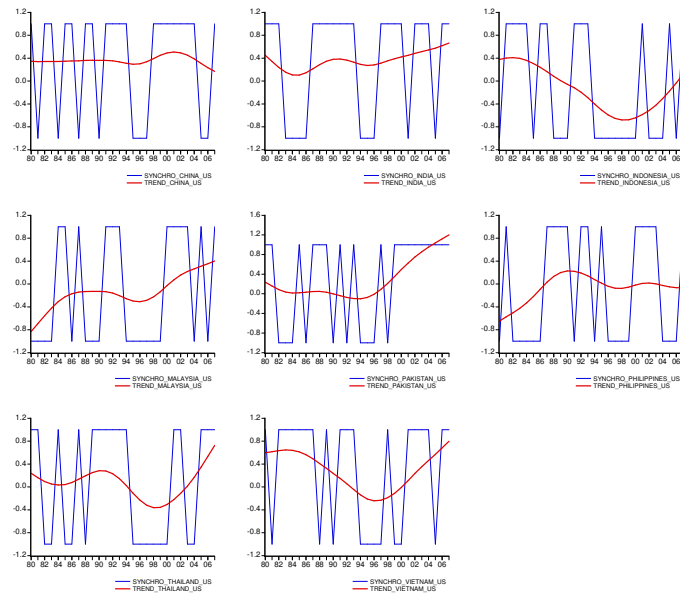


Figure 9: Synchronicity: Asian countries and the G7 group

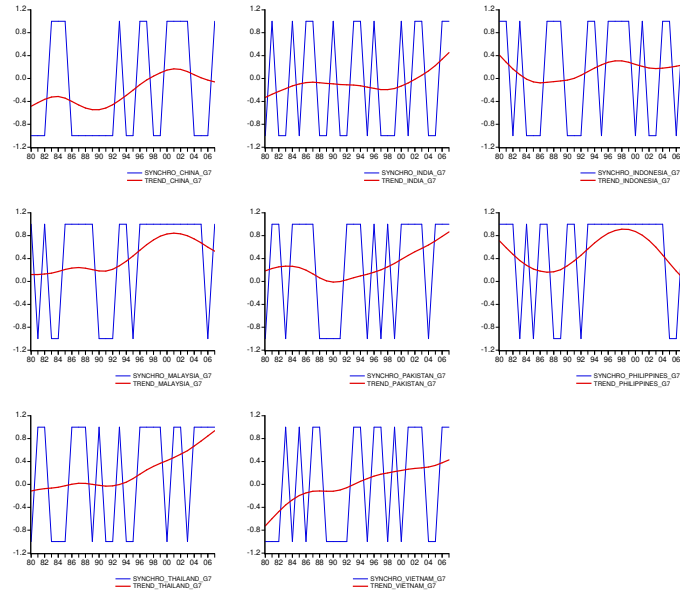


Figure 10: Synchronicity: Asian countries and Europe

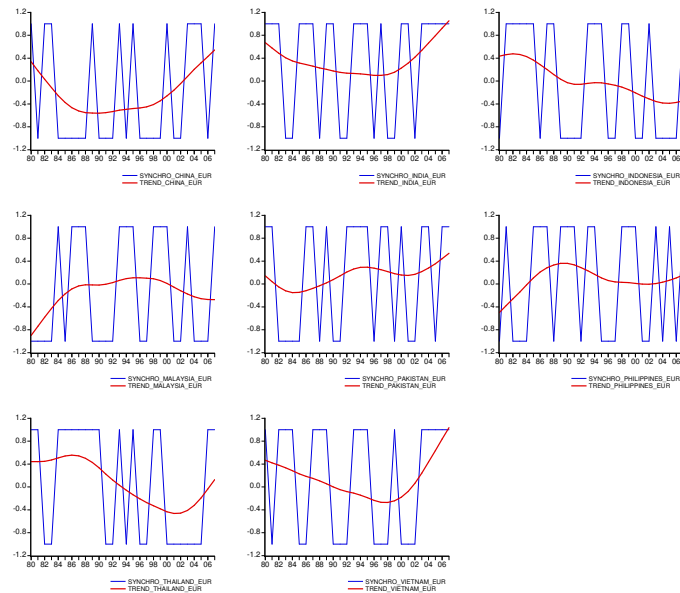




Figure 11: Synchronicity: Latin American countries and advanced economies

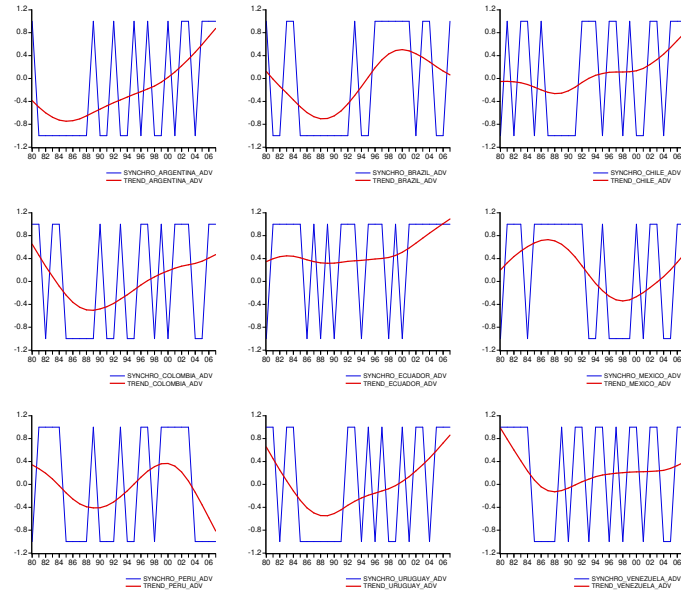


Figure 12: Synchronicity: Latin American countries and the United States

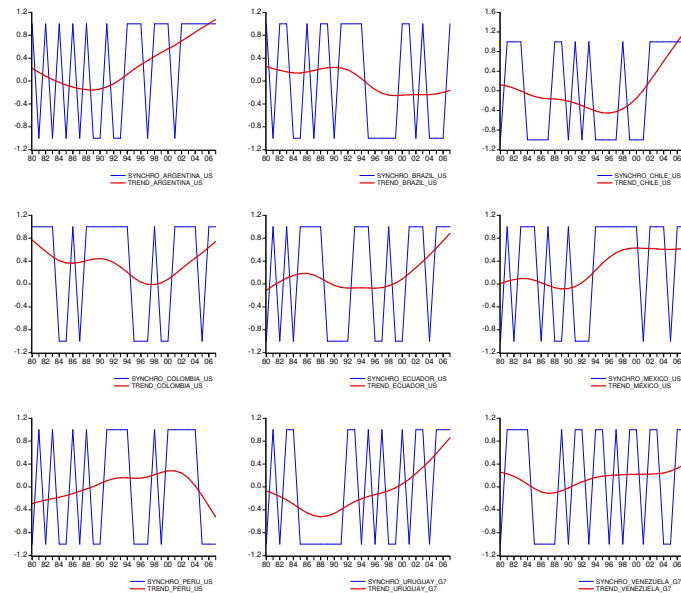


Figure 13: Synchronicity: Latin American countries and the G7 group

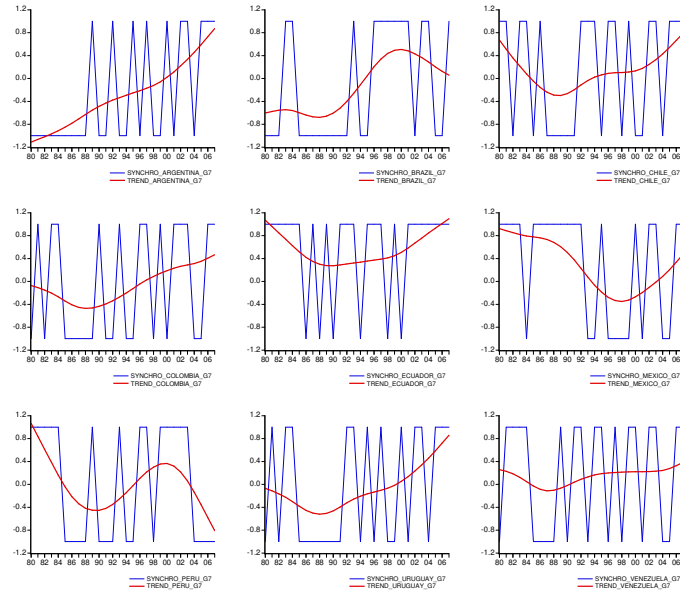


Figure 14: Synchronicity: Latin American countries and Europe

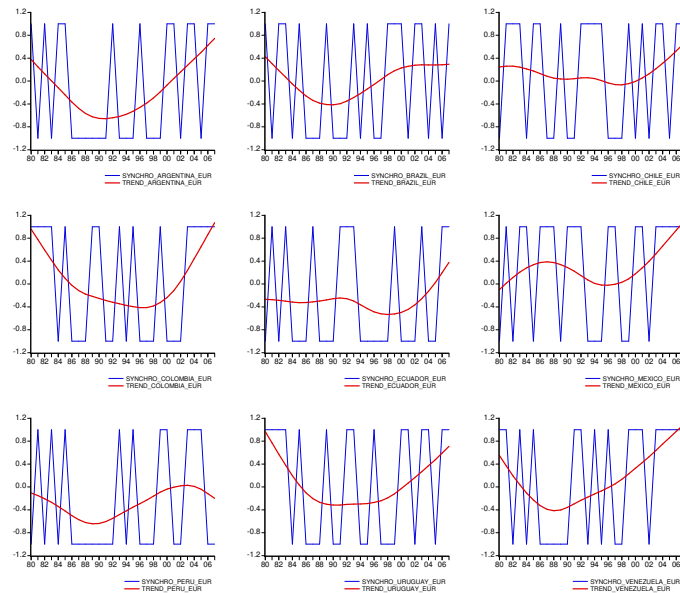


Figure 15: Synchronicity: Eastern European countries and advanced economies

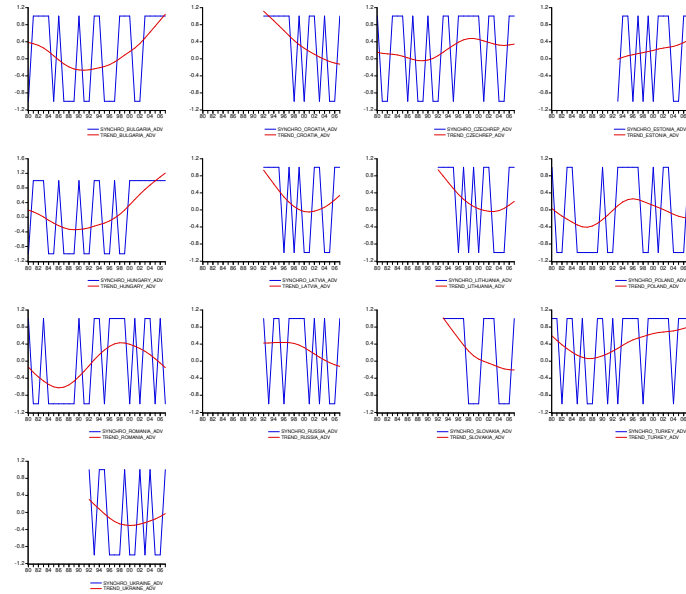


Figure 16: Synchronicity: Eastern European countries and the United States

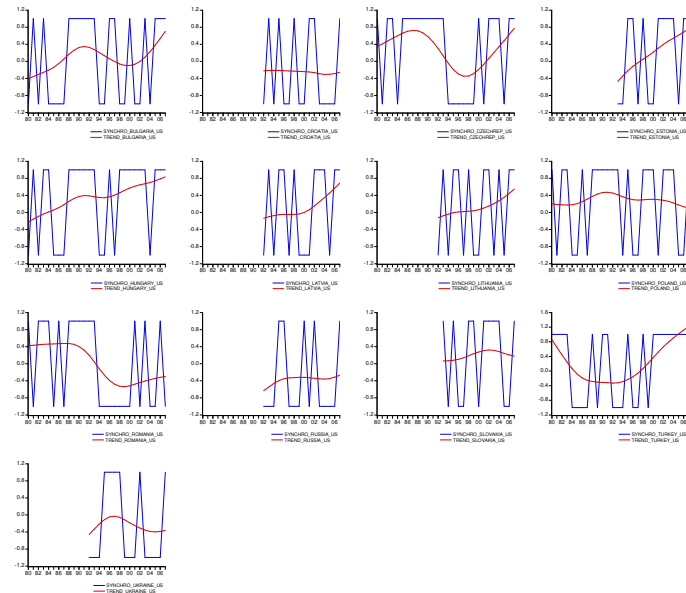


Figure 17: Synchronicity: Eastern European countries and the G7 group

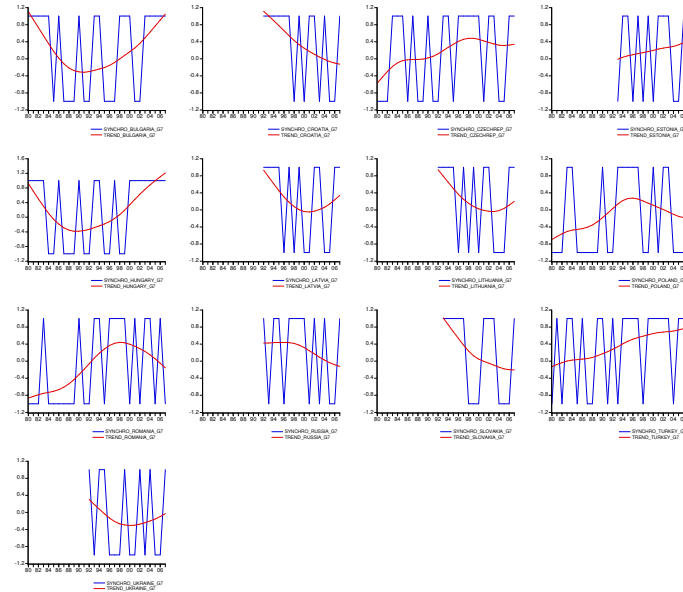


Figure 18: Synchronicity: Eastern European countries and Europe

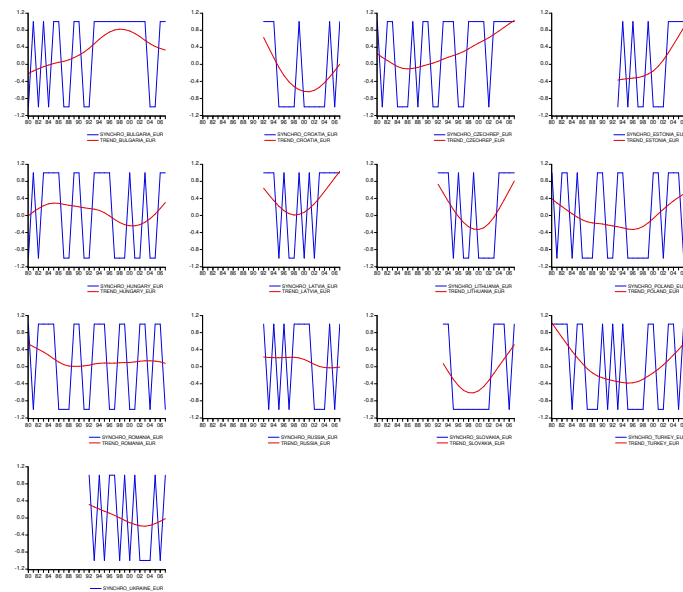


Figure 19: Synchronicity: Other countries and advanced economies

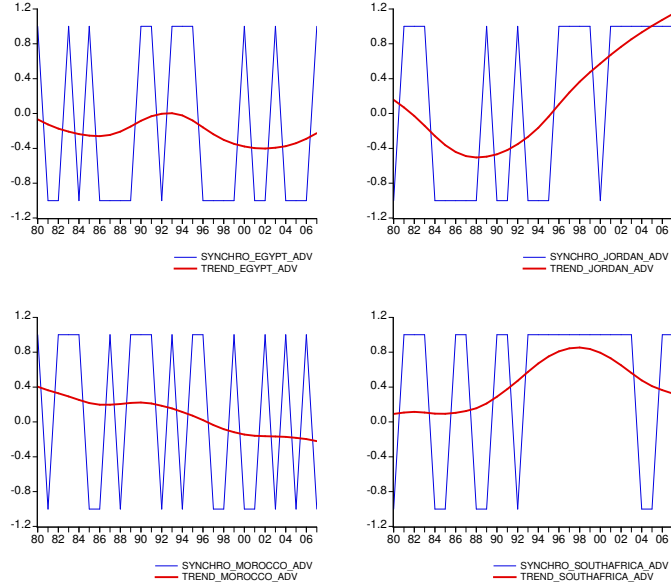


Figure 20: Synchronicity: Other countries and the United States

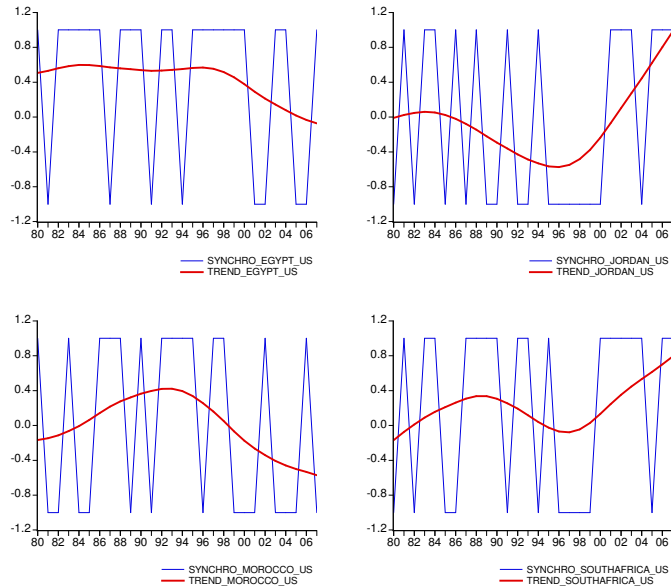


Figure 21: Synchronicity: Other countries and the G7 group

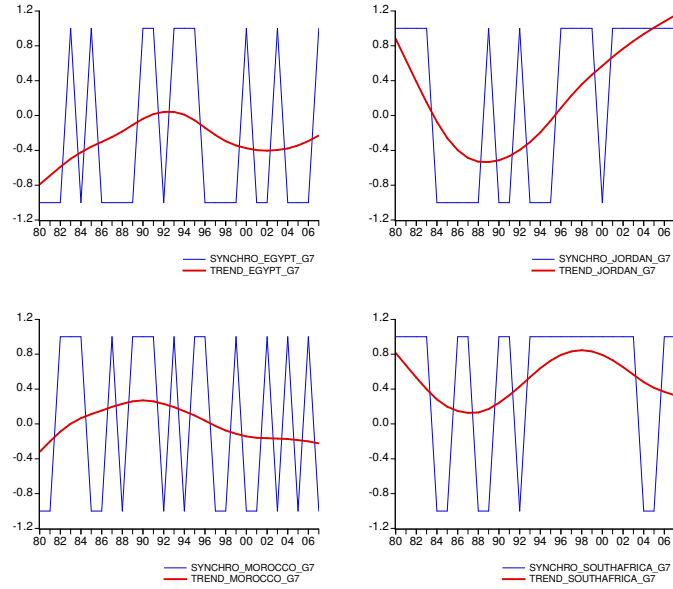


Figure 22: Synchronicity: Other countries and Europe

