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Is there a world business cycle?

by Michael Kouparitsas

In 1999, the year the euro zone was officially launched, the European Central Bank (ECB) had to fashion a single policy for a diverse region where the growth rates of gross domestic product (GDP) ranged from 10.8% in Ireland to 1.6% in Italy. At the time, many commentators questioned the viability of the ECB since its one-size-fits-all monetary policy would likely have negative consequences for part of the zone and positive consequences for the rest. Three years later the economies of the euro zone are finally starting to move in step, with the forecast differential between high- and low-growth countries narrowing to half of that recorded in 1999.[1] The good news is that this convergence should make it a lot easier for the ECB to formulate a single monetary policy for the region.[2] The bad news is that the euro zone is heading in the wrong direction, with output growth forecast to slow for all countries in the region this year.

Looking beyond the euro zone we see that every corner of the global economy is slowing down. In the third quarter of last year, the U.S. economy slowed dramatically, foreshadowing the end of the rapid expansion that began in the mid-1990s. According to the latest Consensus forecasts,[3] U.S. GDP is expected to grow by 1% this year, down from 4% or more recorded in each of the last four years. The spillover effects of the U.S. and euro-zone slowdowns, especially through lower demand for electronic goods, are clearly evident in the weakening economies of North America, Latin America, and Asia. There are many examples. The most dramatic are the current slowdowns in Mexico and Taiwan—two countries that had emerged virtually unscathed from the recent financial crises that ravaged other countries in their regions. After growing by just under 7% in 2000, Mexican GDP is expected to grow by 0.1% this year, while Taiwan GDP is expect to contract by 1.9% after growing by 6% in 2000.

Readers may remember that the last time economic activity slowed in the U.S. was in the early 1990s, about the same time that activity in Europe was slowing in response to German reunification. Armed with these observations, a casual observer might conclude that there is a world business cycle. From a U.S. perspective, this means that when the U.S. expands, the rest of the world expands; and when the U.S. contracts, the rest of the world contracts. In exploring whether this is so, this *Chicago Fed Letter* uses modern *trend/cycle decomposition* techniques to isolate the cyclical components of output data for various countries and regions and estimate the correlation coefficients of their cyclical fluctuations. I provide some perspective on the relative strength of the correlation coefficients by comparing them with similar statistics for U.S. industrial sectors and across total income of U.S. regions.

Measuring cyclical fluctuations

The theoretical and empirical analysis of cyclical fluctuations, known as *business cycle theory*, is one of the more contentious fields of economics. There are many competing theories of the business cycle and, despite the age of the debate, there is little consensus on the causes of cyclical fluctuations. The only restriction theory imposes on empirical methods is that trend and cyclical terms be independent.

The trend/cycle decomposition methodology I use here follows this tradition, which can be traced from Burns and Mitchell's pioneering definition of the business cycle.[4] According to them, a business cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general contractions. This sequence of changes is recurrent but not periodic and has duration of 18 months to eight years. Burns and Mitchell relied on ad hoc methods that are no longer used to isolate cyclical fluctuations in data. A more formal approach, widely used today, was introduced in the early 1980s by Kydland and Prescott.[5] They overcame the shortcomings of earlier methods by using so-called business cycle band-pass filters that more effectively isolate fluctuations at the business cycle frequencies of between 18 months and eight years, while preserving all other features of the business cycle.

I begin my analysis by exploring the U.S. industrial business cycle. I do this by applying a business cycle band-pass filter to U.S. sectoral labor hours data.[6] These data cover six broad goods- and service-producing sectors that account for 97% of all private sector workers in the U.S. economy: nondurable manufacturing, durable manufacturing, construction, transportation and utilities, FIRE (trade, finance, insurance, and real estate), and other services. Following Burns and Mitchell, I use fluctuations in one sector as the reference cycle, in this case the durable goods sector. With the exception of FIRE, which has a correlation coefficient of 0.51, I find a high correlation across sectors, ranging from 0.63

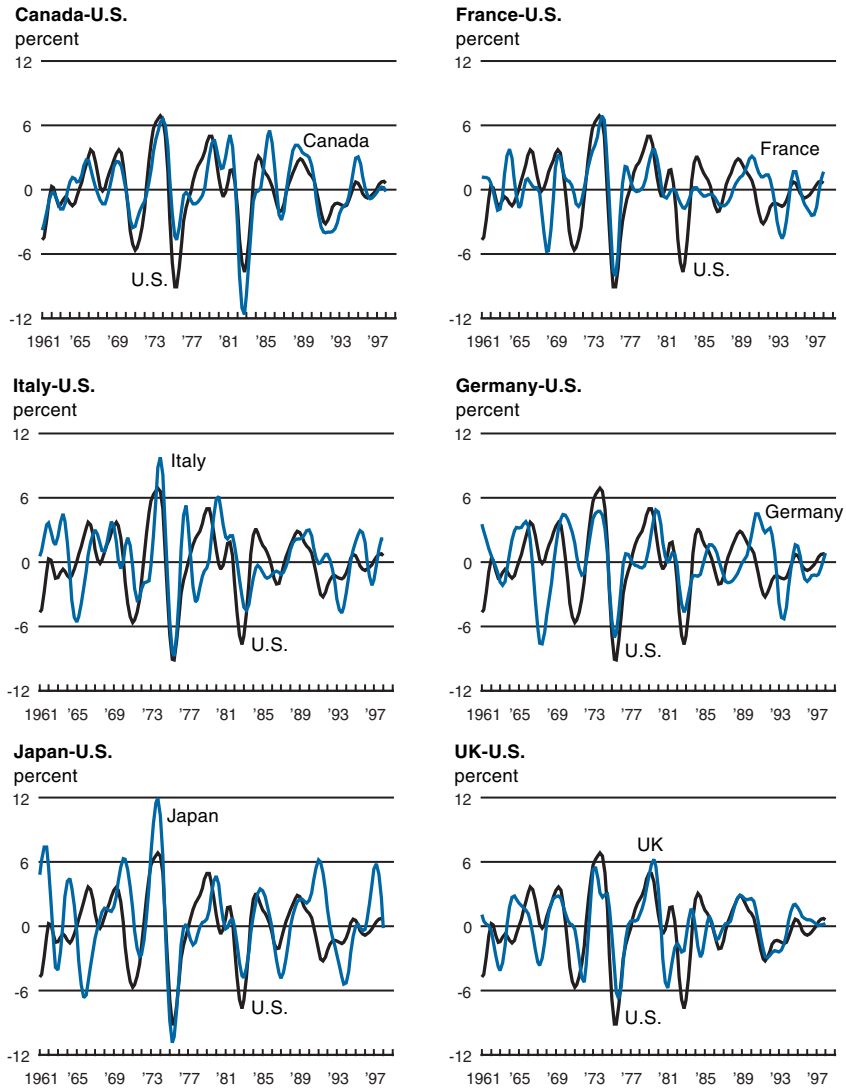
for other services and durable manufacturing to 0.85 for durable and nondurable manufacturing. (A coefficient of 1.0 would be a perfect correlation). Since FIRE accounts for only 6% of total non-farm employment, these results clearly support the view that the U.S. has a business cycle.[7]

Is the business cycle confined to industrial activity?

Burns and Mitchell did not look beyond industrial data in their seminal work, but they raised the question of whether U.S. regions had their own business cycles. Subsequent research has investigated the closely related question of whether cyclical fluctuations of regional economic activity within a country are correlated. I update this exercise using a band-pass filter to isolate the cyclical fluctuations of quarterly real personal income data for the eight Bureau of Economic Analysis (BEA) regions and the reference cycle of total U.S. personal income. The evidence in favor of a business cycle is even stronger in the regional data, with the eight BEA regions displaying relatively high correlation coefficients, ranging from 0.77 in the Southwest to 0.98 in the Southeast.

Further data analysis reveals that the highly correlated cyclical fluctuations of U.S. regions are the product of similar sources of economic disturbance and similar responses to these disturbances across all regions.[8] A highlight of these results is that the estimated effects of monetary policy are similar in all U.S. regions, which makes it easier for the Federal Reserve to formulate its one-size-fits-all monetary policy. In fact, my analysis indicates that the single currency area launched by the signing of the U.S. Federal Reserve Act by President Woodrow Wilson in 1913 closely approximates Robert Mundell's notion of an optimal currency area. This suggests that any macroeconomic costs associated with the U.S. monetary union are greatly outweighed by the microeconomic benefits of using a single currency.[9]

1. Cyclical fluctuations of G7 and U.S. industrial production



Note: Industrial production data filtered using the monthly business cycle band-pass filter described in Baxter and King (1999).

Source: Author's calculations using data from the International Monetary Fund.

Is there an international business cycle?

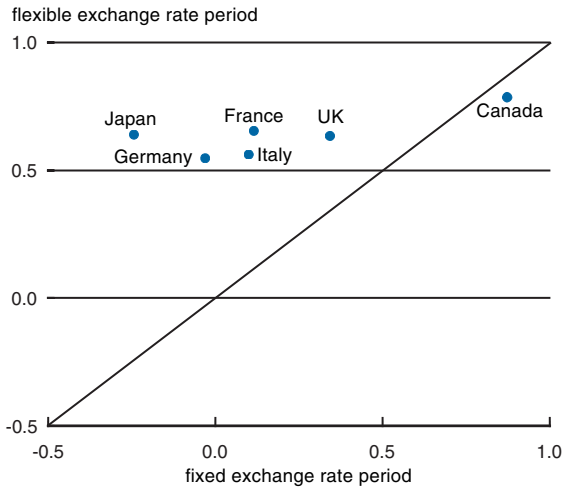
Burns and Mitchell also raised the question of whether a nation was too small rather than too large a geographic unit to display systematic cyclical behavior, thereby suggesting that business cycles might be best observed using international data. There are various ways to approach the question of whether there is an international business cycle. One approach is to repeat the analysis of the previous two sections using international output data. I do this in figure 1, by plotting the cyclical fluctuations of quarterly real industrial production for six of the G7 (Group of Seven) countries against the reference cycle, which in this case is the cyclical component of U.S. industrial production.[10] With the exception of Canada, I find that the correlations of G7 and U.S. cyclical fluctuations are lower than those of the eight U.S. BEA regions. Excluding Canada, the correlation coefficients

range from 0.39 for the U.S. and Germany to 0.59 for the U.S. and UK. The correlation coefficient for U.S.–Canada industrial production is considerably higher at 0.87.

Some authors argue, largely on the strength of theoretical results, that the end of the Bretton Woods (BW) fixed exchange rate system in the early 1970s caused significant structural change in the global economy. They recommend dividing the sample into the BW and post-Bretton Woods (PBW) exchange rate eras when assessing the extent of the international business cycle. Figure 2 describes the cross-country correlation coefficients for G7 industrial production in the fixed and flexible exchange rate periods (the U.S. is the reference cycle). With the obvious exception of Canada, I find that the cross-country correlation coefficients of cyclical fluctuations of U.S.–G7 industrial production are considerably higher in the flexible exchange rate period. For example, the U.S.–Japan correlation rises from –0.24 in the BW era to 0.64 in the PBW period. On the other hand, the U.S.–Canada correlation coefficient is roughly unchanged over the two periods. With correlation coefficients ranging from 0.55 to 0.78, the PBW data provide strong evidence in support of an international business cycle.

Further analysis suggests that the higher correlation of U.S.–G7 output fluctuations emerged in the PBW period due to a combination of two factors.[11] First, the sensitivity to U.S. monetary policy shocks among the rest of the G7 countries remained unchanged over the fixed and flexible exchange rate regimes, but the volatility of shocks to U.S. monetary policy increased significantly relative to country-specific shocks over the flexible exchange rate period. This made U.S. monetary policy disturbances a more important source of variation for G7 industrial production and, in the process, raised the correlation of U.S.–G7 output fluctuations. Second, the responses of the G7 to all shocks, global and domestic, changed in the flexible exchange rate period, so that they became more alike than in the fixed exchange rate period.

2. Correlation with the U.S.



Note: Industrial production data filtered using the monthly business cycle band-pass filter described in Baxter and King (1999).
Source: Author's calculations using data from the International Monetary Fund.

Is there an industrial developing-country business cycle?

In a closely related study, I find that the international business cycle extends to the developing region of the world, by showing that the growth rates of output for the broad industrial and developing regions of the world are highly correlated.[12] Using sectoral data, I show that the industrial developing-country business cycle is supported by a strong positive correlation of the growth rates of industrial output across these regions and a somewhat weaker correlation of the growth rates of services output.

Conclusion

The current slowdown in global economic activity has renewed interest in the notion of a world business cycle. Data presented here suggests that there is a business cycle across major industrial countries. Similarly, results from an earlier study on the relationship between cyclical fluctuations in the industrial and developing regions of the world suggests that there is an industrial developing-region business cycle. Overall, these studies provide evidence to support the claim that there is a world business cycle.

[1]See Consensus Economics, Inc., 2001, *Consensus Forecasts*, October 8.

[2]For details see, M. A. Kouparitsas, 1999, "Is the EMU a viable common currency area? A VAR analysis of regional business cycles," *Economic Perspectives*, Federal Reserve Bank of Chicago, Vol. 23, No. 4, pp. 2–20.

[3]Consensus Economics, Inc., 2001.

[4]See A. Burns and W. Mitchell, 1946, *Measuring Business Cycles*, New York: National Bureau of Economic Research.

[5]See R. J. Hodrick and E. C. Prescott, 1997, "Postwar U.S. business cycles: An empirical investigation," *Journal of Money, Credit, and Banking*, Vol. 29, No. 1, pp. 1–16.

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[6]I use a variant of the Kydland–Prescott filter developed by Baxter and King. For details, see M. Baxter and R. G. King, 1999, “Measuring business cycles: Approximate band-pass filters for economic time series,” *Review of Economics and Statistics*, Vol. 81, No. 4, pp. 575–593.

[7]For more discussion of these data and their implications for theoretical explanations of the U.S. business cycle see, L. J. Christiano and T. J. Fitzgerald, 1998, “The business cycle is still a puzzle,” *Economic Perspectives*, Federal Reserve Bank of Chicago, Vol. 22, No. 4, pp. 56–83.

[8]Kouparitsas (1999).

[9]See, R. A. Mundell, 1961, “A theory of optimum currency areas,” *American Economic Review*, Vol. 51, No. 4, pp. 657–665.

[10]The Baxter–King filter is approximated by a two-sided moving average, with a lag length of three years, so I lose the first and last three years of observations.

[11]For details see, M. A. Kouparitsas, 1998, “Are business cycles different under fixed and flexible exchange rate regimes?,” *Economic Perspectives*, Federal Reserve Bank of Chicago, Vol. 22, No. 1, pp. 46–64.

[12]For details see, M. A. Kouparitsas, 2000, “Evidence of the North–South business cycle,” *Economic Perspectives*, Federal Reserve Bank of Chicago, Vol. 25, No. 1, pp. 46–59.

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