International Business Cycle Correlation

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Abstract:

This paper will look at cross-county business cycle correlations. The countries studied are mainly the United States, European Union, Japan, and some others. The papers I look at show that there is indeed a correlation among countries. It also looks at how the United States has become less correlated with other countries over the past thirty years. I give a basic look into the models used and the conclusions of what was found and the differences between the models and the data.

International business cycle correlation is an extremely important topic in today's economy because of the increased globalization in the world. This topic looks at how connected countries economies are to one another and how what happens in one country might affect another if at all. The research on international business cycle correlation has looked at the major players in the world economy and there have been many models that have been created to try to show this correlation and to back up the data that is available. This topic is important because it can help us see if and possibly how shocks that happen in one country may affect another. We see this happening now with the current sub prime crisis. To be able to know or expect what may happen in our economy based on shocks and other events that are taking place in other areas is an extremely valuable tool to have.

Financial Globalization and Real Regionalization:

The first topic that I looked at deals with both financial globalization and real regionalization. According to Heathcote and Perri (2004)c. financial globalization represents the increase in U.S. international asset trade from the period of 1986-2000, and real regionalization is the weaker international co-movement seen in that same time period. In their paper they state that these two "phenomena" are related. They begin by showing that the economy of the United States has began to be less correlated to an aggregate that they look at of Europe, Canada, and Japan over the past thirty years and this is what they refer to as real regionalization. Their main point is that they believe that the changes seen in the correlation of international business cycles and the increase in international asset trade are closely related. And they say that the increase in globalization in financial markets is the main reason behind the decrease in international co-movement. They use two models to try to show this, one being a simple atemporal two-country endowment economy, and a richer infinite-horizon model with capital. In the second model they use two calibrations to look at both the early high-shock-correlation period, and the recent period with less correlated shocks. They find that the fall of the

correlation of productivity shocks and the increase in international asset trade are accountable for most of the changes in international business cycles. In conclusion they find that "*empirically the trend towards financial globalization has been accompanied by a trend towards real regionalization*."(Heathcote and Perri (2004) p. 44)c. These conclusions are also backed up by Heathcote and Perri (2003)b. This paper looks at the decrease in correlation between the United States and the rest of the world. They address the issue this time with a general-equilibrium model. The two regions looked at are first the United States and secondly the world as an aggregate of the fifteen European Union countries plus Japan. They utilize data on GDP, gross fixed-capital formation, consumption, and civilian employment; and to account for the presence of wars over their time period of 1960-2002 they exclude government consumption from consumption and GDP. They also use two filters to focus on the range of cycles that they are interested in, first is a Hodrick and Prescott filter to remove cycles that are longer than eight years, and secondly a first-difference filter which helps to emphasize shorter cycles. Their results from the HP filter show the cross-country correlations declining for all variables, the largest decrease being investment, and the correlation of productivity does not decline, which they say suggests that a change in the shock process does not play a major role in driving the decline in business-cycle synchronization. In Heathcote and Perri (2003)b. they also state that the two prime candidates that may have led to the changes in international business-cycles co-movement are 1) a change in the productivity shock process and 2) an increase in portfolio diversification. Their model using the HP filter shows that the correlation of productivity did not significantly change. However they believe that this measure may not be completely accurate because of the crude measures of inputs to production. Through their models they come to the conclusion that the increasing financial integration is the key factor in explaining the observed correlation changes. They also believe that there may be a need to find an additional source of shocks to account for the complete set of changes in cross-county correlations, to which they say that monetary shocks would fit that need. Their findings in

both papers are similar and they believe that the United States has become less correlated with the rest of the world in the past thirty years. They also state that increased diversification is one main cause of the reductions in international co-movements in investment; however it has little effect on output correlation. Also that financial integration is a cause of the decline in cross-county correlation of consumption being larger than that of output correlation.

Financial Autarky:

This section focuses on the work of Heathcote and Perri (2000)a., concerning the international business cycles under financial autarky. In the paper they use a two-country, two-good model where they eliminate all markets for international trade in financial assets. They then compare their findings with this model to two others one with markets that are complete, and another where there is a single non-contingent bond being traded. They see that only their financial autarky model is able to show the volatility in the terms of trade that coincide with the data, and account for the cross-county output, consumption, investment, and employment correlations. They describe their financial autarky model as one where there are no existing markets for international asset trade or where all international goods trade must be quid pro quo. The financial autarky model acts very differently from the complete market, but the bond economy is closer to the complete market model. In the conclusion they say

"*In a richer framework we find that a total absence of international asset markets can help to explain the cross-country GDP, employment and investment correlations typically observed in data. Moreover the volatilities of trade-related statistics in the financial autarky model are much higher than in the complete markets model, and are of a similar order of magnitude to those for the U.S.*"(Heathcote and Perri 2000 p. 18)a.

We see that indeed their financial autarky model is able to not only show the correlations, but it also has trade-related statistics similar to those seen in the U.S. They find that regardless of some of the

shortcomings of their model they are still able to narrow the gap between the model and the data by getting rid of international asset trade. Through their model Heathcote and Perri come to the conclusion that financial autarky models are extremely important to future research on international business cycle correlation, because their model acts differently from ones with complete markets and can reproduce certain aspects of the data better.

Trade Balance and Terms of Trade:

In the next paper by Backus et al. (1994)b. they focus on the relationship between the trade balance and the terms of trade in eleven developed countries, using a two-country stochastic growth model. The define the trade balance as the ratio of net exports to output, and the terms of trade as the relative price of imports to exports. One of their major findings is that the trade balance is uniformly countercyclical and is negatively correlated to current and future movements of the terms of trade; however it is positively correlated with past movements. The model that they use has a two country economy where both countries produce imperfectly substitutable goods with capital and labor, and fluctuations arise from persistent shocks to aggregate productivity and government purchases of goods and services. Their model is able to show that there is no relation between the trade balance and the terms of trade in their model economy. Their theory also brings up two anomalies where there is a difference between the theory and data. The first anomaly that they encounter is that the variability of the terms of trade in their model economy is significantly smaller than in the data. Other studies have also encountered this problem, they are able to reduce the difference by using a smaller elasticity of substitution or by adding government purchases, and however this still doesn't completely get rid of the difference. The second anomaly deals with the correlations of output and consumption across countries, or as they call it the consumption/output anomaly. This anomaly shows that in the data the correlation

of consumption is normally smaller across countries than that of output, but in their model they experience the opposite. This paper along with some others, have all encountered this issue of finding these two discrepancies between the data and theories. They conclude that though their theory is able to act similarly to the cross-correlation function for the trade balance and the terms of trade, the presence of the two anomalies shows that there is still work that needs to be done to try to show the relationship between trade and prices.

Determinants of Comovement:

This paper by Baxter and Kouparitsas (2005) looks at data involving over one hundred countries to try and find "robust" variables to try and help explain comovement. Their study looks at six different variables being:

1. Bilateral trade between countries
2. Total trade in each country
3. Sectoral Structure
4. Similarity in export and import baskets
5. Factor endowments
6. Gravity variables

They use the "robustness" approach which means

"*a variable is said to be a robust determinant of business-cycle comovement if the variable has a significant coefficient in a regression when all other potential explanatory variables have had a chance to "knock the variable out of the equation*"" (Baxter and Kouparitsas (2005) p. 2).

They find that almost all of the variables are significant determinants of trade when looked at individually. But only some are robust. One variable that is robust is bilateral trade, meaning that countries that trade more with each other have more-correlated business cycles. They found other variables that are robust and positively related to comovement as well as some that are not robust being:

Robust:

1. An indicator variable that indicates that both countries are industrialized
2. An indicator variable that indicates that both countries are developing
3. A variable measuring the distance between the two countries

Not Robust:

1. Measures of industrial similarity
2. Currency union
3. Total trade undertaken by the two countries
4. Measures of similarity in export and import baskets
5. Measures of factor intensity

These findings of robust and not robust variables lead to their conclusions. First that higher bilateral trade between countries is robustly correlated to business-cycle correlation. Next that the greater similarity in industrial structure is not robust stresses the fact that industrial structure is fragile. They also find that countries in a currency union do not have higher correlated business-cycles, which contrasts past studies. Finally they only found one "gravity" variable to be robust which is distance

between countries, which is negatively correlated to correlation. In Baxter and Kouparitsas (2005) we are able to see which variables are important to finding business-cycle comovement, and which ones are not.

International Real Business Cycles:

The final paper I look at is by Backus et al. (1992)a. concerning international real business cycles. This paper looks at the discrepancy between the available data and their two-country real business cycle model, when looking at the correlation of consumption and output. In Backus et al. (1992)a. they also see that there is a difference between the model and data, being that in the data outputs are more highly correlated than consumption, however the model shows the opposite. They look at both an open and closed economy. In the closed economy the correlation of savings and investment are perfectly correlated, but savings and investment correlations are imperfectly correlated when in an open economy where countries can borrow and lend in international markets. The open economy also gives a look into the cross correlation of output between countries. Their model finds that the cross-country correlation of consumption to output is robust, and that consumption correlation is larger than the output correlation unlike the data. Their other findings are that saving and investment rates are positively correlated in the model, the trade balance is uncorrelated to output, and that foreign and domestic output are negatively correlated in the model unlike in the data. In their model foreign and domestic consumption are more highly correlated than in the data, and the model has a higher consumption than output correlation.

All of these papers highlight different aspects of the research on international business cycle comovement. We see that indeed there is a degree to which what happens in one country affects another. The models that have been created to look at this are not perfect, in fact many of them run

into problems of their consumption or output correlation being higher or lower than that in the data. We also see that there are certain indicators and variables that are robust and have a significant affect on the correlation between countries. None of the research on this topic is perfect and there is not yet one model that works better than any others or that is accepted as the model to show cross country correlation. It will be interesting to see what happens in the future with the study of international business cycle correlations, because as the world changes and more countries become industrialized and begin to trade we will see an increase in the dependence on each other. One thing that I thought was interesting was that the United States has become less correlated with the rest of the world in over the past thirty years. I believe that this is probably a good thing, because we don't want to have to be dependant on other countries, or have the shocks that others experience have drastic affects on us. This topic is extremely important and as the research continues hopefully there will be more breakthroughs and we will no longer see anomalies in the models differing from the data. But we must remember that we cannot ignore what is happening in other countries because we know we will feel the same things that they do, and we don't want one countries sneezing to give the world economy a cold.

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