



Permanent and Transitory Macroeconomic Relationships between China and the Developed World

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Questions this Paper Addresses

- How do the macroeconomic fluctuations of China and the developed world affect each other?
 - How much of the connection is through temporary shocks?
 - How much of the connection is through permanent shocks?
 - Do data on the output of the developed world provide new information about the relative importance of permanent versus transitory shocks for China?



Why Do We Care About Permanent Versus Transitory?

- This decomposition gives us information about:
 - the output gap.
 - the potential role for traditional macroeconomic policy to improve economic outcomes.



Why Do We Care About Correlation?

- Correlation between temporary shocks would indicate traditional business cycle connections.
- Correlation between permanent shocks would indicate long-run growth connections.
- Correlation between permanent and transitory allows for the possibility that permanent and/or temporary movements can be more volatile than the series itself.

The Data

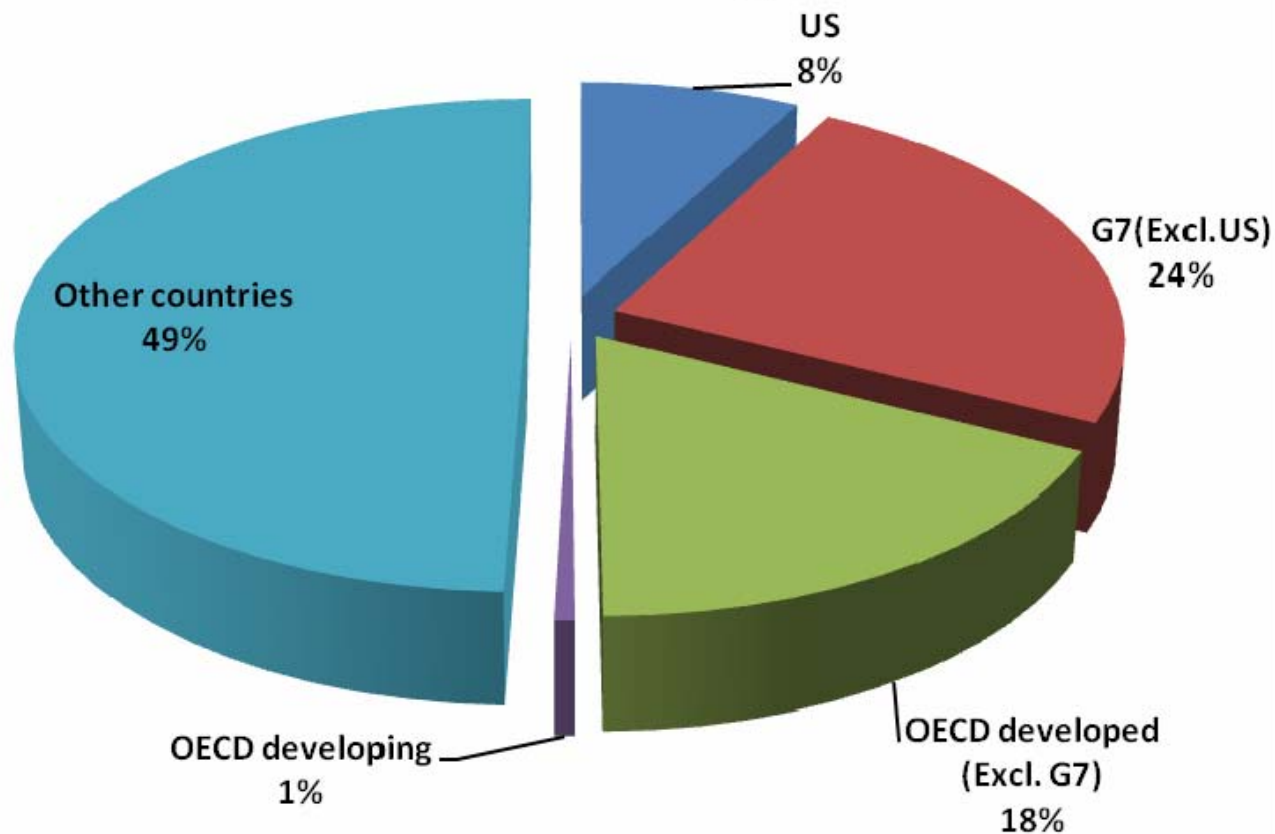
- China real GDP
 - We'll discuss the reliability in a moment.
- Real GDP for a developed country aggregate
 - OECD
 - G7
- 1978.1-2009.4
- I will also compare the results to a model of the US and China (Jia and Sinclair, 2009)

Why Look at Aggregates?



Why Look at Aggregates II

**Share of China's Imports source
2000- 2009 Average**



Source: IMF direction of trade database and calculation of the authors

The Approach

- We estimate a bivariate correlated unobserved components (UC) model
 - Decompose both series into permanent and transitory movements simultaneously.
 - Allows for correlation to estimate relationships across series.
 - Allows for correlation between permanent shocks but does not require cointegration.
 - The most general decomposition with the fewest *a priori* assumptions about the relative role of the permanent versus transitory shocks.
 - Nests most other trend-cycle decomposition methods.

The Multivariate Correlated UC Model

Output :

$$y_{it} = \tau_{it} + c_{it} \quad (1)$$

Permanent Component :

$$\tau_{it} = \mu_i + \tau_{it-1} + \eta_{it} \quad (2)$$

Transitory Component :

$$c_{it} = \phi_{1i}c_{it-1} + \phi_{2i}c_{it-2} + \varepsilon_{it} \quad (3)$$

The Covariance Matrix

$$\Sigma = \begin{bmatrix} \sigma_{\eta_{dev}}^2 & \sigma_{\eta_{dev}\eta_c} & \sigma_{\eta_{dev}\varepsilon_{dev}} & \sigma_{\eta_{dev}\varepsilon_c} \\ \sigma_{\eta_{dev}\eta_c} & \sigma_{\eta_c}^2 & \sigma_{\eta_c\varepsilon_{dev}} & \sigma_{\eta_c\varepsilon_c} \\ \sigma_{\eta_{dev}\varepsilon_{dev}} & \sigma_{\eta_c\varepsilon_{dev}} & \sigma_{\varepsilon_{dev}}^2 & \sigma_{\varepsilon_{dev}\varepsilon_c} \\ \sigma_{\eta_{dev}\varepsilon_c} & \sigma_{\eta_c\varepsilon_c} & \sigma_{\varepsilon_{dev}\varepsilon_c} & \sigma_{\varepsilon_c}^2 \end{bmatrix}$$

Overview of the Data

- $y = \log$ real GDP multiplied by 100.
- Start date
 - 1978 : examine only China's post reform period
- The developed world data
 - Aggregate real GDP for the G7 countries.
 - Aggregate real GDP for the 30 OECD member countries.
 - Both from OECD.stat
- The Chinese data
 - Official data only available quarterly since 2000.
 - From 1978-2000 we use annual data that have been disaggregated.

The Developed World Data

- Millions of US dollars, volume estimates, fixed PPPs, OECD reference year, annual levels, seasonally adjusted.
- Two different measures
 - aggregate real GDP for the G7 countries
 - Canada, France, Germany, Italy, Japan, United Kingdom, and the United States.
 - aggregate real GDP for the 30 OECD member countries (gathered before Chile was added).
 - The G7 countries + Australia, Austria, Belgium, Czech Republic, Denmark, Finland, Greece, Hungary, Iceland, Ireland, Korea, Luxembourg, *Mexico*, Netherlands, New Zealand, Norway, *Poland*, Portugal, Slovak Republic, Spain, Sweden, Switzerland, and *Turkey*.

The Chinese Data

- Quarterly real GDP level before 2000 are disaggregated from annual data based on Abeyasinghe and Rajaguru (2004).
 - Chow-Lin related series method for disaggregation.
 - Using Money Supply and International Trade, both available at the monthly frequency.
 - Found in Jia (2009) to be the most acceptable approach to date.

The Chinese Data II

- Data updated through 2009.4 with official quarterly real growth rates.
 - From the National Bureau of Statistics (NBS) of China.
 - Data gathered before the major revision based on the results of the "Second Economic Census" which ended at the end of 2009.

Chinese Data Reliability

- The official data can serve as “a reliable guide” to the level and growth pattern of GDP, even though the margins of error are “certainly larger than that of the most developed countries.” (OECD 2006)
 - The concerns come from:
 1. The data appear too smooth
 2. Not always consistent with alternative calculations or other economic variables.
 3. Quick publication
 - The problems are not unique for China and alternative data resources have not proved to be more precise. (Holz 2006, Chow 2006)

Table 1: Sample Correlations

Developed Country Measure	Quarterly Growth Rates	Year- on-Year Growth Rates	Hodrick Prescott Cycles	Baxter- King Cycles
G7	0.08	0.21	0.24	0.23
OECD	0.09	0.18	0.20	0.16
US*	0.12	0.39	0.44	0.32

Estimates from the Correlated UC Model: Key Findings

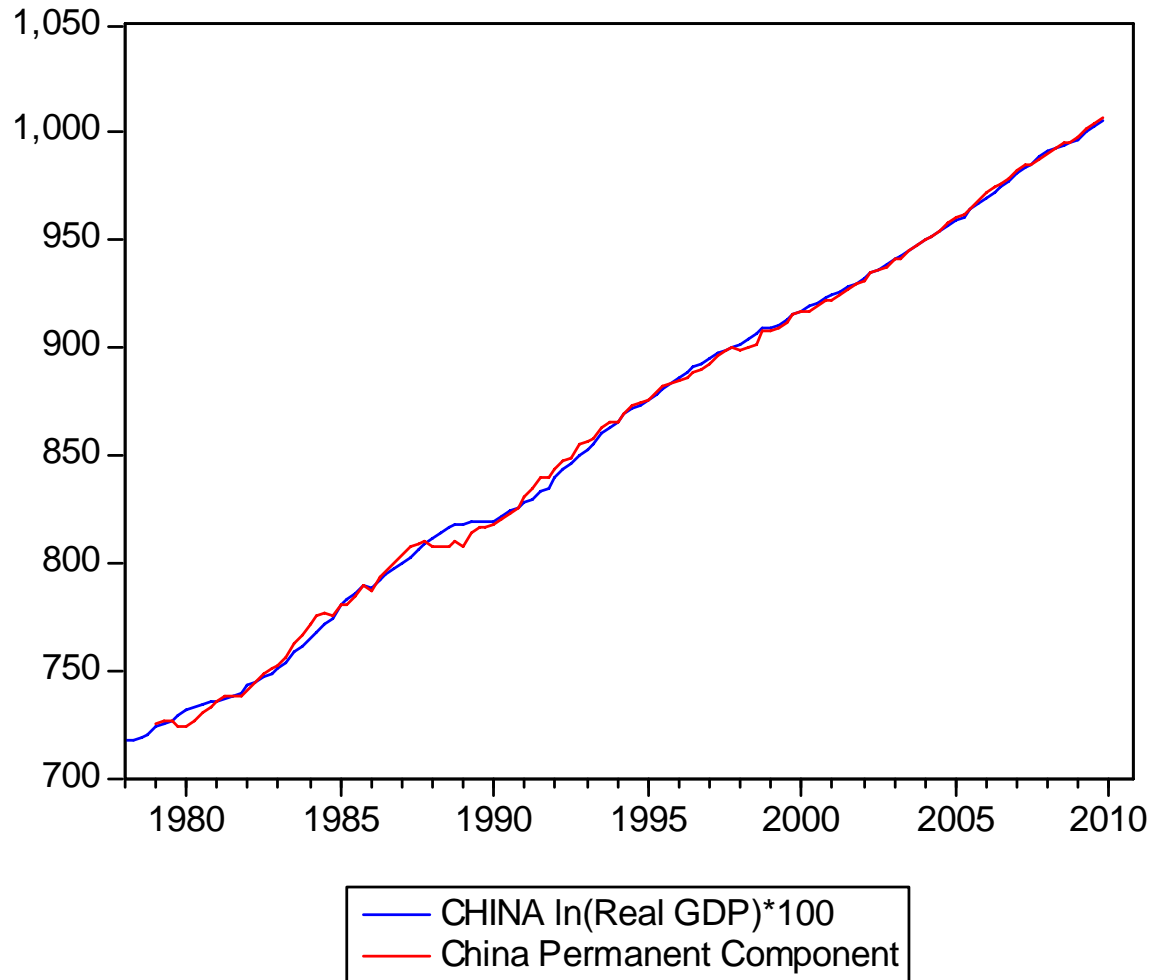
1. Variable permanent components for both China and the developed world.
 - Real shocks are important for explaining economic fluctuations.

Table 3: Standard Deviations of Shocks

	China and G7 (SE)	China and OECD (SE)	China and US* (SE)
Developed Permanent	0.97 (0.10)	0.96 (0.09)	1.08 (0.05)
China Permanent	1.32 (0.07)	1.80 (0.09)	1.88 (0.09)
Developed Transitory	0.54 (0.07)	0.61 (0.04)	0.96 (0.06)
China Transitory	0.40 (0.01)	1.21 (0.07)	0.79 (0.13)
Developed Ratio Perm/Trans	1.79	1.58	1.12
China Ratio Perm/Trans	3.25	1.49	1.50

Estimated Permanent and Transitory Components: China

(based on model with OECD)



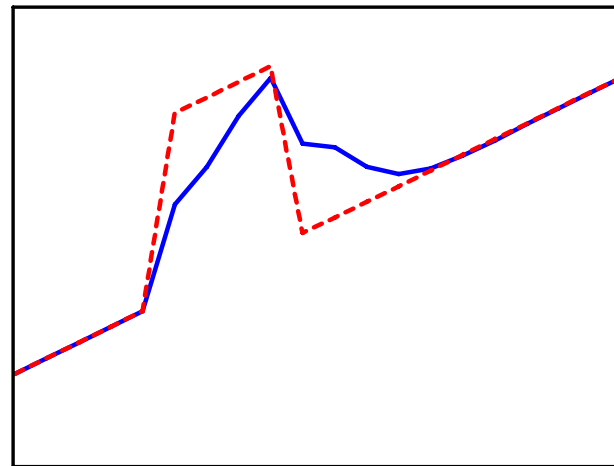
Estimates from the Correlated UC Model: Key Findings

2. Negative “within-series correlations” for both economies.
 - Typical finding for these types of models.
 - Consistent with positive serial correlation in the data.
 - MNZ and others interpret this result as an adjustment to permanent shocks.

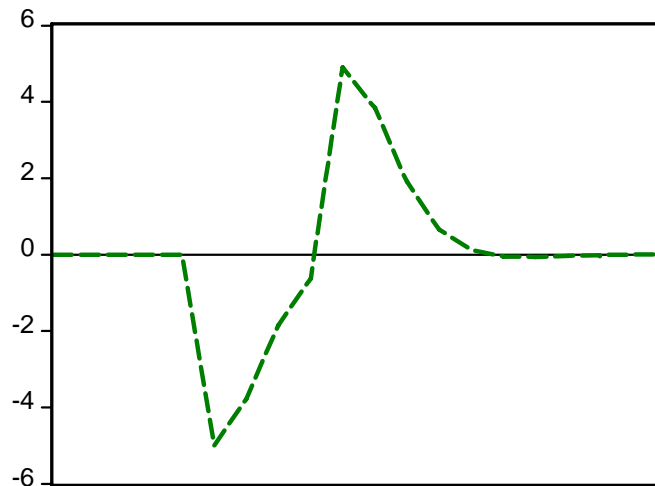
Table 4: Within-Series Correlations

	China and G7	China and OECD	China and US*
Permanent Developed with Transitory Developed	-0.99 (<0.01)	-0.96 (0.03)	-0.89 (0.07)
Permanent China with Transitory China	-0.98 (0.01)	-0.98 (<0.01)	-0.97 (<0.01)

Example of Negative Within-Series Correlation



— GDP Series
- - Permanent Component



- - Transitory Component



Estimates from the Correlated UC Model: Key Findings

3. The correlations between China with the developed aggregates are much lower than between China and the US (especially for the largest aggregate, i.e. OECD).
4. The developed world appears to adjust to permanent shocks to China, but not the reverse.

Table 5: Cross-Series Correlations

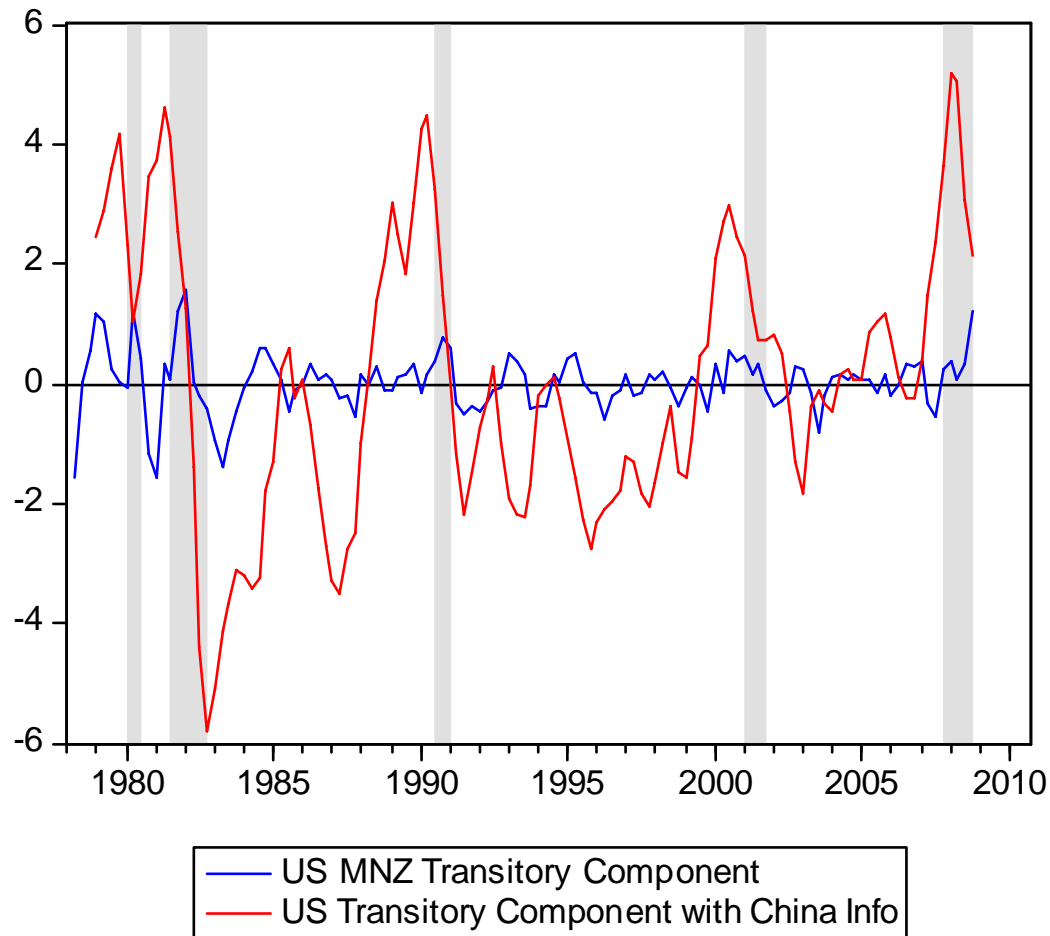
	G7	OECD	US*
Permanent China with Permanent Developed	0.24 (0.05)	0.19 (0.02)	0.56 (0.223)
Transitory China with Transitory Developed	0.19 (0.03)	0.10 (0.02)	0.60 (0.10)
Permanent Developed with Transitory China	-0.03 (0.01)	-0.02 (0.01)	-0.70 (0.17)
Permanent China with Transitory Developed	-0.39 (0.02)	-0.28 (0.03)	-0.55 (0.10)



Estimates from the Correlated UC Model: Key Findings

5. With information from the real output of China, the magnitude of the estimated transitory component of US real GDP is dramatically larger.

Transitory Components Comparison with MNZ Univariate Model--US

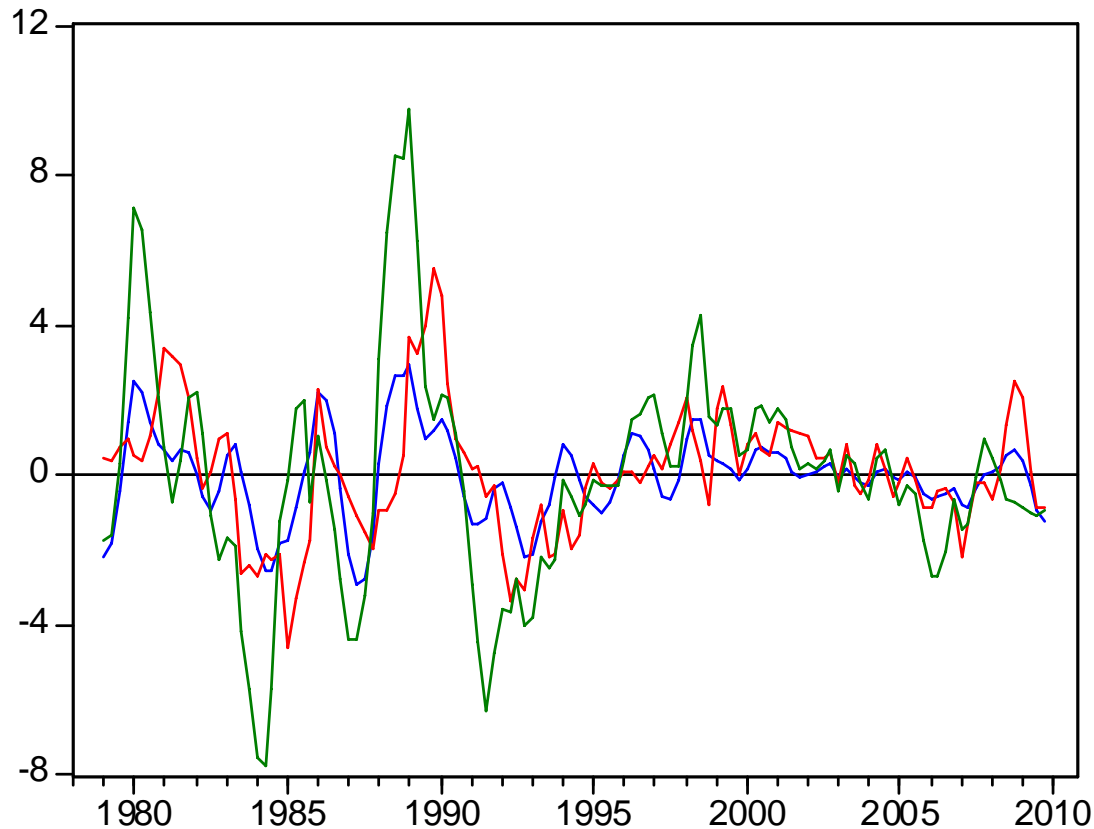




Estimates from the Correlated UC Model: Key Findings

6. China's real GDP decomposition does not change much with the addition of US information or with the G7, but it changes substantially with information from the OECD.

Transitory Components comparison with MNZ univariate model--China



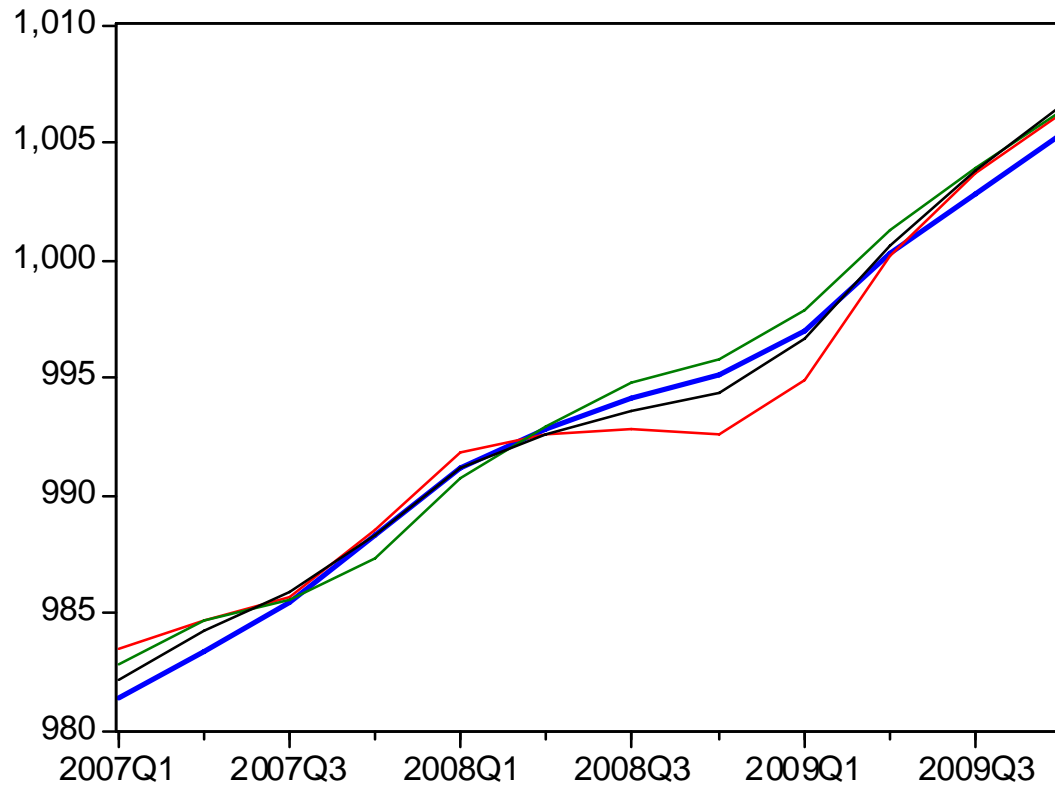
- China Cycle with G7 Information
- China Univariate Cycle
- China Cycle with OECD Information



Estimates from the Correlated UC Model: Key Findings

7. According to the bivariate models, the permanent component remained much closer to the series for the “Great Recession” of 2007-2009 as compared to the estimates from a univariate model. These results emphasize our finding that the bivariate models suggest that there is much more transitory movement in China’s real GDP than found based on a univariate model.

Figure 3: Zoom-in on the Great Recession for China



- China Real GDP
- China Permanent Component from Univariate Model
- China Permanent Component from Bivariate Model with OECD Aggregate
- China Permanent Component from Bivariate Model with G7 Aggregate

Conclusions

- We estimated a bivariate correlated UC model for the real GDP of China with different developed country measures with quarterly data from 1978 through 2009
 - Examine the cross-series relationships.
 - Divided into permanent and transitory relationships.
 - Also reveals the relative importance of permanent versus transitory movements for each series using information provided by the other series.

Conclusions (continued)

- We find that
 - Economic fluctuations of China and developed countries are positively correlated for both permanent and transitory shocks.
 - The OECD measure of developed world output provides substantial information for estimating the transitory component of China, whereas the US provides little information.
 - By contrast, although China provides much information for the US by itself, China provides little information for the aggregate developed world measures.

GDP output
countries
China

transitory
permanent
shocks
components
model
series
fluctuations
information
developed
OECD
China's
real
aggregate
correlations
correlated
estimates
two
series
China's
real
OECD
models
developed
cycle
provides
Component
important
using
movements
Sinclair
world
Permanent growth
measures
trend
based
general
find
unobserved
movements
long
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