

BRICS: Testing for Commonalities using Common Features

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- 4 Cointegration is the most well-known example of common features.
- 5 Serial correlation-common features (SCCF) or *common cycles* are also well-known: stationary series y_{1t} and y_{2t} both have serial correlation (are predictable), but there exists $y_{1t} - \tilde{\alpha}y_{2t}$ which is white noise (unpredictable).

Engle and Kozicki (1993) main example.

- ① No cointegration for log-levels of GDP for the U.S. and Canada. Instantaneous growth rates of GDP for the U.S. and Canada have serial correlation and there is a linear combination of growth rates that is white noise. Cycles in U.S. and Canadian GDP growth are synchronized.

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- 2 This is our main finding between the growth rates of GDP for BRICS countries (also for Industrial Production).

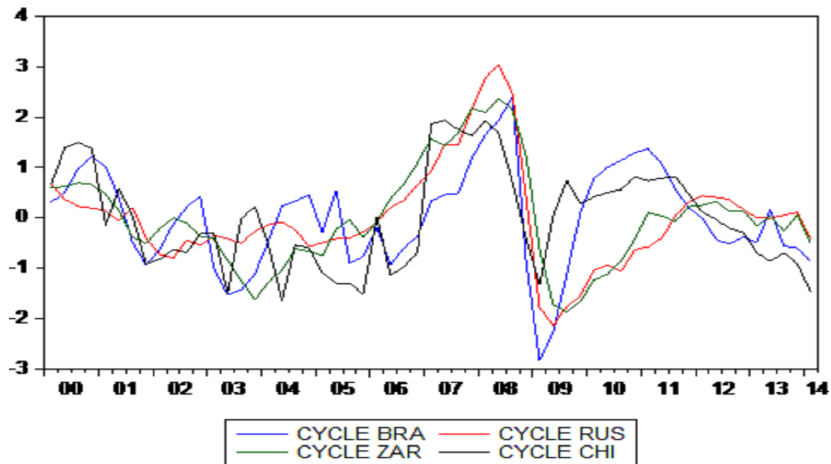
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- 3 Factor models and *latent* features:

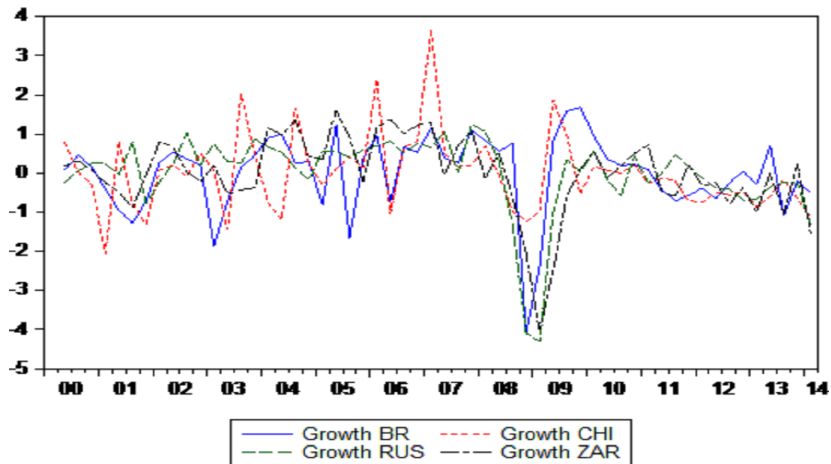
$$\begin{pmatrix} \Delta \ln y_t^{US} \\ \Delta \ln y_t^{CAN} \end{pmatrix} = \begin{pmatrix} \lambda \\ 1 \end{pmatrix} f_t + \begin{pmatrix} \varepsilon_t^{US} \\ \varepsilon_t^{CAN} \end{pmatrix}, \text{ or,}$$
$$\Delta \ln y_t^{US} - \lambda \Delta \ln y_t^{CAN} = \varepsilon_t^{US} - \lambda \varepsilon_t^{CAN},$$

$\begin{pmatrix} 1 & -\lambda \end{pmatrix}$ is the *cofeature* vector, eliminating the SCCF.

Common GDP Cycles – BRICS (no India)



Common Growth Cycles – BRICS (no India)



Vahid and Engle (1993): VAR for y_t , an n -vector of $I(1)$ log GDP (or log Industrial Production):

$$y_t = \Gamma_1 y_{t-1} + \dots + \Gamma_p y_{t-p} + \epsilon_t. \quad (1)$$

VECM:

$$\Delta y_t = \Gamma_1^* \Delta y_{t-1} + \dots + \Gamma_{p-1}^* \Delta y_{t-p+1} + \gamma \alpha' y_{t-1} + \epsilon_t. \quad (2)$$

Normalized cofeature vectors:

$$\tilde{\alpha} = \begin{bmatrix} I_s \\ \tilde{\alpha}_{(n-s) \times s}^* \end{bmatrix}$$

Quasi-structural model (restricted VECM):

$$\begin{bmatrix} I_s & \tilde{\alpha}' \\ \mathbf{0} & I_{n-s} \end{bmatrix} \Delta y_t = \begin{bmatrix} \mathbf{0} & & & \\ & s \times (np+r) & & \\ \Gamma_1^{**} & \dots & \Gamma_{p-1}^{**} & \gamma^* \end{bmatrix} \begin{bmatrix} \Delta y_{t-1} \\ \vdots \\ \Delta y_{t-p+1} \\ \alpha' y_{t-1} \end{bmatrix} + v_t. \quad (3)$$

GMM approach: exploits the following moment restriction and test H_0 : existence of s linearly independent SCCF:

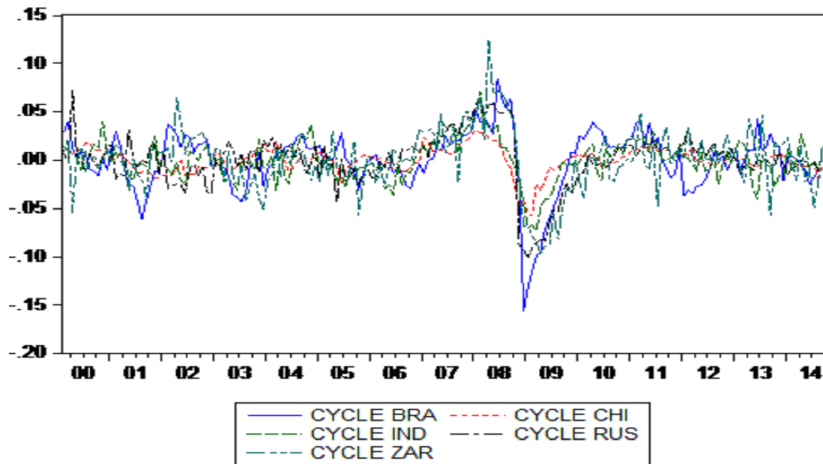
$$0 = \mathbb{E} \left[\begin{pmatrix} \begin{bmatrix} I_s & \tilde{\alpha}^{*'} \\ \mathbf{0} & I_{n-s} \end{bmatrix} \Delta y_{t-} \\ \begin{bmatrix} \mathbf{0} \\ \Gamma_1^{**} \cdots \Gamma_{p-1}^{**} \gamma^* \end{bmatrix} \begin{bmatrix} \Delta y_{t-1} \\ \vdots \\ \Delta y_{t-p+1} \\ \alpha' y_{t-1} \end{bmatrix} \end{pmatrix} \otimes Z_{t-1} \right],$$

where the elements of Z_{t-1} are the instruments comprising past series: $\alpha' y_{t-1}, \Delta y_{t-1}, \Delta y_{t-2}, \dots, \Delta y_{t-p+1}$. The test for common cycles is an over-identifying restriction test – the J test proposed by Hansen (1982). This test is robust to HSK of unknown form if it uses a White-correction in its several forms.

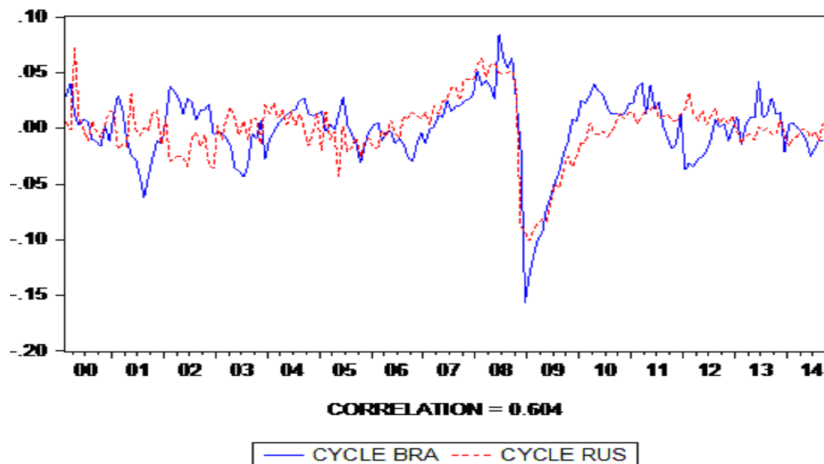
GDP				
Country	Brazil	China	Russia	South Africa
Brazil	-			
China	0.70	-		
Russia	0.50	0.48	-	
South Africa	0.37	0.62	0.17	-

Table: **Real GDP**: P-Values of Common-cycle tests – GMM based

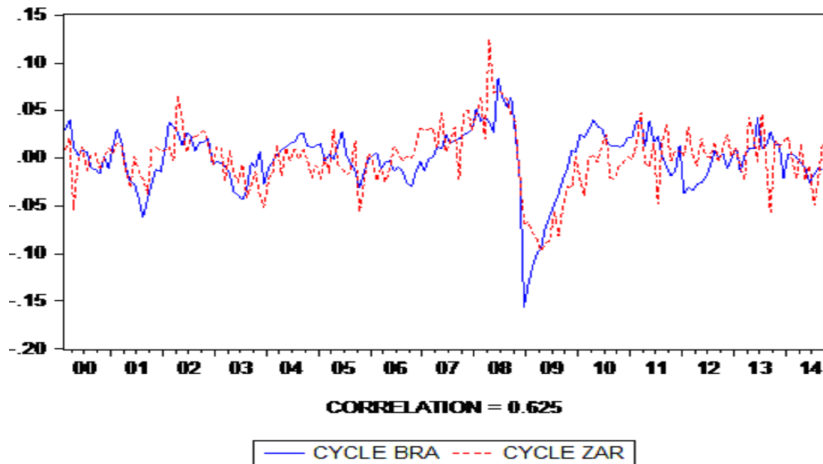
Common Cycles in Industrial Production



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Common Cycles in Industrial Production



Industrial Production

Country	Brazil	China	India	Russia	South Africa
Brazil	-				
China	0.050	-			
India	0.022	0.066	-		
Russia	0.410	0.180	0.015	-	
South Africa	0.390	0.062	0.012	0.030	-

Table: **Industrial Production:** P-Values of Common-cycle tests – GMM based

Exports

Country	Brazil	China	India	Russia	South Africa
Brazil	-				
China	0.004	-			
India	0.013	0.001	-		
Russia	0.002	0.005	0.000	-	
South Africa	0.002	0.001	0.002	0.000	-

Table: Exports: P-Values in Common-cycle tests – GMM based

Imports

Country	Brazil	China	India	Russia	South Africa
Brazil	-				
China	0.002	-			
India	0.015	0.002	-		
Russia	0.210	0.019	0.003	-	
South Africa	0.001	0.001	0.370	0.003	-

Table: Imports: P-Values in Common-cycle tests – GMM based

BRICS and US

Country	Industrial Production	GDP
Brazil	0.09	0.22
China	0.54	0.69
India	0.62	-
Russia	0.21	0.14
South Africa	0.48	0.23

Table: **BRICS and US:** P-Values of Common-cycle tests – GMM based

BRICS and Euro zone

Country	Industrial Production	GDP
Brazil	0.057	0.293
China	0.050	0.420
India	0.011	-
Russia	0.021	0.270
South Africa	0.024	0.210

Table: **BRICS and Euro zone:** P-Values of Common-cycle tests – GMM based