Do BRC Countries Respond to Financial Stress in their Monetary Policy Settings ?

A Time Varying Policy Analysis

Nimantha P. Manamperi, Department of Economics, Texas Tech University.
Lubbock, Texas 79409.

ABSTRACT

This Paper investigates the responsiveness of the monetary policy settings in the BRC countries (Brazil, Russia and China) to different financial stress conditions over the last two decades. The International Monetary Fund's emerging country financial stress index along with its sub components; Banking Stress, Security market Stress and Exchange Rate Stress is used to measure the financial stress. A time varying coefficient model for a forward looking monetary policy rule is used to estimate the results. The estimation was preceded via a varying coefficient (VC) technique.

The initial results suggested the money supply over the official interest rate as the most effective monetary policy tool for BRCs. The main results found that the BRC country central banks have loosened the monetary policy during higher financial stress periods and significantly responded to exchange rate stress over the other two sub stresses. Moreover the financial stress effect on the monetary policy setting was insignificant during normal economic conditions. However the financial stress effect was considerably higher during local and regional economic and financial crisis times than that during global financial crisis times.

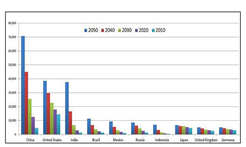
RESEARCH QUESTION

Financial Stress
Advanced Countries → Financial Linkages / Trade Linkages → **Emerging Countries**
Financial Stress

1. Does the Financial Stress affect the Monetary Policy ?
2. Do BRC Countries respond to Global Financial Stress in their Monetary Policy Settings?

BRICS

Brazil, Russia, India, China



- Economic Powers
- Geographical Powers
- Political Powers
- Population Powers

Figure 1 : The ten largest economies in the world in 2050, in GDP (billions of 2006 USD)

FINANCIAL STRESS MEASURED … EM_FSI

Financial Stress

Banking Stress | **Security Stress** | **Exchange Stress**

EM_FSI = β + Stock Market Returns + Stock Market Volatility + Sovereign Debt Spread + EMPI (1)

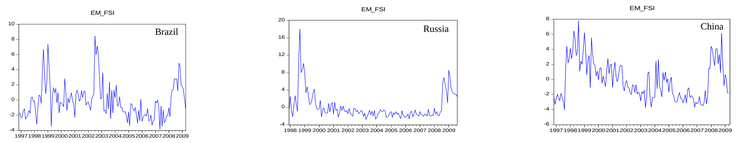


Figure 2 : The EM_FSI Flow of Brazil, Russia and China

MODEL

$$r_t^* = \bar{r} + \beta\,(E\,[\pi_{t+i}\,|\Omega_t\,] - \pi_{t+i}^*) + \gamma E[y_{t+j}|\Omega_t] \quad (2)$$

r_t^*: The target interest rate, $\bar{r}$: The policy neutral rate, π_{t+i} : The forecasted yearly inflation rate, Ω_t : The current information set on interest rate decisions, π_{t+i}^* : The targeted Inflation rate, y_{t+j} : The output gap.

$$r_t = \rho r_{t-1} + (1-\rho) r_t^* + \nu_t \quad ; 0 \le \rho < 1 \text{ (Interest Smoothing)} \quad (3)$$

State Space Representation :

$$r_t = (1-\rho_t)\big[\,\alpha_t + \beta_t\,(\pi_{t+i} - \pi_{t+i}^*) + \gamma_t y_{t+j}\big] + \rho_t r_{t-1} + \delta_t x_{t+k} + \varepsilon_t \quad (4)$$

$$\alpha_t = \alpha_{t-1} + \tau_{1,t} \quad ,\tau_{1,t} \sim i.i.d.N(0,\sigma_{\tau_1}^2) \quad (5)$$
$$\beta_t = \beta_{t-1} + \tau_{2,t} \quad ,\tau_{2,t} \sim i.i.d.N(0,\sigma_{\tau_2}^2) \quad (6)$$
$$\gamma_t = \gamma_{t-1} + \tau_{3,t} \quad ,\tau_{3,t} \sim i.i.d.N(0,\sigma_{\tau_3}^2) \quad (7)$$
$$\rho_t = \rho_{t-1} + \tau_{4,t} \quad ,\tau_{4,t} \sim i.i.d.N(0,\sigma_{\tau_4}^2) \quad (8)$$
$$\delta_t = \delta_{t-1} + \tau_{5,t} \quad ,\tau_{5,t} \sim i.i.d.N(0,\sigma_{\tau_5}^2) \quad (9)$$

$$\pi_{t+i} = Z'_{t-f}\,\psi + \sigma_\varphi \varphi_t \quad ,\varphi_t \sim i.i.d.N(0,1) \quad (10)$$
$$y_{t+i} = Z'_{t-f}\,\Gamma + \sigma_\zeta \zeta_t \quad ,\zeta_t \sim i.i.d.N(0,1) \quad (11)$$
$$x_{t+i} = Z'_{t-f}\,\eta + \sigma_\vartheta \vartheta_t \quad ,\vartheta_t \sim i.i.d.N(0,1) \quad (12)$$

where $[\varepsilon_t\,|\Omega_{t-1}] \sim N(0,\sigma_{\varepsilon t}^2)$

STEP 1 : Estimate equations (10) – (12) via maximum likelihood Kalman filter as in Harvey (1992) to obtain standardized residuals for $\varphi_t, \zeta_t, \vartheta_t$.

$$r_t = (1-\rho_t)\big[\,\alpha_t + \beta_t\,(\pi_{t+i} - \pi_{t+i}^*) + \gamma_t y_{t+j}\big] + \rho_t r_{t-1} + \delta_t x_{t+k} + \lambda_{\varphi,\varepsilon}\sigma_\varepsilon\varphi_t^* + \lambda_{\zeta,\varepsilon}\sigma_\epsilon\zeta_t^* + \lambda_{\vartheta,\varepsilon}\sigma_\varepsilon\vartheta_t^* + \omega_t \quad (13)$$

STEP 2 : Estimate equation (13) using the Varying Coefficient Estimation (VC) Procedure.

$$\sum_{t=1}^{T} w_t^2 + \theta_1 \sum_{t=1}^{T}\tau_{1,t}^2 + \theta_2 \sum_{t=1}^{T}\tau_{2,t}^2 + \theta_3 \sum_{t=1}^{T}\tau_{3,t}^2 + \theta_4 \sum_{t=1}^{T}\tau_{4,t}^2 + \theta_5 \sum_{t=1}^{T}\tau_{5,t}^2 \quad ; \text{Where } \theta_i = \sigma^2/\sigma_i^2$$

Note : BRIC countries use Monetary Aggregates as the Principle Monetary policy tool. Therefore Interest rate is replaced by the M2 Growth Rate (m_t). Equation (15) also includes the Real Effective Exchange rate (E_t) as BRICs consider Exchange rate as another variable in determining the Monetary Policy.

$$m_t = (1-\rho_t)\big[\,\alpha_t + \beta_t\,(\pi_{t+i} - \pi_{t+i}^*) + \gamma_t y_{t+j}\big] + \rho_t m_{t-1} + \delta_t x_{t+k} + \lambda_{\varphi,\varepsilon}\sigma_\varepsilon\varphi_t^* + \lambda_{\varsigma,\varepsilon}\sigma_\epsilon\varsigma_t^* + \lambda_{\vartheta,\varepsilon}\sigma_\varepsilon\vartheta_t^* + \omega_t \quad (14)$$

$$m_t = (1-\rho_t)\big[\,\alpha_t + \beta_t\,(\pi_{t+i} - \pi_{t+i}^*) + \gamma_t y_{t+j} + \phi_t E_t\,\big] + \rho_t m_{t-1} + \delta_t x_{t+k} + \lambda_{\varphi,\varepsilon}\sigma_\varepsilon\varphi_t^* + \lambda_{\varsigma,\varepsilon}\sigma_\epsilon\varsigma_t^* + \lambda_{\vartheta,\varepsilon}\sigma_\varepsilon\vartheta_t^* + \omega_t \quad (15)$$

RESULTS

Figure 3 : The Time varying Effects of Financial stress on Interest Rate Rule Monetary Policy

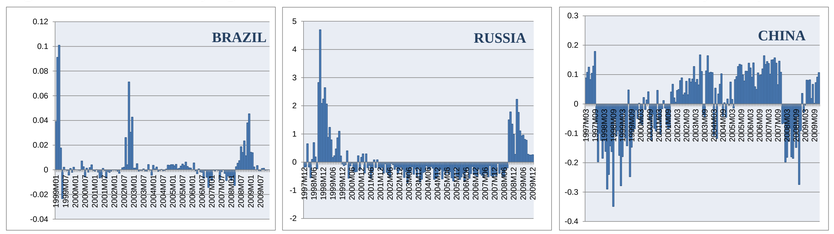
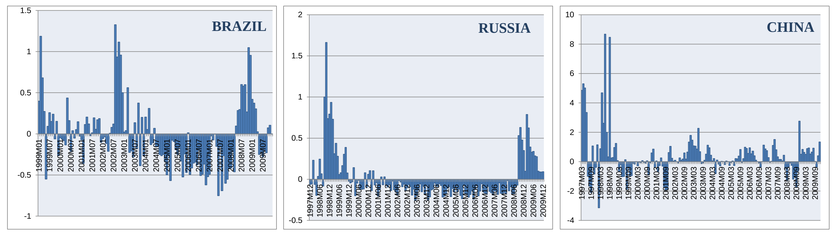


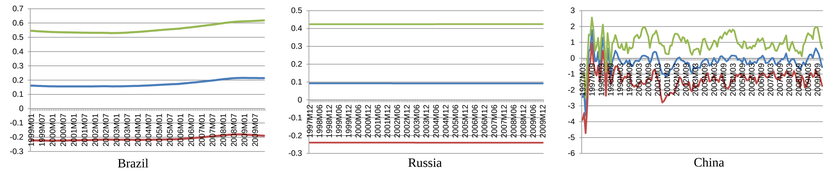
Figure 4 : The Time varying Effects of Financial Stress on Monetary Aggregate Rule



Note: *The y-axis is defined as the product of the financial stress indicator and the estimated coefficient (ôx)*

Figure 5 : The Time varying Effects of Financial Stress on Monetary Aggregate Rule (with E_t)

Figure 6 : Time Varying Coefficients of Financial Stress (δ_t)



Note : *The Blue line indicates the coefficient values. The Green and Red lines represent the 90% confidence interval bands.*

Figure 7 : Banking, Security and Exchange Stress on the Monetary Policy Rule (m_t)

Note: *The y-axis is defined as the product of the corresponding sub-financial stress indicator and the estimated coefficient (ôx)*

CONCLUSION

- Brazil & Russia : The effect of financial stress → Insignificant at 10% significant level for all times.
- China : The effect of financial stress → Significant at 10% significant level during the 1997 Asian Financial Crisis.
- BRC's Monetary Policy did not React to 2008 Global Financial Crisis .
- However the effect of financial stress on the monetary policy setting during economic turbulence times shows considerable impacts.
- Effects are intense during local or regional economic and financial crises than during advanced country economic crises.
- Monetary easing behavior of the Central Banks in BRCs during financial and economic crisis times.
- Higher policy reaction to Exchange Rate Stress than for Banking and Security market Stresses.

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