Country Spreads and Emerging Countries: Who Drives Whom?

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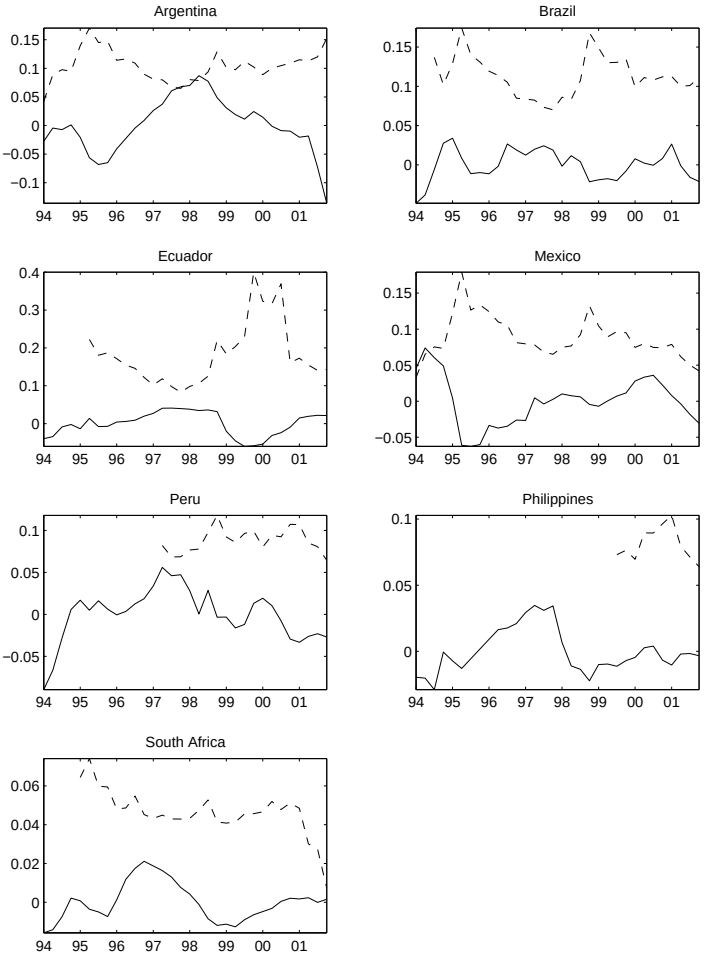
(JIE, 2006)

Country Interest Rates and Output in Seven Emerging Countries



_____ Output _ _ _ _ _ Country Interest Rate

The Empirical Model

$$A \begin{bmatrix} \widehat{y}_t \\ \widehat{\imath}_t \\ tby_t \\ \widehat{R}_t^{us} \\ \widehat{R}_t \end{bmatrix} = B \begin{bmatrix} \widehat{y}_{t-1} \\ \widehat{\imath}_{t-1} \\ tby_{t-1} \\ \widehat{R}_{t-1}^{us} \\ \widehat{R}_{t-1} \end{bmatrix} + \begin{bmatrix} \epsilon_t^y \\ \epsilon_t^i \\ \epsilon_t^{tby} \\ \epsilon_t^{rus} \\ \epsilon_t^r \end{bmatrix}$$

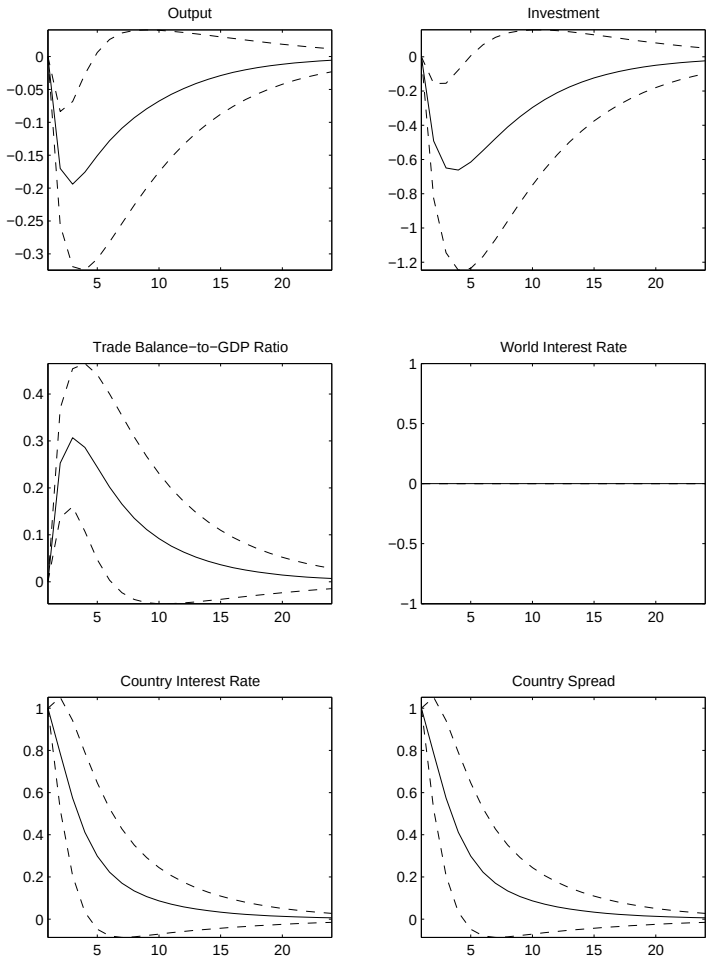
Identification Assumptions:

- A is lower triangular
- R_t^{US} follows a univariate process

Countries: Argentina, Brazil, Ecuador, Mexico, Peru, the Phillipines, South Africa.

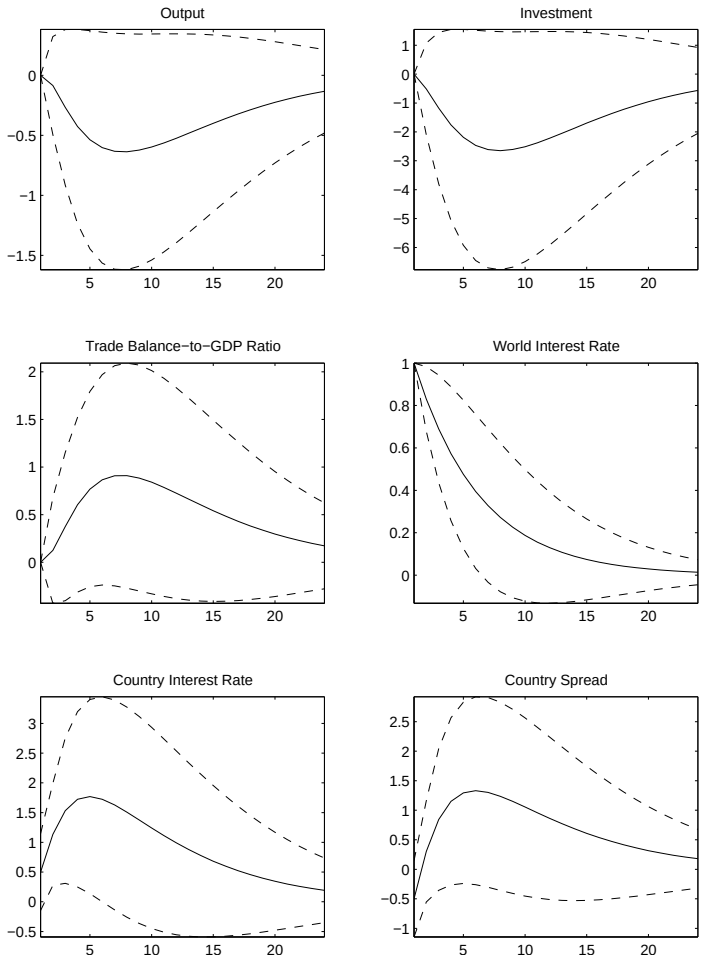
Sample Period: 1994:1 to 2001:4

Impulse Response To A Country-Spread Shock



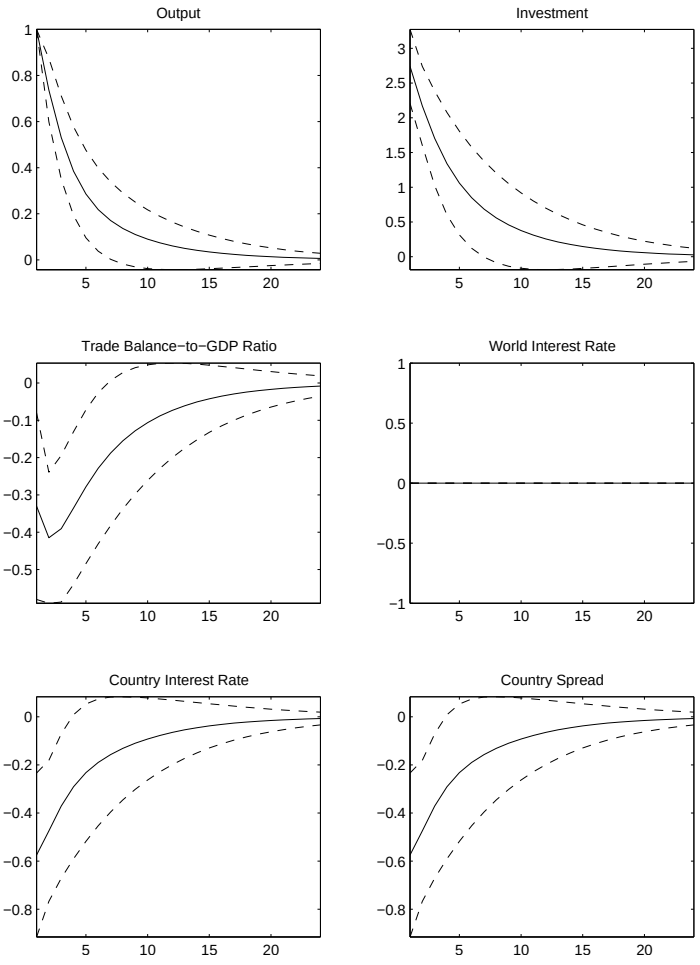
_____ Point Estimate _ _ _ _ _ Error Band

Impulse Response To A World-Interest-Rate Shock



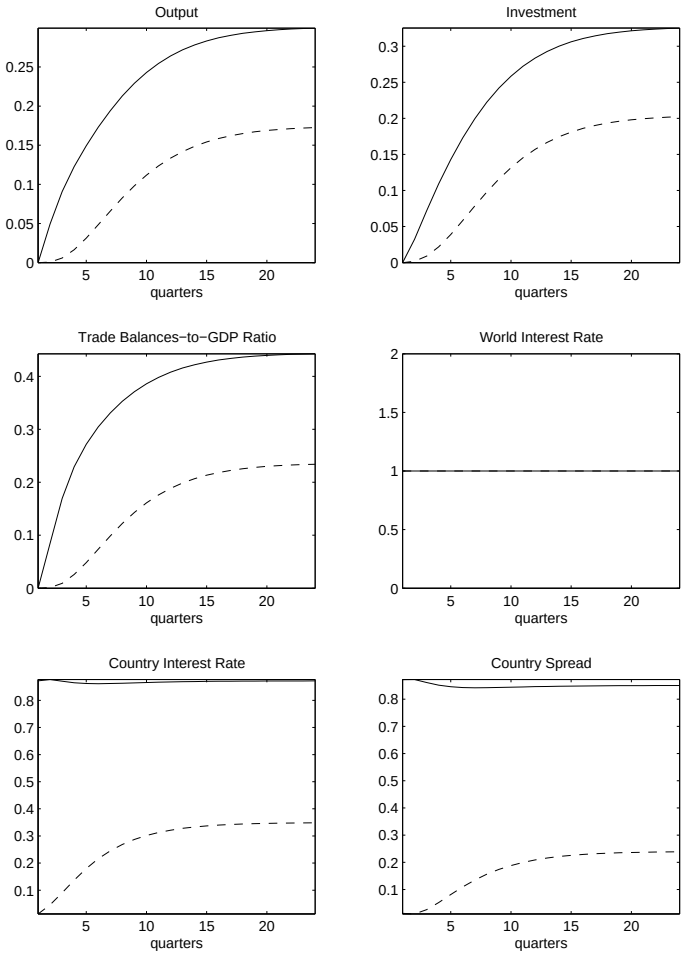
Point Estimate Error Band

Impulse Response To An Output Shock



_____ Point Estimate _ _ _ _ _ Error Band

Variance Decomposition



$\epsilon^{rus} + \epsilon^{r}$ ϵ^{rus}

Alternative Identification Scheme: Place Country Spreads first in the VAR system

Implication: Output and investment expand in response to an increase in the world interest rate.

Problem: It's difficult to rationalize this implication on theoretical grounds.

Aggregate Volatility With and Without Feedback of Spreads from Domestic Variables

Variable	Feedback	No Feedback
	Std. Dev.	Std. Dev.
$\widehat{y}$	3.65	3.07
$\widehat{\imath}$	14.11	11.93
tby	4.38	3.52
R	6.50	4.77

Result: Eliminating feedback of spreads from domestic variables reduces aggregate volatility by about 20 percent.

Caution: The Lucas critique applies. We will redo this exercise using a theoretical optimizing model.

Summary of Empirical Findings

1. An increase in the world interest rate or in the country spread causes output and investment to fall and the trade balance to improve.

2. An increase in the world interest rate causes a delayed overshooting in the country spread

3. The effects of world-interest-rate shocks on domestic variables is measured with significant uncertainty.

4. US-interest-rate shocks account for 20 percent of aggregate fluctuations in Emerging Markets.

5. Country-spread shocks explain about 12 percent of aggregate fluctuations in EM

6. About 60 percent of movements in country spreads are explained by country-spread shocks.

The Theoretical Model

Standard small open economy neoclasscial model with 3 modifications:

- Habit formation
- Gestation lags and convex adjustment costs in investment
- Working-capital constraint on firms

Households

$$\max E_0 \sum_{t=0}^{\infty} \beta^t U(c_t - \mu \tilde{c}_{t-1}, h_t),$$

subject to

$$d_t = R_{t-1} d_{t-1} - w_t h_t - u_t k_t + c_t + i_t + \Psi(d_t)$$

$$i_t = \frac{1}{4} \sum_{i=0}^{3} s_{it}.$$

$$s_{i+1\,t+1} = s_{it}$$

$$k_{t+1} = (1 - \delta) k_t + k_t \Phi \left(\frac{s_{3t}}{k_t} \right)$$

$$\lim_{j \to \infty} E_t \frac{d_{t+j+1}}{\prod_{s=0}^{j} R_{t+s}} \leq 0$$

Decentralizing the Debt Adjustment Costs

Domestic Banks:

- Borrow externally at rate R_t
- Lend domestically at rate R_t^d
- Face operational costs $\Psi(d_t)$
- Compete atomistically for domestic deposits

Domestic Banks' Objective

$$\max_{d_t} R_t^d[d_t - \Psi(d_t)] - R_t d_t$$

Optimality Condition

$$R_t^d = \frac{R_t}{1 - \Psi'(d_t)}$$

Firms

Evolution of the Firm's Debt Position

$$d_t^f = R_{t-1}^d d_{t-1}^f - F(k_t, h_t) + w_t h_t + u_t k_t + \pi_t - \kappa_{t-1} + \kappa_t$$

Working-Capital Constraint

$$\kappa_t \geq \eta w_t h_t; \quad \eta \geq 0$$

Firm's Objective

$$\max E_0 \sum_{t=0}^{\infty} \beta^t \frac{\lambda_t}{\lambda_0} \pi_t$$

Optimality Conditions

$$F_h(k_t, h_t) = w_t \left[1 + \eta \left(\frac{R_t^d - 1}{R_t^d} \right) \right]$$

$$F_k(k_t, h_t) = u_t$$

Driving Forces

$$\begin{aligned}\widehat{R}_t &= 0.63\widehat{R}_{t-1} + 0.50\widehat{R}^{us}_t + 0.35\widehat{R}^{us}_{t-1} - 0.79\widehat{y}_t \\ &+ 0.61\widehat{y}_{t-1} + 0.11\widehat{\imath}_t - 0.12\widehat{\imath}_{t-1} + 0.29tby_t \\ &- 0.19tby_{t-1} + \epsilon^r_t,\end{aligned}$$

$$\widehat{R}^{us}_t = 0.83\widehat{R}^{us}_{t-1} + \epsilon^{rus}_t,$$

where ϵ^r_t ϵ^{rus}_t are mean-zero iid innovations with standard deviations equal to 0.031 and 0.007, respectively.

Functional Forms

$$U(c-\mu\tilde{c},h)=\frac{\left[c-\mu\tilde{c}-\omega^{-1}h^{\omega}\right]^{1-\gamma}-1}{1-\gamma}$$

$$F(k,h)=k^{\alpha}h^{1-\alpha}$$

$$\Phi(x)=x-\frac{\phi}{2}(x-\delta)^2;\quad \phi>0$$

$$\Psi(d)=\frac{\psi}{2}(d-\bar{d})^2$$

Calibrated Parameters (Quarterly)

$$\omega=1.45$$

$$\gamma=2$$

$$\alpha=0.32$$

$$R=\beta^{-1}=1.0277$$

$$\delta=0.025$$

Estimating ϕ, ψ, η, and μ

Criterion: Minimize the distance between empirical and theoretical Impulse Response Functions.

Formally, ϕ, ψ, η, and μ are set so as to minimize

$$[IR^e - IR^m(\psi, \phi, \eta, \mu)]' \Sigma_{IR^e}^{-1} [IR^e - IR^m(\psi, \phi, \eta, \mu)],$$

Result:

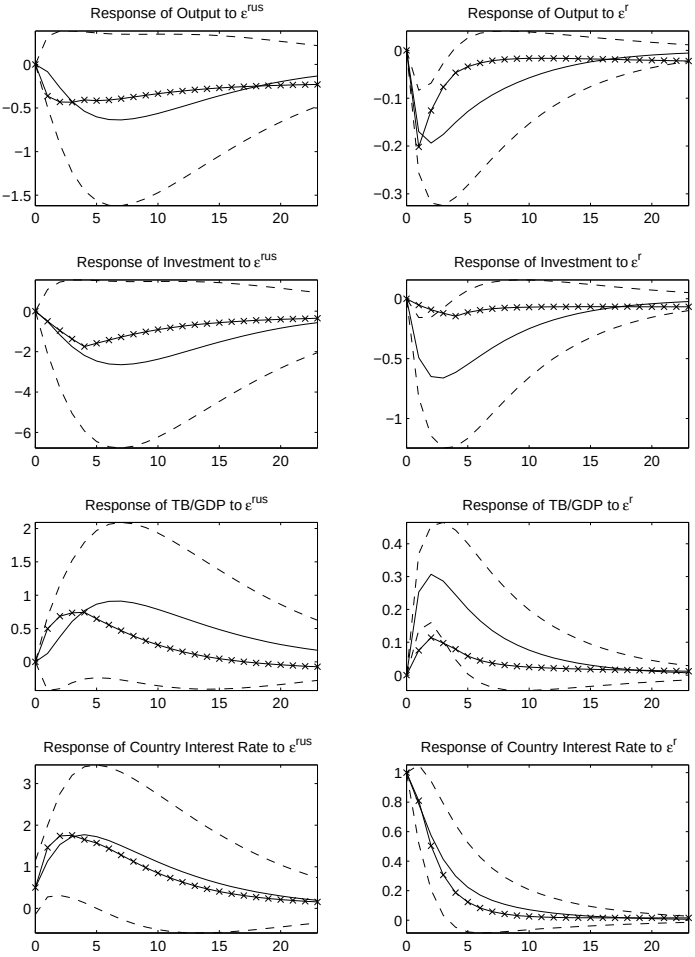
$$\psi = 0.0002$$

$$\phi = 128$$

$$\eta = 1.31$$

$$\mu = 0.26$$

Theoretical and Estimated Impulse Response Functions



___ Empirical IR _ _ _ Error Band -x-x Theoretical IR

Counterfactual Experiment 1: Country Spreads Don't Respond To The World Interest Rate

Replace baseline Interest-Rate process with:

$$\begin{aligned}\widehat{R}_t &= 0.63\widehat{R}_{t-1} + \widehat{R}_t^{us} - 0.63\widehat{R}_{t-1}^{us} - 0.79\widehat{y}_t \\ &+ 0.61\widehat{y}_{t-1} + 0.11\widehat{\imath}_t - 0.12\widehat{\imath}_{t-1} + 0.29tby_t \\ &- 0.19tby_{t-1} + \epsilon_t^r,\end{aligned}$$

Result: Aggregate volatility due to R_t^{us} shocks falls by two thirds $\Rightarrow$ Most of the effects of world-interest-rate shocks on Emerging Countries are mediated through country spreads.

Counterfactual Experiment 2: Country Spreads Don't Respond To Domestic Fundamentals

Replace baseline Interest-Rate process with:

$$\hat{R}_t = 0.63\hat{R}_{t-1} + 0.50\hat{R}_t^{us} + 0.35\hat{R}_{t-1}^{us} + \epsilon_t^r,$$

Result: Aggregate volatility explained jointly by ϵ_t^r and ϵ_t^{rus} falls by one third.

Summary

1. US-interest-rate shocks account for 20 percent of aggregate fluctuations in EM.

2. Country-spread shocks explain about 12 percent of aggregate fluctuations in EM

3. About 60 percent of movements in country spreads are explained by country-spread shocks.

4. US-interest-rate shocks affect domestic variables mostly through their effects on country spreads.

5. Domestic effects of world-interest-rate shocks are measured with significant uncertainty

6. The fact that country spreads respond to business conditions in EM exacerbates aggregate volatility in the region.

7. The US-interest-rate shocks and country-spread shocks identified in this paper are plausible in the sense that they imply similar business cycles in the context of an empirical VAR model as they do in the context of a theoretical dynamic general equilibrium model of the emerging economy.