CAPITAL FLOWS, *TERMS OF TRADE*, *AND REAL EXCHANGE RATE FLUCTUATIONS*

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After financial openings, like that in Spain and Mexico in the late 1980s, large capital inflows have been accompanied by substantial appreciations in the real exchange rate.

Previous work has shown that, to capture the timing of capital inflows and the changes in the relative prices of nontraded goods, frictions in factor markets are important.

The model here stresses the role of the imperfect substitutability between domestic and foreign traded goods in determining the terms of trade, whose movements are major components of real exchange rate fluctuations.

This is preliminary work based on

”Capital Flows and Real Exchange Rate Fluctuations Following Spain’s Entry into the European Community,” with Gonzalo Fernandez de Cordoba.

”Tradability of Goods and Real Exchange Rate Fluctuations” with Caroline M. Betts

REAL EXCHANGE RATE

$$RER = NER \times \frac{P_{ger}}{P_{esp}}$$

units: $\dfrac{\text{pesetas}}{\text{deutsche marks}}$

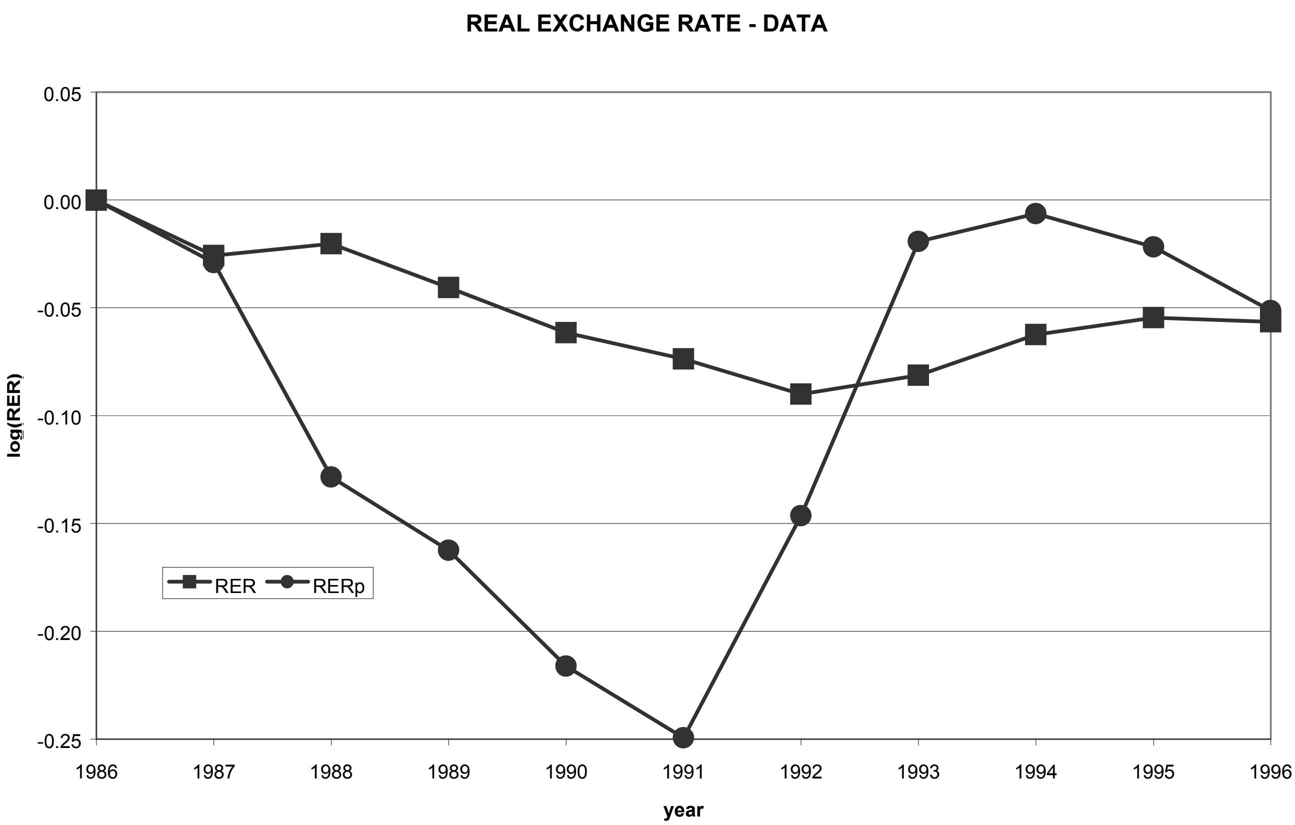
$$\times \frac{\text{deutsche marks/German basket}}{\text{pesetas/Spanish basket}}$$

$$= \frac{\text{Spanish basket}}{\text{German basket}}$$

Suppose $P^T_{esp} = NER \times P^T_{ger}$(law of one price)

$$\widehat{RER} = \frac{P^T_{esp}}{P^T_{ger}} \times \frac{P_{ger}}{P_{esp}} = \frac{(P_{ger}/P^T_{ger})}{(P_{esp}/P^T_{esp})}$$

$\widehat{RER}$ is the part of the real exchange rate explained by the relative price of nontraded goods.


REAL EXCHANGE RATE - DATA
0.05
0.00
-0.05
-0.10
-0.15
-0.20
-0.25
log(RER)
RER
RERp
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
year

What is left over in RER is the part explained by the terms of trade.

$$TOT = \frac{NER \times P_{ger}^{T}}{P_{esp}^{T}}$$

Notice that

$$RER = TOT \times \widehat{RER}$$

TRADED

Agriculture and Industry

NONTRADED

Construction and Services

MODELING CAPITAL FLOWS INTO SPAIN

$$
\begin{aligned}
Y_j &= A N_j^{1-\alpha} K_j^{\alpha} \\
y_j &= A k_j^{\alpha} \\
(r_j &= \alpha A k_j^{\alpha-1} - \delta) \\
y_{esp} &= 21,875 \qquad\qquad (1986) \\
y_{ger} &= 27,879 \\
k_{esp} &= 45,528 \\
k_{ger} &= 73,618
\end{aligned}
$$

$$\frac{y_{esp}}{y_{ger}} = \left(\frac{k_{esp}}{k_{ger}}\right)^{\alpha}$$

Let $\alpha = 0.3020$

$$\frac{y_{esp}}{y_{ger}} = 0.8649$$

in data

$$\frac{y_{esp}}{y_{ger}} = 0.7847$$

Differences in capital per worker explain 63 percent of differences in output per worker between Spain and Germany.

HOW LARGE SHOULD CAPITAL FLOWS BE?

Calibrate

$$A_{esp} = y_{esp}/k_{esp}^{\alpha} = 857.3298$$

$$A_{ger} = y_{ger}/k_{ger}^{\alpha} = 945.0353$$

Equate marginal products

$$\alpha A_{esp} k_{esp}^{\alpha-1} = \alpha A_{ger} k_{ger}^{\alpha-1}$$

$k_{ger} = 73,618$ implies $k_{esp} = 64,030$

Spanish capital stock would have to increase by 18,502, which is 85 percent of Spanish GDP, 41 percent of Spanish capital stock.

($r_{ger} = 0.057$ implies $r_{esp} = 0.088$)

MODEL

Consumers

$$\max \sum_{t=0}^{\infty} \beta^t (\epsilon c_{Tt}^{\rho} + (1-\epsilon) c_{Nt}^{\rho} - 1)/\rho$$

subject to

$$p_{Tt} c_{Tt} + p_{Nt} c_{Nt} + a_{t+1} = w_t \bar{\ell} + (1 + r_t) a_t + T_t$$

$$a_t \geq -A$$

where

$$a_t = q_{t-1} k_t + b_t$$

Feasibility-Equilibrium Conditions

Domestically produced traded good

$$x_{Dt} + x_{Ft} = A_D k_{Dt}^{\alpha_D} \ell_{Dt}^{1-\alpha_D}$$

Armington aggregator

$$c_{Tt} + z_{Tt} = M(\mu x_{Dt}^{\zeta} + (1-\mu) m_t^{\zeta})^{1/\zeta}$$

Nontraded good

$$c_{Nt} + z_{Nt} = A_N k_{Nt}^{\alpha_N} \ell_{Nt}^{1-\alpha_N}$$

Balance of payments

$$m_t + b_{t+1} = p_{Dt} x_{Ft} + (1 + r_t) b_t$$

Investment

$$k_{t+1} - (1-\delta) k_t = G z_{Tt}^{\gamma} z_{Nt}^{1-\gamma}$$

Foreign demand

$$x_{Ft} = D((1 + \tau_{Ft}) p_{Dt})^{\frac{-1}{1-\zeta}}$$

Factor markets

$$k_{Dt} + k_{Nt} = k_t, \quad \ell_{Dt} + \ell_{Nt} = \bar{\ell}$$

Transfer of tariff revenue

$$T_t = \tau_{Dt} m_t$$

Profit maximization

$$w_t = p_{Dt} A_D (1 - \alpha_D)(k_{Dt}/\ell_{Dt})^{\alpha_D}$$
$$= p_{Nt} A_N (1 - \alpha_N)(k_{Nt}/\ell_{Nt})^{\alpha_N}$$

$$1 + r_t = (p_{Dt} A_D \alpha_D (\ell_{Dt}/k_{Dt})^{1-\alpha_D} + (1-\delta) q_t)/q_{t-1}$$
$$= (p_{Nt} A_N \alpha_N (\ell_{Nt}/k_{Nt})^{1-\alpha_N} + (1-\delta) q_t) q_{t-1}$$

$$p_{Tt} = q_t \gamma G (z_{Nt}/z_{Tt})^{1-\gamma}$$
$$p_{Nt} = q_t (1-\gamma) G (z_{Tt}/z_{Nt})^{\gamma}$$

$$x_{Dt} = \mu^{\frac{1}{1-\zeta}} M^{\frac{\zeta}{1-\zeta}} (p_{Tt}/p_{Dt})^{\frac{1}{1-\zeta}} (c_{Tt} + z_{Tt})$$
$$m_t = (1-\mu)^{\frac{1}{1-\zeta}} M^{\frac{\zeta}{1-\zeta}} (p_{Tt}/(1+\tau_{Dt}))^{\frac{1}{1-\zeta}} (c_{Tt} + z_{Tt})$$

where

$$p_{Tt} = (1/M)[\mu^{\frac{1}{1-\zeta}} p_{Dt}^{\frac{-\zeta}{1-\zeta}} + (1-\mu)^{\frac{1}{1-\zeta}} (1+\tau_{Dt})^{\frac{-\zeta}{1-\zeta}}]^{\frac{-(1-\zeta)}{\zeta}}$$

LABOR ADJUSTMENT FRICTIONS

$$\ell_{Dt+1} \leq \lambda \ell_{Dt}$$

$$\ell_{Nt+1} \leq \lambda \ell_{Nt}$$

$$\lambda > 1$$

If constraint binds, labor in traded goods sector receives a different wage, w_{Dt}, than the wage of labor in the nontraded goods sector, w_{Nt}.

(In simulations, $\lambda = 1.01$.)

CAPITAL ADJUSTMENT FRICTIONS

$$i_{Dt+1} + i_{Nt+1} \leq G z_{Tt}^{\gamma} z_{Nt}^{1-\gamma}$$

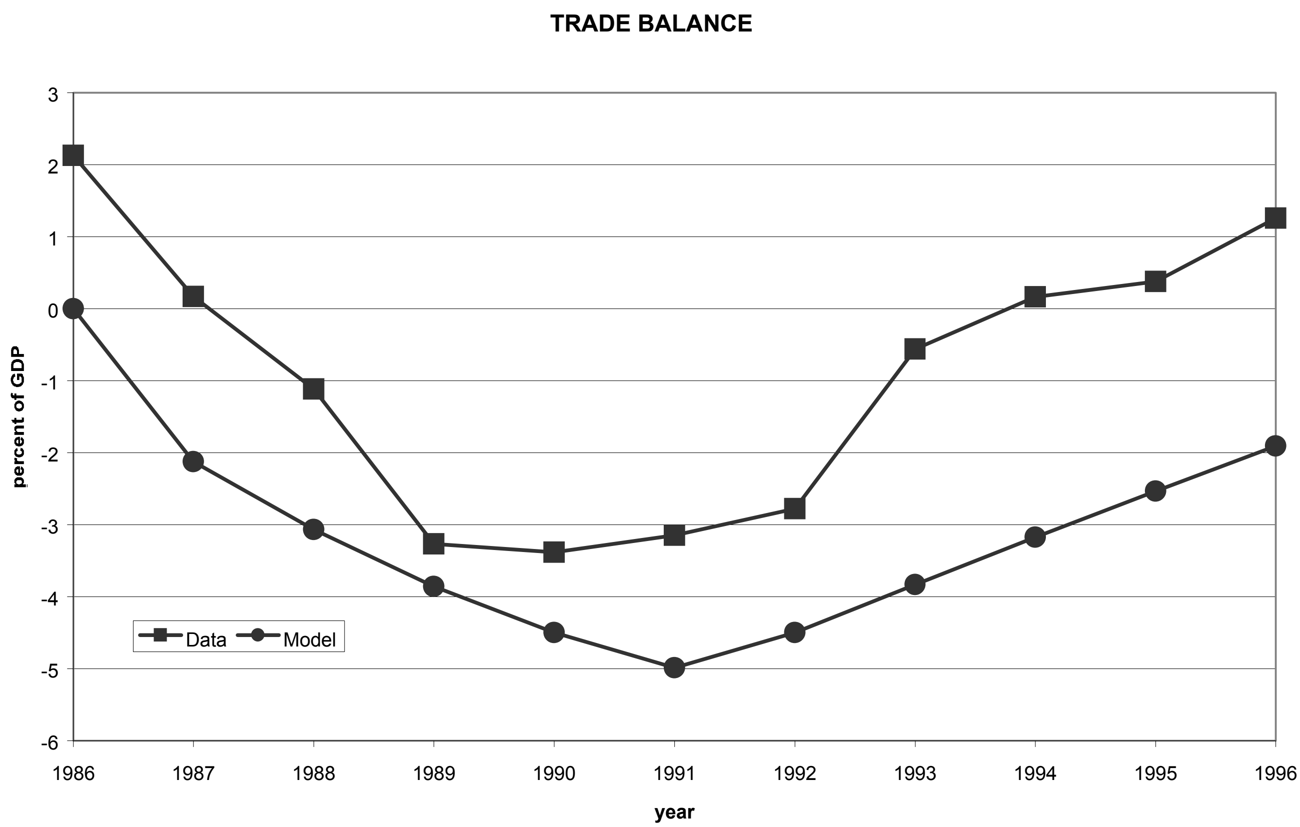
$$k_{Dt+1} \leq \phi(i_{Dt+1}/k_{Dt})k_{Dt} + (1-\delta)k_{Dt}$$

$$k_{Nt+1} \leq \phi(i_{Nt+1}/k_{Nt})k_{Nt} + (1-\delta)k_{Nt}$$

$$\phi'(i/k) > 0, \;\; \phi''(i/k) < 0, \;\; \phi(\delta) = \delta, \quad \phi'(\delta) = 1$$

$$(\phi(i/k) = (\delta^{1-\eta}(i/k)^{\eta} - (1-\eta)\delta)/\eta, \quad 0 < \eta \leq 1)$$

Adjusting the sector specific capital stock rapidly is costly. (In simulations $\eta = 0.9$.)



TRADE BALANCE
3
2
1
0
-1
-2
-3
-4
-5
-6
percent of GDP
Data
Model
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
year

REAL EXCHANGE RATE - MODEL