Exchange-Rate Dynamics
Chapter 2:

Martin D. D. Evans

Macro Models with Frictions

Aims:

- Explore the links between Exchange Rates and Macro Variables in models with fictions in product and financial markets:
  - Product market frictions appear via monopolistic competition among producers of consumer goods.
  - Financial market frictions appear in the form of restrictions on the available array of financial assets.

- Other important features include:
  - A distinction between final and intermediate goods.
  - Central Banks control short term nominal interest rates.

Macro Models without Frictions

Outline:

1. The Model
   i. Structure
   ii. Equilibrium
2. Sticky Prices
   i. Preset Price-Setting
   ii. Staggered Price-Setting
3. International Risk-Sharing
4. Incomplete Markets
   i. International Solvency
   ii. Portfolio Choice
   iii. Portfolio Balance with flexible Prices
   iv. Portfolio Balance with Sticky Prices

Sticky Prices:

Exchange-Rate Overshooting

$$\mathrm{E}_t \Delta\varepsilon_{t+1} = \alpha(2\lambda - 1)\xi \mathrm{E}_t(e^{\mathrm{US}}_{t+1} - e^{\mathrm{EU}}_{t+1}) - \varepsilon_t, \quad \text{and} \quad \mathrm{E}_t \Delta s_{t+1} = \tfrac{1}{\sigma} s_t - \tfrac{\nu - 1}{\sigma\nu}\varepsilon_t - \tfrac{1}{\sigma}(m_t - \hat{m}_t) + \delta_t.$$

- These equations govern the dynamics of the nominal and real exchange rates for given values of the money stocks, the risk premium, and the (net) endowments of intermediate goods.

- When there is no change in any of these variables, the expected rates of real and nominal depreciation on the left hand side of each equation must equal the actual rate of depreciation, so the equations will govern the actual dynamics of real and nominal exchange rates

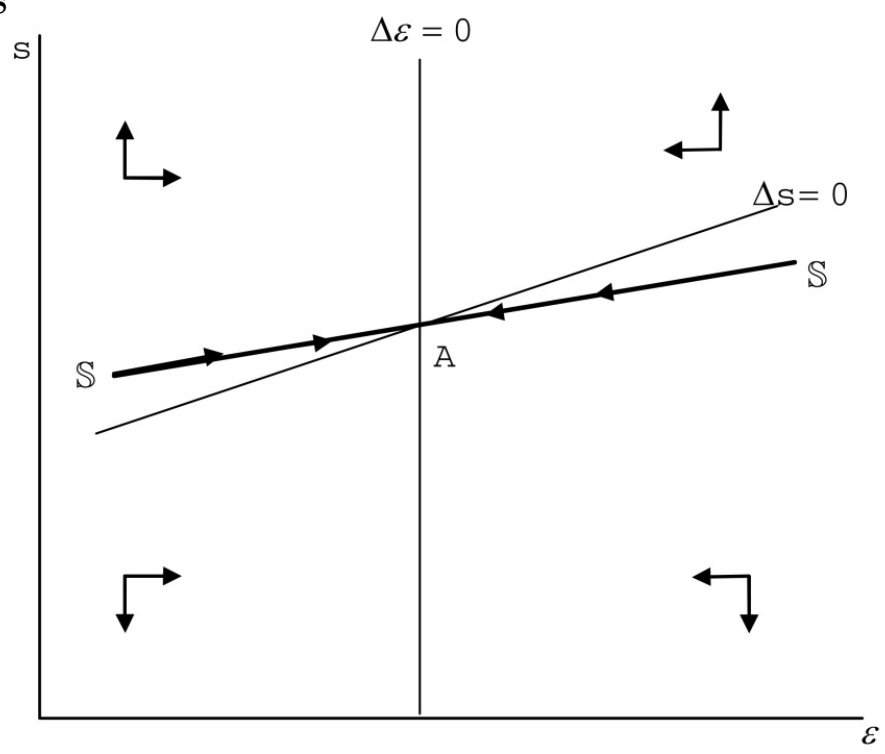


Figure 1: Phase Diagram for Real and Nominal Exchange Rate Dynamics

Sticky Prices:

Exchange-Rate Overshooting

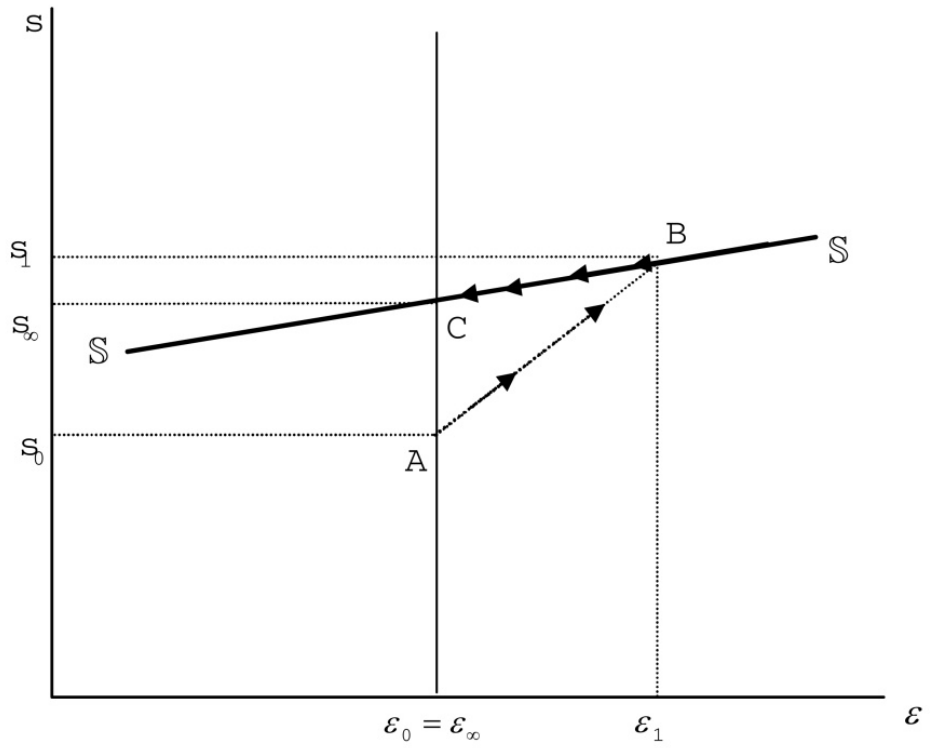


Figure 2: Exchange Rate Overshooting in response to a US Money Supply Shock

- The phase diagram shows the classic example of how a permanent increase in the US money supply leads to exchange rate overshooting

Sticky Prices:

Exchange Rate Dynamics in the Calvo Model

The model is calibrated with half- lives for the policy shock of six and one months, and for varying degrees of price-stickiness. On average retail firms reset prices once every 4 months when $\wp$=1/4, and once every 12 months when $\wp$=1/12.

NB The determinacy condition is satisfied for these parameter values.

Table 1: Staggered Pricing Model Parameters

Parameter	Symbol	Value
discount factor	β	0.997
risk aversion	γ	1.000
intermediate share	α	0.330
domestic intermediate share	λ	0.850
intermediate elasticity	θ	0.740
price-setting probability		
Taylor inflation coefficient	ψ_π	0.500
Taylor output coefficient	ψ_y	0.100
price-setting probability	$\wp$	{1/4, 1/12}
shock persistence	ρ	{0.40, 0.90}

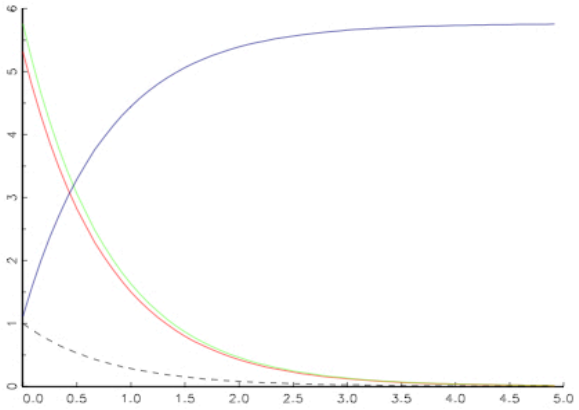
Sticky Prices:

Exchange Rate Dynamics in the Calvo Model

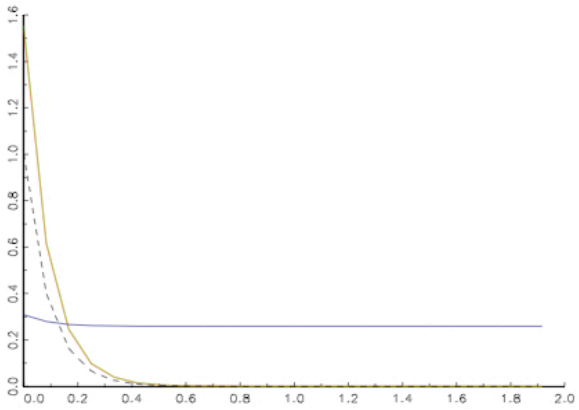
Note:

1. Panels B and D show that reducing the degree of price-stickiness has little quantitative effect on the response of the economy to policy changes with a short half life.

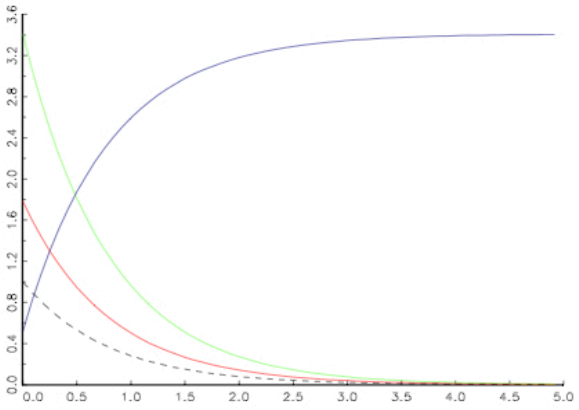
2. Panels A and C, shows that less price-stickiness significantly reduces the impact of the policy change.



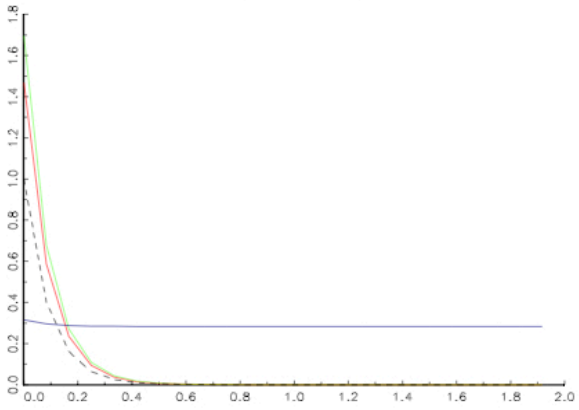
Panel A: $\rho = 0.9, \wp = 1/12$



Panel B: $\rho = 0.4, \wp = 1/12$



Panel C: $\rho = 0.9, \wp = 1/4$



Panel D: $\rho = 0.4, \wp = 1/4$

Figure 3: Impulse responses of the scaled nominal exchange rate, $0.1s_t$ (solid blue); the real exchange rate, ε_t (solid red); and the US/EU inflation differential, $\Delta p_t - \Delta \hat{p}_t$ (solid green); to a monetary policy change, z_t (dashed black).

Sticky Prices:

Price-Setting and Pass-Through

Consider the elasticity of the price differential with respect to the depreciation of the dollar over the 12 months following the shocks to the risk premium.

The red line plots the elasticity for the case with less stickiness and more persistence (e.g., $\wp$=3/4, ρ =0.9), while the green line plots the case with less persistence and more stickiness (e.g., $\wp$=11/12, ρ =0.4).

Clearly, measures of pass through at a single horizon do not provide unambiguous information on the degree of price stickiness.

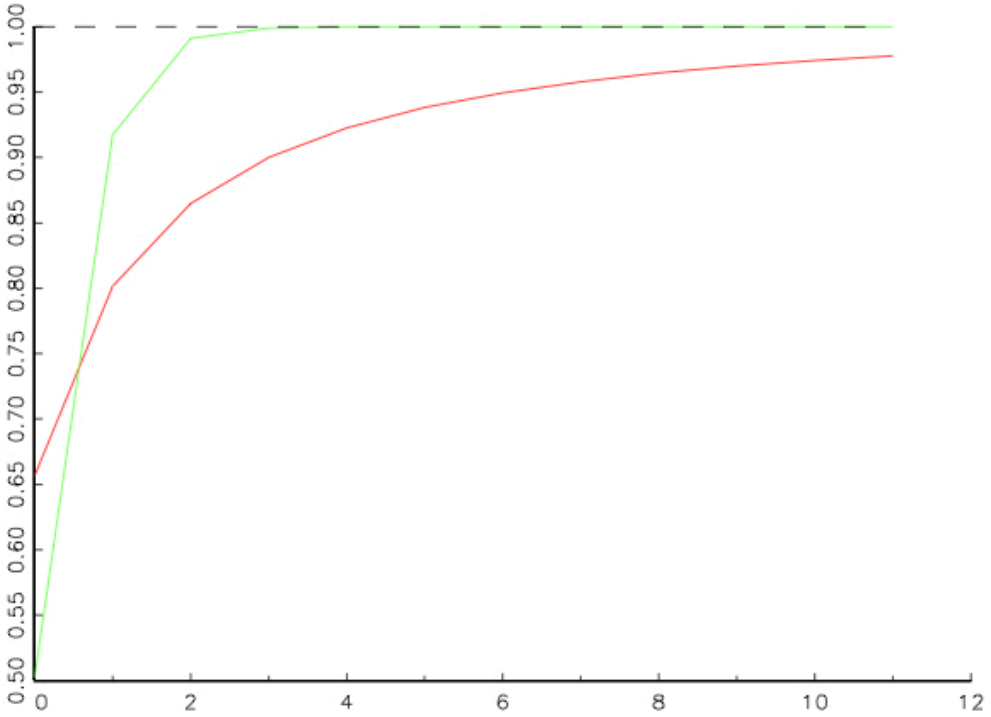


Figure 4: Exchange rate pass through in the 12 months following a shock to the foreign exchange risk premium.

2.3 International Risk Sharing

Table 2: Real Exchange Rate/Consumption Correlations

Country	US	ROW
Australia	-0.09	-0.13
Austria	-0.20	-0.30
Belgium	-0.11	0.19
Canada	-0.20	0.02
Denmark	-0.20	-0.21
E.U.	-0.23	-0.04
Finland	-0.40	-0.55
France	-0.21	-0.01
Germany	-0.13	0.01
Italy	-0.27	-0.31
Japan	0.04	0.08
South Korea	-0.79	-0.63
Mexico	-0.68	-0.74
Netherlands	-0.30	-0.19
New Zealand	-0.27	-0.28
Portugal	-0.48	-0.67
Sweden	-0.34	-0.29
Spain	-0.41	-0.38
Switzerland	0.09	0.32
Turkey	-0.34	-0.17
U.K	-0.40	-0.04
U.S	N/A	-0.31
Median	-0.26	-0.13

Source: Corsetti, Dedola, and Leduc (2008b)

Lessons:

1. There is no direct evidence in either table about the actual degree of risk sharing per se. Table 2 shows that the joint behavior of consumption growth and real exchange rates is inconsistent with complete risk-sharing if household preferences take the time-separable isoelastic form found in many models.

2. Models with complete markets and isoelastic preferences link consumption and the real exchange rate in a completely counter-factual way.

2.4 Incomplete Markets

Portfolio Balance with Flexible Prices

Table 3: Portfolio Balance Model Parameters

Parameter	Symbol	Value
discount factor	β	0.997
risk aversion	γ	1.000
intermediate share	α	0.330
domestic intermediate share	λ	0.850
intermediate elasticity	θ	0.740
net liability discount factor	μ	0.90
portfolio share elasticity	σ	30.0
initial foreign bond shares	h^{B}, $\hat{h}^{\mathrm{B}}$	0.25
shock persistence	ρ	0.90
Taylor inflation coefficient	ψ_π	0.500
Taylor output coefficient	ψ_y	0.100
price-setting probability	$\wp$	1/12

Notes:

1. μ is one minus the steady state ratio of imports to foreign assets.
2. σ is calibrated to the reciprocal of the spot rate variance
3. assume that households invest 25% of their savings in foreign bonds

2.4 Incomplete Markets
Portfolio Balance with Flexible Prices

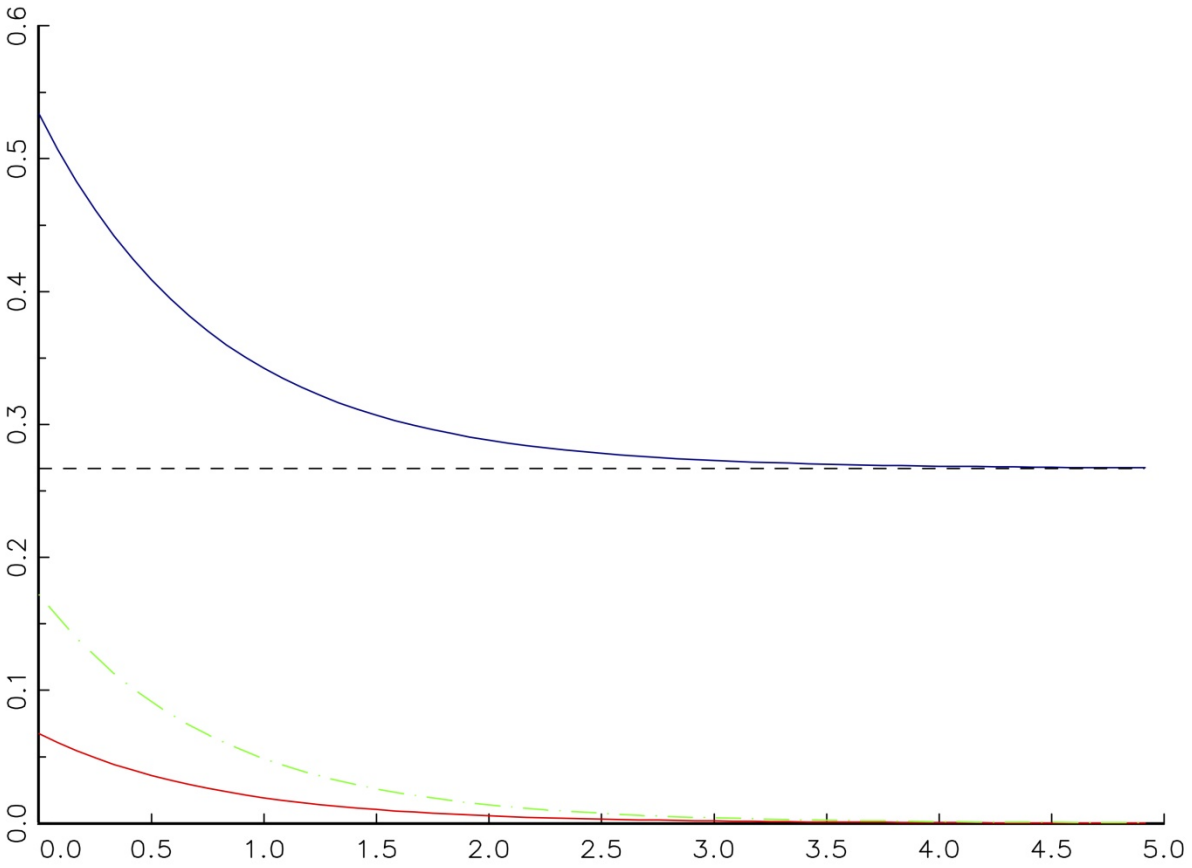


Figure 5: Impulse responses of the nominal exchange rate, s_t (solid blue); US net liabilities, nfl_t (solid red); net exports, nx_t (dashed-dot green); and consumption differential, $c_t - \hat{c}_t$ (dashed black); to a rise in expected US equities returns, $\mathbb{E}_t r^{\mathrm{E}}_{t+1} - r_t$.

2.4 Incomplete Markets
Portfolio Balance with Sticky Prices

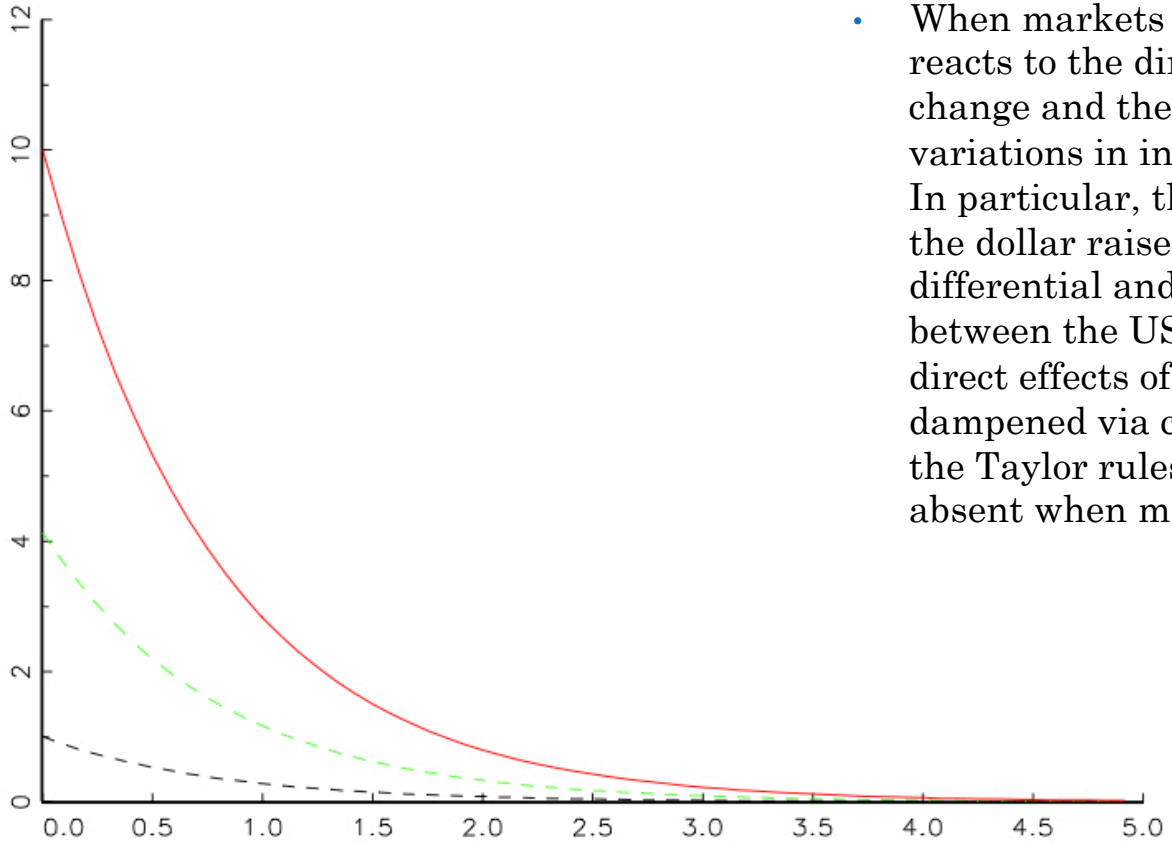


Figure 6: Impulse responses of the real exchange rate under incomplete markets (solid red); the real exchange under complete markets (dashed green); to a monetary policy change, z_t, (dashed black).

- When markets are complete, the spread reacts to the direct effects of the policy change and the indirect effects induced by variations in inflation and the output gaps. In particular, the initial real depreciation of the dollar raises the US/EU inflation differential and increases the difference between the US and EU output gaps, so the direct effects of the policy change are dampened via central banks' adherence to the Taylor rules. This dampening effect is absent when markets are incomplete.