The Dornbusch overshooting model.

The short run and long run together
Overview of the Dornbusch model

• Weaknesses of preceding models:
  – Long run Monetary Model: exchange rate far more volatile than monetary variables (and prices)
  – Short run model: fixed prices valid only in short run.

• Dornbusch (1976) hybrid:
  – Short run properties of Keynesian models
  – Long run properties of the Long Run (Monetary) Model.
Overview of Dornbusch model

• **Empirical observation**: financial markets adjust to shocks far more rapidly than goods markets (i.e. price stickiness keeps Y away from LR equilibrium).

• **Consequence** for the model: in the short run, financial markets have to *over* adjust in order to compensate for sluggish goods markets (OVERSHOOTING).

• With prices fixed in the short run, any change in the nominal money supply changes real balances, requiring the interest rate to adjust to clear the money market

• In the long run, prices adjust fully, returning all real variables to their pre-shock levels, but leaving the nominal exchange rate at the new equilibrium level predicted by the long run model.
Definition of overshooting

When a variable moves towards *and then beyond* its equilibrium level, it is said to **overshoot**. So suppose a variable, \( x \), is initially at its equilibrium level, \( \bar{x}_0 \), then for some reason the equilibrium level rises (or falls) to \( \bar{x}_1 \). If \( x \) subsequently rises (or falls) to \( \bar{x}_1 \) *and carries on rising (falling) to a level beyond* \( \bar{x}_1 \), it is said to have overshot by the amount \((x - \bar{x}_1)\).

Similarly, if \( x \) subsequently rises (or falls) *but only part of the way to* \( \bar{x}_1 \) *(i.e. stopping short of* \( \bar{x}_1 \)), it is said to have **undershoot** by the amount \((\bar{x}_1 - x)\).

The simple version of the Dornbusch model analyses exchange rate adjustment, but it illustrates a more general result: whenever one variable adjusts slowly (undershoots in the short run), some other variable must overadjust (overshoot in the short run).
Outline of the model

1. Small open economy (so $P^*$, $R^*$ exogenous)
2. Start from full equilibrium, with inflation and exchange rate depreciation both zero
3. In the short run, prices are fixed
4. Financial markets adjust instantaneously. Investors are risk neutral, so that UIRP holds always

\[ R = R^* + \Delta E^e \]
\[ \Delta E^e = \left( \frac{\bar{E} - E_t}{E_t} \right) \]

Where $\bar{E}$ is the long run value of exchange rate
The short and long run

• In the long run, the long run exchange rate $E$ is set according to the long run (monetary) model

• Deviations from the long run equilibrium exchange rate result from the following assumptions:
  – The price level is sticky.
  – Aggregate supply curve is horizontal in the immediate impact phase
  – But of course it is vertical in long-run equilibrium.
How to solve the model

- General strategy to analyse the effect of a disturbance (e.g. a money supply increase): *start from the end and work backwards.*

- Determine what happens:
  1. *in the long run,* when the system has returned to full equilibrium
  2. *the impact effect,* at the moment of the disturbance
  3. finally, in the transition from 2 to 1.
The short run

- Deviations from the long run nominal exchange rate happen because prices are sticky,
- Sticky prices cause R to deviate from its long run value (when inflation is zero at home and abroad, in the long run R=R*)
Monetary expansion

THE LONG RUN

- M goes up.
- Prices increase; REAL money supply is unchanged.
- Domestic (nominal) exchange rate depreciates.
- The real exchange rate does not change.
- $E=\text{home/foreign}$, so the new long run value of $E$ is higher.
- If $\pi=\pi^*=0$, then $R=R^*$ (nominal rates).
Monetary expansion

The SHORT RUN

• Money supply increases
• Prices are fixed, real money supply goes up
• Excess supply of money: R<R*
• UIP holds, so investors expect that the home exchange rate will APPRECIATE (over time E will go down)
• But wait – the new long run value is higher! How can we combine this contradiction?
• Exchange rate has to go very high, in order to decrease, and still stay high.
• Yes, that sounds strange 😊
Short-Run and Long-Run Effects of an Increase in the U.S. Money Supply (for simplicity – given real output, \( Y \))
Monetary expansion

• The short run, point 3: no expectations of future depreciation of Home currency
• The short run, point 2: since M is high, we expect that in the future P will go up
• According to PPP this implies a future depreciation of Home currency
• So today, we end up in 2 – a big depreciation.
Money, Prices, and Exchange Rates in the Long Run

• A permanent increase in a country’s money supply causes a proportional long-run depreciation of its currency.
  – However, the dynamics of the model predict a large depreciation first and a smaller subsequent appreciation.

• A permanent decrease in a country’s money supply causes a proportional long-run appreciation of its currency.
  – However, the dynamics of the model predict a large appreciation first and a smaller subsequent depreciation.
Time Paths of U.S. Economic Variables after a Permanent Increase in the U.S. Money Supply

(a) U.S. money supply, $M_{US}$

(b) Dollar interest rate, $R_S$

(c) U.S. price level, $P_{US}$

(d) Dollar/euro exchange rate, $E_{S/€}$
The exchange rate is said to **overshoot** when its immediate response to a change is greater than its long-run response.

Overshooting is predicted to occur when monetary policy has an immediate effect on interest rates, but not on prices and (expected) inflation.

Overshooting helps explain why exchange rates are so **volatile**.
Test yourself – in class exercise

Assume that the money demand at Home goes up

• What happens to nominal exchange rate in the long run?
• What happens to R in the SR?
• What does the market expect?
• What happens with E now?
Main issue

• Price stickiness in the short run causes a deviation from the long run equilibrium
• People expect that in the future prices will change (usually) and nominal exchange rate will change
• Therefore people expect future changes of the exchange rate
• These future adjustments cause the exchange rate to overshoot