

Business Cycles

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Exercise 1. A Demand Shock in the Closed-Economy IS-MP Model

Consider the closed-economy IS-MP model:

$$\tilde{Y}_t = a - b(R_t - r^*),$$

where \tilde{Y}_t is the output gap, R_t is the real interest rate chosen by the central bank, and r^* is the long-run real interest rate.

Inflation evolves according to the Phillips curve:

$$\Delta\pi_t = \theta\tilde{Y}_t,$$

where $\Delta\pi_t = \pi_t - \pi_{t-1}$.

Suppose initially

$$a = 0, \quad b = 2, \quad \theta = 0.5, \quad R_t = r^* = 4\%, \quad \pi_0 = 2\%.$$

At time $t = 1$, household confidence falls because families become worried about future income. As a result, autonomous demand falls from

$$a = 0 \quad \text{to} \quad a = -2.$$

- Before the confidence shock, what is the output gap? Is output above, below, or equal to potential output?
- Is the fall in household confidence a shock to the IS curve or to the MP curve? Which parameter changes?
- If the central bank keeps the real interest rate fixed at $R_t = 4\%$, compute the new output gap.
- Using the Phillips curve, compute inflation in period 1. Is inflation rising or falling?
- What real interest rate should the central bank choose if it wants to return output to potential after the shock?
- Suppose the central bank overreacts and sets $R_t = 2\%$. Compute the output gap and inflation in the next period.
- Explain the policy trade-off. Why can a rate cut stabilize output after a negative demand shock, but also create inflationary pressure if it is too large?

Exercise 2. Foreign Interest Rates and Currency Pressure in an Open Economy

Consider a small open economy. The IS curve is

$$\tilde{Y}_t = a - b(R_t - r^*) + a_{nx} - b_{nx}(R_t - r^*) + b_{nx}^w(R_t^w - r^*),$$

where R_t is the domestic real interest rate and R_t^w is the foreign real interest rate.

The first two terms describe the closed-economy demand channel. The last three terms describe net exports. A higher domestic interest rate appreciates the domestic currency and lowers net exports. A higher foreign interest rate depreciates the domestic currency and raises net exports.

Suppose the economy is initially at potential output:

$$a = 0, \quad a_{nx} = 0, \quad b = 1, \quad b_{nx} = 1, \quad b_{nx}^w = 1, \quad R_t = R_t^w = r^* = 5\%.$$

Now suppose the U.S. central bank raises its real interest rate from

$$R_t^w = 5\% \quad \text{to} \quad R_t^w = 7\%.$$

The domestic central bank initially keeps its real interest rate unchanged at $R_t = 5\%$.

- What is the initial output gap?
- When the foreign interest rate rises, what happens to the domestic currency? Explain the role of capital flows.
- What happens to exports, imports, and net exports?
- Compute the new output gap if the domestic central bank keeps $R_t = 5\%$.
- Suppose depreciation raises import prices. Consider

$$\Delta\pi_t = \theta\tilde{Y}_t + o_t,$$

would this be represented by a positive or negative price shock o_t ?

- Now suppose the domestic central bank raises its own real interest rate to $R_t = 6\%$. Compute the output gap. How does this compare with part (d)?
- Explain why emerging-market central banks may raise interest rates during a currency depreciation, even when higher interest rates reduce domestic demand.
- In this example, does the foreign rate hike shift the domestic IS curve or move the economy along the domestic IS curve? Explain.