INTERMEDIATE MACROECONOMICS

10 – OUTPUT, THE INTEREST RATE, AND THE EXCHANGE RATE. EXCHANGE RATE REGIMES.

University of Massachusetts Amherst

Share 3 take-aways from the reading (textbook Chapters 19 & 20)

19 Output, the Interest Rate, and the Exchange Rate

In Chapter 18, we treated the exchange rate as one of the policy instrume
to the government. But the exchange rate is not a policy instrument. Rathe
mined in the foreign exchange market, where, as you saw in Chapter 17
enormous amount of trading. This fact raises two obvious questions: Wha
the exchange rate? How can policymakers affect it?

These questions motivate this chapter. To answer them, we reintroduce fi
kets, which we had left aside in Chapter 18. We examine the implications of e
both the goods market and financial markets, including the foreign exchange
allows us to characterize the joint movements of output, the interest rate, and t
rate in an open economy. The model we develop is an extension to the open ec
IS-LM model you first saw in Chapter 5 and is known as the **Mundell-Fleming**
the two economists, Robert Mundell and Marcus Fleming, who put it together
(The model presented here retains the spirit of the original Mundell-Fleming m

20 Exchange Rate Regimes

In July 1944, representatives of 44 countries met in Bretton Woods, New Hampshire, to design a new international monetary and exchange rate system. The system they adopted was based on fixed exchange rates, with all member countries other than the United States fixing the price of their currency in terms of dollars. In 1973, a series of exchange rate crises brought an abrupt end to the system—and an end to what is now called "the Bretton Woods period." Since then, the world has been characterized by many exchange rate arrangements. Many countries operate under flexible exchange rates; some operate under fixed exchange rates; some go back and forth between regimes. Which exchange rate regime to choose is one of the most debated issues in macroeconomics and, as the cartoon suggests, a decision facing every country in the world. This chapter discusses this issue.

Section 10: The roadmap

1. IS-LM in the open economy.
2. Policy evaluation using the open economy IS-LM model.
3. Exchange rate regimes.
4. The open economy in the medium run.

Takeaways

- In the open economy the interest rate has a stronger negative effect on output.
- The higher the domestic interest rate, the higher the exchange rate of the domestic currency.
- Countries with a fixed exchange rate regime cannot use monetary policy to manage the economy in the short-run …
- …but in the medium-run they might still achieve the same outcomes (*at least in theory!*).

10.1 IS-LM IN THE OPEN ECONOMY

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Instructor: Daniele Girardi

Equilibrium in the goods market

- Equilibrium condition:

$$Y = C(Y - T) + I(Y, r) + \bar{G} + X(Y^*, \varepsilon) - IM(Y, \varepsilon)/\varepsilon$$

- In terms of net exports NX:

$$Y = C(Y - T) + I(Y, r) + \bar{G} + NX(Y, Y^*, \varepsilon)$$

- In the short-run, with fixed price level,

$$Y = C(Y - T) + I(Y, i) + \bar{G} + NX(Y, Y^*, E)$$

Equilibrium in financial markets

- What determines E?
- Interest parity condition:

$$(1 + i_t) = (1 + i_t^*)\left(\frac{E_t}{E_{t+1}^e}\right)$$

- Rearranging and taking E_{t+1}^e as given:

$$E_t = \frac{1 + i_t}{1 + i_t^*}\,\bar{E}_{t+1}^e$$

An Example

- Initial situation:
  - $i_t = i_t^* = 2\%$
  - $\bar{E}_{t+1}^e = 100$
  - $\rightarrow E_t = \frac{1+i_t}{1+i_t^*} \bar{E}_{t+1}^e = \frac{1+0.02}{1+0.02} 100 = 100$
- Suppose the domestic CB increases i_t to 5%
- What happens next?

An Example

- Initial situation:
  - $i_t = i_t^* = 2\%$
  - $\bar{E}^e_{t+1} = 100$
  - $\rightarrow E_t = \frac{1+i_t}{1+i_t^*} \bar{E}^e_{t+1} = \frac{1+0.02}{1+0.02} 100 = 100$
- Suppose the CB increases i_t to 5%
- What happens next?

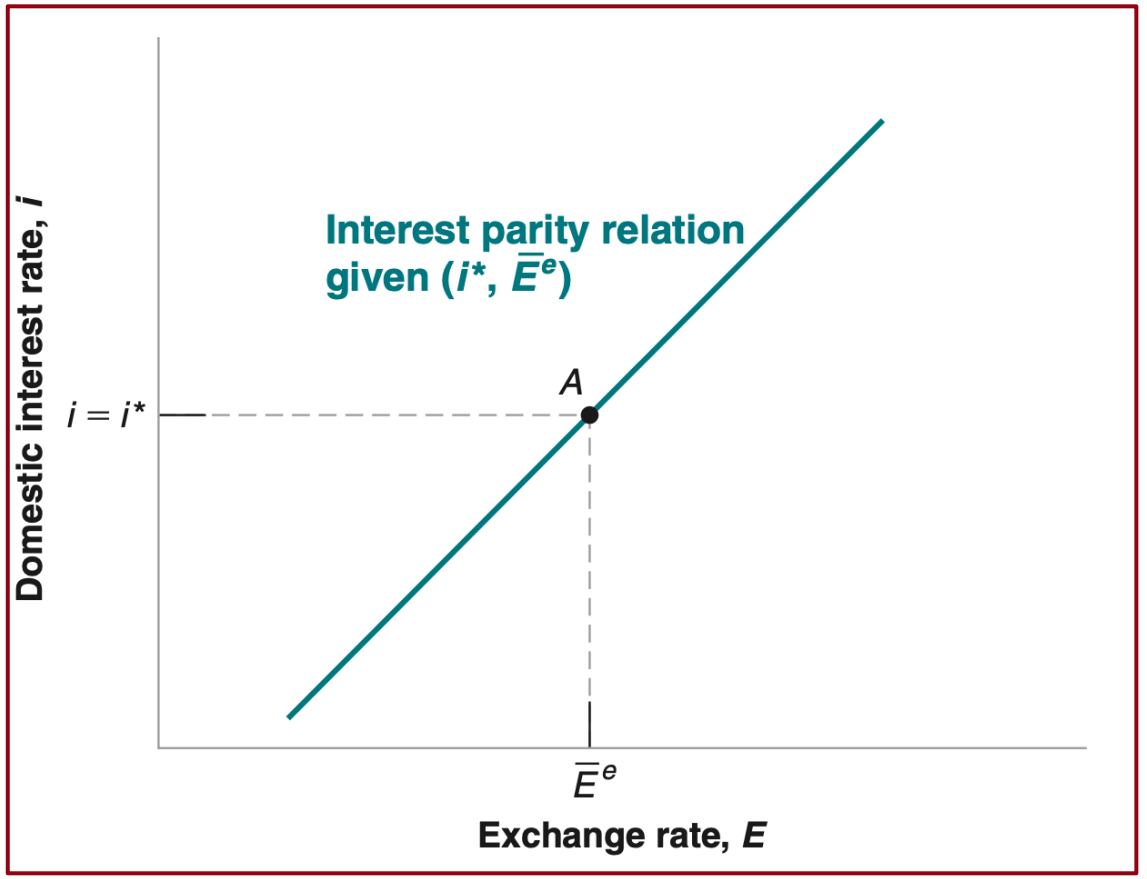
New equilibrium:

$$E_t = \frac{1+0.05}{1+0.02} 100 \approx 102.9$$

- 2.9% appreciation must occur.
- Investors buy domestic currency until returns are equal again.

The interest rate & the exchange rate

Higher domestic interest rate → higher exchange rate (appreciation).



Short-run equilibrium in the open economy

- Goods market equilibrium:

$$Y = C(Y - T) + I(Y, i) + \bar{G} + NX(Y, Y^*, E)$$

- Financial markets equilibrium:

$$i = \bar{\imath}$$

$$E_t = \frac{1 + i_t}{1 + i_t^*} \bar{E}_{t+1}^e$$

IS-LM in the open economy (aka Mundell-Fleming model)

- Plug the interest parity condition in the IS equation to get:

IS equation:

$$Y = C(Y - T) + I(Y, i) + \bar{G} + NX(Y, Y^*, \frac{1 + i_t}{1 + i_t^*} \bar{E}_{t+1}^e)$$

LM equation:

$$i = \bar{\imath}$$

- Together, they determine *i* and *Y* in the short-run.
- They also determine the domestic interest rate *E*.

Clicker question

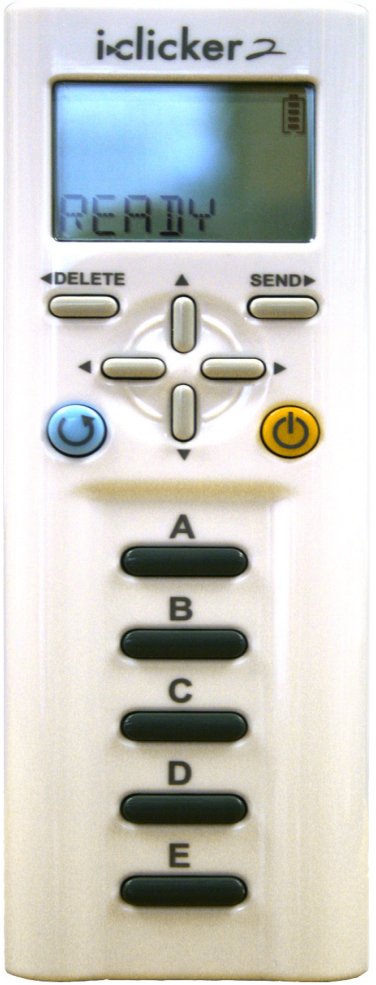
How does the interest rate affect equilibrium output in the open economy?

A. Negatively, just like in the closed economy.

B. Negatively as in the closed economy, but more strongly.

C. Negatively as in the closed economy, but less strongly.

D. Positively, unlike in the closed economy.



Effects of the interest rate in the open economy

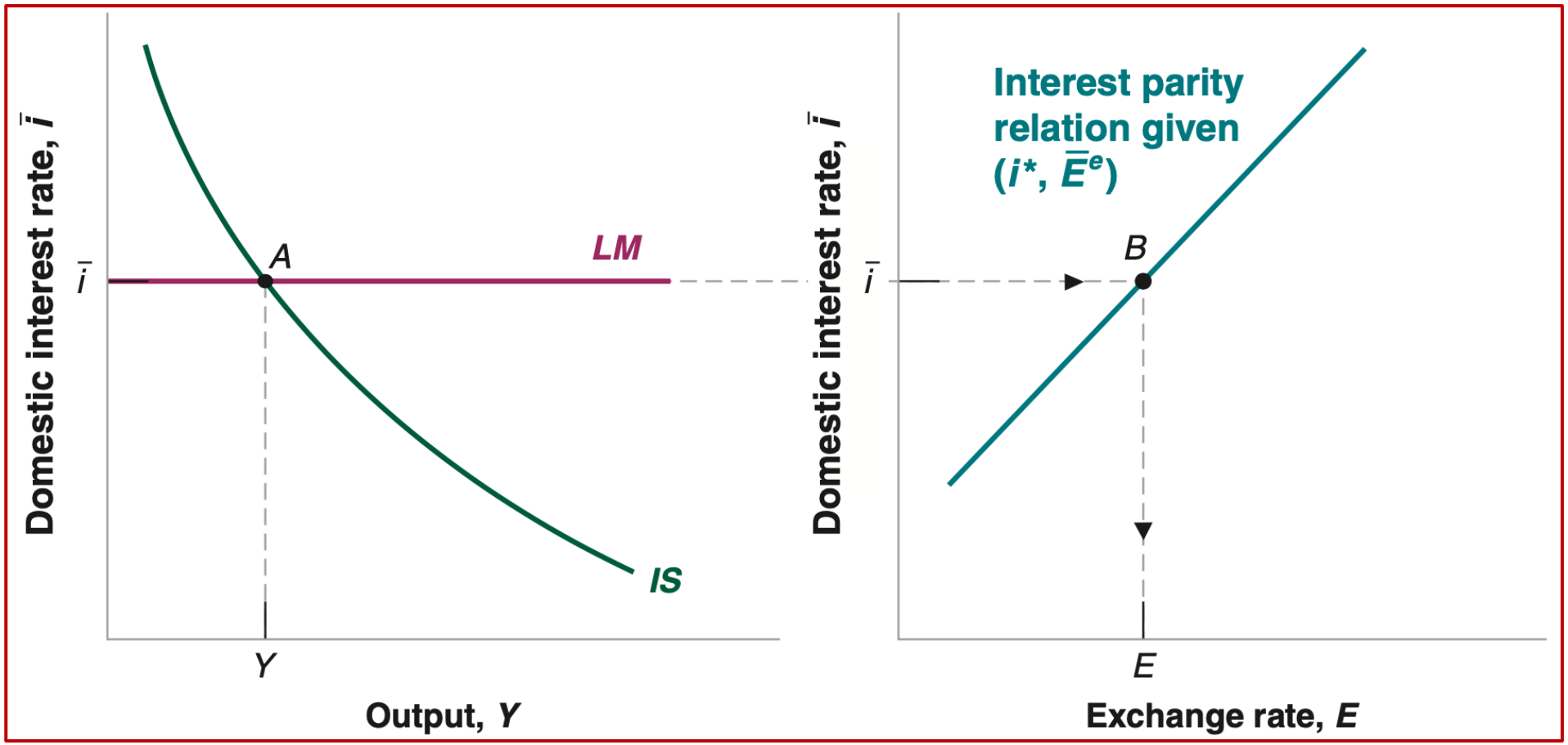
IS equation:

$$Y = C(Y - T) + I(Y, i) + \bar{G} + NX\left(Y, Y^*, \frac{1 + i_t}{1 + i_t^*}, \bar{E}^e_{t+1}\right)$$

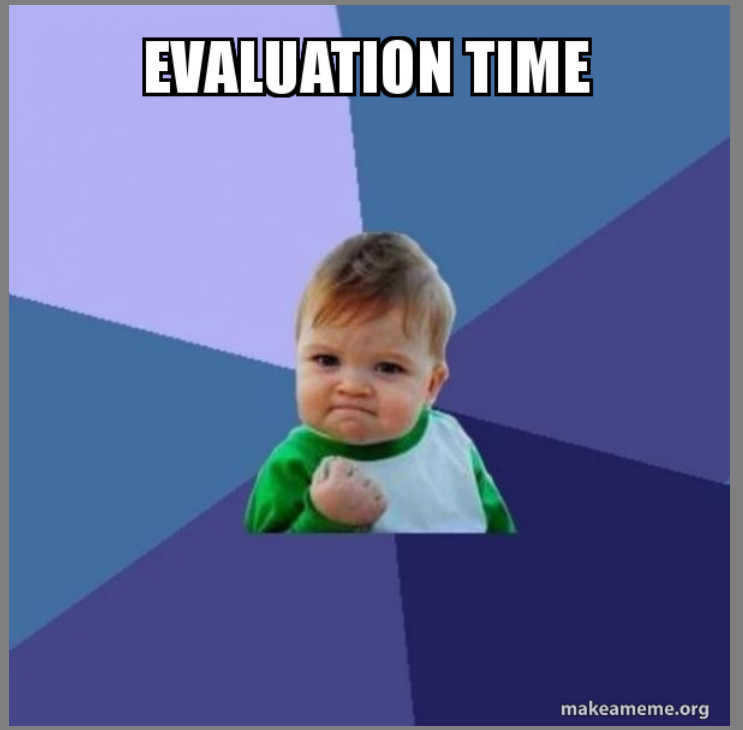
Direct effect through domestic spending

Indirect effect through the exchange rate.

IS-LM in the open economy



10.2 POLICY EVALUATION USING THE OPEN ECONOMY IS-LM MODEL



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Monetary contraction in the open economy IS-LM model

Clicker question

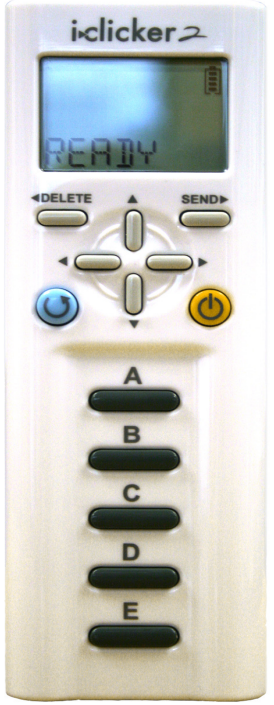
What is the effect of an increase in the domestic interest rate?

A. Lower output & currency depreciation.

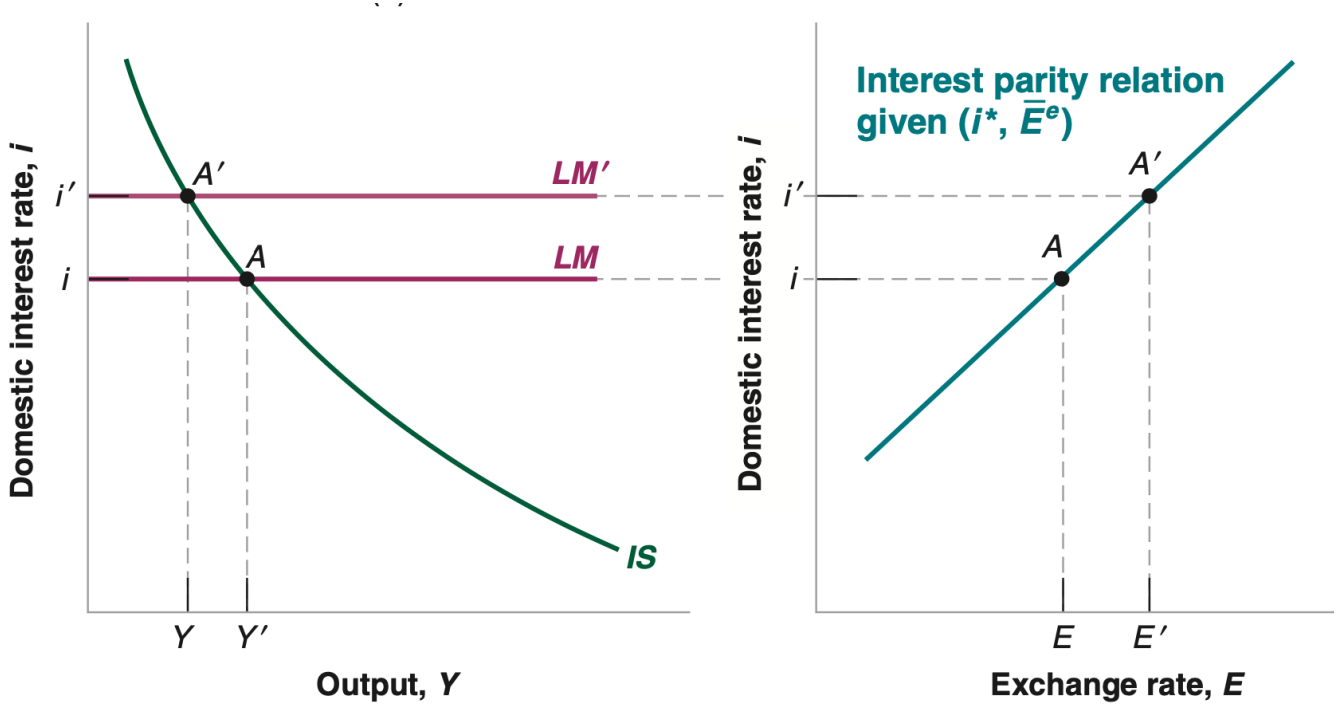
B. Lower output & currency appreciation.

C. Higher output & currency depreciation.

D. Higher output & currency appreciation.



Monetary contraction in the open economy IS-LM model

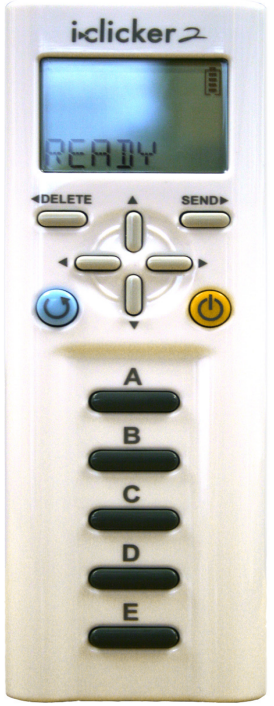


- LM curve shifts up.
- IS & interest-parity curves unaffected.
- Movement along the IS curve → lower output.
- Movement along the interest-parity curve → appreciation.

Fiscal expansion in the open economy IS-LM model

Clicker question

What is the effect of an increase in government spending, assuming the interest rate stays fixed?



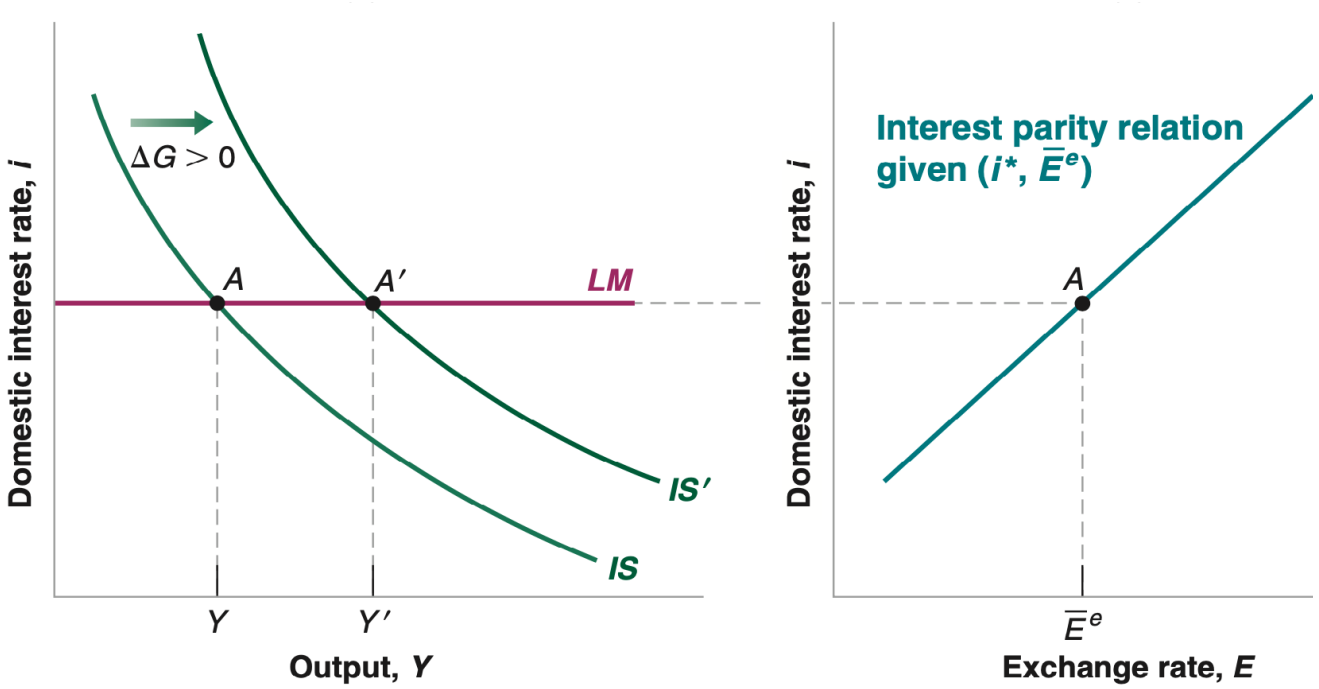
A. Lower output & currency depreciation.

B. Lower output & unchanged exchange rate.

C. Higher output & currency appreciation.

D. Higher output & unchanged exchange rate.

Fiscal expansion in the open economy IS-LM model
Case 1: Unchanged interest rate



- IS curve shifts to the right.
- LM & interest-parity curves unaffected.
- Movement along the LM curve → higher output.
- Unchanged interest rate→ unchanged exchange rate.

Fiscal expansion + monetary contraction

Clicker question

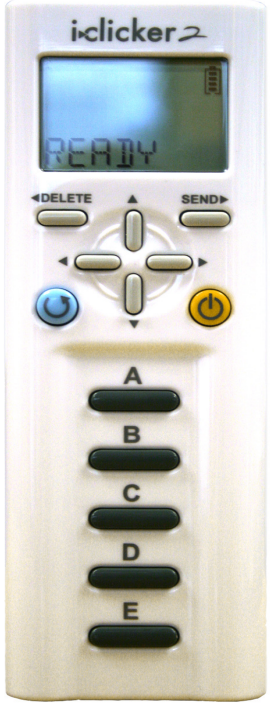
What is the effect of an increase in government spending combined with interest rate increase?

A. Lower output & currency depreciation.

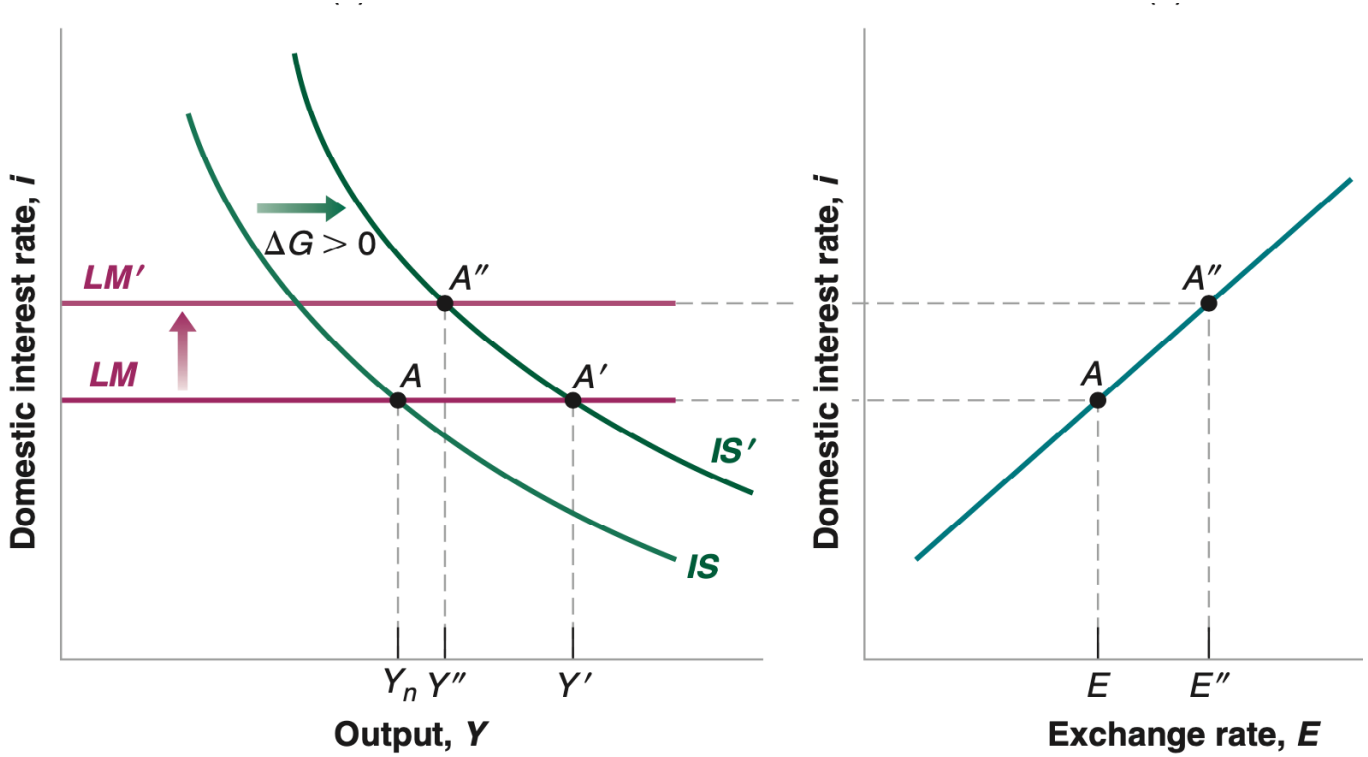
B. Lower output & unchanged exchange rate.

C. Higher output & currency appreciation.

D. Higher output & unchanged exchange rate.



Fiscal expansion in the open economy IS-LM model
Case 2: Interest rate goes up



- IS curve shifts to the right.
- LM curve shifts up.
- Interest-parity curve unaffected.
- Slightly higher output (*if interest rate increase not too big*) & currency appreciation.

Fiscal expansion + monetary contraction in the US in the 1980s

- First Reagan administration implemented large fiscal expansion (tax cuts).
- Volcker Fed greatly increased interest rates.
- Observed outcomes compatible with the predictions of the open economy IS-LM model.

Table 1 Major US Macroeconomic Variables, 1980–1984

	1980	1981	1982	1983	1984
GDP growth (%)	−0.5	1.8	−2.2	3.9	6.2
Unemployment rate (%)	7.1	7.6	9.7	9.6	7.5
Inflation (CPI) (%)	12.5	8.9	3.8	3.8	3.9
Nominal interest rate (%)	11.5	14.0	10.6	8.6	9.6
Real interest rate (%)	2.5	4.9	6.0	5.1	5.9
Real exchange rate	85	101	111	117	129
Trade surplus (% of GDP)	−0.5	−0.4	−0.6	−1.5	−2.7

Inflation: rate of change of the CPI. The nominal interest rate is the three-month T-bill rate. The real interest rate is equal to the nominal rate minus the forecast of inflation by DRI, a private forecasting firm. The real exchange rate is the trade-weighted real exchange rate, normalized so that 1973 = 100. A negative trade surplus is a trade deficit.

10.3 EXCHANGE RATE REGIMES

Exchange rate regimes

- Flexible (or free-floating) exchange rate
- Managed exchange rate
  - Fixed
  - Crawling peg
  - Bands

Monetary policy with fixed exchange rate

- Interest parity condition implies

$$(1+i) = (1+i^*)\left(\frac{E_t}{E_t^e}\right)$$

- Fixed exchange rate: $E_t = E_{t+1} = \bar{E}$

$$\Rightarrow (1+i) = (1+i^*) \Rightarrow \boldsymbol{i = i^*}$$

- *Under a fixed exchange rate, the Central Bank gives up monetary policy as a policy instrument*

Spring 2023 EURA opportunities

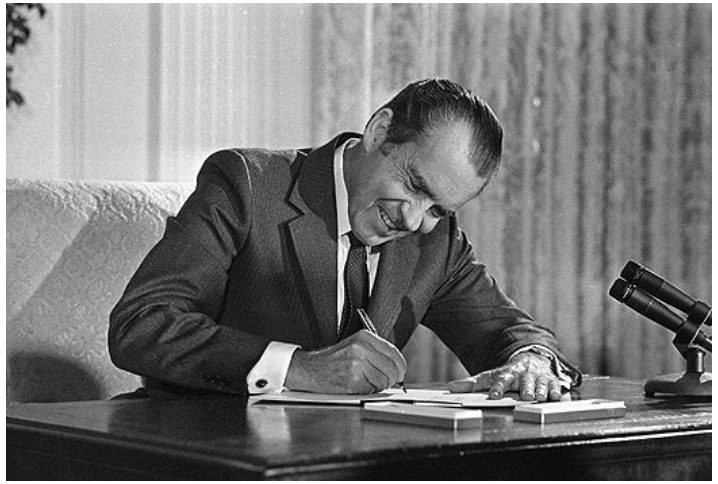
- Economics Undergraduate Research Assistantships (EURA) Program.
- Organized by the Department of Economics. (Click here for more info.)
- Current students majoring in economics work with faculty members to gain valuable research assistant experience on research projects.
- The EURA program engages students in cutting-edge economics beyond the classroom.
- All EURAs receive academic credit + a small (600$) stipend
- Contact me if you are interested in EURA.

PREVIOUSLY ON ECON 204…

- IS-LM model for the open economy.
- Effect of the interest rate on the exchange rate.
- Types of exchange rate regimes.
- Consequences of fixed exchange rate for monetary policy.

Global exchange rate regimes: a brief history

- *1870-World War I*: Gold standard
- *1944-1973*: Bretton Woods system;
- *Post-1973*: different E.R. regimes in different countries.



10.4 THE OPEN ECONOMY IN THE MEDIUM RUN.

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The real exchange rate in the medium run

Real Exchange Rate (RER):

$$\varepsilon = \frac{EP}{P^*}$$

- *Short-run*: ε only changes if nominal exchange rate E changes.
- *Medium-run*: changes in domestic price level P relative to foreign price level P^* can produce adjustment in ε.
  - $\pi < \pi^*$ → real depreciation
  - $\pi > \pi^*$ → real appreciation

The IS relation in the medium-run

- IS relation in the open economy in the medium-run:

$$Y = C(Y - T) + I(Y, r) + \bar{G} + NX(Y, Y^*, \varepsilon)$$

$$Y = C(Y - T) + I(Y, i - \pi^e) + \bar{G} + NX(Y, Y^*, \frac{EP}{P^*})$$

- With fixed exchange rate $i = i^*$ and $E = \bar{E}$, so

$$Y = C(Y - T) + I(Y, i^* - \pi^e) + \bar{G} + NX\left(Y, Y^*, \frac{\bar{E}P}{P^*}\right)$$

The IS relation in the medium-run

- IS relation in the medium-run with fixed exchange rate:

$$Y = C(Y - T) + I(Y, i^* - \pi^e) + \bar{G} + NX\left(Y, Y^*, \frac{\bar{E}P}{P^*}\right)$$

$$\Downarrow$$

$$Y = Y\left(\frac{\bar{E}P}{P^*}, G, T, i^* - \pi^e, Y^*\right)$$

- Equilibrium output is a function of $\bar{E}, P, P^*, G, T, i^*, \pi^e \; and \; Y^*$.

The medium run with flexible exchange rate

- IS relation :

$$Y = Y\left(\frac{EP}{P^*}, G, T, i - \pi^e, Y^*\right)$$

- Phillips Curve:

$$\pi = \bar{\pi} + \beta(Y - Y_n)$$

- Medium-run adjustment (example):

$Y < Y_n$ & $NX < 0$ → Central Bank decreases *i* → $Y = Y_n$

- Not so different from closed economy!

The medium run with *fixed* exchange rate

- IS relation with fixed exchange rates:

$$Y = Y\left(\frac{\bar{E}P}{P^*}, G, T, i^* - \pi^e, Y^*\right)$$

- Phillips Curve:

$$\pi = \bar{\pi} + \beta(Y - Y_n)$$

- Medium-run adjustment with fixed ER:

$Y < Y_n$ & $NX < 0$ → $\pi < \pi^*$ → *real depreciation* → Y recovers until $Y = Y_n$

$Y > Y_n$ & $NX > 0$ → $\pi > \pi^*$ → *real appreciation* → Y drops until $Y = Y_n$

How things can go wrong with fixed ER systems

- Adjustment might be slow.
- Adjustment might just not happen.
- Fixed exchange rate systems are prone to *exchange rate crises* and *capital flights*.

Exchange rate crises in fixed ER systems

- Government might always devaluate to speed up adjustment.
- What if investors expect a devaluation?
- Interest parity condition:

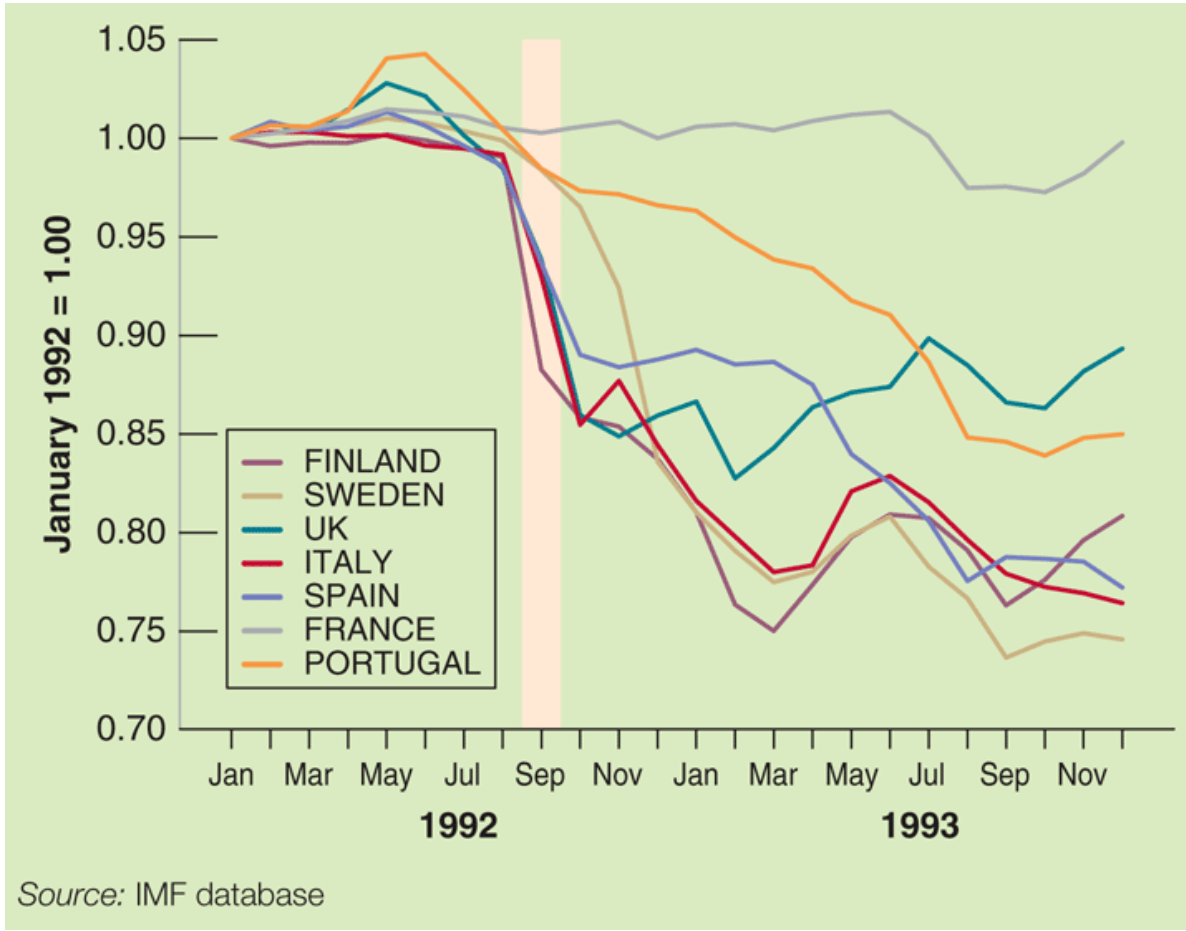
$$i_t = i_t^* - \left(\frac{E_{t+1}^e - E_t}{E_t} \right)$$

- *Exchange rate crises*: investors sell domestic bonds (capital flight), government forced to increase interest rates more & more.
- Usually ends up with a large devaluation.

The 1992 EMS crisis

- *EMS (1979-1999):* fixed ER (with bands) between EU countries.
- *Sep 1992*: markets start expecting devaluations relative to German Mark.
- *Capital flights* force very high interest rates.
- Most members eventually devalue (SPA, POR, SWE) or drop out of the EMS (ITA, UK).

Selected EU currencies relative to Deutsche Mark



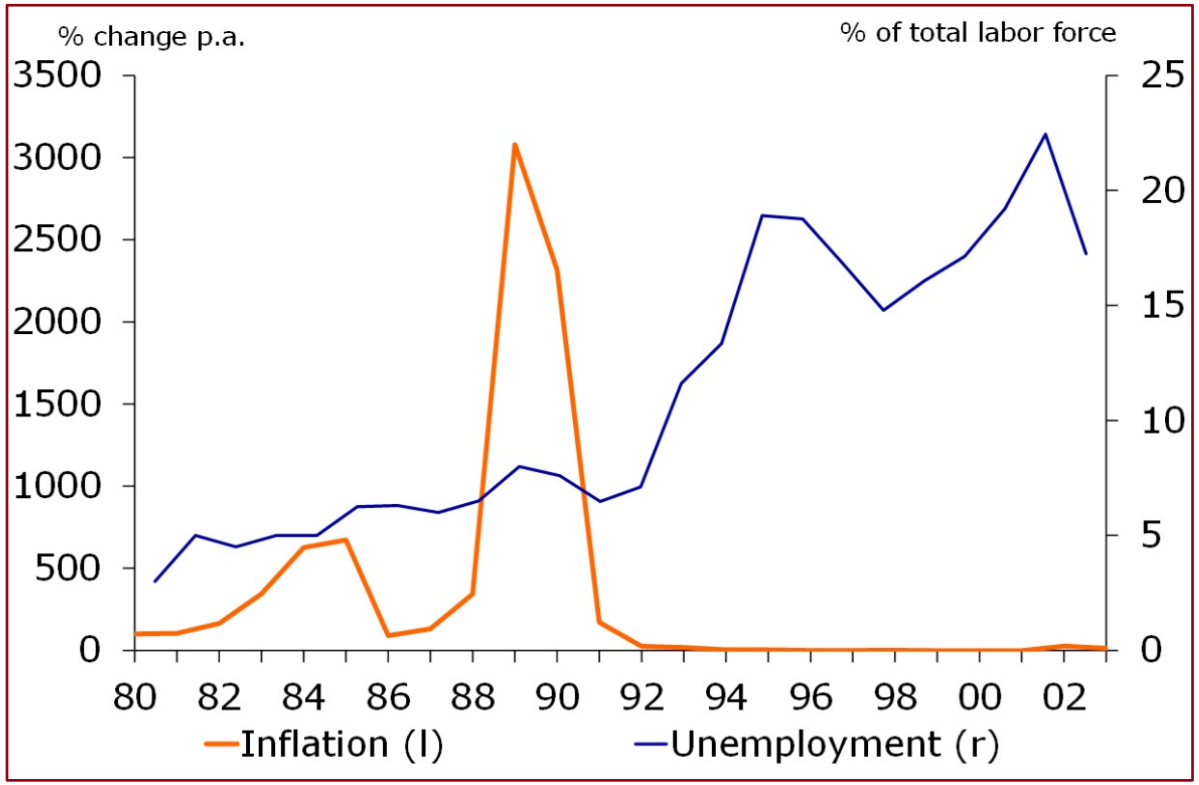
Source: IMF database

PREVIOUSLY ON ECON 204…

- IS-LM model for the open economy.
- Types of exchange rate regimes.
- The medium-run with flexible and fixed exchange rates.
- Exchange rate crises.

The 2000-2001 Argentine crisis

- 1991: Carlos Menem pegs Argentine peso to USD at 1:1.
- Late 1990s: USD appreciates, forcing the Peso to do the same.
  - Depressed economy & trade deficit.
- 2000-2002: huge currency crisis & capital flights.
- 2002: Argentina lets the peso float.



Possible advantages of fixed exchange rate systems

Optimal currency areas (OCAs)

When does a *currency union* make sense?

Optimal Currency Areas (OCAs)

1. Similar economic shocks
2. High labor mobility
3. Some kind of Federal Government ready to redistribute resources to countries that are doing worse*

Theory: sufficient for one condition to *fully* apply.

Practice: need a strong enough *combination* of the three (as in the US).

** not part of the original OCA theory, but true and important and widely recognized in practice.*

Volatility under flexible exchange rates

- Interest parity condition: $E_t = \frac{1+i_t}{1+i_t^*} E_{t+1}^e$

- But what determines E_{t+1}^e ?

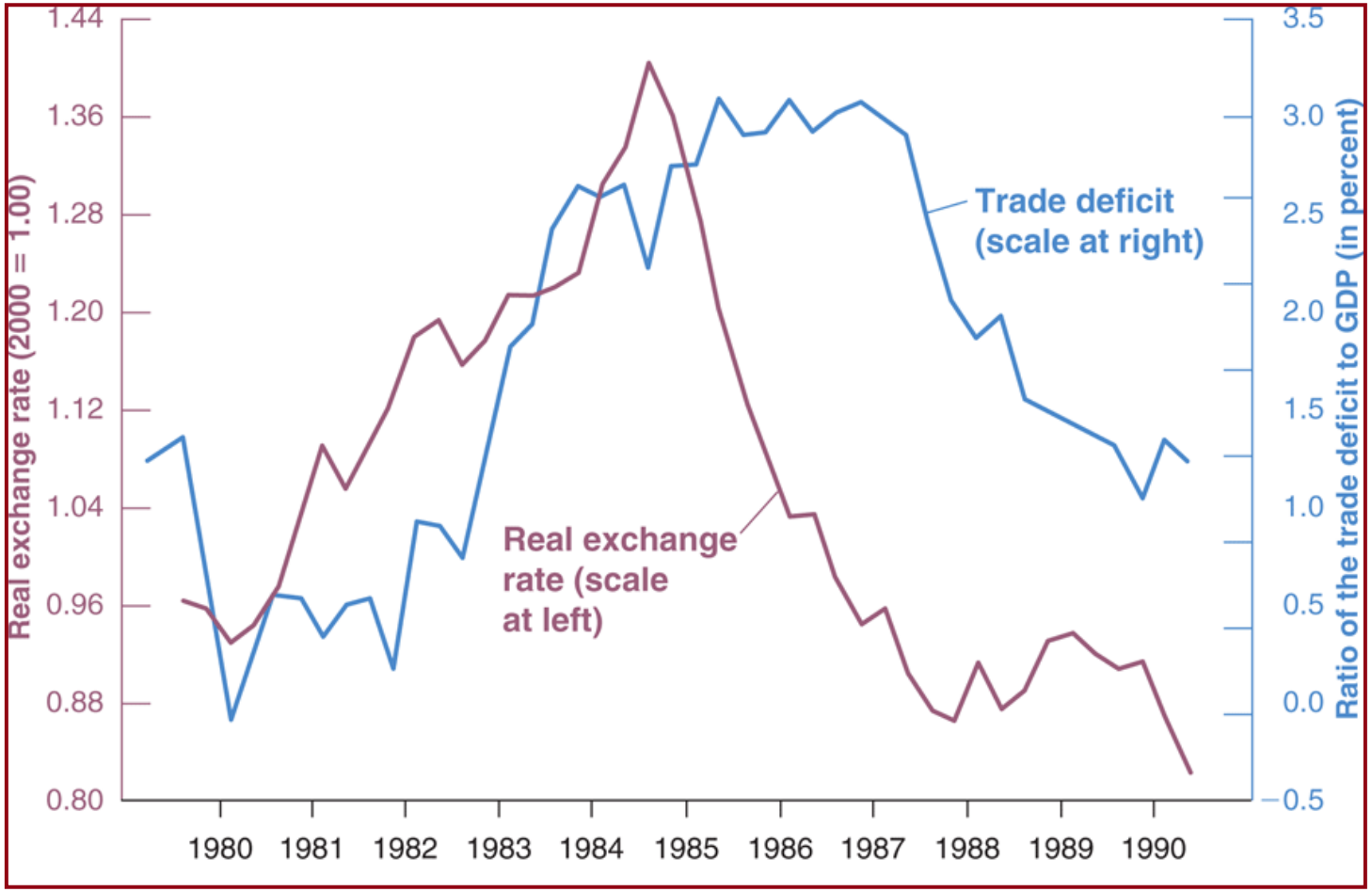
$$E_{t+1} = \frac{1+i_{t+1}}{1+i_{t+1}^*} E_{t+2}^e \rightarrow E_{t+1}^e = \frac{1+i_{t+1}^e}{1+i_{t+1}^{*e}} E_{t+2}^e$$

- Continuing to substitute forward until a distant year *n*:

$$E_t = \frac{(1+i_t)(1+i_{t+1}^e)\ldots(1+i_{t+n}^e)}{(1+i_t^*)(1+i_{t+1}^{*e})\ldots(1+i_{t+n}^{*e})} E_{t+n+1}^e$$

the exchange rate today depends on all expected future interest rate and exchange rate movements!

The dance of the dollar



Capital controls as a third option

- The interest parity condition does not need to hold (not even approximately) if there are *capital controls*.
- With capital controls, you can have fixed exchange rate systems but still control monetary policy.
- Capital controls were widespread and extensive before the 1980s.

Policy options

- Flexible exchange rate and liberalized capital outflows.
  - Can use monetary policy to stabilize the economy.
  - Short-run volatility in exchange rates.
- Fixed exchange rate and liberalized capital outflows.
  - If credible, can avoid short-run exchange rate volatility and anchor inflation
  - Lose control of monetary policy; risk of currency crises.
- Capital controls (with fixed or flexible exchange rates).
  - Allows to avoid exchange rate instability, while still using monetary policy.
  - Inefficient: gives up the benefits of capital inflows.