Lecture 5
The short-run performance of a small open economy
The Mundell-Fleming model

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Objectives

In this Lecture we will study:

- The basics of the Mundell-Fleming model (open economy-extension of the IS-LM model)
- The equilibrium implications of fiscal and monetary policy under different exchange rate regimes (fixed vs. flexible exchange rates)
- The implications of free trade and unlimited capital mobility for the efficacy of domestic monetary and fiscal policy.

Fixed versus flexible exchange rates

The Mundell-Fleming model studies the short-run performance of a small open economy (with rigid prices) under two alternative settings:

- Flexible exchange rates - the nominal exchange rate adjusts instantly to restore equilibrium.
- Fixed exchange rates - the Central Bank commits to buy or sell the domestic currency at a pre-announced exchange rate.

Basic assumptions

1. Small open economy assumption — the country acts as a price taker on international goods and financial markets

2. Perfect capital mobility (no-arbitrage condition):

$$r = r^*$$

3. The value of net-exports depends negatively on the real exchange rate,

$$NX = NX(\epsilon)$$

4. Rigid prices ($P = \bar{P}, P^* = \bar{P}^*$) — without loss of generality we can write $NX(e)$

Reminder

The rest of the assumptions are taken from the IS-LM model for the closed economy.

- The short-run equilibrium is characterised by the intersection of the curves that characterise equilibrium in the goods market (IS^*) and the money market (LM^*)
- The Government can influence aggregate demand through changes in public expenditure G and taxes T
- The Central Bank has perfect control over money supply, denoted by M
- There is a well-defined demand function for "real balances" $L(r, Y)$.

Goods market equilibrium

The equilibrium condition for the goods market, IS^*, can be derived in three steps:

$$Y = C(Y - T) + I(r) + G + XN(\epsilon)$$

Interest rate parity

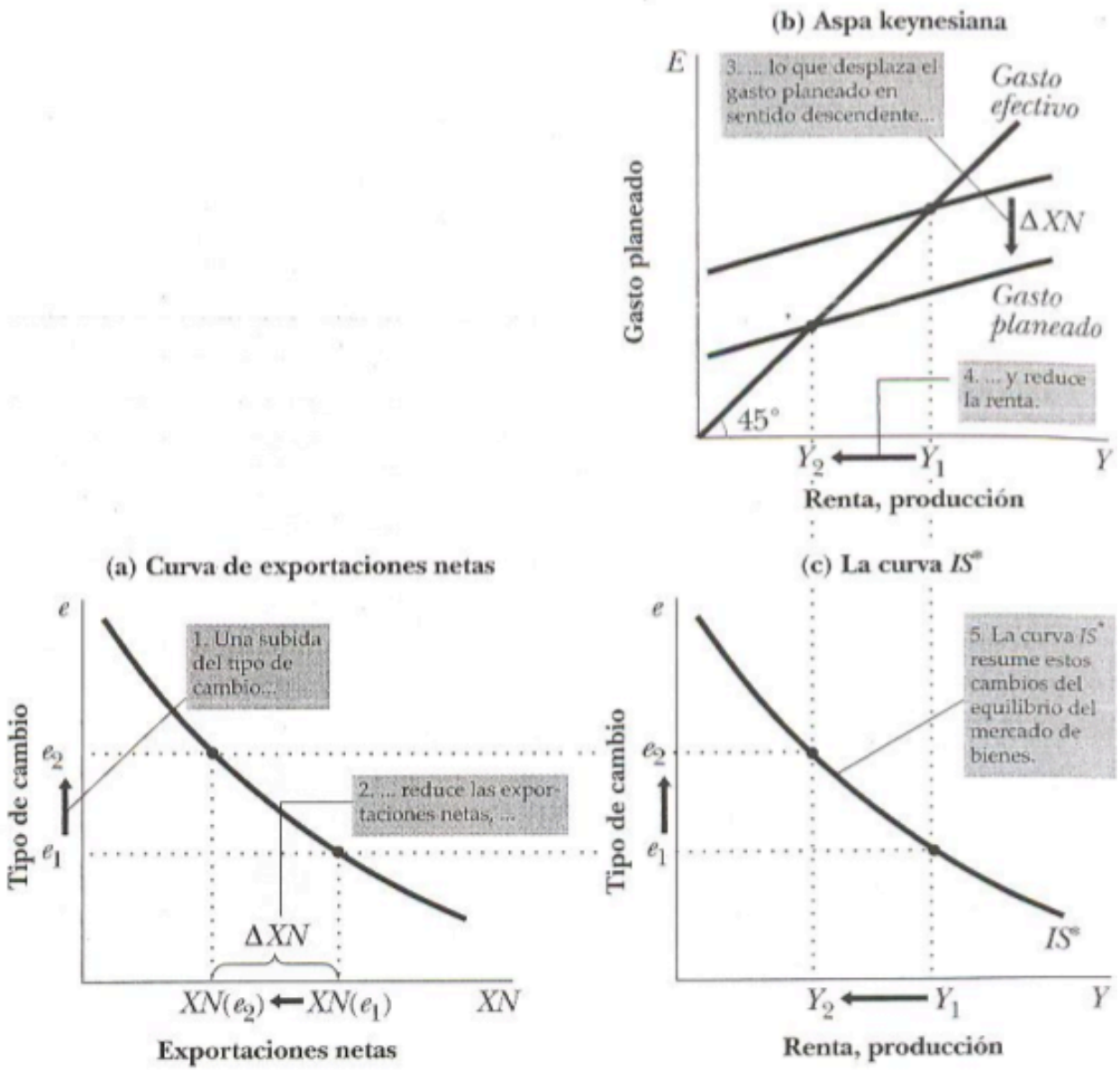
$$Y = C(Y - T) + I(r^*) + G + XN(\epsilon)$$

Rigid prices

$$Y = C(Y - T) + I(r^*) + G + XN(e)$$

This last step follows from the fact that $\dot{\epsilon} = \dot{e}$ when price levels are fixed.

IS^* : The Keynesian cross



Properties of the IS^*

The IS^* has a negative slope in the plain (Y, e).

A decrease in the nominal exchange rate leads to a rise in net-exports and aggregate demand. To restore the goods market equilibrium, output needs to rise.

Notice that the rise in aggregate demand sets in motion a multiplier effect as the rise in Y leads to a rise in consumer spending, $C(Y - T)$.

The position of the IS^* curve depends on the values of $G, T, r*$. Any change in the value of these parameters causes a shift in the position of the IS^* curve. By contrast, a change in the value of e leads to a shift along the IS^* curve.

Comparative statics

Analyse how the following changes affect the position of the IS^* curve.

- A rise in domestic fiscal expenditure ($\Delta G > 0$)
- A rise in fiscal expenditure in the rest of the world
- An appreciation of the currency
- A rise in aggregate income in the rest of the world

Money market equilibrium and the LM^* curve

The model of the money market is identical to the one used in the IS-LM model:

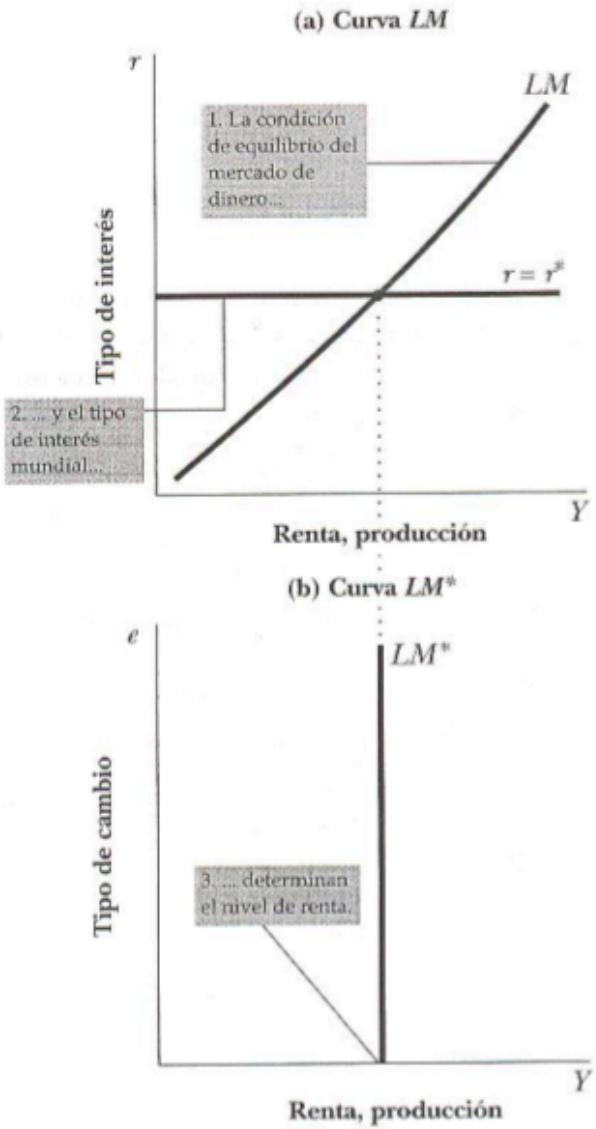
$$\frac{M}{P} = L(r, Y)$$

The only difference is the fact that the interest rate is anchored as $r = r^*$.

$$\frac{M}{P} = L(r^*, Y)$$

As a consequence, there is only one value of Y that clears the money market.

LM^* vs. LM


(a) Curva LM
r
LM
1. La condición de equilibrio del mercado de dinero...
r = r*
Tipo de interés
2. ... y el tipo de interés mundial...
Y
Renta, producción
(b) Curva LM*
e
LM*
Tipo de cambio
3. ... determinan el nivel de renta.
Y
Renta, producción

Properties of the LM^* curve

- The LM^* curve is a vertical line in the plain (Y, e).
- The position of the LM^* curve depends on the value of M, P and r^*.
- Changes in the value of these exogenous variables lead to shifts in the position of the LM^* curve.
- In particular, the Central Bank can shift the LM^* curve through changes in its monetary policy
  - Expansionary monetary policy: $\Delta M > 0 \rightarrow$LM* shifts to the right
  - Restrictive monetary policy: $\Delta M < 0 \rightarrow$LM* shifts to the left

Equilibrium

- We are now in a position to characterise the equilibrium
- We'll start with the case of a country with perfectly flexible exchange rates
- In this setting, the nominal exchange rate adjusts instantly to guarantee equilibrium in both the goods and the money market

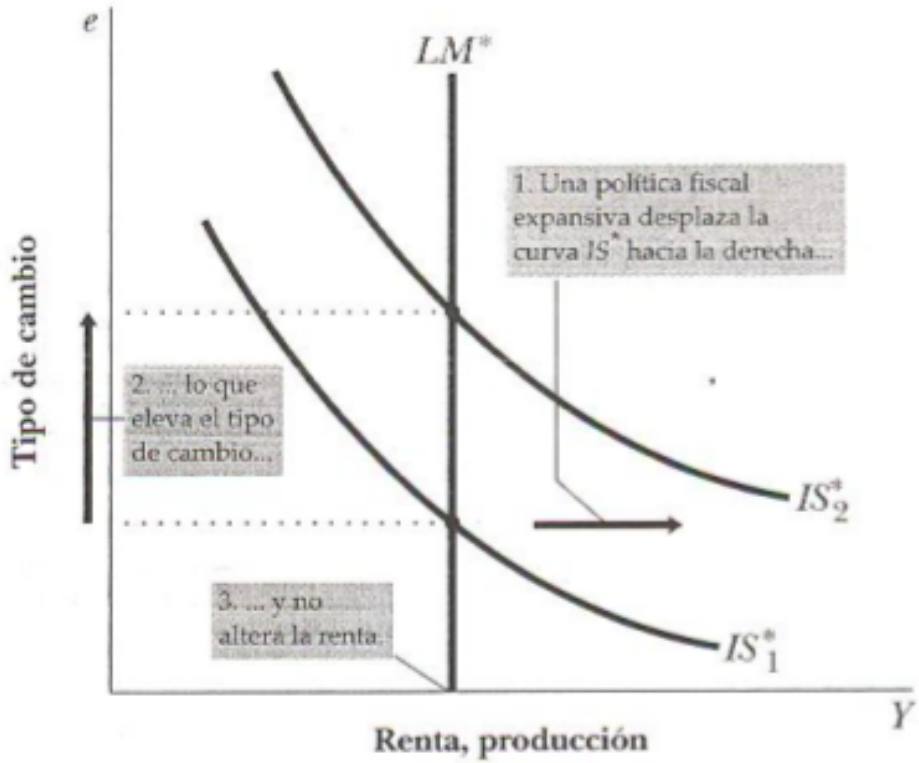
Equilibrium with flexible exchange rates

The short-run equilibrium is defined by a pair (Y, e) that solves the two equilibrium conditions:

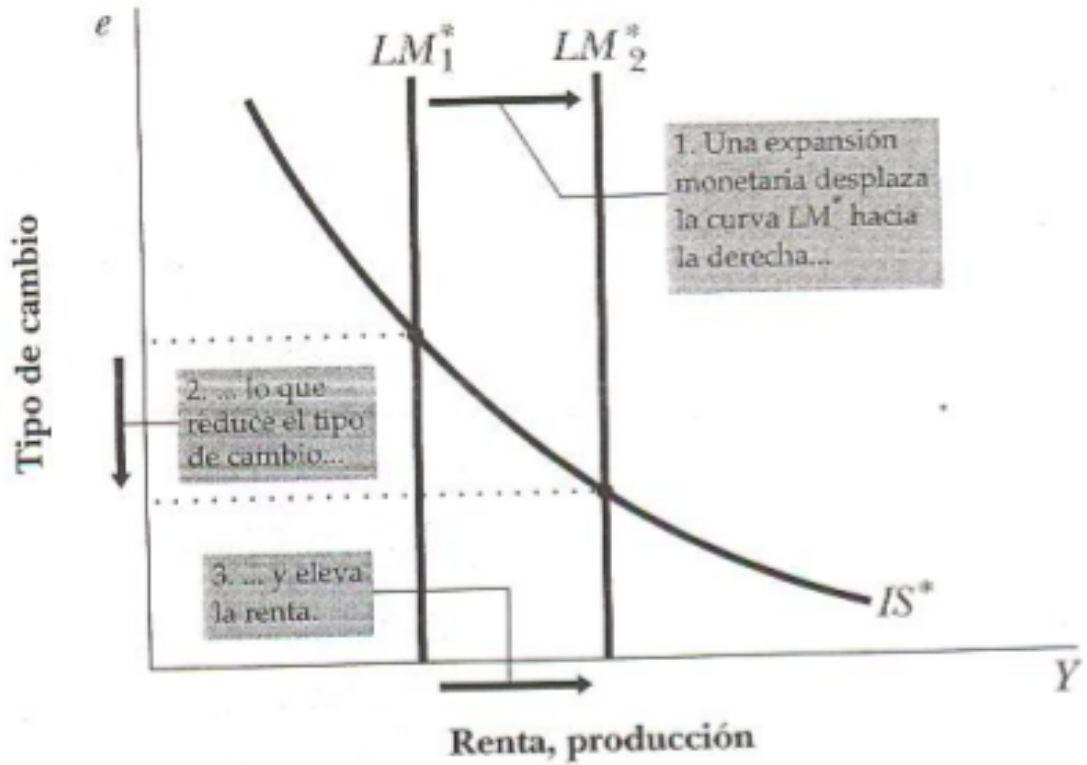
$$\begin{aligned} Y &= C(Y - T) + I(r^*) + G + XN(e) \\ \frac{M}{\bar{P}} &= L(r^*, Y) \end{aligned}$$

Formally, this is a system of two equations in two unknowns (Y, e) and five exogenous parameters $(T, G, r^*, M, \bar{P})$.

Policy experiment I: An expansionary fiscal policy



Policy experiment II: An expansionary monetary policy



Main lessons

In a small open economy with flexible exchange rates

- Fiscal policy is ineffective — a rise in fiscal expenditure leads to an appreciation of the exchange rate and no change in output. In other words, a fiscal expansion crowds out exports
- By contrast, monetary policy is highly effective — a rise in money supply leads to a depreciation of the currency and a rise in net-exports, output (and hence employment).
- A flexible exchange rate insulates the domestic economy from shocks to export demand. By contrast, changes in the world interest rate do affect the domestic economy

The transmission mechanism of monetary policy changes

In any equilibrium, $r = r^*$. Nevertheless, in the transition towards a new equilibrium, the domestic interest rate may deviate from the world interest rate. Consider the effects of a rise in M:

- At the existing equilibrium values for (Y, e), the private agents now have excess liquidity.
- Private agents will try to buy bonds. This drives up the price of bonds and places a downward pressure on interest rates
- In response to this transitory drop in r, investors will offer their excess liquidity on foreign exchange markets.
- The resulting depreciation of the exchange rate stimulates exports and leads to a rise in output and money demand
- In the new equilibrium, the agents voluntarily hold the higher money stock. No money has left the country.

Beggar-thy-neighbour policies

- Flexible exchange rates offer countries the option to export their problems.
- Expansionary monetary generates a depreciation of the currency and an improvement in the trade account at the expense
- Competitive depreciations are an example of zero-sum policies.
- But retaliation by third countries may provoke currency wars.
- World history is full of currency wars. (Great Depression, but also the recent economic and financial crisis)

Unintended effects of QE

- In 2008/9 the USA adopted three rounds of *Quantitative Easing*.
- The massive purchase of assets by the FED was to intended to reduce the domestic interest rate and stimulate the economy.
- But the lower interest rates also caused a considerable depreciation of the US dollar providing a further boost to the economy.
- In Europe QE hardly lowered the value of the Euro. Plus it created tension between Northern and Southern Member States.
- What may explain these differences?

The short-run equilibrium under a fixed exchange rate regime

- The Central Bank commits itself to buy and sell its own currency at a pre-announced exchange rate, e^f, vis-a-vis other currencies.
- If there is excess demand for the currency at e^f the Central Bank will have to sell domestic currency to avoid an appreciation
- If there is an excess supply of the currency at e^f the Central Bank will have to buy domestic currency to avoid an appreciation
- Notice that the capacity to buy domestic currency is limited by the size of the official reserves of the Central Bank

Examples

- The Gold standard
- The system of Bretton-Woods
- The European Exchange Rate Mechanism
- Currency board Argentina

Motives for the adoption of a fixed exchange rate system:

- The adoption of a fixed exchange rate system eliminates a source of risk and may stimulate international trade
- It may act as a credible mechanism to reduce the growth rate of money supply and inflation. To make the fixed exchange rate system sustainable, the inflation rate should be similar to the one in the reference country

Monetary and fiscal policy under fixed exchange rates

In our baseline model, the adoption of a fixed exchange rate regime reverses the predictions obtained under flexible exchange rates:

- Countries with a fixed exchange rate lose the option to alter money supply at will
- Fiscal policy is highly effective and does not cause any crowding-out effect on exports

Short-run equilibrium with fixed exchange rates

The short-run equilibrium with fixed exchange rates is determined by the intersection between the IS^* curve and the horizontal line that indicates the fixed exchange rate. Formally,

$$Y = C(Y - T) + I(r^*) + G + XN(e^f)$$

The interventions of the Central Bank need to ensure that the LM^* will shift to the position at which it crosses the above two lines.

No room for discretionary monetary policy

In a fixed exchange rate regime, the Central Bank loses the option to use monetary policy for other purposes than the maintenance of the exchange rate. A monetary stimulus would be ineffective and cause a loss of international reserves

The effects of a monetary stimulus

Starting from a short-run equilibrium, the rise in the money supply provokes

- A depreciation of the exchange rate to a level below e^f.
- Agents can now obtain gains from arbitrage by buying the domestic currency at e^* and selling it to the CB at $e^f > e^*$
- The sales of the domestic currency lead to a left-ward shift of the LM^* curve.
- The tensions do not disappear until the LM^* curve has shifted back to its original position.

Fiscal policy under fixed exchange rates

By contrast, fiscal policy is highly effective under a fixed exchange rate regime and does not crowd out exports.

Consider the effects of an expansionary fiscal policy. Starting from a short-run equilibrium,

- The right-ward shift of the IS^* curve provokes an appreciation of the exchange rate
- The Central Bank will have to sell its own currency in order to avoid this appreciation.
- The resulting rise in M leads to a right-ward shift in the LM^* curve and a rise in income

The monetary policy response to negative demand shocks

Suppose a country with a fixed exchange rate is hit by a negative demand shock

- The demand shock shifts the IS^* curve to the left
- In the absence of any intervention by the Central Bank, the currency would depreciate and the entire shock would be absorbed through higher net exports
- By contrast, if the Central Bank maintains its commitment to the fixed exchange rate, it will have to adopt a restrictive monetary policy that moves the LM curve leftward
- In sum, the Central Bank is obliged to follow a pro-cyclical monetary policy.
- Notice that this may impose a high cost on society if the shock is persistent.

The effects of a devaluation

The Central Bank cannot alter M to depreciate the currency, but faced with a persistent recession it can decide to devalue its currency. This is the key difference with a monetary union.

The effects of a currency devaluation are straightforward

- Investors will buy the domestic currency at the Central Bank at the newly announced fixed exchange rate
- Domestic money supply increases, causing a right-ward shift in the LM^* curve

Obviously, devaluations cannot be adopted frequently. But the resistance to devaluate weak currencies may impose even higher costs on society than a devaluation.

Speculative attacks

- Suppose a country suffers a deep recession. This may not only cause a contraction. It may also cause doubts about the future value of the currency
- Beliefs about a devaluation cause a rise in the domestic interest rate ("covered interest rate parity")
- The rise in the interest rate causes a further leftward shift in the IS* curve
- This is turn may strengthen the beliefs about a future devaluation and generate an attack on a currency forcing the Central Bank to buy up large amounts of its own currency.

Main lessons

The analysis has revealed important differences between a fixed and flexible exchange rate regime:

- Under a fixed exchange rate system countries lose the option to use monetary policy to respond to shocks
- By contrast, fiscal policy is effective under a fixed exchange rate system, while fiscal policy looses efficacy in a flexible exchange rate regime
- Fixed exchange rate systems become vulnerable to destabilising attacks if the exchange rate drifts away from its fundamental value.

Fiscal multipliers in an open economy

The following analytical version of the Mundell-Fleming model allows a comparison between the fiscal multiplier in closed and open economies:

$$
\begin{aligned}
C &= c_0 + c_1(Y - T) \\
I &= i_0 - br^* \\
G &= G_0 \\
T &= T_0 \\
XN &= x_0 - mY + xY^* - \mu e \\
\frac{M}{P} &= kY - hr^*
\end{aligned}
$$

Notice that the trade balance is assumed to depend on $(Y, Y*, e)$. This is a natural assumption.

Fiscal multiplier

The real side of the model allows us to solve for Y as:

$$Y = \frac{1}{1 - c_1 + m}\left(c_0 + i_o + x_0 + G_0 - c_1 T + xY - \mu e\right)$$

Hence, the effect of an expansionary fiscal policy is given by

$$\Delta Y = \frac{1}{1 - c_1 + m}\Delta G$$

Notice that the size of the fiscal multiplier is decreasing in m. In an open economy some part of the fiscal stimulus "leaks away" through imports, and this effect is stronger the larger is m.

Risk premium

So far, we have maintained the assumption that assets are perfect substitutes so that $r = r^*$.

Nonetheless, the experience during the Euro-crisis has shown that this assumption is unrealistic.

The *risk premium* on souvereign bonds with a 10-year maturity reached a record level of 600 base points in the Summer of 2012.

Reasons why investors may charge a risk premium:

- Exchange rate risk
- Default risk
- Systemic risks in the case of the Euro

Expected devaluation

- Suppose investors expect a θ percent devaluation of the domestic currency
- The interest rate parity condition implies that the domestic interest rate has to increase

$$r = r* + \theta$$

- The higher interest rate depresses domestic investment
- The Central Bank is forced to intervene (by buying up local currency) if it wishes to maintain the fixed exchange rate
- The pressure on interest rates will not disappear until the CB devaluates the currency or investors revise their expectations
- Notice that the impact on short-run interest rates may be dramatic!