

# **Econ 2004:**

## **The Open Economy**

### **Lecture 3: The 3-equation open economy model**

#### **Reading.**

##### **Core:**

Revision: Carlin & Soskice (2006 book) Chapter 3 Section 2, Chapter 5 Section 3

New: Carlin & Soskice (2015) Chapter 9 Sections 9.1 (yes, read it through again), 9.2.4, 9.2.5, 9.3.1

##### **Optional:**

See Moodle

## Last lecture

### Model-building:

#### The medium-run open economy model (AD-ERU model)

- What determines the medium-run real exchange rate? Supply and demand shocks and policies (independent of exchange rate regime) →
- What determines the medium-run inflation rate? Monetary policy (i.e. exchange rate) regime ...

Fixed exchange rates:  $\pi^{\text{MRE}} = \pi^*$

Flexible exchange rates:  $\pi^{\text{MRE}} = \pi^T$

## Summary: the medium run model (AD-ERU)

- What are the variables on the axes?
- Demand side represented by AD curve, incorporates
- Supply side represented by ERU curve incorporates  $WS=PS$
- In MRE, economy is
  - ON an AD curve and ON an ERU curve
  - inflation is constant
  - real exchange rate is constant
  - $r = r^*$



## Summary: the medium run model (AD-ERU)

FAQs:

1. Why is ERU vertical?
2. What does it mean that  $q$  is constant on the ERU curve?



# **This lecture**

## **Model-building:**

**Focuses on flexible exchange rate economy with inflation-targeting CB**

→ The 3-equation open economy model

## **Policy questions:**

How should the CB respond to the following:

- inflation shock?
- demand shock?
- supply shock?

## Recall the closed economy model

Draw the basic diagram for the  
*closed economy* 3-equation model

Write down the 3 equations

1.

2.

3.

using



## Lambda

Speech given by

Mark Carney, Governor of the Bank of England

London School of Economics

Monday 16 January 2017

# Last week at LSE, Governor Carney's speech

- 3-equation model of closed economy
- Informal reference to open economy effects
- We extend model to open economy

Mark Carney on Monday evening said the resilient economy was pushing the Bank of England to pay more attention to inflation and that there are limits to its tolerance for higher prices.

He reminded an audience at the London School of Economics that the Bank's Monetary Policy Committee had [warned in November](#) that there are "limits to the extent to which above-target inflation can be tolerated".

"Recently, there have been signs of continued solid consumer momentum domestically and a stronger growth outlook globally," said Mr Carney.

He added that British consumers appear to be "entirely looking through Brexit-related uncertainties" as they continued to spend strongly.

"The MPC will monitor developments in the light of its inflation tolerance, and will explain its assessment and policy stance accordingly," he added.

# FINANCIAL TIMES

## Related article

### Pound falls below \$1.20 ahead of Theresa May's Brexit speech

UK currency back near 30-year lows on fears of Britain leaving EU single market



The governor of the Bank of England was speaking as the [pound fell to near 30-year lows](#) ahead of the prime minister's speech., is expected to signal that Britain will break with the EU's single market.

A signal that the Bank is tilting towards raising interest rates would expect to provide support to the currency. .

Until now, the Bank has been relaxed about the effect of the weakening pound on inflation, arguing that it would be muted by higher unemployment and a weaker economy. But [recent statistics on employment and economic growth](#) have been robust, suggesting the Bank may now start to adjust its view.

But Mr Carney added the caveat that "episodes of consumption-led growth" tend to be "slower and less durable".

# Why is the open economy different?

One obvious change in the open economy

Until now, the Bank has been relaxed about the effect of the weakening pound on inflation, arguing that it would be muted by higher unemployment and a weaker economy. But recent statistics on employment and economic growth have been robust, suggesting the Bank may now start to adjust its view.

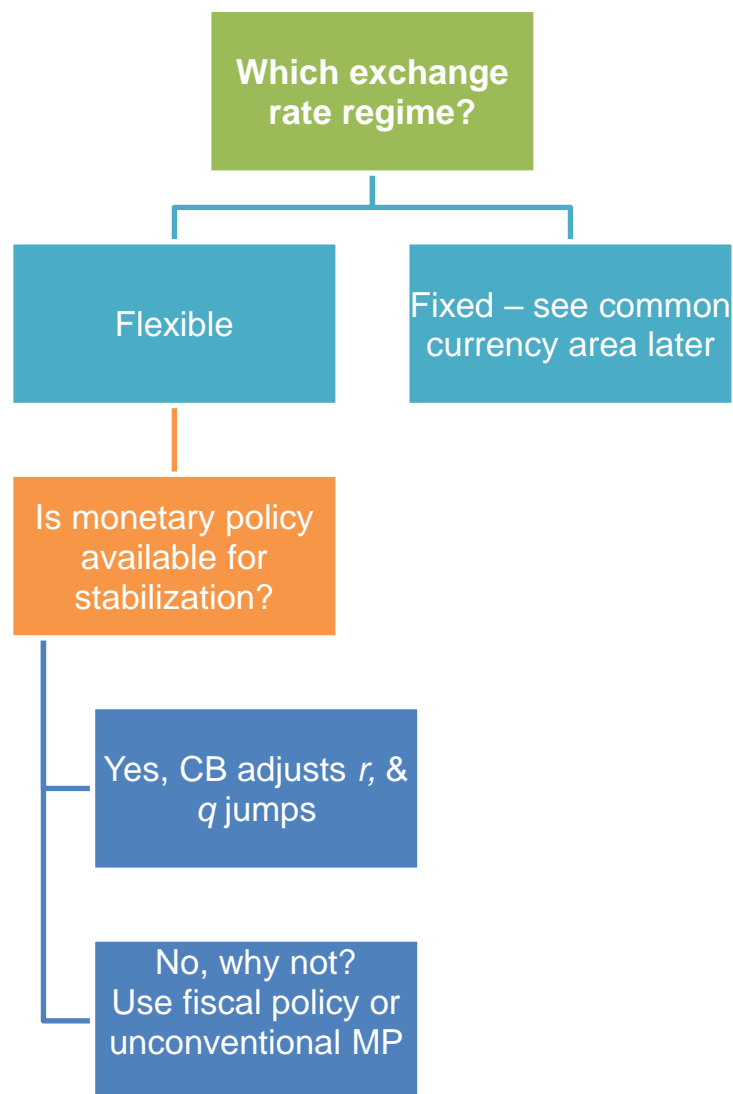
A more subtle change will be needed:

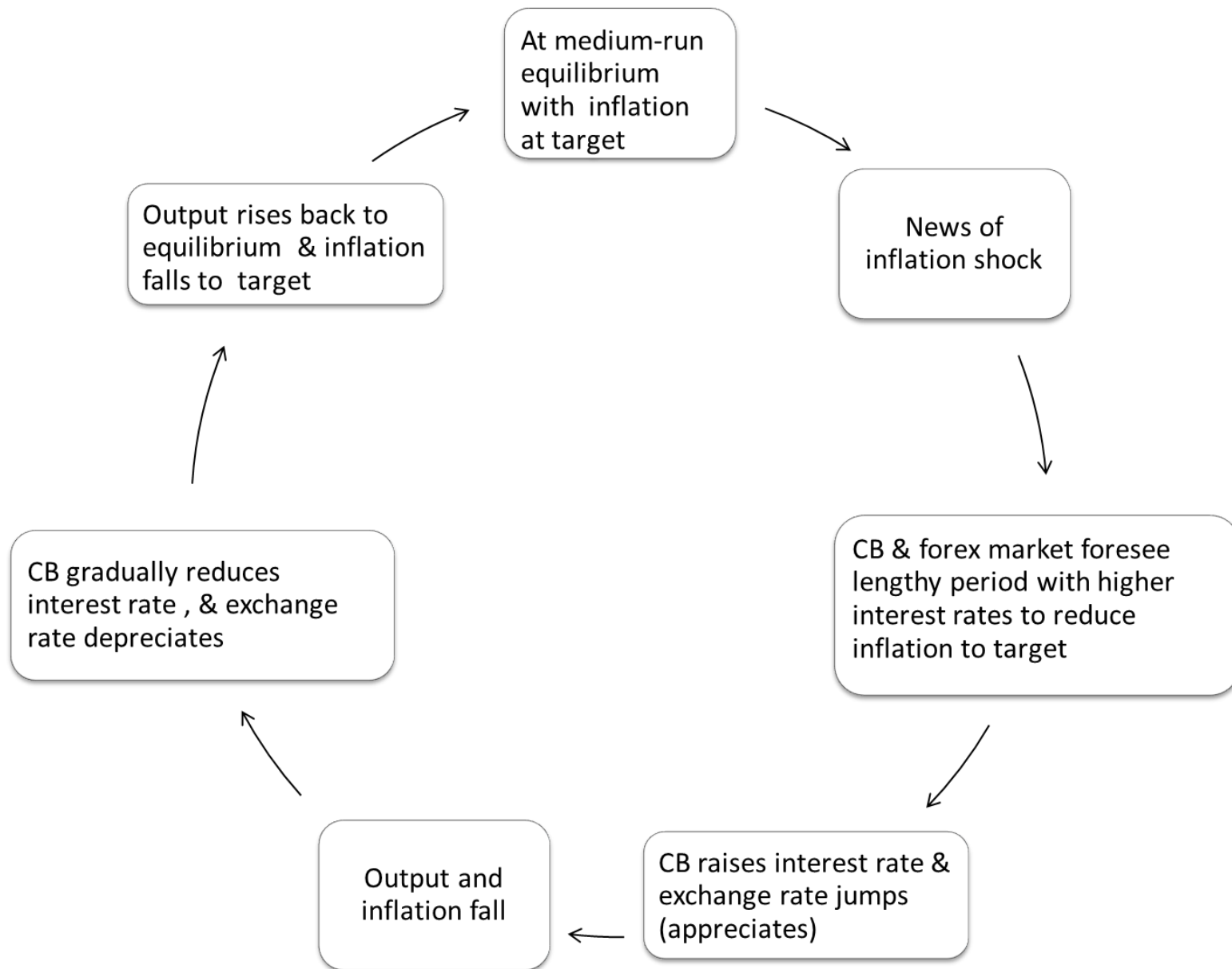
“The dollar rose the most against the euro in a month on speculation government reports tomorrow will show faster inflation in the U.S., underscoring the potential for the Federal Reserve to raise interest rates more than some traders had expected.”

June 9<sup>th</sup> 2004, Dollar Surges Against Euro as Traders Anticipate Fed Rate Moves, Bloomberg News



# Policy-making in the open economy





## The structure of the 3-equation closed economy model

CB minimizes *its loss function*, which expresses its objectives

subject to *the constraint from the supply side*, in the Phillips curve

which produces *the monetary rule function* that pins down the optimal output gap

which is implemented through choice of  $r$  using *the IS equation* (best-response Taylor Rule)

# Analyzing an inflation shock in a closed economy



## The structure of the 3-equation open economy model

CB minimizes the *loss function*, which expresses its objectives

subject to the *constraint from the supply side*, in the Phillips curve

which produces the *optimal monetary rule function* that pins down the optimal output gap

which is implemented through choice of  $r$  using *the IS equation & taking account of the reaction of the forward-looking forex market* (best-response Taylor Rule for the open economy)

# Comparing an inflation shock in closed & open economies

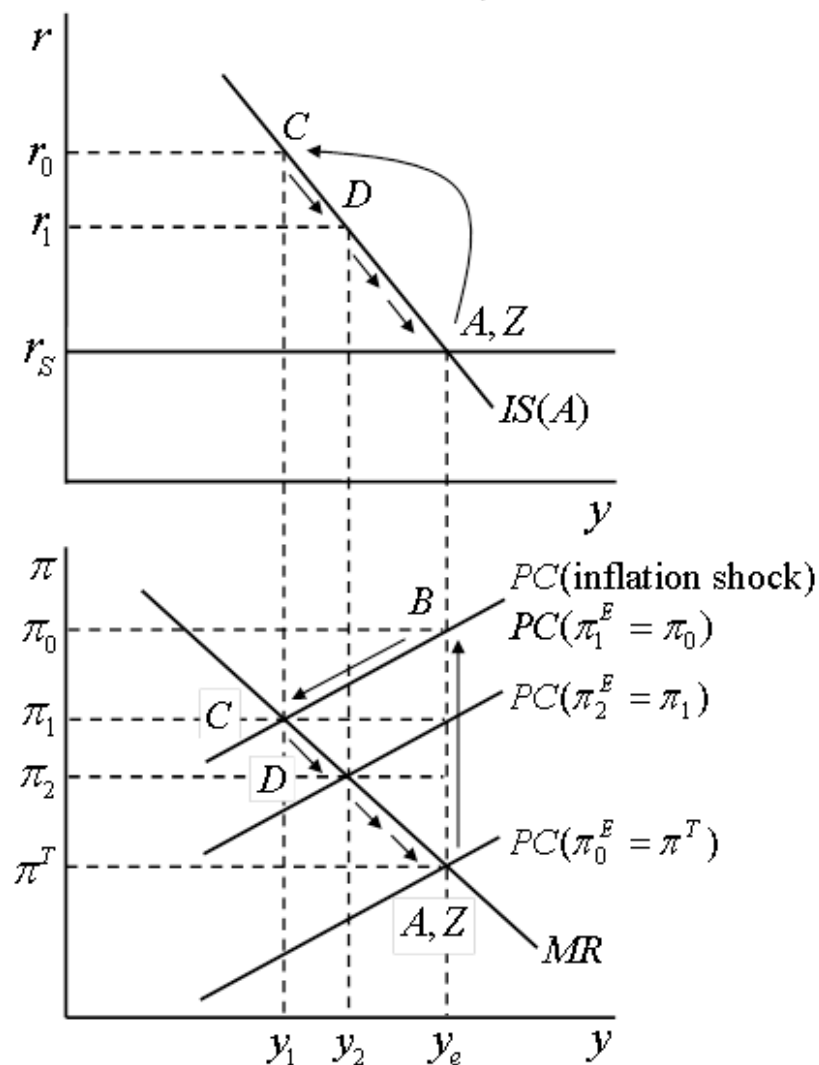
Closed

Open

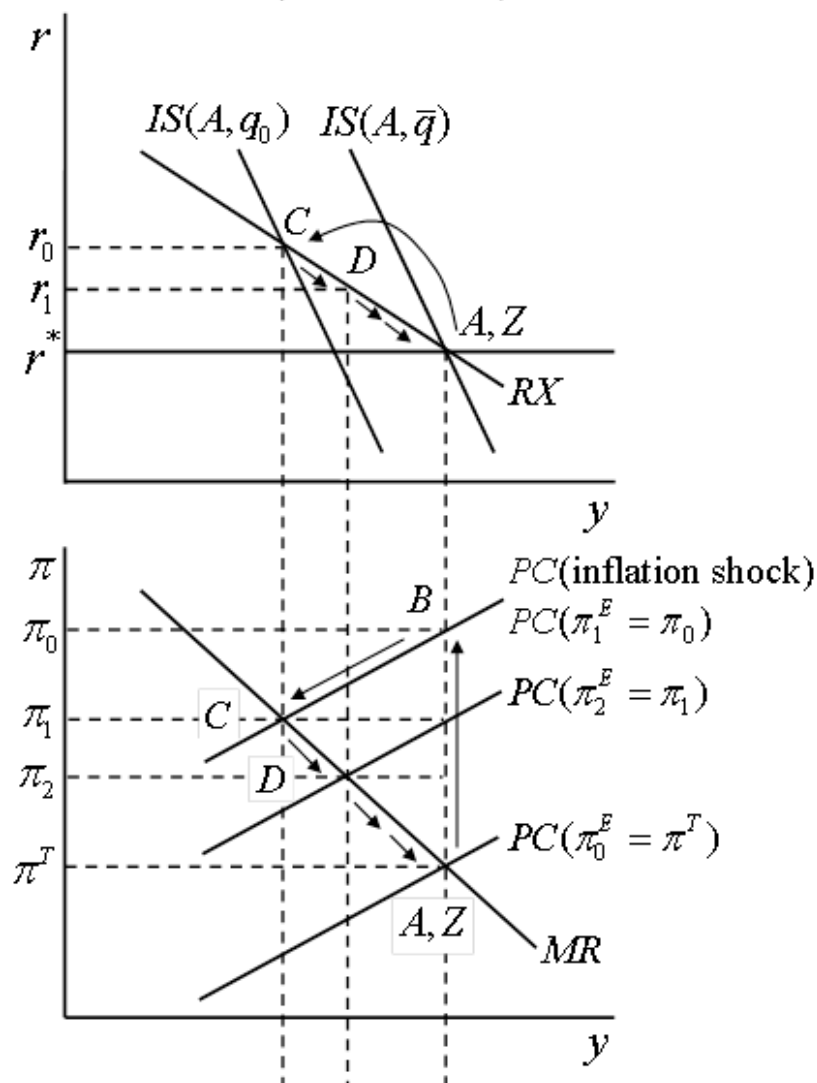


# Comparing an inflation shock in closed & open economies

a. Closed economy



b. Open economy



## What is the RX curve?

Remember this step in the closed economy?

the optimal monetary rule function pins down the optimal output gap,  
which is implemented through choice of  $r$  using the IS equation

In the open economy, the same step is:

the optimal monetary rule function pins down the optimal output gap, which is implemented through choice of  $r$  using the IS equation  
& taking account of the reaction of the forward-looking forex market



# Modelling forward-looking behaviour

## Questions:

How does forex market analyse the CB's optimal reaction to a shock?

How does the CB analyse the forex market's reaction to a shock?

## Puzzle (example of inflation shock):

If forex market knows CB will set  $r$  above  $r^*$  for some time;

it will expect exchange rate \_\_\_\_\_,

which means  $q$  will \_\_\_\_\_ immediately ... but this will

\_\_\_\_\_ output and mean the CB has to raise  $r$  by less ... but in

this case the \_\_\_\_\_ will be less and the CB will have to raise  $r$  by more

Q: How much does CB raise  $r$  and by how much does  $q$  jump?

# Modelling forward-looking behaviour

## Answer:

Both solve the same problem; both use the same model; the model assumes both have

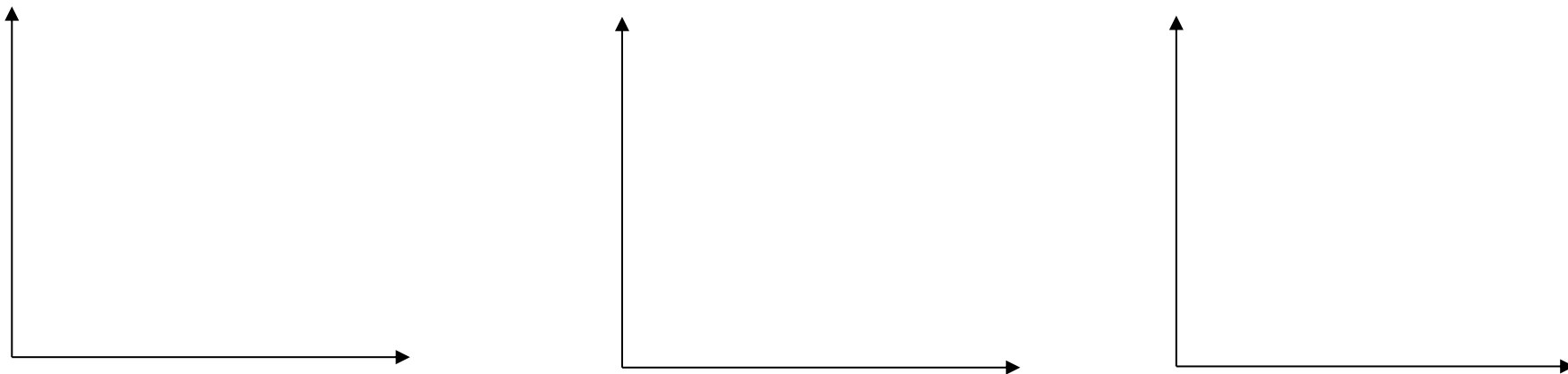
## Tasks:

1. Doing the maths to derive the RX equation ... next week
2. Practising the logic and integrating with the AD-ERU model – so far, we have concentrated on an inflation shock but what about supply & demand shocks?

# Demand & supply shocks: 3 equation model & AD-ERU model

From AD-ERU model, we know that

- permanent demand & supply shocks affect medium-run real exchange rate,  $\bar{q}$
- supply shocks affect equilibrium output,  $y_e$



Why does this matter?

CB and forex market need to calculate new MRE  $q$  and new  $y_e$  for the output gap

Why didn't we worry about this with an inflation shock?

## Example: negative demand shock

“Sterling had lost over a quarter of its value since mid-2007. To some degree, that depreciation had probably reflected the need to rebalance the UK economy away from domestic towards external demand. In addition over the past year, the global outlook had deteriorated with resultant downward revisions to interest rate expectations worldwide. But the downward revision to forecasts of the UK economy appeared to have been greater than for some other countries. And those perceptions may have contributed to sterling's decline.”

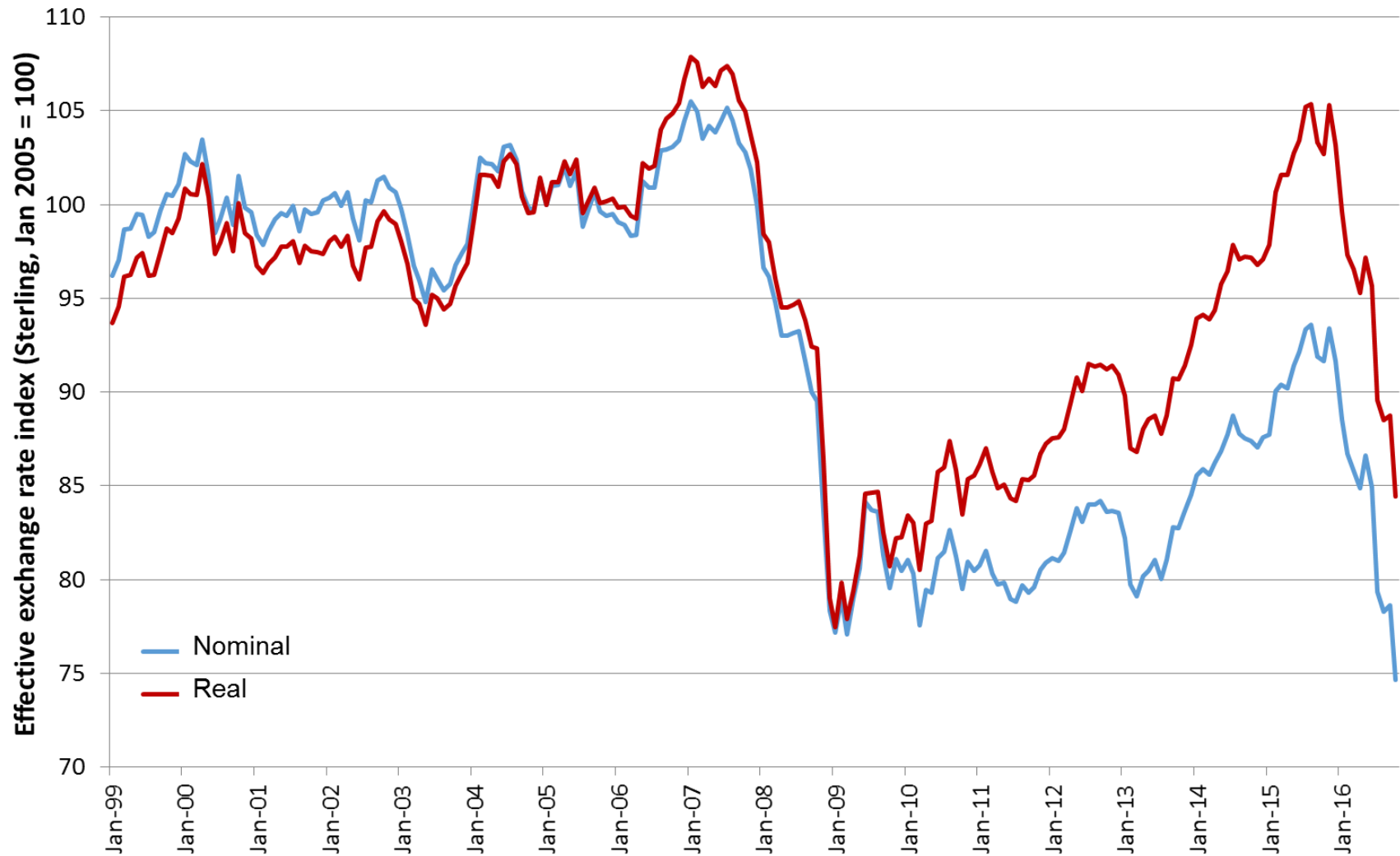
Bank of England, Minutes of the Monetary Policy Committee Meeting, 4 and 5 March 2009

Behaviour of UK exchange rate in context of global financial crisis suggests forex market saw a specific problem for the UK

- the permanent disappearance of some \_\_\_\_\_ demand (revealed as unsustainable)
- need for permanent shift toward \_\_\_\_\_
- not just a temporary crisis-related demand shock

# UK: nominal and real exchange rate indices

↑ appreciation



## Example: negative demand shock

### Using the model to dissect the BoE's statement

“Sterling had lost over a quarter of its value since mid-2007.

To some degree, that depreciation had probably reflected the need to rebalance the UK economy away from domestic towards external demand.”

**[Model: MRE  $q$  is depreciated]**

“In addition over the past year, the global outlook had deteriorated with resultant downward revisions to interest rate expectations worldwide.”

**[Model: likely fall in  $r^*$ ]**

“But the downward revision to forecasts of the UK economy appeared to have been greater than for some other countries.”

**[Model: expect BoE to cut  $r$  relative to  $r^*$ ]**

“And those perceptions may have contributed to sterling's decline.”

# Central bank reaction to a permanent demand shock

Step 1. Use AD-ERU model to work out new equilibrium  $q$

Step 2. Use 3-equation model to work out CB's policy response & dynamic adjustment to shock

Step 1. Negative demand shock in AD-ERU model



# Central bank reaction to a permanent demand shock

Step 2. Use 3-equation model to work out CB's policy response & dynamic adjustment to shock

Diagram



Intuition (in words)

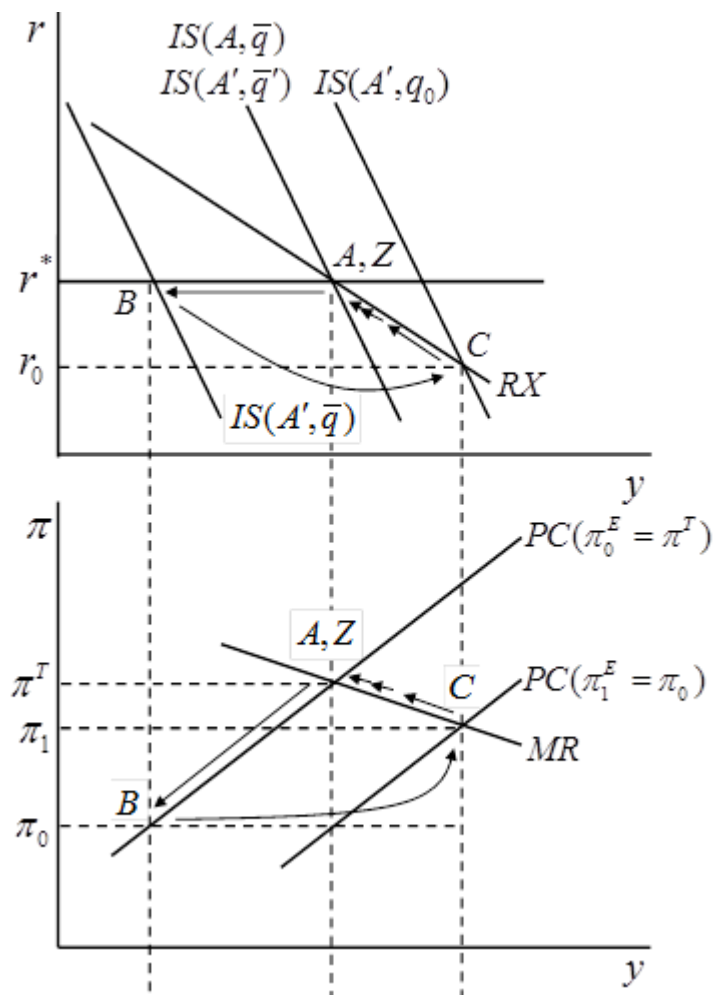




# Central bank reaction to a negative demand shock



# Central bank reaction to a negative demand shock



1. Output falls to B on new IS
2. Inflation falls to B on PC
3. CB & forex market calculate CB's optimal output gap on MR curve at C
4. RX shows how much  $r$  must be cut below  $r^*$  : C on RX
5. IS shifts by equilibrium depreciation  $\bar{q}$  to  $\bar{q}'$  plus extra depreciation to take IS to C
6. CB gradually raises  $r$  back to  $r^*$  along RX (as expected)
7. Since  $r < r^*$  from C to Z,  $q$  appreciates as expected and IS moves to the left

## **Next week**

We get more precise ... in the 3-equation model, how exactly does the CB calculate the right interest rate change in response to a shock? This tells us where the RX curve comes from

What is exchange rate overshooting and why does it happen?

## **Self-test question**

Chapter 9 Checklist question 4