

EC210

MACROECONOMIC

PRINCIPLES

I: Inflation and central banks

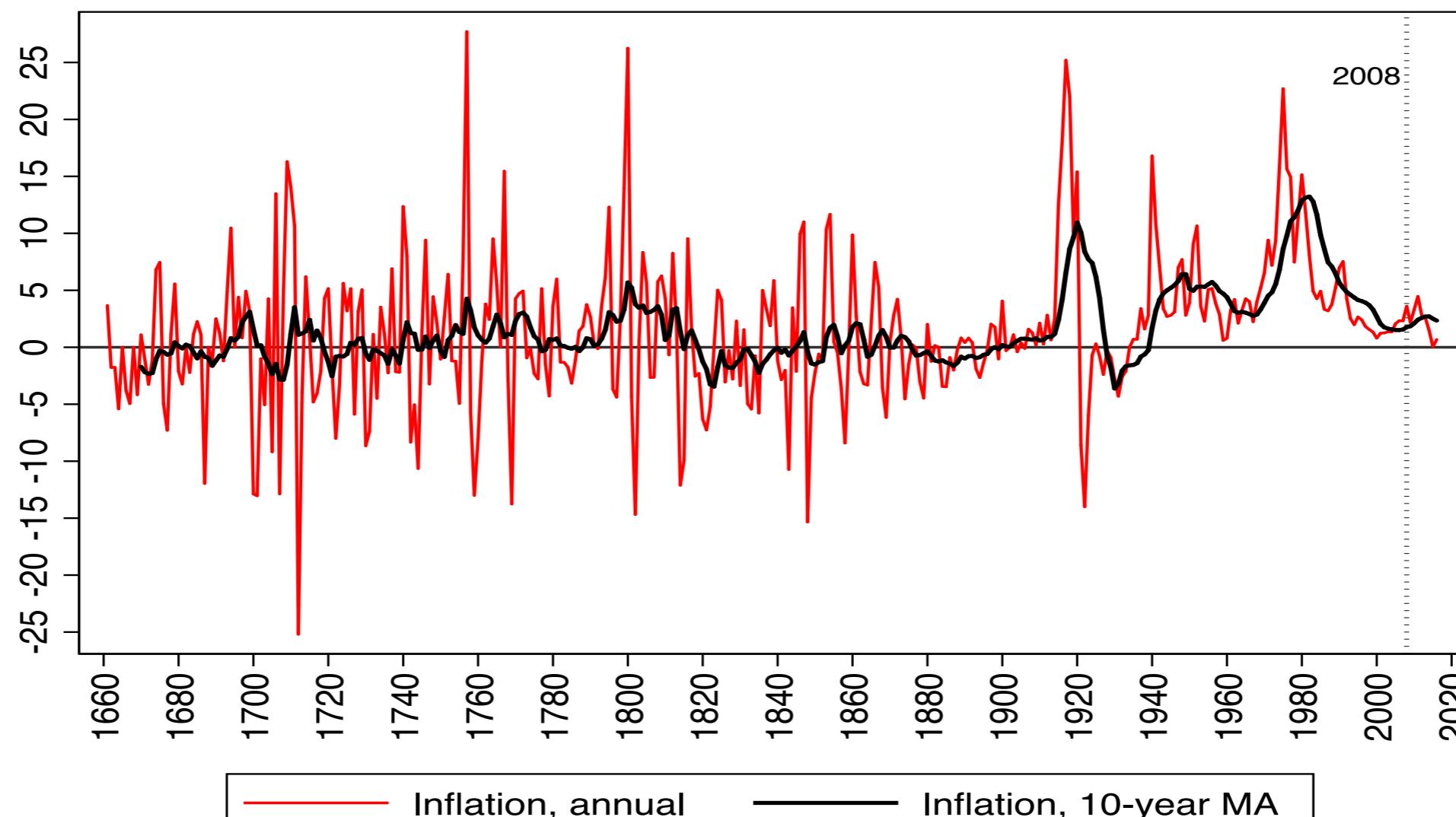
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Department of Economics
Lent term 2020

INFLATION IN THE UK

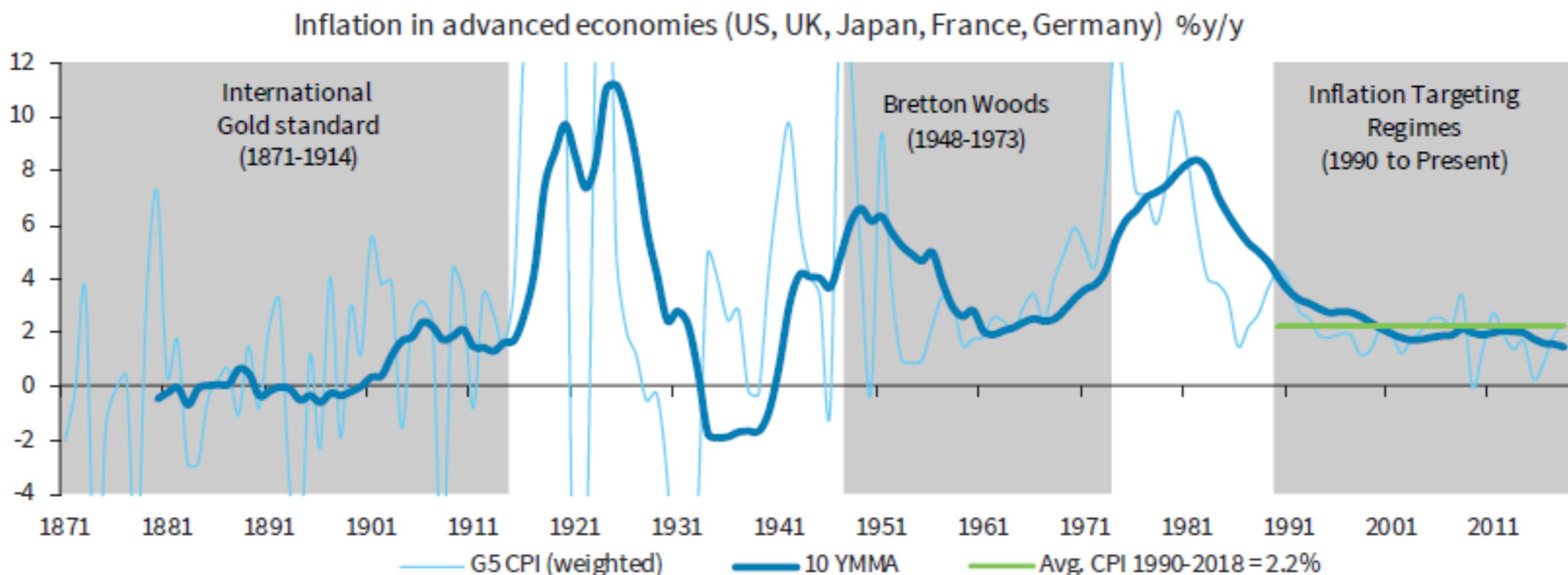
History of inflation

UK: 1660-2016
Average: 1.5%, Std. Dev: 6.5%

Gold Standard (1717-1913)	WW1 & WW2 (1914-1945)	Bretton Woods (1946-1973)	Up to EMS crisis (1974-1993)	Great Mod. (1994-2008)	Post GFC (2008-2016)
$\mu=0.5\%$	$\mu=3.6\%$	$\mu=4.8\%$	$\mu=8.7\%$	$\mu=1.9\%$	$\mu=2.2\%$
$\sigma=6\%$	$\sigma=8.8\%$	$\sigma=2.7\%$	$\sigma=5.6\%$	$\sigma=0.7\%$	$\sigma=1.4\%$



INFLATION IN LARGE ECONOMIES



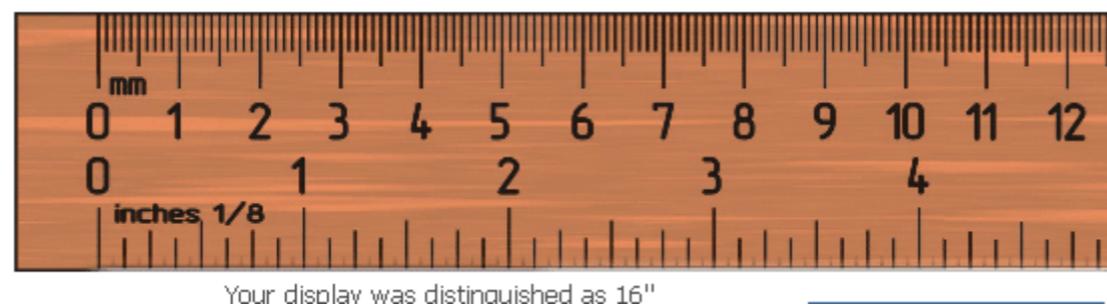
Source: Jordà-Schularick-Taylor Macrohistory Database, Haver Analytics, Barclays Research

What is inflation?



MONEY IS A UNIT OF ACCOUNT

- Call an arbitrary good “**money**”. Its defining feature is that one unit of money has a price of £1.
- Could be physical, like rocks or salt. But like meter or kilo, it is a social convention.



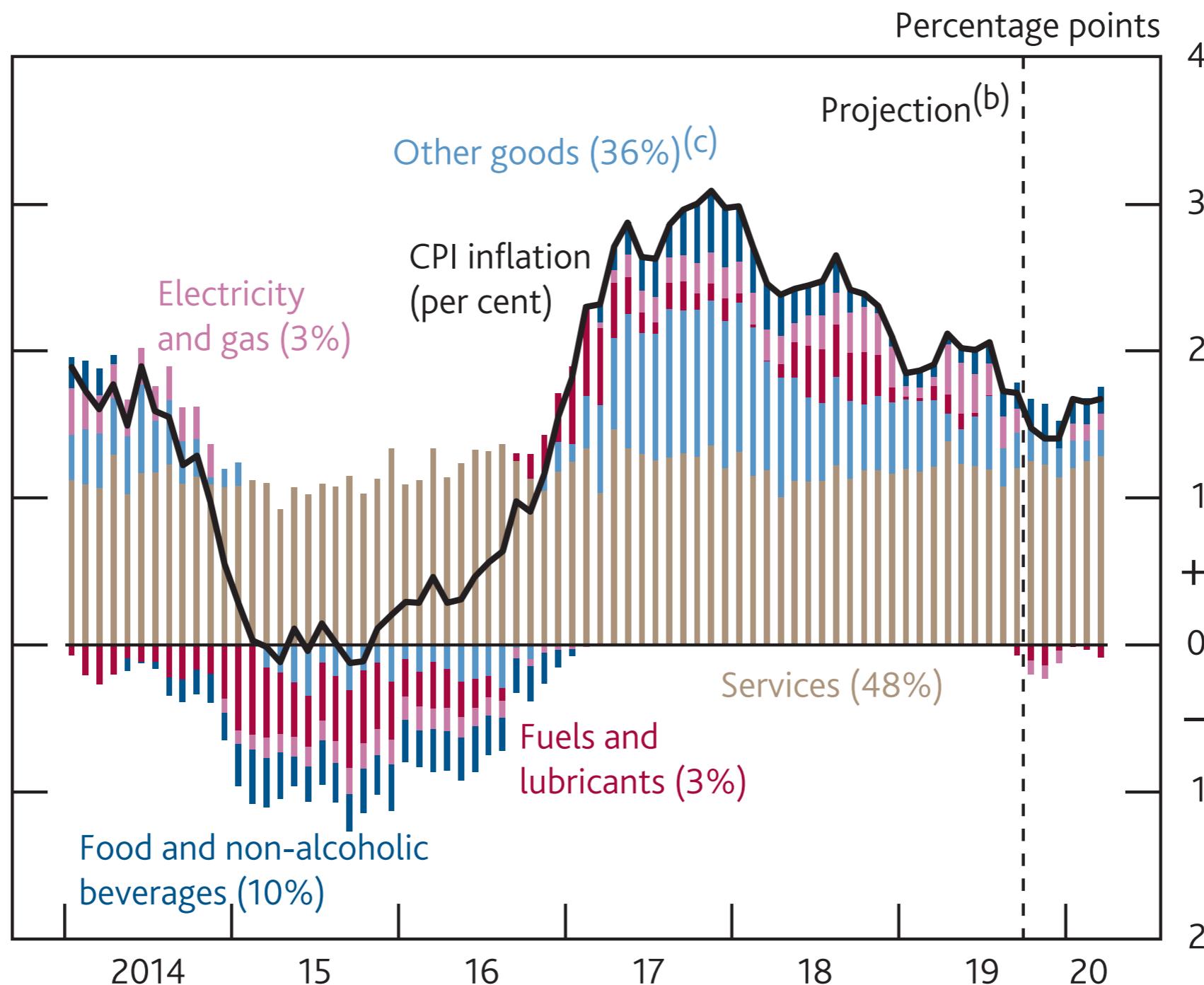
- **The role of the government:** require that all transactions with it are stated in this unit of account. Given indifference between many units, usually this serves as coordination device.

INFLATION

- **A price:** value of good in terms of that unit of account. How much money you give to get a good.
- **The price level:** how much money you must give to get the overall set of goods in the economy. P_t
- **Inflation:** the change in the price level, the change in overall prices. $\pi_t = P_t/P_{t-1} - 1 \approx \Delta \log(P_t)$
- So: **inflation** is the change in the amount of money you must give to get in return the overall set of goods in the economy. **Loss of real value of the unit of account.**

UK INFLATION COMPONENTS

Contributions to CPI inflation^(a)

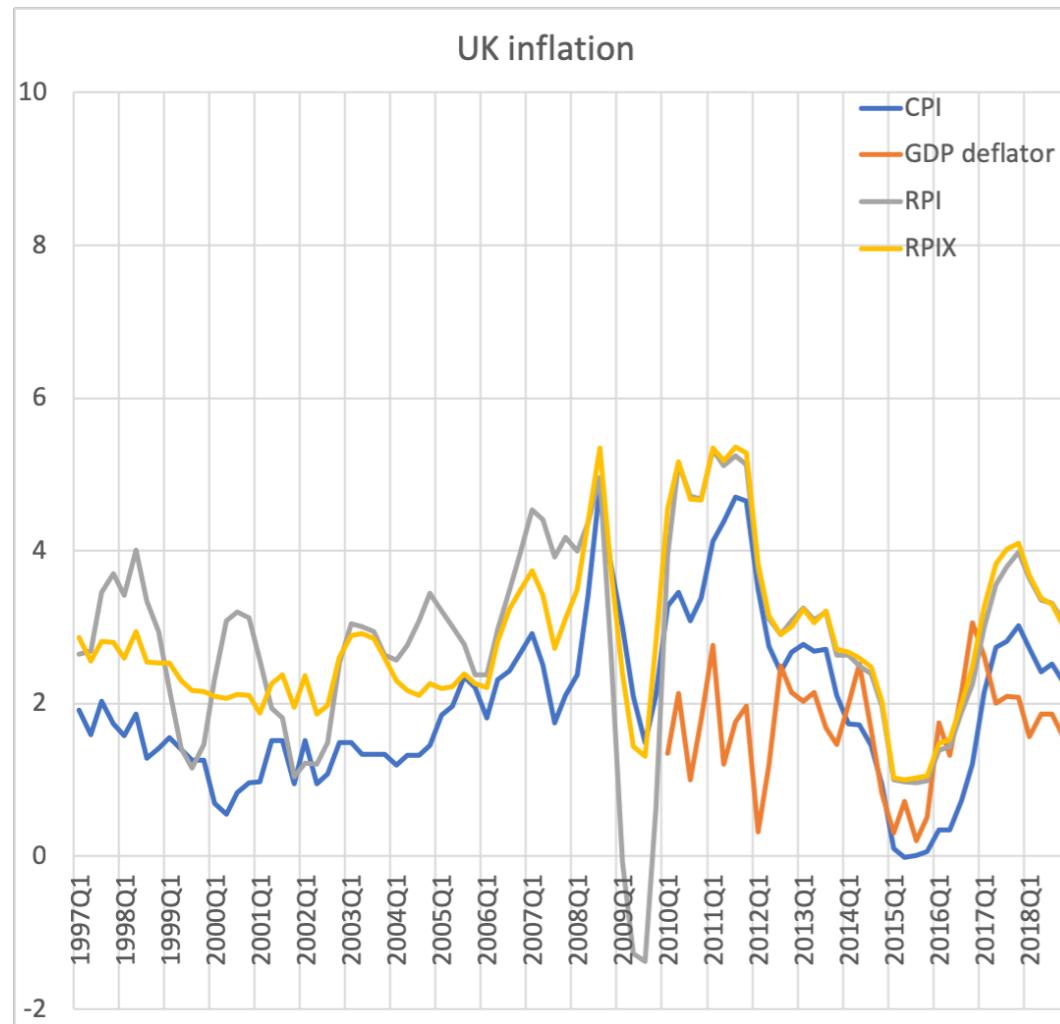


Source: Monetary Policy Report (2019)

MEASUREMENT ISSUES

Which basket?

In UK have CPI, RPI,
RPIX, GDP deflator

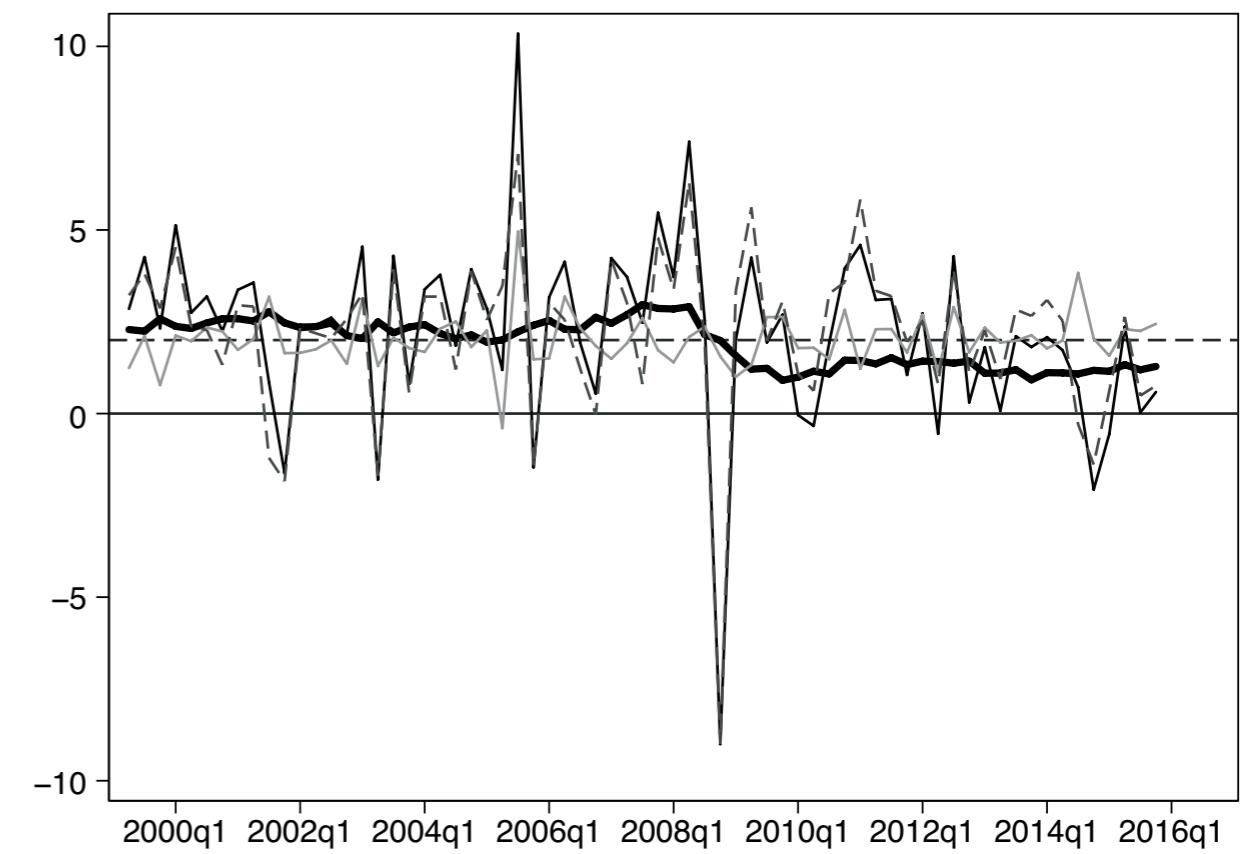


Pure inflation?

Take away relative prices
or not and how

Figure 2.2 Decomposition of inflation into pure inflation, relative price component and idiosyncratic shocks

A: United States



Source:: Miles, Panizza, Reis, Uribe (2016)

What is a central bank?



MODERN BANKING WORLD

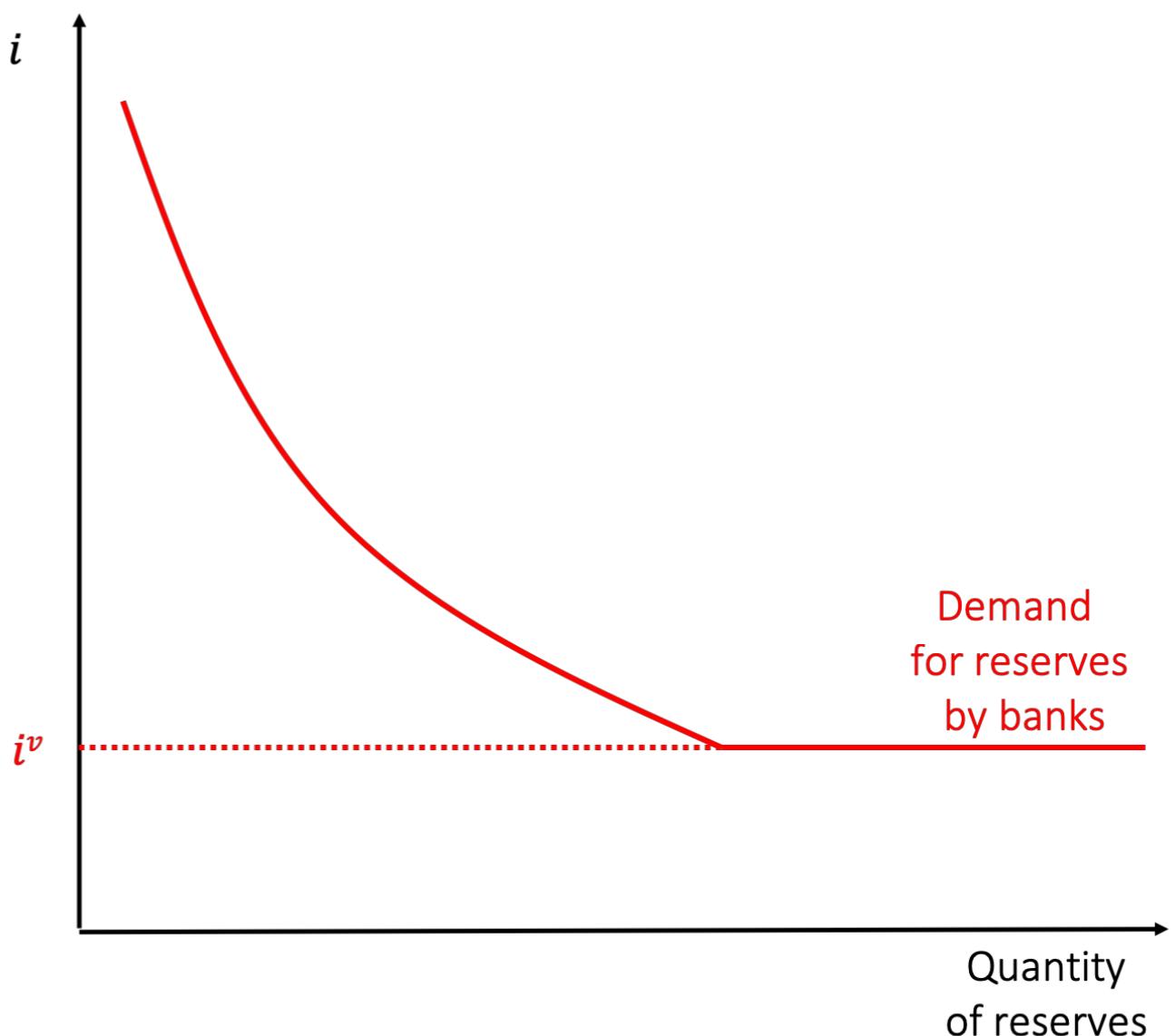
- Unit of account is entry in a spreadsheet in your bank.
- **Problem: many banks.** When I use my debit card at your shop, your bank must get transfer from my bank
- **Solution: clearing houses.** My bank clears your note because trusts the other bank will satisfy their note.
- New problems: (i) when one bank's gross debts are high, it wants to default, (ii) who controls the spreadsheet?
- Frequent **bank failures and panics.**

CENTRAL BANK AND RESERVES

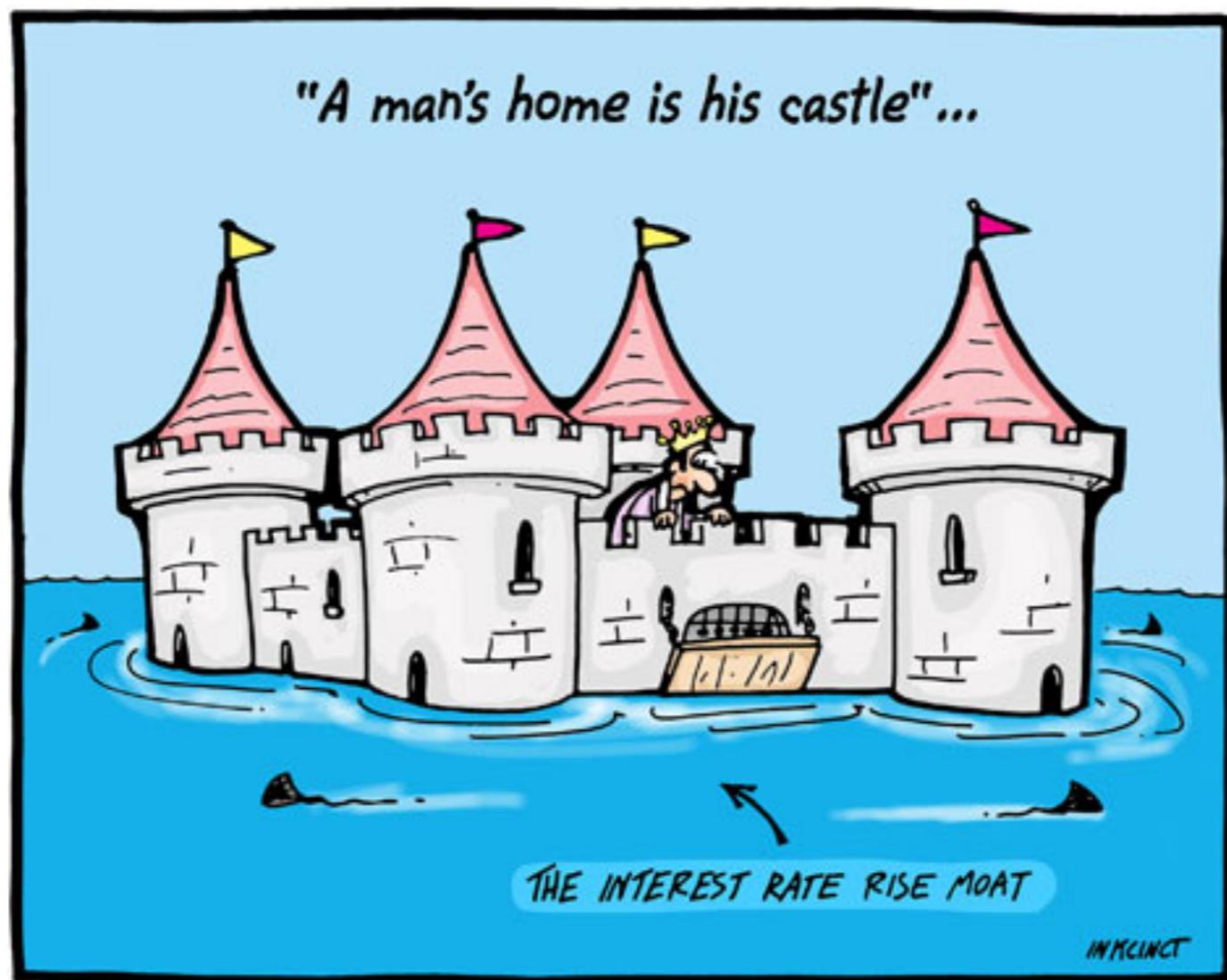
- Solution: **central bank**, owned by banks and government, to serve clearing house for banks. Bank of the banks.
- Advantage: has **regulatory power** over members
- Deposits of banks at central bank are **reserves**.
- **Properties:** can only be held by banks recognized by the CB, can only be issued by central bank, short-term as used to settle claims, free of default as CB can always issue more.

THE DEMAND FOR RESERVES

- Interbank credit is an imperfect substitute for reserves, pays i
- interbank rate (i) minus rate on reserves (i^v) is the opportunity cost of reserves. demand for reserves falls with $i - i^v$
- Friedman rule: $i - i^v = 0$



Setting interest rates

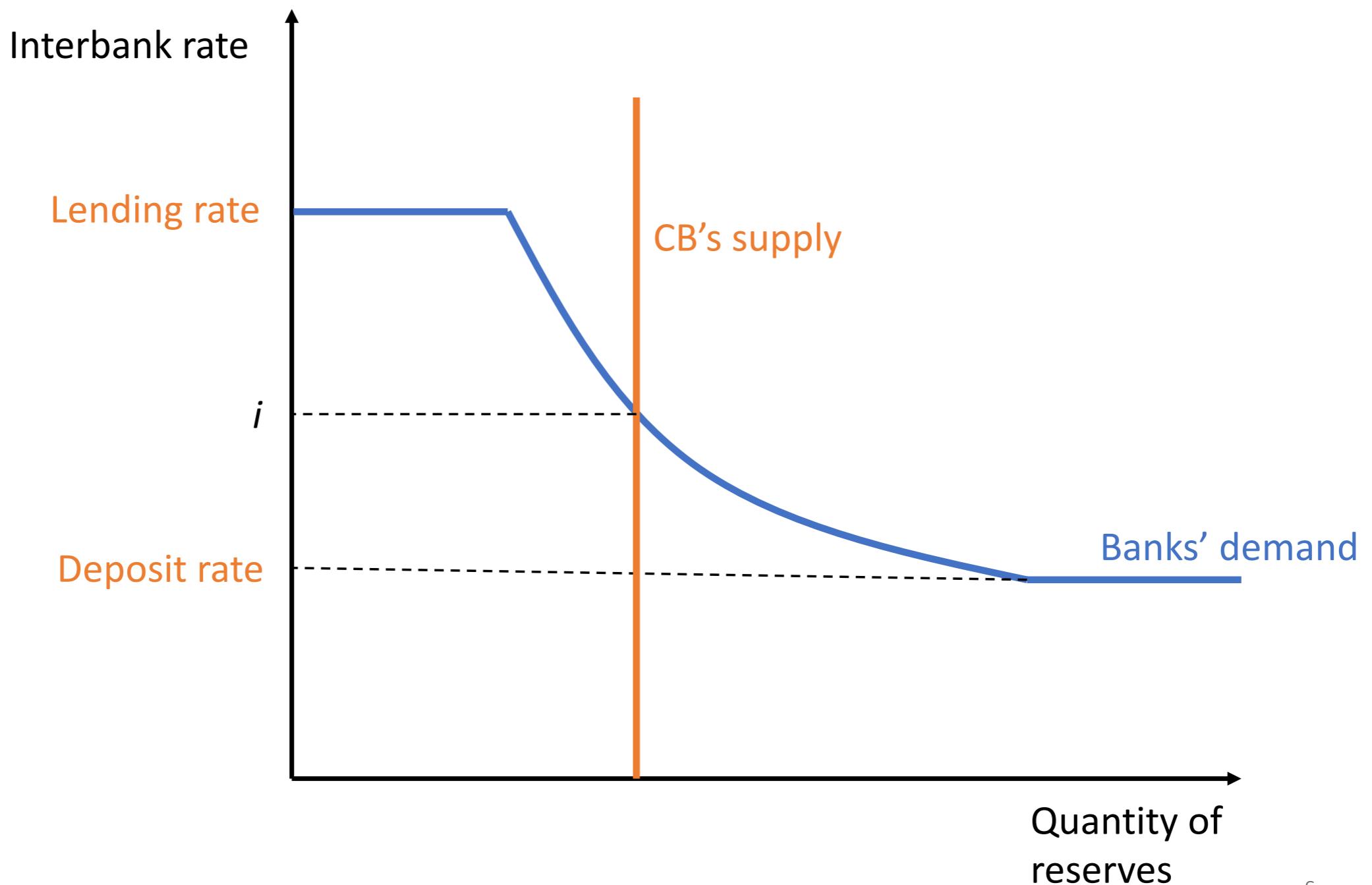


INTERBANK MARKETS

- Banks can lend to and borrow from each other.
- Let i be the interbank rate (bank rate, Federal Funds rate, EONIA) at which this market clears.
- Assume overnight, safe, nominal rates.
- The higher is i , the less deposits a bank wants to have at the central bank, since can lend them out instead at a profit.

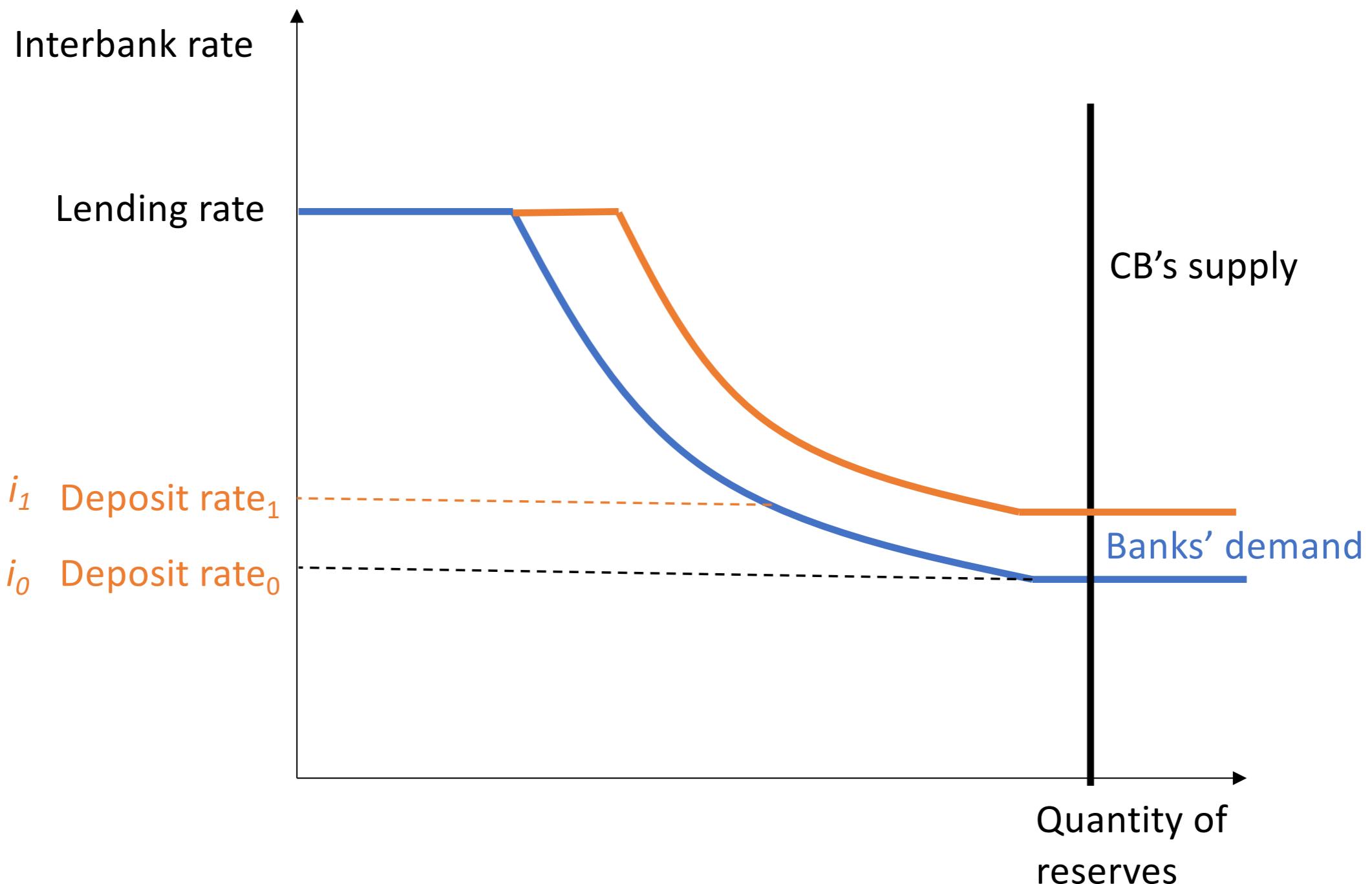
IN PRACTICE

- CB chooses the two rates and the quantity of reserves, given demand for reserves by banks



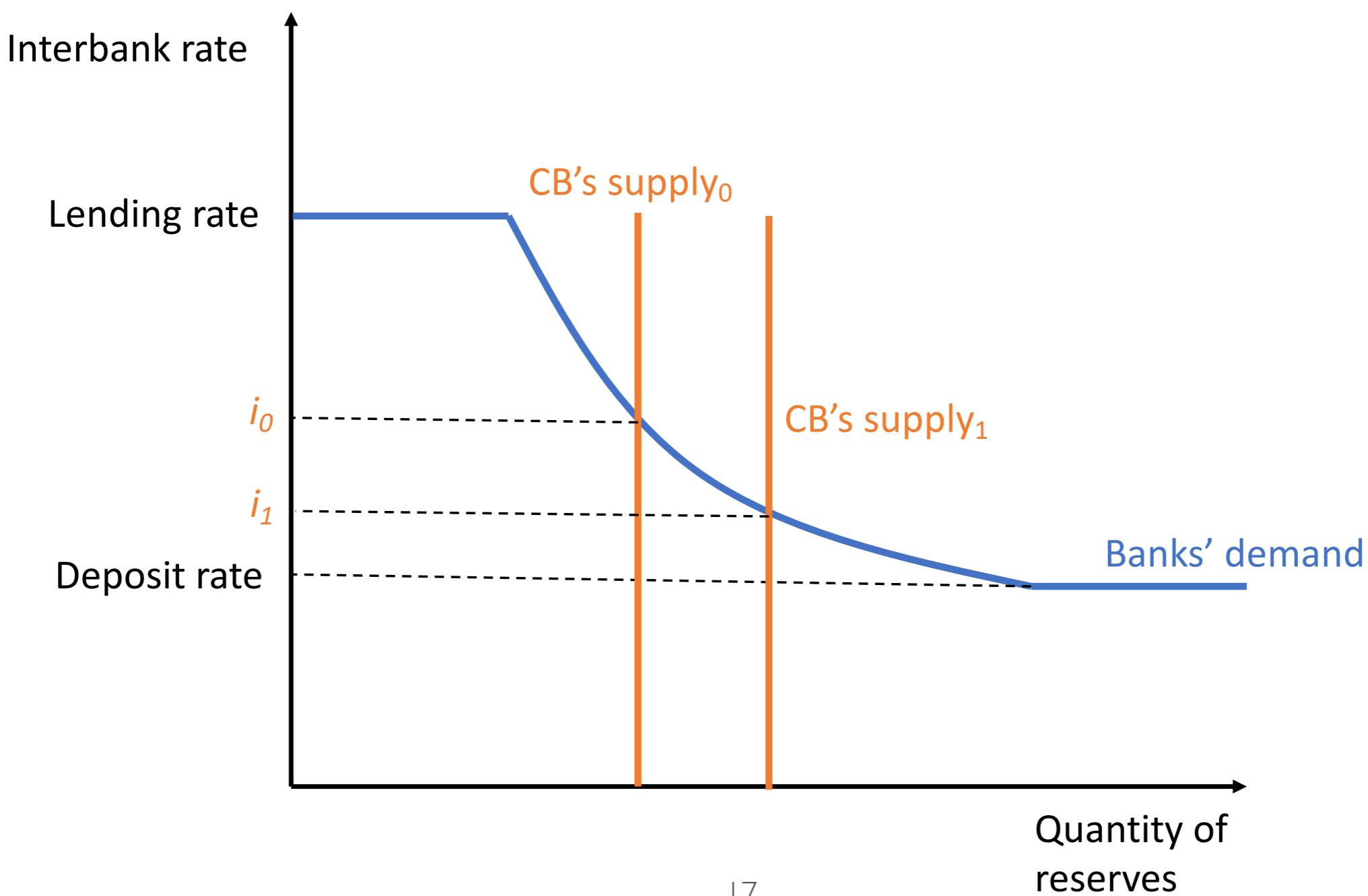
FLOOR SYSTEMS

- Reserve satiation $i = i^v$, deposit rate is policy rate



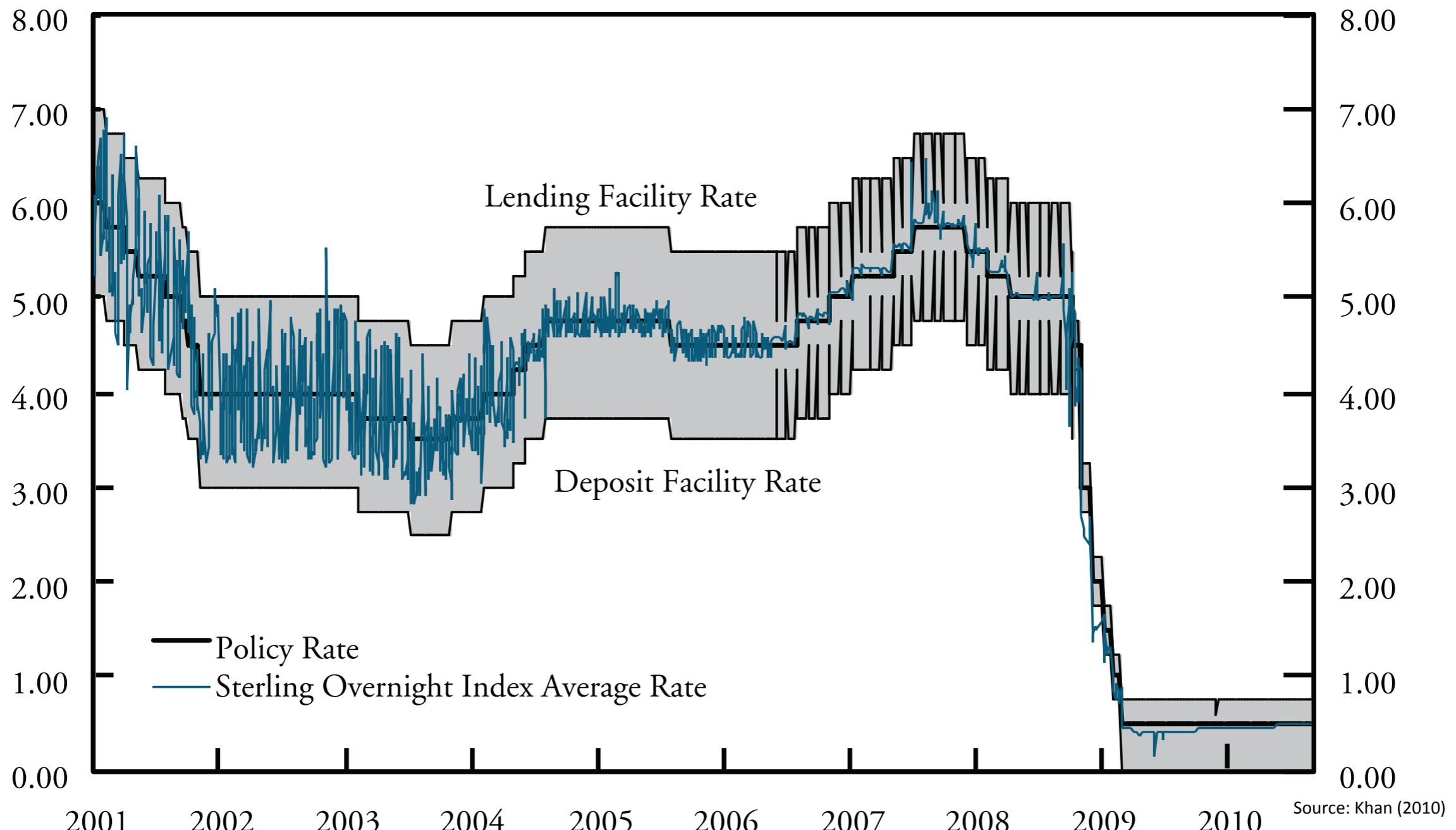
CORRIDOR SYSTEMS

- Fed, Bank of England, ECB pre-2009. Open market operations: shift supply of reserves to hit i target

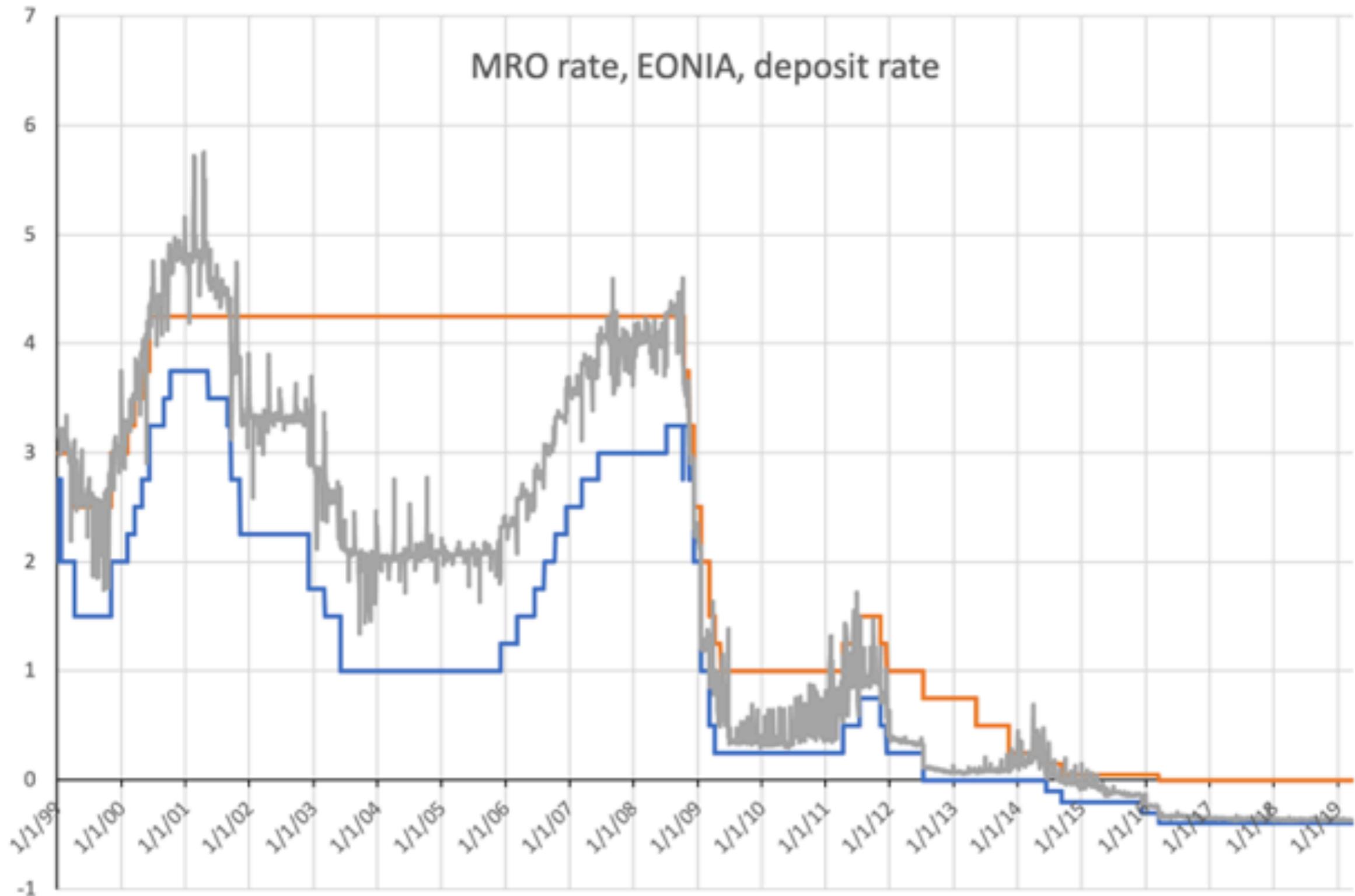


SYSTEMS IN PRACTICE

BANK OF ENGLAND



SYSTEMS IN PRACTICE



CURRENT DEBATE

- Normalization of balance sheet: back to corridor?

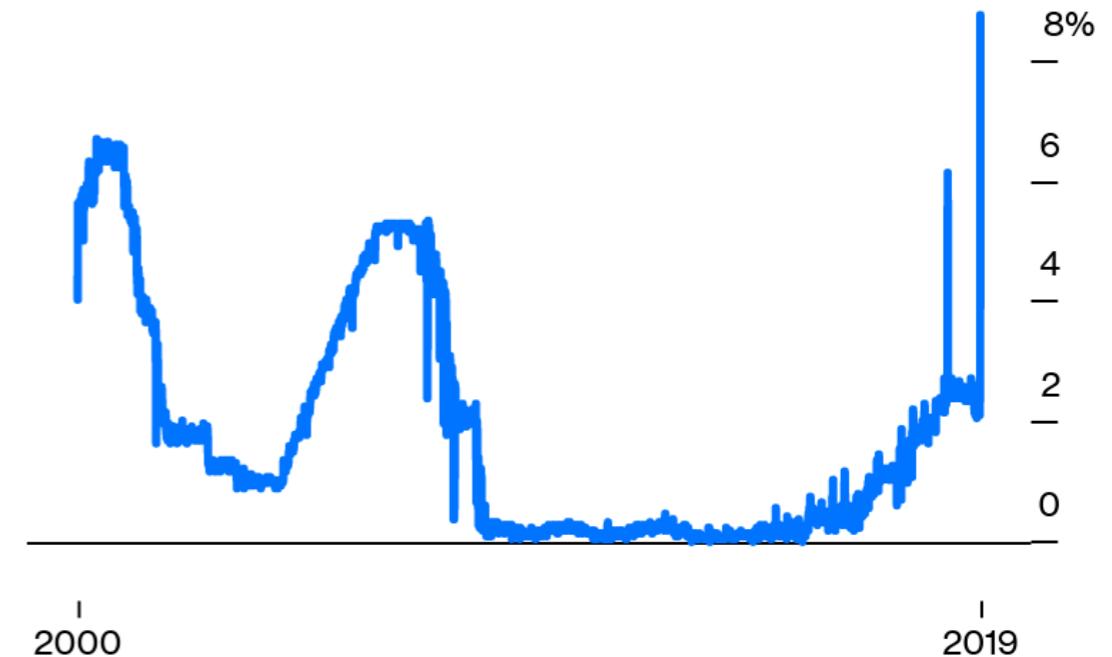
Fed, Jan 3, 2019 statement,
"The Committee intends to continue
to implement monetary policy in a
regime in which an ample supply of
reserves ensures that control over
the level of the federal funds rate
and other short-term interest rates is
exercised primarily through the
setting of the Federal Reserve's
administered rates, and in which
active management of the supply of
reserves is not required."

September event

Surge Pricing

Key overnight funding rate jumped above 8% on Tuesday

Overnight repo rate



Source: ICAP

Note: Most-recent level marks intraday high
of 8.75%

Bloomberg Opinion

Arbitrage and Fisher



NOMINAL AND REAL

- **Nominal return:** Give x today, get y back next year. The nominal net return on the investment is the same as promised rate today, equal to:

$$i = \frac{y}{x} - 1$$

- **Real return:** In units of goods, today gave x/p_t , next year get y/p_{t+1} . So the real return is:

$$\text{ret} = \frac{y/p_{t+1}}{x/p_t} - 1$$

- Simple bond has $x=1$, so $y=1+i$.

NO ARBITRAGE

- Nominal return and real return

$$\begin{aligned}1 + \text{ret} &= \left(\frac{y}{x}\right) \left(\frac{p_t}{p_{t+1}}\right) \\&= (1 + i) \left(\frac{p_t}{p_{t+1}}\right) \\&= (1 + i) \left(\frac{1}{1 + \pi}\right)\end{aligned}$$

- Arbitrage condition taking into account that don't know what the price level will be.

$$1 + r = (1 + \text{ret}^e) = (1 + i) \left(\frac{1}{1 + \pi^e}\right)$$

FISHER EQUATION

- From no arbitrage condition, get measure of expected inflation and three concepts linked

$$1 + r = \left(\frac{1 + i}{1 + \pi^e} \right)$$
$$\pi^e = i - r$$

- Nominal rate = real rate + expected inflation

From interest rates to inflation



POLICY IN LONG RUN

- Long-run variables: bar over them, so
 $\bar{\pi}$
- Define long run: can't fool people all the time so
 $\pi^e = \bar{\pi}$
- Michaelmas term:
 $\bar{r} = MPK$
- Long-run inflation is determined by long-run nominal interest rate set by CB
 $\bar{\pi} = \bar{i} - \bar{r}$
- Given historical $r=2\%$, set $i=4\%$, get $\pi=2\%$

HIGHER I, HIGHER π

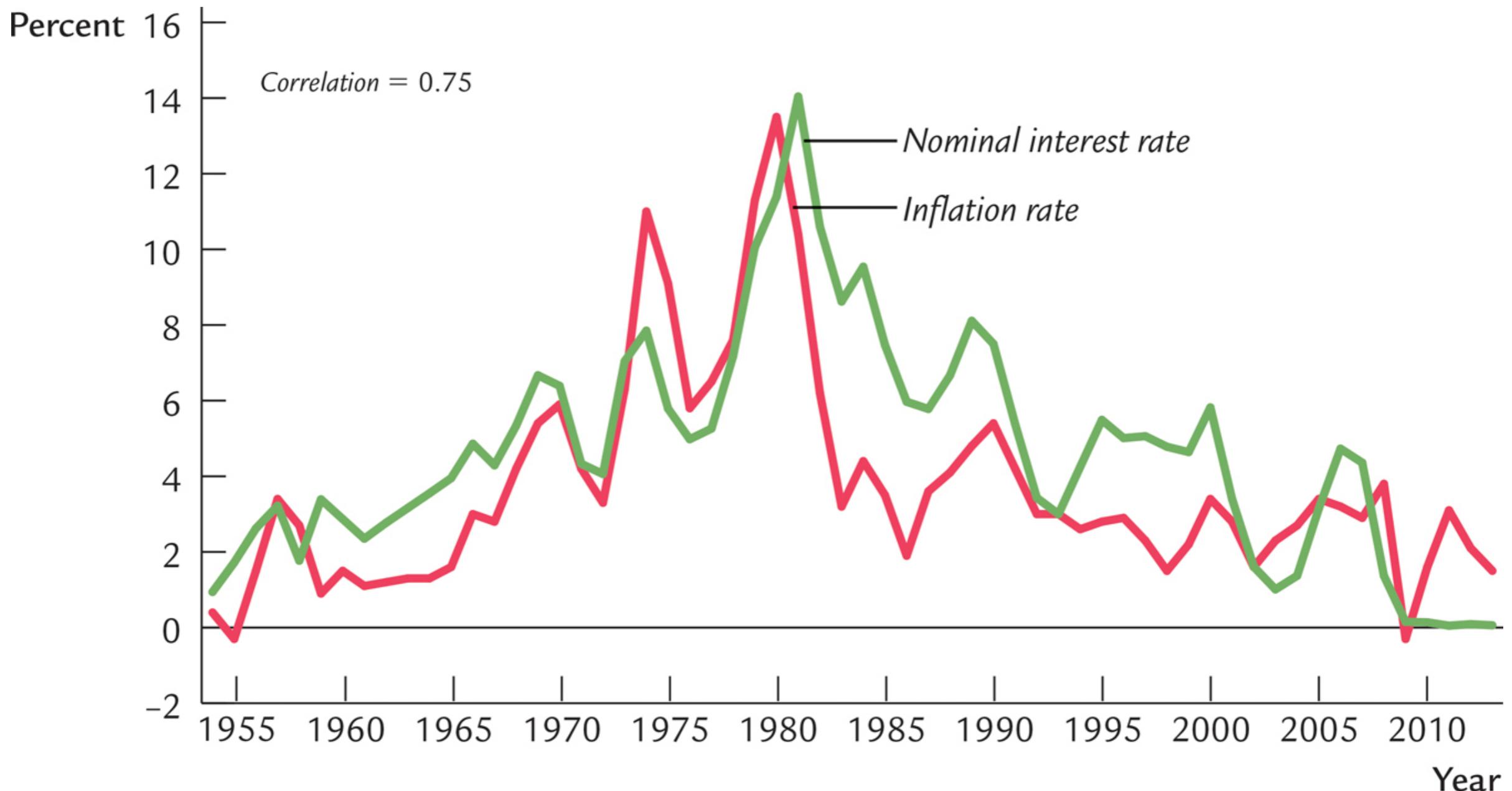
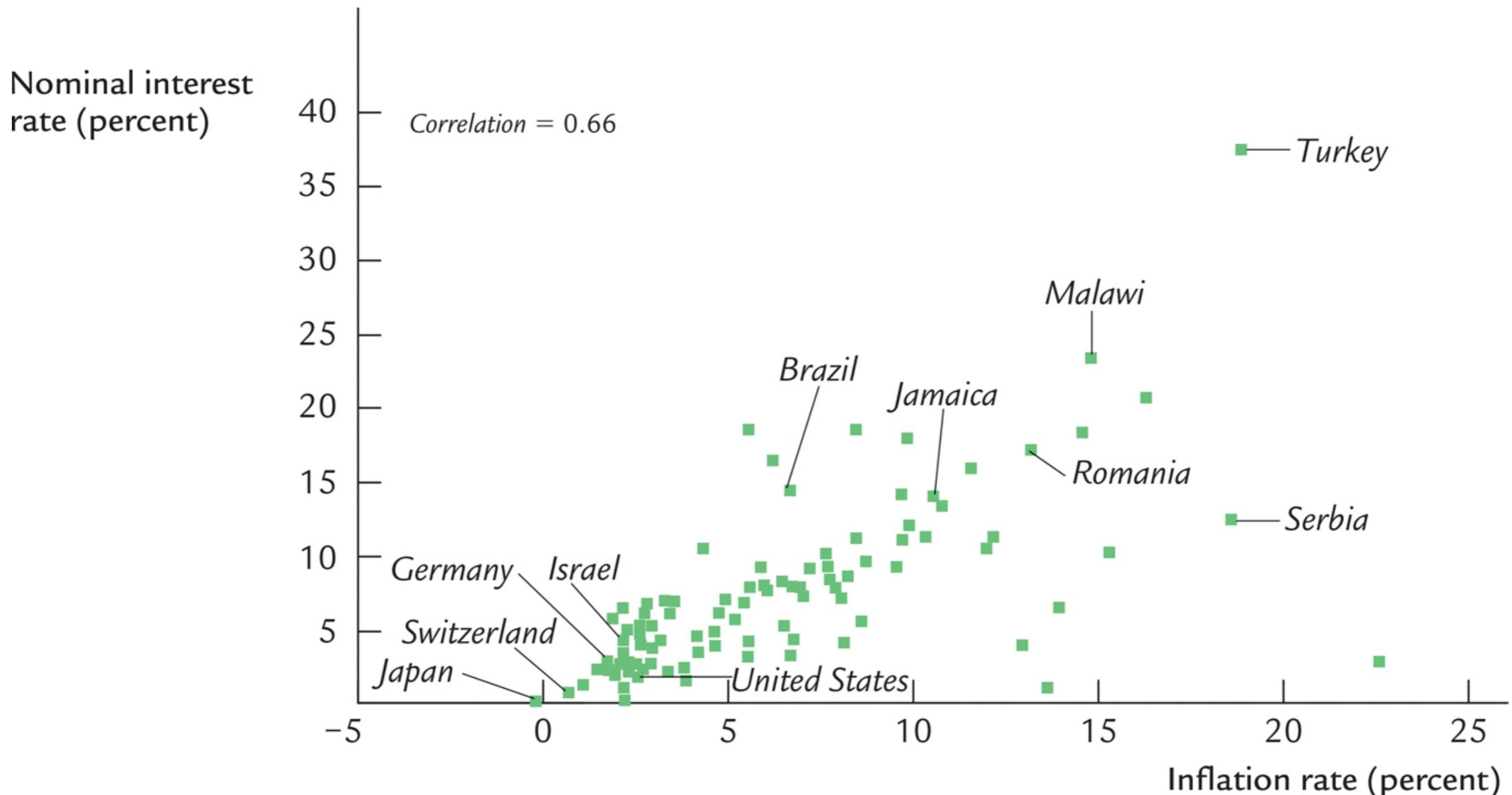


Figure 5.3 Inflation and Nominal Interest Rates Over Time

Mankiw: Macroeconomics, Ninth Edition

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HIGHER I , HIGHER π



CURRENT POLICY DEBATE

- It seems r has fallen to 1%, or even less
- **Why?** Maybe MPK fell (secular stagnation), maybe population ageing has increased demand for savings.
- Should we:
 - I. Keep $i=4\%$ as normal (or higher), so now $\pi=3\%$ (or higher), a higher inflation target?
 2. Or keep $\pi=2\%$, but then lower i to 3%?

The short-run: Taylor rule

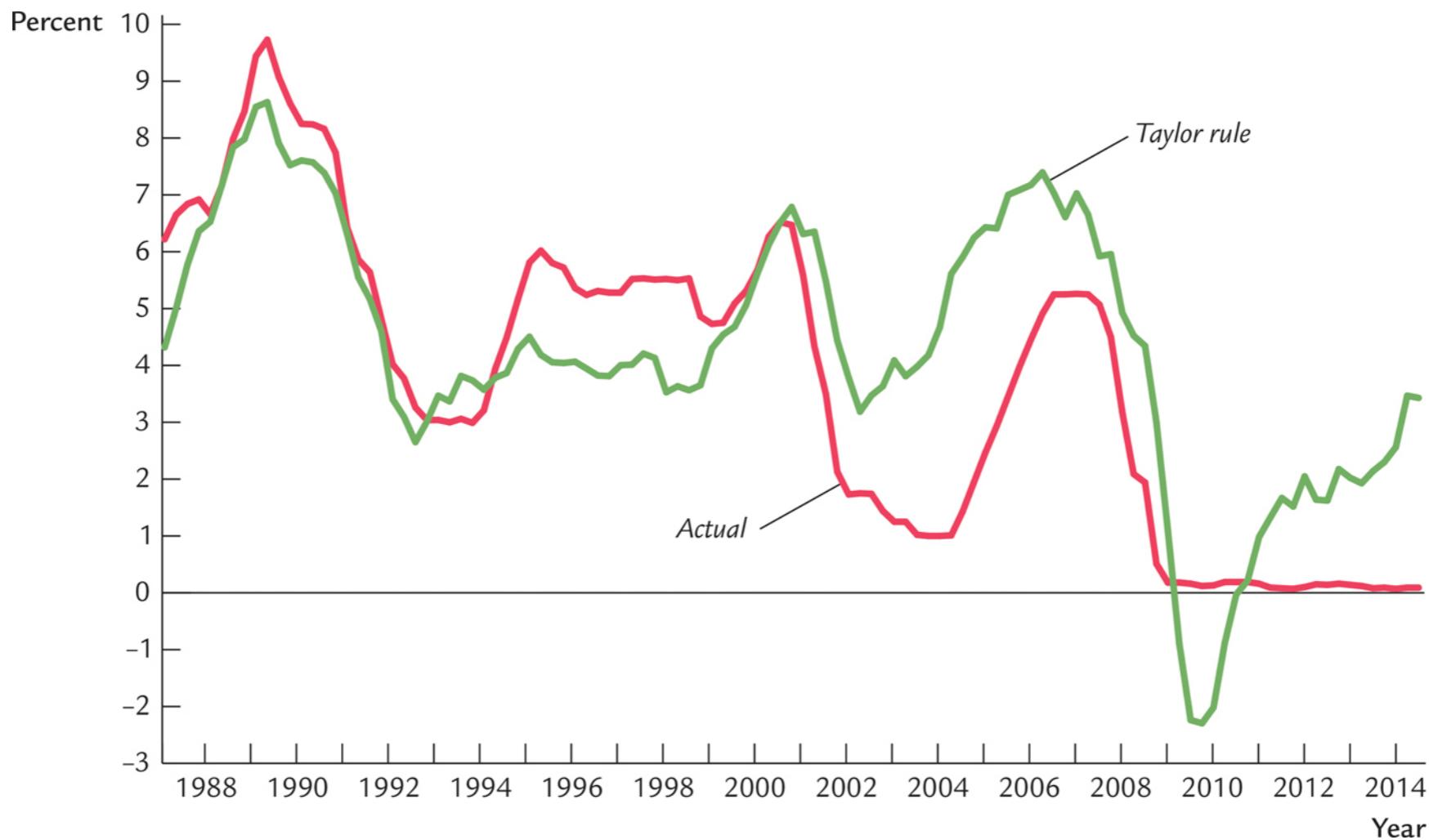


Figure 15.1 The Federal Funds Rate: Actual and Suggested
Mankiw: Macroeconomics, Ninth Edition
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CENTRAL BANK RULES

- Most central banks choose short-run interest rates according to the following **policy rule**:

$$i = \bar{r} + \bar{\pi} + \chi(\pi - \bar{\pi}) + \hat{i}$$

- In long run, it is consistent with long-run target
- Deviate from long-run interest rate if:
 1. Current inflation is not at long-run target
 2. Discretionary policy “shock”

SHORT RUN

- **Expectations** may deviate from target

$$\pi^e = \bar{\pi} + \pi^{as}$$

due to “animal spirits” for now.

- Higher **real interest rate** means less consumption and investment today, firms want to lower their prices, so lower inflation (more later)

$$r = \bar{r} - \alpha(\pi - \pi^e) + \hat{r}$$

and shocks from economy

SOME MATHS

- Combining Fisher equation and policy rule

$$\bar{r} + \bar{\pi} + \chi(\pi - \bar{\pi}) + \hat{i} = i = r + \pi^e$$

- Use short run equations

$$\dots = \bar{r} - \alpha(\pi - \pi^e) + \hat{r} + \bar{\pi} + \pi^{as}$$

- Cancel long run variables

$$\chi(\pi - \bar{\pi}) + \hat{i} = -\alpha(\pi - \bar{\pi} - \pi^{as}) + \hat{r} + \pi^{as}$$

- Rearrange

$$(\chi + \alpha)(\pi - \bar{\pi}) = \hat{r} - \hat{i} + (1 + \alpha)\pi^{as}$$

INFLATION

$$\pi = \bar{\pi} + \frac{\hat{r} - \hat{i}}{\chi + \alpha} + \left(\frac{1 + \alpha}{\chi + \alpha} \right) \pi^{as}$$

- **Lesson I:** Since shocks average zero in long run and no animal spirits (can't fool all the people all the time), the rule is consistent with long run results from before.
- Namely, raising rates permanently is same as having a **new inflation target**, raises inflation.

INFLATION

$$\pi = \bar{\pi} + \frac{\hat{r} - \hat{i}}{\chi + \alpha} + \left(\frac{1 + \alpha}{\chi + \alpha} \right) \pi^{as}$$

- **Lesson 2:** If CB raises discretionary i , this lowers inflation in the short run.
- Raising policy rates temporarily, in the sense of discretionary deviation from rule, is a **policy tightening**, lowers inflation.

INFLATION

$$\pi = \bar{\pi} + \frac{\hat{r} - \hat{i}}{\chi + \alpha} + \left(\frac{1 + \alpha}{\chi + \alpha} \right) \pi^{as}$$

- **Lesson 3:** The central bank does not know the real interest rate, at best can forecast it. Given these forecasts of r , can set i to offset them, and then inflation equals target in short run.
- Why the Bank of England needs many economists, to measure **state of the economy r .**

INFLATION

$$\pi = \bar{\pi} + \frac{\hat{r} - \hat{i}}{\chi + \alpha} + \left(\frac{1 + \alpha}{\chi + \alpha} \right) \pi^{as}$$

- **Lesson 4:** if the central bank raises nominal interest rates more than one to one with inflation, $\chi > 1$, then animal spirits get attenuated.
- Follow the **Taylor principle**. Otherwise, spirits would be enhanced by policy, justifying them, leading to instability.

CURRENT DEBATE

- After many years of keeping interest rates low, did people start thinking that this was a long-run policy, rather than a short-run temporary stimulus?



Source: Bloomberg
© FT

LESSONS THIS WEEK

What is inflation?

Measure of change of value of unit of account.

What is a central bank?

Clearing house for banks with power to issue reserves.

How do central banks set market rates?

Today by choosing the interest on reserves. In the past, through choosing the quantity of reserves.

How do they pin down inflation?

By using rates to steer expected and unexpected inflation.

Do high interest rates rise or lower inflation?

Higher long-run nominal rate, higher inflation target, higher inflation. Higher rates temporarily, lower inflation, squash spirits.