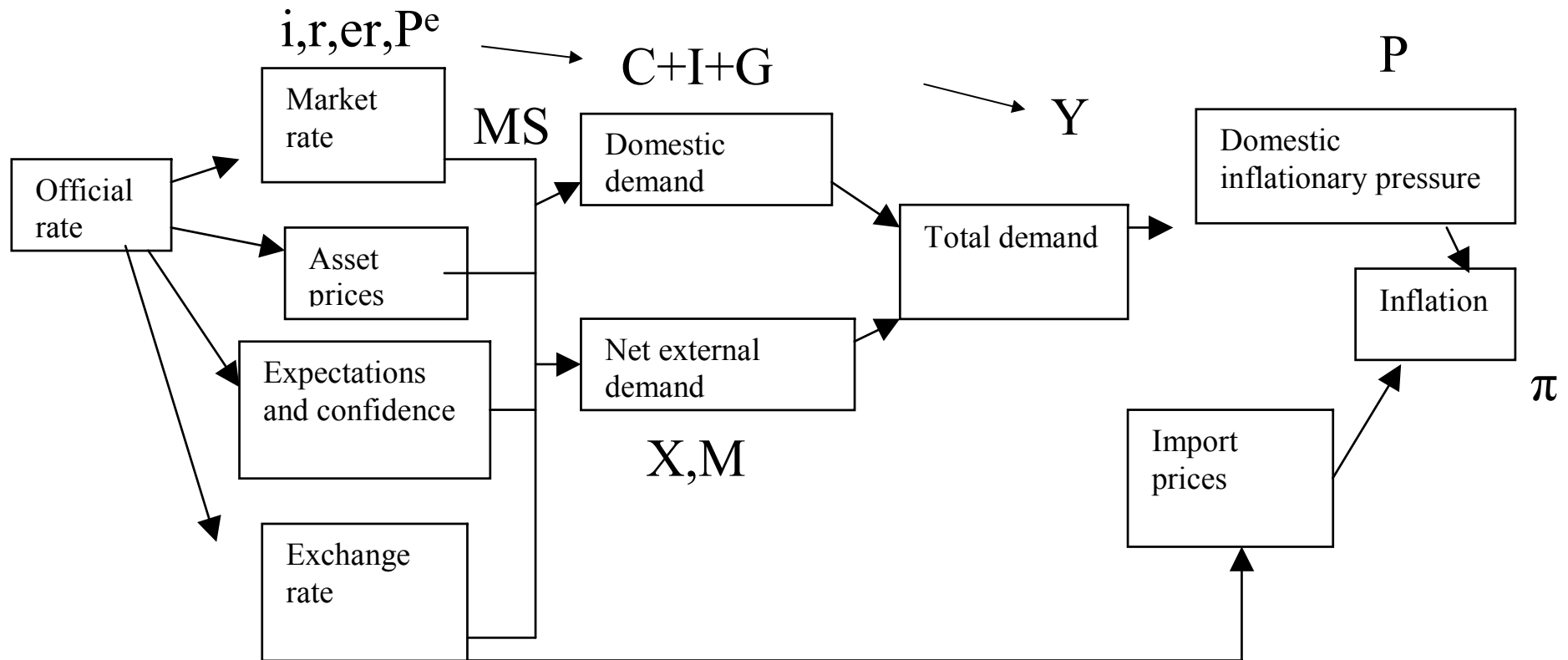


Economic Modelling

Lecture 9

Transmission Mechanism of Monetary
Policy in an Open economy

Bank of England's View on Transmission Mechanisms of Monetary Policy: How Does Money Supply Affect the Price Level?



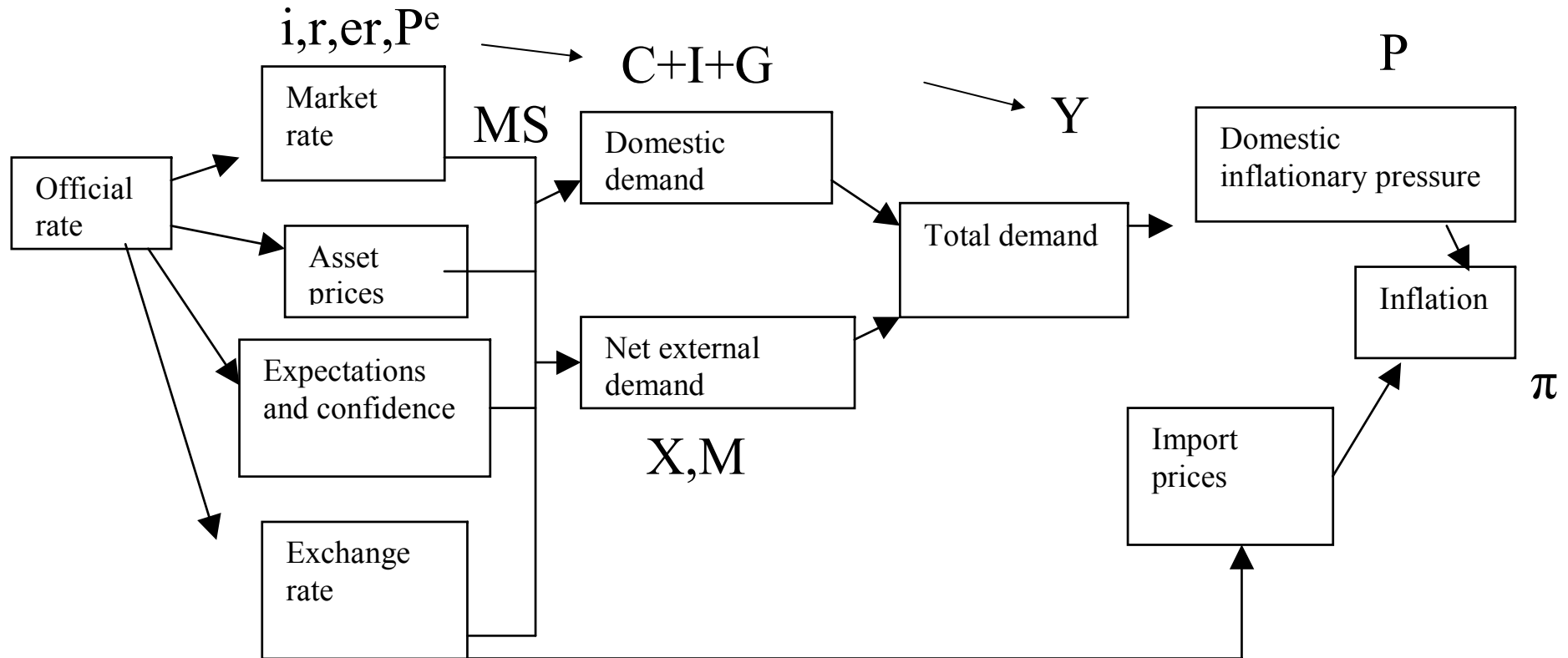
Two Conditions to have real effect of Monetary policy

Central bank controls monetary base $M1 = R + Cu$

Prices do not adjust instantaneously

$$M \uparrow \rightarrow i, r \downarrow \rightarrow C, I, X, G \uparrow \rightarrow Y \uparrow \rightarrow P \uparrow \rightarrow \pi \uparrow \rightarrow \frac{M}{P} \downarrow \rightarrow i, r \uparrow$$

Bank of England's View on Transmission Mechanisms of Monetary Policy: How Does Money Supply Affect the Price Level?



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Objective Targets and Instruments of Monetary Policy

Ultimate objective: stability (P, r, E), high growth rate of output, low unemployment rate

Targets: inflation only; or money supply only; or exchange rate only; all of them; or two of them; or none of them.

Instruments: Open market operation on treasury bills -
rediscounting

Fixing the interest rate, credit control

Money supply rule, reserve requirement

Deposit insurance

Effectiveness of monetary policy depends upon

Central bank independence and credibility ie, who appoints the governor?

Moral hazards - bank panics, systematic risk, regulation -
bank supervision

Channels Transmission of Monetary Policy

- Interest rate Channel

- Lower interest rate
- More borrowing and Spending
- More aggregate demand

Open Market Operation

- Exchange Rate Channel

- Lower interest rate
- Depreciation of domestic currency
- More exports and less imports
- Higher aggregate demand

Buy back own currencies selling some foreign assets to avoid depreciation sterilisation

selling its currency to avoid appreciation

- Credit Channel

- Lower interest
- More reserves
- More lending
- Higher aggregate demand

Deficit financing

Rediscounting of Treasury Bills

- Balance Sheet Channel

- Lower interest rate
- Increase in prices of stocks, bonds and other assets
- More wealth
- More aggregate demand

Moral hazards - bank panics, systematic risk, regulation - bank supervision

Open Market Operation: Interest Rate Channel

Expansionary Monetary Policy

Short run:

Central bank reduces the repo rate

Commercial banks and financial institutions find it profitable to sell bonds to the central bank

Central bank raises their reserves

Commercial banks have more money to lend

Firms and households find it cheaper to borrow

They borrow and create more deposits

Demand for goods and services rises

Money supply expands

Long run:

Prices will eventually rise following higher demand

Real money supply (M/P) shrinks

Interest rises back to natural position

Eco Modelling:KB

Open Market Operation: Interest Rate Channel

- Contractionary Monetary Policy

Short run:

Central bank raises the repo rate

Commercial banks and financial institutions find it profitable to buy bonds from the central bank

Central bank sell bonds and reduces reserves of the financial institutions

Commercial banks have less money to lend

Firms and households find it expensive to borrow

They pay back loans and close deposits accounts

Demand for goods and services falls

Money supply contracts

Long run:

Prices will eventually fall

Real money supply increases

Contribution of Monetarism in Macroeconomic Policy

- Supply of money is the determinant of the national income
- In the long run, the influence of money is primarily on the price level and other nominal magnitudes. Real output and employment are not determined by monetary factors.
- In the short run the supply of money does affect the output. Money is the dominant factor in causing cyclical fluctuations in output and employment in the short run.
- Private sector is inherently stable and instability is primarily the result of the government policy.

Interest Determination Rule

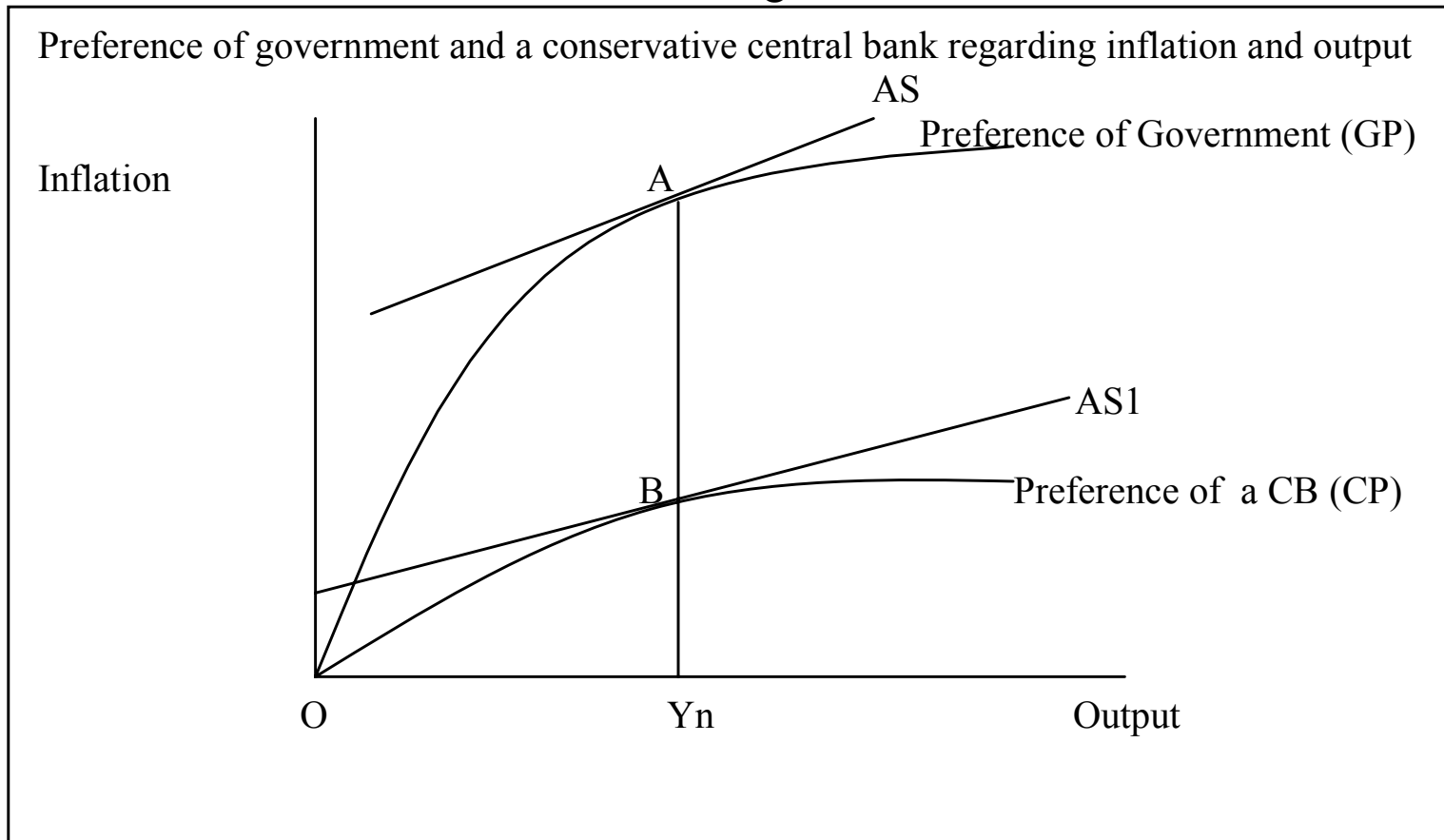
- Higher interest in the past period lowers the level of output at the current period
- Higher output at the current period raises the rate of inflation (remember the aggregate supply
- Interest should be raised when the economy is overheating: output is above the trend to reduce the inflationary pressure
- It should be raised also when the rate of inflation is above the target inflation to reduce aggregate demand
- Interest rate should be lowered in recession
- Interest rates should be determined based on economic facts but not according to whims of the policy makers
- An independent central can take such an independent decision

Lessons for Price Stability From Analysis of the Central Bank Independence

1. Bind the central bank with a zero inflation rate target.
2. Appoint the most conservative central banker.
3. Make the central bank as independent as possible from the government.
4. Peg the exchange rate to the currency of a country with one or more of the above characteristics.

Why Should the Central Bank Be Independent? Inflation Biases of a Government and a Central Bank

Figure 1



G

Policy Rule vs. Optimal Discretion for Inflation

Targeting

Objective of a policy maker is to minimise loss function

Subject to the aggregate supply constraint.

$$\underset{\pi}{Min} \quad S(\pi) = b(y - y^*) - a\pi^2 \quad (1)$$

Subject to

$$y = y^* + c(\pi - E(\pi)) \quad (2)$$

where y is actual output y^* is the natural level of output

and $(y - y^*)$ is the output gap and π is the actual inflation rate.

Aggregate Supply: Output responds to higher level of inflation

Using the value of $(y - y^*)$ from the constraint in the objective function

$$\underset{\pi}{Min} \quad S(\pi) = bc(\pi - E(\pi)) - a\pi^2 \quad (3)$$

Optimal Inflation Under the Policy Rule

$$\underset{\pi}{Min} \quad S(\pi) = bc(\pi - E(\pi)) - a\pi^2 \quad (3)$$

Let inflationary expectation of people, $E(\pi)$ to be a constant.

Policy maker have two choices:

(1) to stick to a policy rule

(2) to use optimal discretion

If they stick to policy rule $\pi = E(\pi)$; $y = y^*$

$$S(\pi) = -a\pi^2 ; \quad \frac{\partial S}{\partial \pi} = -2a\pi = 0$$

Optimal Inflation in the policy rule: $\pi = 0$

Optimal Inflation Under the Discretion

$$\underset{\pi}{\text{Min}} \quad S(\pi) = bc(\pi - E(\pi)) - a\pi^2 \quad (3)$$

Policy makers choose the inflation rate to minimise the loss function (3).

First order condition of (3) wrt π

$$\frac{\partial S}{\partial \pi} = bc - 2a\pi = 0 \Rightarrow \pi = \frac{bc}{2a}$$

Conclusion:

Inflation rate under discretion is higher than the inflation under the policy rule.

This is the main reason for the central bank independence.

Interest Determination Rule to Achieve the Inflation Target: Taylor Rule

$$y_t - y_t^* = -d(i_{t-1} - i_{t-1}^*) \quad d > 0 \quad (9)$$

where y_t is actual output y_t^* is trend output, i_t is the actual interest rate and i_t^* the basic interest rate,

One period lag is assumed between the interest rate decision and the change in the output.

$$\pi_t = \pi_t^* + c(y_{t-1} - y_{t-1}^*) \quad c > 0 \quad (10)$$

where π_t and π_t^* are actual and target inflation rates.

Interest rate rule:

$$i_t = i_t^* + a(y_t - y_t^*) + b(\pi_t - \pi_t^*) \quad a > 0; b > 0 \quad (11)$$

Reduced Form Equation of the Interest Determination Model

$$\begin{aligned}
 y_t - y_t^* &= -d(i_{t-1} - i_{t-1}^*) \\
 \pi_t &= \pi_t^* + c(y_{t-1} - y_{t-1}^*) \\
 i_t &= i_t^* + a(y_t - y_t^*) + b(\pi_t - \pi_t^*) \quad a > 0; b > 0
 \end{aligned}$$

(11)

Substituting the output and inflation equations in the interest rate rule:

$$\begin{aligned}
 i_t &= i_t^* + a\left(-d(i_{t-1} - i_{t-1}^*)\right) + b\left(-cd(i_{t-2} - i_{t-2}^*)\right) \\
 i_t &= i_t^* - ad(i_{t-1} - i_{t-1}^*) - bcd(i_{t-2} - i_{t-2}^*) \\
 i_t + adi_{t-1} + bc di_{t-2} &= i_t^* + adi_{t-1}^* + bc di_{t-2}^*
 \end{aligned}$$

(12)

Reduced Form Equation of the Interest Determination Model

$$i_t = i_t^* - ad(i_{t-1} - i_{t-1}^*) - bcd(i_{t-2} - i_{t-2}^*)$$

$$i_t + adi_{t-1} + bcdi_{t-2} = i_t^* + adi_{t-1}^* + bcdi_{t-2}^*$$

$$\beta_0 = (i_t^* + adi_{t-1}^* + bcdi_{t-2}^*), \text{ and } \beta_1 = ad \text{ and } \beta_2 = bcd.$$

Reduced form: $i_t + \beta_1 i_{t-1} + \beta_2 i_{t-2} = \beta_0$

Steady State: $i_t = i_{t+1} = i_{t+2} = \dots = i_{t+n}$:

Interest Rule: A Numerical Example

Target inflation	2.50%
Target interest rate (basic)	5.00%
Initial interest rate	11.00%
Initial output gap	2.00%
Initial inflation	2.00%

ad-square ==> 0.0625

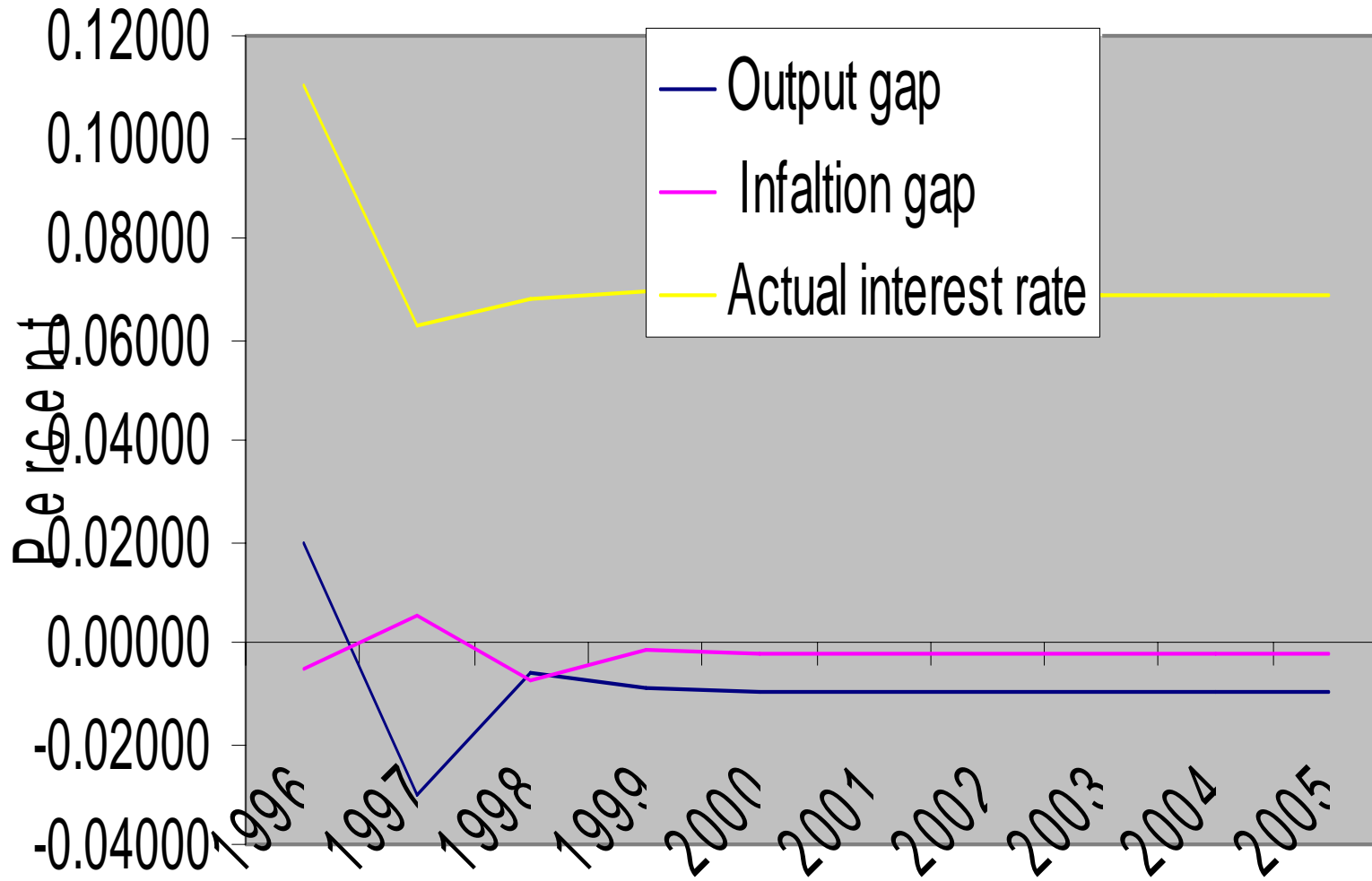
(ad)square
>4bcd for
stability

4bcd ==> -0.25

a	0.5
b	0.5
c	0.25
d	-0.5

Year	Output gap	Inflation gap	Actual interest rate
1996	0.02000	-0.00500	0.11000
1997	-0.03000	0.00500	0.06250
1998	-0.00625	-0.00750	0.06813
1999	-0.00906	-0.00156	0.06969
2000	-0.00984	-0.00227	0.06895
2001	-0.00947	-0.00246	0.06903
2002	-0.00952	-0.00237	0.06906
2003	-0.00953	-0.00238	0.06905
2004	-0.00952	-0.00238	0.06905

Interest Rate Rule

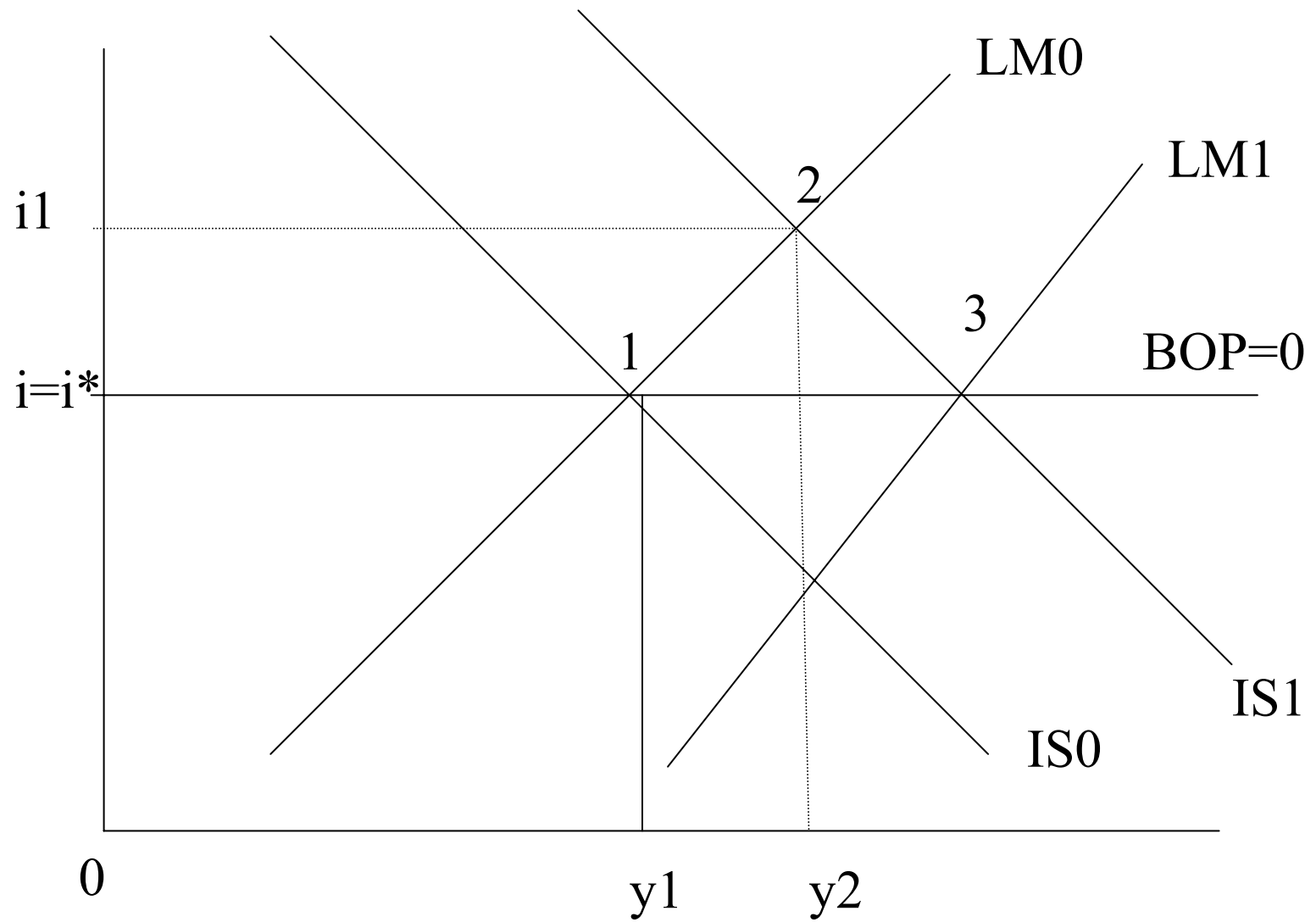


Link between Budget deficit, Money Supply and the Exchange rate

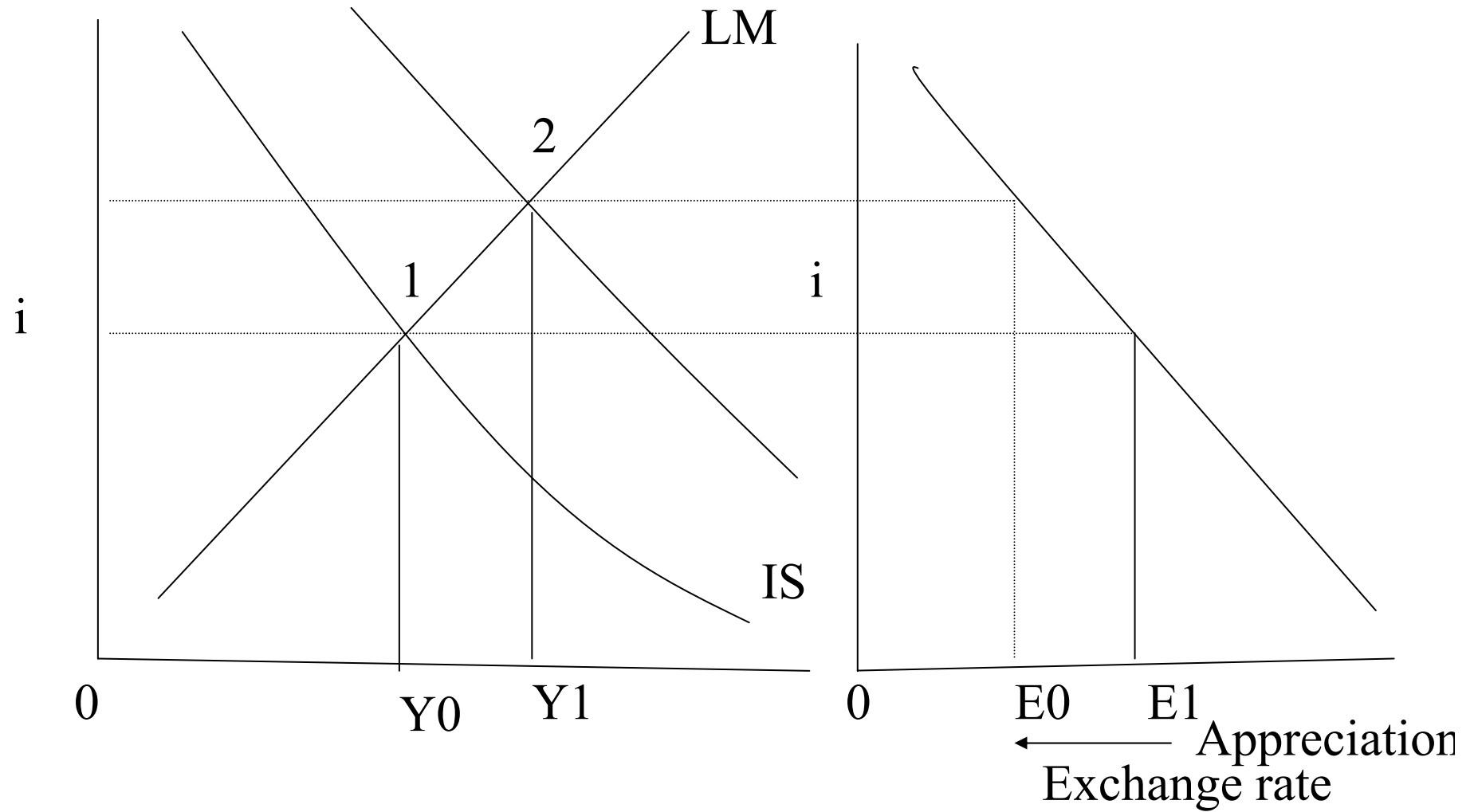
- Higher budget deficit causes expansion in income.
- Government can finance it by printing more notes.
- Income expands
- Imports rise with higher income but exports stay constant.
- Trade imbalance rises.
- Exchange rate rises under the flexible exchange rate system.
- Currency is overvalued in the fixed exchange rate regime.
- the country becomes less competitive.
- Effectiveness fiscal or monetary policy depends on the exchange rate system.
- Fiscal policy works in the fixed exchange rate regime
- Monetary policy works in the flexible exchange rate regime.
- USE purchasing power parity, uncovered interest parity and Mundelf-Fleming Model for analysis

Open Economy Fixed Exchange Rate

Effectiveness of Fiscal Policy and Ineffectiveness of Monetary Policy



IS-LM and Uncovered Interest Parity Model



Real Exchange Rate and Purchasing Power Parity

Real exchange rate : $\lambda \equiv \frac{EP^*}{P}$

In a flexible exchange rate system change in real exchange rate is given by

$$\frac{\dot{\lambda}_t}{\lambda_t} = \frac{\dot{\varepsilon}_t}{\varepsilon_t} + \frac{\dot{P}_t^*}{P_t^*} - \frac{\dot{P}_t}{P_t}$$

Where ε_t is nominal exchange rate; P_t is domestic price level and

P_t^* is foreign price level.

A dot over the variable represents time derivative of that variable, such as the symbol

$\dot{\varepsilon}_t = \frac{\partial \varepsilon_t}{\partial t}$ means change in nominal exchange rate.

Purchasing Power Parity and Monetary Policy in the Long Run

$$\text{PPP-hypothesis: } \frac{\dot{\lambda}_t}{\lambda_t} = 0 \Rightarrow \frac{\dot{\varepsilon}_t}{\varepsilon_t} = \pi - \pi^* = (\mu - \eta g) - \left(\mu^* - \eta^* g^* \right)$$

Where

π^* = foreign inflation,

μ^* = growth rate of money supply abroad,

g^* = growth rate of economy abroad;

π = domestic inflation,

μ = growth rate of money supply at home,

g = growth rate of income at home

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