

6.3 IS-LM in terms of equation

- **Equilibrium in product market ---- IS**
- **Equilibrium in money market ---- LM**

6.3.1 Equilibrium in product market

$$Y = DAE$$

$$DAE = C + I + G, \quad C = C_a + bY^d = C_a + b(Y - T)$$
$$= C_a + bY - bT$$

$$I = I_a - hr$$

$$G = G_a$$

$$T = T_a$$

Equilibrium in product market

$$DAE = C + I + G$$

$$DAE = C_a + bY - bT_a + I_a - hr + G_a$$

At equilibrium : $Y = DAE$

$$Y = C_a + bY - bT_a + I_a - hr + G_a$$

$$Y - bY = C_a - bT_a + I_a - hr + G_a$$

$$(1 - b) Y = (C_a - bT_a + I_a + G_a) - hr$$

Equilibrium in product market

At equilibrium :

$$Y = DAE$$

$$(1 - b) Y = (C_a - bT_a + I_a + G_a) - hr$$

$$Y = \frac{1}{(1 - b)} [C_a - bT_a + I_a + G_a] - \left(\frac{h}{1 - b} \right) r$$

$$\Delta Y = \frac{1}{(1 - b)} \Delta [C_a - bT_a + I_a + G_a] - \left(\frac{h}{1 - b} \right) \Delta r$$

$$\left(\frac{h}{1 - b} \right) r = \frac{1}{1 - b} [C_a - bT_a + I_a + G_a] - Y$$

$$r = \frac{1}{h} [C_a - bT_a + I_a + G_a] - \frac{(1 - b) Y}{h}$$

$$\Delta r = \frac{1}{h} \Delta [C_a - bT_a + I_a + G_a] - \frac{(1 - b) \Delta Y}{h}$$

Slope of IS curve

=

$$\frac{\Delta r}{\Delta Y}$$

=



<

0

Factors cause IS to shift

Factors cause IS to shift :

$$\Delta Y = \frac{1}{1-b} \Delta G_a \quad \Rightarrow \quad \left. \frac{\Delta Y}{\Delta G_a} \right|_{IS} = \frac{1}{1-b}$$

$$\Delta Y = \frac{-b}{1-b} \Delta T_a \quad \Rightarrow \quad \left. \frac{\Delta Y}{\Delta T} \right|_{IS} = \frac{-b}{1-b}$$

Factors cause
IS to shift

:

Every variable (except "r")
causes DAE to shift

6.3.2 Equilibrium in money market

Equilibrium in money market : $M^s = M^d$

$$M^d = C_0 + C_1 Y - C_2 r$$

At equilibrium : $M^s = M^d$

$$M^s = C_0 + C_1 Y - C_2 r$$

Equilibrium in money market

LM equation : $M^s = C_0 + C_1 Y - C_2 r$

$$C_2 r = C_0 + C_1 Y - M^s$$

$$r = \frac{C_0}{C_2} + \frac{C_1}{C_2} Y - \frac{M^s}{C_2}$$

Slope of LM curve

=



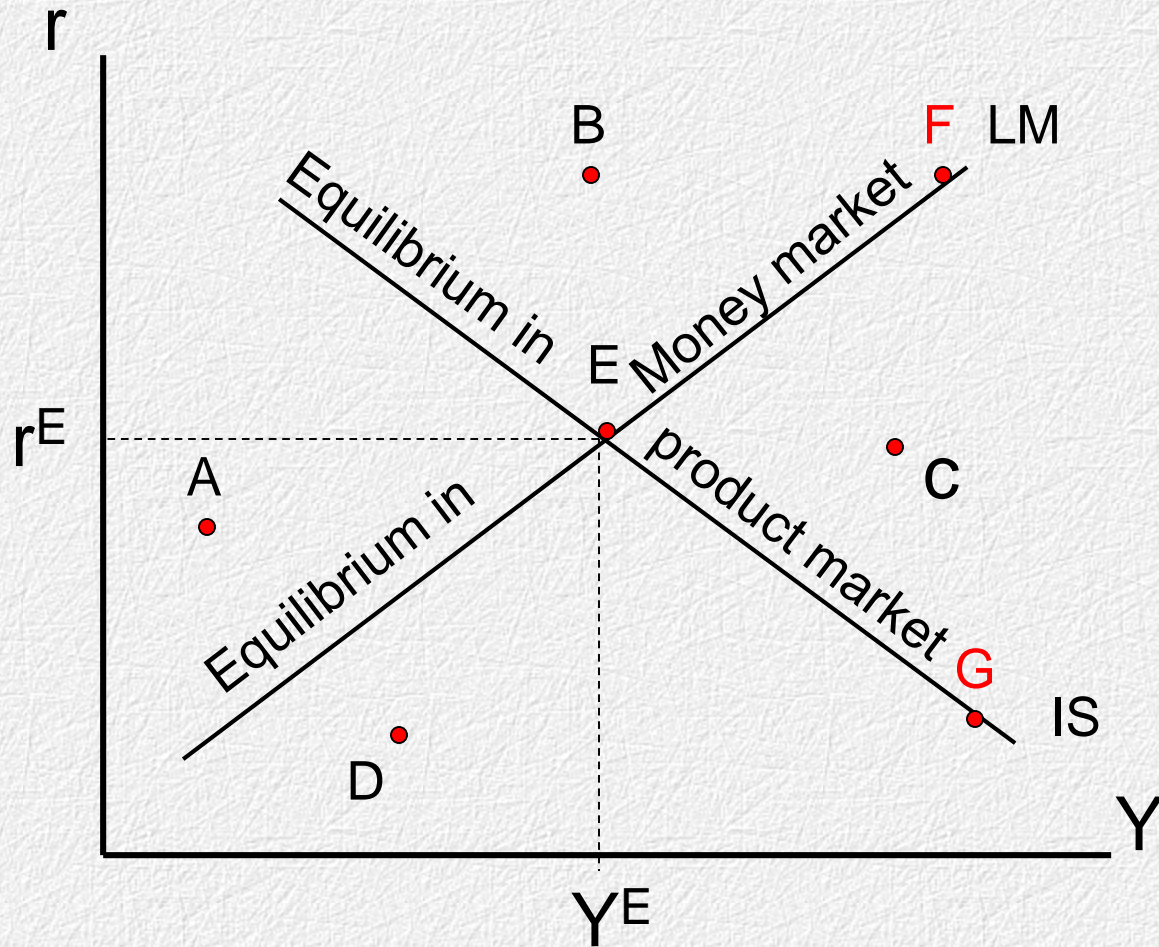
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**Factors
cause LM
to shift**

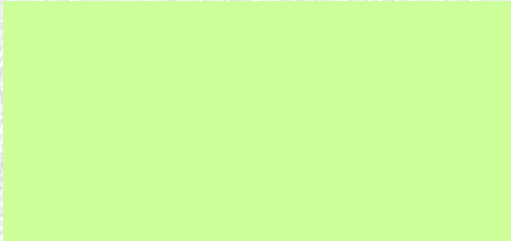
∴ $\Delta r = \frac{-1}{C_2} \Delta M^s \Rightarrow \left. \frac{\Delta r}{\Delta M^s} \right|_{LM} = \frac{-1}{C_2} < 0$

6.4 The IS-LM combined



- Points above LM curve ($r > r_0$) eg.

At point **A** and **B**



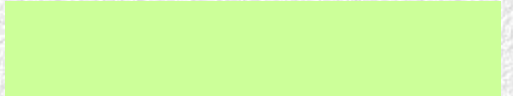
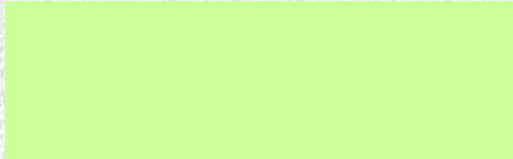
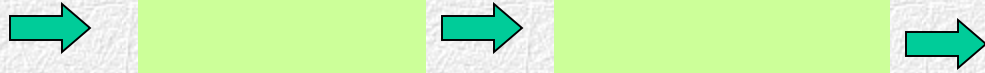
- Points below LM curve ($r < r_0$) eg.

At point **C** and **D**



- Points above IS curve ($Y > Y_0$) eg.

At point **B** and **C**



- Points below IS curve ($Y < Y_0$) eg.



- **Points on LM curve, but not on IS curve, eg. Point F**

Point **F** is not an equilibrium of economic system



Although it is an equilibrium in money market, it is not an equilibrium in product market



- **Points on IS curve, but not on LM curve, eg. Point G**

Point **G** is not an equilibrium of economic system



Although it is an equilibrium in product market, it is not an equilibrium in money market

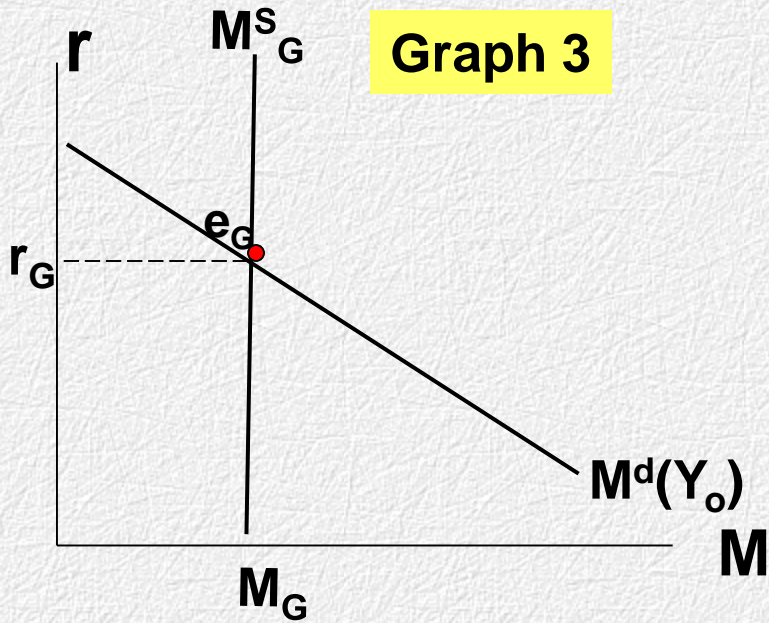


6.5 Changes in equilibrium of product and money market

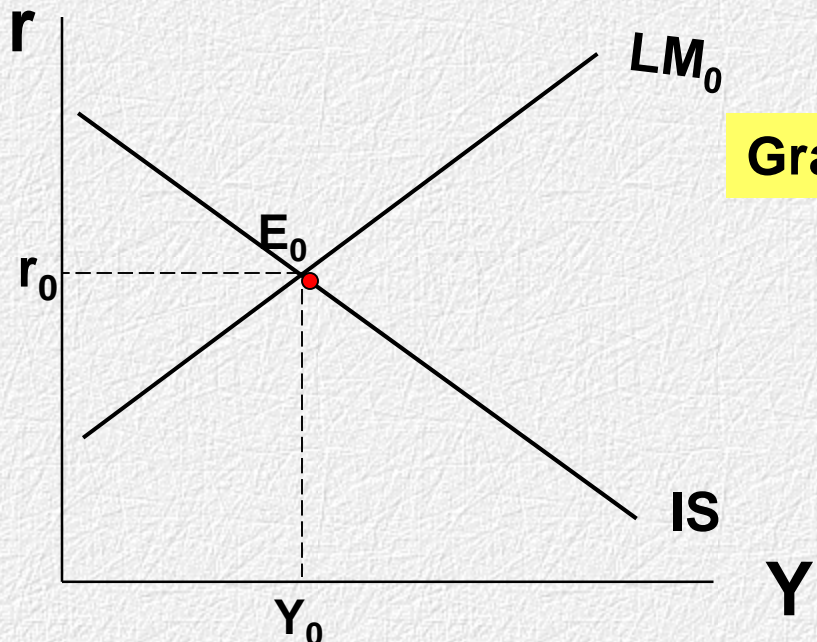
- **From shift of IS curve**
- **From shift of LM curve**

Effect of Expansion fiscal policy $G \uparrow$ or $T \downarrow$ or both

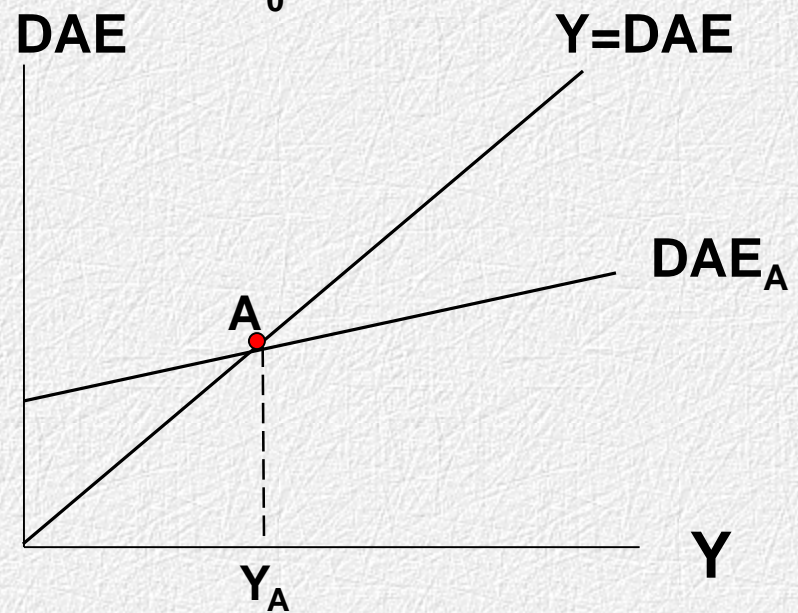
Graph 3



Graph 2



Graph 1



Before applying fiscal policy

- Equilibrium in product market is at point **A** (Graph 1)
- Equilibrium in money market is at point **e_G** (Graph 3)
- Equilibrium in economy is at point **E_0** in IS – LM model (Graph 2)
equilibrium **$r = r_0$** , equilibrium **$Y = Y_0$**

When using expansionary fiscal policy (such as $G \uparrow$)

Graph 1

$G \uparrow$



Graph 2

⇒ Equilibrium in economy changes from **E_0** to **E_1**

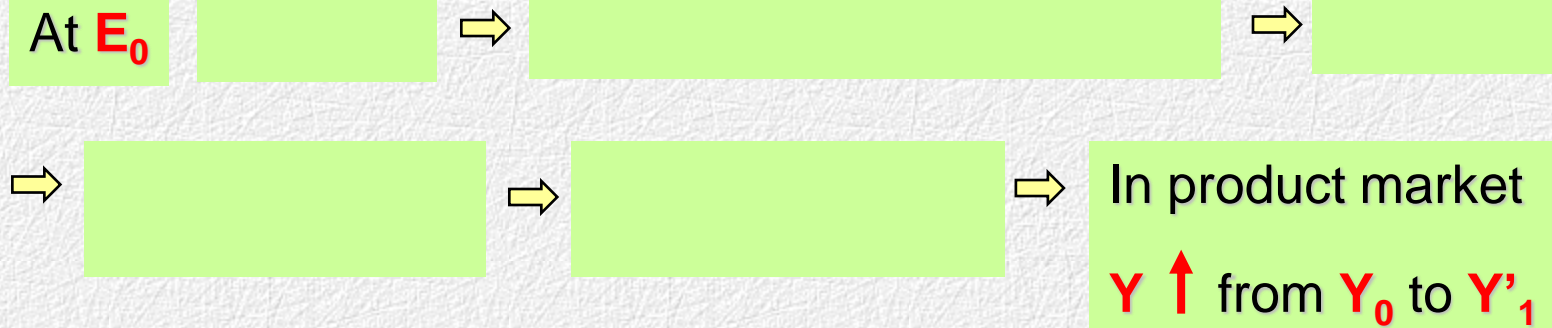
⇒ Equilibrium **$r \uparrow$** from **r_0** to **r_1**

⇒ Equilibrium **$Y \uparrow$** from **Y_0** to **Y_1**



Explaining adjustment from E_0 to E_1


Graph 2

At E_0 E_0 is on LM curve, but not on new IS curve



Graph 3

In money market when $Y \uparrow$  

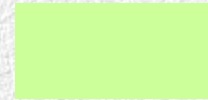
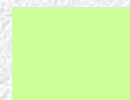


$r \uparrow = r_G r_H = r_0 r_1$

Explaining adjustment from E_0 to E_1 (Continued)

Graph 1

In production market when $r \uparrow$



$$Y \downarrow = Y_B Y_C = Y'_1 Y_1$$



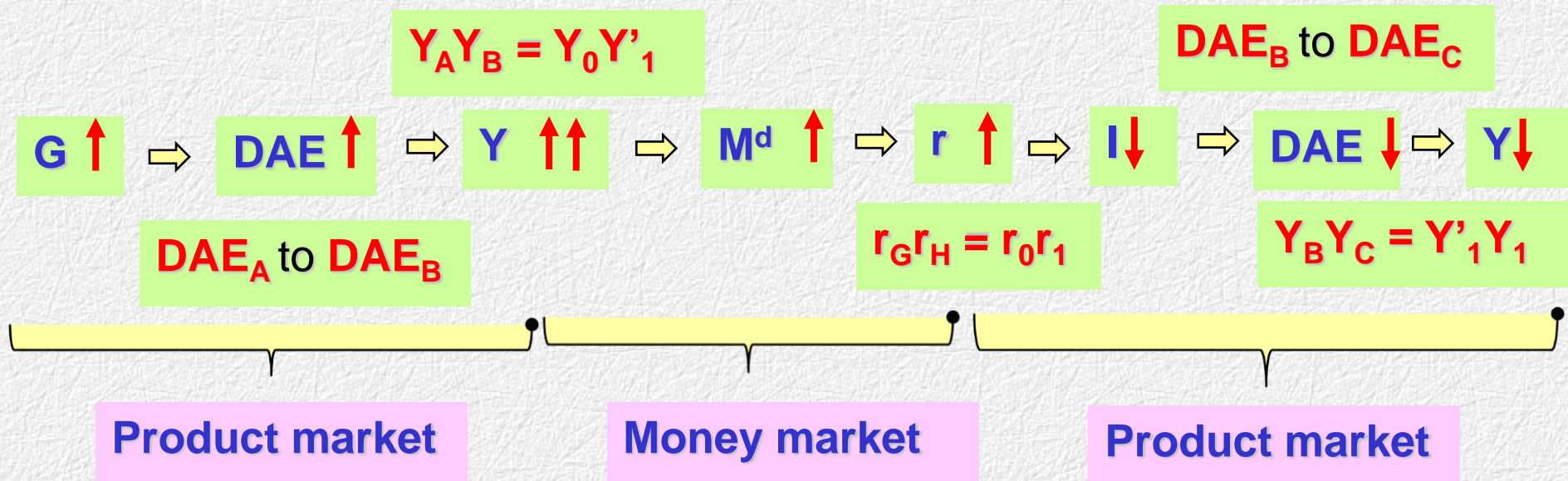
Crowding-out effect

Graph 2

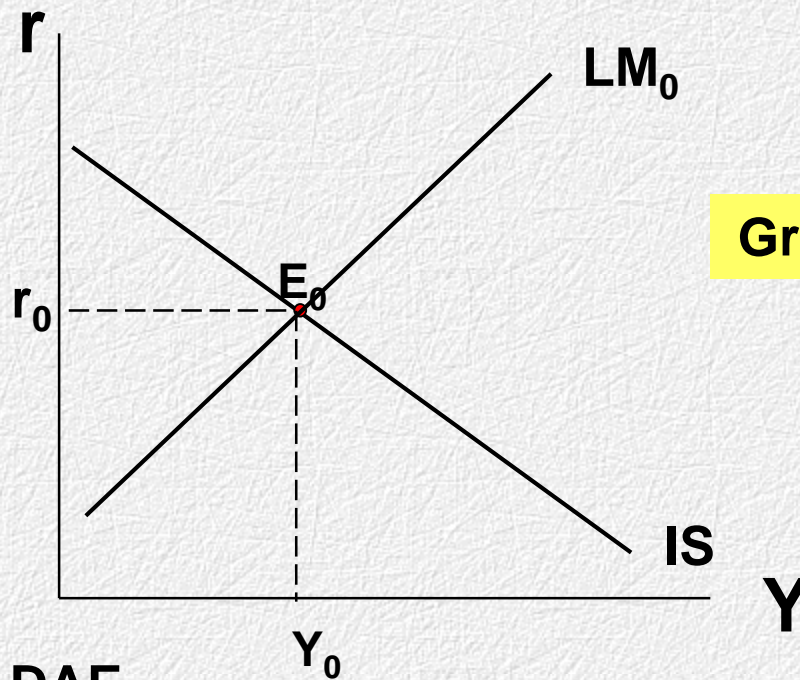
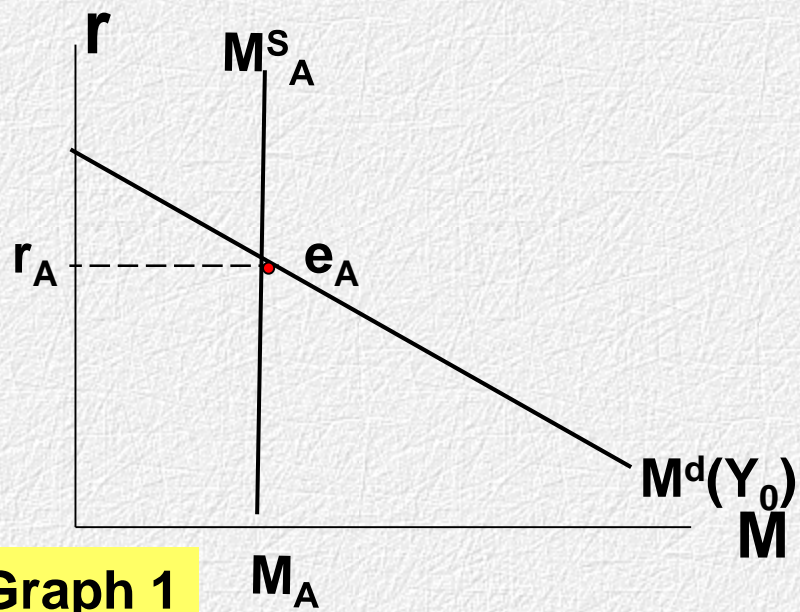
At the end, new equilibrium $r = r_1$, new equilibrium $Y = Y_1$
at point equilibrium point E_1

The net change of **equilibrium r** and **equilibrium Y** of
fiscal policy expansion is $r \uparrow = r_0 r_1$, $Y \uparrow = Y_0 Y_1$

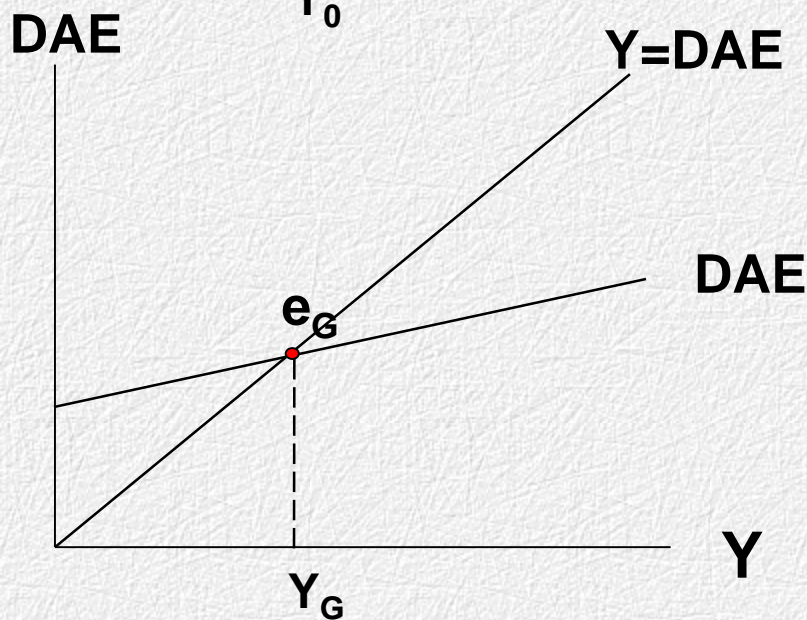
Summarize effects of fiscal policy expansion



Effect of Expansion monetary policy ($\uparrow M^s$)



Graph 2



Graph 3

Before applying monetary policy

- Equilibrium in product market is at point e_A (Graph 1)
- Equilibrium in money market is at point e_G (Graph 3)
- Equilibrium in economy is at point E_0 in IS – LM model (Graph 2)
equilibrium $r = r_0$, equilibrium $Y = Y_0$

When using expansionary monetary policy (eg. BOT buys gov't bond)

Graph 1

$M^s \uparrow$



Graph 2

\Rightarrow Equilibrium in economy changes from E_0 to E_1

\Rightarrow Equilibrium $r \downarrow$ from r_0 to r_1

\Rightarrow Equilibrium $Y \uparrow$ from Y_0 to Y_1

Explaining adjustment from E_0 to E_1

Graph 2

At E_0 E_0 is on IS curve, but not on new LM curve

It is an equilibrium in product market, but not equilibrium in money market

At E_0



Graph 3

In production market when $r \downarrow$



Explaining adjustment from E_0 to E_1 (Continued)

Graph 1

In money market when $Y \uparrow \Rightarrow$



Graph 2

At the end, new equilibrium $r = r_1$, new equilibrium $Y = Y_1$
at point equilibrium point E_1

The net change of **equilibrium r** and **equilibrium Y** of
monetary policy expansion is $r \downarrow = r_0 r_1$, $Y \uparrow = Y_0 Y_1$

Explaining adjustment from E_0 to E_1 (Continued)

Summarize

$$Y_G Y_H = Y_0 Y'_1$$



$$r_A r_B = r_0 r'_1$$

DAE to DAE''

$$r_B r_C = r'_1 r_1$$

Money market

Money market

Product market

Explaining adjustment from E_0 to E_1 (Continued)

Summarize

$$Y_G Y_H = Y_0 Y''_1$$



$$r_A r_B = r_0 r'_1$$

DAE to DAE''

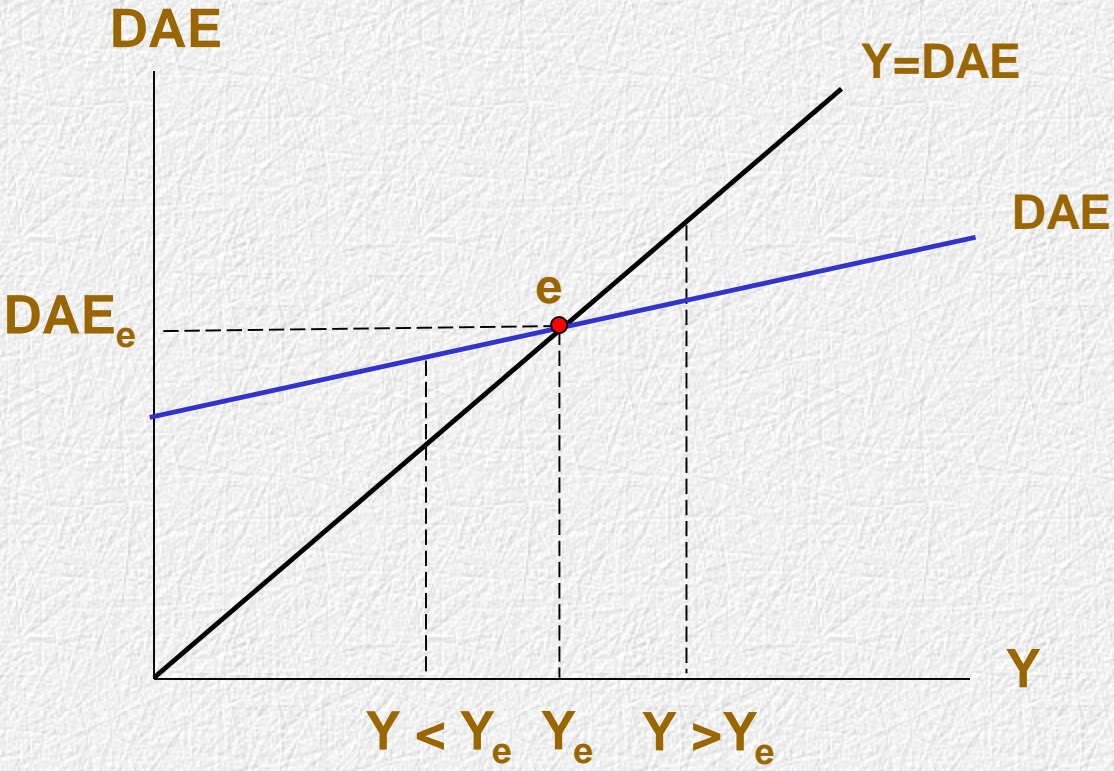
$$r_B r_C = r'_1 r_1$$

Money market

Money market

Product market

Equilibrium in good market, $Y = DAE$ approach



Equilibrium in Money Market

Money supply = Money demand

$M^s = M^d \Rightarrow \text{Equil}^m \text{ money} = M_E$

$\text{Equil}^m \text{ interest rate} = r_E$

