# ECO 209Y
MACROECONOMIC THEORY AND POLICY

LECTURE 9:
THE OPEN ECONOMY WITH FLEXIBLE EXCHANGE RATES

ASSUMPTIONS

- We will *assume* that initially the goods market, the money market, and the external sector are all in equilibrium

- For simplicity, we will also initially *assume* that there is *perfect capital mobility*
  - Therefore, the **BP** line is horizontal at the level of the international rate of interest
  - That is, **i = i*** when the economy is in equilibrium
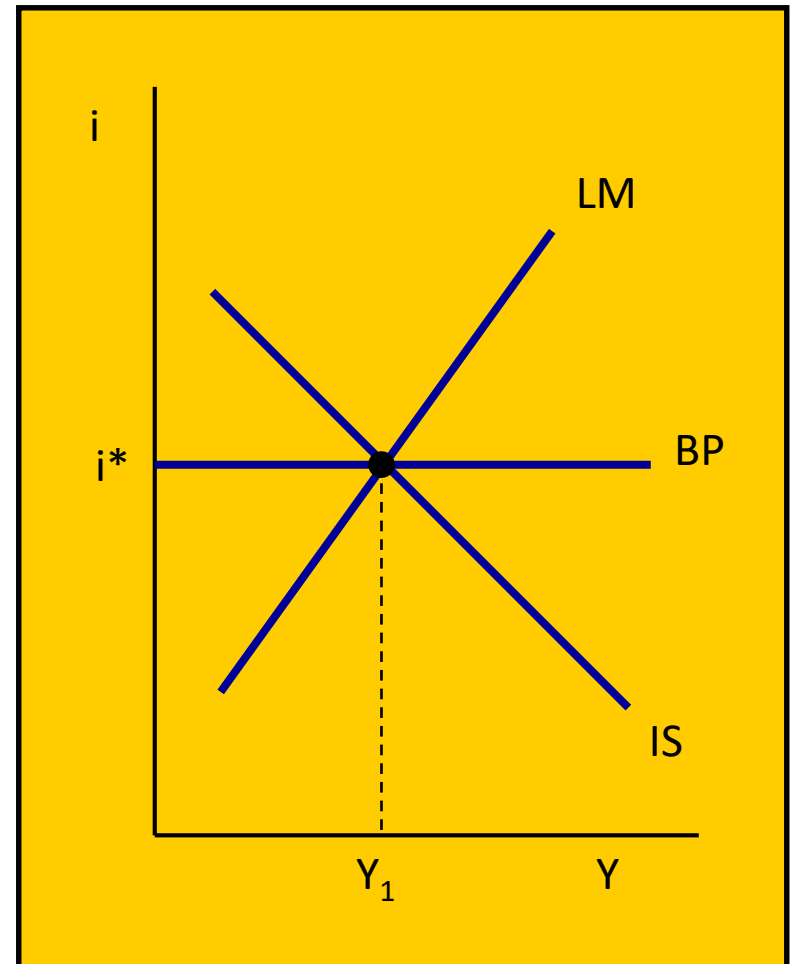
EXCHANGE RATE AND GOODS MARKET EQUILIBRIUM

$$X = \overline{X} + x(eP^f/P)$$
$$Q = \overline{Q} - s(eP^f/P) + mY$$

- Recall the balance of trade is given by:

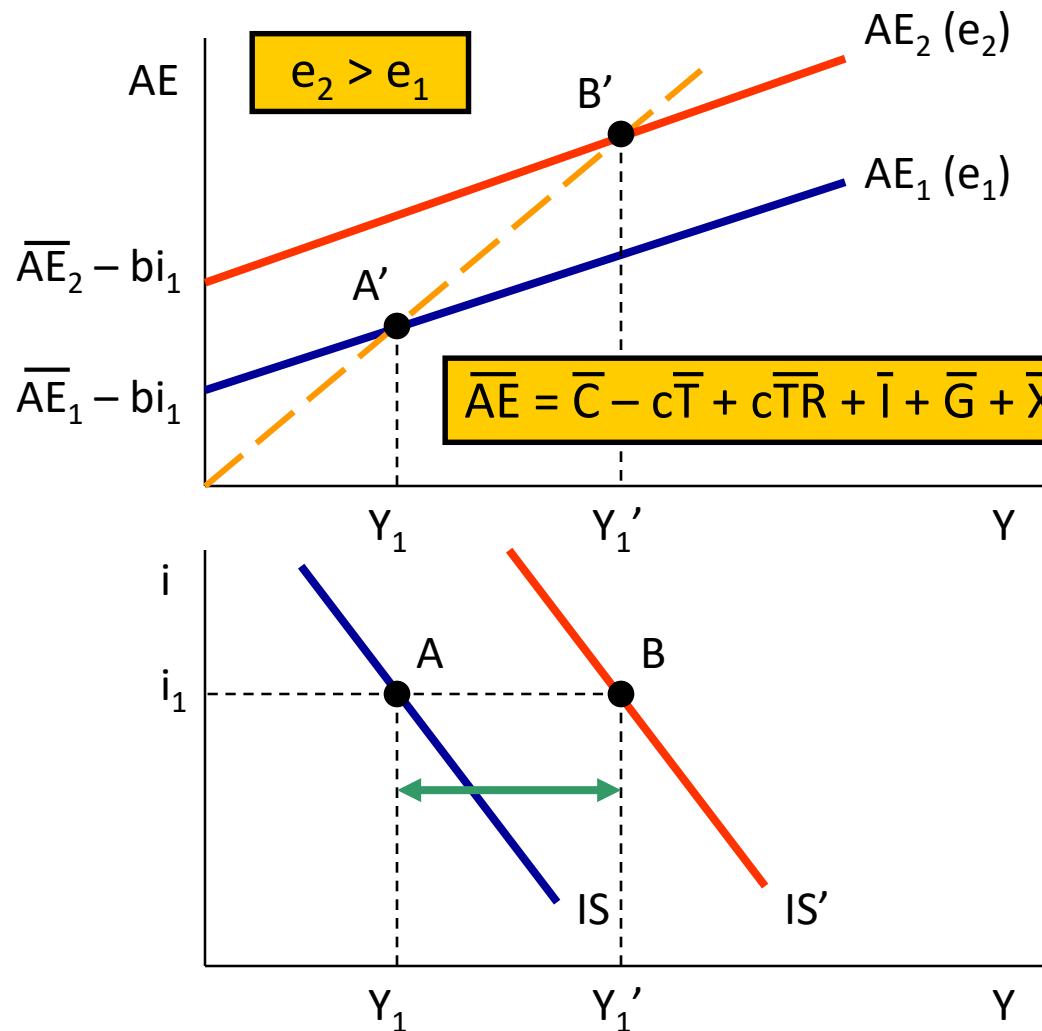$$NX = \overline{X} - \overline{Q} + (x + s)(eP^f/P) - mY$$

- Recall that a **_depreciation_** of the **_Canadian dollar_** is the same as an **_appreciation_** of the **_exchange rate_**, and an **_appreciation_** of the **_Canadian dollar_** is the same as a **_depreciation_** of the **_exchange rate_**

- Therefore, a depreciation of the Canadian dollar (**Δe > 0**) causes **NX** to increase:
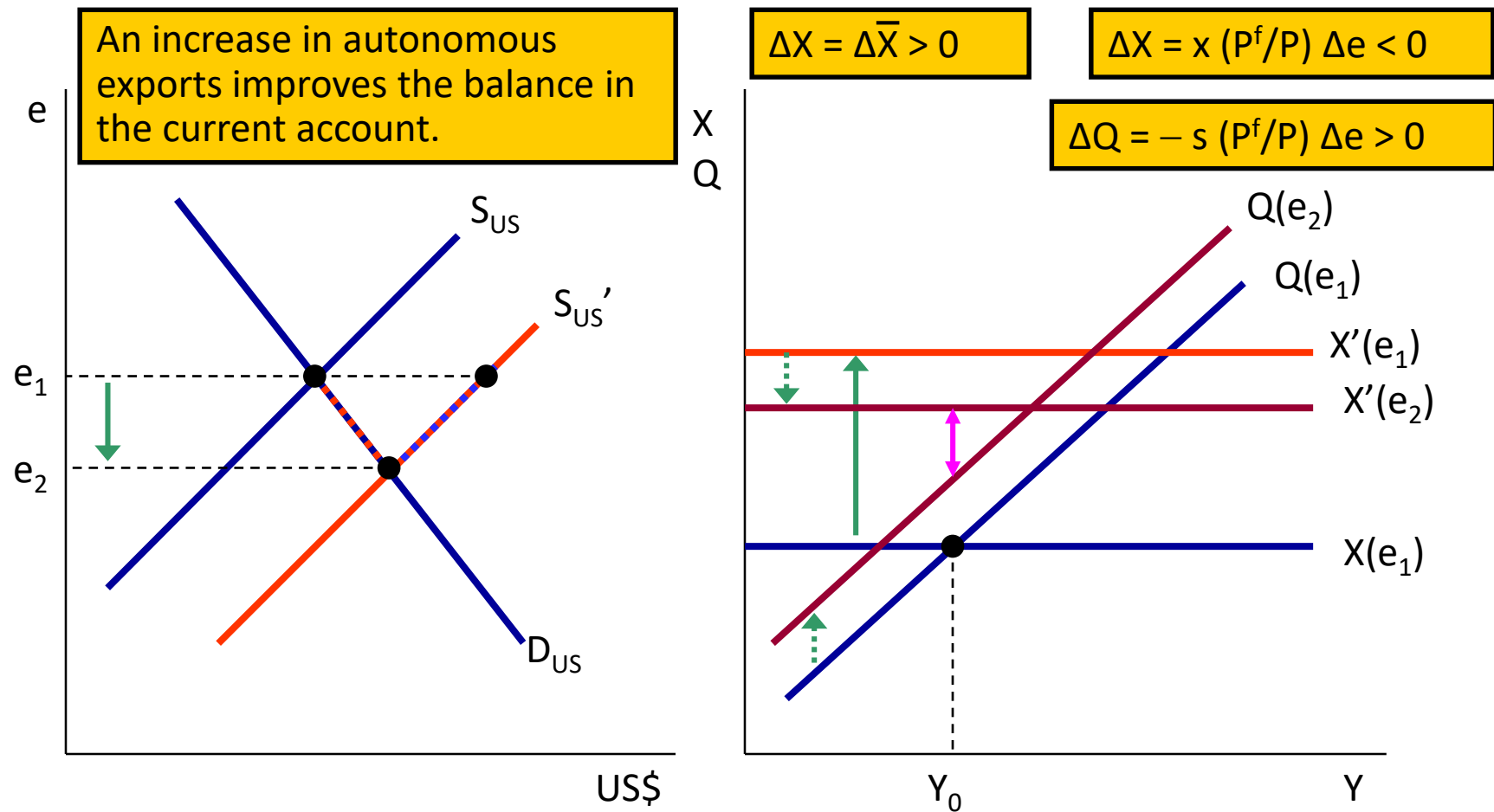
$$\Delta NX = (x + s)(P^f/P)\Delta e > 0$$

- Similarly, an appreciation of the Canadian dollar (**Δe < 0**) causes **NX** to decrease:

$$\Delta NX = (x + s)(P^f/P)\Delta e < 0$$

THE DEPRECIATION OF THE CANADIAN DOLLAR (Δe > 0) AND THE IS CURVE

AE

$e_2 > e_1$

$AE_2 (e_2)$

B′

$AE_1 (e_1)$

$\overline{AE}_2 - bi_1$

A′

$\overline{AE}_1 - bi_1$

The vertical shift of the AE curve is equal to $\Delta\overline{AE} = (x + s) (P^f/P) \Delta e$, i.e., equal to ΔNX.

$$\overline{AE} = \overline{C} - c\overline{T} + c\overline{TR} + \overline{I} + \overline{G} + \overline{X} - \overline{Q} + (x + s)(eP^f/P)$$

Y_1 $Y_1′$ Y

i

A   B

i_1

IS   IS′

Y_1 $Y_1′$ Y

The horizontal shift of the IS curve is equal to $\alpha_{AE} \Delta NX$.

THE INITIAL EFFECT OF AN INCREASE IN AUTONOMOUS EXPORTS ($\Delta\bar{X} > 0$)

THE TOTAL EFFECT ON THE ECONOMY
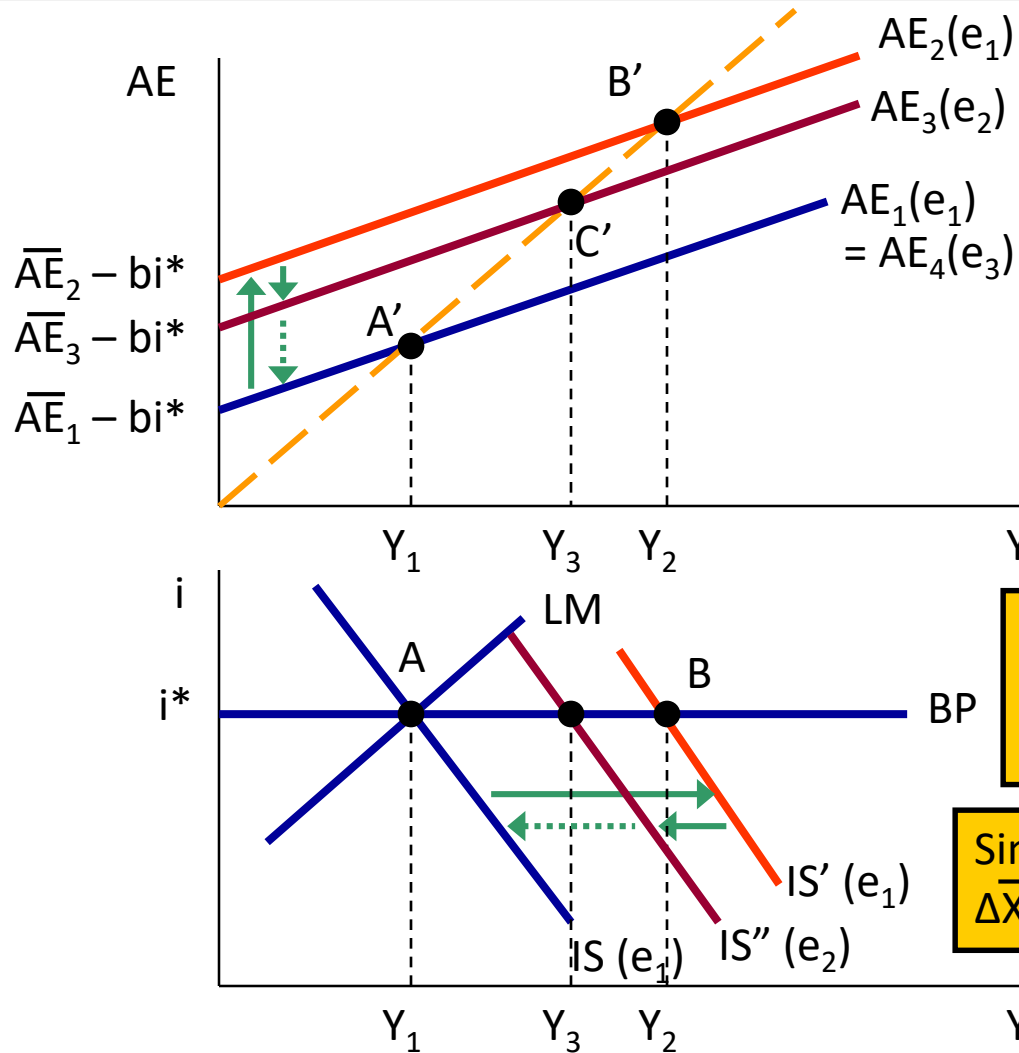
The vertical shift up of the AE curve is equal to $\Delta \overline{AE} = \Delta \overline{X}$.

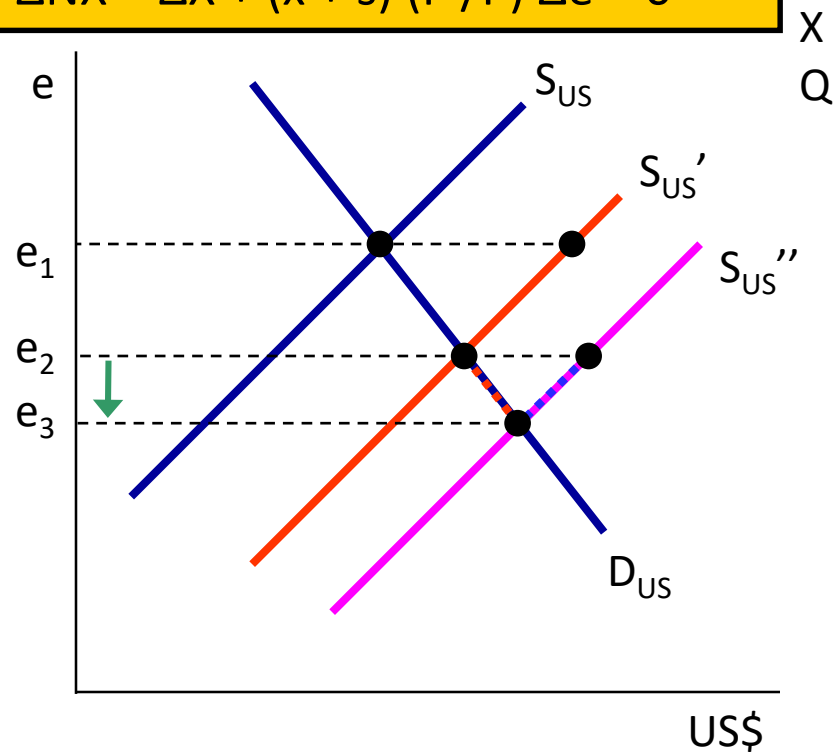The horizontal shift of the IS curve is equal to $\alpha_{AE} \, \Delta \overline{AE}$.

As the exchange rate depreciates, the vertical shift down of the AE curve is equal to $\Delta \overline{AE} = (x + s)(P^f/P) \, \Delta e$.

As Y increases and i rises, capital inflows ensue and the exchange rate depreciates further.

Since $\Delta \overline{AE} = 0$, then $\Delta X = \Delta Q$, i.e., $\Delta \overline{X} + x(P^f/P)\Delta e = - s(P^f/P)\Delta e$.

THE FINAL EFFECT OF AN INCREASE IN AUTONOMOUS EXPORTS ($\Delta \overline{X} > 0$)

$\Delta X = \Delta \overline{X} + x \, (P^f/P) \, \Delta e > 0$

$\Delta Q = -\, s \, (P^f/P) \, \Delta e > 0$

$\Delta NX = \Delta \overline{X} + (x + s) \, (P^f/P) \, \Delta e = 0$

$\Delta X = \Delta \overline{X} > 0$

$\Delta X = x \, (P^f/P) \, \Delta e < 0$

$\Delta Q = -\, s \, (P^f/P) \, \Delta e > 0$
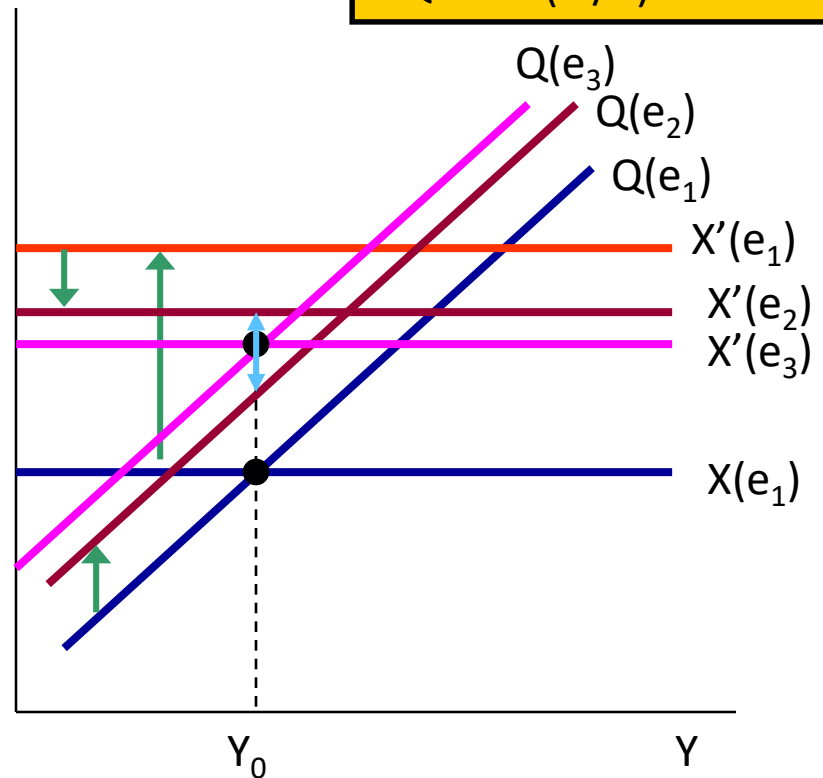
THE FINAL RESULTS OF THE INCREASE IN AUTONOMOUS EXPORTS

- Δe < 0

- ΔNX = 0

- ΔX = ΔQ > 0

- ΔCF = 0

- Δi = 0

- ΔI = 0

- ΔY = 0

$$\Delta X = \Delta \overline{X} + x\,(P^f/P)\,\Delta e > 0$$

$$\Delta Q = -\,s\,(P^f/P)\,\Delta e > 0$$

$$\Delta NX = \Delta \overline{X} + (x + s)\,(P^f/P)\,\Delta e = 0$$

Note that although there is no change in the level of Y, there is a change in the composition of Y. Indeed, there is a reallocation of resources from the import-competing industry towards the export industry.

THE EFFECT OF FISCAL POLICY ($\Delta \overline{G} > 0$)
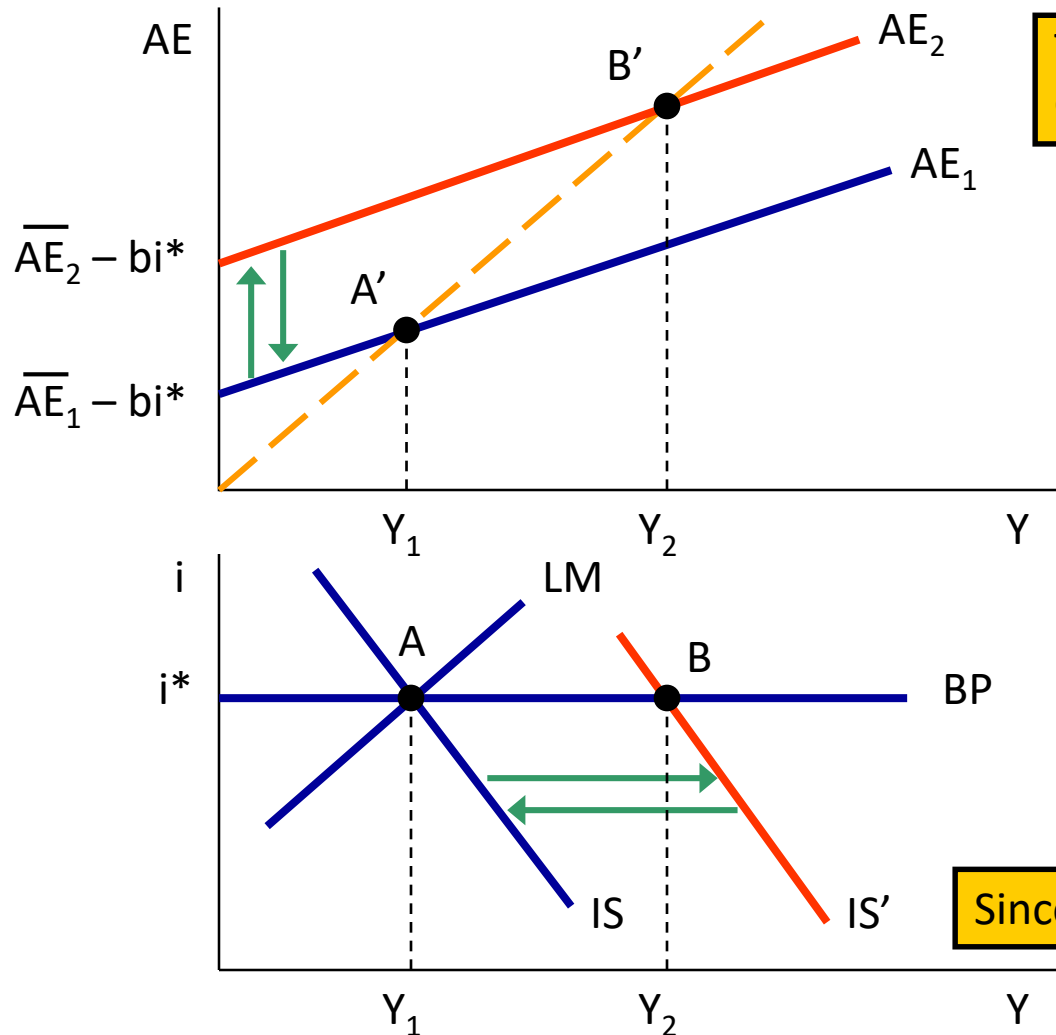
The vertical shift up of the AE curve is equal to $\Delta \overline{AE} = \Delta \overline{G}$.

The horizontal shift of the IS curve is equal to $\alpha_{AE} \Delta \overline{G}$.

The effect of a temporary increase in the domestic rate of interest is a massive inflow of capital, and a corresponding appreciation of the domestic currency.

The vertical shift down of the AE curve is equal to $\Delta \overline{AE} = (x + s)(P^f/P) \Delta e$.

Since $\Delta \overline{AE} = 0$, then $\Delta G = - \Delta NX$.

THE EFFECTS OF AN INCREASE IN $\bar{G}$

- The final results are:
  - ➤ **Δe < 0**
  - ➤ **ΔNX < 0**
  - ➤ **ΔCF > 0**
  - ➤ **Δi = 0**
  - ➤ **ΔI = 0**
  - ➤ **ΔY = 0**

> Note that although there is no change in the level of Y, there is a change in the composition of Y. Indeed, there is a reallocation of resources from the tradable sector towards the non-tradable sector.

- Therefore, the increase in **G** completely crowds out **NX**
  - ➤ This shows that fiscal policy is completely *ineffective* with a flexible exchange rate system and perfect capital mobility

THE EFFECT OF MONETARY POLICY

The increase in the money supply causes the LM curve to shift to the right.

The effect of the fall in the domestic rate of interest is a massive outflow of capital, and a depreciation of the domestic currency.

In turn, the depreciation of the domestic currency causes NX to increase and the IS curve shifts to the right to IS'.

As Y increases and i rises, the domestic currency appreciates and NX falls. Therefore, the IS' curve shifts back to the left to IS".
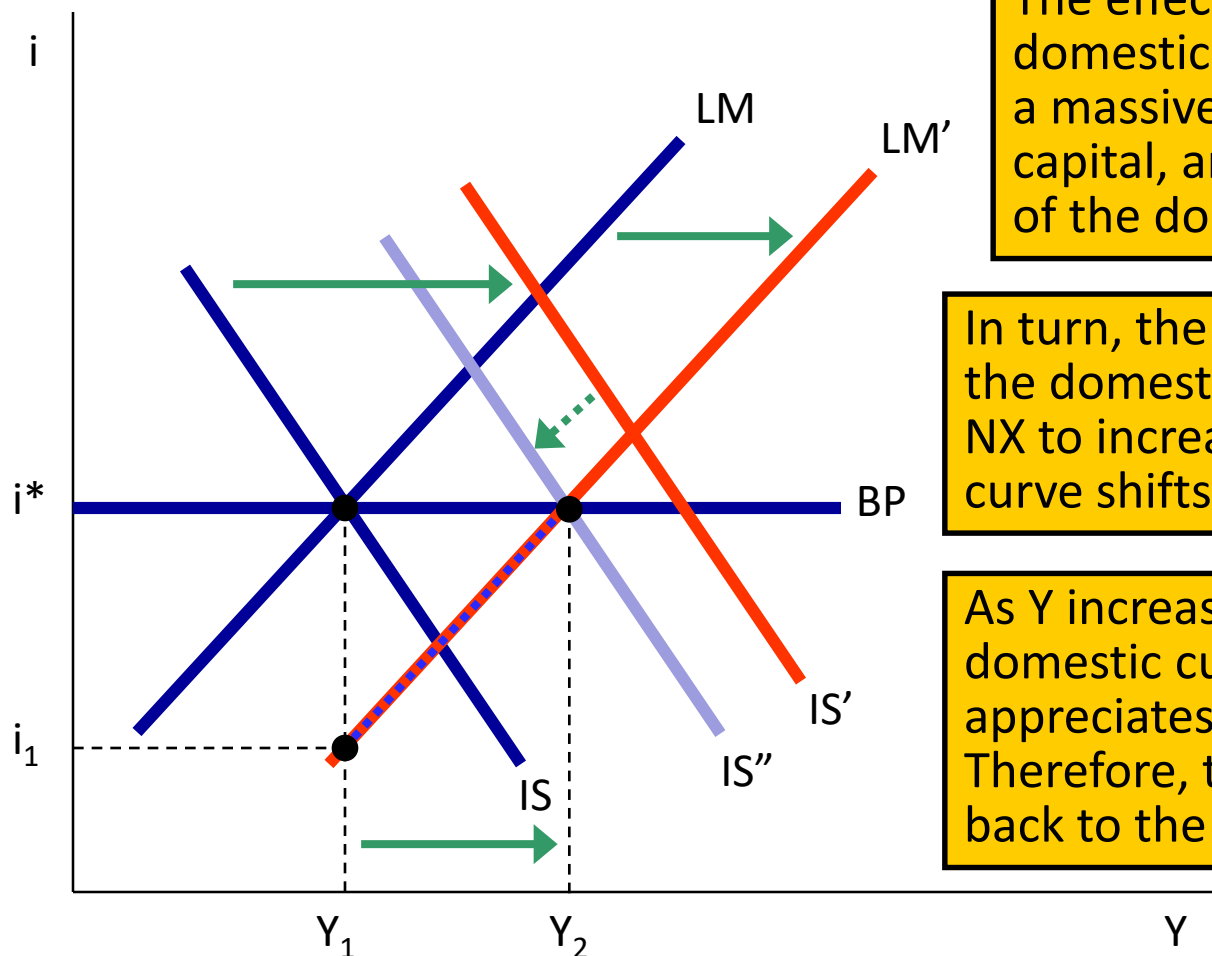
THE EFFECTS OF THE INCREASE IN THE MONEY SUPPLY

- The final results are:

    - $\Delta e > 0$

    - $\Delta NX > 0$

    - $\Delta CF < 0$

    - $\Delta i = 0$

    - $\Delta I = 0$

    - $\Delta Y > 0$

- This shows that monetary policy is *effective* with a flexible exchange rate system and perfect capital mobility

IMPERFECT CAPITAL MOBILITY AND THE EXCHANGE RATE

- With imperfect capital mobility, the expression for the BP curve is given by:

$$i = \frac{-\overline{BP}}{a} + \frac{m}{a}Y$$

where $\overline{BP} = \overline{X} - \overline{Q} + (x + s)(eP^f/P) - ai^*$

- When the exchange rate increases ($\Delta e > 0$), the **BP** line shifts down by $[-(x + s)/a](P^f/P)\,\Delta e$

- When the exchange rate decreases ($\Delta e < 0$), the **BP** line shifts up by $[-(x + s)/a](P^f/P)\,\Delta e$

A Depreciation of the Currency and the Position of the BP Curve

- Why does the **BP** curve shift down when **Δe > 0**?

- Recall that **BP = NX + CF** and that **BP = 0** under flexible exchange rates

- A depreciation of the Canadian dollar reduces the relative price of Canadian goods in the international market

  ➢ Therefore, **ΔNX > 0** at all levels of **Y**

- In order for **BP = 0**, then **ΔCF < 0**

  ➢ This implies that the rate of interest must decrease at all levels of **Y** for **BP = 0**, i.e., the **BP** curve must shift down

A DEPRECIATION OF THE CURRENCY AND THE POSITION OF THE BP CURVE

At the initial level e_1 of the exchange rate, **BP = 0** at point **A**.

When the exchange rate increases to e_2, **ΔCF = 0** but **ΔNX > 0** and thus now **BP > 0** at point **A**.

At the new level e_2 of the exchange rate, **BP = 0** at point **B**. At this point, **ΔCF < 0** offsets **ΔNX > 0** and **BP = 0**.

BP $(e = e_1)$

BP' $(e = e_2)$

A

B

i_1

i_2

Y_1

i

Y
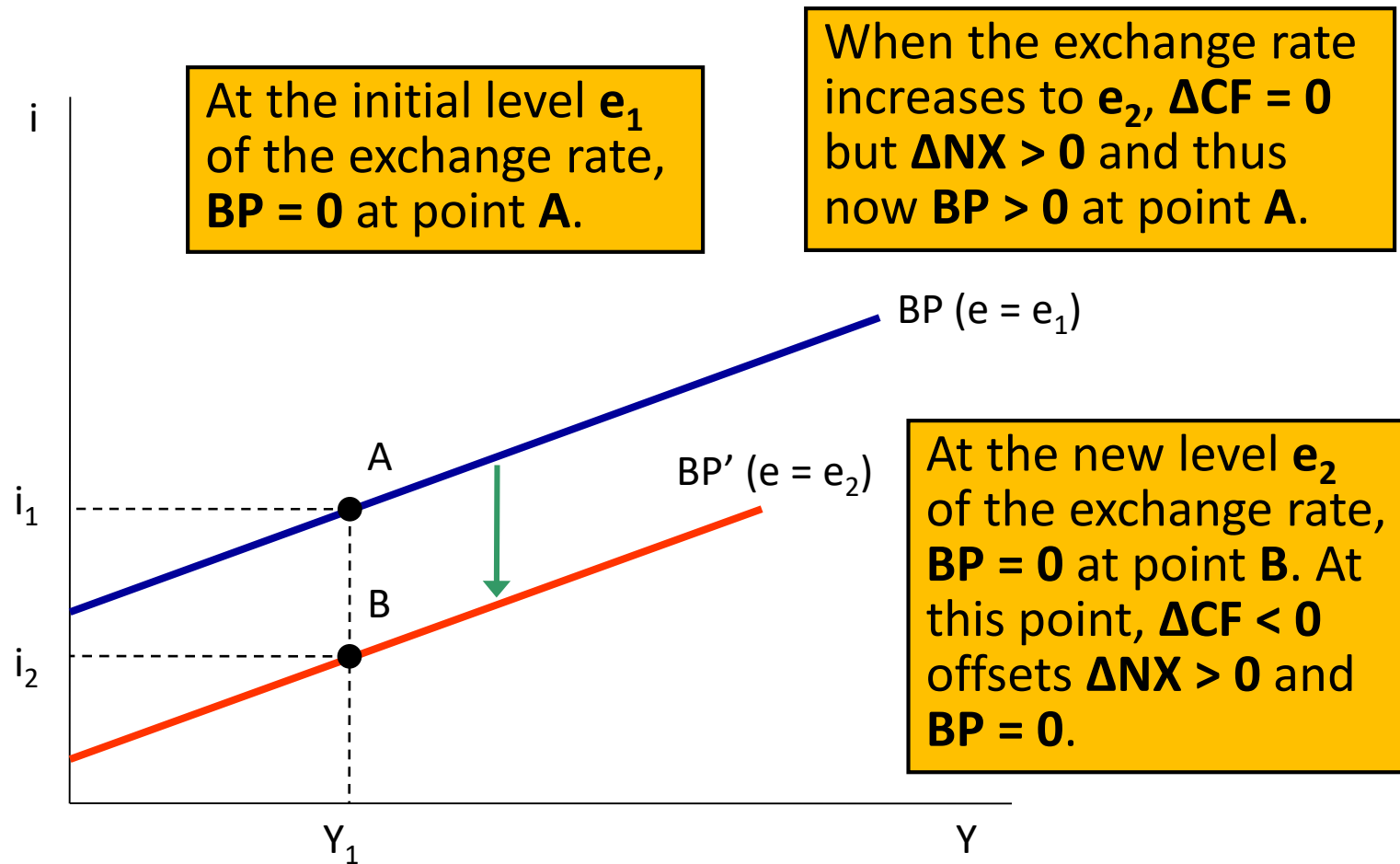
THE EFFECT OF EXPANSIONARY FISCAL POLICY
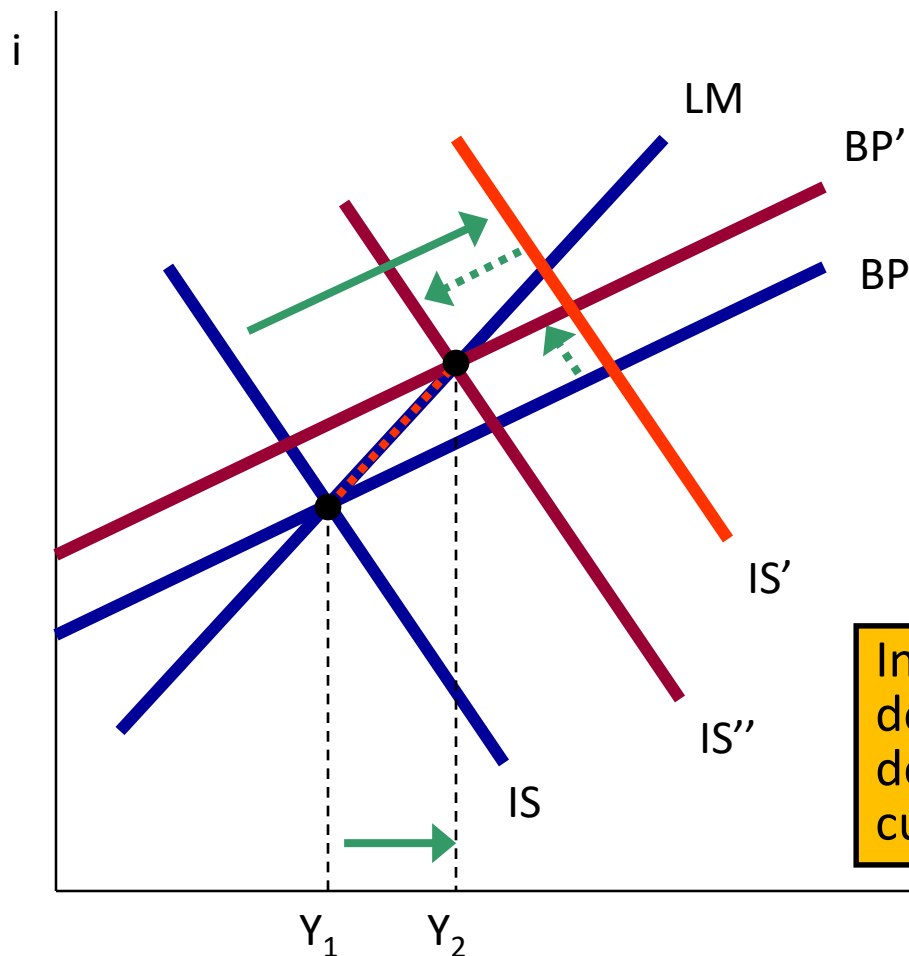
As output starts to increase to eliminate the excess demand in the goods market, the demand for money rises and the rate of interest thus increases. The effect of the rise in the domestic rate of interest is an improvement in the capital account, and the domestic currency appreciates.

In turn, the appreciation of the domestic currency causes NX to decrease and both the IS and BP curves to shift to the left.

THE EFFECTS OF EXPANSIONARY FISCAL POLICY

- The final results are:

  - ➢ **Δi > 0**

  - ➢ **ΔI < 0**

  - ➢ **Δe < 0**

  - ➢ **ΔNX < 0**

  - ➢ **ΔCF > 0**

  - ➢ **ΔY > 0**

- Therefore, there is a partial crowding out effect: **G** increases, but both **I** and **NX** decrease

  - ➢ This shows that fiscal policy is *effective* with a flexible exchange rate system and imperfect capital mobility

THE EFFECT OF EXPANSIONARY MONETARY POLICY

The effect of the fall in the domestic rate of interest is a deterioration of the capital account, and the domestic currency depreciates.

In turn, the depreciation of the domestic currency causes NX to increase and both the IS and BP curves to shift to the right.

As Y increases, the rate of interest increases and the capital account improves. Therefore, the domestic currency appreciates and NX falls. As a result, the BP curve shifts up and the IS curve shifts down.

THE EFFECTS OF EXPANSIONARY MONETARY POLICY

- The final results are:
  - ➢ **Δi < 0**
  - ➢ **ΔI > 0**
  - ➢ **Δe > 0**
  - ➢ **ΔNX > 0**
  - ➢ **ΔCF < 0**
  - ➢ **ΔY > 0**

- Therefore, both **I** (because **Δi < 0**) and **NX** (because **Δe > 0**) increase
  - ➢ This shows that monetary policy is *effective* with a flexible exchange rate system and imperfect capital mobility

EXCHANGE RATE EXPECTATIONS

- We have assumed that under *perfect* capital mobility the *domestic* rate of interest was equal to the *international* rate
  - ➤ However, even under these restrictive assumptions the domestic and the international rate often *differ*
  - ➤ One main reason for the interest rate differential is the *expectation* of changes in the exchange rate

- Suppose that you want to invest $1,000 and that **i = i* = 10%** and **e = 1**

- Under these assumptions, apparently you would be indifferent between investing in the US or in Canada
  - ➤ Indeed, in a year's time you would earn $100 in either the US or Canada

EXCHANGE RATE EXPECTATIONS (CONT'D)

- But for the above to occur, the **e** must be *expected* to remain unchanged during the whole year

- What happens if the **e** is *expected* to change?

- Suppose the exchange rates is *expected* to increase by 5%

  ➢ Then, at the end of the year, the investment in the US would have increased to US $1,100

  ➢ At **e = 1.05**, this amount would represent Cdn. $1,155

  ➢ Therefore, the return of your investment in the US is *expected* to be 15.5% and not 10% as in Canada

- Therefore, we must take exchange rate *expectations* into account when deciding to invest abroad

EXCHANGE RATE EXPECTATIONS (CONT'D)

- If we have perfect foresight, then the equilibrium domestic interest rate would be equal to the foreign interest rate plus the appreciation of the exchange rate:

$$i = i^* + x$$

  where $x = \Delta e$

- The problem is that investors don't know with certainty either the direction or the amount of any future change in the exchange rate

  - Therefore, investors have to form their *expectations* about the behaviour of the exchange rate

INTEREST PARITY CONDITION

- Given these expectations about the behaviour of the exchange rate, under *perfect* capital mobility the equilibrium domestic interest rate will be:

$$i = i^* + x^e$$

where x^e is the expected rate of change of **e**

- This condition, $i = i^* + x^e$, is called the *interest parity condition*

  ➢ If $x^e = 0$, then the expression for the **BP** curve is $i = i^*$

  ➢ If $x^e \neq 0$, then the expression for the **BP** curve is $i = i^* + x^e$

- Then the **BP** curve will shift up if **e** is expected to appreciate ($x^e > 0$), and down if **e** is expected to depreciate ($x^e < 0$)

THE EFFECT OF AN EXPECTED DEPRECIATION OF THE EXCHANGE RATE

Initially $x^e = 0$, and thus the expression for the BP curve is $i = i^*$.

Suppose that now ($x^e < 0$), and thus the expression for the BP curve becomes $i = i^* + x^e$ and the BP curve shifts down.

Since at Y_1 the domestic rate of return is greater than the expected rate of return abroad, i.e., $i > i^* + x^e$, an inflow of capital will ensue and the domestic currency will appreciate. Therefore, NX will decrease and an excess supply will arise in the goods market.

LM

i^*

BP

$i^* + x^e$

BP'

IS

IS'

Y_2 Y_1 Y

i