

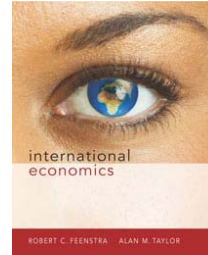
# Advanced International Economics

## ECON 758

Professor Yamin Ahmad

Lecture 12:

- Open Economy IS-LM model
- Macroeconomic Policy



## In This Lecture

1. Demand in the Open Economy
  - Focus On: Trade Balance and the Real Exchange Rate
  - 1. Exchange Rate Pass-Through
  - 2. J-Curve and Current Account Dynamics
  - 3. Marshall – Lerner Condition
2. Keynesian Cross in the Open Economy
3. Goods and Foreign Exchange Market Equilibria
4. Money Market Equilibrium
5. Macroeconomic Policy in the short run
  - Fixed versus Flexible Exchange Rate
6. Stabilization Policy

Note: These lecture notes are incomplete without having attended lectures.

2

## Demand in the Open Economy

- To analyze macroeconomic fluctuations, study how short-run shocks affect three markets.
  - Goods market (output)
  - Money market (money and interest rates)
  - Forex market (exchange rates)

Note: These lecture notes are incomplete without having attended lectures.

3

## Preliminaries and Assumptions

- Two countries: home and “rest of the world” (ROW).
- Home and foreign price levels are fixed.
- Government spending and taxes are fixed.
- Foreign goods market and money market conditions are fixed and taken as given.
- GDP is taken to be the equivalent to Gross National Disposable Income (GDNI)
- Net Factor Income from Abroad (NFIA) = Net Unilateral Transfers (NUT) = 0, so Trade Balance (TB) = Current Account (CA).

Note: These lecture notes are incomplete without having attended lectures.

4

## Consumption

- Consumption is a function of disposable income:

$$C = c(Y - \bar{T})$$

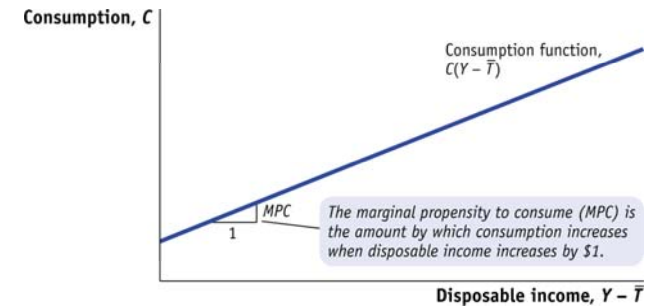
- Keynesian consumption function.
- As disposable income rises, consumption increases.

Note: These lecture notes are incomplete without having attended lectures.

5

## Consumption

- Marginal effects
  - Slope of the consumption function is the marginal propensity to consume (MPC),  $0 < MPC < 1$ .



Note: These lecture notes are incomplete without having attended lectures.

6

## Investment

- Firms engage in capital investment projects only if real return on the project  $>$  cost of borrowing.
  - Firm's borrowing cost is the expected real interest rate:

$$r^e = i - \pi^e$$

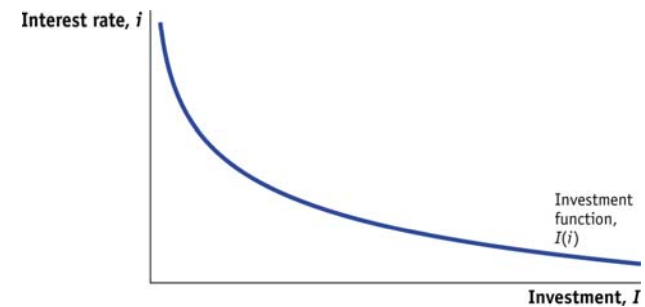
- Fixed prices means  $\pi^e = 0$ , so  $r^e = i$ .
- As nominal interest rate rises, expected real interest rate rises, so the volume of projects that are profitable declines and investment declines.

Note: These lecture notes are incomplete without having attended lectures.

7

## Investment

- Investment demand is therefore:
 
$$I = I(i)$$



8

## The Government

- The government budget
  - Government collects taxes,  $T$ , and spends government consumption,  $G$ , on goods and services.
    - $G$  does not include government transfer programs, designed to redistribute income.
  - Government's tax revenue may not exactly equal its government consumption spending.
    - $G > T$ : Budget surplus.
    - $G < T$ : Budget deficit.
    - $G = T$ : Balanced budget.

Note: These lecture notes are incomplete without having attended lectures.

9

## The Government

- Fiscal policy
  - Decisions about taxes and government consumption.
  - These values are taken as given:

$$T = \bar{T} \qquad G = \bar{G}$$

Note: These lecture notes are incomplete without having attended lectures.

10

## The Trade Balance

- Factors affecting the trade balance
  - **Expenditure switching**
    - The real exchange rate,  $q$ , is defined as:

$$q = E \frac{\bar{P}^*}{\bar{P}}$$

- Changes in  $q$  lead to expenditure switching between home and foreign goods and services:
  - $q \uparrow$  (real depreciation)
    - foreign goods relatively more expensive
    - $\uparrow$  home exports and  $\downarrow$  home imports,  $TB \uparrow$

Note: These lecture notes are incomplete without having attended lectures.

11

## The Trade Balance

- Factors affecting the trade balance
  - Changes in home income,  $Y - T$ 
    - $(Y - T) \uparrow$ 
      - home country increases spending
      - home country imports rise,  $TB \downarrow$
  - Changes in foreign income,  $Y^* - T^*$ 
    - $(Y^* - T^*) \uparrow$ 
      - foreign country increases spending
      - home country exports rise,  $TB \uparrow$

Note: These lecture notes are incomplete without having attended lectures.

12

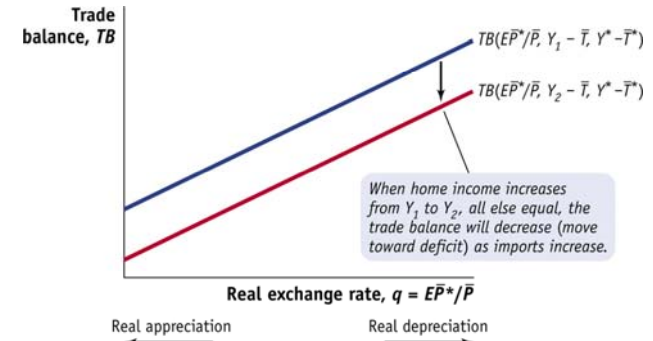
## The Trade Balance

- Combining the three factors above (expenditure switching, home disposable income and foreign disposable income):

$$TB = TB(E\bar{P}^*/\bar{P}, Y - T, Y^* - T^*)$$

## The Trade Balance

- Example: Increase in home income  $(Y - T) \uparrow$



## Soaring Loonie Drives Canadian Shoppers South

- Background
  - In 2007, Canadian dollar (“loonie”) reached U.S. dollar parity for the first time in three decades. Historically,  $E_{\$/C\$} < 1$ .
  - Bellingham, WA —dramatic increase in sales to Canadian consumers, with as much as one-half of business coming from Canada.
  - The weaker U.S. dollar is coupled with lower taxes and sales designed to attract customers away from Canadian retailers.

## Soaring Loonie Drives Canadian Shoppers South

- Lessons
  - Inflow of Canadian customers means an increase not only in products that can be taken back to Canada, but also in spending at local restaurants and similar businesses in the U.S.
  - There are barriers to expenditure switching: duties payable at the border, long waits at the border, and the cost of travel.

## The Trade Balance

- Marginal Effects
    - Effect of a change in output on trade balance.
    - Changes in income affect consumption:
      - ❑  $MPC =$  marginal propensity to consume (all goods).
      - ❑  $MPC_H =$  marginal propensity to consume home goods.
      - ❑  $MPC_F =$  marginal propensity to consume foreign goods.
- $$MPC = MPC_F + MPC_H$$
- The terms above divide consumption expenditures into two parts.
    - ❑ Consumption of home goods.
    - ❑ Consumption of foreign goods.

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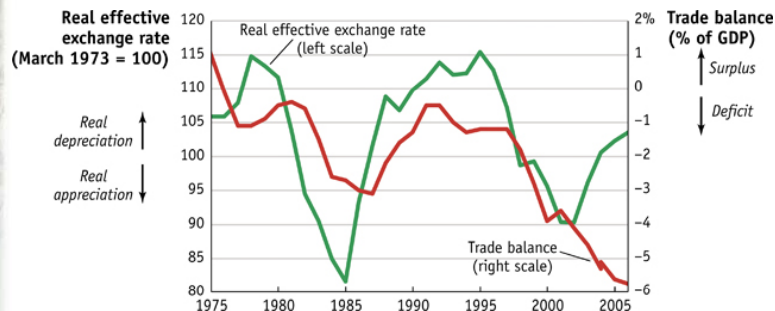
## The Trade Balance and Real Exchange Rates

- Real effective exchange rate
  - Measures real depreciation/appreciation in the U.S. relative to a basket of other countries (weighted by U.S. trade with each country).
  - Empirical measure of  $q$  in the model.
  - Expect to see a negative relationship between  $q$  and the trade balance.

Note: These lecture notes are incomplete without having attended lectures.

## The Trade Balance and Real Exchange Rates

- Empirical observations
  - Real effective exchange rate has a positive relationship with the trade balance, as expected.



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## The Trade Balance and Real Exchange Rates

- Empirical observations
  - Negative correlation is not perfect.
    - ❑ Appears to be a lag between when a real depreciation (appreciation) occurs and when the trade balance increases (decreases).
    - ❑ This lag is attributed to exchange rate pass-through and the J-curve effect.

Note: These lecture notes are incomplete without having attended lectures.

## Barriers to Expenditure Switching: Pass-Through and the J Curve

- Two key mechanisms at work when the real exchange rate changes.
  - A nominal depreciation is associated with a real depreciation (since prices are fixed).
  - The implied change in relative prices (increase in the relative price of foreign goods) reduces imports and increases exports.

Note: These lecture notes are incomplete without having attended lectures.

## Barriers to Expenditure Switching: Pass-Through and the J Curve

- Trade Dollarization, Distribution, and Pass-Through
  - Local pricing.
    - ❑ We assumed all prices are set in local currency and that these prices are fixed in the short run.
    - ❑ Some home goods may be priced in local currency.
    - ❑ To understand how this affects trade, define these two pricing schemes (treating the U.S. as the home country).
      - A share  $d$  of home-produced goods are priced in home-country dollar at price:  $\bar{P}_1$
      - A share  $(1 - d)$  of home-produced goods are priced in local currency at price:  $\bar{P}_2$

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## Barriers to Expenditure Switching: Pass-Through and the J Curve

- Trade Dollarization, Distribution, and Pass-Through
  - Local pricing.

	Exports Denominated in		Imports Denominated in			Exports Denominated in		Imports Denominated in	
	U.S. Dollar	Euro	U.S. Dollar	Euro		U.S. Dollar	Euro	U.S. Dollar	Euro
United States	100%	—	93%	—	<b>Eurozone</b>				
United Kingdom	26	21%	37	27%	Belgium	32	55	33	57
Australia	70	1	50	9	France	34	52	47	45
<b>Asia</b>					Germany	24	63	34	55
Japan	48	10	9	5	Italy	18	75	25	70
Korea	83	7	80	5	Greece	46	47	55	40
Malaysia	90	—	90	—	Luxembourg	25	53	37	42
Thailand	85	3	76	4	Portugal	28	55	33	60
					Spain	30	61	36	60

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## Barriers to Expenditure Switching: Pass-Through and the J Curve

- Trade Dollarization, Distribution, and Pass-Through
  - The real exchange rate with local pricing.

- ❑ Define the price of foreign goods relative to dollar-priced home goods and relative to local-currency priced home goods.

$$\left. \begin{array}{l} \text{Price of foreign goods} \\ \text{relative to dollar-priced} \\ \text{home goods} \end{array} \right\} = \frac{E\bar{P}^*}{E\bar{P}_1} = \frac{\bar{P}^*}{\bar{P}_1}$$

$$\left. \begin{array}{l} \text{Price of foreign goods} \\ \text{relative to local currency-priced} \\ \text{home goods} \end{array} \right\} = E \frac{\bar{P}^*}{\bar{P}_2}$$

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## Barriers to Expenditure Switching: Pass-Through and the J Curve

- Trade Dollarization, Distribution, and Pass-Through
  - The real exchange rate with local pricing.
    - Price of goods sold in the home country, weighted by  $d$ , relative to those sold in the foreign country, weighted by  $(1 - d)$  is the real exchange rate.

$$q = d \frac{\bar{P}^*}{\bar{P}_1} + (1 - d)E \frac{\bar{P}^*}{\bar{P}_2}$$

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25

## Barriers to Expenditure Switching: Pass-Through and the J Curve

- Trade Dollarization, Distribution, and Pass-Through
  - The real exchange rate with local pricing.

$$q = d \frac{\bar{P}^*}{\bar{P}_1} + (1 - d)E \frac{\bar{P}^*}{\bar{P}_2}$$

- A change in nominal exchange rate may not fully pass through to the real exchange rate,  $q$ .
  - A 1% increase in  $E$  leads to a  $(1-d)\%$  increase in  $q$ .
  - This is known as exchange rate *pass-through*—the degree to which changes in nominal exchange rates are passed through to real exchange rates. In the model in the text, we assume  $d=0$ .

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26

## Barriers to Expenditure Switching: Pass-Through and the J Curve

- Trade Dollarization, Distribution, and Pass-Through
  - Limitations on pass-through.
    - Trade dollarization.
      - If a large share of the trade balance is denominated in U.S. dollars, then a depreciation/appreciation of the U.S. dollar relative to the home currency will have little effect on the trade of these goods.

Note: These lecture notes are incomplete without having attended lectures.

27

## Barriers to Expenditure Switching: Pass-Through and the J Curve

- Trade Dollarization, Distribution, and Pass-Through
  - Limitations on pass-through.
    - Distribution.
      - Time and cost associated with moving a good from the port to the local retailer.
      - Changes in the exchange rate affect the price of the good at the port, but have no effect on the mark-ups between the port and the retailer.

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28

## Barriers to Expenditure Switching: Pass-Through and the J Curve

- The J-Curve
  - Model versus the data.
    - ❑ Model: a real depreciation improves a country's trade balance through boosting exports and reducing imports.
    - ❑ Data: depreciation in currency is associated with an increase in imports in the very short run, followed by the expected increase in the trade balance thereafter.
    - ❑ Why the disconnect?
      - Adjustment in trade balance takes time because orders for exports and imports are placed in advance.

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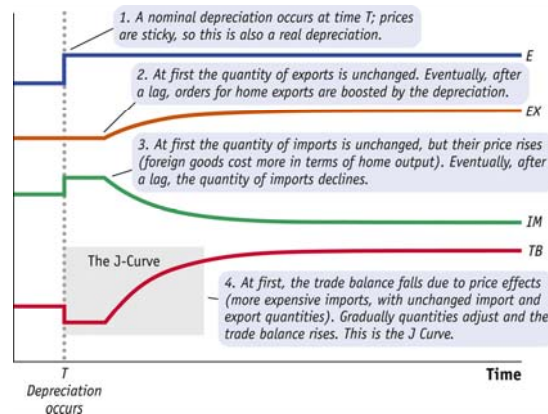
## Barriers to Expenditure Switching: Pass-Through and the J Curve

- The J-Curve
  - Example: depreciation in home currency.
    - ❑ While exports continue to sell, in same quantity at same domestic price, domestic price paid for imports rises.
      - Thus, the *quantity* of imports into the country stays the same, but these goods cost more, increasing total spending on imports.
      - So, before firms adjust orders, total spending on imports rises, total spending on exports remains the same, so trade balance drops.
    - ❑ Eventually, firms adjust their orders, and trade balance recovers, consistent with expenditure switching.

Note: These lecture notes are incomplete without having attended lectures.

## Barriers to Expenditure Switching: Pass-Through and the J Curve

- The J-Curve
  - Example: depreciation in home currency



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## The Marshall-Lerner Condition

- Overview
  - Reconsider the assumption that a depreciation leads to an increase in the trade balance.
  - For simplicity, assume  $TB = 0$ , therefore  $EX = IM$ .
- 1% real depreciation in home country.
  - $q$  = home country real exchange rate.
  - $q^*$  = foreign country real exchange rate.

$$\Delta q/q = 1\%$$

$$\Delta q^*/q^* = -1\%$$

Note: These lecture notes are incomplete without having attended lectures.

## The Marshall-Lerner Condition

- Elasticity

- Elasticity of home exports with respect to home real exchange rate,  $\eta$ :

$$\frac{\Delta EX}{EX} = \eta \times \frac{\Delta q}{q} = \eta\%$$

- Elasticity of foreign exports with respect to foreign real exchange rate,  $\eta^*$ :

$$\frac{\Delta EX^*}{EX^*} = \eta^* \times \frac{\Delta q^*}{q^*} = \eta^*\%$$

Note: These lecture notes are incomplete without having attended lectures.

33

## The Marshall-Lerner Condition

- Home imports and foreign exports

- Home imports (in units of home output)

$$IM(q)$$

- Foreign exports (in units of home output)

$$(1/P) \times E \times P^* \times EX^*(q^*)$$

- Notice  $EX^* = IM$ , from the home country's perspective. Therefore:

$$IM(q) = q \times EX^*(q^*)$$

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34

## The Marshall-Lerner Condition

- Real exchange rate

- The real exchange rate converts foreign exports into home country output (recall  $q$  = ratio of home to foreign basket of goods).
  - In % changes, the previous expression is:

$$\frac{\Delta IM}{IM} = \frac{\Delta q}{q} \times \frac{\Delta EX^*}{EX^*} = \frac{\Delta q}{q} \times \eta^* \times \frac{\Delta q^*}{q^*}$$

- In percentage changes, assuming a 1% real depreciation in the home country:

$$1\% + [\eta^* \times (-1\%)] = (1 - \eta^*)\%$$

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35

## The Marshall-Lerner Condition

- **Marshall-Lerner condition**

$$\eta + \eta^* > 1$$

- The trade balance will increase following a depreciation only if trade volume changes are sufficiently large (e.g. they are sufficiently elastic) to offset the price effects.

- Helps us to explain the J-curve effect.

- Volumes relatively unchanged in the very short run following a depreciation, but price effect still affects the value of imports, causing a decrease in trade balance.
    - Eventually, the volume effects overwhelm the price effect, so the trade balance rises.

Note: These lecture notes are incomplete without having attended lectures.

36

## The Marshall-Lerner Condition

- Two effects from a depreciation

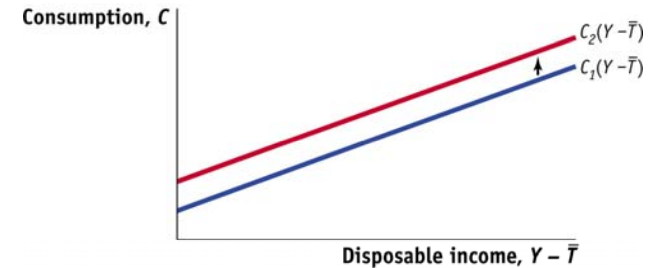
$$1\% + [\eta^* \times (-1\%)] = (1 - \eta^*)\%$$

- Volume Effect:**  $-\eta^*\%$   
 Foreigners export a lower volume of more expensive goods measured in foreign output units.
- Price Effect:**  $+1\%$   
 Goods cost more in terms of home output.

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## Exogenous Changes in Demand

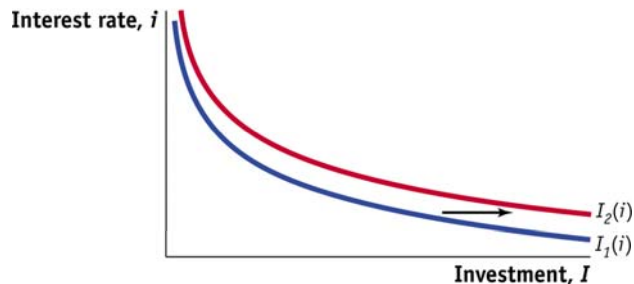
- An exogenous change in consumption,  $C$ .
  - Exogenous increase in consumption
    - $C(Y - T)$  shifts up.
    - For any given level of disposable income, consumption increases, shifting the consumption function upward.



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## Demand in the Open Economy

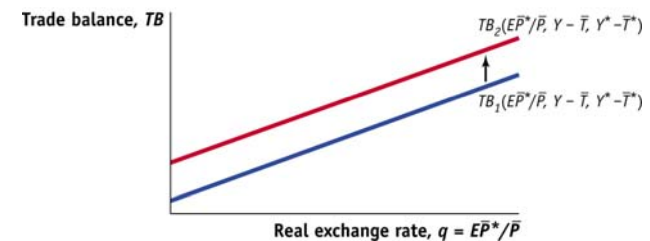
- Exogenous Changes in Demand
  - An exogenous change in investment,  $I$ .
    - Exogenous increase investment:  $I(i)$  shifts right.  
 For any given interest rate, investment is higher, shifting the investment function to the right.
    - Exogenous decrease investment:  $I(i)$  shifts left.



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## Exogenous Changes in Demand

- An exogenous change in the trade balance
  - Exogenous increase trade balance
    - $TB(\cdot)$  shifts up.
    - For any given real exchange rate, trade balance is higher, shifting the trade balance function upward.



Note: These lecture notes are incomplete without having attended lectures.

## Supply and Demand

- The total aggregate supply of final goods and services is equal to total output,  $GDP = Y$ :

$$\text{Supply} = GDP = Y$$

- The demand for goods and services is given by the components defined above:

$$\text{Demand} = D = C + I + G + TB$$

Note: These lecture notes are incomplete without having attended lectures.

41

## Supply and Demand

- National income accounting identity shows supply of output is equal to demand for final goods and services.
  - The national income accounting identity, using the functions given above, is expressed as:

$$Y = C(Y - \bar{T}) + I(i) + \bar{G} + TB(E\bar{P}^*/\bar{P}, Y - \bar{T}, Y^* - \bar{T}^*)$$

Note: These lecture notes are incomplete without having attended lectures.

42

## Determinants of Demand

- Changes in income,  $Y$ 
  - Consumption increases when  $Y$  increases.

$$\Delta C(Y - \bar{T}) = MPC$$

- Trade balance decreases when  $Y$  increases.

$$\Delta TB = -MPC_F$$

- Therefore, the total change in output is:

$$\Delta Y = MPC - MPC_F = MPC_H$$

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43

## Goods Market Equilibrium: the Keynesian Cross

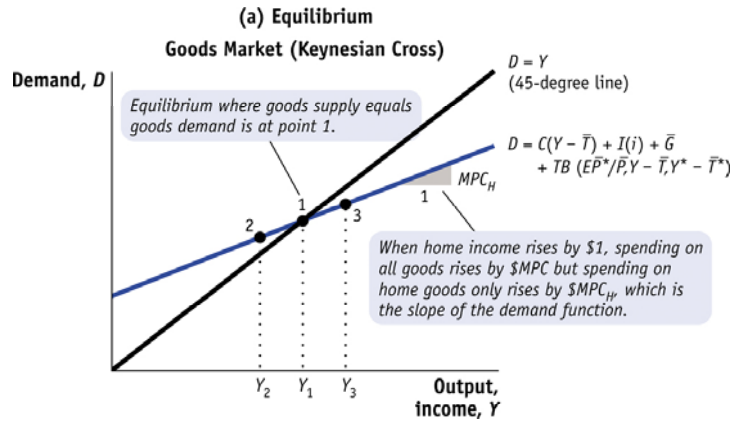
- Determinants of Demand
  - Keynesian cross.
    - Demand for goods and services.
      - $D = C + I + G + TB$ .
      - Slope =  $MPC_H$ .
    - 45-degree line.
      - $D = Y$  (from national income identity).
      - Slope = 1.
    - Goods market equilibrium is given by the intersection of demand and supply ( $Y = C + I + G + TB$ ).

Note: These lecture notes are incomplete without having attended lectures.

44

## Determinants of Demand

- Keynesian cross



Note: These lecture notes are incomplete without having attended lectures.

45

## Determinants of Demand

- Income and demand

- Keynesian Cross

- Adjustment to equilibrium.

- Point 2:  $Y_2 < Y_1 \rightarrow D > Y \rightarrow$  inventories decline  $\rightarrow$  firms expand production until  $D = Y$ .
      - Point 3:  $Y_3 > Y_1 \rightarrow D < Y \rightarrow$  inventories rise  $\rightarrow$  firms decrease production until  $D = Y$ .

- Note: fixed-price assumption is crucial here.

- Employment and production will change according to the demand for goods and services (since prices cannot adjust to achieve equilibrium).

Note: These lecture notes are incomplete without having attended lectures.

46

## Factors that Shift the Demand Curve

- Changes in taxes,  $T$ .

$$\bar{T} \downarrow \Rightarrow (Y - \bar{T}) \uparrow \Rightarrow C(Y - \bar{T}) \uparrow \Rightarrow D \text{ shifts up} \Rightarrow Y \uparrow$$

$$\bar{T} \uparrow \Rightarrow (Y - \bar{T}) \downarrow \Rightarrow C(Y - \bar{T}) \downarrow \Rightarrow D \text{ shifts down} \Rightarrow Y \downarrow$$

- Changes in government consumption,  $G$ .

$$\bar{G} \uparrow \Rightarrow D \text{ shifts up} \Rightarrow Y \uparrow$$

$$\bar{G} \downarrow \Rightarrow D \text{ shifts down} \Rightarrow Y \downarrow$$

Note: These lecture notes are incomplete without having attended lectures.

47

## Factors that Shift the Demand Curve

- Changes in the interest rate,  $i$ .

$$i \downarrow \Rightarrow I(i) \uparrow \Rightarrow D \text{ shifts up} \Rightarrow Y \uparrow$$

$$i \uparrow \Rightarrow I(i) \downarrow \Rightarrow D \text{ shifts down} \Rightarrow Y \downarrow$$

- Changes in the nominal exchange rate,  $E$ .

$$\uparrow E \Rightarrow TB(E\bar{P}^*/\bar{P}, Y - T, Y^* - T^*) \Rightarrow D \text{ shifts up} \Rightarrow \uparrow Y$$

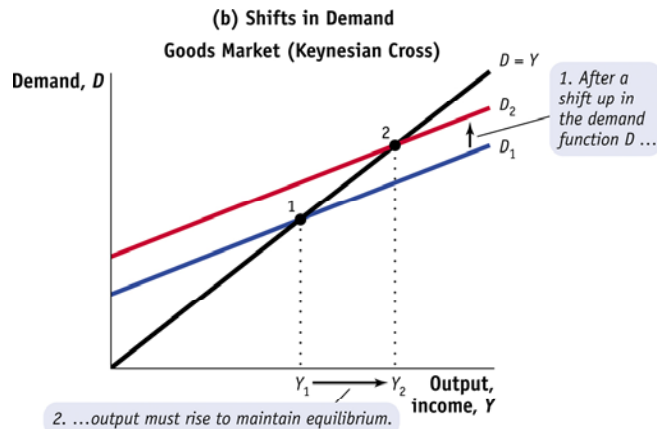
$$\downarrow E \Rightarrow \downarrow TB(E\bar{P}^*/\bar{P}, Y - T, Y^* - T^*) \Rightarrow D \text{ shifts down} \Rightarrow \downarrow Y$$

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48

## Factors that Shift the Demand Curve

- Example: increase in demand.



Note: These lecture notes are incomplete without having attended lectures.

49

## Expenditure Switching and the Dollar Devaluation: Some Headlines

- Background
  - 2001–2004, U.S. dollar depreciated against major currencies.
  - Model predictions
    - US\$ depreciation leads to an increase in exports and the U.S. trade balance, as this implies a real depreciation in the U.S. dollar (assuming fixed prices).
    - For the rest of the world, this would lead to a decrease in ROW's exports (a decrease in U.S. imports) and an increase in ROW's imports (an increase in U.S. exports).

Note: These lecture notes are incomplete without having attended lectures.

50

## Expenditure Switching and the Dollar Devaluation: Some Headlines

- *Financial Times*, January 9, 2004
  - *Dollar's dive set to delight exporters as well as tourists*  
U.S. exports rise and tourists visiting the U.S. from abroad enjoy relatively cheaper U.S. goods.
  - *Euro's rapid rise worries ECB*  
ECB policy makers concerned with "excessive volatility" in forex markets and how euro appreciation will affect region's competitiveness.

Note: These lecture notes are incomplete without having attended lectures.

51

## Expenditure Switching and the Dollar Devaluation: Some Headlines

- *Financial Times*, January 13, 2004
  - *Euro erodes Germany's role as an industrial powerhouse*  
Dollar's depreciation speeds up industrial decline in Germany, as companies struggle to cut costs and increase productivity.
  - *Strong currency hits Australians*  
Australian manufacturers consider moving operations overseas as the Australian dollar appreciates. The appreciation in the Australian dollar means decreased export returns.

Note: These lecture notes are incomplete without having attended lectures.

52

## Goods Market Equilibrium: Summary

- The Keynesian cross is derived based on the relationship between the demand for goods and services, which depends on income, and the supply, or output,  $Y$ .
- Changes in demand NOT associated with changes in output ( $Y$ ) lead to a shift in the demand curve for goods and services.

Note: These lecture notes are incomplete without having attended lectures.

53

## Equilibrium in Two Markets

- The **IS curve** shows combinations of output  $Y$  and interest rate  $i$  such that the goods and forex markets are in equilibrium.
- IS curve plotted with interest rate  $i$  on the vertical axis and output  $Y$  on the horizontal axis.
  - The goods market shares the same horizontal axis.
  - The forex market shares the interest rate  $i$  as its vertical axis.

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54

## Forex Market Recap

- Forex market equilibrium is given by the uncovered interest parity condition (UIP).

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

- Arbitrage
  - Return on domestic deposits equals expected return on foreign deposits (in home currency terms).
  - Forex market equilibrium determines equilibrium interest rate,  $i$  and nominal exchange rate,  $E$ .

Note: These lecture notes are incomplete without having attended lectures.

55

## Deriving the IS Curve

- Initial equilibrium
  - Equilibrium output and interest rate are given from the goods market and forex market.
    - Goods market: the level of output ( $Y$ ) from the goods market equilibrium must be a point on the IS curve. This is a level of output where demand and supply are equal,  $D = Y$ .
    - Forex market: the equilibrium interest rate ( $i$ ) and exchange rate ( $E$ ) insure the UIP condition is met, where Domestic Return (DR) = Foreign Return (FR).

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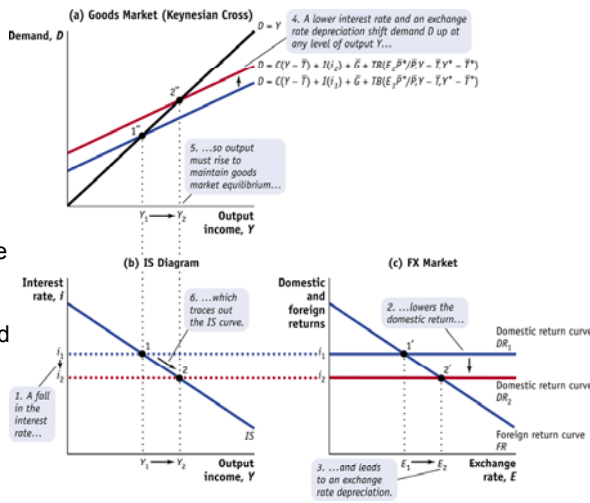
56



## Goods and Forex Market Equilibria: The IS Curve

### Deriving the IS Curve

- > A fall in the Interest Rate
  - A decrease in the interest rate leads to an increase in demand (a) and an increase in the domestic return (c).



Note: These lecture notes are incomplete without having attended lectures.



## Deriving the IS Curve

### • A Fall in the Interest Rate

- > Effects on the markets
  - Goods market:  $\downarrow i \rightarrow \uparrow I(i) \rightarrow \uparrow D \rightarrow \uparrow Y$
  - Forex market:  $\downarrow i \rightarrow \uparrow DR \rightarrow \uparrow E \rightarrow \uparrow TB \rightarrow \uparrow D \rightarrow \uparrow Y$
  - Negative relationship between  $i$  and  $Y$  in goods and forex markets illustrated as a downward sloping IS curve
- > Two channels: investment demand and external demand
  - Decrease in interest rate reduces the cost of borrowing, so more investment projects are profitable.
  - Expenditure switching: a decrease in the interest rate leads to a depreciation in the home currency, and a real depreciation, increasing the trade balance.

Note: These lecture notes are incomplete without having attended lectures.



## Factors that Shift the IS Curve

- Government consumption,  $G$ .
  - >  $\uparrow G \rightarrow \uparrow D \rightarrow \uparrow Y$  for given  $i$  and  $E \rightarrow$  IS shifts right.
  - >  $\downarrow G \rightarrow \downarrow D \rightarrow \downarrow Y$  for given  $i$  and  $E \rightarrow$  IS shifts left.
- Taxes,  $T$ .
  - >  $\downarrow T \rightarrow \uparrow(Y - T) \rightarrow \uparrow C \rightarrow \uparrow D \rightarrow \uparrow Y$  for given  $i$  and  $E \rightarrow$  IS shifts right.
  - >  $\uparrow T \rightarrow \downarrow(Y - T) \rightarrow \downarrow C \rightarrow \downarrow D \rightarrow \downarrow Y$  for given  $i$  and  $E \rightarrow$  IS shifts left.

Note: These lecture notes are incomplete without having attended lectures.



## Factors that Shift the IS Curve

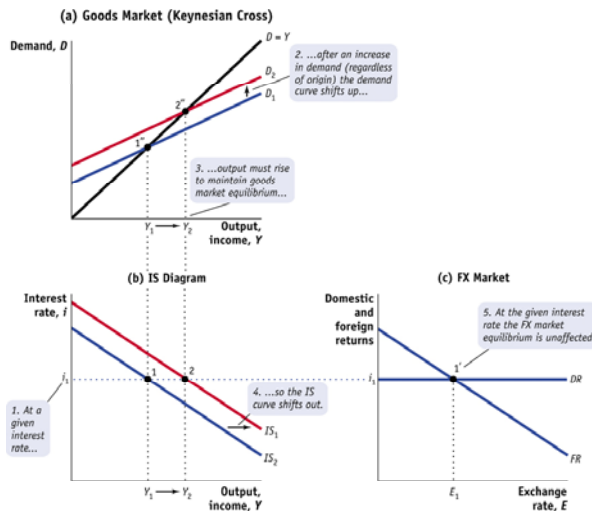
- Foreign interest rate,  $i^*$ , or expected exchange rate  $E^e$ .
  - >  $\uparrow i^*$  or  $\uparrow E^e \rightarrow \uparrow FR \rightarrow \uparrow E \rightarrow \uparrow D \rightarrow$  IS shifts right.
  - >  $\downarrow i^*$  or  $\downarrow E^e \rightarrow \downarrow FR \rightarrow \downarrow E \rightarrow \downarrow D \rightarrow$  IS shifts left.
- Home or foreign price level,  $P$  or  $P^*$ .
  - >  $\downarrow P$  or  $\uparrow P^* \rightarrow \uparrow q \rightarrow \uparrow TB \rightarrow \uparrow D \rightarrow$  IS shifts right.
  - >  $\uparrow P$  or  $\downarrow P^* \rightarrow \downarrow q \rightarrow \downarrow TB \rightarrow \downarrow D \rightarrow$  IS shifts left.
- IS curve can be expressed as:
 
$$IS = IS(G, T, i^*, E^e, P^*, P)$$

Note: These lecture notes are incomplete without having attended lectures.



## Factors that Shift the IS Curve

- Example: exogenous increase in demand.



Note: These lecture notes are incomplete without having attended lectures.

61



## Summing Up the IS Curve

- IS curve is downward sloping
  - A decrease in the interest rate leads to an increase in investment demand and the trade balance.
  - This increases the demand for goods and therefore output, in the short run.
- Shifts in the IS curve are associated with shifts in demand for a given home interest rate.
- Changes in interest rates have indirect effects on demand through their effect on exchange rates (expenditure switching).

Note: These lecture notes are incomplete without having attended lectures.

62



## Money Market Recap

- The **LM curve** shows combinations of output and the nominal interest rate such that the money market is in equilibrium.
  - Money market equilibrium

$$\frac{M}{\bar{P}} = L(i)Y$$

- Real money demand (MD) varies inversely with the nominal interest rate, so the demand for real money balances is downward sloping.
- Real money supply (MS) is fixed, with the price level fixed and the supply of money chosen by the central bank.

Note: These lecture notes are incomplete without having attended lectures.

63



## Deriving the LM Curve

- The money market and the LM diagram share a vertical axis (the interest rate).
- Example: Increase in output.
  - When output increases, money demand increases.
  - MD shifts to the right and the interest rate rises.
  - Hence, we observe a positive relationship between the interest rate and output in the money market.
  - This implies the LM curve is upward sloping.

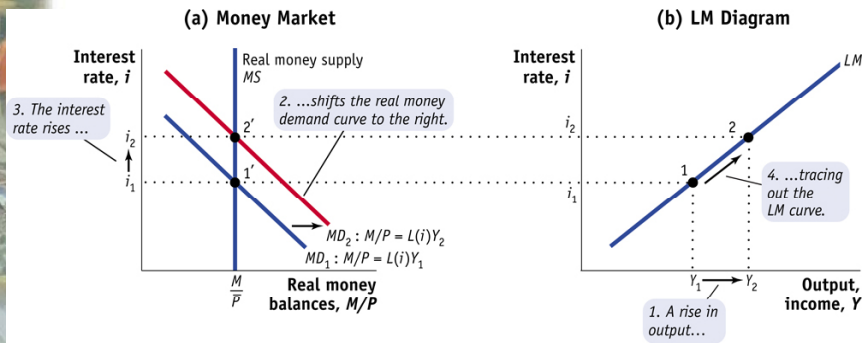
Note: These lecture notes are incomplete without having attended lectures.

64



## Deriving the LM Curve

- Example: Increase in output.



Note: These lecture notes are incomplete without having attended lectures.



## Factors that Shift the LM Curve

- The only exogenous factor that shifts the LM curve is the real money supply,  $M/P$ .
  - $\uparrow M/P \rightarrow \downarrow i$  for given  $Y \rightarrow$  LM shifts right/down.
  - $\downarrow M/P \rightarrow \uparrow i$  for given  $Y \rightarrow$  LM shifts left/up.

- LM curve can be expressed as:

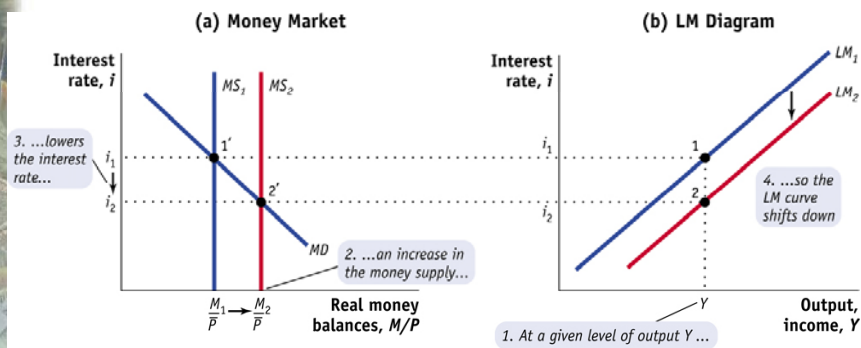
$$LM = LM(M/\bar{P})$$

Note: These lecture notes are incomplete without having attended lectures.



## Factors that Shift the LM Curve

- Example: Increase in the money supply.



Note: These lecture notes are incomplete without having attended lectures.



## Summing Up the LM Curve

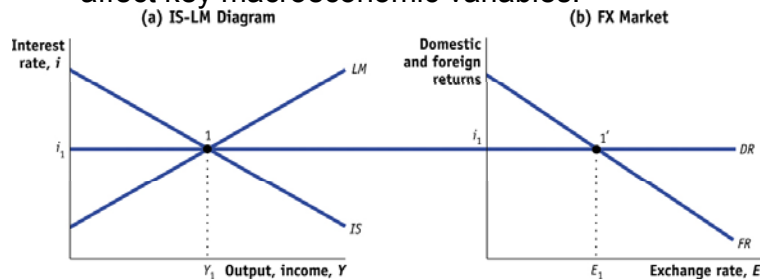
- The LM curve is upward sloping
  - An increase in output leads to an increase in real money demand.
  - This increases the nominal interest rate in the short run.
  - Similarly, a decrease in output reduces real money demand and the nominal interest rate.

Note: These lecture notes are incomplete without having attended lectures.

## Short-Run IS-LM-FX Model of an Open Economy

### • Overview

- Combine the IS-LM diagram with the forex market diagram to study how changes in the economy affect key macroeconomic variables.



Note: These lecture notes are incomplete without having attended lectures.

69

## Macroeconomic Policies in the Short Run

### • Two policy actions

- **Monetary policy:** central bank changes in the money supply.
- **Fiscal policy:** government changes in taxes and government spending.

- The effects of these policies depend critically on the nation's exchange rate regime.

Note: These lecture notes are incomplete without having attended lectures.

70

## Macroeconomic Policies in the Short Run

### • Assumptions

- Economy begins at long-run equilibrium.
- Sticky prices at home and abroad.
- Floating exchange rate regime.

### • Temporary Policies, Unchanged Expectations

- To examine temporary shocks to the economy, we assume investors do not change exchange rate expectations.
- Simplifies the study how temporary policies (designed to affect output in the short run) affect the economy.

Note: These lecture notes are incomplete without having attended lectures.

71

## Short-Run IS-LM-FX Model of an Open Economy

### • Monetary Policy under Floating Exchange Rates

- Monetary expansion:  $\uparrow M/P \rightarrow LM$  shifts right  $\rightarrow \downarrow i$ 
  - Direct effects
    - $\downarrow i \rightarrow \uparrow I \rightarrow \uparrow Y$
    - $\downarrow i \rightarrow \uparrow E \rightarrow \uparrow TB \rightarrow \uparrow Y$
  - Indirect effects
    - $\uparrow Y \rightarrow \uparrow C$
    - $\uparrow Y \rightarrow \uparrow IM \rightarrow \downarrow TB$  (net  $\uparrow TB$  if  $MPC_F$  small)
  - A monetary expansion leads to an exchange rate depreciation and a decrease in the interest rate – both of these imply an increase in output.

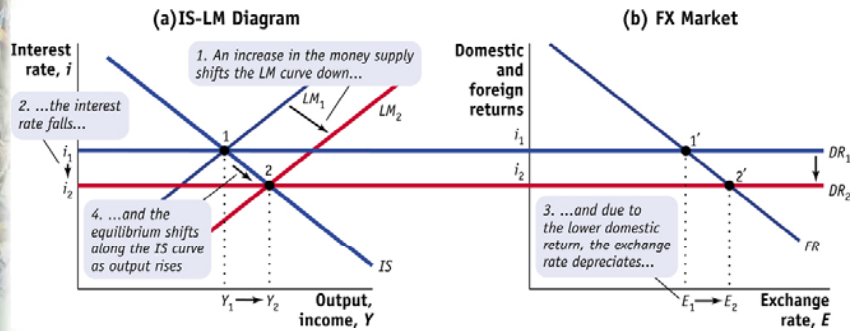
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72



## Monetary Policy under Floating Exchange Rates

- Example: Monetary expansion
  - A monetary contraction will have the reverse effects.



Note: These lecture notes are incomplete without having attended lectures.



## Monetary Policy under Fixed Exchange Rates

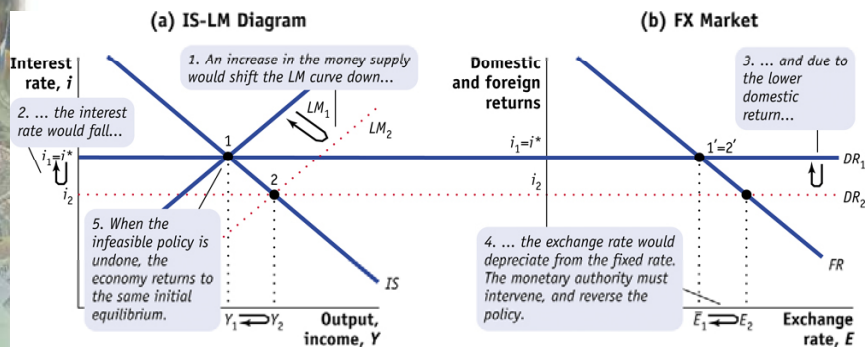
- Consider possible monetary changes.
  - Monetary expansion:  $\uparrow M/P \rightarrow$  LM shifts right  $\rightarrow$  LM must shift back to keep the exchange rate fixed.
  - Monetary contraction: same basic result.
- If committed to a fixed exchange rate regime, central bank cannot change real money supply.
  - Changing the real money supply affects the interest rate, and therefore exchange rate through affecting the return on domestic deposits.
  - Therefore, a fixed exchange rate regime implies that autonomous monetary policy is not an option.

Note: These lecture notes are incomplete without having attended lectures.



## Monetary Policy under Fixed Exchange Rates

- Example: Monetary expansion



Note: These lecture notes are incomplete without having attended lectures.



## Fiscal Policy under Floating Exchange Rates

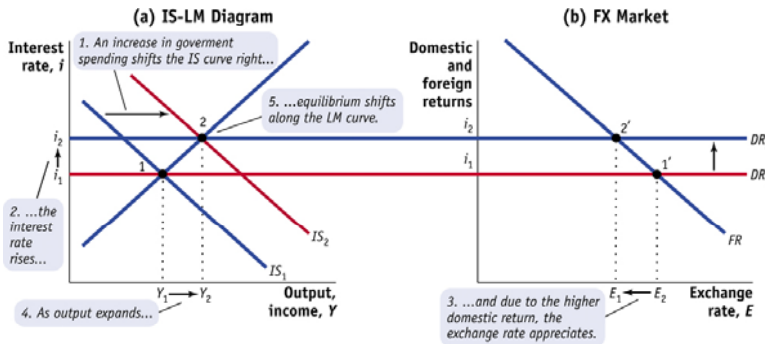
- Fiscal expansion:  $\uparrow G \rightarrow$  IS shifts right
  - Direct effect
    - $\uparrow G \rightarrow \uparrow Y$
  - Indirect effects
    - $\uparrow i \rightarrow \downarrow I$
    - $\downarrow E \rightarrow \downarrow TB$
  - A fiscal expansion leads to crowding out because it leads to an increase in the interest rate.
    - Investment demand decreases.
    - Appreciation, decreasing trade balance.

Note: These lecture notes are incomplete without having attended lectures.



## Fiscal Policy under Floating Exchange Rates

- Fiscal expansion
  - A fiscal contraction will have the reverse effects.



Note: These lecture notes are incomplete without having attended lectures.



## Fiscal Policy under Fixed Exchange Rates

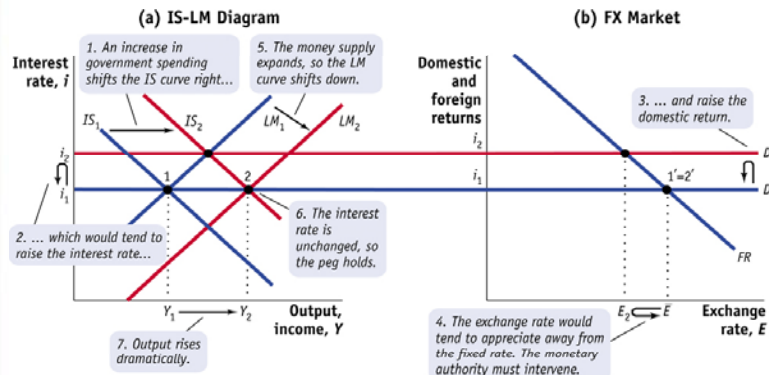
- Mechanics of a fixed exchange rate regime.
  - Real money supply must adjust to keep the E fixed.
  - This implies that any fiscal policy action will require a central bank action, shifting the LM curve.
- Fiscal expansion:  $\uparrow G \rightarrow IS$  shifts right  $\rightarrow LM$  must shift right to keep the  $i$  and  $E$  unchanged.
  - Effects
    - $\uparrow G \rightarrow \uparrow Y$ .
    - $\uparrow M/P \rightarrow i$  and  $E$  unchanged.
  - Notice, in this case, a fiscal expansion does not lead to crowding out.

Note: These lecture notes are incomplete without having attended lectures.



## Fiscal Policy under Fixed Exchange Rates

- Fiscal expansion
  - A fiscal contraction will have the reverse effects.



Note: These lecture notes are incomplete without having attended lectures.



## Summary

- The responses to expansionary policy are summarized below.

Responses to Policy Shocks in the IS-LM-FX Model					
Exchange Rate Regime	Policy	Impact on:			
		$i$	$E$	$I$	$Y$
Floating	Monetary expansion	↓	↑	↑	↑?
	Fiscal expansion	↑	↓	↓	↓
Fixed	Monetary expansion	0	0	0	0
	Fiscal expansion	0	0	0	↓

Note: These lecture notes are incomplete without having attended lectures.

## Summary

- Floating exchange rate regime: two channels for monetary policy and fiscal policy to affect demand.
  - Monetary policy: effects are magnified by appreciation/depreciation.
  - Fiscal policy: crowding out means effects of policy are weakened by appreciation/depreciation.
- Fixed exchange rate regime: autonomous monetary policy not possible, but fiscal policy still an option.

Note: These lecture notes are incomplete without having attended lectures.

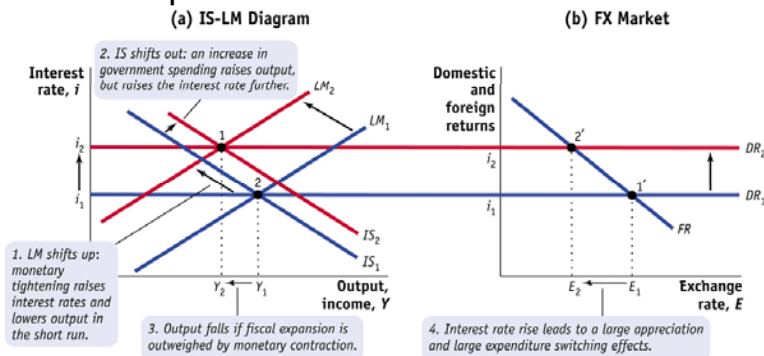
## The Rise and Fall of the Dollar in the 1980s

- Policy actions circa 1980
  - The Fed implemented contractionary monetary policy 1979–1982. LM curve shifts left.
  - At the same time, the Reagan administration implemented a fiscal expansion through a combination of tax cuts and increases in government spending. IS curve shifts right.
  - U.S. suffered recessions 1980 and 1981–82, suggesting monetary contraction has a larger effect than the fiscal expansion.

Note: These lecture notes are incomplete without having attended lectures.

## The Rise and Fall of the Dollar in the 1980s

### • Model predictions



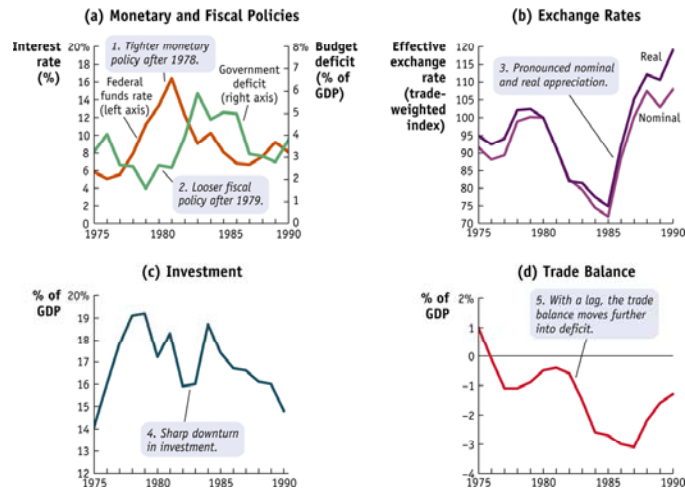
Note: These lecture notes are incomplete without having attended lectures.

## The Rise and Fall of the Dollar in the 1980s

- Model predictions
  - Increase in nominal interest rate.
  - Appreciation in the U.S. dollar.
  - Decrease in investment and the trade balance.
- Data
  - Roughly 25% real appreciation in U.S.
  - Investment declines from 19% to 16% of GDP.
  - Trade balance declines from -1% to -3% of GDP (with a lag).

Note: These lecture notes are incomplete without having attended lectures.

## The Rise and Fall of the Dollar in the 1980s



Note: These lecture notes are incomplete without having attended lectures.

## Stabilization Policy

- Stabilization policy refers to monetary and fiscal policies designed to keep output at its full employment level.
  - If the economy experiences an adverse shock
    - fiscal policy can increase demand through shifting the IS curve to the right, or,
    - monetary policy can expand the money supply, shifting the LM curve to the right.
  - Stabilization policy can be challenging in practice. Mistimed or inappropriate policies can push output beyond full employment, creating instability.

Note: These lecture notes are incomplete without having attended lectures.

## Australia, New Zealand, and the Asian Crisis of 1997

- Australia and New Zealand are open economies that rely on export demand from East Asian economies.
  - In 1997, the East Asian economic crisis lead to a recession in these countries, reducing demand for exports from Australia and New Zealand.
  - A decrease in foreign output  $Y^*$  leads to a decrease in the home country's trade balance (through decreasing exports).
  - This would lead to an economic contraction in Australia and New Zealand.

Note: These lecture notes are incomplete without having attended lectures.

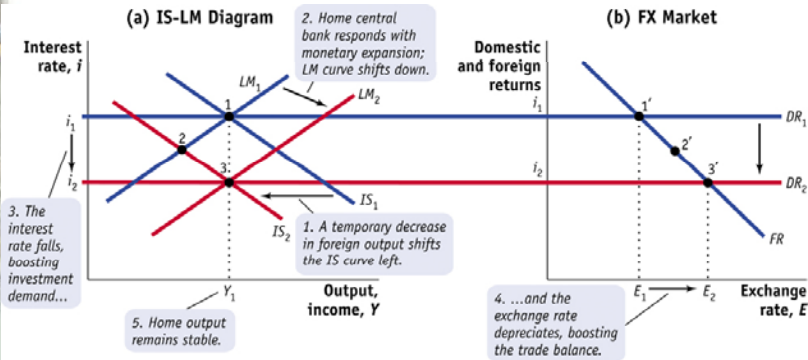
## Australia, New Zealand, and the Asian Crisis of 1997

- Stabilization policy—the model
  - Fiscal or monetary expansion.
    - Central banks in both countries expanded real money supply, shifting LM curve right, reducing interest rates.
    - Model: net effect of decrease in export demand and monetary expansion is as follows:
      - No change in output.
      - Decrease in nominal interest rate—investment increases.
      - Increase in exchange rate—ambiguous effect on the trade balance because decrease in foreign income reduces exports while depreciation increases exports.

Note: These lecture notes are incomplete without having attended lectures.

# Australia, New Zealand, and the Asian Crisis of 1997

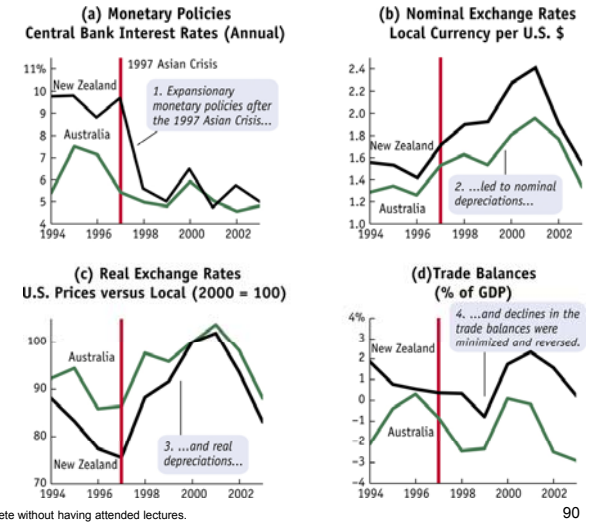
## Stabilization policy—the model



Note: These lecture notes are incomplete without having attended lectures.

# Australia, New Zealand, and the Asian Crisis of 1997

## Stabilization policy—the data



Note: These lecture notes are incomplete without having attended lectures.

# Australia, New Zealand, and the Asian Crisis of 1997

## Stabilization policy—the data

- Both countries experienced a sharp decrease in nominal interest rates accompanied by depreciations.
- The declines in the trade balance were slowed and even reversed by 1999.

Note: These lecture notes are incomplete without having attended lectures.

# Problems in Policy Design & Implementation

## Policy Constraints

- Policy makers may not have the freedom to implement stabilization policies.
- Fixed exchange rates or other “rules” for policy may limit their ability to respond.

Note: These lecture notes are incomplete without having attended lectures.

## Problems in Policy Design & Implementation

- Incomplete Information and the Inside Lag
  - Model assumes policy makers observe state of the economy in real time.
  - In practice, they observe macroeconomic data with a lag.
    - ❑ The lag between the timing of the shock and the policy action is known as an *inside lag*.
    - ❑ In addition, institutional factors severely limit the timely implementation of fiscal policy.

Note: These lecture notes are incomplete without having attended lectures.

93

## Problems in Policy Design & Implementation

- Policy Response and the Outside Lag
  - Even with perfect information on the economy, it may take time for a policy, once implemented to have real economic effects. This is known as an *outside lag*.
  - With monetary policy, it may take time for a change in the money supply to affect the long-term interest rates that matter for investment.

Note: These lecture notes are incomplete without having attended lectures.

94

## Problems in Policy Design & Implementation

- Long-Horizon Plans
  - If households and businesses making decisions about consumption and investment plan over long horizons, they may be less responsive to policy changes.
    - ❑ Example: a business considers borrowing to finance capital expansion
      - Business is likely borrow over a long period of time.
      - Slightly higher interest rates today may be unsuccessful in deterring this investment decision, since the business knows higher interest rates are temporary.

Note: These lecture notes are incomplete without having attended lectures.

95

## Problems in Policy Design & Implementation

- Weak Links from the Nominal Exchange Rate to the Real Exchange Rate.
  - Model assumes changes in nominal exchange rates translate into changes in real exchange rate.
  - In practice, limited *pass-through* between nominal and real exchange rates for several reasons:
    - ❑ dollarization of trade,
    - ❑ large distribution margins that create a wedge between port prices relative to retail, imperfect competition, and
    - ❑ pricing to market.

Note: These lecture notes are incomplete without having attended lectures.

96

## Problems in Policy Design & Implementation

- Pegged Currency Blocs
  - Some countries use a combination of fixed and floating exchange rates in a way that limits one country from boosting export demand through a real effective depreciation.
  - If a large country in the currency bloc pegs to a country like the U.S., this limits the U.S.' ability to increase external demand through a depreciation in the dollar

Note: These lecture notes are incomplete without having attended lectures.

97

## Problems in Policy Design & Implementation

- Weak Links from the Real Exchange Rate to the Trade Balance.
  - Model assumes changes in real exchange rate imply changes in trade balance.
  - In practice, the link between the two may be weak because of transactions costs.
    - The existence of these costs suggests a *neutral band (band of inaction)* where it is not worthwhile for businesses to engage in expenditure switching and lead to the J-curve effect.

Note: These lecture notes are incomplete without having attended lectures.

98

## Key Points

1. The key short-run assumptions are that prices are fixed and there are two countries: home and rest of the world.
2. The demand for goods and services is determined by
  - Consumption—depends on disposable income.
  - Investment—depends on the interest rate.
  - Government consumption.
  - Trade balance—depends on the real exchange rate, home income, and foreign income.

Note: These lecture notes are incomplete without having attended lectures.

99

## Key Points

3. The demand for goods and services must be equal to supply.
  - $Y = C + I + G + TB$ .
  - This condition is used to derive the goods market equilibrium using the Keynesian cross.
  - Exogenous changes in demand arise from changes in C, I, G, or TB, unrelated to a change in output.

Note: These lecture notes are incomplete without having attended lectures.

100

## Key Points

4. The IS curve represents equilibrium in two markets: the goods and forex markets.
  - The uncovered interest parity condition defines the forex market equilibrium in terms of the interest rate and exchange rate.
  - If the interest rate falls, output increases for two reasons
    - ❑ an increase in investment, and
    - ❑ an increase in trade balance (from a real depreciation)
  - Shifts in the IS curve are caused by exogenous changes in demand, unrelated to changes in output or the real interest rate.

Note: These lecture notes are incomplete without having attended lectures.

101

## Key Points

5. The LM curve represents money market equilibrium.
  - The interest rate adjusts in the money market to ensure real money demand equals real money supply.
  - Shifts in the LM curve are caused by changes in real money supply.
6. The IS-LM diagram combines the IS and LM curves, identifying a unique combination of output, interest rate, and exchange rate such that all three markets are in equilibrium.

Note: These lecture notes are incomplete without having attended lectures.

102

## Key Points

7. Floating exchange rate regime.
  - Monetary expansion: LM shifts right, output rises, interest rate falls, and exchange rate depreciation.
  - Fiscal expansion: IS shifts right, output rises, interest rate rises, and exchange rate appreciation.
8. Fixed exchange rate regime.
  - No autonomous monetary policy.
  - Fiscal expansion: IS shifts right and LM shifts right to keep exchange rate fixed, output rises, and interest rate and exchange rate unchanged.

Note: These lecture notes are incomplete without having attended lectures.

103

## Key Points

9. Stabilization policy can be used to keep output unchanged when the economy experiences shocks.
10. There are problems with stabilization policy that limit the policy makers in practice.

Note: These lecture notes are incomplete without having attended lectures.

104