ECON3123
Macroeconomic Theory I

Tutorial #6: Mid-term revision

How is GDP measured?

- There are 3 ways to measure GDP:

Final goods and services produced in a given period

Value added in a given period

PRODUCTION SIDE

Sum of incomes in a given period

INCOME SIDE

Calculating GDP

Firm 1: Coal producer			**Firm 2: Electricity Company**			**Firm 3: Software Company**		
Revenue from sales		A	Revenue from sales		250	Revenue from sales		F
Expenses:		B	Expenses:			Expenses:		
Wages		80	Wages		D	Wages		200
			Purchases of coal		100	Purchases of Electricity		250
Profit		C	Profit		E	Profit		100

- Assume that wages account for 80% of GDP

- A
- B
- C
- D
- E
- F

Calculating GDP

Solution:

Firm 1: Coal producer		Firm 2: Electricity Company		Firm 3: Software Company	
Revenue from sales	100	Revenue from sales	300	Revenue from sales	600
Expenses:		Expenses:		Expenses:	
Wages	80	Wages	200	Wages	200
		Purchases of coal	100	Purchases of Electricity	300
Profit	20	Profit	0	Profit	100

Calculating GDP

Firm 1: Coal producer			Firm 2: Electricity Company			Firm 3: Software Company		
Revenue from sales		100	Revenue from sales		300	Revenue from sales		600
Expenses:			Expenses:			Expenses:		
Wages		80	Wages		200	Wages		200
			Purchases of coal		100	Purchases of Electricity		300
Profit		20	Profit		0	Profit		100

- Calculate GDP using the three methods:
  - Final production
  - Value added
  - Sum of incomes

Nominal and real GDP and the GDP deflator

- Consider the following economy

	2018		2019	
	Quantity	Price	Quantity	Price
Food	100	$20	110	$25
Computers	50	$100	60	$100

1. Calculate nominal GDP in 2018 and 2019 and the % growth rate

GDP 2018:

Nominal growth rate:

GDP 2019:

Nominal and real GDP and the GDP deflator

- Consider the following economy

	2018		2019	
	Quantity	Price	Quantity	Price
Food	100	$20	110	$25
Computers	50	$100	60	$100

2. Using 2018 prices, what is real GDP in 2018 and 2019, and what is its rate of growth?

Real GDP 2018:

Real growth rate 2019/2018:

Real GDP 2019:

Nominal and real GDP and the GDP deflator

- Consider the following economy

	2018		2019	
	Quantity	Price	Quantity	Price
Food	100	$20	110	$25
Computers	50	$100	60	$100

3. Using 2018 prices for real GDP, compute the GDP deflator for 2018 and 2019 and use this to compute the rate of inflation in 2019

GDP deflator 2018:

Inflation 2019:

GDP deflator 2019:

Multipliers in the Keynesian Cross model

- We have:
- $C = c_0 + c_1(Y - T)$
- $Z = C + \bar{I} + G$
- In equilibrium:
  - $Y = Z$
  - $\quad = C + \bar{I} + G$
  - $\quad = c_0 + c_1(Y - T) + \bar{I} + G$
- Therefore:
  - $Y = \frac{1}{1-c_1}[c_0 - c_1 T + \bar{I} + G]$

- Then multipliers are as follows:
- $\frac{\Delta Y}{\Delta c_0}, \frac{\Delta Y}{\Delta G}, \frac{\Delta Y}{\Delta \bar{I}} = \frac{1}{1-c_1}$
- $\frac{\Delta Y}{\Delta T} = \frac{-c_1}{1-c_1}$
- Note that if G and T change by the same magnitude

  (ie $\Delta G = \Delta T$), then the multiplier is $\frac{1-c_1}{1-c_1} = 1$

Multipliers in the Keynesian Cross model

- Examples:
- Suppose that the Marginal Propensity to consume is 0.60
- By how much does Y change in the following cases:
- 1. An increase in government spending of 100
- 2. An increase in taxes of 50 and an increase in government spending of 50
- 3. A simultaneous increase in investment of 50, a reduction in government spending of 30 and a fall in consumer confidence represented by $\Delta c_0 = 20$

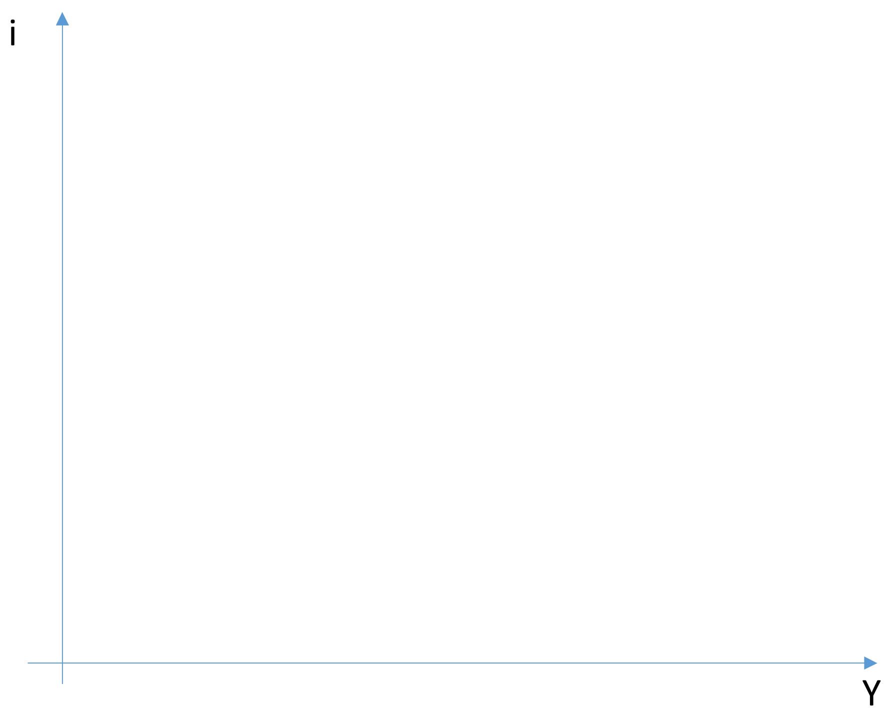
Multipliers in the Keynesian Cross model

- How does the multiplier change if we let investment depend on income:
  - $I = d_0 + d_1 Y$
- Then in equilibrium we have:
  - $= c_0 + c_1(Y - T) + d_0 + d_1 Y + G$
  - ie $Y = \left(\frac{1}{1-c_1-d_1}\right)[d_0 - c_1 T + G]$
- Does the multiplier increase or decrease as a result of the dependency on Y?
- How does the balanced budget multiplier change in this case?
- Examples (assume $c_1 = 0.60$ and $d_1 = 0.20$):
- 1. How does Y change if taxes fall by 50?
- 2. How much does Y change if taxes and government spending both fall by 50?

The IS/LM model: PS2 Q3

(a) Draw an IS-LM diagram. Denote the point representing the current economic situation as point A.

(b) Now, the government raises T to reduce the primary budget deficit without affecting G. Explain any changes in the diagram. Show the new equilibrium and label it as point B.



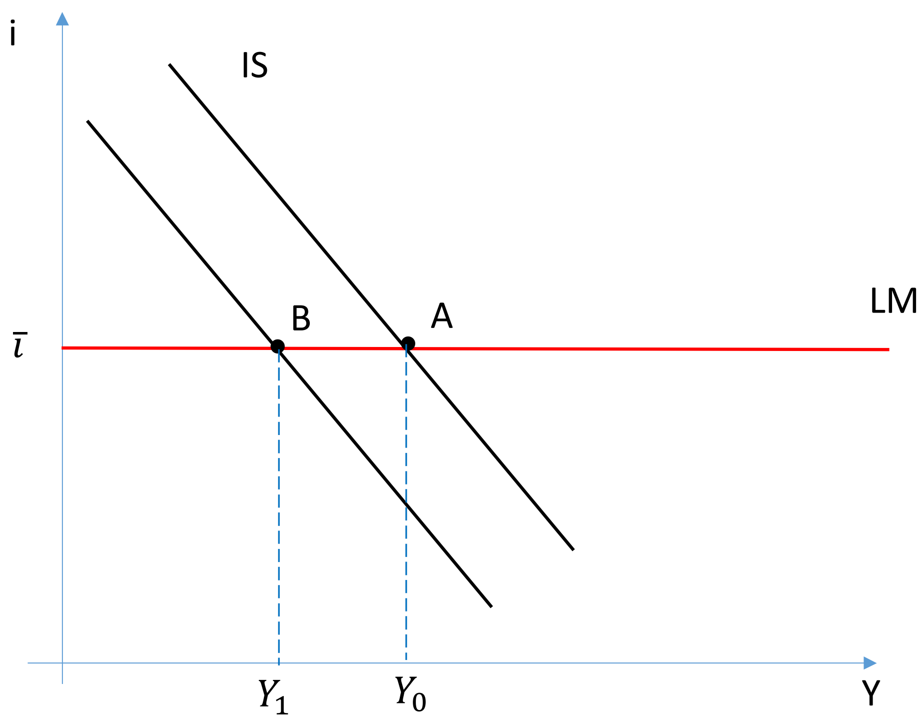
1.

2.

3.

The IS/LM model: PS2 Q3

(c) Given the fiscal policy in (b), if the central bank wants to stabilize output, what should it do in the open market? Explain your answer and show any changes graphically. The new equilibrium with the intervention from the central bank should be labeled as point C.



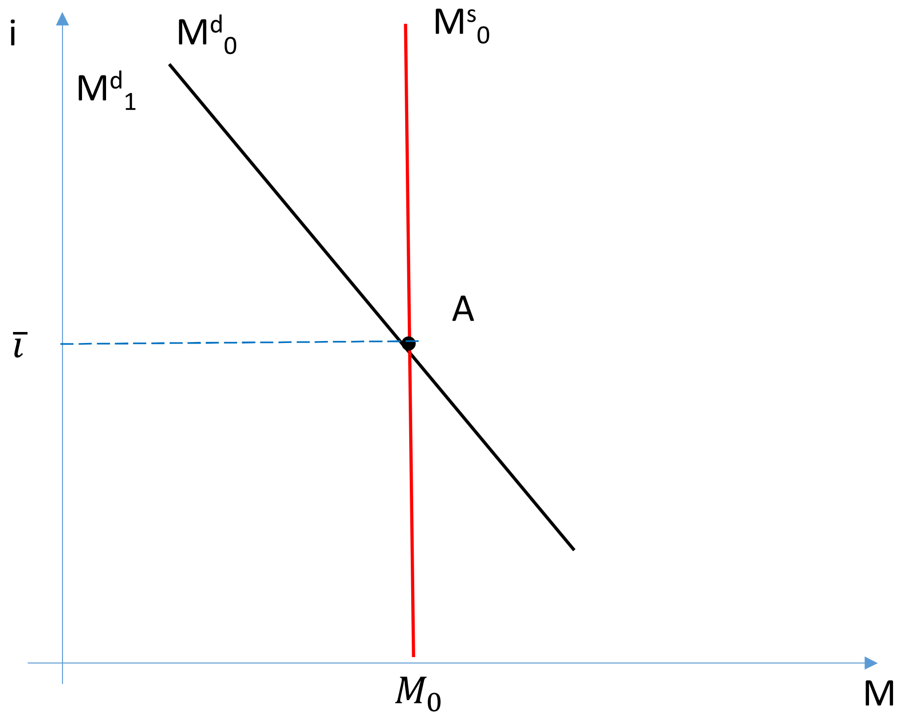
1. What should the CB do?

2. what's the effect of the CB's action?

3. What happens to Y and where is the point C?

The IS/LM model: PS2 Q3

(d) Draw a money market diagram for points **A and C**. It should include real money supply and demand curves corresponding to each point A and C in the IS-LM diagram. If any curve shifts between points A and C, clearly illustrate that. Show the corresponding equilibrium interest rate as i_A and i_C.



- Note that the fall in output from Y_0 to Y_1 causes a shift to the left in the demand for money curve:

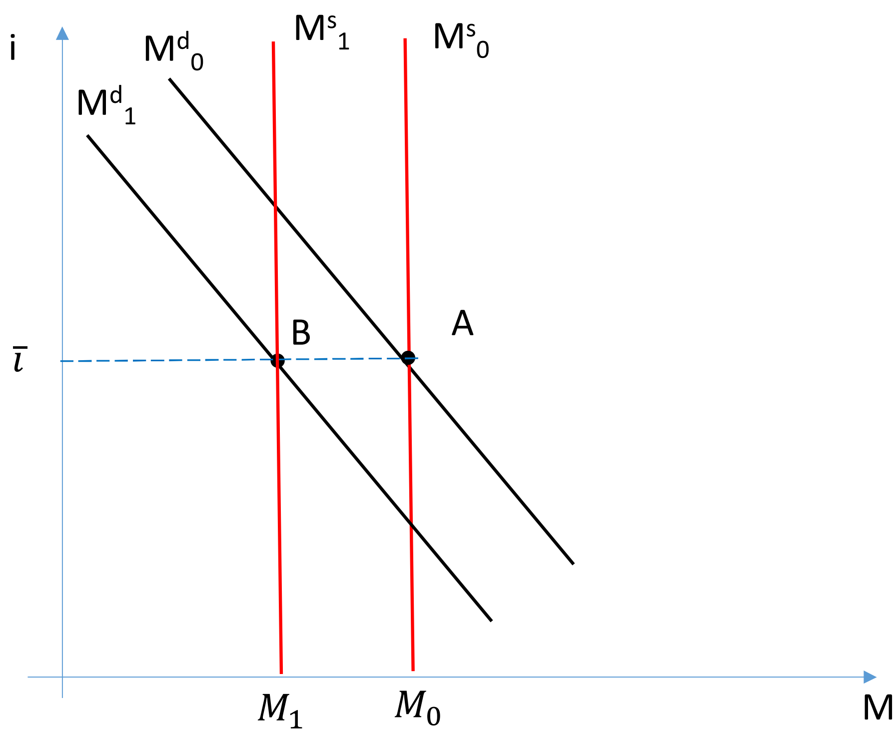
$$M^d = YL(i)$$

- To keep interest rates unchanged, what does the CB have to do in the open market? What is the impact on the money supply?

- Therefore, what does the point B look like in the money market?

The IS/LM model: PS2 Q3

(d) Draw a money market diagram for points **A and C**. It should include real money supply and demand curves corresponding to each point A and C in the IS-LM diagram. If any curve shifts between points A and C, clearly illustrate that. Show the corresponding equilibrium interest rate as i_A and i_C.



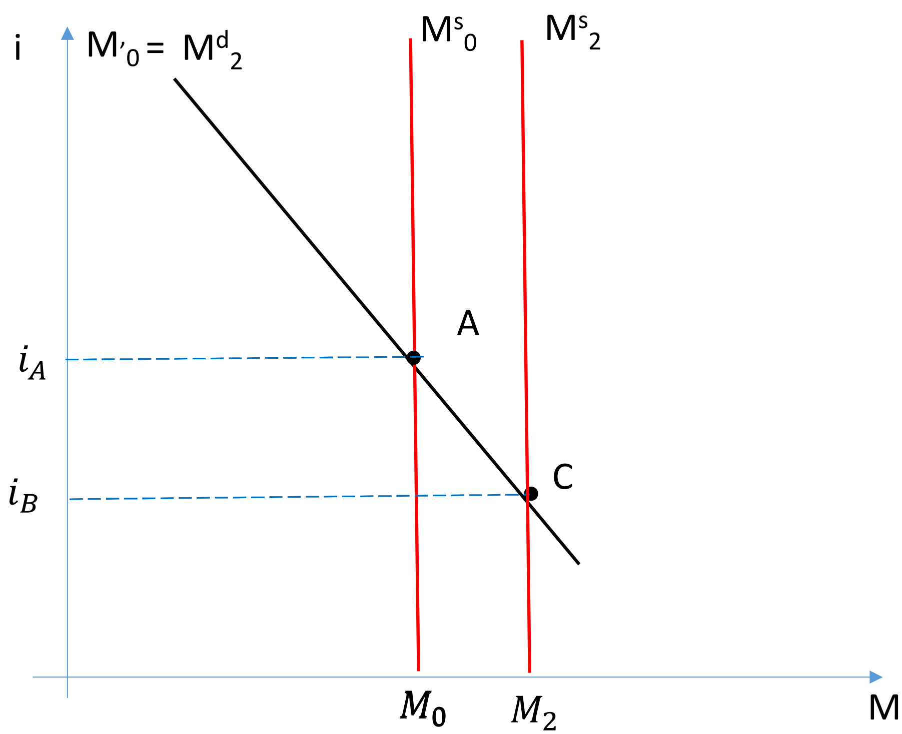
- Where is the point C?
- Re-call that money demand depends on Y and shifts as Y changes
- We know that at point C, Y will be unchanged (ie back at Y_0)

$$M^d = YL(i)$$

- But returning Y to Y_0 is achieved by lower interest rates
- So money supply has to increase to a new equilibrium where money demand = money supply
- This is at the point C

The IS/LM model: PS2 Q3

(d) Draw a money market diagram for points **A and** C. It should include real money supply and demand curves corresponding to each point A and C in the IS-LM diagram. If any curve shifts between points A and C, clearly illustrate that. Show the corresponding equilibrium interest rate as i_A and i_C.

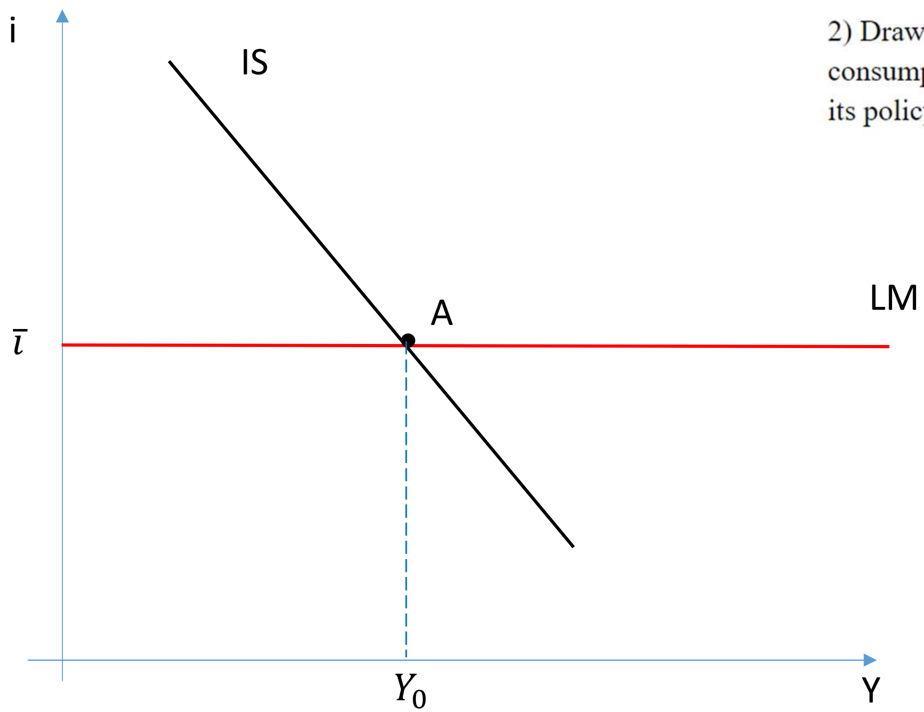


- Which gives the solution shown

Mid-Term Practice Questions Q.12

1) Denote the initial output and interest rate with Y and i. Draw the IS and LM curves and label the equilibrium as point A.

Mid-Term Practice Questions Q.12



The recession in the US in the early 1990s was in part due to growing consumer pessimism. People cut their consumption when they feel pessimistic about economic conditions that lie ahead. Here we we assume that autonomous consumption decreases.

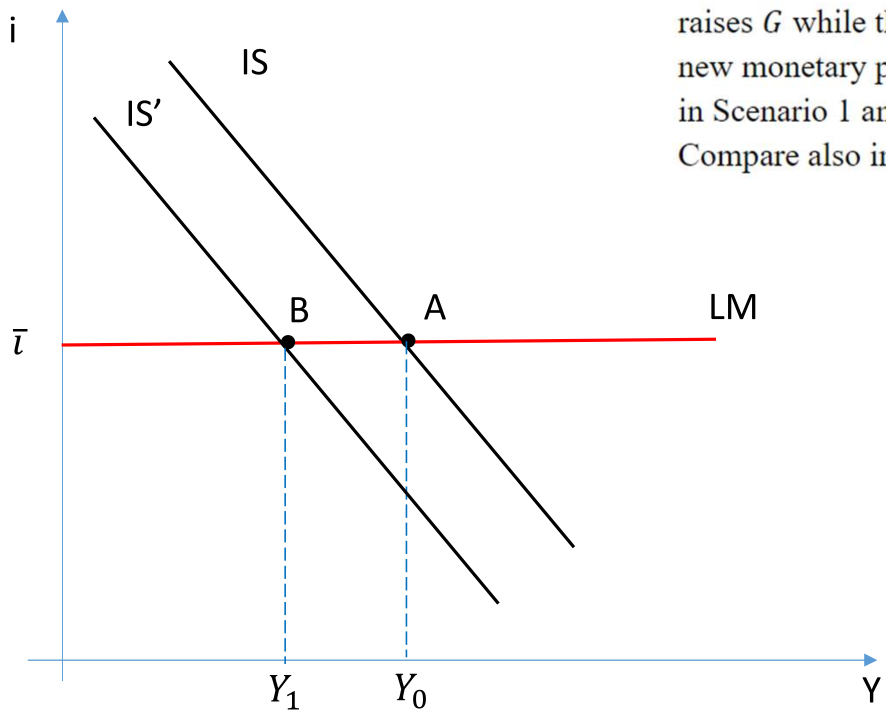
2) Draw the new curve(s) and label the new equilibrium as point B. Explain whether consumption, investment, and output increase or decrease when the central bank does not change its policy rate.

C:

I:

Y:

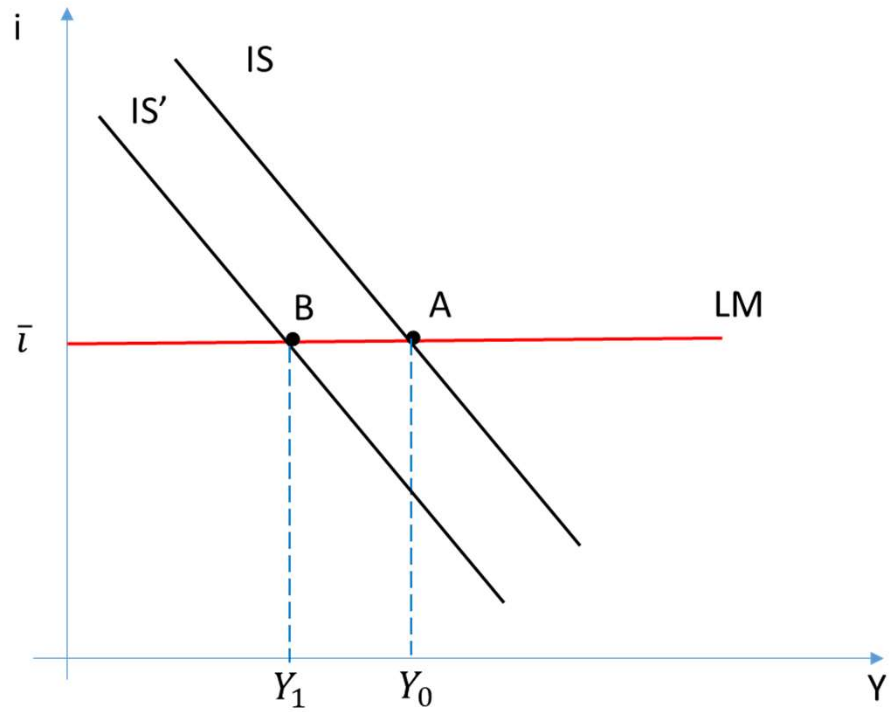
Mid-Term Practice Questions Q.12



3) Consider two scenarios. In Scenario 1, output returns to its initial level Y as the government raises G while the central bank does not change its policy rate. Scenario 2 is instead based on a new monetary policy, and output also returns to its initial level Y. Let C_1 and C_2 be consumption in Scenario 1 and 2, respectively. Determine whether C_1 is greater than, equal to, or less than C_2. Compare also investment, output, and interest rate. No explanation is required.

Mid-Term Practice Questions Q.12

Scenario 1: Higher government spending, interest rates don’t change

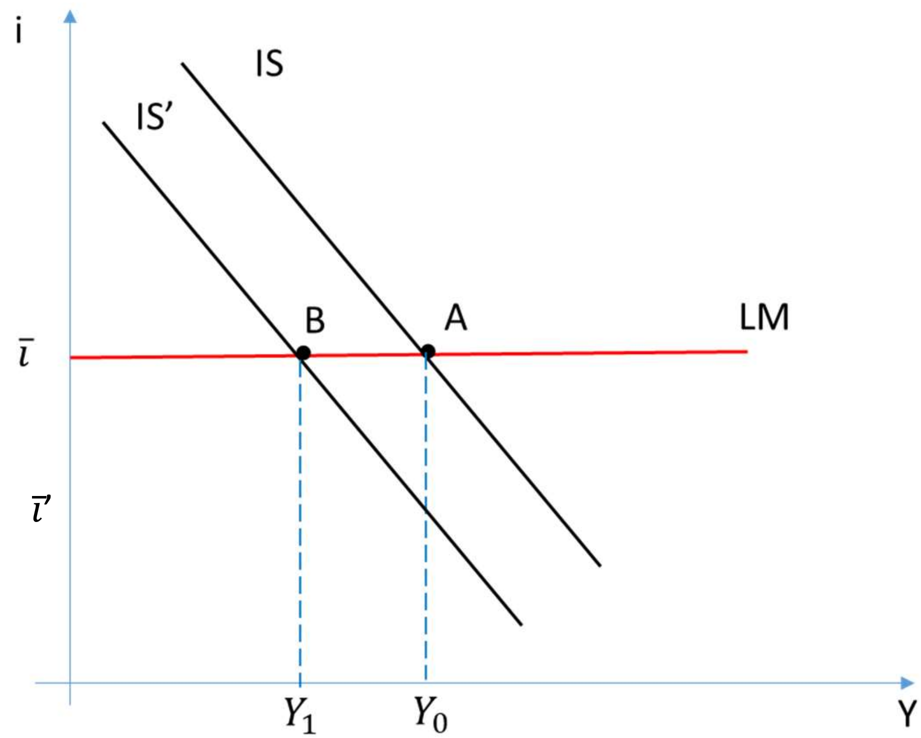


- What is the new equilibrium and how do we get there?

- What happens to consumption?

Mid-Term Practice Questions Q.12

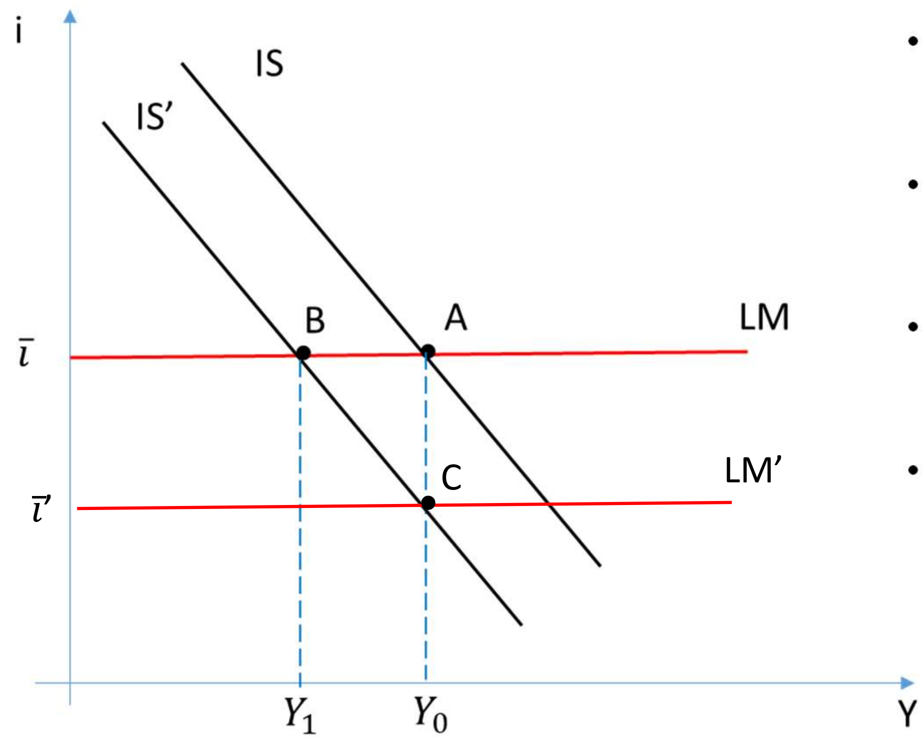
Scenario 2: Lower interest rates, government spending doesn't change



- What is the new equilibrium and how do we get there?
- What happens to consumption?

Mid-Term Practice Questions Q.12

Scenario 2: Lower interest rates, government spending doesn't change



- We have: $C = c_0 + c_1(Y - T)$ and therefore:

$$\Delta C = \Delta c_0 + c_1 \Delta Y$$

- When Y returns to Y_0, $\Delta Y = 0$ and so $\Delta C = \Delta c_0$
- So C is the same in both scenarios
- Y returns to Y_0 via government spending in scenario 1 and via investment in scenario 2

Mid-Term Practice Questions Q.12

Changes in variables in scenarios 1 and 2:

Variable	Scenario 1	Scenario 2	Comparison	Explanation
Consumption				
Investment				
Output				
Interest rate				

Mid-Term Practice Questions Q.12

Changes in variables in scenarios 1 and 2:

Variable	Scenario 1	Scenario 2	Comparison	Explanation
Consumption	$\Delta c_0 < 0$	$\Delta c_0 < 0$	Equal	Y unchanged in equilibrium means that only change in C comes from Δc_0
Investment	Unchanged	Higher	Higher in Scenario 2	Lower interest rates lead to higher investment
Output	Unchanged	Unchanged	Equal	Policy response designed to stabilize output
Interest rate	Unchanged	Lower	Lower in scenario 2	Monetary policy in Scenario 2 lowered interest rate; interest rates unchanged in Scenario 1

Real and nominal interest rate changes

- Real interest rates

$r_t \approx i_t - \pi^e_{t+1}$: ex-ante real interest rate

$i_t - \pi_{t+1}$: ex-post real interest rate

- Examples:
  - If the 1 year nominal interest rate is 2% and expected inflation is 4%, what is the 1 year real interest rate?
  - If inflation is expected to increase by 2% points, by how much should the central bank increase nominal interest rates to keep real interest rates constant?
  - In nominal interest rates are zero, and the central bank wants to reduce real interest rates, what can it do?
    - π^e:
    - The role of unconventional monetary policy

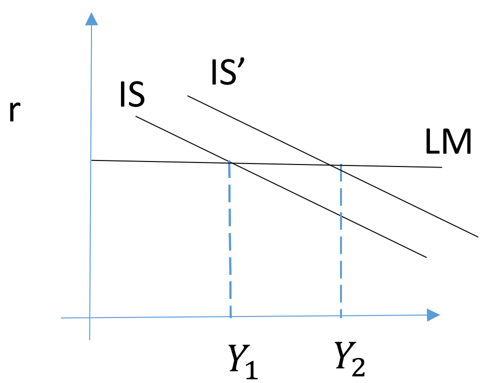
The extended IS/LM model – what changes?

- The IS/LM model:

  IS Relation: $Y = C(Y-T) + I(Y,i) + G$
  LM Relation: $i = \bar{\imath}$

- The Extended IS/LM model:

  IS: $Y = C(Y-T) + I(Y, r+x) + G$
  LM: $r = \bar{r}$



- Example: reduction in the corporate risk premium, x

- What changes in the Extended IS/LM model?:
  - The central bank now controls the real interest rate, r
    - It controls i, as in the basic IS/LM model
    - But now it also can control π^e
  - Investment now depends on the real interest rate and a corporate risk premium, x

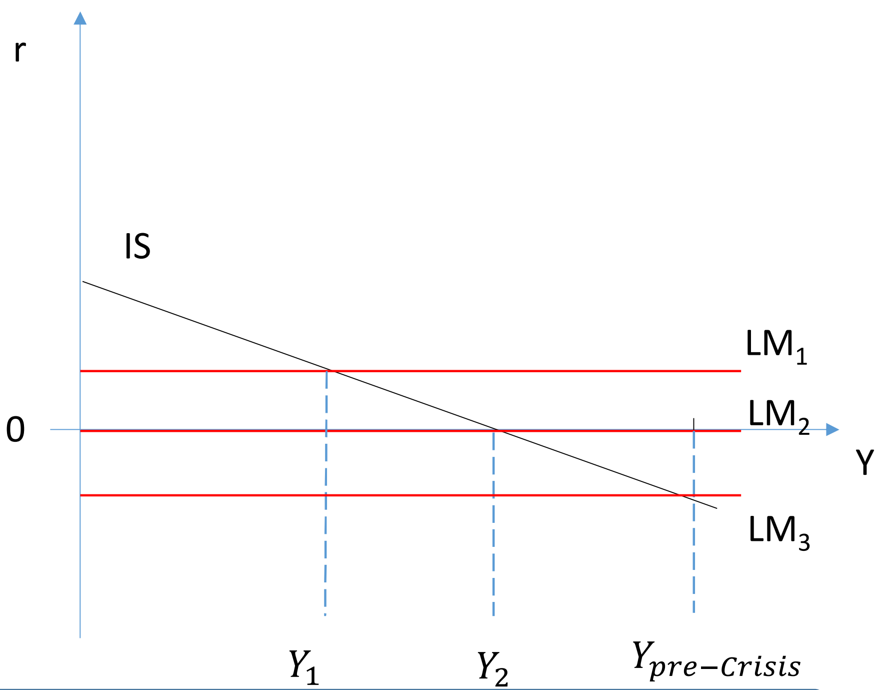
The extended IS/LM model: The zero lower bound and unconventional monetary policy

- The Extended IS/LM model:

IS: $Y = C(Y - T) + I(Y, r + x) + G$

LM: $r = \bar{r}$

- $r = i - \pi^e$



- Suppose the economy is in the middle of the financial crisis, with a deep recession in place
- The central bank cuts nominal interest rates several times (LM_1 to LM_2)
- At LM_2, nominal interest rates are zero, and cannot be cut any more
- The central bank wants the LM curve to move to LM_3
- What can the central bank do to reduce real interest rates further?
  - Which variable can the central bank try to change?
- What means could it use?
  - Unconventional monetary policy
  - Printing money
  - 'Helicopter drops'

The extended IS/LM model – what changes?

- The Extended IS/LM model:

IS: $Y = C(Y - T) + I(Y, r + x) + G$

LM: $r = \bar{r}$

- $r = i - \pi^e$

Change in variable	Effect on IS curve	Effect on LM curve
i	• r changes • Investment (I) increases/decreases • Movement <u>along</u> the existing IS curve	• r changes • LM curve <u>shifts</u> up or down
π^e	• r changes • Investment increases/decreases • Movement <u>along</u> the existing IS curve	• r changes • LM curve <u>shifts</u> up or down
x	• IS curve shifts • Investment increases/decreases	• r unchanged • Movement along the LM curve