

## **Monetary Theory**

### **The Keynesian Framework-ISLM**

Before we investigate the effects of monetary policy on the economy, we need some review.

(Hicks's reinterpretation of Keynes's General Theory) The ISLM model provides a deep understanding of how government and Fed policy affects economic activity.

#### **The determination of aggregate output**

Major Components (see graph: components of GDP)

- Consumption (C): The total amount spent by consumers on newly produced goods and services (excluding new homes, which are investment). It accounts for approximately 2/3 of GDP.
- Investment (I): Expenditures by firms on new plants and equipment plus consumers' purchases of new homes. Only includes physical assets and excludes financial "investments". It also excludes the resale of existing physical assets. This is the most volatile component of GDP since it depends in part on business confidence and expectations about the future economy.
- Government spending (G): Goods and services purchased by all levels of government.
- Net Exports (NX): This is the difference between U.S. exports and U.S. imports. We have to net out goods that U.S. consumers buy that are not American made. It is a negative number for the U.S.

So,  $AD = C + I + G + NX = Y^{AD}$

Keynes assumed that prices are fixed.

Disposable Income ( $Y_D$ ): income individuals in the economy hold after all taxes have been paid and transfer payments added.

$DI = Y - T$  where  $T = \text{taxes} + \text{transfers payments}$  (i.e. taxes net of transfers)

Transfer payments are grants (rather than payment for services) to certain individuals in the economy (e.g. unemployment benefits and social security).

#### **1. Consumption**

There is a very close relationship between consumption and disposable income ( $Y_D$ ). This relationship is called the consumption function.

$$C = a + mpc * (Y_D)$$

Its slope is used to predict the change in consumption that will be caused by a change in income taxes. The slope is called the marginal propensity to consume (MPC).

The term  $a$  is autonomous consumption: portion of consumption that does not depend on  $Y_D$ . This may depend on a person's real wealth ( $W/P$ ).

$$mpc = (\Delta C / \Delta Y_D)$$

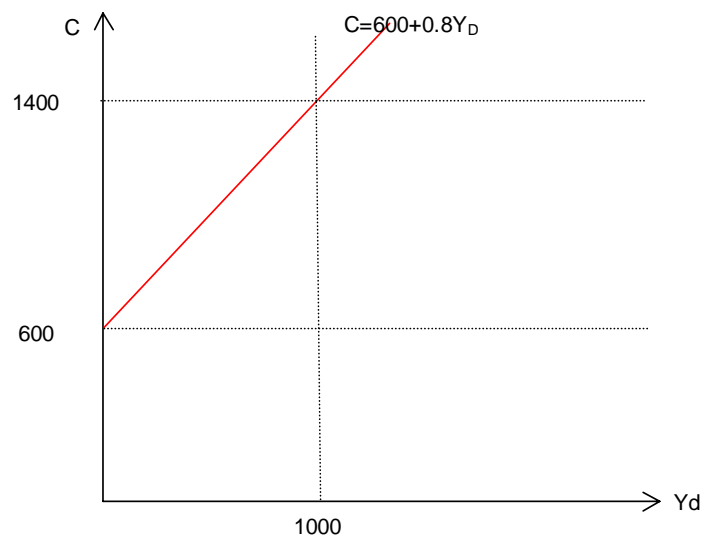
So, the mpc measures the fraction of  $Y_D$  that goes to consumption.

Example:

Consider the following consumption function:

$Y_D$	$C$
0	600
1000	1400
2000	2200
3000	3000
4000	3800
5000	4600
6000	5400

What is autonomous  $C$ ?      600  
 What is the MPC?       $(1400-600)/(1000-0) = 0.8$   
 When is  $C$  equal to  $Y_D$ ?      3000  
 How can  $C$  exceed  $Y_D$ ?      Borrow money



- Changes in  $Y_D$  move us *along* the consumption function.
- All other changes cause a *shift* in the consumption function

- Wealth: Increase in wealth lead to increase in C
- The price level: affects purchasing power when prices rise and causes spending to fall (but is not very strong);
- Expected future incomes: if the change in permanent then will change how people behave but if temporary may not induce people to change as much (consumption smoothing).
- Real Interest Rate: pay more for loans and have great interest on savings (unclear which is stronger so assume no affect)

## 2. Investment

Investment is on physical assets (not financial assets). There are two types of investment: fixed and inventory investment. Fixed investment is spending on equipment and structure and it is planned. Inventory investment is spending on raw materials, parts and finished goods. Sometimes, inventory investment is unplanned.

Two factors affect planned investment: interest rates and businesses' expectations about the future.

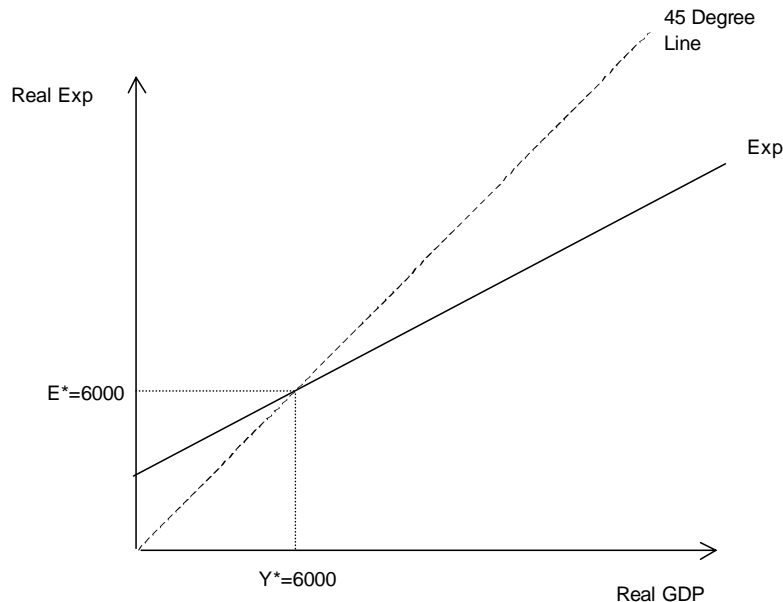
Factors that affect investment overall:

- Business confidence and expectations (↑)
- High sales relative to current capacity and expectations (↑)
- Technology (↑)
- Real rate of interest (↓)
- Taxes (↓)

Only planned investment is included in  $Y^{AD}$ .

### Equilibrium and the Keynesian-Cross Diagram

The Keynesian-cross diagram shows how aggregate output is determined.



## The Expenditure Function

In order to understand aggregate demand in the economy, we need to understand expenditure. We know already that the expenditure function is:

$$\text{Expenditure} = C + I + G + NX = Y_D$$

We know that the consumption function has the following relationship:

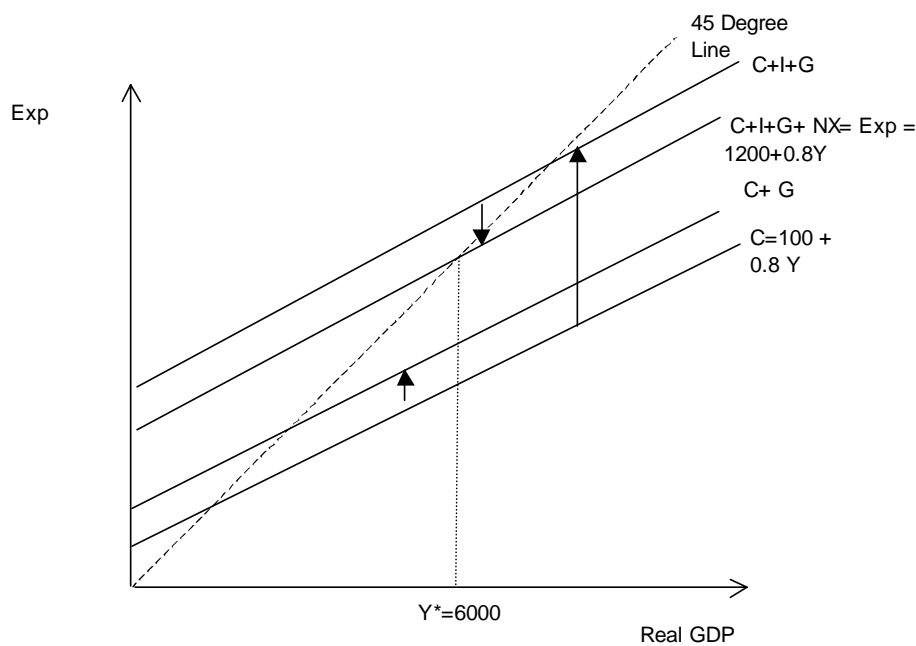
$$C = a + .\text{mpc} (Y_D)$$

We can substitute this information into the expenditure function, so we get:

Recall that expenditure is a function of disposable income and, hence  $Y$   
 $\text{Expenditure} = a + .\text{mpc} (Y_D) + I + G + NX$

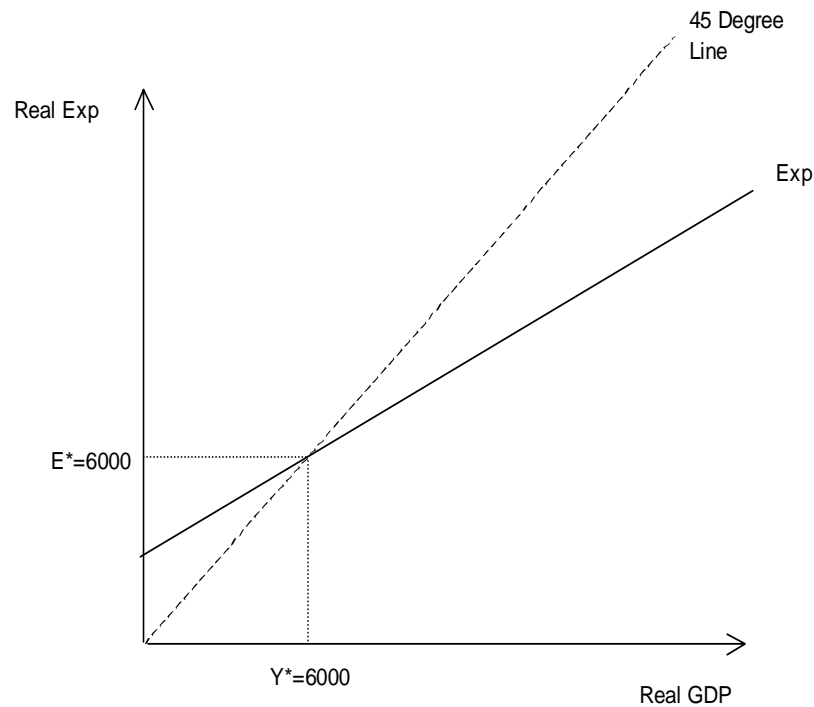
The expenditure schedule shows expenditure at each level of income.

Y	C	I	G	NX	Expenditure
5000	4100	1000	300	-200	5200
5500	4500	1000	300	-200	5600
6000	4900	1000	300	-200	6000
6500	5300	1000	300	-200	6400
7000	5700	1000	300	-200	6800



Add the curves vertically. Essentially, the intercept changes not the slope as it determined by the MPC (assuming no distortionary taxes).

What is the equilibrium income? Where the two curves intersect at 6000.



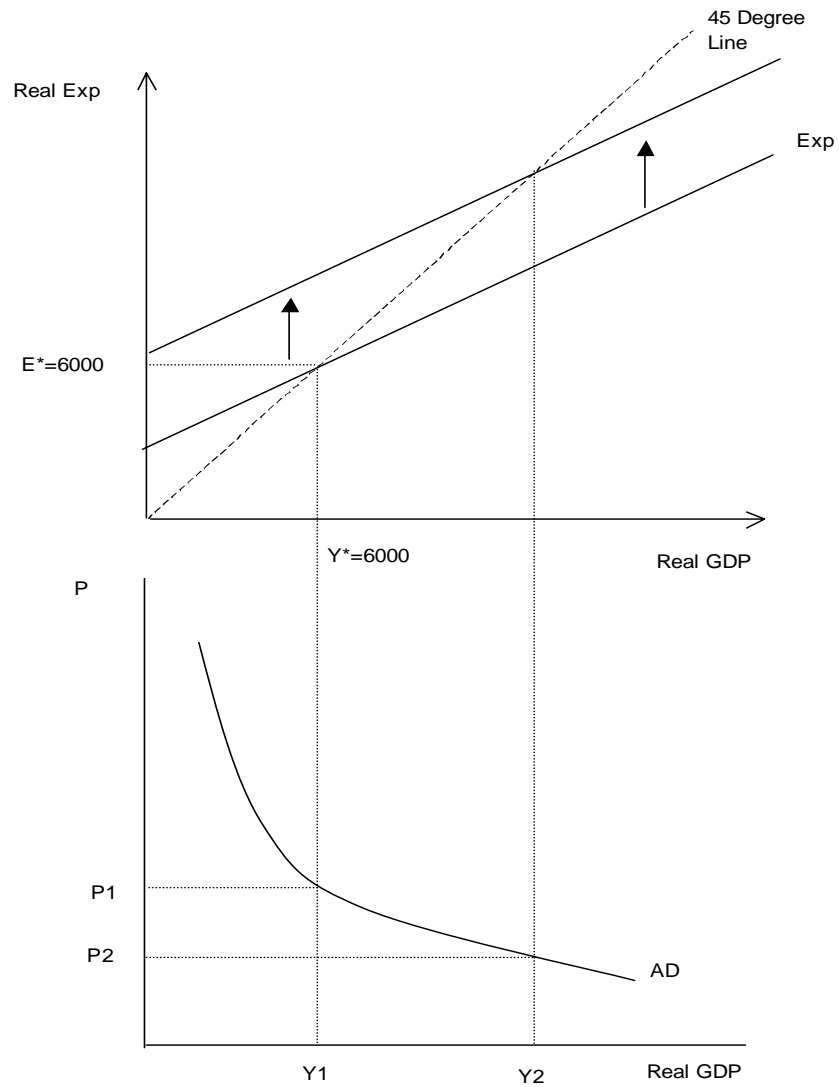
- The 45 degree line shows the combination at which output  $Y =$  expenditure  $Y_D$ . All other levels show disequilibria points at which GDP will move in the direction of equilibrium.

When Expenditures  $>$  Income  $\rightarrow$  Expenditures  $>$  Output  $\rightarrow$  inventories  $\downarrow$   $\rightarrow$  price bid up  $\rightarrow$  produce more to get profit

When Expenditures  $<$  Income  $\rightarrow$  Expenditures  $<$  Output  $\rightarrow$  inventories  $\uparrow$   $\rightarrow$  price bid down  $\rightarrow$  produce less as not as much profit

When Expenditures  $=$  Income  $\rightarrow$  Expenditures  $=$  Output  $\rightarrow$  inventories unchanged and no change in prices  $\rightarrow$  no change in production

- We can use the expenditure function to derive the AD curve. The AD curve shows the combinations of prices and output where output = expenditures. I.e. the equilibria of price levels and GDP.

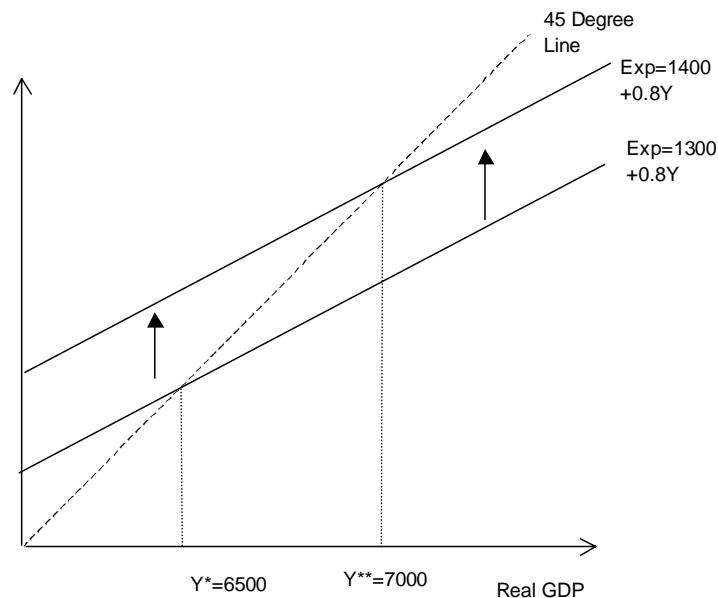


- Recall, each consumption function is specific to a price level. Therefore, each exp function is drawn for a specific price level.
- The consumption function moves *inversely* with the price level. So, the exp line moves inversely with the price level.
- If  $P$  falls, exp increases, which increases  $Y$ . Likewise, the opposite applies. As the general price level rises, output falls.

### 3. The Multiplier

Suppose planned investment increases by 100. What happens to equilibrium output? It increases by 500. Why? It is because of the multiplier effect in the economy. Recall from intro macro, the simple multiplier  $m = 1/(1-mpc) = 1/(1-0.8) = 5$ .

If the government were to increase spending (increase  $G$ ) or decrease lump sum taxes (decrease  $T$ ) or  $NX$  increase by 100, the effect would be the same. Anything that increases, expenditure increases  $AD$ .



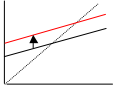
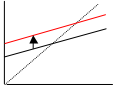
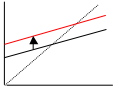
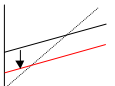
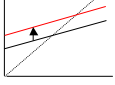
### 4. Net Exports

International trade affects output through the term  $NX$ .

Factors that affect  $NX$ :

- US National income (increase imports), Foreign NI (increase exports)
- Exchange rates (relative price between two currencies e.g.  $e = \text{£}/\text{\$}$  price of pounds in terms of dollars). If the US Dollar appreciates relative to the Pound Sterling, US exports will be more expensive than before and the British will buy less. (Exports fall, imports increase.)
- Interest rates affect  $NX$  via exchange rates. If  $i$  increases,  $e$  increases (dollar appreciates) and  $NX$  falls.

Table 2 has a good summary.

Variable	Change in Variable	Response of Y	Diagram
A	Increase	Increase	
I	Increase	Increase	
G	Increase	Increase	
T	Increase	Decrease	
NX	Increase	Increase	

## The ISLM Model

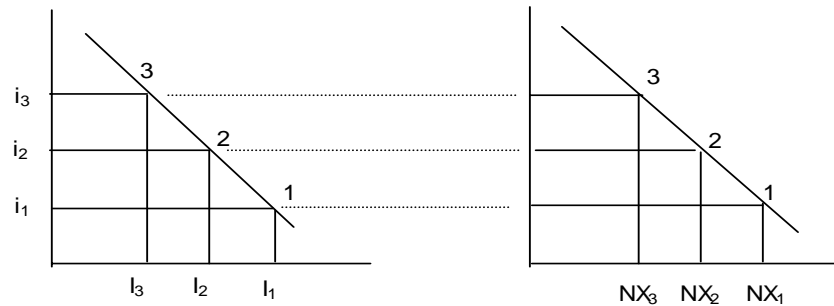
We now include money and interest rates into the Keynesian framework. We will look at the interaction between the goods market and the money market.

The *IS* curve shows all points for which the goods market is in equilibrium. It shows the relationship between output ( $AD =$  Aggregate output) and interest rates.

The relationship between output and interest rates, when the money market is in equilibrium is known as the *LM* curve.

### • The IS Curve

The IS curve is derived from the equilibrium condition in the goods market (aggregate output equals aggregate demand).

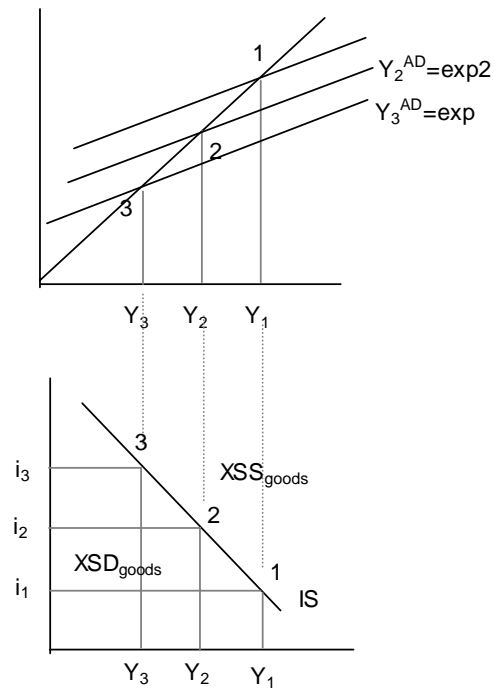


Interest rates and planned investment are negatively correlated. Why? Investment occurs when the expected IRR of the investment project is greater than other assets. When interest rates increase, the opportunity cost of investment increases.

$NX$  and interest rates are negatively correlated. As  $i$  rises, foreigners buy US assets, \$ appreciates, US goods become expensive.

When expenditure falls due to an increase in the interest rate (from 1 to 3), I and NX falls  $\rightarrow$  Y falls. The IS curve shows all points for which the goods market is in equilibrium (see top panel). For each level of interest rate,  $i$ , the IS curve tells us what Y must be for the goods market to be in equilibrium. Below the IS curve, there is excess demand for goods. Why?  $Y^{AD} > 45$  degree line  $\rightarrow$  Y increases. Above the IS curve, there is excess supply of goods. Why?  $Y^{AD} < 45$  degree line  $\rightarrow$  Y decreases.

Why is there a negative relationship between  $i$  and Y? Investment and NX are negatively related to  $i$ .



### • The LM Curve

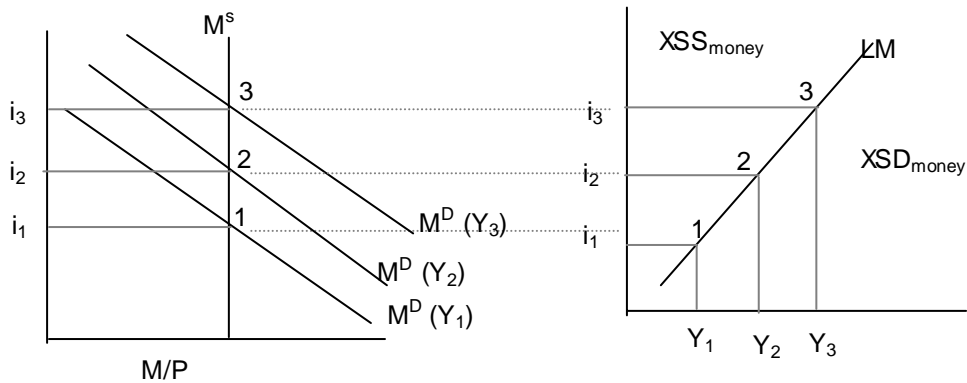
The LM curve is derived from the money market equilibrium condition (money demand = money supply). For a given level of output, it shows the corresponding interest rates required for equilibrium in the money market.

Recall, according to Keynes's *Liquidity Preference Theory*, the demand for real money balances is a function of interest rates and income. The minus sign says that real money balances are negatively related to interest rates and the plus sign says that real money balances are positively related to income.

$$\frac{M^d}{P} = f(i, Y)$$

The opportunity cost of holding money is the interest forgone from other assets, bonds.

According to Keynes, interest rates are determined in the money market via the interaction between demand and supply for money (see diagram below).



The demand for money curve slopes downward because at lower rates of interest, the opportunity cost of holding money is low, so the quantity demanded is higher. For simplicity, here we assume that the money supply is not positively related to the interest rate  $\rightarrow$  it is set by the Fed. When the demand for money increases, because income increases (from  $Y_1$  to  $Y_3$ ), the interest rate increases from  $i_1$  to  $i_3$ . Why? When  $M^D$  increases ( $M^D > M^s$ ), people sell bonds  $\rightarrow$  the price of bonds fall  $\rightarrow$  the interest rate rises.

For higher levels of income ( $Y_1$  to  $Y_3$ ), the interest rates has to be higher for the money market to be in equilibrium. Recall the LM curve shows all points for which the money market is in equilibrium. Below the LM curve, we have XSD. For example, at  $i_1$  and  $Y_2$ , the interest is too low, people are not holding enough  $\rightarrow$  sell bonds  $\rightarrow$   $i$  rises. Above the LM curve, we have XSS. For example, at  $i_3$  and  $Y_2$ , the interest is too high, people are holding more money than they want to  $\rightarrow$  buy bonds  $\rightarrow$   $i$  falls.

### Equilibrium in the goods and money market

Equilibrium occurs where the IS and LM curves intersect, point E. At point E, both the goods market and money market are in equilibrium. At point A (on IS, above LM), we have XSS<sub>money</sub>, people are holding more money than they want to  $\rightarrow$  buy bonds  $\rightarrow$   $i$  falls. At point B (on LM, below IS), we have XSD<sub>goods</sub>  $\rightarrow$   $Y^{AD} >$  45degree line  $\rightarrow$  inventories falling  $\rightarrow$   $Y$  increases.

