

7. AD-AS and Inflation

EE212

Read: Case & Fair, ch. 12, 13; Froyen, ch. 8, ch. 10;
LRS, ch. 23, 24, 25, 30; Mankiw ch. 20, 21, 22

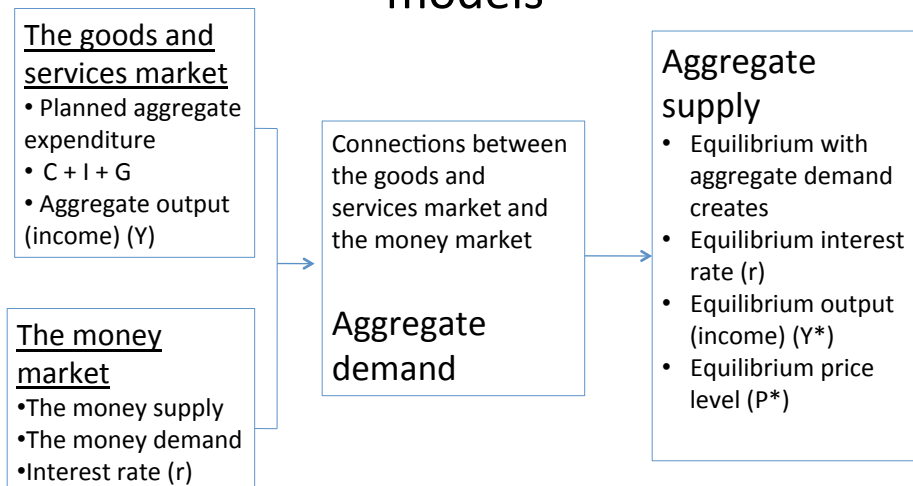
March 2018

Contents

1	Introduction	2
2	Aggregate Demand	2
2.1	Equilibrium in goods market	3
2.2	Equilibrium in money market	3
3	Aggregate Supply (AS)	4
3.1	Introduction	4
3.2	The labor market	4
3.3	Short-run Aggregate Supply	6
3.4	Long Run Aggregate Supply (LRAS)	9
4	Changes in equilibrium	11
4.1	AD shift :	11
4.2	AS shift :	11
5	Using AD-AS to analyze inflation	13
5.1	Demand pull inflation	13
5.2	Cost-push inflation	14
6	The analysis of fiscal policy and monetary policy using AD-AS model	15
6.1	Slope of AS and effects from AD shocks	15
6.2	Expansionary Fiscal Policy	17
6.3	Expansionary Monetary Policy	20

1 Introduction

The overview of basic macroeconomic models



2 Aggregate Demand

- Aggregate Demand: The total demand for goods and services in the economy. It shows the relationship between demand for gross output (Y) at every price level (P)
- Gross output (Y) is the equilibrium output of the economy (It is the equilibrium in both good market and money market)
- Linking the money market with the goods market
 - The linkage occurs through how investment depends on r (real interest rate)
 - Linking the goods market with the money market
 - The linkage occurs through how money demand depends on Y (real output/income)
 - The linkages can be depicted through the IS-LM model.

2.1 Equilibrium in goods market

$$Y = DAE \\ = C + I + G + (X - M)$$

$$\text{Withdrawal} = \text{Injection} \\ S + T + M = I + G + X$$

- All are real variables.
- In good markets we talk about real variable, such as real national income or real gross output
- Therefore, changes in price does not affect equilibrium in good market directly.

2.2 Equilibrium in money market

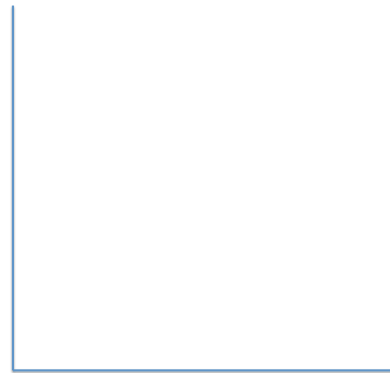
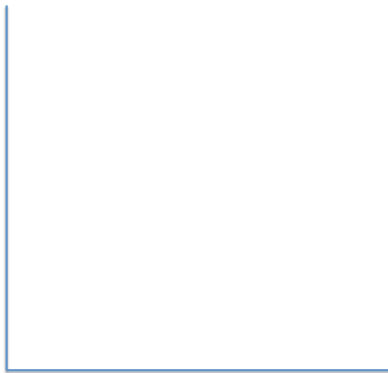
$$M^d = M^s$$

$$\text{Real money Demand} = \text{Real Money Supply}$$

$$L(Y, r) = \frac{\text{Nominal money supply}}{\text{Price level}}$$

- AD

- Shift



3 Aggregate Supply (AS)

- We have already derived the aggregate demand curve.
- Now we want to know what the aggregate supply curve looks like, so that we can find the equilibrium price and output of an economy.
- Unlike the aggregate demand curve, there are variations between short-run and long-run aggregate supply curve.
- Aggregate Supply: shows
 - total supply of goods and services in an economy. A curve that traces out the price decisions and output decisions of all firms in the economy.
 - the relationship between supply of gross output (Y) at every price level (P)
- Short run AS and Long-run AS

3.1 Introduction

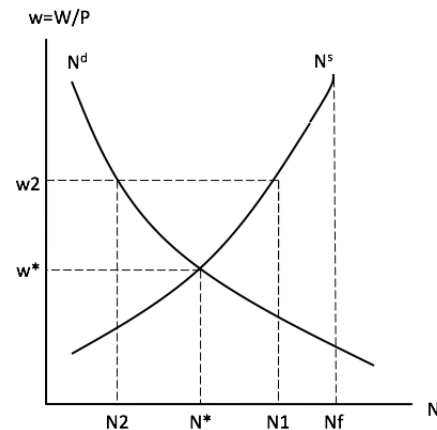
- Assumption :
 - In short run, economy **is not** at full employment level (use all factors of production)
 - Constant Technology
- In short run, prices of factors of production do not change much.
- Suppose producers need to use more factors of production, such as labor, but some people are still unemployed.
- Labor cannot request for higher wage that much because some people are still unemployed, so employers can employ other people
- wage may not change that much
- In short-run, we assume that wage is the main component of input cost, and that wage is “**sticky**”. With wage constant (in SR), as firms face higher demand, they can increase price and raise output in order to earn more profits.
- The labor market does not clear — Keynesian unemployment.
- Discretionary fiscal and monetary policy to stabilize the economy.

3.2 The labor market

- In the short run, the nominal wage (W) is not flexible — wage rigidity.
 - Existence of labor contracts.
 - Cost of renegotiation when the situation changes.
 - Indexation of labor contracts is not popular.

- In theory, rigid nominal wages are treated as the fixed nominal wage rate.
- The labor market does not clear — Keynesian unemployment.
- Discretionary fiscal and monetary policy to stabilize the economy.

- At $w^* = \frac{W^*}{P^*}$, employment = N^* .
- If W is fixed at $W_2 > W^*$, then $w_2 = \frac{W_2}{P^*}$; employment = N_2 .
- Keynesian unemployment = $N_1 - N_2$.
- **Employment depends on labour**



3.2.1 Labor Supply : Worker's Decision, As real wage increases, workers are willing to supply more labor.

3.2.2 Labor Demand : Firm Decision

- **Profit maximization condition : $MR = MC$**

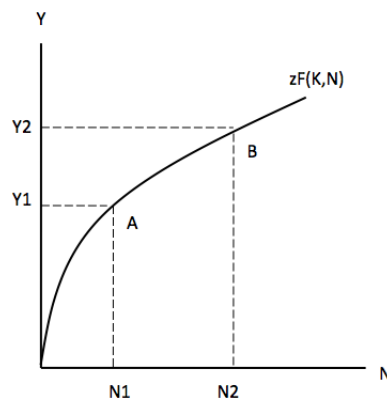
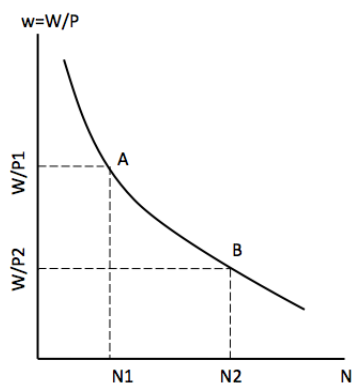
$$MR = MC$$

$$P \times MPL = \text{Real wage}$$

- Example :

Labor (number of employees)	Output (number of output produced per day)	Marginal Product of labor
0	0	0
1	10	
2	19	
3		
4		

- **Marginal Product of labor is hence “labor demand function” as a function of real wage.**



- **Production function, fixed capital**

The slope at A is MP_N when $N = N_1$.

MP_N is falling as the labor input increases, given the capital input.

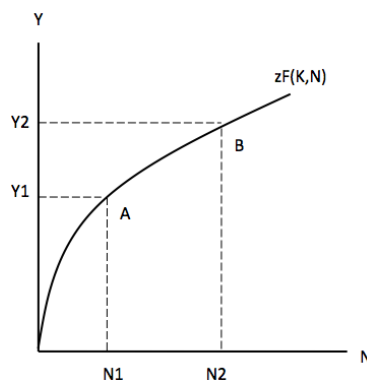
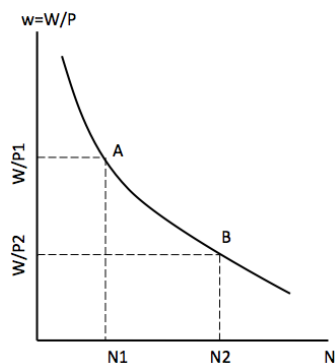
- Nominal wage (W) is fixed. As price increases, real wage $\left(\frac{W}{P}\right)$ and labor demand (N^d)

3.2.3 Labor Market Equilibrium

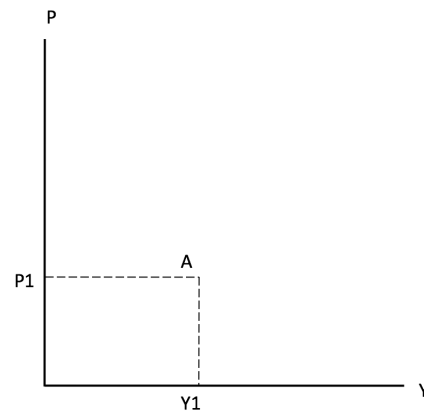
- In the short run nominal wage is fixed at a level above the nominal wage that makes full employment.
- Equilibrium number of labor employed depends on labor

3.3 Short-run Aggregate Supply

3.3.1 Derivation



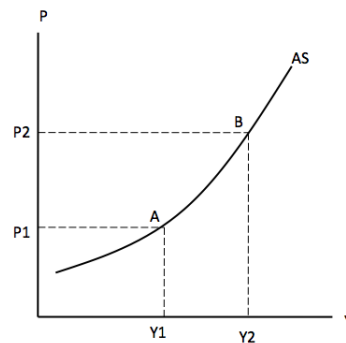
- Given technology and capital stock, the P-Y relationship is positive.
- AS is not related to interest rate



3.3.2 Shift

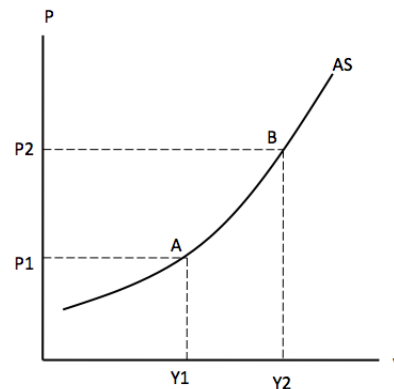
3.3.2.1 A higher W shifts AS to the

- As W increases, the real wage for all level of prices
- For all levels of price, the real wage, labor demand (N^d)
Output, AS shifts left.



3.3.2.2 Lower resources shifts AS to the

- Lower Z and Lower K shifts the production function
- MPN for all level of N
- For all level of prices and real wage, labor demand (N^d)
Output



- Assume that nominal wage is fixed a rate above market clearing equilibrium, employment at equilibrium depends on
- Movement along the curve

Price Level(P) $\uparrow \Rightarrow \frac{\text{Sticky nominal wage}}{\text{price level}} = \text{real wage} \dots \Rightarrow \text{Demand for labor} \dots$

$\Downarrow$
Production
 $\Downarrow$
Output (Y)

$P \uparrow \Rightarrow Y \uparrow$. Thus, aggregate supply curve (AS) has an **upward slope**.

- shift

1. Nominal wage (W) increases,

- real wage for all levels of labor input. Demand for labor (N^d)
- Hence employment for all levels of price (P).
- Output (Y) for all levels of P .
- AS shifts to the

2. Lower Z (technology) or lower K (capital input)

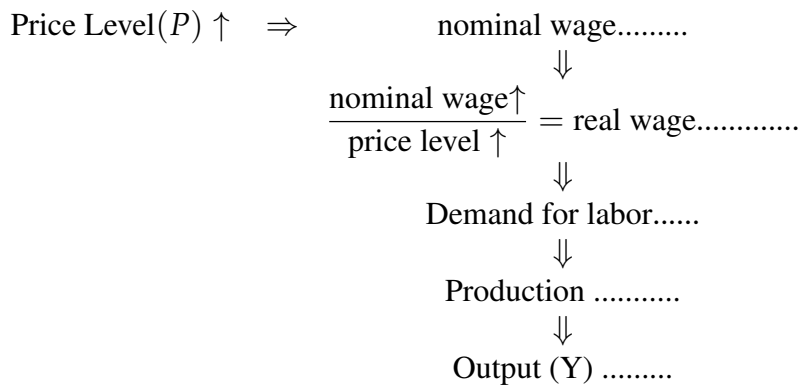
- Output(Y) for all levels of real wage and price.
- AS shifts to the

3.4 Long Run Aggregate Supply (LRAS)

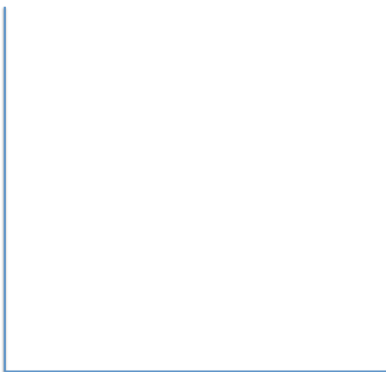
- **Assumption** : In long run, economy is at full employment level.
- In long run, **prices of factors of production can change a lot**

3.4.1 Derivation of LRAS curve

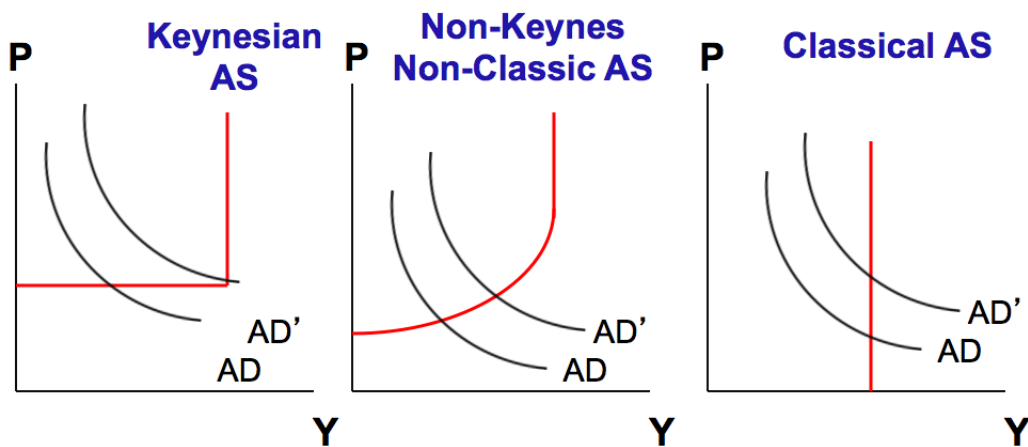
- Suppose producers need more factors of production, such as labor, but all labor are already employed.
- Labor can request for higher wage (D. for labor > S. of labor)
- Wage may change a lot.
- In the long-run, as wages can fully adjust, the profit margin from rise in prices will disappear.



- Graphically illustrate LRAS



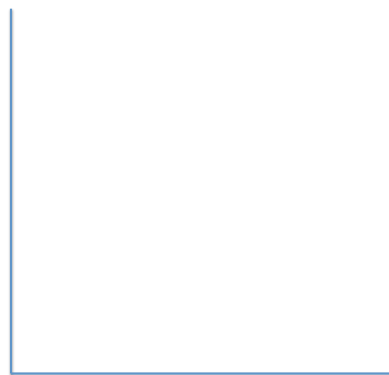
- **Potential GDP** : The point where the LRAS lies signifies the level of output in which, if the actual output rises above there will be inflation.



- Note: LRAS sometimes known as Classical AS

3.4.2 Shift in LRAS curve

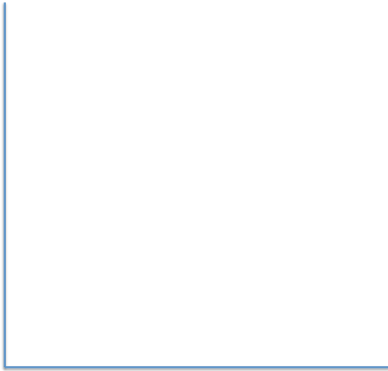
- LRAS may shift when potential output changes; productivity
 1. change in the availability of factors of production
 2. change in the technology
- LRAS shifts to the right ; potential output increases
- LRAS shifts to the left : potential output decrease



4 Changes in equilibrium

4.1 AD shift :

- suppose consumer credit increases
- Short run



- Price (P)
- Output (Y)

- Long run



- Price (P)
- Output (Y)

4.2 AS shift :

- for example, epidemic occurs in the country
- Short run



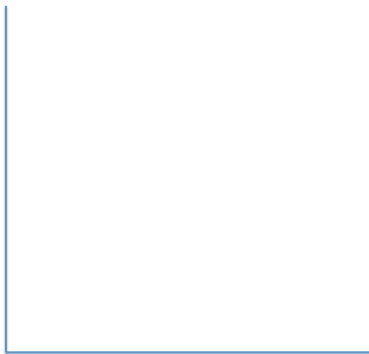
- Price (P)
- Output (Y)

- Long run



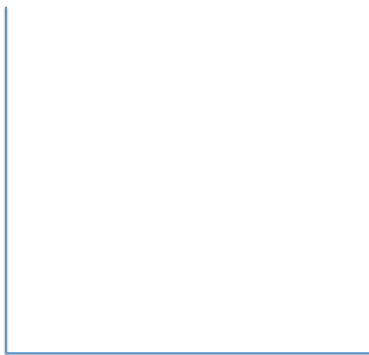
- Price (P)
- Output (Y)

- **Situation where $P \uparrow$ and $Y \downarrow$:** $P \uparrow \Rightarrow$ inflation , $Y \downarrow \rightarrow$ stagnation, $P \uparrow$ and $Y \downarrow \Rightarrow$ stagflation
- **Results of Solving problem of gross output (Y) :** The case when AS shift; AD
 - Short run



- Price (P)
- Output (Y)

- **Results of Solving problem of gross price (P) :** The case when AS shift; AD
 - Short run



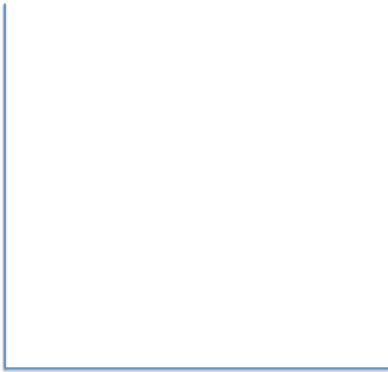
- Price (P)
- Output (Y)

5 Using AD-AS to analyze inflation

- AD-AS can be used to depict the occurrence of inflation (in SR).
- Inflation: An increase in the overall price level
- Sustained inflation Occurs when the overall price level continues to rise over some fairly long period of time.
- Hyperinflation A period of very rapid increases in the price level.
- Causes of inflation
 1. Demand-pull Inflation: Inflation that is initiated by an increase in aggregate demand.
 2. Cost-push inflation: Inflation caused by an increase in costs.

5.1 Demand pull inflation

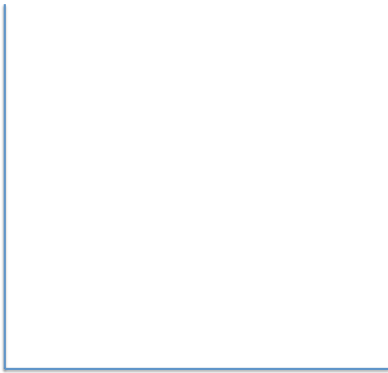
- Inflation caused by shift in AD
- This happens particularly when AD shift at the steep portion of SRAS
- Short run



- AD curve shifts to the
- Price (P)
- Output (Y)

5.2 Cost-push inflation

- Inflation caused by the rise in input prices
- For example, the rises in energy price SRAS shift to the left
- This results in “stagflation”, both the rise in price and the fall in output.
- The government can react to stagflation, but only at the cost of raising price even further.
- Stagflation is thus a very bad news for the economy.
- Short run



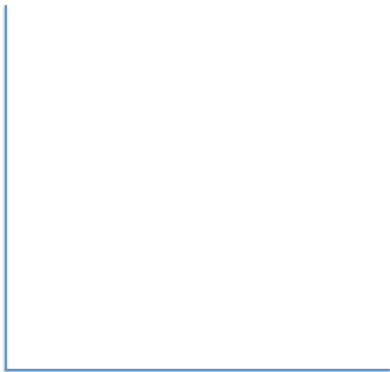
- AS curve shifts to the
- Price (P)
- Output (Y)
- Money and inflation
 - The central bank may choose to control the interest rates (to be at a certain level), but only at the cost of creating inflation, particularly when the government uses expansionary fiscal policy.
 - On the other hand, most central bank today chooses to do “inflation targeting”, controlling the money supply with the goal of allowing inflation to happen only within a limited range.

6 The analysis of fiscal policy and monetary policy using AD-AS model

- Note how the earlier depiction of “expansionary” or “contractionary” policies cause the shift in AD.
 - AD will shift to the left and right, in response to how a policy change output.
- Nonetheless, in order to see the effects on output and price, we will have to check the characteristics of AS curve.
 - Whether we are looking at SR or LR
 - And if in SR, where along the SRAS are we looking at.

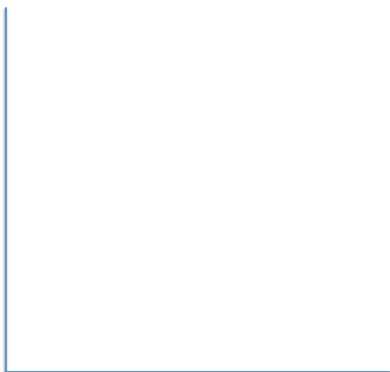
6.1 Slope of AS and effects from AD shocks

- In case of SRAS. We need to check which portion of SRAS are we at.
 - Whether we are in the flat part, where plenty of production capacity is available.
 - * In this case, expansionary policies can yield large change in output.
 - Or whether we are in the steep part, where we are starting to face with limited capacity of production.
 - * In this case, expansionary policies will result in a strong inflation



- When SRAS is, expansionary policies can yield large change in output.
- When SRAS is, expansionary policies will result in a strong inflation.

- The case of LRAS
 - In the LR, wages adjust fully to any change in price.
 - This means firms only produce at their potential output.
 - Any policy changes will only result in changes in the price level.



- **Expansionary policy**

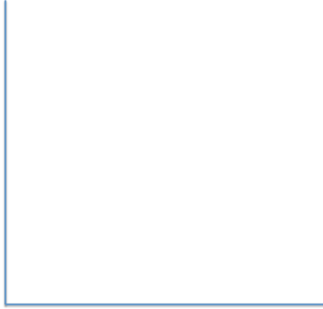
	Price	Output
AS flat		
AS steep		
AS vertical		

- Note that there is a short-run trade off between inflation and output.
- In the long run, output remains the same.

6.2 Expansionary Fiscal Policy

Short-Run Analysis

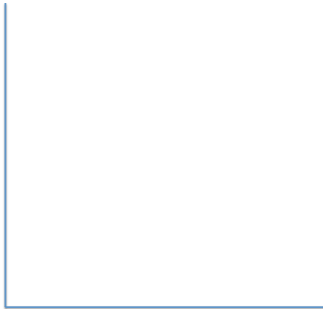
- DAE



- ISLM



- ADAS : Short Run



- Money Market



Expansionary fiscal policy ($G \uparrow$)

- Initially, equilibrium is at r_1, Y_1, P_1, N_1

1. If real interest rate remains the same ($\bar{r}$), DAE shifts

⇒ output (Y) for all level of

⇒ IS shifts to the ; the size of shift is ΔG

2. As Y , Real money demand,

Excess, bonds, Bond price and equilibrium interest rate

As r , investment, output (move along IS curve)

the second effect is called

** If price were constant, total effect = 1 effect + 2 effect

3. From (1) and (2), IS curve shifts to the, and then Y for all levels of price

Hence, AD shifts to the

Y and P

(a) Labor market

As P , real wage and Y (movement along AS curve)

(b) ISLM

As P , real money supply to

LM shifts to the

Output

This is called

4. To summarize, expansionary fiscal policy will cause r, Y, P, employment

- **The steeper AS curve, the larger the crowding out effect.**

- Long run



- AD curve shifts to the
- Price (P)
- Output (Y)
- An alternative explanation on what happens at the steep portion of SRAS.
 - Firms running into full capacity, meaning that a large rise in price is needed for them to produce a little more.
 - As price rises from initial shift in AD is large, the resulting shift in money demand will also be large.
 - This means the crowding out effects will be large, taking away all the initial change in AD.

6.3 Expansionary Monetary Policy

- Money Market



- ISLM



- ADAS : short run



- DAE

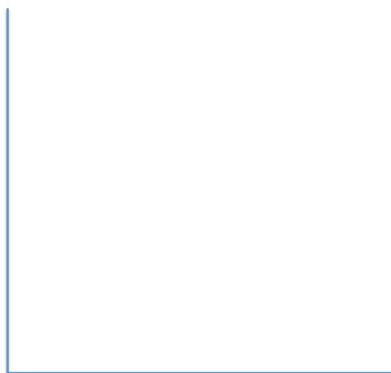


- **Expansionary Monetary policy**

Initially, equilibrium is at r_1, Y_1, P_1, N_1

1. Expansionary Monetary ($MS \uparrow$) $\Rightarrow \frac{MS}{P}$ shift to the
 Excess, people bonds,
 bond price, r for all levels of
 LM shifts to the
 As r, investment $\rightarrow$ output (Y) **for all levels of Price**
2. As output for all level of Price, AD shifts to the
 Price level to and Output to
 (a) Labor market
 P , real wage and Y (movement along AS curve)
 (b) ISLM
 P , real money supply to
 LM shifts to the
 Output
 This is called

- **Long run**



Effect of Monetary Policy : Long Run

- AD curve shifts to the
 - Price (P)
 - Output (Y)
- Through the use of the AD-AS model, please explain in details “the similarity and difference” between Keynesian (short-run) and Classical (long-run) perspective on macroeconomics in relation to:
 - a. The perception of how the government should react to economic recession
 - b. The effects of expansionary macroeconomic policies