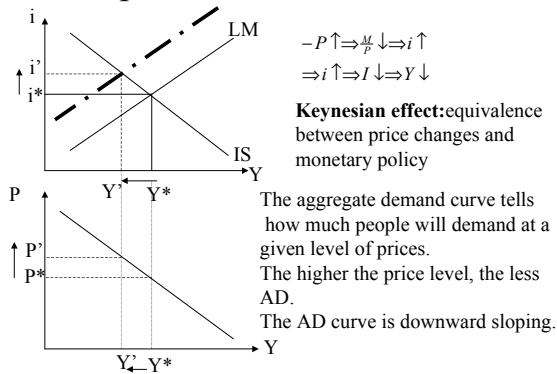# Aggregate Demand and supply

Aggregate demand

- The intersection of the IS-LM curves shows the values of i and y such that the money market clears and actual and planned expenditures are equal for given value of M, P, G and T.
- To see how the IS-LM curves imply the existence of a downward slopping relationship between P and Y, consider the effects of assuming a higher value of P.
- Since the price level does not enter the planned expenditure function Z(.), the IS curve is unaffected.
- The rise in price level reduces the supply of real money. Thus a higher interest rate is needed to clear the money market for a given level of income, and so the LM curve shifts up.

Graphical Derivation of AD

$-P\uparrow \Rightarrow \frac{M}{P}\downarrow \Rightarrow i\uparrow$

$\Rightarrow i\uparrow \Rightarrow I\downarrow \Rightarrow Y\downarrow$

Keynesian effect: equivalence between price changes and monetary policy

The aggregate demand curve tells how much people will demand at a given level of prices.
The higher the price level, the less AD.
The AD curve is downward sloping.

The slope of the Aggregate Demand

$IS:\qquad Y = Z(Y,i,G,T)$

$LM:\qquad \dfrac{M}{P}=L(i,Y)$

differenci ate with respect to P :

$\dfrac{dY}{dP}=Z_y\dfrac{dY}{dP}+Z_i\dfrac{di}{dP}\Rightarrow \dfrac{1-Z_y}{Z_i}\dfrac{dY}{dP}=\dfrac{di}{dP}$

$\dfrac{-M}{p^2}=L_i\dfrac{di}{dP}+L_y\dfrac{dY}{dP}\Rightarrow \dfrac{-M}{P^2}=L_i\left(\dfrac{1-Z_y}{Z_i}\right)\dfrac{dY}{dP}+L_y\dfrac{dY}{dP}$

$\dfrac{dY}{dP}=\dfrac{\frac{-M}{P^2}}{L_y+L_i\left(\frac{1-Z_y}{Z_i}\right)}<0$

$M\uparrow \Rightarrow \frac{dY}{dP}\uparrow \Rightarrow AD\ flatter$
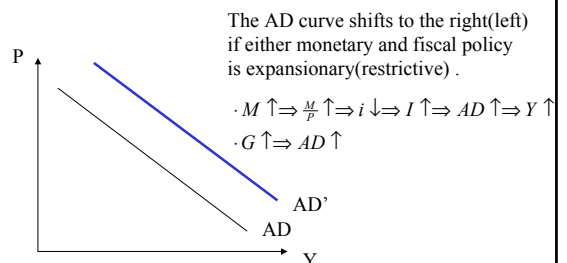
$Z_i\uparrow \Rightarrow \frac{dY}{dP}\uparrow \Rightarrow AD\ flatter$

$Z_Y\uparrow \Rightarrow \frac{dY}{dP}\uparrow \Rightarrow AD\ flatter$

Remarks

$\cdot Z_i=0\Rightarrow IS\ vertical$

$\qquad \Rightarrow \frac{dY}{dP}=0\Rightarrow AD\ vertical$

$\cdot L_i=\infty \Rightarrow$ infinitely elastic demand for money (liquidity trap)

$\qquad \Rightarrow \frac{dY}{dP}=0$

.

• Any parameter configuration that makes monetary policy more effective will make the AD flatter.
• Any parameter configuration that makes monetary policy less effective will make the AD curve steeper.

Shifts of AD

The AD curve shifts to the right(left) if either monetary and fiscal policy is expansionary(restrictive) .

$\cdot M\uparrow \Rightarrow \frac{M}{P}\uparrow \Rightarrow i\downarrow \Rightarrow I\uparrow \Rightarrow AD\uparrow \Rightarrow Y\uparrow$

$\cdot G\uparrow \Rightarrow AD\uparrow$

Introduction

- Aggregate supply (AS) describes the amount of output that the basic resources of the economy are capable of producing.
- The important determinants of AS are:
  - The number of people available for work and their productivity.
  - The amount of equipment, structures, land and other types of capital.
  - The technology : tells us how much output can be produced from the amount of labor and capital used in production. The simple way to describe the technology in terms of a production function: $Y = F(K, N)$

Introduction

- AS behaves very differently in the short run than in the long run. In the long run prices are flexible, and the AS is vertical. Hence shifts in the AD curve affects the price level, but the output remains at its natural level.
- In the short run, prices are sticky, and the AS curve is not vertical. In this case, shifts in aggregate demand do cause fluctuations in output.
- There are four models of the short run aggregate supply curve. These models differ in two characteristics: whether they assume that markets clear and whether the key market imperfection lies in the goods market or in the labour market.

Introduction

- **The four theories of AS**: The sticky-wage, worker-misperception, imperfect-information, and sticky-price models, attribute deviations of output and employment from the natural rate to various market imperfections. According to all four theories, output rises above the natural rate when the price level exceeds the expected price level, and output falls below the natural rate when the price level is less than the expected price level.
- Although the four models of AS differ in their assumptions and emphases, their implications for aggregate output are similar. All can be summarized by the equation: $Y = Y_n + \alpha (P - P^e)$

The sticky-wage Model

- The competition is imperfect in the labor market.
- Sticky wages: nomonal wages adjust slowly.
- Two kinds of imperfectly competitive models of labor market:
- ➢ Model, based on the dynamics of wage setting under trade unions, collective bargaining power. The ability of an individual union to raise wages will be conditioned by the unemployment rate.
- ➢ Model, based on efficiency wage, emphasizes that individual workers have bargaining power. There is an asymmetric information about worker effort. Employers have imperfect information about worker effort, because monitoring and surveillance are costly, so they use wage as an incentive device.

- ➢ Hence job loss is costly for a worker, first when he is fired, he losses the wage and the probability to find a new job. A higher unemployment rate increases the cost of job loss and permits employers to elicit worker effort with a smaller wage.
- Conclusion: the wage bargain depends on the unemployment rate.

Factors that determine the size of the wage adjustment

- The state of the labor market: If unemployment is high then labor will be in a relatively weak bargaining position. The threat of strike is more credible in good time than in bad.
- A second factor influencing wage bargaining is the wage paid to comparable workers in other industries. Because not all contract negotiations are synchronized, there are to components of this comparison wage: the wage settlement of workers who have recently signed contracts, and the expected wage settlements of workers who will be signing their contracts in the near future (backward looking and forward looking behaviour)
- A third factor that will influence wage decisions is the expected rate of inflation.

Bargained real wage curve

Assumptions
- Imperfect competition in the labor market.
- n_1 reflects the sensitivity of wage-setting to labor market forces.
- Labor is the only variable input in production: $Y = f(N)$
- Short run production function displays constant returns to labor: $Y = N$
- N: number of units of labor or workers
- Labor force, L is constant.
- Supply curve for labour is inelastic(vertical)

- The linear version of the wage curve is:

$$\frac{W}{P^e} = F(u), \quad \frac{\partial F}{\partial u} < 0$$

$$\frac{W}{P^e} = n_0 - n_1 u$$

Bargained real wage curve

The unemployment rate u:

$$u = \frac{L-N}{L}$$

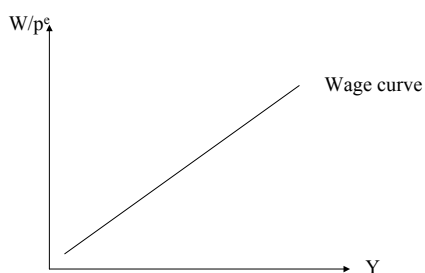$$\frac{W}{P^e} = n_o - n_1\left[\frac{L-N}{L}\right] = (n_0 - n_1) + n_1\frac{Y}{L}$$

$$\frac{W}{P^e} = m_o + m_1 Y$$

$$W = P^e(m_0 + m_1 Y)$$

$$\frac{\partial\left(\frac{W}{P^e}\right)}{\partial Y} = m_1 > 0 \Rightarrow \text{The slope of wage curve is upward}$$

$When\ Y\uparrow \Rightarrow N\uparrow \Rightarrow u\downarrow \Rightarrow$ putting workers in a stronger bargaining position that allows them to

win higher $wage \Rightarrow \frac{W}{P^e}\uparrow$

Bargaining real wage curve

The price-determined real wage

$$\max_{P,Y} PY - C(Y)$$

$$D(P) = Y$$

Letting $P(Y)$ be the inverse demand function, the price that must be charged to sell Y units of output

$$\text{Max}_y\ P(Y)Y - C(Y)$$

$$F.O.C \Rightarrow P(Y) + P'(Y)Y = C'(Y)$$

The F.O.C says that at the profit - maximising choice of output marginal revenue must equal marginal cost.

$$P(Y) + \frac{dP}{dY}Y = C'(Y)$$
.

$$P(Y)\left[1 + \frac{dP}{dY}\frac{Y}{P}\right] = C'(Y)$$

$$P(Y)\left[1 + \frac{1}{\varepsilon(Y)}\right] = W$$

$\varepsilon(Y)$ is the price elasticity of demand facing the monopolist

which is negative so :

$$P(Y)\left[1 - \frac{1}{|\varepsilon(Y)|}\right] = W$$

with $\mu = \frac{1}{\varepsilon - 1}$

$$P(Y)\left(\frac{1}{1+\mu}\right) = W$$

$$P(Y) = (1+\mu)W$$

The price-determined real wage

- Firms are monopolies that face a demand curve with a constant elasticity.
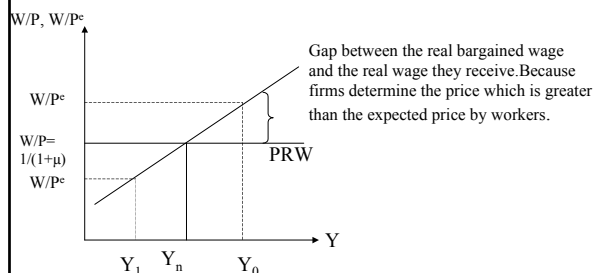- P: depends only on that mark-up:

$$P = (1+\mu)W$$

$$\frac{W}{P} = \frac{1}{1+\mu}$$

- The mark-up is the gap between price and total cost of production.
- The mark-up hypothesis says that the gap is close to constant.
- Under the mark-up hypothesis, costs are the prime determinant of price and changes in demand have little effect on price. With constant elasticity, the effect of demand is ignored

We suppose that prices are set immediately after wages have been negotiated. So firms have better information than workers:Firms know their costs of production but workers do not.

W/P, W/P^e

Wage curve

W/P — — — — — — — — Price determining real wage

Y_n
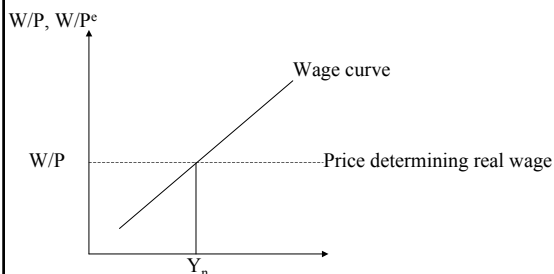
The equilibrium is reached when $P = P^e$, production is equal to the full employment level.

W/P, W/P^e

Gap between the real bargained wage and the real wage they receive.Because firms determine the price which is greater than the expected price by workers.

W/P^e

W/P= $1/(1+\mu)$

W/P^e

PRW

Y_1 Y_n Y_0 Y

$Y_0 > Y_n$, favourable bargaining position of workers, they negotiate an increase in their pay, firms incorporate these cost increase through to prices.

$$\frac{W}{P^e} \uparrow \Rightarrow P \uparrow \Rightarrow \frac{W}{P} \downarrow (illusion)$$

- A high level of output gives rise to an inflationary gap between the
bargained real wage and the price determined real wage.
- When $Y_n > Y_1 \Rightarrow (W/P) > (W/P^e)$, employers bargaining position is strong because the unemployment rate is high. They will press for money wage reductions and a downward spiral of wage and prices will ensue.
- When $Y_n = Y \Rightarrow (W/P) = (W/P^e) \Rightarrow P = P^e$, workers have not miscalculated and they receive precisely the real wage that befits their bargaining position.

Natural rate of unemployment

- There is unemployment even when the economy is in boom, substantial unemployment exists even in equilibrium.
- The natural rate of unemployment= Frictional unemployment + structural unemployment
- There isn't a one unique and well defined natural rate of unemployment. In fact, for new classical and monetarist economist, natural rate of unemployment corresponds to a full employment, so the absence of involuntary unemployment.
- New Keynesian theory accepts the existence of involuntary unemployment at the natural rate of unemployment. In our model, because labour supply is inelastic, workers are involuntary unemployed in equilibrium.Employment is determined by the quantity of labour that firms demand.

Price expectations

- Recall that prices are sticky in the sense that they are not adjusted quickly by firms in response to demand conditions.
- Adaptative expectation: $P^e = P_{-1}$
- Rational expectations $E(P) = P$
- We suppose adaptative expectations, workers expect the price level to remain constant over time. so the wage is:
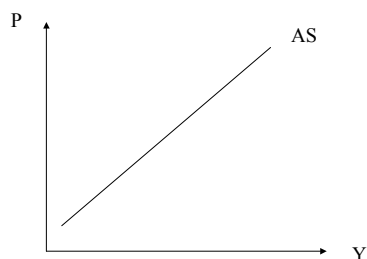
$$W = P^e (m_0 + m_1 Y)$$
$$W = P_{-1}(m_0 + m_1 Y)$$

The AS curve

$$\left. \begin{array}{l} W = P_{-1}(m_0 + m_1 Y) \\ W = \dfrac{P}{1+\mu} \end{array} \right\} \Rightarrow P = P_{-1}(1+\mu)(m_0 + m_1 Y)$$
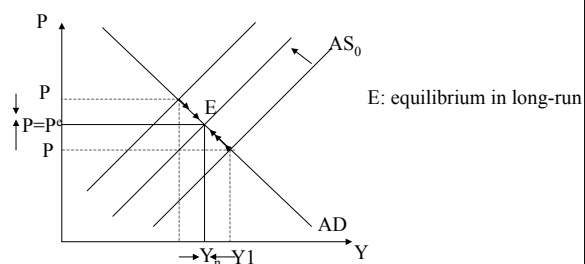
$$\frac{\partial P}{\partial Y} = P_{-1}(1+\mu)m_1 > 0$$

- The AS curve describes the relationship between output and prices at the aggregate level, given the expected price level.
- The slope of the AS curve is positive.

AS curve

P

AS

Y

Equilibrium

P

AS_0

$\downarrow$ P
$\uparrow$ P=Pe
P

E

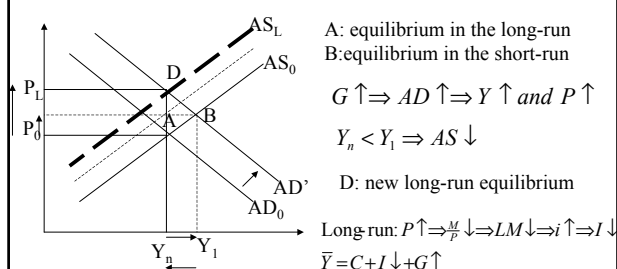E: equilibrium in long-run

AD

$\rightarrow Y_n \leftarrow Y1$

Y

Equilibrium is stable: Remember that, when real GDP is high relative to potential(Y1), unemployment is low and employment is high. These are conditions to lead to rising wages and prices.
If demand has been strong and firms are producing more than they think is appropriate given their current prices, firm will raise their prices.
These two effect cause prices to raise, the aggregate demand decreases (Keynes effect)
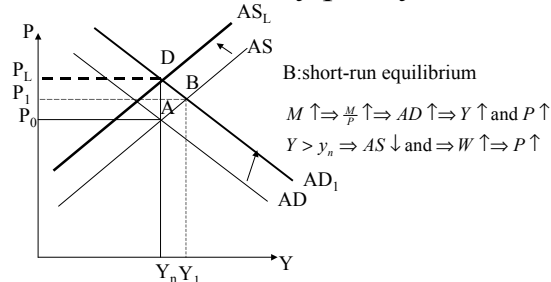
Fiscal policy

AS_L
AS_0

D
P_L
P_0
A B

AD'
AD_0

$Y_n \rightarrow Y_1$

A: equilibrium in the long-run
B:equilibrium in the short-run

$G \uparrow \Rightarrow AD \uparrow \Rightarrow Y \uparrow$ and $P \uparrow$

$Y_n < Y_1 \Rightarrow AS \downarrow$

D: new long-run equilibrium

Long-run: $P \uparrow \Rightarrow \frac{M}{P} \downarrow \Rightarrow LM \downarrow \Rightarrow i \uparrow \Rightarrow I \downarrow$

$\bar{Y} = C + I \downarrow + G \uparrow$

Fiscal policy is an effective instrument for controlling the level of demand in the short-run and could be used for stabilization purposes.
In the long-run, fiscal does not change the level of output but it changes it Composition.Complete crowding out prevails in the long-run.

Monetary policy

AS_L
AS

P

D
P_L
P_1
P_0
A B

AD_1
AD

$Y_n Y_1$

Y

B:short-run equilibrium

$M \uparrow \Rightarrow \frac{M}{P} \uparrow \Rightarrow AD \uparrow \Rightarrow Y \uparrow$ and $P \uparrow$

$Y > y_n \Rightarrow AS \downarrow$ and $\Rightarrow W \uparrow \Rightarrow P \uparrow$

Monetary policy is a valuable instrument for macroeconomic stabilisation in the short run. In the long-run, the price level has risen by the same proportion as the nominal money supply $\Rightarrow$ neutrality of money in the long run

The equation of exchange

$$V = \frac{PY}{M}$$

- The term of velocity is meant to convey the speed at which the money stock is turned over from one individual to another during a period of time such as a year. In practice velocity is usually calculated by dividing the money stock into nominal GDP.
- The quantity theory of money emphasize that excessive money creation by central bank is the cause of inflation in the long run

$$\frac{\Delta M}{M} = \frac{\Delta P}{P}$$

•Under perfect foresight, an anticipated monetary policy will have no real effects in the short-run (the economy moves from A to D). The only way to escape this outcome would be to surprise workers with an unanticipated monetary policy.