M.A.PART - I
ECONOMIC PAPER - I
MACRO ECONOMICS

1. **Basic Macroeconomics**
   Income and spending – The consumption function – Savings and investment – The Keynesian Multiplier – The budget – Balanced budget : theorem and multipliers. Money, interest and income – The IS-LM model – adjustment towards equilibrium – Monetary policy, the transmission mechanism and the liquidity trap – Basic elements of growth theory : Neoclassical and endogenous.

2. **Behavioural foundations of Macroeconomics**
   Consumption and savings – Consumption under certainty : The life-cycle and permanent income hypotheses – Consumption under uncertainty : The random walk approach – Interest rate and savings. – Money stock determination - The money multiplier – instruments of monetary control – Money stock and interest rate targeting.

3. **Dynamic macroeconomics**
   The dynamic aggregate supply curve – The long-run supply curve – short and long run Phillips curves – Strategies to reduce inflation, money, deficit and inflation – The Fisher equation – Deficits and money growth – The inflation tax, interest rates, deficit and debt – The instability of debt financing – Structuralist models of inflation and growth.

4. **Open Economy Macroeconomics**
   The balance of payments and exchange rates – The current account and market equilibrium – The Mundell-Fleming models : Fixed and flexible exchange rates. – The automatic adjustment process – Expenditure switching / reducing policies – Exchange rate changes and trade adjustments : Empirical issues – the monetary approach to the balance of payments – The Polak-IMF model – Flexible exchange rates. Money and prices – exchange rate overshooting – Interest differentials and

exchange rate expectations – Exchange rate fluctuations and policy intervention.

5. **The New Macroeconomics**
   Rational expectations – anticipated and unanticipated shocks – Policy irrelevance : The Lucas Critique. Real business cycle theory – Propagation mechanism – The persistence of output fluctuations – The random walk of GDP : Nelson and Plosser. Microeconomic foundations of incomplete nominal adjustment – New Keynesian models of price stickiness : The Mankiw model – Co-ordination failure models. – The efficiency-wage model-Implicit contracts-Insider – outsider models – Hysteresis

6. **Macroeconomic Policy Issues**
   Specification of monetary policy – Guidelines for fiscal adjustment. Fiscal policy rules – Exchange rate policies – Debt management policies – Policy coordination problems. Some macroeconomic policy issues. Targets, indicators and instruments – Activist policy. Lags in the effects of policy – Expectations, uncertainty and policy – Gradualism versus shock therapy. The role of credibility – Rules versus discretion – The dynamic inconsistency problem. The political economy of stabilization and adjustment.

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Module 1

BASIC MACROECONOMICS

Unit Structure

1.0 OBJECTIVES

After having studied this unit, you should be able

- To Understand the fundamentals of Macro Economics
- To Know the nature of Income and Spending
- To understand the most basic model of aggregate demand, spending determines - output and income, but output and income also determine spending. In particular, consumption depends on income, but increased consumption increases aggregate demand and therefore output.
- Increases in autonomous spending increase output more than one for one. In other words, there is a multiplier effect. The size of the multiplier depends on the marginal propensity to consume and on tax rates.
- Increases in government spending increase aggregate demand and therefore tax collections. But tax collections rise by less than the increase in government spending, so increased government spend increases the budget deficit

1.1 INTRODUCTION OF CONSUMPTION FUNCTION

The world famous modern economist Lord J. M. Keynes wrote a well known book “General theory of employment, interest and money” in 1936. Keynes theory of income and employment states that the volume of employment in the economy depends upon the level of effective demand. The level of effective demand is determined by the aggregate demand function and aggregate supply function. In a two sector mode, Keynes made use of two components of aggregate demand viz. consumption expenditure and investment expenditure. Consumption expenditure is an important constituent of aggregate demand in an economy. Keynes was not interested in the factors determining aggregate supply, since he was concerned with short run and existing productive capacity.

1.2 THE CONCEPT OF CONSUMPTION FUNCTION

As demand of a commodity depends upon its price [DD=*f* (P)]. Similarly the consumption of a commodity depends upon the level of income. The **consumption function or propensity to consume refers to an empirical income consumption relationship**. It is a functional relationship indicating how consumption varies as income varies. Consumption function is a simple relation between income (Y) and consumption (C).

Symbolically $C = f(Y)$ …3.1

Where, C: Consumption
f: Functional relationship
Y: Income

In the functional relation, consumption is dependent variable and income is independent variable. Hence consumption is dependent on income. Apart from income there are many other subjective and objective factors which can influence consumption. But income is an important factor. Thus the consumption function is based on Ceteris Paribus assumption. The functional relationship between income and consumption can take different forms. The simplest form of consumption function would be

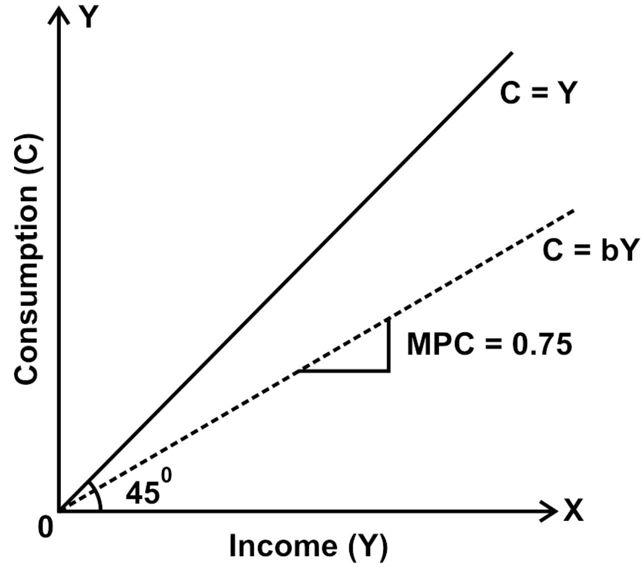


Figure 1.1

$$C = \bar{b}Y$$

Where, C : Consumption
b : Marginal propensity to consume
Y : Income

The consumption function expressed above shows that consumption is a constant proportion of income. This consumption function is shown graphically in **Figure 1.1**

In figure 3.1 income is measured on X-axis and consumption is measured on Y-axis. The $45°$ line (i.e. C=Y) shows that consumption is equal to income. The curve C = bY…….is the consumption function curve (if $b = 3/4$ or 0.75). The consumption function curve C = bY indicates that if income is zero consumption will be zero. But in practice this is not true. However at zero income, consumption is positive (because it is function is sometime expressed in the following form.

$$C = a + bY$$

Where, C : Consumption
a : autonomous consumption
b : Marginal propensity to consume
Y : Income

In fact consumption function is a schedule of various amounts of consumption expenditure corresponding to different level of income. The schedule of consumption function is illustrated in the following table:

Table 1.1

Schedule of Consumption function (Rs. crores)

Income (Y)	**= Consumption (C)**	**+ Savings (S)**
00	20	-20
70	80	-10
140	140	00
210	200	10
280	260	20
350	320	30
420	380	40

Table : 1.1 shows that consumption is an increasing function of income. When income is zero (00) people spend out of their past saving or borrowed income on consumption because they must eat in order to live. When income increases in the economy to the extent of Rs. 70 crores, but it is not enough to meet the consumption expenditure of Rs. 80 crores (negative saving). When both income and consumption expenditure are equal Rs. 140 cores, it is basic consumption level, where saving is zero. After this income is shown to increase by Rs. 70 crores and consumption by Rs. 60 crores i.e. saving by 10 crores. This implies a stable or constant consumption function during the short run as assumed by Keynes. Fig. 3.2 explains the above schedule diagrammatically. In the diagram, income is measured on X-axis and consumption is measured on Y-axis. 45° line i.e. Y = C line I the unity line where at all levels, consumption and income are equal. The C= a + bY curve is linear consumption function curve which is based on the assumption that in the short run consumption changes by the equal amount. C = a +bY curve slopes upward from left to right which indicated that consumption is an increasing function of income. It also indicated that at zero level of income consumption is positive to the extent of OA. At point B consumption function curve intersect to unity line where consumption is OC and income is OY. In the figure point B is the Break Even Point where consumption is equal to income (C = Y). Before the break even point consumption is greater than (C < Y). Above the break even point saving becomes positive and below the break even point saving becomes negative.

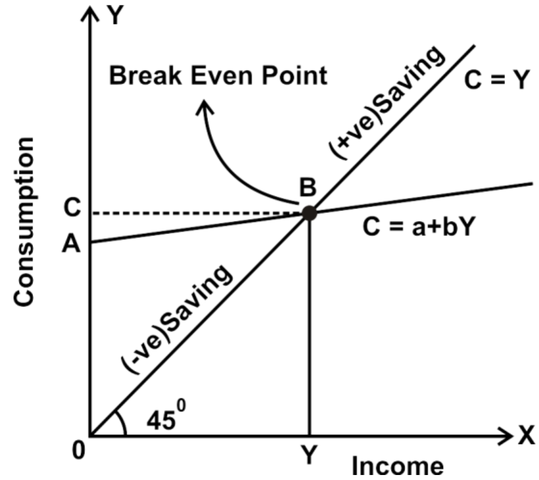


Figure 1.2

The concept of consumption function given by Lord J. M. Keynes is not a linear consumption function form as explained in figure 3.1, but it is in the form of non-linear (curve-linear) consumption function. To explain the concept of consumption function Keynes most probably never used any statistical information. When he wrote general theory, no time series data was available pertaining to national income or national expenditure for any country. Hence his law of consumption function is mainly based on general observation and deductive reasoning to discover relationship between income and consumption. Keynesian, theory of consumption has been empirically tested in the recent decades by the number of economists. The empirical proof of Keynes consumption function we will discuss in next section.

1.3 PROPERTIES OR TECHNICAL ATTRIBUTES OF CONSUMPTION FUNCTION

In this analysis Keynes has used two technical attributes or properties of consumption function.

(1) Average propensity to consume (APC), and
(2) Marginal propensity to consume (MPC)

(1) Average Propensity to Consume (APC): Average propensity to consume refers to the ratio of consumption expenditure to any particular level of income.

Symbolically: $APC = \frac{C}{Y}$ …..3.4

Where: C : Consumption
Y : Income

Average propensity to consume is expressed as the percentage or proportion of income consumed. The APC is shown in the following table 3.2 which shows that APC falls as income increases because the proportion of income spent on consumption decreases but APS (Average propensity to save) increases.

APS = 1 – APC …(1c) …..3.5

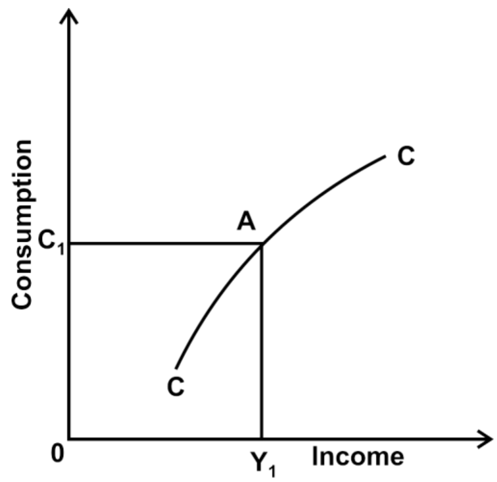


Figure 1.3

Diagrammatically APC is shown in figure 1.2 in which any point on consumption function curve measures the APC. I the figure point A measures the APC of the consumption function curve (CC) which is $\frac{OC_1}{OY_1}$. The flattening of the consumption function curve to the right shows declining APC.

(2) Marginal Propensity to Consume (MPC): Marginal propensity to consume refers to the rate of change in consumption to the change in income.

Symbolically: $MPC = \frac{\Delta C}{\Delta Y}$ …..3.6

Where: ΔC = Change in consumption
ΔY = Change in income

Marginal propensity to consume (MPC) is the rate of change in the average propensity to consume as income changes. In the table 3.2 MPC is constant at all level of income. The marginal propensity to save (MPS0 can be derived from the formula.

MPC = 1 – MPS …..3.7

MPS = 1 – MPC …..3.8

Table 1.2 : Consumption Function Schedule

(1) Income (Y)	(2) Consumption (C)	(3) Saving (S) (1) – (2) = (3)	(4) APC 2 + 1 = 4	(5) MPC $MPC = \frac{\Delta C}{\Delta Y}$	(6) APS 1 – APC	(7) MPS 1 – MPC
1,200	1,200	00	-	-	-	-
1,800	1,700	1,000	0.94	0.83	0.08	0.17
2,400	2,200	2,000	0.91	0.83	0.09	0.17
3,000	2,700	3,000	0.90	0.83	0.10	0.17
3,600	3,200	4,000	0.88	0.83	0.12	0.17

Table 3.2 shows that as income increases from Rs. 1,200, Rs. 2,400, Rs. 3,000, Rs. 3,600 etc., consumption also increases from Rs. 1,200, Rs. 1,700, Rs. 2,200, Rs. 2,700 and Rs. 3,200 respectively. But each level of increased income increases consumption at a constant rate. Therefore we get a straight line curve which slopes upward from left to right. Figure 3.3 shows that CC curve is linear consumption function curve which has positive slope. If income increases from OY_1 to OY_2, consumption will also increase from OC_1 to OC_2. The net change in income y_1 y_2 (Δy_1) leads to a net change in consumption to the extent of C_1C_2 (ΔC_1). As income increases, consumption also increases but at constant rate.

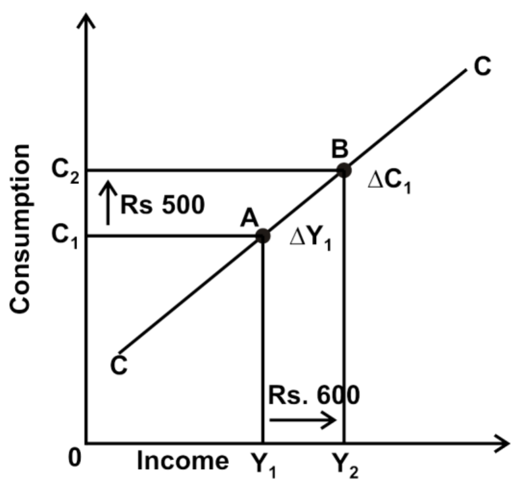


Figure 1.4

In figure 1.3 MPC is calculated as follows:

$$MPC = \frac{\Delta C}{\Delta Y} = \frac{\Delta C_1}{\Delta Y_1}$$

$$MPC = \frac{C_1C_2}{Y_1Y_2} = \frac{500}{600} = \frac{5}{6} = 0.83$$

In the above diagram and table the value of MPC is 0.83 at all level of income. If the value of MPC is falling then the slope of consumption function curve will be non-linear consumption curve shows that as income increases consumption also increases but at a diminishing rate.

Features of MPC:

(1) The value of MPC is greater that zero but less than one (0 < MPC < 1)

(2) MPC cannot be negative (always positive)

(3) As income increases MPC may fall.

(4) MPC may rise, fall or constant depends upon subjective and objective factors.

Relationship between APC and MPC:

(1) When the consumption function is linear (C = a + bY), MPC is constant but APC is declining as income increases.

(2) Ordinarily, APC and MPC both declines as income increases but MPC declines at a faster than decline in APC.

(3) If consumption function line passes through the origin, APC and MPC will be equal and constant.

Significance of MPC:

(1) According to Keynes the value of MPC will always lie between zero and one. (0 < MPC < 1)

(2) The MPC is important for filling the gap between income and consumption through planned investment to maintain desired level of income.

(3) The MPC is useful to the multiplier theory. Higher the MPC higher will be multiplier and vice versa.

1.4 INTRODUCTION OF SAVINGS AND INVESTMENT

In Keynesian Macro Economics, the various concepts have been considered at an aggregate level. The concepts like price are considered as a price level, saving as saving rate, investment as an investment level etc. the concepts of saving the investment has a significance in Macro Economics. In present chapter we will discuss the meaning of saving and investment, we'll proceed with types and determinants of investments. At the end of the topic we will study various approaches to saving and investment.

1.5 MEANING OF SAVING AND SAVING FUNCTION OR PROPENSITY TO SAVE

Saving can be considered with respect to income. Saving is that part of income which is not consume or not spent. In fact, individual income is bifurcated into consumption and saving i.e. some part of income is used to consume goods and services and the test is saved. Thus, saving has a close link with income level. It will change, if income changes. Simply that part of income which is not used for consumption can be treated as a saving. It can be further simplified with the following equations:

$$Y \equiv C + S \qquad \textbf{...(6.1)}$$

Where, Y = Income
C = Consumption
S = Saving

Equation 6.1 suggests that the income is identically equal with consumption and saving. This equation can be reframed as:

$$S \equiv Y - C \qquad \textbf{...(6.2)}$$

i.e. income minus consumption gives us savings. To consider changes in savings with respect to changes in income, the following equation can be given as:

$$\Delta S \equiv \Delta Y - \Delta C \qquad \textbf{...(6.3)}$$

Where, ΔS = change in saving
ΔY = change in income
ΔC = change in consumption

Thus, change in saving depends upon the change in income level. But since income is used for consumption and saving, the saving function can be derived with the help of consumption function.

Hence $Y = C + S$ **...(6.1)**
$C = a + bY$ **...(6.2)**

Now substitute equation (6.4) in equation (6.1)

Then $Y = a + bY + S$
$S = Y – a – bY$ where $(0 < [1 – b] < 1)$
$S = -a + Y – bY$
$S = -a + (1 - b)$ **...(6.5)**

So equation 6.5 is called as saving function equation.

The saving function is given in fig. 6.1 in Panel B. Panel A represents the consumption function. Initially when the disposable income is very low due to autonomous consumption worth consumption exceeds the income level. When income level is OY, consumption and income are the same. Thereafter the saving is generated.

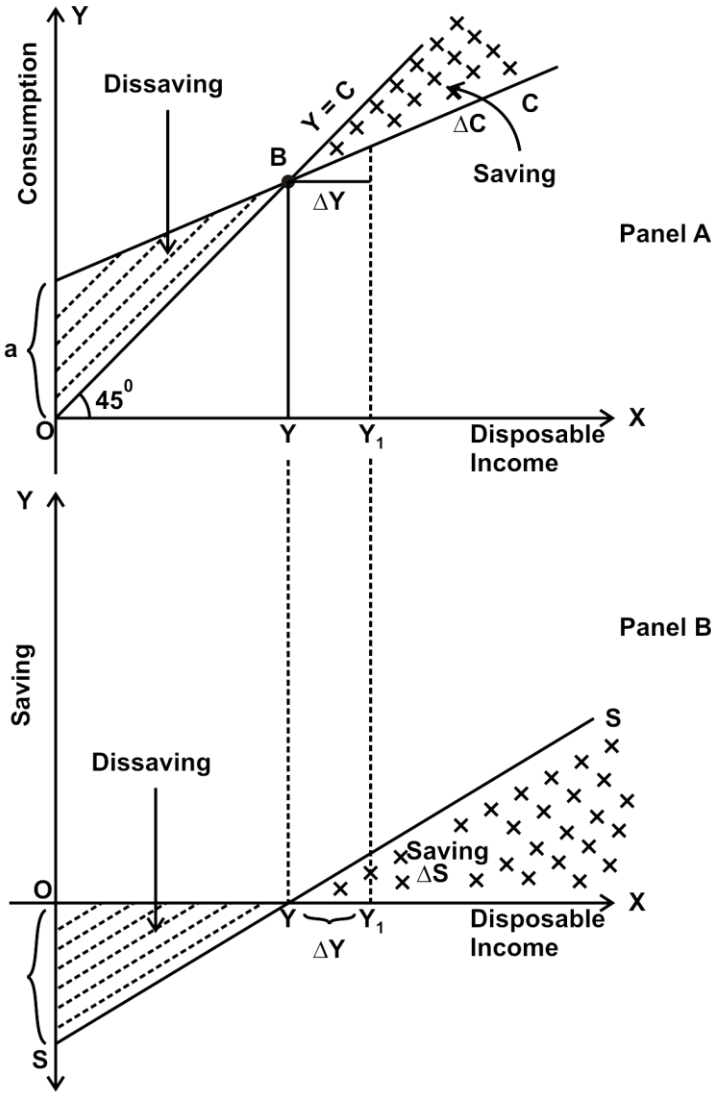


Figure 1.5

In panel B, line SS represents the saving function. When the disposable income is low in the beginning, due to autonomous consumption, there is a dis-saving. As income starts growing slowly and gradually, the dis-saving are reduced and at OY level of disposable income there is a zero saving (S =)), because the entire income is consumed, i.e. (Y = C). Distance Y – Y_1 is a change in disposable income (ΔY), which brings change in savings worth (ΔS). Thus, the link between income, consumption and saving can be understood with the help of the following table 1.4:

Income (Y)	= Consumption (C)	+	Saving (S)
0	400	+	-400
1000	800	+	200
2000	1600	+	400
3000	2400	+	600
4000	3200	+	800
5000	4000	+	1000

In this table initially income is shown as zero, still there is a consumption worth Rs. 400/-, this is an autonomous consumption which is matched by an exact amount of dis-saving worth Rs. 400/- (shown with –ve sign), in column 3. Thus, we realize that as an income increases, savings are also increased but less proportionately.

1.6 TECHNICAL ATTRIBUTES OF PROPENSITY TO SAVE

In simplest words, the propensity to save is nothing but a tendency to save. Every individual who earns income has a common tendency not to spend the entire amount, but to save some part of that income. This human tendency to save part of their income itself is a propensity to save. Technically speaking, the propensity to save is a ratio of total saving to total income.

There are technical attributes of propensity to save. They are:

A. Average Propensity to Save (APS): It is the ratio of total saving to total income. This ratio is given as S / Y. if the income is say Rs. 100/-, saving is say Rs. 40/- and then the Average Propensity to save will be (S/Y = 40 / 100), i.e. 40% of income is saved and remaining 60% of income is not saved i.e. consumed. Since APS is a counterpart of APC, both together constitute total income. Therefore, it is expressed as:

APC + APS = 1, or
APS + 1—APC

The Average Propensity to save can also be represented as:

$$APS = \frac{S}{Y} \qquad \textbf{...(6.6)}$$

B. Marginal Propensity to Save (MPS): It is the ratio of incremental (changing) saving to incremental (changing) income. This ratio is given as $\frac{\Delta S}{\Delta Y}$.

Where, ΔS = change in saving and
ΔY = change in income

If initial income is say Rs. 4000/- and the initial saving is say Rs. 800/- and now if income is increases by Rs. 1000/- and becomes Rs.5000/-. Thus, AY is Rs.1000/-. Due to this if the saving becomes Rs.1000/-, i.e. ΔS Rs. 200/-. Thus, here the Marginal propensity to save is $\left|\frac{\Delta S}{\Delta Y} \text{ i.e. } \frac{200}{1000}\right|$. This means that 20% of 1/5th of additional income is saved or not used for consumption. Since MPS is a counter part of MPS, both together constitute total additional income. Therefore, it is expressed as:

$$MPC + MPS = 1 \text{ or}$$
$$MPS = 1 - MPC$$

The Marginal Propensity to save can also be represented as:

$$MPS = \frac{\Delta S}{\Delta Y}$$

1.7 MEANING AND IMPORTANCE OF INVESTMENT

The concept of Investment has much significance in macro economic analysis. Investment is linked to the concept of savings. This concept of Investment has different meanings. Generally, it is considered as that part of money which is used for purchasing assets. It can also be termed as money spent on buying equities, securities, bonds and other instruments available in the capital market. It can also be considered as spending of money for buying gold, jewellery and other commodities. In modern times, Lord Keynes treated investments as investment which adds to the stock of capital, which helps to expand the production capacity as well as income and employment generations. Investments means the new expenditure incurred on addition of capital goods such as machines, tools, building etc.

Investment has a tremendous importance because it has a capacity to increase the rate of capital formation which is net addition to the existing stock of capital. Due to the investment it is possible to initiate different developmental projects which creates employment opportunities and simultaneously generates income in the economy. The rate of investment is an important determinant in maintaining rate of economic development. Investment plays a significant role in reducing unemployment as well as poverty in the economy. Thus, investment plays a pivotal role in changing economic situation in the country.

1.8 DETERMINANTS OF INVESTMENT

There are two basic determinants of investments:

a) The rate of profits or expected returns (Keynesian view)

b) The rate of interest (classical view).

a) Keynesian View: In modern times **J. M. Keynes** has considered the rate of expected returns as the major determinant of investment. Technically, it is called as a Marginal Efficiency of Capital (MEC). It is simply expected profit on the investment made by the entrepreneur. The marginal efficiency of capital, i.e. expected rate of profit on investment determines an entrepreneur's demand for investment. If an entrepreneur is expecting a good rate of MEC then he may increase his investment demand and vice-versa. Although, the MEC is an important determinant of investment, it is not the sole determinant of investment, but it has to be linked with the rate of interest, i.e.

$$I = f\,(\text{MEC, r}) \qquad \textbf{...(6.8)}$$

b) Classical View: According to classical economists the interest rate is the main governing factor of investment. According to them, investment demand by an entrepreneur depends on the existing rate of interest. They have given the investment demand function as:

$$I = f\,(r) \qquad \textbf{...(6.7)}$$

Where, I = the investment demand
R = the rate of interest

In this function, an reverse relationship between investment demand and the interest rate is expressed, i.e. higher the rate of interest, lower will be the demand for investment and vice-versa.

Relationship between Investment Determinants (MEC and r): It is obvious from the above explanation that if investment is to be profitable then the MEC or the expected profitability must be greater than the current market interest rate. This situation encourages entrepreneur to continue with the new investment. On the contrary, if expected profit on investment is less than the market interest rate the entrepreneur is discouraged and he will not continue with a new investments. The third possibility is the equality between the profitability and the market interest rate. In this situation the entrepreneur will be indifferent and he is reluctant to either raise or to curb down his investment. Thus, the relationship between interest rate and expected profitability together will determine the investment. In a nutshell it can be expressed as.

i) $\text{MEC} > r \rightarrow I\uparrow$
ii) $\text{MEC} < r \rightarrow I\downarrow$
iii) $\text{MEC} = r \rightarrow I$

1.9 THE KEYNESIAN MULTIPLIER

The concept of multiplier (α) is derived from the concept of marginal propensity to consume (MPC). It refers to the effect of change in the outlay on aggregate income through induced consumption expenditure.

It shows the change in Equilibrium income as a result of a change in some component of Autonomous expenditure by (1 unit)

Two-Sector Model (where Government Expenditure (G) = 0, Net Export (NX) = 0)

A) Investment Multiplier : Change in income due to change in investment is called investment multiplier (α).

$$\boxed{\alpha = \frac{1}{1-C}} \quad \text{Invesment multiplier where } C = MPC$$

Proof : Let I_1 be the initial investment

$$\therefore \quad y_1 = \frac{1}{1-C} \ \bar{C} + I_1 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(1)}$$

If investment increases to I_2

$$y_2 = \frac{1}{1-C} \ \bar{C} + I_2 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(2)}$$

Subtracting (2) from (1)

$$\text{i.e.} \quad y_2 - y_1 = \frac{1}{1-C} \ I_2 - I_1$$

$$\Delta y = \frac{1}{1-C} \Delta I$$

$$\boxed{\frac{\Delta y}{\Delta I} = \frac{1}{1-C} = \alpha}$$

Multiplier in Three Sector Model (where $NX = 0$)

B) Government Expenditure Multiplier :

It is the rate of change in equilibrium level of income as a result of change in government expenditure.

(i) $\alpha_G = \dfrac{1}{1-C}$ where T (tax) = 0

Proof : When T = 0

$$y_1 = \frac{1}{1-C} \ \bar{C} + \bar{I} + G_1 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(1)}$$

$$y_2 = \frac{1}{1-C} \ \bar{C} + \bar{I} + G_2 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(2)}$$

Subtracting (2) from (1)

$$y_2 - y_1 = \frac{1}{1-C} \;\; G_2 - G_1$$

$$\Delta y = \frac{1}{1-C} \Delta G$$

$$\frac{\Delta y}{\Delta G} = \frac{1}{1-C} = \alpha_G \qquad \text{Government expenditure multiplier}$$

(ii) $\alpha_G = \dfrac{1}{1-C}$ when T = T_a

Proof : When $T = T_a$

$$y = \bar{C} + C\alpha - C\bar{T} + \bar{I} + G$$

$$y - Cy = \bar{C} + \bar{I} + G$$

$$y \;\; 1-C \;\; = \bar{C} + \bar{I} + G$$

$$y_1 = \frac{1}{1-C} \;\; \bar{C} + \bar{I} + G \;\; \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.... \quad (1)$$

$$y_2 = \frac{1}{1-C} \;\; \bar{C} + \bar{I} + G_2 \;\; \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

$$\boxed{\frac{\Delta y}{\Delta G} = \frac{1}{1-C} = \alpha_G} \qquad \text{(Equation (2) – (1))}$$

(iii) $\alpha_G = \dfrac{1}{1-C+Ct}$ when T = ty

Proof : When T = ty

$$y = \bar{C} + c \;\; y - ty \;\; + I + G$$

$$y - cy + cty = \bar{C} + \bar{I} + G$$

$$y \;\; 1 - c + ct \;\; = \bar{C} + \bar{I} + G$$

$$y_1 = \frac{1}{1-c+ct} \;\; \bar{C} + \bar{I} + G_1 \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

$$y_2 = \frac{1}{1-C+Ct}\; \overline{C} + \overline{I} + G_2 \;\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

$$\frac{\Delta y}{\Delta G} = \frac{1}{1-C+Ct}$$

$$= \alpha_G > 0 \qquad \text{i.e. +ve}$$

C) Tax Multiplier : It is the rate of change in equilibrium level of income when there is a change in taxes

(i) $T = T_a$

$$y_1 = \frac{1}{1-C}\; \overline{C} - CT_1 + \overline{I} + G \;\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

$$y_2 = \frac{1}{1-C}\; \overline{C} - CT_2 + \overline{I} + G \;\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

$$\therefore \quad \Delta y = \frac{1}{1-C} - C\Delta T$$

$$\frac{\Delta y}{\Delta T} = \frac{-c}{1-c} = \alpha_T < 0$$

(ii) $T = ty$

$$\frac{\Delta y}{\Delta T} = \frac{1}{1-c-ct} = \alpha_t$$

D) Transfer Payment Multiplier : It is the rate of change in the equilibrium level of income as a result of change in transfer payment.

$$\boxed{\frac{\Delta y}{\Delta R} = \frac{c}{1-c} = \alpha_R}$$

$$y_1 = \frac{1}{1-c}\; \overline{c} - c\overline{T} + cR_1 + \dot{I} + \overline{G} \;\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (i)$$

$$y_2 = \frac{1}{1-c}\; \overline{c} - c\overline{T} + cR_2 + \dot{I} + \overline{G} \;\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (ii)$$

$$\therefore \quad \Delta y = \frac{1}{1-c} \square c\Delta R$$

$$\boxed{\frac{\Delta y}{\Delta R} = \frac{1}{1-c} = \alpha_R}$$

E) Balanced Budget Multiplier (BBM) : It states that if government spending and taxes change in equal amounts then income will change by an amount equal to the change in government expenditure and the value of multiplier will be = 1. this is called BBM or Balanced Government Multiplier.

Proof: $\alpha_G = \frac{1}{1-c}$

$$\alpha_T = \frac{-c}{1-c}$$

$$\alpha_G + \alpha_T = \frac{1}{1-c} - \frac{c}{1-c} = 1$$

Value of BBM will be 1 only under the following assumptions

(i) Transfer Payment = 0

(ii) T = Ta

As $\frac{\Delta y}{\Delta G}$ is always +ve and $\frac{\Delta y}{\Delta T}$ be always –ve

$\therefore$ sum of 2 will always be = 1 whatever be the value of c (MPC)

Even if T = G and $\Delta T = \Delta G$

Income will increase because the contradictory effect of increase in T is less than the expansionary effect of increase in G.

If government expenditure is financed by taxes which is equal to R (Transfer Payment) (i.e. no government purchase all government expenditure is a transfer payment)

Then, Value of BBM = 0

$$\Delta y = \frac{1}{1-c} \Delta R + \frac{-c}{1-c} \Delta c = 0$$

For eg: if $\Delta G = 5, \Delta T = 5, \ \Delta R = 5, \ MPC = c = \frac{3}{4}$

Then

(1) Government expenditure multiplier:

$$\frac{\Delta y}{\Delta G} = \frac{1}{1-\frac{3}{4}} = 4$$

$$\therefore \quad \boxed{\alpha_G = 4}$$

Thus, increase in G by 5 leads to an increase in income by 20

$$\left[\frac{\Delta y}{5} = 4 \text{ or } \Delta y = 20\right]$$

(2) Transfer payment multiplier:

$$\frac{\Delta y}{\Delta R} = \frac{3/4}{1 - 3/4} = 3$$

$\therefore \quad \alpha_R = 3$

Transfer payment of 5 increases income by 15

$$\left[\frac{\Delta y}{5} = 3 \text{ or } \Delta y = 15\right]$$

(3) Tax Multiplier:

$$\frac{\Delta y}{\Delta T} = \frac{-c}{1-c}$$

Thus, increase in tax by 5 decreases income by 15

$$\left[\text{i.e.} \frac{\Delta y}{5} = -3 \text{ or } \Delta y = -15\right]$$

$$\begin{aligned}\Delta y &= \frac{c}{1-c}\ \Delta R + \frac{-c}{1-c}\ \Delta T \\ &= 15 - 15 \\ &= 0\end{aligned}$$

Thus, value of BBM = 0 because the expansionary effect of an increase in R is offset by the concretionary effect of an increase in T.

F) The Multiplier : The concept of multiplier refers to effect of change in Autonomous spending on aggregate income through induced consumption expenditure, the value of multiplier depends on MPC. Greater the value of MPC, greater in the value of multiplier because a large fraction of additional income will be consumed. This will lead to an increase in demand.

The multiplier theory recognizes the fact that change in income due to change in investment is not instantaneous. It is a gradual process by which income changes. The process of change in income involves a time lag. Thus, the multiplier is a stage by stage computation of change in income resulting from a change in investment till the full affect of multiplier is not realised.

In Period 1

Let's assume autonomous spending increases $\Delta\overline{A}$ with Aggregate Output remaining constant AD > A0

Result $\rightarrow$ it will lead to decrease in inventories

In Period 2

Production will expand by $\Delta\overline{A}$

This increase in production will lead to an equal increase in income, and this increase in income in turn will lead to an increase in expenditure by $c\Delta\overline{A}$ is $AD > A0$

$\therefore$ Production in 3rd period will increase in expenditure by $c\Delta\overline{A}$

In Period 3

Production will be $c\Delta\overline{A}$

Result $\rightarrow$ income will increase

$\rightarrow$ AD will increase by $c^2\Delta\overline{A}$

Again AD > A0

Production in period 4 will increase by

$c^2\,\Delta\,\overline{A}$ A's MPC < 1

$c^2 < c$

$\therefore$ Induced expenditure in the period 3 will be less that the induced expenditure in the second period-

Period	Increase in demand	Increase in production	Total increase in income
1	$\Delta\overline{A}$	$\Delta\overline{A}$	$\Delta\overline{A}$
2	$c\Delta\overline{A}$	$c\Delta\overline{A}$	$1+c\ \Delta\overline{A}$
3	$c^2\Delta\overline{A}$	$c^2\Delta\overline{A}$	$1+c+c^2\ \Delta\overline{A}$
. .	. .	. .	. .
. .	. .	. .	. .
. .	. .	. .	. .
n	. .	. .	$\frac{1}{1-c}\Delta\overline{A}$

$$\Delta AD = \Delta\bar{A} + c\Delta\bar{A} + c^2\Delta\bar{A} + \;\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\text{(i)}$$

$$\Delta AD = \Delta\bar{A} + \; 1 + c + c^2 + ... \;\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\text{(ii)}$$

As increase in income is given by geometric series, and A's C <1, the successive terms in the series become progressively smaller

$\therefore$ Equation (ii) can be written as

$$\Delta AD = \frac{1}{1-c}\,\Delta\bar{A} = \Delta y_0$$

Thus, cumulative change in Aggregate spending equals multiple increase in Autonomous spending.

$$\boxed{\alpha \equiv \frac{1}{1-c}}$$

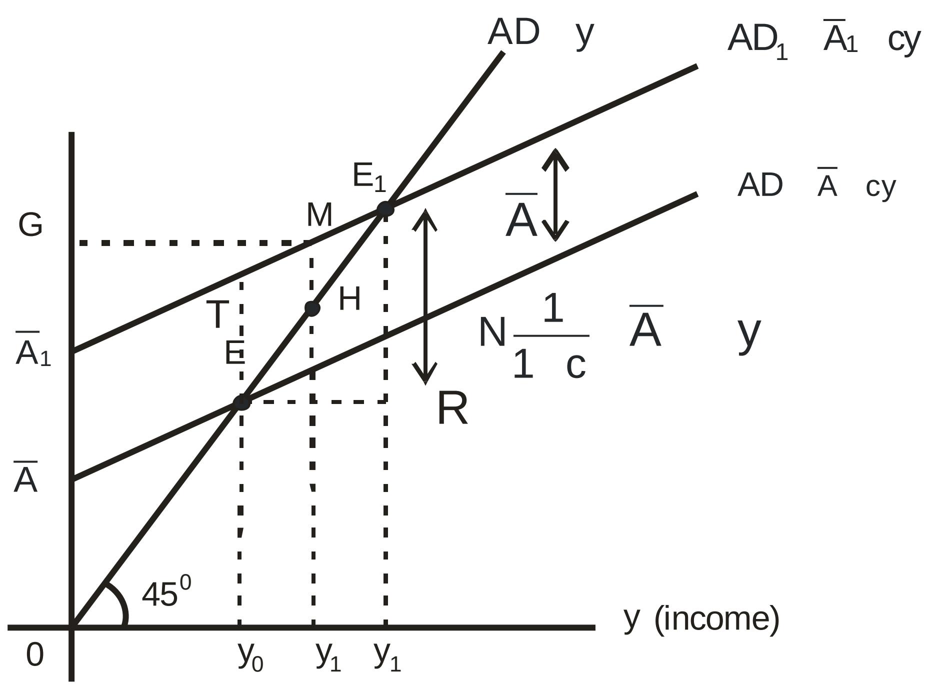


Figure 1.6

In above diagram:

Initial equilibrium is at point E

Initial equilibrium income level = $0y_0$

If Autonomous spending ($\bar{A}$) increases from $\bar{A}$ to $\bar{A}_1$

AD curve shifts upwards to AD_1, shift in AD curve means that at each income level AD will be higher by an amount $\Delta\bar{A}$, where $\boxed{\Delta\bar{A} \equiv \bar{A}_1 - \bar{A}}$

At initial output y_0

AD > A0

$TY_0 > EY_0$

Government affects the equilibrium income in two ways

(i) Government Purchases (G) are a component of AD

(ii) Taxes and Transfer affect the output income

Disposable income (y_d) = y + TR – TA

$$\begin{aligned} AD &= C + I + G + NX \\ &= \left[\bar{c} + c\overline{TR} + \bar{I} + \bar{G} + \overline{NX}\right] + c(1-t)y \\ &= \bar{A} + c(1-t)y \end{aligned}$$

$\boxed{y = \frac{1}{1-c(1-t)}\bar{A}}$ where 1 – c (1 – t) is the MPC out of income

Income tax lowers the multiplier because it reduces the induced increase in consumption out of changes in income due to taxes, AD curve become flat and the value of multiplier decreases

On the other hand, transfer payment raise Autonomous consumption expenditure and thus the value of multiplier increases.

As a result inventories will decrease

$\therefore$ firms will expand production.

Let's assume production increases to y_1. This will lead to rise in induced expenditure.

Result – aggregate demand increases to AD_1

But at this output AD > A0 by HM

This will again lead to an increase in production. The gap between AD and output decreases (HM < TE) because MPC < 1.

Process will continue till a balance between AD and A0 is not restored

Thus u at point E_1

At $E_1 \rightarrow$ AD = A0 is Aggregate demand = Aggregate output

Equilibrium level of income = $0y_2$ ($0y_2 > 0 > 0_1$)

$$\boxed{\Delta y_0 = y_2 - y_0}$$

The magnitude income changes will depend on:

1) $\Delta\overline{A}$ $\rightarrow$ Greater the increase in $\Delta\overline{A}$, larger is the change in income

2) MPC $\rightarrow$ Greater the MPC is, steeper the AD curve, larger is change in the income

G) Effect of a change in Fiscal Policy :

Fiscal Policy is the revenue and expenditure policy of the government.

Sources of revenue $\rightarrow$ taxes

Expenditure of the government $\rightarrow$ Government purchases and transfer payment

H) Effects of a change in Fiscal Policy on the equilibrium level of income :

a) A change in Government Purchases (ΔG**)**

Assume : Government Purchases Increase

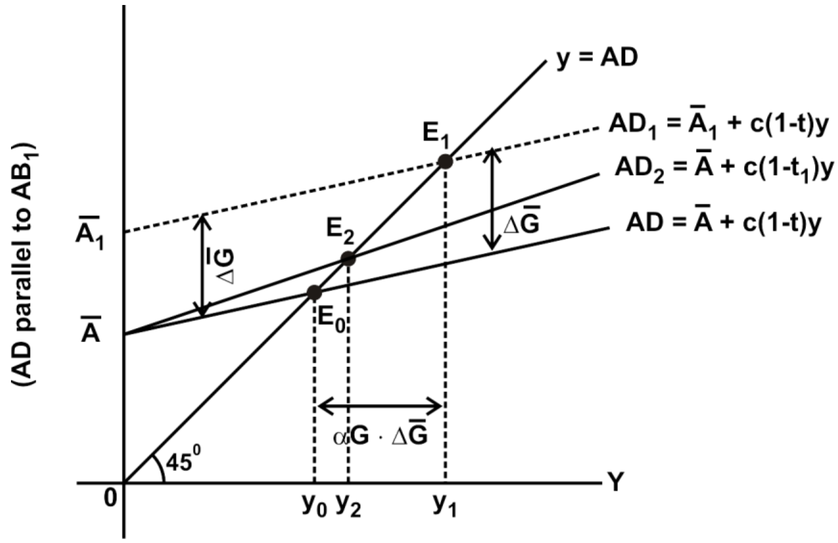


Figure 1.7

In the above diagram

Y_0 = Initial equilibrium level of output and income (where AD = A0)

If government expenditure increases, AD curve will shift upwards from AD to AD_1

At initial level of output (y_0) $\rightarrow$ AD > A0

Result – Inventories will decrease.

The firms will expand production until the new equilibrium is not reached.

This is at point E_1

Equilibrium level of income and output $\rightarrow$ y_1

$Y_1 > y_0$

The change in equilibrium income will be equal to the change in AD.

$$\Delta y_0 = \Delta\overline{G} + c\ \ 1-t\ \ \Delta y_0 \text{ where } \bar{c}, \overline{TR}, \bar{I}, \overline{NX} \text{ are constant}$$

OR
$$\Delta y_0 = \frac{1}{1-c\ \ 1-t}\Delta\overline{G} \qquad \text{where } \alpha_G = \frac{1}{1-c\ \ 1-t}$$
$$= \alpha_G\ \Delta\overline{G}$$

t = 0.5

For e.g.

$$\alpha_G = \frac{1}{1-0.6\ \ 1-0.5}$$

$$\boxed{\alpha_G = 1.4}$$

$$\Delta y\ = \alpha_G\ \Delta G$$

$$= 1.4\ \ 2$$

$$\boxed{\Delta y = 2.8}$$

Thus, in increase in government expenditure by E_2 increases the equilibrium level of income by E 2.80.

b) A change in Transfer Payment (ΔTR **)**

Assume: the government increases the transfer payments

$\bar{A}$ will increase by $c\Delta TR$

Output will increase by $\alpha_G\ c\Delta TR$

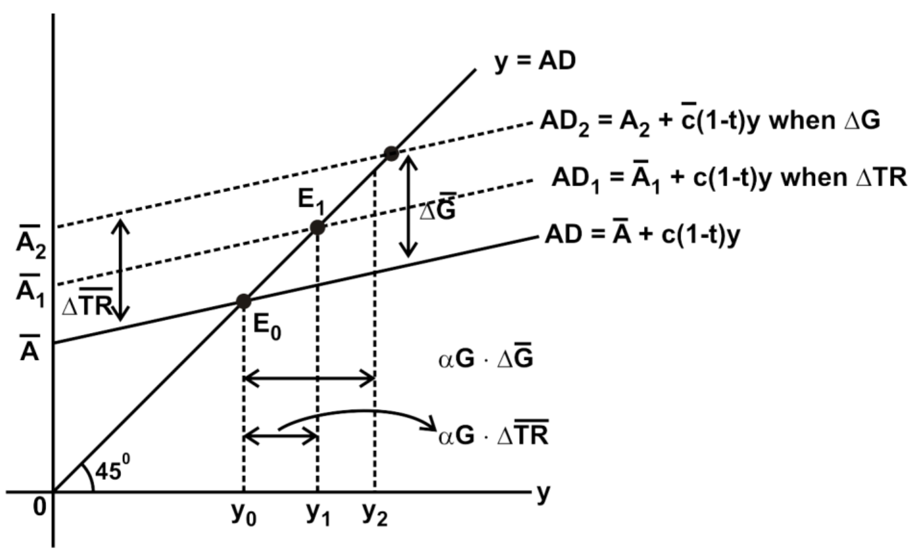


Figure 1.8

	Equilibrium Point	Equilibrium output and income
When ΔG	E_2	Y_2
When ΔTR	E_1	Y_2

$Y_2 > y_1$ (in the above diagram)

The increase in income due to increase in transfer payments is less than increase in income due to government spending (by a factor c). This is because a part of TR is saved is $\alpha_R < \alpha_G$ when $\alpha_R \rightarrow$ Transfer payment multiplier

$\alpha_G \rightarrow$ Government expenditure multiplier

c) A change in Marginal Tax Rates

Let's assume marginal tax rate increases AD_1 with tax = 0 will shift downwards to AD_2 became an increase in tax reduces the disposable income and therefore consumption.

In the above (b)

Equilibrium point shift from E_1 to E_2

Equilibrium level of income $\rightarrow y_2$

$Y_2 < y_1$ because the value of multiplier will be smaller.

Thus, due to tax the income falls.

Implication of Fiscal Policy : Fiscal Policy is used to stabilize the economy.

During Recession: Taxes should be reduced or government spending should be increased to increase the output

During Booms: Taxes should be increased or government spending should be creased to get back to the full employment level.

Government Budget

(1) Budget Surplus is the excess of the government is revenue (taxes) over its total expenditure.

$BS \equiv TA - \left[\overline{G} + \overline{TR}\right]$ …….(i) when T = Ta

$BS \equiv ty - \left[\overline{G} + \overline{TR}\right]$ ……...(ii) when T = ty

Budget Deficit

Expenditure > Revenue

- negative budget surplus

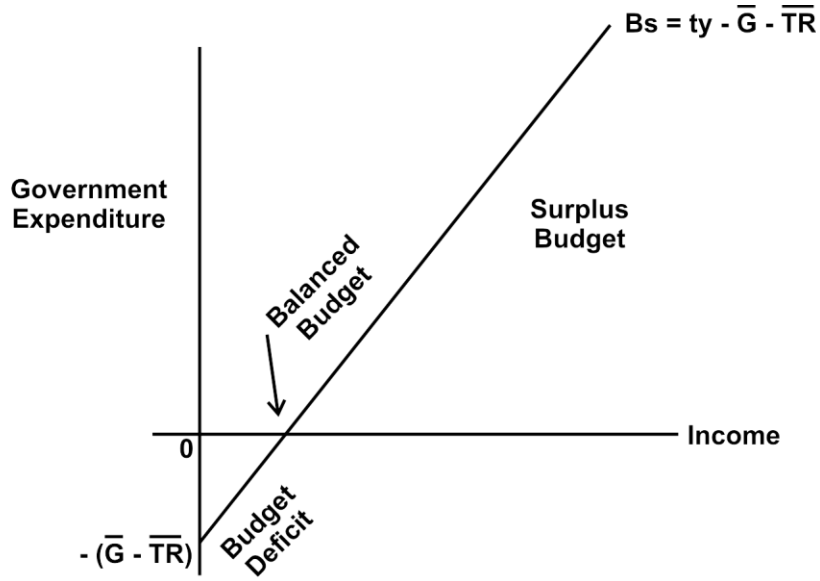


Figure 1.9

At low income level $\begin{pmatrix}\text{income level}\\ \text{less than N}\end{pmatrix} \rightarrow$ Deficit Budget

Because $\overline{G}+\overline{TR}>ty$

Budget surplus is negative

At income level N $\rightarrow$

Balanced Budget because $\overline{G}+\overline{TR}=ty$

Budget surplus $\equiv 0$

At income level after N $\rightarrow$ Budget surplus became

$\overline{G}+\overline{TR}<ty$

Budget surplus in positive.

The above diagram shows that the BD depends not only on $\overline{G}, \overline{TR}$ or t but also on any other factor that shifts the equilibrium income level.

I) Effects of ΔG and ΔTA on the Budget Surplus:

a) If Government Purchases increases-

Budget surplus reduces. This is because change in income ΔG due to increase in government purchases in equal to $\Delta y=\alpha_G \Delta\overline{G}$

A factor of this increase in income is collected in the form of taxes.

$\therefore$ the tax revenue increases by $t\,\alpha_G \Delta\overline{G}$

$$\Delta BS = \Delta TA - \Delta\overline{G}$$
$$= t\,\alpha_G \square \Delta\overline{G} - \Delta\overline{G}$$
$$= \Delta\overline{G}\left[\frac{t}{1-c\ \ 1-t} - 1\right]$$
$$= -\frac{1-c\quad 1-t}{1-c\ \ 1-t} \square \Delta\overline{G}$$

Thus, increase in government purchases reduces BS

b) When tax rate increases. This will lead to increase in the Budget Surplus.

c) When $\Delta G - \Delta TA$ (balanced budget multiplier) BS will be unchanged.

1.10 QUESTIONS

1. Explain the following:
   i) Saving
   ii) Investment
   iii) MPS
   iv) APS
   v) Real Investment
   vi) Induced Investment

2. Explain the validity of the following statements:
   i) Saving is zero, if income is zero
   ii) Saving is a function of interest rate
   iii) Saving is good to individual but bad to society
   iv) Investment is determined only by the rate of profit
   valid – (i, ii), Invalid – (iii, iv)

3. State and explain the Law of Propensity to save.

4. Discuss the two technical attributes of saving function.

5. Bring out the meaning and significance of investment.

6. Write short notes on:
   a) Saving Function
   b) Relationship between MPS and APS
   c) Determinants of investment
   d) Classical and Keynesian approach about saving and investment
   e) Types of investments.

❖❖❖❖

2

THE IS-LM MODEL

Unit Structure

2.0 OBJECTIVES

After having studied this unit, you should be able

- To Understand the fundamentals of The IS-LM model and Adjustment towards equilibrium
- To know the nature of Monetary policy, the transmission mechanism and the liquidity trap
- To understand the Fiscal policy and Monetary policy
- To understand that both fiscal and monetary policy can be used to stabilize the economy.
- To know the effect of fiscal policy is reduced by crowding out: Increased government spending increases interest rates, reducing investment and partially offsetting the initial expansion in aggregate demand.

2.1 INTRODUCTION

THE GOODS MARKET AND MONEY MARKET: LINKS BETWEEN THEM

The Keynes in his analysis of national income explains that national income is determined at the level where aggregate demand (i.e. aggregate expenditure) for consumption and investment goods (C + I) equals aggregate output. In other words, in Keynes' simple model the level of national income is shown to be determined by the goods market equilibrium. In this simple analysis of equilibrium in the goods market Keynes considers investment to be determined by the rate of interest along with the marginal efficiency of capital and is shown to be independent of the level of national income. The rate of interest, according to Keynes, is determined by money market equilibrium by the demand for and supply of money. In this Keynes' model, changes in rate of interest either due to change in money supply or change in demand for money will affect the determination of national income and output in the goods market through causing changes in the level of investment. In this way changes in money market equilibrium influence the determination of national income and output in the goods market.

This extended Keynesian model is therefore known as IS-LM Curve model. In this model they have shown how the level of national income and rate of interest are jointly determined by the simultaneous equilibrium in the two interdependent goods and money markets.

2.2 GOODS MARKET EQUILIBRIUM : THE DERIVATION OF THE IS CURVE

The IS-LM curve model emphasizes the interaction between the goods and money markets. The goods market is in equilibrium when aggregate demand is equal to income. The aggregate demand is determined by consumption demand and investment demand. In the Keynesian model of goods market equilibrium we also now introduce the rate of interest as an important determinant of investment. With this introduction of interest as a determinant of investment, the latter now becomes an endogenous variable in the model. When the rate of interest falls the level of investment increases and vice versa.

In the derivation of the IS Curve we seek to find out the equilibrium level of national income as determined by the equilibrium in goods market by a level of investment determined by a given rate of interest. Thus IS curve relates different equilibrium levels of national income with various rates of interest. As explained above, with a fall in the rate of interest, the planned investment will increase which will cause an upward shift in aggregate demand function (C + I) resulting in goods market equilibrium at a higher level of national income.

The lower the rate of interest, the higher will be the equilibrium level of national income.

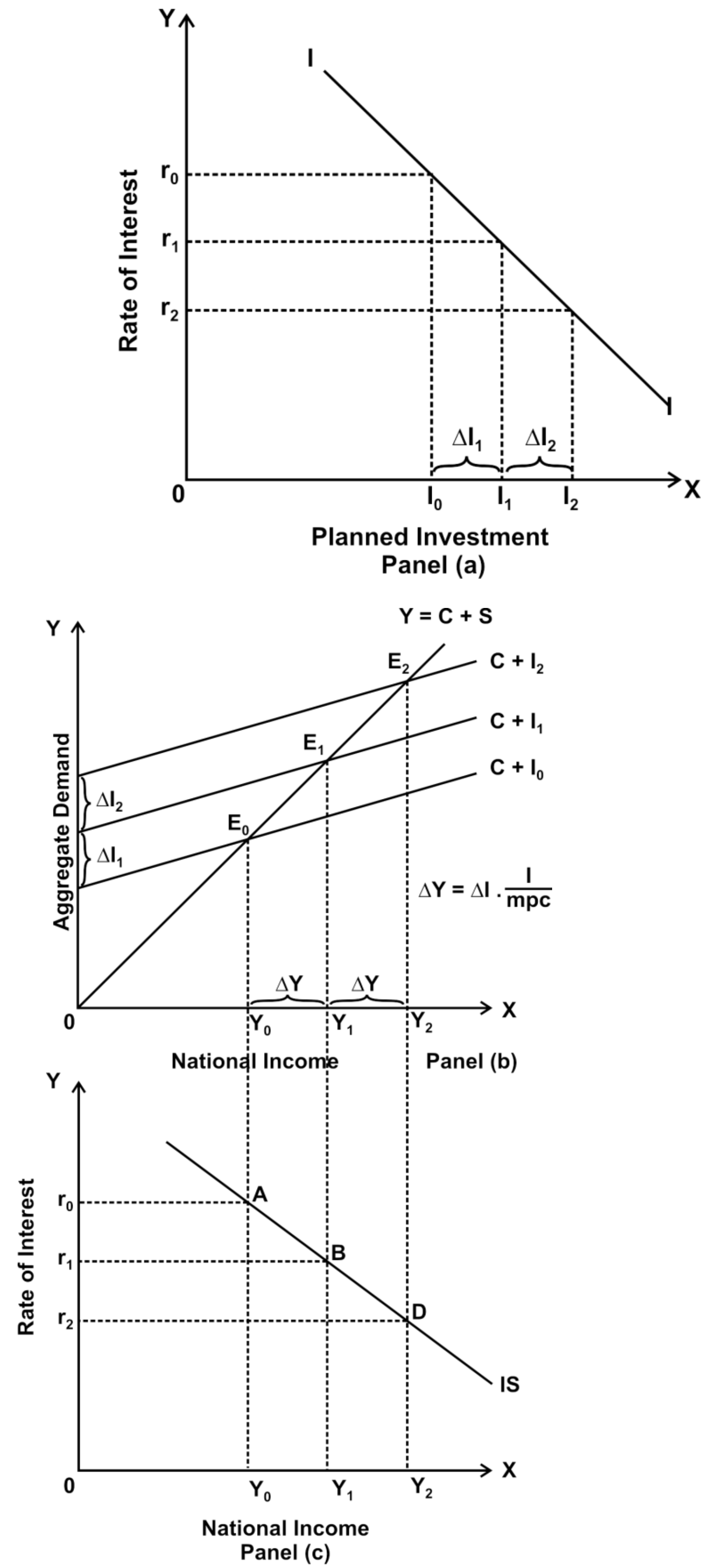


Figure : 2.1 Derivation Of IS curve: linking rate of interest with National Income through Investment and Aggregate demand

Thus, the IS curve is the locus of those combinations of rate of interest and the level of national income at which goods market is in equilibrium. How the IS curve is derived is illustrated in Fig: 2.1. In panel (a) of Fig.2.1 the relationship between rate of interest and planned investment is depicted by the investment demand *curve II.* It will be seen from panel (a) that at rate of interest Or_0 the planned investment is equal to OI_0.

With OI_0 as the amount of planned investment, the aggregate demand curve is ($C + I_0$). which, as will be seen in panel (b) of Fig. 2.1 equals aggregate output at $0Y_0$ level of national income. Therefore, in the panel (c) at the bottom of the Fig. 2.1, against rate of interest Or_0, level of income equal to $0Y_0$ has been plotted. Now, if the rate of interest falls to Or_1, the planned investment by businessmen increases from OI_0 to OI_1 [see panel (a)].

With this increase in planned investment, the aggregate demand curve shifts upward to the new position $C + I_1$ in panel (b), and the goods market is in equilibrium at OY_1 level of national income. Thus, in panel (c) at the bottom of Fig. 3.1 the level of national income OY_1 is plotted against the rate of interest, Or_1. With further lowering of the rate of interest to Or_2, the planned investment increases to OI_2 (see panel 'a'). With this further rise in planned investment the aggregate demand curve in panel (b) shifts upward to the new position $C + I_2$ corresponding to which goods market is in equilibrium at OY_2 level of income.

Therefore in panel (c) the equilibrium income 0Y2 is shown against the interest rate Or_2. By joining points A, B, D representing various interest-income combinations at which goods market is in equilibrium we obtain **the IS Curve**. It will be observed from Fig. 2.1 that the IS Curve is downward sloping (i.e., has a negative slope) which implies that when rate of interest declines, the equilibrium level of national income increases.

2.2.1 Shift in IS Curve

It is important to understand what determines the position of the IS curve and what causes shifts in it. It is the level of autonomous expenditure which determines the position of the IS curve and changes in the autonomous expenditure cause a shift in it. By autonomous expenditure we mean the expenditure, be it investment expenditure, the Government spending or consumption expenditure which does not depend on the level of income and the rare of interest. The government expenditure is an important type of autonomous expenditure. Note that the Government expenditure which is determined by several factors as well as by the policies of the Government does not depend on the level of income and the rate of interest.

Similarly, some consumption expenditure has to be made if individuals have to survive even by borrowing from others or by spending their savings made in the past year. Such consumption expenditure is a sort of autonomous expenditure and changes in it do not depend on the changes in income and rate of interest. Further, autonomous changes in investment can also occur.

In the goods market equilibrium of the simple Keynesian model the investment expenditure is treated as autonomous or independent of the level of income and therefore does not vary as the level of income increases. However, in the complete Keynesian model, the investment spending is thought to be determined by the rate of interest along with marginal efficiency of investment. Following this complete Keynesian model, in the derivation of the IS curve we consider the - level of investment and changes in it as determined by the rate of interest along with marginal efficiency of capital. However, there can be changes in investment spending autonomous or independent of the changes in rate of interest and the level of income.

2.3 MONEY MARKET EQUILIBRIUM : DERIVATION OF LM CURVE

Derivation of the LM Curve

The LM curve can he derived from the Keynesian theory from its analysis f money market equilibrium. According to Keynes, demand for money to hold depends upon transactions motive and speculative motive. It is the money held for transactions motive which is a function of income. The greater the level of income, the greater the amount of money held for transactions motive and therefore higher the level of money demand curve.

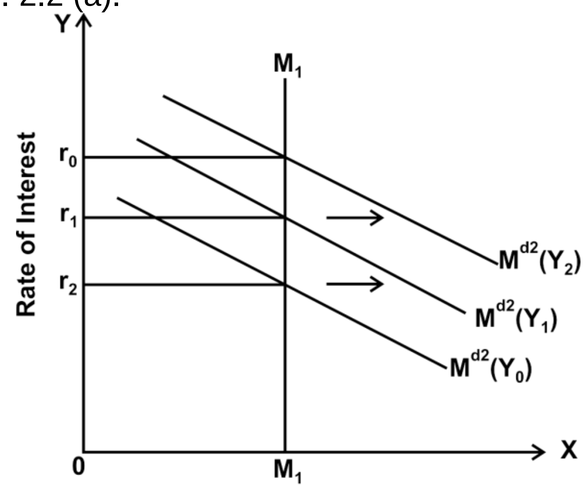
The demand for money depends on the level of income because they have to finance their expenditure, that is, their transactions of buying goods and services. The demand for money also depends on the rate of interest which is the cost of holding money. This is because by holding money rather than lending it and buying other financial assets, one has to forgo interest. Thus demand for money (Md) can be expressed as:

$$Md = L(Y, r)$$

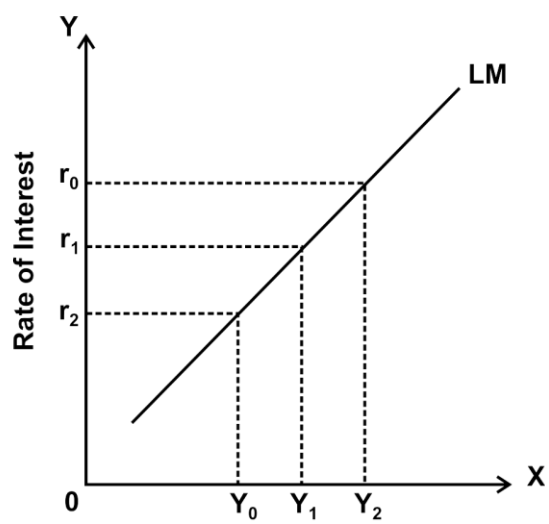
where **Md** stands for demand for money, **Y** for real income and **r** for rate of interest.

Thus, we can draw a family of money demand curves at various levels of income. Now, the intersection of these various money demand curves corresponding to different income levels with the supply curve of money fixed by the monetary authority would gives us the LM curve.

The LM curve relates the level of income with the rate of interest which is determined by money-market equilibrium corresponding to different levels of demand for money. The LM curve tells what the various rates of interest will be (given the quantity of money and the family of demand curves for money) at different levels of income. But the money demand curve or what Keynes calls the liquidity preference curve alone cannot tell us what exactly the rate of interest will be. In Fig. 2.2 (a) and (b) we have derived the LM curve from a family of demand curves for money. As income increases, money demand curve shifts outward and therefore the rate of interest which equates supply of money with demand for money rises. In Fig. 2.2 (b) we measure income on the X-axis and plot the income level corresponding to the various interest rates determined at those income levels through money market equilibrium by the equality of demand for and the supply of money in Fig. 2.2 (a).



Quantity of Money
(a) Equilibrium in the Money Market at various Levels of Income



Level of Income
(b) Constructing the LM Curve

Figure : 2.2 derivation of LM curve

2.4 INTERSECTION OF IS AND LM CURVES: SIMULTANEOUS EQUILIBRIUM OF THE GOODS MARKET & MONEY MARKET.

The IS and the LM curves relate the two variables: (a), income and (b) the rate of interest. Income and the rate of interest are therefore determined together at the point of intersection of these two curves, i.e., E in Fig. 2.3. The equilibrium rate of interest thus determined is Or2 and the level of income determined is At this point income and the rate of interest stand in relation to each other such that (1) the goods market is in equilibrium, that is, the aggregate demand equals the level of aggregate output, and (2) the demand for money is in equilibrium with the supply of money (i.e., the desired amount of money is equal to the actual supply of money). It should be noted that LM curve has been drawn by keeping the supply of money fixed.

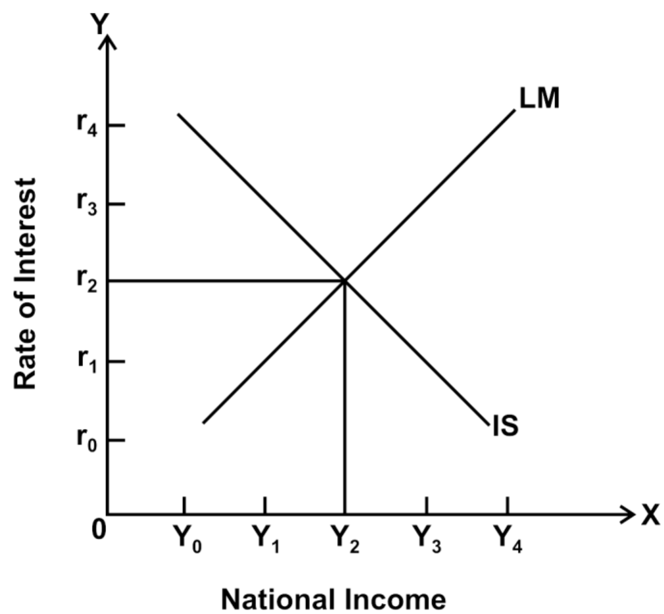


Figure: 2.3 The IS and LM Curves Combined: The Joint Determination of the Interest Rate and the Income Level

Thus, the IS-LM curve model is based on: (1) the investment-demand function, (2) the consumption function, (3) the money demand function, and (4) the quantity of money. We see, therefore, that according to the IS-LM curve model both the real factors, namely, productivity, thrift, and the monetary factors, that is, the demand for money (liquidity preference) and supply of money play a part in the joint determination of the rate of interest and the level of income. Any change in these factors will cause shift in IS or LM curve and will therefore change the equilibrium levels of the rate of interest and income.

2.4.1 Effect of Changes in Supply of Money on the Rate of Interest and Income Level

Let us first consider what will happen if the supply of money is increased by the action of the Central Bank. Given the liquidity preference schedule, with the increase in the supply of money, more money will be available for speculative motive at a given level of income which will cause the interest rate to fall. As a result, the LM curve will shift to the right. With this rightward shift in the LM curve, in the new equilibrium position, rate of interest will be lower and the level of income greater than before.

This is shown in Fig. 2.4 where with a given supply of money, LM and IS curves intersect at point E. With the increase in the supply of money, LM curve shifts to the right to the position LM', and with IS schedule remaining unchanged, new equilibrium is at point G corresponding to which rate of interest is lower and level of income greater than at E. Now, suppose that instead of increasing the supply of money, Central Bank of the country takes steps to reduce the supply of money. With the reduction in the supply of money, less money will be available for speculative motive at each level of income and, as a result, the LM curve will shift to the left of E, and the IS curve remaining unchanged, in the new equilibrium position (as shown by point T in Fig. 2.4) the rate of interest will be higher and the level of income smaller than before.

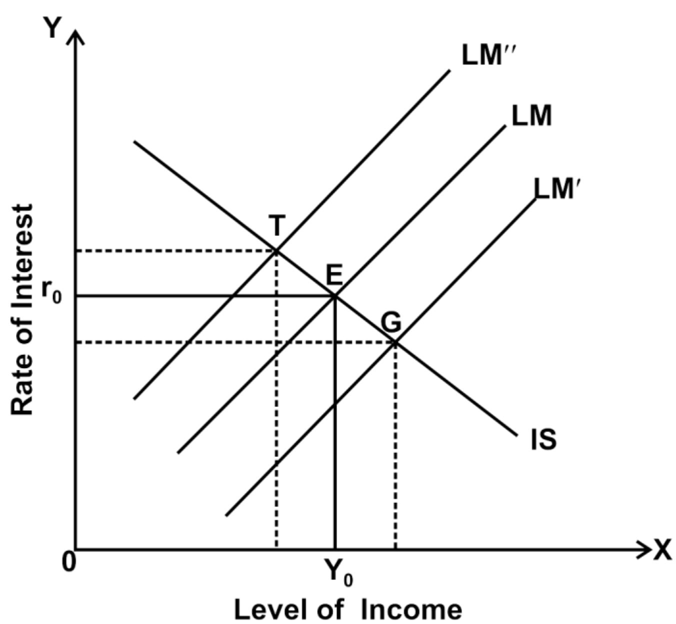


Figure : 2.4 :**Impact of change in Money supply**

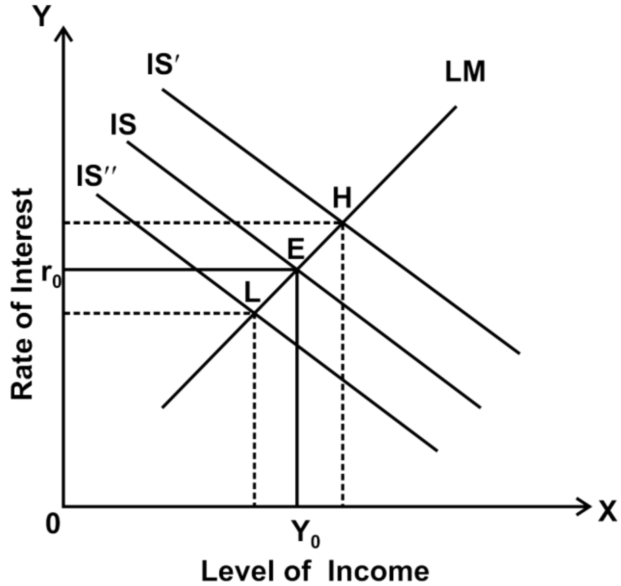


Figure : 2.5 :Impact of change in propensity to save

2.4.2 Changes in the Desire to Save or Propensity to Consume

Let us consider what happens to the rate of interest when desire to save or in other words, propensity to consume changes. When people's desire to save falls, that is, when propensity to consume rises, the aggregate demand curve will shift upward and, therefore, level of national income will rise at each rate of interest. As a result, the IS curve will shift outward to the right. In Fig. 3.5 suppose with a certain given fall in the desire to save (or increase in the propensity to consume), the IS curve shifts rightward to the dotted position IS'.

With LM curve remaining unchanged, the new equilibrium position will be established at H corresponding to which rate of interest as well as level of income will be greater than at E. Thus, a fall in the desire to save has led to the increase in both rate of interest and level of income. On the other hand, if the desire to save rises, that is, if the propensity to consume falls, aggregate demand curve will shift downward which will cause the level of national income to fall for each rate of interest and as a result the IS curve will shift to the left.

With this, and LM curve remaining unchanged, the new equilibrium position will be reached to the left of E, say at point L (as shown in Fig. 2.5) corresponding to which both rate of interest and level of national income will be smaller than at E.

MONETARY POLICY

In IS-LM model it is shown how an increase in the quantity of money affects the economy, increasing the level of output by reducing interest rates. In the United States, Federal Reserve System, a quasi-independent part of the government, is responsible for monetary policy.

We take here the case of an open market purchase of bonds. The Fed pays for the bonds it buys with money that it can create. One can usefully think of the Fed as “printing” money with which to buy bonds, even though that is not strictly accurate. When the Fed buys bonds, it reduces the quantity of bonds available in the market and thereby tends to increase their price, or lower their yield— only at a lower interest rate will the public be prepared to hold a smaller fraction of its wealth in the form of bonds and a larger fraction in the form of money.

Figure 2.6 shows graphically how an open market purchase works. The initial equilibrium at point E is on the initial LM schedule that corresponds to a real money supply, M¯/P¯. Now consider an open market purchase by the Fed. This increases the nominal quantity of money and, given the price level, the real quantity of money. As a consequence, the LM schedule will shift to LM’. The new equilibrium will be at point E’, with a lower interest rate and a higher level of income. The equilibrium level of income rises because the open market purchase reduces the interest rate and thereby increases investment spending.

By experimenting with Figure 2.6, you will be able to show that the steeper the LM schedule, the larger the change in income. If money demand is very sensitive to the interest rate (corresponding to a relatively flat LM curve), a given change in the money stock can be absorbed in the assets markets with only a small change in the interest rate. The effects of an open market purchase on investment spending would then be small. By contrast, if the demand for money is not very sensitive to the interest rate (corresponding to a relatively steep

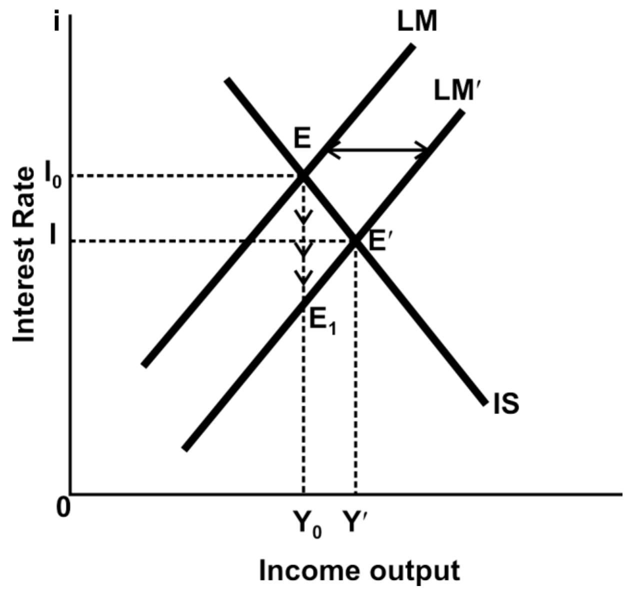


Figure: 2.6 Monetary Policy- Increase in the Real money stock shifts LM curve to the right.

LM curve), a given change in the money supply will cause a large change in the interest rate and have a big effect on investment demand. Similarly, if the demand for money is very sensitive to income, a given increase in the money stock can be absorbed with a relatively small change in income and the monetary multiplier will be smaller.

Consider next the process of adjustment to the monetary expansion. At the initial equilibrium point, E, the increase in the money supply creates an excess supply of money to which the public adjusts by trying to buy other assets. In the process, asset prices increase and yields decline. Because money and asset markets adjust rapidly, we move immediately to point E1, where the money market clears and where the public is willing to hold the larger real quantity of money because the interest rate has declined sufficiently. At point E1, however, there is an excess demand for goods. The decline in the interest rate, given the initial income level Y_o, has raised aggregate demand and is causing inventories to run down. In response, output expands and we start moving up the LM' schedule. Why does the interest rate rise during the adjustment process? Because the increase in output raises the demand for money, and the greater demand for money has to be checked by higher interest rates.

Thus, the increase in the money stock first causes interest rates to fall as the public adjusts its portfolio and then—as a result of the decline in interest rates—increases aggregate demand.

2.5 THE TRANSMISSION MECHAMSM

Two steps in the transmission mechanism :-the process by which changes in monetary policy affect aggregate demand are essential. The first is that an increase in real balances generates a portfolio disequilibrium; that is, at the prevailing interest rate and level of income, people are holding more money than they want. This causes portfolio holders to attempt to reduce their money holdings by buying other assets, thereby changing asset prices and yields. In other words, the change in the money supply changes interest rates. The second stage of the transmission process occurs when the change in interest rates affects aggregate demand.

These two stages of the transmission process appear in almost every analysis the effects of changes in the money supply on the economy. The details of the analyses will often differ—some analyses will have more than two assets and more than one interest rate; some will include an influence of interest rates on other categories of demand, in particular consumption and spending by local government.

Table : The Transmission Mechanism			
(1)>>>>>>>>>>>>> Change in Real Money Supply	**(2)>>>>>>>>>>>>> Portfolio adjustments lead to a change in asset prices and interest rates.**	**(3)>>>>>>>>>> Spending adjusts to changes in interest rates.**	**(4) Output adjusts to the change in aggregate demand.**

The above Table provides a summary of the stages in the transmission mechanism. There are two critical links between the change in real balances (i.e., the real money stock) and the ultimate effect on income. First, the change in real balances, by bringing about portfolio disequilibrium, must lead to a change in interest rates. Second, that change in interest rates must change aggregate demand. Through these two linkages, changes in the real money stock affect the level of output in the economy. But that outcome immediately implies the following: If portfolio imbalances do not lead to significant changes in interest rates, for whatever reason, or if spending does not respond to changes in interest rates, the link between money and output does not exist. We now study these linkages in more detail.

2.6 THE LIQUIDITY TRAP

In discussing the effects of monetary policy on the economy, two extreme cases have received much attention. The first is the liquidity trap, a situation in which the public is prepared, at a given interest rate, to hold whatever amount of money is supplied. This implies that the LM curve is horizontal and that changes in the quantity of money do not shift it. In that case, monetary policy carried out through open market operations has no effect on either the interest rate or the level of income. In the liquidity trap, monetary policy is powerless to affect the interest rate.

The possibility of a liquidity trap at low interest rates is a notion that grew out of the theories of the great English economist John Maynard Keynes. Keynes himself did state, though, that he was not aware of there ever having been such a situation.*** The liquidity trap is rarely relevant to policymakers, with the exception of a special case discussed in the above table. But the liquidity trap is a useful expositional device for understanding the consequences of a relatively flat LM curve.

2.7 FISCAL POLICY AND CROWDING OUT

This section shows how changes in fiscal policy shift the IS curve, the curve that describes equilibrium in the goods market. Recall that the IS curve slopes downward because a decrease in the interest rate increases investment spending, thereby increasing aggregate demand and the level of output at which the goods market is in equilibrium. Recall also that changes in fiscal policy shift the IS curve. Specifically, a fiscal expansion shifts the IS curve to the right.

The equation of the IS curve, derived in last chapter, is repeated here for convenience:

$$Y = \alpha G(\bar{A} - bi) \qquad \alpha G = \frac{1}{1-c\,(1-t)} \qquad (3)$$

Note that G□, the level of government spending, is a component of autonomous spending, A□ , in equation (3). The income tax rate, t, is part of the multiplier. Thus, both government spending and the tax rate affect the IS schedule.

2.7.1 INCREASE IN GOVERNMENT SPENDING

We now show, in Figure 2.7, how a fiscal expansion raises equilibrium income and the interest rate. At unchanged interest rates, higher levels of government spending increase the level of aggregate demand. To meet the increased demand for goods, output must rise. In Figure 2.7, we show the effect of a shift in the IS schedule. At each level of the interest rate, equilibrium income must rise by ac times the increase in government spending. For example, if government spending rises by 100 and the multiplier is 2, equilibrium income must increase by 200 at each level of the interest rate. Thus the IS schedule shifts to the right by 200.

If the economy is initially in equilibrium at point E and government spending rises by 100, we would move to point E" f the interest rate stayed constant. At E" the goods market is in equilibrium in that planned spending equals output. But the money market is no longer in equilibrium. Income has increased, and therefore the quantity of money demanded is higher. Because there is an excess demand for real balances, the interest rate rises. Firms' planned investment spending declines at higher interest rates and thus aggregate demand falls off.

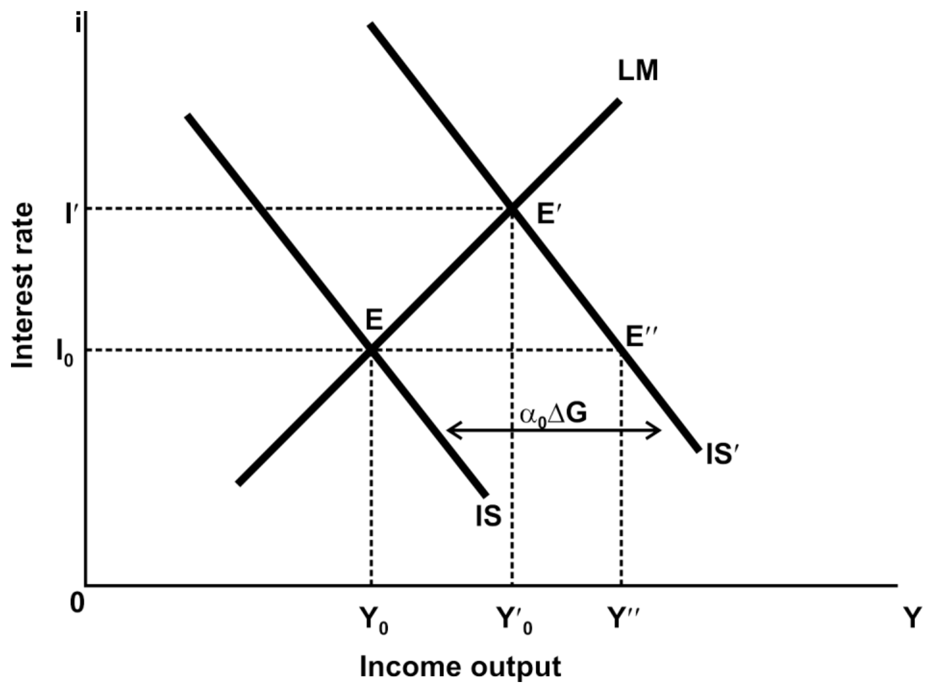


Figure: 2.7 Increased government spending increases aggregate demand, shifting the IS curve to the right.

What is the complete adjustment, taking into account the expansionary effect higher government spending and the dampening effects of the higher interest rate C private spending? Figure 2.7 shows that only at point E' do both the goods and mo markets clear. Only at point E' is planned spending equal to income and, at the same time, the quantity of real balances demanded equal to the given real money stock. point E' is therefore the new equilibrium point.

2.8 CROWDING OUT

Comparing E' to the initial equilibrium at E, we see that increased government spending raises both income and the interest rate. But another important comparison is between points E' and E", the equilibrium in the goods market at unchanged interest rates. Point E" corresponds to the equilibrium. When we neglected impact of interest rates on the economy. In comparing E" and E', it becomes clear that the adjustment of interest rates and their impact on aggregate demand dampen the expansionary effect of increased government spending. Income, instead of increasing to level Y", rises only to Y'_o.

The reason that income rises only to Y'_o rather than to Y" is that the rise in interest rate from i_o to i ' reduces the level of investment spending. We say that the increase in government spending crowds out investment spending. Crowding out occurs when expansionary fiscal policy causes interest rates to rise, thereby reducing private spending, particularly investment.

What factors determine how much crowding out takes place? In other words, what determines the extent to which interest rate adjustments dampen the output expansion induced by increased government spending? By drawing for yourself different IS and LM schedules, you will be able to show the following:

• Income increases more, and interest rates increase less, the flatter the LM schedule.

• Income increases less, and interest rates increase less, the flatter the IS schedule.

• Income and interest rates increase more the larger the multiplier, αG, and thus the larger the horizontal shift of the IS schedule.

In each case the extent of crowding out is greater the more the interest rate increases when government spending rises.

To illustrate these conclusions, we turn to the two extreme cases we discussed in connection with monetary policy, the liquidity trap and the classical case.

2.8.1 THE LIQUIDITY TRAP

If the economy is in the liquidity trap, and thus the LM curve is horizontal, an increase in government spending has its full multiplier effect on the equilibrium level of income. There is no change in the interest rate associated with the change in government spending, and thus no investment spending is cut off. There is therefore no dampening of the effects of increased government spending on income.

You should draw your own IS-LM diagrams to confirm that if the LM curve is horizontal, monetary policy has no impact on the equilibrium of the economy and fiscal policy has a maximal effect. Less dramatically, if the demand for money is very sensitive to the interest rate, and thus the LM curve is almost horizontal, fiscal policy changes have a relatively large effect on output and monetary policy changes have little effect on the equilibrium level of output.

2.8.2 THE CLASSICAL CASE AND CROWDING OUT

If the LM curve is vertical, an increase in government spending has no effect on the equilibrium level of income and increases only the interest rate. This case, already noted when we discussed monetary policy, is shown in Figure:-2.8(a), where an increase in government spending shifts the IS curve to IS' but has no effect on income. If the demand for money is not related to the interest rate, as a vertical LM curve implies, there is a unique level of income at which the money market is in equilibrium.

Thus, with a vertical LM curve, an increase in government spending cannot change the equilibrium level of income and raises only the equilibrium interest rate. But if government spending is higher and output is unchanged, there must be an offsetting reduction in private spending. In this case, the increase in interest rates crowds out an amount of private (particularly investment) spending equal to the increase in government spending. Thus, there is full crowding out if the LM curve is vertical.*

*Note that, in principle, consumption spending could be reduced by an increase in the interest rate, so both investment and consumption would be crowded out. Further, we can see, fiscal expansion can also crowd out net exports.

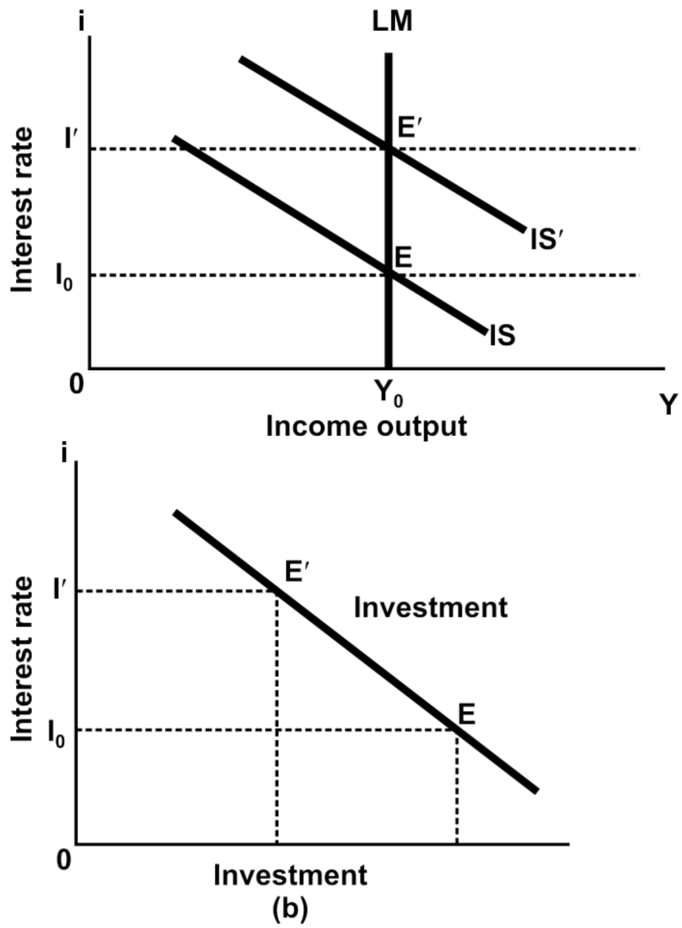


Figure 2.8 : Full Crowding Out. With a vertical LM schedule, a fiscal expansion shifting out the IS schedule raises interest rates, not income. Govt. spending displaces, or crowds out, private spending dollar for dollar

In Figure 2.8, we show the crowding out in panel (b), where the investment schedule of previous figure is drawn. The fiscal expansion raises the equilibrium interest rate from i_o to i‘ in panel (a). In panel (b), as a consequence, investment spending declines from the level I_o to I’.

2.9 THE POLICY MIX

In Figure 2.9 we show the policy problem of reaching full-employment output, Y*, for an economy that is initially at point E, with unemployment. Should we choose a fiscal expansion, moving to point E1 with higher income and higher interest rates? Or should we choose a monetary expansion, leading to full employment with lower interest rates at point E2? Or should we pick a policy mix of fiscal expansion and accommodating monetary policy, leading to an intermediate position?

Once we recognize that all the policies raise output but differ significantly in their impact on different sectors of the economy, we open up a problem of political economy. Given the decision to expand aggregate demand, who should get the primary benefit? Should the expansion take place through a decline in interest rates and increased investment spending, or should it take place through a cut in taxes and increased personal spending, or should it take the form of an increase in the size of government?

Questions of speed and predictability of policies apart, the issues have been settled by political preferences. Conservatives will argue for a tax cut anytime. They will favor stabilization policies that cut taxes in a recession and cut government spending in a boom. Over time, given enough cycles, the government sector becomes very small, as a conservative would want it to be. The counterpart view belongs to those who believe that there is a broad scope for government spending on education, the environment, job training and rehabilitation, and the like, and who, accordingly, favor expansionary policies in the form of increased government spending and higher taxes to curb a boom. Growth-minded people and the construction lobby argue for expansionary policies that operate through low interest rates or investment subsidies.

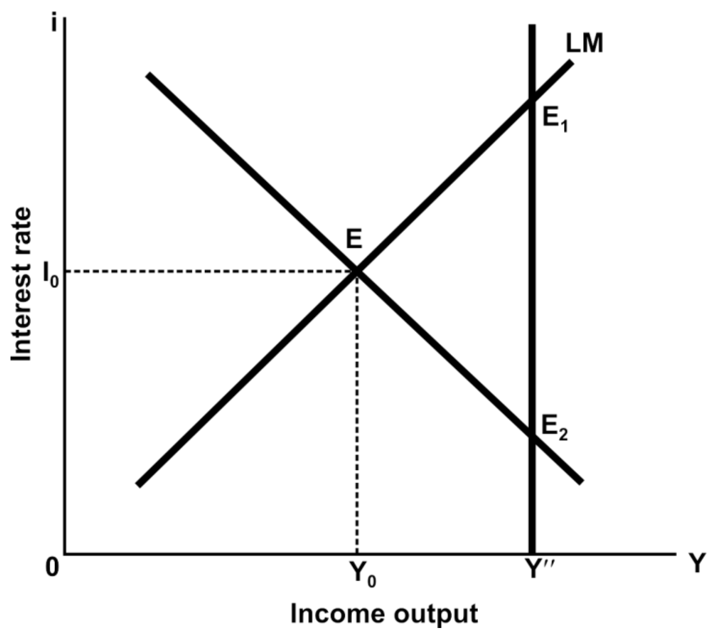


Figure : 2.9 :Expansionary Policies and the Composition of output.

The recognition that monetary and fiscal policy changes have different effects on the composition of output is important. It suggests that policymakers can close a policy mix—a combination of monetary and fiscal policies—that will not only the economy to full employment but also make a contribution to solving other policy problems. We now discuss the policy mix in action.

2.9.1 THE POLICY MIX IN ACTION

In this section we review the US. monetary-fiscal policy mix of the 1980s, the economic debate over how to deal with the U.S. recession in 1990 and 1991, the behavior of monetary policy during the long expansion of the late 1990 and the subsequent recession of 2001, and the policy decisions made in Germany in the early 1990s as the country struggled with the macro economic consequences of the reunification of East and West Germany.

This section serves not only to discuss the issue of the policy mix in the real world but also to reintroduce the problem of inflation. The assumption that the price level is fixed is a useful expositional simplification for the theory of this chapter, but of course the real world is more complex. Remember that policies that reduce aggregate demand, such as reducing the growth rate of money or government spending, tend to reduce the inflation rate along with the level of output. An expansionary policy increases inflation together with the level of output. Inflation is unpopular, and governments will generally try to keep inflation.

2.10 SUMMARY

1. The IS curve is the schedule of combinations of the interest rate and the level of income such that the goods market is in equilibrium. It is negatively sloped because an increase in the interest rate reduces planned investment spending and therefore reduces aggregate demand, thus reducing the equilibrium level of income.

2. The smaller the multiplier and the less sensitive investment spending is to changes in the interest rate, the steeper the IS curve. The IS curve is shifted by changes in autonomous spending.

3. The LM curve is the schedule of combinations of interest rates and levels of income such that the money market is in equilibrium. It is positively sloped. Given the fixed supply, an increase in the level of income, which increases the quantity of money demanded, has to be accompanied by an increase in the

interest rate. This reduces the quantity of maney demanded and thereby maintains money market equilibrium.

4. An increase in an autonomous spending, including an increase in government purchases, shifts the IS curve out to the right. The LM curve is shifted by changes in the money supply. An increase in the money supply shifts the LM curve to the right. Equilibrium in both markets occurs at the point at which the IS and LM schedules interest.

5. A given income level can be attained by easy monetary policy and tight fiscal policy or by the converse. In the latter case the equilibrium interest rate is higher and private spending will be a lower share of the given level of income and spending.

2.11 QUESTIONS

1. What determines the slope of IS curve?
2. What determines the position of the IS curve, given its slope, and what causes curve to shift?
3. What determines the slope of LM curve?
4. ‘Higher money suply increases consumption and investment, and hence income. Higer income increases interest rates. Hence higher money supply increases interest rates. Evaluate this proposition with proper diagrams.

❖❖❖❖

3

THE AGGREGATE DEMAND SCHEDULE – THE NEOCLASSICAL MODEL OF THE LABOUR MARKET – THE AGGREGATE SUPPLY CURVE

Unit Structure

3.0 OBJECTIVES

After having studied this unit, you should be able

- To Understand the fundamentals of the aggregate demand
- To understand the aggregate supply curve
- Two special cases – Monetary and fiscal policy effects under alternative supply assumptions.
- To Understand the fundamentals of Neoclassical Economic growth theory
- To Know the nature of Endogenous growth theory

3.1 INTRODUCTION OF AGGREGATE DEMAND CURVE

In macroeconomics, **aggregate demand** (**AD**) is the total demand for final goods and services in the economy (Y) at a given time and price level. It is the amount of goods and services in the economy that will be purchased at all possible price levels. This is the demand for the gross domestic product of a country when inventory levels are static. It is often called effective demand, though at other times this term is distinguished.

It is often cited that the aggregate demand curve is downward sloping because at lower price levels a greater quantity is demanded. While this is correct at the microeconomic, single good level, at the aggregate level this is incorrect. The aggregate demand curve is in fact downward sloping as a result of three distinct effects: Pigou's wealth effect, the Keynes' interest rate effect and the Mundell-Fleming exchange-rate effect.

An aggregate demand curve is the sum of individual demand curves for different sectors of the economy. The aggregate demand is usually described as a linear sum of four separable demand sources.

$$AD = C + I + G + (X - M)$$

where

- C is consumption (may also be known as consumer spending) = $a_c + b_c(Y - T)$,
- I is Investment,
- G is Government spending,
- $NX = X - M$ is Net export,
  - X is total exports, and
  - M is total imports = $a_m + b_m(Y - T)$.

These four major parts, which can be stated in either 'nominal' or 'real' terms, are:

- **Personal consumption expenditures** (**C**) or "consumption," demand by households and unattached individuals; its determination is described by the consumption function. The consumption function is **C= a + (mpc)(Y-T)**
- ‘a’ is autonomous consumption , **MPC** is the marginal propensity to consume, (Y-T) is the disposable income.
- **Gross private domestic investment** (**I**), such as spending by business firms on factory construction. This includes all private sector spending aimed at the production of some future consumable.
- In Keynesian economics, not all of gross private domestic investment counts as part of aggregate demand. Much or most of the investment in inventories can be due to a short-fall in demand (unplanned inventory accumulation or "general over-production"). The Keynesian model forecasts a decrease in national output and income when there is unplanned investment. (Inventory accumulation would correspond to an

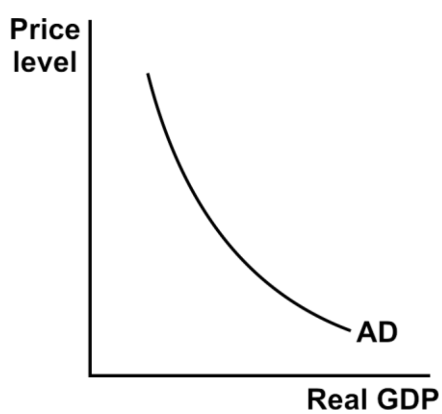
excess supply of products; in the National Income and Product Accounts, it is treated as a purchase by its producer.) Thus, only the *planned* or intended or desired part of investment (**I_p**) is counted as part of aggregate demand.

- Investment is affected by the output and the interest rate (i). Consequently, we can write it as I(Y,i). Investment has positive relationship with the output and negative relationship with the interest rate. For example, an increase in the interest rate will cause aggregate demand to decline. Interest costs are part of the cost of borrowing and as they rise, both firms and households will cut back on spending. This shifts the aggregate demand curve to the left. This lowers equilibrium GDP below potential GDP. As production falls for many firms, they begin to lay off workers, and unemployment rises. The declining demand also lowers the price level. The economy is in recession.
- **Gross government investment and consumption expenditures** (**G**).
- **Net exports** (**NX** and sometimes (**X-M**)), i.e., net demand by the rest of the world for the country's output.

In sum, for a single country at a given time, aggregate demand (**D** or **AD**) = **C** + **I_p** + **G** + **(X-M)**.

Understanding of the aggregate demand curve depends on whether it is examined based on changes in demand as income changes, or as price change.

In macroeconomics, the focus is on the demand and supply of *all* goods and services produced by an economy. Accordingly, the demand for all individual goods and services is also combined and referred to as **aggregate demand**. The **aggregate demand curve** represents the total quantity of all goods (and services) demanded by the economy at different *price levels*. An example of an aggregate demand curve is given in Figure 1 .



3.1 An aggregate demand curve

The vertical axis represents the price level of *all final* goods and services. The aggregate price level is measured by either the GDP deflator or the CPI. The horizontal axis represents the real quantity of all goods and services purchased as measured by the level of *real GDP*. Notice that the aggregate demand curve, *AD*, like the demand curves for individual goods, is downward sloping, implying that there is an inverse relationship between the price level and the quantity demanded of real GDP.

The reasons for the downward-sloping aggregate demand curve are different from the reasons given for the downward-sloping demand curves for individual goods and services. The demand curve for an individual good is drawn under the assumption that the prices of other goods remain constant and the assumption that buyers' incomes remain constant. As the price of good X rises, the demand for good X falls because the relative price of other goods is lower and because buyers' real incomes will be reduced if they purchase good X at the higher price. The aggregate demand curve, however, is defined in terms of the *price level*. A change in the price level implies that *many* prices are changing, including the wages paid to workers. As wages change, so do incomes. Consequently, it is not possible to assume that prices and incomes remain constant in the construction of the aggregate demand curve. Hence, one cannot explain the downward slope of the aggregate demand curve using the same reasoning given for the downward-sloping individual product demand curves.

3.2 THE LABOUR MARKET AND AGGREGATE SUPPLY

The *aggregate supply schedule* shows the quantity of output that firms wish to supply at each price level.

Labour Demand

Firms have a given amount of machines, buildings, and land – we shall call these resources capital-which can be combined with labour to produce output for sale in the goods market. Figure 25.3 plots the labour demand schedule LD showing how much labour firms demand at each real wage.

The *real wage* is the nominal or money wage divided by the price level. It shows the quantity of goods that the nominal wage will buy.

The *marginal product of labour* is the increase in output produced from a given capital stock when an additional worker is employed.

In the following figure, the labour demand schedule *LD* shows that firms will offer more jobs the lower is the real wage. The schedule *AJ* shows how many workers have actually chosen to accept a job at each real wage. At any wage, some workers are in the labour force but have not accepted a job, either because they are holding out for a better offer or because they are temporarily between jobs. Labour market equilibrium occurs at *E,* where the quantity of employment demanded by firms equals the number of jobs that people wish to accept. The horizontal distance between the *AJ* and *LF* schedules shows the level of voluntary unemployment at each wage rate. At the equilibrium wage rate the level of voluntary unemployment *EF* as a percentage of the labour force N_2 is called the natural of unemployment. When the real wage exceeds w^*, some people are involuntarily unemployed. They would like to take a job but can't find one. At the real wage w_1, involuntary unemployment is *AB* and voluntary unemployment is *BC*.

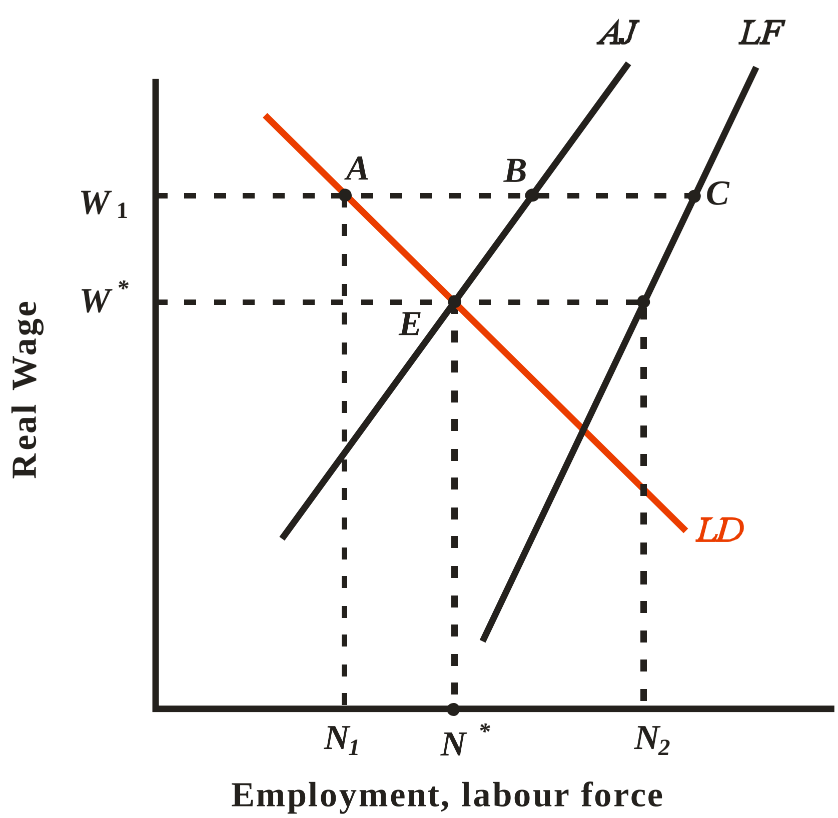


Figure 3.2 The Labour Market

Labour Supply

We must distinguish between the people wishing to register as being in the labour force and the people who actually have accepted a job.

The *registered labour force* is the number of people registered as whishing to work. It is the number of people in employment *plus* the *registered unemployed,* those without a job who are registered as seeking a job.

Labour Market Equilibrium

In the above Figure 3.2 labour market equilibrium occurs at the real wage *w**. The quantity of employment *N** that firms demand equals the number of people wishing to take jobs at the real wage *w**. Everyone who wants a job at this real wage has found a job. Although we call this position the *full-employment equilibrium,* registered unemployment is not zero. Figure 3.2 shows that *EF* people are registered as unemployed. They want to be in the labour force but do not want a job at this real wage.

The *natural rate of unemployment* is the percentage of the labour force that is unemployed when the labour market is in equilibrium. They are *voluntarily unemployed* because they choose not to work at that wage rate.

At any real wage above *w** some people are *involuntarily involuntarily unemployed.*

People are *involuntarily unemployed* when they would like to work at the going real wage but cannot find a job.

At the real wage *w*, there are thus two kinds of unemployment. A number of workers *AB* are involuntarily unemployed. They would like to accept jobs but firms are only offering *N*, jobs at this real wage. In addition a number of workers *BC* are voluntarily unemployed. The real wage *w*, has tempted them into the labour force, perhaps in the hope of securing an unusually good offer in excess of w_i., but they are not actually prepared to take a job at the wage rate w_1.,

When the labour market clears at the real wage *w**., employment can be increased only if firms are prepared to take on more workers at each wage rate (a rightward shift in the labour demand schedule) or if workers are prepared to work for lower wages (a rightward shift in the job acceptance schedule), Moreover, since the *AJ* schedule is probably quite steep in practice, the main consequence of a rightward shift in labour demand will probable be to bid up the equilibrium real wage rather than to increase equilibrium real wage rather than to increase equilibrium employment by very much. In contrast, when the real wage exceeds w^* and there are involuntarily unemployed workers, an increase in labour demand will lead to an increase in employment without increasing the real wage. In Figure 3.2 the number of workers *AB* would be happy to work at the real wage *w*, if only firms were offering more jobs.

3.3 MONETARY AND FISCAL POLICY

Movements along the macroeconomic demand schedule show how changes in prices alter the real money supply, thus changing aggregate demand both by altering the interest rate and through the real balance effect on consumption demand. But changes in the nominal money supply, or in fiscal policy, *shift* the macro economic demand schedule by altering the level of aggregate demand at each price level.

Monetary Policy

Suppose the economy begins in equilibrium at point *E* in Figure and that the nominal money supply is now doubled because the central bank purchases government securities through an open-market operation. At each price level, the real money stock is now higher than before and the macroeconomic demand schedule shifts upwards from *MDS* to *MDS'*. At each price level, interest rates are lower and there is also a real balance effect on consumption.

The new equilibrium point is *E'*. When all wages and prices have adjusted, the only effect of an increase in the nominal money supply is to increase the price level. There is no effect on output, which remains Y_p since the classical aggregate supply schedule is vertical. We can be even more specific. When the nominal money supply doubles, the macroeconomic demand schedule in Figure must shift up from *MDS* to a position *MDS'* such that the equilibrium price level exactly doubles in moving from P_o to P' Why?

With a vertical supply schedule, real aggregate demand must remain unchanged at Y_p in the new equilibrium. This can happen only if the *real* money supply also remains unchanged. Otherwise interest rates would change, thus affecting aggregate demand. There would also be a real balance effect on consumption if the real money balances of households changed.

In the classical model, a change in the nominal money supply leads to an equivalent percentage change in nominal wages and the price level. The real money supply, interest rates, output, employment, and real wages are unaffected.

This proposition, that changes in the nominal money supply lead to changes in pries and wages, rather than to changes in output and employment, is one of the central tenets of the group of economists called *monetarists.* Figure 3.3 shows that the proposition is correct in the classical model in which there is full wage and price flexibility and an absence of money illusion.

It is helpful to spell out the process through which the economy adjusts (instantaneously in the classical model) from point *E* to point *E'* when the nominal money supply is increased. Beginning from *E*, where the price level is P_o, an increase in the nominal money supply increases the real money supply, lowers interest rates, and increases aggregate demand. Aggregate demand exceeds potential output but firms wish to supply Y_p whatever the price level. Excess demand for goods instataneously bids up the price level until equilibrium is restored. Higher prices have offset the initial increase in the nominal money supply and interest rates have returned to their original level. And in the labour market, higher money wages have matched the increase in the price level, maintaining real wages at their original level. The economy has returned to full employment and potential output.

In the following figure the macroeconomic demand schedule is drawn for a given nominal money supply and a given fiscal policy. A doubling of the nominal money supply increases aggregate demand each price level, shifting the macroeconomic demand schedule from *MDS* to *MDS'*. Since the equilibrium point moves from *E* to *E*, in the classical model an increase in the money supply leads to higher prices but not higher output, which remains Y_p. In fact, if nominal money doubles, equilibrium prices must also double. Only then is the real money supply unaltered. Since interest reates are unaltered, aggregate demand will remain exactly Y_p as required. Fiscal expansion also shifts the macro economic demand schedule upwards. Since output supply remains Y_p in the classical model prices must rise just enough to reduce the real money supply and increase interest rates enough to completely crowd out private expenditure, leaving aggregate demand unaltered at Y_p.

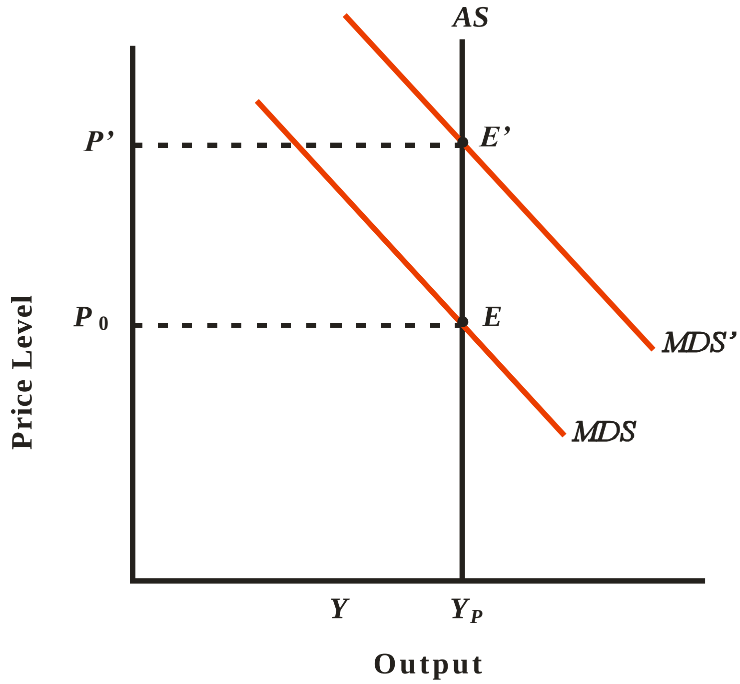


Figure 3.3 Monetary And Fiscal Expansion

Increase in the nominal money supply increases the real money supply, lowers interest rates, and increases aggregate demand. Aggregate demand exceeds potential output but firms wish to supply Y_p whatever the price level. Excess demand for goods instantaneously bids up the price level until equilibrium is restored. Higher prices have offset the initial increase in the nominal money supply. The real money supply and interest rates have returned to their original level. And in the labour market, higher money wages have matched the increase in the price level, maintaining real wages at their original level. The economy has returned to full employment and potential output. In the classical model all these adjustments happen instantaneously.

Fiscal Polity

The above figure may also be used to examine the effect of a fiscal expansion. At each price level, and the corresponding value of the real money supply, an increase in government spending (or a cut in taxes) will increase aggregate demand, shifting the macroeconomic demand schedule from MDS to MDS'. Again, since the classical aggregate supply schedult is vertical, and the consequences of fiscal expansion must be a rise in prices from P_0 to P' but not an increase in output, which remains at its full-employment level Y_p.

The impact of the fiscal exposition is to increase aggregate demand if prices remain unchanged. But since firms wish to supply potential output, there is excess demand. Prices are bid up (instantaneously) until excess demand for goods is eliminated. Since firms which to supply Y_p whatever the price level, higher prices must eliminate excess demand entirely by reducing the demand for goods. With a given nominal money supply, higher prices reduce the real money supply, drive up interest rates, and reduce private expenditure on consumption and investment. When aggregate demand has fallen to its full-employment level again, full equilibrium is restored. The economy has higher pries and nominal wages, a lower real money stock, and higher interest rates. Government spending is higher but private consumption and investments are sufficiently lower that aggregate demand remains at its full employment level. The increase in government spending is exactly offset by a reduction in private expenditure on consumption and investment.

An increase in government spending crowds out an equal amount of private expenditure in the classical model, leaving aggregate demand unaltered at the level of potential output.

There is a subtle difference between partial crowding out I the Keynesian model and this complete crowding out in the classical model. In the Keynesian model discussed in the previous chapter, prices and wages were fixed and output was demand-determined in the short run. Although the nominal and real money supplies were both fixed, an increase in government expenditure bid up the equilibrium level of interest rates through its effect on aggregate demand and actual output. Higher output increased the demand for money and required a higher interest rate to maintain money market equilibrium. In turn, the higher interest rate reduced consumption and investment demand and partly offset the expansionary effect of higher government spending on aggregate demand and output.

In the classical model the mechanism is quite different. Now it is full employment aggregate supply that is the binding constraint. Whenever aggregate demand does not equal the potential outputthat firms wish to produce, excess supply or demand for goods will alter the price level and the real money supply until aggregate demand is restored to its full-employment level. Hence an increase in government expenditure (in real terms) must reduce consumption and investment together by exactly the same amount (in real terms). That is the implication of saying that aggregate demand $C+I+G$ remains equal to the constant level of aggregate supply Y_p

3.4 WAGES, PRICES, AND AGGREGATE SUPPLY

The following figure shows the implications of our discussion of short-term wage adjustment. Suppose the economy begins in full employment at the point *A*. In the short run there is very flat wage schedule *WW*. If firms wish to produce more output, their first reaction will be to use overtime payments to get more labour input out of their existing labour force, producing at a point such as *C*. Conversely, if demand for their output falls, firms will initially meet this reduction in demand and output by reducing the working week, ending overtime and slightly reducing hourly earnings in consequence. Faced with this reduction in demand, the short-term response will be to produce at a point such as *B*.

Beginning at the fully employment point, there is short-run money wage schedule *WW* along which output changes are met primarily by changing hours of work and overtime bonuses. A permanent fall in aggregate demand initially will be met by a move from *A* to *B*. Output is cut and short-time working introduced. As time elapses, workers are fired and wage adjustment begins. The new wage schedule is WW_1. Since wages have not fallen enough to restore full employment, the economy is at point on WW_1 to the left of Y_p. Only in the long run do money wages and prices fall enough to restore aggregate demand and attain full employment and potential output, at the point A_2. Temporary fluctuations in demand around full employment will then be met by movements along WW_2 and will be reflected chiefly in temporary fluctuations in hours worked.

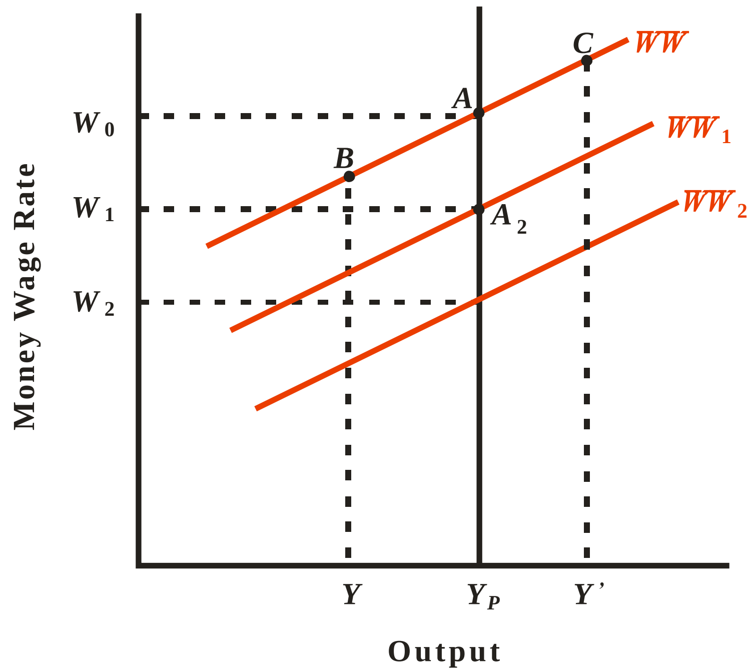


Figure 3.4 Wage Adjustment

If demand does not pick up, in the medium run firms will begin making workers unemployed and cutting wages. However, wage rates are unlikely to be reduced all the way to W_2, the level we assume would restore full employment in the classical long run. Rather, in the medium run there will be partial adjustment, say to say the wage schedule WW_1. As we shall shortly explain, lower wages will allow lower prices, and this will partly restore the level of aggregate demand by increasing the real money supply and reducing interest rates. But sluggish wage adjustment implies that this adjustment will not be accomplished fully in the medium run. Hence firms will still be producing an output below potential output Y_p.

Only in the long run is the wage schedule finally reduced to WW_2. Now, wages and prices have fallen sufficiently to increase the real money supply and lower interest rates to the extent required to restore aggregate demand to its full-employment level. In the absence of any further shock to aggregate demand, firms will now be at the new long-run equilibrium point A_2 and the wage rate will be W_2. Any temporary fluctuations in demand output around this new full-employment position will be met by temporary movements along the new wage schedule WW_2.

Now we make explicit the link between wages in the labour market and prices in the goods market.

The Short-run Aggregate Supply Schedule

Only in some markets, notably agricultural markets such as wheat and soya beans, where there is a standardized product, are prices set in a competitive auction. In most cases prices are set by sellers. Ford sets the price of its cars and Sony the price of its televisions. How are prices set in practice?

In some market structures, such as perfect competition or pure monopoly, prices were related to the marginal cost of producing the last unit of output, with the mark-up of price over marginal cost being determined by the extent of the firm's monopoly power, if any. In other theories, such as the limit pricing model of competition between a few firms in an industry, prices were set as mark-up on average costs, with the size of the mark-up depending on the threat of entry of new firms to the industry if profits became too large.

Whether we base our analysis of pricing on rigorous microeconomic analysis or on the view of pragmatic managers that prices should cover prime costs (average variable costs) and overheads and leave a reasonable profit margin, we reach the same conclusion: when firm's costs rise, they will have to raise the prices they charge.

In modern industrial economies, labour costs are the major part of the costs of production. Of course raw materials, land, and capital are also important. But for the moment we concentrate on wages as the chief determinant of costs. Once our analysis is developed, it will be easy to introduce other costs items.

Thus, we simplify by assuming that firms base output prices on the wages they have to pay. Although we could adopt a much more complex analysis, recognizing the role of other costs, of changes in labour productive, and of changes in firms' profit margins, in practice none of these complications would change significantly the analysis we now present. Ignoring these complications greatly simplifies the exposition and justifies the sacrifice of realism.

The short run aggregate supply schedule shows the pries charged by firms at each output level, given the wages they have to pay.

The following figure shows the short-run aggregate supply schedule *SAS* corresponding to the wage schedule *WW*. Suppose we begin at the point A in both diagrams. The economy is at full employment and all markets clear. Prices are at level P_0 in Figure 3.5. Beginning from this inherited level of money wage settlements, firms will move along the supply schedule *SAS* in the short run. Firms can supply a lot of extra output in the short run at only a slightly higher price. A slightly higher price allows firms to cover the overtime payments needed to produce extra output. But, facing a lower price, firms will want to cut back output a log. At the inherited wage rates, firms have only limited scope for cutting costs, and will have to reduce output a lot if prices fall. In the medium run, however, negotiated wage rates gradually adjust. If demand and output remain low, wage rates will gradually fall, allowing firms to move to a lower wage schedule and a lower short run aggregate supply schedule such as SAS_1 in Figure 3.5. And if full employment and potential output are still not restored, in the longer run negotiated wage rates will fall yet again, leading to a short-run aggregate supply schedule such as SAS_2.

For a given negotiated money wage rate and height of the wage schedule, firms can vary labour costs only be affecting overtime payments and other bonuses. Hence, in the short run they require only a small increase in price to produce more output but can afford to charge only a slightly lower price when producing less output. In the longer term, as firms negotiate lower wages and move on to lower wage schedules, they can also cut their prices. The short-run supply schedule shifts down. At A_2 prices have fallen enough to restore the full-employment level of aggregate demand, and full equilibrium is restored.

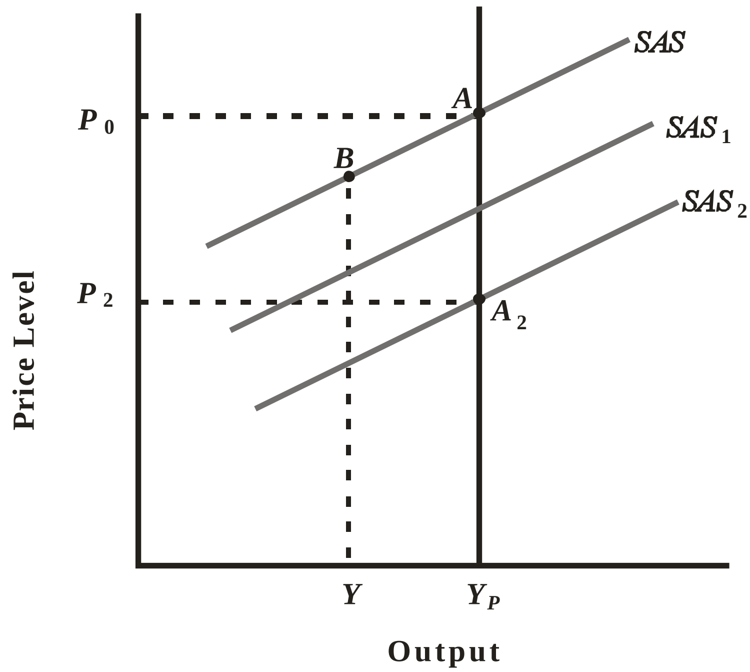


Figure 3.5 The Short-Run Aggregate Supply Schedule

Thus, if demand falls, firms cannot cut their prices much in the short run. They can only move back along the relatively flat short-run aggregate supply schedule *SAS*. In the medium run, firms will be able to negotiate lower wage settlements if demand remains low and they have to start sacking workers. When the wage schedule shifts down, firms will be able to cut prices much more. Corresponding to this wage schedule, the short-run aggregate supply schedule in Figure 3.5 will now be SAS_1. And in the long run, with the wage schedule down to WW_2, the short-run aggregate supply schedule will be SAS_2. Firms will have reached the point A_2, at which they are back on their long-run aggregate supply schedule. There is full employment, and firms are producing potential output. Prices have fallen enough to increase the real money supply and reduce interest rates to the extent required to restore aggregate demand to its full-employment level.

We now use the short-run aggregate supply schedule to develop a realistic picture of the adjustment of the economy to disturbances. Anticipating our main results, we shall show the following. Because the short-run aggregate supply schedule is very flat, a shift in aggregate demand will lead mainly to changes in output rather than changes in price in the short-run, this is the Keynesian feature. But because deviations from full employment gradually change wages and prices over time, the economy gradually works its way back to full employment. That is the classical feature.

3.5 AGGREGATE SUPPLY (AS) CURVE

The **aggregate supply curve** depicts the quantity of real GDP that is supplied by the economy at different price levels. The reasoning used to construct the aggregate supply curve differs from the reasoning used to construct the supply curves for individual goods and services. The supply curve for an individual good is drawn under the assumption that input prices remain constant. As the price of good X rises, sellers' per unit costs of providing good X do not change, and so sellers are willing to supply more of good X-hence, the upward slope of the supply curve for good X. The aggregate supply curve, however, is defined in terms of the *price level*. Increases in the price level will increase the price that producers can get for their products and thus induce more output. But an increase in the price will also have a second effect; it will eventually lead to increases in input prices as well, which, *ceteris paribus*, will cause producers to cut back. So, there is some uncertainty as to whether the economy will supply more real GDP as the price level rises. In order to address this issue, it has become customary to distinguish between two types of aggregate supply curves, the **short-run aggregate supply curve** and the **long-run aggregate supply curve**.

Short-run aggregate supply curve.

The **short-run aggregate supply (SAS) curve** is considered a valid description of the supply schedule of the economy *only* in the short-run. The **short-run** is the period that begins immediately after an increase in the price level and that ends when *input prices* have increased in the *same proportion* to the increase in the price level.

Input prices are the prices paid to the providers of input goods and services. These input prices include the wages paid to workers, the interest paid to the providers of capital, the rent paid to landowners, and the prices paid to suppliers of intermediate goods. When the price level of final goods rises, the cost of living increases for those who provide input goods and services. Once these input providers realize that the cost of living has increased, they will increase the prices that they charge for their input goods and services in proportion to the increase in the price level for final goods.

During the short-run, *sellers of final goods* are receiving higher prices for their products, without a proportional increase in the cost of their inputs. The higher the price level, the more these sellers will be willing to supply. The *SAS* curve—depicted in Figure 3.6 (a)—is therefore upward sloping, reflecting the positive relationship that exists between the price level and the quantity of goods supplied in the short-run.

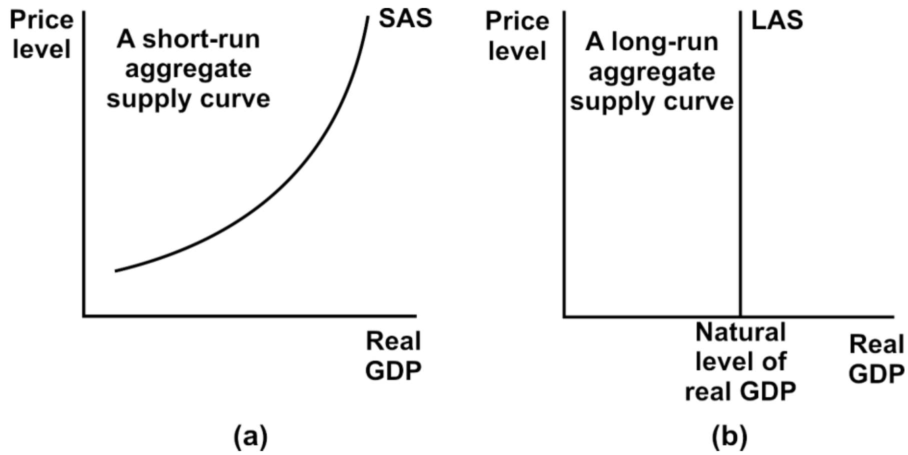


Figure 3.6 The aggregate supply curve

Long-run aggregate supply curve.

The long-run aggregate supply (LAS) curve describes the economy's supply schedule in the long-run. The **long-run** is defined as the period when input prices have completely adjusted to changes in the price level of final goods. In the long-run, the increase in prices that sellers receive for their final goods is completely offset by the proportional increase in the prices that sellers pay for inputs. The result is that the quantity of real GDP supplied by all sellers in the economy is independent of changes in the price level. The LAS curve—depicted in Figure 1 (b)—is a vertical line, reflecting the fact that long-run aggregate supply is not affected by changes in the price level. Note that the *LAS* curve is vertical at the point labeled as the **natural level of real GDP**. The natural level of real GDP is defined as the level of real GDP that arises when the economy is *fully employing all* of its available input resources.

3.6 NEOCLASSICAL ECONOMIC GROWTH THEORY

In the case of the modern economy, the two factors of production most often discussed are those of capital and labor. The problems of characterizing capital will be examined later, but for now capital will be defined as the machinery and buildings of a factory which produces goods. With capital and labor as the inputs to production, we have two possibilities for diminishing returns: 1) Capital is held constant (assume that no new factories are built or expanded) and labor is increased, in which case there are diminishing returns to each additional unit of labor; and 2) labor is held constant (which might happen, for instance, in a condition of full employment), and capital is increased, leading to diminishing returns to each additional unit of capital. The first case is referred to as decreasing marginal productivity of labor, the second as the decreasing marginal productivity of capital.

If the marginal product from one additional unit of the varying factor of production is experiencing diminishing returns, we can find one level of output which matches the cost of the factor of production. This point is the unique solution to the problem of the determination of price. But if there are only increasing (or constant) returns, no single price/output decision can be made. Neoclassical economists tend to concentrate on short-run economic processes.

Since oligopoly and monopoly have characterized much of the twentieth century, and since technological change has been so extensive, one would think that increased returns would be the focus of much economic theory (W. Brian Arthur [1997] is one noted economist who has written extensively on positive feedback and increasing returns). Instead, growth theorists have made the concept of diminishing returns central to their efforts.

According to neoclassical theory, as we have seen, each factor of production receives income according to the output it has contributed to the economy. The income of capital, defined mainly as profits and interest, has constituted only about between one-third and one-fourth of national income. Labor, in the form of wages and salaries, has received the rest, through most of American history. But capital has increased much more than labor.

There are three main points to be made concerning neoclassical growth theory: 1) the "residual" has never been explained; 2) the core of the theory claims that "technology" is responsible for sustained growth, and this technology cannot be explained; and 3) the assumption of diminishing returns puts into question the validity of the entire theory in any case. For 40 years, many economists have attempted to explain the "residual". In 1957, surveying the previous 40 years of growth, Robert Solow estimated that "it is possible to argue that about one-eighth of the total increase is traceable to increased capital per man hour, and the remaining seven-eighths to technical change" (Solow 1957, 316). Denison, in particular, is well-known for trying to estimate factors that could account for the remaining seven-eighths (Denison 1967). But as Solow noted in his lecture accepting the Nobel prize in economics, "the main refinement has been to unpack „technical progress in the broadest sense into a number of constituents" (Solow 1988,313);

The aggregate production function is the staple of neoclassical discussions of growth
It has the general form $Y = F(K,L) = K$

Where K is the amount of capital, usually measured as the dollar value of the plant and equipment of an economy, and L is the amount of labor, usually counted as total man-hours used in an economy over the course of one year. Y is the national output, usually defined as the gross domestic product (GDP).

Recall that the national income of a factor of production is supposed to match the marginal productivity, in the aggregate, of the particular factor of production. In other words, each factor of production receives as income that which it contributes to production. The particular form of the aggregate production function,

$$Y = K$$

, is popular among economists because of two properties it possesses. First, when both K and L (capital and labor) are multiplied by the same amount (say, doubled), then Y will be doubled; that is, there are constant returns to scale. For example, if the plant and machinery of a country doubled and, at the same time, the number of man-hours doubled, the GDP would exactly double, according to the aggregate production function.

According to neoclassical economics, when one factor of production is held constant, and another is increased, the latter factor will yield diminishing returns. The aggregate production function can be transformed into the equation Y/L = (K/L)

which means that output per worker man-hour increases in proportion to the increase of capital per worker, but at a diminishing rate (Y/L = output per worker man/hour, and K/L = amount of plant and machinery per worker man-hour, and □ = percentage of national income received by capital, i.e., interest and profits). There are two main aspects to this form of the equation.

First, more capital per worker leads to more output per worker. If one worker has a more expensive piece of equipment to work with, the worker will be producing more output. The worker that tends a modern textile machine, with, say, 100 spindles, produces much more output than a preindustrial worker with a spinning wheel. Second, the exponent, □, is less than one, because it represents the percentage that capital receives of the national income, and this exponent describes a process of diminishing returns.

There are diminishing returns to capital, and therefore this equation is accepted by the mainstream of economics because it is consistent with the idea of marginal productivity and diminishing returns. Because each new addition of capital per worker yields less and less addition to output, the capital-output ratio (K/Y) is supposed to go up. In other words, a large increase in capital will yield a smaller proportional increase in output, because of diminishing returns to capital; if K increases more rapidly than Y, the ratio K/Y increases.

The problem is that this process of diminishing returns is contradicted by the data; the ratio of capital to output has remained constant. As more and more capital has been added, even with about the same amount of labor, the output keeps going up at the same rate as capital.

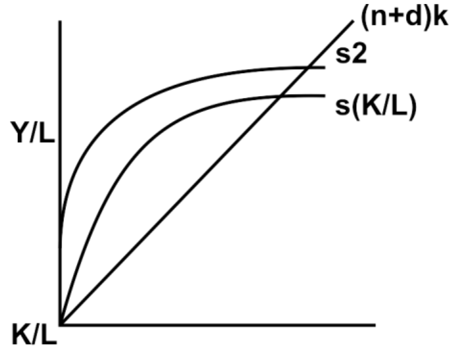
A consistent and obvious contradiction of an integral part of economic theory has been brushed aside by Samuelson by invoking a deus ex machina, technology. We are not "forced" to question the underlying theory, according to Samuelson; we are "forced" to introduce an exogenous variable, technology, in order to save the underlying theory. When data contradict a theory, there are two possible responses: one can question the underlying theory, or one can try to augment the theory by adding another variable.

The neoclassical economists have chosen the second alternative. However, the new variable, technology, is not independently measured. It continues to be, in Abramovitz‟s phrase, simply a "measure of our ignorance", or a "residual". It is the number which is necessary in order to save the theory, not a number whose existence is independently confirmed. Sometimes scientists temporarily postulate a missing factor which will make up the difference between the theory and the observed data.

The economics profession has concentrated on equilibrium, stability, the allocation of a given set of resources, and the determination of price. None of these concepts is helpful in understanding the very dynamic process of the long-term growth experience of an industrial economy. For growth theory to instigate a fundamental discussion of core neoclassical theories would be like the tail wagging the dog for economists. Indeed, the accomplishment of Solow and others is to create a model of growth which is consistent with the assumptions of neoclassical economics – not to explain growth itself.

A fuller explanation of Solow's model will show that it is actually a model explaining why, without technology, there is no sustained growth. Recall that we have a function of the form Y/L = (K/L). As Solow points out, capital per worker will decrease, in this model, if we add more workers without adding more capital. Alternatively, capital per worker will decrease if there is less capital, which is what happens when plant and machinery depreciate; capital does not exist forever, but eventually breaks down and disappears. In either case, there is a decrease in the capital to-labor ratio, which is bad for the economy, because a smaller capital-to-labor ratio translates to less output per worker. Solow uses the term (n + d)k to model this decrease of capital per person, where n is the rate of labor expansion, d is the depreciation rate, and k is capital per worker.

As long as the increase in capital just offsets this (n + d)k value, there will be no deterioration in the income per person in the society. The amount of new capital will just offset the amount of depreciation, on the one hand, or will just accommodate the new additions to labor, on the other hand. The economy will be at equilibrium; it will not become richer, and it will not become poorer. The following diagram will be used to show how Solow's model works.



Solow's growth model

Figure 3.7

The curve s(K/L) represents the amount of investment in new capital per man hour; s is the savings rate. s is usually around 10% to 20% of the economy. More capital translates into more output, but since there are diminishing returns, the curve flattens out after a while. The point at which the s(K/L) curve crosses the line (n+d)k is the equilibrium point; the amount of added capital (in the form of investment per worker) just cancels out the amount taken away by the addition of new workers and/or depreciation. There is no growth per person, but neither is there any decrease.

The important part of the model is the process that takes place if the economy, for whatever reason, is not investing just enough to offset either depreciation or added workers. Like any accepted economic model, Solow had to show that the economy would move automatically back to the equilibrium point, and would stay there, unless something pushed the model off of equilibrium. In the case of this model, there are two possible non-equilibrium situations.

If the economy is investing too little, then the economy is at a point on the s(K/L) curve to the left of the (n+d)k line. In this case, because the returns to investment are greater than the depreciation or population growth rate, more capital per man-hour will be furnished to the economy by entrepreneurs; s(K/L) will go up, and the economy will automatically move along the s(K/L) curve, eventually reaching its equilibrium point where it crosses the (n+d)/k line.

The economy will have been in disequilibrium, but will have moved back to equilibrium. On the other hand, if the economy is investing too much, then the economy will be on a point to the right of the (n+d)k line. In this case the economy will be adding much more capital then it is getting back in the form of greater output. It will be running faster and faster just to advance a little bit. But in this situation, there will be huge amounts of capital piling up; and because the depreciation rate is still the same, large quantities of machinery will be retired. Entrepreneurs will not want to invest in capital, capital will decrease because of depreciation, and so the economy will automatically slide back to the equilibrium point.

Thus, the model has a stable equilibrium. It is the kind of model in which, even if the economy is out of equilibrium, the economy moves back to equilibrium automatically. It is the same situation as a marble at the bottom of a cup; move the ball up the wall of the cup, and as soon as you release the ball, it will be pulled back down by the force of gravity to a resting point. In Solow's model, rational decision making is analogous to the force of gravity.

According to this model an economy can grow in one spurt, and then stop growing, if the investment level is increased. The curve marked s2 on the graph above is the same curve as s(K/L), except that the s factor is increased. So if a society permanently increases its savings rate from, say, 10% to 14%, according to this model, its output will grow, but then the economy will reach equilibrium and stop growing.

This is why Solow says that the growth rate is independent of the investment rate (the savings rate is assumed to be the same as the investment rate). Countries can achieve a one-time increase of their GDP by increasing their savings rate, but the economy can not enjoy continuous, or sustained, growth. There is only one way of sustaining growth in this model: technological progress. In order to have continuous growth, at every point on the s(K/L) curve, the Y/L, or output per worker-hour, would have to be greater.

The same amount of machinery per worker would have to yield more output per worker than before, and therefore labor productivity would increase, if technology improved. This will come about because better machinery has been developed, or the means of production have been organized more efficiently, both of which are considered to be technological progress, and more properly within the realm of the engineer than the economist. If the investment rate stays the same, and the engineers maintain the rate of technological progress (that is, increasing the amount of output per worker), the economy will grow continuously. Solow has therefore succeeded in completely removing all possible sources of sustained growth from his model, other than technological progress. Put another way, there is no sustained growth without technological progress, according to Solow's model.

Obviously, there has been tremendous, sustained growth in the last two centuries. Solow concludes that "increasing the rate of per capita growth is not only not easy in this model, it is impossible unless the rate of technological progress can be altered deliberately. This reversal of conclusions has led to a criticism of the neoclassical model: it is a theory of growth that leaves the main factor in economic growth unexplained" (Solow 1994, 48).

He continues that "there is some truth in that observation, but also some residual misconception", which seems to consist of pointing to the work of the **Endogenous Growth theorists,** which will be discussed below. Neoclassical growth theory has explained growth by showing how growth cannot be explained by neoclassical growth theory. The unknown, "residual" element has never been satisfactorily specified, and the main conclusion of the theory itself is that technology creates growth.

This, in itself, would indicate that an understanding of technological change would be the appropriate focus of research into the rise and decline of Great Powers. But there is a second reason to doubt the usefulness of neoclassical theory. Since the theory cannot explain why the prediction of diminishing returns has not taken place, except to postulate an invisible variable, the entire theory is on shaky ground. Thus whether diminishing returns are plausible, or whether they are not significant, the theory fails to provide a convincing base from which to analyze rise and decline. Recently, however, there has been an attempt to deal with the problem of diminishing returns, and this theory has been named "endogenous growth theory", to underline the idea that technology can be explained from within the model.

Solow's model, the Endogenous Growth theory, and the concept of an aggregate production function suffer from a similar problem: they are attempting to aggregate a factor of production, capital, that is more profitably used in a disaggregated state. Worse, economics – classical and neoclassical – do not have models of how the economy works which include representations of the plant and machinery that make modern industrial economies possible. As Kurz asserts, 80"capital theory is notorious for being perhaps the most controversial area in economics.

For Smith, To maintain and augment the stock which may be reserved for immediate consumption, is the sole end and purpose both of the fixed and circulating capitals. It is this stock which feeds, clothes, and lodges the people. Their riches or poverty depends upon the abundant or sparing supplies which those two capitals can afford to the stock for immediate consumption. (Smith 1776, 307)

In other words, capital generates the goods that comprise the substance of the economy. Later theorists, however, took a step backward in their treatment of capital. The problem started with Ricardo. Ricardo was not trying to understand "The Wealth of Nations", which is the focus not only of Adam Smith but of the present study, but the distribution of income of the nation. Ricardo wanted to know how profit could be understood in terms of wages, rent, and output.

In order to keep his models simple, he resorted to the extreme position of considering seed corn as both the wage of labor and the capital to be used to create output. While this made the model easier to construct, fixed capital, that is, plant and machinery, disappeared from his model of the economy. Later in the nineteenth century, the neoclassical economists developed what came to be known as the "Austrian theory of capital and interest". The two main neo-classical expositors were Bohm-Bawerk and Wicksell. For Bohm-Bawerk, "the role of capital in production is to permit adoption of more productive but also more time-consuming „roundabout‟ methods of production" (Blaug 1996, 480).

Indeed, most of the technological progress that is supposed to explain growth in the Solow model is of the form of decreasing the period of production. For example, while the tools that Adam Smith describes for the production of the pin factory were relatively crude, the machines available to make pins today have enormously speeded up production.

Capital is problematic in the theories of neoclassical economists, particularly as capital applies to problems of growth theory. Both neoclassical and endogenous growth theory are based on the aggregation of capital and labor, in an unrealistic way, and both assume diminishing returns which may not in fact exist. In addition, both theories rely on an exogenous force, technology, which they can not explain.

As two prominent scholars of innovation have put it: For most economists, assessing technological change appears something of a puzzle, far removed from economic reality. The main reason for this goes back to the traditional economic framework, within which technology is reduced to an „exogenous‟

external factor whose impact on, for example, economic growth can be best described…in terms of a particular parametric value: a „black box" variable, not to opened except by scientists and engineers (Freeman and Soete 1997, 426). It would seem natural, then, to focus on the exploration of this crucial force, technological change in the service of production.

Models in Endogenous Growth

In the mid-1980s, a group of growth theorists became increasingly dissatisfied with common accounts of exogenous factors determining long-run growth. They favored a model that replaced the exogenous growth variable (unexplained technical progress) with a model in which the key determinants of growth were explicit in the model. The initial research was based on the work of Kenneth Arrow (1962), Hirofumi Uzawa(1965), and Miguel Sidrauski (1967). Paul Romer (1986), Lucas (1988), and Rebelo (1991) omitted technological change. Instead, growth in these models was due to indefinite investment in human capital which had spillover effect on economy and reduces the diminishing return to capital accumulation.

The AK model**, which i**s the simplest endogenous model, gives a constant-saving-rate of endogenous growth. It assumes a constant, exogenous saving rate and fixed level of the technology. It shows elimination of diminishing returns leading to endogenous growth. However, the endogenous growth theory is further supported with models in which agents optimally determined the consumption and saving, optimizing the resources allocation to research and development leading to technological progress. Romer (1987, 1990) and significant contributions by Aghion and Howitt (1992) and Grossman and Helpman (1991), incorporated imperfect markets and R&D to the growth model.

3.7 THE AK MODEL OF ENDOGENOUS GROWTH

The model works on the property of absence of diminishing returns to capital. The simplest form of production function with diminishing return is:

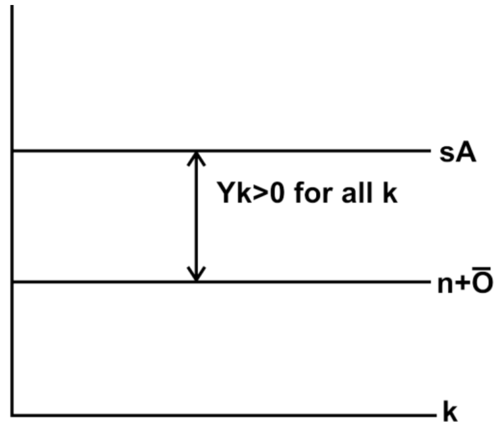
$Y = AK$

where

A, is a positive constant that reflects the level of the technology.

K capital (broad sense to include human capital)

$y = AK$, output per capita and the average and marginal product are constant at the level $A > 0$



The *AK* Model : if the technology is *AK*, then the saving curve, *s. f(k)/k*, is a horizontal line at the level *sA*. If *sA>n+*δ, then the perpetual growth of *k* occurs, even without technological progress.

Figure 3.8

If we substitute $\frac{f(k)}{k} = A$ in equation of transitional Dynamics of Solow-Swan model (Exogenous growth model) which shows how an economy's per capita incomes converges toward its own steady-state value and to the per capita incomes of other nations.

Transitional Dynamics equation, where Growth rate on k is given by,

$$\gamma_K = \dot{k}/k = s.f(k)/k - (n+\delta)\ ,$$

on substituting A, we get,

$$\gamma_K = sA - (n+\delta)\ ,$$

We return here to the case of zero technological progress, $x = 0$, because we want to show that per capita growth can now occur in the long-run even without exogenous technological change. The figure 1.1 explains the perpetual growth, with exogenous technical progress. The vertical distance between the two line, $sA$and n+δ gives theγ_K

As, $sA >$n+δ, so that$\gamma_K > 0$. Since the two line are parallel, $\gamma_K$is constant; in particular, it is independent of K. In other words,K always grows at steady states rate $\gamma_K^* = sA - (n+\delta)$,.

Since

$$y = AK, \gamma_K \text{ equals } \gamma_K^*$$

at every point of time. In addition, since

$$c = (1-s)y,$$

the growth rate of c equals γ_K^*.

Hence, the entire per capita variable in the model grows at same rate, given by

$$\gamma^* = sA - (n + \delta) \ ,$$

However, we can observe that $y = AK$ technology displays a positive long-run per capita growth without any exogenous technological development. The per capita growth depends on behavioural factors of the model as the saving rate and population. It is unlike neoclassical model, which is higher saving, s, promotes higher long-run per capita growth γ^*.

3.8 SUMMARY

1. The macroeconomic demand schedule shows at each price level the level of income at which planned spending on goods equals actual output when the money market is also in equilibrium. The schedule slopes downward. Lower prices increase the real money supply, thus increasing aggregate demand both through lower interest rates and through the real balance effect on consumption.
2. Fiscal and monetary expansion cannot increase output. Rather, they increase prices until the real money supply has fallen sufficiently to restore aggregate demand to the level of potential output that firms wish to supply.

3.9 QUESTIONS

1. Explain the relationship between labour market and Aggregate supply.
2. Dicuss the effect of Monetary policy and Fiscal Policy on consumption and investment.
3. Write a note on Neo-classical growth model.
4. Discuss the AK model of Endogenous Growth.

❖❖❖❖

4

Module 2

BEHAVIOURAL FOUNDATIONS OF MACROECONOMICS

Unit Structure

4.0 OBJECTIVES

- To study consumption under certainty
- To study consumption under uncertainty
- To study relation between interest rate and consumption

4.1 POST KEYNESIAN CONSUMPTION FUNCTION

According to J.M. Keynes, the relationship between consumption and income is non-proportional in the short run. But modern economists have been found that the consumption income relationship is proportional in the long run. There are four basic alternative hypotheses on consumption function. They are as follows:

(a) Absolute income hypothesis
(b) Relative income hypothesis
(c) Permanent income hypothesis
(d) Life cycle hypothesis

We will discuss the last two hypothesis on consumption function in detail.

4.1.1 PERMANENT INCOME HYPOTHESIS: Permanent income hypothesis was put forward by an American Economist **Milton Friedman** in 1957. According to Friedman consumption expenditure depends not on current income but on permanent income. Permanent income is that income which can be permanently sustained. The long term income is the permanent income. Friedman gives an example which is worth quoting. Let us consider a person who receives his income once a week, say on Thursday, he would not concentrate his consumption on one day with zero consumption on all other days of the week. He would like to divide his expenditure over the entire week. Thus consumption in one day is not determined by income received on that particular day. It is determined by average daily income received for a period. Thus people plan their consumption on the basis of expected average income over a long period which Friedman calls permanent income.

Milton Friedman divides current income into two components: permanent income component and transitory (Temporary) income component.

Thus $Y = Y_p + Y_t$ …3.10

Where, Y = current income

Y_p = permanent income

Y_t = transitory income

Similarly current consumption is also divided into two parts: Permanent consumption and transitory consumption.

Thus $C = C_p + C_t$ …3.11

Where, C = current consumption

C_p = permanent consumption

C_t = transitory consumption

According to permanent income hypothesis consumption is proportional to permanent income. Thus,

$C_p = KY_p$ …3.12

Where, C_p = permanent consumption

Y_p = permanent income

K = is the fraction of permanent income that is consumed.

The proportion or fraction K depends upon the following factors:

(i) Rate of interest (r)

(ii) Ratio of non human wealth to labour (w)

(iii) Desire to add to the stock of assets (u)

Thus rewriting the consumption function based on Friedman's permanent income hypothesis. We have,

$$C_p = k(r, w, u)\ Y_p \qquad \ldots 3.13$$

The above function implies that permanent consumption is function of permanent income.

In addition to permanent income the individuals income may contain temporary component that Friedman call as transitory income. The transitory element is accidental or windfall element. Transitory income may be positive (windfall gain) or negative (windfall loss). If transitory income is positive the current income (measured income) will be larger than the permanent income. If the transitory income is negative the current income will be smaller that the permanent income. If transitory income is zero the current income will be equal to permanent income. According to **Friedman** transitory income is not likely to have much effect on consumption.

According to **Friedman,** over a long period of time consumption increases in proportion to the change in the permanent income to permanent consumption is constant irrespective of the level of income. In other words the APC of different families at all levels of income remains the same. The long run APC must be equal to long run MPC.

Friedman's permanent income hypothesis is illustrated in figure 4.1 as below.

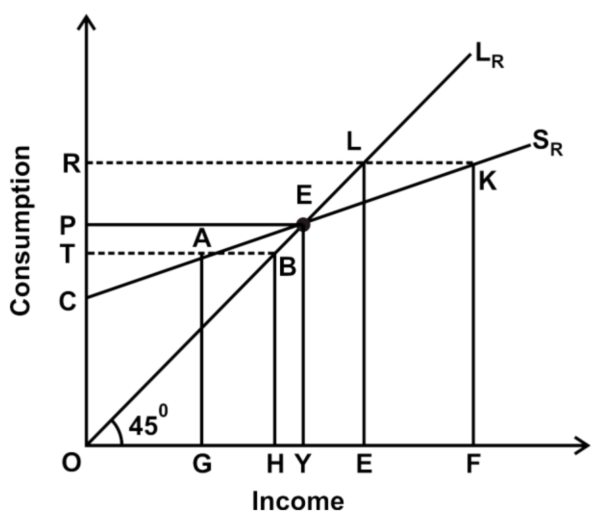


Figure 4.1

In **figure 4.1** permanent consumption function is represented by the long run consumption function curve OL_R. This long run consumption function curve shows the proportional relationship between income and consumption. It also implies that APC is equal to MPC and both are constant. The short run consumption function is represented by the curve CS_R. It is clear that short run consumption curve is flatter than the long run consumption curve. The short run consumption function curve is non proportional indicating that APC is greater than MPC. It also shows that long run MPC is greater than short run income and permanent income are identical. Similarly current consumption and permanent consumption is also equal. At OY level of income transitory factors are absent.

At point A on short run consumption curve current income (measured income) in OG and there is negative transitory income factor (windfall loss). At this point (A) of equilibrium permanent income OH is greater than current income OG. At point a consumption OT is greater than the current income OG. This shows that consumption is greater than current income. According to **Friedman** consumption OT is not related to current income OG but it should be related to permanent income OH. Here higher permanent income sustains higher consumption. (Keynes theory in this case would have related OT consumption with OG income. According to **Friedman** it is wrong).

At point K on short run consumption function curve current income is OF and consumption is OR. But according to **Friedman** OR level of consumption can be positive transitory component (windfall gain). Here current income is greater than current consumption. This shows the non proportionality between current income and current consumption. According to **Friedman** OR consumption is related to OE permanent income and not of OF current income.

Friedman's theory is consistent with the evidence from the cross section budget studies that high income families have low average propensity to consume than that of low income families permanent income hypothesis shows that in the long run there is a proportional relation between income and consumption.

Criticism:

(1) The permanent income hypothesis involves number of subjective problems. There is no unique way of measuring objectivity the concept of permanent income.

(2) Friedman says that transitory income is not consumed but is entirely saved empirically this is not true.

(3) Friedman attempted to club together human and non human form of wealth which is not justified.

(4) Friedman has placed too much emphasis on the long run planning by the consumers.

(5) Friedman's concept of measured income lumps together permanent and transitory income on the one hand and permanent and transitory consumption on the other. This creates some confusion in the theory.

4.1.2 LIFE CYCLE HYPOTHESIS: Life Cycle Hypothesis is another attempt to explain the difference between cyclical short run consumption function and secular long run consumption function. This hypothesis has been developed by **Franco Modigliani, Albert Ando** and later by **Brumberg in 1963**. It is called as life cycle hypothesis or MBA approach (MBA – Modigliani – Brumberg – Ando). The MBA approach is essentially a permanent wealth hypothesis rather than a permanent income hypothesis.

According to life cycle theory the consumption in any period is not the function current income of that period but of the whole life time expected income.

The consumption behaviour of consumer depends on his total resources. The consumer wants to maximise his utility over his own life time. Given the life span of the consumer, the consumption function becomes proportional to his resources. A typical individual in this theory in the early years of his life, as consumer spends but does not earn any income. He lives by borrowing from other or spending the assets bequeathed from his parents. In the middle part of his life time he consumes less than the income he earns ant therefore makes net positive savings. In the final sage of his life (after retirement), his consumption is greater than his income. Therefore he dissaves. However, individual in his life time, the consumption level of the individual consumer will remain more or less constant or slightly increases his consumption in the life time after retirement. The life cycle hypothesis has been depicted in the following figure.

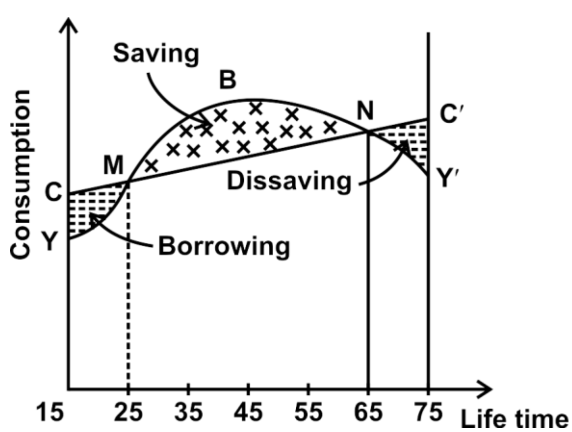


figure 4.2

In **figure 4.2** consumption is measured on Y-axis and life time income of the individual is measured on X-axis. It is assumed that a typical individual knows exactly at what age he will die. In figure 4.2 it is assumed that the individual would die at the age of 75 years. That is 75 years is his expected life time. It is further assumed that the net saving in the entire life time is zero. It is also assumed that interest paid on his assets is zero. The YY_1 curve shows income pattern of the whole life time of the individual whereas CC_1 is the curve of consumption which is assumed to be slightly increasing as the individual grow old. It is assumed that individual enters into working life at the age of 15 years. It is clear from the diagram that up to the age 25 years his income through increases but less than consumption. That is during the first 10 years he was dissaving (borrowing) of his working life. Beyond the age of 25 years of point M on the income and consumption curves and up to the age of 65 years or point N, his income exceeds his consumption. That is he will be saving during this period of his working life. Beyond point N (after retirement)his income becomes less than consumption and therefore he once again dissaves. Therefore during his life time his saving that is shaded area MBN will be equal to the two shaded areas of dissavings that is CMY + $NC_1Y_{1.}$ Thus he dies living behind no wealth or assets for his children.

In a life cycle model consumption is not a mere function of current income but of the expected life time income. Besides in life cycle theory the wealth presently held by individuals also affects their consumption. Life cycle theory can be explained in the form of equation. To do so let us consider an individual of a given age with an additional life expectancy of T years and intended to retire from working after serving for N years more. Then suppose that in the period henceforth the individual will consume a constant proportion. $^1/_T$ of his life time income in equal instalments per annum.

Thus, $$C_t \frac{1}{T} = (Y_{Lt} + (N-1)\, Y^e{}_L + W_t) \qquad \ldots 3.14$$

Where, Ct = consumption expenditure in the current period

Y_{Lt} = income earned from doing labour in the current period t.

N – 1 = remaining future years of doing some labour or work

= income earned from doing labour in the current period t.

N – 1 = Remaining future years of doing some labour or work

$Y^e{}_L$ = the average annual income, expected to be earned over.

N – 1 = Years for which individual plans to do some work
W_t = presently held wealth or assets.

From the above equation it is clear that consumption in aly period does not depend only on current income but also on expected income over his entire working years. It also depends on his presently owned wealth or assets.

The general consumption behaviour as suggested by Ando-Modigliani can be expressed in following equation:

$$C_t = b_1 Y_{Lt} + b_2\, Y^e{}_L + b_3\, W_t) \qquad \ldots 3.15$$

Where, $b_1 y^e{}_{Lt}$ = marginal propensity to consume out of current income.
$b_2 Y^e{}_L$ = marginal propensity to consume out of expected life time income.
$b_3 W_t$ = marginal propensity to consume out of wealth.

Criticism:

(1) Planning of consumption over the whole life span does not seem to be realistic.

(2) Consumption not only depends on assets and resources but it also depends on many other factors.

(3) It is not proper to say that as income increases consumption of an individual also increases.

4.2 CONSUMPTION UNDER CERTAINTY

4.2.1 THE LIFE-CYCLE/PERMANENT-INCOME HYPOTHESIS

Assumptions

- Consumption is the only source of individual utility: consider an individual who lives for T periods whose lifetime utility is:

$$U = \sum_{t=1}^{T} u(C_t), \qquad u'(c) \rangle 0, \qquad u''(c) \langle 0$$

- Both interest rate and discount rate are zero.
- Borrowing or lending is allowed provided that repayment is ensured. The individual's budget constraint is:

$$U = \sum_{t=1}^{T} C_t \le A_0 + \sum_{t=1}^{T} Y_t$$

Where A_0 = initial wealth, Y_t = labour income

Behaviour

The Lagrangian for the maximization problem is:

$$L = \sum_{t=1}^{T} u(C_t) + \lambda\left(A_0 + \sum_{t=1}^{T} Y_1 - \sum_{t=1}^{T} C_t \right)$$

The first-order condition for C_t is:

$$\frac{\partial L}{\partial C} = 0 \quad \Rightarrow u'(C_t) = \lambda$$

$\Rightarrow$ marginal utility is constant for all *t*. Since the level of consumption uniquely determines its marginal utility, consumption is equal across all periods:

$$C_1 = C_2 = \ldots.. = C_T$$

Substituting into the budget constraint yields:

$$C_t = \frac{1}{T}\left(A_0 + \sum_{\tau=1}^{T} Y\tau \right)$$

The individual divides lifetime resources equally among life periods (permanent income by Friedman, 1957).

Implications

- A rise in wealth by A_1, raises consumption only by $\frac{A_1}{T}$.
- A temporary tax will have little effect on consumption (also confirmed empirically).
- Saving is affected substantially.

$$S_t = Y_t - C_t = \left(Y_t - \frac{1}{T}\sum_{\tau=1}^{T} Y_\tau \right) - \frac{1}{T} A_0$$

$\Rightarrow$ saving is high when income is high relative to permanent income, and negative when current income is less than permanent; thus, the individual uses saving and borrowing to smooth the path of consumption: life-cycle/permanent-income hypothesis (Modigliani-Brumberg).

What is saving? Saving is future consumption: the decision about the allocation of income between consumption and saving is driven by preferences between present and future consumption.

- Wealthy individuals save higher fraction of their incomes than the poor do.
- Individuals adjust their consumption to follow that of other.

Empirical Application: Understanding Estimated Consumption Functions

<u>According to Keynes</u>:

- The amount of aggregate consumption depends mainly on the amount of aggregate income.
- Higher absolute level of income lead to a greater proportion of income being saved.

Question: Do the empirical facts demonstrate a consistent stable relationship (between consumption and current income) as Keynes claims?

<u>Case 1</u>: Across households at a given point in time, the Keynes' arguments hold. So if we plot a consumption function it will be like:

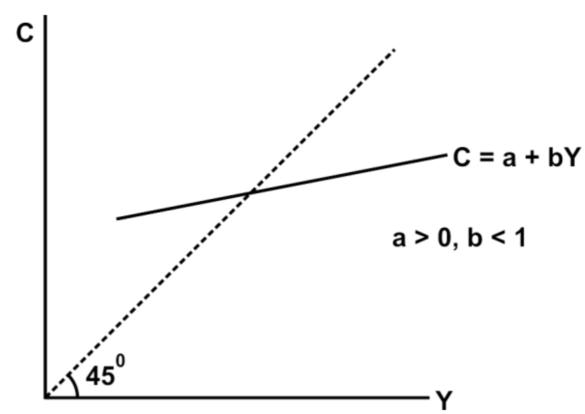


figure 4.3

<u>Case 2</u>: Aggregate consumption within a country over time is a proportion of aggregate income.

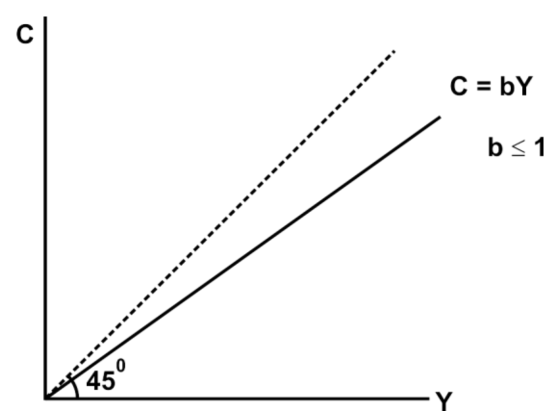


figure 4.4

<u>Case 3</u>: Cross-section consumption function differs across groups. For example, the slope of the estimated consumption function in similar for whites and blacks, but the intercept is higher for whites.

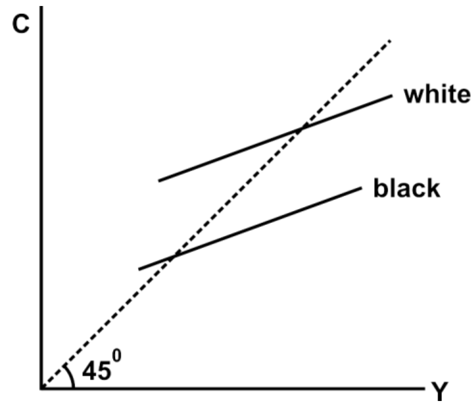


figure 4.5

Can these 3 facts hold the permanent income hypothesis?

Permanent income hypothesis: C = Permanent income hypothesis: C = ^{p}

Current income: $Y = Y^p + Y^T$
We have: $E(Y^T) = 0$, $\quad Cov(Y^P, Y^T) = 0$

Consider a regression of consumption on current income:

$$C_i = a + bY_i + e_i$$

Where

$$\hat{b} = \frac{Cov(Y,C)}{Var(Y)} = \frac{Cov\left[Y^P + Y^T, Y^P\right]}{Var\left[Y^P + Y^T\right]} = \frac{Var\ Y^P}{Var\ Y^P + Var\ Y^T}$$

$$\hat{a} = \hat{c} - \hat{b}\bar{Y} = \bar{Y}^P - \hat{b}\ \bar{Y}^P + \bar{Y}^T \ = \left(1 - \hat{b}\right)\bar{Y}^P$$

4.3 CONSUMPTION UNDER UNCERTAINTY

4.3.1 The Random-Walk Hypothesis

<u>Individual Behaviour</u>

Instantaneous utility function, u , is now quadratic. The individual maximizes:

$$E\,U = E\left[\sum_{t=1}^{T} C_t - \frac{a}{2}C_t^2\right], \qquad a > 0$$

Assumptions

- Both interest rate and discount rate are zero.
- Individual wealth is such that the marginal utility of consumption is positive:

$$u'(c) > 0, c > 0$$

- Individual budget constraint:

$$\sum_{t=1}^{T} C_t \le A_0 + \sum_{t=1}^{T} Y_t$$

Solution:

To describe the individual's behaviour, we use the Euler-equation approach.

Along an optimal path, a reduction *dC* of today's consumption C_1 resulting in a rise of future consumption C_1 should have the same marginal utility.

$$1 - aC_1 = E_1(1 - aC_t) \qquad \text{for all } t = 2, 3, \ldots\ldots$$

Where:

$1 - aC_1$ = today's marginal utility of consumption

$E_1(1 - aC_t)$ = future marginal utility of consumption $\Rightarrow$ today's marginal utility of savings.

Equilibrium

At the optimum the individual should be indifferent between saving and consuming. Since:

$E_1(1 - aC_t) = 1 - aE_1(C_t)$

By the Euler-equation $E_1(C_t) = C_t$ for t = 2,3,…

Thus, the budget constraint can be written:

$$\sum_{t=1}^{T} E_1(C_1) = A_0 + \sum_{t=1}^{T} E_1(Y_t)$$

$$TC_1 = A_0 + \sum_{t=1}^{T} E_1 \; Y_t \; \Rightarrow C_1 = \frac{1}{T}\left(A_0 + \sum_{t=1}^{T} E_1 \; Y_1 \right)$$

The individual consumes $\frac{1}{T}$ of his expected lifetime resources.

<u>Implications</u>

$E_1 \; C_2 \; = C_2 \Rightarrow$ changes in consumption are unpredictable.

By the definition of expectations:

$C_t = E_{t-1} \; C_t \; + e_t$ with

$E_{t-1} \; e_t \; = 0$ (since $E_{t-1} \; C_t \; = C_{t-1} \Rightarrow C_t = C_{t-1} + e_t$)

Result: Consumption follows a <u>random walk</u> (Hall, 1978)

<u>Intuition of this result</u>:

If consumption is expected to rise, current marginal utility of consumption is greater than the expected future marginal utility of consumption and thus the individual is better off raising current consumption. The individual adjusts his current consumption to the point where consumption is not expected to change.

What determines changes in consumption?

Consider the change from 1 to period 2. We have:

$$C_1 = \frac{1}{T}\left(A_0 + \sum_{t=1}^{T} E_1 \; Y_1 \right) \text{and}\, C_2 = \frac{1}{T-1}\left(A_1 + \sum_{t=2}^{T} E_2 \; Y_1 \right)$$

By definition $A_1 = A_0 + Y_1 - C_1$:

$$\Rightarrow C_2 = \frac{1}{T-1}\left(A_0 + Y_1 - C_1 + \sum_{t=2}^{T} E_2 \; Y_t \right)$$

Where $\sum_{t=2}^{T} E_2 \; Y_t \; = \sum_{t=2}^{T} E_1 \; Y_t \; + \left\{ \sum_{t=2}^{T} E_2 \; Y_t \; - \sum_{t=2}^{T} E_1 \; Y_t \right\}$:

Expectation at *t* = 2 of lifetime income =

Expectation at *t* = 1 of lifetime income + information learned between *t* = 1 and *t* = 2.

Replacing in C_2 we get:

$$C_2 = \frac{1}{T-1}\left(A_0 + Y_1 - C_1 + \sum_{t=2}^{T} E_1 \;\; Y_t \;\; + \left\{ \sum_{t=2}^{T} E_2 \;\; Y_t \;\; \right\} \right)$$

and since $A_0 + Y_1 + \sum_{t=2}^{T} E_1 \;\; Y_t \;\; = TC_1$

$$\Rightarrow C_2 = \frac{1}{T-1} \;\; TC_1 - C_1 + \left(\sum_{t=2}^{T} E_2 \;\; Y_1 \;\; - \sum_{t=2}^{T} E_1 \;\; Y_1 \;\; \right) = C_1 + \frac{1}{T-1}\left(\sum_{t=2}^{T} E_2 \;\; Y_t \;\; - \sum_{t=2}^{T} E_1 \;\; Y_1 \;\; \right)$$

The change in consumption between period 1 and 2 equals the change in the individual's estimate of his lifetime resources divided by the number of remaining time periods

$\Rightarrow$ <u>Changes in consumption are unpredictable.</u>

<u>Certainty Equivalence</u>

The individual consumes the amount he would if his future income was certain to equal its mean. So, uncertainty about future income has no effect on consumption (certainty equivalence).

Consider the Euler equation relating consumption in periods 1 and 2.

$$u' \;\; C_1 \;\; = E_1\left[u' \;\; C_2 \;\; \right]$$

When utility is quadratic, marginal utility is linear. Thus:

$$E_1 \;\; 1 - aC_2 \;\; = 1aE_1 \;\; C_2$$

For the quadratic utility function, the general rule is:

$$C_1 = E_1 \;\; C_2$$

This result may not hold if the utility function is not quadratic (i.e. marginal utility is not linear).

4.4 THE INTEREST RATE AND CONSUMPTION GROWTH

The interest rate and saving: An important issue concerning consumption involves its response to rates of return, as tax treatment of interest income may affect savings thus consumption. But, what if consumption is relatively unresponsive to such policies?

$\Rightarrow$ it is important to understand the impact of rates of return on consumption.

Assumptions

- Non-zero interest r
- Budget constraint is now modified (consumption and income will be discounted by the interest rate).

$$\sum_{t=1}^{T} \frac{1}{1+r}^{\,t} C_1 \leq A_0 + \sum_{t=1}^{T} \frac{1}{1+r}^{\,t} Y_t$$

- Non-zero discount rate (that is, individuals do not value future consumption as much as current consumption).
- The instantaneous utility function takes the constant-relative-risk aversion form (CRRA):

$$U = \sum_{t=1}^{T} \frac{1}{1+\rho}^{\,t} \frac{C_t^{1-\theta}}{1-\theta}$$

Where ρ is the discount rate and θ is the coefficient of relative aversion (higher θ implies greater aversion to risk).

The marginal utility with respect to consumption is constant:

$$-\frac{u'' \;\; c}{u' \;\; c} c = \theta$$

$\frac{1}{\theta}$ is the elasticity of substitution between consumption at different time periods.

The smaller the $\theta \rightarrow$ the higher $\frac{1}{\theta} \rightarrow$ the slower τηε marginal utility with respect to consumption, u'©, is reduced as consumption increases $\rightarrow$ individuals are more willing to accept deviation from a uniform pattern.

The Euler Equation

Consider a decrease in consumption at t, accompanied by an increase in consumption at t + 1.

Optimization requires that marginal utility is equal across periods. The Euler equation becomes:

$$\frac{1}{(1+\rho)^{t}} C_t^{-\theta} = 1+r \ \frac{1}{(1+\rho)^{t+1}} C_{t+1}^{-\theta}$$

$$\frac{1}{(1+\rho)^{t}} C_t^{-\theta} \quad \Rightarrow \text{ decrease in consumption at period t}$$

$$\frac{1}{(1+\rho)^{t+1}} C_{t+1}{}^{-\theta} \quad \Rightarrow \text{increase in consumption at period t + 1}$$

$$1+r \ \frac{1}{(1+\rho)^{t+1}} C_{t+1}{}^{-\theta} \quad \Rightarrow \text{return of rise in savings at period t}$$

When consumption is decreased, saving is increased. Individual chooses to decrease consumption is up to the point that he is indifferent between today's and future consumption.

The Euler equation can be written as:

$$\frac{C_{t+1}}{C_t} = \left(\frac{1+r}{1+\rho}\right)^{\frac{1}{\theta}}$$

- if $r \neq \rho \Rightarrow$ consumption is <u>not</u> a random walk (i.e. consumption will not be steady across time).
- If $r > \rho \Rightarrow$ consumption increases over time.
- If $r < \rho \Rightarrow$ consumption decreases over time.
- If $r = \rho \Rightarrow$ individual is indifferent, consumption is a random walk.
- If r varies $\Rightarrow$ there are variations in the predictable component of consumption growth.

<u>Implications</u>

❖ Many of the changes we are interested in do not involve just changes in the interest rate. The Euler equation does not give us any information about the significance of income (or any other variable) in explaining consumption.

- If $r = \rho$, the pattern of consumption is dominated by stochastic trend.

Closed-form solution for consumption

If we take into account the first implication an important issue we have to deal with is how to derive a closed-form solution for consumption (i.e. a solution in which consumption depends on other variables).

For any period i>t the Euler equation is:

$$C_{t+1} = C_t \left(\frac{1+r}{1+\rho} \right)^{\frac{i}{\theta}}$$

One period budget constraint:

$$A_t = 1+r \;\; A_{t-1} + y_t - C_t \qquad \textbf{(1)}$$

$$C_t = 1+r \;\; A_t + y_t \Rightarrow \frac{C_{t+1}}{1+r} = A_t - \frac{A_{t+1}}{1+r} + \frac{y_{t+1}}{1+r} \qquad \textbf{(2)}$$

$$\Rightarrow C_1 + \frac{C_{t+1}}{1+r} + y_t + \frac{y_{t+1}}{1+r} - \frac{A_{t+1}}{1+r} + 1+r \;\; A_{t-1}$$

By (1) : $\frac{A_{t+2}}{1+r} = A_{t+1} + \frac{y_{t+3}}{1+r} + \frac{C_{t+2}}{1+r}$

Replacing into (4) and after continuous substitutions we get:

$$\sum_{i=0}^{\infty} \frac{C_{t+i}}{1+r \;\; ^{i}} = \sum_{i=0}^{\infty} \frac{y_{t+i}}{1+r \;\; ^{i}} + 1+r \;\; A_{t-1} - \lim_{i \to \infty} \frac{A_{t+1}}{1+r \;\; ^{i}}$$

By the transversally condition: $\lim_{i \to \infty} E_t \left\lfloor A_{t+1} \;\; 1+r \;\; ^{i} \right\rfloor = 0$

$$\Rightarrow \sum_{i=0}^{\infty} \frac{C_{t+i}}{1+r \;\; ^{i}} = \sum_{i=0}^{\infty} \frac{y_{t+i}}{1+r \;\; ^{i}} + 1+r \;\; A_{t-1}$$ (inter temporal budget constraint)

After some calculations we can get:

$$C_t = \left\{ - \left[\frac{1+\rho \;\; ^{1/\theta}}{1+r \;\; ^{1/\theta - 1}} \right]^{-1} + 1 \right\} \left(\sum_{i=0}^{\infty} \frac{y_{t+1}}{1+r \;\; ^{r}} + 1+r \;\; A_{t-1} \right)$$

For $r = \rho$ we get the <u>closed-form solution of consumption:</u>

$$C_t = \frac{r}{1+r}\left(\sum_{i=0}^{\infty} \frac{y_{t+1}}{(1+r)^i} + (1+r)A_{t-1}\right)$$

Where $\sum_{i=0}^{\infty} \frac{y_{t+1}}{(1+r)^i}$ is the discounted stream of income and $\left(\sum_{i=0}^{\infty} \frac{y_{t+1}}{(1+r)^i} + (1+r)A_{t-1}\right)$ is permanent income.

Implications

- ❖ We were able to obtain the structural equation for consumption because we assumed that utility function takes the CRRA form.
- ❖ A rise in the interest rate r has two effects:

1) Negative substitution effect (comes from discounted stream of income term).

2) Income effect which is:

- negative if initial wealth is negative. When $A_{t-1} < 0$ the individual is in debt and if r rises the debt rises as well $\Rightarrow$ impact in consumption is negative
- positive if initial wealth is positive. Respectively when $A_{t-1} > 0$ the individual is in credit and as r rises credit rises as well, thus impact in consumption is positive.

- ❖ There are very specific dynamic (future income, initial wealth) that govern consumption. It may be function of wealth but not a linear one!

4.5 SUMMARY

1. There are four basic alternative hypotheses on consumption function. They are as follows:
   (a) Absolute income hypothesis
   (b) Relative income hypothesis
   (c) Permanent income hypothesis
   (d) Life cycle hypothesis

2. Permanent income hypothesis was put forward by an American Economist **Milton Friedman** in 1957. According to Friedman consumption expenditure depends not on current income but on permanent income. Permanent income is that income which can be permanently sustained. The long term income is the permanent income.

3. According to life cycle theory the consumption in any period is not the function current income of that period but of the whole life time expected income.
4. Life-cycle/permanent-income hypothesis implied that saving is high when income is high relative to permanent income, and negative when current income is less than permanent; thus, the individual uses saving and borrowing to smooth the path of consumption.

5. When an individuals concsumption is unpredictable, the Random-walk hypotheisis implies that, if consumption is expected to rise, current marginal utility of consumption is greater than the expected future marginal utility of consumption and thus the individual is better off raising current consumption. The individual adjusts his current consumption to the point where consumption is not expeted to change.

4.6 QUESTIONS

1. Both Modigliani and Friedman argue that the basic relationship between income and consumption is that of proportionality. How, then, do they explain the budget studies, which always show consumption rising in lesser proportion than income?

2. What are some of the pricipal shortcomings of the common conceptual foundation of the permanent income and life cycle theories of consumption.

3. “Consumption is an aspect of social as much as of individual behaviour” Explain. What are the possible implications of this proposition?

❖❖❖❖

5

DEMAND FOR MONEY

Unit Structure

5.0 OBJECTIVES

- To study classical approach to demand for money
- To study Neo classical approach to demand for money
- To study Keynesian approaasch to demand for money
- To study Tobin's portfolio approach to demand for money
- To study Baumol's Inventory approach to demand for money
- To study Friedman's approach to demand for money

5.1 CLASSICAL APPROACH TO DEMAND FOR MONEY

The classical approach to demand for money is known in the name of Prof. Irving Fisher's Cash Transaction approach. Prof. Irving Fisher's famous cash transaction equation is stated below:

$$MV = PT$$

Where; M = Stock of money

V = Velocity of circulation

$P = $ Price level

$T = $ Volume of transactions

By manipulating the equation MV = PT, the money demand function can be derived as stated below:

$$M_d = PT/V$$

Here $M_d = $ Demand for money.

The demand for money is the product of the volume of transactions overtime and the average price level divided by the average velocity of circulation of money. The money demand equation can be restated as follows:

$$M_d = 1/V \times PT$$

Assuming the values of P as Rs.10 per unit of transaction, T as 400,000 Units and V as 8 and substituting these values in the above equations, the demand for money can be obtained as follows

$$M_d = \frac{10 \times 400,000}{8} = \text{Rs.}500000.$$

Assuming that T and V remains constant in the short period, proportionate change in the demand for money will be equal to proportionate change in the price level i.e. demand for money will directly change with the change in price level. According to Irving Fisher, in the short period, changes in the price level are directly related to the changes in money supply. He defines money supply as $M_s = \frac{PT}{V}$. As $M_d = \frac{PT}{V}$, it can be said that $M_d = M_s$. Thus according to Fisher, the demand for money is always equal to the supply of money. In the Fisherian equation, the demand for money is a proportion of the total value of transactions i.e. 1/V = K or M = KPT. In this equation, K = is the proportion of total value of transactions held by the people in the form of money. It is the inverse of velocity 'V'. Assuming that the velocity of circulation of money is 5 then the demand for money is 1/5 or 20 per cent of PT. If PT = Rs.40 lakhs, demand for money would be Rs.8 lakhs and if PT increases by 50 per cent to Rs.60 lakhs, demand for money would be Rs.12 lakhs. Fig. 1 shows the Fisherian demand for money function. The slope of the M_d curve measures K or 1/V. Since K is assumed to be constant, the money demand curve is a linear positively sloping straight line. It indicates a direct proportionate relationship between demand for money and PT.

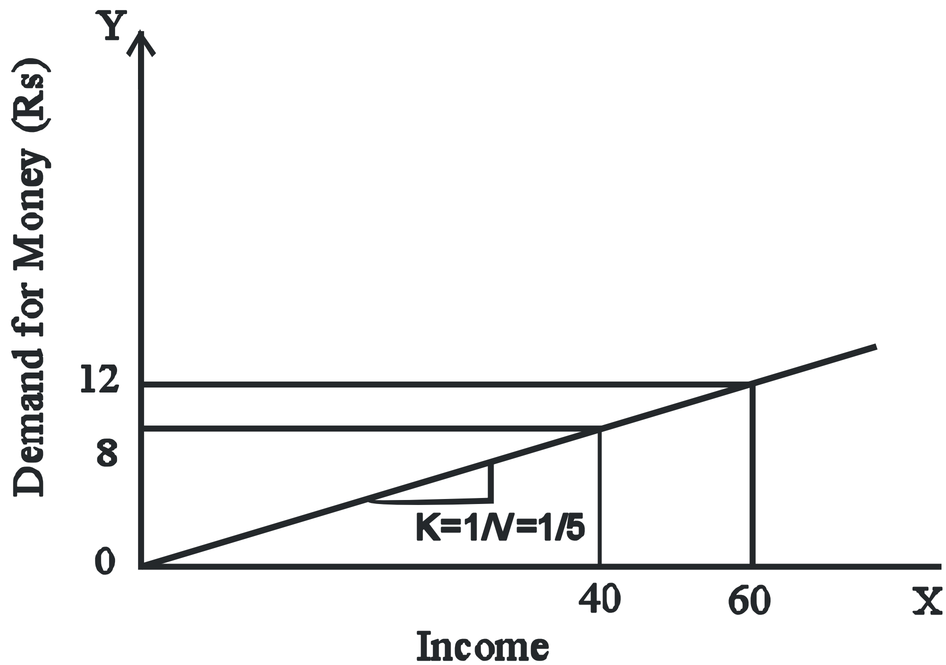


Fig.5.1 Fisher's Money Demand Function

5.2 CAMBRIDGE APPROACH OR THE NEO-CLASSICAL APPROACH TO DEMAND FOR MONEY.

The Cambridge approach or the Cash balance approach to the demand for money was put forward by the Cambridge economists Marshall and Pigou. Both Marshall and Pigou are considered neo-classical economists. These economists emphasized the store of value function of money as against the medium of exchange function of money emphasized by Fisher. According to the neo-classical economists, demand for money is the amount of money people want to hold or the cash balances held by the people. The total demand for money is the sum of individuals desire to hold cash balances in the community. The amount of cash balances held by the people in any given period of time is determined by the following factors:

1. Current price level and expected changes.
2. Current interest rate and expected changes.
3. Wealth owned by individuals.

The neo-classical economists believed that these factors remain constant in the short run. The neo-classical money-demand function can be stated as follows :

$$M_d = KPY$$

Where; M_d = Demand for money.

K = Proportion of national income held in the form of cash balances by the people.

PY = Nominal national income.

5.3 KEYNESIAN APPROACH TO DEMAND FOR MONEY

Keynes put forward his theory of demand for money in his famous work “The General Theory of Employment, Interest and Money” (1936). According to Keynes, people hold cash balances on account of three reasons or motives. These are the transaction motive, the precautionary motive and the speculative motive. Accordingly the demand for money can be separated into three parts namely transaction demand, precautionary demand and speculative demand for money. The total demand for money or cash balances can be divided into two namely; active and idle cash balances.

Active Cash Balances.

Demand for active cash balances is divided into transaction and precautionary demand for money. The **transaction demand** for money arises due to the fact that money is a medium of exchange. Further receipts and payments do not take place simultaneously. There is always a time gap between two successive receipts and payments are an ongoing affair in the routine course. Hence people need to hold cash balances to pay for their regular transactions. According to Keynes, transaction motive for holding money is the need of cash for the current transactions of personal and business expenditure. Therefore, households and firms hold money on account of the transaction motive. Their respective transactions motives can be referred to as income and business motives. The income motive refers to the transaction motive of households. Families hold cash balances to execute routine transactions. Household demand for money depends upon the following factors:

1. **The Level of Income**. Transaction demand for money by the households is directly related to the level of income, i.e. higher the level of income, higher will be the transaction demand for money and vice versa.

2. **The Price Level**. Higher the price level, higher will be the transaction demand for money and vice versa. When prices rise, more money will be required to purchase the same quantity of goods and services and hence the transaction demand for money would rise when prices rise.

3. **The Spending Habits**. If the people in a society are thrifty, they would require less money for transactions purposes. However, if large number of persons in a society is spendthrift, they would require more money for transaction purposes.

4. **The Time Interval.** If the time interval between two successive income receipts is big, then the people will hold larger cash balances under transaction motive and vice versa.

Similarly, firms need cash balances to pay for raw materials, transport, wages and salaries and other payments. Cash balance held by firms to satisfy these requirements is the money held under **business motive**. The quantum of money held under business motive is directly related to the turnover of firms i.e. larger the turnover, larger will be the amount of money held under business motive.

Transactions demand for money is therefore the sum of money held under income motive and business motive. It is income determined and remains stable in the short run because income change takes place only in the long run. Transactions demand for money is an increasing function of income. Symbolically, the transactions demand for money function can be stated as follows:-

$$L_t = f(Y)$$

Where; L_t = Liquidity preference under transactions motive.

Y = Level of national income.

People also hold cash balances to provide for unforeseen requirements. The amount of cash balances held by people to provide for unforeseen requirements is referred to as precautionary demand for money or money held under precautionary motive.

Sickness, unemployment, death, accidents etc are some of the unforeseen events which may take place in the lives of people. The precautionary demand for money depends upon uncertainty of future receipts. It is directly related to income and relatively stable. The precautionary demand for money is interest inelastic and changes in response to changes in uncertainty. Symbolically, the precautionary demand for money can be stated as follows: $L_p = f(Y)$, where; L_p = Liquidity preference under precautionary motive.

The transaction and precautionary demand for money cannot be easily separated in practice and since both the money demand functions are income determined and also interest inelastic, they are collectively known as **active balances**. Symbolically, the demand for active balances can be stated as follows: $L_1 = L_t + L_p$

Both transaction and precautionary demand for money is income determined, we can restate the money demand function for active balances as follows: $L_1 = f(Y)$. The demand for active balances is graphically depicted in Fig.2 below. You will notice that at income level OY_1, OM_1 is the demand for active cash balances. When income level rises to OY_2, the demand for active cash balances also rises to OM_2. The demand for active cash balances is proportionate to changes in income.

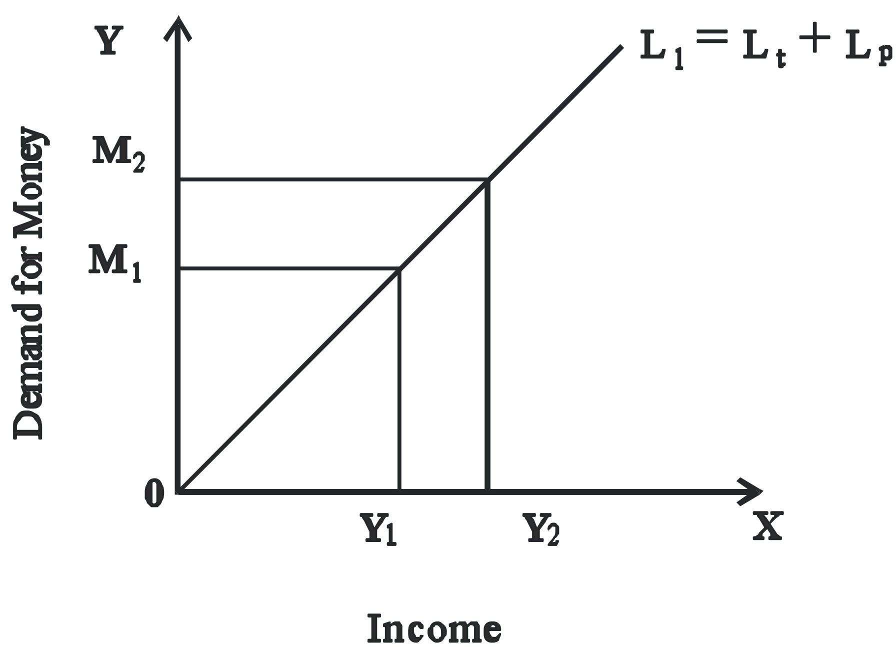


Fig.5.2: Demand for Active Cash Balances.

Idle Cash Balances (Speculative Demand for Money).

The cash balances held by people for speculative purposes are known as demand for idle cash balances. The speculative motive for holding cash balances originates from uncertainty about the future rate of interest. Speculative demand for money arises because of the store of value function of money. The speculator holds cash balances in order to make speculative gains from investment in securities. According to Keynes, investors make capital gains by speculating in securities or bonds. The speculative demand for money depends upon the rate of interest. The demand for speculative cash balances is inversely related to the rate of interest. When people expect the prices of income yielding assets such as bonds to fall, the speculative demand for money rises and vice versa. Symbolically, the speculative demand for money can be stated as follows

$L_2 = f(i)$

Where L_2 = Speculative demand for money.

i = Rate of interest.

The opposite relationship between rate of interest and speculative demand for money is shown in Fig.3 below.

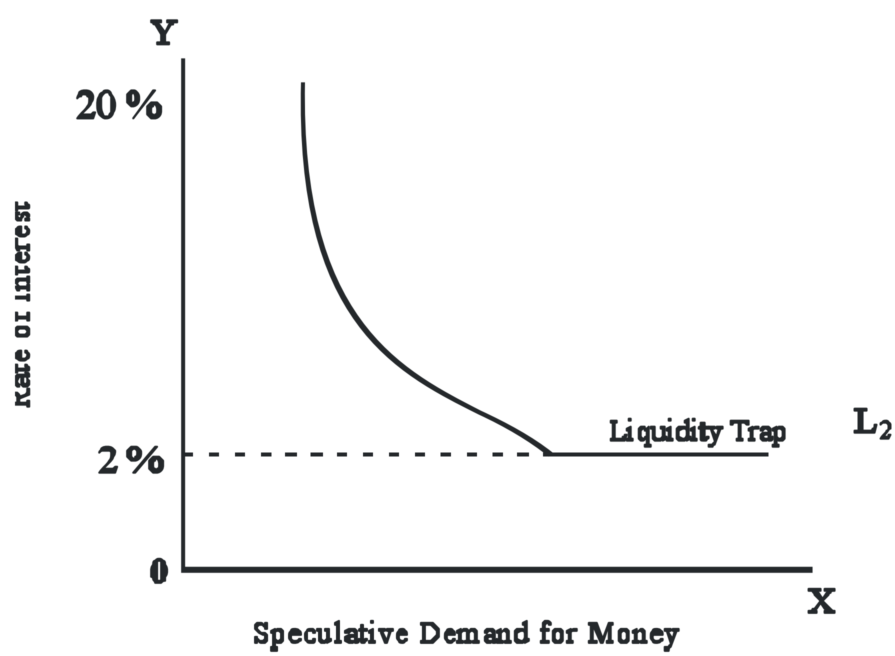


Fig.5.3 : Demand for Idle Cash Balances.

You will notice that the speculative demand for money is inversely related to the rate of interest. When the rate of interest falls, the speculative demand for money rises and vice versa. Speculative demand for money is therefore highly interest elastic. However, at a very low interest rate, the speculative demand for money becomes perfectly elastic i.e., the entire income is held in the form of idle cash balances. This is due to the fact that bond prices and interest rates move in opposite directions. When the interest rate rises, the bond or security prices fall and vice versa. The speculative demand for money is also income determining and not income determined as in the case of transaction and precautionary demand for money. When the interest rate is expected to rise, people prefer to hold cash balances at the current interest rate so that they can take advantage of a rise in interest rate in the future. When speculative demand for money is rising, it indicates a greater preference for liquidity.

The Concept of Liquidity Trap

At a very low rate of interest, the speculative demand for money is perfectly elastic i.e., the entire income is held by people in the form of cash balances for speculative purposes. In the situation of liquidity trap, percentage change in the demand for money in response to a percentage change in the rate of interest is equal to infinity. Symbolically, the liquidity trap situation can be stated as follows:

$$\frac{\Delta M}{M} \times \frac{i}{\Delta i} = \alpha$$

You will notice that the L_2 curve in Fig.5.2 shows the liquidity preference under the speculative motive at different rates of interest. At a very high interest rate of 20%, the speculative demand for money is very low and vice versa. However, when the interest rate is only 2%, the speculative demand for money becomes perfectly elastic. At this point, any increase in money supply or income will be held by the people in the form of idle cash balances. In the diagram, the liquidity trap situation is shown by highlighting the horizontal segment of the liquidity preference curve. The liquidity trap situation arises because at very low rate of interest, the opportunity cost of holding cash balances is negligible and that in future the opportunity cost of holding cash balances is expected to rise.

Aggregate Demand for Money.

The aggregate or total demand for money is the sum of transaction, precautionary and speculative demands for money. Symbolically, the aggregate demand for money can be stated as follows:

$$L = L_1 + L_2$$

Where; L = Aggregate demand for money.

The functional relationship between aggregate demand for money and the determining variables nominal level of aggregate income and the rate of interest can be stated as follows:

$$L = f(Y, i)$$

The liquidity preference schedule of a community can be obtained by superimposing the L_1 curves at each level of income on the L_2 curves. The liquidity preference schedule of a community is shown in Fig.5.3 below.

In Fig.4, Panel (A) shows the schedule of active balances (the sum of transaction and precautionary demand for money) held by people at different levels of income. The demand for active balances is perfectly inelastic to changes in interest rate in the short run and changes proportionately to the changes in the level of income. Accordingly, L_1 (Y_1) shows the demand for active cash balances at Y_1 level of income and so on and so forth. The L_1 curves are vertically sloping because they are interest-inelastic. In Panel (B), the L_2 curves demand for idle cash balances or speculative demand for money. You will recall that speculative demand for money is interest-elastic and inversely related to the rate of interest. Hence the L_2 curve is downward sloping. However, at a very low rate of interest, it becomes horizontal indicating that the entire income is held in the form of idle cash balances. In Panel (C), the liquidity preference curve indicating total demand for money is shown. It is the result of super-imposition of the L_1 curves on the L_2 curves. Accordingly, the curves $L(Y_1)$, $L(Y_2)$ and $L(Y_3)$ are obtained and they represent the liquidity preference schedules of the community at various levels of interest rates and national income.

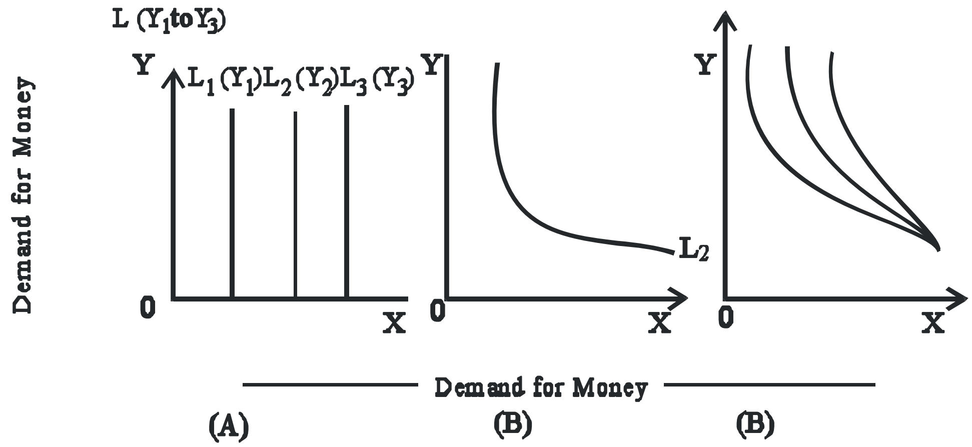


Fig.5.4: Total Demand for Money

5.4 FRIEDMAN'S APPROACH TO DEMAND FOR MONEY

Milton Friedman restated the quantity theory of money and prices and put forward his new money demand function. According to Friedman, the money demand function is the most stable function. Money is an asset in which a part of the wealth can be kept by wealth holders. For firms, money is a capital good which when combined with other factors of production leads to the production of goods and services. According to Friedman, people hold money because it has the power to purchase goods and services. Demand for money is demand for capital assets because money also provides services and returns. The return on monetary wealth is the quantity of goods and services that can be purchased at a given price level. Bonds are also monetary assets in which people can hold their wealth and obtain annualized fixed interest income. The returns on bonds is the sum of the coupon rate of interest and the anticipated capital gains or losses due to expected change in the market rates of interest. The public may also hold wealth in the form of equity shares and obtain returns in the form of dividend and capital gains or losses. Friedman considered that wealth can be held by people in the form of capital and durable consumer goods. But these goods provide returns in kind and not in cash along with returns in the form of expected rate of change in their prices per unit of time.

Milton Friedman's nominal money demand function can be stated as follows:

$$M^d = f\left(W, h, r_m, r_b, r_e, P, \frac{\Delta P}{P}, U\right)$$

The demand for real money balances can be obtained by dividing nominal money demand by the price level and this can be stated as follows:

$$\frac{M^d}{P} = f\left(W, h, r_m, r_b, r_e, P, \frac{\Delta P}{P}, U\right)$$

Where; M^d = Nominal money demand,

$\frac{M^d}{P}$ = Demand for real money balances.

W = Wealth of the individual.

h = Proportion of human wealth to the total wealth held by the people.

r_m = Interest income from money holdings.

r_b = Interest rate on bonds.

r_e = Rate of return on equity shares.

P = Price level.

$\frac{\Delta P}{P}$ = Change in the price level, and

U = Institutional factors.

According to Milton Friedman, the following factors determine the demand for money:

1. Wealth (W). Wealth is the major factor determining the demand for money. Both human and non-human wealth is included in the concept of wealth by Friedman. Bonds, equity shares and money are examples of non-human wealth and human capital is a form of human wealth. Human wealth refers to the value of an individual's present and future earnings and it represents the non-liquid component of wealth and hence the proportion of human wealth to non-human wealth is included in the money demand function as an independent variable. The demand for money is a direct function of individual's total wealth and total wealth sets the upper limit of holding money by an individual. Since human wealth is non-liquid in nature, the demand for money will rise with the rise in proportion of human wealth to non-human wealth.

2. Rates of Return (r_m, r_b, r_e). These three rates of return determine the demand for money. The rate of interest on money held in the form of savings and fixed deposits is denoted by (r_b). The demand for money is a direct function of the rate of interest on money given the other rates of interest i.e., higher the rate of interest on money, higher will be the demand for money. The opportunity cost of holding money is the interest forgone by not holding other assets such as bonds and equities. When the rates of return on bonds and equities rise, the opportunity cost of holding money will rise and the demand for money holdings will fall. Thus the demand for money is inversely related to the rate of interest on bonds, equities and other non-monetary assets.

3. Price Level (P). Higher the price level, higher will be the demand for nominal money balances and vice versa. If income (Y) is used as a proxy for wealth (W), then nominal money income is given by Y/P which becomes an important determinant of money. Here ‘Y’ stands for real income and ’P’ stands for price level.

4. The Expected rate of Inflation $\left(\frac{\Delta P}{P}\right)$.

Higher the rate of inflation, lower will be the demand for money holdings because inflation reduces the value of money balances in terms of purchasing power. If the rate of inflation is greater than the nominal rate of interest, the return on money holdings will be negative. Hence, when people expect a higher arte of inflation, they will convert money holdings into goods or other assets which are not affected by inflation.

5. Institutional Factors (U). Pattern of wage payments and bill payments are some of the institutional factors which affect the demand for money. Further, if people expect an impending recession or war, the demand for money balances will increase. Instability in capital markets will also raise the demand for money. Political instability also influences the demand for money. All these factors have been accounted for as institutional factors and included in the variable `U’ by Friedman in his money demand function.

5.5 TOBIN’S PORTFOLIO APPROACH TO DEMAND FOR MONEY

James Tobin, an American economist in his work “Liquidity Preference as Behavior Towards Risk, Review of Economic Studies Vol.25 (1958) explained that rational behavior of individuals is that they should keep a portfolio of assets which consists of both bonds and money. He assumes that people prefer more wealth to less. An investor needs to decide as to what proportion of his portfolio of financial assets he should keep in the form of liquid money or non-interest bearing assets and interest bearing assets. The portfolio of individuals may also include risk prone assets such as shares. Given the risk profile of various assets, investors may diversify their portfolio by holding a balanced combination of safe and risk prone assets. Investors show risk aversion i.e. they prefer less risk to more risk at a given rate of return. According to Tobin, investors are uncertain about the future rate of interest. If an investor chooses to hold a greater proportion of risk prone assets such as bonds in his portfolio, he will be a earning a high average return but will bear a higher degree of risk. According to Tobin, a risk averse- investor will not opt for risk laden portfolio consisting of only bonds. In contrast, an investor who holds only safe and risk free assets such as liquid money and bank demand deposits, he will be taking zero risk but will also receive very low or no return and hence there will be no growth in his wealth. Thus, investors prefer a diversified portfolio of money, bonds and shares with the proportion of each component determined by the investor's risk profile.

Tobin's Liquidity Preference Function.

Tobin obtained his liquidity preference function by showing the relationship between the rate of interest and demand for money. Tobin argued that with the increase in the rate of interest, wealth holders will be attracted to hold a greater fraction of their wealth in bonds and thus reduce their holding of money. Thus at a higher rate of interest, the demand for holding liquid money will be less and investors will be holding more bonds in their portfolio. In contrast, at a lower rate of interest, investors will hold more liquid money and less of bonds in their portfolio. The demand function for money as an asset slopes downwards as shown in the following figure where the demand for money is depicted on the horizontal axis. This downward sloping liquidity preference function curve shows that the asset demand for money in the portfolio increases as the rate of interest on bonds falls. Tobin derives the aggregate liquidity preference curve by determining the effects of changes in interest rate on the asset demand for money in the portfolio of investors. Tobins's liquidity preference theory has been found to be true by empirical studies conducted to measure interest elasticity of the demand for money. Empirical studies show that aggregate liquidity preference curve is negatively sloped which means that most of the people in the economy have liquidity preference function similar to the one shown in the following figure 5.

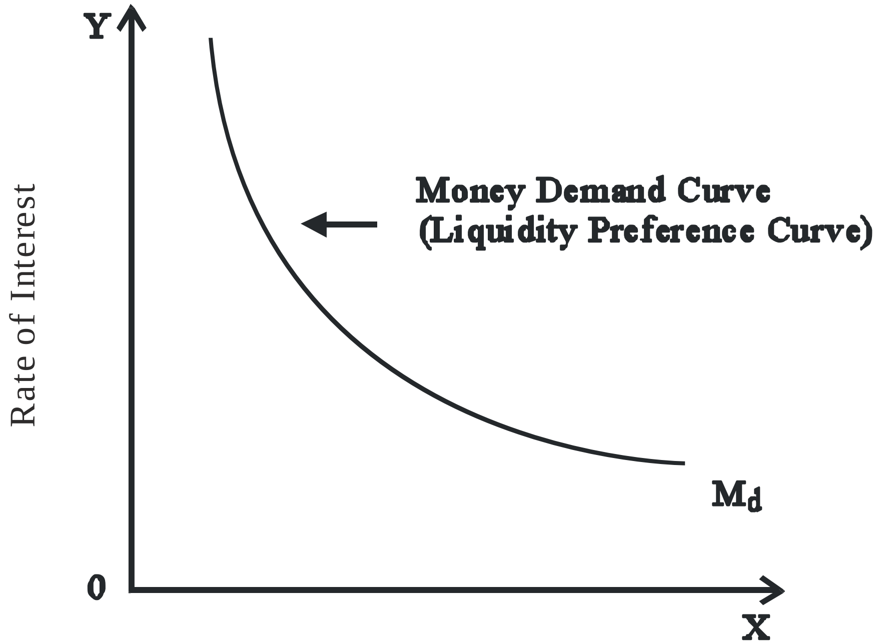


Fig. 5.5 - Tobin's Money Demand Curve.

5.6 BAUMOL'S INVENTORY APPROACH TO TRANSACTIONS DEMAND FOR MONEY.

According to Baumol, the transaction demand for money is similar to the inventory management of goods and materials by business firms. As businessmen keep inventories of goods and materials to facilitate transactions in the context of changes in demand for them, individuals also hold inventory of money because this facilitates transactions of goods and services. However, there is a cost involved in holding inventories of goods and hence there is a need for keeping optimal inventory of goods to reduce cost. In the same manner, individuals have to keep optimum inventory of money for transaction purposes because they incur cost when they hold inventories of money for transaction purposes. The interest income foregone is the cost of holding money for transactions purposes. Baumol says that transaction demand for money is not interest elastic.

Saving deposits in banks are relatively free from risk and yield some interest. However, people hold money i.e. currency and demand deposits for convenience and for effecting their transactions. People hold money for transaction purposes to bridge the gap between the receipt of income and its spending. As interest rate on saving deposits goes up people will tend to shift a part of their money holdings to the interest bearing saving deposits.

According to Baumol, the cost which people incur when they hold money is the opportunity cost of money which is the interest income lost by not putting money in saving deposits.

Transaction Demand for Money

Baumol analyses the transactions demand for money of a person who receives income at a fixed interval and spends it gradually at a steady rate. It is assumed that the person is paid Rs.24000/- salary check on the first day of each month. Assuming, the person liquidates the check on the first day itself and gradually spends it daily throughout the month at the rate of Rs.800/- per day, he will be exhausting his salary by the end of the month. The average money holding in the given month will be Rs.12000/- (Rs.24000/2). In the first fortnight, the person will have more than Rs.12000/- and in the second fortnight he will have less than Rs.12000/-. The average holding of money equal to Rs.12000/- is shown by the dotted line. This is not prudent management of money because the person is losing interest on his money holdings. Instead of withdrawing his entire salary on the first day of the month, if he withdraws only half of it i.e. Rs.12000/- and deposits the remaining amount of Rs.12000/- in saving account bearing five per cent interest (see Fig), it will be seen that his money holdings of Rs.12000/- will be zero at the end of the fortnight or on the 15th day of the month. Now he can withdraw Rs.12000/- on 16th of each month and spend it gradually at a steady rate of Rs.800/- per day for the next 15 days of the month. This is prudent management of funds as the person will be earning interest on Rs.12000/- for 15 days in each month. Average money holding in this scheme of money management is Rs.6000/- (Rs.12000/2).

In the same manner, if the person decides to withdraw Rs.8000/- or 1/3rd of his salary on the first day of each month and deposits Rs.16000/- in the saving deposits. His Rs.8000/- will be reduced to zero on the 10th day and on the 11th of the month, he can withdraw another Rs.8000/- to spend till the 20th day and on the 21st day he can once again withdraw another Rs.8000/- to spend till the end of the month. In this new scheme of money management, he will be holding Rs.8000/2 = Rs.4000/- and will be investing remaining funds in saving deposits and earn more interest on them.

Now the question is as to which scheme of money management will be adopted by the individual. According to Baumol, the optimal amount of money holding is determined by minimizing the cost of interest income foregone and the opportunity cost of withdrawing money frequently (broker's fee). It follows that a higher broker's fee will raise the money holdings as it will discourage the individuals to make more visits to the bank. Conversely, a higher interest rate will induce them to reduce their money holdings for transaction purposes as they will be induced to keep more funds in saving deposits to earn higher interest income. Thus, at a higher rate of interest transactions demand for money holdings will be less.

Baumol's theory of transaction demand for money is definitely an improvement over the Keynesian theory which states that transaction demand for money is interest inelastic. Therefore, the transaction demand for money curve slopes downwards as shown in Figure. At higher interest rates, bonds, savings and fixed deposits are more attractive relative to money holdings for transaction purposes and individuals will be holding less money. Conversely, when the rate of interest is low, opportunity cost of money holding will be less and the transaction demand for money would be more. Further, the transactions demand for money varies directly with the income (Y) of the individuals. At a given rate of interest, the transaction demand for money would be a direct function of the level of income and an inverse function of the rate of interest. In Fig.6 the three transactions demand curves for money MD_1, MD_2 and MD_3 for the three different levels of income Y_1, Y_2 and Y_3 are shown. The optimum money holding for transactions will increase less than proportionately to the increase in income. Thus transaction demand for money according to Baumol and Tobin is a function of both rate of interest and the level of income. The transactions demand for money can be stated as: $M_T = f(r, Y)$, where M_T stands for transaction demand for money, 'r' for rate of interest and 'Y' for the level of income.

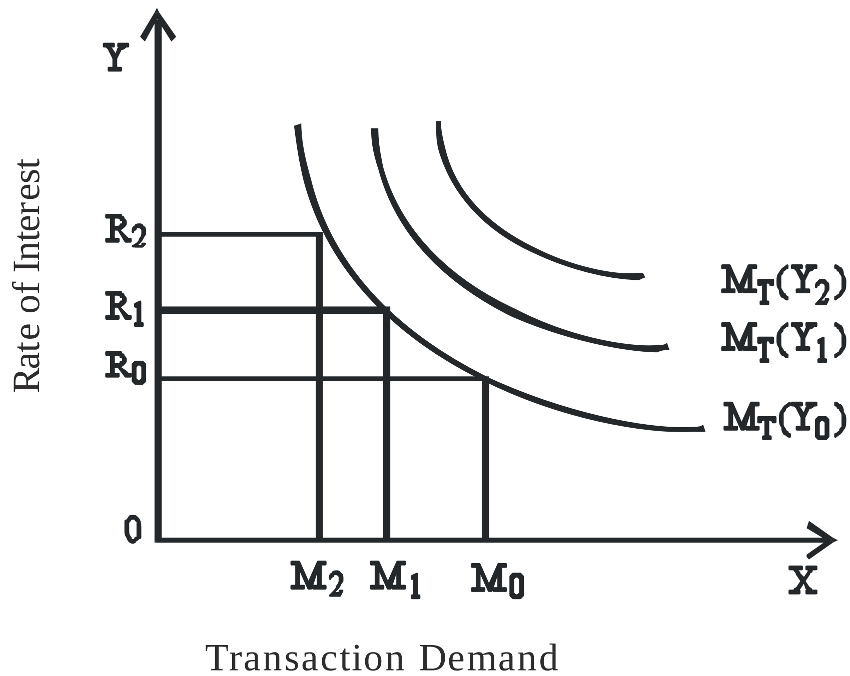


Fig 5.6 – Transactions Demand for Money: Baumol-Tobin Approach

5.7 SUMMARY

1. The classical approach to demand for money is known in the name of Prof. Irving Fisher's Cash Transaction approach. Prof. Irving Fisher's famous cash transaction equation is stated as MV = PT.

2. The Cambridge approach or the Cash balance approach to the demand for money was put forward by the Cambridge neo classical economists Marshall and Pigou. According to the neo-classical economists, the total demand for money is the sum of individuals desire to hold cash balances in the community.

3. According to Keynes, people hold cash balances on account of three reasons or motives. Accordingly the demand for money can be separated into three parts namely transaction demand, precautionary demand and speculative demand for money. The total demand for money or cash balances can be divided into two namely; active and idle cash balances.

4. According to Friedman, people hold money because it has the power to purchase goods and services. Demand for money is demand for capital assets because money also provides services and returns.

5. Tobin obtained his liquidity preference function by showing the relationship between the rate of interest and demand for money.

6. According to Baumol, the transaction demand for money is similar to the inventory management of goods and materials by business firms.

5.8 QUESTIONS

1. Explain the classical approach or the Fisher's approach to Demand for Money.

2. Explain the Cambridge approach or the neo-classical approach to demand for money.

3. Explain the Keynesian approach to demand for money.

4. Explain Tobin's approach to demand for money.

5. Explain Baumol's approach to transaction demand for money.

Q.4. Explain Friedman's approach to demand for money.

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6

SUPPLY OF MONEY & INSTRUMENTS OF MONETARY CONTROL

UNIT STRUCTURE

6.0 OBJECTIVES

- To understand the concept of money supply
- To study the various constituents of money supply
- To study RBI's approach to money supply
- To study the factors determining supply of money
- To study the instruments to control the money supply in an economy

6.1 CONCEPT OF MONEY SUPPLY

Money supply refers to the amount of money which is in circulation in an economy at any given time. It is the total stock of money held by the people consisting of individuals, firms, State and its constituent bodies except the State treasury, Central Bank and Commercial Banks. The cash balances held by the Federal and federating governments with the Central Bank and in treasuries are not considered as part of money supply because they are created through the administrative and non-commercial operations of the government. Further money supply refers to the disposable stock of money. Therefore money supply is stock of money in circulation. Money supply can be looked at from two points of views, namely, money supply as a stock and money supply as a flow. Thus at a given point of time, the total stock of money and the total supply of money is different. Money supply viewed at a point of point is the stock of money held by the people on a given day whereas money supply viewed overtime is viewed as a flow. Units of money are spent and re-spent several times during a given period. **The average number of times a unit of money circulates amongst the people in a given year is known as Velocity of Circulation of Money.** The flow of money is measured by multiplying the stock of money with the coefficient of velocity of circulation of money.

6.2 CONSTITUENTS OF MONEY SUPPLY.

There are two approaches to the constituents of money supply. They are the traditional and the modern approaches.

1. **Traditional Approach.** According to the traditional approach, the money supply consists of currency money consisting of coins and notes and bank money consisting of checkable demand deposits with commercial banks. The currency money is considered high powered money because of the legal backing of the State. The Central Bank of a country issues currency notes and coins because it has the monopoly of note and coin issue. The supply of money in a country depends upon the system of note issue adopted by the country. For instance, India adopted the Minimum Reserve System in 1957. Under this system, the Reserve Bank of India has to maintain a minimum reserve of Rs.200 Crores consisting of gold and foreign securities. Out of this, the value of gold should not be less than Rs.115 Crores. With this reserve, the Reserve Bank of India has the power to issue unlimited amount of currency in the country.

   Checkable demand deposits of commercial banks are used in the settlement of debt. Payments made through checks change the volume of demand deposits by creating derivative deposits. The creation of demand deposits is determined by the credit creation activities of the commercial banks. Bank money is considered as secondary money whereas cash money is known as high powered money. Thus according to the traditional approach, the total supply of money is the sum of high powered money and secondary money or currency and bank money. The ratio of bank money to currency money depends upon the extent of monetization, banking habits and banking development in a country. In advanced countries, ratio of bank money to currency money is high whereas in poor countries the ratio of currency money to bank money is high.

2. **The Modern Approach.** According to the modern approach, money supply includes currency money and near money.

Money supply therefore consists of coins, currency notes, demand deposits of commercial banks, time deposits of commercial banks, financial assets, treasury bills and commercial bills of exchange, bonds and equities.

6.3 RESERVE BANK OF INDIA'S APPROACH TO THE MEASUREMENT OF MONEY SUPPLY

According to the Reserve Bank of India since its inception in 1935, money supply in the narrow sense of the term was the sum of currency with the people and demand deposits with the commercial banking system. Narrow money was denoted by the RBI by M_1. In 1964-65, the concept of broad money or aggregate monetary resources was introduced. Broad money was considered equal to M_1 + Time deposits with commercial banks. In March, 1970 the RBI accepted the report of the Second Working Group on Money Supply. This report was published in the year 1977 and it gave a broad definition of money supply. Accordingly, four measures of money supply were brought into effect.

These four measures are as follows:

1. M_1 = Currency with the public + Demand deposits with the commercial Banks + Other deposits with the RBI.
2. M_2 = M_1 + Post Office Savings Bank Deposits.
3. M_3 = M_1 + Time deposits with the commercial banks.
4. M_4 = M_3 + Total Post Office Deposits (excluding NSCs).

The Reserve Bank of India gives importance to narrow money (M_1) and broad money (M_3). Narrow money excludes time deposits because they are not liquid and are income earning assets while broad money includes time deposits because some liquidity is involved in it as these assets earns interest income in future. Since time deposits have become convertible in recent times, they have become more liquid than what they were before. The M_2 and M_4 measures of money supply include post office savings and other deposits with the post offices.

The third working group on money supply recommended the following measures of monetary aggregates through their report submitted in 1998:

1. M_0 = Currency in circulation + Bankers' deposits with the RBI + Other deposits with the RBI. (M_0 is compiled on weekly basis).
2. M_1 = Currency with the public + Demand deposits with the banking System + Other deposits with the RBI = Currency with the public + Current deposits with the banking system + Demand liabilities Portion of Savings Deposits with the banking system + other Deposits with the RBI.

3. M_2 = M_1 + Time liabilities portion of saving deposits with the banking System + Certificates of deposits issued by the banks + Term Deposits [excluding FCNR (B) deposits] with a contractual maturity of up to and including one year with the banking system = Currency with the public + current deposits with the banking System + Savings deposits with the banking system + Certificates Of Deposits issued by the banks + Term deposits [excluding FCNR (B) deposits] with a contractual maturity up to and Including one year with the banking system + other deposits with the RBI.

4. M_3 = M_2 + Term deposits [excluding FCNR (B) deposits] with a Contractual maturity of over one year with the banking system + Call borrowings from Non-depository financial corporations by the banking system. **(M_1, M_2 & M_3 are compiled every fortnight).**

In addition to the monetary measures stated above, the following liquidity aggregates to be compiled on monthly basis were also recommended by the working group:

1. L_1 = M_3 + All deposits with the Post Office Savings Banks (excluding National Savings Certificates).

2. L_2 = L_1 + Term deposits with Term lending institutions and refinancing Institutions (FIs) + Term borrowing by FIs + Certificates of Deposits issued by FIs.

3. L_3 = L_2 + Public deposits of Non-banking Financial Companies. (L_3 is compiled on quarterly basis).

6.4 DETERMINANTS OF MONEY SUPPLY

Currency in circulation and demand deposits are the main constituents of money supply. While the demand deposits are created by the commercial banks, currency is issued by the Central Bank and the Government. The supply of money is determined by the following factors:

1. **High Powered Money (H).** High powered money (H) consists of currency notes and coins issued by the Government and the Central Bank. A part of the currency issued is held by the public and another part is held by the banks as reserves. A part of the currency reserves of the banks is held by them in their own cash vaults and a part is deposited in the Central bank. The high powered money can therefore be obtained as sum of currency held by the public and the part held by the banks as reserves. Thus, $H = C_p + R$, where H is the amount of high powered money, C_p is the currency held by the public and R = Cash reserves of currency with the banks. The central bank of the country and the Government are the creators of high powered money (H). Commercial Banks are producers of demand deposits which are used like currency money. In order to produce demand deposits or credit, banks have to keep with themselves cash reserves of currency which is denoted by R in the equation above. Since these cash reserves with the banks serve as a basis for the multiple-creation of demand deposits which constitute as important part of money supply, it imparts high power to the currency issued by the Central bank and the Government. The relationship between money supply and the high powered money is determined by the money multiplier. The money multiplier (m) is the ratio of total money supply (M) to the stock of high powered money that is $m = M/H$. The size of money multiplier depends on the preference of the public to hold currency relative to deposits (the ratio of currency to deposits which is denoted by K) and banks' desired cash reserves ratio to deposits which is denoted by 'r'. Thus if there is increase in currency held by the public which is a part of the high powered money with demand deposits remaining unchanged there will be a direct increase in the money supply in the economy. If currency reserves held by the banks increase, this will not change the money supply immediately but will set in motion a process of multiple creation of demand deposits of the public in the banks. The amount of high powered money is fixed by the Central Bank. Thus changes in high powered money are the result of decision of the Central Bank and the Government who own and controls it.

2. **Money Multiplier.** Money multiplier is the degree to which money supply is expanded as a result of the increase in high

powered money. Thus m = M/H or M = H.m. Thus moneys supply is determined by the size of money multiplier (m) and the amount of high powered money (H). The size of the money multiplier is determined by the currency reserve ratio 'r' of the banks (which determines deposit multiplier) and currency deposit ratio of the public (k) which together determines the size of money multiplier.

Size of the Multiplier.

The money supply (M) consists of currency with the public (C_p) and demand deposits with the banks. Thus:

$M = C_p + D$ …….(1)

The public hold the amount of currency in a certain ratio of demand deposits with the banks which is denoted by 'k'. Therefore,

$C_p = kD$

Substituting kD for C_p in equation (1), we get:

$M = kD + D = (k + 1)D$ …… (2)

The equation of high powered money (H) is:

$H = C_p + R$ ……. (3)

Where R represents cash or currency reserves which banks keep as a certain ratio of their deposits and is called cash reserve ratio and is denoted by 'r'. Thus

$R = rD$

Substituting rD for R and kD for C_p in equation (3), we get:

$H = kD + rD$ or

$H = (k + r)D$ …… (4)

The money multiplier is a ratio of total money supply to the high powered money. Therefore, equation (1) will be divided by equation (4) to get the value of multiplier which is denoted by 'm'. Thus,

$$m = \frac{M}{H} = \frac{(k+1)D}{(k+r)D} = \frac{k+1}{k+r}$$

Or, money multiplier

$$m = \frac{M}{H} = \frac{(1+k)}{(r+k)}$$

Or

$$M = H\,\frac{1+k}{r+k} \qquad \ldots\ldots\ldots\ldots..(5)$$

Where 'r' = cash reserve ratio of the banks.

'k' = currency deposit ratio of the public.

Money supply is therefore determined by the following:

1. H or the amount of high powered money.
2. 'r' or the cash reserve ratio of banks (i.e. ratio of currency reserves to deposits of the banks). The CRR determines the magnitude of deposit multiplier.
3. 'k' or the currency deposit ratio of the public.

A change in money supply will take place:

1. When the supply of high powered money (i.e. reserve money) H changes.
2. When the currency deposit ratio (k) of the public changes, and
3. When the cash or currency reserves deposit ratio of the banks (r) changes.

Cash Reserve Ratio and the Deposit Multiplier.

Changes in cash reserves with the banks bring about changes in demand deposits. The ratio of change in total deposits to a change in reserves is called the deposit multiplier which depends on CRR. The value of deposit multiplier is the reciprocal of CRR, dm = 1/r, where dm stands for deposit multiplier. If CRR is 5 per cent of deposits, then dm = 1/0.05 = 20. The deposit multiplier of 20 reveals that for every Rs.100 increase in cash reserves with the banks, there will be expansion in demand deposits of the banks by Rs.2000 assuming that no leakage of cash to the public takes place during the process of deposit expansion by the banks.

Currency Deposit Ratio and Multiplier.

With the increase in reserves of the banks, demand deposits and money supply do not increase to the full extent of deposit multiplier because the public does not hold all its money balances in the form of demand deposits with the banks. As a result of increase in cash reserves, banks start increasing demand deposits, the people may also like to have some more currency with them as money balances. During the process of creation of demand deposits by banks, some currency is leaked out from the banks to the people. This drainage of currency to the people in the real world reduces the magnitude of expansion of demand deposit and therefore the size of money multiplier. Assuming the CRR is 10 per cent and cash of Rs.100 is deposited in bank 'A'. bank 'A' will lend out Rs. 90 and therefore create demand deposits of Rs.90 and the process will continue as the borrowers use these deposits for payment through checks of others who deposit them in another bank B. However, if borrower of bank A withdraw Rs.10 in cash from the bank and issue checks of the remaining borrowed amount of Rs.80, then bank B will have only Rs.80 as new deposits instead of Rs.90. With this new deposit of Rs.80, bank B will create demand deposits of Rs.72 and will lend out Rs.72 and keep Rs.8 as reserves with it (80 x 10/100 = 8). The leakage of currency may occur during all the subsequent stages of deposit expansion in the banking system. The greater the leakage of currency, the lower will be the money multiplier. Thus the currency deposit ratio which is denoted by 'k' is an important determinant of the actual value of the money multiplier. When there is a decrease in the currency reserves with the banks, there will be multiplier contraction in demand deposits with the banks and vice versa.

Excess Reserves

The ratio 'r' in the deposit multiplier is the required cash reserve ratio fixed by the Central Bank. However, banks may keep excess reserves. Excess reserves depend on the extent of liquidity and profitability of making investment and the rate of interest on loans advanced to business firms. Therefore the desired reserve ratio is greater than the statutory minimum required reserve ratio. The holding of excess reserves by the banks will therefore reduce the value of deposit multiplier.

6.5 INSTRUMENTS OF MONETARY CONTROL

The instruments of monetary control available at the disposal of the Central Bank can be classified into general or quantitative instruments and selective or qualitative instruments. The general instruments are macro-economic in impact and are used to control the volume of credit so as to control the inflationary and deflationary pressures caused by business cycles. The general instruments consist of the bank rate policy, open market operations and cash reserve ratio. The selective instruments of monetary policy are used to regulate the use of credit and hence they are sectoral in impact. Selective instruments therefore do not affect the entire economy. Selective instruments are used with an objective to divert the flow of credit to their desirable and productive uses. The selective instruments consist of margin requirements, regulation of consumer credit, use of directives, credit rationing, moral suasion and publicity and direct action.

Quantitative or General Instruments of Monetary Control

1. **Bank Rate or the Discount Rate Policy.** Bank rate or the discount rate is the interest rate charged on borrowings made by the commercial banks from the Central Bank. The Central Bank provides financial assistance to the commercial banks by discounting eligible bills, loans and approved securities. The objective of the bank rate policy is to influence the cost and availability of credit to the commercial banks and the borrowers at large in turn. The cost of credit

is determined by the discount rate or the interest rate charged and the availability of the credit is determined by the legal requirements of making the bills eligible and the duration of the loan. When the Central Bank changes the bank rate, the interest rates in the economy also changes. Changes in the bank rate can therefore make credit cheaper or dearer and also influence the demand for and supply of credit. A rise in bank rate will result in a rise in the deposit and lending rates of banks and vice versa. A fall in the bank rate signals an expansionary monetary policy whereas a rise in the bank rate signals contractionary monetary policy.

The efficacy of the bank rate policy of the Central Bank is influenced by factors such as the development of the money market, liquidity of the banks, business cycles, development of the bill market and the elasticity of the economic system. If the money market where short term loans are made available is not well organized or well developed and consist of different rates of interest, he bank rate policy will not be effective in influencing the varied interest rates and hence realize the objective of making a change in the bank rate. Similarly, if the commercial banks do not approach the Central Bank for rediscounting facility on account of surplus liquid funds, the bank rate will fail to influence the market interest rates. Further, in order to obtain the rediscounting facility, the commercial banks must have sufficient quantity of eligible bills and securities. In the absence of well developed bill market, the bank rate policy will not have the desired effect on the money market interest rates. In the prosperity and recessionary phases of business cycles, investment demand is interest inelastic and hence changes in the bank rate will fail to influence investment demand. During the prosperity phase when the prices are gradually rising, profitability of investment also rises. Thus as long as the rate of return on investment is sufficiently greater than the market interest rates, investment demand will continue to rise. Similarly, during a recession, when prices are falling even if the bank rate falls leading to fall in the market interest rates, investment demand will not pick up because of the poor prospects of making profits. Finally, changes in the bank rate must influence interest rates, prices, costs and trade. The economic system should be sufficiently elastic and respond to the changes in the bank rate. Systemic rigidities will not create the desired impact.

2. **Open Market Operations.** Open market operations refer to buying and selling of government securities in the open market. By doing so, the Central Bank can increase or decrease bank reserves. W hen the Central Bank sells

government securities in the open market, the bank reserves fall to the extent of the sale multiplied by the reverse credit multiplier and vice versa. The open market operation is an important instrument of stabilization in the general price level in the hands of the Central Bank. The Central Bank decides on its monetary policy options given the macro-economic conditions. In an inflationary situation, with a view to control prices, the Central Bank will decide to sell government securities i.e., treasury bills which are short term government securities and long term bonds. By doing so, the Central Bank will reduce the bank reserves and thereby money supply will also be reduced. As a result, the interest rates in the money market will firm up, reducing investment demand. Reduction in investment demand will reduce employment, output and incomes thus reducing the level of aggregate demand in the economy. A reduction in the aggregate demand will help controlling the price rise. Selling government securities through the open market operation indicates a tight or dear monetary policy. A cheap monetary policy will operate exactly in the opposite direction when the Central Bank starts buying government securities in a recessionary situation.

Let us see, how exactly open market transactions in government securities takes place when the Central Bank decides on a tight monetary policy. The Central Bank sells government bonds or securities to dealers in the open market. The dealers in turn, resell them to commercial banks, corporates, financial institutions and individuals. The purchases generally buy government securities by drawing a check in favor of the Central Bank. For instance, if the Reserve Bank of India sells Rs.10 million worth of treasury bills to Ms. Kareena, she will draw a check on State Bank of India where she has a bank account in favor of the Reserve Bank of India. The Reserve Bank of India in turn will present the check at the State Bank of India and when the State Bank of India pays the check, it will reduce its balance with the Reserve Bank of India by Rs.10 million. By the end of the day, the State Bank of India and the entire commercial banking system will lose Rs.10 million worth of reserves at the Reserve Bank of India. Assuming a cash reserve ratio of ten per cent, the Rs.10 million sale of government bonds will reduce money supply in the economy by Rs.100 million; the reverse credit multiplier being ten. This is how the money supply contracts to the extent of the sale multiplied by the reverse credit multiplier.

The success of Open Market Operation depends upon a number of factors such as development of the securities market, the rediscounting window available at the Central bank, risk-bearing ability of the Central bank, balance of payments, flow of capital, speculative activities etc. Nonetheless, open market operations are known to be more effective in controlling credit.

3. **Cash Reserve Ratio.**

The Cash Reserve Ratio or the legal reserve requirements are an important part of the mechanism by which the Central bank controls the supply of bank money. The commercial banks are required to maintain a certain minimum amount of non-interest bearing reserves out of its deposits with the Central bank. The cash reserve requirements are fixed by law land the Central bank has the statutory powers to change the reserve requirements. In India, the Reserve Bank of India Amendment Act, 1962 fixed reserve requirements at three per cent for all the liabilities of the Commercial banks. The Amendment Act also gave powers to the Reserve bank of India to determine reserve requirements in the range of three per cent and 15 per cent. The Central Bank maintains a higher reserve ratio in order to control money supply and facilitate the smooth conduct of Open market Operations. The reserve requirements above the level that banks desire and thereby control the short term interest rates more effectively.

The Central bank can change cash reserve requirements in order to change the quantity of money supply. Under inflationary conditions, the Central bank may follow a dear money policy and may raise the reserve requirements within the given range of three per cent to fifteen per cent. Let6 us see with an example how changes in the reserve requirements brings about changes in the credit creating capacity of the commercial banks. Assume that the total deposits with the commercial banks are equal to Rs.1000 billion and the Cash Reserve Ratio is five per cent. The commercial banks will have to maintain Rs.50 billion worth reserves with the Central Bank. The excess reserves with the commercial banks being Rs.950 billion, the banking system will be able to create credit twenty times its excess reserves i.e. Rs.950 × 100 ÷ 5 = Rs.19 Trillion. Pursuing a tight or dear monetary policy, if the Central bank decides to raise the reserve requirements to ten per cent, then the excess reserves will be Rs.900 billion and the banking system will be able to create only ten times its excess reserves i.e. Rs.9000 billion. Thus when the reserve requirements are raised, the credit creating capacity is reduced and vice-versa. However, in reality, the increase and decrease in reserve requirements is never made on a scale as stated above because such large changes will lead to steep fall or rise in the interest rates. For instance, a steep hike in the Cash Reserve Ratio will lead to very high interest rates, credit rationing, huge decline in investment and large reduction in national income and employment. Changes in the reserve requirements are made incrementally or marginally and in a phased manner i.e. if the current reserve requirement is 10 per cent, with tight monetary policy, the reserve requirement may be raised to 11 per cent and thereafter with a gap, it may be raised by one more percentage point to 12 per cent. Similarly, a cheap monetary policy would entail a marginal and phased reduction in the Cash Reserve Ratio.

Selective or Qualitative Instruments of Monetary Policy.

The selective instruments of monetary control are invoked to influence the use and volume of credit available for particular purposes in specific sectors of the economy. Selective instruments are used to discriminate between various uses of credit in the various sectors so that the available credit in the various sectors is put it its most desirable land productive use. Margin requirements, consumer credit regulation, directives, credit rationing, moral suasion and direct action are the different selective or qualitative or specific instruments of monetary policy. These instruments are as follows.

1. **Margin Requirements.** Margin requirement determines the loan value of a collateral security offered by the borrower. The loan value of a security is the difference between the market value and the margin requirement. For instance, if the market value of 10 grams of gold is Rs.12000 and the margin requirement is 25 per cent then the loan value of 10 grams of gold as a collateral security would be Rs.9000. Equity shares, bonds, precious metals and other financial land real assets are accepted by commercial land co-operative banks as collaterals for granting loans. The Central Bank which is the apex monetary authority in a country has the power to determine margin requirements. Increase or decrease in the margin requirements changes the loan value of a security. Margin requirements are fixed differently for various types of securities. For instance in India margin requirements for equity shares is 50 per cent of the market value and for commodities it various between 20 per cent and 75 per cent. Margin requirements therefore directly influence the demand for credit without affecting the supply of loans or the rate of interest. It is a very instrument used to control speculative activities both in the commodity market as well as money and the capital markets. For

instance, the Reserve Bank of India has greatly used the instrument of margin requirement to check the hoarding of essential commodities and their price rise.

2. **Regulation of Consumer Credit.** A number of consumer durable goods such as television sets, washing machines, refrigerators, computers, furniture, cars etc are available on credit repayable in equated monthly installments. Consumer credit is regulated by the Central Bank by determining the maximum period of payment i.e. the maximum equated monthly installments and the minimum down payment. In order to check consumer credit, the Central bank may increase the minimum down payment and reduce the maximum period of payment by reducing the number of equated monthly installment. By doing so, the Central bank not only increases the size of the initial payment which is known as the minimum down payment but also the size of the installment. Such an action by the Central bank reduces the demand for consumer credit and thus regulates it.

3. **Issue of Directives.** The Central bank may direct the Commercial Banks orally or by a written order to control the direction and volume of credit so that the credit policy followed by the commercial banks is in harmony with the monetary policy objectives of the Central bank. However, issue of directives may not be effective and hence more direct instruments of monetary policy are put into effect along with the directives.

4. **Credit Rationing.** Credit rationing is a qualitative instrument used to control and regulate the purpose for which credit is offered by the commercial banks. Credit rationing is carried out in two forms, namely; the variable portfolio ceiling and the variable capital assets ratio. The variable portfolio ceiling refers to a ceiling imposed by the Central bank on the total portfolios of the commercial banks. The ceiling is imposed to ensure that loans and advances do not exceed the given ceiling. Since the Central bank has the right to change the ceiling, it is called variable portfolio ceiling. Similarly, the Central Bank may also decide the capital assets ratio of commercial banks. These measures restrict the loans and advances made to different categories of borrowers in the economy.

5. **Moral Suasion and Publicity.** Moral suasion refers to formal persuasion and request made by the Central Bank to the commercial banks. As opposed to directives, it is an appeal made by the Central Bank to the moral consciousness of the commercial banks to operate

according to the objectives of the monetary policy. For instance, the Central bank may request the commercial banks to desist from financing speculative activities. It is a psychological instrument of monetary policy. The Central bank may also exert moral pressure on the commercial banks by going public on the unhealthy banking practices. The Reserve bank of India had used moral suasion for the first time in September, 1949 by requesting the commercial banks to exercise restraint in giving advances for speculative purposes.

6. Direct Action. Direct action is a qualitative as well as a quantitative instrument of monetary policy. The Central Bank may stop rediscounting facility to those commercial banks whose credit policy is at divergence with its monetary policy. It may refuse to give more credit to banks where borrowings are in excess of their capital and reserves. It may charge a higher rate of interest for the credit demanded by commercial banks beyond a certain limit.

6.6 SUMMARY

1. Money supply refers to the amount of money which is in circulation in an economy at any given time. It is the total stock of money held by the people consisting of individuals, firms, State and its constituent bodies except the State treasury, Central Bank and Commercial Banks.

2. There are two approaches to the constituents of money supply. They are the traditional and the modern approaches.

3. The third working group of RBI on money supply recommended the M_0, M_1, M_2 and M_3 measures of monetary aggregates.

4. In addition to the monetary measures stated above, the following liquidity aggregates to be compiled on monthly basis were also recommended by the working group as L_1, L_2 and L_3.

5. The instruments of monetary control available at the disposal of the Central Bank can be classified into general or quantitative instruments and selective or qualitative instruments. The general instruments consist of the bank rate policy, open market operations and cash reserve ratio. The selective instruments consist of margin requirements,

regulation of consumer credit, use of directives, credit rationing, moral suasion and publicity and direct action.

6.7 QUESTIONS

1. What is money supply and explain the constituents of money supply.
2. Explain the RBI's approach to the measurement of money supply in India.
3. Explain the determinants of money supply.
4. Explain the instruments of monetary control.
5. Explain the quantitative instruments of monetary control.
6. Explain the qualitative or selective instruments of monetary control.

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MODULE 3

DYNAMIC MACROECONOMICS

Unit Structure :

7.0 OBJECTIVES

- To understand the relationship between wage and employment
- To study and understand the Classical theory of employment
- To understand wage and price stickiness
- To understand the Basic Dynamic AS model with adaptive expectations
- To study and understand the Long Run Aggregate Supply Curve
- To familiar with Short term and long term policies to control inflation

7.2 INTRODUCTION

The basic contention of classical economists was that if wages and prices were flexible, a competitive market economy would always operate at full employment. That is, economic forces would always be generated so as to ensure that the demand for labour was always equal to its supply.

In the classical model the equilibrium levels of income and employment were supposed to be determined largely in the labour market. At lower wage rate more workers will be employed. That is why the demand curve for labour is downward sloping. The supply curve of labour is upward sloping because the higher the wage rate, the greater the supply of labour.

7.3 WAGE-EMPLOYMENT RELATIONSHIP

7.3.1 THE CLASSICAL THEORY OF EMPLOYMENT

The Classical economists gave their views on employment and their model is deemed to be the 'Full Employment' model. They assume perfect competition and full employment of labour can other resources. They say that a normal situation is of stable equilibrium at full employment. Full employment was defined as a situation when there is no 'involuntary unemployment', though there may be frictional/structural or voluntary unemployment. The classists denied the possibility of deficiency of aggregate demand and unemployment equilibrium.

They assume a direct relation between the real wages and money wages (as labour's demand is primarily a demand for real wages and not money wages). If wages are flexible, there would be no unemployment as real wages fall and rise in accordance with **Marginal Productivity of Labour (MPL).**

Fundamental postulates form the base of the Classical theory is as follows:

1. Wage: MPL and accepting the Law of Diminishing Marginal Productivity, as employment increases, any increase is associated with lower real wages.

2. The Existing Real Wage: Marginal disutility of employment. Therefore real wage of an employed person is that which is just sufficient to induce the volume of labour actually employed to be forthcoming. This postulate indicates that workers are more concerned with real wages.

First postulates gives demand schedule for employment, while the second postulate gives supply schedule for employment at different real wage rates (W/P). Equilibrium is reached at the intersection of the two, where **utility of Marginal Product = Disutility of Marginal Employment.**

7.3.2 Assumptions of Short-Run Classical Model:

1. Supply of labour is an increasing function of real wage rates, i.e. more labour will be offered for higher real wage rates.
2. Demand for labour is a decreasing function of real wage rates i.e. less labour will be hired for higher real wage rates and more at lower real wage rates.
3. There are no imperfections of institutional rigidities in the labour market i.e. labour is perfectly mobile.
4. Aggregate demand for goods and services remains constant and no changes are anticipated.
5. Population, tastes, technology are given.

In the following figure the equilibrium wage rate (w_o) is determined by the demand for and the supply of labour. The level of employment is OL_o.

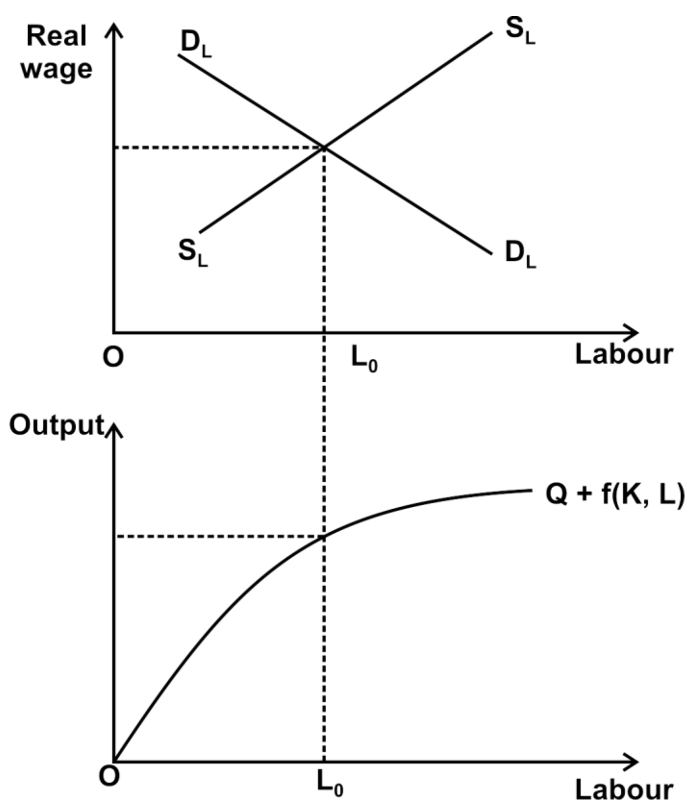

Figure 7.1

The lower panel of the diagram shows the relation between total output and the quantity of the variable factor (labour). It shows the short-run production function which is expressed as Q = f (K, L), where Q is output, K is the fixed quantity of capital and L is the variable factor labour. Total output Q_o is produced with the employment of Lo units of labour. According to classical economists this equilibrium level of employment is the 'full employment' level. So the existence of unemployed workers was a logical impossibility. Any unemployment which existed at the equilibrium wage rate (W_o) was due to frictions or restrictive practices in the economy in nature.

The classical economists believed that aggregate demand would always be sufficient to absorb the full capacity output Q_o. In other words, they denied the possibility of under-spending or overproduction. This belief has its root in Say's Law.

(a) Say's Law: According to Say's Law supply creates its own demand, i.e., the very act of producing goods and services generates an amount of income equal to the value of the goods produced. Say's Law can be easily understood under barter system where people produced (supply) goods to demand other equivalent goods. So, demand must be the same as supply. Say's Law is equally applicable in a modern economy. The circular flow of income model suggests this sort of relationship. For instance, the income created from producing goods would be just sufficient to demand the goods produced.

(b) Saving-Investment Equality: There is a serious omission in Say's Law. If the recipients of income in this simple model save a portion of their income, consumption expenditure will fall short of total output and supply would no longer create its own demand. Consequently there would be unsold goods, falling prices, reduction of production, unemployment and falling incomes.

However, the classical economists ruled out this possibility because they believed that whatever is saved by households will be invested by firms. That is, investment would occur to fill any consumption gap caused by savings leakage. Thus, Say's Law will hold and the level of national income and employment will remain unaffected.

(c) Saving-Investment Equality in the Money Market: The classical economists also argued that capitalism contained a very special market – the money market – which would ensure saving investment equality and thus would guarantee full employment. According to them the rate of interest was determined by the demand for and supply of capital. The demand for capital is investment and its supply is saving. The equilibrium rate of interest is determined by the saving-investment equality. Any imbalance between saving and investment would be corrected by the rate of interest. If saving exceeds investment, the rate of interest will fall. This will stimulate investment and the process will continue until the equality is restored. The converse is also true.

(d) Price Flexibility: The classical economists further believed that even if the rate of interest fails to equate saving and investment, any resulting decline in total spending would be neutralized by proportionate decline in the price level. That is, Rs 100 will buy two shirts at Rs 50, but Rs 50 will also buy two shirts if the price falls to Rs 25. Therefore, if households saves more than firms would invest, the resulting fall in spending would not lead to decline in real output, real income and the level of employment provided product prices also fall in the same proportion.

(e) Wage Flexibility: The classical economists also believed that a decline in product demand would lead to a fall in the demand for labour resulting in unemployment. However, the wage rate would also fall and competition among unemployed workers would force them to accept lower wages rather than remain unemployed. The process will continue until the wage rate falls enough to clear the labour market. So a new lower equilibrium wage rate will be established. Thus, involuntary unemployment was logical impossibility in the classical model.

7.3.3 Keynes Criticism of Classical Theory:

J.M. Keynes criticized the classical theory on the following grounds:

1. According to Keynes saving is a function of national income and is not affected by changes in the rate of interest. Thus, saving-investment equality through adjustment in interest rate is ruled out. So Say’s Law will no longer hold.

2. The labour market is far from perfect because of the existence of trade unions and government intervention in imposing minimum wages laws. Thus, wages are unlikely to be flexible. Wages are more inflexible downward than upward. So a fall in demand (when S exceeds I) will lead to a fall in production as well as a fall in employment.

3. Keynes also argued that even if wages and prices were flexible a free enterprise economy would not always be able to achieve automatic full employment.

7.3.4 THE WAGE-UNEMPLOYMENT RELATIONSHIP: WHY ARE WAGES STICKY?

In the neoclassical theory of supply, wages adjust instantly to ensure that output is always at the full-employment level. But output is not always at the full-employment level, and the Phillips curve suggests that wages adjust slowly in response to changes in unemployment. The key question in the theory of aggregate supply is, why does the nominal wage adjust slowly to shifts in demand? In other words, why are wages sticky? *Wages are sticky, or wage adjustment is sluggish, when wages move slowly over time, rather than being fully and immediately flexible, so as to ensure full employment at every point in time.*

To clarify the assumptions that we make about wage stickiness, we translate the Phillips curve ***in equation (4)*** into a relationship between the rate of change of wages, gw and the level of employment. We denote the full-employment level of employment by N* and the actual level of employment by N. We then define the unemployment rate as the fraction of the full-employment labour force, N*, that is not employed:

$$u - u^* = \frac{N^* - N}{N^*} \qquad (6)$$

Substituting equation (6) into (4), we obtain the Phillips curve relationship between the level of employment, expected inflation, and the rate of change in wages:

$$g_w - \pi^e = \frac{W_{t+1} - W_t}{W_t} - \pi^e = -\epsilon\left(\frac{N^* - N}{N^*}\right) \qquad (3b)$$

Equation (3b), the wage-employment relation, WN, is illustrated in. Figure 1.1. The wage next period (say, next quarter) is equal to the wage that prevailed this period but with an adjustment for the level of employment and expected inflation. At full employment (N = N*), next period's wage is equal to this period's plus an adjustment for expected inflation. If employment is above the full-employment level, the wage next period increases above this period's wage by more than expected inflation. The extent to which the wage responds to employment depends on the parameter €. If € is large, unemployment has large effects on the wage and the WN line is steep.

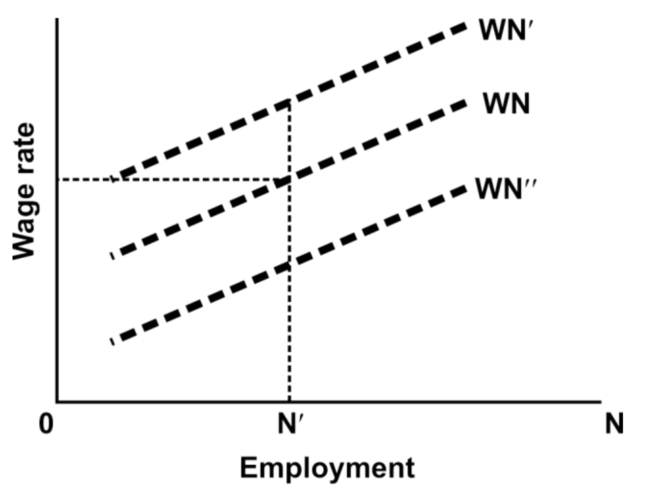

Figure 7.2 : Wage- Employment Relationship

The Phillips curve relationship also implies that the WN relationship shifts over time, as shown in Figure 1.1. If there is over employment this period, the WN curve will shift upward next period to WN'. If there is less than full employment this period, the WN curve will shift downward next period to WN". Thus, changes in aggregate demand that alter the rate of unemployment this period will have effects on wages in subsequent periods. The adjustment to a change in employment is dynamic; that is, it takes place over time.

7.4 WAGE AND PRICE STICKINESS

Although there are different approaches to macroeconomics, each school of thought has had to try to explain why there is a Phillips curve or, equivalently, the reasons for wage and price stickiness. The explanations are not mutually exclusive, and we shall therefore briefly mention several of the leading approaches.

7.4.1 Imperfect Information—Market Clearing

Some economists have sought to explain the Phillips curve in a context in which markets clear: Wages are fully flexible but adjust slowly because expectations are temporarily wrong. In the 1960s, Milton Friedman and Edmund Phelps developed models in which, when nominal wages go up because prices have risen, workers mistakenly believe their zeal wage has risen and so are willing to work more. Thus, in the short run, until workers realize that the higher nominal wage is merely a result of a higher price level, an increase in the nominal wage is associated with a higher level of output and less employment. In these models, the slow adjustment of wages arises from workers' slow reactions to or imperfect information about changes in prices.

7.4.2 Coordination Problems

The coordination approach to the Phillips curve focuses more on the process by which firms adjust their prices when demand changes than on wages. Suppose there is an increase in the money stock. Ultimately, prices will go up in the same proportion as the money supply, and output will be unchanged. But if any one firm raises its price in proportion to the increase in the money stock, and no other firm does, then the single firm that has raised its price will lose business to the others. Of course, if all firms raised their prices in the same proportion, they would move immediately to the new equilibrium. But because the firms in an economy cannot get together to coordinate their price increases, each will raise prices slowly as the effects of the change in the money stock are felt through an increased demand for goods at the existing prices.

Coordination problems can also help explain why wages are sticky downward, that is, why they do not fall immediately when aggregate demand declines. Any firm cutting its wages while other firms do not will find its workers both annoyed and leaving the firm. If firms coordinated, they could all reduce wages together; but since they generally cannot coordinate, wages go down slowly as individual firms cut the nominal wages of their employees, probably with those firms whose profits have been hardest hit moving first.

7.4.3 Efficiency Wages and Costs of Price Change

Efficiency wage theory focuses on the wage as a means of motivating labour. The amount of effort workers make on the job is related to how well the job pays relative to alternatives. Firms may want to pay wages above the market-clearing wage to ensure that employees work hard to avoid losing their good jobs.

Efficiency wage theory offers an explanation for slow changes in real wages but by itself does not explain why the average nominal wage is slow to change, although it does help explain the existence of unemployment. However, taken in combination with the fact that there are ,costs of changing prices, efficiency wage theory can generate some stickiness in nominal wages even if the costs of resetting prices are quite small. Combining that stickiness with problems of coordinating, this theory can help account for nominal wage stickiness.

7.4.4 Contracts and Long-term Relationships

In developing the explanation of wage stickiness, we build on the above theories and on one central element-the fact that the labour market involves long-term relations between firms and workers. Most members of the labour force expect to continue in their current job for some time. Working conditions, including the wage, are renegotiated periodically, but not frequently, because it is costly to negotiate frequently. Even in cases where the wage is supposed to be set by market conditions, obtaining the information needed about alternative wages is costly. Typically, firms and workers reconsider wages and adjust them no more than once a year.

Wages are usually set in nominal terms in economies with low rates of inflation. Thus, the agreement is that the firm will pay the worker so many dollars per hour or per month for the next quarter or year. Most formal union labour contracts last 2 or 3 years and may fix nominal wages for the period of the contract. Frequently, labour contracts include separate wage rates for overtime hours; this implies that the wage rate paid by firms is higher when more hours are worked. That is one reason the *WN* curve in Figure 6.9 is positively sloped.

At any time, firms and workers will have agreed, explicitly or implicitly, on the wage schedule that is to be paid to currently employed workers. There will be some base wage that corresponds to a given number of hours of work per week and depends on the type of job, with perhaps a higher wage for overtime. The firm then sets the level of employment each period.

Now consider how wages adjust when the demand for labour shifts and firms increase the hours of work. In the short run, wages rise along the *WN* curve. With demand up, workers will press for an increase in the base wage at the next labour negotiation. However, it will take some time before all wages are renegotiated. Further, not all wages are negotiated simultaneously. Rather, wage-setting dates are staggered; that is, they overlap. Assume that wages are set for half the labour force in January and for the other half in July. Suppose the money stock goes up in September. Prices will be slow to adjust because no wage will be adjusted until 3 months after the change in the money stock. And when the time comes to renegotiate half the contracts, in January, both the firms and the workers negotiating know that other wages will not change for the next 6 months.

Workers do not seek to adjust their base wage all the way to the level that will take the economy to the long-run equilibrium. If they did, their wages would be very high relative to other wages for the next 6 months, and firms would prefer to employ those workers whose wages have not yet risen. There is thus a danger of unemployment to the January wage-setting workers if the renegotiated wages go too high. Wages are therefore adjusted only partway toward equilibrium.

Then in July, when the time comes to reset the other half of the wages, those too are not driven all the way to the equilibrium level because the January wages would then be relatively lower. So the July wages go, above the January wages, but still only partway to the full-employment equilibrium base wage.

This process of staggered price adjustment keeps on going, with the supply curve rising from period to period as wages leapfrog each other while first one wage and then another is renegotiated. The position of the aggregate supply curve in any period will depend on where it was last period because each unit that is renegotiating wages has to consider the level of its wage relative to the wages that are not being reset. And the level of the wages that are not being reset is reflected in last period’s wage rate.

During the adjustment process, firms will also be resetting prices as wages (and thus firms’ costs) change. The process of wage and price adjustment continues until the economy is back at the full-employment equilibrium with the same real balances. The real-world adjustment process is more complicated than our January—July example because wages are not reset quite as regularly as that and, also, because both wage and price adjustment matter. But the January—July example gives the essence of the adjustment process.

This account of slow wage and price adjustment raises at least two serious questions. First, why do firms and workers not adjust wages more frequently when clearly understandable disturbances affect the economy? If they did, perhaps they could adjust wages so as to maintain full employment. One line of research emphasizes that even comparatively small costs of resetting wages and prices can keep adjustment processes from operating quickly. Further, the problems of coordinating wage and price adjustments so that wages and prices move back rapidly to equilibrium are formidable in a large economy in which there are many different forces affecting supply and demand in individual markets.

Second, when there is high unemployment, why do firms and unemployed workers not get together on wage cuts that create jobs for the unemployed? The main reason, addressed by efficiency wage theory, is that such practices are bad for the morale and therefore the productivity of those in the labour force who are on the job.

To summarize, the combination of wages that are preset for a period of time and wage adjustments that are staggered generates the gradual wage, price, and output adjustment we observe in the real world. This accounts for the gradual vertical movement of the short-run aggregate supply curve.

7.5 FROM PHILLIPS CURVE TO THE AGGREGATE SUPPLY CURVE

Now we are ready to work back from the Phillips curve to the aggregate supply curve. The derivation will take four steps. First, we translate output to employment. Second, we link the prices firms charge to their costs. Third, we use the Phillips curve relationship between wages and employment. Fourth, we put the three components together to derive an upward-sloping aggregate supply curve.

7.5.1 OKUN'S LAW

In the short run, unemployment and output are pretty tightly linked. According to Okun's law, 1 extra point of unemployment costs 2 percent of GDP. Equation (7) presents Okun's law formally:

$$\frac{Y - Y^*}{Y^*} = -\omega(u - u^*) \tag{7}$$

where $\omega \approx 2$.

7.5.2 COSTS AND PRICES

The second step in developing the theory of supply is to link firms' prices to their costs. Labour costs are the main component of total costs. The guiding principle here is that a firm will supply output at a price that at least covers its costs. Of course, firms would like to charge more than cost, but competition from existing firms and firms that might enter the industry to capture some of the profits prevents prices from getting far out of line from costs.

We assume that firms base price on the labour cost of production. If each unit of labour produces '*a'* units of output, the labour cost of production per unit is *W/a*. For instance, if the wage is $15 per hour and *a* is 3, the labour cost is $5 per unit. The ratio *W/a* is called the unit labour cost. Firms set price as a mark-up, *z*, on labour costs:

$$P = \frac{(1 + z)W}{a} \tag{8}$$

The mark-up over labour costs covers the cost of other factors of production that firms use, such as capital and raw materials, and includes an allowance for the firms' normal profits. If competition in the industry is less than perfect, the mark-up will also include an element of monopoly profit.

7.6 EMPLOYMENT AND WAGES AND THE AGGREGATE SUPPLY CURVE

The Phillips curve in equation (3b) gives wage increases as a function of expected price inflation and the gap between unemployment and the natural rate. Okun's law,

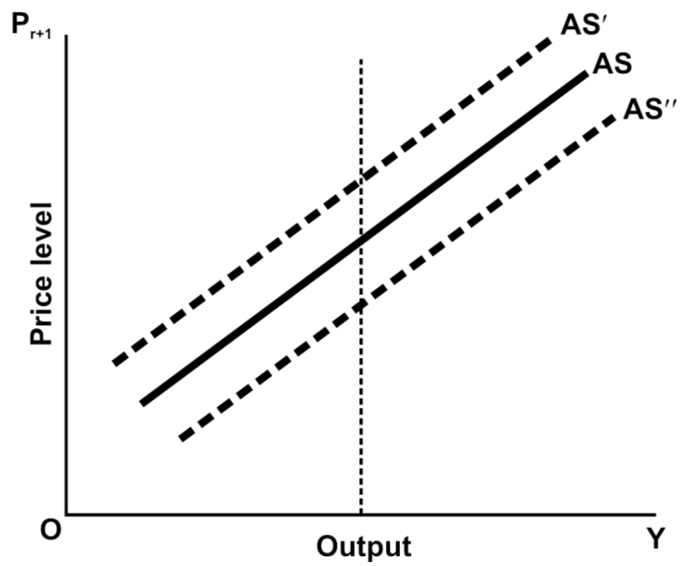

Fig.: 7.3 The Aggregate Supply Curve.The AS curve derived from the WN curve, with the added assumptions that the mark-up is fixed & that output is proportional to employment.

equation (7), translates the unemployment gap to the GDP gap (actual GDP versus potential GDP), which is what we want for the aggregate supply curve. The price-cost relation in (8) tells us that the rate of wage inflation equals the rate of price inflation. Putting these three equations together gives

$$P_{t+1} = P^e_{t+1} + P_t \frac{\epsilon}{\omega}\left(\frac{Y - Y^*}{Y^*}\right) \qquad (9)$$

We often replace equation (9) with an approximate version, as shown in equation (10). Equation (10) is simpler but still emphasizes that the aggregate supply curve shows that next period's price level rises with price expectations and the GDP gap.

$$P_{t+1} = P^e_{t+1}[1 + \lambda(Y - Y^*)] \qquad (10)$$

Figure 1.2 shows the aggregate supply curve implied by equation (10). The supply curve is upward-sloping. Like the *W/N* curve on which it is based, the AS curve shifts over time. If output this period is above the full-employment level, Y*, then next period the AS curve will shift up to AS'. If output this period is below the full-employment level, the AS curve next period will shift down to AS". Thus, the properties of the AS curve are those of the *WN* curve. This results from two assumptions: that the mark-up is fixed at *z*, and that output is proportional to employment.

The AS curve is the aggregate supply curve under conditions in which wages are less than fully flexible. Prices increase with the level of output because increased output implies increased employment, reduced unemployment, and therefore increased labour costs. The fact that prices in this model rise with output is entirely a reflection of the adjustments in the labour market, in which higher employment increases wages.

7.7 THE DYNAMIC AGGREGATE SUPPLY CURVE

Mankiw develops a model of dynamic AS (sometimes called a Phillips Curve model). We will start with a slightly simpler version that is consistent with our assumption of price stickiness. Here, following our approach in, we will assume that the general price level does not respond to changes in AD in the short run (i.e., within a single period in our model), and will flesh out how this price level changes over time as well as how it responds to supply shocks.

7.8 THE BASIC DYNAMIC AS MODEL

Dynamic AS $\pi_t = E_{t-1}\,\pi_t + \Phi \cdot (E_{t-1}\,Y_t - \overline{Y}) + v_t$

Where, E_{t-1} stands for expectations formed using information available at the end of period t-1 (i.e., formed prior to observing outcomes in the current period), and ' **v** ' is a direct price shock which is zero on average.

This equation says that the inflation rate this period depends on three factors:(i) expected inflation this period, (ii) the expected output gap this period, and (iii)price shocks this period.

Here is an underlying story for this model: Suppose that firms set their prices at the beginning of each period (t) and keep these prices fixed during the period as long as their costs of production do not change. When setting price at the beginning of the period, each firm first considers how much it thinks that its competitors and suppliers will raise their prices. Other things equal, assume that the firm will want to match this expected rate of inflation $E_{t-1}\,\pi_t$ (e.g., it won't gain or loose market share if it matches its competitors' price increases). However, the firm also considers whether it expects the economy to be in a recession or boom this period. If it expects a boom ($E_{t-1}Y_t > \bar{Y}$), it will raise its prices more than it expects others to, and if it expects a recession ($E_{t-1}Y_t < \bar{Y}$), it will try to undercut others' price increases. Finally, if there is a shock to the firm's costs (e.g., v > 0), then the firm will pass on this change in costs directly to prices, even if the shock happens after the firm has set its price for the period. I.e., we are assuming that the firm will not change price within this period in response to a surprise change in demand, but will change price immediately in response to a surprise change in costs.

7.9 THE BASIC DYNAMIC AS MODEL WITH ADAPTIVE EXPECTATIONS:

It still remains to specify how these firms form their expectations. A very simple modeling assumption would be that firms believe that the future will be similar to the past. We can call this type of expectations adaptive expectations. A very simple form of adaptive expectations would be the expectation that this period will look just like last period. i.e.:

$$E_{t-1}Y_t = Y_{t-1} \qquad \text{and} \qquad E_{t-1}\pi_t = \pi_{t-1}$$

Then the Dynamic AS in conjunction with these simple Adaptive Expectations would yield

$$\pi_t = \pi_{t-1} + \Phi \cdot (Y_{t-1} - \bar{Y}) + v_t$$

Notice that AD and the Phillips Curve together with adaptive expectations imply that prices adjust over time in the direction required to bring Y back to $\bar{Y}$ in the Long Run. If, for example, output is below its natural rate, the inflation rate will fall over time. When the inflation rate becomes negative, output will rise toward $\bar{Y}$ along the AD curve.

However, notice also that adaptive expectations make inflation very persistent. Suppose that in a particular period (call it period 2) inflation was 10% and output was $\bar{Y}$. Assume that there are no supply shocks.

Then in period 3, expected inflation will be 10% and there will be no expected output gap, so actual inflation will be 10%. Each firm expects all other firms to raise price, and so raises its own price. Note then that, in the absence of other demand shocks, if the Fed doesn't increase the money supply by 10% in period 3, the rising price level will cause spending to fall below $\bar{Y}$ causing a recession in that period. This puts pressure on the Fed to keep raising the money supply. However, while doing so keeps us out of a recession, it also keeps inflation at 10% in the future.

Note that in the diagram, what happens to output in period 3 depends on what happens to AD in period. In the absence of other shocks, if the Fed were to freeze the money supply, then AD_3 would be the same as AD_2, and the economy would go into a recession. If the Fed were to increase the money supply by 10%, then AD would rise fast enough to offset the increase in price and keep output at $\bar{Y}$

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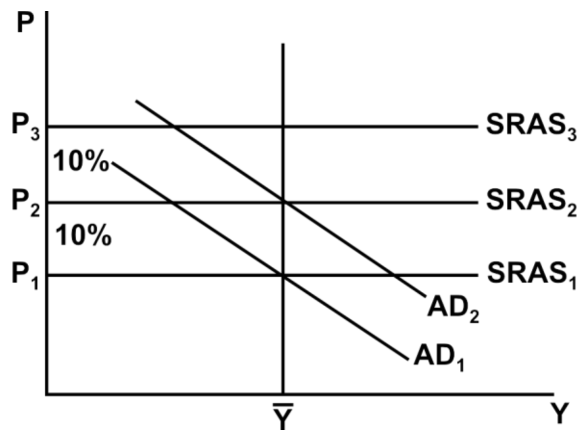


Fig 7.4

So putting together the basic dynamic AS model with our AD model derived from IS-LM, we have a fairly complete but simple model of the short and long run dynamics of a modern macro economy.

Extended Dynamic Model of AS and AD

Mankiw extends the basic dynamic model (of AS and AD) described above in two ways.

First, he makes prices only partly sticky in the SR. The assumption here is that some firms have flexible prices and some have fixed prices in the short run. This makes the SRAS curve upward sloping and implies that prices and inflation will adjust (at least partly) in short run to shifts of the AD curve. Second model builds the monetary policy reactions of the central bank into the AD model. Essentially, we still have IS-LM, but we add to this the assumption that the central bank follows a rule for setting interest rates. This allows us to replace LM with this monetary policy rule for most of our analysis. The type of monetary policy rule Mankiw used is often called a “Taylor Rule.” One benefit of moving to the somewhat more complicated model of is that it allows us to represent the equilibrium state of inflation (rather than the price level) and output on a dynamic AS-AD diagram (DAS and DAD) with inflation and output on the axes.

7.10 LONG-RUN AGGREGATE SUPPLY CURVE

A graphical representation of the long-run relation between real production and the price level, holding all *ceteris paribus* (other things remaining same) aggregate supply determinants constant. The long-run aggregate supply curve, abbreviated LRAS, is one of two curves that graphically capture the supply-side of the aggregate market. The other is the short-run aggregate supply curve. The demand-side of the aggregate market is occupied by the aggregate demand curve. The vertical long-run aggregate supply curve captures the independent relation between real production and the price level that exists in the long run.

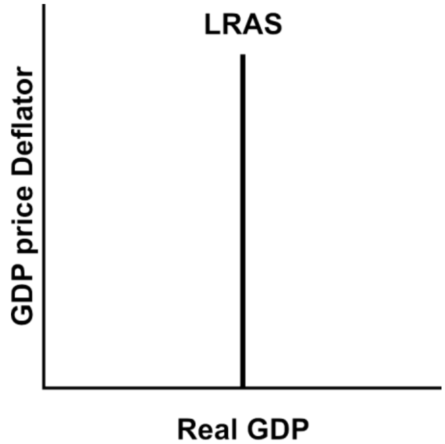
The long-run aggregate supply curve reflects the lack of a cause-and-effect relation between real production and the price level. As the price level rises, real production remains constant at the full-employment level. As the price level falls, real production remains constant at the full-employment level. Due to flexible prices, the same level of real production is generated at every price level.

Interaction between the long-run aggregate supply curve and the aggregate demand curve, as well as the short-run aggregate supply curve is the core mechanism of the aggregate market (or AS-AD) analysis. This analysis is then used to explain and understand macroeconomic phenomenon, including business cycles, inflation, unemployment, and stabilization policies.

The Long-Run Aggregate Supply Curve

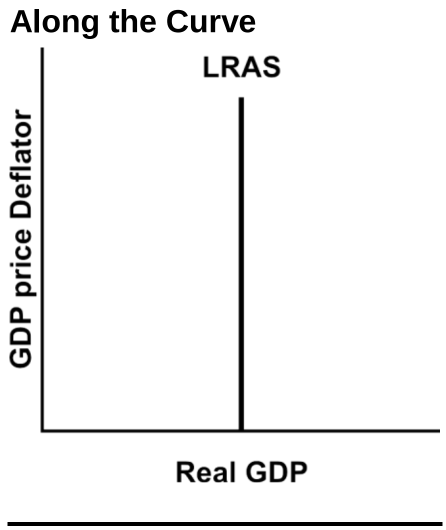
A typical long-run aggregate supply curve, labeled LRAS, is presented in this graph. Consider a few highlights.

Long-Run Aggregate Supply Curve



- First, the price level is measured on the vertical axis and real production is measured on the horizontal axis. The price level is usually measured by the GDP price deflator and real production is measured by real GDP.
- Second, the long-run aggregate supply curve is a vertical line. The aggregate real production offered for sale by the business sector is the same at higher price levels as it is at lower price levels. This constant level of aggregate real production is full-employment production.
- Third, the price level and aggregate real production are the only two variables allowed to change in the construction of this curve. Everything else that could affect long-run aggregate supply is assumed to remain constant. Analogous to market supply, these other variables are ceteris paribus factors that fall under the heading of aggregate supply determinants.
- Fourth, this long-run aggregate supply curve captures the relation between the price level and the flow of real production over a given time period. However, depending on the particular aggregate market analysis, the time period could be shorter (several months) or longer (several years). Of course, if the time period is too short, then the long-run aggregate supply curve might not be relevant.

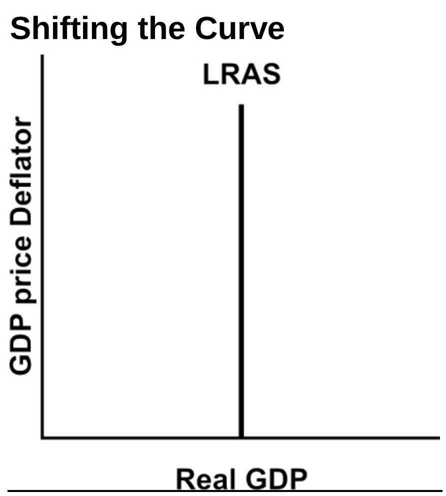
Moving Along the LRAS Curve



The vertical long-run aggregate supply curve captures the independent relation between the price level and aggregate real production. The price level does NOT affect long-run aggregate real production. A higher price level generates the same real production as a lower price level. However, from a graphical standpoint, it is possible to consider how changes in the price level can cause a movement along the long-run aggregate supply curve.

In the analysis of the aggregate market, the price level generally changes in response to a disequilibrium in the economy. While the change in the price level leads to changes in aggregate expenditures on the demand side of the aggregate market and short-run aggregate real production, it does NOT cause changes in long-run aggregate real production. The price level change does cause a movement along the vertical long-run aggregate supply curve, but this is not associated with any quantity change.

Shifting the LRAS Curve



The long-run aggregate supply curve is constructed assuming all aggregate supply determinants remain unchanged. Should any of these determinants change, the long-run aggregate supply curve shifts to a new position. The long-run aggregate supply curve can either shift rightward (an increase in aggregate supply) or leftward (a decrease in aggregate supply).

Shifts of the long-run aggregate supply curve can be brought about by such things as technology or changes in resource quantities. While changes in aggregate supply determinants and resulting shifts of the long-run aggregate supply curve are less dramatic than changes affecting aggregate demand, they DO change. In most cases the changes are slow and steady, for example, the natural growth of the population. From time to time, however, shifts in the long-run aggregate supply curve are more abrupt, such as energy shortages during the 1970s.

The long-run aggregate supply curve is shifted due to changes by any (ceteris paribus) factor other than the price level. Two broad determinant categories include:

- **Resource Quantity:** This determinant is the quantity of the resources--labor, capital, land, and entrepreneurship--that the economy has available for production. If the economy has more resources, then aggregate supply increases and the long-run aggregate supply curve shifts rightward. With fewer resources, aggregate supply decreases and the long-run aggregate supply curve shifts leftward. Specific determinants in this category include population growth, labor force participation, capital investment, and exploration.
-
- **Resource Quality:** This determinant is the quality of resources, especially technology and education. If the quality of labor, capital, land, and entrepreneurship change, then aggregate supply changes and the long-run aggregate supply curve shifts. An improved quality increases aggregate supply, triggering a rightward shift of the long-run aggregate supply curve, and a decline in quality decreases aggregate supply, generating a leftward shift of the long-run aggregate supply curve.

Policy Implications

- Most supply-side policies are designed to improve the long-term performance of the economy. They clearly have short run effects - but we should really judge supply-side policies by measuring the extent to which the United Kingdom economy is able to sustain economic growth over a number of years and raise total employment and average living standards.
- Long run aggregate supply is determined by the productive resources available to meet demand and also by the productivity of factor inputs (labour, land and capital). Changes in technology also affect the potential level of national output in the long run.

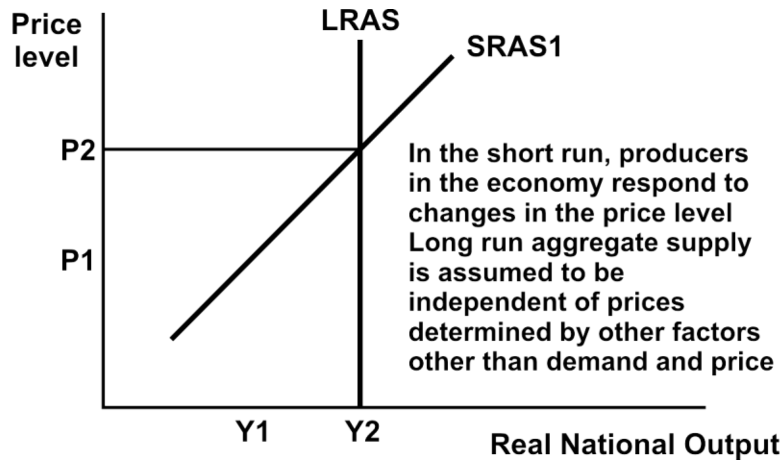


Fig 7.5

- In the short run, producers respond to higher demand (and prices) by bringing more inputs into the production process and increasing the utilization of their existing inputs. Supply does respond to change in price in the short run - we move up or down the short run aggregate supply curve.
-
- In the long run we assume that supply is independent of the price level (money is said to be neutral) - the productive potential of an economy (measured by LRAS) is driven by improvements in productivity and by an expansion of the available factor inputs (more firms, a bigger capital stock, an expanding active labour force etc). As a result we draw the long run aggregate supply curve as vertical.

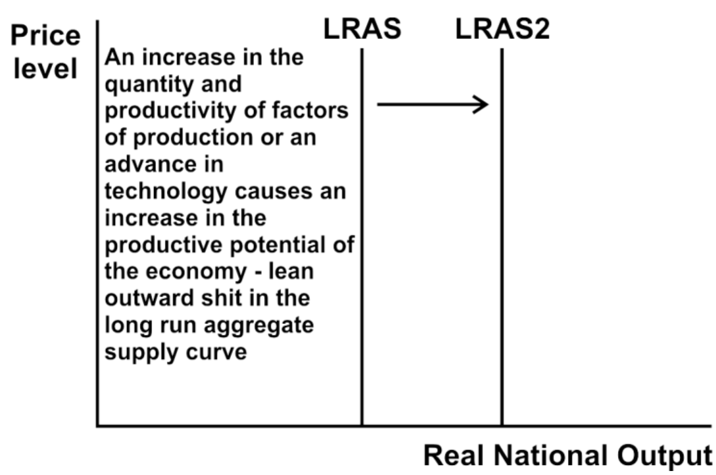


Fig 7.6

- Improvements in labour productivity and efficiency cause the long-run aggregate supply curve to shift out over the years

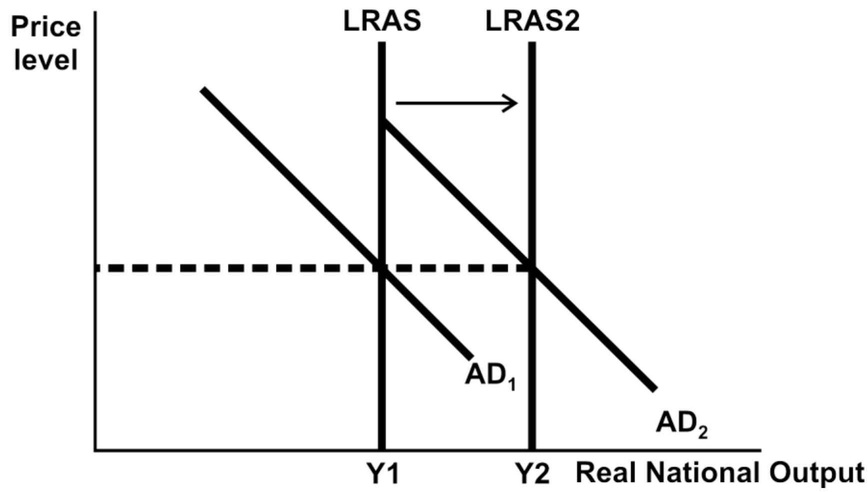


Fig 7.7

- Classical theory relies on market adjustments to changes in individual supplies and demands to keep an economy close to full employment. Thus, it predicts a vertical long-run Aggregate Supply curve. Keynesian theory deals with a depressed economy---so many resources are idle that Aggregate Supply is horizontal. An intermediate position is that Aggregate Supply is positively sloped.

7.11 SUMMARY

1. The aggregate supply curve describes the price adjustment mechanism of the economy.

2. The labour market does not adjust quickly to disturbances. Rather, the adjustment process takes time. The Phillips curve shows that nominal wages change slowly in accordance with the level of employment. Wages tend to rise when employment is high and fall when employment is low.

3. Expectations of inflation are built into the Phillips curve. When actual inflation and expected inflation are equal, the economy is at the natural rate of unemployment. Expectations of inflation adjust over time to reflect the recent levels of inflation.

4. Stagflation occurs when there is a recession plus a high inflation rate. That is, stagflation occurs when the economy moves to the right along a Phillips curve that includes a substantial component of expected inflation.

5. The short-run Phillips curve is quite flat. Within a year, one point of extra unemployment reduces inflation by only about one-half of a point of inflation.

6. Rational expectations theory argues that the aggregate supply curve should shift very quickly in response to anticipated changes in aggregate demand, so output should change relatively little.

7. The frictions that exist as workers enter the labour market and look for jobs or shift between jobs mean that there is always some frictional unemployment. The amount of frictional unemployment that exists at the full-employment level of unemployment is the natural rate of unemployment.

8. The theory of aggregate supply is not yet settled. Several explanations have been offered for the basic fact that the labour market does not adjust quickly to shifts in aggregate demand: the imperfect-information—market-clearing approach; coordination problems; efficiency wages and costs of price changes; and contracts and long-term relationships between firms and workers.

9. In deriving the supply curve in this chapter, we emphasize the long-run relationships between firms and workers and the fact that wages are generally held fixed- for some period, such as a year. We also take into account the fact that wage changes are not coordinated among firms.

10. The short-run aggregate supply curve is derived from the Phillips curve in four steps: Output is assumed proportional to employment; prices are set as a markup over costs; the wage is the main element of cost and adjusts according to the Phillips curve; and the Phillips curve relationship between the wage and unemployment therefore transformed into a relationship between the price level and output.

11. The short-run aggregate supply curve shifts over time. If output is above (below) the full-employment level this period, the aggregate supply curve shifts up (down) next period.

12. A shift in the aggregate demand curve increases the price level and output. The increase in output and employment increases wages somewhat in the current period. The full impact of changes in aggregate demand on prices occurs only over the course of time. High levels of employment generate increases in wages that feed into higher prices. As wages adjust, the aggregate supply curve shifts until the economy returns to equilibrium.

13. The aggregate supply curve is derived from the underlying assumptions that wages (and prices) are not adjusted continuously and that they are not all adjusted together. The positive slope of the aggregate supply curve is a result of some wages being adjusted in response to market conditions and of previously agreed-on overtime rates coming into effect as employment changes. The slow movement of the supply curve over time is a result of the slow

and uncoordinated process by which wages and prices are adjusted.

14. Materials prices (oil price, for example), along with wages, are determinants of costs and prices. Changes in materials prices are passed on as changes in prices and, therefore, as changes in real wages. Materials price changes have been an important source of aggregate supply shocks.

15. Supply shocks pose a difficult problem for macroeconomic policy. They can be accommodated through an expansionary aggregate demand policy, with increased prices but stable output. Alternatively, they can be offset, through a deflationary aggregate demand policy, with prices remaining stable but with lower output.

16. Favourable supply shocks appear to explain rapid growth at the end of the twentieth century Wise aggregate demand policy in the presence of favourable supply shocks can provide rapid growth with low inflation.

7.12 QUESTIONS

1. Critically examine Classical Theory of Employment.
2. Explain in detail why wages are sticky.
3. Explain long run and short run Aggregate Supply Curve.

❖❖❖❖

8

INFLATION AND MONEY

Unit Structure :

8.0 OBJECTIVES

- To Acquaint with the relationship between Inflation and Money supply
- To understand the short run and long run Phillips curve
- To familiar with trade of between Inflation and Unemployment
- To study and understand the short run economic policies to control inflation
- To familiar with long term policies to control inflation
- To understand the empirical evidence of Money-inflation link
- To understand the Quantity theory of money
- To study and understand the Concept of Inflation Tax
- To familiar with the advantages of Inflation tax

8.1 INTRODUCTION

Monetary inflation is a sustained increase in the money supply of a country. It usually results in price inflation, which is a rise in the general level of prices of goods and services. Originally the term "inflation" was used to refer only to monetary inflation, whereas in present usage it usually refers to price inflation.

There is general agreement among economists that there is a causal relationship between the supply and demand of money, and prices of goods and services measured in monetary terms, but there is no overall agreement about the exact mechanism and relationship between price inflation and monetary inflation. The system is complex and there is a great deal of argument on the issues involved, such as how to measure the monetary base, or how much factors like the velocity of money affect the relationship, and what the best monetary policy is. However, there is a general consensus on the importance and responsibility of central banks and monetary authorities in affecting inflation. Keynesian economists favor monetary policies that attempt to even out the ups and downs of the business cycle. Currently, most central banks follow such a rule, adjusting monetary policy in response to unemployment and inflation. Followers of the monetarist school advocate either inflation targeting or a constant growth rate of money supply.

8.2 THE PHILLIPS CURVE

The essence of the Phillips Curve is that there is a **short-term trade-off between unemployment and inflation**. But the original Phillips Curve has come under sustained attack – in particular from monetarist economists, and when we consider the data for unemployment and inflation in Britain over the last fifteen years, we will find that the nature of the trade-off has certainly changed for the economy and others as well.

The basic Phillips Curve idea – economic trade-offs

In 1958 **AW Phillips** from whom the Phillips Curve takes its name plotted 95 years of data of UK wage inflation against unemployment. It seemed to suggest a short-run trade-off between unemployment and inflation. The theory behind this was fairly straightforward. Falling unemployment might cause rising inflation and a fall in inflation might only be possible by allowing unemployment to rise. If the Government wanted to reduce the unemployment rate, it could increase aggregate demand but, although this might temporarily increase employment, it could also have inflationary implications in labour and the product markets.

The key to understanding this trade-off is to consider the possible inflationary effects in both labour and product markets arising from an increase in national income, output and employment.

The labour market: As unemployment falls, some labour shortages may occur where skilled labour is in short supply. This puts extra pressure on wages to rise, and since wages are usually

a high percentage of total costs, prices may rise as firms pass on these costs to their customers

Other factor markets: Cost-push inflation can also come from rising demand for commodities such as oil, copper and processed manufactured goods such as steel, concrete and glass. When an economy is booming, so does demand for these components and raw materials.

Product markets: Rising demand and output puts pressure on scarce resources and can lead to suppliers raising prices to widen profit margins. The risk of rising prices is greatest when demand is out-stripping supply-capacity leading to excess demand (i.e. a positive output gap)

8.2.1 Explaining the Phillips Curve concept using AD-AS and the output gap

Let us consider the explanation for the trade-off using AD-AS analysis and the concept of the **output gap**. In the next diagram, we draw the LRAS curve as vertical - this makes the assumption that the productive capacity of an economy in the long run is independent of the price level.

We see an outward shift of the AD curve (for example caused by a large rise in consumer spending) which takes the equilibrium level of national output to Y2 beyond potential GDP Yfc. This creates a positive output gap and it is this that is thought to cause a rise in inflationary pressure as described above. Excess demand in product markets and factor markets causes a rise in production costs and this leads to an inward shift in short run aggregate supply from SRAS1 to SRAS2. The fall in supply takes the economy back towards potential output but at a higher price level.

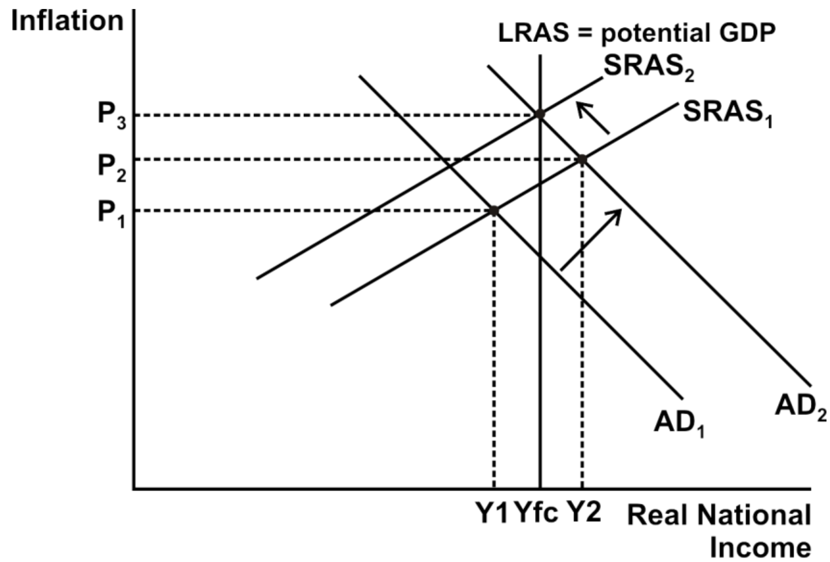


Fig 8.1

So this might help to explain the Phillips Curve idea. We could equally use a diagram that uses a non-linear SRAS curve to demonstrate the argument. The next diagram shows the original short-run Phillips Curve and the trade-off between unemployment and inflation:

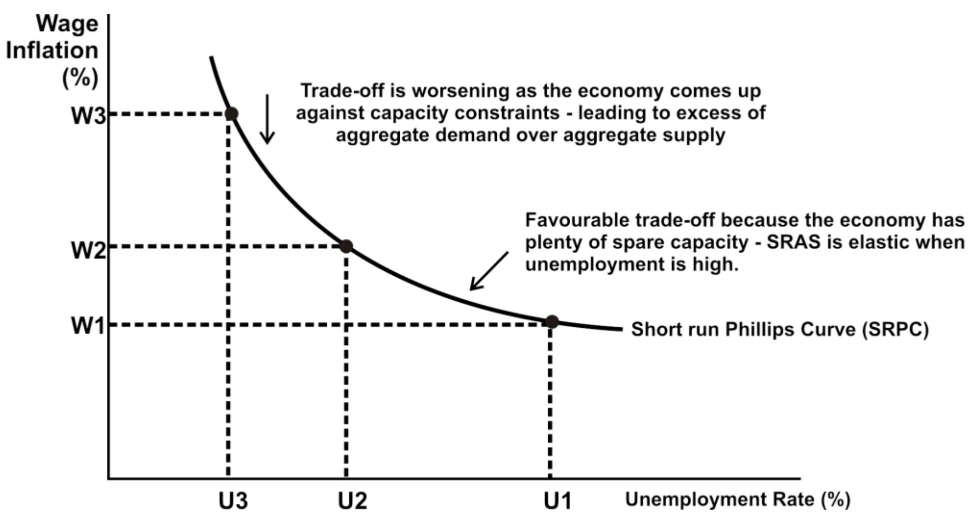


Figure 8.2

8.3 THE NAIRU : THE NON-ACCELERATING-INFLATION RATE OF UNEMPLOYMENT.

Milton Friedman, who criticized the basis for the original Phillips Curve in a speech to the American Economics Association in 1968, introduced the concept of the **NAIRU**. It has been further developed by economists both in the United States and the UK. Leading figures developing the concept of the NAIRU in the UK include Sir Richard Layard and Prof. Stephen Nickell at the LSE.

Nickell is now a member of the Monetary Policy Committee involved in the setting of interest rates.

The **NAIRU** is defined as the rate of unemployment when the rate of wage inflation is stable.

The NAIRU assumes that there is imperfect competition in the labour market where some workers have collective bargaining power through membership of trade unions with employers. And, some employers have a degree of monopsony power when they purchase labour inputs.

According to proponents of the concept of the NAIRU, the equilibrium level of unemployment is the outcome of a **bargaining process** between firms and workers. In this model, workers have in their minds a **target real wage**. This target real wage is influenced by what is happening to unemployment – it is assumed that the lower the rate of unemployment, the higher workers' wage demands will be. Employees will seek to bargain their share of a rising level of profits when the economy is enjoying a cyclical upturn.

Whether or not a business can meet that target real wage during pay negotiations depends partly on what is happening to labour productivity and also the ability of the business to apply a mark-up on cost in product markets in which they operate. In highly competitive markets where there are many competing suppliers; one would expect lower mark-ups (i.e. lower profit margins) because of competition in the market. In markets dominated by monopoly suppliers, the mark-up on cost is usually much higher and potentially there is an increased share of the 'producer surpluses that workers might opt to bargain for.

If actual unemployment falls below the NAIRU, theory suggests that the balance of power in the labour market tends to switch to employees rather than employers. The consequence can be that the economy experiences **acceleration in pay settlements** and the growth of average earnings. Ceteris paribus, an increase in wage inflation will cause a rise in **cost-push inflationary pressure**.

8.3.1 The expectations-augmented Phillips Curve

The original Phillips Curve idea was subjected to fierce criticism from the Monetarist school among them the American economist Milton Friedman. Friedman accepted that the short run Phillips Curve existed – but that in the long run, the **Phillips Curve was vertical** and that there was **no trade-off between unemployment and inflation**.

He argued that each short run Phillips Curve was drawn on the assumption of a **given expected rate of inflation.** So if there were an increase in inflation caused by a large monetary expansion and this had the effect of driving **inflationary expectations** higher, then this would cause an upward shift in the short run Phillips Curve.

The monetarist view is that attempts to boost AD to achieve faster growth and lower unemployment have only a **temporary effect on jobs.** Friedman argued that a government could not permanently drive unemployment down below the **NAIRU** – the result would be higher inflation which in turn would eventually bring about a return to higher unemployment but with inflation expectations increased along the way.

Friedman introduced the idea of **adaptive expectations** – if people see and experience higher inflation in their everyday lives, they come to expect a higher average rate of inflation in future time periods. And they (or the trades unions who represent them) may then incorporate these changing expectations into their pay bargaining. **Wages often follow prices**. A burst of price inflation can trigger higher pay claims, rising labour costs and ultimately higher prices for the goods and services we need and want to buy.

This is illustrated in the next diagram – inflation expectations are higher for SPRC2. The result may be that higher unemployment is required to keep inflation at a certain target level.

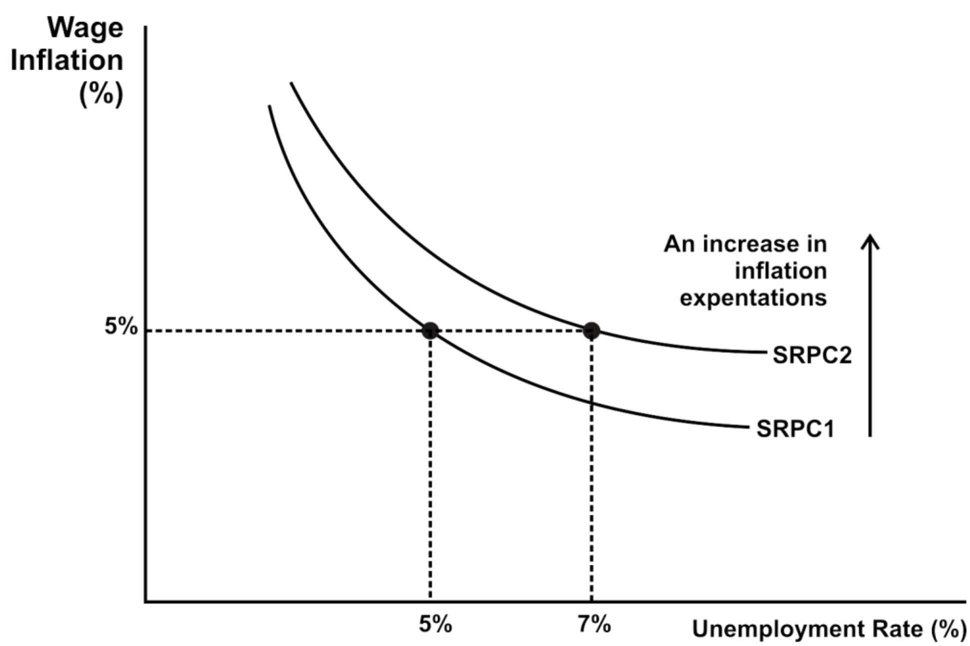


Figure 8.3

The expectations-augmented Phillips Curve argues that attempts by the government to reduce unemployment below the natural rate of unemployment by boosting aggregate demand will have little success in the long run. The effect is merely to create higher inflation and with it an increase in inflation expectations. The Monetarist school believes that inflation is best controlled through tight control of money and credit. Credible policies to keep on top of inflation can also have the beneficial effect of reducing inflation expectations – causing a downward shift in the Phillips Curve.

8.4 THE LONG RUN PHILLIPS CURVE

The long run Phillips Curve is normally drawn as vertical – but the long run curve can shift inwards over time

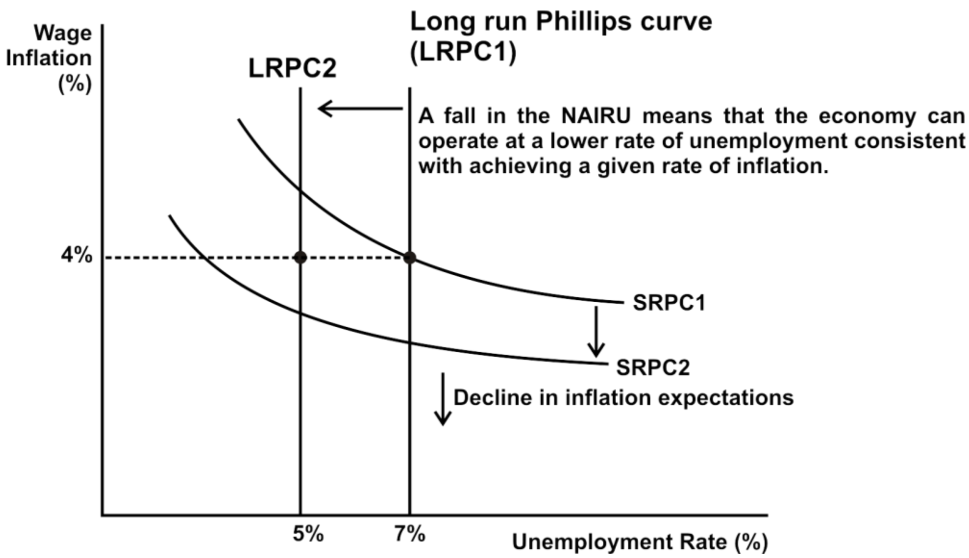


Figure 8.4

An inward shift in the long run Phillips Curve might be brought about by supply-side improvements to the economy – and in particular a reduction in the natural rate of unemployment. For example labour market reforms might be successful in reducing frictional and structural unemployment – perhaps because of improved incentives to find work or gains in the human capital of the workforce that improves the occupational mobility of labour.

8.5 ECONOMICS POLICIES TO CONTROL INFLATION

The control of inflation has become one of the dominant objectives of government economic policy in many countries. Effective policies to control inflation need to focus on the underlying causes of inflation in the economy. For example if the main cause is excess demand for goods and services, then government policy should look to reduce the level of aggregate demand. If cost-push inflation is the root cause, production costs need to be controlled for the problem to be reduced.

8.5.1 Monetary Policy

Monetary policy can control the growth of demand through an increase in interest rates and a contraction in the real money supply. For example, in the late 1980s, interest rates went up to 13% because of the excessive growth in the economy and contributed to the recession of the early 1990s. The effects of higher interest rates are as follows:

Higher interest rates reduce aggregate demand in three main ways;

• Discouraging borrowing by both households and companies

• Increasing the rate of saving (the opportunity cost of spending has increased)

• The rise in mortgage interest payments will reduce homeowners' real 'effective' disposable income and their ability to spend. Increased mortgage costs will also reduce market demand in the housing market

• Business investment may also fall, as the cost of borrowing funds will increase. Some planned investment projects will now become unprofitable and, as a result, aggregate demand will fall.

• Higher interest rates could also be used to limit monetary inflation. A rise in real interest rates should reduce the demand for lending and therefore reduce the growth of broad money.

8.5.2 Fiscal Policy

• Higher direct taxes (causing a fall in disposable income)
• Lower Government spending
• A reduction in the amount the government sector borrows each year (PSNCR)

These fiscal policies increase the rate of leakages from the circular flow and reduce injections into the circular flow of income and will reduce demand pull inflation at the cost of slower growth and unemployment.

8.5.3 An appreciation of the exchange rate

An appreciation in the Rupee makes Indian exports more expensive and should reduce the volume of exports and aggregate demand. It also provides Indian firms an incentive to keep costs down to remain competitive in the world market. A stronger Rupee reduces import prices. And this makes firms' raw materials and components cheaper; therefore helping them control costs.

A rise in the value of the exchange rate might be achieved by an increase in interest rates or through the purchase of Rupee via Central Bank intervention in the foreign exchange markets.

8.5.4 Direct wage controls - incomes policies

Incomes policies (or direct wage controls) set limits on the rate of growth of wages and have the potential to reduce cost inflation. The Government has not used such a policy since the late 1970s, but it does still try to influence wage growth by restricting pay rises in the public sector and by setting cash limits for the pay of public sector employees.

In the private sector the government may try moral suasion to persuade firms and employees to exercise moderation in wage negotiations. This is rarely sufficient on its own. Wage inflation normally falls when the economy is heading into recession and unemployment starts to rise. This causes greater job insecurity and some workers may trade off lower pay claims for some degree of employment protection.

Wage and price controls have been successful in wartime environments in combination with rationing. However, their use in other contexts is far more mixed. Notable failures of their use include the 1972 imposition of wage and price controls by Richard Nixon. More successful examples include the Prices and Incomes Accord in Australia and the Wassenaar Agreement in the Netherlands.

In general wage and price controls are regarded as a temporary and exceptional measure, only effective when coupled with policies designed to reduce the underlying causes of inflation during the wage and price control regime, for example, winning the war being fought. They often have perverse effects, due to the distorted signals they send to the market. Artificially low prices often cause rationing and shortages and discourage future investment, resulting in yet further shortages. The usual economic analysis is that any product or service that is under-priced is over-consumed. For example, if the official price of bread is too low, there will be too little bread at official prices, and too little investment in bread making by the market to satisfy future needs, thereby exacerbating the problem in the long term.

Temporary controls may *complement* a recession as a way to fight inflation: the controls make the recession more efficient as a way to fight inflation (reducing the need to increase unemployment), while the recession prevents the kinds of distortions that controls cause when demand is high. However, in general the advice of economists is not to impose price controls but to liberalize prices by assuming that the economy will adjust and abandon unprofitable economic activity. The lower activity will place fewer demands on whatever commodities were driving inflation, whether labor or resources, and inflation will fall with total economic output. This often produces a severe recession, as productive capacity is reallocated and is thus often very unpopular with the people whose livelihoods are destroyed.

8.6 LONG-TERM POLICIES TO CONTROL INFLATION

8.6.1 Labour market reforms

The weakening of trade union power, the growth of part-time and temporary working along with the expansion of flexible working hours are all moves that have increased flexibility in the labour market. If this does allow firms to control their labour costs it may reduce cost push inflationary pressure.

Certainly in recent years the economy has not seen the acceleration in wage inflation normally associated with several years of sustained economic growth and falling inflation. One reason is that rising job insecurity inside a flexible labour market has tilted the balance of power away from employees towards employers.

8.6.2 Supply-side reforms

If a greater output can be produced at a lower cost per unit, then the economy can achieve sustained economic growth without inflation. An increase in aggregate supply is often a key long term objective of Government economic policy. In the diagram below we see the benefits of an outward shift in the long run aggregate supply curve. The equilibrium level of real national income increases and the average price level remains relatively constant.

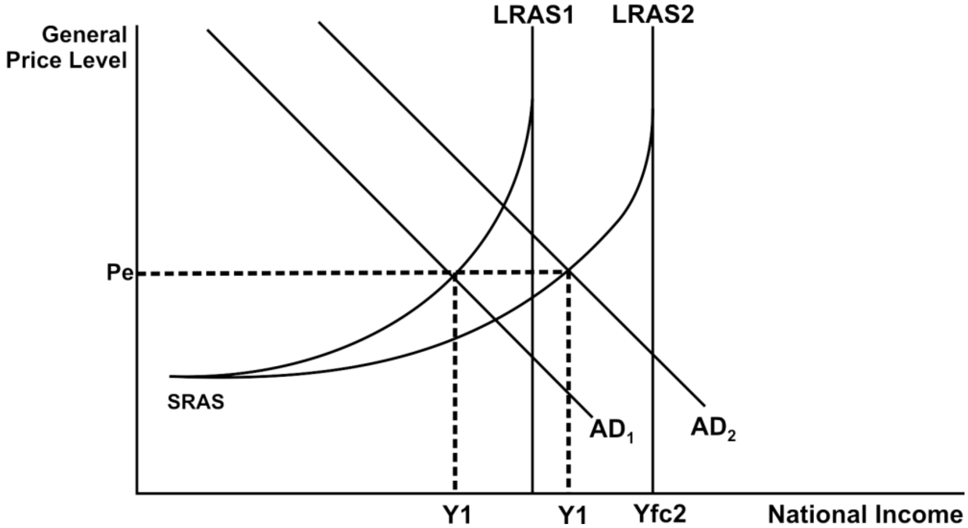


Figure 8.5

Supply side reforms seek to increase the productive capacity of the economy in the long run and raise the trend rate of growth of labour and capital productivity. A number of supply-side policies have been introduced into the Indian economy in recent years.

Productivity gains help to control unit labour costs (an important cause of cost-push inflation) and put less pressure on producers to raise their prices.

The key to controlling inflation in the long run is for the authorities to keep control of aggregate demand (through fiscal and monetary policy) and at the same time seek to achieve improvements to the supply side of the economy. The credibility of inflation control policies can often be enhanced by the introduction of inflation targets.

8.6.3 Cost-of-living allowance

The real purchasing-power of fixed payments is eroded by inflation unless they are inflation-adjusted to keep their real values constant. In many countries, employment contracts, pension benefits, and government entitlements (such as social security) are tied to a cost-of-living index, typically to the consumer price index.

A *cost-of-living allowance* (COLA) adjusts salaries based on changes in a cost-of-living index. Salaries are typically adjusted annually in low inflation economies. During hyperinflation they are adjusted more often. They may also be tied to a cost-of-living index that varies by geographic location if the employee moves.

Annual escalation clauses in employment contracts can specify retroactive or future percentage increases in worker pay which are not tied to any index. These negotiated increases in pay are colloquially referred to as cost-of-living adjustments or cost-of-living increases because of their similarity to increases tied to externally determined indexes. Many economists and compensation analysts consider the idea of predetermined future "cost of living increases" to be misleading for two reasons: (1) For most recent periods in the industrialized world, average wages have increased faster than most calculated cost-of-living indexes, reflecting the influence of rising productivity and worker bargaining power rather than simply living costs, and (2) most cost-of-living indexes are not forward-looking, but instead compare current or historical data.

8.6.4 Problems with forecasting inflation

Inflation can never be forecast with perfect accuracy. The overall inflation measure is the result of millions of pricing decisions made by businesses large and small. The calculation of the retail price index although extremely thorough, is always subject to error and omission. Furthermore, the nature of the inflation process makes it very difficult to forecast, even when inflationary conditions in the economy appear to be benign.

External economic shocks can make forecasts inaccurate. For example, a sharp jump in world oil prices (an inflationary shock) or deep falls in global share prices (a deflationary shock), both have big feedback effects through the economic system. The exchange rate might also fluctuate leading to volatility in the prices of imported goods and services.

8.7 FISHER'S EQUATION

The quantity theory was the basis (or a big part of it) for one of the sharpest policy debates in the postwar period. Then, as now, there were many businessmen, economists, and government officials who thought that monetary policy should be chosen to micro-manage or fine tune the economy: to help smooth out the recurrent ups and downs that we've labeled the business cycle.

8.8 QUANTITY THEORY OF MONEY

The monetarist explanation of inflation operates through the Quantity Theory of Money, $MV = PT$ where M is Money Supply, V is Velocity of Circulation, P is Price level and T is Transactions or Output. As monetarists assume that V and T are determined, in the long run, by real variables, such as the productive capacity of the economy, there is a direct relationship between the growth of the money supply and inflation.

The mechanisms by which excess money might be translated into inflation are examined below. Individuals can also spend their excess money balances directly on goods and services. This has a direct impact on inflation by raising aggregate demand. Also, the increase in the demand for labour resulting from higher demands for goods and services will cause a rise in money wages and unit labour costs. The more inelastic is aggregate supply in the economy, the greater the impact on inflation.

The increase in demand for goods and services may cause a rise in imports. Although this leakage from the domestic economy reduces the money supply, it also increases the supply of money on the foreign exchange market thus applying downward pressure on the exchange rate. This may cause imported inflation.

The **Fisher equation** in financial mathematics and economics estimates the relationship between nominal and real interest rates under inflation. It is named after Irving Fisher who was famous for his works on the theory of interest. In finance, the Fisher equation is primarily used in YTM calculations of bonds or IRR calculations of investments. In economics, this equation is used to predict nominal and real interest rate behavior. (Please note that economists generally use the Greek letter 'π' as the inflation rate, not the constant 3.14159....)

Letting r denote the real interest rate, i denote the nominal interest rate, and let π denote the inflation rate, the Fisher equation is:

This is a linear approximation, but as here, it is often written as an equality:

$$i = r + \pi$$

The Fisher equation can be used in either *ex-ante* (before) or *ex-post* (after) analysis. Ex-post, it can be used to describe the real purchasing power of a loan:

$$r = i - \pi$$

Rearranged into an *expectations augmented Fisher equation* and given a desired real rate of return and an expected rate of inflation over the period of a loan, π^e, it can be used ex-ante version to decide upon the nominal rate that should be charged for the loan:

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

This equation existed before Fisher, but Fisher proposed a better approximation which is given below. The approximation can be derived from the exact equation:

$$1 + i = (1 + r)(1 + \pi)$$

8.8.1 Derivation of the equation

Although time subscripts are sometimes omitted, the intuition behind the Fisher equation is the relationship between nominal and real interest rates, through inflation, and the percentage change in the price level between two time periods. So assume someone buys a $1 bond in period t while the interest rate is i_t. If redeemed in period, t+1, the buyer will receive $(1 + i_t)$ dollars. But if the price level has changed between period t and t+1, then the real value of the proceeds from the bond is therefore

$$(1 + r_{t+1}) = (1 + i_t) / (1 + \pi_{t+1})$$

From here the nominal interest rate can be solved for.

$$1 + i_t = (1 + r_{t+1})(1 + \pi_{t+1}) \ (1)$$

In expanded form, (1) becomes:

$$1 + i_t = 1 + r_{t+1} + \pi_{t+1} + r_{t+1}\pi_{t+1}$$

$$i_t = r_{t+1} + \pi_{t+1} + r_{t+1}\pi_{t+1}$$

Assuming that both real interest rates and the inflation rate are fairly small, (perhaps on the order of several percent, although this depends on the application) $r_{t+1} + \pi_{t+1}$ is much larger than $r_{t+1}\pi_{t+1}$ and so $r_{t+1}\pi_{t+1}$ can be dropped, giving the final approximation.

More formally, this linear approximation is given by using two 1st order Taylor expansions.and hence the example is as follows.

8.8.2 Applications of Fisher's Equation

The Fisher equation has important implications in the trading of inflation-indexed bonds, where changes in coupon payments are a result of changes in break-even inflation, real interest rates and nominal interest rates.

8.8.3 Fisher hypothesis

In economics, the **Fisher hypothesis** , sometimes **Fisher parity** is the proposition by Irving Fisher that the real interest rate is independent of monetary measures, especially the nominal interest rate. The Fisher equation is

$$r_r = r_n - \pi^e.$$

This means, the real interest rate (r_r) equals the nominal interest rate (r_n) minus expected rate of inflation (π^e). Here all the rates are continuously compounded. For simple rates, the Fisher equation takes form of

If r_r is assumed to be constant, r_n must rise when π^e rises. Fisher Effect: The one for one adjustment of the nominal interest rate to the expected inflation rate.

To understand the relationship between money, inflation and interest rates it is important to understand nominal interest rate and real interest rate. The nominal interest rate is the interest rate you hear about at your bank. If you have a savings account, for instance, the nominal interest rate tells you how fast the number of dollars in your account will rise over time. The real interest rate corrects the nominal rate for the effect of inflation in order to tell you how fast the purchasing power of your savings account will rise over time. An easy estimation of the real interest rate is the nominal interest rate minus the expected inflation rate (Note that this estimate is unwise when looking at compounded savings.)

Real interest rate= Nominal Interest Rate - Expected Inflation Rate

Nominal Interest Rate= Real interest Rate + Expected Inflation Rate

If inflation permanently rises from a constant level, let's say 4%/yr., to a constant level, say 8%/yr., that currency's interest rate would eventually catch up with the higher inflation, rising by 4 points a year from their initial level. These changes leave the real return on that currency unchanged. The Fisher Effect is an evidence that in the long-run, purely monetary developments will have no effect on that country's relative prices.

The International Fisher Effect predicts an international exchange rate drift independent of inflation - that is, entirely based on the respective national nominal interest rates.(Though differential real rates will give the same exchange rate drift if inflation is internationally harmonized.)

8.9 INFLATION TAX

Inflation tax is a term which refers to the financial loss of value suffered by holders of cash and fixed-rate bonds, as well those on fixed income (not indexed to inflation), due to the effects of inflation. This financial loss of value is often expressed as a loss of purchasing power. It may be better characterized as a wealth transfer than a tax - since many people including debtors, holders of hard assets and some equities may simultaneously gain. Many economists hold that inflation affects the lower and middle classes more than the rich, as they hold a larger fraction of their income in cash, they are much less likely to receive the newly created monies before the market has adjusted with inflated prices, more often have fixed incomes, wages or pensions, and lack the means to avoid domestic inflation by reallocating assets overseas. Some argue that inflation is a regressive non-linear consumption tax. Nevertheless, inflation improves the economic position of people with outstanding fixed interest debt like student loans and mortgages.

It can improve the nation's balance of trade - stimulating exports with a less expensive currency - and decreasing imports. A large portion of the "tax" also falls on foreign holders of fixed income debt in the inflated currency. It is important to note that this "tax" on creditors is coupled with a simultaneous transfer to debtors - reducing their debt burden. By transferring wealth to people who are more likely to spend it, an inflation "tax" can further increase real (inflation adjusted) economic growth (beyond its beneficial impact on trade). It may also hasten new purchases since inflation makes it costly to keep cash. Inflation can increase liquidity in depressed real estate markets since it would increase nominal asset values back above the loan values. This improved LTV allows for people to sell their homes, and move to pursue better economic opportunities and as such can improve efficiency of the labor markets. In this way, an "inflation tax" can improve real (inflation adjusted) economic growth and improve employment. Therefore a very tight monetary policy which seeks to reduce inflation - even at the cost of real (inflation adjusted) economic growth and jobs can be viewed as a "stagnation tax".

8.9.1 How it occurs

When central banks print notes and issue credit, they increase the amount of money available in the economy. This is sometimes done as a reaction to worsening economic conditions. It is generally held that in the long run, an increase in the money supply causes inflation. Some have argued that, in effect, increasing the money supply and causing the holders of money to pay an inflation tax is a form of taxation. If the annual inflation rate in the United States is 5%, one dollar will buy $1 worth of goods and services this year, but it would require $1.05 to buy the same goods or services the next year; this has the same effect as a 5% annual tax on cash holdings, ceteris paribus.

Governments are almost always net debtors (that is, most of the time a government owes more money than others owe to it). Inflation reduces the relative value of previous borrowing, and at the same time it increases the amount of revenue from taxes. Thus it follows that a government can improve the debt-to-revenue ratio by employing inflationary measures.

However, if the government continues to sell debt, by borrowing money in exchange of debt papers, these debt papers will be affected by inflation: they will lose their value, and therefore they will become less attractive for creditors, until the government will not find any willing to buy debt.

An inflation tax does not necessarily involve debt emission. By simply emitting currency (cash), a government will induce liquidity and may trigger inflationary pressures. Taxes on consumer spending and income will then collect the extra cash from the citizens. Inflation, however, tends to cause social problems (e. g., when income increases more slowly than prices).

8.9.2 "Tax on the inflation tax"

Although not meant by the term "inflation tax", a related effect is the tax on interest and investment "income" when the tax is levied against the nominal interest rate or nominal gains.

For instance, if someone buys a bond with a nominal interest rate of 6% and the rate of inflation is 4%, their "real" interest is 1.92%.

If, however, they are taxed 25% of the 6% interest "income", or 1.5%, this can be thought of as composed of a tax on real income (0.5%) and a tax on inflation (1.0%). The same principle applies to capital "gains" taxes not adjusted for inflation. In any case, this "tax on the inflation tax" is essentially equivalent to a tax on holdings ("wealth tax") equal to the nominal tax rate times the inflation rate (in example above, 25% of 4% inflation equals 1.0%.) This "property tax" can even apply to *non-monetary* assets as well as money earning interest. Thus, money itself is subject to both the inflation tax *and* the tax on the inflation tax, while other assets, on which nominal profit or gains taxes are imposed, are subject only to the tax on inflation.

Another negative effect of this tax is that even inflation-indexed bonds carry inflation risk, as the inflation compensation is taxed.

8.9.3 Negative interest rates

If there is a negative real interest rate, it means that inflation is more than the interest. Suppose if the Federal funds rate is 2% and the inflation rate is 10%, then it means that the borrower would gain 7.27% of every dollar borrowed.This may lead to malinvestment and business cycles, as the borrower experiences a net profit by repaying principal with inflated (devalued) dollars.

Why is it such a bad thing for governments to rely more on the "inflation tax"? As long as it is applied within the context of an inflation-targeting Fed, all the negatives of inflation can be contained. That is, as long as the Fed sets a target inflation rate (say, 15%) and then uses open market techniques to bring inflation into line by taking into consideration the new money, there'll be no unexpected inflation, and therefore no inflation cost.

8.9.4 Advantages of Inflation Tax

There are many advantages to the inflation tax, including: 1) Painless, free "collection." 2) Progressivity (those with the most accumulated assets pay the most.)It is a provocative proposal.
1. The inflation tax is not painless. There are various inefficiencies that inflation causes, even if it is steady and predictable. Those include the "shoe leather" costs of reduced real money balances, increased menu costs, spurious relative-price variability, and distortions in taxes due to the failure to have fully indexed tax laws. These are discussed in more detail in the textbook.

2. The inflation tax is probably less progressive than one might at first think. It is not a tax on all assets but only on non-interest-bearing assets, such as cash. The rich are able to keep their most of their wealth in forms that can avoid the inflation tax. (One exception is the rich in the underground economy; the inflation tax may hit criminals particularly hard.)

3. The inflation tax would raise only a modest amount of revenue. Here is a rough calculation. The monetary base is now about $800 billion. So an inflation rate of 15 % would raise a maximum of $120 billion per year, or about 1 % of GDP. That is an

upper bound on the amount of tax revenue because, as inflation rose, the quantity of money demanded would fall, reducing the size of the tax base. (This is a standard **"Laffer curve"** argument, applied to the inflation tax.)

4. For reasons that are not fully understood, high inflation tends to be volatile inflation. A stable and predictable 15 % inflation seems possible as a matter of economic theory, but it is rarely if ever observed. If we take this empirical regularity as a constraint, then choosing high inflation entails choosing volatile inflation, which increases uncertainty.

8.10 SUMMARY

1. The Classical theory exhibits complete separation between real variables and inflation. There is, by construction, no effect of money growth on real output or the real rate of interest.
2. In the Classical theory, inflation is driven by money growth (the quantity theory) and nominal interest rates by inflation (the Fisher relation).
3. In the data, the theory's predictions look better for long-run trends than for short-run fluctuations.
4. Extremely high rates of inflation are generally associated with high rates of money growth, often the result of financing large fiscal deficits by printing money. In this sense, there's no simple distinction between monetary and fiscal policy.

8.11 QUESTIONS

1. ‘Short term trade-off between unemployment and inflation’ Explian the statement with reference to Phillips curve.
2. Explain the Expectations augmented Phillips curve.
3. Discuss in detail the Fisher’s explaination of money.
4. What do you understand by Inflation Tax?

❖❖❖❖

9

BUDGET CONSTRAINT : MONEY AND DEBT FINANCING OF BUDGET DEFICIT

Unit Structure :

9.0 OBJECTIVES

- To familiar with the Government budget constraints.
- To understand and study budget deficit and growth of money.
- To study money financing of the budget deficit.
- To become familiar with Printed Money and the Inflation Tax.
- To study inflation tax revenue.
- To understand debt financing of budget deficit.
- To understand the Ricardian Equivalence.

9.1 INTRODUCTION

The government normally finances its expenditure through receipts from taxes, both direct and indirect. When government expenditure increases and it finds it difficult to raise more resources from taxation, it resorts to borrowing from the public or printing money to finance its budget deficit. Increase in rates of income and other taxes not only adversely affect incentives to work more, save and invest more but also promotes tax evasion. Further, as Laffer curve concept shows increase in rate of a tax beyond a point causes revenue from taxes to decline. Thus there are limits, to increasing revenue from taxes to finance the increased expenditure of the government. As result government finds it difficult to raise adequate resources to finance its increased expenditure fully through normal taxes, it faces a resource constraint resulting in budget deficit which in recent years is also called fiscal deficit. Thus government budget constraint is reflected in budget or fiscal deficit.

9.2 GOVERNMENT BUDGET CONSTRAINT

The general form of government budget constraint is written as

$$\mathbf{G = T + \Delta B + \Delta M \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)}$$

Where **G** stands for government expenditure (including subsidies and interest payments on past debt), **T** is tax revenue, ∆**B** is the new borrowing from the market (through sale of bonds or securities and ∆**M** is the new printed money issued to finance Government expenditure.

According to the budget constraint equation (1), government expenditure in a year can be financed by tax revenue (T), new borrowing (∆B) by the government from the market (both within and outside the country) through sale of its bonds and by creating new high powered money (∆M) which is also called money financing. Budget constraint equation can be re-written as

$$\mathbf{G - T = \Delta B + \Delta M \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)}$$

G – T represents budget deficit (also called fiscal deficit) that must be financed by new borrowing (∆B) by the government through sale of bonds and creation of new high powered money (∆M) which is called money financing. Thus

Budget deficit = New Borrowing (i.e., sale of Bonds) + Printed Money

The fiscal deficit can be financed either by printing money (also called ***seiniorage*)** by the government or by selling bonds to the public (which also includes banks, insurance companies and other financial institutions)t is through sale of bonds that the government borrows from the public which adds to the government debt. The government has to pay interest annually on its debt and have also to pay the principal sum borrowed at the maturity of bonds or securities.

In times of recessionary conditions which arise due to the deficiency of aggregate demand J.M. Keynes argued for the adoption of deliberate policy of framing a budget deficit to get rid of recession and restore full-employment equilibrium. In recent years there has been a considerable debate among economists about the appropriate methods of financing the budget deficits and their consequences. It is important to discuss the consequences of budget deficit and the mode of its financing as there has been persistent large budget deficits year after year not only in developed countries such as the United States but also in the developing countries such as India resulting in mounting burden of public debt on the one hand and inflation on the other.

9.3 MONEY FINANCING OF BUDGET DEFICIT

As stated above, the government can finance its deficit and meet its increased expenditure by printing high powered money: The revenue raised through printing of money is also called ***seigniorage.*** When government finances its budget deficit through printing money, money supply in the economy increases, there are two views regarding the effect of increase in money supply on inflation.

According to the Keynesian view, when money supply is increased in times of depression when productive capacity and labour are lying idle due to deficiency of aggregate demand, price level is not likely to rise much and the effect of increase in money supply is to raise output or income. The increase in real income, given the rate of taxation, will bring about increase in revenue from taxation, which will tend to be reduce Budget deficit in the short run. How ever, if the economy is operating at or near full employment, printing money, to finance the deficit will cause inflation, Printing money to raise revenue for financing the budget deficit which causes inflation is like **an inflation tax**, This is because the government is able to get resources through printed money which causes inflation and reduces the real value of the holdings of money by the public.

Let us first explain the Keynesian model with a fixed price level when the economy is in recession to demand deficiency and a lot of unemployment of resources prevails. The tax function can be written as

$$\mathbf{T=t(Y)}$$

Where, **t** is the rate of tax and **Y** real income and **T** is the total tax revenue, If **G** is government expenditure, then budget deficit (BD) is given by

$$\mathbf{BD=G—t(Y)……….(\ i)}$$

If G—t(Y)=0, budget deficit will be zero and therefore the budget will be balanced one.

If G—t(Y) > 0 there will be budget deficit.

If the Government finances its deficit through money creation, then the short run macro equilibrium can be written as

Y= Y(G, M) ……….. (ii)

The short run equilibrium in simple IS- LM model is shown rated in following Fig. where IS and LM curves intersect at point E and determine equilibrium income Y_0 and equilibrium interest rate r_0.

Suppose in this equilibrium the government has a budget deficit so that G - t(Y)> 0. Further, government finances this budget deficit through creating high powered money. As a result, money supply in the economy increases and LM curve shifts to the right to the new position LM_1. With this, as it will be seen from the figure, level of equilibrium income increases to Y_1, and rate of interest falls to r_1, Since we are assuming an economy with a depression, increase in demand brought about by expansion in money supply will not cause any rise in price level.

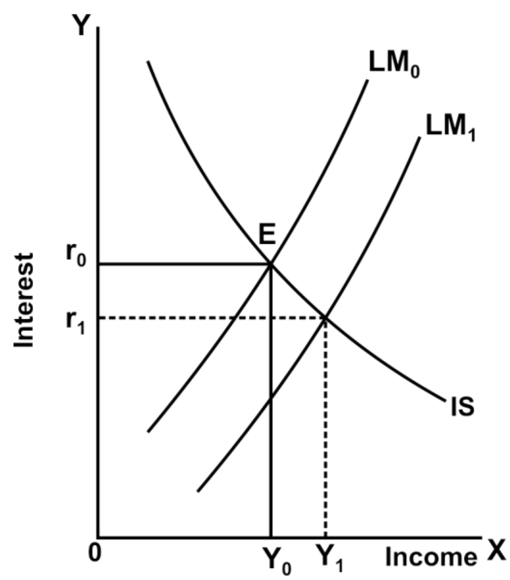


Fig 9.1 : IS-LM Model, The Effect of Budget Deficit financed by printing money.

The adjustment process in this simple IS-LM model with a fixed price level when new money is created to finance budget deficit is shown as under

$$\frac{dM}{dt} = [P(G - t(Y)] \text{ …………………… . (iii)}$$

Substituting Y by Y(M, G) in equation (iii) above we have

$$\frac{dM}{dt} = P[G - t(YM,G)] \text{ ………………….. . (iv)}$$

The above equations (iii) and (iv) imply that growth of high powered money (M) over time to finance budget deficit is equal to budget deficit (G-t(Y) multiplied by the price level. If there is balanced budget that is, G—t(Y) = 0 over the years, from equation (iii) it follows that

$$\frac{dM}{dt} = 0.$$

In the above model of an economy representing the period of recession price level remains unchanged as more money is created to finance budget deficit In an important contribution. Fischer and Easterly explain the condition for non-inflationary printing of money. They write, "the amount of revenue that the government can expect to obtain from the printing of money is determined by the demand for base or high-powered money in the economy, the real rate of growth of the economy and the elasticity of demand for real balances with respect to inflation and income". Further, assuming income elasticity of demand equal to unity and currency to GNP ratio equal to 13, they conclude that for every one percentage point that GNP increases, the government can obtain 0.13 percentage points of GNP is revenue through the printing of money that just meets the increased demand for real balances. With an annual economic growth rate of 6.5 % of GNP the government should be able to obtain nearly 0.9 % of GNP for financing the budget deficit through the non-inflationary printing of money, increasing the high powered money stock at an annual rate of 6.5 %". If rate of growth of money exceeds this and, given a stable demand function for currency, inflation will result.

9.4 PRINTED MONEY AND THE INFLATION TAX

It follows from above that if the economy is operating at full - employment level of GNP or growth rate of money due to persistent budget deficits over time is in excess of rate of growth of GNP, inflation will come about. It has been pointed out by some economists that inflationary financing through the creation of high powered money is an alternative to explicit taxation. Though in most of the industrialized economies (including the United States) the creation of high-powered money or inflationary financing of budget deficits is only a minor source of revenue, in other countries (including India), the creation of high-powered money has been a significant source of raising revenue to finance government expenditure .Before March 1997, in India the creation of money to finance the budget deficit was called ‘deficit financing’ which has been a significant source of revenue for the Central Government in the sixties, seventies and eighties of the last century. Though, as explained above, it is not entirely correct that financing government expenditure through creation of high- powered money necessarily leads to inflation, traditionally every creation of high-powered money or deficit financing has been called inflationary.

Why the creation of high powered money that causes inflation is called inflation tax and is an alternative to explicit taxation as a source of financing government expenditure. When government uses printed money to finance its deficit year after year, it uses it to pay for the goods and services it buys. Thus in this process the government gets the resources to buy goods and services and as a result, money balances with the people increase a part of which they will save and the rest they will also spend on goods and services.

However, due to inflation real value of money balances held by the people decreases That is, with their given money balances. People can buy fewer goods and services due to inflation. Thus when the government finances its budget deficit through creation of new high powered money and in the process causes inflation, the purchasing power of old money balances held by the public falls, Hence inflation caused by creation of new money is like a tax on holding money. Though, apparently people do not pay inflation tax, but since their old money balances can buy fewer goods and services due to inflation they in fact bear the burden of inflation in terms of decline in their purchasing power. To conclude in the words of Dornbusch and Fischer, “Inflation acts just like a tax because people are forced to spend less than their income and pay the difference to the government in exchange for extra money. The government thus can spend more resources and the public less just as if the government had raised taxes to finance extra spending. When the government finances its deficit by issuing money which the public adds to its holdings of nominal balances to maintain the real value of money balances constant we say the government is financing itself through the inflation tax.

We can even estimate the revenue raised through inflation tax as under:-

Inflation tax revenue = Inflation tax × real monetary Base

Note that monetary base is the amount of the high powered money. It may be mentioned that in the eighties of the last century the inflation rate due to excess creation of high powered money in the Latin American Countries was very high and therefore the revenue raised through inflation tax was very high. In fact some Latin American countries experienced hyper inflation. Thus, during 1983- 1988 average annual inflation rate in Argentina was 359 %, in Bolivia 1,797 %, Brazil 341 %, Mexico 87 % and Peru 382%.

9.5 INFLATION TAX REVENUE:

In the Latin American countries, the governments raised large revenues due to high inflation rates and by creation of large amount of printed money due to budget deficits year after year. From the above equation, it is evident that inflation tax revenue of the government depends on the inflation rate and real money base. When the inflation rate is zero, inflation tax revenue obtained by the government will also be zero. As the, inflation rate rises, the revenue obtained by the government through inflation tax increases. But as the inflation rate rises, the people tend to reduce their holdings of the real money balances as the purchasing power of money holdings declines. As a result, as the inflation rate rises the public holds less currency and banks hold less excess reserves with them. With this the real money balances with the public and banks decline so much that inflation tax revenue collected by the government declines after a point. The change in the tax revenue received by the government as the inflation rate rises is shown by AA curve in the following

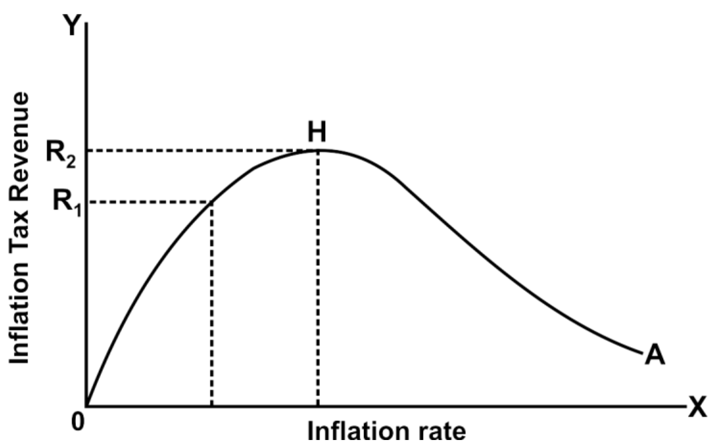


Figure: 9.2 Inflation Tax Revenue

Initially, in the economy there is no budget deficit and therefore no printing of money, inflation rate is zero, inflation tax revenue received by the government is also zero and the economy's situation lies at the point of origin. Now suppose the government reduces taxes, keeping its expenditure constant, budget deficit emerges which is financed by printing high powered money and suppose the resulting inflation rate is π at which the government collects tax revenue equal to OR_1. But as the inflation rate further rises as a result of increase in printed money, the tax revenue collected increases until inflation rate **π *** is reached. Inflation rate π * brought about by a certain amount of increase in printed money, the tax revenue collected by the government is OR_2. Beyond this growth in printed money and rise in inflation rate greater than π *, tax revenue collected declines because real money balances with the public and banks decline, as explained above. Thus OR_2 is the maximum of tax revenue raised by the government through inflation tax and the corresponding inflation rate is π *.

In the developed industrialized countries where the real money base is relatively small, the government collects a small amount of inflation tax revenue. For example, in the United States where money base is only about 6 % of GDP the government raises revenue through inflation tax equal to only 0.3 % of GDP, corresponding to 5 % rate of inflation. However, some developing countries such as Argentina. Brazil, Mexico, Peru have collected 3.5 % to 5.2 % of their GDP as inflation tax revenue. But for this they had to pay a heavy price in terms of a very high rate of inflation. Dornbusch, Fischer and Startz rightly comments, "In countries in which the banking system is less developed and in which people hold large amounts of currency, the government obtains more revenue from inflation and is more likely to give much weight to the revenue aspects of inflation in setting policy. Under conditions of high inflation in which the conventional tax system breaks down, the inflation tax revenue may be the government's last resort to keep paying its bills. But whenever the inflation tax is used on a large scale, inflation invariably becomes extreme."

9.5.1 Evaluation of Inflation Tax Revenue:

The above view of inflation tax revenue is based on the assumption that every increase in printed money causes inflation. In our view this is not correct. When the economy is working much below its full production capacity due to deficiency of aggregate demand, as it happens at times of recession or depression, then more printed money can be created by the government to finance its projects. The increase in demand resulting from this will help in fuller utilization of idle production capacity and will also generate employment for unemployed labour. This will not lead to inflation as output of goods and services will increase in this case to meet the increased demand. This case was analysed by J.M.Keynes who advocated for the adaption of budget deficit to overcome depression and financing it through printed money without causing inflation. It is only when there exists full employment in the economy that financing government expenditure through printed money causes inflation.

Similarly, in developing countries like India where growth in GDP is taking place annually and also the economy is getting more monetized, the demand for money is increasing. Besides, a lot of resources are unutilized or underutilized in the Indian economy. Therefore, a reasonable amount of printed money can be created, which before 1997 was called deficit financing, to finance the investment expenditure of the government without causing inflation. Therefore, it is not true that the use of printed money for financing govt. expenditure necessarily lead to inflation.

9.6 DEBT FINANCING OF BUDGET DEFICIT

A more popular method of financing budget deficit is borrowing by the government which issues bonds and sells it to the public. Generally, sale of interest-bearing bonds to the public is indirect through financial intermediaries such as banks. Banks buy the bonds floated by the government with the currency deposits of the public. Therefore, debt-financing of budget deficit is also known as bond-financy of budget deficit. With the borrowed money in this way the government is able to expand its expenditure but at the same time it adds to public debt which has both short-run and long run consequences. It may also be noted that budget deficit also comes about when taxes are reduced, keeping government expenditure constant. This type of budget deficit can also be financed through incurring debt by selling bonds to the banks or public. The government has not only to pay annually interest on borrowed funds but has to pay back also the principal sum borrowed for which it may levy higher taxes in future.

The Keynesians have emphasized the expansionary effect of debt financing of government expenditure or budget deficit. In the Keynesian model wish a fixed price level, the increase in government expenditure through use of borrowed money causes an upward shift in aggregate expenditure (C+ I+ G) curve. If the economy is working at less than full-employment level of national income so that output gap exists in the economy, the increase in debt-financed government expenditure will bring about expansion in output or income. With the increase in income at the given tax rate, tax revenue collected will rise which will over time reduce the budget deficit or even ultimately eliminate it so that budget becomes balanced. This can also be illustrated through IS-LM model as shown in the following figure. Where IS and LM curves are drawn,

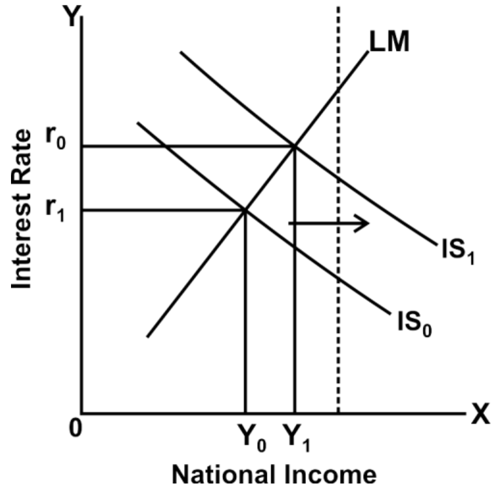


Figure :9.3 Expansionary effect of Debt financed increase in Government expenditure.

Given the money supply in the economy. Y* is the full employment level of output. Initially, the equilibrium is at income level Y_0. Now, with debt-financed increase in government expenditure IS curve shift to the right from IS_0 to IS_1 with LM curve remaining the same. As a result, as will be seen from Fig., national income increases to Y_1.

This will bring about increase in tax revenue collected by the govt. and over time budget deficit will be reduced or even eliminated. It will be seen from the above Figure. That though interest rate also rises but it does not fully offset the expansionary effect of debt-financed increase in government expenditure.

However critics have pointed out that debt-financed government expenditure is largely offset by the crowding-out effect of debt financing on private investment. The crowding-out effect on private investment takes place in a variety of ways. First, it has been pointed out that government's borrowing funds to finance budget deficit will lead to the increase in demand for lendable funds which will cause the rate of interest to rise. The rise in interest rate will cause private investment to decline. Thus debt- financed increase in government expenditure crowds out private investment. According to this view, due to crowding-out effect on private investment net expansionary effect of increase in government expenditure is negligible. On the other hand, the society will have to bear the burden of increase in public debt as a result of debt-financed expansion in government expenditure. If budget deficit arises due to reduction in taxes, keeping government expenditure constant, this will also lead to rise in interest rate and will therefore cause crowding-out effect on private investment. This happens because reduction in taxes stimulates consumption expenditure of the people which reduces savings. The decline in savings causes interest rate to rise resulting in fall in private investment.

9.6.1 Wealth Effect of Debt-Financing

In our above analysis we have not taken into account the wealth effect of debt financing. When the govt. issues bonds to finance its budget deficit, it creates private wealth. This is because bonds are considered as wealth by the people. Patinkin and Friedman in their models include wealth in there money demand function. That is, according to them, demand for money depends on the real value of wealth, apart from other factors. If this wealth effect of bond-financing of budget deficit is recognized, then it exercises an important influence on the dynamic behaviour of the economy. When through debt-financing of budget deficit, more bonds are issued and sold by the government, the wealth of the people increases which wilt raise the demand for money. The increase in demand for money, money supply remaining the same, causes a leftward shift in the LM curve, for instance, from LM_0 to LM_1, in the following Figure.5.4 (Note that financing of Government expenditure through creation of printed money, LM curve has shifted downward,

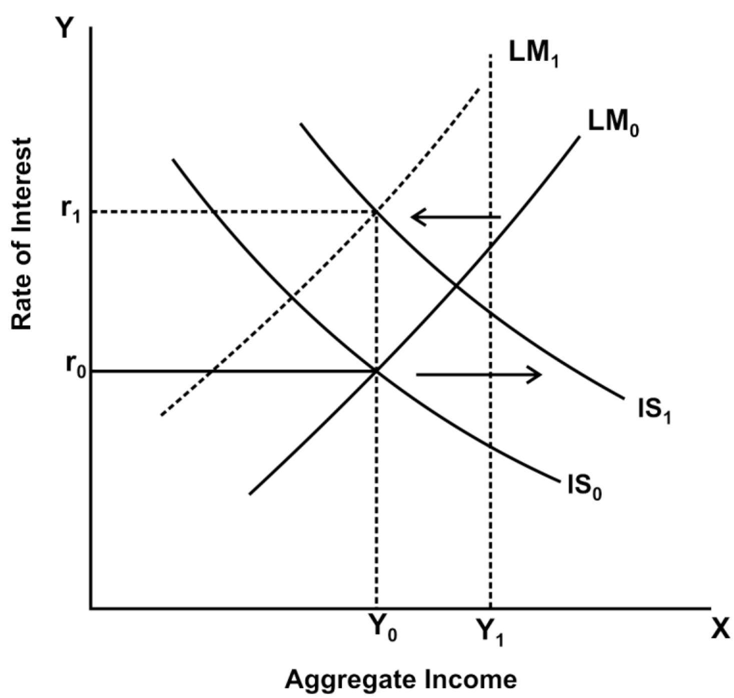


Figure : 9.4 Debt financing of Budget deficit with wealth effect of bonds sold by the government.

i.e. to the right). Thus, while with the increase in govt. expenditure IS curse shifts to the right to the new position IS_1 which tends to raise aggregate income, the wealth effect of bonds issued to finance the deficit causes leftward shift in the LM curve which tends to raise rate of Interest and thereby crowds out private investment. According to Friedman the wealth effect is quite substantial so that it completely offsets the expansionary effect of increase in government expenditure. In above figure, initially the equilibrium is at Y_0 level of income. With bond-financed increase in government expenditure IS curve shifts from to IS_0 to IS_1 and due to wealth effect LM curve shifts leftward to LM_1. It will be seen that interest rate rises from r_0 to r_1 with no net effect on the level of income which remains unchanged at Y_0. Due to rise in interest, private investment declines so much that completely offsets the expansionary effect of debt-financed budget deficit. As a result, budget deficit persists and debt goes on accumulating and becomes unsustainable.

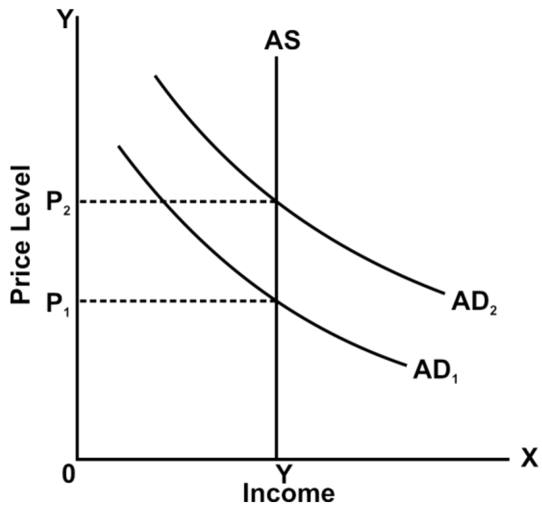


Figure:9.5. Rise in price level offsets the expansionary effect of debt financing of budget deficit.

In the above analysis of crowding-out effect of debt-financing it is assumed that price level remains fixed. However, when the aggregate supply , function is vertical as is the case when the economy is working at full capacity output (i.e. full-employment level), increase in aggregate demand (AD) brought about by debt-financed increase in government expenditure will result in rise in price level, equilibrium income remains unchanged as shown through AS-AD model in the above Figure . Since income remains unchanged, tax-revenue will not increase and therefore budget deficit persists and debt will go on accumulating and over time become unsustainable.

We have seen above that expansionary effect of debt-financed budget deficit has been challenged on the ground of its crowding-out effect. However, in our view the crowding-out effect of debt-financing has been blown out of all proportions. As a matter of fact, crowding-out effect of debt financing of budget deficit is negligible, especially when the economy is working at less than full-employment level of income .Generally, budget deficit and its financing through floating of bonds is recommend to overcome depression when there is under-employment equilibrium and therefore output gap exists. Empirical evidence also shows that wealth effect of sale of bonds is not significant. Besides, as shall be discussed below in detail, even in developing countries where there is gross under-utilization of resources or when they work at less their full-production capacity, policy of budget deficits and financing it through debt is a useful instrument to stimulate economic growth and raise income.

9.7 DEBT-FINANCING OF BUDGET DEFICIT: THE VIEW OF RICARDIAN EQUIVALENCE

An economic theory that suggests that when a government tries to stimulate demand by increasing debt-financed government spending, demand remains unchanged. This is because the public will save its excess money in order to pay for future tax increases that will be initiated to pay off the debt. This theory was developed by David Ricardo in the nineteenth century, but Harvard professor Robert Barro would implement Ricardo's ideas into more elaborate versions of the same concept. Also known as "Barro-Ricardo equivalence proposition"

The basic idea behind Ricardo's theory is that no matter how a government chooses to increase spending, whether with debt financing or tax financing, the outcome will be the same and demand will remain unchanged. The major arguments against Ricardo's theory are due to the unrealistic assumptions on which the theory is based, such as the assumptions of the existence of perfect capital markets, the ability for individuals to borrow and save whenever they want, and the assumption that individuals will be willing to save for a future tax increase even though they may not see it in their lifetimes. Furthermore, the theory provided by Ricardo goes against the more popular theories provided by Keynesian economics.

We have analysed above the traditional Keynesian view of debt financing of budget deficit. As noted earlier, the budget deficit may come about when government increases its expenditure without imposition of higher taxes or it may come about when government cuts taxes without reducing its expenditure. Recently, an alternative view of effects of debt-financed budget deficit has been put forth and this view is known as **Ricardian Equivalence** as this view was first of all put forward by David Ricardo but has been revived and further refined by some modern economists. According to this view, the consumers are forward looking and decide about their consumption expenditure only on the basis of their disposable current income but also on their expected future income. This view of forward looking consumer underlies the post-Keynesian theories of consumption, namely life saving model of Modigliani and permanent income consumption theory of Milton Friedman. A forward-looking consumer views the budget deficit financed by incurring debt by the government that at some point in future, the government will have to raise taxes to pay off the debt and interest accrued on it. Accordingly, the consumers think that present tax cut that causes budget deficit which is financed by debt (i.e. issue of bonds) raises his income only temporarily since it will be eventually reduced in future by imposing higher taxes to pay off the debt. Therefore, as a result of tax cut and debt-financed budget deficit in the present, their permanent or life time income does not rise. Thus the forward-looking consumers do not feel better off as a result of present cut in taxes and therefore keep their consumption and saving unchanged. Elaborating on this view, Mankiw writes, "The forward-looking consumer understands the government borrowing today means higher taxes in future. The tax cut financed by government debt does not reduce the tax burden, it merely reschedules it. It therefore should not encourage the consumer to spend more".

Thus, on this vie if consumers are forward looking or foresighted they will base their expenditure not only on current income but also their life-time income which consists of their present income as well as expected future income. They consider government debt incurred to finance budget deficit is equivalent to future taxes because the debt incurred in the current year will be paid off by levying higher taxes in the future. For forward-looking consumers therefore future taxes are equivalent to current taxes. Therefore, this concept is called **Ricardian equivalence** because it was David Ricardo who first put forward this idea of government debt being equivalent to future taxes.

The concept of Ricardian equivalence implies that debt-financed cut in tax will not affect the present consumption of the people. To quote Mankiw again, "the implication of Ricardian equivalence is that a debt-financed tax cut leaves consumption unaffected. Households save the extra disposable income to pay the future tax liability that the tax cut implies. This increase in private saving exactly offsets the decrease in public saving. National saving—the sum of private and public saving—remains the same. The tax cut therefore has none of the effects that traditional analysis predicts".

Thus, according to the Ricardian equivalence, debt-financed tax cut does not cause increase in consumption expenditure and therefore aggregate demand. Therefore, the debt-financed tax cut will not succeed in stimulating the economy.

9.7.1 Robert Barro and Ricardian Equivalence

Robert Barro, an eminent American economist, presents an alternative view of Ricardian equivalence. He also points out that debt-financed tax cut dos not lead to increase in ‘consumption expenditure and therefore cannot stimulate the economy. He assumes that people have perfect foresight about the future. Further, they do not discount the future because they care about the welfare of future generations as much as they care for their own. That is, according to him, future generations are the children and grandchildren of the current generation. Therefore, it is not correct to consider them independent or different economic agents. He argues that the assumption that the present generation cares about future generation as much as its own is proved by the fact that most people give gifts to their children, often in the form of bequests at the time of their deaths. The evidence of bequests shows that people are not willing to consume more at their children’s expense. He considers an individual belonging to a family which lives for ever. Therefore, a debt-financed tax cut may raise an individual’s income in the present or in his life time but it does not raise his family’s income for ever. Instead of consuming his extra income accrued to him due to cut in tax, he saves it and leaves it to his children who will bear the future tax liability. We thus see that consumption expenditure does not increase and the economy therefore does not receive any stimulus on this count.

It follows from above that the consequence of government debt depends on the nature of consumption behaviour of people. However, the evidence in support of Ricardian equivalence hypothesis is quite weak. The effect of tax cut in stimulating the economy has been tested in some economies, such as that of the United States. President John Kennedy made a tax cut in 1964, and again President Reagan made a tax cut to stimulate the American economy. As a result of it government debt increased but the American economy was revived and got out of recession which gripped it earlier. These real-life experiments confirm the validity of the Keynesian traditional analysis and disproves Ricardian equivalence hypothesis. Recently in the year 2000, President George Bush again tried to revive the American economy through tax cut and financed the budget deficit by sale of bonds. This again was quite successful and by the end of year 2003, American economy got out of recession.

9.8 SUMMARY

1. Crowding-out effect of debt financing of budget deficit is negligible, especially when the economy is working at less than full-employment level of income .Generally, budget

deficit and its financing through floating of bonds is recommend to overcome depression when there is under-employment equilibrium and therefore output gap exists. In developing countries where there is gross under-utilization of resources or when they work at less their full-production capacity, policy of budget deficits and financing it through debt is a useful instrument to stimulate economic growth and raise income.

2. The consequence of government debt depends on the nature of consumption behaviour of people. However, the evidence in support of Ricardian equivalence hypothesis is quite weak. The effect of tax cut in stimulating the economy has been tested in some economies. As a result of it government debt increased but the economy was revived and got out of recession which gripped it earlier. The real-life experiments confirm the validity of the Keynesian traditional analysis and disproves Ricardian equivalence hypothesis.

9.9 QUESTIONS

1. Explain how money supply by the government help to finance deficit budget of the country.
2. Discuss in detail borrowings by the government as debt financing of budget deficit.
3. Explain the Ricardian view of debt financing of budget deficit.

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10

Module 4

OPEN ECONOMY MACROECONOMICS

Unit Structure

10.0 OBJECTIVES

After going through this unit you will be able to-

- Understand the concept of balance of payments.
- Understand the concept of balance of trade.
- Understand the concept of current account.
- Understand the concept of capital account.
- Explain the relation between balance of payment and exchange rate.
- Examine the cause of disequilibrium in the balance of payments.
- Explain the measures to correct disequilibrium in the balance of payments.

10.1 INTRODUCTION

The balance of payment (BOP) is the single most important aspect of international economy that matters most in macro economic analysis. In this chapter, we will discuss : (i) the meaning and purpose of BOP, (ii) the accounting method of BOP, (iii) the causes and kinds of disequilibrium in BOP and (iv) the method of correcting disequilibrium in BOP under free market system and policy regime.

10.2 THE BALANCE OF PAYMENTS : MEANING AND PURPOSE

Meaning -

The countries having economic transaction with other countries prepare periodically their final accounts with a view to taking stock of their foreign receipts and payment and also of their assets and liabilities that arise out of international transactions. This account is known as balance of payment (BOP). The BOP of a country can be defined as a systematic statement of all economic transactions of a country with the rest of the world during a period of time, usually one year. The BOP can also be defined as a systematic accounting of all economic transactions between the residents of a nation and the rest of all the world during a period of time, usually one year.

The term 'systematic accounting' does not refer to any particular system. However, the system which is generally adopted is double entry book- keeping system. In this accounting system, both sides of a transaction 'debit ' and 'credit' are recorded. 'Economic transactions' include all such transactions that involves the transfer of title or ownership of goods, services, money and assets. While some transactions involve physical transfer of goods, money and assets along the transfer of the title, in some transaction, physical transfer is not necessary. For example, even if profits of a subsidiary of a foreign company is held or reinvested within the country it is located, it is deemed to be paid to the parent company abroad. What is important is the transfer of the title, not be physical transfer of what is transacted. The term 'residents' means the nationals of the reporting country. Diplomatic staff, foreign military personnel, tourists, migratory workers and branches of the foreign companies are not treated as the ' residents' even though they works and operate in the reporting country.

Purpose - The purpose of BOP accounting is to take the stock of country's foreign receipts and payments obligations and of assets and liabilities arising out of international economic transactions with a view to correcting unhealthy trends. Some other important uses of the BOP accounts are following.

1) BOP accounting serves a very useful purpose in so far as it yields necessary information on the strength and weakness of the country in international economic relations.

2) By analyzing the BOP accounts of past years, one can find the overall gains and losses from the international economic transactions. It can be ascertained whether composition and direction of international trade and capital movement have improved or caused deterioration in the economic condition of the country.

3) BOP statements give warning signals for future formulation. For, even if the BOP position in recent past has not been a matter of concern, there may be unhealthy development which might create problem in future. For example, building foreign exchange reserves on borrowed funds increases international indebtedness which might lead to financial bankruptcy.

10.3 THE BALANCE OF PAYMENTS ACCOUNTS

For preparing the BOP accounts, economic transactions between a country and the rest of the world are grouped under two broad categories, viz (i) current transaction, and (ii) capital transactions. Current transactions include export and import of goods and service i.e., visible and invisible trade, unrequired receipts and payments. Capital transactions include inflows and outflows of capital. Capital flows increases or decreases country's total stock of capital. The distinctive features of the two kinds of transactions are : (i) current transactions change (increase or decrease) the current level of consumption of the country or change the current level of its nominal income, whereas capital transactions change the capital stock of the country, and (ii) while current transactions are of flow nature, capital transitions are mostly of stock nature. In accordance with two kinds of transactions, BOP accounting is divided into two accounts: (i) current accounts, and (ii) capital account. We give here a brief description of these accounts.

1.3.1 Current Account

Current account items of international transactions are listed in table as suggested by the IMF and currently followed in India. All the transactions included in the current account have their 'credit' and 'debit' counterparts. The credit column shows the 'receivables' and debit column shows the 'payables'. The balance of each item is shown under the 'net balance' column. The sum total of 'net balance' gives the current account balance.

Table 1.1 Balance of payments: Current Account

	Transactions	Credit	Debit	Net Balance (+) or (-)
1	Merchandise	Exports	Imports	-
2	Foreign Travel	Earnings	Payments	-
3	Transportation (shipping)	Earnings	Payments	-
4	Insurance premium	Receipts	Payments	-
5	Banking	Receipts	Payments	-
6	Investment Income	Receipts	Payments	-
7	Government (Purchase and sale of Goods and Service)	Receipts	Payments	-
8	Miscellaneous	Receipts	Payments	-
Current Account Balance Total Surplus / Deficit -				

For a more detailed analysis, the items of current account are also classified as (i) visible items, and (ii) invisible items. Visible items include export and import of goods, called 'merchandise trade. All other item (item 2-8) fall under the category of invisible items. Sometimes, a separate category is created as unilateral transfers' or unilateral items' to give a separate treatment to the unilateral transfers like, foreign gifts, donations, military aid, technical assistance, and so on.

1.3.2 Balance of Trade (BOT)

The 'net balance' of the visible trade' that is' the difference between exports (X) and imports (M) of goods is called trade balance. If X > M, it shows trade surplus, and if M>X, it means trade deficit. The sum of the 'visible net' and 'invisible' gives the balance on the current account is called 'current account balance'. If sum of the entries in the 'credit' column is greater than that of the 'debit' column, it shows a current account surplus, and if sum of 'credit' items is less than that of the 'debit' items, it shows a current account deficit. The current account balance (surplus or deficit) is transferred to the capital account.

1.3.3 Capital Account

The broad items of capital accounts are following:

(a) Short – term capital movements

(b) Long- term capital movements

(c) Inflow and outflow of gold and foreign exchange reserves.

(a) Short- term capital movements - The short term capital movement include (i) purchase of short- term securities, for example, treasury bills, commercial bills and acceptance bills, (ii) speculative purchase of foreign currency, and (iii) cash balance held by foreigners for such reasons as war, political uncertainty, etc.

(b) Long- term capital movements – The long- term capital movements include (i) direct investment in shares, bonds, real estate or physical assets like plant, building and equipment in which the investor holds a controlling power; (ii) portfolio investment, including all other stocks and bonds; e.g. government securities, securities of firms which do not entitle the holder with a controlling power; and (iii) amortization of capital, i.e. repurchase and resale of securities sold to the foreigners. Direct import or export of capital goods fall under the category of foreign direct investment (FDI). It is important to note here that export of capital is a debit item because it causes outflow of foreign exchange, and import of capital is a credit item as it results in inflow of foreign exchange.

(C) Inflow and outflow of gold and foreign exchange reserves - The third item in the capital account i.e. gold and foreign exchange reserves are maintained to stabilize the exchange rate of the home currency and to make payments in case there is a payment deficit on current accounts. The foreign exchange reserves increase or decrease depending on the net balances of other transactions.

10.4 AUTOMATIC ADJUSTMENT IN BOP

The BOP adjustment has been a very complex and complicated issue at both theory and policy levels. The economists have suggested a variety of methods and approaches to correct the BOP disequilibrium. There are basically two approaches to the BOP adjustment. One approach is to rely on the market mechanism to restore equilibrium in the BOP through automatic adjustment mechanism. This approach is also known as the classical adjustment approach. The second approach is to correct the adverse BOP through policy measures. In this section, we will discuss the automatic adjustment mechanism under fixed and flexible exchange rate system. The BOP adjustment through policy measures will be discussed in the nest section.

1. Automatic BOP Adjustment under fixed exchange rate –

Under the fixed exchange rate system, a government is obliged by the IMF to maintain the exchange rate for its currency with in a bond of range. Under this system, when the BOP of a country shows a surplus or a deficit causing a rise or a fall in the exchange rate, then its government is required to take necessary steps to prevent the rise or fall in the exchange rate beyond the permissible limits. The automatic adjustment under fixed exchange is automatic in the sense that the government is required to take action automatically. This section illustrates the process of BOP adjustment in the IS - LM framework under the fixed exchange rate system.

The BOP adjustment mechanism under fixed exchange rate is illustrated in following figure. Suppose that the initial IS and LM curves are given by ISo and LMo curves, respectively, and the BOP function by the schedule marked. BOP. Note that ISo and LMo curves interest at point F determining equilibrium level of income at Yo and interest rate is i_3. Note also that the BOP function intersects the ISo schedule at print E. since point F is placed above and to the left of point E, it shows BOP surplus and disequilibrium in the BOP. The question here is : How does the system adjust to point E, the point of general equilibrium?

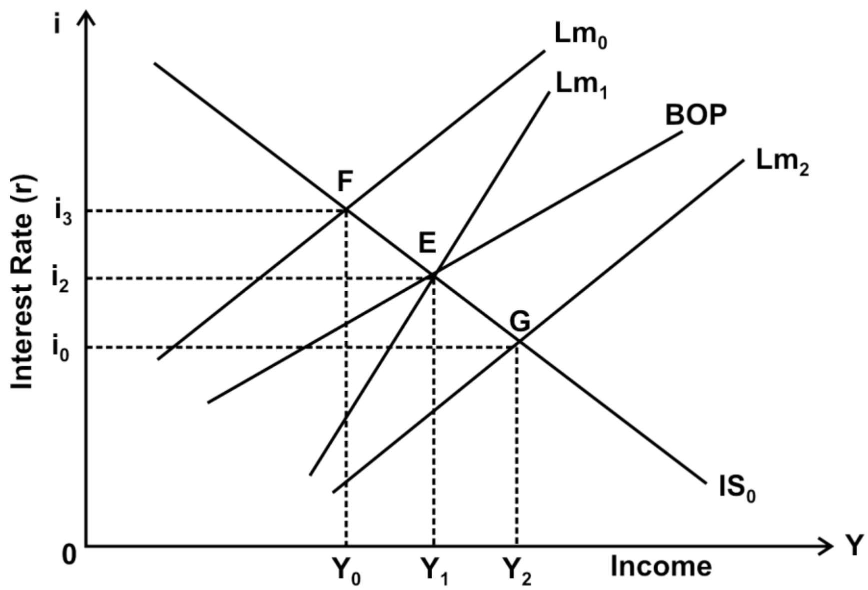

Fig 10.1 BOP Adjustment under Fixed Exchanged Rate

10.5 THE BALANCE OF PAYMENTS AND EXCHANGE RATES

The balance of payment is the record of the transactions of the residents of a country with the rest of the world. There are two main accounts in the balances of payments: the current account and capital accounts. Let us assume that the United States is a home country. The current account records trade in goods and services as well as transfer payments. Services include foresight, royalty payments, and interest payment. Services also include net investment income. The interest and profits on our assets abroad less the income foreigners earn on assests they own in the United States. Transfer payments consist of remittances, gifts and grants. The trade balance simply records trade in goods. Adding trade in services and net transfers to the trade balance, we arrive at the current account balance.

The simple rule for balance of payments accounting is that any transaction that gives rise to a payment by a country's resident is a deficit item in that country's balance of payments. Thus, for the United States, imports of cars, gift to foreigners, a purchase of land in Spain, or a deposit in a bank in Switzrland all are deficit items. Examples of surplus items, by contrast, would be U.S. sales of airoplanes abroad, payments by foreigners for U.S. licenses to use American technology pensions form abroad received by U.S. residents, and foreign purchase of U.S. assets.

The current account is in surplus if exports exceed imports plus net transfers to foreigners, that is, if receipts from trade in goods and services and transfers exceed payments on this account.

The capital account records purchase and sales of assets, such as stocks, bonds and land. There is a U.S. capital account surplus- also called a net capital inflow when our receipts from the sales of stocks, bonds, land, bank deposits, and other assets exceed our payments for our own purchase of foreign assets.

10.5.1 EXTERNAL ACCOUNTS MUST BALANCE

The central point of international payment is very simple: individuals and firms have to pay for what they buy abroad. If a person spends more than his income, his deficit needs to be financed by selling assets or by borrowing. Similarly, if a country runs a deficit in its current account, spending more abroad than it receives from sales to the rest of the world, the deficit needs to be financed by selling assets or by borrowing abroad. This selling or borrowing implies that the country is running a capital account surplus. Thus any current account deficit is necessity financed by an offsetting capital inflow :

Current account deficit + net capital inflow = 0 -----------------------(1)

Equation (i) makes a drastic point: If a country has no assets to sell, if it has no foreign currency reserves to use up, and if nobody will lend to it, the country has to achieve balance in its current account, however painful and difficult that may be.

It is often useful to split the capital account into two separate parts : (1) the transactions of the country's private sector and (2) official reserve transactions, which correspond to the central bank's activities. A current account deficit can be financed by private residents selling off assets abroad or borrowing abroad alternatively, or as well ,a current account deficit can be financed by the government, which runs down its reserves of foreign exchange, selling foreign currency in the foreign exchange market. Conversely, when there is a surplus, the private sector may use the foreign exchange revenues it receives to pay off debt or buy assets abroad; alternatively, the central bank can buy the (net) foreign currency earned by the private sector and add that currency to its reserves.

The increase in official reserves is also called the overall balance of payment surplus. We can summarize our discussion in the following statement.

Balance of payments surplus = increase in official exchange reserves = current account surplus + net private capital in flow .(1a)

In both the current account and the private capital account are in deficits, then the overall balance of payments is in deficit, that is, the central bank is losing reserves. When one account is in surplus and the other is in deficit to precisely the same extent, the overall balance of payments is zero – neither in surplus nor in deficit.

10.5.2 FIXED EXCHANGE RATES

We focus now on how central bank, through their official transactions, finance, or provide the means of paying for, balance of payment surpluses and deficit. At this point we distinguish between fixed and flowing exchange rate systems.

In a fixed exchange rate system foreign central banks stand ready to buy and sell their currencies at a fixed price in terms of dollars. The major countries had fixed exchange rates against one another from the end of World War II until 1973. Today, some countries fix their exchange rates, but others don't.

In the 1960s for examples, the German central bank, the Bundsbank, would buy or sell any amount of dollars at 4 deutsche marks (DM) per U.S. dollar. The French central bank, the Banquet de France, stood ready to buy or sell any amount of dollars at 4.90 French francs (FF) per U.S. dollar. The fact that the central banks were prepared to buy or sell any amount of dollars at these fixed prices, or exchange rates, meant that market prices would indeed be equal to the fixed rates. Why? Because nobody who wanted to buy U.S. dollars would pay more than 4.90 francs per dollar when francs could be purchased at that price from the Banquet de France. Conversely, nobody would part with dollars in exchange for francs for less than 4.90 francs per dollars if the Banquet de France, through the commercial banking system, was prepared to buy dollars at that price.

10.5.3 INTERVENTION

Foreign central bank hold reserves – Inventories of dollars and gold that they can sell for dollars – to sell when they want to or have to intervene in the foreign exchange market. Intervention is the buying or selling of foreign.

Exchange by the central bank.

What determines the amount of intervention that a central bank has to do in a fixed exchange rate system? We already have the answer to that question. The balance of payments measures the amount of foreign exchange intervention needed from the central banks. For examples, if the United States were running a deficit in the balance of payments vis- a- vis Germany, and thus the demand for marks in exchange for dollars exceeded the supply of marks in exchange for dollars from Germans, the Bundesbank would buy the excess dollars, paying for them with marks.

Fixed exchange rates thus operate like any other price support scheme, such as those in agricultural markets. Given market demand and supply, the price fixer has to make up the excess demand or take up the excess supply. In order to be able to ensure that the price (exchange rate) stays fixed, it is obviously necessary to hold on inventory of foreign currencies, or foreign exchange that can be provided in exchange for the domestic currency.

As long as the central bank has the necessary reserves, it can continue to intervene in the foreign exchange markets to keep the exchange rate constant. However, if a country persistently runs deficit in the balance of payments, the central bank eventually will run out of reserves of foreign exchange and will be unable to continue its intervention.

Before that point is reached, the central bank is likely to decide that it can no longer maintain the exchange rate, and it will devalue the currency. In 1967, for instance, the British devalued the pound form $ 2.80 pr pound to $ 2.40 per pound. That meant it became cheaper of Americans and other foreigners to buy British pounds, and the devaluation thus affected the balance of payments by making British goods relatively cheaper.

Since 1979, several European countries have tried to keep their mutual exchange rates constant through the European exchange rate mechanism (ERM). In 1999 the European Union intends to go even further, by replacing notional currencies among. Countries joining the European Monetary Union (EMU) with a single European currency, the Euro. This is a highly controversial and historically important change, and it has been the dominant economic issue in European countries which are candidates for joining the EMU.

10.5.4 FLEXIBLE EXCHANGE RATES

Under fixed exchange rates, the central banks have to provide whatever amounts of foreign currency are needed to finance payments imbalances. In a flexible exchange rate system by contrast the central banks allow the exchange rate to adjust to equate the supply and demand for foreign currency. If the exchange rate of the dollar against the Deutsche mark were 65 cents per mark and German exports to the United States increased. Thus increasing the demand for marks by Americans, the bundes bank could simply stand aside and let the exchange rate adjust. In this particular case, the exchange rate could move from 65 cents per mark to a level such as 67 cents per mark, making German goods more expensive in terms of dollars and thus reducing the demand for them by American. Later in this chapter we shall examine the way in which changes in exchange rates under floating rates affect the balance of payments. The terms flexible rates and floating rates are used interchangeably.

10.6 SUMMARY

- Balance of payments is a systematic record of all the economic transactions between the residents of the reporting country and residents of the rest of the world during a period of time, usually one year.
- BOP is divided into current and capital account.
- Deficit or surplus in the current account results into disequilibrium in the BOP.
- Monetary and final measures are taken to correct the disequilibrium in BOP.

10.7 QUESTIONS

1) Define BOP and explain the structure of it.
2) What is BOP? Distinguish between BOP and BOT.
3) Examine various causes of disequilibrium in the BOP.
4) What are the types of disequilibrium in BOP?

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11

THE MUNDELL – FLEMING MODEL

Unit Structure

11.0 OBJECTIVES

After going through this unit you will be able to-

- Explain the Mundell – Fleming moder under fixed exchange rates.
- Describe the Mundell – Fleming model under flexible exchange rates.
- Examine the concept of exchange rate overshooting
- Explain the relation between interest rate and exchange rate.

11.1 THE MUNDELL – FLEMING MODEL PERFECT CAPITAL MOBILITY UNDER FIXED EXCHANGE RATES

Introduction :

The analysis extending the standard IS – LM model to the open economy under perfect capital mobility has a special name, the Mundell-Fleming model. Robert Mundell, now a professor at Columbia university, and the late Marcus Fleming, who was a researcher at the International Monetary Fund, developed this analysis in the 1960's well before flexible exchange rate came into operation. Although later research has refined their analysis, the initial Mundell- Fleming formulation discussed here remains essentially infact as a way of understanding how policies work under high capital mobility.

Under perfect capital mobility the slightest interest differential provokes infinite capital flows. It follows that with perfect capital mobility, central banks cannot conduct an independent monetary policy under fixed exchange rate. To see why, suppose a country wishes to raise interest rates it tightens monetary policy, and interest rates rise. Immediately, portfolio holders worldwide shift their wealth to take advantage of the new rate. As a result of the huge capital inflow, the balance of payments shows a gigatic surplus; foreigners try to buy domestic assets, tending to cause the exchange rate to appreciate and forcing the central bank to intervene to hold the exchange rate constant. It buys the foreign money, in exchange for domestic money. This intervention causes the home money stock to increase. As a result, the initial monetary contraction is reversed. The process comes to an end when home interest rates have been pushed back down to the initial level.

The conclusion is this : Under fixed exchange rate and perfect capital mobility, a country cannot pursue an independent monetary policy. Interest rates cannot move out of line with those prevailing in the world market, any attempt at Independent monetary policy leads to capital flow and a need to intervene until interest rates are back in line with those in the world market.

Table11.1 shows the steps in the argument. The commitment to a fixed rate involves step 5. With the exchange rate tending to appreciate because foreigners are trying to buy the domestic currency, the central bank has to provide the domestic currency. Just as in an open market operation the central bank buys and sells bonds for money, so in intervention in the foreign exchange market the monetary authority buys and sells foreign money (yen, deutsch marks, or Canadian dollors) for domestic money.

Table 11.1 : Payment imbalances, interventation, and the money supply with fixed exchange Rates & perfect capital mobility.

1. Tightening of money.
2. Increased in interest rates.
3. Capital inflow, Payment Surplus.
4. Pressure for currency appreciation.
5. Intervention by selling home money and buying foreign money.
6. Monetary expansion due to intervention lowers interest rate.
7. Back to initial interest rates, money stock, and payments balance.

Table 2.1 : Payment imbalances, interventation, and the money supply

Thus the money supply is linked to the balance of payments, surpluses imply automatic monetary expansion, deficits imply monetary contraction.

11.1.1 Monetary Expansion :-

It is worthwhile looking at this point in terms of the open economy IS-LM model. In Figure 2.1 we show the IS and LM schedules as well as the BP = 0 schedule, which now, because of perfect capital mobility, is a horizontal line. Only at a level of interest rates equal to those abroad, $i = i_F$, can be the country have payments balance. At any other interest rate, capital flows are so massive that the balance of payments cannot be in equilibrium, and the central bank has to intervene to maintain the exchange rate. This intervention shifts the LM schedule.

Consider specifically a monetary expansion that starts from point E. The LM schedule shifts down and to the right, and the economy moves to point E. But at E’ there is a large payments deficit and hence pressure for the exchange rate to depreciate. The central bank must intervene, selling foreign money and receiving domestic money in exchange. The supply of domestic money therefore declines. As a result, the LM schedule shifts back up and to the left. The process continues until the initial equilibrium at E is restored.

Indeed with perfect capital mobility the economy never even gets to point ‘E. the response of capital flows is so large and rapid that the central bank is forced to reverse the initial expansion of the money stock as soon as it attempts it. Conversely, any attempt to contract the money stock would immediately lead vast reserve losses, forcing an expansion of the money stock and a return to the initial equilibrium.

11.1.2 Fiscal Expansion:-

While monetary policy is essentially infeasible fiscal expansion under fixed exchange rates with perfect capital mobility is, by contrast, extremely effective. We describe the effects in terms of the IS-LM model, but we do not draw the diagram, leaving that for one of the end-of-chapter problems.

With the money supply initially unchanged, a fiscal expansion moves the IS curve up and to the right, tending to increase both the interest rate and the level of output. The higher interest rate sets off a capital inflow that would lead the exchange rate to appreciate. To maintain the exchange rate, the central bank has to expand the money supply, thus increasing income further. Equilibrium is retard when the money supply has increased enough to drive the interest rate back to its original level, i= i_F.

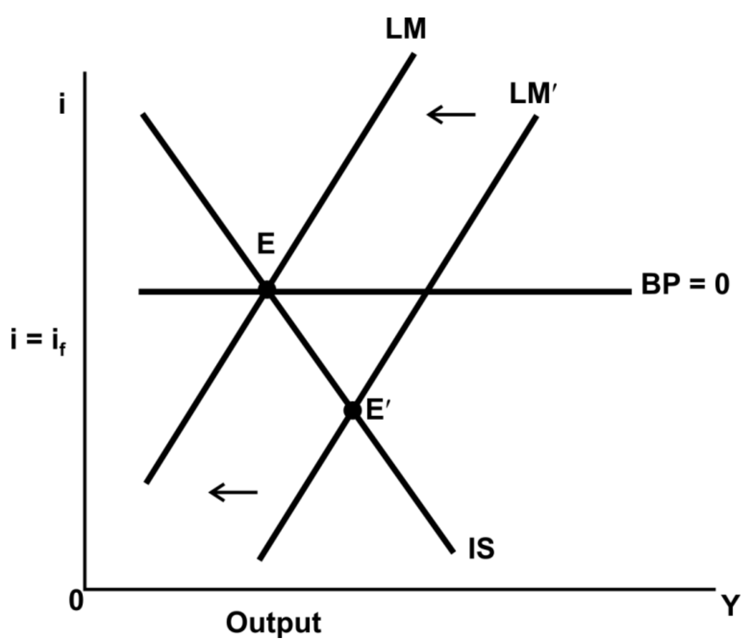

Figure11.1

Monetary Expansion under fixed Rates and perfect

Capital Mobility.

Incase, with an endogenous money supply, the interest rate is effectively fixed, and the simple Keynesian multiplier applies for a fiscal expansion.

11.1.3 The Endogenous Money stock:-

Although the assumption of perfect capital mobility is extreme, it is a useful benchmark case that in the end is not too far from reality for many countries. The essential point is that the commitment to maintain a fixed exchange rate makes the money stock endogenous because the central bank has to provide the foreign exchanges or domestic money that is demanded at the fixed exchange rate. Thus, even when capital mobility is less than perfect, the central bank has only limited ability to change the money supply without having to worry about maintaining the exchange rate.

11.2 PERFECT CAPITAL MOBILITY AND FLEXIBILITY EXCHANGE RATES

In this section we use the Mundell – Fleming model to explore how monetary and fiscal policy works in an economy that has fully flexible exchange rates and perfect capital mobility. We assume here that domestic prices are fixed, even though the exchange rate is flexible. Under fully flexible exchange rates the central bank does not intervene in the market for foreign exchange. The exchange rate must adjust to clear the market so that the demand for and supply of foreign exchange balance. Without central bank intervention, therefore, the balance of payments must be equal to zero.

Under fully flexible exchange rate the absence of intervention implies a zero balance of payments. Any current account deficit must be financed by private capital inflows current accounts surplus is balanced by capital outflows. Adjustments in the exchange rate ensure that the sum of the current and capital accounts is zero.

A second implication of fully flexible exchange rate is that the central bank can set the money supply at will. Since there is no obligation to intervene, there is no longer any link between the balance of payments and the money supply.

Perfect capital mobility implies that there is only one interest rate at which the balance of payments will balance.

$$i = i_f \qquad (1)$$

At any other interest rate, Capital flows are so large that the balance of payments cannot be zero. We show this in Figure 2.2 by the line $i = i_f$.

We know that the real exchange rate is a determinant of aggregate demand and, therefore, that changes in the real exchange rate shift the IS schedule. Given prices P and Pf, a depreciation makes the home country more competitive, improves net exports, and hence shifts the IS schedule to the right. Conversely, a real appreciation means our goods become relatively more expensive. Hence the trade balance worsens and demand for domestic goods declines, so the IS schedule shifts to the left.

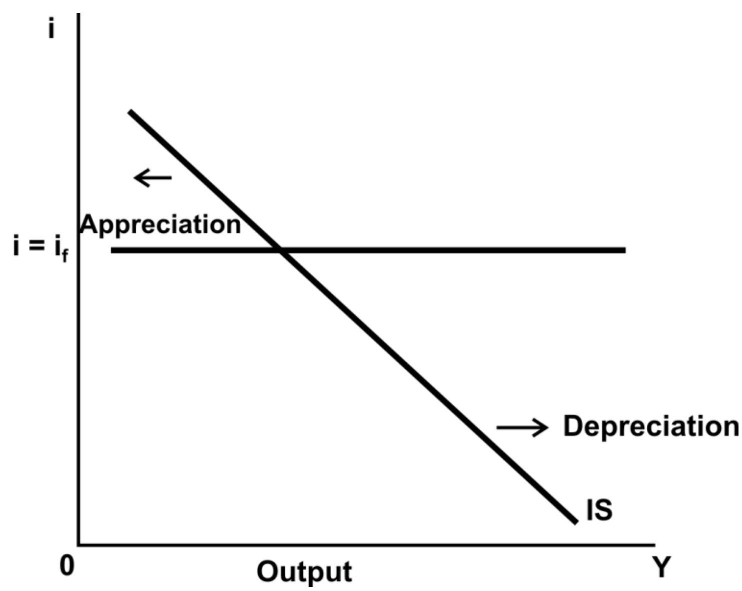

Figure 11.2

The Effect of Exchange Rates on Aggregat Demand.

The arrows in Figure 11.2 link the movement of aggregate demand to the interest rate. If the home interest rate were higher than i_f, capital inflows would cause currency appreciation. At any point above the $I = i_f$ schedule, the exchange rate is appreciating, our goods are becoming relatively more expensive, and aggregate demand is falling, Thus the IS schedule will be shifting to the left. Conversely, any point below the $i = i_f$ schedule corresponds to depreciation, improving competitiveness, and increasing aggregate demand. The IS schedule will therefore be shifting to the right. We now see how various disturbances affect output and the exchange rate.

11.2.1 Adjustment to Real Disturbance:-

Using our model, represented by equation (1), we want to know how various changes affect the level of output, the interest rate, and the exchange rate, the First change we look at is an exogenous rise in the world demand for our goods, or an increase in exports.

Starting from an initial equilibrium at point E in Figure 2.3, we see that the increase in foreign demand implies an excess demand for our goods. At the initial interest rate, exchange rate, and output level, demand for our goods now exceeds the available supply. For goods market equilibrium at the initial interest rate and exchange rate, we require a higher level of output. Accordingly, the IS schedule shifts out and to the right to IS^1.

Now consider for a moment point E^1. At which the goods and money markets clear. Here output has increased to meet the increased demand. The rise in income has increased money demand and thus raised equilibrium interest rates. But point E^1, is not an equilibrium, because the balance of payments is not in equilibrium in fact, we would not reach point E^1 at all.

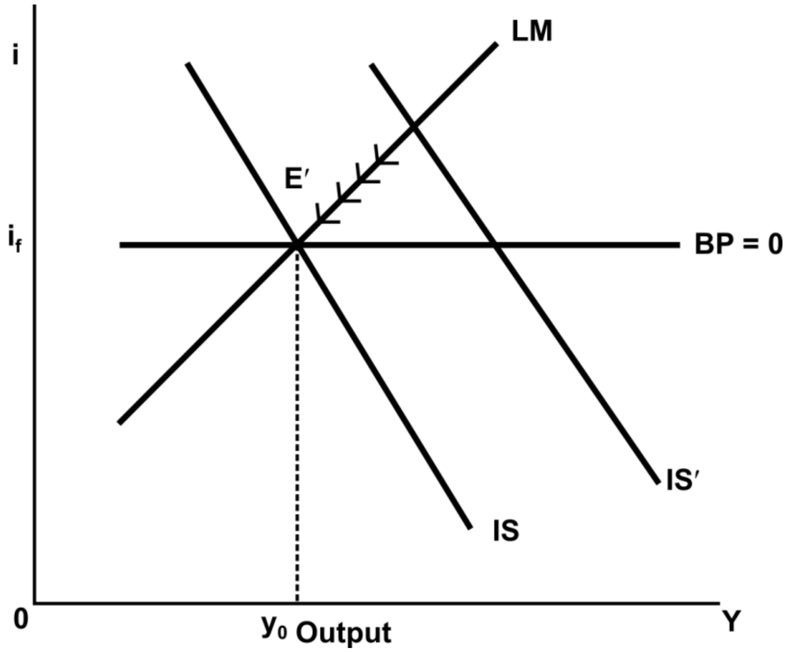

Figure 11.3 Effects of an increase in the Demand for Exports.

The tendency for the economy to move in that direction, as we now show, will bring about an exchange rate appreciation that will take us all the way back to the initial equilibrium at E.

11.2.2 The Adjustment Process:

Suppose, then, that the increase in foreign demand takes place and that, in response, there is a tendency for output and income to increase. The induced increase in money demand will raise interest rates and thus bring us out of line with international interest rates. The resulting capital inflows immediately put pressure on the exchange rate. The capital inflows cause our currency to appreciate.

The exchange appreciation means of course, that import prices fall and domestic goods become relatively more expensive. Demand shifts away from domestic goods, and net exports decline. In terms of figure 2.3, the appreciation implies that the IS schedule shifts back from IS to the left. Next, we have to ask how for the exchange appreciation will go and to what extent it will dampen the expansionary affect of increased net exports.

The exchange rate will keep appreciating as long as our interest rate exceeds the world level. This implies that the exchange appreciation must continue until the IS schedule has shifted back all the way to its initial position. This adjustment is shown by the arrows along the LM schedule. Only when we return to point E will output and income have reached to level consistent with monetary equilibrium at the world rate of interest.

We have now shown that under conditions of perfect capital mobility, an expansion in exports has no lasting effect on equilibrium output. With perfect capital mobility the tendency for interest rates to rise, as a result of the increase in export demand, leads to currency appreciation and thus to a complete offset of the increase in exports. Once we return to point E, net exports are back to their initial level. The exchange rate has, of course, appreciated. Imports will increase as a consequence of the appreciation and the initial expansion in exports is, in part, offset by the appreciation of our exchange rate.

11.3 FISCAL POLICY

We can extend the usefulness of this analysis by recognizing that it is valid for disturbances other than an increase in exports. The same analysis applies to a fiscal expansion. A tax cut or an increase in government spending would lead to an expansion in demand in the same way as does increased exports. Again, the tendency for interest rates to rise leads to appreciation and therefore to a fall in exports and increased imports. There is, accordingly, complete crowding out.

The important lesson here is that real disturbances to demand do not affect equilibrium output under flexible rates with perfect capital mobility. We can drive the lesson home by comparing a fiscal expansion under flexible rates with the results we derived for the fixed rate case. In the previous section, we showed that with a fixed exchange rate, fiscal expansion under conditions of capital mobility is highly effective depreciation induced change in the trade balance has been called a beggar- thy neigh-bar policy- it is a way of exporting unemployment or of creating domestic employment at the expense of the rest of the world.

Recognition that exchange depreciation so mainly a way of shifting demand from one country to another, rather than changing the level of world demand, is important. It implies that exchange rate adjustment can be a useful policy when countries find themselves in different stages of the business cycle- for example, one in a boom (with over employment) and the other in a recession. In that event depreciation by the country experiencing a recession would shifts world demand in its direction and thus works to reduce divergence from full employment in each country.

By contrast, when countries business cycles are highly synchronized, such as in the 1930s or in the aftermath of the oil shock of 1973, exchange rate movements will not contribute much toward worldwide full employment. If total world demand is at the wrong level, exchange rate movements do not correct the level of aggregate demand but essentially affect only the allocation of a given world demand among countries.

Similarly, exchange rate changes within a group of countries experiencing similar shocks can only move demand among them and have a beggar- thy - neighbor quality. This is one of the reasons Europeans are moving toward monetary union.

Nevertheless, from the point of view of an individual country. Exchange depreciation works to attract world demand and raise domestic output. If every country tried to depreciate to attract world demand, we would have competitive depreciation and a shifting around of world demand rather than an increase in the worldwide level of spending. And if everyone depreciated to roughly the same extent, we would end up with exchange rates about where they started. Coordinated monetary or fiscal policies rather than depreciations are needed to increase demand and output in each country when worldwide aggregate demand is at the wrong level.

11.4 FLEXIBLE EXCHANGE RATES, MONEY AND PRICES

In studying flexible exchange rates, we assume that capital is perfectly mobile and that the prices are allowed to change. We examine how output, the exchange rate, and prices respond to monetary and fiscal policies and how that response evolves over time. Our starting point is a discussion of the adjustment of prices and the exchange rate to the state of the economy.

<u>The Adjustment Process:-</u>

Figure 11.4 shows the interest rate and output, with full employment at Y*. The assumption of perfect international capital mobility is reflected in the horizontal BB schedule. Only at an interest rate $I = i_f$ will the balance of payments be in equilibrium. If the interest rate were higher, there would be net inflows of capital. Conversely, with a lower domestic interest rate, capital would flow out and the balance of payments would turn toward a deficit position.

We make two strategic assumptions to describe the adjustment process: first, prices are rising whenever output exceeds the full-employment level. Second, because capital is highly mobile, the interest rate in Figure 11.4 is always moving toward the BB schedule – our interest rate cannot diverge far from that in the rest of the world.

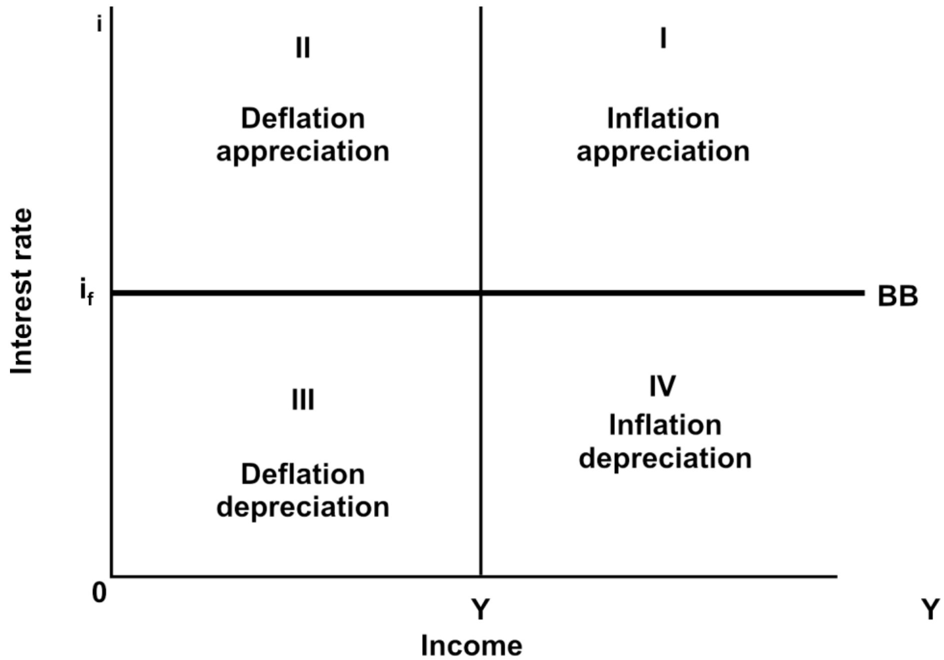

Figure 11.4 Adjustments of Exchange Rates and Prices.

There is a complicated set of adjustments in the back ground as the economy moves toward BB. For instance, say there is a monetary expansion that causes a decline in interest rates. Capital flows and which means that people try to sell our currency to buy foreign currencies. Our currency depreciates, exports and income increase, money demand rises, and so do interest rates, thus moving as back toward BB. This mechanism works in reverse if domestic interest rates tend to rise because of a monetary tightening or fiscal expansion.

With these assumptions we can study the adjustment process using Figure 11.4. Anywhere to the right of Y *, Prices are rising; to the left, prices are falling. Points above BB lead to capital inflows and appreciation, points below, to capital outflows and depreciation. Moreover, with extremely high capital mobility, the exchange rate will adjust very rapidly. So we are always close to or on the BB schedule.

11.4.1 A Monetary expansion: short – And Long – Run Effects:-

With given prices a monetary expansion under flexible rates and perfect capital mobility leads to depreciation and increased income. We ask how that result is modified once we take adjustments in prices into accounts. The answer is that the output adjustment is now only transitory. In the long run, a monetary expansion leads to exchange depreciation and to higher prices with no change in competitiveness.

In Figure 11.5 we start at point E with full employment, a payments balance, monetary equilibrium, and equilibrium in the domestic goods market. Now a monetary expansion takes place and shifts the LM schedule, to LM, the new goods and money market equilibrium at 'E' involves an interest rate below the world level, and therefore the exchange rate immediately depreciates, raising home competitiveness and this shifting the IS schedule to IS^1. The economy moves rapidly from E via 'E to E'. Output has risen, the exchange rate has depreciated and the economy has thereby gained in external competitiveness. But that is not the end of the story.

AT E^H output is above the full- employment level. Prices are therefore rising and that implies that real balances are falling. As the real money stock. M/P declines because of rising prices, the LM schedule starts shifting to the left. Interest rates tend to rise, capital tends to flow in and the resulting appreciation leads now the decline in competitiveness that also shifts the IS schedule back toward is initial equilibrium. Both the IS and LM schedule thus move back toward point E, The process continues until point E is reach end again.

What adjustments have taken place once the economy is back to point E? At point E, interest rates have returned to their initial level and so have relative prices, epf/p. in moving from E to E' the exchange rate depreciated immediately, ahead of the rise in prices. But when prices increased and real balances fell, some of that depreciation was reversed. Over the whole adjustment process, prices and exchange rates rose in the some proportion, leaving relative prices, epf/ p, and therefore aggregate demand unchanged. In the long run, money was therefore entirely neutral. By the end of the adjustment process, nominal money, prices, and the exchange rate have all increased in the same proportion, so the real money stock and relative prices- including the real exchange rate- are unchanged.

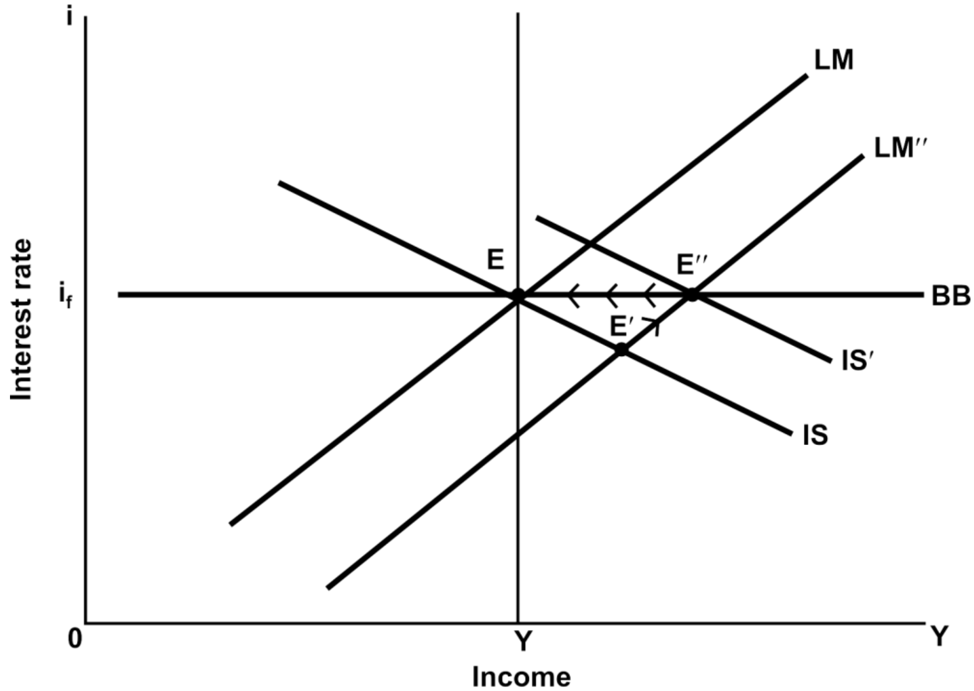

Figure 11.5 Short and long run Effects of a Monetary Expansion

11.4.2 Exchange Rate Overshooting:-

The analysis of monetary policy under flexible exchange rates, given above, leads to an important insight about the adjustment process. The important feature of the adjustment process is that exchange rates and prices do not move at the same rate. When a monetary expansion pushes interest rates down, the exchange rate adjusts immediately but prices adjust only gradually. Monetary expansion therefore leads in the short run to an immediate and abrupt change in relative prices and competitiveness.

Table 11.2 Short and Long – run Effects of a Monetary Expansion					
	M/P	e	p	Elf/p	y
Short run	+	+	0	+	+
Long run	0	+	+	0	0

Figure 2.6 shows time paths of nominal money, the exchange rate, and the price level implied by the analysis of figure. For each of these variables we show an index that is initially equal to 1oo. The

economy starts at long- run equilibrium. Then at time To, the money stock is increased by 50 percent and stays at that higher level, as shown by the red schedule. The exchange rate immediately depreciates. In fact the exchange rate index raises more than money does, say, from the initial level of 100 at point A to a new level of 170 at point A'. Prices by contrast, do not more rapidly.

Following the impact effect at time To, further adjustments take place. Because the gain in competitiveness at time To has raised output above potential, there is now inflation. Prices are rising and, at the same time, the exchange rate is appreciating, thus undoing part of the initial, sharp depreciation. Over time, prices rise to match the increase in money, and the exchange rate will also match the higher level of money and prices. In the long run. real variables are unchanged. The adjustment pattern for the exchange rate seen in Figure 11.6 involves over shooting. The exchange rate overshoots its new equilibrium level when, in response to a disturbance, it first moves beyond the equilibrium to the long- run equilibrium position. Overshooting means that changes in monetary policy produce large changes in exchange rates.

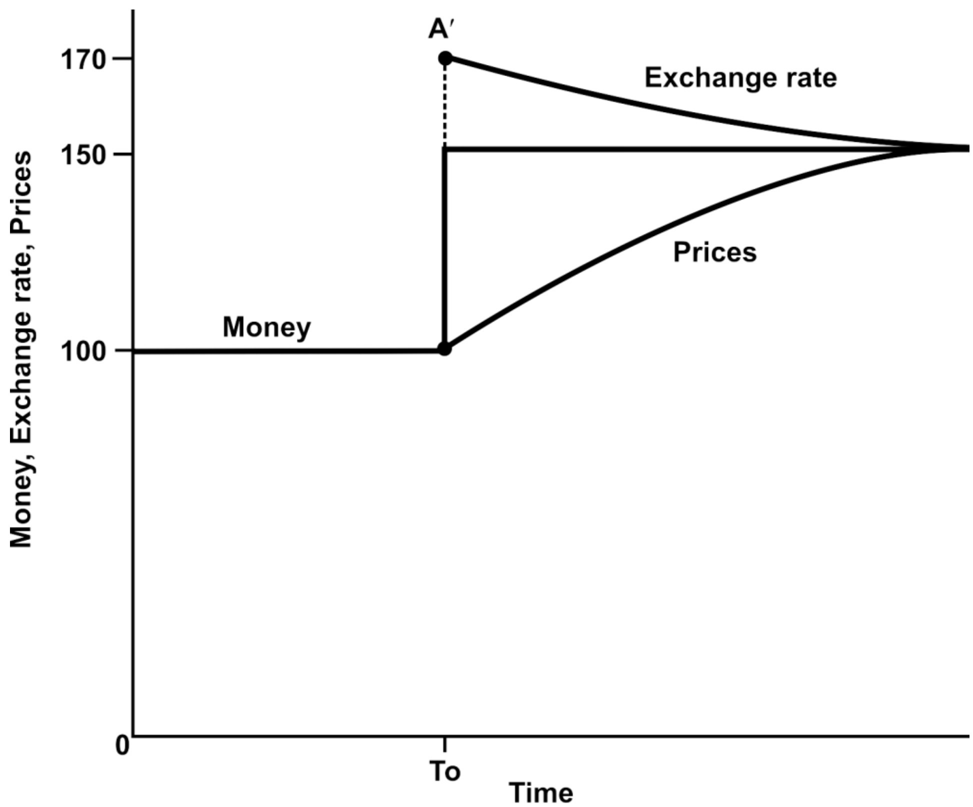

Figure 11.6 Exchange Rate Overshooting.

Those who believe that exchange rate overshooting introduces an undesirable instability into the economy argue that government should intervene in foreign exchange markets to avoid large, excessive exchange rate fluctuations. The sharp dollar appreciation in 1980- 1985 strongly reinforced the call for such intervention. In 1985 the major countries agreed in principle that they would intervene to try to prevent exchange rate instability. The agreement notwithstanding, major exchange rate movements, continue to occur. For instance, in 1995, the yen reached an exchange rate of 80 yen to the dollar. The major industrial countries agreed that the yen was overvalued and should depreciate. This declaration and intervention by the Bank of Japan moved the exchange rate to 110 yen to the dollar within a year. Accordingly, although the current flexible rate system emerged because the Bretton woods system of fixed rates broke down in 1973, it is not viewed as the last word, and reform of the international monetary system is always on the agenda.

11.5 INTEREST DIFFERENTIALS AND EXCHANGE RATE EXPECTATIONS

A Cornerstone of our theoretical model of exchanged rate determination was international capital mobility. In particular we argued that with capital markets sufficiently integrated, we would expect interest rates to be equated across countries. How does this assumption stand up to the facts? In Figure 2.7 we show the U.S. Federal funds rate and the money market rate in Germany. Obviously, these rates are not equal. How do we square this fact with our theory?

11.5.1 Exchange Rate Expectations:-

Our theoretical analysis was based on the assumption that capital flows internationally in response to nominal interest differentials. For examples, if domestic interest rates were 6percent and foreign rates were two percent, we would according to the earlier sections, expect a capital outflow.

However such a theory is incomplete in a world in which exchange rates can, do, and are expected to exchange. For example, consider a situation in which the Deutsche mark is expected to depreciate by 5 percent over the next year relative to the dollar. With a 5 percent Deutsche mark depreciation, the return in Dollars of investing in Germany is only 5 percent (= 10 percent- 5 percent). The natural preference is to invest in American bonds, even though the U.S. interest rate is below the German rate.

It is clear, therefore, that we must extend our discussion of interest rate equalization to incorporate expectations of exchange rate changes. Anyone who invests in domesting bonds earns the interest rate i. Alternatively by investing in foreign bonds, the investor earns the interest rate on Foreign bonds, i_f Plus whatever she earns from the appreciation of the foreign currency. The total return on foreign bonds, measured in our currency, is then.

Return on Foreign bonds (in terms of domestic currency) = if + Δ e/e (1)

Of course, since the investor does not know at the time she makes her decision by how much the exchange rate will change, the term Δ e/e equation (1) should be interpreted as the expected change in the exchange rate.

The introduction of exchange rate expectations modifies our equation for the balance of payments. Now capital flows are governed by the difference between our interest rate and the foreign rate adjusted for expected depreciation : $i=i_f - \Delta e/e$. An increase in foreign interest rates or an expectation of depreciation, given our interest rates or an expectation of depreciation, given out interest rates, would lead to a capital outflow. Conversely, a rise in our rates or an expectation of appreciation would bring about a capital outflow. We thus write the balance of payment as.

$$BP = Nx\left(y \frac{eP_f}{p}\right) + CF\left(i - if - \frac{\Delta e}{e}\right) \qquad (2)$$

The adjustment for exchange rate expectations thus accounts for international differences in interest rates that persist even when capital is freely mobile among countries. When capital is completely mobile, we expect interest rates to be equalized, after adjusting for expected depreciation.

$$i=if - \Delta e/e \qquad (2a)$$

Expected depreciation helps account for differences in interest rates among low and high inflation countries. When the inflation rate in a country is high, its exchange, rate is expected to depreciate. In addition, the Fisher relationship suggests that the nominal interest rate in that country will be high. Thus high – inflation countries tend to have high interest rates and depreciating currencies. Thus is an international extension of the Fisher equation, which relies on PPP to argue that inflation differentials internationally are matched by depreciation. Our long- term relation, then, is

Inflation differential $\cong$ interest differential $\cong$ depreciation rate (3)

The means "approximately equal to". The relation is only approximate because exchange rates can move independently of prices and also because obstacles to capital flow may create long-term interest differentials.

11.5.2 Speculative capital flows:-

Changes in exchange rate expectations can affect the actual exchange rate as well as the domestic interest rate and output. The point is made with the help of Figure 11.7, which assumes perfect capital mobility, as specified in equation (2a), Here the BB schedule is drawn for a given foreign interest rate and a given expected rate of change of the exchange rate, say, zero.

Suppose that we start in full equilibrium at point E and that the market develops the expectation that the home currency will appreciate. This implies that even with a lower home interest rate, domestic assets are attractive, and so the BB schedule shifts downward by the amount of expected appreciation.

Point E is no longer an equilibrium, given the shifts of the BB schedule to BB' but rather a position of surplus with large- scale capital inflows motivated by the anticipation. The surplus at

E cause the exchange rate to start appreciating and we move in a south westerly direction, as indicated by the arrow. The speculative attack causes appreciation, a loss in competitiveness, and, consequently, falling output and employment. Thus the expectation of an exchange rate appreciation is self – fulfilling.

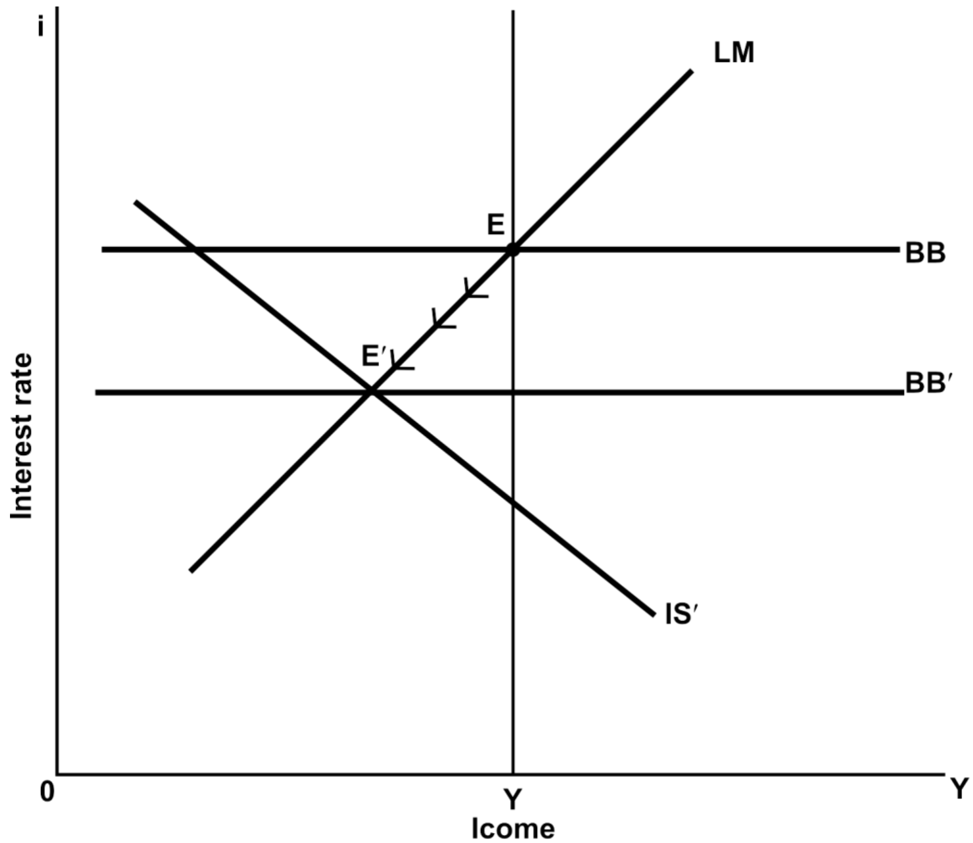

Fig11.7 response to an expected appreciation of currency.

This analysis confirms that exchange rate expectations, through their impact on capital flows and thus on actual exchange rates, are a potential source of disturbance to macroeconomic – something which policy makers who try to fire exchange rates when capital is fully mobile keep having to learn.

11.6 EXCHANGE RATE FLUCTUATIONS AND INTERDEPENDENCE

In the 1960s there was growing dissatisfaction with fixed exchange rates. The bretton Woods system put in place at the end of World War II was called a "crisis system" because from time to time exchange rates would get out of line and expectations of exchange rate changes would mobilize massive capital flows that often precipitated the exchange rate changes that often precipitated the exchange rate changes that speculators expected is the system of flexible rates among the major currencies of the periods since 1973 better? Is it less crisis- prone, and does it provide a better frame work for macroeconomic stability? Before providing answers, we look briefly at how flexibly the system has, in fact, operated.

11.6.1 Foreign exchange Market Intervention:-

When exchange rates are fully flexible, the government takes no action in the foreign exchange market. It says out of the foreign exchange market, whatever happens to the exchange rate. Such a system is almost unheard of, although the United States did behave that way briefly in 1981- `982. More commonly, governments intervene in the foreign exchange market to lesser or greater extent. Foreign exchange market interventation occurs when a government buys or sells foreign exchange in an attempt to influence the exchange rate.

The extent to which governments intervene in the foreign exchange markets, varies substantially. They may try only to offset short-term fluctuations and buy or sell foreign exchange to maintain “orderly markets” but they also may try to keep on overvalued exchange rate from depreciating or an undervalued exchange rate from appreciating. Dirty (as opposed to clean) floating is the practice of using substantial intervention to try to maintain an exchange rate against the pressure of market forces.

For almost the entire period since 1973, exchange rate floating has been of the decidedly dirty variety. Governments have intervened on a very large scale. This leads naturally to the question of why a government would try to resist market forces to prevent an appreciation or a depreciation of the currency.

11.6.2 Why Government Intervene:-

Central banks intervene to affect exchange rates for several reasons. Probably the main reason is the belief that many capital flows represent merely unstable expectations and that the induced movements in exchange rates cause unnecessary changes in domestic output. The second reason for intervention is a central bank’s attempt to move the real exchange rate in order to affect trade flows. The third reason arises from the effects of the exchange rate on domestic inflation. Central banks sometimes intervene. In the exchange market to prevent the exchange rate from depreciating, with the aim of preventing import prices from rising and thereby helping to slow inflation.

The basic argument for intervention (dirty floating) is that the central bank can intervene to smooth out fluctuations in exchange rates. The only- and, over whelming – objection to this argument is that there is no simple way of telling an erratic movement from a trend movement. How can we tell whether a current appreciation in the exchange rate is merely the result of a disturbance that will soon reverse itself or is the beginning of a trend movement in the exchange rate? There is no way of telling at the time a change occurs, although with the benefit of hindsight one can see which exchange rate movements were later reversed.

There is one circumstance under which central bank intervention might be desirable. It is clear from our earlier analysis that one of the key determinants of exchange rate behavior is expectations of economic policy; it may sometimes be possible to make it clear that there has been a change in policy only by intervening in the foreign exchange market. This is a case of putting your money where your mouth is.

11.6.3 Sterilized Versus Nonsterilized Intervention :-

In discussing intervention, it is important also to ask whether it works. For instance, does it make any difference to the exchange rate if the Bundes bank sells $1 billion from its foreign currency reserves?

To judge the effectiveness of intervention, we must distinguish between sterilized and nonsterilized intervention discussed earlier in this chapter. In the case of sterilized intervention a central bank, say, buys foreign exchange, issuing domestic money. But then the increase in home money is reversed by an open market sale of securities. In the sterilized interventation case, therefore, the home money supply is kept unchanged, in the case of nonsterilization, by contrast, there is a change in the money stock equal to the amount of interventation.

It is widely agreed that nonsterilized interventation, because it changes the money supply, will affect exchange rates. There is widespread skepticism, however, about the effectiveness of sterilized intervention. In 1978- 1979 the U.S. dollar was depreciating in Currency markets even though there was carefully sterilized. Only in late 1979, when the dollar depreciation began to alarm the fed, did a change in policy take place. Monetary policy was heightened. And immediately the dollar depreciation was stopped and soon massively reversed.

That episode, and other evidence, strongly suggests the effectiveness of non- sterilized intervention and of intervention that is backed by credible policies. The earlier failure of sterilized intervention suggested that only unsterilized intervention could affect the exchange rate. But a more recent episode gives cause for rethinking that issue.

The very large appreciation of the dollar from 1980 to 1985. was a major concern to policy makers in the United States, Europe, and Japan. Many policy makers thought that the markets had pushed the dollar too high and that only speculative forces were keeping it up. In September 1985 the finance ministers of the “Group of Five” (the United States, Japan, Germany, France and the United Kingdom) announced their view that the dollar was too high, and their central banks went into action to sell dollars in order to drive the rate down. The dollar responded quickly, suggesting that concerted action can affect the exchange rate even if there is no obvious change in monetary policy. Such action is certainly not guaranteed to work, but it could work if there is widespread speculation in the markets about the future course of policy and if announcements and intervention suggest that future policy will try to move the exchange rate in a particular direction. By contract, if policy makers are unwilling to use interest rates to defend their currency, as was the case in the United Kingdom in September 1992, even a $ 30 billion intervention cannot help the exchange rate.

11.6.4 Interdependence:-

It used to be argued that under flexible exchange rates countries could pursue their own national economic policies- monetary and fiscal policy and the inflation rate- without having to worry about the balance of payments. That is certainly correct, but it is also misleading. There are important linkages between countries whatever the exchange rate regime.

These spillover, or interdependence, effects have been at the center of the discussion about flexible exchange rates. For instance, suppose the United States lightens monetary policy. As discussed earlier, U.S. interest rates rise and that attracts capital flows from abroad. The dollar appreciates, and foreign currencies depreciation.

Table 11.3 shows the effects in other countries.

The U.S. appreciation implies a loss in competitiveness. World demand shifts from U.S. goods to those produced by our competitors, therefore, at home, output and employment decline. Abroad, our competitors benefit from the depreciation of their currency, they become more competitive, and therefore output and employment abroad expand, our monetary lightening thus tends to promote employment gains abroad, which come, of course, at the expense of our own employment.

There are also spillover effects through prices. When our currency appreciates, import prices in dollars fall; therefore, our inflation tends to decline quite rapidly when there is a sharp dollar appreciation. But abroad the opposite occurs. Foreign currencies depreciate, and therefore prices in those currencies tend to increase, inflation abroad thus rises, foreigners might welcome an increase in employment as a side effect of our monetary policy, but they certainly could do without in inflation that comes from currency depreciation.

In the same way, U.S. fiscal policies exert effects abroad. A U.S. fiscal expansion, such as the one in the 1980-1085 period will lead to dollar appreciation and a loss in competitiveness. The direct increase in our spending and the deterioration in our competitiveness are the channels through which our expansion is shared abroad. When the united states has a fiscal expansion, the rest of the world shares via increased exports.

Table 11.3 Monetary and Fiscal Policy Effects with Interdependence				
	U.S monetary Contraction		U.S. Fiscal Expansion	
		Rest of		Rest of
	United States $ appreciates	The World	United States $ appreciates	The World
Exchanged rate output Inflation	-	+	+	+
	-	+	-	+

Table 11.3 also shows the effects of monetary and fiscal policy on inflation. Because fiscal expansion leads to appreciation, the decline in import prices helps reduce inflation in the expanding Country. But abroad import price will rise, and that means inflation will be increased. These impacts of exchange rate movements on inflation were important factors in changing inflaction rates in industrial countries in the 1980 – 1985 periods.

Policy makers abroad therefore must decide whether to accept the higher. Employment – higher inflection effects of our policies or whether they should change their own policies. If inflation is already a problem abroad, or if the rest of the world is highly averse to inflation, the policy response abroad to this imported inflation may well be to tighten money. If the dollar appreciation was caused by a tightening of U.S. monetary policy, it will also cause a monetary contraction aboard if foreign countries decide to fight imported inflaction. That means our monetary tightening touches off worldwide tightening. This was substantially what happened in the worldwide recession of 1981 – 1982.

11.6.5 Policy synchronization:-

The large changes in exchange rates that occur when policies are not fully synchronized between countries pose a major threat to free trade. When import prices full by 20 or 30 percent because of a currency appreciation, large shifts in demand will occur. Domestic workers become unemployed, and they have no trouble seeing that it is foreign who gain the jobs they just lost. Accordingly, there will be pressure for protection-tariffs or quotas- to keep out imports that are " artificially cheap" due to the currency appreciation. In the United States in the 1980s repeated calls for protection in the automobile industry. In steel, and in many other industries reflected in large part the side effects of a dollar that appreciated sharply in response to tight money and easy fiscal policy.

The experience of the last 20 years offers an unambiguous answer to the question of whether flexible exchange rates isolate countries from shocks that originate abroad. Under flexible exchange rates there is as much or more interdependence as there is under fixed rates. Moreover, because exchange rates are so flexible and so ready to respond to policies (good or bad) macroeconomic management does not become easier. Further, to the extent that exchange rate overshooting cause sharp charges in competitiveness it leads to protectionist sentimention.

On all counts then, flexible rates are far from being a perfect system. But there is no better system, for the Bretton woods system collapsed. Therefore, we can ask only whether, through international coordination of interests and policies, we can make the system work better than it has in the recent post. Although the leaders of the major industrial countries have repeatedly recognized their interdependence and agreed to work toward more coordinated policies, there have been no major institutional changes to ensure coordination of economic policies.

One more suggestion is to have target zones. In a target – zone arrangement central banks limit the fluctuations of exchange rates to a specified range. Target zones require policy coordination. Specifically, in an effective target – zone arrangement government must synchronize both their monetary and their fiscal policies. The unwillingness to give up this sovereignty stands in the way of more limited exchange rate fluctuations between the United States, Europe and Japan. Even within Europe, as the discussion around the Maastricht Treaty that envisages the creation of a common European central bank shows, giving up monetary independence is not an easy step.

11.7 SUMMARY

- A monetary expansion in the long run increases the price level and the exchange rate, keeping real balances and the terms of trade constant. In the short run, though, the monetary expansion increases the level of the output and reduces the interest rate, depreciating the exchange rate. The exchange rate overshoots its new equilibrium level.
- External imbalances can be financed in the short term. In the long run they call for adjustment. Adjustment of the external balance calls for expenditure reducing and expenditure switching policies.
- Under fixed exchange rates, the automatic adjustment mechanism works through prices and money.

11.8 QUESTIONS

1. Explain Mundell – Fleming model under fixed exchange rates.
2. Describe Mundell – Fleming model under flexible exchange rates.
3. Explain the concept of exchange rate overshooting.
4. Explain the relationship between interest differentials and exchange rate expectations.

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12

MONETARY APPROACH TO BALANCE OF PAYMENTS

Unit Structure

12.0 OBJECTIVES

After going through this unit you will be come to Know -

- The monetary approach to the balance of payments.
- The Fund model.
- The Polak model.
- Absolute Version of PPP theory.
- Relative Version of PPP theory.

12.1 INTRODUCTION

In the early 1970s, there was a strong revival of interest in the re-examination of monetary relationship for an open economy as well as in the analysis of the interactions between the behavior of monetary aggregates and the determination of the BOP this interest led to the formalization of what has to come to be known in the literature as the monetary approach to the balance of payments (MABP) which , from the mid- 1970s until the mid- 1980s, held the centre stage in the theoretical and empirical debates that characterized the literature on open- economy macro economies.

By 1975, the MABP was well established as a more realistic alternative to the ‘ Keynesian’ as well as the ‘elasticities’ approach. As the MABP gained popularity, there arose a debate regarding its origins and ‘ ownership’ while all those involved in the development of the approach routinely acknowledged that its origins could be traced back to the eighteenth century contributions of David Hume, credit for the modern revival of the MABP was simultaneously claimed in two professional circles while there is no doubt that the academic version of the MABP originated with the writings of James Meade in the early 1950s (meade 1951) and continued with the contributions of Harry Johnson and Robert Mundell in the 1960s (Johnson 1958, Mundell 1968), years before the standard expositions of the MABP arising from these and other contributions became prominent, a number of important analytical and empirical studies in this area had already been carried out at the IMF largely under the leadership of Jacques Polak.

Although many of these studies were intended only to yield analytical foundations to the fund practices and therefore, in many ways were geared only to the IMF’s operational procedures, they greatly promoted the subsequent development of a rigourous monetary framework for the examination of BOI performance that essentially became the forerunner to the MABP which emerged later on in the academic literature in a more robust formulation. Despite this’ the IMF work was largely disregarded because of the dominance of Keynesian views in the 1950s and ‘……… the relative impotence and disrepute of the funds as an international monetary institution at that time’ (Johnson 1977. P. 261)

However, since the 1970s, the precursory role played by the Polak model in the development of the MABP has been universally acknowledged to the extent that this approach has come to be identified rather controversially, as the 'theory' underlying IMF supported programmes while it is generally accepted by the fund that the MABP is a central past of the theoretical underpinning of IMF- supported programmes, it belives that identifying, ' IMF theory' with the MAPB is outright erroneous (see, IMF 1987, p.12) not only because the significance accorded to monetary phenomena is very much different in the ' chicago' version of the MABP which followed the Polak model in chronological time, but also because the actual design of a theoretical models can be used as the framework for constructing adjustment programmes.

12.2 THE CHICAGO VERSION

A simple model along the ' Chicago' line of thinking was developed by Johnson (see frenkel and Johnson 1976) and , to illustrate its essential similarities and differences vis- a- vis the Polak model, it is summarized are separated explicitly through the introduction of the domestic price level(p) Thus, nominal income (y) can be to be given exogenously it is further assumed that the law of one price holds, implying that the domestic price level is equal to the foreign price level (P_F) times the nominal exchange rate (E) which is defined as the domestic currency price per unit of foreign currency.

The real demand for money (Md/P) is assumed to be a stable function (f) of real output and the rate of interest although to keep the model as simple as possible, the interest rate can be ignored without loss of generality. The nominal money supply is determined endogenously as the sum of domestic credit (DC) and foreign exchange reserves (R) Finally, the money market is assumed to be in continuous equilibrium, implying that Md= M. consequently the Chicago version of the MABP can be specified as follows.

$Y = Py,$ (1)

$P = EPf,$ (2)

$Md/ P = f (y),$ (3)

$M = Dc + R,$ (4)

$Md = M$ (5)

In therefore follows that

$R= Pf (y) – Dc.$

(6)

Partially differentiating (eqn 3.7) with respect to time (t) yield the following expression where the dot (.) on top of a variable indicated its time derivative, that is 5 /st:

$R = F (Y) P + P [6 f (y) / 6 y] y-DC$ (7)

that is the change in reserves is equal to the difference between the change in money demand and the change in domestic credit, which are independent of each other, if it is further assumed that the nominal exchange rate the foreign price level and real output remain constant, them (equ 3.7) reduces to :

$R = DC.$ (8)

This is the fundamental result of the 'Chicago' version of the MABP which states that under fixed exchange rates, the money supply is endogenous, and any increase in domestic credit will automatically lead to a decrease in foreign exchange reserves on a 'one – for – one basis' if the economy is growing, the demand for money will also be growing, and so domestic credit can expand without causing any BOP problems. But if the yate of credit expansion exceeds the flow demand for money, reserves will fall therefore, a good BOP performance depends on controlling domestic credit expansion.

This central conclusion was also reached by Polka, but there is one fundamental difference between the two models in the ' chicago' version. Only increase in domestic credit expansion cetenis Paribus will instantly 'Crowd out' foreign exchange reserves by an equivalent amount. In the Polak model, this complete 'Crowding out' is also true but only in the long run, where the end result is reached through a transmission mechanism involving changes in money supply, nominal income and imports as the instantaneous depletion in reserves as a result of credit expansion is substantially lower in the Polak model, this implies the possibility of short and medium – term disequibria. This result appears for more realistic than that of the ' chicago' version.

Summing – Up

While there are some evident difference between the earlier fund work and the academic version of the MABP, there is no doubt that both these versions deal with similar questions using comparable methodologies the essence of the MABP is an analytical formulation that emphasizes the interaction between the supply of and demand for money in determining a country's overall BOP. It could be seen, in fact, as a logical extension of the conventional closed economy monetary models to an open economy which, by assuming stable money demand function. Assess the consequences of changes in money supply is not consistent with the equivalent changes in the demand for money, a stock disequibrium in the money market arises, which affects the spending patterns of economic agents. When money supply grows faster that real money demand, the excess flow supply of money so generated given rise to a corresponding excess demand for goods and non- monetary financial assets. In a money market is eliminated by an increase in prices, interest rates and possibly output, these changes affect the nominal demand for money and bring it to a level commensurate with the increase money supply there by restoring monetary equilibrium.

Unlike in closed economy, In an economy open to trade and financial flows, the central bank can influences the increase in money supply by domestic credit creation as well as by foreign exchange accretion under these circumstances, the MABP emphasizes that money market disequilibria are reflected not only in change in the country is foreign exchange reserves. Therefore, the approach concentrates on the relationship between the supply of and demand for money on the one side, and prices, output, interest rates and the BOP on the other.

An important implication of this analysis is that, under a regime of fixed exchange rates, the aggregate money supply is beyond the direct control of the monetary authority and is consequently rendered endogenous the central bank, how ever, retains control over the volume of credit which is one of the sources of monetary over the expansions. Thus, within the frame work of the MABP, the distinction between the monetary base and its domestic- credit component becomes central. The monetary authority can control the letter but not the former for any given expansion in the demand for real money balances an equivalent growth in the money supply can be realized through a suitable increase in domestic credit creation diverges from this suitable level, the differences in automatically adjusted by equivalent changes in foreign exchange reserves resulting from either a BOP surplus exchange reserves resulting from either a BOP surplus or deficit.

The MABP was extended in several ways to analyse the consequences of once-and- for –all devaluations as well as the abandonment of the fixed exchange rate assumption monetary research on exchange rate determination in a flexible exchange rate system was seen as the logical, and other extended formulations, monetary approach to the exchange rate began to lose ground in the mid- 1980s the impact of the debt crisis after 1982 (with the consequent intensification of the phenomenon of currency substitution) and the central seemingly exogenous upsurge of capital inflows into emerging markets in the 1990s weekends the credibility of some of the central tends of the MABP particularly with regard to the endogeneity or exogeneity of the various monetary aggregates. (See bleger, khan and masson 1995) Despite this failings, the MABP has had a lasting influence on macro economic thought because some of the major propositions it brought to the therefore (that is importance of money demand in BOP analysis) have been widely accepted and have been largely incorporated into the macroeconomic framework of the financial programming models currently used by the fund.

12.3 The Fund Approach: The Basic Framework

With the polak MABP apparatus in hand, we can now describe the fund model, referred to as the representative model- version I (RMI) the fundamental ingredient of this basic framework is the specification of nominal income (y) which, following the MABP approach is given by:

$$y = py \qquad (9)$$

Where, as before, p denotes the domestic price level and y is real output which is assumed to be given exogenously the change in nominal income can therefore be approximated by:

$$\Delta y = \Delta py(-1) + P(-1)\Delta y, \qquad (10)$$

Where we assume that both Δp and Δy are small, so that the second – order interaction term $\Delta p\ \Delta y$ can be ignored, that is $\Delta p\ \Delta y = o$, as real output growth rate (g) and inflaction rate (л) are defined as $9 = \Delta y / y(-1)$ and $л = \Delta p / p(-1)$, we rewrite (eqn.10) as follows.

$$\Delta y = (9 + л)\ y(-1) \quad (11)$$

In the above equation, y (-1) is pre – determined, the real growth rate is exogenous, and the inflection rate is endogenous."

The remaining two essential ingredients of the model are the financing constraints for the monetary and external sectors.

The monetary sector financing constraint is given by

$$\Delta M = \Delta DC + \Delta R, \quad (12)$$

In both these equations, foreign exchange reserves appear explicitly and, consequently, the external and monetary sectors can be linked germ.

Private sale and purchase of foreign currency is suspended. And change in the official exchange rate is made by monetary authority of the country in consultation with the IMF. In practice, however, most countries adopt a dual system fixed exchange rate for all official transactions and a market rate for private transactions.

12.4 DETERMINATION OF FIXED EXCHANGE RATE

The determination and regulation of the fixed exchange rate is illustrated in fig. 3.1 suppose that India's demand curve for foreign exchange (say, us dollor) is given by the demand curve D_2 and dollar supply by the Curves in the absence of the fixed exchange rate system, the exchange rate will be determined at R_2 by the intersection of foreign exchange demand curve (D_2)

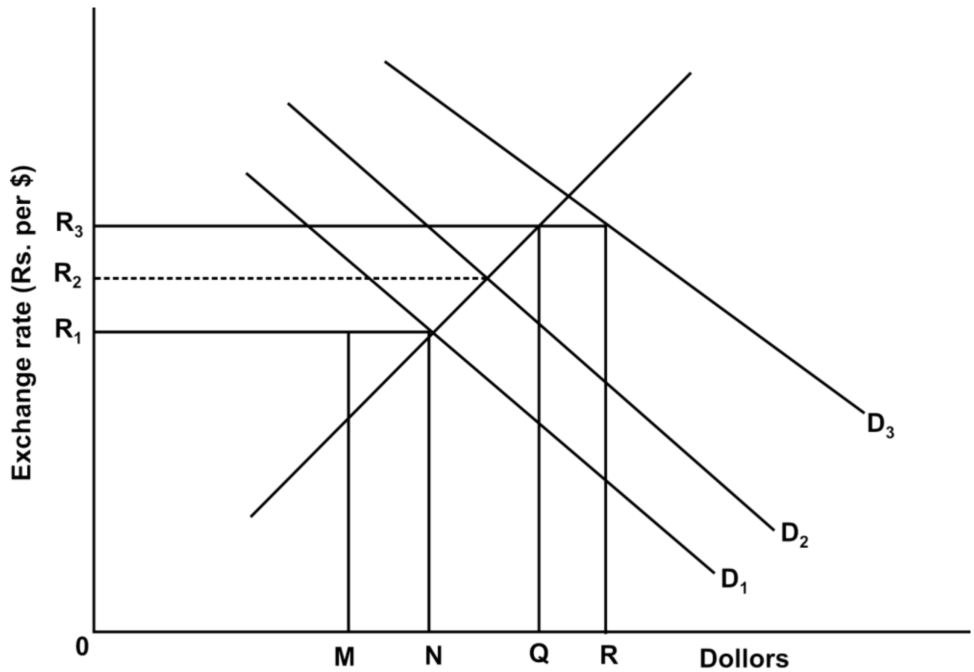

Fig 12.1

Fig 12.1 Determination of fixed exchange rate and supply curves this exchange rate may fluctuate up and down to any level which is not desirable therefore, the Indian government adopts the fixed exchange rate system and fixes the exchange rate between R_1 and R_3, that is, exchange rate variation is allowed between R_1 and R_3, this implies that demand for dollor can fluctuate between the lower and upper limits of OM and OQ, respectively, and exchange rate can move up and down between R_1 and R_3, so long as demand variation is limited between OM and OQ and exchange rate between R_1 and R_3, the monetary authority need not intervene but, if dollor demand and exchange rate variations cross these limits for such reasons as seasonal variation in demand, increase in imports, increase in short- term foreign investments, and so on then the authorities will be required to intervene to control the demand variation and limit the exchange rate variation within permissible limits. R_1 and R_3, for example, suppose demand for dollar increase and demand curve D_2 shifts to D_3 and dollar demand exceeds the upper limit by QR, dollor from its reserves to vent the demand pressure on the exchange rate similarly, if for some reason, demand for dollor decreases and demand curve D_2 shifts leftward to D_1. Then the authorities will buy dollors to the extent of MN to retain the exchange rate between R_1 and R_3. This is show the fixed exchange system works.

12.4.1 Pegging of the Currency.

When the value of domestic currency is tried to the value of another currency, it is called ‘pegging’ under the fixed exchange rate system, a currency is pegged to a reserve currency or to a basket of ‘key’ currencies. Besides, Currencies pegged are also the special drawing rights (SDRs) an instruments created by the IMF. The currencies of about one- third of the developing nations are pegged to a single currency, that is, either to the US dollors or to French frame the value of pegged currency is allowed to vary within certain lower and upper limit.

Pegging of currency to a basket of currencies is called composite currency pegging. This system is adopted to avoid frequent adjustment problem caused by the variation in the reserve currency. Under this system, many countries have pegged their currency to more than one currency, mainly to the stability in the fixed exchange rate in this system. The rate of exchange is fixed on the basis of a weighted average value of the regional distribution of trade partners and the volume of trade and foreign investment the European monetary system. Or the euro currency system is the best example of this system India has pegged her currency to the US dollars, SDRs and the pound sterling.

12.5 THE CONTROVERSY OF FIXED V/S FLEXIBLE EXCHANGE RATE

The IMF system of fixed exchange rate adopted under Bretten woods Agreement in 1945 worked effectively till 1973. Worked effectively till 1973 thereafter, however, the IMF failed to provide an adequate solution to three major problems.

i) Providing sufficient reserves to the member nations to mitigate the short – run fluctuations in their BOP and to maintain the fixed exchange rate system.
ii) The problem of Long- Term adjustment in the BOP; and
iii) Managing the cries generated by speculative transactions.

Consequently, the currencies of many countries, especially the reserve currencies were devaluated frequently in the early 1970, causing instability in the exchange rate. This raised doubts about the sustainability of the Bretton Woods system and viability of the fixed exchange rate system, and the Bretten woods system broke down. The breakdown of the system generated a debate on whether fixed exchange rate is desirable and whether it is sustainable the arguments were put forward in favor of and against both fixed and flexible exchange rate system the argument in favor of one system is essentially the argument again the other system. We will therefore confine to the arguments in favour of each system.

12.5.1 The Arguments for Flexible exchange Rate.

The advocates of flexible exchange rate have put forward equally convicting argument in its favour, they have challenged all the arguments against the flexible exchange rate. It is often argued that flexible exchange rate causes destabilization. uncertainty, risk and speculative the proponents of the flexible exchange rate have not only, Rebutted these charges but also have put forward strong arguments in favour of flexible exchange rate.

First, flexible exchange rate provides a good deal of autonomy in respect of domestic policies as it does not require any obligatory constraints. This advantage is of great significance in the formulation of domestic economic policies.

Second, flexible exchange rate is self- adjusting and therefore it does not devolve on the government to maintain an adequate foreign exchange reserves to stabilize the exchange rate.

Third, since flexible exchange rate is based on a theory, it has a great advantage of predictability and has the merit of automatic adjustment.

Fourth, flexible exchange rate serves as barometer of actual purchasing power of a currency in the foreign exchange market.

Finally, some economists argue that the most serious charge against the flexible exchange rate, that is uncertainly, is not tenable because speculative tendency under this system itself creates conditions for certainly and stability they argue that the degree of uncertainly under flexible exchange rate system, if any is not greater than one under the fixed exchange rate.

12.5.2 The Debate remains inconclusive

The debate on fixed vs flexible exchange rate remains inconclusive the reason in that both the system have their own merits and demerits empirical evidence on their side is not conclusive the fixed exchange under Britten woods system as already mentioned, had come under greater pressure during the early 1970s the destabilizing effects have been experienced under both the system there is ample evidence to show that fixed exchange rate is subject to 'periodic bouts of very heavy speculations' on the other hand, the experiment with flexible exchange rate in the 1950s and in 1969 by Britain and Germany in 1971 have not produced any evidence of serious fluctuation in the exchange rate.

The Counter – arguments keep flowing from the advocates of the fixed and flexible exchange rate However, the majority of central banks and policy- makers favors a fixed exchange rate and economic the oreticiars and analysis favour mostly the flexible exchange rate system , perhaps because of their faith in the efficiency of the market mechanism.

12.6 PURCHASING POWER PARITY THEORY

Purchasing Power Parity (PPP) theory which explains the determination of exchange rate is generally attributed to Gustav Cassel a Swedish economist. However, its origin dates back to the writings of David Ricardo, during and after the first world war when many of the western countries allowed their exchange rates to float, it was observed that the changes in exchange rates were highly influenced by the changes in domestic prices, the essence of the theory is that under the competitive market structure and absence of transport cost and other restrictions on trade, identical goods which are said in different markets will sell at the same price when expressed in common currency.

Purchasing Power Parity theory has two versions one is based on a strict interpretation of the above mentioned law of single price and is termed ' Absolute' Purchasing Power Parity the other is a liberal interpretation and called 'Relative' purchasing power parity.

12.6.1 ABSOLUTE VERSION OF PPP

According to the Absolute PPP, the identical basket of goods in two different countries must sell for the single price when expressed in the same currency stating differently. The exchange rate between the currencies of two different countries is decided by their respective purchasing power. For example if a identical basket of goods costs Rs. 100 in India and $ 2.5 in U.S. A. then the exchange rate defined as rupees per dollar will Rs. 100/- $2.5 Rs 40 $ 1. Algebraically, the absolute version of PPP can be stated as

Where R is the exchange rate defined as units of domestic currency per unit of foreign currency.

$$(R = \frac{P}{P*})$$

P is price of a basket of goods expressed in the domestic currency i.e. Indian rupees.

P* is the price of identical basket of goods in the foreign country expressed in terms of foreign currency i.e. US $

Limitations:-

The Absolute PPP has been criticized on the following grounds.

1. Not applicable to absolute level of prices

The absolute form of the theory suffers from a basic weakness that it attempts to compare purchasing power of the currencies at any particular point of time. Such comparisons are not possible as purchasing power is a relative concept and not an absolute one. It is not possible to speak about value of money can only be compared between two periods of time in other words the purchasing power parity theory " cannot …… be applied to absolute level of prices, but only to the changes in the price levels."

2. Neglects transport cost

The Absolute version also neglects the costs of transporting commodities between two countries in the absence of transport costs, it is true that prices of all commodities tend towards equality with each other and the market rate will move towards equilibrium rate. In fact, the presence of transport costs makes the prices of internationally traded goods differ between countries thus the absolute form the theory considers only the ideal conditions of absence of transport cost which in practice cannot be ignored.

3. Quality of goods ignored

The theory also ignores the differences in the quality of commodities sold in two countries the difference in the quality of goods prevent the equalization of price of goods and hence acts as an obstacle towards working out an equilibrium rate of exchange.

12.6.2 RELATIVE VERSION OF PPP

The Absolute PPP does not hold good due to transport cost, imperfect information and distorting effects of tariffs and protection. It is argued that the Relative form of PPP can be expected to hold even in the presence of such imperfections the relative version of PPP theory argues that the exchange rate will adjust by the amount of inflation differential between the two countries algebraically it can be stated as :

$$R_1 = R \frac{p_1}{P_2}$$

Where, R_1 = New equilibrium exchange rate

R_0 = Equilibrium rate in the base period

P_1 = Change in the price index in the home country (India)

P_2 = Change in the price index in other country (U.S.A)

Limitations:-

The relative PPP though considered as a superior approach, yet not without its drawbacks the important of them are:

1. Difficult to select appropriate base year.

The theory attempts to arrive at a new equilibrium rate on the basis of the old equilibrium rate economists have encountered many difficulties in calculating a correct base rate- therefore it becomes equally difficult to calculate the new rate.

2. Selecting relevant index numbers

Another difficulty encountered in calculating the new rate is in the use of index numbers there are so many different types of price indices, the question would be- which one of them will be most relevant to the theory? E.g. wholesale price index, a general price index with weighted average, there is retail price index- that the choice becomes difficult and unreliable.

3. Price does not change at an uniform rate

The purchasing power parity theory consider that all prices and costs rise or fall uniformly but in periods of hyper inflation some prices rise faster than others, e.g. food prices rise faster than the prices of manufactured goods. Because of the variations in the degree of price changes, the index numbers cannot be a true indicator of purchasing power.

4. No direct link between change in price and exchange rate

The theory assumes that changes in the price level get reflected in the rate of exchange such a direct and immediate link between price level and exchange rates may not exist many times prices may change but there may not be change in the rate of exchange.

5. Impact of a change in exchange rates on price level is neglected

The theory assumes that changes in price levels lead to changes in exchanges rates, but changes in the exchange rates do not have any influence on the price level. Such a conclusion appears to be a hasty one as changes in exchange rates also influences prices e.g. devaluation makes imports costlier, thereby pushing up prices of commodities using imports in their manufacture.

6. Limited application to large countries

The theory has a greater relevance and applicability to small countries such as Singapore, Denmark, and Holland etc where a large part of the national income comes from international trade. In such countries price levels and exchange aerates are closely connected but for larger countries the applicability of this theory is limited.

7. Capital transfers neglected:

The theory takes into account only trade in merchandise exports and imports it excludes other unilateral transfers all of which create a demand for and supply of foreign exchange by excluding such factors the theory can only be termed as an incomplete theory in fact it is more of a balance of trade theory rather than a balance of payments theory.

8. Quality of goods ignored

The theory ignores qualitative differences in goods and services produced by different countries.

9. Assumes no restrictions on trade

The theory disregards obstacles such as transport costs, tariffs, goudas, government, interference which will prevent the actual market rate from conforming to the equilibrium rate of exchange.

10. To Much emphasis is on purchasing power

The theory places too much emphasis on purchasing power as a deter mining factor of rate of exchange it ignores factor such as reciprocal demand of the trading countries which can influence the rate of exchange even with no change in price levels.

The purchasing power parity theory was expected to provide an answer to find out the exchange rate under floating exchange rate system when price change in different countries are at variance when countries come out from international economic and political disturbances, it is belived that PPP will provide the base on which an exchange rate can be exchange rates are highly influences by the purchasing power of respective currencies. Since 1990, the world bank makes use of PPP to calculate the per capita income (adjusted to PPP) while working out the human development Index (HDI) it enables us to compare the real income level of different countries as against the exchange rate determined purely by market forces.

12.7 MANAGED FLEXIBILITY

(a) Historical Perspective

Purchasing power parity theory explains the base on which the exchange rate can be determined by two countries earlier we explained the demand for and supply for foreign exchange and determination of equilibrium exchange rate internal as well as external purchasing power of a currency is basically based on demand and supply forces.

Foreign exchange rate e.g. the rate at which domestic currency is exchanged against the foreign currency has historically undergone different system. Broadly, they are fixed exchange rate and flexible exchange rate fixed changes rate operated under the rigid system of gold standard and also under the IMF in the form of pegged exchange rate (Dollar exchange rate) between the two world wars and again since the recent past i.e. since 1973 a variety of flexible exchange rates have been operating in the monetary world.

(b) The I.M.F. experience 1947 – 1973.

The interwar period witnessed serial economic crises in the forms of hyper inflation (Germany), stock market callapse (USA) and world wide recession leading to trade imbalances and widespread protectorism many countries were corpelled to adopt deflationary policies and competitive devolutions. Noted economist – Ranger Nurkse in his report competitive devaluations noted to League of Nations (1944), argued that experience with floating exchange rates had shown that they discouraged international trade, caused a mis allocation of resources and were generally characterized by bouts of destabilizing speculations.

The IMF or Bretton woods system as it is popularly known as, started operating in 1947, to provide stability in exchange rate as one of its major objectives. Under the articles of Agreement of the IMF, each member country was asked to declare the par value of its currency against gold and U.S. dollar the exchange rate thus declared was allowed to fluctuate not more than I percent plus or minus either side of the parity, in case of fundamental disequilibrium in its balance of payments a member country is allowed to devalue or revalue its currency up to 10 percent for which usually IMF would not object. However changes in exchange rate more than that required the permission of the IMF the exchange rate prevailed under the IMF since 1947, was known as dollar standard or gold exchange standard. Under this system, to infuse confidence among the member countries, USA whose currency had become a reserve currency guaranteed the member countries to purchase their official holding of dollars at the rate of $35 = 1 ounce of gold. Such a promise infused the required confidence in the bretton woods (IMF) system.

The IMF system operated well in the 1950s but the confidence in the system slowly deteriorated in the 1960s the main reason for the declining confidence was the increasing demand by some of the member countries to convert their dollar holdings into gold the situation worsened during 1986 to 1972 which ultimately led to the collapse of the system.

Several attempts were made to restore the system. The dollar was delinked from gold on August 1971 and president Nizon announced the termination of USA's commitment to buy and sell gold at $ 35. Further, the dollar was devalued by 15 percent under the Smithsonian Agreement (named after the Smithsonian building in Washington where negotiations were held) the exchange rates were allowed to change with in the range of # 2¼ percent around the new central rates. The dollar continued to be in trouble leading to the second devaluation in 1973 ($42.22 pr ounce of gold) when all the measured failed to restore confidence in the dollar, many countries decided to let their currencies float more or less freely the floating currencies included the British pound, candian dollar, German mark, Japanese yen, French Frane, Italian lira and Swiss franc the era of stable exchange rate thus came to an end in 1973 paving the way for different varieties of flexible exchange rate.

However, not all the countries opted for a compete float Government of many countries found it necessary to intervene and influence the exchange rate rather than leaving it fully to the market.

Exchange market intervention is defined as sales or a purchase of foreign currency of monetary authorities with the aim of changing the exchange rate of their own currency vis-à-vis one or more currencies in the seventies, an over whelming number of countries which switched to a flexible regime have a followed a managed exchange rate system in most of these countries central banks intervene in the foreign exchange markets to minimize the fluctuation in exchange rate in case of the developing countries where the foreign exchange markets are thin and narrow, central banks" leaving against wind" intervention policy is to check erratic fluctuation in the exchange rate of its currency.

The important reasons put forward for government intervention to manage exchange rate are.

i) Ability to produce a more appropriate rate

The government or monetary authorities may be in a better position together all the relevant information than the market the market may have the wrong perception and may find it difficult to use the information to determine the appropriate rate of exchange the authorities are in a better position than the market in predicting the future course of policies and their implications for the exchange rate for example, if there is an expected increase in money supply, the intervention to influence the exchange rate. In the absence of intervention, the market may indulge in speculation due to its inability to have accurate information.

ii) To mitigate costs of overvalued or undervalued exchange rates

Exchanges rates which deviate from the real exchange rates (in relation to purchasing power parity) lead to distortion in resource allocation between the domestic and external sectors undervaluation leads to inflationary pressure, while overvaluation brings in higher rates of unemployment changes in the exchange rate in either direction bring in uncertainty and affect investment decisions. The disturbances in economic activities caused by changes in the exchange rate can thus be kept under control if the authorities interfere and bring the necessary changes in the exchange rate.

iii) To smoothen the economic adjustment process

A persistent surplus or deficit the balance of pavements leads to changes in the exchange rate to correct the disequilibrium if the change are larger, than the consequent disturbances in the domestic economic activities require adjustments in employment price, levels etc. if adjustment required are of higher magnitude, it becomes painful in its effects intervention can reduce such disturbances and the effects. An economy may be caught in vicious circle of depreciation leading to price and wage rises which in tom leads to further depreciation i.e. depreciation – wage- price spiral intervention by the authorities may slow down or avoid the spiral .

Intervention is also preferred by many economists to other methods of protection or correction like tariffs. Subsidies, exchange rate controls etc. most of theses methods have the tendency to become permanent and cause more demand to the company.

In Conclusion it can be stated that there is no definite case in favors of any particular type of exchange rate system. Neither the fixed nor the flexible exchange rates provide a complete solution to maintain. Internal and external stability based on the macro fundamentals of the economy and its external relations, the exchange rate requires undergoing changes. Such changes can be brought about with minimum negative affects by the government through its intervention.

(c) Exchange rate management in India

Under Bretton woods system, India adopted a fixed exchange rate regime where the Indian rupee was pegged to the pound sterling on an account of historic links with Britain and was in line with the IMF rules prevailing at the time from September 1975. Indian rupee was delinked form pound sterling and the exchange rate was delinked from pound sterling and the exchange rate was determined against and undisclosed basket of currencies of the countries which were India's major trading partners.

Since, 1991, the exchange rate in India is largely determined by the market forces. Since then the country has had a variety of episodes of long periods of excessive inflows of foreign currencies exercising an upward pressure on the exchange rate followed by short spells of small amount of capital out flows and consequent speculative pressures necessitating correction in the exchange rate the RBI has intervened in the market both always through sales and purchases both spot and forward exchange market interventions check speculative activities and demand – supply imbalances. Monetary measures include changes these measures, changes in export credit rates and the interest rate surcharge on import finance also resorted to.

India as a member of the IMF worked with in the IMF frame work observing the rules of stable exchange rate. In the 1970's when most of the countries opted for flexible exchange rate India could not remain aloof and thus got into the regime of flexible exchange rate managed by the authorities under economic liberialisation introduced since 1991, the government has allowed the rupee to float under trade account and subsequently on current account, yet the authorities cannot allow the exchange rate to be determined entirely by market forces it is managed by the monetary authorities as per the requirement of the economy through intervention as and when necessary.

12.8 SUMMARY

The essence of the MABP is an analytical formulation that emphasizes the interaction between the supply of and demand for money in determining a countries overall BOP.

12.9 QUESTIONS

1. Explain the monetary approach to the balance of payments.
2. Explain the Fund approach to BOP.
3. Discuss the absolute version of PPP Theory.
4. Describe the relative version of the PPP Theory.

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13

MODULE 5

THE NEW MACROECONOMICS

Unit Structure

13.0 OBJECTIVES

After going through this unit you will come to know:

- The concept of expectations
- The Concept of rational expectations
- The Lucas critique
- Adaptive expectations
- Keynesian's approach to expectations
- New classical approach to expectations

13.1 INTRODUCTION

In the 1930s when Keynes wrote his General Theory, Unemployment was the major problem in the world. During the Second World War, inflation emerged as the main economic problem. In the post-war years till the late 1960s, unemployment again became a major economic issue. From the late 1960s to the 1970s, a new phenomenon approached in the form of both high unemployment and inflation, known as stagflation. This phenomenon of stagflation posed a serious challenge to economists and policy makers because the Keynesian theory was silent about it, so out of this crisis emerged a new microeconomics theory which is called the Rational Expectations Hypothesis.

13.2 ADAPTIVE EXPECTATIONS

Before we discuss the Ratex hypothesis, it is essential to understand the meaning of adaptive Expectations used in microeconomics before the Ratex theory was developed.

Expectations are forecasts on predictions by an economic agent regarding the uncertain economic variables which are relevant to his decision. They are based on past trends as well as current information and experience. The main body of economic theory is based on the assumption of rational behaviour of economic agents(i.e. consumers, producers, etc.) in forming their expectation. But till recently economists have not been able to incorporate the role of expectations in measuring human behaviour. Keynes discussed the importance of expectations but he was silent as to how they are formed.

In recent years, economists have mostly used the adaptive expectations hypothesis in model building. The pioneering work was done by Cagon in 1956 and Nerlove in 1957. According to the adaptive expectations hypothesis, economic agents expect the future to be essentially a continuation of the past. They expect the future values of economic variables like prices, incomes etc. to be an average of past values and to change very slowly. The economic agents make the expected values of these variable equal to a weighted average of their present and past values. They revised their expectations in accordance with the last forecasting error. Errors resulting from past behaviour represent an important source of information for forming expectations. But such expectations are based on the assumption that the economic agents expect them to change very little. This often leads to absurd forecasts when there is change in economic policy.

For instance, according to the adaptive expectations hypothesis, economic agents from expectations of future inflation rates from a weighted average of experienced average past inflation rates and they periodically revise those expectations if actual inflation turns out to be different than expected. This implies irrational behaviour on the part of economic agents. Friedman's analysis of the long-run Philips curve is based on the adaptive expectations hypothesis. The assumption implicit in Friedman's acceleration hypothesis that price expectations are based mainly on the basis of the experience of past inflation is unrealistic. When economic agents base their price experience on this assumption, they are irrational. If they think like this in a period of issuing prices, they will find that they were wrong. This is because expectations are formed from direct forecasts of the future as from mere projections of the past. People base their expectations as much on current information about a variety of factors as on past price changes. This rational people will use all available information to forecast future inflation more accurately.

13.3 RATIONAL EXPECTATIONS

The idea of rational expectations was first put forth by John Muth in 1961 who borrowed the concept from engineering literature. His model dealt mainly with modelling price movements in markets. By assuming that economic agents optimise and use information efficiently when forming expectation, he was able to construct a theory of expectations in which consumers & producers responses to expected price changes depended on their responses to actual price changes. Muth pointed out that certain expectations are rational in the sense that expectations and events differ only by a random forecast error.

Muth's notion of rational expectations related to microeconomics. It did not convince many economists and lay dormant for ten years. It was in early 1970s that Robert Lucas, Thomas Sargent and Neil Wallace applied the idea to problems of microeconomics policy.

13.4 BASIC PROPOSITIONS OF THE RATIONAL EXPECTATIONS HYPOTHESIS

The Ratex hypothesis holds that economic agents from expectations of the future values of economic variable like prices, incomes, etc. by using all the economic information available to them. This information includes the relationships governing economic variables particularly monetary and fiscal policies of the government. Thus, the rational expectations assumed that economic agents have full and accurate information about future economic events. According to Muth, information should be considered like any other available resource which is scare. Further, rational economic agents should use their knowledge of the structure of the economic system informing their expectations.

Thus the Ratex hypothesis "presumes that individual economic agents use all available and relevant information in forming expectations and that they process this information in an intelligent fashion. It is important to recognise that this does not imply that consumers our firms have "perfect foresight" are that their expectations are always "correct". What is suggested is that agents reflect upon past errors and, if necessary, revise their expectations behaviour so as to eliminate regularities in these errors. Indeed the hypothesis suggests that agents succeed in eliminating regularities involving expectational errors so that the errors will on the average be unrelated to available information".

The Ratex hypothesis has been applied to economic (monetary, fiscal and income) policies. The rational expectationists have shown the short run ineffectiveness of stabilisation policies. According to them no one knows much about what happens to the economy when economic (Monetary or fiscal) fiscal is changed. Specifically, it means that macroeconomics policy designed to control recession by cutting taxes, increasing government spending increasing the money supply or the budget deficit may be curbed. They argue that the public has learnt from the past experience that the government will follow such a policy. Therefore, the government cannot fool the people by adopting its effects and mere signs of such a policy in the economy create expectations of countercyclical action on the part of the pubic. Thus according to the Ratex hypothesis, people form expectations about government monetary and fiscal policies and then refer to them in making economic decisions. As a result, by the time the signs of government policies appear, the public has already acted upon them, thereby off setting their effects. In other words, the Ratex hypothesis holds that the only policy moves that cause changes in people's economic behaviour are those that are not expected, the surprise moves by the government once the public acquires economic behaviour. We discuss some of the policy changes in the light of the Ratex hypothesis below.

13.4.1 RATIONAL EXPECTATIONS AND THE PHILIPS CURVE

In the Friedman-Philips acceleration hypothesis of the Philips curve, there is a short run trade- off between unemployment and inflation but no long run trade- off exists. The reason is that inflationary expectations are based on past behaviour of inflation which cannot be predicted accurately. Therefore, there is always an observed error so that the expected rate of inflation always lags behind the actual rate. But the expected rate of inflation is revised in accordance with the first period's experience of inflations by adding on some proportion of the observed error in the previous period so that the expected rate of inflation adjusts toward the actual rate.

Economists belonging to the rational expectations school have denied the possibility of any trade-off between inflation & unemployment even during the long-run. According to them, the assumption implicit in Friedman's version that price expectations are formed mainly on the basis of the experience of past inflation is unrealistic. When people base their price expectations on this assumption they are irrational. If they think like this during a period of using prices, they will find that they were wrong. But rational people will not commit this mistake. Rather, they will use all available information to forecast future inflation mere accurately.

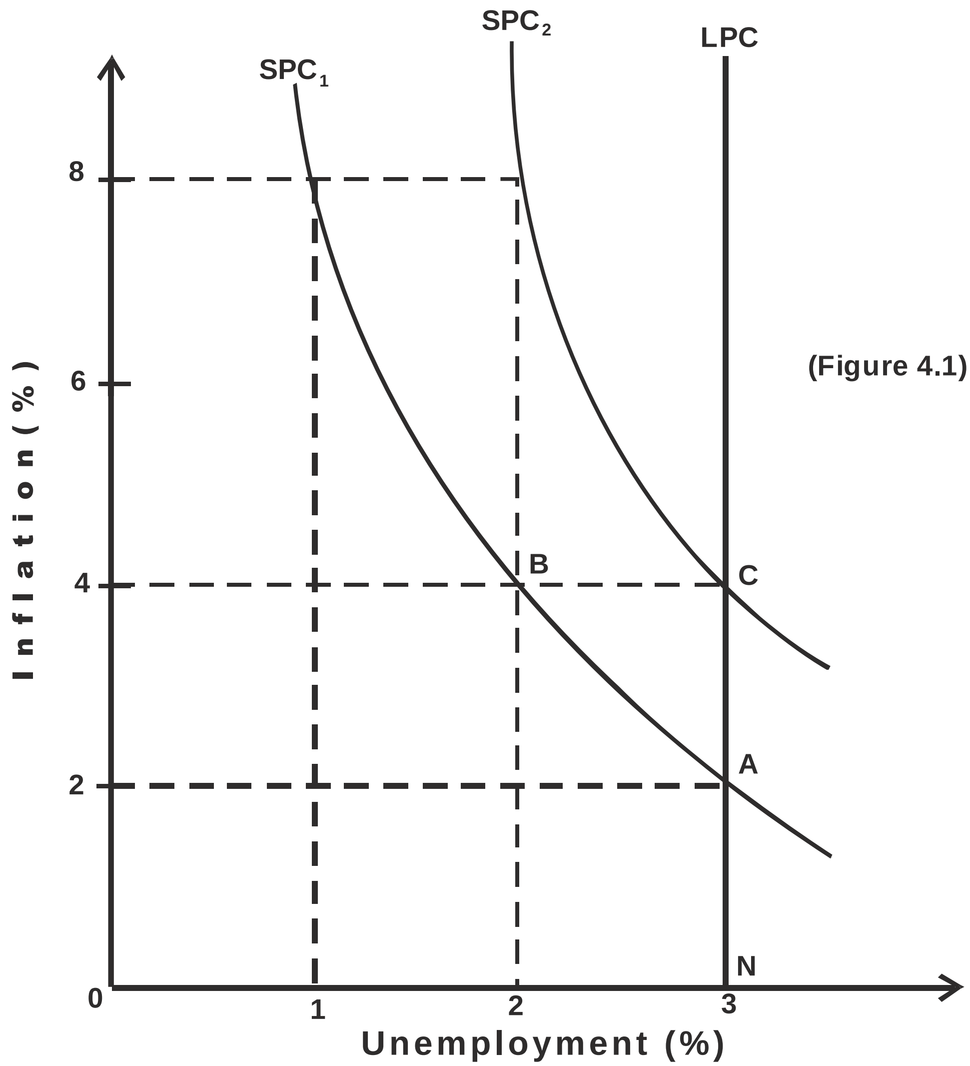


Fig 13.1

The rational expectations idea is explained diagrammatically in figure 13.1 in relation to the Philips curve. Suppose the unemployment rate is 3% in the economy and the inflation rate is 2%. We start at point ‘A’ on the SPC1 curve in order to reduce unemployment; the government increases the rate of money supply so as to stimulate the economy, prices start rising according to the Ratex hypothesis. Firms have better information about prices in there own industry that about the general level of prices. They mistakenly think that the increase in price is due to the increase in the demand for their products. As a result, they employ more workers in order to increase output. In this way, they reduce unemployment. The workers also mistake the rise in prices as related to their own industry. But wages rise as the demand for labour increases and workers think that the increase in money wages is an increase in real wages. Thus the economy moves upward on the short- run Philips curve SPC1, from point ‘A’ to ‘B’. But soon workers and firms find that the increase in prices and wages is prevalent in most industries. Firms find that their costs have increased. Workers realise that their real wages have fallen due to rise in the inflation rate to 4% and thy press for increase in wages. Thus the economy finds itself at the higher inflation rate due to government's monetary policy. As result, it moves from point 'B' to point 'C' on the SPC2 curve where the unemployment rate s 3% which is the same before the government adopted an expansionary monetary policy.

When the government again tries to reduce unemployment by again increasing the money supply. It cannot fool workers and firms who will now watch the movements of prices and costs in the economy. If firms expect higher costs with higher prices for their products. They are not likely to increase their production, as happened in the case of the SPC1 curve. So far as workers are concerned, labour unions will demand higher wages to keep pace with prices moving up in the economy. When the government continues an expansionary monetary (or fiscal) policy, firms and workers get accustomed to it. They build their experience into their expectations. So when the government again adopts such a policy, firms raise prices of their products to nullify the expected inflation so that there is no effect on production and employment. Similarly, workers demand higher wages in expectation of inflation and firms do not offer more jobs. In other word, firms and workers build expectations in to their price policies and wage agreements so that there is no possibility for the actual rate of unemployment to differ from the natural rate even during the short-run.

13.4.2 ITS POLICY IMPLICATIONS

The Ratex hypothesis assumes that people have all the relevant information of the economic variables. Any discrepancy between the actual rate of inflation and the expected rate is only in the nature of the random error. When people act rationally, they know that past increases in prices and the rate of change in prices have invariably been accompanied by equal proportional changes in the quantity of money. When people act on this knowledge, it leads to the conclusion that there is no trade-off between inflation and unemployment either in the short-run. It implies that monetary (or fiscal) policy is unable to change the difference between the actual and natural rate of unemployment. This means that the economy can only be to the left or right of point N of the long-run Philips curve LPC (in figure4.1) in a random manner. Thus the implication is that stabilisation policy is ineffective and should be abandoned.

13.5 STABILISATION POLICY AND RATEX HYPOTHESIS

According to the Ratex hypothesis, monetary and fiscal (stabilisation) policies are ineffective even in the short-run because it is not possible to anticipate accurately how expectations are formed during the short-run. This is called “policy impotence”. The Ratex hypothesis is based on the assumption that consumers and firms have accurate information about future economic events. Their expectations are rational because they take into account all available information, especially about expected government actions. If the government is following any consistent monetary or fiscal policy, people who know about it and adjust their plans accordingly, so when the government adopts the expected policy measure, it will not be effective because it has been anticipated by the people who have is ineffective. Another important assumption is that all markets are fully competitive and prices and wages are completely flexible.

Let us first take fiscal policy. The Keynesians advocated an “activist” fiscal policy to reduce unemployment. But according to the Ratex hypothesis, a tax cut and/or increase in government spending will reduce unemployment only if it’s short-run effects on the economy are unexpected (or unanticipated) by people. In other words, an expansionary fiscal policy may have short-term effects on reducing unemployment provided people do not anticipate that prices will rise. But when the government persists with such a policy, people expect the rate of inflation to rise. So the workers will press for higher wages in anticipation of more inflation in the future and firms will raise the prices of their products in anticipation of the rise in future costs. As result, fiscal policy will become ineffective in the short-run. It may cause more unemployment and inflation in the long-run when the government tries to control inflation.

Similarly, if the government adopts an expansionary monetary policy by increasing the money supply to reduce unemployment, it is also ineffective in the short-run. Such a policy may reduce unemployment in the short-run provided its effects on the economy are unanticipated. But when the government persists with such an expansionary monetary policy, people expect the inflation rate to rise. Firms raise the prices of their products to overcome the anticipated inflation so that there is no effect on production. Similarly, workers press for higher wages in anticipation of inflation and firms do not employ more workers. So there is no effect on employment.

Thus the Ratex hypothesis suggests that expansionary fiscal and monetary policies will have a temporary effect on unemployment and if continued may cause more inflation and unemployment. For each policies to be successful, they must be unanticipated by the people. Once people anticipate these policies and make adjustments towards them the economy reverts back to the natural rate of unemployment. Thus for expansionary fiscal andmonetary policies to have an impact on unemployment in the short-run, the government must be able contiunes to persist with suh policies, they become ineffective to fool the people. But it is unlikely to happen all the time. If the government because people cannot fooled for long and they anticipate their effects on production and unemployment. Thus fiscal and monetary policies become ineffective in the short run. According to the advocates of the Ratex hypothesis, inflation can be controlled without causing widespread unemployment, if the government announces fiscal and monetary measures and convinces the people about it and do not take them by surprise.

13.5.1 ITS CRITICSM

The Ratex hypothesis has been criticised by economists on the following grounds:

The assumption of rational expectations is unrealistic. The critics agree that large firms may be able to forecasts accurately, but a small firm or the average worker will not.

Further, it costs much to collect, distil and disseminate information. So the market for information is not perfect. Therefore, majority of economic agents cannot act on the basis of rational expectations. The critics also point on that the information available to the government differs from that available to firms and workers. Consequently, expectations of the latter about the expected rate of inflation need not necessary diverse from the actual rate only by the error. But the government can accurately forecast about the difference between the expected inflation rate and actual rate on the basis of information available with it.

Again, even if both individuals and government have equal access to information, there is no guarantee that their expectations will be rational. Critics point out that prices and wages are not flexible. Economists like Phillips Taylor and Fischer have demonstrated that if wages and price are rigid monetary or fiscal policy becomes effective in the short-run. The rigidity of wage rates imply that they adjust to market forces two or three years at a time. Similarly, the expected price level at the beginning of the period is expected to hold till the end of the period, thus even if expectations are rational, monetary or fiscal policy can influence production and employment in the short-run.

Gordon rejects the logic of the Ratex hypothesis entirely. He assigns two reasons for this: first, individuals do not know enough about the structure of the economy to estimate the market clearing price level and stick with adaptive expectations and second, if individuals gradually learn about the structure of the economic system by a least squares learning method, rational expectations closely approximate to adaptive expectations.

It is generally said that according to the Ratex hypothesis the government is impotent in the economic sphere. But the Ratex economists do not claim thus rather, they believe that government has a tremendous influence on economic policies.

13.6 KEYNESIAN THEORY AND THE NEW CLASSICAL (LUCAS) CRITIQUE

Keynesian Theory: The Keynesian economists such as Toblin and Franco Modigliance point out that for ensuring macroeconomics stability in a market economy the government should pursue active demand management policy. On the other hand Lucas and other new classical economists believe that real variables such as output and employment cannot be stabilised by management of aggregate demand through, the activist monetary and fiscal policies. This is because they show that the values of such real variable cannot be affected in both the short-run and long-run by any systematic aggregate demand management policies.

To understand, the new classical critique of the Keynesian macroeconomic model, it will be useful to review in brief the Keynesian analysis of relationship between aggregate demand on the one hand, and output and employment on the other. This is illustrated in figure 4.2 (a) where in left-hand panel (a) we show the equilibrium in the product market and in the right hand panel (b) we show the labour market equilibrium LAS is long-run aggregate supply curve drawn at potential output level y^0 at which only natural rate of unemployment exists, pe0 is the expected price level which, according to the Keynesian mode, is based on the price level prevailing in the previous period.

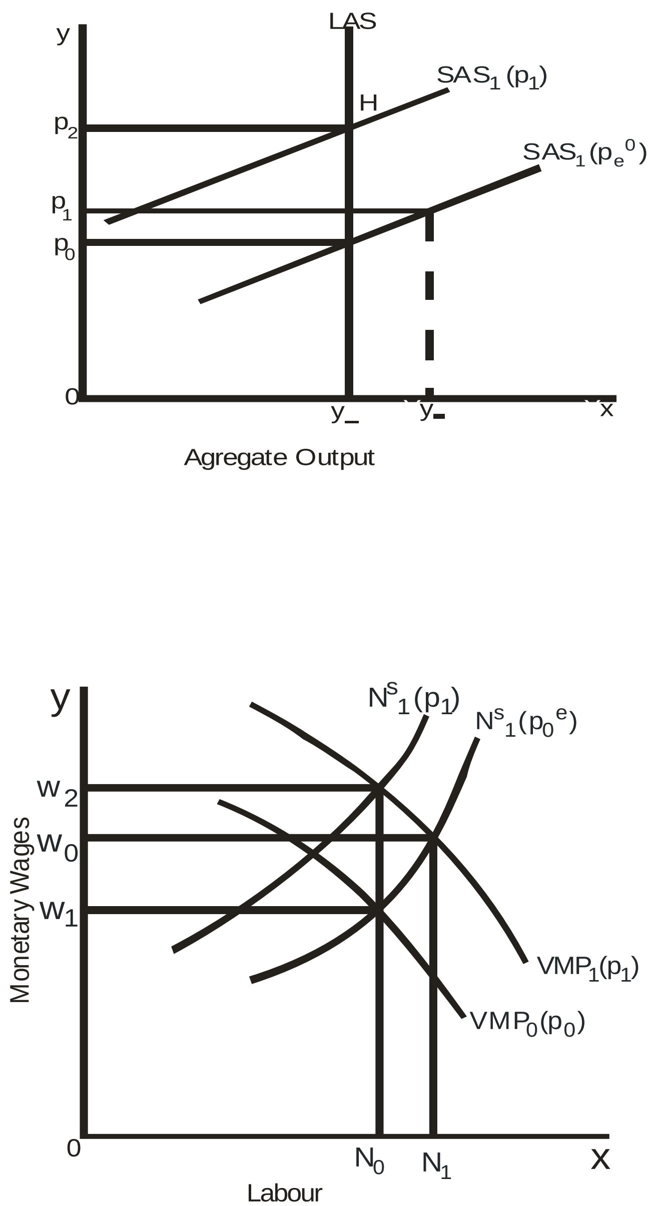


Fig.13.2 The Keynesian Model: short-run & long-run effect of increase in aggregate demand.

The people expect that this past period price level will continue to prevail in the current period. The short-run aggregate supply curve based on this expected price level (P_0^e) is SAS_0 which passes through the long-run aggregate supply curve at the level of this expected price level P_0^e. With the given aggregate demand curve AD_0, the macroeconomic equilibrium is at point E_0 corresponding to potential aggregate output y^0 (i.e. at natural rate of unemployment). It is important to note that expected price level (P_0^e) remains constant during the short-run and therefore the corresponding short-run aggregate supply curve SAS_0 remains fixed in the short-run. In the left-hand panel (b) of figure 4.2 the VMP0 is the curve of the value of marginal product of the labour which represents the demand curve for labour (note the $VMP_0 = MPP_N \times P_0^e$ where MPP_N is marginal physical product of labour). Given the expected price level P_0^e, the labour supply curve is N_0^e which is sloping upward. The given labour supply function is written as:

$$N_0^s = f\left(\frac{W}{P_0^e}\right)$$

Where N^s is the supply of labour, w is the money wage rate and P_0^e is the expected price level and $\frac{W}{P_0^e}$ is therefore the expected real wage rate. Labour market is in equilibrium at wage rate w_0 so that real wage determined is $\frac{W}{P_0^e}$.

Now suppose that aggregate demand increases, say as a result of increase in money supply, causing a shift in the aggregate demand curve to AD_1(see panel (a) of fig. 4.2). Since short-run equilibrium is at E_1 at which new higher price of output P_1 is determined with rise in price of product from P_0^e to P_1 in the short-run and consequently lowering of the real wage rate $\frac{W_0}{P_1} \langle \frac{W_0}{P_0^e}$, demand curve for labour shifts to VMP_1 with short-run supply curve of labour remaining the same at $N_0{}^s$, the labour employment increases to N_1 and money wage rate rises W_1. It must be remembered that in the Keynesian model the worker's short-run supply of labour is governed by the past price level P_0^e, which they expect will continue to prevail in the short-run whatever the current changes in the price level.

It is evident from figure 4.2 that as result of increase in aggregate demand brought about by increase in money supply, both output ad employment increase to Y_1 and N_1 respectively in the short-run, that is, above their long-run equilibrium levels Y_0 and N_0. According to the Keynesian model (and this applies to monetarist model as well), output and employment levels will continue to remain above the long-run equilibrium levels until the workers perceive correctly the rise in price level of output that has been brought about by expansionary monetary policy. When in the long-run the workers perceive that price level of output has risen from P_0^e to P_1 as a result of expansionary monetary policy, they will demand higher wages which will cause a shift in their labour supply curve to the left to N^s_1 and together with the new higher labour demand curve VMP_1 will determine a higher wage rate. Thus, in the long-run, according to the Keynesian theory, this will cause a shift in the aggregate supply curve SAS to the left and this process of leftward shift in labour supply curve will continue until new long-run equilibrium in the product market at H is established at which original output and employment levels are restored [see panel (a) of fig. 13.2].

13.7 LUCAS CRITIQUE

The new classical economists, Lucas and other do not agree with the Keynesian and monetarist analysis that the workers from their expectations of current prices level and the inflation rate on the basis of past behaviour of price level. They question the Keynesian and monetarist view that there is slow adjustment of price expectations and for analysis of the effects of a policy. These expectations argue that such formulation of expectation formation is quite simplistic and naïve. The firms and workers cannot continue to form expectations on the basis of the past behaviour of prices resulting from changes in policy when they are proved to be systematically wrong. Therefore, according to them, as explained above, people quickly form and revise their expectations using all available information and intelligently predict the changes in prices and form their expectations on that basis.

Thus, if expectations are rational, private economic agents use all information to predict the price level following the adoption of expansionary monetary policy. If the expectations are rational, then the policy change by the government will be anticipated by the people. Firstly either the government has announced the policy change for the people may anticipate the change because the policy maker, the central government or bank, is known to respond in a certain systematic way.

For understanding of new classical (Lucas) model of rational expectations, it is necessary to explain Lucas aggregate supply function and aggregate demand function.

13.8 THE NEW CLASSICAL (LUCAS) RATIONAL EXPECTATIONS MODEL

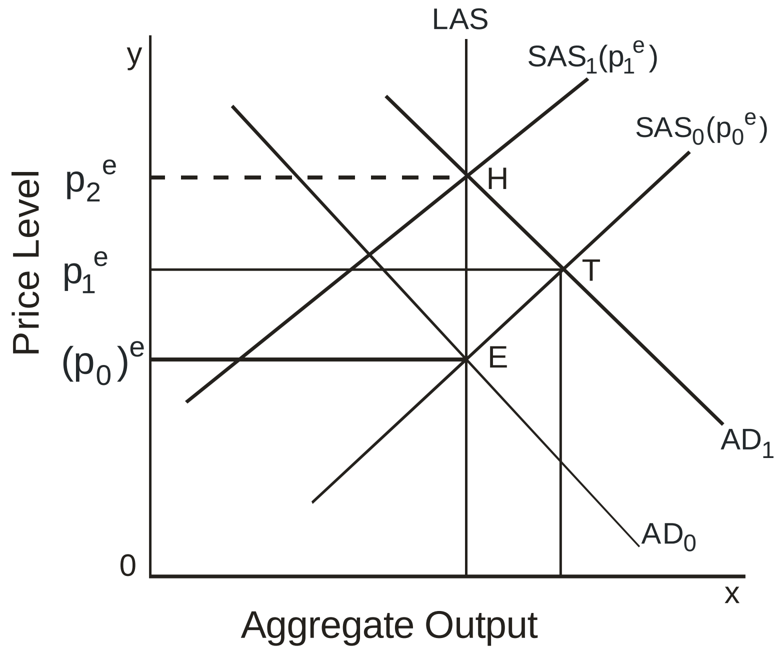
In view of rational expectations by the people, the new classical economists modify the effects of a policy change, say of expansionary monetary policy, explained by Keynesian and monetarists models as illustrated in fig. 4.1(a). the crucial departure that the new classical economists make from Keynesian and monetarists rests on the variables that determine position of labour supply curve and the aggregate supply curve of output. It is therefore important to mention on what factors these curves depend. As in the Keynesian theory, in rational expectations model also labour supply curve depends on the expected real wage rate. Thus,

$$N^s = f\left(\frac{W}{P^e}\right)$$

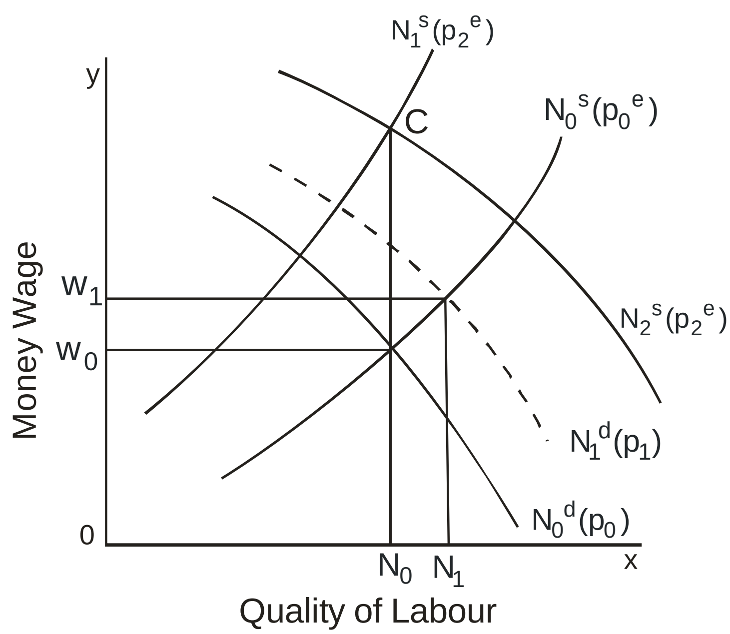
Thus, the position of labour supply curve N^s and therefore short-run aggregate supply curve of output depends on the expected price level, P^s. The increase in the expected price level will lower the real wage rate leading to the demand for higher money wages which will cause a shift in the labour supply curve and the aggregate supply curve of output to the left.

In the rational expectations model, expected price level depends on the expected levels of the variables within the model that actually determine the price level which becomes the expected price level by the workers and supplies of output. These price determining variables on the demand side are the expected level of money supply (M^e), government expenditure (g^e), tax collected (t^e) and the amount of autonomous investment (I^e). On the supply side, oil prices custom duties, excise duties, prices of raw materials and capital goods are important factors determining price level of output. In this new classical model the position of labour supply curve and aggregate supply curve of output depends on the expected values of these policy variables such as M^e, g^e, I^e which determine the price level.

Let us describe how the rational expectations model explains the effect of a fully anticipated expansion in money supply, say from M_0 to M_1.



Panel(a) Product Market



Panel(b) Product Market

Fig 13.3 Rational Expectations Model: The Effect of Expansionary Monetary Policy

Consider fig 4.3 where to begin with AD_0 is the aggregate demand curve which is determined by the given money supply M_0, government expenditure g_0, tax collection to and autonomous investment I_0. SAS_0 is the aggregate supply curve which depends on price level which is determined by money supply (M_0) with the increase in money supply from M_0 to M_1, other determining variables remaining the same, aggregate demand curve shifts to AD_1. As a result, price level rises to P_1^e, short-run aggregate supply curves remaining the same level SAS_0. With the rise in price level to P^e, labour demand curve shifts to N_1^d which intersects the labour supply curve $N^s{}_0$ at point B and determining wage rate w_1 and as a result labour employment increases to N_1. In the Keynesian model where the expected price level is ununueleated to the current period or level of policy variables and there fore aggregate supply curve and labour curve remains fixed in the short-run, the analysis ends here so far as the short-run period is lonwrned.

However, in the rational expectations model, the positions of aggregate supply and labour supply curve do not remain fixed in the short-run. This is because in the rational expectations model of adoption of expansionary policies are fully anticipated in response to the situation of recession or rise in unemployment that may emerge. As a result, it is anticipated by the public that money supply would be increased resulting in rise in their expected price level to P_1^e. This is because with rational expectations, the worker who supply their labour services fully know that increase in money supply will cause the rise in price level to P_1^e. The rise in the expected price level will cause workers to demand more money wages and will therefore result in leftward shift in the labour supply curve to N_1^s (P_1^e) and leftward shift in the aggregate supply curve of output to the new position SAS_1 (P_1^e) as show in fig 4.3. it will be seen from panel (a) that the new short-run aggregate supply curve SAS_1 intersects the new aggregate demand curve AD_1 at point H and determines a higher price P_2^e.

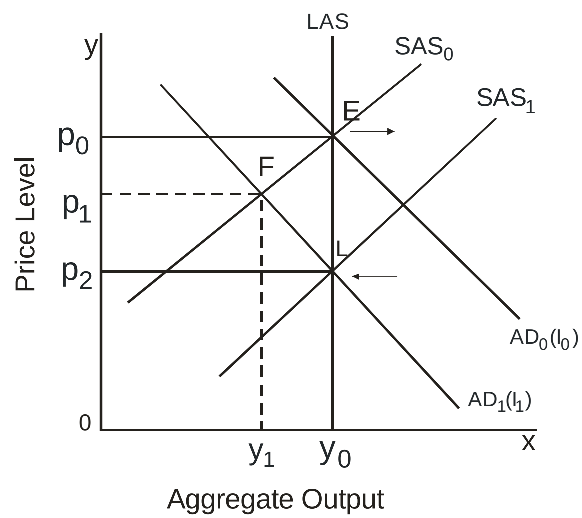
With the rise in price level to (P_2^e), the labour demand curve will further shift to the left to the new position N_2^d (P_2^e). With these change, the equilibrium in the labour market and product market will be established where the output and labour employment are restored to their original levels, namely: N_0 and Y_0 respectively. Wage rate rises to the same extent as the rise in price level. Thus, in rational expectations model it is only price level and money wage rate rise permanently while output and employment remain the same. It is important to note that with rational expectations the original levels of output and employment are restored in the short-run itself and there is no time lag in the adjustment process because workers correctly perceive the change in price level as the money supply in increased by the policy maker.

13.9 POLICY IMPLICATIONS OF NEW CLASSICAL APPROACH: Ineffectiveness of Economic Policy

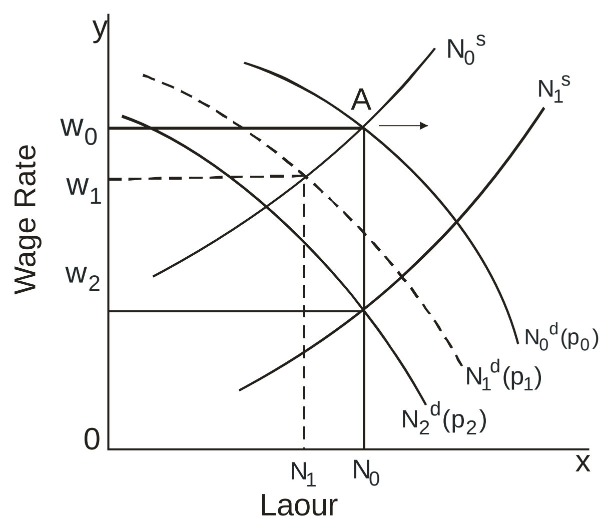
Since despite the adoption of expansionary monetary policy, in rational expectational model the real variable output and employment remain unaffected, this model leads to the conclusion of ineffectiveness (or irrelevance) of economic policy. Emphasising this conclusion of the new classical theory of rational expectations Richard Freoyen write "if expectations are formed rationally, anticipated aggregate demand policy actions will not affect real output or employment, even in the short-run. Notice that, because the public will learn any systematic "rules" of policy action such as hypothetical response of the money stock to unemployment…..any such set of systematic policy actions will come to be anticipated and will not affect the behaviour of output or employment. The values of real variables such as output and employment will be insensitive to systematic changes in aggregate demand management policies". The new classical economists regard the discretionary demand management policies, both monetary fiscal, to achieve economic stability as ineffective or irrelevant in view of rational expectations by labour suppliers and other economic agents. This is because the new classical economists believe that with rational expectations workers do not make systematic mistakes in their price predictions. In the rational expectations not only policy action by the government (or the central bank in case of monetary policy) but also the price effects of that policy are correctly predicted. As a result, they immediately respond to their anticipated or expected price and this renders the economic policy ineffective in having any influence on the level of output and employment.

To show further the ineffectiveness of policy aimed at stabilising output and employment we consider Keynesian policy prescription of adopting expansionary fiscal or monetary policy to offset the decline in private autonomous investment demand so as to stabilise output and employment.

The new classical view of the effects of decline in private investment demand is illustrated in fig.4.4 to start with in the panel (a)



(a) Product Market



(b) Market Labour

Fig 13.4 Rational expectations mode, irrelevance of expansionary fiscal policy to offset decline in private investment demand.

Panel (a) showing the product market the aggregate demand curve with private investment demand equal to I_0 is AD_0 and aggregate supply curve is SAS_0. The intersection of aggregate demand curve AD_0 and short-run aggregate supply curve SAS_0 determine equilibrium price level P_0 and output Y_0 corresponding to this situation in the product market the demand curve of labour is N_0^d, given the price level P_0 determined in the product market and N_0^s is the supply curve of labour. The supply curve of labour N_0^s and demand curve of labour N_0^d determine wage rate equal to W_0.

Now suppose the private autonomous investment decline say from I_0 to I_1 and cause leftward shift in the aggregate demand curves from AD_0 to AD_1 (in the brackets I_0 & I_1,are given to show the aggregate demand curves corresponding to them) with the new aggregate demand curve AD_1 and the given aggregate short-run supply curve SAS_0 the price level falls to P_1 and output fall to Y_1 with the fall in price, demand curve of labour shifts downward to the new position N_1^d (rember the labour demand curve represents the curve of value of marginal product of labour (VMP_N) where av is given by $MPP_N \times$ price of output). Therefore, with fll in price level labour demand curve shifts downward to N_1^d as $P_1 \langle P_0$. With this new labour demand curve N_1^d and the initial given supply curve of labour N_0^s, the wage rate falls to W_1 and employment falls to N_1. Thus, in the short-run equilibrium with the fall in money wage rate and price level of output, employment and output have declined to N_1 and Y_1 respectively. These effects in the new classical theory are the final ones if the decline in private sector investment was unanticipated by the economic agents including this suppliers of labour. These short-run effects of unanticipated decline in private autonomous investment demand in the new classical theory are the same as we obtain from Keynesian and monetarist models. However it is important to not that the new classical model assumes that economic agents have rational expectation byt they do not have perfect information. There may be some unanticipation or surprise changes that may bring about changes in aggregate demand. The unanticipated changes in aggregated demand which ay both result of changes in fiscal an monetary policies or changes in some other factors.

But in the new classical theory with the assumption of rational assumptions we have different short-run effects in these changes in economic policies are anticipated by private economic agents. Consider fig 13.4 again if the worker had anticipated the decline in investment demand they with rational expectations would have also predicted the fall in price level to P_1 as a result of this. The workers expecting the prices level to fall to P_1, would supply more labour as their real wages rise with the fall in price level to P_1, money wages remaining at W_0, as a result, supply curve of labour shifts to the right to N_1^s indicating more labour will be supplied. With this rightward shift in labour supply curve, short-run aggregated supply curve of output will also shift to the right to new position SAS_1 in panel A of fig 4.4. This new aggregated supply curve SAS_1 together with the new aggregate demand curve AD_1 determine price P_2 and the original output Y_0. It will be seen from panel (b) that with price level equal to P_2 labour demand curve shifts further to the left to the new position N_2^d which together with labour supply curve N_1^s determine wage rate w_2 and employment N_0 which represent full employment of labour. Thus, in the new short-run equilibrium in case of anticipated change and with the assumption of rational assumptions, prices and wages have fallen sufficiently to restore equilibrium at the initial levels of potential output and employment, Y_0 and N_0 respectively. Therefore, like the classical economists, the new classical economists conclude that there is no need for adopting expansionary fiscal or monetary policy to offset the decline in private investment demand for stabilisation of output and employment. According to the new classical economists with their assumption of rational expectations the economy is self-stabilising with respect to change in demand shocks such as decline in private investment. This shows irrelevance of activist economic policies to stabilise the economy.

13.10 RATIONAL EXPECTATION AND BUSINESS CYCLE

According to the new classical theory with its assumption of rational expectation, the economy experiences business cycles or economic fluctuations due to unanticipated changes in aggregate demand. We have seen above, that with rational expectations private economic agents such as firms and workers are able to anticipate the changes in aggregate demand and its effect on prie and wages and therefore immediately adjust so that only price level and money wages change, level of output remaining at full employment level. In the new classical theory, as seen above, if there is unanticipated increase in aggregate demand, price level will rise in the short-run resulting in increase aggregate output and employment.

On the other hand, if decrease in aggregate demand occurs and it is not anticipated by the firms and workers, the price level will fall causing increase in real wages. As a result, labour employment and aggregate output will fall. Thus, in the new classical theory it is only unanticipated fluctuation in aggregate demand that are not taken into account in wage agreements cause changes in aggregate output and employment in the economy.

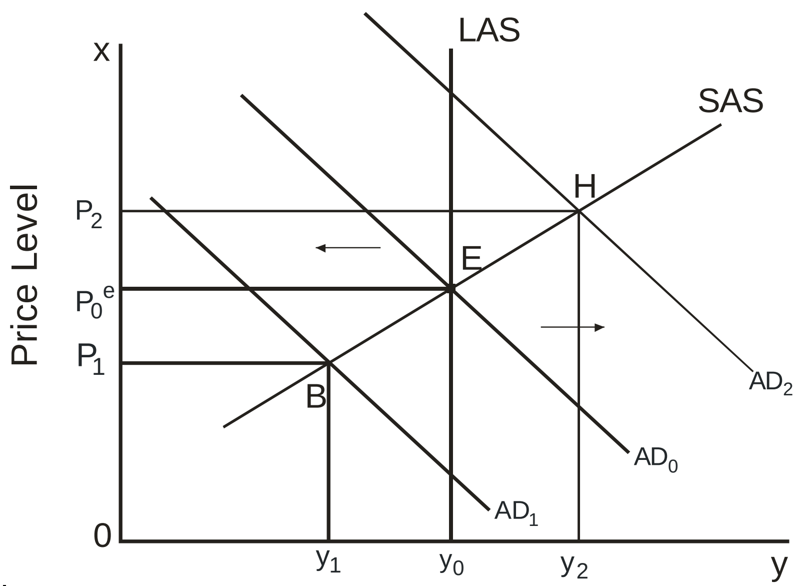


Fig. 13.5, in new classical theory, unanticipated changes in aggregate demand is the cause of fluctuations in output and employment.

The new classical view of business cycles is illustrated in fig 13.5 where LAS is the long turn aggregate supply curve at the potential GDP level of y^* which corresponds to the level of natural employment. To begin with, aggregate demand curve is AD_0 and with expected price level is P_0^e, SAS is the short-run aggregate supply curve. Point E represents long-run equilibrium. Suppose there is unanticipated decrease in aggregate demand which causes a shift in aggregate demand curve to the left to AD_1. As result price level falls to P_1 and output declines to Y_1. This unanticipated fall in price level, money wage rate remaining constant, will cause real wage rate to rise and as a result employment will fall and unemployment will rise above the natural level, that is cyclical unemployment will emerge.

Now suppose that there is increase in unanticipated aggregate demand, so that aggregate demand curve shifts from AD_0 to AD_2. As result, price level rises to P_2 and aggregate output increases to Y_2. With this unanticipated or unexpected rise in price level, money wage rate remaining constant, unchanged real wage will fall inducing the firms to employ more labour. This increase in employment will lead to fall in unemployment below the natural level.

It therefore follows from above those only changes in aggregate demand that are unanticipated and are therefore not taken in to account in money wage contracts cause fluctuations in output and employment. On the contrary, anticipated changes in aggregate demand bring about appropriate changes in price level and money wages, leaving aggregate output and employment unchanged and therefore do not cause business cycles.

13.11 MANKIW'S NEW KEYNESIAN MODEL

In the traditional Keynesian model it was assumed that perfect competition prevailed in the product market. In Mankiw's model, as in other Keynesian models, it is maintained that a firm must not be working perfect competition. This is because under perfect competition in the product market, prices are determined by demand for & supply of a product, on individual firm has no control over the price of a product. A perfectly competitive firm can sell all it ca produce at the prevailing price. Now, suppose price as determined by demand for and supply of the product under perfect competition falls from Rs.100 to Rs.80 per unit. Now, if the firm does not reduce its price and goes on changing price of rs.100, its sales would fall to zero. Therefore a perfectly competitive firm will lower the price if it has to produce the product. Thus under perfect competition there is no scope for stickiness of prices.

On the other hand, Mankiw and other new Keynesian economists explain that under imperfect competition (monopolistic competition or oligopoly) in the product market, the firms are likely t keep their prices constant (i.e., sticky) when there is aggregate demand. Under imperfect competition demand curve for a firm's product is downward-sloping. If in the face of a fall in aggregate day, say due to the contraction of money supply in the economy, an imperfectly competitive firms does not adjust or lower its price, it will loose some consumers but not all of there. For example, when aggregate demand decreases and as a result demand for Maruti cars decreases. The Maruti car company can continue to sell cars at the previous high prices and may not low its prices, that is, price may remain sticky in the face of decrease in demand. Elaborating on this point Richard Froyen writes-"Monopolistic competitors and oligopolies have some control over the price of their products. In fact, the incentive to lower prices may be fairly weak for those types of firms if they hold to their initial price when demand falls, they will lose sales, but the sales they retain will still be at the relatively high initial price. Also, if all firms hold to the initial price, no individual firm will lose sales".

However, it may be noted that when the demand for a product decreases, a firm gains or benefits from lowering price even under conditions of imperfect competition. Due to downward sloping demand curve facing an imperfectly competitive firm the reduction of price by it will cause the quantity demanded of its product will increase and as a result, there may be some gain in profits. So the question arises why then the firm does not lower price when there is decline in aggregate demand?

Menu Cost: according to Mankiw and other new Keynesian economists one reason why the firms do not change or adjust prices when demand for their products changes is that they have to incur costs for making adjustment in prices. To change prices, a firm has to print a new catalogue and send it to its customer, distribute new price list among its sales staff. Such costs of making price adjustments are called Menu Costs. This term originates from the practice of restaurants when charge prices, they print new menus and incur cost on it.

Mankiw and other new Keynesian economists argue that the firm will change prices only when gains or benefits changing price out weights costs. However, some economists are sceptical of this new Keynesian view point. They have pointed out that menu costs are quite small and therefore they cannot explain stickiness of price in the face of decrease in aggregate demand. They question as to how small menu costs explain recession which result from price stickiness and prove very costly for the society. But Mankiw has argued that "small does not mean inconsequential; even though menu costs are small, they can have large effects on the economy as a whole".

In defence of his viewpoint. Mankiw points to the aggregate demand externality. He emphasises that there are beneficial externalities to price adjustment by one firm that must be recognised. According to this beneficial externality effect, a price reduction by a firm will benefit other firms. If a firm which is initially charging a high price, reduce its price it will result in slightly lower average price level that will lead to the expansion in aggregate income by causing a rightward shift in LM curve. This expansion in aggregate income will benefit other firms through its effect on the demands for their products. Therefore, this has been called aggregate demand externality. But, according to Mankiw, since this beneficial effect is external to the firms, they ignore it in their decision making about charging of price for their products. To quote Mankiw, “the firm makes decision by comparing the benefit of a price cut higher sales & projects to the cost of price adjustment. Yet because of the aggregate demand externality, the benefits to society of the price cut would exceed the benefits to the firm ignores this externality when making its decision, so it may decide not to pay the menu cost and cut its price even though the price cut is socially desirable. Hence sticky prices may be optimal for those setting prices, even though they are undesirable for the economy as a whole”.

13.12 OTH REASONS FOR STICKY PRICES

Two other important reasons have been given for sticky prices by the new Keynesian economists. They are:

An important costs of not adjusting prices is the potential loss of consumer goodwill. Though the consumer goodwill is lost when a firm raises its price, but the cut in prices but a firm at time of recession implies that it will raise them when the economy recovers from recession. This change in relative price quite often harms the goodwill of a firm among its customer. The consumers understand the firm raising its prices when they know the costs of the firm have risen. But changing prices in response to changes in demand of the consumers is not will received by the consumers. Therefore, firms prefer to keep prices sticky.

A second possible perceived cost of cutting price at times of recession is that it may lead to higher price cuts by the rival firms or it may even lead to price war which harms every firm. This response is more relevant in case of oligopolistic markets where rival firms keep their eyes on the pricing decisions of their rival firms.

If the above costs of price adjustments are high enough, there will be price stickiness. If prices do not adjust in response is more relevant to changes in aggregate demand, the fluctuations in demand cause business cycles, that is, recessions and booms in the economy.

13.13 MANKIW'S NEW KEYNESIAN MODEL IN MATHEMATICAL FORM

Let us present the new Keynesian model in mathematical forms. We assume that an economy consists of many firms each having some monopoly power (note that firms working under monopoly competition and oligopoly enjoy some monopoly power over its product). Let Y_1 represents demand facing each firm, P_i is the relative price of the product of a firm to the overall price level (P) and Y is the aggregate demand for the product. The demand function for each firm's product can be written as

$$Y_i = \left(\frac{P_i}{P}\right)^{-e} Y_{e\rangle 1} \qquad ....(1)$$

The above equation (1) shows that demand for a firm's product depends on its relative prices $\left(\frac{P_i}{P}\right)$, price elasticity of demand (e) and aggregate demand (y).

To simplify the model Mankiw assumes that real aggregate demand (y) is determined by the real money supply, that is, $Y = \frac{M}{P}$. Substituting $\frac{M}{P}$ for Y is equation (1) we have

$$Y_1 = \left(\frac{P_i}{P}\right)^{-e} \cdot \frac{M}{P} \qquad .....(2)$$

The equation (2) tells us that demand facing a firm depends on its relative price to the overall price $\left(\frac{P_1}{P}\right)$ and real money supply $\left(\frac{M}{P}\right)$

which determines aggregate demand. Besides, the relative price of a firm determines its relative position on the given aggregate demand for the product.

An imperfectly competitive firm will set its price by adding a mark up over marginal cost. Thus

$$P_i = \frac{e}{e-1}\frac{W}{MP_L} \qquad \text{.....(3)}$$

Where, $\frac{e}{e-1}$ is mark up and $\frac{W}{MP_L}$ is marginal cost. A firm's profits which we denote by π can be obtained by multiplying the difference between price and marginal cost multiplied by the amount of output demanded and sold. Thus,

$$\text{Profit } \pi = \left(P_i - \frac{M}{MP_L}\right)Y_i \qquad \text{.....(4)}$$

Now, suppose the nominal money supply decreases which results in decrease in aggregate demand, with price P_i remaining unchanged in terms of equation (2) with the fall in M, demand for output of each firm, Y_i will decline which will result in recession, price of each firm remaining unchanged.

To maintain output in the face of a fall in demand requires reduction in prices by the firms. Reduction in price by a firm facing downward-sloping downward demand curve will lead to more sales and profits. However, according Mankiw, price adjustment by a firm would yield only second order gain and even small menu costs exceed it. Therefore, firms will not adjust (i.e. cut) prices. As a result, average price level will not get adjusted to the new reduced demand conditions for output, the recession will occur in the economy with reduced output (Y_i) of the firm, the profits as measured by equation (4) will fall.

It may be noted that Mankiw explains that as compared to menu costs of price adjustment, potential gain from price cutting will be very small, that is, of second order under the following two conditions.

1) If the difference between the existing price and profit maximising (i.e. optimal) price is small, the potential gain of making price adjustment is very small.

2) If price elasticity of demand for firm's product is low, the increase in profit is less sensitive to adjusting price to the exactly new profit maximising level.

It may be stressed again that firms do not adjust prices in the face of changes in demand because in their price making decisions they do not take into account the external demand benefits of adjusting their prices. As a result, overall price level (P) and the relative prices of the firms remain unchanged. The fall in aggregate demand therefore results in reduction in output i.e. recession.

13.14 PRICE ADJUSTMENT AND COORDINATION FAILURES

Some new Keynesian economists including Gregory Mankiw think the not adjusting prices in the face of a fall in aggregate demand results in recession. In recession, levels of output and employment are low, a number of factories do not work or below their capacity. This is socially undesirable happening. If a society fails to attain its potential GDP and full employment that is socially desirable, then it follows that the members of a society have failed to coordinate among them in some way. The coordination problem is relevant to the explanation of stickiness of prices of the firms setting their prices firms anticipate what prices other firms will be setting. But they take these decisions uncertainly about what prices the other firms will charge.

To see how price stickiness and therefore recession occurs due to failures of coordination when aggregate demand decreases we consider that the economy consists of two firms A and B and therefore we have a market situation of oligopoly. With the decrease in aggregate demand (say as a result of fall in money supply) each firm has to decide whether it should cut its price to achieve profit maximising state or keep its price at the existing high level. It is important to note that each firm's profits depend on not only its own price decision but also the pricing decision of the other.

In the following table we give payoff matrix of the tow firms of various possible combinations of pricing decisions of the two firms:

Pay off Matrix

Firm B (in crores)

Cut Price Firm A Kiping Price high	Cut Price	Kiping Price high
	Firms A's Profits : 50 Firms B's Profits : 50	Firms A's Profits : 10 Firms B's Profits : 25
	Firms A's Profits : 25 Firms B's Profits : 10	Firms A's Profits : 20 Firms B's Profits : 20

It will be seen from the table that if both firms decide not to cut price accordingly keep their prices at the existing high level each of them will make profits of Rs20 crores (see right hand side bottom box). In this case of price stickiness the result is fall in output and employment and hence recession. On the other hand, if both of them cut their prices, each of them will get profits of Rs.50 crores. This is not only most profitable for the two firms individually but also represents a social optimum. This is because lowering of prices by both of them will result in reduction in overall price level and this will stimulate aggregate demand. The recession would therefore not occur in this case.

Further, if firms A cuts its price, while the firm B keeps its price at the existing high level, firm A's profits are Rs.10 crores while firm B's profits are Rs.25 crores (see the right hand side upper box of the table). This is because not cutting price by firm B results in recession and a result firm A's profits are smaller due to both lower output and lower price. Similarly, if firm B cut's its price but firm A keeps its price at the existing high level, firm A'a profits are Rs.25 crores and firm B's firm are Rs.10 crores (see bottom box of left side of pay off matrix table).

Although both firms would like to avoid recession, neither can achieve this by its action alone. Each firm's decision affects the profit opportunities available to the other firm. When a firm cuts its price, it benefits other due to beneficial aggregate demand externality (in the terms of improved profits) created by it . but since each firm ignores this beneficial externality and are therefore likely to land themselves in recession due to the absence of coordination between them.

Of course, if each firm expects that the other will cut its price, both will cut prices and the result will be desirable outcome not only for them individually but for the society as a whole because the cut in prices by them will cause the reduction in overall price which will enable them to avoid recession in terms of output and employment loss. On the other hand, if each firm expects that the other will keep its price at the present high level both will keep prices unchanged at the present relatively high level. Therefore, outcome in this case is recession which is not only bad for both the firms individually but also for the society as a whole. Though both outcome are possible but the new Keynsian economists generally believe the later inferior outcome, that is, not cutting all adjusting prices leading to recession is more probable because of coordination failure. Thus Gregory writes, "If the two firms could coordinate they would both cut their price and reach the preferred outcome. In the real world ….coordination is often difficult because the numbers of firms setting prices is large. The moral of the story is the prices can be sticky simply because people expect them to be sticky, even though stickiness is in to ones interest"

13.15 SUMMARY

- Expectation are forecasts by an economic agent regarding the uncertain economic variables which are relevant to his decision.
- The Keynesian economists point out that for ensuring macroeconomic stability in a market economy the government should pursue active demand management policy.
- The new classical economists put forth their views on expectations.

13.16 QUESTIONS

1. Explain the main features of new classical economics. How does the new classical model differ from the classical model?
2. What are rational expectations? How is monetary poliry neutral in the rational expectations hypothesis?
3. Explain the concept of rational expectations. How does it differ from the adaptive expectations?

❖❖❖❖

14

THE GENERIC EFFICIENCY –WAGE MODEL

Unit Structure

14.0 OBJECTIVES

After going through this unit you will be able to:

- Explain the generic efficiency – wage model
- Discuss a more general version of the generic efficiency- wage model
- Examine the Shapiro-Stiglitz model
- Learn the No-Shirking condition

14.1 INTRODUCTION

According to efficiency – wage models there is benefit as well as cost to a firm of paying a higher wage. Higher wages can increase worker's food consumption and hence productivity; worker's efforts in situations where they cannot be monitored properly; higher wages can improve worker's ability.

In this unit let us discuss the same through various models.

14.2 A GENERIC EFFICIENCY – WAGE MODEL

Potential reasons for efficiency wages.

The central assumption of efficiency- wage models is that there is a benefit as well as a cost to from of paying a higher wage. There are many reasons that this could be the case. Here we describe four of the most important (see fallen, 1984, & karts 1986 for surveys and references).

First and most simply, a higher wage can increase workers food consumption, and thereby cause them to be better nourished and more productive. Obviously this possibility is not important in developed economies. Nevertheless, it provides a concrete example of an advantage of paying a higher wage. For that reason, it is often a useful reference point.

Second, a higher wage ca increase workers effort in situations where the firm cannot monitor them perfectly. In a walrasian labour market, workers are indifferent about losing their jobs, since identical jobs are immediately available. Thus if the only way that firms can punish workers who exert low effort is by living them, workers in such a labour market have no incentive to exert effort. But if a firm pays more than the market clearing wage, its jobs are valuable. Thus its workers many choose to exert effort even if there is some chance they will not be caught if they do not. This idea is developed in section 14.4.

Third, paying a higher wage can improve workers ability along dimensions the firm cannot observe. Specifically, if higher ability workers have higher raises the average ability of the workers the firm hires.

Finally, a high wage can build loyalty among workers, and hence induce high effort; conversely, a low wage can cause anger, and desire for revenge, and thereby lead to shirking or sabotage. Akrilof and yellon (1990) present intensive evidence that workers' effort is affected by such forces as anger, jealousy, and gratitude. For ex, they describe studies showing that workers who believe they are underpaid sometimes perform their work in ways that are harder for them in order to reduce their employer's profits.

14.3 OTHER COMPENSATION SCHEMES

This discussion implicitly assumes that firm's financial arrangements with its workers take the form of some wage per unit of time. An important question is whether there are more complicated ways for the firm to compensate its workers that allow it to obtain the benefits of a higher wage less expensively. The nutritional advantages of a higher wage, for ex- can b3eotrained by compensating workers partly in kind (such as by feeding them at work). To give another example firms can give workers an incentive to exert effort by requiring them to past a bond that they lose if they are caught shirking.

If ther are cheaper ways for firms to obtain the benefits of a higher wage, then these benefits lead not to a higher wage but just to complicated compensation policies whether the benefits can be obtained in such ways depends on the specific reason that a higher wage is advantageous. For that reason, we will not attempt a general treatment. The end of section 5.4 discusses this issue in the content of efficiency. Wage theories based on imperfect monitoring of workers' efforts. In this section and the real, however, we simply assume that compensation takes the form of a conventional wage and investigate the effects of efficiency wage under this assumption.

ASSUMPTIONS

We now turn to a model of efficiency wages. There is large number, N, of identical competitive firms. The representative firm seeks to maximize its real profits which are give by

$$\pi = y - wL \quad \_\_\_\_\_\_\_\_\_\_ \qquad (14.1)$$

Where y is the firm's output, w is the real wage that it pays, and L is the amount of labour it hires.

A firm's output depends both on the number of workers its employs and on their effort. For simplicity we neglect other inputs and assume that labour and effort enter the production function multiplicatively. Thus the representative firm's output is

$$Y = F\left(eL\right), F^{'}\left(\bullet\right) \rangle 0, F^{''}\left(\bullet\right) \langle 0, \text{\_\_\_\_\_\_\_\_\_\_} (14.2)$$

Where e denotes workers' efforts. The crucial assumption of efficiency wage models is that effort depends positively on the wage the firm pays. In this section we consider the simple case (due to Solow, 1979) where the wage is the only determinant of effort. Thus,

$$e = e(w),\ e'(\bullet) \rangle 0 \quad \text{\_\_\_\_\_\_\_\_\_\_\_\_} \qquad (14.3)$$

Finally, there are L identical workers, each of whom supplies one unit of labour in elastically.

Analysing the Model

The problem facing the representative firm is

$$\max F(e(w)L) - wL \text{ \_\_\_\_\_\_\_\_\_\_\_} \qquad (14.4)$$

If there are unemployed workers, the firm can choose the wage freely. If unemployment is zero, on the other hand, the firm must pay at least the wage paid by other firms.

When the firm is unconstrained, the first order condition for L and w are

$$F'(e(w)L)\, e(w) - w = 0, \text{ \_\_\_\_\_\_\_\_\_\_} \qquad (14.5)$$

$$F'(e(w)L)\, Le'(w) - \Lambda = 0, \text{ \_\_\_\_\_\_\_\_\_} \qquad (14.6)$$

We can rewrite (5.5) as

$$F'(e(w)L) = \frac{w}{e(w)}, \quad \underline{\hspace{3cm}} \qquad (14.7)$$

Substituting (14.7) into (14.6) and dividing by L yields

$$we'(w)$$

Equation (14.8) states that at the optimum, the elasticity of effort with respect to the wage is 1 to understand this condition, not that output is a function of the quantity of effective later, eL. The firms therefore wants to hire effective labour as cheaply as possible. When the firm hires a worker, it obtains e(w) units of effective labour at a cost of w; thus the cost per unit of effective labour is w/e(w) when the elasticity of e with respect to w is 1, a marginal change in w has no effect on this ratio; thus this is the first order condition for the problem of choosing w to minimize the cost of effective labour. The wage satisfying (14.8) is known as the efficiency wage.

Figure14.1 depicts the choice of w graphically in (w, e) space. The rays coming out from the origin are lines where the ratio of e to w is constant; the ratio is larger on the higher rays. Thus the firm wants to choose w to attain as high a ray as possible. This occurs where that e (w) functions just tangent to one of the rays that is where the elasticity of e with respect to w is 1. Panel (a) shows a case where effect is sufficiently responsive to the wage that over some range the firm prefers a higher wage. Panel (b) shows a case where the firm always prefers a lower wage.

Finally, equation (14.1) states that the firm hires worker until the marginal product of effective labour equals its cost. This is analogous to the condition in a standard labour demand problem that the firm hires labour up to the point where the marginal product equals the wage.

Equation (14.7) and (14.8) describe the behaviour of a single firm. Describing the economy wide equilibrium is straight forward. Let w^* and L^* denote the values of w and L that satisfy (14.7) and (14.8). since firms are identical, each firm chooses these same values of w and L. total labour demand is therefore NL^* if labour supply, $\bar{L}$, exceeds this amount, firms are unconstrained in their choice of w. In this case the wage is w^*, employment is NL^*, and there is unemployment of amount $\bar{L} - NL^*$. If NL^* exceeds $\bar{L}$, on the other hand, firms are constrained. In this case, the wage is bid up to the point where demand and supply are in balance, and there is no unemployment.

IMPLICATIONS:

This model shows how efficiency wages can give rise to unemployment. In addition, the model implies that the real wage is unresponsive to demand shifts. Suppose the demand for labour increases. Since the efficiency wage w^*, is determined entirely by the properties of the effort function, $e(\bullet)$, there is no reason for firms to adjust their wages.

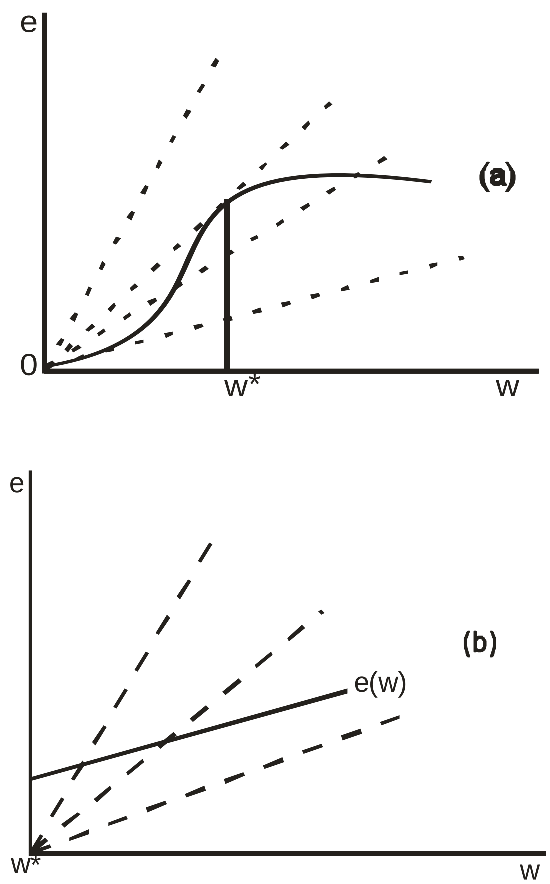


Fig. 14.1.The determination of the efficiency wage.

Unfortunately, these results are less promising that they may appear. The difficulty is that they apply not just to the short run but to the long run the mode implies that…

No clear trend in unemployment over extended periods. In other words, the basic fact about the labour market that we had to understand is not just that shifts in labour demand appear to have little impact on the real wage and fall almost entirely on employment in the short run; it is also that they fall almost entirely on the real wage in the long run. Our model does not explain this pattern.

14.4 A MORE GENERAL VERSION

Introduction

With many of the potential sources of efficiency wages, the wage is unlikely to be the only determinant of effort. Suppose, for ex that the wage affects effort because firms cannot monitor workers perfectly and workers are concerned about the possibility of losing their jobs if the firm catches them shirking. In such a situation, the cost to a worker of being fixed depends not just on the wage the job pays, but also on how easy it is to obtain other jobs and on the wages those jobs pay. Thus workers are likely to exert more effort at a given wage when unemployment is higher, and to exert less effort when the wage paid by other firms is higher. Similar argument apply to situations where the wage affects effort because of unobscrued ability or feelings of gratitude or a anger.

Thus a natural generalisation of the effort function (14.3), is

$$e = e(w, wa, u), \quad e_1(\bullet) \rangle 0, \quad e_2(\bullet) \langle 0, \quad e_3(\bullet) \rangle 0 \_\_\_\_\_ \quad (14.9)$$

Where Wa is the wage paid by other firms and u is the unemployment rate, and where subscripts denote partial derivatives.

Each firm is small relative to the economy, and therefore takes Wa and u as given. The representative firms problem is the same as before, except that Wa and u now affect the effort function. The first order conditions can therefore be rearranged to obtain.

$$F^{'}(e(w, wa, u)L) = \frac{w}{e(w, wa, u)'} \_\_\_\_\_\_\_\_\_\_\_ \quad (14.10)$$

$$\frac{we_1(w, wa, u)}{e(w, wa, u)} = 1 \_\_\_\_\_\_\_\_\_\_\_\_\_ \quad (14.11)$$

These conditions are analogous to (14.7) and (14.8) in the simpler version of the model.

Assume that the $e(\bullet)$ function is sufficiently well behaved that there is a unique optimal w for a given wa and u. given this assumption, equilibrium requires w = wa; if not, each firm wants to pay a wage different from the prevailing wage. Let w^* and L^* denote the values of w and L satisfying (5.10) – (5.11) with w – wa. As before, if NL^* is less than $\bar{L}$, the equilibrium wage is w^* and there is unemployment of amount $\bar{L} - NL^*$. And if NL^* exceeds $\bar{L}$, the wage is bid un and the labour market clears.

This extended version of the model has promise for accounting for both the absence of any trend in unemployment over the long run and the fact the shifts in labour demand appear to have large effects on unemployment in the short run. This is most easily run by means of an example.

EXAMPLE.

Suppose effort is given by

$$e = \begin{cases} \left(\frac{w-x}{x}\right)^{B} & \text{if } w > x \quad \_\_\_\_\_\_\_\_ \\ 0 & \end{cases} \qquad (14.12)$$

otherwise

$x = 1 - bu \ \ wa,$

Where $0 > \beta < 1$ and b > 0. x is a measure of labour market conditions. If b equals 1, x is the wage paid at other firms multiplied by the fraction of workers who are employed. If b is less than 1, workers put less weight on unemployment; this could occur if there are unemployment benefits as if workers value leisure. If b is greater than 1 workers put more weight on unemployment; this might occur because workers who lose their jobs face unusually high chances of continued unemployment, are because of risk aversion. Finally, equation (5.12) shows that for this functional form, the condition that the elasticity of effort with respect to the wage equals 1 equation (5.11) is

$$\beta \frac{w}{[(w-x)/x]^{\beta}} \left(\frac{w-x}{x}\right)^{\beta-1} \frac{1}{x} = 1 \qquad (14.14)$$

Straightforward algebra can be used to simplify (14.14) to

$$\begin{aligned} w &= \frac{x}{1-\beta} \\ &= \frac{1-bu}{1-\beta} wa \end{aligned} \qquad (14.15)$$

For small values of $\beta, 1/(1-\beta) ; \; 1+\beta$. Thus (14.15) implies that when β is small, the firm offer a premium of approximately fraction β over the index of labour market opportunities, x.

Equilibrium requires that the representative firm wants to pay the prevailing wage, or that w= wa. Imposing this condition in (14.15) yields

$$(1-\beta)\, wa = (1-bu)\, wa \qquad (14.17)$$

For this condition to be satisfied, the unemployment rate must be given by

$$\begin{aligned} u &= \frac{\beta}{b} \\ &= u_{EQ} \end{aligned}$$

As equation (14.15) shows, each firm wants to pay more that the prevailing wage if unemployment is less than u_{EQ}, and wants to pay less if unemployment is more than u_{EQ}. Thus equilibrium requires that $u = u_{EQ}$.

Substituting (14.17) and w = wa into the effort function, (14.12), implies that equilibrium effort is given by

$$e_{EQ} = \left[\frac{wa - 1 - bu_{EQ} \;\; wa}{1 - bu_{EQ} \;\; wa} \right]^{\beta}$$

$$= \left[\frac{1 - (1 - \beta)}{1 - \beta} \right]^{\beta} \qquad \text{\_\_\_\_\_\_\_\_\_\_} \qquad (14.18)$$

$$= \left(\frac{\beta}{1 - \beta} \right)^{\beta}$$

Finally, the equilibrium wage is determined by the condition that the marginal product of effective labour equals its cost (equation [14.10]) : $F'(eL) - w / e$. We can rewrite this condition as $w = eF'(eL)$.

Since total employment is $(1 - u_{EQ})\bar{L}$ in equilibrium. Each firm must hire $(1 - u_{EQ})\bar{L}/N$ workers. Thus, the equilibrium wage is given by

$$w_{EQ} = e_{EQ} F' \left(\frac{e_{EQ}\,(1 - u_{EQ})\,\bar{L}}{N} \right) \text{\_\_\_\_\_\_\_\_} \qquad (14.19)$$

IMPLICATIONS:

This analysis has three important implications. First (14.17) implies that equilibrium unemployment depends only on the parameters of the effort function; the production function is irrelevant. Thus an upward trend in the production function does not product a trend in unemployment.

Second, relatively modest values of β - the elasticity of effort with respect to the premium firms pay over the index of labour market condition- can lead to non negligible unemployment. For ex, either β -= 0.06 and b= 1 or β = 0.03 and b = 0.5 imply the equilibrium unemployment is 6%.

Third, firms' incentive to adjust wages or prices (or both) in response to changes in aggregate unemployment is likely to be small for reasonable cases. Suppose we embed this model of wages and effort in a model of price setting firms consider a situation where the economy is initially in equilibrium, so that $u = u_{EQ}$ and marginal revenue and marginal cost are equal for the representative firm. Now suppose that the money supply falls and firms do not change their nominal wages or prices; as a result, unemployment rises above u_{EQ}. We know that small barriers to wage and price adjustment can cause this to be an equilibrium only if the representative firms incentive to adjust is small.

For concreteness, consider the incentive to adjust wages. Equation (14.15), $w = (1-bu)wa/(1-\beta)$, shows that the cost minimising wage is decreasing in the unemployment rate. Thus the firm can reduce its cost, and hence raise its profits, by cutting its wage. The key issue is the rise of the gain. Equation (14.12) for effort implies that if the firm leaves its wage equal to the prevailing wage, wa, its cost per unit of effective labour, w/e, is.

$$
\begin{aligned}
C_{FIXED} &= \frac{wa}{e(wa, wa, u)} \\
&= \frac{wa}{\left(\frac{wa - x}{x}\right)^{\beta}} \\
&= \frac{wa}{\left[\frac{wa - (1-bu)\,wa}{(1-bu)\,wa}\right]^{\beta}} \qquad \text{———} \qquad (14.20) \\
&= \left[\frac{1-bu}{bu}\right]^{\beta} wa
\end{aligned}
$$

If the firm changes its wage, on the other hand , it sets its according to (14.15) and thus chooses $w = x/(1-\beta)$. In this case, the firms cost per unit of effective labour is

$$
\begin{aligned}
c_{ADJ} &= \frac{w}{\left(\frac{w - x}{x}\right)\beta} \\
&= \frac{x/(1-\beta)}{\left\{\frac{x/(1-\beta)x}{x}\right\}\beta} \qquad \text{———} \qquad (14.21) \\
&= \frac{1}{\beta^{\beta}} \frac{1}{(1-\beta)-\beta}(1-bu)\,wa
\end{aligned}
$$

Suppose that $\beta = 0.06$ and $b = 1$, so that $u_{EQ} = 6\%$. Suppose, however, that unemployment rises to 9% and that other firms do not change their wages. Equations (14.20) and (14.21) imply that this rise lowers C_{FIXED} by 2.6% and C_{ADJ} by 3.2%. Thus the firm can save only 0.6% of costs by cutting its wages. For $\beta = 0.03$ and $b = 0.5$, the declines in C_{FIXED} and C_{ADJ} are 1.3% and 1.5% ; thus in this case the incentive to cut wages is even smaller.

In a competitive labour market, in contrast, the equilibrium wage falls by the percentage fall in employment divided by the elasticity of labour supply. For a 3% fall in employment and a labour supply elasticity of 0.2, for ex, the equilibrium wage falls by 15%. And without endogenous effort, a 15% fall in wages translates directly into a 15& fall in costs. Firms therefore have an overwhelming incentive to cut wages and prices in this case.

Thus efficiency wages have a potentially large impact on the incentive to adjust wages in the face of fluctuations in aggregate output. As a result, they have the potential to explain why shifts in labour demand mainly affect employment in the short run. Intuitively, in a competitive market firms are initially at a corner solution with respect to wages: firms pay the lowest possible, are unambiguously beneficial with efficiency wages, in contrast, firms are initially at an interior optimum where the marginal benefits and costs of wage cuts are equal.

14.5 THE SHAPIRO – STIGLITZ MODEL

The source of efficiency wages that has probably received the most attention is the possibility that firms limited monitoring abilities force them to provide their workers with an incentive to exert effort. This section presents a specific model, due to Shapiro and Stiglitz (1984) of this possibility.

Presenting a formal model of imperfect monitoring serves three purposes. First, it allows us to investigate whether this idea holds up under scrutiny. Second, it permits us to analyse additional questions; for ex. Only with a formal model can we ask whether government policies can improve welfare. Third, the mathematical tools the model employs are useful in other settings.

ASSUMPTION :

In economy consists of a large number of workers, $\bar{L}$, and a large number of firms, N. The workers maximize their expected discounted utilities, and firms maximize their expected discounted profits. The model is set in continuous time. For simplicity, the analysis focuses on steady states.

Consider workers first the representative workers' lifetime utility is

$$u = \int_{t=0}^{\infty} e^{-pt} u(t)dt, \quad p > 0 \qquad \text{\_\_\_\_\_\_\_\_\_\_\_\_\_\_} \qquad (14.22)$$

U(t) is instantaneous utility at time t, and p is the discount rate, instantaneous utility is

$$u(t) = \begin{matrix} w(t) - e(t) \text{ if employed} \\ 0 \qquad\qquad \text{if employed} \end{matrix} \qquad \text{\_\_\_\_\_\_\_\_\_\_\_\_} \qquad (14.23)$$

W is the wage and e is the workers' effort. There are only two possible effort levels, e=0 and $e = \bar{e}$. Thus at any moment a worker must be in one of three states: employed and exerting effort (denoted "E"), employed and not exerting effort (denoted "S", for shirking),k or unemployed (denoted "U").

A key ingredient of the model is its assumption concerning workers' transitions among the three states. First, there is an exogenous rate at which jobs end. Specifically, if a worker begins working in a job at some time to (and if the worker exerts effort), the probability that the worker is still employed in the job at some later time is

$$p(t) = e^{-b(t-t_0)}, \quad b > 0 \qquad \text{\_\_\_\_\_\_\_\_\_\_} \qquad (14.24)$$

(14.24) implies that p(t+j)/p(t) equals e^{-bj}, and thus that it is independent of t : if a worker is employed at some time, the probability that he or she is still employed time j later is e^{-bj} regardless of how long the worker has already been employed. This lack of time dependence simplifies the analysis greatly, because it implies that there is no need to keep track of how long workers have been in their jobs. Processes like (14.24) are known as Poisson processes.

An equivalent way to describe the process of job break up is to say that it occurs with probability b per unit time, or to say that the hazard rate for job break-up is b. that is, the probability that an employed workers' job ends in the next dt units of time approaches bolt as dt approaches zero. To see that own assumptions imply this, not that (14.24) implies p'(t) = -bp(t).

The second assumption concerning workers' transitions between states Is that firms' detection of workers who are shirking i s also a Poisson process. Specifically, detection occurs with probability q per unit time. q is exogenous, and detections independent of job break-ups. Workers who are caught shirking care fired. Thus if a worker is employed but shirking, the probability that he or she is still employed time j later is e^{-qj} (the probability that the workers has not been caught and fired) times e^{-bj} (the probability that the job has not ended exogenously).

Third, unemployed workers find employment at rate 'a' per unit time. Each worker takes 'a' as given. In the economy as a whole, however, 'a' is determined indigenously. When firms want to hire corkers they choose workers at random out of the pool of unemployed workers. Thus 'a' is determined by the rate at which firms are hiring (which is determined by the number of employed workers and the rate at which jobs end) and the number of unemployed workers. Because workers are identical, the probability of finding a job does not depend on how workers become unemployed or on how long they are unemployed.

Firms' behaviour is straightforward. A firms' profits at t are

$$\pi(t) = F[\bar{e}\,L(t) - w(t)(L(t) + s(t)],$$

$$f'(\bullet) > 0, \;\; F''(\bullet) < 0 \qquad \text{\_\_\_\_\_\_\_\_} \qquad (14.25)$$

Where L is the number of employees who are exerting effort and s is the number who are shirking. The problem facing the firm is to set w sufficiently high that its works do not shirk, and to choose L. because the firm's decision at any date affect profits only at that date, there is no need to analyse the present value of profits: the firm chooses w and L at each moment to maximize the instantaneous flow of profits.

The final assumption of the model is $\bar{e}$ F ($\bar{e}$ $\bar{L}$/N) >$\bar{e}$, or F' ($\bar{e}$ $\bar{L}$/N)>1. This condition states that if each firm hires 1/N of the labour force, the marginal product of labour exceeds the cost of exerting effort. Thus in the absence of imperfect monitoring, there is full employment.

14.6 THE VALUES OF E, U AND S

Let V_i denote the " value" of being in state I (for i= e, s and u). that is , V_i is the expected value of discounted lifetime utility from the present moment forward of a worker who is in state i. Because transitions among states are Poisson processes, the V_i 's do not depend on how long the worker has been in his or her current state or on his or her prior history. And because we are focusing on steady states, the V_i 's are constant over time.

To find $V_{E,}$ V_S and V_U, it is not necessary to analyse the various paths the workers may follow over the infinite. Instead we can use <u>dynamic programming</u>. The central ide3a of dynamic programming is to look at only a brief internal of time and use the V_i 's themselves to summarise what occurs after the end of the internal. Consider first a worker who is employed and exerting effort at time 0. Suppose temporarily that time is divided into intervals of length Δt, and that a worker who loses his or her job during one internal cannot begin to look for a new job unit the beginning of the next internal. Let $V_E\,(\Delta t)$ and $V_U\,(\Delta t)$ denote the values of employment and unemployment as of the beginning of an internal under this assumption. In a moment we will let Δt approach zero. When we do this, the constraint that a worker who loses his or her job during an internal cannot find a new job during the remainder of that internal becomes irrelevant. Thus $V_E\,(\Delta t)$ will approach V_E .

If a worker is employed in a job paying a wage of w, $V_E\,(\Delta t)$ is given by

$$V_E\,(\Delta t) = \int^{\Delta t} e^{-bt}\, e^{-pt}(w - \bar{e})dt + e^{-p\Delta t}\left[e^{-b\Delta t} v_E\,(\Delta t) + (1 - e^{-b\Delta t})\, v_u\,(\Delta t)\right]$$

___________ (14.26)

The first term of (5.26) reflects utility during the internal $(0, \Delta t)$. The probability that the worker is still employed at time t is e^{-bt}. If the worker is employed, flow utility is $w - \bar{e}$. Discounting this back to time 0 yields can expected contribution to lifetime utility of $e^{-(p+b)t}(w - \bar{e})$.

The second term of (14.26) reflects utility after Δt. At time Δt, the worker is employed with probability $e^{-b\Delta t}$, and is unemployed with probability $1 - e^{-b\Delta t}$. Combining these probabilities with the V 's the discounting yields the second term.

It we compute the integral in (14.26), we can rewrite the equation as

$$V_E(\Delta t) = \frac{1}{p+b}\left[1 - e^{-(p+b)\Delta t}\right](w - \bar{e}) + e^{-p\Delta t}\left[e^{-b\Delta t} v_E(\Delta t) + (e^{-b\Delta t}) v_u(\Delta t)\right]$$

Solving this expression $V_E(\Delta t)$ gives

$$V_E(\Delta t) = \frac{1}{p+b}(w - \bar{e}) + \frac{1}{1 - e^{-(p+b)\Delta t}} e^{-p\Delta t}(1 - e^{-b\Delta t}) v_u(\Delta t)$$

___________(14.28)

As described above, V_E equals the limit of $V_E(\Delta t)$ as the Δt approaches zero. (similarly, V_u equals the limit of $V_u(\Delta t)$ as t approaches zero). To find this limit, we apply 1 hopital's rule to (5.28). This

$$V_E = \frac{1}{p+b}\left[(w - e) + \bar{b}v_u\right]$$ ____________(14.29)

Equation (14.29) can also be derived intuitively. Think of an asset that pays dividends at rate $w - \bar{e}$ per unit time when the worker is employed & no dividends when the worker is unemployed, and assume that the asset is being priced by risk neutral investors with required rate of return P. Since, the expected present. Value of lifetime dividends of this asset is the same as the workers' expected present value of lifetime utility, the assets price must be V_E when the worker is employed and V_u when the worker is unemployed. For the asset to be held, it must provide an expected rate of return of Pl. that is, its dividends per unit time, plus any expected capital gains or losses per unit time must equal pV_E. When the worker is employed, dividends per unit time are $w-\bar{e}$, and there is a probability per unit time of a capital loss of $V_E - V_u$. Thus,

$$pV_E = (w-\bar{e}) - b(V_E - V_u) \qquad \text{\_\_\_\_\_\_\_\_\_\_} \quad (14.30)$$

Rearranging this expression yields (5.29),

If the worker is shirking, the "dividend" is w per unit time, and the expected capital loss is $(b+q)(V_s - V_u)$ per unit time. Thus, reasoning parallel to that used to derive (5.30) implies:

$$pV_s = w - (b+q)(V_s - V_u) \qquad \text{\_\_\_\_\_\_\_\_\_\_\_\_}(14.31)$$

Finally, if the worker is unemployed, the divided is zero and the expected capital again (assuming that firms pay sufficiently high wages the employed workers exert effort) is $a(V_E - V_u)$ per unit time. Thus,

$$pV_u = a(V_s - V_u). \qquad \text{\_\_\_\_\_\_\_\_\_\_\_\_\_}(14.32)$$

14.7 THE NO – SHIRKING CONDITION

The firm must pay enough that $V_E \geq V_s$; otherwise its workers exert no effort and produce nothing. At same time, since effort cannot exceed $\bar{e}$, there is no need to pay any excess over the minimum needed to induce effort. Thus the firm chooses w so that V_E just equals V_s:

$$V_E = V_s \qquad \text{\_\_\_\_\_\_\_\_\_\_\_\_}(14.33)$$

Since, V_E and V_s must be equal, (5.30) and (5.31) imply

$$(w-\bar{e})-b\,(V_E-V_u)=w-(b+q)\,(V_E-V_u) \quad \text{\_\_\_\_\_\_\_\_(14.34)}$$

Or

$$V_E-V_u=\bar{e}/q \quad \text{\_\_\_\_\_\_\_\_\_(14.35)}$$

Equation (14.35) implies that firms set wages high enough that workers strictly prefer employment to unemployment. Thus workers obtain rents. The size of the premium is increasing in firms' efficiency in detecting shirkers, q.

The next step is to find what the wage must be for the rent to employment to equal $\bar{e}/q$. Rearranging (14.30) to obtain an expression for w yields

$$\begin{aligned} w &= \bar{e}+pV_E+b(V_E-V_u) \\ &= \bar{e}+pV_u+(b+p)\,(V_E-V_u) \quad \text{\_\_\_\_\_\_\_\_\_\_\_(14.36)} \\ &= \bar{e}+(a+b+p\,)\,(\,V_E-V_u) \end{aligned}$$

Where the last line uses (14.32) to substitute for pV_u. Thus for V_E-V_u to equal $\bar{e}/q$, the wage must be

$$w=\bar{e}\;+(\,a+b+p)\frac{\bar{e}}{q} \quad \text{\_\_\_\_\_\_\_\_\_\_ (14.37)}$$

This condition states that the wage needed to induce effort is increasing in the cost of effort $(\bar{e})$, the ease of finding jobs (a), the rate of job break-up (b), and the discount rate (p), and is decreasing in the probability that shirkers are detected (q). It turns out to be easier to express the wage needed to prevent shirking in terms of employment per firm, L, rather than the rate at which the unemployed firm jobs, a. to substitute for a, we use the fact that, since the economy is in steady state, movements into and out of unemployment must balance. The number of workers becoming unemployed per unit time is N (the number of firms) times L (the number of workers per firm) times b (the rate of job break-up). The number of unemployed workers finding jobs is $\bar{L}-NL$ times a. Equating these two quantities yields.

$$a=\frac{NLb}{\bar{L}-NL} \qquad \text{\_\_\_\_\_\_\_\_\_\_\_(14.38)}$$

Equation (5.38) implies $a+b=\bar{L}b/(\bar{L}-NL)$. Substituting this into (5.37) yields

$$w=\bar{e}+\left(p+\frac{\bar{L}}{\bar{L}-NL}b\right)\frac{\bar{e}}{q} \qquad \text{\_\_\_\_\_\_\_\_\_\_\_\_(14.39)}$$

Equation (14.39) is the no-shirking condition. It shows, as function of the level of employment, the wage that firms must pay to induce workers to exert effort. The more workers who are employed, the smaller is the pool of unemployed workers and the larger is the number of workers leaving their jobs, and so the easier it is for unemployed workers to find employment. The wage needed to deter shirking is therefore an increasing function of employment. At full employment, unemployed workers find work instantly, and so there is no cost to being fixed and thus no wage that can deter shirking. The set of points in (NL, w) space satisfying the no-shirking condition (NSC) is shown in figure 14.2.

14.8 CLOSING THE MODEL

Firms hire workers up to the point where the marginal product of labour equals the wage. From equation (14.25) for profits, this condition is,

$$\bar{e}F'(\bar{e}L)=w \qquad \text{\_\_\_\_\_\_\_\_\_\_\_(14.40)}$$

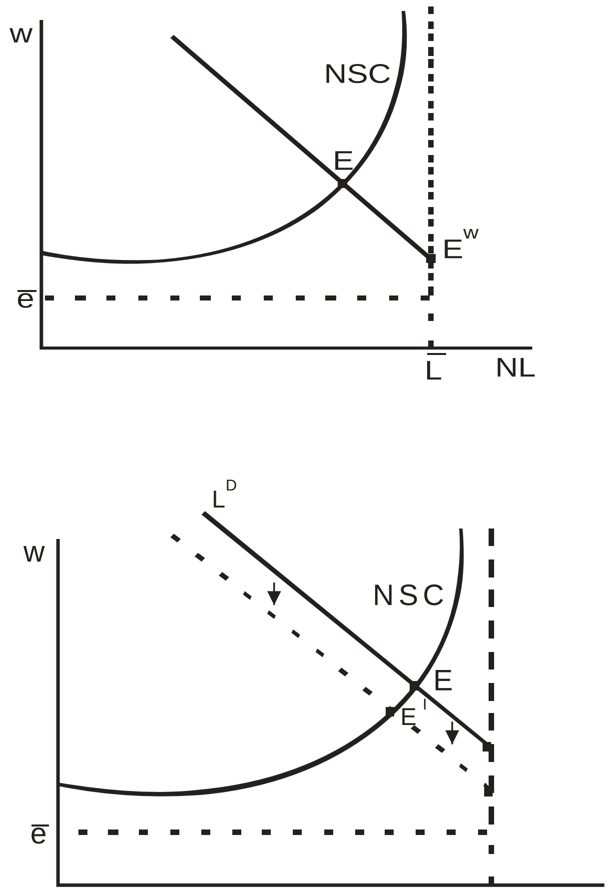


Fig.14.2. The Shapiro-Stiglitz Model

The set of point satisfying (14.40) (which is simply a conventional labour demand curve) is also shown in fig. 14.2.

Labour supply is horizontal at $\bar{e}$ up to the number of workers, $\bar{L}$, and then vertical. In the absence of imperfect monitoring, equilibrium occurs at the intersection of labour demand and supply. Our assumption that the marginal product of labour at full employment exceeds the disutility of effort $(F'(\bar{e}\bar{L}/N) > 1)$ implies that this intersection occurs in the vertical part of the labour supply curve. The Wasrasian equilibrium is shown as point E^w in the diagram.

With imperfect monitoring, equilibrium occurs at the intersection of the labour demand curve (equation [14.40]) and the no-shirking condition (equation [14.39]). This is shown as point E in the diagram. At the equilibrium there is unemployment. Unemployed workers strictly prefer to be employed at the prevailing wage and the exert effort, rather than to remain unemployed. Nonetheless, they cannot bid the wage down: firms know that if they hire additional workers at slightly less than the prevailing wage, the workers will prefer shirking to exerting effort. Thus the wage does not fall, and the unemployment remains.

Two examples may help to clarify the workings of the model. First, a rise in q – an increase in the probability per unit time that a shirker is detected – shifts the no- shirking locus down and does not affect the labour demand curve. This is down in fig 14.3. Thus the wage falls and employment rises.

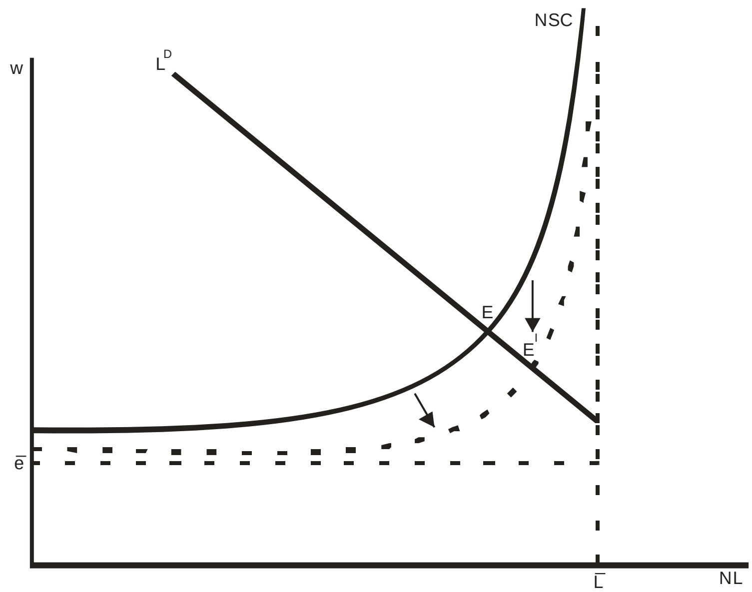


Fig.14.3. The effects of a rise in q in the Shapiro-Stiglitz Model

As a approaches infinity, the probability that shirker detected in any firite length of time approaches 1. As a result, the no-shirking wage approaches $\bar{e}$ for any level of employment less than full employment. Thus the economy approaches the Walrasian equilibrium.

Second, if there is no turnover (b=0), unemployed workers are never hired. As a result, the no-shirking wage is independent of the level of employment. From (5.39), the no-shirking wage in this case is $\bar{e}+p\bar{e}/q$. intuitively, the gain from shirking relative to exerting effort is $\bar{e}$ per unit time. The cost is that there is probability a per unit time of becoming permanently unemployed and thereby losing the discounted surplus from the job, which is $(w-\bar{e})/p$. Equating the cost and benefit gives $w=\bar{e}+p\bar{e}/q$. This case is shown in fig 14.4.

IMPLICATIONS:

The model implies the existence of equilibrium unemployment, and suggests various factors that are likely to influence it. Thus the model has some promise as a candidate explanation of unemployment. Unfortunately the model is so stylized that it is difficult to determine what level of unemployment it predicts or to use it to derive specific predictions concerning the behaviour of unemployment over time.

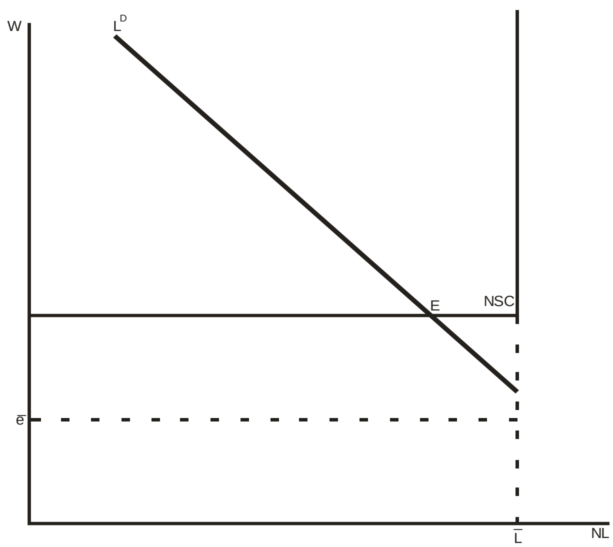


Fig.14.4. The Shapiro-Stiglitz Model without turnover

With regard to short-run fluctuations, consider the impact of a fall in labour demand, shown in figure 14.5 w and L move down along the no-shirking locus. Since labour supply is perfectly inelastic, employment necessarily responds more than it would without imperfect monitoring. Thus the model suggests one possible reason that wages may respond less to demand driven output fluctuations than they would if workers were always on their labour supply curves again however, the model is sufficiently stylized that it is difficult to gauge its quantitative implications.

Finally, the model implies that the decentralised equilibrium is inefficient. To see this, not that since the marginal product of labour at full employment, $\bar{e}F'(\bar{e}\bar{L}/N)$, exceeds the cost to workers of supplying effort, $\bar{e}$, first best allocation is for everyone to be employed and exert effort. Of course, the government cannot bring this about simply by dictating that firms move down the labour demand curve until full employment is reached: this policy causes workers to shirk, and thus results in zero output. But Shapiro and Stiglitz note that wage subsidies financed by lump-sum taxes or profits taxes improve welfare. Such a policy shifts the labour demand curve up, and thus increases the wage and employment along the no-shirking locus. Since the value of the additional output exceeds the opportunity cost of producing it, overall welfare rises. How the gain is divided between workers and firms depends on how the wage subsidies are financed.

EXTENSIONS:

The basic model can be extended in many ways. Here we discuss three.

First, an important question about the labour market is why, given that unemployment appears so harmful to workers, employers use layoffs rather than work-sharing arrangements when they reduce the amount of labour they use. One might expect workers to peace sufficient value on reducing the risk of unemployment that they would accept a lower wage to work at a firm that used word-sharing rather than layoffs. Shapiro and Stiuglitz's model (modified so that the number of hours employees work can vary) suggests a possible explanation for the puzzling infrequency of work-sharing. A reduction in hours of work lowers the surplus that employees are getting from their jobs. As a result, the wage that the firm has to pay to prevent shirking rises. If the firm lays off some workers, on the other hand, the remaining workers' surplus is unchanged, and so no increase in the wage is needed. Thus the firm may find layoffs preferable to work sharing even though it subjects its workers to greater risk.

Second d, Bulow and Summers (1986) extend the model to include a second type of job where effort can be monitored perfectly.

These jobs could be piece-rate jobs where output is observable, for example. Since there is no asymmetric information in this sector, the jobs provide no surplus and are not rationed. Under plausible assumptions, the absence of surplus results in high turnover. The jobs with imperfect monitoring continue to pay more than the market-clearing wage. Thus marginal products in these jobs are higher, and workers, once they obtain such jobs, are reluctant to leave them. If the model is extended further to include groups of workers with different job attachments (different b's), a higher wage is needed to induce effort from workers with less job attachment. As result, firms with jobs that require monitoring are reluctant to hire workers with low job attachment, and so these workers are disproportionately employed in the low-wage, high-turnover sector. These predictions concerning wage levels, turnover, and occupational segregation fit the stylized facts about primary and secondary jobs identified by Doeringer and Piore (1971) in their theory of dual labour markets.

The third extension is more problematic for the theory. So for, we have assumed that compensation takes the form of conventional wage payment. But, as suggested in the general discussion of potential sources of efficiency wages, more complicated compensation policies can dramatically change the effects of imperfect monitoring. Two examples of such compensation policies are bonding and job selling. Bonding occurs when firms require each new worker to post a bond that must be forfeited if he or she is caugh shirking. By requiring sufficiently large bonds, the firm can induce workers not to shirk even at the market clearing wage; that is, they can shift the no-shirking locus down until it coincided with the labour supply curve. If firms are able to require bonds they will do sol, and unemployment will be eliminated from the mode. Job selling occurs when firms require employees to pay a fee when they are hired. If firms are obtaining payments from new workers, their labour demand is higher for a given wage; thus the wage and employment rise as the economy, moves up the no-shirking curve. Again, if firms are able to sell their jobs, they will do so.

Bonding job selling, and the like may be limited by an absence of perfect capital markets (so that it is difficult for workers to post large bonds, or to pay large for when they are hired); they may also be limited by workers fears that the firm may falsely accuse them of shirking and claim the bonds, or dismiss them and keep the job fee. But, as Carmichael (1985) emphasises, considerations like these will not eliminate these schemes entirely: if workers strictly prefer employment to unemployment, firms can raise their profits by, for example, charging marginally more for job. In such situations, jobs are not rationed, but go to those who are willing to pay the most for them; thus even if these schemes are limited by such factors as imperfect capital markets, they still eliminate unemployment. In short, the absence of job fees and performance bonds is a puzzle for the theory.

14.9 SUMMARY

- Higher wages improve workers' productivity.
- Higher wages encourage workers to take efforts
- They lead to higher efficiency.
- Higher wages also add to the cost of a firm.

14.10 QUESTIONS

1. Explain the Generic Efficiency- Wage Model.
2. Discuss the Shapiro – Stiglitz Modes.
3. Examine the No-shirking condition.
4. Explain a more general version of generic – efficiency wage mode.

❖❖❖❖

15

INSIDER-OUTSIDER MODELS

Unit Structure

15.0 OBJECTIVES

After going through this unit you will come to know-

- The Insider-Outsider Models.
- Cyclical Behaviour of labour costs

- The concept of Hysteresis
- The Nelson and Plosser's Test
- The Campbell and Mankiw's Test
- The real – Business Cycle Model

15.1 INTRODUCTION

There are two groups of potential workers. The first group- the insiders – are workers who have some connection with the firm at the time of the bargaining. The second group - the outsiders - are workers who have no initial connection with the firm.

In this unit let us learn how the insider – outsider model is employed to determine the effects of wages.

15.2 INSIDER – OUTSIDER MODEL

In reality, there are two groups of potential workers. The first group – the insiders – are workers who have same connection with the firm at the time of the bargaining, and whose interest is therefore taken into account in the contract. The second group – the outsiders – are workers who have no initial connection with the firm but who may be hired after the contract is set. This distinction may be important for both fluctuation and unemployment.

15.2.1 INSIDER AND OUTSIDER AND THE CYCLICAL BEHAVIOUR OF LABOUR COST:

Consider a firm and a set of insiders. The firm and the insider bargain over the wage and employment as functions of the state. Hours are fixed, so labour input can vary only through changes in the number of workers. The firm's profits are

$$\pi = AF(L_I + L_0) - W_I L_I - W_0 L_0 \qquad \text{\_\_\_\_\_\_\_\_} \qquad (15.1)$$

Where L_I and L_0 are the numbers of insiders and outsiders the firm hires, and W_I and W_0 are their wages. As before, A is random, taking on the value A_i with probability P_i. The insiders have priority in hiring; thus L_0 can be positive only if L_I equals the number of insiders, $\bar{L}_I$.

Oswales (1987) and Gottfries (1992) argue that labour market have two features that critically affect the problem facing the firm. The first is that because of normal employment growth and turnover, must of the time the insiders are fully employed and the only hiring decision concerns how many outsiders to hire. Taking this to the extreme, here we assume that L_I always equals $\bar{L}_I$. Since the insiders are always employed their utility depends only on their wage:

$$u_I = u(w_I),\ u^{'}(o) > 0,\ u^{''}(\bullet) < 0 \quad \text{\_\_\_\_\_\_\_} \quad (15.2)$$

The Second feature of labour markets emphasized by oswald and Gott-fries is that the wages paid to the two types of workers cannot be set independently : in pratise, the ghiher the wage that the firm plays to its existing employees, the more it must pay to its new hires. Again adopting an extreme form for simplicity, we assume that W_o rises one-for-one with W_I :

$$W_O = W_I - c, c \geq O. \quad \text{\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_} \quad (15.3)$$

Finally, we assume that the insiders have sufficient bargaining power an that the gap between insider and outsider wages (C) is sufficiently small that the firm is always able to hire as many new workers at $w_I - c$ as it wants. Thus the model applies most clearly to a firm that faces a strong union or that must pay a high wage for some other reason.

It is convenient to think of the firms choice variable as w_1 and equation (15.3); L_1 is fixed at $\bar{L}_I$. As in the previous section, the firm must provide the insiders with expected utility of at least u_0. The Lagrangian for the firm's problem is thus

$$L = \sum_{i=1}^{k} Pi\,[A_i F(\bar{L}_1 + L_0) - w_{li}\bar{L}_i - (w_{li} - c)\,Lo_i] + A\left\{\left[\sum_{i=1}^{k} piu(wIi)\right] - uo\right\}$$

______________ (15.4)

The first order condition per Loi is

$$P_i\left[AiF'(\bar{L}_1 + L_{0i}) - (w_{li} - c) = 0\right] \quad \text{______________} \quad (15.5)$$

OR

$$AiF'(\bar{L}_l + L_{oi}) = w_{li} - c \quad \text{______________} \quad (15.6)$$

Equation (15.6) implies that just as in a conventional labour demand problem, but in sharp contrast to what happen with implict contracts, employment is chosen in equate the marginal product of labour with the wage. The marginal product of labour with the wage. The reason is that outsiders, who are the workers relevant to the marginal employment decision, are not involved in the orginal bargaining. The insider and the firm act to maximize their joint surplus. They therefore agree to hire outsiders up to the point where their marginal product equals the wage they must be paid; the outsiders' preferences are irrelevant to this calculation.

The first order condition for w_{li} is

$$-_{pi}(\bar{L}_i - L_0) + \lambda p_i u'(w_i) = 0 \quad \text{______________} \quad (15.7)$$

This implies

$$u'(wIi) = \frac{\bar{L}_l + L_{0i}}{\lambda} \quad \text{______________} \quad (15.8)$$

Since L_{0i} is higher in good states. (15.7) implies u' (w_{li}) is higher. This requires that w_{li} is lower, that is , that the wage is countercyclical. Intuitively, the firm and the insiders want to keep the expenses of hiring outsider down; they therefore lower the wage in states where employment is high. In short, this model implies that the real wage is countercyclical and that it represents the true cost of labour to the firm.

It is easy to think of changes that weaken these results. For example, if there are slates in which same insiders are laid off, for those slates the contract would equate the marginal product of labour with the opportunity cost of insiders' time rather than with the wage. Similarly if there is not an unlimited supply of outsiders, this would tend to make the wage increasing rather than decreasing in A. such changes, however, do not entirely undo the result that insider-outsider consideration reduces the cyclical sensitivity of the marginal cost of labour of to firms.

The critical assumption of the model is that the outsiders and the insiders' wages are linked. Without this link, the firm can hire outsiders at the prevailing economy wide wage with in elastic labour supply, that wage is low in recession and high in booms, and so the marginal cost of labour to the firm is high pro-cyclical.

The insider-outsider literature has not made a definitive care that outsiders and insider wages are linked. Gottfries argues that such a given some freedom to discharge insiders who are incompetent or shirking and that an excessive gap between insiders and outsiders wages would give the firm an incentive to take advantage of this freedom. Blanchard and Runmers (1986) argue that the insiders are reluctant to allow the hiring of large numbers of outsiders at a low wage because they realize that over time, such a policy would result in the outsiders controlling the bargaining process. But it is for from clear that tying insiders' and outsiders' wages is the best way of dealing with these problems. If, the economy wide wages is very costly. The firms and insiders might therefore be better off it they charged new hires a fee (and let the fee vary with the gap between w_i and the economy wide wage). Thus we can conclude only that if a link between insiders and outsiders wages can be established, insiders outsiders considerations have potentially important implications.

15.2.2 UNEMPLOYMENT

If the entire labour market is characterized b y insider power, greater insider power reduces employment by raising the wage and causing firms to move up their labour demand curves. Thus in this case the insider-outsider distinction provides a candidate explanation of unemployment.

The more realistic care, however, is for there to be insider power only in part of the labour market, with the rest relatively competitive. But even in this case, insider power can increase average unemployment, when same sectors offer higher wages than others. Workers have an incentive to try to attain jobs in the competitive sector, and workers who have been laid off from the high-wage sector accept longer spells of unemployment before they give up hope of returning to their old jobs.

There is relatively little evidence concerning how important these mechanisms are to actual unemployment. Summer (1986) argues that such wait unemployment in central to the determination of average unemployment. He presents evidence both across US states and over time that general measures of wage differences between “high-quality” and “low-quality” jobs are strongly associated with differences in average unemployment rates. This is precisely what one would expect if workers’ efforts to obtain jobs paying more than market-clearing wage are an important source of unemployment. Thus the limited evidence we have suggests their models may offer a promising route to understanding unemployment.

15.3 HYSTERESIS

One of the building blocks of the previous model is the assumption that the insiders are always employed. This assumption is likely to fail in same situations, however most importantly, if insiders bargaining power is sufficiently great, they will set the wage high enough to risk some unemployment: if the insiders are fully employed with certainty, there is a benefit but not a cost to them of raising the wage further. In addition, unusually large negative shocks to labour demand are likely to lead to same unemployment among the insiders.

Variations in employment can give rise to dynamics in the n umbers of insiders. Under many institutional arrangements, workers who become un-employed eventually gain a rate in bargaining. Thus a fall in employment caused by a decline in labour demand is likely to increase the number of insiders. There changes in the number of insiders then affect future wage-setting and employment.

These ideas are developed formally by Blanchard and Summers (1986). Blanchard and Summers focus an Europe in the 1980s, where they argue, the conditions for these effects to be relevant were satisfied: workers had a great deal of power in wage-setting, there were large negative shocks, and the rules and institutions led to same extent to the disenfranchisement firm from the bargaining process of workers lost their jobs.

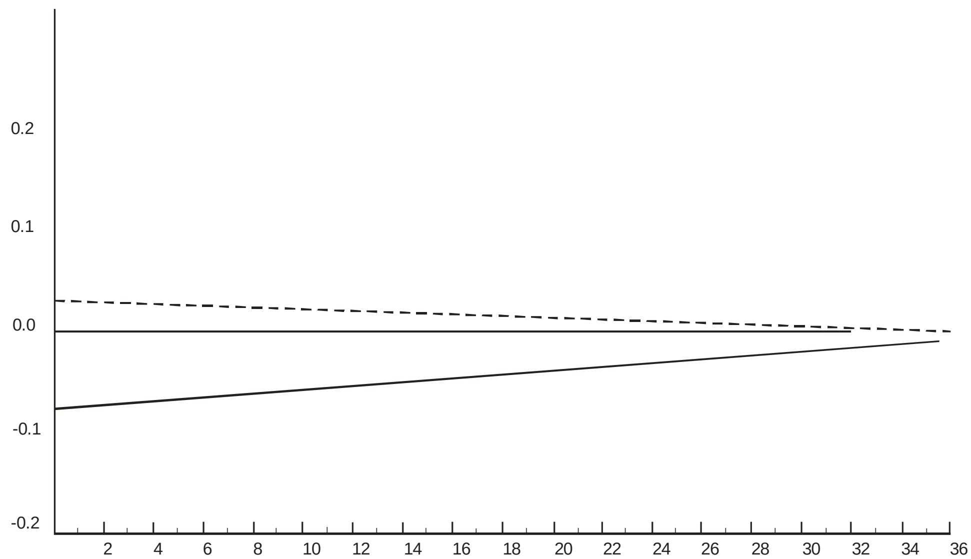


Figure 15.1, the effects of a 1% government-purchases shock on the pates of the wage and the interest rate.

No logy shocks, there is no over shooting. Because technology is unchanged and the capital stock moves little, the movements in output are small and track the changes in employment fairly closely. Consumption declines at the time of the shock and then gradually returns to normal. The increase in employment and the fall in capital shock cause the wage to fall and the interest rate to rise. The anticipated wage movements after the period of the shock are small and positive, thus, as before, the source of the increase in labour supply are the increases in the interest rate.

As with technology, the persistence of movements in government purchases has important effects on how the economy responds to shock. If p_0 falls to 0.5, for example, a_{LG} falls from -0.13 to -0.03, a_{LG} falls from .015 to 0.03, and b_{KG} increases from -0.04 to -0.002: because movements in purchases are much shorter lived, much more of the response takes the from of reduction in capital holdings. These values imply that output rises by about one-tenth of the increase, and that investment falls by about four-fifth of the increase. In response to a 1% shock for example output increases by just .002% in the period of the shock and then falls below normal, with a low of -0.004% after seven quarters.

15.4 EMPIRICAL APPLICATION: THE PERSISTENCE OF OUTPUT FLUCTUATIONS

INTRODUCTION:

Real business-cycle models emphasize shifts in technology as central sources of output fluctuations. The specific model analysed in this chapter assumes that technology fluctuations around a deterministic trend; as a result the effects of a given technological shock eventually approach zero. But this assumption is made purely for convenience. It seems plausible that changes in technology have a significant permanent component. For example, an innovation today may have little impact on the likelihood of additional innovations in the future. In this case, the innovation raises the expected path of the level of technology permanently. Thus real-business cycle models are quite consistent with a large permanent component of output fluctuations. In traditional Keynesian models in contrast, output movements are largely the result of monetary & other aggregate demand disturbances coupled with sluggish adjustment of nominal prices or wages. Since the models assume that prices and wages adjust eventually, under natural assumptions they imply that changes in aggregate demand have no long run effects. For this reason, natural baseline versions of these models predict that output fluctuates around a deterministic trend path. These considerations have sparked a considerable literature on the persistence of output movements.

15.4.1 NELSON AND PLOSSER'S TEST

The persistence of fluctuations was first addressed try Nelson and Plosser (1982), who consider the question of whether fluctuations have a permanent component (see also McCulloch, 1975). The idea behind their test is conceptually simple, though it turns out to involve same econometric trend, then output growth will tend to be less that normal when output is above its trend and more than normal when it is below its trend. That is, consider regression of form.

$$\Delta \ln y_t = a + b\ \ln y_{t-1} - \ \alpha + \beta(t-1)\ \ + E_t\,,$$

Where In y is log real GDP, $\alpha + \beta_t$ is its trend path, and E_t is mean –zero disturbance uncorrelated with in $y_{t-L} - \ \alpha + \beta(t-1)$. (the regression can also include other variables that may affect out put growth) the term in is the difference between log output and the trend in period t-1. thus if output tends to revert toward the trend, b is negative if it does not be is zero.

We can rewrite as

$$\Delta \ln y_t = \alpha' + \beta' t + b \ln y_{t-1} + E_t\,,$$

Where $\alpha' \equiv a - b\alpha + b\beta$ and $\beta' \equiv -b\beta$. Thus to test for trend reversion issues permanent shocks, we need only estimate and test whether b=0. Note that with this formulation, the null hypothesis is that output does not revert toward a trend. Formally, the null hypothesis is that output is non stationary or has a unit root; the alternation is that it is trend stationary.

There is however, an important econometric complication in carrying out this test; under the null hypothesis, ordinary least squares (OLS) estimates of b are biased toward negative values. To see why, consider the case of $\beta = 0$; thus

$$\Delta \ln y_t = \alpha' tbly_{t-1} + E_t\,,$$

Assume for simplicity that the E's are independent, identically distributed mean-zero disturbances. The in y_{t-1}'s are combinations of the E's specifically, under the null hypothesis of b=0, in y_{t-1} is $\ln y_0 + (t-1)\alpha' + E_1 + E_2 + ... + E_{t-1}$. Since the E's are not correlated with one another Et is uncorrelated with the contemporaneous value of the right hand side variable at all leads and lags, the fact that the past E's enter positively into y_{t-1} means that in y_{t-1} is positively correlated with past values of the error term. One can show that this causes the estimates of b from OLS to be biased towards negative values. That is even when the null hypothesis that output has no tendency to revert toward a trend is true, OLS tends to suggest that output is trend reverting.

This econometric complication is an example of a more general difficulty: the behaviour of statistical estimators when variables are highly persistent is often complere and unintuitive care needs to be taken in such situations, and conventional econometric tests often cannot be used.

Because of the negative trias in estimates of b under the null hypothesis one cannot use conventional t-tests of the significance of the OLS estimates of b to test whether output is trend stationary, Nelson and Plosser therefore employ a Ddiuckey-fuller unit root test (Dickey and Fuller, 1979). Dickey and Fuller use a Monte Carl experiment to determine the distribution of the t-statistic on b form OLS estimates of equations when the true value of b is zero. That is, they use a random number generator to choose E's: they then estimate (4.55) or (4.56) by OLS and find the t-statistic or b. they repeat this procedure symmetric around zero, is considerably skewed-loward negative values. For example, Nelson and Plosser report that for the ease of 100 observations with true parameters value of $\alpha' = 1$ and b=0, the average value of the t-statistics and is -2.22. the t-statistic is greater in absolute value than the -3.455 of the time. Thus an investigator who is unaware of the econometric complications and therefore uses standard critical values is more likely than not to reject the hypothesis of non stationary at 5% level even if it is true. In a Dicky Fuller test, however one compares the t-statisties an b not with the standard t-distribution, but with the distribution produced by the Monte-Carlo experiment. Thus for example, a t-statistic of rather than -3.45 in absolute value is needed to reject the null hypotheses of b=0 at the 5% level.

With this lengthy econometric preface we can now describe Nelson and Plosser's results. They estimate equations slightly more complere than (4.55) for US real GNP, real GNP per capita, industrial production, and employment; they find that the OLS estimates of b are between -0.1, and -0.2, with t-statistics ranging from -2.5 to -3.0. All of these are comfortably less than the correct 5% critical value of -3.45 based on this and other evidence. Nelson and Plosser conclude that one cannot reject the null hypothesis that fluctuations have a permanent component.

15.4.2 COMPBEU AND MANKIW'S TEST

An obvious limitation of simply testing for the existence of a permanent component of fluctuations is that it cannot tell us anything about how big such a permanent component might be. The literature since Nelson and Plosser has therefore focused on determining the extent of persistence output movements. Vampbell and uantaio (1987) propose a natural measure of persistence. They consider several specific processes for the change in log output. To take one example, they consider the third-order out regressive case:

$$\Delta \ln y_t = a + b,\ \Delta \ln y_{t-1} + b_2\, \Delta \ln y_{t-2} + b_3\, \Delta \ln y_{t-3} + E_t$$

Campbell and Uanteio estimate and compute the implied response of the level of In y to a none-unit shock to E^{30}. Their measures ofr persistence is the value that this forecast converges to. Intuitively, their measure is the answer to the question: if output is 1% higher this period than expected by what percent should I change my forecast of output in the distant future. It output is trend-stationary; the answer to this question is zero. If output is a random

wacle (so $\Delta \ln y_t$ is simply $a + E_t$), the answer is y percent. Compbell and Mankiw's results are surprising: this measure of persistence generally exceeds 1. that is, shocks to output are generally followed by further output movements in same direction for the AR-3 case considered, the estimated persistence measure is 1.57. compbell and Mankiw consider a variety of other processes for the change in log output for most of them (though not all), the persistence measure takes on similar values.

DISCUSSION

There are two major problems with the general idea of investigating the persistence of fluctuation, one statistical and one theoretical. The statistical problem is that it is difficult to learn about long-term characteristics of output movements from data from limited time spans. The existence of a permanent component to fluctuations and the asymptotic response of output to an innovation concern characteristic of the data at infinite horizons. As a result, no finite amount of data can shed any light on these issues. Suppose, for example, output movements are highly persistent in same sample. Although this is consistent with the presence of a permanent components to fluctuations, it it equally consistent with the view that output reverts extremely slowly to a deterministic trend. Alternatively, suppose we observe that output reterun rapidly to same trend over a sample. Such a finding is completely consistent not only with trend stationarity, but also with the view that a small portion of output movements are not just permanent but explosive so that the correct reaction to an output innovation is to drastically revise one's forecast of output in distant future.

Thus at the very least, the appropriate questions are whether output fluctuations have a large, highly persistent component, and how output forecasts at moderately long horizons should be affected by output innovations, and not questions about characteristics of the data at infinite horizons. Clearly, similar modifications are needed in any other situation where researchers claim to be providing evidence about the properties of series at infinite horizons.

Even if we shift the focus from infinitive to moderately long horizons, the data are unlikely to be highly informative. Consider for example, Compbell and Mankiw's procedure for the AR-3 case described above. Campbell and mankiw are using the relationship between current output growth is and ists three most recent lagged values to make inferences about outputs long run behaviour. This in risley suppose, for example, the output growth is actually AR-20 instead of AR-3 and that the coefficients on the 17 additional lagged values of $\Delta \text{in}\, y$ are all small but all negative. In a sample of plausible size, it is difficult to distinguish this case from the AR-3 case. But the long-run effects of an output shock may be much smaller.

This difficulty arises from the brevity of the sample, not from the specified of Campbell and mankiws procedure. The basic problem is that samples of plausible length contain few independent long sub samples. As a result, no procedure is likely to provide decisive evidence about the long term effects of shocks. Various approaches to studying persistence have been employed. The point estimates generally suggest considerable persistence (though probably somewhat less than Compbell and Mankiw found). At horizons of more than about five years, however, the estimates are not very precise. Thus the data are also consistent with the view that the effects of output shocks die out gradually at moderate horizons.

The theoretical difficulty with this literature is that there is only a weak case that the persistence of output movements, even if it could be measured precisely, provides much information about the driving forces of economic fluctuations. Since technology may have an important trend-reverting component, and since real-business cycle models allow for shocks coming from sources other than technology, these models do not require that persistence be low. To begin with, although they attribute the bulk of short-run fluctuations to aggregate demand disturbances, they do not assume that the processes that drive long run growth follow a deterministic trend' thus they allow at least one part of output movement to be highly persistent. More importantly, the part of fluctuations that is due to aggregate demand movements may also be quite persistent. A shift by the Federal Reserve to a policy of extended gradual disinflation, for example, may reduce output over long period if nominal prices and wages adjust only gradually. And if technological progress results in part from learning-by-doing output changes causes by aggregate demand movements affects technology.

Thus in the end, the main contribution of the literature on persistence is to sound same warnings about time. series econometrics: mechanically removing trends or otherwise ignoring the potential complications caused by persistent movements can cause statistics procedures to yield highly misleading results.

15.5 ADDITIONAL EMPIRICAL APPLICATIONS

Calibrating a real cycle mode

How should we judge how well a real business cycle model fits the data? The standard approach is calibration (Leyland and Prescott, 1952). The basic idea of calibration is to choose parameter values on the basic of micro economic evidence, and than to compare the modes prediction concerning the variance and-variances of various series with these in data.

Calibration has two potential advantages over estimating models econometrically evidence, a large body of information beyond that usually employed can be brought to bear, and the models can therefore be held to a higher standard. Second, the economic importance of statistical rejection or lack of rejection, of a model is often hard to interpret. A model that fits the data well along every dimension except one unimportant one may be overwhelmingly rejected statistically or a model may fail to be rejected simply because the data are consistent with a wide range of possibilities.

To see how calibration works in practise, consider the baseline real-business-cycle model of Prescott 91986) and Hansen (1985). This model differs from the model we have been considering in two ways. First government is absent, second, the trend component of technology is not assumed to follow a simple linear path: instead a smooth t but non linear trend is removed from the data before the model prediction and actual fluctuations are compared.

We consider the parameter values proposed by Hansen and Wright (1992), which are similar to those suggested by Prescott and by Hansen.

15.6 IMPLICIT CONTRACTS

The second departure from Walrasian assumption that we consider in this chapter is the existence of long-term relationships between firms and workers. Firms do not hire workers a fresh each period. Instead, many jobs involve long-term attachments and considerable firm-specific skills on the part of workers. A Kerlof and Main 91981) and Hall (1982), for example, find that the average worker in the United States is in a job that will last about ten years.

The possibility of long-term relationships implies that the wage does not have to adjust to clear the labour market each period. Workers are content to stay in their current jobs as long as the income streams they expect to obtain are preferable to their outside opportunities; because of their long-term relationships with their employers, their current wages may be relatively unimportant to this comparison.

15.7 EFFICIENT CONTRACTS

To see how it is possible to improve on a wage contract. Suppose that the firm offers the workers a contract js pecifying the wage and hours for each possible realization of A. since actual contracts do not explicitly specify employment and the wage as functions of the state, such contracts are known as <u>implicit contracts</u>.

Recall that the firm must offer the workers at least some minimum level of expected utility, V_0, but is otherwise unconstrained. In addition, since L_i and W_i determine c;, we can think of the firms choice variable as L and C in each state rather than as L and W the lagrangian for the firm's problem is therefore.

$$L = \sum_{i=l}^{k} P_i \; A_i F(L_i) - C_i \; + \lambda \left(\left\{ \sum_{i=l}^{k} P_i \; U(C_i) - V(L_i) \right\} - V_0 \right)$$

The first order condition for C_i is ________ (1)

$$-P_i + \lambda P_i U'(C_i) = 0. \qquad \text{\_\_\_\_\_\_\_\_} \quad (2)$$

OR

$$V'(C_i) = \frac{I}{\lambda} \qquad \text{\_\_\_\_\_\_\_\_} \quad (3)$$

Equation (3) implies that the marginal utility of consumption is constant across states, and thus that consumption is constant across states. Thus the risk-neutral firm fully insures the risk-averse workers.

The first-order condition for L_i is

$$P_i A_i F'(L_i) = \lambda P_i V'(L_i) \qquad \text{\_\_\_\_\_\_\_\_\_\_\_\_} \qquad (4)$$

Equation (3) implies $\lambda = 1/U'(C)$, where C is the constant level of consumption. Substituting this fact into (4) and dividing both sides by p; yields

$$A_i F'(L_i) = \frac{V_i(L_i)}{U_i(C)} \qquad \text{\_\_\_\_\_\_\_\_\_\_\_\_} \qquad (5)$$

IMPLICATIONS

Under efficient contract, workers real incomes are constant. Thus the model appears to imply strong real wage rigidity; in fact, because L is higher when A is higher, the model implies that the wage per hour is countercyclical. Unfortunately, however, this result does not help to account for the puzzle that shifts in labour demand appear to result in large changes in employment. The problem is that with long-term contracts, the wage is no longer playing an allocative role. That is, firms do not choose employment taking the wage as given. Rather, the level of employment as a function of the state is specified in the contract. And, from (5), this level is the level that equates the marginal product of labour with the marginal disutility of additional hours of work.

As result, the model implies that the cost to the firm of varying the amount of labour it uses changes greatly with its level of employment. Suppose the firm wants to increase employment marginally in state i. to do this, it must raise workers' compensation to make them no worse off that before. Since, the expected utility cost to workers of the change is $P_i V'(L_i), C$ must rise by $P_i V'(L_i)/U'(C)$. Thus the marginal cost to the firm of increasing employment in a given state is proportional to $V_i(L_i)$. If labour supply is relatively inelastic, $V'(L_i)$ is sharply increasing in L_i, and so the cost of labour to the firm is much higher when employment is high than when it is low. Thus, for example, embedding this model of contracts in a model of price determination would not after the result that relatively inelastic labours supply creates a strong incentive for firms to cut prices and increase employment in recessions, and to raise prices and reduce employment in booms.

In addition to failing to predict relatively a cyclical labour costs, the model fails to predict unemployment: as emphasised above the implicit contract equates the marginal product of labour and the marginal disutility of work. The model does, however, suggest a possible explanation for apparent unemployment. In the efficient contract, workers are not free to choose their labour supply given the wage; instead the wage and employment are simultaneously specified to yield optimal risk-showing and allocative efficiency. When employment is low, the marginal disutility of work is low and the hourly wage, C / L_i, is high. Thus workers wish that they could work more at the wage the firm is paying. As a result, even though employment and the wage are chosen optimally, workers appear to be constrained in their labour supply.

15.8 SUMMARY

Higher wages can increase workers' food consumption and thereby cause them to be better nourished and more productive and vice versa.

15.9 QUESTIONS

1. Write a note on implicit contracts.
2. Explain the Insider-Outsider Model
3. Elaborate upon the Nelson and Plosser's Test.
4. Write a note on (A) Nelson and Plosser's Test (B) Compbell and Mankiw's Test.

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16

Module 6

MACROECONOMIC POLICY ISSUES

Unit Structure

16.0 OBJECTIVES

- Understand the policy objectives of Monetary Policy.
- Understand the nature of shocks to the economy and the selection of instruments.
- Understand the operations of Monetary Policy under alternative policy objectives.
- Understand the concept of “rules vs. discretion” in monetary policy.

16.1 MONETARY POLICY OBJECTIVES

Monetary policy refers to the operations of the central bank of a country through the changes in cost and availability of credit and the money supply. The two major policy goals of monetary policy are: a) stabilise the level of aggregate output and alleviate the business cycles; b) to ensure price stability and c) minimise the cost of adjustment in the short-run. In conducting the monetary policy, the central bank chooses a particular macroeconomic variable, known as the intermediate target that it can influence to achieve its objectives. It can be seen as a compromise in the absence of full information about the ultimate policy objectives of output and inflation. According T.R.Saving, the central bank chooses an intermediate target on the following considerations:

a) Observability

The intermediate target should be readily and frequently observable for effective policy interventions. The wholesale price data and data on money supply are observable on weekly basis where as GDP data can be observed on quarterly basis. Therefore, the WPI or money supply would be a more suitable intermediate target.

b) Consistency

When the central bank tries to influence an intermediate target, it should be taking certain values that are consistent with the ultimate policy objectives. The intermediate target should, at the same time meet the goals for inflation and output.

c) Controllability

The central bank be able to influence the influence the value of intermediate target so that achieving it would eventually help to achieve the ultimate monetary policy objectives. Based on the above discussion, it is easy to see three alternative intermediate targets that were applied in real life policy making.

16.2 INTERMEDIATE TARGETS OF MONETARY POLICY

The central bank of a country can choose from among the following an intermediate target that can be used to achieve the ultimate policy objectives.

a. Monetary and credit aggregates

The three traditionally used intermediate targets were narrow money (M1) or broad money (M3) or aggregate and sectoral credit. These variables are observable on weekly or fortnightly basis. A survey by the Bank of England in 1999 observed that out of 50 central banks, 43 considered monetary aggregates as relevant intermediate targets while only seven central banks considered interest rates as suitable intermediate targets. This is because, though the degree of effectiveness differs, the different schools in macroeconomic modelling accept that changes in money supply results in changes in the level of output. For this reason, the Broad Money or M3 is the most accepted intermediate target. The Bank of Japan (1975-94), the UK (1976-94), and Germany (1975-2001) used M3 as the intermediate target. Financial innovations led to the weakening of M3 as an effective intermediate target. In China, Russia and India bank credit was used as the intermediate target. In India, selective credit controls were used until 1994. The emphasis shifted from supply of liquidity to managing the demand. In India, like in other countries, monetary targeting was successful during the late 1980s and early 1990s since inflation was largely due to excessive monetary expansion.

b. Interest Rates

Nominal interest rate is another intermediate target. The central bank can directly influence the cost of credit and the interest rate can be observed on daily basis. The link between the rate of interest and the level of economic activity is not direct, though the low interest rate results in higher volume of investment. In most of the developing countries, the monetary policy operations directly influence the interest rate. Some of these countries use re-financing facilities, while still others use open market operations (OMOs) to influence the interest rates. In case of using the interest rate as the intermediate target, the central bank has to choose between overnight rates and the 3-month rate. Further, it has to choose whether to target a specific rate or allow the interest rate to move within a given band. This is because; interest rate targeting does not involve keeping the money market rate constant over long periods of time, but to exert an effect over economic events via a money market rate. The Federal Reserve tried to keep the money market rate stable during the second half of the 1990s with reasonable success. Since the financial variables like interest rate, money supply and bank credit are more readily available, traditionally, they have been a more popular set of intermediate target variables.

c. Nominal GDP

The stability in the nominal GDP would be consistent with the ultimate policy objectives of stability in real output and price level. Hence, nominal GDP is also used as an intermediate target. However, since GDP data is available only on quarterly basis, this is not a very popular target.

c. The Indian Case: As noted earlier, until the mid-1990s, the Reserve Bank of India used monetary targeting as recommended by the Chakravarty committee. Since then the RBI adopted 'multiple-indicator' approach. Under this, the RBI uses the Liquidity Adjustment Facility (LAF), changes in the cash reserve ratio (CRR), open market operations (OMO) and the Market Stabilisation Scheme (MSS) to ensure adequate liquidity at reasonable cost. This approach is known as 'controlled expansion'. This is because the economic reforms allowed the banks to hold foreign currency assets with them. Further, financial innovation also made many traditional controls ineffective. The RBI focuses on the LAF to influence liquidity on daily basis to transmit the interest rate signals to the market.

16.3 EFFECTS OF INTERMEDIATE TARGETS UNDER ALTERNATIVE MACROECONOMIC CONDITIONS

In the absence of random shocks, the monetary authority can achieve the objectives of price stability and output growth by using interest rate or monetary aggregates with equal efficiency. In such a case, the central bank can influence either the interest rate or the level of income without any difficulty. Depending on the nature of shocks, the effectiveness of a particular intermediate target varies. We use the IS-LM framework to explain the difference in selecting an intermediate target. We first examine the difference in the use of interest rate or money supply and then we examine the issues involving the use of nominal GDP as an intermediate variable. We first explain the macroeconomic shocks arising out of changes in aggregate demand and supply and then relate them to the alternative intermediate targets.

A. Implications of Monetary Targeting

In case of monetary targeting, the central bank fixes the money supply and allows the interest rate to vary. We now examine the different alternative policy scenarios under monetary targeting.

A.1. Aggregate Demand Shocks and Monetary Targeting

An aggregate demand shock arises when there are changes in autonomous consumption, investment, government expenditure, net exports or net taxation. Any of these will change the equilibrium level of real income and cause a shift in the IS curve. A positive shock will help to increase the level of income and the aggregate demand at the given price level would increase. Conversely, a negative shock to the IS curve results in lower level of income. Figure 3.1 explains the changes in the economy in case of an aggregate demand shock to the IS curve. (Insert Figure 3.1 of sheet No. 1)

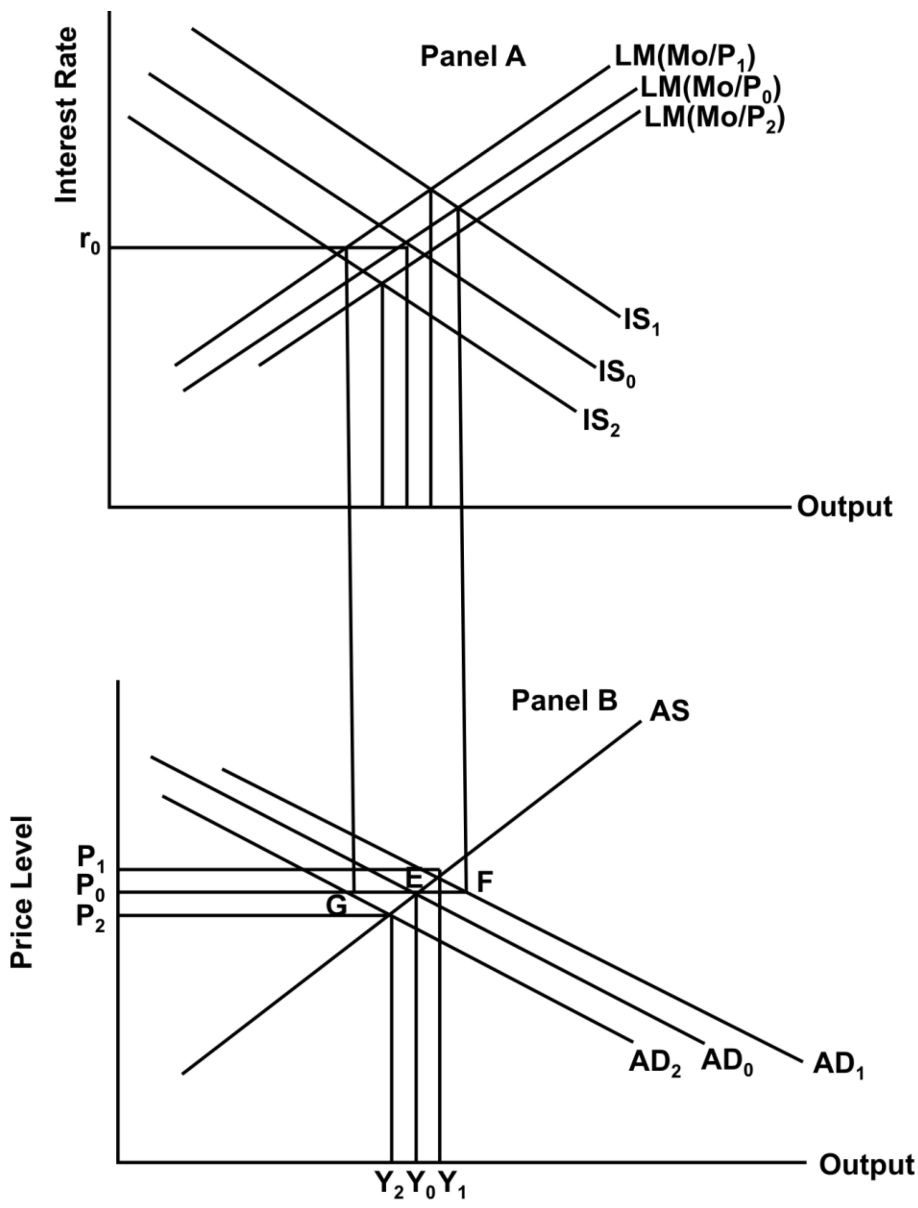

Figure 16.1

Shocks to IS curve with Monetary Targeting

In the above figure, Panel A shows the equilibrium of the economy in terms of the IS-LM framework and Panel B shows the corresponding equilibrium of the economy in terms of the AS-AD framework. The economy is in equilibrium with r_0 rate of interest and Y_0 is the initial level of income, with IS_0 and LM (M_0/P_0) are the initial goods and money market curves. P_0 and Y_0 are the equilibrium price and output levels. As the IS curve experiences a positive shock, it shifts to IS_1 and will help to increase the level of income and the corresponding level of aggregate demand from AD_0 to AD_1. At the given level of income, the real money supply decreases and so the LM curve shifts upwards to LM (M_0/P_1). This causes the interest rate and price level to move upwards. The prices would increase until the excess demand is eliminated. The economy will settle at Y_1 level of income and P_1 level of prices. Conversely, a negative IS shock as seen by IS_2 lowers level of income and the rate of interest. The central bank lowers the money supply and the LM curve moves to LM ($M0/P_2$). There will be excess supply in the market at the initial price level. As the interest rate and price level fall, the economy settles at Y_2 level of income and P_2 level of prices. The level of income moves in the range of GEF in Panel B. Thus, in case of monetary targeting, fluctuations in the IS result in the real income and price level to fluctuate in a given range (Y_2 and Y_1).

A.2. Demand for Money Shocks and Monetary Targeting

The economy can experience a positive demand for money shock with an increase in the demand for money or a negative demand shock through a fall in the demand for money. In this case, financial innovations and not the changes in the level of income are the cause of fluctuations. Figure 16.2 shows the implications of changes in the demand for money when the central bank uses monetary targeting.

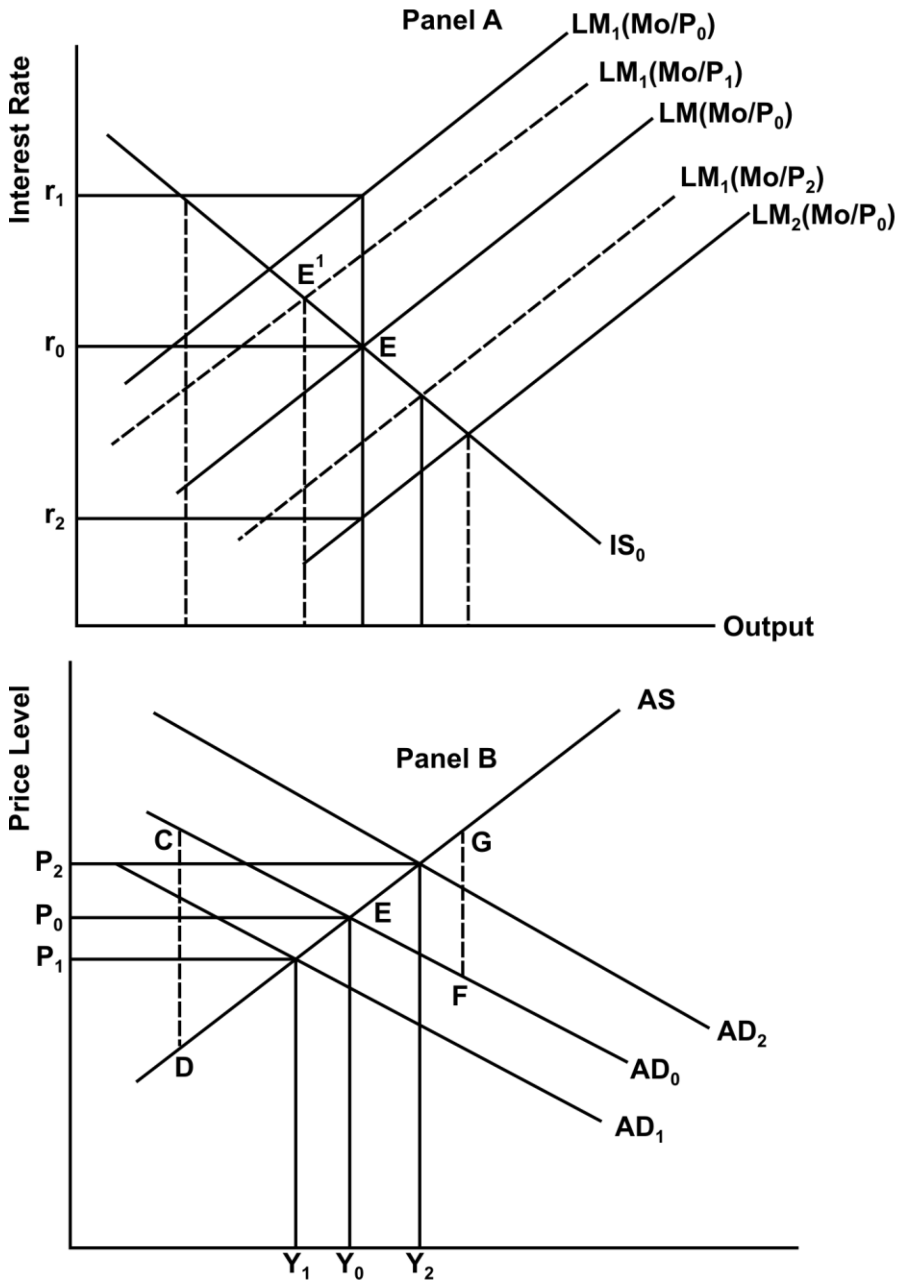

Figure 16.2

Monetary Targeting with Money Demand Shocks

In the above figure, the economy is in equilibrium at Y_0 level of income and r_0 rate of interest. As the demand for money increases, the LM curve shifts to LM_1 (M_0/P_0). At this point, the rate of interest increases to r_1 and money market equilibrium is restored at point E^1 with a higher rate of interest rate and lower level of income. At r_1 interest, there will be excess supply in the economy equal to CD as shown in Panel B. This pushes both the interest rate and the price level downwards. The economy settles at Y_1 level of income and P_1 price level. Conversely, when the demand for money decreases, the LM curve shifts to LM_2 (M_0/P_0). On this LM curve, the equilibrium interest would be r_2 for the given level of income. Thus, there will be an excess demand equal to GF. The economy adjusts itself to LM_2 (M_0/P_2), through an increase in the rate of interest, eliminating part of the excess demand. Y2 and P_2 are the equilibrium levels of output and prices.

A.3. Aggregate Supply Shocks under Monetary Targeting:

An aggregate supply shock can arise due to an increase in the wage rate, increase in the prices of inputs like oil, crop failures, increase in taxation and so on. In such a case, the aggregate supply curve will shift upwards. Figure 16.3 shows the changes in the equilibrium of the economy facing aggregate supply shocks when the central bank is using money supply as its intermediate target.

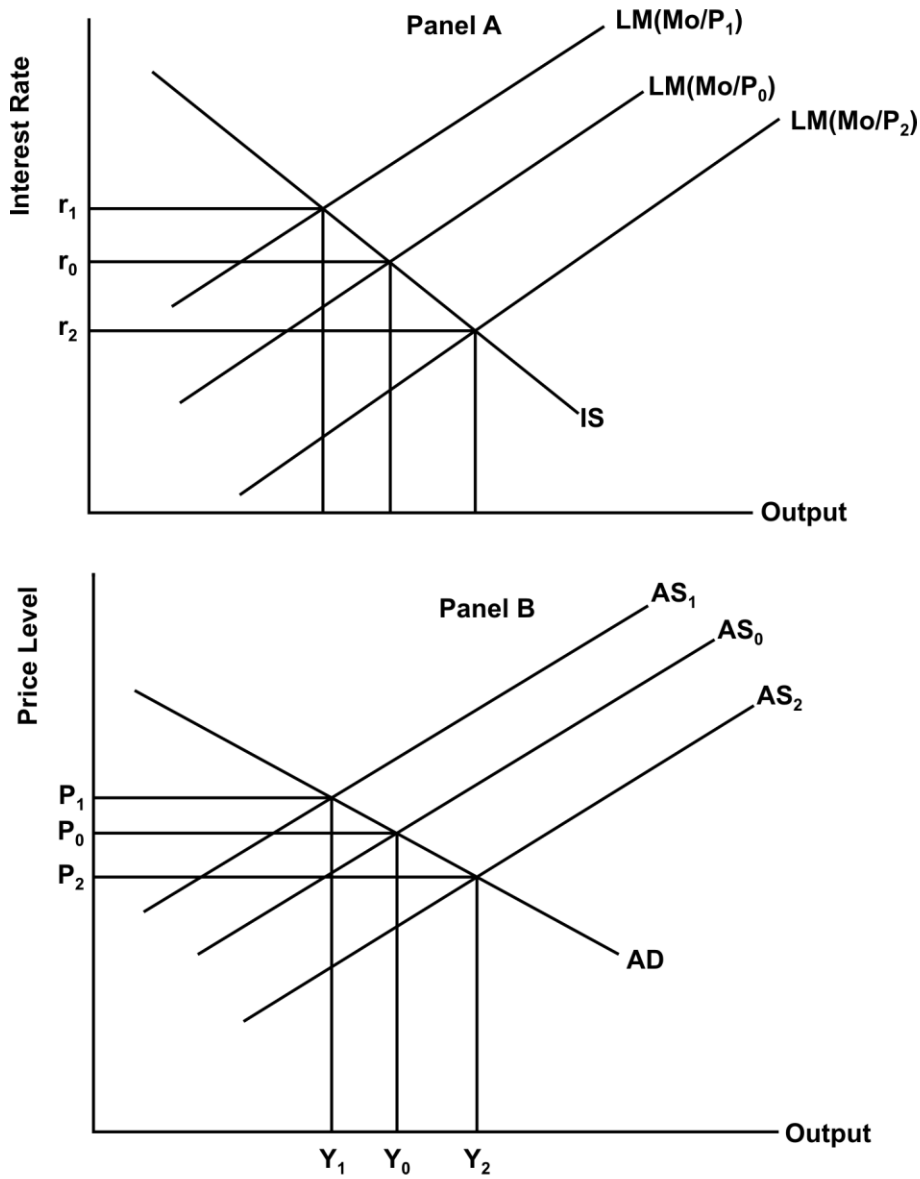

Figure 16.3

Monetary Targeting with Aggregate Supply Shocks

As the cost of production increases, the aggregate supply curve will shift from AS_0 to AS_1. This increases the demand for money and the LM curve shifts upwards from LM (M_0/P_0) to LM (M_0/P_1). This is because; the monetary authority will keep the aggregate money supply unchanged at M_0. The economy will experience an increase in the rate of interest. As a result, the interest rate increases from r_0 to r_1. The equilibrium level of income decreases to Y_2, and the economy settles at P_1 price level. Thus, monetary targeting with supply shocks results in greater variability in the level of income and prices than in the case of demand shocks. An economy can also experience a positive supply shock in which case, the aggregate supply curve will move outwards, say to AS_2. This will result in an outward shift in the LM curve to LM (M_0/P_0). This brings down the interest rate to r_2. The economy settles at higher level of income Y_2 with lower price level $P_{2.}$

B. Implications of Interest Rate Targeting

In case of interest rate targeting, the central bank fixes the interest rate and adjusts the money supply accordingly. If the interest rate increases, it will increase the nominal money stock, usually the M3 and vice versa when the interest rate decreases. Thus, the IS and LM curves will always intersect at the desired rate of interest. We now see the implications of monetary policy when the central bank targets a given rate of interest in terms of the demand and supply shocks as in Section 3.A.

B.1. Interest Rate Targeting and Aggregate Demand Shocks

In this case, a positive IS shock, the interest rate would increase and the central bank will have to increase the money supply to restore the equilibrium interest rate. The expansionary monetary policy will reinforce the original excess demand. Conversely, a negative IS shock would force the monetary authority to lower the money supply, reinforcing the initial contractionary effects. Figure shows the implications of interest rate targeting in case of IS shocks.

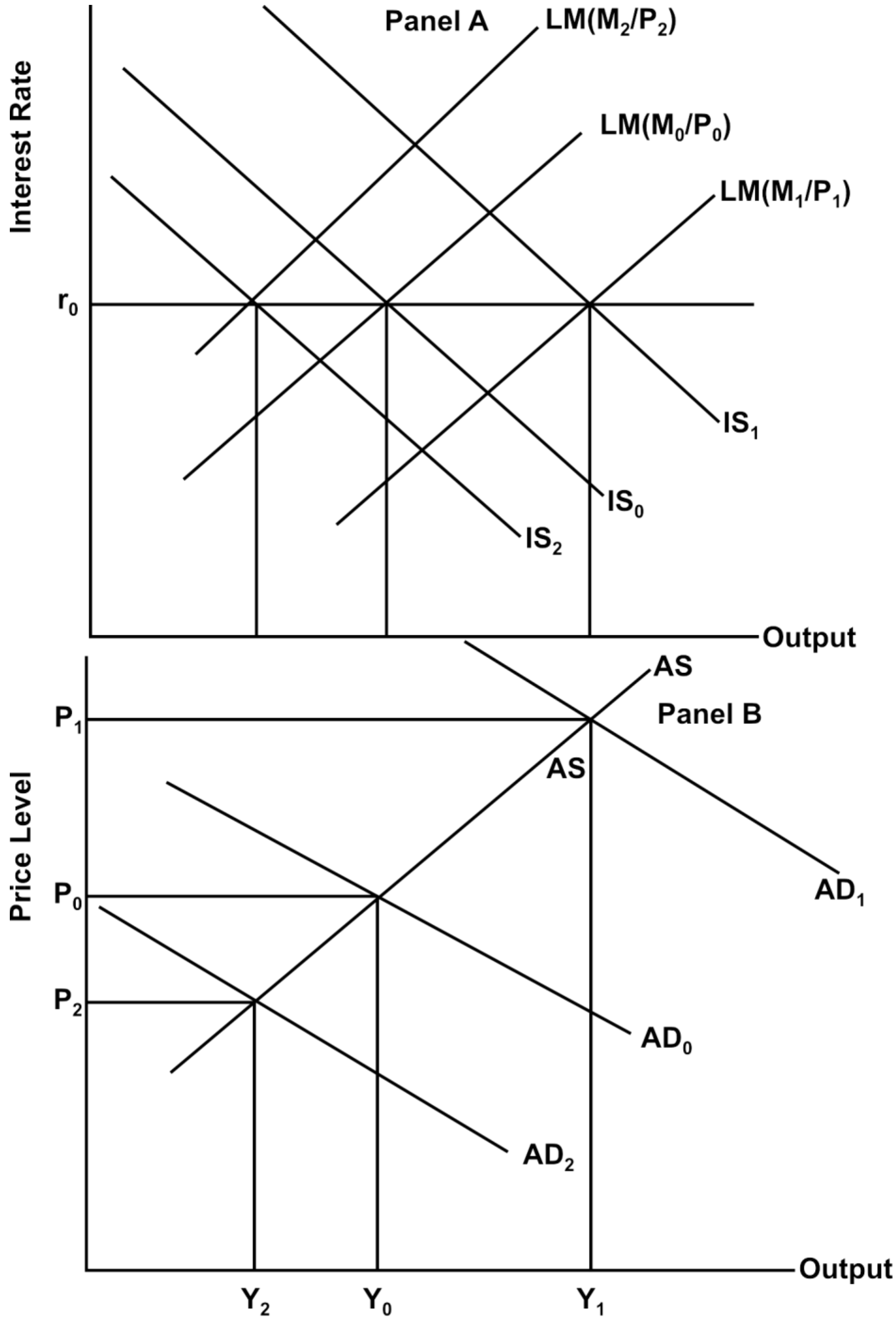

Figure 16.4

Interest Rate Taregeting and IS Shock

In the above diagram, Panel A shows the equilibrium of the economy in terms of the IS-LM framework and Panel B shows the equilibrium in terms of AS-AD model. LM (M_0/P_0) and IS_0 are the initial money and goods market schedules. The central bank targets r_0 rate of interest. Y_0 and P_0 are the initial equilibrium levels of income and prices.

At this point, a positive IS shock shifts the IS schedule to IS_1. In order to maintain the interest rate, the money supply will be increased to LM (M_1/P_1). However, the interest rate remains the same, the equilibrium levels of income and prices will increase to Y_1 and P_1. The economy will experience higher levels of income and prices. Conversely, a negative IS shock will lower the IS to IS_2 and to maintain the rate of interest, the central bank will lower the money supply as given by LM (M_2/P_2). This causes a contractionary effect and the economy will move to Y_2 level of income and P_2 price level. It can be seen that the variability of income and prices is higher when the central bank adopts interest rate targeting in face of IS shocks.

B.2. Interest Rate Targeting and Demand for Money Shocks

As noted earlier, financial innovations cause positive demand for money shocks. Figure 16.5 shows the effects of interest rate targeting in case of shocks arising out of changes in the demand for money. 16.5 Panel A shows the equilibrium of the economy in terms of the IS-LM framework. If the demand for money increases, the LM curve will shift from LM (M_0) to LM_1 (M_0). Moreover, the interest rate increases from r^e to r_1. However, to maintain the interest rate, the central bank increases the nominal money supply and the LM curve will shift back to LM (M_1). Conversely, a negative money demand shock will shift the LM curve to LM_2 (M_0) and the market interest rate falls to r_2. However, to maintain the interest rate the central bank would lower the money supply to LM (M_2) Panel B shows the equilibrium in terms of the AS-AD framework. The economy will always remain in equilibrium at Y_0 level of income and P_0 price level. Therefore, the interest rate targeting will be most effective in case of demand for money shocks.

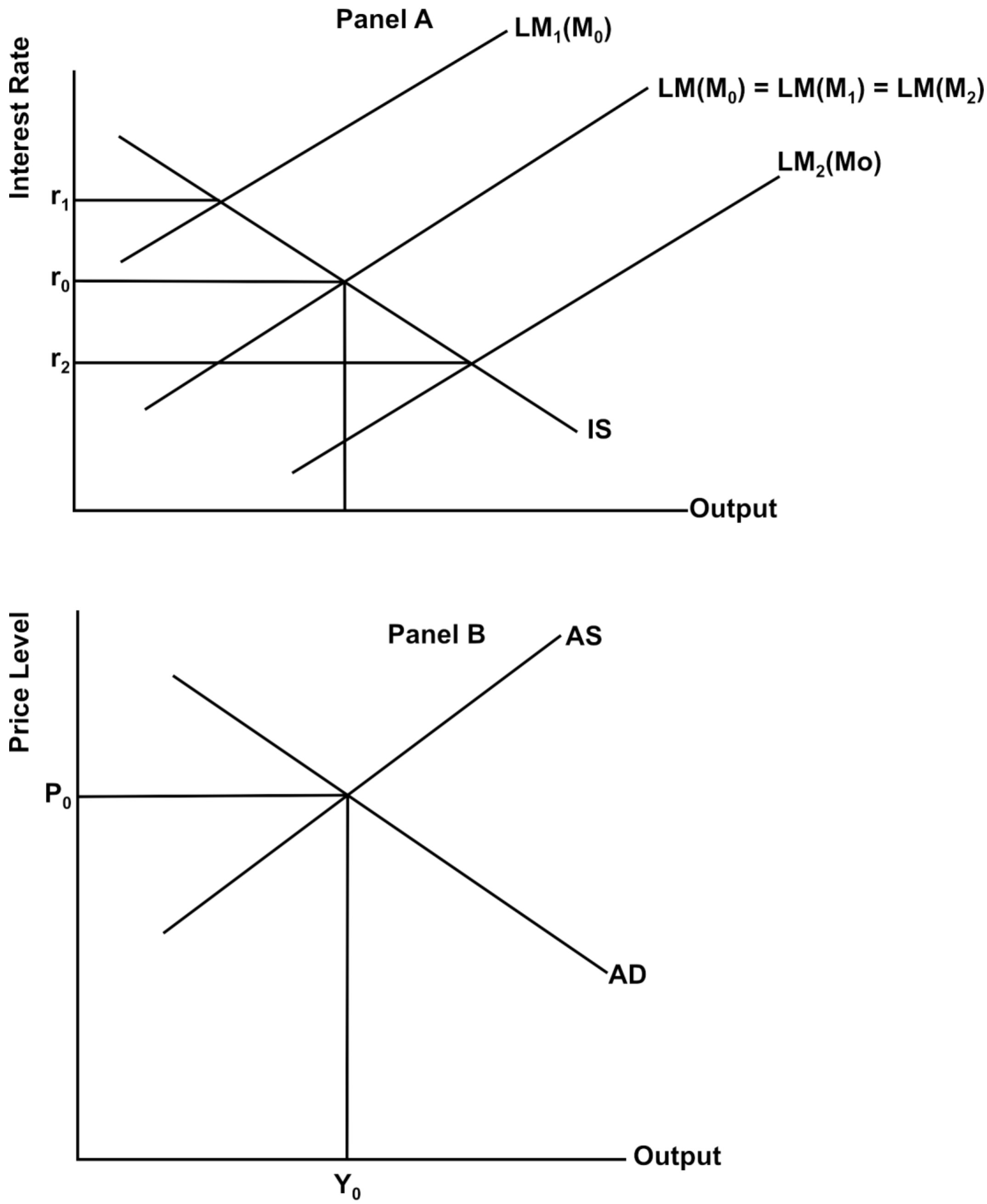

Figure 16.5

Interest Rate Targeting with Money Demand Shocks

B. 3. Interest Rate Targeting in case of Aggregate Supply Shocks:

In this case, the central bank targets a given rate of interest and tries to adjust the money supply to reach this interest rate. Figure 16.6 shows the equilibrium of the economy when it faces an aggregate supply shock.

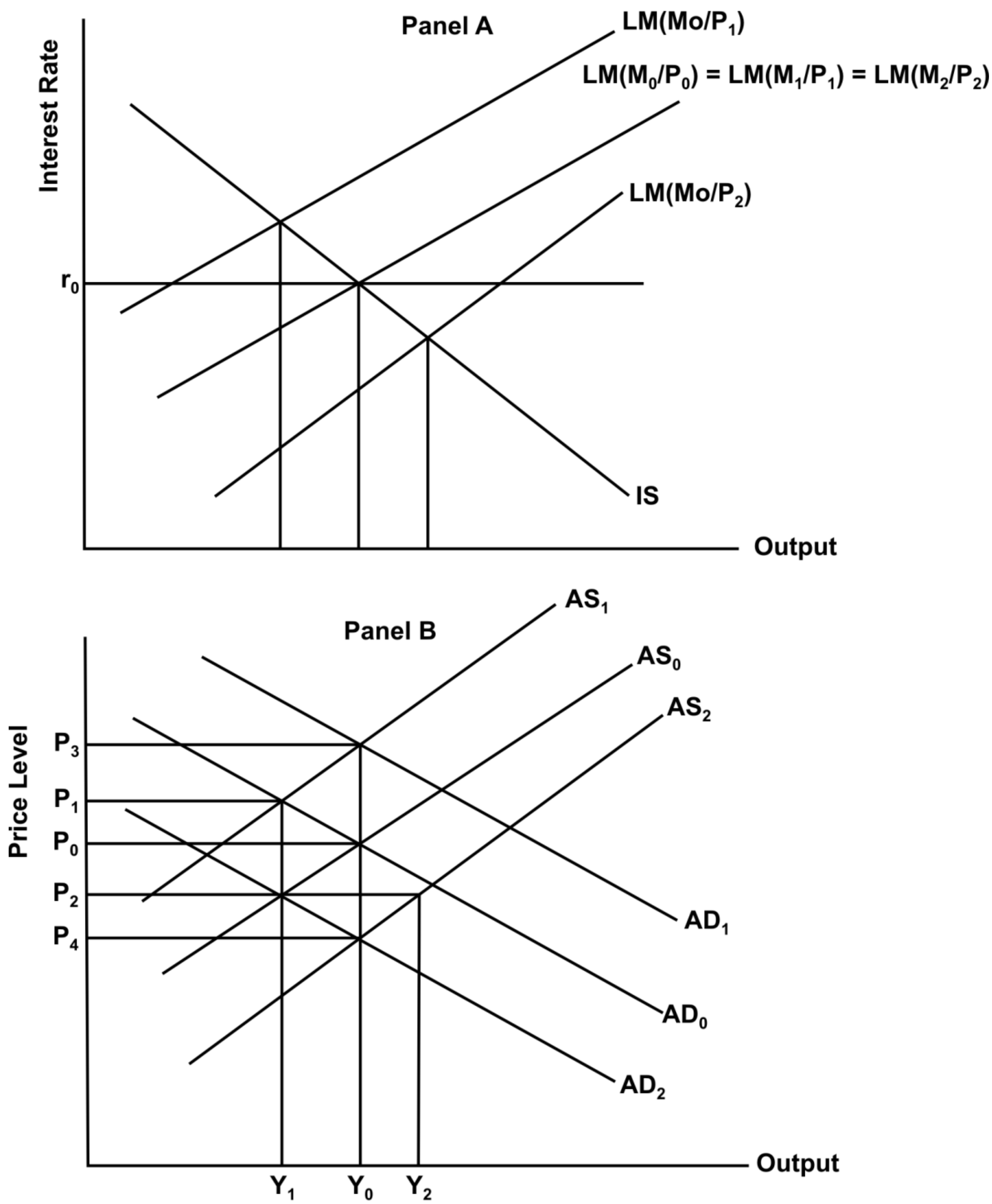

Figure 16.6

Interest Rate Targeting with Aggregate Supply Shocks

In the above figure, Panel A shows the equilibrium of the economy in terms of the IS-LM model. The central bank targets an interest rate, say r_0. LM (M_0/P_0) and IS are the initial money and goods market schedules. Panel B shows the equilibrium of the economy in terms of the AS-AD model. The economy will be in equilibrium at Y_0 level of income and P_0 price level. At this point, a negative aggregate supply shock will push the price level up to P_1 and reduces the level of income to Y_1. At this price level, the demand for money falls and the LM schedule will shift upwards. The central bank tries to increase the money supply to bring down the interest rate. LM (M_1/P_1). This will cause the aggregate demand from AD_0 to AD_1. The economy will settle at the original Y_0 with a higher price level at P_3. Conversely, a positive supply shock will push the aggregate supply schedule to AS_2. At the original aggregate demand, this results in a lowering of prices and an increase in the level of output to P_2 and Y_2 respectively. As the LM curve shifts downwards to LM (M_0/P_1), the interest rate falls. To maintain the interest rate, the central bank reduces the nominal money supply and the LM curve shifts to LM (M_2/P_2), with the interest rate restored to the targeted rate. In this case, the aggregate demand schedule shifts downwards to AD_2. The economy reaches the original level of equilibrium output Y_0 with lower prices at P_4. Thus, the interest rate targeting in case of supply shocks ensures a stable level of income with positive relation between the cost of production and price level.

From the above discussion, the following conclusions emerge in case of monetary and interest rate targeting:

1. They are equally effective when the source of variability is on the demand side of the economy in terms of variations in IS or LM. This is because, demand shocks move both prices and output in the same direction and any policy changes that offset the changes in price level will simultaneously offset the changes in the level of output.

2. This is not so in case of supply shocks. In case of supply shocks, prices and output move in the opposite direction. Interest rate targeting stabilises output but prices vary substantially. In case of monetary targeting, prices are stabilised but output variability increases.
3. Economy faced with shocks in the demand for money will face less variations in the prices and output if it targets interest rate rather than if targets the money supply. Monetary targeting is fruitful only if the demand for money is stable. This is because, the financial innovations have adverse effects on the ability of the central bank to control the economy through changes in the money supply variables.

4. If the central bank selects the intermediate target to minimise the variability in output, in case of real shocks, monetary targeting is superior to interest rate targeting. Using money supply would be

preferable to interest rate targeting since the later causes higher variability in the output and prices.

16.4 NOMINAL GDP TARGETING

Another popular intermediate target is the nominal GDP. Here, the central bank tries to stabilise the nominal GDP around the level that is consistent with the long-run level that is given by the full employment or the full information output level. The interest rate and monetary targets are based on the Keynesian assumption of money illusion on the part of the workers. The nominal GDP targeting is explicitly based on the 'staggered wages' or 'rational expectations' model. In this model, it is explicitly assumed that the workers negotiate their wages based on expected changes in the prices. The nominal GDP targeting minimises the variations in output and prices.

16.4.1. Nominal GDP Targeting with Aggregate Demand Shocks:

The economy may experience a positive demand shock in the form of increase in the aggregate demand in the short-run or a negative demand shock with a fall in the aggregate demand in the short-run. Figure 16.7 shows the implications of nominal GDP targeting in case of an aggregate demand shock.

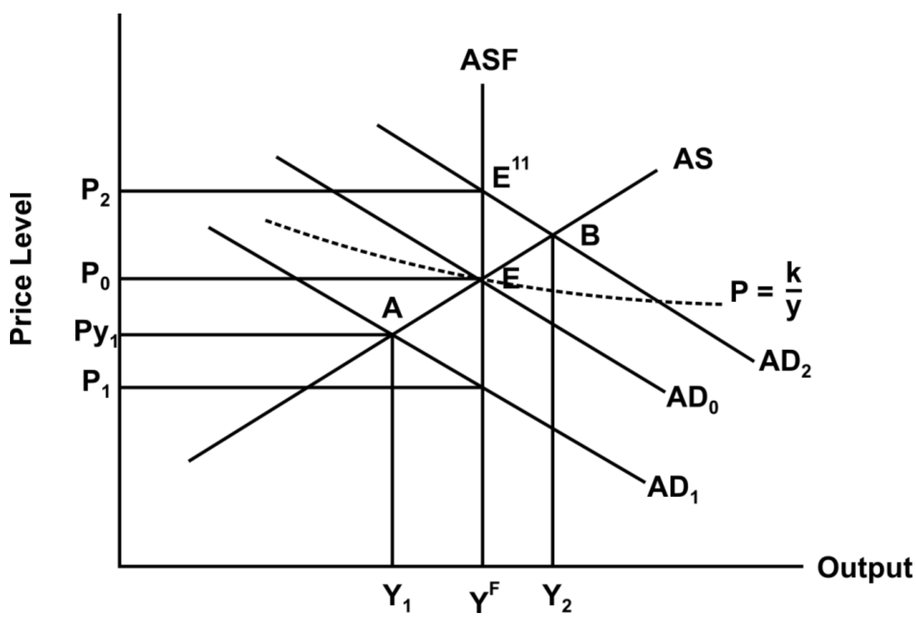

Figure 16.7

Nominal GDP Targeting with Demand Shocks

In the above figure, ASF is the long-run aggregate supply function based on the assumption of full employment and rational expectations on the part of the workers. AS is the short-run aggregate supply curve. AD_0 is the original aggregate demand schedule. The economy is in equilibrium at E with Y^F level of income and P_0 price level. The dotted line $p = \frac{k}{Y}$ shows the intersections of points of identical nominal spending. A negative demand shock will shift the aggregate demand curve to AD_1. The economy moves to point A along the short-run aggregate supply curve and the level of income falls to Y_1 and the price level to P_{Y1}. At this stage, the central bank reduces the money supply to finance the lower level of income at lower prices. The workers agree for lower wages in face of the decreased demand for output and the economy returns to the full employment output at E^I. Conversely, a positive demand shock will cause the aggregate demand curve to shift to AD_2. In the short-run, the economy reaches equilibrium at point B with Y_2 level of income. At this point, the workers will negotiate for higher wages and the central bank will increase the money supply to finance the higher level of income. The economy reaches equilibrium along the long-run aggregate supply at E^{II} with Y^F level of income and P_2 price level. Thus, while the real output remains stable, the price level varies directly with the demand conditions. The nominal income alone changes.

16.4.2. Nominal GDP Targeting with Aggregate Supply Shocks:

In the short-run, an economy may suffer an adverse supply shock, which results in an upward movement of the aggregate supply schedule. Conversely it can experience a positive supply shock that will shift the aggregate supply schedule outwards. Figure 16.8 shows the implications of supply shocks when the central bank targets the nominal GDP.

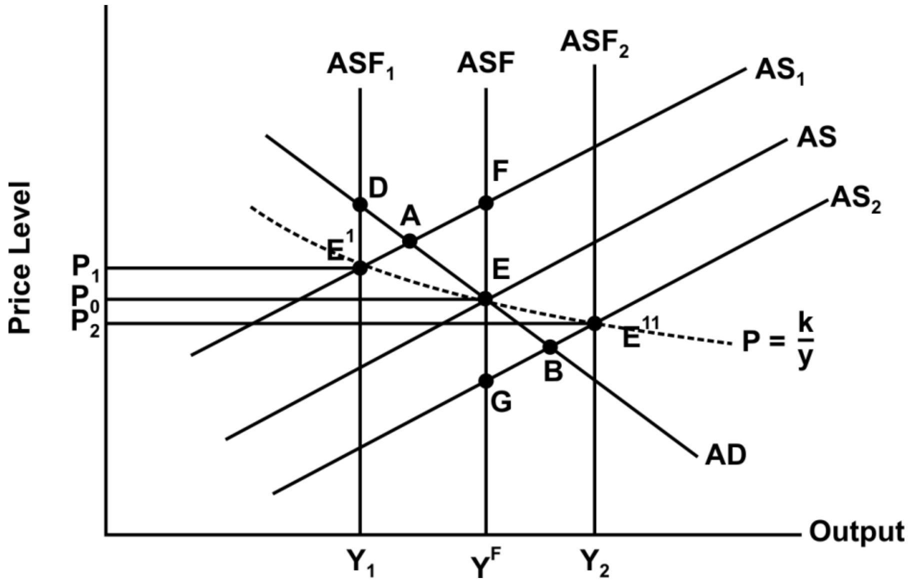

Figure 16.8

Nominal GDP Targeting with Supply Shocks

In the above figure, ASF is the long-run aggregate supply function based on the assumption of full employment and rational expectations on the part of the workers. AS is the short-run aggregate supply curve. AD is the original aggregate demand schedule. The economy is in equilibrium at E with Y^F level of income and P_0 price level. A negative supply shock moves the short-run supply curve to AS_1 and the long-run supply curve to ASF_1, level of output falls to Y_1 along the aggregate demand curve. The staggered wage negotiations and lowering of the money stock results in the economy to move from E^I to E and the price level falls from P_1 to P_0 and the output level returns to Y_F. Points A and D are transitory points while the economy adjusts itself to the adverse supply shocks. The economy moves from ASF_1 to ASF. Conversely, a positive shock will push the aggregate supply curve outwards to AS_2 and the level of output increases to Y_2. The economy will adjust itself through wage negotiations back to Y_F level of output. If the monetary policy aims at a stable long-run price level also, it can ensure this by changing the money supply in the same direction as the aggregate supply. Or it can allow a stable output with varying price level. In this case, the economy moves along the dotted line E^IEE^{II}.

The superiority of nominal GDP targeting is that it allows the central bank to choose whether to concentrate on output alone or on both prices and output. It is for this reason that the nominal GDP targeting emerged as a more popular monetary policy objective in recent years. However, it is to be remembered that the nominal GDP targeting can result in excessive inflation and output fluctuations even when the monetary policy is not directly responsible for the as in the case of an aggregate demand shock.

16.5 INFLATION TARGETING

During the 1990s, many countries have realised that in the medium and long-run, maintaining a low and stable rate of inflation is vital. A high and variable rate of inflation casues adverse social and economic effects in terms of price distortions that cause the resources to be diverted to less productive and conspicuous consumptions. It results in lower levels of savings and investment that will adversely affect the long-term growth of the economy. In order to protect from the falling value of money, people will hedge into real estate and purchase of precious metal that reduces the available financial savings. In an open economy, it can result in flight of capital that causes unsustainable balance of payments. Further, the short-run trade-off between unemployment and price level does not result in higher levels of output and employment in the long-run. The use of intermediate targets like money supply, interest rates and nominal GDP do not give satisfactory results. Therefore, the central banks have started to directly targeting the rate of inflation itself.

We can explain the help of certain structural equation. They are as under:

$$\pi_t - \pi_{t+1} = \alpha_1 y_{t-1} + \alpha_2 g_{t-1} + \varepsilon_t \qquad (1)$$

$$y_t = \beta_1 y_{t-1} - \beta_2(i_{t-1} - \pi_{t-1}) + \beta_3 g_{t-1} + \eta_t \qquad \text{such that } \beta_1 < 1 \qquad (2)$$

$$g_t = \gamma\, g_{t-1} + v_t \qquad \text{such that } \gamma < 1 \qquad (3)$$

where, π_t is the rate of inflation in period t, y_t is the output gap, defined as the logarithm of the ratio of actual to potential output, g_t is the fiscal impulse, i_t is the interest rate, directly under the control of the central bank and ε_t, η_t, and v_t are error terms. From equation (1) we can see that the rate of inflation is positively related to the cyclical changes in the output and the fiscal impulse, with a one period gap. The output gap is positively related to its previous period and government spending and inversely with the real rate of interest with a two period lag in case of the latter two variables. The model states that, monetary policy actions like changes in the nominal interest rate will affect the output with a one-period lag and, inflation with a two-period lag. The time gap between a change in the policy instrument and inflation is known as ‘control lag’ or ‘control horizon’. Under strict inflation targeting, the central bank will have a period-by-period loss function L_t that will indicate the deviations of actual and targeted inflation (π^*). Therefore, the central bank's loss function is given as

$$L_t = \frac{((t - (()^2}{2} \qquad (4)$$

The above equations will give us the optimal path of the policy variable. Since interest rate will operate with a two-period lag, we can set the path for inflation targeting as:

$$i_t = \pi_t + b_1(\pi_t - \pi^*) + b_2y_t + b_3g_t \qquad (5)$$

From the above equation we can see that the inflation in two period hence is given by the previous period inflation, output gap and government spending in the previous period and shocks to real output two-periods previously.

In an open economy, exchange rate depreciation causes inflation and aggregate demand to change with a one-period lag. The exchange rate is assumed to be inversely related to the nominal interest rate since an increase in the domestic interest rates result in capital inflows and an appreciation of the exchange rate. The optimal interest rate rule for an open economy is:

$$I_t = \pi_t + b_1(\pi_t - \pi^*) + b_2y_t + b_3g_t + b_4e_t \qquad (6)$$

The above condition highlights the need to monitor the exchange rate as the central tries to monitor the output gap and government spending.

16.6 RULES V/S DISCRETION IN MONETARY POLICY

An important aspect of monetary policy formulation is the controversy over the operations based on certain pre-announced or committed rules regarding the monetary aggregates and the freedom of the central bank to decide the money supply and interest rate based on its perception about the economic conditions. It can be reasonably shown that once the monetary authority adopts a rule that is in itself discretionary.

When commitment to a rule leaves the possibility of it being violated at a later point of time, it creates a dynamic inconsistency. Finn Kydland and Edward Prescott originally explained this concept. Barro and Gordon have shown that a monetary authority operating under a discretionary regime can itself be responsible for higher inflation, which will adverse effect the economy. The advantage of following certain rules can be explained in terms of the strategic interaction between the central bank and the private sector. Barro-Gordon approach assumes that the central bank has instruments at its disposal that can perfectly manage the economy. Further, it has a social welfare function, which corresponds to the preferences of private individuals. It can be expressed as:

$$L = \pi^2 + (bu - ku_n)^2 \quad \text{such that } b>0,\ 0<k<1 \qquad (1)$$

L is the social loss, seen as a weighted average of the deviation of inflation from the target rate, which is taken as zero and the deviation from the target rate of unemployment. The rate of unemployment is given by u and ku is the rate of unemployment with zero rate of inflation. The natural rate of unemployment is u_n. It is assumed that the private agents operate on the basis of rational expectations-augmented Phillips' curve, such that:

$$\pi - \pi^e = \alpha\,(u_n - u) \qquad (2)$$

Once the individual agents set their wage contracts, the monetary authority can deploy the policy instrument, i.e., the money supply. It is assumed that there are no lags and so the monetary authority keeps continuous control on the rate of inflation.

$$\text{Thus, } \Delta M / M = (\qquad (3)$$

The long-run Phillips' curve (LRPC) passes through the natural rate of unemployment, u_n indicating that the rate of unemployment equals the natural rate on this line. The short-run Phillips' curve (SRPC $(\pi^e = 0)$) indicates short-run trade off when the rate of inflation is zero. Figure 16.9 explains the short- and long-run equilibrium of the economy under the conditions of commitment to rules and the use of discretion in monetary policy operations.

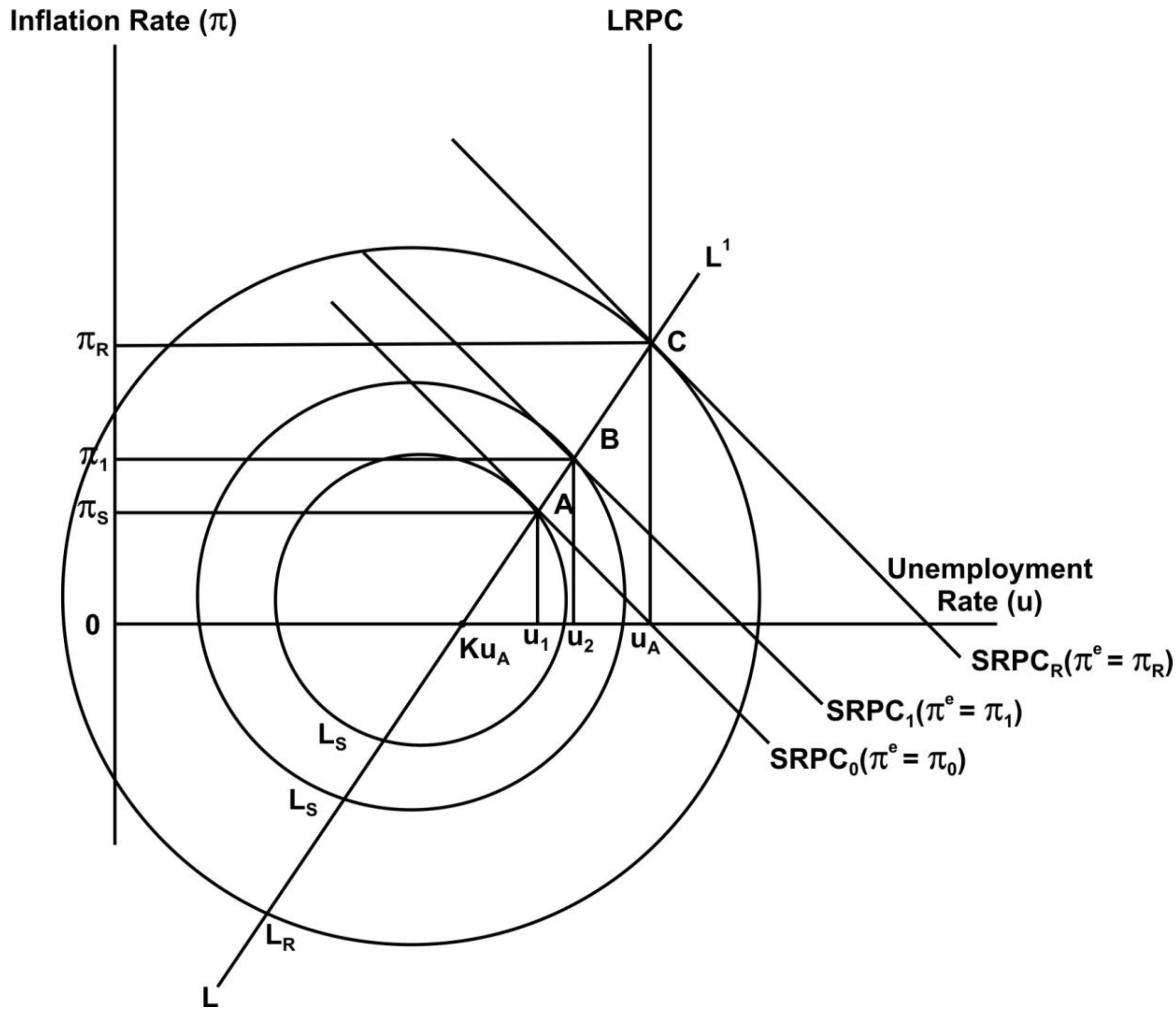

Figure 16.9

Inflation and Unemployment Trade off

When the central bank tries to exploit the lock-in period of fixed wages, it tries to lower the rate of unemployment, and to achieve a lower value of the loss function, as given by the loss function, L_s that is tangent to short-run Phillips' curve at point A. The economy in this case experiences a trade-off between the rate of unemployment at u_1 and the rate of inflation at π_1. Thus, the behaviour of the central bank is said to be time inconsistent. When the private agents see this, they would renegotiate wages and move on to $SRPC_{s(}\pi^{e} =_{\pi 1)}$. This gives the central bank further incentive to move on to a higher loss function, $Ls^{!}$. This continues until the economy reaches point B. At this point, the short-run Phillips' curve, $SRPC_{R(\pi}^{e} = \pi_{1)}$, equals the natural rate of unemployment and the loss function based on rational expectations, L_R. At this point, the expected and actual rate of inflation will be the same for the private agents. The corresponding social welfare losses are also the minimum.

A commitment to the rule of zero rate of inflation $\pi_R = 0$, will eliminate the incentive to cause surprise inflation and try to lower the rate of unemployment. At the same time, the private sector will be assured that there is no need to set positve rates of inflation in wage bargaining. “Credibility” of the central bank refers to the perception of the private agents as to how serious is the monetary authority to bring down the rate of inflation in the economy to operate at the highest possible rate of unemployment. It is in other words, how seriously the central bank is viewed to keep the target rate of inflation. It is important to note that achieving policy credibility is a long-term exercise that requires pursuing disinflationary policy where the actual rate of inflation is below the expected rate. Following measures can be taken to ensure policy credibility:

1. Withdrawing of currency as Germany did in 1923 and 1948. However, this policy was not successful in Latin America and Ukraine in recent times.

2. Joining a currency union as the former East Germany did. But in this case, other members in the union may resist the entry of a country with high rates of inflation since it will destabilise their own economies.

3. Following a more transparent monetary policy through an independent central bank is the easiest solution. Barro comments that “the ideal central banker should always appear sombre in public, never tell any jokes, and complain continually about the dangers of inflation.

16.7 QUESTIONS

1. Explain the concept of objectives and instruments of monetary policy.
2. Explain the operation of ‘interest rate targeting’ by the monetary policy to achieve the objectives of price and output stability.
3. Who is the monetary targeting used to achieve the objectives of the monetary policy?
4. Explain the use of nominal GDP targeting as an instrument of monetary policy.
5. Explain the concept of ‘inflation targeting’.
6. What do you understand by ‘rules vs. discretion’ in case of monetary policy?
7. Explain the concepts of ‘dynamic inconsistency’ and ‘policy credibility’ in case of monetary policy.
8. Explain the Barro-Gordon approach to monetary policy rules.

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17

MACROECONOMIC POLICY OBJECTIVES AND INSTRUMENTS

Unit Structure

17.0 OBJECTIVES

- Understand the concept of sectoral and economy-wide budget constraints.
- Understand the concepts of targets and instruments in the context of economic policy-making.
- Understand the issues related to fiscal policy in the context of a given set of objectives.
- Understand the issues related to exchange rate policy in the context of a given set of objectives.

17.1 CONCEPTS OF BUDGET CONSTRAINTS

This concept of budget constraint refers to the availability of resources to a particular sector of the economy. They together will help to understand the economy-wide budget constraint that indicates the availability of resources for the entire economy.

A. The Household Sector

The household sector budget constraint is given by the following equation in a closed economy:

Y_d = GDP + Transfers Received from Government – Taxes or

$$Y_d = Y + T_r - T \qquad (1)$$

B. Government Sector

The government budget constraint is given by the following equation:

$$G_t = (T_T + T_N + T_D)_t + rB_{t-1} = (M_t - M_{t-1}) + (B_t - B_{t-1}) \qquad (2)$$

where, G_t is the public expenditure in a given period,

T_T = tax revenue net of non-debt related transfer payments, such as subsidies.

T_N = non-tax revenue such as user charges on public utilities,

T_D = revenues from disinvestment

B_t = public debt outstanding with an interest rate of r.

M_t = net central bank credit to the government.

Restricting to only debt financing of deficits, the government budget constraint can be rewritten as:

$$\Delta B = B_t - B_{t-1} = rB_{t-1} + (G+T) \text{ or}$$

$$B_t = (1+r)B_{t-1} + D_t \qquad (3)$$

where D_t is the primary deficit. Public debt increases because the government issues debt to cover its excess expenditure and because it has to pay interest on its existing debt. It is important to note that the sustainability of a given volume of public debt is determined by whether the growth rate of GDP exceeds the interest rate on public debt or not. This is known as the Sargent-Wallance condition.

17.1.1 Fiscal Policy Rules

Fiscal policy rules refer to restraints on fiscal policy expressed in terms of an indicator of overall fiscal performance. According to Kopits and Symansky, following are the more common fiscal rules:

1. Expenditure-limiting Rules: These impose a ceiling on the level or growth of total public spending. Alternatively, specific categories of public expenditure can also be restricted. Brazil adopted a rule limiting the government wage bill. Argentina has a limit on primary expenditure. The USA has a limits on discretionary expenditure.

2. Current Balance Rules: In this case, current public expenditure is stipulated not to exceed the current revenues. This measure prevents the government from borrowing to meet excess current expenditure. These rules are operated in Brazil and the UK.

3. Over-all Balance Rules: In this case, limits to the extent of budget deficits are specified. India, Chile, Peru and the European Union follow this practice.

4. Public Debt Rules: in this case, the law specifies the limits to the extent of public debt. In some of these cases, the sources of debt are also specified and borrowings from the central bank are prohibited. Such rules are in force in India, Indonesia, the European Union.

However, in practice the governments circumvent these rules. The experiences in the USA and EU show that non-compliance with the fiscal rules does not involve strict punishments. Therefore, the durability of fiscal rules is more in case of discretionary policy. The government can demonstrate its commitment to certain macroeconomic objectives better when it is given the freedom to operate on any instrument that it feels suitable to the needs of the economy.

17.1.2 Policy Effects of Fiscal Policy

While choosing a fiscal policy instrument, it is necessary to understand the outcomes of each of these instruments. Three possible instruments are considered here. 1. Changes in the income tax: A cut in the income tax will increase the disposable income and will thus increase the consumption and GDP. As spending increases, investment will reduce. 2. Changes in government spending: An increase in public expenditure will increase the level of income, consumption. However, this will reduce the investment. The reductions in investment will be higher if the expenditure is financed through additional debt. In such cases, the market interest rate will increase, further discouraging the investment. This is known as the crowding-out effect. 3. Investment Subsidies: when the government provides subsidies on investments, it will encourage investment, which will add to the productive capacity of the country. This will also increase consumption. Thus, the government will have to choose a policy instrument in consonance with the overall macroeconomic objectives.

C. Central Bank Budget Constraint

The central bank balance sheet is given by the following equation:

$$\Omega^b = ER^c + (L^b + L^g) - M \qquad (4)$$

R^c is the net foreign exchange assets of the central bank, L^b is the net central bank credit to the commercial banking sector; L^g is the net central bank credit to the government and M is high-powered money. From the above equation, we can see that changes in the base money occur due to changes in the central bank's lending to the government and non-government sector, balance of payments surplus/deficits, and the quasi-fiscal deficits.

D. External Sector Balance

The external sector balance is given by two components: 1) current account surplus/deficit; and 2) the capital account surplus/deficit. Thus,

$$BP = NX (Y_d, Y_f, R) + CF (i - i_f) \qquad (5)$$

BP is the balance of payments, expressed in home currency; NX is net exports, positive. The domestic income is inversely related to the net exports. This is because; higher the level of income, larger would be the propensity to import. The net exports are similarly positively related with the level of income in the trading partners. R is the exchange rate. An appreciation in R would lower the exports and vice versa when there is depreciation. CF is the foreign capital or the capital account balance. This is given by the difference between the home and foreign country interest rate.

17.2 NATURE OF POLICY LAGS

Before understanding the concept of economic stabilisation, it is important to understand the concept of policy lags. This is because, when a policy-maker tries to influence the economy, or wishes to alter the possible effects of an exogenous change in the economic parameters, it is essential to identify whether the change is permanent or temporary. For example, it was feared during the World War II that in the post-war period, there will be world-wide recession. This fear was found to be unfounded. Similarly, the oil embargo by the OPEC was considered a short-run problem. This was found to be wrong. There are two types of lags in that a policy maker will face in trying to stabilise the economy. Further, the policy makers face the uncertainty of the outcome of their decisions. We shall now discuss each of them.

A. Inside Lag: An inside lag is the time it takes to undertake a policy action. This the time taken to cut a tax or increase the money supply. The inside lag is further divided into three lags.

A. 1. Recognition Lag: The recognition lag is the period that elapses between the time a disturbance occurs and the time the policymaker recognises its consequences and concludes that some action is required. If the policymaker foresees that possible disturbance,, he/she will act in advance and hence the lag is negative. This is case with seasonal variations in demand for money and output. Generally, most of the disturbances are unpredictable and hence some time elapses between the occurrence of the event and the realisation of the need to act. Kareken and Solow observed that on an average, there is a five-month recognition lag. The lag was found to be shorter when expansionary policies were needed and longer when contractionary policies are required.

A.2. Decision Lag: The delay or time gap between the recognition of the need for action and actual policy decision is the decision lag. This lag is important since it differs for fiscal and monetary policies. The monetary policy has shorter decision lags since the central banks conduct frequent meetings about the working of the economy. Thus, in case of monetary policy, the decision lag is very short. In case of fiscal policy, the decision lag is longer. Once the need for action is recognised, the government has to prepare the necessary legislations. This legislation has to be approved by the legislature before it can come into effect.

A.3.. Action Lag: Action lag refers to the time required to implement the policy decision taken in a given situation. In case of monetary policy, the action lag virtually zero. This is because, once a decision is taken about a situation, decision can be implemented immediately. Whereas, in case of fiscal policy, the actions, like a tax cut will take time after they are approved by the legislature.

B. Outside Lag: The outside lag is the time it takes from the recognition to decision and implementation. Therefore, it is a discrete lag expressed in months. It is generally a distributed lag. Once a policy action has been taken, its effects are spread over a period. Some of these effects may be immediate, while others occur later. For example, if money supply is increased by a given percentage, its immediate effect on expenditure is very small. It takes several months before the full effects are felt on spending and output. The concept of outside lag helps us to understand the importance of the size of policy change required. If the policymaker is trying to cause some immediate effect in aggregate income, the decision can result in more than desired changes at a later period. The outside lags exist because no policy instrument has direct, immediate effect on any one variable only. A particular policy decision does affect different macroeconomic variables differently. For example, an increase in the rate of interest of interest not only reduces investment, it can also reduce spending, this is case with housing loans.

The understanding of policy lags helps in better policy formulation. It is for this reason that the monetary policy is considered preferable in case of controlling price level and external sector. Fiscal policy is more effective in regulating the level of output and aggregate spending through expenditure and tax policies.

C. Reaction Uncertainties: An important aspect of macroeconomic policymaking is the uncertainty that surrounds the outcome of a decision. This is because; the economic agents are going to react to the decision. For example, if the central bank decides to increase the lending rates, the borrowers may expect the changes to be reversed at a later stage and will only postpone their borrowings. If they expect the increase to be permanent, then only possibly, they may reduce borrowing. If the expected rate of return on investment is higher, then borrowing may not decrease at a higher rate of interest also. If the expected rate of return is too low, a lower interest rate may not stimulate economic activity. Similarly, in case of fiscal policy a tax cut may not stimulate the economy when the taxpayers form expectations about the nature of tax cut.

3. Exchange Rate Policies

Exchange rate refers to the units of domestic currency required to buy a unit of foreign currency. Alternatively, it is the price of foreign exchange. For example, if we say US$ 1 = Rs. 48, we indicate that we need 48 Indian rupees to buy one dollar of the USA. The exchange rate links the domestic economy with the world economy and is thus a very important macroeconomic policy variable. A stable and strong domestic currency is essential for the long-run growth of the economy. The demand for exports is positively related to the exchange rate. This is because, when the exchange rate increases, the domestic currency becomes cheaper for the foreigners. We can give a simple illustration for this. If India is exporting a good that costs Rs. 120, the buyer in the USA is paying $ 2.50 at the exchange are of US$ 1 = Rs. 48. If the rupee depreciates to US $ 1 = Rs. 50, the American buyer will pay only US $ 2.40 for the same product and vice versa when the exchange rate appreciates. It can be seen that the imports are inversely related to the exchange rate. A depreciation of the domestic currency will increase the foreign exchange price of imports and thus dampen the import demand. When central bank tries to change the exchange rate to influence the current account, the outcome is given by the Marshall-Lerner condition. According to this condition,

$$dB = (\eta x + \varepsilon m) - 1 \qquad (6)$$

where, dB = change in the trade balance, ηx = price elasticity of exports, and εm = price elasticity of imports. In other words, only when the imports and exports are elastic to the prices, a country can hope to improve its trade balance through a change in the exchange rate. Since most of the developing countries have inelastic import demand and uncertain export demand, the exchange rate changes are not a popular instrument in these countries. Further, this policy can result in speculative attacks on the currency and so the monetary authorities in developing countries prefer to use other measures to regulate the trade balance.

The flow of capital is also related to the exchange rate. As noted in the external sector balance, the exchange rate and the expected changes in it result in changes in the direction of flows. An appreciation attracts inflows and depreciation forces outflows. When there are large appreciations or depreciations, they cause destabilising capital flows. Speculation is an important aspect of capital flows in recent years. Under the managed floating, most of the central banks intervene in the foreign exchange market to avoid instability in the exchange rate. In face of depreciation, the central bank buys domestic currency or sells foreign exchange to reduce the supply of domestic currency. Conversely, in case of an appreciation, it sells domestic currency or buys foreign currency. It is important to note that the buying of foreign currency is easier than selling. This is constrained by the availability of adequate foreign exchange reserves. Since most of the developing countries have balance of payments problems, selling foreign exchange rate becomes difficult in case of speculative attacks. The Asian Currency crisis and the Latin American currency crisis strongly indicate this.

A further problem is the effectiveness of foreign exchange market intervention. Studies have shown that there is no certainty in the outcome of intervention policies. Larger the size of the foreign exchange market, greater is the possibility of fluctuations.

In ddition, when a country is faced with the problem of inflows, it is necessary to insulate the domestic economy from the adverse effects of excess liquidity. A liquidity overhang can cause inflationary pressures and destabilise the economy. In this case, the central banks undertake sterilisation. This is a policy where the central bank sells dated government securities to the commercial banks in exchange for the foreign currency reserves held by them. The sterilised foreign exchange market intervention has the following dimensions.1) It might be used to peg an exchange rate or modify its path. The monetary authorities would purchase all of the foreign or domestic currency that the market was unwilling to absorb. This is sometimes called brute-force intervention. 2) It might be used to alter asset-market equilibrium by changing money supplies or supplies of nonmonetary assets in various currencies. It would be nonsterilized in the first case and sterilized in the second. 3) It might be used to alter expectations by underscoring the authorities' commitment to a particular policy, signalling a future policy change, or making the market more or less confident about its own projections. Maurice Obstfeld (1986) showed that a speculative crisis does occur even when it is not foreordained by current policies; it can be produced by self-fulfilling expectations about the policy response to a future crisis.

In India, this scheme is known as the Market Stabilisation Scheme (MSS). Under this scheme, the Reserve Bank of India holds government securities worth Rs. 55,000 crore with it. These securities are sold to the commercial banks. Though these securities are in the name of the government, the Reserve Bank holds the entire proceeds with and the government has no claim on them.

17.3 QUESTIONS

1. Explain the sectoral budget constraints of an economy.
2. What are fiscal policy rules? Explain the different fiscal policy rules that are practiced by governments.
3. Explain the concept of policy lags. What are the different lags in monetary and fiscal policies?
4. What do you understand by foreign exchange market intervention? Discuss the various issues involved in foreign exchange market intervention by the central bank.

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