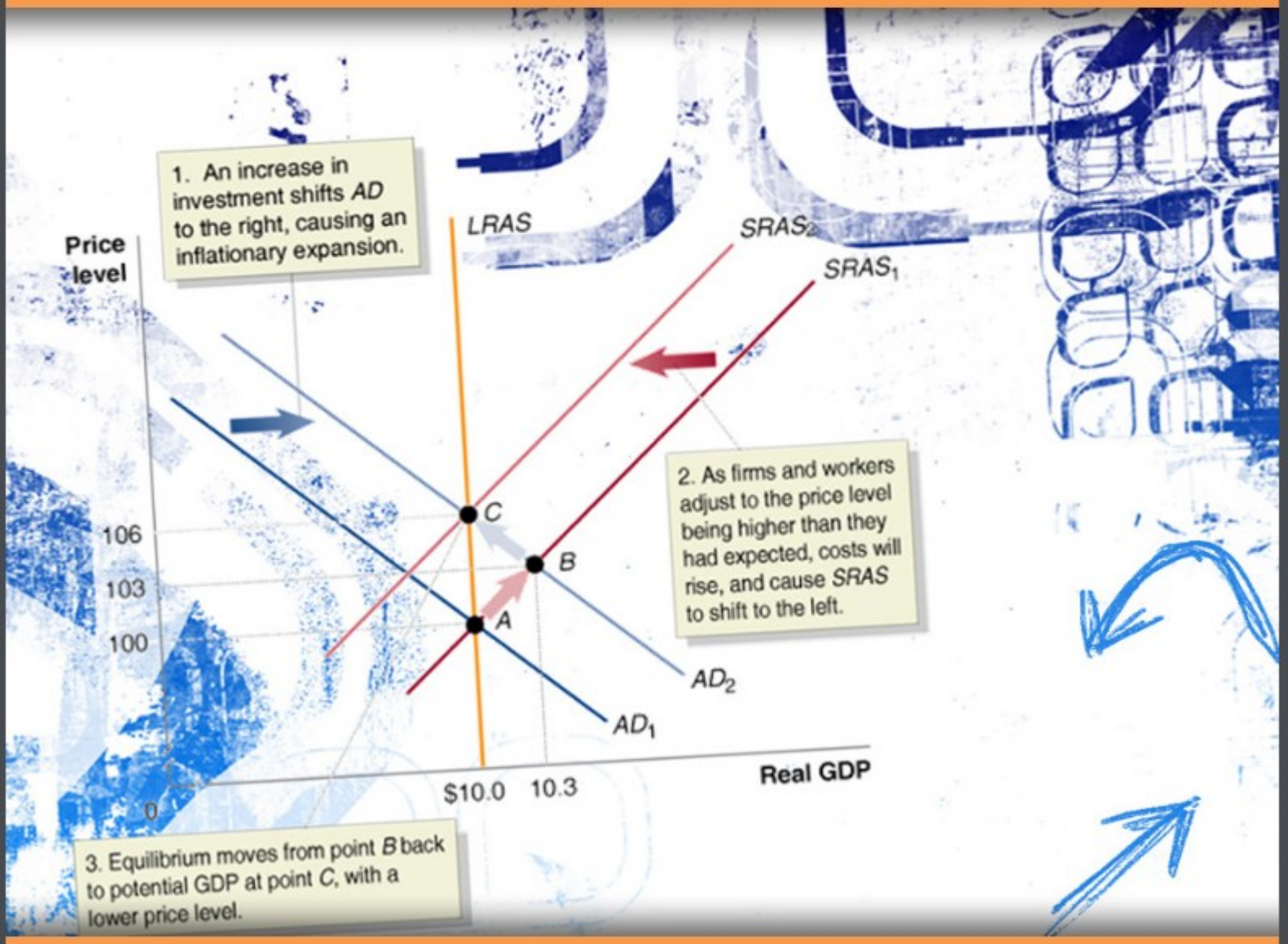
Advanced Macroeconomics

Sanjay Rode



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Preface

This book aims at fulfilling the curriculum requirement of the Masters students of Macroeconomics. Macroeconomics is one of the most practical subjects and is very useful for policy making. The domestic and international economy is subjected to different variations in saving, income, exchange as well as interest rate and balance of payment. This book attempts to explain the domestic and international factors responsible for creating the equilibrium of balance of payment, interest rate and inflation. The various dimensions of issues and logics form the basic core of this book.

This book will help the students to think, analyze and apply the content of this book practically. Various industry related example such as data of exchange rate, inflation, domestic output etc. are mentioned to understand the macroeconomic issues. It also aims at providing insights to the students, teachers and policy makers to think about various macroeconomic issues in broader way. Once the issues are known to the policy makers, planners and academicians, then it is easier for them to think in that direction and ultimately help them to solve some of these issues.

The advanced macroeconomics book provides fundamentals of the basic macroeconomic identities. It will also assist the other educational stream students to understand macroeconomics who are studying it for the first time.

This book is divided into two parts. The first part explains the topics related to the closed economy. Second part is related to the open economy where open economy and macro economy is explained. Both the parts are equally important because the first part forms the basic crux for understanding the second part which needs higher comprehension levels. Some current issues such as foreign exchange, money and capital market are also explained in this book as such issues help students to understand the subject in greater depth.

The first chapter explains the basic concepts of macroeconomics. The IS-LM model is explained with expansionary fiscal and monetary policy. The aggregate demand curve is derived from the IS-LM equilibrium. The aggregate demand and supply explains the price adjustment in the short and long run.

Second chapter clarifies in detail, the consumption function. The lifecycle and permanent income hypothesis form the major parts of the chapter. The investment theories demand and supply of money and the money multiplier are also a part of this chapter.

Third chapter elucidates the aggregate supply curve, inflation and Philips curve. The linkage of inflation, deficit, and debt; as well as deficit and debt financing is also depicted in the last part.

Chapter four describes the open economy as well as the macro-economy. The chapter attempts to interpret the Mundell-Fleming model under fixed and flexible exchange rate, exchange rate fluctuation and the reserve bank policy.

Chapter fifth defines the fundamentals of the modern macroeconomics. Rational expectations and real business cycle theory is explained in the latter part. Efficiency wage hypothesis explains the wage bargaining of the workers in industry.

Insider and outsider model explains how workers perform the wage bargaining in the industry. Search and match model explains the asymmetric information and moral hazard problem of selection of workers and employment issues.

Chapter six clarifies the monetary and fiscal policy mix for internal stability in details. Exchange rate and debt management of government is discussed in the second section. Rules versus discretion and the Polak Fund model are also discussed in this chapter.

Acknowledgement

The researchers and academicians are unique in their contribution to Macroeconomics. Nobody can correspond with each other in terms of their contribution. My work is just a piece of paper and is subjected to various limitations but sincere efforts are made to study the domestic and international factors affecting on macroeconomics. Words fall short to express my deep sense of gratitude to my research guide, Dr. Neeraj Hatekar, Professor, Department of Economics, University of Mumbai, Mumbai, India. His continuous support in my research endeavor was a source of inspiration. He taught me various principles of macroeconomics – theoretically as well as practically. I am lucky to work with him as a research student.

I am inspired by Dr. Indira Hirway, Professor and Director of Center for Development Alternatives (CFDA), Ahmedabad, India. Her work in labor and gender economics, time use study has helped me understand the various macroeconomic issues in detail. She took many efforts to teach me the theory and advanced macroeconomics topics in her office and in the field work.

I wish to express my heartfelt gratitude to Dr. Sangita Kohli, Principal, S. K. Somaiya College of Arts, Science and Commerce for continuous support and encouragement starting right from the planning of the research to the eventual writing of this book. I am thankful to Dr. Mahadeo Deshmukh, Department of Economics, S.K.Somaiya College, University of Mumbai, for having provided consistent support for research work.

I would like to thank Dr. Sindhu Sara Thomas from the Department of English for the valuable suggestions and help during the research work. I owe very special gratitude to Mrs. Smitha Angane, Department of Statistics and Mathematics who has always lent a helping hand.

I would like to record my deep appreciation for the administrative staff of S.K. Somaiya College, University of Mumbai, particularly to Mr. Sanam Pawar, Librarian and Mr. Mane for their immense help in meeting the requirements smoothly. I am thankful to my friend Mr. Srinivasan Iyar for some very fruitful discussions on various aspects and part of this book. Mr. Amit Naik and Mr. Anant Phirke have been a continuous source of inspiration and help at need. Their affection and encouragement has helped me throughout this research work. I must also acknowledge the support of my numerous friends Mr. Rajesh Patil, and associates Mr. Rajendra Ichale to name only a few.

Finally, I would like to express my affectionate appreciation of my mother and father. It is difficult to explain how much efforts they have taken in order to pursue my study. I am especially thankful to my uncle and aunt. Without their co-operation and help I would have not completed this book. My brother, Mr.Shantaram Rode constantly provided moral support in difficult times. The continuous inspiration from Sushma and Rani was an advantage. I am thankful to many of my friends and colleagues without their help, this work would not have seen the light of day. Last but not the least, I would like to thank to my postgraduate and undergraduate students whom I teach economics.

Sanjay Jayawant Rode

1 Introduction to Macroeconomics

1.1 Close to open economy

The productive activities have been an active part of human civilization since ancient times. Modern economies have more diversion in form of production function. Now, skilled labors and advanced computerized machineries are used in the production process. The production system, at the first instance satisfies the consumption need of the people. Therefore in a closed economy, without government sector, all income which is generated from all natural resources is consumed by people. In terms of equations, it is presented as follows -

$$Y=C \tag{1.1}$$

Where,

Y: Production

C: Consumption

All consumption is equal to the income or production. If we assume that no external sector exists, then exports and imports are not possible. In case of lower consumption and more income, some income can be saved; the equation can be presented as -

$$Y=C+S \tag{1.2}$$

Where,

Y: Production

C: Consumption

S: Saving

Ultimately, saving can be converted in to investment (S=I) after some time. It can be interpreted as -

$$Y=C+I \tag{1.3}$$

Where,

Y: Production

C: Consumption

I: Investment

If equation (1.2) and (1.3) are combined then it can be computed as follows-

$$C+I \equiv Y \equiv C+S \quad (1.4)$$

Income which is either consumed or invested is equivalent to income consumed and saved. This is because savings become investments in the long run. We live in a democracy and government forms an important part in economy. If we add government in the above equation then government does expenditure on various infrastructure projects and welfare schemes. It imposes direct taxes on people's income. Hence, the total disposable income is affected by government expenditure. Further, the equation becomes -

$$Y=C+I+G \quad (1.5)$$

Where,

G = Government levied taxes

Government not only finances various development projects but also provides subsidies and maintains defense, law and order in society. Such activities require expenditure and it is regularly maintained in economy with additional expenditure. The total income of the population declines after imposing direct taxes, deducing the current equation to -

$$YD= C+S \quad (1.6)$$

Where,

YD: Disposable income of people

C: Consumption

S: Saving

In the modern world, all the economies are open economies and we cannot neglect external sector. Foreign trade is a must in the globalized world and it is increasing with increase in openness of a country's economy. Including these factors, it can be interpreted as follows-

$$Y=C+I+G+(X-M) \quad (1.7)$$

Where,

(X-M): Net exports to other countries

All governments encourage export and try to minimize imports. The aim is to increase the foreign capital flow and reserves. Including net exports is not enough for equilibrium in the balance of payment. Capital flow is also taken into consideration. It can be interpreted as -

$$Y=C+I+G+(TR-TA) \quad (1.8)$$

Where,

TR- Total Receipts

TA- Total Payments

A total receipt comprises the capital flow and net exports. Similarly, the total payments comprises of the capital outflow and payment for import.

If we combine the equation (1.6) and (1.7) then

$$C+S \equiv YD \equiv Y+TR-TA \quad (1.9)$$

$$C \equiv YD-S \equiv Y+TR-TA-S \quad (1.9a)$$

$$S-I \equiv (G+TR-TA)+NX \quad (1.10)$$

Where,

NX: Net Exports

Therefore, saving, investment government budget and foreign trade has following macroeconomic identity, it is presented as

$$C+I+G+NX \equiv Y \equiv YD + (TA-TR)$$

$$\equiv C+S+ (TA-TR) \quad (1.11)$$

Left hand side of the equation shows the output component of economy. Output supply is measured in terms of money; it is the national income of the country. Right hand side of the equation shows the disposal income, it is equivalent to the Gross Domestic Product (GDP) plus transfer payment and taxes.

1.1.1 Income and spending

Aggregate income in the economy comprises the consumption, income, government expenditure and net exports. It is explained as

$$AD= C+I+G+ (NX) \quad (1.12)$$

Where

AD: Aggregate Demand

NX: Net Exports

Figure 1.1 Income and spending in economy

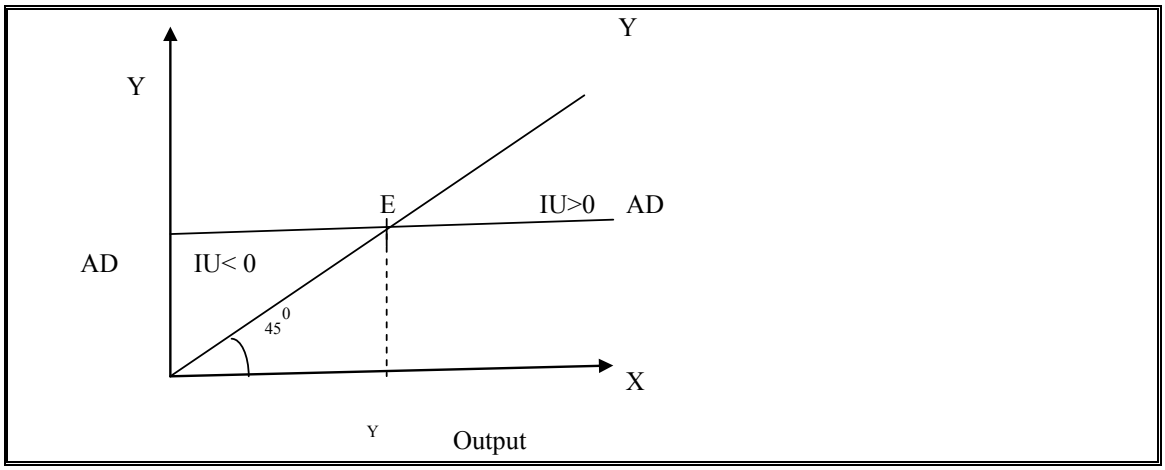


Figure 1.1 shows that the aggregate demand is a horizontal line. It shows that the aggregate demand in the economy is independent. Point E shows that the income is equal to the aggregate demand. In the economy, if output is more than income then the firms reduce production. In the long run, when there is less production. The output remains in equilibrium. Thus the output and equilibrium income is achieved. In an economy, goods are produced up to the point where they are adjusted to aggregate demand. Therefore,

$$AD=C+I+G+NX=Y \tag{1.13}$$

If there is less demand for goods produced then firms will hold the stock of goods and produce less. In this case unplanned inventories are working in direction to control supply. It can be written as -

$$IU=Y-AD \tag{1.14}$$

In scenarios where unplanned inventories control the aggregate demand in the economy, the aggregate demand equals income. It can further be deduced as-

$$Y=AD \tag{1.15}$$

Sometimes, the producer expects more demand in future. It is their regular exercise to forecast the aggregate demand. Hence they invest more economic resources in their firm and find a market for their products in the long term. In such case, planned spending is equal to planned output in an economy. Therefore the planned spending is also equal to the planned income. This is a direct relationship between the income and the spending in an economy. But an opposite situation is also possible which is commonly known as recession. We will discuss this issue in detail in the next section.

1.1.2 The consumption function

There is direct relationship between disposable income and consumption. In general, the higher the disposal income, then higher is the consumption. We must understand that consumption of individual cannot be zero. It always increases with increase in age. Consumption in simple terms is defined as -

$$C=\bar{C}+cY \tag{1.16}$$

Where

C: Consumption

Y: Income

Consumption is depending up on income and average consumption remains same for a long period of time. Alternatively we can redefine consumption as -

$$Y=C+S \tag{1.17}$$

In the above equation, income is equally divided in consumption and saving. In a different way, it is defined as -

Y-S=C (1.18a)

In order to get the saving out of income and consumption, we can reorganize the above equation as -

S=Y-C (1.18b)

Some households have minimal income thus they cannot save out of their income regularly. Their income is equal to their consumption. If the household income increases and the consumption remain constant then the saving occurs. But it is usual that income rises with the rise in consumption.

If we substitute equation (1.15) into (1.18b) then,

S=Y- ($\bar{C}$+cY) (1.18)

= -$\bar{C}$(1-c)Y (1.19)

Where savings depend on the average consumption and change in income, there is regular investment in the economy by the government. Aggregate demand depends on the consumption and planned average investment. It is explained as follows -

$$AD = C + \bar{I} \tag{1.20}$$

Aggregate demand is equal to aggregate consumption and average investment. It is very dynamic in nature, thus it can be inferred as –

$$AD = \bar{C} + I + \bar{c}Y \tag{1.21}$$

As per the equation (1.15), we have substituted consumption with $\bar{c} + cY$. We assume that autonomous investment in economy should be equivalent to average consumption. Therefore, the investment will take care of the aggregate consumption in the economy. If the income level rises then the propensity to consume can rise. Therefore there is need to increase in autonomous investment.

$$\bar{AD} = \bar{C} + \bar{I} \tag{1.22}$$

If the economy is capitalistic economy, and there is no government intervention, then autonomous investment takes care of rising consumption. But in a welfare state, government regularly invests in economy. If commodities are short in supply then the government takes initiatives to supply them. If overall production is less then government imports commodities from various countries. Therefore, government and external sector cannot be ignored.

Y=AD (1.23)

If we minus consumption from both sides of the above equation then, the above equation can be written as -

Y-C=AD-C (1.24)

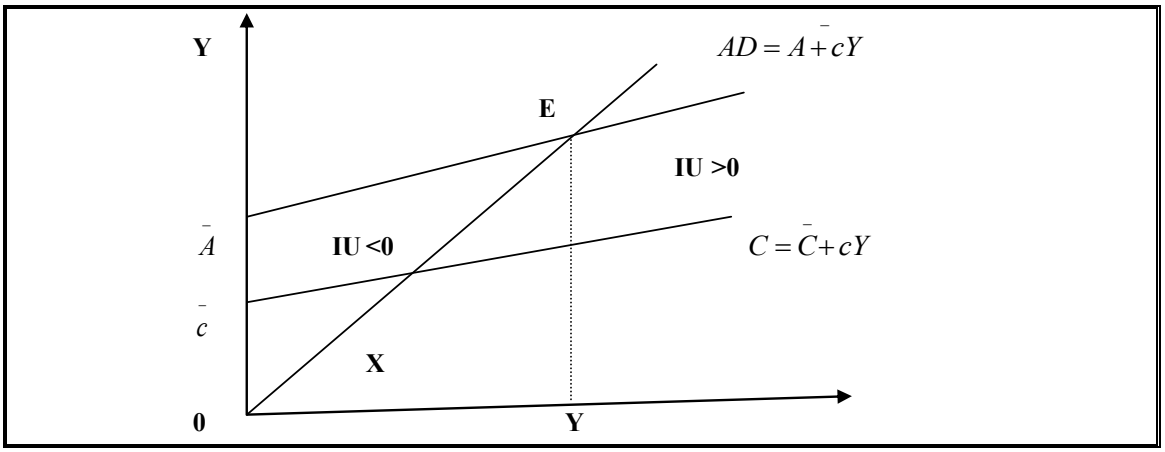
Thus the equation becomes -

$$S = \bar{I} \tag{1.25}$$

Where, the saving is almost equal to the planned investment in economy.

The following figure 1.2 shows planned saving and investment in the economy. The diagram shows that consumption remains constant at $\bar{C}$ point. But with rise in aggregate consumption, inventories need to increase investment. Therefore, aggregate investment increases up to $\bar{A}$. Where demand increases and equilibrium aggregate gets achieved at E. When inventory invests in the economy then output increases up to Y. If more output is produced then there is decline in the income. Therefore, final output is achieved with Y and equilibrium at E.

Figure 1.2 Change in aggregate demand



1.1.3 The Multiplier

The autonomous investment (A) is equal to average ($\bar{A}$) autonomous investment where income is at equilibrium level. As the autonomous investment increases, it leads to increase in the income. If the income increases then expenditure also increases. As the expenditure increases, firstly output starts increasing and then income. It can be explained by the following equation as -

$$AD = \Delta A + \bar{C}\,\Delta \bar{A} + C^2 \bar{A} + C^3\,\Delta \bar{A} \tag{1.26}$$

$$= \Delta \bar{A} + [(1 + C) + C^2 + C^3 \tag{1.27}$$

$$= \Delta \bar{A} + [(1 + C + C^2 + C^3] \tag{1.28}$$

If we solve the above equation through geometric method, then it is simplified as

$$\Delta AD = \frac{1}{1-c} \Delta \bar{A} \tag{1.29}$$

$$= \Delta Y_0 \tag{1.30}$$

Consequently, the change in aggregate demand is equivalent to the change in income. Therefore (1/1-c) is called the multiplier. The multiplier is defined as the amount at which equilibrium output changes when autonomous demand increases by one unit. In simple equation it can be defined as -

$$Y_0 = \frac{\bar{A}}{1 - c(1-t)} \frac{1}{1-c} = \Delta Y / \Delta \bar{A} \tag{1.31}$$

If we exclude government and external sector from the above equation then multiplier can be defined as -

$$\alpha = \frac{1}{1-c} \tag{1.32}$$

Multiplier is influenced by autonomous spending. If the output change is more, then autonomous investment is also more. It can be explained in two ways as -

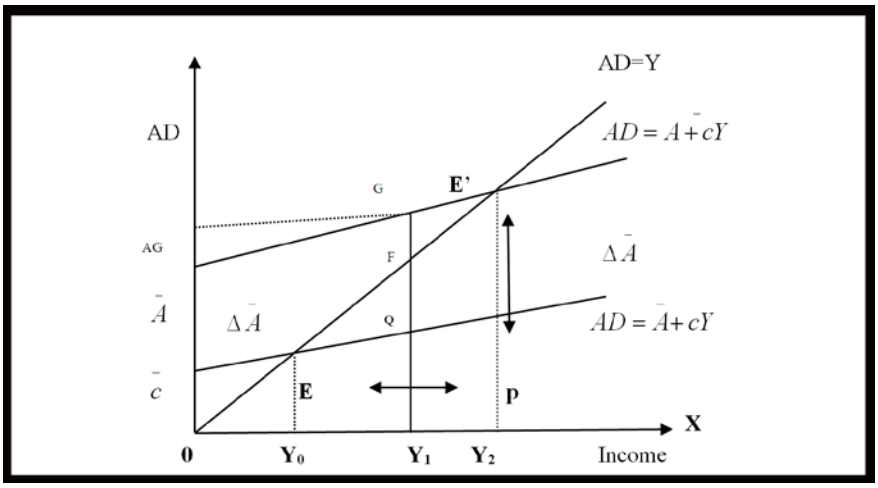
$$\Delta A \equiv \bar{A}' - \bar{A} \tag{1.33}$$

Where there is a change in present to past, the autonomous investment also leads to change in multiplier. Similarly,

$$\Delta Y0 = Y'0 - Y0 \tag{1.34}$$

The above equation explains that past and present income also shows the change in income. The change in the aggregate demand is explained as follows -

Figure 1.3 The multiplier effect and aggregate demand



In figure 1.3, the aggregate demand exceeds from Y_0 to Y_1. Therefore the firms will respond to the change and expansion resulting in production. It will lead to increase in induced expenditure. Such expansion in the production increases the induced expenditure; hence the outcome is an increase in aggregate demand to the A_G. The expansion reduces the gap between aggregate demand and output to the vertical distance FG. The equilibrium output and income is Y'_0. The change in income is defined as Y_2. The PE equal to PE'. It exceeds the increase in autonomous demand EQ. In the diagram, multiplier exceeds 1 because consumption demand increases with the change in output. It finally leads to change in the demand.

1.1.4 The government sector

During inflation and recession, the role of government is important in a welfare state. Government decisions directly affect disposable income of people. The change in income occurs by two ways. Firstly, government produces or purchases goods and services from the market. It provides goods to the people at lower prices. It is done through the public distribution system. Therefore disposable income of people increases. Secondly, government reduces the taxes and it leads to increase in the disposable income of people. Similarly, government spends on defense, infrastructure facilities and law and order. The expenditure in all welfare schemes is always higher. The equation can be rewritten as -

$$AD = C + I + G \tag{1.35}$$

Consumption depends on disposable income. Therefore, C can be replaced with YD. Similarly net income to households is transfer payment of taxes.

Therefore, consumption function can be rewritten as follows -

$$c = \bar{c} + cYD = \bar{c} + c(Y + TR - TA) \tag{1.36}$$

Where,

YD=Y+TR-TA

If we assume that government spends in the economy at an average rate, there is average transfer from the government to the public. Government collects average taxes from people, then

$$G = \bar{G}, TR = \bar{TR}$$
$$TA = tY \tag{1.37}$$

Now TA is replaced with tY. Therefore, above equation can be rewritten as -

$$C = \bar{C} + C(Y + \bar{TR} - tY)_{\text{C =C}} \tag{1.38}$$

$$C = \bar{C} + C\bar{TR} + C(1-t)Y \tag{1.39}$$

The above equation shows that taxes reduce the disposable income and thereby affecting consumption. Net transfer also affects consumption. The higher the net transfer from the government then consumption expenditure of people is also higher. Marginal propensity to consume is related to C (1-t). It means people consume income after paying taxes.

If we combine above equations then

$$AD = \bar{C} + (\bar{TR} + \bar{I} + \bar{G}) + c(1-t)y$$

$$= \bar{A} + c(1-t)Y \tag{1.40}$$

Now aggregate demand is related to the autonomous investment in the economy, consumption and disposal income.

1.1.5 Government and aggregate demand

In figure 1.4, aggregate demand curve is shown as the consumption, average consumption and income. The new AD is

denoted as flat slope. The slope is flat because government put taxes on income and whatever is income left after disposable income is used for consumption. Therefore propensity to consume out of income is now c (1-t) instead of c.

If we define income as follows

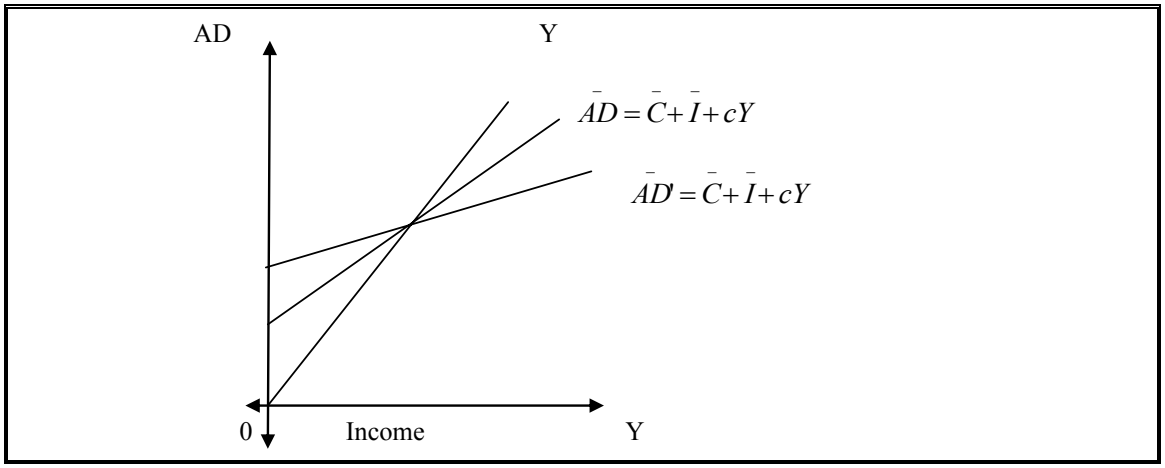
Y=AD

We can substitute AD in the above equation as follows -

$$Y = \bar{A} + c(1-t)Y \tag{1.41}$$

Government purchases goods and services from private sector. It spends $\bar{G}$ and the transfer payment is denoted as $\bar{TR}$. The taxes are assumed constant. In this case government expenditure shifts the intercept of the aggregate demand curve up and flattens the curve.

Figure 1.4 Aggregate demand and equilibrium



Now aggregate demand is equal to as follows -

$$Y[1-c(1-t)] = \bar{A}$$

$$Y_0 = \frac{1}{1-c(1-t)}[\bar{c} + c\bar{TR} + \bar{I} + \bar{G}$$

$$Y_0 = \frac{\bar{A}}{1-c(1-t)} \tag{1.41}$$

Government expenditure substantially makes the difference in economy. Government expenditure, purchase and net

transfer affect the income of people in the economy. The government spending, taxes, government purchase is explained in detail in the next part.

1.1.6 The Budget

The good balanced budget is one that takes care of receipts and payments. Balanced budget manage government expenditure and increases income. Budget surplus consists of more revenue and less expenditure. Government budget consists of total expenditure of goods and services as well as transfer payments.

S=TA-G-TR (1.42)

The budget is surplus if the total government payments are less than government receipts. Alternatively, if expenditure exceeds the total taxes the budget is in deficit. Now, we can substitute the TA as Ty then

S=Ty-G-TR (1.43)

The aim of each government is to maximize the tax collection and increase tax base. The tax rate is not given much importance. But it depends on the tax efforts and collection of each government. Each government has different capacity and efforts but it tries to minimize the expenditure. But increase in government purchase is equal to $\Delta Y_0 = \alpha_G \Delta G$. The increase in income is in the form of taxes. Tax revenue increases by $T\alpha_G \Delta G$. The change in budget surplus is defined as -

$$\Delta S = \Delta TA - \Delta \bar{G}$$

$$\Delta S = t\alpha_G \Delta \bar{G} - \Delta \bar{G}$$

$$= [\frac{t}{1-c(1-t)} - 1]\Delta \bar{G}$$

$$= \frac{(1-c)(1-t)}{(1-c)(1-t)} \Delta \bar{G} \tag{1.44}$$

The above equation shows that increase in government purchase will reduce the budget surplus. It is further explained in the following Table 1.1-

Table 1.1 Budget of Government of India at a Glance (*In crore of Rupees*)

No.	Details		2009-2010	2010-2011	2010-2011	2011-2012
			Actuals@	**Budget**	**Revised**	**Budget**
				Estimates	**Estimates**	**Estimates**
1	Revenue Receipts		572811	682212	783833	789892
	2	Tax Revenue (net to centre)	456536	534094	563685	664457
	3	Non-Tax Revenue	116275	148118	220148	125435
4	Capital Receipts (5+6+7)$		451676	426537	432743	467837
	5	Recoveries of Loans	8613	5129	9001	15020
	6	Other Receipts	24581	40000	22744	40000
	7	Borrowings and other liabilities*	418482	381408	400998	412817
8	Total Receipts (1+4) $		1024487	1108749	1216576	1257729
9	Non-Plan Expenditure		721096	735657	821552	816182
	10	On Revenue Account of which,	657925	643599	726749	733558
	11	Interest Payments	213093	248664	240757	267986
	12	On Capital Account	63171	92058	94803	82624
13	Plan Expenditure		303391	373092	395024	441547
	14	On Revenue Account	253884	315125	326928	363604
	15	On Capital Account	49507	57967	68096	77943
16	Total Expenditure (9+13)		1024487	1108749	1216576	1257729
	17	Revenue Expenditure (10+14)	911809	958724	1053677	1097162
	18	Of which, grants for				
		creation of Capital				
		Assets		31317	90792	146853
	19	Capital Expenditure (12+15)	112678	150025	162899	160567
20	Revenue Deficit (17-1)		338998	276512	269844	307270
			-5.2	-4	-3.4	-3.4
21	Effective Revenue					
	Deficit (17-18)#			245195	179052	160417
				-3.5	-2.3	-1.8
22	Fiscal Deficit		418482	381408	400998	412817
	{16-(1+5+6)}		-6.4	-5.5	-5.1	-4.6
23	Primary Deficit (20-11)		205389	132744	160241	144831
			-3.1	-1.9	-2	-1.6

Source: Budget 2011, GOI

1.2 IS-LM Framework

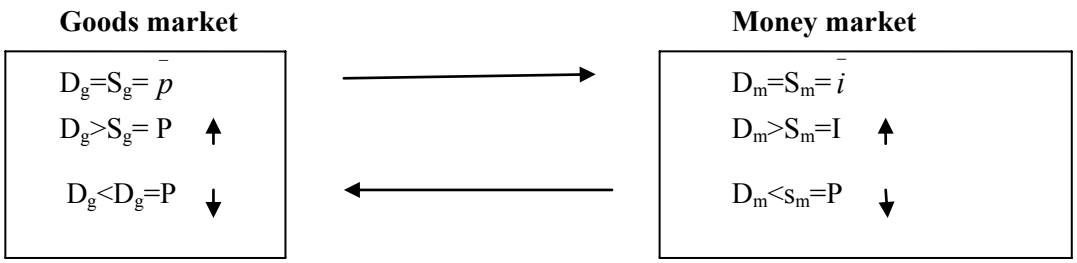
Introduction

In an economy, the production of goods depends on a number of factors. But the average supply of goods in the economy is considered as aggregate supply. Such average supply keeps the prices at a constant level. The aggregate supply of goods decides the equilibrium of price. The average price level decides the aggregate demand. If the prices change then aggregate demand is affected. Aggregate demand is related to the average price and supply. If the aggregate demand rises, it reflects on the aggregate supply.

1.2.1 Goods and Money market

The economy is divided into goods and money market. The money and goods market have different equilibriums.

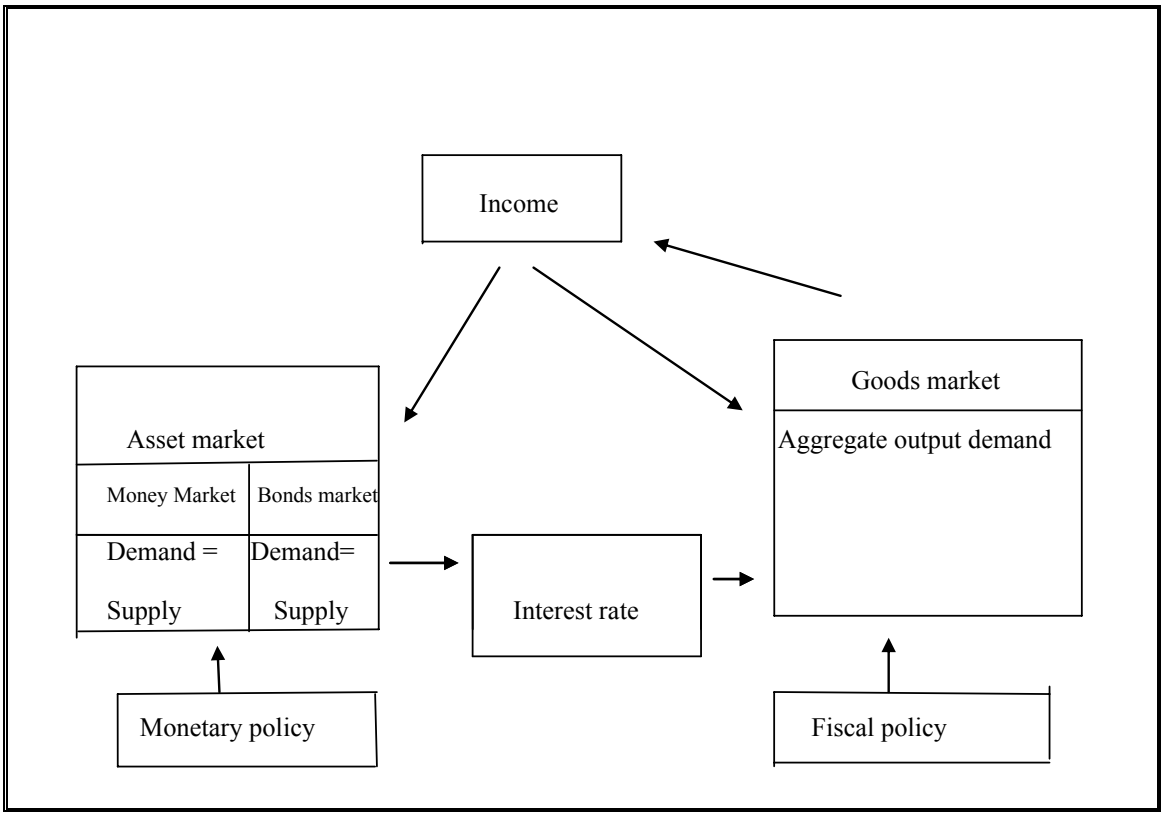
Graph 1.1 Equilibrium of goods and money market in economy



Goods market is in equilibrium when the demand for goods is equal to the supply of goods. The price level remains equilibrium. The prices of commodities can change if the demand for goods rises faster and supply remains constant resulting in price rise of the commodities. The rise in price will have effect on demand of the commodity. It is inversely related when the supply of goods rises and demand remains constant. Therefore, prices of commodities declines or falls.

If we consider money market equilibrium then the demand for money is equal to the supply of money. The interest rate remains constant in the long run. If the demand for money increases fast due to number of reasons and the supply remains constant then the interest rate start rising. It is opposite when the supply of money rise and demand for money declines. The interest rate declines but it is a short term adjustment.

Figure 1.5 Flowchart of goods and money market



Source: Dornbusch and Fischer (1994)

In the long run, demand and supply of money remains e qual to the supply of money and interest rate remains unchanged. At the same time, the demand for goods is also equal to the supply of goods. The prices remain constant and the goods and money market remain in equilibrium with stable prices and stagnant interest rate. Such equilibrium in goods and money market may change after expansion or contraction monetary and fiscal policy in the short run. In the long run both markets remain in equilibrium. The detail of each market is explained as follows -

1.2.2 Goods market equilibrium

The goods market is in equilibrium when desired investment and desired national saving are equal or equivalent, when the aggregate quantity of goods supplied equals the aggregate quantity of goods demanded (Bernanke, 2003). Alternatively, in the goods market, the demand for goods and supply of goods remains at equilibrium. Prices of goods remain in equilibrium. In other words, prices of goods remain constant. The aggregate demand curve is related to the interest rate and income level. As the aggregate demand shifts upward the interest rate falls and the aggregate income increases. The planned investment increases in the economy with increase in output and income.

In a closed economy, the output is equal to expenditure.

$$Y = C+I+G \tag{1.45}$$

Now we will classify each variable in to different categories.

$$C= c(Y, r) \tag{1.46}$$

Consumption is related to income and interest rate. As the level of income rises, the consumption expenditure increases. It is a positive relation between consumption and income. The income is negatively co-related to the interest rate. As the interest rate starts rising, the consumption expenditure start declining. The income is further categorized as -

$$Y = Y^D + T \tag{1.47}$$

Now consumption function can be written as follows -

$$C = c(\underset{+}{Y-T}, \underset{-}{i-\pi^e}) \tag{1.48}$$

The linear version of consumption function is written as -

$$C = c_0 + c_1(Y-T) - c_2(i-\pi^e) \tag{1.49}$$

Where, c0 is the autonomous consumption and it is independent of income. C_1 is the responsiveness of consumption to a change in disposal income. The C_2 is the responsiveness to a change in the ex-ante real rate of interest. Now investment function is defined as

$$I=a-b(i-\pi^e) \tag{1.50}$$

Where, a is shorthand for business confidence and the productivity of investment. The b is the parameter that explains how much investment declines in response to an increment in the ex-ante real interest rate.

The government expenditure is defined as -

$$G = \bar{G} \tag{1.51}$$

Government expenditure in the economy is considered as the average expenditure. The IS curve is derived as follows -

Figure 1.6 Derivation of IS curve

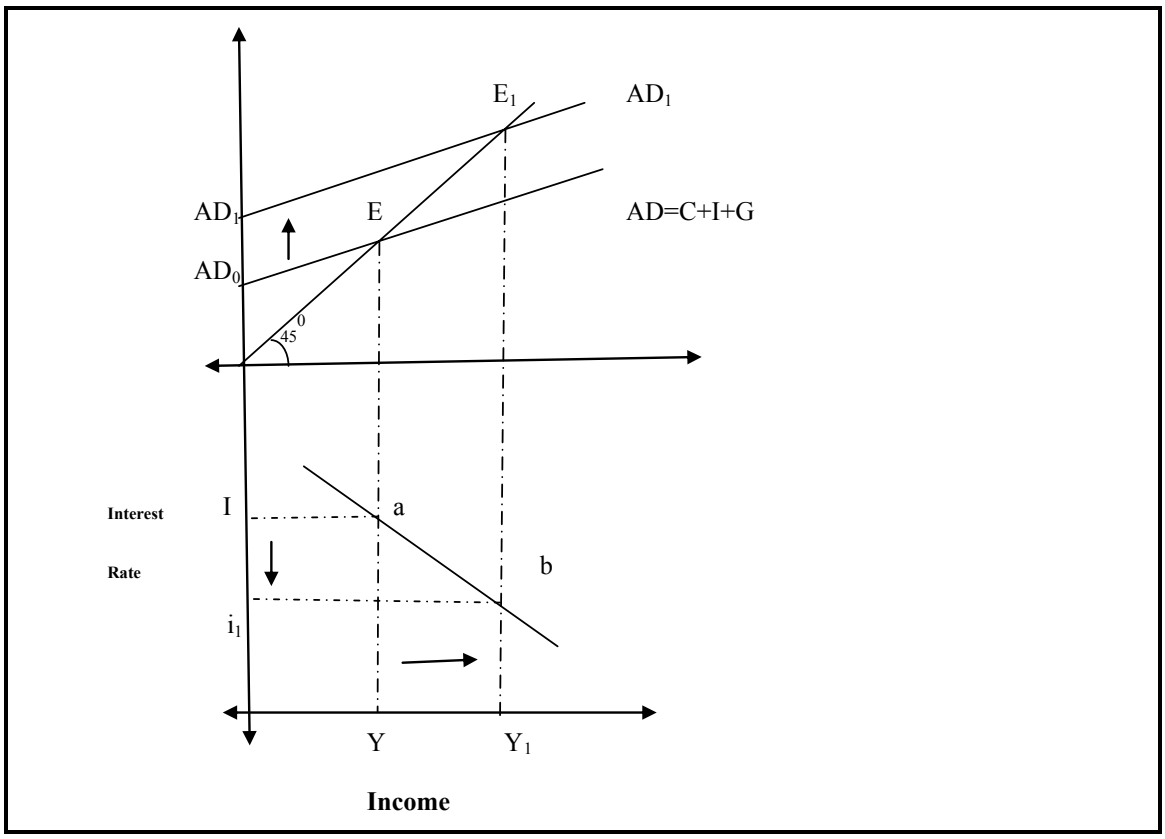


Figure 1.6 shows that the aggregate demand of investment is equal to the aggregate supply. The interest rate is constant. The interest rate is related to the aggregate demand. At point E, the aggregate demand curve shows interest rate and income.

Aggregate demand curve remains equilibrium with income and interest rate. In the long run, consumption expenditure increases due to increase in disposable income. Fall in interest rate leads to rise in the investments and it also leads to rise in income and investment by the government and private sector. The government expenditure (infrastructure projects, defense, law and order) increases in the economy due to the concept of welfare state every year. Such developmental and social welfare expenditures increase the aggregate demand in the economy.

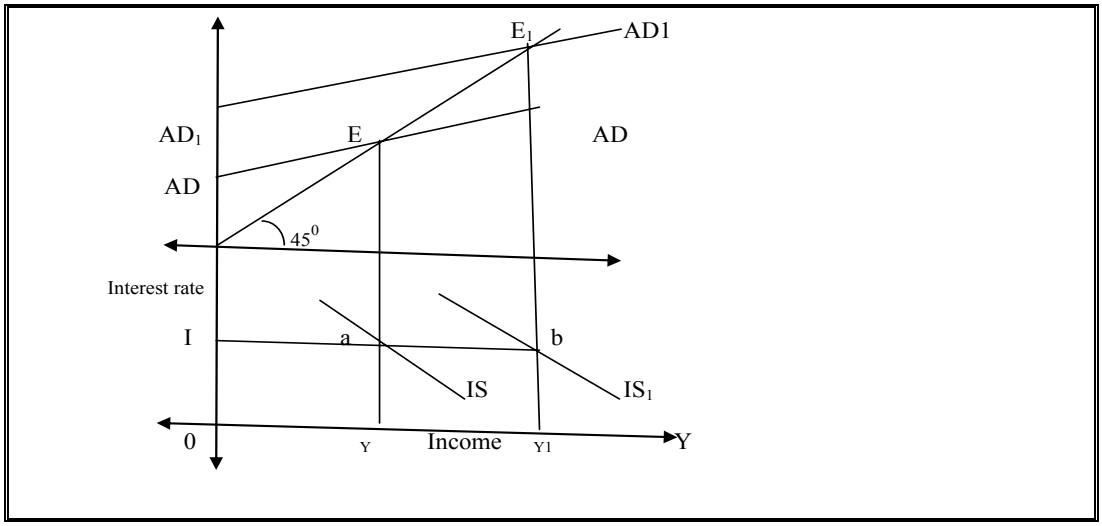
In figure 1.6, the rise in aggregate demand leads to shift in equilibrium from E to E'. Therefore the interest rate falls from i to i_1. The fall in interest rate leads to rise in income. If we join point a and b it results in the downward sloping IS curve.

Properties and shift of IS curve

1. IS curve is downward sloping from left to right.
2. The IS curve shows the interaction between interest rate and income/output.
3. Change in aggregate demand curve leads to shift of IS curve from left to right
4. IS curve is steep when there is small change of interest rate and large change of income.

Shift of the IS curve

Figure 1.7 Shift of IS curve



As the investment starts rising in the economy, the output also increases. It leads to rising in the aggregate demand which is observed at point E. But rise in aggregate demand shifts the AD curve to AD_1. The new equilibrium is achieved at E_1. At new equilibrium, the income rises from Y to Y_1. If we derive points a and b, then a shift occurs from IS to IS_1 curve. The new IS_1 curve does not get affected by the interest rate. Interest rate does not change but the income changes. The slope of the IS curve remains same.

1.2.3 Derivation of LM curve

LM curve shows the relationship with money demand and supply. Interest rate remains constant when there is no change in demand and supply of money. In the short run, the demand for money changes very fast but supply of money doesn't. Therefore, the interest rate rises fast. It is also possible that the demand does not rise and supply remains high. In this case, interest rate declines.

The demand for real balances increases with the level of real income and decreases with the interest rate. The demand for real balances is written as -

$$L=kY-hi \qquad k,h>0 \tag{1.52}$$

The parameters k and h reflect the sensitivity of the demand for real balances to the level of income and the interest rate.

For money market equilibrium, the demand for money should equal to supply of money.

$$\frac{\bar{M}}{\bar{P}} = kY - hi \tag{1.53}$$

If we solve it for interest rate then it can be written as -

$$i = \frac{1}{h}(kY - \frac{\bar{M}}{\bar{P}}) \tag{1.54}$$

The above equation is for the LM curve. In the following figure 1.8, the LM curve is derived.

Figure 1.8 Derivation of LM curve

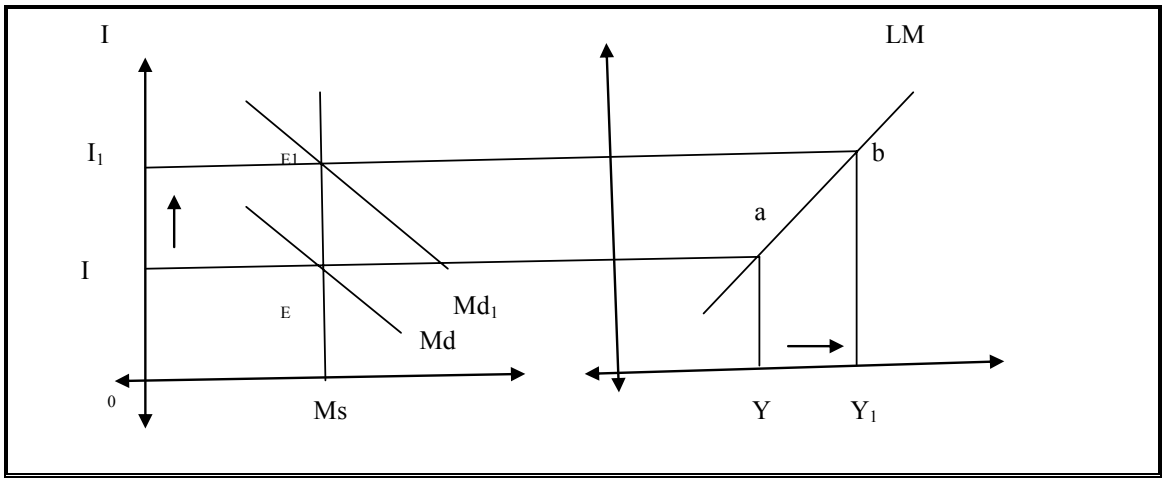


Figure 1.8 shows that the money demand and money supply are at equilibrium at E. The interest rate is constant at income level Y. As the money demand shifts from Md to Md_1, then the interest rate also rises from I to I_1. At the same time income rises from Y to Y_1. As there is more and more demand for money, it further increases the income. But at the same time, interest rate also rises. It means the LM curve shows the link between the interest rate and the income. It is a positive relationship between the two variables.

1.2.4 Shift of LM curve

Figure 1.9 Shift of LM curve

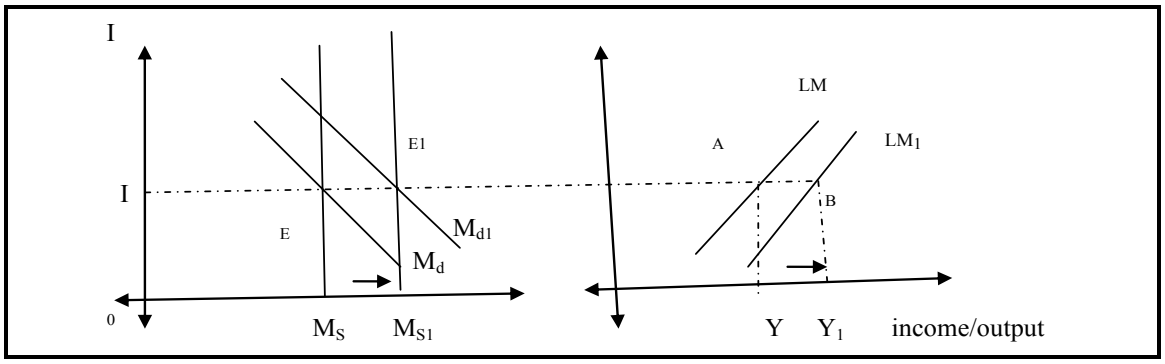


Figure 1.9 shows that money demand in the short run shifts from M_d to Md_1. The supply of money also shifts from MS to MS_1. The new demand and supply of money (E1 point) increases the income in the economy. It is shown as Y to Y_1. At point A and at point B, two separate LM curves are drawn. The expansionary monetary policy leads to increase in income. The interest rate remains constant at I. The LM curve shifts to LM_1.

Properties of LM curve:

1. LM curve is upward sloping
2. LM curve shows the relationship between income and interest rate.
3. At same level of interest rate, demand for money shift IS curve to right.

1.2.5 Equilibrium of the IS-LM model

In the long term, IS-LM model intersect each other and they remain in equilibrium. The downward sloping IS curve and upward sloping LM curve always interact with each other with different possibilities of equilibriums.

Figure 1.10 Equilibrium of the IS-LM model

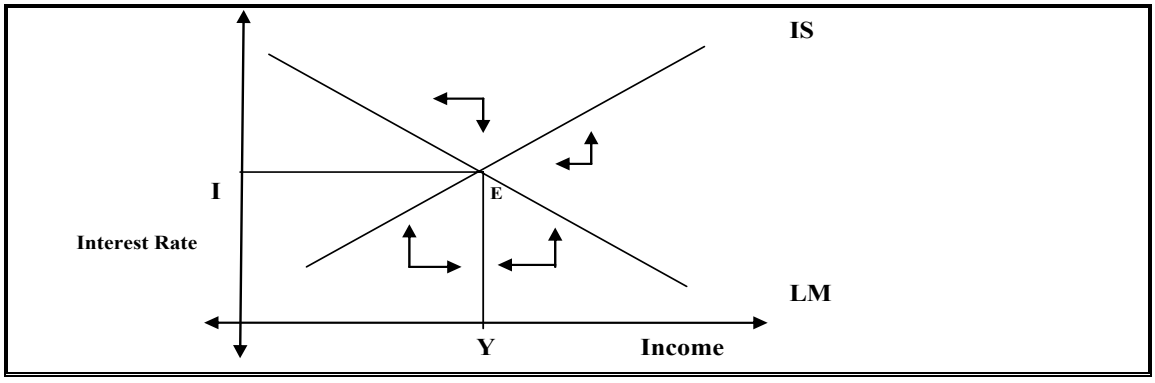


Figure 1.10 presents the intersection point of IS and LM curves at point E. It is always at long term equilibrium. It means the rate of interest and income remains constant. It is possible that in the short run due to expansionary and contractionary fiscal and monetary policy. The shift is either backward or forward. It reduces or increases interest rate and income. The arrows in the diagram show the movements to the original equilibrium. The following adjustments are shown in the table 1.2.

Table 1.2 Adjustments in the IS-LM model

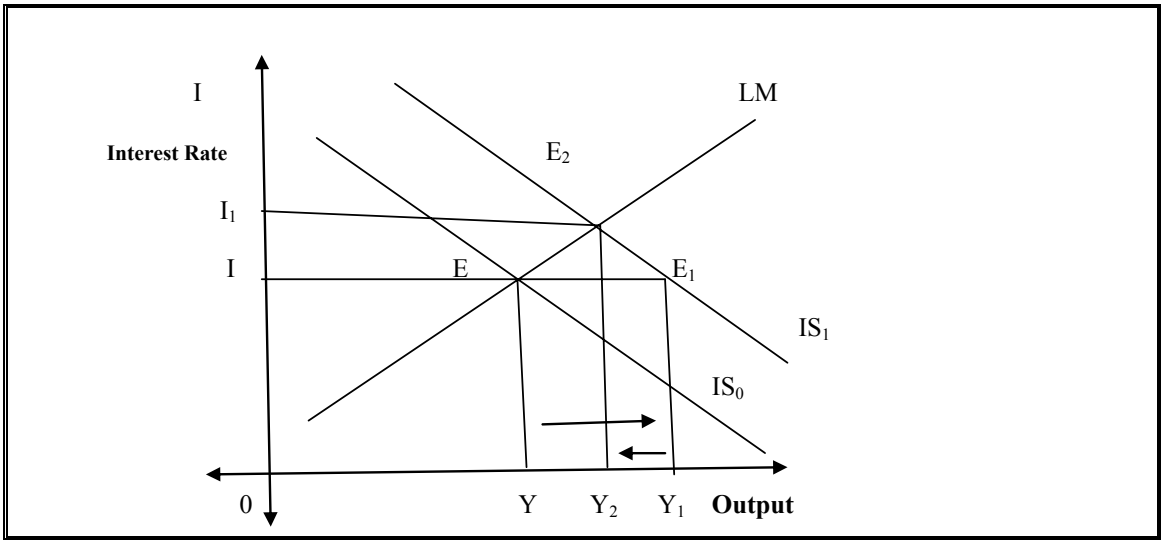
Quadrants	Income	Interest rate
I	Increase	Decrease
II	Increase	Increase
III	Decrease	Increase
IV	Decrease	Decrease

It is not advisable to follow the particular monetary or fiscal policy. This is because following one policy has effect on the income and interest rate. In the long run both policies are ineffective.

1.2.6 Effect of fiscal policy

If government has the expansionary fiscal policy then such policy leads to the rise in income and interest rate. Here the government's objective is to increase the disposable income of people.

Figure 1.11 Effect of fiscal policy on IS-LM model



Effects of fiscal policy on IS-LM model

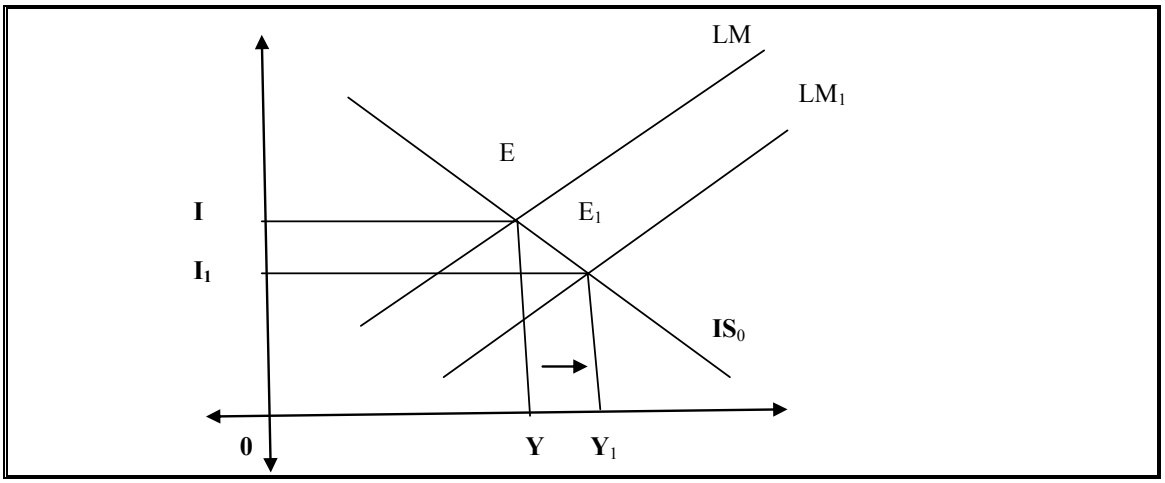
Government helps to improve income of people through expansionary fiscal policy. Government reduces the direct and indirect taxes. Here an attempt is made to increase the disposable income of people. After reduction of direct taxes, disposable income of people increases. The direct taxes are also reduced on the various commodities resulting in increase in the income of people

The figure shows that the expansionary fiscal policy leads to increase in income. Government's expansionary fiscal policy will increase in income from Y to Y_1. Due to expansionary fiscal policy, the income of the people increases very fast. But increase in income leads to more saving and people keep money in bank to keep the advantage of increase in interest rate. In the figure, interest rate increases from I to I_1. The increase in income was expected Y_1 but income increases up to Y_2. The crowding out occurs in the expansionary fiscal policy. It is shown as Y_1 to Y_2. The increase in interest rate wipes out the increase in total income. Therefore, again at higher level of income and higher interest rate, industrialists do not find it easy to invest money and their investment in firms starts declining. As the investment declines the employment generation in the economy also starts declining. Workers do not find jobs and the levels of income decline. Therefore, the increase in interest rate reduces the investment, employment and level of income in the economy. Therefore, again, in the long run, economy is in equilibrium at point E. Short term expansionary fiscal policy has no effect on the income and interest rate.

1.2.7 Effect on monetary policy on IS-LM model

The objective of each monetary authority is to have economic growth in the country. Therefore, it always increases the money supply and reduces the interest rate. At lower interest rate more investment is possible.

Figure.1.12 Effect of monetary policy on IS-LM model



Monetary policy always improves the income of people through reducing the interest rate. The reduction in interest rate helps for investment in the economy. Figure 1.12 shows that the monetary authority reduces the interest rate, therefore I decline to I_1. The level of income increases from Y to Y_1. But in the long run the reduction in the interest rate and increase in income leads to more investment. The production in the economy increases due to high capital investment. But the high production leads to lower demand, and the prices declines. This is because every firm tries to sell their products in national and international markets. They may sell at lower prices to cover the fixed cost of production. The decline in prices due to competition reduces the profit margin. The investment and profit does not match each other. Therefore, investment in the future period is affected. Thus, a recession stage is observed in the economy. Decline in the investment reduces the employment opportunities and the level of income declines in the economy. The income declines further and it comes again at the original level. In the long run, expansionary monetary policy is ineffective. The interest rate (I) and income (Y) remains unaffected in long run.

1.2.8 Conclusion

The goods market is in equilibrium with demand for goods equal to supply of goods. The prices are constant. The money market is in equilibrium with demand for money equal supply of money. Both goods and money market are in equilibrium with interest rate and income. It is long run equilibrium with income and interest rate. The expansionary fiscal and monetary policy leads to increase and decrease in the interest rate and income. But such changes are short term changes in the economy. In the long term both monetary and fiscal policies are ineffective. Therefore, the equilibrium interest rate and income is achieved in the long run in the economy.

1.3 Aggregate demand and supply

Aggregate demand depends on the goods and money market. Goods market shows the equilibrium of income and price level. The money market equilibrium shows the relationship between interest rate and income. If both markets are in equilibrium with interest rate and income then the aggregate demand is also in equilibrium. It shows the relationship between the interest rate and income. Figure 1.13 shows the aggregate demand curve and IS-LM curve equilibrium.

Figure 1.13 Derivation of aggregate demand

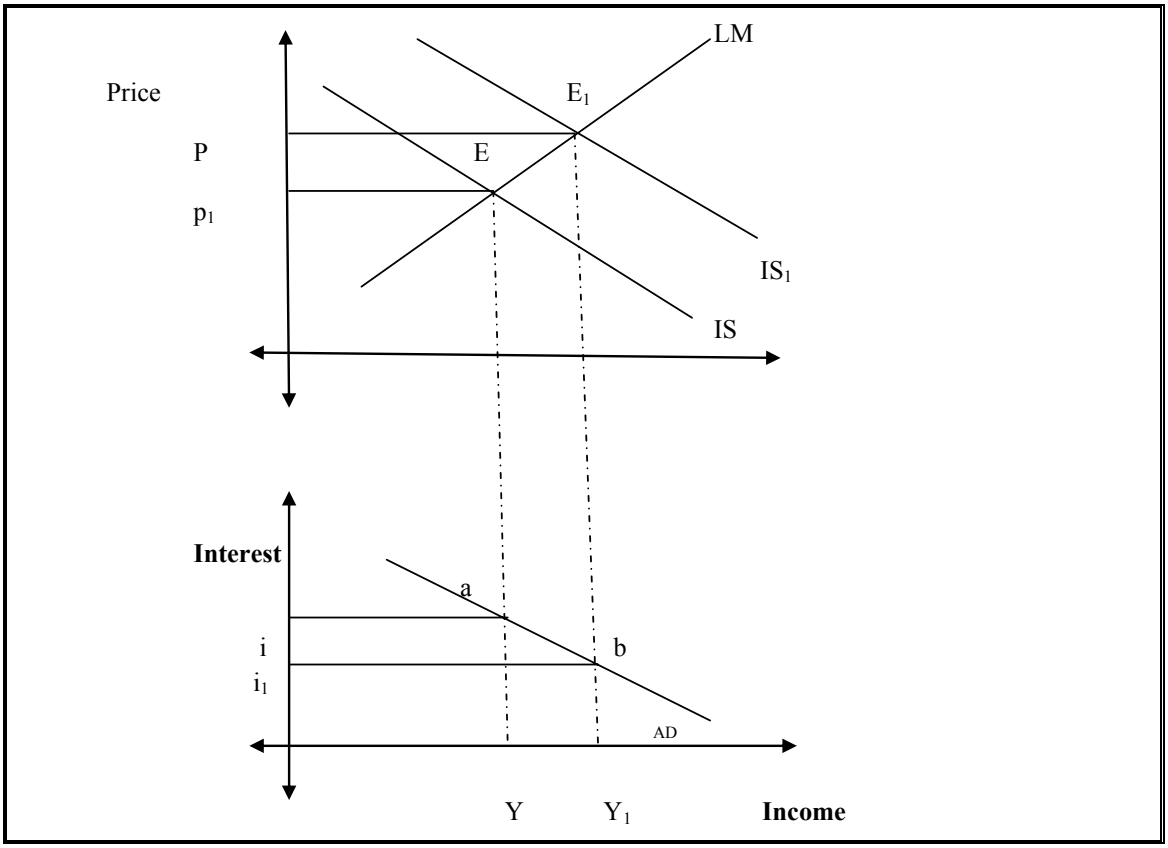


Figure 1.13 exhibits that the IS-LM curves are intersecting at Point E. At point E, IS curve shifts to IS_1 then the new equilibrium is observed at E_1. The IS curve shifts to right because expansionary fiscal policy. Government increases the investment on infrastructure facilities and social services. At the same time reduction in the direct and indirect taxes improve the income of people. In second diagram, if a and b points are joined then the aggregate demand curve can be derived.

1.3.1 Effects of monetary expansion on AD

The aggregate demand curve is affected by the expansionary monetary policy. The rise in the money supply and decline in interest rate has the effect on income and output. Therefore, there is increase in output and income. Figure 1.14 presents the expansionary monetary policy and its effects on aggregate demand.

Figure 1.14 Effect of monetary policy on aggregate demand

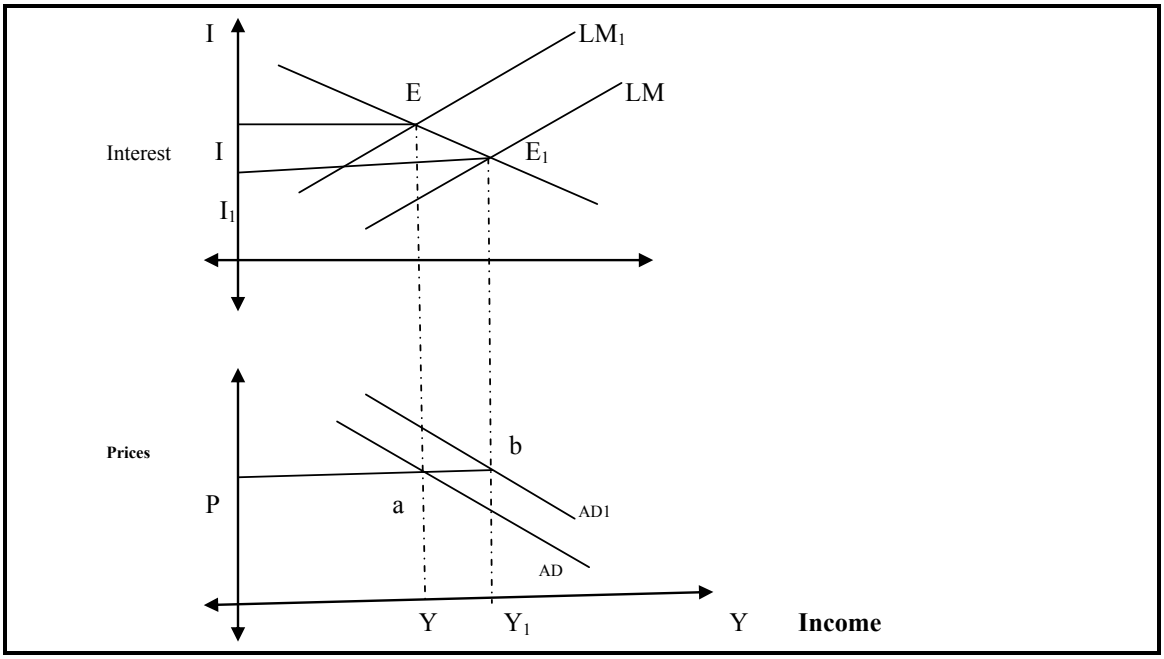
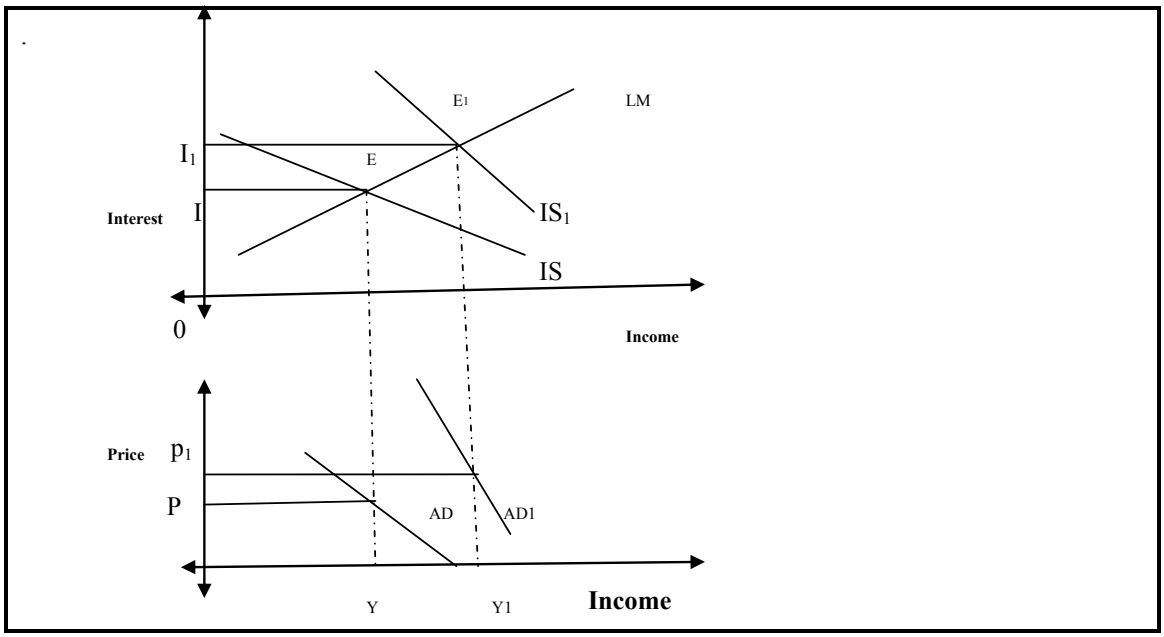


Figure 1.14 indicates that the expansionary monetary policy will have a positive effect on the income and output. The interest rate will fall from i to i1. The LM curve shifts from LM to LM_1. The expansionary monetary policy will have no effect on the price level. The prices will remain at equilibrium at P. If we join the two points a and b separately, then AD curve can be derived.

1.3.2 Shifts of aggregate demand curve

Aggregate demand curve shifts towards the right, if there is expansionary fiscal policy.

Figure 1.15 Fiscal policy and shift of aggregate demand

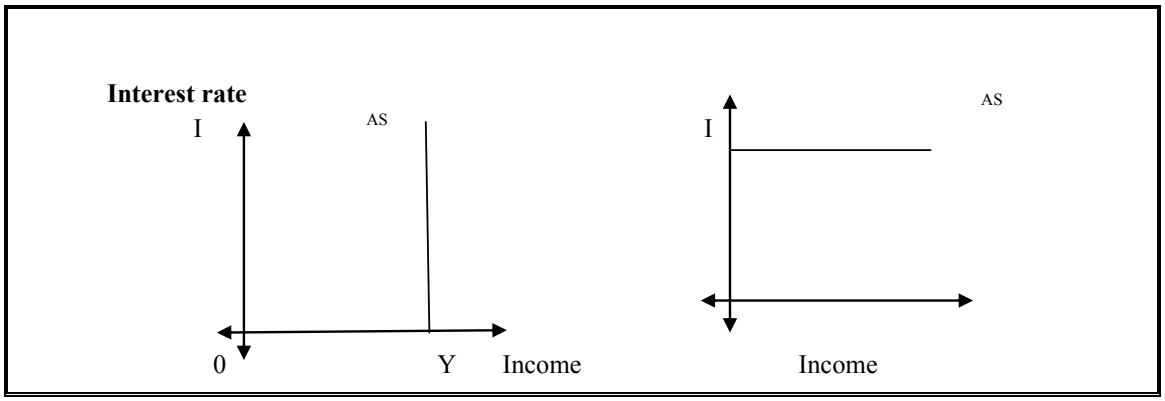


In figure 1.15, the expansionary fiscal policy has positive effects on aggregate demand. The expansionary fiscal policy leads to increase in income with large increase in the interest rate. The downward sloping supply curve is the aggregate demand curve.

1.3.3 Aggregate supply curve

Aggregate supply curve is classified into two types. The Keynesian and Classical aggregate supply curves are based on separate assumptions. The classical supply curve assumes that the supply of the factor of production is fixed in the classical way. The supply of land, labor, and capital is fixed in economy and it does not change.

Figure 1.16 Classical and Keynesian aggregate supply curve



a) Classical aggregate supply curve **b) Keynesian aggregate supply curve**

Figure 1.16 shows the Classical and Keynesian aggregate supply curve. In the first diagram, AS curve is vertical straight line and in b part it is horizontal line. In Classical case, all the factors of production in the economy are fully employed. Therefore, there is no scope to increase the factors of production. The supply remains fixed for the long period.

1.3.4 The effects of monetary and fiscal policy on classical aggregate supply curve

A. Fiscal policy and aggregate supply curve

The expansionary fiscal policy will shift the IS curve upward without changing output.

Figure 1.17 Effect of fiscal policy on classical aggregate supply curve

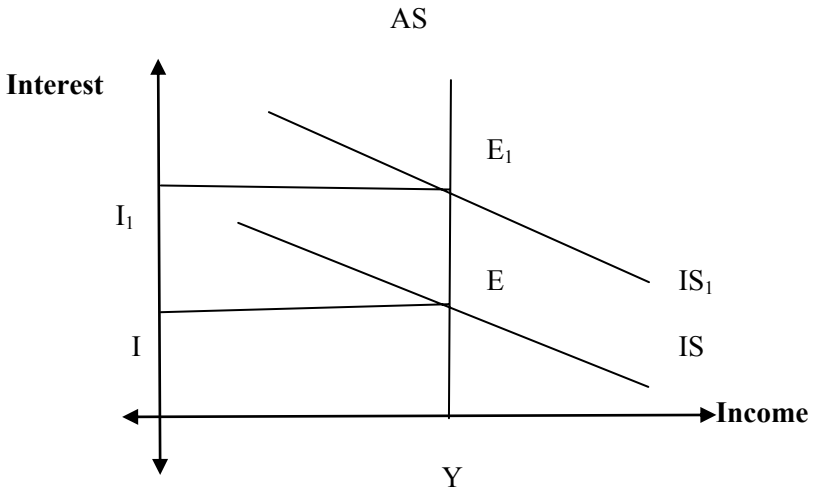


Figure 1.17 represents the effect of fiscal policy on the classical aggregate curve supply. It shifts towards up. It leads to increase in the interest rate. The increase in interest rate is shown as I to i_1. Income remains same in the long run. The income effect is not positive in the long run as far as classical aggregate supply curve is concerned.

B. Effects of monetary policy on classical aggregate supply curve

The fiscal policy is ineffective in the long run as far as the classical aggregate supply curve is concerned. The expansionary monetary policy has also no positive effect on output in classical aggregate supply curve. It is explained as follows.

Figure 1.18 Effect of monetary policy on aggregate supply curve

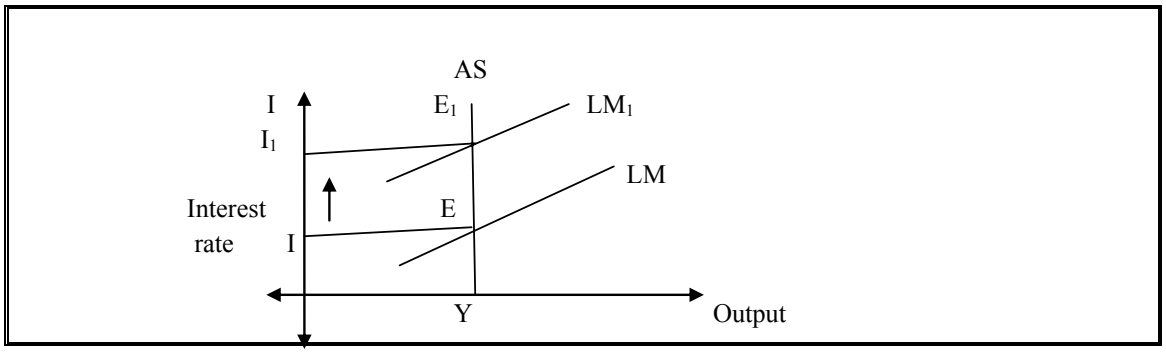
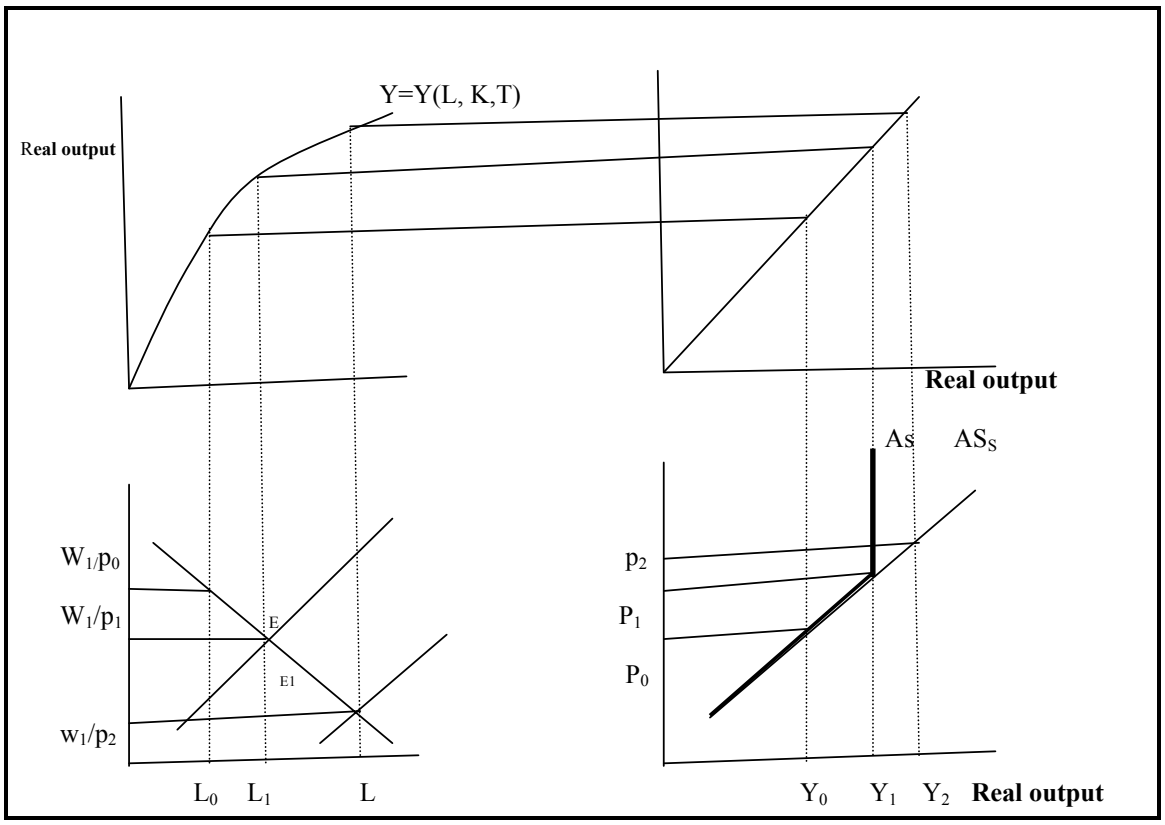


Figure 1.18 shows that the aggregate income is in equilibrium at Y. If there is expansionary monetary policy then the LM curve shifts upward. The increase in money supply has positive effect on the interest rate. The income remains unchanged or same in the long run. Therefore the expansionary monetary policy is ineffective in classical aggregate supply curve.

1.3.5 Derivation of Aggregate supply

Wages are flexible upward but sticky downwards; so that rise in price cannot decrease the real wage rate but falls in price can increase it. Downwardly sticky wages gives a J shape to the AS curve, labeled AS_J with the curve beginning at the existing price level P_1. A further combination is possible if wages are sticky upwards and price level P_2 lowers the real wage rate. The double sticky case yields the positively sloped AS curve throughout its length labeled AS_S in figure 1.19 as -

Figure 1.19 Derivation of an aggregate supply curve



The AS curve is derived with the help of demand for labor, real wages, production function, and output. All their combinations show the J type aggregate supply curve. It is more elaborated in the following equilibrium of aggregate demand and supply.

1.3.6 Equilibrium of aggregate demand and supply

In the modern economy the aggregate demand and supply are always equilibrium with price level and income. The demand curve is downward sloping but the supply curve is upward sloping and it is vertical at the top. It means it is a combination of Keynesian and Classical supply curve.

Figures 1.20 Equilibrium of aggregate demand and supply curve

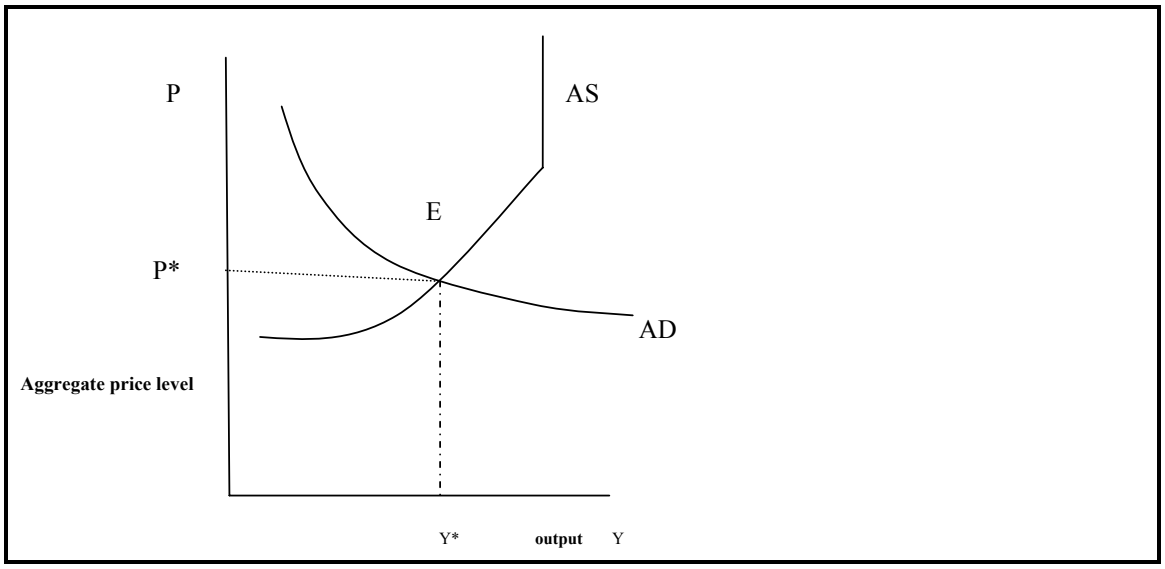


Figure 1.20 displays that the aggregate demand and supply intersect at point E. It is an equilibrium point with price P* and aggregate income Y*. At equilibrium point, price and income is equilibrium. If the aggregate demand increases then the prices increases.

Figure 1.21 **Effect of change in aggregate demand and supply**

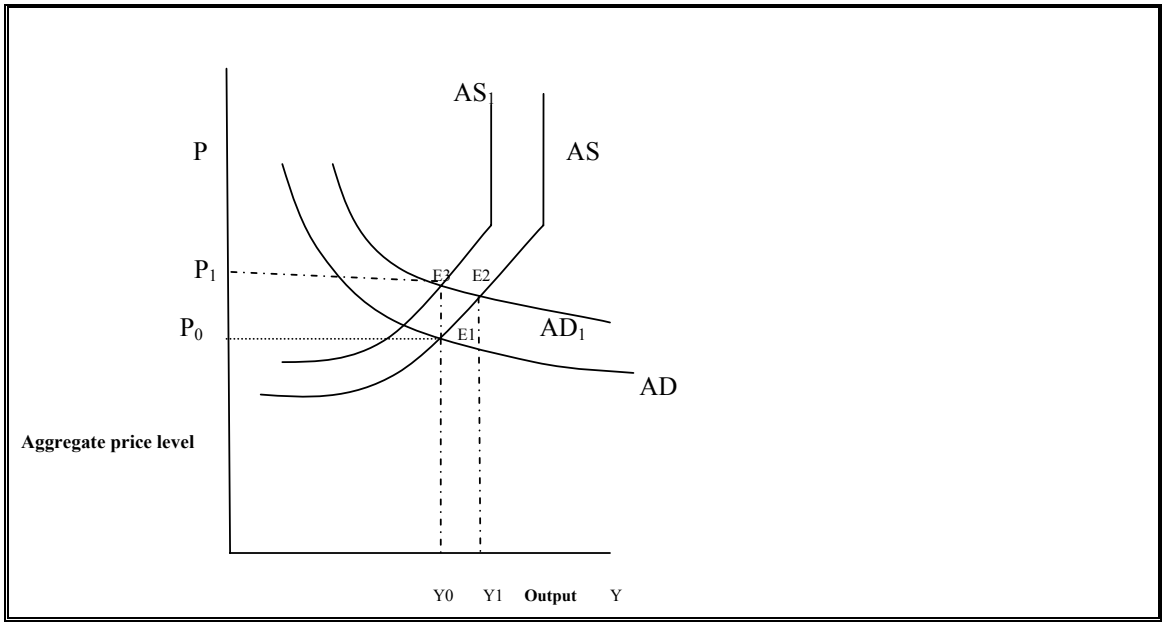


Figure 1.21 illustrates that the aggregate demand and supply are in equilibrium at E1. Suppose the aggregate demand increases and the aggregate demand remain constant, then the new equilibrium is achieved at E2. The price level increases and the output also increase up to Y1. It is a short term effect. The supply cannot increase in the long run because all the factors of production are fully employed. The output Y0 remains unchanged in the long run. Therefore the aggregate supply curve shifts back to AS1. The aggregate demand curve and aggregate supply curve intersect each other at E3. It is new equilibrium in the long term. In the long run, aggregate output does not change only the price level increases from P_0 to P_1. We often experience increase in the different commodity prices. In the same proportion of price, income of people also rises. Government provides the dearness allowance to the employee. Private sector provides higher pay package for contract labors. The output of commodities in the economy remains same in the long run. We experience inflation but the real income and output remains the same.

Questions

1. Write a note on following -

a) Income and spending.

b) Balanced budget theorem.

c) What is crowding out and when do you expect it to occur? Is monetary or fiscal policy appropriate in this case?

2. Write short note on full-employment budget surplus.
3. Derive the fiscal and monetary policy effect on the IS-LM framework.
4. Bring out the relative effectiveness of fiscal and monetary policies under different conditions.

5. Explain the following:

a) Show the effect of monetary and fiscal policies on the Classical supply curve.
b) Explain why the aggregate supply curve is vertical. How does it differ from the Keynesian aggregate supply curve?

c) Write a short note on aggregate supply curve.
6. Write a note on neo-classical theory of investment?
7. What are the implications of an increase in the tax-rate in the IS-LM model?

8) How does an increase in the tax rate in the IS-LM model affect the following?
(i)The IS Curve
(ii) The equilibrium rate of interest

9. If the government were to reduce the income tax, how would output and the price level be affected in the short run and the long run? Show the impact on aggregate demand and aggregate supply in both cases.

10. Derive the income and substitution effects of a wage increase on the hours of work.

11. Write a short note on money multiplier.

12. Write a short note on the instruments of monetary control.

13. Derive the equilibrium of the aggregate demand and supply?

14. How does the expansionary fiscal policy affect IS-LM equilibrium?
15. Contractionary monetary policy leads to decline in the interest rate. Comment.
16. In the long run, prices have positive effect on wages? Explain it in relation to aggregate demand and supply equilibrium?
17. Inventories invest in the economy when they predict increase in aggregate demand, what do they do when there is contraction in the aggregate demand?
18. What is an effect of monetary policy on goods market? Examine in detail.
19. Draw the flowchart of equilibrium of goods and money market.
20. Explain the equilibrium of aggregate demand in open and closed economy.

2 Consumption Function

2.1 Introduction

Consumption function is important because of number of reasons. Consumption is part of aggregate demand. If income is not consumed then saving rate rises. Consumption is an integral part of day today life. Most of the traditional and modern theories have explained consumption function. The life cycle theory is associated with Franco Modigliani of MIT. He is Nobel Prize winner in economic science. The permanent income theory is primarily with Milton Friedman of the University of Chicago. He is winner of same price in 1976. Both theories are same in their nature and pay attention on microeconomic foundation. The other classical theories of consumption such as Ando-Modigliani approach which proposes that people make consumption decisions according to the stage of life they are in as well as the resources available during lifetime. It is developed in 1950 and it is also known as the life cycle hypothesis. This approach was criticized by Friedman in 1956. He developed a new approach known as the Friedman's approach of permanent income advocating that consumer choices for consumption pattern is determined majorly by a change in their permanent income as compared to temporary. This approach was later replaced with Duesenberey approach. It was replaced with relative income approach in 1960.

Friedman and Modigliani Approach

Friedman and Modigliani begin with the explicit common assumption that observed consumer behavior is a result of an attempt by rational expectation. Consumers maximize utility by allocating a life time stream of earning to an optimum lifetime pattern of consumption.

Consumption and present value of income:

We assumed that there is single consumer and the utility function of consumer is defined as

$U=u\ (c_0 \ldots\ldots c_1 \ldots\ldots c_T)$ (2.1)

The lifetime utility is a function of his real consumption c in all time period up to 'T'. The instant before he dies. The consumer will try to maximize his utility that is obtain the highest level of utility subject to the constraints that the PV of his total consumption in life exceed the present value of his total income in life that is

$$\sum_0^T \frac{Yt}{(1+r)^t} = \sum_0^T \frac{Ct}{(1+r)^t} \quad 2.2)$$

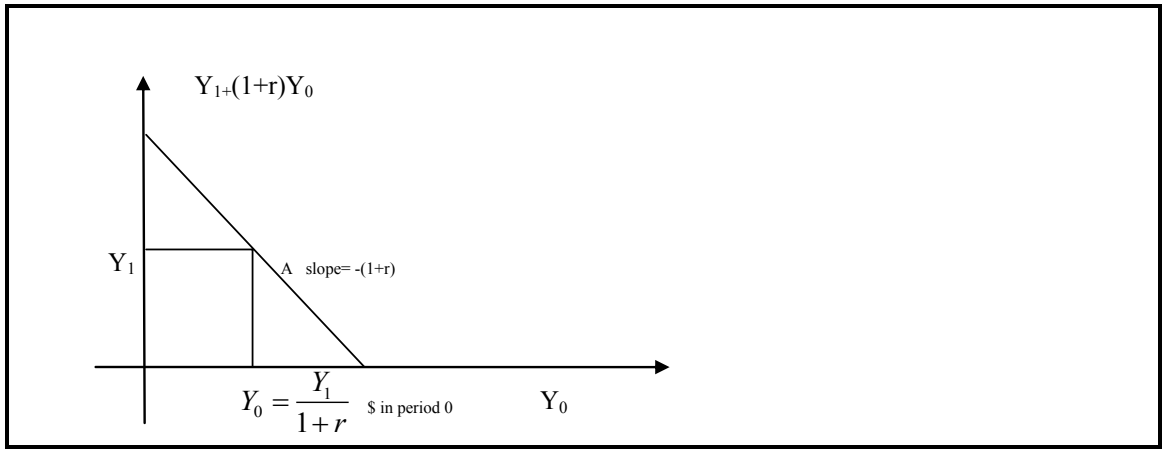
This constraint states that the consumer can allocate his income stream to a consumption stream by borrowing and lending but the present value of consumption is limited by present value of income.

Let us consider a two period case in which the individual has an income stream Y_0,Y_1 and wants to maximize $U(C_0,C_1)$ subject to borrowing and lending constraints as -

$$C_0 + \frac{C_1}{(1+r)} = Y_0 + \frac{Y_1}{(1+r)} \quad (2.3)$$

In Figure 2.1, the income stream Y_0, Y_1, locates the point A. This point shows the amount of income the individual will earn in period 0, Y_0 and the amount of income he will earn in period 1, Y_1.

Figure 2.1 Income of individual in two periods



If his income in period 0 is greater than the value of goods and services he wants to consume in that period; then he can lend, that is save his unspent income.

$S_0 = Y_0 - C_0$ = money lent in period 0

By lending this amount, he will receive in period one an amount equal to S0 (1+r)

$$S_1 = -(1+r)s_0 = Y_1 - C_1 \tag{2.4}$$

The negative sign enters equation (2.4) because the dis-saving in period 1 is of the opposite sign to the saving in period and $C_1 > Y_1$

By dividing the expression for S_1 by t S_0, the equation yields the tradeoff between present and future consumption.

$$\frac{S_1}{S_0} = \frac{S_0(1+r)}{S_0} = \frac{Y_1 - C_1}{Y_0 - C_0} \tag{2.5}$$

From the right hand side equality in the equation (2.5) by cancelling the S_0 and multiplying through by $(Y_0 - C_0)$ we obtain

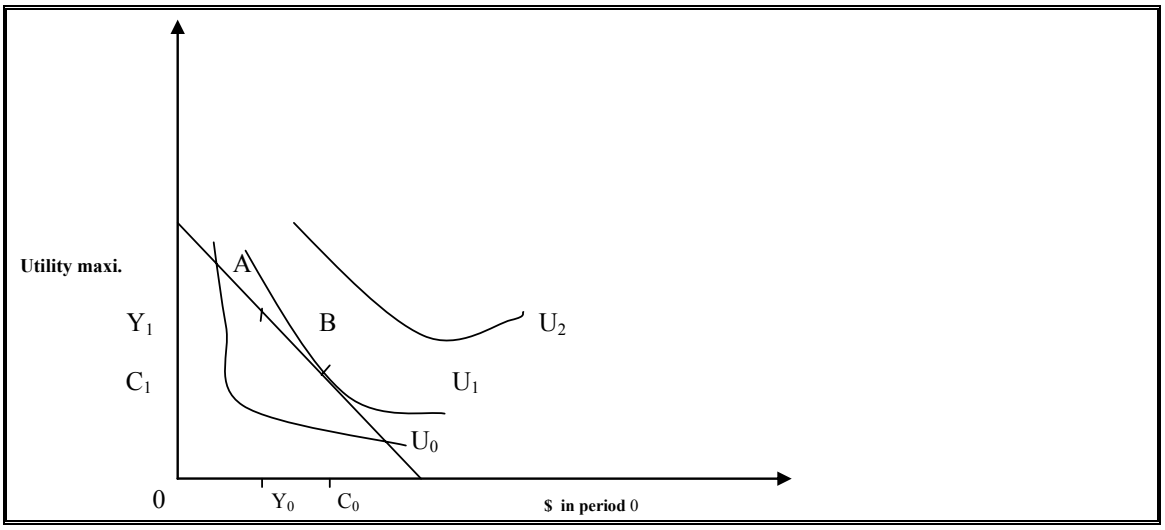
$$Y_1 - C_1 = -(1+r)(Y_0 - C_0) \tag{2.6}$$

Thus the above equation explains that reducing consumption in period 0 below income by the

amount $S_0=Y_0-C_0$, the consumer can enjoy in period 1 consumption in excess income C_1-Y_1 by the amount - (1+r)sb.

From the individual utility function $U=u(C_0,C_1)$,we can obtain a set of difference curves that show the point at which he is indifferent between additional consumption period 1 or period at 0 at each level of utility. These curves U_0,U_1 to U_2 raises the individual's level of utility.

Figure 2.2 Individual utility function



At point B, the individual's consumption pattern is C_0,C_1. The position of budget line is determined by two variables that is income period and interest rates. The relationship between the present value of the income stream and current consumption from above figure gives us the first general formulation of consumption function.

$$C_t=f(pv_t) : f>0 \quad (2.7)$$

Where Pv_t is present value of current and future income at time t is

$$\sum \frac{Y_t}{(1+r)^t}$$

Thus it can be simply stated that an individual's consumption in time t is an increasing function of the present value of his income in time t.

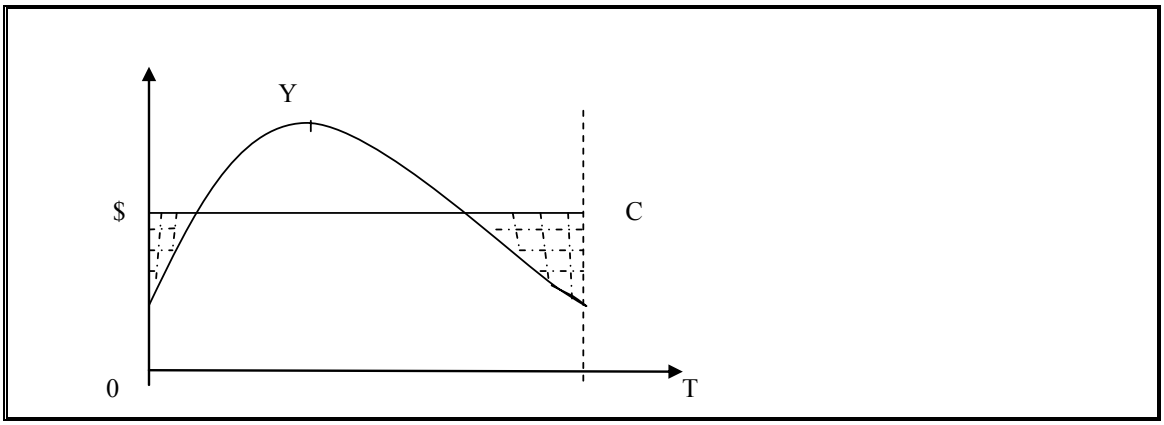
Both A. Modigliani and Friedman began their analysis of the consumption function with the general form of the function given in equation (2.8).

2.2 The Ando Modigliani Approach: The life cycle hypothesis

According to this hypothesis, the typical individual has an income stream which is relatively low at the beginning and end of his life when his productivity is low and high during the middle years of his life.

Thus 'typically' income stream is shown as the Y curve in figure 2.3 where T is the expected life time.

Figure 2.3 Lifespan income and consumption of individual



On the other hand, the individual might be expected to maintain a more or less constant or perhaps a slightly increasing level of consumption. Thus the model suggests that in the early years of a person's life, the first shaded area of figure, he is a net borrower. In the middle years, he saves to repay debt and provide for retirement. In later years, the second shaded portion of figure he dis-saves.

To assume that in the absence of any particular reason to favor, consumption in any period over any other, for representative consumer I, if present value (PV^i) raises all of his C_f^i rises more or less proportionately. In other words, for consumer i

$$C_t^i = K^i(PV_t^i).....0 < k < 1 \tag{2.8}$$

Here Ki is the fraction of the consumer's PV that he wants to consume in period t. It would depend on the shape of his indifferent curve. The above equation explains that if an increase in any income entry , present or expected raises the consumers estimate of PV, he will consume the fraction of K' of the increase in the current period. If the population distribution by age and income is relatively constant and the tastes between present and future consumption are stable through time, we can add up all the individual consumption function (2.8) to a stable aggregate function presented as -

$$C_t=k(PV_t) \tag{2.9}$$

The theory involves consumption as function of expected income which of course cannot be measured.

Ando-Modigliani began to make the present value term operational by nothing that income can be divided into income from labor Y^L and income from assets or property Y^p. Thus permanent income is presented as follows-

$$PV_0 = \sum_0^t \frac{Y_t^L}{(1+r)} + \sum_0^T \frac{Y_t^P}{(1+r)^t} \tag{2. 10}$$

Where time 0 is the current period and t ranges from 0 to the remaining years of life T, we assume that the PV of the income from an asset is equal to the value of the asset itself measured at the beginning of the current period, i.e.,

$$\sum_0^t \frac{Y_t}{(1+r)^t} = a_0 \tag{2.11}$$

Where a is the real household net worth at the beginning of the period. We can separate out known current labor income from the unknown or expected future labor income. Thus given PV_0 can be deduced as -

$$PV_0 = Y_0^L + \sum_1^T \frac{Y_1^L}{(1+r)_t} + q_0 \tag{2.12}$$

The next step in this sequence is to determine how the expected labor income in time 0 evolves, yi_0 such that

$$Y_0^i = \frac{1}{T-1} \sum_1^T \frac{Y_1^L}{(1+r)^t} \tag{2.13}$$

Where,

T-1 is the average remaining life expectancy of the population and the term $\frac{1}{T-1}$ average the PV of future labor income over T-1 year. Thus expected labor income term (2.12) can be written as -

$$\sum_{1}^{T}\frac{Y_t^L}{(1+r)^t}=(T-1)Y_0^e \tag{2.14}$$

This gives us an expression for the PV of the income stream as -

$$PV_0=Y_0^L+(T-1)Y_0^e+a_0 \tag{2.15}$$

It has only one remaining variable that is not yet measurable average expected labor income Y^e

The simplest assumption would be that average expected labor income is just a multiple of present labor income.

$Y_0^e=\beta Y_0^L$ β>0

The assumption that if current income rises, people adjust their expectation of future income up so that Y^e rises by the fraction β of the increase in Y^L.

Alternatively, we could assume that Y^e is related to both; the present labor income and the employment on the theory that as employ t goes up people will expect their chances for future employment and thus income to rise too.

Thus assumption can be formulated as -

$$Y_0^e=\beta Y_0^L=f(\frac{W}{L}).Y_0^L \quad S'>0$$

Where,

N: Employment

L: Size of the labor force

Ando-Modigliani tried a number of similar assumptions and found that the simplest assumption that

$Y^e=\beta Y^L$

Thus, substituting βY_0^L for Y_0^e in equation (2.15) for PV we obtain

$$PV_0 = [1 + \beta(T-1)]Y_0^L + a_0 \tag{2.16}$$

As an operational expression for PV in equation 2.16both Y^L and *a* can be measured statistically. Substituting *o* this equation into equation 2.9 from consumption yield, the expression becomes -

$$C_0 = K[1 + \beta(T-1)]Y_0^L + Ka_0 \tag{2.17}$$

Above equation is a statistically measurable form of the Ando-Modigliani consumption function. The co-efficient of YL and *a* in equation (2.11) were estimated statistically by Ando-Modigliani using annual U.S.A data.

A typical result of their procedure is explained as follows -

$$C_0 = 0.7Y_t^L + 0.06a_t \tag{2.18}$$

This says that an increase of $ 1 billion in the real labor income will raise the real consumption by $ 0.7 billion. The MPC out of labor income is 0.7. Similarly the MPC out of assets is 0.06.

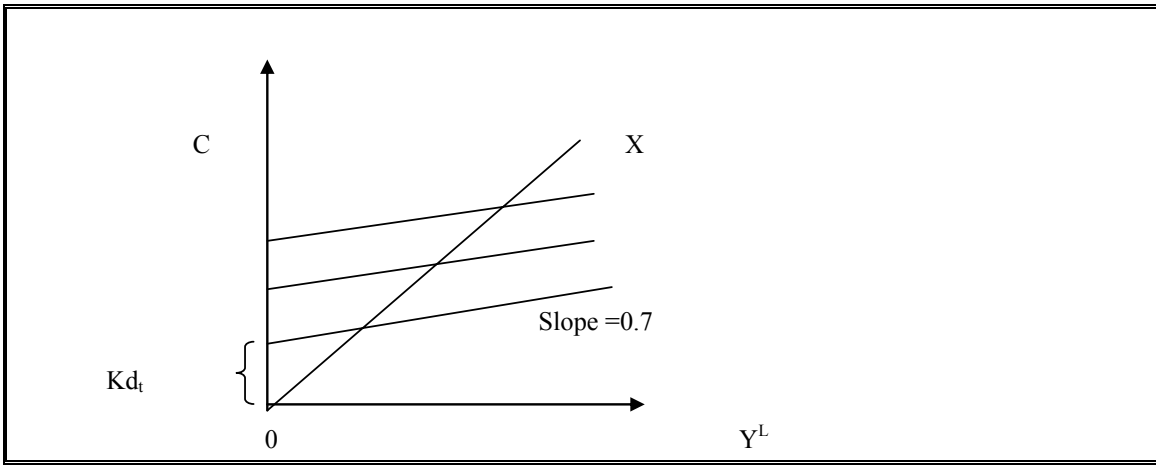
The value of β from equation 2.17 that is implicit in the estimate of the Y^L co-efficient in equation (2.18)

0.7 =k [1+β (T-1)]

= 0.06 (1+44β)

So that β is about 0.25 percent. This suggests that when the current labor income goes up by $100 in the aggregation estimates of average expected labor income rise by dollar twenty five.

Figure 2.4 Consumption and labor income



The Ando-Modigliani consumption function of equation (2.11) is shown in the figure. It shows the consumption against the labor income. The intercept of the consumption income function is set by the level of asset *a*. The figure 2.4 shows a constraint consumption income ratio trend as the economy grows.

Thus constancy of the trends c/y ratio can be derived from the Ando-Modigliani function as follows.

We can divide all the terms in equation (2.18) by total real income to be obtained as -

$$\frac{C_t}{Y_t} = 0.7\frac{Y_t^L}{Y_t} + 0.06\frac{a_t}{Y_t} \tag{2.19}$$

The Ando-Modigliani model of consumption behavior explains all three of the observed consumption phenomena that is

1. Cross sectional budget studies show that s/y increases as income (y) rises, so that in cross sections of the population MPC<APC.
2. Business cycle or short run data shows that the c/y ratio is smaller than average during boom periods; greater than average during boom periods; greater than average during stumps so that in the short run as income fluctuates MPS<APS.
3. Long run data trend as MPC=APC
   It explains the MPC <APC, result of the cross sectional budget studies by the life cycle hypothesis. It provides an explanation for the cyclical behavior of consumption with the consumption income ratio inversely related to income along a short term function.

2.3 The Friedman approach: Permanent income

Friedman began with the assumption of individual consumer's utility maximization which gives us the relation between an individual's consumption and present value.

The model

Consumption function is defined as follows -

$$C_t = f(PV_t) \text{ : s'>0} \tag{2.19}$$

Where PV_t , the present value of current and future income at time t is

$$\sum \frac{Y_t}{(1+r)^t}$$

$$C^i = f^{'}(PV^i) \text{ : s'>0} \tag{2.20}$$

Friedman differs from Ando-Modigliani beginning with his treatment of PV term in equation (2.20), multiplying, by a rate of return gives us Friedman's permanent income as -

$$Y_p^i = r.PV^i \tag{2.21}$$

Thus permanent income from the consumers' present value which includes human capital. The present value of future labor income is included in the above equation.

Friedman along with Ando-Modigliani assumes that the consumer wants to smooth his actual income stream into a more or less flat consumption pattern. This gives a level of permanent consumption

C_p^i that is proportional to Y_p^i

$$C_p^i = K^i Y_p^i \tag{2.22}$$

The individual rate of permanent consumption to permanent income is k', presumably depends on the interest rate. The return on saving – individual tastes shaping the indifference curves and the variability of expected income.

If there is no reason to expect these factors to be associated with the level of income, we assume that the average K^i for all income classes will be the same equal to the population average $\bar{K}$. We can classify a sample of the population by income as -

$$\bar{C}_{pi} = \bar{K}\,\bar{Y}\,P \tag{2.23}$$

Strata is done in the cross section budget studies, we would expect that the average permanent consumption to each income class I would be $\bar{K}$ times its average permanent income for all income classes i.

We observed that total income in a given period is made up permanent income Y_p^i which the individual has imputed to himself; plus a random transitory income component Y_t^i which can be positive, negative or zero. Here subscript t refers to "transitory" not time. Thus it gives us measured income as the sum of the permanent and transitory component. It can be defined in terms of equation as follows -

$$Y^i = Y_p^i + Y_t^i \tag{2.24}$$

Similarly total consumption in any period is permanently consumption. $C_p{}^i$ is random transitory consumption component and C_t^i which represents positive, negative or zero deviation from the "normal" or permanent and transitory consumption.

$$C^i = C_p{}^i + C_t{}^i \tag{2.25}$$

Friedman's theory of the cross sectional result in MPC<APC

1. Friedman assumes that there is no correlation between transitory and permanent income. In other words, Yt is just a random fluctuation around. So that co-variation of $Y_p{}^i$ and Y_t^i across individuals is zero.

Implications

Suppose we take a sample of families from a roughly normal income distribution and then sort them out by income classes. Since $Y_p{}^i$ and Y_t^i are not related, the income class that centers on the population average income will have an average transitory income component $\bar{Y}_t = 0$ and for that income class $\bar{Y} = \bar{Y}_p$.

2. Friedman assumes that there is no relationship between permanent and transitory consumption so that C_t is just a random verification around C_p.
3. Finally Friedman assumes that there is no relationship between transitory consumption income and transitory income.

Friedman assumes that the co-variance of C_t and Y_t is also zero. The last two assumptions that transitory consumption is not co-related with either permanent consumption or transitory income means that when we sample the population and classify the sample by income levels for each income class, the transitory variation in consumption will cancel out so that for each income class the equation becomes -

$$\bar{C}_{ti} = 0$$

$$\bar{C} = \bar{C}_{Pi} \tag{2.26}$$

For each income class i,

We can now being this series of assumption together into an explanation of the cross section result that MPC<APC even when the basic hypothesis of the theory is that the ratio of permanent consumption to permanent income and a constant $\bar{K}$.

Consider a randomly selected sample of the population classified by income levels. A group I with average observed income $\bar{Y}_i$. Above average population income will have a positive average transitory income component $\bar{Y}_{ti} > 0$ for this above average group. Then observed average income will be greater than average permanent income that is

$$\bar{Y}_i > \bar{Y}_{pi}$$

All income groups will have average permanent consumption given by $\bar{C}_{pi} = \bar{K}\bar{Y}_{pi}$. But since $\bar{C}_{ti}$ is not related to either C_{pi} or Y_{ti}, all groups including the above average income group will have a zero average transitory consumption components, so that $\bar{C}_i = C_{Pi}$. Linking these two consumption condition gives us

$$\bar{C}_i = C_{Pi} = \bar{K}\bar{Y}_{pi} \tag{2.27}$$

Thus, the above average income group will have average measured consumption equal to permanent consumption but the average measured income is greater than permanent income so that its measured C_i / Y_i ratio will be less than $\bar{K}$. Similarly a below average income group j will have a measured $\bar{C}_j / \bar{Y}_j$ ratio > $\bar{K}$.

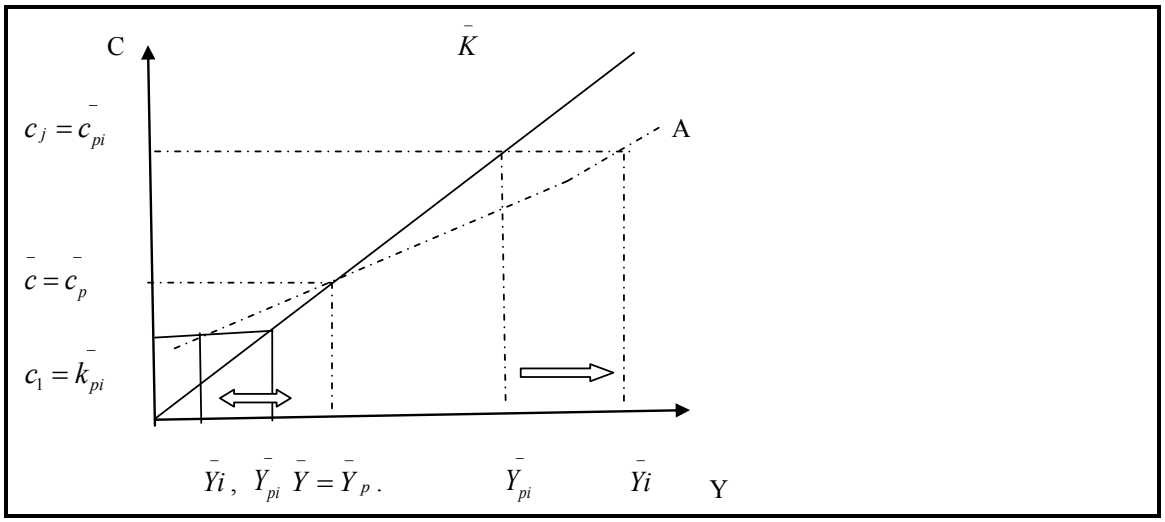
In the figure $\bar{K}$ represents the relationship between permanent consumption and income. The point $\bar{Y}$ is the population average measured income if the sample is taken in a normal year when measured.

Average income is a trend. Average transitory income will be zero so that $\bar{Y} = \bar{Y}_P$. The point $\bar{C}_p$ is the population average measured and the permanent consumption.

2.4 Friedman consumption function: Cyclical movement

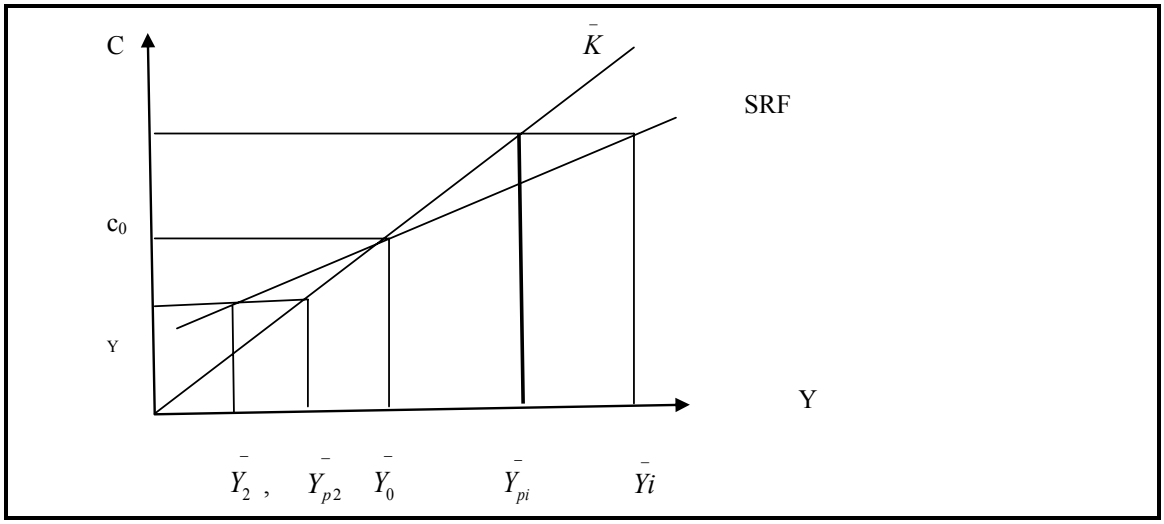
In an average year, when $\bar{Y}_t = 0$, the $\bar{C}_0$, Y0 point falls on the long run $\bar{K}$ line. In a year with above trend income $\bar{Y}i$, transitory income is positive so that $\bar{Y}_{pi} < \bar{Y}_1$ and the $\bar{C}_1$, Y1 point below the $\bar{K}$ line giving us the short run function.

Figure 2.5 Permanent and transitory income effect



Thus Friedman's model also explains the cross section budget studies and short run cyclical observation that the c/y ratio is fairly constraint that is APC=MPC. This Model is somewhat less satisfactory than Ando-Modigliani model. In that model assets are only implicitly taken into account as a determinant of permanent income. And it relies on less observable aspect of income "permanent" income and "transitory" income than the Ando-Modigliani model which separates out the observable component labor income and the value of assets.

Figure 2.6 Consumption and income effect



Nevertheless, the two models are closely related and familiar with transitory high income. In Friedman's analysis, it could be familiar in the middle years. In the Ando-Modiglian life cycle, positive transitory income could be the one at the end of the life cycle. Thus the life cycle hypothesis could be one explanation of the distribution of Friedman's transitory income. The two models are similar in the starting point of the analysis in the consumption. Present value relationship is given in equation firstly as -

$c^i=f^i(PV^i)$ and the explanation of cross section result. The Ando-Modigliani model might be more useful to econometric model builders and forecasts. It explicitly includes measured current income and asset to explain consumption. But it may also need careful interpretation. In cases where income changes are clearly temporary and permanent income consideration are less relevant. The strength of Friedman theory is that it is related to the acceptance by many economist of the proposition that people base current consumption saving decision on more than just current and past values of income and assets.

2.5 The Duesenberry Approach: Relative income

The model developed by Duesenberry in 1949 differs considerably from the Ando-Modigliani and the Friedman model. The Duesenberry model does not begin with the basic assumption – present value relationship. Duesenberry's analysis is based on two relative income hypotheses.

A) First hypothesis:

The first hypothesis is essentially that the consumers are not so much concerned with their absolute and relative level of consumption. They are concerned with their consumption relative to the rest of the population. The Ando-Modigliani and the Friedman model are based on the solution to the problem of consumer choice where the individual tries to maximize

$U=u(C_0, \ldots\ldots\ldots\ldots C_t \ldots\ldots\ldots\ldots\ldots C_T)$ subject to a present value constraint.

In that case only the absolute level of individual's consumption enters the utility function. Duesenberry however writes the utility function as -

$$U = U(\frac{C_0}{R_0} ..... \frac{C_t}{R_1} ..... \frac{C_T}{R_T}) \quad (2.28)$$

Where, P's is weighted average of the rest of population's consumption. This approach explains that utility increases only if the individual's consumption rises relative to the average.

This assumption leads to the result that the individual's consumption to income (c/y) ratio will depend on his position in the income distribution. A person with an income below the average will tend to have a high c/y ratio because essentially he is trying to keep up to a national average consumption standard with a below average income.

On the other hand, an individual with an above average income will have a lower c/y ratio because it takes a smaller portion of his income to buy the standard basket of consumer goods. This provides the explanation of both the cross section result that MPC<APC and the long run consistency of c/y.

B) Second hypothesis:

Duesenberry's second hypothesis is that the present consumption is not influenced by present levels of absolute and relative income but also by levels of consumption in the previous periods. It is much more difficult, he argues for a family to reduce level of consumption once attained than to reduce the portion of its income saved in any period.

Thus assumption suggests that the aggregate ratio of saving to income depends on the level of present income relative to previous peak income $\hat{Y}$, mathematically,

In Duesenberry's formulation -

$$\frac{S}{Y} = \partial_0 + \partial_1 \frac{Y}{\hat{Y}} \tag{2.29}$$

Where, Y is a real disposal income. As present income rises relative to its previous peak, s/y increases and vice a versa.

We can convert this Duesenberry saving function into a consumption function by observing that if Y is disposal income c/y=1=1-(s/y) so that from (2.2) we can obtain

$$\frac{C}{Y} = (1 - \partial_0) - \partial_1 \frac{Y}{\hat{Y}} \tag{2.30}$$

As income grows along trends, previous peak income will always be last year's income, so that Y/Y would be equal to 1+g, where g_y is the growth rate of real income. If Y grows at 4 percent along trend $\frac{Y}{\hat{Y}}$ will be 1.04 and $\frac{C}{Y}$ will be constant, as required by the long run data of Kuznets.

But as income due to the negative co-efficient of $\frac{Y}{\hat{Y}}$ in (2.3),

To compute MPC, we can multiply the c/y ratio of (2.3) by Y to obtain

$$C = (1 - \partial_0)Y - \partial_1 \frac{Y^2}{\hat{Y}}$$

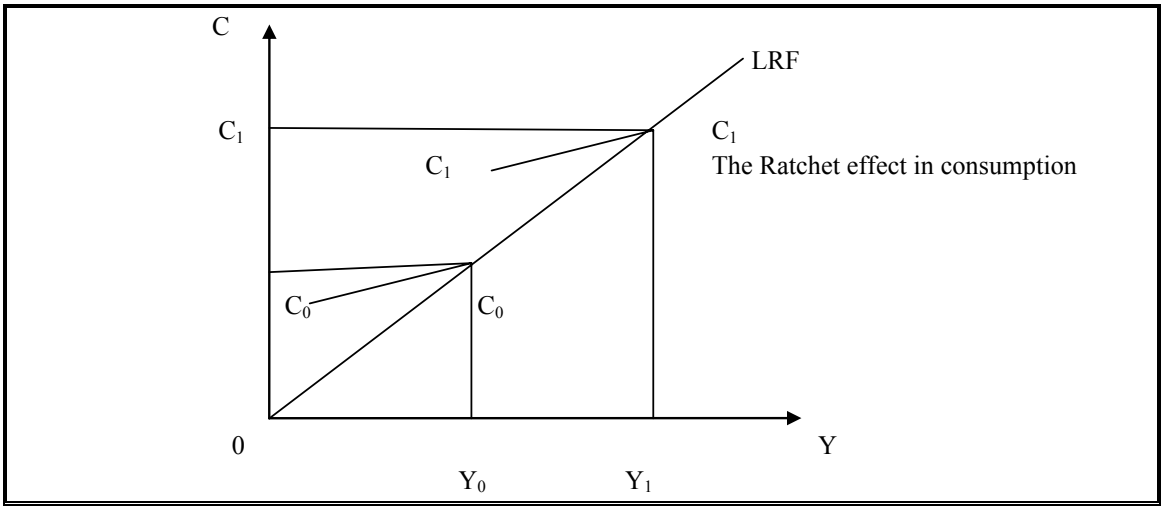
The MPC the partial derivatives of C with respect to Y is then

$$MPC = \frac{\partial_c}{\partial_y} = (1 - \partial_0) - 2\partial_1 \frac{Y}{\hat{Y}} \tag{2.31}$$

Comparison of equation 4 giving the MPC and equation (2.30) giving the APC shows that in the short run with previous peak income fixed. The Duesenberry model implies MPC<APC.

Thus the combination of short run and long run behavior of consumption gives us the Ratchet effect shown in the figure 2.7 -

Figure 2.7 Ratchet effects of consumption



With a constant c/y ratio, at some point like C_0, Y_0 income falls off and the economy goes into a recession c and y move down along a short run function c_0c_0 with slope given by MPC in equation (2.4). Recovery of income back to its trend level, which is also the peak, will take c and y back up c_0c_0 to the initial c_0, $y_0$point. Where trend growth resume along the long run function if another recession occurs at c_1y_1, consumption and income will fall back along c1c1 and rise back to c1y1 during the recovery. Thus Duesenberry's model implies a Ratchet effect in that when income falls off. The theories of Ando-Modigliani and Friedman seem to be more successful than Duesenberry's.

2.6 Money: Definition and function

In traditional societies, goods were exchanged for goods. But even today, barter system is often practiced in the rural areas. Due to monetization of the economy, the use of money has increased. There are three approaches to demand for money developed by the Classical, Cambridge and Keynes. The money is supplied in the economy on regular basis by the reserve bank. The determinants of money and the velocity of circulation of money determine the total volume of money in the economy.

2.6.1 Origin of money

In traditional society, not the actual money but its proxy was used in all the transactions. There were various forms of money. Such money was commodity, representative or credit money. Such forms of money are explained as follows -

1. Commodity money
   In the ancient times, the barter system existed in societies. People were exchanging commodities for commodities through a common understanding between two parties. The net gain from sharing of commodities was assumed to be the equal for both parties. Such transactions were practiced for a long time in the developing countries. But they suffer from a number of limitations. Some commodities were not perfectly divisible. One party wanted to share commodities for another commodity which were indivisible, for example, animals such as pigs and cattle were often considered as commodity.

Secondly, there was absence of common measure value in multi- commodities trade. If all the commodities are exchanged for commodities then it is difficult to understand and remember value of each commodity into the exchange for another commodity. Thirdly, perishable commodities cannot be substituted for another commodity. They cannot be stored for longer periods of time and carried for long distances. Due to all these limitations, commodity money use declined slowly in different transactions.

2. Representative money

   The representative money is any type of money that has face value greater than its value as material substance such as precious stones and metals, gold or silver, which were used extensively in ancient transactions. Such representative commodities money was used for transaction of commodities. Though the representative money suffered from a number of limitations, such as representative commodities are overvalued and other commodities are undervalued. Also, the representative money is in limited quantity and therefore not available for common transaction which people required all the time.

3. Credit money

   Most of the commodities were exchanged based on the credit basis. More assets, such as land, houses, and factory were used against the exchange of commodities. But such commodities were not liquid and available with the masses. Therefore credit money had limitations in exchange for the commodities. In order to overcome all the limitations of commodities, representative and credit money, money is used as a medium of exchange. Now almost all the transactions take place in terms of money.

2.6.2 Money: Concept and definition

Money is any object that is accepted as a method of payment for the goods and services. It is a medium of exchange. Various definitions are given and money is defined. Money is sometimes defined as a store of value. The important characteristics of money are as follows -

1. Acceptability
   Money has universal acceptability. The coins are supplied by the government. The currency notes are supplied by the reserve bank. Therefore money is widely acceptable to all the people despite its size, shape and color for every country.

2. Durability
   Money is durable and cannot be easily destroyed. If money is saved for a long time then it remains as it is in terms of color and shape for longer periods. Durability depends on quality of paper, color, size etc. Even though, it is exchanged and it is circulated in the economy then also money remains durable for longer periods of time.

3. Divisibility
   Money is perfectly divisible. It means, money can be converted into different forms of notes. A five hundred rupees note is easily converted in to ten rupees notes. It can be used to pay an actual amount for goods and services purchased. Such divisibility helps commerce and trade. Easy divisibility of money is an important feature of money.

4. Uniformity
   Money is uniform as it has equal shape, size, color etc. Money can be used in all transactions because it is uniform. Money in the form of currency is available to all the people. Uniform money helps to identify money within short periods of time. The money printed in the past and present are in the same form. If the old coins or notes are going out of exchange or circulation under any change in size or shape, the same is informed in newspapers and magazines timely.

5. Recognizable
   All people easily recognize and identify money and use money at the time of need. Even small children can easily identify money. Money is used in regular transactions all over the world.

6. Scarcity
   Money is scarce and it is not easily available. In order to get the money, person has to take debt, borrow or work for it. Farmers have to produce commodities in their farm. Industries must do the business. Money cannot be transferred easily from one person to another. The scarcity factor forces money to be used wisely because it has alternative uses. If the money is cheap and it is easily available then the monetary authority decides to reduce its supply through monetary policy and instruments.

7. Stability
   Money provides stability for individuals as well as the economies. The scarce money can be saved and it can be used when it is required. During economic crisis and recession, money needs to be used wisely so the crisis can be converted into an opportunity. More stability is expected with more money. Therefore all people like to earn money and store it for future needs.

2.6.3 Functions of money

There are four functions performed by money. They are explained as follows-

1. Medium of exchange
   Money is used in all transactions. The value of all the commodities and services are converted into money. Therefore now a day's commodities are not exchanged for commodities but money is paid for each commodity in exchange. Therefore all human beings carry cash and pay the amount of commodity in money terms. Thus money is used as a medium of exchange.

2. Unit of account
   Money is used as a medium of exchange. It is a scarce commodity. Therefore money has to be accountable. A detail record is kept of money paid and money received. More receipts of money are added into credit account where payments are added in debit. The account summary of debit and credit is regularly available from all the transactions. The debits are paid from the credits and the balance is maintained. Money is used for accounting purposes. How much your employer will pay you in wages , how much you owe the bank , how much a firm has earned and how much a bond is worth are all recorded in some unit of account (Gordon 1998).

3. Store of value
   Money is used as a medium of exchange and it is stored to pay or buy goods and services. Money is easily stored either in the house or in bank. The store of value of money may change with inflation. If interest rate adjustment takes place then the money value remains same in the long period. Most of the time money is stored in the form of savings or wealth. Such wealth is used for future period.

4. Standard of deferred payment
   Money has an important feature that it is a standard of deferred payment. Money can be paid in future. Most of the people buy goods and services and they pay bills in the future period. It is the only method of payment available to money.

2.6.4 Demand for money

Money is demanded for different transactions. The money demand is a function of prices, interest, and monetary base. But the money demanded for the transaction purposes is interest inelastic. The demand for money approaches are mainly divided into the following two approaches.

1. **Classical approach**

   The classical economists have given their views of demand for money. The money demand and velocity of circulation of money decides the price level and volume of transaction. If the price level is higher than volume of transaction affects whereas the stock of money and velocity of circulation declines. The equation is presented as follows.

   $$MV=PT \qquad (2.32)$$

   Where
   M: stock of money
   V: velocity of circulation of money
   P: price level
   T: transaction

   The money supply and velocity of circulation of money decides the price and transaction. But it is not always true. The money demand is decided by the people. People use money as precaution. It is not added in the classical approach to demand for money.

2. **Cambridge approach**

   The demand for money is decided by the price level and the actual holding of cash balances and nominal money. It can be defined as

$M^d = KPY$ (2.33)

Where

M^d: Money demand

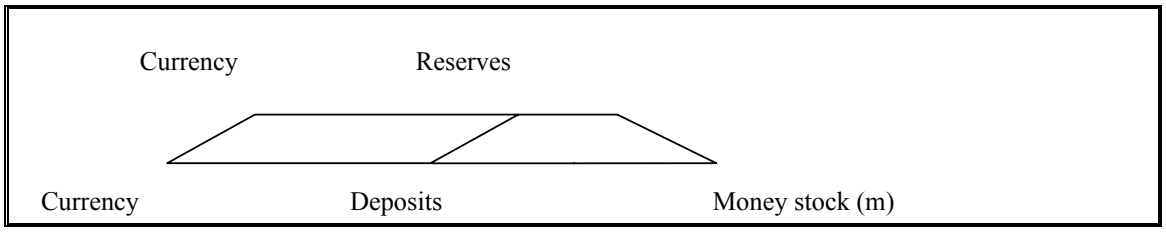
K: Proportion of national income with people

PY: Nominal income

2.6.5 Money multiplier

Money multiplier is mainly influenced by the high powered money. High powered money is defined as the currency and bank deposits. The money supply influences the currency and the bank deposits. The contractionary monetary policy influences money available to the people. The money multiplier is therefore defined as the ratio of stock of money to high power money. It is presented in Figure 2.8 as -

Figure 2.8 High power money in economy



High power money consists of the upper portion of the figure that is currency and reserves. The money stock is a broad concept and it consists of currency and reserve. It also includes the deposits. The money supply is defined more clearly as -

$$M = \frac{1+Cu}{re+Cu}H \tag{2.34}$$

$$= MM\ (I, i_D, r_R, C_u, \sigma)\ H \tag{2.35}$$

Where

I: Interest rate

iD: Discount interest rate

rR: Required reserve

In order to control the money supply, reserve bank always uses the high power money. The monetary authority regularly decides the total money supply in economy.

2.6.6 Money stock measures

There are two views of measuring money stock. The traditional view favors transaction theories; it ultimately leads to the narrow measure of money stock. The asset theories emphasizing 'broader' measure of money. Therefore money has no fixed measure and it is more of judgment or preference. There are different financial and real assets can be arranged in a descending order with reference to liquidity. The currency and demand deposit is the most liquid asset and they are the medium of exchange. Time deposits and government bonds are liquid assets but they cannot be converted into the medium of exchange without incurring some cost. At the bottom of the liquidity continuum lie automobiles, real estate and the like, this can be liquidated at a short notice only at a substantial cost. The monetary authorities all over the world provide alternate measures of money, leaving the choice to individual researchers and to the dictates of specific situations. At present most of the central banks classify the monetary aggregates which are functional characteristics of monetary assets.

In India, money stock measures currently published range from M1 to M4 is defined as:

M1= currency (with public) + demand deposits + other deposits with the Reserve Bank of India

M2=M1+ saving deposits with the post office savings bank

M3=M1 + Time deposits

M4 = M3 + all deposits with the post office savings organization

The separation of M1 and M3 is based on separation of time deposits with banks from currency and demand deposits with banks. The major difference between M1, M3 and M2, M4 is based on the institutional differentiation between banks and post office savings organization.

2.6.7 Sources of change in reserve money

Reserve money is to recognize as net monetary liabilities of the central bank. These liabilities are created in the process of generating matching assets by the central bank. The reserve money comprises as the net monetary liabilities of the central bank that is currency with the public (C) and banks' reserves (R). It follows from the asset side of the balance sheet as -

Reserve money = Net RBI credit to government

+ RBI credit to Banks
+ RBI credit to commercial sector
+ Net foreign exchange assets of RBI
+ Government's currency liabilities to the public
-Net non –monetary liabilities of RBI

The change in reserve money could be treated as changes in assets acquired by the RBI in the course of its operations.

Table 2.1 Balance sheet of RBI

Liabilities	**Assets**
1.Currency with general public	1. Net RBI credit to government (centre to states)
2.Bank reserves i. Cash in hand ii. Bankers deposits with the RBI	2. RBI credit to banks
3.Net non-monetary liabilities	3.RBI credit to commercial sector
	4.Net foreign exchange assets of RBI
	5.Government's currency liabilities to the public

2.6.8 Equilibrium in money market

Equilibrium in money market means demand for money is equal to supply of money. The interest rate is constant. But money supply should be in proportion with price level.

$$\frac{M}{P} = L(i, Y) \tag{2.36}$$

If we assume that prices in the present and past is constant (P_0=P) and income is also constant with y_0=y then money supply in proportion with price influences the interest rate. Alternatively, it can be written as

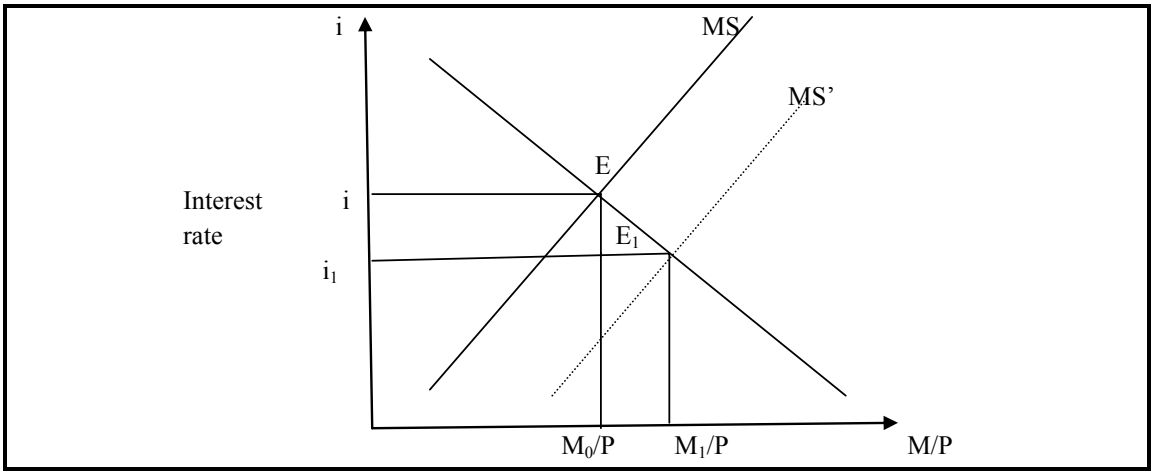
$$MM(i, iD, rR, Cu, \sigma)\frac{H}{P_0} = L(i, Y_0) \tag{2.37}$$

Money multiplier and interest rate, discount interest rate, required reserve, currency deposit ratio and high power money and past prices are equivalent to interest rate and income in the past period.

Interest rate and money target

It depends on the monetary authority to target money supply or the interest rate. If we assume that money supply is a target variable then the following figure 2.9explains the equilibrium. Figure also explains the money stock equilibrium with interest rate. The increase in money stock will reduce the interest rate. The money stock increases from $m_0/P_0$to M_1/p. The money supply shifts to MS_1 from MS. The new equilibrium is adjusted at E_1. The interest rate falls from i to i1. It is the money supply change on interest rate.

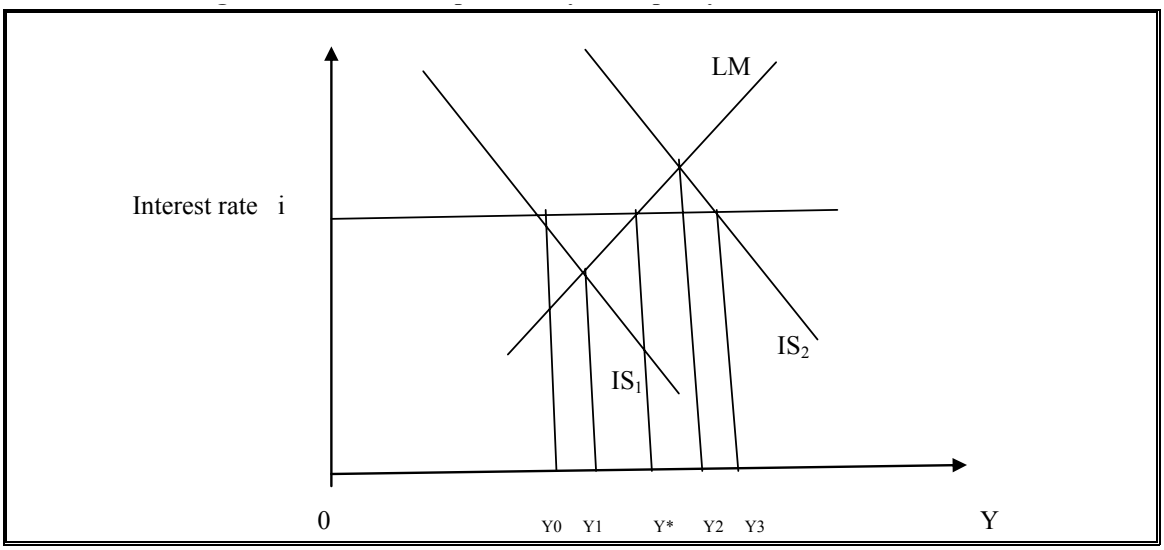
Figure 2.9 Money supply and change in interest rate



2.6.9 Monetary targeting

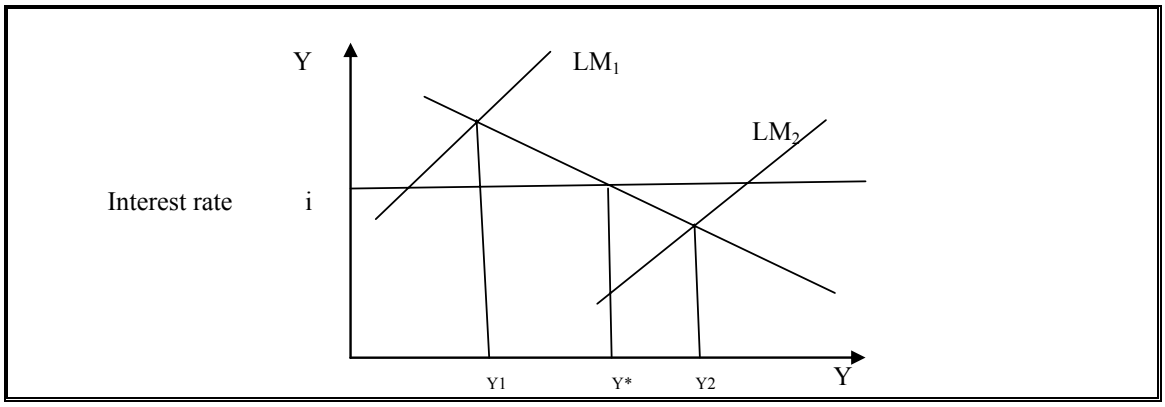
Sometimes monetary authority targets interest rate. It remains at the same point but output targeted. It is growth targeting and national income forecasting. In order to increase the output, interest rate is kept constant or a different alternative output is managed by the government. Output growth is given higher in employment. Thus, GDP forecast and fixed interest rate policy is used. A monetary authority deciding on monetary policy for today, this authority needs to forecast how variables such as inflation and output will behave now and in the future, which means that it must forecast private behavior in the future. But the decision of private actors depends on their expectations about future monetary policy (Chari, V.V. and Patrick J. Kohoe, 2006).

Figure 2.10 Effect of expansionary fiscal policy on income



Similarly monetary policy uses the fixed interest targeting. The level of output or GDP is forecasted at different level. Money supply in particular level of interest is provided. It is the only output which allows becoming flexible. Therefore targeting interest rate is sometime very ineffective in the long run. There is perfect relationship between money demand and interest rate. Such policy is more widely used in the economy.

Figure 2.11 Effect of monetary policy on income



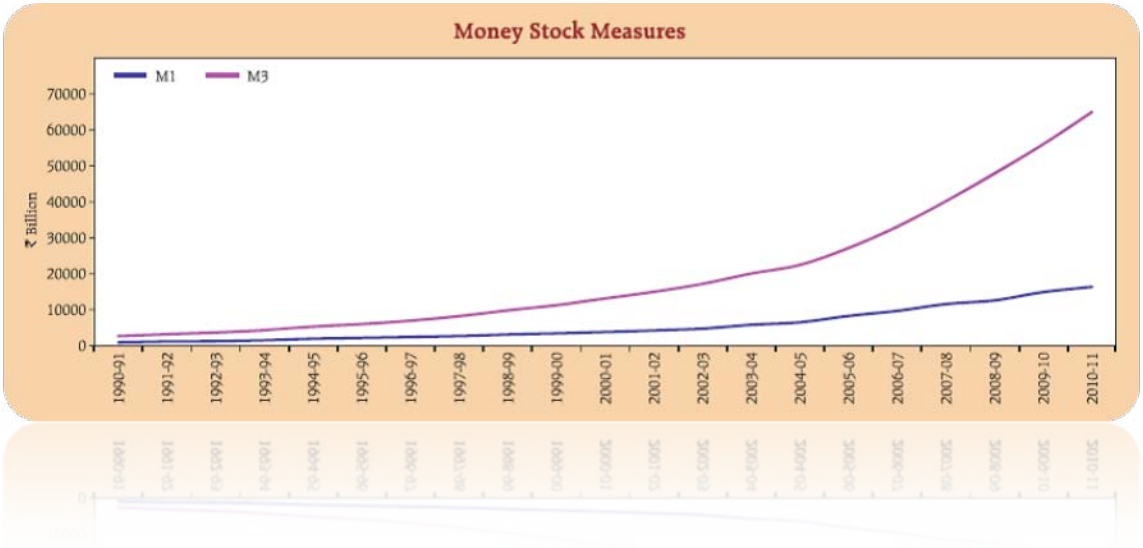
Appendix

Table 2.2 Money supply in India (Billion)

	2011	2012	Variations over Fortnight	
Item	**Mar 31**	**Jan 13**	**Amount**	**%**
1	2	3	4	5
M3	**64994.9**	**71925.7**	**-61.1**	**-0.1**
Components (i+ii+iii+iv)				
i) Currency with the Public	9142.0	10006.0	226.1	2.3
ii) Demand Deposits with Banks	7176.6	6699.1	-394.7	-5.6
iii) Time Deposits with Banks	48639.8	55199.2	109.0	0.2
iv) `Other ' Deposits with Reserve Bank	36.5	21.4	-1.5	-6.5
Sources (i+ii+iii+iv-v)				
i) Net Bank Credit to Government Sector (a+b)	19827.7	22753.3	402.2	1.8
a) Reserve Bank	3965.5	4933.5	432.9	
b) Other Banks	15862.2	17819.8	-30.7	-0.2
ii) Bank Credit to Commercial Sector (a+b)	42354.1	46715.9	-102.1	-0.2
a) Reserve Bank	21.6	31.6	-1.0	-
b) Other Banks	42332.4	46684.3	-101.0	-0.2
iii) Net Foreign Exchange Assets of Banking Sector *	13933.4	15208.6	-697.0	-4.4
iv) Government's Currency Liabilities to the Public	127.2	137.2	0.0	0.0
v) Banking Sector's Net Non-Monetary Liabilities	11247.6	12889.3	-335.8	-2.5
of which : Net Non-Monetary Liabilities of R.B.I.	3683.5	5697.1	-535.3	-8.6

Source: RBI statistics

Figure 2.12 money stock measures



Source: RBI statistics

Table 2.3 Measurement of money supply in India

March 31/ reporting Fridays of the month/last reporting Friday of the month			2008-2009	2009-2010	2010-2011	November 5, 2010	November 19, 2010	July 2011	August 2011	September 2011	October 2011	November 4, 2011	November 18, 2011
Currency with the Public	Notes in Circula-tion (1)		6,811.0	7,882.8	9,369.4	8,863.3	8,969.8	9,631.6	9,705.8	9,696.6	9,840.4	9,989.5	10,081.3
	Circulation of	Rupee Coins (2)	84.9	97.0	111.6	105.8	106.9	116.3	117.4	117.4	117.4	117.4	117.4
		SmallCoins (2)	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7
	Cash on Hand with Banks		257.0	320.6	354.6	335.5	374.6	408.3	407.1	413.6	451.6	442.1	440.6
	Total (1+2 +3-4)		6,654.5	7,674.9	9,142.0	8,649.4	8,717.7	9,355.2	9,431.8	9,416.1	9,521.9	9,680.5	9,773.8
Deposit Money of the Public	Demand Deposits with Banks		5,886.9	7,179.7	7,176.6	6,625.9	7,107.4	6,463.2	6,378.6	6,379.2	6,460.1	6,440.6	6,384.7
	'Other' Deposits with Reserve Bank (3)		55.7	38.4	36.5	42.8	35.6	14.4	28.3	23.4	11.6	13.1	11.2
	Total (6+7)		5,942.6	7,218.1	7,213.1	6,668.7	7,143.0	6,477.6	6,406.9	6,402.6	6,471.7	6,453.7	6,396.0
M_1 (5+8)			12,597.1	14,893.0	16,355.1	15,318.1	15,860.7	15,832.8	15,838.8	15,818.7	15,993.6	16,134.2	16,169.8
Post Office Saving Bank Deposits			50.4	50.4	50.4	50.4	50.4	50.4	50.4	50.4	50.4	50.4	50.4
M_2 (9+10)			12,647.5	14,943.4	16,405.5	15,368.5	15,911.1	15,883.2	15,889.2	15,869.2	16,044.0	16,184.6	16,220.2
Time Deposits with Banks			35,351.0	41,134.3	48,639.8	45,086.7	45,045.3	52,221.8	52,545.1	52,773.1	53,593.1	53,971.4	53,966.9
M_3 (9+12)			47,948.1	56,027.3	64,994.9	60,404.8	60,906.0	68,054.6	68,383.9	68,591.8	69,586.6	70,105.6	70,136.7
Total Post Office Deposits			259.7	259.7	259.7	259.7	259.7	259.7	259.7	259.7	259.7	259.7	259.7
M_4 (13+14)			48,207.8	56,287.0	65,254.5	60,664.4	61,165.7	68,314.3	68,643.5	68,851.5	69,846.3	70,365.3	70,396.4

Source: RBI statistics

Table 2.4: Components of Money Stock (Rupees crore)

Year	Currency in circulation	Cash with banks	Currency with the public	'Other' deposits with the RBI	Bankers' deposits with the RBI	Demand deposits	Time deposits	Reserve money (M_0)	Narrow money (M_1)	Broad money (M_3)
			(2-3)					(2+5+6)	(4+5+7)	(8+10)
1	2	3	4	5	6	7	8	9	10	11
1951-52	1292	43	1249	18	47	545	325	1357	1812	2137
1961-62	2256	54	2202	23	73	824	1198	2352	3049	4247
1971-72	5006	205	4801	80	296	3442	4370	5382	8323	12693
1981-82	15411	937	14474	168	5419	10295	37815	20998	24937	62752
1991-92	63738	2640	61098	885	34882	52423	202643	99505	114406	317049
2001-02	250974	10179	240794	2850	84147	179199	1075512	337970	422843	1498355
2002-03	282473	10892	271581	3242	83346	198757	1244379	369061	473581	1717960
2003-04 P	327028	12057	314971	5119	104365	258626	1426960	436512	578716	2005676
2004-05 P	368661	12893	355768	6478	113996	284017	1607675	489135	646263	2253938

Source: RBI statistics

Table 2.5: Sources of Money Stock (Rupees crore)

Year	Net RBI credit to Central Government	Net RBI credit to State Governments	Net RBI credit to Government	Other banks' investments in Government securities	Net bank credit to Government	RBI credit to commercial sector	Other banks' credit to commercial sector	Bank credit to commercial sector
			(2+3)		(4+5)			(7+8)
1	2	3	4	5	6	7	8	9
1971-72	4249	621	4870	1755	6625	232	7131	7363
1981-82	18486	1954	20440	10193	30633	2044	41418	43462
1991-92	92266	1750	94016	64247	158263	7260	180733	187993
2001-02	141384	10794	152178	437387	589565	5929	753718	759647
2002-03	112985	7695	120680	555844	676523	3048	895932	898981
2003-04 P	36920	7988	44908	697996	742904	2061	1014089	1016151
2004-05 P	-23258	5283	-17975	775880	757906	1390	1279150	1280540

Source: RBI statistics

Questions

1. Explain the Friedman and Modigliani theory of consumption.
2. Critically evaluate the Ando Modigliani Approach of the life cycle hypothesis**?**
3. Explain the Friedman's approach of permanent income.
4. Critically examine Friedman's approach of consumption function with reference to cyclical movements?
5. What is the Duesenberry Approach of relative income? Explain.
6. Explain the various types of money.
7. What are the characteristics of money? Explain in detail.
8. What are the functions of money?
9. What are the approaches to demand for money?
10. Explain the term money multiplier in detail.
11. How is the money measured? Explain the monetary aggregates in detail?
12. What are the sources of change in reserve money? Explain in detail.
13. Explain equilibrium in the money market. How does expansionary monetary policy affect equilibrium?
14. Net foreign exchange assets of monetary authority changes the reserve money. Comment.
15. Credit to the commercial banks is an asset for the monetary authority. Comment.
16. More money supply in the economy leads to increase in the prices. Comment.
17. Expansionary fiscal policy helps to keep the interest rate stagnant in the economy. Explain.
18. Critically examine the effect of monetary policy on income?
19. Write a note -

a) Consumption function
b) Permanent income
c) Life cycle hypothesis

20. Explain the lifespan income and consumption of an individual.
21. The population structure and education helps to change the consumption pattern of a country. Comment.

3 Aggregate supply, wages, prices and employment

Aggregate supply and employment in the economy are co-related. The aggregate supply also decides the wages. The price level rises with rise in wages. There is difference in the full employment and natural rate of employment in the economy.

3.1 Philips Curve

Philips a New Zealand born economist wrote a paper in 1958. In this paper, he has shown the relationship between unemployment and the rate of change of money wage rates in United Kingdom, 1861-1957. Such paper is published in quarterly journal of Economica. According to Philips, there is an inverse relationship between the rate of unemployment and the rate of increase in money wages. If there is higher rate of unemployment then there is lower rate wage inflation. In other words, there is tradeoff between inflation and unemployment. The Philips curve shows that the rate of wage inflation decreases with the unemployment rate. Thus w is defined as wage in current period. The W_{-1} is the last period wage. Therefore wage inflation is defined as follows -

$$g_W = \frac{W - W_{-1}}{W_{-1}} \tag{3.1}$$

Where,

g_W : wage growth

W: present wage

W_{-1}: Past wage rate

If u* is defined as the natural rate of unemployment then wage growth is defined as

$$g_W = - \in (u - u^*) \tag{3.2}$$

Where,

U: unemployment rate in economy

U*: natural rate of unemployment

If u=u* and g_W =0

And u>u* then g_W is negative. The wage rate is decreasing but if u>u* then the growth rate of wage is rising. The Philips curve implies that wages and prices adjust slowly to change in aggregate demand. After using wage inflation, it can be further defined as

$$g_W = \frac{W - W_{-1}}{W_{-1}}$$

$$= \frac{W}{W_{-1}} - \frac{W_{-1}}{W_{-1}}$$ Dividing W_{-1} from both sides,

$$g_w = \frac{W}{W_{-1}} - 1 \tag{3.3}$$

If we substitute $g_W = - \in (u - u^*)$ into equation (3.3) then

$$\frac{W}{W_{-1}} - 1 = - \in (u - u^*)$$

$$\frac{W}{W_{-1}} = 1 - \in (u - u^*)$$

Therefore,

$$W = W_{-1}[1 - \in (u - u^*)] \tag{3.3a}$$

It means that the present wage depends on past wage $1 - \in$ and difference between natural unemployment and present unemployment.

It also represents the level of wage today relative to the past level for wages to rise above their previous level of unemployment. Unemployment may fall below the natural rate.

The Philips curve rapidly became a corner stone of macroeconomic policy analysis. It suggests that policy makers could choose different combinations of unemployment rates of inflation.

The Friedman Phelps amendment

The Friedman Phelps proposition shows that in the long run, the economy will move to the natural rate of unemployment whatever the rate of change of wages and the inflation rate. There is no trade off in the long run. It is a counter argument to the Philips curve. The notion of a stable relationship between inflation and unemployment was challenged by Friedman and Phelps who both denied the existence of a permanent tradeoff between inflation and unemployment (Snowdon, Brian

and Howard R.Vane, 2005).

3.1.1 Wage Stickiness

The assumption that wages are slow to adjusts. The shift in demand is essential to our derivation of an AS curve. It produces a gradual rather than an instantaneous adjustment of the economy to disturbances.

Wages are sticky or wage adjustment sluggish when wages move slowly over time rather than being fully and immediately flexible so as to assure full employment at every point in time.

We translate the Philips curve in (3.3) to a relationship between the trade of change of wages g_w and the level of employment by N. We define the unemployment rates as the fraction of the full employment labor force N*.

We assume that u*=0, then u is defined as

$$u = \frac{N^* - N}{N^*} \tag{3.4}$$

If we substitute 3.4 in to 3.2 then we obtain the Philips curve. The Philips curve shows the relationship between the wage this period and the wage last period and the actual level of employment.

Thus,

$$W = W_{-1}[1+ \in (\frac{N - N*}{N*})] \tag{3.5}$$

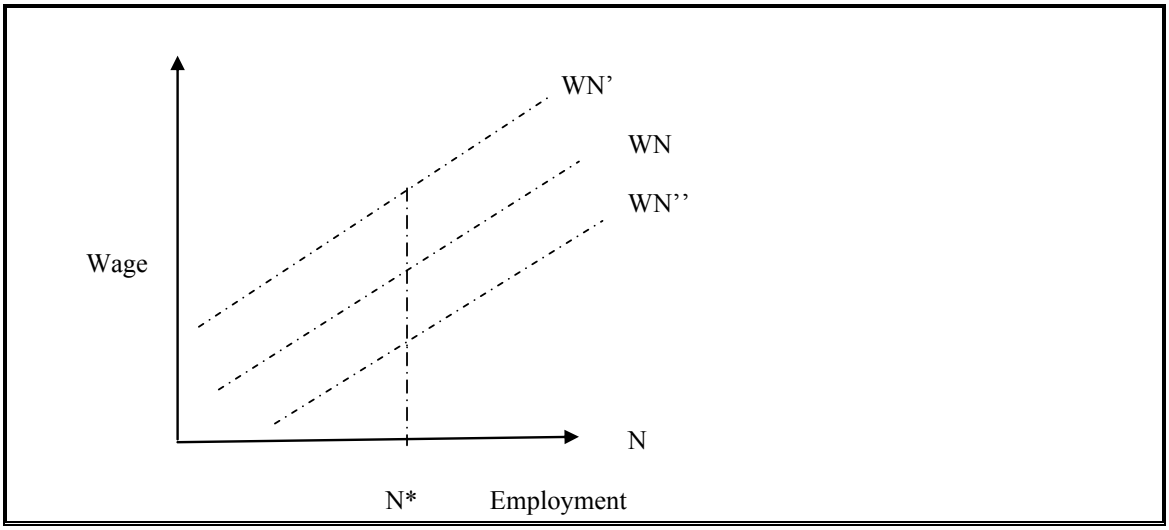
Where,

N*: Full employment

N: Actual level of employment

The above equation shows the relationship between wage employment relations. If we draw the diagram of wage last period and actual level of employment, the diagram is drawn as follows

Figure 3.1 Wage and employment relationship



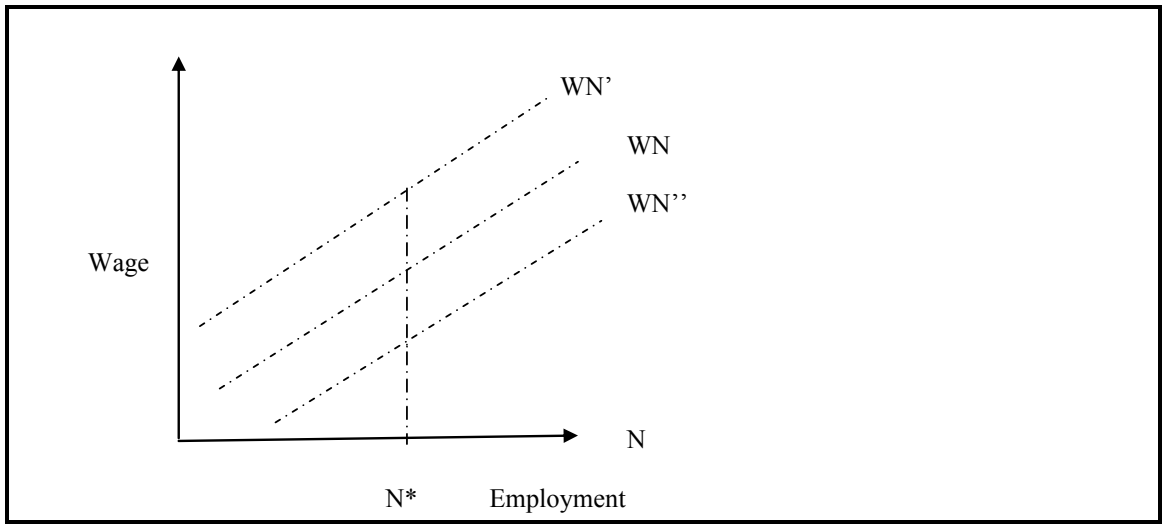
The Y axis shows the wage and the X axis shows the employment. The wage shows upward line. The WN line shows the wage this period equal to wage that prevailing last period, with an adjustment for the level of employment.

At full employment (N=N*) this period of wage is equal to last period's wage, equation (3.5) can be defined again as follows -

$$W = W_0[1+ \in (\frac{N_1 - N*}{N*})]$$

Within a period, the wage increases with the level of employment as shown by WN. If employment at its neoclassical equilibrium level N*, the wage rate level in this period is equal to last period.

Figure 3.2 Change in wages and employment



Equation 3.5 implies that WN relationship shifts over time as in the figure 3.2. If there is over employment this period, then WN curves will shift upward next period to WN'. If there is less than full employment this period, WN line will shift downward next period to WN".

The wage and employment relationship changes with time. The WN curve shifts overtime if employment differs from full employment. N* is defined as the full employment level. The WN curve shifts upward WN" in next period. Therefore if there is over employment in current period then it shifts upwards and vis-à-vis.

3.2 The aggregate supply curve (Dynamic)

The value of national income in current prices can be split up as follows -

p.y= WN+zWN

Where z is a markup prices

p.y= (1+z) WN

$$p = \frac{1+z}{Y} WN \tag{3.6}$$

If we divide the above equation by N then, the above equation can be written as

$$p = \frac{(1+z)\frac{WN}{Z}}{Y/N}$$

$$p = \frac{(1+z)/W}{Y/N} \tag{3.7}$$

In order to derive the aggregate supply curve, following steps are required -

1. We relate output to employment
2. We also relate the prices that firms charge to their cost
3. We use the Philips curve relationship between wage and employment.
   If we put all 3 components with each other then we can derive the dynamic aggregate supply curve. It is defined as follow.

3.3 The Production Function

Normally, production is a function of labor and capital. If we link the level of employment of labor to the level of output, then the production function can be defined as follows -

$$Y=aN \tag{3.8}$$

Where

Y: level of output produced

N: amount of labor input

a: the input co-efficient

In simple production function, output is proportional to input of labor. Level of outcome produced is related to amount of labor input used. In the above equation a is a co-efficient in production function.

Cost and Prices

We assume that the firm's base price is the labor cost of production. The ratio w/a is often called as the unit labor cost. The higher is the labor cost, higher the firms base price. Therefore firms set price as markup Z on labor costs.

If $a = \frac{Y}{N}$ then equation (3.8) can be written as

$$P = \frac{(1+z)W}{a} \tag{3.9}$$

Above equation shows that if the mark up price rises then the price will rise. Similarly, wage rate rises with price level. But as a rises then the price level decreases. The mark up over labor costs cover the cost of other factors of production that firms use such as capital , raw material . It includes an allowance for the firm's normal profit.

There are three components of the aggregate supply curve and they are defined as follows

- Firstly, production function is given in equation 3.8
- Secondly price cost relation in equation 3.9
- Thirdly Philips curve is given in equation as

$$W = W_{-1}[1+ \in \frac{(N-N^*)}{N^*}]$$

If we substitute the above equation into equation 3.9 then it can be rewritten as

$$P = (\frac{1+z}{a})W_{-1}[1+ \in \frac{(N-N^*)}{N^*}] \tag{3.10}$$

The prices are related to mark up prices and last period wage and employment.

$$P_{-1} = (\frac{1+z}{a})W_{-1}$$

Such equation can be reduced to

$$P = P_{-1}[1+ \in \frac{(N-N^*)}{N^*}] \tag{3.11}$$

Now the prices depend on the past prices and employment

Therefore

$$a = \frac{Y}{n}$$

And

Y*=an

We can write alternatively as

Y*=aN

The income level is depends on employment. If we modify the above equation then $N^* = \frac{Y^*}{a}$ and $N = \frac{Y}{a}$ employment is equal to income divided by a.

We can replace N and N* into equation (3.11) by y/a. alternatively we can substitute y*/a into (3.11) above equation then

$$P = P_{-1}[1 + \in \frac{(\frac{Y}{a} - \frac{Y^*}{a})}{\frac{Y^*}{a}}]$$

$$P = P_{-1}[1 + \in (\frac{Y - Y^*}{Y^*})]$$

If the λ is defined as $\lambda = \in / Y^*$

Thus we can obtain the dynamic aggregate supply curve as

$$P = P_{-1}[1 + \lambda(Y - Y^*)] \tag{3.12}$$

It is a dynamic aggregate supply curve.

Figure 3.3 Aggregate supply curve and price level

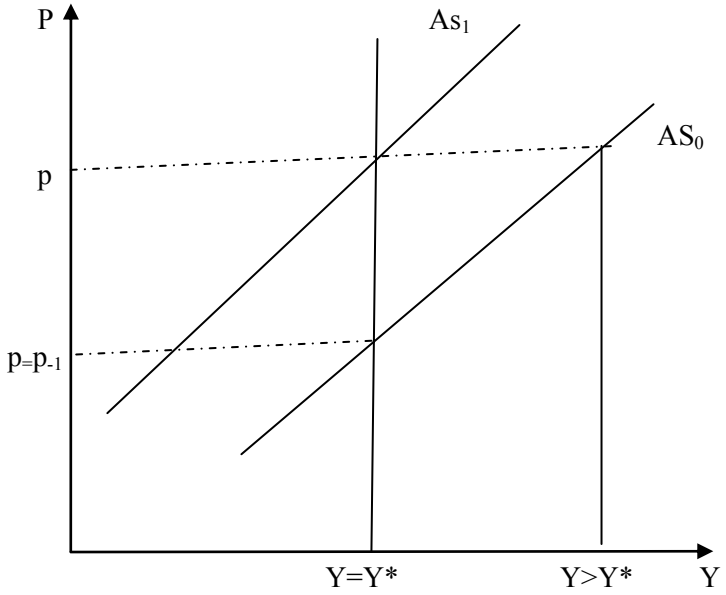


Figure 3.3 shows the aggregate supply curve in equation (3.12). The supply curve is upward sloping. The aggregate supply curve shifts if output in current period is above the full employment level Y* then next period the AS curve will shift up AS'.

The aggregate supply curve shows that the wages are less than fully flexible. Prices increase with the level of output because increased output implies increase in employment, therefore increase in labor cost. The fact that prices rise with output is entirely a reflection of the adjustment in labor market, in which higher employment increases wages. Firms pass on these wage increases by raising prices and for that reason prices rise with the level of output.

3.4 The properties of aggregate supply curve

There are three properties of aggregate supply curve. They are explained as follows.

1. Aggregate supply curve is flatter then the smaller is the impact of output on employment changes and current wages
2. The position of the aggregate supply curve depends on the past level of prices.

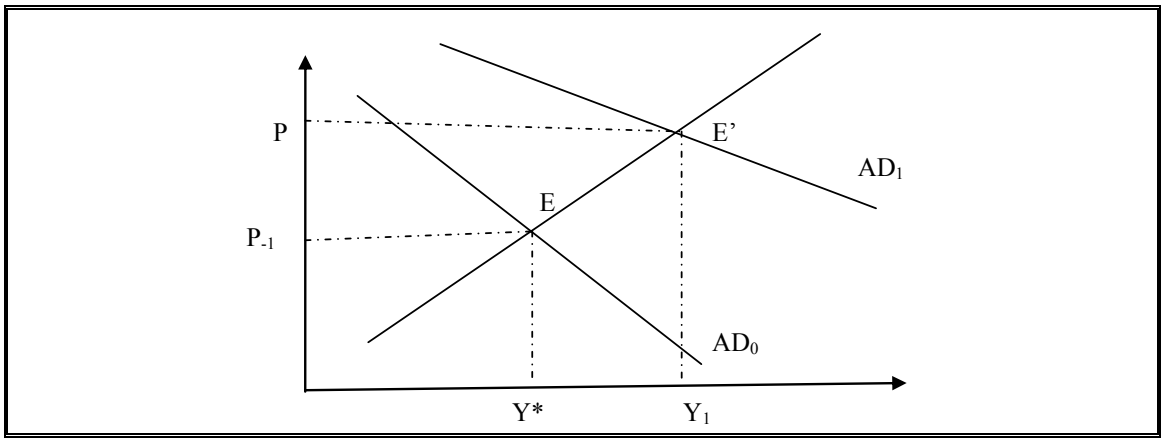
3. The aggregate supply curve shifts overtime, if output maintained above the y* then overtime wages continue to rise and the wage increases are passed on as increased prices.
   In order to make the aggregate supply curve dynamic, the y=y* is the first condition.
   Second condition is a $P = P_{-1}[1 + \lambda(Y - Y^*)]$
   And thirdly $p_1=p_0$ and $P_2=P_1$.
   All the three conditions make the dynamic ggregate supply curve.

3.4.1 The effects of monetary and fiscal policy on aggregate supply curve

The monetary and fiscal policy effects are further divided into short, medium and long term effects. Due to rise in money supply, the wages increases and the output and prices also increase. It is divided in to three parts as follows,

1. **Short run effects**
   In figure 3.4, the aggregate supply curve is AS0. It is drawn for a given past price level P-1. It poses through the full employment output level Y_0^* . At the price level P-1 output is at the full employment level. There is no tendency for wages to change. Hence costs and prices are also constant from period to period. The aggregate supply curve has drawn relatively flat. It suggests a small effect of output and employment changes on wages.

Figure 3.4 Effect of aggregate demand on prices and income



In figure 3.4, the initial equilibrium at E is disturbed by an increase in the money stock. It shifts the aggregate demand curve from AD_0 to AD_1. Short run equilibrium is at E'. At this point, both the price level and output increases. Prices are higher because the output expansion has caused an increase in wages. The ASC is drawn quite flat. It reflects the assumption that wages are quite sticky. Suppose nominal money stock is increasing at each price level, real balances are higher. The interest rate is lower hence the demand for output rises. The AD_0 curve shifts upward to the right that is AD'. At initial price level $p=p_{-1}$, there is now an excess demand for goods. At point E' both prices and output have risen. A monetary expansion has led to a short run increase in output. In simple words, AD_0 shifts to AD_1. The output increases to Y_1. The prices increase from p_0 to p_1.

2. The medium term adjustment

The next point comes as the medium term adjustments in aggregate demand and supply curve. The short run equilibrium point at E' is not the end of the point. At point E output is normal. Therefore

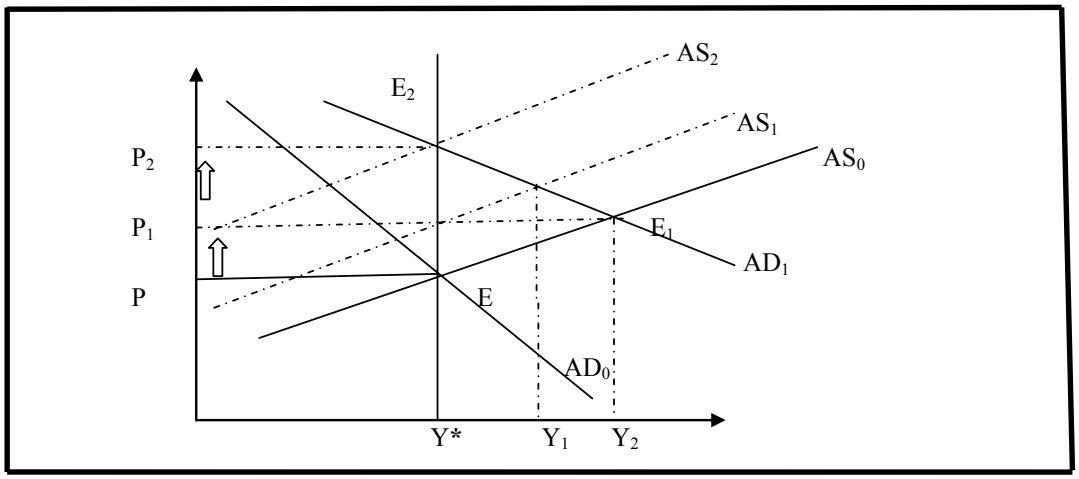
$$W = W_{-1}[1+ \in (\frac{N - N*}{N*})]$$

The above equation indicates that prices will keep on rising in the second period. Supply curve passes through the full employment output level. The price level is equal to P_1. We show thus by shifting the aggregate supply curve up to AS_1 to AS_2. With the new aggregate supply curve, AD schedule unchanged at the higher level AD'. The new equilibrium is achieved at E". If we compare E_1toE_2 then output falls and price level increases.

In short, the aggregate supply increases from AS_0 to AS_1. The output decreases from Y_1 to Y_2. The price level increases from P_1 to P_2.

The diagram shows the as AD_1 shifts from AD_0 , the new equilibrium is adjusted at E_1. But the Aggregate supply shifts back and income declines from Y_2 to Y_1. It is a new equilibrium adjustment.

Figure 3.5 Effect of aggregate supply on prices and income



3.5 Long term adjustment

In the long run, the price increases, the output remains constant. As long as output is above normal employment, the wages are rising. Because wages are rising, the firm experience increase in cost. These are passed on at each output level. In the long, short and medium term, equilibrium shifts from E, E_1 to E_2. As a result, output will be declining and level of price will keep rising. In short, output comes back at Y*. There is no change in output and price increases from P_0 to P_1. The dynamic aggregate supply curve in short long and medium term and the monetary expansion is given as follows

Table 3.1 Effect of monetary policy on output, prices aggregate demand and supply

Period	Output	Prices	ASC	ADC
Short run	$Y_{0\rightarrow}Y_1$, increases	$p_{0\rightarrow}p_1$ increases	-	$AD_{0\rightarrow}$ AD_1
Medium run	$Y_{1\rightarrow}Y_2$, decreases	$p_{1\rightarrow}p_2$ increases	$AS_{0\rightarrow}AS_1$	-
Long run	Output back to Y(no Change)	$P_{2\rightarrow}p_1$ increases	$AS_1\rightarrow AS_T$	$AD_{0\rightarrow}$ AD_T

3.6 Inflation expectation and aggregate supply curve

Inflation is linked to the aggregate supply curve. The wage inflation and the aggregate supply curve is related to output. The Philips curve and the aggregate supply curve are directly related to level of employment in the economy. The previous growth equation is given as

$$g_W = -\in(u-u^*) \tag{3.13}$$

g_w = The rate of wage inflation

$\in$: Measures the responsiveness of wages to unemployment

U* = Natural rate of unemployment

U: Unemployment

The growth rate of wage is negatively related to epsilon and natural rate of unemployment and actual unemployment.

If we assume that U*=0 and $u = \frac{N^*-N}{N}$ then

$$g_w = -\in\left(\frac{N-N^*}{N^*}\right)$$

Similarly, we can also write the above equation as follows

$$g_w = \in\left(\frac{N-N^*}{N^*}\right) \tag{3.14}$$

The growth rate of wage is related to unemployment and natural rate of unemployment.

N*=Y*/a and N=Y/a that means

$$g_w = \frac{\in(\frac{Y}{a}-\frac{Y^*}{a})}{\frac{Y^*}{a}} \tag{3.15}$$

If we divide the denominator and numerator by a then the following growth of wage inflation will get replaced as

$$g_w = \in \left(\frac{\frac{Y}{a} - \frac{Y^*}{a}}{\frac{Y^*}{a}}\right)$$

$$= \in \left(\frac{Y - Y^*}{Y^*}\right) \tag{3.16}$$

The above equation explains that the growth of wages is related to the epsilon, Y and Y*.

$$g_w = \frac{\in}{Y^*}(Y - Y^*) \quad \text{if} \quad \lambda = \frac{\in}{Y^*}$$

Then

$$g_w = \lambda(Y - Y^*) \tag{3.17}$$

It is a wage Philips curve.

1. There are three foundations on which the aggregate supply curve is built. They are explained as follows -
2. The Philips curve shows that the wage increases more rapidly than it lower the level of unemployment.
3. There is a relationship between the unemployment rate and the level of output.

The assumption of markup pricing is that the firm prices are based on labor costs. They are higher because wages are higher.

Therefore we develop the aggregate supply curve into two directions. We notify the aggregate supply curve to include inflation. Secondly, we transform the aggregate supply curve into a relationship between output and the inflation rate rather than price level.

Friedman and Phelps pointed out one major flow in the wage Philips curve as described in equation (6). It ignores the effect of expected inflation on wage setting. Workers are interested in real wage not nominal wage.

Therefore if $Y=Y^*$ the $g_W=0$ or $w=w_{-1}$.

Secondly $Y>Y^*$ then $g_w>0$ and $w>w_{-1}$

It means when income is above the Y^* then growth of wage is above zero and current wages are above the past wage. Thirdly, $Y<Y^*$ then $g_w<0$ and $w<w_{-1}$.

It means if income is above Y^* then g_W is less than gw and present wage is less than last period wage.

When inflation is expected, the wage Philips curve becomes

$$g_w = \pi^e + \lambda(Y - Y^*) \tag{3.18}$$

In the above equation, π^e is the expected inflation rate. The above equation is called the augmented wage Philips curve. It is the original Philips curve augmented or adjusted to take account of expected inflation.

At any given level of output, the wages and prices increase more. It means there is higher expected rate of inflation. The assumption is that nominal wage rise one percent faster for each extra one percent of expected inflation.

3.7 Aggregate supply curve

Next step is to transform the augmented wage. Philips curve shows relationship between the inflation rate and the rate of output in which it depends on the expected rate of inflation. There are assumptions for the aggregate supply curve which are as follows -

The assumption is that the firms maintain a constant markup prices over wages. The rate of increase of prices or the rate of inflation as $\prod = \frac{(P - P_{-1})}{P_{-1}}$. It means that inflation is equal to rate of wage. Alternatively

$$\prod = g_w \tag{3.19}$$

Substituting the rate of wage increase (3.18) into (3.19) yield the dynamic aggregate supply curve

$$\prod = \prod^{e} + \lambda(Y - Y^{*}) \tag{3.20}$$

The above equation shows that one of the two building blocks of a model of the inflation prices. It is the expected augmented aggregate supply curve.

3.7.1 Short run aggregate supply curve

The Short run aggregate supply curve examines the relationship between inflation, output and expected inflation rate that is $\prod$, Y and $\prod^{e}$.

Secondly, given the expected inflation rate, the aggregated supply curve shows the inflation rate rising with the level of output. That the higher the level of output, the higher the rate of inflation.

Figure 3.6 Short run aggregate supply curve and income effect

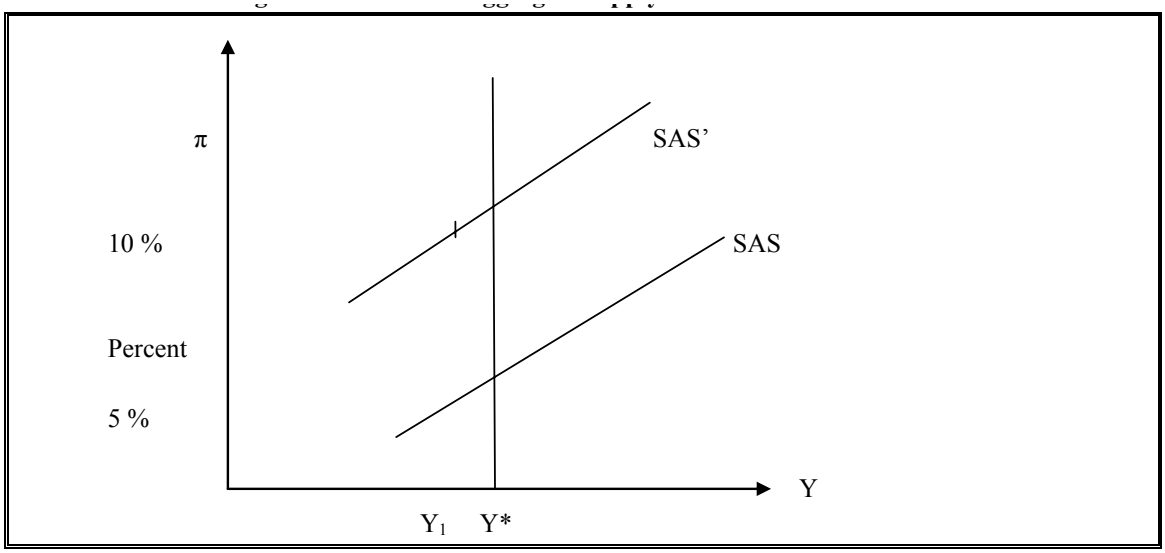


Figure 3.6 depicts that higher the expected inflation rate, the higher is the SAS. Thus at SAC', the expected inflation rate is 10 percent. For any expected inflation rate, there is a corresponding short run aggregate supply curve. It is parallel to SAS and SAS', with the vertical distance between any two short run supply curve which is equal to difference in Π^e between them.

In the above figure, the $\prod^e$ is constant on a SAS curve. It is five percent on short run aggregate supply and 10 percent on SAS'. Each short run ASC is shown quite flat, reflecting the fact that in the short run, it takes a large change in output to generate to a given change in inflation.

The short run aggregate supply curve shifts with the expected rate of inflation. The inflation rate is corresponding to any given level of output. Therefore changes over time as the $\prod^e$ changes. The higher is the expected $\prod^e$, the higher is the inflation. The π rate is corresponding to a given level of output.

3.7.2 Long run aggregate supply curve:

If the inflation rate remains constant for any long run period, firms and workers will expect that inflation rate to continue. The expected inflation rate will become equal to the actual rate. The assumption that $\prod = \prod^e$ distinguishes the long run from the short run aggregate supply curve.

The long run aggregate supply curve describes the relationship between inflation and output when actual and expected inflation is equal. In terms of equation, it is presented as

$$\prod = \prod^e$$

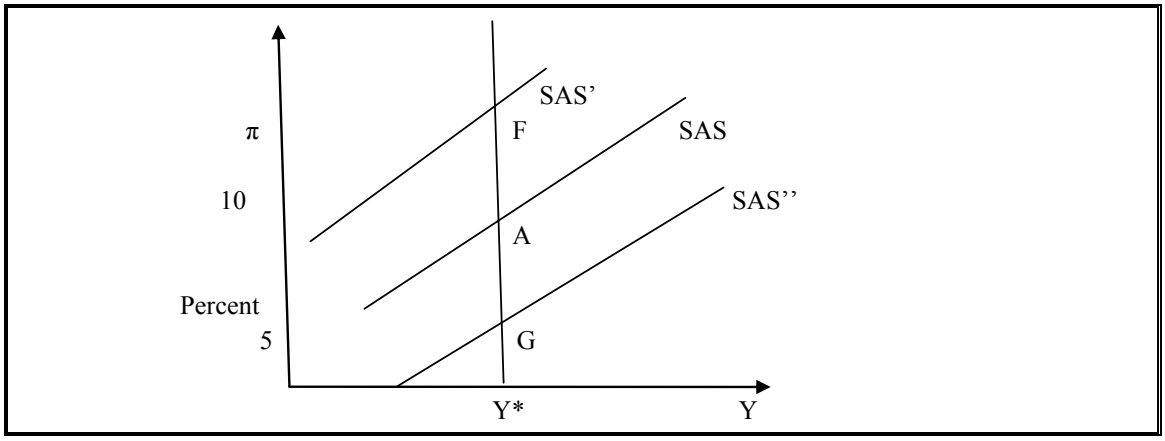
The equation can be further explained as

$\prod = \prod^e + \lambda(Y - Y^*)$ It shows that

$Y=Y^*$

The meaning of vertical long run aggregate supply curve is that in the long run, the level of output is independent of the inflation rate. In figure 3.7, the points of short run aggregate supply curve show the expected inflation which is equal to actual inflation. The long run curve is thus the vertical line. The long run aggregate supply is Y* at level of output. The short run aggregate supply curve shows that point A where 5 percent inflation is observed. If the inflation rises from 5 percent to 10 percent then SAS curve shifts upwards from SAS to SAS'.

Figure 3.7 Short run aggregate supply curve and inflation



3.8 The Modified Philips Curve

The Philips curve shows the relationship between unemployment and inflation. The inflation is equivalent to the growth of wage. The original Philips curve is given as

$$g_w = -\in (u - u^*) \tag{3.21}$$

Growth is equal to the actual minus the natural rate of unemployment rate and $\in$ is negatively related.

Thus $\prod = g_w$. As the inflation increases the growth of wage also increases then

$$\prod = -\in (u - u^*) \tag{322}$$

The Philips curve is replaced with the inflation. The Philips curve is downward sloping and it shows the inverse relationship between inflation and unemployment.

If $\pi = -\in (u - u^*)$

π=-3 (4-5percent) then

π=4

For example if u=5 percent then π=0 and if u=4 percent the π=3 percent

3.9 Expected augmented Philips Curve:

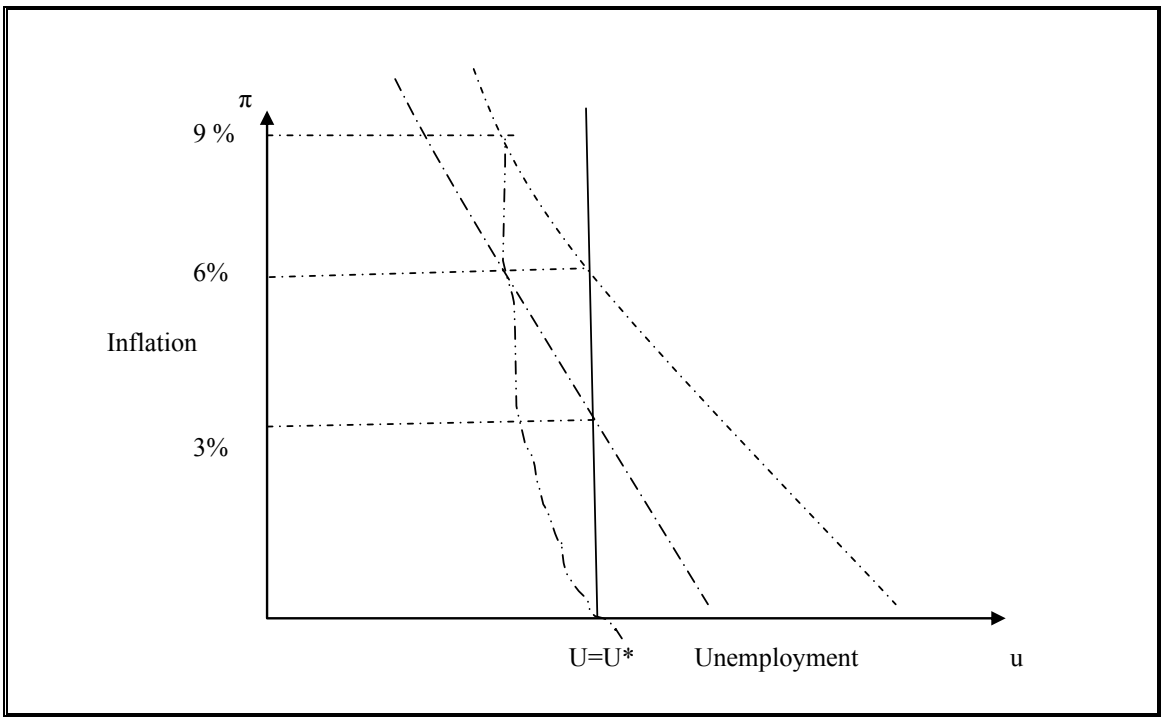
$$\pi = \pi^e - \in (u - u^*) \text{ ------} \tag{3.23}$$

Now π^e is called as augmented Philips curve. But suppose π^e =0 then

π =0 percent -3 (4-5 percent)

=5 percent

Figure 3.8 Augmented Philips curve



In the short run, there is choice but in the medium run there is no choice. In the long run $\pi^e = \pi$

Long run Philips curve

In the long run, u=u*, means the natural rate of employment is equal to permanent unemployment.

U=u* (3.24)

In the long run, Philips curve is vertical.

Extended Philips curve

$$\pi = \pi^e - \in (u - u^*) \tag{3.25}$$

Where,

Π: inflation rate

π^e : expected inflation rate

Philips curve states that inflation rate π^e declines relative to the previous trend if the actual unemployment rate exceeds the natural rate u *. But often it is argued that the rate of inflation depends not only on the expected inflation rate π^e and the level of the unemployment rate but also on the change in the unemployment rate. The extension of equation (3.25) where we have added another term $\beta = (\mu - \mu_{-1})$ to the Philips curve, the co-efficient β measures the extent to which changing unemployment $(\mu - \mu_{-1})$ affects inflation.

$$\pi = \pi^e - \in (u - u^*) - \beta(\mu - \mu_{-1}) \tag{326}$$

The above equation is useful for policy decision. It suggests that there is a concrete trade off. The more rapid the reduction in unemployment, the fewer disinflations is achieved at each unemployment level.

3.10 Criticism

The grease effect of inflation for growth as suggested by the conventional Philips curve does not hold after a threshold level of inflation. If monetary policy tolerates somewhat higher inflation as a means to sustain higher growth momentum it may at some stage just become a sure path to sacrificing both inflation and growth objectives. The justification for inflation tolerance is often based on the perception of a positive relationship which invariably turns negative after a threshold level of inflation. The mainstream monetary policy emphasis on low and stable inflation reflects this realization; a central bank can best contribute to the growth objective by ensuring a low and stable inflation regime (Pattanaik S. and G.V.Nadhanael, 2011).

Questions

1. Explain the Philips curve in detail.
2. Explain the dynamic aggregate supply curve.
3. Explain the term production function in short.
4. What are the properties of aggregate supply curve?
5. Explain the effects of monetary and fiscal policy on aggregate supply curve.
6. Explain the long term adjustments in the aggregate supply curve.
7. Explain the inflation expectation and aggregate supply curve in short.
8. Critically explain the short run aggregate supply curve and relationship of inflation, output, and inflation rate.
9. What is the modified Philips curve?
10. Why is the Philips curve criticized?
11. Explain the Friedman Phelps amendment on Philips curve.
12. Explain the relationship of wages and employment.

4 Open economy: Macro economy

4.1 Introduction

Economies in the present situation are global economies. They are integrated in terms of the finance, trade and culture. The foreign exchange market, equity, and commodity markets are lined with each other as well as at the global level. The domestic and the international trading of equities, shares and commodities are allowed in almost all the countries. Due to the free flow of capital, the exchange rate appreciation and depreciation, the domestic and international price level effects on the IS-LM framework; the exchange rate, the international and domestic prices and the interest rate shows the equilibrium balance of payment. Export promotion yields more foreign exchange when there is exchange rate depreciation. The monetary policy of reserve bank effects on the money supply. But higher money supply leads to rise in prices whereas it lowers the interest rate. International investors withdraw their money at lower domestic interest rate. They invest money where there are higher returns. The money supply, interest rate, and the exchange rate policies decide the capital inflow and outflow. Therefore there is competition for currency depreciation.

4.1.1 Balance of payment and exchange rate

The balance of payment and exchange rate are linked with each other. Balance of payment records all the monetary transaction of a resident country with the rest of the world. The balance of payment is mainly divided as current and capital account. The current account is influenced by the exports and imports of a country including the transfer of payments.

The services included are freight, royalty payments and interest payments. The services also include net investment income and the interest and profits on the assets. Transfer payments mainly consist of the remittances, gifts and grants. The trade balance consists of trade in services and the net transfers. The deficit in balance of payment is defined as the payment of country's residents in that country's balance of payment. For example import of cars, foreign gifts, machinery etc. Such imports increase the current account deficit. But the export of the agricultural commodities, machinery garments, and diamond units improves the current account deficit resulting in increasing the surplus in the country's current account. Similarly, if the net transfers exceeds the net payments then capital account becomes surplus. If the current account along with the capital account is surplus then the country can have surplus in the balance of payment.

The current account records the purchases in addition to the sale of assets. They consist of stocks, bonds, etc. If the capital surplus is the net capital flow, the receipt from the sale of stocks, bonds, bank deposits and other assets exceeds payments for purchases of the foreign assets.

4.1.2 External balance must be balance

The deficit arises when the country's current account's expenditure is more outside nation than it receives from the sales to the rest of the world. The deficit needs to finance by selling assets or by borrowing abroad. The sale of assets means country runs into capital account deficit but current account deficit can be financed by more capital inflow.

Therefore

$$CAD+NCI=0 \tag{4.1}$$

Where,

CAD: current account deficit

NCI: Net capital inflow

If the country has no assets of foreign exchange reserves then firstly, the country has to achieve the current account balance. But now most of the countries do not follow the strategy. All countries are not always promoting exports. Sometimes emphasis is given on the capital inflow. The capital account is important in the present globalization phase. The capital account is mainly divided into two parts. Firstly, it is transaction of private sector coupled with official reserves. The second form of transaction is in permission with the Reserve Bank and the government.

In India, current account deficit is financed by the Government of India and the Reserve Bank of India. It maintains the reserves in the form of foreign currency. The central bank also holds the foreign currency. The central bank also buys the foreign currency which is earned by the private sector and its reserves of foreign currency. Similarly, the reserve bank also sells foreign currency when there is a decline in the value of domestic currency. But the policies are cautious because some policies are framed for long term and some are for short term. Sometimes foreign exchange market is highly volatile.

Domestic value of currency may decline or increase. Consequently, the reserve bank observes the market situation very carefully rather than immediate intervention. Therefore, the balance of payment surplus/deficit is equal to increase or decrease in foreign exchange reserves; i.e., the current and capital account surplus, deficit, and the net capital inflow are also affected. If current account and capital account are deficit then the balance of payment is deficit. The reserve bank has to sell the gold or foreign currency. If current account is surplus and capital account deficit then the balance of payment may be in deficit.

4.1.3 Fixed exchange rate

Fixed exchange rate is defined as the system wherein the central bank is ready to buy and sell currency at a fixed price in terms of all the other countries' currencies. The central bank buys and sells any amount of currency at a given price. Central bank intervenes in the foreign exchange market. It is mainly done for buying or selling of foreign currency. In order to correct the balance of payment, the interventions in foreign exchange market are conducted. In order to insure the price, the excess supply is taken away at fixed price whereas excess demand is filled with the same price. Such practice also exists in agricultural commodity markets. Government ensures the prices with available supply and demand of the commodities. Government purchases the agricultural commodities from farmers at fixed prices but it sells at a higher price. In India, it is called as minimum support price for crops. Reserve bank keeps the necessary reserves to maintain the currency at a fixed rate. It provides the stability to economy. But fixed exchange rate suffers from a number of limitations. It does not represent the true picture of economy. Sometimes, the currency is overregulated.

4.1.4 Flexible exchange rate

The reserve bank cannot intervene in the foreign exchange market of the global economies. Most of the economies are open to trade with all. The domestic currency is freely allowed to flow with other currencies. The exchange rate is flexible and it is more dependent on the current and capital account. Such demand and supply of foreign currency decides the value of domestic currency. The study of Magud Nicolas et.al (2012) explains that countries with less flexible exchange rate regimes may stand to benefit the most from regulatory policies that reduce banks incentives to tap external markets and to lend/borrow in foreign currency, these policies include marginal reserve requirements on foreign lending currency dependent liquidity requirements and higher capital requirement and/or dynamic provisioning on foreign exchange loans.

Most of the times, exchange rate is allowed to freely determine the value of domestic currency in foreign exchange market. The central bank does not intervene in the foreign exchange market. The official reserves of foreign currency are kept zero. The current along with the capital account is freely adjusted. Such clean floating does not exist in the modern world. Most of the exchanges are managed exchange rates. Under the managed /dirty floating exchange rate, the reserve bank buys or sells the foreign currency in order to correct the foreign exchange market. Such practices are regularly observed in the foreign exchange market. Under floating exchange rates, the exchange rate is determined together with the interest rate in the financial sector. This reflects the importance of international financial capital flows relative to flows in goods and services which in the modern world are very small in comparison. Thus the most important factors determining exchange rates are not the competitiveness of goods and services but the stock of money and the stock of bonds outstanding and the level of income (Pentecost, 2006). India moved away from pegged exchange rate to the liberalized exchange rate management system in 1992 coupled with the market determined exchange rate regime in 1993 which is considered as an important structural change in the exchange rate market.

With increased volatility in exchange rate and to mitigate the risk arising out of excess volatility , currency futures were introduced in India in 2008, marking itself as second important structural change. If it is believed that the currency futures will help in hedging the exposures of exchange rate to the unfavorable movements in exchange rate. The role of derivatives for risk taking and risk management cannot be understood by any means and it has increased significantly in the recent times. The research also supports that there is two- way causality between the volatility in the spot exchange rate and the trading activity in the currency future market (Sharma S., 2011).

4.2 Open economy and goods market

In an open economy, the domestic firms export their output and domestic consumers import the commodities from other countries. The spending on domestic goods decides the domestic outcome.

Domestic residents spending =A=C+I+G ------

Spending on domestic goods = A+ NX

= (C+I+G) +(X-Q)

= C+I+G+NX (4.2)

Where the C+I+G remain the same as compare to the earlier equation. The NX means the net exports and imports. It is the spending of domestic residents on foreign goods and trade surplus. Domestic spending depends on income and interest rate.

4.2.1 Net exports

If the income of the domestic people is increasing then imports also increases. The real exchange rate remains fix. The rise in real exchange rate that is real depreciation improves the trade balance. The demand for domestic goods will increase, especially those produced at home.

$$NX=X(Yf, R)-Q(Y, R)$$

$$= NX(Y, Yf, R) \quad (4.3)$$

It means that the net export is a function of income, income spending on foreign goods and real exchange rate. If foreign income increases, then the demand for domestic goods will rise. The trade balance may become surplus. Real depreciation of domestic currency will improve the trade balance. A rise in income increases import spending. It may worsen the trade balance.

4.2.2 Goods market equilibrium

The marginal propensity to imports is defined as the per unit increase in the income to import. If the money is spent on foreign goods then IS curve will be steeper. If interest rate is reduced then it will give small rise in the income and output. The real exchange rate affects goods market that is, the IS curve. The depreciation of exchange rate increases the demand for domestic goods. The IS curve shifts to the right with same interest rate. If the income of the foreigners increases then the demand for export also increases.

The IS curve is as follows -

$$Y=A(Y,i)+NX(Y,Yf, R) \quad (4.4)$$

The level of income is decided by the foreign domestic income and the real exchange rate. It is interesting to examine how the foreign income changes in IS curve and equilibrium level of income.

Figure 4.1 Effect of fiscal policy on income

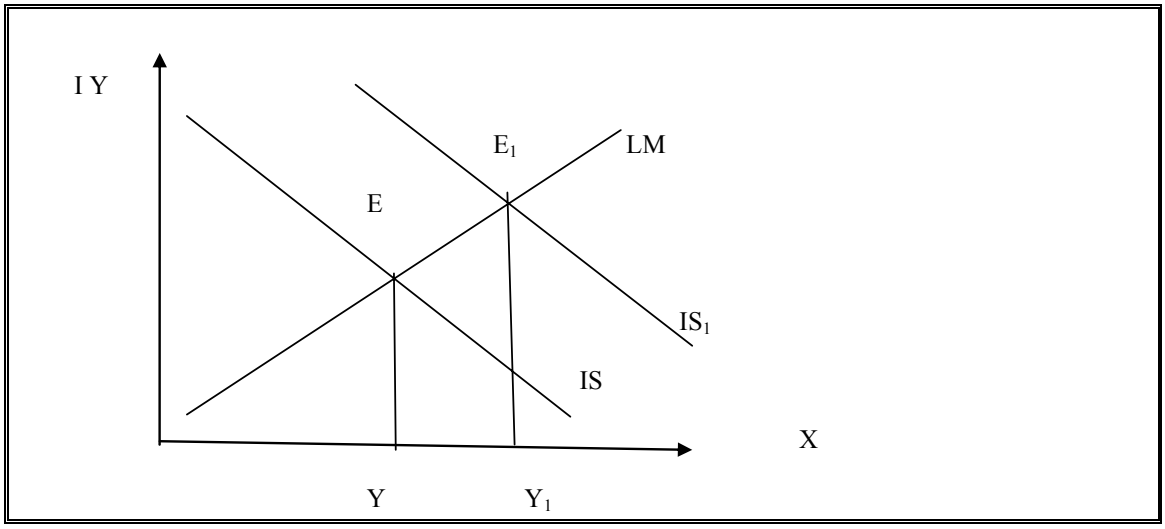


Figure 4.1 shows that increase in foreign income has positive effect on the IS curve. The IS curve shifts to the right side. The level of domestic income rises due shift of IS curve towards right. It also increases the interest rate in domestic economy. Due to decline in interest rate, the foreign capital flow declines. Low investment in domestic economy reduces the exports. Hence, the level of income and output in domestic economy continuously declines. The interest rate declines s observed in the figure. The long term equilibrium is observed at E. It has the only solution to increase the export. It is the real depreciation of currency. It may raise the domestic exports.

4.2.3 Capital mobility

In globalization, all economies are integrated with trade and finance. The money and capital market of one country gets integrated with other countries money and capital market globally. The bonds and stocks are traded across several countries for purchase and sale. Therefore households hold onto their wealth in the forms of physical and financial assets of more than one country. Their yield depends on the capital and money market and monetary, fiscal policies of any other country. Under the fixed exchange rate investors do not face any risk in wealth management or investment. The government policies are protective and investors hold assets which gives more return. Therefore there is equality in the return in asset market. But in reality, such markets do not exist. There are wide differences among countries in terms of their money and capital market. In India, money market is seasonal. The demand for cash is high during harvest seasons. The foreign investment, direct and indirect taxes, government policies/fiscal policies, monetary policies are different. All these factors continuously impact the capital inflow and outflows. They are directly related to income and unemployment. The interest rates are not equal among all the countries. But under the current and capital account convertibility, the capital is perfectly mobile internationally. The investors purchase assets /bonds and debentures of any country while choosing such assets and bonds they choose with lower transaction cost. In such situation, maximum people take chance to invest money where there are higher returns. There is also competition among the countries to bring in more capital flow. In global economy, there is no difference among the countries interest rate. If the difference exists then capital flow moves in larger quantity to cross borders in search of the higher returns. International investors always see the monetary policy and interest rate behaviors of each country. The balance of payment also gets affected because it results in the capital outflow. The monetary and fiscal policies affect the capital account and balance of payment. Now, in globalization, monetary and fiscal policies are not much effective for trade balance but the capital account gets influenced. Both monetary and fiscal policies may affect domestic as well as foreign economies. It is done through the balance of payment changes and capital inflows. At the aggregate level, the cumulative gross capital flows appear to increase by 0.05 percentage point in response to one percent point increase in interest rate differential. Moreover contrary to general perceptions, stronger growth in OECD countries actually co-exist that RBI'S monetary policy needs to continue its focus on objectives relating to the inflation and growth. The magnitude and composition of capital flows that might change in response to the monetary policy action could be managed using other instruments as has been the case in the past. Monetary policy should not be constrained by the explicit impact on capital inflows since other determinants of capital inflows could dominate the impact of interest rate differential most of the time (Verma Radheshyam and Anand Prakash, 2011).

4.2.3 Balance of payment and capital inflows

If the domestic rate of interest is above the world interest rate then the capital flow will be to the resident country from abroad. The capital flow will be unlimited. The balance of payment is now affected by both trade balance and capital flow. It is as follows -

$$BP=NX(Y,Y_f, R)+CF(i-i_f) \quad (4.5)$$

The equation explains that trade balance is influenced by the income, foreign income and real exchange rate. The capital account simply explains the difference of interest rate between domestic and resident country. If the imports and interest rate falls of any country, the balance of payment worsens. But if the interest rate increases above world level then capital account improves. If the capital inflow increases then it can be used to finance trade deficit. The interest rate can be maintained to attain the equilibrium in balance of payment.

4.2.4 Equilibrium in internal and external balance

All the economies face the problem of internal and external balance. In external balance, the economy is in equilibrium in the balance of payment. The reserve keeps its balance after losing the reserve or gaining the reserves. It won't be continued for long period of time. Internal balance exists when output is at the full employment level. The countries maintain internal balance or full employment in the long run.

Figure 4.2 Internal and external equilibrium in economy

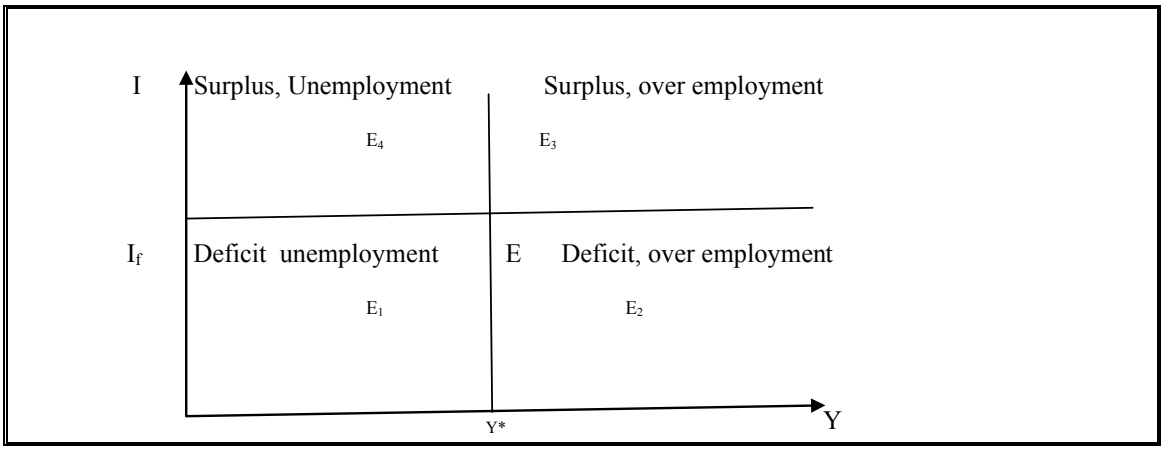


Figure 4.2 exhibits that the balance of payment is equal to zero. The balance of payment is deficit, if interest rate is below the international interest rate. It is at point E1, where unemployment is higher. But at point E2, the balance of payment is surplus and there is over employment. The point is of surplus in BoP and over employment. At point E, the expansionary monetary policy would reduce the unemployment problem but balance of payment deficit exists. The capital flow is sensitive; it would continue to create capital deficit and finally the balance of payment is deficit. But both monetary and fiscal policy will help to achieve the internal and external trade balance simultaneously. The effects are presented in the next section. The study of Tim Callen and Paul Cashin (1999) has used three approaches, an inter-temporal model of the current account that allows for capital controls, a composite model of macroeconomic indicators that yields probabilities of future balance of payments crisis, and scenarios that examine the path of the current account consistent with the stabilization of India's external liability to GDP ratio. The result indicates that India's inter temporal budget constraint is satisfied and that the path of its current account imbalances is sustainable with some support for the optimality of its external borrowings.

4.3 The Mundell- Fleming model

Capital mobility under fixed and flexible exchange rate in an open economy is developed by Robert Mundell and Marcus Fleming. Robert Mundell was professor at Columbia University and the late Marcus Fleming was a researcher at International Monetary Fund. They developed this model in 1960. The model was a research study before flexible exchange rate came into existence.

4.3.1 Capital mobility under fixed exchange rate

In a fixed exchange rate regime, the tight monetary policy allows interest rate to rise. Therefore the portfolio holders worldwide shift their wealth to take advantage of higher interest rate. There is surplus in balance of payment because of capital flow. The foreigners buy domestic assets and securities. In such a process, there is surplus in capital account and exchange rate appreciates. The reserve bank holds more foreign exchange through increased sale of domestic currency. It continues till the interest rates are back in line with those in the world market.

The following steps occur in the fixed exchange rate -

1. Reserve bank tightens the money supply through monetary policy
2. interest rate rise as a result
3. Capital inflow and balance of payment are surplus
4. Pressure for currency appreciation increases
5. Interventions by selling home currency for foreign currency
6. Monetary expansion due to intervention lowers interest rate
7. Back initial interest rates, money stock and balance of payment

4.3.2 Monetary expansion

Under perfect capital mobility, the balance of payments can be in equilibrium only at the interest rate $i=i_f$. At higher interest rate, the capital inflow is observed and at lower interest rate capital outflow is observed. A monetary expansion in domestic economy cuts the interest rate up to E'. It causes the downward pressure on exchange rate. The monetary authority sells the foreign exchange and buys domestic currency until LM curve shift back to initial position.

Figure 4.3 Monetary expansion and interest rate effect

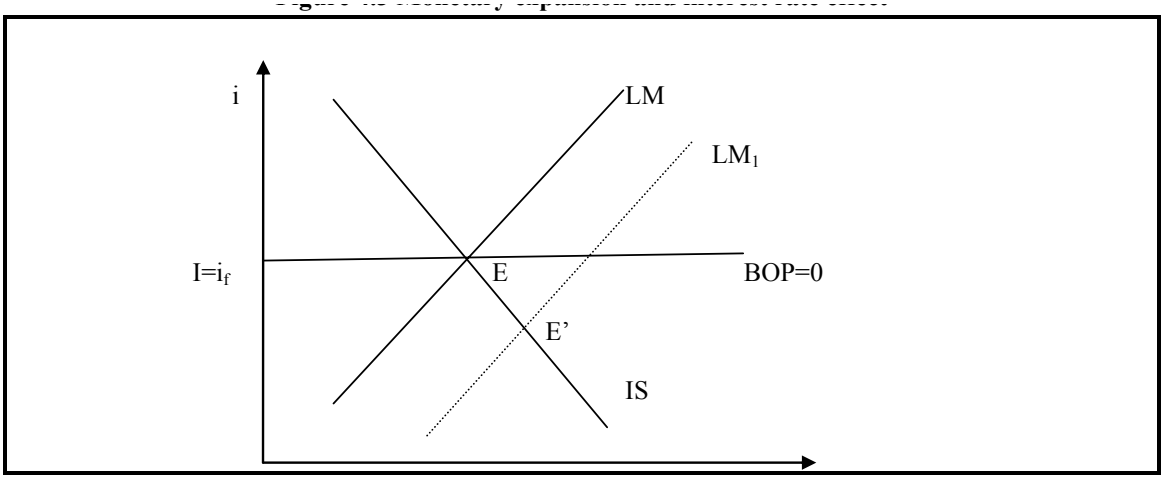


Figure 4.3 presents the balance of payment line which is horizontal. Due to perfect capital mobility, the domestic and foreign interest rate is at equilibrium E. The central bank has to intervene if the interest rate goes down. The balance of payment cannot attain equilibrium and the central bank needs to maintain the exchange rate.

The figure also shows that as the monetary expansion takes place, the LM curve shifts to LM1. At point E', there is a large balance of payment deficit and hence pressure for exchange rate depreciation. The central bank sells foreign currency and receives domestic money in exchange. The supply of domestic money declines. As a result, LM curve shifts towards right. The process continues until it is restored at E. The contraction of the monetary policy leads to more loss of reserves and it forces the reserve bank to force monetary expansion. It returns to initial equilibrium. The study by Mankiw, N.G and Ricardo R. (2002), explains that if a central bank that wants to achieve maximum stability of economic activity, it should give substantial weight to the growth in nominal wages when monitoring inflation. This conclusion is deduced from the fact that wages are more cyclically sensitive than most other prices in the economy. Moreover, compared to other cyclically sensitive prices, wages are not subjected to large idiosyncratic shocks. Thus, if nominal wages are falling relative to other prices it indicates a cyclical downturn which in turn calls for more aggressive monetary expansion. Conversely, when wages rise faster than other prices, targeting the stability price index requires tighter monetary policy than does targeting conventional inflation

4.3.3 Fiscal expansion

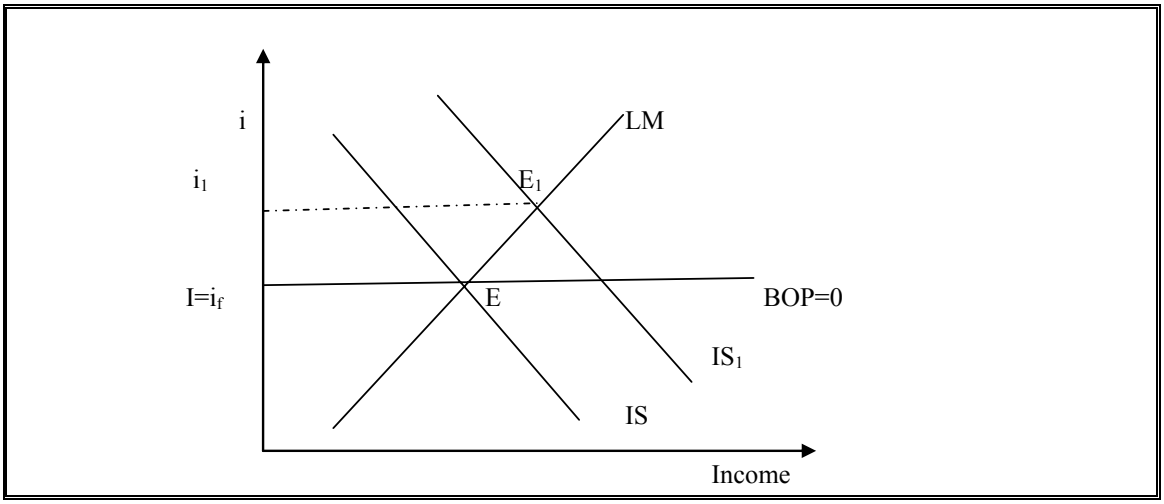
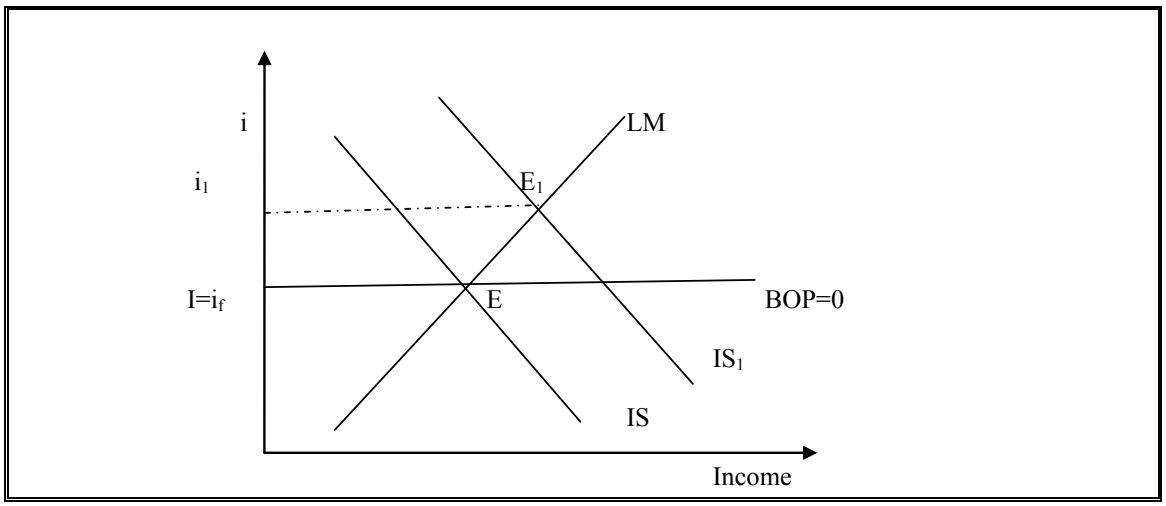


Figure 4.4 Effect of fiscal policy and domestic interest rate



In the fiscal expansion, IS curve shifts towards right. It increases the interest rate and the level of output. At higher interest rate, capital flows in domestic country; it leads to exchange rate appreciation. To maintain the exchange rate, the central bank expands the money supply. In this process, credit to individuals and business man increases and thus overall income increases. The currency appreciates due to high capital flows. It reduces the exports and the income. The IS curve shift back to original position where i=If. The figure above shows that the balance of payment remains in equilibrium. The following steps occur during the fiscal expansion. The IS and LM curve intersect each other at point E. But expansionary fiscal policy shifts IS curve to IS1. The interest rate rises from E to E1. At higher rate of interest, the capital flows in domestic country. Therefore the domestic currency appreciates. The reserve bank sells the currency in such a period. The money supply expands and the equilibrium shifts from E1 to E.

Table 4.1 The Mundell Fleming model: policy effects

Policy		**Floating**			**Fixed**	
	Impact on					
	Y	e	NX	Y	e	NX
Fiscal expansion	0	Increase	Decrease	Increase	0	0
Monetary expansion	Increase	Decrease	Increase	0	0	0
Import restriction	0	Increase	0	Increase	0	Increase

4.3.4 Perfect capital mobility and flexible exchange rate

Under this model, the domestic prices are assumed to remain fixed and only exchange rate adjusts. The model is developed to show how the monetary and fiscal policy works in an economy with fully flexible exchange rates and perfect capital mobility. In the flexible exchange rate, central bank does not intervene in foreign exchange market. The value of the domestic currency gets decided on the basis of demand and supply. The balance of payment must be equal to zero. An automatic adjustment takes place. The current account deficit gets financed by private capital inflows. A current account surplus is balanced by the capital outflows. The adjustments in the exchange rate ensure that the sum of the current and capital account is zero. Under this model, the central bank supplies money at their assumption because money supply cannot correct balance of payment deficit. The balance of payment is in equilibrium with interest rate. It is equilibrium under perfect capital mobility.

$I=i_f=BoP$

But if the real exchange rate determines the aggregate demand then real exchange rate shifts the IS curve. The country faces depreciation in the domestic currency. In this case, the domestic prices become more competitive.

Figure 4.5 Effect of depreciation and appreciation of currency on interest rate

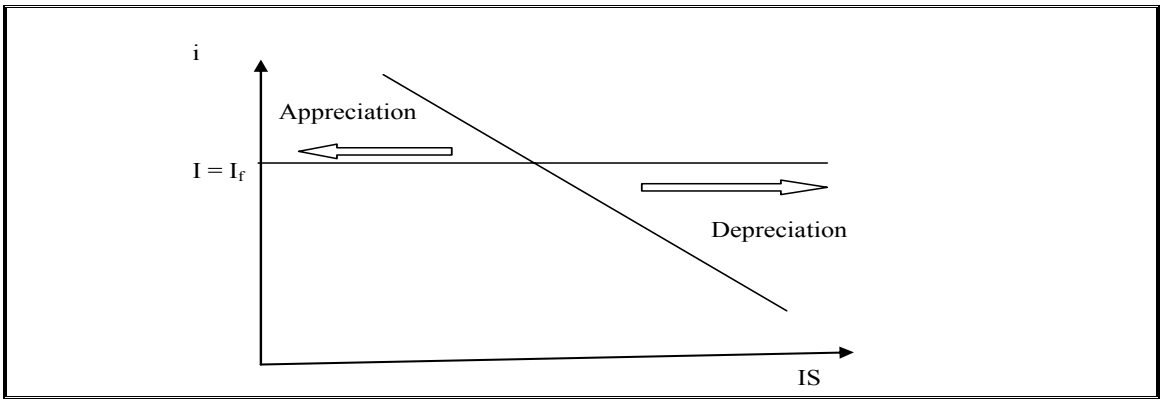


Figure 4.5 shows that under perfect capital mobility, flexible exchange rate and capital flows affect the aggregate demand. If the interest rate falls above international interest rate then the capital outflows leads to exchange depreciation. It leads to gain in competitiveness and hence a rise in demand for domestic goods. The IS curve shifts towards right. If interest rate goes up then the capital flow leads to depreciation of currency. It leads to loss of competitiveness of exports and a decline in demand for the domestic goods. It shows leftward shifting of IS curve. If the interest rate is higher than the international interest rate then capital inflow takes place because people invest more money in domestic assets. It leads to the currency appreciation, so the goods to foreigners become more expensive. Therefore, aggregate demand falls. The aggregate demand forces to shift IS curve to left any point below of I=If. It further depreciates the domestic currency. Thus, competitiveness improves and aggregate demand increases. Again the IS curve shifts to rightward.

4.3.5 Export led policies

Most of the countries encourage exports of their goods. The increase in exports affects initial interest rate, exchange rate and output in the domestic economy. The demand for goods exceeds the supply. At initial exchange rate, interest rate and output rises. Therefore, the IS curve shifts towards IS'. The increase in output increases the demand. The rise in income increases the money demand and thus raises the interest rate.

Fiscal policy effect

If government has the expansionary fiscal policy then it reduces the direct and indirect taxes. Similarly government spending on various infrastructure and welfare schemes increases. The export rises because of the export led policy of government. But expansionary fiscal policy increases the interest rate. It leads to the appreciation of currency. The export falls and imports increases. This time crowding out will not take place because exchange rate appreciation will lead to decline in exports. Under fixed exchange rate, it does not increase output but it appreciate exchange rate. It shifts the demand for goods to foreign goods and reduces the demand for domestic goods.

Figure 4.6 Effect of expansionary fiscal policy in open economy

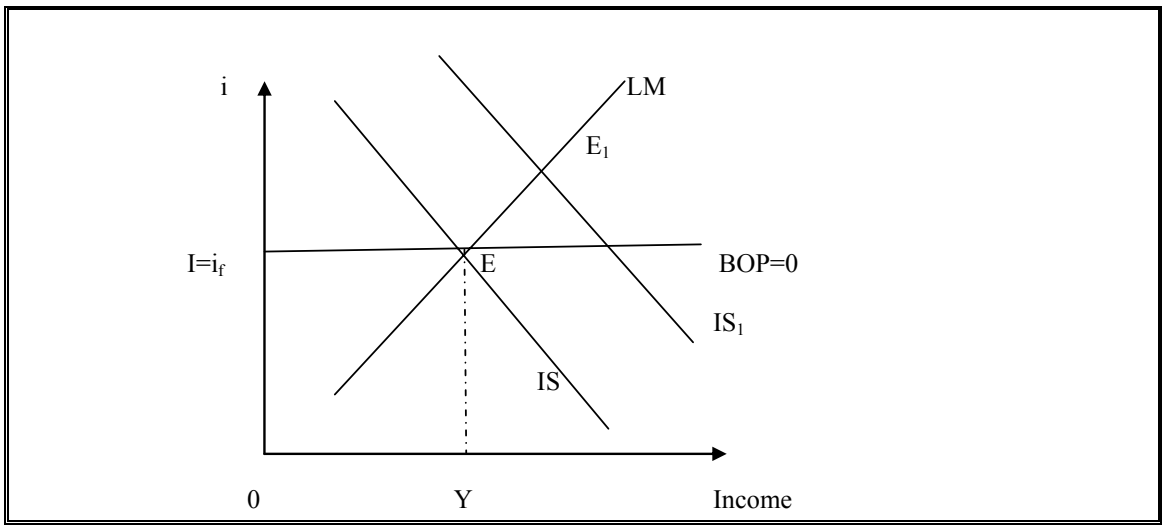
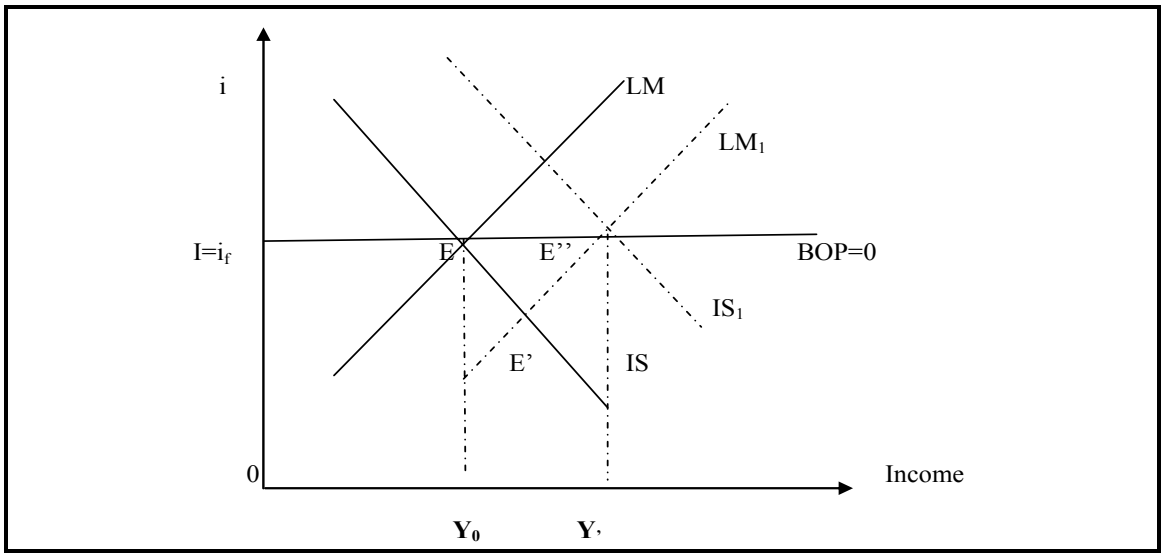


Figure 4.6 displays the IS-LM curve equilibrium at point E. The IS curve shifts because of demand for exports. The increase in exports leads to increase in income. The new equilibrium is achieved at E_1. At E_1 point, the balance of payment is not in equilibrium. It is an exchange rate appreciation point. The interest rate is higher than the international interest rate. The capital outflow is observed in domestic economy. Therefore the economy shifts back to equilibrium point E.

4.3.6 Monetary policy

In expansionary monetary policy, money stock increases in the domestic economy. The interest rate declines and the income increases. The exchange rate depreciates and export becomes competitive. The demand for export rises. The figure points that the expansionary monetary policy shifts LM to LM_1andthe interest rate declines up to E'. The interest rate falls below the foreign rate of interest. At lower interest rate, the capital outflows from domestic economy. The exchange rate depreciates at this point. It leads to import prices to rise. The domestic goods become competitive therefore the output rises. The IS curve shifts towards right. It continues up to the exchange rate depreciation. It raises the demand and output to the level indicated by point E". It is an equilibrium point with more output, equilibrium interest rate and exchange rate. The conclusion is that monetary expansion improves the current account through the induced depreciation.

Figure 4.7 Effect of expansionary monetary policy on income



The study suggests that large capital inflows and less flexible exchange rate regimes tend to exacerbate domestic credit cycles. The fact that the exchange rate regime is statistically significant despite controlling for capital inflows suggests that the impact of exchange rate flexibility is likely working through a transmission channel that goes beyond the monetary expansion associated with capital inflow. A large share of capital inflow could be intermediated through the banking system or the credit multiplier might be larger in economies with less flexible exchange regimes (Magud, Nicolas E. et.al. 2011)

4.4 Competitive depreciation

It is simple to understand that the increase in monetary expansion leads to exchange rate depreciation via cut in interest rate. The net exports rises and therefore increase in output and employment. The demand for domestic goods rises because the imports are costlier. It reflects in the different countries output and employment and both declines. But all countries will try to follow the same policies. This is because it improves their trade balance and capital account. The country's different competitive policies export unemployment and disequilibrium in balance of payment of other countries. All economies will increase money supply and reduce interest rate. Countries will try to reduce the interest rate to depreciate the currency. It depends on the internal business cycle. Different countries find the boom and recession at different points. Depreciation and recession shift towards countries demand for goods. It achieves the full employment. A number of factors correct the disequilibrium. But competitive depreciation shifts the demand rather than increase in demand. The crowding out in real exchange rate may force a country to remain at equilibrium where they started. At this point, both coordinated fiscal and monetary policies are required to increase the export. The study of Chikako Baba and Annamaria Kokenyne (2011) explains that capital control is generally associated with a decrease in inflow and a lengthening of maturities but the relationship is not statistically significant in all cases and the effects are temporary. Control is more successful in providing room for the monetary policy than dampening currency appreciation pressure. The study also describes that macroeconomics impact of capital control depends on the extensiveness of the policy, the level of capital market development, the support provided by other policies and the persistence of capital flow.

4.5 The role of prices in open economy

In an open economy, prices are influenced by the exchange rate. The exchange rate is defined as

$$R = \frac{eP_f}{P} \tag{4.6}$$

Where

R: Real exchange rate

e: Nominal exchange rate

pf:: Prices in foreign countries

p: Domestic prices

If we reorganize the above equation then

$$P = \frac{eP_f}{R} \tag{4.7}$$

In an open economy, prices are influenced by the real and nominal exchange rate. In an open economy, with fixed exchange rate, an increase in the price level reduces demand for additional goods. An increase in our commodity prices makes our goods less competitive with foreign produced goods. Given the exchange rate, when the prices of goods rises our goods become more expensive for foreigners to buy. Their goods become relatively cheaper for us to buy. An increase in our price level shifts demand away from our goods towards imports as well as reducing exports.

Figure 4.8 Effect of devaluation on price level

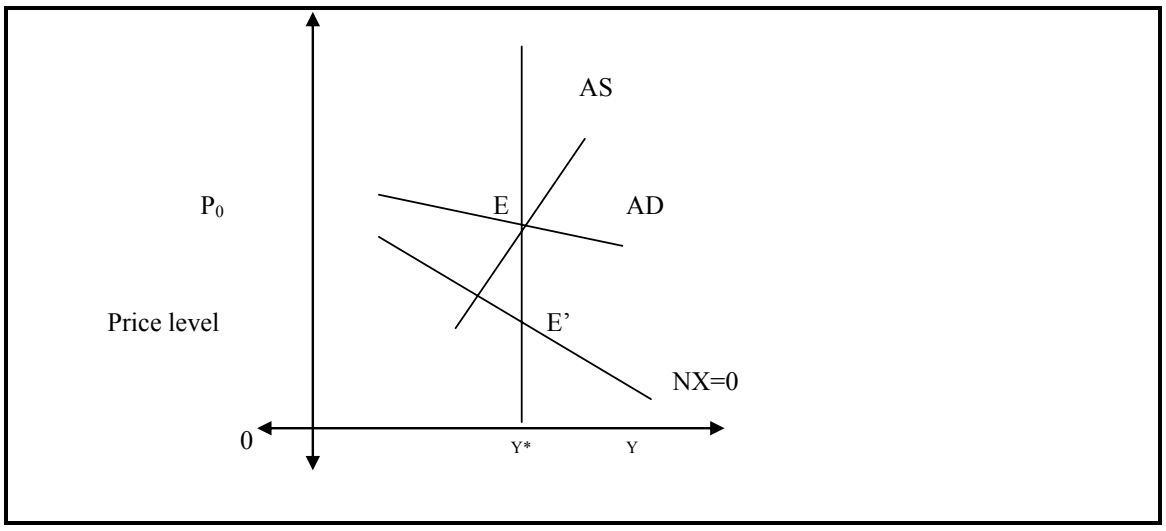


Figure 4.8 illustrates that AD is downward sloping curve. The demand is equal to aggregate spending by domestic residents plus net exports. Now we can define aggregate demand curve as follows -

$$AD= A+NX \quad (4.8)$$

The AD is drawn for a given level of foreign prices, a given nominal money supply, given fiscal policy and fixed exchange rate. An increase in nominal money stock shifts the schedule upward as does expansionary fiscal policy. Equilibrium point E shows the aggregate supply and demand intersect each other. The full employment level is Y* and equilibrium point is E. At this point there is some unemployment in economy. The trade balance equilibrium is NX=0. An increase in domestic income raises imports and worsens trade balance. To restore trade balance equilibrium, domestic prices would have to be lower. This would make the home country more competitive and it can raise exports and reduce imports. The trade balance equilibrium is downward sloping. It is steeper than the demand schedule for domestic goods. The schedule is drawn for a given level of prices abroad. At point E, home country has trade deficit. Our prices are too high or our income is too high to have export equals imports. To achieve trade balance equilibrium, country should become competitive through exporting more and importing less. Country could reduce its level of income in order to reduce the import spending.

In a fixed exchange rate system, it is possible for the central bank to use its reserves to finance temporary imbalances of payments which means to meet the excess demand for foreign currency at the existing exchange rate arising from balance of payment deficits. A country experiencing balance of payment difficulties can borrow foreign currencies abroad. The current account deficit cannot be financed by borrowing from abroad without raising the question of how the borrowing will be repaid. If a country explains that the money would be used for export boost or finance the temporary deficit then loans will be available. But if loan is used for unproductive purposes then problem arises.

4.6 Automatic adjustment

When there is balance of payment deficit, the demand for foreign exchange is larger than the amount being supplied by the private market and central bank. When reserve bank sells foreign exchange, it reduces domestic high power money and therefore the money stock declines. It sterilizes its foreign exchange intervention by buying bonds as it sells foreign exchange to keep the exchange rate from depreciating and reducing the domestic money stock. The aggregate demand schedule will shift downward and to the left.

The figure shows unemployment at E. It leads to the decline in wages and costs which are reflected in a downward shifting aggregate supply. E moves downward as both the demand and supply schedules shift. The short run equilibrium moves in the direction of point E. At point E, country has automatically achieved long run equilibrium. The trade balance is in equilibrium, there is no pressure on the exchange rate. Therefore there is no need for exchange market intervention and Reserve Bank does not require further changes in money supply. The constant wage and costs does not allow where trade balance is achieved at full employment. Despite several unexpected adverse developments on the external and domestic fronts, India's external situation has remained satisfactory. The Reserve Bank continues to follow the approach of watchfulness caution and flexibility by closely monitoring the developments in the financial markets at home and abroad. It will co-operate its market operations carefully particularly with regard to the foreign exchange market with appropriate monetary regulatory and other measures as considered necessary from time to time (RBI, 2012).

4.7 Expenditure switching and reducing policies

The combined expenditure switching policies will shift demand between domestic and imported goods and expenditure reducing policies in order to cope with the two targets that is internal and external balance. Reducing current account deficit is used to reduce aggregate demand. It is expenditure reducing policies.

$$NX= Y- (C+I+G) \tag{4.9}$$

Where

NX: Trade surplus

I: Actual investment

The balance of trade deficit can be reduced by reducing spending (C+I+G) relative to income (Y) through restrictive monetary or fiscal policy. The link between external deficit and budget deficit as

$$NX=S-I+T-G \tag{4.10}$$

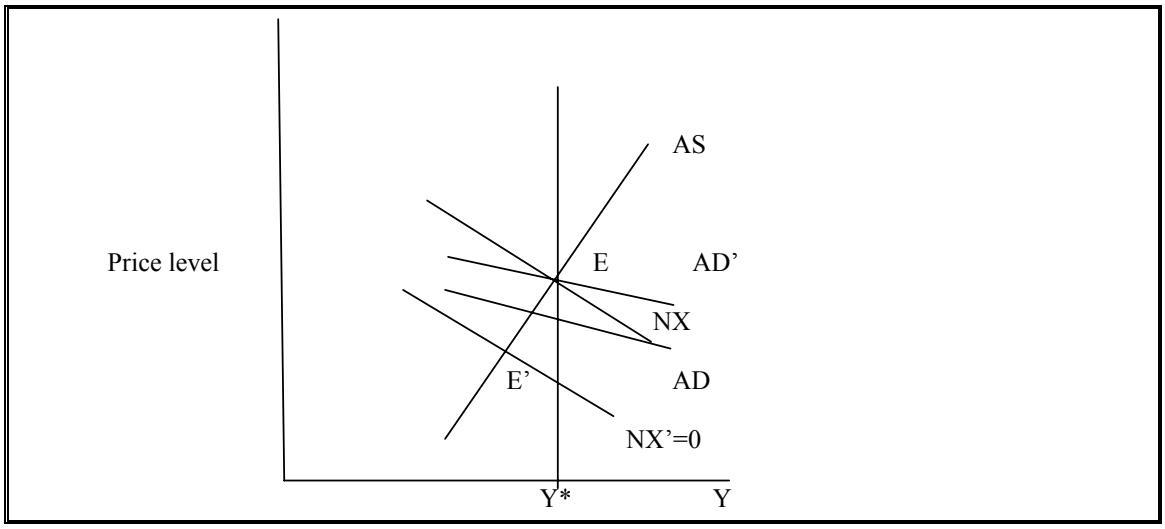
S denotes private saving; T-G is the budget surplus.

If the saving and investment is constant then changes in the budget would translate one for one into changes in the external balance. Budget cutting would bring about equal changes in the external deficit.

4.8 Devaluation

There is unemployment and automatic adjustment and the desirability of free trade which argues against the use of tariff. Both suggest the need for an alternative policy for restoring internal and external balance. The major policy instrument for dealing with payment deficit is devaluation which usually has to be combined with restrictive monetary and fiscal policy.

Figure 4.9 Effect of devaluation on exports



Devaluation is defined as increase in the domestic currency price of foreign exchange. It increases the relative price of imported goods in the devaluing country and reduces the relative prices of exports from devaluing country. India has devalued its currency to boost its exports and reduce imports. Devaluation is the expenditure switching policy. In devaluation, NX schedule shifts NX'. With the lower demand for exports and with a fixed exchange rate, output would decline. Aggregate demand schedule shift left as a result of fall in exports. The lower level of income reduces imports but not enough to make up for the loss of export revenue. The net effects are therefore, unemployment and a trade deficit. The automatic adjustment mechanism would work but slowly to restore equilibrium, the country can devalue its currency. This has the obvious advantage that it does not require a protracted recession to reduce domestic costs. Given prices of foreign goods in terms of foreign currency devaluation raises the relative price of foreign goods. Import falls and export rises.

The disturbance to the economy takes place in the trade account. The NX'=0, the locus back to the full employment level of income as we could do with a devaluation – both internal and external balance would be attained. The central bank can change the exchange rate as an instrument of policy. It can change the exchange rate for policy purposes. It devalues currency when current account looks as though it will be in for a prolonged deficit. In a system of clean floating by contrast, the exchange rate moves freely to equilibrate the Balance of Payment (BoP). In a system of dirty floating, the central bank attempts to manipulate the exchange rate while not committing itself to any given rate. The dirty floating system is thus an immediate between a fixed rate system and clean floating system.

4.9 Exchange rate and prices

The effect of devaluation on trade balance is always positive. Devaluation reduces the relative prices of the country's goods.

Price levels also change along with the exchange rate. A country achieves a real devaluation when devaluation reduces the price of the country's own goods relative to the price of foreign goods. The real devaluation occurs when e/p rises or when the exchange rate increases by more than the price level.

Figure 4.10 Effect of devaluation on trade balance and income

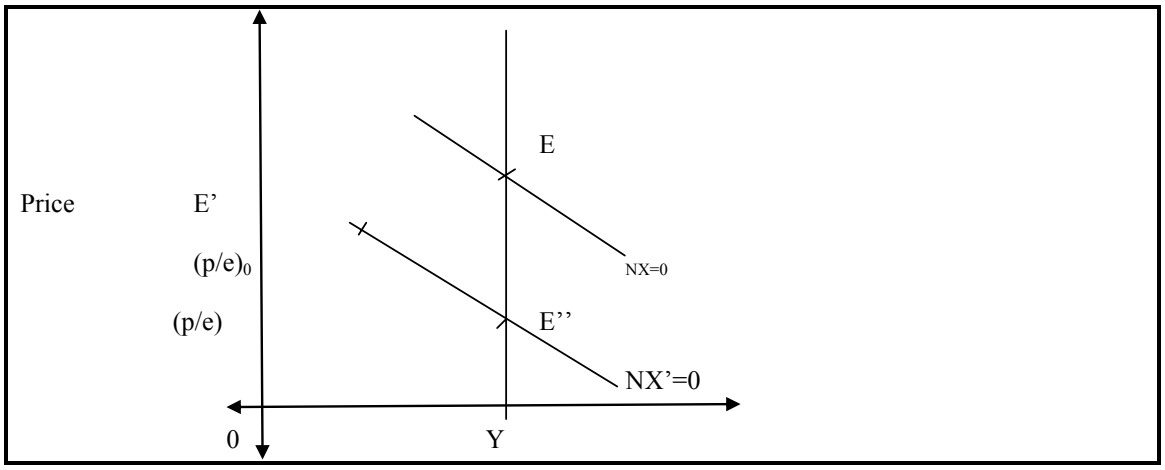


Figure 4.10shows that in short tem a country might absorb an external shock and stay at E'. It can borrow from abroad and finance external deficit. But in long term country can come at point E". It can devalue its currency and come at point E". But if domestic prices are increasing then it frustrates devaluation. Therefore devaluation increases the general price level at domestic level. It is a deviation crisis.

4.10 Crawling peg exchange rate

In order to avoid the wide deficit in balance of payment, countries follow a crawling peg exchange rate policy. Under this system, the exchange rate is depreciated at a rate roughly equal to the inflation differential between the country and its trading partners. In India, reserve bank often follows this policy. The idea of crawling peg is to maintain the real exchange rate $R=P_f/ (P/e)$ constant by raising e at the same rate as (P/P_f) is rising.

4.10.1 Exchange rates and relative price adjustment

If we assume that wages and prices adjust to achieve full employment. But prices are based on labor cost or wages. Suppose wages are flexible in real terms because labor wants to maintain the purchasing power of wages. It is an outcome of the bargaining between the firms and its workers. Changes in the cost of living triggered by devaluation would lead to changes in money wages which would feed back into prices, which in change could offset the effects of the nominal devaluation. Changes in prices feed back into wages and from there, into prices. It is one of a wage price spiral that may produce considerable volatility in the price level. Small disturbances can sometimes set off quite large changes in the price level. Suppose a country has to devalue its currency to restore the trade balance. The devaluation raises imports and thereby raises consumer prices. To maintain the real wages, workers demand high money wages which grant and pass on by raising prices. Real wages are constant which means wages and the price levels have risen in the same proportion. Wage increase has been fully passed on, which means that real wage in terms of domestic output is also unchanged.

The two results imply that relative prices are unchanged out of that the nominal devaluation has no effect on the real exchange rate. If government does not increase the money stock then the higher prices reduce real balances and aggregate demand with income down, the current accounts improves. When wages rise, the government raises the money stock so as not to create unemployment. It is important that under devaluation, reserve bank should not accommodate nominal price increase if it wants to achieve a real devaluation. The idea of stick real wages is important that of real disturbances. Suppose, due to superior technology, if the demand for export declines then relative prices of goods must fall in order to encourage foreign goods. But if government devalues currency and the workers succeed in restoring their real wages and prices are marked up on wages then there will be no changes in the relative price of our goods. The only way to reduce the real wage would be prolonged unemployment. In an open economy with substantial cost of living indexation in wage agreement, it may indeed be very difficult to change real wages and relative prices through exchange rate changes. In general, countries that devalue their currencies have to use restrictive aggregate demand policies to make sure that induced increase in prices does not simply undo the real effects of the nominal devaluation.

4.11 J curve effect

The effects of changes in relative prices on the trade balance and the possibility that depreciation worsens the trade balance. The trade balance, measured in terms of domestic goods as -

$$NX = X - \frac{eP_f}{P}Q \tag{4.11}$$

Where

X: The foreign demand for goods

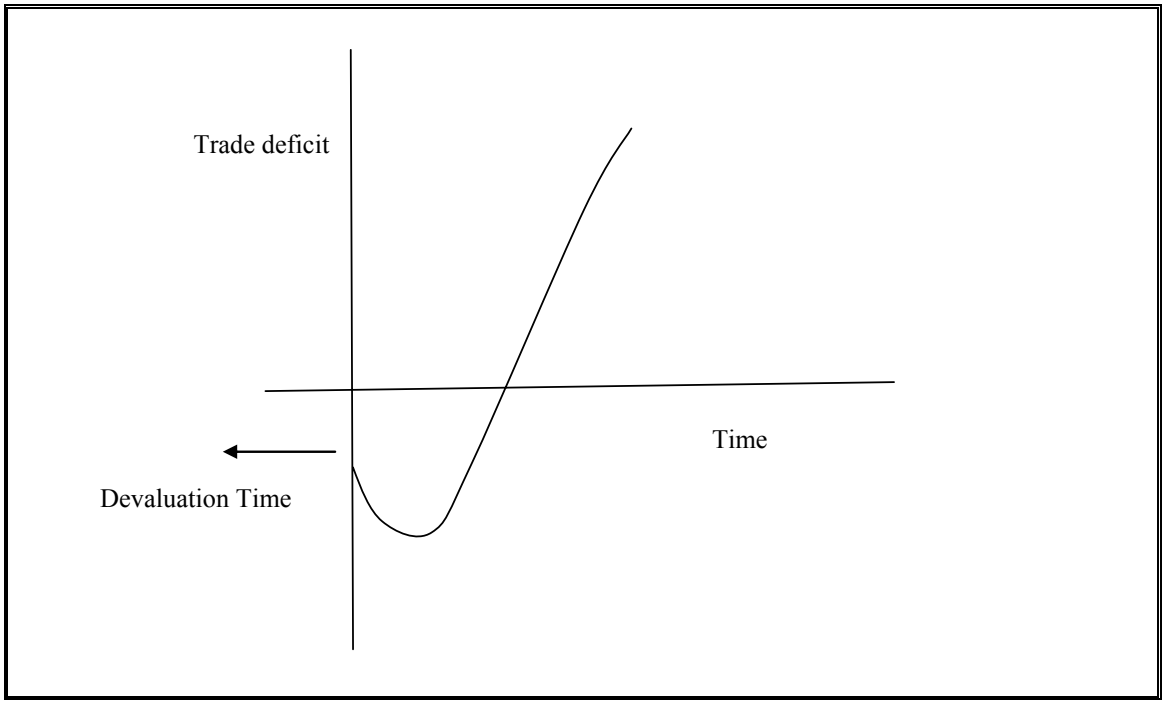
Q: Own import quantity

$(eP_f/P)Q$: value of import in terms of domestic goods

Suppose exchange rate depreciates plus domestic and foreign prices p and pf are unchanged; then the relative price of imports ePf/P rises. It has two effects -

Firstly, the physical volume of imports does not change their value measured in domestic currency. This means higher import spending and thus a worsening of the trade balance. This is the source of the potentiality preserve response of the trade balance to exchange depreciation. There are two volume responses that run in the opposite direction. Export should rise because our goods are now cheaper for foreigners to buy and the volume of imports should decline because imports are more expensive. The short term volume effect within a year is quite small and thus does not outweigh the price effect. The long term volume effects by contrast are quite substantial and certainly enough to make the trade balance respond in the normal fashion to a relative price change. Low short term and high long term volume effects result from the time consumers and producers take to adjust to changes in relative prices. Some adjustments may be instantaneous but it is clear that tourism patterns. With particular deficit, the depreciation raises the relative prices of imports. The short run effects result primarily from increased import prices with very few offsetting volume effects. Therefore, trade balance initially worsens. Over time as trade volume adjust to the changes in relative prices, export rise and import volume progressively decline. The volume effects come to dominate and the long run trade balance shows an improvement. This pattern of adjustment is referred to as the J curve effect. The response of the trade balance looks like J. It is presented in the following diagram.

Figure 4.11 The J curve effect



The J curve effect provides important clues for the interpretation of macroeconomics and it is observed across countries. It particularly shows why appreciations typically do not lead to improvement in the current account in the short run.

4.12 The Monetary Approach to Balance of Payment (MABoP)

It is frequently suggested that external balance problem is monetary in nature. For any given BoP deficit, a sufficient contraction of the money stock will restore external balance by raising the interest rates and reducing spending. It generates a contraction in economic activity, a decline in income and therefore a decline in imports. The BoP identity, we have

BOP=ΔH-ΔDC

ΔM=ΔDC+ΔR

Where

ΔH: High power money

MM: Monetary sector equilibrium

ΔR: Target variable

ΔM: Endogenous variable

ΔDC: Domestic credit

The above equation shows that the balance of payment is equal to the change in high power money and domestic credit. The change in money supply is equal to the change in domestic credit and reserves. In the external sector change in money supply (ΔM) is an exogenous variable. Reserves can be further stated as

$$(X-Z) + \Delta F = \Delta R \tag{4.12}$$

Where ΔR is a target variable, Z is an exogenous variable, XΔF is an exogenous variable

A more sophisticated interpretation of the problem recognizes the link among the balance of payment deficit, foreign exchange market intervention and the money supply. The automatic mechanism is for a sale of foreign exchange as a rise in the case of a balance of payment deficit. It can reflect in an equal reduction in the stock of high powered money. The deficit in current account, country sells foreign exchange and in return receives high powered money, thereby reducing the money stock. A surplus current account increases the outstanding stock of high powered money when it buys foreign exchange, thereby expanding the money stock.

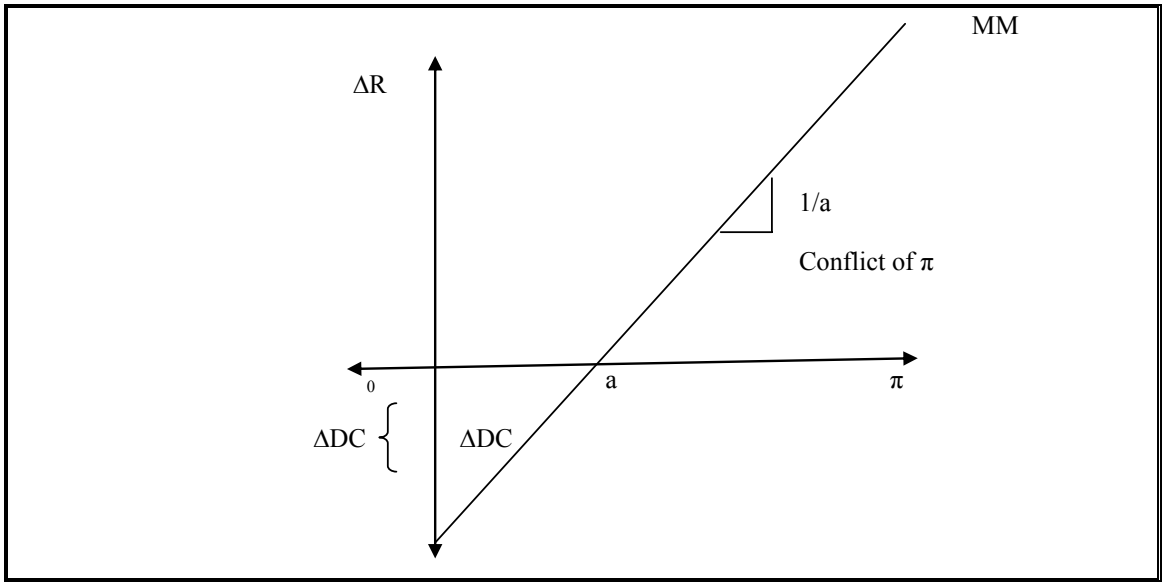
4.12.1 Instrument target approach

If there is a change in domestic credit then inflation increases. The exchange rate change will lead to increase in reserves similarly

ΔDC	Π
E	ΔR

Through figure 4.12, the change is explained as follows. The diagram shows that "a" point is a domestic credit. As money supply/credit increases, the inflation also increases.

Figure 4.12 Money supply and domestic credit



The change in reserves is interpreted as

ΔR=ΔM-ΔDC

The change in reserves will have positive effect on the money supply and negative effect on domestic credit. Therefore the monetary authority would keep the balance between the two. The assumption is that inflation is a function of money supply change.

Π= f (ΔM) (4.12)

Inflation is a function of change in money supply. Money supply is an independent variable. It can be further stated as follows -

Π= a ΔM

Therefore $(\frac{1}{a})\prod = \Delta M$

Then

ΔR=ΔM-ΔDC

If we substitute ΔM in above equation then it can be rearranged as

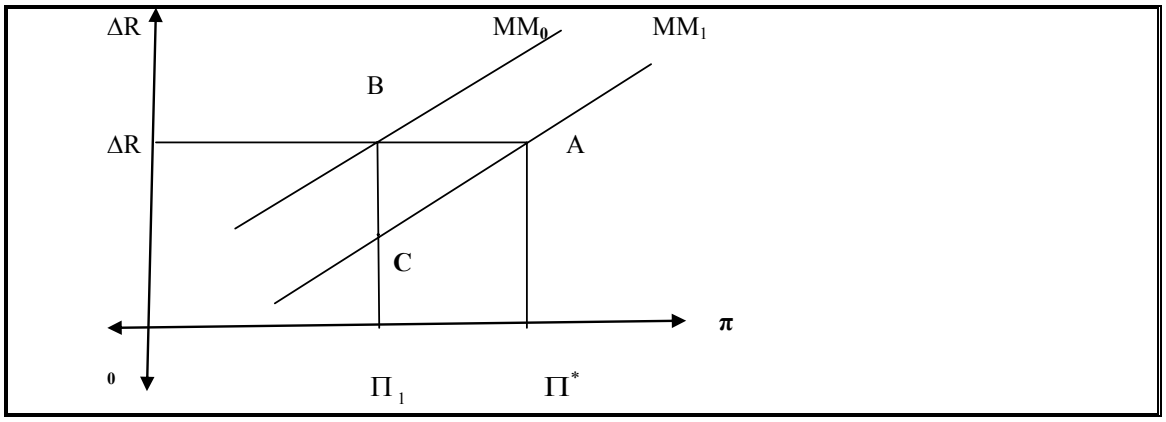
$$\Delta R = \frac{1}{a}\prod - \Delta DC$$

The policy instruments are as follows

Π	0	aΔDC
ΔR	-ΔDC	0

Similarly, ΔR and inflation in economy can be explained as follows. In the 4.13figure, it shows that inflation and reserves are equilibrium at point A. But contraction in domestic credit increases money supply from MM0 to MM_1. The change in domestic credit will decline MM_1 to net line after the credit restriction. Thus change in domestic credit reduce the same reserves and at lower inflation π (A& B). For the same inflation (π) higher reserves are expected Δ R (B&C).

Figure 4.13 Effect of money supply and inflation



Second line

The change in foreign exchange reserves are equivalent to the flow of foreign capital and difference in export and import.

(X-Z) +ΔF=ΔR (4.13)

The above equation can be interpreted alternatively as export minus import and change in foreign capital is equal to change in reserves

ΔR=(X-Z) +ΔF

$$X - Z = f(E^{+}\ \bar{\Pi}) \qquad (4.14)$$

Here trade balance is positively related to the exchange rate and negatively related to the inflation. If the inflation is higher, trade balance is negative. It can be further stated as

$X-Z = -b\pi+OE$

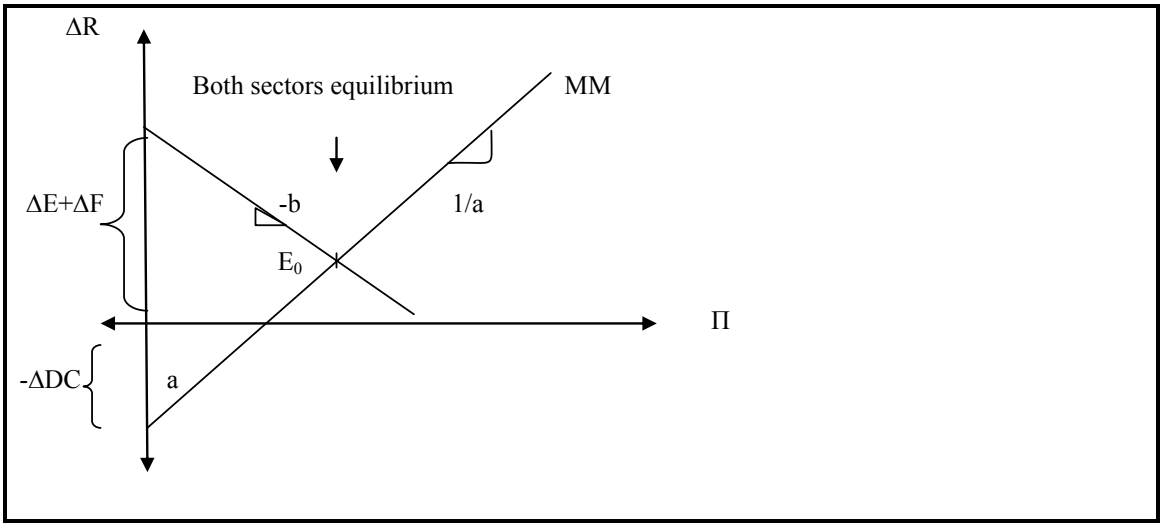
$\Delta R=-b\pi+CE+\Delta F$ (4.15)

It means the reserves are negatively related to inflation and positively related to exchange rate and foreign capital. A policy frame work is given as follows

Π	0	$\frac{CE+\Delta F}{b}$
ΔR	CE+ΔF	0

The above variables are shown in diagram as follows. MM curve shifts due to monetary policy. Capital flow is very important for macroeconomic stabilization. In the diagram, E0 is shown as equilibrium in both sectors. Monetary sector equilibrium is shown as upward line.

Figure 4.14 Macroeconomic stabilization in economy



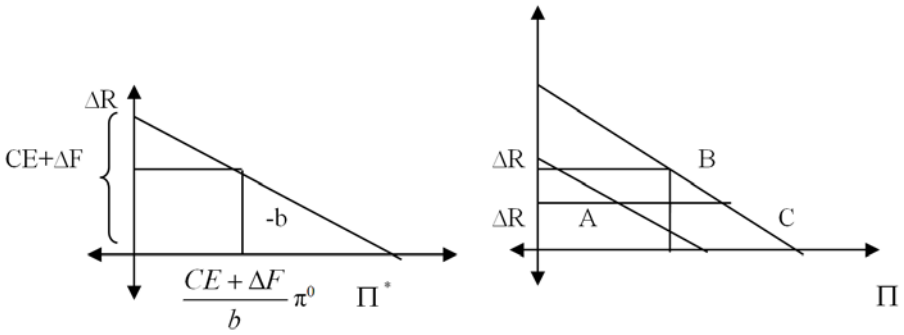
The external sector is explained in more detail in the following diagram,

External sector equilibrium:

The figure that the external sector equilibrium as

$$(X - Z) + \Delta F = \Delta R \tag{4.16}$$

Figure 4.15 External sector equilibrium



In the figure 4.15, Y axis is the exchange rate and foreign capital whereas the X axis shows the inflation. The above figure represents the link between exchange rate and inflation. It can be defined more broadly with change in exchange rate as follows. The diagram also shows the equilibrium between reserves and inflation. The point A shows the devaluation phenomena. After devaluation the inflation remains same and it is possible to get higher reserves. Same inflation (π) and higher (R.) reserves at point B are maintained. But at point C, there is less reserves and more inflation. If we compare point A and C then one gets same reserve and higher inflation devaluation phenomena. After devaluation the inflation remains same and it . Secondly, at same reserves, there is high inflation (Point A and C). Therefore, everything depends on real exchange rate. The real exchange rate is defined as

$$R = \frac{E \uparrow Pf}{P \uparrow} \tag{4.17}$$

Where

R: Real exchange rate

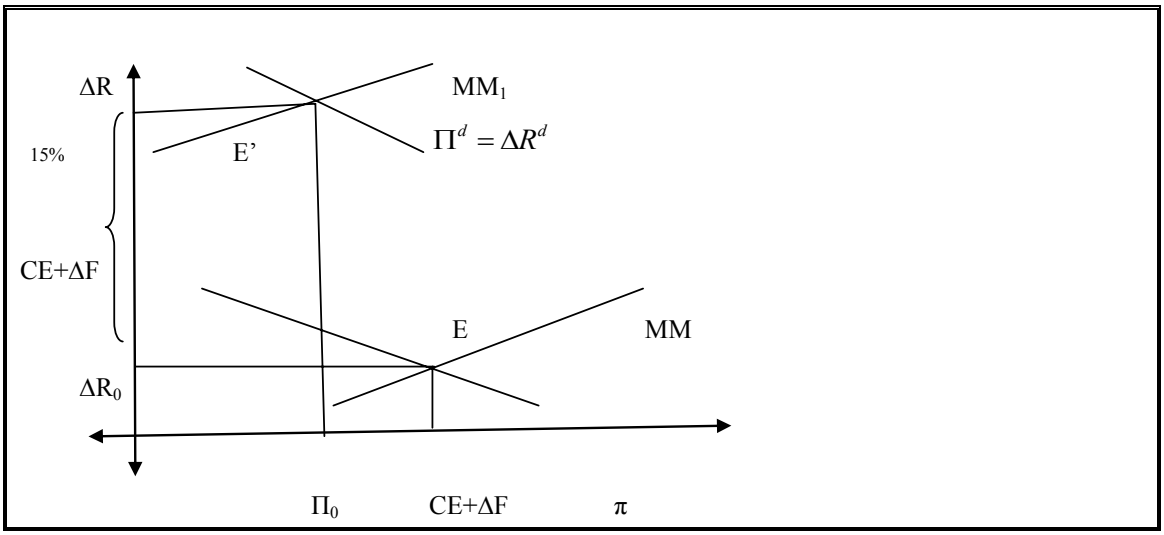
E: Nominal exchange rate

Pf: Price in foreign countries

P: Prices of domestic currencies

When we superimpose the above two conditions, the figure evolves itself as one shown in 4.16. Figure 4.16shows that the money supply exchange rate and foreign capital are equilibrium at E with π_0. If the money supply gets reduced then MM line shifts to MM'. The new equilibrium is achieved with higher reserves with lower inflation.

Figure 4.16 Change in money supply and inflation in economy



The above diagram shows that the reserve changes could be 15 percent. The instrument targets are explained as

ΔDC	Π
E	ΔR

The emphasis of monetary consideration in the interpretation of external balance problem is called the monetary approach to the balance of payment. The monetary approach has been used extensively by the IMF in its analysis and design of economic policies for countries in balance of payment trouble. The use of domestic credit ceiling is a crude policy to

improve balance of payment.

4.13 Exchange rate overshooting

Monetary authority supply money regularly in the economy. The devaluation improves the trade balance in the short run. But in the long run along with money supply, the prices also rise in the economy. Exchange rate devaluation, money supply and prices remain in equilibrium.

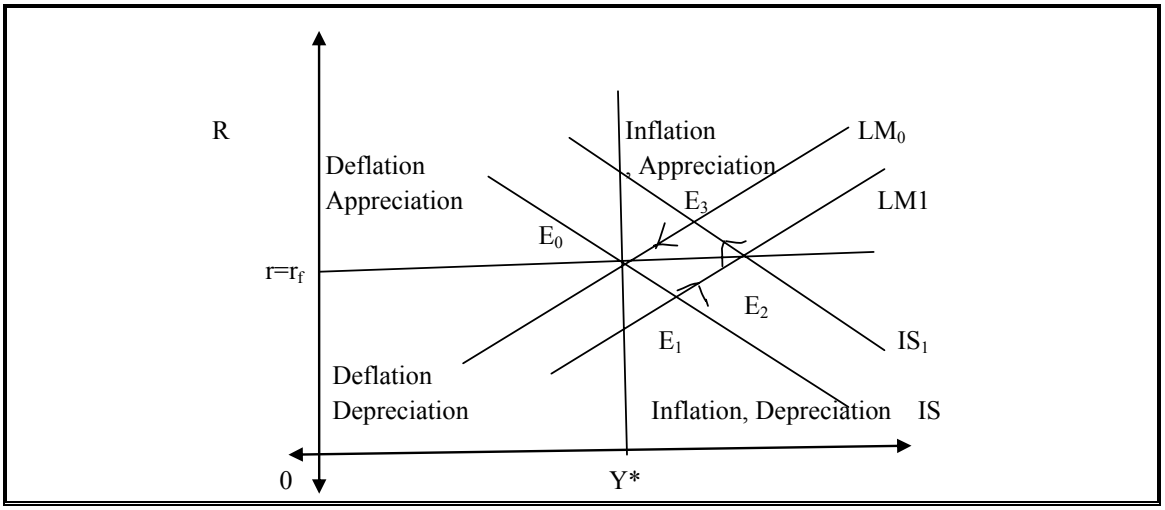
Assumption

The exchange rate overshooting model is based on the following assumptions. They are explained as follows -

1. There is perfect capital mobility in the economy.
2. Exchange rate is flexible.
3. Prices are freely allowed to change.

The model explains the relationship between output and prices. Secondly, interest rate, exchange rate and monetary policy are linked. In the long run, monetary expansion leads to exchange rate depreciation. It is because higher prices with no change in competitiveness. The following diagram shows the link between inflation, interest rate and income.

Figure 4.17 Effect of monetary policy on income in open economy



The monetary policy assumes the flexible exchange rate. The equilibrium point is observed at E_0.

The monetary expansion leads to shift of LM_0 line to LM_1. The new equilibrium point is achieved at E_1. The exchange rate depreciates because domestic interest rate is less than foreign interest rate ($r<r_f$). The exports become competitive and they rise because of competitiveness. The IS_0 shifts to IS_1. This is because export rises. Equilibrium point is achieved at E_2. This is end of phase one. At point E_2, $Y>Y^*$ prices rises (m/p) falls and LM_1 curve shifts LM_0. It shifts back to original point LM_0. Interest rate rises and the equilibrium point is achieved at E_3. The exchange rate appreciates, rate of domestic interest rate is below the foreign interest rate ($r>r_f$). Exports fall due to lack of competitiveness in the global market. IS curve shift back to IS1. The equilibrium is achieved at E_0. In the long run, output returns to normal level. Money, prices and the exchange rate rises in the same proportion. The short run effects of monetary expansion leads to rise in M/P, e ep_f/p and Y. The prices are unaffected by monetary expansion. In the long run, exchange rate (e) prices (p) have positive effects In the long run, the relation of money supply to prices (M/P), real exchange rate (ep_f/p) and income (Y) is unaffected. It is presented in table as follows

Table 4.2 Effect of monetary expansion money supply exchange rate and prices

Period	M/P	e	P	ep_f/p	Y
Short run	+	+	0	+	+
Long run	0	+	+	0	0

4.13.1 Exchange rate overshooting

The analysis of monetary policy under flexible exchange rate given above leads to an important insight about the adjustment process. The important feature of the adjustment process is that exchange rate and prices do not move in the same direction. When a monetary expansion pushes interest rates down, the exchange rate adjusts immediately and there is an abrupt change in relative prices and competitiveness.

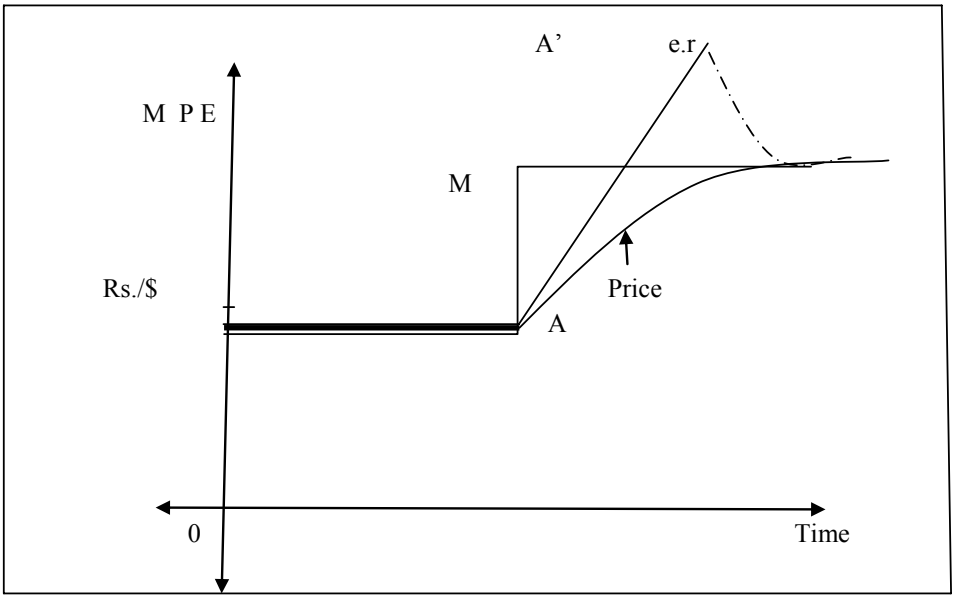
The overshooting of exchange rate means exchange rate rises above the money supply. The prices slowly adjust in the long run. Therefore in the long run, money supply, exchange rate and prices are in equilibrium.

Figure 4.18 shows the overshooting. The depreciation and appreciation is equal to depreciation. For example, depreciation is 10 percent and appreciation is 5 percent. The real depreciation effect is calculated as follows

$$D- A = D$$
$$10 -5 = 5$$

Therefore, the real depreciation after reducing the appreciation effect is 5 percent. The effect of money supply, prices and exchange rate is shown in the following diagram.

Figure 4.18 Exchange rate overshooting



The diagram above explains that m/p will remain unchanged in the long run. Prices imply that P must rise proportionately with money supply. The ratio ep_f/p that is real exchange rate should remain unchanged because IS_1 shift back to same as before. Exchange rate E must rise proportionately with P

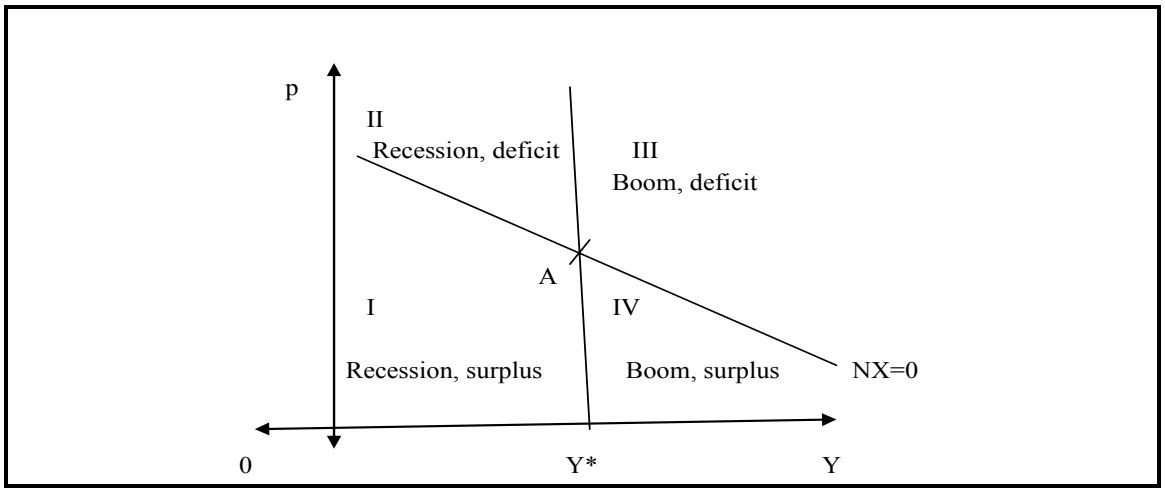
$$X = x(\frac{E \uparrow \bar{P}}{P \uparrow}) \tag{4.18}$$

In the above diagram, initial economy is in full employment equilibrium. The exchange rate is in equilibrium at A. suppose exchange rate depreciates up to A'. The effect is more than the increase in money supply. Prices adjust only gradually in the short run. The relative price of imports EP_f/P increases sharply. That gain in competitiveness causes a transitory income expansion. But over time, prices rise and the exchange rate appreciates. In the long run, nominal money, the exchange rate and prices rise in the same proportion. The real balances, M/P and relative price of import are therefore unchanged. The exchange rate overshoots its new equilibrium level. In response to a disturbance, it first moves beyond the equilibrium. Ultimately, it reaches and then gradually returns to the long run equilibrium position. Overshooting means that monetary policy produces large change in exchange rate.

4.13.2 Policy Dilemma

The government wants to achieve not only external balance but also the internal balance. Internal balance means that output is at the full employment level Y*. External balance occurs when the trade balance is zero. Important point about internal and external balance is that there is sometimes a policy conflict between the solutions to the two problems. It can happen that policies to improve the external balance will worsen internal balance. The policy dilemma shows that in region I& III monetary and fiscal policy can move the economy towards internal and external balance. In region II & IV there is a policy dilemma.

Figure 4.19 Policy dilemmas to achieve equilibrium in economy



At point A, the economy is in a position of recession and deficit. Here, we have to choose whether we want to use tight policies to achieve trade balance equilibrium or expansionary policies to achieve full employment. If we are unable to reach one target it gets it further away from the other. Such a situation is called a policy dilemma and it can always arise when there are more targets of policy than instruments with which to move the economy towards its targets. In this case, we have only one policy instrument. But we have two independent targets that is external and internal balance. The policy dilemma can be solved by finding another policy instrument to cope with the multiple targets.

4.13.3 Policy Dilemma: twin deficit

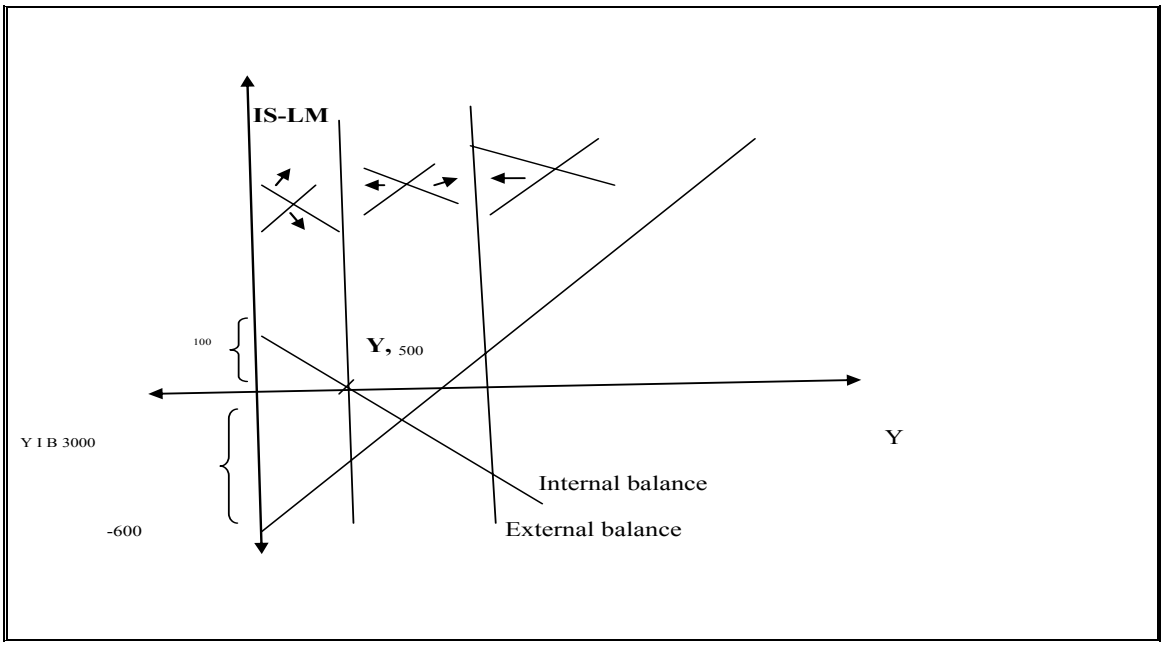
The policy dilemma explains that there is need to achieve internal balance or external balance. The dilemma is also to achieve fiscal deficit versus the current account deficit. Internal balance comprises of the budget surplus with taxes minus government expenditure -

BS=T-G
The external balance means export minus imports, the net export positive.
NX=X-Z
Now
BS=tY-G
Where,
T=tY
NX=mY

Adjustments:

1. Economy b caught under I, IS-LM curve intersect, trade surplus, if we conduct monetary policy LM curve shift to LM1. It shifts rightward. There is no dilemma. In zone III, there is no conflict, since we reduce the trade deficit, there is no dilemma.
2. An expansionary monetary policy will increase in the trade deficit, i.e., of paying for the excess of imports over exports. So there is policy dilemma. This dilemma cannot be solved in the above situation because there are two targets and one instrument that are internal and external balance and income. In order to solve the dilemma, we need a second instrument.

Figure 4.20 Internal and external adjustment with income



Explanation:

The balance of payment comprises of the net exports and capital account deficit. It can be arranged further and solved as follows -

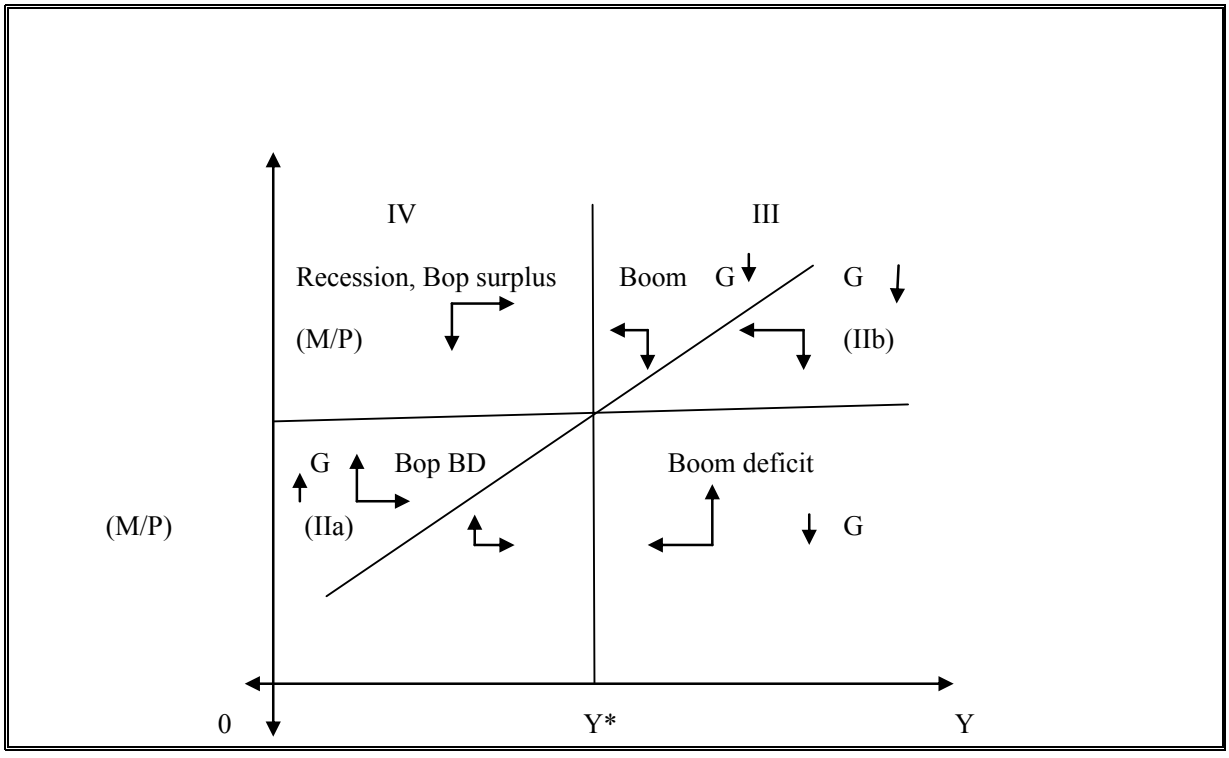
$$BOP = NX + CAD$$

$$= (X-Z) + \Delta F$$

$$BOP = (X-mY) + (r-rf) \quad (4.19)$$

Here, the balance of payment comprises of export minus import and the domestic income. The balance of payment is also related to the capital inflow. Capital inflow depends on the difference between the domestic and international interest rate.

Figure 4.21 Adjustment of balance of payment, deficit and money supply



Increase in exports is the best strategy to improve the balance of payment. But increase in income will have negative effect on the balance of payment. Because people will import goods ($Y\uparrow \rightarrow$ BoP $\downarrow$) from foreign countries and the balance of payment will be deficit. Similarly, if the rate of interest rate rises, then balance of payment also becomes surplus(r increases then BoP increases). If the government expenditure increases, then investment economy also rises. It consequently increases the income. Increased income (G) leads to investments and thereby again generating more income. It is opposite when government reduces the expenditure then income decreases and therefore rate of interest decreases (G decreases then income decreases and r decreases).

Secondly, as money supply (M/P) increases, income (Y) increases and the rate of interest decrease. Alternatively M/P increases and r decreases; or vice versa. Therefore, any increase in income leads to effects in balance of payment. The balance of payment worsens. The vertical line shows the internal balance resulting in full employment. At every point on IS0, the balance of payment is equal to zero. Above the line, any point shows the balance of payment surplus. Every point below the line (BoP=0 is the zone) is deficit in the balance of payment. New challenges have emerged in the form of large and rapid movements in the exchange rate. The consequences of these movements for both flow and stock indicators are unquestionably adverse. However, in the event of a prolonged non-resolution of global problems, considerations of financial and external stability are critical. A prudent policy approach is to accommodate the pressure of depreciation in a way which reduces the likelihood of a much more severe and perhaps uncontrollable shock (RBI 2012).

The above explanation can be presented with the following example -

The break even in BS implies, BS=0

$0 = 0.2y - 600$

$600/0.2 = Y$

$Y = 3000$

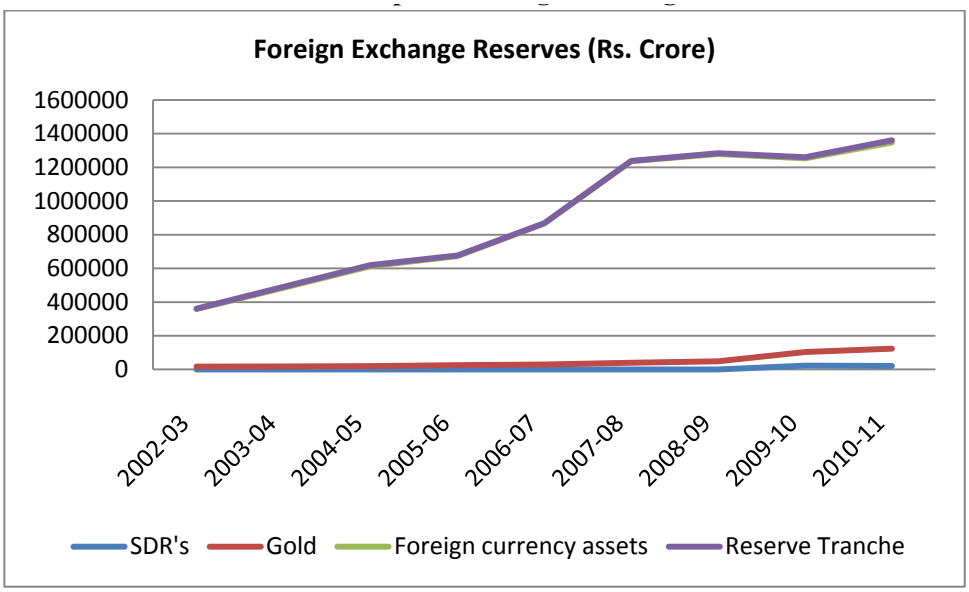
Break even in $NX = x - mY$

$0 = 100 - 0.2Y$

$Y = 500$

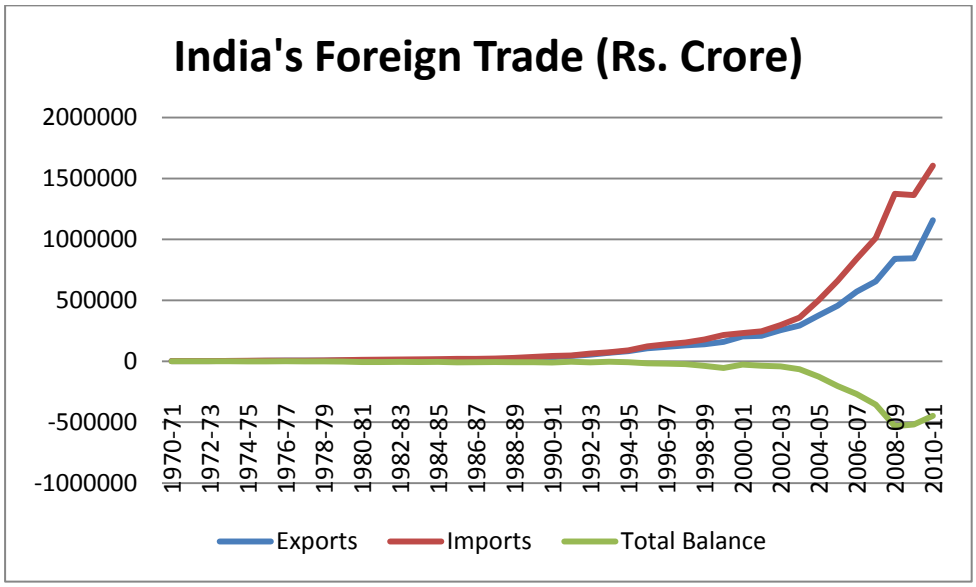
Appendix:

Graph 4.1 Foreign exchange reserves in India



Source: RBI statistics

Graph 4.2 Foreign trade of India



Source: RBI statistics

Table 4.3 India's Overall Balance of Payments (` Billion)

Item		2007-08 (R)			2008-09 (R)		
Credit		Debit	Net	Credit	Debit	Net	
1		2	3	4	5	6	
A.	CURRENT ACCOUNT						
	I. MERCHANDISE	6,680	10,357	-3,677	8,580	14,054	-5,474
	II. INVISIBLES (a+b+c)	5,981	2,939	3,042	7,704	3,506	4,198
	a) Services	3,630	2,068	1,562	4,880	2,396	2,484
	i) Travel	455	372	83	502	433	69
	ii) Transportation	402	463	-61	521	585	-65
	iii) Insurance	66	42	24	65	52	13
	iv) G.n.i.e.	13	15	-2	18	38	-20
	v) Miscellaneous	2,694	1,176	1,518	3,774	1,287	2,487
	of which						
	Software Services	1,620	135	1,485	2,122	116	2,006
	Business Services	674	665	10	855	709	146
	Financial Services	129	126	4	204	136	69
	Communication Services	97	35	62	105	50	55
	b) Transfers	1,777	93	1,685	2,169	126	2,043
	i) Official	30	21	10	30	19	11
	ii) Private	1,747	72	1,675	2,139	107	2,032
	c) Income	573	778	-205	655	984	-329

	i) Investment Income	555	734	-180	617	924	-307
	ii) Compensation of Employees	18	44	-26	38	60	-22
	Total Current Account (I+II)	12,661	13,296	-635	16,284	17,560	-1,276
B.	CAPITAL ACCOUNT						
	1. Foreign Investment (a+b)	10,865	9,121	1,744	7,755	7,405	351
	a) Foreign Direct Investment (i+ii)	1,499	861	638	1,965	964	1,001
	i) In India	1,399	5	1,394	1,914	8	1,906
	Equity	1,077	4	1,073	1,462	8	1,454
	Reinvested Earnings	309	–	309	415	–	415
	Other Capital	12	–	12	37	–	37
	ii) Abroad	100	857	-756	51	956	-905
	Equity	100	680	-579	51	620	-569
	Reinvested Earnings	–	44	-44	–	50	-50
	Other Capital	–	133	-133	–	287	-287
	b) Portfolio Investment	9,366	8,260	1,106	5,790	6,441	-650
	i) In India	9,357	8,257	1,100	5,783	6,425	-642
	of which						
	FIIs	9,079	8,257	822	5,735	6,425	-691
	ADR/GDRs	266	–	266	49	–	49
	ii) Abroad	9	3	7	7	15	-8
	2. Loans (a+b+c)	3,303	1,668	1,635	2,854	2,506	348
	a) External Assistance	170	86	85	244	129	115
	i) By India	1	1	–	3	19	-16
	ii) To India	169	84	85	241	110	131
	b) Commercial Borrowings	1,219	309	911	708	343	365
	i) By India	64	65	-1	92	36	56
	ii) To India	1,155	243	912	616	307	309
	c) Short Term to India	1,914	1,274	639	1,901	2,034	-133
	i) Suppliers' Credit > 180 days & Buyers' Credit	1,712	1,274	438	1,778	1,777	2
	ii) Suppliers' Credit up to 180 days	202	–	202	123	257	-135
	3. Banking Capital (a+b)	2,240	1,768	472	2,954	3,146	-192
	a) Commercial Banks	2,237	1,751	486	2,948	3,119	-170
	i) Assets	784	507	276	1,148	1,306	-158
	ii) Liabilities	1,453	1,244	209	1,801	1,813	-12
	of which: Non-Resident Deposits	1,181	1,174	7	1,710	1,506	204
	b) Others	3	17	-14	6	27	-22
	4. Rupee Debt Service	–	5	-5	–	5	-5
	5. Other Capital	1,171	737	434	761	973	-212
	Total Capital Account (1 to 5)	17,579	13,300	4,279	14,324	14,034	290
C.	Errors & Omissions	52	–	52	15	–	15
D.	Overall Balance (Total Current Account, Capital Account and Errors & Omissions (A+B+C))	30,293	26,596	3,697	30,673	31,644	-971
E.	Monetary Movements (i+ii)	–	3,697	-3,697	971	–	971

	i) I.M.F.	–	–	–	–	–	–
	ii) Foreign Exchange Reserves (Increase - / Decrease +)	–	3,697	-3,697	971	–	971
	of which: SDR allocation	–	–	–	–	–	–

Source: RBI statistics

Questions

1. Explain the relationship of balance of payment and exchange rate.
2. Why must the external balance be in balance?
3. Explain the difference between fixed and flexible exchange rate.
4. How does the open economy affect the goods market? Explain.
5. Capital inflow affects the balance of payment equilibrium. What is the effect of the exchange rate in it?
6. How does internal and external equilibrium get disturbed? What are the policies required to correct it?
7. Explain the Mundell- Fleming model with relation to fixed exchange rate and capital mobility.
8. Explain the Mundell- Fleming model with reference to fixed exchange rate along with the effect of the monetary and fiscal policy on it.
9. What is the effect of flexible exchange rate and monetary and fiscal policy on Mundell- Fleming model?
10. Explain the term competitive depreciation.
11. Explain the role of prices in an open economy.
12. Explain the term devaluation in detail.
13. What is J curve effect?
14. Explain the monetary approach to balance of payment.
15. What is exchange rate overshooting?
16. Explain policy dilemma in the equilibrium of economy.
17. What are the adjustments required to reduce the twin deficit in an economy?
18. Exchange rate overshooting reduces the trade deficit of country.
19. Explain the external sector equilibrium in detail.
20. What is the macroeconomic stabilization approach? Explain.
21. Exchange rate depreciation leads to increase in the price level in a country. Explain.
22. Devaluation of currency helps to reduce the trade deficit. Discuss.
23. Export lead policies help to achieve the balance of payment equilibrium. How can the disequilibrium in the capital account of a county corrected?
24. Explain the relation of currency appreciation and depreciation with effect to interest rate. How it will help to make equilibrium in the balance of payment?
25. Write a note on the followings -

a) Mundell- Fleming model
b) Perfect capital mobility and flexible exchange rate
c) Policy effect of Mundell- Fleming model
d) Goods market equilibrium in an open economy
e) Exchange rate system

5 Modern Macroeconomics

5.1 Introduction

Modern macroeconomics discusses the new development in macroeconomics. The usual national economy and equilibrium is a part of traditional macroeconomics. But modern economics debates the efficiency wage hypothesis, insider and outsider models, implicit contracts, search and match models, etc. Such topics also review the labor market behaviors in an economy. Modern economies are dynamic and changing with the global factors. The labor markets are dynamic and they are directly influenced by the global production methods. It is difficult for the workers to find a job with advanced skills. Firms are also competitive to gain more profit and replace workers with skills and efficiency. The search and match model show the equilibrium level of employment and wages. The nominal wages in the economy are changing and more inflation in economy leads to more rise in wages and prices. Workers are also alert to the change in the prices of commodities. They expect higher wages to cope up with rising prices and the standard of living.

5.2 The efficiency wage hypothesis

The efficiency wage hypothesis is well discussed in relation work capacity and nutrition. As per discussed in previous chapter, the workers may make mistakes for expected prices. The expected prices are higher than the actual prices. Wages are set too high and it results in unemployment. The nominal wages are set too high either because workers are concerned about their relative position in the labor market. This is also because workers expect prices to be high. The workers who are identical to the firms can be offered less than what the firms currently pay. Workers should be accepted to a firm that seeks any opportunity to increase profit. Efficiency wage theory explains that firms may not find it profitable to hire more workers at reduced wages.

The efficiency wage theory explains that if workers offer to work for lower wages, firms do not want to reduce wages. Firms may simply pay higher wages because there is more benefit to them. It pays more to workers because of the higher output, skill enhancement; etc. The efficiency wage is equal to the marginal cost of increasing the wage exactly equal to marginal gain in the productivity of the firm's workers. Firms cannot observe each worker in daily routines. Monitoring each worker's unproductive activities is an expensive task for any firm. Workers spend time on various activities such as newspaper reading, gossip, chatting, calling and sending SMS to friends, union activities, politics at different levels etc. Most of the times, workers spending time on other activities but they do not like to work for which they are hired. Such activities reduce the productivity and total production. The workers contract and wage offer do not agree to shrink at all. Firms discourage quitting and shirking of the workers at work. It sends wrong signal to other workers. Highly paid workers have high consumption expenditure. Higher wage is an incentive for workers to work more and be punctual. The nutritious food improves health and increases productivity. It is similar to nutrition and efficiency wage theory. Undernourished workers affect production as they remain absent for long period of time. It reduces the productivity and production in the firm. Well- nourished workers can improve the firms comparative wage condition. The firm pays high wages where labor cost increases. It is compensated for greater upsurge in the productivity.

Suppose there are $\bar{N}$ workers in the economy and labor supply is inelastic. If w/p is a real wage and e is the workers efforts then the benefit to workers is given as

$$\beta = \frac{w}{p} - e \text{, employed by firm} \tag{5.1}$$

$\beta = 0$, if not employed by firm

The first condition explains that workers are employed and they do not shirk. Therefore, benefits are equal to W/P. But suppose workers shirk firm's fire and remove the workers, and then the workers think of the net benefits. If the net benefits are lower, shirking is higher.

$NB_{shirking} = S - B$ (Where B means exerting efforts)

$$= \frac{w}{p} - \frac{w}{p} - e$$
$$= e \tag{5.2}$$

The net benefits of shirking depend on the efforts.

The expected loss from shirking is that cheating is detected (μ) times the loss of income from firing is -

Expected loss of shirking = $\mu \frac{w}{p}$

Expected loss of wages from cheating is equal to gain from cheating -

$$\mu \frac{w}{p} = e$$

$$\frac{w}{p} = \frac{e}{\mu} \tag{5.3}$$

Firms must pay high wage to avoid shrinking of workers. Sometimes workers leave job because of various reasons. But if the unemployment rate is higher in the economy, then μ is large. In such situations, if workers are caught while shirking and cheating, they workers do not get employment for a long period of time. Firms get more labor at lower wage in the economy but it is opposite when unemployment is low. Firms must pay high wages to reduce shirking. The following diagram shows unemployment and no shirking condition which declines with full employment. The firm's behavior is only to earn more profit. The workers efficiency is given as follows -

$$Y = F(e\ n) \tag{5.4}$$

There are number of workers who always shirk. Therefore, a firm's profit is given as -

$$\pi = F(eN) - \frac{W}{p}(N + S) \tag{5.5}$$

Figure 5.1 Real wage and employment in economy

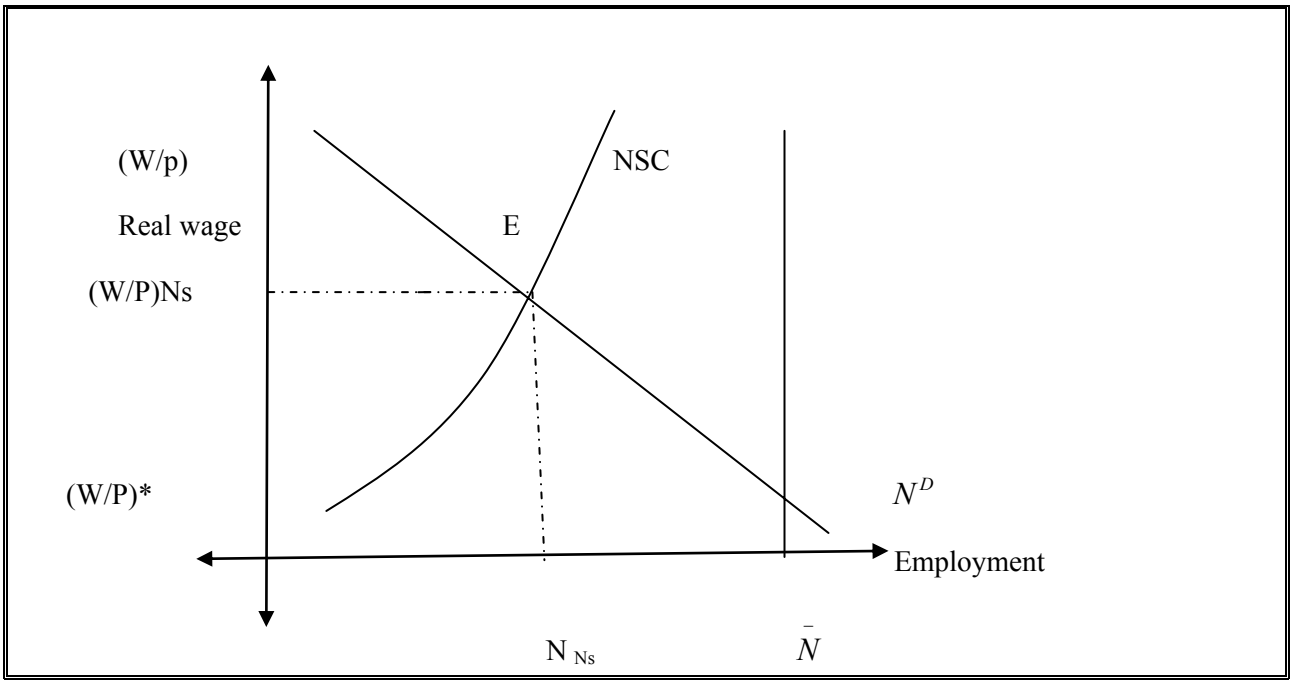


Figure 5.1 depicts that the N^D is the demand for labor. The N on shirking condition is upward sloping. At higher wage, there is less shirking. The marginal product of labor is -

$$\frac{w}{p} = eMP_{eN} = eF'(eN) \tag{5.6}$$

The wage is at equilibrium where there is no shirking and demand curve intersect. The equilibrium is (W/P) NS in the figure. It is an efficiency wage. N, N_{NS} is the total unemployment in the economy. If there is perfect monitoring of workers through television and cameras then the intersection point is $\bar{N}, N^D$. But due to non-monitoring, there is intersection of labor demand and NSC at point E.

If the real wage is (w/p) <(w/p)NS more than shirking and employment NNS<ND, this would force to rise in real. The shirking is less. It is opposite when (W/P) > (W/P)NS . The demand for workers at wage NNS>ND, results so that wage will fall and workers cannot bid down wages to the competitive level. There is involuntary unemployment $\bar{N} - N_{NS}$ in the economy. If there is full employment then fired workers will join the next best firm. There is too much competition to get skilled labor.

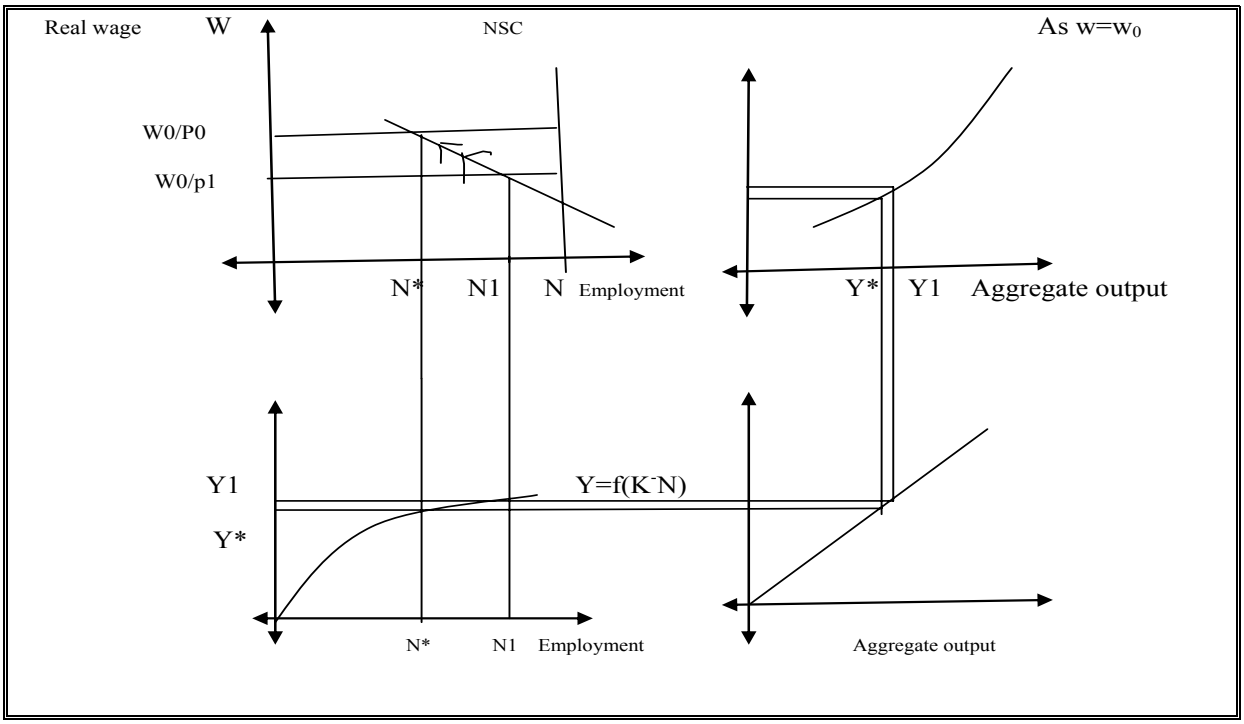
Shapiro and Stiglitz explained that firms choose to pay higher wage than the market clearing wage. This is because firms are unable to detect shirking on the job. Similarly, higher wage is incentive for the workers to work more. Friedman argues that the workers should get higher wage because of cost of living. It always rises over time.

Long run and staggered wage setting

Keynes has assumed that the wages are set less frequently than the employment chosen by the firm. The nominal wage is said to be sticky. The firm set wages less frequently than it hires or fires workers.

Figure 5.2 displaysthat real wage is W0/p0 and unemployment that is natural unemployment is N*. Suppose the price level rises from P0 to P1. The nominal wage adjustment takes time but in the short run, real wage declines to w0/p1. Firms employ more labor, unemployment in the economy declines. The output rises. In the figure, it is shown in the B panel. It is inversely related; when the price level declines and nominal wage declines. The firm reduces the total workers through hire and fire policy, the resultant output declines. It continues till the real wage is equal to the efficiency wage. The natural rate of unemployment is U*. Panel A shows the Quasi-equilibrium rate of unemployment. It is a point of equilibrium of profit maximization and NSC. It is shown because there is aggregate excess supply of labor. It is the only point where demand for labor is consistent with wage setting behavior that differs shirking. If the price level is p1 and unemployment is below the natural rate. The new Keynesian assumes that adjustment begins with some fraction of firms adjusting their nominal wages over any given period of time.

Figure 5.2 Wage setting in the long run



5.2.1 Staggered wage contracts

According to Taylor, the contract decisions are staggered in which all wage contract decisions in the economy are not made at the same point of time. Wages are pre-decided because the cost of adjustment of wage is higher. Firms first explain the remuneration of workers; fix the production and sale in future. It does not monitor the workers performance very frequently. But workers always search the probable wages elsewhere. If they get good salary in other firms then workers shift and their wage rise. It is observed at different point of time. It is only dependent on the information available to firm and workers. Sometimes firms set wages higher and it keeps on at a high level. In such cases, workers do not have chance to leave the job because they do not find alternatives to the present job.

Sometimes due to high cost of wage adjustment, the contracts are set in first year and half contracts are set in the next year. There are two cohorts of workers, each negotiating a wage contract for two periods in a staggered manner. In simple, mathematical term, it is called as t, t+1 and t+2. The first contract overlaps with the second cohorts' contract. It is set in T-1 period. The first and second cohort contracts overlap in T+1 period. The firm faces average cost. The current wage contract is signed as (Xt) and previous contract wages signed in period T-1 as

$$t_{-1}\ (X_{t-1}) \text{ or } Wt=1/2(X_{t-1}+X_t) \tag{5.7}$$

Here, X_t is the wage contract settlement signed in period t. Sometimes; the firms pay the average wage in the next contract or period. It depends on the labor market. If the workers want high wages then they should negotiate for t+1 period. There is also a possibility that the economy will downturn and unemployment will rise. It reduces the changes of increase in wage.

Wage adjustment

The prices cannot be controlled and they are always on a rise. It is the firm which decides the amount of increment in wages. If the firm is competitive then they increase the wage rate. But if the firm is less competitive then it adjusts slowly. It is the time in which all the firms adjust their wages and prices. It is a natural equilibrium achieved in the economy. The decline in prices forces firms to reduce the nominal wage and consequently, the temporary real wage increases. But if real wages are less, then fewer workers will agree to work. If the real wages are higher than the efficiency wage, then more workers will not work. If the efficiency wage is higher than the market wage then workers will not shirk as it proves costlier to them.

5.3 The government budget constraint and debt dynamics

Some taxes fall on income, others on expenditure, and some on the holdings of property. But one way or another, the amount that someone pays depends on his or her economic activity; none of these levies looks like the lump sum taxes (Barro, 2001).

The budget constraint is given as -

$$G_t-(T_T+T_N+T_D)_t+rB_{t-1}=(M_t-M_{t-1})+(B_t-B_{t-1}) \tag{5.8}$$

Where,

G: Public current and capital expenditure

T_t : Tax revenue

T_N : Non tax revenue

T_D: Revenue from disinvestment

B_t : Stock of domestic public debt

Mt: Stock of credit allotted by central bank

The total government revenue is defined as T= (TN+TT+TD)

Therefore, the budget constraints are given as -

$$\Delta B = (B_t - B_{t-1}) = G_t - T_t + rB_{t-1} \tag{5.9}$$

The left hand side explains the fiscal deficit. The primary deficit is the non-interest component of fiscal deficit which is -

Primary deficit $= G_t - T_t = D_t$

Another way of writing budget constraint is -

$$\Delta B = B_t - B_{t-1} = rB_{t-1} + (G - T) \tag{5.10}$$

The fiscal deficit is the government expenditure that is not related to the repayment of the debt, G plus repayment of the debt, rB less government revenue T. The difference between the fiscal deficit and interest payments is the primary deficit.

The above equation is rewritten differently as -

$$B_t = (1+r)B_{t-1} + D_t \tag{5.11}$$

D_t is a primary deficit . If we divide the above equation by Yt, then the equation evolves as -

$$\frac{B_t}{Y_t} = (1+r)\frac{B_{t-1}}{Y_{t-1}}\frac{Y_{t-1}}{Y_{t-1}} + \frac{D_t}{Y_{t-1}} \tag{5.12}$$

If $b_t = B_t / Y_t$, the debt/GDP ratio $d_t = D_t / Y_t$. The primary deficit/GDP ratio and the one period rate of GDP be

$$g = \frac{Y_t - Y_{t-1}}{Y_{t-1}}$$
$$= (Y_t / Y_{t-1}) - 1$$
$$or$$
$$1 + g = \frac{Y_t}{Y_{t-1}}$$

We can rewrite the above equation as -

$$b_t = \frac{1+r}{1+g} b_{t-1} + d_t$$

The debt/GDP ratio increases because firstly, governments issue debts to cover a primary deficit. Secondly, the government must pay interest on existing debt. It is expressed as 1+r/1+g. If primary deficit is zero then,

$$b_t = \frac{1+r}{1+g} b_{t-1} \tag{5.13}$$

If government increases the interest on existing debt, then the debt/GDP ratio increases. But if GDP increases at the rate (1+g) with increase in tax revenue, the GDP increases. This helps to decline the debt/GDP ratio.

The net effect on the increase in GDP and interest is debt/ GDP ratio. If g>r, the debt /GDP ratio will not increase, it is at sustainable basis. It can be presented with the help of graph as -

Figure 5.3 Debt and gross domestic product with effect of interest and growth

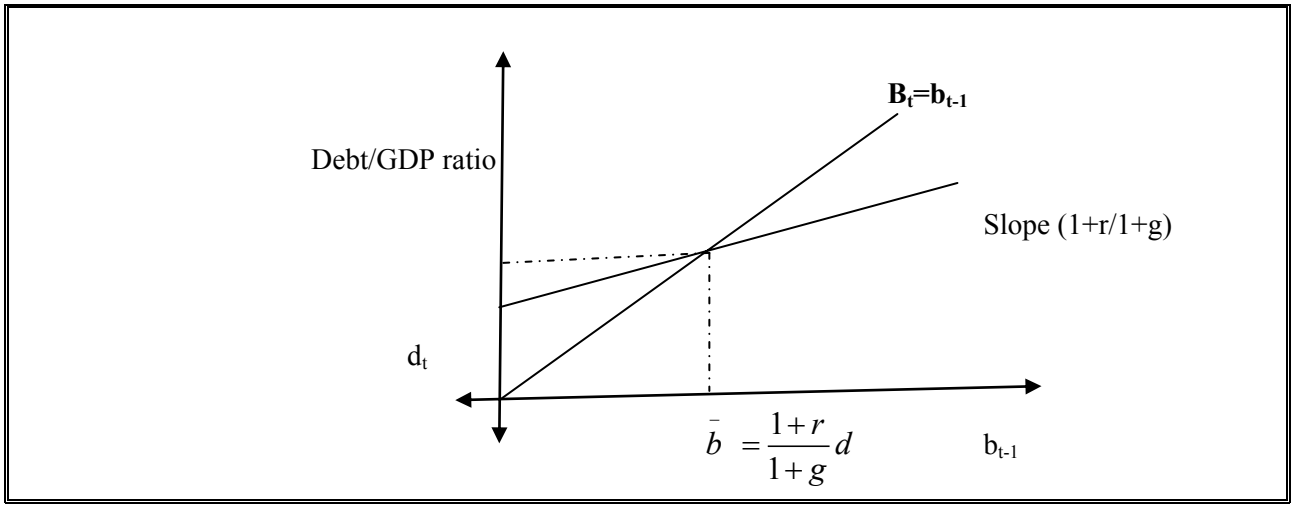


Figure 5.3 shows that the debt/GDP ratio in period t is bt. The first is the primary deficit/GDP ratio is dt. The second is the ratio of one plus interest rate to growth rate of GDP times. The debt /GDP ratio of the previous period is t-1. The steady state debt/GDP, which does not change with time, it is given by $\bar{b}$.

Figure 5.4 Unstable steady state conditions in debt GDP ratio

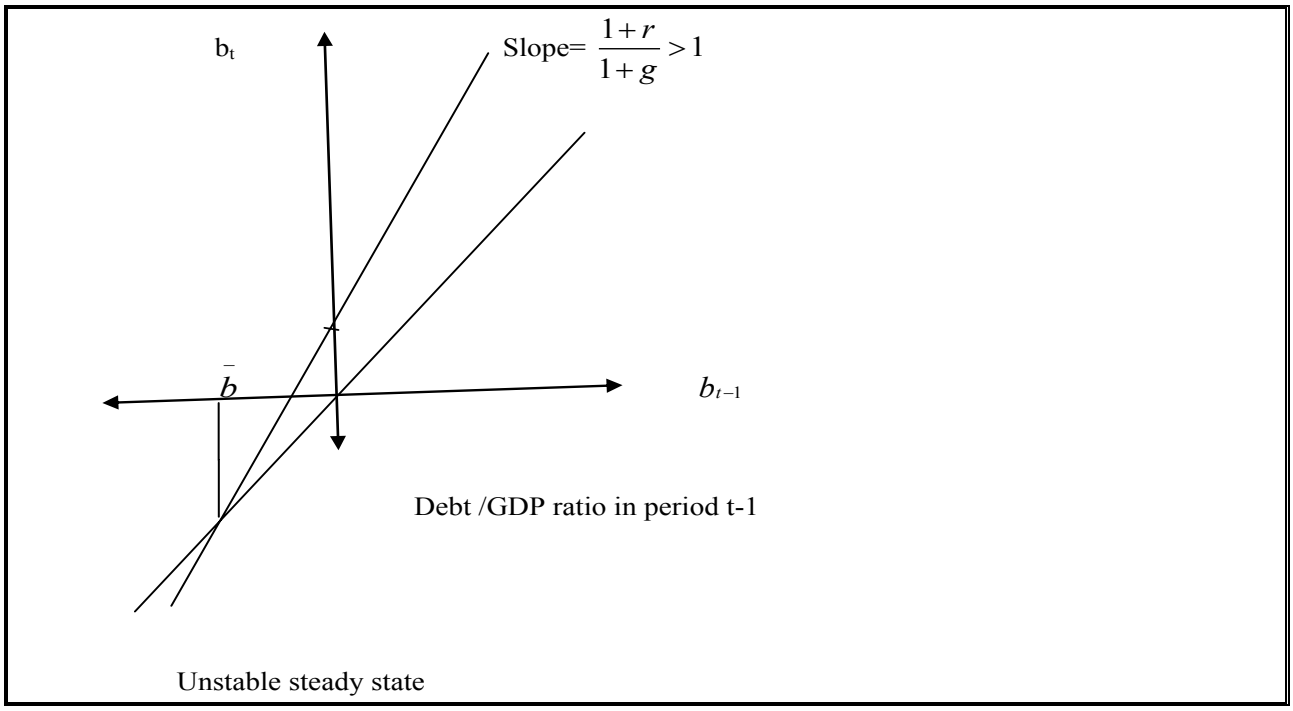


Figure 5.4 illustrates that a Debt/GDP value other than $\bar{b}$ will gravitate towards $\bar{b}$. If the interest rate is greater than the growth rate of GDP then the debt is considered to be unstable.

A steady state $b_t = b_{t-1} = \bar{b}$ is a condition. It is given as

$$\bar{b} = \frac{1+r}{1+g}\bar{b} + d$$

$$\bar{b} = \frac{g-r}{1+g} = d$$

$$\bar{b} = \frac{1+g}{g-r}d \tag{5.14}$$

5.3.1 Primary deficits and stability

The first part of the figure shows [(1+r)/(1+g)]<1 or r>g. It is a stable steady state. The debt/GDP ratio at any time t, bt moves close to the steady state value $\bar{b}$. The second figure displays [(1+r) +(1+g)]>1 or r>g, it depicts unstable steady state. The debt /GDP ratio moves towards bt. The value is $\bar{b}$ over time for any starting value of bt other than $\bar{b}$ the steady state value itself. It is [(1+r) + (1+g)]>0 if r>-1 and g>-1.

The second figure indicates that economy could settle at a debt/GDP ratio which is constant at $\bar{b}$ .The constant debt/ GDP ratio is not problem for economist. But the constant value of debt/GDP leads to non- repayment of debt. The debt/ GDP ratio will tend towards $\bar{b}$, bt- $\bar{b}$. It means government is not paying the principle sum of debt borrowed. The figure also shows that r>g, it means Debt/GDP ratio increases. The debt will be larger than GDP and when the debt is larger, the entire GDP is insufficient to pay the interest on debt. Government becomes bankrupt in this case. Further loans are denied by all the government and various international institutions. The results is in conformity with the recent trend in Indian public finance where the high interest rate fuelled the accumulation of more debt; through increase in interest payments and the consequent debt-deficit spiral (Chakraborty, L.S.,2002). From the above discussion, it can be concluded that if the government increases taxes above its expenditure and use revenue to first pay off the existing government debt and then purchase financial assets from the private sector.

For primary deficit to be positive, government must accumulate enough assets. This can be done by running the average value of $\bar{b}$. But government should find the alternatives and raise enough revenue to service the interest on it.

Under balance budget, government set close to zero fiscal deficit. If (G-T)+rB=0, the rate of interest on debt is rB>0 positive we must have (G-T)<0, the government has a primary surplus . It is expressed as follows -

Figure 5.5 shows that if the government continues to have primary surplus the debt/GDP ratio is b*. It can repay debt eventually. It can accumulate a stock of positive assets /GDP as $\bar{b}$.

Figure 5.6 explains government has primary surplus. The debt /GDP ratio of b* diverge away from the steady state debt/GDP ratio of $\bar{b}$. If $\bar{b}$ is positive, the government manages debt/GDP ratio to its steady state value. Government will never pay the debt $\bar{b}$ raised. It is not solved here. At b*<$\bar{b}$, government gets of debt. It accumulates more assets at increasing debt.

Figure 5.5 Repayment of government debt over time

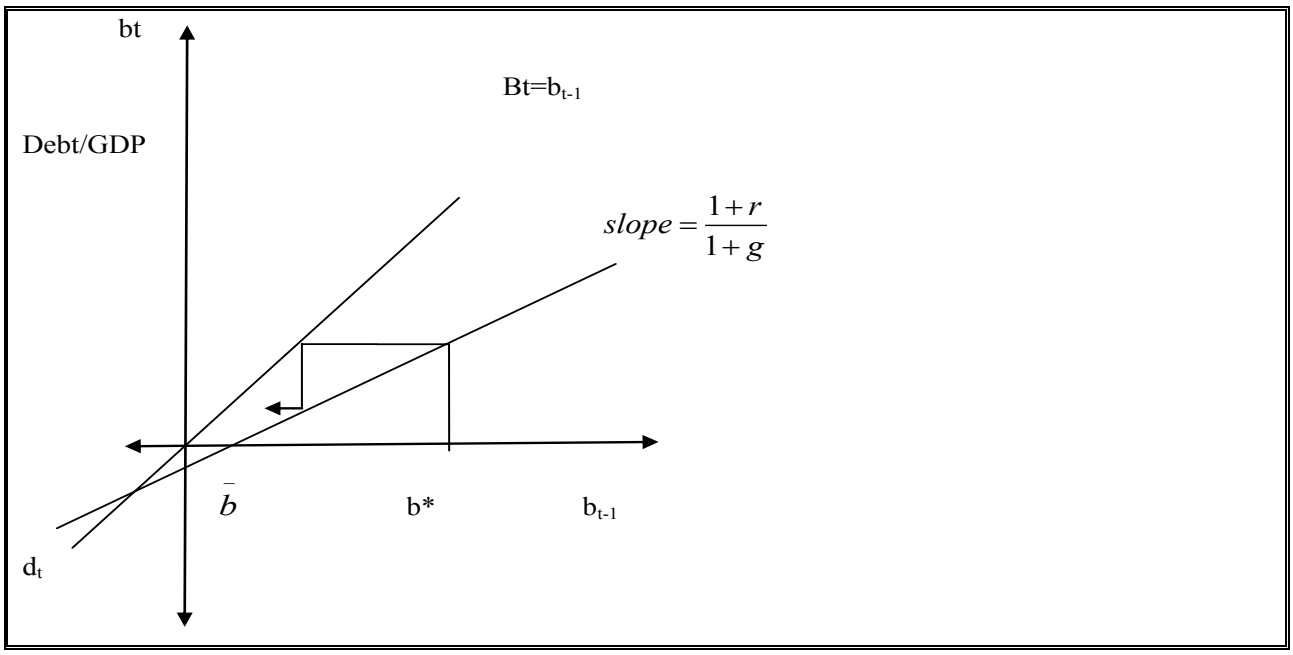
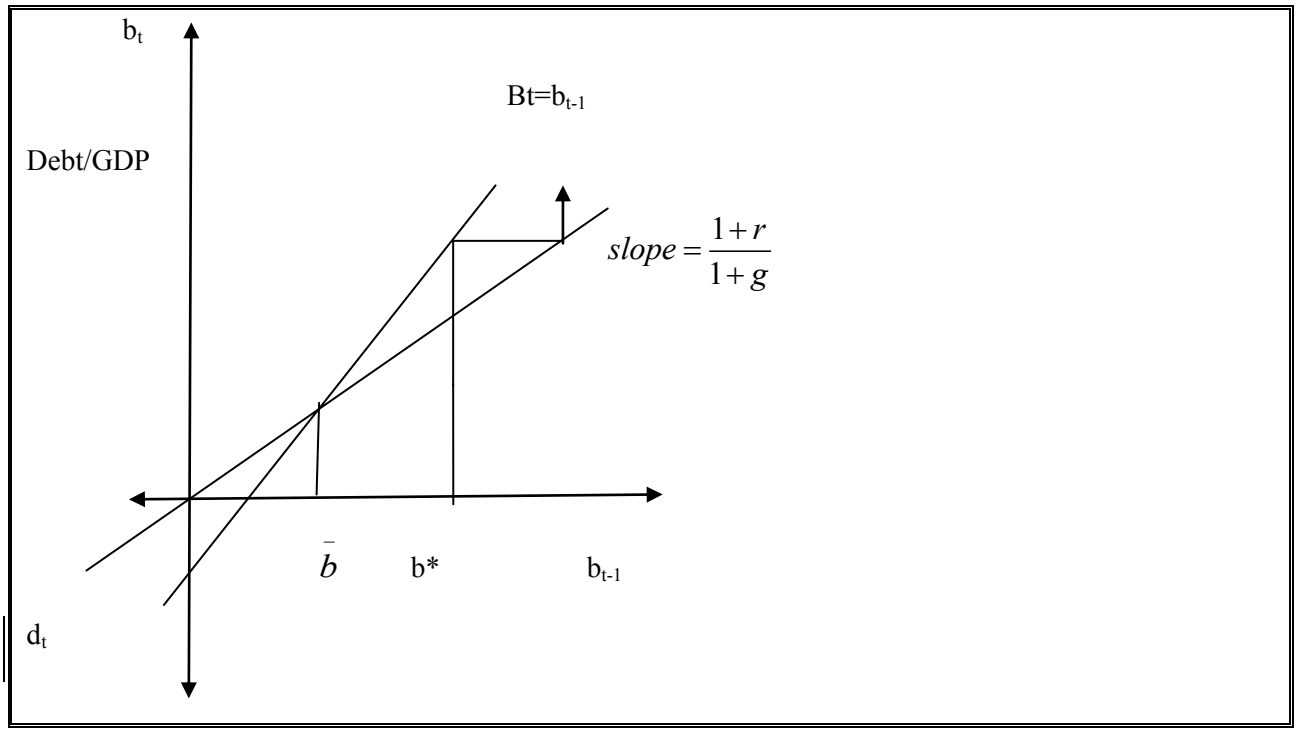


Figure 5.6 Government assets with rising debt



Debt management policy should ensure that the states can borrow on terms comparable to those of the centre, so that the spread of interest rates between the debt of the centre and the states is reduced (Chakraborty, P., 2005). Another study shows that, India's public deficit bias and indebtedness cannot be sustained much longer especially with stepped up external liberalization. Thus, there is a strong case for adopting fiscal responsibility legislation that involves, a high degree of transparency, well designed fiscal policy rules at the national and sub-national levels of government, short run contingency measures and a multiyear macro budgetary process, an institutional framework for implementation of rules and appropriate preparation and sequencing including the phase in of supporting structural reforms (Kopits G., 2001).

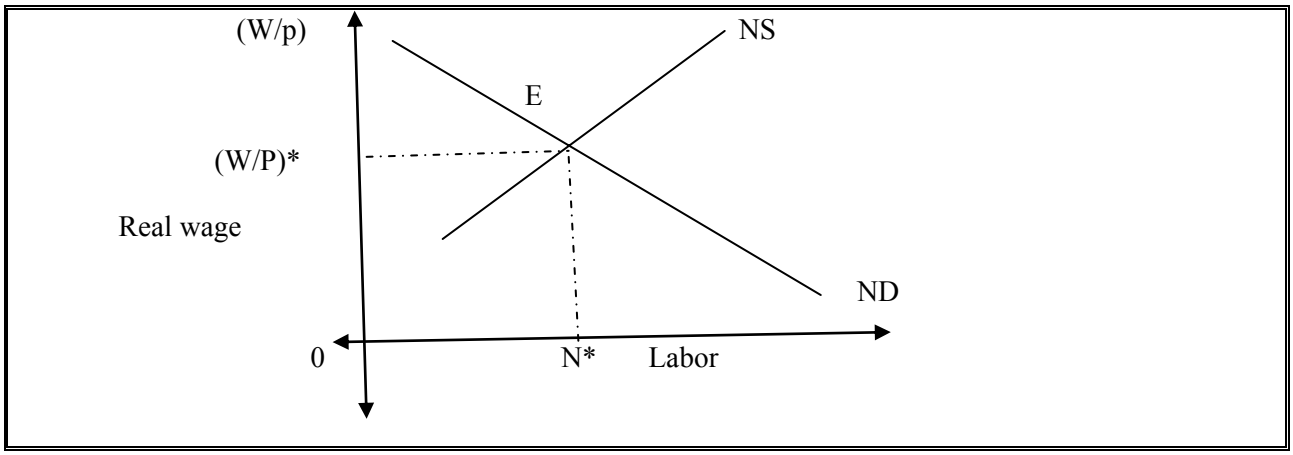
5.4 Rational expectation

Every person is economical by nature. Such an economic agent does not know the future with certainty and therefore has to base his/her plans and decisions including the price setting or forecasts or expectations for the future. Such expectations about the future are made up of a rational fashion. The economic agents use all the available information to come out with best possible forecasts. In this chapter, real business cycles and rational expectation model is explained. Both models explain that economic fluctuations are caused entirely by real shocks such as crop failure, change in prices and global recession that hit the economy negatively. The change in prices and output for markets is always in equilibrium.

The Fraction less neoclassical model of the labor market

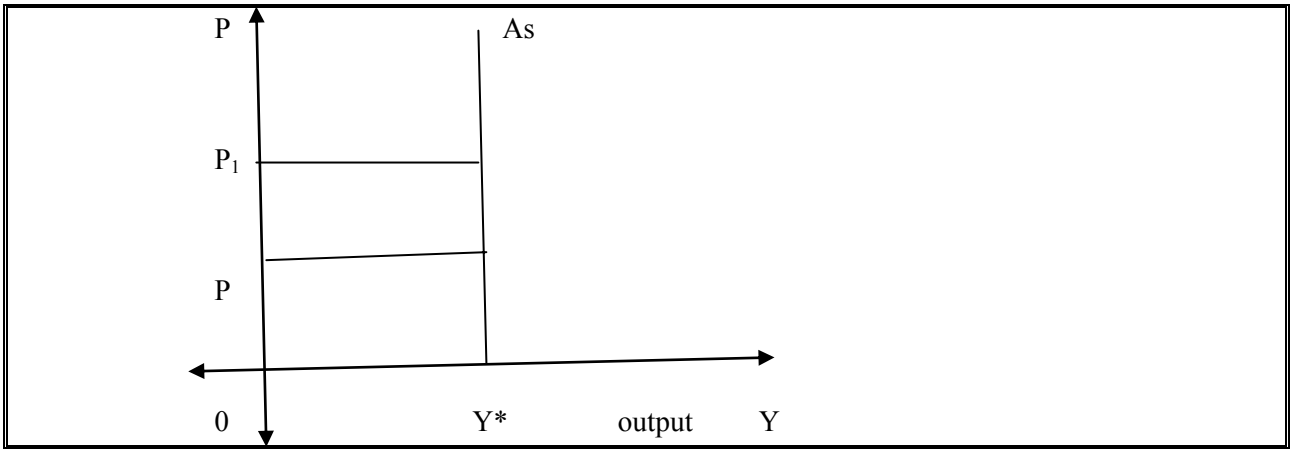
The demand and supply of labor depends on the real wage. The real wage W/P, is the ratio of the wage rate (w) to the price level (p) or the amount of goods that can be bought with an hour of work (w/p). The diagram shows that the ND is labor demand. At lower real wage firms want to hire more labor. The labor supply and demand intersect at point E. The upward sloping supply curve shows that the (NS) more labors are supplied at higher real wage. The firms are competitive and they are willing to pay real wage equal to the value of the marginal product of labor. Firms' capital stock is fixed in the short run but in the long run firms can increase the capital stock. But in the short run, the marginal productivity of workers does not change. If more workers are added in the short run then marginal productivity declines. It is because additional workers will have low machines to produce output. Thus, marginal productivity of labor declines in the short run. Hence, firms employ labor where marginal productivity of labor is equal to real wage. They employ labor if the real wage is lower and the demand curve for labor is downward sloping.

Figure 5.7 Equilibrium of real wage and labor market



The supply curve shows that laborers are ready to work more when there is real wage rise. As the real wage rises more workers come into the labor force to seek work. But the aggregate supply curve could be completely inelastic if the amount of labor supplied in sensitive to the real wage. In figure 5.7 N* is a full employment level. The firm employs labor up to N* with (w/p)* real wage. In the frictionless neoclassical model, there is assumed to be a full employment level. This is about labor only. But output is also produced at Y* where all the existing factors of production are used. All the capital stock, land, raw material is fully used with labor stock N*. In figure 5.8, the output and price level is shown.

Figure 5.8 Output and price level in economy



There is initial equilibrium of price level and wage in the economy. But as the price level changes from P to P1 then, wage rate is also changes. It changes in proportion with price. The real wage and output remains unchanged. Therefore the aggregate supply curve is a vertical line.

Therefore in the fraction less neoclassical model, aggregate supply explains that the unemployment is always at the natural rate, output always at the full employment level and any unemployment is purely fractional. Thus change in money stock changes the price level, leave output and employment unchanged. The money wages rise but the real wages remain same. The labor supply and demand does not change in the model.

5.4.1 Market clearing Approach: Lucas supply curve

The great economist Robert Lucas has given the theory of rational expectation. He explains that the markets are clear and the expectations are rational. He changed the fractional neoclassical model slightly and assumed that, some people do not know the aggregate price level, but do know the absolute wage or price at which they buy and sell commodities. The workers do not know the real wage. They only know the price level. Therefore they divide the price level and wage. It clearly gives them the amount of money which buys the goods from their wage. At the given real wage rate, w/p *, the firm does not know much work to be done. But both workers and firm expect the price level to change that is pe. Figure5.9 shows that the labor supply is Ns*. The level of full employment is N* at wage rate w*. The equilibrium of real wage can be defined as -

$(W/P)^*=(W^*/P^e)$

It is possible that workers do not know the price. The firms are also not informing them. For the firms if the price exceeds the expected price level i.e p>pe then firms demand more labor. This is because actual price level is P and nominal wage is W0. The real wage is (W0/p). It is lower than nominal wage say w0. The real wage is w0/p. it is lower than the same nominal wage and pe. That is p>pe,(W0/P<w0/Pe).

Figure 5.9 Nominal wage and labor supply and demand

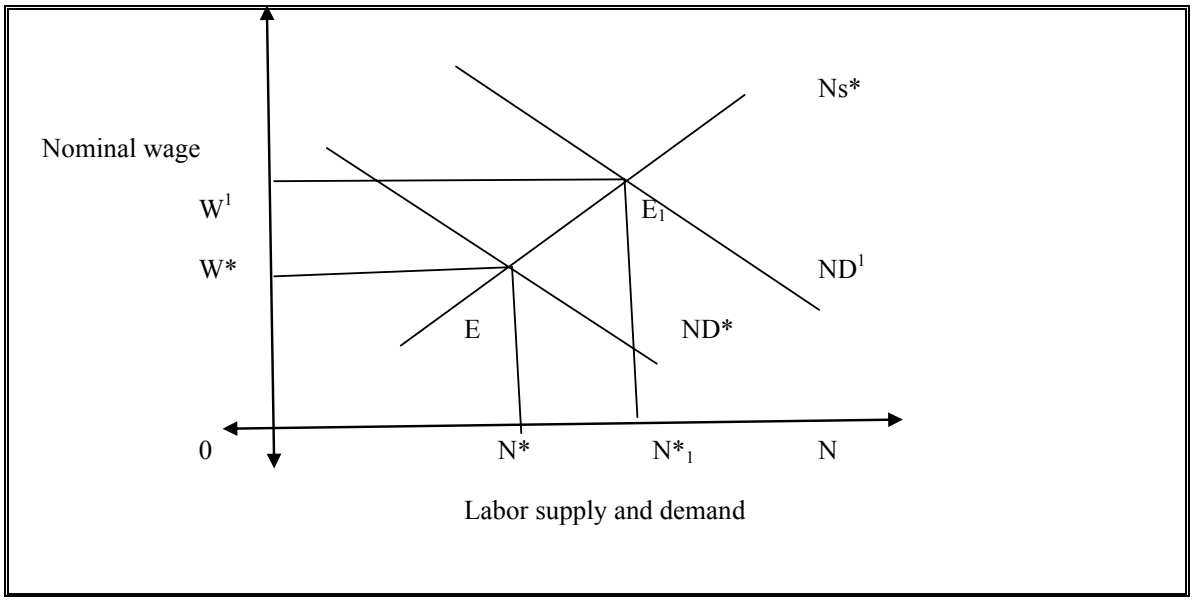


Figure 5.9 speculates that firms know the price level which is greater than actual price level P>Pe. Therefore, labor demand shifts to ND1. The nominal wage rises from N to N*1as per the figure.

Consequently, under imperfect information of the workers, a rise in the price level lead to an increase in the level of employment and finally, the output. Now we can show exactly inverse of the above condition. The firm predicts that the actual price level below the expected price level. In this case, employed workers demand shift left from ND^1 to ND*.

Employment and output falls. It is possible that firms and workers differ on the available information. Workers are careful about the real wage. If the real wage is higher than price level, output will not increase. It means the demand for the production in a given market is affected by increase in aggregate demand or the aggregate price level.

5.4.2 Lucas supply Curve

Following adjustments are given in price, output and wage.

Table 5.1 Adjustments of prices, output and wages

Price, output and wage	Under predicted	Correctly predicted	Over predicted
P/Pe price level	Increase	Equilibrium	Decrease
(w/p)/(w/p)* real wage	Decrease	Equilibrium	Increase
Y/Y* , output	increase	Equilibrium	Decrease

If the demand for firms' product increases then workers demand of their services also increases. Therefore, the demand of employment shifts.

The Lucas supply cure is given as $Y = \psi \frac{P}{P_e}$ (5.15)

Where P/P_e , price and expected price ratio.

The Lucas supply curve explains that the amount of output firms is willing to supply increases as the ratio of the actual to the expected price level increases. It is P/P_e

The table shows that if the predicted price level is too high, then the actual price level is below the expected price level. The actual real wage turns out to be too high for full employment and the level of output will be below the full employment level. Lucas supply curve and aggregate demand supply is given as follows.

The aggregate demand curve is given as -

$$P = \frac{\beta \bar{M}}{Y - r\bar{A}} \quad (5.16)$$

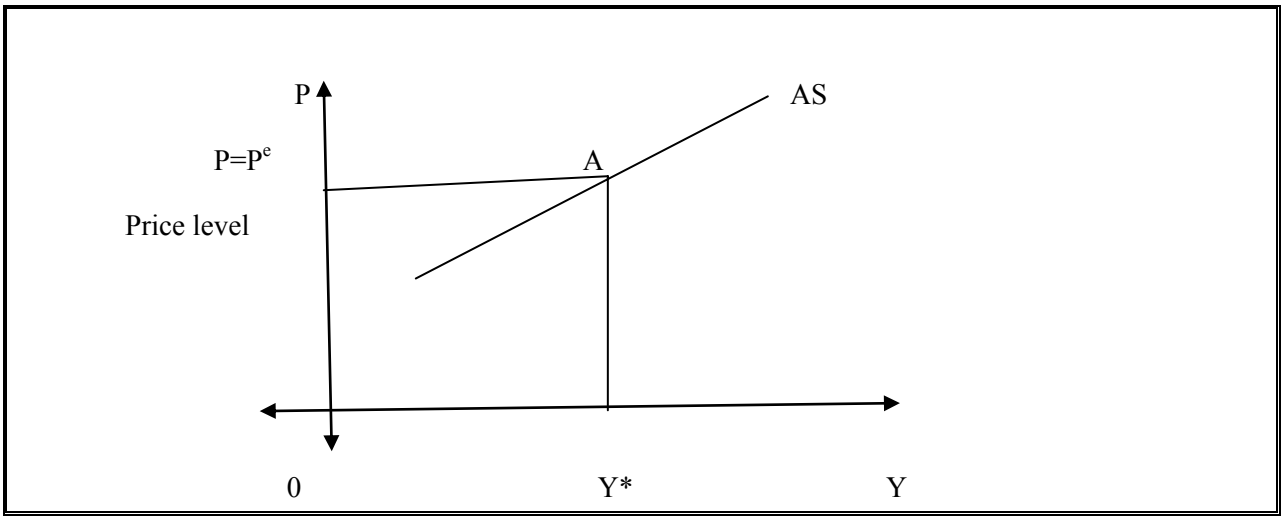
Where

M: Money supply

Y: Income

$r\bar{A}$ =Rate of interest on assets

Figure 5.10 Price level and income effect



The Lucas model has linked the aggregate supply and demand curve with the rational expectations. People use all relevant information informing expectations of economic variables. If we assume that people do not make error then P=Pe and the output is expected to be at the full employment level Y*. The price level must be equilibrium where AD=AS. People expect full employment and Y=Y*. Therefore actual wage rate is equal to the real wage rate. Therefore people do not make systematic errors.

People also predict the money stock. It is assumed as the Me. The predicted price level is Pe. So,

$$\overset{e}{P} = \frac{\beta M^{e}}{Y^{*} - r\bar{A}} \tag{5.17}$$

Therefore, equation (5.15) is used for price and expected price prediction. Now we have to see the different possibilities with increase in money supply and change in aggregate demand and supply curve.

Figure 5.11 Price level and anticipated, unanticipated money

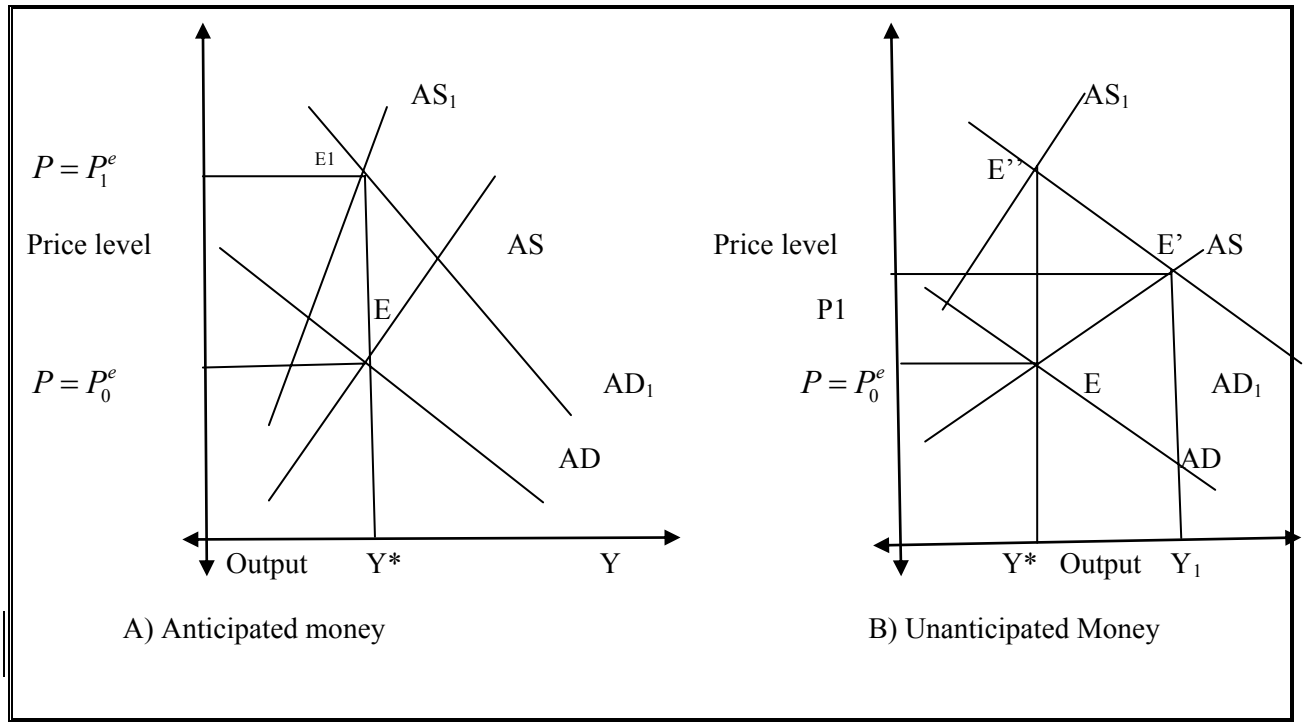


Diagram "A" in figure 5.11 shows that the price level and expected price is at equilibrium e. Suppose there is a change in money supply then the aggregate demand curve shifts upward. But Pe increases with same proportion of rise in money stock. The output remains unchanged. At new equilibrium E1, the price level is P equal to expected price level P= P_1^e . The workers and firms know that that the money stock and aggregate demand going to increase on proportion with $P_1^e = P_0^e$. The nominal wage increases and the real wage remain same. As we have observed in the classical case, there is nominal effect on wages and prices.

The diagram "B" explains that change in money stock causes the aggregate demand to shift to AD1. At new equilibrium, workers do not expect to rise in price level. So, aggregate supply does not shift upward. The new equilibrium is achieved at E'. Hence, the actual prices increases P> P_0^e above expected price level. The outcome increases from Y* to Y1. But under rational expectation hypothesis, the point E does not remain last and the prices are above expectation instead of rise in output. As a result, the firms, households, workers revise their expectation or forecast it. They revise their price expectations of P_1^e . Thus, AS curve shifts to AS1. The effect of money supply does not remain effective forever. It soon reflected in prices. Money is natural in the long run. The change in money supply is used as new information tool to calculate price and wages. Expectations play an important part in the working of an economy. If a theory takes them to be exogenous, not a lot can be explained and forecasts are hardly possible because the given expectations are liable to change at any instant (Felderer and Homburg, 1992).

5.4.3 Criticism:

Lucas model is almost similar like the classical model. It assumes that fiscal and monetary policy is ineffective. In the long run, the income real prices and wages remain unchanged. Economy remains at full employment level. There is full employment then if agents make the mistakes and government announces the new statistics where market clears and full employment can be achieved. There is no need of either fiscal or monetary policy for full employment. This approach is confusing to an economic agent. Sometimes agents only follow the governments and policy makers.

5.5 The New Keynesian alterative

The new Keynesian macroeconomics explains about the contracting approach to counter the Lucas curve. Such approach also starts from the labor market and the frictionless neoclassical model. The model assumes that wages of workers are fixed by contract at the beginning of a period, while the prices of goods may change within the period.

Firms fix the wage which makes the equilibrium in the labor market and the frictionless neoclassical model. The model assumes that wage of workers are fixed by contract at the beginning of a period. The prices of goods may change within each period.

Firms fix the wage which makes the equilibrium in the labor market. They fix the nominal wage. They will be equal to real wage (W/P)* in the long run. The P^e is the expected price level. Therefore,

$$(W_n / P^e) = (W / P)^* \tag{5.18}$$

It means expected prices are equal to the actual price level. The wage set equal to real wage. If we assume that real wage is equal to $(W/P)^*$ to the V* then the nominal wage is

$$W_n = V^* P^e \tag{5.19}$$

If the wage set by firm they produce for the market. Therefore firm will produce more to real wage. Thus, in the short run aggregate supply curve is

$$Y=f(p/Wn) \tag{5.20}$$

Where, Wn is substituted from above equation

$$Y=f(P/V^*P^e) \tag{5.21}$$

It means that income is also equal to change in price and expected price level. This approach also implies that the anticipated changes in money stock have real effects on output while unanticipated changes are not. The above approach explains that contracts are not signed for one period. They are not renegotiated at the same time. The prices adjust slowly in economy. The supply curve shifts slowly. Sometimes old contracts are negotiated. Monetary policy allows change in output for years and there are some contracts live longer in economy.

5.6 Ricardian equivalence

Government expenditure is financed by raising tax revenue. Increase in government expenditure increases the consumption expenditure. It is $C_1 \Delta Y$. The consumption expenditure may decline as the tax increases. It further reduces the disposable income which is available for spending.

If the government expenditure is tax financed then

$$\Delta Y = \Delta G + C_1 \Delta (Y - T)$$
$$= \Delta G + C_1 \Delta Y - C_1 \Delta G$$

Or

$$\Delta Y(1 - C_1) = \Delta G + (1 - C_1)$$

Or

$$\Delta Y|_{tax} = \Delta G < \frac{\Delta G}{1 - C_1} = \Delta Y|_{bonds} \tag{5.22}$$

The IS curve shifts right when there is large bond than tax financing. Bond financing does not reduce disposable income. The tax reduces disposable income and lowers aggregate expenditure. The Ricardian equivalence is named after the classical economist David Ricardo (1772-1823). He argued that the impact on real income is the same whatever government expenditure is tax financed or bond financed. The IS curve shifts left whether government follows the tax or bond financing. Due to high expenditure, government issues bonds and increases the expenditure. It pays interest on bonds in future. Therefore, government substitutes the current tax that it could have imposed to finance it expenditure with future tax. The individuals are self- motivated and attempt to maximize his or her profit. They save more and reduce taxes. Saving will be used to increase in tax. Therefore, individuals save money which is equivalent to the increase in future tax.

The Ricardian equivalence is based on two assumptions -

1. Individuals are forward looking and they have perfect foresight
2. The government budget is inter temporally balanced

When government finances its expenditure by selling bonds, households recognize that it is a balanced budget. There will be more taxes in future to pay back the borrowing on the bonds sold today. Therefore, present burden of taxes is current taxes plus the present value of taxes in the future. It is required to pay the interest on current bond sales. Government pays an interest on them.

Market price for bonds is $P_B = \frac{1}{i}$

If ΔB be the number of bonds sold to finance the increased government expenditure then nominal value of bonds is

Value of bonds = $P_B \Delta B = \frac{\Delta B}{i}$ (5.23)

The annual interest payments on the bond sold will be $i = (\frac{\Delta B}{i})\Delta B$

Government pays interest on bonds in each period. Such payments increase the taxes. Therefore,

Pv (future taxes) = PV (interest payment)

$$= \frac{\Delta B}{(1+i)} + \frac{\Delta B}{(1+i)^2}$$

$$= \frac{\Delta B}{i} \quad (5.24)$$

The real present value of implied future taxes will then be $= \frac{\Delta B}{ip}$. The current period tax burden on individuals who have perfect foresight and realize the inter-temporal nature of the budget, individual follow the proposition of RE

$$T_{RE} = T\frac{\Delta B}{ip} \quad (5.25)$$

Current expenditure is financed by current taxes and the real value of debt issued to finance current expenditure as given by

$$\frac{P_B \Delta B}{p} = \frac{\Delta B}{ip} \tag{5.26}$$

The current period budget constraint of the government can then be written as

$$G = T + \frac{\Delta B}{ip} \tag{5.27}$$

Right hand side is current period tax burden experienced by people.

It is further stated as

$$Y_{RE}^{d} = Y - T_{RE} = Y - G \tag{5.28}$$

The current burden of the government is the current taxed levied, T which affects the amount of disposable income in the hands of individuals. In the Ricardian approach, the current burden of government by contrast is the goods and services it absorbs.

Goods market equilibrium is given as -

$$
\begin{aligned}
&Y = C + I + G \\
&= C_0 + C_1(Y - G) - C_2(i - \Pi^e) + a - b(i - \Pi^e) + G \\
&Y(1 - C_1) = C_0 + G(1 - C_1) - C_2(1 - \Pi^e) + a - b(i - \Pi^e)
\end{aligned}
\tag{5.29}
$$

It leads to two propositions -

I) Increase in expenditure is financed by government through taxes or bonds

Therefore,

$$
\begin{aligned}
&\frac{\Delta Y}{\Delta G} = \frac{1 - C_1}{1 - C_1} = 1 \\
&\Delta Y = \Delta G
\end{aligned}
\tag{5.30}
$$

The IS curve under RE effect will shift the same distance irrespective of government expenditure on tax or bond financed. It is because bond sales impose the same burden on individuals as the taxes that would have been imposed in their place.

II) A tax cut financed by bonds sales has no effect on output.

The bond sales in present have the effect on future taxes. They will have to be levied to pay back the interest the bonds.

The present value of higher taxes is equal to the present tax cut

The disposable income can again be defined as

$$Y^d = Y - T = C + S \tag{5.31}$$
$$S = Y - C - T$$

Under RE,
$$C = C(Y - G, i - \Pi^e) \tag{5.32}$$
$$S = Y - C(Y - G, i - \Pi^e) - T$$

G unchanged when, current taxes are substituted by debt.
$\Delta S = -\Delta T$

The taxes have equal and opposite effect on saving. Tax cut increases disposable income by the amount $(Y - \Delta T)$ and a fraction $C_1(Y - \Delta T)$ of this is spent by individual and IS shift upwards. RE approach explains that when government dis-saves, the private sector saves and aggregate savings in an economy do not alter much. People save to pay for the anticipated higher taxes in the future when the government dis-saves.

5.6.1 Criticisms

1. Ricardian Equivalence (RE) gives people more freedom to look ahead in future. People are short sighted. There is no fixed time and future time is not given. Most of the households struggle to satisfy their minimum credit needs than long term adjustments.
2. RE is true to a certain extent, consumers may cut high consumption. They reduce it with available credit.
3. In India, financial system is under developed. People do not know much about bond financing.
4. However though individuals may not have perfect insight, they are forward looking as any policymaker who is smart realizes fast on the job. Individuals anticipate policy, figure out if they are credible and take offsetting action if necessary.

5.7 Search and matching model

In the global world, the jobs and employment skills are always changing. The global production methods decide the types of production. The sectors in the economy are heterogeneous and workers and firms will try to match their needs and skills. Sometimes training is given to fulfill the needs. But such efforts are not enough in changing the world. The wages and employment respond with shock often resulting in loss of jobs.

5.7.1 The Model

The employed workers in the economy are defined as E and unemployed as U. The numbers of jobs filled are F and vacant posts are V; making E equal to F. The labor force is fixed at I. Thus,

$$E + U = \bar{L} \tag{5.33}$$

There is fixed cost of c per unit time. However of maintaining a job, C can be thought of as reflecting the cost of capital.

Workers producing output at rate A per unit time and he is paid wage w per unit time. Therefore A>C, w is determined exogenously. Suppose costs of efforts and job search are ignored then workers utility per time is w if employed and 0 if unemployed.

Therefore, profit per unit of time is A-W-C, if it is filled and c if it is vacant. Workers aim at discounted value of lifetime profits. The discounted rate is r and it is exogenous and constant. The positive level of unemployment and vacancies can co-exist without being immediately eliminated by hiring. The unemployment and vacancies assumed to yield a flow of new jobs at the same rate per unit time.

M=M (U,V)

$$= KU^{\beta}V^{r} \; 0 \le \beta \le 1 \; 0 \le r \le 1 \tag{5.34}$$

The above equation shows a complicated process of employer recruitment workers search and mutual evaluation, when it exhibits as $(\beta + r > 1)$. There are thick market effects. Increasing the level of search makes the matching process operate more effectively. It yields more output per input. When there is matching function it is decreasing returns $(\beta + r < 1)$, there is crowding out effect. Such crowding out is observed in IS-LM model with expansionary fiscal policy.

The dynamics of the number of employed workers is given by $E = M(UV) - bE$. The steady state must focus M and E as

$$M = (U,V) = bE \tag{5.35}$$

a denotes the rate of per unit time that unemployed workers find jobs and the rate per unit time that vacant jobs are filled , a and α given by

$$a = \frac{M(U,V)}{U}$$

$$\alpha = \frac{M(U,V)}{V}$$

The return on being employed is divided of as w per unit time minus the probability b per unit time of a capital loss of VE-VU

Thus

$$rV_E = w - b$$

The r is interest rate, similarly

$$rV_F = (A - w - c(V_F - V_V)$$

$$rV_u = a(V_E - V_U)$$

$$rV_U = -c + \alpha(V_F - V_V) \tag{5.36}$$

When an unemployed worker and a firm with a vacancy meet they must choose a wage. It must be high enough that the worker wants to work. Both workers and firm do not find a replacement. These requirements do not uniquely determine the wage. The range of wages determines who is better off to them when they meet. Both should be set the same wage as given

VE-VU=VF-VV (5.37)

Here new vacancies can be created and the value of vacancy cannot be zero. The labor supply is perfectly inelastic at $\bar{L}$ and labor demand is perfectly elastic at A-C. Since A-C>0, there is full employment at this wage. Shift in labor demand changes in A and leads to immediate changes in the wage and leaves employment unchanged.

5.7.2 Solving the model

Suppose there is full employment (E) and the value of vacancy (VV) at initial level VV is zero, then

the wage determination and value of vacancy given a and α as -

$$V_E - V_U = \frac{w}{a+b+r} \tag{5.38}$$

Also implies

$$V_F - V_V = \frac{A-w}{\alpha+b+r} \tag{5.39}$$

If $V_E - V_V$ and $V_F - V_V$ are equal then

$$\frac{w}{a+b+r} = \frac{A-w}{\alpha+b+r}$$

Solving this condition for w yields

$$w = \frac{(a+b+r)A}{a+\alpha+2b+2r} \tag{5.40}$$

When a and α are equal, the firm and the workers divide the outcome from the job equally. When a exceeds α, workers can find new jobs more rapidly than firms can find new employers and so more than half of the output goes to the workers. When α a reverse exceeds occur.

The value of vacancy is $rV_V = -C + \alpha(V_F - V_v)$. Therefore, VF-VV gives

$$rV_V = -C + \alpha\frac{A-W}{\alpha+b+r} \tag{5.41}$$

Substituting values in the above we get

$$rV_V = -C + \alpha\frac{A - \frac{a+b+r}{a+\alpha+2b+2r}A}{\alpha+b+r}$$

$$= -C + \frac{\alpha}{a + \alpha + 2b + 2r} A \tag{5.42}$$

The above equation express rVv in terms of C, A, rb, a and α. A and α are endogenous. The fact that a=M (U, V)/U that M=bE and $E + U = \bar{Z}$.

It implies

$$a = \frac{bE}{\bar{L} - E}$$

Similarly

$$\alpha = \frac{M(U,V)}{V} \tag{5.43}$$

We need to express M (U, V) and V in terms of E. In steady state M (U, V) equal bE. It implies

$$bE = kU^{\beta}V^{r}$$

Or

$$V = \left(\frac{bE}{kU^{\beta}} \right)^{1+r}$$

$$= \left(\frac{bE}{k(L-E)^{\beta}} \right)^{1+r} \tag{5.44}$$

Substituting this expression and the fact that M (UV) equals bE into the above equation

$$\alpha = \frac{bE}{\left(\frac{bE}{k(\bar{L}-E)^{\beta}} \right)^{1/\gamma}}$$

$$= K^{1/\gamma}(bE)^{(r-1)/r}(\bar{L}-E)^{\beta/r} \tag{5.45}$$

The above equation implies that a is increasing in E and that α is decreasing. rVv is a decreasing function of E. As E approaches $\bar{L}$ a approaches infinity and a approaches 0 hence rVv approaches c. Similarly as E approaches 0, a approaches 0 and α. Thus, in this case rVv approaches A-C which we have assumed to be positive Π. The equilibrium level of employment is determined by the intersection of the rVv locus with the free entry condition, which implies rVv=0.

Imposing this condition on yields -

$$-c + \frac{\alpha(E)}{a(E)+\alpha(E)+2b+2r} A = 0 \tag{5.46}$$

Where the function a(E) and $a(E)$ are given in the above equation . This expression implicitly defines E and thus completes the solution of the model.

Impact of shift in labor demand

Figure 5.12 Labor demands in economy

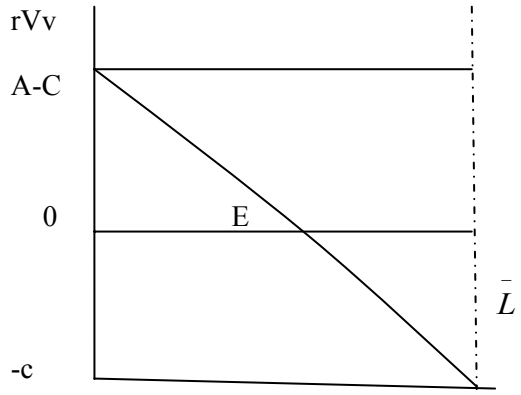


Figure 5.12 illustrates that if A and C changes in the same proportion, the value of E for which the condition holds does not change. Thus the model implies that long run productivity growth does not affect employment. It means α and a do not change and thereby the wage changes by the same proportion.

Figure 5.13 Equilibrium of employment in the search and matching model.

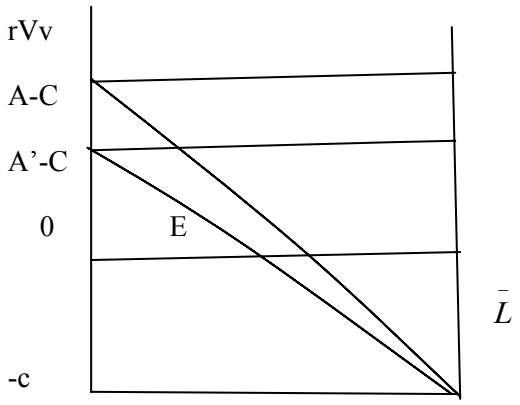


Figure 5.13 displays that equilibrium falls. In a Walarasian market in contrast, employment is changed at $\bar{L}$ institutively in the absence of a frictionless market, workers are not available at less cost as per the prevailing wage. The decline in A with C fixed raises firms costs of searching for workers relative to the profits they obtain when they find one. Thus the number of firms and employment falls. Effects of a fall in labor demand in search and matching model.

In the above equation M (V, U) equals bE in steady state implies that steady state vacancies are $(bE/K)^{1/r}/(\bar{L}-E)^{\beta/r}$. Thus the decline in A and the resulting decrease in the number of firms reduces vacancies. The model therefore implies a negative relation between unemployment and vacancies a Beveridge Curve. When E falls and it causes a to fall and α to rise. When unemployment is higher, workers cannot find jobs as early as before and firms can fill positions more rapidly.

The firms wherein positions are filled to discharge their workers stock, the reduced attractiveness of hiring in contrast causes Vv to fall. Thus, there is exit and as a result discontinuous drop in V. This could take the form of some firms with opening stopping their attempts to fill them. With employment and unemployment the same as before but vacancies lower. The flows into unemployment exceed the outflows and so unemployment rises. Thus the fall in A leads only to a gradual rise in unemployment. Finally unemployment rises, the value of vacancy would rise if vacancies did not change, thus vacancies must rise as unemployment rises. This implies that the initial drop in V exceeds its steady state response that is there is overshooting. A temporary change in A leads to smaller employment responses. The value of filled job is clearly higher than A is temporarily low than when it is permanently low. Thus there is a smaller fall in the number of vacancies and hence a smaller rise in unemployment. But since the matching process is not instantaneous unemployment remains above normal for a time after A return to its initial value. Thus, labor market frictions create channels that make the effects of a shock more persistent. In extreme cases of an infinitesimally brief decline AVv and Vu are unaffected. In case firms and workers simply share the loss equally by reducing the wage by half the amount that A falls and there is no impact on employment or unemployment.

7.3 Criticism

This model does not explain the critical changes that impact a cyclical shift in labor demand. They are divided between employment and wages. According to Walarasian case labor market adjust immediately to a change in A. But with frictions, both permanent and temporary changes in a trigger complicated adjustment processes for vacancies, unemployment and wages.

5.8 Implicit contracts

Sometime there are long term relationships of firms and workers. Firms do not hire new workers each time. This is mainly because of training cost. The old workers are more efficient than new ones. Some workers are skilled for particular jobs. They cannot leave the firm or the firm cannot afford to leave them. It is a long term attachments and arrangements. Such long term contracts do not require firms to set wages. The workers remain in the job for the long period to obtain a higher income. Some workers learn and get experience. It makes workers more competitive equally in other firms. Therefore, they get experience or learn the new methods of production; current wage is not given much importance.

5.8.1 The Model

The firm always makes a profit after payment of wages

$$\Pi = AF(L) - wL \tag{5.47}$$

Where

L: Quantity of labor the firms employ

W: Real wages

A: Factor that shifts the profit function

We assume only single period and A is random. Then workers decide whether to work for the firm or not. They consider the expected utility they obtain in the single period. Their hours and income varies with response to fluctuations in A.

If A is distributed directly then the k possible values of A indexed by I, Pi denotes the probability that A=Ai. Therefore firms profit is

$$E(\Pi) = \sum_{i=1}^{k} Pi(AiF(Li) - WiLi) \tag{5.48}$$

Where

Li: Quantity of labor

Wi: Real wage

We consider A=Ai, the firm maximizes profit and risk is natural. Each worker is assumed to work the same amount. The representative workers utility is

U=U(c.)-V(L) (5.49)

Where

U: Given utility from consumption

V: Disutility from working

Utility is negative and workers are risk averse

Workers consumption is assumed to equal their labor income, wL. Workers do not have insurance against employment and wage fluctuations. Some workers have information of wage in rival firm.

The workers expected utility from current job is

$$E(u) = \sum_{i=1}^{k} Pi(U(Ci) - V(Li)) \tag{5.50}$$

There is some expected utility and workers must attain to be willing to work for the firm. There is no mobility if there is contract between workers and firm. At the time of contract, only average level of utility is offered. It is not what individuals expect.

5.8.2 Wage contract

Firm decides the contract with workers. Under contracts, real wage and rigidity arise immediately. The fall in demand for labor causes the firms to reduce employment at the fixed real wage while labor supply does not shift and thus creates unemployment, the cost of labor does not respond because by assumption, the real wage is fixed. But it is not practical. The wages are fixed and firms choose employment. The marginal productivity of labor is fixed. The employment varies with A and marginal disutility of workers depends on A. Sometimes, marginal product of labor in generally is not equal to the marginal disutility of work. In contrast, both parties should get better off. If the disutility of work is less, workers can work more and the workers and firms may get better off.

5.8.3 Efficient contracts

The implicit contract means actual contract does not explicitly specify employment and the wage is the function of state. The firms and workers do a contract and specify the wage and hours for each possible realization of A.

The assumptions are that the firms offer a worker at least minimum level of expected utility u0, but it is otherwise constrained. The Li and Wi determine Ci, we think of the firm's choice variable as L and C in each state rather than as L and W. The Lagrangian of the firm's problem is therefore,

$$\ell = \sum_{i=1}^{k} Pi(AiF(Li) - Ci) + \lambda(\{\sum_{i=1}^{k} P_i[U(C_i) - V(L_i)]\} - u_0)$$

1st order condition for Ci is

$$-Pi + \lambda PiU'(C_i) = 0$$

Or

$$U'(C_{i)} = \frac{1}{\lambda} \tag{5.51}$$

The above equation implies that the marginal utility of consumption is constant across state and thus that consumption is constant across states. Thus, the risk neutral firm fully insures the risk adverse workers.

The 1st order condition for Li is

$$P' AiF'(Li) = \lambda PiV'(Li) \tag{5.52}$$

The above equation implies

$\lambda = \frac{1}{U'}(C)$ where C is the constant level of consumption. Substituting this into above equation and dividing both sides by Pi yields

$$AiF'(Li) = \frac{V'(Li)}{U'(C)} \tag{5.53}$$

5.9 Insider –Outsider model

The approach explains that various types of labor turnover costs create rents and market power for incumbent workers in existing firms. They are called the insiders. It allows the insiders to push their wages above the market clearing wages without losing their jobs. Insiders are experienced incumbent employees whose positions are protected by labor turnover cost. Outsiders are taken to be unemployed. All firms from garments to the automobiles are doing such experiments regularly.

The firm has cost of hiring and firing labor. The hiring cost includes the costs of searching, screening, negotiating with and training newly hired workers. The firing costs include costly firing procedures and severance pay that are often part of job security legislation. The labor turnover costs arise when insider workers refuse to co-operate with outsiders. Outsiders try to get jobs by underbidding the wages of insiders. If outsiders' unemployed workers are ready to work at lower wage then insider workers will not cooperate. They will not co-operate to outsiders. It affects production and it may cause a decline in production. Therefore, firms will not employ the outsiders at low wage. But if the firm accepts it and employs workers at lower wage then outsider must see the working environment and conditions. Thus, if they are not given the lower wage and working condition certainly raises the cost of accepting employment.

5.9.1 Model

Let us understand that there are NI and NE labor. NI is insider labor and NE is outsiders. The (NI +NE) is total workforce for a firm. The demand for insider and outsider labor is downward sloping. For insider labor, the demand curve for labor is the sum of marginal product of labor MPN=F' plus the marginal cost of firing that labor MCF. The demand curve for the insider worker is marginal cost minus the marginal cost of hiring workers.

IDC=F'+MCF (5.54)

EDC=F'-MCH (5.56)

If there is no labor turn over cost then MCH=MCH=0 and the traditional demand curve for labor would be given by F, if we assume that WE=R means that wages of insiders is equal to their reservation wage.

The insiders get more wages because of insiders' wages and sum of the marginal cost of hiring and firing labor. WE+MCH+MCF. If the wage is less, then firm replaces outsiders with insiders.

Figure 5.14 Real wage, insider and outsider equilibrium

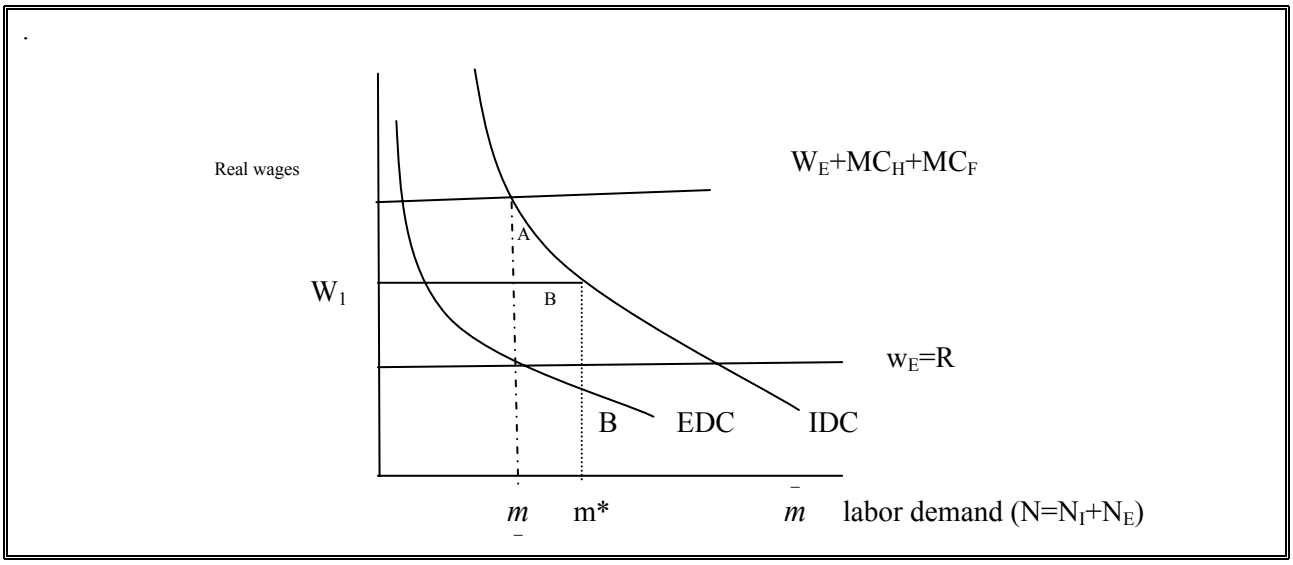


Figure 5.14 shows that M* is the insiders demand. The wage earned by them is W1. At this point, no outsiders are employed. At point B, the marginal productivity after deducting for labor turnover costs is below the entrant wage WE.

There are unemployed workers between $\bar{m}$ and $\bar{m}$. The hiring situation will occur when insiders in the firm are less than $\bar{m}$. The firm will hire more outsiders and fire insiders. This situation is greater than $\bar{m}$. The insiders will be fired even when they accept wages equivalent to outsiders. This is because their productivity is low and it is below WE. But it is inversely related when outsiders have more productivity.

Now we can see at the aggregate level, where aggregate demand is ND. It comprises as NI+NE. At labor demand m*, it is an aggregate labor demand.

5.9.2 Criticism

The insiders and outsiders' model fail to explain the new firm and their employment. They could hire unemployed workers. This would reduce the competitive wage. The IDC curve could shift back; sometimes firms operate in small size at different locations. It is not always the same units produced in terms of size, quality etc. Such heterogeneous production, skills, many does not affect firms much on the inside outside model. Labor market is dynamic, sometimes it automatically clears. Insiders have more favorable opportunities than outsiders; policies that create a more level playing field in the labor market can improve both efficiency and equity. This is so regardless of primary versus secondary sectors employed, unionized versus non-unionized workers and so on. The two policies i.e., power reducing policies and enfranchising policies create a more level playing field between insiders and outsiders. Power reducing policies such as restrictions on strikes and picketing; relaxing job security legislation are formulated. These policies are usually not Pareto improving since they tend to reduce insiders welfare. Thus the insider may resist these policies either through the political process or rent creating activities at the place of work. These insiders' responses will of course limit the effectiveness of the power reducing policies. Enfranchising policies often take the form of vocational training programs and job counseling for the unemployed profit sharing schemes. Schemes to convert wage claims into equity shares, employment voucher for the long term unemployment policies to reduce barriers to the entry of new firms (Lindbeck and Snower, 2002).

5.10 Real business cycle

Real business cycle means that the fluctuations in employment and output in the economy are results of variety of real shocks. Markets adjust with shocks and it remains in equilibrium in the long run. It is sometimes called boom and recession in the economy. When economy goes down, it is regularly reflected in the data when governments announces or publish reports. According to Keynesion view, government must intervene to smooth business cycle fluctuations. But monetary economists explain that government must not interfere in the economy and let market forces play the power to make equilibrium. There are three kinds of policies that is monetary, fiscal and exchange rate policy. All policies affect private demand consumption and investment spending. The supply side also affects the production side that is natural resources, climate change and technological innovations. The demand shocks may arise because of collapse of investor confidence due to domestic and international events, change in consumption spending, change in government expenditure and money supply. Figure 5.15 exhibits that if there are demand shocks then AD shifts to AD1. It results in decline in price P1 and output from Y0 to Y1 in panel C. The supply shocks are also observed. The AS curve shifts to AS1. The panel D shows the shift of aggregate output towards the left and new output is observed at Y2.

The supply side shocks in the real business cycle are as follows.

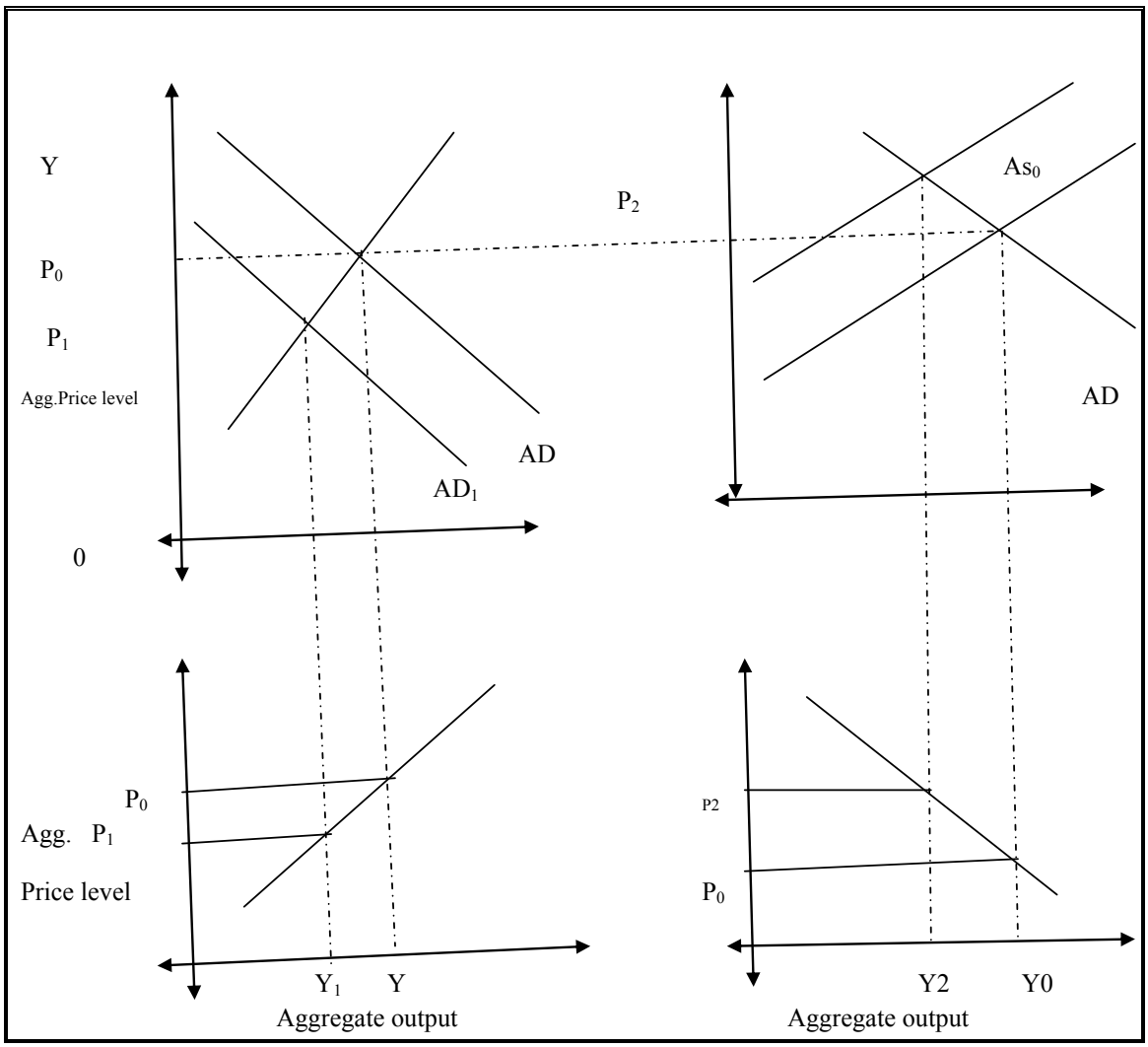
1. Un-favorable natural events adversely affect output in the economy. For example earthquakes, drought, floods etc.
2. Significant increase or decrease in the oil prices. They are highly volatile now.
3. War , political environment /instability , labor disputes disturb the production
4. Government imports export policy, imports quotas.

5. New techniques, innovations, capital and labor skill changes the productivity.

The supply side shocks are temporary in nature. The demand side shocks stressing productivity. These stem from technological progress and so real over nominal shocks.

But from the real business cycle, economic agents act to maximize their utility subject to production possibilities and resources constraints. In the economy the agent has a fixed utility function, consumption and leisure. The business cycle affects these three.

Figure 5.15 Effect of real business cycle on prices, employment and output



$$U = U(c, H - N_1 + \frac{U(c_{2H-N_2}}{1+P}$$

$$= \log C_1 + \beta \log(H - N_1) + \frac{\log C_2}{1+P} + \frac{\beta \log(H - N_1)}{1+P} \quad (5.57)$$

Where

H: Fixed time endowment of the individual

N: Labor supplied in time i

Therefore H-N=I is a leisure enjoyed by person "i" in time t. Here p is inter-temporal discount rate.

Each agent is rational and supply labor in economy.

The production is a function of capital and labor.

$$Y_t = F(K_{t,} N_t) = A_t K'_t - \alpha N_t^{\alpha} \tag{5.58}$$

Capital stock in the economy is fixed in the short run, Therefore the capital stock at time t is given as

$$K_{t+1} = (1-\partial)K_t + I_t \tag{5.59}$$

Where, ∂ is depreciation. In the economy, investment and capital stock decides the present capital in economy. We must subtract consumption from the above equation. Now investment is income minus consumption

$$K_{t+1} = (1-\partial)K_t + Y_t - C_t \tag{5.60}$$

Now consumption depends on propensity to save from income. Therefore consumption is constituted in the above equation C=(1-S)Yt as

$$K_{t+1} = (1-\partial)K_t - sY_t \tag{5.61}$$

Now the person will decide how much to work and how to maximize consumption and leisure. The life time budget constraints is given as

$$C_1 + \frac{C_2}{1+r} = W_1 N_1 + \frac{W_2 N_2}{1+r} = Y_{lifetime} \tag{5.62}$$

Here w is real wage (w/p). But the consumer has budget constraints. It is given as

$$w_1(H - I_1) + \frac{W_2(H - I_2)}{1+r} = Y_{lifetime} \tag{5.63}$$

If we multiply 1+r then

$$(1+r)w_1(H - I_1) + W_2(H - I_2) = (1+r)Y_{lifetime} \tag{5.64}$$

If the agent does not enjoy the leisure in period 2 then

$$I_2 = \frac{1 + rW_1 H + W_2 H - (1+r)Y_{lifetime}}{W_2} \tag{5.65}$$

If the agent do not enjoy the leisure in period 2 then

$$I_1 = \frac{1 + rW_1H + W_2H - (1+r)Y_{lifetime}}{(1+r)W_2} = \frac{\psi}{(1+r)W_1} \tag{5.66}$$

Both points are presented in the following figure then

$$\text{Slope of budget line} = \frac{OA}{OB} = \frac{\psi / W_2}{\psi / (1+r)W_1} = \frac{(1+r)W_1}{W_2} \tag{5.67}$$

Figure 5.16 shows the preference of individual in two periods. Individual enjoys leisure OD1 and spend N_1=DB_1 hours in work in period 1. Suppose, in first period wage W_1 increases. The slope of budget line is OA. Now it becomes AB_1. There is substitution and income effect. Current productivity and income is high. It encourages for substitution of current to future work. The substitution effect denominates that the current labor supply rises. $N_1^1 = D'B$. It is a current wage rate. Now the labor supply can be written as

$$N^s = N^s(\frac{w_1}{w_2}, r) \tag{5.68}$$

Here rate of interest also decides the supply of labor. The demand for labor is equal to the marginal productivity of labor. It is explained as W=MPN. The labor demand is given as

$$N^D = N^D(MP_N) \tag{5.69}$$

Figure 5.16 Labor demand and supply in two periods

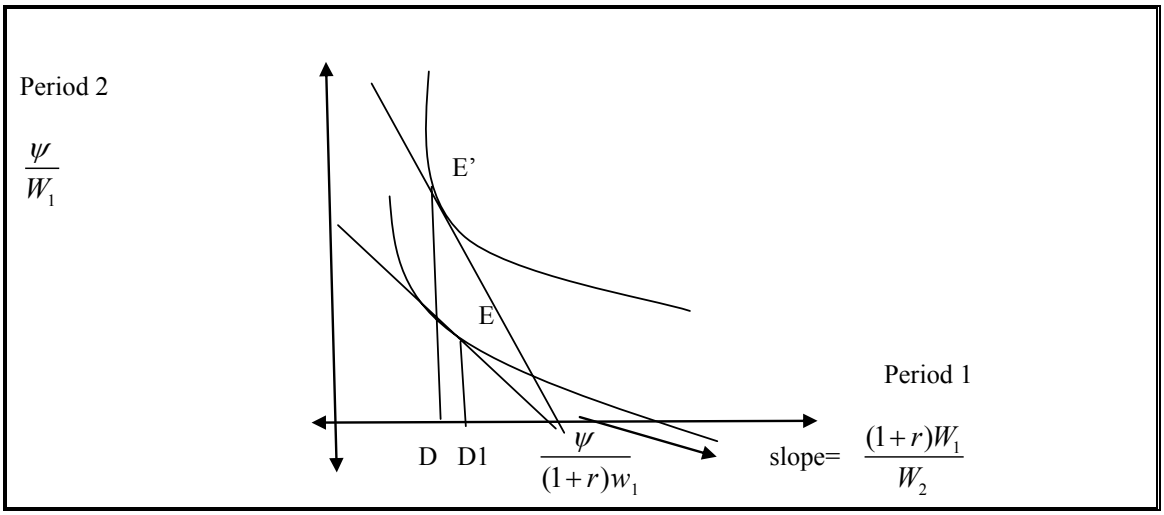


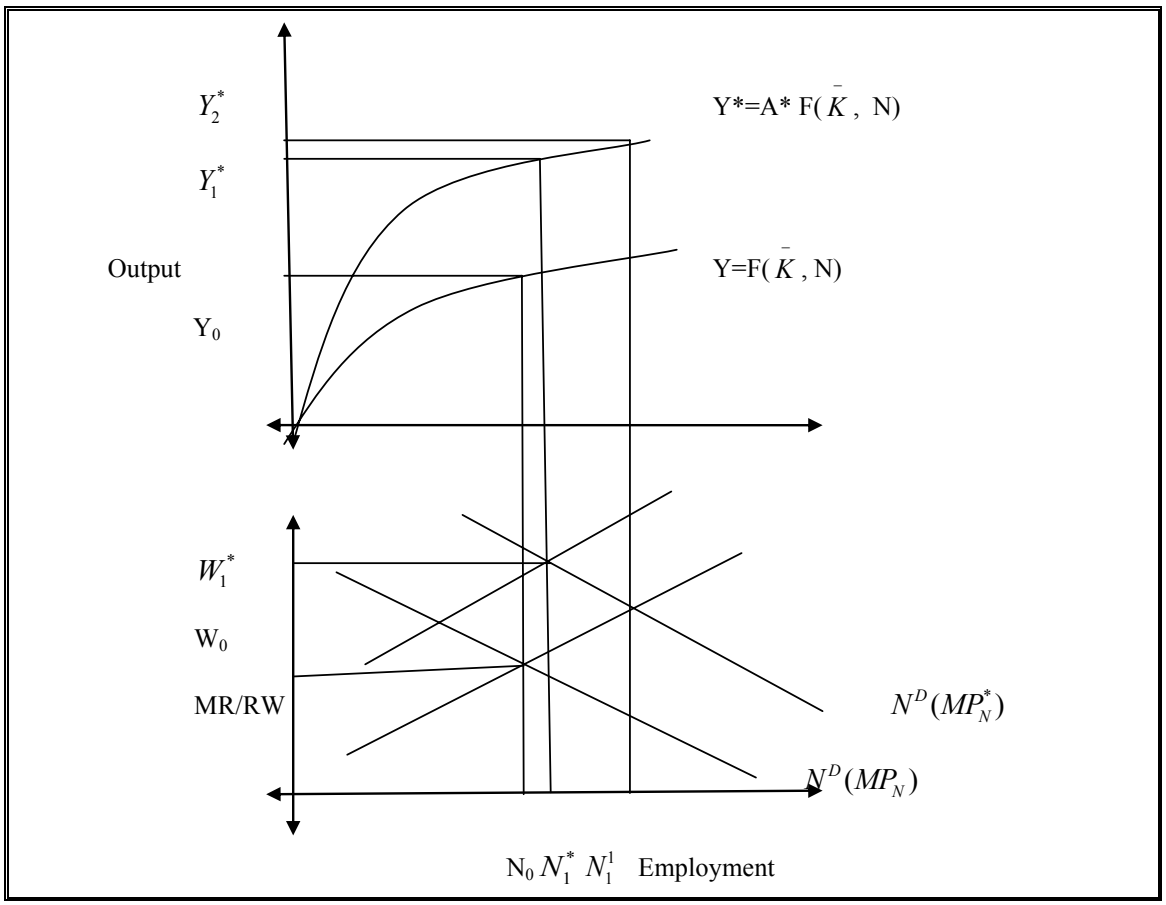
Figure 5.16 shows the labor demand and supply. The A part of the figure shows the production function. More sophisticated and modern technology will produce more output with same inputs. As the labor productivity increases then the labor demand curve shifts towards $N^D(MP_N^*)$. The individual supply more labor then the total employment increases up to N_1^1 output and income increases from Y_1 to $Y_1^{'}$. Rising income reduces the interest rate via saving. It shifts the labor supply left, declines in interest rate increases the present value of future income and makes the return from current labor supply unattractive. The income and output thus finally increases to Y_1^* and real wage is defined as W_1^*

The real wages are pro-cyclical with output when the economy goes into a boom period in real business cycle, leisure falls and labor supply increases. Consumption rises because output and income rises. In boom, leisure and consumption shows inverse relationship. Both goods are normal goods. For real business cycle these two variables are expected to move together. The real wage increases in boom. Therefore there are high returns to working. Hence, economic agents work more and reduce leisure. In boom, the production technology is relatively favorable resulting high wage and marginal product of labor. Technology shocks are of sufficient magnitude to explain observed business cycle and the related question of whether observed changes in employment can actually be explained as the voluntary choices of economic agents facing changing production possibilities (Froyen, 2002).

5.10.1 Criticism

Real business cycle explains that individual reallocates the leisure and labor overtime. He reduces the quantity of labor when the real wage declines. If individual gets more real wages today then he will work more today and relatively low in the future. There is no study which finds that individual response to the expected real wage changes by considerably reallocating leisure over time. Most of the time unemployment is voluntary unemployment and we can overcome by optimizing behavior. There is no relation of any corrective policy or government intervention and unemployment. Sometimes, the information asymmetries exist. In reality, shocks affect economy differently but they are nominal in nature. The real shock is a result of optimum output for the economy. There is no single stabilization policy useful. It is a world of art and it is an automatic correction over time. The real business theories need not rely on technology shocks to explain economic fluctuations. In an indeterminate RBC model with capacity utilization and mild increasing returns to scale, demand shocks can play a pivotal role in explaining actual economic fluctuation (Benhabib and Yiwen, 2003).

Figure 5.17 Production functions and adjustment in employment and wages



Questions

1. Explain the efficiency wage hypothesis.
2. How does the efficiency wage hypothesis help to achieve equilibrium in output and employment? Discuss.
3. What is the concept of the staggered wage contract?
4. Explain the government budget constraints.
5. Debt and gross domestic product is related to interest rate? Explain.
6. Examine the primary deficit and its stability.
7. What is rational expectation hypothesis? Explain.
8. Explain the Lucas supply curve in detail.
9. Why is the Lucas supply curve criticized?
10. Explain the term Ricardian equivalence.
11. What is the implicit contract? How does it help firms to decide the wages?
12. Why implicit contracts are criticized by the policy makers?

Appendix

Table 5.2 Debt indicators of central and state government

Select Debt Indicators of Central and State Governments						
(As Percentage to GDP) in India						
(1980-1981 to 2010-2011)						
Year	Domestic Liabilities of Centre	External Liabilities of Centre	Total Liabilities of Centre	Aggregate Liabilities of States	Combined Domestic Liabilities of Centre & States	Combined Total Liabilities of Centre & States
1980-81	33.33	7.77	41.1	18.42	40.07	47.84
1981-82	32.7	7.22	39.92	18.53	40.06	47.28
1982-83	37.26	7.16	44.42	19.35	44.27	51.43
1983-84	36.02	6.8	42.82	19.42	43.3	50.1
1984-85	38.84	6.67	45.51	20.35	46.91	53.58
1985-86	42.42	6.45	48.87	21.81	50.79	57.24
1986-87	46.45	6.45	52.9	22.2	55.11	61.56
1987-88	48.16	6.49	54.65	22.68	57.04	63.53
1988-89	48.06	6.06	54.12	22.09	56.93	62.99
1989-90	49.18	5.81	54.99	22.52	58.57	64.38
1990-91	49.69	5.53	55.22	22.5	59.21	64.75
1991-92	48.53	5.64	54.17	22.46	58.27	63.91
1992-93	47.79	5.62	53.41	22.37	58.03	63.65
1993-94	49.74	5.47	55.21	21.71	59.77	65.23
1994-95	48.01	5.01	53.03	21.37	58.07	63.09
1995-96	46.57	4.3	50.87	21.05	56.8	61.1
1996-97	45.08	3.93	49.01	20.9	55.42	59.35
1997-98	47.34	3.62	50.96	21.86	58.21	61.83
1998-99	47.66	3.27	50.93	23.03	59.35	62.62
1999-00	49.31	2.99	52.31	26.43	63.61	66.6
2000-01	52.45	3.14	55.58	28.26	67.46	70.59
2001-02	56.82	3.14	59.96	30.31	72.91	76.05
2002-03	61.09	2.43	63.52	32.04	77.86	80.29
2003-04	61.37	1.67	63.05	32.79	79.42	81.09
2004-05	59.64	1.88	61.51	31.28	76.68	78.55
2005-06	58.66	2.55	61.21	31.08	74.89	77.44
2006-07	56.73	2.39	59.12	28.92	71.7	74.1
2007-08	54.66	2.25	56.9	26.64	69.18	71.43
2008-09	54.39	2.2	56.59	26.34	69.9	72.11

Source: RBI statistics

Table 5.3 Fiscal indicators of central government

Select Fiscal Indicators of Central Government							
(As Percentage to GDP) in India - Part III							
(1970-1971 to 2011-2012)							
Year	Revenue Expenditure	Interest Payments	Subsidies	Defence (Revenue + Capital)	Capital Expenditure	Capital Outlay	Total Expenditure
1970-71	6.77	1.31	0.2	2.59	5.39	2.04	12.16
1971-72	8.01	1.35	0.21	3.08	5.9	2.26	13.92
1972-73	8.31	1.42	0.38	3.03	6.08	1.79	14.39
1973-74	7.19	1.33	0.54	2.53	5.18	1.52	12.37
1974-75	7.24	1.28	0.53	2.69	5.43	2.08	12.67
1975-76	8.29	1.46	0.56	2.94	6.41	2.67	14.7
1976-77	9.11	1.64	1.04	2.82	5.94	2.06	15.05
1977-78	8.86	1.6	1.25	2.56	6.22	2.18	15.08
1978-79	9.59	1.78	1.32	2.58	7.26	2.17	16.85
1979-80	9.66	1.88	1.49	2.75	5.86	2	15.52
1980-81	9.91	1.79	1.4	2.48	5.75	2.11	15.66
1981-82	9.02	1.87	1.14	2.53	5.77	2.46	14.79
1982-83	9.81	2.06	1.18	2.63	6.31	2.44	16.12
1983-84	10	2.16	1.3	2.62	5.97	2.35	15.97
1984-85	11.11	2.4	1.62	2.83	6.4	2.71	17.5
1985-86	12.06	2.67	1.7	2.84	6.66	2.72	18.72
1986-87	12.98	2.94	1.73	3.33	7.01	2.94	19.99
1987-88	12.9	3.14	1.67	3.34	6.17	2.6	19.07
1988-89	12.74	3.36	1.82	3.14	5.89	2.42	18.63
1989-90	13.17	3.64	2.15	2.96	5.88	2.42	19.05
1990-91	12.91	3.77	2.13	2.71	5.58	2.13	18.49
1991-92	12.57	4.06	1.87	2.5	4.45	1.69	17.02
1992-93	12.32	4.13	1.44	2.34	3.98	1.78	16.29
1993-94	12.49	4.24	1.34	2.52	3.89	1.51	16.38
1994-95	12.02	4.34	1.17	2.29	3.8	1.47	15.82
1995-96	11.74	4.2	1.06	2.25	3.22	1.18	14.96
1996-97	11.53	4.31	1.12	2.14	3.05	1.03	14.58
1997-98	11.81	4.3	1.21	2.31	3.39	1.15	15.2
1998-99	12.36	4.45	1.35	2.28	3.59	1.08	15.95
1999-00	12.76	4.62	1.25	2.41	2.51	1.23	15.27
2000-01	13.22	4.72	1.28	2.36	2.27	1.18	15.49
2001-02	13.23	4.72	1.37	2.38	2.67	1.17	15.9
2002-03	13.8	4.8	1.77	2.27	3.04	1.19	16.84
2003-04	13.14	4.5	1.61	2.18	3.96	1.24	17.11
2004-05	11.86	3.92	1.42	2.34	3.52	1.62	15.38
2005-06	11.9	3.58	1.28	2.17	1.79	1.48	13.7
2006-07	11.99	3.5	1.33	1.99	1.6	1.4	13.59
2007-08	11.92	3.43	1.42	1.84	2.37	2.14	15.29
2008-09	14.22	3.44	2.32	2.05	1.61	1.36	15.83

Source: RBI statistics

6 International adjustments: Policy implications

6.1 Government budget constraints

Every government has revenue receipts and revenue and capital expenditure. It always makes the balance between receipts and expenditure. Fifth chapter has explained about the budget constraint. But in the welfare state, expenditure of government is always higher than income and therefore deficit occurs. Government finances its deficit through two methods. Firstly it either sells bonds or prints money. By printing money, the high power money increases. But through open market operation, government buys up a part of the debt that sells treasury bills.

$BD=SB+\Delta Mb$

Where
BD: Budget deficit
SB: Sales of bonds
Mb: Increase in monetary base

In the short period, increase in deficit may cause rise in the interest rate because of government expansionary fiscal policy. The target is kept to not increase the rate of interest. Government monetizes its deficit when it purchases a part of the

debt sold by the treasury to finance the deficit. Government faces dilemma to monetize deficit because it does not finance the deficit, the fiscal expansion not being accompanied by accommodating monetary policy raises interest rate and thus crowding out private expenditure. Government buys securities, thereby increasing the money supply and hence allowing an increase in income without rising interest.

If there is full employment, then monetization of debt could lead to inflation. Higher aggregate demand will lead to rise in real interest rate. The crowding out will occur and it leads to high inflation. Government should supply money at constant level at the same time interest rate should allow to rise. At full employment, it could lead to inflation. An unwise fiscal expansion could lead to more monetary expansion. It depends on the government whether to pursue an accommodating monetary policy or whether to rather stay with an unchanged monetary target or even offset a fiscal expansion by a tightening of monetary policy. Government has to compare the cost of higher inflation with those of higher unemployment wherever expansionary policy threatens to cause inflation. In India, inflation in nonfuel commodities is seen as a more important driver of domestic inflation rather than fuel inflation. The exchange rate passes through co-efficient is found to be modest, but nonetheless sharp depreciation in a short period of time can add to inflationary pressures (Kapur, 2012). High output growth and low inflation are among the most important objectives of macroeconomic policy. But there is perceived tradeoff between lowering inflation and achieving high growth. Empirical evidence emphasizes that the growth inflation relationship depends on the level of inflation at some low levels; inflation may be positively co-related with growth but a higher level inflation is likely to be harmful to growth. In other words, the relationship between inflation and output growth is non-linear (Mohanty D. et.al, 2011).

6.1.1 The Inflation tax

Government prints money and increases high powered money. The source of revenue is sometimes known as seigniorage which is the governments' ability to raise revenue through its right to create money. When government finances deficit by creating money then money can be printed period after period. It uses money to pay for the goods and services it buys. This money is absorbed by the public. The real income growth aside, public adding to its holding of nominal balances would be to offset the effects of inflation. In the long run, prices rise then the purchasing power of a given stock of nominal balances is falling. To maintain a constant real value of money balances, the public has to be adding to its stock of nominal balances at a rate that will exactly offset the effects of inflation. When public is adding to its stock of the nominal balances in order to offset the effects of inflation on holding of real balances; it is simultaneously using a part of its income to increase the holding of nominal money. Persons are doing it to prevent his or her wealth from falling as a result of inflation. 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. Therefore, government can thus spend more in the economy and the public spends less. Government has money to finance extra spending. When government finances its deficit by issuing money, the public adds to its holding of nominal balances to maintain the real value of money balances constant. It means government is financing itself through the inflation tax.

If the output is constant then,

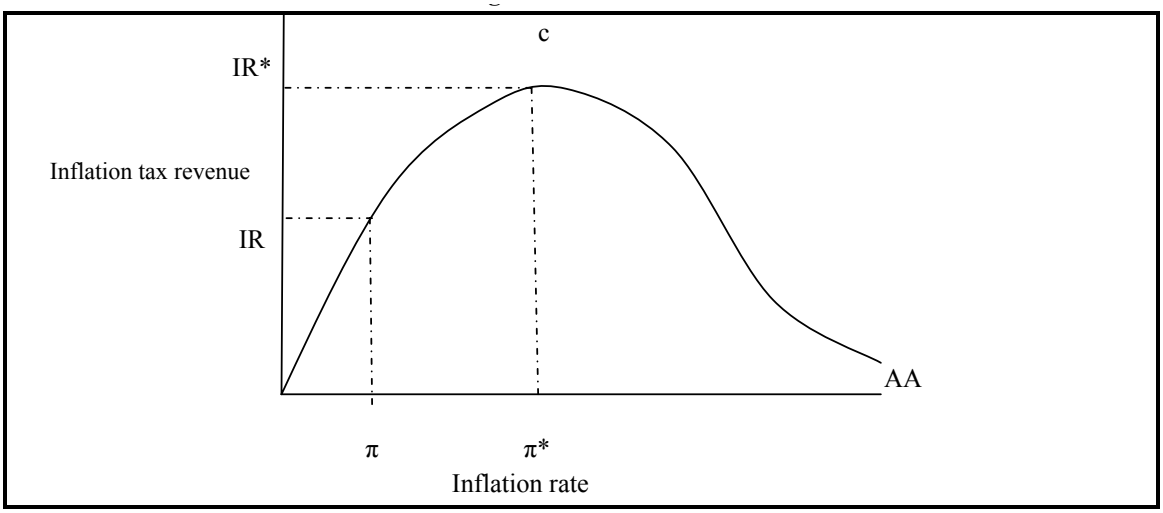
ITR=IR*RMB

Where

ITR: Inflation tax revenue
IR: Inflation rate
RMB: Real money base

The inflation tax is clearly distortionary, but so are the other alternative taxes. Many of the distortions from inflation come from a tax system that is not inflation neutral; for example, from nominal tax brackets or from the deductibility of nominal interest payments. These could be corrected allowing for a higher optimal inflation volatility indexed bonds that can protect investors from inflation risk (Blanchard, Olivier et.al, 2003).

Figure 6.1 Inflation and tax revenue



When inflation is zero the government gets no revenue from inflation. As the inflation rate rises, the amount of inflation tax received by the government also increases. But as the inflation rate rises, people reduce their real holding of the money base. This is because the base is becoming increasingly costly to hold. Individuals hold less currency and banks hold as little excess reserves as possible. The real monetary base falls so much that the total amount of inflation tax revenue received by the government falls. It is starting point at c and this signifies that there is maximum amount of revenue than government raises through the inflation tax. The maximum is shown as amount IR*. The inflation rate, denoted as π*, is the steady state inflation rate at which the inflation tax is at its maximum. At initial point, there is no inflation and printing of money. Economy is at O. But in the long run, government cuts taxes and finances the deficit by printing money. The deficit is at IR' and inflation in economy is π'. But the second point, government wishes to increase revenue. The economy is on the rising part of the curve. Government deficit is also at high (IR*) rate. In the less developed countries, banking sector is less developed. People hold maximum cash balances. Government gets revenue from inflation.

6.2 Hyperinflation

In hyperinflation, the annual inflation rate reaches thousand percent per annum. When inflation becomes high it knocks through monthly statistics. In hyperinflation, people spend significant amount of resources minimizing the inflationary damage. They shop very often and reduce the real balances to a remarkable extent to avoid the inflation tax, but they have to compensate by going to the bank more often, that is, hourly or may be daily rather weekly.

6.2.1 Deficit and hyperinflation

Economies suffer from deficit in hyperinflation. During war, hyperinflation is generated and it increases the debt and reduces the tax generating capacity of the country. But large deficit forces government to print money to finance deficit.

Tax collection system

As the inflation rises, the real revenue from taxation falls. But in principle, the tax system can be indexed to adjust for the inflation. But that is difficult in practice.

6.2.2 Nominal interest rates and deficits

The budget deficit includes the interest payments on the national debt. The nominal interest rate tends to rise when inflation increases. The higher inflation generally increases the nominal interest payments that are made by the government and the measured deficit therefore increases.

In short, high nominal rates are not necessarily high real rates of interest. If inflation gets reduced then deficit will decline. It will lower the interest rates.

IAD=TD-(IT*ND)

Where
IAD: Inflation adjusted deficit

TD: Total deficit
IT: Inflation tax
ND: National debt

Above equation removes the component of interest payments on the debt that is attributed directly to inflation and gives a more accurate picture of what the budget situation would be at a very low inflation rate than does the actual deficit.

6.2.3 Inflation tax and accelerating hyperinflation

The money growth is high during hyperinflation. It leads to monetary financing of the deficit. If tax revenue is limited then government prints money. It is faster than people's realization. It further leads to rise in inflation. But government prints money and spends more or finances its expenditure. The process continues till it breaks down. A rise in the inflation rate leads workers to supply more labor over the contract period, generating a significant positive long run inflation rate. Given standard calibrations, optimal monetary policy is associated with a long run inflation rate around two percent (Ahrens S. and Dennis J. Snower, 2012)

Stopping hyperinflation

Government regularly reforms the direct and indirect taxes in economy. The exchange rate of the new money is pegged to foreign currency in order to provide an anchor for prices and expectations. But it is not enough. The monetary, fiscal and exchange rate policies are combined with income policies in this approach to stabilization. People expect less in inflation, nominal interest rates decline and the demand for real balance rises. The demand for real balances increases then government can create money without creating inflation. Thus at the beginning of a successful stabilization, there may be a bonus for the government, it can temporarily finance part of the deficit through the printing of money, without renewing inflation. But it certainly cannot do so for much more than a year without reigniting inflation.

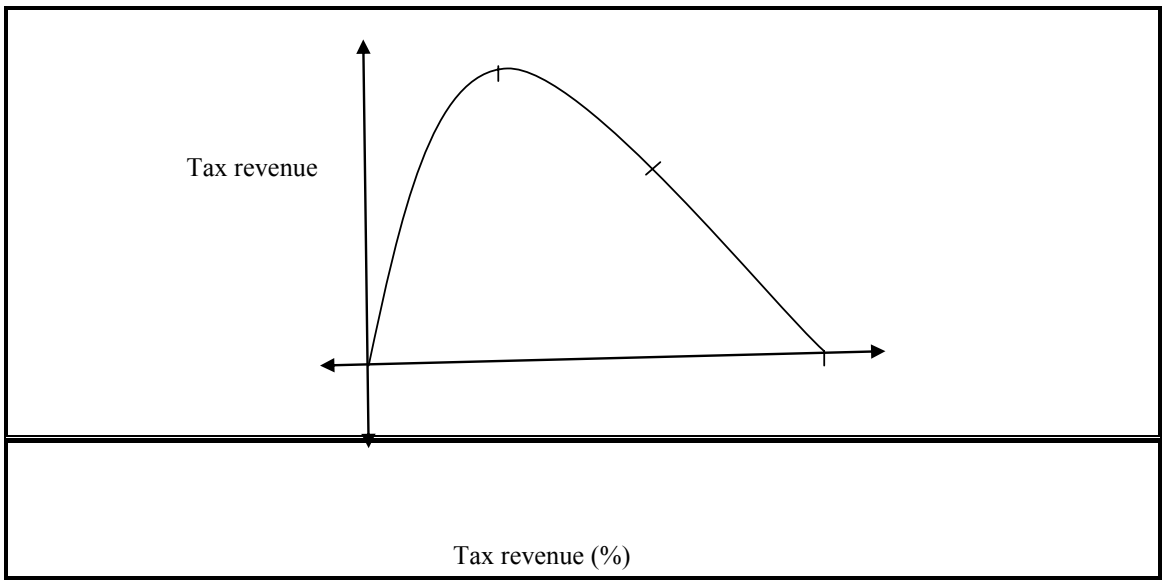
6.2.4 Budget deficit and the public debt

The deficit is actual and structural. The structural deficit or the full employment or high employment or cyclically adjusted deficit is the level at which the deficit would be if output were at its full employment level. The cyclical component of deficit reflects the impact of recessions or booms on tax revenue and government outlays such as unemployment compensation. When economy goes into recession, the budget automatically worsens as government tax revenue falls and outlays increase. Conversely, in a boom the budget automatically improves.

6.3 Laffer curve

Arthur Laffer, a former professor of economics has proposed the Laffer curve. The Laffer curve relates tax revenues to the tax rate. The curve shows total tax revenue first increasing as the tax rises and then eventually decreases. In the income tax category, if the tax rate is zero the government tax revenue is certainly zero. The point A shows such a situation in graph. Now suppose tax rate is 100 percent then government revenue is 100 percent. From point A and B, government takes some income from tax. But beyond point C at tax rates above 60 percent, any increase in the tax rate reduces total revenue, a cut in tax rate increase total tax revenue. A point beyond C, a cut in the tax rate causes people to work so much more than the increased work efforts out weight the reduced taxes on the amount they used to work. But such an effort makes people work more. At higher after tax wage, a worker needs to work less to support the same standard of living. When the after tax wage rises, the response is to work less, earn more income and have more leisure.

Figure 6.2 Tax rate and tax revenue for government



6.4 Controlling deficit

A large deficit impairs economic growth by reducing the national saving and capital formation. Deficit creates vicious cycle of borrowing and higher debt service costs which in turn make it still more difficult to reduce the deficit. In India, central as well as state governments have spent much more on the various welfare programs.

Therefore it has resulted in to large deficit in their budgets. Such deficit is continuously rising. Now the FRBM act is prepared to control the deficit. Central and state governments are supposed to follow the guideline of act and control the deficit.

6.4.1 The mechanism of deficit financing

Government is not different from individual. It also requires enough balances to withdraw money. If there are no balances then government should borrow money. It is neither by debt to the public or from central bank. When treasury finances its deficit by borrowing from its public, it engages in debt financing.

The budget constraints can be explained as -

$$P^*BD=\Delta Bf+\Delta Bp+\Delta A$$

$$= \Delta H+\Delta Bp+\Delta A \quad (6.1)$$

Where,

The deficit is financed by borrowing either the central bank (ΔBf) or from private sector (ΔBp) or by selling assets ΔA. The change in central banks holdings of treasury debts causes a corresponding change in high powered money (ΔH) so that it is in this sense that the central bank monetizes the debt. When government sells public land or public sector enterprises, the receipts from the sale can be used to finance the deficit or to entire public debt. It is a temporary solution. There is a limit to sale assets and they are limited.

6.5 Debt management

The sale of treasury bills is regular in the economy. It is done by the reserve bank. Government auctions treasury bills to prospective buyers each week and issues longer term debt less regularly. Issues of treasury debt are not all made for the purpose of financing the budget deficit. Most debt issues are made to refinance parts of the national debt that are maturing. The treasury bills have to pay the face amount to the holder. Treasury options the funds to make those payments by further borrowing. The process by which treasury finances and refinances the national debt is known as debt management. Only a minor part of debt management is concerned with financing the current budget deficit, i.e., with net debt issue as opposed to refinancing the large existing stock. When government has more tax revenue, government can retire debt. Government accomplishes this by not renewing maturing debt but rather paying off bonds or treasury bills that are coming due. The public debt stock declines. If future government spending were known with certainty then optimal tax rate would be constant. Because future government spending is uncertain, the optimal tax rates sets the present values of revenue equal to the present value of expected spending. As information about spending becomes available the optimal tax rate changes, under this view , the budget deficit is simply the difference between government spending and the amount of revenue generated by this tax rate and the debt will rise and fall accordingly over time (Elmendorf, Douglas W., and N. Gregory Mankiw, 1998).

6.6 The dynamic of deficit and debts

The deficit is primary and no interest deficit and interest payments on the public debt.

Total deficit= Primary deficit + Interest payments

The primary deficit (or surplus) represents all government outlays except interest payments less all government revenue. The primary deficit is also called the non interest deficit.

Primary deficit = Non interest outlays –Total revenue

The budget will be in deficit unless the interest payments on the debt are more than matched by a primary surplus. If there is a primary deficit in the budget, then the total budget deficit will keep growing as the debt grows because of the deficit; and interest payments rise because the debt is growing. If economy is not growing, any policy that leads debt to keep on growing cannot be viable. This is because ultimately the debt will be unmanageable largely relative to the size of the economy.

The debt income ratio is defined as -

Debt ratio= Debt/PY

Where PY is nominal GDP.

The ratio of debt to GDP falls when nominal GDP grows more rapidly than the debt. The debt grows because of deficits. The denominator nominal GDP, grows as a result of both inflation and real GDP growth.

The Debt income ratio rises when

$$\Delta b=b(r-y) -z>0 \quad (6.2)$$

Where

R: Real or inflation adjusted interest rate

Z: Non interest or primary budget surplus measured as a fraction of GDP

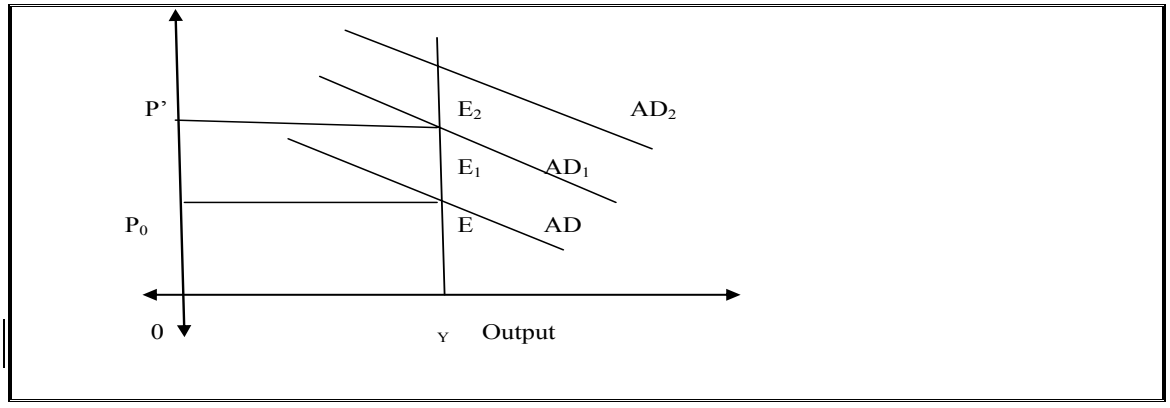
Y: Growth rate of real GDP

B: Debt income ratio

The debt income ratio depends on the relationship among the real interest rate, the growth rate of output, the noninterest budget surplus. The higher the interest rate and lower the growth rate of output, the more likely the debt income ratio is to be rising. A large non-interest surplus tends to make the debt –income ratio fall.

Figure 6.3 illustrates the aggregate demand curve. The tax cut is temporary and the budget deficit is financed by selling debt to be the private sector. A cut in taxes is to shift the aggregate demand curve out from AD to AD1. Because the private sector is buying bonds during the period of the deficit, it ends up holding a higher stock of government bonds. If individuals hold government bonds then such bonds are the part of their wealth. At given level of income aggregate demand should rise when the stock of government bonds rises because individuals holdings those bonds have higher wealth. The higher wealth increases consumption demand and the demand curve shift out the right. The final aggregate demand curve returns to original equilibrium, after government spending. The AD and AD2 difference from the higher stock of government bonds price B compared with B on the initial aggregate demand curve.

Figure 6.3 Output and price level with effect of aggregate demand



6.7 The Borrow Ricardo problem

At the aggregate level, everyone believed that the national debt would eventually be paid off. The government should run a surplus to pay off the debt. It should increase taxes in future. Then increase in debt would increase individual wealth and at the same time suggest to them that their taxes would be higher in future. The net effect on aggregate demand might then be zero. Now, the government bonds are wealth, the issue is raised by David Ricardo. It is further given prominence in the work of the new classical economist that is Robert Barro. Hence, it is known as the Barro-Ricardo equivalence proposition or Ricardo equivalence. The proposition is that debt financing by bonds issue merely postpones taxation. Therefore, in many instances it is strictly equivalent to current taxation. Borrow Ricardo proposition that government bonds net wealth turns on the augment that people realize their bonds will have to be paid off with future increases in taxes. If so an increase in the budget deficit unaccompanied by cuts in government spending should lead to an increase in savings that precisely matches deficit. Borrow –Ricardo objected because firstly people have finite lifetime, the people who receive tax cut today will not be paying off the debt tomorrow. It is assumed that people now alive do not take into account the higher taxes their descendants will have to pay in future. Secondly many people cannot borrow and thus do not consume according to their permanent income. They like to consume but liquidity constraints. They cannot borrow and thus do not consume according to their permanent income. A tax cut eases their liquidity constraints their inability to borrow are constrained to consuming less than they would want according to their permanent income. A tax cut for these people eases their liquidity constraints and allows them to consume more.

6.8 Money and debt financing

Money financing of the deficit tends to reduce the interest rate in the short run. Money financing increases the nominal money stock. The debt financing does not. The debt financing reduces the level of investment compared with money financing. That is an issue connected with the crowding out question. The price level is higher with money financing than with debt financing. Firstly, money financing increases the money stock and debt financing does not. The higher is the money stock, the greater is aggregate demand at any given price level. Secondly, a rise in price in the case of debt financing to the wealth effect of a greater stock of debt on consumption. The wealth effect on consumption is larger in the case of money financing than of debt financing. It means that aggregate demand at any given price level will be higher with money than with debt financing. Deficit financing probably increases aggregate demand but because of the possible effects of anticipated future tax liabilities on consumption that is not certain. Debt financing starts from a balanced budget and is not compensated for by higher taxes or reductions in other transfer payments, lead to a permanent deficit in the budget because interest has to be paid on the debt. Debt financing raises the interest rate and reduces investment in the short run compared to the effects of money financing.

6.9 The burden of debt

Each individual shares in the obligation to repay the public debt, but many individuals own the national debt. The debt represents as cancelling out the asset that the debt represents to the individuals who hold claims on the government. In case, would not on net be a burden on society. Debt may be a burden through the potential long run effects of the deficit and debt in the capital stock. Debt financing increases interest rate and reduces investment. The capital stock will be lower with debt financing than otherwise and thus output will be lower as a result of debt financing of a deficit. This is a real burden. The debt can also be a burden because the higher taxes needed for debt servicing could have adverse effects on the economy, for instance by discouraging investment or work effort. Such an effect would reduce output.

The major source of the burden arises from the possible effects of the national debt on the country's net national worth; an increase in the national debt can reduce the capital stock and or increase the nation's external debt. The result shows that the relationship between FDI both inflow and outflows and growth. The relationship between growth and equity flows is smaller and less stable. Finally the relationship between growth and short term debt is nil before the crisis and negative during the crisis (Aizenman, Joshua, Yothin Jinjark and Donghyun Park, 2011).

Inter-generational burden

Deficit financing shifts some of the burden of current government spending to future generations. The research lacks in the field which describes what is fair and unfair in allocating burdens among generations. Policymakers, politicians and civil society are less concerned on how burdens should be shared across generations. Such principals and conclusions have to be based on account of just how much current policies impose burdens on different generations. Intergenerational accounting evaluates the costs and benefits of the entire fiscal (tax and spending) system for various age groups in society. The study shows that debt crisis produce significant and long lasting output losses reducing output by about 10 percent after eight years. The results also suggest that debt crisis tend to be more detrimental than banking and currency crisis. The significance of the results is robust to different specifications, identification and endogeneity checks and data sets (Davide and Aleksandra, 2011).

6.10 Government assets

The government has income as well as expenditure. If incomes are lesser than expenditure then government tries to finance it through asset sale or borrowing. Government runs fiscal deficit and borrow from public to finance its expenditure. Government spends on roads, post offices, railway, health, education and several others. The real capital acquired by the government should be treated as an offset against the debt issued. The valuation of government assets raises serious issues. Government can sell public company, hotel, garden, park or post office. But government will try to maintain its assets operating. In India, Indian airline is continuously making operational losses and government is providing aid to run it properly. The aim is to provide the service to people. But government cannot privatize or sell airline. It is always considered as public asset. But it is not clear whether that item or service should count as government assets in calculating the government's net worth. Due to inflation, money value of assets changes. Whatever the details, concentrating only on government debt rather than on all the government's potential sources of future income and outlays is misleading.

6.11 The budget deficit

Usually creating public assets may require borrowing. It is a cause of deficit. From domestic side, the deficit does not match with an increase in saving. Government of India has done such task in first and second five year plan. Suppose government offers consumer lower present taxes, financing a significant part of the deficit by borrowing abroad. Someone will ultimately have to pay the taxes that finance the interest on those loans from abroad.

6.12 The size of debt /budget

Over a period of time, government expenditure has increased. It is mainly because of the acceptance the idea of welfare state. This increase reflects largely in the broadening of government social programs, especially the growth of transfer program. The budget and debt clearly depends on the existing government programs. Some government's social programs are widely regarded as desirable. Few disputes, the need for an additional defense expenditure, employment, health program etc. The social security programs and others are widely previewed. In India, government of India finances the welfare projects such as Mahatma Gandhi National Rural Employment Guarantee Program (MGNREGP), National Rural Health Mission (NRHM) etc. But such programs are controversial because their size is not desirable. There is corruption, inefficiency and lack of transparency in these programs. If the government budget is too large and it is in deficit, then it pressurizes the interest and financial stability. It is desirable. Deficit laws put pressure and it is the best way to get spending cuts. There is no clear method which will tell us the tax payer's money worth from government spending. Therefore the numbers of government programs have been evaluated. Different studies show that money programs are ineffective but they are expected. Some programs should be stopped or abandoned. The private market can take care of these programs. Now all government works are on public private partnership model. Social security and food stamp have received substantial attention. The final solution is that, the individual programs should examine their success and suggest changes which are clearly the most careful way to evaluate government spending. But in the long term, the aim of the government should be to control deficit and ensure macroeconomic stability. The social programs and their success depend on the agreement of policy makers and society. But the resources are scarce and they should be used very efficiently. Social programs are must and they can be evaluated regularly to see their effectiveness.

6.13 Merged Bank Fund Model

The Polak model, alternatively known as the fund model, is a model of short term stabilization. This model was developed by Jean Jacques Polak in 1957. The Bank model, also known for medium term stabilization, comprises of the two models – namely, the Two Gap model proposed by Chenery and Bruno in 1962; and the Harrod Domar model was developed independently by Sir Harrod in 1939 and Domar in 1946. The two gap model was given by the Bank model which is known for the medium term model. The structure can be derived as follows -

A] The Fund model: Jean Jacques Polak (1957)

B] The Bank model – i) Two Gap model: Chenery and Bruno (1962)

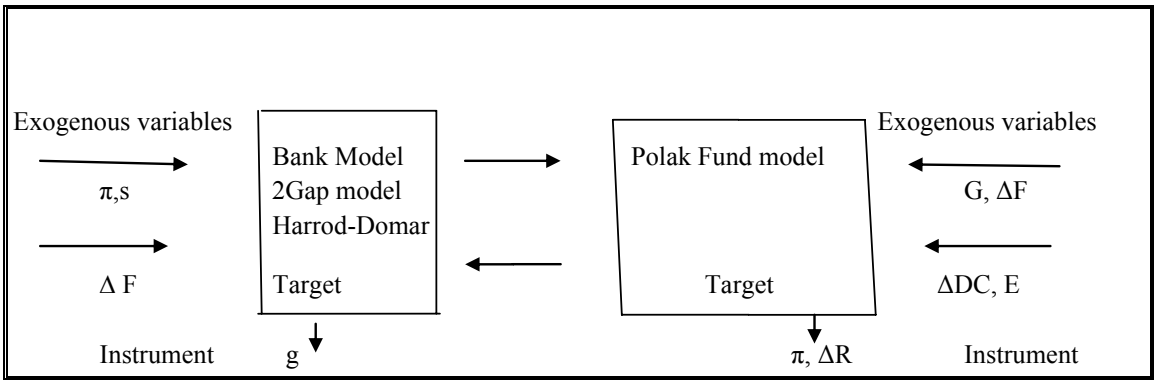
ii) Harrod-Domar model

Both merged models are called the Merge Bank Fund model. The differences in both the models are explained as -

Table 6.1 **Instruments in Bank and Fund model**

Number	**Bank Model**	**Fund Model**
1	Model : 1. Two gap model 2. Harrod-Domar model	Polak fund model
2	These models are medium term models	The fund model is short term stabilization
3	Target –g	Target –π, ΔR
4	Instrument- ΔF	Instrument ΔDC, E
5	Exogenous variables –π, s	Exogenous – G ΔF
6	Endogenous variable	Endogenous

Graph 6.1 Variables and instruments in model



Flaws

1. No interconnection between g and π
2. No link between DC and g
   No link between E and ΔF
3. No link between Δ F and (π and s)

Target	Instrument	Endogenous	Exogenous	Historical factors	Parameters
ΔR	ΔDC	ΔM	X	Y_{-1}	v
Π	E	Z	ΔF	P_{-1}	a
G	ΔF	I			b
					s
					r

6.13.1 Polak Fund Model

Polak (1957) being dissatisfied with the Keynesian overemphasis on fiscal policy and the inappropriate treatment meted out to monetary policy in the 'General Theory'. He attempted to streamline the monetary side of the analysis. However, Polak clearly stressed that his model was not an alternative to Keynesian model. The model was specified in nominal term and consequently no explicit distinction was made between price and real income changes. The model is based on certain assumptions.

Assumption:

1. The demand for money (Md) depends on nominal income (Y), with the income velocity of money (V) being assumed to be a constant.
2. Imports (z) are a fraction (m) of nominal income: Z= mY
3. Money supply (M) is determined through the identity for monetary balance, i.e ΔDC+ΔR=ΔM
4. Reserves (R.) are determined through the identity for external balance i.e Z-X=ΔF-ΔR
5. The money market is in flow equilibrium Δm=Δmd

The Polak Fund model is also known as the financial programming model approach. It is used by the IMF for structural adjustment in developing countries. The objective of IMF is to help developing countries stride over BOP problem.

Proof:

1. **Monetary sector Financial constraints**
   ΔM=ΔDC+ΔR
   ΔR= ΔM-ΔDC (6.3)

The change in money supply is related to change in domestic credit and change in reserves. Similarly changes in reserves are equal to the change in money supply minus change in domestic credit.

This is monetary sector budget constraints.

Balance sheet	
Assets	Liabilities
ΔDC	ΔM
ΔR	
ΔDC+ ΔR	= ΔM

The country has assets that are domestic credit and reserves. The liability of any country is money supply. Both assets and liabilities are subjected to change. Therefore the targets are to tackle inflation and increase reserves. The instrument with monetary authority is domestic credit. The parameters are velocity of money and the exogenous variable is government expenditure. The historical factor is past income. All the variables are explained in the table.

Target	**Instrument**	**parameter**	**Exogenous**	**Historical factor**
Π , ΔR	ΔDC	V	G	Y_{-1}

Now using the quantity theory of money
MV=PT

Here we assume $\bar{V}$ constant for short term.

pY=Y (nominal income)

$$M\bar{U} = Y$$

$(\Delta M)\bar{V} = \Delta Y$ {The demand for nominal money balance (M_d=ΔM) depends only on nominal income with the income velocity money ($\bar{V}$) constraint}.

$$\Delta M = \frac{1}{V}\Delta Y \tag{6.4}$$

Substituting equation (6.3) into (6.4)

$$\Delta R = (\frac{1}{V})\Delta Y - \Delta DC \tag{6.5}$$

Now Y= $(1+g)_{y-1}$,
Pre-determined real growth rate is exogenous
P=$(1+\pi)_{p-1}$
The inflation rate is endogenous -
Y=PY
Y=$(1+g)_{Y-1}$. $(1+\pi)_{p-1}$
Y=$(1+g+\pi+\pi_g)\, Y_{-1}$
Now π_g=0
Y= (1+g+π)Y-1
Y=Y_{-1}+(g+π)y_{-1}
Nominal income increases because of two factor growth rate and Y_{-1}
Y-Y_{-1}= (g+π)Y_{-1}
Y-Y_{-1}= ΔY

ΔY = (g+π)Y_{-1} (6.6)

Substituting equation (6.5) into (6.4) we get

$$\Delta R = (\frac{1}{V})(g + \Pi)_{Y-1} - \Delta DC$$

It is the fundamental equation of Monetary Approach to Balance of Payment (MABOP) where the Balance of Payment (BOP) is expressed as the difference between the flow demand for money and expansion of domestic credit where increase in domestic credit will be offset by decrease in reserve on a one to one basis.

$$\Delta R = (\frac{g}{V})Y_{-1} + (\frac{\Pi}{V})Y_{-1} - \Delta DC$$

Conditional on a chosen expansion of domestic credit, therefore regrouping variable two endogenous variable ΔR, π and it is not possible to find a unique solution for both therefore regrouping variables.

$$\Delta R = (\frac{g}{V})Y_{-1} - \Delta DC + (\frac{\Pi}{V})Y_{-1}$$

Or

$$\Delta R = (\frac{g}{V})Y_{-1} - \Delta DC + (\frac{1}{V})Y_{-1}.\Pi \quad (6.7)$$

Target	Instrument	Parameter	Exogenous	Historical factor
Π, ΔR	ΔDC	V	G	Y_{-1}

Now

$$\Delta R = \alpha_1 + \alpha_2 \Pi$$

The monetary sector constrains (mm line) shows the various combinations of ΔR and π for which the monetary sector in equilibrium. MM line is a straight upward sloping line with slope = $(\frac{1}{V})Y_{-1}$ and intercept term $(\frac{g}{V})Y_{-1} - \Delta DC$

While the slope of line cannot change, the intercept can be changed as policy instrument ΔDC. When ΔDC decreases, then MM_0 line shifts up to MM_1. Reduction in domestic credit leads to two possibilities.

1. Same π and higher ΔR (comparing point A and B)
2. Same ΔR and lower π (comparing point B and C)
   Therefore, an upward shift in mm0 line implies either increases reserves for given π or decreases in π for given reserves.

ii) External sector financial constraints

External sector depends on the reserves with monetary authority. If the economy earns more foreign exchange then the reserves will rise. Similarly the external capital flow will rise. It is explained as -

ΔR=(X-Z)+ΔF

External sector budget constraints

ΔR=(X+ΔF)-Z (6.8)

Target	instrument	exogenous	endogenous	parameter	Historical factor
ΔR	ΔE	X,ΔF &	Z	a	Y_{-1}
Π		g		b	Z_{-1}

The targets are to increase the reserves and control inflation. The instrument with monetary authority is exchange rate. The exogenous variables are given as X, Δf and g. The exogenous variables are Z. The parameters are A and b. The historical factors are past income level and past exports.

Import demand function

Import is a function income level and depreciated exchange rate. It is defined as -

$Z=f(\overset{+}{Y}, \overset{-}{E})$

Z=aY-bE

ΔZ=aΔY-bΔE

$Z=Z_{-1}+\Delta Z$ [ΔZ=Z-Z-1]

$Z=Z_{-1}+a\Delta Y-b\Delta E$ (6.9)

Now, if

$\Delta E>0$ devaluation

$\Delta E<0$ revaluation

Here a is marginal propensity to import out of income

And b is responsiveness of import to exchange rate

$a>0, b>0$

Sub-equation (7) into (6)

$\Delta R=(X+\Delta F)-Z$

$\Delta R=(X+\Delta F)-(Z_{-1}+a\Delta Y-b\Delta E)$

$\Delta R=(X+\Delta F)-Z_{-1}-a\Delta Y+b\Delta E$

$\Delta R=(X+\Delta F-Z_{-1}+b\Delta E)-a\Delta Y$

$\Delta R=(X+\Delta F-Z_{-1}+b\Delta E)-a(g+\pi)Y_{-1}$ i.e $\Delta Y=(g+\pi)Y_{-1}$

$\Delta R=(X+\Delta F-Z_{-1}-agY_{-1}+b\Delta E)-aY_{-1}\pi$ (6.10)

$\Delta R=\beta 1-\beta 2\pi$

Figure 6.4 Devaluation and reserves in economy

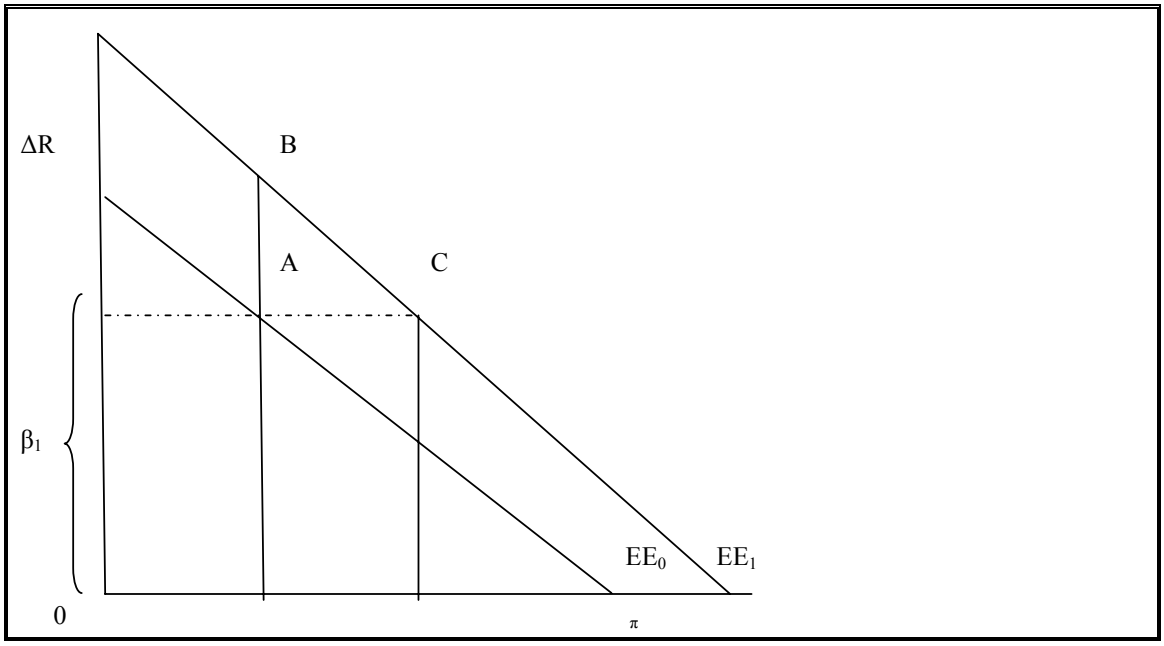


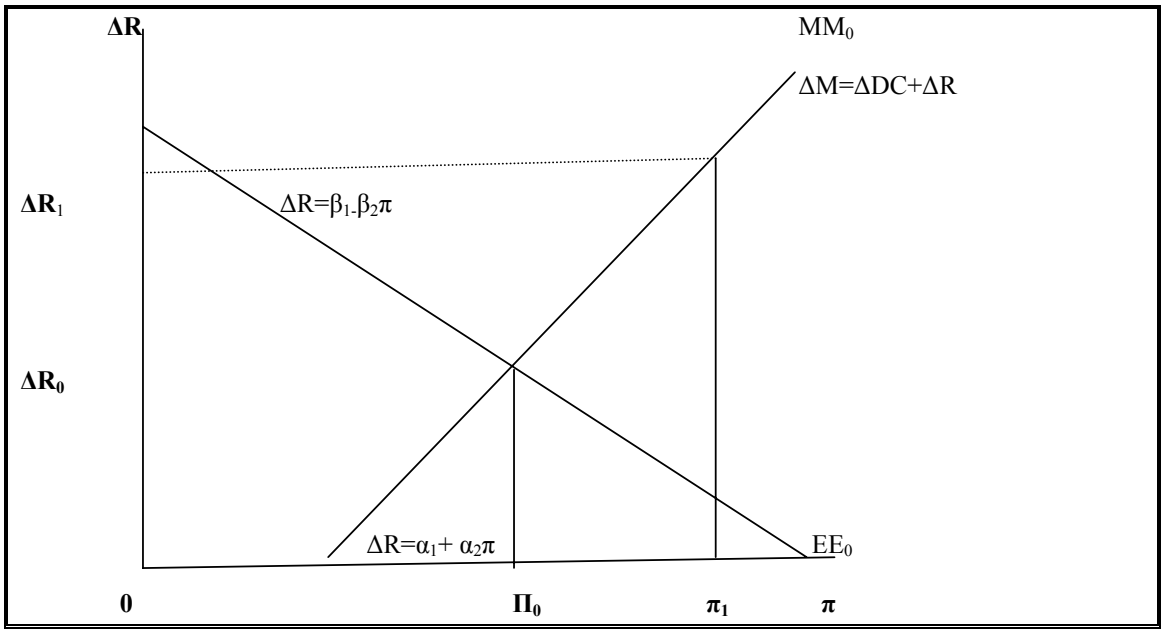
Figure 6.4 displays, EE_0 line is a downward sloping straight line. The slope $=aY_{-1}\pi$ and intercept $=X+\Delta F+b\Delta E-agY_{-1}$

Here again the slope cannot be changed but the intercept can be changed as it has the instrument ΔE. An increase in change π devaluation will shift EE_1outward.

Devaluation of currency leads to two possibilities. They are -

1. Same π higher ΔR (comparing point A and B)
2. Same ΔR and higher π (comparing point A & C)

Figures 6.5 Equilibrium of inflation and reserves in economy



Every point on MM_0 line refers to monetary constraints and content ΔR and π

ΔM=ΔDC+ΔR. On the other hand EE_0 contains ΔR and π (X-Z)+ΔF=ΔR

$$[A].\begin{bmatrix}\Pi\\ \Delta R\end{bmatrix}=[B]\begin{bmatrix}\Delta DC\\ \Delta E\end{bmatrix}+[Z]$$

Now

$$\Delta X=\beta u+Z$$

$$\Delta R=\alpha_1+\alpha_2\Pi$$

$$\Delta R=\beta_1-\beta_2\Pi$$

$$\alpha_1 + \alpha_2\Pi = \beta_1 - \beta_2\Pi$$

$$\alpha_2\Pi + \beta_2\Pi = \beta_1 - \alpha_1$$

$$\Pi = \frac{\beta_1 - \alpha_1}{\alpha_2 + \beta_2}$$

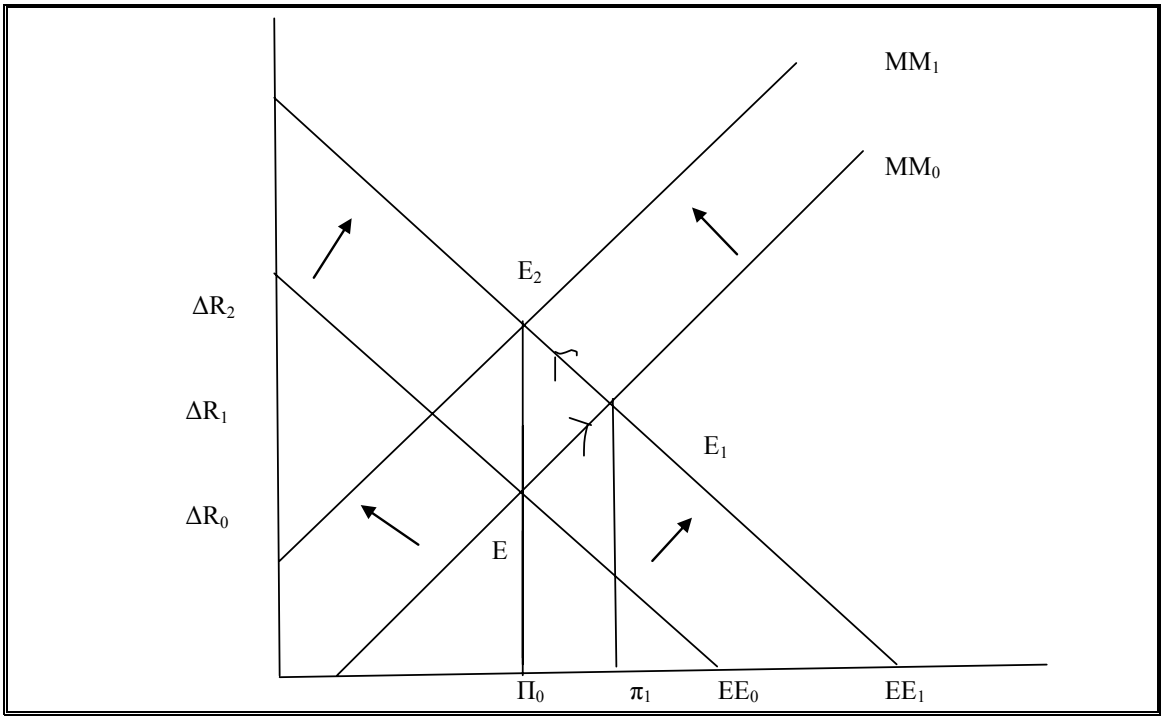
Substituting this into ΔR,

$$\Delta R = \alpha_1 + \alpha_2\Pi$$

$$\Delta R = \alpha_1 + \alpha_2(\frac{\beta_1 - \alpha_1}{\alpha_2 + \beta_2})$$

$$\Delta R = \frac{\alpha_1\beta_2 - \alpha_2\beta_1}{\alpha_2 + \beta_2} \quad (6.11)$$

Figure 6.6 Devaluation, money supply and its effect on reserves



In figure 6.6, the intersection of MM_0 and EE_0 line shows the value of π and ΔR which simultaneously satisfies the budget constraints for both monetary and external sector. If the objective is to improve their serve position and lower inflation, (π) then the domestic credit decreases (DC). This will shift MM0to MM_1. If devaluation takes place the EE_0 line shifts to EE_1. After achieving position E_2 , there is no shifting of curves because we achieved the higher 'R' at same π.

Conclusion:

The above analysis is a simplified representation of the actual dynamic of inflation (π) and reserve (R.) which for the present can be considered as a first approximation of how these variables interact. Above figure shows that high reserves are achieved at same inflation after devaluation, reducing the money supply.

6.13.2 Bank Model

In contrast with Fund's concern with temporary Balance of Payment (BoP) disequilibria, the bank has been charged with financing growth and development over medium term. This is basic approach that the bank uses for its macroeconomic projections and policy work. It emphasizes the relationship between saving, foreign capital inflows, investment and growth.

1. **Two Gap Growth Model: Michel Bruno and Hollis Chenery**
   The two gap model was developed simultaneously by Chenery and Bruno (1962), Mckinnon (1964), and Chenery and Strout (1966). This price model includes the saving constraints but in addition considered the possibility of foreign exchange acting as separate and independent constraints on an economic growth.

A) The saving constraints

Y=C+I+X-Z

Y=C+S

C+S=C+I+X-Z

S=I+X-Z

I=S+ (Z-X) (6.12)

Current account deficit

Industrial resources=domestic saving +external saving

ΔR=(X-Z) +ΔF

External sector financial constraints

ΔF-ΔR= (Z-X) (6.13)

Finance by capital flows or running down a depleting reserve

That is 0-(-100) =100

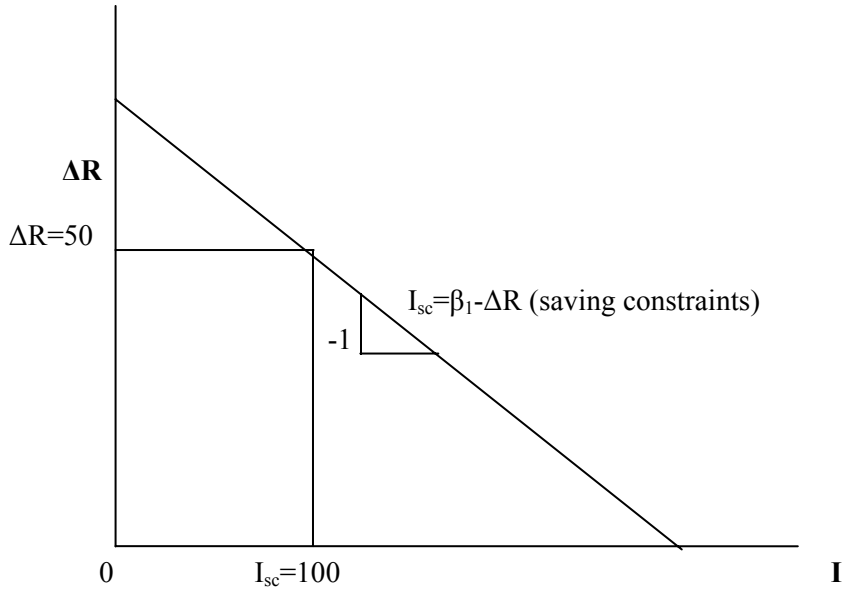
Substituting equation (6.13) into (6.12)

I=S+ΔF-ΔR

$I = [\bar{S} + \Delta \bar{F}] - \Delta R$ Saving constraints (6.14)

I=β1-ΔR

Figure 6.7 Foreign reserves and investment in economy



Actual investment level =min [Isc, IFc]

B) **Foreign exchange (trade) constraints**

Investment in domestic economy is determined by the trade constraints**.** If there is more export then reserves will rise. Such reserves can be utilized for investment.

$\Delta R=(X-Z)+\Delta F$

$(Z-X)= \Delta F-\Delta R$

Z_{CAD}= (Capital flows-Reserves)

Current Account Deficit can be financed by either running down own (saving) reserves or by increase K inflows.

$Z= [X+\Delta F)-\Delta R$ (6.16)

Import demand function

$Z=aY-bE$

Substituting the import demand function into the equation above

$aY-bE=(X+\Delta F)-\Delta R$

$aY=[X+\Delta F+bE]-\Delta R$

Now, $Y=Y-1-\Delta Y$

Here, present income depends on the past income and change in income. If we substitute the value of Y into above equation then it can be written as

$a(Y_{-1}+\Delta Y]=[X+\Delta F+bE]-\Delta R$

$aY_{-1}+a\Delta Y=[X+\Delta F+bE]-\Delta R$

$a\Delta Y=[X+\Delta F+bE-aY-1]- \Delta R$

$\Delta Y=\beta I$

B is incremental output –capital ratio, $\frac{\Delta Y}{\Delta K}$

$a\beta I=[X+\Delta F+bE-aY_{-1}]-\Delta R$

$$I_{FC} = \frac{1}{a\beta}[X + \Delta F + bE - aY_{-1}] - \frac{1}{a\beta}\Delta R \quad (6.17)$$

'a' is marginal propensity to import, a<1

B<1, $\frac{1}{a\beta} > 1$

$$I_{FC} = \beta_2 - \frac{1}{a\beta}\Delta R$$

If $\frac{1}{a\beta}\Delta R$ =0

$$I_{FC} = \frac{1}{a\beta}[X + \Delta F + bE - aY_{-1}] \quad (6.18)$$

Figure 6.8 Equilibrium of foreign reserves and investment

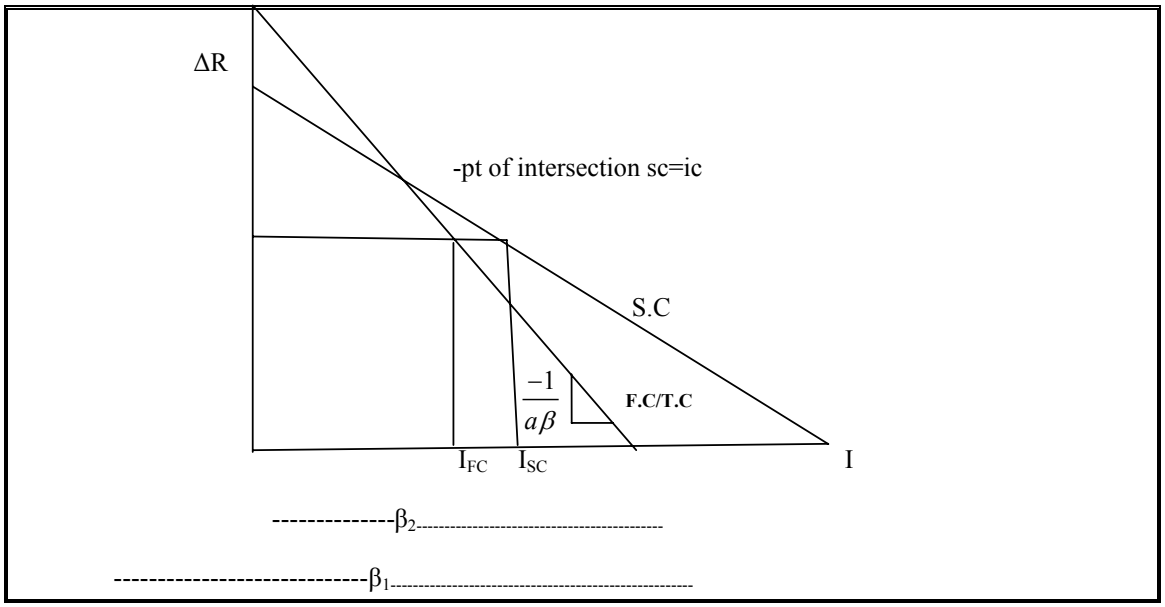


Figure 6.8 shows that the line which hits first is called a binding constraint. If we draw a line above the point and intersection then S.C. would be binding constraints. The binding constraint can be retained by shifting the line -

I-S= ΔF-ΔR

Isc=(S+ΔF)-ΔR

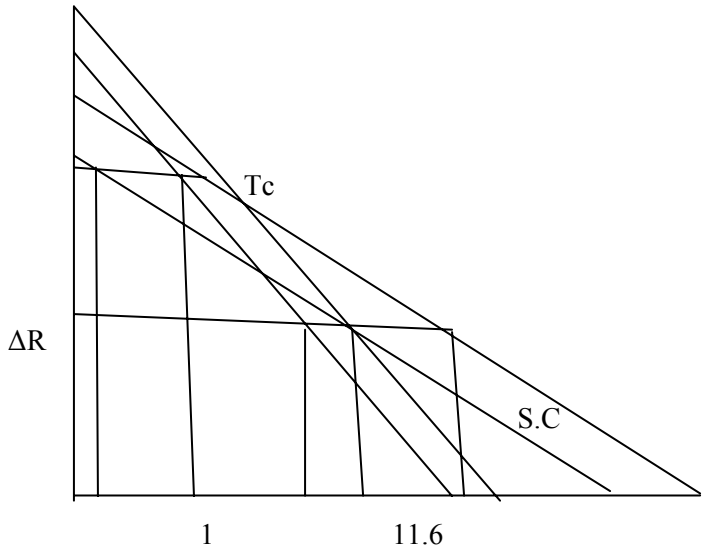
Isc=(sY+ΔF)-ΔR [S=sY]

If ΔF increases by one unit then S.C. increases by one unit. Similarly, I also increase by one unit, then

Isc=(s+ΔF)-ΔR_0

$$I_{FC} = \frac{1}{a\beta}[X + \Delta F + bE - aY_{-1}] - \frac{1}{a\beta}\Delta R \tag{6.19}$$

Figure 6.9 Foreign reserves and investment change in economy



S.C binding s or ΔF

F.C/I.C is binding X or ΔF

Therefore, ΔF increases one unit and I increases $\frac{1}{a\beta}$

Shadow prices of capital are higher in those countries where investment is lower.

Therefore I=Min[I_{SC} , $I_{tc/fc}$]

Target	Instrument	Exogenous	Parameter	Historical factor
ΔR	ΔF	π,S&X	U1 S,, a,b	$Y_{-1,}$ Z_{-1}

II] The Harrod-Domar model

The focus on rapid growth and capital accumulation, characteristics of the early work in development economics implied that the aggregate growth theory developed by Harrod (1939) and Domar (1946) become natural. It is the first building block in the World Bank approach to economic development.

In the Harrod-Domar model, the economy is supposed to grow at the warranted rate of growth given by

$$\left.\begin{array}{l} g=\frac{s}{v} \\ S=sY \\ g=\frac{i}{v} \end{array}\right\} \text{Closed economy}$$

$$\left.\begin{array}{l} i=\frac{i}{Y}=\frac{s}{Y}+\frac{CAD}{Y} \\ g=\frac{(I/Y)}{V} \end{array}\right\} \text{Open economy}$$

V=ICOR [Incremental capital output ratio]

$$=\frac{\Delta K}{\Delta Y}=\frac{4.2}{1}$$

Basic logic of H-D model

$$g=\frac{1}{V}(\frac{I}{Y})$$

$$g=\beta(\frac{I}{Y}) \qquad (6.20)$$

Where $\frac{1}{V}\beta$

Now $g=(\frac{\Delta Y}{Y})$

$$\frac{\Delta Y}{Y}=\beta(\frac{I}{Y})$$

$$\Delta Y=\beta I \qquad (6.21)$$

Nominal income =β. nominal investment

$$\Delta Y = \beta(\frac{1}{p})$$

$$\Delta Y = Y - Y_{-1}$$

$$Y - Y_{-1} = \beta.(\frac{I}{P})$$

Now we divide both side by Y_{-1}

$$g = \frac{Y - Y_{-1}}{Y_{-1}} = \frac{\beta(\frac{I}{p})}{Y_{-1}}$$

$$g = \beta.\frac{1}{Y_{-1}}.\frac{1}{p}$$

$$g = \beta.\frac{1}{Y_{-1}}.\frac{1}{p}$$

Now

$$Y = \rho y$$

$$y = \frac{Y}{P}$$

$$Y_{-1} = \frac{Y_{-1}}{P_{-1}}$$

$$\frac{1}{Y_{-1}} = \frac{P_{-1}}{Y_{-1}}$$

This when replaced in the above equation can be written as -

$$g = \beta \frac{P_{-1}}{Y_{-1}} \frac{I}{P}$$

$$g = \frac{\beta}{Y_{-1}} \frac{P_{-1}}{P} .I$$

Now p= (1+π) P_{-1}

$\frac{1}{(1+\pi)} = \frac{P_{-1}}{p}$ put into the above equation

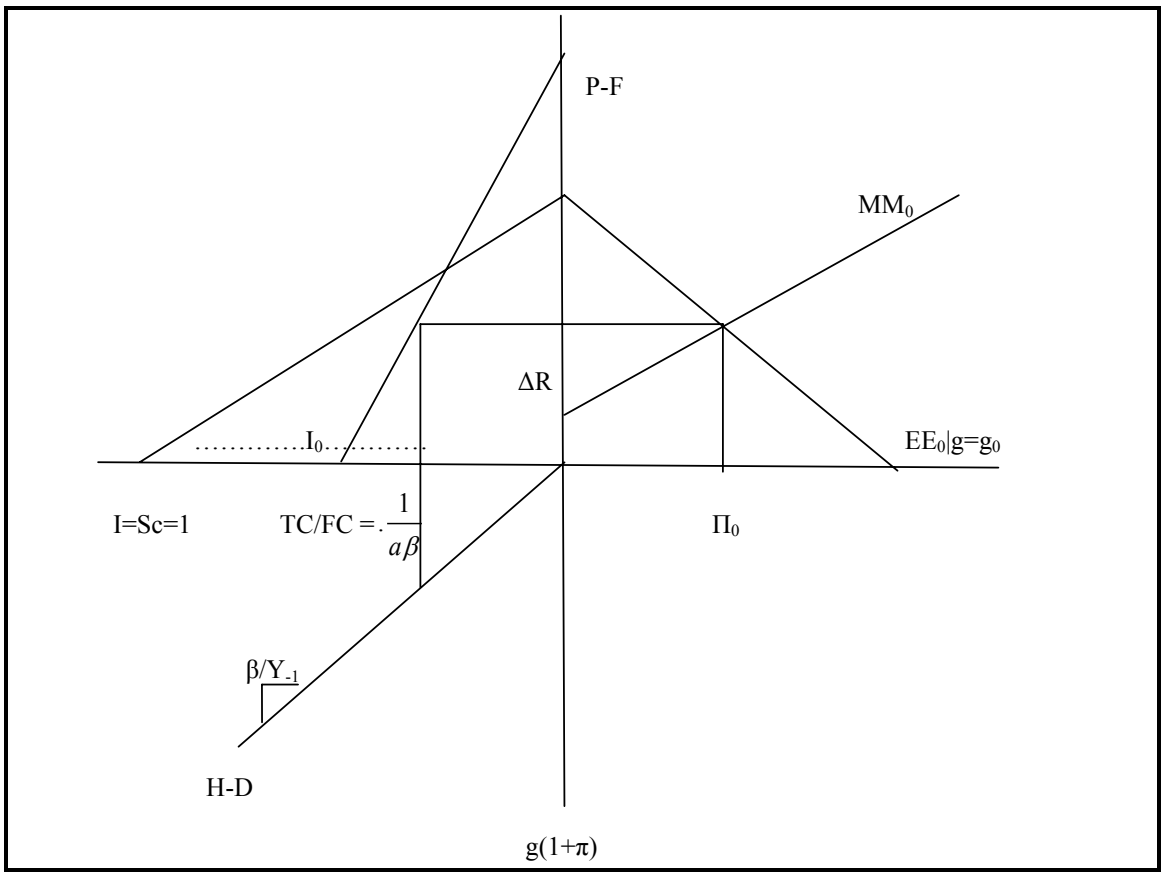
$$g = \frac{\beta}{Y_{-1}} . \frac{1}{1+\pi} .I$$

$$g(1+\pi) = \frac{\beta}{Y_{-1}} .I$$

$$g + g\pi = \frac{\beta}{Y_{-1}} .I \qquad (6.22)$$

Polak fund model assumes g at second round equation

Figure 6.10 Equilibrium of reserves, investment and inflation



Two Gap

$I_{SC}=(I_1)$

$I_{FC}=[I_2]$

$I=MM(I_1, I_2]$

A. Money demand function

$$\frac{M}{P}=\frac{MD}{P}=L(\overset{+}{Y},\overset{-}{i})$$

$$\frac{M}{P}=\frac{MD}{P}=mY-\iota i$$

$$i = \frac{1}{\iota}(my - \frac{m}{p})$$

$$i = (\frac{m}{\iota})y - \frac{1}{\iota}(\frac{m}{p})$$

M increases in money demand for increase in output

$$m = \frac{\partial(\frac{m}{p})}{\partial y}$$

ℓ→ decreases in money for unit increase in interest rate.

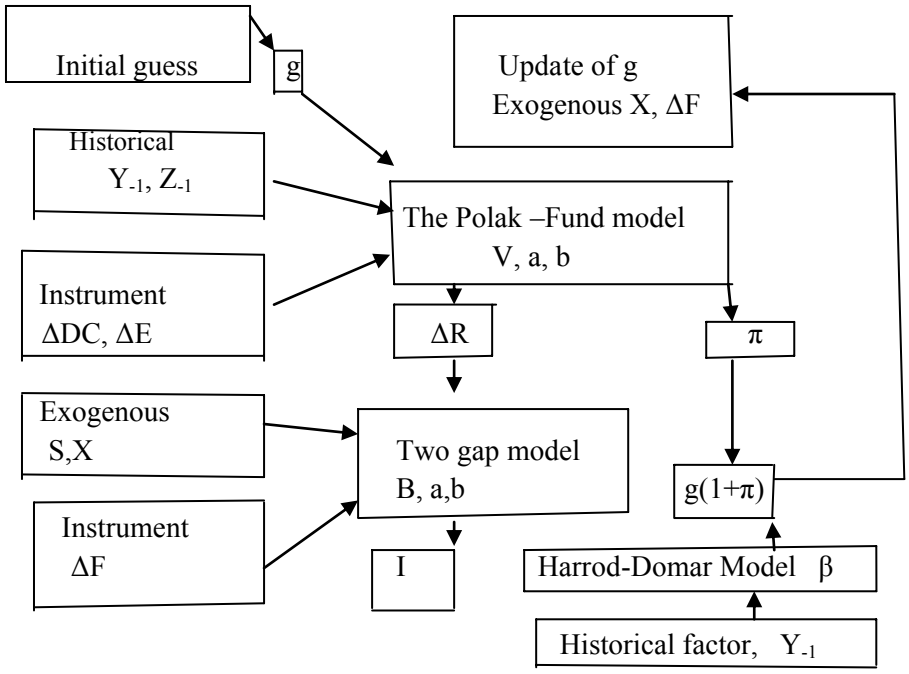
$$\frac{M}{P} = \hat{M}\ y - \hat{\iota}_i$$

$$\frac{\frac{M}{P} - mY}{\ell} = \frac{\ell_i}{\ell}$$

$$\frac{\frac{M}{P} - mY}{\ell} = \dot{\ell} e \tag{6.23}$$

For sustainability g>r

Graph 6.3 Merged Bank Fund model and policy



6.14 Rules versus discretion

The central bank and central government conduct fiscal and monetary policy in accordance with pre-announced rules that describe how their policy variables will be determined in all future situations or should be allowed to use their discretion in determining the values of the policy variables at different times. This concept explains that the most proponent of rules have been non activities whose preferred monetary rule is a constant rate rule. We can design rules that have countercyclical features without at the same time, leaving any discretion about their actions to policy makers. Both economy and knowledge is changing. There is no economic case for starting permanent policy rules that would tie the hands of the monetary and fiscal authorities permanently. There are issues to change the rule located. The growth rate of money is prescribed by constitution. At the other hand it is left to the central bank. Each policy can change but constitution cannot change. There is tradeoff between future and flexible policy. Financial sector responds very quickly to shocks and it is so interconnected. Reserve bank has considerable discretions and thus flexibility to respond to disturbances. But it is far from a universal judgment. Policy makers should announce the policies they will be following for the foreseeable future. Such principles are desirable because they help private sector to forecast future policies. But monetary authority does not stick to its target. Reserve bank keeps output close to potential and keeps inflation low. It helps the private sector to forecast variables as they are interested in future income. The firm forecasts demand for goods rather than those like money supply. They need to know only the intermediate step in forecasting.

Dynamic inconsistency: Rules vs. discretion

As already discussed in the chapter, once the inflation expectations augmented Philips curve is understood, we would hope policymakers would keep inflation low on an average. It will keep expected inflation low. There is long run tradeoff between unemployment and inflation. There is no unemployment reducing benefit from keeping inflation high. The policy makers who have discretion will be tempted to take short run actions. That is in consistent with the economy's best long run interests. There is natural outcome with rational will intentioned policy makers. The analysis in consistency begins with the assumption that the policy makers share the public dislike of both inflation and unemployment. The inconsistency arises when there is short run tradeoff between inflation and unemployment. There is no trade off because of the adjustment of inflationary expectations. The best long run position for the economy is full employment with zero or at least low inflation. Policy makers who announce full employment zero inflation policy will immediately be led to cheat by seeking lower unemployment and slightly higher inflation. It is a split between announced and expected plans that give rise to name a dynamic inconsistency.

The policy makers and adjustments of the economy occur in three sequential steps -

1. The policy makers announce a policy with zero inflation.
2. Policy makers choose a level of anticipated inflation consisting of the announced policy, implying the economy will be positioned on the short run Philips curve at full employment.
3. The policy makers reduce unemployment at the expense of a little inflation. The Philips curve is fixed. The policy is optimal although, it is inconsistent with the policy at first point.

Figure 6.11 Relationship of unemployment and inflation

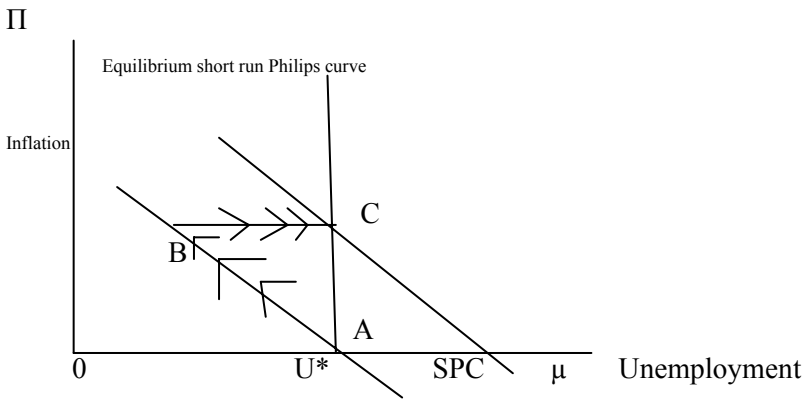


Figure 6.11 depicts that downward sloping curve is the short run Philips curve. The curve shows the tradeoff between unemployment and inflation. Point A shows the policymakers and public preference point. It is a point with full employment and inflation. Point A is the best point with zero inflation. The economy operates on lower short run Philips curve. At this point people and policy makers are ready to take risks and reduce unemployment rate. The policy makers push the economy from A to B. It is a point where the inflation is high. The marginal loss from more inflation equals the marginal benefit from lower unemployment. At point B, inflation is high and decision makers expect more inflation.

The Philips curve move up to the equilibrium Philips curve. The economy reaches at point C with full employment with high inflation. All people prefer point A. Policy makers and reserve bank promises to reduce the inflation up to point A. But it is not possible because again economy will move from point A to B and then C. Therefore, promising and not performing enough is the best strategy.

Solutions

1. There are pressures to maintain adequate inflation. The policy makers should have reputation for consistency.
2. Government chooses policy makers that are anti-inflationary.
3. Policy makers are dictated to reduce the inflation by providing inflationary figures. They are rewarded if they achieve it.
4. Low inflation rules can be adopted to prevent the policy makers from making the discretionary choices that lead to dynamic consistency.

All these policies are adopted at some extent in the economy. It depends on the central bank how it tries to reduce inflation. But it should adjust with the government. If both disagree with each other's policies then inflation cannot be controlled. Sometimes effectiveness of policy is not always from one side.

6.15 Lags in the effects of policy

In the long run, economy is in equilibrium. But in short run if economy gets disturbed by an aggregate demand. It reduces the income below full employment. It is a job of policy makers to respond and direct disturbances. The policy makers find it as a long or short term disturbance. It is transitory such as one year reduction in consumption spending.

Sometimes changes are short term and the best policy is to do nothing at all. Since monetary policy acts with lag decisions about the short term interest rate taken at a certain point in time only influence the economy at future dates. A well-structured monetary policy framework requires analytical support in the form of mechanisms for anticipating future inflation and responding to it a head of time (Bhattacharya R. et.al, 2008).

If demand changes in the short term then suppliers and producers will not make mistakes and adjust the production and inventory the changes. They will not adjust capacity. This will affect income in this period but it will have very little permanent effect. Therefore today's actions take time to have an effect; today's actions would be hitting the economy. It will tend to move economy away from full employment level. This disturbance is temporary and it has no long term effects and policy operates with a lag then the best policy is to do nothing.

Figure 6.12 GNP with stabilization policy

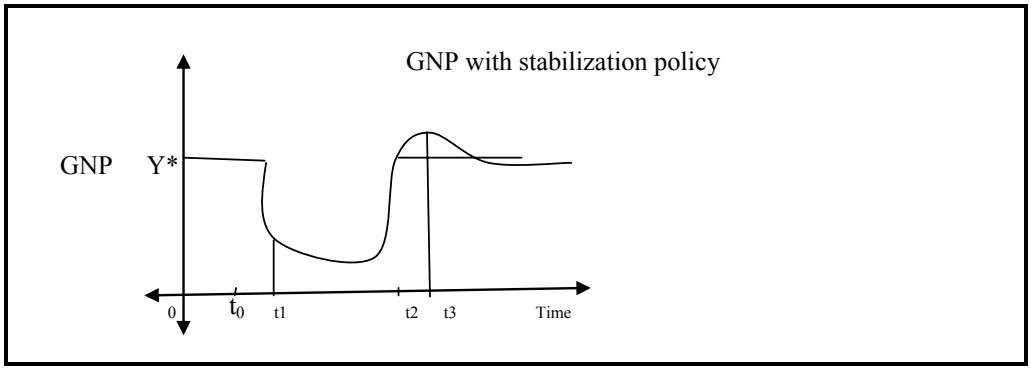


Figure 6.12 illustrates that at time t_0, there is disturbance and output declines. At point t_2, it reaches at equilibrium. The expansionary policy might be initiated at time t_1. Expansionary policy starts taking effect sometime after output which is now tends to recover faster. Sometimes due to expansionary policy, the output expands very high and it causes the overshooting of employment. It is observed between t2 and t3. By time t3, the restrictive policy is initiated and sometime after, output starts turning down towards full employment and may well continue cycling for a while.

For stabilization, one has to think whether it is worth trying to stabilize output or whether the effect of stabilization policy is in fact making things worse. Stabilization policy may actually destabilize the economy. It is important to understand that actions can be taken as disturbance has occurred and then the process by which that policy action affects economy. There are delays or lags at every stage, namely. Inside lags and outside lags. The inside lag is the time period which the policy takes to commence a policy action such as tax cut or an increase in the money supply. The outside lag describes the timing of the effects of the policy action on the economy. The inside lags are divided as recognizable, decision and action lags.

6.15.1 The recognition lags

It means the period that lapse between the time when disturbance occurs and the time the policy makers recognize that action is required. The lag could be negative if the disturbance is predicted and appropriate policy actions considered before it even occurs. For example, during Diwali/ Christmas and in June the demand for credit is high. During this season, reserve bank increases the high power money.

6.15.2 The decision and action lag

It means the delay between the recognition of the need for action and the policy decision –differs between monetary and fiscal policy. Once the action is recognized, the decision lag for monetary policy is short. The action lag means the lag between policy decision and its implementation for monetary policy is also short. At present decision lag for monetary policy is short and the action lags practically zero. For fiscal policy, once the action is recognized, then administration has to prepare legislation for that action. Both houses should see the bill. They should discuss and pass or approve it. If the bill is passed regarding taxes then it takes time to change the tax rates and see the pay checks. It is an action lag in policy.

6.15.3 Outside lags

The outside lags are generally distributed lags once the policy action has taken its effects on the economy spread over time. It is a small immediate effect of a policy action but the effect occurs later. The impacts of lags are very small and it continues over a long period of time. For example, the expansionary monetary policy leads to spending and output increases. It takes several quarters to see the change in output. The lags are because aggregate demand depends on lagged values of income, interest rates and other economic variables. An open market purchase initially has effect mainly on interest rates and not on income. The interest rates in turn affect investment with a lag and also affect consumption by affecting the value of wealth. When aggregate demand is ultimately affected, the increase in spending itself produce a series of induced adjustments in output and spending.

6.15.4 Monetary and fiscal policy lags

Fiscal policy lags are related to government spending. It directly impacts on the aggregate demand. It changes income more rapidly than the monetary policy. It has short outside lags, but it has longer inside lags. Therefore long side lags in fiscal policy is less useful for stabilization and means that fiscal policy tends to be used relatively infrequently to try to stabilize the economy.

6.15.5 Conclusion

The above points highlight that undertaking short term policy actions takes time to set the policies in actions. The policies themselves take time to affect the economy. But it is not a problem. The policy makers cannot be certain about the size and timing of the effects of policy actions.

6.16 Gradualism vs. shock therapy

Gradualism attempts a slow and steady return to lower inflation. Figure 6.13shows that small reduction in the money growth rate that shifts the aggregate demand curves down from DAD to DAD'. It helps to move economy a little way along the short run aggregate supply SAS from E to E1. In response to the lower inflation at E1, the short run aggregate supply curve shifts downward to SAS'. A further small cut in the money growth rate moves the economy to E2. The aggregate supply curve shifts down again and the process continuous. Eventually output returns to its potential level at point E' at a lower inflation rate. There is no massive recession during the adjustment process, although unemployment is above normal throughout.

Figure 6.13. Reducing inflation through gradual method

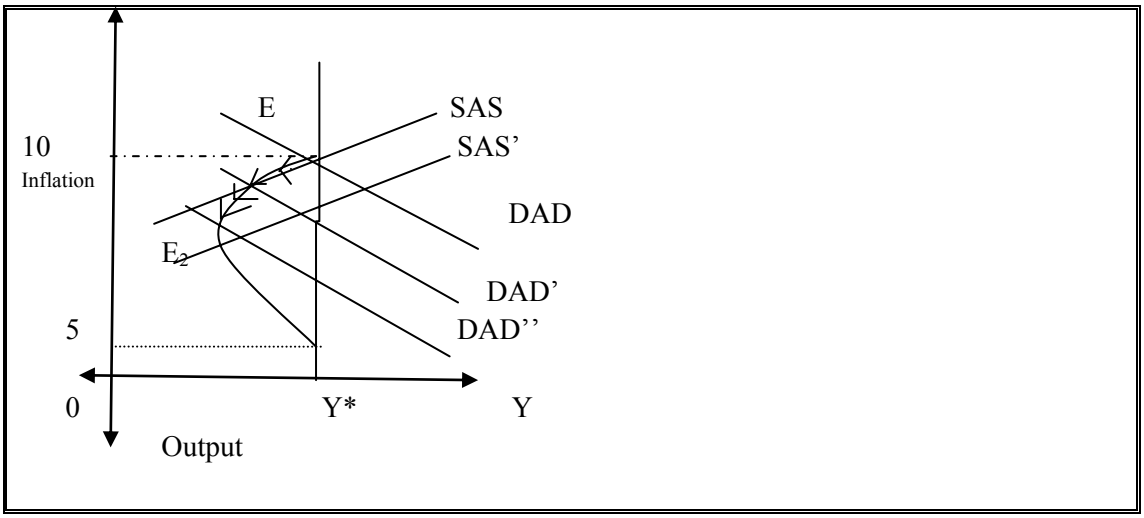
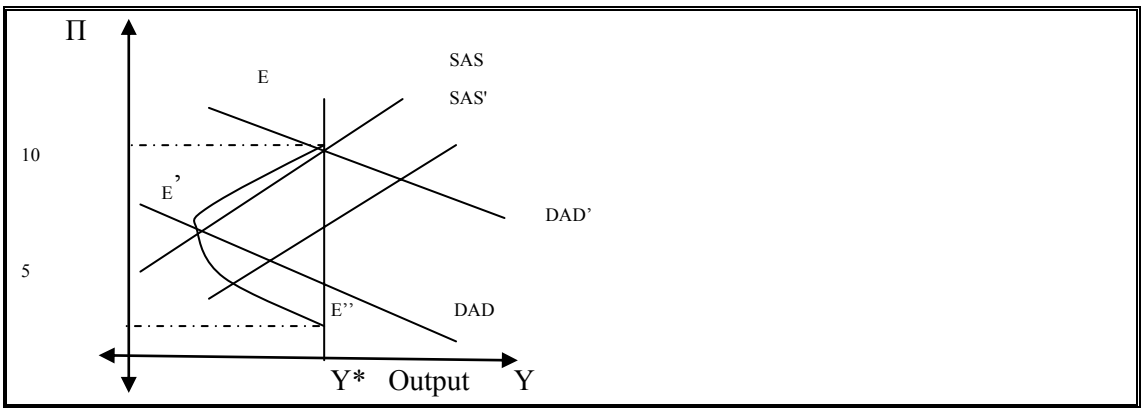
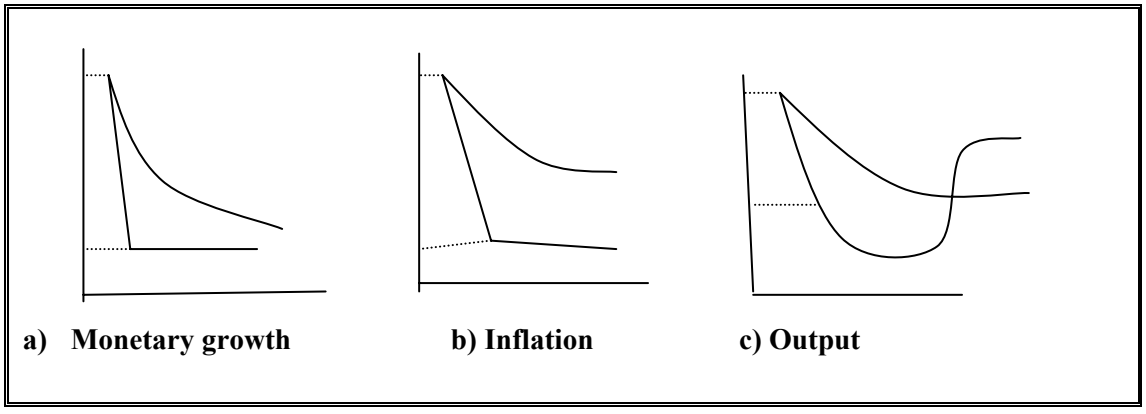


Figure 6.14. Reducing inflation through shock therapy



In figure 6.14, shock therapy tries to cut the inflation rate fast. The strategy starts with an immediate sharp cut back in money growth, shifting the aggregate demand curve from DAD to DAD' and moving the economy from E to E'. The immediate recession is larger than under gradualism. By creating a larger fall in the inflation rate than the gradualist policy, the shock therapy causes the short run supply curve to move down faster than it does. The shock therapy keeps up the pressure by holding the rate of money growth low. Eventually the rate of inflation falls enough that output and employment begin to grow again. The economy returns to point E with full employment and lower rate inflation.

Figure 6.15. Difference of gradual and shock therapy methods to reduce inflation



In the gradualism strategy, the growth rate of money is initially reduced only slightly and economy never stays far from the natural rate of unemployment. But the inflation rate comes down only slowly. The shock therapy starts with massive cut in the growth rate of money and a large recession. The recession is much worse than it ever is in the gradualist strategy, but the reduction in inflation is more rapid.

6.17 Credibility

A credibility policy is one that the public believes will be kept up and will succeed. A belief that policy has changed by itself will drive down the expected rate of inflation and for that reason because the short term Philips curve to shift down. Thus, credibility policies earn a credibility bonus in the fight against inflation.

The augmented aggregate supply curve is -

$$\Pi = \Pi^e + \lambda(Y - Y^*) \tag{6.24}$$

If the policy is credible, people instantly adjust their expectations of inflation when a new lower money growth rate is adjusted to the short run aggregate supply curve therefore moves down immediately. If policy is credible and if expectations are rational, the economy can move immediately to new long run equilibrium when there is a change in policy.

6.17.1 Criticism

There are a number of possibilities due to which, it is not practical. Firstly, credibility may be very difficult to obtain. Secondly, past contracts affect past expectations and the contract renegotiations take time. This is because of inflationary inertia a rapid return to lower inflation in economies experiencing inflation rates in the 10 to 20 percent range is unlikely. It is easiest to change the inflation rate when there are no long term contracts that embody the ongoing inflation –negotiations are not signed because they will be gambling too much on the future behaviors of price level. Long term nominal contracts disappear and wages and prices are frequently reset. In these circumstances, a credible policy will have rapids effects. But such success cannot be expected in an economy in which the structure of contracts has not been destroyed by extreme inflation. It remains true though whatever the structure of contracts the more credible a policy aims to dis-inflate the economy, the more successful that policy will be. Credibility is widely regarded around the world as the key to effective monetary policy because it guards against inflation, scares and improves the flexibility for monetary policy to stabilize employment over the business cycle (Friend, Marvin Good, 2000).

Questions

1. Explain the government's budget constraints.
2. Inflation tax reduces the inflation in economy. Explain in detail.
3. What is the relationship of deficit and hyperinflation?
4. Explain the relationship of the budget deficit and public debt.
5. Write a note on the Laffer curve.
6. How can the deficit be financed? What is the mechanism for it?
7. Write a note on the debt management of government?
8. Explain the dynamics of debt and deficit.
9. What is Borrow Ricardo problem?
10. Write a note on the burden of debt? What policies are required to get rid of this debt?
11. Size of debt matters for an economy. What is the role of welfare programs in government budget?
12. Explain the merged bank fund model in detail.

13. Write note on following

a) Polak fund model

b) Bank Model

c) Gradualism

d) Credibility

e) Gradualism

f) Credibility

14. What is a rule versus discretion concept? Explain.

15. Explain the following lags in detail.

a) Inside lags

b) Outside lags

c) Monetary and fiscal policy lags

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Glossary

A

Absorption approach: An approach to trade balance determination that emphasizes changes in domestic income and expenditure.

Action lag: The period between the time a policy is decided and the time it is implemented

Aggregate demand: The sum of values of all the final goods purchased in an economy

Aggregate demand curve: Relationship between the amount of goods and services people wish to purchase and the price level

Aggregate supply curve: Relationship between the amount of final goods and services produced in an economy and the price level

Aggregate supply and demand model: The unique point that determines the equilibrium price level and output in economy

Anticipated inflation: Inflation expected/estimated by people in economy

Appreciation: The value of the domestic currency increases vis-a-vis other countries currency

Arbitrage: Buying and selling assets to take advantage difference in returns

Augmented Philips curve: Phillips curve that includes the inflationary expectations as a determinant of the inflation rate

Automatic adjustment mechanism: It is a mechanism that automatically acts to eliminate balance of payment problem

B

Balance of payment: It is a measure of net flow of currency into the country from abroad

Balance of payment deficit: It means when more money is leaving the country than is entering it

Balance of payment surplus: It occurs when more money is entering the country than is leaving it.

Begger thy neighbor policy: An attempt to increase domestic output at the expense of output of other countries

Budget constraints: The difference between the amount of money the government spends and the revenue that it receives in the form of taxes

Budget deficit: The difference between the amount of money that government spends and the revenue earned through taxes

Budget surplus: It is the amount of taxes earned is more bythe government than spending in an economy

Burden of debt: Each individual share of the national debt

Business cycle: Pattern of expansion and contraction of the economy

C

Capital account: Net flow of dollars into the economy resulting from the acquisition of domestic assets by foreigners

Central bank: The bank that control the money supply. In India, it is the Reserve Bank of India

Classical adjustment process: Process by which the economy automatically moves towards internal and external balance

Classical aggregate supply curve: Vertical AS curve shows output equals potential output

Clean floating: Flexible exchange rate in which the central bank does not intervene in foreign exchange markets

Consumption function: It is equation relating consumption to disposable income

Credibility: The degree to which the public believes that the government will implement its announced policies

Crowding out: Reduction in some component of aggregate demand –usually investment that results from an increase in government spending

Current account: Net flow of currency into the country the country resulting from the sale of domestic goods and services and from net transfers from abroad

D

Debt income ratio: Ratio of national debt to GDP

Decision lag: The period of time required to decide on the proper response to macroeconomic shocks

Deflation: Rate at which the price the price level falls in percentage terms: it is opposite of inflation

Depreciation: Rate at which the capital stock wears out

Dirty floating: The central bank in flexible exchange rate system intervenes in foreign exchange markets in order to affect the short run value of its currency

Discount rate: Interest rate charged by the central bank that borrows money from it

Discrete lags: The time that passes before an effect is felt

Disposable income: Income available for a household to spend: total income less taxes plus transfers

Distributed lags: Time that passes while an effect gradually accumulates

E

Efficiency wage model: The wages might be set above the market clearing rate in order to motivate workers

Endogenous growth: Steady state growth determined within a particular model

Excess reserves: Reserves held by banks over and above the level required by the reserve bank

Exchange rate: The price of foreign currency pre unit of domestic currency

Exchange rate overshooting: It is a movement of the exchange rate past to its target. It is an adjustment of exchange rates toward long run equilibrium is frequently accompanied by a move, in the medium run, of the exchange rate past its final position.

Exogenous variables: The variables which are determined outside a particular model

Expected inflation rate: The inflation expected in the future by workers and firms

Expected real interest rate: The real cost of borrowing or the real return on a deposit

Expenditure reducing policies: Policies aimed at offsetting the effects of expenditure switching policies

Expenditure switching policies: A policy aims at increasing purchases of domestic goods and increasing purchases of imported goods

External balance: It occurs when the balance of payments is neither in surplus nor in deficit; when the current account and the capital account exactly offset each other

F

Face value: The amount that a bond pays its holder on expiration. The market value of a bond will equal its face value when the market interest rate is equal to the coupon rate on the bond.

Factors of production: Inputs to production, capital, labor and natural resources are examples

Fiscal policy: Government policy with respect to government purchases, transfer payments and the tax structure

Fixed exchange rate system: The exchange rate system which is decided by the central government and reserve bank and is managed through the exchange rate system

Flexible exchange rate system: In this system, the exchange rate is allowed to fluctuate with the forces of supply and demand

Foreign exchange market intervention: The sale and purchase of currency in foreign exchange market for the express purpose of increasing or decreasing the value of the domestic currency. It is usually carried out by the central bank

G

Globalization: It is movement where the world is moving towards a single global economy

Government budget constraints: A limit that says the government can finance its deficits only by selling bonds or by increasing the monetary base

Government budget deficit: Excess of government expenditure over government revenue

Government expenditure: Total government spending, including both government purchases and transfers

Government purchases: It means government expenditure of money on several goods and services.

Gradualism: It is a strategy of moving toward a desired target slowly

Gross domestic product: It is a measure of all final goods and services produced in an economy during a period with all domestic owned factors of production

Growth rate: Rate at which a variable increases in value, percentage change in the level of variables

H

High powered money: Currency and banks deposits at the central bank. It is also called as the monetary base

Hyperinflation: A rise in price level is above 1000 percent per year

Hysteresis: It occurs when temporary fluctuations in one variable have permanent effects on another

I

Indicators: Economic variables that signal us to whether we are getting close to our desired targets

Inflation: Percentage rate of increase in the general price level

Inflation tax: Revenue gained by the government because of inflation's devaluation of money holding

Inside lag: Revenue gained by the government because of inflation's devaluation of money holding

Inside –outside model: Predicts that wages will remain above the market clearing level because those who are unemployed do not sit at the bargaining table

Instruments: The tools policymakers manipulate directly to affect the economy

Internal balance: It occurs when output equals potential output

International trade: It is an exchange of goods and services between countries

Inventory cycle: Response of inventory investment to changes in sales that causes further changes in aggregate demand

Investment: Purchase of new capital, principally by the business sector

IS curve: It shows of the combinations of interest rate and the output in the goods market

J

J curve effect: It occurs when a currency depreciates; the value of net exports rises temporarily and then falls

K

Keynesian aggregate supply curve: It is a horizontal aggregate supply curve shows the relationship between price and output

L

Labor force: It consists of people those are working and they are actively looking for work

Liquidity: A measure of the ability to make funds available on short notice

Liquidity constraints: Limitations on ability to make funds available on short notice

Liquidity trap: It is a horizontal LM curve due to extreme interest sensitivity of money demand

LM curve: It shows all of the combinations of the real interest rate and the level of output for which the demand for real money balances equals the supply of real money balances

M

M1: It is currency plus demand deposits

M2: It is M1 plus small time and saving deposits, overnight re-purchases agreements

Marginal propensity to consume: Increase in consumption for each rupee increase in disposable income

Marginal propensity to import: The increase in the demand for imports that results from a one unit increase in domestic income

Marginal propensity to save: It is an increase in saving for each rupee increase in disposable income. It is equal one minus the marginal propensity to consume

Medium of exchange: It is one of the roles of money and the assets used to make payments

Monetary approach to balance of payment: It is emphasizes monetary causes of balance of payments problem

Money: It is an asset which is used for making immediate payment

Money multiplier: Ratio of money stock to the monetary base

Mundell- Fleming model: It explores economy with flexible exchange rates and perfect capital mobility

N

National income: It is a total payment to factors of production, net national product minus indirect taxes

Net national product: It is GDP minus allowance for depreciation of capital

Net exports: Exports minus imports

Net present value: The amount today that is equivalent to a future payment –the amount of money that, invested at the market interest rate, would generate that amount of money

Nominal exchange rate : The price of one currency in terms of another

Nominal interest rate:It is expressed as the payment in current rupee on a loan or other investment in terms of an annual percentage

Nominal money supply: Nominal value of bills and coins in circulation, says nothing about the amount that these bills and coins can purchase

O

Open economy: The economy that trades the goods, assets and services to other countries

Open market operation: Reserve bank purchases and sell the treasury bills in exchange of money

Open market sale: It is an operation in which the reserve bank buys government bonds on the secondary market

Opportunity cost: It is a forgone thing to take an action

Outside lags: It is a time required for a policy change to take effect

P

Pegged the interest rate: It is a practice of using monetary policy to keep the interest rate near a target level

Perfect capital mobility: The capital is mobile when it has the ability to move instantly and with a minimum of transactions costs, across national borders in search of the highest returns

Perfect anticipated inflation: When people have perfect foresight with regards to the inflation rate

Permanent income theory: People for expectations of their future income and choose how much to consume based on those as well as their current income

Personnel or personal saving: It is an income saved by individuals or families

Philips Curve: Relation between inflation and unemployment, in a sense, a dynamic version of the aggregate supply curve

Precautionary motive: The reason for which people hold money-people do not know how much they require for future contingency

Price stickiness: The prices are unable to adjust quickly enough to keep markets in equilibrium

Production function: It is a technological relation showing how much output can be produced for a given combinations of inputs

Purchasing power parity: It is an exchange rate adjusts to maintain equal purchasing power of foreign and domestic currency

Q

Quantity theory of money: It is a theory of money demand emphasizing the relation of nominal income to nominal money

R

Rational expectations: The theory of expectations formation in which expectations are based on available information about the underlying economic variable

Real business cycle theory: It is a theory that recessions and booms are due primarily to shocks in real activity such as supply shocks rather than to changes in monetary factors

Real devaluation: It means a decline in the purchasing power of the rupee relative to other currencies

Real exchange rate: It is a purchasing power of foreign currency relative to rupee

Real GDP: It is a measure of output which adjusts the value of final goods and services to reflect changes in the price level

Real interest rate: Return on investment measured in rupees of constant value. It is roughly equal to the difference between the nominal interest rate and the rate of inflation

Recognition lag: The period between the time a disturbance occurs and the time policy makers discover the disturbance

Reservation wage: It is a lowest wage which individual is willing to accept a job. If the wage is lower than the reservation wage then he/she will return it down

Reserve ratio: It is a ratio of bank reserves to bank deposits; a primary determinant of the money multiplier.

Reserves: It is a deposit which central bank keeps with itself instead of lending it

Revaluation: It is an increase in value of the domestic currency relative to the currencies of other countries

Ricardian equivalence: When there is no difference between taxes and the accumulation of debt is thought to be the same as future taxes

Rules versus discretion: It is an issue whether or not the central bank and government should conduct their policy in accordance with preannounced rules

S

Saving: The money not spent on the daily needs

Seigniorage: It means the revenue derived from the government's ability to print money

Short run: It is a period of time short enough that markets are unable to clear therefore output cannot be derived from the potential output

Speculative motive: It means a people hold money , although the return on holding money is small , people hold it because it reduces the risk associated with their portfolio assets

Stagflation: It means simultaneous inflation and recession

Standard of deferred payment: The assets which are normally used for making payments due at a later date

Stock variable: A variable that is measured in levels rather than rates of change

Store of value: It is assets that maintain its value over time

Supply shocks: It is an economic disturbance whose first impact is a shift in the aggregate supply curve

T

Targets: It is identified goals of policy

Total factor productivity: The rate at which productivity of inputs increases; it is measure of technological progress

Trade balance: The net flow of rupee into the country due to sales of goods abroad.

Transactions motive: It is a reason people hold money and they use it to purchase goods and services.

Transfer payment: The money given by the government to people. They are the welfare payment such as entitlement program.

U

Unemployment gap: It means the difference between the actual unemployment rate and the natural rate

Unit of account: It is an asset in which prices are denoted

Unstable equilibrium: It pushes nearby variables away from itself, if a variable is moved slightly away from the unstable equilibrium, It forces will push it even further away

V

Velocity of money: It means the number of times the typical rupee changes hands during the year

W

Wage stickiness: When wages are unable to adjust quickly enough to clear the labor market

Y

Yield curve: It shows the change in interest rate as the bonds maturities increase