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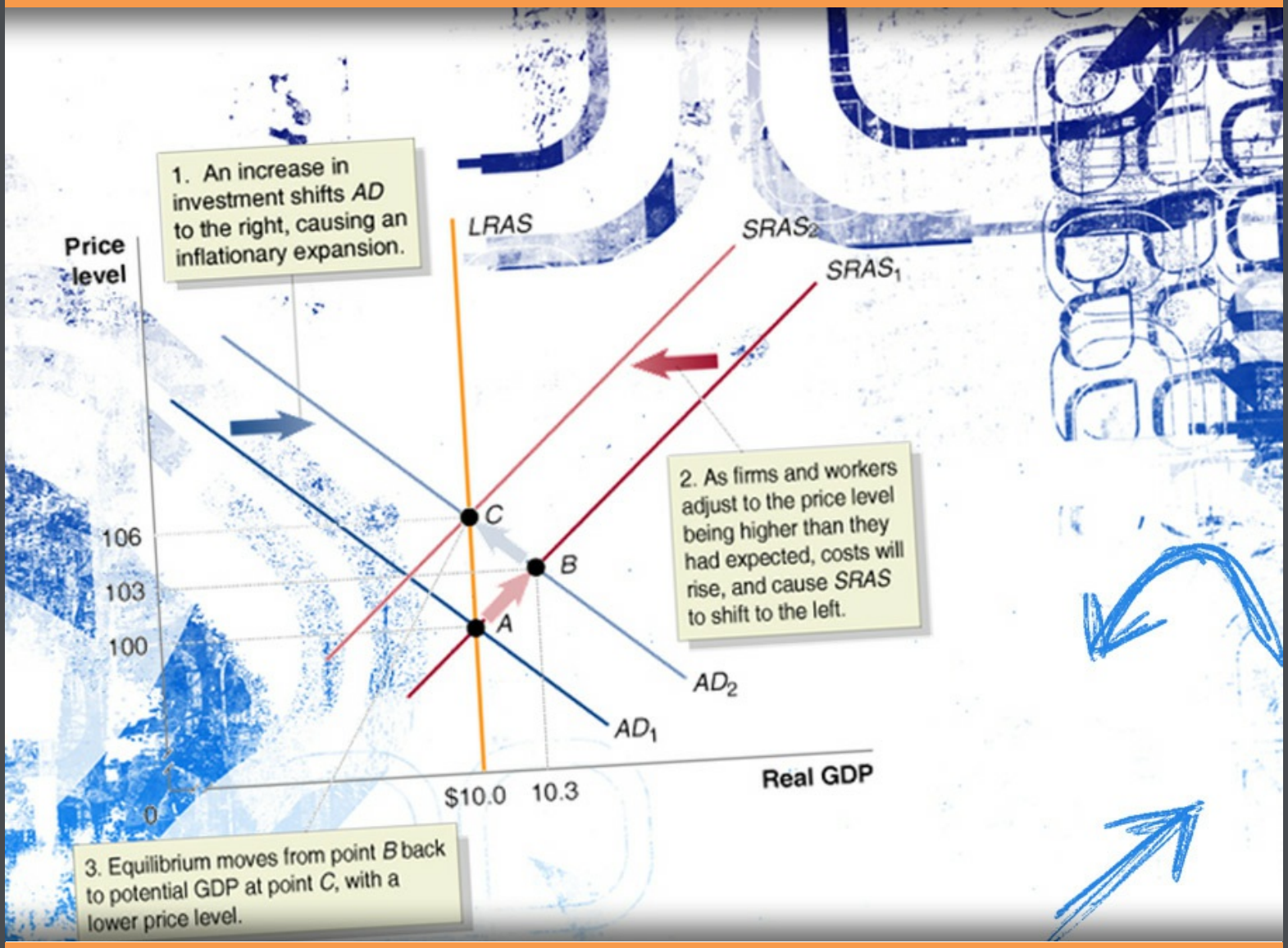
Advanced Macroeconomics

Sanjay Rode



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Sanjay Rode

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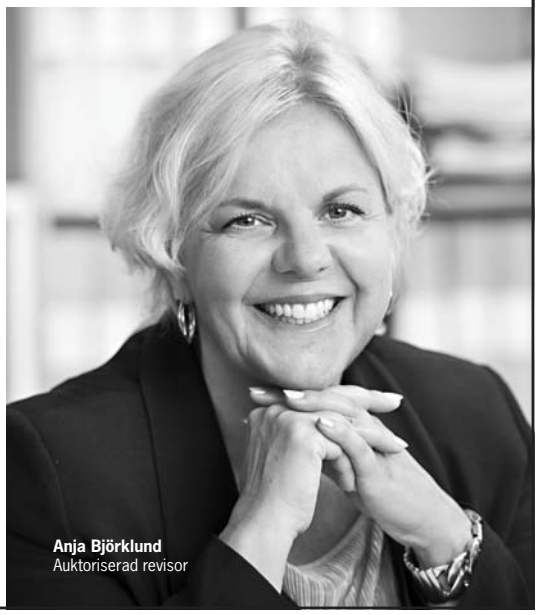

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Preface

This book was written to complete the curriculum requirement of the Master's of Macroeconomics degree. Macroeconomics is a very practical subject and can be very useful for policy making. Domestic and international economies are subjected to variations in savings, income, exchange rates, as well as interest rates and the balance of payments. This book attempts to explain the domestic and international factors responsible for creating the equilibrium of the balance of payments, interest rates and inflation.

It is hoped that this book's contents will help students to think, analyze and apply what they have learned. Various industry-related examples such as exchange rate, inflation, domestic output and other data have been included to assist the understanding of macroeconomic issues. This book was written with the aim to provide insights to students, teachers and policy makers to think about various macroeconomic issues in a broader way. Once the issues are known to the policy makers, planners and academicians, it will be easier for them to think in that direction and ultimately, this knowledge may help them solve some of these problems related to these issues.

This advanced macroeconomics book will provide fundamentals of the basic macroeconomic principles, and thus, will be also useful to non-students of economics learning about macroeconomics for the first time.

This book is divided into two parts. The first part explains the topics related to a closed economy. The second part will discuss topics related to an open economy and includes the open economy and the macroeconomy. Both are equally important because the first part forms the basis for understanding the second part. Some current issues such as foreign exchange, money and capital markets are also explained because learning about such topics will help students understand macroeconomics 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 curve explains the price adjustment in the short and long run.

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

The third chapter elucidates the aggregate supply curve, inflation and the Philips curve. The linkage of inflation, deficit and debt, as well as deficit and debt financing are also included in this chapter.

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The fourth chapter describes the open economy as well as the macroeconomy. The chapter includes an interpretation of the Mundell-Fleming model under fixed and flexible exchange rates, exchange rate fluctuations and the reserve bank policy.

In the fifth chapter, the fundamentals of modern macroeconomics are defined. Rational expectations and the real business cycle theory are explained in the latter part. The efficiency wage hypothesis describes the wage bargaining activities of workers in industry. The insider and outsider models show how workers perform wage bargaining in industry. The search and match model explains the asymmetric information and moral hazard problems of the selection of workers and employment issues.

The sixth chapter clarifies the monetary and fiscal policy mix for internal stability in detail. The exchange rate and debt management of government are discussed in the second section. Rules versus discretion and the Polak Fund model are also explained in this chapter.

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Acknowledgement

Many researchers and academicians have contributed to the field of macroeconomics. Each one has made a unique contribution to the advancement of the field. With this book, I am making my small contribution, which, though subject to various limitations, should reflect my sincere efforts to study the domestic and international factors affecting 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 was a source of inspiration. He taught me various principles of macroeconomics – theoretical as well as practical. I am lucky to have worked with him as his research assistant.

Dr. Indira Hirway, Professor and Director of the Center for Development Alternatives (CFDA), in Ahmedabad, India, was an inspiration. Her work in labor and gender economics, and time use study has helped me understand the various macroeconomic issues in detail. She made great effort to teach me the theory and advanced macroeconomics topics in her office and during field work.

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

I also would like to thank Dr. Sindhu Sara Thomas of the Department of English for her valuable suggestions. I owe Mrs. Smitha Angane of the Department of Statistics and Mathematics a debt of gratitude.

I would like to express my deep appreciation to the administrative staff of the S.K. Somaiya College, University of Mumbai, particularly to Mr. Sanam Pawar, Librarian, and Mr. Mane, for their immense help. Thanks to my friend, Mr. Srinivasan Iyar, for some very fruitful discussions on various aspects and parts of this book. Mr. Amit Naik and Mr. Anant Phirke have been a continuous source of inspiration and were there when I needed them. Their affection and encouragement has helped me throughout my research work. I must also acknowledge the support of my numerous friends and associates;Mr. Rajesh Patil and Mr. Rajendra Ichale, to name only a few.

Finally, I would like to express my affectionate appreciation to my mother and father. It is difficult to explain how much effort they have taken in order for me 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 my postgraduate and undergraduate students.

Sanjay Jayawant Rode

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1 Introduction to Macroeconomics

1.1 From a closed to an open economy

People have been involved in production activities since ancient times. Modern economies are much more diversified in terms of production. Now, skilled labor and advanced computerized machineries are used in the production process. The production system, in the first instance, satisfies the need of people for consumable goods and services. It follows therefore, that in a closed economy, without a government sector or interference, all products generated from all natural resources are consumed by people. This could be expressed in an equation, as follows:

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

where Y = production
C = consumption

All consumption is equal to all 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 = savings

After some time, savings can be converted into investments (S = I). This can be interpreted as

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

where Y = production
C = consumption
I = investments

If equations (1.2) and (1.3) are combined, then

$$C+ I = Y= C+ S \tag{1.4}$$

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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 the government forms an important part of the economy. We could add the government to the above equation, as the government makes expenditures on various infrastructure projects and welfare schemes. To pay for such expenditures, the government imposes direct and indirect taxes on people's incomes. Hence, the total disposable income is affected by government expenditures. The equation becomes

$$Y = C + I + G \tag{1.5}$$

where G = government-levied taxes

The government not only finances various development projects but also provides subsidies and maintains defense, law and order in society. These activities require additional expenditures. The total income of the population declines after direct taxes are imposed, resulting in the current equation:

$$YD = C + S \tag{1.6}$$

where YD = disposable income of people
C = consumption
S = savings

In modern times, all economies are open economies and we cannot neglect the external sector. Foreign trade is a must in the globalized world and increases when a country's economy is more open. Including these factors, we arrive at this equation:

$$Y = C + I + G + (X - M) \tag{1.7}$$

where (X – M) = net exports to other countries

All governments encourage exports 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 payments. Capital flow is also taken into consideration. This can be interpreted as

$$Y = C + I + G + (TR\text{-}TA) \tag{1.8}$$

where TR = total receipts
TA = total payments

Total receipts comprise the capital flow and net exports. Similarly, total payments comprise the capital outflow and payment for imports.

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If we combine equations (1.6) and (1.7)

$$C + S = YD = Y + TR - TA \tag{1.9}$$

$$C = YD - S = Y + TR - TA - S \tag{1.9a}$$

$$S - I = (G + TR - TA) + NX \tag{1.10}$$

where NX = net exports

Therefore, savings, investments, the government budget and foreign trade have the following macroeconomic identities, and can be presented as

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

$$= C + S + (TA - TR) \tag{1.11}$$

The left hand side of the equation shows the output component of the economy. Output is measured in terms of money; it is the national income of the country. The right hand side of the equation shows the disposable income which is equivalent to the Gross Domestic Product (GDP) plus transfer payments and taxes.

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1.1.1 Income and spending

The aggregate income in the economy comprises the consumption, income, government expenditures and net exports. It can be expressed as follows:

$$AD = C + I + G + (NX) \tag{1.12}$$

where AD = aggregate demand
NX = net export

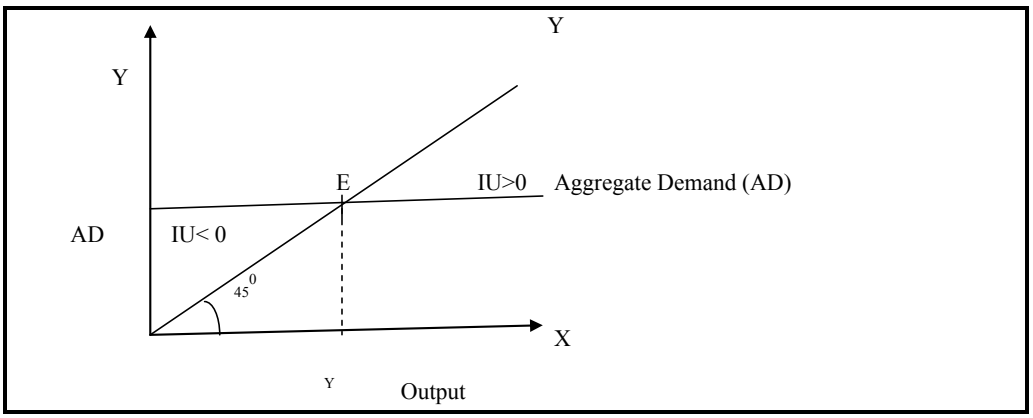

Figure 1.1 Income and spending in an economy

Figure 1.1 shows that the aggregate demand is a horizontal line and that in an economy it is independent. Point E shows that income is equal to the aggregate demand. If output is more than income then firms reduce production. In the long run, there is less production. The output remains in equilibrium. Thus, the output and equilibrium income are achieved. 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, the presence of unplanned inventories causes the firms to work 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 that

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

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

1.1.2 The consumption function

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

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

where C = consumption
Y = income

Consumption depends upon income and average consumption remains the 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 the sum of consumption and savings. We could rewrite the equation as

$$Y - S = C \tag{1.18a}$$

In order to get the savings out of income and consumption, we can reorganize the above equation into:

$$S = Y - C \tag{1.18b}$$

Some households have very little income and are not able to save on a regular basis. Their income is equal to their consumption. When the household income increases but consumption remains constant saving can occur. But it is usual that as income rises, consumption also rises. If we substitute equation (1.16) into (1.18b) then,

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

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

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

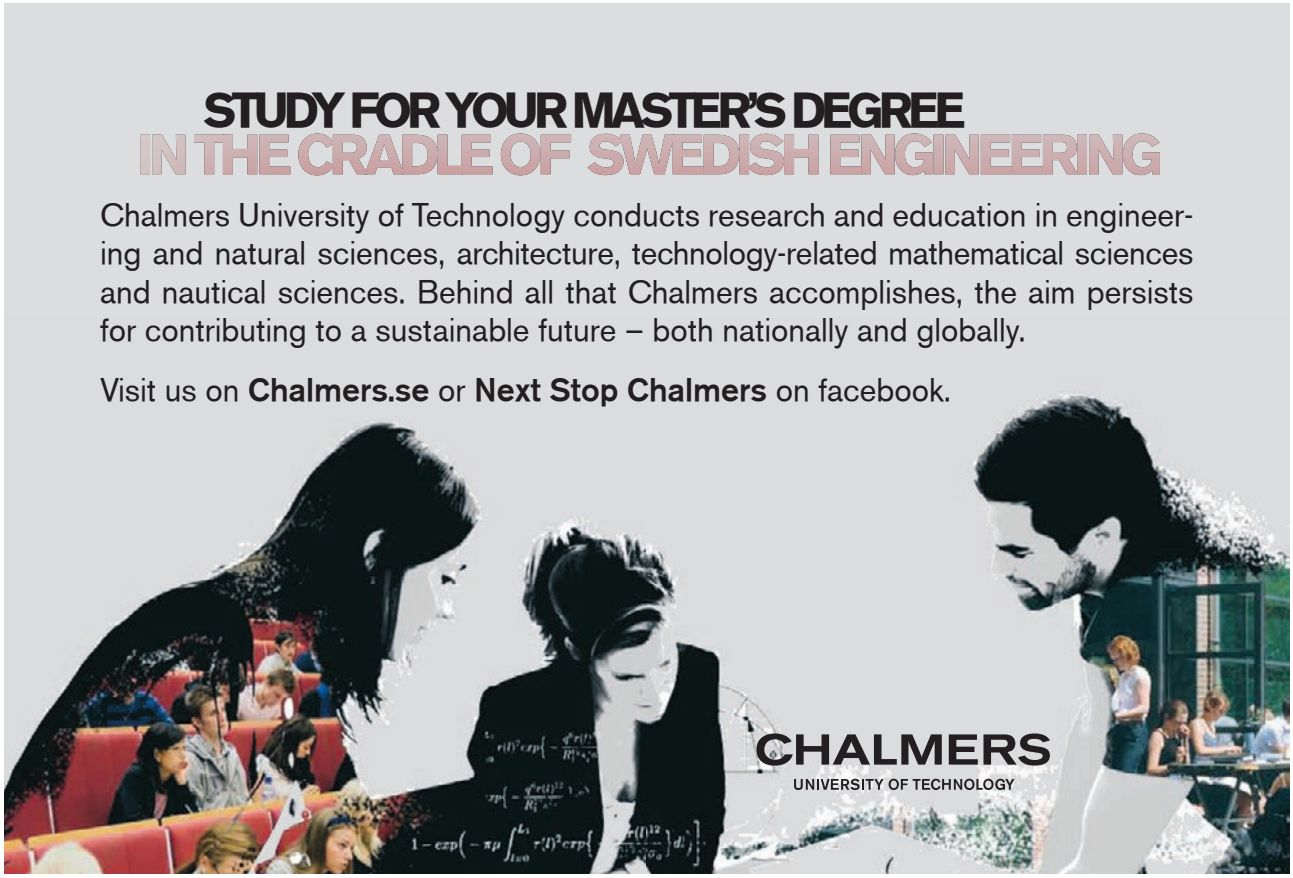
$$AD = C + \bar{I} \tag{1.20}$$

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

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

As per equation (1.16), we substituted consumption with $\bar{c} + cY$. We assume that the autonomous investment in the economy will be equivalent to the average consumption. Therefore, investment will take care of the aggregate consumption in the economy. If the income level rises, then the propensity to consume will also rise. Therefore, the autonomous investment needs to be increased, as in the following equation:

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



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

$$Y = AD \tag{1.23}$$

If we subtract consumption from both sides of the above equation, we get

$$Y - C = AD - C \tag{1.24}$$

The equation becomes

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

where saving is equal to the planned investment in the economy.

Figure 1.2 shows planned saving and investment in the economy. The diagram shows that the consumption remains constant at $\bar{C}$ point. But with a rise in the aggregate consumption, the investment in inventories needs to increase. Therefore, the aggregate investment increases to $\bar{A}$, where demand increases and the equilibrium aggregate will be achieved at E. When there is an investment in inventory, output increases to Y. If more output is produced then income declines. Therefore, final output is achieved at Y and equilibrium at E.

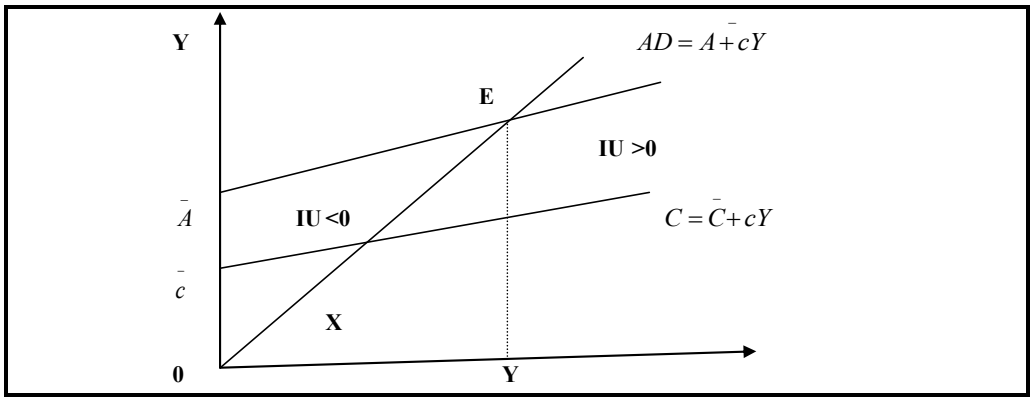

Figure 1.2 Change in the aggregate demand

1.1.3 The multiplier

The autonomous investment (A) is equal to average ($\bar{A}$) autonomous investment where income is at the equilibrium level. An increase in the autonomous investment leads to an increase in income. When income increases expenditures also increase. As expenditures continue to increase, at first, output starts to increase and then income. This can be explained by the following equation:

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

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

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

If we solve the above equation through the geometric method, we get

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

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

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 a simple equation it can be defined as

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

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

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

The multiplier is influenced by autonomous spending. If the output change is more, then autonomous investment is also more. This 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 changes in the multiplier. Similarly,

$$\Delta Y_0 = Y'_0 - Y_0 \tag{1.34}$$

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:

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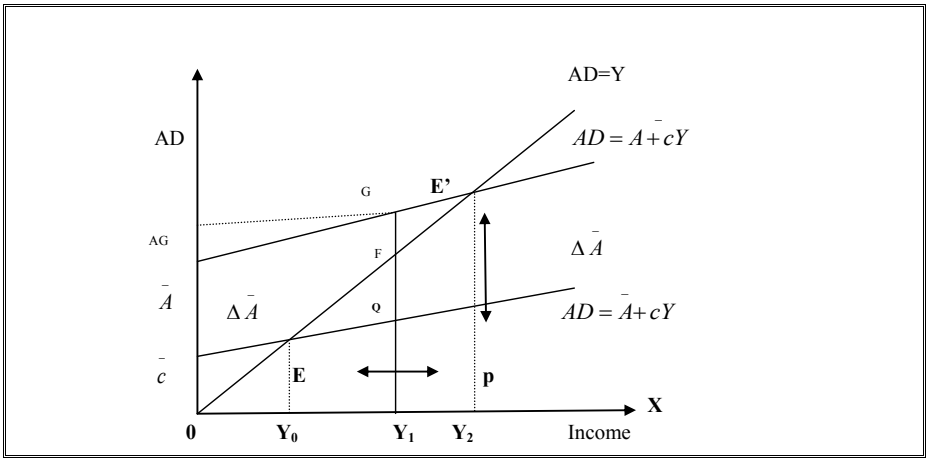

Figure 1.3 The multiplier effect and aggregate demand

In figure 1.3, the aggregate demand changes from Y_0 to Y_1. Therefore, firms will respond to the change and increase production. This will lead to an increase in induced expenditures. Such expansion in production increases the induced expenditures; hence, the outcome is an increase in aggregate demand to 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. PE equals PE' It exceeds the increase in autonomous demand EQ. In the diagram, the multiplier exceeds 1 because consumption demand increases with the change in output, finally leading to a change in demand.

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1.1.4 The government sector

During a recession, the role of the government is important in a welfare state. Government decisions directly affect the disposable income of people. The change in income occurs in two ways. Firstly, the government produces or purchases goods and services from the market. It provides these goods to the people at low prices. This is done through the public distribution system. The disposable income of people increases as a result. Secondly, the government reduces taxes and this leads to an increase in the disposable income of the people. Similarly, the government spends on defense, infrastructure facilities, and law and order. The expenditures in all welfare schemes are 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 the transfer payment of taxes.

Therefore, the 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 the government spends at an average rate, there is an average transfer from the government to the public. The government collects average taxes from people, then

$$\begin{aligned} G &= \bar{G}, TR = \bar{TR} \\ TA &= tY \end{aligned} \tag{1.37}$$

If we replace TA with tY, then the 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, thereby affecting consumption. Net transfers also affect consumption. The higher the net transfers from the government, the higher the consumption expenditures of the people. The marginal propensity to consume (MPC) is related to C (1-t).

If we combine the above equations, then

$$\begin{aligned} AD &= \bar{C} + (\bar{TR} + \bar{I} + \bar{G}) + c(1-t)y \\ &= \bar{A} + c(1-t)Y \end{aligned} \tag{1.40}$$

Here, the aggregate demand is related to the autonomous investment in the economy, consumption and disposable income.

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1.1.5 The government and aggregate demand

In figure 1.4, the aggregate demand is shown as consumption, average consumption and income. The new aggregate demand curve AD is denoted as a flat slope. The slope is flat because the government levies taxes on income and whatever income is left (disposable income) is used for consumption. Therefore, the propensity to consume out of income is now c (1-t) instead of c.

If we define income as follows:

$$Y = AD$$

then substitute AD in the above equation

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

The government purchases goods and services from the private sector. It spends $\bar{G}$ and the transfer payments are denoted as $\bar{TR}$. Taxes are assumed to be constant. In this case, the government expenditures shift the intercept of the aggregate demand curve up and the curve becomes flatter.

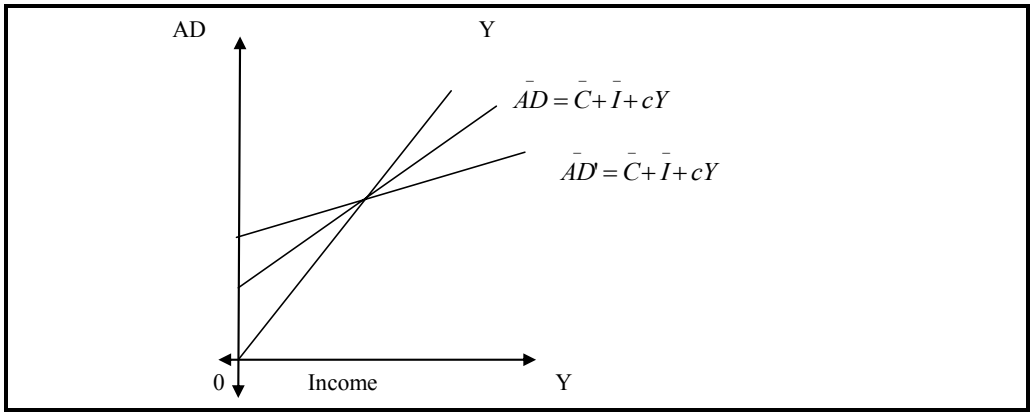

Figure 1.4 Aggregate demand and equilibrium

Now aggregate demand is defined as follows:

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

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

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

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The government expenditures make a substantial difference in the economy. Government expenditures, purchases and net transfers affect the income of people, and will be explained in detail in the next part.

1.1.6 The budget

A good, balanced budget is one that takes care of receipts and payments. A balanced budget helps manage government expenditures and increases income. A budget surplus consists of more revenues and lower expenditures. A government budget consists of the total expenditures on goods and services as well as transfer payments, and can be expressed as

$$S = TA - G - TR \tag{1.42}$$

The budget is in surplus when the total government payments are less than the government receipts. Alternatively, if the expenditures exceed the total taxes collected, the budget is in deficit. Now, if we substitute TA for Ty then

$$S = Ty - G - TR \tag{1.43}$$

The aim of each government is to maximize tax collection and increase the tax base. The tax rate is not given much importance; but is dependent on the tax collection efforts of each government. Each government has a different capacity for tax collection but each government tries to minimize its expenditures. An increase in government purchases is equal to $\Delta Y_0 = \alpha_G \Delta G$. The increase in income is in the form of taxes. Tax revenues increase by $T\alpha_G \Delta G$. The change in the 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 an increase in the purchases of the government will reduce the budget surplus. This is further explained in the Table 1.1

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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

Table 1.1 The Budget of the Government of India at a Glance (In crore of Rupees)
Source: Budget 2011, GOI

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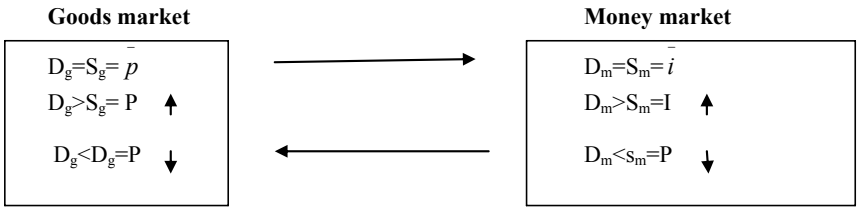
1.2 The IS-LM Framework

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 the aggregate supply. Such an average supply keeps prices at a constant level. The aggregate supply of goods determines the equilibrium price. The average price level decides the aggregate demand. If prices change then the aggregate demand is affected. The aggregate demand is related to the average price and supply. If the aggregate demand rises, it reflects on the aggregate supply.

1.2.1 The goods and money markets

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



Graph 1.1 Equilibrium of the goods and money markets in an economy

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The goods market is in equilibrium when the demand for goods is equal to the supply of goods. The price level remains in equilibrium. The prices of commodities can change if the demand for goods rises faster while the supply remains constant. This could result in a rise in the price of the commodities. The rise in price, in turn, will have an effect on the demand for the commodity. There is an inverse relationship. When the supply of a certain good rises while demand remains constant, the price of this good 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 a number of reasons while the supply remains constant, then the interest rate will start rising. When the supply of money rises while demand for money declines, the interest rate declines but this is a short term adjustment.

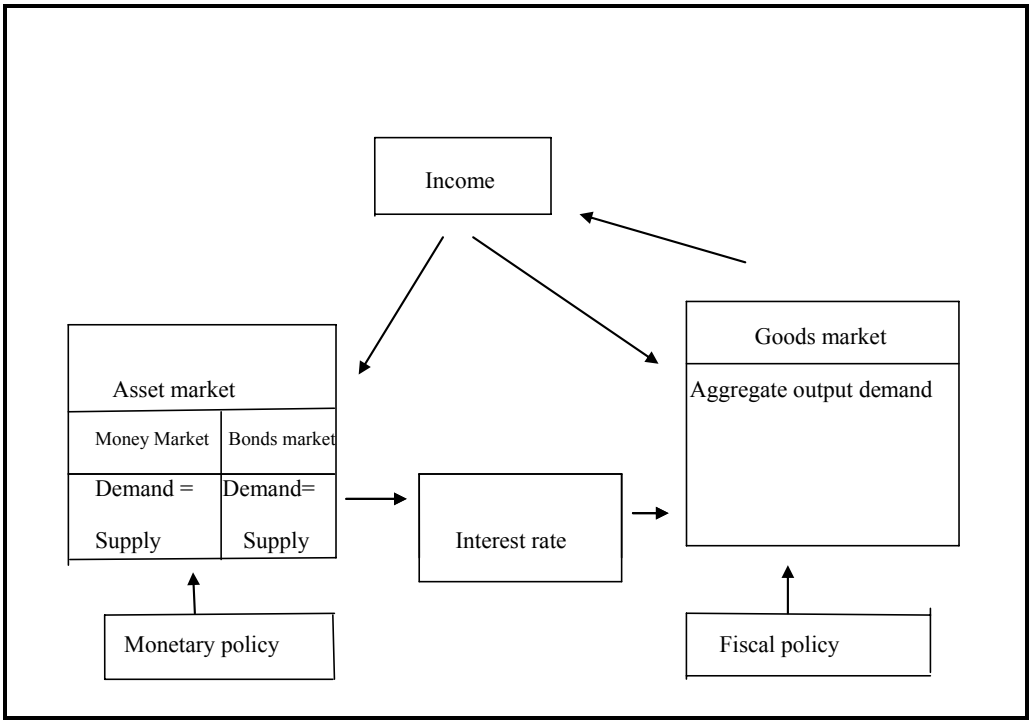

Figure 1.5 Flowchart of the goods and money markets
Source: Dornbusch and Fischer (1994)

In the long run, the demand for and the supply of money remain equal to the supply of money and the interest rate remains unchanged. At the same time, the demand for goods is also equal to the supply of goods. Prices remain constant and the goods and money markets remain in equilibrium with stable prices and stagnant interest rates. Such equilibrium in the goods and money markets may change after an economic expansion or contraction due to monetary and fiscal policies in the short run. In the long run, both markets remain in equilibrium.

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1.2.2 The goods market equilibrium

The goods market is in equilibrium when the desired investment and the desired national savings 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 remain in equilibrium. The prices of goods remain in equilibrium. In other words, the prices of goods remain constant. The aggregate demand curve (ADC) is related to the interest rate and to the income level. As the aggregate demand curve shifts upward, the interest rate falls and the aggregate income increases. The planned investments in the economy increase with an increase in output and income.

In a closed economy, output is equal to expenditures.

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

Now we will classify each variable into different categories.

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

Consumption is related to income and the interest rate. As the level of income rises, the consumption expenditures increase. There is a positive relationship between consumption and income. Income is inversely related to the interest rate. As the interest rate starts rising, the consumption expenditures start declining. Income is further categorized as

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

The consumption function can be written as follows:

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

The linear version of the consumption function can be written as

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

where c_0 is the autonomous consumption independent of income. c_1 is the responsiveness of consumption to a change in disposable income. c_2 is the responsiveness of consumption to a change in the ex-ante real rate of interest. The investment function can be defined as

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

where a is shorthand for business confidence and the productivity of investments. b is the parameter that explains how much investments decline in response to an increment in the ex-ante real interest rate.

The government expenditures can defined as

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

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The government's expenditures in the economy are considered the average expenditures. The IS curve is derived as follows:

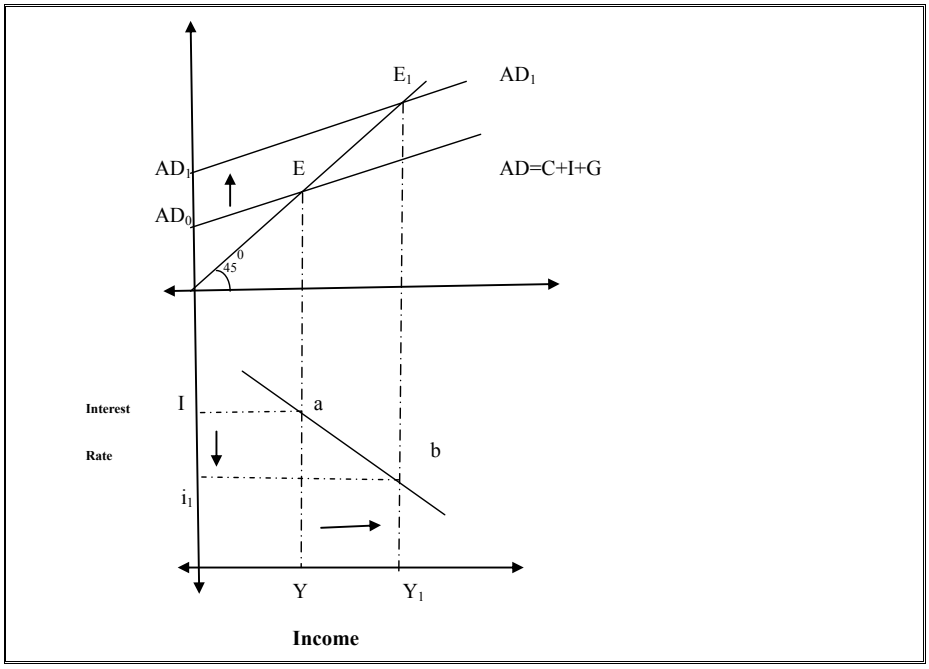

Figure 1.6 Derivation of the IS curve

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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 the interest rate and income.

The aggregate demand curve remains in equilibrium with income and the interest rate. In the long run, consumption expenditures increase due to the increase in disposable income. A fall in the interest rate leads to an increase in investments and also leads to a rise in incomes and investments by the government and the private sector. The government expenditures (infrastructure projects, defense, law and order) increase every year due to the welfare state. Such developmental and social welfare expenditures raise the aggregate demand in the economy.

In figure 1.6, the rise in aggregate demand leads to a shift in equilibrium from E to E', making the interest rate fall from i to i_1. The decrease in the interest rate leads to a rise in income. If we join points a and b, the result is a downward sloping IS curve.

Properties and shift of the IS curve

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

Shifts of the IS curve

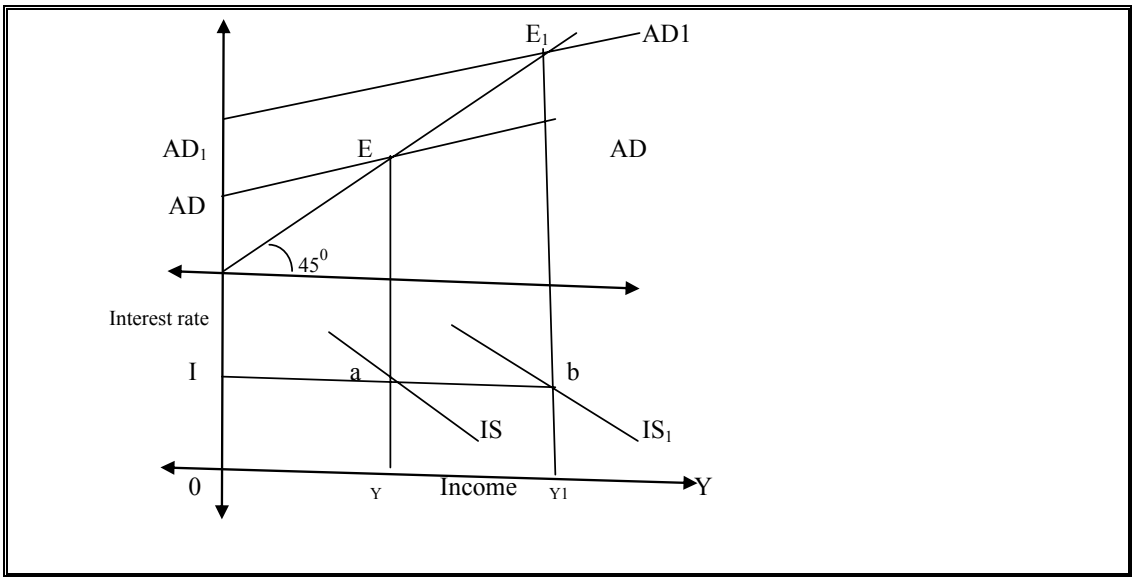

Figure 1.7 Shifts of the IS curve

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As investments in the economy start rising, output also increases. This leads to an increase in the aggregate demand which is observed at point E. But a rise in the aggregate demand shifts the AD curve to AD_1. The new equilibrium is achieved at E_1. At this new equilibrium point, income rises from Y to Y_1. If we derive points a and b, then a shift occurs from IS to IS_1. The new IS_1 curve does not get affected by the interest rate. There is no change in the interest rate but income changes. The slope of the IS curve remains the same.

1.2.3 Derivation of the LM curve

The Liquidity preference-Money supply (LM) curve shows the relationship between money supply and demand. The interest rate remains constant when there is no change in the demand for and the supply of money. In the short run, the demand for money changes very fast but the supply of money doesn't. Therefore, when the demand for money rises, the interest rate rises, too. It is also possible that the demand does not rise but the supply remains high. In this case, the interest rates decline.

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 the supply of money.

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

If we solve the above equation for the interest rate, we can rewrite it 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, figure 1.8, the LM curve is derived.

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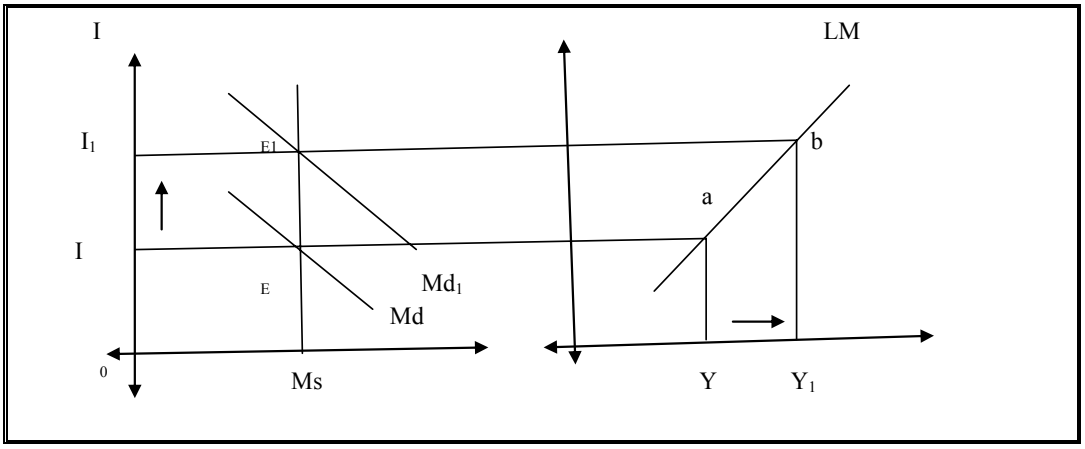

Figure 1.8 Derivation of the LM curve

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

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1.2.4 Shifts of the LM curve

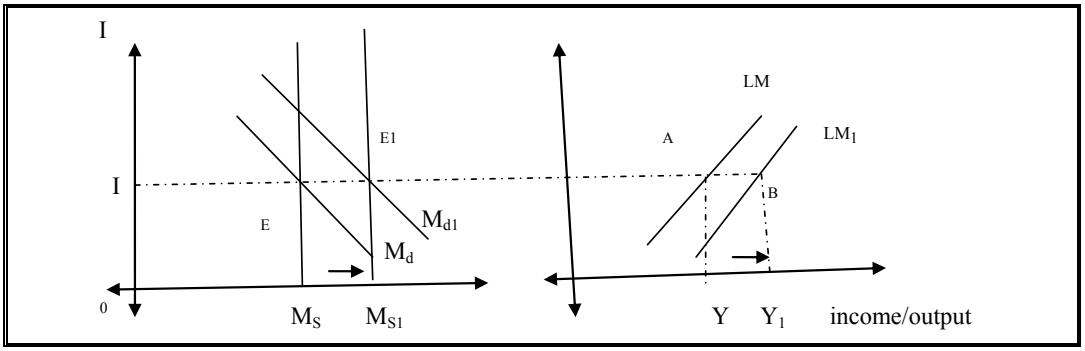

Figure 1.9 Shifts of the LM curve

Figure 1.9 shows that the demand for money 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 point E1 shows an increase in the income, as shown at Y to Y_1. At point A and at point B, two separate LM curves are drawn. An expansionary monetary policy leads to an increase in the income. The interest rate remains constant at I. The LM curve shifts to LM_1.

Properties of the LM curve:

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

1.2.5 Equilibrium of the IS-LM model

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

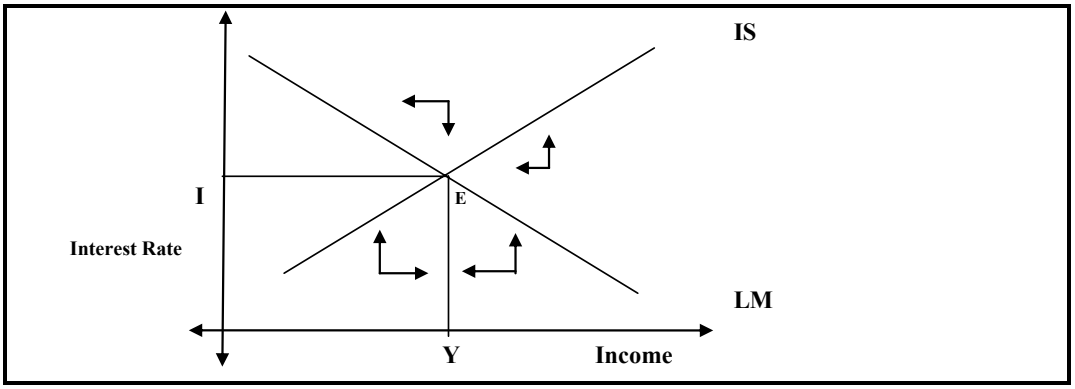

Figure 1.10 Equilibrium of the IS-LM model

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Figure 1.10 shows the intersection point of the IS and LM curves at point E, where it is always at long-term equilibrium. This means that the interest rate and income remain constant. It is possible that in the short run, due to expansionary and contractionary fiscal and monetary policies, the shift can either be backward or forward. The interest rate and income can either decrease or increase. The arrows in the diagram show the movements of the original equilibrium point. The following adjustments are shown in the table 1.2.

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

Table 1.2 Adjustments in the IS-LM model

It is not advisable to follow any particular monetary or fiscal policy. This is because following one policy may have an effect on the income and on the interest rate. In the long run, either policy is ineffective.

1.2.6 Effects of fiscal policies on the IS-LM model

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

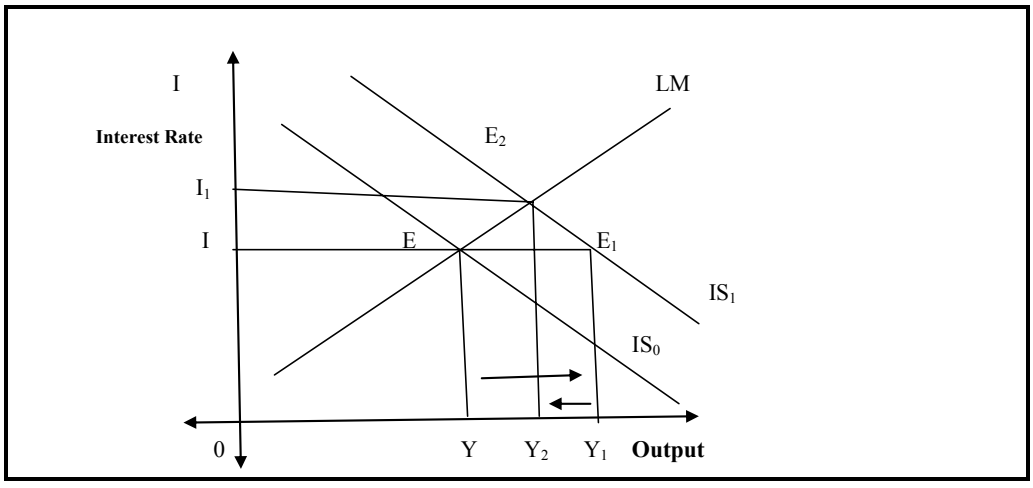

Figure 1.11 Effects of fiscal policies on the IS-LM model

Effects of fiscal policies on the IS-LM model

A government can help to increase the income of people by conducting an expansionary fiscal policy, like when a government reduces direct and indirect taxes. Lower taxes to pay means people have more disposable income. Lower taxes on various commodities means that there is an increase in the disposable incomes of people.

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Figure 1.11 shows that an expansionary fiscal policy leads to an increase in disposable incomes. A government's expansionary fiscal policy will result in an increase in income from Y to $Y_{1.}$ But an increase in disposable incomes could also lead to people saving and keeping their money in banks to take advantage of the rise in the interest rates. In the figure, the interest rate increases from I to I_1. The increase in incomes was expected at Y_1 but they increase further to Y_2. The crowding out occurs in the expansionary fiscal policy. It is shown at Y_1 to Y_2. The increase in the interest rate wipes out the increase in the total income. Therefore, at a higher level of income and higher interest rates, industrialists do not find it easy to invest money and their investments in firms start declining. As investments decline, the generation of employment also starts declining. Workers will not be able to find jobs and their incomes will also decline. The figure shows that an increase in the interest rate reduces investments made by industrialists leading to changes in the level of employment and income in the economy. In the long run, the economy is in equilibrium at point E. Short-term expansionary fiscal policies have no effect on incomes and the interest rate.

1.2.7 Effects of monetary policies on the IS-LM model

The objective of each monetary authority is to stimulate economic growth in the country. The monetary authority therefore, always tries to increase the money supply and reduce the interest rate. At lower interest rates, increased investments are possible.

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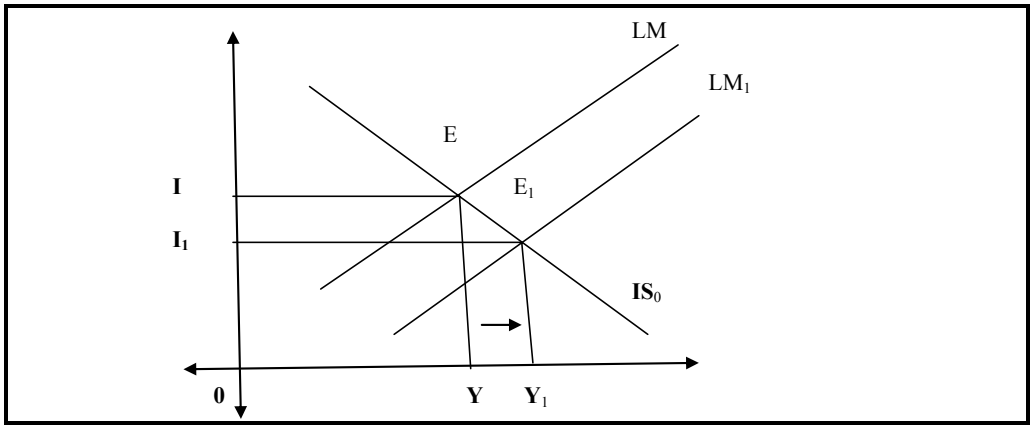

Figure.1.12 Effects of monetary policies on the IS-LM model

A monetary policy, by reducing the interest rate, always improves the income of people. The reduction in the interest rate helps increase investments in the economy. Figure 1.12 shows that the monetary authority reduces the interest rate, and so, I declines 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 the increase in incomes lead to more investments. Production increases due to higher capital investments. But higher production could also lead to lower demand, and to prices declining. This is because every firm tries to sell their products in the national and international markets. They may sell at lower prices just to cover the fixed costs of production. The decline in prices due to competition reduces the profit margin. The investments made and profits gained do not match. Future investments are affected. A recession occurs. A decline in investments reduces the employment opportunities, which reduces the income levels. Incomes decline further and go back to the original level. In the long run, an expansionary monetary policy is ineffective. The interest rate (I) and incomes (Y) remain unaffected in the long run.

1.2.8 Conclusion

The goods market is in equilibrium when the demand for goods and services equals the supply of goods and services. Prices are constant. The money market is in equilibrium when the demand for money equals the supply of money. Both the goods and money markets are in equilibrium with the interest rate and income. Expansionary fiscal and monetary policies lead to increases and decreases in the interest rate and incomes, but only in the short term. In the long term, both monetary and fiscal policies are ineffective.

1.3 Aggregate demand and supply

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

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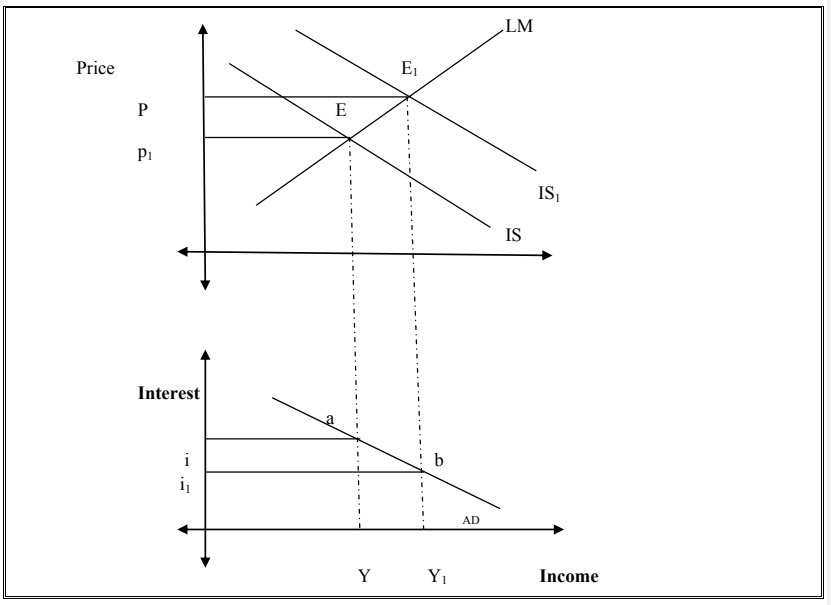

Figure 1.13 Derivation of aggregate demand

Figure 1.13 shows that the IS-LM curves are intersecting at Point E. When the IS curve shifts to $IS_{1,}$ perhaps because of an expansionary fiscal policy, the new equilibrium point is observed at E_1. In the second diagram, if points a and b are joined, the aggregate demand curve can be derived.

1.3.1 Effects of monetary expansion on the aggregate demand

The aggregate demand (AD) curve is affected by an expansionary monetary policy. The rise in the money supply and decline in interest rates affect income and output, increasing them. Figure 1.14 shows an expansionary monetary policy's effects on aggregate demand.

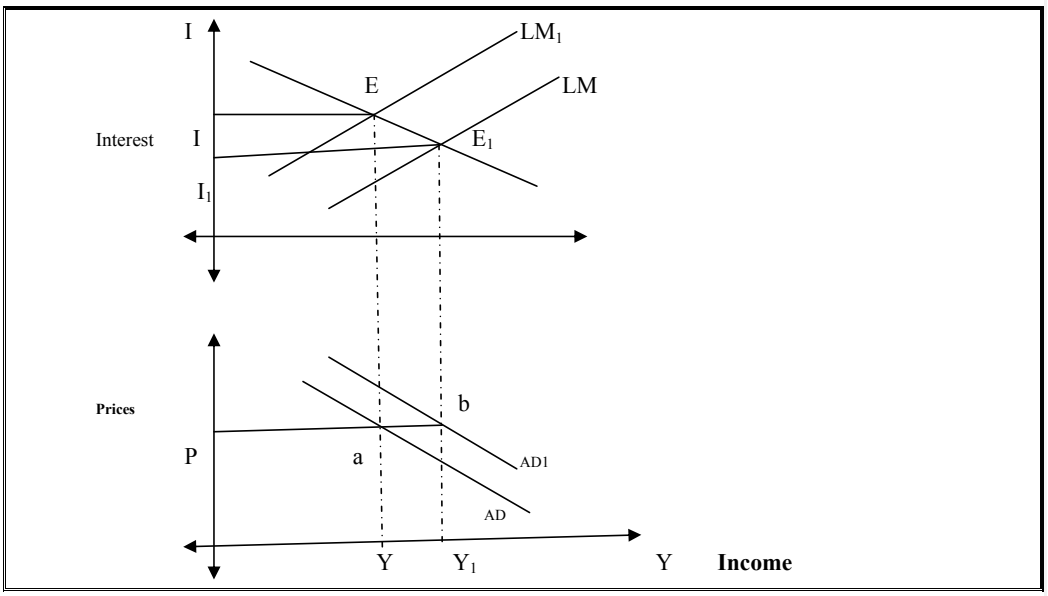

Figure 1.14 Effects of monetary policies on the aggregate demand

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Figure 1.14 indicates that the expansionary monetary policy will have a positive effect on income and output. The interest rate will fall from i to i_1. The LM curve shifts from LM to LM_1. An expansionary monetary policy will have no effect on the price level. Prices will remain at equilibrium at P. If we join the two points a and b, the AD curve can be derived.

1.3.2 Shifts of the aggregate demand curve

The aggregate demand (AD) curve shifts towards the right, if there is an expansionary fiscal policy.

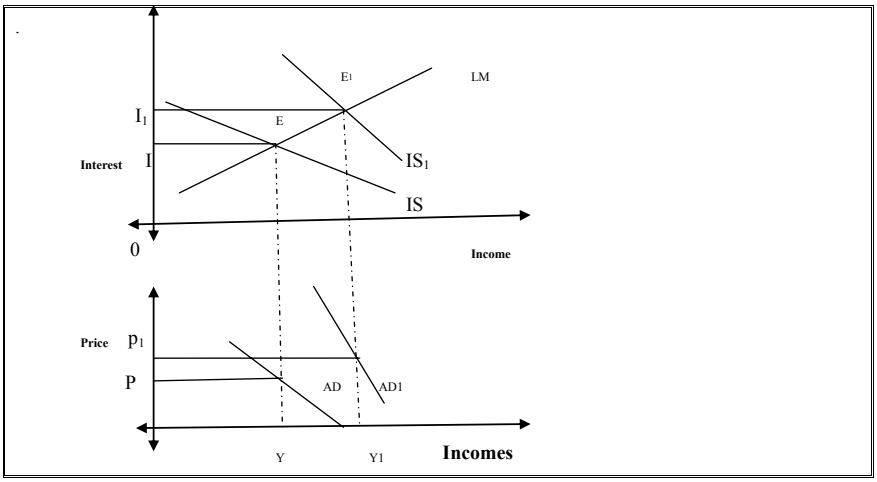

Figure 1.15 Fiscal policies and shifts of the aggregate demand

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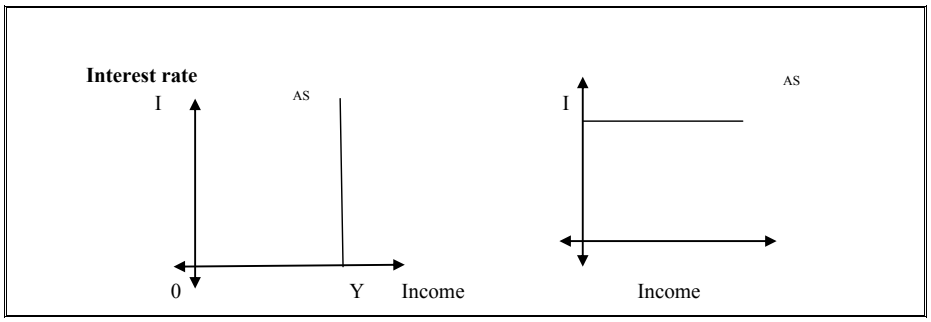
In figure 1.15, the expansionary fiscal policy has positive effects on the aggregate demand, leading to an increase in income together with a large increase in the interest rate. The downward sloping supply curve is the aggregate demand curve.

1.3.3 The aggregate supply curve

The aggregate supply curve (ASC) is classified into two types: the Keynesian and the Classical aggregate supply curves, which are based on different 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 an economy and does not change.



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

Figure 1.16 The Classical and Keynesian aggregate supply curves

Figure 1.16 shows the Classical and Keynesian aggregate supply curves. In a, the aggregate supply (AS) curve is a vertical straight line but in b, it is a horizontal line. In the 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 policies on the classical aggregate supply curve

A. Fiscal policy and the aggregate supply curve

An expansionary fiscal policy will shift the IS curve upwards without changing output.

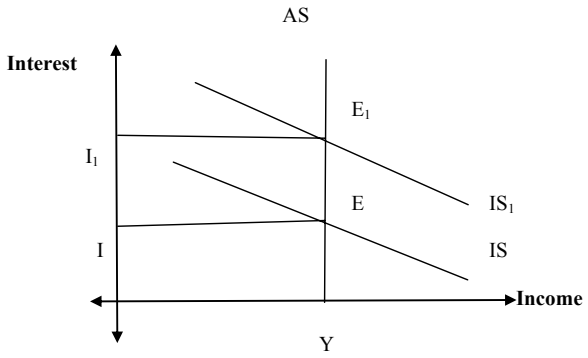


Figure 1.17 The effect of fiscal policies on the classical aggregate supply curve

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Figure 1.17 represents the effect of fiscal policy on the classical aggregate supply curve. It shifts upwards, leading to an increase in the interest rate, I to I_1. Income remains the same in the long run. In the long run, the effect on income is not positive.

B. Monetary policy and the classical aggregate supply curve

Fiscal policies are ineffective on the classical aggregate supply curve in the long run. An expansionary monetary policy has also no positive effect on output in the classical aggregate supply curve. This is explained as follows:

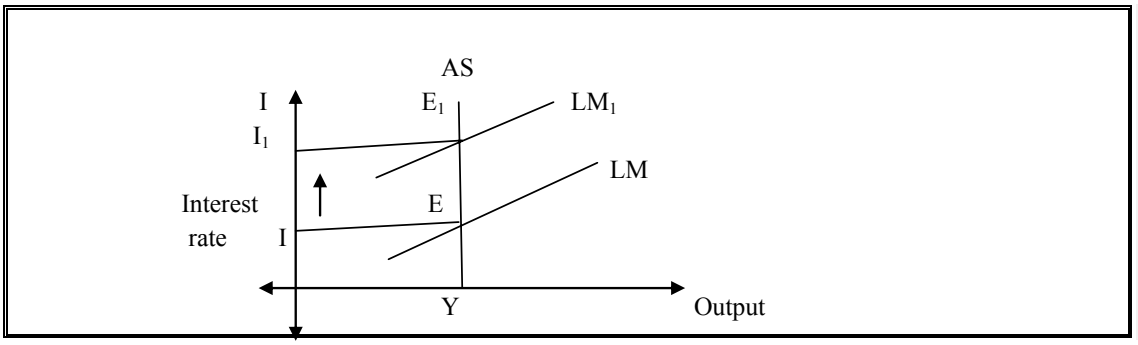

Figure 1.18 The effect of monetary policies on the aggregate supply curve

Figure 1.18 shows that aggregate income is in equilibrium at Y. An expansionary monetary policy causes the LM curve to shift upward. The increase in the money supply has a positive effect on the interest rate. The income remains unchanged or the same in the long run. We can conclude therefore that an expansionary monetary policy is ineffective on the classical aggregate supply curve.

1.3.5 Derivation of the Aggregate Supply Curve

Wages are upwardly flexible but sticky downwards. A rise in prices cannot decrease the real wage rate but a fall in prices can increase it. Downwardly sticky wages give 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 aggregate supply curve labeled AS_S in figure 1.19.

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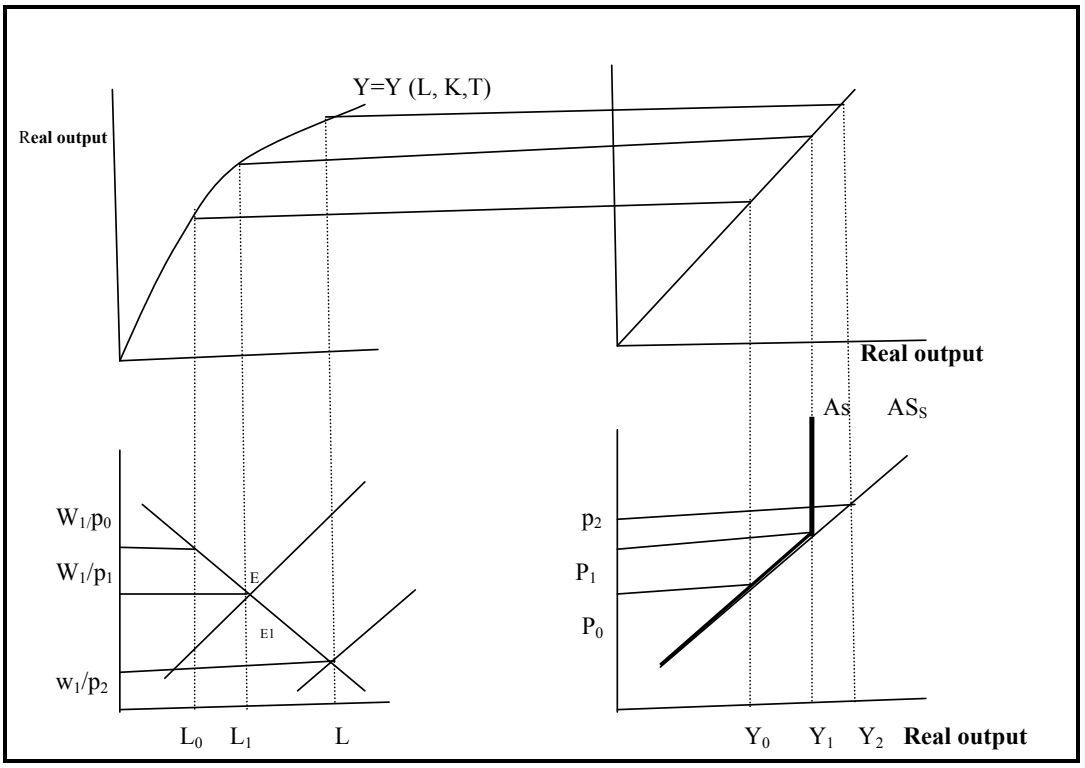

Figure 1.19 Derivation of the aggregate supply curve

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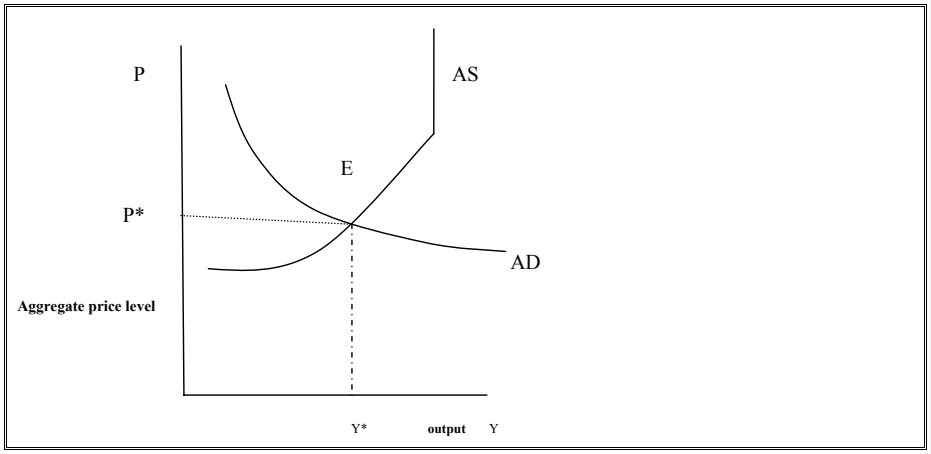
The AS curve is derived with the help of the demand for labor, real wages, the production function, and the output. All their combinations show the J type aggregate supply curve. This will be elaborated further in the discussion on equilibrium of the aggregate demand and supply.

1.3.6 Equilibrium of the aggregate demand and supply

In a modern economy, the aggregate demand and the aggregate supply are always in equilibrium with price levels and income. The demand curve is downward sloping but the supply curve slopes upward and is vertical at the top. This means that it is a combination of the Keynesian and the classical supply curves.



Figures 1.20 Equilibrium of the aggregate demand and supply curves

Figure 1.20 shows that the aggregate demand and the aggregate supply curves intersect at point E, the equilibrium point, with price at P* and aggregate income at Y*. At this equilibrium point, price and income are in equilibrium. If the aggregate demand increases prices will also increase.

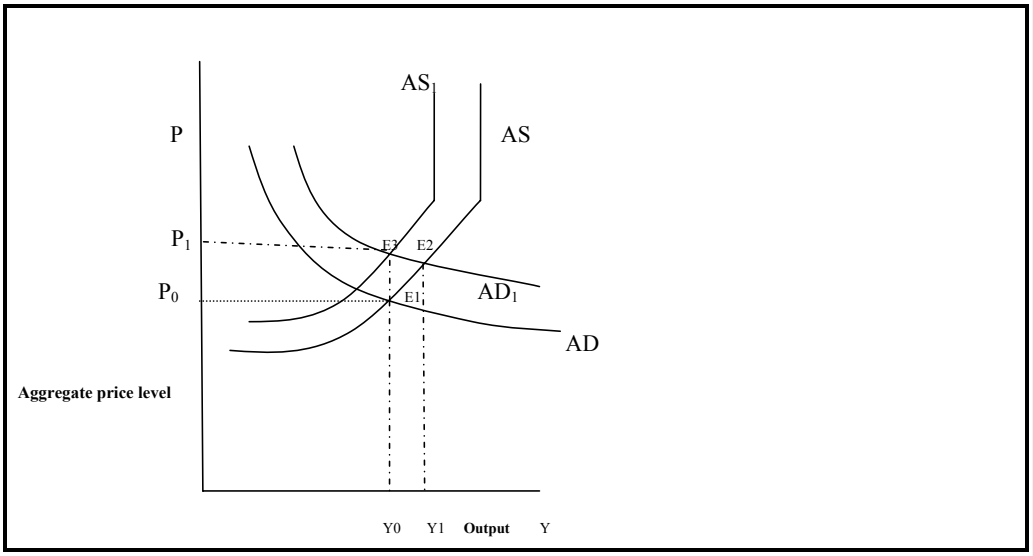


Figure 1.21 Effect of changes in the aggregate demand and supply

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Figure 1.21 illustrates that the aggregate demand and supply curves are in equilibrium at E1. Suppose that the aggregate demand increases while the aggregate supply remains constant, then the new equilibrium is achieved at E2. The aggregate price level increases and the output also increases to Y1. This is a short term effect. The supply cannot increase in the long run because all the factors of production are already fully employed. The output Y0 remains unchanged in the long run. Therefore, the aggregate supply curve shifts back to AS_1. The aggregate demand and aggregate supply curves intersect at E3, the new equilibrium point in the long term. In the long run, the aggregate output does not change; only the price level increases from P_0 to P_1. We often experience increases in different commodity prices. In the same proportion as the increase in price, people's incomes also rise. The government gives the dearness allowance to all civil servants. The private sector provides higher pay packages for labor contracts. The output of commodities in the economy remains the same in the long run. We experience inflation, but real income and output remain the same.

Questions:

1. Write a note on the following:
    a) Income and spending.
    b) Balanced budget theorem.
    c) What is "crowding out" and when do you expect it to occur? Would a monetary or a fiscal policy be appropriate in this case?
2. Write a 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 classical 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?
    a) The IS curve
    b) The equilibrium rate of interest
9. If the government were to reduce income taxes, how would output and the price level be affected in the short run and the long run? Show the impact on the aggregate demand and the 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.

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

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2 The Consumption Function

2.1 Introduction

The consumption function is important because of a number of reasons. Consumption is part of the aggregate demand. If income is not spent on consumption, then the saving rate rises. Consumption is an integral part of day-to-day life.

Most of the traditional and modern theories have explained the consumption function. The life cycle theory is associated with Franco Modigliani of MIT, who was a Nobel Prize winner in economic science. The permanent income theory is associated primarily with Milton Friedman of the University of Chicago. He won the Nobel prize for economics in 1976. Both theories are similar in nature and pay attention to a foundation in microeconomics. The classical theory of consumption known as the Ando-Modigliani approach proposes that people make consumption decisions according to the stage of life they are in as well as the resources available to them during their lifetime. It was developed in 1950 and 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 are determined primarily by a change in their permanent income as compared to their temporary income. This approach was later replaced by the Duesenberry approach, which was further replaced by the relative income approach in 1960.

The 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 lifetime stream of earnings to an optimum lifetime pattern of consumption.

Consumption and present value of income:

We assume that there is a single consumer and the utility function of this consumer is defined as

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

The lifetime utility is a function of his real consumption c in all time periods 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 present value (PV) of his total consumption in life exceeds the present value (PV) of his total income in life.

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

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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 the 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

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

In Figure 2.1, the income streams Y_0 and Y_1, intersect at 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.

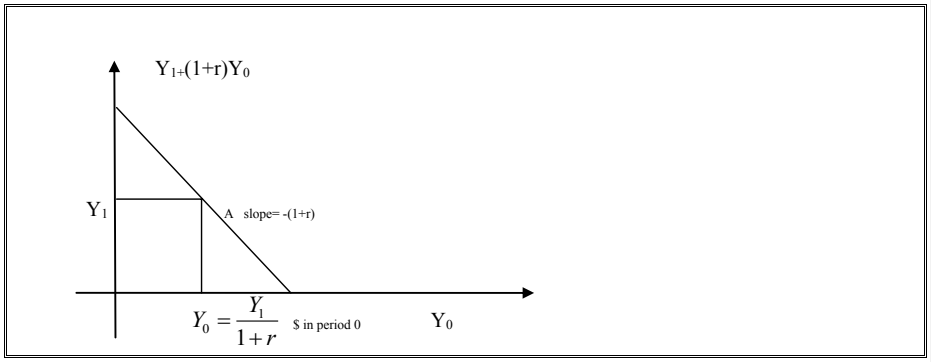

Figure 2.1 The income of an individual in two periods

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.

$$S_0 = Y_0 - C_0 = \text{money lent in period 0}$$

By lending this amount, he will receive in period 1 an amount equal to S_0 (1+r)

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

The negative sign enters equation (2.4) because the dissaving in period 1 is opposite to the saving in period 0 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.

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

By cancelling the S_0 in equation (2.5) and multiplying through by $(Y_0\text{-}C_0)$, we obtain

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

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The above equation explains that by 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 of income C_1-Y_1 by the amount of $-(1+r)s_b$.

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 the individual is indifferent between additional consumption period 1 or period 0 at each level of utility. These curves U_0,U_1 to U_2 raises the individual's level of utility.

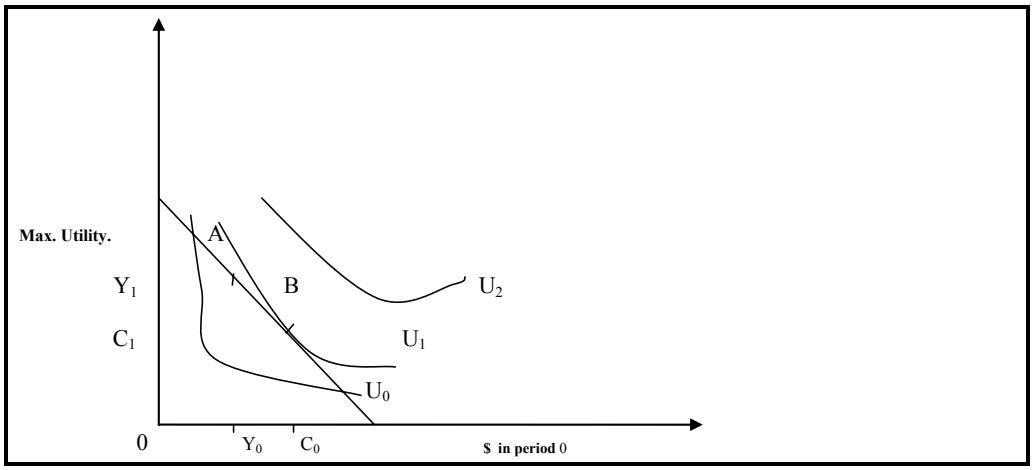

Figure 2.2 The individual utility function

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

$$C_t = f(PV_1) \text{ and } f > 0 \tag{2.7}$$

where PV_1 is the 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 Ando-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 at the end of his life when his productivity is low and high during the middle years of his life.

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

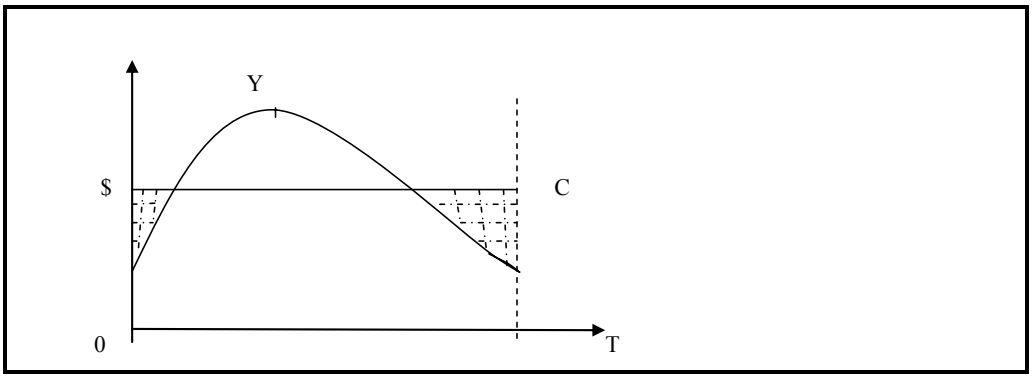

Figure 2.3 The lifespan income and consumption of an individual

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

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We 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) rises, 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 K^i is the fraction of the consumer's PV that he wants to consume in period t. It would depend on the shape of his indifference curve. The above equation explains that if there is an increase in any income, present or expected, raising the consumer's estimate of PV, he will consume the fraction of K^i 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 functions (2.8) to a stable aggregate function as

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

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

Ando-Modigliani began to make the present value term operational by noting 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 α 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, such that

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

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where T-1 is the average remaining life expectancy of the population and the term $\frac{1}{T-1}$ the average PV of future labor income over T-1 year. Thus, expected labor income (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

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

There is only one remaining variable that is not yet measurable: the average expected labor income Y^e. The simplest assumption would be that average expected labor income is just a multiple of present labor income.

$$Y_0^e = \beta Y_0^L \text{ and } \beta > 0$$

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

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

This assumption can be formulated as

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

where N = employment
L = size of the labor force

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

$$Y^e = \beta Y^L$$

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 (2.16), both Y^L and *a* can be measured statistically. Substituting *o* in this equation into equation (2.9) from the consumption yield, the expression becomes

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

The above equation is a statistically measurable form of the Ando-Modigliani consumption function. The co-efficient of Y^L 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 real labor income will raise the real consumption by $0.7 billion. The marginal propensity to consume (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)

$$0.7 = k\,[1+\beta\,(T-1)]$$
$$= 0.06\,(1+44\beta)$$

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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 \$1.25.

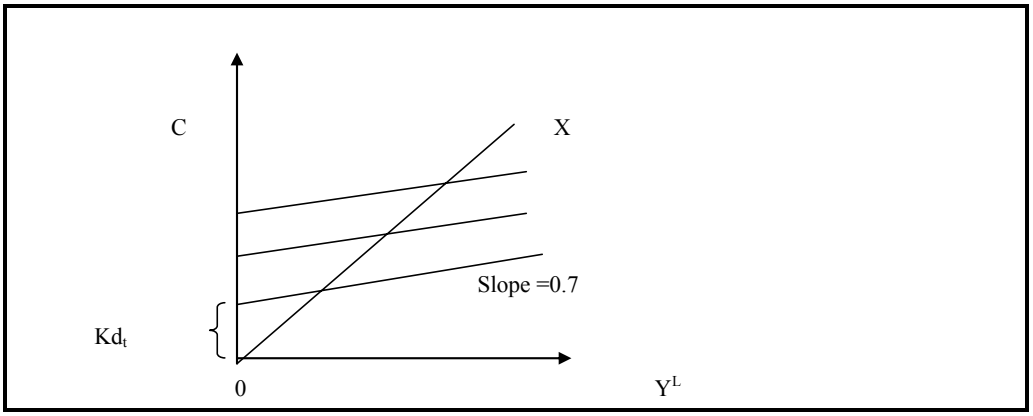

Figure 2.4 Consumption and labor income

The Ando-Modigliani consumption function of equation (2.11) is shown in the figure. It shows consumption against labor income. The intercept of the consumption income function is set by the level of asset *a*. 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, namely:

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, income fluctuates and MPS < APS.
3. Long run data trend as MPC = APC.
   It explains the MPC < APC, the 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.

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2.3 The Friedman approach: Permanent income

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

The model

The consumption function is defined as:

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

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

$$\sum \frac{Y_t}{(1+r)^t}$$
$$C^i = f'(PV^i): \; s'>0 \tag{2.20}$$

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

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

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Thus, permanent income from the consumer's present value 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', and presumably depends on the interest rate. The return on saving-individual tastes shapes 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

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

If strata are included 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 the 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. It gives us thus the measured income as the sum of the permanent and transitory component, which can be defined in an equation as

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

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

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

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

1. Friedman assumes that there is no correlation between transitory and permanent income. In other words, Y_t is just randomly fluctuating around, so that the 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

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

$$C = C_{Pi} \tag{2.26}$$

For each income class i, we can now bring this series of assumptions 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. There is a group I with average observed income of $\bar{Y}_i$. The above average population income will have a positive average transitory income component $\bar{Y}_{ti} > 0$ for this above average group. The observed average income will be greater than the average permanent income, that is,

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

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All income groups will have an 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 component, so that $\bar{C}_i = C_{Pi}$. Linking these two consumption conditions gives us

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

Thus, the above average income group will have an average measured consumption equal to permanent consumption but the average measured income is greater than permanent income so that its measured $\bar{C}_i / \bar{Y}_i$ 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.

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2.4 Friedman's consumption function: Cyclical movement

In an average year, when $\bar{Y}_t = 0$, the $\bar{C}_0, Y_0$ points fall on the long run $\bar{K}$ line. In a year with above trend income $\bar{Yi}$, transitory income is positive so that $\bar{Y}_{pi} < \bar{Y}_1$ and the $\bar{C}_1, Y_1$ points are below the $\bar{K}$ line, giving us the short run function.

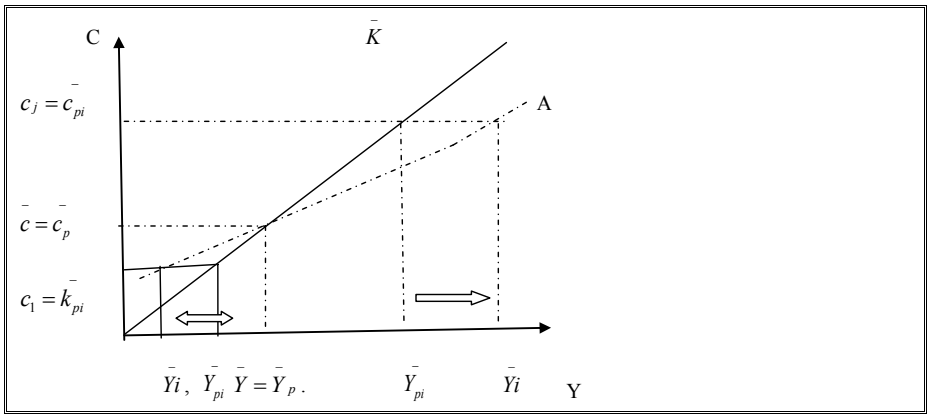

Figure 2.5 Permanent and transitory income effects

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

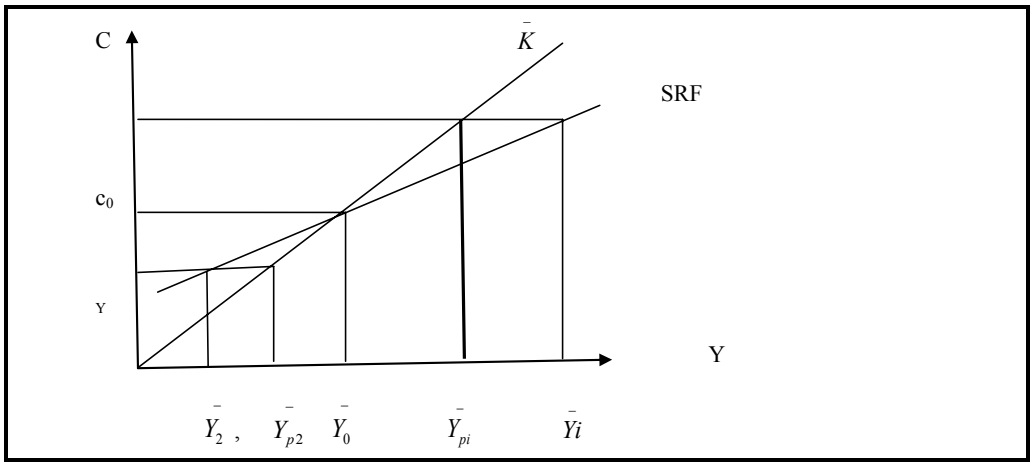

Figure 2.6 Consumption and income effect

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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-Modigliani life cycle model, 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 that the starting point of the analysis is the consumption function. The present value relationship is given in the equation as

$$c^i = f^i(PV^i)$$

and the explanation of the cross section result. The Ando-Modigliani model might be more useful to econometric model builders and forecasters. It explicitly includes measured current income and assets to explain consumption. But it may also need careful interpretation, particularly in cases where income changes are clearly temporary and permanent income considerations are less relevant. The strength of Friedman's theory is that it is related to the acceptance by many economists of the proposition that people base current consumption or saving decisions 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 models. The Duesenberry model does not begin with the basic assumption of present value relationship. Duesenberry's analysis is based on two relative income hypotheses.

A) First hypothesis:

The first hypothesis is essentially that consumers are not so much concerned with their absolute and relative levels of consumption; they are concerned with their consumption relative to the rest of the population. The Ando-Modigliani and the Friedman models 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 an individual's consumption enters the utility function. Duesenberry however, writes the utility function as:

$$U = U\left(\frac{C_0}{R_0} \ldots\ldots \frac{C_t}{R_1} \ldots\ldots \frac{C_T}{R_T}\right) \tag{2.28}$$

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

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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 average will tend to have a high c/y ratio because essentially, he is trying to keep up with a national average consumption standard on his below average income.

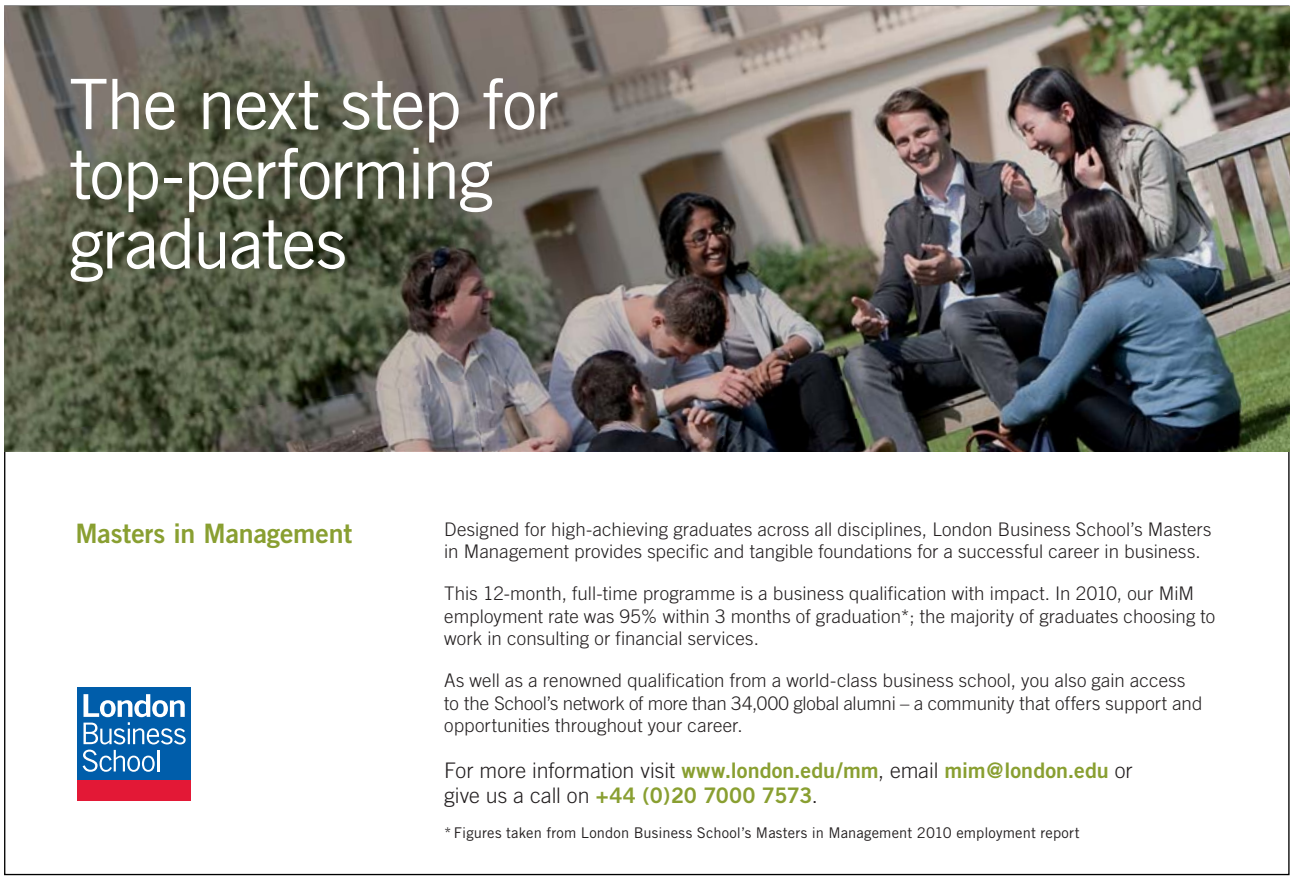
On the other hand, an individual with an above average income will have a lower c/y ratio because it takes a smaller portion of his income to buy the standard basket of consumer goods. This provides the explanation for both the cross section result that MPC < APC and the long run consistency of c/y.

B) Second hypothesis:

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

This assumption suggests that the aggregate ratio of savings to income depends on the level of present income relative to previous peak income, $\hat{Y}$, mathematically, in Duesenberry's formulation

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



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where Y is real disposable income. As present income rises relative to its previous peak, S/Y increases and vice versa.

We can convert this Duesenberry saving function into a consumption function by observing that if Y is disposable 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 $\frac{Y}{\hat{Y}}$ would be equal to 1+ g, where g_y is the growth rate of real income. If Y grows at four percent along the 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.

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 derivative of C with respect to Y, is then

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

A comparison with equation (2.31) 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 that MPC < APC. Thus, the combination of short run and long run behavior of consumption gives us the Ratchet effect shown in figure 2.7.

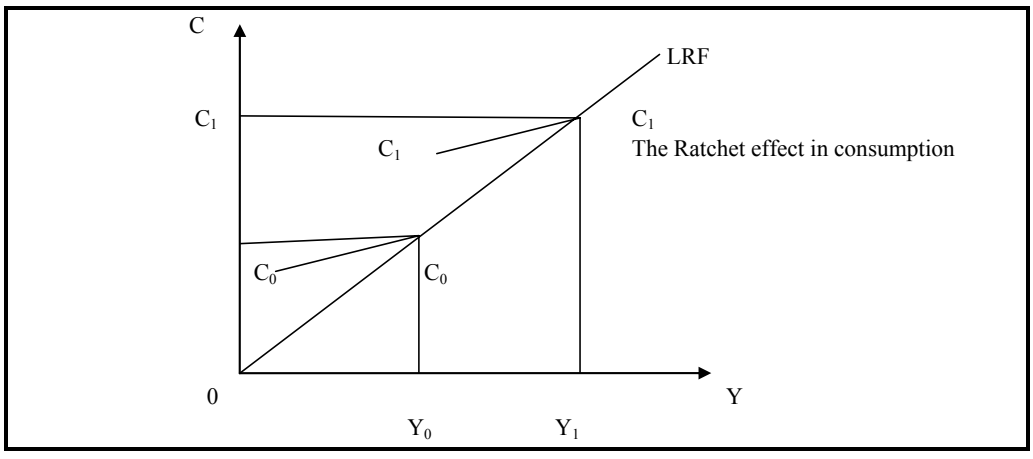

Figure 2.7 The Ratchet effect in consumption

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With a constant c/y ratio, at some point like C_0, Y_0, income declines and the economy goes into a recession. C and Y move down along a short run function C_0C_0 with slope given by the MPC in equation (2.4). The 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 resumes along the long run function. If another recession occurs at $C_1Y_{1,}$ the consumption level and income will fall back along C_1C_1 and rise back to C_1Y_1 during the recovery. Thus, Duesenberry's model implies a Ratchet effect. The theories of Ando-Modigliani and Friedman seem to have been more successful than Duesenberry's.

2.6 Money: Definition and function

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

2.6.1 Origin of money

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

1. **Commodity money**
   In ancient times, the barter system existed in societies. People exchanged commodities for commodities through a common agreement between two parties. The net gain from sharing of commodities was assumed to be equal for both parties. Such transactions were practiced for a long time in the developing countries. But there are a number of limitations. Some commodities were not perfectly divisible. One party may want to exchange commodities for another commodity which was indivisible; for example, animals such as pigs and cattle were often considered as commodities. Secondly, there was an absence of a common value in multi-commodities trade. If all commodities were exchanged for other commodities, it was difficult to determine and remember the value of one commodity when exchanged for another Thirdly, perishable commodities could not be substituted for other commodities. They could not be stored for long periods of time nor carried over long distances. Due to all these limitations, commodity money use declined and almost disappeared.

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2. **Representative money**

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

3. **Credit money**

   Most of the commodities were exchanged based on a credit basis. Other assets such as land, houses, and factories were also used in the exchange of commodities. But such commodities were not liquid and available for the masses. Therefore, credit money had severe limitations for it to be used extensively in commodities exchanges.

   In order to overcome all the limitations of commodity, representative and credit money, money is used as a medium of exchange. Now almost all transactions take place in terms of money.

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2.6.2 Money: Concept and definition

Money is any object that is accepted as a method of payment for goods and services. It is a medium of exchange. 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 people despite its unique size, shape and color for every country.

2. Durability
   Money is durable and cannot be easily destroyed. If money is to be kept for a long time then it must retain its color and shape for long periods. Durability depends on the quality of paper, color, size, etc. Even though it is exchanged and circulated in the economy, money remains durable and usable for long periods of time.

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

4. Uniformity
   Money is uniform in that it has a consistent 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 people identify money within a short period of time. The money printed in the past and present are in the same form. If old coins or notes are going out of circulation, or undergo any change in size or shape, the people will be so informed in the newspapers and other media in a timely manner.

5. Recognizability
   People can easily recognize and identify money and use money when needed. Even small children recognize money. Money is used in regular transactions all over the world.

6. Scarcity
   Money is scarce and not easily available. In order to get money, a person has to take on debt, borrow or work for it. Farmers have to produce commodities in their farms. Industries must produce goods. 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 money were cheap and too easily available, the monetary authority will decide to reduce its supply through monetary policies and instruments.

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7. Stability
   Money provides stability for individuals as well as economies. Scarce money can be saved and used when required. During economic crises and recessions, 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, namely:

1. Medium of exchange
   Money is used in all transactions. The value of all commodities and services are converted into money. These days, commodities are no longer exchanged for commodities but money is paid for each commodity. All human beings carry cash and pay for the commodity with money. 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 moneys paid and moneys received. Receipts of money are added into the credit account while payments are added into the debit account. The account summary of debit and credit is regularly available for all 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, as a medium of exchange, is stored to pay for goods and services. Money is easily stored either in the house or in the bank. The value of money stored may change with inflation. If an interest rate adjustment does not take place, then the money value remains the same for a long period. Most of the time, money is stored in the form of savings or wealth. Such wealth is often used in the future.

4. Standard of deferred payment
   Money has an important feature that it is a standard of deferred payment. Money can be paid in the future. A lot of people buy goods and services now but pay for them in the future.

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2.6.4 Demand for money

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

1. **The classical approach**
   The classical economists have given their views on the demand for money. Both the demand for money and the velocity of circulation of money decide the price level and volume of transactions. If the price level is higher than the volume of transactions, the stock of money and the velocity of circulation decline. The equation is presented as follows:

$$MV = PT \tag{2.32}$$

   where M = stock of money
   V= velocity of circulation of money
   P = price level
   T = transaction.

   The supply of money and the velocity of circulation of money decide the price and volume of transaction. But this is not always true. The demand for money is decided by the people. People use money as a precaution.

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2. **The 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:

$$M^d = KPY \tag{2.33}$$

where M^d = demand for money
K = proportion of national income with people
PY = nominal income

2.6.5 Money multiplier

A money multiplier is mainly influenced by high powered money. High powered money is defined as the currency and bank reserves. The money supply influences the currency and the bank reserves. A contractionary monetary policy affects how much money is made available to the people. Money multiplier is therefore defined as the ratio of the stock of money to high powered money. It is presented in Figure 2.8 as

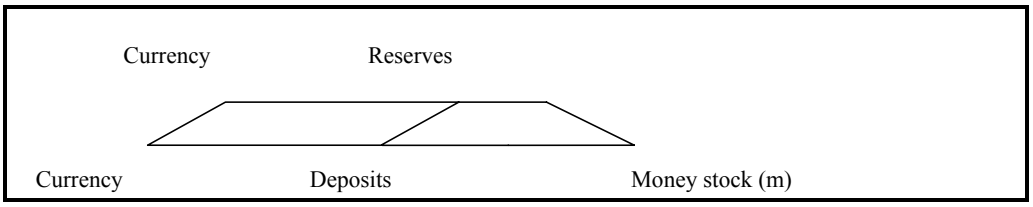

Figure 2.8 High powered money in an economy

High powered 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 reserves. 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
i_D = discount interest rate
$r_{R:}$ = required reserve

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

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2.6.6 Money stock measures

There are two views of measuring money stock. The traditional view favors transaction theories; it ultimately leads to a narrow measure of the money stock. The asset theory emphasizes a 'broader' measure of money. Therefore, money has no fixed measure and is measured as a matter of judgment or preference. There are different financial and real assets which can be arranged in descending order with reference to liquidity. The currency and demand deposits are the most liquid of assets, and make up money. Time deposits and government bonds are liquid assets but they cannot be converted into money without incurring some costs. At the bottom of the liquidity continuum lie automobiles, real estate and the like; these can be liquidated at short notice only at a substantial cost. The monetary authorities all over the world provide alternative 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 the functional characteristics of monetary assets.

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

M1 = currency (with public) + demand deposits + other deposits with the Reserve Bank of India (RBI)
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 the separation of time deposits with banks from currency and demand deposits with banks. The major difference between M1, M2, M3 and M4 is based on the institutional differentiation between banks and the post office savings organization.

2.6.7 Sources of changes in reserve money

Reserve money is recognized 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 the net monetary liabilities of the central bank, which are currency with the public (C) and banks' reserves (R). It follows from the asset side of the balance sheet that:

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

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

Liabilities	Assets
1. Currency with general public	1. Net RBI credit to government (centre to states)
2. Bank reserves a) Cash in hand b) 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

Table 2.1 Balance sheet of the RBI

2.6.8 Equilibrium in the money market

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

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

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

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

The money multiplier and the interest rate, the discount interest rate, required reserves, currency, the deposit ratio and high powered money and past prices are equivalent to the interest rate and the income in the past period.

The interest rate and the money supply target

It depends on the monetary authority to target the money supply or the interest rate. If we assume that the money supply is a target variable then figure 2.9 explains the equilibrium. The figure also explains the money stock equilibrium with the interest rate. An increase in the stock of money will reduce the interest rate. The stock of money increases from $M_{0/}P_0$to M_1/P. The money supply curve shifts to MS_1 from MS. The new equilibrium is adjusted at E_1. The interest rate falls from i to i_1. This is the money supply change effect on the interest rate.

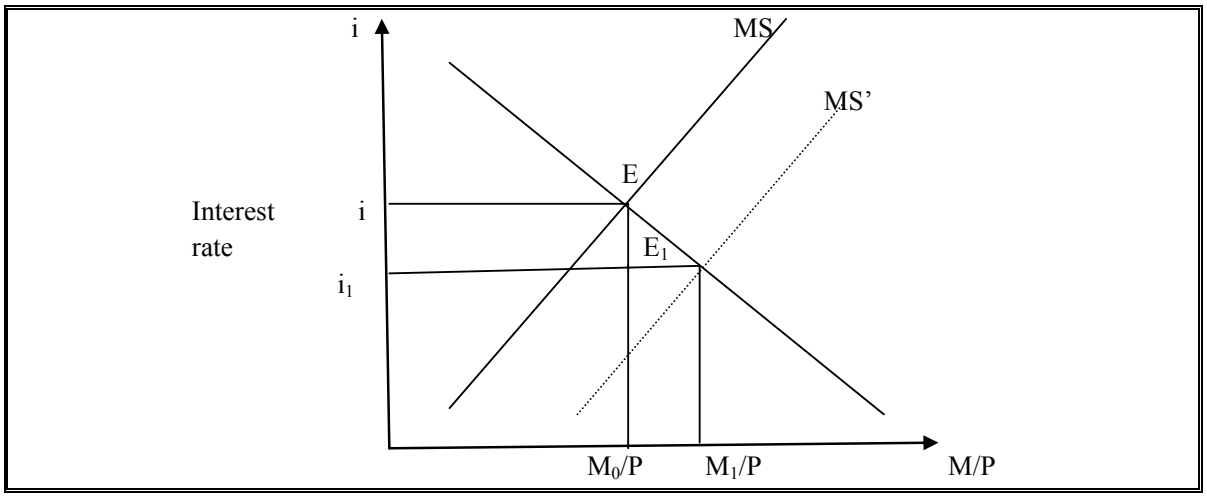

Figure 2.9 Money supply and changes in the interest rate

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2.6.9 Monetary targeting

Sometimes, the monetary authority targets the interest rate, which remains at the same point while output is targeted. This is known as growth targeting and national income forecasting. In order to increase the output, the interest rate is kept constant or a different alternative output is managed by the government. Gross domestic product (GDP) forecasts and a fixed interest rate policy are used. A monetary authority deciding on a monetary policy for today, needs to be able to forecast how variables such as inflation and output will behave now and in the future, which means that it must be able to forecast private behavior in the future. The decision of private actors depends on their expectations about future monetary policy (Chari and Kohoe 2006).

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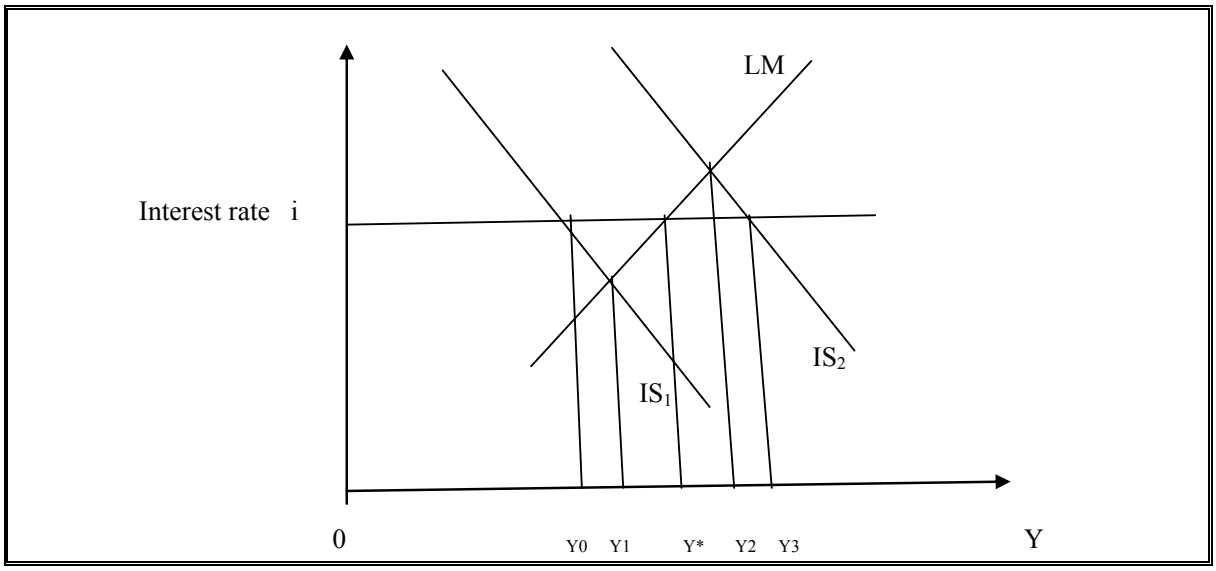

Figure 2.10 Effects of an expansionary fiscal policy on income

Similarly, a monetary policy uses a fixed-interest rate targeting. The level of output or GDP is forecasted at different levels. The money supply in any particular level of interest rate is provided. This is the only output which is allowed to become flexible. Therefore, interest rate targeting is sometimes very ineffective in the long run. There is a perfect relationship between the demand for money and the interest rate. Interest rate targeting is widely used in an economy.

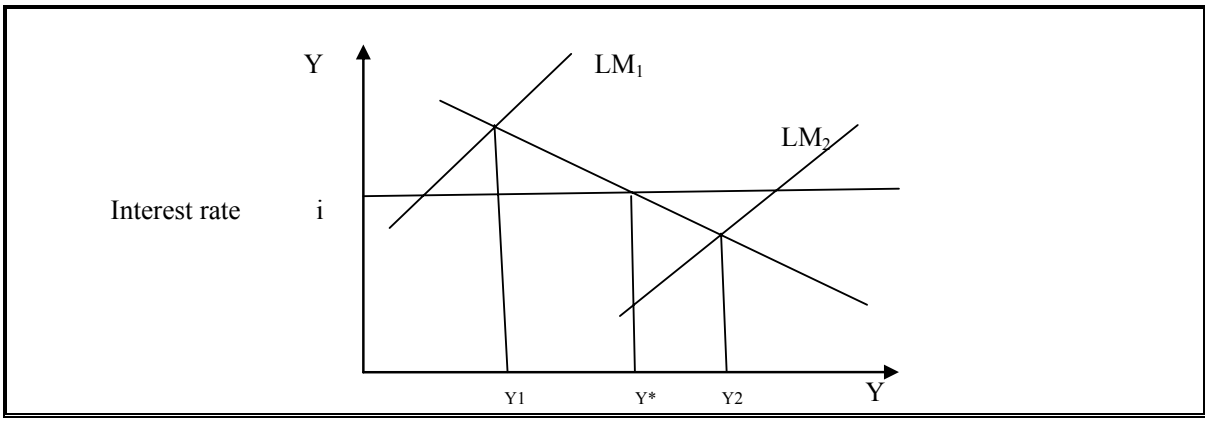

Figure 2.11 Effects of a monetary policy on income

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Appendix

	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

Table 2.2 The money supply in India (Billions)
Source: RBI statistics

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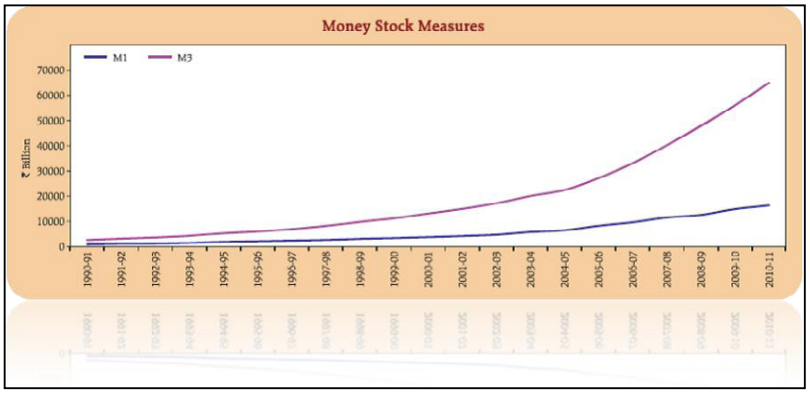

Figure 2.12 Money stock measures
Source: RBI statistics

March 31/ reporting Fridays of the month/last reporting Friday of the month			2008–2009	2009–2010	2010–2011	Nov. 5, 2010	Nov. 19, 2010	July 2011	Aug. 2011	Sep. 2011	Oct. 2011	Nov. 4, 2011	Nov.18, 2011
Currency with the Public	Notes in Circulation (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
		Small Coins (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

Table 2.3 Measurement of the money supply in India
Source: RBI statistics

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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

Table 2.4: Components of the Money Stock (Rupees crore)
Source: RBI statistics

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

Table 2.5: Sources of the Money Stock (Rupees crore)
Source: RBI statistics

Questions

1. Explain the Friedman and Ando-Modigliani theories of consumption.
2. Critically evaluate the Ando-Modigliani approach of the life cycle hypothesis.
3. Explain Friedman's approach of permanent income.
4. Critically examine Friedman's approach of the consumption function with reference to cyclical movements.

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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 the demand for money?
10. Explain the term "money multiplier" in detail.
11. How is 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 The net foreign exchange assets of the monetary authority change 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 an 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 on:
    a) The consumption function
    b) Permanent income
    c) The 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

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3 Aggregate supply, wages, prices and employment

The aggregate supply and employment in an economy are co-related, in that the aggregate supply also decides how high wages will be. Also, price levels rise with a rise in wages. There is a difference in the full employment and natural rate of employment in the economy.

3.1 The Philips Curve

Philips, a New Zealand-born economist, wrote a paper in 1958. In this paper, he showed the relationship between unemployment and the rate of change in money wage rates in the United Kingdom between 1861 and 1957. His paper was published in the quarterly journal, 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 a high rate of unemployment then the rate of wage inflation is lower. In other words, there is a tradeoff between wage inflation and unemployment. The Philips curve shows that the rate of wage inflation decreases with the unemployment rate. Thus, w is defined as the wage in the current period. e W_{-1} is the wage during the last period. 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 = the unemployment rate in the economy
U*= the 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 wages is rising. The Philips curve implies that wages and prices adjust slowly to changes in aggregate demand. After using wage inflation, it can be further defined as

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

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

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

This means that the present wage depends on the past wage $1 - \in$ and the difference between natural unemployment and present unemployment. This also shows 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 cornerstone 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 states that in the long run, the economy will move to the natural rate of unemployment whatever the rate of the change in wages and the inflation rate. There is no tradeoff 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 and Vane 2005).

3.1.1 Wage Stickiness

The assumption is that wages are slow to adjust. The shift in demand is essential to our derivation of an aggregate supply (AS) curve. Wages are sticky or wage adjustments 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 the change in wages g_w and the level of employment N. We define the unemployment rate as a fraction of the full employment labor force N*.

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

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

If we substitute (3.4) into (3.3a) then we obtain the Philips curve. The Philips curve shows the relationship between the wages during this period and the wages during the 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 wages during the last period and actual level of employment, we come up with the following.

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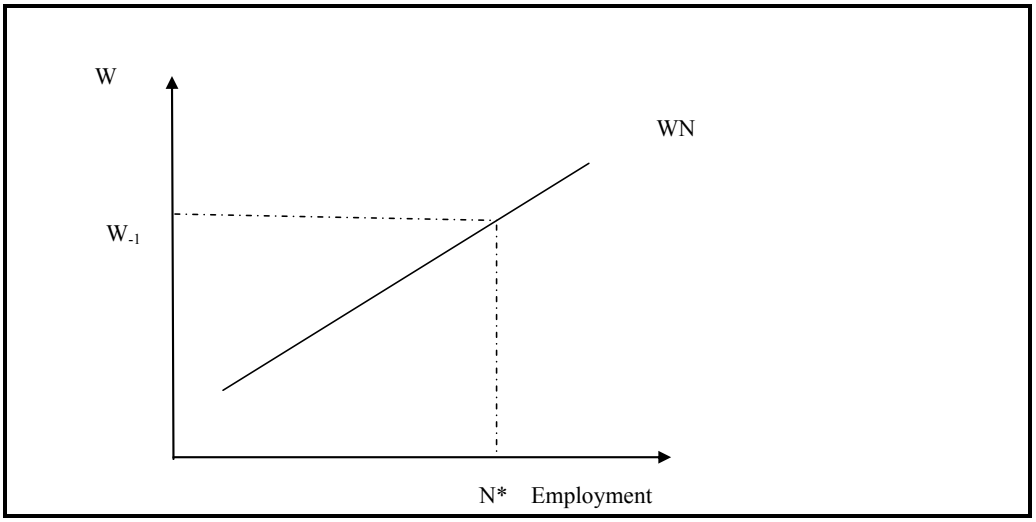

Figure 3.1 Wages and employment relationship

The Y axis shows the wages W and the X axis shows the employment. Wages show an upward line. The WN line shows the wage during this period is equal to the wage that prevailed during the last period, with an adjustment for the level of employment.

At full employment (N = N*) the wage of this period 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 is at its neoclassical equilibrium level N*, the wage rate level in this period is equal to that of last period.

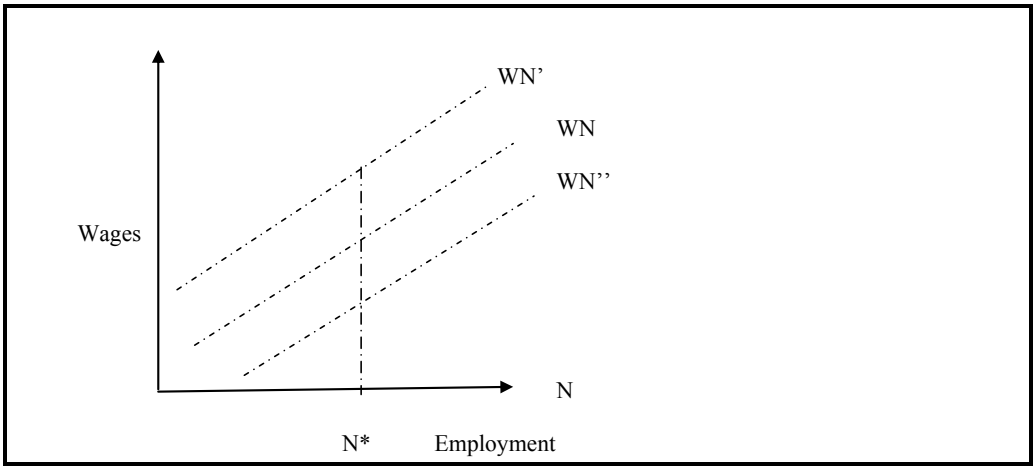

Figure 3.2 Changes in wages and employment

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Equation (3.5) implies that the WN relationship shifts over time as in figure 3.2. If there is over-employment during this period, the WN curve will shift upwards at the next period to WN'. If there is less than full employment at this period, the WN line will shift downwards to the next period to WN".

The wage and employment relationship changes with time. The WN curve shifts over time if employment differs from full employment. N* is defined as the full employment level. The WN curve shifts upwards to WN" in the next period. Therefore, if there is overemployment in the current period then the curve shifts upwards.

3.2 The dynamic aggregate supply curve

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

$$p.y = WN + zWN$$

where z are markup prices

$$p.y = (1+z)\ WN$$

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

If we divide the above equation by N, 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, the following steps are required:

1. We relate output to employment;
2. We also relate the prices that firms charge to their costs;
3. We use the Philips curve relationship between wages and employment.

If we put all three components together, we can derive the dynamic aggregate supply curve.

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:

$$Y = aN$$

(3.8)

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where Y = level of output produced
N = amount of labor input
a = the input co-efficient

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

Costs 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 the labor cost, the higher is the firm's 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

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

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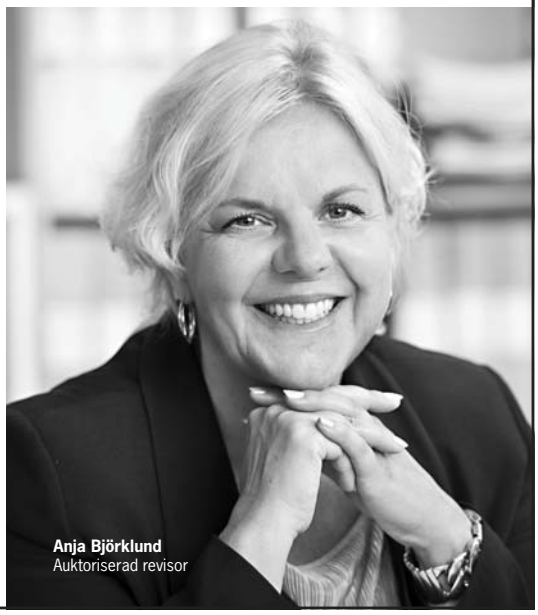

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The above equation shows that if the markup price rises, then the price will rise. Similarly, wage rates rise with price levels. When α rises, the price level decreases. The markup over labor costs covers the costs of other factors of production that firms use such as capital and raw materials. An allowance for the firm's normal profit is also included.

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

- Firstly, the production function is given in equation (3.8);
- Secondly, the price-cost relation is given in equation (3.9);
- Thirdly, the Philips curve is given in an equation as

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

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

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

Prices are related to mark up prices and the last period's wage and employment.

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

The equation can be reduced to

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

Now, prices depend on the past prices and employment. Therefore,

$$a = \frac{Y}{n} \text{ and } Y^{\star} = a\ n$$

We can write alternatively as

$$Y^{\star} = aN$$

The income level depends on the level of employment.

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

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We can replace N and N* into (3.11) by Y/α. Alternatively we can substitute Y*/α into (3.11) 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 λ is defined as $\lambda = \in / Y*$. Thus, we can obtain the dynamic aggregate supply curve as

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

This is the dynamic aggregate supply curve.

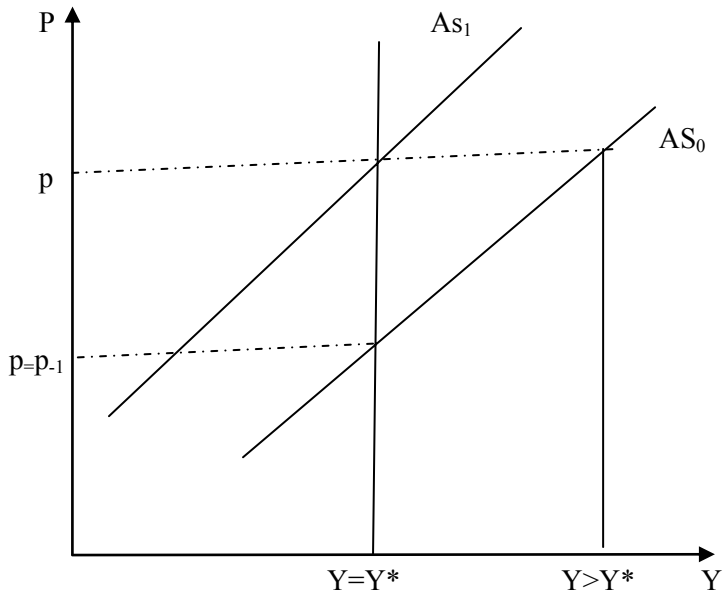

Figure 3.3 The aggregate supply curve and price level

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 the current period is above the full employment level Y*. At the next period, the AS curve will shift upwards to AS'.

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

3.4 The properties of the aggregate supply curve

The aggregate supply curve has three properties, namely:

1. The aggregate supply curve is flatter, the smaller 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 over time, if output is maintained above Y*. Over time, wages continue to rise and the wage increases are passed on as higher prices.

In order to make the aggregate supply curve dynamic, Y = Y* is the first condition.

The second condition is $P = P_{-1}[1 + \lambda(Y - Y^*)]$. And thirdly, $P_1 = P_0$ and $P_2 = P_1$. All these three conditions make up the dynamic aggregate supply curve.

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3.4.1 The effects of monetary and fiscal policies on the aggregate supply curve (ASC)

Monetary and fiscal policy effects are further divided into short, medium and long term effects. Due to a rise in the money supply, wages increase; output and prices also increase.

1. Short run effects

In figure 3.4, the aggregate supply curve is AS_0. It is drawn for a given past price level P_{-1}. It passes 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 constant from period to period. The aggregate supply curve has been drawn to be relatively flat. This suggests a small effect on output.

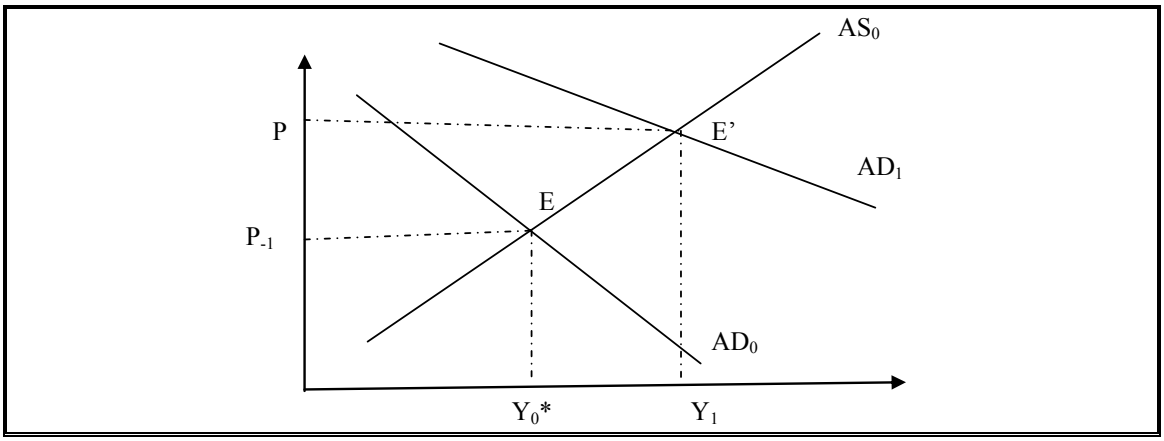

Figure 3.4 Effects of changes in aggregate demand on prices and income

In figure 3.4, the initial equilibrium at E is disturbed by an increase in the money stock. This shifts the aggregate demand curve from AD_0 to AD_1. Short run equilibrium is at E'. Beyond this point, both the price level and output increase. Prices are higher because the output expansion has caused an increase in wages. The aggregate supply curve is drawn quite flat. This reflects the assumption that wages are quite sticky. Suppose nominal money stock is increasing at each price level, real balances are then higher. The interest rate is lower, hence, the demand for output rises. The AD_0 curve shifts upwards to the right, to AD'. At the 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. Put simply, 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 the aggregate demand and supply curves. The short run equilibrium point at E' is not the end of the point. At point E, output is normal. Therefore,

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

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The above equation indicates that prices will keep on rising in the second period. The supply curve passes through the full employment output level, where the price level is equal to P_1. We show that by shifting the aggregate supply curve up to AS_1 to AS_2. With the new aggregate supply curve, the aggregate demand schedule remains unchanged at the higher level AD'. The new equilibrium is achieved at E". If we compare E_1 to E_2 then output falls and price level increases. In short, the aggregate supply increases from AS_0 to AS_1. Output decreases from Y_1 to Y_2. The price level increases from P_1 to P_2.

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

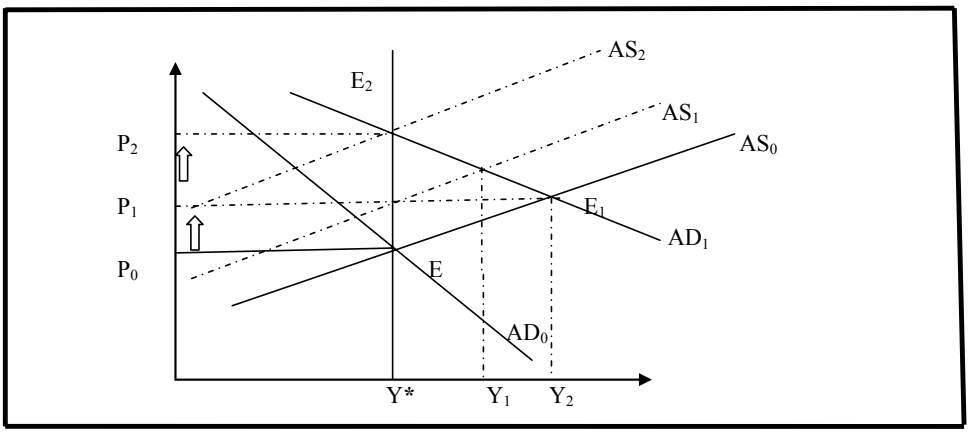

Figure 3.5 Effects of changes in aggregate supply on prices and income

3. The long term adjustment

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

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	$AS_1 \rightarrow AS_T$	$AD_0 \rightarrow AD_T$

Table 3.1 Effects of a monetary policy on output, prices, the aggregate demand (ADC) and the aggregate supply (ASC) curves

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3.5 Inflation expectations and the aggregate supply curve

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

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

where 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 wages is negatively related to Є and the natural rate of unemployment and actual unemployment.

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

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

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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.

$N^*=Y^*/\alpha$ and $N=Y/\alpha$, 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 α then the following growth rate of wages will be

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

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

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

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

Then

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

This is a wage Philips curve.

There are three foundations on which the aggregate supply curve is built, namely;

1. The Philips curve shows that the wage increases more rapidly than it lowers the level of unemployment.
2. There is a relationship between the unemployment rate and the level of output.
3. The assumption of markup pricing is that the firm's prices are based on labor costs. They are higher because wages are higher.

Therefore, we develop the aggregate supply curve into two directions. First, we modify 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 output with price level.

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Friedman and Phelps pointed out one major flow in the wage Philips curve. It ignores the effect of expected inflation on wage setting. Workers are interested in real wages, not nominal wages.

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

Secondly, Y > Y* then $g_w > 0$ and $w > w_{-1}$ This means that when income is above Y* then the growth of wages is above zero and current wages are above the past wage.

Thirdly, Y < Y* then $g_w < 0$ and $w < w_{-1}$. This means that if income is above Y* then g_W is less than g_w and present wage is less than the last period wage.

When inflation is expected, the 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, wages and prices increase more. This means there is a higher expected rate of inflation. The assumption is that the nominal wage rises one percent faster for each extra one percent of expected inflation.

3.6 The aggregate supply curve (ASC)

The next step is to transform the augmented wage Philips curve. The augmented wage Philips curve shows the relationship between the inflation rate and the rate of output on which the expected rate of inflation is based. There are assumptions for the aggregate supply curve which are as follows:

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

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

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

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

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

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3.6.1 The short run aggregate supply curve

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

Given the expected inflation rate, the aggregated supply curve shows the inflation rate rising with the level of output, that is, the higher the level of output, the higher is the rate of inflation.

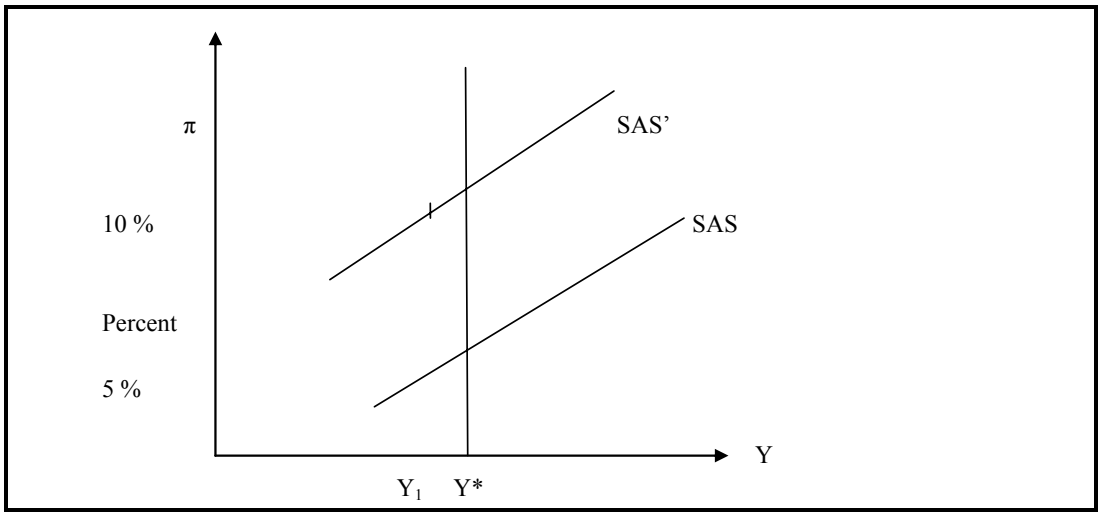

Figure 3.6 The short run aggregate supply curve and income

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Figure 3.6 shows that the higher the expected inflation rate, the higher the short run aggregate supply curve (SAS). Thus, at SAS', 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 curves equal to the difference in $\prod^e$ between them.

In the above figure, the $\prod^e$ is constant on a SAS curve. It is five percent on the short run aggregate supply and 10 percent on the SAS'. Each short run ASC is shown to be quite flat, reflecting the fact that in the short run, it takes a large change in output to generate a certain change in inflation. The short run aggregate supply curve shifts with the expected rate of inflation. The inflation rate corresponds to any given level of output. Therefore, there are changes over time as the $\prod^e$ changes. The higher the expected $\prod^e$, the higher the inflation. The π rate corresponds to a given level of output.

3.6.2 The long run aggregate supply curve

If the inflation rate remains constant for any long term period, firms and workers will expect the inflation rate to continue to rise. 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. Assume

$$\prod = \prod^e$$

The equation can be further explained as

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

It shows that Y = Y*

The meaning of the 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 on the short run aggregate supply curve show the expected inflation which is equal to actual inflation. The long run curve is thus a vertical line. The long run aggregate supply is Y* at any level of output. The short run aggregate supply curve shows point A where 5 percent inflation is observed. When the inflation rate rises from 5 to 10 percent, the SAS curve shifts upwards from SAS to SAS'.

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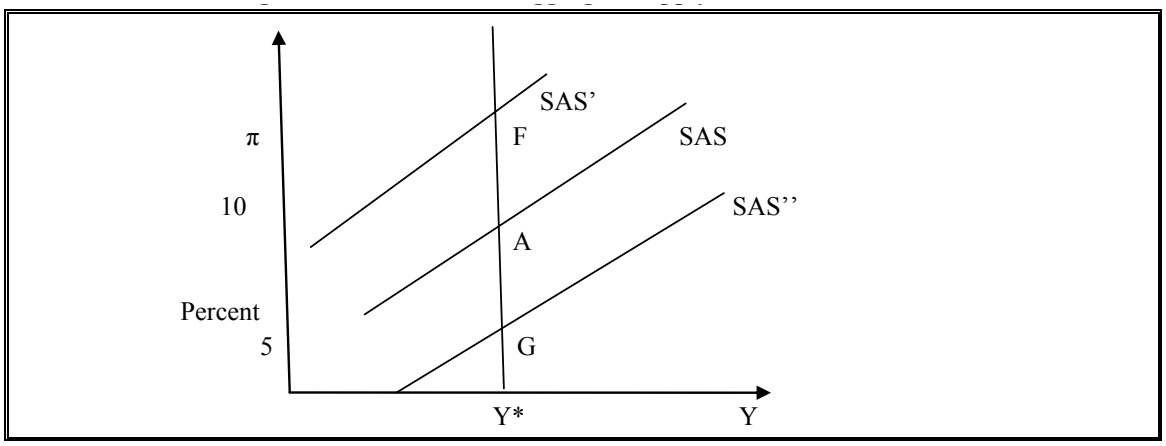

Figure 3.7 The short run aggregate supply curve and inflation

3.7 The modified Philips Curve

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

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

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

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

$$\prod = - \in (u - u^*) \tag{3.22}$$

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

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

π = -3 (4 – 5 percent), then

π = 4

For example, if u = 5 percent, π = 0, and if u = 4 percent, π = 3 percent.

3.8 The expected augmented Philips Curve

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

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

π = 0 percent – 3 (4 – 5 percent)

= 5 percent

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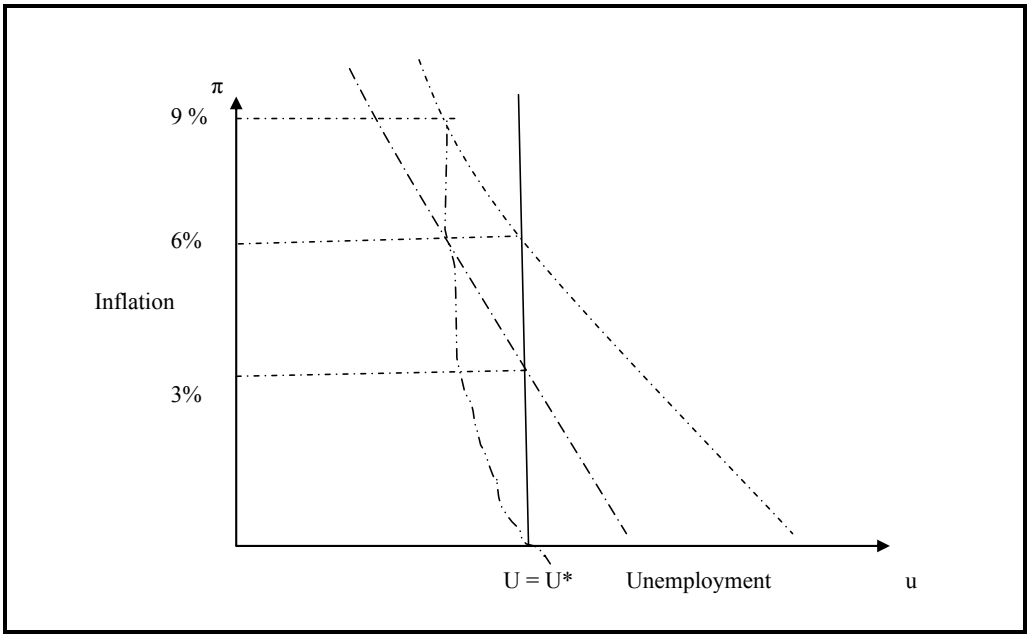

Figure 3.8 The augmented Philips curve

In the short run, there is a choice, but in the medium run there is no choice. In the long run,

$$\pi^e = \pi$$

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The long run Philips curve

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

$$U = U^* \tag{3.24}$$

In the long run, the Philips curve is vertical.

The extended Philips curve

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

where Π = inflation rate

π^e = expected inflation rate

The Philips curve states that inflation rate π^e declines relative to the previous trend if the actual unemployment rate exceeds the natural rate u*. It is often 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. In the extension of equation (3.25) to which 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.

$$\pi = \pi^e - \in (u - u^*) - \beta(\mu - \mu_{-1}) \tag{3.26}$$

The above equation is useful for making policy decisions. It suggests that there is a concrete tradeoff. The more rapid the reduction in unemployment, the fewer disinflations are achieved at each unemployment level.

3.9 Criticism

The grease effect of inflation on growth as suggested by the conventional Philips curve does not hold after a certain threshold level of inflation is reached. If a monetary policy tolerates a 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 is reached. 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 and Nadhanael 2011).

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Questions

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

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4 The open economy: Macroeconomy

4.1 Introduction

Most economies at present are global economies. They are integrated in terms of finance, trade and culture. The foreign exchange market, equity and commodity markets are aligned with each other on the national as well as at the global level. Domestic and international trading of equities, shares and commodities are allowed in almost all countries. Due to the free flow of capital, the exchange rate appreciates or depreciates, affecting the domestic and international price levels on the IS-LM framework. Export promotion yields more foreign exchange when there is an exchange rate depreciation. The monetary policy of the reserve bank affects the supply of money. A higher money supply leads to a rise in prices while lowering the interest rate. When domestic interest rates are low, international investors withdraw their money, and invest it where higher returns can be had. The supply of money, the interest rate, and the exchange rate policies decide the volume of capital inflow and outflow.

4.1.1 The balance of payments and the exchange rate

The balance of payments and the exchange rate are linked with each other. The balance of payments is a record of all the monetary transactions a country has with the rest of the world. The balance of payments is mainly divided into current and capital accounts. The current account is influenced by the exports and imports of a country and includes the transfer of payments. Services as freight, royalty payments and interest payments are also included, as well as net investment income and the interest and profits on assets. Transfer payments mainly consist of remittances, gifts and grants. The trade balance consists of the trade in services and the net transfers. A deficit in the balance of payments is defined as the payment of a country's residents in that country's balance of payments, for, for example, imports of cars, foreign gifts, machinery, etc. Such imports increase the current account deficit. But the export of agricultural commodities, machinery, garments, and other products improves the current account deficit and could result in a surplus in the country's current account. Similarly, if net transfers exceed net payments, then there is a capital account surplus. If the current account along with the capital account are in surplus, then the country can have a surplus in its balance of payments.

Purchases, and the sale of assets are recorded in the current account, which also consists of stocks and bonds. When the receipts from the sale of stocks, bonds, bank deposits and other assets exceed payments for purchases of the foreign assets, the net capital flow is positive.

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4.1.2 The external balance must be balanced

A deficit arises when a country's current account's expenditures exceed what it receives from sales to the rest of the world. The deficit needs to be financed by the country selling assets or borrowing from abroad. The sale of assets means a country runs into a capital account deficit but a current account deficit can be financed by more capital inflow.

$$\text{Therefore,} \quad CAD + NCI = 0 \tag{4.1}$$

where CAD = current account deficit

NCI = net capital inflow

If a country has no foreign exchange reserves, then that country has to achieve the current account balance some other way. Not all countries promote exports. Sometimes, emphasis is given to the inflow of capital. The capital account is important in the present globalization trend. The capital account is mainly divided into two parts: transactions of the private sector and the official reserves.

In India, the current account deficit is financed by the Government of India and the Reserve Bank of India, the latter of which maintains the reserves in the form of foreign currency. The central bank also holds foreign currency, and buys the foreign currency which is earned by the private sector to augment its reserves of foreign currency. On the other hand, the reserve bank sells foreign currency when there is a decline in the value of the domestic currency. The foreign exchange market can be highly volatile. The domestic value of currency may decline or increase. Consequently, the reserve bank monitors the market situation very carefully rather than intervening immediately. The surplus or deficit in the balance of payments is equal to any increase or decrease in the foreign exchange reserves. If both current and capital accounts are in deficit, then the balance of payments is in deficit. The reserve bank has to sell gold or foreign currency. If the current account is in surplus while the capital account is in deficit, the balance of payments may also be in deficit.

4.1.3 The fixed exchange rate

The fixed exchange rate is defined as the system in which 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. To be able to correct the balance of payments, the central bank intervenes in the foreign exchange market, mainly by buying or selling foreign currency. In order to insure the price, the excess supply is taken away at a fixed price while excess demand is filled at the same price. Such practice exists in agricultural commodity markets. The government ensures the prices with the available supply of and demand for the commodities. The government purchases the agricultural commodities from farmers at fixed prices but sells the same commodities at a higher price. In India, this is called the minimum support price for crops. The reserve bank holds the necessary reserves to maintain the currency at a fixed rate. Doing so helps keep the economy stable. But a fixed exchange rate suffers from a number of limitations. It does not represent the true picture of the economy. Sometimes, the currency is overregulated.

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4.1.4 The flexible exchange rate

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

Most of the time, the exchange rate is allowed to freely determine the value of the domestic currency in the foreign exchange market. The central bank does not intervene in the foreign exchange market. The official reserves of foreign currency are kept at zero. The current account, along with the capital account, is freely adjusted. Such clean floating of the exchange rate does not exist in the modern world. Most of the exchange rates are managed. 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 a pegged exchange rate to the liberalized exchange rate management system in 1992. Coupled with the market determined exchange rate regime in 1993, this was considered an important structural change in the exchange rate market. With increasing volatility in exchange rates and to mitigate the risk arising out of excess volatility, currency futures were introduced in India in 2008, making this the second most important structural change. It is believed that the currency futures will help in hedging the exposures of the exchange rate to unfavorable movements. The role of derivatives in risk taking and risk management cannot be understood by any means and derivatives trading has increased significantly in recent times. The research also supports a two-way causality between the volatility in the spot exchange rate and the trading activity in the currency future market (Sharma 2011).

4.2 The open economy and the goods market

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

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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 C + I + G remains the same as compared to the earlier equation. NX means the net exports and imports: what domestic residents spent on foreign goods and any trade surplus. Domestic spending depends on income and the interest rate.

4.2.1 Net exports

If the incomes of people are increasing, then imports also increase. The real exchange rate remains fixed. The rise in the real exchange rate, that is, real depreciation, improves the trade balance. The demand for domestic goods will increase.

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

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

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This means that net exports are a function of income – income spent on foreign goods – and the real exchange rate. If foreign income increases, then the demand for domestic goods will rise. The balance of trade could have a surplus. A real depreciation of the domestic currency will improve the trade balance. A rise in income increases import spending, and worsens the trade balance.

4.2.2 The goods market equilibrium

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

The IS curve can be expressed in an equation as follows:

$$Y = A\ (Y,i) + NX\ (Y,Y_f, R) \tag{4.4}$$

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

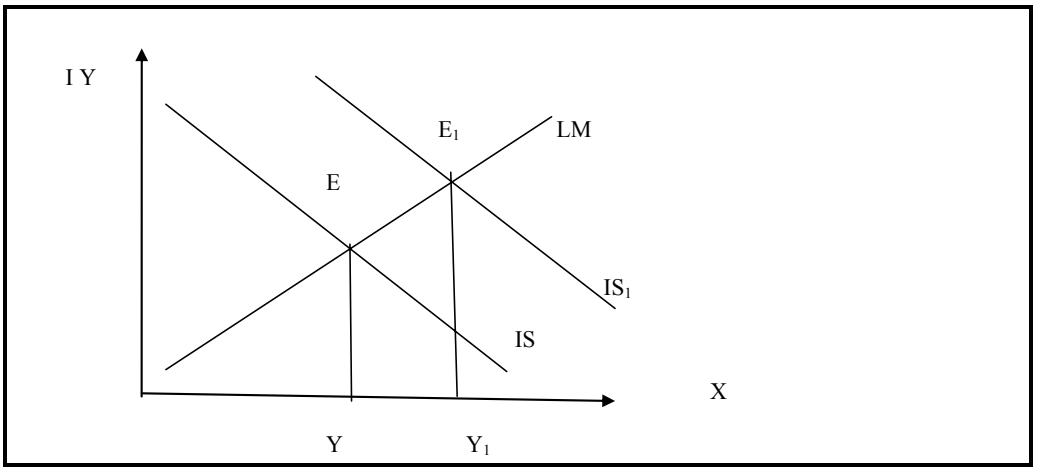

Figure 4.1 Effect of a fiscal policy on income

Figure 4.1 shows that an increase in foreign income has a positive effect on the IS curve. The IS curve shifts to the right. The level of domestic income rises due to the shift of the IS curve towards the right. There is also an increase in the interest rate in the domestic economy. Due to a decline in the interest rate, the flow of foreign capital declines. Lower investments in the domestic economy reduce exports. Hence, the level of income and output in the domestic economy continues to decline. The interest rate also declines as can be observed in the figure. The long term equilibrium point is observed at E. The only solution is to increase exports. There is a real depreciation of currency, which may raise domestic exports.

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4.2.3 Capital mobility

In globalization, all economies are integrated in terms of trade and finance. The money and capital markets of one country get integrated with the money and capital markets of other countries all over the world. Bonds and stocks are sold and bought among several countries. Therefore, households hold on to their wealth in the forms of physical and financial assets of more than one country. Their yield depends on the capital and money markets and on the monetary and fiscal policies of other countries. With the fixed exchange rate, investors do not face any risks in wealth management or investments. The government's policies are protective and investors hold assets which give more returns. There is therefore equality in the returns in the asset market. But in reality, such markets do not exist.

There are wide differences among countries in terms of their money and capital markets. In India, the money market is seasonal. The demand for cash is high during harvest season. Foreign investments, direct and indirect taxes, government policies – fiscal and monetary policies – are all different, and continuously impact the inflow and outflow of capital. They are directly related to income and unemployment. The interest rates are not the same in all countries. But under the current and capital account convertibility, capital is perfectly mobile internationally. Investors purchase assets/bonds and debentures of any country, and choose such assets and bonds with the lowest transaction costs. In such a situation, a maximum number of people takes the chance to invest money where there are higher returns. There is also competition among countries to bring in more capital flow.

In the global economy, there is no difference among the countries' interest rates. If a difference exists, then capital flow moves in larger quantities in search of the highest returns. International investors always look at the monetary policies and the interest rate behaviors of each country. The balance of payments also gets affected because of the resulting capital outflow. The monetary and fiscal policies of a country affect that country's capital account and balance of payments. Presently, because of globalization, monetary and fiscal policies are not very effective for the trade balance, but the capital account does get affected. Both monetary and fiscal policies may affect domestic as well as foreign economies, usually through policies involving balance of payments changes and capital inflows. At the aggregate level, the cumulative gross capital flows appear to increase by 0.05 percentage point in response to a one percent point increase in the interest rate differential. Moreover, contrary to general perceptions, stronger growth in the OECD countries means that the RBI's monetary policies need to focus on objectives relating to inflation and growth. The magnitude and composition of capital flows that might change in response to the changes in monetary policy 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 the interest rate differential most of the time (Radheshyam and Prakash 2011).

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4.2.3 The Balance of Payments (BoP) and capital inflows

If the rate of interest in a country is higher than the world interest rate, then the capital flow will be to that country from abroad. The capital inflow will be unlimited. The balance of payments is now affected by both the balance of trade and capital inflow, and can be written in an equation as

$$BoP = NX\ (Y, Y_f, R) + CF\ (i - i_f) \tag{4.5}$$

The equation explains that the trade balance is influenced by income, foreign income and the real exchange rate. If the imports and the interest rate of any country fall, the balance of payments worsens. But if the interest rate increases above the world level then the capital account improves. If the capital inflow increases, this can be used to finance the trade deficit. The interest rate can be maintained to attain the equilibrium point in the balance of payments.

4.2.4 Equilibrium in the internal and external balances

All economies face the problem of internal and external balances. In an external balance, the economy is in equilibrium with the balance of payments. The reserves are kept constant in the short run. In the long run, they may increase or decrease. The Reserve bank and government will not allow the reserves to decline in the long term. Internal balance exists when output is at the full employment level. Countries maintain internal balance or full employment in the long run.

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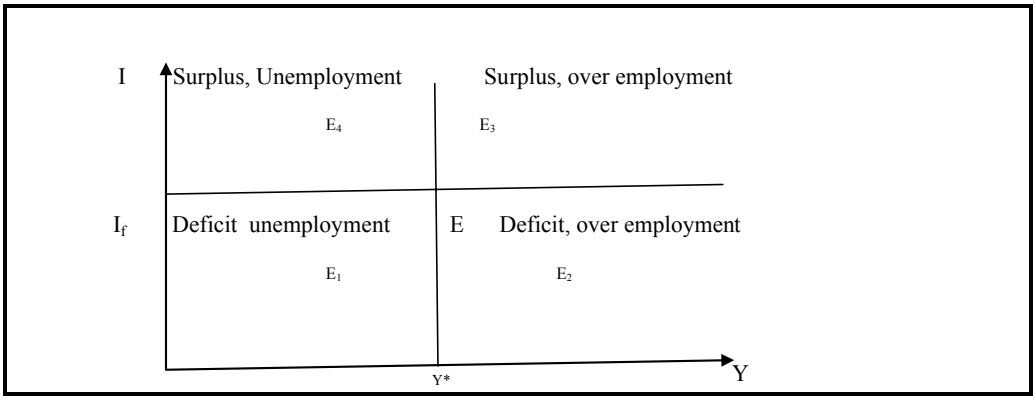

Figure 4.2 Internal and external equilibrium in an economy

Figure 4.2 shows that the balance of payments is equal to zero. The balance of payments is in deficit if the interest rate is below the international interest rate, at point E_1, where unemployment is higher. But at point E_2, the balance of payments is in surplus and there is overemployment. At point E, an expansionary monetary policy would reduce the unemployment problem, but the balance of payments would be in deficit. Capital flow is sensitive; it would continue to create a capital account deficit and eventually, the balance of payments would be in deficit. Both monetary and fiscal policies will help achieve the internal and external trade balances simultaneously. The effects are presented in the next section. The study of Tim Callen and Paul Cashin (1999) used three approaches: an intertemporal model of the current account that allows for capital controls; a composite model of macroeconomic indicators that yields probabilities of future balance of payments crises; 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 intertemporal 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

A model in which capital mobility under a fixed or flexible exchange rate regime in an open economy was developed by Robert Mundell and Marcus Fleming. Robert Mundell was a professor at Columbia University and the late Marcus Fleming was a researcher at the International Monetary Fund (IMF). They developed this model in 1960, before the flexible exchange rate came into existence.

4.3.1 Capital mobility under a fixed exchange rate regime

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

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The following steps occur in a fixed exchange rate regime:

1. The reserve bank tightens the money supply through the conduct of monetary policies.
2. The interest rates rise as a result.
3. Capital inflow and the balance of payments are in surplus.
4. The pressure for currency appreciation increases.
5. Interventions by selling home currency for foreign currency occur.
6. A monetary expansion occurs due to the interventions, and the interest rate decreases.
7. Back to the initial interest rates, money stock and the balance of payments.

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 this higher interest rate, capital inflow is observed and at the lower interest rate, capital outflow is observed. A monetary expansion in the domestic economy cuts the interest rate down to E'. It causes the downward pressure on the exchange rate. The monetary authority sells foreign exchange and buys domestic currency until the LM curve shifts back to its initial position.

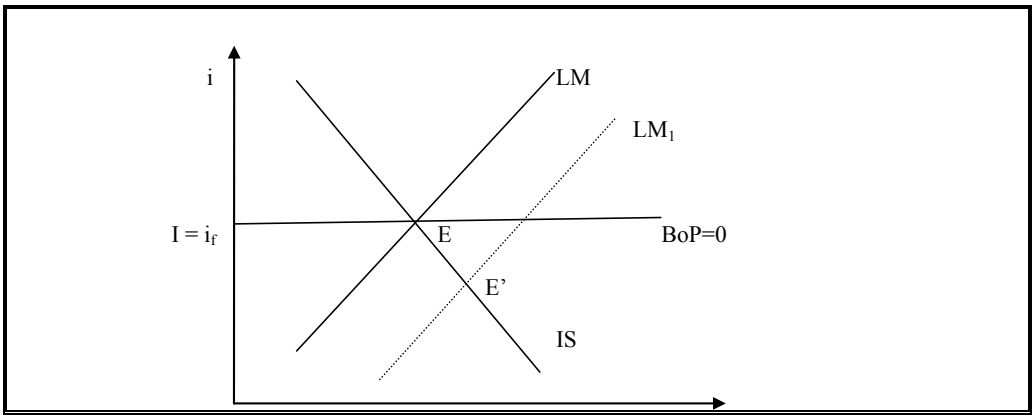

Figure 4.3 Monetary expansion and the interest rate effect

Figure 4.3 shows the balance of payments line as horizontal. Due to perfect capital mobility, the domestic and foreign interest rates are in equilibrium at E. The central bank has to intervene if the interest rate goes down. The balance of payments cannot attain equilibrium and the central bank needs to maintain the exchange rate. The figure also shows that as monetary expansion takes place, the LM curve shifts to LM_1. At point E', there is a large balance of payments deficit and hence pressure for a depreciation of the exchange rate. The central bank sells foreign currency and receives domestic money in exchange. The supply of domestic money declines. As a result, the LM curve shifts towards the right. The process continues until equilibrium is restored at E. The contractionary monetary policy leads to more loss of reserves and it forces the reserve bank to push for a monetary expansion, which then returns it to the initial equilibrium point.

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The study by Mankiw and Reis (2002) explains that if a central bank 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, this indicates a cyclical downturn which in turn calls for more aggressive monetary expansion policies and actions. Conversely, when wages rise faster than other prices, targeting the stability price index requires tighter monetary policies than does targeting conventional inflation.

4.3.3 Fiscal expansion

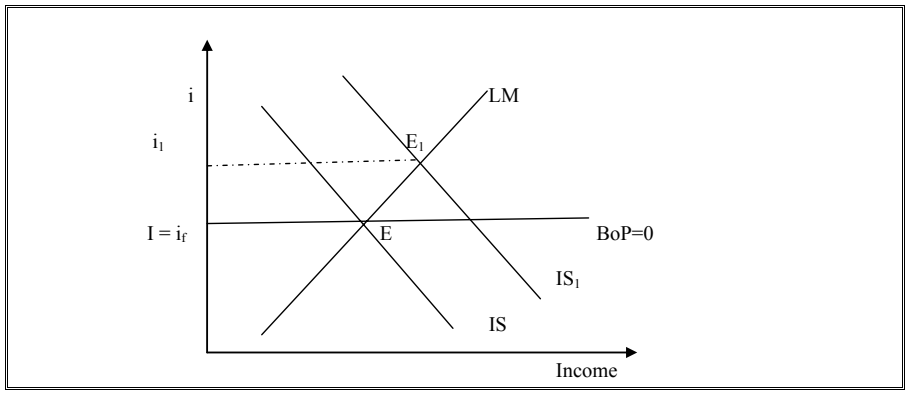

Figure 4.4 Fiscal policies and the domestic interest rate

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In a fiscal expansion, the IS curve shifts towards the right. The interest rate and the level of output both increase. At the higher interest rate, capital flows into the domestic country, leading to an exchange rate appreciation. To maintain the exchange rate, the central bank expands the money supply. In this process, credit to individuals and business people increases and thus, overall, incomes increase. The currency appreciates due to the high capital inflows. This reduces exports and increases incomes. The IS curve shifts back to its original position where $i = i_f$. The figure above shows that the balance of payments remains in equilibrium.

The following steps occur during a fiscal expansion: the IS and LM curves intersect each other at point E. But an expansionary fiscal policy shifts the IS curve to IS_1. The interest rate rises from E to E_1. At the higher rate of interest, capital flows into the domestic country. Therefore, the domestic currency appreciates. The reserve bank sells the domestic currency during such a period. The money supply expands and equilibrium shifts from E_1 to E.

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

Table 4.1 The Mundell-Fleming model: Policy effects

4.3.4 Perfect capital mobility and a flexible exchange rate

Under this model, the domestic prices are assumed to remain fixed and only the exchange rate adjusts. The model was developed to show how monetary and fiscal policies work in an economy with fully flexible exchange rates and perfect capital mobility. With a flexible exchange rate, the central bank does not intervene in the foreign exchange market. The value of the domestic currency gets decided on the basis of demand and supply. The balance of payments must be equal to zero. An automatic adjustment then 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 on the assumption that the money supply cannot correct the balance of payments deficit. The balance of payments is in equilibrium with the interest rate, an equilibrium under perfect capital mobility.

$$I = i_f = BoP$$

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

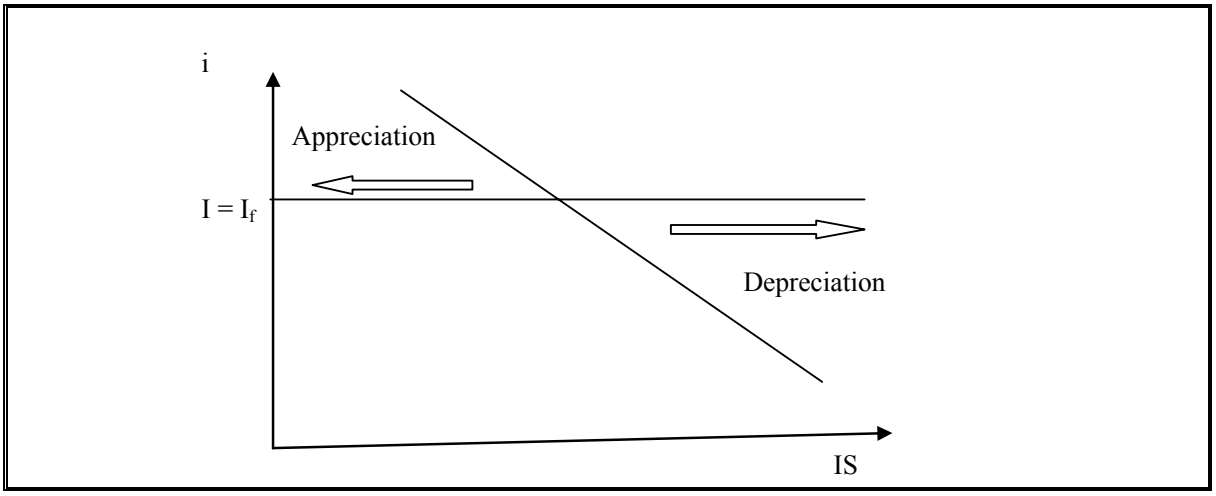

Figure 4.5 Effects of depreciation and appreciation of a currency on interest rates

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

4.3.5 Export-led policies

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

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Fiscal policy effect

When a government has an expansionary fiscal policy, it reduces direct and indirect taxes, or increases spending on various infrastructure and welfare schemes. Exports rise because of the export-led policies of the government. But an expansionary fiscal policy increases the interest rate, leading to an appreciation of the currency. Exports then fall and imports increase. This time, crowding out will not take place because the exchange rate appreciation will lead to a decline in exports. With a fixed exchange rate, output does increase but the exchange rate also appreciates, increasing the demand for foreign goods while reducing the demand for domestic goods.

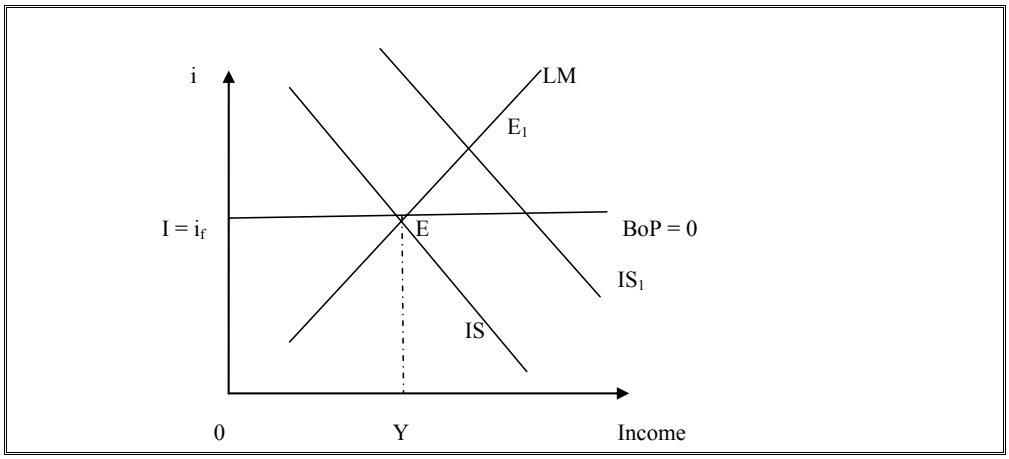

Figure 4.6 Effect of an expansionary fiscal policy in an open economy

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Figure 4.6 shows the IS-LM curve in equilibrium at point E. The IS curve shifts to the right because of higher demand for exports. The increase in exports leads to an increase in income. The new equilibrium is achieved at E_1. At point E_1, the balance of payments is not in equilibrium; at this point, the exchange rate appreciates. The domestic interest rate is higher than the international interest rate, and capital inflow is observed. The economy shifts back to the equilibrium point E.

4.3.6 Monetary policy

With an expansionary monetary policy, the money stock increases. The interest rate declines while incomes increase. The exchange rate depreciates and exports become more competitive. The demand for exports rises. The figure shows that an expansionary monetary policy shifts LM to LM_1 and the interest rate declines to E'. The interest rate falls below the foreign rate of interest. At this lower interest rate, capital flows out from the domestic economy. The exchange rate depreciates at this point, leading to a rise in import prices. Domestic goods become more competitive so that output rises. The IS curve shifts towards the right, up to the point of the exchange rate depreciation. Demand and output rise to the level indicated by point E". The conclusion is that a monetary expansion policy improves the current account through induced depreciation of the interest rate.

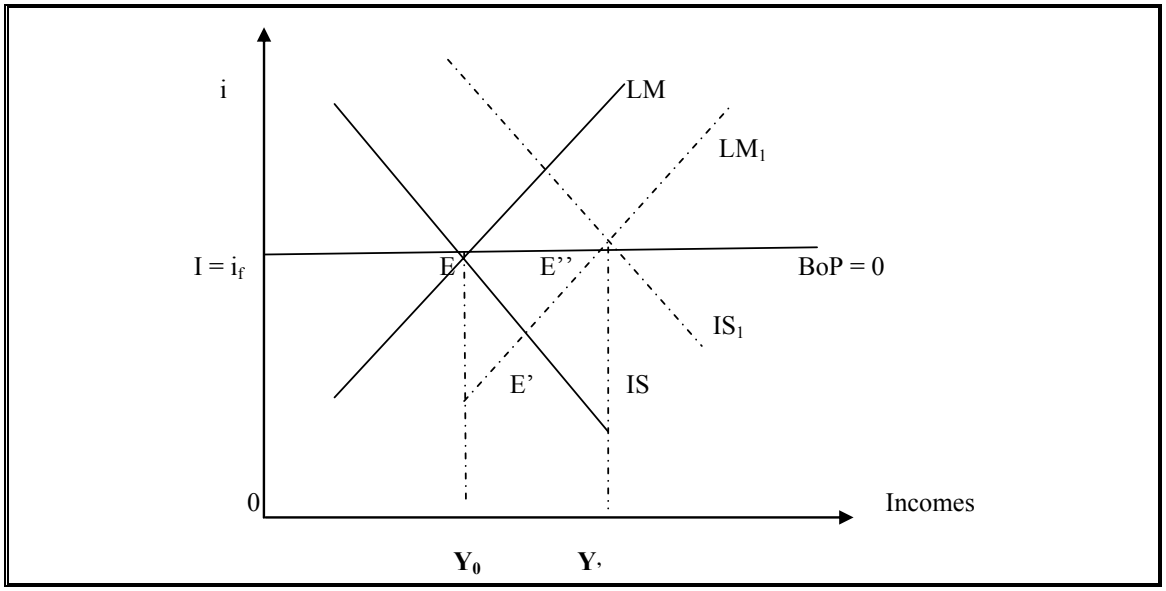

Figure 4.7 Effects of an expansionary monetary policy on incomes

Magud et al. 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 rate regimes (Magud et.al. 2011).

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4.4 Competitive depreciation

It is easy to understand that an increase in monetary expansion leads to an exchange rate depreciation via a cut in the interest rate. Net exports rise and therefore, there is an increase in output and employment. The demand for domestic goods rises because imports are costlier. This is reflected in the output of different countries when employment and output both decline. But all countries will try to follow the same policies. This is because doing so improves their balance of trade and capital accounts. All economies will try to increase the money supply and reduce the interest rate. These same countries will try to reduce the interest rate to depreciate the currency, depending on the internal business cycle. Different countries find economic booms and recession periods at different points of time. Depreciation and recession shift countries towards higher demand for goods. The countries then achieve full employment. A number of factors can correct the disequilibrium. But competitive depreciation shifts the demand rather than increases the demand. The crowding out in the 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 exports. The study of Baba and 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 pressures. The study also describes that the macroeconomic 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 an 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 = the real exchange rate
e = the nominal exchange rate
p_f = 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 a 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 rise, 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.

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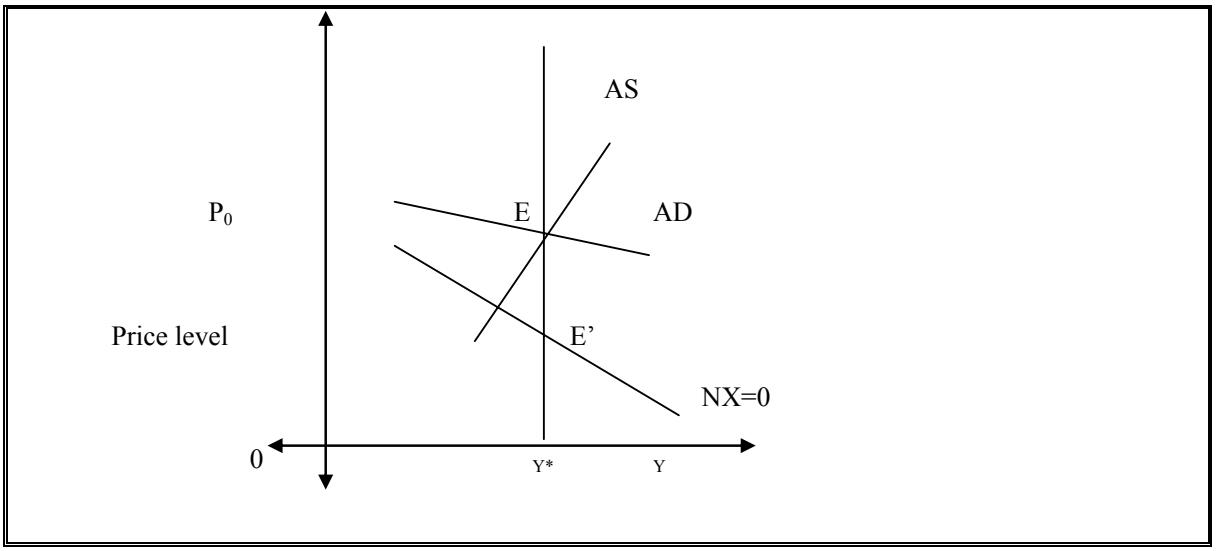

Figure 4.8 Effects of a devaluation on price levels

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

$$AD = A + NX \tag{4.8}$$

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The aggregate demand is drawn for a given level of foreign prices, a given nominal money supply, a given fiscal policy and a fixed exchange rate. An increase in the nominal money stock shifts the schedule upwards as does an expansionary fiscal policy. Equilibrium point E shows that the aggregate supply and demand curves intersect each other. The full employment level is at Y* and the equilibrium point is at E. At this point, there is some unemployment in the economy. The trade balance equilibrium is when NX = 0. An increase in domestic income could result in more imports and more imports worsen the trade balance. To restore the balance of trade equilibrium, domestic prices would have to be lowered. This would make the home country more competitive, enabling it to increase 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, the home country has a trade deficit. Our prices are too high or our income is too high to have exports equal imports. To achieve the equilibrium in the trade balance, a country should become more competitive by exporting more and importing less. A country could reduce its level of income in order to reduce spending on imports.

In a fixed exchange rate system, it is possible for the central bank to use its reserves to finance temporary imbalances of payments. This means meeting the excess demand for foreign currency at the existing exchange rate, arising from the balance of payments deficits. A country experiencing balance of payments difficulties can borrow foreign currencies from 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 boosting exports or to finance a temporary deficit then loans will be made available. But if a loan is used for unproductive purposes, then problems will arise.

4.6 Automatic adjustment

When there is a balance of payments deficit, the demand for foreign exchange is higher than the amount being supplied by the private market and the central bank. When the reserve bank sells foreign exchange, it reduces domestic high powered money and therefore, the money stock declines. The reserve bank stimulates its foreign exchange intervention by buying bonds while it sells foreign exchange to keep the exchange rate from depreciating and reducing the domestic money stock. The aggregate demand schedule will shift downwards and towards the left.

The figure shows unemployment at E. Unemployment leads to a decline in wages and costs which are reflected in a downward shifting aggregate supply curve. E moves downwards as both the demand and supply schedules shift. The short run equilibrium moves in the direction of point E. At point E, the 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 a foreign exchange market intervention and the reserve bank does not require further changes in the money supply.

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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 operate its market operations carefully, particularly with regard to the foreign exchange market with appropriate regulatory monetary and other measures considered necessary from time to time (RBI 2012).

4.7 Expenditure switching and expenditure reducing policies

A country's expenditure policies will shift demand between domestic and imported goods in order to cope with the two targets, that is, internal and external balance. Reducing the current account deficit is used to reduce aggregate demand. This is an expenditure reducing policy.

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

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 a restrictive monetary or fiscal policy. The link between the external balance deficit and budget deficit is defined as:

$$NX = S – I + T – G \tag{4.10}$$

where S = private savings and T – G is the budget surplus.

If savings and investments are constant then changes in the budget would translate one-for-one into changes in the external balance. Budget cutting would bring about similar changes in the external deficit.

4.8 Devaluation

There is unemployment, and automatic adjustment and the desirability of free trade argue against the use of tariffs. There is a need for an alternative policy for restoring the internal and external balance. The major policy instrument for dealing with payment deficits is a devaluation of the currency which usually has to be combined with a restrictive monetary and fiscal policy.

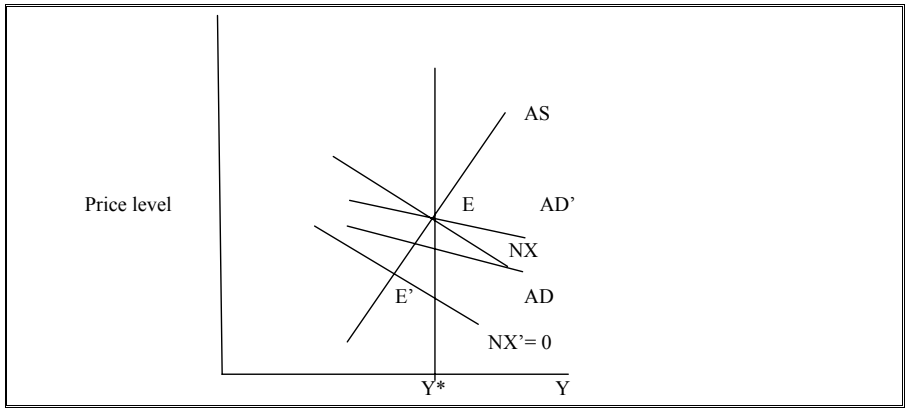

Figure 4.9 Effects of a devaluation on exports

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Devaluation is defined as the 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 the devaluing country. India has devalued its currency to boost its exports and reduce imports. Devaluation is an expenditure switching policy. In devaluation, the NX schedule shifts to NX'. With the lower demand for exports and with a fixed exchange rate, output would decline. The aggregate demand schedule shifts to the left as a result of the fall in exports. The lower level of income reduces imports but not enough to make up for the loss of export revenues. The net effects are therefore, unemployment and a trade deficit. The automatic adjustment mechanism would work slowly to restore equilibrium, so that the country can devalue its currency. This has the obvious advantage that it does not require a protracted recession to reduce domestic costs. Given that with a devaluation, foreign goods will be relatively expensive, imports will fall and exports will rise.

The disturbance to the economy takes place in the trade account. When NX'= 0, the locus goes back to the full employment level of income, 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 devalues the currency when the current account looks like it will be in for a prolonged deficit. In a system of clean floating by contrast, the exchange rate moves freely to bring the balance of payments (BoP) into equilibrium. 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 stage between a fixed rate system and a clean floating system.

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4.9 The exchange rate and prices

The effect of a devaluation on the 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 prices of the country's own goods relative to the prices of foreign goods. The real devaluation occurs when e/p rises or when the exchange rate increases by more than the price level.

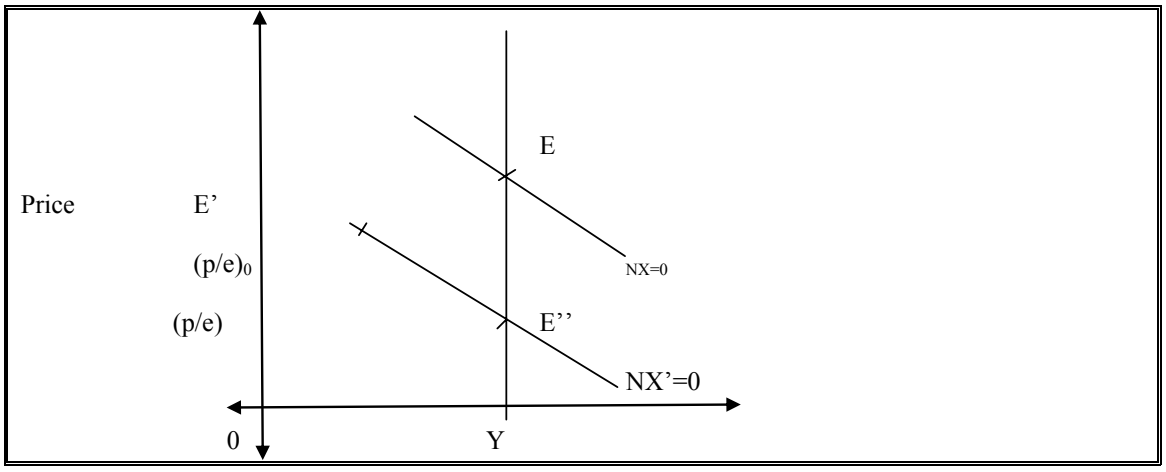

Figure 4.10 Effects of a devaluation on the trade balance and income

Figure 4.10 shows that in the short term, a country might absorb an external shock and stay at E'. It can borrow from abroad and finance its external deficit. It can devalue its currency and reach point E". But if domestic prices are increasing then this frustrates the devaluation. A devaluation, therefore, increases the general price levels at the domestic level, resulting in a deviation crisis.

4.10 The crawling peg exchange rate

To avoid a huge deficit in their balance of payments, 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, the reserve bank often follows this policy. The idea behind the crawling peg is to keep the real exchange rate $R=P_f/ (P/e)$ constant by raising e at the same rate as (P/P_f) is rising.

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4.10.1 Exchange rates and relative price adjustments

We assume that wages and prices adjust for the economy to achieve full employment., but prices are based on labor costs 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 their workers. Changes in the cost of living triggered by a devaluation would lead to changes in the money wages which would feed back into prices, which in turn, could offset the effects of the nominal devaluation. Changes in prices feed back into wages and from there, into prices. Take the case of a wage price spiral that may produce considerable volatility in price levels. Small disturbances can sometimes set off quite large changes in price levels. Suppose a country has to devalue its currency to restore the trade balance. The devaluation leads to more imports and thereby a rise in consumer prices. To maintain real wages, workers demand higher money wages which the employers grant but they in turn pass the extra costs on to consumers by raising prices. Real wages are constant, which means wages and price levels rise in the same proportion. Wage increases have been fully passed on, which means that the real wage in terms of domestic output remains unchanged. The two results imply that relative prices are unchanged.

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

4.11 The J curve effect

The trade balance, measured in terms of domestic goods can be expressed 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

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Suppose the exchange rate declines, and domestic and foreign prices p and p_f remain unchanged. The relative price of imports eP_f/P rises, resulting in:

Firstly, the volume of imports does not change their value measured in the domestic currency. This means higher import spending, thus, a worsening of the trade balance. This is a potential constant response of the trade balance to a currency exchange depreciation. There are two volume responses that run in opposite directions. Exports 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 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 with tourism patterns. With a particular deficit, the depreciation causes the relative prices of imports to rise. The short run effects result primarily from increased import prices with very few offsetting volume effects. Therefore, the trade balance initially worsens. Over time, as trade volumes adjust to the changes in relative prices, exports will rise and import volumes will progressively decline. The long run trade balance will show an improvement. This pattern of adjustment is referred to as the J curve effect. The response of the trade balance looks like a J, as in the following diagram.

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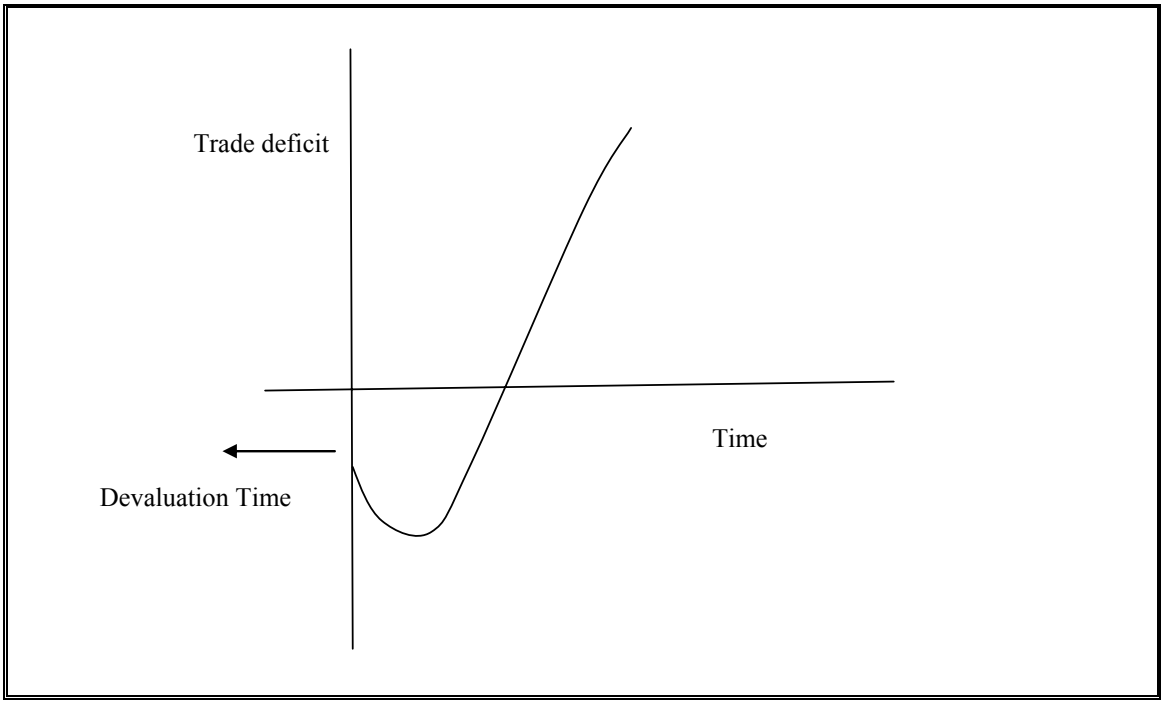

Figure 4.11 The J curve effect

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

4.12 The Monetary Approach to Balance of Payments (MABoP): the IMF approach to macroeconomic stabilization

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

$$\mathbf{BoP = \Delta H - \Delta DC}$$

$$\mathbf{\Delta M = \Delta DC + \Delta R}$$

where ΔH = high powered money
MM = monetary sector equilibrium
ΔR = target variable
ΔM = endogenous variable
ΔDC = domestic credit

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

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

where ΔR is a target variable, Z is an exogenous variable, and XΔF is an exogenous variable.

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

4.12.1 The instrument target approach

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

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ΔDC	Π
E	ΔR

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

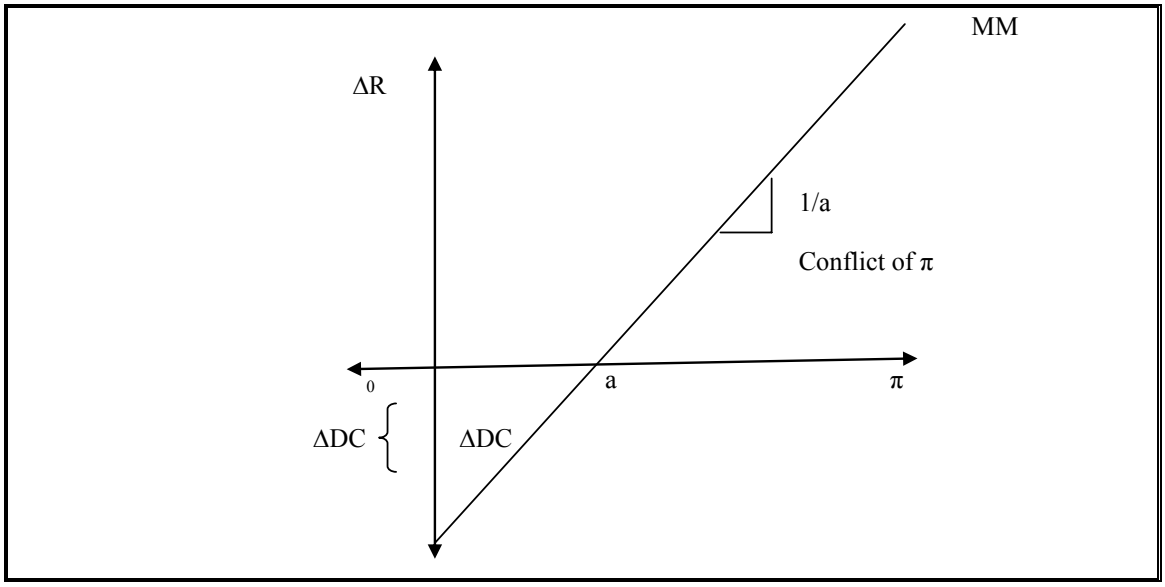

Figure 4.12 The money supply and domestic credit

The change in reserves is interpreted as:

$$\Delta R = \Delta M - \Delta DC$$

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

$$\Pi = f(\Delta M) \tag{4.12}$$

Money supply is an independent variable. It can be further stated as follows:

$$\Pi = a\,\Delta M$$

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

Then ΔR=ΔM-ΔDC

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If we substitute ΔM in the above equation, then we obtain

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

The policy instruments are as follows:

Π	0	aΔDC
ΔR	-ΔDC	0

Similarly, ΔR and inflation in the economy can be explained as follows. In figure 4.13, it shows that inflation and reserves are in equilibrium at point A. But a contraction in domestic credit increases the money supply from MM_0 to MM_1. The change in domestic credit will reduce MM_1 to a new line after the credit restriction. Thus, a change in domestic credit reduces the same reserves and at lower inflation π (A& B). For the same inflation (π), higher reserves are expected for Δ R (B&C).

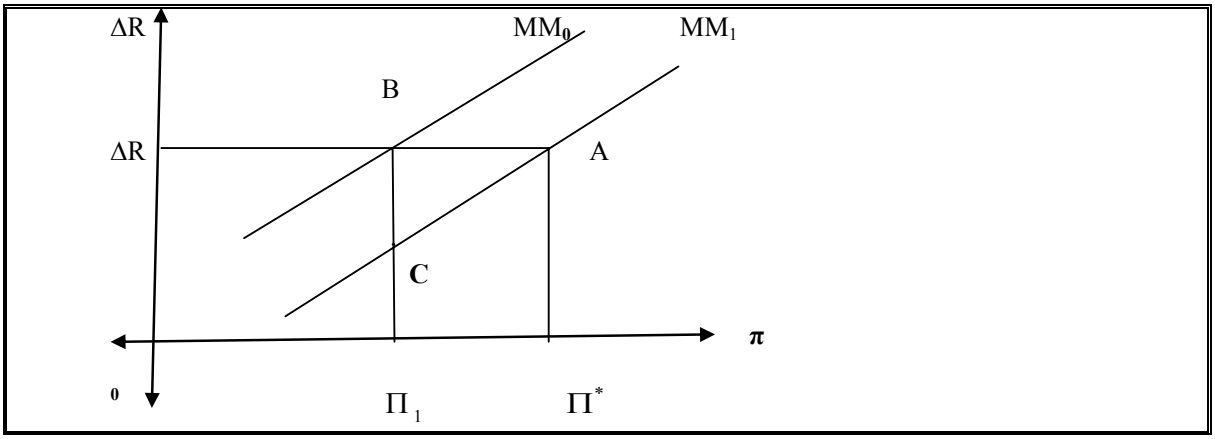

Figure 4.13 Money supply and inflation

The change in foreign exchange reserves is equivalent to the flow of foreign capital and the difference in exports and imports, so that:

$$(X\text{-}Z) + \Delta F = \Delta R \tag{4.13}$$

The above equation can be interpreted alternatively as exports minus imports and the change in foreign capital is equal to the change in reserves

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

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

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

$$X\text{-}Z = -b\pi + OE$$

$$\Delta R = -b\pi + CE + \Delta F \tag{4.15}$$

This means that reserves are negatively related to inflation and positively related to the exchange rate and foreign capital. A policy framework is given as follows:

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

The above variables are shown in the following diagram. The MM curve shifts due to the monetary policy. Capital flow is very important for macroeconomic stabilization. In the diagram, E_0 is shown to be in equilibrium in both sectors. The monetary sector equilibrium is shown as an upward line.

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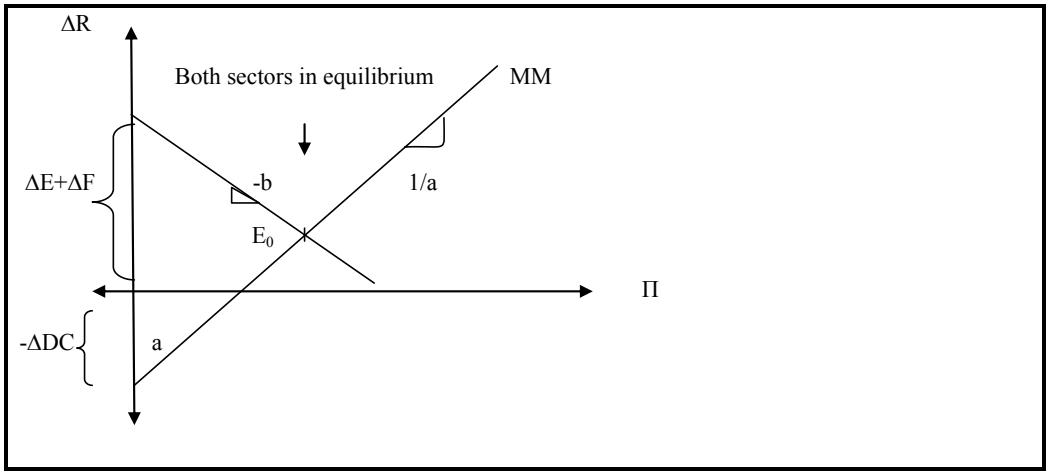

Figure 4.14 Macroeconomic stabilization in an economy

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

External sector equilibrium:

The external sector in equilibrium can be expressed as:

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

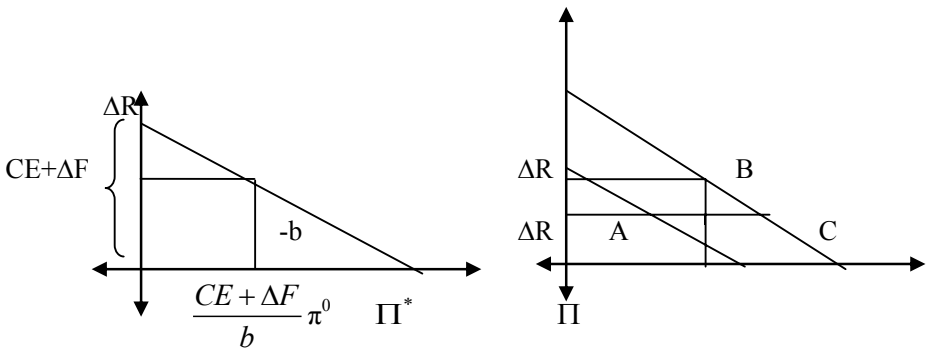

Figure 4.15 External sector equilibrium

In figure 4.15, the Y axis is the exchange rate and the foreign capital whereas the X axis shows the inflation rate. The above figure represents the link between the exchange rate and inflation. The diagram also shows the point of equilibrium between reserves and inflation. Point A shows the devaluation phenomena. After a devaluation, inflation remains the same and it is possible to get higher reserves. The same inflation (π) and higher (R.) reserves at point B are maintained. But at point C, there are fewer reserves and more inflation. At the same reserves level, there is high inflation (Points A and C). Therefore, everything depends on the real exchange rate. The real exchange rate is defined as:

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

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where R = the real exchange rate
E = the nominal exchange rate
P_f = the price in foreign countries
P = prices of domestic currencies

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

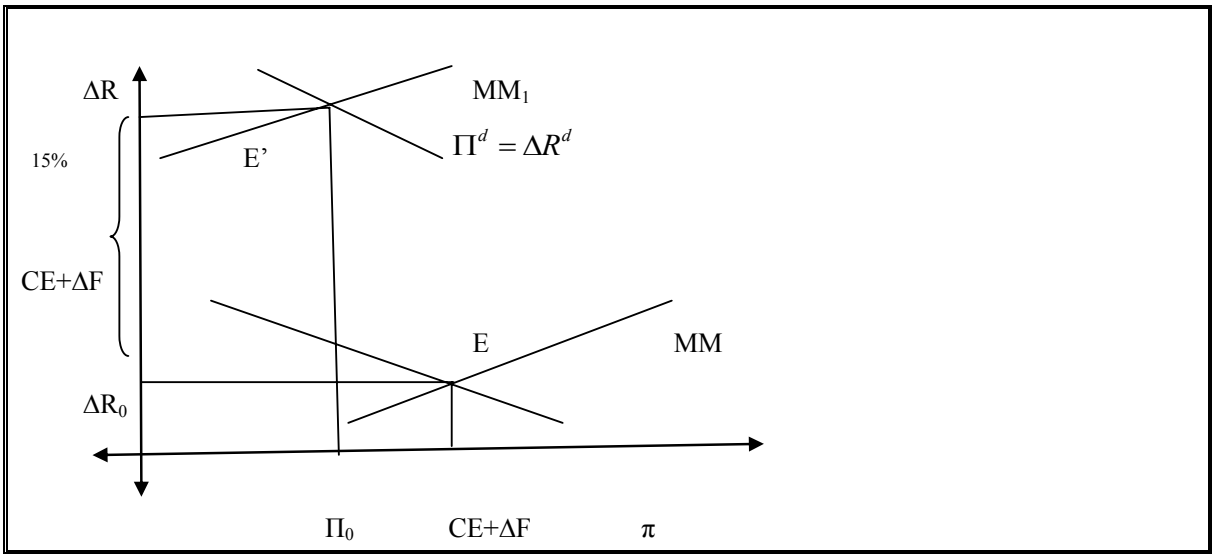

Figure 4.16 Changes in the money supply and inflation in an economy

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

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4.13 Exchange rate overshooting

The monetary authority supplies money regularly to the economy. A devaluation improves the trade balance in the short run. But in the long run, along with money supply increases, prices rise in the economy. The exchange rate devaluation, money supply and prices remain in equilibrium.

Assumption

The exchange rate overshooting model is based on the following assumptions, namely:

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

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

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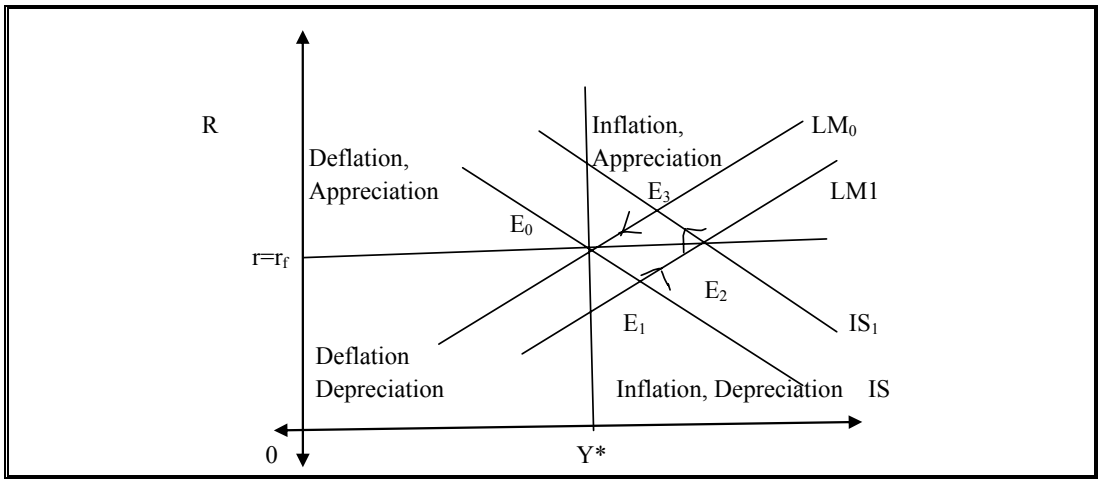

Figure 4.17 Effects of a monetary policy on income in an open economy

The monetary policy assumes a flexible exchange rate. The equilibrium point is observed at $E_{0.}$

The monetary expansion leads to a shift of the LM_0 line to LM_1. The new equilibrium point is achieved at $E_{1.}$ The exchange rate depreciates because the domestic interest rate is lower than the foreign interest rate ($r < r_f$). Exports become competitive and rise because of increased competitiveness. The IS_0 curve shifts to $IS_{1.}$ This is because exports rise. The equilibrium point is achieved at E_2. This is the end of phase one. At point E_2, where $Y > Y^*$, prices rise, (M/P) falls and the LM_1 curve shifts to LM_0, then shifts back to the original point LM_0. The interest rate rises and the equilibrium point is achieved at E_3. The exchange rate appreciates, when the domestic interest rate is below the foreign interest rate ($r > r_f$). Exports fall due to a lack of competitiveness in the global market. The IS curve shifts back to IS_1. The equilibrium is achieved at E_0. In the long run, output returns to the normal level. Money, prices and the exchange rate rise in the same proportion. The short-run effects of monetary expansion lead to a rise in M/P, e ep_f/p and Y. Prices are unaffected by a monetary expansion. In the long run, the exchange rate (e), and 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 the following table as:

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

Table 4.2 Effects of monetary expansion on the money supply, the exchange rate and prices

4.13.1 Long term exchange rate adjustment

The analysis of monetary policy with a flexible exchange rate as given above leads to an important insight about the adjustment process. The 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.

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The overshooting of the exchange rate means the exchange rate rises above the money supply. The prices slowly adjust in the long run. In the long run, the money supply, the 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 the exchange rate are shown in the following diagram.

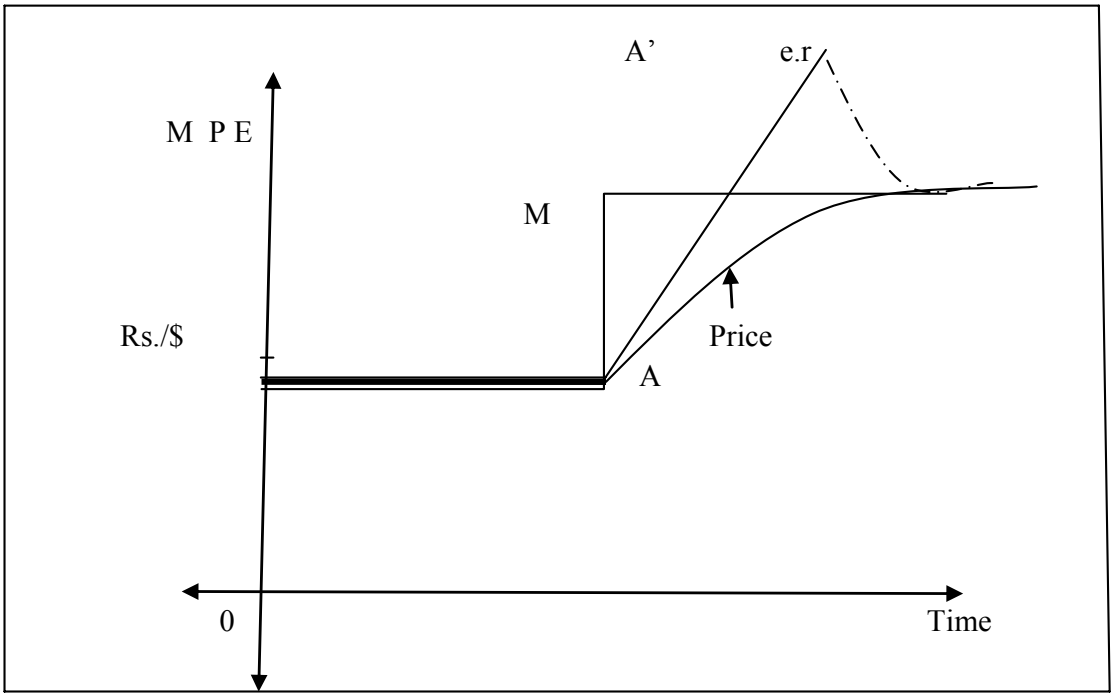

Figure 4.18 Exchange rate overshooting

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

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

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In the above diagram, initially, the economy is in full employment equilibrium. The exchange rate is in equilibrium at A. Suppose the exchange rate depreciates to A'. The effect is more than an increase in the 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 imports 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 the monetary policy produces a large change in the exchange rate.

4.13.2 Policy Dilemma

The government wants to achieve not only an external balance but also an internal balance. Internal balance means that output is at the full employment level Y*. External balance occurs when the trade balance is zero. An important point about internal and external balances 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 the internal balance. The policy dilemma shows that in region I & III, monetary and fiscal policies can move the economy towards both internal and external balances. In region II & IV there is a policy dilemma.

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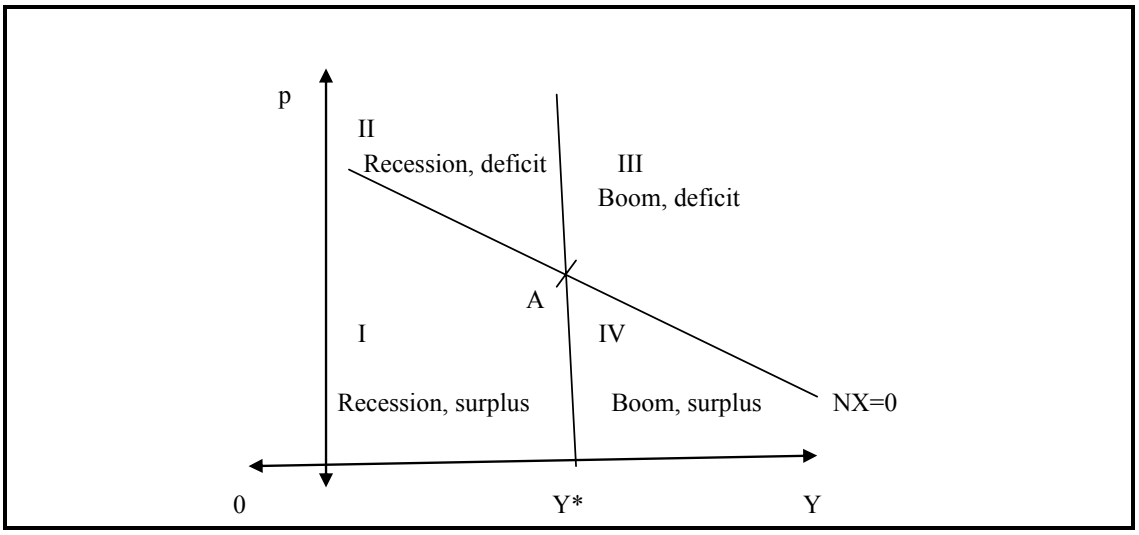

Figure 4.19 Policy dilemmas to achieve equilibrium in the economy

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 the trade balance equilibrium or expansionary policies to achieve full employment. If we are unable to reach one target, one gets farther away from the other. Such a situation is called a policy dilemma and it can always arise when there are more targets of policies 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 balances. The policy dilemma can be solved by finding another policy instrument to cope with the multiple targets.

4.13.3 Policy dilemma: Twin deficits

The policy dilemma explains that there is a need to achieve internal balance or external balance. The dilemma is also whether to reduce the fiscal deficit versus the current account deficit. Internal balance comprises the budget surplus and taxes subtracted by any government expenditures, expressed as:

$$BS = T - G$$

The external balance means exports minus imports, the net export will be positive.

$$NX = X - Z$$

Now $BS = t\,Y - G$

where $T = tY$

$$NX = mY$$

Adjustments:

I. The economy is under quadrant I:, the IS-LM curves intersect, there is a trade surplus. If we conduct an expansionary monetary policy, the LM curve shifts to the right to LM_1. There is no dilemma. In zone III, there is no conflict. Since we reduced the trade deficit, there is no dilemma.

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II. An expansionary monetary policy will increase the trade deficit, i.e., paying for the excess of imports over exports. So there is a policy dilemma. This dilemma cannot be solved in the above situation because there are two targets and one instrument: internal and external balance and income.

In order to solve the dilemma, we need a second instrument.

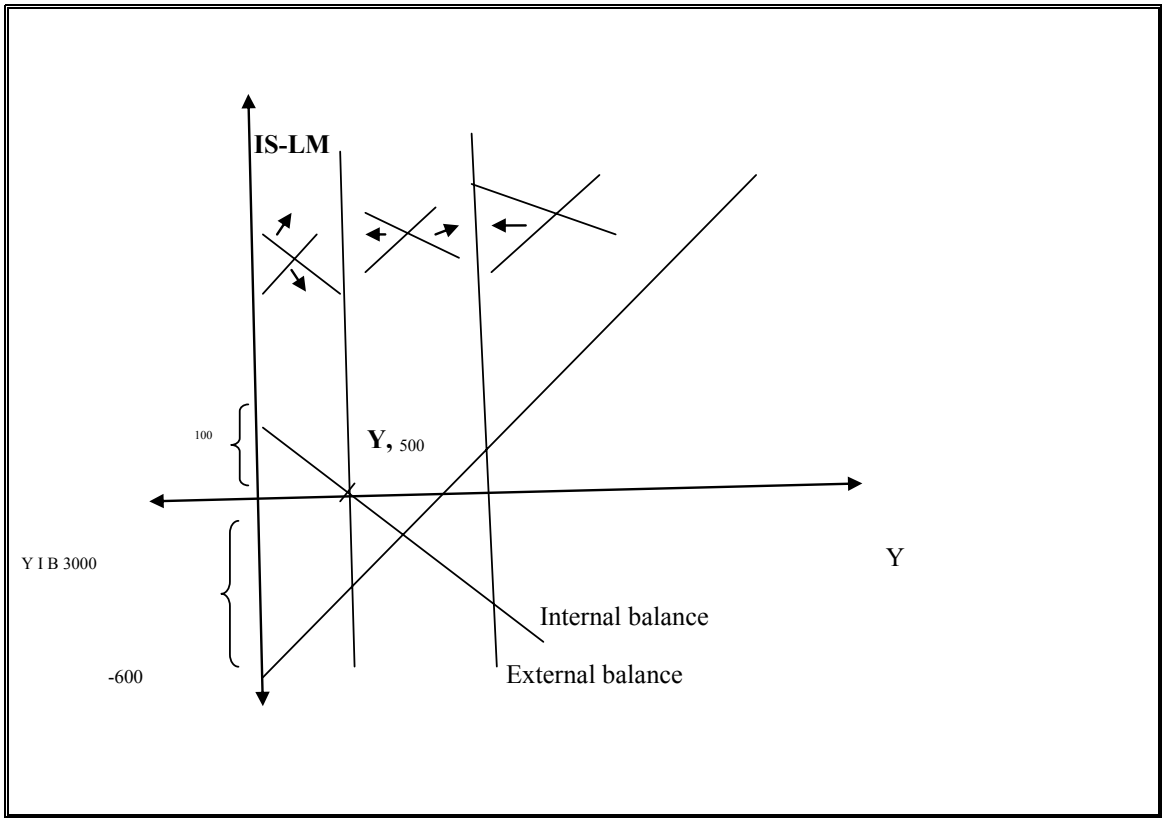

Figure 4.20 Internal and external balance adjustments with income

Explanation:

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

$$\begin{aligned} BoP &= NX + CAD \\ &= (X\text{-}Z) + \Delta F \end{aligned}$$

$$BoP = (X\text{-}mY) + (r\text{-}r_f) \tag{4.19}$$

Here, the balance of payments comprises exports minus imports and the domestic income. The balance of payments is also related to the capital inflow. Capital inflow depends on the difference between the domestic and international interest rates.

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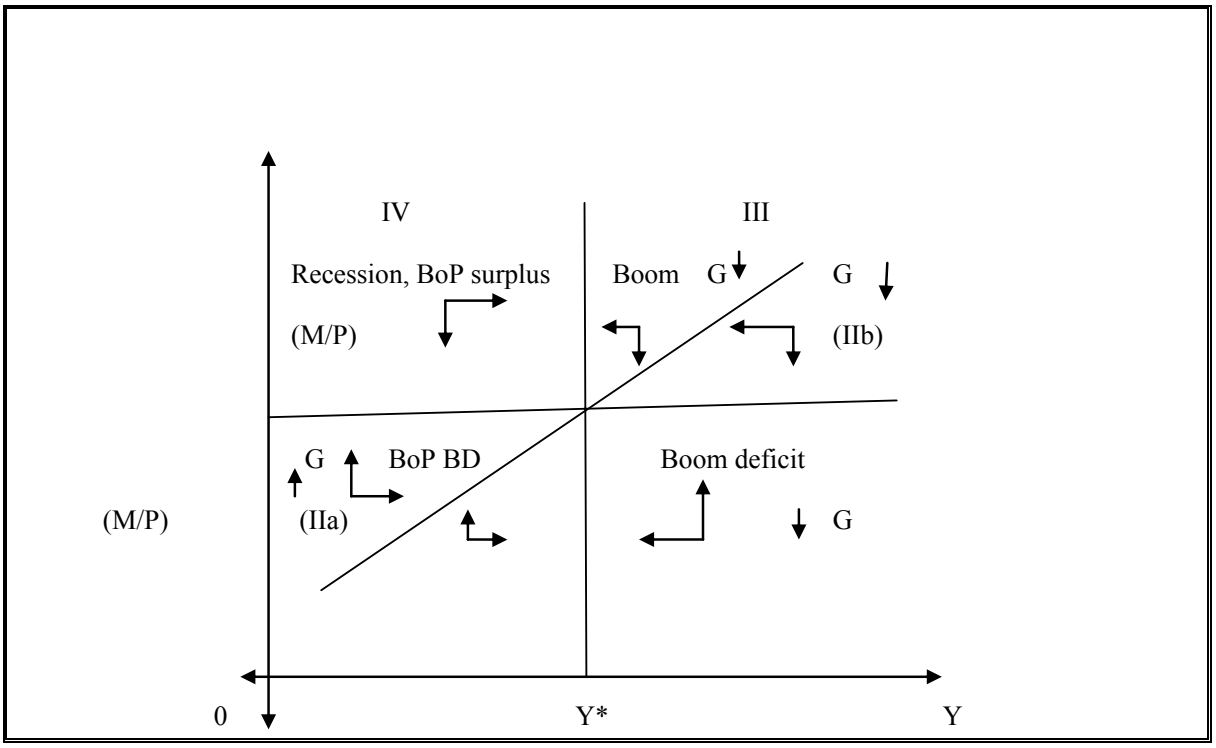

Figure 4.21 Adjustments of the balance of payments, the deficit and the money supply

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An increase in exports is the best strategy to improve the balance of payments. But an increase in income will have a negative effect on the balance of payments, because people will import more goods (Y↑ → BoP ↓) from foreign countries and the balance of payments will then be in deficit. Similarly, if the interest rate rises, then the balance of payments will be in surplus (if r increases, BoP increases). If the government expenditures increase, then there will be more investment in the economy. It consequently increases incomes. Increased incomes (G) lead to more investments, thereby, generating more income. It is the opposite when the government reduces its expenditures. Incomes decrease and therefore, the interest rate decreases (when G decreases, income and r decrease).

Secondly, as the money supply (M/P) increases, incomes (Y) will increase and the interest rate will decrease. Alternatively, when M/P increases, r will decrease; or vice versa. Therefore, any increase in income worsens the balance of payments. The vertical line shows the internal balance resulting in full employment. At every point on IS_0, the balance of payments is equal to zero. Above the line, any point shows the balance of payments in surplus. At every point below the line (where BoP = 0) the balance of payments is in deficit. New challenges have emerged in the form of large and rapid movements in the exchange rate. The consequences of these movements for both external flow of credit 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 such a way to reduce the likelihood of a much more severe and perhaps uncontrollable shock (RBI 2012).

The above explanation can be presented with the following example:

The breakeven in BS implies: BS = 0

$$0 = 0.2y - 600$$
$$600/0.2 = Y$$
$$Y = 3000$$

Breakeven in NX = x - mY

$$0 = 100 - 0.2Y$$
$$Y = 500$$

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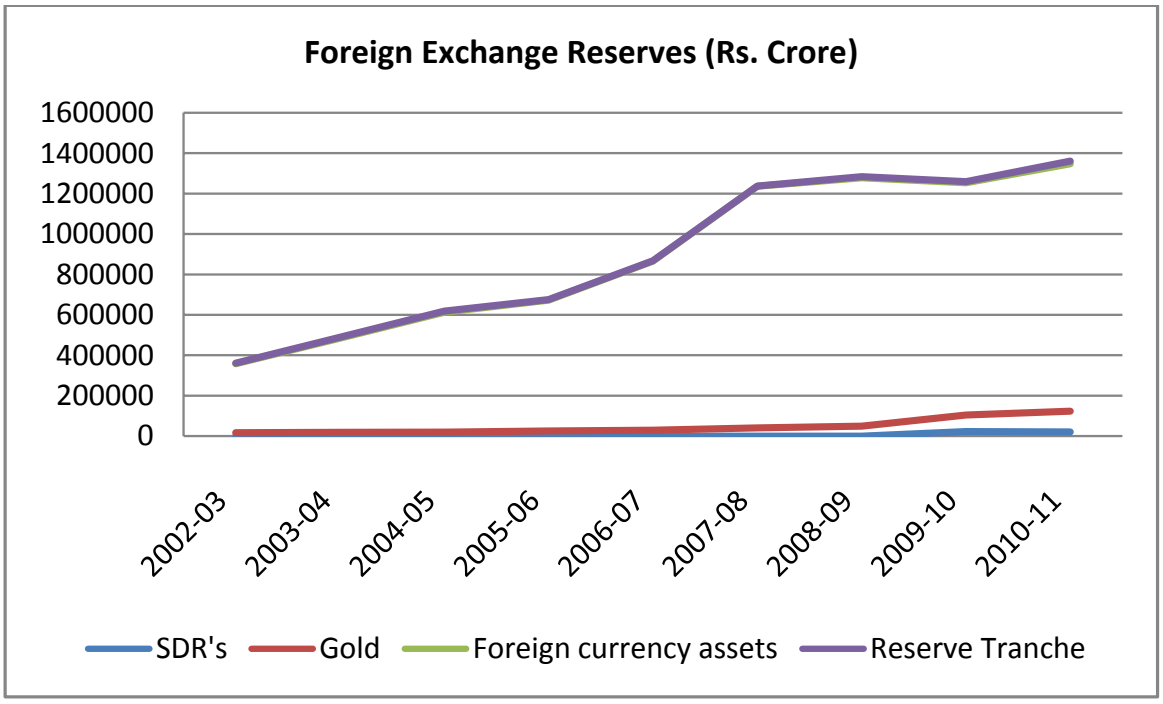
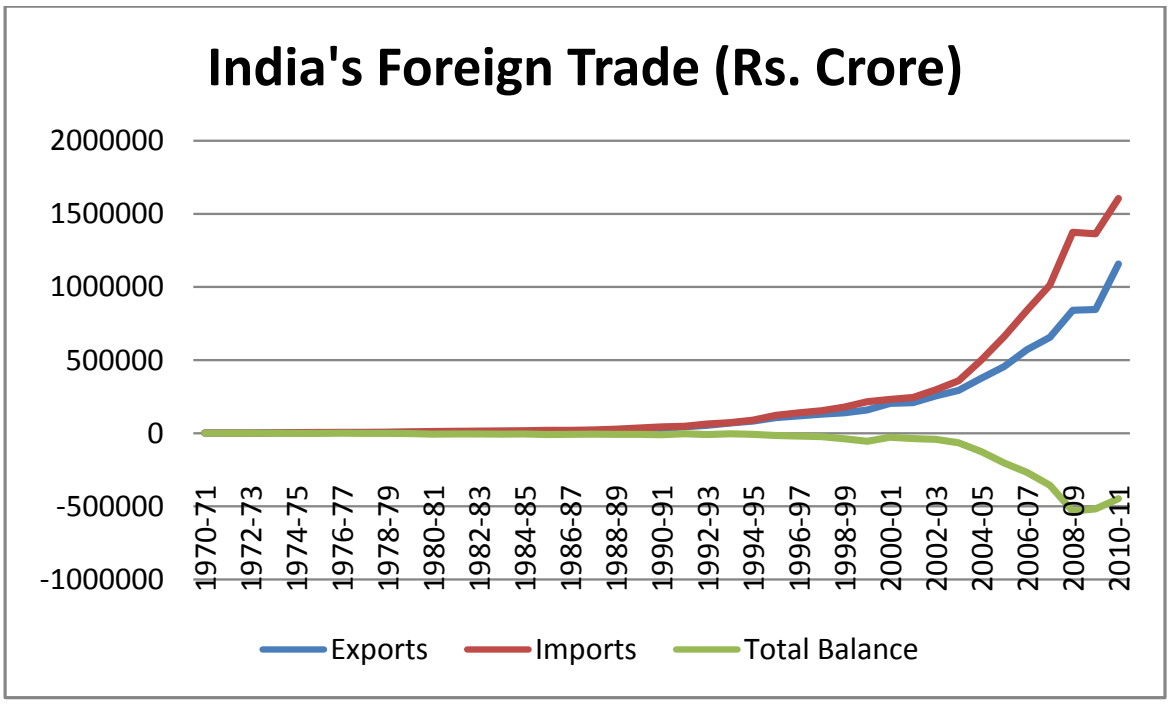
Appendix:



Graph 4.1 Foreign exchange reserves in India
Source: RBI statistics



Graph 4.2 Foreign trade of India
Source: RBI statistics

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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 Investments(a+b)	10,865	9,121	1,744	7,755	7,405	351
	a) Foreign Direct Investments (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

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	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	–	–	–	–	–	–

Table 4.3 India's Overall Balance of Payments (Billions)
Source: RBI statistics

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Questions

1. Explain the relationship between the balance of payments and the exchange rate.
2. Why must the external balance be in balance?
3. Explain the difference between a fixed and a flexible exchange rate.
4. How does an open economy affect the goods market? Explain.
5. Capital inflow affects the balance of payments 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 any disturbances?
7. Explain the Mundell-Fleming model in terms of a fixed exchange rate and capital mobility.
8. Explain the Mundell-Fleming model in terms of a fixed exchange rate along with the effect of monetary and fiscal policies on it.
9. What is the effect of a flexible exchange rate and monetary and fiscal policy on the Mundell- Fleming model?
10. Explain the term "competitive depreciation".
11. Explain the role of prices in an open economy.
12. Explain devaluation in detail.
13. What is the J curve effect?
14. Explain the monetary approach to the balance of payments.
15. What is exchange rate overshooting?
16. Explain policy dilemma in the equilibrium of economy.

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17. What are the adjustments required to reduce the twin deficits in an economy?
18. Exchange rate overshooting reduces the trade deficit of a country. Explain.
19. Explain the external sector equilibrium in detail.
20. What is the macroeconomic stabilization approach? Explain.
21. Exchange rate depreciation leads to an increase in the price level in a country. Explain.
22. The devaluation of a currency helps to reduce the trade deficit. Discuss.
23. Export-led policies help to achieve the balance of payment equilibrium. How can the disequilibrium in the capital account of a county be corrected?
24. Explain the relationship between currency appreciation and depreciation and the interest rate. How will it help to achieve equilibrium in the balance of payments?
25. Write a note on the following:
    a) The Mundell-Fleming model
    b) Perfect capital mobility and a flexible exchange rate
    c) Policy effect of the Mundell-Fleming model
    d) Goods market equilibrium in an open economy
    e) Exchange rate system

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5 Modern Macroeconomics

5.1 Introduction

Modern macroeconomics discusses the new developments in macroeconomics. The national economy and equilibrium are part of traditional macroeconomics. But in modern economics, the efficiency wage hypothesis, insider and outsider models, implicit contracts, search and match models, etc. are debated. How the labor market behaves in an economy is also studied. Modern economies are dynamic and ever-changing with globalization. Labor markets are also dynamic and they are directly influenced by global production methods. It is difficult for a worker to find a job requiring advanced skills. Firms are becoming more competitive to be able to gain more profit and replace workers regularly with others with more skills and more efficiency. The search and match model shows the equilibrium level of employment and wages. The nominal wages in the economy are changing and higher inflation leads to increases in wages and prices. Workers are also alert to the changes in the prices of commodities. They expect higher wages for them to cope with rising prices and a rising standard of living.

5.2 The efficiency wage hypothesis

The efficiency wage hypothesis is well discussed in relation to work capacity and nutrition. As discussed in the previous chapter, workers may make mistakes for expected prices. The expected prices are higher than the actual prices. Wages are set too high and this results in unemployment. The nominal wages are set too high, too, either because workers are concerned about their relative position in the labor market, or because workers expect prices to be high. Workers who are loyal to their employers can be offered less than what the firm currently pays. The efficiency wage theory explains that firms may not find it profitable to hire more workers even at reduced wages.

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The efficiency wage theory further explains that if workers offer to work for lower wages, firms may not want to reduce wages. Firms may simply pay higher wages because doing so may gain them more benefits. Paying higher wages to workers could motivate these workers to work more productively, and produce a higher output, or become more skilled. The efficiency wage is equal to the marginal cost of increasing the wage exactly equal to the 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 SMSes to friends, engaging in union activities or office politics at different levels, etc. Most of the time, workers spend time on other activities because they do not like to do the work for which they were hired. Such non-work activities reduce productivity and total production Firms discourage quitting and shirking of the workers. It sends a wrong signal to other workers. Highly-paid workers have high consumption expenditures. Higher wages are an incentive for workers to work harder. The nutritious food offered by some employers improves employees' health and increases productivity. Undernourished workers produce less as they will be absent for a period of time, reducing the productivity and total production of the firm. A firm will be willing to pay high wages whereby labor costs increase. These higher costs will be compensated by a rise in productivity.

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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:

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

$$\beta = 0 \text{, if not employed by firm}$$

The first condition explains that workers are employed and they do not shirk. Therefore, benefits are equal to w/p. But suppose workers shirk, the firm fires them. This makes the other workers think of the net benefits. If net benefits are lower, shirking is higher.

$$\begin{aligned} NB_{shirking} &= S - B \text{ (where B means exerting efforts)} \\ &= \frac{w}{p} - \frac{w}{p} - e \\ &= e \end{aligned} \tag{5.2}$$

The net benefits of shirking depend on the efforts.

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

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

Expected loss of wages from cheating is equal to what is gained from cheating:

$$\begin{aligned} \mu \frac{w}{p} &= e \\ \frac{w}{p} &= \frac{e}{\mu} \end{aligned} \tag{5.3}$$

Firms must pay high wages to avoid shirking by workers. Workers leave their jobs for various reasons. But if the unemployment rate is high, then μ is large. In such a situation, if workers are caught shirking and cheating, they will be unable to find employment for a long period of time. Firms will be able to acquire more workers at a lower wage but when unemployment is low, firms will find it difficult to hire workers at a lower wage. The following diagram shows unemployment and little or no shirking conditions which decline with full employment. The workers' efficiency is given as follows:

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

There are a number of workers who always shirk. A firm's profit is given as:

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

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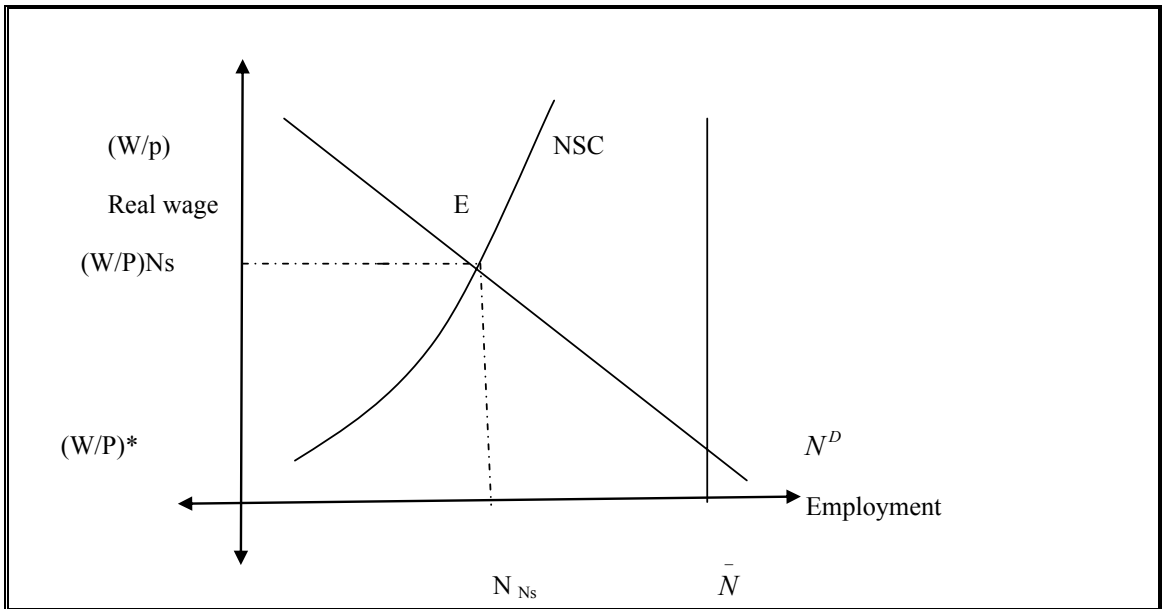

Figure 5.1 Real wages and employment in an economy

Figure 5.1 depicts N^D as the demand for labor. The N with shirking is upward sloping. With higher wages, 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 the demand curve intersects. The equilibrium point is $(W/P)_{NS}$ in the figure, and is an efficiency wage. $\bar{N}, N_{NS}$ is the total unemployment in the economy. If there is perfect monitoring of workers through short-circuit television and cameras then the intersection point is $\bar{N}, N^D$. But due to non-monitoring, the labor demand and NSC intersect at point E.

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

Shapiro and Stiglitz (1984) explained that firms choose to pay higher wages than the market clearing wage. This is because firms are unable to detect shirking on the job. Similarly, higher wages are an incentive for workers to work harder. Friedman argued that workers should get higher wages because the cost of living always rises over time.

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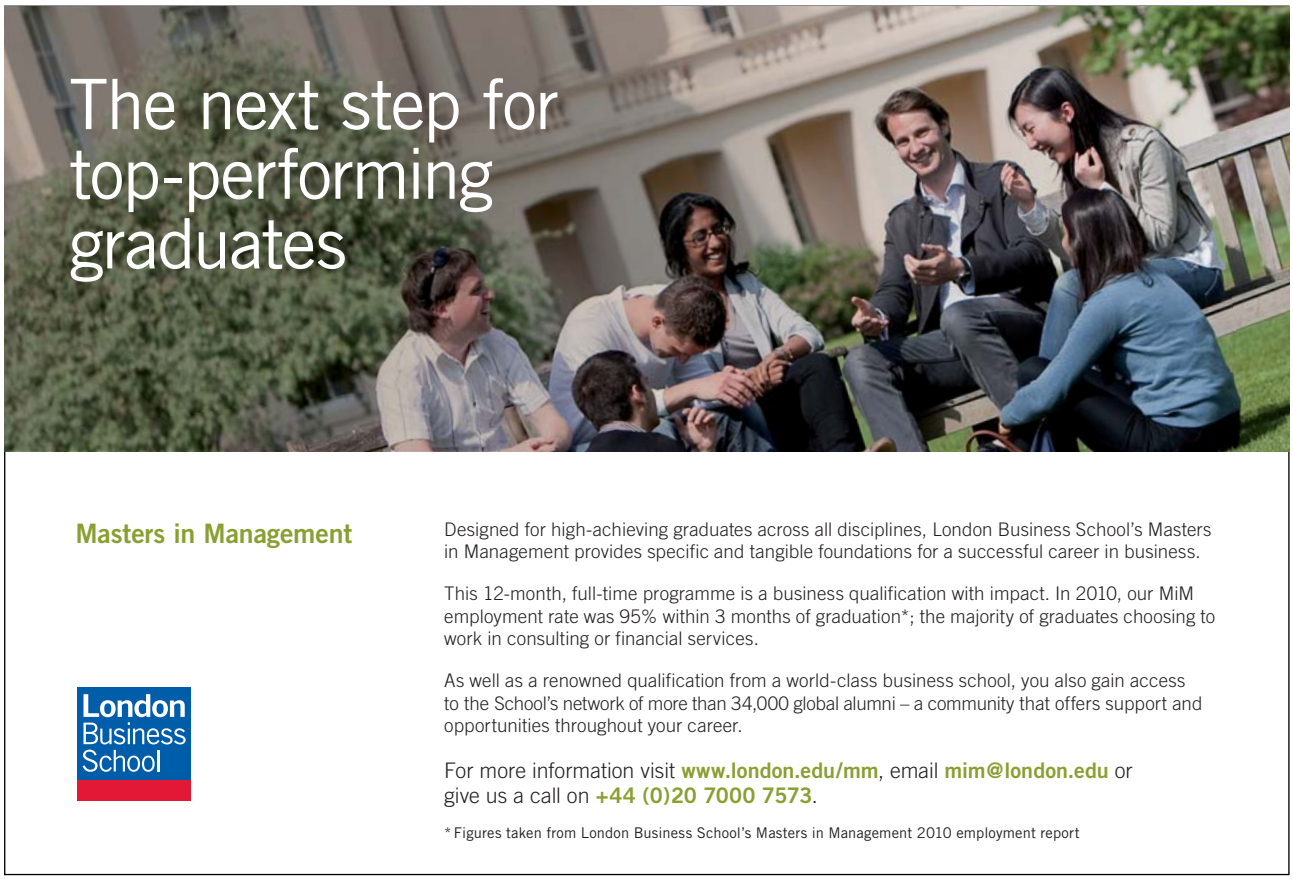
Long run and staggered wage setting

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

Figure 5.2 displays that the real wage is W_0/P_0 and that natural unemployment is N*. Suppose the price level rises from P_0 to P_1. The nominal wage adjustment takes time but in the short run, the real wage declines to W_0/P_1. Firms employ more labor, unemployment declines and output rises. In the figure, this is shown in the B panel. There is an inverse relationship; when the price level declines, the nominal wage declines. The firm reduces the total workers by firing more workers than hiring new ones, and the resultant output declines. It continues until 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 the point of equilibrium of profit maximization and NSC. It is shown because there is an aggregate excess supply of labor. This is the only point where demand for labor is consistent with wage setting. The price level is P_1 and unemployment is below the natural rate. The new Keynesian approach assumes that adjustment begins with some fraction of firms adjusting their nominal wages over any given period of time.



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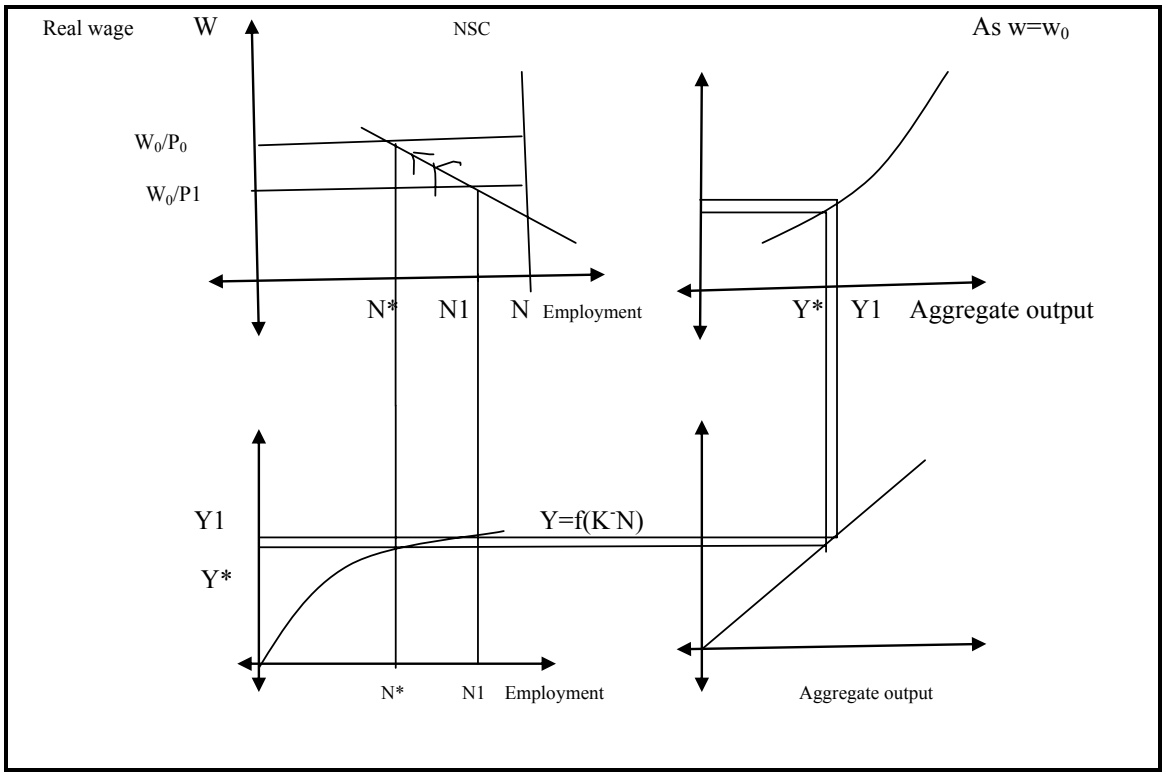

Figure 5.2 Wage setting in the long run

5.2.1 Staggered wage contracts

According to Taylor (1980), contract decisions are staggered, i.e. all wage contract decisions in the economy are not made at the same point in time. Wages are pre-decided because the cost of adjustment of wages is higher. Firms first decide on the remuneration of workers, and then fix the production and sale in the future. It does not monitor the workers' performance very frequently. But workers always look for higher wages elsewhere. If they can get a better salary at other firms then workers change employers and their wages rise. This is observed at different points in time, and is dependent on the information available to firms and workers. Sometimes, firms set wages higher and keep them at that high level. In such a case, workers do not get the chance to leave their jobs because they are unable to find better alternatives to the job they currently have.

Due to the high costs of wage adjustment, the contracts are set in the 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 terms, these periods are designated as t, t+1 and t+2. The first cohorts' contract overlaps with the second cohorts' contract, which is set in the t-1 period. The first and second cohorts' contracts overlap in t+1 period. The firm faces average costs. The current wage contract is signed as (X_t) and previous contract wages signed in period t-1 as

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

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Here, X_t is the wage contract settlement signed in period t. Sometimes, firms pay the average wage in the next contract period, depending on the labor market. If the workers want high wages then they should negotiate for the t+1 period. There is also a possibility that the economy will experience a downturn and a rise in unemployment, which would reduce the chances of a wage increase.

Wage adjustment

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 will increase the wages. But if the firm is less competitive, then wages are adjusted slowly. There comes a time when all firms adjust their wages and prices. A natural equilibrium is then achieved in the economy. The decline in prices forces firms to reduce the nominal wages and consequently, the temporary real wage increases. But if real wages are less, then fewer workers will agree to work. If 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 doing so proves to be more costly.

5.3 The government budget constraints and debt dynamics

Some taxes are levied on income, others on expenditures, and some on property holdings. 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:

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

where G = public current and capital expenditure
Tt = 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:

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

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

$$\text{Primary deficit} = G_t - T_t = D_t$$

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Another way of writing the budget constraints is:

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

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

The above equation can be rewritten as:

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

D_t is the primary deficit. If we divide the above equation by Y_t, then the equation becomes:

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

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If $b_t = B_t / Y_t$, the debt/GDP ratio is $d_t = D_t / Y_t$. The primary deficit/GDP ratio and the one period rate of GDP will 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, a government issues debts to cover a primary deficit. Secondly, the government must pay interest on existing debt. It is expressed as 1+r/1+g. If the primary deficit is zero, then

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

If the government increases the interest rate on existing debt, then the debt/GDP ratio increases. But if GDP increases at the rate (1+g) with an increase in tax revenues, GDP will also increase, helping the debt/GDP ratio to be reduced somewhat.

The net effect on the increase in GDP and interest is the debt/GDP ratio. If g r, the debt/GDP ratio will not increase; it is sustainable. This can be presented in the following:

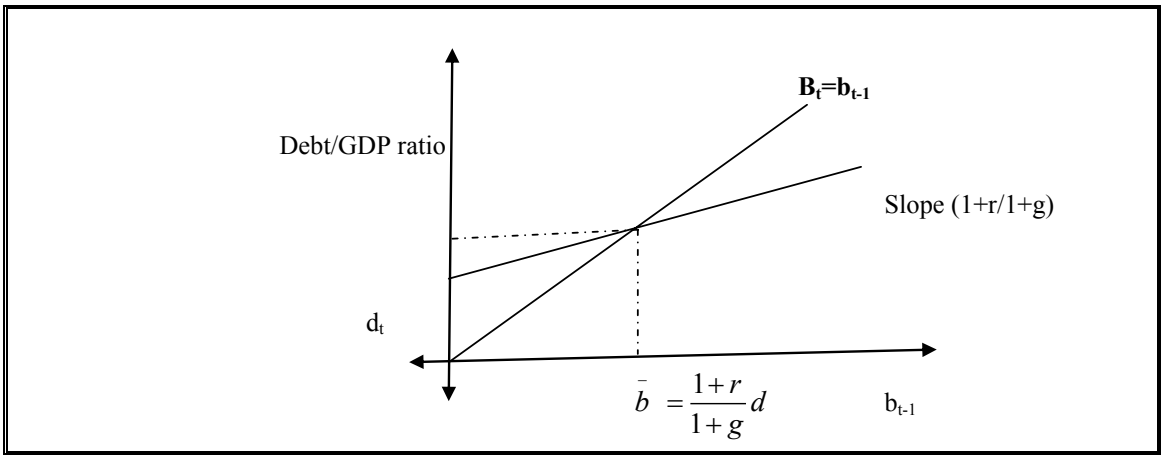

Figure 5.3 Debt and the gross domestic product (GDP) with effects of interest and growth

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

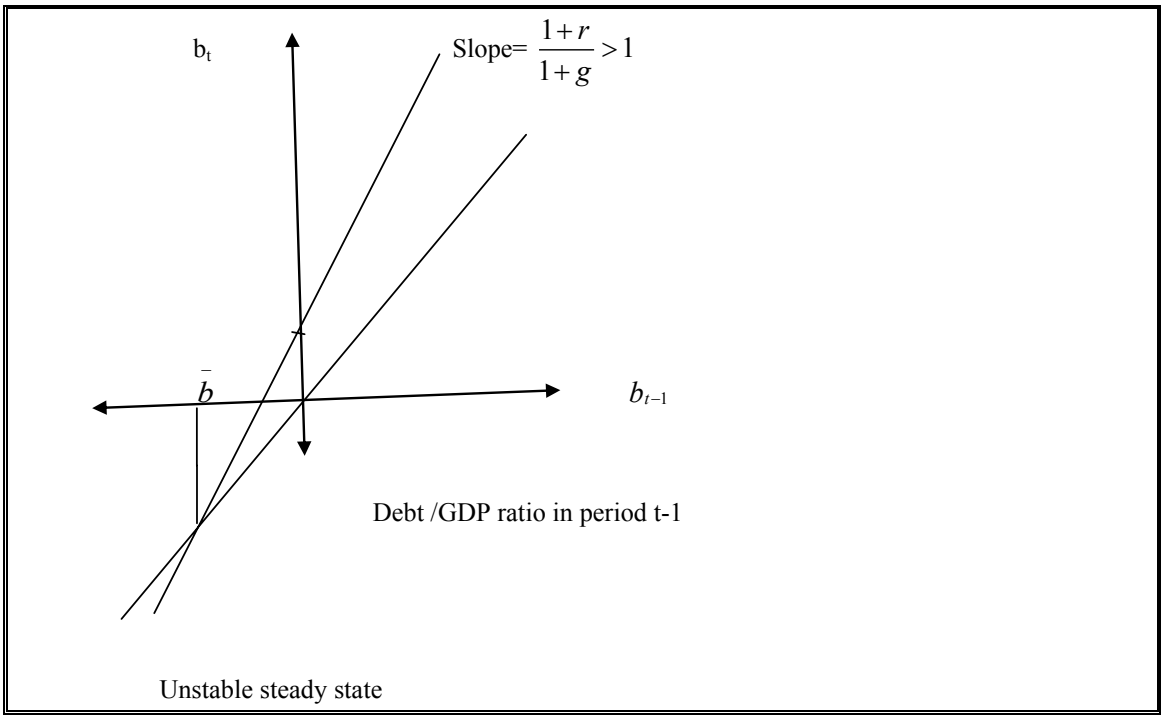

Figure 5.4 Unstable steady state conditions in debt-to-GDP ratio

Figure 5.4 illustrates that a debt/GDP value other than $\bar{b}$ will gravitate towards $\bar{b}$. If the interest rate is higher 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, a stable steady state. The debt/GDP ratio at any time t, bt moves closer to the steady state value $\bar{b}$. The second part of the figure displays [(1+r) +(1+g)] ≥ 1 or r > g, and depicts an unstable steady state. The debt /GDP ratio moves towards b_t. 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.

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The second part of the figure indicates that the economy could settle at a debt/GDP ratio which is constant at $\bar{b}$.The constant debt/GDP ratio is not a problem for economists. 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 that the government is not paying back the principal of its debt. The figure also shows that r > g, which means the debt/GDP ratio increases. The debt will be larger than GDP and when the debt is larger, the entire GDP will be insufficient to pay the interest on the debt. The government becomes bankrupt in this case. Further loans are denied by all other government and international institutions. The result is in conformity with the recent trend in Indian public finance where the high interest rate fuelled the accumulation of more debt, an increase in interest payments and the consequent debt-deficit spiral (Chakraborty 2002). From the above discussion, it can be concluded that the government increases taxes and collects above its expenditures, then uses this revenue to first pay off the existing government debt or to purchase financial assets from the private sector.

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

Under a balanced budget, the government has a close to zero fiscal deficit. If (G-T) + rB = 0, the rate of interest on debt is rB > 0. To be positive, we must have (G-T) < 0, then the government will have a primary surplus.

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

Figure 5.6 shows that the government has a primary surplus. The debt /GDP ratio of b* diverges 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 $b^* < \bar{b}$, the government gets out of debt. It accumulates more assets while increasing debt.

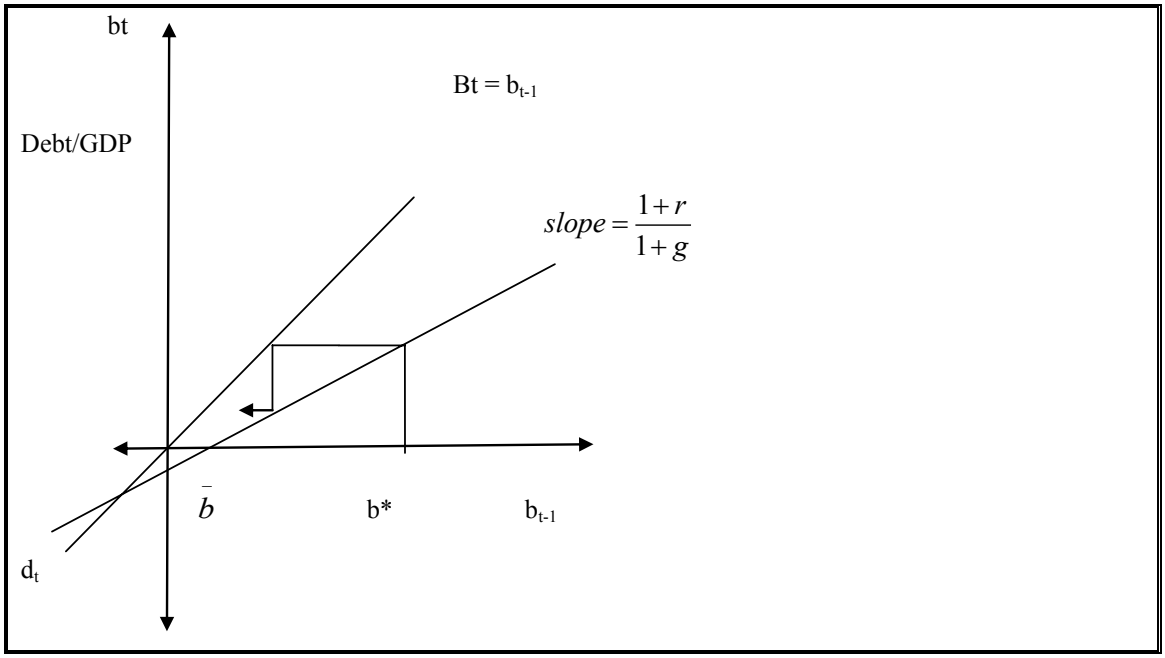

Figure 5.5 Repayment of government debt over time

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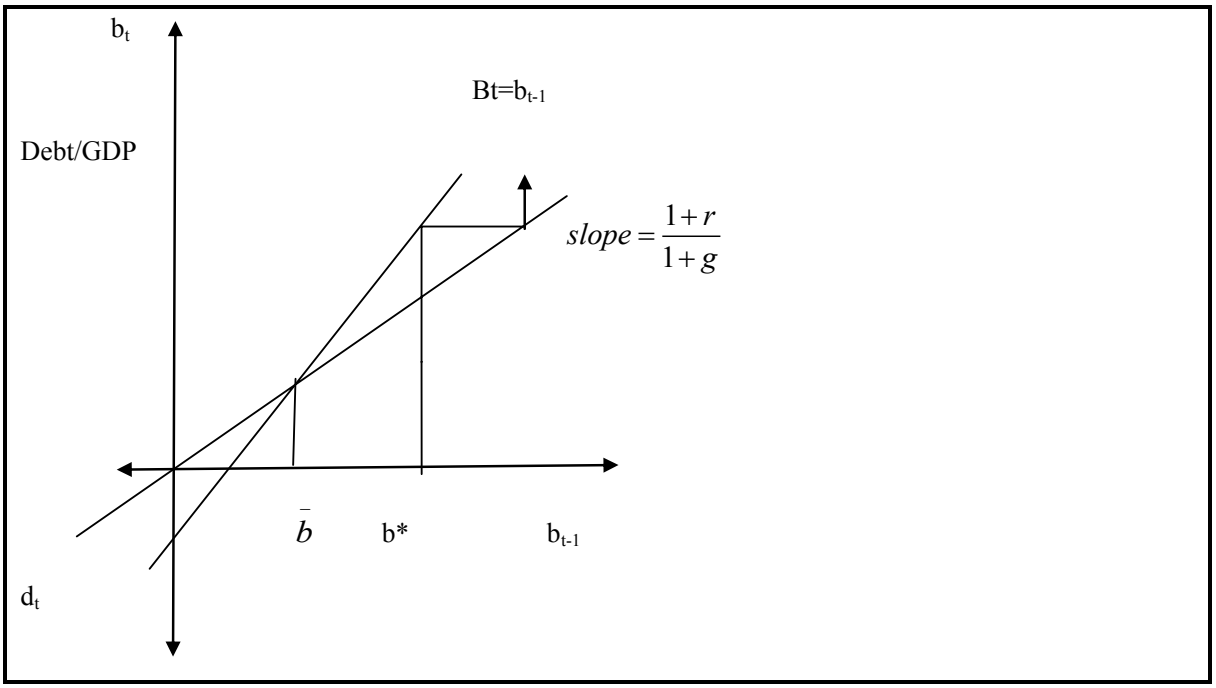

Figure 5.6 Government assets with rising debt

A government's debt management policy should ensure that the states can borrow on terms comparable to those of the central government, so that the spread of interest rates between the debt of the central government and the states is reduced (Chakraborty 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, for well designed fiscal policy rules at the national and sub-national levels of government, for short-run contingency measures and a multi-year macro budgetary process, an institutional framework for implementation of rules and appropriate preparation and sequencing including the phasing in of supporting structural reforms (Kopits 2001).

5.4 Rational expectations

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 on expectations for the future. Such expectations about the future are usually made in a rational manner. The economic agent uses all the available information to come up with the best possible forecast. In this chapter, real business cycles and the rational expectation model are explained. Both models explain that economic fluctuations are caused entirely by real shocks such as crop failure, change in prices and global recessions that affect the economy negatively. The change in prices and output for markets are always in equilibrium.

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The fractionless neoclassical model of the labor market

The demand for and supply of labor depend 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 wages, firms want to hire more labor. The labor supply and demand intersect at point E. The upward sloping supply curve (NS) shows that more labor is supplied at the higher real wage. The firms are competitive and they are willing to pay a real wage equal to the value of the marginal product of labor. A firm's capital stock is fixed in the short run but in the long run a firm can increase its 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 more workers will have fewer machines with which to produce output. Thus, marginal productivity of labor declines in the short run. Hence, firms employ labor when the marginal productivity of labor is equal to the real wage. They employ more labor if the real wage is lower, thus, the demand curve for labor is downward sloping.

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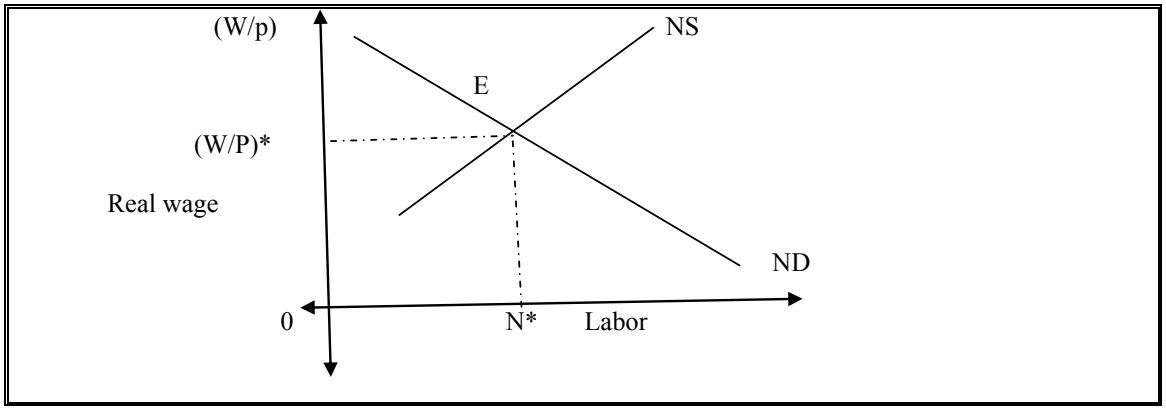

Figure 5.7 Equilibrium of the real wage and the labor market

The supply curve shows that laborers are ready to work more when there is a real wage rise. As the real wage rises, more workers enter the labor force seeking work. But the aggregate supply curve could be completely inelastic if the amount of labor supplied is 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, a full employment level is assumed. But output is also produced at Y* where all the existing factors of production are used. All the capital stock, land, raw materials are fully used with labor stock N*. In figure 5.8, the output and price level are shown.

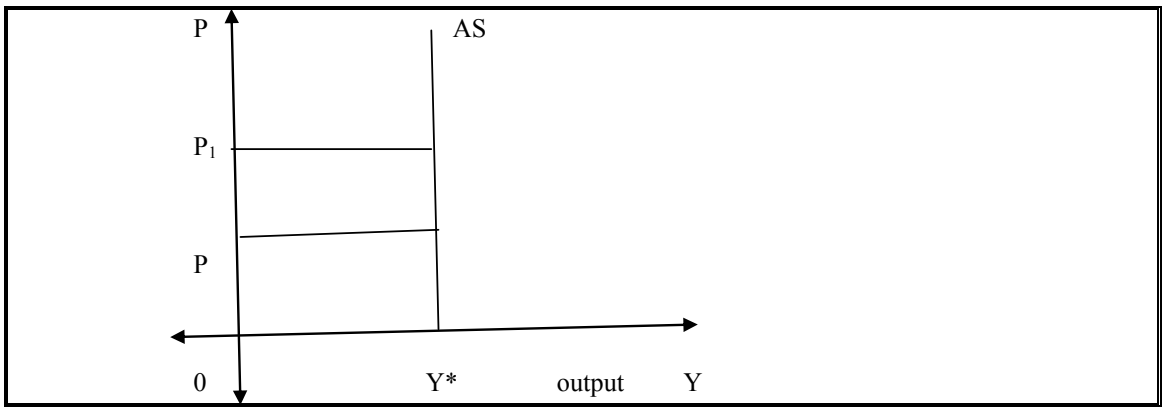

Figure 5.8 Output and price levels in an economy

There is an initial equilibrium of price level and wage in the economy. But as the price level changes from P to P_1 , the wage rate also changes. It changes in proportion to price. The real wage and output remain unchanged. Therefore, the aggregate supply curve is a vertical line.

In the fractionless neoclassical model, the aggregate supply curve explains that unemployment is always at the natural rate, output always at the full employment level and any unemployment is purely fractional. Thus, a change in the money stock changes the price level, and leaves output and employment unchanged. The money wages rise but the real wages remain the same. The demand for and supply of labor do not change in the model.

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5.4.1 The market clearing approach: The Lucas supply curve

The great economist Robert Lucas was the author of the theory of rational expectation. He explains that markets are clear and 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 will buy and sell commodities. Workers do not know the real wage. They only know the price level. Therefore, they divide the price level by the real wage, which clearly gives them the amount of money to buy the goods from their wages. At the given real wage rate, w/p *, the firm does not know how much work is to be done. But both workers and firm expect the price level to change, that is P^e. Figure 5.9 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 have not informed them. When the price exceeds the expected price level, i.e., $P > P^e$, then firms demand more labor. This is because the actual price level is P and the nominal wage is W_0. The real wage is (W_0/P). It is lower than the nominal wage W_0. The real wage is W_0/P, and is lower than the same nominal wage P^e. That is $P > P^e$, $(W_0/P<W_0/P^e)$.

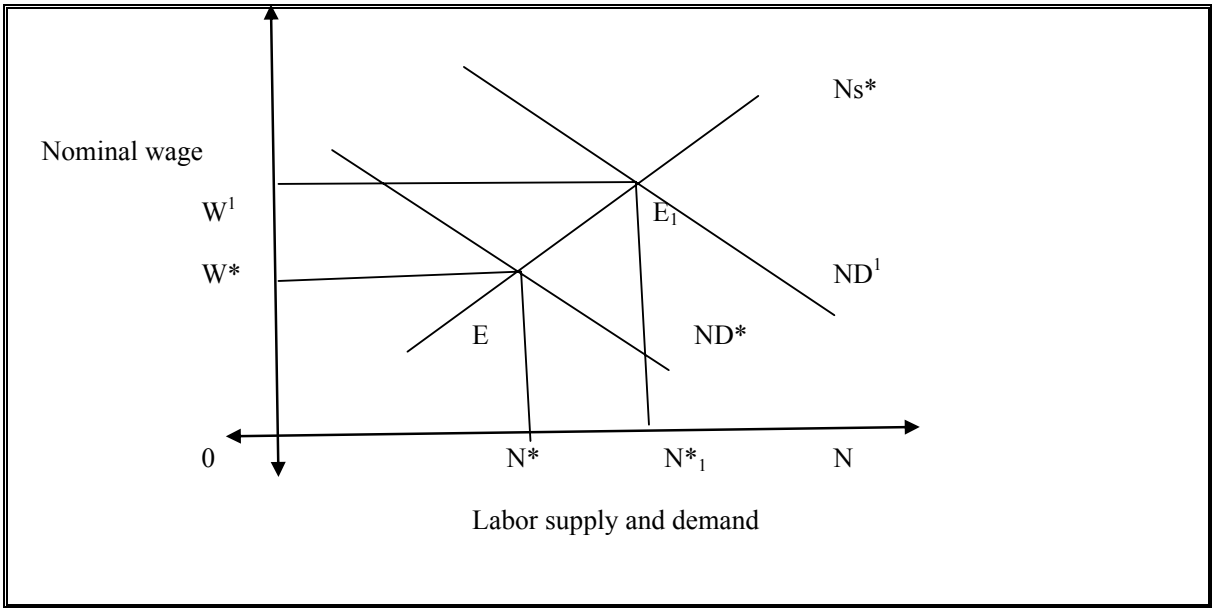

Figure 5.9 The nominal wage and the supply of and demand for labor

Figure 5.9 speculates that firms know the price level which is greater than actual price level $P>P^e$. Therefore, labor demand shifts to ND^1. The nominal wage rises from N to $N^*_{1,}$ as shown in the figure.

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Consequently, when workers have imperfect information, a rise in the price level leads to an increase in the level of employment and ultimately, output. Now we can show exactly the inverse of the above condition. The firm predicts that the actual price level will go below the expected price level. In this case, the employed workers' demand curve shifts to the left from ND^1 to ND^*. Employment and output falls. It is possible that different information is available to firms and workers. Workers are careful about the real wage. If the real wage is higher than the price level, output will not increase. This means that the demand for production in a given market is affected by an increase in the aggregate demand or in the aggregate price level.

5.4.2 The Lucas supply curve

The following adjustments are given in price, 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

Table 5.1 Adjustments of prices, output and wages

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If the demand for a firm's products increases, then workers demand of their services also increases. Therefore, the employment demand curve shifts.

The Lucas supply curve 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 at which firms are willing to supply increases as the ratio of the actual to the expected price level increases. This is P/P_e.

The table shows that if the predicted price level is too high, then the actual price level will be 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.

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

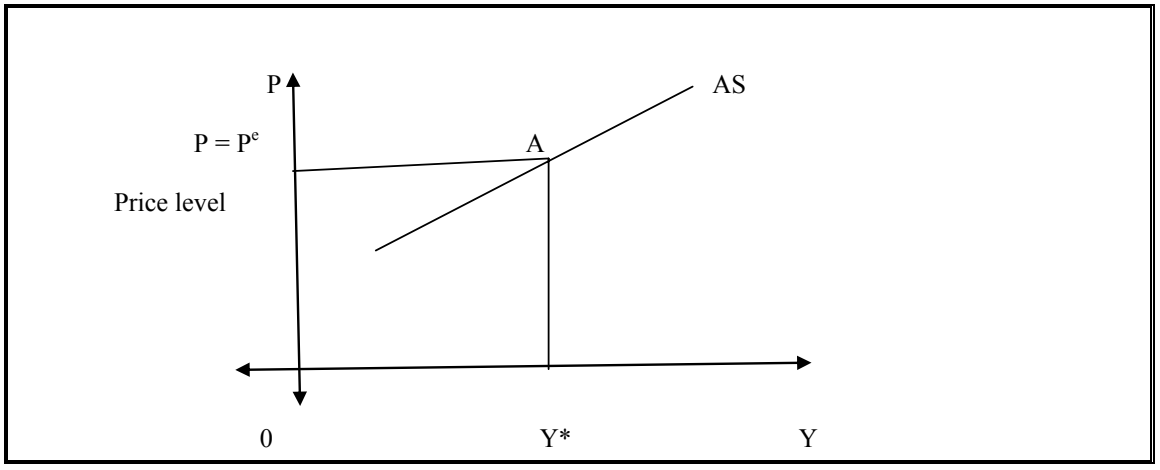

Figure 5.10 Price level and income

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The Lucas model linked the aggregate supply and demand curves with people's rational expectations. People use all relevant information to form their expectations of economic variables. If we assume that people do not make errors, then P = P^e and the output is expected to be at the full employment level Y*. The price level must be in equilibrium where AD = AS. People expect full employment when Y = Y*. Therefore, the actual wage rate is equal to the real wage rate. We can assume that people do not make systematic errors.

People also predict the money stock. It is assumed to be M^e. The predicted price level is P^e. So,

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

Now we look at the different possibilities with an increase in the money supply and changes in the aggregate demand and supply curves.

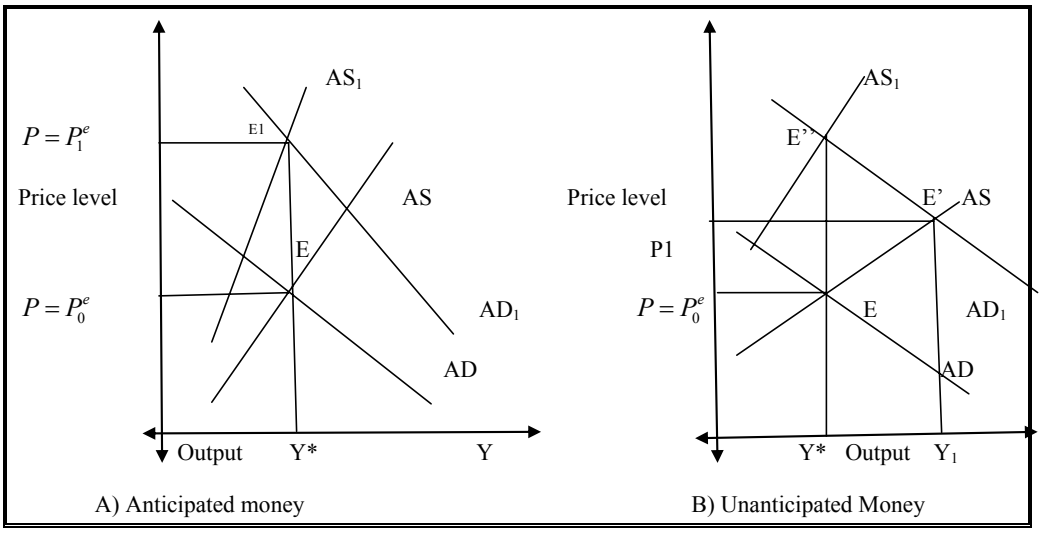

Figure 5.11 Price level and anticipated, unanticipated money

Diagram "A" in figure 5.11 shows that the price level and expected price is at equilibrium E. Suppose there is a change in the money supply, the aggregate demand curve then shifts upwards. But P_e increases in the same proportion as the rise in the money stock. Output remains unchanged. At the new equilibrium point E_1, the price level *P* is equal to expected price level, $P = P_1^e$. The workers and firms know that the money stock and the aggregate demand are going to increase in proportion to $P_1^e = P_0^e$. The nominal wage increase and the real wage remain the same. As we have observed in the classical case, there is a nominal effect on wages and prices.

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Diagram "B" explains that a change in the money stock causes the aggregate demand curve to shift to AD_1. At this new equilibrium point, workers do not expect a rise in the price level. So, the aggregate supply curve does not shift upward. The new equilibrium is achieved at E'. Hence, the actual prices increase $P > P_0^e$ is above expected price level. The outcome increases from Y* to Y_1. But considering the rational expectation hypothesis, point E does not remain vast and the prices are above expectations. Instead there is a rise in output. As a result, the firms, households, workers revise their expectations or forecasts. They revise their price expectations of P_1^e. Thus, the AS curve shifts to AS_1. The effect on the money supply does not remain forever. It is soon reflected in prices. The change in the money supply is used as a 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

The Lucas model is similar to the classical model. It assumes that fiscal and monetary policies are ineffective. In the long run, income, real prices and wages remain unchanged. The economy remains at its full employment level. The government announces the new statistics where market clears and full employment can be achieved. There is no need for either fiscal or monetary policies in a full employment economy. This approach is confusing to an economic agent. Sometimes, agents can only follow the government and its policy makers.

5.5 The new Keynesian alternative

The new Keynesian macroeconomics explains the approach to counter the Lucas curve. Such approach also has its start from the labor market and the frictionless neoclassical model. Firms set the wages which achieve equilibrium in the labor market and in the frictionless neoclassical model. The model assumes that the wages of workers are fixed by contract at the beginning of a period. The prices of goods may change within each period.

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

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

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

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

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At the wage set by a firm, the workers produce for the market. Therefore a firm will want to produce more compared to the real wage. Thus, in the short run, the aggregate supply curve is:

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

when Wn is substituted in the above equation, we get

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

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

5.6 The Ricardian Equivalence (RE)

The government expenditures are financed by raising tax revenues. An increase in government expenditures increases the consumption expenditures. This is $C_1\Delta Y$. The consumption expenditures may decline as taxes increase, which further reduces the disposable income of people.

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If the government expenditures are 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 to the right when there is a large bond financing rather than tax financing. Bond financing does not reduce the disposable income. A tax reduces the disposable incomes of people and lowers the aggregate expenditures. The Ricardian equivalence is named after the classical economist David Ricardo (1772–1823). He argued that the impact on real income is the same whether government expenditures are tax financed or bond financed. Whichever financing a government uses to finance its expenditures, the IS curve shifts to the left. Due to the high expenditures, the government issues bonds, and pays interest on these bonds, in the future. Therefore, the government substitutes the current tax that it could have imposed today to finance its expenditures with future tax. Individuals are self-motivated and attempt to maximize their profits. They save more and try to minimize paying taxes. Their savings will be used up to pay the rise in taxes. Therefore, individuals will save money which is equivalent to the increase in future taxes.

The Ricardian Equivalence (RE) is based on two assumptions:

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

When a government finances its expenditures by selling bonds, households recognize this as a balanced budget. There will be more taxes in the future, to allow the government to pay back the borrowing on the bonds sold today. Therefore, the present burden of taxes is current taxes plus the present value of taxes in the future. This is required to pay the interest on current bond sales.

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

If ΔB is the number of bonds sold to finance the increased government expenditures then the nominal value of bonds is:

$$\text{Value of bonds} = P_B\Delta B = \frac{\Delta B}{i} \tag{5.23}$$

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

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The government pays interest on bonds at certain periods. To be able to pay the interest, the government will have to raise taxes. Therefore,

$$\begin{aligned}\text{Pv (future taxes)} &= \text{PV (interest payment)} \\ &= \frac{\Delta B}{(1+i)} + \frac{\Delta B}{(1+i)^2} \\ &= \frac{\Delta B}{i}\end{aligned} \tag{5.24}$$

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

$$T_{RE} = T\frac{\Delta B}{ip} \tag{5.25}$$

Current expenditures are financed by current taxes and the real value of debt issued to finance current expenditures is 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:

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

The right hand side is the current period tax burden experienced by people. It can be further stated as:

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

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

The goods market equilibrium is given as:

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

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This leads to two propositions:

1) Increases in expenditures are financed by the government through levying taxes or issuing bonds

   Therefore,

$$\frac{\Delta Y}{\Delta G} = \frac{1 - C_1}{1 - C_1} = 1$$
$$\Delta Y = \Delta G \tag{5.30}$$

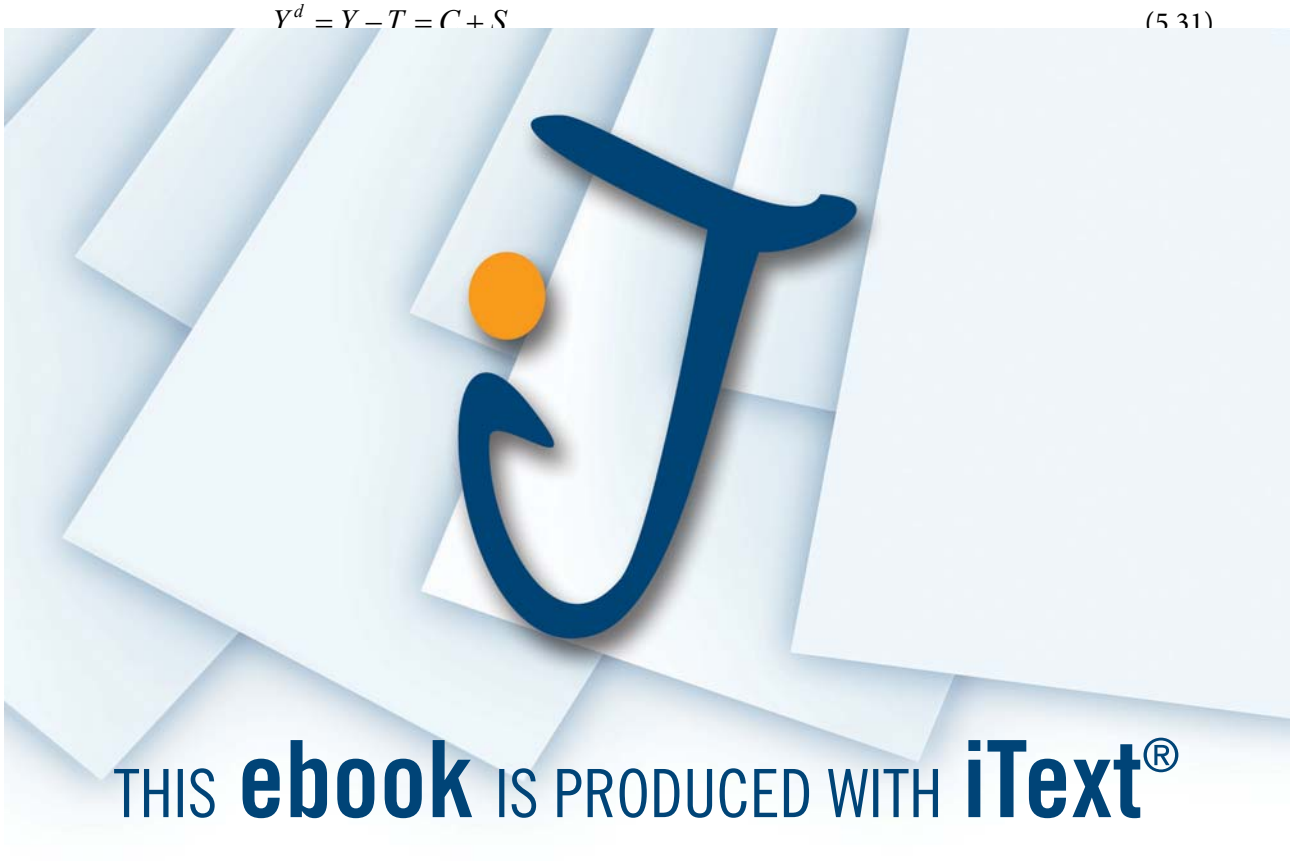
   The IS curve considering the RE effect will shift the same distance irrespective whether the government expenditures were financed with taxes or bonds. This is because bond sales impose the same burden on individuals as the taxes that would have been imposed in their place.

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

   The bond sales in the present have an effect on future taxes. Taxes will have to be levied to pay back the interest on the bonds. The present value of higher taxes is equal to the present tax cut.

   The disposable income can again be defined as:

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



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Considering RE,
$$C = C(Y - G, i - \Pi^e)$$
$$S = Y - C(Y - G, i - \Pi^e) - T \quad (5.32)$$

G is unchanged when current taxes are substituted by debt.

$$\Delta S = -\Delta T$$

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

5.6.1 Criticisms

1. The Ricardian Equivalence (RE) gives people more freedom to look ahead in the future. People are short sighted. There is no fixed time and future time is not yet given. Most households struggle to satisfy their minimum credit needs.
2. The Ricardian Equivalence is true to a certain extent. Consumers may make cuts on their high consumption. They reduce it with available credit.
3. In India, the financial system is underdeveloped. People do not know much about bond financing.
4. Though individuals may not have perfect insight, they are forward looking as any policymaker who is smart realizes. Individuals anticipate policies, figure out if they are credible and take offsetting action if necessary.

5.7 The search and matching model

Around the world, jobs and employment skills are always changing. Global production methods decide the types of production used in a country. 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 a changing world. Wages and employment respond with shock, often resulting in the loss of jobs.

5.7.1 The model

The employed workers in the economy are defined as E and the 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,

$$E + U = \bar{L} \quad (5.33)$$

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There is a fixed cost c per unit time. C can be thought of as reflecting the cost of capital. Workers producing output at rate A per unit time are paid a wage w per unit time. Therefore A > C, w is determined exogenously. Suppose the costs of efforts and job searching 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 a 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 are assumed to yield a flow of new jobs at the same rate per unit time.

$$\begin{aligned} &M = M(U,V) \\ &= KU^{\beta}V^{r} \quad 0 \le \beta \le 1 \quad 0 \le r \le 1 \end{aligned} \tag{5.34}$$

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

The dynamics of the number of employed workers is given by $E = M(UV) - bE$. The steady state must focus on *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 as w per unit time minus the probability b per unit time of a capital loss of VE-VU.

Thus,

$$rV_E = w - b$$

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The r is the interest rate, therefore,

$$\begin{aligned} rV_F &= (A - w - c(V_F - V_V) \\ rV_u &= a(V_E - V_U) \\ rV_U &= -c + \alpha(V_F - V_V) \end{aligned} \tag{5.36}$$

When an unemployed worker and a firm with a vacancy meet, they must choose a wage. It must be high enough for the worker to want to work for the firm. Both workers and firm cannot find a replacement. easily These requirements do not uniquely determine the wage. The range of wages determines who is better off when they meet. Both should set the wage as given:

$$V_E - V_U = V_F - V_V \tag{5.37}$$

Here, new vacancies can be created and the value of a 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. A 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 (V_V) at initial level V_V is zero, then the wage determination and value of vacancy a and α can be given as:

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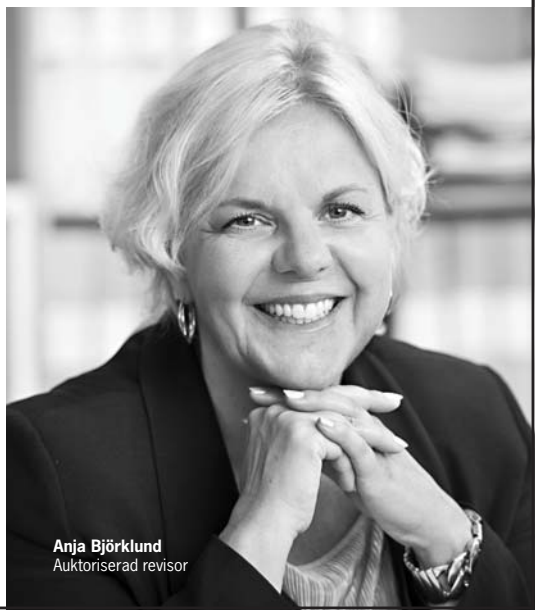

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$$V_E - V_U = \frac{w}{a+b+r} \tag{5.38}$$

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 employees and so more than half of the output goes to the workers. When α exceeds a, the reverse occurs.

The value of a vacancy is $rV_V = -C + \alpha(V_F - V_v)$. Therefore, V_F-V_V 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 expresses rVv in terms of C; A, rb, a and α. A and α are endogenous. The fact that a = M (U, V)/U and that M = bE and $E + U = \bar{Z}$ implies that

$$a = \frac{bE}{\bar{L} - E}$$

Similarly

$$\alpha = \frac{M(U,V)}{V} \tag{5.43}$$

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We need to express M (U, V) and V in terms of E. In steady state, M (U, V) equals bE. It implies that

$$bE = kU^{\beta}V^{r}$$

$$V = \left(\begin{matrix} \text{or} \\ \dfrac{bE}{kU^{\beta}} \\ \end{matrix} \right)^{1+r}$$

$$= \left(\frac{bE}{k(L-E)^{\beta}} \right)^{1+r} \tag{5.44}$$

Substituting this expression into the above equation while M (UV) equals bE

$$\alpha = \frac{bE}{\left(\dfrac{bE}{k(\bar{L}-E)^{\beta}} \right)^{1/\gamma}}$$

$$= K^{1/\gamma}(bE)^{(r-1)/r}(\bar{L}-E)^{\beta/r} \tag{5.45}$$

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 Cc. 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 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.

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Impact of a shift in labor demand

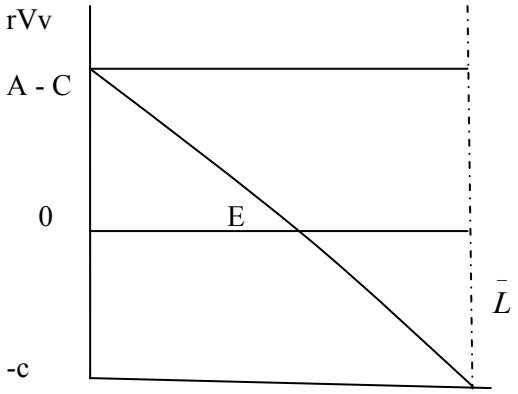

Figure 5.12 Labor demand in an economy

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.

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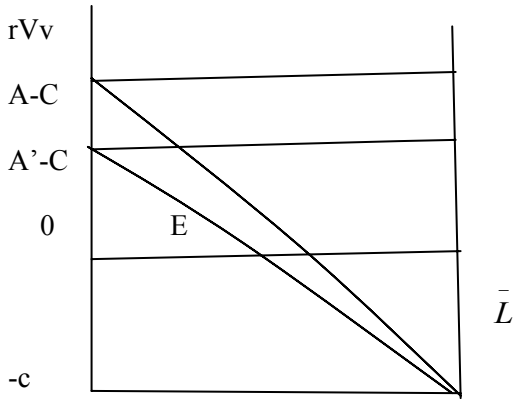

Figure 5.13 Equilibrium of employment in the search and matching model

Figure 5.13 shows that equilibrium falls. In a Walrasian market, in contrast, employment changes at $\bar{L}$ instinctively. In the absence of a frictionless market, workers are not available at less cost than 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, both the number of firms and employment fall.

Effects of a fall in labor demand in the search and matching model.

In the above equation *M (V, U)* equals *bE* in steady state. This 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 the number of vacancies. The model therefore implies a negative relationship 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 easily as before and firms can fill positions more rapidly. The reduced attractiveness of hiring, in contrast, causes V_v to fall. This could take the form of some firms with job openings ceasing their attempts to fill them. Employment and unemployment remain the same but there are fewer vacancies. The flows into unemployment exceed the outflows and so unemployment rises. The fall in A leads only to a gradual rise in unemployment. After a time, unemployment rises. The value of a 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 so that there is overshooting. A temporary change in A leads to smaller employment responses. The value of filling a job is clearly higher when A is temporarily low than when it is permanently low. Thus, there is a smaller decline 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 returns to its initial value. Thus, labor market frictions create channels that make the effects of a shock more persistent. In the extreme case of an infinitesimally brief decline, AVv and Vu are unaffected. In such a case, firms and workers simply share the loss equally by reducing the wage by half the amount that A falls. There is no impact on employment or unemployment.

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5.7.3 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 Walras, the labor market adjusts immediately to a change in A. But with frictions, both permanent and temporary changes trigger complicated adjustment processes for vacancies, unemployment and wages.

5.8 Implicit contracts

Sometimes there are long-term relationships between firms and workers. Firms do not hire new workers each time. This is mainly because training a new employee costs any firm a lot of money. Also, the old employees are often more efficient than new ones. Some workers are skilled for particular jobs. They cannot leave the firm or the firm cannot afford to lose them. It is a long term arrangement. Such long term contracts do not require firms to set wages. The workers remain in the job for a long period to obtain a higher income. Some workers learn and get experience. It makes workers more competitive with workers at 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 a single period and that A is random. Workers decide whether to work for the firm or not. They consider the expected utility they can obtain in a single period. Their hours and incomes vary in response to fluctuations in A.

If A is distributed directly, then the k possible values of A as indexed by I, Pi denotes the probability that A=Ai. Therefore, a firm's profits can be defined as:

$$E(\Pi) = \sum_{i=1}^{k} Pi(AiF(Li) - WiLi) \tag{5.48}$$

where Li = quantity of labor
Wi = real wage

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We consider A = Ai and the firm maximizes profit and risk is natural. Each worker is assumed to work the same amount. The representative worker's utility is:

$$U = U(c.)-V(L) \tag{5.49}$$

where U = given utility from consumption
V = disutility from working

Utility is negative and workers are risk averse. The workers' consumption is assumed to equal their labor income, wL. Workers do not have insurance against unemployment and wage fluctuations. Some workers have information on the wages paid at rival firms.

A worker's expected utility from their 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 be willing to work for the firm. There is no mobility if there is a contract between workers and the firm. At the time of contract, only the average level of utility is offered. This is not what individuals expect.

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5.8.2 Wage contracts

A firm decides the contract with its workers. While under contract, the real wage and rigidity rise immediately. The fall in demand for labor causes firms to reduce employment at the fixed real wage while labor supply does not shift and there is unemployment. The cost of labor does not change because by assumption, the real wage is fixed. But it is not practical. Wages are fixed and firms choose employment.. The marginal productivity of labor is fixed. The rate of employment varies with A and the marginal disutility of workers depends on A. The marginal product of labor is not equal to the marginal disutility of work. In contrast, both parties should be better off. If the disutility of work is less, workers can work more and both workers and firms may prosper.

5.8.3 Efficient contracts

The implicit contract means the actual contract does not explicitly specify employment and the wage is determined by the state. The firms and workers draw up a contract d specifying the wage and hours for each possible realization of A.

The assumptions are that firms offer a worker at least the minimum level of expected utility u_0, but are otherwise constrained. Li and Wi determine Ci. We think of the firm's choices as variable as L and C in each state rather than as L and W. The Lagrangian of the firm's problem is therefore:

$$\ell = \sum_{i=1}^{k} Pi(AiF(Li) - Ci) + \lambda(\{\sum_{i=1}^{k} P_i[U(C_i) - V(L_i)]\} - u_0)$$

The first order condition for Ci is $-Pi + \lambda PiU'(C_i) = 0$ or $U'(C_{i)} = \frac{1}{\lambda}$ (5.51)

The above equation implies that the marginal utility of consumption is constant across states and thus that consumption is constant across states. Thus, the risk-neutral firm fully insures the risk adverse workers.

The first order condition for Li is $P'AiF'(Li) = \lambda PiV'(Li)$ (5.52)

The above equation implies that

$\lambda = \frac{1}{U'}(C)$ where C is the constant level of consumption.

Substituting this into the above equation and dividing both sides by Pi yields

$$AiF'(Li) = \frac{V'(Li)}{U'(C)} \quad (5.53)$$

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5.9 The insider–outsider model

This approach explains that various types of labor turnover costs create market power for incumbent workers in existing firms. They are called the insiders. Insiders are allowed 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 costs. Outsiders are taken to be unemployed. All firms from garments manufacturers to automobile assemblers have experienced this.

A firm has costs of hiring and firing labor. The hiring costs include the costs of searching, screening, negotiating with and training newly hired workers. The firing costs include costly firing procedures and the payment of severance pay that are often part of job security legislation. 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 wages then insider workers will not cooperate. This affects production and may cause a decline. Therefore, firms will generally not employ outsiders at low wages.

5.9.1 The model

In this model, there are two types of labor: N_I and N_E . N_I is insider labor and N_E is outsider labor. N_I + N_E is the total workforce of a firm. The demand for insider and outsider labor is downward sloping. For insider labor, the demand curve for labor is the sum of the marginal product of labor $MP_N = F'$ plus the marginal cost of firing that labor MC_F. The demand curve for the insider worker is the marginal product cost minus the marginal cost of hiring workers.

$$IDC = F' + MC_F \tag{5.54}$$

$$EDC = F' - MC_H \tag{5.56}$$

If there is no labor turnover cost, then $MC_H = MC_H = 0$ and the traditional demand curve for labor would be given by F. If we assume that $W_E = R$, then the wages of insiders are equal to their reservation wage.

Insiders get higher wages because of the insiders' wages and the sum of the marginal cost of hiring and firing labor, $W_E + MC_H + MC_F$.

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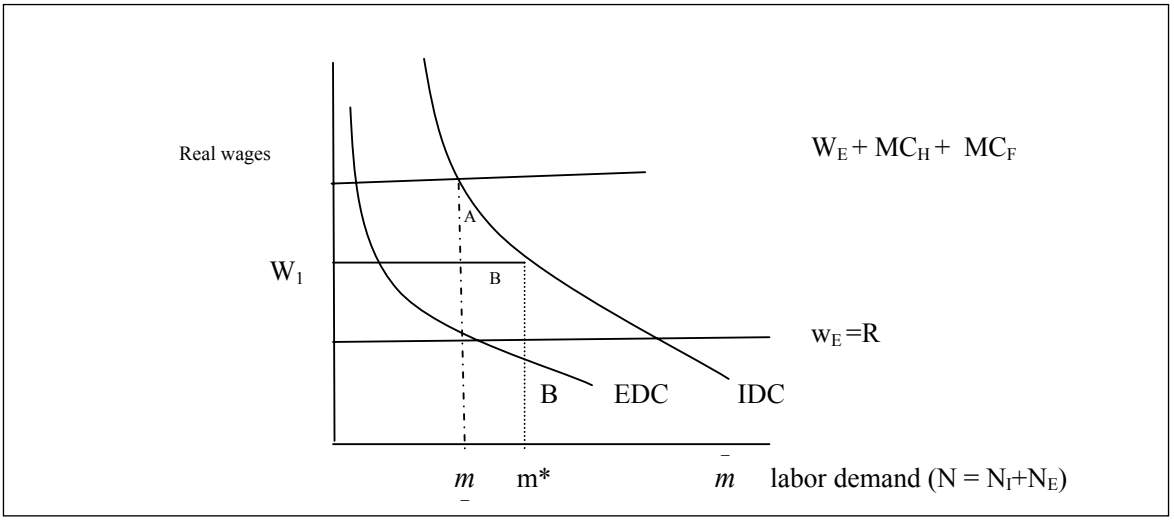

Figure 5.14 The real wage, insider and outsider equilibrium

Figure 5.14 shows that M* is the insiders' demand. The wage earned by them is W_1. At this point, no outsiders are employed. At point B, the marginal productivity after deducting for labor turnover costs is below the entrant wage W_E.

There are unemployed workers between $\underline{m}$ and $\bar{m}$. A hiring situation will occur when insiders in the firm are fewer than $\underline{m}$. The firm will hire more outsiders and fire insiders. When insiders are greater than $\bar{m}$, the insiders will be fired even when they accept wages equivalent to the wages outsiders get. This is because their productivity is low and it is below W_E. But when outsiders are more productive, it is inversely related. We can see this at the aggregate level, where aggregate demand is N^D. It comprises N_I+N_E. At labor demand m*, there is an aggregate labor demand.

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5.9.2 Criticism

The insider and outsider model fails to explain the new firm and their employment. A firm could hire unemployed workers. Doing so would lower the competitive wage. The IDC curve could shift back; sometimes firms have small operations at different locations, where not the same number of units are produced and there might be differences in size or quality. uch heterogeneous production skills will not affect firms much. The labor market is dynamic, sometimes it clears automatically. 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 regardless of whether primary versus secondary sectors are employed, whether workers are unionized or non-unionized and so on. The two policies, i.e., power reducing policies and enfranchising policies, create a more level playing field for both insiders and outsiders. An example of a power reducing policy is restricting strikes and picketing. Relaxing job security legislation can also be formulated. These policies are usually not Pareto improving since they tend to reduce the welfare of insiders. Insiders may therefore resist these policies either through the political process or rent-seeking activities at the workplace. 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 and profit sharing schemes. Schemes to convert wage claims into equity shares, or employment vouchers for the long-term unemployment policies to reduce barriers to the entry of new firms are also part of enfranchising policies (Lindbeck and Snower 2002).

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5.10 The real business cycle theory

The real business cycle theory poses that the fluctuations in employment and output in the economy are the result of a variety of real shocks. Markets adjust to shocks and they remain in equilibrium in the long run. The real business cycle is sometimes called boom and recession in the economy. From the Keynesian point of view, a government must intervene to smoothen business cycle fluctuations. But monetary economists believe that government must not interfere in the economy and let market forces act to reach equilibrium.

Nevertheless, there are three kinds of policies available to a government, should it decide to interfere in the economy, and these are: monetary, fiscal and exchange rate policy. All these policies affect private demand consumption and investment spending. The production side is also affected by the supply side, that is, natural resources, climate change and technological innovations. Demand shocks may arise because of a collapse in investor confidence due to domestic and international events, and result in a change in consumption spending, a change in government expenditures and a change in the money supply. Figure 5.15 shows that if there are demand shocks, then AD shifts to AD_1, resulting in a decline in price P_1 and a decline in output from Y_0 to Y_1 in panel C. Supply shocks are also observed. The AS curve shifts to AS_1. Panel D shows the shift of aggregate output towards the left where the new output is observed at Y_2.

The supply side shocks in the real business cycle are identified as the following:

1. Unfavorable natural events, such as earthquakes, drought, floods, etc., adversely affect output.
2. A significant increase or decrease in oil prices, which are highly volatile now.
3. War, political environment /instability, or labor disputes disturb production.
4. The government's import/export policies such as setting import quotas.
5. New techniques, innovations, increased capital and honing labor skills can improve the productivity of workers.

The supply side shocks tend to be temporary in nature. The demand side shocks stress productivity. These stem from technological progress and so are real rather than nominal shocks.

Economic agents act to maximize their utility subject to production possibilities and resource constraints. In any economy an agent has a fixed utility function, consumption and leisure. The business cycle affects these three.

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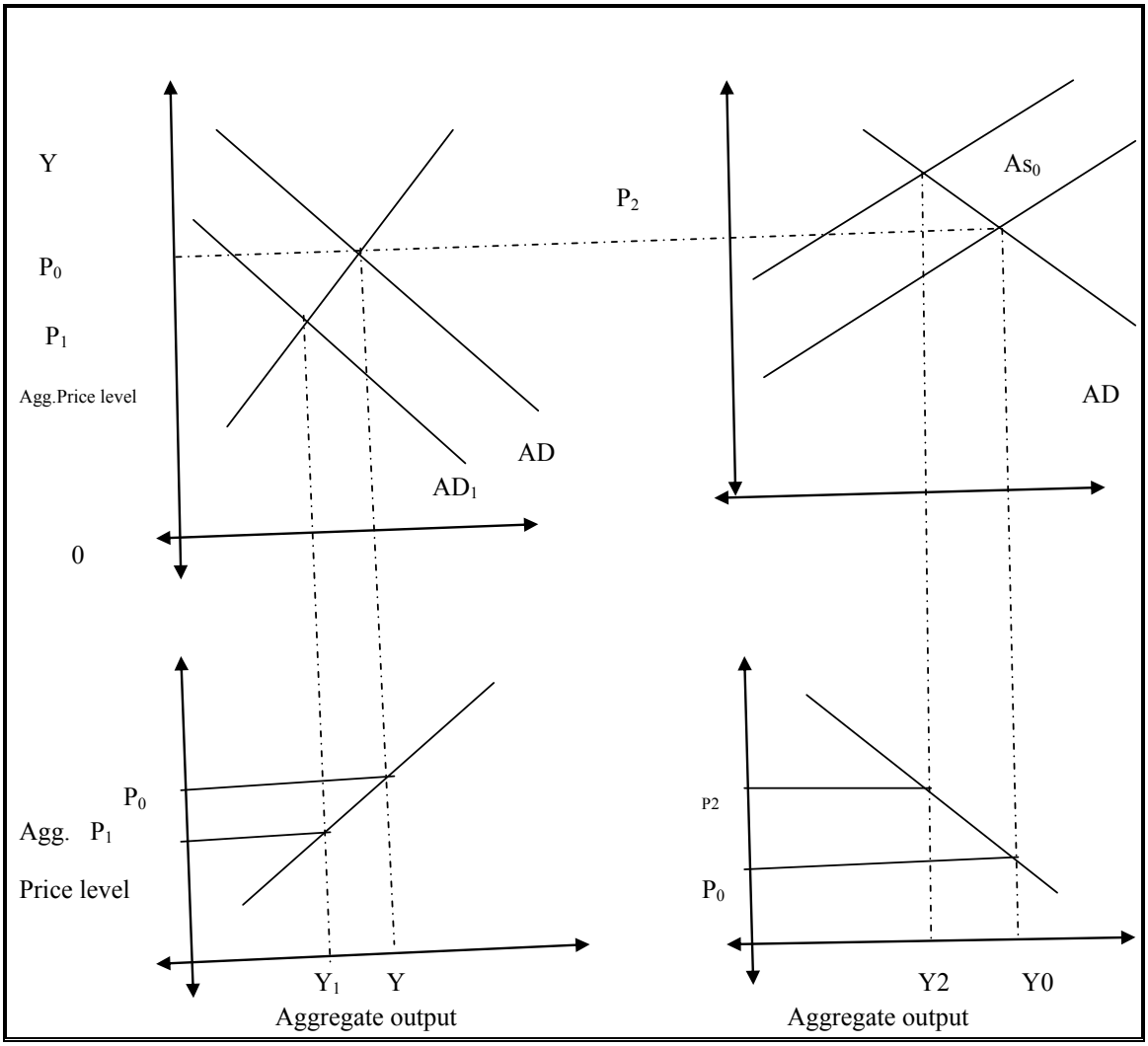

Figure 5.15 Effects of the real business cycle on prices, employment and output

$$U = U(c, H - N_1 + \frac{U(c_{2H-N_2}}{1+P}$$

$$= \log C_1 + \beta \log(H - N_1) + \frac{\log C_2}{1+P} + \frac{\beta \log(H - N_1)}{1+P} \tag{5.57}$$

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 the intertemporal discount rate.

Each agent is rational and supplies labor in the economy.

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Production is a function of capital and labor.

$$Y_t = F(K_{t,} N_t) = A_t K'_t - \alpha N_t^{\alpha} \tag{5.58}$$

The capital stock 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, investments and capital stock decide the present. We must subtract consumption from the above equation. Investment is income minus consumption

$$K_{t+1} = (1-\partial)K_t + Y_t - C_t \tag{5.60}$$

Consumption (C) depends on the propensity to save from income; in the above equation, we substitute $C = (1 - S)Y_t$ and get

$$K_{t+1} = (1-\partial)K_t - sY_t \tag{5.61}$$

A 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 both sides of the equation by 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 their leisure in period 2, then

$$I_2 = \frac{1 + rW_1H + W_2H - (1+r)Y_{lifetime}}{W_2} \tag{5.65}$$

If the agent do not enjoy their leisure in period 2, then

$$I_1 = \frac{1 + rW_1H + W_2H - (1+r)Y_{lifetime}}{(1+r)W_2} = \frac{\psi}{(1+r)W_1} \tag{5.66}$$

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Both points are presented in the following figure as

$$\text{Slope of budget line} = \frac{OA}{OB} = \frac{\psi / W_2}{\psi / (1+r)W_1} = \frac{(1+r)W_1}{W_2} \tag{5.67}$$

Figure 5.16 shows that the preference of an individual in two periods. This individual enjoys leisure OD_1 and spends $N_1 = DB_1$ hours in work in period 1. Suppose, in the first period, wage W_1 increases. The slope of budget line was OA. Now it becomes AB_1. There is a substitution and income effect. Current productivity and income are both high. This encourages substitution of current to future work. The substitution effect determines that the current labor supply rises. $N_1^1 = D'B$. It is the 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 the 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 $W = MP_N$. The labor demand is given as

$$N^D = N^D(MP_N) \tag{5.69}$$

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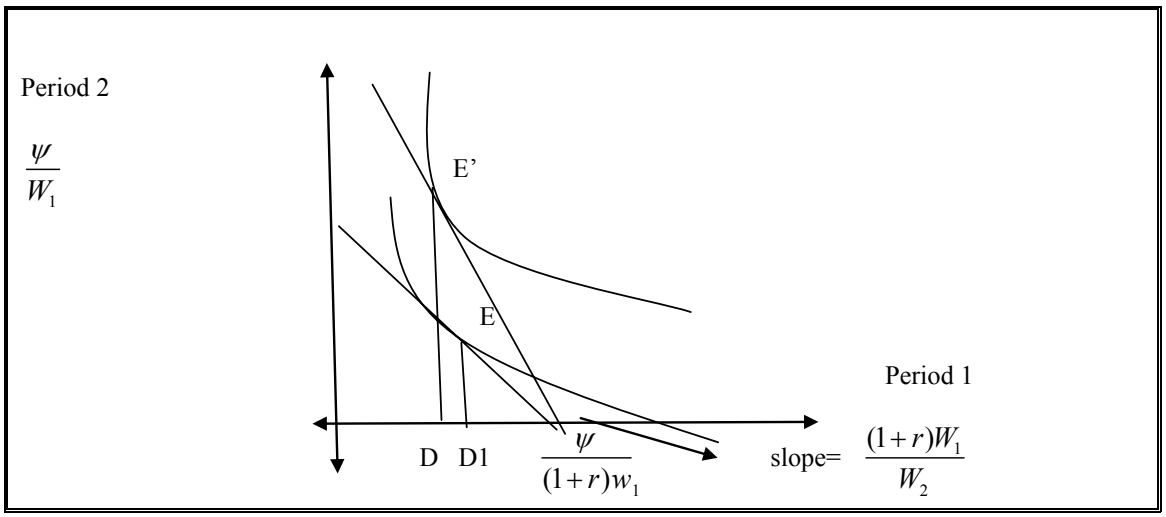

Figure 5.16 Labor demand and supply in two periods

Figure 5.16 shows the labor demand and supply in two periods. The first part of the figure shows the production function. More sophisticated and modern technology will result in more output produced with the same input. As labor productivity increases, the labor demand curve shifts towards $N^D(MP_N^*)$. The individual supplies more labor and total employment rises to N_1^1 output. Income increases from Y_1 to. With rising income, people save more, and the interest rate goes down. This shifts the labor supply curve to the left. A decline in the interest rate increases the present value of future income and makes the return from current labor supply unattractive. Both income and output increase to Y_1^* and real wage is defined as W_1^*.

Real wages are pro-cyclical with output. When the economy goes into a boom period in the real business cycle, leisure falls and labor supply increases. Consumption rises because output and income rise. During the boom period, leisure and consumption show an inverse relationship. Both goods are normal goods. In the real business cycle, these two are expected to move together. The real wage increases in a boom period. There are high returns to working. Hence, economic agents work more and reduce their leisure. In a boom period, the production technology is relatively favorable resulting in high wages and marginal product of labor. Technology shocks are of sufficient magnitude to explain the 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).

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5.10.1 Criticism

The real business cycle theory explains that an individual reallocates their leisure and labor over time. He reduces the hours he works when the real wage declines. If an individual were to get more real wages today then he will work more hours today. There is no study which finds that an individual responds to the expected real wage changes by considerably reallocating leisure over time. Most of the time, unemployment is voluntary unemployment and we can overcome this by optimizing behavior. There is no relation between any corrective policy or government intervention and unemployment. Sometimes, information asymmetries exist. In reality, shocks affect an economy differently but they are nominal in nature. The real shock is the result of optimum output for an economy. There is no single useful stabilization policy. There is an automatic correction over time. The real business cycle theory does not need to rely on technology shocks to explain economic fluctuations. In an indeterminate real business cycle model with capacity utilization and mild increasing returns to scale, demand shocks can play a pivotal role in explaining actual economic fluctuations (Benhabib and Wen 2003).

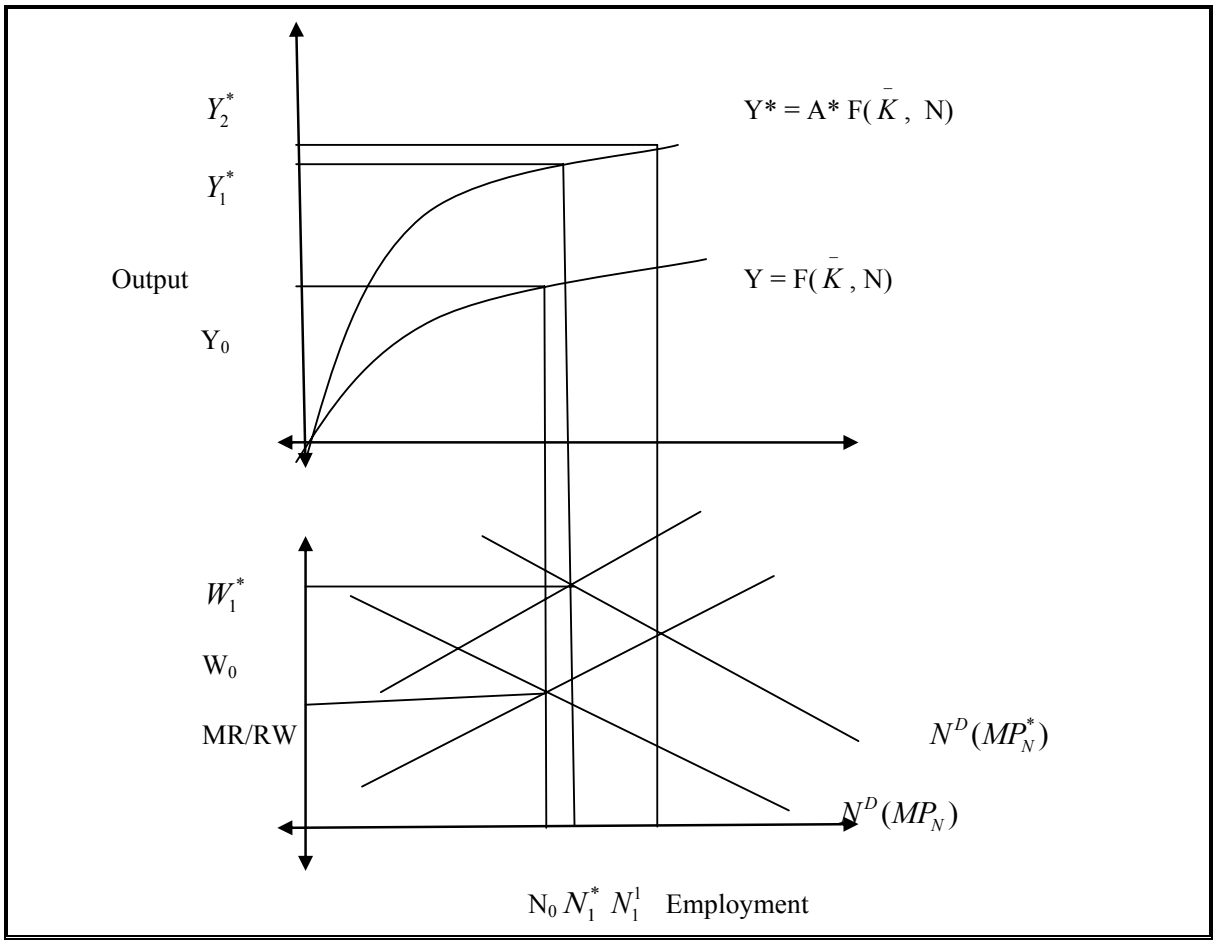

Figure 5.17 The production function and adjustments in employment and wages

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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 are related to interest rate. Explain.
6. Examine the primary deficit and its stability.
7. What is the 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 are implicit contracts criticized by policy makers?

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Appendix

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

Table 5.2 Debt indicators of the central and state governments
Source: RBI statistics

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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

Table 5.3 Fiscal indicators of the central government
Source: RBI statistics

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6 International adjustments: Policy implications

6.1 Government budget constraints

Every government has revenue receipts and capital expenditures. A government always tries to keep a balance between receipts and expenditures. Budget constraints were discussed in Chapter 5. But in a welfare state, a government's expenditures are always higher than income and therefore, a deficit occurs. A government can finance its deficit through two methods. First, it could sells bonds or print money. By printing money, there is an increase in high powered money. Through an open market operation, the government buys up a part of the debt by selling treasury bills.

$$BD = SB + \Delta Mb$$

where BD = budget deficit
SB = sales of bonds
Mb = increase in monetary base

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In the short run, a rise in the deficit may cause a rise in the interest rate because of the government's expansionary fiscal policy. But the goal is not to increase the interest rate. A government monetizes its deficit when it purchases a part of the debt sold by the treasury to finance the deficit. The government faces a dilemma whether to monetize the deficit or not. A fiscal expansion unaccompanied by supporting monetary policies raises the interest rate and thus crowds out private expenditures. The government buys securities, thereby increasing the money supply, and allowing an increase in income without raising the interest rate.

If there is full employment, then the monetization of debt could lead to inflation. Higher aggregate demand will lead to a rise in the real interest rate. Crowding out will occur and lead to high inflation. The government should supply money at a constant level and at the same time, allow the interest rate to gradually rise. At full employment, this 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 stay with an unchanged monetary target or even offset a fiscal expansion by a tightening of monetary policy. The government has to compare the costs of higher inflation with those of higher unemployment whenever an expansionary policy threatens to cause inflation. In India, inflation in non-fuel commodities is seen as a more important driver of domestic inflation than fuel.

The exchange rate passing through a co-efficient is found to be modest, but nonetheless, a 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 a 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 of inflation is likely to be harmful to growth. In other words, the relationship between inflation and output growth is nonlinear (Mohanty et.al. 2011).

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6.1.1 The inflation tax

The government prints money and increases the supply of high powered money. This source of revenue is sometimes known as seigniorage which is the government's ability to raise revenue through its right to create money. When a government finances its deficit by creating money, then money can be printed period after period. This money is used to pay for the goods and services the government buys. This money is absorbed by the people. In the long run, prices rise then the purchasing power of a given stock of nominal balances falls. To maintain a constant real value of money balance, the people have to add to their stock of nominal balances at a rate that will exactly offset the effects of inflation. When the people do so, they simultaneously use a part of their income to increase their holding of nominal money. People do this to prevent their wealth from declining as a result of inflation. Inflation acts just like a tax because people are forced to spend less of their income to be able to pay the difference to the government in exchange for the extra money. Therefore, a government can thus spend more in an economy while the public spends less. The government has the resources to finance extra spending. When a government finances its deficit by issuing money, the public adds to its holding of nominal balances to keep the real value of money balances constant. It means the government is financing the deficit through the inflation tax.

If 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 by allowing for a higher, optimal, inflation volatility-indexed bond that can protect investors from inflation risk (Blanchard et.al. 2003).

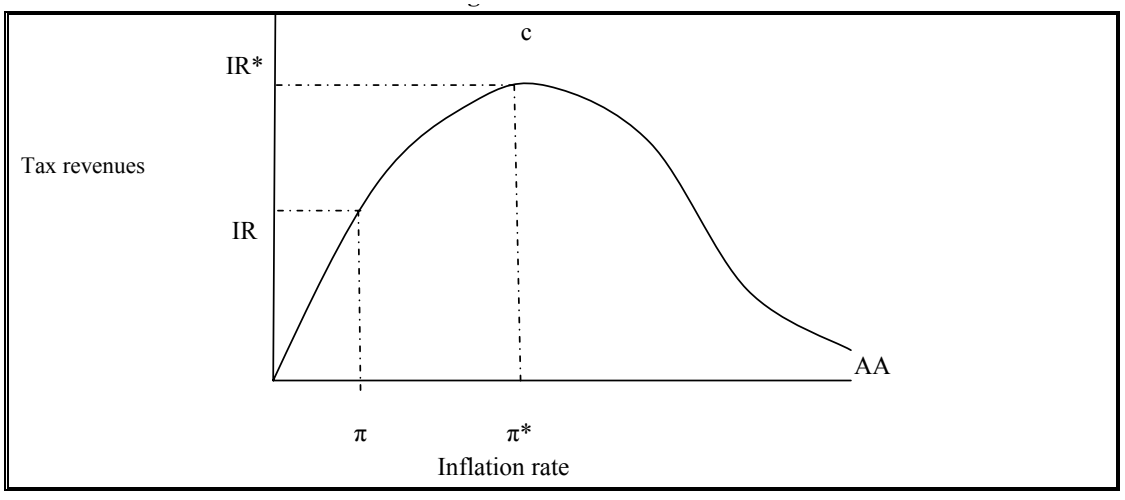

Figure 6.1 Inflation and tax revenues

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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 few excess reserves as possible. The real monetary base falls so much that the total amount of inflation tax revenues received by the government falls. At the starting point c this signifies that there is a maximum amount of revenue that the government can raise through the inflation tax. The maximum is shown as IR*. The inflation rate, denoted as π^*, is the steady state inflation rate at which the inflation tax is at its maximum. At this initial point, there is no inflation and no printing of money. But in the long run, the government cuts taxes and finances the deficit by printing money. The deficit is at IR' and inflation in the economy is π'. But at the second point, the government wishes to increase revenues. The economy is on the rising part of the curve. The government deficit is also at the high (IR*) rate. In less developed countries, the banking sector is also less developed. People hold maximum cash balances. The government gets its revenue from inflation.

6.2 Hyperinflation

In hyperinflation, the annual inflation rate reaches a thousand percent per annum. When inflation becomes this high it knocks through monthly statistics. In hyperinflation, people spend a significant amount of resources to minimize 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, daily, rather than weekly.

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6.2.1 The deficit and hyperinflation

Economies suffer from a deficit during hyperinflation. In times of war, hyperinflation is generated and this increases the debt and reduces the tax generating capacity of the country. But a large deficit forces a government to print money to finance the deficit.

Tax collection system

As 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 deficit further increases. In short, high nominal rates are not necessarily high real rates of interest. If inflation gets reduced, then the deficit will decline, lowering interest rates.

$$IAD = TD - (IT*ND)$$

where IAD = inflation-adjusted deficit
TD = total deficit
IT = inflation tax
ND = national debt

The 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 the actual deficit.

6.2.3 The inflation tax and accelerating hyperinflation

Money growth is high during hyperinflation, leading to monetary financing of the deficit. If tax revenues are limited, then the government prints money. This happens more often than people realize. It further leads to a rise in inflation. But the government prints money and spends more to finance its expenditures. 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, an optimal monetary policy is associated with a long run inflation rate of around two percent (Ahrens and Snower 2012).

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Stopping hyperinflation

A government regularly reforms the direct and indirect taxes levied on the people. The exchange rate of the new money is pegged to foreign currency in order to provide an anchor for prices and expectations. But this is not enough. The monetary, fiscal and exchange rate policies are combined with income policies in this approach to stabilization. People expect less inflation, nominal interest rates decline and the demand for real balances rises. When the demand for real balances increases the government can print money without creating inflation. Thus, at the beginning of a successful stabilization program, there may be a bonus for the government, in that it can temporarily finance part of the deficit through the printing of money, without increasing inflation. But it certainly cannot do so for more than a year without causing inflation to rise.

6.2.4 The budget deficit and the public debt

The deficit is actual and structural. The structural deficit at full employment or the cyclically-adjusted deficit with high employment is the level at which the deficit would be if output were at its full employment level. The cyclical component of a deficit reflects the impact of recessions or booms on tax revenues and government outlays such as unemployment compensation. When the economy goes into a recession, the budget automatically worsens as government tax revenues fall and outlays increase. Conversely, in an economic boom, the budget automatically improves.

6.3 The Laffer curve

Arthur Laffer, a former professor of economics, proposed the Laffer curve. The Laffer curve relates tax revenues to the tax rate. The curve shows total tax revenues first increasing as the tax rises and then eventually decreasing. In the income tax category, if the tax rate is zero, the government tax revenues are certainly zero. Point A shows such a situation in the figure. Suppose the tax rate is 100 percent then government revenues are 100 percent. From point A to B, the government gets some income from tax. But beyond point C, at tax rates above 60 percent, any increase in the tax rate reduces total revenues, a cut in the tax rate increases the total tax revenues. At any point beyond C, a cut in the tax rate causes people to work so much more that the increased work efforts outweigh the reduced taxes on the amount they used to work. At a wage that is higher after tax, a worker has to work less to support the same standard of living. When the after tax wage rises, the response is to work less, but still earn more income and have more leisure.

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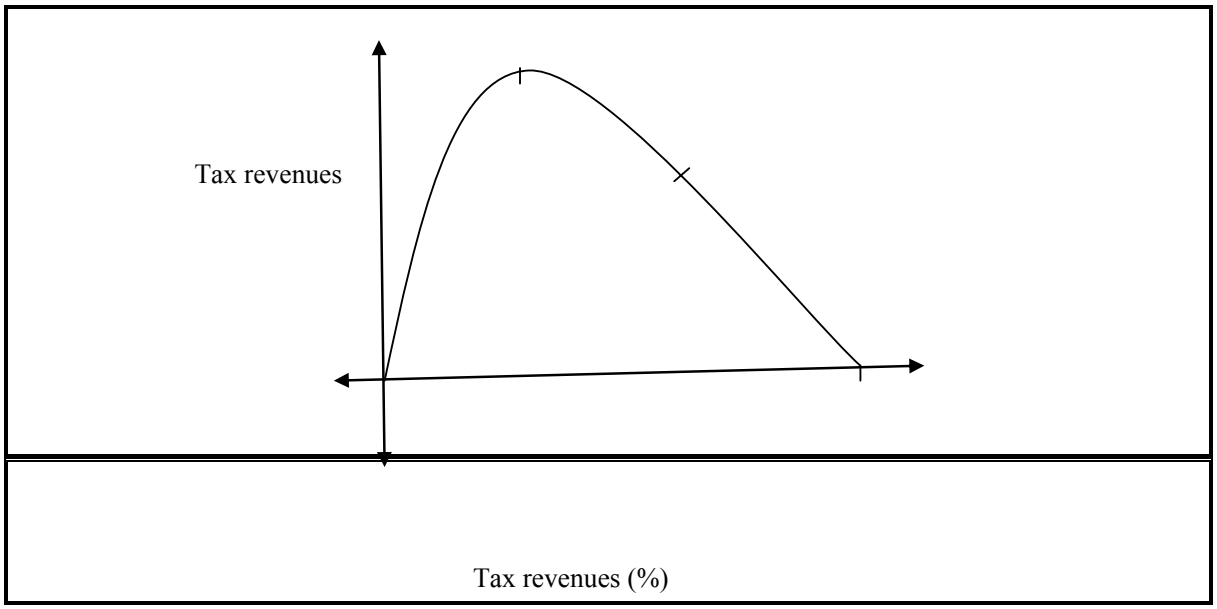

Figure 6.2 Tax rates and tax revenues

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6.4 Controlling the deficit

A large deficit impairs economic growth by reducing the national savings and capital formation. A deficit creates a vicious cycle of borrowing and higher debt service costs which in turn make it still more difficult to reduce the deficit. In India, the central as well as state governments have spent much on the various welfare programs. This has resulted in large deficits in their budgets. Such deficits continue to rise. The FRBM act was prepared to control such deficits. The central and state governments are supposed to follow the guidelines of the act and control their deficits.

6.4.1 The mechanism of deficit financing

A government is not much different from an individual. It requires enough of a balance in the bank to be able to withdraw money. If there is an insufficient balance, then the government has to borrow money, either from the public or from the central bank. When the treasury finances the deficit by borrowing from the public, it engages in debt financing.

The budget constraints can be explained as:

$$P^*BD = \Delta Bf + \Delta Bp + \Delta A$$

$$= \Delta H + \Delta Bp + \Delta A \quad (6.1)$$

The deficit is financed by the government borrowing either from the central bank (ΔBf) or from the private sector (ΔBp) or by selling assets ΔA. The change in the holdings of the central bank of treasury debts causes a corresponding change in high powered money (ΔH) so that the central bank monetizes the debt. When the government sells public land or public sector enterprises, the receipts from the sale can be used to finance the deficit or to retire public debt. This is a temporary solution. There is a limit to assets that can be sold.

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6.5 Debt management

The sale of treasury bills by the reserve bank occurs regularly in an economy. The 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 require the government to pay the face amount to the holder. The treasury options the funds to make those payments by further borrowing. The process by which the 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 issues as opposed to refinancing the large existing stock. When a government has more tax revenues, the government can retire debt. A government accomplishes this not by renewing maturing debt but rather by paying off bonds or treasury bills that are coming due. The public debt stock declines. If future government spending were known with certainty, then the optimal tax rate would be constant. Because future government spending is uncertain, the optimal tax rates set the present value of revenues equal to the present value of expected spending. As information about spending becomes available, the optimal tax rate changes. Viewed this way, the budget deficit is simply the difference between government spending and the amount of revenue generated by a certain tax rate and the debt will rise and fall accordingly over time (Elmendorf and Mankiw 1998).

6.6 The dynamics of the deficit and debts

The deficit is primary and there are no interest deficits 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 revenues. 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 the 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 relative to the size of the economy.

The debt-to-income ratio is defined as:

$$\text{Debt ratio} = \text{Debt}/PY$$

where PY is nominal GDP.

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The ratio of debt to GDP falls when the nominal GDP grows more rapidly than the debt. The debt grows because of the deficit. The denominator, the nominal GDP, grows as a result of both inflation and real GDP growth.

The debt-to-income ratio rises when

$$\Delta b = b(r-y) - z > 0 \qquad (6.2)$$

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-to-income ratio

The debt-to-income ratio depends on the relationship between the real interest rate, the growth rate of output and the non-interest budget surplus. The higher the interest rate and the lower the growth rate of output, the more likely the debt-to-income ratio is to rise. A large non-interest surplus tends to make the debt-to-income ratio fall.

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Figure 6.3 illustrates the aggregate demand curve. The tax cut is temporary and the budget deficit is financed by the government selling debt to the private sector. A cut in taxes shifts the aggregate demand curve from AD to AD_1. 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 a part of their wealth. At a given level of income, the aggregate demand should rise when the stock of government bonds rises because individuals holding those bonds have greater wealth. The greater wealth increases consumption demand and the demand curve shifts to the right. The final aggregate demand curve returns to the original equilibrium point, after government spending. The AD and AD_2 lines show a difference in stock of the government bond price. The bond price is compared with the initial aggregate demand curve.

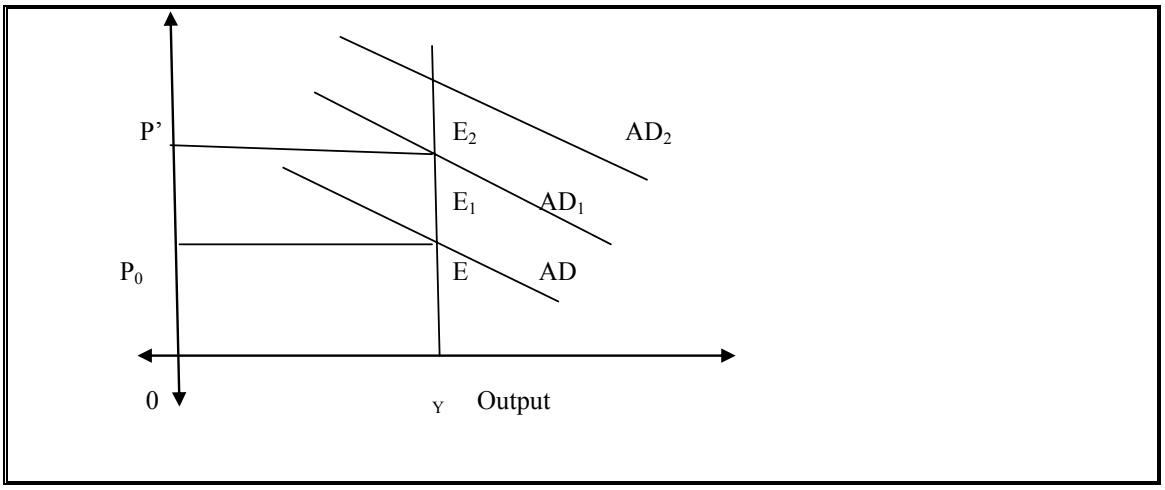

Figure 6.3 Output and price levels with the effect of the aggregate demand

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6.7 The Barro-Ricardo problem

At the aggregate level, everyone believes 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 the future. The increase in debt would increase individual wealth and at the same time suggest to them that their taxes would be higher in the future. The net effect on aggregate demand might then be zero. The government bonds are wealth, this issue was 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 the Ricardo equivalence. The proposition is that debt financing by issuing bonds merely postpones taxation. Therefore, in many instances it is strictly equivalent to current taxation. Consumers internalize that the government is raising money by issuing future bonds or increasing taxes, and that the bonds they buy now will be paid off with tax increases in the future. An increase in the budget deficit unaccompanied by cuts in government spending should lead to an increase in savings that precisely matches the deficit. Barro-Ricardo objected because firstly, people have a finite lifetime, that is, the people who receive a 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 the future. Secondly, many people are not able to borrow and thus, do not consume according to their permanent income. They would like to be able to consume but have liquidity constraints, i.e., because they are unable to borrow to pay for the commodities they want to consume. A tax cut for these people would ease their liquidity constraints and allow 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. Compared to money financing, debt financing reduces the level of investments.. This is an issue related to the crowding out question. With money financing, the price level is higher than it would be with debt financing. Firstly, money financing increases the money stock while debt financing does not. The higher the money stock, the greater is the aggregate demand at any given price level. Secondly, in the case of debt financing, a rise in prices leads to a wealth effect, which in turn affects debt and consumption. The wealth effect on consumption is larger in the case of money financing than with debt financing. This means that aggregate demand at any given price level will be higher with money financing than with debt financing. Debt financing probably increases aggregate demand but because of the possible effects of anticipated future tax liabilities on consumption it is not certain. Debt financing starts from a balanced budget and is not compensated for by higher taxes or reductions in other transfer payments, and can 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 investments in the short run.

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6.9 The burden of debt

Each individual has a share in the obligation to repay the public debt, but many individuals own the national debt. The debt represents a cancelling out of assets that the debt represents to the individuals who hold claims on the government. In this case, there would not be a net burden on society. Debt may be a burden through the potential long run effects of the deficit and debt in the capital stock. We already know that debt financing increases the interest rate and reduces investment. The capital stock will also be lower with debt financing and thus, output will also be lower. This can be a real burden, because the higher taxes needed for debt servicing could have adverse effects on the economy, for instance by discouraging investment or work effort, which would then 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 increase the nation's external debt. Results have shown that the rates of inflows, outflows and growth are affected. 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, Jinjarak and Park 2011).

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Intergenerational burden

Deficit financing shifts some of the burden of current government spending to future generations. Research is lacking in the field which describes what is fair and unfair in allocating burdens among generations. Policy makers, politicians and civil society are less concerned on how burdens should be shared across generations. Such principals and policies need to take account of how much of a debt burden is imposed on future generations. Intergenerational accounting evaluates the costs and benefits of the entire fiscal (tax and spending) system for various age groups in society. A study shows that a debt crisis produces significant and long lasting output losses, reducing output by about 10 percent after eight years. The results also suggest that a debt crisis tends to be more detrimental than a banking or currency crisis. The significance of the results is robust to different specifications, identification and endogeneity checks, and data sets (Furceri and Zdziniecka 2011).

6.10 Government assets

A government has income as well as expenditures. If income is less than expenditures then the government tries to finance its expenditures through the sale of assets or by borrowing. The government could borrow from the public to finance its expenditures, usually on roads, post offices, railways, health care, education, etc. The real capital acquired by a government should be treated as an offset against the debt issued. The valuation of government assets raises serious issues. A government can sell a public company, a hotel, a garden, a park or post office. But any government will try to keep its operating assets. In India, Indian Airlines continues to make operational losses and the government is providing aid to run it properly. The aim is to provide a service to people. But the government cannot privatize or sell the airline, which has always been considered a public asset. But it is not clear whether Indian Airlines should count as a government asset when calculating the government's net worth. Due to inflation, the 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

The creation of public assets may require borrowing, and contribute to the government's deficit. On the domestic side, there is no increase in saving to match the increase in the deficit. After independence, India devised five-year plans for economic development. The first was for the period 1951–55 and the second, for 1956–61. The government could choose to lower the present taxes while financing a significant part of the deficit by borrowing abroad.

6.12 The size of debt /budget

Over a period of time, the government's expenditures have increased, due mainly to the welfare state. This increase is reflected in the broadening of government social programs, especially the growth of transfer program. The budget and debt clearly depend on existing government programs.

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Some of the government's social programs are widely regarded as desirable. Few dispute the need for additional defense expenditures, expenditures to encourage more employment, expenditures on health programs, etc. The social security and other programs are widely viewed as desirable. The government of India finances such welfare projects as the Mahatma Gandhi National Rural Employment Guarantee Program (MGNREGP), and the National Rural Health Mission (NRHM) program. But such programs are controversial because of their sheer size, which makes corruption, inefficiency, and lack of transparency unavoidable. If the government budget is too large, and in deficit, there is an undesirable pressure on the interest rate and on financial stability. Laws to curtail the deficit put pressure on the government to find ways to cut spending. It is not clear how taxpayers' money is being used to finance government spending. Therefore, a number of government programs have been evaluated. Different studies show that money programs are ineffective, but this is to be expected. Some programs should be stopped or abandoned. The private sector can take care of certain of these programs.

Presently, all government works are on a public-private partnership model. Social security and food stamps programs have received substantial attention. The final solution is that, individual programs should be evaluated as to how successful they are, and changes suggested to clearly identify the best way to evaluate government spending. But in the long term, the aim of every government should be to control the deficit and ensure macroeconomic stability. The success of social programs depends on the agreement between policy makers and the society. Resources are scarce and should be used as efficiently as possible. Social programs are necessary and can be evaluated regularly to determine their effectiveness.

6.13 The merged Bank-Fund model

The Polak model, alternatively known as the Fund model, is a model of short term stabilization, and was developed by Jean Jacques Polak in 1957. The Bank model, also known for medium term stabilization, comprises two models, namely: the Two Gap model proposed by Chenery and Bruno in 1962; and the Harrod-Domar model which was developed independently by Sir Harrod in 1939 and Domar in 1946. 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

Merging both models resulted in what is called the merged Bank-Fund model. The differences in both models are explained in the following table.

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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 variable

Table 6.1 Instruments in the Bank and Fund models

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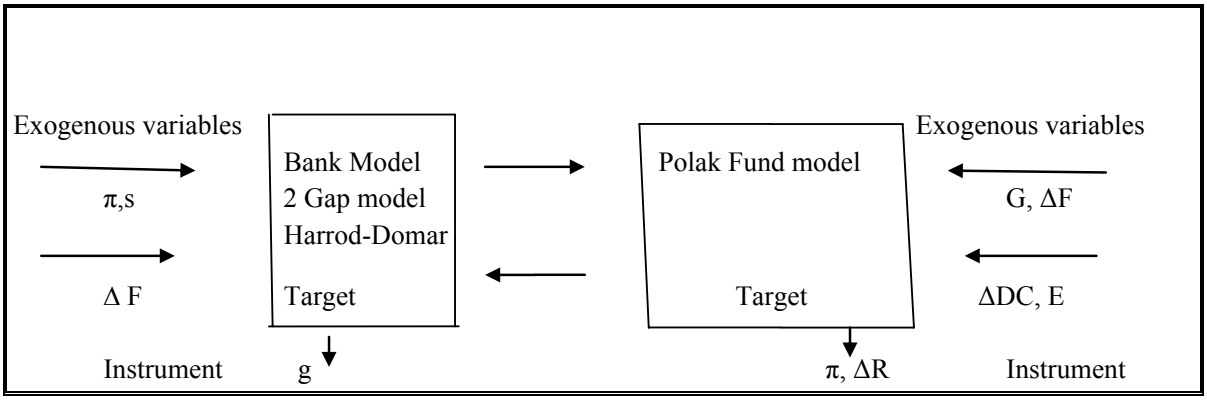

Graph 6.1 Variables and instruments in the models

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 The Polak Fund Model

In 1957 Polak, being dissatisfied with the Keynesian overemphasis on fiscal policy and the inappropriate treatment meted out to monetary policy in the 'General Theory', attempted to streamline the monetary side of the analysis. However, Polak clearly stressed that his model was not an alternative to the Keynesian model. The model was specified in nominal terms and consequently, no explicit distinction was made between price and real income changes. The model is based on certain assumptions:

1. The demand for money (M_d) depends on nominal income (Y), with the income velocity of money (V) 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

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5. The money market is in flow equilibrium

$$\Delta m = \Delta md$$

The Polak Fund model is also known as the financial programming model approach. It is used by the International Monetary Fund (IMF) for structural adjustments in developing countries. The objective of the IMF is to help developing countries hurdle their balance of payments (BoP) problems.

Proof:

I) Monetary sector financial constraints

$$\Delta M = \Delta DC + \Delta R$$

$$\Delta R = \Delta M - \Delta DC \tag{6.3}$$

The change in money supply is related to the change in domestic credit and reserves. Similarly, changes in reserves are equal to the change in money supply minus change in domestic credit. These are the monetary sector budget constraints.

Balance sheet	
Assets	Liabilities
ΔDC	ΔM
ΔR	
ΔDC+ ΔR	= ΔM

A country has assets: domestic credit and reserves. The main liability of any country is its money supply. Both assets and liabilities are subject to change. The targets are to tackle inflation and increase reserves. The instrument with which the monetary authority can achieve the targets is domestic credit. The parameters are the velocity of money and the exogenous variable is government expenditures. 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

$$MV = PT$$

We assume that $\bar{V}$ is constant for the short term.

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pY = Y (nominal income)

$$M\bar{U} = Y$$

$(\Delta M)\bar{V} = \Delta Y$ {The demand for nominal money balance ($M_d = \Delta M$) 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 $Y = (1 + g)_{y-1}$,

The pre-determined real growth rate is exogenous,

$$P = (1 + \pi)_{p-1}$$

The inflation rate is endogenous,

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$$Y = PY$$

$$Y = (1 + g)_{Y-1} . (1 + \pi)_{p-1}$$

$$Y = (1 + g + \pi + \pi_g)Y_{-1}$$

Now, $\pi_g = 0$

$$Y = (1 + g + \pi)\ Y\text{-}1$$

$$Y = Y_{-1} + (g + \pi)\ y_{-1}$$

Nominal income increases because of the two factor growth rates and Y_{-1}

$$Y - Y_{-1} = (g + \pi)Y_{-1}$$

$$Y - Y_{-1} = \Delta Y$$

$$\Delta Y = (g + \pi)\ Y_{-1} \qquad (6.6)$$

Substituting equation (6.5) into (6.4) we get

$$\Delta R = (\frac{1}{V})(g + \Pi)_{Y-1} - \Delta DC$$

This is the fundamental equation of the Monetary Approach to Balance of Payments (MABOP) where the Balance of Payments (BoP) is expressed as the difference between the flow demand for money and expansion of domestic credit where an increase in domestic credit will be offset by a decrease in reserves 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, taking the endogenous variable ΔR, π , 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

$$\Delta R = (\frac{g}{V})Y_{-1} - \Delta DC + (\frac{1}{V})Y_{-1}.\Pi \qquad (6.7)$$

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Target	Instrument	Parameter	Exogenous	Historical factor
Π, ΔR	ΔDC	V	G	Y_{-1}

Now, $\Delta R = \alpha_1 + \alpha_2 \Pi$

The monetary sector constraints (MM line) show the various combinations of ΔR and π for which the monetary sector in equilibrium. The MM line is an upward sloping straight line with a 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 into a policy instrument ΔDC. When ΔDC decreases, then MM_0 line shifts upwards to MM_1. A 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 the MM_0 line implies either increased reserves for given π or decreases in π for the given reserves.

ii) External sector financial constraints

The external sector depends on the amount of reserves with the monetary authority. If the economy earns more foreign exchange then these reserves will rise. Similarly, the external capital flow will rise. This can be explained as

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

The external sector budget constraints

$$\Delta R = (X + \Delta F) - Z \qquad (6.8)$$

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 to control inflation. The instrument that the monetary authority can use is the 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.

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Import demand function

Import is a function of income level and the depreciated exchange rate. It is defined as:

$$Z = f(\overset{+}{Y}, \overset{-}{E})$$

$$Z = aY - bE$$

$$\Delta Z = a\Delta Y - b\Delta E$$

$$Z = Z_{-1} + \Delta Z \qquad [\Delta Z = Z - Z_{-1}]$$

$$Z = Z_{-1} + a\Delta Y - b\Delta E \qquad (6.9)$$

Now, if $\Delta E > 0$ devaluation

$\Delta E < 0$ revaluation

Here, a is the marginal propensity to import out of income, and b is responsiveness of import to the exchange rate.

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When $a > 0, b > 0$

Substituting equation (6.9) into (6.8)

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

$$\Delta R = (X+\Delta F) - (Z_{-1} + a\Delta Y - b\Delta E)$$

$$\Delta R = (X+\Delta F) - Z_{-1} a\Delta Y + b\Delta E$$

$$\Delta R = (X+\Delta F - Z_{-1} + b\Delta E) - a\Delta Y$$

$$\Delta R = (X + \Delta F - Z_{-1} + b\Delta E) - a(g + \pi)Y_{-1}, \text{ i.e., } \Delta Y = (g + \pi)Y_{-1}$$

$$\Delta R = (X + \Delta F - Z_{-1} agY_{-1} + b\Delta E) - aY_{-1}\pi \quad (6.10)$$

$$\Delta R = \beta_1 - \beta_2\pi$$

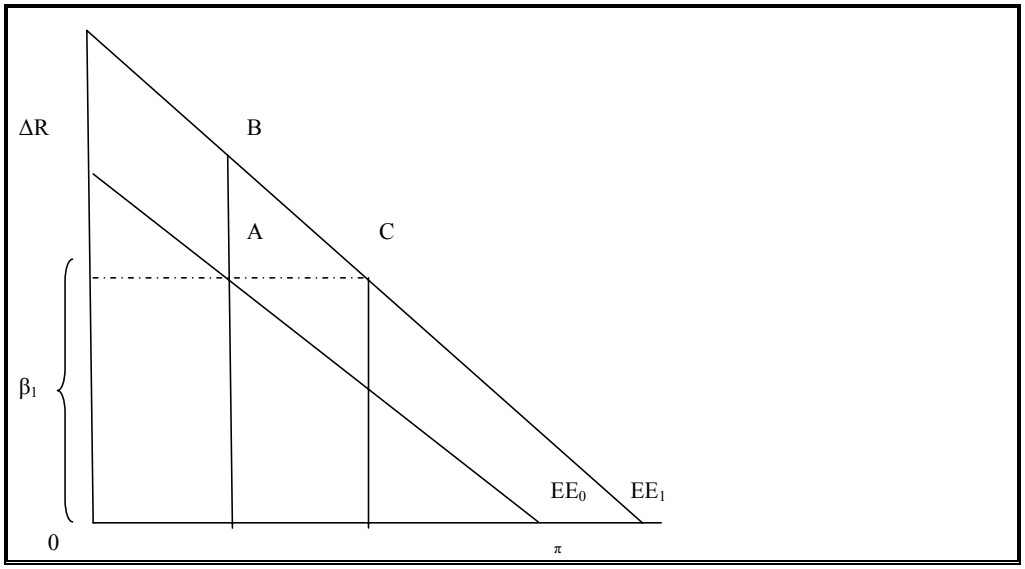

Figure 6.4 Devaluation and reserves in the economy

Figure 6.4 shows EE_0 as a downward sloping straight line. The slope = $aY_{-1}\pi$ and intercept = $X + \Delta F + b\Delta E - agY_{-1}$.

Here, the slope cannot be changed but the intercept can be changed as it has instrument ΔE. A change in π devaluation will shift EE_1 outwards.

The devaluation of the currency leads to two possibilities, which are:

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1) Same π higher ΔR (comparing point A and B)
2) Same ΔR and higher π (comparing point A & C)

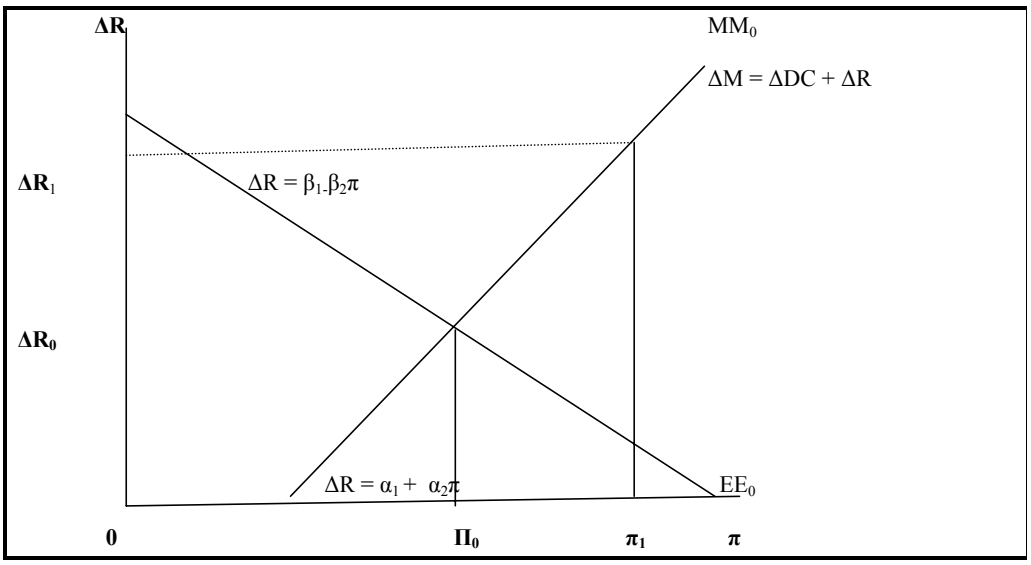

Figure 6.5 Equilibrium of inflation and reserves in the economy

Every point on the 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,

$$\Delta R = \alpha_1 + \alpha_2 \Pi$$

$$\Delta R = \alpha_1 + \alpha_2 (\frac{\beta_1 - \alpha_1}{\alpha_2 + \beta_2})$$

$$\Delta R = \frac{\alpha_1 \beta_2 - \alpha_2 \beta_1}{\alpha_2 + \beta_2} \quad (6.11)$$

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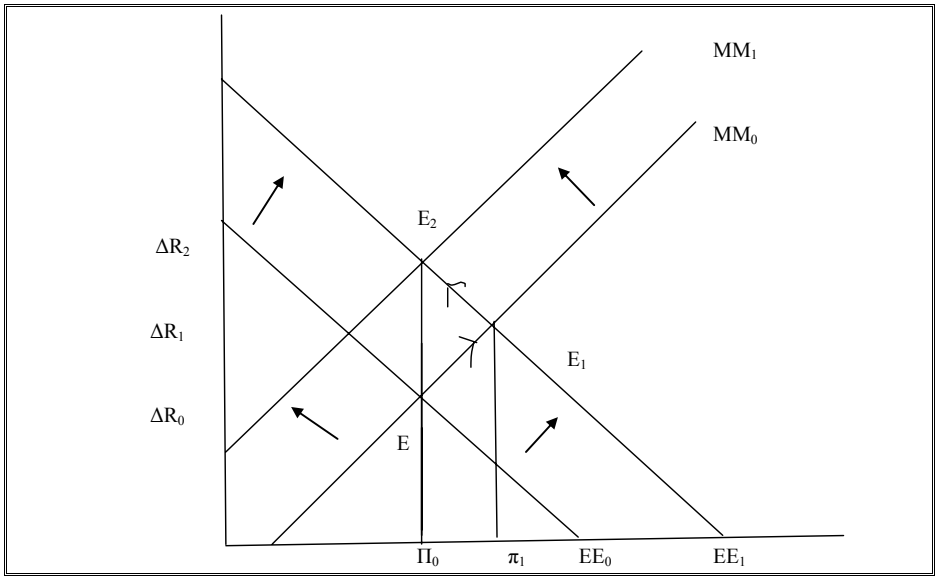

Figure 6.6 Devaluation and the money supply; effect on reserves

In figure 6.6, the intersection of the MM_0 and EE_0 lines shows the value of π and ΔR which simultaneously satisfies the budget constraints for both the monetary and the external sectors. If the objective is to improve their reserve position and to lower inflation, (π) then the domestic credit decreases (DC). This will shift MM_0 to MM_1. If a devaluation takes place, the EE_0 line shifts to EE_1. After achieving position E_2, there is no more shifting of curves because the higher 'R' at same π has been achieved.

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Conclusion:

The above analysis is a simplified representation of the actual dynamics of inflation (π) and reserves (R.) which for the present can be considered as a first approximation of how these variables interact. The above figure shows that high reserves are achieved at the same inflation rate after a devaluation, reducing the money supply.

6.13.2 The Bank model

In contrast to the Fund model's concern with temporary balance of payments (BoP) disequilibria, the Bank model is concerned with financing growth and development over the medium term. This is the 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.

i) Two Gap Growth Model: Michel Bruno and Hollis Chenery

The two gap growth 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 economic growth.

A) The saving constraints

$$Y = C + I + X - Z$$

$$Y = C+S$$

$$C + S = C + I + X - Z$$

$$S = I + X - Z$$

$$I = S + (Z - X) \tag{6.12}$$

Current account deficit

Industrial resources = domestic saving + external saving

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

External sector financial constraints

$$\Delta F - \Delta R = (Z-X) \tag{6.13}$$

Financed by capital flows or running down a depleting reserve, that is, 0-(-100) = 100

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Substituting equation (6.13) into (6.12)

$$I = S + \Delta F - \Delta R$$

$$I = [\bar{S} + \Delta \bar{F}] - \Delta R \qquad \text{Saving constraints} \qquad (6.14)$$

$$I = \beta_1 - \Delta R$$

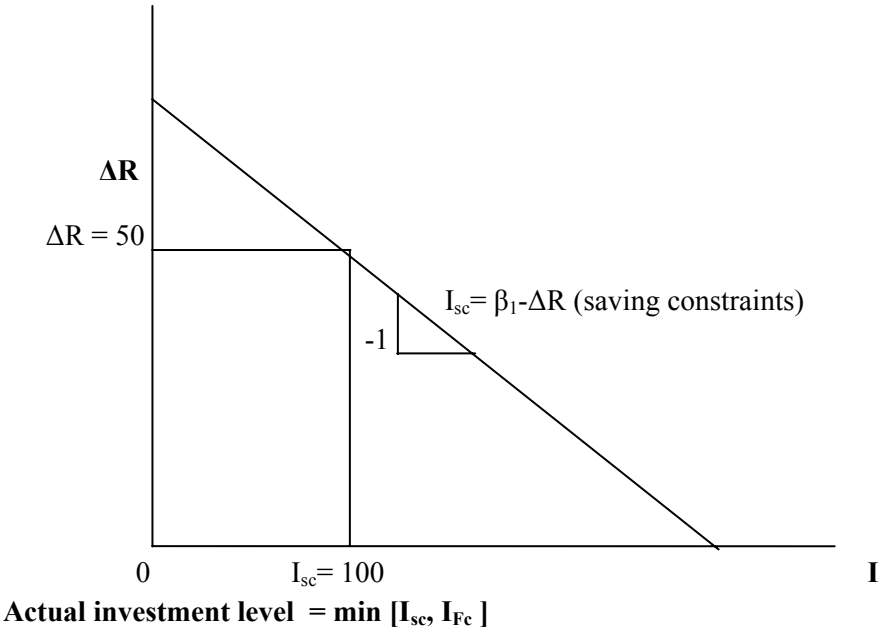

Figure 6.7 Foreign reserves and investments in an economy

B) Foreign exchange (trade) constraints

Investments in the domestic economy are determined by the trade constraints**.** If there are more exports, then reserves will rise. Such reserves can be utilized for investments.

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

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

$$Z_{CAD} = \text{(Capital flows-Reserves)}$$

The Current Account Deficit can be financed by either running down one's own (saving) reserves or by increasing K inflows.

$$Z = [X + \Delta F) - \Delta R \qquad (6.16)$$

Import demand function

$$Z = aY - bE$$

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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, the present income depends on the past income and the change in income. If we substitute the value of Y into the above equation, then

$$a(Y_{-1} + \Delta Y] = [X + \Delta F + bE] - \Delta R$$
$$aY_{-1} + a\Delta Y = [X + \Delta F + bE] - \Delta R$$
$$a\Delta Y = [X + \Delta F + bE - aY_{-1}] - \Delta R$$
$$\Delta Y = \beta I$$

B is the incremental output-capital ratio, $\frac{\Delta Y}{\Delta K}$

$$a\beta I = [X + \Delta F + bE - aY_{-1}] - \Delta R$$
$$I_{FC} = \frac{1}{a\beta}[X + \Delta F + bE - aY_{-1}] - \frac{1}{a\beta}\Delta R \qquad (6.17)$$

Som medarbetare i Riksbyggen vill vi att du ska känna att du är viktig och att du tydligt kan se hur du bidrar till att vi uppnår våra mål. Vi erbjuder dig stimulerande och utvecklande arbetsuppgifter i ett kreativt arbetsklimat.

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a is the marginal propensity to import, a< 1

$$B < 1, \frac{1}{a\beta} > 1$$

$$I_{FC} = \beta_2 - \frac{1}{a\beta}\Delta R$$

$$\text{If } \frac{1}{a\beta}\Delta R = 0$$

$$I_{FC} = \frac{1}{a\beta}[X + \Delta F + bE - aY_{-1}] \tag{6.18}$$

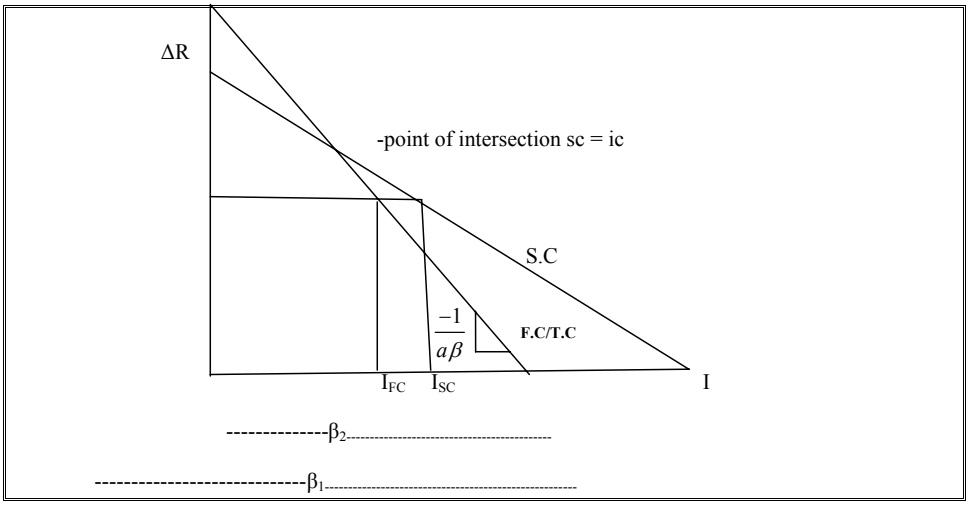

Figure 6.8 Equilibrium of foreign reserves and investments

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 also be a binding constraint. The binding constraint can be retained by shifting the line,

$$I - S = \Delta F - \Delta R$$

$$I_{sc} = (S + \Delta F) - \Delta R$$

$$I_{sc} = (sY + \Delta F) - \Delta R \; [S = sY]$$

If ΔF increases by one unit then S.C. increases by one unit. I also increases by one unit, then

$$I_{sc} = (s + \Delta F) - \Delta R_0$$

$$I_{FC} = \frac{1}{a\beta}[X + \Delta F + bE - aY_{-1}] - \frac{1}{a\beta}\Delta R \tag{6.19}$$

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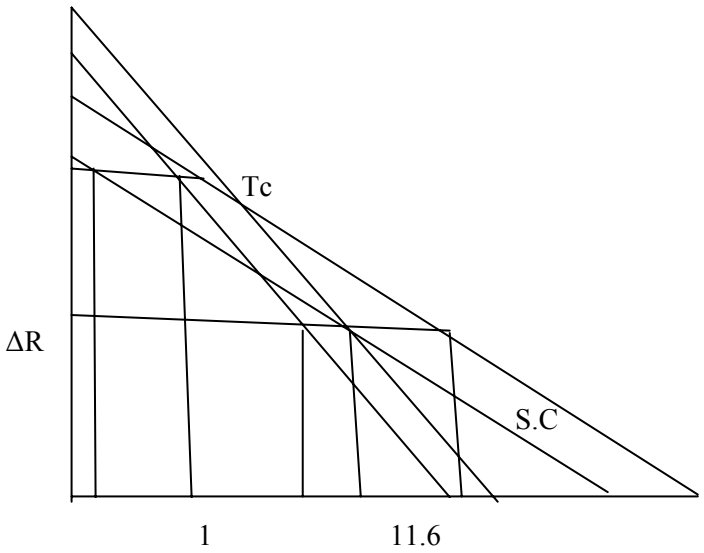

Figure 6.9 Changes in the foreign reserves and investments in an economy

S.C is binding s or ΔF

F.C/I.C is binding X or ΔF

Therefore, ΔF increases by one unit and I increases by $\frac{1}{a\beta}$

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 were characteristics of the early work in development economics and implied that the aggregate growth theory developed by Harrod (1939) and Domar (1946) becomes natural. This model is the first building block in the World Bank's approach to economic development.

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In the Harrod-Domar model, the economy is supposed to grow at a warranted rate of growth given by:

$$g = \frac{s}{v}$$

$$S = sY$$

Closed economy

$$g = \frac{i}{v}$$

$$i = \frac{i}{Y} = \frac{s}{Y} + \frac{CAD}{Y}$$

Open economy

$$\underline{(I / Y)}$$

V = ICOR (Incremental capital output ratio)

$$= \frac{\Delta K}{\Delta Y} = \frac{4.2}{1}$$

Basic logic of the Harrod-Domar model

$$g = \frac{1}{V}(\frac{I}{Y}) \qquad (6.20)$$

$$g = \beta(\frac{I}{-})$$

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where $\frac{1}{V}\beta$

Now $g = (\frac{\Delta Y}{Y})$

$$\frac{\Delta Y}{Y} = \beta(\frac{I}{Y})$$

$$\Delta Y = \beta I \quad (6.21)$$

Nominal income = β. nominal investment

$$\Delta Y = \beta(\frac{1}{p})$$

$$\Delta Y = Y - Y_{-1}$$

$$Y - Y_{-1} = \beta.(\frac{I}{P})$$

If we divide both sides 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 $Y = \rho y$

$$y = \frac{Y}{P}$$

$$Y_{-1} = \frac{Y_{-1}}{P_{-1}}$$

$$\frac{1}{Y_{-1}} = \frac{P_{-1}}{Y_{-1}}$$

When replaced in the above equation, this 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 $p = (1+\pi)\ P_{-1}$

$\frac{1}{(1+\pi)} = \frac{P_{-1}}{p}$ put into the above equation

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$$g = \frac{\beta}{Y_{-1}} . \frac{1}{1+\pi} . I$$

$$g(1+\pi) = \frac{\beta}{Y_{-1}} . I$$

$$g + g\pi = \frac{\beta}{Y_{-1}} . I \qquad (6.22)$$

The Polak fund model assumes g at the second equation.

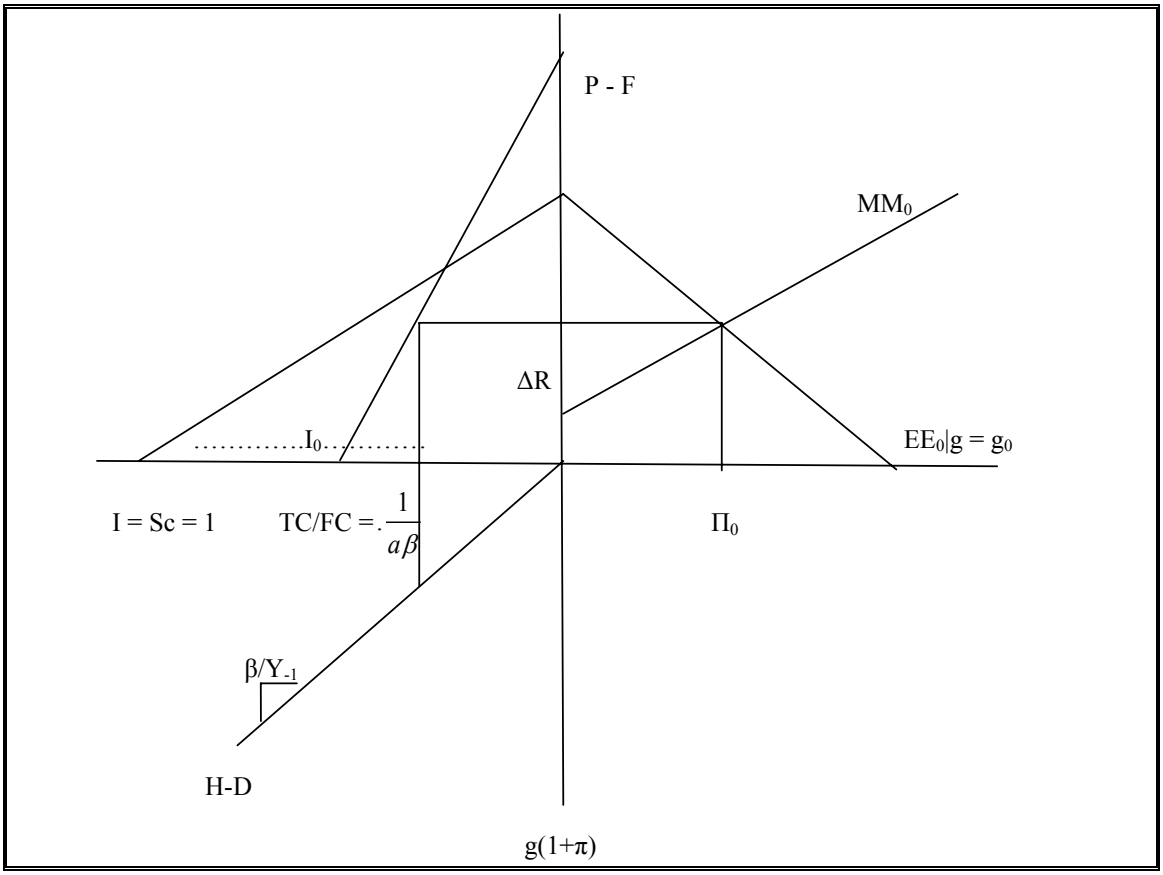

Figure 6.10 Equilibrium of reserves, investments and inflation

Two Gaps

$$I_{SC} = (I_1)$$

$$I_{FC} = [I_2]$$

$$I = MM(I_1, I_2)$$

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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 each increase in output

$$m = \frac{\partial(\frac{m}{p})}{\partial y}$$

ℓ→ decreases in money for each unit increase in interest rate

$$\frac{M}{P} = \hat{M}\ y - \hat{\iota}_i$$

$$\frac{\frac{M}{P} - mY}{\ell} = \frac{\ell_i}{\ell}$$

$$\frac{\frac{M}{P} - mY}{\ell} = \dot{\ell}\, e \qquad (6.23)$$

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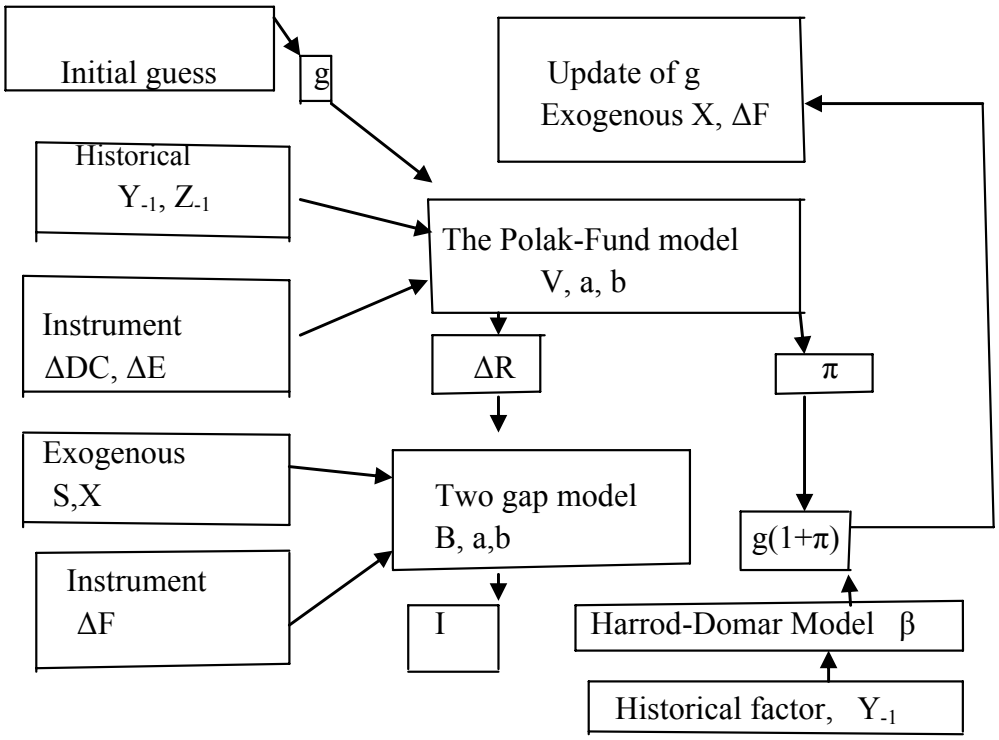

Graph 6.3 The merged Bank-Fund model

6.14 Rules versus discretion

The central bank and the central government conduct fiscal and monetary policies in accordance with pre-announced rules that describe how their policy variables will be determined in all future situations, and that discretion should be used in determining the values of the policy variables at different times. This concept explains that the most proponents of rules have been non-activists whose preferred monetary rule is a constant rate rule. Rules that have countercyclical features can be designed, and at the same time, leave some element of discretion to policy makers. There is no economic case for making permanent, policy rules that would tie the hands of the monetary and fiscal authorities. The growth rate of money is prescribed by the constitution. On the other hand, how much to let money grow is up to the central bank to decide. Policies can change but the constitution cannot change. There is a tradeoff between the future and flexible policies. The financial sector responds very quickly to shocks, and is so interconnected. The reserve bank has considerable discretion, and thus flexibility to respond to disturbances. But this is far from a universal judgment. Policy makers should announce the policies they will be following for the foreseeable future. Doing so would enable the private sector to forecast future policies. But the monetary authority does not stick to its target. The reserve bank keeps output close to its potential and tries to keep inflation low. It helps that the private sector is able to forecast variables because the private sector is interested in future income.

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Dynamic inconsistency: Rules versus discretion

As already discussed, once the expected inflation-augmented Philips curve is understood, we would hope that policymakers would keep inflation low, because this would keep expected inflation low. There is a 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, which would be inconsistent for the economy's best long term interests. There is a natural outcome with rational, well-intentioned policy makers. The analysis in consistency begins with the assumption that policy makers share the public dislike for both inflation and unemployment. The inconsistency arises when there is a short run tradeoff between inflation and unemployment. The best position for any economy in the long run is full employment with zero or at least low inflation. Policy makers who announce a full employment-zero inflation policy will immediately be tempted to cheat by seeking lower unemployment and a slightly higher inflation rate. It is this disparity between announced and expected plans that gives rise to a dynamic inconsistency.

Dynamic inconsistency can occur in three sequential steps:

1. The policy makers announce a policy of zero inflation.
2. The policy makers choose a level of anticipated inflation consistent with the announced policy, implying that the economy will be positioned at full employment on the short-run Philips curve.
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 earlier policy that was announced.

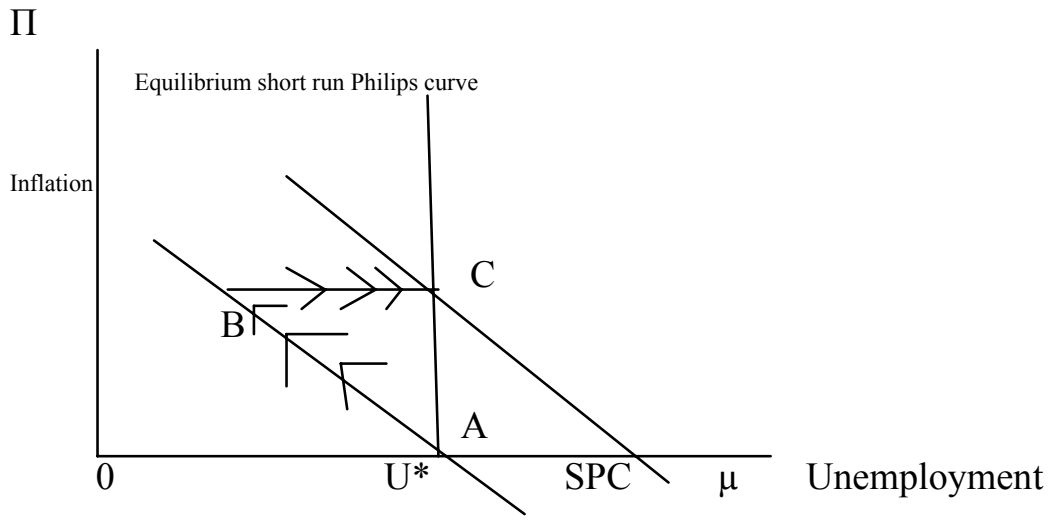

Figure 6.11 Relationship between unemployment and inflation

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Figure 6.11 depicts the short run Philips curve as a downward sloping curve. The curve shows the tradeoff between unemployment and inflation. Point A shows the policy makers and public preference point. It is a point with full employment and zero inflation. The economy operates on the lower, short run Philips curve. At this point, people and policy makers are ready to take risks and reduce the unemployment rate. The policy makers push the economy from A to B, a point where 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 moves upwards to the equilibrium Philips curve. The economy reaches point C at full employment with high inflation. All people prefer point A. Policy makers and the reserve bank promise to reduce inflation to point A. But it is not possible because the economy will move from point A to B and then to 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 a reputation for consistency.
2. The government should choose policy makers who are known to be anti-inflationary.
3. The policy makers are told to reduce the inflation by setting inflationary targets. They will be rewarded if they achieve these targets.
4. Low inflation rules can be adopted to prevent the policy makers from making the discretionary choices that could lead to dynamic inconsistency.

These policies are adopted at some extent in any economy. How it reduces inflation is up to the central bank to decide. But it should consult with the government. If either cannot agree on each other's policies then inflation cannot be controlled. The effectiveness of a policy does not always come from one side.

6.15 Lags in the effects of policy

In the long run, the economy is in equilibrium. But in the short run an economy gets disturbed by the aggregate demand which reduces income below full employment. It is the job of policy makers to respond to direct disturbances. The policy makers have to determine whether it is a long term or a short term disturbance. It can be transitory such as a one-year reduction in consumption spending. Sometimes changes are short term and the best policy is to do nothing at all. Since it takes time for monetary policies to take effect, it might be good for decision makers to take into consideration that decisions about the short term interest rate will influence the economy at a later date yet. A well-structured monetary policy framework requires analytical support in the form of mechanisms for anticipating future inflation and responding to it ahead of time (Bhattacharya et al. 2008).

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If demand changes in the short term, then suppliers and producers will not make mistakes and adjust the production and inventory in response to the change. They will not adjust capacity. Doing this will affect income in this period but there will be a very small permanent effect. Therefore, today's actions take time to take effect and affect the economy tomorrow yet. The disturbance could be temporary and have no long term effects. Taking into consideration that it takes time for a policy to take effect, the best policy might be to do nothing.

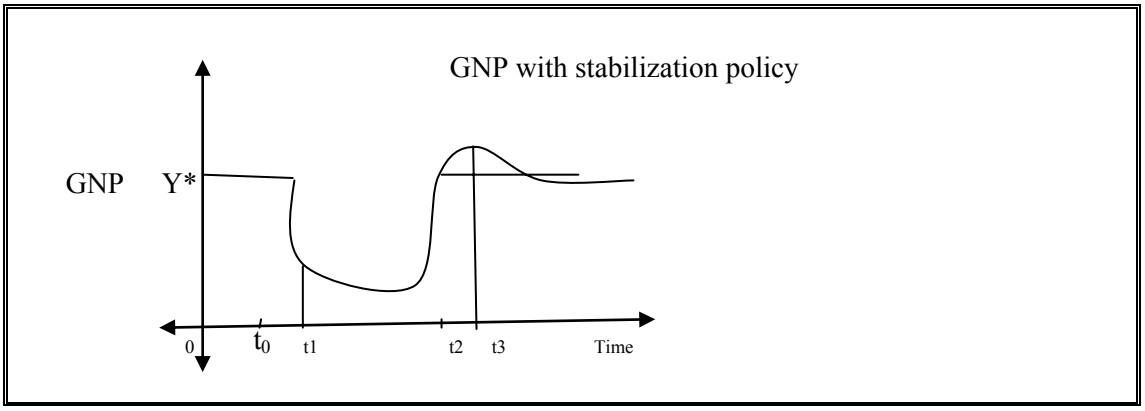

Figure 6.12 GNP with stabilization policy

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Figure 6.12 illustrates that at time t_0, there is a disturbance and output declines. At point t_2, equilibrium is reached. The expansionary policy might be initiated at time t_1, but starts to take effect some time after output declines. Sometimes, due to the expansionary policy, the output expands very fast and causes the overshooting of employment. This is observed between t2 and t3. By time t3, the restrictive policy is initiated and some time afterwards, output starts declining as full employment approaches and the cycle may well continue for a while.

For stabilization, one has to think whether it is worth trying to stabilize output or whether the effect of a stabilization policy is in fact making things worse. A stabilization policy may actually destabilize the economy. It is important to understand that events that can be taken as disturbances have occurred. There are delays or lags at every stage, namely: inside lags and outside lags. The inside lag is the time period which the policy makers take to commence a policy action such as a 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 recognition, decision and action lags.

6.15.1 Recognition lags

A recognition lag refers to the period that lapses between the time when a disturbance occurs and the time when 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, the reserve bank increases the high powered money.

6.15.2 Decision and action lags

Decision lags refer to the delay between the recognition of the need for action and the implementation of the policy decision, which can be a monetary or a fiscal policy. Once the action is recognized, the decision lag for a monetary policy is short. The action lag refers to the lag between the policy decision and its implementation, which for a monetary policy, is also short. At present, the decision lag for a monetary policy is short and the action lag, practically zero. For a fiscal policy, once the action is recognized, then the administration has to prepare legislation for that action. Both houses of the legislature should be able to view the bill. They should discuss it then pass or approve it. If the bill is passed regarding taxes, then it will take time to change the tax rates and collect the tax. This is an action lag in fiscal policy.

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6.15.3 Outside lags

The outside lags are generally-distributed lags that occur once the policy action has taken its effects on the economy spread over time. There is a small immediate effect of the policy action but the full effect occurs later. The impact of outside lags is very small and continues over a long period of time. For example, an expansionary monetary policy leads to spending and output increases. It takes several quarters to see the change in output. The lags are there 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 investments with a lag and also affect consumption by affecting the value of wealth. When aggregate demand is ultimately affected, the increase in spending itself produces a series of induced adjustments in output and on spending.

6.15.4 Monetary and fiscal policy lags

Fiscal policy lags are related to government spending. They impact directly on the aggregate demand. Fiscal policy lags change incomes more rapidly than monetary policy lags. There are short outside lags, but also longer inside lags. Long inside lags in fiscal policy are less useful for stabilization and means that fiscal policy tends to be used relatively infrequently in attempts to stabilize the economy.

6.15.5 Conclusion

The above points highlight that it takes time to set policies into action, once short term policy actions are undertaken. The policies themselves take time to affect the economy. But this is not a problem. 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 6.13 shows that small reductions in the money growth rate shift the aggregate demand curves down from DAD to DAD'. It helps to move the economy a little way along the short run aggregate supply curve SAS from E to E1. In response to the lower inflation at E1, the short run aggregate supply curve shifts downwards to SAS'. A further small cut in the money growth rate moves the economy to E2. The aggregate supply curve shifts downwards again and the process continues. 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 will be above normal throughout.

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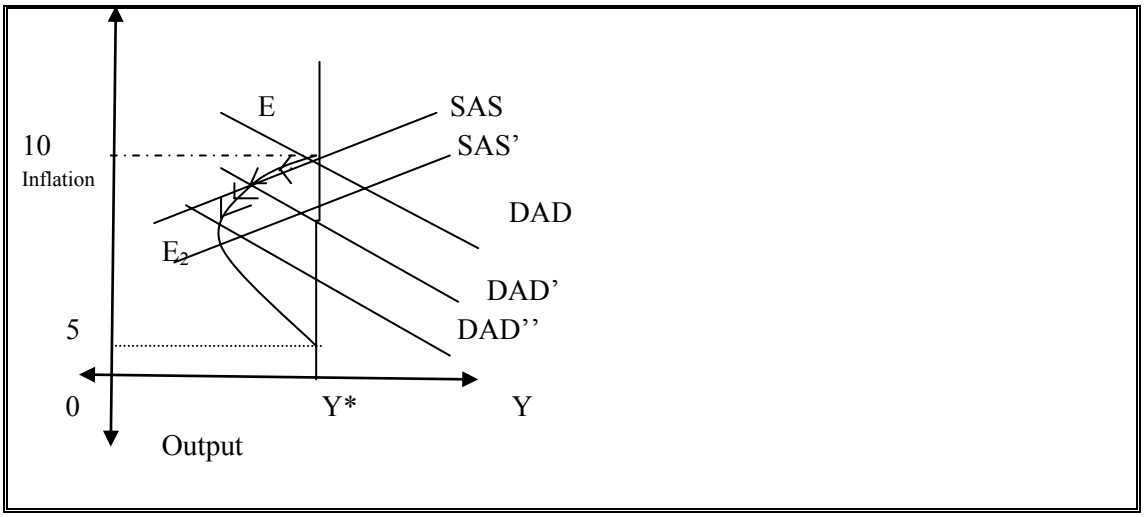

Figure 6.13. Reducing inflation through gradualism

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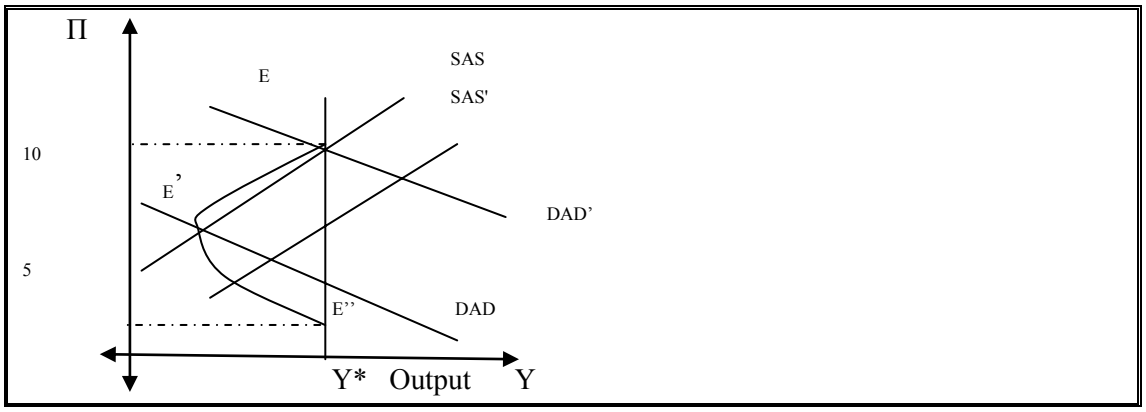

Figure 6.14. Reducing inflation through shock therapy

In figure 6.14, shock therapy is used to cut the inflation rate fast. The strategy starts with an immediate, sharp cutback 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 with the gradualism policy, shock therapy causes the short run supply curve to move down faster. Shock therapy keeps up the pressure by keeping 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 a lower rate of inflation.

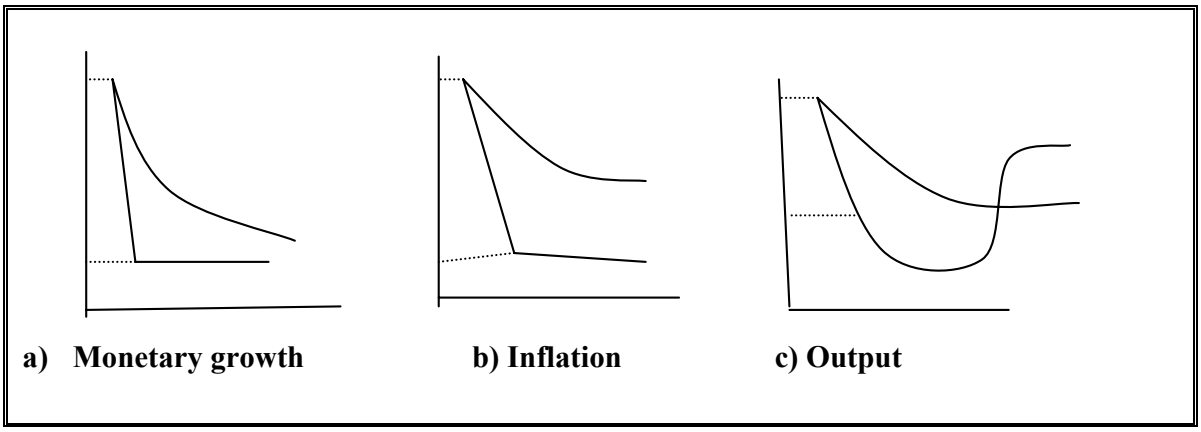

Figure 6.15. Differences of gradual and shock therapy methods to reduce inflation

In the gradualism strategy, the growth rate of money is initially reduced only slightly and the economy never strays far from the natural rate of unemployment. But the inflation rate comes down only slowly. Shock therapy starts with massive cuts in the growth rate of money and a large recession. The recession will be much worse than it ever will be in the gradualism strategy, but the reduction in inflation is more rapid.

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6.17 Credibility

A credibility policy is one that the public believes will be kept up and will succeed. A belief that the policy has changed will drive down the expected rate of inflation and for that reason the short term Philips curve shifts downwards. 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 a policy is credible, people will instantly adjust their expectations of inflation. When a new, lower money growth rate is adjusted in the short run, the aggregate supply curve moves down immediately. If the policy is credible and if expectations are rational, the economy can move immediately to a new, long run equilibrium.

6.17.1 Criticism

There are a number of possibilities due to which, the credibility approach is not practical. Firstly, credibility may be very difficult to obtain. Secondly, past contracts affect past expectations and 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 rapid 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 disinflate 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 a monetary policy to stabilize employment over the business cycle (Goodfriend 2000).

Questions

1. Explain the government's budget constraints.
2. Inflation tax reduces the inflation in an economy. Explain in detail.
3. What is the relationship between the deficit and hyperinflation?
4. Explain the relationship between the budget deficit and public debt.
5. Write a note on the Laffer curve.
6. How can a deficit be financed? What is the mechanism for such financing?
7. Write a note on the debt management of government.

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8. Explain the dynamics of debt and deficit.
9. What is the Barro-Ricardo problem?
10. Write a note on the burden of debt. What policies are required to get rid of this debt?
11. The size of debt matters in an economy. What is the role of welfare programs in a government's budget?
12. Explain the merged bank fund model in detail.
13. Write a note on following:
    a) the Polak fund model;
    b) the Bank Model;
    c) the gradualism policy;
    d) credibility
14. What is the "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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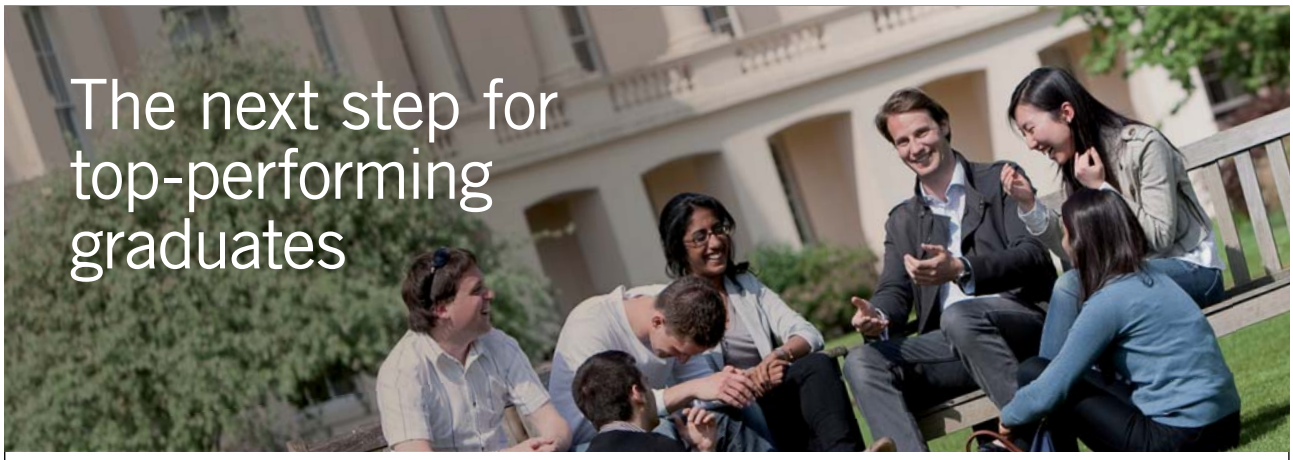

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Glossary

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 – a curve depicting the relationship between the amount of goods and services people wish to purchase and the price level

Aggregate supply curve – a curve depicting the 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

Appreciation – the value of the domestic currency increases vis-a-vis the currencies of other countries

Arbitrage – buying and selling of assets to take advantage of the difference in returns

Augmented Philips curve – Phillips curve that includes the inflationary expectations as a determinant of the inflation rate

Automatic adjustment mechanism – a mechanism that automatically acts to eliminate balance of payments problem

B

Balance of payments – a measure of net flow of currency into the country from abroad

Balance of payments deficit – when more money is leaving the country than is entering it

Balance of payments surplus – when more money is entering the country than is leaving it

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Beggar thy neighbor policy – an attempt to increase domestic output at the expense of the 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 – when the amount of taxes earned by the government is more than the government is spending in an economy

Burden of debt – each individual's 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 controls the money supply. In India, it is the Reserve Bank of India (RBI)

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Classical adjustment process – the process by which the economy automatically moves towards internal and external balance

Classical aggregate supply curve – vertical AS curve showing output equals potential output

Clean floating – flexible exchange rate, when the central bank does not intervene in foreign exchange markets

Consumption function – 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 resulting from the sale of domestic goods and services and from net transfers from abroad

D

Debt income ratio – the 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 price levels fall in percentage terms: it is the opposite of inflation

Depreciation – rate at which the capital stock wears out

Dirty floating – flexible exchange rate system; the central bank intervenes in foreign exchange markets in order to affect the short run value of its currency

Discount rate – interest rate charged lending banks by the central bank

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

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E

Efficiency wage model – when wages might be set above the market clearing rate in order to motivate workers to work harder

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 per unit of domestic currency

Exchange rate overshooting – a movement of the exchange rate past its target; an adjustment of exchange rates toward long run equilibrium 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 aimed at increasing purchases of domestic goods and increasing purchases of imported goods

External balance – 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 is paid to the holder of a bond 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 of which 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 the reserve bank and is managed through the exchange rate system

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Flexible exchange rate system – a system in 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, usually carried out by the central bank

G

Globalization – 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 expenditures over government revenues

Government expenditure – total government spending, including both government purchases and transfers

Government purchases – government expenditures of money on several goods and services.

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Gradualism – strategy of moving toward a desired target slowly

Gross domestic product – 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 bank deposits at the central bank; also called the monetary base

Hyperinflation – when the rise in price level is above 1000 percent per year

Hysteresis – occurs when temporary fluctuations in one variable have permanent effects on another

I

Indicators – economic variables that signal to us 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 holdings

Inside lag – delay between when a crisis or problem becomes apparent in an economy and when the government responds with a policy or policies to mitigate the problem

Insider-outsider model – model that 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 use to affect the economy

Internal balance – occurs when output equals potential output

International trade – 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 – shows the combinations of interest rate and output in the goods market

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J

J curve effect – occurs when a currency depreciates; the value of net exports rises temporarily and then falls

K

Keynesian aggregate supply curve – a horizontal aggregate supply curve showing the relationship between price and output

L

Labor force – consists of people who are working and are actively looking for work

Liquidity – a measure of the ability to make funds available on short notice

Liquidity constraints – limitations on the ability to make funds available on short notice

Liquidity trap – a horizontal LM curve due to extreme interest sensitivity of money demand

LM curve – 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 – currency plus demand deposits

M2 – M1 plus small time deposits and savings deposits, overnight re-purchase agreements

Marginal propensity to consume (MPC) – increase in consumption for each rupee increase in disposable income

Marginal propensity to import (MPI) – increase in the demand for imports that results from a one unit increase in domestic income

Marginal propensity to save (MPS) – an increase in savings for each rupee increase in disposable income. It is equal to one minus the marginal propensity to consume

Medium of exchange – one of the roles of money and the assets used to make payments

Monetary approach to balance of payments (MABOP) – emphasizes monetary causes of balance of payments problem

Money – an asset which is used for making immediate payments

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Money multiplier- ratio of money stock to the monetary base

Mundell-Fleming model – explores economy with flexible exchange rates and perfect capital mobility

N

National income – total payments to factors of production, net national product minus indirect taxes

Net national product – GDP minus allowances for depreciation of capital

Net exports – exports minus imports

Net present value (NPV) – 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 – expressed as the payment in current rupees 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

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O

Open economy – the economy that trades the goods, assets and services to other countries

Open market operation – the reserve bank purchases and sells treasury bills in exchange for money

Open market sale – an operation in which the reserve bank buys government bonds on the secondary market

Opportunity cost – thing forgone when taking an action

Outside lags – a time required for a policy change to take effect

P

Pegging the interest rate – a practice of using monetary policy to keep the interest rate near a target level

Perfect capital mobility – situation in which 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 – theory in which people's expectations of their future income guides their choice on how much to consume based on those expectations as well as their current income

Personal savings – an income saved by individuals or families

Philips Curve – curve showing the relationship 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 will require for future contingencies.

Price stickiness – when prices are unable to adjust quickly enough to keep markets in equilibrium

Production function – the technological relationship showing how much output can be produced for a given combinations of inputs

Purchasing power parity – when the exchange rate adjusts to maintain equal purchasing power between foreign and domestic currency

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Q

Quantity theory of money – theory of money demand emphasizing the relationship of nominal income to nominal money

R

Rational expectations – the theory of the formation of expectations in which expectations are based on available information about the underlying economic variable

Real business cycle theory – 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 – a decline in the purchasing power of the rupee (currency) relative to other currencies

Real exchange rate – purchasing power of foreign currency relative to the rupee (currency)

Real GDP – 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 rupee (currency) 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 – lowest wage at which an individual is willing to accept a job. If the wage is lower than the reservation wage then he/she will reject the job offer

Reserve ratio – the ratio of bank reserves to bank deposits; a primary determinant of the money multiplier

Reserves – deposits which the central bank keeps to itself instead of lending

Revaluation – an increase in the 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 – an issue whether or not the central bank and government should conduct their policy in accordance with pre-announced rules

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S

Savings – money not spent on one's daily needs

Seigniorage – means the revenue derived from the government's ability to print money

Short run – a period of time short enough that markets are unable to clear therefore output cannot be derived from the potential output

Speculative motive – people holding money, even though the return on holding money is small. People hold money because it reduces the risk associated with their portfolio assets

Stagflation – 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 – assets that maintain their value over time

Supply shocks – an economic disturbance the first impact of which is a shift in the aggregate supply curve

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T

Targets – 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 rupees (currency) into a country due to sales of goods abroad

Transactions motive – the reason why people hold money and they use it to purchase goods and services

Transfer payments – money given by the government to the people, e.g. welfare payments of entitlement programs

U

Unemployment gap – the difference between the actual unemployment rate and the natural rate

Unit of account – an asset in which prices are denoted

Unstable equilibrium – pushes nearby variables away from itself, if a variable is moved slightly away from the unstable equilibrium, will push it even further away

V

Velocity of money – the number of times the typical rupee (currency) changes hands during the year

W

Wage stickiness- when wages are unable to adjust quickly enough to clear the labor market

Y

Yield curve – shows the change in the interest rate as the bonds' maturities increase