Distance eDucation Module on

MACROECOnOmiCs (ECOn -2072)

For ACFN StudeNtS

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Preface

Macroeconomics is one of the approach in which the study of economics is undertaken. This material is designed for both the course Macroeconomics-I and II.

Regarding to the module's organization, there are six chapters to be covered in this course. The first chapter give introduction to the concept of macroeconomics; chapter two presents the details of national income accounting, chapter three is about aggregate demand in the closed economy, chapter four exclusively devoted to the theory of aggregated demand in the open economy, chapter five give emphasis on theory of consumption, and finally chapter six exclusively give emphasis on the theory investment.

All possible efforts have been made to enhance the usefulness of the material. In the module, it has been tried to discuss the main principles of economics and to make the science of economics understandable. Further, the explanation of various economic theories has been supported by appropriate tables, figures and examples. In addition, adequate number of activities and exercises are included for further learning procedures.

Dear learners and other interested readers! We hope that you will find this material worth reading. And perhaps, if any editorial or technical errors are committed, they are all ours.

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CHAPTER ONE

INTRODUCTION TO MACROECONOMICS

Dear distance learners! under this chapter we will learn about introductory concepts to macroeconomics. The modern macroeconomics has passed through different schools of thought. Classical laid the foundation; Keynesians build and monetarist have decorated it.

Chapter Objectives

At the end of this chapter, you will be able to:

- ✓ Differentiate macroeconomics from microeconomics
- ✓ Explain and understand various macroeconomic goals and instruments
- ✓ Explain different schools in macroeconomics

1.1. What Macroeconomics is about?

Dear distance learners! *Economics is the study of the economy and the behaviour of people in the economy.* Traditionally, economics is divided into ***microeconomics***, which studies the behaviour of individuals and organizations (consumers, firms and the like) at a disaggregated level, and ***macroeconomics***, which studies the overall or aggregate behaviour of the economy. Since our interest here is with macroeconomics, we seek to explain phenomena such as inflation, unemployment, and economic growth and we are not concerned with, say, the demand for or supply of a specific commodity. ***Macroeconomics*** is concerned with the behaviour of the economy as a whole- with booms and recessions, the economy's total output of goods and services and the growth of output, the rate of inflation and unemployment, the balance of payments, and exchange rates. Macroeconomics focuses on the economic behaviour and policies that affect consumption and investment, trade balance, the determinants of changes in wages and prices, monetary and fiscal policies, the money stock, government budget, interest rate, and national debt.

Dear learners! In macroeconomics, we do ***two things***.

- ✓ ***First****, we seek to understand the economic functioning of the world we live in*; and,
- ✓ ***Second****, we ask if we can do anything to improve the performance of the economy*.

That is, we are concerned with both explanation and policy prescriptions. Explanation involves an attempt to understand the behaviour of economic variables, both at a moment in time and as

time passes. Modern macroeconomics recognizes that it is important to focus on more than just short period of time, and so has an explicitly dynamic focus. We thus try to explain the behaviour of economic variables over time. This means that we wish to explain the behavior of the economy both in the long run and in the short run.

 ***Dear distance learners! What is the difference between macro and micro economics?***

1.2. Macroeconomic Goals and Instruments

The major macroeconomic goal is to maintain

a) Economic Growth: - produce more and better services, or, more simply, develop a higher standard of living.

b) Full Employment: - Provide suitable jobs for all citizens who are willing and able to work.

c) Economic efficiency: - Achieve the maximum fulfilment of wants using the available productive resources

d) Price level stability: - stability: - Avoid large upswings and downswings in the general price level; that is avoid inflation and deflation.

e) Equity: - Ensure that no group of citizens faces stark absolute poverty while others enjoy luxury.

f) Balance of trade: - seek a reasonable overall balance with the rest of the word in international trade and financial transactions.

Nations use different policy instruments in order to achieve these and other goals.

A policy instrument is an economic variable under the control of government that can affect one or more of the macroeconomic goals. Some of the policy instruments are; fiscal policy, monetary policy, international economic policy, and incomes policy.

a) Fiscal policy is the use of government expenditures and taxes to affect aggregate demand and aggregate supply.

- ❖ Government expenditure includes government spending on goods and services. It determines the relative size of the public and private sectors.

- ❖ Taxation affects the overall economy in two ways: **i)** Taxes tend to reduce the amount people spend on goods and services. **ii)** Taxes affect market prices, thereby influencing incentives and behaviour.

b) ***Monetary policy*** determines the money supply as well as interest rates, in order to achieve desired economic objectives. Changes in the money supply move interest rates up or down and affect spending in sectors such as investment, housing, and net exports. Monetary policy has an important effect on both actual GNP and potential GNP.

c) ***International Economic Policy*** consists of two sets of policies:

- ❖ Trade policies, which consist of tariffs, quotas, and other devices that restrict or encourage imports and exports.
- ❖ Exchange-rate setting. Exchange rate represents the price of one currency in terms of the currencies of the other nations. There are different systems to regulate foreign exchange market.

d) ***Incomes policies*** are government attempts to moderate inflation by direct steps (legislated wage, price controls). Incomes policies are the most controversial of all macroeconomic policies.

1.3. The State of Macroeconomics: Evolution and Recent Developments

❖ The Development of Macroeconomics

Partly as a reaction to the Great Depression of the 1930's and with the publication of Keyne's General Theory of Employment, interest and Money in 1936, modern macroeconomics developed as analytical framework for understanding what causes fluctuations in the levels of employment and output.

What economic theory needed during the 1930's was an explanation of the disastrous experience of those years. How could an economy plunge to a predicament in which a quarter of a nation's resources were idle? Keynes provided a theory to explain this phenomenon. It was so successful that it began a Keynesian era in macroeconomic theory that stood in sharp contrast to the classical theory that had prevailed over the preceding century or more.

During the decade, following the appearance of the General Theory of Keynes, economists addressed themselves to refining and building on the pioneer work of Keynes, to analyzing the

complex economic processes that determine the actual level of employment. This was a major shift from early held belief that the economy, through forces of competitive market, will remain uninterruptedly at full utilization (full employment).

The accepted economic theory of the pre-Keynesian era argued that full employment was the normal state of affairs and that departure from this were strictly temporary.

❖ Schools of Thoughts in Macroeconomics

Following the appearance of the General Theory of Keynes, macroeconomic theory could be neatly divided into two parts: Classical and Keynesian. Keynes chooses to contrast the ideas he presented in the General Theory with the prevailing ideas by labeling them as classical.

In economic theory, the term "Classical" had been coined by Karl Marks, who used it to cover the theories of David Ricardo, James Mill and their predecessors. Keynes extended the term to include the followers of Ricardo, who perfected the theory of the Ricardian economics, like J.S.Mill, Marshal, Edge Worth, and Pigou.

Despite the tremendous success of Keynes work, it did not by any means put an end to the further development of classical macroeconomics. New and different formulations of Classical theory appeared under the heading ***neoclassical in 1870s***. Beginning in 1950s another extension of classical macro-economic theory has emerged. This theory is known as ***monetarism***, so called because of the critical role it assigns to money as a determinant of what happens in the economy. Finally, in ***1970s*** came the latest theoretical development with roots in classical theory-the ***New Classical Economics.***

As these developments were occurring on the classical side, there were also changes on the Keynesian side. Over the years following the publication of the General theory, economists refined and extended the many insights contained in it and gradually built what is known as Keynesian economics. Keynesian economics has also two groups: ***Neo-Keynesian*** (members of this school are predominantly British) and ***Post-Keynesians*** (members are predominantly Americans).

So much is about the development of Macroeconomic thought. Based on the current debates, it is possible to classify the schools of thought into two:

- ✓ The New Classical School
- ✓ The New Keynesian School

So far, it has been tried to highlight the evolution of macroeconomic thinking over time. Now, let's consider somewhat deeper analysis of macroeconomic thinking of each school emphasizing major tenets and policy implications of the same.

1) Classical (1776 – 1870)

Dear learners! In this period the distinction between micro and macro was not clear. The ruling principle was the *invisible hand* coined by Alfred Marshall. The Classicals have made an ample contribution to the development of economic science. They felt the ***market was self-adjusting***.

- o *With regard to the labor market*, they contend that *labor demand and labor supply are brought into equilibrium by the real wage*. As a result, there is *no involuntary unemployment*.
- o With regard to the *financial market*, for Classicals *saving and investment are brought into equilibrium by the interest rate* and *investment responds to the interest rate*.
- o *In the money market, money demand is simply a transaction demand and money has no any effect on the real economy and hence raising the money supply simply pushes up prices (i.e. inflationary).* In general, for this school markets (be it, commodity, factor, and money) works best if left to themselves.

Implication

Government has no any role in the economy through its fiscal and monetary policy. To this end, the classical are the proponents of laissez-faire (no government role).

Influential Classical Economists Include: *David Hume (1711-1776), Adam Smith (1723-90), Thomas Malthus (1766-1834), David Ricardo (1772-1823), John Stuart Mill (1806-1873), Karl Marx (1818-1883), Alfred Marshall (1842-1924), and Arthur Pigou (1877-1959).*

2) *Neo-classical (1870–1936)*

Basically the neoclassical school is not different from the classical school. The main distinction is the tool of analysis, such as the marginal analysis. In the area of growth theory, they gave us neoclassical growth models. Eg: Solow growth model

3) Keynesian (1936 – 1970s)

The main theme of the Keynesian stream is that the economy is subjected to failure so that it may not achieve full employment level. Thus, government intervention is inevitable. This school views the labor market in that workers and firms bargain for a money wage, not for real wage. Money wages adjust slowly and workers resist any drop in the money wage. Unlike the Classicals, for Keynesians saving and investment are brought into equilibrium by changes in income. *Investment is not influenced by a mere change in interest rate*; rather it is affected by expectations of the future, which is uncertain. Money demand is affected by transactions, but also by other things, in particular fear, which may lead to a "speculative demand" for high money balances. *With regard to the role of the government, Keynes argued that the government role was needed to preserve capitalism because without management, a modern capitalist economy is so unstable that it may threaten the social compact that it rests on.*

- **In short, the following are the Principal Tenets of the Keynesian school:**
  - Keynesians believe that AD is influenced by a host of economic decisions – both public and private.
  - Changes in AD, whether anticipated or unanticipated, have their greatest short-run impact on real output and employment, not on prices.
  - Keynesians believe that prices and especially wages respond slowly to changes in supply and demand, resulting in shortages and surpluses,
  - Keynesians are more concerned about combating unemployment than about conquering inflation.

Policy Implication

During recessions, government should satisfy peoples demand for more cash preventing the downward spiral of shrinking income and shrinking spending via ***monetary expansion***. But Keynes worried that even this might sometimes not be enough, particularly if a recession had been allowed to get out of hand and become a true depression. Once the economy is deeply depressed, households and especially firms may be unwilling to increase spending no matter how much cash they have; they may simply add any monetary expansion to their hoarding. Such a situation, in which monetary policy has become ineffective, has come to be known as a

"liquidity trap".[1] In such a case, the government has to do what the private sector will not spend. ***When monetary expansion is ineffective, fiscal expansion must take its place.*** Such a fiscal expansion can break the vicious circle of low spending and low incomes and getting the economy moving again.

Influential Keynesian Economists Include: *John Maynard Keynes* (1883-1946), *Paul Samuelson* (1915-), ***James*** *Tobin* (1918-), and *Franco Modigliani* (1918-),

4) 1970s – Present.

There is no dominant school of thought of macroeconomics. There have been two main intellectual traditions in macroeconomics. One school of thought believes that government intervention can significantly improve the operation of the economy; the other believes that markets work best if left to themselves. In the 1960s, the debate on these questions involved *Keynesians*, including Franco Modigliani and James Tobin, on one side, and *monetarists*, led by Milton Friedman, on the other. In the 1970s, the debate on much the same issues brought to the for a new group- the *new classical macroeconomists*, who by and large replaced the monetarists in keeping up the argument against using active government policies to try to improve economic performance. On the other side are the *new Keynesians*; they may not share some of the detailed belief of Keynesians, except the belief that government policy can help the economy perform better.

5) Monetarism

Monetarism, as advocates of free market, started challenging Keynes's theory in the 1970s. Milton Friedman, the founder of monetarism, attacked Keynes idea of smoothing business cycle on the ground that such active policy is not only unnecessary but actually harmful, worsening the very economic instability that it is supposed to correct, and should be replaced by simple, mechanical monetary rules. This is the doctrine that came to be known as "monetarism." *Friedman began with a factual claim: most recessions, including the huge slump that initiated*

[1] ***A liquidity trap*** is a situation, described in Keynesian Economics, in which injections of cash into the private banking system by a central bank fail to decrease interest rates and hence make monetary policy ineffective. A liquidity trap is caused when people hoard cash because they expect an adverse event such as deflation, insufficient aggregate demand, or war.

the Great Depression, did not follow Keynes's script. That is, they did not arise because the private sector was trying to increase its holdings of a fixed amount of money. Rather, they occurred because of a fall in the quantity of money in circulation. With regard to the labor market, while not putting forward his own theory of the labor market, Friedman argues that people do tend to think in real terms and not in nominal amounts. Friedman had a strong faith in the ability of the private sector to produce growth and stability if it is not constrained by government. *Friedman is a libertarian, opposed to government interference on principle***.**

Policy Rule under Monetarism

If economic slumps begin when people spontaneously decide to increase their money holdings, then the monetary authority must monitor the economy and pump money in when it finds a slump is imminent. If such slumps are always created by a fall in the quantity of money, then the monetary authority need not monitor the economy; it need only make sure that the quantity of money doesn't slump. In other words, a straightforward rule- ***"Keep the money supply steady"- is good enough,*** so that there is no need for a "discretionary" policy of the form, "Pump money in when your economic advisers think a recession is imminent." ***Thus, for Monetarists, depressions were the consequence of a temporary shortage of money and this implied that monetary policy was of prime importance in determining the aggregate level of output and employment.***

Influential Monetarists Include: *Milton Friedman (1912-), & Karl Brunner (1916-), Allan Meltzer (1928-), & David Laidler (1938-)*

6) The New Classical School (1980s)

Dear learners! The new classical macroeconomics remained influential in the 1980s. This school of macroeconomics shares many policy views with Friedman. It sees the world as one in which individuals act rationally in their self-interest in markets that adjust rapidly to changing conditions. The government is claimed, likely only to make things worse by intervening. The central working assumptions of the new classical school are:

1. ***Economic agents maximize***. Households and firms make optimal decisions given all available information in reaching decisions and that those decisions are the best possible in the circumstances in which they find themselves.
2. ***Expectations are rational***, which means they are statistically the best predictions of the future that can be made using the available information. Rational expectations imply that people will eventually come to understand whatever government policy used, and thus that it is not possible to fool most of the people all the time or even most of the time.
3. ***Markets clear.*** There is no reason why firms or workers would not adjust wages or prices if that would make them better off. Accordingly prices and wages adjust in order to equate supply and demand; in other words, market clear. For instance, any unemployed person who really wants a job will offer to cut this or her wage until the wage is low enough to attract an offer from some employer. Similarly, anyone with an excess supply of goods on the shelf will cut prices so as to sell. The essence of the new classical approach is the assumption that markets are continuously in equilibrium.

Influential New Classical Economists include: *Robert Lucas (1937-), Neil Wallace (1939-),* ***Thomas*** *Sargent (1943-),and Robert Barro (1944-)*

7) The New Keynesian Macroeconomics (1980s)

New Keynesian economics is the school of thought in modern macroeconomics that evolved from the ideas of John Maynard Keynes. Keynes wrote *The General Theory of Employment, Interest, and Money* in the thirties, and his influence among academics and policymakers increased through the sixties. In the seventies, however, new classical economists such as Robert Lucas, Thomas J. Sargent, and Robert Barro called into question many of the principles of the Keynesian revolution. The label *"new Keynesian"* describes those economists who, in the eighties, responded to this *new classical* critique with adjustments to the original Keynesian tenets.

The new classical group remains highly influential in today's macroeconomics. But a new generation of scholars, the *new Keynesians,* mostly trained in the Keynesian tradition but moving beyond it, emerged in the 1980s. They do not believe that markets clear all the time but seek to understand and explain exactly why markets fail.

The new Keynesians argue that markets sometimes do not clear even when individuals are looking out for their own interests. Both information problems and costs of changing prices lead to some price rigidities, which help cause macroeconomic fluctuations in output and employment.

The primary disagreement between new classical and new Keynesian economists is over how quickly wages and prices adjust. New classical economists build their macroeconomic theories on the assumption that wages and prices are flexible. They believe that prices "clear" markets—balance supply and demand—by adjusting quickly. New Keynesian economists, however, believe that market-clearing models cannot explain short-run economic fluctuations, and so they advocate models with "sticky" wages and prices. *New Keynesian theories rely on this stickiness of wages and prices to explain why involuntary unemployment exists and why monetary policy has a strong influence on economic activity.*

A long tradition in macroeconomics (including both Keynesian and monetarist perspectives) emphasizes that monetary policy affects employment and production in the short run because prices respond sluggishly to changes in the money supply. According to this view, if the money supply falls, people spend less money, and the demand for goods falls. Because prices and wages are inflexible and don't fall immediately, the decreased spending causes a drop in production and layoffs of workers. ***New classical economists criticized this tradition because it lacked a coherent theoretical explanation for the sluggish behavior of prices. Much new Keynesian research attempts to remedy this omission.***

A. Menu Costs and Aggregate-Demand Externalities

One reason that prices do not adjust immediately to clear markets is that adjusting prices is costly. To change its prices, a firm may need to send out a new catalog to customers, distribute new price lists to its sales staff, or in the case of a restaurant, print new menus. These costs of price adjustment, called "*menu costs,*" cause firms to adjust prices intermittently rather than continuously.

Economists disagree about whether menu costs can help explain short-run economic fluctuations. Skeptics point out that menu costs usually are very small. They argue that these small costs are

unlikely to help explain recessions, which are very costly for society. Proponents reply that small does not mean inconsequential. Even though menu costs are small for the individual firm, they could have large effects on the economy as a whole.

Proponents of the menu-cost hypothesis describe the situation as follows. To understand why prices adjust slowly, one must acknowledge that *changes in prices have externalities*—that is, effects that go beyond the firm and its customers. For instance, a price reduction by one firm benefits other firms in the economy. When a firm lowers the price it charges, it lowers the average price level slightly and thereby raises real income. (Nominal income is determined by the money supply.) The stimulus from higher income, in turn, raises the demand for the products of all firms. This ***macroeconomic impact of one firm's price adjustment on the demand for all other firms' products is called an "aggregate-demand externality." Firms which do not lower their prices causes real aggregate demand to be lower in recessions than it would be otherwise; if all firms were to lower their prices together, real balances would rise and real demand for all firms' output would increase. Thus, aggregate demand externality due to firms' inability to reduce prices explains fluctuations in aggregate output and employment.***

In the presence of this aggregate-demand externality, small menu costs can make prices sticky, and this stickiness can have a large cost to society. Suppose that General Motors announces its prices and then, after a fall in the money supply, must decide whether to cut prices. If it did so, car buyers would have a higher real income and would, therefore, buy more products from other companies as well. But the benefits to other companies are not what General Motors cares about. Therefore, General Motors would sometimes fail to pay the menu cost and cut its price, even though the price cut is socially desirable. This is an example in which sticky prices are undesirable for the economy as a whole, even though they may be optimal for those setting prices.

B. The Staggering of Prices

New Keynesian explanations of sticky prices often emphasize that *not everyone in the economy sets prices at the same time*. Instead, the adjustment of prices throughout the economy is staggered. Staggering complicates the setting of prices because firms care about their prices

relative to those charged by other firms. Staggering can make the overall level of prices adjust slowly, even when individual prices change frequently.

Consider the following example. Suppose, first, that price setting is synchronized: every firm adjusts its price on the first of every month. If the money supply and aggregate demand rise on May 10, output will be higher from May 10 to June 1 because prices are fixed during this interval. But on June 1 all firms will raise their prices in response to the higher demand, ending the three-week boom.

Now suppose that price setting is staggered: Half the firms set prices on the first of each month and half on the fifteenth. If the money supply rises on May 10, then half the firms can raise their prices on May 15. Yet because half of the firms will not be changing their prices on the fifteenth, a price increase by any firm will raise that firm's relative price, which will cause it to lose customers. Therefore, these firms will probably not raise their prices very much. (In contrast, if all firms are synchronized, all firms can raise prices together, leaving relative prices unaffected.) If the May 15 price setters make little adjustment in their prices, then the other firms will make little adjustment when their turn comes on June 1, because they also want to avoid relative price changes. And so on. The price level rises slowly as the result of small price increases on the first and the fifteenth of each month. Hence, staggering makes the price setting sluggish, because no firm wishes to be the first to post a substantial price increase.

C. Coordination Failure

Some new Keynesian economists suggest that recessions result from a failure of coordination. ***Coordination problems can arise in the setting of wages and prices because those who set them must anticipate the actions of other wage and price setters***. Union leaders negotiating wages are concerned about the concessions other unions will win. Firms setting prices are mindful of the prices other firms will charge.

To see how a recession could arise as a failure of coordination, consider the following parable. The economy is made up of two firms. After a fall in the money supply, each firm must decide whether to cut its price. Each firm wants to maximize its profit, but its profit depends not only on its pricing decision but also on the decision made by the other firm.

If neither firm cuts its price, the amount of real money (the amount of money divided by the price level) is low, a recession ensue, and each firm makes a profit of only fifteen dollars.

If both firms cut their price, real money balances are high, a recession is avoided, and each firm makes a profit of thirty dollars. Although both firms prefer to avoid a recession, neither can do so by its' own actions. If one firm cuts its price while the other does not, a recession follows. The firm making the price cut makes only five dollars, while the other firm makes fifteen dollars.

The essence of this parable is that each firm's decision influences the set of outcomes available to the other firm. When one firm cuts its price, it improves the opportunities available to the other firm, because the other firm can then avoid the recession by cutting its price. This positive impact of one firm's price cut on the other firm's profit opportunities might arise because of an aggregate-demand externality.

What outcome should one expect in this economy? *On the one hand, if each firm expects the other to cut its price, both will cut prices, resulting in the preferred outcome in which each makes thirty dollars*. On the other hand, *if each firm expects the other to maintain its price, both will maintain their prices, resulting in the inferior solution, in which each makes fifteen dollars.* Hence, either of these outcomes is possible: there are multiple equilibria.

The inferior outcome, in which each firm makes fifteen dollars, is an example of a coordination failure. If the two firms could coordinate, they would both cut their price and reach the preferred outcome. ***In the real world, unlike in this parable, coordination is often difficult because the number of firms setting prices is large***. *The moral of the story is that even though sticky prices are in no one's interest, prices can be sticky simply because people expect them to be.*

D. Efficiency Wages

Another important part of new Keynesian economics has been the development of new theories of unemployment. Persistent unemployment is a puzzle for economic theory. *Normally, economists presume that an excess supply of labor would exert a downward pressure on wages.* A reduction in wages would, in turn, reduce unemployment by raising the quantity of labor

demanded. *Hence, according to standard economic theory unemployment is a self-correcting problem.*

However, New Keynesian economists often turn to theories of what they call efficiency wages to explain why this market-clearing mechanism may fail. *These theories hold that high wages make workers more productive.* ***The influence of wages on worker efficiency may explain the failure of firms to cut wages despite an excess supply of labor***. Even though a wage reduction would lower a firm's wage bill, it would also—if the theories are correct—cause worker productivity and the firm's profits to decline.

Let's mention three of the various theories about how wages affect worker productivity.

1. ***One efficiency-wage theory holds that high wages reduce labor turnover.*** Workers quit jobs for many reasons—to accept better positions at other firms, to change careers, or to move to other parts of the country. The more a firm pays its workers, the greater their incentive to stay with the firm. By paying a high wage, a firm reduces the frequency of quits, thereby decreasing the time spent hiring and training new workers.
2. ***The average quality of a firm's work force depends on the wage it pays its employees.*** If a firm reduces wages, the best employees may take jobs elsewhere, leaving the firm with less productive employees who have fewer alternative opportunities. By paying a wage above the equilibrium level, the firm may avoid this adverse selection, improve the average quality of its work force, and thereby increase productivity.
3. ***A high wage improves workers' effort***. This theory posits that firms cannot perfectly monitor the work effort of their employees and that employees must themselves decide how hard to work. Workers can choose to work hard, or they can choose to shirk and risk getting caught and fired. The firm can raise worker effort by paying a high wage. The higher the wage, the greater is the cost to the worker of getting fired. By paying a higher wage, a firm induces more of its employees not to shirk and, thus, increases their productivity.

Policy Implications

Because new Keynesian economics is a school of thought regarding macroeconomic theory, its adherents do not necessarily share a single view about economic policy. At the broadest level

new Keynesian economics suggests—in contrast to some new classical theories—that recessions do not represent the efficient functioning of markets. The elements of new Keynesian economics, such as menu costs, staggered prices, coordination failures, and efficiency wages, represent substantial departures from the assumptions of classical economics. *In new Keynesian theories recessions are caused by some economy-wide market failure*. Thus, new Keynesian economics provides a rationale for government intervention in the economy, such as countercyclical monetary or fiscal policy.

Chapter-One: Review Questions

Part I: Choose the best answer from the given alternatives

1) Which of the following **does not** refer to macroeconomics?

A) The study of the cause of inflation

B) The study of the economic behavior of individual decision-making units such as consumers, resource owners, and business firms.

C) The study of the cause of unemployment

D) The study of the aggregate level of economic activity.

E) It studies the aggregate behavior.

2) Fiscal policy refers to the

A) Household's attempts to change savings to encourage growth.

B) Government's use of spending and taxing policies to influence aggregate demand and aggregate supply.

C) Government's use of policy tools to influence the net export function, thereby influencing GDP.

D) Business sector's influence on investment and GDP.

E) Government's attempts to maintain a vertical long run aggregate supply curve.

3) Which one of the following is **true** about liquidity trap?

A) It is best explained by the new classical school economists

B) If the economy is in liquidity trap, both fiscal and monetary policy are ineffective

C) If the economy is in liquidity trap, fiscal policy must be in action

D) Monetary policy is ineffective if the economy moved to liquidity trap

E) It is not the concern of policy makers since it has no treat for the economy

4) **Except one,** all are **true** about Monetarism school of thought

A) Active policy is not only unnecessary but actually harmful

B) Most recessions occurred because of a fall in the quantity of money in circulation

C) In labour market, people do tend to think in nominal terms and not in real amounts.

D) Depressions were the consequence of a temporary shortage of money

E) Monetary policy was of prime importance in determining the aggregate level of output and employment.

5) One is **not** appreciating the '***invisible hand theory'***

A) Franco Modigliani

B) Alfred Marshall

C) Robert Lucase

D) Milton Friedman

E) All except 'B'

6) One of the following consists of tariffs, quotas, and other devices that restrict or encourage imports and exports.

A) Fiscal Policy

B) International economic policy

C) Monetary policy

D) Income policy

E) A & B

7) One of the following is **not** the view of Keynesian economists

A) Workers and firms bargain for a money wage, not for real wage

B) Government intervention is inevitable.

C) Saving and investment are brought into equilibrium by changes in interest rate.

D) They concerned about combating unemployment than about conquering inflation.

E) None of the above

Part II: Essay

1) Briefly explain at least four major macroeconomic goals?

2) Briefly discuss the three theories about how wages affect worker productivity?

CHAPTER TWO

NATIONAL INCOME ACCOUNTING

2.1. Introduction

Dear distance learner! In this chapter, we will discuss the various concepts related to national income accounting and the methods of measuring national income. More specifically, after the completion of this chapter you will be able to:

- Understand the concepts of GDP and GNP, and how they can be measured
- Differentiate Nominal GDP from Real GDP
- Understand the concept of GDP Deflator and the Consumer Price Index
- Explain the relationship between GDP and Welfare
- Understand the concept of Business Cycle, Unemployment and Inflation

Dear learner! National income accounting is considered as the most comprehensive measure of how well an economy is performing. To have an idea of the performance of the economy, measuring the national income of a country is extremely important. But measuring national income is an extremely complicated large task. However, economists have devised various ways of estimating national income. In fact, national income estimates are made in every country these days.

What Is National Income (Output)?

The national income of a country in a year is the value, expressed in monetary terms of the net contribution of the factors of production through the production units in the country and abroad in the year. It is thus, the monetary expression of the current flow of net final good and services resulting from the production activities of the normal residents of a country during the year. Concretely, national income is the net domestic product (or net domestic income) of a country plus net income from abroad.

If all the national income is in fact consumed then the national income consists of consumer's goods and services only. If only a part of the national income is consumed in the year then the part that remains accumulate as a stock of goods or as capital stocks. National income then would consist of consumer's goods and services plus increase in stocks of goods,

i.e., of consumption plus investment. Net investment includes increase in the stocks of fixed capital goods and working of capital goods.

If however, people consume more than the national income then it would probably mean that the stock of capital goods has been eaten in to or that the people have received gifts from abroad. Gifts from abroad refer to current transfer from abroad of consumer goods and services. The national income is, thus the goods and services available to the normal residents in a country, as a result of their production efforts in the year, to consume or to invest.

*In simple words**, national income is the aggregate factor income (i.e., earning of labour and capital, etc), which arises from the current production of goods and services by the nation's economy.** The nation's economy refers to the factor of production (labour and capital,etc) supplied by the normal residents of the national territory.*

From the above definitions it is clear that the concept of national income has three types of interpretations:

- ✓ National income represents a receipt total,
- ✓ National income represents an expenditure total, and
- ✓ National income represents a total value of production.

This three-fold interpretation takes place because of the fact that every expenditure is at the same time a receipt, and if goods or services bought are valued at their sales prices, we have a three-fold identity that the value received equals the value paid, equal the value of goods and services given in exchange.

Dear distance learners, the following are points to note from National income Definition

Firstly, national income refers to the income of a country, say, Ethiopia. ***Secondly***, its measurement refers to a specified period of time, say, a year. ***Thirdly***, national income includes all types of goods and services, which have an exchange value, counting each one of them only once.

When we calculate the national income of a nation, we should remember that no commodity or service should be counted twice; otherwise the results will not be accurate. For

example, if raw cotton has been evaluated in agricultural production, it should not be included while calculating the total value of cotton textiles. In the same manner, the value of raw cotton shall have to be kept out while calculating the total value of readymade garments, such as, bush-shirts and trousers made out of cotton textiles. Generally, two statistical methods are used to avoid double counting or multiple counting in the calculation of national income: Final products method, and Value-added method.

1. ***Final products method***
   - *We add up the value of final products only.*
   - We first take the total value of the final consumer goods and producer goods produced in the country during the year.
   - This will provide us the aggregate value of all the final goods produced in the country during the year.
   - Collective and government services (evaluated at cost price) are also to be added to this aggregate value of the final goods in order to arrive at the total product of the nation concerned.
2. ***Value-added method***
   - ✓ We add the values created at each stage in the manufacturing of a commodity.
   - ✓ Then all such values accruing at all processes in the manufacturing of all commodities are added up together to arrive at the national income of the country.

Example:

Let us suppose that a ready-made bush-shirt passes through four Stages of production. In the first stage, the farmer produces raw cotton from the soil. In the second stage, the raw cotton is converted in to cotton cloth in a factory. In the third stage, the cotton cloth is converted in to a bush-shirt by the ready-made garments firm. In the fourth stage, the ready-made bush-shirt is sold to a retailer from whom the customer finally purchases it. Now money value of all the transactions, which take place in the various stages of production of a bush-shirt, should not be added up while making an estimate of the national income of the country; otherwise, there will be multiple counting and the result will not be accurate.

❖ *Factors determining national income*

Dear learners! There are a number of factors that determine the size of the national income in a country. It's on account of these influences that one country may have a larger national income than another. Following are the three main influences:

1. ***Quantity and Quality of Factors of production.*** The quantity and quality of a country's stocks of the factors of production is one of the most important influences on its national income. The quantity and quality of land, the climate, the rainfall etc., determine the quantity and quality of agricultural production, and hence, the size of national income. The quantity of a labour has doubled influences since labour is at the same time both a factor of production as well as the consumer of what is produced. The quality of labour, depending upon inborn intelligence, education and training, also influences the volume of industrial production. Capital may comprise simple, primitive tools or the most modern type of industrial equipment. The quantity and quality of capital is one of the greatest influences on total output. Likewise, the quantity and quality of entrepreneurial ability is also an important element to consider within the determination of the size of national income of a country.
2. ***The state of technical know-how***: Another influence on output and national income is the state of technical know-how in the country. A country with a poor technical knowledge cannot have a large-sized national income, because it will not be in a position to make the best possible use of its resources.
3. ***Political Stability***: Political stability is an essential prerequisite for maintaining production at the highest level.

❖ *Then what is National Income Accounting?*

National income accounts are the instruments that help us to measure the national income of the country. The various types of national income accounts helps us to measure the level of production in the economy at some point of time, and explain the immediate causes of the level of performance.

Dear learners! Various aggregates and concepts concerning domestic and national income are used in national income accounting. The following are some of the most important totals relating to national income accounts:

- Gross national product (GNP)
- Gross domestic product (GDP)
- Net national product (NNP)
- National income (NI) or net national income at factor cost (NNI at factor cost)
- Personal income (PI)
- Disposable personal income (DPI); and
- Real income (RI)

Instead of giving a single comprehensive estimate of national income, economists use different such aggregates. The reasons for this are:

- ✓ There is disagreement among the economists over what should and what should not be counted as national income. Instead of passing a judgment on this controversy, the statistics department of the government gives some totals leaving it to each user to select the one he/she prefers.
- ✓ Another reason for this is that a certain total may be most useful for one purpose and a different total for another purpose.

2.2. Basic Concepts of GDP and GNP

1. Gross National product (GNP)

What is Gross national product?

- It is the nation's total production of goods and services (usually for one year) evaluated in terms of the market prices of goods and services produced.
- It includes all the economic productions in the economy during one year.
- Strictly speaking, then ***the GNP is the money value of the total national production for any given period.***

2. Gross Domestic Product (GDP)

- The other most important measure of overall economic performance is *GDP*.

- GDP is an attempt to summarize all economic activity over a period of time in terms of a single number; it is a measure of the economy's total output and of total income.
- In other words, ***GDP is the value of all final goods and services produced in the economy in a given time period*** (Note that GDP is a flow not a stock concept).



Dear distance learners! Have you got the difference between GDP and GNP form their definitions?

GNP is the value of final goods and services produced by domestically owned factors of production within a given period. While GDP is the value of final goods and services produced within the country's territory within a given period, the factors of production used might not be domestically owned.

The difference between GDP and GNP also corresponds to the net income earned by foreigners. When GDP exceeds GNP residents of a given country are earning less abroad than foreigners are earning in that country. That is, GNP can be higher than GDP, less than GDP or equal to GDP depending on the magnitude of the net factor income /NFI= factor income earned by residents less factor income paid for foreigners/

I.e., $\boldsymbol{GNP = GDP + NFI}$

- ✓ *In simple words, GDP is territorial while GNP is national.*

Dear learners from the above discussion we should note two points:

First, we must take in to account the ***money value of the final goods*** (and services) produced in the economy to avoid double or multiple counting. It should be remembered that final goods and services are those, which are finally consumed by the consumers. Such goods and services do not enter in to the manufacture of other goods. As against this, intermediate goods and services are those goods and services, which do enter in to the production of other goods and services (Bread, for example, is final good, but flour is an intermediate good). Intermediate products are to be excluded from GDP or GNP.

Second, we must take in to account the money value of ***only currently produced goods* and services** while estimating the GNP of the country. This is due to the fact that the GNP is a measure of the economy's productivity during a particular period of time.

2.3. Approaches of Measuring National Income (GDP/GNP)

Dear learners! There are two methods of estimating the national income of a country. Both the methods lead to the same results. Those are: Expenditure approach and Income approach.

❑ Expenditure Approach:

The GDP can be viewed as the nation's total expenditure on goods and services produced during the year. Each unit of goods and services produced is matched by an expenditure on that unit. The consumers buy most of the good and services produced in the country. But there are some goods and services, which remains unsold. If the unsold goods and services were regarded as having been bought by the producers who hold them as stocks or inventories, then the monetary value of the total national production would be equal to the total national expenditure.

Under the expenditure approach to GDP, the total national expenditure can be broken down in to the following four categories:

A) ***Personal Consumption Expenditure (C):*** It includes the consumption expenditure made for both ***durable goods*** (such as, motor-cars, radio-sets, etc., but not houses) and ***non-durable goods*** (such as, food, drinks, clothing, etc.) produced in the country during the year. This sub-head also includes expenditure on the purchase of a house but it should be treated as investment rather than consumption expenditure.

B) ***Gross Domestic Private Investment (I):*** This item includes private investment in 'capital' or 'producer goods', such as, buildings, machinery, plant, equipment, etc; Business firms primarily purchase such goods. Houses are also included in this category of expenditure, because they are so durable that they represent, in fact, capital goods. Three points should be carefully noted here.

- ✓ ***Firstly***, this sub-head includes *capital or investment goods* needed not only to replace the existing depreciated capital goods, but also the *capital goods* required to increase the society's production of goods and services.
- ✓ ***Secondly***, the term '*investment*' here means *real investment* in the Keynesian sense rather than financial investment. It means the purchase of real investment goods, such as, buildings, machinery, plant, etc. produced during the year.

- ✓ ***Thirdly***, '*investment'* here does not include mere financial transfer, such as, the purchase of existing stocks and shares on the stock exchange. The purchase of existing stocks and shares does not represent new investment for purposes of the national income accounts since it does not involve any production.

C) Governments' Purchases of Goods and Services (G): The governments-central, state and local-purchase from the market ***consumer goods***, such as, paper, stationery, cloth, etc, as well as investment goods, such as machinery, equipment, plant, etc, for their own enterprises. In addition, the governments also purchase a number of different services-military, police, secretarial etc. Transfer payments should be excluded.

D) ***Net Export /Net Foreign Demand (N_x)***: As is well known, the entire production of a country is not sold within the country. At the same time, the country imports some finished goods from other countries during the year. To make proper allowance for such exports and imports, the value of imports should be deducted from the value of exports. Net exports represent the net expenditure from abroad on our goods and services, which provides income for domestic producers.

Thus, it is clear that if the entire production of a country is purchased at market prices, the amount so spent will represent the GDP of the country at market price. Therefore, to estimate the GDP, we have to add the above four categories of expenditure. Symbolically:

$$\boldsymbol{GDP = C + I + G + N_X}$$

Dear distance learners! Having the above method of calculating GDP, how can we get the value of GNP?

We know the difference between GDP and GNP is the net factor income from abroad (NFI) which is the difference between Income received from abroad by the citizen of the country (IR), and the income paid to the foreigner (IP):

$$\boldsymbol{NFI = IR - IP}$$

Gross national product, the market value of all final goods and services produced domestically owned factors of production, is the sum of GDP and net factor income from abroad.

Symbolically:

$$\boldsymbol{GNP = GDP + NFI}$$

I.e., $GNP = C + I + G + N_X + NFI$

If there is no net factor income received from abroad:

$$GNP = GDP = C + I + G + N_X$$

❑ Income Approach:

Dear learners! The expenditure incurred on purchasing goods and services produced in a country during the year also becomes the income of the various factors, which collaborated in the production of those goods and services. We can group these factor-incomes in the following categories:

A. Wages and salaries of the employees (or compensation to employees),
B. Incomes of non-company business
C. Rental incomes of persons
D. Corporate profits, and
E. Incomes from Interest

- The first category, as said above, includes the *wages and salaries received by the employees during the year plus certain supplements.* These supplements are the contributions, which the employers make to ***social security*** and other ***provident funds*** or ***pension funds of the workers***.
- The second category includes the incomes earned by individual proprietors, parents and self-employed persons.
- The third category comprises rental income earned by individuals on agricultural and non-agricultural property.
- The fourth category includes corporate profits earned by business corporations before the payment of corporate profit taxes or the payment of dividends to the shareholders. Thus, the corporate profits, used in calculating the GNP, are equal to the sum of corporate profit taxes plus dividends paid to the shareholders plus undistributed corporate profits.
- The fifth category contains net interest earned by individuals from sources other than the organs of the government.



Dear distance learners! Do you think that an aggregate of the above five categories of incomes will be equal to the GDP as estimated by the Expenditure Method?

An aggregate of the above five categories of incomes will not be equal to the GDP as estimated by the Expenditure Method. The reason is that a part of the total expenditure incurred by the community does not become available to the other factors of production in the form of incomes. There are two such leakages.

- ✓ *First,* indirect taxes levied by the government on goods and services; and
- ✓ *Second*, depreciation of machinery, plants and buildings.

The expenditure incurred by the households (factors) on goods and services includes the indirect taxes levied by the government. The income from these indirect taxes goes to the government and is not available to the households (factors). Likewise, while calculating the GDP, we include the depreciation (loss in value suffered by machinery, equipment, buildings etc.). *Like the indirect taxes, the payment on account of depreciation does not become available to the households (factors) in the form of income.* In other words, depreciation is not part of the factor incomes. Therefore, while estimating the GDP by the Income Method, we have to add indirect taxes and depreciation charges to the factor incomes.

***Symbolically*: $GDP = W/S + I + R + \Pi + r + IT + D$**

Therefore, $GNP = \frac{W}{S} + I + R + \Pi + r + IT + D + NFI$

Or

$$GNP = GDP + NFI$$

2.4. Other Social Accounts

Various aggregates and concepts concerning domestic income and national income are used in national income accounting. We have discussed the meaning and measurements of two of them GDP and GNP. The following section gives a brief introduction to some other concepts relating to national income.

i) Net Domestic Product (NDP) and Net National Product (NNP)

The second important concepts of national income are net domestic product and net national product.

- ***Net Domestic Product*** is the net market value of all the final goods and services produced in the domestic territory of a country during a year.
- ***Net national product*** is defined as the net production of goods and services produced by citizens of a country during a year

As we know, in the course of a year's production, part of the physical plant that was on hand at the beginning of the year is worn out, or it may depreciate in value as it becomes outdated. Building gradually deteriorate, machinery wears out or becomes obsolete, and so on. No sooner or later, if depreciated capital is not replaced, the income of the nation will decline, and the economy as a whole will become poorer. If we want to measure the level of income that can be sustained therefore, we must deduct the depreciation of capital from gross output (GNP or GDP) during the period concerned. What is left after this deduction is the net product. Thus,

$$\boldsymbol{NNP = GNP - Depreciation}$$

$$\boldsymbol{NDP = GDP - Depreciation}$$

Net products are better concepts than gross products, because it makes proper allowance for the depreciation suffered by capital goods during the period under consideration. These concepts give a proper idea of the net increase in total production of a country. They are, therefore, used in analyzing the long-period problems of maintaining and increasing the supply of capital goods in the country.

In spite of this fact that for some purposes of economic growth NNP is much more important than GNP, it is more difficult to measure statistically, because we have no accurate record of the amount of depreciation for various capital goods, such as, buildings, equipment, plants etc. The result is that the deduction that has to be made from GNP to arrive at NNP is a matter of judgment, rather than of exact measurement. Because of this difficulty, this concept of NNP is not fairly used.

ii) Net National Income at Factor Cost (NNI)

National Income at factor cost means the sum of all incomes earned by resource suppliers for their contribution of land, labour, capital and entrepreneurship during the year's net production. In other words, national income at factor cost shows how much it costs society in terms of economic resources to produce that net output. Sometimes, we simply call it national income.

Both GNP and NNP measure the values of goods produced in industry at the prices that those goods actually bring in the market. Here the difficulty is that when we buy these goods at market prices, then the ***prices include the respective taxes*** on these goods levied by the government. Hence, not all of the payment made for goods goes to the people who produced them. Some part of it goes to the government. It does not constitute a part of the true cost of producing the goods concerned. This violates the basic identity that the value of goods produced is equal to the sum of the money incomes received by the producers. In other words, the GNP will exceed the sum money incomes received by people of the country (resource suppliers). The excess is explained by the fact that we have included in GNP the entire output of government services, but we have also included part of the payments made for these services in the prices of the products (in terms of sales tax). In other words, a part of the cost of government has been counted twice. In order to get rid of this double counting, we may introduce the concept of net national income at factor cost. It is equal to net national product minus indirect tax plus subsidies.

Mathematically:

$$\boldsymbol{NI_{FC} = NNP_{MP} - Indirect\ taxes + Subsidies}$$

Where, NI_{FC} is national income at factor cost & NNP_{MP} is net national product at market price.

The concept of national income at factor cost occupies an important place in economics. It indicates the nature of distribution of wealth among various factor inputs. This concept is more satisfactory than the concept of GNP and NNP, because it eliminates the element of double counting inherent in those two concepts. It accords with the basic principle of economic theory, that the payments received by the factor suppliers equal the value of the goods

produced. Further, the components of national income (at factor cost) are very useful in dealing with certain economic problems. Changing relative shares of different elements in the population from time to time have an important bearing on the fluctuations of economic activity, and on the personal inequality of incomes, which has much to do with economic welfare.

iii) Personal Income (PI)

Personal income is the sum of all incomes actually received by all individuals or households during a given year. National income (that is, total income earned during a year) is different from personal income (That is, the income actually received by households). We know that all, which is produced by industry and government, must necessarily belong to someone, and hence can be regarded as national income received or accrued by the people (of the country), but not all of the value of this product is paid to them as money income.

Part of the net earnings of business firms are taken away from them by government in the form of corporate income taxes, excess profits taxes, and the like, before being paid to the owners of the business firms. These are direct taxes that do not enter into the prices of commodities. Further, many firms retain part of their earnings in the business, to make addition to their plants or as a reserve for future emergencies, instead of distributing the entire profits to their shareholders. Therefore, these earnings are not allowed to receive in money all of the salaries or wages that they earn. The government charges a withholding tax, which is used to finance social security payments to the aged, the unemployed and certain other persons. Similarly, the government makes some other transfer payments to people of the country.

All these things create a difference between the total incomes received by individuals and the total social income produced. We subtract from national income all undistributed corporate profits, corporate income taxes and social security withholding taxes and then add transfer payments from government and business firms directly to persons; the resulting figure will be the personal income.

Thus,

$$Personal\ Income\ (PI) = Net\ National\ Income - undivided\ corporate\ Profits - Corporate\ Income\ Taxes - Social\ Security\ Contributions + Transfer\ payments.$$

The above concept of personal income is useful for certain special purposes. For example, it shows the ability of people to pay taxes. The personal income data are available on monthly basis whereas the data for national product and national income are not published so frequently and, therefore, the accurate idea cannot be drawn. This is the reason that personal income data are used for analyzing current changes in the economy.

iv) Disposable Income (DI)

The main drawback of personal income is that they do not tell us how much is actually at the disposable of people for their personal expenditure. For this we use the concept of disposable income. After a good part of personal income is paid to government in the form of personal taxes (such as income tax, property tax etc.), what remains of personal income is called Disposable Income. Thus,

$$\boldsymbol{Disposable\ Income\ (DI) = Personal\ Income - Personal\ Income\ Taxes}$$

Disposable income data are useful for studying the purchasing power of the consumers. Since disposable income can either be consumed or it can be saved; with its help we may study of consumption and saving that individuals make in the economy.

2.5. GDP and Its Imperfections

GDP measures the market values of all goods and services produced in the given period defined. Although most goods and services are valued at their market prices when computing GDP, some productions are not sold in the marketplace and therefore do not have market prices. *If GDP is to include the value of these goods and services, we must use an estimate of their value.* Such an estimate is called an ***imputed value***.

A. Housing Services and Imputations: Imputations are especially important for determining the value of housing. A person who rents a house is buying housing services and providing

income for the landlord; the rent is part of GDP, both as expenditure by the renter and as income for the landlord. Many people, however, live in their own homes. Although they do not pay rent to a landlord, they are enjoying housing services. To take account of the housing services enjoyed by homeowners, the Department of Commerce estimates what the market rent for a house would be if it were rented and includes that imputed rent as part of GDP.

In many cases, an imputation is called for in principle but, to keep things simple, is not made in practice. Because GDP includes the imputed rent on owner-occupied houses, one might expect it also to include the imputed rent on cars, lawn mowers, jewelry, and other durable goods owned by households. Yet the value of these services is left out of GDP.

B. Home productions: some of the output of the economy is produced and consumed at home and never enters the marketplace. For example, meals cooked at home are similar to meals cooked at a restaurant, *yet the value added in meals at home is left out of GDP.*

C. The Underground Economy: - Finally, no imputation is made for the value of goods and services sold in the underground economy. The underground economy is the part of the economy that people hide from the government either because they wish to evade taxation or because the activity is illegal. Domestic workers paid "off the books"- is one example. The illegal drug trade is another.

Because the imputations necessary for computing GDP are only approximate, and because the value of many goods and services is left out altogether, GDP is an imperfect measure of economic activity. These imperfections are most problematic when comparing standards of living across countries. The size of the underground economy, for instance, varies from country to country. Yet as long as the magnitude of these imperfections remains fairly constant over time, GDP is useful for comparing economic activity from year to year.

2.6. Nominal GDP Versus Real GDP

Dear distance learners! Do you think that GDP is a good measure of economic well-being?

Economists use the rules just described to compute GDP, which values the economy's total output of goods and services. ***But is GDP a good measure of economic well-being?*** Now let's consider two basic concepts: Nominal and Real GDP.

❑ ***Nominal GDP:*** Refers to the market value of goods and services measured at current prices.

- ✓ It increases either because prices rise or because quantities rise.
- ✓ ***It is not a good measure of economic well-being.*** Because this measure does not accurately reflect how well the economy can satisfy the demands of households, firms, and the government. For instance, if all prices doubled without any change in quantities, GDP would double. Yet it would be misleading to say that the economy's ability to satisfy demands has doubled, because the quantity of every good produced remains the same.

❑ ***Real GDP*****:** Refers to the market value of goods and services measured using a constant set of prices/ base-year prices.

- ✓ ***It changes only with changes in quantities, not prices.*** It shows what would have happened to expenditure on output if quantities had changed but prices had not.
- ✓ Because the prices are held constant, real GDP varies from year to year only if the quantities produced vary. Because a society's ability to provide economic satisfaction for its members ultimately depends on the quantities of goods and services produced, ***real GDP provides a better measure of economic well-being than nominal GDP.***

2.7. The GDP Deflator and the Consumer Price Index

Dear distance learners! How can we measure price level? Explain it.

We can use three indices to measure prices over time: The GDP Deflator, the Consumer Price Index (*CPI*) and the producer price index, among which the GDP deflator and *CPI* are widely applicable**.**

❑ *The GDP Deflator*

From nominal GDP and real GDP we can compute a third statistic: the ***GDP deflator***. The GDP deflator, also called the implicit price deflator for GDP, is defined as the ratio of nominal GDP to real GDP:

$$\text{GDP Deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}}$$

The GDP deflator reflects what's happening to the overall level of prices in the economy.

Dear learners! To better understand this, consider an economy with only one good, bread. If P is the price of bread and Q is the quantity sold, then $nominal\ GDP$ is the total number of dollars spent on bread in that year, $P \times Q$. Real GDP is the number of loaves of bread produced in that year times the price of bread in some base year, $P_{base} \times Q$. The GDP deflator is the price of bread in that year relative to the price of bread in the base year P/P_{base}.

The definition of the GDP deflator allows us to separate nominal GDP into two parts: one part measures quantities (*real GDP*) and the other measures prices ($the\ GDP\ deflator$). That is,

$$\boldsymbol{Nominal\ GDP = Real\ GDP \times GDP\ Deflator}.$$

Recall that Nominal GDP measures the current dollar value of the output of the economy. Real GDP measures output valued at constant prices. The GDP deflator measures the price of output relative to its price in the base year. We can also write this equation as

$$\text{Real GDP} = \frac{\text{Nominal GDP}}{\text{GDP Deflator}}.$$

The GDP deflator is used to deflate (i.e, take inflation out of) nominal GDP to yield real GDP.

- ***The Consumer Price Index (CPI)***

The most commonly used measure of the level of prices is the consumer price index (CPI). Just as GDP turns the quantities of many goods and services into a single number measuring the value of production, the CPI turns the prices of many goods and services into a single index measuring the overall level of prices. Thus, the CPI is the current year cost of basket of goods and services relative to the cost of the same basket in some base year.

For example, suppose that the typical consumer buys 5 apples and 2 oranges every month. Then the basket of goods consists of 5 apples and 2 oranges, and the CPI is

$$CPI = \frac{(5 \times Current\ Price\ of\ Apples) + (2 \times Current\ Price\ of\ Oranges)}{(5 \times 2002\ Price\ of\ Apples) + (2 \times 2002\ Price\ of\ Oranges)}$$

In this CPI, 2002 is the base year. The index tells us how much it costs now to buy 5 apples and 2 oranges relative to how much it cost to buy the same basket of fruit in 2002.

Note: The consumer price index is the most closely watched index of prices, but it is not the only such index. Another is the producer price index, which measures the price of a typical basket of goods bought by firms/producers rather than consumers.



Dear distance learners! What is the difference between CPI and GDP deflator? Explain it.

❑ *The CPI Versus the GDP Deflator*

Dear learners! The GDP deflator and the CPI give somewhat different information about what's happening to the overall level of prices in the economy. There are three key differences between the two measures.

1. The GDP deflator measures the prices of all goods and services produced, whereas the CPI measures the prices of only the goods and services bought by consumers. Thus, an increase in the price of goods bought by firms or the government will show up in the GDP deflator but not in the CPI.

2. The GDP deflator includes only those goods produced domestically. Imported goods are not part of GDP and do not show up in the GDP deflator. Hence, an increase in the price of a Toyota made in Japan and sold in this country affects the CPI, because the Toyota is bought by consumers, but it does not affect the GDP deflator.

3. The third and most subtle difference results from the way the two measures aggregate the many prices in the economy. The CPI assigns fixed weights to the prices of different goods, whereas the GDP deflator assigns changing weights. In other words, the CPI is computed using a fixed basket of goods, whereas the GDP deflator allows the basket of goods to change over time as the composition of GDP changes.

2.8. *GNP and Welfare*

Traditionally, growth is measured as the relative change in GNP per capita. The basic idea is that GNP per capita measures the current and the future per capita welfare. GNP equals (in a closed economy) consumption plus gross investment. Current welfare is then measured by current consumption, and the change in future consumption opportunities caused by current saving –and-investment decisions is measured by current investments. Obviously, GNP is not an appropriate

measure of welfare. Besides, the fact that it doesn't incorporate equity issues (both intra and intergenerational equity), and it also suffers from other drawbacks. In this connection, the following seems to be the most important failure:

- GNP is not a net concept. We are interested in net investment and therefore in NNP.
- Conventional net investments do not include changes in most natural assets, although they are indispensable for human welfare
- Consumption as conventionally measured does not include environmental damage.

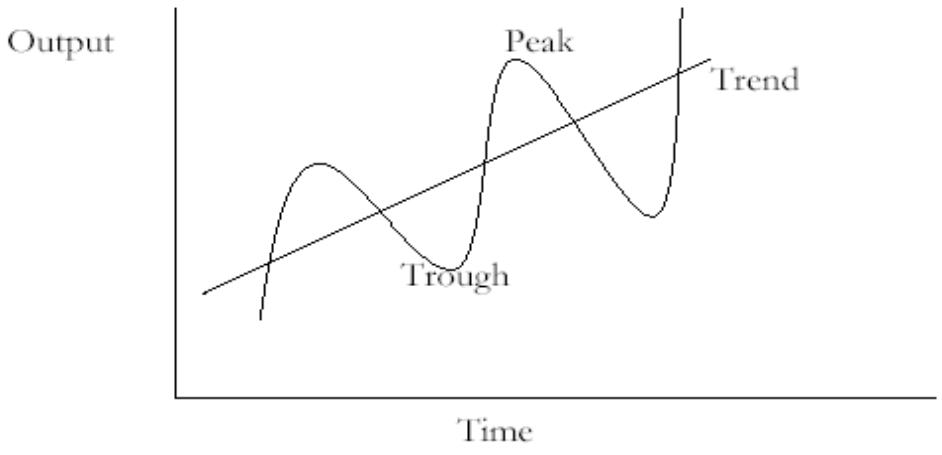
These and other perceived drawbacks of GNP as a welfare measure have created a number of studies on how to redefine the standard National Accounts in order to improve the informational content of NNP. In this connection Dasgupta and Maler (1991), Hartwick (1990, 1992) and Maler (1991) have tried to develop a theoretical framework for accounting system. ***It turns out that the 'correct' measure should be constructed as follows:***

NNP = Consumption - current environmental damage + Net investment in real capital
+ Net change in the value of Human capital
+ Net change in the value of the stock of natural capital

2.9. The Business Cycle and the Output Gap

The business cycle is the more or less regular pattern of expansion (recovery) and contraction (recession) in economic activity around the path of trend growth. At a cyclical peak, economic activity is high relative to trend; and at a cyclical trough, the low point in economic activity is reached. Inflation, growth, and unemployment all have clear cyclical patterns.

Figure 1: Business cycle



The trend path of GDP is the path GDP would take if factors of production were fully employed. Over time, real GDP changes for two reasons: ***First***, more resources become available which allows the economy to produce more goods and services, resulting in a rising trend level of output. ***Second***, factors are not fully employed all the time. Thus, output can be increased by increasing capacity utilization.

Output is not always at its trend level, that is, the level corresponding to full employment of the factors of production. Rather output fluctuates around the trend level. During expansion (or recovery) the employment of factors of production increased, and that is a source of increased production. Conversely, during a recession unemployment increases and less output is produced than can in fact be produced with the existing resources and technology. ***Deviations of output from trend are referred to as the output gap***.

The output gap measures the gap between actual output and the output the economy could produce at full employment given the existing resources. Full employment output is also called potential output.

$$\boldsymbol{Output\ gap\ =\ potential\ output - actual\ output}$$

When looking at the business cycle fluctuation, one question that naturally arises is whether expansions give way inevitably to old age, or whether they are instead brought to an end by policy mistakes. Often a long expansion reduces unemployment too much, causes inflationary pressures, and therefore triggers policies to fight inflation- and such policies usually create recessions.

❑ *Okun's Law*

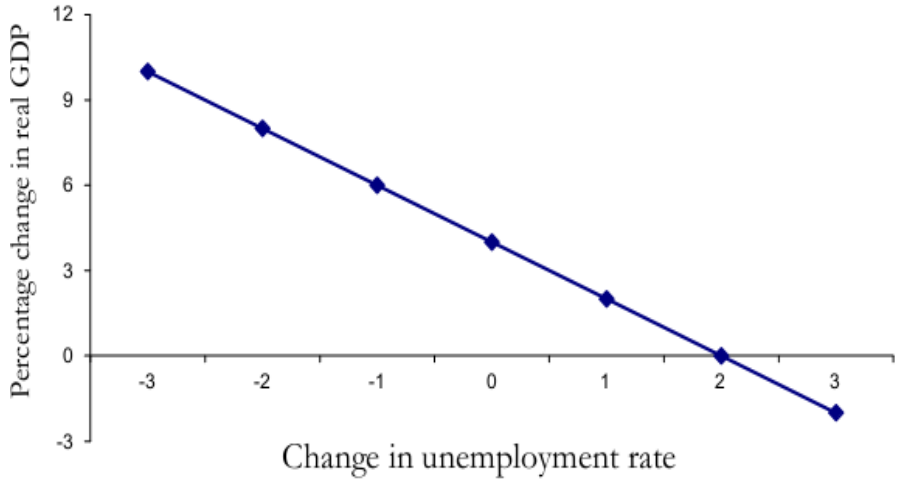
A relationship between real growth and changes in the unemployment rate is known as Okun's law, named after its discoverer, Arthur Okun. Okun's law says that the unemployment rate declines when growth is above the trend rate.

$$\Delta \boldsymbol{u} = -\boldsymbol{x}(\boldsymbol{y_a} - \boldsymbol{y_t})$$

Where $\Delta \boldsymbol{u}$ is change in unemployment, $\boldsymbol{x}$ the magnitude in which unemployment declines due to a percentage point growth, $\boldsymbol{y_a}$ actual growth rate of output, and $\boldsymbol{y_t}$ is trend output growth rate.

The figure below shows the Okun's law relationship between unemployment and growth in output.

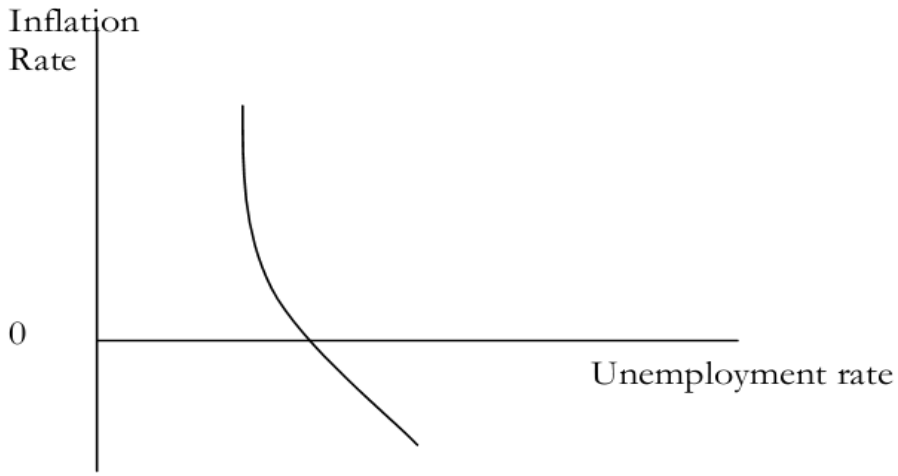
Fig 2: Change in unemployment rate



2.10. Inflation –Unemployment Dynamics: The Phillips Curve

The Phillips curve describes the empirical relationship between inflation and unemployment: the higher the rate of unemployment, the lower the rate of inflation. The curve suggests that less unemployment can always be attained by incurring more inflation and that the inflation rate can always be reduced by incurring the costs of more unemployment. In other words, the curve suggests that there is a trade-off between inflation and unemployment.

Fig. 3: Phillips curve



Chapter -Two: Review Questions

Part I: Choose the best answer from the given alternatives

1) One of the following refer GDP
   A) It include the value of used goods
   B) The sales of inventories doesn't affect the GDP
   C) It includes intermediate goods
   D) It doesn't reflect the economy's current production
   E) None

2) Which of the following statements is **true**?
   A) A peak occurs when economic activity starts decreasing.
   B) A peak occurs at the start of an economic recovery.
   C) A trough occurs when economic activity starts decreasing.
   D) A trough occurs at the start of an economic decline
   E) At trough the unemployment rate is very low

3) A positive GDP gap exists when:

   A) Real GDP is greater than potential GDP.
   B) Potential GDP is greater than real GDP
   C) Nominal GDP is greater than real GDP.
   D) Economic activity is at its full-employment level.
   E) When output gap gives negative result.

4) Economists use the term ***"business cycle"*** to refer to:
   A) The growth of small businesses into major corporations.
   B) Changes in products that occur from improved technology.
   C) Fluctuations in economic activity, measured by GDP or unemployment.
   D) Periods of increases and decreases in the rate of inflation.
   E) The fluctuations of the private sector profit level

5) GDP is an imperfect measure of economic activity because
   A) It doesn't include homely produced commodities for home consumption
   B) It can't absorb underground economy in its calculation
   C) It includes only final goods and service
   D) All of the above
   E) Both A and B

6) Which of the following best describes the difference between gross domestic product (GDP) and gross national product (GNP)?
   A) GDP measures output produced within domestic borders, while GNP measures output produced by domestic citizens.
   B) GDP measures output produced by domestic citizens within domestic borders, while GNP measures all output produced within domestic borders.

C) GDP measures output produced by domestic citizens, while GNP measures output produced within domestic borders.
D) GDP measures all output produced within domestic borders, while GNP measures output produced by domestic citizens within domestic borders.
E) None of the above

7) **Except one**, all of the following are **true** about GNP
A) Net products are better concepts than gross products,
B) GNP does not constitute a part of the true cost of producing the goods concerned.
C) GNP indicates the nature of distribution of wealth among various factor inputs
D) GNP will exceed the sum money incomes received by people of the country
E) None of the above

8) Which one of the following is **not true** about the Okun's law?
A) It shows the relationship between real growth and changes in the unemployment rate
B) It says that the employment rate declines when growth is above the trend rate.
C) It suggests that employment and growth have a negative relationship
D) Is describes the empirical relationship between inflation and unemployment.
E) All except A

Part II: Give the appropriate answer for the following questions

9) Briefly explain the three key differences between GDP deflator and Consumer Price Index (CPI)?

10) The following is the information from the national income accounts for a hypothetical country (in million Birr):

Gross National Product	**Birr 5000**
Indirect taxes	**Birr 580**
Subsidies	**Birr 330**
Net Domestic Product	**Birr 5900**
Net National Product	**Birr 4250**

Then,

A) Calculate Gross domestic product
B) Calculate Net National Income at Factor Cost
C) Calculate Net Factor Income

11) Imagine you buy six burgers, three books, and four T-shirts. In the first period, burgers are Birr 50 each, books are Birr 100 each, and T-shirts are Birr 120 each. Assume this will be our base period. In the second period, burgers are Birr 55, books are 110, and T-shirts are 130. Then, calculate the Consumer price index and interpret the result?

CHAPTER THREE

AGGREGATE DEMAND IN THE CLOSED ECONOMY

3.1. Foundation of the Theory of Aggregate Demand

The devastating episode of 1930s great depression caused many economists to question the validity of classical economic theory-seemed incapable of explaining the depression. According the classical theory, national income depends on factor supplies and the available technology, neither of which changed substantially from 1929 to 1933. After the onset of the Depression, many economists believed that a new model was needed to explain such a large and sudden economic downturn and to suggest government policies that might reduce the economic hardship so many people faced.

In 1936 the British economist John Maynard Keynes revolutionized economics with his book The General Theory of Employment, Interest, and Money. Keynes proposed a new way to analyze the economy, which he presented as an alternative to classical theory. His vision of how the economy works quickly became a center of controversy. Yet, as economists debated The General Theory, a new understanding of economic fluctuations gradually developed.

Keynes proposed that low aggregate demand is responsible for the low income and high unemployment that characterize economic downturns. He criticized classical theory for assuming that aggregate supply alone—capital, labor, and technology— determines national income. Economists today reconcile these two views with the model of aggregate demand and aggregate supply.

He argued that in the short run prices are sticky, so changes in aggregate demand influence income. In the long run, however, it is flexible and aggregate supply may influence income. But, in the long run **we all are dead**-Keynes popular statement. The implication is: Policy makers' looks into strategies how to influence aggregate demand and thereby address economic ills like downturns and depressions.

The model of aggregate demand developed in this chapter, called the IS-LM model, the leading interpretation of Keynes's theory. The goal of the model is to show what determines national

income for any given price level There are two ways to view this. We model can view the IS-LM model as showing what causes income to change in the short run when the price level is fixed. Or we can view the model as showing what causes the aggregate demand curve to shift. The two parts of the IS-LM model are, not surprisingly, the IS curve and the LM curve. IS stands for "investment" and "saving," and the IS curve represents what's going on in the market for goods and services. LM stands for "liquidity" and "money," and the LM curve represents what is happening to the supply and demand for money.

The two curves, IS and LM are linked by interest rate (i) which affects both investment and money demand. The model shows how interactions between the goods and money markets determine the position and slope of the aggregate demand curve and, therefore, the level of national income in the short run.

Figure 3.1: Aggregate Demand Curve

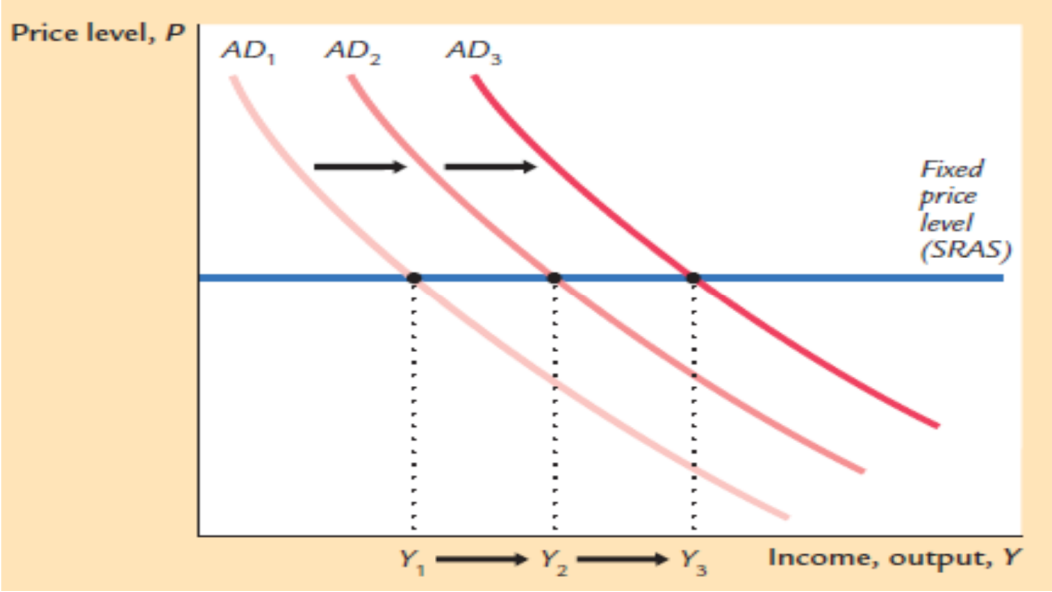


Figure 3.1 shows that in the short run when the price level is fixed, shifts in the aggregate demand curve lead to changes in the equilibrium level of national income.

3.2. The Goods Market and the IS Curve

The IS curve plots the relationship between the interest rate and the level of income that arises in the market for goods and services. To develop this relationship, we start with a basic model called the Keynesian cross. This model is the simplest interpretation of Keynes's theory of national income and is a building block for the more complex and realistic IS-LM model.

A) The Keynesian Cross

In his *General Theory,* Keynes proposed that an economy's total income was, in the short run, determined largely by the desire to spend by households, firms, and the government. The more people want to spend, the more goods and services firms can sell. The more firms can sell, the more output they will choose to produce and the more workers they will choose to hire. Thus, the problem during recessions and depressions, according to Keynes, was inadequate spending. The Keynesian cross is an attempt to model this insight. Planned Expenditure We begins our derivation of the Keynesian cross by differentiating between actual and planned expenditure. *Actual expenditure* is the amount households, firms, and the governments spend on goods and services and it equals the economy's gross domestic product (GDP). ***Planned expenditure*** is the amount households, firms, and the government would like to spend on goods and services.



Dear learners! Why would actual expenditure ever differ from planned expenditure?

The answer is that firms might engage in unplanned inventory investment because their sales do not meet their expectations. When firms sell less of their product than they planned, their stock of inventories automatically rises; conversely, when firms sell more than planned, their stock of inventories falls. Because these unplanned changes in inventory are counted as investment spending by firms, actual expenditure can be either above or below planned expenditure. Assuming the economy is closed, so that net exports are zero, we write planned expenditure AD as the sum of consumption(C), investment (I) and government purchase (G)

$$E=C+I+G \quad \text{.....} \quad (1)$$

Consumption is a function of disposable income (Y - T)

$$C= C(Y - T) \quad \text{.....} \quad (2)$$

This equation states that consumption depends on disposable income *(Y - T),* which is total

income *Y* minus taxes *T*.

To keep things simple, for now we take planned investment as exogenously fixed:

$$I = \bar{I} \quad \ldots\ldots\ldots\

they have no reason to change what they are doing. We can write the equilibrium condition as:

Actual Expenditure = Planned Expenditure

$$Y = E$$

In the figure below, the 45-degree line serves as a reference line that translates any horizontal distance in to an equal vertical distance. Thus, anywhere on the line, planned expenditure is equal to output. The equilibrium of this economy is at point A, where the planned-expenditure function crosses the 45-degree line.

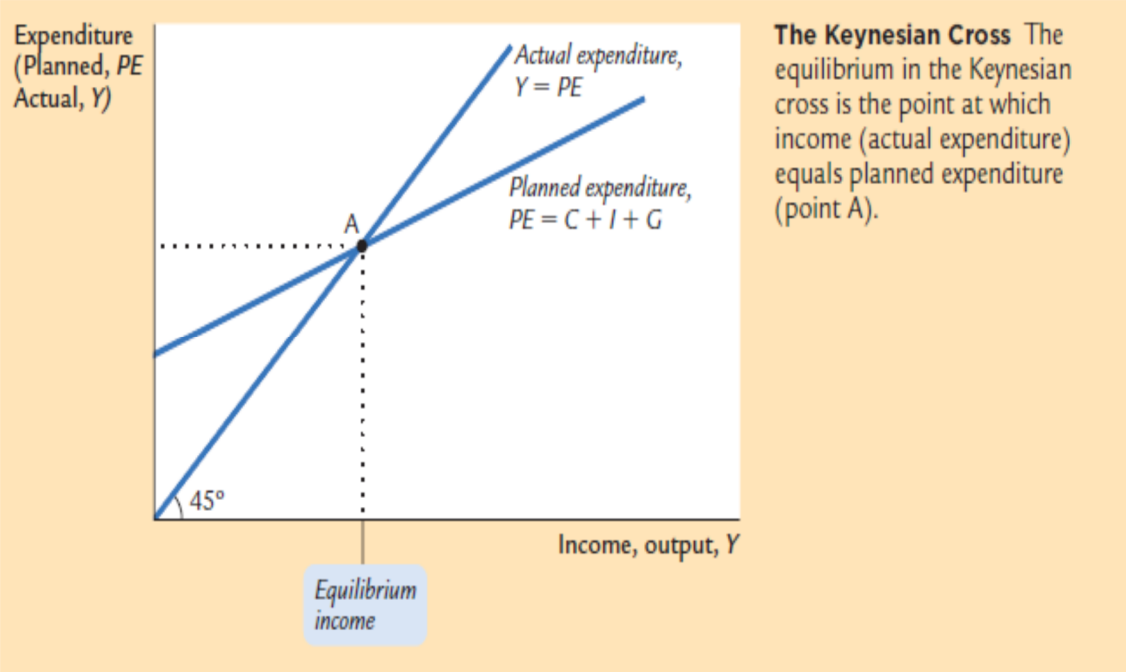


Fig. 3.3 the Keynesian cross

In summary, the Keynesian cross shows how income *Y* is determined for given levels of planned investment *I* and fiscal policy G and *T*. We can use this model to show how income changes when one of these exogenous variables changes.

C) How does the economy get to the equilibrium?

The equilibrium output would be achieved through inventory adjustment. Unplanned changes in inventories induce firms to change production levels, which in turn changes income and expenditure. For example, suppose the economy were ever to find itself with GDP at a level greater than the equilibrium level, such as the level Y_1 in Figure below.

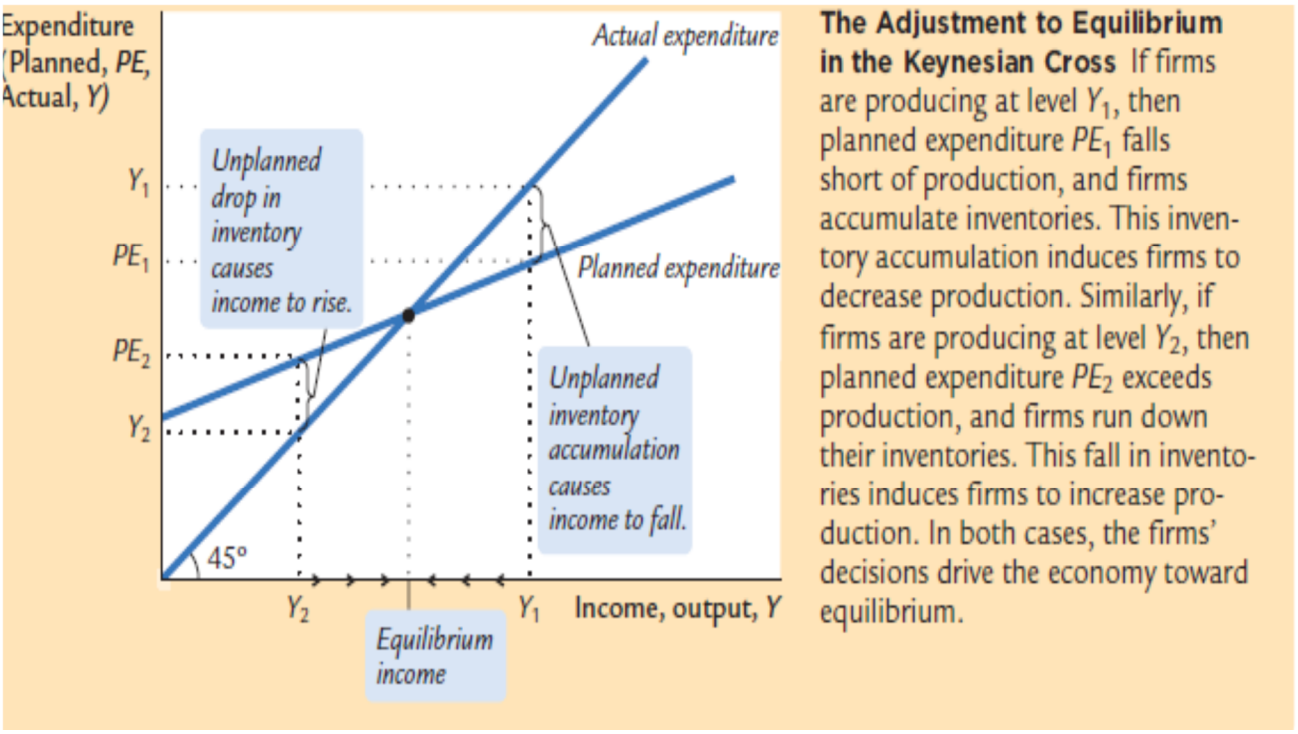


Figure 3.4 Adjustment in Keynesian cross

In this case, planned expenditure E_1 is less than production Y_1, so firms are selling less than they are producing. Firms add the unsold goods to their stock of inventories. This unplanned rise in inventories induces firms to lay off workers and reduce production, and these actions in turn reduce GDP. This process of unintended inventory accumulation and falling income continues until income Y falls to the equilibrium level. Similarly, suppose GDP were at a level lower than the equilibrium level, such as the level Y_2 in Figure 3.4. In this case, planned expenditure E_2 is greater than production Y_2. Finns meet the high level of sales by drawing down their inventories. But when firms see their stock of inventories decline, they hire more workers and increase production. GDP rises and the economy approaches the equilibrium.

In summary, the Keynesian cross shows how income Y is determined for given levels of planned investment I and fiscal policy G and T. We can use this model to show how income changes when one of these exogenous variables changes.

D) Fiscal Policy and the Multiplier: Government Purchases

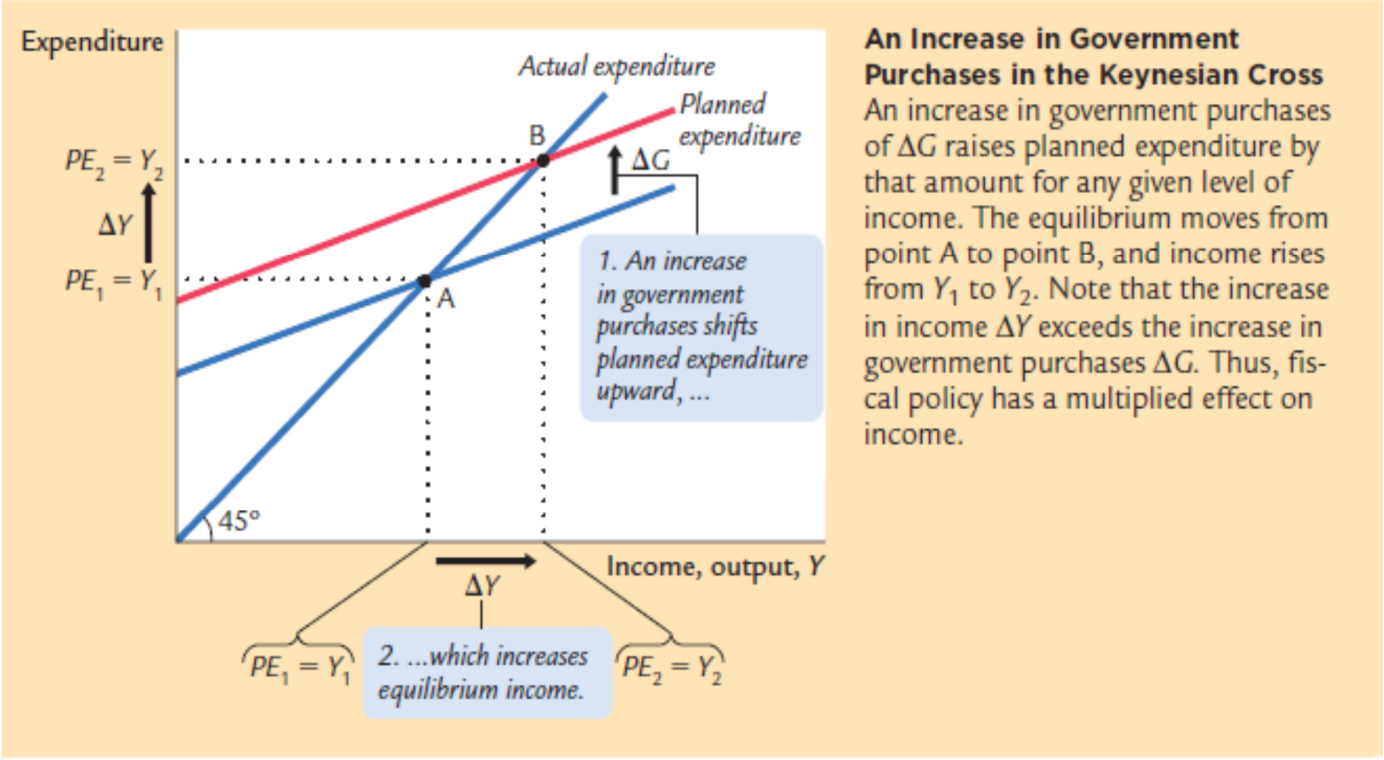


Fig. 3.5 Effect of government purchase on output in Keynesian cross

Consider how changes in government purchases affect the economy. Since government purchases are one component of expenditure, higher government purchases result in higher planned expenditure for any given level of income. If government purchases rise by ΔG, then the planned expenditure curve shifts upward by ΔG, as shown on the figure 3.5.

The graph shows that, an increase in government purchase leads to an even greater increase in income. That is, $\Delta Y > \Delta G$. The ratio $\Delta Y / \Delta G$ is called the **government purchases multiplier;** it tells us how much income rises in response to a $1 increase in government purchases. An implication of the Keynesian cross is that the government-purchases multiplier is larger than one.

Dear learners! Why does fiscal policy have a multiplied effect on income?

The reason is that, according to the consumption function $C = C(Y - T)$, higher income causes higher consumption. When an increase in government purchases raises income, it also raises consumption, which further raises income, which further raises consumption, and so on.

Therefore, in this model, an increase in government purchases causes a greater increase in income.

How big is the multiplier?

The process begins when expenditure rises by' $\triangle$ G, which implies that income rises by $\triangle$G as well. This increase in income in turn raises consumption by *MPC* * $\triangle$G, where *MPC* is the marginal propensity to consume. This increase in consumption raises expenditure and income once again. This second increase in income of *MPC* * $\triangle$G again raises consumption, this time by *MPC* * *(MPC* * $\triangle$G), which again raises expenditure and income, and so on. This feedback from consumption to income to consumption continues indefinitely. The total effect on income is:

Initial Change in Government Purchases =$\triangle$G

First Change in Consumption = *MPC** $\triangle$G

Second Change in Consumption = MPC^2*$\triangle$G

Third Change in Consumption = MPC^3 * $\triangle$G

" "

" "

" "

$\triangle$Y: = (1 + MPC + MPC^2 + MPC^3 + ...) $\triangle$G.

The government-purchases multiplier is

$$\triangle Y/\triangle G = 1 + MPC + MPC^2 + MPC^3 + ...$$

This expression for the multiplier is an example of an ***infinite geometric series***. A result from algebra allows us to write the multiplier as[2]

$$\triangle Y/\triangle G = 11 (1 - MPC).$$

For example, if the marginal propensity to consume is 0.6, the multiplier is

$$\triangle Y/\triangle G = 1 + \mathbf{0.6 + 0.6^2 + 0.6^3 + \ldots}$$

$$= 11 (1 - 0.6)$$

$$=2.5.$$

.:

In this case, a $1.00 increase in government purchases raises equilibrium income by $2.50.[2]

---

[2] *A Mathematical note:* We prove this algebraic result as follows.

Let

$z = 1 + x + x\,2 + ...$

Multiply both sides of this equation by *x:*

Alternatively, the government-purchases multiplier is can be easily derived using a little calculus. Begin with the equation

$$Y = C(Y - T) + I + G$$

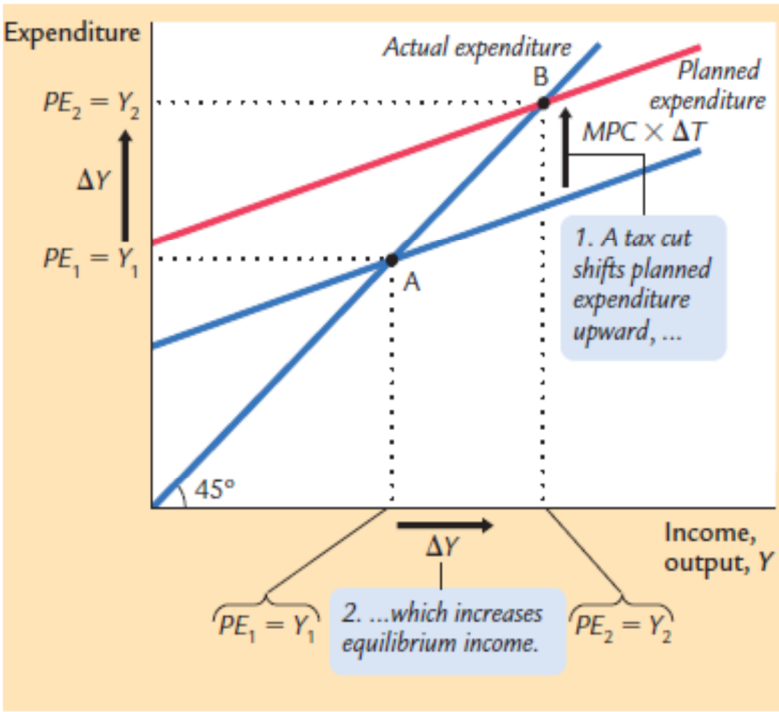
Holding T and I fixed, total differentiate to obtain

$$dY = CdY + dG,$$

and then rearrange to find

$$dY/dG = 1/(1 - C').$$

E) Effects a decrease in tax



A Decrease in Taxes in the Keynesian Cross A decrease in taxes of ΔT raises planned expenditure by $MPC \times \Delta T$ for any given level of income. The equilibrium moves from point A to point B, and income rises from Y_1 to Y_2. Again, fiscal policy has a multiplied effect on income.

Fig 3.6 Effect of tax on output in Keynesian cross

Just as an increase in government purchases has a multiplied effect on income, so does a decrease in taxes. As before, the initial change in expenditure, now *MPC* x *DT*, is multiplied by 1/ (1 - MPC).The overall effect on income of the change in taxes is

---

$xz = x + x2 + x3 + ...$

Subtract the second equation from the first:

$z + xz = 1.$

Rearrange this last equation to obtain

$z\ (1 - x) = l,$

which implies

$z = 1/\ (1 - x).$

$$\triangle Y / \triangle T = -MPC / (1 - MPC).$$

This expression is the **tax multiplier,** the amount income changes in response to a $1 change in taxes. For example, if the marginal propensity to consume is 0.6, then the tax multiplier is

$$\triangle Y / \triangle T = -0.6 / (1 - 0.6) = -1.5.$$

In this example, a $1.00 cut (decrease) in taxes raises equilibrium income by $1.50. The multiplier implies that taxes and income are inversely related and a unit decrease in taxes increase income by more than proportionately.

Dear learners! Describe government purchase multiplier and Tax multiplier and interpret the results.

3.2.1. The interest rate, Investment, and IS Curve

The Keynesian cross is only a stepping stone on our path to the *IS-LM* model. The Keynesian cross is useful because it shows how the spending plans of households, firms, and the government determine the economy's income. Yet it makes the simplifying assumption that the level of planned *investment I is fixed.* Here we set an important macroeconomic relationship between planned investment and the interest rate *r*.

The transition from the Keynesian cross to the *IS* curve is achieved by nothing that if the real interest rate changes, this change planned investment. The Keynesian cross analysis tells us that changes **III** planned investment change *GDP*.

Holding ***I*** and G fixed, differentiate to obtain $dY = C'(dY - dT)$, and then rearrange to find

$$dY / dT = -C' / (1 - C').$$

Thus, for example, if interest rate increases, planned investment falls, and so does output. Thus, higher levels of interest rate are associated with lower level of output.

To add this relationship between the interest rate and investment to our model, we write the level of planned investment as

$$I = I(r).$$

Here we drive the IS curve from the Keynesian cross and the investment function, which we can summarize in the following graphical relationship.

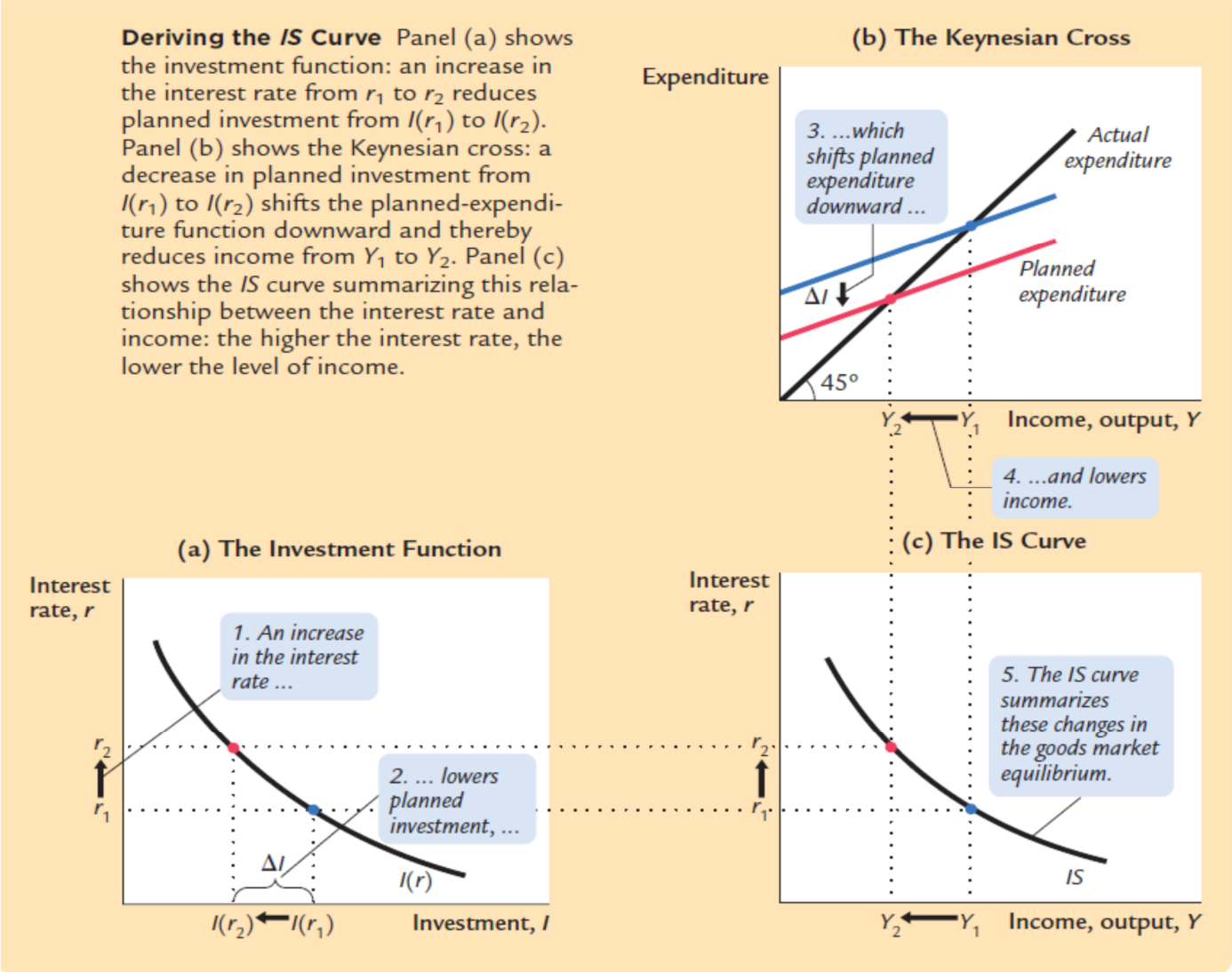


Fig.3.7 The derivation of IS curve

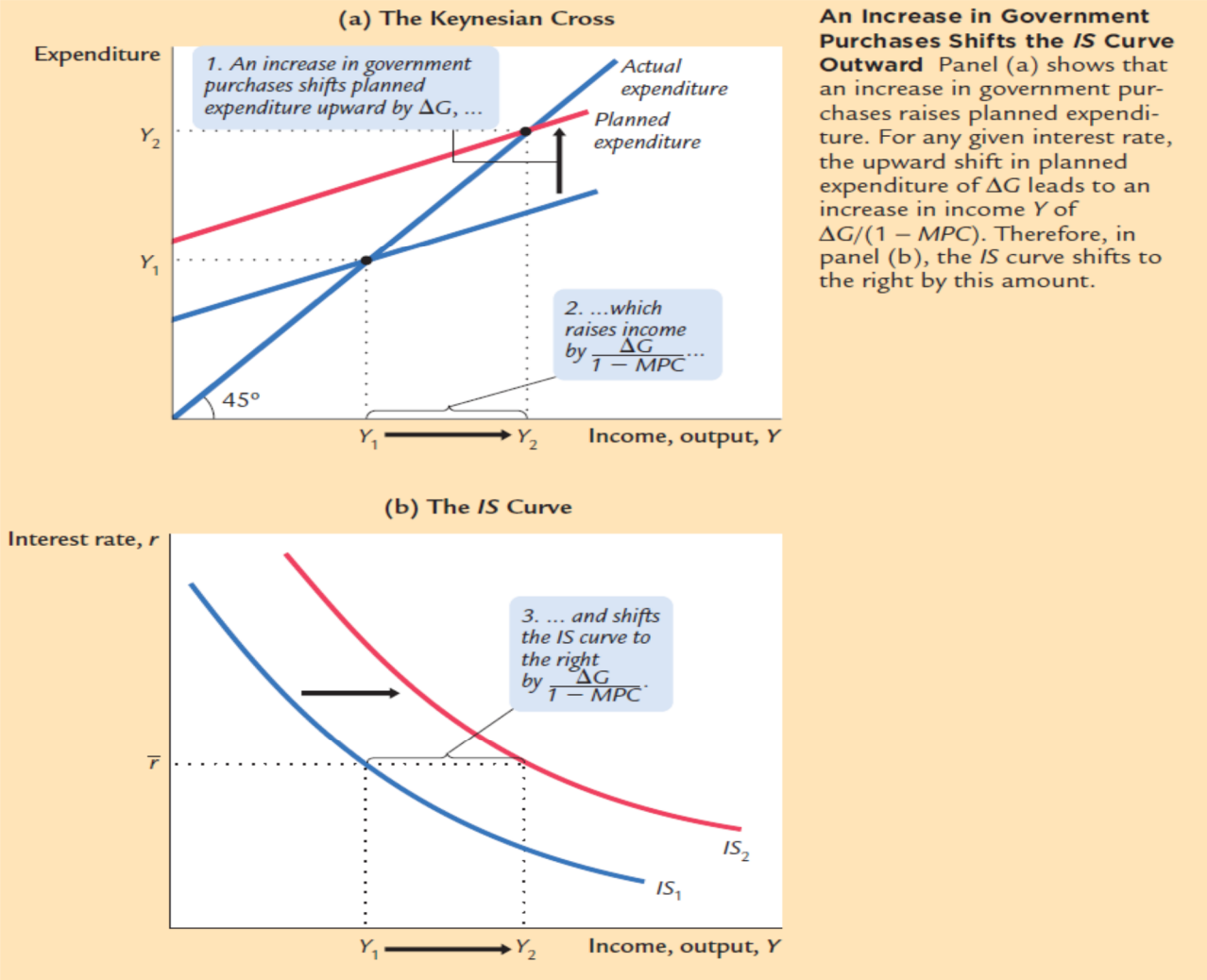
This investment function is graphed in panel (a) of figure above. Because the interest rate is the cost of borrowing to finance investment projects, an increase in the interest rate reduces planned investment. As a result, the investment function slopes downward.

To determine how income changes when the interest rate changes, we can combine the investment function with the Keynesian-cross diagram. Because investment is inversely related to the interest rate, an increase in the interest rate from r_1 to r_2 reduces the quantity of investment from $f(r_1)$ to $f(r_2)'$ The reduction in planned investment, in turn, shifts the planned-expenditure function downward, as in panel (b) of figure above. The shift in the planned-expenditure function causes the level of income to fall from $Y1$ to Y_2. Hence, an increase in the interest rate lowers income.

The *IS* curve, shown in panel (c) of Figure, summarizes this relationship between the interest rate and the level of income. In essence, the *IS* curve combines the interaction between *r* and *I* expressed by the investment function and the interaction between *I* and *Y* demonstrated by the Keynesian cross. Because an increase in the interest rate causes planned investment to fall, which in turn causes income to fall, the *IS* curve slopes downward.

3.2.2. How Fiscal Policy Shifts the *IS* Curve

The *IS* curve is drawn for a given fiscal policy; that is, when we construct the *IS* curve, we hold G and *T* fixed. When fiscal policy changes, the *IS* curve shifts. Figure below uses the Keynesian cross to show how an increase in government purchases by **ΔG** shifts the *IS* curve.



An Increase in Government Purchases Shifts the *IS* Curve Outward Panel (a) shows that an increase in government purchases raises planned expenditure. For any given interest rate, the upward shift in planned expenditure of ΔG leads to an increase in income Y of $\Delta G/(1 - MPC)$. Therefore, in panel (b), the *IS* curve shifts to the right by this amount.

Figure 3.8. Impact of an increase Government expenditure on IS curve

This figure is drawn for a given (constant) interest rate and thus for a given level of planned

investment. The Keynesian cross shows that this change in fiscal policy raises planned expenditure and thereby increases equilibrium income from Y_1 to *y2.* Therefore, an increase in government purchases shifts the *IS* curve outward. We can use the Keynesian cross to see how other changes in fiscal policy shift the *IS* curve. Because a decrease in taxes also expands expenditure and income, it too shifts the *IS* curve outward. A decrease in government purchases or an increase in taxes reduces income; therefore, such a change in fiscal policy shifts the *IS* curve inward.

Dear distance learners! How does a decrease in tax rate affect the IS curve?

3.3. The Money Market and the LM curve

The *LM* curve plots the relationship between the interest rate and the level of income that arises in the market for money balances. To understand this relationship, we begin by looking at a theory of the interest rate, called the **theory of liquidity preference.**

(A) The Theory of Liquidity Preference

This is a theory of interest rate determination in short run. It argues that interest tare, in the short run, is determined in the money market, where the demand and supply of real money balances intersect. Just as the Keynesian cross is a building block for the *IS* curve, the theory of liquidity preference is a building block for the *LM* curve. To develop this theory, we begin with the **supply of real money** balances. If *M* stands for the supply of money and *P* stands for the price level, then *MI P* is the supply of real money balances. The theory of liquidity preference assumes there is a fixed supply of real money balances. That is,

$$(\mathbf{M/P})^{\mathbf{s}} = \overline{\mathbf{M}}/\overline{\mathbf{P}}.$$

The money supply *M* is an exogenous policy variable chosen by a central bank, such as the National Bank. The price level *P* is also an exogenous variable in this model. (We take the price level as given because the *IS-LM* model-our ultimate goal in this chapter--explains the short run when the price level is fixed.) These assumptions imply that the supply of real money balances is fixed and, in particular, does not depend on the interest rate. Thus, when we plot the supply of real money balances against the interest rate in figure below, we obtain a vertical supply curve.

Next, consider the demand for real money balances. The theory of liquidity preference posits that

the interest rate is one determinant of how much money people choose to hold. The reason is that the interest rate is the opportunity cost of holding money: it is what you forgo by holding some of your assets as money, which does not bear interest, instead of as interest-bearing bank deposits or bonds. When the interest rate rises, people want to hold less of their wealth in the form of money. We can write the demand for real money balances as:

$$(M/P)d = L(r).$$

where the function *L( )* shows that the quantity of money demanded depends on the interest rate. Thus, the demand curve in figure below slopes downward because higher interest rates reduce the quantity of real money balances demanded. Money demand is best understood here if you consider it as the amount of money people hold in their pocket.

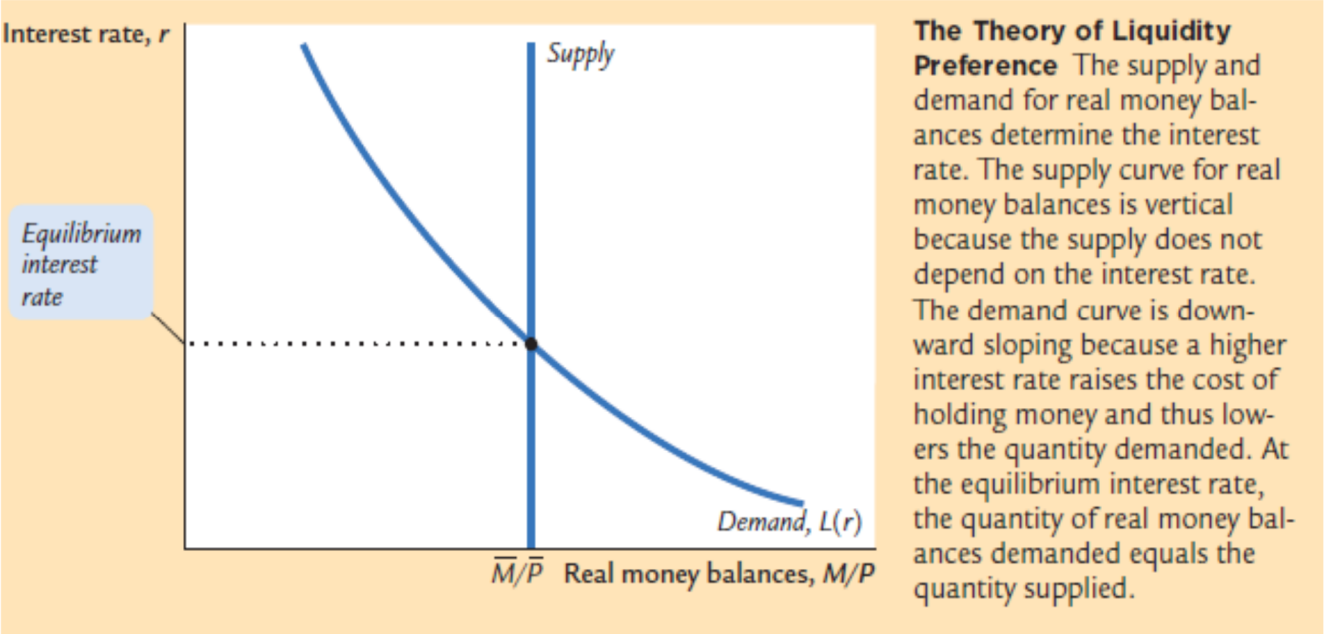


Figure 3.9 Equilibrium in money market

According to the theory of liquidity preference, the supply and demand for real money balances determine what interest rate prevails in the economy. That is, the interest rate adjusts to equilibrate the money market.

How does the interest rate get to this equilibrium of money supply and money demand?

The adjustment occurs because whenever the money market is not in equilibrium, people try to adjust their portfolios of assets and, in the process, alter the interest rate. For instance, if the

interest rate is above the equilibrium level, the quantity of real money balances supplied exceeds the quantity demanded. Individuals holding the excess supply of money try to convert some of their non-interest-bearing money into interest-bearing bank deposits or bonds. Banks and bond issuers, who prefer to pay lower interest rates, respond to this excess supply of money by lowering the interest rates they offer. Conversely, if the interest rate is below the equilibrium level, so that the 'quantity of money demanded exceeds the quantity supplied, individuals try to obtain money by selling bonds or making bank withdrawals. To attract now-scarcer funds, banks and bond issuers respond by increasing the interest rates they offer. Eventually, the interest rate reaches the equilibrium level, at which people are content with their portfolios of monetary and non-monetary assets.

We can also use the theory of liquidity preference to show how the interest rate responds to changes in the supply of money. Suppose, for instance, that the National Bank suddenly decreases the money supply. A fall in *M* reduces ***M/P,*** because ***P*** is fixed in the model. The supply of real money balances shifts to the left, as in figure below. The equilibrium interest rate rises from $\mathbf{r_1}$ to $\mathbf{r_2}$ and the higher interest rate makes people satisfied to hold the smaller quantity of real money balances. The opposite would occur if the Fed had suddenly increased the money supply. Thus, according to the theory of liquidity preference, a decrease in the money supply raises the interest rate, and an increase in the money supply lowers the interest rate.

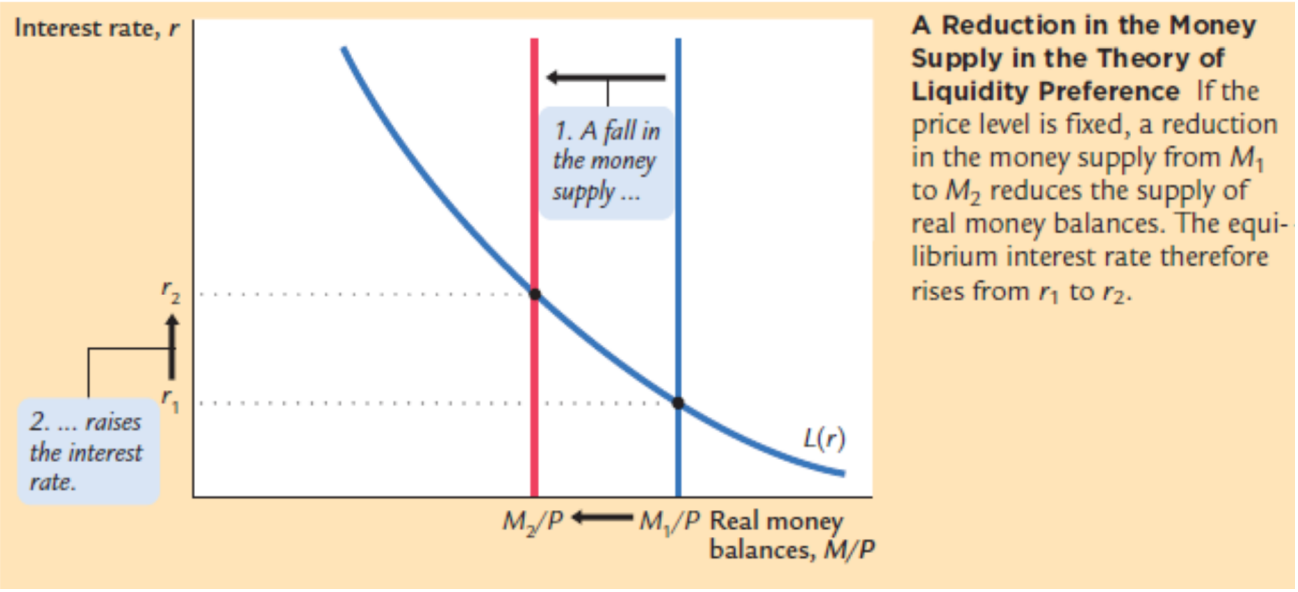


Fig. 3.10 Interest rate as an adjustment tool in the money market

(B) Income, Money Demand, and the LM Curve

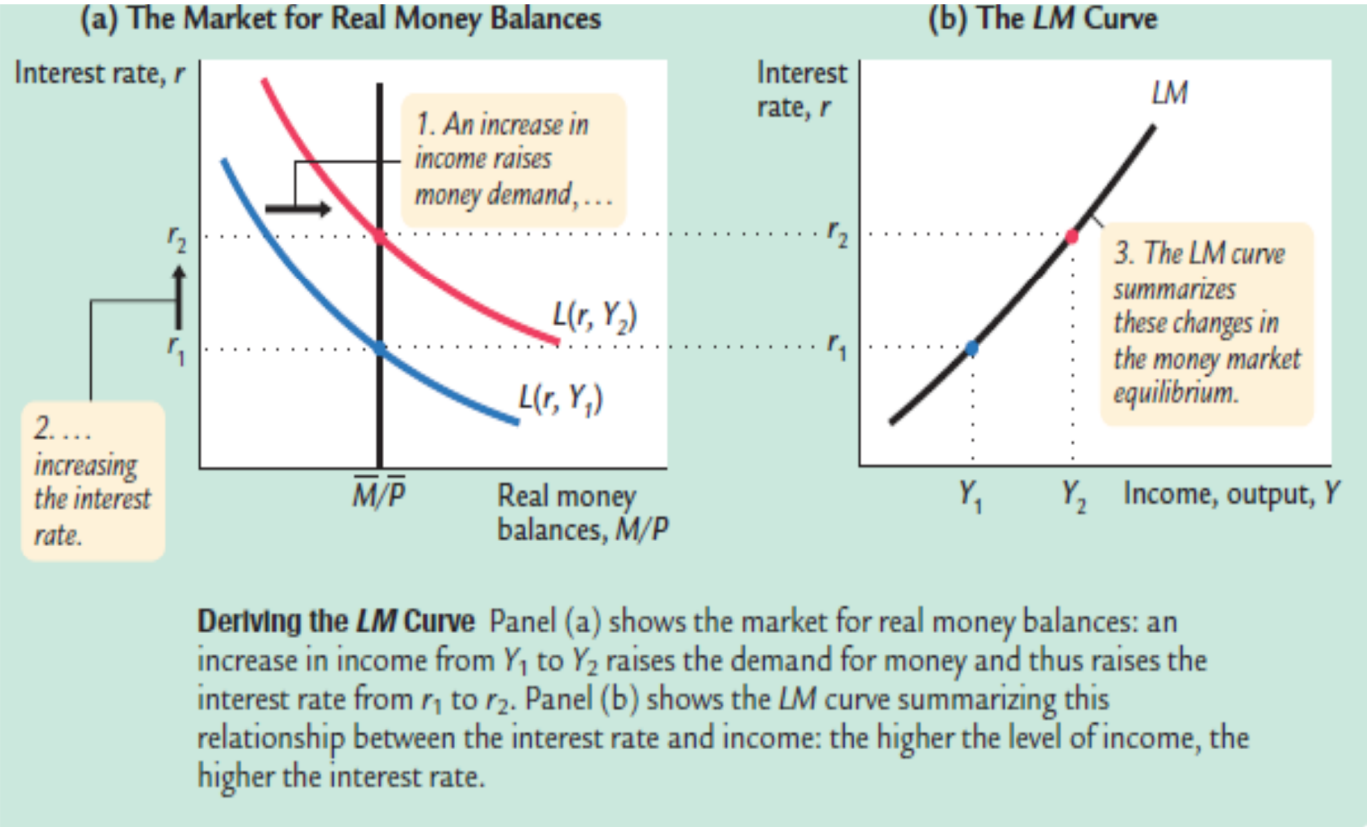
So far, we assumed that only interest tare determines the quantity of real money balances demanded. But more, realistically, the level of income Y also affects money demand.

How does a change in the economy's level of income Y affect the market for real money balances?

When income is high, expenditure is high, so people engage in more transactions that require the use of money. Thus, greater income implies greater money demand. We can express these ideas by writing the money demand function as

$$(M/p)d = L(r, Y).$$

The quantity of real money balances demanded is negatively related to the interest rate and positively related to income. Using the theory of liquidity preference we can see what happens to the interest rate when the level of income changes. For example, consider what happens when income increases from **Y1** to $\mathbf{Y_2}$.



Deriving the *LM* Curve Panel (a) shows the market for real money balances: an increase in income from Y_1 to Y_2 raises the demand for money and thus raises the interest rate from r_1 to r_2. Panel (b) shows the *LM* curve summarizing this relationship between the interest rate and income: the higher the level of income, the higher the interest rate.

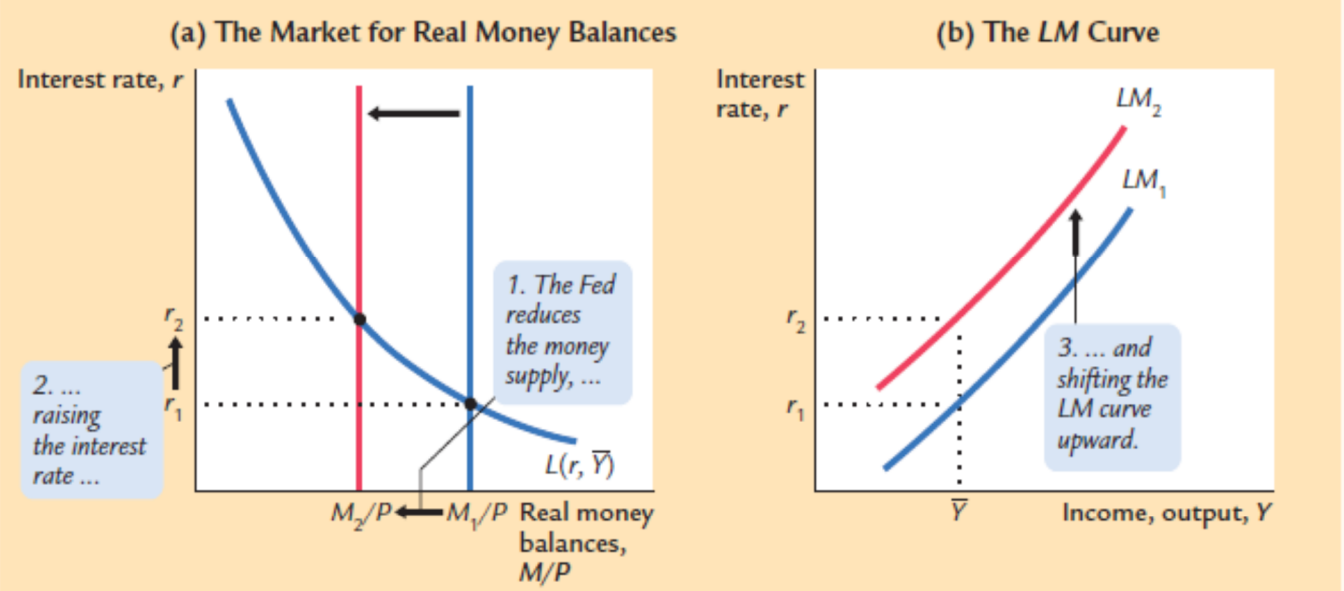
Figure 3.11 Derivation of LM curve

As panel (a) in the above graph illustrates, this increase in income shifts the money demand curve to the right. With the supply of real money balances unchanged, the interest rate must rise from r_1 tor_2 to equilibrate the money market. Therefore, according to the theory of liquidity preference, higher income leads to a higher interest rate.

The *LM* curve plots this relationship between the level of income and the interest rate. The higher the level of income; the higher the demand for real money balances, and the higher the equilibrium interest rate. For this reason, the *LM* curve slopes upward, as in panel (b) of Figure above.

(C) How Monetary Policy Shifts the *LM* Curve

The *LM* curve tells us the interest rate that equilibrates the money market at any level of income. Yet, as we saw earlier, the equilibrium interest rate also depends on the supply of real money balances, *MIP*. This means that the *LM* curve is drawn for a *given* supply of real money balances. If real money balances change- for example, if the Fed alters the money supply-the *LM* curve shifts.



A Reduction in the Money Supply Shifts the *LM* Curve Upward Panel (a) shows that for any given level of income $\bar{Y}$, a reduction in the money supply raises the interest rate that equilibrates the money market. Therefore, the *LM* curve in panel (b) shifts upward.

Fig. 3.12 A shift in the LM curve

Suppose that the National Bank decreases the money supply from Ml to $M2$ which causes the supply of real money balances to fall from Ml/P to $M2/P$. Figure below shows what happens. Holding constant the amount of income and thus the demand curve for real money balances, we see that a reduction in the supply of real money balances raises the interest rate that equilibrates the money market. Hence, a decrease in the money supply shifts the *LM* curve upward.

In summary, the **LM** curve shows the combinations of the interest rate and the level of income that is consistent with equilibrium in the market for real money balances. The **LM** curve is drawn for a given supply of real money balances. Decreases in the supply of real money balances shift the **LM** curve upward. Increases in the supply of real money balance shift the LM curve downward.

Dear distance learners! Drive the LM Curve from the money market

3.4. The Short run Equilibrium

We now have all the pieces of the ***IS-LM*** model. The two equations of this model are; the model takes fiscal policy, G and *T,* monetary policy *M,* and the price level *P* as exogenous. Given these exogenous variables, the *IS* curve provides the combinations of *r* and Y that satisfy the equation representing the goods market, and the *LM* curve provides the combinations of rand *Y* that satisfy the equation representing the money market. These two curves are shown together in Figure 3.13.

$$\boldsymbol{Y = C(Y - T) + I(r) + G} \qquad \boldsymbol{IS\ curve}$$

$$\boldsymbol{\frac{M}{P} = L(r, Y)} \qquad \boldsymbol{LM\ curve}$$

The Equilibrium:

$$\boldsymbol{IS = LM}$$

The equilibrium of the economy is the point at which the *IS* curve and the *LM* curve cross. This point gives the interest rate *r* and the level of income *Y* that satisfy conditions for equilibrium in both the goods market and the money market. In other words, at this intersection, actual expenditure equals planned expenditure, and the demand for real money balances equals the supply.

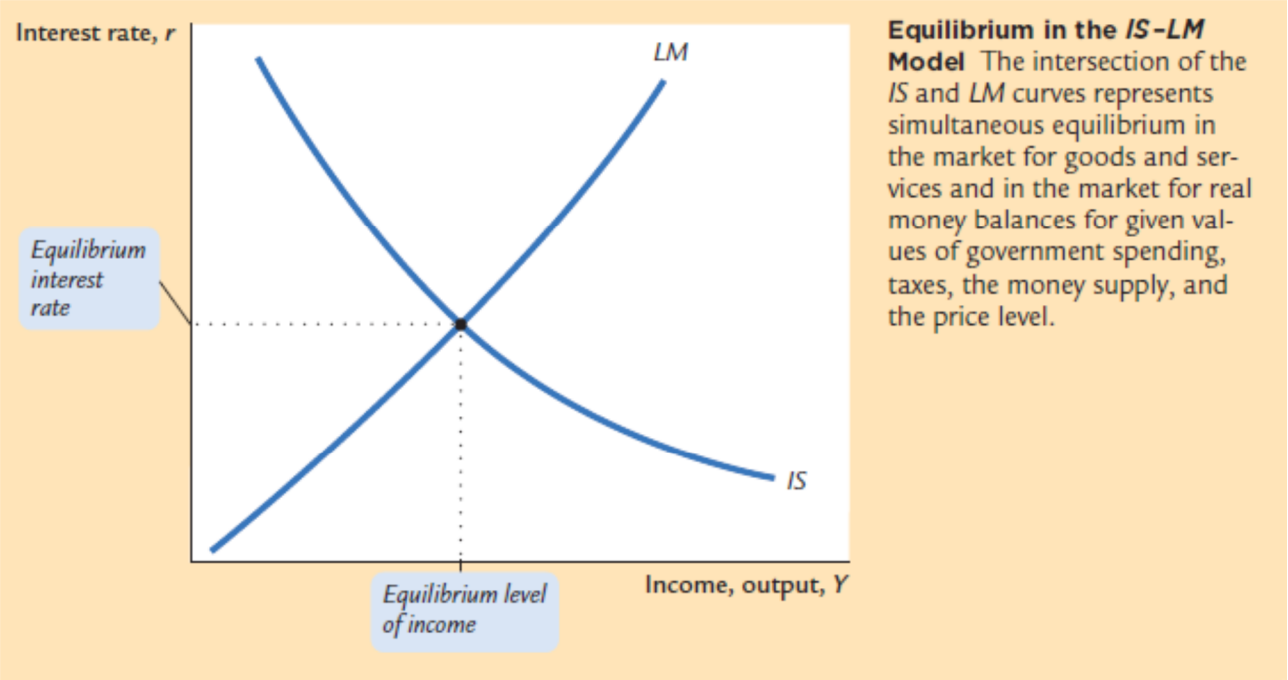


Figure 3.13 Equilibrium of an economy in the short run.

3.5. Monetary and Fiscal Policy Analysis

The intersection of the IS and LM curves determine the level of national income. National income fluctuates when one of these curves shifts, changing the short run equilibrium of the economy. In this section we examine how changes in policy and shocks to the economy can cause these curves to shift.

(A) How Fiscal Policy Shifts the *IS* Curve and Changes the Short-Run Equilibrium

We begin by examining how changes in fiscal policy (government purchases and taxes) alter the economy's short-run equilibrium. The *IS-LM* model shows how these shifts in the *IS* curve affect income and the interest rate.

❑ Changes in Government Purchases

Consider an increase in government purchases of ΔG. The government-purchases multiplier in the Keynesian cross tells us that, at any given interest rate, this change in fiscal policy raises the level of income **by** $\Delta G/(1 - MPC)$. Therefore, as the figure below shows, the ***IS*** curve shifts to the right by this amount. The equilibrium of the economy moves from point A to point B. The increase in government purchases raises both income and the interest rate.

To understand fully what's happening in the Figure below, it helps to keep in mind the building blocks for the *IS-LM* model from the preceding topics-the Keynesian cross and the theory of liquidity preference. Here is the story. When the government increases its purchases of goods and services, the economies planned expenditure rises. The increase in planned expenditure stimulates the production of goods and services, which causes total **income *Y* to rise.** These effects should be familiar from the Keynesian cross. Now consider the money market, as described by the theory of liquidity preference. Because the economy's demand for money depends on income, the rise in total income increases the quantity of money demanded at every interest rate. The supply of money has not changed; however, so higher money demand causes the equilibrium **interest rate *r* to rise.**

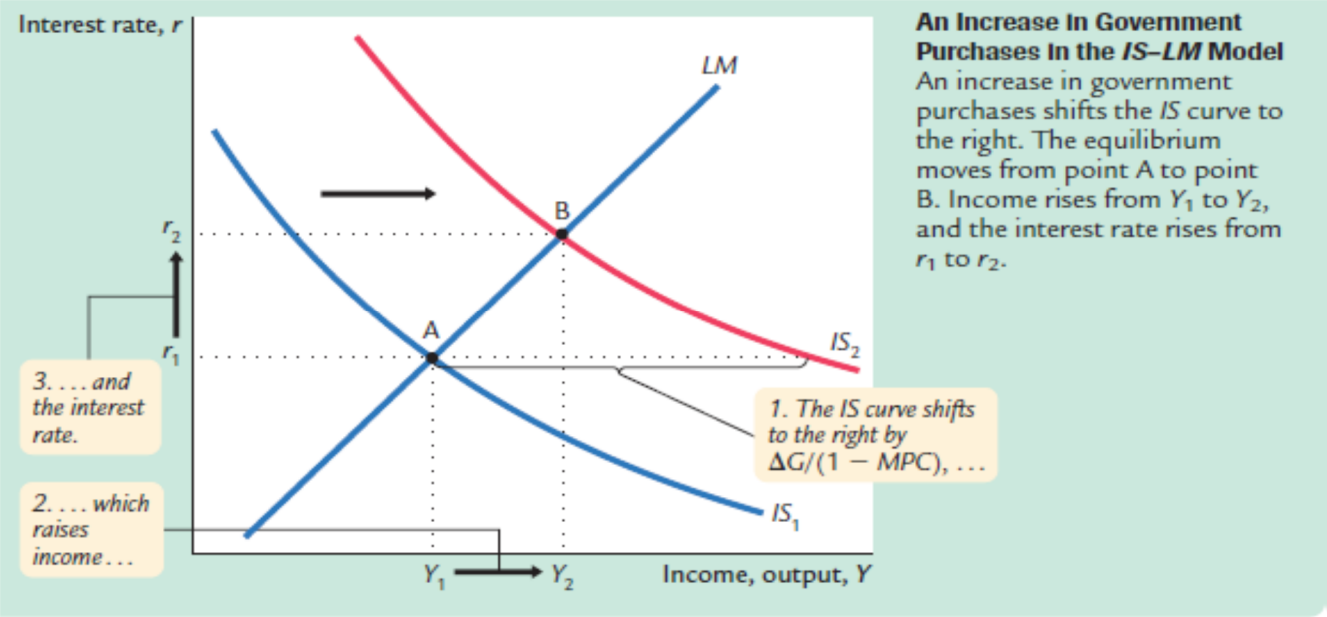


Figure 3.14 Effects of an increase in government spending on equilibrium

The higher interest rate arising in the money market, in turn, has ramifications back in the goods market. When the interest rate rises, firms cut back on their investment plans. This fall in investment partially offsets the expansionary effect of the increase in government purchases. Thus, the increase in income in response to a fiscal expansion is smaller in the *IS-LM* model than it is in the Keynesian cross (where investment is assumed to be fixed). The horizontal shift in the *IS* curve equals the rise in equilibrium income in the Keynesian cross. This amount is larger than the increase in equilibrium income here in the *IS-LM* model. The difference is explained by the crowding **out** of investment caused by a higher interest rate.

❑ Changes in Taxes

In the *IS-LM* model, changes in taxes affect the economy much the same as changes in government purchases do, except that taxes affect expenditure through consumption. Consider, for instance, a decrease in taxes of $\triangle T$. The tax cut encourages consumers to spend more and, therefore, increases planned expenditure. The tax multiplier in the Keynesian cross tells us that, at any given interest rate, this change in policy raises the level of income by $\triangle T^* MPC/(1 - MPG)$. Therefore, as the figure below illustrates, the *IS* curve shifts to the right by this amount. The equilibrium of the economy moves from point A to point B. The tax cut raises both income and the interest rate. Once again, because the higher interest rate depresses investment, the increase in income is smaller in the *IS-LM* model than it is in the Keynesian cross.

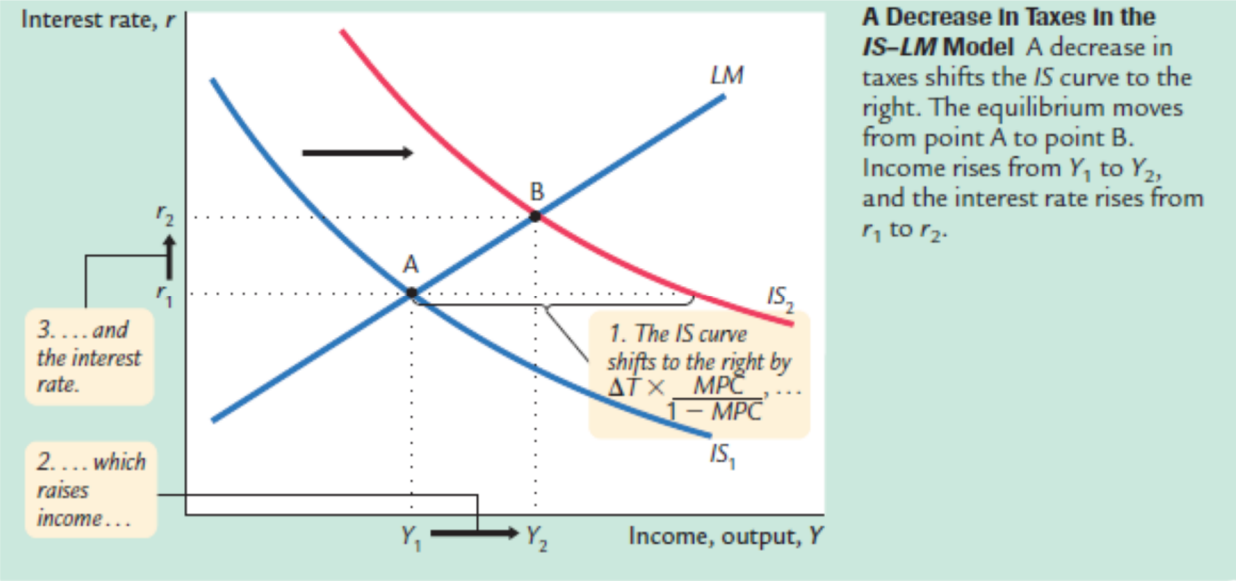


Fig. 3.15 Effect of change in tax in the model

(B) How Monetary Policy Shifts the *LM* Curve and Changes the Short- Run Equilibrium

Consider an increase in the money supply. An increase in *M* leads to an increase in real money balances *MI P*, because the price level *P* is fixed in the short run. The theory of *liquidity preference shows that for* any *given level* of *income*, an *increase in real money* balances leads to a lower interest rate. Therefore, the LM curve 'Shifts downwind, as in the figure below (Fig 3.16). The equilibrium moves from point A to point B. The increase in the money supply lowers the interest rate and raises the level of income.

Once again, to tell the story that explains the economy's adjustment from point **A** to point **B**, we rely on the building blocks of the *IS-LM* model-the Keynesian cross and the theory of liquidity preference. This time, we begin with the money market, where the monetary- policy action occurs. When the Federal Reserve increases the supply of money, people have more money than they want to hold at the prevailing interest rate. As a result, they start depositing this extra money in banks or use it to buy bonds. The interest rate *r* then falls until people are willing to hold all the extra money that the national bank has created; this brings the money market to a new equilibrium. The lower interest rate, in turn, has ramifications for the goods market. A lower interest rate stimulates planned investment, which increases planned expenditure, production, and income *Y*.

Thus, the *IS-LM* model shows that monetary policy influences income by changing the interest rate. The *IS-LM* model shows that an increase in the money supply lowers the interest rate, which stimulates investment and thereby expands the demand for goods and services. This process is called the **monetary transmission mechanism.**

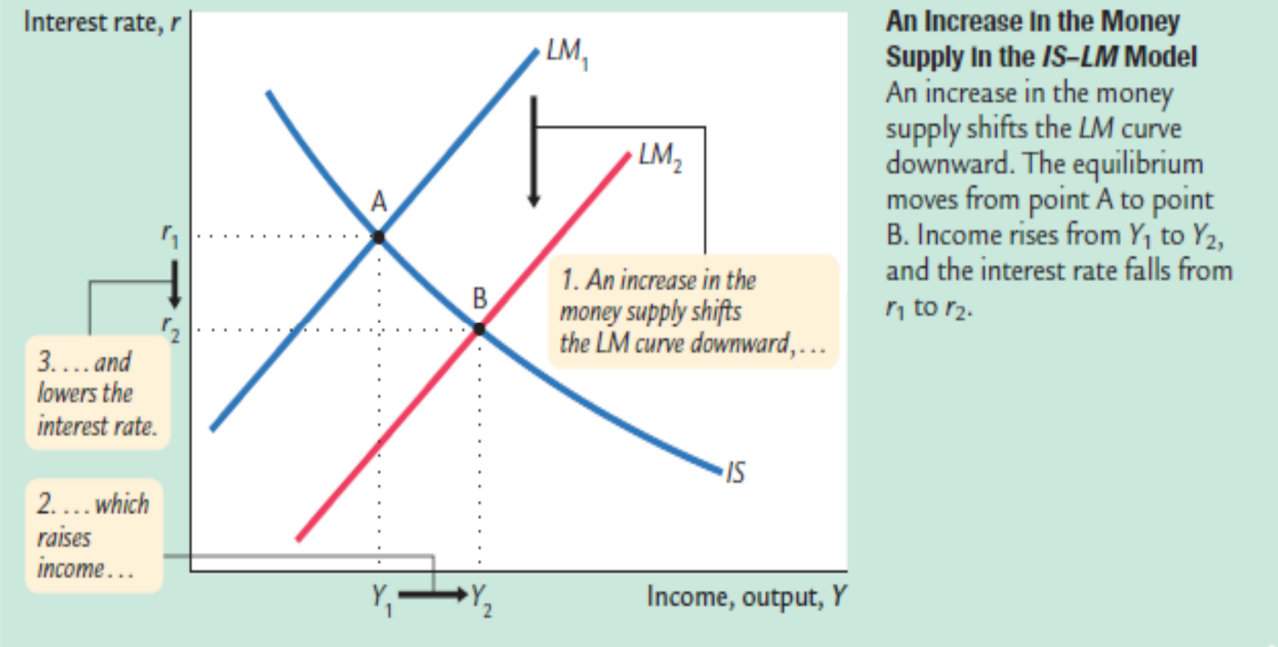


Fig. 3.16 Effect of money supply in the model

3.5.1. The Interaction between Monetary and Fiscal Policy

When analyzing any change in monetary or fiscal policy, it is important to keep in mind that the policymakers who control these policy tools are aware of what the other policymakers are doing. A change in one policy, therefore, may influence the other, and this interdependence may alter the impact of a policy change. For example, suppose fiscal authorities were to raise taxes. *What effect should this policy have on the economy?* According to the *IS-LM* model, the answer depends on how the National bank responds to the tax increase.

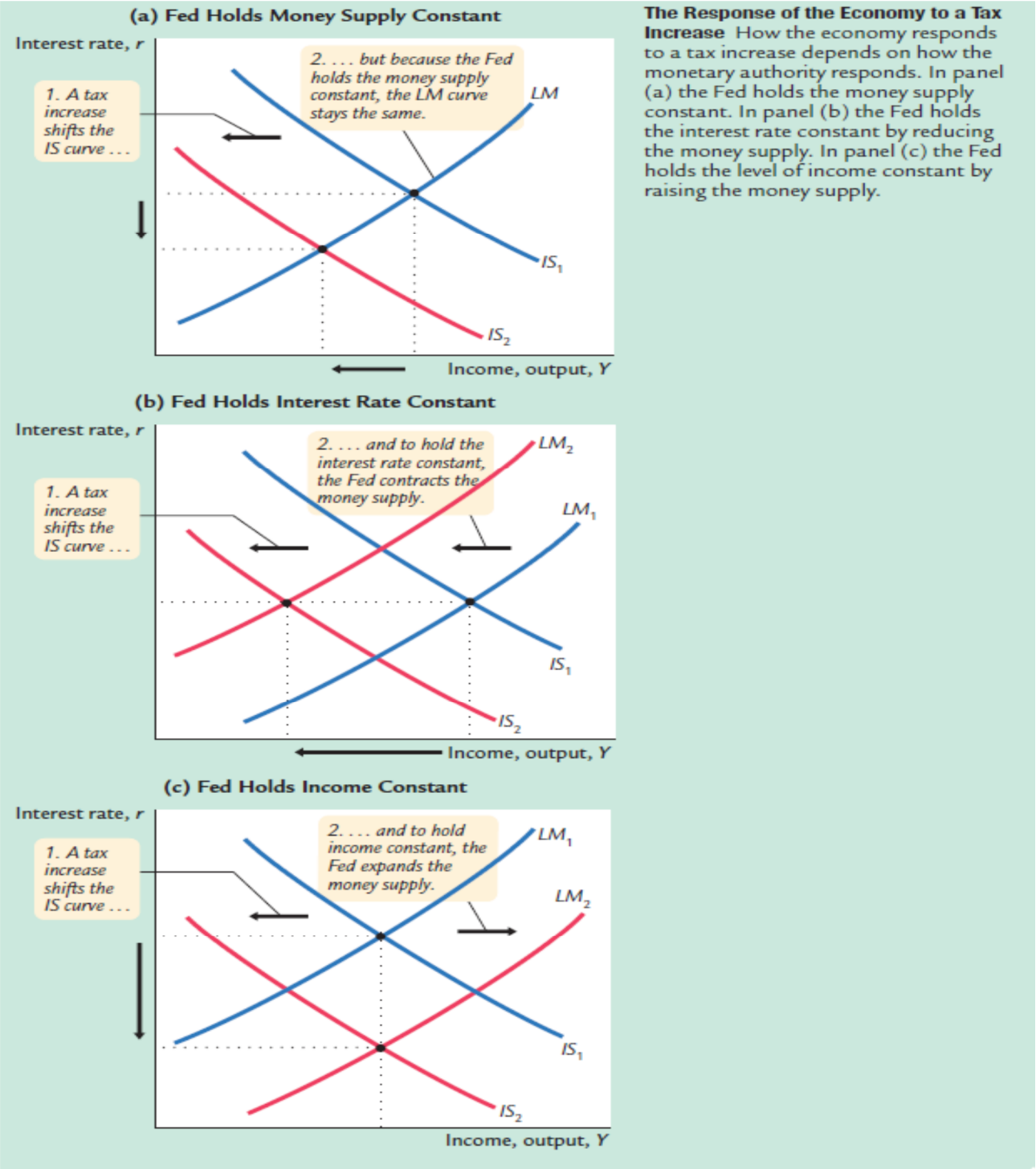
The figure below shows three of the many possible outcomes. In **panel** (a), the National Bank holds the money supply constant. The tax increase shifts the *IS* curve to the left. Income falls (because higher taxes reduce consumer spending), and the interest rate falls (because lower income reduces the demand for money). The fall in income indicates that the tax hike causes a recession.

In **panel** (b), the National bank wants to hold the interest rate constant. In this case, when the tax increase shifts the *IS* curve to the left, the National Bank must decrease the money supply to keep the interest rate at its original level. This fall in the money supply shifts the *LM* curve upward. The interest rate does not fall, but income falls by a larger amount than if the National Bank had held the money supply constant. Thus, the opportunity cost of holding the interest tare constant is an even greater fall in income.

In **panel** (c), the National Bank wants to prevent the tax increase from lowering income. It must, therefore, raise the money supply and shift the *LM* curve downward enough to offset the shift in the *IS* curve. In this case, the tax increase does not cause a recession, but it does cause a large fall in the interest rate. Although the level of income is not changed, the combination of a tax increase and a monetary expansion does change the allocation of the economy's resources. The higher taxes depress consumption, while the lower interest rate stimulates investment. Income is not affected because these two effects exactly balance. Thus, the cost of keeping income constant is greater fall in interest tare.

From this example we can see that the impact of a change in fiscal policy depends on the policy the National Bank pursues-that is, on whether it holds the money supply, the interest rate, or the level of income constant. More generally, whenever analyzing a change in one policy, we must

make an assumption about its effect on the other policy. The most appropriate assumption depends on the case at hand and the many political considerations that lie behind economic policymaking.



The Response of the Economy to a Tax Increase How the economy responds to a tax increase depends on how the monetary authority responds. In panel (a) the Fed holds the money supply constant. In panel (b) the Fed holds the interest rate constant by reducing the money supply. In panel (c) the Fed holds the level of income constant by raising the money supply.

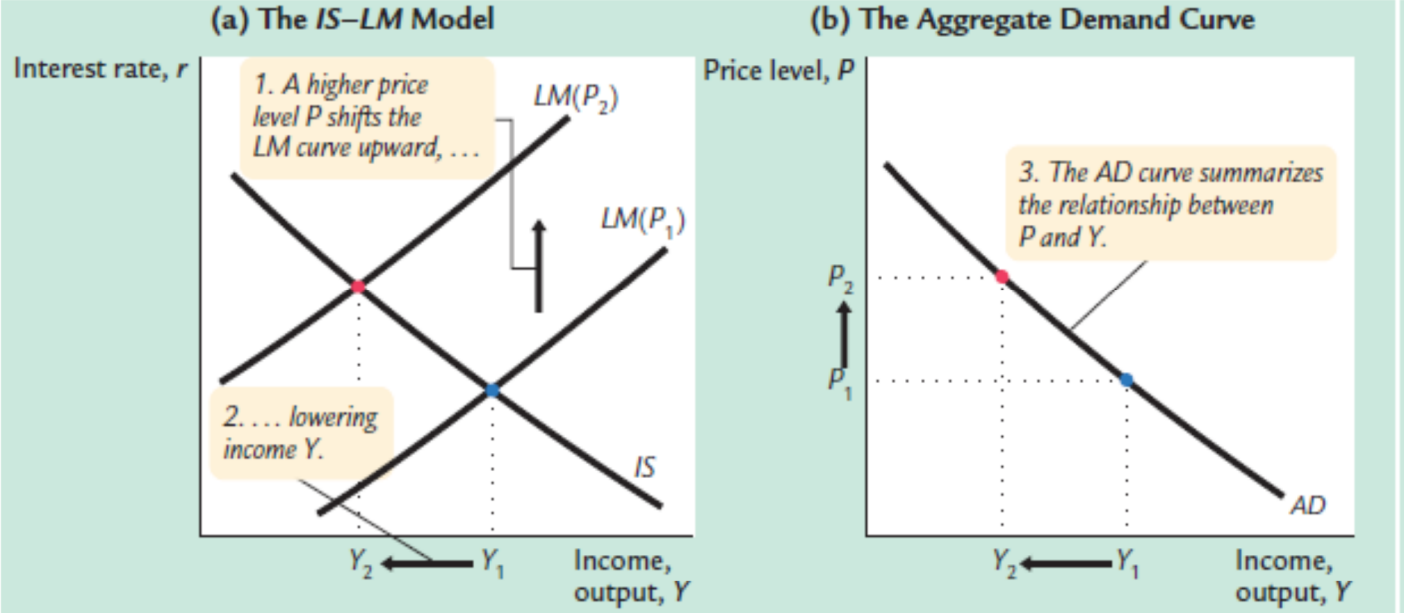
Figure 3.17 Effects of change in money supply on LM curve

3.6. From IS-LM to Aggregate Demand

We have been using the *IS-LM* model to explain national income in the short run when the price level is fixed. To see how the *IS-LM* model fits into the model of aggregate supply and aggregate demand, we now examine what happens in the *IS-LM* model if the price level is allowed to change. As was promised when we began our study of this model, the *IS-LM* model provides a theory to explain the position and slope of the aggregate demand curve. In this part we explain two important things about the aggregate demand curve. First, we use the *IS-LM* model to show why national income falls as the price level rises-that is, why the aggregate demand curve is downward sloping. Second, we examine what causes the aggregate demand curve to shift.

To explain why the aggregate demand curve slopes downward, we examine what happens in the *IS-LM* model when the price level changes. This is done in the figure below. For any given money supply *M,* a higher price level *P* reduces the supply of real money balances *MIP.* A lower supply of real money balances shifts the *LM* curve upward (to the left), which raises the equilibrium interest rate and lowers the equilibrium level of income, as shown in *panel (a).* Here the price level rises from P_1 to P_2 and income falls from Y_1 to Y_2. The aggregate demand curve in *panel (b)* plots this negative relationship between national income and the price level. In other words, the aggregate demand curve shows the set of equilibrium points that arise in the *IS-LM* model as we vary the price level and see what happens to income.

What causes the aggregate demand curve to shift? Because the aggregate demand curve is merely a summary of results from the *IS-LM* model, events that shift the *IS* curve or the *LM* curve (for a given price level) cause the aggregate demand curve to shift. For instance, an increase in the money supply raises income' in the *IS-LM* model for any given price level; it thus shifts the aggregate demand curve to the right, as shown in *panel (a)* of the figure below.

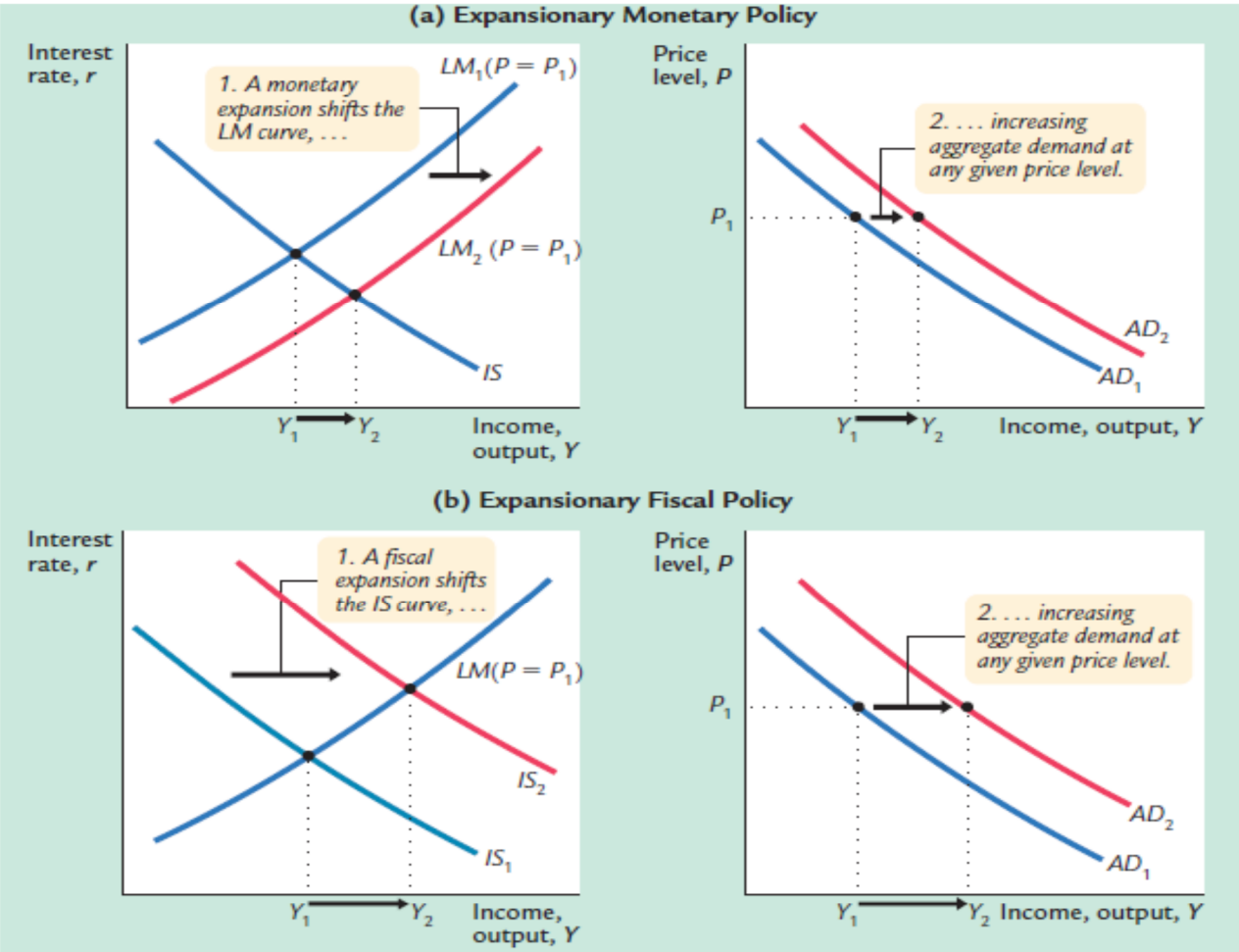


Deriving the Aggregate Demand Curve With the *IS–LM* Model Panel (a) shows the *IS-LM* model: an increase in the price level from P_1 to P_2 lowers real money balances and thus shifts the *LM* curve upward. The shift in the *LM* curve lowers income from Y_1 to Y_2. Panel (b) shows the aggregate demand curve summarizing this relationship between the price level and income: the higher the price level, the lower the level of income.

Fig. 3.18 the derivation of the Aggregate demand curve

Similarly, an increase in government purchases or a decrease in taxes raises income in he *IS-LM* model for a given price level; it also shifts the aggregate demand curve to the right, as shown in panel (b) of the figure below. Conversely, a decrease in the money supply, a decrease in government Purchases, or increase in taxes lower income in the *IS-LM* model and shift the aggregate demand curve to the left.

We can summarize these results as follows: *A change in income in the IS-LM model resulting from a change in the price level represents a movement along the aggregate demand curve. A change in income in the IS-LM model for a fixed price level represents a shift in the aggregate demand curve.*



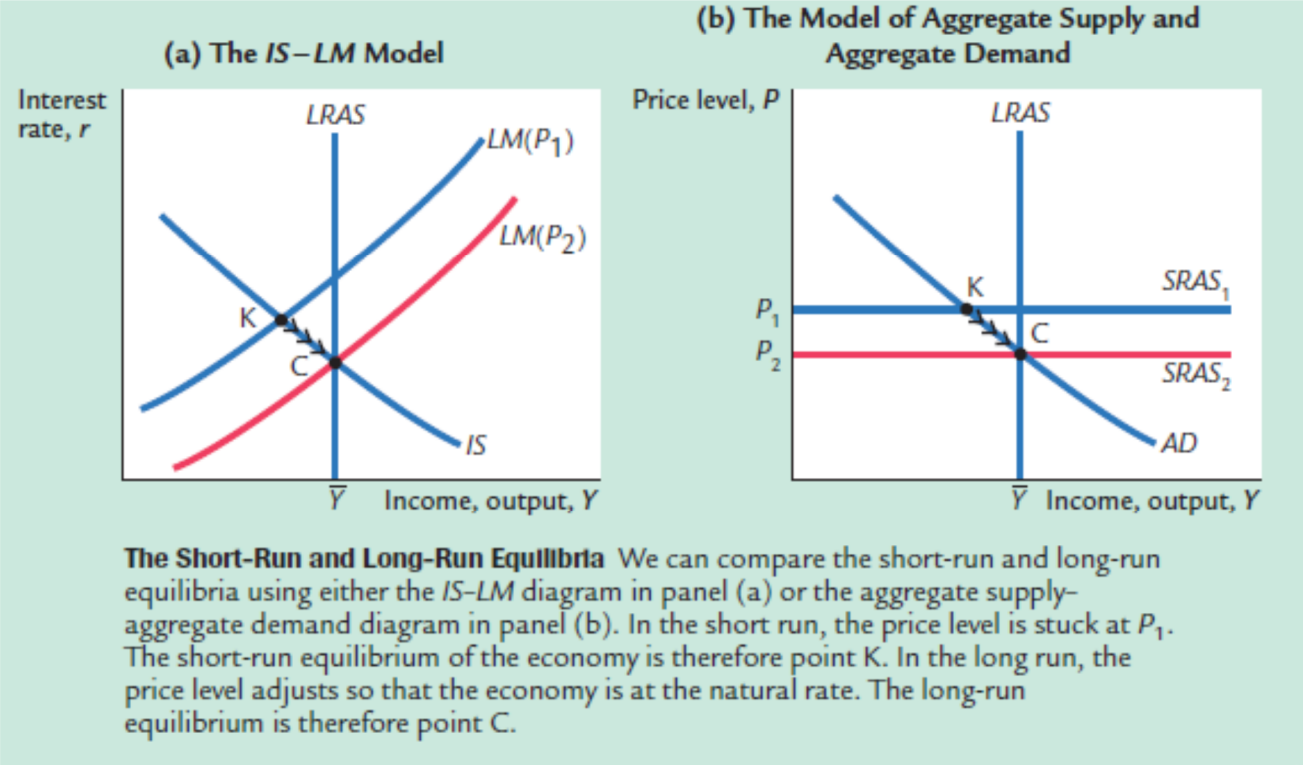
How Monetary and Fiscal Policies Shift the Aggregate Demand Curve Panel (a) shows a monetary expansion. For any given price level, an increase in the money supply raises real money balances, shifts the *LM* curve downward, and raises income. Hence, an increase in the money supply shifts the aggregate demand curve to the right. Panel (b) shows a fiscal expansion, such as an increase in government purchases or a decrease in taxes. The fiscal expansion shifts the *IS* curve to the right and, for any given price level, raises income. Hence, a fiscal expansion shifts the aggregate demand curve to the right.

Fig. 3.19 Shifts in Aggregate demand

3.6.1. The *IS-LM* Model in the Short Run and Long Run

The *IS-LM* model is designed to explain the economy in the short run when the price level is fixed. Yet, now that we have seen how a change in the price level influences the equilibrium in the *IS-LM* model, we can also use the model to describe the economy in the long run when the price level adjusts to ensure that the economy produces at its natural rate (full-employment level of output).

Panel (a) of Figure below shows the three curves that are necessary for understanding the short-run and long-run equilibrium: the *IS* curve, the *LM* curve, and the vertical line representing the natural rate of output, *Y* -. The *LM* curve is, as always, drawn for a fixed price level, P_1. *The* short-run equilibrium of the economy is point K, where the *IS* curve crosses the *LM* curve. Notice that in this short-run equilibrium, the economy's income is less than its natural rate.



The Short-Run and Long-Run Equilibria We can compare the short-run and long-run equilibria using either the *IS–LM* diagram in panel (a) or the aggregate supply–aggregate demand diagram in panel (b). In the short run, the price level is stuck at P_1. The short-run equilibrium of the economy is therefore point K. In the long run, the price level adjusts so that the economy is at the natural rate. The long-run equilibrium is therefore point C.

Fig. 3.20 Long run equilibrium

Panel (b) of the figure below shows the same situation in the diagram of aggregate supply and aggregate demand. At the price level P_1, the quantity of output demanded is below the natural rate. In other words, at the existing price level, there is insufficient demand for goods and services to keep the economy producing at its potential. In these two diagrams we can examine the short-run equilibrium at which the economy finds itself and the long-run equilibrium toward which the economy gravitates. Point K describes the short-run equilibrium, because it assumes that the price level is stuck at P_l.

Eventually, the low demand for goods and services causes prices to fall, and the economy moves back toward its natural, rate. When the price level reaches n, the economy is at point C, the

long-run equilibrium. The diagram of aggregate supply and aggregate demand shows that at point C, the quantity of goods and services demanded equals the natural rate of output. This long-run equilibrium is achieved in the *IS-LM* diagram by a shift in the *LM* curve: the fall in the price' level raises real money balances and therefore shifts the *LM* curve to the right.

3.7. Limitations of IS-LM Model

Both the simple income-expenditure model and the quantity theory of money engage in drastic aggregation. The quantity theory of money aggregates the economy into only two markets, the market for money balances and the market for all other things. The simple income expenditure model involves an equally drastic but different aggregation, to a market for goods and services and a market for all other things. Then each, by Walras' Law, ignores the second market and focuses on only one market. These drastic aggregations make sense if the main source of problems in a market economy arise in only one sector and the problems that are evident in other sectors are simply reflections of problems that originate in that one sector.

A year after the publication of the *General Theory,* John Hicks proposed ISLM as a less dramatic aggregation that he saw as a more general case of both the quantity theory and the simple income-expenditure model. Part of its popularity this model, which has reigned as the standard macroeconomic model for half a century, undoubtedly lies in its ability to present macroeconomics in terms of a model with exactly the same structure and mechanics as the model of supply and demand.

Though the ISLM model is a fundamental model of macroeconomics, seldom do macro economists try to estimate the parameters of the model and use it to predict the future course of GDP. There has been at least one attempt to estimate the importance of fiscal and monetary policy with equations similar to the equation one attains when one solves the model for equilibrium income. However, many economists have argued that such an approach could not capture the subtleties of how the economy works and thus do not give reliable estimates.

The fact that economists have not used the ISLM model in their attempts to **numerically** predict the effects of policy suggests that ISLM has weaknesses. The first of these is the question of whether or not ISLM is meant as a long-run or short-run model. If it is meant as a long-run model, then its prediction that equilibrium can exist at any level of output is controversial. ISLM aggregates the economy into three markets: goods, money, and all other. This aggregation makes sense if nothing interesting happens in the "all-other" market, if it simply adjusts passively to changes in the goods and money market. Included in the passively adjusting sector is the resource market, even though many economists point to the labor market as a sector that does not readjust rapidly.

ISLM predicts the equilibrium can be at any level because it assumes, as does the simple income-expenditure model, a passive supply. Sellers produce whatever is demanded, and all adjustment to changes in demand are in the form of changes in output and none of the adjustment is in the form of changes in prices. Adjustment cannot be in the form of price changes because the price level does not enter the model. Since changes in prices are the primary way markets adjust in microeconomic theory, the failure of ISLM to say anything about prices is a serious weakness.

If meant as a short-run model, the model is severely limited because it does not incorporate the rate of inflation. Inflation creates a difference between real and nominal interest rates. The nominal rate is the visible rate that people pay and receive, and the real interest rate is what is happening in terms of purchasing power. Thus if the rate of interest is 5% and the rate of inflation is 10%, a person who borrows $100 and pays back $105 in a year will pay back less in terms of purchasing power than he borrowed. He pays back 105 dollars, but each dollar can buy 10% less than it did a year earlier. Hence his rate of interest in real terms is actually negative. The real interest rate is computed as the nominal interest rate less the rate of inflation.

The distinction between real and nominal interest rates is important in ISLM because investment spending should respond to the real interest rate and money demand to the nominal interest rate. To see why investment depends on the real rate, consider a situation of zero inflation in which a person buys a machine that will cost $100 and earn

$105 one year later. This purchase will be worthwhile if the interest rate is below 5%. Now suppose that inflation jumps from zero to 10%. The same machine will produce the same output, but because of the increase in prices, the output will be 10% more valuable in terms of the money it brings. Thus the $100 machine will earn $115.05 (which is 10% more than 105) in one year. The investment is now worthwhile at any nominal rate under 15% (which is a real rate under 5 %.) Investment will remain constant if the real interest rate does not change; change in nominal rates will not change investment if it does not change the real rate.

To keep the demand for money constant (which means that the velocity of circulation remains constant), the nominal interest rate must remain constant. When people hold cash balances for transactions; they are concerned with **purchasing power.** If all prices double, the amount of money people want to hold will double, but the amount of purchasing power they want will remain constant. The interest rate is a cost of holding purchasing power. If the rate of inflation increases, and the rate of interest with it, holding money becomes more expensive and people will want to hold smaller amounts of purchasing power. Thinking of the demand for money in terms of purchasing power lets us ignore price level and is the key to seeing the effects of the rate of interest. It is the nominal rate, not the real rate that matters.

Further, the rate of inflation independently affects the demand for money by changing its desirability as a store of wealth. In cases of very serious inflation, such as the German hyperinflation of 1923, people try to spend money as quickly as possible because it is losing its value. As a result, the velocity of money increases. To some extent estimates of how sensitive money demand is to interest rates may be catching this sensitivity of money demand to inflation because rates of inflation and interest rates move together.

One could graph the ISLM model assuming that the vertical axis measured the real rate. Then any time the rate of inflation changed (and thus the nominal rate), one could shift the LM curve. A more rapid inflation would shift the LM curve to the right, for example, reducing real interest rates and increasing income. The problem with this solution, however, is that it leaves the rate of inflation as autonomous, unrelated to what is

happening to fiscal and monetary policy. Though there have been times when many economists considered inflation autonomous ("cost-push" theories that were very popular in the 1950s are an example-prices rise because costs rise), most economists believe that macroeconomic policy is by far the most important determinant of rates of inflation.

Given these serious weaknesses, why has ISLM remained as a framework for so much macroeconomic thinking? A major reason is that no other simple model gives as much insight. ISLM suggests that economic disturbances can arise in either the money market or the goods market, a conclusion that predates ISLM. Economists want a simple model that concludes this. Also, ISLM can be expanded and made more complex in an effort to overcome its limitations.

Chapter Three: Review Questions

1. Use the Keynesian cross to examine the effect of
   a. An increase in government purchases.
   b. An increase in taxes.
   c. An equal increase in government purchases and taxes.

2. In the Keynesian cross, assume that the consumption function is given by

$$\boldsymbol{C = 200 + 0.75\,(Y - T)}$$

Planned investment is 100; government purchases and taxes are both 100.

   a. Graph planned expenditure as a function of income.
   b. What is the equilibrium level of income?
   c. If government purchases increase to 125, what is the new equilibrium income?
   d. What level of government purchases is needed to achieve an income of 1,600?

3. Suppose that the money demand function is $(M/P)^d = 1{,}000 - 100r$, where r is the interest rate in percent. The money supply M is 1,000 and the price level P is 2.
   a. Graph the supply and demand for real money balances.
   b. What is the equilibrium interest rate?
   c. Assume that the price level is fixed. What happens to the equilibrium interest rate if the supply of money is raised from 1,000 *to* 1,200 ?
   d. If the Central bank wishes to raise the interest rate to 7 percent, what money supply should it set?

4. According to the IS –LM model, what happens to the interest rate, income, consumption, and investment under the following circumstances?

a. The central bank increases the money supply.
b. The government increases government purchases.
c. The government increases taxes.
d. The government increases government purchases and taxes by equal amounts.

5. Consider a hypothetical economy.

a. The consumption function is given by

$$\boldsymbol{C = 200 + 0.75(Y - T)}.$$

The investment function is

$$\boldsymbol{I = 200 - 25r}$$

Government purchases and taxes are both $\mathbf{100.}$

For this economy, graph the IS curve for $\boldsymbol{r}$ ranging from $\mathbf{0}$ to $\mathbf{8}$.

b. The money demand function of the economy is

$$\boldsymbol{(M/P)^d = Y - 100r}.$$

The money supply $\boldsymbol{M}$ is $\mathbf{1,000}$ and the price level $\boldsymbol{P}$ is $\mathbf{2}$.

For this economy, graph the LM curve for r ranging from 0 to $\mathbf{8}$.

c. Find the equilibrium interest rate r and the equilibrium level of income Y.

d. Suppose that government purchases are raised from 100 *to* 150. How much does the IS curve.

CHAPTER FOUR

AGGREGATE DEMAND IN THE OPEN ECONOMY

Introduction

In the previous chapter, we simplified our aggregate demand theory analysis by assuming a closed economy. The last three decades, however, have seen an increased international interdependence as controls on trade and capital flows between countries have been much reduced. Moreover, since the early 1980s, many countries have permitted much more flexibility in their exchange rates. That is, most economies become open: they export goods and services abroad, they import goods and services from abroad, and they borrow and lend in world financial markets. These changes have raised several issues: how does the exchange rate regime affect the efficacy of domestic monetary and fiscal policies undertaken by small, open economies? Why have exchange rates been so volatile? Can expansionary policies in one group of countries lead to contractionary impacts on their trading partners? In response to such kind of questions many analysts have contributed to the rapid development of open-economy macro models.

Chapter Objectives

Dear distance learner! After completing this chapter, you will be able to:

- Explain the concept and characteristics of an open economy;
- Identify the link between exchange rate and the level of investment;
- Discuss the difference between current account and capital account;
- Realize the effect of devaluation in the overall performance of the economy;
- Understand the concept of fiscal policy and monetary policy in an open economy;

Chapter Outline

- The basic concepts of aggregate demand in the open economy.
- The concepts of exchange rate and its effect on economic performance.
- The concept of current account and capital account.
- The concept of devaluation and its effect in the performance of the economy.
- The application of fiscal policy and monetary policy in the open economy.

4.1. Basic Concepts of Open Economy Macroeconomics

Before developing any theories about consumption and investment choices by people it is important to define what is meant by aggregate demand in the open economy.

Activity

Dear student, what do you understand when people say open economy? Please, write your answer on the space provided below.

4.1.1. Open Economy National Income Identity

- The key macroeconomic difference between open and closed economies is that, in an open economy, a country's spending in any given year need not equal its output of goods and services. A country can spend more than it produces by borrowing from abroad, or it can spend less than it produces and lend the difference to foreigners.
- Thus, in an open economy gross domestic product (GDP) differs from that of a closed economy because there is an ***additional injection***- export expenditure which represents foreign expenditure on domestically produced goods. There is also an ***additional leakage***- expenditure on imports which represents domestic expenditure on foreign goods and which raises foreign national income.
- To derive the open economy national income identity, note that the expenditure on an open economy's output of goods and services can be divided into four components:
    - C^d - personal consumption of domestic goods and services,
    - I^d - investment in domestic goods and services,
    - G^d - government purchases of domestic goods and services,
    - EX - exports of domestic goods and services.

Mathematically, the division of expenditure into these components can be expressed as:

$$Y = C^d + I^d + G^d + EX$$

- Note that domestic spending on all goods and services is the sum of domestic spending on domestic goods and services and on foreign goods and services.
- Therefore,

$$C = C^d + C^f \qquad I = I^d + I^f$$

$$G = G^d + G^f$$

where, C^f –personal expenditure on foreign goods & services

I^f- Investment expenditure on foreign goods by domestic firms

G^f-Government expenditure on foreign goods and services

- Now, substitute these three equations into the identity above:

$Y = C^d + I^d + G^d + EX$ and rearranging

$Y = (C - C^f) + (I - I^f) + G - G^f + EX$

$Y = C + I + G + EX - (C^f + I^f + G^f)$

$Y = C + I + G + EX - IM$ Where, $IM = C^f + I^f + G^f$ -denotes imports

- The national income identity in an open economy is therefore:

$$Y = C + I + G + Nx$$

Or $Nx = Y - (C + I + G)$,

Net Exports = Output − Domestic Spending.

- ✓ The national income identity shows how domestic output, domestic spending, and net exports are related.

- It shows that in an open economy, domestic spending need not equal the output of goods and services. If output exceeds domestic spending, we export the difference: net exports are positive. If output falls short of domestic spending, we import the difference: net exports are negative.

Activity

Dear student, what do you understand when people say exchange rate? Please, write your answer on the space provided below.

4.1.2. Exchange Rates

As countries are interlinked through trade in goods and services and of finance, we need to examine the prices that apply to these transactions.

- The exchange rate is perhaps the central concept in an open economy.
- **The exchange rate (e)** is the rate at which one currency exchanges for another.
- One may view the exchange rate as indicative of the relative price of goods and services denominated in the currencies of the two countries concerned.
- Alternatively, the exchange rate can be regarded as the relative price of assets denominated in the currencies of a pair of countries.

- In any case, conversion from one currency unit to another is the job of the exchange rate.

➢ There are two conventions for measuring the exchange rate, the distinction between which can be the source of serious confusion:

A. Domestic currency units per unit of foreign currency

- For example, if the birr is the home currency and the dollar ($) is the foreign Currency, and 20 birr exchanges for $1, then the exchange rate is 20. The domestic currency is on the numerator of the ratio.
- Here, whenever E rises the home currency gets weaker; **it depreciates**. For example, a rise from 20 to 21 means that 21birr exchanged for $1, less than before.
- Conversely, when E falls, the domestic currency gets stronger, it appreciates.

B. Foreign currency units per unit of Domestic Currency

This is exactly the converse of the first convention.

- The domestic currency is on the denominator. When 20birr is exchanged for $1, the exchange rate is 0.05.
- **If E rises, the home currency gets stronger, and vice versa.**

Real and Nominal Exchange Rates

➢ The **Nominal Exchange Rate (e)** is the relative price of the currency of two countries. For example, if the exchange rate between the Ethiopian birr and the U.S dollar is 20 birr per dollar, then you can exchange one dollar for 20 birr in the world markets for foreign currency. That is,

- An Ethiopian who wants to obtain dollars would pay 20 birr for each dollar he bought.
- An American who wants to obtain birr would get 20 birr for each dollar he paid.

➢ The **Real Exchange Rate** is the relative price of the goods of two countries. That is, the real exchange rate tells us the rate at which we can trade the goods of one country for the goods of another. It measures a country's competitiveness in the international trade.

The real exchange rate R, is usually defined as

$$\mathbf{R = e.P^f/P}$$

Where P and Pf are the price levels here and abroad, respectively and e is the birr price of foreign exchange (the nominal exchange rate).

- The rate at which we exchange foreign and domestic goods depends on the prices of the goods in the local currencies and on the rate at which the currencies are exchanged.

- If the exchange rate equals 1, currencies are at purchasing power parity (PPP).
- **A real exchange rate above 1 means, that goods abroad are more expensive than goods at home**. Other things equal, this implies that people- both at home and abroad- are likely to switch some of their spending to goods produced at home. This is often described as an increase in the competitiveness of our products. As long as **R** is greater than 1, we expect the relative demand for domestically produced goods to rise.

Exchange rate Determination/Fixed versus Flexible Exchange rate/

***A.* Flexible Exchange Rates**:

- Under this system the exchange rate is completely market- determined, without any interference from government authorities (the central bank).
- The balance of payments balances: surpluses are eliminated via exchange rates appreciation; deficits are cured by exchange rate depreciation.
- In other words, balance of payments disequilibria are self correcting.

***B.* Fixed Exchange Rate system**

- Here the rate of exchange is a policy parameter fixed by the authorities. They have to meet excess demand for a foreign currency (not financed by sales in that foreign country) from their reserves of foreign currency.
- Net inflows of foreign currency swell the domestic money supply, as private economic agents who don't use it to purchase goods abroad convert foreign currency to domestic money at the fixed rate of exchange.
- Fixed exchange rates make the domestic money Supply dependent on changes in foreign exchange reserves. Also, balance of payments deficits cause reserve losses and surpluses cause reserve to be built up: **there is no self-correcting mechanism to balance of payments disequilibria.**

➢ These two exchange rate regimes are the two polar extremes in the economics of exchange rate. In reality we have a pastiche of arrangement, somewhere in between the two. Even with flexible rates, central banks do interfere with the market-determined exchange rate, often in an internationally concerted fashion. This is known as a **Managed Float** (Eg: the current Ethiopian exchange rate system). Fixed Exchange rates also allow for realignments and changes in the exchange rate, usually devaluation.

- **Devaluation Versus Revaluation.**

✓ Devaluation takes place when the price of foreign currencies under fixed exchange rate regime is increased by official action (you can consider the action of the Ethiopian government to devalue the currency in 1992. The Birr was devalued in 1992 and this is expected to promote exporters and discourage importers. This was expected to narrow the gap between exports and imports and consequently improve the current account.

✓ Devaluation thus means that foreigners pay less for devalued currency and that residents of the devaluing country pay more for foreign currencies. The opposite of devaluation is revaluation.

- **Depreciation versus Appreciations**

A currency is said to be depreciated when under floating rates it becomes less expensive in terms of foreign currency. By contrast, currency appreciates when it becomes more expensive in terms of foreign money.

4.1.3. Current Account and Capital Account

- One of the striking features of open international economies is the high degree of integration among financial, or capital, markets—the markets in which bonds and stocks are traded, and integration among goods markets-the markets in which goods and services are traded. The international transactions of a nation are recorded in a nation's Balance of Payment /BOP/ account: record of the transactions of the residents of a country with the rest of the world.
- The Balance of Payment /BOP/ account has two components: the capital account-which records financial transaction & current account –which records transaction in goods and services as well as transfer payments.
- **Capital account** refers to the transactions into domestic currency (capital inflows) and into foreign currency (capital outflows). The capital account records purchases and sales of assets, such as stocks, bonds, and land. The movements of funds are motivated by asset market consideration; money flows in to the domestic financial market if domestic money and financial assets are more attractive relative to foreign currency assets. This relative attractiveness is usually measured by the differential between domestic and foreign interest rates, funds flowing into the country with the higher returns. The perceived economic & political risks of holding assets abroad, Government policies that affect foreign ownership of

domestic assets can also determine the flow of financial transaction. The capital account can be a Surplus, Deficit or Balanced.

- **Capital Account Surplus**—also called a net capital inflow occurs—when our receipts from the sale of stocks, bonds, bank deposits, and other assets exceed our payments for our purchases of foreign assets, and vice versa.
- **Current account**, on the other hand, is the account that records trade in goods and service, as well as transfer payments. The values of receipt on account of export of goods and services as well as transfer payments received less the values of payment on account of imports of goods and services plus transfer payment abroad gives us the current account balance. This account can be a surplus, deficit or balanced.
- **The current account** is in **surplus if exports of goods and services exceeds imports** plus **net transfers to foreigners,** that is, if receipts from trade in goods and services and transfers exceed payments on this account.

4.1.4. Devaluation and the Current Account Balance

As nations open up there economy to interact with the rest of the world, concern arises as to which policies to stick on for economic progress to happen. The reason is that the interaction with the rest of the world by itself can influence economic performance. When nations take expansionary fiscal policy, it was observed that the level of employment rises and thereby output grows. However, expansionary fiscal policy tends to result in greater expenditure on imports and consequently it leads to a deterioration of the current account, and thereby slows national income.

To maintain the current account balance, devaluation would be a good candidate. By making imports expensive in the domestic market and by making exports cheaper in the foreign market, devaluation is expected to improve the current account balance. On the basis of this expectation, devaluation has been one of the major policy prescriptions over the last several decades by the international organizations, International Monetary Fund (IMF) and World Bank (WB) to developing countries.

However, the effectiveness of devaluation to improve the current account balance depends on the **Marshall-Lerner Condition (MLC).** The MLC can be derived as follows.

The current account balance (CA) when expressed in terms of the domestic currency is given by:

$$\mathbf{CA = X - eM} \quad \text{(1)}$$

Where, e is the nominal exchange rate.

Totally differentiating [1]*

$$\mathbf{d(CA) = dX - edM - Mde}$$

Dividing by **de** throughout gives us:

$$\frac{\mathbf{d(CA)}}{\mathbf{de}} = \frac{\mathbf{dX}}{\mathbf{de}} - \frac{\mathbf{edM}}{\mathbf{de}} - \mathbf{M} \quad (2)$$

At this point we introduce two definitions; **the price elasticity of demand for exports** η_x is defined as the percentage change in exports over the percentage change in price as represented by the percentage change in the exchange rate; this gives:

$$\eta x = \frac{dX}{de} \cdot \frac{e}{X} \quad \textbf{------- (3)}$$

$$So\ that \qquad \frac{dX}{de} = \eta x . \frac{X}{e}$$

And the **price elasticity of demand for imports** η_m is defined as the percentage change in imports over the percentage change in their price as represented by the percentage change in the exchange rate:

$$\eta m = -\frac{dM}{de} \cdot \frac{e}{M} \quad \textbf{---------- (4)}$$

$$So\ that \qquad \frac{dM}{de} = -\eta m . \frac{M}{e}$$

Substituting [3] and [4] into [2] we obtain:

$$\frac{d(CA)}{de} = \eta x . \frac{X}{e} + \eta m . M - M \quad \textbf{-------- (5)}$$

Dividing [5] by **M** throughout we get:

$$\frac{d(CA)}{de . M} = \eta x . \frac{X}{e . M} + \eta m - 1 \quad \textbf{------- (6)}$$

- Assuming that we initially have balanced trade $\mathbf{X = eM}$ and hence, $\mathbf{X/eM = 1}$, and rearranging [6] Yields:

$$\frac{d(CA)}{de} = M(\eta x + \eta m - 1) \quad \text{------ (7)}$$

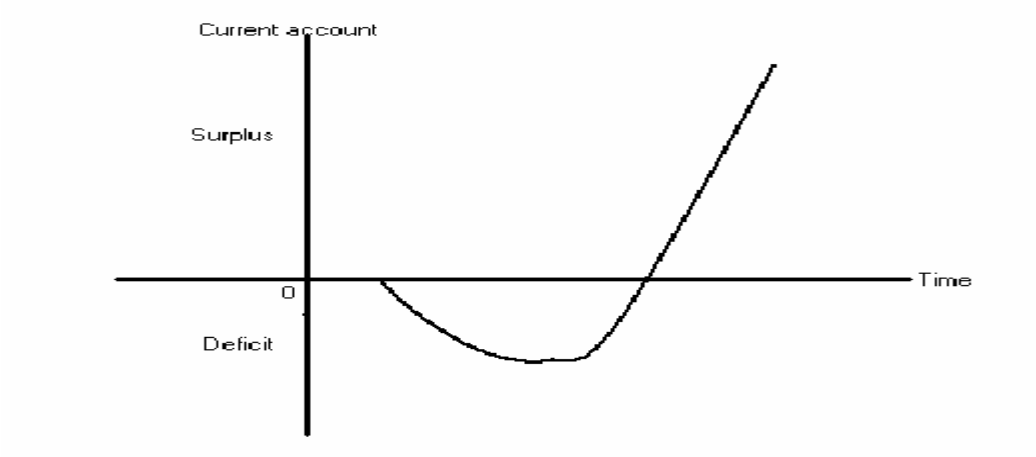
Equation [7] is known as the **Marshall-Lerner Condition**. It says that starting from a position of equilibrium in the current account, devaluation will improve the current account; that is, $\frac{\mathbf{d(CA)}}{\mathbf{de}} > 0$, only if the sum of the foreign elasticity of demand for exports and the home country elasticity of demand for imports is greater than unity, that is $\eta_x + \eta_m > 1$. **If the sum of these two elasticities is less than unity then a devaluation will lead to a deterioration of the current account.**

Empirical Evidence on η_x and η_m

The possibility that devaluation may lead to a worsening rather than improvement in the current account balance had led to much research into empirical estimates of the elasticity of demand for exports and imports. Economists divided up into two camps popularly known as 'elasticity optimists' who believed that the sum of these two elasticities tended to exceed unity, and 'elasticity pessimists' who believed that these elasticities tended to be less than unity. It was argued that devaluation may work better for industrialized countries than for developing countries. Many developing countries are heavily dependent upon imports so that their price elasticity of demand for imports is likely to be very low. While for industrialized countries that have to face competitive export markets, the price elasticity of demand for their export may be quite elastic. The implication of the **Marshall-Lerner condition** is that devaluation may be a cure for some countries balance of payment deficits but not for others.

Even for countries that devaluation is a solution for the BOP deficit, the initial J-curve effect (see the figure below) may not be precluded. The **J-curve** shows that the deficit may initially rise but after a lag of sometime the trend would be reversed so that the BOP would be in surplus. **The J-curve effect** arises mainly as elasticity are lower in the short run than in the long run, in which case the **Marshall-Lerner condition** may only hold in the medium to long run.

Figure 3.4 The J-Curve



The possibility that in the short run the Marshall-Lerner condition may not be fulfilled although it generally holds over the longer run leads to the phenomenon of what is popularly known as the ***J-curve effect.*** The idea underlying the J-curve effect is that in the short run export volumes and import volumes do not change much, so that devaluation leads to deterioration in the current account. However, after a time lag export volumes start to increase and import volumes start to decline; consequently the current deficit starts to improve and eventually moves into surplus. The issue then is whether the initial deterioration in the current account is lower than the future improvement so that overall devaluation can be said to work.

There have been numerous reasons advanced to explain the slow responsiveness of export and import volumes in the short run and why the response is far greater in the long run. Two of the most important are:

- **A time lag in consumer responses**- It takes time for consumers in both the devaluing country and the rest of the world to respond to the changed competitive situation.
- **A time lag in producer response**- Even though devaluation improves the competitive position of exports, it will take time for domestic producers to expand production of exportable.

Activity

Dear student, what do you understand when people say IS-LM model? Please, write your answer on the space provided below.

4.2. The Mundell-Fleming Model

- The model developed in this chapter, called the Mundell–Fleming model, is an open-economy version of the IS – LM model.
- This model owes its origins to papers published by James Flemming (1962) and Robert Mundell (1962, 1963).
- Their major contribution was to incorporate international capital movements into formal macroeconomic models based on the Keynesian IS-LM framework.
- Their papers led to some dramatic implications concerning the effectiveness of fiscal and monetary policy on national income.

Notice the Relationship b/n IS-LM and Mundell–Fleming Model:

- Both models stress the interaction between the goods market and the money market.
- Both models assume that the price level is fixed and then show what causes short-run fluctuations in aggregate income (or, equivalently, shifts in the aggregate demand curve).
- The key difference is that the IS –LM model assumes a closed economy, whereas the Mundell–Fleming model assumes an open economy. The Mundell–Fleming model extends the short-run model of national income by including the effects of international trade and finance.

The Mundell–Fleming model makes one important and extreme assumption: it assumes that the economy being studied is a small open economy with perfect capital mobility. That is, the economy can borrow or lend as much as it wants in world financial markets and, as a result, the economy's interest rate is determined by the world interest rate. One virtue of this assumption is that it simplifies the analysis: once the interest rate is determined, we can concentrate our attention on the role of the exchange rate.

In this section, we will build the Mundell –Fleming model, and use the model to examine the impact of various policies to discern how the economy operates under floating and fixed exchange rate regimes and notice whether a floating or fixed exchange rate is better- /an important question in recent years, as many nations around the world have debated what exchange-rate system to adopt/.

Small Open Economy with Perfect Capital Mobility

- Domestic interest rate, **r** is determined by the world interest rate r^* -the small open economy being under consideration do not affect world interest rate. Mathematically: $\mathbf{r = r*}$
- The $\mathbf{r = r*}$ equation represents the assumption that the international flow of capital is rapid enough to keep the domestic interest rate equal to the world interest rate.
- Since r is fixed, fiscal and monetary policies will affect the IS and LM curves through the exchange rates.

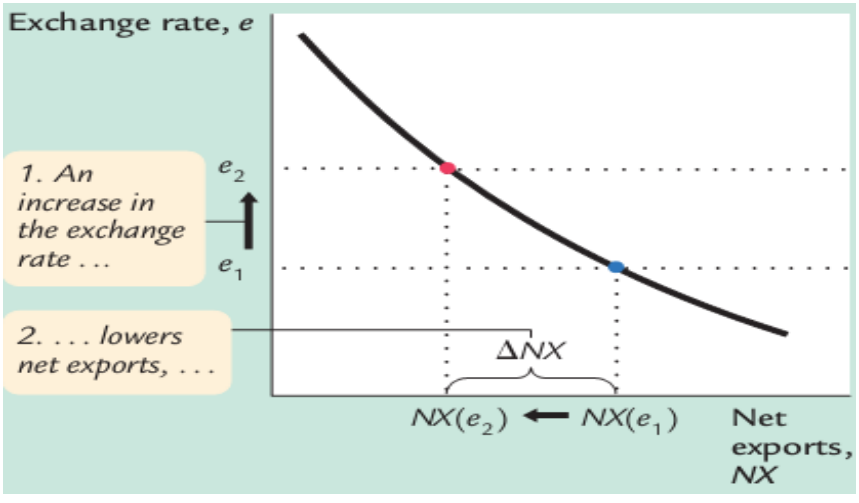
4.2.1. The Goods Market and the IS* Curve

The Mundell–Fleming model describes the market for goods and services much as the IS–LM model does, but it adds a new term for net exports. In particular, the goods market is represented with the following equation:

$$\mathbf{Y = C(Y - T) + I(r*) + G + Nx(e)}$$

- The net exports depend on the real exchange rate. The Mundell-Fleming model, however, assumes that the price levels at home and abroad are fixed, so the real and nominal exchange rates are proportional.
- When the nominal exchange rate appreciates foreign goods become cheaper compared to domestic goods, and this causes exports to fall and imports to rise, and lowers the aggregate income.
  - ✓ The relation of the exchange rate and aggregate income is called the IS^*curve.

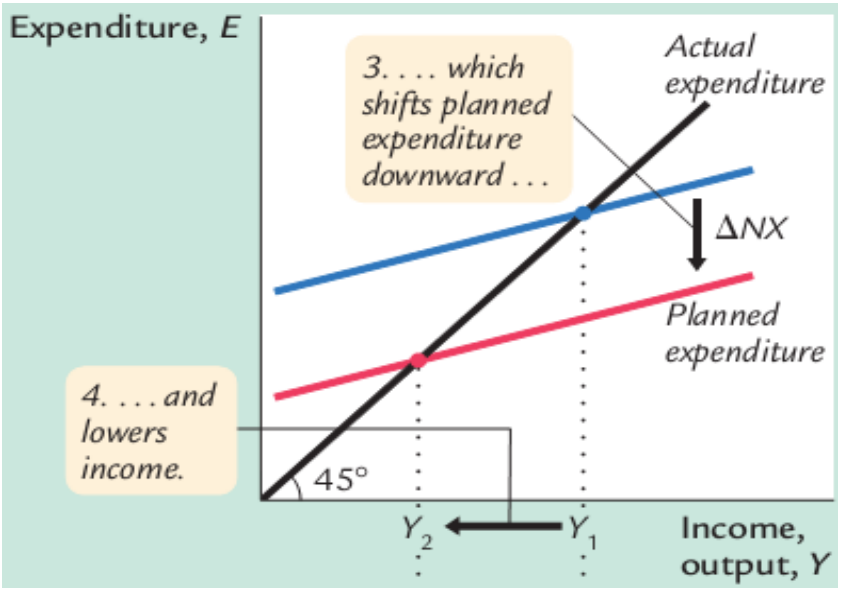
Figure: 4.1: The Net-Exports Function



✓ An increase in the exchange rate from e_1 to e_2 lowers net exports from $\mathbf{Nx(e_1)}$to $\mathbf{Nx(e_2)}$.

How changes in the exchange rate do affect income?

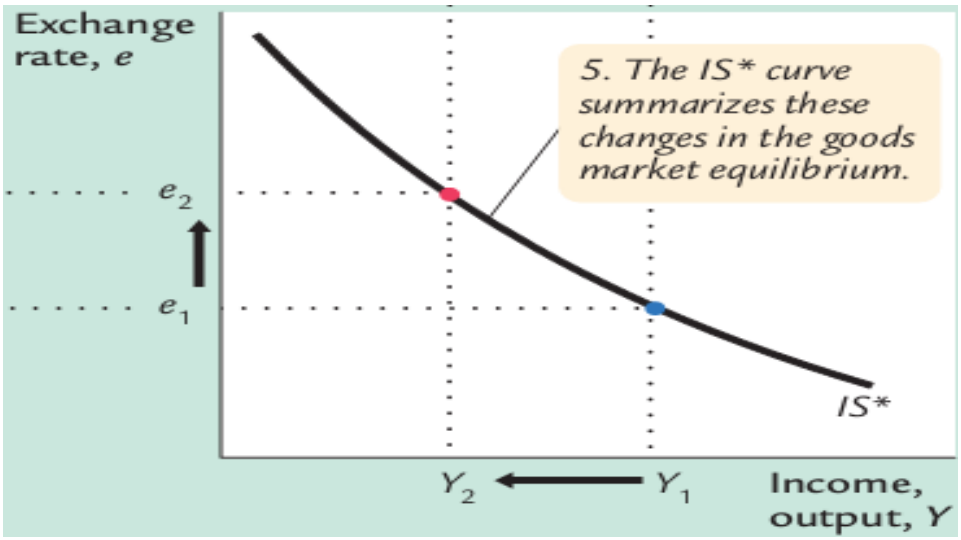
Figure: 4.2: The Keynesian Cross/Expenditure-output Model



- ✓ A decrease in net exports from $\mathbf{Nx(e_1)}$ to $\mathbf{Nx(e_2)}$ shifts the planned-expenditure schedule downward and reduces income from $\mathbf{Y_1}$ to $\mathbf{Y_2}$ as indicated above.

The IS* curve summarizing this relationship between the exchange rate and income: the higher the exchange rate, the lower the level of income.

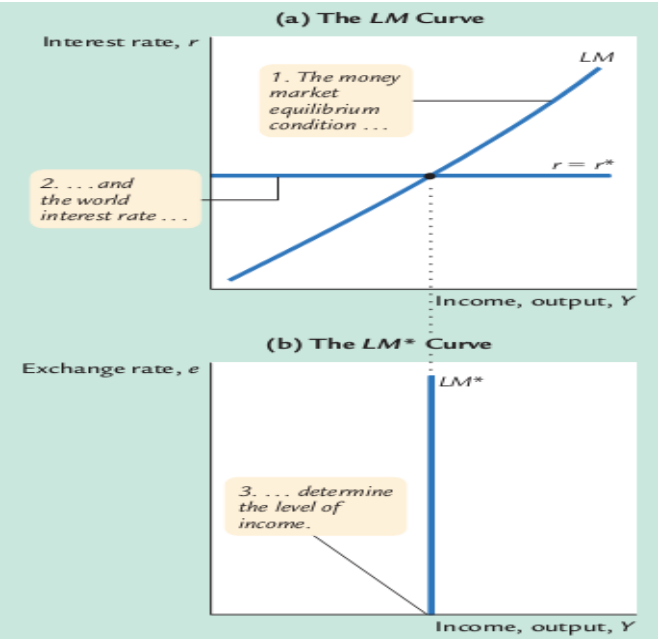
Figure: 4.3: The IS* Curve



4.2.2. The Money Market and the LM* Curve

- LM curve is derived on the basis of liquidity preference theory: $\boldsymbol{M/P = L(r, Y)}$
- The model assumes M as fixed policy variable chosen by central banks and P is also fixed in the short-run, and thus LM curve draws combinations of r and Y satisfying the equation written above.
- Since r is fixed by the world interest rate in an open economy, the equation finds a fixed amount of income Y.
- This is to say Y is not affected by the exchange rate. Hence, the LM curve, which draws the relation of the exchange rate and aggregate income, is vertical.

Figure: 4.4: The LM Curve:*



- ✓ *Panel (a) shows the standard LM curve [which graphs the equation* $\boldsymbol{M/P = L(r, Y)}$ *] together with a horizontal line representing the world interest rate, r*.*
- ✓ *The intersection of these two curves determines the level of income, regardless of the exchange rate.*
- ✓ *Therefore, as panel (b) shows,* ***the LM* curve is vertical.***

4.2.3. The Equilibrium/Combining the IS* and LM* Curves

According to the Mundell–Fleming model, a small open economy with perfect capital mobility can be described by two equations:

$$\mathbf{Y = C(Y - T) + I(r^*) + G + Nx(e)} \quad : \mathbf{IS^*}$$

$$\mathbf{M/P = L(r^*, Y)} \quad \mathbf{LM^*}$$

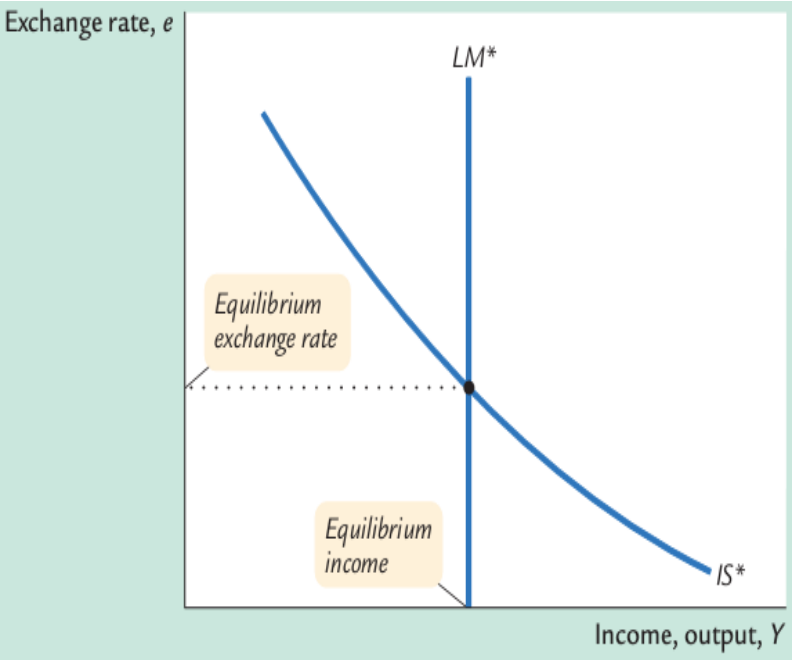
- The first equation describes equilibrium in the goods market, and the second equation describes equilibrium in the money market. The exogenous variables are fiscal policy G and T, monetary policy M, the price level, P and the world interest rate, r*.

- The endogenous variables are income Y and the exchange rate **e**.

Figure 4.5 illustrates these two relationships. The equilibrium for the economy is found where the IS^* curve and the LM^* curve intersect. This intersection shows the exchange rate and the level of income at which both the goods market and the money market are in equilibrium.

Using the Mundell–Fleming model, we can show how aggregate income **Y** and the exchange rate **e** respond to changes in policy.

Figure: 4.5: Mundell–Fleming Model



- *This graph of the Mundell–Fleming model plots the goods market equilibrium condition: IS* and the money market equilibrium condition: LM*.*
- *Both curves are drawn holding the interest rate constant at the world interest rate. The intersection of these two curves shows the level of income and the exchange rate that satisfy equilibrium both in the goods market and money market.*

4.2.4. Monetary and Fiscal Policy Analysis in an Open Economy with Perfect Capital Mobility

4.2.4.1. The Small Open Economy under Floating Exchange Rates

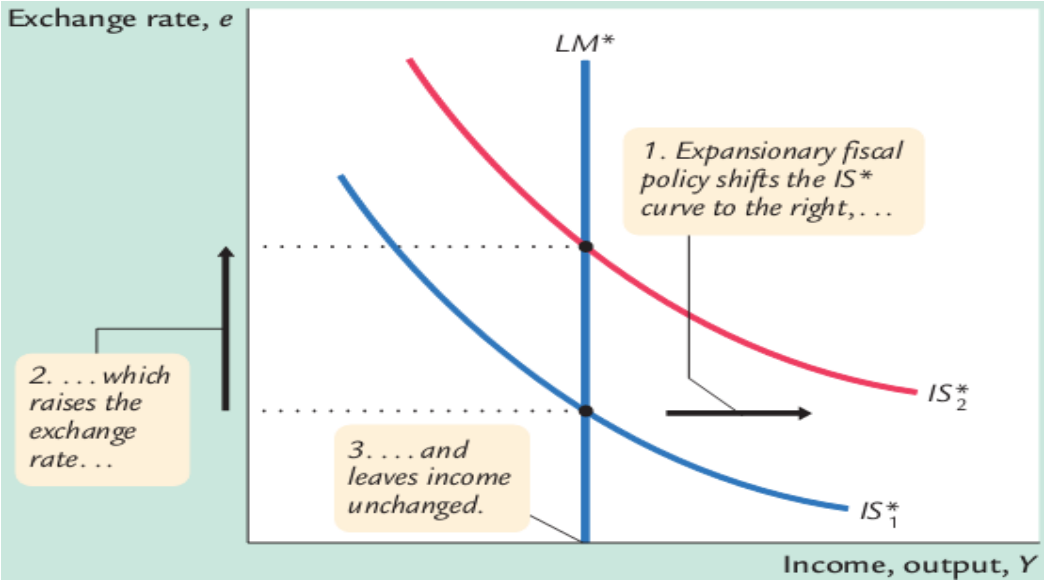
A) Fiscal Policy under Floating Exchange Rates

- Suppose that the government stimulates domestic spending by increasing government purchases or by cutting taxes. Because such expansionary fiscal policy increases planned expenditure, it shifts the IS* curve to the right, as in figure 4.6. As a result, the exchange rate appreciates, whereas the level of income remains the same.

Note the mechanism:

- When income rises in a small open economy, due to the fiscal expansion, the interest rate tries to rise but capital inflows from abroad put downward pressure on the interest rate. This inflow causes an increase in the demand for the domestic currency pushing up its value (the currency appreciates).
- The appreciation of the exchange rate makes domestic goods expensive for foreigners, and this reduces net exports. The fall in net exports offsets the effects of the expansionary fiscal policy on income.

Figure: 4.6: A Fiscal Expansion Under Floating Exchange Rates



✓ **Note that an increase in government purchases or a decrease in taxes shifts the IS* curve to the right. This raises the exchange rate but has no effect on income.**

B) Monetary Policy under Floating Exchange Rates

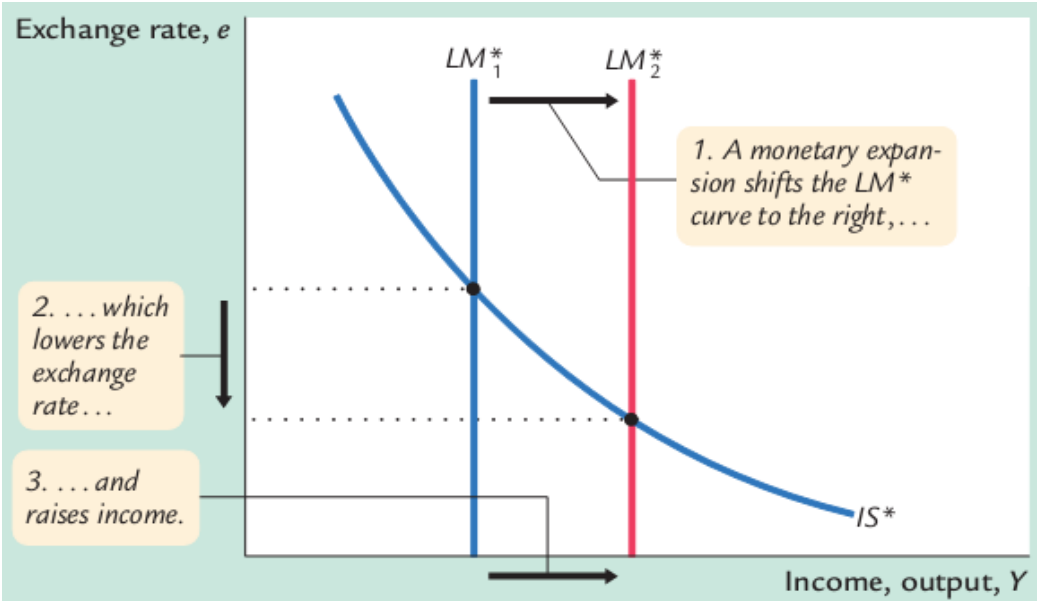
- Suppose now that the central bank increases the money supply. Because the price level is assumed to be fixed, the increase in the money supply means an increase in real balances.
- The increase in real balances shifts the LM* curve to the right, as in Figure 4.7.
- Hence, an increase in the money supply raises income and lowers the exchange rate.

Note the mechanism:

✓ When **increase in the money supply** puts **downward** pressure on the **domestic interest rate,** capital flows out of the economy as investors seek a higher return elsewhere. This capital outflow prevents the domestic interest rate from falling.

✓ In addition, because the **capital outflow** increases the supply of the domestic currency in the market for foreign-currency exchange, the **exchange rate depreciates**. The fall in the exchange rate makes **domestic goods cheap** relative to foreign goods and, thereby, **stimulates net exports**. Hence, in a small open economy, monetary policy influences income by altering the exchange rate.

Figure: 4.7: A Monetary Expansion Under Floating Exchange Rates



✓ **Note that an increase in the money supply shifts the LM* curve to the right, lowering the exchange rate and raising income.**

4.2.4.2. The Small Open Economy under Fixed Exchange Rates

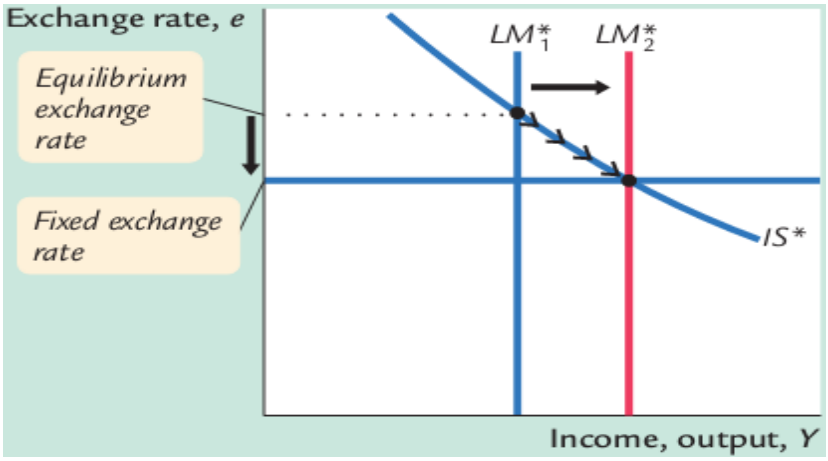
- Under a fixed exchange rate, the central bank announces a value for the exchange rate and stands ready to buy and sell the domestic currency at a predetermined price to keep the exchange rate at its announced level.
- Fixed exchange rates require a commitment of a central bank to allow the money supply to adjust to whatever level will ensure that the equilibrium exchange rate in the market for foreign-currency exchange equals the announced exchange rate.
- i.e., the sole objective of monetary policy is to keep the exchange rate at the announced level.

How a Fixed-Exchange-Rate System Works

- Suppose that the Ethiopian national bank announces that it is going to fix the exchange rate at 32 birr per dollar (I.e., $0.03125 per birr). It would then stand ready to give 32 birr in exchange for $1 or to give $1 in exchange for 32 birr.
- Hence, the NB would need a reserve of birr (which it can print) and a reserve of dollars (which must have been purchased previously).

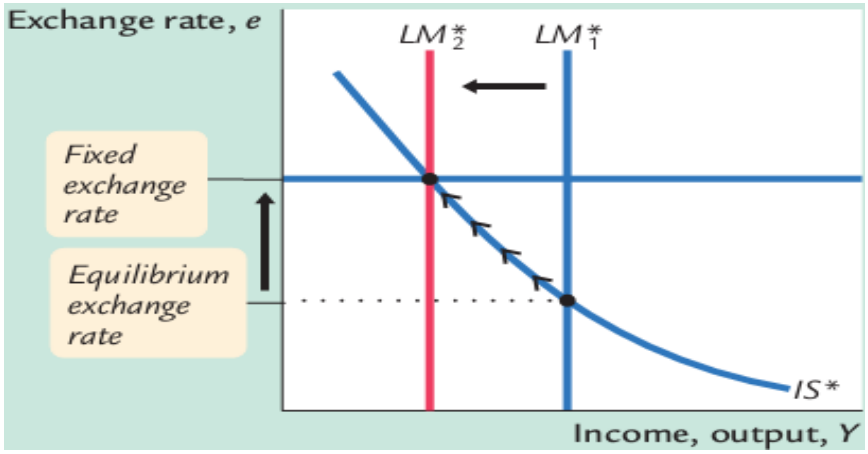
Suppose in the current equilibrium with the current money supply, the exchange rate is 20 birr per dollar ($0.05 per birr) that is better (there is profit opportunity) than 32 birr per dollar (determined by the national bank). Arbitrageurs use their birr to buy foreign currency in foreign-exchange markets and sell it to the domestic national bank for a profit. ***This process automatically increases the money supply (the base money)-shifting the LM* curve to the right and lowers the equilibrium exchange rate.*** In this way, the money supply continues to rise until the equilibrium exchange rate falls to the announced level (***as the figure 4.8 presents).***

Figure: 4.8: When the equilibrium exchange rate is greater than the fixed exchange rate



Contrary to this, suppose the equilibrium exchange rate is lower than the fixed exchange rate. Arbitrageurs will buy birr in foreign-exchange markets and use them to buy foreign currency from national bank of Ethiopia. **This process automatically reduces the money supply, shifting the LM* curve to the left and raises the exchange rate as figure 4.9, presents.**

Figure: 4.9: When the equilibrium exchange rate is less than the fixed exchange rate



Figures: 4.8 and 4.9 shows how a fixed exchange rate governs the money supply.

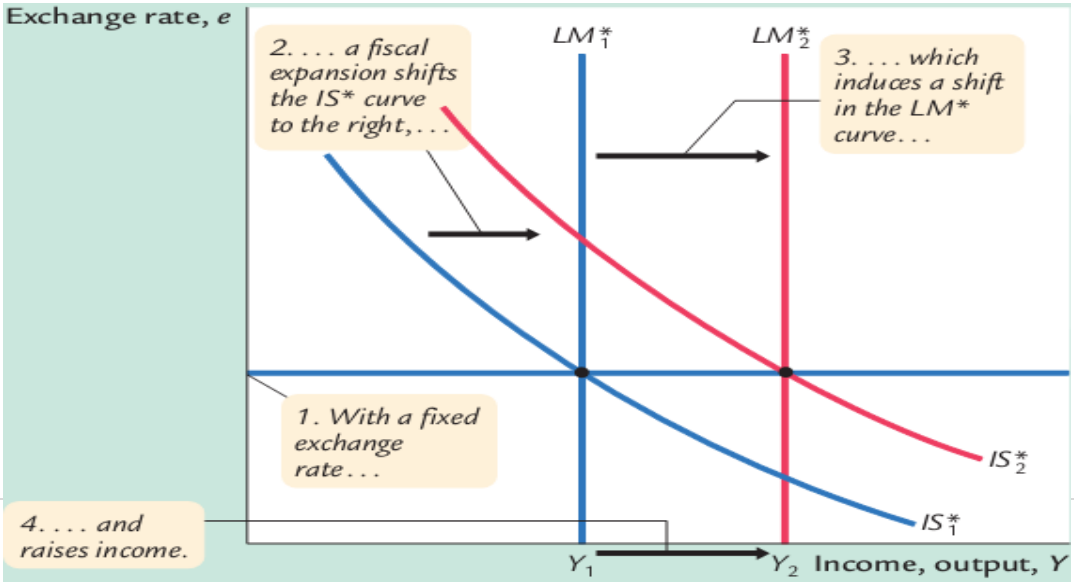
✓ Let's now examine how economic policies affect a small open economy with a fixed exchange rate system.

A) Fiscal Policy under Fixed Exchange Rates

- Suppose that the government stimulates domestic spending by **increasing government purchases or by cutting taxes**. This policy shifts the IS* curve to the right, as in Figure 4.8, **putting upward pressure on the exchange rate**.
- But because the central bank stands ready to trade foreign and domestic currency at the fixed exchange rate, arbitrageurs quickly respond to the rising exchange rate by selling foreign currency to the central bank, leading to an **automatic monetary expansion**.
- The rise in the money supply (in the **base money**) shifts the LM* curve to the right.

➢ **Thus, under a fixed exchange rate, a fiscal expansion raises aggregate income.**

Figure: 4.10: A Fiscal Expansion Under Fixed Exchange Rates

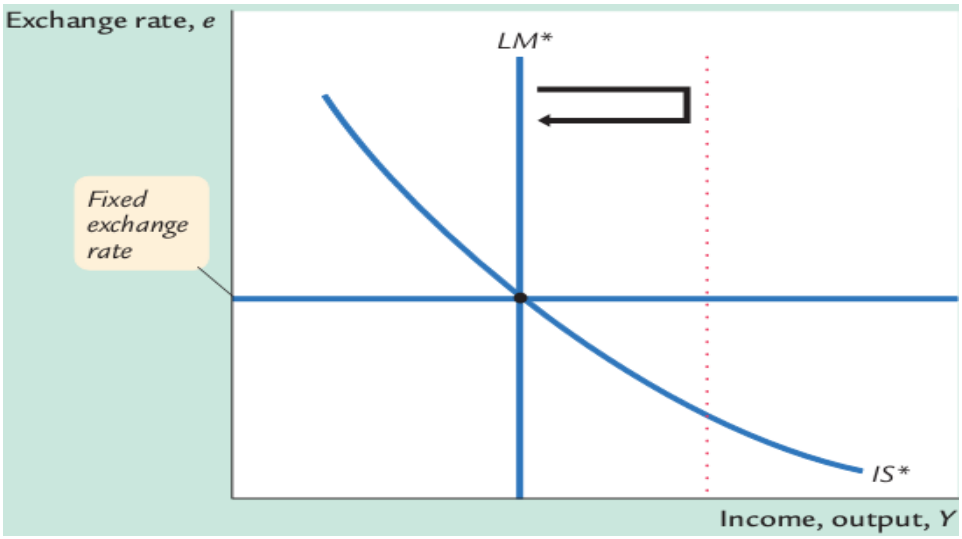


✓ A fiscal expansion shifts the IS* curve to the right. To maintain the fixed exchange rate, the central bank must increase the money supply, thereby shifting the LM* curve to the right. Hence, in contrast to the case of floating exchange rates, under fixed exchange rates a fiscal expansion raises income.

B) Monetary Policy under Fixed Exchange Rates

- Imagine that a central bank operating with a fixed exchange rate were to try to increase the money supply —for example, by buying bonds from the public.
- What would happen? The initial impact of this policy is to shift the LM* curve to the right, lowering the exchange rate, as in Figure 4.9.
- But, because the central bank is committed to trading foreign and domestic currency at a fixed exchange rate, arbitrageurs quickly respond to the falling exchange rate by selling the domestic currency to the central bank, causing the money supply and the LM* curve to return to their initial positions.
- Hence, monetary policy is ineffective under a fixed exchange rate. By agreeing to fix the exchange rate, the central bank gives up its control over the money supply.

Figure: 4.11: A Monetary Expansion Under Fixed Exchange Rates



✓ If the National bank tries to increase the money supply -for example, by buying bonds from the public—it will put downward pressure on the exchange rate.

✓ To maintain the fixed exchange rate, the money supply and the LM* curve must return to their initial positions.

✓ Hence, under fixed exchange rates, monetary policy is ineffectual.

❖ **A Summary :Policy in the Mundell-Fleming Model:**

✓ The Mundell-Fleming model shows that the effect of almost any economic policy on a small open economy depends on whether the exchange rate is floating or fixed.

✓ To be more specific, the Mundell –Fleming model shows that the power of monetary and fiscal policy to influence aggregate income depends on the exchange-rate regime.

- ➢ Under floating exchange rates, only monetary policy can affect income. The usual expansionary impact of fiscal policy is offset by a rise in the value of the currency.
- ➢ Under fixed exchange rates, only fiscal policy can affect income. The normal potency of monetary policy is lost because the money supply is dedicated to maintaining the exchange rate at the announced level. In short, we can summarize the effectiveness of policies in the Mundell-Fleming model as follows

Fixed Exchange Rate	**Floating Exchange Rate**
➢ Fiscal Policy is Powerful. ➢ Monetary Policy is Powerless.	➢ Fiscal Policy is Powerless. ➢ Monetary Policy is **Powerful**

4.2.5. The Mundell-Fleming Model with a Changing Price Level

Recall the two equations of the Mundell-Fleming model:

$$Y = C(Y - T) + I(r^*) + G + Nx(e) \quad : IS^*$$

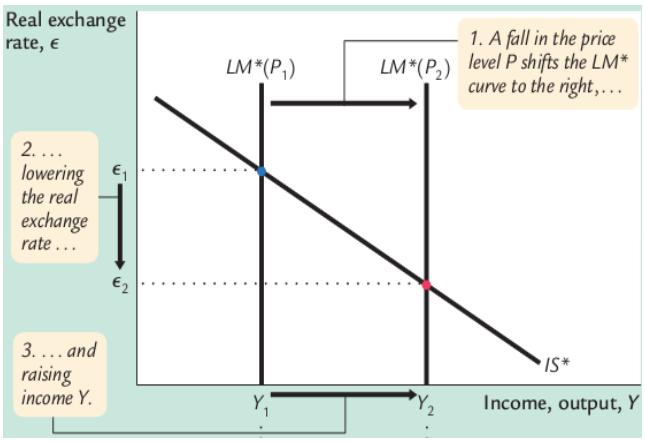
$$M/P = L(r^*, Y) \quad : LM^*$$

✓ The $IS^* - LM^*$ model is constructed for fixed price level. However, a change in the price level shifts the LM^* curve and changes the equilibrium income.

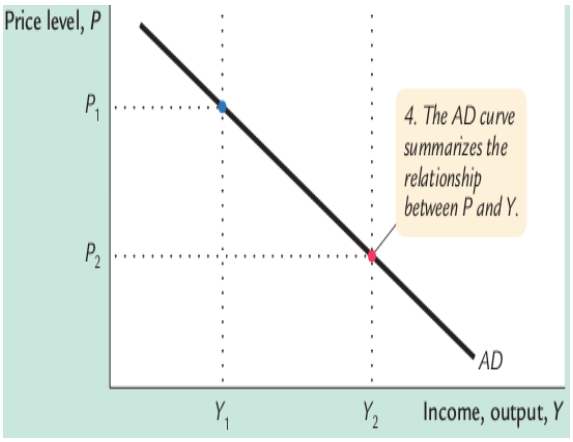
✓ Consider reduction in the price level. When the price level falls, the LM* curve shifts to the right. The equilibrium level of income rises.

✓ The second graph displays the negative relationship between P and Y, which is summarized by the aggregate demand curve.

a) The Mundell–Fleming Model



b) The Aggregate Demand Curve

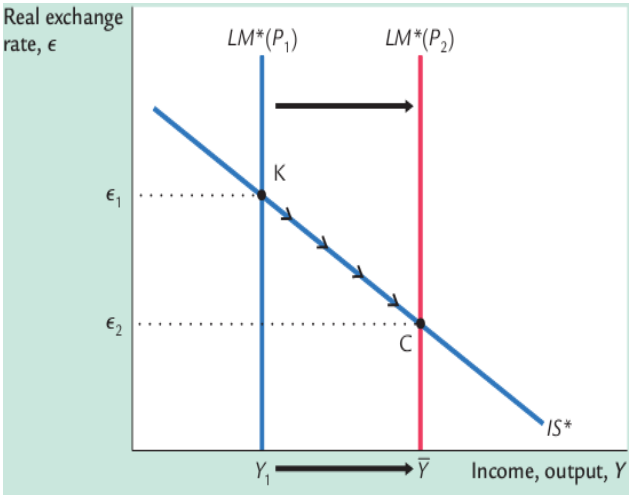


4.2.6. The Short-Run and Long-Run Equilibrium in a Small Open Economy

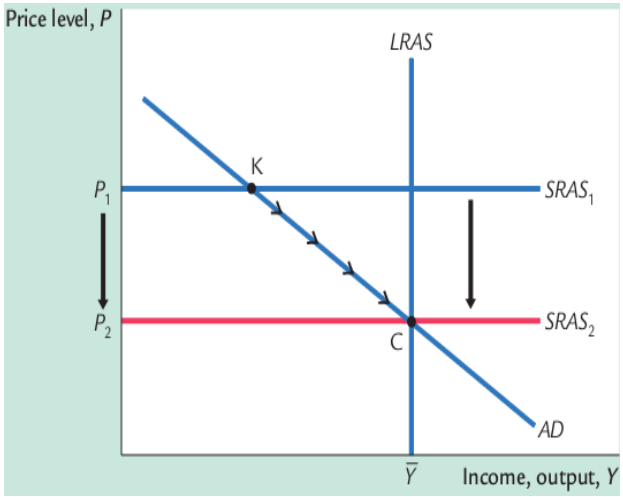
Now let's compare the short-run and the long-run equilibrium of the economy using the $\boldsymbol{IS^* - LM^*}$ and aggregate demand-aggregate supply models.

- ✓ Point **K** in both panels shows the equilibrium under the Keynesian assumption that the price level is fixed at, $\boldsymbol{P_1}$.
- ✓ Point **C** in both panels shows the equilibrium under the classical assumption that the price level adjusts to maintain income at its natural level, $\boldsymbol{\bar{Y}}$.

a) The Mundell –Fleming Model



b) The AD-AS model



4.2.7. Limitations of the Mundell-Fleming Model

1. **Neglect the long run budget constraints:** the model fails to take account of long run constraints that govern both the private and public sector. In the long run private sector spending has to equal its disposable income, while in the absence of money creation government expenditure has to equal its revenue from taxation. This means that in the long run the current account has to be in balance. One implication of these budget constraints is that a forward looking private sector would realize that increased government expenditure will imply higher taxation for them in the future, and this will induce increased private sector savings today that will undermine the effectiveness of fiscal policy.
2. **Wealth Effect:** the model does not allow for wealth effects that may help in the process of restoring long run equilibrium. A decrease in wealth resulting from a fall in foreign assets associated with a current account deficit will ordinarily lead to a reduction in import expenditure which should help to reduce the current account deficit. While such an omission of wealth effects on the import expenditure function may be justified as being small significance in the short run, the omission nevertheless again emphasizes the essentially short-term nature of the model.
3. **Neglect of supply side factors:** one of the obvious limitations of the model is that it concentrates on the demand side of the economy and neglects the supply side. There is an implicit assumption that supply adjust in accordance with changes in demand. In addition, because the aggregate supply curve is horizontal up to full employment, increases in aggregate demand do not lead to changes in the domestic price level, rather they are reflected solely by increases in real output.
4. **Treatment of capital flows:** one of the biggest problems of the model concerns the modeling of capital flows. It is assumed that a rise in the domestic interest rate leads to a continuous capital inflow from abroad. However, to expect such flows to continue indefinitely is unrealistic because after a point international investors will have rearranged the stocks of their international portfolios to their desired content and once this happens the net capital inflows into the country will cease. The only way that the country could then continue to attract capital inflows would be a further rise in its interest rate until once again international portfolios are restored to their desired content. Hence, a country that needs a continuous capital inflow to finance its current account deficit has to continuously raise its

interest rate. In other words, capital inflows are a function of the change in the interest differential rather than the differential itself.

5. **Exchange rate expectations:** A major problem with the model is the treatment of exchange rate expectations. The model does not explicitly model these and implicitly presumes that the expected change is zero, which is known as static exchange rate expectation. While this might not seem to be an unreasonable assumption under fixed exchange rates, it is less tenable under floating exchange rates. According to the model a monetary expansion leads to a depreciation of the currency under floating exchange rates- in such circumstances it seems unreasonable to assume that economic agents do not expect depreciation as well. If agents expect depreciation this may require a rise in the domestic interest rate to encourage them to continue to hold the currency which will have an adverse effect on domestic investment- implying a weaker expansionary effect of monetary policy than is suggested by the model. Indeed, the need to maintain market confidence in exchange rates can severely restrict the ability of government to pursue expansionary fiscal and monetary policies.

Chapter Four: Review Questions

1. What does it mean when we are saying an aggregate demand of an open economy? On what grounds it differ from closed economy?
2. What is the difference between fixed exchange rate and variable exchange rate? What is the economic situation to prefer one of the other?
3. What is the difference between current account and capital account?
4. What is devaluation? and when should be applied as a policy parameter?

CHAPTER FIVE

CONSUMPTION

Introduction

Dear learner! In this chapter, we would like to familiarize you with some of the basic concepts of consumption in a given economy. In this chapter we examine the consumption function in greater detail and develop a more through explanation of what determines aggregate consumption. The chapter also presents the view of five prominent economists to show the diverse approaches to explaining consumption.

Chapter objectives:

Upon a successful completion of this chapter, students will be able to:

- understand the Keynesian consumption function and which consumption behavior is well explained by it
- Understand the way economists' judge rational and forward looking consumers
- Comprehend different consumption functions that solve the consumption puzzle

Chapter Outline:

- The concept of consumption
- Keynes and the consumption function
- Fisher and inter-temporal choice
- Modigliani and the life-cycle hypothesis
- Friedman and the permanent income hypothesis
- Robert Hall and the random walk hypothesis

5.1. The Concept of Consumption

How do households decide how much of their income to consume today and how much to save for the future? This is a microeconomic question because it addresses the behavior of individual decision makers. Yet its answer has macroeconomic consequences. As we have seen in Macroeconomics I, households' consumption decisions affect the way the economy as a whole behaves both in the long run and in the short run.

The consumption decision is crucial for long-run analysis because of its role in economic growth. The consumption decision is crucial for short-run analysis because of its role in

determining aggregate demand. Consumption is two-thirds of GDP, so fluctuations in consumption are a key element of booms and recessions. The $IS-LM$ model shows that changes in consumers spending plans can be a source of shocks to the economy, and that the marginal propensity to consume is a determinant of the fiscal policy multipliers.

In previous chapters we explained consumption with a function that relates consumption to disposable income: $C = C(Y-T)$. This approximation allowed us to develop simple models for long-run and short-run analysis, but it is too simple to provide a complete explanation of consumer behavior. In this chapter we examine the consumption function in greater detail and develop a more thorough explanation of what determines aggregate consumption.

Since macroeconomics began as a field of study, many economists have written about the theory of consumer behavior and suggested alternative ways of interpreting the data on consumption and income. This chapter presents the views of some of the prominent economists to show the diverse approaches to explaining consumption.

5.2. The Keynesian Consumption Function

Activity

Dear learners, explain the Keynes' consumption function

We begin our study of consumption with John Maynard Keynes's *General Theory*, which was published in 1936. Keynes made the consumption function central to his theory of economic fluctuations, and it has played a key role in macroeconomic analysis ever since. Let's consider what Keynes thought about the consumption function, and then see what puzzles arose when his ideas were confronted with the data.

Keynes's Conjectures

Today, economists who study consumption rely on sophisticated techniques of data analysis. With the help of computers, they analyze aggregate data on the behavior of the overall economy from the national income accounts and detailed data on the behavior of individual households from surveys. Because Keynes wrote in the 1930s, however, he had neither the advantage of these data nor the computers necessary to analyze such large data sets. Instead of relying on

statistical analysis, based on introspection and casual observation. Conjecture is inference based on incomplete evidence.

First, Keynes conjectured that the ***marginal propensity to consume***, the amount consumed out of an additional dollar of income, is between zero and one. He wrote that the "fundamental psychological law, upon which we are entitled to depend with great confidence,...is that men are disposed, as a rule and on the average, to increase their consumption as their income increases, but not by as much as the increase in their income." That is, when a person earns an extra dollar, he typically spends some of it and saves some of it. As we saw in *Macroeconomics I* when we developed the Keynesian cross, the marginal propensity to consume was crucial to Keynes's policy recommendations for how to reduce widespread unemployment. The power of fiscal policy to influence the economy-as expressed by the fiscal-policy multipliers-arises from the feed-back between income and consumption.

Second, Keynes posited that the ratio of consumption to income, called the average propensity to consume, falls as income rises. He believed that saving was a luxury, so he expected the rich to save a higher proportion of their income than the poor. Although not essential for Keynes's own analysis, the postulate that the average propensity to consume falls as income rises became a central part of early Keynesian economics.

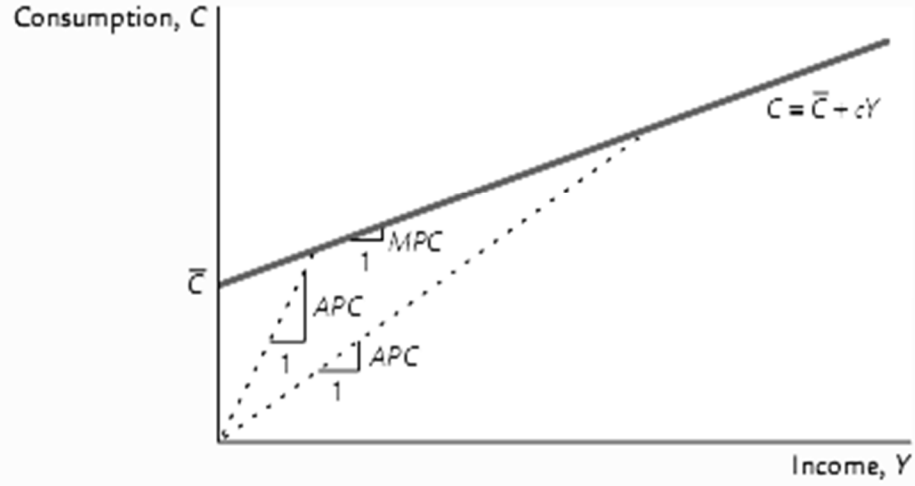
Third, Keynes thought that income is the primary determinant of consumption and that the interest rate does not have an important role. This conjecture stood in stark contrast to the beliefs of the classical economists who preceded him. The classical economists held that a higher interest rate encourages saving and discourages consumption. Keynes admitted that the interest rate could influence consumption as a matter of theory. Yet he wrote that "the main conclusion suggested by experience, I think, is that the short-period influence of the rate of interest on individual spending out of a given income is secondary and relatively unimportant."

On the basis of these three conjectures, the Keynesian consumption function is often written as

$$C = \bar{C} + cY, \quad \bar{C} > 0, \ 0 < c < 1$$

where C is consumption, Y is disposable income, $\bar{C}$ is constant, c marginal propensity to consume. This consumption function, shown in Figure 1-1 (below), is graphed as a straight line.

Figure 5.1



The Keynesian Consumption Function This figure graphs a consumption function with the three properties that Keynes conjectured. First, the marginal propensity to consume c is between zero and one. Second, the average propensity to consume falls as income rises. Third, consumption is determined by current income.

Note: The marginal propensity to consume, *MPC*, is the slope of the consumption function. The average propensity to consume, $APC = C/Y$, equals the slope of a line drawn from the origin to a point on the consumption function.

Notice that this consumption function exhibits the three properties that Keynes posited. It satisfies Keynes's first property because the marginal propensity to consume c is between zero and one, so that higher income leads to higher consumption and also to higher saving. This consumption function satisfies Keynes's second property because the average propensity to consume APC is

$$APC = C/Y = \bar{C}/Y + c$$

As Y rises, $\overline{C}/Y$ falls, and so the average propensity to consume C/Y falls. And finally, this consumption function satisfies Keynes's third property because the interest rate is not included in this equation as a determinant of consumption.

Activity

Dear learners! Elucidate the three conjectures Keynes made about the consumption function

The Early Empirical Successes

Soon after Keynes proposed the consumption function, economists began collecting and examining data to test his conjectures. The earliest studies indicated that the Keynesian consumption function is a good approximation of how consumers behave.

In some of these studies, researchers surveyed households and collected data on consumption and income. They found that households with higher income consumed more, which confirms that the marginal propensity to consume is greater than zero. They also found that households with higher income saved more, which confirms that the marginal propensity to consume is less than one. In addition, these researchers found that higher-income households saved a larger fraction of their income, which confirms that the average propensity to consume falls as income rises. Thus, these data verified Keynes's conjectures about the marginal and average propensities to consume.

In other studies, researchers examined aggregate data on consumption and income for the period between the two world wars. These data also supported the Keynesian consumption function. In years when income was unusually low, such as during the depths of the Great Depression, both consumption and saving were low, indicating that the marginal propensity to consume is between zero and one. In addition, during those years of low income, the ratio of consumption to income was high, confirming Keynes's second conjecture. Finally, because the correlation between income and consumption was so strong, no other variable appeared to be important for explaining consumption. Thus, the data also confirmed Keynes's third conjecture that income is the primary determinant of how much people choose to consume.

Secular Stagnation, Simon Kuznets, and the Consumption Puzzle

Although the Keynesian consumption function met with early successes, two anomalies soon arose. Both concern Keynes's conjecture that the average propensity to consume falls as income rises.

The first anomaly became apparent after some economists made a dire-and, it turned out, erroneous-prediction during World War II. On the basis of the Keynesian consumption function, these economists reasoned that as incomes in the economy grew over time, households would consume a smaller and smaller fraction of their incomes. They feared that there might not be enough profitable investment projects to absorb all this saving. If so, the low consumption would lead to an inadequate demand for goods and services, resulting in a depression once the wartime demand from the government ceased. In other words, on the basis of the Keynesian consumption function, these economists predicted that the economy would experience what they called secular

stagnation-a long depression of indefinite duration-unless fiscal policy was used to expand aggregate demand.

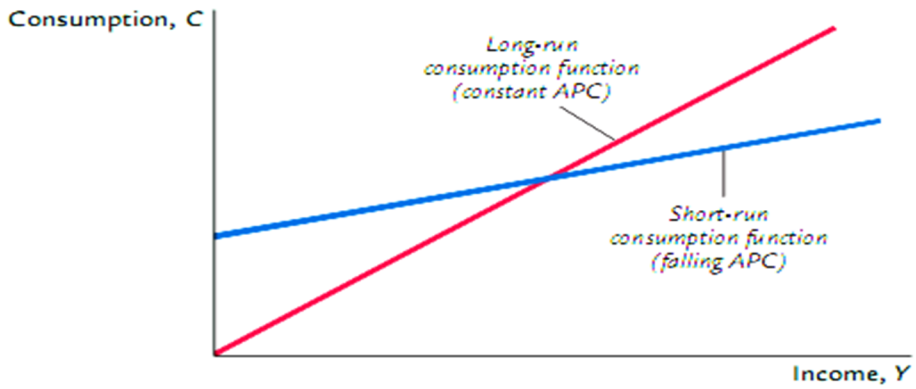
Fortunately for the economy, but unfortunately for the Keynesian consumption function, the end of World War II did not throw the country into another depression. Although incomes were much higher after the war than before, these higher incomes did not lead to large increases in the rate of saving. Keynes's conjecture that the average propensity to consume would fall as income rose appeared not to hold.

The second anomaly arose when economist Simon Kuznets constructed new aggregate data on consumption and income dating back to 1869. Kuznets assembled these data in the 1940s and would later receive the Nobel Prize for this work. He discovered that the ratio of consumption to income was remarkably stable from decade to decade, despite large increases in income over the period he studied. Again, Keynes's conjecture that the average propensity to consume would fall as income rose appeared not to hold.

The failure of the secular-stagnation hypothesis and the findings of Kuznets both indicated that the average propensity to consume is fairly constant over long periods of time. This fact presented a puzzle that motivated much of the subsequent work on consumption. Economists wanted to know why some studies confirmed Keynes's conjectures and others refuted them. That is, why did Keynes's conjectures hold up well in the studies of household data and in the studies of short time-series, but fail when long time-series were examined?

Figure 5-2 illustrates the puzzle. The evidence suggested that there were two consumption functions. For the household data or for the short time-series, the Keynesian consumption function appeared to work well. Yet for the long time-series, the consumption function appeared to have a constant average propensity to consume. In Figure 5-2, these two relationships between consumption and income are called the short-run and long-run consumption functions. Economists needed to explain how these two consumption functions could be consistent with each other.

Figure 5.2



The Consumption Puzzle Studies of household data and short time-series found a relationship between consumption and income similar to the one Keynes conjectured. In the figure, this relationship is called the short-run consumption function. But studies of long time-series found that the average propensity to consume did not vary systematically with income. This relationship is called the long-run consumption function. Notice that the short-run consumption function has a falling average propensity to consume, whereas the long-run consumption function has a constant average propensity to consume.

5.3. Fisher and Inter-temporal Choice

The consumption function introduced by Keynes relates current consumption to current income. This relationship, however, is incomplete at best. When people decide how much to consume and how much to save, they consider both the present and the future. The more consumption they enjoy today, the less they will be able to enjoy tomorrow. In making this tradeoff, households must look ahead to the income they expect to receive in the future and to the consumption of goods and services they hope to be able to afford.

The economist Irving Fisher developed the model with which economists analyze how rational, forward-looking consumers make inter-temporal choices-that is, choices involving different periods of time. Fisher's model illuminates the constraints consumers face, the preferences they have, and how these constraints and preferences together determine their choices about consumption and saving.

The Inter-temporal Budget Constraint

Most people would prefer to increase the quantity or quality of the goods and services they consume-to wear nicer clothes, eat at better restaurants, or see more movies. The reason people consume less than they desire is that their consumption is constrained by their income. In other words, consumers face a limit on how much they can spend, called a budget constraint. When

they are deciding how much to consume today versus how much to save for the future, they face an *inter-temporal budget constraint*, which measures the total resources available for consumption today and in the future. Our first step in developing Fisher's model is to examine this constraint in some detail.

To keep things simple, we examine the decision facing a consumer who lives for two periods. Period one represents the consumer's youth and period two represents the consumer's old age. The consumer earns income Y_1 and consumes C_1 in period one, and earns income Y_2 and consumes C_2 in period two. (All variables are real-that is, adjusted for inflation.) Because the consumer has the opportunity to borrow and save, consumption in any single period can be either greater or less than income in that period.

Consider how the consumer's income in the two periods constrains consumption in the two periods. In the first period, saving equals income minus consumption. That is,

$$S = Y_1 - C_1,$$

where S is saving. In the second period, consumption equals the accumulated saving, including the interest earned on that saving, plus second-period income. That is,

$$C_2 = (1 + r)S + Y_2,$$

where r is the real interest rate. For example, if the interest rate is 5 percent, then for every $1 of saving in period one, the consumer enjoys an extra $1.05 of consumption in period two. Because there is no third period, the consumer does not save in the second period.

Note that the variable *S* can represent either saving or borrowing and that these equations hold in both cases. If first-period consumption is less than first-period income, the consumer is saving, and *S* is greater than zero. If first-period consumption exceeds first-period income, the consumer is borrowing, and S is less than zero. For simplicity, we assume that the interest rate for borrowing is the same as the interest rate for saving.

To derive the consumer's budget constraint, combine the two preceding equations. Substitute the first equation for *S* into the second equation to obtain

$$C_2 = (1 + r)(Y_1 - C_1) + Y_2.$$

To make the equation easier to interpret, we must rearrange terms. To place all the consumption terms together, bring (1 + r) C_1 from the right-hand side to the left-hand side of the equation to obtain

$$(1 + r)C_1 + C_2 = (1 + r)Y_1 + Y_2.$$

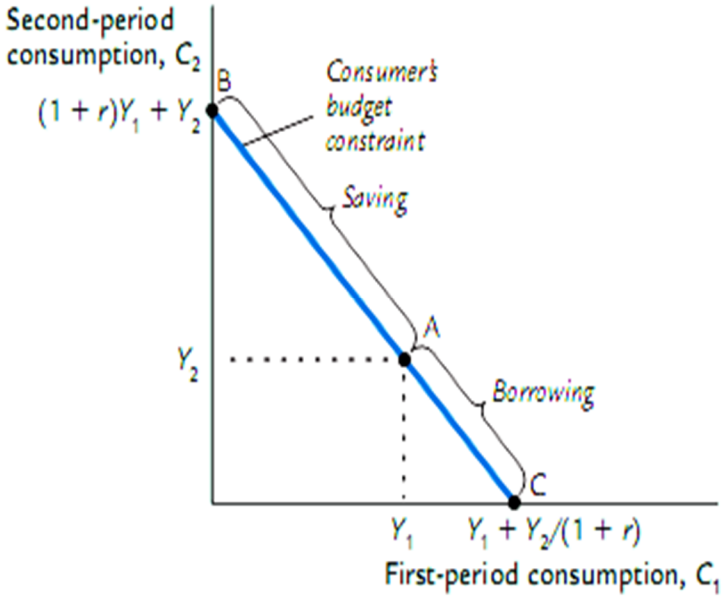
Now divide both sides by 1 + r to obtain

$$C_1 + \frac{C_2}{1 + r} = Y_1 + \frac{Y_2}{1 + r}.$$

This equation relates consumption in the two periods to income in the two periods. It is the standard way of expressing the consumer's intertemporal budget constraint.

Figure 5-3 graphs the consumer's budget constraint. Three points are marked on this figure. At point A, the consumer consumes exactly his income in each period ($C_1 = Y_1$ and $C_2 = Y_2$), so there is neither saving nor borrowing between the two periods. At point B, the consumer consumes nothing in the first period (C_1=0) and saves all income, so second-period consumption C_2 is (1 +r)Y_1 +Y_2 .At point C, the consumer plans to consume nothing in the second period (C_2=0) and borrows as much as possible against second-period income, so first-period consumption C_1 is $Y_1 + Y_2 /(1 + r)$. Of course, these are only three of the many combinations of first- and second-period consumption that the consumer can afford: all the points on the line from B to C are available to the consumer.

Figure 5.3



The Consumer's Budget Constraint This figure shows the combinations of first-period and second-period consumption the consumer can choose. If he chooses points between A and B, he consumes less than his income in the first period and saves the rest for the second period. If he chooses points between A and C, he consumes more than his income in the first period and borrows to make up the difference.

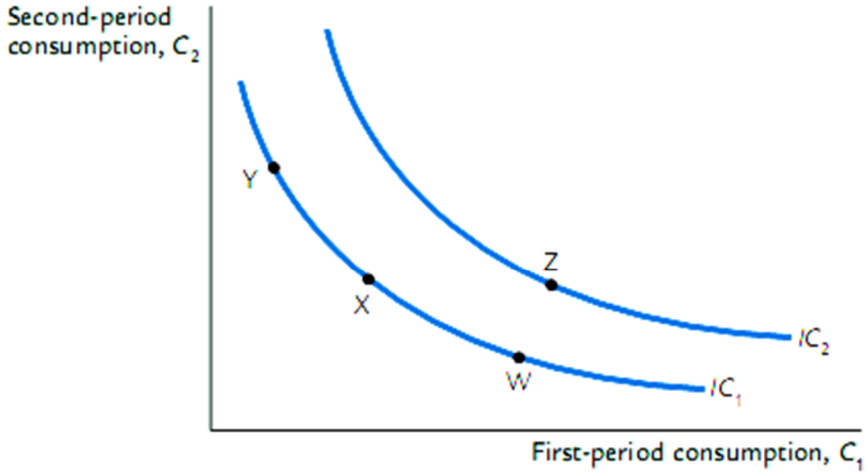
Consumer Preferences

The consumer's preferences regarding consumption in the two periods can be represented by indifference curves. An indifference curve shows the combinations of first-period and second-period consumption that make the consumer equally happy.

Figure 5-4 shows two of the consumer's many indifference curves. The consumer is indifferent among combinations W, X, and Y, because they are all on the same curve. Not surprisingly, if the consumer's first-period consumption is reduced, say from point W to point X, second-period consumption must increase to keep him equally happy. If first-period consumption is reduced again, from point X to point Y, the amount of extra second-period consumption he requires for compensation is greater.

The slope at any point on the indifference curve shows how much second-period consumption the consumer requires in order to be compensated for a one-unit reduction in first-period consumption. This slope is the *marginal rate of substitution* between first-period consumption and second-period consumption. It tells us the rate at which the consumer is willing to substitute second-period consumption for first-period consumption.

Figure 5.4



The Consumer's Preferences Indifference curves represent the consumer's preferences over first-period and second-period consumption. An indifference curve gives the combinations of consumption in the two periods that make the consumer equally happy. This figure shows two of many indifference curves. Higher indifference curves such as IC_2 are preferred to lower curves such as IC_1. The consumer is equally happy at points W, X, and Y, but prefers point Z to points W, X, or Y.

The consumer is equally happy at all points on a given indifference curve, but he prefers some indifference curves to others. Because he prefers more consumption to less, he refers higher

indifference curves to lower ones. In Figure 5-4, the consumer prefers the points on curve IC_2 to the points on curve IC_1.

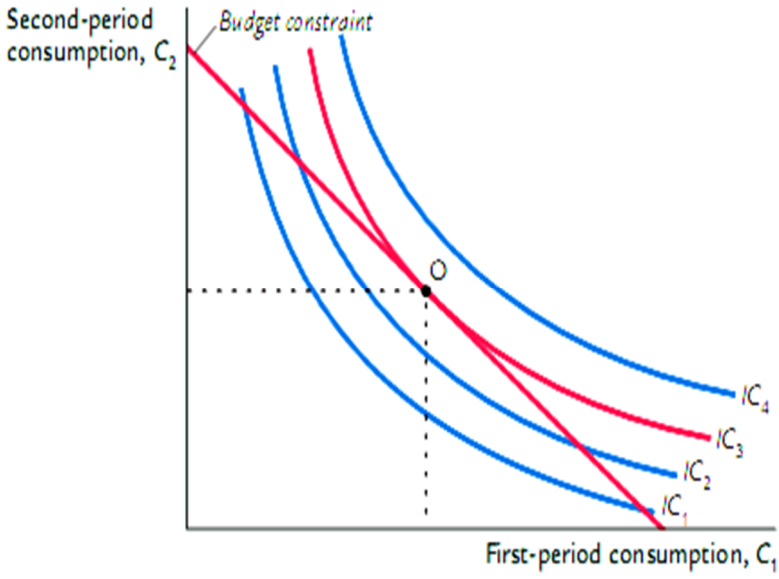
The set of indifference curves gives a complete ranking of the consumer's preferences. It tells us that the consumer prefers point Z to point W, but that may be obvious because point Z has more consumption in both periods. Yet compare point Z and point Y: point Z has more consumption in period one and less in period two. Which is preferred, Z or Y? Because Z is on a higher indifference curve than Y, we know that the consumer prefers point Z to point Y. Hence, we can use the set of indifference curves to rank any combinations of first-period and second-period consumption.

Optimization

Having discussed the consumer's budget constraint and preferences, we can consider the decision about how much to consume. The consumer would like to end up with the best possible combination of consumption in the two periods- that is, on the highest possible indifference curve. But the budget constraint requires that the consumer also end up on or below the budget line, because the budget line measures the total resources available to him.

Figure 5-5 shows that many indifference curves cross the budget line. The highest indifference curve that the consumer can obtain without violating the budget constraint is the indifference curve that just barely touches the budget line, which is curve IC_3 in the figure. The point at which the curve and line touch-point O for "optimum"-is the best combination of consumption in the two periods that the consumer can afford.

Figure 5.5



The Consumer's Optimum
The consumer achieves his highest level of satisfaction by choosing the point on the budget constraint that is on the highest indifference curve. At the optimum, the indifference curve is tangent to the budget constraint.

Notice that, at the optimum, the slope of the indifference curve equals the slope of the budget line. The indifference curve is tangent to the budget line. The slope of the indifference curve is the marginal rate of substitution MRS, and the slope of the budget line is one plus the real interest rate. We conclude that at point O,

$$MRS = 1 + r.$$

The consumer chooses consumption in the two periods so that the marginal rate of substitution equals one plus the real interest rate.

How Changes in Income Affect Consumption

Now that we have seen how the consumer makes the consumption decision, let's examine how consumption responds to an increase in income. An increase in either Y_1 or Y_2 shifts the budget constraint outward, as in Figure 1-6. The higher budget constraint allows the consumer to choose a better combination of first-and second-period consumption-that is, the consumer can now reach a higher indifference curve.

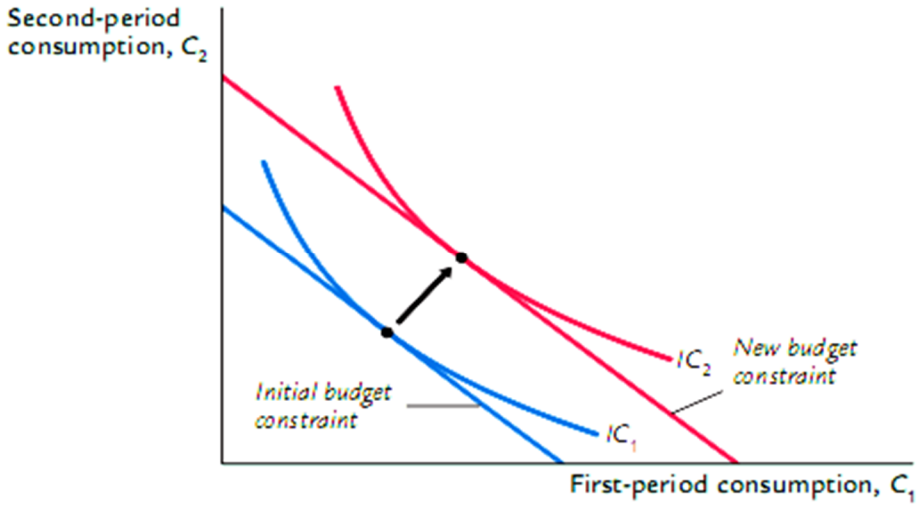
In Figure 5-6, the consumer responds to the shift in his budget constraint by choosing more consumption in both periods. Although it is not implied by the logic of the model alone, this situation is the most usual. If a consumer wants more of a good when his or her income rises, economists call it a normal good. The indifference curves in Figure 5-6 are drawn under the assumption that consumption in period one and consumption in period two are both *normal goods*.

The key conclusion from Figure 5-6 is that regardless of whether the increase in income occurs in the first period or the second period, the consumer spreads it over consumption in both periods. This behavior is sometimes called consumption smoothing. Because the consumer can borrow and lend between periods, the timing of the income is irrelevant to how much is consumed today (except, of course, that future income is discounted by the interest rate).The lesson of this analysis is that consumption depends on the present value of current and future income-that is, on

$$\text{Present Value of Income} = Y_1 + \frac{Y_2}{1 + r}.$$

Notice that this conclusion is quite different from that reached by Keynes. *Keynes posited that a person's current consumption depends largely on his current income. Fisher's model says, instead, that consumption is based on the resources the consumer expects over his lifetime.*

Figure 5.6



An Increase in Income An increase in either first-period income or second-period income shifts the budget constraint outward. If consumption in period one and consumption in period two are both normal goods, this increase in income raises consumption in both periods.

How Changes in the Real Interest Rate Affect Consumption

Let's now use Fisher's model to consider how a change in the real interest rate alters the consumer's choices. There are two cases to consider: the case in which the consumer is initially saving and the case in which he is initially borrowing. Here we discuss the saving case; Problem one at the end of the chapter asks you to analyze the borrowing case.

Figure 5-7 shows that an increase in the real interest rate rotates the consumer's budget line around the point (Y_1, Y_2) and, thereby, alters the amount of consumption he chooses in both periods. Here, the consumer moves from point A to point B. You can see that for the indifference curves drawn in this figure first-period consumption falls and second-period consumption rises.

Economists decompose the impact of an increase in the real interest rate on consumption into two effects: an income effect and a substitution effect. Textbooks in microeconomics discuss these effects in detail. We summarize them briefly here.

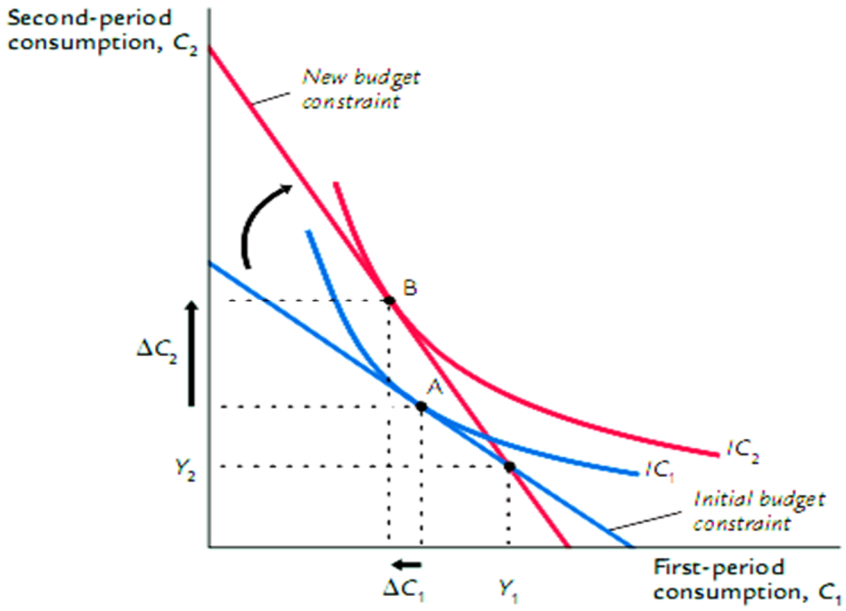
The income effect is the change in consumption that results from the movement to a higher indifference curve. Because the consumer is a saver rather than a borrower (as indicated by the

fact that first-period consumption is less than first-period income), the increase in the interest rate makes him better off (as reflected by the movement to a higher indifference curve). If consumption in period one and consumption in period two are both normal goods, the consumer will want to spread this improvement in his welfare over both periods. This income effect tends to make the consumer want more consumption in both periods.

The substitution effect is the change in consumption that results from the change in the relative price of consumption in the two periods. In particular, consumption in period two becomes less expensive relative to consumption in period one when the interest rate rises. That is, because the real interest rate earned on saving is higher, the consumer must now give up less first-period consumption to obtain an extra unit of second-period consumption. This substitution effect tends to make the consumer choose more consumption in period two and less consumption in period one.

The consumer's choice depends on both the income effect and the substitution effect. Both effects act to increase the amount of second-period consumption; hence, we can confidently conclude that an increase in the real interest rate raises second-period consumption. But the two effects have opposite impacts on first-period consumption, so the increase in the interest rate could either raise or lower it. Hence, depending on the relative size of the income and substitution effects, an increase in the interest rate could either stimulate or depress saving.

Figure 5.7



An Increase in the Interest Rate
An increase in the interest rate rotates the budget constraint around the point (Y_1, Y_2). In this figure, the higher interest rate reduces first-period consumption by ΔC_1 and raises second-period consumption by ΔC_2.

Constraints on Borrowing

Fisher's model assumes that the consumer can borrow as well as save. The ability to borrow allows current consumption to exceed current income. In essence, when the consumer borrows, he consumes some of his future income today. Yet for many people such borrowing is impossible. For example, a student wishing to enjoy spring break in Langano would probably be unable to finance this vacation with a bank loan. Let's examine how Fisher's analysis changes if the consumer cannot borrow.

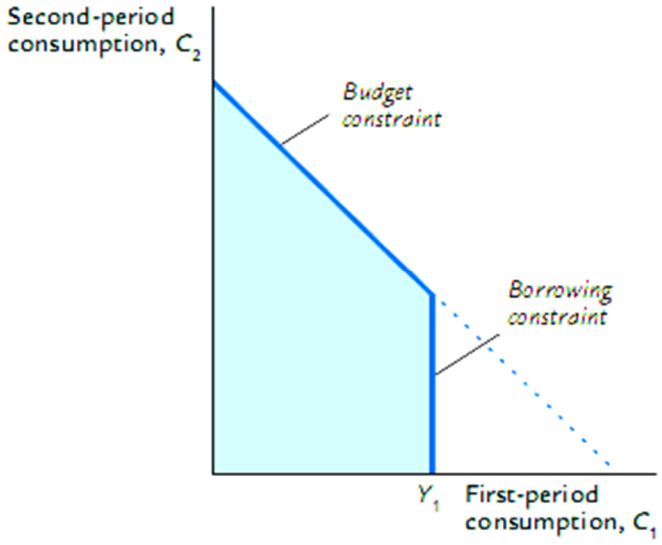
The inability to borrow prevents current consumption from exceeding current income. A constraint on borrowing can therefore be expressed as

$$C_1 \leq Y_1.$$

This inequality states that consumption in period one must be less than or equal to income in period one. This additional constraint on the consumer is called a *borrowing constraint* or, sometimes, a *liquidity constraint*.

The consumer's choice must satisfy both the intertemporal budget constraint and the borrowing constraint. The shaded area in the Figure 5-8 represents the combinations of first-period consumption and second-period consumption that satisfy both constraints.

Figure 5.8



A Borrowing Constraint If the consumer cannot borrow, he faces the additional constraint that first-period consumption cannot exceed first-period income. The shaded area represents the combination of first-period and second-period consumption the consumer can choose.

Figure 5-9 shows how this borrowing constraint affects the consumption decision. There are two possibilities. In panel (a), the consumer wishes to consume less in period one than he earns. The

borrowing constraint is not binding and, therefore, does not affect consumption. In panel (b), the consumer would like to choose point D, where he consumes more in period one than he earns, but the borrowing constraint prevents this outcome. The best the consumer can do is to consume his first-period income, represented by point E.

The analysis of borrowing constraints leads us to conclude that there are two consumption functions. For some consumers, the borrowing constraint is not binding, and consumption in both periods depends on the present value of lifetime income,

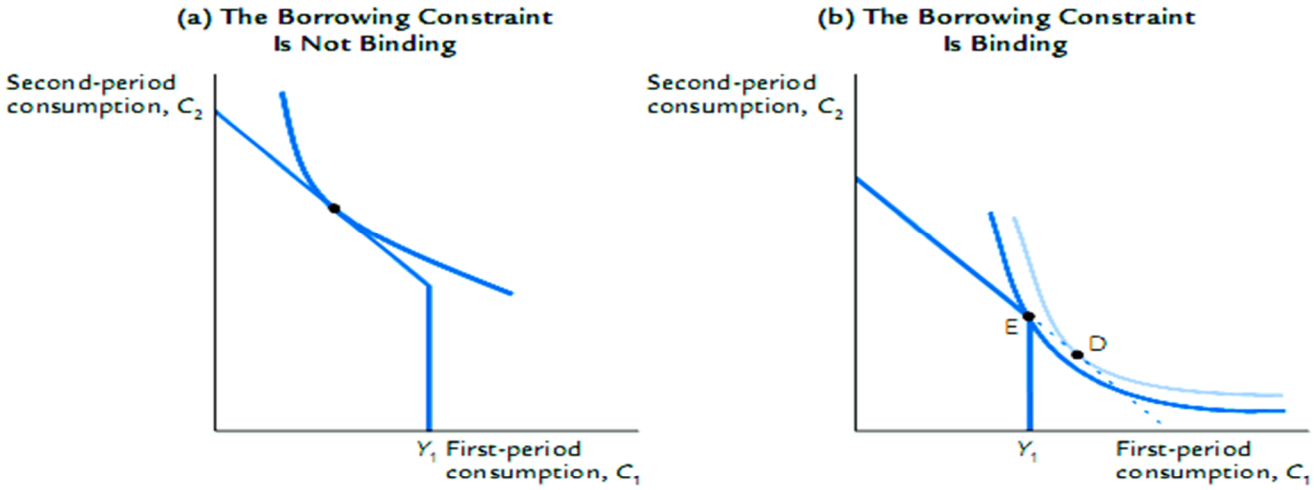
$$Y_1 + [Y_2/(1 + r)].$$

For other consumers, the borrowing constraint binds, and the consumption function is

$$C_1 = Y_1 \text{ and } C_2 = Y_2.$$

Hence, for those consumers who would like to borrow but cannot, consumption depends only on current income.

Figure 5.9



The Consumer's Optimum With a Borrowing Constraint When the consumer faces a borrowing constraint, there are two possible situations. In panel (a), the consumer chooses first-period consumption to be less than first-period income, so the borrowing constraint is not binding and does not affect consumption in either period. In panel (b), the borrowing constraint is binding. The consumer would like to borrow and choose point D. But because borrowing is not allowed, the best available choice is point E. When the borrowing constraint is binding, first-period consumption equals first-period income.

5.4. Franco Modigliani and the Life-Cycle Hypothesis

In a series of papers written in the 1950s, *Franco Modigliani* and his collaborators *Albert Ando* and *Richard Brumberg* used Fisher's model of consumer behavior to study the consumption function. One of their goals was to solve the consumption puzzle-that is, to explain the

apparently conflicting pieces of evidence that came to light when Keynes's consumption function was brought to the data. According to Fisher's model, consumption depends on a person's lifetime income. Modigliani emphasized that income varies systematically over people's lives and that saving allows consumers to move income from those times in life when income is high to those times when it is low. This interpretation of consumer behavior formed the basis for his *life-cycle hypothesis*.

The Hypothesis

One important reason that income varies over a person's life is retirement. Most people plan to stop working at about age 65, and they expect their incomes to fall when they retire. Yet they do not want a large drop in their standard of living, as measured by their consumption. To maintain consumption after retirement, people must save during their working years. Let's see what this motive for saving implies for the consumption function.

Consider a consumer who expects to live another T years, has wealth of W, and expects to earn income Y until she retires R years from now. What level of consumption will the consumer choose if she wishes to maintain a smooth level of consumption over her life?

The consumer's lifetime resources are composed of initial wealth W and life-time earnings of R*Y.(For simplicity, we are assuming an interest rate of zero; if the interest rate were greater than zero, we would need to take account of interest earned on savings as well.) The consumer can divide up her lifetime resources among her T remaining years of life. We assume that she wishes to achieve the smoothest possible path of consumption over her lifetime. Therefore, she divides this total of W + RY equally among the T years and each year consumes

$$C = (W + RY)/T.$$

We can write this person's consumption function as

$$C = (1/T)W + (R/T)Y.$$

If every individual in the economy plans consumption like this, then the aggregate consumption function is much the same as the individual one. In particular, aggregate consumption depends on both wealth and income. That is, the economy's consumption function is

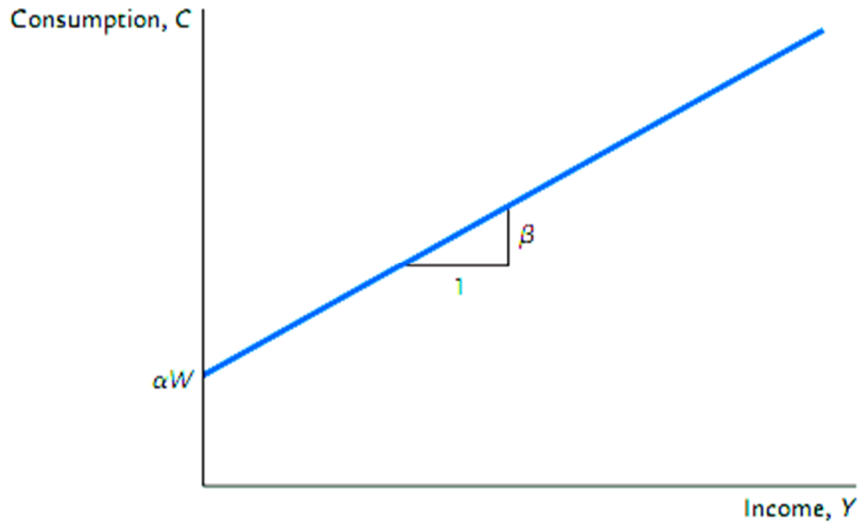
$$C = \alpha W + \beta Y,$$

where the parameter α is the marginal propensity to consume out of wealth, and the parameter β is the marginal propensity to consume out of income.

Implications

Figure 5-10 graphs the relationship between consumption and income predicted by the life-cycle model. For any given level of wealth W, the model yields a conventional consumption function similar to the one shown in Figure 5-1.

Figure 5.10



The Life-Cycle Consumption Function The life-cycle model says that consumption depends on wealth as well as income. In other words, the intercept of the consumption function depends on wealth.

Notice, however, that the intercept of the consumption function, which shows what would happen to consumption if income ever fell to zero, is not a fixed value, as it is in Figure 5-1. Instead, the intercept here is W and, thus, depends a on the level of wealth.

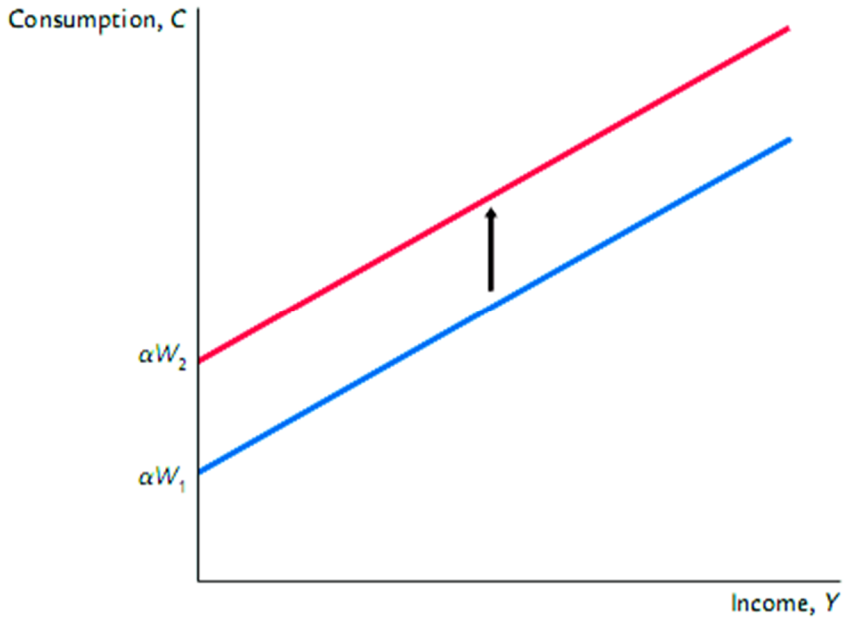
This life-cycle model of consumer behavior can solve the consumption puzzle. According to the life-cycle consumption function, the average propensity to consume is

$$C/Y = \alpha(W/Y) + \beta.$$

Because wealth does not vary proportionately with income from person to person or from year to year, we should find that high income corresponds to a low average propensity to consume when looking at data across individuals or over short periods of time. But, over long periods of time, wealth and income grow together, resulting in a constant ratio W/Y and thus a constant average propensity to consume.

To make the same point somewhat differently, consider how the consumption function changes over time. As Figure 5-10 shows, for any given level of wealth, the life-cycle consumption function looks like the one Keynes suggested. But this function holds only in the short run when wealth is constant. In the long run, as wealth increases, the consumption function shifts upward, as in Figure 5-11. This upward shift prevents the average propensity to consume from falling as income increases. In this way, Modigliani resolved the consumption puzzle posed by Simon Kuznets's data.

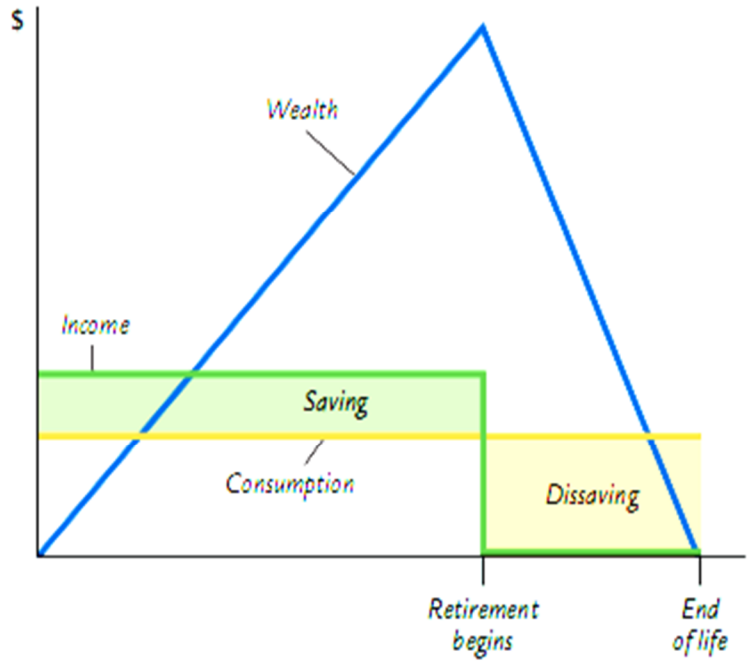
Figure 5.11



How Changes in Wealth Shift the Consumption Function If consumption depends on wealth, then an increase in wealth shifts the consumption function upward. Thus, the short-run consumption function (which holds wealth constant) will not continue to hold in the long run (as wealth rises over time).

The life-cycle model makes many other predictions as well. Most important, it predicts that saving varies over a person's lifetime. If a person begins adulthood with no wealth, she will accumulate wealth during her working years and then run down her wealth during her retirement years. Figure 5-12 illustrates the consumer's income, consumption, and wealth over her adult life. According to the life-cycle hypothesis, because people want to smooth consumption over their lives, the young who are working save, while the old who are retired dissave.

Figure 5.12



Consumption, Income, and Wealth Over the Life Cycle If the consumer smooths consumption over her life (as indicated by the horizontal consumption line), she will save and accumulate wealth during her working years and then dissave and run down her wealth during retirement.

Activity

Dear students, how does the life-cycle hypothesis solve the consumption puzzle?

5.5. Milton Friedman and the Permanent-Income Hypothesis

In a book published in 1957, Milton Friedman proposed the permanent-income hypothesis to explain consumer behavior. Friedman's permanent-income hypothesis complements Modigliani's life-cycle hypothesis: both use Irving Fisher's theory of the consumer to argue that consumption should not depend on current income alone. But unlike the life-cycle hypothesis, which emphasizes that income follows a regular pattern over a person's lifetime, the permanent-income hypothesis emphasizes that people experience random and temporary changes in their incomes from year to year.

The Hypothesis

Friedman suggested that we view current income Y as the sum of two components, permanent income Y^P and transitory income Y^T .That is,

$$Y = Y^P + Y^T$$

Permanent income is the part of income that people expect to persist into the future. Transitory income is the part of income that people do not expect to persist. Put differently, permanent income is average income, and transitory income is the random deviation from that average.

Different forms of income have different degrees of persistence. A good education provides a permanently higher income, whereas good weather provides only transitorily higher income. Although one can imagine intermediate cases, it is useful to keep things simple by supposing that there are only two kinds of income: permanent and transitory.

Friedman reasoned that consumption should depend primarily on permanent income, because consumers use saving and borrowing to smooth consumption in response to transitory changes in income. For example, if a person received a permanent raise of $10,000 per year, his consumption would rise by about as much. Yet if a person won $10,000 in a lottery, he would not consume it all in one year. Instead, he would spread the extra consumption over the rest of his life. Assuming an interest rate of zero and a remaining life span of 50 years, consumption would rise by only $200 per year in response to the $10,000 prize. Thus, consumers spend their permanent income, but they save rather than spend most of their transitory income.

Friedman concluded that we should view the consumption function as approximately

$$C = \alpha Y^{P}.$$

Where α is a constant that measures the fraction of permanent income consumed. The permanent-income hypothesis, as expressed by this equation, states that consumption is proportional to permanent income.

Implications

The permanent-income hypothesis solves the consumption puzzle by suggesting that the standard Keynesian consumption function uses the *wrong variable*. According to the permanent-income hypothesis, consumption depends on permanent income; yet many studies of the consumption function try to relate consumption to current income. Friedman argued that this errors-in-variables problem explains the seemingly contradictory findings.

Let's see what Friedman's hypothesis implies for the average propensity to consume. Divide both sides of his consumption function by Y to obtain

$$APC = C/Y = \alpha Y^{P}/Y.$$

According to the permanent-income hypothesis, the average propensity to consume depends on the ratio of permanent income to current income. When current income temporarily rises above permanent income, he average propensity to consume temporarily falls; when current income temporarily falls below permanent income, the average propensity to consume temporarily rises.

Now consider the studies of household data. Friedman reasoned that these data reflect a combination of permanent and transitory income. Households with high permanent income have proportionately higher consumption. If all variation in current income came from the permanent component, the average propensity to consume would be the same in all households. But some of the variation in income comes from the transitory component, and households with high transitory income do not have higher consumption. Therefore, researchers find that high-income households have, on average, lower average propensities to consume.

Similarly, consider the studies of time-series data. Friedman reasoned that year-to-year fluctuations in income are dominated by transitory income Therefore, years of high income should be years of low average propensities to consume. But over long periods of time-say, from decade to decade-the variation in income comes from the permanent component. Hence, in long time-series, one should observe a constant average propensity to consume, as is fact Kuznets found.

Activity

Dear students, how does the permanent income hypothesis solve the consumption puzzle?

5.6. Robert Hall and the Random-Walk Hypothesis

The permanent-income hypothesis is based on Fisher's model of inter-temporal choice. It builds on the idea that forward-looking consumers base their consumption decisions not only on their current income but also on the income they expect to receive in the future. Thus, the permanent-income hypothesis highlights that consumption depends on people's expectations. Recent research on consumption has combined this view of the consumer with the assumption of

rational expectations. The rational-expectations assumption states that people use all available information to make optimal forecasts about the future. This assumption can have profound implications for the study of consumer behavior.

The Hypothesis

The economist Robert Hall was the first to derive the implications of rational expectations for consumption. He showed that if the permanent-income hypothesis is correct and if consumers have rational expectations, then changes in consumption over time should be unpredictable. When changes in a variable are unpredictable, the variable is said to follow a **random walk.** According to Hall, the combination of the permanent-income hypothesis and rational expectations implies that consumption follows a random walk. Hall reasoned as follows. According to the permanent-income hypothesis, consumers face fluctuating income and try their best to smooth their consumption over time. At any moment, consumers choose consumption based on their current expectations of their lifetime incomes. Over time, they change their consumption because they receive news that causes them to revise their expectations. For example, a person getting an unexpected promotion increases consumption, whereas a person getting an unexpected demotion decreases consumption. In other words, changes in consumption reflect "surprises" about lifetime income. If consumers are optimally using all available information, then they should be surprised only by events that were entirely unpredictable. Therefore, changes in their consumption should be unpredictable as well.

Implications

The rational-expectations approach to consumption has implications not only for forecasting but also for the analysis of economic policies. *If consumers obey the permanent-income hypothesis and have rational expectations, then only unexpected policy changes influence consumption. These policy changes take effect when they change expectations.* For example, suppose that today the government passes a tax increase to be effective next year. In this case, consumers receive the news about their lifetime incomes when the government passes the law (or even earlier if the law's passage was predictable). The arrival of this news causes consumers to revise their expectations and reduce their consumption. The following year, when the tax hike goes into effect, consumption is unchanged because no news has arrived.

Hence, if consumers have rational expectations, policymakers influence the economy not only through their actions but also through the public's expectation of their actions. Expectations, however, cannot be observed directly. Therefore, it is often hard to know how and when changes in fiscal policy alter aggregate demand

Summary

- ✓ Keynes conjectured that the marginal propensity to consume is between zero and one, that the average propensity to consume falls as income rises, and that current income is the primary determinant of consumption. Studies of household data and short time-series confirmed Keynes's conjectures. Yet studies of long time-series found no tendency for the average propensity to consume to fall as income rises over time.
- ✓ Recent work on consumption builds on Irving Fisher's model of the consumer. In this model, the consumer faces an intertemporal budget constraint and chooses consumption for the present and the future to achieve the highest level of lifetime satisfaction. As long as the consumer can save and borrow, consumption depends on the consumer's lifetime resources.
- ✓ Modigliani's life-cycle hypothesis emphasizes that income varies somewhat predictably over a person's life and that consumer's use saving and borrowing to smooth their consumption over their lifetimes. According to this hypothesis, consumption depends on both income and wealth.
- ✓ Friedman's permanent-income hypothesis emphasizes that individuals experience both permanent and transitory fluctuations in their income. Because consumers can save and borrow, and because they want to smooth their consumption, consumption does not respond much to transitory income. Consumption depends primarily on permanent income.
- ✓ Hall's random-walk hypothesis combines the permanent-income hypothesis with the assumption that consumers have rational expectations about future income. It implies that changes in consumption are unpredictable, because consumers change their consumption only when they receive news about their lifetime resources

Chapter Five: Review Questions

1. Assume that a consumer has already lived 30 years and expects to live for more 40 years of which he intends to work 20 years. According to the life-cycle hypothesis, the consumption function of the consumer is?

   A) $C = 0.025W + 0.5Y$ C) $C = 0.014W + 0.285Y$
   B) $C = 0.5W + 0.5Y$ D) None

2. Which one of the following is **not** one of the Keynes's conjectures about consumption function

   A) MPC is between 0 and 1
   B) Both income and interest rate are the primary determinants of consumption
   C) APC falls as income increases
   D) None

3. Identify the wrong match

   A) Life-Cycle Hypothesis: Franco Modigliani
   B) Permanent Income Hypothesis: Milton Friedman
   C) Random Walk Hypothesis: Robert Hall
   D) Inter temporal Choice: John Maynard Keynes

4. According to Hall's random walk hypothesis,

   A) Predictable changes in income doesn't lead to predictable changes in consumption
   B) Only unexpected policy changes influence consumption
   C) Consumption follows a random walk
   D) All

5. According to Fisher's two period intertemporal choice when borrowing constraint is binding,

   A) First-period consumption equals to first-period income
   B) Consumption depends on only current income
   C) Second-period consumption equals second-period income
   D) All

6. All of the following are transitory incomes, **except**

   A) income due to promotion
   B) income due to winning a lottery
   C) income due to unusual good weather condition
   D) income due to a one year bonus

7. Which one of the following is true about permanent income hypothesis

   A) Consumption depends on current income alone
   B) Income follows a regular pattern over a person's lifetime
   C) Consumption depend primarily on permanent income
   D) All

8. Secular-stagnation

   A) It is the Great Depression
   B) It is a boom of indefinite duration
   C) It is coined by Keynes
   D) It is a depression of indefinite duration

9. At the optimum of the intertemporal choice of a consumer?

   A) The indifference curve is tangent to the budget line
   B) The slope of the indifference curve is equal to the slope of the budget line
   C) $MRS = 1 + r$
   D) All

10. Abebe obeys the two-period Fisher's model consumption. He earns nothing in the first period, and earns 11,000 birr in the second period. He can borrow or save money at the interest rate r. We observe that Abebe consuming 5000 birr in the first period and 5000 in the second period. What is the interest rate r ?

    A) 20%
    B) 10%
    C) 5%
    D) 1%

CHAPTER SIX

INVESTMENT

Introduction

Dear learners! In the previous chapter we have discussed about spending on consumption goods which provide utility to the household today. In this chapter, we study spending on investment goods which provide a higher standard of living later in life.

Chapter Objectives:

Dear students, after reading this chapter thoroughly, you are expected to know:

- *Investment is the most volatile sector of aggregate demand*
- *The different types of investment*
- *The factors that shift the investment function*
- *Investment reflects the adjustment of the existing capital stock to the current demand for capital*
- *Investment spending is the primary link from monetary policy to aggregate demand*

Chapter Outline:

- *The concept of investment*
- *Business fixed investment*
- *Investment and the capital stock*
- *Effects of tax laws*
- *Residential investment*
- *Inventory investment*
- *The impact of government policy on investment*

6.1. The Concept of Investment

Before developing any theories about investment choices by people it is important to define what is meant by investment.

Activity

Dear student, what do you understand when people say investment? Please, write your answer on the space provided below.

Good! In macroeconomics, investment doesn't include purchases that merely reallocate existing assets among different individuals. Investment creates new capital.

Definition of Investment: It is the formation of real capital, tangible or intangible, that will produce a stream of goods and services in the future.

Investment is the most volatile component of GDP. When expenditure on goods and services falls during a recession, much of the decline is usually due to a drop in investment spending. Investment makes up 25% of GDP, and although obviously not as large as consumption it is at least of equal importance for two reasons.

First, because investment adds to the capital stock which is a key input used to produce output and thus in determining economic output. The relationship between investment and the capital stock can be expressed in the following way:

$$K_{t+1} = K_t - \delta K_t + I_t$$

Where

- ✓ K_t = stock of capital at time *t*.
- ✓ I_t = gross investment at time *t*.
- ✓ δ = the depreciation rate.

Note that the notation used above assumes that investment undertaken today does not really become productive until the future. This is usually the assumption we use in modern macroeconomics.

Second, because most of the fluctuations in output seem to occur due to fluctuations in investment. Thus, if we want understand business cycles we have to understand investment.

For example, a well-established fact of modern economies is that investment fluctuates a lot more than C or Y (we can also see that Y fluctuates more than C, probably because of the large fluctuations in investment which helps to make up Y).

Furthermore, inventory investment, which makes up only a small percentage of GDP, is extremely volatile and in a recession more than half the fall in spending for a typical

industrialized country comes from a decline in inventory investment as firms run down their inventories.

Moreover, private investment makes up roughly 85% of total investment and so this is where we need to focus our attention. This is not to say that government investment is not important, as basic infrastructure is crucial for a whole range of activities, including for firms producing output. But, private investment clearly is of much greater importance.

Finally, understanding investment decisions allows us to consider the economic effects will of many types of government policies, even those that we would not think at a first glance would impact on investment.

6.2. Types of Investment

There are three basic types of investment undertaken in an economy:
1. *Investment in Physical Capital* — business fixed investment (e.g. plant and machinery, office buildings); residential construction investment (e.g. houses, and significant additions to houses, that require building permits); changes in firm's inventories (e.g. as they provide revenue in the future, not today); purchases of durable goods by households (e.g. cars, fridges); government purchases of investment goods and buildings (e.g. roads, hospitals, harbors);
2. *Investment in Human Capital* — schooling, university study, apprenticeships etc.
3. *Investment in Knowledge Capital* — things we know about scientific and other areas.
The national income accounts only measure parts of 1.

6.2.1. Business Fixed Investment

Many people are intensely interested in business fixed investment and it not difficult to understand why; it constitutes the basic equipment used by firms to produce output whether it be computers, factories, machine tools, or offices. The term "business" means that these investment goods are bought by firms for use in future production. The term "fixed" means that this spending is for capital that will stay put for a while. We will learn about the most common theory developed to explain this form of investment, ***the neoclassical theory of investment***, which is the one currently used by economists.

Underlying Theory

The neoclassical theory of investment looks at investment decisions as being affected by output, but on the basis of a cost-benefit decision. That is, firms may have a desired output level they wish to produce, given the price the output can be sold at, but the bundle of inputs they use will depend on their relative costs and benefits so as to maximize the profits of firms.

The Formal Model

We will now write the basic idea described above as a formal model. To begin with define the following variables:

Y = the quantity of output produced by the firm.

K = the quantity of capital used by the firm.

L = the quantity of labour used by the firm.

$f(K, L)$ = the production function which relates how the inputs capital and labour are used to produce outputs.

Next, we need to specify the key assumption used by the model:

Firms act to maximize their profits where profits equal revenue less costs. If firms maximize profits by hiring labor and capital, then the amount they choose to hire will satisfy the condition $MB = MC$ for each factor, or in this case their MRP equals their cost. Let,

W = the marginal nominal wage cost paid to employees.

R = the marginal nominal "rental" cost that firms incur in using capital.

Py = the price the firms receive for their output.

P = the aggregate price level.

Where it is important to note that the implicit or explicit cost of using capital is not simply the actual price of the capital, since the capital can be resold. The cost of using the capital is the implicit (or explicit if rented from another firm) cost of renting the capital over the period it is used (we will discuss this in more detail soon) which we are calling R (e.g. if we build a dam and use it to produce electricity then the capital cost per unit of electricity is not the total cost of the dam, but some fraction of it relating to what portion of it was used to produce the unit of electricity). Given our assumption, we know that the logical implication is that capital and labor are employed up to the point where.

$$Py \times MPL = W \; or \; MPL = \frac{W}{P_y}$$

And

$$Py \times MPK = R \; or \; MPK = \frac{R}{P_y}$$

And we will now explore more about the MB and the MC of using capital.

Marginal Benefit of Using Capital

The real benefit of using capital is given by the MP that the production firm earns from the output it produces using the capital. It is also worth noting that the MP of the factors, and hence the MPK, depends in general on the actual quantities of the factors used. That is,

$$MPK = \Delta y / \Delta k = (\Delta f[k, l]) / \Delta k$$

Where it is clear that the level of output depends on both l and k. In many cases economists assume diminishing returns to the factors of production, or that as we increase the amount of a factor used output increases but at a diminishing rate. We will use this assumption here.

From following the logical implications of our assumptions we have deduced that there are three things that will influence the marginal benefit of using capital:

1. *Stock of Capital* — e.g. the higher the stock of capital, the lower the MPK. This is just the assumption of diminishing returns to the factors of production.
2. *Quantity of Labor Used* — e.g. the higher the quantity of labor used, the higher the MPK.
3. *State of the Production Technology* — e.g. the better the technology, the higher the MPK.

Remark: Labor may be a substitute for capital, but it also complements it as well.
If there was no labor then it is doubtful capital would be able to produce output!

Marginal Cost of Using Capital

The cost of owning capital is more complex. For each period of time that it rents out a unit of capital, the rental firm bears three costs:

1. When a rental firm borrows to buy a unit of capital, it must pay interest on the loan. If P_K is the purchase price of a unit of capital and i is the nominal interest rate, then iP_K is the interest cost. Notice that this interest cost would be the same even if the rental firm did

not have to borrow: if the rental firm buys a unit of capital using cash on hand, it loses out on the interest it could have earned by depositing this cash in the bank. In either case, the interest cost equals iP_K.

2. While the rental firm is renting out the capital, the price of capital can change. If the price of capital falls, the firm loses, because the firm's asset has fallen in value. If the price of capital rises, the firm gains, because the firm's asset has risen in value. The cost of this loss or gain is $-\Delta P_K$.
3. While the capital is rented out, it suffers wear and tear, called **depreciation.** If δ is the rate of depreciation—the fraction of capital's value lost per period because of wear and tear—then the dollar cost of depreciation is δP_K.

The total cost of renting out a unit of capital for one period is therefore

$$\text{Nominal cost of capital} = iP_K - \Delta P_K + \delta P_K$$
$$= P_K (i - \Delta P_K / P_K + \delta)$$

And to summarize, the nominal cost of capital depends on:

- The price of capital.
- The interest rate.
- The rate at which capital prices are changing
- The depreciation rate

Example: Assume that XYZ is a car-rental company. The company buys cars for 500,000 birr each and rents them out to other businesses. The company faces an annual interest rate of 10 %. In the market, car prices are raising at 5% per annum for each car the company owns, and each car depreciates at 20% per year. Find the company's cost of capital.

Solution:

- ✓ Interest cost = $iP_K = 0.1 \times 500{,}000 = 50{,}000$
- ✓ Capital gain = $\Delta P_K = 0.05 \times 500{,}000 = 25{,}000$
- ✓ Depreciation = $\delta P_K = 0.2 \times 500{,}000 = 100{,}000$

Therefore, total cost of capital = 50,000 + 25,000 + 100,000 = 175,000 . It means that the cost to the car-rental company of keeping a car in its capital stock is 175,000 birr.

What we have worked out is perfectly correct, but we will involve one more assumption to simplify the expression for the cost of capital. For simplicity, assume that the price of capital

goods increases at the same rate as the inflation rate. This can be characterized mathematically as,

$$\Delta P_K / P_K = \Delta P / P = \pi$$, where π = the inflation rate.

We also know that $r = i - \pi$ (i.e. the real interest rate is approximately equal to the nominal interest rate less the inflation rate)

Hence, we can write the cost of capital as

$$\text{Cost of capital} = P_K(r + \delta)$$

The above equation states that the cost of capital depends on the price of capital, the real interest rate, and depreciation rate.

Finally, we want to express the cost of capital relative to other goods in the economy. The real $cost\ of\ capital$ (the cost of buying and renting out a unit of capital measured in units of the economy's output) is

$$\text{Real Cost of Capital} = (P_K / P)(r + \delta)$$

This equation states that the real cost of a capital depends on:

i) The relative price of the capital good, P_K/P

ii) The real interest rate, r

iii) The depreciation rate, δ.

Profit Rate of Capital

Now we know what determines both the MB and the MC of using and thus owning capital. We are now in a position to answer the basic question of how much capital should firms in total use and own. The answer to this is that it all depends on the profit rate of capital, which equals,

$$Profit\ Rate = Revenue - Cost$$

$$= MPK - (P_K/P)(r + \delta)$$

There are three cases to consider:

1. $MPK > cost\ of\ capital$: It means there are potential profits a firm could earn by increasing its capital stock. $\uparrow K$ and the amount of net investment is positive $(i.e.\ K_{t+1} > K_t)$.

2. $MPK < cost\ of\ capital$: It means the firm is making losses on the last units of capital it is using and it could increase profits by reducing its capital stock. $\downarrow K$ and the amount of net investment is negative $(i.e.\ K_{t+1} < K_t)$.

3. $MPK = cost\ of\ capital$: It means the firm is maximizing the amount of profits it can earn from using capital and does not want to change its capital stock $(i.e. K_{t+1} = K_t)$.

And so a firm's decision about whether to add to its capital stock, or reduce it through depreciation depends upon the profit rate or the difference between the MPK and the cost of capital. Note that unlike the accelerator theory, the neoclassical theory shows us what determines the optimal or desired capital stock, it is the amount of capital where $MB = MC$, or no more profits can be made from changing the firm's amount of capital.

The Determinants of Investment

Now consider a rental firm's decision about whether to increase or decrease its capital stock. For each unit of capital, the firm earns real revenue R/P and bears the real cost$(P_K/P)\ (r + \delta)$. The real profit per unit of capital is

$$\text{Profit Rate} = \text{Revenue} - \text{Cost}$$

$$= R/P - (P_K/P)\ (r + \delta)$$

Since the real rental price in equilibrium equals the MPK, we can write the profit rate as

$$\text{Profit Rate} = MPK - (P_K/P)\ (r + \delta)$$

The rental firm makes a profit if the MPK is greater than the cost of capital. It incurs a loss if the MPK is less than the cost of capital.

We can now see the economic incentives that lie behind the rental firm's investment decision. The firm's decision regarding its capital stock - that is, whether to add to it or to let it depreciate - depends on whether owning and renting out capital is profitable. The change in the capital stock, called $net\ investment$, depends on the difference between the MPK and cost of capital. $If\ the\ MPK\ exceeds\ the\ cost\ of\ capital, firms\ find\ it\ profitable\ to\ add\ to\ their\ capital\ stock. If\ the\ MPK\ falls\ short\ of\ the\ cost\ of\ capital, they\ let\ their\ capital\ stock\ shrink.$

We can also now see that the separation of economic activity between production and rental firms-although useful to clarify our thinking - is not necessary for our conclusion regarding how firms choose investment.

For a firm that both uses and owns capital, the benefit of an extra unit of capital is the MPK, and the cost is the cost of capital. Like a firm that owns and rents out capital, this firm adds to its capital stock if the MP exceeds the cost of capital. Thus, we can write

$$\Delta K = I_n\,(MPK - (P_K/P)\,(r + \delta))$$

Where I_n is the function showing how much net investment responds to the incentive to invest.

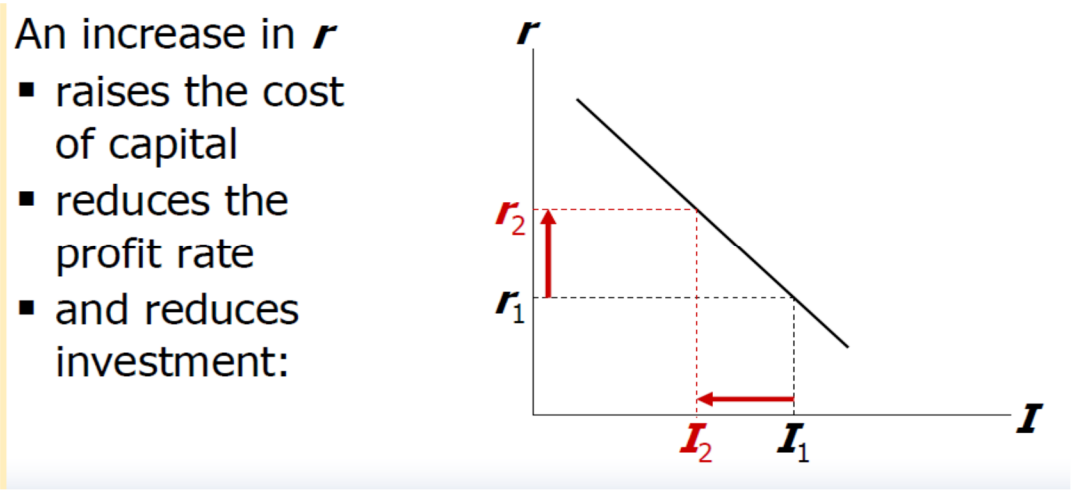
We can now derive the investment function. Total spending on business fixed investment is the sum of net investment and the replacement of depreciated capital. The investment function is

$$I = I_n\,[MPK - \left(\frac{P_K}{P}\right)(r + \delta)] + \delta K$$

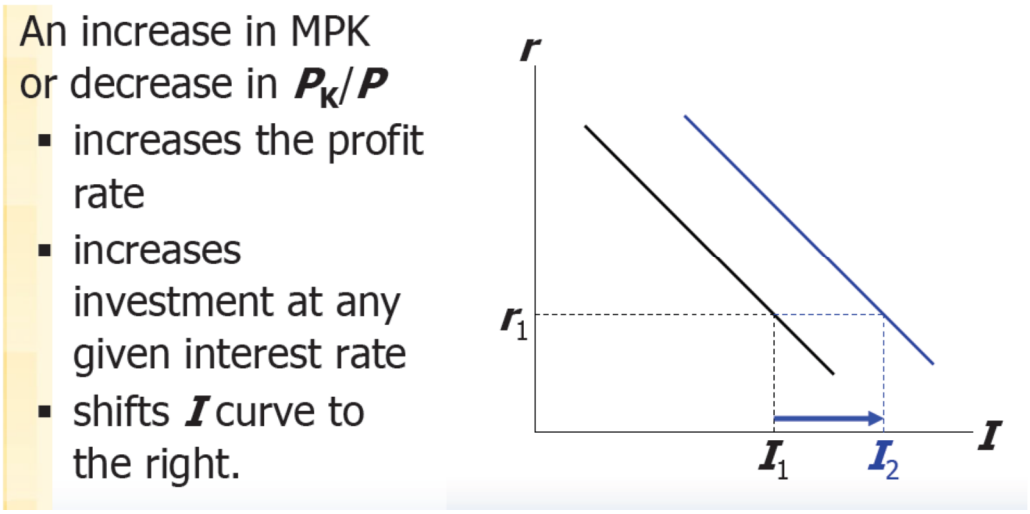
Business fixed investment depends on the MPK, the cost of capital, and the amount of depreciation. This model shows why investment depends on the interest rate. An increase in the real interest rate raises the cost of capital and leads firms to reduce their investment. Similarly, a decrease in the real interest rate lowers the cost of capital. It therefore raises the amount of profit from owning capital and increase the incentive to accumulate more capital. For this reason, the investment schedule relating investment to the interest rate slopes downward, as in panel (a) of Figure 6.1. The model also shows what causes the investment schedule to shift. Any event that raises the marginal product of capital increases the profitability of investment and causes the investment schedule to shift outward, as in panel (b) of Figure 6.1.

For example, a technological innovation that increases the production function parameter A raises the marginal product of capital and, for any given interest rate, increases the amount of capital goods that rental firms wish to buy.

Figure 6.1



Panel a) shows that business fixed investment increases when the interest rate falls. This is because a lower interest rate reduces the cost of capital and therefore makes owning capital more profitable



Panel b) shows an outward shift in the investment function, which might be due to an increase in the marginal product of capital or a decrease in the relative price of capital.

Finally, consider what happens as this adjustment of the capital stock continues over time. If the MP begins above the cost of capital, the capital stock will rise and the MP will fall. If the MPK begins below the cost of capital, the capital stock will fall and the MP will rise. Eventually, as the capital stock adjusts, the MPK approaches the cost of capital. When the capital stock reaches a steady-state level, we can write

$$MPK = (P_K/P)(r + \delta)$$

Thus, in the long run, the MPK equals the real cost of capital.

Investment and the Capital Stock

A logical conclusion from the neoclassical theory of investment is that both net and gross investment of firms are a negative function of real interest rate because the cost of capital is positively affected by changes in real interest rate, which negatively affects the profit rate of capital. We can show this relationship graphically as: and a change in any other variable that affects the MB or MC of using and owning capital by firms in an economy other than the real interest rate can be shown by a shift of the investment function (e.g. an increase in the MPK, say from a technological innovation, causes a rightward shift in the investment schedule).

The amount of investment that is undertaken depends on whether or not firms are using and owning the optimal amount of capital, that is, whether or not the profit rate is zero or non-zero. In the long-run equilibrium, with the profit rate equaling zero, we would expect that the amount

of net investment is zero with gross investment being positive and just offsetting the amount of depreciated capital each period. Once a firm is in its long-run state, only a change in real interest rate, or MPK, or some other variable, will affect the demand for capital and thus the amount of investment demanded. This will cause net investment to stop being zero and the capital stock will adjust to get back to a new long-run equilibrium situation.

Effects of Tax Laws

We have focused on a few key variables which affect the amount of investment undertaken, but in reality anything which affects the cost or benefit or using capital will affect the amount of investment undertaken by firms. One key set of variables are tax rates set by the government. We can amend the profit rate relationship we derived above to include the effects of government taxes. Let τ be the tax rate on firm revenues. Then the after-tax profit rate of capital equals,

$$\text{Profit rate} = (1 - \tau)\, MPK - (P_K/P)\,(r + \delta)$$

So that we can see that the tax reduces the profits earned from capital by reducing the MB of using and owning capital.

Taxes on Income Earned from Owning Capital

This is simply the company tax. This tax isn't directly levied on capital income but on a company's profits, which include income and costs from all factors, but some proportion of its incidence is on income earned from capital and we can think of it in this way. An increase in the company tax will effectively increase τ and hence decrease investment. This sort of policy will discourage the accumulation of K.

Investment Tax Credits

This is a policy where firms' tax liabilities are reduced by how much they spend on new capital during a year. This effectively lowers, reducing the cost of capital and causing an increase in investment. This sort of policy will encourage the accumulation of K.

Tax Treatment of Depreciation

Corporate profits are taxed and profits are just revenue minus costs. Part of the costs of production of firms is depreciation on capital so that firms are allowed to include depreciation of their capital as a cost when calculating the amount of profit to be taxed.

But depreciation is calculated using historical cost, not replacement cost which tends to understate the true cost of depreciation in periods of high inflation, which overstates the profits being made. This means a tax is levied even if the economic profit is zero, which effectively increases τ, reducing investment, and discouraging the accumulation of capital.

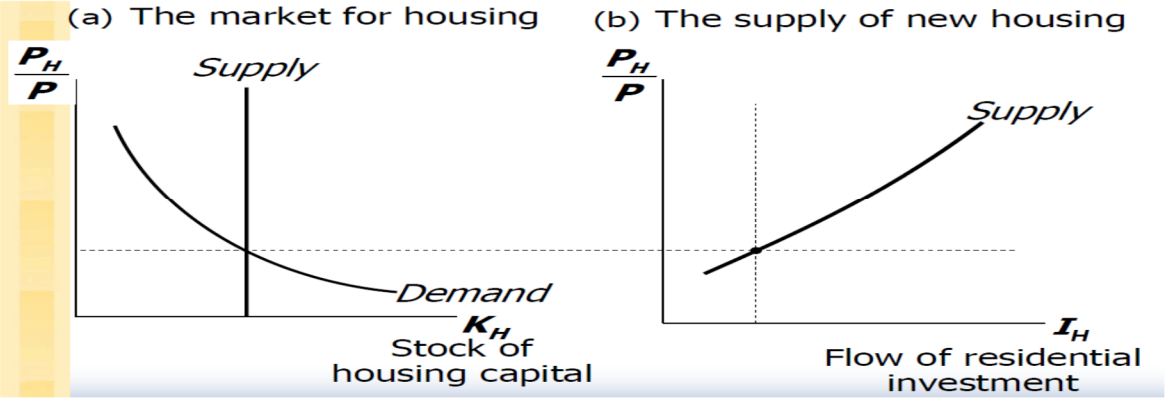
6.2.2. Residential Investment

In this section we consider the determinants of residential investment. We begin by presenting a simple model of the housing market. Residential investment includes the purchase of new housing both by people who plan to live in it themselves and by landlords who plan to rent it to others. To keep things simple, however, it is useful to imagine that all housing is owner-occupied.

The Stock Equilibrium and the Flow Supply

There are two parts to the model. First, the market for the existing stock of houses determines the equilibrium housing price. Second, the housing price determines the flow of residential investment. Panel (a) of Figure 6.2 shows how the relative price of housing P_H / P is determined by the supply and demand for the existing stock of houses. At any point in time, the supply of houses is fixed. We represent this stock with a vertical supply curve. The demand curve for houses slopes downward, because high prices cause people to live in smaller houses, to share residences, or sometimes even to become homeless. The price of housing adjusts to equilibrate supply and demand Panel (b) of Figure 6.2 shows how the relative price of housing determines the supply of new houses. Construction firms buy materials and hire labor to build houses and then sell the houses at the market price.

Figure 6.2



The Determination of Residential Investment: The relative price of housing adjusts to equilibrate supply and demand for the existing stock of housing capital. The relative price then determines residential investment, the flow of new housing that construction firms build.

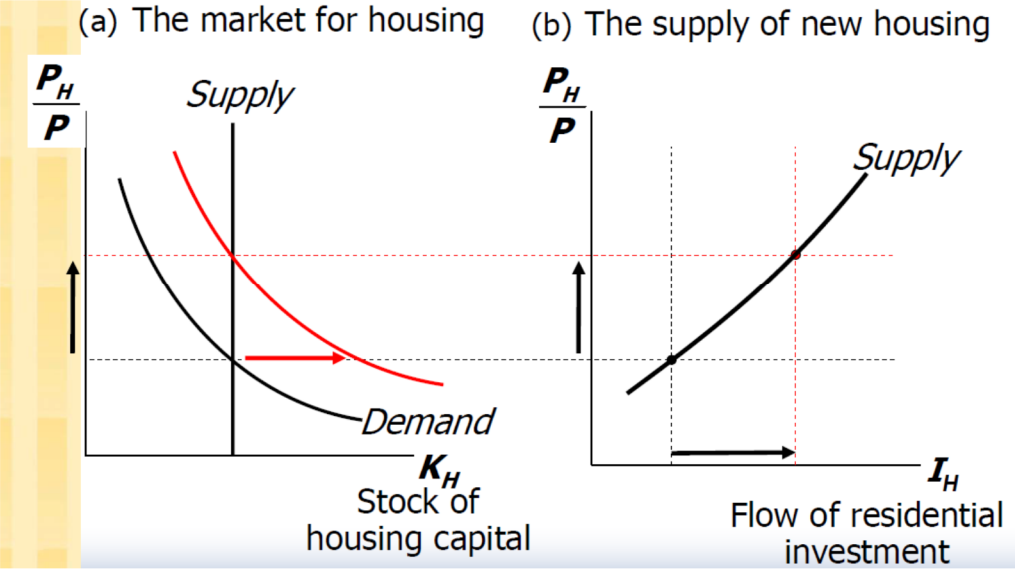
Their costs depend on the overall price level P (which reflects the cost of wood, bricks, plaster, etc.), and their revenue depends on the price of houses P_H. The higher the relative price of housing, the greater the incentive to build houses and the more houses are built. The flow of new houses—residential investment—therefore depends on the equilibrium price set in the market for existing houses. According to this model of the housing market, residential investment depends on the relative price of housing. The relative price of housing, in turn, depends on the demand for housing, which depends on the imputed rent that individuals expect to receive from their housing. Hence, the relative price of housing plays much the same role for residential investment.

Changes in Housing Demand

When the demand for housing shifts, the equilibrium price of housing changes, and this change in turn affects residential investment. The demand curve for housing can shift for various reasons. An economic boom raises national income and therefore the demand for housing. A large increase in the population, perhaps because of immigration, also raises the demand for housing. Panel (a) of Figure 6.3 shows that an expansionary shift in demand raises the equilibrium price. Panel (b) shows that the increase in the housing price increases residential investment. One important determinant of housing demand is the real interest rate.

Many people take out loans—mortgages—to buy their homes; the interest rate is the cost of the loan. Even the few people who do not have to borrow to purchase a home will respond to the interest rate, because the interest rate is the opportunity cost of holding their wealth in housing rather than putting it in a bank. A reduction in the interest rate therefore raises housing demand, housing prices, and residential investment. Another important determinant of housing demand is credit availability. When it is easy to get a loan, more households buy their own homes, and they buy larger ones than they otherwise might, thus increasing the demand for housing. When credit conditions become tight, fewer people buy their own homes or trade up to larger ones, and the demand for housing falls.

Figure 6.3



An Increase in Housing Demand: An increase in housing demand, perhaps attributable to a fall in the interest rate, raises housing prices and residential investment.

6.2.3. Inventory Investment

The last category of investment that we will study is inventory investment. It is not that large compared to the other forms of investment, but as mentioned at the beginning of this topic there is a strong relationship between changes in inventory investment and changes in output over the business cycle. Inventory investment is normally high during a boom and low during a recession.

Reasons for Holding Inventors

Before developing a theory of inventory investment we will study the reasons why inventories are held. Knowing the reasons for holding inventories will help us understand better the factors which influence the level of inventory investment. There are four reasons for holding inventories:

1) **Production Smoothing**

One use of inventories is to smooth the level of production over time. Consider a firm that experiences temporary booms and busts in sales. Rather than adjusting production to match the fluctuations in sales, the firm may find it cheaper to produce goods at a steady rate. When sales are low, the firm produces more than it sells and puts the extra goods into inventory. When sales are high, the firm produces less than it sells and takes goods out of inventory.

This motive for holding inventories is called *production smoothing.*

2) **Inventories as a Factor of Production**

Firms carry inventories of spare parts in case a machine breaks down, so that the entire assembly line does not come to a stop. E.g. car assembly factory. These forms of inventories tend to be high in a boom and low in a recession, mirroring the amount of output being produced and thus the need for spare parts.

3) **Stock-Out Avoidance**

A third reason for holding inventories is to avoid running out of goods when sales are unexpectedly high. Firms often have to make production decisions before knowing the level of customer demand. For example, a publisher must decide how many copies of a new book to print before knowing whether the book will be popular. If demand exceeds production and there are no inventories, the good will be out of stock for a period, and the firm will lose sales and profit. Inventories can prevent this from happening. This motive for holding inventories is called *stock-out avoidance***.**

4) **Work in Process**

Partly completed products are counted as inventories e.g. cheese making where cheeses are aging. These are normally high in a boom and low in a recession, reflecting the amount of output being produced.

Accelerator Theory of Inventory Investment

Theory behind the Accelerator Model

The basic idea is that firms might hold stocks of inventories that are proportional to their levels of output, for the reasons mentioned above which are directly related to the level of output being produced and sold. For example, say output is high and the economy is booming then production firms require more supplies, and have more work in process and retail firms want more merchandise to keep up with the higher sales.

Furthermore, it is likely that firms can change their inventory investment much more quickly than they can change their fixed investments.

The Formal Model

We will now write the basic idea described above as a formal model. First, define the following variables:

n_t = actual stock of inventories by the firm at time t.

n_t^d = desired stock of inventories by the firm at time

i_t^s = inventory investment by the firm at time t.

y_t = output of the firm at time t.

β = the desired inventory to output ratio of the firm.

Next, we need to specify the two key assumptions used by the model:

1. There exists an desired amount of inventories related to the amount of output, or,

$$n_t^d = \beta y_t \quad (1)$$

There may be short-run deviations from this amount because of output fluctuations, but on average, this relationship holds.

2. All inventory investment undertaken today is assumed to be ready for use today

(Note that again this differs from the "standard" assumption that investment today only becomes productive in the future), or that,

$$n_t = n_{t-1} + i_t^s \text{ or}$$

$$i_t^s = n_t - n_{t-1} \ldots\ldots\ldots\ldots\ldots (2)$$

And notice the different time subscripts as to why this is true. This is not a strong behavioral assumption in this context as if we are thinking of periods of time being a year then most firms can alter their inventories to changing conditions very quickly if they choose to do so.

Now, put everything together. The logical implication of the second assumption is that the capital stock each period equals the desired capital stock because inventories can be changed very fast, or that,

$$n_t = n_t^d \quad (3)$$

Using (2), and substituting in (3) and (1) we can rewrite the determination of net inventory investment in the following way:

$$i_t^s = n_t - n_{t-1}$$

$$= n_t^d - n_{t-1}^d$$

$$= \beta y_t - \beta y_{t-1}$$
$$= \beta (y_t - y_{t-1})$$
$$= \beta \Delta y_t$$

So what we find is that a firm's inventory investment is determined by changes in output. This is called the naive accelerator model, since all the change happens in one period.

6.3. The Impact of Government Policy on Investment

The Issue

Currently, a very important issue facing the world is what to do about the likely global warming that is occurring and is forecast to occur. One important measure is the introduction of a carbon tax in some countries. The reason for the tax is that it penalizes carbon energy intensive production and consumption, reducing the quantities of them and thus of carbon being introduced into the atmosphere, and mitigate the extent of global warming.

An important implication of the policy is on investment. Why? Because all production processes use energy, in order to convert matter in one state into matter in other states. And production normally requires capital, which uses the energy to transform the matter. As a result, the carbon tax is effectively a tax on forms of production and of the associated capital, and hence of investment in that capital.

An Economic Analysis of the Effects of the Carbon Tax

To include the impact of the carbon tax we can use the amended profit rate relationship we derived previously. The carbon tax is really a txt on capital's MPK as it is a tax on output of carbon, which is determined by the amount of output, which depends on the level of K which produces the carbon. Let τ be the effective tax rate on firm revenues due to the carbon tax. Then the after-tax profit rate of capital equals,

$$\text{Profit rate} = (1 - \tau)\, MPK - (P_K/P)\,(r + \delta)$$

So that we can see that the tax reduces the profits earned from capital by reducing the MB of using and owning capital.

The net impact is to lower the benefit of using and owning capital, and hence for a given user cost of capital, will lower the level of desired capital. This will lead to a lower level of investment. Growth of material output will thus fall.

A carbon tax will likely lower investment and the capital stock. This would lead to lower levels of material output and a reduction in economic growth. It is the reduction in output that is needed to cause a reduction in energy use, and thus of carbon produced. Whether or not this is a "good" thing depends on the stream of benefits from any mitigating of the effects of global warming versus the stream of costs from reduced material output, and people's valuation of these.

As with pensions and savings, government policies have economic effects. When weighing up and deciding which policies to implement it is important to think about all the effects of these policies.

Chapter Summary

- ✓ Investment is the most volatile component of GDP over the business cycle.
- ✓ All types of investment are negatively related to real interest rate.
- ✓ The marginal product of capital determines the real rental price of capital. The real interest rate, the depreciation rate, and the relative price of capital goods determine the cost of capital. According to the neoclassical model, firms invest if the rental price is greater than the cost of capital, and they disinvest if the rental price is less than the cost of capital.
- ✓ There are three types of investment. Namely, i) Business fixed investment: businesses' spending on equipment and structures for use in production ii) Residential Investment: Purchases of new housing, and iii) Inventory investment: the value of the change in inventories of finished goods, materials and supplies, and work in progress.
- ✓ Technological improvements increase in population, and economic policies like corporate income tax shift the investment function.
- ✓ Firms have various motives for holding inventories of goods: smoothing production, using them as a factor of production, avoiding stock-outs, and storing work in process. How much inventories firms hold depends on the real interest rate and on credit conditions
- ✓ Residential investment depends on the relative price of housing. Housing prices in turn depend on the demand for housing and the current fixed supply. An increase in housing demand, perhaps attributable to a fall in the interest rate, raises housing prices and residential investment.

Chapter-Six: Review Questions

1. In the neoclassical model of business fixed investment, under what conditions will firms find it profitable to add to their capital stock?
2. Write at least three motives for holding inventories
3. List at least three causes that can shift the investment function outward
4. List factors which can shift the demand curve for housing
5. Explain the three costs of capital that rental firms bear

Reference:

Text Books

1. N. Gregory Mankiw, 2007, Macroeconomics 4th edition Worth Publishers USA
2. William H. Branson, 2006 Macroeconomic Theory and Policy
3. Dornbusch, R. and S. Fischer: Macroeconomics

Additional Readings

4. Eduard Shapiro, 2007. Macroeconomic Analysis 5th edition New Delhi
5. Olivier Blanchard, 1997.Macroeconomics Prentice Hall Inc. New jersey USA
6. Frederick Mishkin, 1998. The Economics of Money, Banking and Financial Markets 5th edition USA.
7. Colander, 2001. Macreconomics 4th edition New York.

ARBA MINCH UNIVERSITY

DISTANCE EDUCATION

ASSIGNMENT FOR MACRO ECONOMICS (ECON -2072)

Name: _____

ID.No: _____

Department: _____

Center: _____

Date of submission: ----------

INSTRUCTIONS

- ✓ ***This assignment is to be completed and send to AMU, College of Continuing & Distance Education for Evaluation. Its maximum weight is 30%***
- ✓ ***Make sure that your exam contains ten (13) questions***
- ✓ ***Do not try to complete the assignment until you have covered all the lessons and reviewed the study guide and your exercises and activities.***
- ✓ ***Duplication from other will result total cancellation of your marks***
- ✓ ***After successfully completing this assignment, be certain to write your name, ID.No and program on the cover page of your assignment.***

❖ Give the appropriate answer for the following questions

1) An economy with no government or foreign sector is represented below.

$$C = 500 + 0.6Y, \quad I = 400 \ \& \ G = 800$$

Calculate the following (show the steps)

a) Equilibrium gross domestic product?

b) Equilibrium personal consumption expenditures and personal savings?

c) Marginal propensity to consume?

d) Multiplier?

e) If the equilibrium output is changed to 3000, what will be the change in investment?

2) Suppose that the money demand function is

$(M/P)d = 2,000 - 200r$, where *r* is the interest rate in percent.

The money supply, *M,* is 2,000 and the price level, *P,* is 4. Then

a) Graph the supply and demand for real money balances.

b) What is the equilibrium interest rate?

c) Assume that the price level is fixed. What happens to the equilibrium interest rate if the supply of money is raised from 2,000 to 2,500?

3) Using the Mundell-Fleming model of a small open economy with a pegged exchange rate, and starting from the equilibrium shown at the right, determine the effects of an upward shift in the investment function ($\triangle I > 0$, meaning an increase in investment for each level of the interest rate). First show using diagram how the curves shift, then answer and explain in words how the indicated economic variables (such as the exchange rate, National Savings, Central bank reserves, and the money supply) respond, and why?

4) For each of the following, draw the diagram how the curve(s) should shift in the IS-LM model of a closed economy with fixed prices, and explain in a sentence the reason(s) for the shift(s).

a) An increase in government purchases financed by borrowing.

b) An increase in government purchases financed by printing money.

c) An increase in government purchases financed by increasing taxes by the same amount.

d) An increase in the reserve requirement of commercial banks.

5) Suppose that investment, in addition to depending on the interest rate as we normally assume, also depends positively on a government policy, D, that is designed to encourage investment. (I call it D since I'm thinking of it as a "depreciation allowance," but you need not worry about that, nor about any implications it might have for the government budget, which you should assume is unaffected.) Thus, $I = I(r, D)$, where I_D>0 . Using whatever analytical tools you prefer (graphs and/or equations), use the IS-LM model of a closed economy with fixed prices to analyze the effect of an increase in D on the following variables (being sure to justify your answers):

a) Real GDP

b) The interest rate

c) The level of investment

d) The level of consumption

e) The level of national savings

f) The demand for money

6) Suppose that the central bank increases the money supply by 10%. Derive and compare the effects of this policy on

a) real GDP,

b) real domestic investment, and

c) the nominal exchange rate

In the following contexts:

a) A closed economy in the short run (for which you can ignore the exchange rate).

b) A small open economy with a floating exchange rate in the short run.

c) A small open economy with a floating exchange rate in the long run

Note: The instruction "and compare" means that for each of the variables (i), (ii), and (iii) you should indicate how its change differs across these three contexts.

7) Briefly explain the following macroeconomic policy issues

i) According to Keynes, what should the government do to taxes and government spending during a time of recession?

ii) According to Keynes, what should the government do to taxes and government spending during a period of rapid inflation?

8) Consider a hypothetical economy.

a) The consumption function is given by

$$C = 200 + 0.75(Y - T).$$

The investment function is

$$I = 200 - 25r$$

Government purchases and taxes are both 100.

For this economy, graph the IS curve for r ranging from **0** to **8**.

b) The money demand function of the economy is

$$(M/P)^d = Y - 100r.$$

The money supply M is $1,000$ and the price level P is 2.

For this economy, graph the LM curve for r ranging from 0 to 8.

c) Find the equilibrium interest rate r and the equilibrium level of income Y.

d) Suppose that government purchases are raised from 100 *to* 150. How much does the IS curve.

9) In the Neoclassical model of business fixed investment, under what conditions will firms find it profitable to add to their capital stock?

10) Addis Ababa, the capital of Ethiopia experienced a large increase in population owing to high birth rate and rural-urban migration in recent times. Use the Neoclassical model of residential investment to predict the impact of this event on housing prices and residential investment?

11) Suppose that the firm faces a Cobb–Douglas production function with two inputs: K is capital (the number of machines $= 15$), L is labor (the number of workers $= 60$). The production function is $Y = 100K^{0.3}L^{0.7}$. Suppose further the cost of capital to a Machine-rental company. The company buys Machines for

$\$6,000$ each and rents them out to other businesses, and the economy's price level, $\mathbf{P\ is\ \$25}$. The company faces a real interest rate r of **10 percent** per year and the machines depreciate at **20 percent** per year.

A. Compute the marginal product of machines and the real cost of machines, and interpret the result (should the rental firm add to its capital stock -invest in new machines)?

B. What happen to the firms' decision if the relative price of machines increases by 10% and 15% in order?

12) [***IS-LM Model***] Assume the following model of the closed economy in the short run, with the price level, **P**, fixed at **2.0**:

$$C = 100 + 0.75(Y - T) \quad - \textit{Consumption function}$$
$$I = 150 - 25r \quad - \textit{Investment function}$$
$$G = 4000,\ T = 3000 \quad - \textit{Exogenous Fiscal policy variables}$$
$$(M/P)^d = 0.5Y - 200r \quad - \textit{Money demand Function}$$
$$M^S = 4000 \quad - \textit{Nominal money supply}$$

a) Write a numerical formula for the **IS curve**, showing Y as a function of r?

b) Write a numerical formula for the **LM curve**, showing Y as a function of r?

c) Find the equilibrium interest rate r and the equilibrium level of income Y in this $IS-LM$ model?

d) Now, suppose that government increases its spending from $4000\ to\ 4500$ to stimulate spending in the economy but the monetary authority responds by increasing the money supply from $4000\ to\ 4500$. Determine the new short-run equilibrium national income, Y (*Hint: Use the* $IS-LM$ *model and support your computation with graphical presentation)*?

13) In the Mundell–Fleming model with floating exchange rates, explain what happens to aggregate income, the exchange rate, and the trade balance when the money supply is reduced. What would happen if exchange rates were fixed rather than floating?