Introducing the Economy

Monetary policy refers to central bank activities that are directed toward influencing the quantity of money and credit in an economy.

By contrast, fiscal policy refers to the government's decisions about taxation and spending.

Scope of Macroeconomics

- Macroeconomics is concerned with the behavior of the economy as a whole—with booms and recessions, the economy's total output of goods and services, the growth of output, the rates of inflation and unemployment, the balance of payments, and exchange rates.
- Macroeconomics deals with both long-run economic growth and the short-run fluctuations that constitute the business cycle.
- Macroeconomics focuses on the economic behavior and policies that affect consumption and investment, the trade balance, the determinants of changes in wages and prices, monetary and fiscal policies, the money stock, the budget, interest rates, and national debt.
- Macroeconomics goes beyond details of the behavior of individual economic units, such as households and firms, or the determination of prices in particular markets, which are the subject matter of microeconomics.

- In macroeconomics we deal with the market for goods as a whole, treating all the markets for different goods—such as the markets for agricultural products and for medical services—as a single market. Similarly, we deal with the labor market as a whole, abstracting from differences between the markets for, say, unskilled labor and doctors.
- The benefit of the abstraction is that it facilitates increased understanding of the vital interactions among the goods, labor, and assets markets. The cost of the abstraction is that omitted details sometimes matter.
- A fundamental question in macroeconomics is whether the government can and should intervene in the economy to improve its performance.

GDP: Production and Income

- The measure of **aggregate output** in the national income accounts is called the **gross domestic product**, or **GDP**, for short.
- To understand how GDP is constructed, it is best to work with a simple example. Consider an economy composed of just two firms. Firm 1 produces steel, employing workers and using machines to produce the steel. It sells the steel for Rs 100 to Firm 2, which produces cars. Firm 1 pays its workers Rs 80, leaving Rs 20 in profit to the firm.
- Firm 2 buys the steel and uses it, together with workers and machines, to produce cars. Revenues from car sales are Rs 200. Of the Rs 200, Rs 100 goes to pay for steel and Rs 70 goes to workers in the firm, leaving Rs 30 in profit to the firm.
- The aggregate output in this economy would be just the value of cars, the final good. Steel output is not counted as it is an intermediate good, one which is used in the production of final good. The inclusion of steel would lead to **double counting.**

Definitions of GDP

- **GDP Is the value of the final goods and services produced in the economy during a given period.** We want to count only the production of final goods, not intermediate goods. Suppose both the firms merged, steel sale would not be recorded. All we would see is the output of the final product, cars. That is to say the definition of aggregate output does not depend on whether firms decide to merge or not.
- **GDP is the sum of value added in the economy during a given period.** The value added by a firm is defined as the value of its production minus the value of the intermediate goods used in production. In our two-firms example, the steel company does not use intermediate goods. Its value added is simply equal to the value of the steel it produces, Rs 100. The car company, however, uses steel as an intermediate good. Thus, the value added by the car company is equal to the value of the cars it produces minus the value of the steel it uses in production, Rs 200 - Rs 100 = Rs 100. Total value added in the economy, or GDP, equals Rs 100 + Rs 100 = Rs 200.
- Note that aggregate value added would remain the same if the steel and car firms merged and became a single firm. In this case, we would not observe intermediate goods at all—as steel would be produced and then used to produce cars within the single firm—and the value added in the single firm would simply be equal to the value of cars, Rs 200

- Put together, the two definitions imply that the value of final goods and services—the first definition of GDP—can also be thought of as the sum of the value added by all the firms in the economy—the second definition of GDP.
- **GDP is also equal to the sum of incomes in an economy during a given period.** Think about the revenues left to a firm after it has paid for its intermediate goods: Some of the revenues go to pay workers—this component is called *labor income.* The rest goes to the firm—that component is called *capital income* or *profit income*.
- Of the Rs 100 of value added by the steel manufacturer, Rs 80 goes to workers (labor income) and the remaining Rs 20 goes to the firm (capital income). Of the Rs 100 of value added by the car manufacturer, Rs 70 goes to labor income and Rs 30 to capital income.
- For the economy as a whole, labor income is equal to Rs 150 (Rs 80 + Rs 70), capital income is equal to Rs 50 (Rs 20 + Rs 30). **Value added is equal to the sum of labor income and capital income** is equal to Rs 200 (Rs 150 + Rs 50).

Nominal and Real GDP

- **Nominal GDP** is the sum of the quantities of final goods produced times their current price. This definition makes clear that nominal GDP increases over time for two reasons:

➢ First, the production of most goods increases over time.

➢ Second, the prices of most goods also increase over time.

- If our goal is to measure production and its change over time, we need to eliminate the effect of increasing prices on our measure of GDP. That's why **real GDP** is constructed as the sum of the quantities of final goods times *constant* (rather than *current*) prices.
- Nominal and real GDP are equal (by construction) in the year for which we take the reference (constant) price level. Real GDP is also called **GDP in terms of goods**, **GDP in constant rupees or GDP adjusted for inflation.**
- In January 2015, Indian government moved to a new base year of **2011-12** from the earlier the base year of 2004-05 for national accounts.

GDP: Level versus Growth Rate

- We have focused so far on the level of real GDP. This is an important number that gives the economic size of a country. A country with twice the GDP of another country is economically twice as big as the other country. Equally important is the level of **real GDP per person**, the ratio of real GDP to the population of the country. It gives us the average standard of living of the country.
- In assessing the performance of the economy from year to year, economists focus, however, on the rate of growth of real GDP, often called **GDP growth**. Periods of positive GDP growth are called **expansions**. Periods of negative GDP growth are called **recessions**.

GDP Purchasing Power Parity

- **Purchasing power parity** (**PPP**) is the measurement of prices in different countries that uses the prices of specific goods to compare the absolute purchasing power of the countries' currencies, and, to some extent, their people's living standards. PPP produces an inflation rate equal to the price of the basket of goods at one location divided by the price of the basket of goods at a different location. The PPP inflation and exchange rate may differ from the market exchange rate because of tariffs, and other transaction costs.
- Poverty, tariffs, transportation and other frictions prevent trading and purchasing of various goods, so measuring a single good can cause a large error. The PPP term accounts for this by using a basket of goods, that is, many goods with different quantities. PPP then computes an inflation and exchange rate as the ratio of the price of the basket in one location to the price of the basket in the other location. For example, if a basket consisting of 1 computer, 1 ton of rice, and half a ton of steel was 1000 US dollars in New York and the same goods cost 60000 rupees in Mumbai, the PPP exchange rate would be 60 Indian rupee for every 1 US dollar.
- Because PPP exchange rates are more stable and are less affected by tariffs, they are used for many international comparisons, such as comparing countries' GDPs or other national income statistics. These numbers often come with the label **PPP-adjusted.**

GDP and GNP

GNP- Excludes income earnt by multinational when profit is sent back to other country

GDP- Includes income of foreign multinationals

- GDP is the total output of goods and services within the economy (i.e. domestic boundary) irrespective of whether that output (income) is attributable to entities resident inside or outside the economy. GNP is the total output of goods and services (income) attributable to entities resident within the economy irrespective of whether that output was created inside or outside the economy.
- For instance, part of Indian GDP corresponds to the profits earned by Honda from its Indian manufacturing operations. These profits are part of Japan's GNP, because they are the income of Japanese-owned capital.
- **GNP= GDP+ Net factor Income from Abroad**. Factor income includes interest and dividends earned on financial and real capital assets working abroad, as well as wages, salaries, and other labor income earned by domestic residents working outside the country. Thus, GNP can be greater than or lesser than GDP depending on whether Net factor income is positive or negative.

GDP and NDP

- Capital wears out, or depreciates, while it is being used to produce output. **Net domestic product (NDP) is equal to GDP minus depreciation.**
- NDP thus comes closer to measuring the net amount of goods produced in the country in a given period: It is the total value of production minus the value of the amount of capital used up in producing that output.

Net domestic product at market prices, abbreviated as NDP, is gross domestic product (GDP) minus the consumption of fixed capital (CFC). NDP, unlike GDP, also takes into account the decrease in the value of fixed assets (e.g. computers, buildings, transport equipment, machinery, etc.) used in the production process.

Uses of GDP

- GDP provides a direct indication of the health and growth of the economy. Hence, businesses can use GDP as a guide to their business strategy.
- Comparing the GDP growth rates of different countries can play a part in asset allocation, aiding decisions about whether to invest in fast-growing economies abroad—and if so, which ones.
- Government and the central bank use the growth rate and other GDP statistics as part of their decision process in determining what type of fiscal and monetary policies to implement.

Problems in GDP measurement

- **GDP growth alone cannot measure a nation's development or its citizens' well-being**, as noted above. For instance, a nation may be experiencing rapid GDP growth, but this may impose a significant cost to society in terms of environmental impact and an increase in income disparity.
- GDP relies on recorded transactions and official data, so **it does not take into account the extent of informal economic activity** or the black economy. Further, some outputs are poorly measured because they are not traded in the market. If you cook rice, the value of your labor isn't counted in official GDP statistics.
- Some activities measured as adding to GDP in fact represent the use of resources to avoid or contain "bads" such as crime or risks to national security. Similarly, **the accounts do not subtract anything for environmental pollution and degradation**. For instance, one study of Indonesia claims that properly accounting for environmental degradation would reduce the measured growth rate of the economy by 3 percent.
- **It is difficult to account correctly for improvements in the quality of goods**. This has been the case particularly with electronic gadgets and computers, whose quality has improved dramatically while their price has fallen sharply.

Important facts

- National Income in India is calculated by the National Statistical Office which comes under the Ministry of Statistics and Programme Implementation.
- The first estimation of National Income was done under the Ministry of Commerce during the years 1948-49. P C Mahalanobis was the Chairman of the first National Income Committee.
- The First rough estimate of National Income was made by Dadabhai Naoroji for the year 1867-68 which is mentioned in his book *Poverty and Unbritish Rule in India*.
- The First Scientific estimate was made by Professor V K R Rao in 1931-32.

The Unemployment Rate

- **Employment** is the number of people who have a job. **Unemployment** is the number of people who do not have a job but are looking for one. The **labor force** is the sum of employment and unemployment

  Labour force= employed + unemployed

- The **unemployment rate** is the ratio of the number of people who are unemployed to the number of people in the labour force. Most countries rely on large surveys of households to compute the unemployment rate. India has the Periodic Labour Force Survey.
- Note that only those *looking for a job* are counted as unemployed; those who do not have a job and are not looking for one are counted as **not in the labor force**. When unemployment is high, some of the unemployed give up looking for a job and therefore are no longer counted as unemployed. These people are known as **discouraged workers.**

- If all workers without a job gave up looking for one, the unemployment rate would equal zero. This would make the unemployment rate a very poor indicator of what is happening in the labor market. This example is too extreme; in practice, when the economy slows down, we typically observe both an increase in unemployment and an increase in the number of people who drop out of the labor force.
- Equivalently, a higher unemployment rate is typically associated with a lower **participation rate, defined as the ratio of the labor force to the total population of working age.** The working age population is defined as those aged 15 to 64.

The Inflation Rate

- **Inflation** is a sustained rise in the general level of prices—the **price level.** The **inflation rate** is the rate at which the price level increases. (Symmetrically, **deflation** is a sustained decline in the price level. It corresponds to a negative inflation rate).
- The practical issue is how to define the price level so the inflation rate can be measured. Macroeconomists typically look at at three price indexes: the GDP deflator and the Consumer Price Index and the Wholesale Price Index.
- Increases in nominal GDP can come either from an increase in real GDP, or from an increase in prices. Put another way, if we see nominal GDP increase faster than real GDP, the difference must come from an increase in prices. The **GDP deflator** in year t, P_t , is defined as the ratio of nominal GDP to real GDP in year t
- *The GDP deflator is called an index number and has no economic interpretation.* But its rate of change, $(P_t - P_{t-1}) / P_{t-1}$ has a clear economic interpretation: It gives the rate at which the general level of prices increases over time—the rate of inflation.
- One advantage to defining the price level as the GDP deflator is that it implies a simple relation among nominal GDP, real GDP, and the GDP deflator. Nominal GDP is equal to the GDP deflator times real GDP. Or, putting it in terms of rates of change: **The rate of growth of nominal GDP is equal to the rate of inflation plus the rate of growth of real GDP.**

Consumer Price Index

- The GDP deflator gives the average price of output—the final goods produced in the economy. But consumers care about the average price of consumption—the goods they consume. The two prices need not be the same.
- The set of goods produced in the economy is not the same as the set of goods purchased by consumers, for two reasons:

➢Some of the goods in GDP are sold not to consumers but to firms (machine tools, for example), to the government, or to foreigners.

➢Some of the goods bought by consumers are not produced domestically but are imported from abroad.

- To measure the average price of consumption, or, equivalently, the **cost of living**, macroeconomists look at another index, the **Consumer Price Index, or CPI which is based on a basket of goods.** India has CPI, CPI Rural, CPI Urban and CPI Industrial Workers.

- RBI sets the target of CPI for controlling the inflation in its monetary policy. There are four CPI in India for four different set of workers:

➢CPI (Industrial Workers)

➢CPI (Urban Non- Manual Employees)

➢CPI (Agricultural Labour)

➢CPI (Rural Worker)

- In India, CPI (Rural/Urban/Combined) is published by the Central Statistics Office (Ministry of Statistics and Programme Implementation) and CPI (IW/AL) is published by Labour Bureau in the Ministry of Labour and Employment. It is published on monthly basis
- The items covered in CPI are divided into eight categories viz. Education, communication, transportation, recreation, apparel, foods and beverages, housing and medical care. The number of items in CPI basket include 448 in rural and 460 in urban.

Wholesale Price Index

- WPI is average **price changes of goods that are traded in the wholesale market**. It is a weekly measure of wholesale price movement of the economy. It includes only the prices of goods and does not include items pertaining to services. In India, WPI is published by the Office of Economic Adviser, Ministry of Commerce and Industry weekly. It has a time lag of two weeks.
- There are 697 items are included in the index. These items are further divided into three categories:

➢ **Primary articles**: The Primary articles are food items, non-food items and minerals. There are 117 items for Primary Articles (weightage 22.62%)

➢ **Fuel and Power**: It includes power, light and lubricants, electricity, coal mining and mineral oil. There are 16 items for Fuel & Power. (weightage 13.15%)

➢ **Manufactured Goods**: It includes food products, beverages, tobacco and tobacco products, wood and wood products, textiles, paper and paper products, basic metals, alloys, rubber and rubber products etc. There are 564 items for Manufactured Products. (weightage 64.23%)

General Price Indices

- Price indices are used to monitor changes in prices levels over time. This is useful when separating real income from nominal income, as inflation is a drain on purchasing power. The two most basic indices are the Laspeyres index and the Paasche index
- They work by dividing expense on a specific basket in the current period (the sum of p*q for each product in the basket considered when calculating the index) by how much the same basket would cost in the base period (period 0). The main difference is the quantities used: the Laspeyres index uses q_0 quantities, whereas the Paasche index uses period *n* quantities.

$$P_L = \frac{\sum(p_{c,t_n}) * (q_{c,t_0})}{\sum(p_{c,t_0}) * (q_{c,t_0})}$$

$$P_P = \frac{\sum(p_{c,t_n}) * (q_{c,t_n})}{\sum(p_{c,t_0}) * (q_{c,t_n})}$$

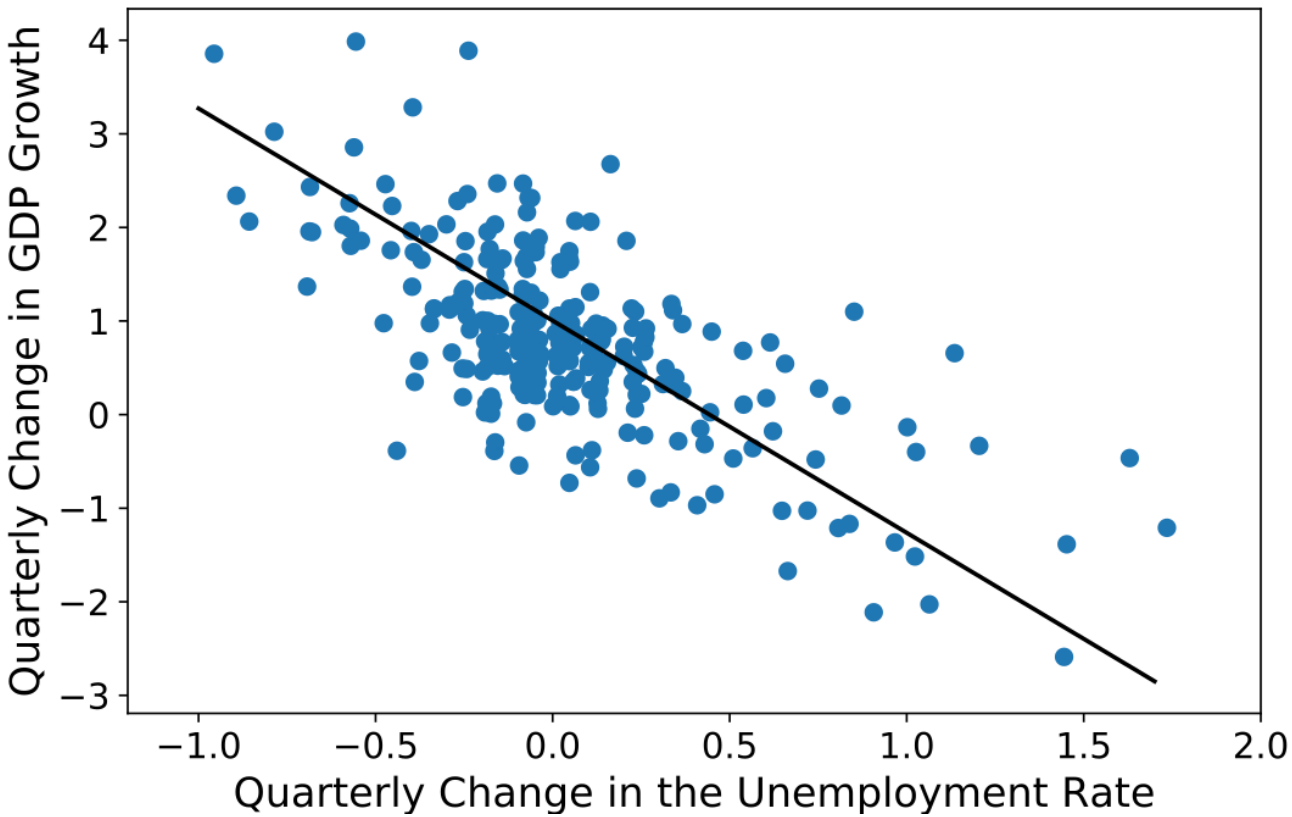
L0Pn

Why do economists care about inflation?

- If a higher inflation rate meant just a faster but proportional increase in all prices and wages—a case called pure inflation—inflation would be only a minor inconvenience, as relative prices would be unaffected.
- Take, for example, the workers' *real wage*—the wage measured in terms of goods rather than in rupees. In an economy with 10% more inflation, prices would increase by 10% more a year. But wages would also increase by 10% more a year, so real wages would be unaffected by inflation.
- However, there is no thing such as pure inflation. During periods of inflation, not all prices and wages rise proportionately. Because they don't, inflation affects income distribution. For example, retirees in many countries receive payments that do not keep up with the price level, so they lose in relation to other groups when inflation is high.
- Inflation leads to other distortions. Variations in relative prices also lead to more uncertainty, making it harder for firms to make decisions about the future, such as investment decisions. Some prices, which are fixed by law or by regulation, lag behind the others, leading to changes in relative prices.

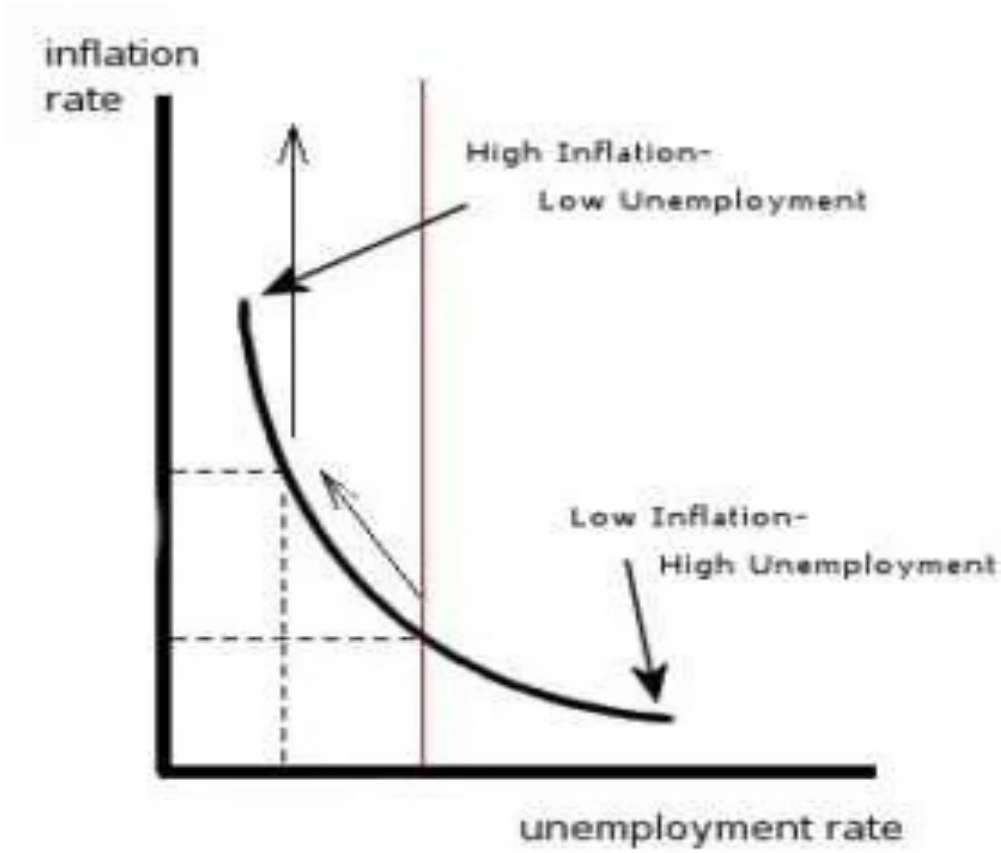
Okun's Law

- Intuition suggests that if output growth is high, unemployment will decrease, and this is indeed true. This relation was first examined by American economist Arthur Okun and for this reason has become known as **Okun's law.** It predicts that a 1% increase in unemployment will usually be associated with a 2% drop in gross domestic product (GDP).
- This is why unemployment goes up in recessions and down in expansions. This relation has a simple but important implication: The key to decreasing unemployment is a high enough rate of growth.
- This is for two reasons. The first is that population, and thus the labor force, increases over time, so employment must grow over time just to keep the unemployment rate constant. The second is that output per worker is also increasing with time, which implies that output growth is higher than employment growth.


Quarterly Change in GDP Growth
4
3
2
1
0
−1
−2
−3
−1.0
−0.5
0.0
0.5
1.0
1.5
2.0
Quarterly Change in the Unemployment Rate

Phillips Curve

- Okun's law implies that, with strong enough growth, one can decrease the unemployment rate to very low levels. But intuition suggests that, when unemployment becomes very low, the economy is likely to overheat, and that this will lead to upward pressure on inflation.
- This relation was first explored in 1958 by a New Zealand economist, A. W. Phillips, and has become known as the **Phillips curve**. Phillips plotted the rate of inflation against the unemployment rate.


inflation
rate
High Inflation-
Low Unemployment
Low Inflation-
High Unemployment
unemployment rate

Short, Medium and Long Run

- Movements in output come from movements in the demand for goods. Factors that affect demand like consumer confidence and interest rates affect aggregate output.
- How much can be produced depends on how advanced the technology of the country is, how much capital it is using, and the size and the skills of its labor force. These are the fundamental determinants of a country's level of output.
- The technological sophistication of a country depends on its ability to innovate and introduce new technologies. The size of its capital stock depends on how much people save. The skills of workers depend on the quality of the country's education system. Other factors are also important: If firms are to operate efficiently, for example, they need a clear system of laws under which to operate and an honest government to enforce those laws.
- This suggests a third answer: The true determinants of output are factors like a country's education system, its saving rate, and the quality of its government.

- In the **short run**, say, a few years, year-to-year movements in output are primarily driven by movements in demand. Changes in demand, perhaps due to changes in consumer confidence or other factors, can lead to a decrease in output (a recession) or an increase in output (an expansion).
- In the **medium run**, say, a decade, the economy tends to return to the level of output determined by supply factors: the capital stock, the level of technology, and the size of the labor force. And, over a decade or so, these factors move sufficiently slowly that we can take them as given.
- In the **long run**, say, a few decades or more, the third answer is the right one. To understand why China has been able to achieve such a high growth rate since 1980, we must understand why both the capital stock and the level of technology in China are increasing so fast. To do so, we must look at factors like the education system, the saving rate, and the role of the government.

National Income Accounting

Introduction

- We study national income accounting for two reasons. **First, the national income accounts provide the formal structure for our macro theory models**.
- We divide output in two ways. On the production side, output is paid out to labor in the form of wages and to capital in the form of interest and dividends. On the demand side, output is consumed or invested for the future.
- The division of output into factor payments (wages, etc.) on the production side provides a framework for our study of growth and aggregate supply. The division of income into consumption, investment, and so on, on the demand side provides the framework for studying aggregate demand. The input and output, or demand and production, accountings are necessarily equal in equilibrium.
- **The second reason for studying national income accounts is to learn a few ballpark numbers that help characterize the economy**. How much is per capita income, what is its change over time, how much of income goes to labour and how much to capital.

Outlays and Components of Demand

- The **components of the aggregate demand** for domestically produced goods and services relate to the different purposes for which GDP is demanded.
- Total demand for domestic output is made up of four components: (1) consumption spending by households (*C*), (2) investment spending by businesses and households (*I*), (3) government (central, state, and local) purchases of goods and services (*G*) and (4) foreign demand for our net exports (*NX*). **The fundamental national income accounting identity is**

$$Y = C + I + G + NX$$

C and G

- The chief component of demand is **consumption spending** by the household sector. This includes spending on anything from food to airline tickets, but it also involves, as we shall see in discussing investment, consumer spending on durable goods such as automobiles—spending that might be regarded as investment rather than consumption.
- We refer to government spending on goods and services as *purchases* of goods and services. **Government purchases of goods and services** includes such items as national defense expenditures, costs of road paving by state and local governments, and salaries of government employees(In effect, the national income accounts treat the government as buying the services provided by government employees—and then providing these services to the public, free of charge).
- In addition, the government makes *transfer payments* , payments that are made to people without their providing a current service in exchange. Typical transfer payments are social security benefits and unemployment benefits. **Transfer payments are *not* counted as part of GDP** because transfers are not part of current production. Interest payments are also not included. Although these are clearly government expenditures, they are not purchases of goods and services.

Investment

- *Gross private domestic investment* means additions to the physical stock of capital. As we use the term, investment does *not* include buying a bond or purchasing stock. Investment includes housing construction, building of machinery, construction of factories and offices, and additions to a firm's inventories of goods.
- If we think of investment more generally as any current activity that increases the economy's ability to produce output in the future, we would include not only physical investment but also what is known as investment in human capital.
- *Human capital* is the knowledge and ability to produce that is embodied in the labor force. Investment in education can be regarded as investment in human capital, but the official accounts treat personal educational expenditures as consumption and public educational expenditures as government spending.

Net Exports

- Net exports accounts for domestic spending on foreign goods and foreign spending on domestic goods. When foreigners purchase goods we produce, their spending adds to the demand for domestically produced goods.
- Correspondingly, that part of our spending that purchases foreign goods has to be subtracted from the demand for domestically produced goods. Accordingly, the difference between exports and imports, called *net exports* , is a component of the total demand for our goods.

Notes

- **GDP is the value of final goods and services** produced. The insistence on final goods and services is simply to make sure that we do not double-count. For example, we would not want to include the full price of an automobile in GDP and then also include as part of GDP the value of the tires that were bought by the automobile producer for use on the car. The components of the car that are bought by the manufacturers are called intermediate goods , and their value is not included in GDP.
- **GDP consists of the value of output currently produced** . It thus excludes transactions in existing commodities, such as old masters or existing houses. We count the construction of new houses as part of GDP, but we do not add trade in existing houses. We do, however, count the value of realtors' fees in the sale of existing houses as part of GDP. The realtor provides a current service in bringing buyer and seller together, and that is appropriately part of current output.

Short Run

Goods Market

Introduction

- In the short run, demand determines output. Many factors affect demand, from consumer confidence to fiscal and monetary policy.

- Here, we look at **equilibrium in the goods market and the determination of output**. It focuses on the interaction among demand, production, and income. It also shows how fiscal policy affects output.

- Using the decomposition of GDP we can write the total demand for goods (Z) as

$$Z = C + I + G + X - IM$$

- It *defines* Z as the sum of consumption, plus investment, plus government spending, plus exports, minus imports. We now need to think about the determinants of Z.
- Assume that all firms produce the same good, which can then be used by consumers for consumption, by firms for investment, or by the government. With this simplification, we need to look at only one market—the market for "the" good— and think about what determines supply and demand in that market.
- Assume that firms are willing to supply any amount of the good at a given price level P. This assumption allows us to focus on the role demand plays in the determination of output
- Under the assumption that the economy is closed, $X = IM = 0$, so the demand for goods Z is simply the sum of consumption, investment, and government spending.

Consumption

- Consumption decisions depend on many factors. But the main one is surely income, or, more precisely, **disposable income**, the income that remains once consumers have received transfers from the government and paid their taxes. When their disposable income goes up, people buy more goods; when it goes down, they buy fewer goods.

$$C=F(Y_{D+})$$

- This is a formal way of stating that consumption *C* is a function of disposable income Y_D. The function $C=F(Y_D)$ is called the **consumption function**. The positive sign beside Y_D reflects the fact that when disposable income increases, so does consumption. Economists call such an equation a **behavioral equation** to indicate that the equation captures some aspect of behavior—in this case, the behavior of consumers.

- It is reasonable to assume that the relation between consumption and disposable income is given by the simpler relation:

$$C = c_0 + c_1 Y_D$$

- In other words, it is reasonable to assume that the function is a **linear relation.** The relation between consumption and disposable income is then characterized by two **parameters**, c_0 and c_1.
- The parameter c_1 is called the **propensity to consume**. (It is also called the *marginal propensity to consume).* It gives the effect an additional rupee of disposable income has on consumption.
- A natural restriction on c_1 is that it be positive: An increase in disposable income is likely to lead to an increase in consumption. Another natural restriction is that c_1 be less than 1: People are likely to consume only part of any increase in disposable income and save the rest.

- The parameter c_0 has a literal interpretation. It is what people would consume if their disposable income in the current year were equal to zero. A natural restriction is that, if current income were equal to zero, consumption would still be positive: With or without income, people still need to eat. This implies that c_0 is positive.
- People consume if their income is equal to zero by dissaving. They consume either by selling some of their assets or by borrowing.
- Changes in c_0 reflect changes in consumption for a given level of disposable income. Increases in c_0 reflect an increase in consumption given income, decreases in c_0 a decrease.
- There are many reasons why people may decide to consume more or less, given their disposable income. They may, for example, find it easier or more difficult to borrow, or may become more or less optimistic about the future.

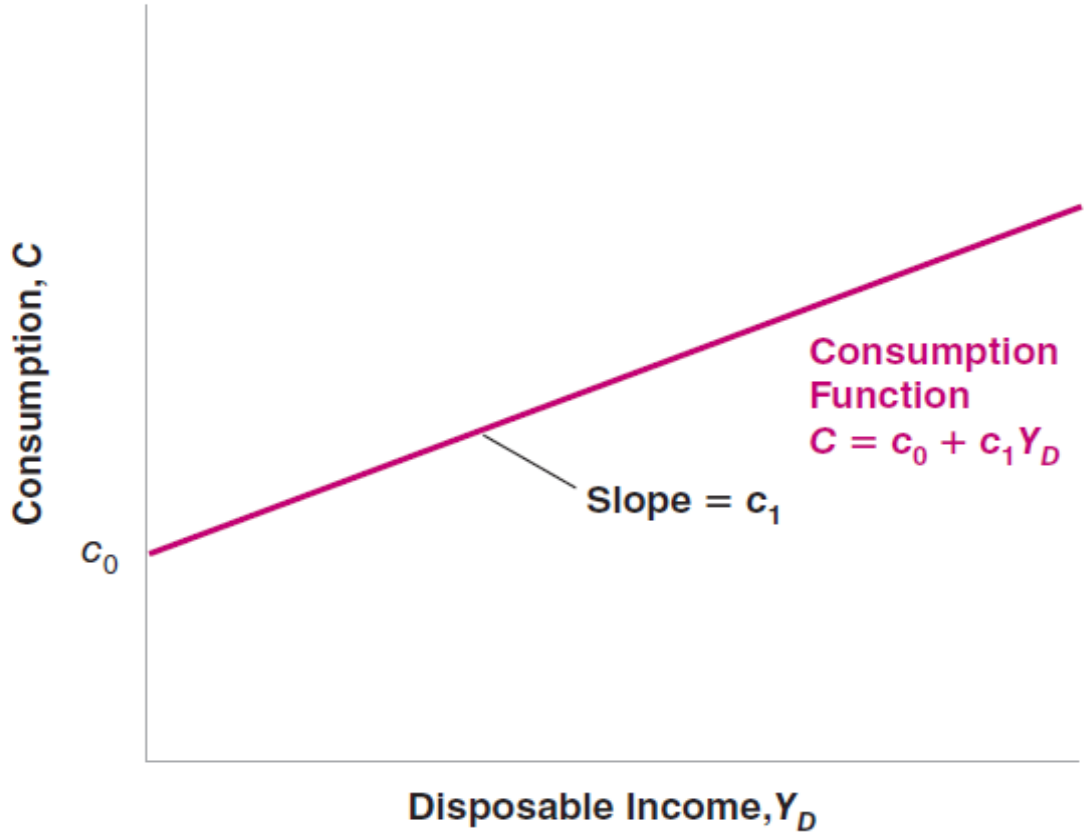
- Now we need to define disposable income Y_D. Disposable income is given by

$$Y_D = Y - T$$

where Y is income and T is taxes paid minus government transfers.

- Thus, consumption C is a function of income Y and taxes T. Higher income increases consumption, but less than one for one. Higher taxes decrease consumption, also less than one for one.

Consumption and Disposable Income



Investment

- Models have two types of variables. Some variables depend on other variables in the model and are therefore explained within the model. Variables like these are called **endogenous**. This was the case for consumption above.
- Other variables are not explained within the model but are instead taken as given. Variables like these are called **exogenous**. This is how investment is considered.
- It implies that, when we later look at the effects of changes in production, we will assume that investment does not respond to changes in production. It is not hard to see that this implication may be a bad description of reality: Firms that experience an increase in production might well decide they need more machines and increase their investment as a result.

Government Spending

- The third component of demand in our model is government spending, *G*. Together with taxes *T*, *G* describes **fiscal policy**—the choice of taxes and spending by the government. Just as we just did for investment, we will take *G* and *T* as exogenous.
- The reason why we assume *G* and *T* are exogenous is different from the reason we assumed investment is exogenous. It is based on two distinct arguments:

➢First, governments do not behave with the same regularity as consumers or firms, so there is no reliable rule we could write for *G* or *T* corresponding to the rule we wrote for consumption.

➢Second, and more importantly, one of the tasks of macroeconomists is to think about the implications of alternative spending and tax decisions. We want to be able to say, "If the government were to choose these values for *G* and *T*, this is what would happen."

Determination of Equillibrium Output

- Assuming that exports and imports are both zero, the demand for goods is the sum of consumption, investment, and government spending

$$Z = C + I + G$$

$$Z = c_0 + c_1(Y - T) + I + G$$

- The demand for goods Z depends on income Y, taxes T, investment I , and government spending G.
- Let's now turn to **equilibrium** in the goods market, and the relation between production and demand. If firms hold inventories, then production need not be equal to demand: For example, firms can satisfy an increase in demand by drawing upon their inventories—by having negative inventory investment. They can respond to a decrease in demand by continuing to produce and accumulating inventories—by having positive inventory investment.
- However, we will ignore this complication and assume that firm does not hold inventories. In this case, inventory investment is always equal to zero, and **equilibrium in the goods market** requires that production Y be equal to the demand for goods Z

Y=Z

- Replacing demand Z by the expression that we arrived at, gives

$$Y = c_0 + c_1(Y - T) + I + G$$

- **That is to say in equilibrium, production, Y (the left side of the equation), is equal to demand (the right side). Demand in turn depends on income, Y, which is itself equal to production.** We can look at GDP either from the production side or from the income side. Production and income are identically equal.

- **From the equillibrium equation,** move $c_1 Y$ to the left side and reorganize the right side

$$(1 - c_1)\, Y = c_0 + I + G - c_1 T$$

Dividing both sides by $(1 - c_1)$ we get

$$\boldsymbol{Y = \frac{c_0 + I + G - c_1 T}{(1 - c_1)}}$$

- The last equation characterizes equilibrium output, the level of output such that production equals demand.

- The term $c_0 + I + G - c_1T$ is that part of the demand for goods that does not depend on output. For this reason, it is called **autonomous spending**.
- We cannot be sure that autonomous spending is positive but it is very likely to be. The first two terms in brackets, c_0 and I , are positive.
- Suppose the government is running a **balanced budget**—taxes equal government spending. If $T = G$, and the propensity to consume c_1 is less than 1 (as we have assumed), then $(G - c_1T)$ is positive and so is autonomous spending. Only if the government were running a very large budget surplus—if taxes were much larger than government spending—could autonomous spending be negative.
- Because the propensity to consume c_1 is between zero and one, $1/(1-c_1)$ is a number greater than one. For this reason, this number, which *multiplies* autonomous spending, is called the **multiplier**. The closer c_1 is to 1, the larger the multiplier.

- The multiplier has the following implication. Any change in autonomous spending—from a change in investment, to a change in government spending, to a change in taxes—will have the same qualitative effect: **It will change output by more than its direct effect on autonomous spending**.
- Where does the multiplier effect come from? An increase in c_0 increases demand. The increase in demand then leads to an increase in production. The increase in production leads to an equivalent increase in income (remember the two are identically equal). The increase in income further increases consumption, which further increases demand, and so on.

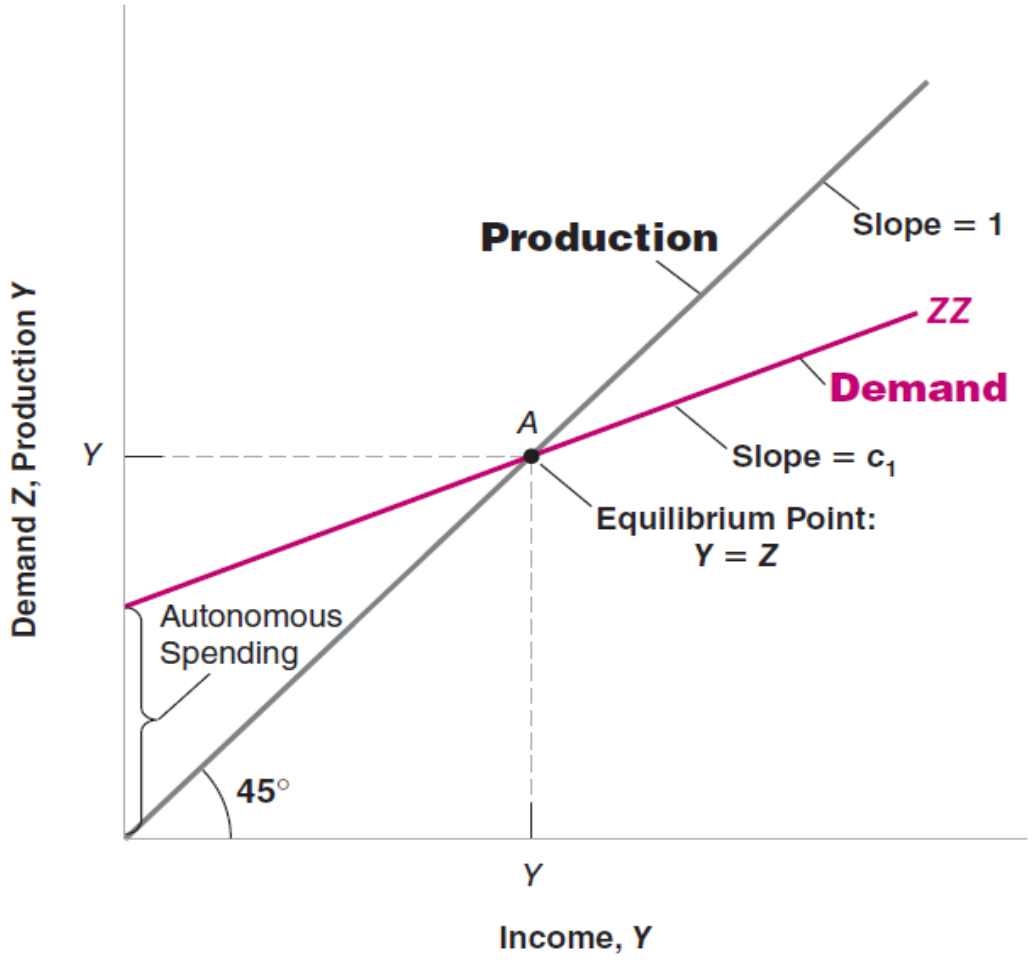
Equillibrium using graphs

- First, plot production as a function of income. Measure production on the vertical axis and income on the horizontal axis. Plotting production as a function of income is straightforward: Production and income are identically equal. Thus, the relation between them is the 45-degree line, the line with a slope equal to 1.
- Second, plot demand as a function of income. regrouping the terms for autonomous spending together in the term in parentheses

$$Z = (c_0 - c_1T + I + G) + c_1Y$$

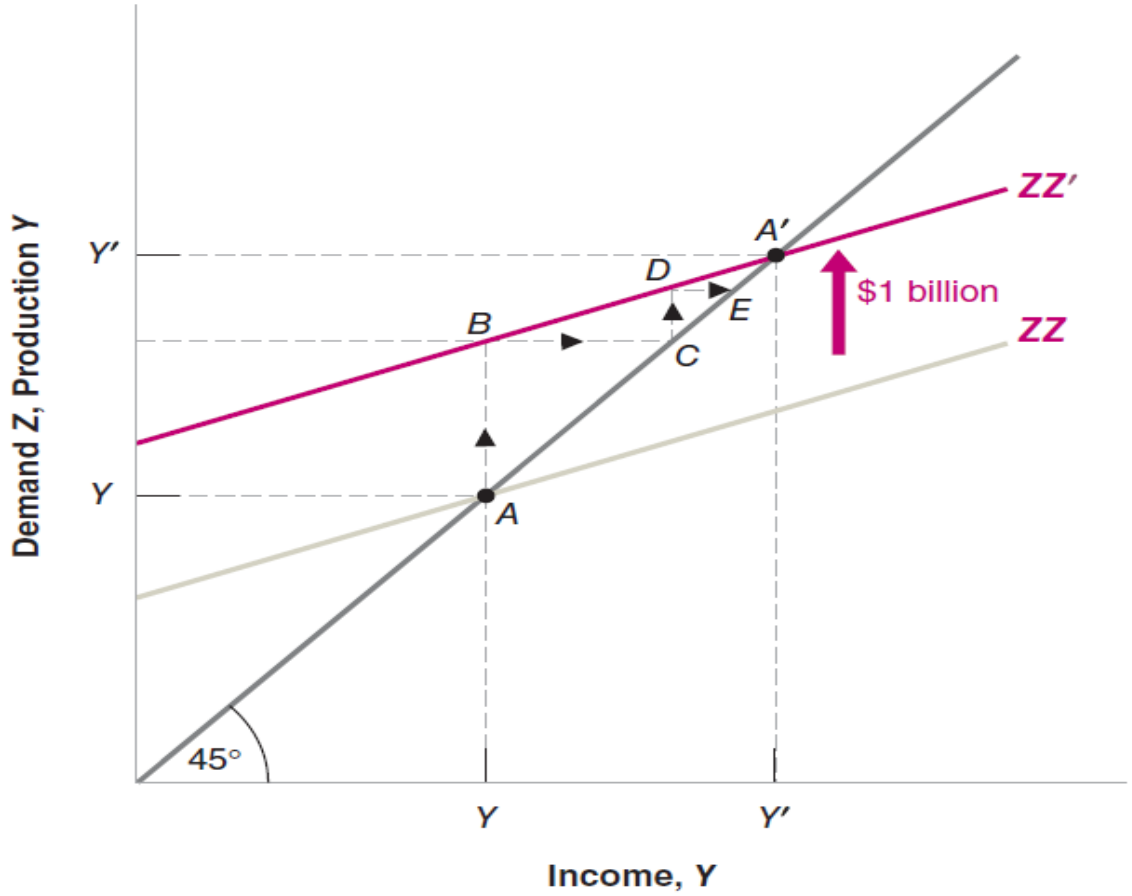
- Demand depends on autonomous spending and on income—via its effect on consumption. The relation between demand and income is drawn as *ZZ* in the graph. The intercept with the vertical axis—the value of demand when income is equal to zero—equals autonomous spending. The slope of the line is the propensity to consume, c_1: When income increases by 1, demand increases by c_1. Under the restriction that c_1 is positive but less than 1, the line is upward sloping but has a slope of less than 1.
- In equilibrium, production equals demand. Equilibrium output, *Y*, therefore occurs at the intersection of the 45-degree line and the demand function. This is at point *A*. To the left of *A*, demand exceeds production; to the right of *A*, production exceeds demand. Only at *A* are demand and production equal.

Equillibrium in the goods market



- Suppose that the economy is at the initial equilibrium, represented by point *A* in the graph, with production equal to *Y*. Now suppose c_0 increases by $1 billion. At the initial level of income (the level of disposable income associated with point *A* since *T* is unchanged in this example), consumers increase their consumption by $1 billion. That is, for any value of income, demand is higher by $1 billion.
- Before the increase in c_0, the relation between demand and income was given by the line *ZZ*. After the increase in c_0 by $1 billion, the relation between demand and income is given by the line *ZZ'*, which is parallel to *ZZ* but higher by $1 billion. In other words, the demand curve shifts up by $1 billion. The new equilibrium is at the intersection of the 45-degree line and the new demand relation, at point *A'*.
- Equilibrium output increases from *Y* to *Y'*. The increase in output, (*Y'* – *Y)*, which we can measure either on the horizontal or the vertical axis, is larger than the initial increase in consumption of $1 billion. This is the multiplier effect.

Effects of increase in autonomous spending on output



- With the help of the graph, it becomes easier to tell how and why the economy moves from *A* to *A'*. The initial increase in consumption leads to an increase in demand of $1 billion.
- At the initial level of income, *Y*, the level of demand is shown by point *B*: Demand is $1 billion higher. To satisfy this higher level of demand, firms increase production by $1 billion. This increase in production of $1 billion implies that income increases by $1 billion (recall: income = production), so the economy moves to point *C*. (In other words, both production and income are higher by $1 billion).
- But this is not the end of the story. The increase in income leads to a further increase in demand. Demand is now shown by point *D*. Point *D* leads to a higher level of production, and so on, until the economy is at *A*, where production and demand are again equal. This is therefore the new equilibrium.

- The first–round increase in demand, shown by the distance *AB* equals $1 billion. This first–round increase in demand leads to an equal increase in production, or $1 billion, which is also shown by the distance *AB*.
- This first–round increase in production leads to an equal increase in income, shown by the distance *BC*, also equal to $1 billion.
- The second–round increase in demand, shown by the distance *CD*, equals $1 billion (the increase in income in the first round) times the propensity to consume, c_1—hence, $ c_1 billion.
- This second–round increase in demand leads to an equal increase in production, also shown by the distance *CD*, and thus an equal increase in income, shown by the distance *DE*.
- The third–round increase in demand equals $ c_1 billion (the increase in income in the second round), times c_1, the marginal propensity to consume; it is equal to $$c_1 * c_1 = \$c_1^2$$ billion, and so on.
- Following this logic, the total increase in production after, say, $n + 1$ rounds equals $1 billion times the sum:

$$1 + c_1 + c_1^2 + \ldots + c_1^n$$

- Such a sum is called a **geometric series**. One property of geometric series is that, when c_1 is less than one and as n gets larger and larger, the sum keeps increasing but approaches a limit. That limit is $1/(1- c_1)$, making the eventual increase in output \$ $1/(1- c_1)$ billion.
- We can think of the original increase in demand as triggering successive increases in production, with each increase in production leading to an increase in income, which leads to an increase in demand, which leads to a further increase in production and so on. The multiplier is the sum of all these successive increases in production.
- Production depends on demand, which depends on income, which is itself equal to production. An increase in demand, such as an increase in government spending, leads to an increase in production and a corresponding increase in income. This increase in income leads to a further increase in demand, which leads to a further increase in production, and so on. The end result is an increase in output that is larger than the initial shift in demand, by a factor equal to the multiplier.
- **The size of the multiplier is directly related to the value of the propensity to consume: The higher the propensity to consume, the higher the multiplier.**

Dynamics of Adjustment

- Suppose that c_0 increases by \$1 billion. We know that output will increase by an amount equal to the multiplier $1/(1- c_1)$ times \$1 billion. But how long will it take for output to reach this higher value?
- Instantaneous adjustment isn't really plausible: A firm that faces an increase in demand might well decide to wait before adjusting its production, meanwhile drawing down its inventories to satisfy demand. A worker who gets a pay raise might not adjust her consumption right away. These delays imply that the adjustment of output will take time.
- Suppose, for example, that firms make decisions about their production levels at the beginning of each quarter. Once their decisions are made, production cannot be adjusted for the rest of the quarter. If purchases by consumers are higher than production, firms draw down their inventories to satisfy the purchases. On the other hand, if purchases are lower than production, firms accumulate inventories.

- Now suppose consumers decide to spend more, that they increase c_0. During the quarter in which this happens, **demand increases, but production—because we assumed it was set at the beginning of the quarter—doesn't yet change. Therefore, income doesn't change either.**
- Having observed an increase in demand, firms are likely to set a higher level of production in the following quarter. This increase in production leads to a corresponding increase in income and a further increase in demand. If purchases still exceed production, firms further increase production in the following quarter, and so on.
- In short, in response to an increase in consumer spending, output does not jump to the new equilibrium, but rather increases over time from *Y* to *Y'*. How long this adjustment takes depends on how and how often firms revise their production schedule. **If firms adjust their production schedules more frequently in response to past increases in purchases, the adjustment will occur faster.**

Investment equals Saving

- Equilibrium in the goods market in terms of the equality of the production and the demand for goods. An alternative—but equivalent— way of thinking about equilibrium focuses instead on **investment and saving**. This is how John Maynard Keynes first articulated this model in 1936, in *The General Theory of Employment, Interest and Money*.
- Saving is the sum of private saving and public saving. By definition, **private saving** (*S)*, saving by consumers, is equal to their disposable income minus their consumption:

$$S = Y_D - C = Y - T - C$$

- By definition, **public saving** is equal to taxes (net of transfers) minus government spending, $T - G$. If taxes exceed government spending, the government is running a **budget surplus**, so public saving is positive. If taxes are less than government spending, the government is running a **budget deficit**, so public saving is negative.
- The equation for equilibrium in the goods market that we derived earlier. Production must be equal to demand, which, in turn, is the sum of consumption, investment, and government spending:

$$Y = C + I + G$$

Subtract taxes (T) from both sides and move consumption to the left side

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

- The left side of this equation is simply private saving (S), so

S = I + G – T or equivalently I = S + T- G

- That is to say **investment is equal to the sum of private and public saving**. What firms want to invest must be equal to what people and the government want to save.

- To summarize: There are two equivalent ways of stating the condition for equilibrium in the goods market:

Production = Demand

Investment = Saving

- **Consumption and saving decisions are one and the same**: Given their disposable income, once consumers have chosen consumption, their saving is determined, and vice versa. The way we specified consumption behaviour implies that private saving is given by

$$S = Y - T - C = Y - T - c_0 - c_1(Y - T)$$

Rearranging, we get

$$\mathbf{S = -c_0 + (1 - c_1)(Y - T)}$$

- We can denote $(1 - c_1)$ as the propensity to save. The propensity to save tells us how much of an additional unit of income people save. The assumption we made earlier—that the propensity to consume c_1 is between zero and one implies that **the propensity to save $(1 - c_1)$ is also between zero and one**. Private saving increases with disposable income, but by less than one rupee for each additional rupee of disposable income.

We saw that I = S + T- G. Replacing S by the previous equation we get

$$I = -c_0 + (1 - c_1)(Y - T) + T - G$$

Solving for output

$$\mathbf{Y = \frac{[c_0 + I + G - c_1 T]}{(1 - c_1)}}$$

We are looking at the same equilibrium condition, just in a different way.

THANK YOU

FINANCIAL MARKETS

Short run

The Demand for Money

- Suppose, as a result of having steadily saved part of your income in the past, your financial wealth today is Rs 50,000. You may intend to keep saving in the future and increase your wealth further, but its value today is given. Suppose also that **you only have the choice between two assets, money and bonds**.
- *Money*, which you can use for transactions, pays no interest. In the real world, there are **two types of money**: **currency** (coins and bills), and **demand deposits**, the bank deposits on which you can write cheques. The sum of currency and demand deposits is called **M1**.
- **Bonds** pay a positive interest rate, *i*, but they cannot be used for transactions. In the real world, there are many types of bonds and other financial assets, each associated with a specific interest rate. For the time being, we will also ignore this aspect of reality and assume that there is just one type of bond and that it pays, *i*, the rate of interest.

- Holding all your wealth in the form of money is very convenient. You won't ever need to call a broker or pay transaction fees for buying bonds. But it also means you will receive no interest income. On the other hand, if you hold all your wealth in the form of bonds, you will earn interest on the full amount, but you will have to call your broker frequently to get money for daily use.
- Thus you should hold both money and bonds. **The proportion you hold either will depend on your level of transactions and the interest rate.** The higher the interest rate, the more you will be willing to deal with the hassle and costs associated with buying and selling bonds.

Deriving the demand for money

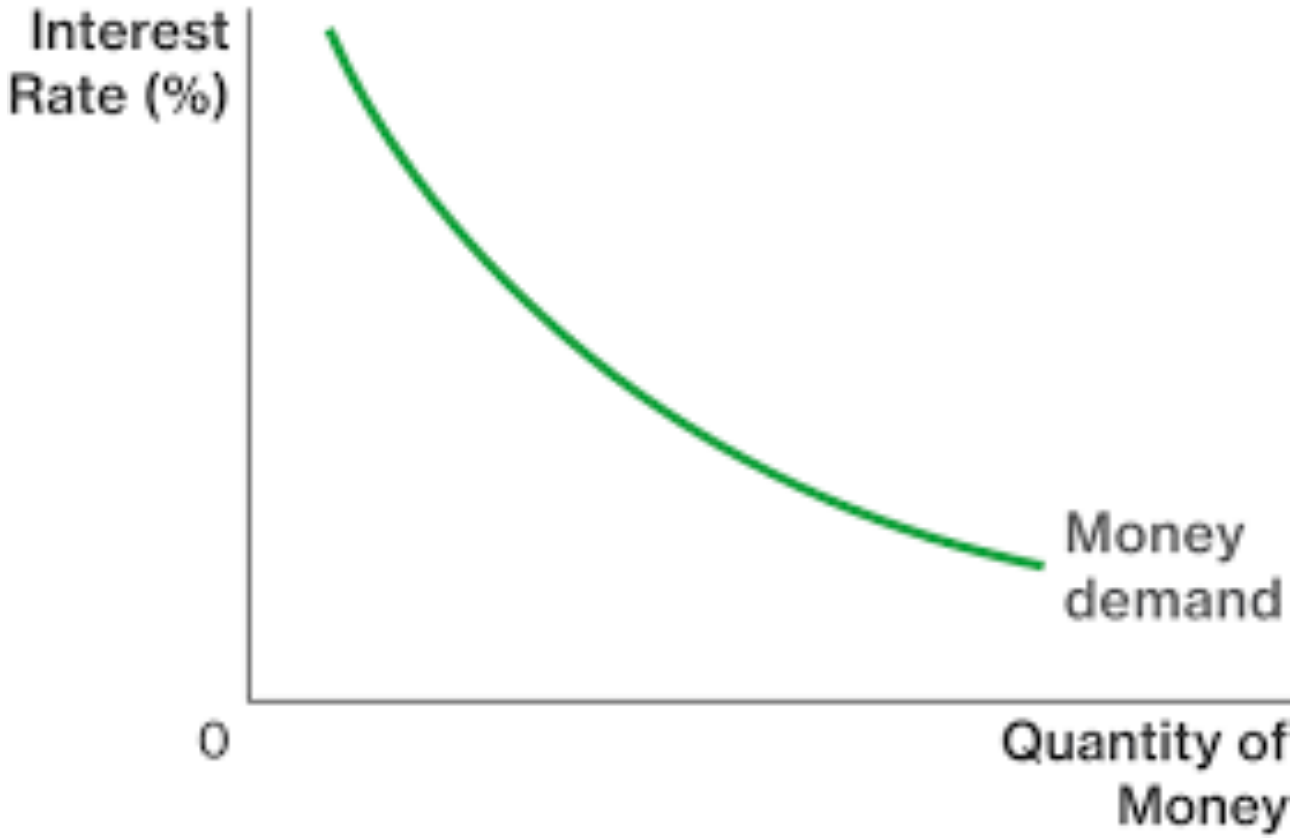
- The amount of money people want to hold—their *demand for money*—can be denoted by M^d. The demand for money in the economy as a whole is just the sum of all the individual demands for money by the people in the economy.
- Therefore, money demand depends on the overall level of transactions in the economy and on the interest rate. The overall level of transactions in the economy is hard to measure, but it is likely to be roughly proportional to nominal income.

$$M^d = Y.\ L(i)$$

$$(-)$$

- **The relation between the demand for money and the interest rate for a given level of nominal income is represented by the M^d curve**. The curve is downward sloping: The lower the interest rate (the lower *i*), the higher the amount of money people want to hold (the higher M^d). For a given interest rate, an increase in nominal income increases the demand for money. In other words, an increase in nominal income shifts the demand for money to the right.

Money demand



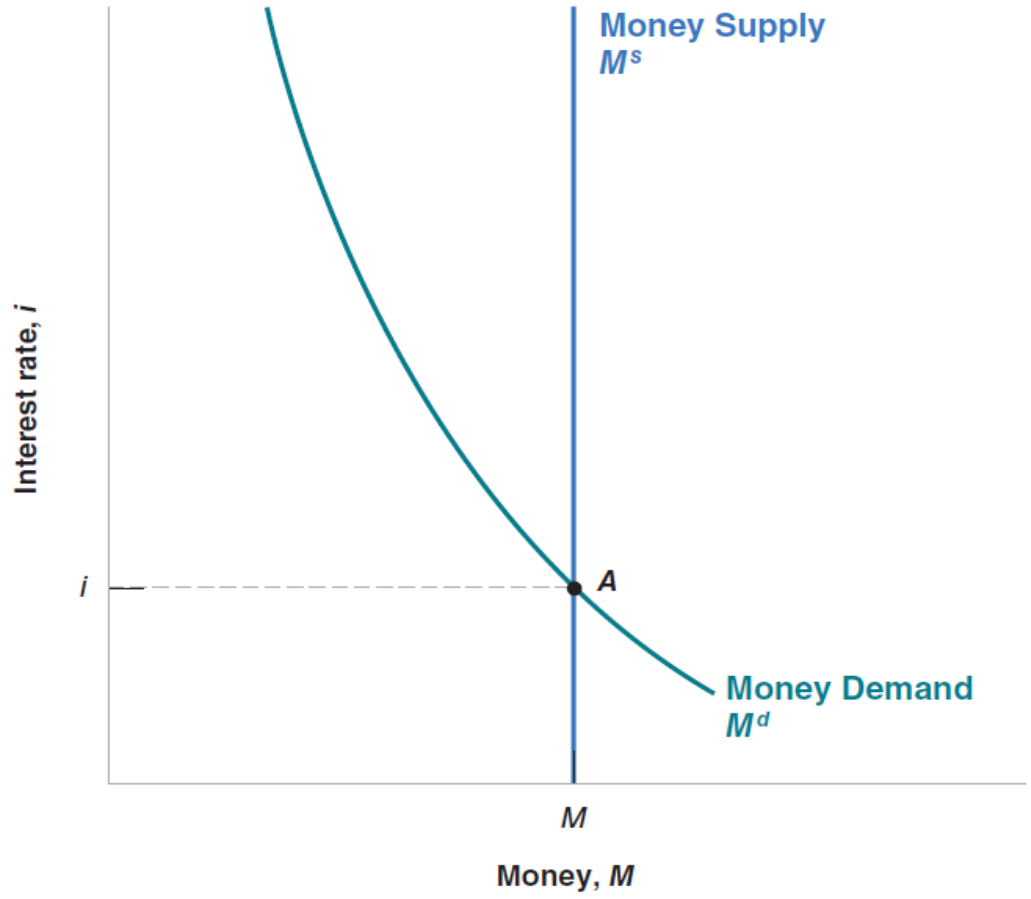
Determination of the interest rate

- In the real world, there are two types of money: demand deposits, which are supplied by banks, and currency, which is supplied by the central bank. For now, we will assume that demand deposits do not exist—that **the only money in the economy is currency.**
- Suppose the central bank decides to supply an amount of money equal to *M*, so $M^s = M$. Equilibrium in financial markets requires that money supply be equal to money demand, that $M^s = M^d$

$$\boldsymbol{M = Y.\ L(i)}$$

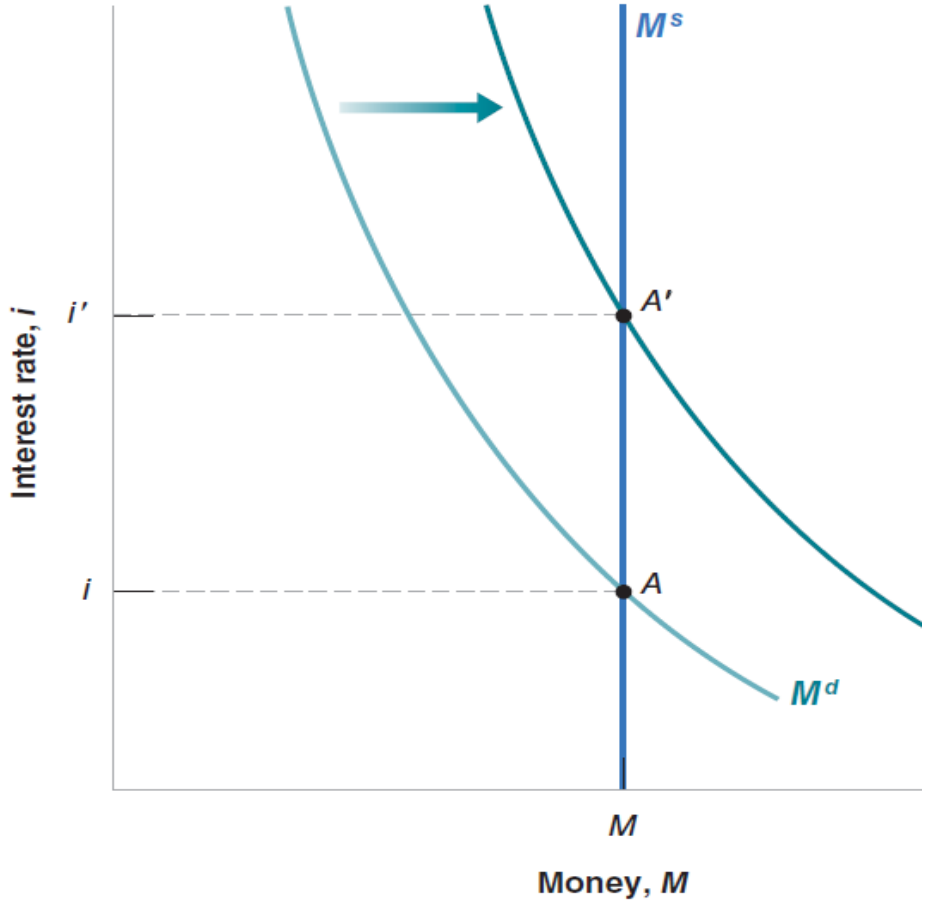
- This equation tells us that the interest rate *i* must be such that, given their income people are willing to hold an amount of money equal to the existing money supply *M*. **This equilibrium relation is called the *LM* relation.** *L* stands for liquidity: Economists use liquidity as a measure of how easily an asset can be exchanged for money. We can think of the **demand for money as a demand for liquidity**. The letter *M* stands for money. The demand for liquidity must equal the supply of money.

Equillibrium

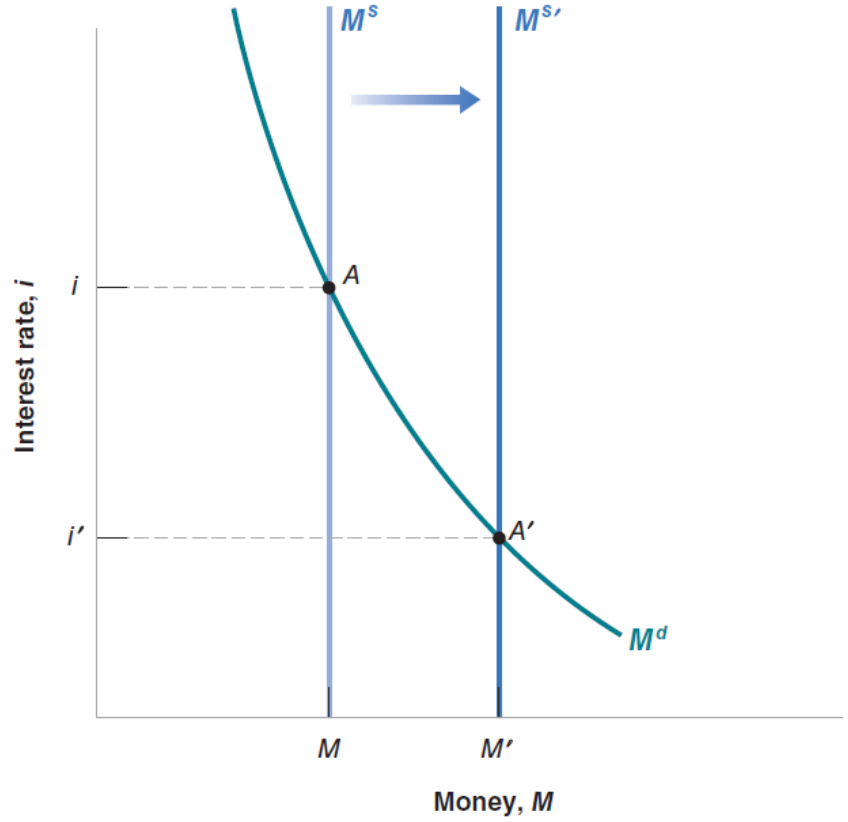


- The demand for money, M^d, drawn for a given level of nominal income is downward sloping: A higher interest rate implies a lower demand for money. The supply of money is drawn as the vertical line denoted M^s: The money supply equals M and is independent of the interest rate. The equilibrium interest rate is given by i^*.
- Now that we have characterized the equilibrium, we can look at how changes in nominal income or changes in the money supply by the central bank affect the equilibrium interest rate.
- **An increase in nominal income leads to an increase in the interest rate.** At the initial interest rate, the demand for money exceeds the supply. An increase in the interest rate is needed to decrease the amount of money people want to hold and to reestablish equilibrium.
- **An increase in the supply of money by the central bank leads to a decrease in the interest rate.** The decrease in the interest rate increases the demand for money so it equals the now larger money supply.

Effects of increase in Nominal Income on Interest Rate



Effects of increase in Money supply on interest rate



Monetary Policy and Open Market Operations

- Central banks change the supply of money by buying or selling bonds in the bond market. If a central bank wants to increase the amount of money in the economy, it buys bonds and pays for them by creating money. If it wants to decrease the amount of money in the economy, it sells bonds and removes from circulation the money it receives in exchange for the bonds. These actions are called **open market operations** because they take place in the "open market" for bonds.
- If the central bank buys, say, Rs 1 lakh worth of bonds, the amount of bonds it holds is higher by Rs 1 lakh , and so is the amount of money in the economy. Such an operation is called an **expansionary open market operation**, because the central bank increases (*expands*) the supply of money.
- If the central bank sells Rs 1 lakh worth of bonds, both the amount of bonds held by the central bank and the amount of money in the economy are lower by Rs 1 lakh. Such an operation is called a **contractionary open market operation**, because the central bank decreases (*contracts*) the supply of money.

- Bonds issued by the government promising payment in a year or less are called **treasury bills** or **T-bills**. The price of the bond today is equal to the final payment divided by 1 plus the interest rate. If the interest rate is positive, the price of the bond is less than the final payment. The higher the interest rate, the lower the price today.
- Open market operations in which the central bank increases the money supply by buying bonds lead to an increase in the price of bonds and a decrease in the interest rate. Open market operations in which the central bank decreases the money supply by selling bonds lead to a decrease in the price of bonds and an increase in the interest rate.
- We have describe the central bank as choosing the money supply and letting the interest rate be determined at the point where money supply equals money demand. Instead, we could have described the central bank as choosing the interest rate and then adjusting the money supply so as to achieve the interest rate it has chosen. **The latter is more appropriate as central banks typically choose the interest the rate and then move the money supply so as to achieve it.**

Money, Bonds and other Assets

- We have assumed that all money in the economy consisted of currency, supplied by the central bank. **In the real world, money includes not only currency but also demand deposits**. **Demand deposits are supplied not by the central bank but by other banks.**
- Modern economies are characterized by the existence of many types of **financial intermediaries**—institutions that receive funds from people and firms and use these funds to buy financial assets or to make loans to other people and firms. The assets of these institutions are the financial assets they own and the loans they have made. Their liabilities are what they owe to the people and firms from whom they have received funds.

What Banks do

- What makes banks special—and the reason we focus on banks here rather than on financial intermediaries in general—is that **their liabilities are money**: People can pay for transactions by writing cheques up to the amount of their account balance.
- Banks receive funds from people and firms who either deposit funds directly or have funds sent to their demand accounts (via direct deposit of their paycheques, for example.) At any point in time, people and firms can write cheques or withdraw up to the full amount of their account balances. **The liabilities of the banks are therefore equal to the value of these demand deposits**.
- Banks keep as **reserves** some of the funds they receive. They are held partly in cash and partly in an account the banks have at the central bank, which they can draw on when they need to.

- **Banks hold reserves for three reasons**.

➢On any given day, some depositors withdraw cash from their savings accounts while others deposit cash into their accounts. There is no reason for the inflows and outflows of cash to be equal, so the bank must keep some cash on hand.

➢In the same way, on any given day, people with accounts at the bank write cheques to people with accounts at other banks, and people with accounts at other banks write cheques to people with accounts at the bank. What the bank, as a result of these transactions, owes the other banks can be larger or smaller than what the other banks owe to it. For this reason also, the bank needs to keep reserves.

➢In addition, banks are subject to reserve requirements, which require them to hold reserves in some proportion of their demand deposits. In India, **reserve requirements are set by the RBI (CRR).**

- The distinction between bonds and loans is unimportant at present—which is to understand how the money supply is determined.
- For this reason, to keep the discussion simple, we will assume that banks do not make loans, that they hold only reserves and bonds as assets.

Supply and Demand for Central Bank Money

- The assets of the central bank are the bonds it holds. The liabilities of the central bank are the money it has issued, **central bank money**. The new feature is that not all of central bank money is held as currency by the public. Some of it is held as reserves by banks.
- The easiest way to think about how the interest rate in this economy is determined is by thinking in terms of the supply and the demand for *central bank money.*
- **The demand for money by people is for both demand deposits and currency**. Because banks have to hold reserves against demand deposits, demand deposits leads to a demand for reserves by banks. Consequently, **the demand for central bank money is equal to the demand for reserves by banks plus the demand for currency.**
- The supply of central bank money is determined by the central bank. **The interest rate must be such that the demand and the supply of central bank money are equal.**

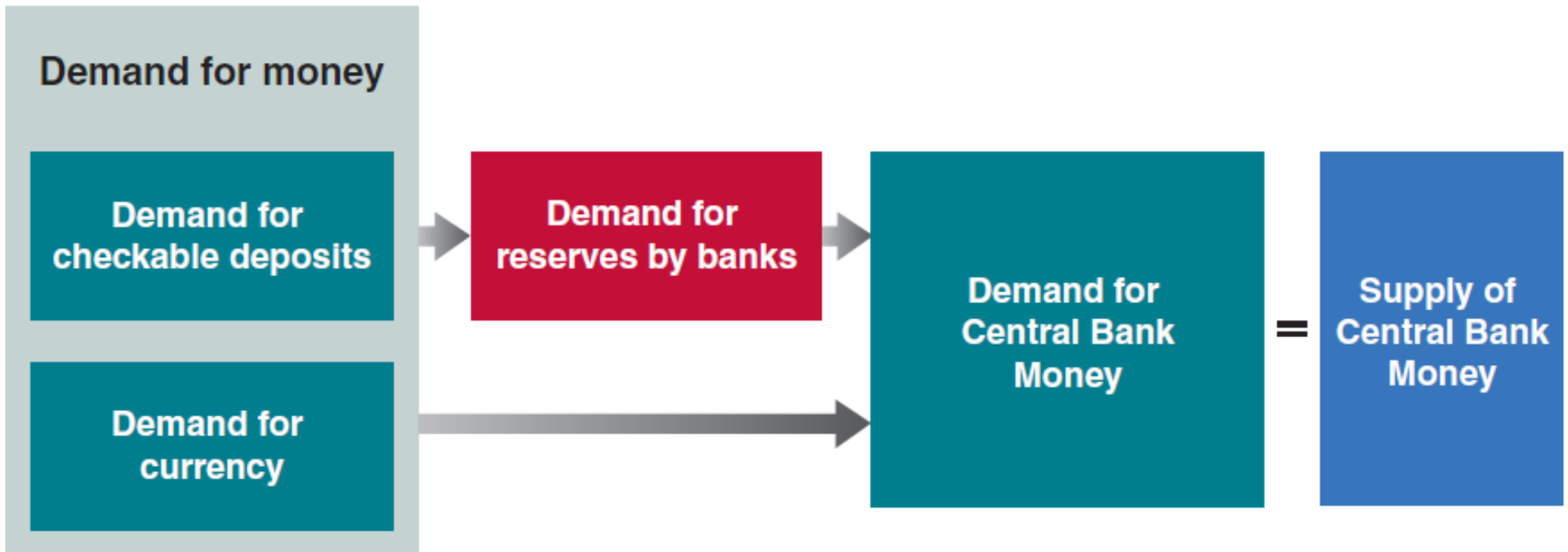
Balance sheet of central bank and banks

(a) **Central Bank**

Assets	Liabilities
Bonds	Central Bank Money = Reserves + Currency

(b) **Banks**

Assets	Liabilities
Reserves Loans Bonds	Checkable deposits


Demand for money
Demand for checkable deposits
Demand for currency
Demand for reserves by banks
Demand for Central Bank Money
=
Supply of Central Bank Money

The Demand for Money

- When people can hold both currency and demand deposits, the demand for money involves ***two*** **decisions**. First, people must decide how much money to hold. Second, they must decide how much of this money to hold in currency and how much to hold in demand deposits.
- It is reasonable to assume that the overall demand for money (currency plus demand deposits) is given by the same factors as before. People will hold more money the higher the level of transactions and the lower the interest rate on bonds.

$$M^d = Y.\ L(i)$$

(-)

- How do people decide how much to hold in currency, and how much in demand deposits? Currency is more convenient for small transactions (it is also more convenient for illegal transactions.) Cheques are more convenient for large transactions. Holding money in your saving account is safer than holding cash.
- Let's assume people hold a fixed proportion of their money in currency *c* and, by implication, hold a fixed proportion (1 – *c*) in demand deposits. We can then write

$$\mathbf{CU^d \text{ (demand for currency)} = c.M^d}$$

$$\mathbf{D^d \text{ (demand for demand deposits)} = (1 - c)\, M^d}$$

Demand for Reserves

- The demand for demand deposits leads to a demand by banks for reserves, the second component of the demand for central bank money. To see how, let's turn to the behaviour of banks.
- The larger the amount of demand deposits, the larger the amount of reserves the banks must hold, both for precautionary and for regulatory reasons. Let θ (the Greek lowercase letter theta) be the reserve ratio, the amount of reserves banks hold per rupee of demand deposits.
- Let *R* denote the reserves of banks. Let D^d denote the rupee amount of demand deposits. Then, by the definition of θ, the following relation holds between *R* and *D*:

$$R = \theta D^d$$

- If people want to hold D^d in deposits, then, banks must hold θD^d in reserves. Now R, the demand for reserves, can be written as

$$\mathbf{R^d = \theta (1\text{-}c) M^d}$$

Demand for Central Bank Money

- The demand for central bank money (H^d) is equal to the **sum of the demand for currency and the demand for reserves.**

$$H^d = CU^d + R^d$$

$$H^d = c.M^d + \theta\ (1\text{-}c)\ M^d$$

$$= [c + \theta\ (1 - c)]\ M^d$$

- We know that M^d =Y. L(i). Therefore the above expression can be written as

$$\mathbf{H^d = [c + \theta\ (1 - c)]Y.\ L(i)}$$

Determination of the interest rate

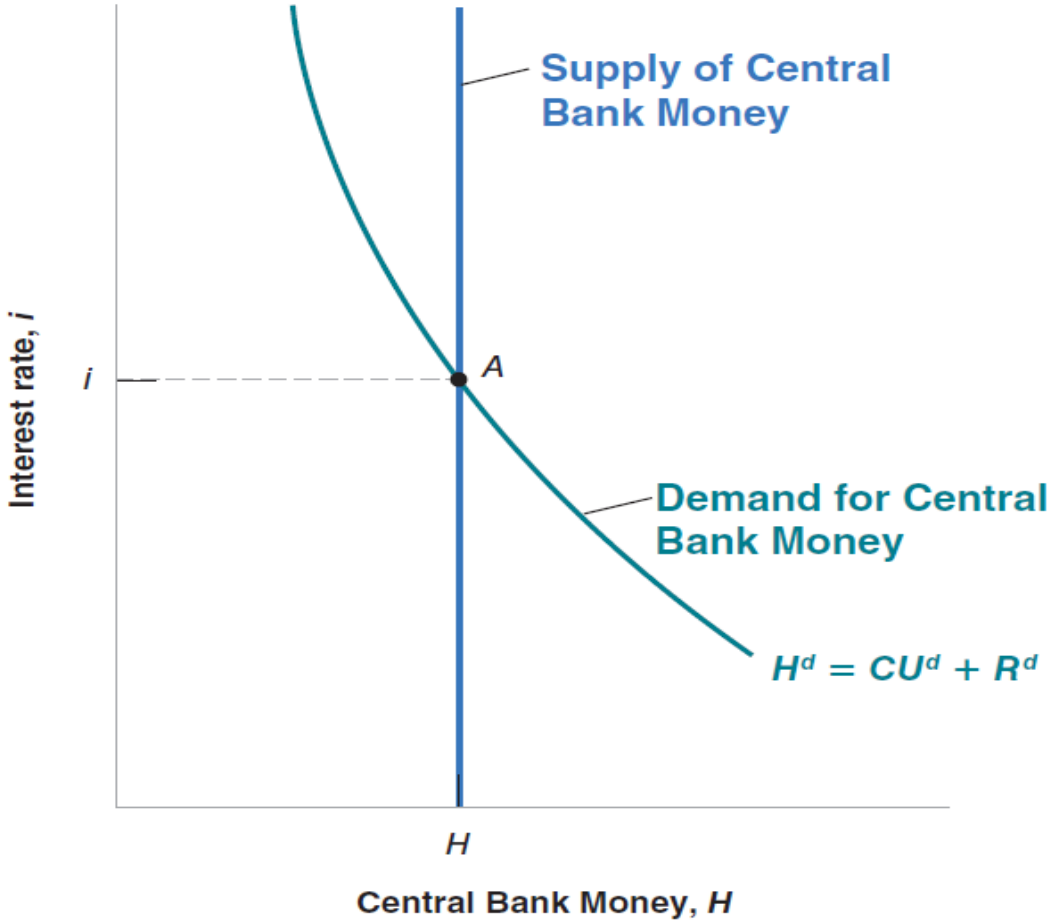
- We are now ready to characterize the equilibrium. Let *H* be the supply of central bank money; ***H* is directly controlled by the central bank. the central bank can change the amount of *H* through open market operations**. The equilibrium condition is that the supply of central bank money be equal to the demand for central bank money.

$$H = [c + \theta (1 - c)]Y. L(i)$$

- Suppose that people held only currency, so $c = 1$. Then, the term in brackets would be equal to 1. In this case, people would hold only currency, and banks would play no role in the supply of money.
- Assume instead that people did not hold currency at all, but held only demand deposits, so $c = 0$. Then, the term in brackets would be equal to θ. Suppose, for example, that $\theta = 0.1$, so that the term in brackets was equal to 0.1. Then the demand for central bank money would be equal to one-tenth of the overall demand for money. **People would hold only demand deposits**. For every rupee they wanted to hold, banks would need to have 10 paisa in reserves. In other words, the demand for reserves would be one-tenth of the overall demand for money.

- Leaving aside these two extreme cases, note that, as long as people hold some demand deposits (so that c <1), the term in brackets is less than 1: This means the demand for central bank money is less than the overall demand for money. This is due to the fact that the demand for reserves by banks is only a fraction of the demand for demand deposits.
- In the following figure, central bank money (rather than money) is shown on the horizontal axis. The interest rate is measured on the vertical axis. The demand for central bank money, $CU^d + R^d$, is drawn for a given level of nominal income.
- **A higher interest rate implies a lower demand for central bank money for two reasons: (1) The demand for currency by people goes down; (2) the demand for demand deposits by people also goes down**. This leads to lower demand for reserves by banks. The supply of money is fixed and is represented by a vertical line at H. Equilibrium is at point A, with interest rate i.

Equillibrium in the market for Central bank money



The Money Multiplier

- We have seen how we can think of the equilibrium in terms of the equality of the supply and demand of central bank money.
- To derive an equilibrium condition in terms of the overall supply and the overall demand for money, start with the equilibrium condition (which states that the supply of central bank money must equal the demand for central bank money) and divide both sides by $[c + \theta (1 - c)]$, we get

$$\frac{1^* \quad H}{[c + \theta (1 - c)]} = Y.\ L(i)$$

- **The above equation just says that overall supply of money (currency plus demand deposits) is equal to overall demand for money (currency plus demand deposits)**

- In the equation characterizing the equilibrium in an economy without banks, you will see that the only difference is that the overall supply of money is not equal just to central bank money but to central bank money times a constant term $1/ [c + \theta (1 - c)]$
- Notice also that, because $[c + \theta (1 - c)]$ is less than one, its inverse—the constant term on the left of the equation—is greater than one. For this reason, this constant term is called the **money multiplier**. The overall supply of money is therefore equal to central bank money times the money multiplier. If the money multiplier is 4, for example, then the overall supply of money is equal to 4 times the supply of central bank money.
- To reflect the fact that the overall supply of money depends in the end on the amount of central bank money, central bank money is sometimes called **high powered money** (this is where the letter *H* we used to denote central bank money comes from), or the **monetary base**. The term *high-powered* reflects the fact that increases in *H* lead to more than one-for-one increases in the overall money supply and are therefore "high-powered." In the same way, the term *monetary base* reflects the fact that the overall money supply depends ultimately on a "base"—the amount of central bank money in the economy.

Understanding the money multiplier

- The presence of a multiplier implies that a given change in central bank money has a larger effect on the money supply—and in turn a larger effect on the interest rate—in an economy with banks than in an economy without banks. To understand why, it is useful to return to the description of **open market operations**, this time in an economy with banks.
- To make the arithmetic easier, let's consider a special case where people hold only demand deposits, so $c = 0$. In this case, the multiplier is $1/\theta$. In other words, an increase of a rupee of high powered money leads to an increase of $1/\theta$ rupees in the money supply. Assume further that $\theta = 0.1$, so that the multiplier equals $1/\theta = 10$.

- Suppose the central bank buys Rs 100 worth of bonds in an open market operation. It pays the Seller 1 Rs 100. To pay the seller, the central bank creates Rs 100 in central bank money. The increase in central bank money is Rs 100. When we looked earlier at the effects of an open market operation in an economy in which there were no banks, the money supply ends here. However, here its just the beginning.
- Seller 1 (who, we have assumed, does not want to hold any currency) deposits the Rs 100 in a deposit account at his bank—bank A. This leads to an increase in demand deposits of Rs 100.
- Bank A keeps Rs 100 times 0.1 = Rs 10 in reserves and buys bonds with the rest, Rs 100 times 0.9 = Rs 90. It pays Rs 90 to the seller of those bonds—seller 2.
- Seller 2 deposits Rs 90 in a deposit account in her bank—call it bank B. This leads to an increase in demand deposits of Rs 90.
- Bank B keeps Rs 90 times 0.1 = Rs 9 in reserves and buys bonds with the rest, Rs 90 times 0.9 = Rs 81. It pays Rs 81 to the seller of those bonds- seller 3.

- The eventual increase in money supply is equal to 1/(1 - 0.9) = 10. The money supply increases by Rs 1,000—10 times the initial increase in central bank money.
- We can think of the ultimate increase in the money supply as the result of ***successive rounds of purchases of bonds—***the first started by the central bank in its open market operation, the following rounds by banks. Each successive round leads to an increase in the money supply, and eventually the increase in the money supply is equal to 10 times the initial increase in the central bank money.

The IS-LM model

Introduction

- **IS-LM model** is a two-dimensional macroeconomic tool that **shows the relationship between interest rates and assets markets** (real output in goods market plus money market).
- The intersection of the "investment–saving" (IS) and "liquidity preference–money supply" (LM) curves models "general equilibrium" where supposed simultaneous equilibria occur in both the goods and the asset markets. Yet two equivalent interpretations are possible: first, the **IS–LM model explains changes in national income when the price level is fixed in the short-run**; second, **the IS–LM model shows why an aggregate demand curve can shift**. Hence, this tool is sometimes used not only to analyze economic fluctuations but also to suggest potential levels for appropriate stabilization policies.
- **The model was developed by John Hicks in 1937** and was later extended by Alvin Hansen, as a **mathematical representation of Keynesian macroeconomic theory**. Between the 1940s and mid-1970s, it was the leading framework of macroeconomic analysis.

Goods Market and the IS relation

- We characterized equilibrium in the goods market as the condition that production, *Y*, be equal to the demand for goods, *Z*. We called this condition the *IS* relation.
- We defined demand as the sum of consumption, investment, and government spending. We assumed that consumption was a function of disposable income (income minus taxes), and took investment spending, government spending, and taxes as given:

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

- The equilibrium condition was thus given by

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

- Using this equilibrium condition, we then looked at the factors that moved equilibrium output. We looked in particular at the effects of changes in government spending and of shifts in consumption demand.

- The **main simplification of this first model was that the interest rate did not affect the demand for goods**. Our first task is to abandon this simplification and introduce the interest rate in our model of equilibrium in the goods market. For now, we focus only on the effect of the interest rate on investment and leave the discussion of its effects on the other components of demand.

Investment and interest rate

- Investment is in fact far from constant and depends primarily on two factors: **the level of sales and the interest rate**. Consider a firm facing an increase in sales and needing to increase production. To do so, it may need to buy additional machines or build an additional plant. In other words, it needs to invest.
- Consider a firm deciding whether or not to buy a new machine. Suppose that to buy the new machine, the firm must borrow. **The higher the interest rate, the less attractive it is to borrow** and buy the machine.
- We assume two simplifications, that there is only a single interest rate. Also the distinction between nominal and real interest rate is left aside.
- Our first task is to abandon the simplification that interest rate do not affect the demand for goods and introduce the interest rate in our model of equilibrium in the goods market. To capture these two effects, we write the investment relation as follows

$$I = I(Y, i)$$
$$(+)\ (-)$$

Determining Output

- Taking into account the investment relation, the condition for equillibrium becomes

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

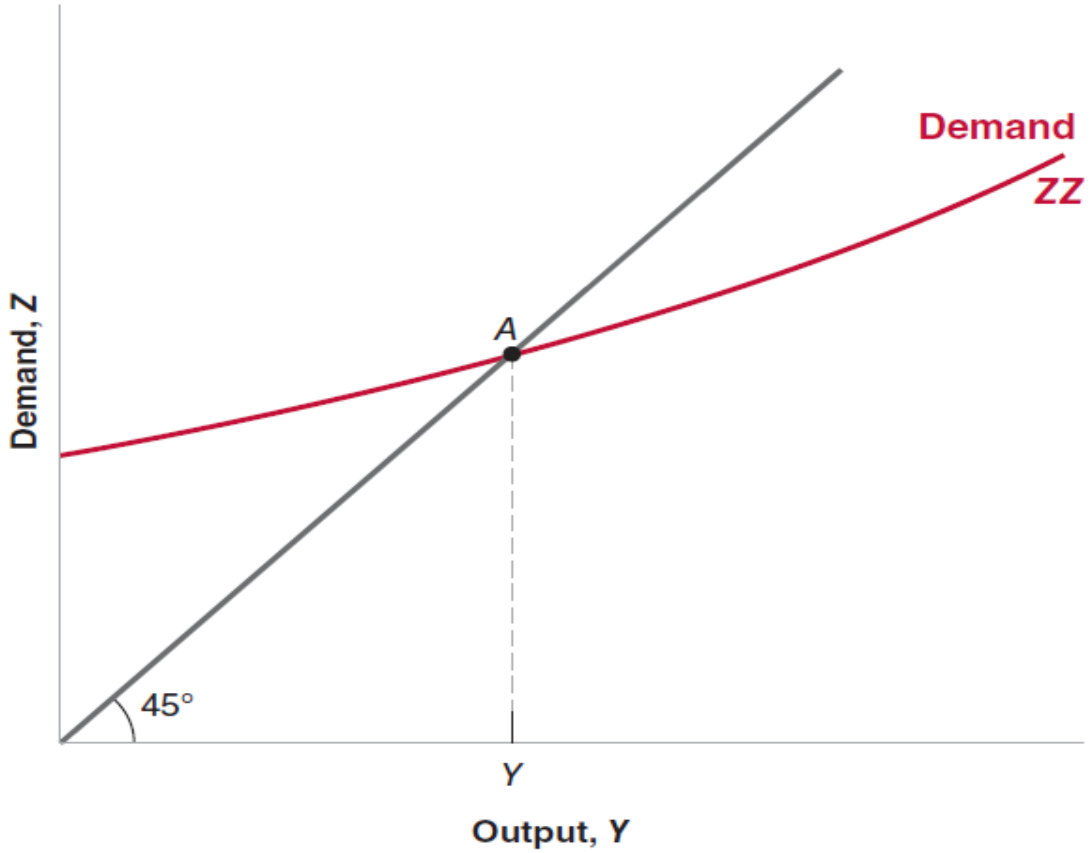
- The above equation is our expanded *IS relation*. We can now look at what happens to output when the interest rate changes.
- For a given value of the interest rate *i*, **demand is an increasing function of output, for two reasons**:

➢ An increase in output leads to an increase in income and thus to an increase in disposable income. The increase in disposable income leads to an increase in consumption.

➢ An increase in output also leads to an increase in investment.

- In short, an increase in output leads, through its effects on both consumption and investment, to an increase in the demand for goods. This relation between demand and output, for a given interest rate, is represented by the upward-sloping curve *ZZ*. Since we have not assumed that the consumption and investment relations are linear, ***ZZ* is in general a curve rather than a line**.

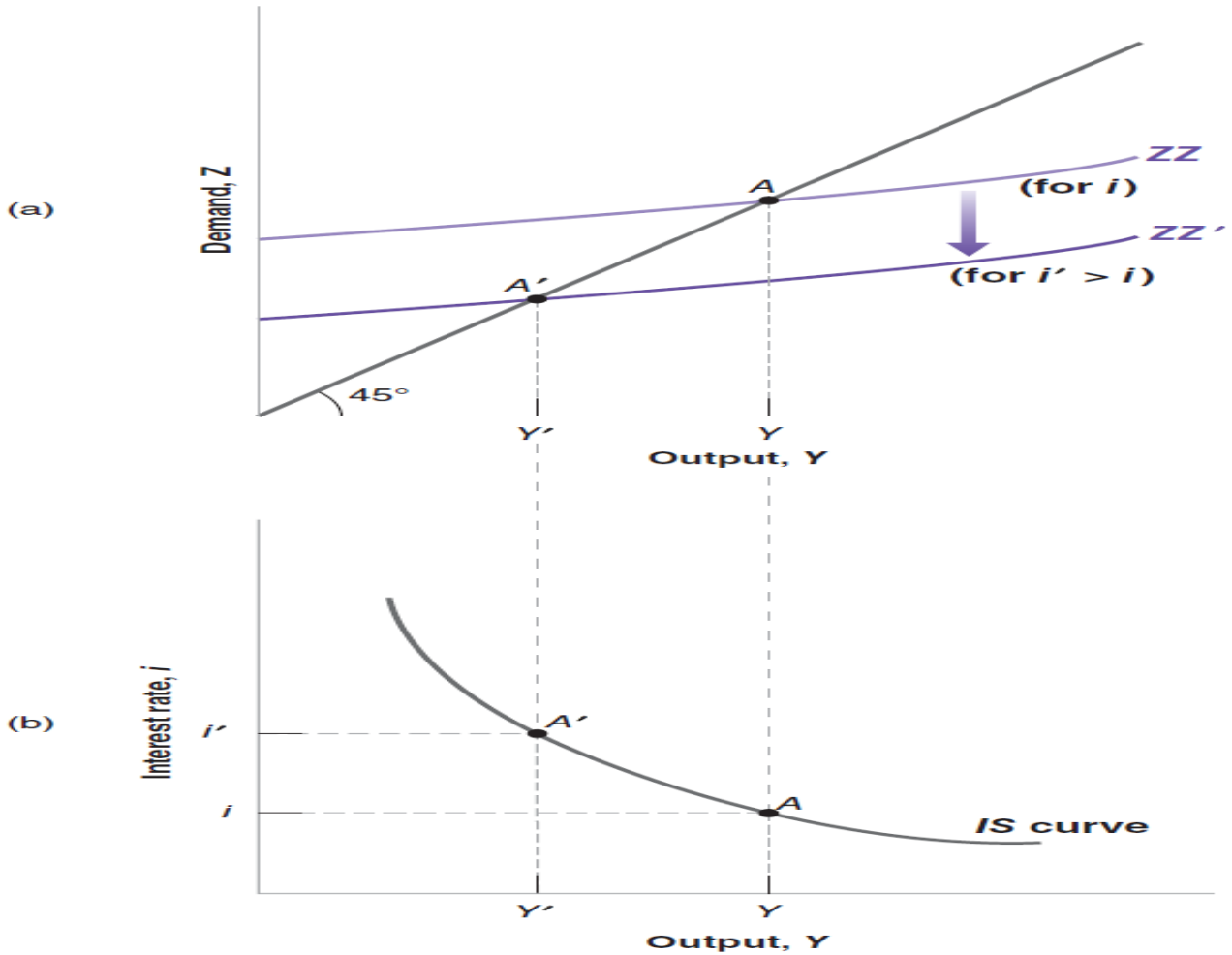
Equillibrium in the Goods Market



- We have drawn *ZZ* so that it is flatter than the 45-degree line. Put another way, we have assumed that **an increase in output leads to a less than one-for-one increase in demand.**
- Where investment was constant, this restriction naturally followed from the assumption that consumers spend only part of their additional income on consumption. But now that we allow investment to respond to production, this restriction may no longer hold. **When output increases, the sum of the increase in consumption and the increase in investment could exceed the initial increase in output**.
- Although this is a theoretical possibility, the empirical evidence suggests that it is not the case in reality. That's why we will assume the response of demand to output is less than one-for-one and draw *ZZ* flatter than the 45-degree line.

Deriving the IS curve

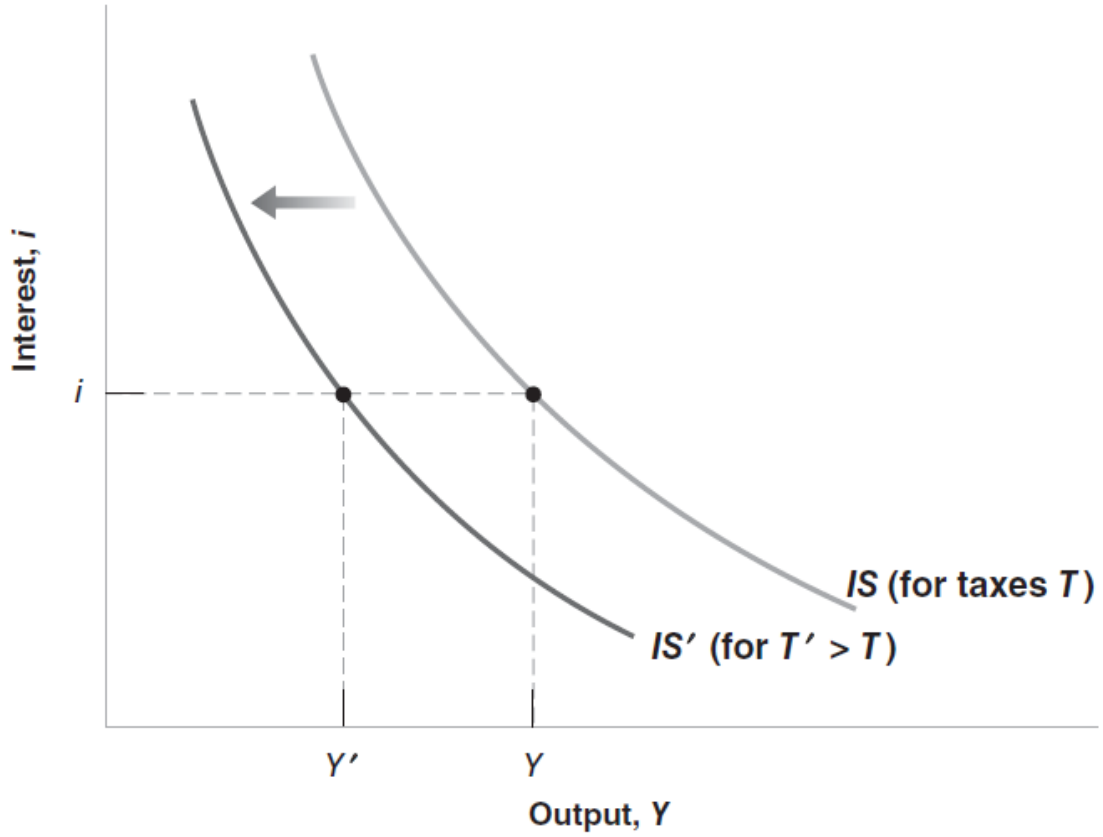
- **We have drawn the demand relation, *ZZ*, for a given value of the interest rate**. Let's now see what happens if the interest rate changes.
- Suppose that, the demand curve is given by *ZZ*, and the initial equilibrium is at point *A*. Suppose now that the interest rate increases from its initial value *i* to a new higher value *i'*. At any level of output, the higher interest rate leads to lower investment and lower demand.
- The demand curve *ZZ* shifts down to *ZZ*': At a given level of output, demand is lower. The new equilibrium is at the intersection of the lower demand curve *ZZ* and the 45-degree line, at point *A*. The equilibrium level of output is now equal to *Y'.*
- The increase in the interest rate decreases investment. **The decrease in investment leads to a decrease in output, which further decreases consumption and investment, through the multiplier effect.**
- We can find the equilibrium value of output associated with *any* value of the interest rate from the following figure. **The resulting relation between equilibrium output and the interest rate is represented by the downward sloping IS curve.**


(a)
Demand, Z
ZZ
(for i)
ZZ′
(for i′ > i)
A
A′
45°
Y′
Y
Output, Y
(b)
Interest rate, i
i′
i
A′
A
IS curve
Y′
Y
Output, Y

Shifts of the IS curve

- We have drawn the *IS* curve taking as given the values of taxes, *T*, and government spending, *G*. Changes in either *T* or *G* will shift the *IS* curve.
- Consider an increase in taxes, from *T* to *T'*. At a given interest rate, say *i*, disposable income decreases, leading to a decrease in consumption, leading in turn to a decrease in the demand for goods and a decrease in equilibrium output. The equilibrium level of output decreases from *Y* to *Y'*. Put another way, the *IS* curve shifts to the left.
- More generally, **any factor that, for a given interest rate, decreases the equilibrium level of output causes the *IS* curve to shift to the left**. We have looked at an increase in taxes. But the same would hold for a decrease in government spending, or a decrease in consumer confidence (which decreases consumption given disposable income).
- Symmetrically, any factor that, for a given interest rate, increases the equilibrium level of output—a decrease in taxes, an increase in government spending, an increase in consumer confidence—causes the *IS* curve to shift to the right.

IS curve shift left due to increase in taxes



Financial Markets and the LM relation

- We saw that the interest rate is determined by the equality of the supply of and the demand for money.

$$M = Y.\ L(i)$$

- The variable *M* on the left side is the nominal money stock. We will ignore the details of the money-supply process **and simply think of the central bank as controlling *M* directly**. The right side gives the demand for money, which is a function of nominal income, *Y*, and of the nominal interest rate, *i*.
- The equation $M = Y\ L(i)$ gives a relation among money, nominal income, and the interest rate. It will be more convenient here to rewrite it as a relation among real money (that is, money in terms of goods), real income (that is, income in terms of goods), and the interest rate.

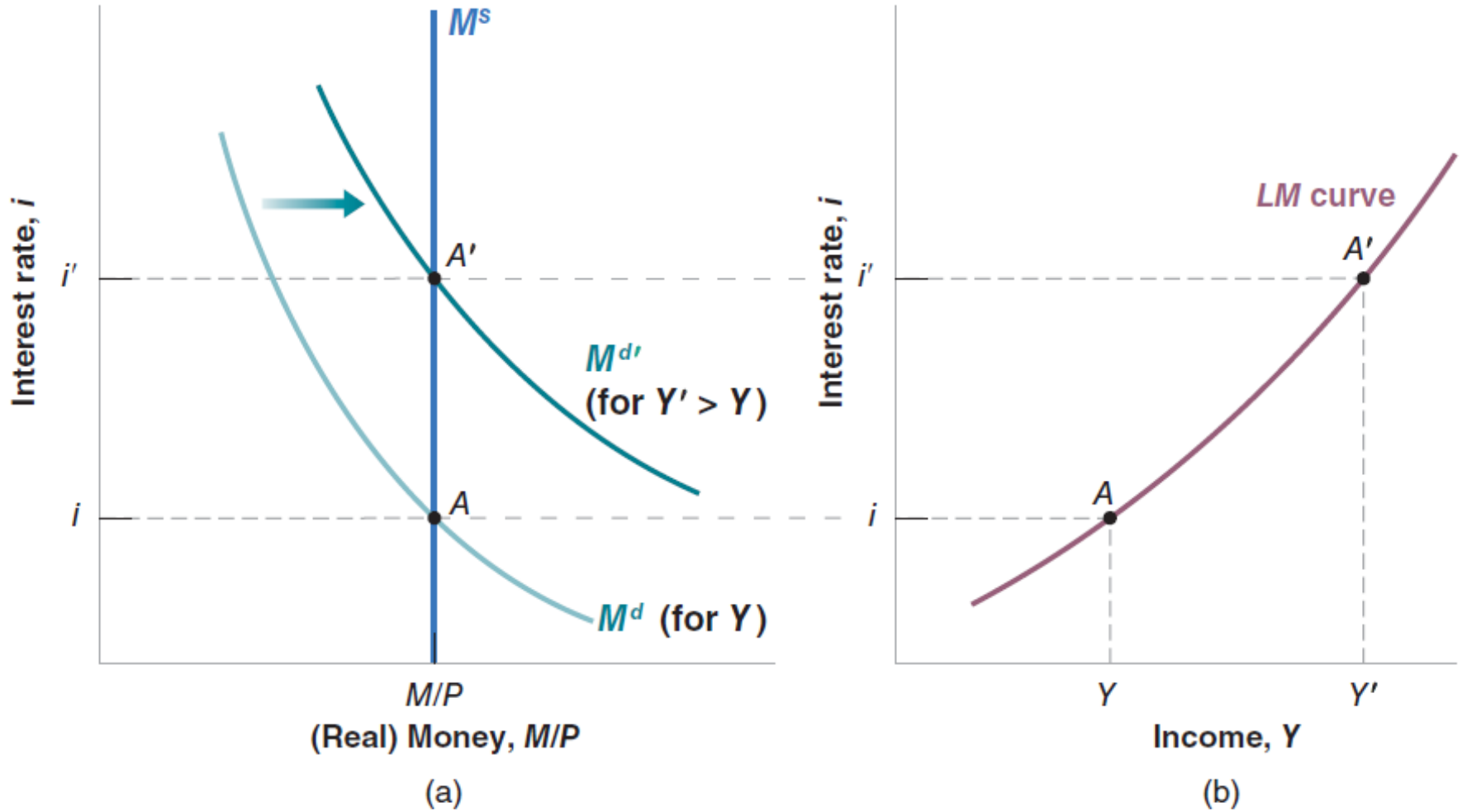
- Nominal income divided by the price level equals real income, *Y*. Dividing both sides of the equation by the price level *P* gives

$$\boldsymbol{M/P = Y\,L(i)}$$

- Hence, we can restate our equilibrium condition as the condition that the *real money supply*—that is, the money stock in terms of goods, not rupees—be equal to the *real money demand*, which depends on real income, *Y*, and the interest rate, *i*.
- The above equation is the *LM relation*. The advantage of writing things this way is that *real income*, *Y*, appears on the right side of the equation instead of *nominal income*, *Y*. And real income (equivalently real output) is the variable we focus on when looking at equilibrium in the goods market.

Deriving the LM curve

- (Real) money supply is given by the vertical line at M/P and is denoted M^s. For a given level of (real) income Y, (real) money demand is a decreasing function of the interest rate. It is drawn as the downward-sloping curve denoted M^d.
- The equilibrium is at point A, where money supply is equal to money demand, and the interest rate is equal to i.
- Consider an increase in income from Y to Y', which leads people to increase their demand for money at any given interest rate. Money demand shifts to the right, to M^d. The new equilibrium is at A', with a higher interest rate, i'. When income increases, money demand increases; but the money supply is given. Thus, the interest rate must go up to re-establish equillibrium.
- We can find the value of the interest rate associated with *any* value of income for a given money stock.
- More generally, equilibrium in financial markets implies that the higher the level of output, the higher the demand for money, and therefore the higher the equilibrium interest rate. This relation between output and the interest rate is therefore represented by the upward sloping curve ***LM* curve**.

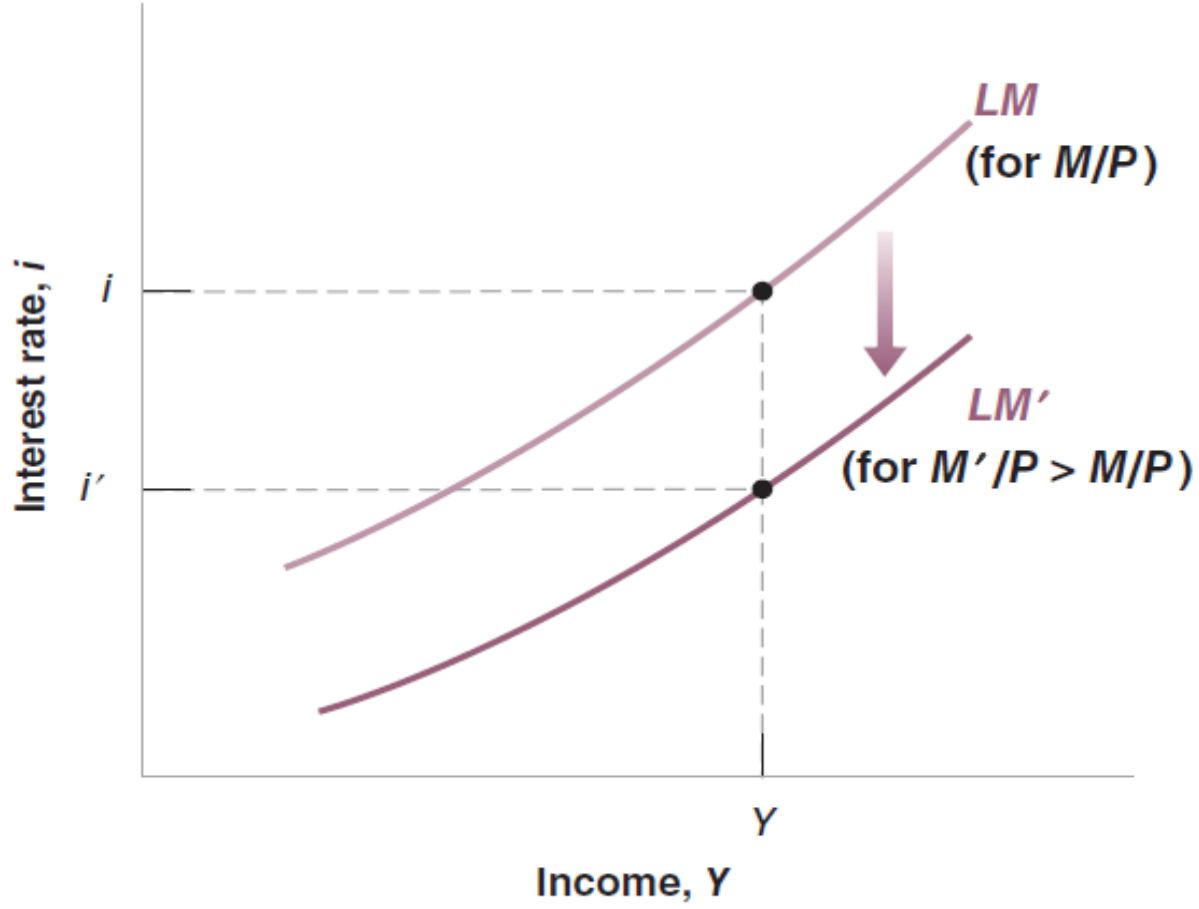

M^s
A′
i'
$M^{d'}$
(for $Y' > Y$)
A
i
M^d (for Y)
Interest rate, i
M/P
(Real) Money, M/P
(a)
LM curve
A′
i'
A
i
Interest rate, i
Y
Y'
Income, Y
(b)

Shifts of the LM curve

- We have derived the *LM* curve, taking both the nominal money stock, *M*, and the price level, *P*—and, by implication, their ratio, the real money stock, *M*/*P*—as given. Changes in *M*/*P*, whether they come from changes in the nominal money stock, *M*, or from changes in the price level, *P*, will shift the *LM* curve.

- Consider an increase in the nominal money supply, from *M* to *M'*. Given the fixed price level, the real money supply increases from *M*/*P* to *M'*/*P*. Then, at any level of income, say *Y*, the interest rate consistent with equilibrium in financial markets is lower, going down from *i* to, say, *i'*. The *LM* curve shifts down, from *LM* to *LM'.*

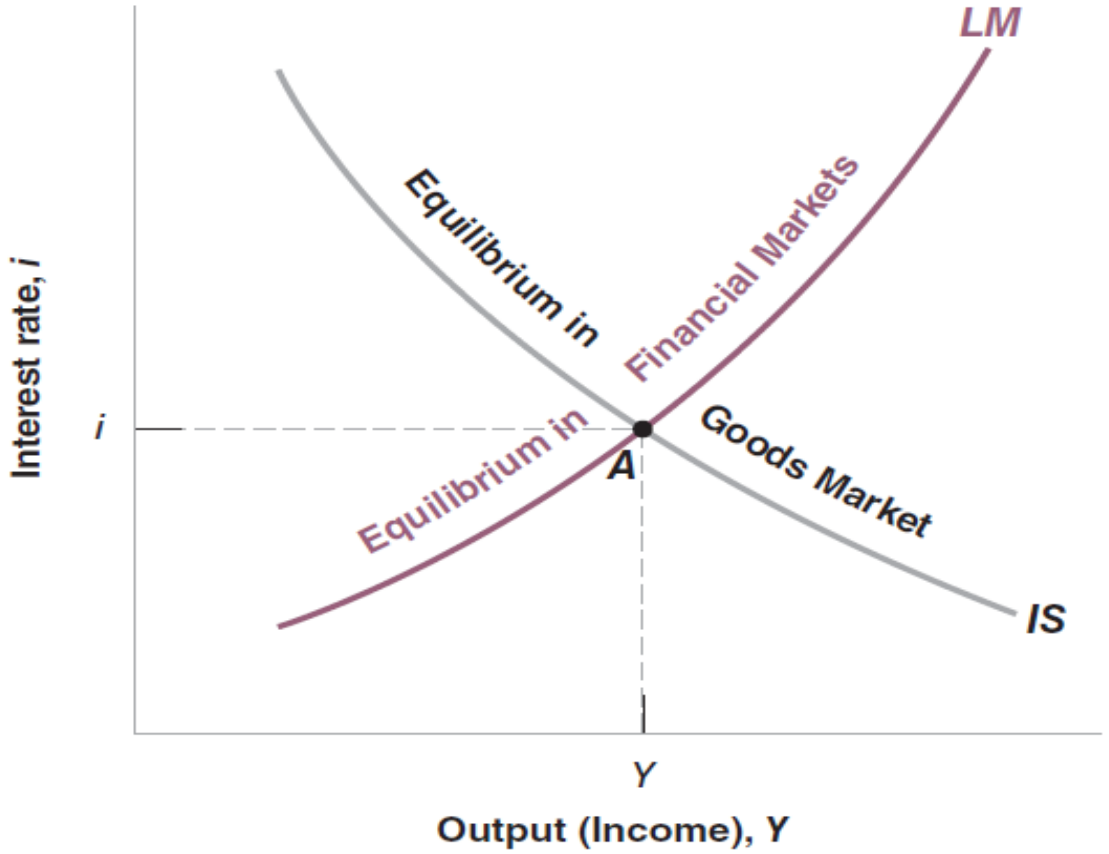
LM shifts due to increase in money supply



Putting IS and LM relations together

- The *IS* relation follows from the condition that the supply of goods must be equal to the demand for goods. It tells us how the interest rate affects output. The *LM* relation follows from the condition that the supply of money must be equal to the demand for money. It tells us how output in turn affects the interest rate. We now put the *IS* and *LM* relations together.
- *Any point* on the downward-sloping *IS* curve corresponds to equilibrium in the goods market. *Any point* on the upward-sloping *LM* curve corresponds to equilibrium in financial markets. *Only at point A* are both equilibrium conditions satisfied. That means **point *A*, with the associated level of output *Y* and interest rate *i*, is the overall equilibrium—the point at which there is equilibrium in both the goods market and the financial markets**.

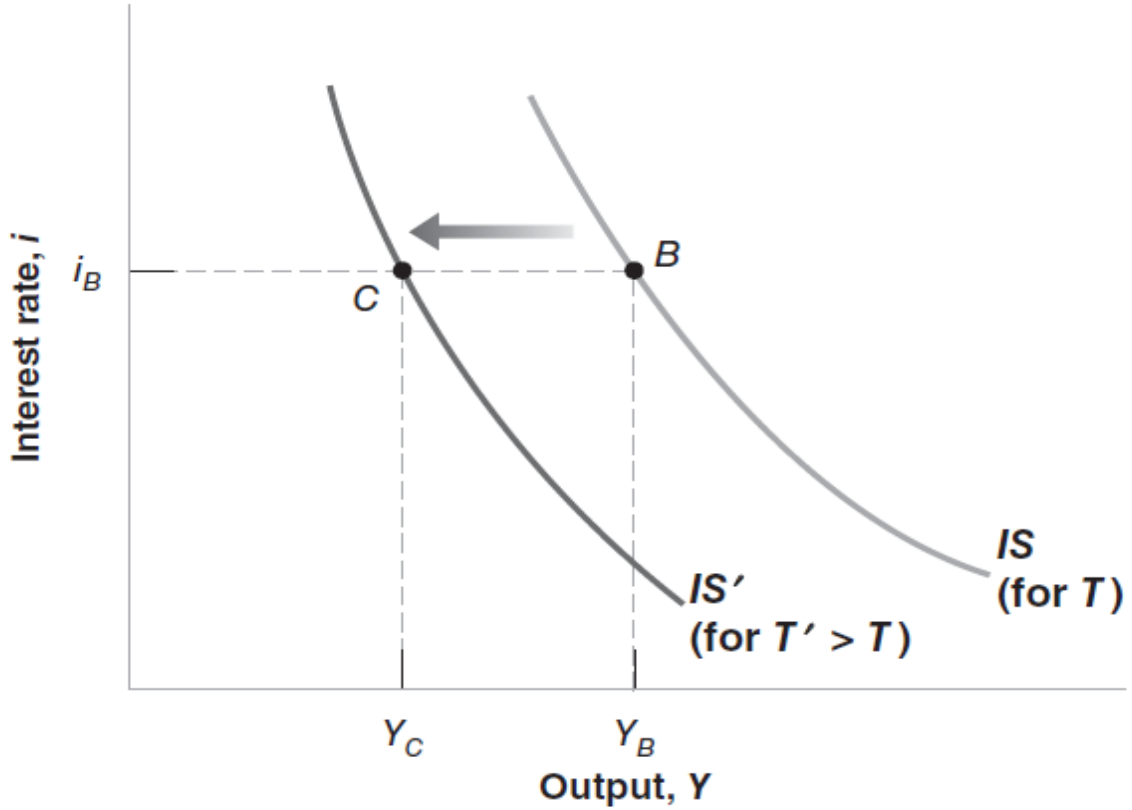
The IS-LM model



Fiscal Policy, Activity and the Interest Rate

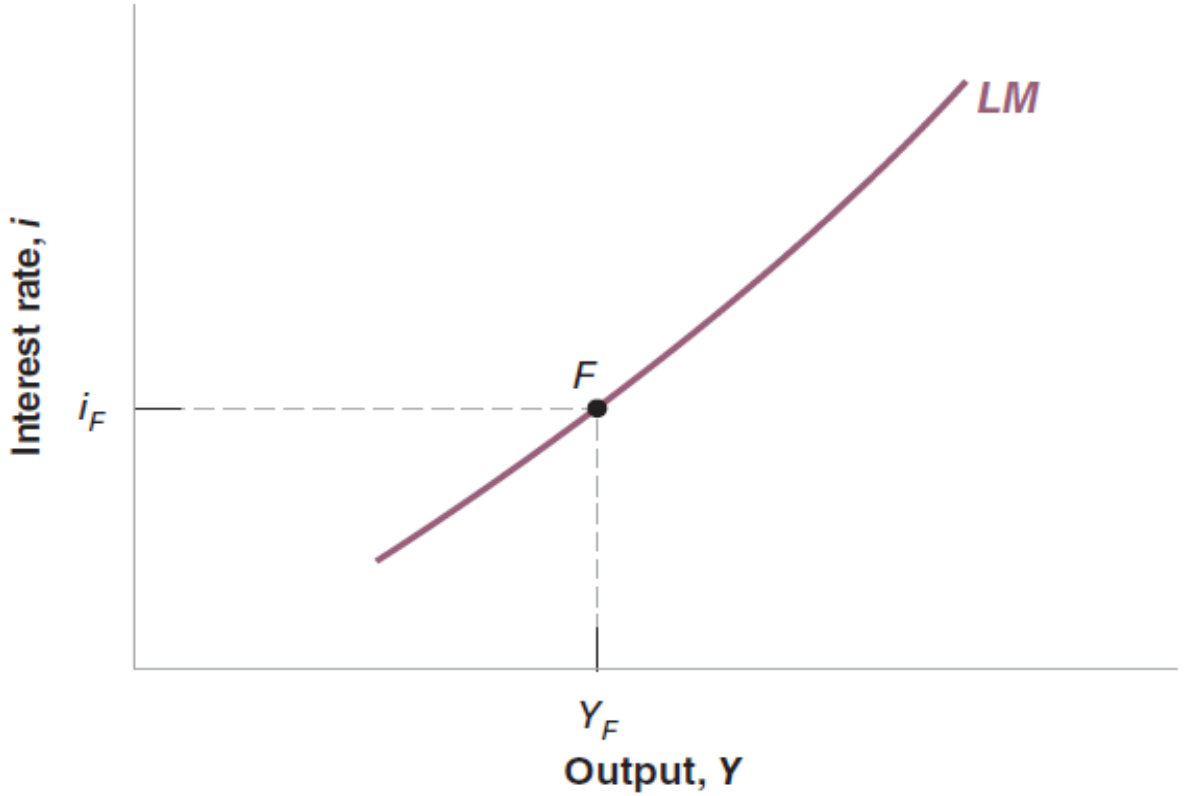
- Suppose the government decides to reduce the budget deficit and does so by increasing taxes while keeping government spending unchanged. Such a change in fiscal policy is often called a **fiscal contraction** or a **fiscal consolidation**. (An *increase* in the deficit, either due to an increase in government spending or to a decrease in taxes, is called a **fiscal expansion**.)
- At the interest rate i_B, ask what happens to output if taxes increase from T to T'. Because people have less disposable income, the increase in taxes decreases consumption, and through the multiplier, decreases output. At interest rate i_B output decreases from Y_B to Y_C.
- More generally, at *any* interest rate, higher taxes lead to lower output. Consequently, the *IS* curve shifts to the left, from *IS* to *IS'*.

Effects of an increase in Taxes

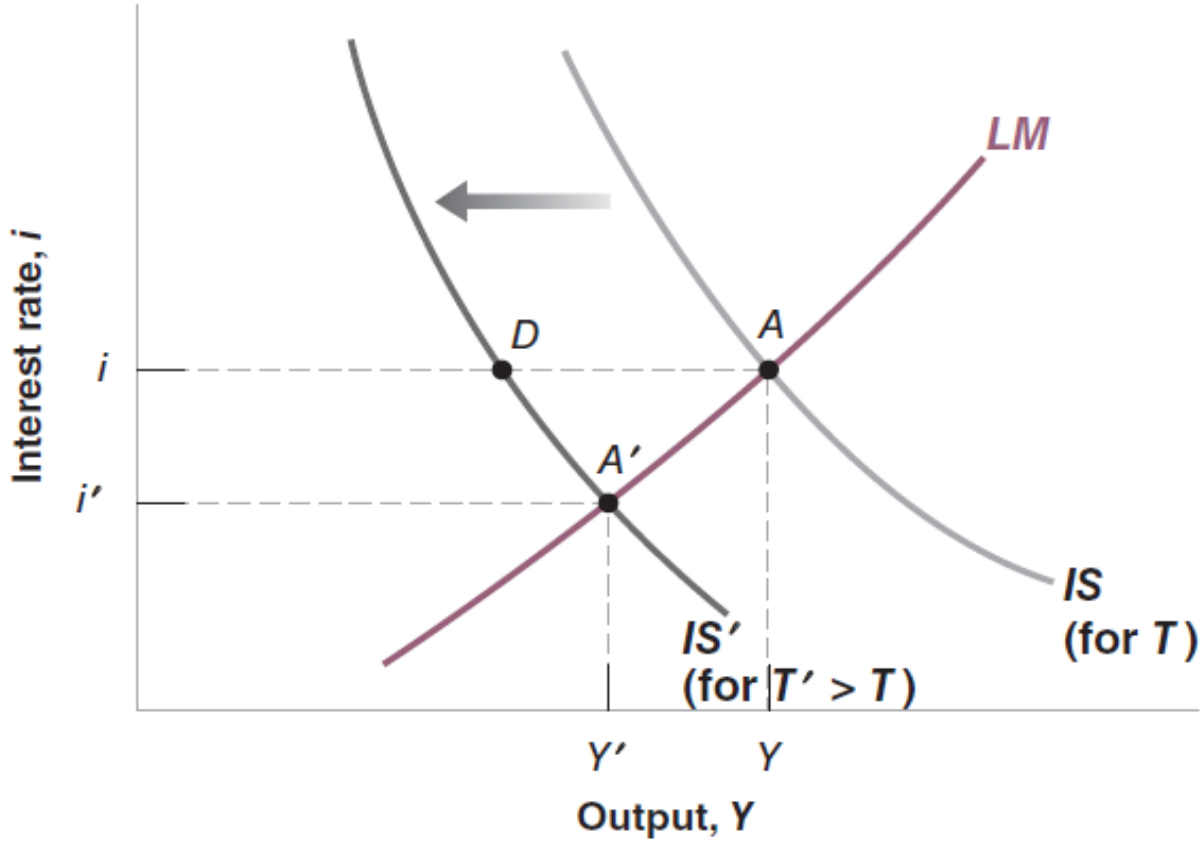


- What happens to the *LM* curve when taxes are increased? At the given level of income Y_F the interest rate at which the supply of money is equal to the demand for money is the same as before, namely i_F. In other words, because taxes do not appear in the *LM* relation, they do not affect the equilibrium condition. **They do not affect the *LM* curve.**
- Note the general principle here: **A curve shifts in response to a change in an exogenous variable only if this variable appears directly in the equation represented by that curve**.

LM does not shift



New equillibrium



- After the increase in taxes, the *IS* curve shifts to the left—from *IS* to *IS'*. The new equilibrium is at the intersection of the new *IS* curve and the unchanged *LM* curve, or point *A*. Output decreases from *Y* to *Y'*. The interest rate decreases from *i* to *i'*. **Thus, as the *IS* curve *shifts*, the economy *moves along* the *LM* curve, from *A* to *A'*.**
- The increase in taxes leads to lower disposable income, which causes people to decrease their consumption. This decrease in demand leads, in turn, to a decrease in output and income. At the same time, the decrease in income reduces the demand for money, leading to a decrease in the interest rate. **The decline in the interest rate reduces but does not completely offset the effect of higher taxes on the demand for goods.**

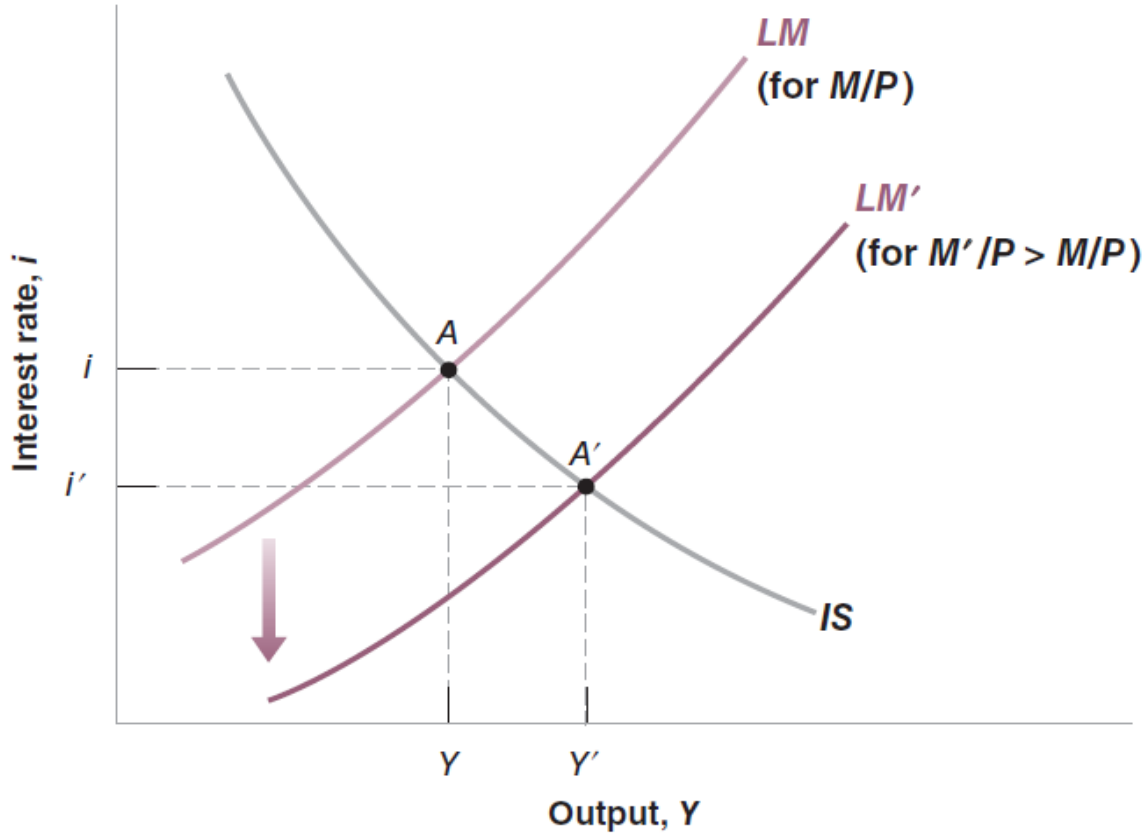
- **What happens to the components of demand?** By assumption, government spending remains unchanged (we have assumed that the reduction in the deficit takes place through an increase in taxes). **Consumption surely goes down: Taxes go up and income goes down, so disposable income goes down on both counts.**
- The last question is, what happens to investment? On the one hand, lower output means lower sales and lower investment. On the other, a lower interest rate leads to higher investment. Without knowing more about the exact form of the investment relation, we cannot tell which effect dominates: If investment depended only on the interest rate, then investment would surely increase; if investment depended only on sales, then investment would surely decrease.
- In general, **investment depends on both the interest rate and on sales, so we cannot tell**.
- The case where investment falls as the deficit rises is called the **crowding out** of investment by the deficit. If investment instead rises when the deficit rises, there is **crowding in** of investment by the deficit.

Monetary Policy, Activity and Interest Rate

- An increase in the money supply is called a **monetary expansion**. A decrease in the money supply is called a **monetary contraction** or **monetary tightening**.
- Let's take the case of a monetary expansion. Suppose that the central bank increases nominal money, *M*, through an open market operation. Given our assumption that the price level is fixed in the short run, this increase in nominal money leads to a one-for-one increase in real money. The initial real money supply is denoted by *M*/*P*, the new higher one by *M'*/*P*.
- The money supply does not *directly* affect either the supply of or the demand for goods. In other words, *M* does not appear in the *IS* relation. Thus, **a change in *M* does not shift the *IS* curve**.

- Money enters the *LM* relation, however, so the *LM* curve shifts when the money supply changes. As we saw before, **an increase in the money supply shifts the *LM* curve down**, from *LM* to *LM'*: At a given level of income, an increase in money leads to a decrease in the interest rate.
- The monetary expansion shifts the *LM* curve. It does not shift the *IS* curve. The economy moves along the *IS* curve, and the equilibrium moves from point *A* to point *A'*. Output increases from *Y* to *Y'*, and the interest rate decreases from *i* to *i'*
- The increase in money supply leads to a lower interest rate. The lower interest rate leads to an increase in investment and, in turn, to an increase in demand and output.

Effects of Monetary Expansion



- **In contrast to the case of fiscal contraction, we can tell exactly what happens to the different components of demand after a monetary expansion**: Because income is higher and taxes are unchanged, disposable income goes up, and so does consumption.
- Because sales are higher and the interest rate is lower, investment also unambiguously goes up. So **a monetary expansion is more investment friendly than a fiscal expansion.**

Dynamics of Adjustment

- When looking at the effects of an increase in taxes or the effects of a monetary expansion, it looked as if the economy moved instantaneously to adjust output but clearly takes time. To capture this time dimension, **we need to reintroduce dynamics**.

➢ Consumers are likely to take some time to adjust their consumption following a change in disposable income.

➢ Firms are likely to take some time to adjust investment spending following a change in their sales.

➢ Firms are likely to take some time to adjust investment spending following a change in the interest rate. Firms are likely to take some time to adjust production following a change in their sales.

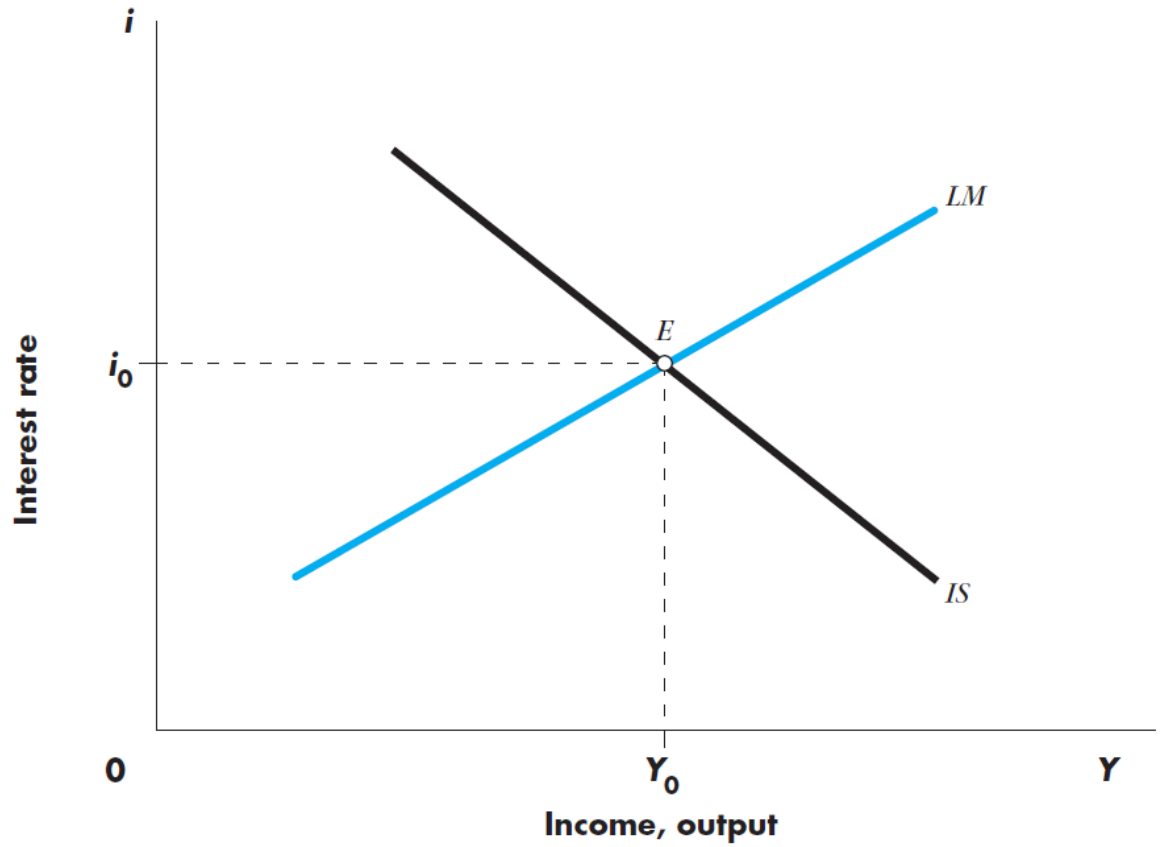
- So, in response to an increase in taxes, it takes some time for consumption spending to respond to the decrease in disposable income, some more time for production to decrease in response to the decrease in consumption spending, yet more time for investment to decrease in response to lower sales, for consumption to decrease in response to the decrease in income, and so on.
- In response to a monetary expansion, it takes some time for investment spending to respond to the decrease in the interest rate, some more time for production to increase in response to the increase in demand, yet more time for consumption and investment to increase in response to the induced change in output, and so on.

Monetary and Fiscal Policy

Introduction

- The *IS* curve represents equilibrium in the goods market. The *LM* curve represents equilibrium in the money market. The intersection of the two curves determines output and interest rates in the short run, that is, for a given price level.
- Expansionary monetary policy moves the *LM* curve to the right, raising income and lowering interest rates. Contractionary monetary policy moves the *LM* curve to the left, lowering income and raising interest rates.
- Expansionary fiscal policy moves the *IS* curve to the right, raising both income and interest rates. Contractionary fiscal policy moves the *IS* curve to the left, lowering both income and interest rates.

IS-LM equillibrium

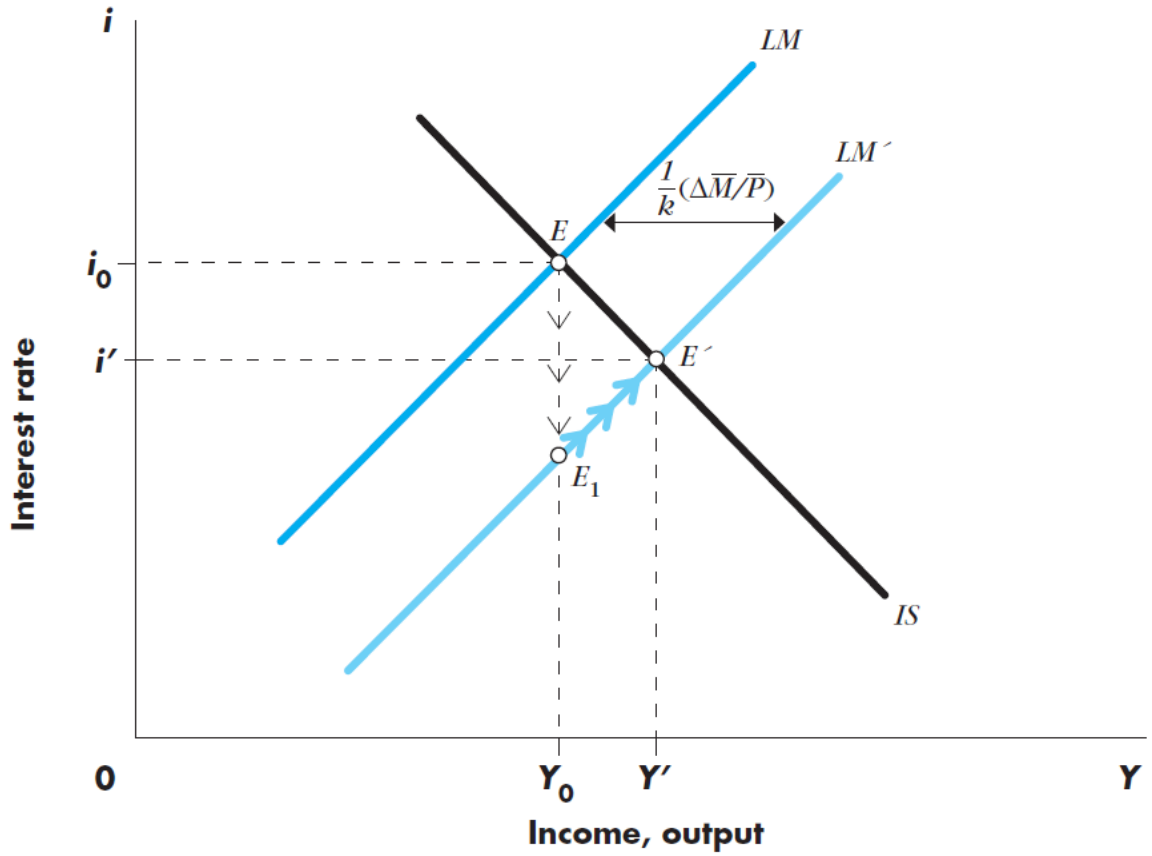


Monetary Policy

- The central bank conducts monetary policy mainly through *open market operations.* **In an open market operation, the central bank buys bonds in exchange for money, thus increasing the stock of money, or it sells bonds in exchange for money paid by the purchasers of the bonds, thus reducing the money stock.**
- In the case of an open market purchase of bonds, RBI pays for the bonds it buys with money *that it can create.* The purchase of bonds reduces the quantity of bonds available in the market and thereby tends to increase their price, or lower their yield. That is, only at a lower interest rate will the public be prepared to hold a smaller fraction of its wealth in the form of bonds and a larger fraction in the form of money.

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

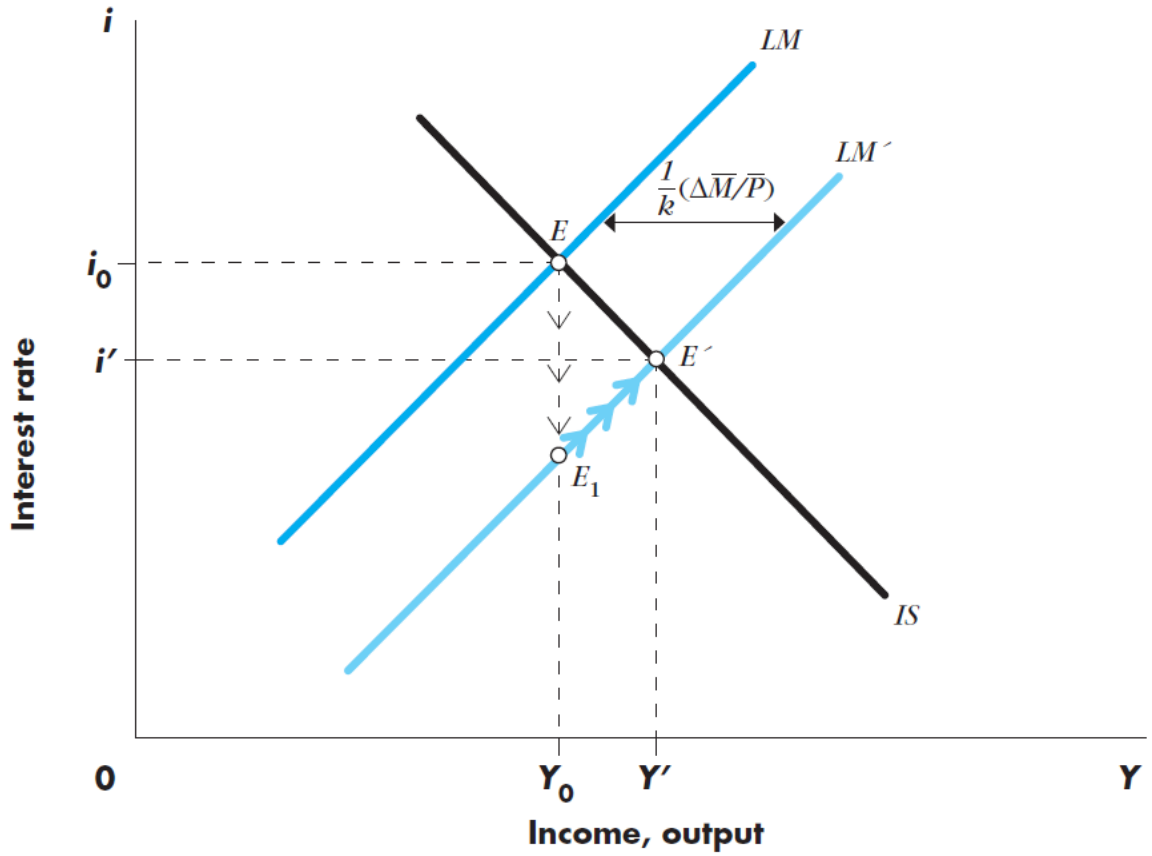
Increase in real money stock



- If money demand is very sensitive to the interest rate (corresponding to a relatively flat *LM* curve), a given change in the money stock can be absorbed in the assets markets with only a small change in the interest rate. The effects of an open market purchase on investment spending would then be small.
- By contrast, if the demand for money is not very sensitive to the interest rate (corresponding to a relatively steep *LM* curve), a given change in the money supply will cause a large change in the interest rate and have a big effect on investment demand and thus a larger change in income.

- Consider next the process of adjustment to the monetary expansion. At the initial equilibrium point, *E*, the increase in the money supply creates an excess supply of money to which the public adjusts by trying to buy other assets. In the process, asset prices increase and yields decline. Because money and asset markets adjust rapidly, we move immediately to **point E_1, where the money market clears and where the public is willing to hold the larger real quantity of money because the interest rate has declined sufficiently.**
- At point E_1 , however, there is an excess demand for goods. The decline in the interest rate, given the initial income level Y_0, has raised aggregate demand and is causing inventories to run down. In response, output expands and we start moving up the *LM* schedule.

Increase in real money stock



- Because the increase in output raises the demand for money, and the greater demand for money has to be checked by higher interest rates.
- Thus, the increase in the money stock first causes interest rates to fall as the public adjusts its portfolio and then—as a result of the decline in interest rates—increases aggregate demand.

The Transmission Mechanism

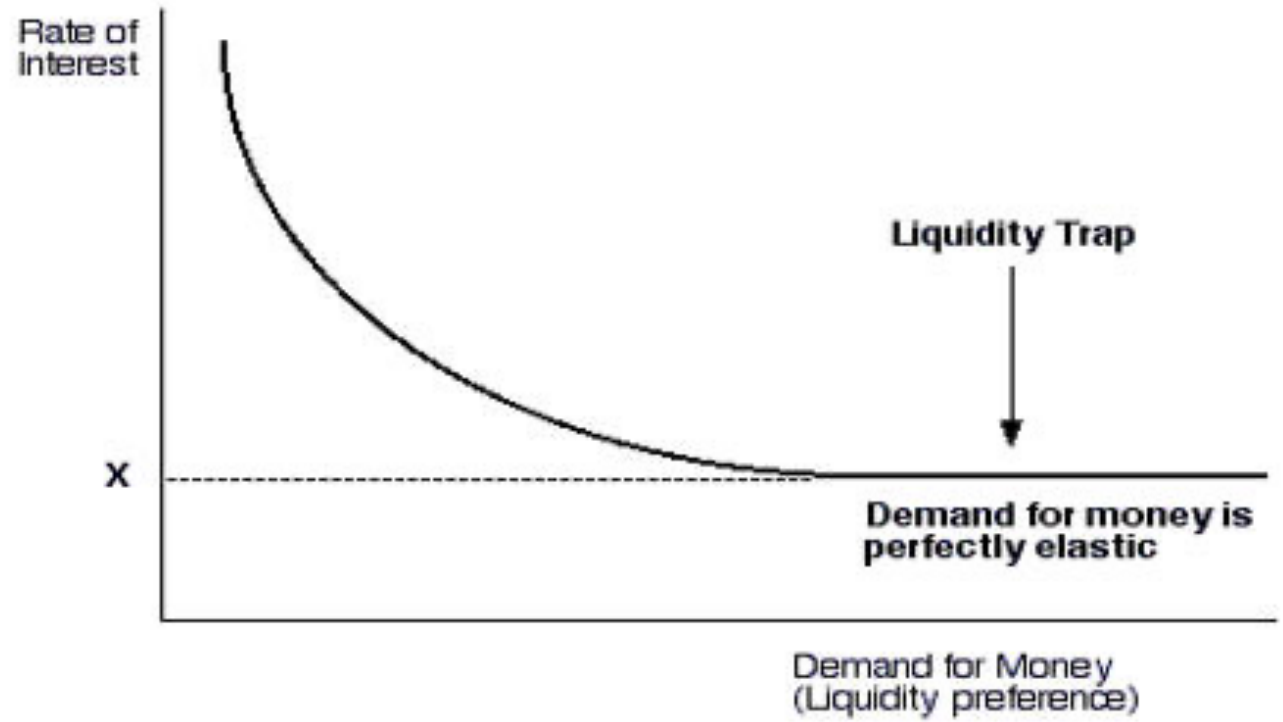
- Two steps in the *transmission mechanism* —the **process by which changes in monetary policy affect aggregate demand**—are essential. The first is that an increase in real balances generates a *portfolio disequilibrium*; that is, at the prevailing interest rate and level of income, people are holding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

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

(1) ⟶	(2) ⟶	(3) ⟶	(4)
Change in real money supply.	Portfolio adjustments lead to a change in asset prices and interest rates.	Spending adjusts to changes in interest rates.	Output adjusts to the change in aggregate demand.

The Liquidity Trap

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

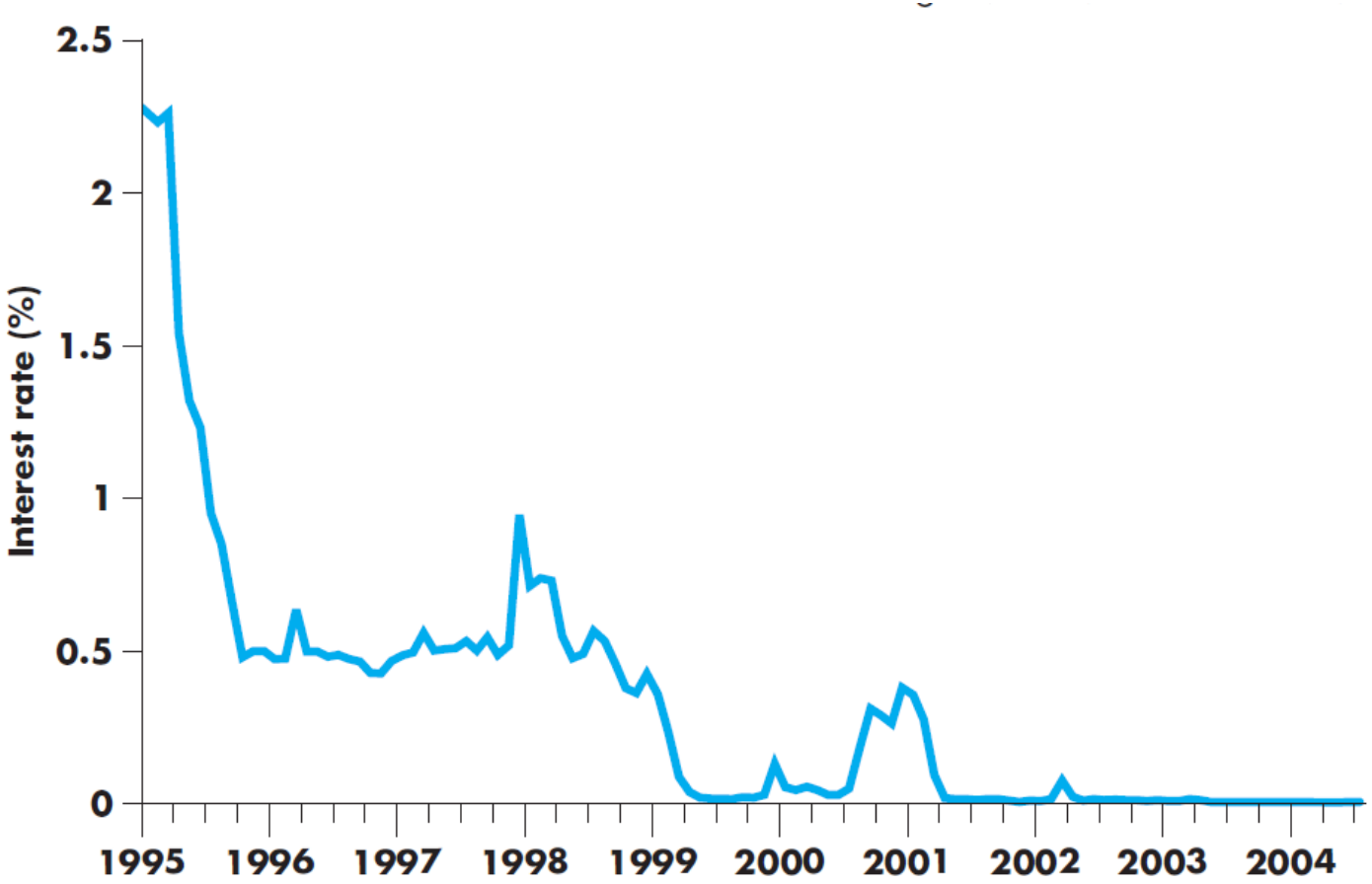

Rate of Interest
Liquidity Trap
X
Demand for money is perfectly elastic
Demand for Money (Liquidity preference)

- Historically, the liquidity trap has been a useful expositional device mostly for understanding the consequences of a relatively flat *LM* curve, with little immediate relevance to policymakers.
- But **there is one situation in which the liquidity trap can be of critical practical concern—that's when interest rates are so close to zero that they can't go any lower**.

The Japanese case

- Once the interest rate hits zero, there is nothing further that a central bank can do with *conventional* monetary policy to stimulate the economy because monetary policy cannot reduce interest rates any further.
- The following figure shows that this is pretty much what happened in Japan in the late 1990s and in the early years of the twenty-first century. Interest rates went from a few percent, down to around .5 percent, and then effectively to zero.
- The inability to use conventional monetary policy to stimulate the economy in a liquidity trap had long been mostly important as an illustrative example for textbook writers. But **in Japan the zero interest rate liquidity trap became a very real policy issue.**
- The nominal interest rate has two parts: the real interest rate and expected inflation. As a practical matter, an economy hits a zero interest rate bound when it experiences significant *deflation*. (Deflation means that prices are dropping or, equivalently, that the inflation rate is negative.) One way for policymakers to avoid the zero interest rate liquidity trap is to pump enough money to keep inflation slightly positive.

Japanese interest rates



The Classical Case

- The **polar opposite of the horizontal *LM* curve**—which implies that monetary policy cannot affect the level of income—is the vertical *LM* curve. The ***LM* curve is vertical when the demand for money is entirely unresponsive to the interest rate**.
- The *LM* curve is described by

$$\overline{M}/\overline{P} = k.Y - hi$$

- If *h* is zero, then corresponding to a given real money supply, $\overline{M}/\overline{P}$ there is a unique level of income, which implies that the *LM* curve is vertical at that level of income.

- The **vertical *LM* curve is called the *classical case***. Rewriting the previous equation, with *h* set equal to zero and with *P* moved to the right-hand side, we obtain

$$\overline{\boldsymbol{M}} = \mathbf{k}(\overline{\boldsymbol{P}} * \mathbf{Y})$$

- We see that the classical case implies that nominal GDP, *P*Y* , depends only on the quantity of money. This is the classical *quantity theory of money* , which argues that the level of nominal income is determined solely by the quantity of money.
- The quantity theory was originally motivated by the belief that people would hold money in a quantity proportional to total transactions, *P*Y* , irrespective of the interest rate.

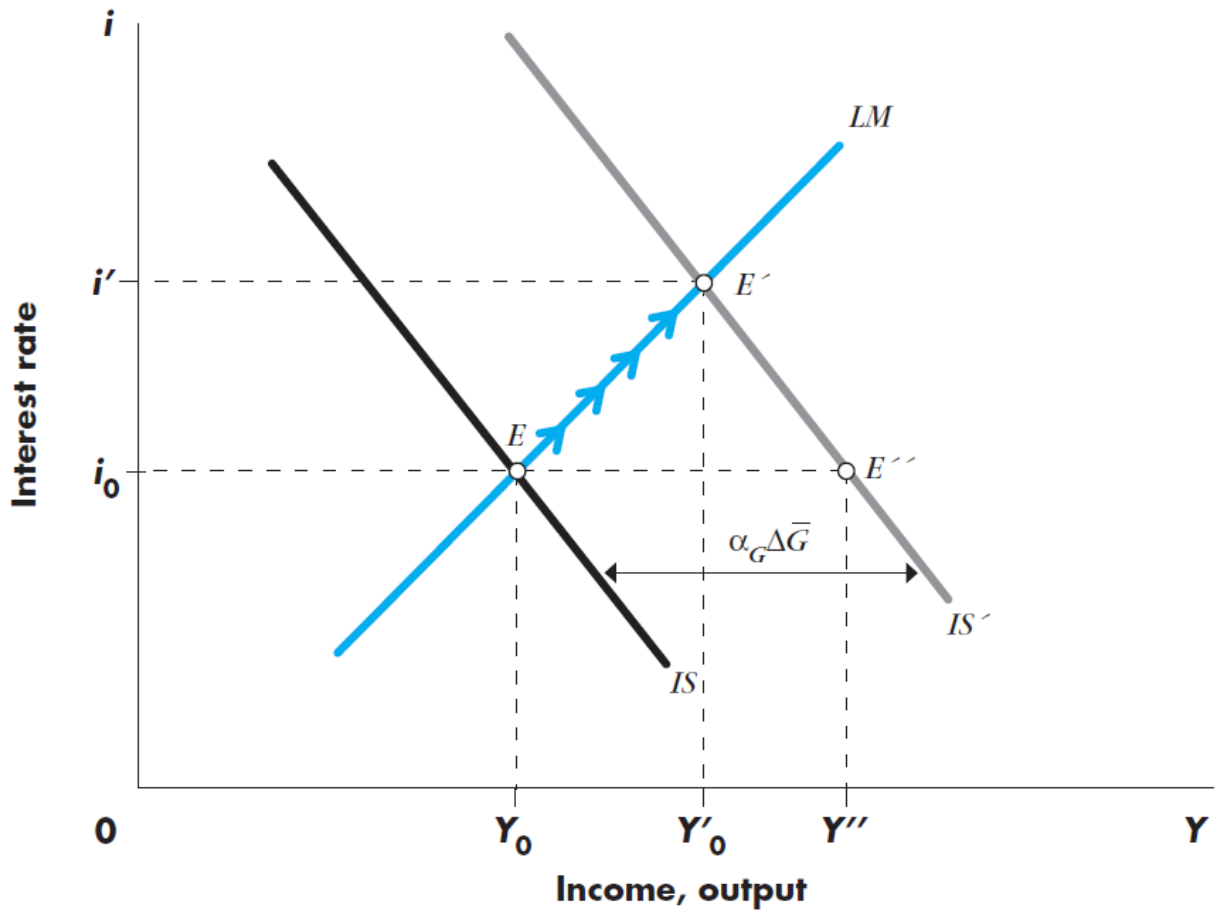
- When the *LM* curve is vertical, a given change in the quantity of money has a maximal effect on the level of income.
- you can also see that shifts in the *IS* curve do not affect the level of income when the *LM* curve is vertical. **Thus, when the *LM* curve is vertical, monetary policy has a maximal effect on the level of income, and fiscal policy has no effect on income.**
- The vertical *LM* curve, implying the comparative effectiveness of monetary over fiscal policy, is sometimes associated with the view that "**only money matters" for the determination of output**. Since the *LM* curve is vertical only when the demand for money does not depend on the interest rate, the interest sensitivity of the demand for money turns out to be an important issue in determining the effectiveness of alternative policies.

Fiscal Policy and Crowding Out

- The *IS* curve slopes downward because a decrease in the interest rate increases investment spending, thereby increasing aggregate demand and the level of output at which the goods market is in equilibrium.
- Changes in fiscal policy shift the *IS* curve. Specifically, a fiscal expansion shifts the *IS* curve to the right. Thus, both government spending and the tax rate affect the *IS* schedule.
- A fiscal expansion raises equilibrium income and the interest rate. At unchanged interest rates, higher levels of government spending increase the level of aggregate demand. To meet the increased demand for goods, output must rise.

- The following figure shows the effect of a shift in the *IS* schedule. At each level of the interest rate, **equilibrium income must rise by αG times the increase in government spending**. For example, if government spending rises by 100 and the multiplier is 2, equilibrium income must increase by 200 at each level of the interest rate. Thus the *IS* schedule shifts to the right by 200.
- If the economy is initially in equilibrium at point *E* and government spending rises by 100, we would move to point *E''* *if the interest rate stayed constant.* At *E* the goods market is in equilibrium in that planned spending equals output. But the money market is no longer in equilibrium. Income has increased, and therefore the quantity of money demanded is higher.
- Because there is an excess demand for real balances, the interest rate rises. **Firms' planned investment spending declines at higher interest rates**, and thus aggregate demand falls off.

Effects of increase in G



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

Crowding Out

- Comparing *E''* to the initial equilibrium at *E*, we see that increased government spending raises both income and the interest rate. But another important comparison is between points *E'* and *E''* (the equilibrium in the goods market at unchanged interest rates).
- In comparing *E'* and *E''*, it becomes clear that the adjustment of interest rates and their impact on aggregate demand dampen the expansionary effect of increased government spending. Income, instead of increasing to level *Y''* , rises only to Y'_0 .
- The reason that income rises only to Y'_0 rather than to *Y''* is that the rise in the interest rate from i_0 to *i'* reduces the level of investment spending. We say that the increase in government spending crowds out investment spending. ***Crowding out*** **occurs when expansionary fiscal policy causes interest rates to rise, thereby reducing private spending, particularly investment.**

- Income increases more, and interest rates increase less, the flatter the *LM* schedule.
- Income increases less, and interest rates increase less, the flatter the *IS* schedule.
- Income and interest rates increase more the larger the multiplier, **α** , and thus the larger the horizontal shift of the *IS* schedule.

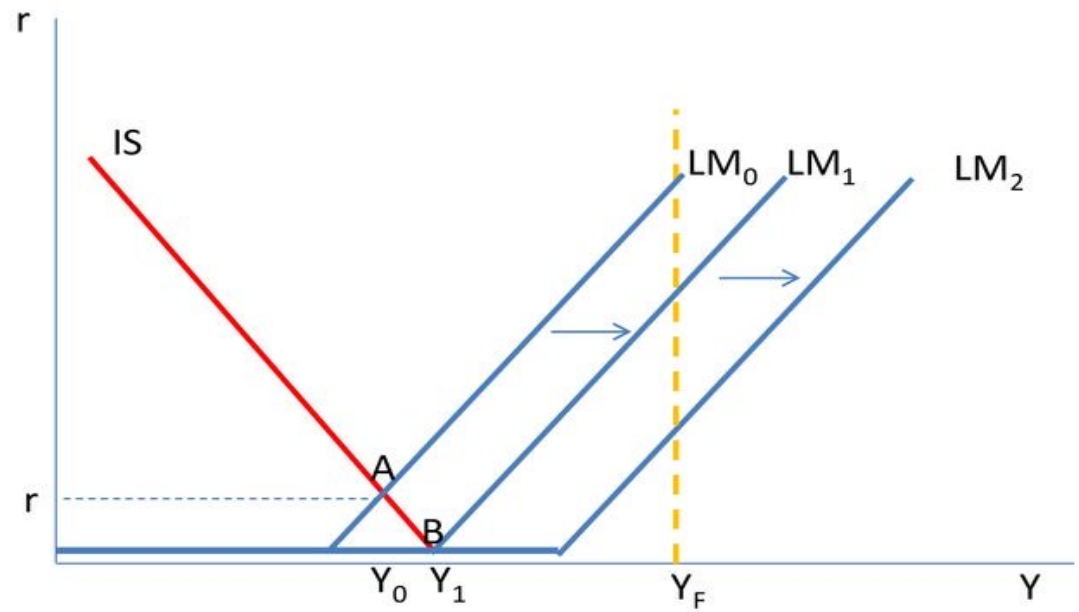
➢ **In each case the extent of crowding out is greater the more the interest rate increases when government spending rises.**

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

The Liquidity Trap

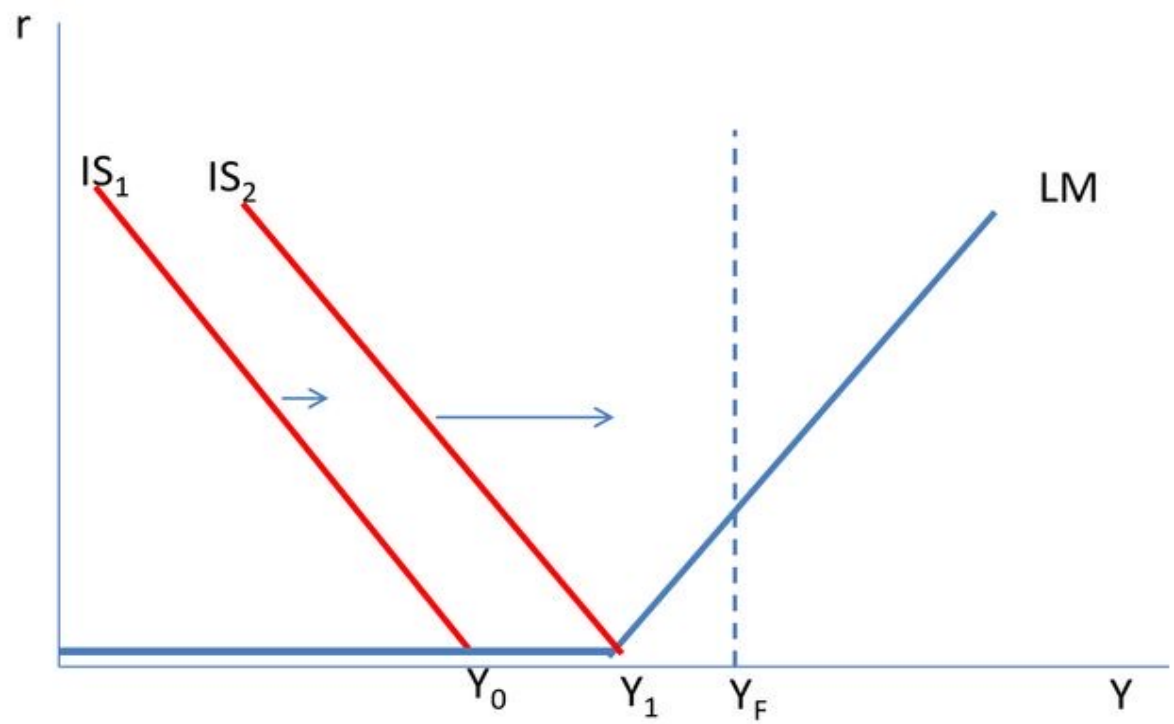
- If the economy is in the liquidity trap, and thus the *LM* curve is horizontal, an increase in government spending has its full multiplier effect on the equilibrium level of income.
- There is no change in the interest rate associated with the change in government spending, and thus no investment spending is cut off. There is therefore no dampening of the effects of increased government spending on income.
- **If the *LM* curve is horizontal, monetary policy has no impact on the equilibrium of the economy and fiscal policy has a maximal effect**. Less dramatically, if the demand for money is very sensitive to the interest rate, and thus the *LM* curve is almost horizontal, fiscal policy changes have a relatively large effect on output and monetary policy changes have little effect on the equilibrium level of output.

Monetary Policy in a Liquidity Trap



The economy is at Y_0 below full employment potential. Monetary policy is ineffective in pushing the economy beyond Y_1.

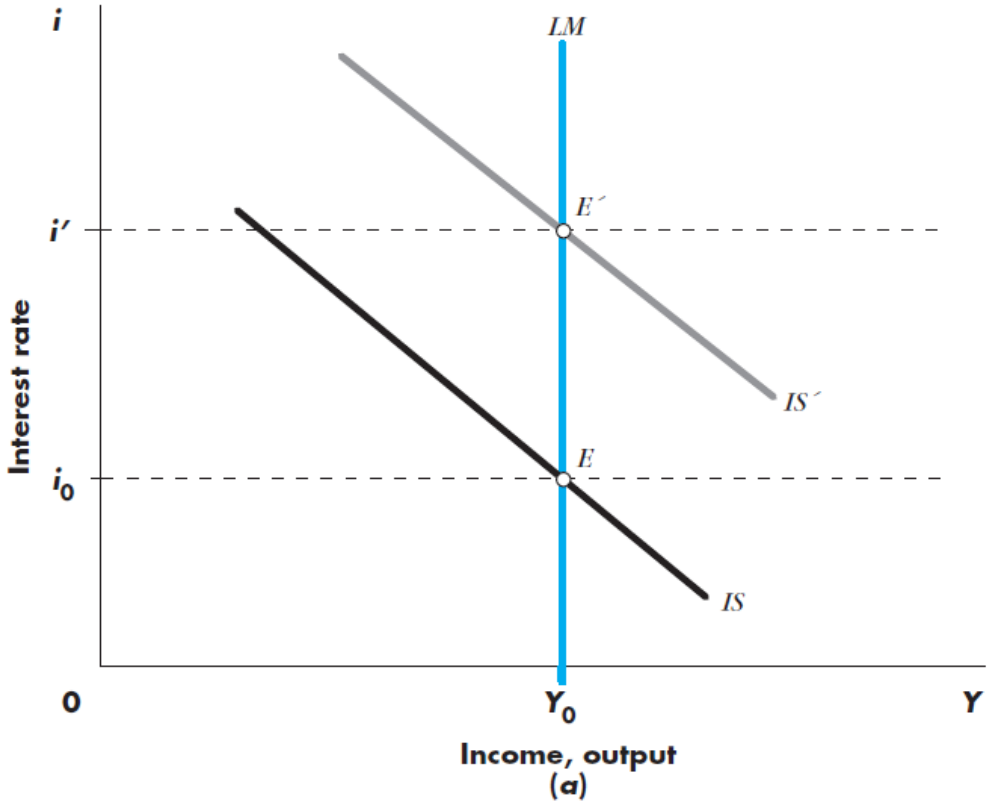
Fiscal Policy in a Liquidity Trap

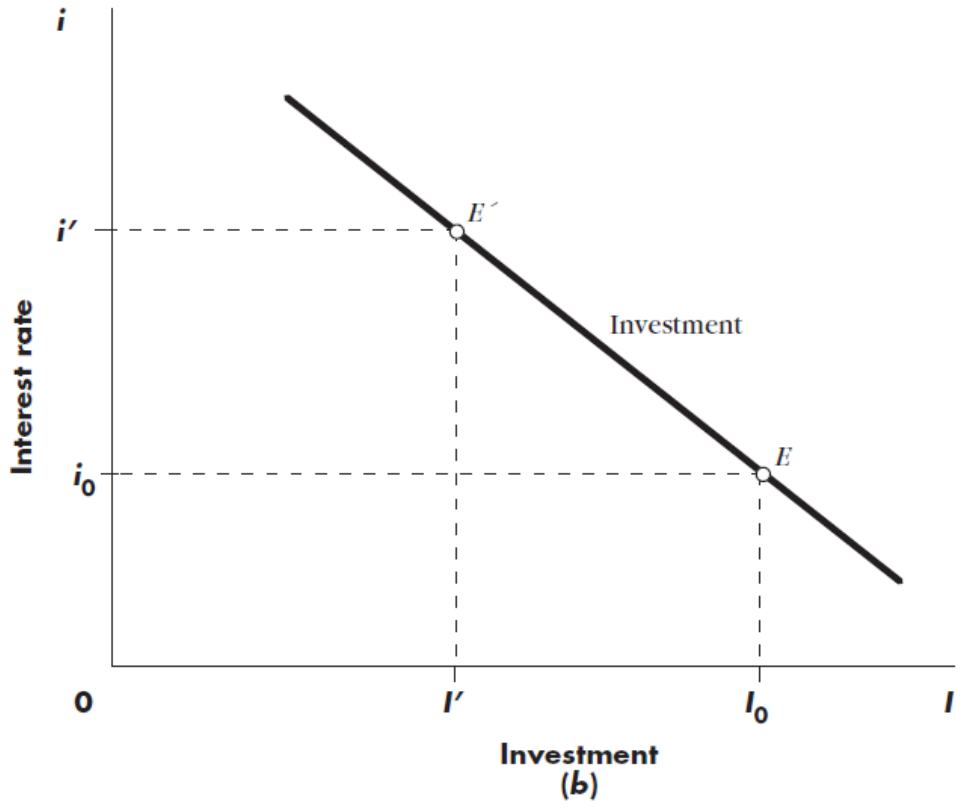


The Classical Case and Crowding Out

- If the *LM* curve is vertical, an increase in government spending has *no* effect on the equilibrium level of income and increases only the interest rate. If the demand for money is not related to the interest rate, as a vertical *LM* curve implies, there is a unique level of income at which the money market is in equilibrium.
- Thus, with a vertical *LM* curve, an increase in government spending cannot change the equilibrium level of income and raises only the equilibrium interest rate. But if government spending is higher and output is unchanged, there must be an offsetting reduction in private spending.
- In this case, the increase in interest rates crowds out an amount of private (particularly investment) spending equal to the increase in government spending. Thus, there is full crowding out if the *LM* curve is vertical.

Full Crowding Out



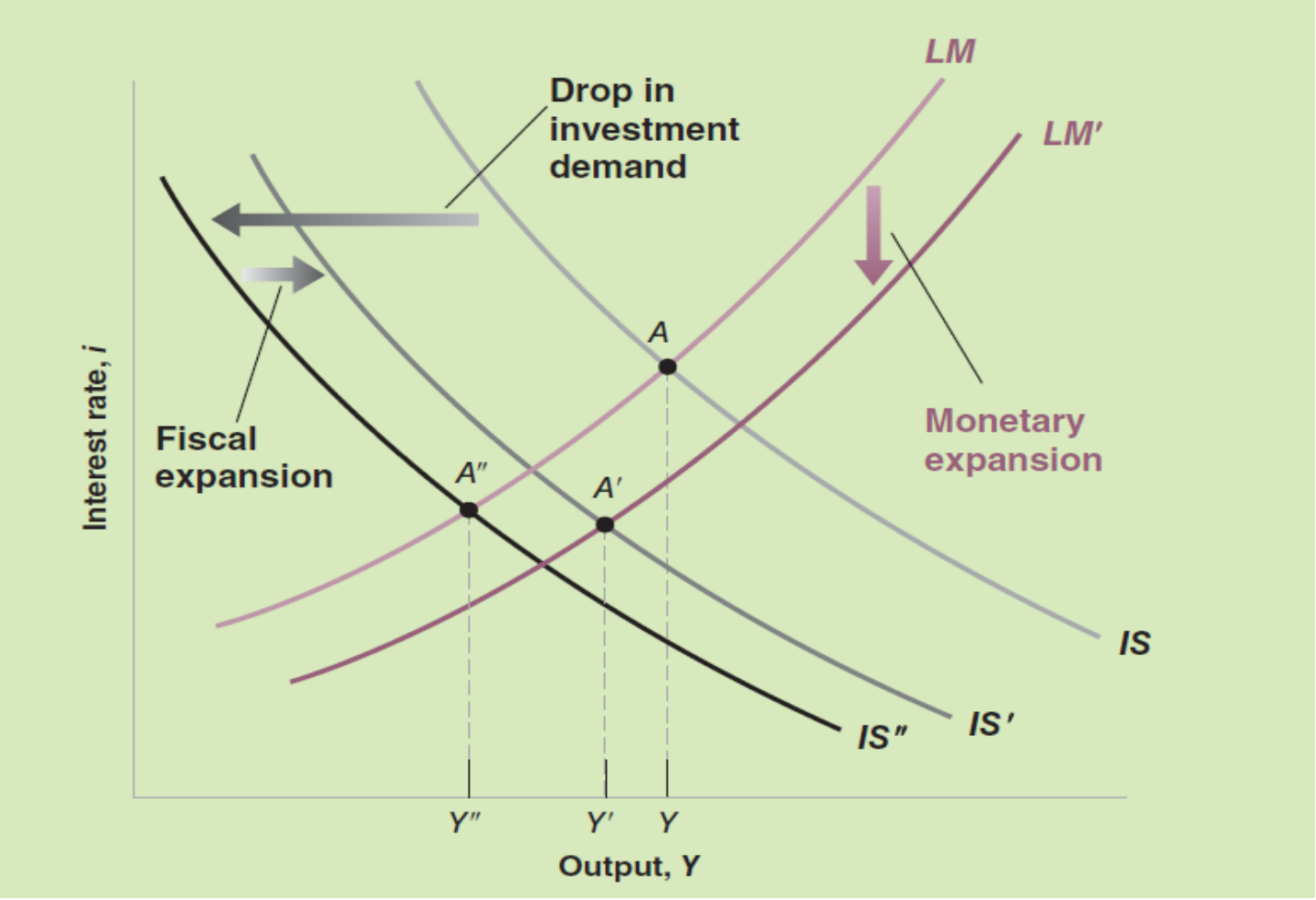


How important is crowding out?

- **In an economy with unemployed resources there will *not* be full crowding out because the *LM* is not, in fact, vertical**. A fiscal expansion will raise interest rates, but income will also rise. Crowding out is therefore a matter of degree.
- The increase in aggregate demand raises income, and with the rise in income, the level of saving rises. This expansion in saving, in turn, makes it possible to finance a larger budget deficit without *completely* displacing private spending schedule.
- Another point is that with unemployment, and thus a possibility for output to expand, interest rates need not rise at all when government spending rises, and there need not be any crowding out. This is true because the monetary authorities can *accommodate* the fiscal expansion by an increase in the money supply.

- **Monetary policy is accommodating when, in the course of a fiscal expansion, the money supply is increased in order to prevent interest rates from increasing.** Monetary accommodation is also referred to as ***monetizing budget deficits*** **,** meaning that the RBI prints money to buy the bonds with which the government pays for its deficit.
- When the central bank accommodates a fiscal expansion, both the *IS* and the *LM* schedules shift to the right. Output will clearly increase, but interest rates need not rise. Accordingly, there need not be any adverse effects on investment.

Policy mix to fight recession



International Linkages

Introduction

- At the beginning of the twenty-first century, national economies are becoming more closely interrelated, and the notion of *globalization* —that we are moving toward a single global economy—is increasingly accepted.
- **Economies are linked internationally through trade in goods and through financial markets**. The *trade* linkage means that some of a country's production is exported to foreign countries, while some goods that are consumed or invested at home are produced abroad and imported.
- Spending on imports escapes from the circular flow of income, in the sense that part of the income spent by residents is not spent on domestically produced goods; by contrast, exports appear as an increase in the demand for domestically produced goods. Thus, the **basic *IS-LM* model of income determination must be amended to include international effects**.

- In addition, the prices of domestic goods relative to those of our competitors have direct impacts on demand, output, and employment. A decline in the rupee prices of our competitors, relative to the prices at which our firms sell, shifts demand away from domestic goods toward goods produced abroad.
- There are also strong international links in the area of *finance.* As international investors shift their assets around the world, they link asset markets here and abroad, and thereby affect income, exchange rates, and the ability of monetary policy to affect interest rates.

Balance of Payments

- **The balance of payments is the record of the transactions of the residents of a country with the rest of the world.** There are two main accounts in the balance of payments: the current account and the capital account.
- The simple rule for balance-of-payments accounting is that any transaction that gives rise to a payment by a country's residents is a deficit item in that country's balance of payments.
- **The *current account* records trade in goods and services, as well as transfer payments.** The *trade balance* simply records trade in goods. Services include freight, royalty payments, and interest payments.
- Services also include *net investment income* , the interest and profits on our assets abroad less the income foreigners earn on assets they own in India. Transfer payments consist of remittances, gifts, and grants. Adding trade in services and net transfers to the trade balance, we arrive at the current account balance.

- The current account is in *surplus* if exports exceed imports plus net transfers to foreigners, that is, if receipts from trade in goods and services and transfers exceed payments on this account.
- **The *capital account* records purchases and sales of assets, such as stocks, bonds, and land.** There is a capital account surplus—also called a net capital inflow—when our receipts from the sale of stocks, bonds, land, bank deposits, and other assets exceed our payments for our own purchases of foreign assets.

External Accounts must balance

- The central point of international payments is very simple: Individuals and firms have to pay for what they buy abroad. If a person spends more than her income, her deficit needs to be financed by selling assets or by borrowing.
- Similarly, if a country runs a deficit in its current account, spending more abroad than it receives from sales to the rest of the world, the deficit needs to be financed by selling assets or by borrowing abroad.
- This selling or borrowing implies that the country is running a capital account surplus. Thus, any current account deficit is of necessity *financed* by an offsetting capital inflow:

Current account + Capital account = 0

- If a country has no assets to sell, if it has no foreign currency reserves to use up, and if nobody will lend to it, the country *has* to achieve balance in its current account, however painful and difficult that may be.

- **It is often useful to split the capital account into two separate parts: (1) the transactions of the country's private sector and (2) official reserve transactions, which correspond to the central bank's activities**.
- A current account deficit can be financed by private residents selling off assets abroad or borrowing abroad. Alternatively, or as well, a current account deficit can be financed by the government, which runs down its reserves of foreign exchange, selling foreign currency in the foreign exchange market.
- Conversely, when there is a surplus, the private sector may use the foreign exchange revenues it receives to pay off debt or buy assets abroad; alternatively, the central bank can buy the (net) foreign currency earned by the private sector and add that currency to its reserves.
- **The increase in official reserves is also called the overall *balance-of-payments surplus* .** We can summarize our discussion in the following statement:

Balance-of-payments surplus = increase in official exchange reserves

=current account surplus + net private capital inflow

- If both the current account and the private capital account are in deficit, then the overall balance of payments is in deficit; that is, the central bank is losing reserves.
- When one account is in surplus and the other is in deficit to precisely the same extent, the overall balance of payments is zero—neither in surplus nor in deficit.

Exchange Rates

- We focus on how central banks, through their official transactions, finance, or provide the means of paying for, balance-of-payments surpluses and deficits. At this point we distinguish between fixed and floating exchange rate systems.
- **In a *fixed exchange rate system* foreign central banks stand ready to buy and sell their currencies at a fixed price in terms of dollars.** The major countries had fixed exchange rates against one another from the end of World War II until 1973. Today, some countries fix their exchange rates, but others don't.

Fixed Exchange Rates

- Central banks hold *reserves* —inventories of dollars, other currencies, and gold that they can sell for rupees—to sell when they want to or have to intervene in the foreign exchange market. ***Intervention*** **is the buying or selling of foreign exchange by the central bank.**
- The balance of payments measures the amount of foreign exchange intervention needed from the central banks. For example, if India were running a deficit in the balance of payments vis-à-vis Japan, and thus the demand for yen in exchange for rupees exceeded the supply of yen in exchange for rupees from Japanese, the Bank of Japan would buy the excess rupees, paying for them with yen.

- Fixed exchange rates operate like any other price support scheme, such as those in agricultural markets. Given market demand and supply, the price fixer has to make up the excess demand or take up the excess supply. In order to be able to ensure that the price (exchange rate) stays fixed, it is obviously necessary to hold an inventory of foreign currencies, or foreign exchange, that can be provided in exchange for the domestic currency.
- As long as the central bank has the necessary reserves, it can continue to intervene in the foreign exchange markets to keep the exchange rate constant.
- **However, if a country persistently runs deficits in the balance of payments, the central bank eventually will run out of reserves of foreign exchange and will be unable to continue its intervention.** Before that point is reached, the central bank is likely to decide that it can no longer maintain the exchange rate, and it will devalue the currency.

Flexible Exchange Rates

- Under fixed exchange rates, the central banks have to provide whatever amounts of foreign currency are needed to finance payments imbalances. **In a *flexible (floating) exchange rate system* , by contrast, the central banks allow the exchange rate to adjust to equate the supply and demand for foreign currency.**
- **In a system of *clean floating* , central banks stand aside completely and allow exchange rates to be freely determined in the foreign exchange markets.** Since the central banks do not intervene in the foreign exchange markets in such a system, official reserve transactions are, accordingly, zero. That means the balance of payments is zero in a system of clean floating: The exchange rate adjusts to make the current and capital accounts sum to zero.
- In practice, the flexible rate system, in effect since 1973, has been one of *managed,* or *dirty, floating* . **Under managed floating, central banks intervene to buy and sell foreign currencies in attempts to influence exchange rates.** Official reserve transactions are, accordingly, not equal to zero under managed floating.

- **A *devaluation* takes place when the price of foreign currencies under a fixed rate regime is increased by official action.** A devaluation thus means that foreigners pay less for the devalued currency and that residents of the devaluing country pay more for foreign currencies. The opposite of a devaluation is a *revaluation* .
- A change in the price of foreign exchange under flexible exchange rates is referred to as *currency depreciation* or *appreciation* . **A currency *depreciates* when, under floating rates, it becomes less expensive in terms of foreign currencies.**
- There is no economic difference between devaluation and depreciation and between revaluation and appreciation. These terms describe the *direction* in which an exchange rate moves.

The Exchange Rate in the Long Run

- A government or central bank can peg the value of its currency, that is, fix the exchange rate, for a period of time. But in the long run, the exchange rate between a pair of countries is determined by the relative purchasing power of currency within each country. This illustrates the theory of *purchasing power parity* , or *PPP.*
- **Two currencies are at purchasing power parity when a unit of domestic currency can buy the same basket of goods at home or abroad.** The relative purchasing power of two currencies is measured by the *real exchange rate.*
- **The real exchange rate is the ratio of foreign to domestic prices, measured in the same currency. It measures a country's competitiveness in international trade.** The real exchange rate, *R* , is defined as

$$R = e.P_f/P$$

where P and P_f are the price levels here and abroad, respectively, and e is the dollar price of foreign exchange.

- If the real exchange rate equals 1, currencies are at purchasing power parity. **If the real exchange rate rises above 1 that means that goods abroad are more expensive than goods in the domestic market**. Other things equal, this implies that people— both in India and abroad—are likely to switch some of their spending to goods produced in the India. 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. Eventually, this should either drive up domestic prices or drive down the exchange rate, moving us closer to purchasing power parity.

Slow adjustment of exchange rate to PPP

- Market forces prevent the exchange rate from moving *too* far from PPP or from remaining away from PPP indefinitely. However, pressures to move to PPP work only slowly.
- There are several reasons for slow movement toward PPP. The first reason is that **market baskets differ across countries**. Consumers in both countries do not consume the same bundle of goods.
- Secondly, there are many **barriers to the movement of goods** between countries. Some are natural barriers—transportation costs are one obvious extra cost—while others, tariffs for example, are imposed by governments.
- Third, and probably of greatest importance, many goods— land is the classic example—are “nontraded” and cannot move.

- Since both P_f and P in the formula for the real exchange rate represent baskets of goods specific to each country, PPP does not necessarily imply that the real exchange rate should be equal to 1.
- Rather, in practice, **PPP is taken to mean that in the long run the real exchange rate will return to its average level**. This is sometimes called *relative PPP.* Thus, if the real exchange rate is above its long-run average level, PPP implies that the exchange rate will fall.

Spending and Balance of Trade

- We can now look at the effects of trade in goods on the level of income and the effects of various disturbances on both income and the trade balance. We do not include the capital account at this stage, so for the present the current account and the balance of payments are the same.
- **We fit foreign trade into the *IS-LM* framework**. We assume that the price level is given and that the output demanded will be supplied.
- In an open economy, part of domestic output is sold to foreigners (exports) and part of spending by domestic residents purchases foreign goods (imports). We have to modify the *IS* curve accordingly.

- The most important change is that domestic spending no longer determines domestic output. Instead, *spending on domestic goods* determines domestic output. Some spending by domestic residents is on imports.
- Demand for domestic goods, by contrast, includes exports or foreign demand along with part of spending by domestic residents.

$$\textbf{Spending by domestic residents} = DS = C + I + G$$

$$\textbf{Spending on domestic goods} = DS + NX = (C + I + G) + (X - Q)$$

$$= (C + I + G) + NX$$

where X is the level of exports, Q is imports, and $NX = X - Q$ is the trade (goods and services) surplus. Spending on domestic goods is total spending by domestic residents less their spending on imports *plus* foreign demand or exports. Since exports minus imports is the trade surplus, or net exports (NX), **spending on domestic goods is spending by domestic residents plus the trade surplus.**

- We can return to our model of income determination. We will assume that domestic spending depends on the interest rate and income, so

$$\mathbf{DS = DS(Y, i)}$$

- **Net exports**, or the excess of exports over imports, depend on our income, which affects import spending; on foreign income, Y_f , which affects foreign demand for our exports; and on the real exchange rate, *R.* A rise in *R* or a real depreciation improves our trade balance as demand shifts from goods produced abroad to those produced at home.

$$\mathbf{NX = X(Y_f , R) - Q(Y, R) = NX(Y, Y_f , R)}$$

- We can then state three important results.

➢A rise in foreign income, other things being equal, improves the home country's trade balance and therefore raises the home country's aggregate demand.

➢A real depreciation by the home country improves the trade balance and therefore increases aggregate demand.

➢A rise in home income raises import spending and hence worsens the trade balance.

Goods Market Equillibrium

- The increase in import demand caused by a Re 1 increase in income is called the *marginal propensity to import* . **The marginal propensity to import measures the fraction of an extra rupee of income spent on imports.**
- The fact that part of income will be spent on imports (rather than on domestic goods) implies that the *IS* curve will be steeper than it would be in a closed economy. For a given reduction in interest rates it takes a smaller increase in output and income to restore goods market equilibrium.

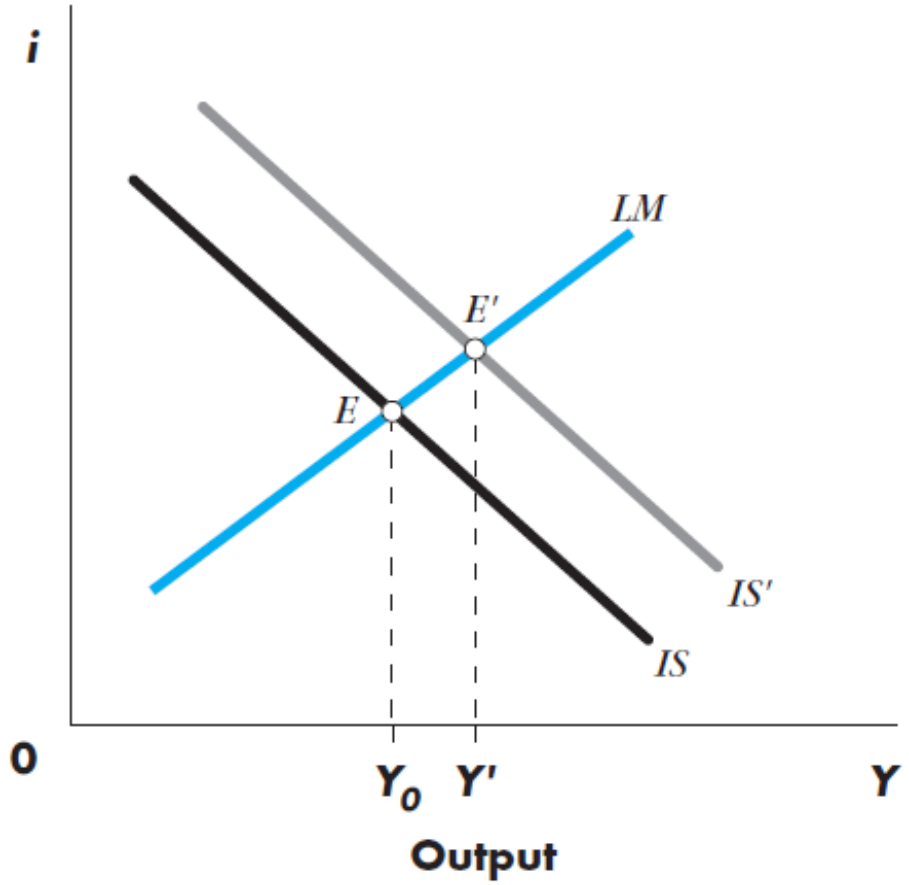
- The open economy *IS* curve includes net exports as a component of aggregate demand. Therefore, the level of competitiveness, as measured by the real exchange rate *R* , affects the *IS* curve.
- A real depreciation increases the demand for domestic goods, shifting the *IS* curve out and to the right. Likewise, an increase in foreign income and, with it, an increase in foreign spending on our goods will increase net exports or demand for our goods. The IS curve is given by

$$\mathbf{Y = DS(Y, i) + NX(Y, Y_f, R)}$$

- Since the equilibrium level of income will now depend on both foreign income and the real exchange rate, we have to ask how disturbances in foreign income, or real exchange rate changes, affect the equilibrium level of income.

- The following figure shows the effect of a rise in foreign income. The higher foreign spending on our goods raises demand and hence, at unchanged interest rates, requires an increase in output. This is shown by the rightward shift of the *IS* schedule. **The full effect of an increase in foreign demand thus is an increase in interest rates and an increase in domestic output** and employment.
- It is easy to go through the opposite change. A weakening of foreign economies reduces their imports and hence pulls down domestic demand. Equilibrium income at home would fall as would our interest rates.
- A real depreciation raises net exports at each level of income and hence shifts the *IS* schedule up and to the right. A real depreciation therefore leads to a rise in our equilibrium income.

Effect of a Rise in Foreign Income



Repercussion Effects

- In an interdependent world, our policy changes affect other countries as well as ourselves, and then feed back to our economy. When we increase government spending, our income rises; part of the increase in income will be spent on imports, which means that income will rise abroad, too.
- The increase in foreign income will then raise foreign demand for our goods, which in turn adds to the domestic income expansion brought about by higher government spending, and so on. These *repercussion effects* can be important in practice.
- Note that **whereas an expansionary fiscal policy increases both our GDP and that of other countries, a depreciation of our exchange rate increases our income while reducing foreign incomes.**

Capital Mobility

- One of the striking facts about the international economy is the high degree of integration, or linkage, among financial, or capital, markets—the markets in which bonds and stocks are traded. search around the world for the highest return (adjusted for risk), link together yields in capital markets in different countries.
- *We assume that capital is perfectly mobile*. **Capital is perfectly mobile internationally when investors can purchase assets in any country. they choose, quickly, with low transaction costs, and in unlimited amounts.** When capital is perfectly mobile, asset holders are willing and able to move large amounts of funds across borders in search of the highest return or lowest borrowing cost.

- The high degree of capital market integration implies that any one country's interest rates cannot get too far out of line without bringing about capital flows that tend to restore yields to the world level. From the point of view of the balance of payments, this implies that a **relative decline in interest rates—a** decline in our rates relative to those abroad—**will tend to worsen the balance of payments** because of the capital outflow.
- The recognition that interest rates affect capital flows and the balance of payments has important implications for stabilization policy. First, because monetary and fiscal policies affect interest rates, the policies have an effect on the capital account and therefore on the balance of payments. The effects of monetary and fiscal policies on the balance of payments are *not* limited to the trade balance effects but extend to the capital account.
- The second implication is that the way in which monetary and fiscal policies work in affecting the domestic economy and the balance of payments changes when there are international capital flows.

Balance of Payments and Capital Flows

- We introduce the role of capital flows within a framework in which we assume that the home country faces a given price of imports and a given export demand. In addition, we assume that the world rate of interest, i_f (i.e., the rate of interest in foreign capital markets), is given.
- Moreover, with perfect capital mobility, capital flows into the home country at an unlimited rate if our interest rate is above that abroad. Conversely, if our rate is below that abroad, capital outflows will be unlimited.
- The balance-of-payments surplus, *BP* , is equal to the trade surplus, *NX* , plus the capital account surplus, *CF:*

$$\mathbf{BP = NX(Y, Y_f , R) + CF(i - i_f)}$$

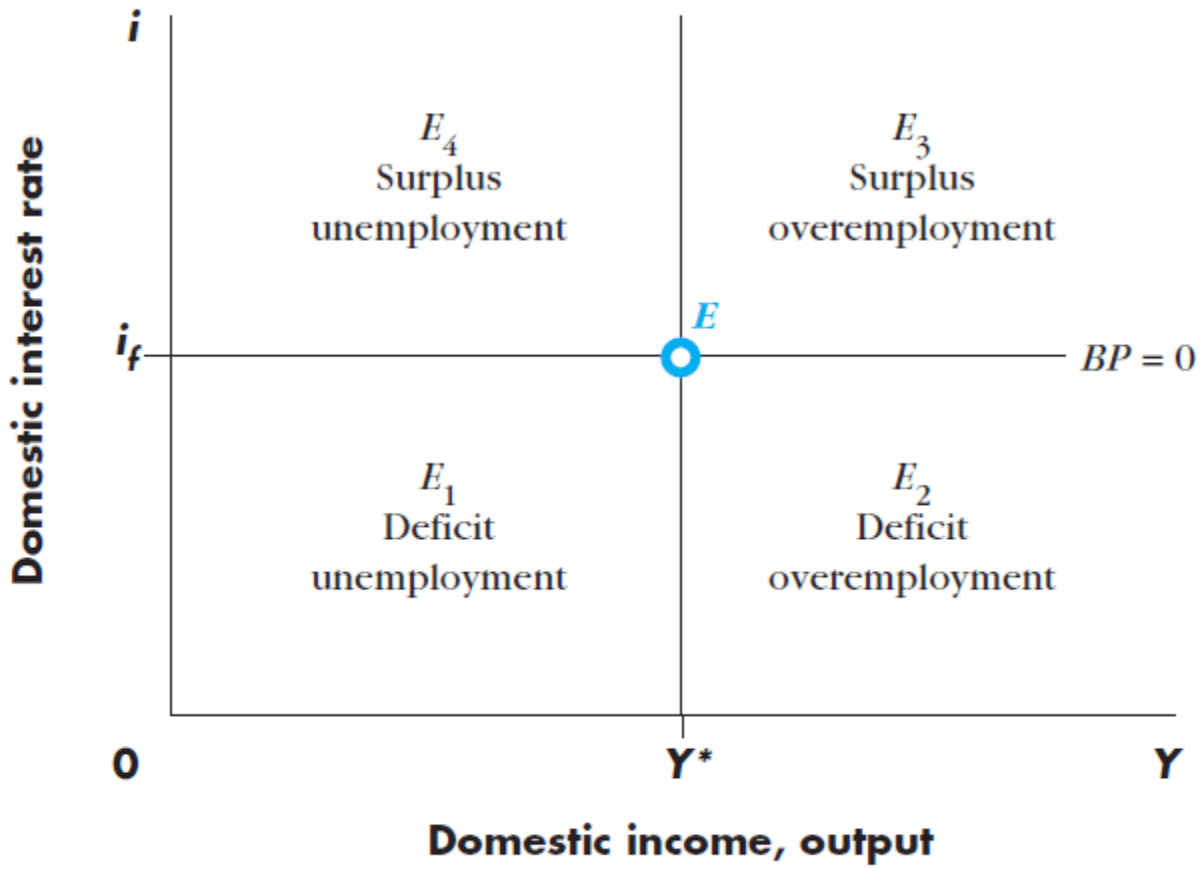
- The trade balance is written as a function of domestic and foreign income and the real exchange rate, and it shows the capital account as depending on the *interest differential*. An increase in income worsens the trade balance, and an increase in the interest rate above the world level pulls in capital from abroad and thus improves the capital account.
- It follows that **when income increases, even the tiniest increase in interest rates is enough to maintain an overall balance-of-payments equilibrium**. The trade deficit would be financed by a capital inflow.

Policy Dilemmas: Internal and External Balance

- The potential for capital flows to finance a current account deficit is extremely important. Countries frequently face policy dilemmas, in which a policy designed to deal with one problem worsens another problem. In particular, there is sometimes a **conflict between the goals of external and internal balance.**
- *External balance* exists when the balance of payments is close to balance. Otherwise, the central bank is either losing reserves—which it cannot keep on doing—or gaining reserves—which it does not want to do forever. *Internal balance* exists when output is at the full employment level.

- The following figure shows the schedule $BP = 0$, along which we have balance-of-payments equilibrium. Our key assumption—perfect capital mobility—forces the $BP = 0$ line to be horizontal.
- Only at a level of interest rates equal to that of rates abroad can we have external balance: If domestic interest rates are higher, there is a vast capital account and overall surplus; if they are below foreign rates, there is an unlimited deficit.
- Thus, $BP = 0$ must be flat at the level of world interest rates. Points above the $BP = 0$ schedule correspond to a surplus, and points below to a deficit. The full employment output level is Y^* where there is internal balance .
- **Point *E* is the only point at which both internal balance and external balance are achieved**. Point E_1 , for example, corresponds to a case of unemployment and a balance-of-payments deficit. Point E_2 , by contrast, is a case of deficit and overemployment.

Internal and External Balance under Fixed Exchange Rates



- We can talk about policy dilemmas in terms of points in the four quadrants in the figure. For instance, at point E_1, there is a deficit in the balance of payments, as well as unemployment. An expansionary monetary policy would deal with the unemployment problem but worsen the balance of payments, thus apparently presenting a dilemma for the policymaker.
- The presence of interest-sensitive capital flows suggests the solution to the dilemma: If the country can find a way of raising the interest rate, it would obtain financing for the trade deficit. That means that **both monetary and fiscal policies would have to be used to achieve external and internal balance simultaneously.**
- Each point in the figure can be viewed as an intersection of the *IS* and *LM* curves. Each curve has to be shifted. How the adjustment takes place depends critically on the exchange rate regime.

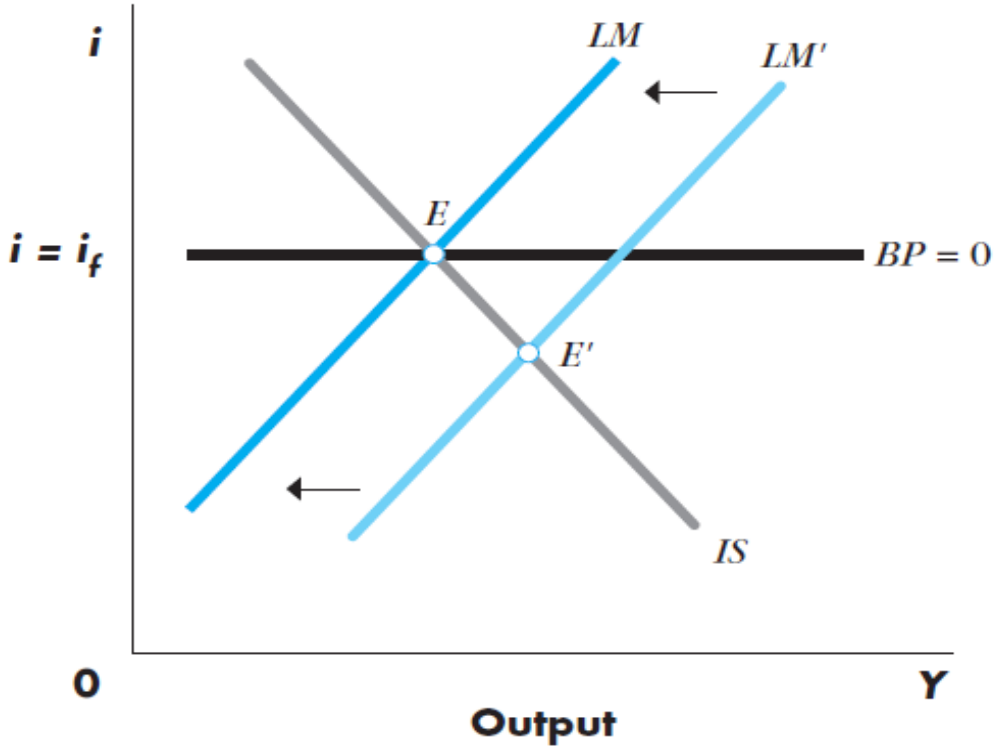
THE MUNDELL - FLEMING MODEL: PERFECT CAPITAL MOBILITY UNDER FIXED EXCHANGE RATES

- Under perfect capital mobility, the slightest interest differential provokes infinite capital flows. It follows that with perfect capital mobility, **central banks cannot conduct an independent monetary policy under fixed exchange rates.**
- Suppose a country wishes to raise interest rates. It tightens monetary policy, and interest rates rise. Immediately, portfolio holders worldwide shift their wealth to take advantage of the new rate. As a result of the huge capital inflow, the balance of payments shows a gigantic surplus; foreigners try to buy domestic assets, tending to cause the exchange rate to appreciate and forcing the central bank to intervene to hold the exchange rate constant. It buys the foreign money, in exchange for domestic money.

- **This intervention causes the home money stock to increase. As a result, the initial monetary contraction is reversed**. The process comes to an end when home interest rates have been pushed back down to the initial level.
- In other words, a small interest differential moves enough money in or out of the country to completely swamp available central bank reserves. The only way to keep the exchange rate from falling is for the monetary authority to back off from the interest rate differential.
- Thus, the money supply is linked to the balance of payments. Surpluses imply *automatic* monetary expansion; deficits imply monetary contraction.

- In the following figure, consider specifically a monetary expansion that starts from point *E.* The *LM* schedule shifts down and to the right, and the economy moves to point *E'*. But at *E'* there is a large payments deficit and hence pressure for the exchange rate to depreciate.
- The central bank must intervene, selling foreign money and receiving domestic money in exchange. The supply of domestic money therefore declines. As a result, the *LM* schedule shifts back up and to the left. The process continues until the initial equilibrium at *E* is restored.

Monetary Expansion under Fixed Rates and Perfect Capital Mobility



Fiscal Expansion

- While monetary policy is essentially infeasible, fiscal expansion under fixed exchange rates with perfect capital mobility is, by contrast, extremely effective.
- With the money supply initially unchanged, a fiscal expansion moves the *IS* curve up and to the right, tending to increase both the interest rate and the level of output. The higher interest rate sets off a capital inflow that would lead the exchange rate to appreciate. To maintain the exchange rate, the central bank *has* to expand the money supply, shifting the *LM* curve to the right, thus increasing income further.
- Equilibrium is restored when the money supply has increased enough to drive the interest rate back to its original level, $i=i_f$. In this case, with an endogenous money supply, the interest rate is effectively fixed, and the simple Keynesian multiplier applies for a fiscal expansion.

- Although the assumption of perfect capital mobility is extreme, it is a useful benchmark case that in the end is not too far from reality for many countries. The essential point is that **the commitment to maintain a fixed exchange rate makes the money stock endogenous** because the central bank has to provide the foreign exchange or domestic money that is demanded at the fixed exchange rate.
- Thus, even when capital mobility is less than perfect, the central bank has only limited ability to change the money supply without having to worry about maintaining the exchange rate.

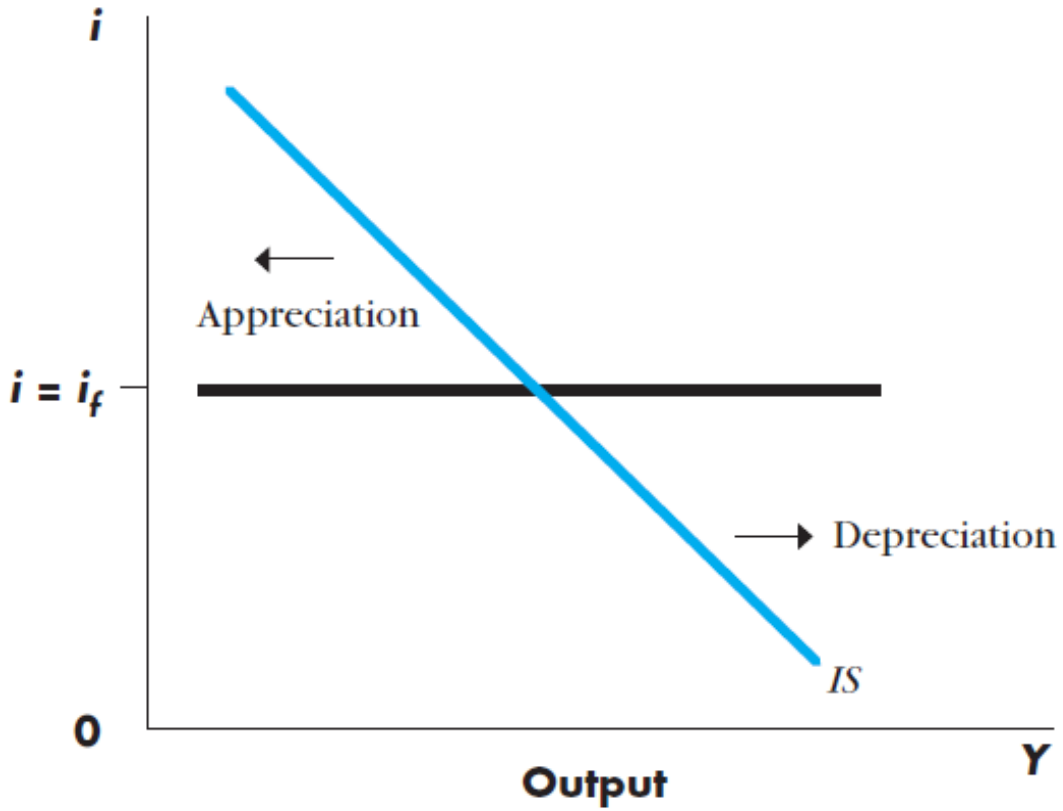
Perfect Capital Mobility and Flexible Exchange Rates

- We can use the Mundell-Fleming model to explore how monetary and fiscal policy works in an economy that has fully flexible exchange rates and perfect capital mobility. We assume here that domestic prices are fixed, even though the exchange rate is flexible.
- Under fully flexible exchange rates the central bank does not intervene in the market for foreign exchange. The exchange rate must adjust to clear the market so that the demand for and supply of foreign exchange balance. **Without central bank intervention, therefore, the balance of payments must be equal to zero**.
- A second implication of fully flexible exchange rates is that the **central bank can set the money supply at will**. Since there is no obligation to intervene, there is no longer any automatic link between the balance of payments and the money supply.

- We know that the real exchange rate is a determinant of aggregate demand and, therefore, that changes in the real exchange rate shift the *IS* schedule.
- Given prices P and P_f , **a depreciation makes the home country more competitive, improves net exports, and hence shifts the *IS* schedule to the right.** Conversely, a real appreciation means our goods become relatively more expensive; hence the trade balance worsens and demand for domestic goods declines, so the *IS* schedule shifts to the left.

- The arrows in the following figure link the movement of aggregate demand to the interest rate. **If the home interest rate were higher than i_f, capital inflows would cause currency appreciation.** At any point above the $i=i_f$ schedule, the exchange rate is appreciating, our **goods are becoming relatively more expensive**, and aggregate demand is falling. Thus, the ***IS* schedule will be shifting to the left**.
- Conversely, any point below the $i=i_f$ schedule corresponds to depreciation, improving competitiveness, and increasing aggregate demand. The *IS* schedule will therefore be shifting to the right.

Effect of Exchange rates on Aggregate Demand

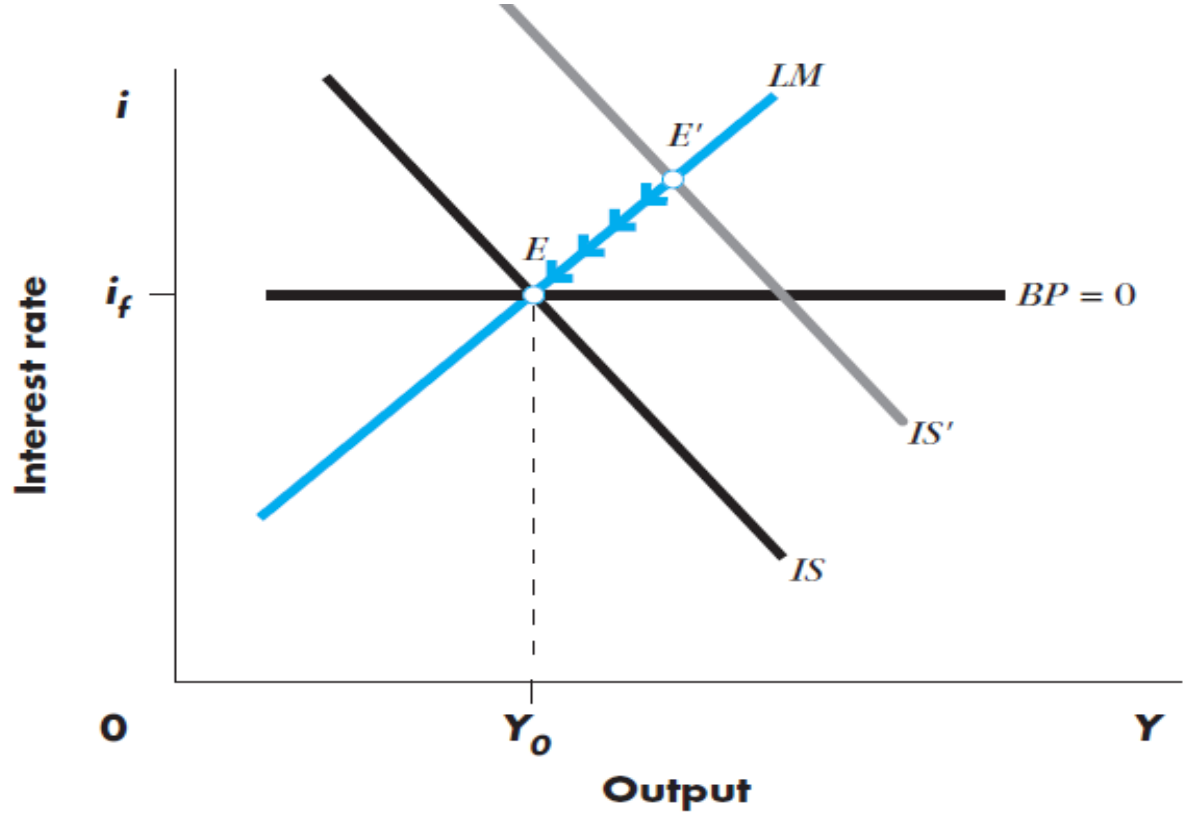


Adjustment to a Real Disturbance

- **The first change we look at is an exogenous rise in the world demand for our goods, or an increase in exports**.
- Starting from an initial equilibrium at point *E*, we see that the increase in foreign demand implies an excess demand for our goods. At the initial interest rate, exchange rate, and output level, demand for our goods now exceeds the available supply.
- For goods market equilibrium at the initial interest rate and exchange rate, we require a higher level of output. Accordingly, the *IS* schedule shifts out and to the right, to *IS'*.
- Now consider for a moment point *E'* , at which the goods and money markets clear. Here output has increased to meet the increased demand. The rise in income has increased money demand and thus raised equilibrium interest rates.

- Point *E'* is, however, not an equilibrium, because the balance of payments is not in equilibrium. In fact, we would not reach point *E* at all. The **tendency for the economy to move in that direction, will bring about an exchange rate appreciation** that will take us all the way back to the initial equilibrium at *E.*

Effect of an increase in the Demand for Exports



The Adjustment Process

- Suppose, then, that the increase in foreign demand takes place and that, in response, there is a tendency for output and income to increase. The induced increase in money demand will raise interest rates and thus bring us out of line with international interest rates.
- The resulting capital inflows immediately put pressure on the exchange rate. The capital inflows cause our currency to appreciate. The exchange appreciation means, of course, that import prices fall and domestic goods become relatively more expensive.
- Demand shifts away from domestic goods, and net exports decline. In terms of the previous figure, the appreciation implies that the *IS* schedule shifts back from *IS'* to the left.

- The exchange rate will keep appreciating as long as our interest rate exceeds the world level. This implies that the exchange appreciation must continue until the *IS'* schedule has shifted back all the way to its initial position. This adjustment is shown by the arrows along the *LM* schedule.
- Only when we return to point *E* will output and income have reached a level consistent with monetary equilibrium at the world rate of interest.
- We have now shown that **under conditions of perfect capital mobility, an expansion in exports has no lasting effect on equilibrium output**. With perfect capital mobility the tendency for interest rates to rise, as a result of the increase in export demand, leads to **currency appreciation** and thus to a complete offset of the increase in exports. Once we return to point *E* , **net exports are back to their initial level**.

Fiscal Policy

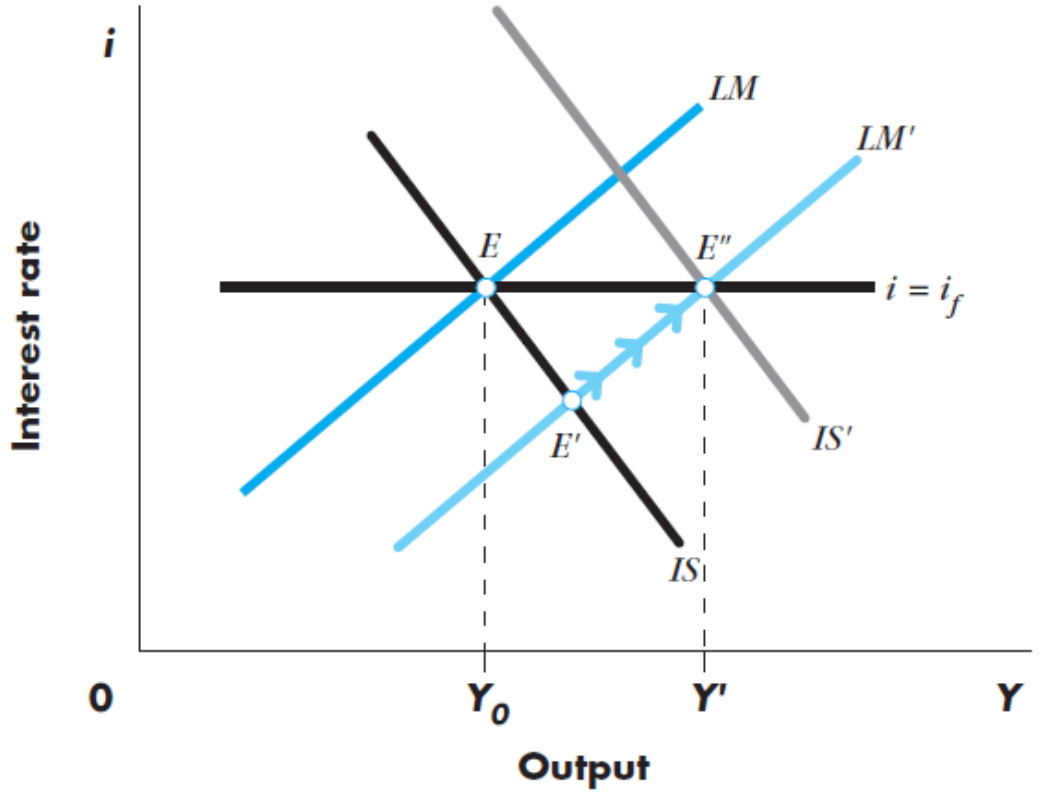
- We can extend the usefulness of this analysis by recognizing that it is valid for disturbances other than an increase in exports. The same analysis applies to a fiscal expansion.
- A tax cut or an increase in government spending would lead to an expansion in demand in the same way as does increased exports. Again, the tendency for interest rates to rise leads to appreciation and therefore to a fall in exports and increased imports.
- There is, accordingly, complete crowding out. The crowding out takes place not because higher interest rates reduce investment but because the exchange appreciation reduces net exports.

- **With a fixed exchange rate, fiscal expansion under conditions of capital mobility is highly effective in raising equilibrium output. For flexible rates, by contrast, a fiscal expansion does not change equilibrium output.** Instead, it produces an offsetting exchange rate appreciation and a shift in the composition of domestic demand toward foreign goods and away from domestic goods.

Adjustment to a change in the Money Stock

- We now analyze a change in the money stock and show that it leads, under flexible exchange rates, to an increase in income and a depreciation of the exchange rate. We start from an initial position at point *E* and consider an increase in the nominal quantity of money, $\overline{\boldsymbol{M}}$. Since prices are given, we have an increase in the real money stock, , $\overline{\boldsymbol{M}}/\overline{\boldsymbol{P}}$.
- At *E* there will be an excess supply of real balances. To restore equilibrium, interest rates would have to be lower or income would have to be larger. Accordingly, the *LM* schedule shifts down and to the right to *LM'*.

Effects of an increase in the Money Stock



- **At *E'*, the goods and money markets are in equilibrium (at the initial exchange rate), but interest rates have fallen below the world level.** Capital outflows therefore put pressure on the exchange rate, leading to a depreciation.
- The exchange depreciation caused by the capital outflows leads import prices to increase, domestic goods become more competitive, and the demand for our output expands. The *IS* curve shifts out and to the right, and it continues doing so until exchange depreciation has raised demand and output to the level indicated by point *E''* .
- **Only at *E''* do we have goods market and money market equilibrium compatible with the world rate of interest**. Consequently, there is no further tendency for exchange rates and relative prices, and hence demand, to change. The interesting implication of our analysis is the proposition that monetary expansion improves the current account through the induced depreciation.

- **Under fixed rates, the monetary authorities cannot control the nominal money stock,** and an attempt to expand money will merely lead to reserve losses and a reversal of the increase in the money stock.
- Under flexible rates, by contrast, the central bank does not intervene, and so the money stock increase is *not* reversed in the foreign exchange market. The depreciation and expansion in output actually do take place, given the assumed fixed prices.
- **The fact that the central bank *can* control the money stock under flexible rates is a key aspect of that exchange rate system.**

Beggar-Thy-Neighbour Policy

- A monetary expansion in the home country leads to exchange depreciation, an increase in net exports, and therefore an increase in output and employment. But our increased net exports correspond to a deterioration in the trade balance abroad.
- The domestic depreciation shifts demand from foreign goods toward domestic goods. Abroad, output and employment decline. It is for this reason that a depreciation induced change in the trade balance has been called a *beggar-thy-neighbor policy* —it is a way of exporting unemployment or of creating domestic employment at the expense of the rest of the world.

- Recognition that exchange depreciation is mainly a way of shifting demand from one country to another, rather than changing the level of world demand, is important. It implies that **exchange rate adjustment can be a useful policy when countries find themselves in different stages of the business cycle—**for example, one in a boom (with overemployment) and the other in a recession. In that event, a depreciation by the country experiencing a recession would shift world demand in its direction and thus work to reduce divergence from full employment in each country.
- By contrast, **when countries' business cycles are highly synchronized**, such as in the 1930s or in the aftermath of the oil shock of 1973, **exchange rate movements will not contribute much toward worldwide full employment**. If total world demand is at the wrong level, exchange rate movements do not correct the level of aggregate demand but essentially affect only the allocation of a *given* world demand among countries.