# Principles of Economics II[1]

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[1]This is prepared for EC202 Spring 2018. It is based on the materials from the text book *Macroeconomics. 6th Edition* by Hubbard and O'Brien.

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# Contents

# Lecture 1

## Introduction

### 1.1   Three Key Economic Ideas

A **market** is a group of buyers and sellers of a good or service and the institution or arrangement by which they come together to trade.

1. People are rational.
   Rational individuals weigh the benefits and costs of each action based on all information, and choose an action if the benefits outweigh the costs.

2. People Respond to Economic Incentives.
   Economists emphasize that consumers and firms consistently respond to economic incentives.

3. Optimal Decisions Are Made at the Margin.
   Economists use the word marginal to mean an extra or additional benefit or cost from making a decision. The optimal decision is to continue any activity to the point where the marginal benefit equals the marginal cost. Marginal analysis is analysis that involves comparing marginal benefits and marginal costs.

### 1.2   Solving Economic Problems

After you graduate most of you will be doing with jobs in the future to solve problems. You have to recognize what the problems are before solving any of them. In this section, we will be discussing the three fundamental questions that every society faces and the responses to those questions in different markets.

### 1.2.1   Three Fundamental Economic Questions

1. What goods and services will be produced?
   The first question originates from the scarcity of resources[1]. Because a society can only produce a limited amount of goods and services, every activity has an opportunity cost since producing one good or service means less of another good or service.

2. How will the goods and services be produced?
   For example, in most economic models, we assume the production sector consists of firms which choose how to produce the goods and services they sell, i.e., $Y = AK^{\alpha}L^{1-\alpha}$. One of the most important decisions they have to make is to choose how many workers they hire ($L$) and how many machines they use ($K$). If holding the workers and machines constant, do they also upgrade technology ($A$).

3. Who will received the goods and services produced?
   In the United States, who receives the goods and services produced depends largely on how income is distributed. An important policy question is whether the government should intervene to make the distribution of income more equal.

### 1.2.2   Centrally Planned Economies versus Market Economies

Different societies respond differently to those above questions. But there are two main ways: centrally planned economy and market economy. A **centrally planned economy** is an economy in which the government decides how resources will be allocated. A **market economy** is an economy in which the decisions of households and firms interacting in markets allocate economic resources. Today, only a few small countries, such as Cuba and North Korea, still have completely centrally planned economies. In a market economy, the income of an individual is determined by the payments he receives for what he sells. Generally, the more extensive the training a person has received and the longer the hours the person works, the higher his income will be.

### 1.2.3   The Modern "Mixed" Economy

The high rates of unemployment and business bankruptcies during the Great Depression of the 1930s caused a dramatic increase in government intervention in the economy in the United States and other market economies. Some government intervention is designed to raise the incomes of the elderly, the sick, and people with limited skills. In recent years, government intervention has expanded to meet goals such as the protection of the environment, the promotion of civil rights, and the provision of medical care to low-income people and the elderly.

Some economists argue that the extent of government intervention makes it more accurate to refer to the economies of the United States, Canada and Western Europe as mixed economies rather

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[1]This should remind you of the concept in ECO 201 where individual economic agents make decisions to determine the allocation of resources.

than pure market economies. A **mixed economy** is an economy in which most economic decisions result from the interaction of buyers and sellers in markets but in which the government plays a significant role in the allocation of resources.

### 1.2.4 Efficiency and Equity

People generally believe market economies tend to be more efficient than centrally planned economies. There are two types of efficiency.

1. **Productive efficiency**

   Productive efficiency is a situation in which a good or service is produced at the lowest possible cost.

2. **Allocative efficiency**

   Allocative efficiency is a state of the economy in which production is in accordance with consumer preferences; in particular, every good or service is produced up to the point where the last unit provides a marginal benefit to society equal to the marginal cost of producing it.

Voluntary exchange is a situation that occurs in markets when both the buyer and the seller of a product are made better off by the transaction. Sometimes governments reduce efficiency by interfering with voluntary exchange in markets. But in some other cases, even though production is conducted in a way where a good or service is produced at the lowest possible cost to the *firm*, there are damages to the *society* if the firms ignore other costs such as environmental cost. In this case, government intervention can improve efficiency.

Society may not find an efficient economic outcome to be desirable. Many people prefer economic outcomes that they consider fair or equitable even if these outcomes are less efficient. Equity is the fair distribution of economic benefits. There is often a trade-off between efficiency and equity.[2]

## 1.3 Economic Models

Models are simplified versions of reality used to analyze the real-world situations. To develop a model, economists generally follow five steps.

1. Make Assumptions

   The first step to building a model is making assumptions. Since models are abstracted from the real-world and the real-world is complicated, we must make reasonable assumptions to serve the purposes of the model. For example, in microeconomics when we analyze individuals' choices between different bundles of goods, we are assuming consumers are rational and maximize utility.

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[2]Thomas Piketty's book "*Capital in the 21st Century*" is a good reference to look.

2. Form Testable Hypotheses

   An economic variable is something measurable that can have different values. A hypothesis in an economic model is a statement that may be correct or incorrect about an economic variable. The most important feature of a model is to predict a value of certain variables under certain conditions, which are hypotheses. If a hypothesis cannot be tested, then the model is not so useful since it does not provide any support to solving the real-world issues.

3. Test Hypotheses

   To test a hypothesis, we analyze statistics on the relevant economic variables. Economists accept and use an economic model if it leads to hypotheses that are confirmed by statistical analysis.

4. Revise the Model to Fit the Data

   If the model fails to explain what the real world is, then we need to revise the model to make it fit the data.

5. Explain Results

   **Positive analysis** is analysis concerned with facts and what it is. **Normative analysis** is analysis concerned with values and what it should be. Economics is about positive analysis, which measures the costs and benefits of different actions.

Because economics studies the actions of individuals, it is a social science. Economics considers human behavior in every context, not just in the context of business. Economists have played an important role in formulating government policies in areas such as the environment, health care, and poverty.

## 1.4 Microeconomics and Macroeconomics

Microeconomics is the study of how households and firms make choices, how they interact in markets, and how the government attempts to influence their choices.
Macroeconomics is the study of the economy as a whole, including topics such as inflation, unemployment, and economic growth.

## 1.5 Using Graphs and Formulas

Please refer to examples in slides.

# Lecture 2

# GDP: Measuring Total Production and Income

## 2.1 Measures of Total Production

### 2.1.1 Gross Domestic Product

There are a variety of measures used in estimating the total economic activity in an economy, including gross domestic product (GDP) and gross national product (GNP).

**Definition 2.1. GDP** is the *market value* of all *final goods and services* produced *in a country* during *a period of time*, typically one year.

In contrast, GNP is the market value of all the products and services produced in one year by the *citizens of a country*. We only focus on GDP in this class.

Economists measure total production in an economy by taking the value, in dollar terms, of all goods and services produced. GDP includes only final goods and services. A **final good or service** is a good or service purchased by a final user. An *intermediate good or service* is a good or service that is an input into another good or service, such as a tire on a truck. If we included the value of intermediate goods and services in GDP, we would be double counting. GDP includes only production that takes place during the indicated time period. GDP does not include the value of used goods.

### 2.1.2 Production and Income

There are two main conceptual ways to measure the total economic activity in an economy: total production or total income. They are identical because everything that is produced and sold is income for someone.
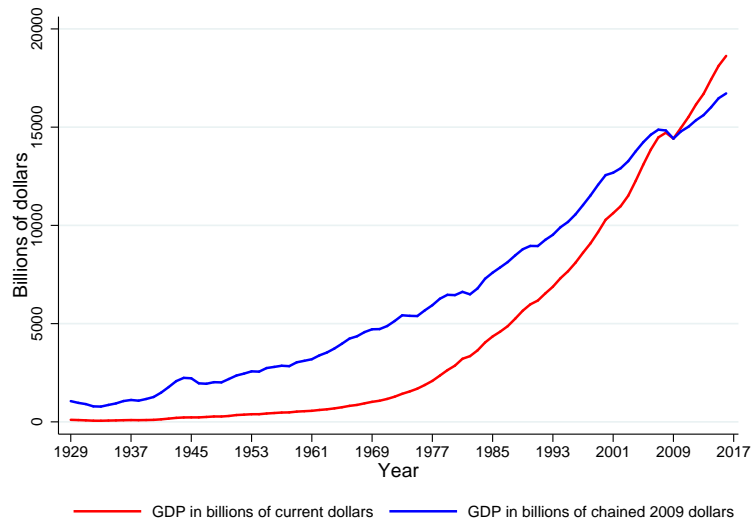
Figure 2.1: U.S. GDP
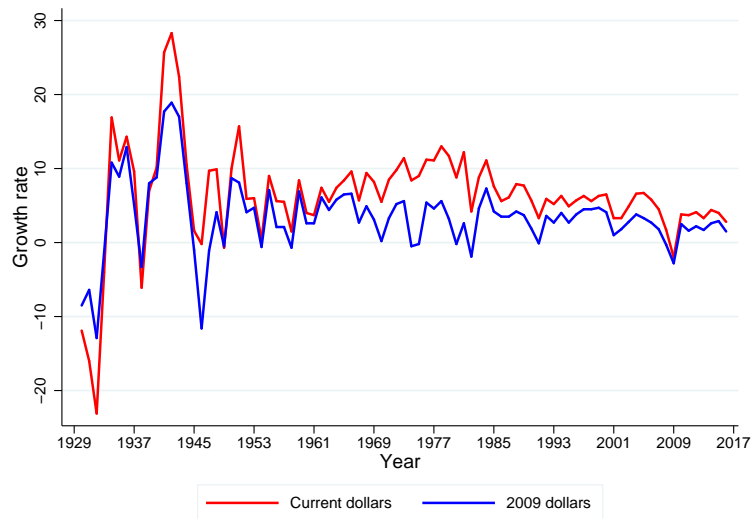


Figure 2.2: U.S. GDP Growth Rate

### 2.1.3 An Equation for GDP

A simple equation sums up the components of GDP:

$$Y = C + I + G + NX, \tag{2.1}$$

where $Y$ denotes GDP (total income), $C$ denotes consumption, $I$ denotes investment, $G$ denotes government expenditures and $NX = X - IM$ denotes next exports, which equals export $X$ minus import $IM$. This equation also implies total income must be equal to total expenditures.

1. Consumption is spending by households on goods and services, not including spending on new houses (which are counted instead in investment). In BEA statistics, consumption is further divided into expenditure on

   (a) Services
   (b) Nondurable goods
   (c) Durable goods

2. Investment is spending by firms on new factories, office buildings, and additions to inventories, plus spending by households and firms on new houses. The BEA measures the following categories of investment:

   (a) Business fixed investment
   (b) Residential investment
   (c) Changes in business inventories

3. Government expenditures are spending by federal, state, and local governments on goods and services, such as teachers' salaries, highways, and aircraft carriers. This does not include transfer payments, since those do not result in immediate production of new goods and services.

4. Net exports are the value of exports minus the value of imports.

### 2.1.4 Measuring GDP Using the Value-Added Method

An alternative way of calculating GDP is the value-added method. **Value added** is the market value a firm adds to a product. It is equal to the difference between the price for which the firm sells a good and the price it paid other firms for intermediate goods.

## 2.2 Shortcomings in GDP Measure

1. Measure of Total Production
   Household production and underground economy are omitted. Household production refers

to economic activity such as child care, cleaning, and cooking, which are not typically paid for with money. Underground economy refers to buying and selling of goods and services that is concealed from the government to avoid taxes or regulations, or because the goods and services are illegal.

2. Measure of Well-Being

   Leisure, pollution, and other social problems are not included in GDP.

## 2.3   Real GDP versus Nominal GDP

**Definition 2.2. Nominal GDP** is the value of final goods and services evaluated at current-year prices.

**Definition 2.3. Real GDP** is the value of final goods and services evaluated at base-year prices.

The number of real GDP will be different if you use different base-year prices, but the relative measure will be the same since it is only a scaling issue. Using real GDP we are able to separate prices changes from quantity changes. Because above all, all people care is the purchasing power, which reflects the quantity of goods one can buy with money.

Real GDP holds prices constant, which makes it a better measure than nominal GDP of changes in the production of goods and services from one year to the next. Because, on average, prices rise from one year to the next, real GDP is greater than nominal GDP in years before the base year and less than nominal GDP for years after the base year. In the base year, real and nominal GDP are the same. Sometimes people also call real GDP the price-adjusted GDP because it adjusts GDP for different price levels. The **price level** is a measure of the average prices of goods and services in the economy.

**Definition 2.4.** The GDP deflator is a measure of the price level, calculated by dividing nominal GDP by real GDP and multiplying by 100, i.e.,

$$\text{GDP deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} \times 100 \qquad (2.2)$$

**Example 2.1.** Consider the following example,

|                | 2013             | 2014             |
| -------------- | ---------------- | ---------------- |
| Nominal GDP    | $16,768 billion  | $17,419 billion  |
| Real GDP       | $15,710 billion  | $16,086 billion  |

Using Formula 2.2, we can calculate the GDP deflator for each year:

$$\text{GDP deflator}_{2013} = \frac{\$16,768 \text{ billion}}{\$15,710 \text{ billion}} \times 100 = 106.7$$

and
$$\text{GDP deflator}_{2014} = \frac{\$17,419 \text{ billion}}{\$16,086 \text{ billion}} \times 100 = 108.3.$$

The GDP deflator increased from 106.7 to 108.3:

$$\frac{108.3 - 106.7}{106.7} \times 100 = 1.5\%.$$

So we can say the price level rose by 1.5% over this period.

## 2.4 Other Measures of Total Production and Total Income

1. Gross National Product

   Gross National Product (GNP) is the value of final goods and services produced by residents of a country, even if the production takes place outside the country. GNP includes foreign production by domestic firms but excludes domestic production by foreign firms. For the United States, GNP is almost the same as GDP.

2. National Income

   In producing goods and services, some machinery, buildings and equipment wear out and have to be replaced. Depreciation is referred to as the consumption of fixed capital. If we subtract this value from GDP, we are left with national income.

3. Personal Income

   Personal income is income received by households. To calculate personal income, we subtract the earnings that corporations retain rather than pay to shareholders in the form of dividends and we add in the payments received by households from the government in the form of transfer payments or interest on government bonds.

4. Disposable Personal Income

   Disposable personal income is equal to personal income minus personal tax payments, such as the federal personal income tax. Disposable personal income is the best measure of the income households have available to spend.

5. The Division of Income

   We can measure GDP in terms of total expenditure or as the total income received by households. GDP calculated as the sum of income payments to households is sometimes referred to gross domestic income. The largest component of gross domestic income is wages, which are about three times as large as profits.
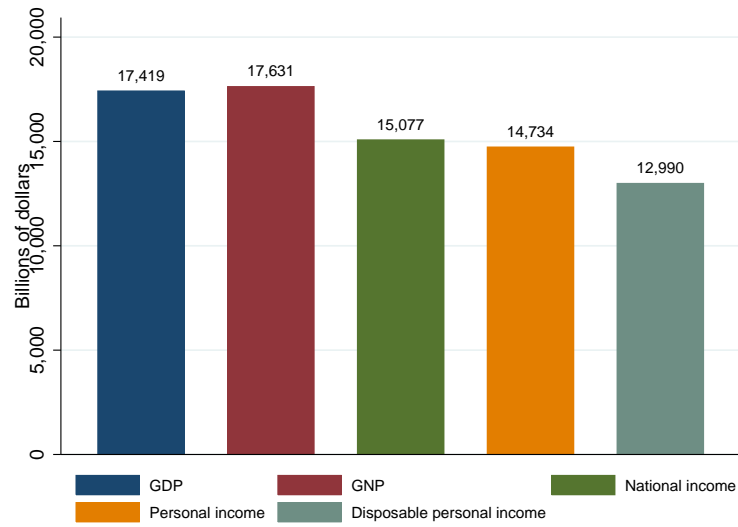
Figure 2.3: Measures of Total Production and Total Income, 2014

# Lecture 3

## Inflation

Recall that price level is a measure of average prices of goods and services in the economy. The **inflation rate** is the percentage increase in the price level from one period to another. The GDP deflator is the broadest measure of the price level, but to know the impact of inflation on the typical household, the deflator can be misleading. Changes in the consumer price index come closest to measuring changes in the cost of living as experienced by the typical household.

### 3.1 Measuring Inflation

**Definition 3.1.** The inflation rate is the percentage increase in the price level from one period to the next.

The Bureau of Labor Statistics (BLS) surveys households on spending habits and constructs a *market basket* of goods and services. The **consumer price index (CPI)** is measure of the average change over time in the prices a typical urban family of four pays for the goods and services they purchase.[1] One year is chosen as the base year, and the value of the CPI is set equal to 100 for that year. In any other year the CPI equals the ratio of the dollar amount necessary to buy the market basket in that year divided by the dollar amount necessary to buy the market basket in the base year, multiplied by 100. The CPI is sometimes called the *cost-of-living index*.

To calculate the CPI in a given year, we need

- A basket of goods

- The cost to purchase the basket of goods in a base year

- The prices in the current year

The CPI in the current year is the cost to purchase the basket of goods this year, divided by the cost in the base year. By convention, we multiply this by 100, so that the CPI in the base year is 100.

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[1] For details, please visit https://www.bls.gov/cpi/overview.htm.
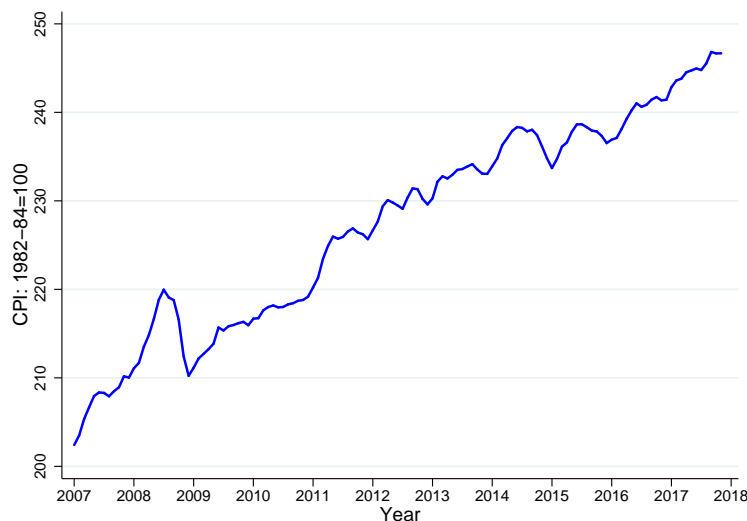
Figure 3.1: Consumer Price Index, 2007-2017

**Example 3.1.** Calculating the CPI.

|  |  | Base Year (1999) | | 2016 | | 2017 | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Product | Quantity | Price | Expenditures | Price | Expenditures | Price | Expenditures |
| Eye examinations | 1 | $50.00 | $50.00 | $100.00 | $100.00 | $85.00 | $85.00 |
| Pizzas | 20 | 10.00 | 200.00 | 15.00 | 300.00 | 14.00 | 280.00 |
| Books | 20 | 25.00 | 500.00 | 25.00 | 500.00 | 27.50 | 550.00 |
| Total |  |  | $750.00 |  | $900.00 |  | $915.00 |

Using the basket of goods from 1999 and the current prices, we can calculate the CPI in 2016 and 2017,

$$CPI_{2016} = \frac{\$900}{\$750} \times 100 = 120, \quad CPI_{2017} = \frac{\$915}{\$750} \times 100 = 122.$$

The inflation rate from 2016 to 2017 then is the percentage change in the CPI:

$$\frac{122 - 120}{120} \times 100 = 1.7\%.$$

The CPI is the most widely used measure of inflation. It is important that the CPI be as accurate as possible, but there are four biases that cause the CPI to overstate the true inflation rate: substitution bias, increase in quality bias, new product bias, and outlet bias.

- Substitution bias: Consumers may change their purchasing habits.

- Increase in quality bias: Hard to separate improvement in quality from increase in price.

- New product bias: The basket of goods do not change frequently.

- Outlet bias: CPI uses full retial price, but many people buy from discount stores or online.

Another type of price index is the **producer price index (PPI)** is an average of the prices received by producers of goods and services at all stages of the production process. Changes in the PPI can give early warning of future movements in consumer prices, because it predicts the final goods prices.

## 3.2   Inflation Adjustment, Nominal and Real Variables

Now we know that due to price level changes, the real GDP is not the same as nominal GDP. The purchasing power of consumer's money also applies. Suppose your mother received a salary of $25,000 in 1989 and this would have bought much more than the same amount of salary in 2014.[2]

Using price indexes to adjust for the effects of inflation allows us to compare dollar values from different years so we will have a better sense of the change in purchasing power and cost of living.

The basic formula for inflation adjustment for previous period values is as follows:

$$Y_{t_1} = \frac{CPI_{t_1}}{CPI_{t_0}} \times Y_{t_0}. \tag{3.1}$$

$Y_{t_0}$ is the amount of dollars you received in period $t_0$. $CPI_t$ is the price index for time $t$. Then you can calculate the purchasing power of $t_0$ in $t_1$ to get $Y_{t_1}$ and compare it with the actual amount you receive in time $t_1$.

Similarly, you can work backwards to get the purchasing power of $Y_{t_1}$ in $t_0$:

$$Y_{t_0} = \frac{CPI_{t_0}}{CPI_{t_1}} \times Y_{t_1}. \tag{3.2}$$

The current standard base "year" for the CPI is an average of 1982-1984 prices. Values like wages in current-year dollars are called **nominal variables**. When we adjust them for inflation, we divide them by the current year's price index and multiply by 100, to convert them to **real variables**.

**Example 3.2.** Calculating Real Wages at Caterpillar.

In 2013, Caterpillar and the United Steelworkers Union signed a labor contract that froze the wages of caterpillar workers for six years. In 2013, the average wage at Caterpillar was about $27 per hour and the CPI was 233. Suppose the CPI rises to 260 in 2018, the last year of the contract. Calculate the percentage change between 2013 and 2018 in the real wage earned by an average Caterpillar worker.

**Solution:**

We know that $Y_{2013} = Y_{2018} = \$27$, $CPI_{2013} = 233$ and $CPI_{2018} = 260$. The real wage for the amount of 2013 dollars in base year is then

$$Y_{2013} = \frac{100}{230} \times \$27 = \$11.59.$$

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[2]https://data.bls.gov/cgi-bin/cpicalc.pl is a place to calculator the purchasing power. You can play around with it.

The real wage for the amount of 2018 dollars in base year is then

$$Y_{2018} = \frac{100}{260} \times \$27 = \$10.38.$$

Now we are comparing dollars of 2013 and 2018 in the base year, which is the period 1982-84.

$$\frac{\$10.38 - \$11.59}{\$11.59} = -10.4\%.$$

So the real wage actually declines 10.4% between 2018 and 2013.

## 3.3 Nominal Interest Rates versus Real Interest Rates

Similar to the wage which is the price for labor, the interest rate is the price for capital. When you lend money to someone, you are letting them work for other people to make more money and hence you get the return on those money you lend. For example if the interest rate is 6 percent, for a \$1,000 loan you get \$1,060 back after one year. But notice, here we are referring to the nominal interest rate, which is the stated interest rate on a loan. Combining what we learned in the previous section, you might start to question due to the inflation change, the real value of that money I get back may not worth \$1,060 dollars today. Then what is the real interest rate?

The **real interest rate** is equal to the nominal interest rate minus the inflation rate. Suppose the inflation rate is $\pi_t$ for year $t$ and the nominal interest rate is $r_t$ for year $t$. The real interest rate then is[3]

$$R_t = r_t - \pi_t. \tag{3.3}$$

**Example 3.3.** Computing the Real Interest Rate.

|  | 1980 | 1981 | 1984 | 1985 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|
| Interest rate on three-month T-bills | 11.39 | 14.04 | 9.54 | 7.47 | 0.05 | 0.09 | 0.06 | 0.03 | 0.05 |
| Percentage change in the CPI-U | 13.5 | 10.38 | 4.37 | 3.53 | 3.14 | 2.08 | 1.46 | 1.61 | 0.12 |

The real interest rate for those years are obtained by subtracting percentage change in the CPI from nominal interest rate.

|  | 1980 | 1981 | 1984 | 1985 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|
| Real interest rate | -2.11 | 3.66 | 5.17 | 3.94 | -3.09 | -1.99 | -1.4 | -1.58 | -0.07 |

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[3]To see why this is true, suppose you have $Y_t$ amount in the beginning of $t$. The nominal interest rate is $r_t$ for year $t$. Then you expect to get back $Y_t \times (1 + r_t)$ at the end of $t$. However, due to the inflation rate $\pi$, for every \$1 you receive eventually, it only worths $\$\frac{1}{1+\pi}$ now. It implies the real value of the money you get back is $Y_t \times \frac{1+r_t}{1+\pi_t}$. Then it is straightforward to calculate the real return on the money you lend:

$$\frac{Y_t \times \frac{1+r_t}{1+\pi_t} - Y_t}{Y_t} = \frac{1+r_t}{1+\pi_t} - 1 = \frac{r_t - \pi_t}{1+\pi_t}.$$

For small $\pi$, it is approximate to $r_t - \pi_t$.

## 3.4   Does Inflation Impose Costs on the Economy?

After we learned so much about inflation, some of you might start to ask if inflation is a good thing or bad thing. Essentially, if all prices (including wage and interest rate, since they are prices of labor and capital) change at the same rate, then nothing will change since you will use the money in your hands to buy exact the same amount of goods and services. But the problem is most of the time it is not true that all prices and wages change at the same rate. Then it will cause some people to benefit and some people to lose.[4] Particularly, for people who rely more on fixed incomes, inflation seems to be a bad thing, because the purchasing power of their income falls.

One solution to solve the problem is to peg wage to inflation change. This is so called "anticipated inflation". Suppose you anticipate this year's inflation will be 5 percent, then you will sign a contract with a company only if it will raise your wage 5 percent next year. But it also causes problems in three ways:

- People and firms have increased real costs of holding cash.

- Firms have **menu costs**, which are the costs to firms of changing prices. Frequently changing prices are costly for firms.

- Investors are taxed on nominal returns, rather than real returns; so this can increase the tax due.

Unanticipated inflation will make things even worse because it discourage people or firms from participating economic activities because they are not able to forecast the rate of inflation so that they can calculate the real return rate on a loan or the real wages.

On the contrary, **deflation** is much more dangerous for an economy than inflation. Deflation is the opposite of inflation where price level falls. Suppose you know that you will only use $80 to buy a $100 good next month, a rational consumer will postpone this purchase. But if everyone does the same thing, there is no buying taking place in the market and the firms are not able to sell goods, so people lose jobs and all economic activities are interrupted. Economists believe this occurred after the Great Depression of the 1930s and also in Japan in the 1990s.

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[4]See Piketty's book where he discusses the distribution of income through wage and capital.

# Lecture 4

## Unemployment

### 4.1 Measuring the Unemployment

#### 4.1.1 Basic Definitions

Each month the U.S. Bureau of the Census conducts the *Current Population Survey (CPS)* to collect data needed to compute the monthly unemployment rate. Here are several main concepts in labor economics.

**Definition 4.1.** An **employed** person is a person who currently has a job or is temporarily away from his or her job.[1]

**Definition 4.2.** An **unemployed** person is a person who is not currently at work but **actively looked for** work during the previous month.

**Definition 4.3.** The **labor force** is the sum of employed and unemployed persons.

**Definition 4.4.** The **labor force participation rate** is the labor force as a percent of the civilian noninstitutional population.[2]

**Definition 4.5.** The employment-population ratio is the employed people as a percent of the civilian noninstitutional population.

For simplicity, let $N$ be the civilian noninstitutional population, $E$ be the number of people employed, and $U$ be the number of people unemployed, then the labor force is

$$LF = E + U, \tag{4.1}$$

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[1] BLS Definition: Employed persons consist of: persons who did any work for pay or profit during the survey reference week; persons who did at least 15 hours of unpaid work in a family-operated enterprise; and persons who were temporarily absent from their regular jobs because of illness, vacation, bad weather, industrial dispute, or various personal reasons. https://www.bls.gov/cps/lfcharacteristics.htm#emp

[2] Civilian noninstitutional population are persons 16 years of age and older residing in the 50 states and the District of Columbia who do not live in institutions (for example, correctional facilities, long-term care hospitals, and nursing homes) and who are not on active duty in the Armed Forces. *U.S. Bureau of Labor Statistics, Civilian Noninstitutional Population [CNP16OV].*

the unemployment rate is

$$UR = \frac{U}{LF} = \frac{U}{E + U},$$ (4.2)

the labor force participation rate is

$$LFP = \frac{LF}{N},$$ (4.3)

and the employment-population ratio is

$$EPR = \frac{E}{N}.$$ (4.4)

### 4.1.2 Problems with Measuring the Unemployment Rate

The unemployment rate is not a perfect measure of the current state of joblessness for two reasons:

- It may understate unemployment:
  - Distinguishing between people who are unemployed and not in the labor force requires judgment (should we exclude "discouraged workers?")
  - Only measures employment, not intensity of employment (full-time vs. part-time; some people are underemployed)

- It may overstate unemployment:
  - People might claim falsely to be actively looking for work
  - May claim not to be working to evade taxes or keep criminal activity unnoticed

## 4.2 Trends and Facts
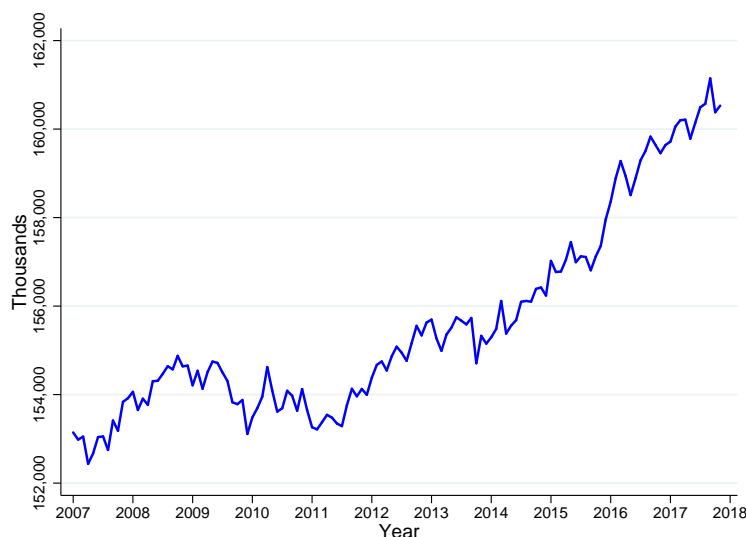


Figure 4.1: U.S. Labor Force
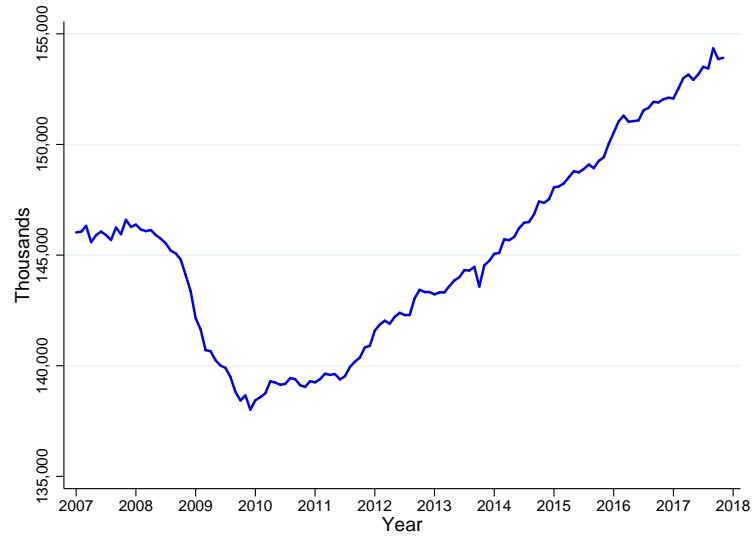
Figure 4.2: U.S. Employment
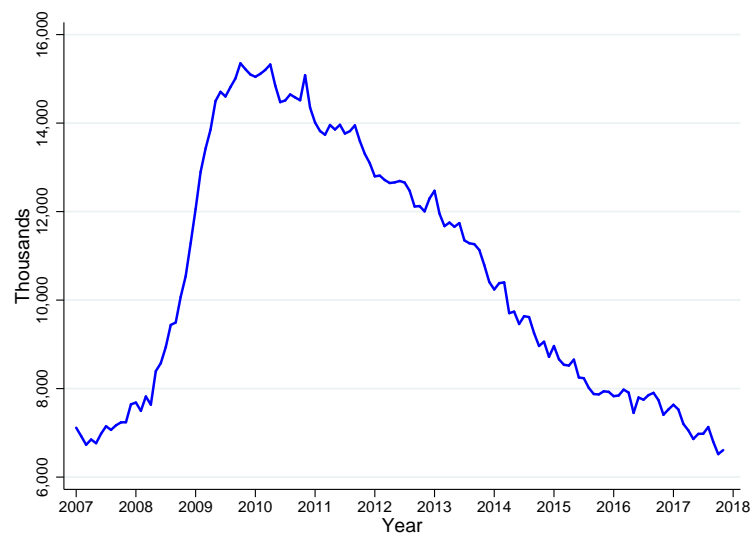
Figure 4.3: U.S. Unemployment
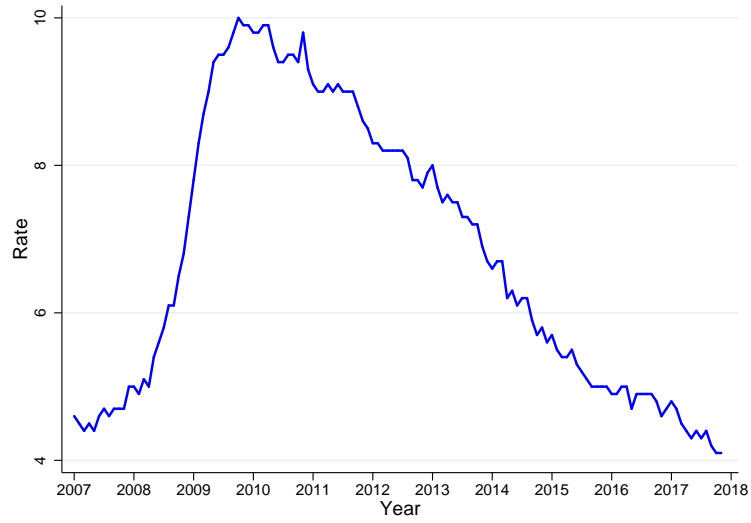
Figure 4.4: U.S. Unemployment Rate
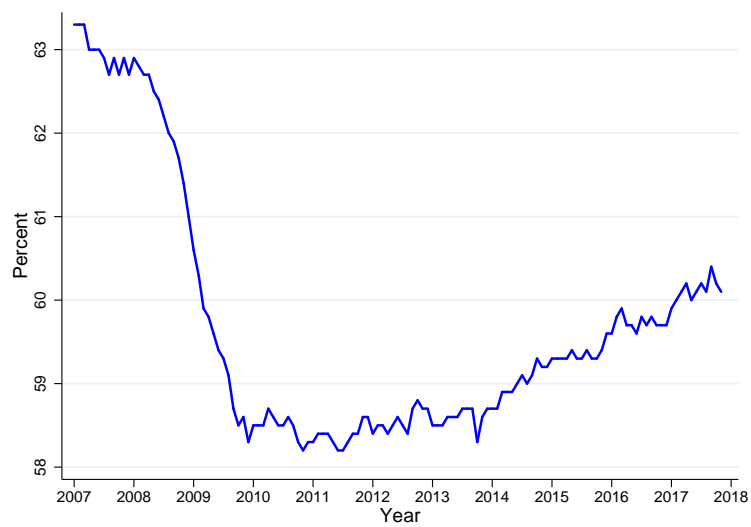


Figure 4.5: U.S. Employment Population Ratio
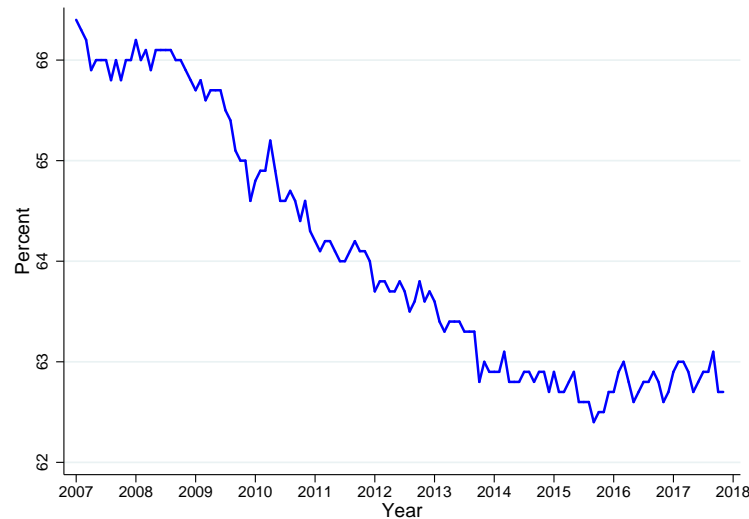
Figure 4.6: U.S. Labor Force Participation Rate

The BLS also conducts the establishment survey to measure the total employment in the economy. This monthly survey samples about 300,000 business establishments to provide information on the total number of persons who are employed and on a company payroll. However, it does not include self-employed people, newly opened firms are often omitted, and it only includes information on employment. Despite these drawbacks, since it has more accurate data on actual payrolls and economists are using more of this in analyzing current labor market conditions.

### 4.2.1 Job Creation and Job Destruction

The U.S. economy creates and destroys millions of jobs every year. The creation and destruction of jobs results from changes in consumer tastes, technological progress, and the successes and failures of entrepreneurs in responding to the opportunities and challenges of shifting consumer tastes and technological change. When the BLS announces each month the increases or decreases in the number of people employed and unemployed, these are net figures.

## 4.3 Types of Unemployment

**Definition 4.6. Frictional unemployment** is short-term unemployment that arises from the process of matching workers with jobs.

**Definition 4.7. Structural unemployment** is unemployment that arises from a persistent mismatch between the skills and attributes of workers and the requirements of jobs.

**Definition 4.8. Cyclical unemployment** is unemployment caused by a business cycle recession.

### 4.3.1 Frictional Unemployment

There will always be workers who search for a job and firms that look for people who fit their vacant jobs. These search and match process result in the frictional unemployment. Some unemployment is due to seasonal factors, such as weather or fluctuations in demand during different times of the year. Seasonal unemployment refers to unemployment due to factors such as weather, variations in tourism, and other calendar-related events.

### 4.3.2 Structural Unemployment

Structural unemployment is unemployment that arises from a persistent mismatch between the skills or attributes of workers and the requirements of jobs. This type of unemployment can last for longer periods than frictional unemployment because workers need time to learn new skills. For instance, the decline of manufacturing industry could lead to a large reduction in employment in those manufacturing firms and it takes longer for those workers to learn new skills and have new jobs.

### 4.3.3 Cyclical Unemployment

When the economy moves into recession, many firms find their sales falling and cut back on production. As production falls, firms lay off workers. Cyclical unemployment is unemployment caused by a business cycle recession.

### 4.3.4 Full Employment

The natural rate of unemployment is the normal rate of unemployment, consisting of frictional unemployment and structural unemployment. The natural rate of unemployment is also called the full employment rate of unemployment.

## 4.4 Explaining Unemployment

### 4.4.1 Unemployment Insurance

If you are unemployed and have been looking for a job, there are two options available when a new job is offered. You can either take it or wait and look for a better job. If you have unemployment insurance with you and it is still within the time period that the insurance covers, you probably will take more time to find a "better" job instead of just accepting the job that is available. Because you have support from the government to get through the hardship and maintain the income and spending. Some studies have shown that unemployment insurance will increase the search spell.

### 4.4.2   Minimum Wage Laws

Federal minimum wage law was introduced in 1938 with $0.25/hour. Today the federal minimum wage is $7.25/hour and it varies by states. Studies have suggested that a 10 percent increase in the minimum wage reduces teenage employment by about 2 percent.

### 4.4.3   Labor Union

Labor unions are organizations of workers that bargain with employers for higher wages and better working conditions for their members. In unionized industries, the wage is usually above what otherwise would be the market wage, but most economists believe that this does not result in an increase in the overall unemployment rate because only about 9 percent of workers outside the government sector are unionized.

### 4.4.4   Efficiency Wages

An efficiency wage is an above-market wage that a firm pays to increase workers' productivity. Efficiency wages are another reason economies experience some unemployment even when cyclical unemployment is zero. Since it pays above the market wage, the labor supply is higher and therefore a fraction of people will be unemployed. Another way of thinking this is that when people lose jobs it is more difficult for them to accept a new job pays below the efficiency wage.

# Lecture 5

# Economic Growth and Business Cycles

Not only economists care about economic growth, but also workers, reporters, press, governments, and everyone cares about growth. Why do we all care about economic growth? Economic growth is the increase in a country's standard of living over time. People want a better life which cannot be achieved without a strong economy. In this chapter, we study the growth both in a long-term and short-term perspective and explore various factors that lead to a stronger or weaker economy.

## 5.1 Long-Run Economic Growth

**Definition 5.1. Long-run economic growth** refers to the process by which rising productivity increases the average standard of living.

The most commonly used measure of standard of living is real GDP per capita. It is the amount of production in the economy per person adjusted for changes in the price level. Because fundamentally, we see population is growing and if the production can not catch the speed of population growth, the goods and services one person can get will decline and that is not what a strong economy represents. Real GDP per capita in the U.S. has risen more than eight-fold since 1900, meaning the average American can buy more than eight times as many goods and services now as in 1900.

### 5.1.1 Calculating Growth Rates and the Rule of 70

The growth rate of real GDP or real GDP per capita during a particular year is equal to the percentage change from the previous year. Let $Y_t$ be the real GDP in year $t$, $Y_{t+1}$ the real GDP in year $t + 1$. The growth rate of GDP in year $t + 1$ is just

$$GR = \frac{Y_{t+1} - Y_t}{Y_t} \times 100. \tag{5.1}$$
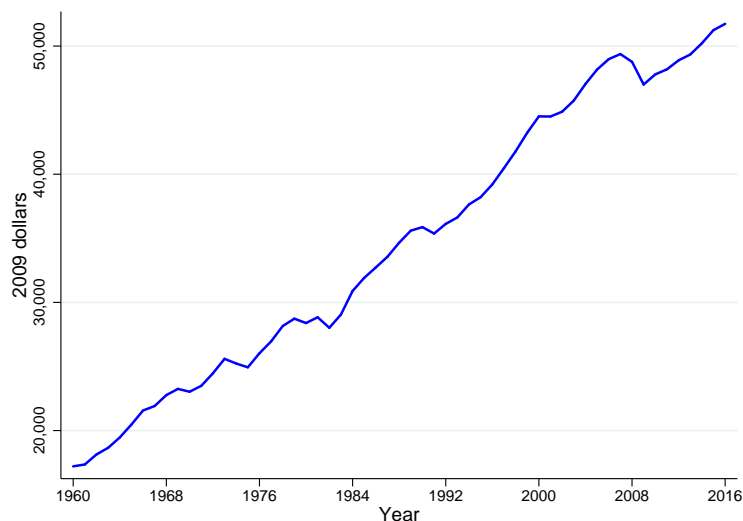
Figure 5.1: U.S. Real GDP per Capita

For a **longer** time period, it is **not** a good way to calculate the annual growth rate and average them out. Usually we use the following formula to calculate the compound growth rate $g$:

$$Y_0 \times (1 + g)^t = Y_t, \tag{5.2}$$

where $Y_0$ is the base year real GDP and $Y_t$ is the current year real GDP. $t$ is the number of time periods between the base year and current year.

We can judge how rapidly an economic variable is growing by calculating how many years it would take to double. An easy way to calculate how many years it will take real GDP per capita to double is to use the rule of 70. The formula for the rule is:

$$\text{Number of years to double} = \frac{70}{\text{Growth rate}}. \tag{5.3}$$

If the growth rate is 5 percent, then it takes 14 years to double.

### 5.1.2 Determinants of Long-Run Growth

The key determinant of long-run growth is **labor productivity**, which is defined as **the quantity of goods and services produced by one worker of one hour of work**. In order to avoid the fluctuations in the length of the working time and fraction of population that are employed, people usually use output per hour of work as a measure of labor productivity.

There are four main factors affecting the growth in labor productivity.

- Capital

- Human capital

- Technology

- Institutions

### 5.1.3 Potential GDP

Another concept when people compare economic growth is the potential GDP, which refers to the level of real GDP attained when all firms are operating at capacity. Potential GDP will increase over time as the labor force grows, new factories are open, new machinery and equipment are installed, and new technological change takes place.

## 5.2 Saving, Investment, and the Financial System

Economic growth relies very much on the sophistication of financial system because it provides the funds for firms to operate and expand and entrepreneurs who possess wonderful ideas to start up their companies and make investments. Financial markets are markets where financial institutions as well as individuals to buy and sell financial secretaries such as stocks and bonds. The most important component of financial markets is financial intermediaries, which consists of banks, insurance companies, mutual funds, etc. The basic idea of a financial intermediary is to gather money from those who do not use for now and lend them to borrowers who need money to invest and get better return in the future. Therefore, the financial system provides three key services for savers and borrowers:

- Risk sharing.

- Liquidity.

- Information.

### 5.2.1 The Macroeconomics of Savings and Investment

In this section we will derive the savings-investment identity under the national income accounting. Recall that the GDP of a country $Y$ is the sum of consumption $C$, investment $I$, government expenditure $G$, and net exports $NX$,

$$Y = C + I + G + NX. \tag{5.4}$$

If we assume a closed economy and there is no trade with other countries, so export and import will be zero,

$$Y = C + I + G. \tag{5.5}$$

Rearranging the above equation we can get

$$I = Y - C - G. \tag{5.6}$$

Investment is equal to total income minus private consumption and government expenditures.

Next we derive the total savings. Total savings is composed of **private savings** (by households, $S_p$) and **public savings** (by government $S_g$).

$S_p$ is household income that is not spent; household income includes payments for factors of production $(Y)$ and transfer payments $(TR)$; households consume $(C)$ and pay taxes $(T)$. So

$$S_p = Y + TR - C - T.$$

The government "saves" whatever it brings in but does not spend (this may be negative, known as dissaving):

$$S_g = T - G - TR.$$

Therefore, total saving is

$$S = S_p + S_g = Y + TR - C - T + T - G - TR = Y - C - G \tag{5.7}$$

Compare 5.7 with 5.6, we know that total savings must equal total investment.

$$S = I.$$

When the government spends whatever it collects in taxes, we call it *balanced budget*. When the government spends more than it collects in taxes, we call it *budget deficit*, which means that the government is overspending and dissaving, $S_g < 0$. When the government runs a budget deficit, the U.S. Department of the Treasury sells Treasury bonds to borrow the money necessary to fund the gap between taxes and spending. We discussed the implications of government budget deficit which results in lower total saving and lower investment.

### 5.2.2 The Market for Loanable Funds

The market for loanable funds refers to the interaction of borrowers and lenders that determines the market interest rate and the quantity of loanable funds exchanged. The **demand** for loanable funds is determined by the willingness of firms to **borrow** money and to engage in new investment projects. The lower the interest rate, the more investment projects a firm can profitably undertake. The **supply** of loanable funds is determined by the willingness of households to **save** and by the extent of government saving or dissaving. The higher the interest rate, the greater the reward for saving and the larger the amount of funds households will save. Because both borrowers and lenders are interested in the real interest rate they will receive or pay, equilibrium in the market for loanable funds determines the real interest rate.
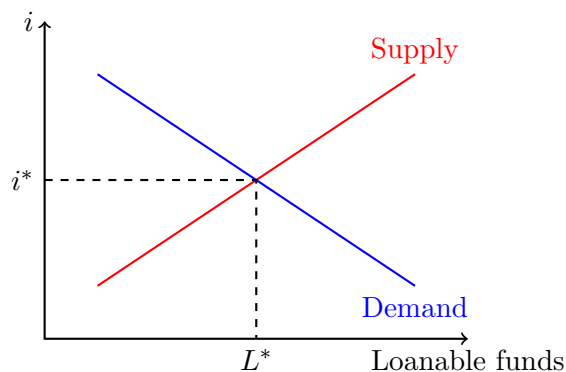
We draw the demand curve for loanable funds by holding constant all factors, other than the interest rate, that affect the willingness of borrowers to demand funds. We draw the supply curve by holding constant all factors, other than the interest rate, that affect the willingness of lenders to supply funds. An increase in the demand for loanable funds increases the equilibrium interest rate. As a result, the equilibrium quantity of loanable funds increases. A government deficit reduces the level of total saving in the economy and, by increasing the interest rate, reduces the level of investment by firms. By borrowing the money to finance its budget deficit, the government will have crowded out some firms that would otherwise have been able to borrow to finance investment. **Crowding out** is a decline in **private expenditures** as a result of an increase in **government purchases**. The effect of government budget deficits and surpluses on the equilibrium interest rate is small, partly because of the importance of global saving in determining the interest rate.

## 5.3   The Business Cycle

### 5.3.1   Some Basic Definitions and Facts

A business cycle often consists of **expansion phase**, **peak**, **recession phase**, and **trough**. During expansion, production, employment, and income are increasing. It ends with a peak and followed by the decline in those economic variables. Once it reaches the trough, another expansion will begin.

Usually it is difficult to forecast. NBER use historical data and more time to gather information and announce business cycle dates.

### 5.3.2   Effects

- Durable goods consumption will be reduced during recession.

- Price level will go down during recession and increase when in the expansion phase.

- Unemployment will be worse and often continues to rise at the end of each recession.

### 5.3.3 The Great Moderation

Before 1950, real GDP had suffered greater fluctuations than it has since. By the early twenty-first century, some economists had begun referring to the absence of severe recessions in the United States as the *Great Moderation*. This view was questioned with the recession-the Great Recession-of 2007-2009, which lasted 18 months, the longest of the post-1950 period. Are we going back? Before answering this question, we should know the fundamentals of the great moderation.

- The increasing importance of services.

    - Manufacturing (especially of durable goods) is more strongly affected by recessions.

- The establishment of unemployment insurance

    - Welfare programs increase the ability of consumers to purchase goods and services during recessions.

- Active federal government stabilization policies (still in debate)

- Increased stability of the financial system

# Lecture 6

# Long-Run Economic Growth: Sources and Policies

## 6.1 Economic Growth over Time and around the World

### 6.1.1 Long-Run Growth since Industrial Revolution

We do not see sustained economic growth between 1,000,000 B.C. and 1300 A.D. Industrial Revolution refers to the application of mechanical power to the production of goods, beginning in England around 1750. Before that, production of goods had relied heavily on human or animal power. First England, then other countries, experienced *long-run* economic growth with sustained increases in real GDP per capita.

Even small growth rate matters a lot in the long-run perspective. The following graph shows a numerical plot of the same initial GDP starting from unity, one with 1% annual growth rate and the other with 2% annual growth rate. You can see the gap widened as time passes. The absolute value does not have any interpretation but you can easily compare the ratio between these two economies.
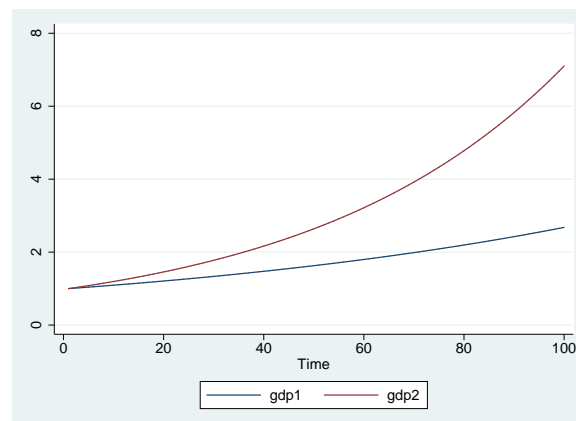


Figure 6.1: Comparison of 1% and 2% Growth Rate in a 100-Year Window

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Why do we care about growth rate? Because it is related to the growth of our living standards and not only mean income, but also life expectancy, infant mortality and other important aspects.

## 6.2 What Determines Growth

### 6.2.1 Growth Model

We introduce a growth model[1] which explain growth rate in real GDP per capita over the long-run. It can be illustrated by using the **per-worker production function**, the relationship between real GDP per hour worked and capital per hour worked, holding the level of technology constant.

- Increases in the quantity of capital per hour worked result in movements up along the per-worker production function.

- Holding technology constant, equal increases in the amount of capital per hour worked lead to **diminishing** increases in output per hour worked.

What affect technological change?

- Better machinery and equipment.

- Human capital.

- Better means of organizing and managing production.

Technological change is the key to make sustainable economic growth. Because it generates increasing return at the economy level. Paul Romer proposed **new growth theory** which emphasizes that technological change is influenced by economic incentives and so is determined by the working of the market system. Unlike the previous model focuses on a exogenous shift in technology level, new growth theory argues that the rate of technological change is influenced by how individuals and firms respond to economic incentives.

The use of knowledge capital is nonrival because one firm's use of that knowledge does not prevent another firm from using it. Romer points out that firms are unlikely to engage in research and development up to the point where the marginal cost of the research equals the marginal return from the knowledge gained because other firms will gain much of the marginal return. Government policy can increase the accumulation of knowledge capital in three ways:

- Protecting intellectual property with patents and copyrights.

- Subsidizing research and development.

- Subsidizing education.

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[1]Mainly by Robert Solow, so-called neo-classical model, which focuses on capital accumulation and exogenous technological change.

### 6.2.2 Joseph Schumpeter and Creative Destruction

The new growth theory echoes the ideas of Joseph Schumpeter, who developed a model of growth that emphasized his view that new products drive older products-and the firms that produce them-out of the market. For Schumpeter, the key to rising living standards is the development of new products that meet consumer needs in qualitatively different ways. Successful entrepreneurs can use their profits to finance the development of new products.

## 6.3 Economic Growth in the U.S.

By looking at the growth rate of the U.S. since 1800, we saw two slow-down periods which are between 1974 and 1995 and after the Great Recession. Productivity in the United States grew rapidly from the end of World War II until the mid-1970s. Growth then slowed down for 20 years. Beginning in the mid-1990s, the growth rate picked up again, but beginning in 2006, growth slowed once more.

Some economists argue that quality improvements are hard to measure so actually the growth rate was underestimated. Pessimistic views believe that IT revolution resulted in insufficient demand for investment spending and hence the secular stagnation. They claim that

- Slowing population growth will reduce the demand for housing.

- Modern information technology firms will require less capital than older firms.

- The price of capital has been falling relative to the prices of other goods.

Other optimistic people think

- Once the economy continues to recover from the recession, demand for investment goods will increase.

- The rest of the world will also create demand for U.S. products.

- Education and health services are becoming more and more important in U.S. GDP, and this is robust to shocks.

## 6.4 Why Isn't the Whole World Rich?

The growth model tells us that economies grow when the quantity of capital per hour worked increases and when technological change takes place. The profitability of using additional capital is more efficient in a developing country than in a high-income country. The economic growth model predicts that poor countries will grow faster than rich countries. Catch-up is the prediction that the level of GDP per capita (or income per capita) in poor countries will grow faster than in rich countries. It can be shown by a downward sloping line with vertical axis the growth rate and horizontal axis the initial level of GDP per capita.

But we only found limited evidence supporting the catch-up. We do not see world-wide evidence of catching up. Even for high-income countries, they still fail to catch up the U.S. Why? Because U.S. has flexible labor markets and efficient financial system comparing to other developed economies.

There are several reasons why low-income countries do not grow fast enough.

- The governments fail to enforce the rule of law.

- There are long time wars and frequent revolutions.

- They have poor public education and health, which resulted in less human capital accumulation.

- They have low rates of saving and investment and hence do not have sufficient capital.

Solutions? Foreign investment and globalization.

## 6.5   Growth Policies

From the previous discussion on the causes of the lack of growth, we think that in order to promote long-run economic growth, a government needs to do the following:

- Enhancing property rights and the rule of law.

- Improving health and education.

- Policies that promote technological change.

- Policies that promote savings and investment.

# Lecture 7

# Aggregate Expenditure, Demand, and Supply

This summary covers chapter 12 and chapter 13, which focus on aggregate expenditure and then goes from expenditure to demand and supply analysis. The aggregate demand and aggregate supply model explains short-run fluctuations in real GDP and the price level. The aggregate demand ($AD$) curve shows the relationship between the price level and the quantity of real GDP demanded by households, firms, and the government. The short-run aggregate supply ($SRAS$) curve shows the relationship in the short run between the price level and the quantity of real GDP supplied by firms. In the short run, real GDP and the price level are determined by the interaction of the aggregate demand curve and the short-run aggregate supply curve.

## 7.1 Aggregate Expenditure and Output in the Short-Run

### 7.1.1 The Aggregate Expenditure Model

**Definition 7.1.** Aggregate expenditure model is a macroeconomic model that focuses on the **short-run** relationship between **total spending** and **real GDP**, assuming that the price level is constant.

Aggregate expenditure (AE) is total spending in the economy: the sum of consumption ($C$), planned investment ($I$), government purchases ($G$), and net exports ($NX$):

$$AE = C + I + G + NX$$

### 7.1.2 The Difference between Planned Investment and Actual Investment

**Inventories** play an important role in adjusting macroeconomic equilibrium. Inventories are goods that have been produced but not yet sold. Notice,

$$\text{Planned investment} = \text{Actual investment} - \text{unplanned change in inventories}$$

If there is an unplanned increase in inventories, then we know that the actual investment is higher than planned investment. Alternatively, if there is a decrease in unplanned inventories, then actual investment spending will be less than planned investment spending.

### 7.1.3 Macroeconomic Equilibrium and Adjustment

For the economy as a whole, macroeconomic equilibrium occurs where aggregate expenditure equals total production, or GDP

$$AE = Y$$

How does the adjustment to equilibrium happen? You should refer to the lecture slide where there is a table showing different cases. Generally, when aggregate expenditure is greater than GDP, inventories will decline, and GDP and total employment will increase. When aggregate expenditure is less than GDP, inventories will increase, and GDP and total employment will decrease. Only when aggregate expenditure equals GDP will firms sell what they expected to sell. In this case, their inventories will be unchanged, and they will not have an incentive to increase or decrease production.

## 7.2 Determining the Level of Aggregate Expenditure in the Economy

Now we examine the four components of aggregate expenditure one by one.

### 7.2.1 Consumption

Consumption takes the largest share of aggregate expenditure, which also follows a relatively smooth and upward trend (unlike investment with a lot of fluctuations). *Current* **disposable** income $(+)$, household wealth $(+)$, expected *future* income $(+)$, the price level $(-)$, and the interest rate $(-)$ all affect **current** consumption. I put the direction of how **current** consumption respond to those variables in the parentheses.

The consumption function is the relationship between consumption spending and disposable income.

**Example 7.1.** The marginal propensity to consume (MPC) is the slope of the consumption function: The amount by which consumption spending changes when disposable income changes. We can write the expression for the MPC as:

$$MPC = \frac{\text{Change in consumption}}{\text{Change in disposable income}} = \frac{\Delta C}{\Delta YD}$$

Notice, $MPC \leq 1$. It measures how much you are willing to consume with an extra dollar disposable income. Normally you will only consume a fraction of your income and save a portion

of it. That will be the marginal propensity to save. How to derive that? You should understand the following derivations.

If we assume that net taxes do not change as national income changes, we have the result that any change in disposable income is the same as the change in national income because

$$\text{Disposable income} = \text{National income} - \text{Net taxes}.$$

If $\Delta T = 0$ net taxes change is zero, we have $\Delta YD = \Delta Y$, the change in disposable income is the change in national income. Since

$$\text{National income} = \text{Consumption} + \text{Saving} + \text{Taxes},$$

Change in national income = Change in consumption + Change in saving + Change in taxes,

which can be written as
$$Y = C + S + T$$

and
$$\Delta Y = \Delta C + \Delta S + \Delta T = \Delta C + \Delta S.$$

Therefore, divide both sides by $\Delta Y$ we have

$$1 = \frac{\Delta C}{\Delta Y} + \frac{\Delta S}{\Delta Y}$$

$$1 = MPC + MPS.$$

### 7.2.2 Planned Investment

Investment are affected by expectations of future profitability $(+)$, the interest rate $(-)$, taxes $(-)$, and cash flow $(+)$.

### 7.2.3 Government Purchases

Total government purchases include all spending by federal, state and local governments for goods and services. Government purchases have generally, though not consistently, increased over time; exceptions include the early 1990s (end of Cold War) and after the recession of 2007-2009. It is related to fiscal policy which we will cover in later chapters.

### 7.2.4 Net Exports

Net exports equal exports minus imports. The three most important variables that determine the level of net exports are: The price level in the United States relative to the price levels in other countries $(-)$, the growth rate of GDP in the United States relative to the growth rates of GDP in other countries $(-)$, and the exchange rate between the dollar and other currencies $(-)$. The

intuition behind these relationship are: 1) higher domestic goods price will make citizens substitute for foreign goods hence import will be increasing; 2) higher GDP growth rate means U.S. citizens are more capable of buying other countries goods, hence import is increasing; and 3) strong dollar value will make buying foreign goods cheaper, so import is increasing. If import is increasing relative to export, the net exports will decrease.

### 7.2.5   Graphing Macroeconomic Equilibrium
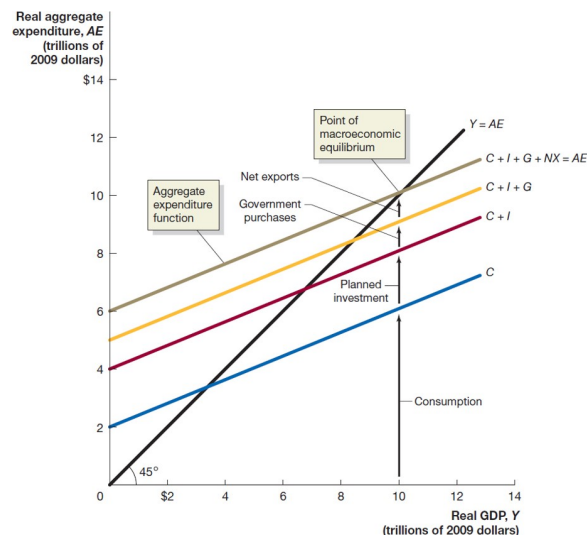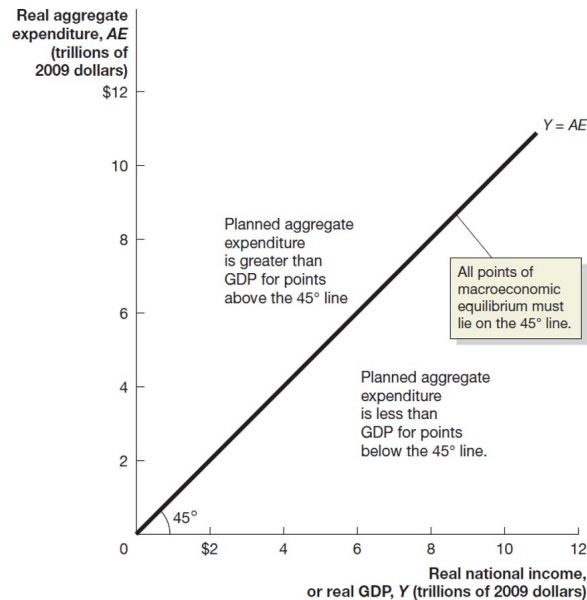




We can use a 45°-line diagram to illustrate macroeconomic equilibrium. In a graph, the line represents all the points that are equal distances from both axes. Since macroeconomic equilibrium occurs where planned aggregate expenditure equals GDP, we know that all points of macroeconomic equilibrium must lie along the 45°-line. We assume that the variables that determine planned

investment, government purchases, and net exports all remain constant, as well as the variables other than GDP that affect consumption. Where the aggregate expenditure ($AE$) line crosses the 45°-line, planned aggregate expenditure is equal to GDP, and the economy is in macroeconomic equilibrium.

From this graph, we can also show how an economy is back to macroeconomic equilibrium by adjusting inventories. When planned aggregate expenditure is less than real GDP, firms will experience unplanned increases in inventories. If firms accumulate excess inventories, then even if spending quickly returns to its normal levels, firms will have to sell these excess inventories before they can return to producing at normal levels.

### 7.2.6   The Multiplier Effect

The multiplier is the increase in equilibrium real GDP divided by the increase in autonomous expenditure. The multiplier effect is the process by which an increase in autonomous expenditure leads to a larger increase in real GDP.

$$\text{Multiplier} = \frac{\text{Change in equilibrium real GDP}}{\text{Change in autonomous expenditure}} = \frac{1}{1 - MPC}$$

## 7.3   Aggregate Demand

### 7.3.1   The Aggregate Demand Curve

Because

- a rising price level decreases consumption by decreasing the real value of household wealth (wealth effect).

- if the price level in the U.S. rises relative to the price levels in other countries, U.S. exports will become relatively more expensive, and foreign imports will become relatively less expensive, causing net exports to fall (interest rate effect).

- when prices rise, firms and households need more money to finance buying and selling. If the money supply does not increase, the result will be an increase in the interest rate. A higher interest rate will reduce investment spending (international trade effect).

Therefore, we expect a inverse relationship between price level and aggregate expenditures. The aggregate demand ($AD$) curve is a curve that shows the relationship between the price level and the level of planned aggregate expenditure in the economy, holding constant all other factors that affect aggregate expenditure.

### 7.3.2   Shifts of the Aggregate Demand Curve and Movements along It

The aggregate demand curve tells us the relationship between the price level and the quantity of real GDP demanded, holding everything else constant. If the price level changes but other variables

that affect the willingness of households, firms, and the government to spend are unchanged, the economy will move up or down a stationary aggregate demand curve. If any variable changes other than the price level, the aggregate demand curve will shift.

What variables will shift the aggregate demand curve?

- Monetary policy changes money supply and interest rates and hence will affect investment spending.

- Fiscal policy changes taxes and government purchases hence will indirectly affect household income and consumption and directly affect aggregate demand.

- Changes in domestic household income and firms' profit will shift aggregate demand curve.

- Changes in foreign income and exchange rate will also change aggregate demand through net exports.

## 7.4  Aggregate Supply

### 7.4.1  The Long-Run Aggregate Supply Curve

Because changes in the price level do not affect the number of workers, the capital stock, or technology in the long run, changes in the price level do not affect the level of real GDP. The level of real GDP in the long run is potential GDP or full-employment GDP. The long-run aggregate supply ($LRAS$) curve is a vertical line. Because potential GDP increases each year, the long-run aggregate supply curve shifts to the right each year.

### 7.4.2  The Short-Run Aggregate Supply Curve

The short-run aggregate supply curve is upward sloping because, over the short run, as the price level increases the quantity of goods and services firms are willing to supply increases. The deeper reason behind this is

- Contracts make some wages and prices "sticky".

- Firms are often slow to adjust wages.

- Menu costs, the costs to firms of changing prices, make some prices sticky.

### 7.4.3  Shifts of the Short-Run Aggregate Supply Curve versus Movements along It

If any variable other than the price level changes, the aggregate supply curve will shift. Variables that shift the short-run aggregate supply curve include:

- Increases in the labor force and in the capital stock

- Technological change

- Expected changes in the future price level

- Adjustments of workers and firms to errors in past expectations about the price level

- Unexpected changes in the price of an important natural resource

A supply shock is an unexpected event that causes the short-run aggregate supply curve to shift. Supply shocks are often caused by unexpected increases or decreases in the prices of important natural resources.

## 7.5  Macroeconomic Equilibrium in the Long Run and the Short Run

### 7.5.1  Long-Run Equilibrium
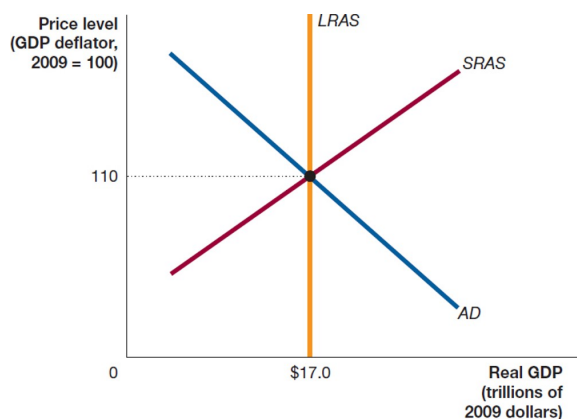


Figure 7.1: Long-Run Macroeconomic Equilibrium

Long-run macroeconomic equilibrium occurs when the AD and SRAS curves intersect at the LRAS level, i.e. when the economy is in short-run equilibrium, and GDP is at its full-employment level.

### 7.5.2  Static Model of a Change in Aggregate Demand

Please refer to the lecture slides where we consider a demand shift (either positive or negative shock). If it is a positive shock, demand curve is shifted to the right. Then unemployment falls and wages rise, which will cause more demand for goods and services so prices will be higher. Then firms and workers will react to these by raising expectations of future prices and demand for higher wages, resulting firms having higher cost in production. Hence supply curve will shift to the left to restore the long run equilibrium.

The similar case applies to a negative shock. The logic behind it is unemployment rise and people are difficult to find a job which will make them accept lower wages and reduce firms' cost. This will then shift the supply curve to the right to restore equilibrium.

In both cases, the output level remains the same. However, a positive demand shock eventually has higher prices and a negative demand shock has lower prices.

### 7.5.3   Static Model of a Change in Aggregate Supply

Suppose a sudden increase in oil prices shifts $SRAS$ to the left. This will result unemployment and products will go unsold. Hence in order to find a job workers have to accept lower wage and firms decrease prices in order to clear inventories. With the expectations of prices decreasing, $SRAS$ will move to the right, restring long-run equilibrium. Notice, here demand curve is not shifting.

### 7.5.4   A Dynamic Aggregate Demand and Aggregate Supply Model
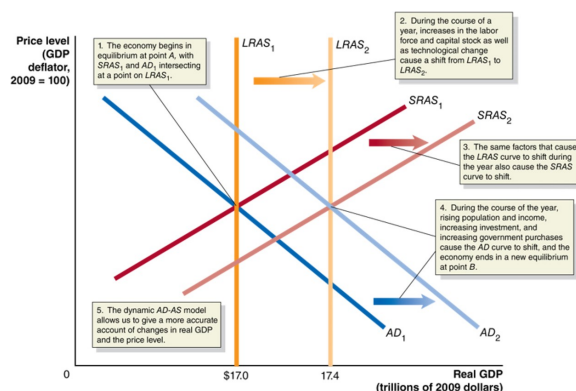


Figure 7.2: A Dynamic Aggregate Demand and Aggregate Supply Model

In this section, we covered the cause of inflation. The slide shows inflation is caused by total spending increasing faster than production. On the contrary, if demand does not keep pace with aggregate supply, that's when a recession kicks in. You should be familiar with the two graphs in slides and how to derive them.

# Lecture 8

## Fiscal Policy

## 8.1   What is Fiscal Policy

**Definition 8.1.** Fiscal policy refers to changes in *federal taxes* and *purchases* that are intended to achieve macroeconomic policy goals.

State and local government actions on taxes and spending are not generally aimed at affecting national level objectives so we are not considering them as macroeconomic policies.

**Definition 8.2. Automatic stabilizers** are government spending and taxes that automatically increase or decrease along with the business cycle.

For example unemployment insurance payments will increase during recession time and when the economy is expanding and employment is increasing, government spending on those payments will automatically decrease. This is in contrast to *discretionary* fiscal policy, which the government takes actions to change spending or taxes.

## 8.2   The Effects of Fiscal Policy on Real GDP and the Price Level

### 8.2.1   Expansionary and Contractionary Fiscal Policy

Before implementing a fiscal policy, we should first recognize where the economy is. Generally speaking, when the economy is in recession, increases in government purchases or decreases in taxes increase aggregate demand. Decreasing government purchases or raising taxes slow the growth of aggregate demand and reduce the inflation rate, which is often used when the economy is considered to be over-heated. Table 8.1 shows how fiscal policy is used to offset the business cycle to restore the economy back to equilibrium.

Table 8.1: Countercyclical Fiscal Policy

| Problem | Type of policy | Actions | Result |
| --- | --- | --- | --- |
| Recession | Expansionary | Increase $G$; cut $T$ | Real GDP and the price level rise. |
| Rising inflation | Contractionary | Decrease $G$; raise $T$ | Real GDP and the price level fall. |

### 8.2.2   Fiscal Policy in the Dynamic Aggregate Demand and Aggregate Supply Model

The model of fiscal policy in the previous section ignores two facts about the economy: (1) The economy experiences continuing inflation, with the price level rising every year, and (2) the economy experiences long-run growth, with the long-run aggregate supply curve shifting to the right every year.

When we put these factors together, we will have a dynamic model that incorporates

- Long-run aggregate supply curve shifts to the right.

- Short-run aggregate supply curve shifts to the right due to the rising price level.

- Short-run aggregate demand curve shifts to the right further than the short-run supply curve.

Figure 8.1 and 8.2 shows expansionary and contractionary fiscal policies in a dynamic model. In the first case, demand is insufficient to push the economy to its long-run equilibrium, therefore, the expansionary fiscal policy is used to raise the aggregate demand to meet the short-run and long-run aggregate supply curves in point $C$. The second case is the opposite where we have excess demand which exceeds the capacity of potential output. Using contractionary fiscal policy we are pushing the demand back to the long-run equilibrium level.
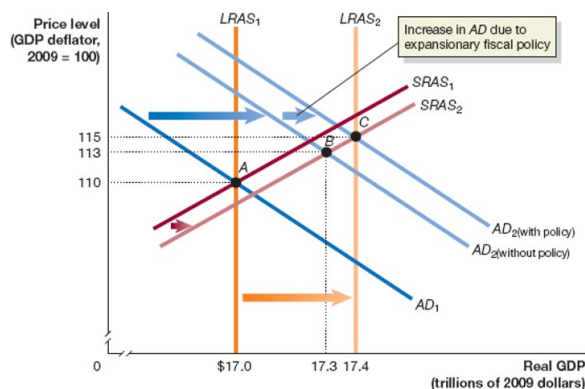


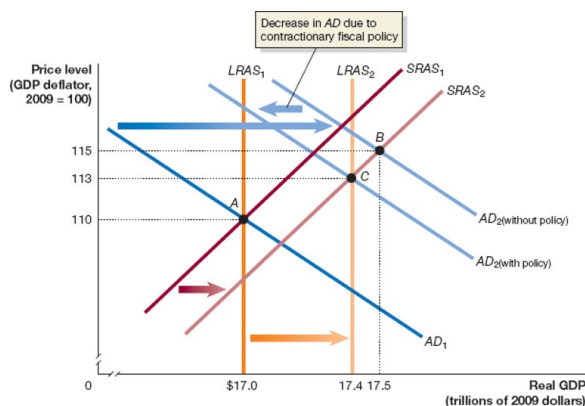Figure 8.1: Expansionary Fiscal Policy in the Dynamic Model

Figure 8.2: Contractionary Fiscal Policy in the Dynamic Model

## 8.3   The Government Purchases and Tax Multipliers

The government purchases have both autonomous effect and induced effect. The autonomous effect refers to the direct increase (decrease) in aggregate demand by how much spending the government increases (decreases). The induced effect refers to the extra change of aggregate demand caused by people receiving the change of income and spending them accordingly. This effect is also known as multiplier effect.

$$\text{Government purchases multiplier} = \frac{\text{Change in equilibrium real GDP}}{\text{Change in government purchases}}$$

$$\text{Tax multiplier} = \frac{\text{Change in equilibrium real GDP}}{\text{Change in taxes}}$$

The tax multiplier will be a negative number: an increase in taxes will **decrease** equilibrium real GDP and vice versa. We expect the tax multiplier to be smaller (in absolute value) than the government purchases multiplier because a \$100 billion increase in purchases initially increases spending by \$100 billion; but a \$100 billion tax cut is partially spent and partially saved.

The effect of changes in tax rates is more complicated and a cut in tax rates can affect equilibrium real GDP in two ways:

1. a cut in tax rates increases the disposable income of households, which leads them to increase their consumption spending;

2. a cut in tax rates increases the size of the multiplier effect.

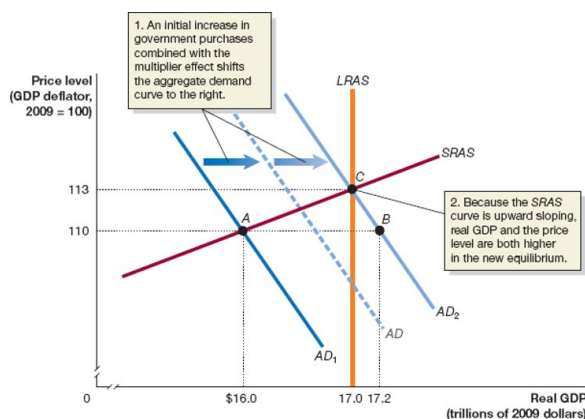We will discuss this in details in the appendix.

Figure 8.3: The Multiplier Effect and Aggregate Supplu

We know when the demand is increasing, real GDP and price level will both increase. As a result of the rise in the price level, equilibrium GDP will not increase by the full amount that the multiplier effect indicates (distance between $A$ and $B$). The actual change in real GDP resulting from an increase in government purchases or a cut in taxes (distance between $A$ and $LRAS$) will be less than that indicated by the simple multiplier with a constant price level.

## 8.4 The Limits to Using Fiscal Policy to Stabilize the Economy

- Timing.
  Unlike monetary policy (open market operations) can be done within a short-period of time, fiscal policy involves large amount of time in legislation and implementation. Getting the perfecting timing of fiscal policy is extremely difficult.

- Crowding out.
  The increase in government purchases will crowd out private consumption, investment, and net exports in the short-run. The greater the sensitivity to changes in interest rates, the more crowding out will occur. In the long-run, the decline in investment, consumption, and net exports will exactly offset the increase in government purchases, and the aggregate demand remains unchanged.

## 8.5 Deficits, Surplus, and Federal Government Debt

Recall the equation for government savings:

$$S_g = T - G - TR.$$

A budget deficit is the situation in which the government's expenditures are greater than its tax revenue ($S_g < 0$). A budget surplus is the situation in which the government's expenditures are
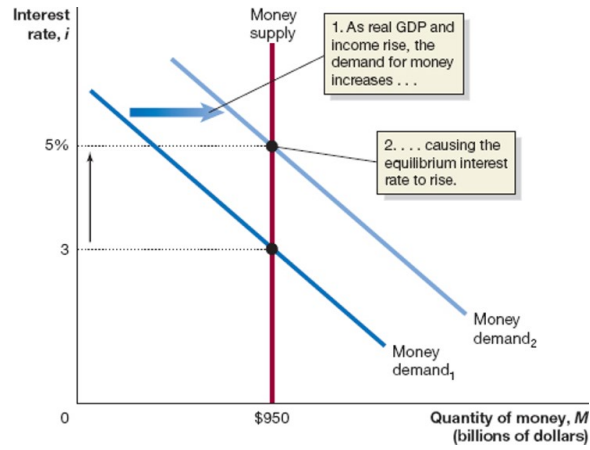
Figure 8.4: Fiscal Policy and Interest Rate
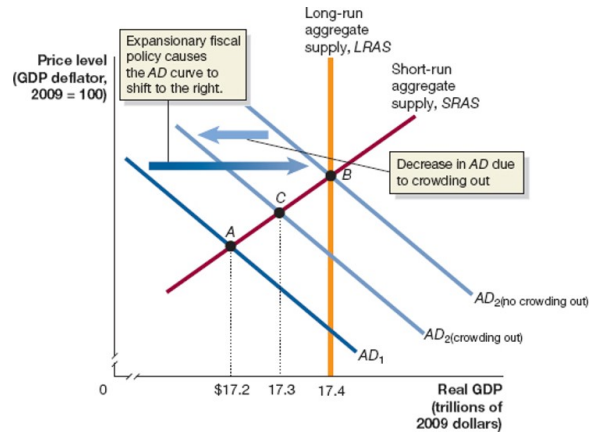


Figure 8.5: Short-Run Crowding Out Effect

less than its tax revenue ($S_g > 0$).

The case we studied in class is the Great Depression. After adjusting for the cyclical factors, the *cyclically adjusted budget* actually was in surplus, leading E. Cary Brown to conclude that "Fiscal policy. . . seems to have been. . . unsuccessful. . . not because it did not work, but because it was not tried." So should the Fed budget always be balanced? Borrowing from a long-run perspective is not a bad policy if the purpose is to invest in long-lived capital goods.

At this moment, the federal government is in no danger of defaulting on its debt for two reasons: (1) the interest rate is low and (2) the size of the debt to GDP is still low. But in the long run, an increasing size relative to GDP will pose a problem.

## 8.6    The Long-Run Effects of Fiscal Policy

In this section, we focus on the supply side economics, which is related to changing the long-run productivity capacity.

### 8.6.1    The Long-Run Effects of Tax Policy

Tax cuts affect aggregate supply through three ways:

- Individual income tax.

- Corporate income tax.

- Taxes on dividends and capital gains.

Simplifying tax codes can reduce the number of hours spent on tax report and increase the time to work. If tax reduction and simplification are effective, the economy will experience increases in labor supply, saving, investment, and the formation of new firms. The long-run aggregate supply curve will shift to the right and economic efficiency will also be improved.

# Lecture 9

# Money, Banks, the Federal Reserve System, and Monetary Policy

## 9.1 What is Money

**Money** refers to assets that people are generally willing to accept in exchange for goods and services or for payment of debts. An asset is anything of value owned by a person or a firm.

Money originated from barter economies where people trade goods with double coincidence of wants. A good used as money that also has value independent of its own use is called commodity money.

Anything used as money must serve four key functions:

1. Medium of exchange

   Money is acceptable to a wide variety of parties as a form of payment for goods and services.

2. Unit of account

   Money allows a way of measuring value in a standard manner.

3. Store of value

   Money allows value to be stored easily.

4. Standard of deferred payment

   Money can facilitate exchange over time.

Then based on the functions we need, what can serve as money? We have five criteria:

1. The good must be **acceptable** to most people.

2. It should be of **standardized quality** so any two units are alike.

3. It should be **durable** so that value is not lost by storage.

4. It should be **valuable** relative to its weight, so that it can easily be transported even in large quantities.

5. It should be **divisible** because different goods are valued differently.

Dollar bills meet all of these criteria. Commodity money such as gold has a significant problem because its value depends on its purity. Another problem with using gold as money is that the money supply is difficult to control because it depends partly on unpredictable discoveries of new gold fields. Paper money is generally issued by a central bank. The Federal Reserve is the central bank of the United States. Paper currency has no value unless it is used as money, so it's not a commodity money.

Fiat money is money, such as paper currency, that is authorized by a central bank or governmental body and that does not have to be exchanged by the central bank for gold or some other commodity money.

### 9.1.1   How Is Money Measured in the United States Today?

- A narrow definition is $M1$.

  $M1$ includes the sum of currency in circulation, checking account deposits in banks, and holdings of traveler's checks. Checking account deposits are used more often than currency to make payments.

- A broad definition is $M2$.

  $M2$ includes $M1$ plus savings account deposits, small denomination time deposits, balances in money market deposit accounts in banks, and noninstitutional money market fund shares.

Balances in credit cards are not counted as money supply but the balances in debit cards are.

### 9.1.2   Money Creation

The key role that banks play in the money creation is they accept deposits and then make loans.

**Bank Balance Sheets**

The most important assets of banks includes reserves, loans, and securities. The liabilities side of banks include deposits (it's not banks money, it belongs to savers so it's banks' liabilities. When people want to withdraw money, they have to pay back), and some borrowing and debt. The left and right sides must equal to each other.

How do banks make money? They pay low interest rate to depositors but charge high interest rate to borrowers. From a profit making perspective, banks would make more money if they make use of every dollar people put in banks. But banks cannot use all deposits to make loans because they have to be able to let savers withdraw money (though they don't withdraw all the time) whenever they want to. So there is a required reserve ratio set by the central bank in order to reduce the risk of banks' lending behavior. Reserve ratio ($RR$) is the minimum fraction of deposits banks are required by law to keep in the central bank. Usually banks will hold some excess reserves which are over the legal requirement.

**The Deposit Multiplier**

The simple deposit multiplier is the ratio of the amount of deposits created by banks to the amount of new reserves. The formula for the simple deposit multiplier is:

$$\text{Simple deposit multiplier} = \frac{1}{RR}$$

where $RR$ is the required reserve ratio. We can use this formula to calculate the total increase in checking account deposits from an increase in bank reserves due, for instance, to currency being deposited in a bank:

$$\text{Change in checking account deposits} = \text{Change in bank reserves} \times \frac{1}{RR}.$$

### 9.1.3 The Federal Reserve System

It was established to prevent a bank run and a bank panic. A bank run is a situation in which many depositors simultaneously decide to withdraw money from a bank. A bank panic is a situation in which many banks experience runs at the same time. Discount loans are loans the Federal Reserve makes to banks. The discount rate is the interest rate the Federal Reserve charges on discount loans. The Fed's first significant test as a lender of last resort came in the early years of the Great Depression of the 1930s. In 1934, Congress established the Federal Deposit Insurance Corporation (FDIC) to insure deposits in most banks up to a limit, which is currently $250,000 per deposit.

The Federal Reserve manages the money supply through monetary policy tools:

1. Open market operations
   The buying and selling of Treasury securities by the Federal Reserve in order to control the money supply.

2. Discount policy
   The interest rate paid on money banks borrow from the Fed.

3. Reserve requirements

All of the Fed's policy tools are aimed at affecting the reserves of banks as a means of changing the volume of checking account deposits and hence affect the lending and borrowing activities in the financial system.

The securitization and development of "shadow banking system" have led to the financial crisis in 2007. Securitization is the process of transforming loans or other financial assets into securities which can be traded in financial market. It is also because of the "shadow banking", the money supply relationship broke down, which we discussed in the class that the Fed abandoned the money supply as its main target.

### 9.1.4   The Quantity Theory of Money

In the early twentieth century, Irving Fisher formalized the relationship between money and prices as the quantity equation:

$$M \times V = P \times Y.$$

$M$ is money supply, $V$ is velocity of money (the average number of times each dollar in the money supply is used to purchase goods and services included in GDP), $P$ is price level, and $Y$ is real output. If we use $M1$ to measure money supply, GDP deflator to measure $P$, real GDP to measure $Y$, then we can calculate $V$:

$$V = \frac{P \times Y}{M}.$$

We can also use a trick of turning the above multiplication of levels of variables into the summation of growth rate:

Growth rate of the money supply $+$ Growth rate of velocity

$= $ Growth rate of the price level $+$ Growth rate of real output

If we assume $V$ is constant, then

Inflation rate $=$ Growth rate of the money supply $-$ Growth rate of real output.

So when the money supply is growing faster than real GDP, there will be inflation.

## 9.2   Monetary Policy

### 9.2.1   What Is Monetary Policy

We have discussed the tools can be used by the Fed, but what is monetary policy?

**Definition 9.1.** Monetary policy: The actions the Federal Reserve takes to manage the money supply and interest rates to pursue macroeconomic policy goals.

The Fed conduct monetary policy to achieve the following goals:

1. Price stability.

2. High employment.

3. Stability of financial markets and institutions.

4. Economic growth.

Price stability and high employment are also referred as the dual mandate of the Fed. But as

William Phillips found out[1], there is an inverse relationship between inflation rate and unemployment rate. So it is impossible to have both low inflation and low unemployment.

### 9.2.2 The Money Market and the Monetary Policy Targets

We know that the Fed has three monetary policy tools at its disposal. The Fed can't affect unemployment and inflation rates directly. They use these tools to directly influence its monetary policy **targets**: the money supply and the interest rate.

To understand how the monetary policy can affect economic performance, we first need to understand the relationship between money supply and money demand.
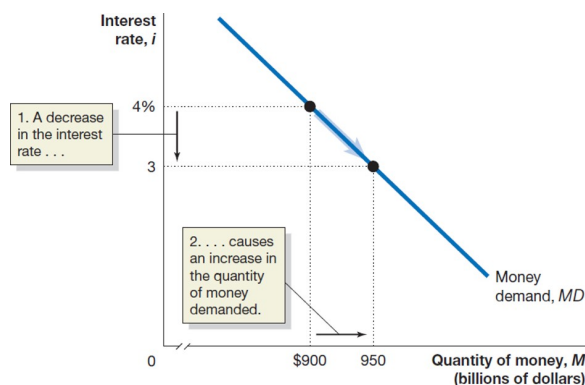


Figure 9.1: The Demand for Money

The demand curve for money slopes downward because a lower interest rate causes households and firms to switch from financial assets, such as U.S. Treasury bills, to money. When interest rates on Treasury bills and other financial assets are low, the opportunity cost of holding money is low, so the quantity of money demanded by households and firms will be high. The opportunity cost of holding money is the interest rate.

Shifts in real GDP and the price level change may shift the money demand curve. An increase in real GDP means that the amount of buying and selling of goods and services has increased, which increases the quantity of money demanded at each interest rate, shifting the money demand curve to the right. An increase in the price level increases the quantity demanded of money at each interest rate, shifting the demand curve for money to the right.

We assume the Fed can completely control the money supply so the money supply curve is a vertical line. To increase the money supply, the Fed buys securities by giving money out to the market. The supply curve shifts to the right and the interest rate goes down. Alternatively, the Fed may decide to lower the money supply by selling Treasury securities.

This money demand and supply model is similar but slightly different from the loanable funds model introduced in chapter 10. The loanable funds model focuses more on long-term investment but the money market model is more related to short-term borrowing and lending decisions.

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[1]Phillips, A. W. "The Relation between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom, 1861-1957." Economica, New Series, 25, no. 100 (1958): 283-99. doi:10.2307/2550759.
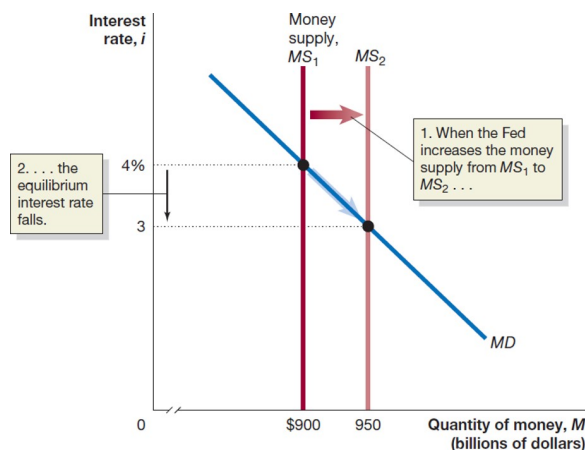
Figure 9.2: Change in Money Supply

Which target does the Fed choose? It used to target the money supply, but as the relationship between the money supply and real GDP growth broke down, the Fed now concentrates on interest rate. The federal funds rate is the interest rate banks charge each other for overnight loans. The Fed does not set the federal funds rate. Instead, the federal funds rate is determined by the supply of reserves relative to the demand for them. The FOMC announces a target for the federal funds rate after each meeting. Changes in the federal funds rate usually result in changes in interest rates on other short-term financial assets, such as Treasury bills, and changes in interest rates on long-term financial assets, such as corporate bonds and mortgages traded in the financial market.

### 9.2.3 Monetary Policy and Economic Activities

Our main job is to use aggregate demand and aggregate supply graphs to show the effects of monetary policy on real GDP and the price level. The ability of the Fed to affect economic variables such as real GDP depends on its ability to affect long-term real interest rates. Why? Because interest rates affect aggregate demand:

1. Consumption.
   Lower interest rates encourage buying on credit, which typically affects the sale of durables. Lower rates also discourage saving.

2. Investment.
   Lower interest rates encourage capital investment by firms (cheaper to borrow through selling bonds, raise money by selling stocks, new residential investment).

3. Net exports.
   High U.S. interest rates attract foreign funds, raising the $US exchange rate, causing net exports to fall.

Because of the inverse relationship between interest rate and aggregate demand component, the Fed can affect real GDP through interest rate.
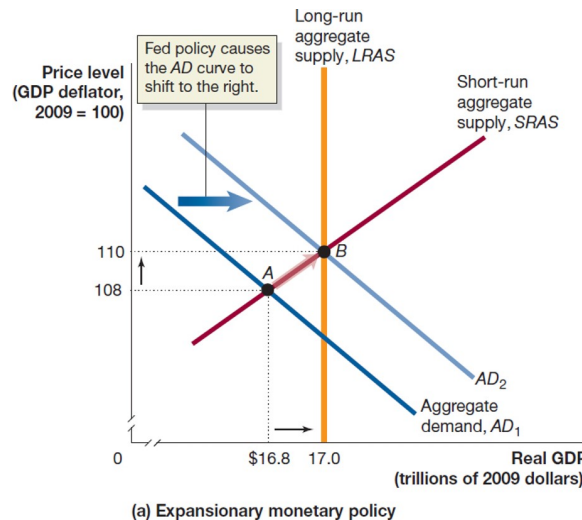
Figure 9.3: Expansionary Monetary Policy

The graph is similar to expansionary fiscal policy where the Fed takes actions to decrease interest rate or increase money supply to shift the aggregate demand to the right. So the economy will move from the initial point $A$ where the aggregate demand was not sufficient to meet the short-run and long-run supply, to $B$ where the economy achieves its short-run and long-run equilibrium. The contractionary monetary policy works the opposite. When the Fed believes the economy is too hot, it increases the interest rate or reduce the money supply to shift the demand curve to the left so the price level goes down.
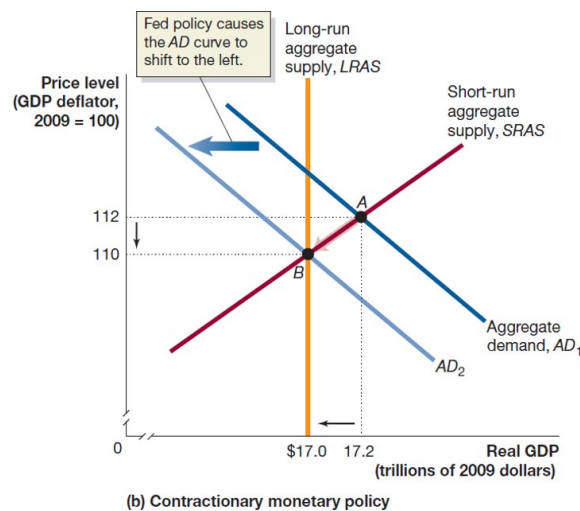


Figure 9.4: Contractionary Monetary Policy

Can the Fed eliminate recessions? It is very difficult because knowing how far to shift the demand curve and the ability to shift demand curve that far is hard, but the best the Fed can hope for is to make recessions milder and shorter. And a bad timing policy could lead to high inflation and more severe next recession. That is why forecasting in macroeconomics is so important.

### 9.2.4 Monetary Policy in the Dynamic Aggregate Demand and Aggregate Supply Model

Similar to what we learned in fiscal policy, here we assume potential GDP increases every year (long-run growth), and the economy generally experiences inflation every year.
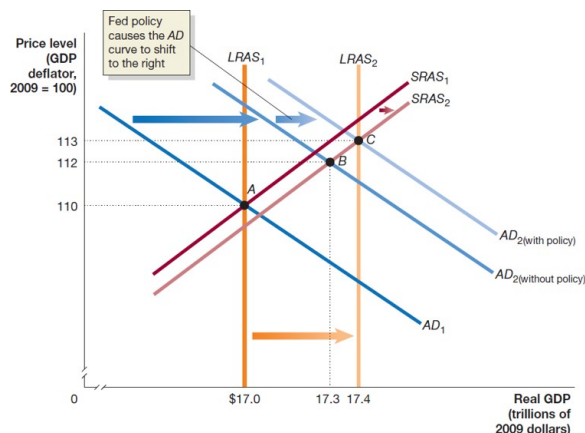


Figure 9.5: Expansionary Monetary Policy in a Dynamic Model

If we start with long-run equilibrium at $A$. The Fed forecasts that aggregate demand will not rise fast enough where the short-run equilibrium will fall below potential GDP, at $B$. So the Fed uses expansionary monetary policy to increase aggregate demand. Real GDP at its potential and a higher level of inflation will be achieved.

### 9.2.5 A Further Look at Monetary Policy Targets

Milton Friedman advocated a monetary growth rule, increasing the money supply at about the long-run rate of real GDP growth. Why? We can use the quantity theory of money to understand the relationship.

$$P = \frac{M \times V}{Y}.$$

By keeping the growth rate of $M$ at the same pace with growth rate of $Y$, $P$ is stabilized. But the link between the money supply and real GDP seems to have broken down: M1 seems to change wildly, but real GDP and inflation do not react in the same way. Now, targeting the money supply is not seriously considered.

How about interest rate targeting? The Taylor rule is a rule developed by John Taylor of Stanford University that links the Fed's target for the federal funds rate to economic variables. Taylor estimates that:

$$i_t = \pi_t + r_t^* + w_1(\pi_t - \pi^*) + w_2(y_t - \bar{y}_t)$$

or

Fed funds target rate = Current inflation rate + Equilibrium real Fed funds rate
$$+ \frac{1}{2} \times \text{inflation gap} + \frac{1}{2} \times \text{output gap}$$

where $w_1 = w_2 = \frac{1}{2}$ we choose equal weight. Equilibrium real federal funds rate is the estimate of the inflation-adjusted federal funds rate that would be consistent with maintaining real GDP at its potential level in the long run. The Taylor rule was a good predictor of the federal funds rate during Alan Greenspan's tenure as Fed chair (1987-2006).

How about inflation targeting which involves the central bank announcing its target level of inflation? This policy has been adopted by central banks in some other countries, including the Bank of England and the European Central Bank. But the typical outcome of adopting inflation targeting appears to be that inflation is lower, but unemployment is (temporarily) higher (recall Phillips Curve).

In 2012, the Fed announced its first explicit inflation target: an average inflation rate of 2 percent per year. Since 2004, the Fed has used the "core PCE": the PCE without food and energy prices. The core PCE is more stable; the Fed believes it estimates true long-run inflation better.

# Lecture 10

## Open Macroeconomics

## 10.1 International Financial Market

This section covers Chapter 18 and 19 which mainly discuss the international financial market and exchange rate.

### 10.1.1 The Balance of Payments

An open economy is an economy that has interactions in trade or finance with other countries. A closed economy is an economy that has no interactions in trade or finance with other countries. A good way to understand the interactions between one economy and other economies is through the balance of payments, which is the record of a country's trade with other countries in goods, services, and assets. The balance of payments contains three accounts: the current account, the financial account and the capital account.

**Current Account**

Current account reflects a country's **net exports**, **net income on investments**, and **net transfers**. The balance of trade is the difference between the value of the goods a country exports and the value of the goods a country imports. If a country exports more than it imports, it has a trade surplus. If a country exports less than it imports, it has a trade deficit.

Net exports are a component of aggregate expenditure. We can calculate net exports by adding together the balance of trade and the balance of services. The balance of services is the difference between the value of the services a country exports and the value of services a country imports.

**Financial Account and Capital Account**

The financial account is the part of the balance of payments that records purchases of assets a country has made abroad and foreign purchases of assets in the country. The capital account is the part of the balance of payments that records relatively minor transactions, such as migrants' transfers and sales and purchases of nonproduced, nonfinancial assets. Prior to 1999 the capital

account recorded all the transactions now included in both the financial account and the capital account. In analysis we often ignore capital account and focus on current account and financial account.

There is a capital *outflow* from the United States when an investor in the United States buys a bond issued by a foreign company or government or when a U.S. firm builds a factory in another country. There is a capital *inflow* into the United States when a foreign investor buys a bond issued by a U.S. firm or by the government or when a foreign firm builds a factory in the United States. When firms build or buy facilities in foreign countries, they are engaging in *foreign direct investment.* When investors buy stocks or bonds issued in another country, they are engaging in *foreign portfolio investment.*

Net capital flows are the difference between capital inflows and capital outflows. Net foreign investment is the difference between capital outflows from a country and capital inflows, also equal to net foreign direct investment plus net foreign portfolio investment. When net capital flows are positive, net foreign investment is negative; when net capital flows are negative, net foreign investment is positive.

One thing to notice is that the balance of payments always zero, meaning the sum of current account balance and financial account balance is zero. This is intuitive because a negative current account balance implying trade surplus, so the U.S. is importing more than exporting. The rest of the world is accumulating U.S. dollars which will come back to the U.S. and invest, so foreign holdings of assets in the U.S. will be greater than U.S. holdings of foreign assets. You need to know this relationship between current account and financial account.

Notice that the balance of payments should always be equal to zero.

### 10.1.2 The Foreign Exchange Market and Exchange Rates

**Definition 10.1.** The nominal exchange rate is the value of one country's currency in terms of another country's currency.

**Definition 10.2.** The real exchange rate corrects the nominal exchange rate for changes in prices of goods and services.

We have two ways to define exchange rates. In the textbook, it uses indirect quotation, which measures how many units of foreign currency is equivalent to one unit of domestic currency, i.e., the U.S. dollar. So if 1\$ = 100¥, the exchange rate is

$$e = 100¥/\$.$$

The real exchange rate is defined as

$$\text{Real exchange rate} = \text{Nominal exchange rate} \times \frac{\text{Domestic price level}}{\text{Foreign price level}}$$

if using indirect quotation.

**Example 10.1.** Suppose initially $1 = £1$, and the U.S. and British price levels are both 100. Then the real exchange rate between \$US and £is:

$$\text{Real exchange rate} = 1\frac{£}{\$} \times \frac{100}{100} = 1\frac{£}{\$} = 1£/\$ = 1$$

If the price level in the U.S. increases to 105, which we observe 5% inflation, then the real exchange rate is

$$e^* = 1 \times \frac{105}{100} = 1.05$$

So the U.S. dollar appreciates, implying a higher real price level comparing to Britain.

The market exchange rate is determined by the interaction of demand and supply. There are three sources of foreign currency demand for the U.S. dollar:

1. Foreign firms and households that want to buy goods and services produced in the United States.

2. Foreign firms and households that want to invest in the United States either through foreign direct investment or through foreign portfolio investment.

3. Currency traders who believe that the value of the dollar in the future will be greater than its value today.

**Equilibrium in the Market for Foreign Exchange**

The demand curve for dollars in exchange for a foreign currency has the normal downward slope, while the supply curve has the normal upward slope. Equilibrium occurs in the foreign exchange market where the quantity supplied equals the quantity demanded.

Currency **appreciation** is an increase in the market value of one currency relative to another currency. Currency **depreciation** is a decrease in the market value of one currency relative to another currency. Based on the factors behind the demand for the U.S. dollar, we can also understand three main factors cause the demand and supply curves in the foreign exchange market to shift:

1. Changes in the demand for U.S.-produced goods and services and changes in the demand for foreign produced goods and services.

2. Changes in the desire to invest in the United States and changes in the desire to invest in foreign countries.

3. Changes in the expectations of currency traders about the likely future value of the dollar and the likely future value of foreign currencies.

The demand curve for dollars shifts to the right when incomes in a foreign country rise, when interest rates in the U.S. rise, or when speculators decide that the value of the dollar will rise relative to the value of the foreign currency.

The factors affecting the supply curve for dollars are similar to those that affect the demand curve for dollars. A recession in the United States will decrease the demand for a foreign country's products and cause the supply curve for dollars to shift to the left (because we are less willing to buy foreign goods due to reduced income). A decrease in interest rates in a foreign country will make financial investments in that foreign country less attractive and cause the supply curve of dollars to shift to the left. Whether the exchange rate increases or decreases depends on the direction of and size of the shifts in the demand curve and supply curve.
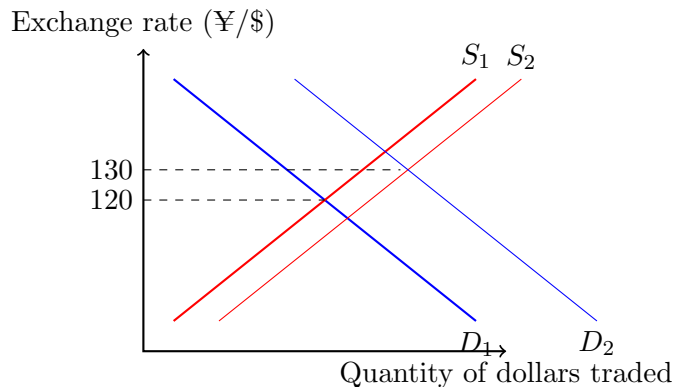


## Purchasing Power Parity

In the short run, relative interest rates and expectations about future values of currencies will influence exchange rates because capital will move freely to find arbitrage over the international exchange market. But over the long run, exchange rates should move to equalize the purchasing powers of different currencies. This is known as the theory of purchasing power parity.

**Example 10.2.** Suppose that candy bars sell for £2 in the United Kingdom and for $1 in the United States. If the exchange rate were £1 = $1, then an entrepreneur could:

1. For a British entrepreneur, go to banks to exchange £1,000,000 for $ 1,000,000 and buy a million candy bars in the U.S. Notice here we have an increase in demand for the U.S. dollars because American stores will only sell candy bars for the U.S. currency. If a foreigner wants to buy it, it has to exchange their currency for the U.S. dollar. Therefore there is an upward pressure to push up the demand for the U.S. dollars.

2. After purchasing candy bars, transport them back to the U.K. and sell them for £2,000,000. Notice here we are selling goods for the currency without exchanging them through banks.

3. Profit? The cost is £1,000,000 but revenue is £2,000,000.

What stops the purchasing power parity?

1. Not all products can be traded internationally (especially services).

2. Products and consumer preferences are different across countries; prices are determined by supply but also by demand.

3. Countries impose barriers to trade, like tariffs (taxes on imports) and quotas (numerical limits on imports).

Big Mac is a classic example to see the purchasing power of different currencies and you can compare the implied exchange rate and actual exchange rate to see whether or not a currency is overvalued or undervalued.

**The Four Determinants of Exchange Rates in the Long Run**

1. Relative price levels
   Prices in Japan have risen slower than prices in the U.S., helping to explain why the Japanese yen has appreciated in value relative to the U.S. dollar.

2. Relative rates of productivity growth
   Japanese productivity rose faster than U.S productivity in the 1970s and 1980s, contributing to the depreciation of the U.S. dollar over that time.

3. Preferences for domestic or foreign goods
   If consumers in Canada increase their demand for U.S. goods, they increase their demand for U.S. dollars, and hence appreciate the value of the $US.

4. Tariffs and quotas
   High tariffs or restrictive quotas reduce the demand for foreign goods, and hence cause the domestic currency to appreciate.

### 10.1.3   The Exchange Rate System

There are three types of exchange rate systems:

1. Floating exchange rate.

2. Fixed exchange rate.

3. Managed floating exchange rate.

The current exchange rate system has three features:

1. The United States allows the dollar to float against other major currencies.

2. Nineteen countries in Europe have adopted a single currency, the euro. The euro is the common currency of many European countries.

3. Some developing countries keep their currencies' exchange rates fixed against the dollar or another major currency.

Why do those developing countries choose to fix their currency to the dollar or other major currency? Because when the exchange rate is fixed, business planning becomes much easier. In the 1980s and 1990s the flow of foreign investment funds to developing countries increased substantially. Borrowing dollars directly from foreign investors or indirectly from foreign banks was easier. Also because in the 1980s and 1990s, some countries feared the inflationary consequences of a floating exchange rate.

Pegging refers to a policy by which a country keeps fixed the exchange rate between its currency and another country's currency. When a developing country has pegged the value of its currency against the dollar, it has to take the responsibility to keep the value. A currency pegged at a value above the market equilibrium exchange rate is said to be overvalued. A currency pegged at a value below the market equilibrium exchange rate is said to be undervalued. When investors make it more difficult to maintain a fixed exchange rate, it is referred to as destabilizing speculation. Most countries that continue to use pegged exchange rates are small and trade primarily with a single, much larger, country. Overall, the trend has been toward replacing pegged exchanges rates with managed floating exchange rates.

### 10.1.4 The National Saving and Investment in Open Economy

**Net Exports Equal Net Foreign Investment**

Our main job is to define and apply the saving and investment equation in an international perspective. When a country's spending exceeds its income, it finances the difference by **selling** assets or by borrowing. When a country sells more assets to foreigners than it buys from foreigners, or when it borrows more from foreigners than it lends to foreigners, the country experiences a **net capital inflow** and a **financial account surplus**. Therefore, net capital flows will be equal to net exports (but with the opposite sign), and net foreign investment will also be equal to net exports (and with the same sign). In summary,

$$\text{Current account balance} + \text{Financial account balance} = 0$$

or

$$\text{Current account balance} = -\text{Financial account balance}$$

That is,

$$\textbf{Net exports} = \textbf{Net foreign investment}$$

This equation tells us that countries that import more than they export must borrow more from abroad than they lend abroad. If net exports are negative, net foreign investment will also be negative by the same amount.

**Domestic Saving, Domestic Investment, and Net Foreign Investment**

Saving in an economy can be expressed as:

$$\text{National saving} = \text{Private saving} + \text{Public saving}$$

$$S = S_p + S_g$$

with

$$S_p = Y - T - C$$

and

$$S_g = T - G$$

if assuming no transfer payments. So

$$S = (Y - T - C) + (T - G).$$

But

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

so

$$S = (C + I + G + NX - T - C) + (T - G)$$

$$S = I + NX$$

And since net exports equals net foreign investment,

$$\text{National saving} = \text{Investment} + \text{Net foreign investment}$$

We still have the saving must equal investment equation: an equation that shows that national saving is equal to domestic investment plus net foreign investment.

### 10.1.5   Policies in Open Economy

**Government Budget Deficit**

When the government runs a budget deficit, national saving will decline unless private saving increases by the amount of the budget deficit. As the saving and investment equation shows, the result of a decline in national saving must be a decline in either domestic investment or net foreign investment.

If the federal government runs a budget deficit, the U.S. Treasury must raise an amount equal to the deficit by selling bonds. To attract investors, the U.S. Treasury may have to **raise the interest rates** on its bonds. Higher interest rates will discourage some firms from borrowing funds to build new factories or to buy new equipment. Higher interest rates will attract foreign investors, who

will buy U.S. dollars which make the U.S. dollar appreciate. Exports then will fall, and imports will rise. Net exports and net foreign investment will fall.

When a government budget deficit leads to a decline in net exports, the result is sometimes referred to as the twin deficits, which refers to the possibility that a government budget deficit will also lead to a current account deficit.

### Monetary and Fiscal Policy Effectiveness

When the Federal Reserve engages in an *expansionary* monetary policy, it buys Treasury securities to lower interest rates and stimulate aggregate demand. In an open economy, lower interest rates will also affect the exchange rate and cause the dollar to depreciate and net exports to increase. This additional policy channel will increase the ability of an expansionary monetary policy to affect aggregate demand.

To engage in an expansionary fiscal policy, the federal government increases its purchases or cuts taxes. Increases in government purchases directly increase aggregate demand. Tax cuts increase aggregate demand by increasing household disposable income and business income. An expansionary fiscal policy may result in higher interest rates. Then it will lead to an increase in the foreign exchange value of the dollar and a decrease in net exports.

## 10.2 Comparative Advantage and International Trade

### Comparative Advantage

Comparative advantage is the ability of an individual, a firm, or a country to produce a good or service at a lower opportunity cost than competitors. Opportunity cost is the highest-valued alternative that must be given up to engage in an activity.

Comparative advantage explains why people pursue different occupations and why countries produce different goods and services. Countries are better off if they specialize in producing the goods for which they have a comparative advantage and trade for the goods for which other countries have a comparative advantage. Absolute advantage is the ability to produce more of a good or service than competitors when using the same amount of resources.

Table 10.1: Comparative Advantage

|  | Output per Hour Work Smartwatches | Output per Hour Work Tablets |
| --- | --- | --- |
| Japan | 12 | 6 |
| United States | 2 | 4 |

This table shows that Japan has an absolute advantage in producing both smartwatches and

tables. For each hour, Japan can produce more smartwatches and tablets than the U.S. However, the opportunity costs of producing these two goods differ across the two countries.

Table 10.2: Opportunity Costs

|  | Opportunity Costs Smartwatches | Opportunity Costs Tablets |
|---|---|---|
| Japan | 0.5 tablets | 2 smartwatches |
| United States | 2 tables | 0.5 smartwatches |

Basically, it's just the relative price of producing the two goods, which you have already seen in ECO201. If the nations were in autarky, a situation in which a country does not trade with other countries, these would also be the relative prices in each country: a smartwatch would trade for half the price of a tablet computer in Japan, and double the price of a tablet computer in America. As can be seen from this table, Japan has comparative advantage over smartwatches and United States has comparative advantage over tablets. Japan would like to trade its cell phones for American tablets, and vice versa.

Where does comparative advantage come from?

- Climate and natural resources (bananas in Costa Rica vs. wheat in U.S.)

- Relative abundance of labor and/or capital (China has lots of low-skilled workers, vs. relatively many high-skilled workers in the U.S.)

- Technological differences

- External economies (Silicon Valley, Hollywood, Swiss watchmakers)

## 10.2.1 Gains from Trade

Suppose that initially each country has 1,000 hours to spend. Japan uses 750 hours to produce 9,000 smartwatches and 250 hours to produce tablets. The U.S. uses 750 hours to produce only 1,500 smartwatches and 250 hours to produce 1,000 tablets. In total, 10,500 smartwatches and 2,500 tablets computers are produced between these two countries.

Observe what happens if each country specializes in its comparative advantage: if Japan can produce 12,000 smartwatches with 1,000 hours and the U.S. produces 4,000 tablet computers, in total 12,000 smartwatches and 4,000 tablet computers are produced. More goods are produced! And they can trade 1,500 cell phones for 1,500 computers which lead to both of the two countries consumption increase.

Table 10.3: Gains from Trade

| | Production | | Trade | | Consumption | |
|---|---|---|---|---|---|---|
| | Smartwatches | Tablets | Smartwatches | Tablets | Smartwatches | Tablets |
| Japan | 12,000 | 0 | -1,500 | 1,500 | 10,500 | 1,500 |
| United States | 0 | 4,000 | 1,500 | -1,500 | 1,500 | 2,500 |

With trade, the United States and Japan specialize in the good they have a comparative advantage in producing. Then they export some of that good in exchange for the good the other country has a comparative advantage in producing. The increased consumption made possible by trade represents the gains from trade.

But we don't we see complete specialization in the world? Mainly because

- not all goods and services can be traded internationally such as medical services.

- production of many goods involves increasing opportunity costs (so small amounts of production are likely to take place in several countries).

- tastes for products differ (cars, for example); countries might have comparative advantages in different sub-types of products.
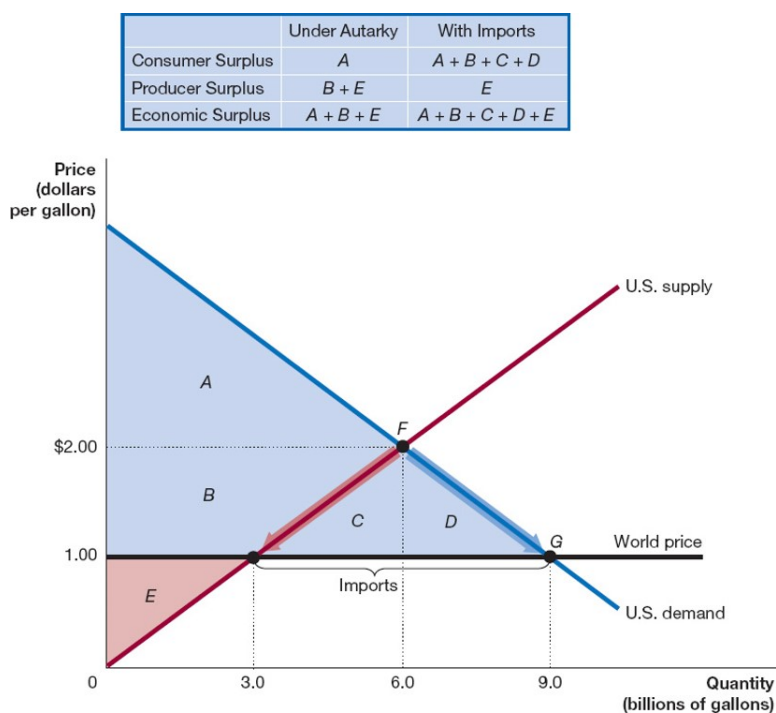
Overall, trade is good at the national level but individuals and firms may lose. These groups would likely ask their governments to implement protectionist measures like tariffs and quotas, in order to protect them from foreign competition.

### 10.2.2 How Tariffs Affect International Trade
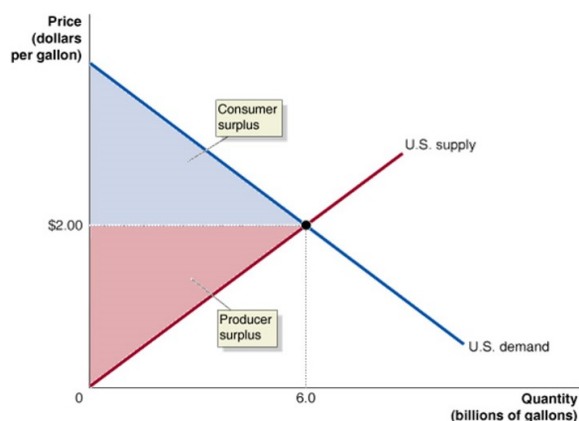


Comparative advantage suggests countries should not produce goods at which they do not have a comparative advantage. But there is often political pressure on governments to preserve industries that have lost their comparative advantage, or that never had one in the first place. The above

graph shows a domestic market of ethanol where the equilibrium price is $2.  The blue shaded area is consumer surplus and pink shaded area is producer surplus.  Now suppose the American government decides to open up imports and/or exports of ethanol.  Assume that the world price of ethanol is $1.00 per gallon.  Then American will import ethanol and American consumers will benefit from cheaper ethanol.  However, American ethanol producers will suffer because they will sell at a lower price.  How can we decide whether allowing free trade makes Americans better off overall? By comparing the economic surplus in the market with and without free trade.

| | Under Autarky | With Imports |
| --- | --- | --- |
| Consumer Surplus | $A$ | $A + B + C + D$ |
| Producer Surplus | $B + E$ | $E$ |
| Economic Surplus | $A + B + E$ | $A + B + C + D + E$ |



As price is lowered, consumer surplus increases from $A$ to $A+B+C+D$ but producer decreases by $B$. However, the whole economy enjoys the benefits of $C + D$. If the U.S. government plans to protect domestic producers and impose a tariff on ethanol, which is $0.5. We can see that there will be deadweight loss.

| Loss of Consumer Surplus | = | Increase in Producer Surplus | + | Government Tariff Revenue | + | Deadweight Loss |
|---|---|---|---|---|---|---|
| $A + C + T + D$ | | $A$ | | $T$ | | $C + D$ |