Macroeconomics

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Goals

• The first goal of this course is to acquaint you with fundamental principles and methods of modern macroeconomic theories.

• The second goal of this course is to teach you how to use these principles and methods to think about macroeconomic issues in real life.

• The third goal, which is more specific, is that after this course, you should be able to understand almost all the reports and rebate related to macroeconomic data and policy in the Wall Street Journal.
Chapter 1
Introduction

1 What is Macroeconomics?

- Macroeconomics studies the economy as a whole. It tries to explain how the economy as a whole works and seeks to find out ways (design economic policies, institutions) to make it work more efficiently.

- Microeconomics is the study of how individual economic agents (workers, managers, students and professors, firms, universities) make decisions (behave) and how these decision makers (their behavior) interact in individual markets.

- (What’s the marketplace? e-market?)
2 A List of Macro and Micro Economic Questions

- What determines a country’s Real GDP (which measures the total income of everyone in the economy, adjusted for price changes)? What determines an economy’s growth path in the long-run?

- How does a farmer set the price of corns? How does a firm decide what to produce, and how much to produce? What determines a firm’s dividend policy? Why do firms pay dividends? What explains mergers and takeovers? Why are prices sticky? Why do firms use stock options to compensate their managers? What explains the Golden Parachute?

- What explains business fluctuations? what explains unemployment? What explains the great depression? What explains the new economy? What explains the so-called globalization?

- How to reduce unemployment and business fluctuations? What is the optimal size of the government deficit or surplus? How does the Fed decide what kind of monetary policy to implement? How does the federal reserve decide to cut or raise the interest rate?
3 Why Macroeconomics?

Macroeconomics is important for anybody that must live a life in a modern economic society.

You are a student. You probably want to know how the labor market is going to be in two or three years. That has a lot to do with how the macroeconomy is performing in two or three years, whether the economy is going to keep growing or go into a new recession. That in turn may have to do with the government’s macro policies, fiscal and monetary policies. If for example the government thinks deflation is still a threat to growth and it then follows an expansionary monetary policy to fight. This might be good news for you. If the government sees inflation rising and then follows a policy to tighten money supply, the economy is likely to slow down and that can have a negative effects on the labor market.

If you are an investor. I are sitting on a bunch of cash. To invest in realstate or in stocks? It again depends on how you think the macroeconomy is doing. If you think the macroeconomy is picking up speed and so stocks are rising higher, whereas interest rates are likely to increase to crash the realstate market, you probably want to buy stocks.
Macroeconomics is important for each of us in a sense because each of us must live in the macroeconomy. Each of us is part of the macroeconomy. Each of us must make decisions that depend on how the economy as a whole is doing.

Likewise, business firms and institutions must also operate in the macro economy. Macroeconomy is thus also essential for business decision making.

For instance, suppose your firm is thinking about investing in a new project. You must borrow to invest. You must then think about the interest rate. Interest rates that are too high can make your project’s NPV negative. You must then think how the central bank’s policy is going to be. That’s macro. The interest rate is a key macro variable.

If your company wants to acquire a smaller competitor. That costs cash. You must be careful. Where the macroeconomy is standing? Is it going into a recession? If yes, you may want to conserve cash to prepare for the forthcoming winter. If on the other hand the economy is booming and future cash flows are expected to be higher then you are in a very different position.
You work for the company’s human resources department. To hire new workers now? That again requires you to judge how the economy is a whole is doing, because the depend for your company’s product depends on whether your customers are spending. Hiring and firing are both costly.

You company is thinking about entering an exporting business. You worry about the exchange rates and the government’s trade policies. Macroeconomics again. If the domestic currency is appreciating, that’s going to make it harder for you to sell in foreign markets. Higher exchange rates make your product more expensive for foreigners.
4 How Do Economists Think?

- I want to make this course the first *serious* economics course you are going to have.
- *Serious* in the sense that most material I teach will be based on rigorous scientific treatments.
- *Serious* also in the sense that I am going to treat all of you in this classroom as future economists. Starting this course, you have to learn how to **think** like an economist.
- How does the economist approach a question he has in mind? The answer is: He constructs and uses models.
- A model is a simplified version of reality. Reality is often highly multi-dimensional and complex, a model leaves out details which are not essential to the issue at hand.
  A model is like a map that shows the connections of economic variables that you are interested in.
  A model is a like a lab which economists use to conduct thought experiments. Each model is a tool that economists use for studying a specific set of questions.
- For economists, models are often mathematical. Making models mathematical has benefits which I will dis-
cuss as I proceed.

- How to construct models? What makes a good model? How to use models? — One purpose of this course is teach you how to construct a model, and then use it to derive answers to the questions at hand.
5 The Model of Demand and Supply — A Review

• Suppose an economist wants to analyse what determines the price of corns and the quantity of corns sold in the market. He most likely would construct a model with three major components: One component that describes the buyers’ behavior, the second describing the sellers’ behavior, and the third describing how the market functions (the market structure).

• He assumes that the buyers’ behavior can be summarized by the demand function

\[ Q^d = D(P, Y) \]  

where \( Q^d \) denotes the aggregate quantity of corns demanded, \( D \) is the “demand function”, \( P \) is the price of corns, and \( Y \) is the economy’s total income (real GDP). The above equation simply states that the aggregate demand for corns is determined by the price at which corns are to be sold and the economy’s total purchasing power.

• He then assumes that the sellers’ behavior can be sum-
marized by the following supply function

\[ Q^s = S(P, P_m) \]  \hspace{2cm} (2)

where \( Q^s \) denotes the aggregate quantity of corns supplied, \( S \) is the “supply function”, \( P \) is the price of corns, and \( P_m \) is the price of materials involved the production of corns (i.e., \( P_m \) indicates the cost of producing corns).

- The economist then makes an assumption about how the buyers and sellers interact in the market. Specifically, he assumes
  
  (1) If \( Q^s > Q^d \), that is, if there is “excess supply”, then price will fall.
  
  (2) If \( Q^s < Q^d \), that is, if there is “excess demand”, then price will rise.

And thus the price is stable (when the market reaches an equilibrium) only when demand and supply are in balance (the market clears):

\[ Q^s = Q^d. \]  \hspace{2cm} (3)

The above equation shows how the market works: it sets the price to equate demand and supply.
• To summarize, equation (1) states how the buyers behave, equation (2) describes how the sellers behave, equation (3) describes how buyers and sellers interact.

• Figures 1-5, 1-6
Suppose the demand function is
\[ D(P, Y) = 60 - 10P + 2Y. \]
Suppose the supply function is
\[ S(P, P_m) = 60 + 5P - P_m. \]
Suppose it is given that \( Y = 10 \) and \( P_m = 10 \).

Question: What is the equilibrium price and what is the equilibrium quantity?

Well, the equilibrium price must equate demand and supply:
\[ 60 - 10P + 2Y = 60 + 5P - P_m. \]
Given \( Y = P_m = 10 \), we have
\[ 60 - 10P + 2 \times 10 = 60 + 5P - 10 \]
which in turn implies \( 30 = 15P \) or \( P = 2 \),
and the equilibrium quantity bought and sold is equal to
\[ Q = 60 - 10P + 2Y = 60. \]

Classwork: What happen if \( Y \) falls from 10 to 5?
7 Exogenous and Endogenous Variables

- Models have two kinds of variables: endogenous variables and exogenous variables.

- Exogenous variables are the variables that are determined outside the model, the variables that the model take as given, the variables that the economist does not intend to use the model to explain.

- Endogenous variables are the variables that the model tries to explain, these are the variables that are to be determined inside the model.

- The endogenous variables in the above model of demand and supply are the price of corns and the quantity of corns exchanged.

- Models are built to show how changes in the model’s exogenous variables affect its endogenous variables.

Readings: Mankiw: Chapter 1.
Chapter 2
Macro Economic Variables

8 Gross Domestic Product (GDP)

- GDP is the total dollar value of all final goods and services produced in a country within a given period of time.

- GDP includes the value of goods produced, such as houses and corns. It also includes the value of services, such as airplane rides and the professors’ lectures. The output of each of these is valued at its market price, and the values are added together to get GDP.

- The level of GDP is computed every three months by the Bureau of Economic Analysis (a part of the U.S. Department of Commerce).

- In 1997, the GDP of the United States is about 8 trillion dollars. In 1997 the US population is about 268 million. Thus in 1997 the per capita GDP (GDP per person) is roughly 30,000 US dollars.
9 Computing GDP

• Suppose the economy produces two types of goods, apples and oranges. Then

\[ GDP = \text{Price of Apples times quantity of apples} + \text{Price of oranges times quantity of oranges} \]

• Suppose the price of apples is 0.5 and the price of oranges is 1.0. Suppose the economy produced 4 units of apples and 3 units of oranges. Then

\[ GDP = 0.5 \times 4 + 1.0 \times 3 = 5.00. \]

• Suppose the economy produces \( N \) types of goods, the price of the \( i \)th type is \( P_i \), and the quantity of the \( i \)th type good is \( Q_i \). Then

\[ GDP = P_1 \times Q_1 + P_2 \times Q_2 + \ldots + P_N \times Q_N. \]
10 Nominal versus Real GDP

- Prices of goods change over time. The value of final goods and services measured at current prices is called Nominal GDP. The value of goods and services measured using a set of constant prices (base year prices, the base year can be for example 1992) is called the Real GDP.

Suppose again the economy produces two types of goods, apples and oranges. Suppose we choose 1998 as the base year. Then

\[
\text{Real GDP of 2002} = 1998 \text{ Price of Apples} \times 2002 \text{ quan ty of apples} + 1998 \text{ Price of oranges} \times 2002 \text{ price of oranges}
\]

and

\[
\text{Nominal GDP of 2002} = 2002 \text{ Price of Apples} \times 2002 \text{ quan ty of apples} + 2002 \text{ Price of oranges} \times 2002 \text{ price of oranges}
\]
11 Some Notes

• GDP measures the value of currently produced goods and services. Used goods are not included. The sale of used cars, for example, are not included in GDP.

• The sale of intermediate goods are not included in GDP. GDP includes only final goods and services. For example, suppose a cattle rancher sells one unit of meat to McDonald’s for 0.5 dollars, and then McDonald’s sells you a hamburger for 1.50 dollars. Should GDP include both the meat and the hamburger (a total of 2 dollars) or just the hamburger (1.5 dollars)?

• Inventories are often included in GDP.
12 National Income Accounting

- Goods and services produced by the economy are ultimately purchased by consumers and other agents who spend money to buy them. A useful division of GDP according to alternative uses of the economy’s output is the following:

\[ Y = C + I + G + NX \]

where \( Y \) stands for GDP, \( C \) is consumption, \( I \) is investment, \( G \) is government purchases, and \( NX \) is net exports.
• **Consumption** consists of goods and services bought by households or consumers.
  Durable goods: goods that last a long time, such as cars and TYs.
  Nondurable goods: goods that last a short time, such as food and clothing.
  Services: such as haircuts and airplane rides.

• **Investment** consists of good bought for future use. Investment can also be divided into three categories.
  Business fixed investment: new machinery and equipment bought by firms.
  Residential fixed investment: new houses bought by households.
  Inventory investment: increase in firms’ inventories.

• **Government Purchases** are the goods and services bought by federal, state and local governments. This includes military equipment, highways and bridges, and the services of government employees.

• **Net Exports** are the goods and services purchased by foreigners.
13 The Components of GDP

- Table 2.1.

- The Increasing role of services:

  In 1992, the service sector in the US accounts for 72 percent of its GDP (in Germany it is 57 percent) and employed 76 percent of its labor force.

  Meanwhile, the share of manufacturing has fallen in all the big economies. In 1992, it accounts for only 23 percent of America’s GDP and even smaller 18 percent of jobs. In Britain and Canada manufacturing has also tumbled to less than 20 percent. Even in Japan and Germany, the strongholds of manufacturing, services is no more than 30 percent of GDP.

  Services are also the fastest growing part of international trade, accounting for 20 percent of total world trade and 30 percent of American exports.

- The services Sector:

  Legal services, business services (consulting), health, hotels, education, financial services, transport and communications.
14 Other Measures of Income

- GNP, gross national product, measures total income earned by *nationals*.

  GNP is equal to GDP plus total income earned by US nationals in other countries minus income earned domestically by foreign nationals.

- NNP, net national product, is GNP net of the depreciation of capital.

  Depreciation, the consumption of fixed capital, is the amount of the economy’s capital stock that wears out during the year. Depreciation equals 10 percent of GNP each year.

  Because the depreciation of capital is a cost of producing the output of the economy, subtracting it from GNP shows the net result of economic activity.

- National Income is NNP minus Indirect Business Taxes (sales taxes). NNP measures how much everyone in the economy has earned after the indirect taxes.

  Indirect business taxes are the difference between the price the consumers pay and the price the firm receives.

  Important: Employee compensation accounts for 70
percent of national income, corporate profits 12 percent.

- Disposable Personal Income is the amount households and noncorporate businesses have available after satisfying their tax obligations to the government.
The GDP Deflator

Different goods and services have different prices and they change over time and relative to each other. Economists want to summarize the **Overall level of prices in the economy** in one number.

One index that does that is the **GDP Deflator**, also called the implicit price deflator for GDP.

\[
GDP\ Deflator = \frac{Nominal\ GDP}{Real\ GDP}.
\]

or

\[
Nominal\ GDP = Real\ GDP \times GDP\ Deflator
\]

Thus the definition of the GDP deflator separates nominal GDP into two parts: the part that measures quantities (real GDP) and the other that measures prices (the GDP deflator).

Here, nominal GDP measures the *current* dollar value of the output of the economy. Real GDP measures the economy’s current output valued at constant (base-year) prices. The GDP deflator measures the price
of output (or the overall level of current prices) relative to its price in the base year.
To better understand this, consider an economy with only one good, corns. Let $P$ be the current price of corns. Let $Q$ be the quantity of corns the economy produces currently. Let $P_{bas}$ be the price of corns in some base year. Then Nominal GDP is $P \times Q$ and real GDP is $P_{bas} \times Q$ and

$$GDP\ Deflator = \frac{P}{P_{bas}}$$

which is just the price of corns in the current year relative to the price of corns in the base year.

**Note:** Suppose the economy produces two goods, or three goods, do you know how compute the GDP deflator?
The Consumer Price Index (CPI) is the most commonly used measure of the economy’s overall level of prices.

The aim of CPI is to measure in a single index the cost of living. It focuses on the prices of goods and services that typical consumers buy (or the goods and services included in a typical consumer’s basket), not the prices of all goods and services produced in the whole economy.

Suppose a typical consumer buys 5 apples and 2 oranges every month. Suppose 1992 is chosen to be the base year. Then

\[
CPI = \frac{5 \times \text{current price of apples} + 2 \times \text{current price of oranges}}{5 \times 1992 \text{ price of apples} + 2 \times 1992 \text{ price of oranges}}
\]

CPI tells us how much it costs now to buy 5 apples and 2 oranges relative to how much it costs to buy the same basket in the base year.

Notice in the above definition, the quantities of the goods in the typical consumer’s basket are fixed, or in other words the weights of the different goods in
the formula are fixed. Thus CPI is also called a fixed-weight price index.
17 The GDP deflator vs. the CPI

The GDP deflator and the CPI give somewhat different information about what’s happening to the overall level of prices in the economy.

The first difference is that the GDP deflator measures the prices of all goods and services produced, whereas the CPI measures the prices of only the goods and services bought by consumers.

The second difference is that the GDP deflator includes only those goods produced domestically. Imported goods are not part of GDP and do not show up in the GDP deflator.

The third and most subtle difference results from the way the two measures aggregate the many prices in the economy. The CPI assigns fixed weights to the prices of different goods, whereas the GDP deflator assigns changing weights. In other words, the CPI is computed using a fixed basket of goods, whereas the GDP deflator allows the basket of goods to change over time as the composition of GDP changes.
Class Work: Mankiw page 38. Problem 6:
Two goods: bread and car.
Year 2000: 100 cars produces and sold at 50,000 dollars each; 500,000 units of bread produced and sold at 10 dollars each unit.
Year 2010: 120 cars produces and sold at 60,000 dollars each; 400,000 units of bread produced and sold at 20 dollars each unit.
(b) Suppose a typical consumer consumes 1 car and 10 units of bread. Compute the year 2010 CPI, taking again year 2000 as the base year.
18 The Inflation Rate

Let $P_t$ be the price level of period $t$. Let $P_{t-1}$ be the price level of period $t - 1$. Then the rate of inflation over periods $t$ and $t - 1$ is

$$\pi = \frac{P_t - P_{t-1}}{P_{t-1}}.$$

Correspondingly, period $t$ price level is equal to last year’s price level adjusted for inflation:

$$P_t = P_{t-1} + \pi \times P_{t-1}$$

In the United States in the mid-and-later-1990s, the inflation rate was relatively low, around 2 to 3 percent per year, even though prices were much higher than they were 20 years earlier. High inflation rates in the 1970s had pushed up the price level. Once raised, the price level does not fall unless the inflation rate is negative— that is, unless there is deflation.
19 The Unemployment Rate

The unemployment rate measures the percentage of those people wanting to work who do not have jobs.

A person is employed if he or she spent most of the previous week working at a paid job, as opposed to keeping house, going to school, or doing something else.

A person is unemployed if he or she is not employed and is waiting for the start date of a new job, is on temporary layoff, or has been looking for a job.

A person who fits into neither of the above two categories, such as a student or retiree, is not in the labor force. A person who wants a job but has given up looking – a discouraged worker – is counted as not being in the labor force.

The labor force is defined as the sum of the employed and unemployed, and the unemployment rate is defined as the percentage of the labor force that is unemployed.
The labor-force participation rate measures the percentage of the adult population that is in the labor force:
What relationship should we expect to find between unemployment and real GDP?

Employed workers help to produce goods and services and unemployed workers do not, increases in the unemployment rate should be associated with decreases in real GDP. This negative relationship between unemployment and GDP is called Okun’s law, after Arthur Okun, the economist who first studied it in 1962.

Question: Can you think of a scenario in which the Okun’s law is violated?

Readings: Mankiw, chapter 2.