Introduction to Macroeconomics

1 What Is Macroeconomics About?

In contrast to microeconomics, which studies the behavior of individuals and firms, macroeconomics studies the economy as a whole.

Macroeconomics seeks to understand the causes and consequences of "business cycles" and why some countries achieve long-term economic growth while others do not. A better understanding may lead to better policymaking on the part of the government, whether the objective is to promote growth and employment or to smooth business cycles. For market participants, a better understanding of macroeconomics helps to form better expectations on the future evolutions of the economy and government policies. Finally, for general citizens, a better understanding of macroeconomics leads to more productive discussions and debates on government policymaking.

A better understanding of macroeconomics leads to better management of the economy, which in turn leads to a better economy. A better economy is important not only for the satisfaction of material needs. A stably growing economy leads not just to better living for millions of people, but also to a better society. As Guanzi of ancient China says, "when the granaries are full, the people follow appropriate rules of conduct, and when there is enough to eat and wear, the people know honor and shame."[1] In contrast, recent world history teaches us that economic depressions often breed political radicalism, extremism, and wars, which always make human lives cheap and miserable. In poverty and misery, human morality and dignity are bound to decay, overwhelmed by more basic and urgent human desires such as survival.

The fact that macroeconomics studies the economy as a whole has some important implications. First, macroeconomics must rely on aggregation. We must measure the economy using aggregated variables such as gross domestic product (GDP), consumer price index (CPI), and so on. Macroeconomists must also rely on aggregated concepts such as aggregate demand, aggregate supply, representative firm, among others.

Second, the economic meaning of aggregated variables is not necessarily the same as its microeconomic counterpart. For example, the price of a certain good in microeconomics is in the relative sense. That is, a rise in the price of a good signals an increased attractiveness of the good relative to other alternatives, holding the supply fixed. But the aggregated price, or the general price level (e.g., CPI), is nothing but an index. A rise in the aggregated price indicates inflation or the loss of purchasing power of money. The absolute value of the aggregated price does not have economic meaning, as it is meaningless to compare different price indices,

such as CPI and GDP deflator. The price indices contain information only in their variations over time.

As a direct consequence, some familiar laws of microeconomics cannot automatically carry to macroeconomics. For example, the demand curve in microeconomics is almost always downward sloping: Demand increases as the price declines. But in macroeconomics, the aggregate demand does not necessarily increase as the general price level declines. Some classical economists, for example, may argue that the aggregated demand does not depend on the general price level at all since consumers can see through the *veil of money*. Inflation would not fool consumers to buy less, and deflation would not fool them to buy more. Even for those who support the downward-sloping aggregate demand curve, they do not take it for granted. Keynes, for example, would argue that a decline in the price level increases the real money supply, which reduces the real interest rate and stimulates the aggregate demand.

Third, macroeconomic analysis is inherently general-equilibrium analysis since macroeconomic equilibrium, in which the aggregate demand matches the aggregate supply, is necessarily a general equilibrium in all markets. Partial-equilibrium analysis, which is productive in microeconomics, has no place in macroeconomics. The problem of unemployment, for example, cannot be separately analyzed in the labor market, holding other markets (e.g., the goods market) constant. The goods market simply cannot be held constant when the labor market shifts, since the level of employment and wage affects both aggregate demand and supply in the goods market.

Finally, it is often more reasonable to use the behavioral approach in macroeconomic modeling.[2] That is, we do not need to assume that people are rational, having rational expectations, and so on. Even when everyone in the economy behaves rationally, as a whole they may exhibit strong irrationality. The history of Wall Street alone offers many such examples. Besides, the economy as a whole has structural constraints that individuals do not have. For example, a rational individual may smooth his consumption to the extent that the variation of current income has a small effect on current consumption. In macroeconomics, however, the current total consumption must depend crucially on the current total income due to the simple fact that consumption expenditure generates income to the sellers of consumption goods.

In the rest of this chapter, we first describe how different types of economies work. Then we describe how, in general terms, economists use models to understand the economy. In the end, we briefly talk about the history of macroeconomic thoughts.

2 How Do Economies Work?

The economy is an integrated part of society. It addresses the production and distribution of material goods and services for individuals in society. For an economy to work for society, it must find ways to solve three fundamental problems: (1) What and how many goods and services should be produced? (2) How should resources that are scarce and have alternative uses be used in producing these goods and services? (3) For whom are they produced? The first two problems are related to production, and the third is related to distribution.

There are several conceptual forms of economy, each of which solves the aforementioned problems in distinct ways. The most primitive is the economy of instinct, in which bees and ants, for example, solve these problems by instinct. Early human societies, according to Karl Marx and Friedrich Engels, may solve these problems in the form of primitive communism. As human societies grow and become more complex, the market economy emerges to solve these problems using the "invisible hand" of the market. Finally, in the twentieth century, a group of countries (including China) experimented with the planned economy or command economy, which relied on administrative commands to solve these three problems.

Note that these are very stylized conceptual forms of economy. With the possible exception of the economy of instinct, these forms only exist in theory. Reality is much more complex. In the following, we describe in more detail the market economy and the planned economy. Understanding these two stylized economies helps us understand the mixed economy, which is arguably closer to what we have in reality.

2.1 The Market Economy

A market economy relies on voluntary transactions to solve the three fundamental problems. As the demand for some goods and services increases, consumers bid up their prices, which induce suppliers to produce more. To produce more of the demanded goods and services, suppliers bid up prices of required inputs (labor, capital, land, energy, metals, etc.). The increased prices then lead to the re-allocation of these resources for production. Workers receive their compensation for the supply of labor, owners of capital get paid for the supply of capital, and owners of the firms claim the residual profit. Capable workers or those with sought-after skills receive more; shrewd or/and lucky capitalists and entrepreneurs survive and become rich. All of them are consumers of goods and services in the economy.

In a market economy, price plays a crucial role. Prices signal the supply and demand condition in the market of consumer goods and services. Prices also signal the relative scarcity of factor inputs (i.e., labor and capital), thus inducing factor suppliers to increase or decrease their supply. Without any coercion, prices direct resources to be used in producing millions of goods and services demanded by millions of consumers with different tastes and preferences.

The market of a market economy, however, cannot function by itself. For the market to work, that is, transactions should be fair (no cheating) and fast (no unbearable delay), there should be strong protection of property rights, efficient enforcement of contracts, efficient means of money settlement, and so on. The government, which provides the legal and monetary infrastructure, is indispensable for the functioning of the market economy.

The government also restricts the domain that the market can operate. Some voluntary transactions should never happen, that is, there are things money should not buy. For example, human beings should not be on sale, child labor should not be employed, and political rights should not be for sale. The ground for such restrictions of the market is moral. There are moral limits on the market.

And the government's role is often much bigger than restricting and safeguarding voluntary transactions. Due to various reasons (externality, monopoly, information asymmetry, etc.), the "free market" has severe limitations in running the economy. Examples abound: Without government expenditure, the market alone would under-supply public goods (e.g., defense and public security); without government regulation, the market would over-supply public "bads" (e.g., pollution); without anti-trust policies, monopolies may emerge and lead to under-supply of goods and services with distortional prices; Without proper regulation of the financial industry, the market may experience violent boom-bust cycles.

Finally, the government has compelling reasons to intervene in income distribution and to conduct welfare policies. For one, the market value of labor can be unfair. For example, the salary of "super managers" of big corporations can be hundreds of times of what nurses can earn. Such differences in pay arguably cannot be justified by differences in contributions to society. For another, if the government does not conduct transfer payment (taxing the rich and providing welfare benefits to the poor), the distribution of income and wealth in a free-market economy may be dangerously unequal.

2.2 Planned Economy

From 1953 to 1978, China experimented with the planned economy, modeled after the former Soviet Union. Historically speaking, China's adoption of the planned economy was somewhat inevitable. After World War II, there appeared to be a consensus among economists that the planned economy could work. And given the success of the Soviet wartime economy, many even argued that the planned economy was better than the "chaotic" market economy, especially for developing countries. Paul Samuelson, arguably the "foremost academic economist of the 20th century" (New York Times), repeatedly wrote in his textbook that the Soviet economy was growing faster than that of the United States.

Given such views by mainstream economists, even if Chinese leaders had turned to the West for ideas, they would still choose the planned economy since China lagged

far behind the advanced economies, and the Chinese people were desperate to build a powerful industrialized nation. Of course, Chinese leaders did not really turn to the west for ideas. The apparent success of the Soviet experience was convincing enough. The rest of the history was a gigantic social and economic experiment, or with the benefit of hindsight, a gigantic gamble.

The new republic soon removed almost all market activities from the economy. The government nationalized private firms and started to direct production according to government plans. Factory managers were more like government officials than business decision-makers. In fact, factory managers had no power to hire or fire workers, no power to select resource inputs, and no power to reward workers. The government determined what and how much goods and services would be produced, what resources would be used in production, and how final goods and services would be distributed.

In the countryside, the government collectivized farms. Farmers were organized into "communes" working for meager pay. Indeed, to support investment in heavy industry, the government suppressed rural demand by setting an exorbitantly low price for farm products. And to prevent farmers from leaving communes for cities, the government established the household registration system. Rural status, under the household registration system, made it impossible for farmers to migrate to the cities. They had to remain in their commune and work on the collective's land. Since farmers no longer claimed the "residual" profit of farming, they did not have any incentive to work hard, let alone invest.

Prices in the planned economy no longer directed resource allocation. They were still in place for the mere purpose of accounting. Prices are highly distortional. Wages were very low, even for industrial workers. Prices of consumer goods were also very low, to the extent that the government had to issue "ration coupons" to regulate sales. Almost every consumer good, from grain to meat to clothes, was on ration. The prices for industrial goods were comparatively high, keeping heavy industry viable.

The gigantic experiment of the economic planning turned out to be a gigantic failure. In particular, the Great Leap Forward, a misguided industrialization campaign, resulted in huge waste in the use of labor and capital, paving the way for a disastrous famine in 1959–1961. Making matters worse, political campaigns and revolutions persisted, disrupting the economy. For nearly thirty years, Chinese people had to live with extreme scarcity of consumer goods. The planned economy failed to make the nation rich. Neither did it industrialize China. By the end of the 1970s, China was still an agricultural economy, and there was a strong consensus in the society for economic reforms. In retrospect, Hayek was right that market activities are essential for aggregating diffuse private knowledge and that the system of market prices is too valuable to dispense with.

From 1978, the Chinese government started to let the market play more and more important roles. The so-called "Reform and Open-Up" has led to a China

Miracle that has transformed a stagnant agricultural economy into a modern industrial economy. As the Chinese economy becomes one of the largest in the world, hundreds of millions of ordinary people have been lifted out of poverty.

2.3 Mixed Economy

The current economic model of China can be more precisely described as a mixed economy, where both the market and the government play important roles in solving the fundamental economic problems. It is worth noting that in the advanced Western economies, government also plays important roles. It is the author's opinion that China's socialist market economy and the Western market economies differ only in degree, not in category.

In a mixed economy, the government typically plays the following roles. First, the government should provide public goods such as national defense and public security, and quasi-public goods such as infrastructure and education. The private sector tends to under-supply public goods because the private cost of supplying public goods exceeds the total benefit to the public.

Second, since the private sector tends to over-supply "public bads" (e.g., pollution), the government is responsible for imposing penalties and costs on the provision of public bads and protecting public interests. A typical example is protection of the environment. The government is responsible for maintaining environmental standards for farming and manufacturing, ensuring sustainable development.

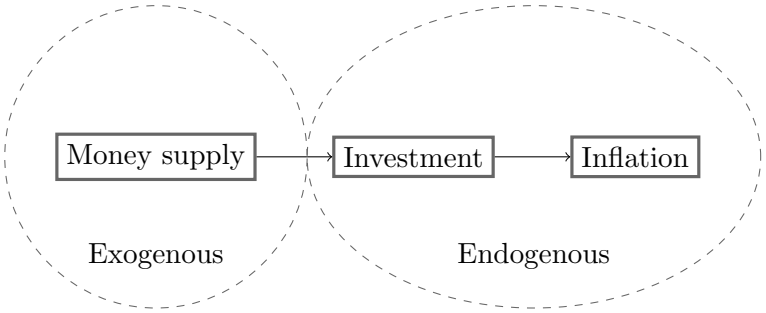
Third, the government is responsible for promoting economic growth. The government may invest in infrastructure, public education, scientific research, and so on. In China, local governments often actively attract private investment from other regions or countries, which stimulates the growth of the local economy. They may offer lower taxes, and lower land fees, and even facilitate bank lending for firms.

Fourth, to alleviate income inequality, or as social insurance, the government may make transfer payments to the disadvantaged groups such as the elderly, the unemployed, and so on. To balance regional differences in the public-good provision, the central government may make transfer payments to less-developed provinces and cities.

Fifth, the government is responsible for regulating financial institutions (e.g., banks, security firms, insurance companies, and others), fighting against financial crime, and protecting retail savers and investors from misinformation and fraud.

Sixth, the government also implements macro-prudential measures to reduce "systemic risk" in the financial system. Unchecked "animal spirits" in the financial industry may easily lead to excessive leverage, bubbles, and financial crises. In a modern economy, a healthy financial industry is indispensable for the provision of financing and risk-sharing products for firms and households. Financial crises, with widespread failure of financial institutions, almost always lead to economic crises.

Figure 1: A graphic illustration of a macroeconomic model.



Seventh, the government is responsible for conducting fiscal and monetary policies. Even with a robust financial sector, economic cycles are inevitable. Fiscal and monetary policies, if rightly conducted, can take the steam out of an overheating economy and give a backstop to an economy in freefall.

Finally, the government may also directly own and manage state-owned enterprises (SOE). China's central and local governments control a large number of SOEs, a legacy of the era of the planned economy. Since the 1980s, China has been continuously reforming its state sector.

3 Macroeconomic Modeling

We "know" the economy as a whole through macroeconomic variables (e.g., GDP, inflation, etc.), which are measurements of the economy from different dimensions or perspectives. We "understand" the economy using models that define functional relationships between macroeconomic variables. Key macroeconomic variables include GDP, (un)employment, inflation, interest rates, exchange rates, and so on.

There are two sets of variables in any model: endogenous variables and exogenous variables. Endogenous variables are variables whose values are determined within the model, while exogenous variables are those whose values are given outside the model, say, by the experimenter. Figure 1 graphically illustrates a macroeconomic model, with investment and inflation as endogenous variables and money supply as an exogenous variable.

A macroeconomic model is a toy economy, with which we can do virtual experiments. A typical virtual experiment goes like this: If we change the money supply (Figure 1), how do endogenous variables (investment and inflation) change?

The macroeconomic model is most often expressed in a set of equations involving both endogenous and exogenous variables. Solving the model is nothing but solving the set of equations, that is, representing endogenous variables with exogenous variables. Mathematically speaking, endogenous variables are unknowns, and

exogenous variables are considered known.

A typical modeling exercise starts from some puzzle, a phenomenon that cannot be (adequately) explained by old models. For example, the occurrence of the Great Depression, which is impossible in classical models, prompted John Maynard Keynes to propose his revolutionary theory.

A model succeeds when the virtual experiments on the model yield predictions that are consistent with data. In this way, the model can "explain" changes in some endogenous variable with changes in exogenous variables. In other words, the model characterizes *a* causal relationship between endogenous and exogenous variables.

For example, suppose that we observe a positive correlation between money supply and inflation. The correlation does not tell us anything about whether the money supply causes inflation. It may be that a third variable causes both unemployment and inflation, making them correlated. Now we construct a model that involves both money supply and inflation, treating the former as exogenous and the latter as endogenous to the model, as in Figure 1. With this model, we can perform virtual experiments. Specifically, we increase the money supply and see what happens to inflation. If inflation increases as well (consistent with data), then we say that the model characterizes a causal relationship between money supply and inflation. In fact, the model in Figure 1 provides a mechanism of how changes in money supply lead to changes in inflation: An increase in money supply leads to more investment, which in turn drives up inflation. In short, this model offers an economic explanation of inflation.

Of course, we should also perform other experiments on the model. For example, how investment and inflation relate to each other when money supply behaves as the data. If the additional prediction is not consistent with data, we would have less confidence in the model. In such a case, we set out to improve the model in some way or propose a new model. If the additional prediction is also consistent with data, we would be more confident in the model.

There is a crucial difference between models in economics and those in natural sciences. In natural science, a new model replaces an old one when the former is more general, meaning that the new model can explain facts that the old model cannot explain. In economics, however, new models rarely replace old ones. Instead, they add to the ever-richer set of models, each of which may give us insight in some particular settings. Economics is an arsenal of models.

Often it is a challenge to select one of the models available for analyzing a particular problem. It takes science to propose and evaluate models, but it takes art to choose an appropriate model in a particular setting. The default answer to an economic question should be: It depends. There is no definite answer since the setting where an economic question arises is almost always complex, so much so that there is uncertainty whether a model's assumptions would hold. It is thus important to have observations that are as accurate and complete as possible. And

it is important to be humble.

4 A Brief History of Macroeconomics

Macroeconomics was born in the ruins of the Great Depression, at a time when classical economics failed to recommend any policy responses to the widespread misery even in advanced countries. John Maynard Keynes, in his magnum opus *General Theory of Employment, Interest and Money*, offered a theory that explained why the Great Depression could occur and what governments could do. Keynes challenged many classical assumptions, such as flexibility of price and rationality of individuals. He started to look at the economy as a whole and, thus, introduced many important macroeconomic concepts such as the aggregate demand, aggregate supply, marginal propensity to consume, multipliers, and so on. Only after the Keynesian revolution did economists find it necessary to have a separate discipline within economics – macroeconomics – different from microeconomics, which mainly deals with individual behavior.[3]

Before Keynes, there were already discussions of problems that we call macroeconomic problems. For example, there were many versions of the *quantity theory of money*, including Irving Fisher's formulation (1867–1947),

$$M \cdot V = P \cdot Y,$$

where M is money supply, V is the velocity of money, P is price, and Y is the real value of aggregate transactions (real GDP). In classical thinking, prices (and wages) are assumed to be flexible, and both V and Y are assumed to be constant. So an increase in money supply (M) would bring a proportional increase in the price level (P). It is in this sense that classical economists regarded money as a "veil" over the real economy: Money is exogenously given and does not have any impact on real activities.

For another example, the business cycles were well-studied by the Austrian School. The Austrian theory of business cycles regards bank credit as the key to understanding economic fluctuations. The Austrians argued that the prevailing interest rates were too low, for which the central bank was to blame. The low level of interest rate encouraged businesses to take loans and over-invest in capital goods, resulting in booms and busts.

Keynes was an original thinker and wrote in his own way, making his *General Theory* difficult to read, even for professional economists. This opens the way for different interpretations of *General Theory*. The neoclassical Keynesians, notably John R. Hicks (1904–1989) and Paul A. Samuelson (1915–2009), offered an interpretation that soon dominated the academic and policy circles. They combined Keynes's macroeconomics with neoclassical economics and produced the socalled *neoclassical synthesis*. In addition, Samuelson was instrumental for establishing a

new pattern for economic teaching and research: economic theories expressed in formal, mathematical models.

At the same time, large-scale econometric models were developed for macroeconomic forecasts and policy evaluations. These models may employ hundreds of regression equations. An important one of these is the Phillips curve, named after A.W.H. Phillips, who found an inverse relationship between wage inflation and unemployment. The Phillips curve gave support to policies that combat unemployment by creating inflation using fiscal and monetary policies.

This doctrine was then challenged by monetarism, which was championed by Milton Friedman. Friedman (and Phelps) argued that there would be no long-run trade-off between inflation and unemployment since people would expect inflation following stimulus measures. In contradiction to his contemporary Keynesians, Friedman argued that monetary policy mattered and that fiscal policy might fail. During the great inflation era of the 1970s, monetarism was successful in explaining why inflation happened with a persistently high unemployment rate. A famous doctrine of monetarism is "inflation is always and everywhere a monetary phenomenon."

New classical economists, notably Robert Lucas, further challenged the Keynesians on the methodological front. The new classicals emphasized the *microeconomic foundation* of macroeconomics. They built models of representative rational agent with *rational expectations*. Large-scale econometric models were discredited since the empirical relationship (reduced model) might break down when the underlying structural model changes (Lucas's critique). Moreover, Edward C. Prescott and Finn E. Kydland propose the real business cycle (RBC) theory, which argued that business cycles might be efficient responses to exogenous shocks. The model that the RBC theorists employed, the dynamic stochastic general equilibrium (DSGE) model, soon became the dominant framework of macroeconomic modeling in academia.

Monetarism, new classical, and RBC all shared the same view that the market economy was inherently self-correcting and that government interventions (aggregate demand management) were at least unnecessary, if not harmful. Keynesianism, in contrast, held that the market economy was inherently unstable and that aggregate-demand management would help to stabilize the unstable economy.

Despite the attacks by monetarists, new classicals, and RBC theorists, Keynesianism is still well alive today. On the one hand, some new Keynesians investigate how market imperfections occur, e.g., sticky-price, asymmetric information, and so on. These imperfections lay the "microeconomic foundation" that makes the economy unstable. On the other hand, the Global Financial Crisis (GFC) has dealt a blow to the notion of self-correcting market forces. After GFC, indeed, post-Keynesian economists such as Hyman Minsky received widespread recognition on their analysis of recurring financial crises.

5 Concluding Remarks

Macroeconomics is the study of the economy as a whole. The Chinese economy is a mixed economy, where both the market and government play important roles. To explain macroeconomic phenomena, economists rely on models that define functional relationships between endogenous and exogenous variables.

A model is, in a sense, always wrong, since it is necessarily an abstraction from reality. It is valuable as long as it sheds light on one or two questions. As we can see in the previous section, there are many schools of thought in the evolution of macroeconomics. Different schools differ in the modeling assumptions, sometimes not easily verifiable, about the world. In which school should we believe? The obvious answer should be none. We may have a prior opinion, but we should not religiously believe in any *ism*. We should confront theory with facts and tests, and even when we settle on a seemingly satisfactory model, we should use it cautiously. In macroeconomics, as in other sciences, there is no absolute, unchanging truth, but tentative and temporary understanding. Research improves such understanding in a dynamic and evolutionary manner.

Notes

[1]管子：仓廪实则知礼节，衣食足则知荣辱。

[2]George A. Akerlof once said, "If there is any subject in economics which should be behavioral, it is macroeconomics." In *Behavioral Macroeconomics and Macroeconomic Behavior*, by George A. Akerlof, a lecture delivered in Stockholm, Sweden, on December 8, 2001, when Akerlof received the Bank of Sweden Prize in Economic Sciences in Memory of Alfred Nobel.

[3]Although Ragnar Frisch (1895–1973), a Norwegian economist, invented the terms macroeconomics as well as microeconomics as early as in 1933, the category of macroeconomics entered the consciousness of economists as a result of the publication of Keynes's *General Theory of Employment Interest and Money* in 1936.

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