



PRINCIPLES OF MACROECONOMICS

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Preface

This book is provided for students taking Principles of Macroeconomics course at Faculty of Economics, Thammasat University. Others who want to review the elementary concept of macroeconomics are also welcome to enjoy. Contents in this notes are the minimum requirement for those enrolling in such course. They are, however, encouraged to further their studies in other macroeconomics textbooks.

The author hopes that readers find it useful for their macroeconomic refreshment and revision. Comments and discussion are always appreciated. Special thanks are given to those commentators in the previous draft.

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Chapter 1

Introduction to Macroeconomics

1.1 Meaning, Objectives and Macroeconomic Policies

The economy has been developed throughout the course of human history. Economic phenomena have been observed by social scientists. Economics is one branch of such study to investigate how individuals within the economy making economic choices. Economics was then initiated and nowadays its scope and meaning have been defined to be the study of scarcity and trade-off. The limited resources are allocated to satisfy non-satiated human wants. Choices are needed to be made in order to attain the desirable goal. After choosing it, the cost or the best value of other alternatives forgone is called the *opportunity cost*.

Microeconomics and Macroeconomics are two subfields in this economic discipline. While microeconomics examines the functioning of individual industries and the behavior of individual decision-making units such as business firms, households and sometimes government; macroeconomics explores economic behavior of public and private sectors, and the rest of the world in aggregate terms involving output, employment, price level and so on. In this course, we are going to discuss the big picture of the economy. Here are some questions macroeconomics tries to answer:

Why does the cost of living continue increasing?

Why are people unemployed, even when the economy is growing?

What will happen if there are shocks towards the economy?

Should government intervene to end economic depression?

What is the government budget deficit? How does it affect the economy?

How does financial market work and what are its functions for the economy?

How will the central bank play its role for the economic stability?

Why do we have to consider other countries' economies?

Apart from those exemplified questions, many macroeconomic objectives are raised and discussed. Economic growth, stability and equity are among the most desirable goals for policymakers to achieve. The three are detailed as following:

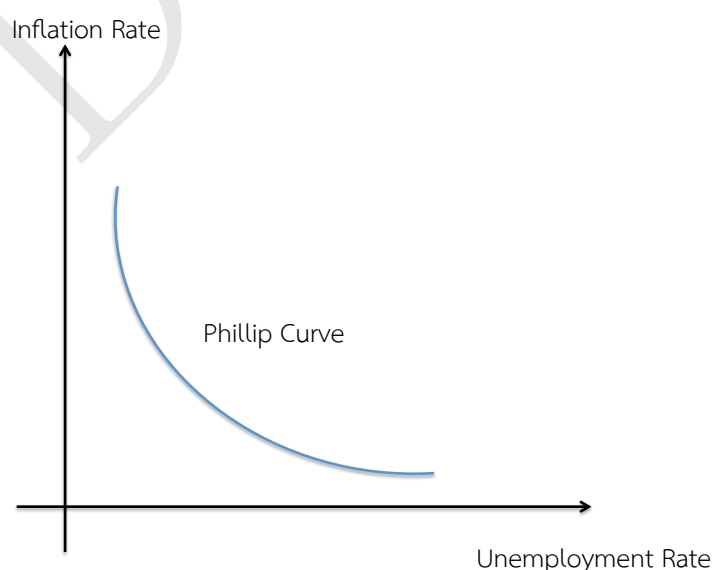
1. *Economic growth* is the increase in total output of one particular economy. Once people can produce more, it will generate more foods, clothes and other necessary as well as unnecessary things for household to dispose of. As long as there is an incentive for people to consume more, the economy keeps expanding.

2. *Economic stability* is the condition that national output is growing steadily, with low inflation and full employment of resources. Volatility is not preferred as uncertainty will make firms, households and other economic agents reluctant to decide.

3. *Equity* is talking about fairness of the economy, how income is distributed within the society. Even income distribution tends to create less civil turbulence. Economic injustice might bring political concerns to all citizens. Macroeconomic policies are then implemented to attain such objectives.

In addition, policymakers are aware of the tradeoff in this macroeconomic analyses. Phillips curve indicated the relationship between inflation and unemployment rate (figure 1-1). His study in 1958 found that when the economy operated closely to full employment, there would be a competition in factor of production, hiring more labors and pushing up price level of the economy. This means higher inflation causes lower unemployment rate. Nonetheless, if the economy is facing low inflation rate, less firms are willing to search for new workers, leaving more people unemployed. Negative relationship is examined between the two.

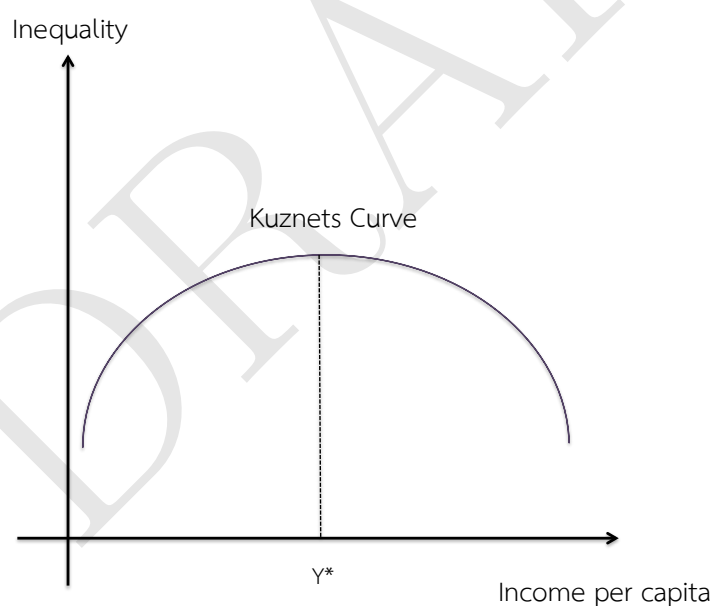
Figure 1-1: Phillip Curve



Nicholas Kaldor also purposed that capitalists tend to save more than workers. If more of income are in the hand of the rich, more saving is the result and then larger amount of income should be channeled to investment to fuel economic growth. Uneven distribution towards profit earners than wage earners is likely to create bigger economy. The tradeoff between economic prosperity and inequality is realized.

Another hypothesis relating to this tradeoff, at first, between economic growth and income distribution is Kuznets curve (figure 1-2), which indicating that at the very beginning, all laborers are in agriculture so they are all equally even. As the economy grows, many markets emerge. There will be wage differential among sectors that create large inequality. Nonetheless, as time passes by and the economy reaches Y^* , government might come in and introduce redistribution policies and then factor payment will be properly allocated and the equality can be reached. Three phases of development are classified and the major factor is income per capita.

Figure 1-2: Kuznets Curve



Macroeconomic policies are categorized to be fiscal policy and monetary policy. Fiscal policy is launched by the government. It relates to government spending and taxes. The results of government intervention in macroeconomic context could be from a better market atmosphere to a failure in economic development. Monetary policy is another tool from the central bank to control the quantity of money circulated within the economy. Policymakers are to consider and carry them out in order to reach their macroeconomic objectives.

1.2 Basic Concepts

Given the aggregate economy, policymakers need information to analyze the situation and impose policies just in time to achieve their goals. To know the exact problem of the economy and react punctually, the nature of data or variable is also important. If they are categorized by time measurement, there are stock and flow variables, which assessing variables at a point in time or over a period of time. Nevertheless, if they are distinguished by its price impact, there are nominal and real variables.

1.2.1 Stock and Flow Variables

Stock variable is a variable whose value depends on an instant rather than on a period of time. It represents quantity generated and accumulated at a particular time.

Example: Population, Inventory, Saving, Capital Stock, and etc.

Flow variable is a variable whose value depends on a period of time rather than an instant. A flow would be measured per unit of time.

Example: Income per day, Expenditure per week, Saving per month, and etc.

To distinguish these two variables, imagine the water accumulated in the reservoir is the stock variable while flow ones might be the rain falling each day, or the drainage each month.

Flow variables add more or lessen the amount of stock ones. For instance, investment per year give more of capital stocks while depreciation rate will deteriorate the value of capital. Then, that means if depreciation rate is less than investment, or net investment is positive, capital stock will rise and vice versa. Another example is the death and birth rate, which are flow variables, that can increase or decrease the number of population residing in the country.

Nevertheless, sometimes relationship between stock and flow might not be defined. For example, Gross Domestic Product (GDP) per capita is the variable that cannot be classified whether it is stock or flow variable since it is the ratio between GDP (flow variable) and population (stock variable).

1.2.2 Nominal and Real Variables

Nominal Variable is the variable that adjusts for change in price. Nominal GDP is a classic example that it describes the money value of total output of the economy. A change in this measure can be from a variation in either the physical quantities or the prices it is based.

Real Variable is the variable that does not adjust for change in price. For example, real GDP measures the value of total outputs not at current prices but at a set of prices

that prevailed in some base period. A change in real GDP indicates only a change in its quantities.

People consume goods and services, not money. Therefore, economists often care more about real variables since the change in price can be caused by various factors and do not represent the well-being of the whole economy.

1.3 Macroeconomic Objectives and Indicators

1.3.1 Input and Output

Macroeconomics captures things in aggregate. Aggregate output is the summation of goods and services produced within the economy. Firms resort to factors of production to provide goods and services for households to consume while individuals will receive factor payment as a return from the private sector after working in the production process. Output continues being created, given only one country in this world and no government. The economic system is then in equilibrium. Sometimes, this arrangement is obstructed by external shocks. Disasters can disrupt the production process, causing the downturn of economic growth for a country. A recession might occur if the downturn takes time and if it is long and deep enough, depression is another word economists defined. Innovation is the breakthrough for new experiments that leads to a better way to manufacture goods and services, contributing to the upturn of economic growth. Business cycle, the ups and downs of the economic growth, is the normal phenomena for the economy.

Definition 1. *Input and Output*

Input = Factors of production such as labor, capital, land and entrepreneurs as well as raw materials, intermediate inputs and all other things needed to produce goods and services.

Aggregate output = The total quantity of goods and services produced in an economy in a given period of time.

Business cycle = The cycle of short-term ups and downs of economic growth in the economy.

Recession = A period during which aggregate output declines. Conventionally, a period in which total output declines for two consecutive quarters.

Depression = A prolonged and deep recession.

1.3.2 Employment and Unemployment

Labor forces are the number of workers in the labor market that are in the age level, able to work and willing to be hired. Unemployment is the situation that people who are willing to work but cannot seek for an employer to employ them. Population is the combination of labor force and non-labor force. The unemployment rate measures how well the labor market functions, showing how severe the unemployment situation is. The social and political concerns over unemployment is tremendous. Unemployed people create economic waste since their services, if employed, are being ignored. Persistent periods of unemployment might lead to social and political difficulties. Crime, mental illness and general social unrest are likely to positively relate to the level of unemployment.

There are 4 types of unemployment as following:

1. Frictional unemployment is the portion of unemployment that is due to the normal turnover of labor. New members enter the workforces; another quit their positions and take some times to find jobs.

2. Structural unemployment is the portion of unemployment that is due to changes in the structure of the economy that result in a significant loss of jobs in certain industries, a mismatch between the structure of the supplies of workers and the demand for workers,

3. Natural rate of unemployment is the unemployment that occurs as a normal part of the functioning of the economy, sometimes taken as the sum of frictional unemployment and structural unemployment.

4. Cyclical unemployment is the increase in unemployment that occurs during recessions and depressions.

Definition 2. *Employment and Unemployment*

Labor Force = People who are at the working age level, be able to work, and want to work.

Unemployed Labor = People who are in the labor force but cannot find job.

Population = Labor force + Non-labor force

Unemployment rate = $\frac{\text{Number of the Unemployed}}{\text{Labor Force}} \times 100$

1.3.3 Price level and Inflation

Price level is the measurement of value of goods and services in money term. The change in price level leads to certain economic effects. Inflation is to describe the situation where price level keep increasing, while deflation is in the opposite. Consumer price index is the main variable that policymakers use to monitor the change in price level since its change affects all people, the poor more than the rich. A slight increase in necessary goods makes the poor adjust themselves by reducing their consumption, but maybe not for the rich. Furthermore, an increase in inflation might discourage investors to invest since it will be hard to project its profit with price uncertainty. Inflation can also reduce comparative advantage of one country as foreigners will perceive the higher price of imported goods, less demand for export will be inevitable.

Definition 3. *Price Level and Inflation*

Price level = The average level of all prices in the economy.

Inflation = The rate at which the price level is rising.

Consumer Price Index (CPI) = The indicator measures the average cost of goods and services that are bought by the typical consumers. Normally, CPI is used to capture inflation.

Producer Price Index (PPI) = The indicator measures the average cost of intermediate inputs that are bought by the typical producers. Normally, PPI captures inflation from the producer side.

Hyperinflation = A period of very rapid increases in the overall price level.

Deflation = A decrease in the overall price level.

1.3.4 Interest rate

Commercial banks normally operate by lending money with higher rate of interest to those in deficit and obtaining money from those in surplus with a promise to give return to depositors. Interest rate is then the cost of borrowing for private sector or the return on deposited assets. As inflation can eat up people's purchasing power, there is no exception for the nominal return on loan or deposit. Real interest rate is then the real return on loan in term of purchasing power, measuring how much people will acquire from banks after eliminating the price effect. Real interest rate can also be negative, meaning that the purchasing power that lenders will receive including interest will be less than purchasing power of the amount originally lent.

Definition 4. *Interest Rate*

Loan rate = Rate that banks lend money to individuals or firms.

Deposit rate = Rate that individuals or firms receive after depositing their money in the banks.

Real interest rate = Nominal Interest Rate - Inflation Rate

1.3.5 Exchange rate

The value of currency can refer to its power to purchase foreign currencies. Each country often has her own domestic mediums of exchange. For example, Thailand offer Thai baht as a tool to exchange goods and services. If those holding Thai Baht want to buy goods and services from other countries, they need to exchange Thai Baht for that particular currency before making a transaction.

The value of domestic currency to foreign currency can vary. A reduction in external value of domestic currency is called depreciation, meaning that you need more of domestic currencies to exchange with the same amount of foreign ones. For example, last year you need 30 Thai Baht for 1 US dollar; now Thai currency depreciates, then 35 Thai Baht is required. The opposite story goes for a rise in value of domestic currency against foreign ones, so called appreciation.

Definition 5. *Exchange Rate*

Exchange rate = the number of domestic currency required to purchase one unit of foreign currency.

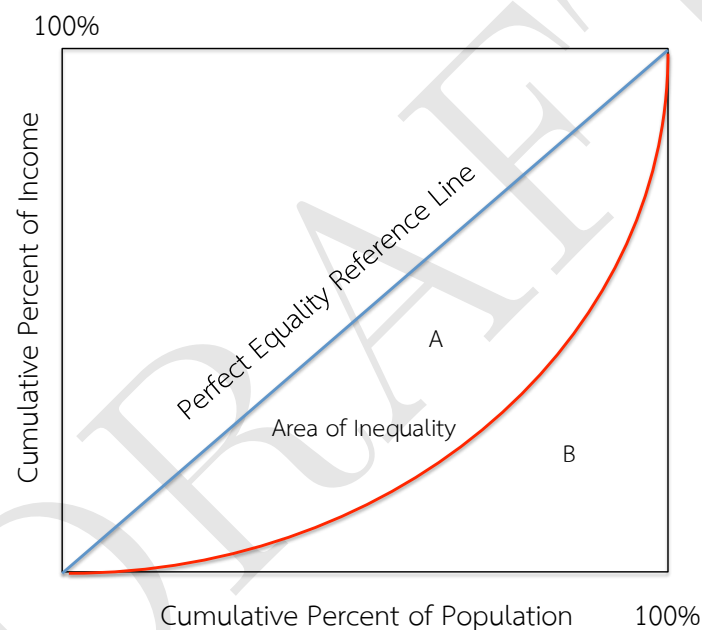
Appreciation = a rise in the external value of currency

Depreciation = a fall in the external value of currency

1.3.6 Income Distribution

Income disparity is one of the macroeconomic objectives policymaker are aiming at. Many indicators are performed to evaluate the situation. The most cited one is Gini coefficient. It shows how income is distributed among the citizen of the economy. Lorenz curve (figure 1-3) is invented to measure the distribution of income, plotting the number of population of the society against the income each particular group of people has, ranging from the poorest to the richest. As this index is calculated the ratio between the area (A) and the area of lower triangle (A+B), the higher the number, the more uneven the income is distributed. The drawback of this coefficient is that it gives only the information on the shape of the entire distribution, not on how the poorest relate to the mean and to the rich.

Figure 1-3: Lorenz Curve



1.4 Conclusion

Macroeconomics is the study of the economy as a whole, including growth in incomes, changes in the overall level of prices, the unemployment, and other variables in aggregate senses. Macroeconomists attempt to explain the economy and to devise policies to improve its performance. Data and variables are additionally taken into account so that policymakers can decide what direction the macroeconomic situation should be corrected. Stock and flow variables are variables measured at a point in time and over a period of time, respectively, while nominal and real variables involve the change in price level.

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Chapter 2

National Income and National Product

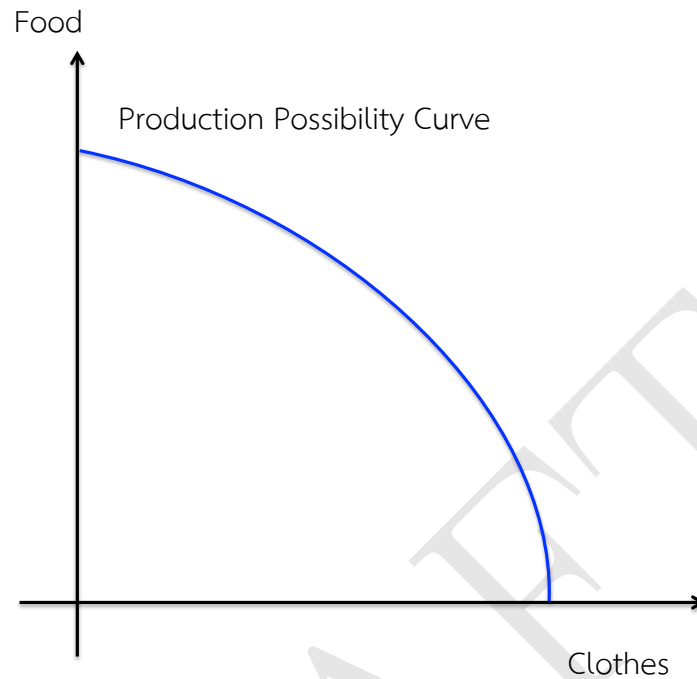
2.1 Introduction

This chapter discusses about national income and national product. All the basic ideas how to quantify national product of the economy are presented. In reality, there are a lot of economic units operating in the economy but for simplicity, five units will be raised; namely, households, business firms, financial institutions, government and the rest of the world. They are all functioning in the economy and involved in the production process.

Normally, firms need input to go through the production process and their by-products are actual output. Production of goods and services explicitly indicates how well resources are exploited. Suppose that there are only two types of goods produced given full employment and technology. Points on Production Possibility Curve (PPC) show different bundles of goods that economy can supply (figure 2-1). Economy can choose to produce as many clothes as they want but its cost is no food yielded. Choices are for the economy to think of what combination of those two products should be provided. Area above PPC is the unattainable ones, demonstrating the nature of scarcity, if human wants exceed the available goods and services. Opportunity cost is the slope of the PPC, how many sacrifice needed to produce another product. When the economy performs to its fullest, all the points on PPC, potential output is the result.

Sometimes, the economy cannot work well, some resources are left idle, ending up with actual output produced less than the potential one. The difference between actual output and the potential one is the output gap. Countries then try to reduce this gap as it means better efficiency is attained. Hence, if policymakers want a good economic growth number, two choices are open. One is to try to minimize the output gap and the other is to enhance the potential output. Before launching any policies, policymakers also require knowledge of how the economy actually works and how much we can actually produce.

Figure 2-1: Production Possibility Curve



Real income is what people really consume; hence, economists are interested in real value. Suppose that there are n products in the economy. Preferably, total output should be assessed and the summation of outputs produced should be in focus; however, different products and services have different units of measurement and therefore it is impossible to combine and report them in a meaningful way as aggregation problem arises (equation 2.1). Value of total output is then introduced to solve such trouble (equation 2.2).

$$\text{Total Output} = Q_1 + Q_2 + \cdots + Q_n = \sum_{i=1}^n Q_i \quad (2.1)$$

$$\text{Value of Total Output} = P_1Q_1 + P_2Q_2 + \cdots + P_nQ_n = \sum_{i=1}^n P_iQ_i \quad (2.2)$$

After adding price and summing them all to calculate the value of total output to solve aggregation problem, another difficulty is realized. The value of total output, the nominal value, varies due to the change in either price or output, or both. To handle it, price attached to each product will be held constant, using base year for an alternative. That is, rather applying price for that year, we pick last-year price to multiply with the quantities and with this, if the value changes, the conclusion is from the change in only quantities, not price level.

The existence between nominal and real GDP sometimes is hard to translated. GDP deflator is invented to change nominal terms to real values and vice versa, calculated by

equation 2.3. The change in GDP deflator can be interpreted as how price level changes over a year. It widely covers all sectors in the market, compared to Consumer Price Index (CPI) or Producer Price Index (PPI). CPI only captures the change in baskets of consumer goods and services, while PPI emphasizes on the change in price level of inputs for production.

$$\text{GDP Deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} = \frac{\sum_{i=1}^n P_i^{\text{current}} Q_i}{\sum_{i=1}^n P_i^{\text{base}} Q_i} \quad (2.3)$$

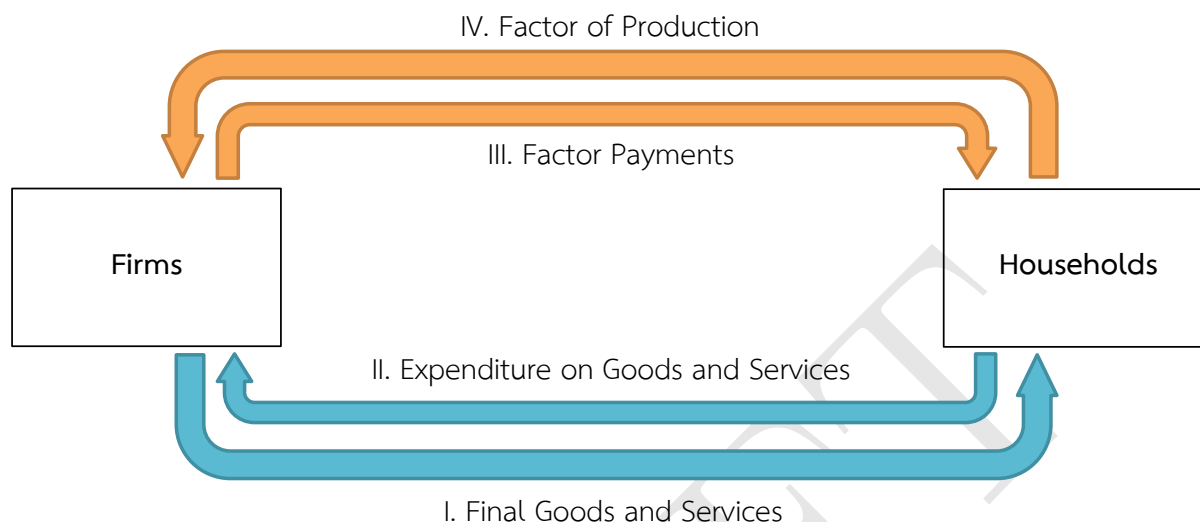
How to select base year is also another topic needed to discuss. If base year is in the booming period where price level goes skyrocketing, the following year will turn out to be depression; whereas if base year is selected in year of recession, the result will become too good to be true. Thereby, in order to get the best result for real GDP, neither too high nor too low, year with price stability should be chosen.

2.2 Circular Flow of Production and Expenditure

Practically, macroeconomists come up with approaches to measure how many of goods and services produced in the economy. The very simple concept in macroeconomics to understand the economy in aggregate and how to start evaluating the economy are circular flow of production and expenditure.

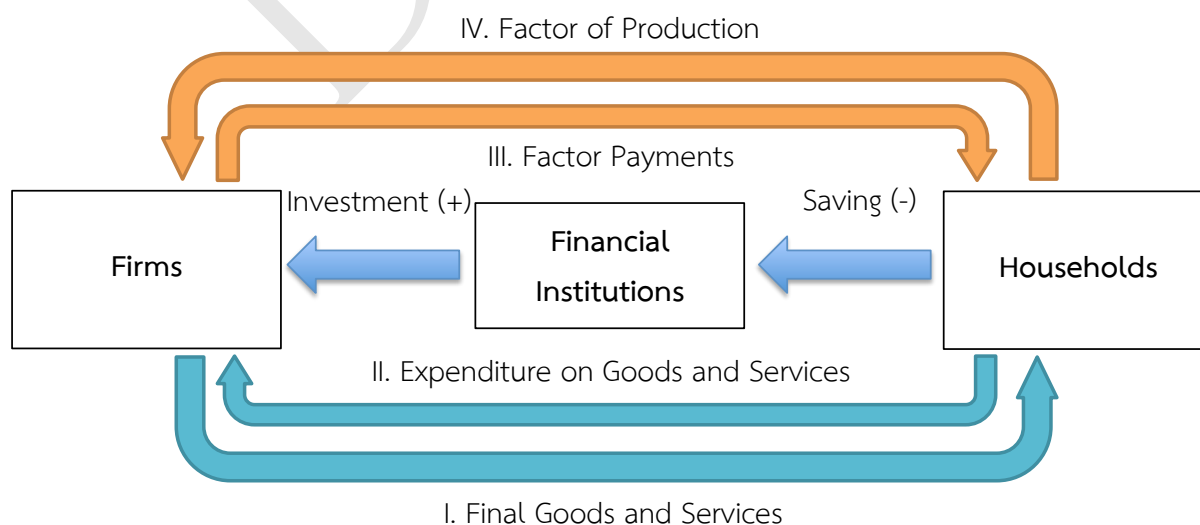
In case of completely closed economy and no government, households and business firms are two economic units. Assume that households only consume and own factors of production. They purchase goods and services for their consumption, and provide inputs for business firms. To produce goods and services, firms need to hire factors of production from households and factor payment is transferred to households as a compensation. Ideally, the value of final goods and services should be equal to the expenditure spent on them. Moreover, they should be in the same amount for factor payments as well as the factor of production. Measuring each of them should give the same result (figure 2-2).

Figure 2-2: Circular Flow of Production and Expenditure for Completely Closed Economy



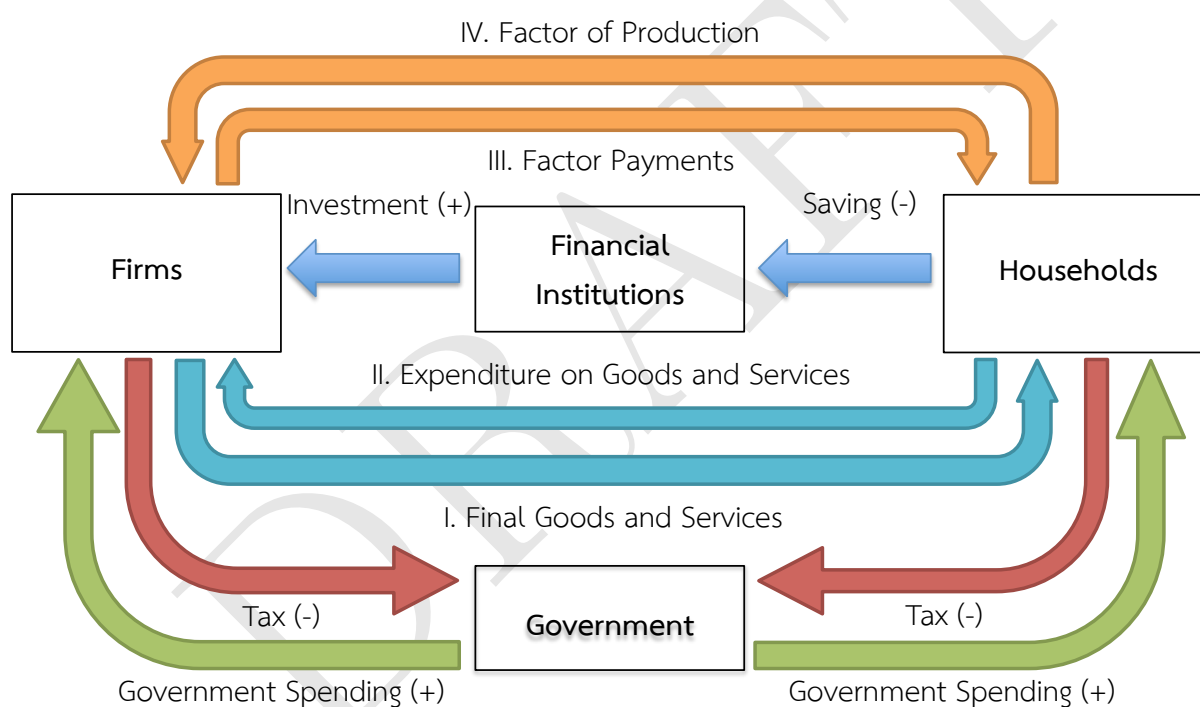
If households do not only consume, they also care for their future consumption so they work for firms to receive factor payments and then start saving. The overall flow will be deducted by the leakage from such saving. Financial institutions are then added in figure 2-3 to absorb the leakage. This new economic unit will decide what to do with that amount of saving. Those in deficit will demand for loan so that they can invest. Financial institutions will react to this demand by providing them with saving obtained. The economy is then back to the equilibrium once investment is injected back to the circular flow.

Figure 2-3: Circular Flow of Production and Expenditure for Closed Economy



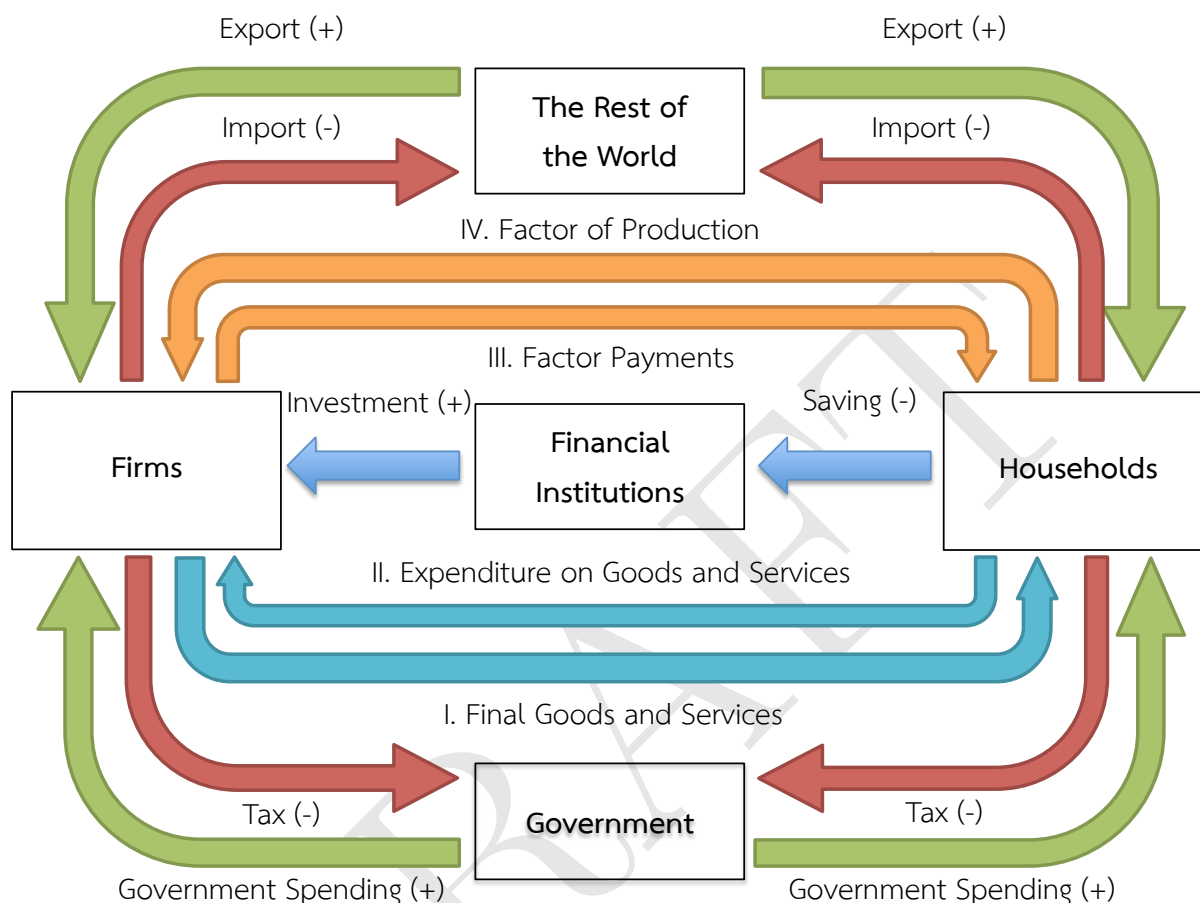
In economic principle, government exists just because there is the inefficiency that market alone cannot work out and it needs certain institution to come in and intervene so that more desirable outcomes are attained. Government is then introduced in the model (figure 2-4); households and business firms are asked to contribute some of their resources for the government so that they can allocate those endowment for public goods and services. Tax is collected from both households and business firms, as a result certain amount of money are leaked from the system and government spending will be injected back to the flow in certain areas of the society so that macroeconomic objectives will be accomplished.

Figure 2-4: Circular Flow of Production and Expenditure for Closed Economy and Government



In the world community, there are many countries and each of them tries to specialize in certain industry, produce such goods and services and trade among one another; hence, there will be many economic units within this international arena. To simplify, the rest of the world is presented in the circular flow of production and expenditure. Households and Firms will make a transaction with other countries. Exporting goods and services outward will act as the injection to the economy as income will flow into the system from the rest of the world, whereas importing foreign goods and services inward is the leakage since national income will be sent out of the system (figure 2-5).

Figure 2-5: Circular Flow of Production and Expenditure for Open Economy



2.3 Meaning and Significance of National Income Accounting

National income accounting is the approach to present all data concerning income circulated in the economy, reporting all the components of national income and output within the economy. For Thailand, Office of National Economic and Social Development Board (NESDB) is the authority to work on this issue. From this account, Gross Domestic Product (GDP) is demonstrated as the value of all final goods and services, which are produced and marketed in the territory of one country in a given period of time. Note that final goods and services are goods and services that are for final consumption, which is different from intermediate goods that are prepared to be in the process for another production of goods and services. Hence, GDP measures the total output produced domestically in money term.

Furthermore, national income accounts show level of production and production struc-

ture of the economy so that policymakers are aware of the situation and plan ahead. Aggregate expenditure on consumption and investment of different economic sectors and value of export and import of the economy are detailed. It also show sources and levels of households' income, which will be easier to monitored. Economic growth rates of the economy and various economic sector are indicated. Policymakers can then use for economic planning of the economy and evaluate the changes in macroeconomic conditions. Last but not least, this national income accounts can be used as a base to examine the success and failure of the government economic policies.

2.4 Distinction between GNP and GDP

Gross National Product (GNP) is the value of final goods and services obtained by the specifically national citizens anywhere they are in the given period of time, while Gross Domestic Product (GDP) the value of final goods and services produced in a country with no consideration of nationality of those produced. Thus, in closed economy - no foreign sector, GDP should be equal to GNP, provided that there is no foreign production within the economy.

Nonetheless, once there is the international trade with the rest of the world, GNP should be equal to GDP plus net income from abroad, which are the combination of income Thai citizens living in other countries earn and transfer them back, minus those incomes foreigners manipulate factors of production in that country to produce goods and services and bring back home. For example, Thai citizens transfer income earned from their businesses such as Thai restaurants in foreign countries to their family. This will be a plus for GNP. The minus will be for the case that multinational corporations establish their businesses in Thailand. They hire Thai workers to produce certain goods and services to sell to Thai consumers, receiving the amount of money from that operation and channelling such return back to their home country. In this open-economy case, GDP and GNP can still be equal if net income from abroad is zero.

2.5 Measurement of GDP

Circular flow of production and expenditure in figure 2-5 gives the overall picture of how the economy works. Total output can be captured by flow number I. Final Goods and Services, which is provided by firms for households, this measurement of GDP is called product approach. Alternatively, as the value of total outputs is equal to the expenditure spent on them, II. Expenditure on Goods and Services is the expenditure approach to calculate GDP. Households can disburse just because they work for firms and obtain their incomes as III. Factor Payment. If households use up all received, factor payment should be equal to the expenditure of goods and services. Nevertheless, the value of factors production will be hard to assess. In this chapter, we will talk about how to calculate GDP from those aforementioned flows.

2.5.1 Expenditure approach

Expenditure approach is the method to trace out all the expenses on goods and services in the economy. There are four main categories for expenditure (equation 2.4); namely, personal consumption expenditure (C), gross private and public domestic investment (I), government consumption (G) and net exports (X-M).

$$\boxed{\text{GDP} = C + I + G + X - M} \quad (2.4)$$

Personal consumption expenditure (C) is the spending from household to purchase consumer goods such as durable goods, non-durable goods and services. Durable goods are goods that relatively last long and not quickly wear out, whereas non-durable goods are goods that can be used up in a short period of times, less expected lifespan. Cars, refrigerators, and washing machines are among the samples of durable goods. Food and clothing are then the example for nondurable goods. Services are intangible commodity, not involving with the production of physical things such as spa and medical care, but we also calculate that as a part of GDP.

Gross private and public domestic investment (I) is the total expenditure for capital goods, not for present consumption, including inventories, and investment goods both for private and public sectors. There are three subcategories for investment such as nonresidential investment, residential investment and inventory. Nonresidential investment is the expenditure by firms on machines, tools, plants and so forth. Residential investment is the expenditure by households and business firms on housing. Inventory is the stocks of their outputs that are produced now and accumulated to sell in the future. The change in inventories is counted in the GDP, as the expenditure approach measure the expenditure on inventories rather than the amount of money spent to produce them. Another important concept for investment is the depreciation. The value of an asset tends to fall over time. Gross investment is total investment in the economy. Net investment is then the subtraction of depreciation from gross investment.

Government purchase of goods and services (G) is the spending of government and local government on final goods and services. It composes of salaries of government officers, cost of public services and so on. This component counts only the government purchase of goods and services but not for transfer payment as it does not relate to the real production within the economy. For example, the government hire teachers for public schools and pay them a salary for their services, while government normally pays a social security fund for pension benefit of their elder workers or the unemployment insurance benefit for those unemployed, which no exchange of goods and services are provided.

Net export is the difference between export (value of goods and services bought by foreign countries) and import (value of foreign goods and services purchased by local residents). This net exports is either positive or negative, depending on whether which one is greater. It is another source of economic value to the economy. In case of Thailand, degree of openness (the ratio of summation of value of export and import to GDP) of

Thai economy has been over 100 percent for many years as Thai authority has employed export-oriented strategy to foster economic growth for more than a decade.

In conclusion, GDP is the composition of personal consumption expenditure (C), gross private and public domestic investment (I), government consumption (G) and net exports (X-M). Net Domestic Product (NDP) is value of actual output produced in the economy. In reality, capital goods always depreciate. To represent this scenario, NDP is invented and equal to the subtraction of depreciation to GDP. Similar story goes for GNP, if we want to know about Net National Product (NNP), set GNP less depreciation, as presented mathematically below (equation 2.5 and 2.6).

$$\begin{aligned} \text{GDP} &= C + I + G + X - M \\ \text{NDP} &= C + \text{Net I} + G + X - M \\ \text{NDP} &= C + (I - \text{depreciation}) + G + X - M \\ \text{NDP} &= (C + I + G + X - M) - \text{depreciation} \end{aligned}$$

$$\text{NDP} = \text{GDP} - \text{depreciation} \quad (2.5)$$

and

$$\text{NNP} = \text{GNP} - \text{depreciation} \quad (2.6)$$

2.5.2 Income approach

Alternatively, GDP can be measured through factor payments in flow number III as displayed in figure 2.5. Factors of production are labor, land, capital and entrepreneur. Compensation to employees are returns for labor. Firms will pay wages and salaries for labor's work and also other supplements such as employer contributions to social insurance and pension funds. Property owners receive rental incomes from their rent. Interest is the return from capital. Entrepreneurs also get paid by their profit. The combination of compensation to employee, rental income, interest and profit is national income at factor cost or NI at factor cost (equation 2.7).

$$\text{NI at Factor Cost} = \text{Compensation to Employee} + \text{Rent} + \text{Interest} + \text{Profit} \quad (2.7)$$

When households obtain those factor payments, they need some adjustment before reporting it as GDP. Indirect taxes are collected from household to government such as sale taxes, custom duties, license fees and so on. These taxes will add on and make expenditure on final goods and services not reflect factor payment. It is therefore needed to consider these tax before measuring GDP with income approach. For example, price of rice sold to consumer is 15,000 Thai Baht, but it includes 7 percent of sale tax, so 13,950 Thai Baht is available for factor payment. Subsidies, as another distortion, transferred from government to business firms or household should also be claimed. This will allow income to exceed the market value of factor of production. Imagine that government subsidizes railway company by 200,000 Thai Baht, even though this enterprise can generate income only 800,000 Thai Baht. Available factor payment will be 1,000,000

Thai Baht. The difference made up by both indirect tax and subsidy should be concerned so that correct value of GDP will be composed (equation 2.8). If this NNP is added by depreciation, following equation 2.6, NNP will be transformed to be GNP. Moreover, if we include net income earned abroad with GNP, the consequence is the value of GDP.

$$\text{NI at Market Price or NNP} = \text{NI at Factor Cost} + \text{Indirect Taxes} + \text{Net Subsidies} \quad (2.8)$$

2.5.3 Product approach

There are two ways to calculate GDP for this product approach. The first one is to directly measure the value of all final goods and services. Value of final goods and services is just the multiplication of such prices and the quantities, just to avoid the aggregation problem on different units of measurement. Table 2.1 indicates how to measure GDP for final goods and services. The value of rice for final consumption is 8,000. The second is the value-added approach.

The value-added method is to sum all the value added of all goods and services in each production process. Value added is the difference between the value of goods and services once they are out of the final production process and the cost of goods and services before entering the those stages of production.

For example, to deliver rice for final consumers, the main actors for first stage of production are farmers, which they have to use certain inputs covering fertilizers, seeds and so on. The price farmers sell paddy to rice mill minus production cost is the value added farmers work for. Wholesalers come in and buy those rices from rice mills with a mark-up price, the value-added, since rice mills need to mill those paddies so that they are edible. Wholesalers will transport all rices and sell them to retailers with a higher margin, since this process relates to transportation and managerial expenses. The summation of all value added in different stages of production is 8,000, as illustrated in table 2.1. If we sum all value of goods in all stages of production, *multiple counting* will be the result. What economists want to measure is then the value of final goods and services or the value added in different stages of production.

Table 2.1: Measurement of the Value Added and Value of Final Goods

Stages of Production	Value of Goods	Value of Intermediate Goods	Value Added
Farmer	1,000	-	1,000
Rice Mill	4,000	1,000	3,000
Wholesaler	6,000	4,000	2,000
Retailer	8,000	6,000	2,000
<i>Total</i>	19,000	11,000	8,000

2.5.4 Relationship among GDP, GNP, NDP, NNP, NI, PI, DI

GDP is the value of final goods and services produced and marketed domestically in a given period of time, while GNP cares about national citizen, how much people of that country receive from the economy. Net Domestic Product and Net National Product are mentioned in equation 2.5 and 2.6; just less depreciation out of GDP and GNP respectively. National Income (NI) is similar to NNP. NNP considers income at market price but NI is at factor cost, which are compensation to employee, rent, interest and profit (equation 2.7 and 2.8).

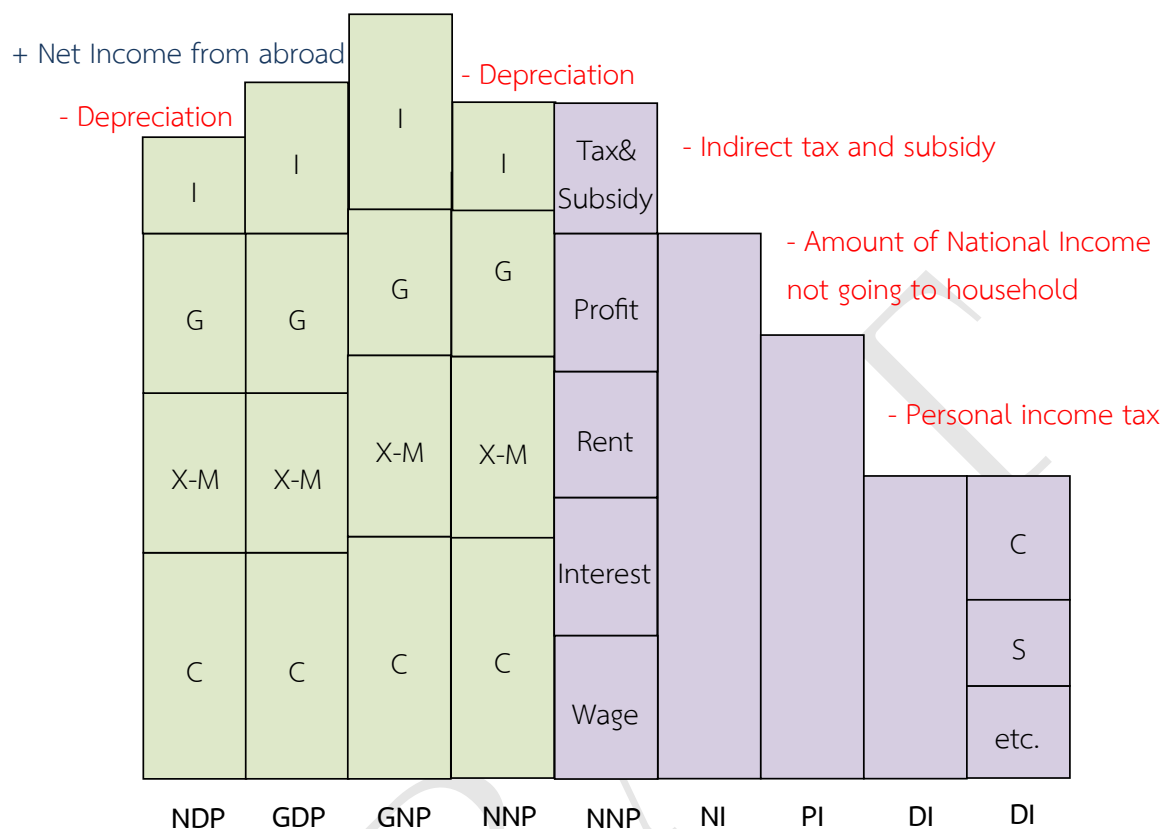
Those GDP, GNP, NDP and NNP have already been discussed in the context, three new terms will be introduced in this section. The first one is Personal Income (PI). It is the income which household get paid so it is the national income less with the amount of national income not going to be in households' pocket (equation 2.9). In reality, some of factor payments do not fly into the hand of household. The example for such income not going to households is retained earning of corporation, which is corporate profit less dividend.

$$\text{Personal Income} = \text{NI} - \text{Amount not going to households} \quad (2.9)$$

Second term is disposable income. Disposable Income (DI) is the income household can dispose of. Once households get paid by firms, some of their income will be collected by government as taxes. So DI will be the subtraction of tax to personal income. People usually spend this disposable income on their own decision. They can buy goods and services or save part of them for future consumption or other things people willing to do. Personal interest payment and Transfer payments made by households are examples for disposable income. Figure 2.6 summarizes all of these relationship.

$$\text{Disposable Income} = \text{Personal Income} - \text{Personal Income Tax} \quad (2.10)$$

Figure 2-6: Relationships among GDP, NDP, GNP, NNP, NI, PI and DI



2.6 Applications of GNP in Economic Analysis

Gross National Product (GNP) per capita is the ratio between value of final goods and services obtained by national citizens to total population of that particular country. It is then the average of how much each people of that country has for their daily life and somehow signal the well-being of people.

There are, however, some attentions needed to consider about GNP per capita. First, GNP cannot measure people welfare since it does not indicate whether such amount of output per capita is sufficient for the need of one person. An increase in GNP year after year also cannot tell whether there are an improvement or deterioration of people quality of life because they may work harder with longer hours and hence leisure time is reduced. In addition, GNP cannot measure consumers' satisfaction. There may be more production of military goods and less civilian goods available for private consumption or more unmerited goods are produced in relative. Furthermore, GNP does not illustrated how total products are distributed among the population.

Secondly, higher level GNP may be associated with increased level of pollution, as

more resources are depleted with not enough awareness to environmental issues; health problems are likely to rise. Thirdly, GNP calculated only includes final goods and services that are produced and go through the market. Several significant economic activities do not include in the calculation such as self activities, illegal and informal transaction as well as under-reported works.

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Chapter 3

National Income and Equilibrium Determination

3.1 Introduction

In chapter 2, we talk about national income and national product, which is the modern way to measure how well people in a particular country live. Product, income and expenditure approaches are how to measure national income. It is not the best one to perform this job but it is by far the most suitable one to compare and contrast the economy.

In this chapter, we are going to analyze the equilibrium of national income, how it happens, and what will be the adjustment process. Since there are five components in GDP measurement; theories of consumption, investment, government spending and net export will be exposed, the interaction among them will be presented and eventually equilibrium of national income will be discussed.

Looking back into the economic history, great depression occurred in 1930s, originated in the US and widespread to the other parts of the world. It was a prolonged and severe recession. John Maynard Keynes then introduced the theory of national income determination in his book *The General Theory of Employment, Interest and Money* to solve such depression. Later on in this course, we will detail more of his idea but for now, theory of national income determination is emphasized.

National income equilibrium theory involves the relationship between the national income equilibrium and the desired aggregate expenditure (DAE). National income accounts measure the actual aggregate expenditure mentioned in chapter 2, while DAE refers to what people want to spend out of the resources that are in their potency. DAE then acts as if it is an aggregate demand of the economy. Once there is a change in DAE, its impacts range from commodity markets to resource markets.

3.2 Composition of Desired Aggregate Expenditure (DAE)

Similar to components of actual aggregate expenditure or GDP, Desired Aggregate Expenditure (DAE) is composed of desired consumption expenditure, desired investment, desired government spending and desired net export. At the equilibrium, the actual one is equal to desired one; however, it is not always the case. Some components in DAE might be distracted and the adjustment can take place and eventually the equilibrium is attained. In this section, each composition will be diagnosed, starting from consumption expenditure, investment, government spending and net export, respectively.

3.2.1 Desired aggregate consumption expenditure and consumption theories

There are many theories postulating the consumption determination. *The absolute income theory* was purposed by John M. Keynes. He stated that current consumption is determined by fraction of current income. James S. Duessenberry argued, with his *Relative income theory* that consumption depends on the level of income in relative to income of neighboring families or other families which are identified and not on the absolute level of income. Another consumption hypothesis discussed about *permanent income theory*. In 1950s, Milton Friedman found that permanent consumption depends on permanent income (throughout the time span), while Albert Ando and Franco Modigliani established *life-cycle theory*, believe that once people are at young age and retired age, they are likely to consume more than income, contributing to negative saving. Nonetheless, if they are adult and at the working age, they will have ability to work and find more income. This is the period which they can save from the surplus. Nonetheless, in this section, *absolute income theory* will be detailed.

In his absolute income theory, Keynes believed that people spend for their consumption by a fraction of their disposable income, which is what people is left for their consumption expenditure. Even though, they have no stream of income, they still need to spend for food and other necessary items. Therefore, their consumption will not be zero, when they have no earning; borrowing for consumption is then a choice people make, or they might sell their existing assets. With this idea in mind, consumption function is presented in equation 3.1

$$C = C_0 + cY_d \quad (3.1)$$

, where:

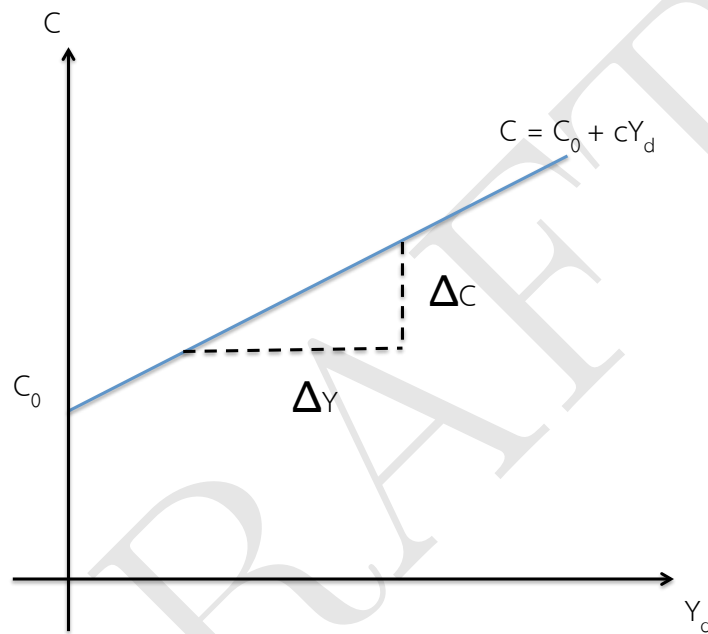
C_0 is autonomous consumption

c is induced consumption and $0 < c < 1$

To clarify equation 3.1, c is the fraction people will spend in proportion of their disposable income, so called induced consumption; while C_0 is the amount of money that people

need for their subsistence. Another way to express c is *marginal propensity to consume*, which is the tendency for people to consume, counting on their income. Autonomous consumption or expenditure represents the amount of expenses are independent to any other factors, whereas induced ones are those varying on national income. This equation 3.1 can be illustrated in figure 3-1, which we plot income against consumption and its slope is the *marginal propensity to consume*.

Figure 3-1: Consumption Function



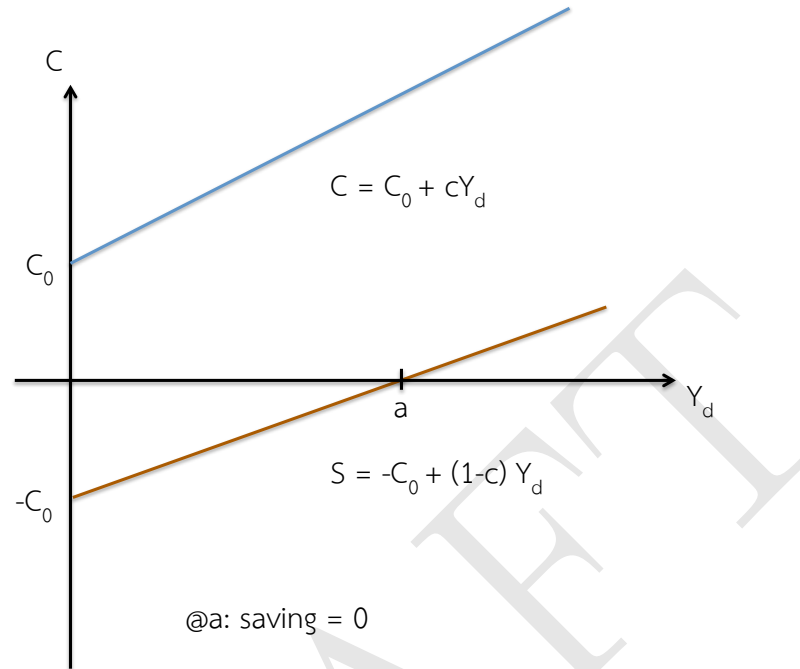
This consumption function is the mirror of the saving one. People save for their future, considered as a leakage of the economy since no goods and services will be produced from saving in the case that it is not injected back to the economy. Mathematically, saving is the subtraction of consumption from disposable income, therefore saving function is shown in equation 3.2 and plotted in figure 3-2. Note that consumption is either greater or lower than saving, depending on the fraction that people will spend. If c is larger than $1 - c$, consumption will be always higher as people consume more than save.

$$\begin{aligned} Y_d &= C + S, \text{ then} \\ S &= Y_d - C, \text{ and} \\ C &= C_0 + cY_d, \text{ hence} \end{aligned}$$

$$\therefore S = Y_d - C_0 - cY_d, \text{ rearrange and get}$$

$$S = -C_0 + (1 - c)Y_d \quad (3.2)$$

Figure 3-2: Consumption and Saving Functions



Apart from *marginal propensity to consume* for consumption function, *average propensity to consume* is another term to be introduced. They are presented in equation 3.3 and 3.4. Because saving and consumption functions are the reflections of another, the derivation of the relationship of average propensity to consume and save is written below and the addition of both should be equal to one, marginal propensity to consume and save are also the same.

$$\text{Average Propensity to Consume (APC)} = \frac{C}{Y_d} \quad (3.3)$$

$$\text{Marginal Propensity to Consume (MPC)} = \frac{\Delta C}{\Delta Y_d} \quad (3.4)$$

To find APC and APS relationship:

$$Y_d = C + S, \text{ divide both side with } Y_d$$

$$1 = \frac{C}{Y_d} + \frac{S}{Y_d}$$

$$\frac{C}{Y_d} + \frac{S}{Y_d} = APC + APS = 1 \quad (3.5)$$

To find MPC and MPS relationship:

$$\begin{aligned}
 Y_d &= C + S, \text{ if take } \Delta \text{ into linear-combination equation} \\
 \Delta Y_d &= \Delta C + \Delta S, \text{ then divide both side with } \Delta Y_d \\
 1 &= \frac{\Delta C}{\Delta Y_d} + \frac{\Delta S}{\Delta Y_d} \\
 \frac{\Delta C}{\Delta Y_d} + \frac{\Delta S}{\Delta Y_d} &= MPC + MPS = 1
 \end{aligned} \tag{3.6}$$

From consumption function, consumption will increase, depending on the disposable income and that makes it move along the curve. Nevertheless, there are many factors affecting this consumption function at each and every level of national income as represented in equation 3.7.

$$C = f(Y_d, CRi, AST, EXP, W, SV, POP, \dots) \tag{3.7}$$

Consumer credit and interest rate (CRi) is the crucial determinant of how much people will consume. If consumer loan rate is low, more incentive for people to borrow and pay more for their goods and services is realized. They tend to consume now rather save for future consumption. More consumption is expected, given the same amount of disposable income people have.

Consumer assets (AST) is another thing economists consider to affect consumption function. If people either inherits some heritage from their parents or their husband are a millionaire, they tend to consume more as they know that they can spend more without worries.

People expectation (EXP) is another story for people to make a decision. If people expect that the world is going to end soon enough, they will realize that no need to future consumption or saving. Consumption might be shifted by such expectation. Additionally, once people are pessimistic about the market condition, they predict that everything will collapse in no time. Less money for consumption should be expected.

Consumers' wealth (W) is also taken into account in this consumption function. Inflation can decrease the value of money people store in their wallets. Higher price level means their money value falls and less to be brought for consumption. Pigou's effect indicates that once there is an inflation, people real wealth deteriorates and low level of consumption is the result.

Social value (SV) establishes the foundation of how people think about consumption. Consumerism might create a lot of demand for goods and services while sufficiency economy will turn the opposite. More goods and services will be provided if people's

purchasing habit is aggressive.

The more population (POP) one economy has, the more mouths they have to feed. Consumption will then rely on how many people are there in that country. A small will face less demand for consumption while a large one will need more of goods and services to supply people need.

The change in these factors make consumption function shifts, upwards or downwards depends on how that factor associates with consumption function. There are other determinants of consumption as well, one needs to take into account whether those variation will affect people's pattern of consumption or not. For instance, government policy can create incentive for people to consume. The reimbursement of excise tax for first-car purchaser is one of it. People who still do not own automobile are likely to buy it, leading to more consumption in durable goods.

Looking back in the circular flow, if there is the government in the system, that means this authority will have tax power. Incorporating this into our analysis, when people receive their income, what is left for consumption after tax will be disposable income. For simplicity, there are lump-sum (T_0) and income tax (t). Therefore, we can derive consumption and saving functions, represented as following.

If no tax, $Y_d = Y$, but if tax comes in:

Disposable Income: $Y_d = Y - T$

$$C = C_0 + cY_d = C_0 + c(Y - T) \quad (3.8)$$

Recall $Y_d = C + S$, then our saving function will be:

$$\begin{aligned} Y_d &= C_0 + cY_d + S \\ S &= -C_0 - cY_d + Y_d \\ &= -C_0 + (1 - c)Y_d \end{aligned}$$

$$S = -C_0 + (1 - c)(Y - T) \quad (3.9)$$

If we consider lump-sum and income taxes, consumption function will be:

Lump-sum tax: $T = T_0$

$$C = C_0 + cY_d = C_0 + c(Y - T_0)$$

$$C = (C_0 - cT_0) + cY$$

Income tax: $T = tY$

$$C = C_0 + cY_d = C_0 + c(Y - tY)$$

$$C = C_0 + c(1 - t)(Y)$$

Equations above indicate that after introducing tax into the economy, consumption and saving functions will change accordingly. Slope and intercept will be different from figure 3-1 and 3-2.

3.2.2 Desired aggregate investment expenditure

Investment is one of the component in GDP. Both public and private investment are in this category. This desired aggregate investment is volatile since its change are in accordance with the economic fluctuation, either boom or bust. What happened in 1997 for Thai economy is that there was a sharp decline in investment. When the economy is in recession, investors are reluctant to invest. One of the reason is perhaps they do not know whether that amount of investment in capital goods and other things will yield any positive returns. Hence, we are going to discuss the determinants of investment and with this we will be able to capture the picture of how one of the main engine of economic growth works. Equation 3.10 helps us determine factors affecting the desired aggregate investment expenditure (I) for investors.

$$I = f(r, EXP, Y, \Delta Y, \Delta Technology, G_p, \dots) \quad (3.10)$$

Rate of interest (r) is the cost of borrowing for investors. If it is high, investors will perceive that they can borrow with higher cost and thus they tend to invest less after considering cost and benefit of particular projects. If the interest rate is however low, smaller cost of borrowing will be what those in deficit and want to invest are interested. More incentives for investors to invest for their return.

Expectation (EXP) plays a role determining the amount of aggregate investment expenditure. For example, a country explores an abundant of oil sources, people will think that this country will be richer and if investors invest in that country, more profits should

be derived from that rich people. More investment will be the consequence.

Sometimes, national income (Y) is taken into account as the determinant for investor to choose to invest. A bigger market size means that there is the division of labor and specialization, leading to more of goods and services produced. With a rise in national income, businesses can use this opportunity to profit. A better technology to support this huge demand will be invested.

Accelerator principle indicates that once there is a change in national income (ΔY), it will lead to a change in investment. When the economy grows, it needs more capital stocks to invest in technology and innovation to produce goods and services. The derived demand for capital is then the main reason for more investment. Suppose that capital-output ratio is equal to 2. That means this economy needs additional 2 units of capital in order to produce an incremental unit of output. Those countries where this ratio is very high will face a difficulty to raise output.

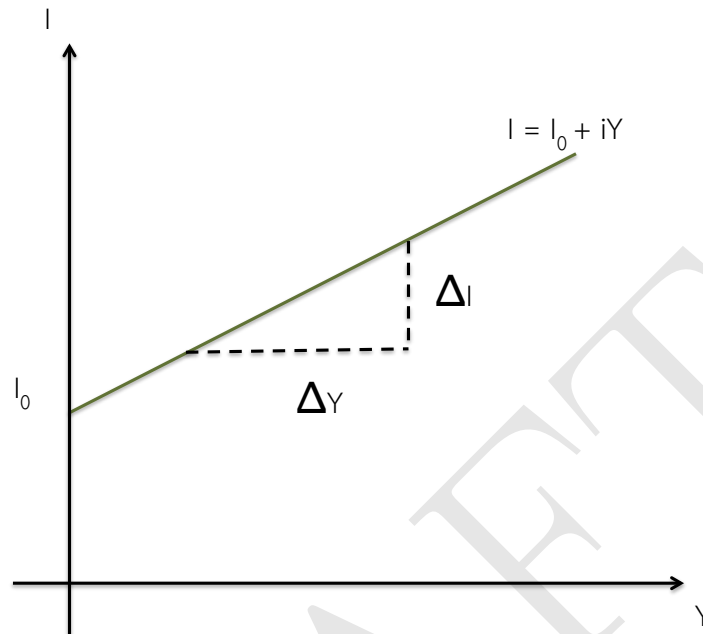
The change in technology ($\Delta \text{Technology}$) means the change in production function. An improvement leads to better ways to produce goods and services, which need more investment to finance so that productive capacity will be enhanced. The innovation then needs more of investment, shifting the amount of desired aggregate investment expenditure at each and every level of it.

Government policy (G_p) does matter in the sense that they can nurture or obstruct investment. Government can initiate special zone in the country for investment promotion. Tax holidays might be introduced if investors locate their factories in such zone, which is the government policy to give more incentives for capitalists to invest.

In this chapter, we will focus on only autonomous and induced investment expenditures, which means that certain amount of investment is planned beforehand and the other will depend on national income. If those factors, and some others, mentioned above change; this desired aggregate investment expenditure will change accordingly. This represents in figure 3-3 and equation 3.11. The value of i in the equation is called *marginal propensity to invest*.

$$I = I_0 + iY \tag{3.11}$$

Figure 3-3: Investment Function



3.2.3 Desired aggregate government expenditure

For simplicity, what government plans to spend will be counted as the desired aggregate government expenditures, excluding those for investment since it will be included in desired aggregate government expenditure. Once public authority wants to purchase more goods and services, higher level of desired aggregate government expenditure is the result. Equation 3.12 shows the determinants of desired aggregate government expenditure.

$$G = f(G_r, G_p, \dots) \quad (3.12)$$

The amount of government spending will depend on how much government has in their pocket and what they can borrow from others. Government receipt (G_r), which composes of government revenue and public debt, is one of the main factor government takes into account to launch any policies. If government receipt is higher, more government spending should be realized.

Government policy (G_p) is also the main source of how much government will disburse. What political parties promise for their citizen need to be imposed, since those are what people really expect from the government. If many policies are announced to gain votes, good politicians will deliver what they declare. Hence, a larger amount of government spending are needed. Some of that money spent come from tax and if it is

not adequate, the creation of public debt to finance the deficit is unavoidable .

Figure 3-4 illustrate how government function looks like. In this case, national income will not matter. What government plans to do will rely on those factors discussed above. The change in such factors will lead to the change in government spending function; shifting the whole curve either upward or downward.

Figure 3-4: Government Spending Function



3.2.4 Desired aggregate net exports

If the rest of the world is introduced in the system, international transactions should be considered as the source of national income. A country produces goods and services for the rest of the world and the compensation of those goods and services will be the flow injected back into the economy. On the other hand, once local residents want to purchase foreign goods and services just because of the unavailability of such goods and services in home country or only their own preference, certain flows will be the leakage of the economy. The summation between these leakage and injection will be net export that we are going to discuss in this section.

Desired aggregate exports

The determinants of desired aggregate export is expressed in equation 3.13. Normally, national income of a particular country has no relationship with the goods and services which the rest of the world will buy. Therefore, many factors mentioned above will be

mostly the external ones that will affect the pattern of export, shifting the export function either upward or downward.

$$X = f(Y_f, \frac{P_f}{P_d}, ER, D_f, P_x, G_p, POL \dots) \quad (3.13)$$

The first and the most important drive to the rise or fall of desired aggregate export is foreign national income (Y_f). The increase in income of other countries will raise their purchasing power and they are likely to ask for more of goods and services. Higher level of demand from the rest of the world will create more incentives for local suppliers to provide and that will magnify the value of goods and services produced domestically.

The relative price of foreign country to domestic price ($\frac{P_f}{P_d}$) will create substitution effect for people's perception on export (of a particular country). Suppose that there is inflation in such country. The rest of the world will find that goods and services from that country are priced higher and they will seek for other cheaper ones for substitute, lessening the amount of export of that country. The opposite will take place if there is a rise in general price level in other country.

Exchange rate (ER) plays an important role to this international trade of goods and services. Since each country offers different currency and people use them as a medium of exchange, one needs to use domestic cash in order to buy goods and services from that particular country. Then, the price of each currency in term of another one is the exchange rate. If domestic currency depreciates, meaning that value of such currency decreases; the rest of the world will perceive that they can buy more with the same amount of their money so this creates incentives for the rest of the world to import more or more of exports of that country will be purchased. Nevertheless, if domestic currency appreciates, different story is expected.

Foreign demand (D_f) is another drive for exports. Imagine that Toyland invests a lot in agricultural research and now can produce the best quality of rice in the world. As many Asian countries consume rice, they have heard this news and would like to taste this new type of product. More foreign demand on Toyland's rice will be observed, raising the exports of Toyland at each and every level of national income.

Law of demand states that if there is a change in price, the quality demanded will go in the opposite direction. No exception is for exports. If there is a change in price of export (P_x), the amount of exports demanded by the rest of the world will change.

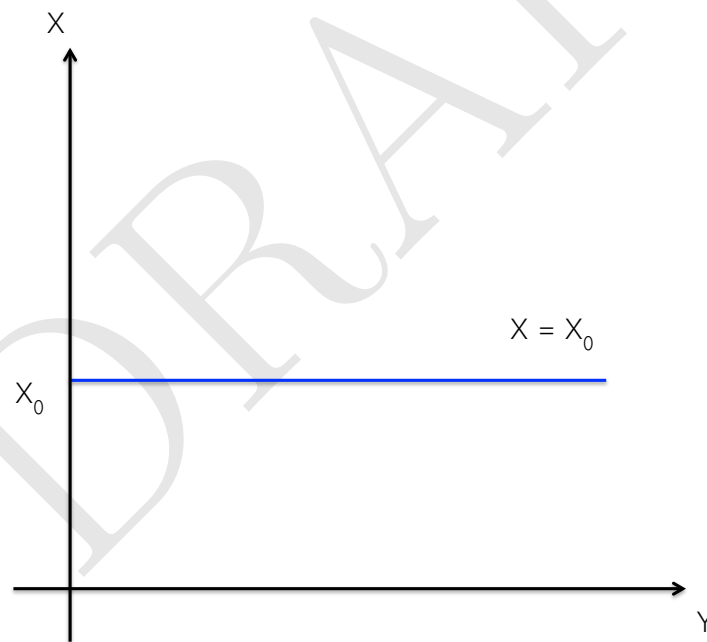
Government policy (G_p) could be launched to promote export. Public authorities impose policies to encourage producers to export goods and services. For example, Export-Import Bank of Thailand facilitates export company by giving loan for both short and

long runs if they need and offers other packages to help and promote exports. If these policies are in place, exports of a country is inclined to rise at each and every level of income.

Political stability (*POL*) matters in the sense that political demonstration will obstruct production processes and might diminish the amount of export. Even though there are demands from the rest of the world, once no delivery can be made, there is high tendency for other countries to find substitute, losing all consumers in the long run.

Those determinants are examples of what will influence the export function, shifting either upward or downward (figure 3-5). Other factors might shape export pattern as well. For instance, the disaster such as flood in a country can halt factories from production. If those corporations produce goods and services for export, the amount of export tends to decline.

Figure 3-5: Export Function



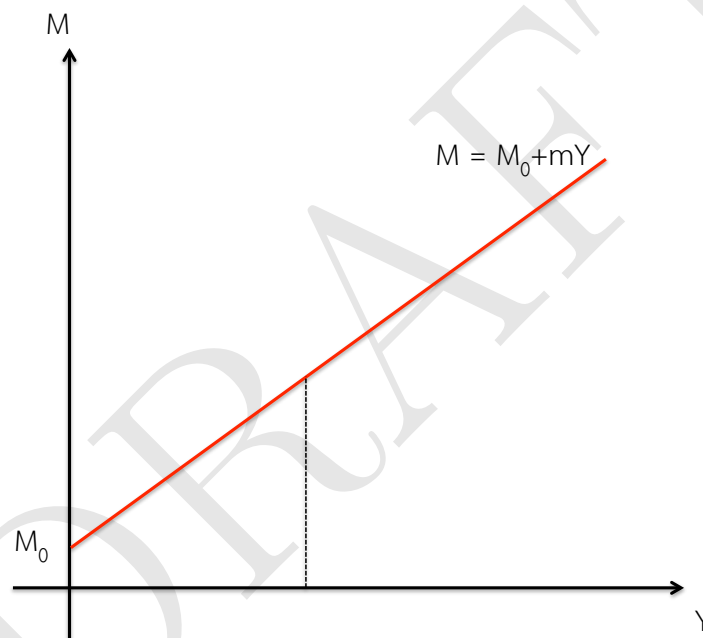
Desired aggregate imports

People do not consume just only domestic goods and services but those produced outside of the country as well. The desired aggregate imports are then similar to consumption function. There are both induced and autonomous import for import function (equation 3.14 and figure 3-6). m represents *marginal propensity to import*, the fraction of national income that people will import goods and services from the rest of the world. Other determinants are the same as desired aggregate consumption except for disposable

income since the capacity to import for all economic units in Thailand, not only households but also others, will come from national income of the country. In this context, import function will then have induced and autonomous characteristics. Even though national income is equal to zero, a country still needs minimum requirement for import. They might need to import energy such as oil and electricity from their neighbors, financing those purchase by either borrowing or selling existing assets.

$$M = f(Y, CRi, AST, EXP, W, SV, POP, \dots) \quad (3.14)$$

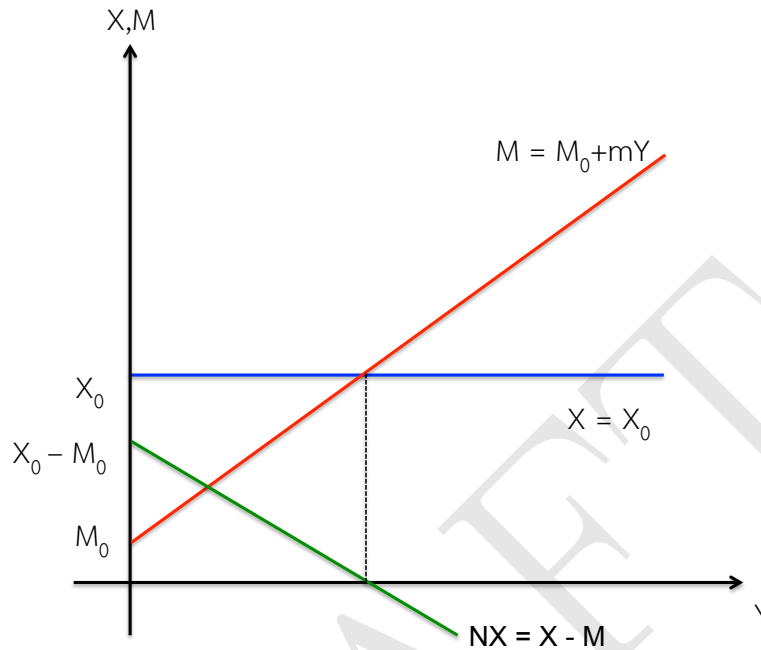
Figure 3-6: Import Function



Desired aggregate net exports

To find net export, we subtract import out of export and the result is net flow injected back to the economy. If we plot both export and import functions in one graph, we can find net export, sloping downward as shown in figure 3-7. Movement along the curve is from the change in national income. A rise of it will decrease net export and that will deteriorate the flow within the economy. The change of this function will depend on those determinants of export and import function discussed earlier.

Figure 3-7: Net Export Function



3.3 Equilibrium National Income

3.3.1 Definition

The equilibrium is the situation where all parties are happy and there is no tendency to change unless external force affects the system. In this case for equilibrium national income, certain level of this total output will make the amount of desired aggregate expenditure equal to the value of what are actually produced. There are two approaches to explain how the equilibrium of national income is attained. The first one is the situation which income is equal to expenditure or $Y = DAE$. The other is where leakage (Saving, Tax and Import) is equal to injection (Investment, Government Spending and Export) in case of the open economy. We will discuss each scenario in accordance with the circular flow and explain the national income equilibrium in each case.

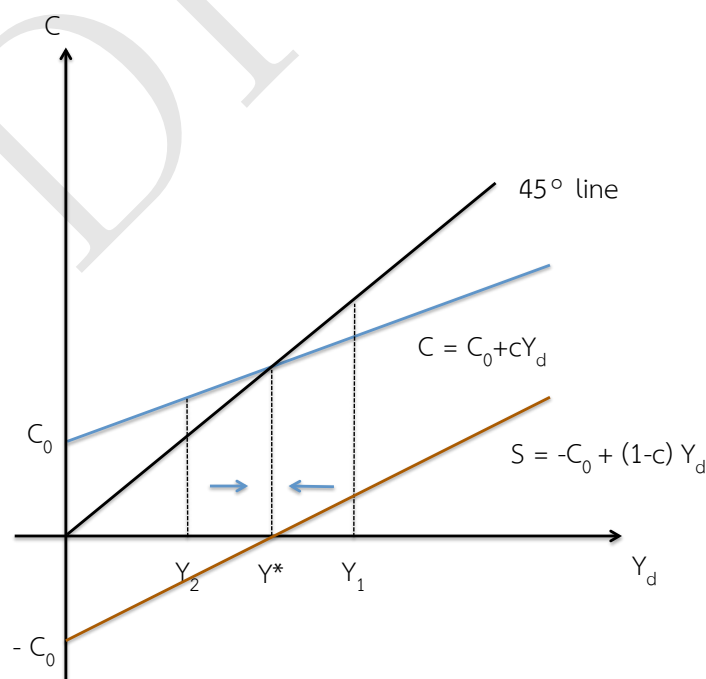
3.3.2 Determination of equilibrium national income

For completely closed economy, business firms produce all goods and services by hiring factors of production from household. Household spend money for goods and services by factors payment paid by firms. In this case, there will be only consumption counted for national income. In this chapter, one of the most important assumption is that *price remains constant*, which means any excess demands and excess supplies will not push price level upward or downward.

Figure 3-8 shows the equilibrium national income at Y^* , the break-even income. The intersection between 45-degree line and the consumption function. 45-degree line represents the situation where the desired aggregate expenditure, in this case only consumption (C), is equal to the actual output (Y). What we need to find next is how much people need or desire for consumption so that we can equate the desired one with the real things produced and eventually the equilibrium is attained. This method to find national income equilibrium is called the expenditure approach ($Y = DAE$). We also have another way for the equilibrium determination It is the leakage being equal to injection, which in this completely closed economy, no leakage to consider. If households do not consume all of their income, some save for future consumption but no investment. Therefore, at the equilibrium where leakage is equal to injection, saving is equal to zero investment or zero.

The equilibrium is the situation where there is no tendency to change except external forces affect it. At Y^* (break-even income), it is the equilibrium because if the national income is at Y_1 , there are supplies left unsold so firms will consider to shut down some factories and reduce employment so that those inventories (products kept in the storage) will be at the desirable level and result in lower level of national income, reaching at the equilibrium. On the contrary, when the economy operates at Y_2 , the amount of goods and services to satisfy people demand is not enough. Excess demand takes place, driving down inventories and that will give incentives for firms to increase their production level as well as hire more workers and eventually national income rises to the equilibrium.

Figure 3-8: National Income Equilibrium



To complete the picture, mathematical analysis should be presented. Suppose the economy is estimated to be as following:

$$\begin{aligned}
 C &= C_0 + cY_d \\
 Y_d &= Y \\
 \text{At the equilibrium: } Y &= DAE \\
 \text{and in this case, } DAE &= C \\
 Y &= C_0 + cY_d \\
 Y &= C_0 + cY \\
 (1 - c)Y &= C_0 \\
 Y^* &= \frac{1}{1-c}C_0
 \end{aligned}$$

Therefore, the national income illustrated in figure 3-8 is equal to $Y^* = \frac{1}{1-c}C_0$. If there is the exact numerical example, the equilibrium will be found by plugging in the number in the equation and now the slope of the DAE will be called *marginal propensity to spend*

For closed economy where financial institutions are introduced within the system, households do not only consume at the time. They can save for future consumption, which financial institutions will facilitate by matching those being in deficit to those being in surplus by injecting (investment) the leakage (saving) back to the economy. In this scenario, the expenditure spent in the economy will be consumption and investment. The desired aggregate expenditure will compose of these two and if we use expenditure approach, we can equate national income to DAE.

Figure 3.9 shows the equilibrium determination where Y^* will not alter except any other factors come in and make it change. The desired aggregate expenditure will be the composition of consumption and investment in this case. The equilibrium is attained once national income is at Y^* .

Since there are two approaches to find the equilibrium national income, injection = leakage method will be presented here. In this closed economy, if more saving is pouring out of the system more than what investment is injected back, it is the situation there is too much income (Y_1) in the economy and people save too much. Eventually, the leakage will reduce national income and reach the equilibrium where injection being equal to leakage. On the other hand, if the level of national income is too low (Y_2), there is too little of saving or leakage out of the economy while investment is a lot higher. The injection will expand the level of national income and that will finally lead to the equilibrium where both level of investment and saving is the same. Figure 3.10 shows the diagram where the equilibrium national income is achieved.

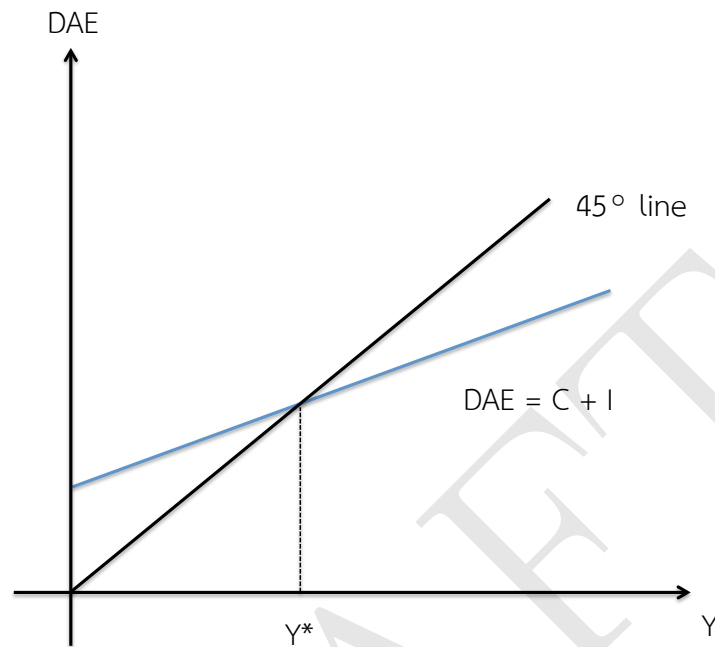
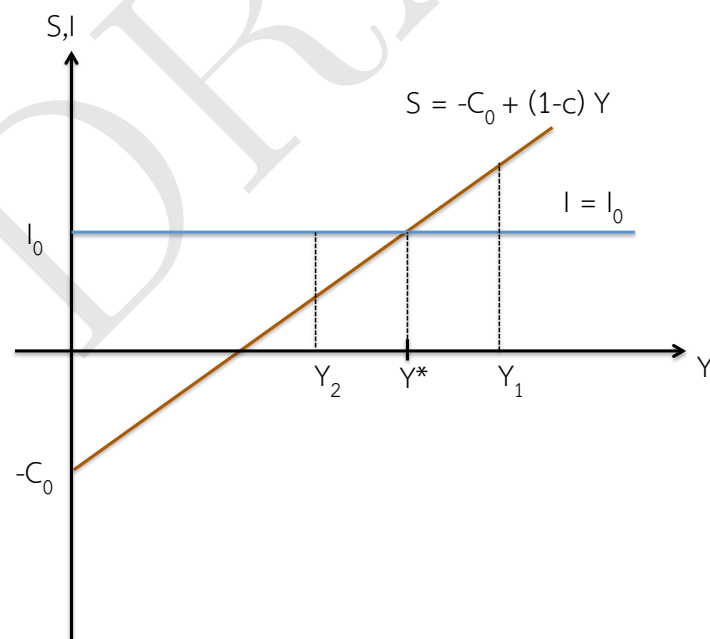
Figure 3-9: National Income Equilibrium for Closed Economy ($Y = DAE$)

Figure 3-10: National Income Equilibrium for Closed Economy (leakage = injection)



For mathematical illustration, suppose that investment is both autonomous and induced. The equilibrium national income in this case will be equal to $Y^* = \frac{1}{1-c-i}(C_0 + I_0)$. If the investment is autonomous just like presented in the figure above, the answer will be just eliminating i out ($Y^* = \frac{1}{1-c}(C_0 + I_0)$). The processes are written below.

With autonomous investment:

$$C = C_0 + cY_d$$

$$I = I_0$$

$$Y_d = Y$$

At the equilibrium: $Y = DAE$

and in this case, $DAE = C + I$

$$\therefore Y = C_0 + cY_d + I_0$$

$$Y = C_0 + cY + I_0$$

$$(1 - c)Y = C_0 + I_0$$

$$Y^* = \frac{1}{1-c}(C_0 + I_0)$$

With autonomous and induced investment:

$$C = C_0 + cY_d$$

$$I = I_0 + iY$$

$$Y_d = Y$$

At the equilibrium: $Y = DAE$

and in this case, $DAE = C + I$

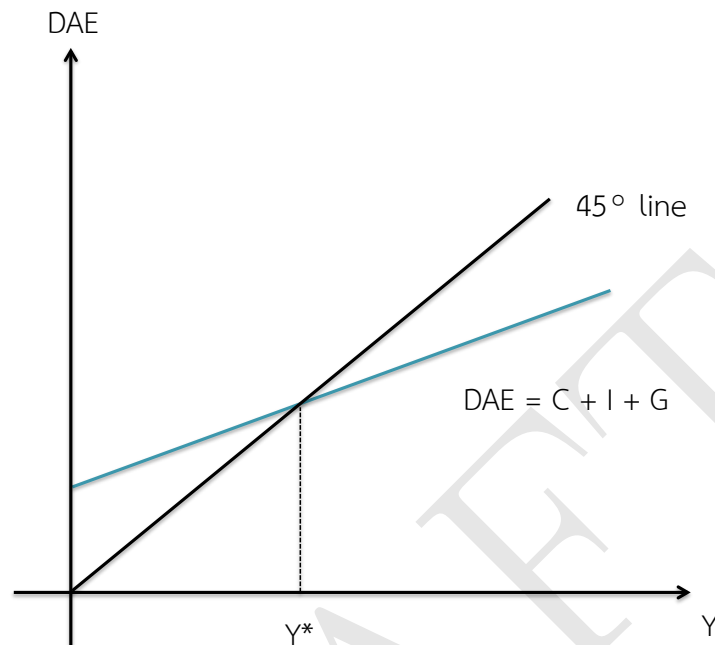
$$\therefore Y = C_0 + cY_d + I_0 + iY$$

$$Y = C_0 + cY + I_0 + iY$$

$$(1 - c - i)Y = C_0 + I_0$$

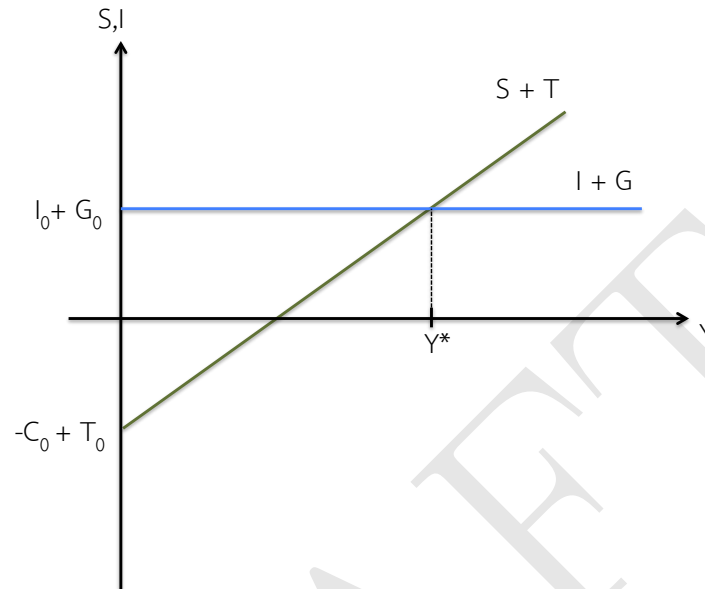
$$Y^* = \frac{1}{1-c-i}(C_0 + I_0)$$

In microeconomics, government exists because this organization can reduce market power of any particular firms, eliminate externalities, provide public goods and solve asymmetric information. In macroeconomics, we now examine what the role is for government to play. For closed economy and government, government has tax power to excise households and firms which we consider that as the leakage out of the economy while the amount of spending government paid is the injection to the economy as authority needs to provide public services and solve market failure. At the equilibrium national income level, the desired aggregate expenditure consisting of desire aggregate consumption, investment and government spending should be then even with the actual output at Y^* (figure 3-11).

Figure 3-11: National Income Equilibrium for Closed Economy and government ($Y=DAE$)

Put it differently. In this case, those counted as leakage are saving and tax whereas those considered as injection are investment and government spending. The process is still the same. At the equilibrium, leakage matches injection (figure 3-12). If the national income is too high or too low, the adjustment towards the equilibrium will take place.

Figure 3-12: National Income Equilibrium for Closed Economy and government (Leakage = Injection)



Nevertheless, there are two categories of tax that we will deliberate in this course, which are lump-sum and income tax. Lump-sum tax is the autonomous one. Government just collects that revenue and it does not depend on any other factors while the income tax fluctuates with the change in national income since this tax will be attached with the income people have. Once we incorporate these tax in the system, the mathematical presentations are followed:

For closed economy and government without tax:

$$C = C_0 + cY_d$$

$$I = I_0 + iY$$

$$G = G_0$$

$$Y_d = Y$$

At the equilibrium: $Y = DAE$

and in this case, $DAE = C + I + G$

$$\therefore Y = C_0 + cY_d + I_0 + iY + G_0$$

$$Y = C_0 + cY + I_0 + iY + G_0$$

$$(1 - c - i)Y = C_0 + I_0 + G_0$$

$$Y^* = \frac{1}{1-c-i}(C_0 + I_0 + G_0)$$

For closed economy and government with lump-sum tax:

$$C = C_0 + cY_d$$

$$I = I_0 + iY$$

$$G = G_0$$

$$T = T_0$$

$$Y_d = Y - T$$

At the equilibrium: $Y = DAE$

and in this case, $DAE = C + I + G$

$$\therefore Y = C_0 + cY_d + I_0 + iY + G_0$$

$$Y = C_0 + c(Y - T_0) + I_0 + iY + G_0$$

$$Y = C_0 + cY - cT_0 + I_0 + iY + G_0$$

$$(1 - c - i)Y = C_0 - cT_0 + I_0 + G_0$$

$$Y^* = \frac{1}{1-c-i}(C_0 - cT_0 + I_0 + G_0)$$

For closed economy and government with income tax:

$$C = C_0 + cY_d$$

$$I = I_0 + iY$$

$$G = G_0$$

$$T = tY$$

$$Y_d = Y - T$$

At the equilibrium: $Y = DAE$

and in this case, $DAE = C + I + G$

$$\therefore Y = C_0 + cY_d + I_0 + iY + G_0$$

$$Y = C_0 + c(Y - tY) + I_0 + iY + G_0$$

$$Y = C_0 + cY - ctY + I_0 + iY + G_0$$

$$(1 - c - i + ct)Y = C_0 + I_0 + G_0$$

$$Y^* = \frac{1}{1-c-i+ct}(C_0 + I_0 + G_0)$$

For closed economy and government with lump-sum and income tax:

$$C = C_0 + cY_d$$

$$I = I_0 + iY$$

$$G = G_0$$

$$T = T_0 + tY$$

$$Y_d = Y - T$$

At the equilibrium: $Y = DAE$

and in this case, $DAE = C + I + G$

$$\therefore Y = C_0 + cY_d + I_0 + iY + G_0$$

$$Y = C_0 + c(Y - T_0 - tY) + I_0 + iY + G_0$$

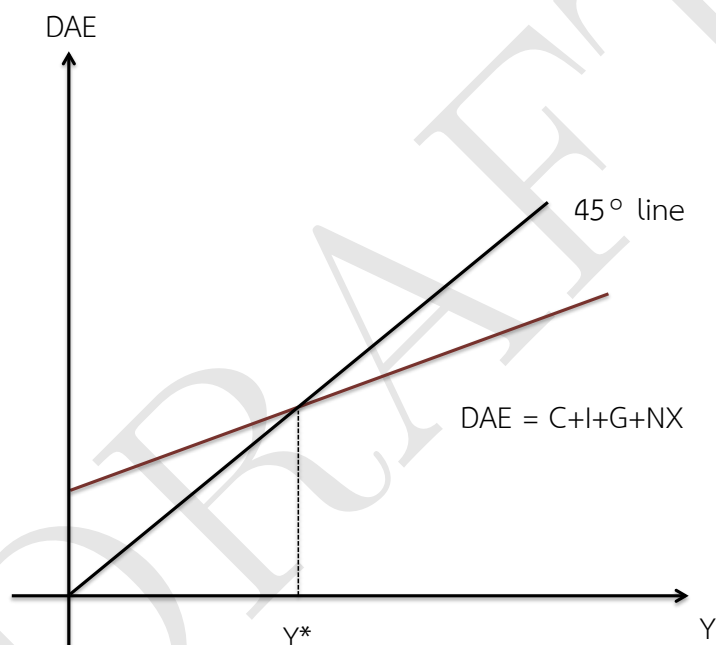
$$Y = C_0 + cY - cT_0 - ctY + I_0 + iY + G_0$$

$$(1 - c - i + ct)Y = C_0 - cT_0 + I_0 + G_0$$

$$Y^* = \frac{1}{1-c-i+ct}(C_0 - cT_0 + I_0 + G_0)$$

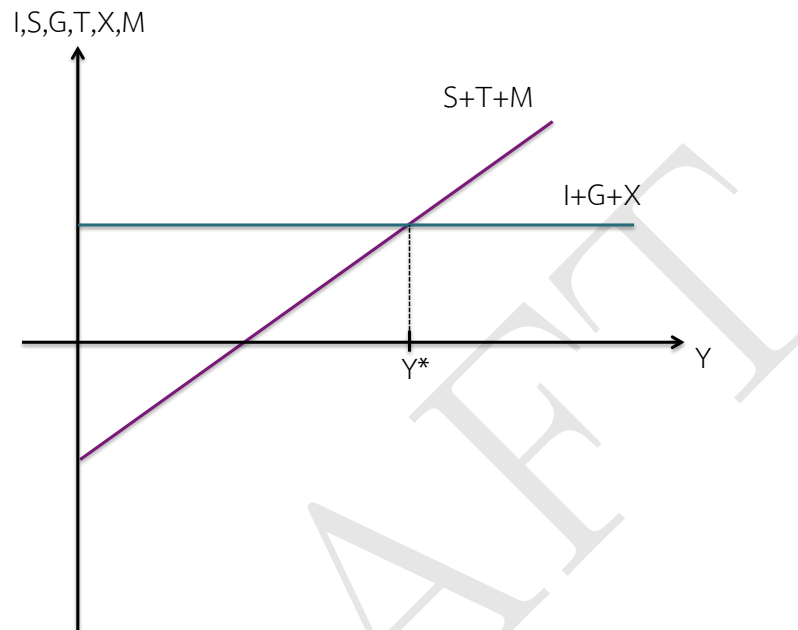
What we analyze earlier is the national income at the equilibrium of closed economy where the economy operates within and those households, firms and government interact one another and no transaction with the rest of the world. In reality, there are trades and capital flows internationally. The rest of the world is then introduced here in the circular flow. To find this equilibrium national income, we need to search for what and how much people are willing to spend. The desired aggregate expenditure here will be the composition of desired aggregate consumption, investment, government spending, export and import. Figure 3-13 demonstrates Y^* , the equilibrium national income where the desired aggregate expenditure is equal to the actual output.

Figure 3-13: National Income Equilibrium for Open Economy ($Y = DAE$)



Another way to explore the equilibrium is then again leakage and injection. Figure 3-14 shows us that export is the injection as people can sell final goods and services for foreign consumption, certain returns will be brought back and infused within the economy. In contrast, people do not only consume goods and services produced within a country, they would perhaps like to purchase foreign goods and services as well. Those will be measured as import and once we import, those foreign sellers will benefit. Certain flow will leak out of the system. For the equilibrium, the adjustment process is the same.

Figure 3-14: National Income Equilibrium for Open Economy (Leakage = Injection)



Furthermore, we can find the exact value of the equilibrium if this model represents the real economy. Suppose that all the equations are estimated and ordered below. Equilibrium national income, in this case where investment and tax have both autonomous and induced trait, can be found mathematically as following.

For open economy:

$$C = C_0 + cY_d$$

$$I = I_0 + iY$$

$$G = G_0$$

$$T = T_0 + tY$$

$$X = X_0$$

$$M = M_0 + mY$$

$$Y_d = Y - T$$

At the equilibrium: $Y = DAE$

and in this case, $DAE = C + I + G + X - M$

$$\therefore Y = C_0 + cY_d + I_0 + iY + G_0 + X_0 - M_0 - mY$$

$$Y = C_0 + c(Y - T_0 - tY) + I_0 + iY + G_0 + X_0 - M_0 - mY$$

$$Y = C_0 + cY - cT_0 - ctY + I_0 + iY + G_0 + X_0 - M_0 - mY$$

$$(1 - c - i + ct + m)Y = C_0 - cT_0 + I_0 + G_0 + X_0 - M_0$$

$$Y^* = \frac{1}{1 - c - i + ct + m} (C_0 - cT_0 + I_0 + G_0 + X_0 - M_0)$$

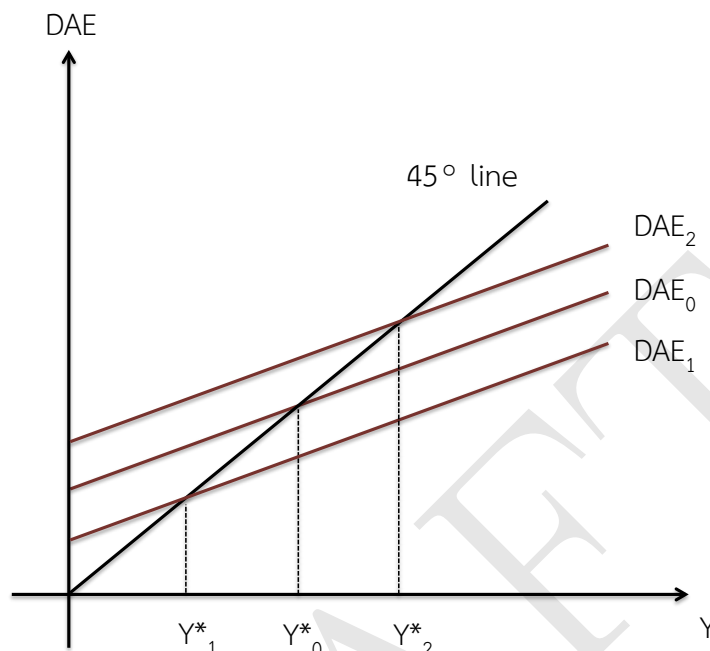
3.4 Changes in Equilibrium National Income and the Multipliers

After we found the national income at the equilibrium and the adjustment towards it, what we are going to discuss next is if external factors cause disequilibrium, the changes in equilibrium national income is unavoidable and multipliers measure how much the national income at the equilibrium will be refined. Changes in national income equilibrium can be caused by various factors such as the variation of autonomous expenditures or the marginal propensity to spend and the change in price level. We will talk about the case with constant price and then continue to the change in price level.

3.4.1 Constant price level

Suppose that there is a change in autonomous expenditure, *ceteris paribus*. A rise in any component of DAE means more demand for goods and services. Graphically, DAE will shift either downward or upward, depending on whether that change in autonomous expenditure increases or decreases the desired aggregate expenditure. Figure 3-15 indicates that if there is a rise in either desired consumption expenditure (C), desired investment expenditure (I), desired government expenditure (G), desired export (X) or a fall in desired import (M). The result is the new equilibrium national income at Y_2^* . Nevertheless, if there is a fall in either desired consumption expenditure (C), desired investment expenditure (I), desired government expenditure (G), desired export (X) or a rise in desired import (M), DAE will shift downward and the adjustment process will take place. Eventually, equilibrium national income will be at Y_1^* .

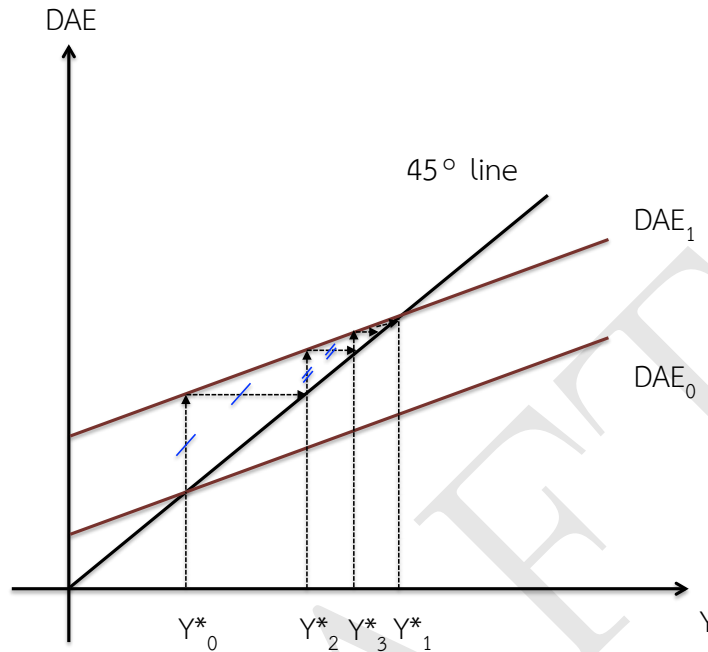
Figure 3-15: The Change in Autonomous Expenditure to Equilibrium National Income



Normally, a rise in desired consumption expenditure by 50 million THB will make DAE increase by 50 million THB. The final change in equilibrium national income will, however, be larger than that due to multiplier effect. Multiplier effect in this case intensifies the overall change in equilibrium national income, even though only a slight change in autonomous expenditure will result in larger amount of change in equilibrium national income, given other things remaining constant.

Figure 3-16 illustrates the process of adjustment. Once autonomous expenditure change and make DAE_0 shift upwards to DAE_1 . At the same equilibrium national income (Y_0^*), DAE is greater than actual output. Inventory will be sold out and then firms need to adapt their production pattern, employing more of factors of production and eventually national income will rise to Y_2^* . Again at Y_2^* , DAE is still greater than national income. Inventory will be sold out and then firms need to adapt their production, employing more of factors of production and eventually national income will rise to Y_3^* . This process will continue and finally reach at Y_1^* .

Figure 3-16: Multiplier Effect - Graphical Representation



Mathematically, once we apply the equation where income is equal to expenditure or leakage is equal to injection. Our final solution for equilibrium national income, given open economy with income and lump-sum taxes from the government, is:

$$Y^* = \frac{1}{1-c-i+ct+m} (C_0 - cT_0 + I_0 + G_0 + X_0 - M_0)$$

If we take delta just to find the difference of the national income, allowing the change in autonomous expenditure excluding tax (AE) as well as autonomous tax (T), we will have:

$$\begin{aligned} \Delta Y &= \frac{1}{1-c-i+ct+m} (\Delta AE); AE = \{C_0, I_0, G_0, X_0\} \\ \Delta Y &= \frac{-c}{1-c-i+ct+m} (\Delta T) \\ \Delta Y &= \frac{-1}{1-c-i+ct+m} (\Delta M) \end{aligned}$$

Therefore, if one wants to find the magnitude of change from any particular change in autonomous expenditure, it can be calculated by the multiplication of the change with the multiplier as following:

$$\frac{\Delta Y}{\Delta AE} = \frac{1}{1-c-i+ct+m}$$

$$\frac{\Delta Y}{\Delta T} = \frac{-c}{1-c-i+ct+m}$$

$$\frac{\Delta Y}{\Delta M} = \frac{-1}{1-c-i+ct+m}$$

Nonetheless, this mathematic representation is for open economy with income and lump-sum taxes. In case of other systems, multipliers are in table 3-1 and 3-2. Notice

that the effect from changes in both tax and import will be different from others in autonomous expenditure (C,I,G) and also note that balanced budget multiplier is the situation which government increases or decreases government spending and tax with the same magnitude. Given closed economy with no induced investment and no income tax, balanced budget multiplier will be 1 as it is the summation of government multiplier and tax multiplier.

Table 3-1: Multipliers for closed economy

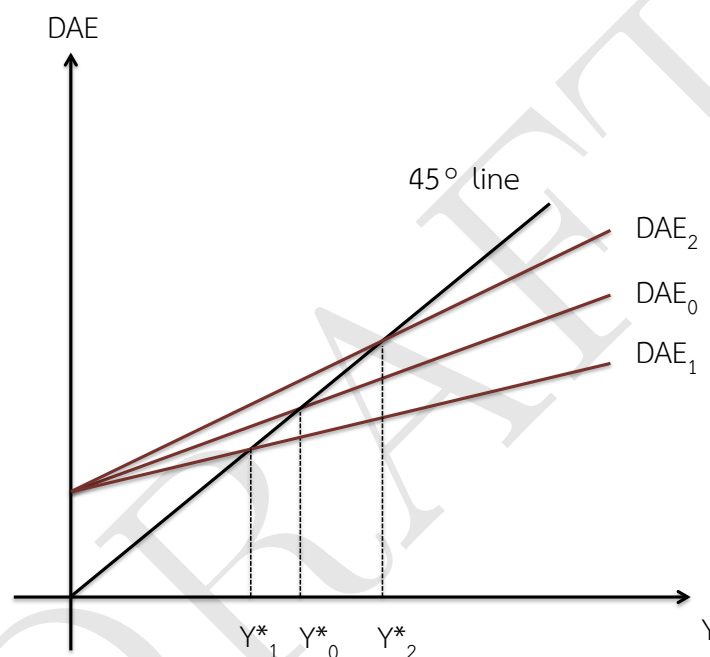
Multiplier ($\frac{\Delta Y}{\Delta AE}$)	$I = I_0$ $T = T_0$	$I = I_0$ $T = T_0 + tY$	$I = I_0 + iY$ $T = T_0$	$I = I_0 + iY$ $T = T_0 + tY$
$\Delta C, \Delta I, \Delta G$	$\frac{1}{1-c}$	$\frac{1}{1-c+ct}$	$\frac{1}{1-c-i}$	$\frac{1}{1-c-i+ct}$
ΔT	$\frac{-c}{1-c}$	$\frac{-c}{1-c+ct}$	$\frac{-c}{1-c-i}$	$\frac{-c}{1-c-i+ct}$
Balanced Budget Multiplier ($\Delta G = \Delta T$)	$\frac{1}{1-c} + \frac{-c}{1-c}$ =1			

Table 3-2: Multipliers for open economy

Multiplier ($\frac{\Delta Y}{\Delta AE}$)	$I = I_0$ $T = T_0$	$I = I_0$ $T = T_0 + tY$	$I = I_0 + iY$ $T = T_0$	$I = I_0 + iY$ $T = T_0 + tY$
$\Delta C, \Delta I, \Delta G, \Delta X$	$\frac{1}{1-c+m}$	$\frac{1}{1-c+ct+m}$	$\frac{1}{1-c-i+m}$	$\frac{1}{1-c-i+ct+m}$
ΔT	$\frac{-c}{1-c+m}$	$\frac{-c}{1-c+ct+m}$	$\frac{-c}{1-c-i+m}$	$\frac{-c}{1-c-i+ct+m}$
ΔM	$\frac{-1}{1-c+m}$	$\frac{-1}{1-c+ct+m}$	$\frac{-1}{1-c-i+m}$	$\frac{-1}{1-c-i+ct+m}$

Furthermore, changes in equilibrium national income can come from the change in marginal propensity to consume, to invest, to import and also income tax. If people tend to spend more out of disposable income, that means marginal propensity to consume increases, making DAE rotate counter clockwise. Induced investment is similar to MPC. Marginal propensity to import will be different since if we are likely to import more out of national income, lessening and rotating DAE clockwise and it is the same for income tax.

Figure 3-17: The Change in Slope of DAE



3.4.2 Price level varies

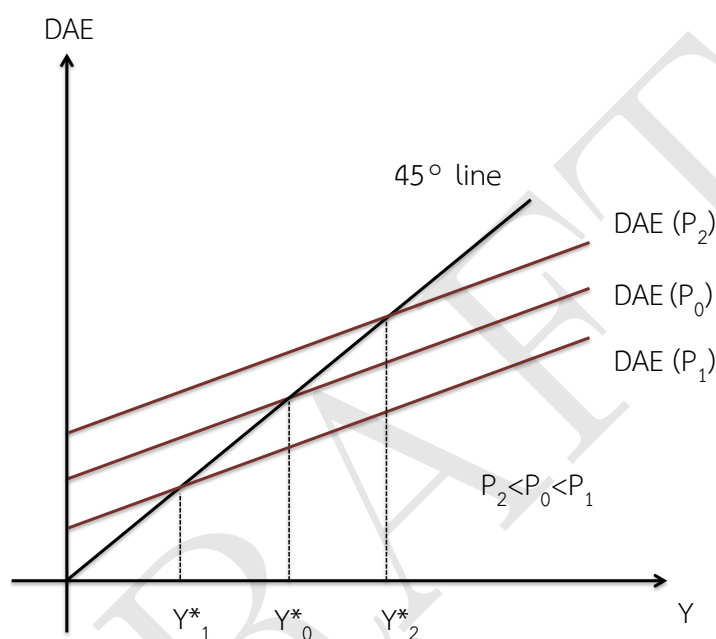
In the previous section, we analyze equilibrium national income with fixed price level. Any changes in autonomous expenditure will shift DAE and reach new equilibrium national income. Now, if we will allow price level to change and examine its consequence, the effect towards equilibrium national income will not be the same.

After price level rises, two components of DAE will be affected. The first is the consumption function; once consumers find that their real wealth declines because people feel that they are poorer as they are not able to purchase the same amount of goods and services with same amount of money. The amount of desired consumption expenditure is then going down, unavoidably changing DAE. This phenomena is called “Pigou’s effect”

Second is that once price level in one particular country soars, foreign people will find both goods and services of such country more expensive, diminishing desired export. In

addition, domestic people will substitute their goods and services by foreign ones, shooting up the amount of import. Net export is then subsided. Overall, the consequence of a rise in price level will make DAE shifts downward as shown in figure 3-18 that price increases from P_0 to P_1 . The result will be in the opposite if there is the decline in price level from P_0 to P_2 . Eventually, the new equilibrium will be attained.

Figure 3-18: Changes in Price Level towards Equilibrium National Income



3.5 Paradox of Thrift

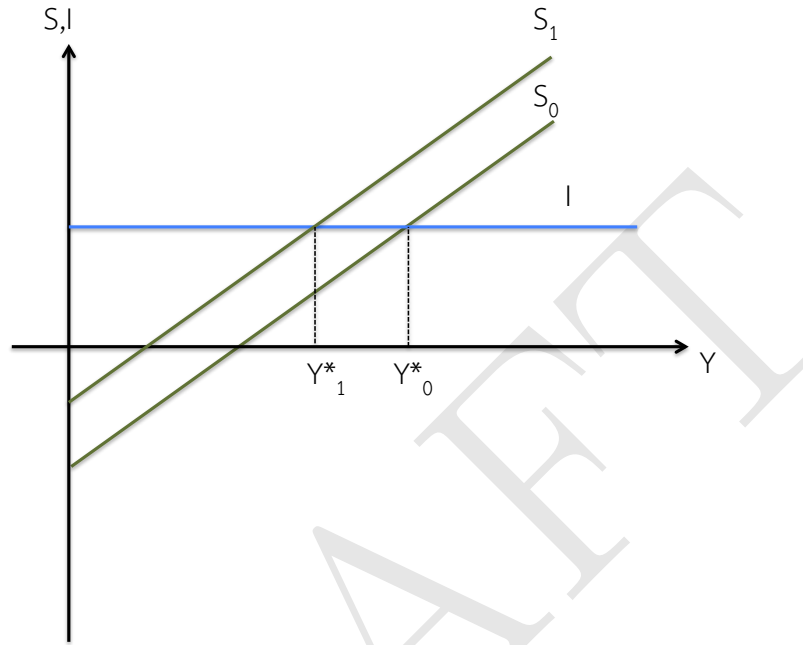
In microeconomics, we believe that once people save more, people can use that amount of money for their future consumption despite the sacrifice of present consumption. If this is true for all individuals, it should be true for the overall economy, creating *fallacy of composition* which one concludes that it is correct for whole part since it is correct for some part already. In reality, it is not, however, always the case.

In macroeconomics, when there are more saving in the aggregate economy, that means more leakage out of the circular flow, shifting leakage curve downward and making the economy in recession. Figure 3-19 illustrates that as a rise in saving shifts upwards from S_0 to S_1 , more of leakage is for the economy and that will deteriorate equilibrium national income from Y_0^* to Y_1^* .

In spite of this fallacy of composition, in the long run, once those saving is channeled to investment. Injection will be in for the economy and it will alleviate the worsen condition created by the leakage, as more investment will shift injection curve upwards and

might return the economy back to the previous scenario.

Figure 3-19: Paradox of Thrift



3.6 Inflationary and Deflationary Gap

Assume that the economy can operate with their full potential, the value of total output is at full-employment national income (Y^F). *Deflationary gap* is the situation despite the exploitation of factors of production at its full capacity, people demand less than the full-employment one (figure 3-20). The vertical gap, considered at (Y^F), demonstrates that actual output exceeds what people are desired to spend or the economy operates less than full employment. To solve this problem so that the economy utilizes resources efficiently, government can intervene and increase desired aggregate expenditure, which will make DAE shift upwards from Y^* to Y^F , just enough to close the deflationary gap.

In the situation which the economy exploits resources more than its full capacity, people might work too hard from normally 8 hours to 12 hours per day. As a result (figure 3-21), the economy can produce goods and services at (Y^*) more than its full-employment national income (Y^F), and we call this situation as *inflationary gap*. The vertical gap at Y^F points out that the desired aggregate expenditure is greater than what the economy generates. To solve this problems just to improve people standard of living back to normal condition, government can decrease desired aggregate expenditure, which will make DAE shift downwards from Y^* to Y^F , just enough to close the inflationary gap.

Figure 3-20: Deflationary Gap

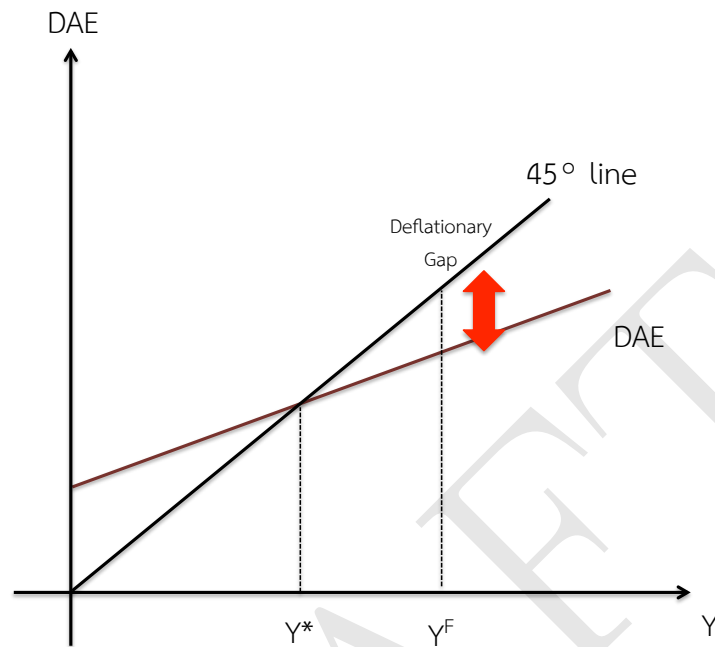
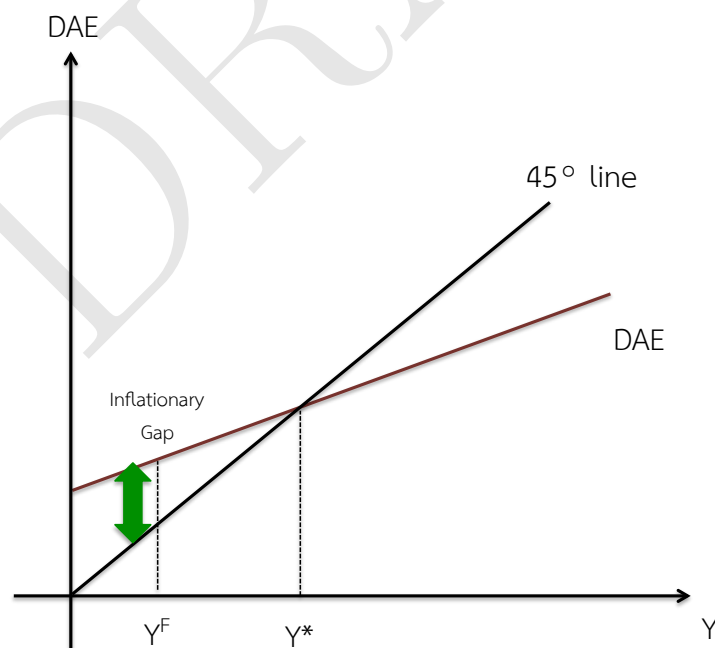


Figure 3-21: Inflationary Gap



DRAFT

Chapter 4

AD and AS Model

4.1 Introduction

In chapter 3, we discuss about the equilibrium national income, how it is determined and how it can be changed. In this chapter, we will focus more on how price level affects the equilibrium national income. We will talk about the aggregate economy where we have aggregate demand and aggregate supply. The equilibrium in this aggregate market will lead the the equilibrium price level and national income.

Aggregate demand is the schedule which represents the demand for the aggregate economy. From microeconomic analysis, there are two hidden effects to explain the shape of ordinary demand, so called substitution and (real) income effects. Substitution effect tells that once there is a rise in price of that goods, individuals will substitute that product with another, lessening the quantities demanded, while (real) income effect states that a soar in price will make people have less ability to purchase that goods; as a result, people real income then reduces.

In macroeconomics, same kinds of effects are there in aggregate demand as well. As price level of the economy goes up, first people will find substitute from other countries by importing more of foreign goods and services, diminishing the national income and secondly people will have less to consume. We will talk more about how we derive this aggregate demand in the next section.

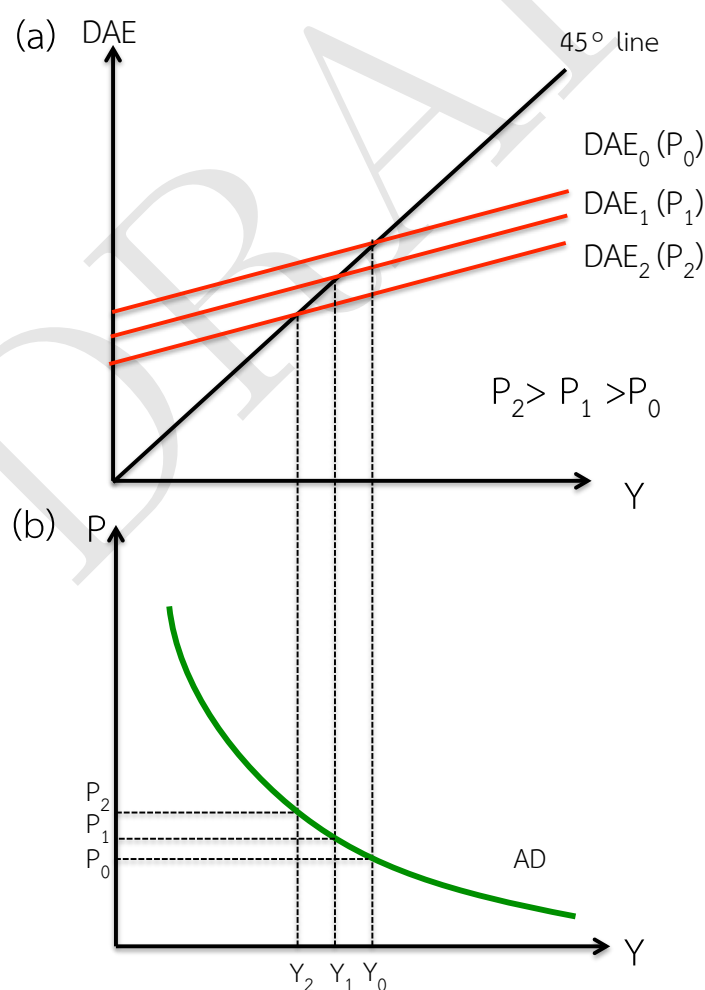
For aggregate supply, in this principle course, we will focus on different assumptions and different shapes of this aggregate supply. This aggregate supply indicates the relationship between price level and national income from producers' side. Both short-run and long-run aggregate supply curves will be described. Three schools of thought will be presented and different underlying assumptions are the cause of different policy implication in macroeconomics.

4.2 The derivation of aggregate demand

Aggregate demand represents the demand of the aggregate economy. It is the schedule of price level and final goods and services demanded. The change in price level affects how much the economy produces. The derivation of aggregate demand could be explained via our previous analysis, $Y=DAE$ approach.

If there is the change in price level, people wealth will decline as they will perceive that the value their existing assets deteriorates. As a consequence, people will adjust their behavior and consume less. Furthermore, higher domestic price level will result in less export because foreigners will substitute more expensive export of that country with cheaper ones, and more of import since people will substitute more expensive domestic products with cheaper foreign ones. All in all, change in price leads to changes in consumption and net export.

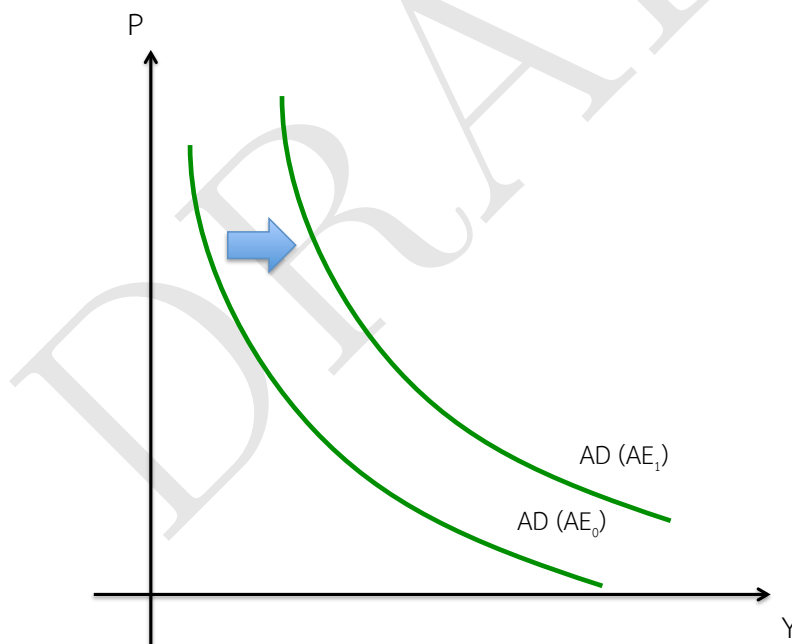
Figure 4-1: Derivation of Aggregate Demand via $Y=DAE$ approach



To derive this aggregate demand, figure 4-1 (a) illustrates that once price level rises from P_0 to P_1 , DAE then shifts downwards from DAE_0 to DAE_1 . Given the same national income, it is the situation where income is greater than expenditure ($Y > DAE$), inventory will be left over. Firms will change their production by producing less and then national income falls. Again if price level surges from P_1 to P_2 , DAE then shifts downwards from DAE_1 to DAE_2 , and eventually, national income reaches Y_2 . These national income and price level are negatively related and shown in figure 4-1 (b). Movement along this aggregate demand curve happens once there is the change in price level, other things remaining constant.

Apart from price level, other factors can affect the demand for the aggregate economy. A rise or fall of aggregate expenditure passages to change in national income at each and every price level (figure 4-2). Any external forces can disturb the system and bring the shift to aggregate demand curve; in addition, if that causes the variation in total output at each and every degree of price level.

Figure 4-2: Shift of Aggregate Demand



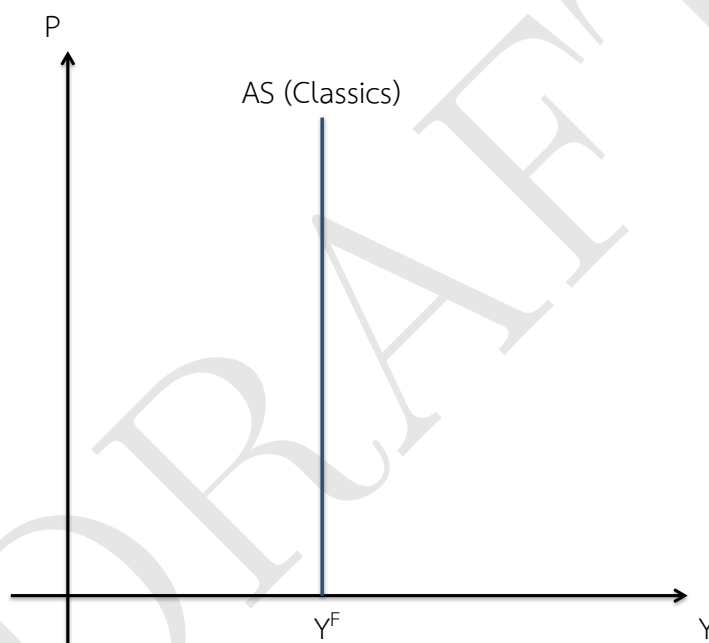
4.3 Aggregate supply

Aggregate supply represents the relationship between price level and national income from producers' perspectives. In microeconomics, it is simple to say that once there is a rise in price level, firms will have more incentives to produce and earn more income. Nevertheless, in macroeconomics, it is the situation in which we incorporate all agents in

the economy. With different underlying assumptions, we can distinguish AS to be in 3 schools of thought which are Classics, Keynes and Non-Keynes (Non-Classics).

Starting with Classics (figure 4-3), the economy is believed to always operate at full employment and price and wage are fully flexible upwards and downwards. What determine how much the economy can produce is due to the level of productivity. Firms always utilize all factors of production at their full capacity, resulting in full-employment national income (Y^F). Thus, the change in price will not contribute to higher national income since the economy can only produce up to Y^F in both short- and long- runs.

Figure 4-3: Classical Aggregate Supply



For Keynesian aggregate supply (figure 4-4), this school originated in 1930s which the economies were in depression. There were many resources left idle, or left unemployed which laborers are willing to work even though they get paid at the same wage. Firms then faced the constant cost per unit once they wanted to hire more labors and produced more goods and services in short run. When the economy reached full employment, however, all resources would be fully manipulated so firms would be back to confront with higher cost of production or AS is vertical in the long run.

Non-Keynes (Non Classics) aggregate supply is the combination of both Keynesian and Classical schools (figure 4-5). The upward sloping shape of AS comes from labor optimization choosing between leisure and working time and the derived demand from firms in short run together with the law of diminishing return. Incremental production will be more costly as firms create more; therefore, they require higher price for compensation

as well as more incentives to produce more. Similar reasoning is applied for the economy as a whole. In the long run, it will also work at full employment so national income will be at Y^F .

Figure 4-4: Keynesian Aggregate Supply

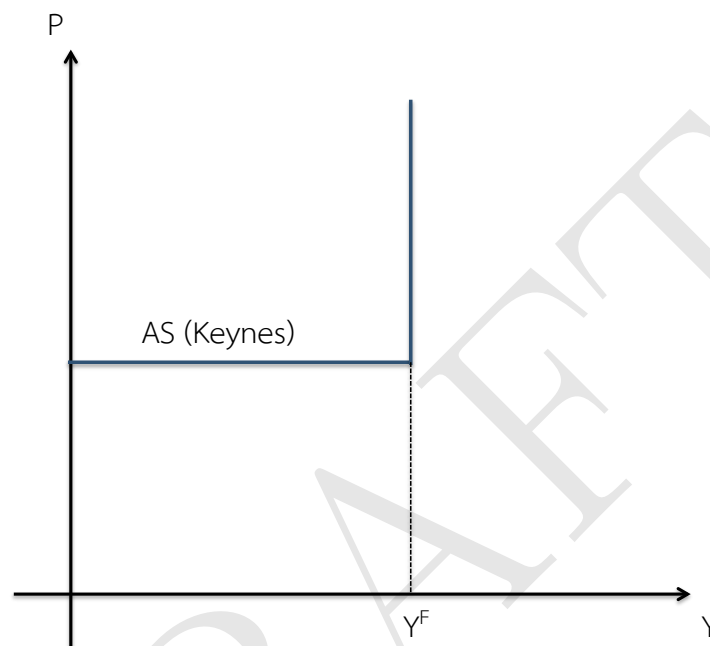
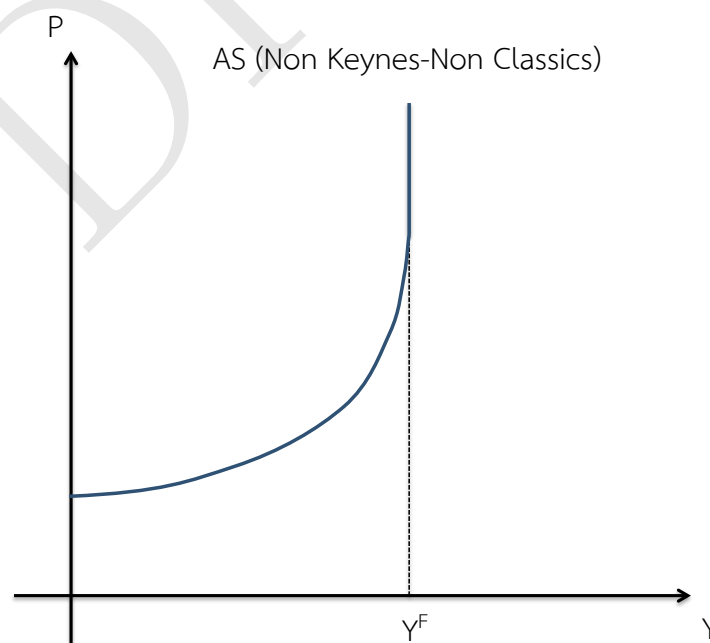


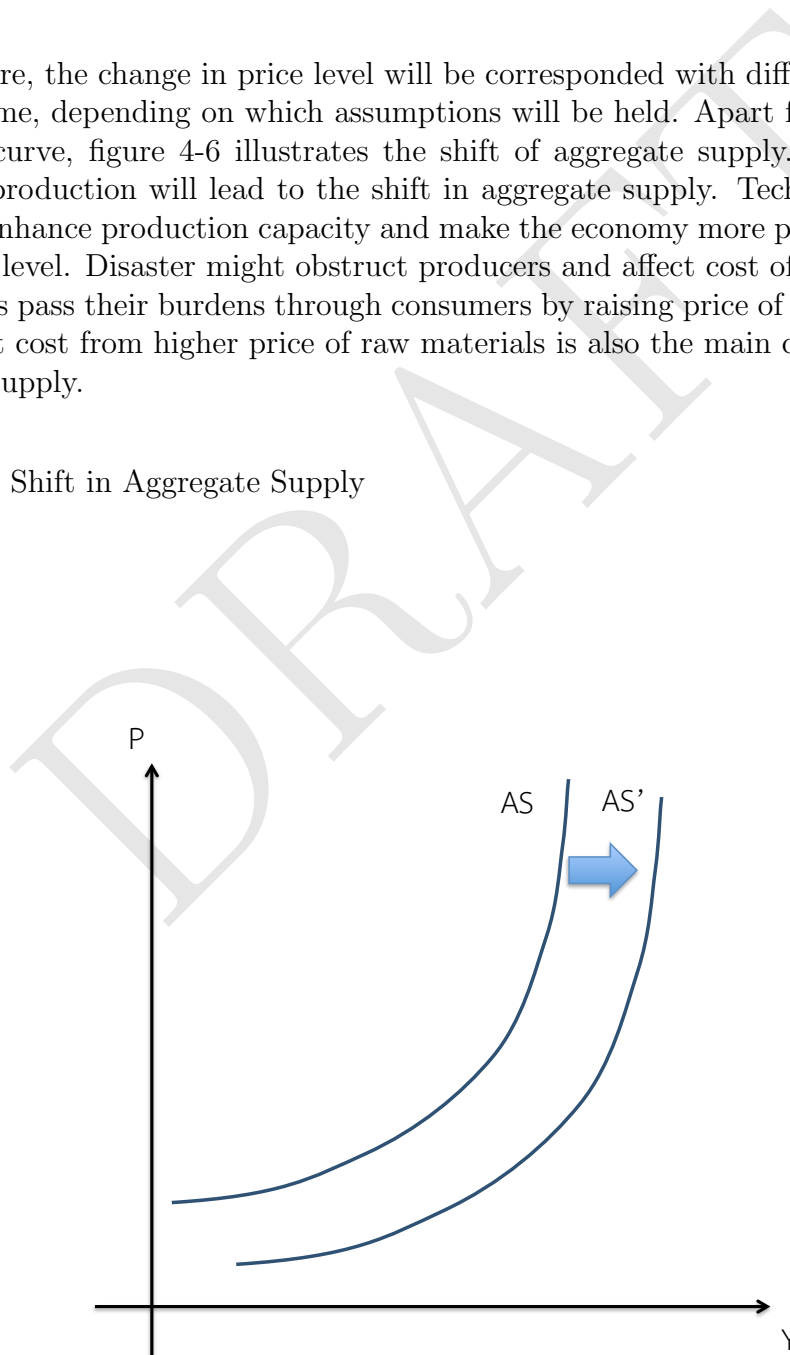
Figure 4-5: Non-Keynes (Non-Classics) Aggregate Supply



As we can see in these different shapes of aggregate supply, this is because there are different assumptions behind. Classical aggregate supply believes in market economy always operating at full employment, leading to the vertical AS in both short and long runs, while Keynesian aggregate supply purposes that once the economy is in depression, there will be no rise in cost of production if firms want to produce more since there are too many resources left unemployed, contributing to the horizontal AS in short run but vertical in the long run. The combination of both schools creates the last school of thought which is Non-Keynes (Non-Classics) where there is upward sloping AS curve at first in short run and vertical in the long run.

Therefore, the change in price level will be corresponded with different change in national income, depending on which assumptions will be held. Apart from the movement along the curve, figure 4-6 illustrates the shift of aggregate supply. Any factors that affect the production will lead to the shift in aggregate supply. Technological advancement will enhance production capacity and make the economy more productive given the same price level. Disaster might obstruct producers and affect cost of production, which makes firms pass their burdens through consumers by raising price of goods and services. Higher unit cost from higher price of raw materials is also the main cause of the shift in aggregate supply.

Figure 4-6: Shift in Aggregate Supply



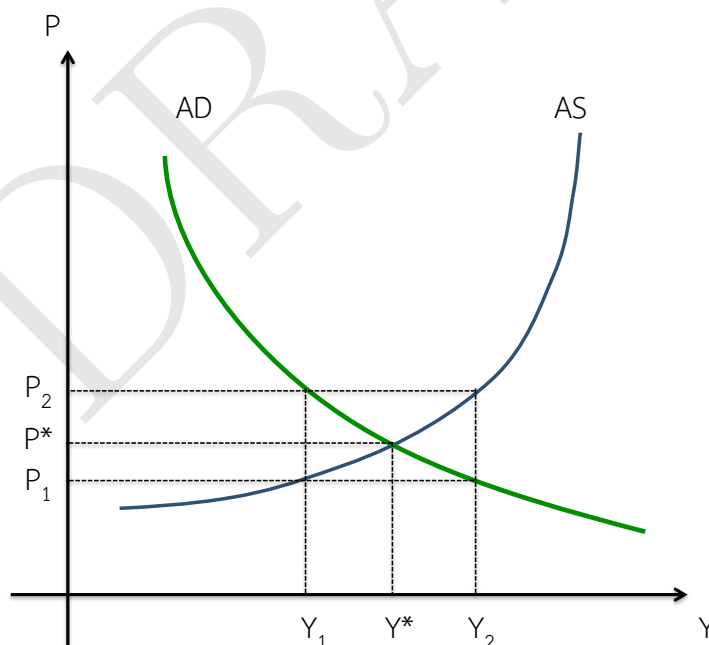
4.4 Determination of equilibrium, change in equilibrium and multipliers

In this section, we will combine both aggregate demand and aggregate supply together and then the equilibrium in which determines both optimal price level and national income is attained. We will use Non-Keynes (Non-Classics) AS in short run for our discussion.

Figure 4-7 shows the equilibrium where P^* is the equilibrium price level associated with equilibrium national income at Y^* . This is the equilibrium because if price is higher than that, say P_2 , at this price level, firms want to supply too much of output (Y_2) in the market, whereas people will demand only up to Y_1 , contributing to excess supply in aggregate market. Price will be driven downwards as firms could not sell their products and eventually reach back at Y^* .

On the contrary, if price is lower at P_1 , there will be more demand than what firms are willing to supply, creating excess demand for total output the aggregate market. Then, there will be the competition for goods and services, pushing up price till P^* associated with more of national income at Y^* .

Figure 4-7: Equilibrium in Aggregate Market

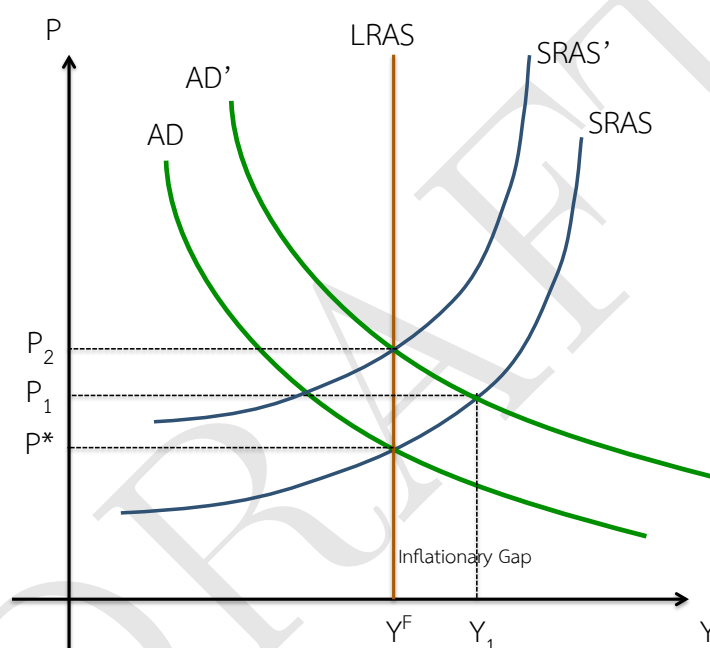


The disequilibrium of this aggregate market is caused by any shifts in both aggregate demand and aggregate supply. If it is in short run and the economy does not function at its full capacity, the shift of AD and AS will not cause any further changes. The shift of AD to the right will lead to excess demand and higher equilibrium price level and national

income, while that of AS to the left will contribute to excess demand in aggregate market but the result will be higher price level and lower national income.

In the situation where the economy is at full employment, both short-run aggregate demand and aggregate supply intersect at the equilibrium without any excess demand and supply. Changes in AD and AS will be corrected by market mechanism and eventually we can derive vertical long-run AS as shown in figure 4-8, which we assume that price of factors of productions are completely flexible both upwards and downwards.

Figure 4-8: Disequilibrium in Aggregate Market



To illustrate what happens in the long run, suppose that the economy is already operating at full employment (Y^F) and external force makes aggregate demand shift to the right from AD to AD'. There will be excess demand for goods and services in the aggregate economy which means the economy wants to produce more than full employment and once firms react by producing more, they need to exploit labors so Y_1 and P_1 are reached. This will not last long as the economy operates more than full employment, so called *inflationary gap*. Labors will demand higher wage since they work harder. Firms will face higher cost of factors of production and that will drive up unit cost which in turn affects AS curve to shift upwards from SRAS to SRAS' and eventually back to full employment equilibrium with higher price level (P_2) but same national income.

On the other hand, if there is a fall in aggregate demand, shifting downwards. There will be excess supply of goods and services and then as a consequence the economy will produce less than full employment, so called *deflationary gap*. In this circumstance, factors of production will be left unemployed so those are then willing to be hired even with

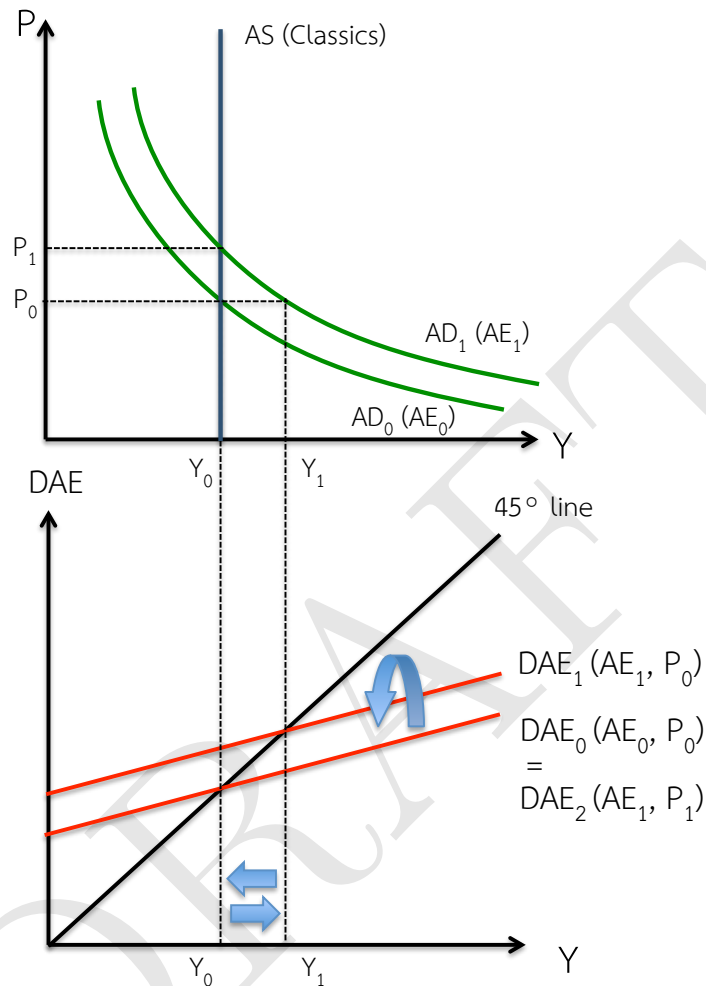
lower returns. As a result, unit cost decreases and AS shifts downwards enough to close the deflationary gap and the economy is then back to full employment with lower price level.

These are the adjustment process in the long run where the economy is at full employment. Market mechanism takes place and adjusts the economy by itself, given price flexibility. Policy implication from this analysis is that there should be no government intervention as the change in aggregate expenditure will not affect the national income in the long run and it will also worsen macroeconomic objective about price stability as price level in the long-run will be higher and higher.

If, however, there is price rigidity or price flexibility not being held, price of factors of production is not freely moving either upwards or downwards and that will not make AS shift to clear the aggregate market. Therefore, invisible hand could not work and result in full-employment equilibrium.

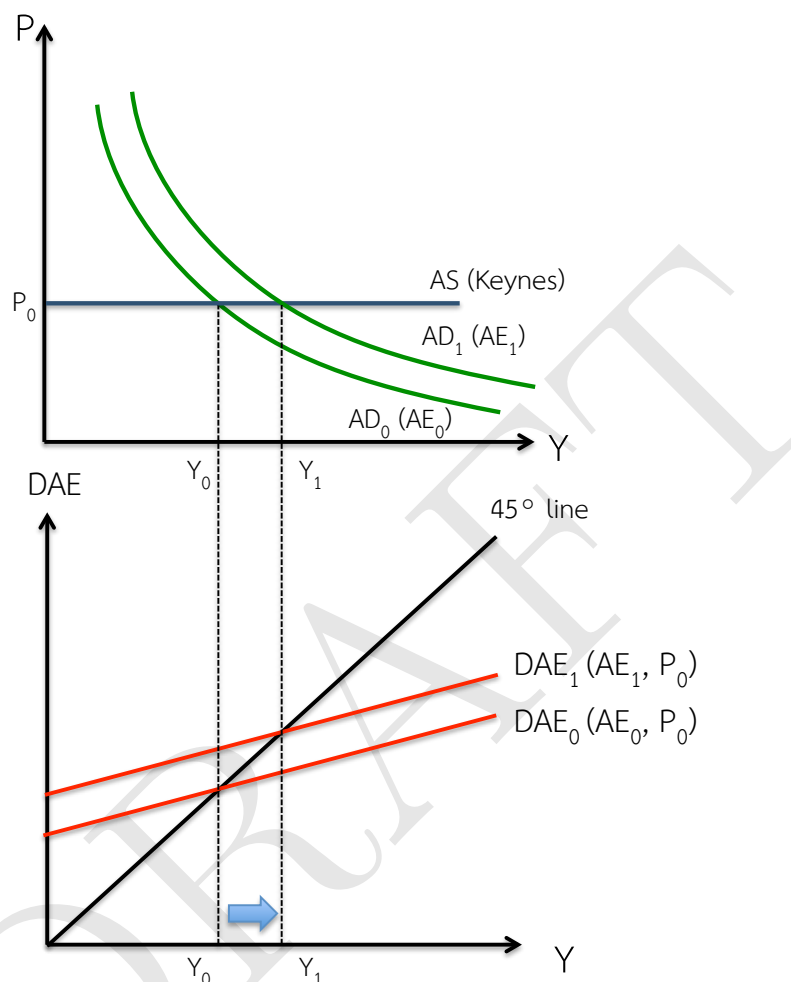
Considering multipliers in different schools of AS, if there is a rise in aggregate expenditure from DAE_0 to DAE_1 , Y_0 is raised to Y_1 , shifting aggregate demand to the right from AD_0 to AD_1 . Since aggregate supply is vertical, the change in aggregate demand leads to only higher price level from P_0 to P_1 . The increase in price level makes consumption and net export fall and eventually that change makes DAE shift back from DAE_1 to DAE_2 . Consequently, there is no change in national income at all after all adjustment as multiplier effect is nullified by the change in price level. Figure 4-9 points out the effect after the change in aggregate demand and vertical aggregate supply.

Figure 4-9: Multiplier in case of Classical Aggregate Supply



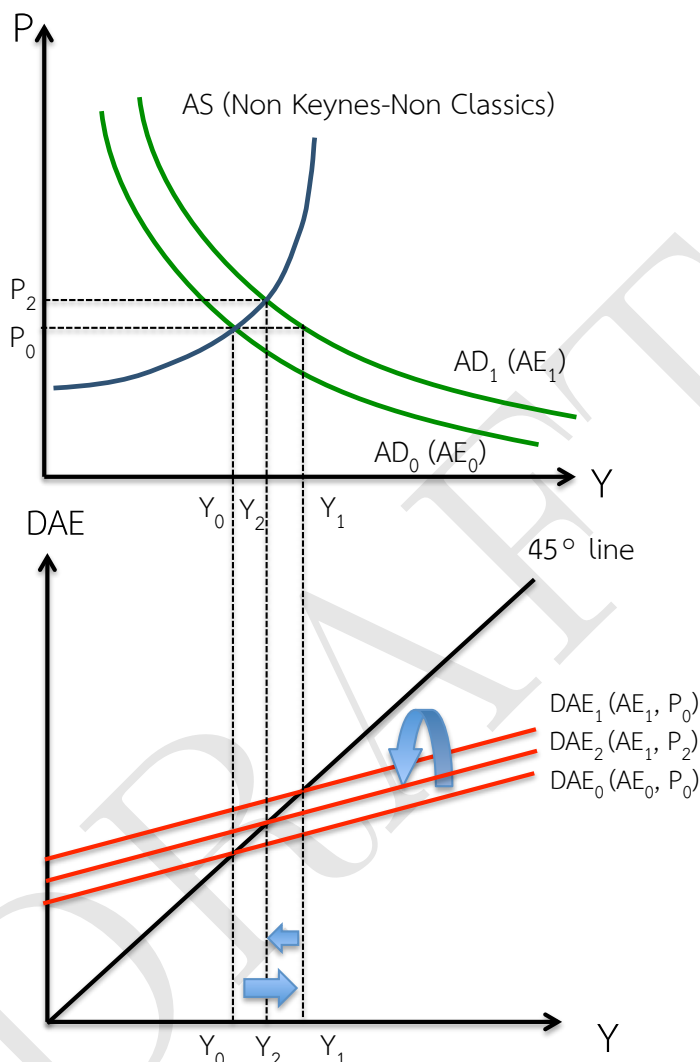
In Keynesian aggregate supply (figure 4-10), a rise in aggregate expenditure shifts DAE from DAE_0 to DAE_1 and also AD from AD_0 to AD_1 . Because the economy is assumed to have horizontal aggregate supply, equilibrium price level is going to stand still. There will be no shift back of DAE due to the change in price level. Thereby, multiplier works at its full capacity.

Figure 4-10: Multiplier in case of Keynesian Aggregate Supply



For non-Keynes (non-Classics) aggregate supply, the escalation in aggregate expenditure makes DAE shift from DAE_0 to DAE_1 and also AD from AD_0 to AD_1 . In aggregate economy, there will be excess demand for goods and services, then driving up price level from P_0 to P_2 (figure 4-11). Since price level is higher, there will be price effect towards consumption and net export. Then DAE will shift back from DAE_1 to DAE_2 and reach new equilibrium national income from Y_0 to Y_2 . Therefore, multiplier in this case works partially, compared to the case of Classical aggregate supply.

Figure 4-11: Multiplier in case of Non-Keynes (Non-Classics) Aggregate Supply



In conclusion, the change in price level will make DAE change and the price effect will offset the initial change of DAE. Depending on the shape of AS, multiplier effect will take place completely in Keynesian-aggregate-supply case, partially in non-Keynes (non-Classics) case and incompletely in classical-aggregate-supply case.

4.5 The equilibrium price level and inflation

Price level is essential for the economy since it is one of the macroeconomic objective that policymaker want to achieve. AD-AS framework helps us analyze the effect of the change in price level of the entire economy. In the previous section, we discuss the change in the equilibrium but now we simply talk about inflation, the situation which there is a

rise in price level of one particular economy.

Figure 4-12 indicates higher price level is from the shock in aggregate demand. A rise in demand creates inflationary pressure towards aggregate economy and eventually results in soaring price level. This situation is called *demand-pull inflation*.

Figure 4-12: Demand-Pull Inflation

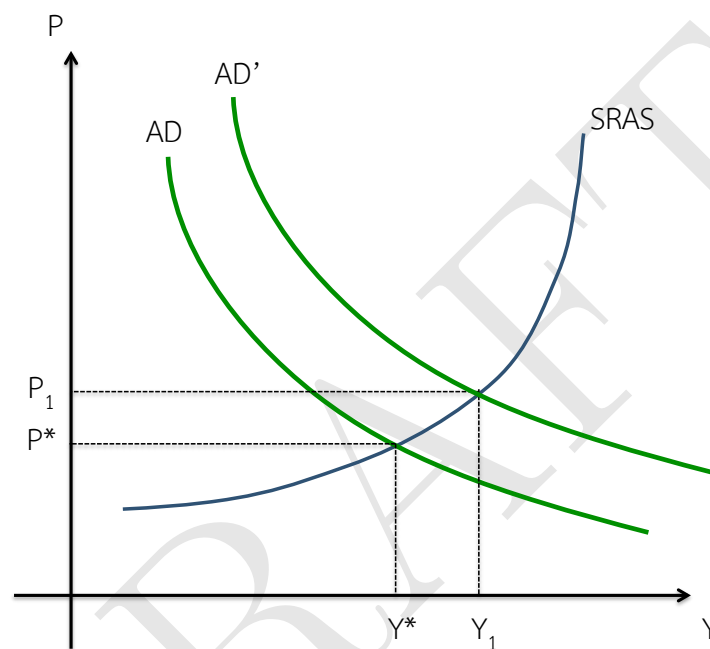
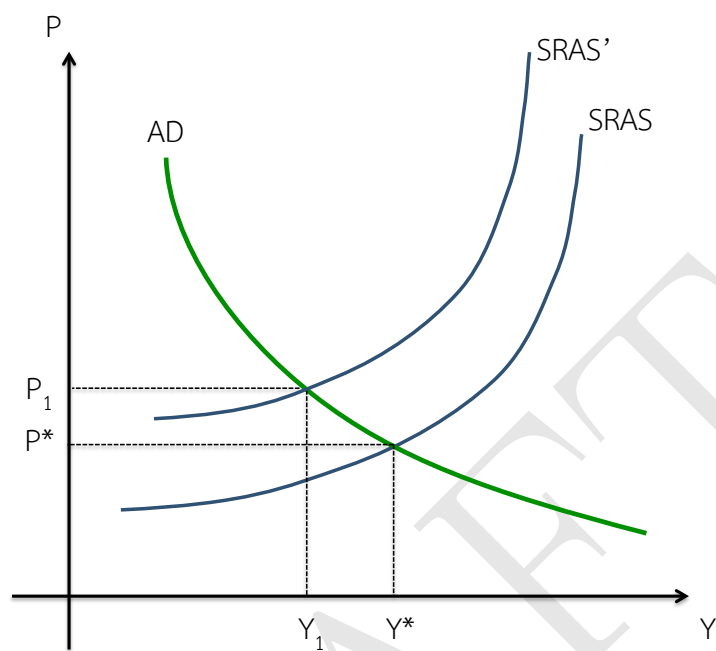


Figure 4-13 demonstrates different scenario. If there is the shock from producers' side. Firms perhaps find it is hard to produce goods and services given the same cost structure. The elevated price of raw materials is channeled to overall price level of the economy. The ascending price level in this situation comes from aggregate supply shocks and therefore it is called *cost-push inflation*.

Figure 4-13: Cost-Push Inflation



Chapter 5

Fiscal Policy at Work

5.1 Meaning, objectives and tools of fiscal policy

In economics, government is there to solve market failure. Monopoly power distorts surplus while externalities fail market economy to deliver the best attainable outcomes. Asymmetric information dilute the potential of both consumers and producers to better their capacity, whereas public goods should be produced but no one would like to do so since the market is not there. These problems should be solved by public authorities.

Apart from that, the existence of government also promotes market economy. In the old days, people gather and hunt food. Sometimes, they also need to protect what they earn from their work. Certain form of government was created and provided protection of their properties, enhancing specialization since people have no need to worry about their safety anymore. Division of labor was then the consequence which eventually leads to bigger economy.

In this chapter, we will talk about the functioning of the government. Its objectives and tools for government to intervene the market. We will start with the resources government has in its hand which is tax power. People are willing to sacrifice certain amount of their money for the government so that government can use and spend them to provide public services and solve market failures.

Policymakers would like to assure that macroeconomic objectives such as growth, stability and equity are accomplished. Fiscal policy is then implemented by government authorities to attain such objectives. If the resources they get from tax and non-tax payments are not enough for their disbursement, creation of public debt is needed. Government will employ government budget deficit, that is, they tax less than spend. Nonetheless, if they spend less than tax, it is called government budget surplus. We will first discuss about the nature of tax and then move to the effects of fiscal policy in detail.

Tax is the main resource for government, collected directly from owners of factors of production and indirectly from other means. Direct tax includes personal income tax, corporate income tax and other kinds of tax being paid directly from income receivers, while indirect tax deals with tax being paid indirectly, certain burdens are able to be distributed to other parties; for example, value-added tax (VAT) is collected from transactions made by consumers and producers. Both groups might share tax burden, depending on price elasticity of that goods. In case of Thailand, 7 percent of VAT is taxed in any purchases of goods and services.

We can categorize tax with its structure into 3 types which are progressive, proportional, and regressive taxes. The first one is progressive tax is the system that government tax those having larger tax base with higher rate of tax.

Table 5-1 illustrates the situation which *progressive tax* is implemented. Tax base in this example might be income tax. The higher the income people obtain, the more tax needs to be paid. From the first basket of income (0-1,000), tax rate will be 10 percent and if people have 1,000 THB, that means they need to pay 100 THB. Calculate the average tax rate (ATR) to be 0.10. The next income basket is 1,001 to 2,000, taxed with 12-percent rate. Totally, tax is paid 220 (100 from the first basket plus 120 from the second basket). Now ATR will be 0.11 and with this we can count the marginal tax rate and it is 0.12. In this table, it indicates that in order to have progressive tax, average tax rate will be less than the marginal tax rate ($ATR < MTR$)

Table 5-1: Example of Progressive Tax Scheme

Tax Base	Tax Rate	Tax Paid	Average Tax Rate $= \frac{\text{Tax Paid}}{\text{Tax Base}}$	Marginal Tax Rate $= \frac{\Delta \text{Tax Paid}}{\Delta \text{Tax Base}}$
0 - 1,000	10	100	0.10	
1,001 - 2,000	12	220	0.11	0.12
2,001 - 3,000	15	370	0.12	0.15

Next tax scheme is *proportional one*. Tax rate will be equal for all income basket. Table 5-2 exemplifies that there is 10 percent of tax rate and as a result, average tax rate is at the same level as marginal tax rate ($ATR = MTR$).

Table 5-2: Example of Proportional Tax Scheme

Tax Base	Tax Rate	Tax Paid	Average Tax Rate $= \frac{\text{Tax Paid}}{\text{Tax Base}}$	Marginal Tax Rate $= \frac{\Delta \text{Tax Paid}}{\Delta \text{Tax Base}}$
0 - 1,000	10	100	0.10	
1,001 - 2,000	10	200	0.10	0.10
2,001 - 3,000	10	300	0.10	0.10

For the last tax structure, *regressive tax* is the scheme that government collect tax lower and lower once tax base becomes larger and larger. Table 5-3 points out that 15 percent of tax rate is for the first basket (0-1,000), 12 for the second (1,001-2,000) and 10 for the third one (2,001-3,000). When we find the average and marginal tax rate, regressive tax scheme makes average tax rate greater than marginal tax rate ($ATR > MTR$).

Table 5-3: Example of Regressive Tax Scheme

Tax Base	Tax Rate	Tax Paid	Average Tax Rate $= \frac{\text{Tax Paid}}{\text{Tax Base}}$	Marginal Tax Rate $= \frac{\Delta \text{Tax Paid}}{\Delta \text{Tax Base}}$
0 - 1,000	15	150	0.15	
1,001 - 2,000	12	270	0.13	0.12
2,001 - 3,000	10	370	0.12	0.10

If we add proportional tax into the income-expenditure approach discussed in chapter 3, we can see the effect of tax from table 5-4 that the change in income tax leads to the change in marginal propensity to consume out of national income ($\frac{\Delta C}{\Delta Y}$) but not for marginal propensity to consume out of disposable income ($\frac{\Delta C}{\Delta Y_d}$). Higher tax rate leads to higher tax collected and that reduce the amount of money people can consume (disposable income). As disposable income (Y_d) varies and channels its change towards consumption (C), the ratio of this marginal propensity to consume out of disposable income does not change.

Table 5-4: Effects of Tax on Marginal Propensity to Consume

income tax (t)	ΔY	ΔT	ΔY_d	ΔC	$\frac{\Delta C}{\Delta Y}$	$\frac{\Delta C}{\Delta Y_d}$
0.2	1,000	200	800	640	0.64	0.8
0.4	1,000	400	600	480	0.48	0.8

5.2 Effects of fiscal policy on equilibrium national income

Government can impose fiscal policy by various means since they have fiscal power to tax and spend. In this section, we will distinguish fiscal policies into 2 main classification, categorized by its function and objectives.

By its function, there are non-discretionary and discretionary fiscal policies. How this policies work is the way we classify them. For **non-discretionary fiscal policy**, it is automatically working without further intervention. If it is once employed, it will be there and operate. Non-discretionary fiscal policy or **automatic stabilizer** or **built-in stabilizer** is the stance that government imposes such built-in feature of fiscal policy. Given closed economy, the equilibrium of national income is solved below;

$$C = C_0 + cY_d$$

$$I = I_0 + iY$$

$$G = G_0$$

$$T = T_0 + tY$$

$$Y_d = Y - T$$

$$\text{At the equilibrium: } Y = DAE$$

$$\text{and in this case, } DAE = C + I + G$$

$$\therefore Y = C_0 + cY_d + I_0 + iY + G_0$$

$$Y = C_0 + c(Y - T_0 - tY) + I_0 + iY + G_0$$

$$Y = C_0 + cY - cT_0 - ctY + I_0 + iY + G_0$$

$$(1 - c - i + ct)Y = C_0 - cT_0 + I_0 + G_0$$

$$Y^* = \frac{1}{1-c-i+ct}(C_0 - cT_0 + I_0 + G_0)$$

$$\frac{\Delta Y}{\Delta AEt} = \frac{1}{1-c-i+ct}$$

Compared with no income tax system, multiplier will be as following;

$$C = C_0 + cY_d$$

$$I = I_0 + iY$$

$$G = G_0$$

$$T = T_0$$

$$Y_d = Y - T$$

$$\text{At the equilibrium: } Y = DAE$$

$$\text{and in this case, } DAE = C + I + G$$

$$\therefore Y = C_0 + cY_d + I_0 + iY + G_0$$

$$Y = C_0 + c(Y - T_0) + I_0 + iY + G_0$$

$$Y = C_0 + cY - cT_0 + I_0 + iY + G_0$$

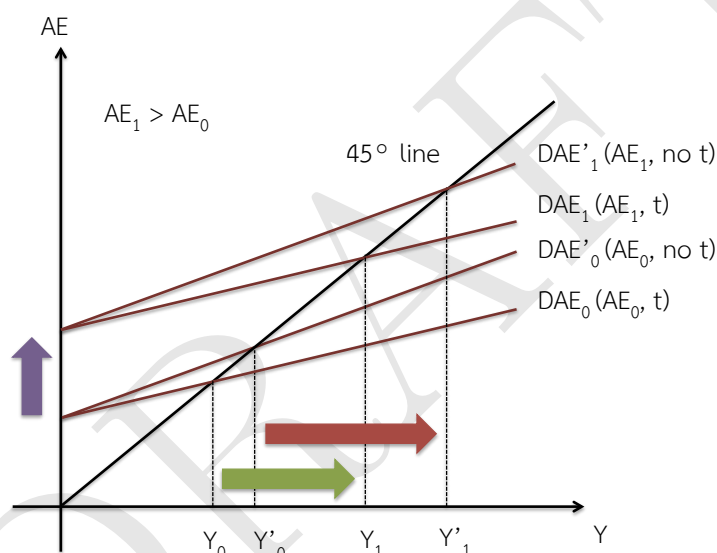
$$(1 - c - i)Y = C_0 - cT_0 + I_0 + G_0$$

$$Y^* = \frac{1}{1-c-i}(C_0 - cT_0 + I_0 + G_0)$$

$$\frac{\Delta Y}{\Delta AE} = \frac{1}{1-c-i}$$

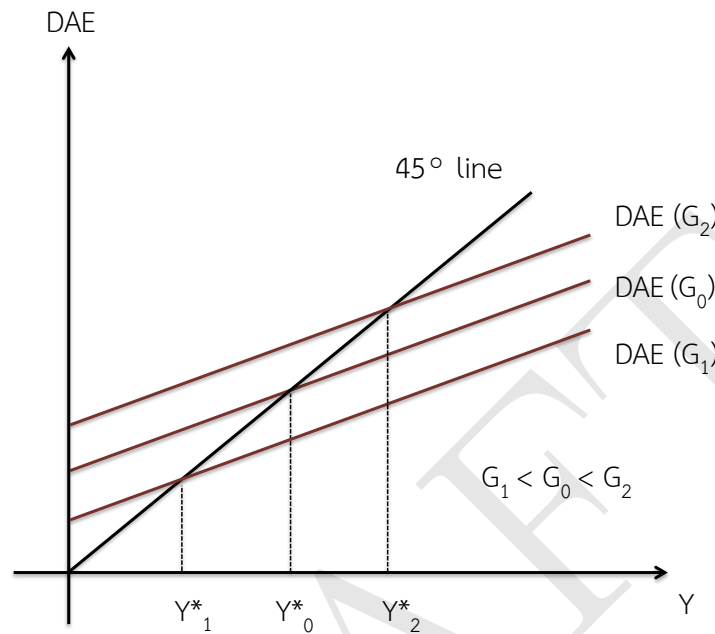
Multiplier in closed economy with income tax is less than that in closed economy without income tax. The shock from the change in autonomous expenditure would then affect equilibrium national income of the latter greater than that of the former case. Automatic stabilizer then means it helps reduce the fluctuation of the economy. It will not grow as much as expected since income tax slows down the economy but it will also not contract as much as predicted since income tax will adjust by collecting tax less in accordance with the economic situation. Being imposed income tax, figure 5-1 reveals the effect of non-discretionary fiscal policy. Once there is a shock to autonomous expenditure, the magnitude of change in equilibrium national income in without-income-tax system will be larger.

Figure 5-1: Effects of Non-Discretionary Fiscal Policy



For **discretionary fiscal policy**, government can plan to change the amount of government spending or tax collected as pleases. If government decides to increase government expenditure, figure 5-2 shows its effect. A rise in government spending contributes to higher level of national income while a fall in government expenditure leads to lower level of national income. As government changes their desired aggregate expenditure, firms' inventories will be affected and they need to adjust their production plan; eventually, new equilibrium national income is attained.

Figure 5-2: Effects of Discretionary Fiscal Policy by Increasing or Decreasing Government Expenditure



In addition, government has tax power. They can consider to tax more or less. For simplicity, government in this system will employ lump-sum and proportional income taxes. Figure 5-3 and 5-4 indicate the change in tax scheme. If government raises lump-sum tax, shifting DAE downwards, more tax will be collected and as the leakage of the economy, national income will fall consequently, vice versa for lump-sum-tax reduction. They can additionally change income tax and since this tax is built into the multiplier which affects the slope of DAE equation, leading to the rotation of DAE either clockwise or counter-clockwise.

Figure 5-3: Effects of Discretionary Fiscal Policy by Increasing or Decreasing Lump-Sum Tax

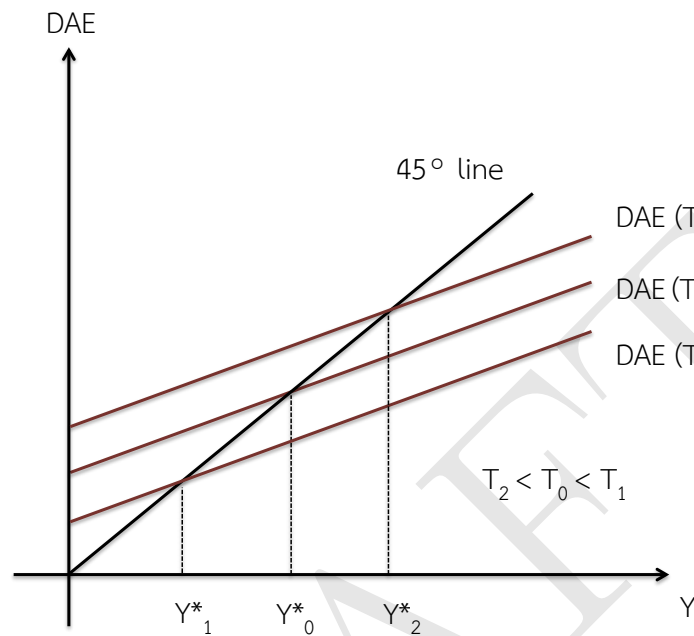
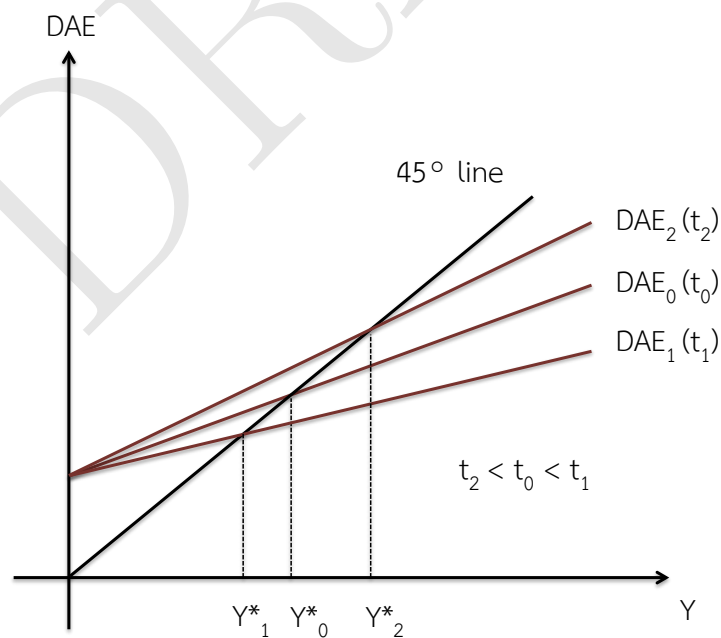


Figure 5-4: Effects of Discretionary Fiscal Policy by Increasing or Decreasing Income Tax



In case of balanced-budget campaign, government can increase government spending as the same amount as they increase tax. We see in chapter 3 that the effect towards

equilibrium national income will be the same magnitude that government spends, given closed economy with no income tax and induced investment. We show mathematical equation here as following;

$$\begin{aligned}
 C &= C_0 + cY_d \\
 I &= I_0 \\
 G &= G_0 \\
 T &= T_0 \\
 Y_d &= Y - T \\
 \text{At the equilibrium: } Y &= DAE \\
 \text{and in this case, } DAE &= C + I + G \\
 \therefore Y &= C_0 + cY_d + I_0 + G_0 \\
 Y &= C_0 + c(Y - T_0) + I_0 + G_0 \\
 Y &= C_0 + cY - cT_0 + I_0 + G_0 \\
 (1 - c)Y &= C_0 - cT_0 + I_0 + G_0 \\
 Y^* &= \frac{1}{1-c}(C_0 - cT_0 + I_0 + G_0) \\
 \frac{\Delta Y}{\Delta G} &= \frac{1}{1-c} \\
 \frac{\Delta Y}{\Delta T} &= \frac{-c}{1-c} \\
 \frac{\Delta Y}{\Delta G} + \frac{\Delta Y}{\Delta T} &= 1
 \end{aligned}$$

Closed economy without income tax and induced investment yields balanced budget multiplier. This will not be the case when any assumptions are violated. If there is induced investment, the summation of tax and government-spending multipliers is not equal to 1. In open economy, import will be introduced and that will make balanced-budget multipliers not 1 and so on.

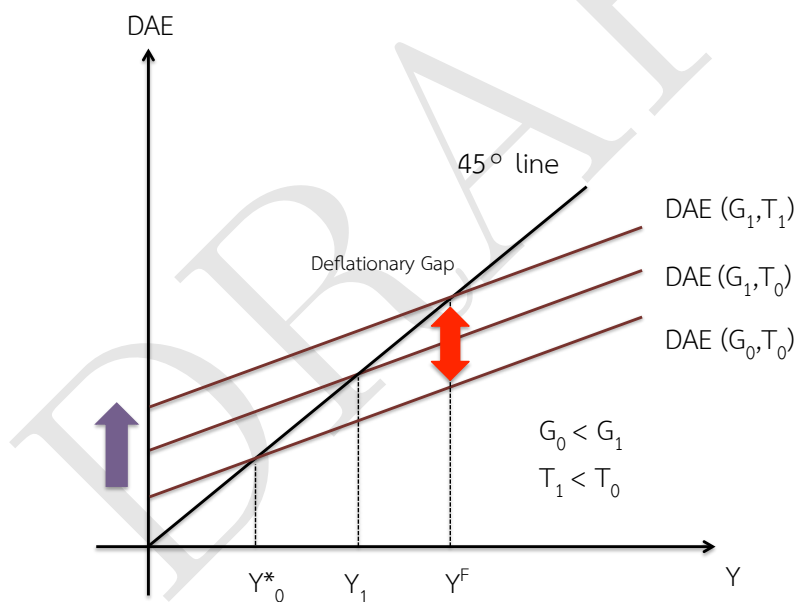
Moreover, fiscal policies are classified to be **expansionary and contractionary** by its objectives. Expansionary fiscal policy is implemented when government wants to stimulate the economy while contractionary fiscal policy is employed once the economy needs to be slowed down. Government will launch these policies to solve macroeconomic problems, which we will talk in the next section.

5.3 Fiscal policy in solving macroeconomic problems

Suppose that the economy does not operate at full employment. Either inflationary or deflationary gaps are there and leave certain rooms for government to intervene. Changes in government spending, lump-sum tax or income tax are tools for government to solve these macroeconomic problems

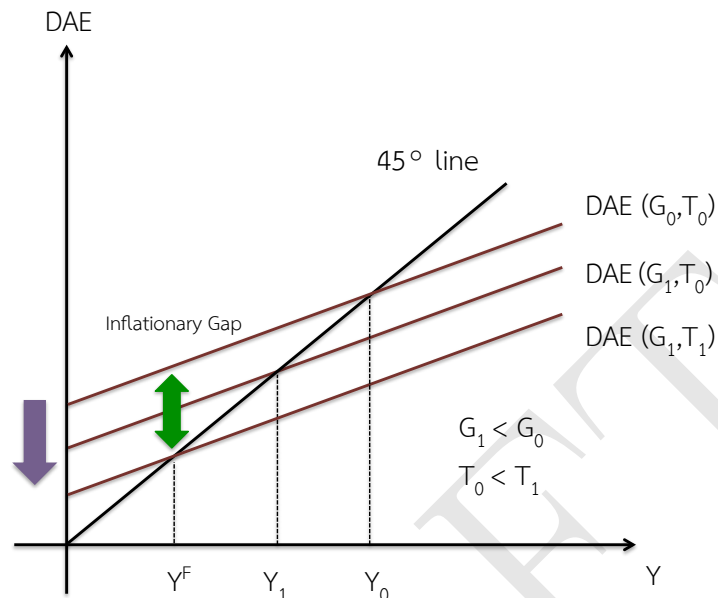
Once the equilibrium national income is less than full-employment level, firms cannot utilize resources efficiently, the economy is then in deflationary gap. Economic growth is the objective in this scenario. To solve this phenomena, government has set of expansionary fiscal policies to stimulate the economy. Figure 5-5 illustrates the situation which government raise their disbursement and reduce lump sum tax, equilibrium national income rises from Y_0^* to Y^F . Furthermore, income tax is another alternative government can select but its effect will be the rotation of DAE.

Figure 5-5: Expansionary Fiscal Policy to Solve Deflationary Gap



Imagine instead that the economy is now at more than full employment, producing at Y_0 (figure 5-6). In this case, there is inflationary gap which means that factors of production are exploited to work more than their normal rate of utilization. Economic stability is then violated. To achieve this goal, government can contract the economy by employing contractionary fiscal policies by decreasing government spending as well as increasing either autonomous or income taxes. With such policy implementation, the economy will be decelerated and back to their full-employment equilibrium at Y^F .

Figure 5-6: Contractionary Fiscal Policy to Solve Inflationary Gap



Fiscal policies seem to be able to solve macroeconomic problems; nonetheless, in order to impose it, government needs certain time to prepare. There is fiscal lag in the process since policymakers need to diagnose the economic environment and plan ahead what to do. After the map is drafted, it needs to be approved by the cabinet and sometimes by the parliament before being carried out. All of these steps take times and it might be too late for the economy to wait for policy taking place.

Last but not least, government can perform their role to achieve economic equity. Raising government spending by more provision of public services facilitating some economic function help those low income people. Progressive tax that collects more money from the rich than the poor steers the economic equity. Other forms of taxes such as property tax, inheritance tax might also absorb wealth from high-income people. Government could distribute those resources for the alleviation of economic inequality.

Chapter 6

Money Market and Monetary Policy

6.1 Introduction

The role of fiscal policy is discussed in the last chapter. Government has certain power to expand or contract the economy by their policies in the real sectors. In this chapter, we will discuss about the existence of financial markets. Recall from circular flow, there is financial institution in the middle between firms and households. These markets assist all agents in the economy to interact and better the economic prosperity.

Those in surplus can save their money in financial institutions and such institutions will lend to those in deficit. In this sense, resources will be exploited efficiently. This is how financial markets work, channelling the leakage out of the economy to injection back into the circular flow. The link between real and financial markets will be discussed in this chapter.

6.1.1 Financial markets

Financial markets compose of *capital market* and *money market*. Money market is where short-term investment is made, being the indirect channel from those in surplus to those in deficit via financial intermediaries, while capital market is for long-term investment. Both direct and indirect borrowing are there in this market. Those in deficit ask directly from those in surplus by selling bonds and other type of financial assets or indirectly via certain financial institutions.

Capital market can be classified as primary and secondary markets. *Primary market* is the place where firms in deficit directly issue financial assets for more capital from those in surplus, such as newly issued stocks, whereas *secondary market* is where people trade financial assets one another but not from firms such as already issued stocks in Stock Exchange of Thailand (SET). The purchase of financial assets in this secondary market does not create any economic value. Compared this assets with lands, people buy land and leave it without any production, wait for certain periods of times and sell it

with higher price. This is just the transfer of ownership, no value added in the land in transaction.

In this chapter, we will focus on money market. Money is anything that is accepted as a medium of exchange and market is the situation composing of buyers, sellers and one particular goods or services. Money market is then the situation where buyers and sellers interact to have money in their pocket. Normally, goods and services will be quoted in nominal term or in THB but in this case for money market, price of money or the cost of holding money is the interest forgone. More of money market will be discussed later on in this chapter.

6.1.2 Functions and evolution of money

Money functions to facilitate and fuel the economic growth. Its first role is to be the medium of exchange and its value should be stable so that exchange of goods and services easily happens. Secondly, money is the unit of account. Quoted price in money term can be used to compare one particular goods and services to the other. Thirdly, money is the store of value. It is the source of people's wealth and such value will be kept as time passes by even though its value might be eaten up by inflation but its value is still there. As a result, money can be standard for deferred payment as people can use money to pay debt in the future.

In the old days before the introduction of money, barter trade was prevalent. This kind of trade needs coincidence of wants from both parties. If not, trades will not occur. For example, those who want rice offer a mat to those who have rice but want chicken. Coincidence of wants costed too much and that hindered market expansion. After money has been created, trade is easier taken place and that leads to bigger market size.

Commodity money was the initial invention of money but it did not last long since it was not durable. *Metallic money* did replace the previous version of money. Gold and silver were popular to be used as a medium of exchange, although it created *Gresham's law* indicating that "bad money would drive out good one." This statement claimed that gold has its intrinsic value, people tend to keep gold and use silver instead. If all did so, eventually all money circulated in the system would be left with only silver, only bad money being in the economy. Additionally, metallic money were too heavy to carry for transaction.

Due to those problems, *paper money* was then introduced. At first, it was *convertible*. Gold were often deposited with goldsmiths and a piece of paper would be issued to guarantee that it was backed up by gold. People then spent it for other transactions, so such paper is convertible with gold. Another step of evolution of money is that government came in and assured that pieces of paper can be used as a medium of exchange, so called *legal tender*. Medium of exchange, thus, turns to be *fiat money*, which derives its value from law and regulation of the state, perhaps not being intrinsic.

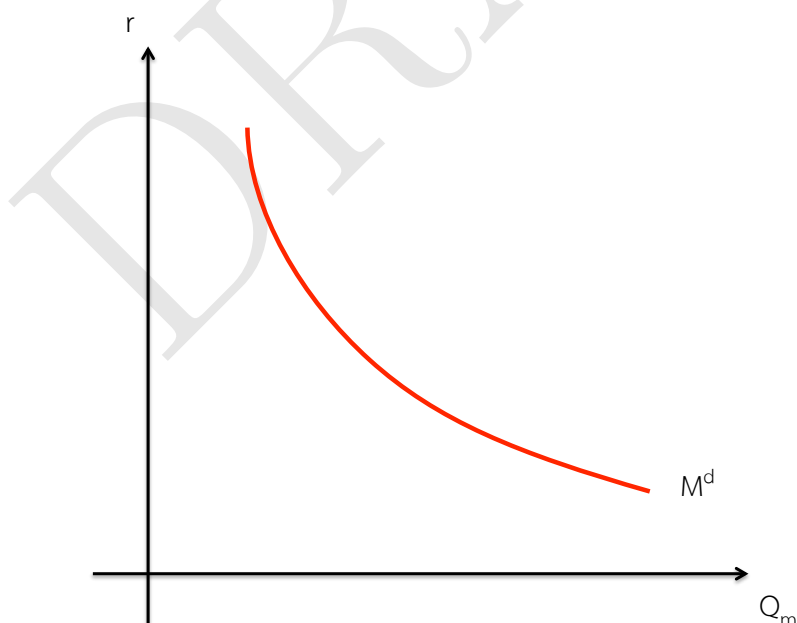
6.2 Demand for money

In order to find the equilibrium in money market, demand and supply of money will be examined, starting with the demand for money. In this principle course, we separate money demand into 3 types which are *transaction money demand* (M_t^d), *precautionary money demand* (M_p^d) and *speculative money demand* (M_s^d).

Transaction money demand is the amount of money people would like to hold for their daily purchase of goods and services. If people are richer, they tend to demand more of money for transaction since they are able to buy more of goods and services. Precautionary money demand is the amount of money people want to have with themselves to be ready for unexpected events such as emergency issues.

The last classification is money demand for speculation. For simplicity, suppose that there are only money and bonds in the economy. In order to hold more money, there is the cost since they need to sacrifice interest gain from having more bonds. Interest rate for bonds is then the price of holding money. According to law of demand, higher price of money causes less quantity demanded for money. People have tendency to buy more bonds once interest rate is high since they will get more of interest rate, meaning money is less demanded and vice versa. Combining all money demand, figure 6-1 points out that there is negative relationship between quantity of money demand and interest rate (r).

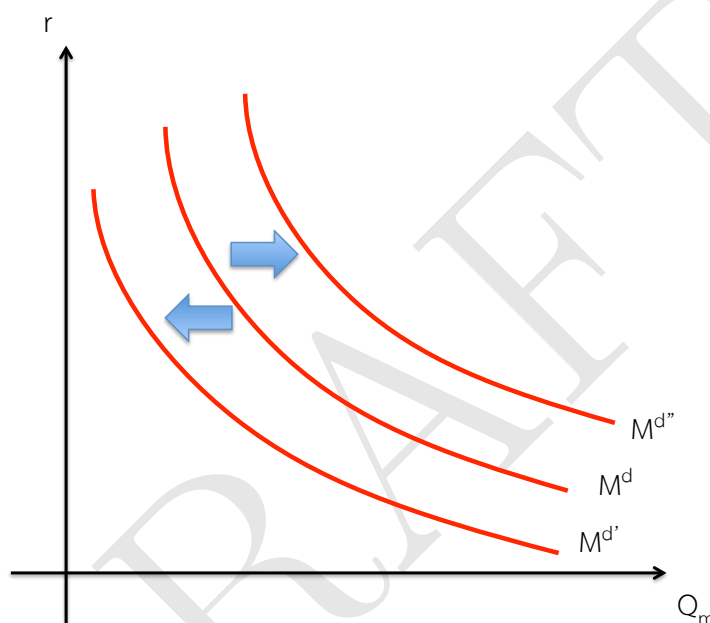
Figure 6-1: Money Demand



When interest rate rises, people demand more for bonds and less for money. Any factors that do not affect the interest rate will cause money demand curve to shift either rightwards or leftwards depending on its effect (figure 6-2). For example, if investors are

too pessimistic of holding bonds, they change their minds to have more money. A fall in confidence in bonds leads to more demand for money at each and every level of interest rate, shifting money demand to the right. Moreover, the dwindling of national income means that people wealth deteriorates and their desired to spend decreases. There is no need for people to hold much money to purchase goods and services, then less demand for money is the consequence. Quantity of money demanded will then decrease at each and every level of interest rate.

Figure 6-2: Shifts in Money Demand



6.3 Supply of money

Money supply is the amount of money circulated in the economy. It is the stock variable, that is, measured at the specific period of time. It is defined differently since many forms of money can be accepted as the medium of exchange. Three definition of money supply will be presented here.

1. Narrow definition of money supply performing as a medium of exchange.

$$M_1 = \text{currency} + \text{demand deposit}$$

2. Broader definition of money supply performing as a medium of exchange and store of value

$$M_2 = M_1 + \text{saving and time deposit}$$

3. Broadest definition of money supply

$$M_3 = M_2 + \text{savings in other financial institutions}$$

In this course, money supply in money market will be narrow definition of money supply or M_1 . This money supply will be controlled directly by the central bank, which in Thailand, Bank of Thailand is the bank for the country. Its role is to regulate and monitor financial sectors including commercial bank and other financial institutions. Central bank also has tools to expand or contract the economy but we will talk about this in section 6.5 on monetary policy.

Money supply is said to be affected by various sectors such as foreign, private and government sectors, according to Ungpakorn's Theory on money supply. Government spending and tax involves with the amount of money flowing in the economy. Balanced budget does not affect since the injection is equal to the leakage but not the case for government budget surplus and deficit. Government can also borrow from central bank by printing more money, total output remains the same but more money are flowing in the system, meaning that there will be the pressure for price to rise as the value of money declines.

Moreover, government can choose to borrow from domestic market by issuing bonds, creating public debt. If government spends the same amount of what is borrowed, money supply is constant as a result. Government could also borrow from the rest of the world and spend domestically, inflating the amount of money supply in short run.

For the rest of the world, once capital from overseas flows into the economy, the amount of money supply will be affected. If domestic investors invest their capitals in other countries, capital is flowing out of the system, deflating the money supply. International trade from export and import also involves with money circulated. Private sector is another agent playing in this game. Commercial banks have ability to create money many times out of the initial demand deposit.

Suppose that bank number 1 gets the deposit 1,000 THB from customers. To assure that the liquidity of financial institutions does not cause any troubles, central bank sets minimum legal reserve requirement. Commercial banks need to reserve certain amount of money to guarantee that there is enough money if customers withdraw their deposits, assumed that banks are required to keep 10 percent of deposit within its reserve. The rest can be lent, and in this example we assume further that the amount of money lent by bank number 1 is deposited in bank number 2. The same process follows and, in the end, commercial banks can create money out of the air from 1,000 THB to be 10,000 THB totally, just from the process of their diary businesses. Table 6-1 shows the example of how money is created by commercial banks. Assumptions are held that excess cash is all loaned and one must deposits his or her money totally. If these are relaxed, the amount of money created will not be as illustrated.

Table 6-1: Example of Money Creation

Bank	Deposit	Legal Reserve	Excess Cash Reserve/Loan
1	1,000	100	900
2	900	90	810
3	810	81	729
$\vdots$	$\vdots$	$\vdots$	$\vdots$
Total	10,000	1,000	9,000

This money creation, furthermore, is shown in mathematical equation below. To elaborate the equation, demand deposit created at the first time is equal to the initial cash multiplied with the amount bank can lend ($P(1 - rr)$), that is for the first round of loan. The second round can create money up to the first loan giving by bank number 1 multiplied by the ratio that banks can loan ($P(1 - rr)^2$). We continue this process until no money left and in sum demand deposit will be equal to $(\frac{P(1-rr)}{rr})$, thank to geometric-series formula. To examine total money supply in the system, we can multiply initial demand deposit with money multiplier ($\frac{1}{rr}$) and we get 10,000 THB.

Given,

p = initial cash deposit

rr = minimum legal reserve requirement

A = excess cash reserve

D = demand deposit created by banking system

$$D = P(1 - rr) + P(1 - rr)^2 + P(1 - rr)^3 + \dots$$

$$D = \frac{P(1-rr)}{rr}$$

$$\text{Money Multiplier} = \frac{1}{rr}$$

Note that if authorities intervene at the very step of money creation. Customers are prohibited to deposit his money totally at 1,000 THB. Instead 800 THB is allowed. Money created will be only 8,000 THB. By doing so, money is destroyed by 2,000 THB. *Money destruction* is the opposite of money creation.

Overall, money supply in the economy is controlled by central bank and again we will emphasize on narrow definition of money supply or M_1 in this chapter. The price of money or the interest rate does not affect the amount of money that central bank decides to let it flow. Figure 6-3 shows vertical money supply as a consequence. X-axis demonstrates the quantity of money in the economy, while Y-axis is the cost of money, which is the interest rate that plays crucial role in this money market.

Figure 6-3: Money Supply



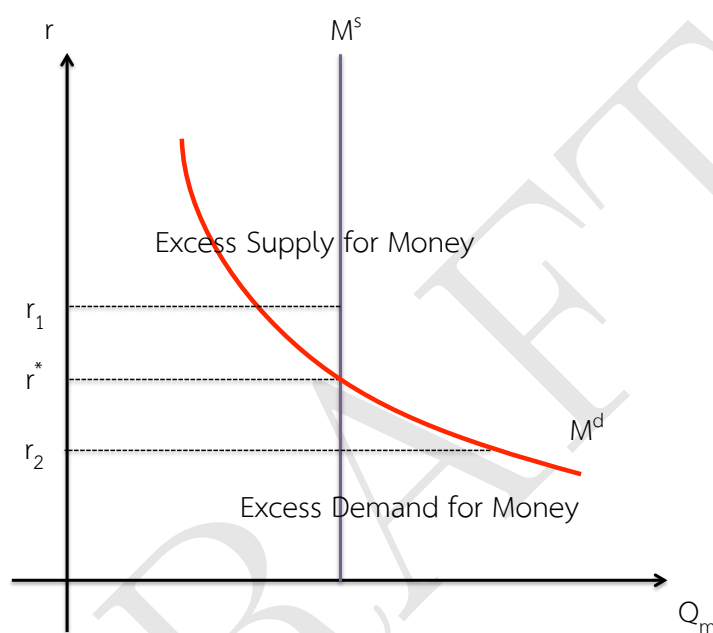
6.4 Equilibrium in money market

Putting both money supply and demand together, equilibrium in money market is realized. Figure 6-4 demonstrates the equilibrium interest rate at r^* . At this level of interest rate, money demand will be met with money supply without any tendencies to change. Again, for simplicity, there are only two types of financial assets; namely, money and bonds.

Higher rate of interest fabricates excess supply for money and at r_1 people will demand less money. Due to too much money in the system, people will eradicate their money by purchasing bonds, bidding price of bond higher and higher. With that in mind, interest rate goes down and eventually reaches at the equilibrium interest rate (see the relationship between price of bond and interest rate in box 6-1 and 6-2).

Suppose instead that interest rate is at r_2 . Right now, rate of return from bond is too low. Cost of holding money is not high so demand for money is greater than money supply, which creates excess demand for money. In order to have more money, they need to sell bonds. Supply of bonds will rise and make price of bond fall. As a result, interest rate will increase and reach back at the equilibrium interest rate.

Figure 6-4: Equilibrium in Money Market

**Box 6-1:** Definition of Bond

Bond is financial asset that promises to give predetermined return at its maturity. Normally, the return from bonds will be the coupon paid every specific period of times i.e. every month.

Zero-coupon bond is the type of bond that does not give any coupons or payment. Bond holders will get only the difference of price purchased and face value at its maturity.

Bond maturity is the time that bond holder gets principal plus certain interest back.

Face value is redemption value or the value of bond paid at its maturity.

Box 6-2: Relationship between price of bonds and interest rate.

Price of bond is corresponded with the interest rate. Imagine that price of zero-coupon bond is equal to 100 THB today and its face value paid at its maturity in a year is 110 THB. The return from this bond is calculated to be 10 percent.

Suppose that price of bond immediately declines to 95 THB. The nature of this zero-coupon bond is that its face value will still be at 110 THB if bond holders hold it until its promising date. The return of this bond, calculated from the difference between 95 and 110, is then 15.8 percent, rising from 10 percent as a result from a fall in price of bond.

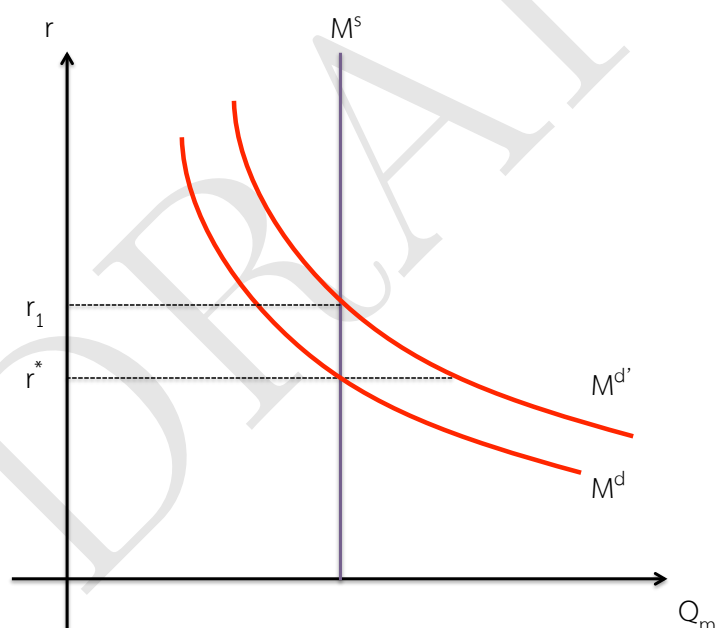
If price of bond instead increases to 105 THB from whatsoever reasons, its face value is still at 110 THB. This bond promises to be valued at 110 THB at the time of maturity. Therefore, the return is 4.8 percent. A rise in price of bond contributes to a fall in interest rate.

In conclusion, there is inverse relationship between price of bond and interest rate. If price of bond goes up (down), interest rate will fall (rise) as a consequence.

This money-market equilibrium will sustain except there is external force disturbs the system. For example, investors lose confidence in bonds, making demand for money shift to the right. Excess demand for money takes place and then people will sell more bonds just to hold more money. Price of bond declines and interest will rise, as a result, to r_1 . Figure 6-5 clarifies the adjustment process towards new equilibrium. The change in money supply will also distract the equilibrium but money supply is controlled by central bank. Any changes in money supply by central banks' intervention will be considered as monetary policy, which will be discussed in the next section.

Apart from monetary policy, the change in price level could inflate or deflate the amount of real money supply in the system. At first, real and nominal money supplies are the same, given fixed price but if price level goes up, the purchasing power of money will reduce as a result, real money supply will fall and will also disturb the equilibrium money market.

Figure 6-5: Change in Money-Market Equilibrium



6.5 Monetary policy

Central bank in any countries has played certain roles in the economy. Bank of Thailand, according to the Bank of Thailand (BOT) Act B.E.2485 as amended by B.E.2551, functions by regulating financial institutions and imposing monetary policies. Quantitative control over money supply is one of the main task central bank assigned in order to pursue macroeconomic objectives through money-market channel.

Central bank has 3 measures to employ monetary policies, for simplicity since central bank has more tools to affect money supply in practice. These approaches are as following;

1. Minimum legal reserve requirement:

Central bank can set certain level of reserve requirement that liquidity of financial institutions is protected. If this ratio, the minimum amount of demand deposit commercial banks need to keep, is cut, commercial banks have more rooms to loan. Money multiplier will be affected and the amount of money created will be larger, raising the amount of money supply circulated in the economy.

2. Discount rate or bank rate:

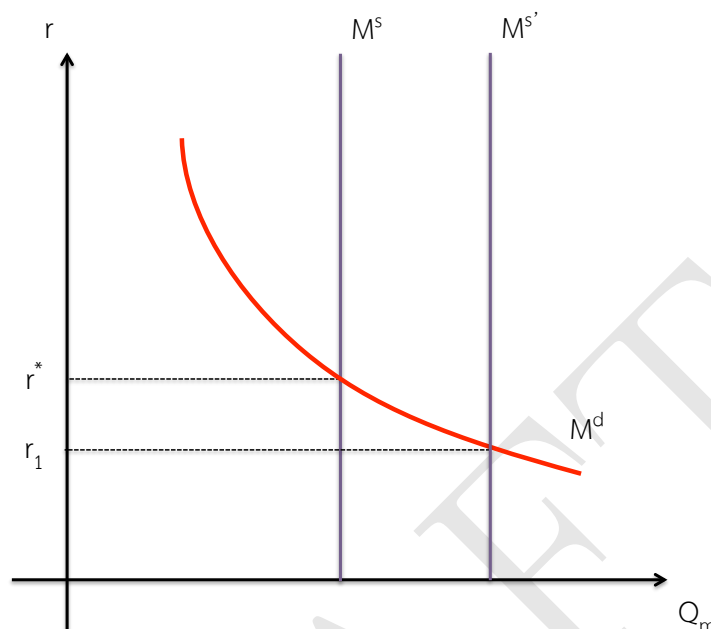
This discount rate or bank rate is the interest rate charged by central bank, as a lender of last resort, once other banks ask for loans. To raise money supply, central bank can reduce this bank rate so that cost of borrowing is lower and commercial banks will have more incentives to borrow.

3. Open-market operation:

Central bank can intervene bond market. Either buying or selling bonds is the measure for central bank to control money supply. Purchasing bonds from bond holders will result in more money in exchange of bonds flowing into hands of people, inflating money supply. On the other hand, selling bonds will absorb money back into central bank, deflating money supply circulated in the economy.

Figure 6-6 explains the result from monetary policy. Once central bank increases money supply either from bank rate reduction, minimum legal reserve requirement diminution, or buying bonds via open-market operation, there will be excess supply of money in money market. People will then get rid of money by buying bonds, resulting in higher price of bonds and lower equilibrium interest rate.

Figure 6-6: Monetary Policy



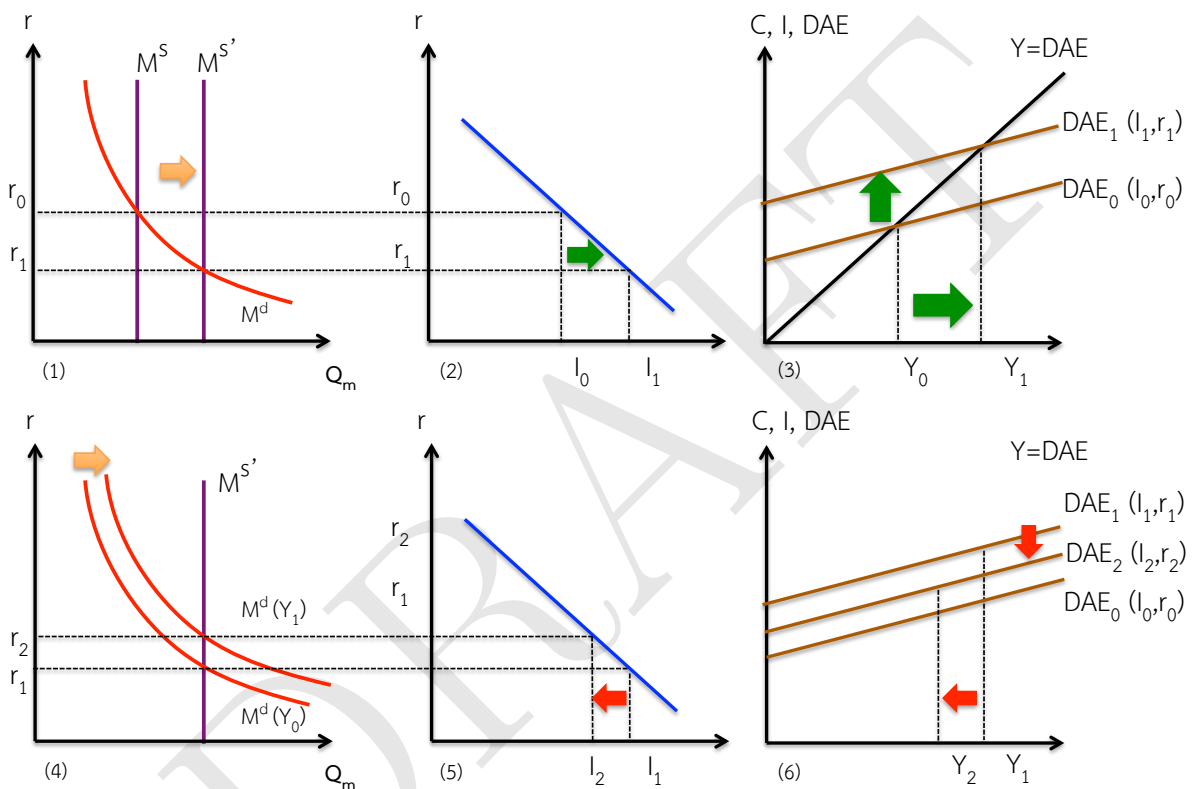
This change in interest rate has implication back to commodity market. Desired investment expenditure, one of DAE components, is decided on the cost of borrowing. If such rate of interest is lower, investors are likely to borrow more for investment, raising DAE and the equilibrium national income. The economy is then expanded. *Expansionary monetary policy* works that way; it increases money supply and then rate of interest will be reduced which in effect raises national income.

Contractionary monetary policy will function and result in the opposite. Central bank can reduce money supply and that creates excess demand for money. People will sell bonds to hold more money and then price of bond will decline, accompanied by the rise of interest rate. Higher cost of borrowing leads to less incentive for investor to invest, diminishing DAE and equilibrium national income. This effect from money market through commodity market is called **transmission mechanism**.

The change in money market affects equilibrium in commodity market. Figure 6-7 shows the effect of monetary policy in detail. After expansionary monetary policy is employed and results in higher level of national income. A rise of national income will make people demand more for money (figure 6-7 (4)), fabricating excess demand for money in money market, and raising interest rate. Investment will then decline (figure 6-7 (5)) and that will make commodity market adjust towards new equilibrium. As less desired aggregate expenditure leaves more of inventories, firms will change their production by producing less. The fall in national income is attained (figure 6-7 (6)). The previous rise of equilibrium national income from expansionary monetary policy will be partially offset.

In order to employ monetary policy, central bank can announce their policy action and intervene the amount of money supply immediately after that. The effect towards interest rate will be sudden and if investors react promptly. Monetary policy will take less time for the final effect, compared to fiscal policy that needs certain periods of times to be implemented, due to fiscal lag.

Figure 6-7: Effects of Monetary Policy Forth and Back



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Chapter 7

Policy Effectiveness

7.1 Monetary policy and its effectiveness in solving macroeconomic problem

Monetary policy will be effective if its effect towards equilibrium national income is as large as expected. Due to the rise of national income that raises interest rate and results in a fall in equilibrium national income, expansionary monetary policy might not be effective as previously predicted.

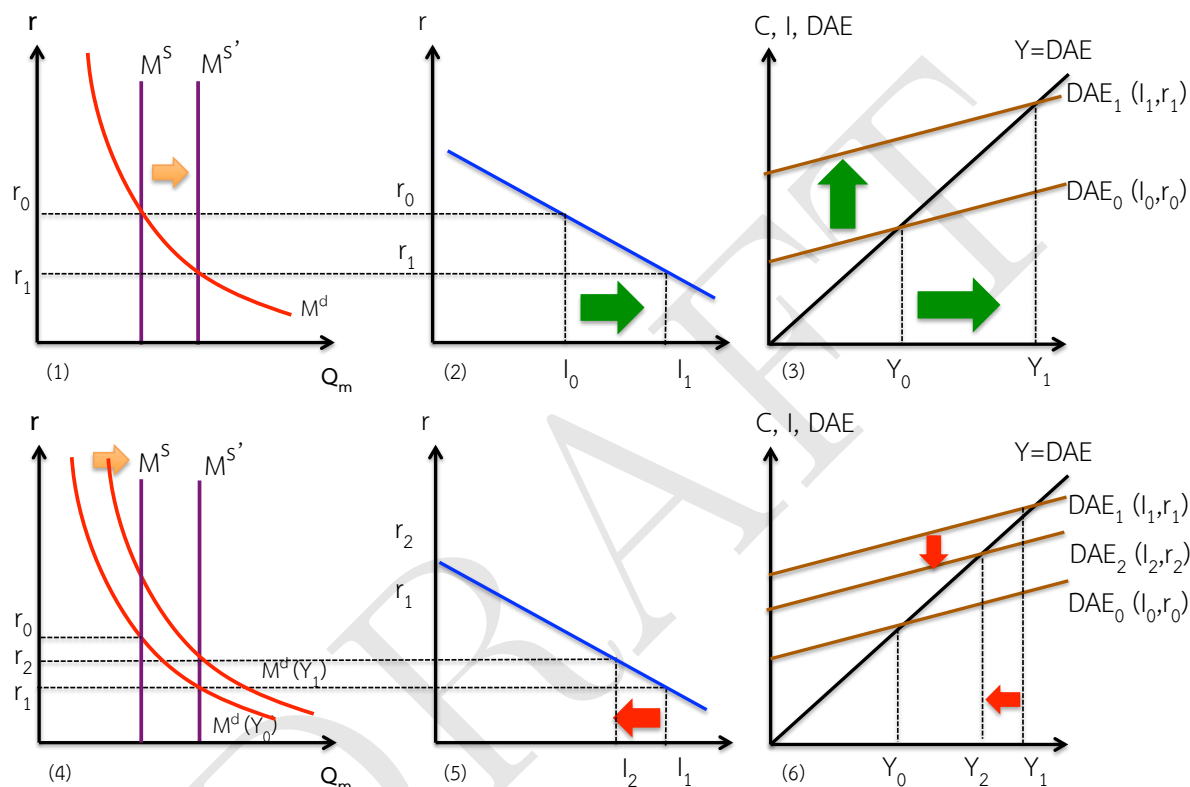
Its effectiveness is then depending on how much interest rate affects investment. If investment is interest elastic or responsiveness of investment to interest rate is high, the change in interest rate will lead to larger change in investment. Expansionary monetary policy will be effective in this sense. The first link from money market to commodity market, however, is inadequate as the very first rise of interest rate will depend on the shape of money demand curve. Thus, sensitivity of money demand to interest rate is also important.

Once money supply is injected into the economy, excess supply is recognized and thus interest rate will fall. Due to assumed inelasticity of money demand to interest rate, the restoration of equilibrium needs more change in interest rate to increase money demand up to the point where money demand and money supply are met at the new equilibrium. Figure 7-1 shows the effectiveness of monetary policy given that investment is interest elastic (flat investment curve) and money demand is interest inelastic (steep money demand). Large change in interest rate leads to larger change in investment and therefore expansionary monetary policy will be effective to stimulate the economy i.e. solve deflationary gap. These assumptions are Monetarists' belief that monetary policy is better than fiscal policy.

In fact, the first rise in national income from the change in interest rate will be offset by another rise of money demand. As a result, there is another assumption needed to be held. Money demand should be national income elastic, i.e. the change in national

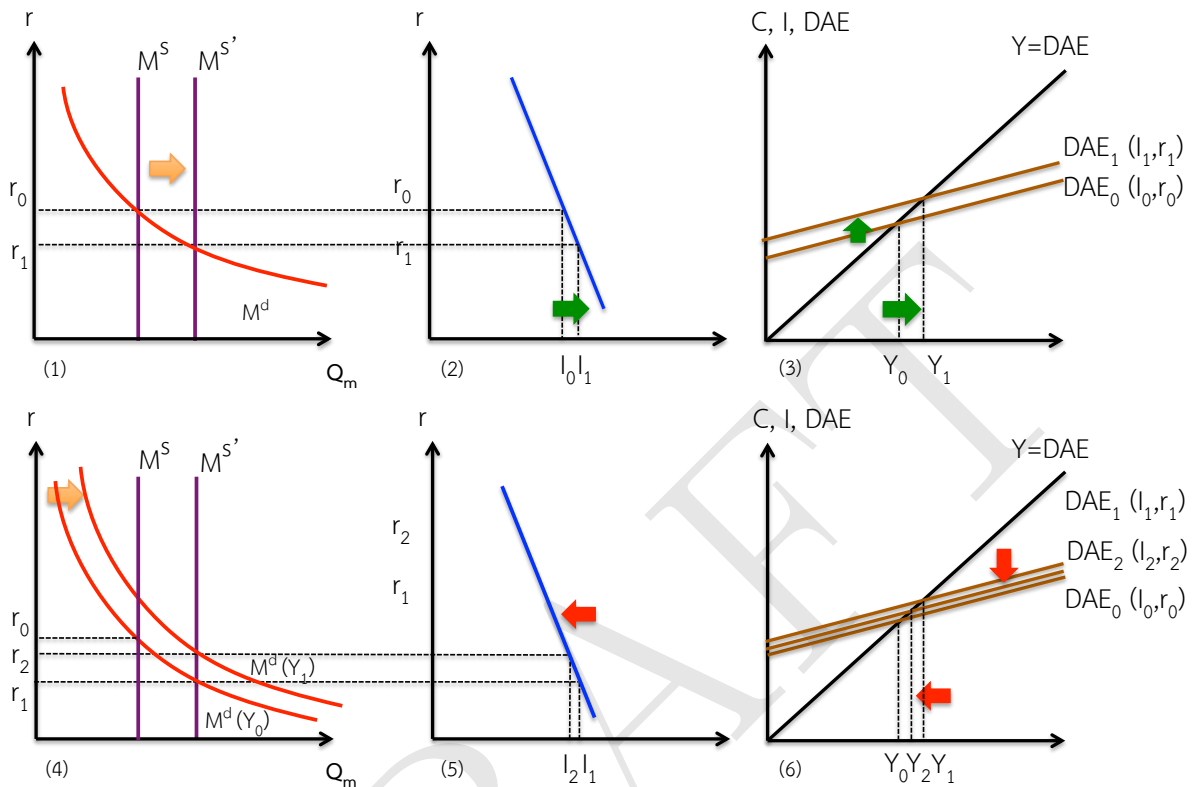
income shifts money demand not that much and then there will be a small rise interest rate that leads to a small fall in investment, DAE and equilibrium national income. Still, in this principle course, we need only interest inelasticity of money demand and interest elasticity of investment, as believed by monetarists.

Figure 7-1: Monetary Policy in Monetarist's View



This monetarists' view is against by Keynesian disciplines. Keynes would like to say that fiscal policy is better to stimulate the economy so the economic conditions are assumed to be interest elasticity of money demand (flat money demand) and interest inelasticity of investment (steep investment curve). Once expansionary monetary policy is employed (figure 7-2), its fall in interest rate will be smaller as money demand is interest elastic, meaning that a small change in interest rate is enough to bring money demand to meet excess supply, created by central bank. Together with interest inelasticity of investment, a fall in interest rate leads to a small rise in investment, DAE and equilibrium national income. Not only that, there will be another offset from the rise of money demand from the change in national income. The effect of expansionary monetary policy will be limited, as a result.

Figure 7-2: Monetary Policy in Keynesian's View



7.2 Fiscal Policy and its effectiveness in solving macroeconomic problems

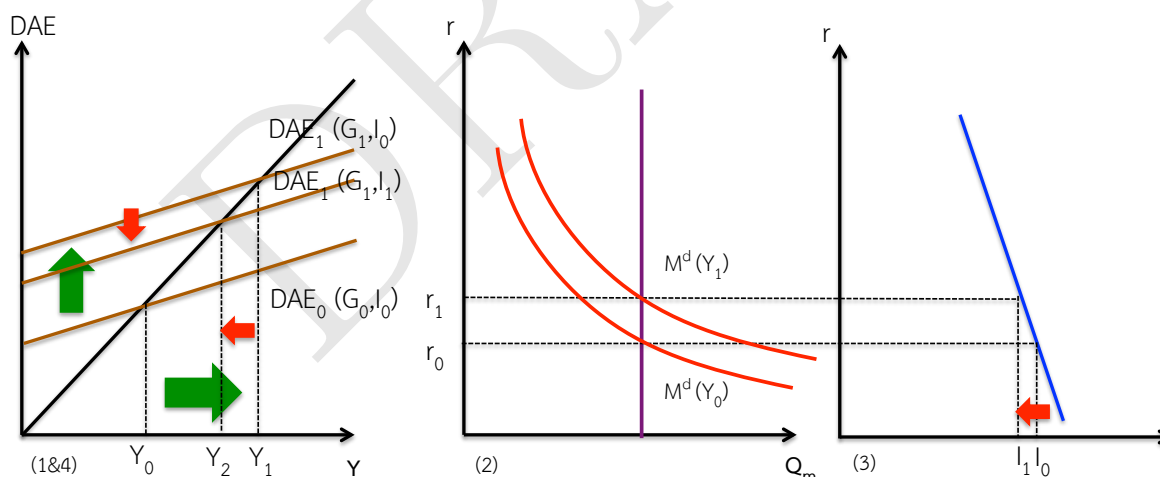
In chapter 5, we talk about fiscal policy and its role solving macroeconomic problems like inflationary and deflationary gaps. In this section, we will exemplify the effectiveness of fiscal policy to solve deflationary gap. Government then either increases their spending, cut autonomous tax, or reduce income-tax rate. The final result is equilibrium national income at full-employment level but we leave further analysis there. In this section, we will complete all the processes.

Normally, after government launches fiscal policy to stimulate the economy. Desired aggregate expenditure is raised, inventories will be depleted, then firms will adjust their production and new equilibrium national income is accomplished. A rise in national income will affect money demand. There will be excess demand for money and then people will sell bonds to have more money. Price of bond will drop down and interest rate in turn increases. This change in interest rate will bring equilibrium national income lower than previously mentioned. This situation is called **crowding-out effect**.

This crowding-out effect comes from the action of the government that, in order to spend more, they need to run government budget deficit and borrows from loan market. Government competes with private companies for loans, driving up interest rate. As a consequence, it crowds out private investment, and equilibrium national income falls. The offset in monetary policy is not called crowding-out effect as government does not involve and all happen because of private competition.

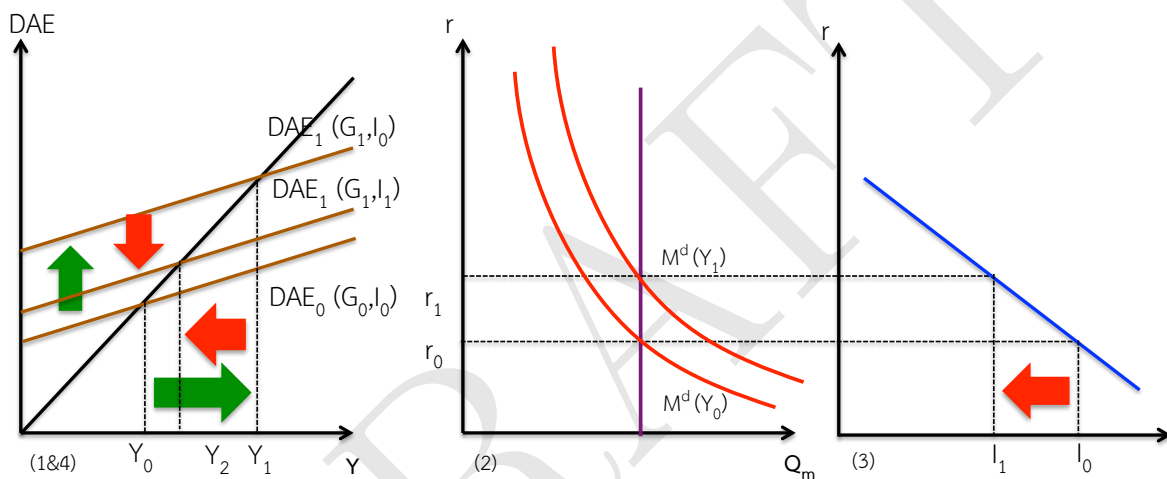
From such process of fiscal policy, the effectiveness depends on the magnitude of crowding-out effect. Two main factors are there to determine, namely, interest elasticity of investment and interest elasticity of money demand. According to Keynesian's belief, fiscal policy will be effective given that investment is interest inelastic and money demand is interest elastic. Figure 7-3 demonstrates the overall process of fiscal policy under those two assumptions with steep investment curve and flat money demand. A rise in national income from expansionary fiscal policy will lead to a rise in money demand that creates excess demand for money. Due to interest elasticity of money demand, a small increase in interest rate is sufficient to bring money demand lower and restore equilibrium in money market. Soaring interest rate will make investors hesitate to invest. Assumed interest inelasticity of investment, smaller changes in investment, DAE and equilibrium are the result. This small crowding-out effect makes, therefore, Keynesians believe fiscal policy is more effective.

Figure 7-3: Fiscal Policy in Keynesian's View



Nonetheless, monetarists oppose this and purpose another set of assumptions that is flat investment curve and steep money demand. When government spend more of their disbursement, equilibrium national income will increase. A rise in national income leads to demand more for money. Since money demand is interest inelastic, it requires larger change in interest rate eradicate excess demand in money market. This ascending trend of interest rate makes investment lower and thank to the assumption about interest elasticity of investment, investment will fall with greater magnitude; therefore, crowding-out effect is large, consequently. Monetarists then perceive that fiscal policy is ineffective, rather impose monetary policy to achieve macroeconomic objectives.

Figure 7-4: Fiscal Policy in Monetarist's View



In conclusion, either fiscal or monetary policies can be effective, depending on economic conditions. If investment is interest elastic and money demand is interest inelastic, monetary policy will be more effective than fiscal policy, according to Monetarists' belief. Nonetheless, If investment is interest inelastic and money demand is interest elastic, fiscal policy will be more effective than monetary policy, postulated by Keynesians.

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Chapter 8

International Economics

8.1 International trade

International trade is the extension from microeconomic analysis since it is the exchange between domestic economy and the rest of the world. Different countries are endowed with different resources, climates and technologies, reflecting in different cost structures. Thai weather might be suitable to produce rice and other agricultural products, while weather in other countries in middle-east Asia is not properly doing the same task. Cost in Thailand will be less as a result. Advantage occurs from this different geographic and economic conditions.

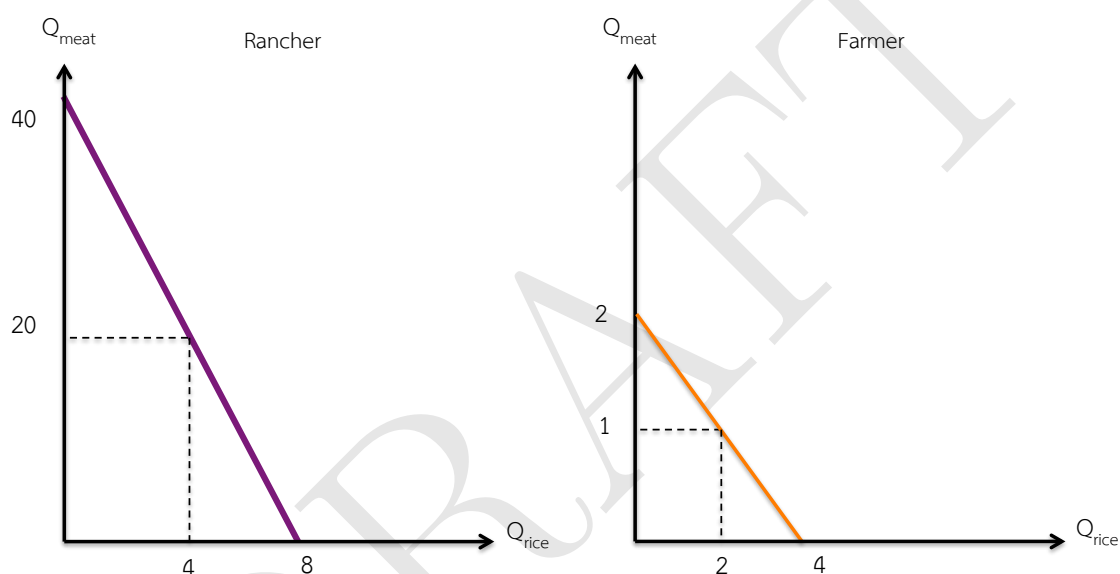
Absolute advantage is the situation one country or individual can produce certain product with less cost. Suppose that there are rancher and farmer that is going to be associated with trade, for example. Table 8-1 shows that rancher has absolute advantages over farmer on meat and rice production. Rancher will utilize 1 and 5 hour to produce 1 unit of meat and rice, consecutively, while farmer needs to spend 20 hours and 10 hours to produce incremental meat and rice, respectively.

Table 8-1: Example - Cost of Meat and Rice Production

Cost (hour/unit)	Meat	Rice
Rancher	1	5
Farmer	20	10

Assume that both rancher and farmer have 40 hours for production, given technology and full employment, which means both of them work 40 hours with assigned cost structure. Therefore, rancher can produce 40 units of meat without rice production and 8 units of rice without meat production, whereas farmer can produce 2 units of meat with no rice and 10 units of rice with no meat. The combinations of feasible meat and rice are plotted in production possibility frontiers below (figure 8-1). If both of them divide their times equally to produce both meat and rice, rancher will have 20 units of meat and 4 units of rice, while farmer will have 1 unit of meat and 2 units of rice.

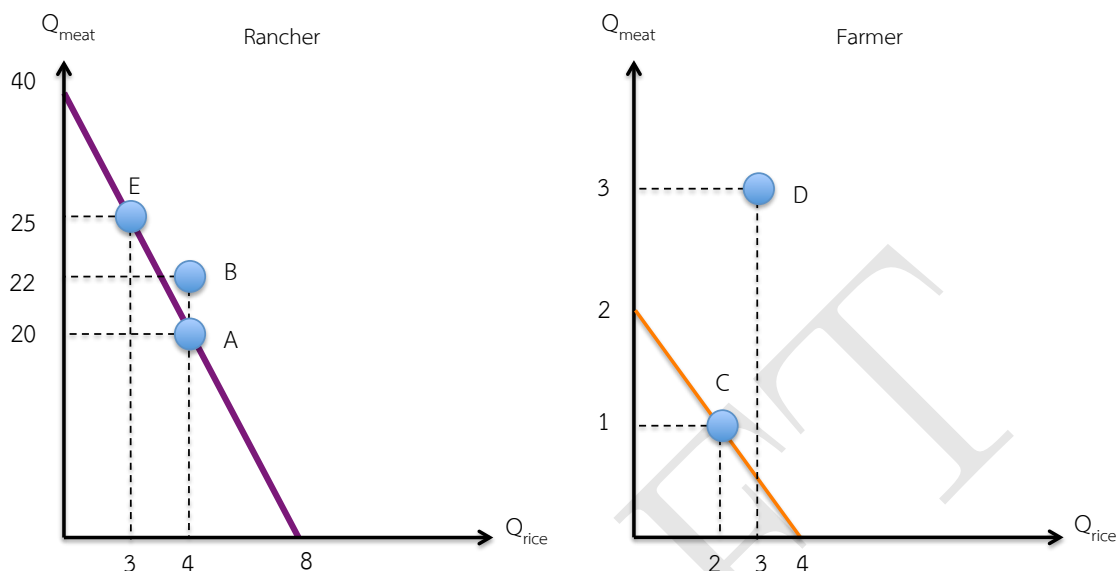
Figure 8-1: Example - Production Possibility Frontiers of both Rancher and Farmer without Trade



Suppose that rancher agrees to exchange 3 units of meat with 1 unit of rice. Farmer decides to produce 4 units of rice and he will benefit if they exchange only one unit of rice since farmer will get 3 units of meat, which is the combination (D) of rice and meat that farmer cannot attain himself (figure 8-2). For rancher, he first produces 25 units of meat and 3 units of rice (E) and then trades additional 1 units of rice with 3 units of meat. He attains combination B which is above than what he can do himself. Gain from trade is realized by both parties once they are engaged in trade activities. Rancher gains 2 units of meat but 0 unit of rice (A Vs B), while farmer gains 2 units of meat and 1 unit of rice (C Vs D), compared with no trade situation.

In this example, we assume fixed resources and given technology. Imagine that both rancher and farmer work more than 40 hours, production possibility frontiers will be extended. Rancher and farmer are able to produce more than the previous scenario. Once new technology is employed, cost of production is reduced. Rancher has better capacity to grow rice and raise meat, so as farmer. Production possibility curve will then shift upwards.

Figure 8-2: Example - Production Possibility Frontiers of both Rancher and Farmer with Trade



Putting production cost differently, if rancher wants to produce additional unit of meat, he needs to reduce his rice production by $\frac{1}{5}$, while farmer will sacrifice 2 units of rice. Rancher is better in meat production. Nonetheless, for rice production, opportunity cost for rancher to produce rice is 5 units of meat, whereas that for farmer to produce rice is $\frac{1}{2}$. With lower cost, farmer is better in rice plantation. This indicates *comparative advantage* of both rancher and farmer.

Table 8-2: Example - Opportunity Cost of Meat and Rice Production

Cost	Meat	Rice
	(in term of rice)	(in term of meat)
Rancher	$\frac{1}{5}$	5
Farmer	2	$\frac{1}{2}$

8.2 The balance of payments

Balance of payments is the record of the international economic transaction between one nation to the rest of the world. For Thai economy, Bank of Thailand is responsible for collecting this statistics. Balance of payments composes of current account, capital account and international reserve account.

Current account is the record payments and receipts from trade in goods and services and from interest and dividends that are earned by capital owned in one country and invested in another. It composes of trade, service, income and transfer accounts. Normally, current account is records of what the residents of that country obtain. For instance, if Thai economy imports more than export, this current account might be in deficit, and the payments will be made for the rest of the world. Current account surplus might come from trade surplus (exports greater than imports), additionally.

Capital account is the record payments and receipts from import and export of short- and long-terms financial capitals. It comprises of capital and financial accounts. Investment in stock market, foreign direct investment (FDI), and other kinds of foreign capital flows are counted in this capital account. Generally, capital account is the records of the amount of capital owned by foreigners. For example, in case of capital inflow from the rest of the world, this capital account will be in surplus. If there is capital outflow from Thai economy, capital account turns to be in deficit.

For international reserve account, international reserve is for international payment. Central bank is in charge of international reserve for the country to be engaged with international exchanges since in order to trade with the rest of the world, domestic currency is not accepted as the medium of exchange, international reserve is then the option. Since international trade needs acceptable medium of exchange, next section we will discuss about market for foreign exchanges.

8.3 The market for foreign exchanges

Because dollar is widely accepted as medium of exchange in international community, we will then talk about price of USD in term of THB in this section. To analyze the equilibrium in foreign-exchange market, demand and supply of USD will be explained.

Those demanding foreign exchange are going to deal with international economies. For example, Thai tourists will demand for USD to travel in the US. Those buying products from the rest of the world or import pay with foreign currencies. Thai investors planning to invest in other countries need dollar to invest over there. In order to have dollars, people will pay such dollars by baht. Therefore, demand for dollar will be the reflection of supply for baht.

On the other hand, supply for foreign currency will come from those selling products or export and being paid with foreign currency. Foreign tourist would like to come to travel in Thailand and they need to exchange their currencies with THB so that they can properly buy goods and services. All these are supplying foreign currencies for Thai economy. Again, to supply dollar, it means that people want baht in exchange. Thus, supply for dollar is also demand for baht. We will begin our analysis with demand and supply for USD afterwards.

8.3.1 Demand for foreign exchange

Quantity demanded for USD will depends on various factors. The very first one is its price in term of THB. For example, people need 30 THB in exchange with 1 USD. Price of USD matters in the sense that if its value falls from 30 to 25 THB, demand for USD will be higher. There is negative relationship between quantity demanded for USD and price of USD. Quantity demanded for dollar is described in equation 8.1.

$$Q_{\$}^D = f(P_{\$}, EXP, P_{USX}, I_{US-TH}, \dots) \quad (8.1)$$

Expectation (EXP) matters because if people expect that price of dollar will increase. Buying now will be cheaper than in the future. Hence, quantity demanded for USD will rise at each and every level price of USD. On the contrary, if people foresee that USD will depreciate, buying now will be more expensive. Demand for USD will shift to the left.

Another factor is *price of American exports* (P_{USX}). Price elasticity of US export is important to determine the effects on demand for foreign currencies. If total expenditure rises, local people need more dollar to pay. On the other hand, less expenditure on imports and less demand for US dollar are the results. Therefore, there are three possible cases, that is, price elastic, inelastic and unitary elastic.

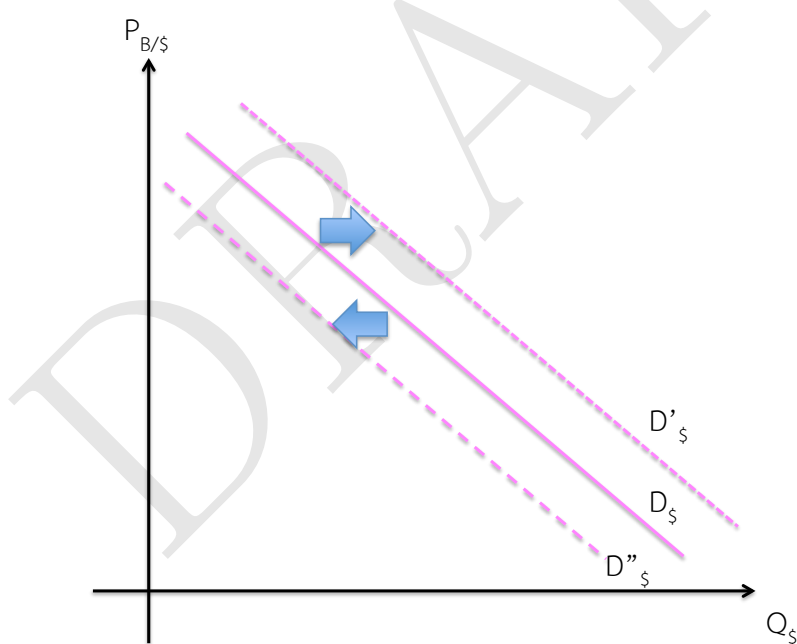
If such exports are price elastic, the change in price of such exports by 1 percent will change its quantity by more than 1 percent in the opposite direction. In this case, the change in quantity will dominate the change in price of American exports and that means total expenditure on US exports, which will affect the demand for US dollar, moves in the same direction as quantities vary. A rise in price of US exports will decrease quantities exported, and lessening both total expenditure on US exports and demand for dollar as a consequence.

Nonetheless, if American export is price inelastic, price dominates quantity. Total expenditure will move in the same direction. Soaring price will shift demand for US dollar to the right. Unitary elasticity will lead to no change in total expenditure even though price moves either upwards or downwards. Thus, the change in American-export price does not contribute to change in total expenditure and demand for US dollar.

Investment in US by Thai citizen (I_{US-TH}) also affects demand for dollar. If more investors would like to run businesses in the US, those businessmen need more dollars to pay for local factors of production and so forth. Then demand for US dollar will shift to the right.

Other situations could change this the demand as well. For example, if there is inflation in Thailand, people will find that foreign goods and services are cheaper so they decide to import more and as a result demand more for US dollar in order to purchase imports. Figure 8-3 shows shifts of demand for dollar.

Figure 8-3: Shifts of demand for US dollar



8.3.2 Supply for foreign exchange

Many variables are associated with quantities supplied of USD. Price of USD is one of the main factors. If price of US dollar falls, it will not be worthwhile to supply such currencies into the market; then quantity supplied then move in the same direction and vice versa for a rise in price of US dollar in term of THB. Other factors are presented in the equation 8.2.

$$Q_{\$}^S = f(P_{\$}, EXP, P_{THX}, I_{TH-US}, \dots) \quad (8.2)$$

Expectation (EXP) causes the change in quantity supplied of dollar. If people expect that US dollar is going to appreciate in the future – its value in term of Thai baht is expected to rise, then supplying US dollar now will be less profitable. On the other hand, expecting US dollar to depreciate will make people propose to sell more USD since supplying now will be more rewarding.

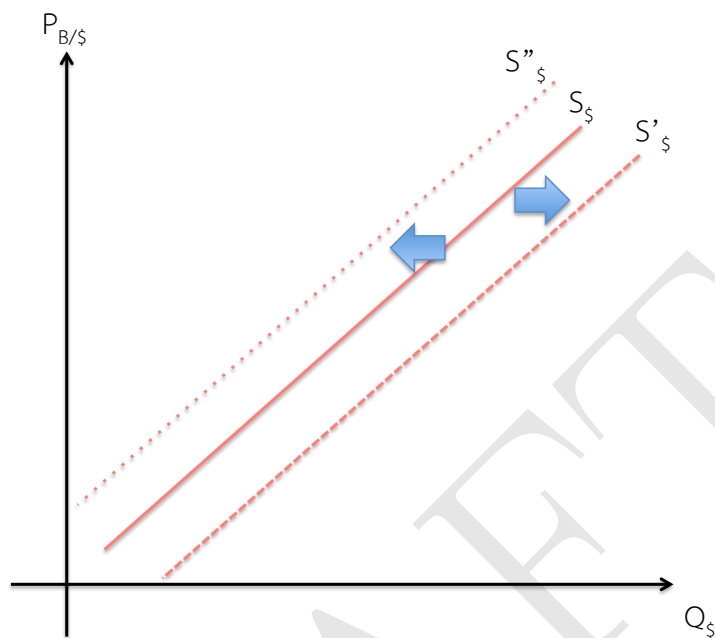
Next factor is *price of Thai export* (P_{THX}). Price elasticity of such goods will determine the direction of total revenue Thai exporters receive. If it is price elastic, quantity will dominate the direction of change. A rise in price of Thai export will make total revenue decline and thus Thai exporters obtain less US dollar. Dollar will be less supplied, shifting supply for dollar to the left.

Instead, if price of Thai export is inelastic, price will dominate. The increase in price of Thai export will make total revenue rise, resulting in more supply of dollar at each and every level of price of dollar in term of THB. Unitary elasticity is another characteristics of certain goods. Total revenue remains unchanged given any changes in price. Therefore, no shift will be the consequence.

Investment in Thailand by US citizen (I_{TH-US}) is the situation which US people need to exchange their currency to be THB so that they can pay factors of production and open factories in Thailand. More of this capital inflow will make supply of dollar shift to the right.

There may be other variables shaping the amount of quantities supplied given any price of US dollar in term of Thai Baht. Figure 8-4 shows the shift of supply of US dollar, either to the right or to the left depending on which factors change.

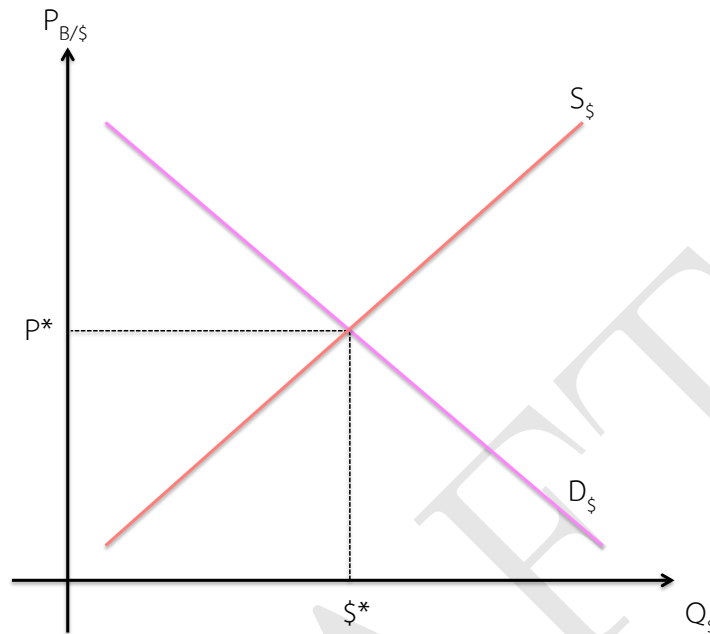
Figure 8-4: Shifts of Supply for US dollar



8.3.3 Equilibrium in foreign exchange market

Once we combine demand and supply to analyze foreign-exchange market, equilibrium in price of US dollar in term of THB will be revealed. Figure 8-5 shows the equilibrium. If price is higher, there will be excess supply for dollar. Sellers cannot sell the amount they want to sell so they need to offer lower price and eventually price of US dollar falls until the equilibrium. If instead price is too low, there will be excess demand for dollar. Buyers cannot get dollar they want so offer higher price and then reach the equilibrium.

Figure 8-5: Equilibrium in Foreign Exchange Market



This exchange rate can move freely under **flexible exchange rate system**. Price of foreign currency under this scheme moves unrestrictedly by market mechanism. However, if the economy is with **fixed exchange rate system**. Since both supply and demand for foreign currency could be perturbed by any external forces, to peg the price of currency, central bank needs to intervene to make sure that demand and supply for dollar in the economy are at the right amount to make exchange rate fixed.

Exchange rate intervention is either buying or selling foreign currencies into the economy. Suppose that capital is flowing out of the system (figure 8-6), then demand for dollar shifts to the right, making exchange rate depreciated (P_0 to P_1). To fix price at P_0 , central bank needs to supply the demand by selling dollar in exchange with THB so central bank is to sell dollar and buy baht, shifting supply for dollar to the right and new equilibrium with the same price is attained.

However, if there is capital inflow to Thai economy (figure 8-7). Supply for dollar is shifted to the right, appreciating Thai baht (P_0 to P_1). Central bank then requires to eliminate supply by purchasing dollar and selling baht in foreign exchange market. This action will shift demand for dollar to the right and central bank keeps doing this until exchange rate is back to where it is fixed.

Figure 8-6: Exchange Rate Intervention - Selling dollar and Buying baht

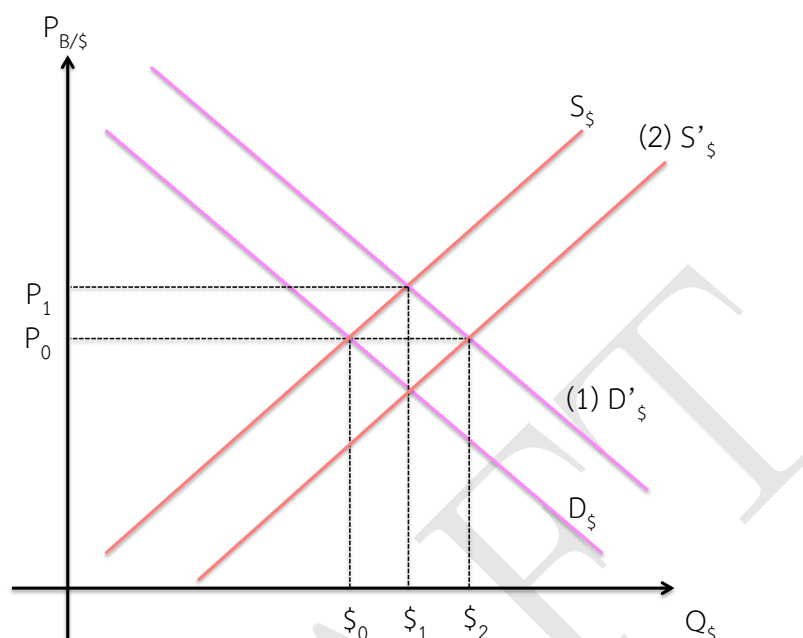
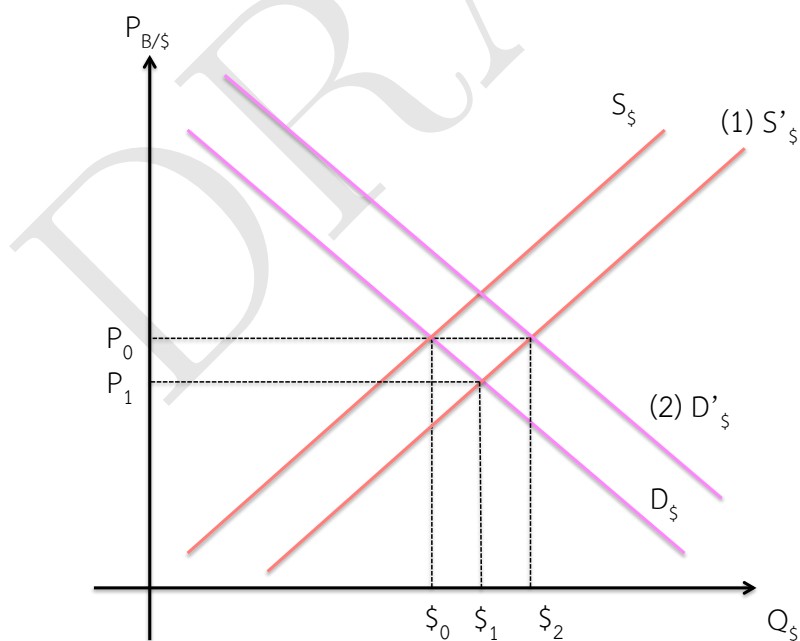


Figure 8-7: Exchange Rate Intervention - Buying dollar and Selling baht

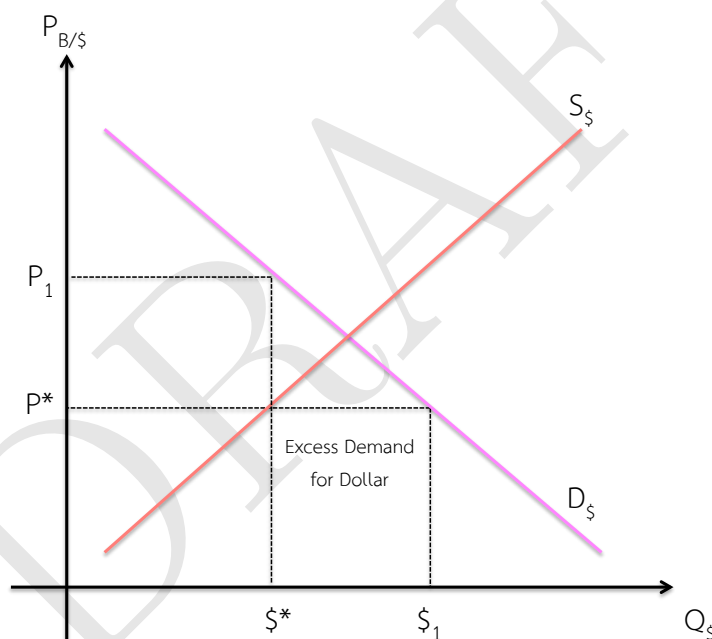


Furthermore, if central bank announces that the fixed rate will be changed. We call it *revaluation* if that makes the value domestic currency rise (appreciation). *Devaluation* will be the case when the value of currency falls (depreciation).

With this fixed exchange rate system, economic analysis on price ceiling can be applied. Fixed system makes baht more expensive artificially and will create excess demand for dollar as well as black market. Figure 8-8 explains this circumstance. In this situation, if price is to be fixed at P^* , government needs to shift either $D_{\$}$ or $S_{\$}$ to reach at the fixed level but it is perhaps impossible to increase supply for dollar since right now it faces shortage of dollar and decrease demand for dollar because it is difficult to change human's behavior.

Furthermore, as the amount of dollar is limited to $\* , shortage of dollar is unavoidable. Non-price rationing device is needed to allocate dollar such as quota system for imports, first-come-first-serve basis and other approaches, which is inefficient. In addition, since people are willing to pay up to P_1 , black market and economic rent are to emerge.

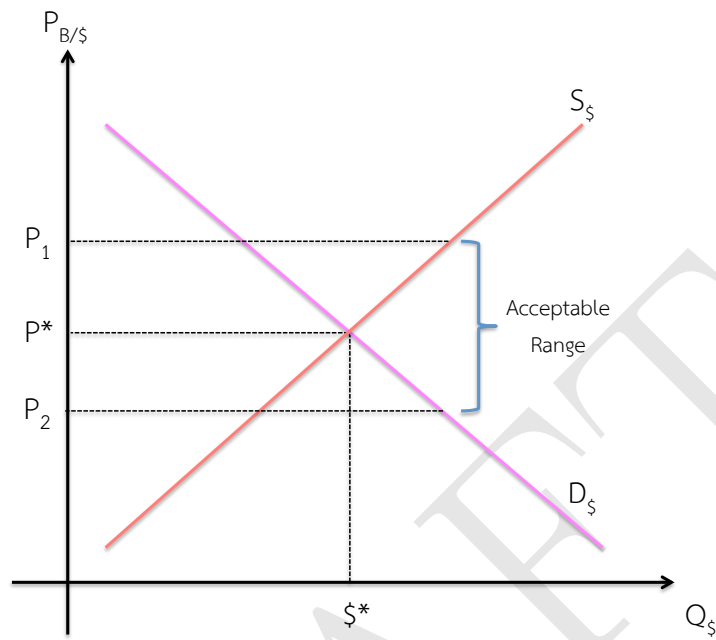
Figure 8-8: Problem in Fixed Exchange Rate Regime



For Thailand, Bank of Thailand employs **managed-float regime** for exchange rate market. Central bank will intervene if the value of exchange is not in the acceptable range (figure 8-9). If price exceeds P_1 , central bank will sell dollar and buy baht to make sure that its value does not rise further. Nonetheless, if price is lower than P_2 , intervention by buying dollar and selling baht will be implemented to guarantee that it does not appreciate further.

Central bank needs to assure that volatility of exchange does not cause any instability towards the economy since the depreciation or appreciation will affect quantities exported and imported, which will eventually result in the change in equilibrium national income.

Figure 8-9: Managed-Float Regime



Chapter 9

General Equilibrium Model (IS-LM model)

9.1 The derivation of IS schedule

The equilibrium in commodity market is derived from income-expenditure approach. Its limitation is that it does not incorporate the change in interest rate, the crucial factors for the prosperity of the economy, within the same diagram. Investment-Saving or IS schedule will solve this trouble and purpose a set of combination of interest rate and national income, which all are the equilibrium in the commodity market.

There are two approaches to extract the relationship between interest rate and national income for product market, since income-expenditure and leakage-injection are two means to find the equilibrium in commodity market. Suppose that the economy operate at Y_0 (figure 9-1). The rise in interest rate from r_0 to r_1 will lower incentives for investors to borrow. The desired aggregate investment and desired aggregate expenditure decrease. With this phenomena, actual output exceeds what the economy demands. Inventories are to be depleted so firms adjust their production accordingly and eventually another equilibrium national is reached at Y_1 . In commodity market, there is inverse relationship between interest rate and equilibrium national income.

Figure 9-2 purposes another way to examine interest rate and equilibrium national income. Generally, saving depends on national income because it is the reflection of consumption function and investment reacts negatively to the change in interest rate. Saving and investment are equal at the equilibrium national income where leakage and injection meet. Equilibrium national income at Y_0 is associated with saving at S_0 and this saving needs to be equal to investment at I_0 , to express saving-injection approach where investment is corresponded to interest rate at r_0 . Once interest rate falls to r_1 , there will be more investment injecting into the economy. Injection will be greater than leakage at first and this will drive up the equilibrium national income so as saving and eventually arrive at the new equilibrium.

Figure 9-1: IS Derivation from Income-Expenditure Approach

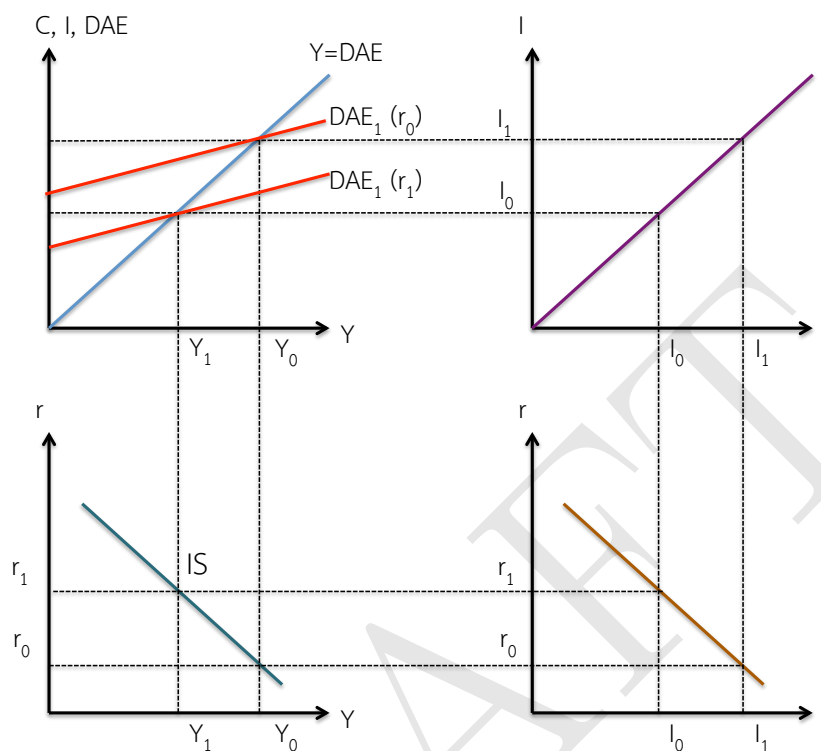
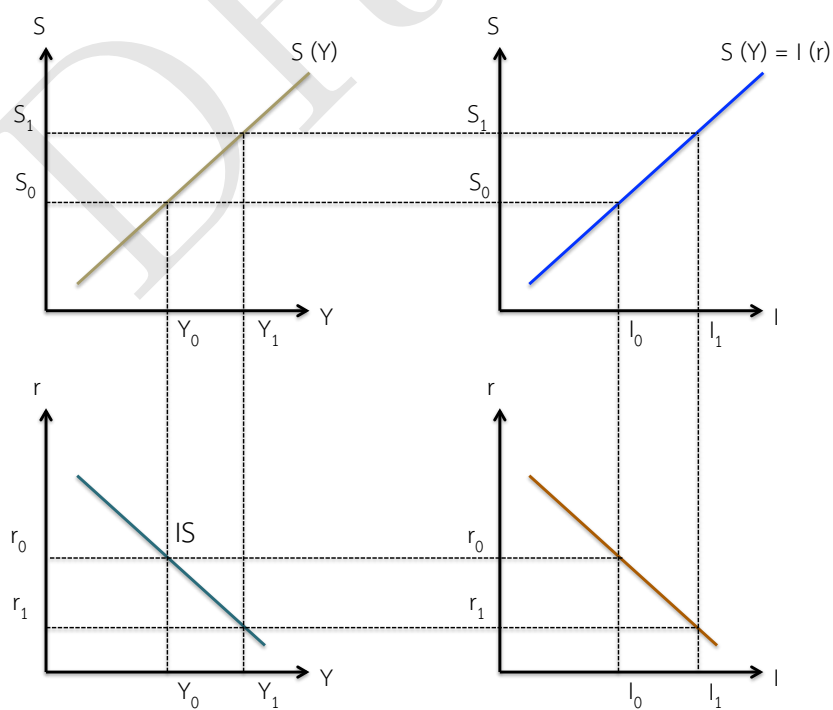
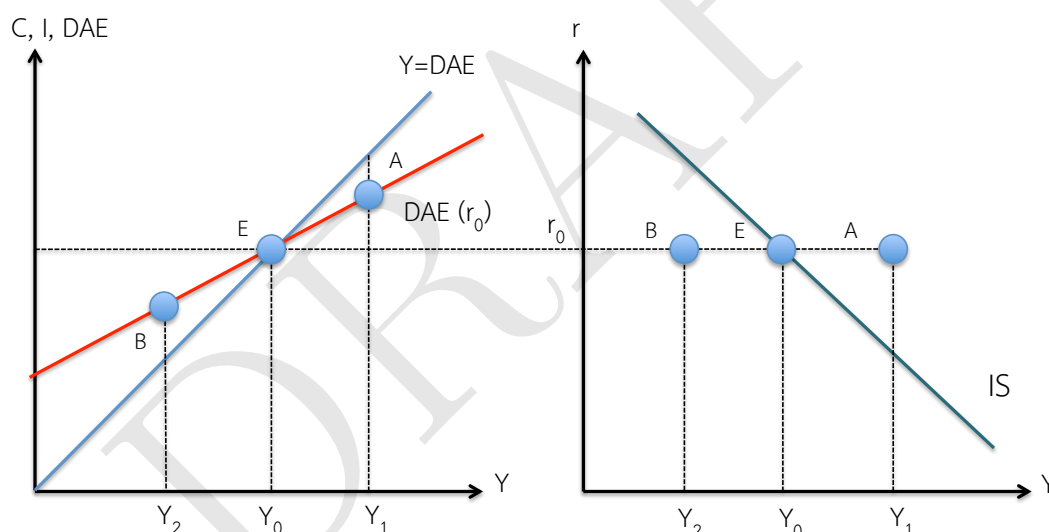


Figure 9-2: IS Derivation from Leakage-Injection Approach



All combinations between interest rate and equilibrium national income are the equilibrium in commodity market. Suppose that the economy is now at point E in figure 9-3, which the equilibrium national income at Y_0 and interest rate at r_0 . If national income rises to Y_1 , there will be excess supply for goods and services, indicated in $Y=DAE$ diagram at point A. Point B shows excess demand for goods and services in income-expenditure-approach graph. Therefore, combinations of interest rate and national income above IS represent excess supply of goods and services, which the economy tends to adjust by decreasing national income back to be on IS curve, while those below IS display excess demand of goods and services, which will create pressure for firms to produce more and national income is likely to increase further to reach the equilibrium on IS curve.

Figure 9-3: IS - Disequilibrium in Commodity Market



This negative relationship between interest rate and equilibrium national income is expressed in mathematical representation below. The economy is closed with induced investment and both income and lump-sum taxes. Since IS model have interest rate as the main variable and it affects investment negatively, therefore there is another term added in desired investment expenditure equation. Interest elasticity of investment (j) shows the sensitivity of investment to the change in interest rate. Higher (j) means investment is more sensitive to the change in interest rate. With this model, we can conclude our simple IS model in the equation.

$$\begin{aligned}
C &= C_0 + cY_d \\
I &= I_0 + iY - jR \\
G &= G_0 \\
T &= T_0 + tY \\
Y_d &= Y - T \\
\text{At the equilibrium: } Y &= DAE \\
\text{and in this case, } DAE &= C + I + G \\
\therefore Y &= C_0 + cY_d + I_0 + iY - jR + G_0 \\
Y &= C_0 + c(Y - T_0 - tY) + I_0 + iY - jR + G_0 \\
Y &= C_0 + cY - cT_0 - ctY + I_0 + iY - jR + G_0 \\
(1 - c - i + ct)Y &= C_0 - cT_0 + I_0 - jR + G_0 \\
Y^* &= \frac{1}{1-c-i+ct}(C_0 - cT_0 + I_0 + G_0) \\
\text{Rearrange and obtain} \\
\text{IS equation: } R^* &= \frac{(C_0 - cT_0 + I_0 + G_0)}{j} - \frac{(1-c-i+ct)}{j}Y
\end{aligned}$$

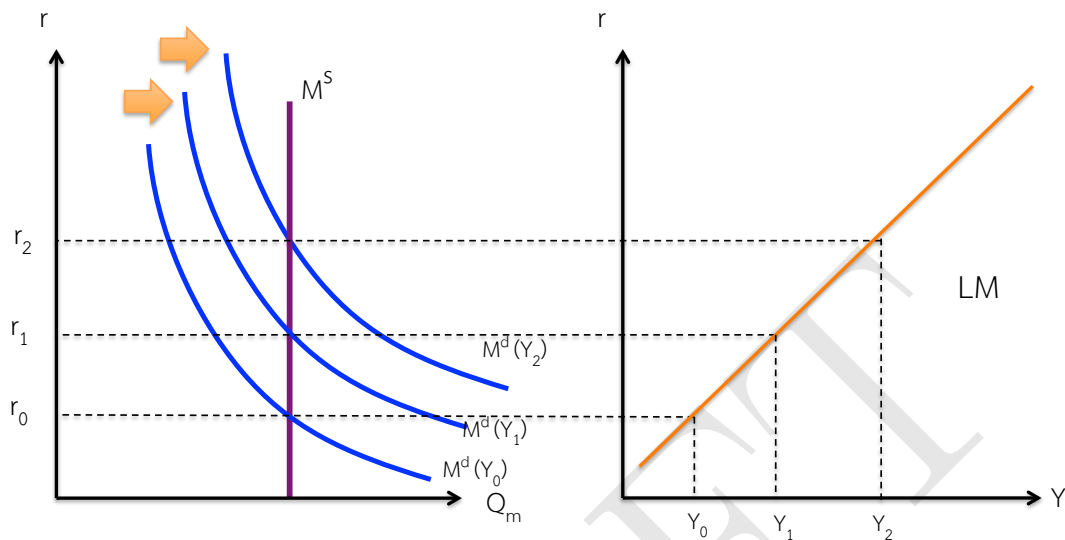
Its implication from this equation is that change in autonomous expenditure will shift IS. Interest elasticity of investment (j) involves with the intercept as a cause to the shift of IS as well. Its slope is negative and depends on the value of marginal propensity to consume (c), to invest (i), income tax (t) and the responsiveness of investment to interest rate (j). Higher value of the ratio between interest rate and national income is steeper IS schedule, which comes either from a rise in income tax (t) or a fall in marginal propensity to consume (c), to invest (i), or interest elasticity of investment (j).

9.2 The derivation of LM schedule

Previously, equilibrium in money market is presented in the money market diagram between interest rate and quantity of money. This LM schedule will shorten our analysis by replacing quantity of money with national income. This will be easier to analyze what will happen if national income changes to the equilibrium interest rate.

LM schedule represents the equilibrium points in the money market for the given aggregate outputs. Positive relationship is found between these two variables. Figure 9-4 indicates combinations of equilibrium interest rate and total output. Once aggregate output increases from Y_0 to Y_1 , people will demand more for money, shifting money demand upwards and creating excess demand for money in money market. People will sell bonds so that they have money in their pockets and that makes price of bond fall and equilibrium interest rate rise from r_0 to r_1 . In conclusion, there is positive relationship between equilibrium interest rate in money market and national income.

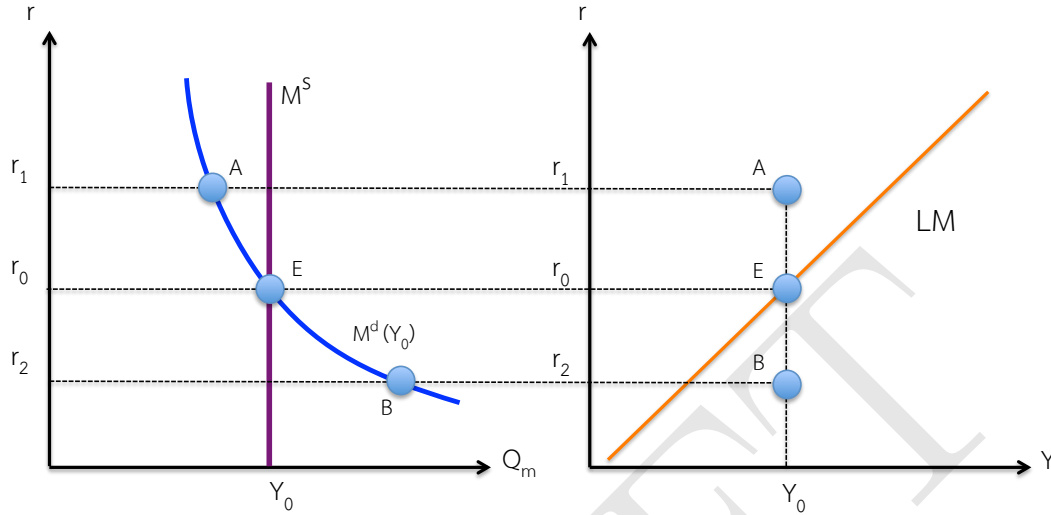
Figure 9-4: LM Derivation from Equilibrium in Money Market



Since any points on LM curve is the equilibrium in money market, any deviation from LM is disequilibrium. Suppose that the economy is not at point E with aggregate output at Y_0 and interest rate r_0 . Lower interest rate at r_2 than the equilibrium interest rate contributes to excess demand for money at point B. People will sell bonds to satisfy their demand for money. Price of bond then declines and equilibrium interest rate will be brought back to r_0 . Nevertheless, if interest rate is at r_1 , it will be too high for investors to hold money. Less money demand is the result. Excess supply for money at point A will be corrected by invisible hand. Too much money is circulated in the economy so people will eliminate them by purchasing bonds. Price of bond increases and interest rate decreases to equilibrium interest rate at r_0 .

Therefore, points above LM is disequilibrium in money market which excess supply for money occurs, while combinations of interest rate and total output below LM will create excess demand for money in money market. This disequilibrium tends to adjust towards equilibrium by falling of interest rate once there is excess supply for money and by rising of interest rate when excess demand for money exists.

Figure 9-5: LM - Disequilibrium in Money Market



Equations in money market are presented. Money demand depends positively on national income and negatively on interest rate. Responsiveness of money demand to national income and interest rate are l_1 and l_2 , respectively. Money supply is the stock concept controlled by central bank. To find the equilibrium in money market, it is the situation where money demand is equal to money supply. Arrange the equation in such a way that interest rate is on the left hand side and national income on the right hand side so that LM will be plotted accordingly.

$$\begin{aligned}
 M^d &= l_0 + l_1 Y - l_2 R \\
 M^s &= M_0 \\
 \text{At the equilibrium: } M^s &= M^d \\
 \therefore M_0 &= l_0 + l_1 Y - l_2 R \\
 l_2 R &= l_0 - M_0 + l_1 Y \\
 \text{LM equation: } R^* &= \frac{(l_0 - M_0)}{l_2} + \frac{l_1}{l_2} Y
 \end{aligned}$$

Positive relationship between equilibrium interest rate and national income is indicated in the equation. Once central bank increases stock of money in the economy, there will be the change in the intercept of LM curve. Thus, monetary policy will make LM shift. Any other factors apart from national income and interest rate will affect constant term l_0 in money demand equation and if it changes, LM will shift as a result. Furthermore, interest elasticity to money demand (l_2) involves with the intercept of LM curve, too.

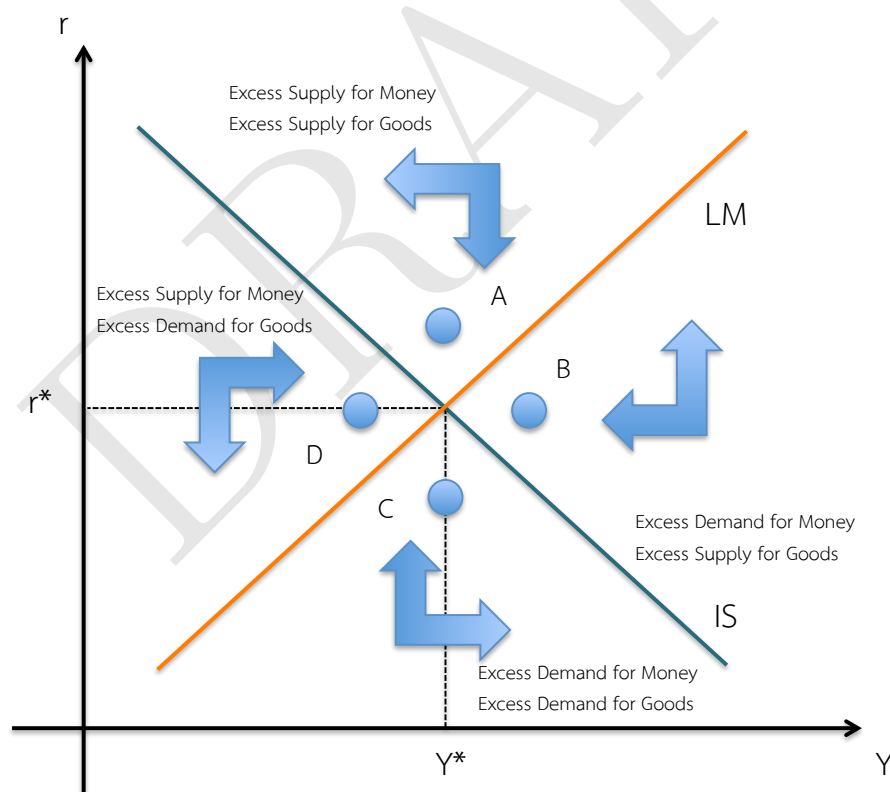
For slope of LM, if national income elasticity of money demand (l_1) is high, LM will be steep. High value of such elasticity implies that a small rise in national income leads to a larger increase in money demand and thus to restore the equilibrium it needs higher interest rate to reduce money demand back to the equilibrium. LM is steep as a result.

Interest elasticity of money demand (l_2) is another factor determining the shape of LM. If it is high, LM will be flat. This is because a small rise in interest rate will make money demand increase a lot and it requires large change in national income to bring money market back to its equilibrium. This shape of LM is important to examine the effectiveness of fiscal and monetary policies.

9.3 The IS-LM combined

IS represents equilibrium in commodity market, whereas LM illustrates equilibrium in money market. There exists the combination of interest rate and aggregate output that brings equilibrium in both commodity and money markets. Equilibrium interest rate (r^*) and Equilibrium national income (Y^*) are there at the intersection between IS and LM schedules that satisfy both commodity and money markets, eliminating any excess supply and demand for goods and services and money (figure 9-6).

Figure 9-6: IS-LM general equilibrium



Any disequilibriums will be adjusted towards equilibriums by market mechanism. For example, if the economy is at point A where interest rate is too high for both money and commodity markets. It is the situation with excess supply of goods and money. This excess supply will drive national income and interest rate down until it reaches equilibrium

in both markets. However, if the economy is at point C where interest is too low for both money and product markets. There are excess demands in both markets, raising both interest rate and national income towards the equilibriums.

The adjustment process at point B and D towards equilibrium will be different. At B, there will be excess demand for money and excess supply for goods and services. Excess demand for money will pressure interest rate to increase while excess supply for goods and services will bring national income down until both equilibriums are reached. For point D, there are excess supply for money and excess demand for goods. Interest rate will be lowering and national income will be escalating until these excesses are eradicated.

9.4 Effectiveness of Monetary and Fiscal Policies

The effectiveness of monetary and fiscal policies can be analyzed by IS-LM framework. Their effectiveness depends upon the shape of IS and LM curves. Keynesians believe that fiscal policy will be effective in which the economy is assumed to have interest inelasticity of investment and interest elasticity of money demand. Meanwhile, monetarists say that monetary is more effective in economic stimulation since they set the economy to be interest elastic in investment and interest inelastic in money demand.

Those assumptions have certain implication on the shape of both IS and LM. For Keynes, interest inelasticity of investment means that j is small or IS is steep and interest elasticity of money demand indicates that l_2 is low or LM is flat. Once government spends more money, IS will shift to the right (figure 9-7). A rise in national income leads to excess demand for money in money market. Interest rate will be driven up but its effect will not be large since investment is interest inelastic. With these assumptions, crowding-out effect is small and fiscal policy is effective to stimulate the economy.

If central bank launches monetary policy to stimulate economy, given Keynesians' economic conditions, change in money supply will shift LM to the right (figure 9-8). Its effect will be small since investment is interest inelastic. Furthermore, excess supply for money will not bring the interest rate lower that much because money demand is interest elastic. A small change in interest rate is enough to eliminate excess supply. Therefore, monetary policy will be less effective, compared with fiscal policy, given Keynesians' assumptions.

Figure 9-7: Keynesians' Fiscal Policy

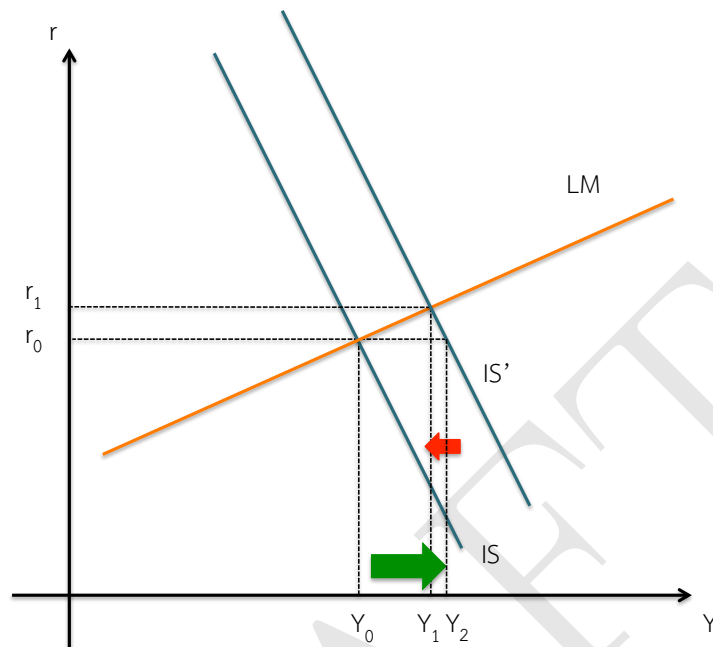
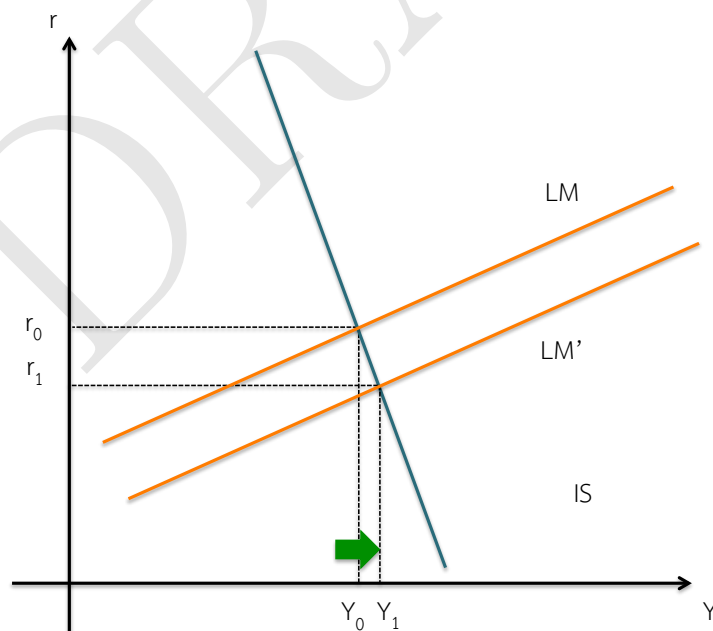


Figure 9-8: Keynesians' Monetary Policy



Monetarists purpose different ways to view the economy. They assume investment is interest elastic and money demand is interest inelastic. High sensitivity of investment to interest rate means j is high; then IS slope will be smaller or flat in this case. LM will be steep since money demand is interest inelastic (low value of l_2).

When government increases their spending, IS will shift to the right, creating excess demand for money. Interest rate will rise accordingly and since investment is interest elastic, the increase in interest rate makes investment fall with large magnitude. Monetarists' assumption claims that crowding-out effect is large and then fiscal policy is not that effective (figure 9-9).

In the meantime, monetarists are in favor of monetary policy. As inflating money supply fabricates excess supply for money, lessening equilibrium interest rate in money market. Because investment is interest elastic, monetary policy will be effective to stimulate desired investment expenditure and equilibrium national income. Hence, monetary policy should be employed to accelerate economic growth, rather than fiscal policy.

Apart from these assumptions, other variables are able to shape the slope of both IS and LM. For example, if *marginal propensity to save* is higher, IS will be steeper. Given normal LM, fiscal policy will be more effective than monetary policy. If, instead, money demand is less responsive towards national income (l_1), LM will be flatter. Provided with normal IS, monetary policy will be more effective than fiscal policy. In conclusion, fiscal policy will be effective with steep IS and flat LM, while monetary policy will be effective with flat IS and steep LM.

Figure 9-9: Monetarists' Fiscal Policy

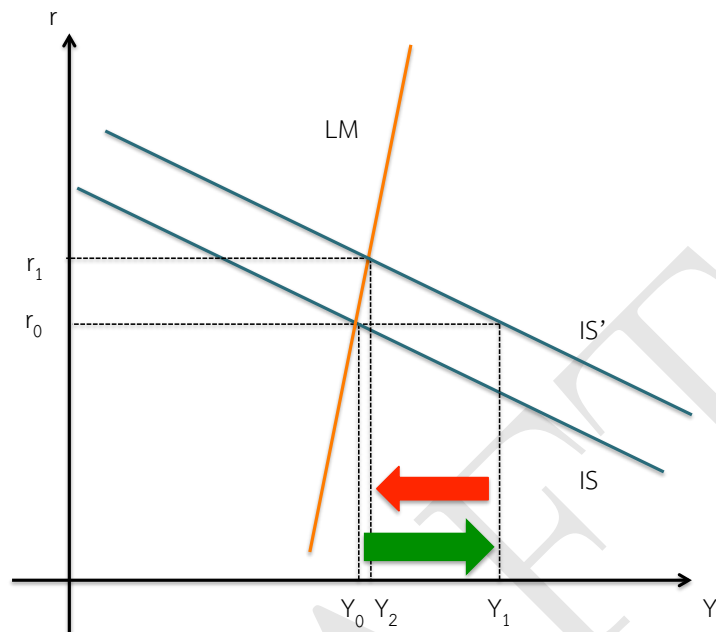
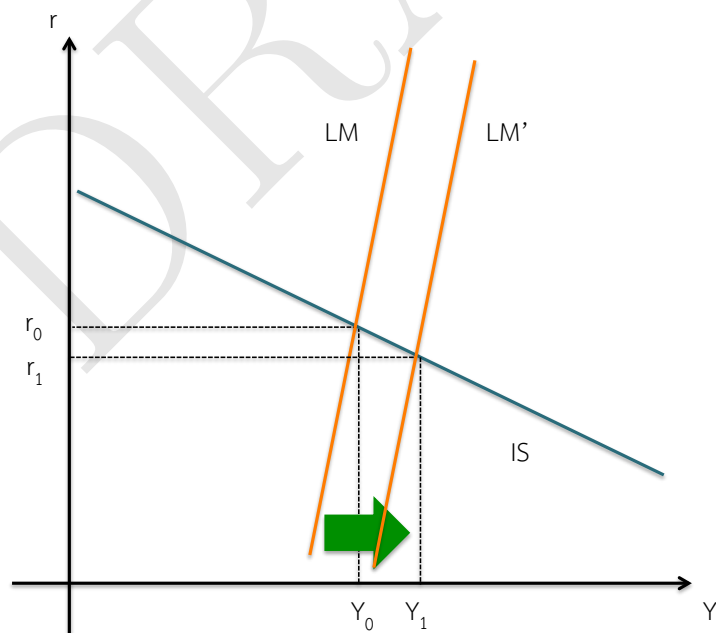


Figure 9-10: Monetarists' Monetary Policy



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