Chapter 2 : Macroeconomic Measurement

EE312

Macroeconomics, Stephen Wiliamson, Chapter 2

2015

* *Note: Much of the contents in this lecture presentation are borrowed from Dr.Pichit's. He kindly allowed us to use his lecture presentation. All credits and rights go to Dr.Pichit. Please note that I modified/added some parts on my own. Hence, any mistake is my own responsibility. Please notify me if you find any. Thank you!*

Outline

1. Review on Gross Domestic Product (GDP)
2. Nominal GDP Vs. Real GDP
3. Chain-weighted real GDP
4. Price index and inflation
5. Labor market measurement

1.1 The three approaches to measuring GDP

- GDP is the value of all final goods and services produced in a year within the country's borders.
- Calculation methods:
  1. Production or value-added approach.
  2. Expenditure or final output approach.
  3. Income approach.

  All three give the same result.

1. Production approach : the value-added approach

- GDP is the sum of value-added in all production processes in a given period.
- Value-added is the increase in the value of goods at the current stage of production.

Value-added = Value of output – value of intermediate goods.

2. Expenditure approach.

- GDP is the sum of expenditures on final goods and services in the economy during a given period.

GDP = Consumption + Investment + Government expenditures + Net exports

3. The income approach

- GDP is the sum of all factor incomes from current production.
- GDP = Labor income + Non-labor income

GDP= wages and salary + corporate profits + rent + proprietary income + net interest income + taxes

1.2 Items excluded from GDP

- Nonmarket activity: house works, etc.
- Underground economy: illegal incomes (drugs, prostitution, smuggling),
- unreported income.
- Intermediate goods transactions.
- Second-hand transactions (cars, houses, durable goods).
- Securities transactions (stocks, bonds, land).

1.3 Not a good welfare measurement

- GDP is not a good measurement of the population's welfare.
  - Some nonmarket activities increase welfare but are not recorded.
  - No indication of income distribution (Per Capita GDP).
  - Large government means large GDP but may not imply higher social welfare.

1.4 GDP VS. GNP

1.4.1 Gross National Product (GNP)

- GNP is the value of output produced by domestic factors of production both inside and outside the country's borders.
- Factor incomes generated by corporations and residents of the country.
- Exclude foreigners' earnings inside the country.
- Include earnings by corporations and residents abroad.

GNP = GDP + net factor incomes from abroad

1.4.2 GDP VS. GNP

- Thailand $\rightarrow$ import some inputs from aboard $\rightarrow$ output (goods and services)
- Some of Thai factors of production $\rightarrow$ is used aboard $\rightarrow$ output (goods and services)
- Gross Domestic Product (GDP) : “Geographic based”
- Gross National Product (GNP) : “Ownership based”
- GDP is superior to GNP as a measure of domestic economic activity.
- GNP is superior to GDP as a measure of the economic well-being of domestic residents.

1.4.3 **Thailand’s GDP :**

- The statistics are prepared by the National Economic and Social Development Board (NESDB).
  - GDP by expenditures;
  - GDP by production sectors;
  - GDP by factor income distribution.

2.1 Nominal GDP

- GDP must be calculated in value terms.
- Nominal GDP uses the current-year prices for the current year quantities of final goods.
- Market-price GDP; Current-price GDP.
- Nominal GDP growth includes the combined effect of changes in prices and quantities.

Nominal GDP growth

- Nominal GDP uses prices of the current year.
- So nominal growth includes price changes!

$$GDP^{2015} = \sum_i P_i \cdots\cdots Q_i^{2015}$$

$$GDP^{2014} = \sum_i P_i \cdots\cdots Q_i^{2014}$$

$$g^{2015} = \left[\frac{GDP^{2015}}{GDP^{2014}} - 1\right] \times 100 : \text{ unit=\%}$$

2.2 Real GDP

2.2.1 Real GDP : Calculations by using base-year

- Real GDP uses the base-year prices for the current-year quantities of final goods.
- Constant-price GDP.
- Real GDP growth includes only the change in the quantities of final goods.
- Assume the base year = 1988

$$rGDP^{2015} = \sum_i P_i \cdots\cdots Q_i^{2015}$$

$$GDP^{2014} = \sum_i P_i \cdots\cdots Q_i^{2014}$$

$$rg^{2015} = \left[\frac{rGDP^{2015}}{rGDP^{2014}} - 1\right] \times 100 : \text{ unit=\%}$$

2.2.2 Problems with a fixed base year

- If the base year changes, GDP figures also change — the NESDB has used four base years (1956 1962 1972 1988).
- Fixed base years do not reflect economic changes over time.
- Changes in the composition of output and relative prices.
- Improved quality of existing products. New goods come to markets; old goods die out.

3.1. The geometric mean of the real GDP growth rates between the two-year period.

1. Calculate the real GDP growth using year-1 prices.
    1. Calculate the real GDP growth using year-2 prices.
    2. Compute their geometric mean to get the annual chain-weighted growth rate from Year 1 to Year 2.
    3. Do the same for any pair of the successive two-year set.

$$RGDP_P^Q: \qquad RGDP_{2014}^{2014} = 130, \qquad RGDP_{2014}^{2015} = 135,$$

$$RGDP_{2015}^{2014} = 133, \qquad RGDP_{2015}^{2015} = 139$$

$$1.\, g_{P=2014}^{Y=2015} = g_{2012}^{2013}: \quad \left[\frac{RGDP_{2014}^{2015}}{RGDP_{2014}^{2014}} - 1\right] \times 100 = \left[\frac{135}{130} - 1\right] \times 100 = 3.8\%$$

$$2.\, g_{P=2015}^{Y=2015} = g_{2013}^{2013}: \quad \left[\frac{RGDP_{2015}^{2015}}{RGDP_{2015}^{2014}} - 1\right] \times 100 = \left[\frac{139}{135} - 1\right] \times 100 = 4.5\%$$

$$\begin{aligned} \text{3. Geometric} \quad g^{2015} &= \sqrt{(1 + g_{2014}^{2015}) \times (1 + g_{2015}^{2015})} - 1 \\ \text{mean} &= \sqrt{1.038 \times 1.045} - 1 \\ &= 4.149\% \end{aligned}$$

- Example :The profit of Company B, OZYS Ltd., has grown the over last three years by 2.5%, 3%, and 3.5%. Here we cannot use the arithmetic mean and say that the average growth was 3%. Why not?

Suppose that Company B, OZYS Ltd., started with a 100-million-dollar profit. Three years later it will have become:

$100,000,000 * 1.025 * 1.03 * 1.035 = $109,270,125.

3.2. Chain-volume-measure GDP

- calculate Direct Index (DI).
  - GDP for Year 2 using prices in Year 1.
  - GDP for Year 1 using prices in Year 1.
- Direct Index for Year 2 is the annual growth rate of Year 2 using Year 1 prices.

2011 2012 2013 2014 2015

$\overbrace{\quad}^{DI_{2012}}$ $\overbrace{\quad}^{DI_{2013}}$ $\overbrace{\quad}^{DI_{2014}}$ $\overbrace{\quad}^{DI_{2015}}$

rg_{2012} rg_{2013} rg_{2014} rg_{2015}

- 2011 = Base year
- Real GDP 2011 = Nominal GDP 2011
- 1+ growth rate = Direct Index
- real GDP 2012 = ?
- real GDP 2013 = ?
- real GDP 2014 = ?
- real GDP 2015 = ?

- Example : Chain-Volume-Measure GDP - CVM. Given the following infomation, calculate CVM GDP in 2012, 2013, 2014 and 2015. The base year is 2012. Show how to calculate.

t	GDP (2012's Price) $\sum_i P_{i,2012} Q_{i,t}$ unit: \$	GDP (2013's Price) $\sum_i P_{i,2013} Q_{i,t}$ unit: \$	GDP (2014's Price) $\sum_i P_{i,2014} Q_{i,t}$ unit: \$	GDP (2015's Price) $\sum_i P_{i,2015} Q_{i,t}$ unit: \$
2012	100	108	115	125
2013	105	110	120	130
2014	110	121	125	140
2015	120	130	150	160

*Note : The numbers in the table may not be very realistic. The main idea is just to understand the CVM method.

- real GDP 2012 = ?
- real GDP 2013 = ?
- real GDP 2014 = ?
- real GDP 2015 = ?

3.2. Chain-volume-measure GDP

- **Step 1**: calculate Direct Index (DI).
  - GDP for Year 2 using prices in Year 1.
  - GDP for Year 1 using prices in Year 1.
- Direct Index for Year 2 is the annual growth rate of Year 2 using Year 1 prices.
  - Do the same for Year 3, Year 4, ...
  - Each year has its own DI based on the previous year's prices.

$$\begin{aligned} GDP^t &= \sum_i P^{t-1} \times Q^t \\ GDP^{t-1} &= \sum_i P^{t-1} \times Q^{t-1} \end{aligned}$$

$$DI^t = \frac{GDP^t}{GDP^{t-1}} = \frac{\sum_i P^{t-1} \times Q^t}{\sum_i P^{t-1} \times Q^{t-1}}$$

- Chain index: Base year =2011

$$DI^{2015} = \frac{\sum_i P^{2014} \times Q^{2015}}{\sum_i P^{2014} \times Q^{2014}}$$

$$DI^{2014} = \frac{\sum_i P^{2013} \times Q^{2014}}{\sum_i P^{2013} \times Q^{2013}}$$

$$DI^{2013} = \frac{\sum_i P^{2012} \times Q^{2013}}{\sum_i P^{2012} \times Q^{2012}}$$

$$DI^{2012} = \frac{\sum_i P^{2011} \times Q^{2012}}{\sum_i P^{2011} \times Q^{2011}}$$

- **Step 2**: create the Chain Index (CI).
  - Link the series of DI's into CI for each year.
  - CI for each year is the geometric mean of growth rates from the base year (2011).
  - CI = cumulative growth rate from 2011.

$$C_{2011}^{2015} = CI^{2015} = DI^{2015} \times DI^{2014} \times DI^{2013} \times DI^{2012}$$

$$C_{20011}^{2014} = CI^{2014} = DI^{2014} \times DI^{2013} \times DI^{2012}$$

$$C_{2011}^{2013} = CI^{2013} = DI^{2013} \times DI^{2012}$$

$$C_{2011}^{2012} = CI^{2012} = DI^{2012}$$

- **Step 3**: calculate chain-volume-measure GDP value using CI and the base-year value.
  - Use the value of nominal GDP 2009 as reference.

$$\text{CVM}GDP^{2012}_{2011} = GDP^{2011} \times CI^{2012}$$

$$\text{CVM}GP^{2013}_{2011} = GDP^{2011} \times CI^{2013}$$

$$\text{CVM}GDP^{2014}_{2011} = GDP^{2011} \times CI^{2014}$$

$$\text{CVM}GDP^{2015}_{2011} = GDP^{2011} \times CI^{2015}$$

3.3. Notes on CVM GDP

- The calculated growth rates are closer to reality.
- Growth rates from DI, CI and CVM are identical.
- CVM series are non-additive.
- For the base year, GDP subcategories sum up to total GDP.
- For other years, subcategories do not sum up.

3.4 Implicit GDP price deflator

- The ratio of the nominal GDP to the real GDP of a given year.
- The most comprehensive price index.
  - includes prices of all final goods and services.

$$\text{Implicit GDP Deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} \times 100$$

4. Price index and inflation

- Price index is a weighted average of the prices of a basket of the goods and services produced over a period of time.
  - Consumer price index (CPI).
  - Producer price index (PPI).
- Inflation is the rate of change in the price index.

4.1 Calculations of Consumer Price Index

- The consumer price index (CPI) uses the current-year prices and the base-year quantities of the goods.
- Base year = 2007; $CPI_{2007} = 100$

$$CPI^{2015} = \frac{\sum(Q^{2007} P^{2015})}{\sum(Q^{2007} P^{2007})} \times 100$$

4.2 Calculation of inflation

- Inflation can be calculated by using either the implicit GDP price deflator or CPI.

$$\text{CPI Inflation} = \left[\frac{CPI^{2015}}{CPI^{2014}} - 1\right] \times 100\%$$

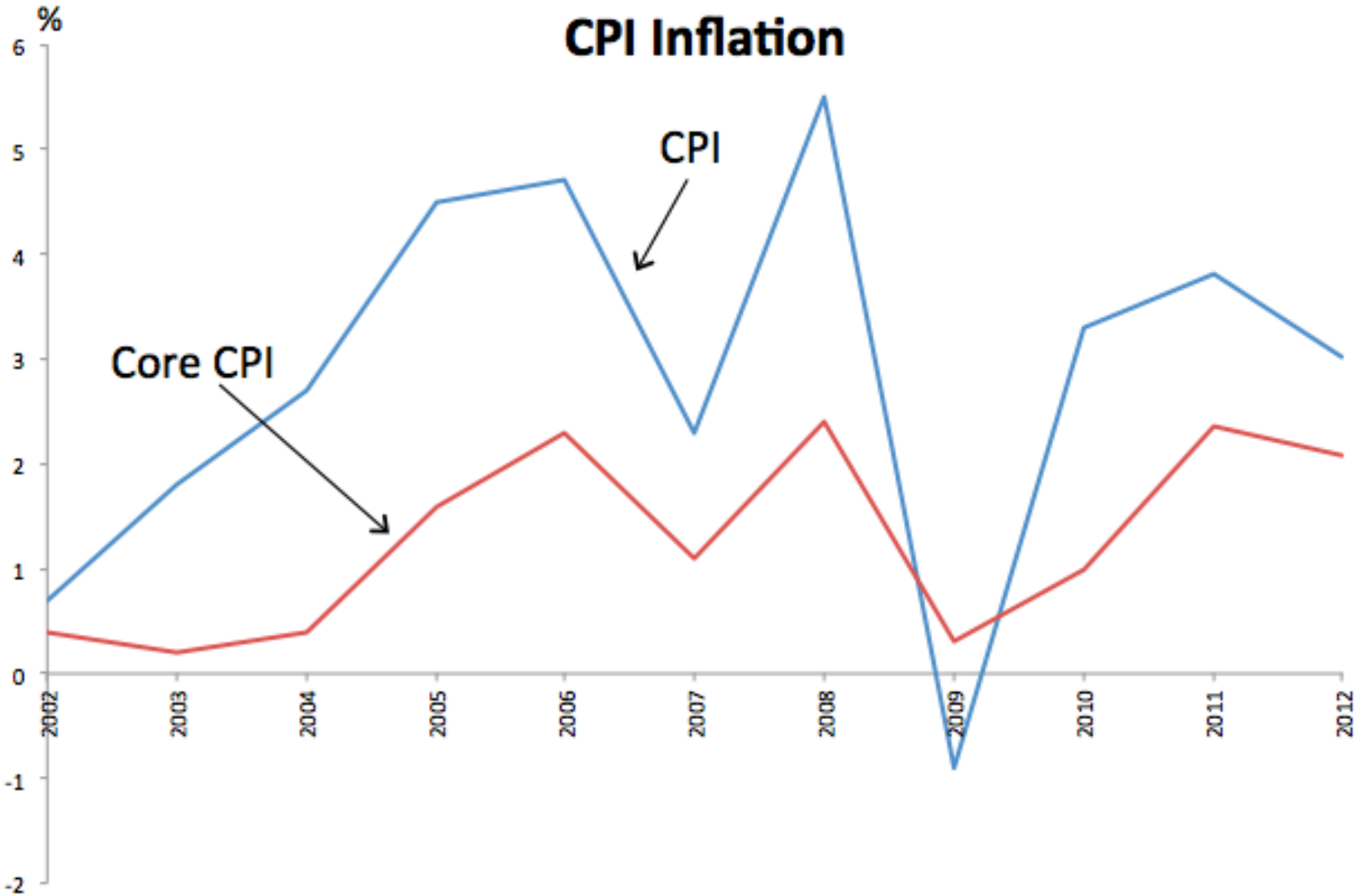
$$\text{GDP Deflator Inflation} = \left[\frac{\text{GDP Deflator}^{2015}}{\text{GDP Deflator}^{2014}} - 1\right] \times 100\%$$

4.3. Problems with price indices

- Changes in the relative prices over time.
  - Assuming no change in consumers' choice despite changes in relative prices.
  - The items with rising prices will be over-weighted.
- Changes in the quality of the goods over time.
- Emergence of new goods.

4.4 Thailand's inflation figures

- The series are calculated monthly by the Bureau of Trade and Economic Indices, Internal Trade Department Ministry of Commerce General
  - **CPI**: prices of 7 groups (373 items) of goods and services.
  - **Core CPI:** prices of 266 items, excluding fresh food and energy group (107 items).


CPI Inflation
%
6
5
4
3
2
1
0
-1
-2
CPI
Core CPI
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012

29

5.1. Measurement

- Working-age population: labor force plus not in labor force.
- Labor force = the employed + unemployment.
- The participation rate = the employed/total labor force.
- Unemployment rate = the unemployed/labor force.

5.2. Problem with unemployment figures

- Discouraged workers: those who wish to work but have stopped searching for jobs and thus are dropped out of the labor force.
- Unemployment figures do not reflect the intensity of job searching.

5.3 Thailand's labor force figures

- Statistics collected by the NESDB. Labor force: persons with the age of 15-59.
- Underemployment: work less than 35 hours and available for more.
- Unemployment in Thailand is mostly structural and seasonal.

2012	Thousand persons	%
Population	67,871.96	100
- Age under 15	13,377.93	19.7
- Age 15 and over	54,514.03	80.3
Labor force	39,408.99	58.1
- Employment	38,941.1	57.4
- of which underemployment	348.08	0.5
- Unemployment	259.09	0.4
Unemployment rate	0.66%	