

Chapter 2 : Macroeconomic Measurement

EE312

Macroeconomics, Stephen Williamson, Chapter 2

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- 1 Review on Gross Domestic Product (GDP)
- 2 Nominal GDP Vs. Real GDP
- 3 Chain-weighted real GDP
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1. Review on Gross Domestic Product (GDP)

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.

$$\text{GNP} = \text{GDP} + \text{net factor incomes from abroad}$$

1.4.2 GDP VS. GNP

- Thailand → import some inputs from abroad → output (goods and services)
- Some of Thai factors of production → is used abroad → 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. Nominal GDP and Real GDP

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!

$$GDP^{2013} = \sum_i P_i \dots Q_i^{2013}$$

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$$g^{2013} = \left[\frac{GDP^{2013}}{GDP^{2012}} - 1 \right] \times 100 : \text{unit}=\%$$

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

$$rGDP^{2013} = \sum_i P_i \dots Q_i^{2013}$$

$$GDP^{2012} = \sum_i P_i \dots Q_i^{2012}$$

$$rg^{2013} = \left[\frac{rGDP^{2013}}{rGDP^{2012}} - 1 \right] \times 100 : \text{unit}=\%$$

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. Chain-weighted real GDP

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.

$$RGDP_P^Q : \quad RGDP_{2012}^{2012} = 130, \quad RGDP_{2012}^{2013} = 135,$$

$$RGDP_{2013}^{2012} = 133, \quad RGDP_{2013}^{2013} = 139$$

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

$$2. g_{P=2013}^{Y=2013} = g_{2013}^{2013} : \left[\frac{RGDP_{2013}^{2013}}{RGDP_{2013}^{2012}} - 1 \right] \times 100 = \frac{139}{133} \times 100 = 4.5\%$$

$$3. \text{ Geometric mean } g^{2013} = \sqrt{g_{2012}^{2013} \times g_{2013}^{2013}} = \sqrt{3.8 \times 4.5} = 4.1\%$$

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.

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

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

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

- Chain index: Base year =2009

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

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

$$DI^{2011} = \frac{\sum_i P^{2010} \times Q^{2011}}{\sum_i P^{2010} \times Q^{2010}}$$

$$DI^{2010} = \frac{\sum_i P^{2009} \times Q^{2010}}{\sum_i P^{2009} \times Q^{2009}}$$

- **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 (2010).
 - CI = cumulative growth rate from 2009.

$$C_{2010}^{2013} = CI^{2013} = DI^{2013} \times DI^{2012} \times DI^{2011} \times DI^{2010}$$

$$C_{2010}^{2012} = CI^{2012} = DI^{2012} \times DI^{2011} \times DI^{2010}$$

$$C_{2010}^{2011} = CI^{2011} = DI^{2011} \times DI^{2010}$$

$$C_{2010}^{2010} = CI^{2010} = DI^{2010}$$

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

$$CVMGDP_{2009}^{2010} = GDP^{2009} \times CI^{2010}$$

$$CVMGDP_{2009}^{2011} = GDP^{2009} \times CI^{2011}$$

$$CVMGDP_{2009}^{2012} = GDP^{2009} \times CI^{2012}$$

$$CVMGDP_{2009}^{2013} = GDP^{2009} \times CI^{2013}$$

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; $CPI_{2007} = 100$

$$CPI^{2013} = \frac{\sum(Q^{2007}P^{2013})}{\sum(Q^{2007}P^{2007})} \times 100$$

4.2 Calculation of inflation

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

$$\text{CPI Inflation} = \left[\frac{CPI^{2013}}{CPI^{2011}} - 1 \right] \times 100\%$$

$$\text{GDP Deflator Inflation} = \left[\frac{\text{GDP Deflator}^{2013}}{\text{GDP Deflator}^{2011}} - 1 \right] \times 100\%$$

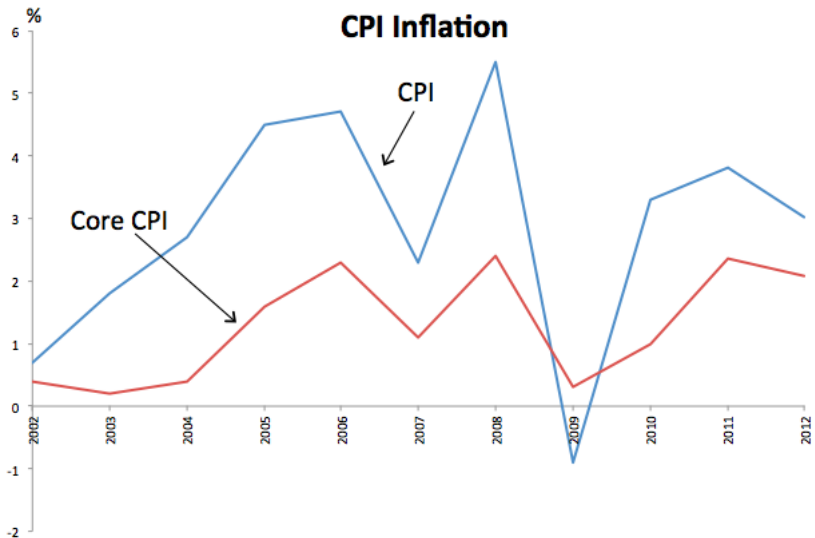
4.3. Problems with price indices

- 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



5. Labor market measurement

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%	