



ECON 310 - MACROECONOMIC THEORY

Instructor: Dr. Juergen Jung

Towson University

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Chapter 2: Measurement

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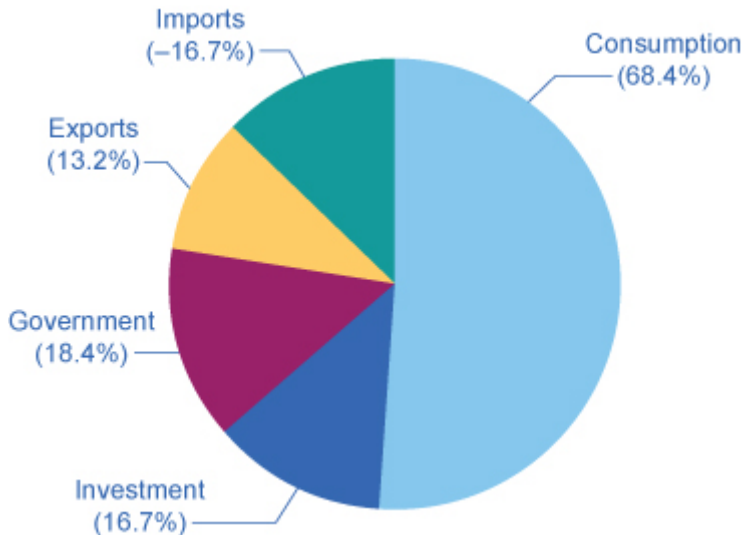
- 1 Understand basic issues concerning measurement of key macroeconomic variables
- 2 Need understanding of variables to understand the important role they play in economic models
- 3 Measuring GDP
- 4 Nominal and real GDP and price indices
- 5 Savings, wealth and capital
- 6 Labor market measurement

Measurement: A Review

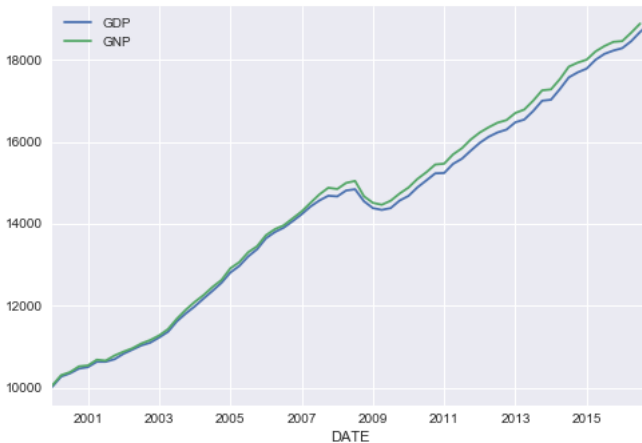
- Gross Domestic Product (GDP): dollar value of final output produced during a given period of time domestically.
- In the United States (US) measured quarterly as part of **National Income and Product Accounts** (NIPA).
- Three approaches:
 - 1 Product - sum of all the value-added in the economy (do not count intermediate goods).
 - 2 Expenditure - total spending on all final goods and services in the economy (do not count intermediate goods).
 - 3 Income - add up all incomes received by economic agents contribution to production.

GDP	C	I	G	NX
\$18,000	\$12,300	\$3,000	\$3,312	-\$630

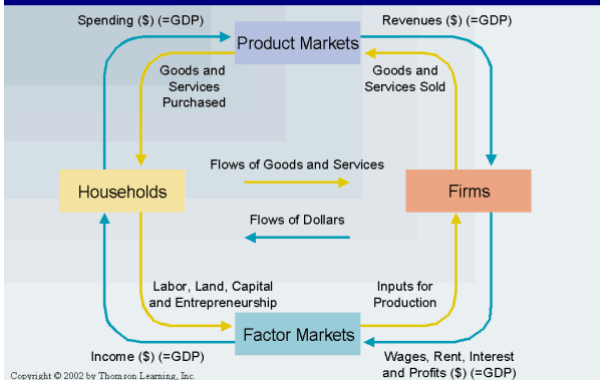
Components of GDP (2014)



GDP vs. GNP



The Circular Flow Model of Income and Output



National Income Accounting

Firm, Government and Household Sector

Table 2.1 Coconut Producer

Total Revenue	\$20 million
Wages	\$5 million
Interest on Loan	\$0.5 million
Taxes	\$1.5 million

Table 2.2 Restaurant

Total Revenue	\$30 million
Cost of Coconuts	\$12 million
Wages	\$4 million
Taxes	\$3 million

Table 2.3 After-Tax Profits

Coconut Producer	\$13 million
Restaurant	\$11 million

Table 2.4 Government

Tax Revenue	\$5.5 million
Wages	\$5.5 million

Table 2.5 Consumers

Wage Income	\$14.5 million
Interest Income	\$0.5 million
Taxes	\$1 million
Profits Distributed to Producers	\$24 million

GDP Using the Product Approach

Table 2.6 GDP Using the Product Approach

Value added - coconuts	\$20 million
Value added - restaurant food	\$18 million
Value added - government	\$5.5 million
GDP	\$43.5 million

GDP Using the Expenditure Approach

Table 2.7 GDP Using the Expenditure Approach

Consumption	\$38 million
Investment	0
Government Expenditures	\$5.5 million
Net Exports	0
GDP	\$43.5 million

GDP Using the Income Approach

Table 2.8 GDP Using the Income Approach

Wage Income	\$14.5 million
After-tax profits	\$24 million
Interest Income	\$0.5 million
Taxes	\$4.5 million
GDP	\$43.5 million

Extensions

- Production of 13 million coconuts (instead of 10) and storing the additional 3 million
- Restaurant imports 2 million coconuts from other islands for \$2.00 each and all of the coconuts are used in the Restaurant

U.S. GDP: Key Components

Table 2.9 Gross Domestic Product for 2011

Component of GDP	\$Billions	% of GDP
GDP	15,094.0	100.0
Consumption	10,726.0	71.1
Durables	1,162.9	7.7
Nondurables	2,483.7	16.4
Services	7,079.4	46.9
Investment	1,916.2	12.7
Fixed Investment	1,870.0	12.4
Nonresidential	1,532.5	10.2
Residential	337.5	2.2
Inventory Investment	46.3	0.3
Net Exports	-578.7	-3.8
Exports	2,085.5	13.8
Imports	2,664.2	17.7
Government Expenditures	3,030.6	20.1
Federal Defense	824.9	5.5
Federal Nondefense	407.9	2.7
State and Local	1,797.7	11.9

Problems with measuring GDP

TABLE 5.6 The World Underground Economy, 2002–2003

Region of the World	Underground Economy as Percent of Reported GDP
Africa	41%
Central and South America	41
Asia	30
Transition Economies	38
Europe, United States, and Japan	17
Unweighted Average over 145 Countries	35

Nominal vs. Real GDP

An Example of Nominal and Real GDP

Table 2.10 Data for Real GDP Example

	Apples	Oranges
Quantity in Year 1	$Q_1^a = 50$	$Q_1^o = 100$
Price in Year 1	$P_1^a = \$1.00$	$P_1^o = \$0.80$
Quantity in Year 2	$Q_2^a = 80$	$Q_2^o = 120$
Price in Year 2	$P_2^a = \$1.25$	$P_2^o = \$1.60$

An Example: Nominal GDP

- Period 1 nominal GDP is

$$GDP_1 = P_1^a Q_1^a + P_1^o Q_1^o = (1 \times 50) + (.8 \times 100) = 130.$$

- Period 2 nominal GDP is

$$GDP_2 = P_2^a Q_2^a + P_2^o Q_2^o = (1.25 \times 80) + (1.6 \times 120) = 292.$$

- Percentage growth in nominal GDP from 1 to 2 is :

$$\frac{GDP_2 - GDP_1}{GDP_1} \times 100 = 125 \text{ percent}$$

An Example: Real GDP

- Setting period 1 real GDP as period 1 nominal GDP

$$RGDP_1 = GDP_1 = 130.$$

- Holding prices constant in period 1 prices

$$RGDP_2 = P_1^a Q_2^a + P_1^o Q_2^o = (1 \times 80) + (.8 \times 120) = 176.$$

- Percentage growth in real GDP from 1 to 2 is :

$$\frac{RGDP_2 - GDP_1}{RGDP_1} \times 100 = \frac{176}{130} - 1 = 35.4 \text{ percent}$$

- Holding prices constant in period 2 prices, real GDP in period 1 is

$$RGDP_1 = P_2^a Q_1^a + P_2^o Q_1^o = (1.25 \times 50) + (1.6 \times 100) = 222.5$$

Chain-weighted Measure

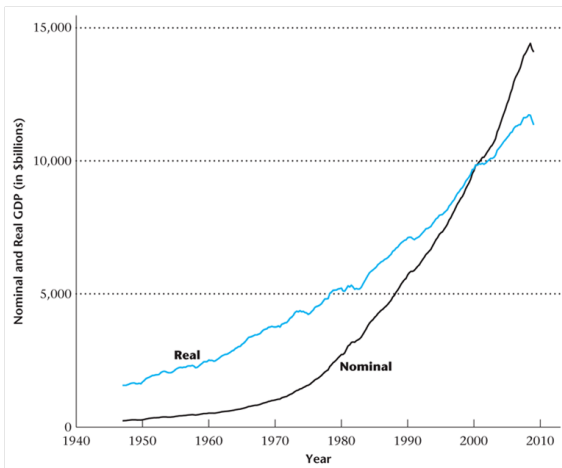
- Chain-weighted ratio of real GDP between two periods is:

$$g_c = (g_1)^{.5}(g_2)^{.5}$$

$$g_c = (RGDP_2^1/RGDP_1^1)^{.5}(RGDP_2^2/RDGP_1^2)^{.5} = 1.333$$

- This is a geometric average between consecutive ratios, each using either base year.
- So period 2 real GDP in period 1 dollars is
 $GDP_1 \times g_c = 130 \times 1.333 = 173.29$
- Or period 1 real GDP in period 2 dollars is
 $GDP_2 \div g_c = 292 \div 1.333 = 219.05$

Figure 1: Nominal and Chain-Weighted GDP



Price Level and CPI Inflation

Measures of Aggregate Price Level

- General Price Level (P-GDP)

$$\text{Implicit GDP price deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} * 100$$

- Consumer Price Index (CPI)

$$\text{CPI} = \frac{\text{Price}_{\text{current}} * \text{Quantity}_{\text{base}}}{\text{Price}_{\text{base}} * \text{Quantity}_{\text{base}}} * 100$$

- $\text{CPI}_1 = 100$ and $\text{CPI}_2 = \frac{222.5}{130} = 171.2$

Measures of Aggregate Price Level (cont.)

Table 2.11 Implicit GDP Price Deflators, Example

	Year 1	Year 2	% Increase
Year 1 = base year	100	165.9	65.9
Year 2 = base year	58.4	100	71.2
Chain-weighting	100	168.5	68.5

Figure 2: Inflation using CPI and GDP deflator

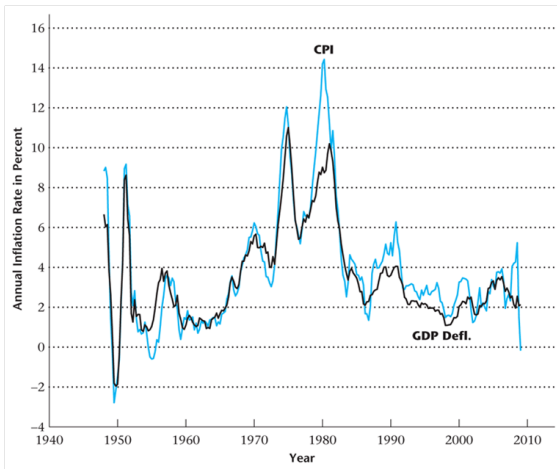


Figure 3: Price Level, CPI vs. GDP deflator

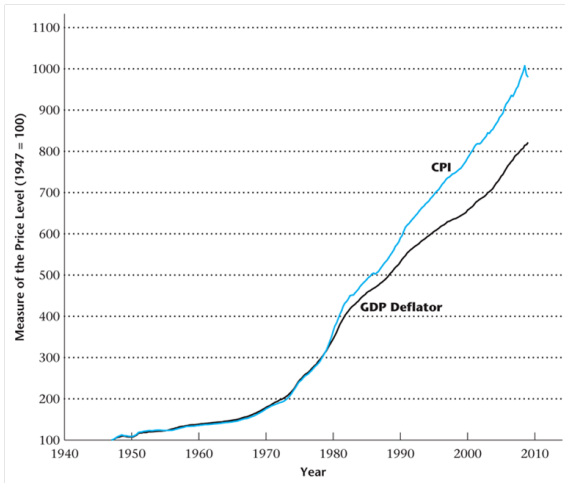


Figure 4: The Relative Price of Housing in the United States



Accounting Identities

- Private disposable Income (Y^d)

$$Y^d = Y + NFP + TR + INT - T$$

- NFP = Net Factor Payments,
- TR = Transfers from Govt to Private sector,
- INT=interest on govt debt,
- T = Taxes

Unemployment

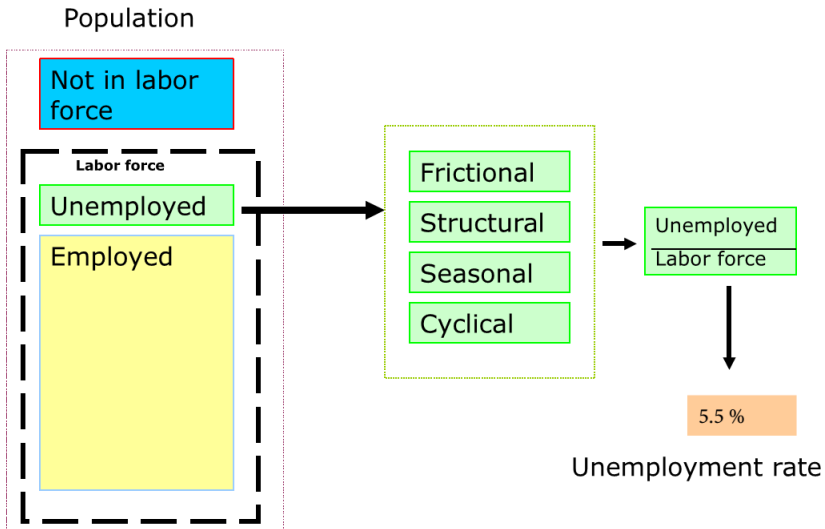
Who is Unemployed?

- Jack having lost his job in a car factory
- 15 year old Mike going to High school
- Homemakers
- Undergrad student at TU looking for a summer job in June
- Person who is serving in the army
- Uncle Bob working 10 hours per month at the local library
- Ski instructor in June in Colorado

Definition of Unemployment

- Labor Force:
 - 16+,
 - non-institutionalized
 - non-retired
 - non-student
 - non-military and
 - able to work
- Labor Force = Employed + Unemployed

Unemployment: Labor Force and Unemployment



Labor Force Participation Rate in 2015

- The labor force participation rate is the fraction of the population that is over 16 years of age that is in the labor force

$$\text{labor force participation rate} = \frac{\text{labor force}}{\text{population} \geq 16}$$

- The labor force participation rate for this year was 62.8%
- The unemployment rate was 5.5%

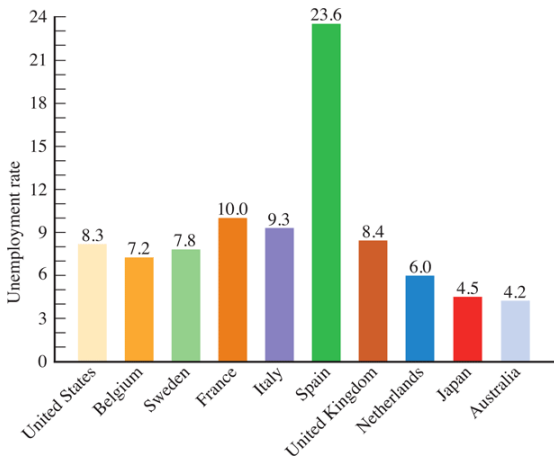
Four Types of Unemployment

- 1 Frictional Unemployment
- 2 Seasonal Unemployment
- 3 Structural Unemployment
- 4 Cyclical Unemployment

Question Revisited: Who is Unemployed?

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Unemployment Rates around the World



Alternative Measures of Unemployment

