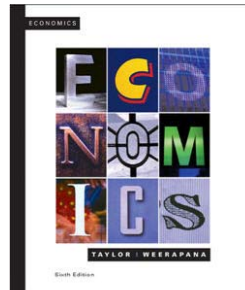


Economics 202 Principles Of Macroeconomics

Professor Yamin Ahmad

Lecture 6

- Measuring GDP
- Real GDP and the Price Level
- Economic Growth and Welfare



Big Concepts

- Ways to Measure GDP
 - Expenditure Approach
 - Income Approach
 - Value Added Approach
- GDP Deflator
- Why measure Economic Growth Rates?...

Note: These lecture notes are incomplete without having attended lectures.

Measuring U.S. GDP

- The Bureau of Economic Analysis uses two approaches to measure GDP:
 - **The Expenditure Approach**
 - **The Income Approach**
- An alternative approach is to compute value added at each stage of production

Note: These lecture notes are incomplete without having attended lectures.

The Expenditure Approach

- The **Expenditure Approach** measures GDP as the sum of consumption expenditure, investment, government purchases of goods and services, and net exports.
- [NIPA Table 1.1.5: GDP](#)

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The Components of Gross Domestic Product in 2008

	Billions of dollars	Percent of GDP
GDP (Y)	14,413	100
1. Consumption (C)	10,163	70.5
2. Investment (I)	2,011	14
Nonresidential	1,581	11.0
Residential	479	3.3
3. Government spending (G)	2,946	20.4
4. Net exports	-708	-4.9
Exports (X)	1,969	13.7
Imports (IM)	-2,677	-18.6
5. Inventory investment	-49.7	0.5

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The Components of Gross Domestic Product in 2008

- **Consumption:** Approx 70% of US GDP
 - Includes expenditure on durables, which is like investment
- **Investment:** Approx 14% of GDP
 - 14% private, 3.5% public. We shall ignore the latter (typically included in government expenditures);
 - Includes accumulation of inventories of unsold goods and work in progress (very volatile but small on average).

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The Components of Gross Domestic Product in 2006

- **Government Consumption:** Approx 16.5% of GDP
 - Including public investment, total public spending on goods and services becomes approximately 20% of GDP
 - Does not include spending on pensions, etc., which are like negative income taxes;
 - Including these **transfer payments** total public spending is 33% of GDP.
- **Exports:** Approx 14% of GDP
- **Imports:** Approx 19% of GDP

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The Income Approach

- The **Income Approach** measures GDP by summing the incomes that firms pay households for the factors of production they hire.
- [NIPA Table 1.12: National Income by Type of Income](#)
- [NIPA Table 1.10 Gross Domestic Income by Type of Income](#)

Note: These lecture notes are incomplete without having attended lectures.

Measuring U.S. GDP

- The *National Income and Product Accounts* divide incomes into five categories:
 1. Compensation of employees
 2. Net interest
 3. Rental income
 4. Corporate profits
 5. Proprietors' income
- The sum of these five income components is *net domestic income (or national income) at factor cost*.

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Measuring U.S. GDP

Two adjustments must be made to get GDP:

6. Indirect taxes minus subsidies are added to get from *factor cost* to *market prices*.
 - This gives us *net domestic income or net domestic product*
7. Depreciation (or capital consumption) is added to get from *net* domestic product to *gross* domestic product.

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Example of Income Approach

- The table to the right shows the NIPA numbers for the third quarter of 2008
- Calculate Net National Income
 - Answer:
- Calculate GDP
 - Answer:

Items	2008 Q3
Compensation of Employees	8087.6
Proprietors Income	901
Rental Income	1080.5
Corporate Profits	68.5
Net Interest Payments	1136.4
Indirect Taxes	1044
Subsidies	50
Depreciation	1898

Source: Bureau of Economic Analysis; Numbers above are in billions of US dollars

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Value Added Approach: (Exercise)

1. A farmer grows a bushel of wheat and sells it to a miller for \$1.00.
2. The miller turns the wheat into flour and sells it to a baker for \$3.00.
3. The baker uses the flour to make a loaf of bread and sells it to an engineer for \$6.00.
4. The engineer eats the bread.

Compute & compare value added at each stage of production and GDP

Note: These lecture notes are incomplete without having attended lectures

Final goods, value added, and GDP

- GDP = value of final goods produced
= sum of value added at all stages of production.
- The value of the final goods already includes the value of the **intermediate** goods, so including **intermediate** and **final** goods in GDP would be double-counting.
- Gross Domestic Product (at current prices)
= Value of goods and services
less cost of intermediate inputs
= $P_1Q_1 + P_2Q_2 + \dots + P_nQ_n$

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Real GDP and the Price Level

- **Real GDP** is the value of final goods and services produced in a given year when valued at constant prices.
- Calculating Real GDP
 - The first step in calculating real GDP is to calculate **nominal GDP**, which is the value of goods and services produced during a given year valued at the prices that prevailed in that same year.

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Real GDP and the Price Level

- The table provides data for 2002 and 2003.
- In 2002, nominal GDP is:
 - Expenditure on balls \$100
 - Expenditure on bats \$100
- Nominal GDP \$200

Item	Quantity	Price
2002		
Balls	100	\$1.00
Bats	20	\$5.00
2003		
Balls	160	\$0.50
Bats	22	\$22.50

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Real GDP and the Price Level

- In 2003, nominal GDP is:
 - Expenditure on balls \$80
 - Expenditure on bats \$495
- Nominal GDP \$575

Item	Quantity	Price
2002		
Balls	100	\$1.00
Bats	20	\$5.00
2003		
Balls	160	\$0.50
Bats	22	\$22.50

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Real GDP and the Price Level

- The old method of calculating real GDP was to value each year's output at the prices of a base year—the *base year prices method*.
- Suppose 2002 is the base year and 2003 is the current year.

Item	Quantity	Price
2002		
Balls	100	\$1.00
Bats	20	\$5.00
2003		
Balls	160	\$0.50
Bats	22	\$22.50

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Real GDP and the Price Level

- Expenditure on balls in 2003 valued at 2002 prices is \$160.
- Expenditure on bats in 2003 valued at 2002 prices is \$110.
- Real GDP in 2003 (base-year prices method) is \$270.

Item	Quantity	Price
2002		
Balls	100	\$1.00
Bats	20	\$5.00
2003		
Balls	160	\$0.50
Bats	22	\$22.50

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Practice Question:

Item	2006		2007		2000
	Price	Quantity	Price	Quantity	Price
Apples	\$1	100	\$1.50	200	\$2
Bananas	\$0.50	100	\$1	100	\$1
Chocolate	\$2	200	\$1	400	\$1

From the table above:

- Calculate Nominal GDP in 2006 and 2007.
- Suppose that 2000 is the base year. Calculate Real GDP in 2006 and 2007.
- What is the percentage change in real GDP?

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Real GDP and the Price Level

- The new method of calculating real GDP, which is called the **chain-weighted output index** method, uses the prices of two adjacent years to calculate the real GDP growth rate.
- This calculation has four steps described on the next slide.

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Real GDP and the Price Level

- Step 1: Value last year's production and this year's production at *last year's prices* and then calculate the growth rate of this number from last year to this year.
- Step 2: Value last year's production and this year's production at *this year's prices* and then calculate the growth rate of this number from last year to this year.
- Step 3: Calculate the average of the two growth rates. This average growth rate is the growth rate of real GDP from last year to this year.
- Step 4: Repeat steps 1, 2, and 3 for each pair of adjacent years to link real GDP back to the base year's prices.

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Real GDP and the Price Level

Using numbers from our previous example, we have done step 1:

- 2002 production at 2002 prices (GDP in 2002) is \$200.
- 2003 production at 2002 prices is \$270.
- The 2003 growth rate in 2002 prices is 35 percent.

Item	Quantity	Price
2002		
Balls	100	\$1.00
Bats	20	\$5.00
2003		
Balls	160	\$0.50
Bats	22	\$22.50

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Real GDP and the Price Level

Step 2:

- 2002 production at 2003 prices is \$500.
- 2003 production at 2003 prices (GDP in 2003) is \$575.
- The 2003 growth rate in 2003 prices is 15 percent.

Item	Quantity	Price
2002		
Balls	100	\$1.00
Bats	20	\$5.00
2003		
Balls	160	\$0.50
Bats	22	\$22.50

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Real GDP and the Price Level

Step 3:

- The 2003 growth rate in 2002 prices is 35 percent.
- The 2003 growth rate in 2003 prices is 15 percent.
- The average of these two growth rates is 25 percent.
- Real GDP in 2003 with 2002 as the base year is \$250.

Item	Quantity	Price
2002		
Balls	100	\$1.00
Bats	20	\$5.00
2003		
Balls	160	\$0.50
Bats	22	\$22.50

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Real GDP and the Price Level

Step 4:

- Because we're calculating real GDP in 2003 at 2002 prices, step 4 is completed!
- Real GDP in 2002 is \$200.
- Real GDP in 2003 is \$250.

Item	Quantity	Price
2002		
Balls	100	\$1.00
Bats	20	\$5.00
2003		
Balls	160	\$0.50
Bats	22	\$22.50

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Calculating the Price Level

- The average level of prices is called the **price level**.
- One measure of the price level is the **GDP deflator**, which is an average of the prices of the goods in GDP in the current year expressed as a percentage of the base year prices.

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Real GDP and the Price Level

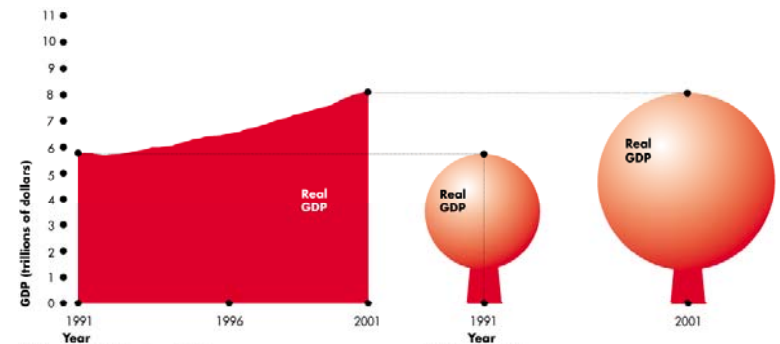
- Nominal GDP and real GDP are calculated in the way that you've just seen.
- $\text{GDP Deflator} = (\text{Nominal GDP} / \text{Real GDP}) \times 100$.
- In 2002, the GDP deflator is $(\$200 / \$200) \times 100 = 100$.
- In 2003, the GDP deflator is $(\$575 / \$250) \times 100 = 230$.

Year	Nominal GDP	Real GDP	GDP deflator
2002	\$200	\$200	100
2003	\$575	\$250	230

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Real GDP and the Price Level

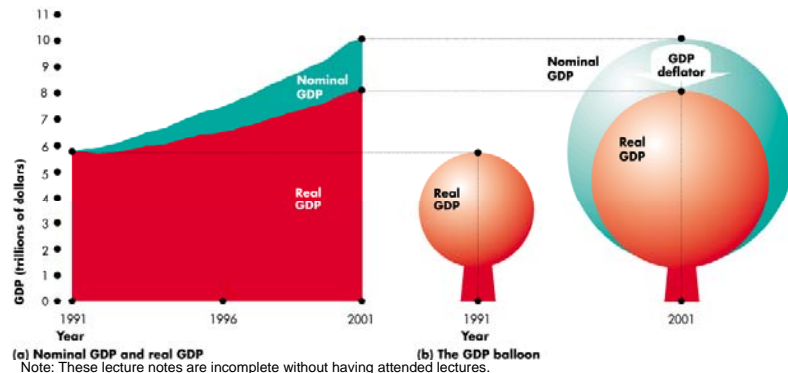
- Deflating the GDP Balloon
 - Nominal GDP increases because production—real GDP—increases.



(a) Nominal GDP and real GDP
 (b) The GDP balloon
 Note: These lecture notes are incomplete without having attended lectures.

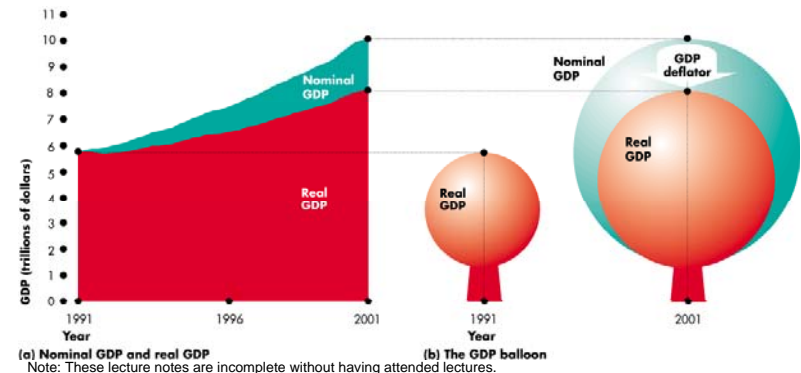
Real GDP and the Price Level

- Deflating the GDP Balloon
 - Nominal GDP also increases because prices rise.



Real GDP and the Price Level

- Deflating the GDP Balloon
 - We use the GDP deflator to let the air out of the nominal GDP balloon and reveal real GDP.



Measuring Economic Growth

- We use real GDP to calculate the economic growth rate.
- The **economic growth rate** is the percentage change in the quantity of goods and services produced from one year to the next.
- We measure economic growth so we can make:
 - Economic welfare comparisons
 - International welfare comparisons
 - Business cycle forecasts

Note: These lecture notes are incomplete without having attended lectures.

Economic Welfare Comparisons

- Economic welfare measures the nation's overall state of economic well-being.
- Real GDP is not a perfect measure of economic welfare for seven reasons:
 1. Quality improvements tend to be neglected in calculating real GDP so the inflation rate is overstated and real GDP understated.
 2. Real GDP does not include household production, that is, productive activities done in and around the house by members of the household.

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Economic Welfare Comparisons

- Economic welfare measures the nation's overall state of economic well-being.
- Real GDP is not a perfect measure of economic welfare for seven reasons:
 3. Real GDP, as measured, omits the underground economy, which is illegal economic activity or legal economic activity that goes unreported for tax avoidance reasons.
 4. Health and life expectancy are not directly included in real GDP.

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Economic Welfare Comparisons

- Economic welfare measures the nation's overall state of economic well-being.
- Real GDP is not a perfect measure of economic welfare for seven reasons:
 5. Leisure time, a valuable component of an individual's welfare, is not included in real GDP.
 6. Environmental damage is not deducted from real GDP.
 7. Political freedom and social justice are not included in real GDP.

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International Comparisons

- Real GDP is used to compare economic welfare in one country with that in another.
- Two special problems arise in making these comparisons.
 - Real GDP of one country must be converted into the same currency units as the real GDP of the other country, so an exchange rate must be used.
 - The same prices should be used to value the goods and services in the countries being compared, but often are not.

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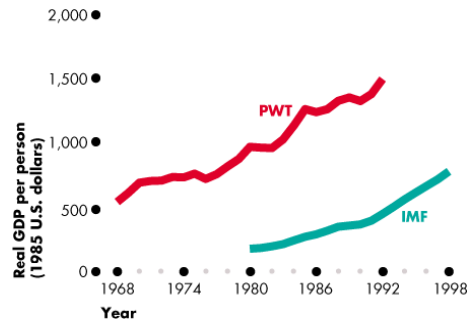
Measuring Economic Growth

- Using the exchange rate to compare GDP in one country with GDP in another country is problematic because prices of particular products in one country may be much less or much more than in the other country.
- Using the exchange rate to value Chinese GDP in dollars leads to an estimate that U.S. real GDP per person was 69 times Chinese real GDP per person.

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Measuring Economic Growth

- Using purchasing power parity prices leads to an estimate that per person GDP in the United States is (only) 12 times that in China



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Business Cycle Forecasts

- Real GDP is used to measure business cycle fluctuations.
- These fluctuations are probably accurately timed but the changes in real GDP probably overstate the changes in total production and people's welfare caused by business cycles.

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Review Questions:

- What are the two approaches to calculating GDP? What formula depicts these two approaches?
- For each approach, what items have to be added up to calculate GDP?
- What adjustments need to be made to total income to make it equal to GDP?
- What is the difference between nominal and real GDP? Why would we want to calculate real GDP?
- How is real GDP calculated by the base year prices method? What is the intuition behind calculating real GDP this way?
- What are some problems with calculating real GDP by the base year prices method?
- What are the four steps involved in calculating real GDP by the chain-weighted method?
- What is the GDP Deflator? How is it calculated?
- What are some of the reasons for calculating real GDP?
- For each reason, explain some of the problems associated with using real GDP for that purpose.

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