ECON 206
MACROECONOMIC ANALYSIS

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Chapter # 2

National income accounting produces estimates of **GDP**

- **G**ross **D**omestic **P**roduct measures the total value of production in an economy in a year
- Everything produced must be purchased (or be placed in an inventory), that is, bought and sold
- So total production equals total expenditures equals total income

Measuring the Macroeconomy (Chapter 2)

An example

- Homer and Marge own a tangerine farm with workers
- Production: In 2005, their workers picked 100 tangerines whose market value was $1 per tangerine
- Expenditure: In 2005, their fruit stand sold 100 tangerines at $1 per tangerine
- Income: In 2005, Homer and Marge netted a profit of $33 while their workers earned $67
- Measured each way, GDP for the farm is $100 in 2005

How do we measure well-being?

- We can think of many different but equally meaningful dimensions of human well-being:
  - Happiness, health, employment, income, consumption
- But how do you measure them?
- Today, we might just ask people by conducting a survey, but detailed surveys are difficult to conduct frequently, even today
- **National income accounting** produces frequent estimates of well-being along a significant and easily measured dimension: income

The most commonly used measure of GDP is of expenditures grouped by function

- The national income identity is:
  - $Y = C + I + G + NX$
- Income equals consumption
  - plus investment
  - plus government purchases
  - plus net exports (exports minus imports)
- Or: Count up all the cars, industrial machines, roadways, telecommunications exports, and subtract imported cars

- GDP was $11 trillion in 2003
- Most (70%) of GDP is consumption
- Government purchases include national defense, roads, *but not transfers or taxes*
- Net exports is also called the trade balance

Table 2.1: The Composition of U.S. GDP in 2003

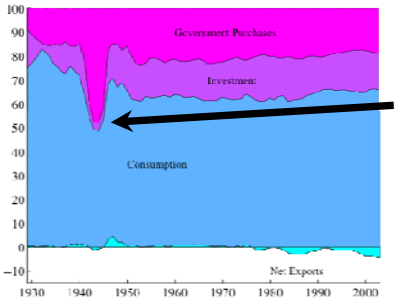
	Total (billions of dollars)	Share of GDP	Per Person (dollars)
Gross domestic product	11,004	100.0%	37,808
Consumption	7,761	70.5%	26,665
Motor vehicles and parts	440	4.0%	1,512
Food	1,064	9.7%	3,657
Housing	1,188	10.8%	4,083
Medical care	1,301	11.8%	4,470
Investment	1,666	15.1%	5,723
Structures (Nonresidential)	282	2.6%	969
Equipment and software	833	7.6%	2,862
Residential	572	5.2%	1,966
Government purchases	2,076	18.9%	7,131
National defense	496	4.5%	1,706
Net Exports	-498	-4.5%	-1,711
Exports	1,046	9.5%	3,595
Imports	1,544	14.0%	5,306

Source: U.S. Department of Commerce, Bureau of Economic Analysis, http://www.bea.gov.

GDP is "value added"

- The macroeconomy is filled with many interdependent consumers and firms, not just one Homer and Marge, Inc.
- When measuring the total value of production, it is vital not to **double count** by mistreating the value of intermediate production; You must either count only final goods *OR* value added
- Example:
  - A steel company produces $10 million worth of steel
  - A car company buys it and produces $100 million in cars
  - Total GDP is [redacted]: either the $100 million in final goods (the cars) or the $10 million in steel produced plus the value added by the car company, which is 100 – 10 = $90 million

Figure 2.1: Composition of GDP, 1929-2003



- By function, the composition of GDP has been fairly stable over time
- But World War II was a time of vastly expanded government purchases
- More recently, consumption has risen while net exports have fallen.
- Why? Stay tuned...

Limitations to the GDP measure

- GDP only measures market transactions
  - Anything you "pay yourself to do," like housekeeping, own child-care, etc. does not get measured
  - This is a huge problem in countries with large black markets
  - Sales of used goods are not counted because they are not produced, only transferred between individuals
- GDP does not measure health or the environment
- Separating prices and quantities out of a measure of total value is difficult

- Income shares of GDP have also remained stable over time
- There are two factors of production:
- Labor: workers earning wages, including business owners
- Capital: machinery, buildings, equipment
- Later, we'll investigate further

Figure 2.3: Labor's Share of Gross Domestic Product

Source: U.S. Department of Commerce and author's calculations.

Prices and quantities

- Why the distinction? Well-being is better measured by quantities: years of life, number of donuts, etc.
- In microeconomics, we would be able to observe these more easily with particular goods, at particular times
  - For example, in telecommunications: quantities are bits of data transmitted, prices are dollars per bit
- In macroeconomics, we measure a composite "good," which is all production = income, and we measure it over time
- The same accounting principle holds:
  - [redacted]
  - Nominal GDP = Price Level x Real GDP
- But the Price Level changes over time, creating a problem

Our goal: Recover quantities from total expenditures to gauge well-being over time

- Price levels change over time — this is called **inflation**, and we will study it in Chapter 7
- What is the right price level for measuring real GDP over several years? (Real GDP = Nominal GDP ÷ **Price Level**)
- We have 3 choices:
  - Initial prices (Laspeyres)
  - Final prices (Paasche)
  - A mixture of the two (Chain Weighted or Fisher)

Real GDP in an economy that produces apples and computers

- In 2005, suppose the economy produces 500 apples and 5 computers at prices of $2 per apple and $1,000 per computer
- In 2006, suppose production is 550 apples and 6 computers at prices of $3 per apple and $1,000 per computer

Each method produces slightly different results

- The Laspeyres (Initial Prices) was standard for years
- The Chain-Weight method — where you take the *average percentage change* implied by the Laspeyres and Paasche — is widely used today and an "ideal index"

- **Nominal GDP is**
  - in 2005: 500 x $2 + 5 x $1,000 = $6,000
  - in 2006: 550 x $3 + 6 x $1,000 = $7,650
  - That is an increase of $1,650 or 27.5% (= 1650÷6000)
- But did real GDP rise 27.5%? A price rose also!

Calculating percentage changes (Rate of Growth)

- Suppose a variable X starts at 50 and increases to 55
- The (level) change in X is 55 – 50 = 5
- The percentage change in X is the change divided by the initial level, or
  - (55 – 50) ÷ 50 = 5 ÷ 50 = 0.10 = 10%

	2005	2006	Percent change
Quantity of apples	500	550	10%
Quantity of computers	5	6	20%
Price of apples	$2	$3	50%
Price of computers	$1,000	$1,000	0%
Nominal GDP	$6,000	$7,650	27.5%
Real GDP in 2005 prices			
Real GDP in 2006 prices			
Real GDP in chained 2006 prices			

Although nominal GDP rose 27.5%, one price rose 50%!!

	2005	2006	Percent change
Quantity of apples	500	550	10%
Quantity of computers	5	6	20%
Price of apples	$2	$3	50%
Price of computers	$1,000	$1,000	0%
Nominal GDP	$6,000	$7,650	27.5%
Real GDP in 2005 prices	$6,000		
Real GDP in 2006 prices		$7,650	
Real GDP in chained 2006 prices		$7,650	

We can fill these in

	2005	2006	Percent change
Quantity of apples	500	550	10%
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Price of computers	$1,000	$1,000	0%
Nominal GDP	$6,000	$7,650	27.5%
Real GDP in 2005 prices	$6,000	$7,100	18.3%
Real GDP in 2006 prices	$6,500	$7,650	17.7%
Real GDP in chained 2006 prices		$7,650	

Note that these are different

	2005	2006	Percent change
Quantity of apples	500	550	10%
Quantity of computers	5	6	20%
Price of apples	$2	$3	50%
Price of computers	$1,000	$1,000	0%
Nominal GDP	$6,000	$7,650	27.5%
Real GDP in 2005 prices	$6,000		
Real GDP in 2006 prices	$6,500	$7,650	
Real GDP in chained 2006 prices		$7,650	

Use 2006 prices and 2005 quantities

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Real GDP in 2005 prices	$6,000	$7,100	18.3%
Real GDP in 2006 prices	$6,500	$7,650	17.7%
Real GDP in chained 2006 prices		$7,650	18.0%

This is the *average* percent change

	2005	2006	Percent change
Quantity of apples	500	550	10%
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Price of apples	$2	$3	50%
Price of computers	$1,000	$1,000	0%
Nominal GDP	$6,000	$7,650	27.5%
Real GDP in 2005 prices	$6,000	$7,100	
Real GDP in 2006 prices	$6,500	$7,650	
Real GDP in chained 2006 prices		$7,650	

Use 2005 prices and 2006 quantities

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Real GDP in 2005 prices	$6,000	$7,100	18.3%
Real GDP in 2006 prices	$6,500	$7,650	17.7%
Real GDP in chained 2006 prices	$6,483	$7,650	18.0%

We divide $7,650 by 1.18 to get $6,483

Extension: Comparing GDP across countries with different currencies

- For every pair of currencies, like the dollar ($, U.S.) and the yen (¥, Japan), there is a market exchange rate between them
- In the text, $1 = ¥108 (On 8/24/06, it was ¥116)
- Suppose we knew GDP was $9.8 trillion in the U.S. in 2000 and ¥515 trillion in Japan
- At the current exchange rate, Japan's GDP in 2000 would be $4.8 trillion, about 50% the size of the U.S. figure
- But what if prices within Japan are higher or lower than they are in the U.S? How do we compare GDP in that case?

When price levels are different across countries, the best comparison uses one country's prices

- Suppose Japan's prices were 45% higher than those in the U.S.
- To measure Japanese and U.S. GDP using U.S. prices:

$$\text{Real GDP}_{\text{Japan}}^{\text{U.S. Prices}} = \text{Price Level}_{\text{U.S.}} \times \text{Real GDP}_{\text{Japan}}, \qquad (2.4)$$

$$\text{Real GDP}_{\text{Japan}}^{\text{U.S. Prices}} = \text{Price Level}_{\text{U.S.}} \times \frac{\text{Nominal GDP}_{\text{Japan}}}{\text{Price Level}_{\text{Japan}}}$$

$$= \frac{\text{Price Level}_{\text{U.S.}}}{\text{Price Level}_{\text{Japan}}} \times \text{Nominal GDP}_{\text{Japan}}.$$

  - = (1 ÷ 1.45) x $4.8 trillion
  - = $3.3 trillion
- Real GDP in Japan, adjusting for prices, is 33% of the U.S. level