Measuring the Macroeconomy

1. NIPA: GNP and GDP
2. Saving and Wealth
3. Prices and Inflation
4. Unemployment
5. Problems with Measuring the Macroeconomy
There are three alternative approaches give the same measurements

1. Product Approach: the amount of output produced, excluding output used up in intermediate stages of production.

2. Income Approach: the income generated by production

3. Expenditure Approach: the amount of spending by purchasers

All three approaches are equivalent

- Any output produced (product approach) is purchased by someone (expenditure approach) and result in income to someone (income approach).

- So we get the fundamental identity of national income accounting:
  \[ \text{total production} = \text{total income} = \text{total expenditure} \]
GNP, GDP

- **Gross National Product** – market value of final goods and services newly produced by domestically owned factors of production.

- **Gross Domestic Product** – market value of final goods and services newly produced by domestically located factors of production, regardless of ownership.

- Difference of the two:
  - GNP – nationally-owned factors of production
  - GDP – nationally-located factors of production
• In GNP but not in GDP:
  – Wages and salaries of American citizens working abroad
  – Profits and interest received by American citizens on their holdings of foreign-located assets.

• In GDP but not GNP:
  – Wages and salaries of foreign citizens working in the U.S.
  – Profits and interest received by foreign citizens on the holdings of U.S. located assets.
MEASURING GDP

- Once again ...
  1. production approach
  2. expenditure approach
  3. income approach
- All three approaches are identical by definition. To see this, let’s take the simplest example possible. Suppose we live in a world with no intermediate goods. There are just two goods, apples and oranges. Then:

$$GDP = (\text{price of apples} \times \text{quantity of apples}) + (\text{price of oranges} \times \text{quantity of oranges})$$

- prices are market prices
- quantity are the quantities produced this period

But what about intermediate goods?
Production Approach to Measuring GDP

• Basic Idea: Add up inflation adjusted dollar value of each firm’s output minus the dollar value of intermediate goods used up in production. So GDP just counts the value added of each producer.

• Suppose a cattle rancher sells one-quarter pound of meat to McDonald’s for 50 cents and then McDonald’s sells you a hamburger for $1.50. Should GDP include both the meat and the hamburger, or just the hamburger? The answer of course is just the hamburger. We don't want to double count.
• The way it actually happens is the BEA says the rancher produced 50 cents worth of value added (since in this example there were no other inputs). And McDonald’s produced $1.50 - $0.50 worth of output. So McDonald’s value added is $1.00.

• Total value added is the sum of the 50 cents from the rancher and the dollar from McDonald’s.

• The BEA does this for all the sectors
<table>
<thead>
<tr>
<th>Industry</th>
<th>1950</th>
<th>1992</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>9%</td>
<td>2%</td>
</tr>
<tr>
<td>Mining</td>
<td>3%</td>
<td>2%</td>
</tr>
<tr>
<td>Construction</td>
<td>4%</td>
<td>5%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>28%</td>
<td>19%</td>
</tr>
<tr>
<td>Transportation and Utilities</td>
<td>9%</td>
<td>9%</td>
</tr>
<tr>
<td>Wholesale &amp; Retail Trade</td>
<td>19%</td>
<td>16%</td>
</tr>
<tr>
<td>Finance, Insurance, and Real Estate</td>
<td>10%</td>
<td>17%</td>
</tr>
<tr>
<td>Services</td>
<td>9%</td>
<td>18%</td>
</tr>
<tr>
<td>Government</td>
<td>9%</td>
<td>12%</td>
</tr>
</tbody>
</table>

Decomposition of GDP: the production approach
EXPENDITURE APPROACH TO MEASURING GDP

- Add up expenditures of final goods by every purchaser in the economy.
- In our McDonald’s example, meat is an intermediate good, so it doesn’t count.
- We get a $1.50 in output since that is the total expenditure by the final consumer for the good.
Categorizing allows simple equation:

\[ GDP = C + I + G + NX \]  \hspace{1cm} (1)

where

\( C \quad = \quad \text{private consumption} \) – spending by private households on final goods and services.
- durable – goods lasting 3 or more years, e.g. cars, dishwashers, TVs.
- nondurable – goods lasting fewer than 3 years, e.g. food, clothing, fuel.
- services – goods that cannot be inventoried, e.g. haircuts, health-care.

\( I \quad = \quad \text{investment} \) – spending on \textbf{new} capital goods and changes in inventories

\( G \quad = \quad \text{government consumption and investment} \)

\( NX \quad = \quad \text{net exports} \)
INCOME APPROACH

• In our McDonald’s example, we would ask, how much did the rancher make (50 cents). How much did the owner and workers of McDonald’s make ($1.50 - $0.50) = $1.00.

• In the real world ...

\[
\text{GDP} = \text{Compensation of Employees} + \text{Proprietor’s Income} + \text{Rental Income of Households} + \text{Corporate Profits} + \text{Net Interest} + \text{Indirect Business Taxes} - \text{Net Factor Payments From Abroad} + \text{Depreciation}
\]
Compensation of Employees wages, salaries, benefits

Proprietor’s Income barbers, lawyers

Rental Income from Households not businesses – those go into profits.

Corporate Profits includes corporate taxes, dividends, retained earnings.

Net Interest interest earned by households minus interest paid.

Indirect Business Taxes sales taxes, excise taxes

Net Factor Payments From Abroad payments to US owners of foreign-located factors less payments to foreign owners of domestically-located factors.

Depreciation the value of capital that wears out during the year.
Two types of economic variables will be discussed in this class: stocks and flows.

Variables that are measured per unit time are called *flow variables*.

Variables that are measured at a point in time are called *stock variables*.

A classic example is a bath tub with water flowing in from the faucet. The amount of water in the tub at any moment is a stock variable. The units of a stock variable (gallons, in this case) don’t have a time dimension. The rate at which water enters the tub is a flow variable; it’s units (gallons per minute) have a time dimension.
SAVING, WEALTH, AND CAPITAL

Wealth

• Household wealth = household’s assets minus its liabilities.

• National wealth = sum of all households’, firms’, and governments’ wealth within the nation.

\[ W_{t+1} = (1 + r)W_t + Y_t - C_t \]  \hspace{1cm} (2)

• Saving by individuals, businesses, and government determine wealth. Note wealth is a stock variable.
SAVING

- Saving = current income - current spending
- Saving is a flow variable.
- But savings (with an s!) is a stock variable.
- The saving rate = saving / current income
PRIVATE SAVING

- Private saving = private disposable income - consumption

\[ S_{pvt} = Y - C \]
\[ = (GDP + NFP - T + TR + INT) - C \]

- NFP: Net Factor Payments from Abroad
- T: Taxes Paid to the Government
- TR: Transfers Received from the Government
- INT: Interest Payments on the Government Debt

- The Private Saving Rate

\[ \text{saving rate} = \frac{Y - C}{Y} \] (3)
GOVERNMENT AND NATIONAL SAVING

- Government Saving

\[ S_{govt} = T - (G + TR + INT) \]

includes state and local governments

- National Saving

\[ S = S_{pvt} + S_{govt} = GDP + NFP - C - G \]
WHERE DOES SAVING GO?

- We know from the expenditure equation that

\[ GDP = C + I + G + NX \]  \hspace{1cm} (4)

which implies that

\[ S - NFP + C + G = C + I + G + NX \]  \hspace{1cm} (5)

\[ S = I + NX + NFP \]  \hspace{1cm} (6)

- We define \( CA = NX + NFP \). \( CA \) is called the current account balance. This is the amount paid to Americans by foreigners for both final goods and services (NX) as well as factor payments to Americans from foreigners. This implies

\[ S = I + CA \]  \hspace{1cm} (7)
The current account represents lending by Americans to foreigners

- A positive CA represents goods and services going out from American owners to foreigners which aren’t begin paid for by good and services going in the other direction.
- This represents savings by the US since these goods must be paid for at a future date or are paying off past debts of Americans.
- In other words, savings is either invested or lent off to foreigners.
WHERE DOES PRIVATE SAVING GO?

Since

\[ S = S_{pvt} + S_{govt} = I + CA \]  \( (8) \)

\[ S_{pvt} = I + (-S_{govt}) + CA \]  \( (9) \)

In words, private saving goes either into investment, is lent to the government, or is lent to foreigners.
PRICES AND INFLATION

Real vs. Nominal GDP

- Nominal GDP measures output at current (today’s) prices

\[
\text{nominal GDP} = (P_{\text{apples}}^{04} \times Q_{\text{apples}}^{04}) + (P_{\text{oranges}}^{04} \times Q_{\text{oranges}}^{04})
\]

- Real GDP measure output at base year (now 1992) prices.

\[
\text{real GDP} = (P_{\text{apples}}^{92} \times Q_{\text{apples}}^{04}) + (P_{\text{oranges}}^{92} \times Q_{\text{oranges}}^{04})
\]
• GDP deflator = Nominal GDP/Real GDP

\[
\text{GDP deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} = \frac{(P_{04}^{\text{apples}} \times Q_{04}^{\text{apples}}) + (P_{04}^{\text{oranges}} \times Q_{04}^{\text{oranges}})}{(P_{92}^{\text{apples}} \times Q_{04}^{\text{apples}}) + (P_{92}^{\text{oranges}} \times Q_{04}^{\text{oranges}})}
\]

• Inflation \( \pi_{t+1} = \frac{P_{t+1} - P_t}{P_t} \times 100 \) where \( P \) is some price index such as the GDP deflator. So \( \pi \) in the percent change in the price index.
We have been discussing real GDP as if the prices used to compute this measure never change from their base year values. If the BEA really did this, over time the prices used would become more and more dated.

To solve this problem the BEA has periodically updated the prices used to compute real GDP. About every five years, a new base year is chosen. In 1995 the BEA announced a new policy. It now emphasizes *chain-weighted* measures of real GDP. The base year changes continuously over time. In essence, prices in 1995 are used to measure real growth from 1995 to 1996; prices in 1996 are used to measure real growth from 1996 to 1997; and so on.

These various year-to-year growth rates are then put together to form a “chain” that can be used to compare the output of goods and services in any two years.
OTHER PRICE INDICES

*CPI*—*Consumer Price Index*—Price of a “typical” basket of consumer goods. How much does it cost to buy what the average consumer buys each year.

\[
CPI = \frac{(P_{apples}^{04} \times Q_{apples}^{92}) + (P_{oranges}^{04} \times Q_{oranges}^{92})}{(P_{apples}^{92} \times Q_{apples}^{92}) + (P_{oranges}^{92} \times Q_{oranges}^{92})}
\]

- CPI uses a fixed basket of goods (*Laspeyers*), GDP deflator use a changing basket of goods (*Paasche*).

*PPI*—*Producer Price Index*—price of “typical” basket of intermediate goods.
THE UNEMPLOYMENT RATE

Every month the U.S. Bureau of Labor Statistics survey 60,000 households. At the end of this survey they categorize people into three groups:

**employed** if he or she spent most of the previous week working at a job

**unemployed** not employed and is waiting for the start date of a new job, is on temporary layoff, or has been looking for a job.

**not in the labor force** none of the above – works at home, student, retired.

A person who wants a job but has given up looking – a *discouraged worker* – is counted as not in the labor force.
**labor force** sum of employed and the unemployed

\[
\text{unemployment rate} = \frac{\text{number of unemployed}}{\text{labor force}} \times 100 \tag{10}
\]

\[
\text{labor force participation rate} = \frac{\text{labor force}}{\text{adult population}} \times 100 \tag{11}
\]
• August 2004: 139.7 million employed and 8.0 million unemployed
• Total labor force is 147.7 million
• unemployment rate 5.4%
• working age population 223.7 million
• labor force participation rate (147.7/223.7) = 66%
PROBLEMS WITH MEASURING THE MACROECONOMY

The gross national product does not allow for the health of our children, the quality of their education, or the joy of their play. It does not include the beauty of our poetry or the strength of our marriages, the intelligence of our public debate or the integrity of our public officials. It measures neither our courage, nor our wisdom, nor our devotion to country. It measures everything, in short, except that which make life worthwhile, and it can tell us everything about America except why we are proud to be Americans.

1. Aggregation
   • gains not necessarily equal across regions

2. Leisure and home production
   • make dinner at home vs. eat out
   • raising kids vs day-care

3. Accounting for quality.
   • In transportation, output is measured by the number tons-miles hauled.
   • argument for explaining the productivity decline since 1973.

4. Accounting for non-market goods (e.g. the environment, crime)
   • how do you put a price on items where there are no market prices.
   • “green accounting”

GDP does not equal happiness or standard-of-living.
CPI

1. substitution bias
   - fixed basket index
   - consumer substitute toward items whose prices have fallen
   - when relative prices change, the true cost of living rises less rapidly than the CPI.

2. introduction of new goods
   - when new goods are added consumers are better off; e.g DVD players.

3. unmeasured changes in quality
   - The price of NBA tickets has been rising in recent years; but the NBA commissioner, David Stern, would argue so has the quality of play.

   - Boskin commission
   - BEA and BLS are aware of these problems, but they are hard.