Measurement
Outline

• GDP
  – Product
  – Expenditure
  – Income
• Government budget
• National saving
• National wealth
• Real variables
  – Chain-weighted GDP
  – Price indices and inflation
• Nominal and real interest rates
• Major Economic Problems
Gross Domestic Product

GDP – *product approach*

GDP is the market value of final goods and services newly produced within a nation during a fixed period of time (usually a year)

• Market value
• Final goods and services (sum value added because it automatically excludes intermediate goods)
• Newly produced
• GDP – output produced within a nation
• GNP – output produced by domestically-owned factors of production
• GDP = GNP – NFP (net factor payments from abroad)
GDP – **expenditure approach**

- Measures total spending on final goods and services produced within a nation during a specified period of time
- Consumption (C)
- Investment (I)
- Government purchases of goods and services (G)
- Exports – imports = net exports (NX)
GDP - Income approach

• Sums income generated by production (includes profits and taxes paid to the gov)

• Private disposable income equals

\[
\text{GDP} + \text{NFP} + \text{TR} (\text{transfer payments from gov}) + \text{INT} (\text{interest payments from govt}) - \text{T} (\text{taxes paid to gov})
\]

• Government net income = \( T - \text{TR} - \text{INT} \)

Private disposable income + gov net income = GDP + NFP = GNP
Approaches Equivalent

Any output produced (product approach) is purchased by someone (expenditure approach) and results in income to someone (income approach)
Government Budget Deficit

• Deficit = G + TR + INT − T
  – G = expenditures of current real goods and services
  – TR = transfer payments
  – INT = interest payments on debt
  – T = tax revenue

• Primary Deficit = G + TR − T

• Government saving – negative of the deficit, i.e. government surplus
Saving

- Private Saving = private disposable income – consumption
  \[ S_{pvt} = (Y + NFP - T + TR + INT) - C \]

- Government Saving = net gov income – gov purchases of goods and services
  \[ S_{govt} = T - (G + TR + INT) \]

- National Saving = Private saving + gov saving
  \[ S = S_{pvt} + S_{govt} = Y + NFP - C - G \]
Uses of Saving

\[
S = S_{pvt} + S_{govt} = Y + NFP - C - G
\]

\[
Y = C + I + G + NX
\]

\[
S = NFP + I + NX
\]

\[
CA = NX + NFP
\]

\[
S = I + CA
\]
National Wealth

- Domestic physical assets (capital and land) plus net foreign assets (foreign physical and financial assets minus foreign physical and financial liabilities)
- Wealth changes due to capital gains and losses
  national saving (I + CA)
Nominal and Real Variables

• Nominal = dollar values
• Real; adjust for price changes; reflect only quantity changes
### Nominal and Real GDP

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<tr>
<th>Quantity</th>
<th>Year 1</th>
<th>Year 2</th>
<th>% Change</th>
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<tbody>
<tr>
<td>Food</td>
<td>10</td>
<td>11</td>
<td>10%</td>
</tr>
<tr>
<td>IT</td>
<td>4</td>
<td>6</td>
<td>50%</td>
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<table>
<thead>
<tr>
<th>Price</th>
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</thead>
<tbody>
<tr>
<td>Food</td>
<td>$2</td>
<td>$3</td>
<td>50%</td>
</tr>
<tr>
<td>IT</td>
<td>$6</td>
<td>$4</td>
<td>-33%</td>
</tr>
</tbody>
</table>

| Nominal GDP | $44 | $57 | 29.55% |
| Real GDP (1)| 44  | 58  | 31.82% |
| Real GDP (2)| 46  | 57  | 23.91% |
Chain-Weighted Real GDP

• Pick a year to start (2000) and let real GDP in this year equal 1
• Compute growth rate of real GDP between 2000 and 2001 using initial year as base
• Compute growth rate of real GDP using final year as base
• Average growth rates
• Chain-weighted real GDP for 2001 is base year GDP (=1) multiplied by average (gross) growth rate
• Repeat for 2002, etc.
Price Indices

• Measures average level of prices for specified set of goods and services, relative to the prices in a base year

• GDP deflator = 100 X nominal GDP/real GDP

• CPI = monthly index of consumer prices of basket of goods relative to a base year
Inflation

- **Definition**

\[ \pi_{t+1} = \frac{(P_{t+1} - P_t)}{P_t} = \frac{\Delta P_{t+1}}{P_t} \]

where \( P \) is a price index

- **CPI and inflation bias**
  - Substitution bias
  - Quality adjustment bias
Figure 2.1 The inflation rate in the United States, 1960–2002
Real and Nominal Interest Rates

- Nominal interest rate = dollar value of return to asset
- Real interest rate = purchasing power of return to asset
  \[ i - \pi \]
- Expected real interest rate = expected purchasing power of return to asset
  \[ r = i - \pi^e \]
Figure 2.2 Nominal and real interest rates in the United States, 1960–2002