National Income & Business Cycles

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2. Measuring Macroeconomic Performance

Learning objectives

- There are three main measures of macroeconomic performance:
  - Gross Domestic Product (GDP), GNP, and others
  - Inflation
  - Unemployment

Key Concepts

- Gross domestic product (GDP)
- National income accounting
- Imputed value
- Nominal versus real GDP
- GDP deflator
- National income accounts identity
- Consumption
- Investment
- Government purchases
- Net exports
- Consumer price index (CPI)
- Labor force
- Unemployment rate
- Labor-force participation rate

Gross Domestic Product

- measures the ______ of all goods and services produced in a country (domestically).
- is also total ______ earned by domestically-located factors of production.

Definition: Gross Domestic Product (GDP) is the market value of all ______ goods and services produced within a country in its own currency and in a given period of time.

To measure GDP we use the National Income Accounting Identity: ____________________
3 ways to calculate GDP

1. GDP by expenditure
2. GDP by income
3. GDP by production (output)

Computed _______ by the ________
__________________ (______)

1. Measuring GDP by expenditure

Consumption (C)
def: the value of all goods and services bought by households. Includes:

- durable goods
- non-durable goods
- services

U.S. consumption, 2018

<table>
<thead>
<tr>
<th></th>
<th>$ billion</th>
<th>% of GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumption</td>
<td>$ 13,999</td>
<td>68%</td>
</tr>
<tr>
<td>Durables</td>
<td>1,476</td>
<td>7.2</td>
</tr>
<tr>
<td>Nondurables</td>
<td>2,889</td>
<td>14</td>
</tr>
<tr>
<td>Services</td>
<td>9,634</td>
<td>46.8</td>
</tr>
</tbody>
</table>

Investment (I)
def1: spending on (the factor of production) capital.
def2: spending on goods bought for future use.
Includes:

- business fixed investment
- residential fixed investment
- inventory investment
U.S. Investment, 2018

<table>
<thead>
<tr>
<th></th>
<th>$ billions</th>
<th>% of GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment</td>
<td>$3,628</td>
<td>17.6 %</td>
</tr>
<tr>
<td>Business</td>
<td>2,787</td>
<td>13.5</td>
</tr>
<tr>
<td>Residential</td>
<td>787</td>
<td>3.8</td>
</tr>
<tr>
<td>Inventory</td>
<td>55</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Government spending (G)

- includes all government spending on goods and services.
- excludes transfer payments (e.g. unemployment insurance payments),

U.S. Government Spending, 2018

<table>
<thead>
<tr>
<th></th>
<th>$ billions</th>
<th>% of GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Govt spending</td>
<td>$3,592</td>
<td>17.5%</td>
</tr>
<tr>
<td>- Federal</td>
<td>1,347</td>
<td>6.5</td>
</tr>
<tr>
<td>Non-defense</td>
<td>554</td>
<td>2.7</td>
</tr>
<tr>
<td>Defense</td>
<td>794</td>
<td>3.9</td>
</tr>
<tr>
<td>- State &amp; local</td>
<td>2,244</td>
<td>10.9</td>
</tr>
</tbody>
</table>

Net Exports (NX = EX – IM)

- def: the value of total exports (EX) minus the value of total imports (IM)
2. Measuring GDP by income

- Circular flow
  - In every transaction, the buyer’s expenditure becomes the seller’s income.
  - The sum of all ______ equals the sum of all ______.
- Components of National Income
  1. Compensation for _____ – wages, salaries and other employment benefits (roughly 2/3% of NI in the US has been falling).
  2. Compensation for _____ – interest, rents and profits.

3. Measuring GDP by production

- GDP = value of final goods produced
  - = sum of value added at all stages of prod.
- The goal is to attribute to each industry its contribution to GDP without ____________
- A firm’s value added is:
  - the value of its output minus the value of the intermediate goods the firm used to produce that output

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

Labor shares on National Income

![Graph showing labor shares on national income for different countries over time.](Image)

Source: OECD

3. Measuring GDP by production

A question for you:

Suppose a firm
- produces $10 million worth of final goods
- but only sells $9 million worth.

Does this violate the expenditure = output identity?
- Unsold output goes into ________, and is counted as “____________”...
  - In effect, we are assuming that firms ____________________.
- So, output ___ expenditure
GNP vs. GDP

- Gross National Product (GNP): total income earned by the nation’s factors of production, regardless of where located.
- Gross Domestic Product (GDP): total income earned by domestically-located factors of production, regardless of nationality.

\[(\text{GNP} - \text{GDP}) = (\text{factor payments from abroad}) - (\text{factor payments to abroad})\]

GNP vs. GDP in select countries, 2011

<table>
<thead>
<tr>
<th>Country</th>
<th>GNP</th>
<th>GDP</th>
<th>GNP – GDP (% of GDP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>122,061</td>
<td>111,879</td>
<td>9.1</td>
</tr>
<tr>
<td>Japan</td>
<td>6,041,592</td>
<td>5,867,154</td>
<td>3.0</td>
</tr>
<tr>
<td>China</td>
<td>7,305,440</td>
<td>7,318,499</td>
<td>-0.2</td>
</tr>
<tr>
<td>United States</td>
<td>15,211,300</td>
<td>14,991,300</td>
<td>1.5</td>
</tr>
<tr>
<td>India</td>
<td>1,856,807</td>
<td>1,872,840</td>
<td>-0.9</td>
</tr>
<tr>
<td>Canada</td>
<td>1,705,545</td>
<td>1,736,050</td>
<td>-1.8</td>
</tr>
<tr>
<td>Greece</td>
<td>281,225</td>
<td>289,627</td>
<td>-2.9</td>
</tr>
<tr>
<td>Iraq</td>
<td>111,865</td>
<td>115,388</td>
<td>-3.1</td>
</tr>
<tr>
<td>Ireland</td>
<td>178,195</td>
<td>217,274</td>
<td>-18.0</td>
</tr>
</tbody>
</table>

Real vs. Nominal GDP

- GDP is the value of all final goods and services produced.
- Nominal GDP measures these values using ________ prices.
  - changes in nominal GDP can be due to:
    - changes in __________
    - changes in __________ of output produced
- Real GDP measure these values using the prices of a _____ year.
  - changes in real GDP can only be due to
    - changes in __________

Practice problem, part 1

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P</td>
<td>Q</td>
</tr>
<tr>
<td>good A</td>
<td>$10</td>
<td>100</td>
</tr>
<tr>
<td>good B</td>
<td>$100</td>
<td>50</td>
</tr>
</tbody>
</table>

- Compute nominal GDP in each year
- Compute real GDP in each year using 2010 as the base year.
**Answers to practice problem, part 1**

nominal GDP
2010:  
2011:  

real GDP
2010:  
2011:  

---

**GDP Deflator**

- The inflation rate is the percentage increase in the overall level of prices.

- One measure of the price level is the **GDP Deflator**, defined as

  \[
  \text{GDP deflator} = \frac{\text{Nominal GDP}}{\text{GDP deflator}}
  \]

  \[
  \text{Real GDP} = \frac{\text{Nominal GDP}}{\text{GDP deflator}}
  \]

- Inflation is the **percentage change** in the GDP deflator

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**Practice problem, part 2**

<table>
<thead>
<tr>
<th></th>
<th>Nom. GDP</th>
<th>Real GDP</th>
<th>GDP deflator</th>
<th>Inflation rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>$6,000</td>
<td>$6,000</td>
<td>1</td>
<td>n.a.</td>
</tr>
<tr>
<td>2011</td>
<td>$8,040</td>
<td>$7,200</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[
\text{GDP deflator}_{2010} = \frac{\text{Nom. GDP}_{2010}}{\text{GDP deflator}}
\]

\[
\text{GDP deflator}_{2011} = \frac{\text{Nom. GDP}_{2011}}{\text{GDP deflator}}
\]

\[
\text{Inflation rate}_{2011} = \text{GDP deflator}_{2011} - \text{GDP deflator}_{2010}
\]
Chain-Weighted Real GDP

- Over time, relative prices change, so the base year should be updated periodically.
- In essence, chain-weighted real GDP updates the base year every year, so it is more accurate than constant-price GDP.
- Your textbook usually uses constant-price real GDP, because:
  - the two measures are highly ____________.
  - constant-price real GDP is easier to compute.

Inflation

Inflation is a measure of changes in the price level.

Definition: The rate of inflation is the percentage rate of change in the general price level from one period to the next.

There are three main approaches to measuring the price level

1. CPI – consumer price index
2. PPI – producer price index
3. deflators – implicit measure of inflation
   → already covered

Consumer Price Index (CPI)

- Definition: The CPI is a ratio that shows the weighted value of a basket of goods (i.e., prices) relative to prices in a given ________ year.
- It is a measure of the overall level of prices
- Published by the __________________ (___)
- Used to
**How the BLS constructs the CPI**

1. _______ consumers to determine composition of the typical consumer's _______ of goods.
2. Every _______, collect data on prices of all items in the basket; compute cost of basket.
3. CPI in any month equals
   \[ \frac{100 \times \text{Cost of basket in that month}}{\text{Cost of basket in base period}} \]

   Inflation is the ___________ in the CPI.

**Exercise: Compute the CPI**

Basket contains 20 pizzas and 10 compact discs.

<table>
<thead>
<tr>
<th></th>
<th>pizza</th>
<th>CDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>$10</td>
<td>$15</td>
</tr>
<tr>
<td>2011</td>
<td>$11</td>
<td>$15</td>
</tr>
</tbody>
</table>

For each year, compute:
- the cost of the basket
- the CPI (use 2010 as the base year)
- the inflation rate from the preceding year

**Answers:**

<table>
<thead>
<tr>
<th>Year</th>
<th>Cost of basket</th>
<th>CPI</th>
<th>Inflation rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>n.a.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**The composition of the CPI’s “basket”**

- Food and bev. 15.3%
- Housing 7.7%
- Apparel 5.8%
- Transportation 3.3%
- Medical care 3.7%
- Recreation 3.4%
- Education 42.2%
- Communication 15.3%
- Other goods and services 3.3%
Reasons why the CPI may overstate inflation

- Substitution bias:
  -
  -

- Introduction of new goods:
  -

- Unmeasured changes in quality:
  -

Producer Price Index (PPI)

- measures the prices charged by ________ at various stages of the production process; or “it measures the price of a typical basket of goods bought by firms.”
- firms are surveyed instead of consumers.
- Problems
  -
    - Weights issue
- Benefit
  - information on raw material prices

CPI vs. GDP Deflator

Differences between CPI and GDP deflator?

- the basket of goods
  - CPI: ______________
  - GDP deflator: ______________

- prices of capital goods
  - ________ in GDP deflator (if produced domestically)
  - ________ CPI

- prices of imported consumer goods
  - ________ CPI
  - ________ GDP deflator

Two measures of inflation in the U.S.
Measuring Employment, Unemployment, and Wages

- Each month the BLS conducts the “Current Population Survey”

- People are interviewed to find out if they were:
  - 
  - 
  - 

Categories of the population

- employed \((E)\)
  working at a paid job

- unemployed \((U)\)
  not employed but looking for a job

- labor force \((LF)\)
  the amount of labor available for producing goods and services; all employed plus unemployed persons

- not in the labor force \((NILF)\)
  not employed, not looking for work.

Two important labor force concepts

- unemployment rate \((U/L)\)
  percentage of the labor force that is 

\[
\text{Unemployment rate} = \left( \frac{\#\text{unemployed}}{\text{labor force}} \right) \times 100\% 
\]

- labor force participation rate \((L/POP)\)
  the fraction of the adult population that ‘participates’ in the labor force

\[
\text{Labor force participation rate} = \left( \frac{\text{labor force}}{\text{adult population}} \right) \times 100\% 
\]

Answers:

- data: \(E = \), \(U = \), \(POP = \)

- labor force \(L = E + U = \)

- not in labor force \(NILF = POP - L = \)

- unemployment rate \(U/L \times 100\% = \)

- labor force participation rate \(L/POP \times 100\% = \)
Exercise: Compute labor force statistics

U.S. adult population by group, Jul 2019
Number employed = 157.288 million
Number unemployed = 6.063 million
Adult population = 259.225 million

Use the above data to calculate
- the labor force
- the number of people not in the labor force
  - the labor force participation rate
  - the unemployment rate

Answers:
- data: $E = \quad U = \quad POP =$
- labor force
  $L = E + U =$
- not in labor force
  $NILF = POP - L =$
- unemployment rate
  $U/L \times 100\% =$
- labor force participation rate
  $L/POP \times 100\% =$

Summary

1. Gross Domestic Product (GDP) measures both total income and total expenditure on the economy’s output of goods & services.
2. Nominal GDP values output at current prices; real GDP values output at constant prices. Changes in output affect both measures, but changes in prices only affect nominal GDP.
3. GDP is the sum of consumption, investment, government purchases, and net exports.

Summary

4. The overall level of prices can be measured by either
   - the Consumer Price Index (CPI),
   - the Producer Price Index (PPI)
   - the GDP deflator
5. The unemployment rate is the fraction of the labor force that is not employed. When unemployment rises, the growth rate of real GDP falls.