Measuring the Macroeconomy

ECO 120: Global Macroeconomics

Goals

Describe measures of macroeconomic activity including the following:

- Total production
- Total income
- Aggregate price level
- Inflation
- Employment
- Worker compensation
- Unemployment

Reading and Exercises

- Measuring production: Ch 9, pp. 217-236
- Measuring unemployment: Ch 11, pp. 272-277
- Measuring inflation: Ch 12, pp. 296-305
- **Canvas Quiz due Wednesday 11:59 PM**.
  Multiple-choice, 15 questions, unlimited attempts allowed, only best score counts
- **Homework due Friday 11:59 PM**. We will work together in class on Thursday.

National Income Accounting

National Income Accounting

Different measures of a country's overall economic activity in a given time period.

Why Do We Care?

- Assess the health of the economy by comparing income per person across countries and across time periods.
- Track long run growth of the economy.
- Assess the effectiveness of government policies to fix economic problems.

Gross Domestic Product

- **Gross domestic product**: total market value of all *final* goods and services produced in a given year
- To avoid double counting, intermediate goods are not counted.
- Monetary measure: A common unit allows us to add apples and oranges and pickup trucks and everything else together
- Does not include purely financial transactions
- Does not include secondhand sales / sales of used goods

Example: $350 suit

The birth of suit

1. Sheep rancher sells $120 wool to a wool processor.
2. Wool processor makes material and sells it to a suit manufacturer for $180.
3. The suit manufacturer makes a suit and sells it to a wholesaler for $200.
4. The wholesaler sells the suit to a retailer for $250.
5. The retailer sells the suit to you for $350.

Value?

- If we counted all these transactions in GDP we get:
  $120 + $180 + $200 + $250 + $350 = $1,100.
- When actually, in the end we are only left with a suit worth $350

Value Added Approach

- Add to GDP only the value added at each step:
  1. Sheep rancher: $120
  2. Wool processor: $180 - $120 = $60
  3. Suit manufacturer: $200 - $180 = $20
  4. Wholesaler: $250 - $200 = $50
  5. Retailer: $350 - $250 = $100
- Add up the value added at every stage of production:
  $120 + $60 + $20 + $50 + $100 = $350

What Is Not Counted in GDP?

- Non-production transactions: any transactions that do not involve production of a good.
- Purely financial transactions
  - Public transfer payments such as social security payments and veterans payments
  - Private transfer payments such as gifts between family members
  - Financial transactions: loans, trading financial assets
  - Stock market transactions
- Secondhand transactions: contribute nothing to production, just moving ownership of final goods between people.

Expenditure approach

Expenditure approach: method of computing GDP by adding up all expenditures of final goods and services

- Consumption: consumption expenditures of households
- Investment: purchases of capital goods by firms
- Government expenditures
- Net exports

Investment

- **Gross private domestic investment**
  - *Most important:* Capital - final purchases of machinery, equipment, and tools.
  - All construction: includes construction of new offices, factories, *and* residential houses.
  - Changes in inventories: "unsold" output (not counted in consumption, because never purchased).
- **Net private domestic investment** = gross private domestic investment - depreciation.
  - Depreciation: every day some old investment goods need repair or replacement.

Net Exports

- **Net exports** = exports - imports.
- Export goods are produced in the U.S. and consumed outside the U.S.
- Imports are subtracted
  - Some things in consumption, investment, and government spending may have been imported (not produced in U.S.).
  - Subtracting imports from exports results in a net quantity of goods produced in the U.S. that are sold outside the U.S.

Gross Domestic Product

Expenditure approach leads to the equation:

$$Y = C + I + G + X - M$$

- Y: Total Output $\equiv$ GDP.
- C: Private Consumption
- I: Investment
- G: Government Expenditures
- X: Exports
- M: Imports

Gross Domestic Product

Gross Domestic Product

Income Approach

- **Income approach**: another method of computing GDP, add up total income.
- **National income** is composed of:
  - Compensation of employees (income earned from labor)
  - Rent (income earned from owning land)
  - Interest (income earned from owning capital)
  - Proprietors' income (income earned from organizing production)
  - Corporate profits (income earned from organizing production)
- National income = income paid to all the factors of production
- National income is *almost* equal to GDP.
  - Requires some statistical adjustments (corporate income taxes, undistributed corporate profits)

Disposable Income

- **Personal income** = National income
    1. *minus* social security payments
    2. *minus* corporate income taxes
    3. *minus* undistributed corporate profits
    4. *plus* transfer payments
- **Disposable income** = Personal income - personal taxes.
- Close approximation:

$$\text{Disposable income} \approx \text{GDP} - \text{Personal Taxes}$$

Nominal vs. Real GDP

- Problem with GDP calculation is that it measures *market value* of goods and services.
- Prices may increase, but production stay the same.
- **Nominal GDP**: (unadjusted) GDP calculation using prices that prevailed when output was produced.
- **Real GDP**: GDP calculation that is adjusted for changes in prices.
  - A single measure of the *quantity* of all final goods and services.

Calculating Real GDP

- Don't use current year prices to compute real GDP.
- Use prices from a chosen **base year**.
- Example:
  - Suppose only two goods: Brats and Cheese
  - Let's use 2023 a base year, compute real GDP for 2024

$$\text{Real GDP}_{2024} = P_{Brats,2023}Q_{Brats,2024} + P_{Cheese,2023}Q_{Cheese,2024}$$

Example: Nominal GDP

Item	2023 Quantity	2023 Price
Brats	100	\$1.00
Cheese	20	\$5.00

Item	2024 Quantity	2024 Price
Brats	150	\$2.00
Cheese	25	\$7.00

$$\text{Nominal GDP}_{2023} = 100(\$1) + 20(\$5) = \$200$$

$$\text{Nominal GDP}_{2024} = 150(\$2) + 25(\$7) = \$475$$

Example: Real GDP using 2023 as Base Year

Item	2023 Quantity	2023 Price
Brats	100	\$1.00
Cheese	20	\$5.00

Item	2024 Quantity	2024 Price
Brats	150	\$2.00
Cheese	25	\$7.00

- Real GDP using 2023 as a base year.

$$\text{Real GDP}_{2023} = 100(\$1) + 20(\$5) = \$200$$

$$\text{Real GDP}_{2024} = 150(\$1) + 25(\$5) = \$275$$

- What is real GDP growth?

$$\text{Real GDP Growth} = \frac{\$275 - \$200}{\$200} \times 100\% = 37.5\%$$

- Interpretation: We had 37.5% more stuff in 2024 than in 2023.

Example: Real GDP using 2024 as Base Year

Item	2023 Quantity	2023 Price
Brats	100	\$1.00
Cheese	20	\$5.00

Item	2024 Quantity	2024 Price
Brats	150	\$2.00
Cheese	25	\$7.00

- Real GDP using 2023 as a base year.

$$\text{Real GDP}_{2023} = 100(\$2) + 20(\$7) = \$340$$

$$\text{Real GDP}_{2024} = 150(\$2) + 25(\$7) = \$475$$

- What is real GDP growth?

$$\text{Real GDP Growth} = \frac{\$475 - \$340}{\$340} \times 100\% = 39.7\%$$

- Interpretation: We had 39.7% more stuff in 2024 than in 2023.

Chain-Weighted Real GDP

- Different base years lead to different conclusions for output growth.
- **Chain-weighted GDP:** Another measure of real GDP that averages out these differences.
- Process to compute chain-weighted real GDP for 2024 (given you already calculated chain-weighted real GDP for 2023):
  - Compute real GDP growth using 2023 as base year.
  - Compute real GDP growth using 2024 as base year.
  - Average the two growth rates.
  - Use this average growth rate, and the measure for real GDP in 2023, to compute real GDP for 2024.
  - Start of the chain: Set real GDP to nominal GDP
- I won't ask you to do it, but you should know it exists, and is the standard measure that economists use.

Shortcomings of GDP

Valuable Non-Market Activities Not Counted

- Leisure: Average workweek in 1900 in U.S. was 53 hours. Today it's 35 hours.
- Improved product quality (eg. computers and electronic devices).
- Informal or "underground" economy not counted.
  - United States: 8.3% of total production
  - Georgia: 64.9% of total production

Other Shortcomings

- Externalities: Production that leads to costs or negative consequences to others (eg. pollution)
- Says nothing about income or wealth inequality.

Calculating the Price Level

- **Price level**: an overall measure of prices in the economy
- **GDP deflator**: average of current year prices as a percentage of base year prices.

$$\text{GDP deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}}(100)$$

- **Inflation:** Growth rate of the price level

$$\text{inflation}_t = \frac{\text{GDP Deflator}_t - \text{GDP Deflator}_{t-1}}{\text{GDP Deflator}_{t-1}}\,(100\%)$$

Consumer Price Index

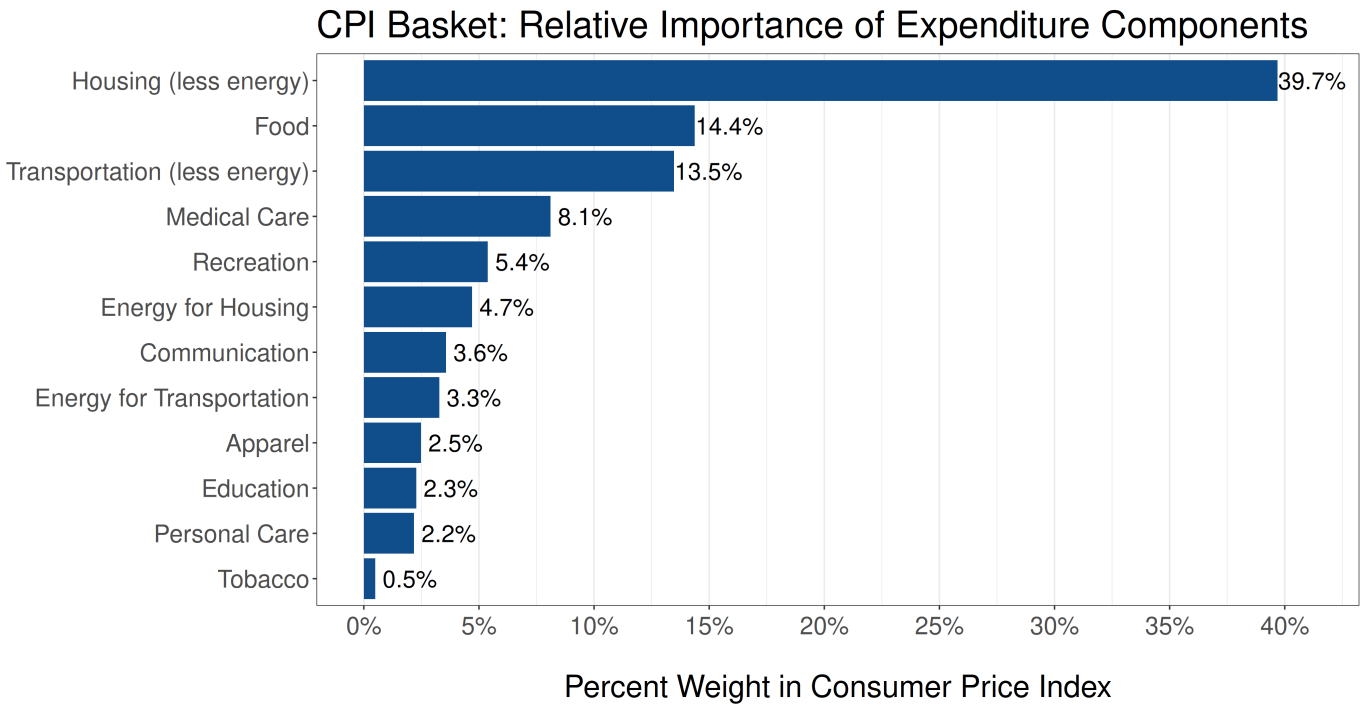
- **Consumer price index (CPI)**: another measure of the aggregate price level.
- Bureau of Labor Statistics (BLS) chooses a basket of goods: specific goods with specific weights.

$$\text{CPI}_t = \frac{\text{Price of basket at time } t}{\text{Price of same basket in base year}} (100)$$

- CPI inflation rate: percentage change in CPI.

$$\text{inflation}_t = \frac{\text{CPI}_t - \text{CPI}_{t-1}}{\text{CPI}_{t-1}} (100\%)$$

CPI Basket



Average relative importance for all U.S. urban households, November 2022.
Source: https://www.bls.gov/cpi/tables/relative-importance/home.htm

Labor force

Labor force: people in the population who are *willing* and *able* to work. The labor force does *not* include:

- Children
- People who are institutionalized
- Active-duty military personnel
- People legally not allowed to work
- People not employed who are not looking to be employed (eg. some students, retired people).
- **Discouraged workers**: people who are not employed and gave up looking for work because they don't think any jobs are available
- **Marginally attached workers:** people who would take a job if offered one, but are not looking

Employment Statistics

Unemployment Rate

Unemployed people: people *in the labor force* not employed.

$$\text{Unemployment Rate} = \frac{\text{Number of unemployed people}}{\text{Labor force}} \times 100\%$$

Labor force participation rate

Labor force participation rate: percentage of adult civilian working-age population who are in the labor force.

$$\text{Labor Force Participation Rate} = \frac{\text{Labor Force}}{\text{Adult Civilian Working-Age Population}} \times 100\%$$

Computing Employment Statistics

Population

Working-age population:

- 115 people work full time
- 33 people work part time
- 25 people work part time, but want full time jobs
- 15 people do not work, but want to and are looking for work
- 10 people want to work, but they got frustrated, and gave up looking for work
- 40 people are in school, not currently working nor looking for work
- 12 people are retired

Employment Statistics

- Working-age population (everyone)
  = 115 + 33 + 25 + 15 + 10 + 40 + 12 = 250
- Labor force
  = 115 + 33 + 25 + 15 = 188
  (includes working and unemployed)
- Unemployed = 15
  (must be in labor force)
- Labor force participation rate
  = 188 / 250 * 100% = 75.2%
- Unemployment rate
  = 15 / 188 * 100% = 8.0%

Scholar Spotlight: Hie Joo Ahn and James Hamilton

Measuring labor-force participation and the incidence and duration of unemployment
Review of Economic Dynamics, April 2022

Mis-Measures of the Labor Market

- Labor market participation and unemployment are measured by the BLS
- Identify and fix inconsistencies in how these measures are aggregated
- Unemployment rate is about 2% higher
- Labor market participation is 2% higher
- Unemployment duration 11 weeks shorter

About the Scholars

Dr. Hie Joo Ahn (left)
Senior Economist
Federal Reserve Board of Governors

Dr. James Hamilton (right)
Robert F. Engle Professor of Economics
University of California San Deigo

Types of Unemployment

- **Frictional unemployment**: unemployment caused by delays in job search, job candidate search.
- **Structural unemployment**: caused by changes in demand for types of work.
  - Changes in technology makes some types of jobs obsolete.
  - Changes in international trade shrink some industries.
  - Changes in tastes and preferences.
- **Cyclical unemployment**: caused by declines in total spending in the economy.
  - Unemployment that increases during recessions, decreases during expansions.

Full employment

- **Natural rate of unemployment**: whatever unemployment rate that is associated with zero cyclical unemployment.
- **Full employment**: When there is zero *cyclical unemployment*; the other types may be positive
- **Potential GDP or Full-Employment GDP**: Level of GDP that would occur with full employment

Real Wage

- **Nominal wage:** Unadjusted, before tax, hourly earnings for labor
- **Real wage:** Inflation-adjusted wage, reflects the real purchasing power of the wage

$$\text{real wage} = \left(\frac{\text{nominal wage}}{\text{Price Level}} \right) 100$$

Computing the Real Wage

Nominal Wages and Price Levels

Nominal wages:

- Nominal wage(2021) = $18 / hour
- Nominal wage(2022) = $19 / hour

Actual GDP Deflators (base year 2012):

- GDP Deflator(2021) = 118.866
- GDP Deflator(2022) = 127.183

Real Wages

- Real wage(2021)
  = $18 / 118.866 * 100 = $15.14
- Real wage(2022)
  = $19 / 127.183 * 100 = $14.94
- Nominal raise, but *real pay cut*.
- Purchasing power of wages is lower in 2022.

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