# Worksheet 2 — Measuring Output, Unemployment, and Inflation

## Part 1. GDP measured three ways

**1.1** GDP is the market value of all _____ goods and services produced _____ in a given period.

**1.2** Define the pair.

Final good:

Intermediate good:

**1.3** Why does the definition of GDP insist on *final* goods?

**1.4 The two-firm economy**.

Firm 1 sells $100 of steel to Firm 2, and pays $80 in wages.

Firm 2 buys the steel, pays $70 in wages, and sells $200 of cars to consumers.

*(a) Production approach — value added*

| | Sales | Intermediate inputs | Value added |
|---|---|---|---|
| Firm 1 | | | |
| Firm 2 | | | |
| **GDP** | | | |

*(b) Income approach*

| | Amount |
|---|---|
| Wages | |
| Profits | |
| **GDP** | |

*(c) Expenditure approach*

**1.5** Why do the three approaches give the same number? Is this a coincidence, an empirical finding, or something else?

**1.6** Suppose Firm 2 produces \$200 of cars but sells only \$180. What is GDP now, and where does the missing \$20 go?

## Part 2. What counts, and where?

**2.1** For each transaction, say whether it enters this year's GDP, and if so under which letter: $C$, $I$, $G$, $X$, $IM$, or inventories.

| | Transaction | In GDP? | Which letter? |
|---|---|---|---|
| 1 | A household buys a newly built apartment | | |
| 2 | A household buys a 40-year-old house | | |
| 3 | A firm buys a new delivery van | | |
| 4 | A firm buys \$2m of corporate bonds | | |
| 5 | The government sends a Social Security cheque | | |
| 6 | The government pays a public school teacher | | |
| 7 | A mill sells flour to a bakery | | |
| 8 | A US consumer buys a Japanese laptop | | |
| 9 | A German firm buys a US-made turbine | | |
| 10 | You cook dinner for your housemate for free | | |
| 11 | A firm produces 500 units and sells 460 | | |
| 12 | A homeowner lives in the house she owns | | |

**2.2** Two of the rows above are the ones people most often get wrong. Which two do you think they are, and why?

**2.3 Value added, on your own.** A farmer grows wheat using no inputs and sells it to a miller for \$50. The miller sells flour to a baker for \$120. The baker sells bread to consumers for \$200.

(a) Compute value added at each stage.

(b) What is GDP? _____

(c) Why is GDP not \$370?

## Part 3. Nominal and real

**3.1** Fill in the in-class example as we do it.

| | Year 1 $Q$ | Year 1 $P$ | Year 2 $Q$ | Year 2 $P$ |
|---|---|---|---|---|
| Cars | 10 | \$20 | 9 | \$30 |
| Computers | 4 | \$10 | 12 | \$5 |

Nominal GDP

- Year 1
- Year 2

Nominal growth rate

Real GDP Year 2 (Year 1 prices)

Real growth rate

GDP deflator

- Year 1
- Year 2

Inflation rate

**3.2** Check against **Proposition 7** from the math handout: growth of nominal GDP $\approx$ inflation + growth of real GDP.

Nominal growth: _____ vs. sum of the other two: _____

Are they equal? Why not, and what does that tell you about when the approximation is safe to use?

**3.3 Does the base year matter?** Recompute real growth using **Year 2** prices as the base instead.

Year 1 output at Year 2 prices: _____

Year 2 output at Year 2 prices: _____

Growth rate: _____

**3.4** Put the two answers side by side.

Using Year 1 prices: _____ Using Year 2 prices: _____

Same economy, same quantities, same prices, two different growth rates — and no arithmetic error in either. Which good is responsible, and what is unusual about it?

**3.5 Name them.** The two measures you just computed have names.

| Weighted at | Name | Your number |
|---|---|---|
| **Old** (Year 1) prices | | |
| **New** (Year 2) prices | | |

**3.6 The substitution argument.** Do not memorize the ordering — derive it.

(a) Which good became relatively cheaper _____ and which became relatively more expensive _____?

(b) What is the change in consumption measured:

- Year 1 prices

- Year 2 prices

(c) In one sentence, why is this ordering not just a feature of my numbers?

**3.7 The fix.** The two answers differ because the base year's prices go out of date. So what is the obvious thing to do about it?

This is called _____. Instead of pricing everything at one distant base year forever, you compare each year only with the year _____ and join the results into a long series.

It is why official tables say "**chained** 2017 dollars" rather than just "2017 dollars".

## CPI

**3.8** CPI, what do we do differently from GDP Deflator?

1. _____

2. _____

**3.9** Complete the comparison.

| | GDP deflator | CPI |
|---|---|---|
| Covers which goods? | | |
| Includes imported goods? | | |
| Includes capital goods? | | |
| Fixed or changing basket? | | |

**3.10** Compute the CPI for the same two-good economy

| | Year 1 $Q$ | Year 1 $P$ | Year 2 $Q$ | Year 2 $P$ |
|---|---|---|---|---|
| Cars | 10 | \$20 | 12 | \$24 |
| Computers | 4 | \$10 | 6 | \$5 |

Cost of the _____

- Year 1
- Year 2
- CPI Year 1
- CPI Year 2
- Inflation

What are some issues with CPI?

1. _____

2. _____

3. _____

**3.10** World oil prices double. The US imports most of its oil.

What happens to the CPI?

What happens to the GDP deflator?

Why?

## Part 4. Unemployment

**4.1** Write the two definitions.

$L =$ _____ $u =$ _____

**4.2** Complete the three categories.

| Category | Requirement |
|---|---|
| Employed | |
| Unemployed | |
| Not in the labor force | |

The requirement that does most of the work is: _____

**4.3** An economy has population 200 million: 140 million employed, 10 million unemployed, the rest out of the labor force.

(a) labor force: _____

(b) Unemployment rate: _____

(c) Participation rate ($L$ / population): _____

**4.4** Now 3 million of the unemployed give up looking, believing there are no jobs.

(a) New unemployment rate: _____

(b) New participation rate: _____

(c) Did the economy get better or worse? Did the headline statistic get better or worse? Write one sentence on what this implies about reading unemployment data.

## Part 5. How the three move together

Everything before this point in today's class was **true by definition**. The next two relations are not. Somebody looked at data and found them, and they could have come out differently.

### Okun's law and Phillips Curve

What is the Okun's law relationship between unemployment and _____? _____

What is the Phillips curve relationship between unemployment and _____ ? _____

## Part 6. Practice problems

**6.1** A two-good economy.

| | Year 1 $Q$ | Year 1 $P$ | Year 2 $Q$ | Year 2 $P$ |
|---|---|---|---|---|
| Bread | 100 | \$2.00 | 110 | \$2.50 |
| Books | 20 | \$10.00 | 25 | \$12.00 |

Compute: nominal GDP in each year, real GDP in Year 2 using Year 1 prices, the real growth rate, the GDP deflator in Year 2, and the inflation rate.

**6.2** Explain, in your own words and without formulas, why measuring *real* output is harder than measuring *nominal* output.

**6.3** A politician says: "We must cut imports. Look at the formula — $Y = C + I + G + X - IM$. Imports are subtracted, so cutting them raises GDP."

Identify the error precisely. What is wrong about treating this identity as a causal statement?

**6.4** True, false, or uncertain — and explain in one or two sentences each.

(a) "If nominal GDP rose and real GDP fell, then prices must have risen."

(b) "A rise in the unemployment rate always means more people lost jobs."

(c) "GDP is a measure of a country's welfare."

(d) "Because the accounts count a new house as investment but a new car as consumption, the national accounts contain an inconsistency."