

# INTERMEDIATE MACROECONOMICS

## 1 - INTRODUCTION & DEFINITIONS

University of  
Massachusetts  
Amherst



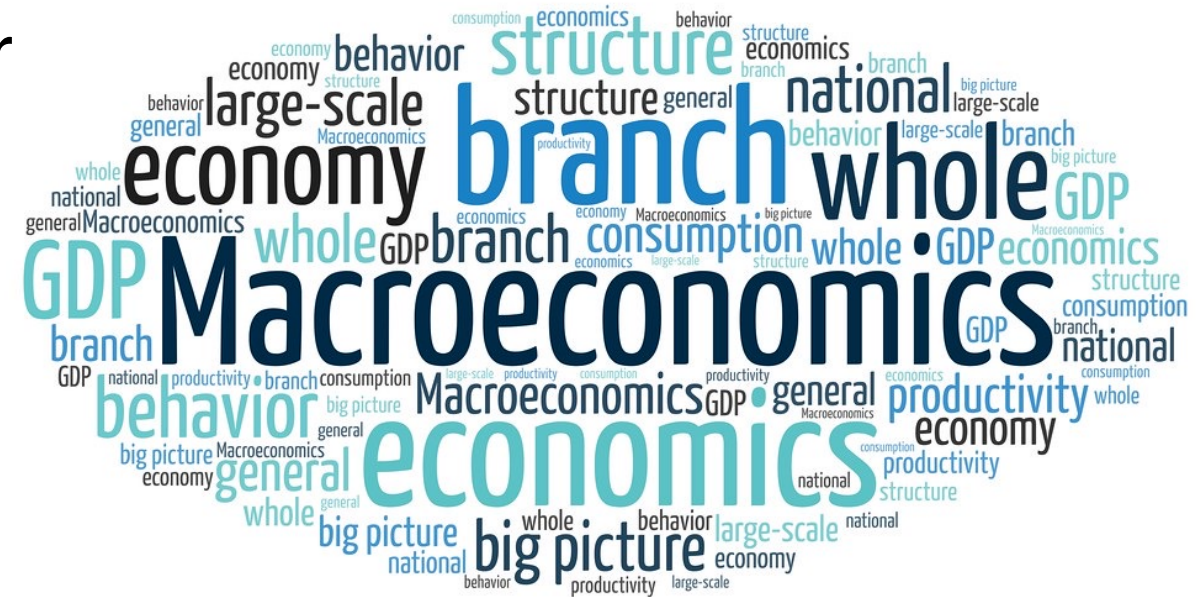


**Write down 3 things you remember from  
Tuesday's class**

(If you weren't here on Tuesday, name 3 things that  
come to your mind when you think  
“Macroeconomics”)

# 1 – Introduction & Definitions

- What is macroeconomics?
- What is it for?
- How do we measure and monitor the economy?



# Section 1: The roadmap

1. What is Macroeconomics?
2. Measuring aggregate output.
3. Measuring the labor market.
4. Measuring inflation.
5. Okun's law & the Phillips Curve



# Section 1: The main ideas

- **Macro** studies the economy as a whole and focuses on some key aggregate variables.
- **Real GDP** measures aggregate production.
- **Unemployment rate** = share of workforce that can't find a job.
- **Inflation** is the rate at which prices increase.
- There tends to be **systematic relations** between these 3 variables (Okun's law & Phillips curve).

# 1.1 WHAT IS MACROECONOMICS?

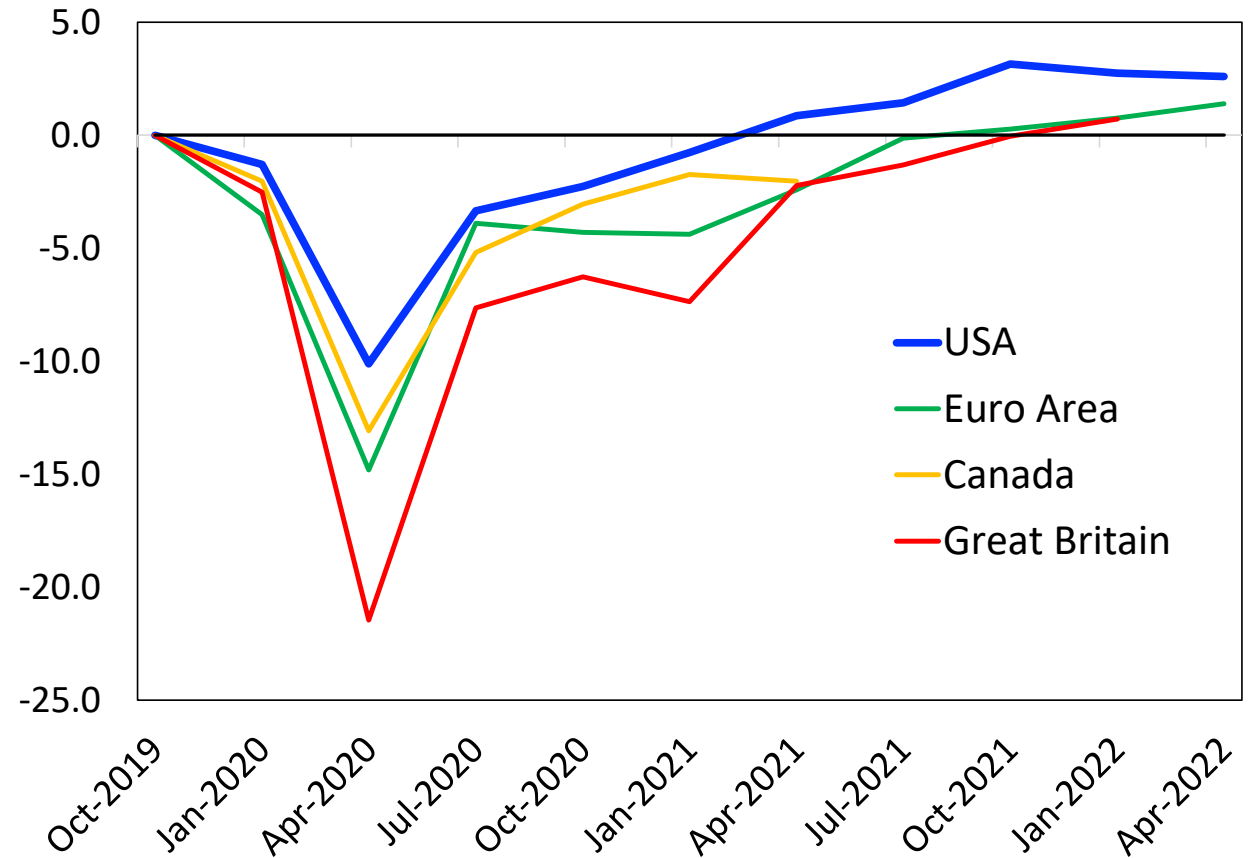


# What is Macroeconomics?

- *Macroeconomics* studies the behavior of the economy taken as a whole.
- It tries to explain the evolution of some key *aggregate* variables that describe the state of the economy.
  - ✓ output (GDP).
  - ✓ employment and unemployment.
  - ✓ wages.
  - ✓ inflation.
  - ✓ interest rates.

# Facts that we would like Macro to explain

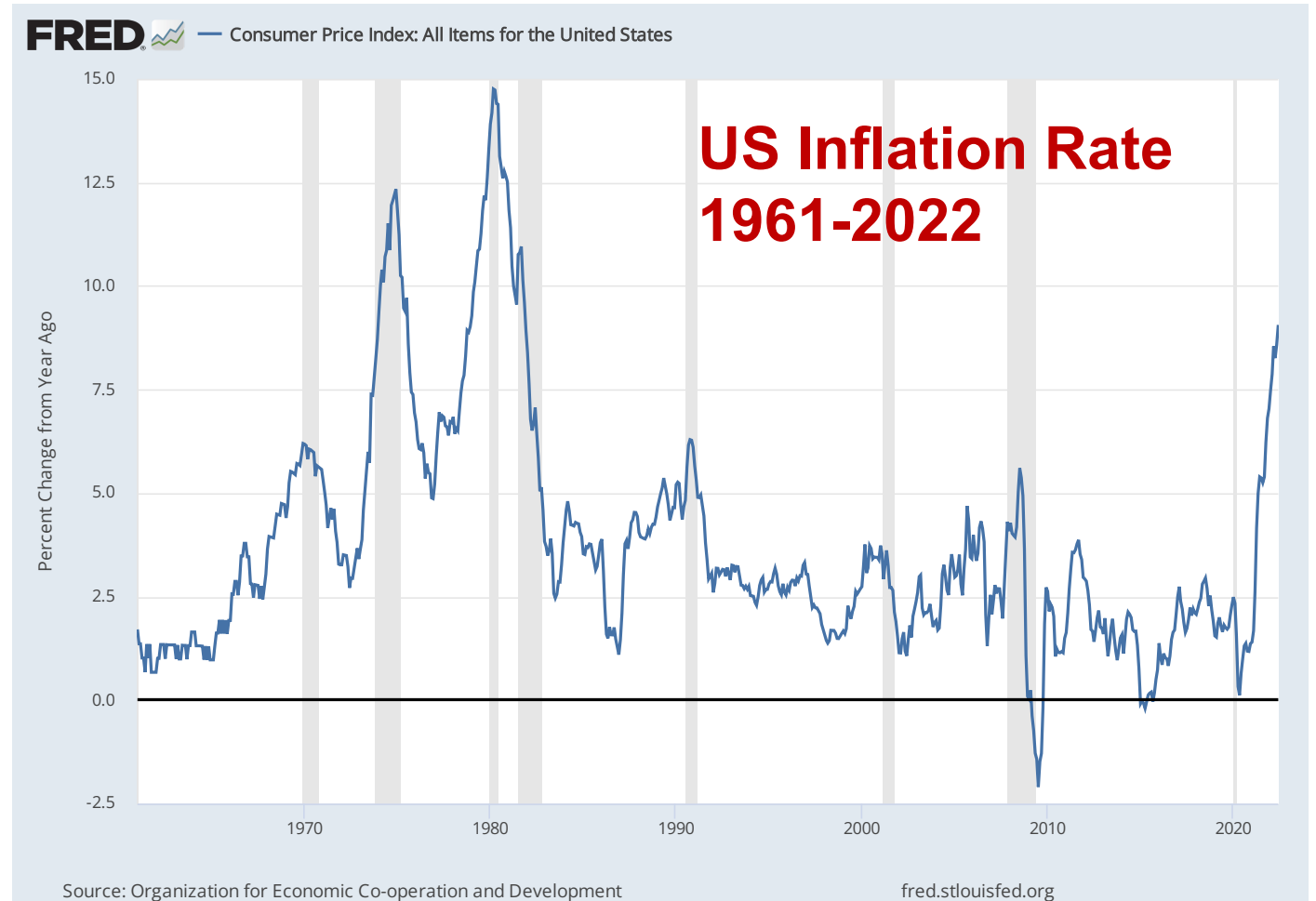
The US economy has done better than other rich economies during the Covid-19 pandemics.



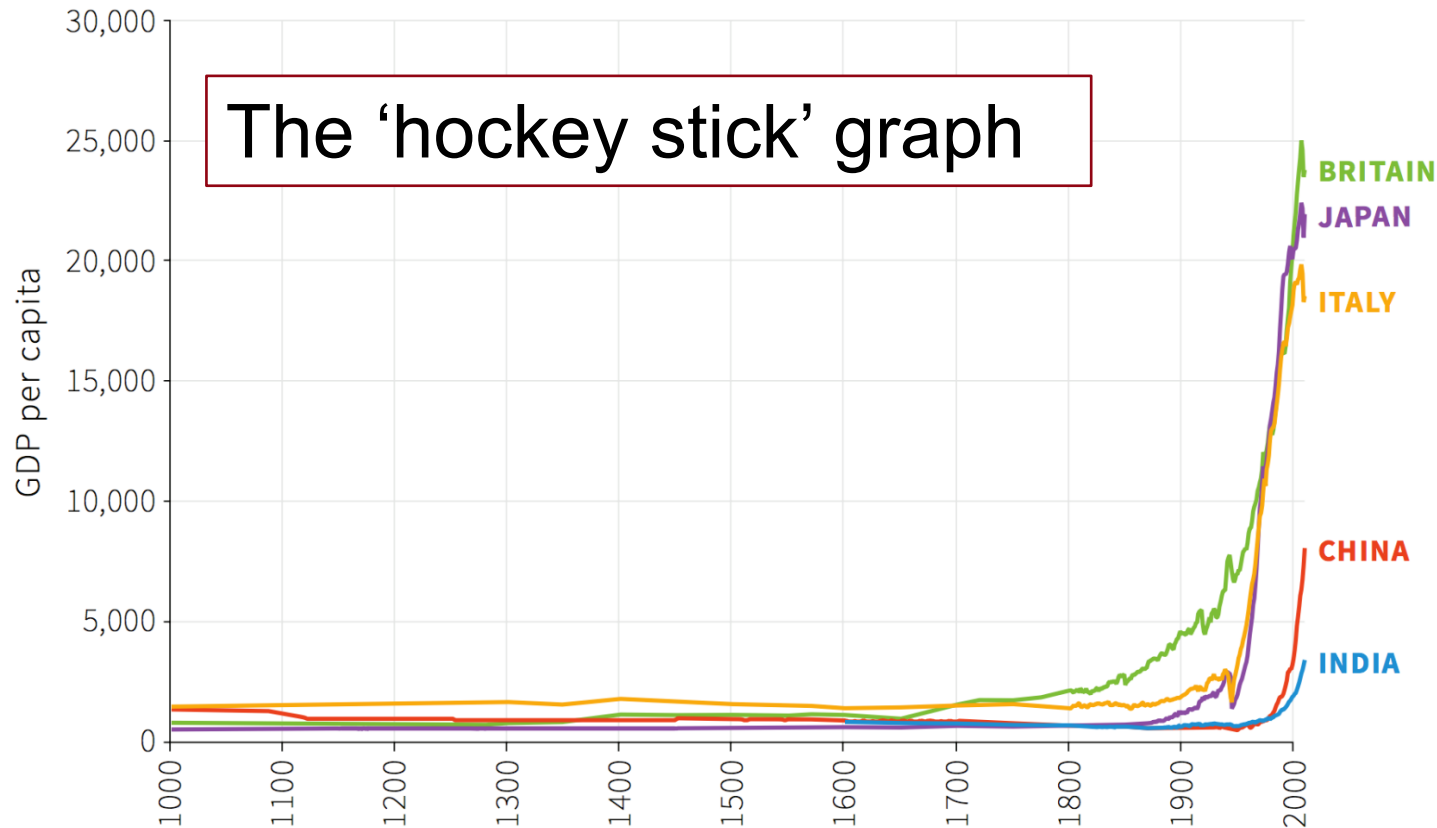


# Facts that we would like Macro to explain

Inflation is making a comeback.



# What this course will *not* attempt to explain.



- Emergence of capitalism.
- Industrial revolution.
- Structural change (from agrarian to industrial).
- We will take for granted an industrialized market economy.

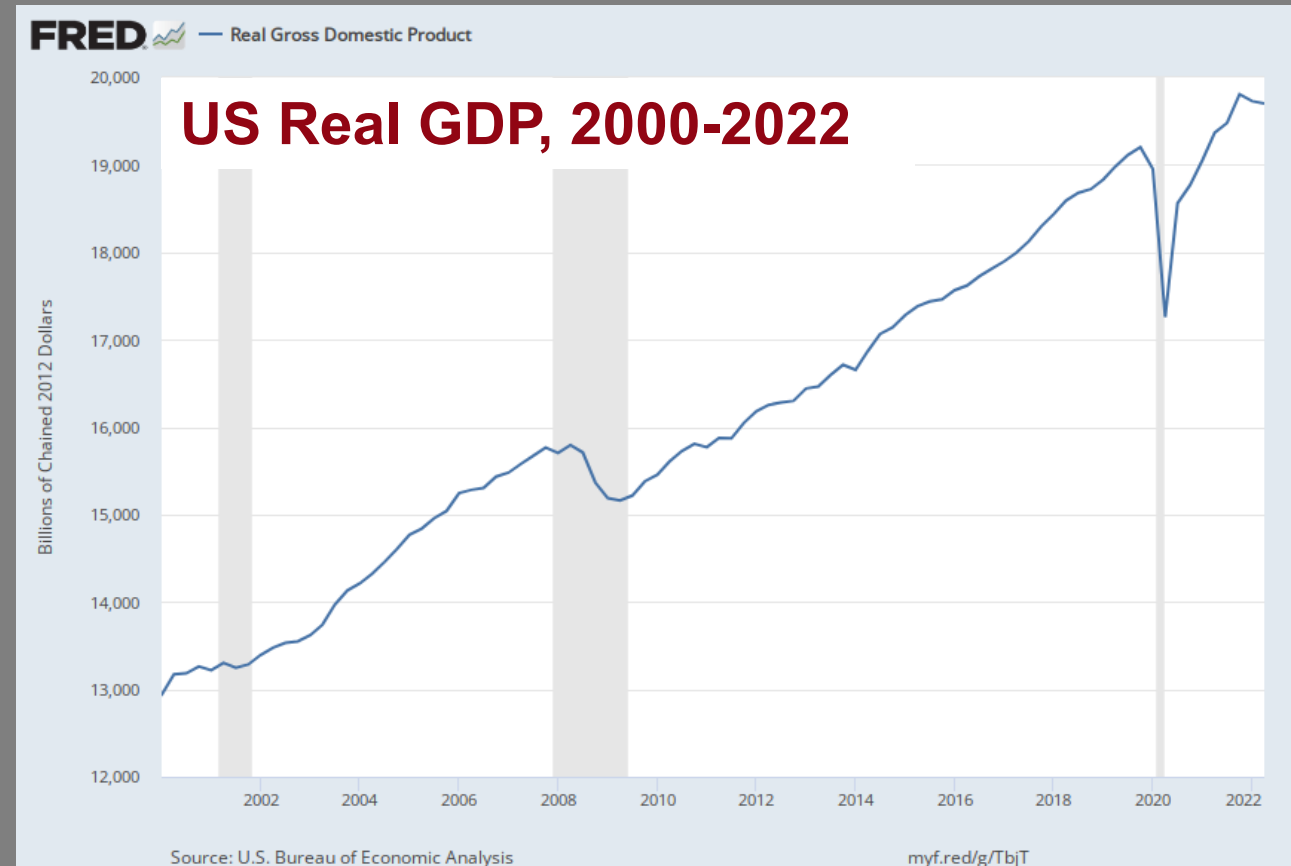
# What do macroeconomists do?

- Private sector: help firms or banks assess the macroeconomic context and what it means for them.
- Government or international institutions: make macroeconomic forecasts, help design & evaluate macroeconomic policies.
- Academia: research & teaching.





# 1.2 MEASURING AGGREGATE OUTPUT



# GDP: A measure of aggregate output

- Gross domestic product (GDP).
- Calculated since 1948
  - National Income and Product Accounts (NIPA)
- How would *you* define aggregate output in the economy?

# An economy with just 2 firms:

Steel Company (Firm 1)		Car Company (Firm 2)	
Revenues from sales	\$100	Revenues from sales	\$200
Expenses	\$80	Expenses	\$170
Wages	\$80	Wages	\$70
		Steel purchases	\$100
Profit	\$20	Profit	\$30

- How do we sum up quantities of different goods?
- Is GDP the sum of values of all goods produced (\$300)?
- Or just the value of cars (\$200)?
- Steel = *intermediate* good, Car = *final* good.



# Three equivalent definitions of GDP:

1. The value of final goods and services produced in the economy during a given period.
2. The sum of value added in the economy during a given period.
3. The sum of all incomes earned in the economy during a given period.

# 1. GDP is the value of final goods and services produced in the economy during a given period.

- We want to count only *final* goods, not intermediate goods.
  - GDP in the steel & car economy is just the value of cars (\$200)
- production-side GDP is \$200.

## 2. GDP is the sum of value added in the economy during a given period.

- The value added (VA) by each firm equals:  
*value of final production – value of intermediate goods used up*
  - Steel company VA: \$100
  - Car company VA:  $\$200 - \$100 = 100\$$
  - Aggregate VA: *Steel company VA + Car company VA = \$200*
- Value added-based GDP is \$200.



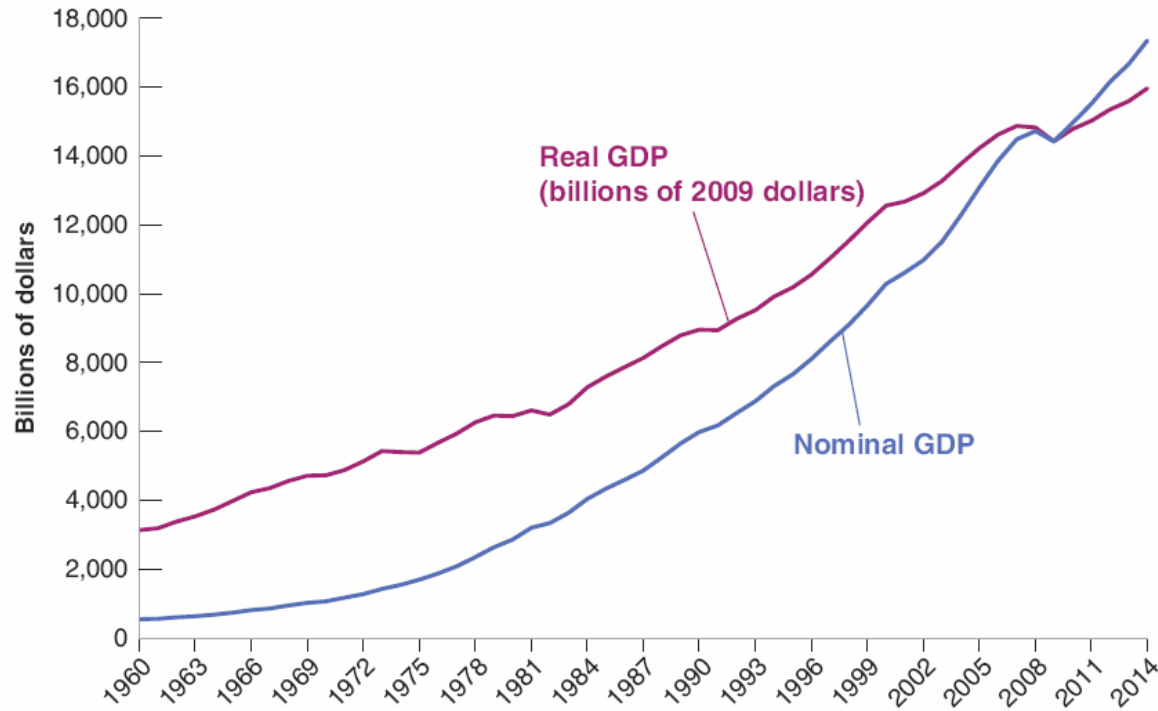
### 3. GDP is the sum of all incomes earned in the economy during a given period.

- In the two-firms example:

*labor income* (\$150) + *profit income* (\$50) = tot. income (\$200).

→ GDP from the income side is \$200.

# Nominal GDP and Real GDP



- Nominal GDP: quantities produced x *current* prices.
- But prices can change over time!
- Real GDP: quantities produced x *constant* prices.

# Nominal GDP and Real GDP

Example: Real and Nominal GDP in a one-good economy

Year	Quantity of Cars	Price of Cars	Nominal GDP	Real GDP (in 2009 dollars)
2008	10	\$20,000	\$200,000	\$240,000
2009	12	\$24,000	\$288,000	\$288,000
2010	13	\$26,000	\$338,000	\$312,000



# Nominal GDP and Real GDP

With many goods?

- Can still use the prices of a given year as weights.
  - Real GDP in 2009\$ dollars
  - Real GDP in 2010\$ dollars
  - Real GDP in 2011\$ dollars
  - ....

# Nominal GDP and Real GDP

- **Example:** an economy producing wine & potatoes.
- **Your turn!** Calculate:
  1. Nominal GDP growth
  2. Real GDP growth in Year 0 dollars
  3. Real GDP growth in Year 1 dollars.

## Nominal GDP in Year 0 and in Year 1.

	Quantity	Year 0	
		\$ Price	\$ Value
Potatoes (pounds)	10	1	10
Wine (bottles),	5	2	10
Nominal GDP			20
	Quantity	Year 1	
		\$ Price	\$ Value
Potatoes (pounds)	15	1	15
Wine (bottles),	5	3	15
Nominal GDP			30

# Clicker questions

What is nominal GDP growth in the 'wine & potatoes' economy?

- A. 10%      C. 25%  
B. 20%      **D. 50%**

What is real GDP growth in the 'wine & potatoes' economy?

- A. 10%      **C. 25%**  
B. 20%      D. 50%

- **Problem:** Real GDP *and* real GDP growth depend on the year chosen.
- **Solution:** Chained Real GDP.

What is real GDP growth in constant year 1 dollars?

- A. 10%      C. 25%  
**B. 20%**      D. 50%

# Chained Real GDP

Computed in 4 steps:

1. Compute Real GDP growth between two years in two ways:
    - a. Using prices from year  $t$  as the set of common prices
    - b. Using prices from year  $t+1$  as the set of common prices
  2. Real GDP growth between  $t$  and  $t+1$  = average of (a) and (b)
  3. Build a real GDP index:
    - a. set it equal to 100 in a base year;
    - b. then apply the growth rates of step 2 to obtain values for the other years.
  4. Multiply this index by nominal GDP in the *base year*.
- Chained Real GDP still depends on the base year, *but its growth rate doesn't*



# Chained Real GDP in the ‘wine & potatoes’ economy

Nominal GDP in Year 0 and in Year 1.

Your turn!

Calculate Chained Real GDP for the wine & potatoes economy.

Use year 0 as the base year.

		Year 0	
	Quantity	\$ Price	\$ Value
Potatoes (pounds)	10	1	10
Wine (bottles),	5	2	10
Nominal GDP			20
		Year 1	
	Quantity	\$ Price	\$ Value
Potatoes (pounds)	15	1	15
Wine (bottles),	5	3	15
Nominal GDP			30

## Clicker question

What is *Chained Real GDP* growth in the ‘wine & potatoes’ economy?

A. 15.8%

B. 22.5%

C. 25.5%

D. 40.0%

## Clicker question

What is *Chained Real GDP* growth in the ‘wine & potatoes’ economy?

A. 15.8%

**B. 22.5%**

C. 25.5%

D. 40.0%

# Real GDP and quality improvements

- How about changes in the *quality* of goods?
- Principle of *Hedonic pricing*
  - treat goods as providing a collection of characteristics/services.
- Keeping price fixed, a quality improvement means you get more ‘services’ at the same price.
- So we can treat a quality improvement as a decrease in the unit price (of the services/characteristics that the good provides).

# Real GDP and quality improvements: the case of laptops

- Quality of new laptops increased by 18% a year since 1995.
  - Dollar price of typical laptop declined by about 7% a year.
- > laptops' quality-adjusted price has fallen at an average rate of  $18\% + 7\% = 25\%$  per year.





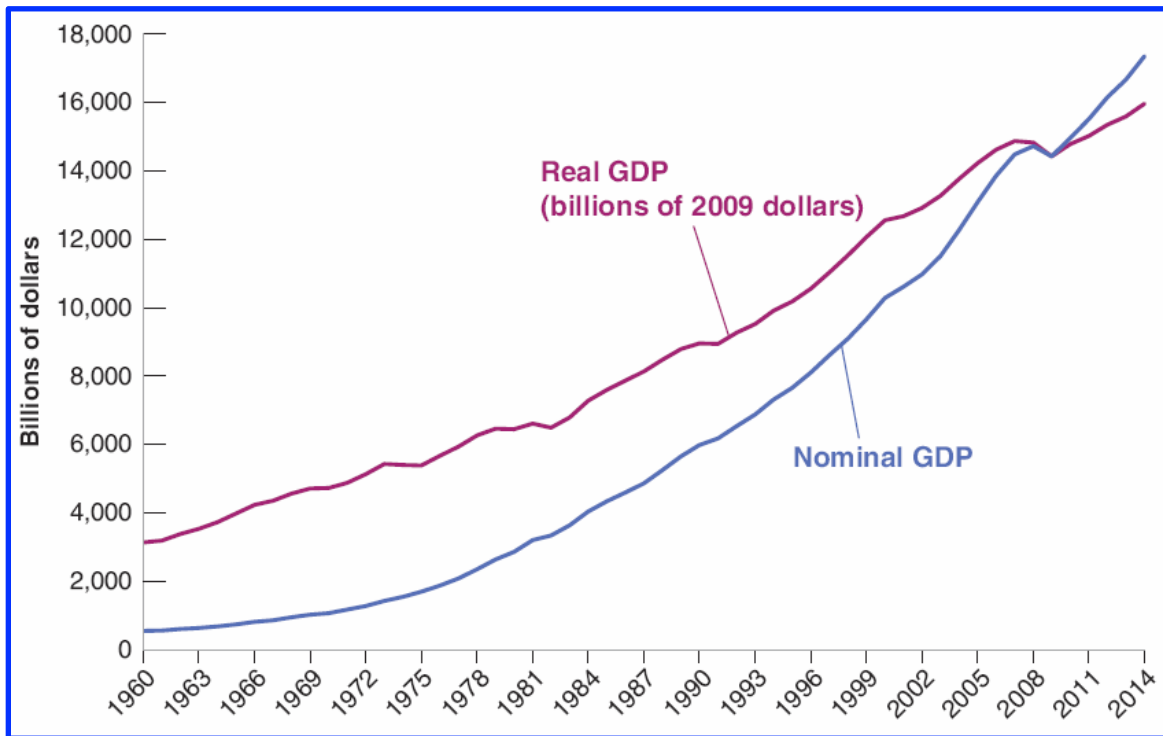
# Some notes on notation (1/2)

- Other ways to call Nominal GDP:
  - GDP in current dollars.
  - GDP at current prices.
- Other ways to call Real GDP:
  - GDP at constant prices.
  - GDP in constant 2009 dollars.
- Other way to call Chained Real GDP:
  - GDP in chained (2009) dollars.



## Some notes on notation (2/2)

- GDP usually refers to real *GDP*.
- $Y_t$  will denote real GDP in year  $t$ .
- Nominal GDP & other variables in current dollars will be denoted by a dollar sign in front of them
  - for example:  $\$Y_t$



← Nominal and Real US GDP (*level*)

Yearly *growth rate* of Real US GDP

