

Discussion 2

1 Math Review

Ratio calculation is extremely useful when computing price index with a given base year. The normalization can be expressed more clearly under the use of ratio.

- A *ratio* is a method of comparing two numbers by division.
- It is the quotient obtained when the first number is divided by the second, nonzero number.
- No units, normally written in \mathbb{Z} .
- Ratio is usually expressed in simplest form $\Rightarrow \text{GCF}(\text{numerator}, \text{denominator}) = 1$.

The ratio of 2 to 5 is written as $\frac{2}{5}$ or $3 : 1$.

1.1 Examples

1. A map scale is $1 : 1,000\text{m}$. On the map, the distance between *Ding's Garden* and *Class 302* is 2.25 cm. What is the actual distance (in meters) between these two restaurant?
2. The Celcius scale defines the temperature at which water freezes into ice is defined as 0°C , and the boiling point of water is defined to be 100°C . What is 68°F in terms of Celcius?

2 Definitions

1. Consumer Price Index: CPI measures the overall cost of goods and services bought by **consumer** (cost of living).

$$\text{CPI} \equiv \frac{\text{price of basket in current year}}{\text{price of basket in base year}} \times 100 \quad (1)$$

2. Producer Price Index: PPI measures the cost of goods and services bought by **firm**.
3. Inflation rate: percentage rate of change in the CPI.

- Deflation: inflation rate < 0 .

$$\pi_{1,2}^{\text{CPI}} = \frac{\text{CPI}_2 - \text{CPI}_1}{\text{CPI}_1} = \frac{\text{CPI}_2}{\text{CPI}_1} - 1 \quad (2)$$

4. Indexation: automatic correction by law or contract of a dollar amount for the effects of inflation.

3 Measuring the CPI

1. Roadmap:

- (a) Survey consumers to determine the relevant “basket of goods.”
- (b) Record the price of each good in each year.
- (c) Compute the cost of the “basket” in each year.
- (d) Choose a base year and compute the CPI for the current year
- (e) Compute the inflation rate as the percentage change in the CPI from one year to the next.

2. Measuring errors¹

(a) Substitution bias

- In any given year, the prices of some goods rise faster than others.
- CPI is based on the implicit assumption that consumers will not reduce the quantity of shirts purchased.
- Fixed basket problem: consumers tend to substitute less expensive goods for more expensive goods.
- Overstates the true change in the cost of living.

(b) Unmeasured change in quality

- Goods improve/deteriorate in quality over time.
 - car gas mileage improves
 - cell phones have better displays
 - CPU becomes faster
- If the price of a good rises because the quality has improved, then that is **not** inflation.
- Any quality *improvements* for which the BLS does not account for will cause the CPI to overstate inflation.

(c) Introduction of new goods

- Consumer has more choices, people like variety
 - preferences are convex
- Regardless of price, the introduction of new goods makes consumers better-off by expanding their set of opportunities.
- The cost of living goes down when new goods are introduced, but that effect does not get captured by the CPI.
- Overstates the true change in the cost of living.

4 CPI v.s GDP Deflator

	Consumer Price Index (CPI)	GDP Deflator
Price Indicator	Reflects the prices of all goods consumed domestically	Reflects the prices of all goods produced domestically
Price of imported Good rises	Affected	Not affected (Consumption↑, Net export↓)
Price of domestically-produced capital good rises	Not affected	Affected
Price of goods	fixed basket goods	currently produced goods

5 The Fisher equation

$$i \text{ (nominal interest rate)} = r \text{ (real interest rate)} + \pi \text{ (inflation rate)} \quad (3)$$

¹ Armknecht, Lane, and Stewart (1996).

6 Exercise

1. GDP measures:
 - (a) the value of the goods that a country took from the rest of the world.
 - (b) the value of a country's unexploited natural resources.
 - (c) the accumulated wealth of a country.
 - (d) the flow of new goods and services into the economy .
2. The CPI is a statistic that:
 - (a) measures how the average price of all goods has changed relative to the previous year.
 - (b) measures how the average price of consumer goods has changed relative to a base year.
 - (c) takes into account how changes in average consumer income affect the quantity of goods that people buy each month.
 - (d) measures how the average price of all goods has changed relative to a base year.
3. Last year Lorenzo earned a after-tax income \$700 and bought a Tesla Model 3 for \$490 and a new house located at Newport Beach for \$900. To decorate his living room, he spent \$300 on a Danish Bang & Olufsen sound system. Which of the following is true?
 - (a) $C = 490, I = 0, M = 300$
 - (b) $C = 790, I = 300, M = 0$
 - (c) $C = 790, I = 900, M = 300$
 - (d) $C = 490, I = 900, M = 300$
4. Given the following information, calculate the rate of increase in the price level from 2004 to 2005.

	2004	2005
Nominal GDP	\$10,000	\$12,000
Real GDP	\$9,500	\$10,500

- (a) 7.9%
 - (b) -7.9%
 - (c) -8.6%
 - (d) 8.6
5. Nominal GDP was \$2 billion in year one and \$2.4 billion in year two. Prices increased between year one and year two. We can say that
 - (a) real GDP clearly increased between year one and year two.
 - (b) real GDP clearly decreased between year one and year two.
 - (c) real GDP increased if prices went up by more than 20%.
 - (d) real GDP increased if prices went up by less than 20%.

Use the following information to answer the next 2 questions. Suppose that for some country, the CPI in 2010 was 200 and in 2011 the CPI was 210. Furthermore, suppose that the nominal interest rate between 2010 and 2011 was 7%.

6. What was the rate of inflation between 2010 and 2011?
 - (a) 10%.
 - (b) 5%.
 - (c) 210%.
 - (d) 21%.

7. What was the real interest between 2010 and 2011?
 - (a) 2%.
 - (b) 12%.
 - (c) -3%.
 - (d) 3%.
8. You visit the website of a Belgium chocolate maker and you purchase \$430 worth of Gianduja and White chocolates that is to be shipped from Belgium to your apartment in Campus Village. As a result of this transaction:
 - (a) Belgium GDP rises by \$430 and U.S. GDP falls by \$430.
 - (b) Belgium GDP falls by \$430 and U.S. GDP rises by \$430.
 - (c) Belgium GDP rises by \$430 and U.S. GDP is unchanged.
 - (d) Belgium GDP falls by \$430 and U.S. GDP is unchanged.
9. Core inflation increased 1.9% over the last year. What items are excluded from the core inflation calculation?
 - (a) Housing and Gas
 - (b) Energy and Food
 - (c) Housing and Autos
 - (d) Autos and Gas
10. You purchased a new house for \$105,000 in 2016. In 2017, you sold the house for \$170,000. Your transactions:
 - (a) contributed \$105,000 to GDP in 2016 and \$170,000 to GDP in 2017.
 - (b) contributed \$170,000 to GDP in 2016 and -\$65,000 to GDP in 2017.
 - (c) contributed \$105,000 to GDP in 2016 and nothing to GDP in 2017.
 - (d) contributed \$170,000 to GDP in 2016 and \$65,000 to GDP in 2017.
11. In 2017, Kendall Ford, an automobile dealership, spends \$20,000 on a new car lift for its repair shop, \$2000 on a new scanner for its sales division, and \$600,000 on Audi company stock. Unsold cars and trucks were valued at \$400,000 on January 1, 2017 and unsold cars and trucks were valued at \$900,000 on December 31, 2017. What is Kendall Ford's total investment spending (I) in 2017?
 - (a) \$22,000
 - (b) \$322,000
 - (c) \$522,000
 - (d) \$1,022,000
12. Which of the following could cause nominal GDP to increase, but real GDP to decrease?
 - (a) The price level rises and the quantity of final goods and services produced rises.
 - (b) The price level falls and the quantity of final goods and services produced falls.
 - (c) The price level rises and the quantity of final goods and services produced falls.
 - (d) The price level falls and the quantity of final goods and services produced rises.
13. If real GDP grows at an annual rate of 1%, it will double in approximately ____ years.
 - (a) 11
 - (b) 70
 - (c) 23
 - (d) 35