

Recitation 4

1. Measuring the price level

- a. Complete the table below! The typical consumption basket is 1 apple, 4 bananas, and 7 coconuts. Use Year 1 as the base year!

	Year 1	Year 2	Year 3
P(A)	4	5	3
Q(A)	2	1	2
P(B)	7	7	7
Q(B)	2	3	7
P(C)	5	1	5
Q(C)	1	10	1
nGDP	27	36	60
rGDP	27	75	62
GDP deflator	100	48	96.8
Cost of basket	67	40	66
CPI	100	59.7	98.5

(1)

n GDP = $P(A) \cdot Q(A) + P(B) \cdot Q(B) + P(C) \cdot Q(C)$ when calculating nominal GDP, you should use given year's prices.

$$\text{n GDP at year 1} = 4 \cdot 2 + 7 \cdot 2 + 5 \cdot 1 = 27$$

$$\text{n GDP at year 2} = 5 \cdot 1 + 7 \cdot 3 + 1 \cdot 10 = 36$$

$$\text{n GDP at year 3} = 3 \cdot 2 + 7 \cdot 7 + 5 \cdot 1 = 60$$

(2) for real GDP, always use base year's prices. $P(A)=4$; $P(B)=7$; $P(C)=5$

$$\text{r GDP at year 1} = 4 \cdot 2 + 7 \cdot 2 + 5 \cdot 1 = 27$$

$$\text{r GDP at year 2} = 4 \cdot 1 + 7 \cdot 3 + 5 \cdot 10 = 75$$

$$\text{r GDP at year 3} = 4 \cdot 2 + 7 \cdot 7 + 5 \cdot 1 = 62$$

$$\text{GDP deflator} = \frac{\text{nGDP}}{\text{rGDP}} * 100$$

(3)

(please memorize this formula)

GDP deflator at year 1= $27/27*100=100$

GDP deflator at year 2= $36/75*100=48$

GDP deflator at year 3= $60/62*100=9.8$

(4) By question, the typical consumption basket is 1 apple(good A), 4 bananas(good B),, and 7 coconuts(good C),.

cost of basket= $P(\text{apple})*1 + P(\text{banana})*4 + P(\text{coconut})*7$

cost of basket at year 1 = $4*1 + 7*4 + 5*7= 67$

cost of basket at year 2 = $5*1 + 7*4 + 1*7= 40$

cost of basket at year 3 = $3*1 + 7*4 + 5*7= 66$

$$(5) \quad CPI_t = \frac{\text{Cost}(\text{basket})_t}{\text{Cost}(\text{basket})_{\text{base year}}} * 100$$

$$CPI_1 = \frac{\text{Cost}(\text{basket})_1}{\text{Cost}(\text{basket})_{\text{base year}}} * 100 = \frac{67}{67} * 100 = 100$$

$$CPI_2 = \frac{\text{Cost}(\text{basket})_2}{\text{Cost}(\text{basket})_{\text{base year}}} * 100 = \frac{40}{67} * 100 = 59.7$$

$$CPI_3 = \frac{\text{Cost}(\text{basket})_3}{\text{Cost}(\text{basket})_{\text{base year}}} * 100 = \frac{66}{67} * 100 = 98.5$$

2. Measuring the inflation

- a. Complete the table below! The typical consumption basket is 4 apples, 4 bananas, and 4 coconuts. Use Year 1 as the base year!

	Year 1	Year 2	Year 3
P(A)	3	7	11
P(B)	1	1	1
P(C)	4	3	2
Cost of basket	32	44	56
CPI	100	137.5	175
Inflation	-	37.5	27.3

(1)

By question, the typical consumption basket is 4 apples(good A), 4 bananas(good B), and 4 coconuts(good C),.

cost of basket = $P(\text{apple}) \cdot 4 + P(\text{banana}) \cdot 4 + P(\text{coconut}) \cdot 4$

cost of basket at year 1 = $3 \cdot 4 + 1 \cdot 4 + 4 \cdot 4 = 32$

cost of basket at year 2 = $7 \cdot 4 + 1 \cdot 4 + 3 \cdot 4 = 44$

cost of basket at year 3 = $11 \cdot 4 + 1 \cdot 4 + 2 \cdot 4 = 56$

$$(2) \quad CPI_t = \frac{\text{Cost}(\text{basket})_t}{\text{Cost}(\text{basket})_{\text{base year}}} * 100$$

$$CPI_1 = \frac{\text{Cost}(\text{basket})_1}{\text{Cost}(\text{basket})_{\text{base year}}} * 100 = 32 * 100 = 100$$

$$CPI_2 = \frac{\text{Cost}(\text{basket})_2}{\text{Cost}(\text{basket})_{\text{base year}}} * 100 = \frac{44}{32} * 100 = 137.5$$

$$CPI_3 = \frac{\text{Cost}(\text{basket})_3}{\text{Cost}(\text{basket})_{\text{base year}}} * 100 = \frac{56}{32} * 100 = 175$$

(3)

$$\text{Inflation rate}_t = \frac{CPI_t - CPI_{t-1}}{CPI_{t-1}} * 100 \text{ (the denominator is the CPI for the last period, not base year)}$$

$$\text{Inflation rate}_2 = \frac{CPI_2 - CPI_1}{CPI_1} * 100 = \frac{137.5 - 100}{100} * 100 = 37.5$$

$$\text{Inflation rate}_3 = \frac{CPI_3 - CPI_2}{CPI_2} * 100 = \frac{175 - 137.5}{137.5} * 100 = 27.3$$

3. Standardizing economic variables

We can use the following two formulas in next two questions.

$$\text{real}_t = \frac{\text{nominal}_t}{\text{CPI}_t} * 100 \text{ or } \text{real}_t = \frac{\text{nominal}_t}{\text{GDP deflator}_t} * 100$$

- a. What is the nominal wage rate if the real wage is \$22/hour, and the CPI is 112?

According to the first formula, $\text{real wage} = \frac{\text{nominal wage}}{\text{CPI}} * 100$,
Then $22 = \frac{\text{nominal wage}}{112} * 100$, the nominal wage is \$24.64/hour.

- b. What is the nominal wage rate if the nominal GDP per capita is \$250,000, the real GDP per capita is \$10,000, and the real wage rate is \$16/hour?

We can use the second formula, $\text{real wage} = \frac{\text{nominal wage}}{\text{GDP Deflator}} * 100$, then we just need to calculate GDP deflator.

$$\text{GDP deflator} = \frac{\text{nominal GDP}}{\text{real GDP}} = \frac{\text{nominal GDP/population}}{\text{real GDP /population}} = \frac{\text{nominal GDP per capita}}{\text{real GDP per capita}} = \frac{250000}{10000} * 100 = 2500$$

$16 = \frac{\text{nominal wage}}{2500} * 100$, we can get nominal wage is \$400/h.

- c. What is the real interest rate if the inflation rate is 7.5% and the nominal interest rate is 10%?

$$\text{real interest rate} = \text{nominal interest rate} - \text{inflation rate} = 10\% - 7.5\% = 2.5\%$$