Computational Problems

ALL THE QUESTIONS WILL BE IN MULTIPLE CHOICE FORMAT. YOU WILL NOT NEED PROVIDE ANY WRITTEN EXPLANATIONS TO YOUR ANSWERS. THE PROBLEMS BELOW ARE PRESENTED IN A DIFFERENT FORMAT SO IT IS MORE CONVENIENT FOR YOU TO PRACTICE.

Problem 1

Consider a student with the following monthly nominal expenditure and monthly nominal income:

Year	Soda		Pizza		Nominal Income
	q	p	q	p	
2013	30	$1.00	30	$4.00	$200
2014	30	$1.10	30	$4.50	$200
2015	30	$1.15	30	$5.00	$200

a) Pick a base year and identify what is in the CPI basket

Base year: 2013	CPI basket: 30 sodas + 30 pizzas

b) Find the price level in each year:

$$PL^{2013} = \frac{30 \times \$1 + 30 \times \$4}{30 \times \$1 + 30 \times \$4} \times 100 = 100$$

$$PL^{2014} = \frac{30 \times \$1.10 + 30 \times \$4.50}{150} \times 100 = 112$$

$$PL^{2015} = \frac{30 \times \$1.15 + 30 \times \$5.00}{150} \times 100 = 123$$

2013: 100	2014: 112	2015: 123

c) Find the inflation rate in 2014 and 2015:

$$\pi_{2014} = \frac{PL_{2014} - PL_{2013}}{PL_{2013}} \times 100 = 12 \%$$

$$\pi_{2015} = \frac{123 - 112}{112} = 9.82\%$$

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2014: 12%	2015: 9.82%

d) Find the real income in each year:

$$Y_{2013}^{2013\$} = Y_{2013}^{nom} \times \frac{PL_{2013}}{PL_{2013}} = \$200$$

$$Y_{2014}^{2013\$} = Y_{2014}^{nom} \times \frac{PL_{2013}}{PL_{2014}} = \$200 \times \frac{100}{112} = \$178.57$$

$$Y_{2015}^{2013\$} = \$200 \times \frac{PL_{2013}}{PL_{2015}} = \$200 \times \frac{100}{123} = \$162.60$$

2013: $\$200$	2014: $\$178.57$	2015: $\$162.60$

e) What is the student's real income growth rate in 2014 and 2015:

$$g_{2014}^{y} = \frac{\$178.57 - \$200}{\$200} = -10.72\%$$

$$g_{2015}^{y} = \frac{\$162.60 - \$178.57}{\$178.57} = -8.94\%$$

2014: -10.72%	2015: -8.94%

f) At the end of 2015 the student got a job with a starting salary of $2,000 per month (nominal). His employment contract says that each year he will get a 5% increase from the previous year salary. What will his salary be in 2025?

$$Y_{2025} = Y_{2015} \times \underbrace{(1+0.05)}_{g}^{2025-2015} = \$2000 \times 1.6289 =$$

$$= \$3257.8$$

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2025:	$3257.8

g) The student knows that the price level in 2015 is 110. He is pessimistic about inflation and thinks that by 2025 the price level will be 180. Based on this prediction, is his employment contract good? Show how you came up with the conclusion.

$$Y^{2015\$}_{2025} = \$3257.8 \times \frac{PL_{2015}}{PL_{2025}} = \$3257.8 \times \frac{110}{180} = \boxed{\$1990.9}$$

$< \$2000$

Real salary decreased ⇒ bad contract

Answer:	NO

Problem 2

Consider a country where real GDP per capita is currently $1,500. What will GDP per capita be in 100 years if the economy experiences a constant growth of 1% and if the economy experiences a constant growth of 4%?

$$1\% : \quad RGDPpC^{(1\%)}_{t+100} = RGDPpC_t \times (1+g)^{100} = \$1500 \times 1.01^{100} = \boxed{\$4,057.20}$$

↑ 1% growth

$$4\% : \quad RGDPpC^{(4\%)}_{t+100} = \$1500 \times 1.04^{100} = \boxed{\$75,757}$$

↑ 4% growth

Problem 3

Consider a student with the following monthly nominal expenditure and monthly nominal income:

Year	Tuition		Burgers		Nominal Income
	q	p	q	p	
2013	1	$500	30	$4.00	$700
2014	1	$520	30	$4.50	$700
2015	1	$540	30	$5.00	$700

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a) Pick a base year and identify what is in the CPI basket

Base year: 2013	CPI basket: 1 tuition + 30 burgers

b) Find the price level in each year:

$$PL^{2013} = 100$$

$$PL^{2014} = \frac{1 \times \$520 + 30 \times \$4.50}{1 \times \$500 + 30 \times \$4.00} = \frac{\$655}{\$620} = 105.65$$

$$PL^{2015} = \frac{1 \times \$540 + 30 \times \$5}{1 \times \$500 + 30 \times \$4.00} = \frac{\$690}{\$620} = 111.29$$

2013: 100	2014: 105.65	2015: 111.29

c) Find the real income in each year:

$$Y^{2013}_{2013} = \$700$$

$$Y^{2013}_{2014} = \$700 \times \frac{100}{105.65} = \$662.57$$

$$Y^{2013}_{2015} = \$700 \times \frac{100}{111.29} = \$628.99$$

2013: $700	2014: $662.57	2015: $628.99

d) In which year the student had the least ability to afford things?

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Problem 4

(20 points/minutes) Consider a country with the following data:

Year	Nominal GDP per capita	CPI
2012	$910	95
2013	$900	90
2014	$920	102
2015	$940	110

a) Find the growth rate of the real GDP per capita in 2013, 2014, and 2015:

Real GDP$_{pc}$:

$$GDP_pC_{2012}^{base\$} = \$910 \times \frac{CPI\ base}{CPI\ 2012} = \$910 \times \frac{100}{95} = \boxed{\$957.89}$$

$$GDP_pC_{2013}^{base\$} = \$900 \times \frac{100}{90} = \boxed{\$1000}$$

2014: $\$920 \times \frac{100}{102} = \boxed{\$901.96}$; 2015: $\$940 \times \frac{100}{110} = \boxed{\$854.55}$

| 201: $g = \frac{\$1000-\$957.89}{\$957.89} = 4.4\%$ | 2014: $\frac{\$901.96-\$1000}{\$1000} = -9.8\%$ | 2015: $\frac{\$854.55-\$901.96}{\$901.96} = -5.26\%$ |

b) Find the inflation rate in in 2013, 2014, and 2015:

$$\Pi_{2013} = \frac{90-95}{95} = -5.26\%$$

$$\Pi_{2014} = \frac{102-90}{90} = 13.33\%$$

$$\Pi_{2015} = \frac{110-102}{102} = 7.84\%$$

| 2013: -5.26% | 2014: 13.33% | 2015: 7.84% |

c) What will real GDP per capita be in 2050 if starting 2015 the economy experiences a constant growth of 0%, 1% and 3%?

$$0\%: \$854.55 \times (1+0)^{2050-2015} = \$854.55$$

$$1\%: \$854.55 \times 1.01^{35} = \$1210.60$$

$$3\%: \$854.55 \times 1.03^{35} = \$2404.60$$

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| 0%: $854.55 | 1%: $1210.60 | 3%: $2404.60 |

d) What would lead this country to experience sustained (constant) growth from 2015 to 2050 (think about aggregate production function)?

technological progress