

MIDTERM_01: SOLUTIONS

Part 01

Answer to Question No 01

Before we start answering different part of the question, it would be helpful to construct tables summarizing the economic activities of different agents of our model.

Coal Producer			
Activity	Quantity(million ton)	Price(\$)	Total Monetary value of the activity(in million \$)
Sells Coal	20	5.00	100.00
Pays wage			60.00
Tax			10

Iron Producer			
Activity	Quantity(million ton)	Price(\$)	Total Monetary value of the activity(in million \$)
Buys Coal	10.00	5.00	50.00
Pays wage			15.00
Pays tax			11.00
Sells iron	30.00	3.00	90.00

Steel producer			
Activity	Quantity(million ton)	Price(\$)	Total Monetary value of the activity(in million \$)
Buys Coal	5.00	5.00	25.00
Buys Iron	25.00	3.00	75.00
Pays wage			18.00
Pays tax			13.00
Sells steel	40.00	6.00	240.00
Exports steel	10.00	6.00	60.00

Consumer			
Activity	Quantity(million ton)	Price(\$)	Total Monetary value of the activity(in million \$)
Buys Coal	5.00	5.00	25.00
Buys Iron	5.00	3.00	15.00
Buys Steel	10.00	6.00	60.00
Gets wage from Coal Producer			60.00
Gets wage from iron Producer			15.00
Gets wage from steel Producer			18.00
Gets wage from Government			17.00
Pays Tax			14.00

Government			
Activity	Quantity(million ton)	Price(\$)	Total Monetary value of the activity(in million \$)
Tax From Coal Producer			10.00
Tax from iron producer			11.00
Tax from steel producer			13.00
Tax from consumer			14.00
Buys Steel	20.00	6.00	120.00
Pays wage to consumer			17.00

The after tax profit for the coal producer = Total Revenue – wages - cost of intermediate goods – tax = 100 – 60 – 0 - 10 = 30.00

After tax profit for the iron producer = 90.00 -15.00 -50.00 – 11.00 = 14.00

After tax profit for the steel producer = 240.00 – 18.00 – 13.00 – 25.00 -75.00 = 109.00

1) **Calculation of GDP using value added approach:**

$$\begin{aligned} \text{Value added by the coal producer} &= \text{final goods} - \text{intermediate goods} \\ &= 100.00 - 0 = 100.00 \end{aligned}$$

$$\text{Value added by the iron producer} = 90.00 - 50.00 = 40.00$$

$$\text{Value added by the steel producer} = 240.00 - 25.00 - 75.00 = 140.00$$

$$\text{Value added by the government} = \text{only wages} = 17.00$$

$$\begin{aligned} \text{So, GDP in value added approach} &= \text{sum of valued added} = 100 + 40 + 140 + 17 \\ &= 297.00 \end{aligned}$$

2) **Calculation of GDP by Expenditure Approach:**

$$\text{GDP} = C + I + G + NX$$

$$C = 15.00 + 25.00 + 60.00 = 100.00$$

$$I = 0$$

$$G = \text{purchase of steel by govt} + \text{wages paid by govt} = 120.00 + 17.00 = 137.00$$

$$\text{Export} = 60.00$$

$$\text{Import} = 0.0$$

$$NX = 60.00 - 0 = 60.00$$

$$\text{GDP by expenditure approach} = 100 + 137 + 60 = 297.00$$

3) **Calculation of GDP by Income Approach:**

$$\text{Consumer's income} = 60.00 + 15.00 + 18.00 + 17.00 = 110.00$$

$$\text{Producer's income} = 30.00 + 14.00 + 109.00 = 153.00$$

$$\text{Govt's income} = 10.00 + 11.00 + 13.00 = 34.00$$

$$\text{So, GDP by income approach} = 110 + 153 + 34 = 297.00$$

Answer to Question No 02

Year 1

Good	Quantity	Price
Apples	40	\$1.00
Oranges	80	\$2.00

Year 2

Good	Quantity	Price
Apples	50	\$3.00
Oranges	100	\$4.00

- 1) Nominal GDP in year 1 = $NGDP_1 = (40 \times 1) + (80 \times 2) = 200$
 Nominal GDP in year 2 = $NGDP_2 = (50 \times 3) + (100 \times 4) = 550$
 % change in nominal GDP = $((550 - 200) / 200) \times 100 = 175\%$
- 2) $RGDP^1_1 = NGDP_1 = 200$

$$\text{RGDP}_2^1 = (50*1) + (100*2) = 50 + 200 = 250$$
$$\% \text{ change in RGDP when year 1 is the base year} = ((250-200)/200)*100$$
$$= 25\%$$

3) $\text{RGDP}_1^2 = (40*3) + (80*4) = 440$
 $\text{RGDP}_2^2 = (50*3) + (100*4) = 550$
% change in RGDP when year 2 is the base year = $((550-440)/440)*100$
= 25%

4) $g_1 = \text{RGDP}_2^1 / \text{RGDP}_1^1 = 1.25$
 $g_2 = \text{RGDP}_2^2 / \text{RGDP}_1^2 = 1.25$
 $g_c = \sqrt{g_1 * g_2} = 1.25$
% change in real GDP using chain weighted index = $(1.25 - 1.00)*100$
= 25%

- 5) It is clear from the above results that the measurement of inflation based on RGDP is more accurate. In general, the measurement of inflation based on chain-weighted index is the most accurate measurement of inflation. The reason. Any measurement of inflation based on RGDP is more accurate because prices are constant and this gives us better measure of change in the purchasing power of the consumer. The chain weighted index is the most accurate one because it adjusts for the distortions created by using one specific year as base year.

Part 02

- 1) We will answer the different parts as follows:
- They are thought as inputs.
 - Two examples are social security benefits, Medicaid, unemployment benefits.
 - There are two reasons. First, Spending on Imported goods by consumer and the producer has already been included in C and I. We subtract Import to have a precise measure of the economic activity within the borders of USA. Second, Imported goods are final goods that were produced abroad. So, they should not be included in the GDP.
 - The answer is not clear. One explanation might be that the consumers do not contribute to the production. Hence the tax they pay should not be included in the GDP calculation. This argument is not that strong.
 - The most important three components that are included in consumer's income are as follows:
 - Compensation of employees (wages, salaries, benefits).
 - Corporate profits.
 - Net interest (interest income).

- f) The GDP calculation fails to take into consideration of the following:
 - i. GDP calculation does not reflect how income is distributed.
 - ii. It leaves out non-market activity (eating at home?).
 - iii. Does not take into consideration of underground economy, which is unreported economic activity (illegal drugs, baby sitting).
 - iv. Leaves out major portion of government activity (defense) most of the times.

2) We will answer the different parts as follows:

- a) the two examples of net factor payments are:
 - i) Remittance.
 - j) Foreign direct investment.
 - k) Profit from abroad.
- b) There are two kinds of investment expenditures. They are:
 - i) Fixed investment: production of capital or houses.
 - j) Inventory investment expenditures.
- c) They are as follows:
 - i. Purchase of used durables such as used car.
 - ii. “ “ Non-durables such as used clothing.
- d) It includes:
 - i) Federal Expenditure: this is central government's expenditure.
This includes:
 - Federal defense: largest government expenditure.
 - Federal non-defense: salary of workers. Building roads. Public schools.
 - i) State: Mainly state level non-defense expenditures. Examples are public schools.
 - ii) Local: similar local level non-defense expenditures such as public schools, police services.
- e) Transfers such as social security payments, unemployment benefits are not included in G. These are transfers of purchasing power from one group (tax payer) to another group (recipient).
- f) If you buy an automobile for your company, that might be treated as fixed investment. If you buy that for your own self, it is consumption expenditure.

3) we will answer each part of the questions as follows:

- a) $CPI = (\text{Cost of the base year quantity basket at current price} / \text{Cost of the base year quantity basket at base year price}) * 100$
- b) In data CPI is more volatile than GDP deflator
- c) Defined as : $LF = \text{Employed} + \text{Unemployed}$
Where, Employed = people who had a full or part time job during the survey

Unemployed = People who did not have a job and is actively searching for jobs

It does not include

i) People who are institutionalized (mental hospital, jail).

ii) People who are in the army.

d) $Y_d = Y + NFP + TR + INT - T$

e) Private Savings: $S^P = Y_d - C = Y + NFP + TR + INT - T - C$

Government savings: $S^G = T - TR - INT - G$

f) $S = I + CA$

Where, $CA = NFP + NX$

4) we will try to answer the questions as follows:

a) Correlation Coefficient = $\rho_{xy} = \frac{Cov(x, y)}{\sqrt{Var(x) * Var(y)}}$

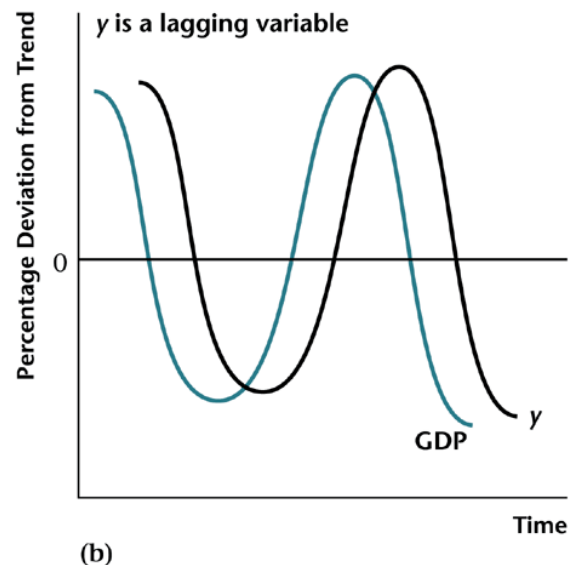
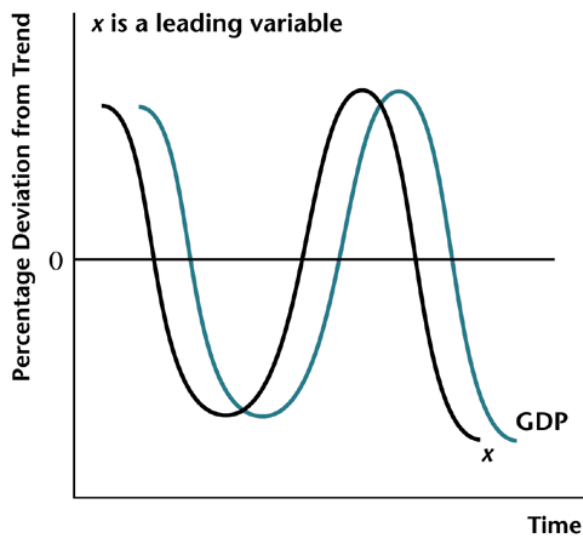
Also it should be noted, $-1 \leq \rho_{xy} \leq 1$, where,

i) $\rho_{xy} = 1$, perfect positive correlation, Pro-Cyclical

ii) $\rho_{xy} = -1$, perfect negative correlation, Countercyclical

iii) $\rho_{xy} = 0$, no correlation / uncorrelated, Acyclical

b), c)



d), e) and f)

	<i>Cyclicity</i>	<i>Lead/Lag</i>	<i>Variability Relative to GDP</i>
Consumption	Procyclical	Coincident	Smaller
Investment	Procyclical	Coincident	Larger
Price Level	Countercyclical	Coincident	Smaller
Money Supply	Procyclical	Leading	Smaller
Employment	Procyclical	Lagging	Smaller
Real Wage	Procyclical	?	?
Average Labor Productivity	Procyclical	Coincident	Smaller

5) we will try to answer the questions as follows:

a) The time constraint looks like:

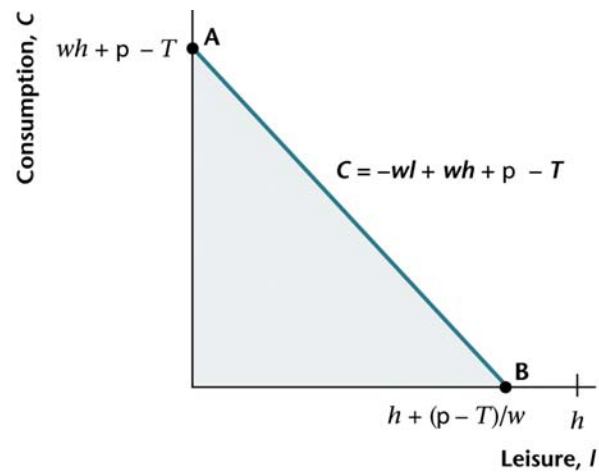
$$L + N^S = h$$

The budget constraint looks like:

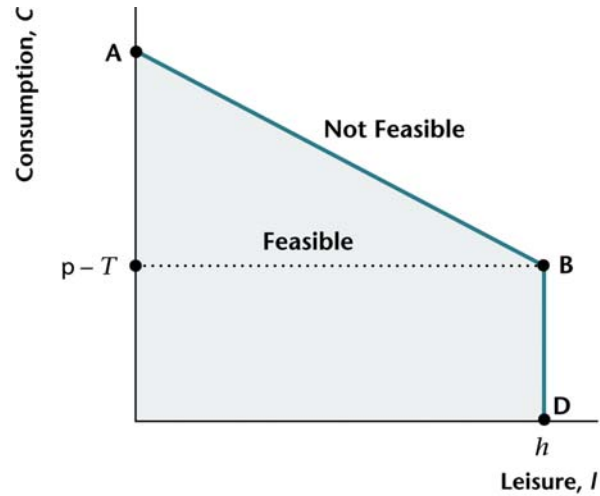
$$C = wN^S + \pi - T$$

b) We will draw the budget constraint for the following two cases:

i) **When $T > \pi$**



ii) When $T < \pi$



c) Optimal consumption bundle at the kink is a theoretical possibility. In the above figure, consumer can choose point B. but at point B, consumer does not work at all. This is inconsistent with actions taken by firms and consumer (if consumer does not work, firms cannot produce anything). Therefore, this situation cannot happen.