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Exercise 2
National Output and National Income

1. Is the following a stock or flow variable?
   - 2.1 Inventories stock
   - 2.2 Change in Inventories flow
   - 2.3 Money Supply stock
   - 2.4 Change in Money Supply flow
   - 2.5 National Income flow
   - 2.6 Expenditure flow
   - 2.7 Wealth stock
   - 2.8 Population stock
   - 2.9 Capital stock
   - 2.10 Interest flow
2. What is the difference between GDP and GNP? When looking at the US and China, which country do you expect to have higher GNP? Why?
3. The canned apple has 5 stages of production as follows. Find the value added of each stage and the GDP value of the canned apple.

Stages of Production	Value of Sales	Value Added
Growing Apple	12	12
Pickling	15	3
Canning	18	3
Shipping	20	2
Retail Sale	22	2

22 ← market value of final good ← GDP

4. What is Transfer Payment? Why is it not included in GDP?
5. Why are we interested in Real GDP? Explain with examples. Is there a problem associated with Real GDP?
6. Suppose 2018 is the base year. What can we say about Real GDP, Nominal GDP, and GDP Deflator of 2018?
7. Explain three limitations of the GDP concept.

$GDP_{2018} = C + I + G + (X - M) = 400 + 600 + 200 + (800 - 1000) = 1000$ *

8. In 2018, Kingdom Asgard made the following transactions. Using the expenditure approach, identify which component of GDP is affected by each transaction, and calculate the 2018 GDP.
   - The citizens bought 8 new cars, each worth 50$. C = $8 \times 50 = 400$ $

- The citizens bought 4 new houses, each worth 150$. I = 4×150 = 600 $
- The citizens grew rice for their own consumption. The rice was worth 500$. X NOT GDP
- The firms bought 6 used machines, each worth 50$. 2nd hand = NOT GDP
- The firms bought 8 car parts, each worth 25$. → Intermediate product = NOT GDP G = 4×50 = 200 $
- The government bought 4 new computers, each worth 50$.
- The government paid 1000$ to the poor as welfare payment. transfer payment = NOT GDP
- The citizens bought 10 imported ships, each worth 100$. M = 10×100 = 1000 $
- The firms sold 4 planes abroad, each worth 200$. export X = 4×200 = 800 $

9. Suppose that there are three goods in the economy – goods A, B, and C. Calculate Nominal GDP, Real GDP, and GDP Deflator when 2012 is the base year. Also, calculate the annual inflation rate from 2014 to 2015.

Year	Price of A	Quantity of A	Price of B	Quantity of B	Price of C	Quantity of C
2012	1	3	2	3	3	3
2013	3	1	4	2	1	4
2014	2	2	3	4	2	1
2015	4	4	1	1	4	2

P × Q P_{2012} × Q nominal / real ×100

Year	Nominal GDP	Real GDP	GDP Deflator
2012	3+6+9 = 18	$P_{2012} \times Q_{2012}$ = 18	$\frac{18}{18} \times 100$ = 100
2013	3+8+4 = 15	$P_{2012} \times Q_{2013}$ = 17	$\frac{15}{17} \times 100$ = 88.26
2014	4+12+2 = 18	$P_{2012} \times Q_{2014}$ = 13	$\frac{18}{13} \times 100$ = 138.5
2015	16+1+8 = 25	$P_{2012} \times Q_{2015}$ = 12	$\frac{25}{12} \times 100$ = 208.3

Nominal GDP = $\Sigma(P \times Q)$

Real GDP = $\Sigma(P_{base\ year} \times Q)$

GDP deflator = $\frac{\text{Nominal}}{\text{Real}} \times 100$

GDP deflator = CPI → price index telling you how expensive the goods

Annual Inflation rate 2014-2015

$= \frac{\text{new} - \text{old}}{\text{old}} \times 100$

$= \frac{208.3 - 138.5}{138.5} \times 100$

= 50.4 % #

The Inflation rate = % change in GDP deflator

10. Using the table below, calculate GNP and NNP.

GNP = GDP + NFFI

= GDP + (income from abroad - to abroad)

= 8000 + (250 - 300)

= 7,950 #

NNP = GNP - depreciation

= 7,950 - 900

= 7,050 #

	Billions of Dollars
GDP	8000
Receipts of factor income from the rest of the world	250
Payments of factor income to the rest of the world	300
Depreciation	900
Indirect taxes minus subsidies	500
Corporate profits minus dividends	500
Social insurance payments	700
Personal interest income received from the government and consumers	300
Transfer payments to persons	1100
Personal taxes	1000

11. Using the table below, Calculate the following items.

11.1 Gross domestic investment (I) GDI = NDI + Depreciation = 784 + 168 = 952 #

11.2 GDP, using the expenditure approach GDP = C + I + G + (X − M)

11.3 GNP (from-to) GNP = GDP + NFFI = 3849.6 + (35.2 − 68.8) = 3,816 # | = 2,203.2 + 952 + 716.8 + (212.8 − 235.2)

11.4 NNP NNP = GNP − Depreciation = 3,816 − 168 = 3648 # | = 3849.6 #

11.5 National Income, using the income approach = 1407.7 + 257.6 + 593.6 + 182.2 + 173.9 + 341 + 44.8 = 2,604.3 #

(Do not worry if NNP and NI differ greatly.)

Table 6.5

	Depreciation	168.0
	Compensation of employees	1,407.7 wage
	Corporate profits	257.6 corporate profit
	Dividends	78.4
(X)	Exports	212.8
(G)	Government purchases	716.8
(M)	Imports	235.2
	Indirect taxes	593.6 indirect tax
	Net interest income	182.2 interest
	Net private domestic investment	784.0
(C)	Personal consumption expenditures	2,203.2
	Personal interest income	112.0
	Receipts of factor income from the rest of the world	35.2
	Personal taxes	627.2
	Proprietor's income	173.9 non-corporate profit
	Payments of factor income to the rest of the world	68.8
	Rental income	34.1 rent
	Social insurance payments	380.8
	Subsidies	44.8 subsidy
	Transfer payments	504.0

12. In a simple economy, suppose that all income is either compensation (wage) of employees or profits. Suppose also that there are no indirect taxes. Calculate GDP from the table below. Show that

the expenditure approach and the income approach add up to the same figure.
(Hints: (1) NNP + Depreciation = GNP, (2) NFFI = 0, and (3) NI = NNP)

C	Consumption	9500
I	Investment	3000
✓	Depreciation	1750
✓	Profits	2400
X	Exports	850
✓	Compensation of employees (wage)	11500
G	Government purchases	3200
	Direct taxes	1200
	Saving	1600
M	Imports	900

Expenditure Approach

GDP = C + I + G + (X - M)

= 9,500 + 3,000 + 3,200 + (850 - 900)

= 15,650 #

Income Approach

NI = NNP

GNP = NNP + Depleciation

GNP = GDP when NFFI = 0 (from-to)

→ NI = 11,500 + 2,400 = 13,900 = NNP

→ GNP = NNP + Depleciation

= 13,900 + 1,750 = 15,650

→ GNP = GDP + NFFI

GDP = GNP - NFFI

GDP = 15,650 - 0

GDP = 15,650 #

1) Stock vs. Flow variables

Stock ⇒ point of time / no time dimension
Flow ⇒ period of time / time dimension

2) GDP vs. GNP

GDP (gross domestic product) - total market value of all final goods & services which produce and locate in a country
- given period → flow variable

GNP (gross national product) - total market value of all final goods & services which produce and owned by a country's citizens regardless where they live
- given period → flow variable

United state : GNP > GDP b/c US. opens factory in many other countries
China : GDP > GNP b/c there is so many factories opened in Chin

4) Transfer payment is a payment made by the goverment to people who don't supply any goods & services. In other words, It is a free payment w/o any production. This is why it's not included in GDP. e.g. social security payment, ~~Awards~~, unemployment benefits.

5) We interest in Real GDP because we want to see the actual output that has been adjust for inflation.

e.g.

year	P	Q
2020	20	5
2019	5	18

Nominal GDP_{2020} : $20 \times 5 = 100$
Nominal GDP_{2019} : $5 \times 18 = 90$
→ It seems like 2020 is better than 2019

But if we use real GDP, w/ 2019 as a base year

Real GDP_{2020} : $5 \times 5 = 25$
Real GDP_{2019} : $5 \times 18 = 90$
→ we can clearly see that 2019 is better.

Problems
1) Supply shift, price changed → Real GDP will be implement
2) structural changed, price fluctuated → Real GDP will be accurate

6) Real GDP = Production of G&S valued at fixed price (base year) = $\Sigma(P_{2018} \times Q_{2018})$
Nominal GDP = Production of G&S valued at current price = $\Sigma(P_{2018} \times Q_{2018})$
∴ Nominal GDP = Real GDP when 2018 → base year

GDP Deflator = overall price level = $\frac{\text{Nominal GDP}}{\text{Real GDP}} \times 100$

7) 3 limitations of GDP concept.

- Inequalities : GDP isn't affected by people's level of outcome b/c GDP focuses in overall economy.
- Informal market : unreported & illegal product & transfer payment aren't counted as GDP
- Externality : pollution & environment cost