Lecture Notes
GDP and Inflation Measurement

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Draft Notes for Chapters 2, and 3 (Blanchard, 2013)

1. GDP

In the class today, we discussed GDP. GDP can be thought of as- we did this in class- the total income of everyone in a country. GDP can be also visualised as the total spending in the economy. Both these ways must give you the same number. Consider an example. Assume that there are two people in the economy, and that they earn ₹50 each. The total income in the economy is ₹100. The amount spent on buying different goods in this economy must also be ₹100.
Let us formally define GDP. *Gross domestic product (GDP) is the market value of all final goods and services produced within an economy in a given period of time.*

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1.1 Rules for Computing GDP

- **Market Value:** Since we want a single number to define the value of everything produced in the economy, we use market prices. Because market prices measure the willingness to pay, they reflect the value of those goods. Example: the price of a car is five times the price of a scooter, then given that equal number of cars and scooters are produced in the economy, the contribution of cars towards the GDP would also be five times to that of scooters.

- **Final Goods:** GDP only includes the value of the final goods. Consider the following example. You are having cappuccino at Blue Tokai in Green Park. The coffee procured by Blue Tokai from a coffee plantation in Karnataka is an intermediate good. The cappuccino or macchiato you get in the end is the final good. The price of cappuccino already incorporates the price of coffee beans from Chikmagalur.

- **Used Good:** The computation of GDP excludes used goods. Example: when Mi produces and sells a new phone, this goes into GDP. On the other hand, when you get bored and decide to sell it on OLX, this transaction is not included in GDP.

- **National boundary:** GDP measures the value of production within the geographic confines of a country.

  - When an Indian citizen works temporarily in the United States, her income is part of U.S. GDP.

  - When an American citizen owns a factory in India, the production at his factory is not part of U.S. GDP. Thus, items are included in a nation's GDP if they are produced domestically, regardless of the nationality of the producer.

- **Intermediate Goods and Value Added**: Let us go back and think about the cappuccino story again. You paid ₹160 for a cup of coffee. You also learn that the price of the coffee bean (that gets you a cup of cappuccino) is ₹50. Should GDP include both the coffee bean and the cappuccino? The answer, we learnt elsewhere, is no. GDP of economy is ₹160, but you can always compute the value added at each stage of production. So, the value added of the coffee plantation is ₹50, but the value added in case of Blue Tokai is $₹160 - ₹50 = ₹110$. If you add these two values ($₹50$ and $₹110$), you should be able to arrive at GDP again.

1.2 Nominal and Real GDP

What if we want to track GDP over time? Since prices are changing all the time, it is difficult to make the case that economy is growing. How do you separate changes in output from changes in price level? We can start by fixing the price level to a certain *base-year* level, and recompute GDP for all other years. Consider Table 1.

Year	Price (per kg)	Quantity	Price	Quantity
	Rice		Fish	
2015	10	1000	20	500
2016	20	1500	30	1000
2017	30	2000	40	1500

Table 1

Let me help you with one piece. I will compute the nominal GDP for 2015.

$$\begin{aligned}\text{Nominal GDP (2015)} &= \text{price}_{\text{rice}} \cdot \text{quantity}_{\text{rice}} + \text{price}_{\text{fish}} \cdot \text{quantity}_{\text{fish}} \\ &= 10 \times 1000 + 20 \times 500 \\ &= 10,000 + 10,000 \\ &= 20,000\end{aligned}$$

How about the real GDP? Let us fix the prices of rice and fish at 2015 level. Let us compute the real GDP for year 2016.

$$\begin{aligned}\text{Real GDP (2016)} &= \text{price}_{\text{rice(2015)}} \cdot \text{quantity}_{\text{rice}} + \text{price}_{\text{fish(2015)}} \cdot \text{quantity}_{\text{fish}} \\ &= 10 \times 1500 + 20 \times 1000 \\ &= 15,000 + 20,000 \\ &= 35,000\end{aligned}$$

Once you have computed all the numbers- real and nominal, you will get a table like the one you see below.

Year	Price (per kg) Rice	Quantity Rice	Price Fish	Quantity Fish	Nominal GDP	Real GDP
2015	10	1000	20	500	20,000	20,000
2016	20	1500	30	1000	60,000	35,000
2017	30	2000	40	1500	120,000	50,000

Table 2

2. Tracking Changes in Price Level

2.1 GDP Deflator

An offshoot of the exercise that we ran in the last section is a statistic that gives us a measure of change in the price level. Formally, it is known as the **GDP deflator**. For any given year, the deflator is the ratio of nominal GDP to real GDP:

$$\text{GDP Deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}}$$

Refer to Table 2. We computed real and nominal GDP. Let us compute GDP deflator for each year.

$$\begin{aligned}\text{GDP Deflator (2016)} &= \frac{60,000}{35,000} \\ &= 1.71\end{aligned}$$

Year	Nominal GDP	Real GDP	GDP Deflator
2015	20,000	20,000	$\frac{20,000}{20,000} = 1$
2016	60,000	35,000	$\frac{60,000}{35,000} = 1.71$
2017	120,000	50,000	$\frac{120,000}{50,000} = 2.4$

Table 3

2.2 Consumer Price Index (CPI)

The most popular measure to track prices is the consumer price index. The CPI aggregates the prices of several goods (oil, rice, wheat, car, etc.) into a single number. How should this be done? I offer you the recipe.

- *Fix the basket.* Determine which prices are most important to the typical consumer. If the typical consumer buys more rice than wheat, then the price of rice is more important than the price of wheat and, therefore,

should be given greater weight in measuring the cost of living.

- *Find the prices.* Find the prices of each of the goods and services in the basket at each point in time.

- *Compute the basket's cost.* Use the data on prices to calculate the cost of the basket of goods and services at different points of time.

- *Choose a base year and compute the consumer price index.*

$$\text{CPI} = \frac{\text{Cost of the basket in current year}}{\text{Cost of the basket in base year}} \times 100$$

- Compute the inflation.

$$\text{Inflation} = \frac{CPI_1 - CPI_0}{CPI_0} \times 100$$

Suppose that a typical consumer buys 2 units (a kg, let's say) of rice, and 1 unit of fish every month. Then, the basket of good consists of 2 units of rice and 1 unit of fish. Then, the CPI for any given year is:

$$CPI = \frac{2 \times \text{Current price of rice} + 1 \times \text{Current price of fish}}{2 \times \text{Base year price of rice} + 1 \times \text{Base year price of fish}}$$

Table 4 describes an economy with two goods- car and bread. Assume that the basket of goods is fixed at the quantity of the two goods purchased in 2017. Compute the CPI and the deflator in 2018.

Year	Price	Quantity	Price	Quantity
	Car		Bread	
2017	5,00,000	100	10	50,00,000
2018	6,00,000	120	20	40,00,000

Table 4

To compute the CPI, you need to know the cost of the basket of goods at each point of time. The basket is fixed at

$\text{Quantity}_{\text{Car}} = 100, \text{Quantity}_{\text{Bread}} = 50,00,000.$

Cost of this basket in 2017

$= 100 \times 5,00,000 + 50,00,000 * 10 = 10,00,00,000$

Cost of the same basket (100 units of cars and 50 lakh units of bread) in 2018

$= 100 \times 6,00,000 + 50,00,000 * 20 = 16,00,00,000$

Therefore, $CPI_{2018} = \frac{16,00,00,000}{10,00,00,000} = 1.6$.

2.3 The CPI vs the GDP Deflator

There are three key differences between the two:

1 The GDP deflator includes all the goods produced in the economy, whereas the CPI includes only those which are important from consumer's perspective.

2 The CPI assigns fixed weights to prices every year, whereas the GDP de-

flator uses shifting weights.

- What happens when, let's say, in a given year, the crop of mangoes is destroyed because of a cyclone. Now, the price of mangoes for this year suddenly becomes very high. Which one- the deflator or the CPI- gives you the correct estimate of price change?

3 Because the GDP deflator follows the computation of GDP, it excludes imported goods. Therefore, a rise in the price of an imported iPhone will not affect the deflator.