Economic Environment and Business Strategy
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Measuring Inflation: Concepts, Tools, and Techniques

Welcome to this session of the course "Economic Environment and Business Strategy." Today, we focus on a vital macroeconomic indicator that significantly influences business decisions and economic policy: inflation. Inflation reflects the rate at which the general price level in an economy changes over time. It influences purchasing power, cost structure, and financial planning across all sectors of the economy. In this section, we will examine what inflation is and why it is important, focusing on its specific implications. Next, we'll discuss the key methods used to measure inflation, including the GDP deflator, the Consumer Price Index, the Wholesale Price Index, and the Producer Price Index.

We will use simple examples and practical data to understand how these measures work and how they are used to monitor inflation trends in India and globally. Let's begin by unpacking the concept of inflation and then explore how it is measured using these four methods. Beginning with what inflation is all about. How do we measure prices? We need to distinguish between price and price level.

A price is the cost of an individual good or service; for example, when we refer to rupees 14 for a litre of milk, that is a separate price. When it comes to price level, that is the average of prices across a broad basket of goods and services in the economy. Furthermore, why it matters: In macroeconomics, we don't track individual prices because we are dealing with aggregate indicators. Here, we track the overall trends in prices. To achieve this, we utilize price indices such as the Consumer Price Index, the Wholesale Price Index, GDP deflators, and others.

In this context, let's start by defining what inflation is. Inflation is the rate at which the overall price level increases over time. It tells us how quickly purchasing power is declining or how prices are rising. To make a distinction between inflation and the price level, consider the price level as the current position on a hill and inflation as the rate of change in how steeply you are climbing that hill. Today's price level reflects the cumulative effect of past inflation.

Let us now proceed to a more formal understanding of inflation. First of all, what is inflation? Inflation is defined as the rate of change in the overall price level over time.

Here, inflation refers to the rate of change in prices. For example, when we say the definition here, this is inflation, and what it means is that Pt is today's price in the current year, and suppose we want to measure the cost as compared to the previous year; suppose Pt, t is for example, the period 2025, and Pt minus 1, you know, is equal to 2024. Then, for this ratio formula, we calculate inflation as the current price minus the price in 2025 minus the price in 2024, divided by the price in 2024.

What we mean here is that the price, especially this P, is not individual. Instead, we will calculate a price index by aggregating the prices of all goods and services in the economy. Then we get the price index. Here, the P does not actually refer to the individual prices. Instead, this one is a price index.

Therefore, when we observe that the inflation rate is greater than 0, it means prices are increasing, which indicates the presence of inflation. When the inflation rate is less than 0, we refer to it as a deflationary stage, meaning that prices are decreasing. An alternative method for estimating the price is to use the price index for the current year, 2025, which is equal to the price index in the previous year plus the price in 2024, multiplied by the inflation rate, typically expressed as a percentage. For example, when we say inflation is seven percent, we express it in two ways: seven percent or 0.07. To summarize this slide, today's price is the price from the last period adjusted for inflation. Let us now move to how inflation has been measured. Four key indices have been widely used. Inflation is measured using different indices, depending on the prices being tracked. And whose perspective is considered, whether it is that of the consumer, the producer, or the economy? Here, we use four major indices: the GDP deflator, the Consumer Price Index, the Wholesale Price Index, and the Producer Price Index.

So, let's move one by one; what does the GDP deflator mean to begin with? And the GDP deflator is one of the broadest measures of inflation. It captures price changes in all domestically produced final goods and services. In the GDP definition, GDP is defined as the market value of all final goods and services produced in a country's domestic territory within a given period, typically one quarter or one year. Nominal GDP multiplied by 100. What is meant by nominal GDP? We talked about in the session that nominal GDP measures the value of output in a given period using the prices that prevailed during that period.

Suppose we calculate the GDP in 2025 using the prices of 2025, which represent the nominal GDP for that year. If the GDP for 2020 is calculated using the prices of 2020, that is the nominal GDP for 2020. Therefore, it measures the value of the output at current market prices. In that way, we know that we already understand this, which means that in the previous session, we observed that it reflects the changes in both prices and quantities. If prices rise due to inflation, nominal GDP may increase even if output remains constant.

Then, regarding real GDP, it measures changes in physical output by valuing goods at prices from a base year. It measures output at constant prices. For example, that is adjusted for inflation. That means that if we use 2020 as the base year for the 2025 GDP, we calculate the 2025 GDP and then convert it into real GDP at the base price of 2020. That means we can easily calculate the GDP for 2025 using the 2020 data.

It reflects changes in the actual volume of production. It enables the comparison of economic performance over time without price distortions. This is why the distinction matters: it helps us distinguish between price level changes and real economic growth. The formula we have already seen is that the GDP deflator equals nominal GDP divided by real GDP, expressed as a percentage of 100. Let us use an illustrative example.

Let us see how to calculate the GDP deflator. First, I will show you the GDP for 2023 and 2024. Assume that in this economy, we have only two products: one is rice, and the other is apples. In 2023, they produced 500 kilograms of rice and 150 kilograms of apples. And in 2023, the prices were 10 for rice per kilo and 20 for apples per kilo.

And in 2025, after one year, we will calculate the GDP for that year, which will be the 2025 GDP. At that time, you could see there was a marginal increase in the quantity of rice produced. In the previous year, we produced 500 units; this year, production reached 510 units. Similarly, Apple experiences only a marginal increase in production. Last year's production was 150, and this year's production is 160.

From there, looking at it itself, there is actually nominal economic growth compared to the previous year. This year, they have been producing more rice and apples, although the amounts are very low in magnitude. However, in the illustrative example, I deliberately doubled the price in 2024. For instance, consider rice. Last year, it was $10, and this year, it is $20.

Similarly, the apple price was $20 in 2023, and in 2024, we doubled it; it is now $40. Suppose you are calculating GDP. How does the CSO calculate it? Suppose that when calculating GDP in 2023, they use the quantity of 2023 and the price of 2023 itself. That means when the CSO calculates, in fact, they directly calculate nominal GDP. They calculate the nominal GDP in 2023 and then, in 2024, calculate the nominal GDP for 2024, using the quantity of 2024 and the price of 2024.

Based on this, let us examine the estimation of nominal GDP. You know that the nominal GDP in 2024 can be straightforwardly calculated, for example, as follows: the rice contribution is 500 times 10, and the apple contribution is 150 times 20. Similarly, in 2024, you can calculate the respective quantity of that product multiplied by its price. Accordingly, you will receive the nominal GDP for each year. Therefore, from this, you can see that the nominal GDP in 2023 is 8,000 and the nominal GDP in 2024 is 16,600.

So, by looking, you can see that the nominal GDP has increased by more than 100 times, which is more than double. As a result, you can see that there is an increase in nominal GDP. However, the issue here is that any change in nominal GDP, you know, that one, results in a marginal increase in the quantity produced. For example, rice shows an increase from 500 to 510 grams. However, we have deliberately doubled the price.

As you can see, the first part is obviously a slight increase in the quantity produced. At the same time, you can see a change in prices. So, when the nominal GDP ranges from $8,000 to $16,600, it reflects two key points. One is a change in real GDP, and the second one is a change in due prices. So, when using inflation, what we want to do is determine how much the prices change here.

Therefore, to calculate the real GDP, we need to consider the nominal GDP for 2024. As I mentioned earlier, the CSO directly calculates the nominal GDP. Then, suppose they want to convert this one. In that case, the 2024 nominal GDP into real GDP, using all these quantities the same, with the base year of 2023, they should now multiply this quantity by this price, and this quantity by this price; so you can see here that 510 multiplied by the rise price, 510, is the quantity produced in 2024. And 10 is the price in 2023; similarly, 160 is the quantity produced in 2024.

The price of apples in 2023 is $20, so we are using the quantity from 2024. Briefly, we use the amount from 2024, but the price we use is from 2023. So, when we calculate this, what you are getting is that the real GDP in 2024 at 2023 prices is going to be $8,300, but the nominal GDP we obtained is $16,600. The real GDP growth was only from 8,000 to 8,300. The remaining amount we observed is due to an increase in the price level, which we deliberately doubled in this table.

Therefore, to calculate the GDP deflator, we use the following method: nominal GDP in 2024 divided by the real GDP of 2024, using 2023 prices, times 100. When you do this, what you will get is the GDP deflator. Here, you have 200. In the base year, the GDP deflator is always 100. That means when you calculate the GDP deflator and divide, you will get one.

That means 100 when you multiply by 100. In the base year, we always set the GDP deflator to 100. Here we have 200; in this case, we have 200. To calculate the GDP deflator, we need to subtract the final value. To determine the inflation rate, we then subtract 100 from this result. To summarize, the GDP deflator is calculated by dividing the nominal GDP in period t by the real GDP in period t, and then multiplying the result by 100.

What we have done here is use the concepts of nominal GDP and real GDP to calculate the GDP deflator, which is a measure of inflation. Here is what you can see: when you examine the individual prices for 2023 and 2024, you will notice that the prices have

doubled, representing a 100 percent increase. Here, using the formula, the nominal GDP divided by the real GDP, we obtain the value that measures inflation. This is one of the broadest measures of inflation, known as the GDP deflator. Then, let's move on to another measure known as the Consumer Price Index.

The Consumer Price Index measures the inflation faced by households. It tracks price changes in a fixed basket of consumer goods and services. The formal definition is that it measures the cost of purchasing a fixed basket of goods and services that are representative of the purchases made by consumers. The methodology involved here is stepwise: first, we survey consumers to determine the composition of the typical consumer's basket of goods and services. And every month, collect data on the prices of all items in the basket, then compute the cost of the basket for that month.

Every month, we collect data on the prices of all items in the basket, then calculate and compute the total cost of the basket. Then, we calculate the CPI (Consumer Price Index) for any given month. This is equal to the cost of the basket in that month; for example, if we are calculating the cost of a basket in December. 2025 is the cost of a basket. Then we calculate the price of the same basket for the base year, for example, January 2025.

Suppose this is the base year; we then multiply it by 100, and the resulting value is the CPI. To gain a better understanding of the concept, we would like to use one illustrative example. Suppose that a typical consumer buys 20 apples and 10 oranges each month. This is a brave assumption.

The consumer buys only two commodities. However, for the sake of simplicity and ease of calculation, we assume that a typical consumer buys only 20 apples and 10 oranges each month. Then, the consumer basket consists of 20 apples and 10 oranges. So, how do you calculate CPI in 2025 with a 2024 base year? In this case, we calculate the formula as follows: 20 is the quantity of apples at the current price of 2025. What is the current price of apples in 2025, and also calculate the quantity of oranges and the price of oranges at the current price of 2025, divided by the same amount used for the 20 apples, but what is the cost? The price we use as the base is the 2024 price, and similarly, the quantity of oranges remains unchanged. However, the price we are using is the price of one orange in 2024, multiplied by 100.

This is the formula. Let's present this concept in a table to gain a better understanding. In our example, a typical consumer basket contains 20 apples and 10 oranges. Let us consider the years 2000, 2001, 2002, and 2003. A key point to note is that the quantity of the consumer basket remains constant throughout the year.

We will not change it. The quantity remains the same, but the prices of apples and oranges change. You can see the price of apples over the years; it changes from $10 to

$11, $12, and $13. An orange, also in the first year, was 50. Next year, there is no change, but there is an increase of 22 and a decline of 23. Now, using the steps we just discussed, let us first calculate the cost of a basket in each year. Then, we need to calculate the CPI from that, and we can calculate the price change.

Therefore, for each year, you need to calculate the cost of the basket, and the CPI uses 2000 as the base year. Therefore, we will use 2000 as the base year. Then, you can calculate the price change from the previous year by following this procedure: multiply the cost of the basket by the quantity, and then multiply the result by the price in the respective year. You know that in 2000, to buy the typical basket of 20 apples and 10 oranges, the consumer had to pay $350. Next year, due to the price increase, the cost of the basket will be $370.

The following year, 2022, it became 400. And in 2023, it became 410. This is the cost of buying this basket in the respective years. Then, how do you calculate the CPI? Here, to calculate the CPI, you need to debate the cost of the basket in that particular year. Suppose you want to calculate the CPI in 2000. To do so, you need to find the CPI for that year and the base year.

Here, the base year we have taken is 2000 itself, so you can see that the cost of the basket in 2023 is 350, while in the year 2000, it was different. And since we are taking 2000 as the base year, the cost of the basket is the same. What you will get is 350 divided by 350, which equals 1. It also states that in the base year, you always get 100 as the CPI, the price index. So, in the subsequent year, the cost of the basket in 2001 divided by the cost of the basket in 2000 will give you 105.7. The cost of a basket in 2002 was $400. The cost of a basket in 2000 was $350. You will get this, which is the cost of a basket in 2002. Accordingly, you will also receive the CPI; in 2003, the CPI was 117.1. So, what we have done here in the CPI calculation is measure the cost of the basket in that particular year, divide it by the price of the basket in the base year, and then multiply by 100.

From this, how do we calculate inflation? I'd like you to please remember the formula for calculating inflation. This one is the price of the current year divided by the price index of the previous year. Here, 'P' means that 'P' is nothing but the CPI, the CPI for the respective year. This is the CPI. Then, how do we calculate inflation? Inflation has been calculated in this manner: the CPI for the current year is calculated by subtracting the CPI for the previous year, then dividing the result by the CPI for the previous year.

Accordingly, you can see that, for example, the annual inflation rate in 2002, compared to 2001, was 8.1. This is the formula. You use the CPI, specifically the 2002 CPI, which is calculated by subtracting the 2001 CPI from the 2002 CPI price level, then dividing by the 2001 CPI, and finally multiplying by 100. Similarly, applying the same formula, you

will find that the inflation rate in 2003 is 2.5. Suppose you are getting this kind of table; here, we do not think we are defining any cost basket or consumer basket. Suppose you are not defining any consumer basket, but we are given the quantity of each item and its price in the respective years. From this year, you need to select one of the years as the base year, and in that year, you must use that quantity to define the consumer basket. If you want to take the question here, use 2023 as the base year. What is the appropriate inflation rate for 2024? In this case, you need to calculate the quantity for 2023 as the consumer basket.

To define the consumer basket, you can use this quantity. Therefore, the solution here is to consider the quantity of the base year as the quantity that defines the basket. Then, accordingly, you can calculate the CPI for both 2023 and 2024. Using the inflation formula, you will obtain an inflation rate of 38%. According to this table, the individual value of the inflation rate shows a 38 percent increase in the price level from 2023 to 2024.

Let's now move on to another price index, the Wholesale Price Index. The wholesale price index measures prices at the wholesale or producer level. That is what the WPI measures: the average change in prices of goods at the wholesale level; that is, before retail sale to consumers. And the WPI reflects the price movements in bulk transactions, often between producers and intermediaries. Unlike the CPI, it excludes services and focuses only on goods. I have provided a summary of the WPI composition in India, as calculated by the Government of India for the estimated Wholesale Price Index.

In this, they have included three categories of goods and services, mainly goods, with no primary service category. The primary articles include fuel and manufactured goods. They also assign weights; the most considerable weight is given to manufactured goods in calculating the Wholesale Price Index. Regarding coverage and data collection, the Government of India collects a total of items, tracking around 676 goods. It obtains price quotations from wholesalers, totaling 5,482.

Then, we take the average that has been reported monthly by the Office of the Economic Advisor, Ministry of Commerce, and Industry. Some of the key uses of the wholesale price index include its role as a primary input for industrial policy, procurement pricing, and macroeconomic analysis. It remains widely referenced, although the CPI is the primary index used for monetary policy. Shortly, in the next session, we'll discuss the CPI. Initially, we have used the wholesale price index as the primary measure of inflation.

However, we have recently shifted to the CPI as the primary index for monetary policy and other economic policymaking; nonetheless, the wholesale price index remains valuable for these reasons. Now, let's move on to the fourth method, known as the

Producer Price Index. This indicator is based on input costs, measuring the average change in prices received by domestic producers for their output. It reflects the changes in the cost of production for a typical firm, capturing inflation at an earlier stage, primarily in the PPI, which includes raw materials and semi-finished goods. The key features are based on a fixed basket of inputs used by firms, including raw materials, intermediate goods, and energy and fuel inputs, and focus on wholesale input prices, not.

Final consumer prices are primarily the focus for the inputs used by producers, including intermediate goods, raw materials, and energy and fuel inputs. We would also like to highlight the importance of the PPI. Early indicators provide us with an indication of inflationary pressure in an economy at the production stage itself. Therefore, cost increases at the production stage may later be reflected in retail prices. Obviously, you know that if the cost of production increases, the consumer prices also increase.

This has been closely tracked by policymakers, primarily central banks and businesses, for cost forecasting and contract adjustments. I have made a summary of the distinction between PPI and CPI. This table provides an overview of the distinction between PPI and CPI.

It's a short-run trend. Not only PPI and CPI, but also WPI are important. All these measures differ in their short-term trends, but they often converge over more extended time frames, reflecting similar inflationary forces. Let's proceed to conclude this session. In this session, we defined what inflation is, discussed its use, measurement, and the various indices employed, depending on the prices being tracked and the perspective considered. Accordingly, we have discussed four measures. The first is the GDP deflator, the second is the Consumer Price Index, the third is the Wholesale Price Index, and the fourth is the Producer Price Index. And thank you for watching this video. See you in the next session. Thank you.