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Office Hour: Tuesday 2:30-3:30 at 7481 Social Science

GDP: Definition and Calculations

Gross Domestic Product (GDP) is the market value of all goods and services produced within a country over a given time period, typically a year.

- GDP is measured in market value, not quantities
- GDP includes only final goods, not intermediate goods
  - A *final good* is purchased by the final user and is not used in the production of any other good or service
  - An *intermediate good* is used as an input for another good or service
- GDP only includes production in the current time period/year

Calculating GDP: The Price-Quantity Method

In this method we take the market value of all final goods and services produced in an economy and multiply them by their market value. This formula can be represented by the following:

$$GDP = \sum_{i=1}^{n} P_i Q_i$$

Example 1: Suppose that in a year an economy produces 100 golf balls that sell for $3 each and 75 pizzas that sell for $8 each. What is the GDP in this economy?

Calculating GDP: The Expenditures Approach

In this method we calculate GDP by summing the expenditures on final goods and services in an economy. The formula used here is:

$$Y = C + I + G + NX$$

- C = Consumption Spending
- I = Investment Spending. Includes purchase of durable/capital goods by firms, purchase of new homes, and changes in inventory over a year
- G = Government Spending. Only includes purchases of goods and services by the government, and not transfers of wealth
- NX = Net Exports = Exports – Imports

Example 2: In 2011, consumption spending is $7,000, government purchasing is $2,000, and investment spending is $1,500. If GDP for 2011 is $10,300, then what are net exports in the economy?

Calculating GDP: The Value Added Approach

In this approach you add the *value added* by each good in the economy

$$Value\ Added = Price\ of\ final\ good - Price\ of\ intermediate\ goods$$

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Example 3: Suppose that a pizza maker sells their product for $20. To do so, the company uses $5 worth of bread, $2 worth of cheese, $3 worth of sauce, and $3 worth of pepperoni. What is the value added of the pizza maker?

Calculating GDP: The Income Approach

In this method we add up the income paid to all the factors of production

$$GDP = Wages + Interest + Rent + Profit$$

- Note that these approaches should all yield the *same* value of GDP

Real vs. Nominal GDP

Nominal GDP is defined as GDP that has not been adjusted for prices and has been calculated using the prices in the year in which the output is produced

Real GDP is GDP calculated as if prices had remained at the level of some given *base year*

There are two methods to solve problems involving real/nominal GDP. One involves using the price-quantity method and the other involves a new formula comparing real/nominal GDP

Revisiting the Quantity Method

$$Nominal\ GDP = \sum_{i=1}^{n} P_i^{current\ year} Q_i$$

$$Real\ GDP = \sum_{i=1}^{n} P_i^{base\ year} Q_i$$

Example 4: Suppose that in year 1 an economy produces 100 golf balls that sell for $3 each and 75 pizzas that sell for $8 each. The next year the economy produces 110 golf balls that sell for $3.25 each and 80 pizzas that sell for $9 each. What is the real GDP in year 2 using year 1 as the base year?

The GDP Deflator Method

$$GDP\ Deflator = \frac{Nominal\ GDP}{Real\ GDP} \cdot 100$$

The GDP Deflator is an *index number*. It is a data point reflecting the price level compared to some base level, which is almost always 100. Note that the GDP Deflator can be used to find the inflation rate over two years, provided you calculate the GDP Deflator first for each year in question.

Example 5: Using the information from question 4, and assuming that year 1 is the base year, calculate the GDP Deflator in years 1 and 2.

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Market Baskets and the CPI

A *price index* is a single number used to summarize the prices of all goods and services in an economy

The most widely used price index is the *Consumer Price Index (CPI)*

The CPI, as with many price indexes, is calculated through the use of a *market basket*, which is a hypothetical bundle of goods thought to represent the consumption of a typical household

$$CPI = \frac{Cost\ of\ market\ basket\ in\ a\ given\ year}{Cost\ of\ market\ basket\ in\ base\ year} \times Scale\ Factor$$

Example 1:

Year	Price of Apple	Price of Orange
2013	5	10
2014	6	12

Suppose that a typical market basket consists of 6 apples and 4 oranges. If the base year is 2013, and the scale factor is 100, what is the CPI in 2013? 2014?

Price indexes are also the basis for measuring inflation. The *inflation rate* is the percent change in price over time

$$Inflation\ Rate = \frac{Price\ index\ in\ year\ 2 - Price\ index\ in\ year\ 1}{Price\ index\ in\ year\ 1} \times 100$$

Example 2: Using the information from example 1, calculate the inflation rate from 2013 to 2014

If the inflation rate is positive from one year to another, we claim there was *inflation* during that time period. If the inflation rate is negative from one year to another, we claim that there was *deflation*. If there is a decrease in the inflation rate form one year to the next we claim there was *disinflation*.

Inflation has several impacts on the economy at large. The first is its impact on *real wages*, which are nominal wages divided by the price level. While real wages typically adjust with the price level, unexpected inflation (or deflation) will cause real wages to be lower (or higher) than expected, harming households (or firms). *Shoe-leather costs* and *menu costs* refer to the impact that inflation has on everyday economic activities, such as the rate at which transactions take place or on how often firms change the prices of their goods.

Most notably, inflation has an impact in lending markets. When there is inflation, borrowers who have borrowed money pay their debtors back with money which is less value than that they borrowed. To adjust, lenders set the *nominal interest rate* such that after inflation the real return determined by the *real interest rate* is acceptable.

$$Real\ interest\ rate = Nominal\ interest\ rate - Expected\ inflation$$

However when there are unexpected changes in the price level, this impacts the actors in the lending market. When there is unexpected inflation, the real interest rate falls, hurting lenders. In contrast, when there is unexpected deflation, this increases the real interest rate, hurting borrowers.

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Practice Questions

1. The difference in the definition between Real and Nominal GDP is
a) Real GDP is measured by excluding some of the sectors
b) Real GDP is always smaller than Nominal GDP
c) The price level is changed from the base year to the current year
d) Answers (a), (b), and (c) are all true
e) Answers (a), (b) and (c) are all false

2. Teddy's Creations (located in Duluth, MN, USA) manufactures bathmats that they sell for $20 each on the web. In 2013, Teddy's Creations manufactured 1,000 of these bathmats and sold 600 of them. Teddy, the owner of Teddy's Creations during 2013-2014, also purchased a number of items to use at home: he bought $400 worth of Italian shoes, $300 worth of California wine, and $250 worth of Wisconsin cheese. In 2014, Teddy bought the same dollar value of Italian shoes, the same dollar value of California wine, but decreased his purchases of Wisconsin cheese by $100. In 2014, Teddy's Creations produced 1,000 bathmats and sold 1200 bathmats at a price of $20 per bathmat. Given this information, which of the following statements is true about Teddy and Teddy's Creations contribution to GDP?
a) The effect of these activities on GDP in 2013 is to increase GDP by $20,550 while the effect of these activities on GDP in 2014 is an increase of $20,450
b) The effect of these activities on GDP in 2013 is to increase GDP by $20,150 while the effect of these activities on GDP in 2014 is an increase of $24,050
c) The effect of these activities on GDP in 2013 is to increase GDP by $20,950 while the effect of these activities on GDP in 2014 is an increase of $24,850
d) The effect of these activities on GDP in 2013 is to increase GDP by $12,950 while the effect of these activities on GDP in 2014 is an increase of $24,450
e) The effect of these activities on GDP in 2013 is to increase GDP by $12, 950 while the effect of these activities on GDP in 2014 is an increase of $24,850

3. Investment spending is spending on productive physical capital. According to the national accounts system the construction of a new house
a) Would be included as a part of investment spending
b) Would not be included as a part of investment spending

4. If a used-car dealer purchases a used car for $4,000, restores it, and resells it for $4,800, the dealer contributes
a) Value added equal to $4,800, but nothing is added to GDP
b) Value added equal to $4,800, but only $800 is added to GDP
c) Nothing to production because only existing goods are involved.
d) Value added equal to $800, and consequently $800 is added to GDP

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5. Which of the following is counted in GDP?
a) The value of goods and services produced in the underground economy
b) The cost of a speedboat purchased at Bob's Boats used by drug smugglers
c) The value of do-it-yourself work
d) The value of leisure

6. How are intermediate goods treated in the calculation of GDP?
a) Their value is counted separately, plus it is also included as part of the value of the final goods of which they are an input
b) Their value is not counted separately, but their value is included as part of the value of the final goods of which they are an input
c) They are included only in the year that they are produced
d) They are included only if they are imported

7. Consider the following information for a certain economy in 2006 (in billions of $)
Self-employment Income = 800
Personal Consumption = 9,300
Indirect business taxes = 200
Gross private investment = 1,500
Government consumption and gross investment = 2,500
Net exports = –500
Indirect business taxes = 400
Depreciation = 1,500

According to the data above, gross domestic product is equal to which of the following?
a) $12,800 b) $12,500 c) $11,400 d) $10,500

8. Suppose that nominal per capita GDP was $40,000 in 2000 and $60,000 in 2007. If the GDP deflator was100 in 2000 and 150 in 2007, indicate the 2007 per capita real GDP measured in 2000 dollars.
a) $32,000 b) $38,000 c) $40,000 d) $42,500

9. According to the following table, what is the GDP deflator in 2005?

	2004	2005
Nominal GDP	$10,000	$12,000
Real GDP	$9,500	$10,500

a. 95 b. 114 c. 87 d. 105

10. If real GDP rises while nominal GDP falls, the prices on average have:
a) Risen
b) Fallen
c) Stayed the same
d) Real GDP cannot rise when nominal GDP falls

11. A decrease in inventories is:
A) An increase in investment spending that will lead to an increase in future production

B) Part of government spending
C) Thought to have no impact on investment, since it is not part of investment spending
D) A fall in investment spending that will lead to a drop in future production

12. If the cost of a market basket is $150 in year 1 and $200 in year 2, the price index for year 1 using year 2 as the base is:
A) 150. B) 100 C) 75 D) 133

13.
Scenario: Market Basket
Suppose a market basket consists of the following goods: 50 pens, 25 notepads, and 25 paperclips. Also assume the price per unit of these goods is as follows for the years noted and 2007 is the base year.

	Price in 2010	Price in 2011
Pens	$0.25	$0.30
Notepads	0.30	0.25
Paperclips	0.10	0.15

14. (Scenario: Market Basket) Assume the base year is 2010. What is the value of the price index in 2010?
A) 111
B) 100
C) 0
D) 90

15. Assume that the CPI for 2009 was 72.6 and for 2010 was 82.4. What was the inflation rate between the two years?
A) 13.5% B) 11.9% C) 0.88% D) 1.13%

16. To examine how the production of goods has changed over time, it would be better to consider:
a) Nominal GDP
b) GDP at current prices
c) Real GDP
d) The GDP deflator