Chapter 4

MACROECONOMIC MEASUREMENT: THE CURRENT APPROACH

Macroeconomics in Context (Goodwin, et al.), 4th edition

Chapter Overview

In this chapter, you will be introduced to a standard examination of the National Income and Product Accounts (the NIPA), but with a "contextual" flavor. You will learn that the accounts have been created for specific purposes. The chapter highlights how the production and investment undertaken by household and communities have historically been deemphasized in national accounting. It explains what has been included in the measurement of the GDP, and you will learn about three different approaches to measuring GDP: product, spending, and income. The chapter also describes how economic growth, nominal GDP, real GDP, price indices, and national saving are commonly measured. You will also be introduced to the simple representations of the components of GDP that are deployed in the traditional macroeconomic model.

Chapter Objectives

After reading and reviewing this chapter, you should be able to:

1. Understand when the U.S. system of national accounts was developed, in the context of the pressing problems of that time.
2. Identify the four sectoral classifications of the U.S. national accounts, and what is included in each sector.
3. Identify what capital stocks are included in the U.S. national accounts.
4. Define the Gross Domestic Product and identify what is included and excluded in its measurement.
5. Understand and apply the three approaches to measuring GDP.
6. Calculate GDP growth rates, nominal GDP, and real GDP.
7. Identify commonly used price indices, and construct a constant-weight price index, and differentiate between the GDP deflator and consumer price index (CPI).
8. Identify the saving identity in a closed economy; and define the Net Domestic Product (NDP) and Net Saving.
9. Understand the simplifying assumptions made by the traditional macroeconomic model, and identify the model's basic identity (taken from the spending approach).
10. (Appendix) Understand the value and limitations of the chained dollar method in measuring real GDP.

Key Terms

National Income and Product Accounts (NIPA)
Bureau of Economic Analysis (BEA)
national accounting conventions
fixed assets
inventories
consumer durable goods
gross investment
net investment
depreciation
gross domestic product (GDP)
final good
intermediate good
value-added
imputation
closed economy
open economy
net exports
national income (NI)
gross national income (GNI)
GDP growth
nominal (current dollar) GDP
real GDP
base year
index number
GDP deflator
consumer price index (CPI)
rule of 72
net domestic product (NDP)

From Appendix:
quantity index
Fisher quantity index
chain-type quantity index

Active Review

Fill in the Blank

1. The U.S. government agency that publishes statistics on production, income, spending, prices and employment is the _____.

2. The four sectors into which the U.S. national accounts are divided are the households and institutions sector, the business sector, the government sector, and the _____sector.

3. The BEA puts non-profit institutions serving households in the _____ sector.

4. Equipment owned by businesses and governments, structures, residences, and software are all forms of _____.

5. Cars, washing machines, refrigerators and other equipment that are purchased by households and that typically lasts for longer than three years are called _____.

6. A newly produced automobile that remains unsold at the end of the year is included as _____ in the manufactured capital stocks.

7. The GDP measures the total _____ of _____ goods and services _____ produced in a _____ over a period of _____.

8. To estimate the value of services from owner-occupied houses, the BEA uses the method of _____ by taking data from the rental housing market.

9. The sum of all the production-related incomes (such as from wages, rents, and profits) earned by all people and organizations located inside the United States is called _____.

10. The measure of GDP that reflects the actual value of goods and service produced by removing the effect of changes in prices is called _____GDP.

True or False

11. Often referred to as the "national accounts", the National Income and Product Accounts (NIPA) includes statistics on production, income, and spending.

12. Catholic Hospital, a non-profit hospital, would be included in the national accounts in the households and institutions sector, whereas Hospital Corporation of America, a for-profit hospital chain, would be included in the business sector.

13. A government agency, like the U.S Postal Service, which produces goods and services for sale, would be included in the government sector.

14. The GDP deflator measures the average prices of goods consumed by households while the Consumer Price Index measures the average prices of goods produced in the economy.

15. Net saving adjusts for what a country must put aside to replace capital goods that are wearing out, by subtracting depreciation from gross saving.

Short Answer

16. When did the idea of creating a system of national accounts first take hold, and for what purpose? What were the concerns of that time? And who created them?

17. How much of GDP (in terms of share of the total) was produced by the different sectors (as defined by the BEA) in 2020? (That is, how much was produced by the business sector, the household and institutions sector, and the government sector?)

18. Where are non-profit organizations put in the BEA's 4-way classification?

19. What kinds of non-financial capital stocks are included in the accounting of national non-financial assets?

20. What are the two components of manufactured capital stocks?

21. What are the three approaches to measuring GDP?

22. How does the government estimate the value of the services produced by government and nonprofit institutions that are not sold on the market? And the value of the services produced by households?

23. Why did the BEA switch to calculate real GDP using the "chained-dollar method" from the "constant-dollar method"?

24. When measuring price levels in the economy (such as when calculating the CPI index), why is a weighted average used?

25. Why does a price index based on constant weights tend to overstate inflation in periods after the base year when the price of one good is rising quickly compared to other goods?

26. What does the GDP deflator measure?

27. What simplifying assumptions does the traditional macroeconomic model make (in addition to those made in the NIPA)?

Problems

1. Determine which of the following would be counted in the spending approach of GDP, and which would not be counted. Identify the category under which it would fall (C, I, G, NX, or not counted).

a. The housecleaning services of a stay-at-home mom.
b. The housecleaning services of the "Merry Maids" company.
c. The babysitting services of a babysitter whose earnings are kept "off the books" and not reported to the tax authorities.
d. A brand new house built and sold this year.
e. A new car made by Ford in the U.S., and sold to a household in the U.S.
f. A new car made by Ford in the U.S, and sold in Mexico.
g. Sale of a 2012 used Ford car.
h. 3 shares of Ford Motor Company stock
i. A new car made by Ford in the U.S. but not sold by the end of the year.
j. A new car added to the fleet of taxis of Mr. Taxi Company.
k. A new bridge to accommodate all the new and used cars and taxis on the road.

2. Use the following table to answer the next question:

Stage of Production	**Stage of production**	**Sales value of material**
Stage 1	Grapes produced in the vineyard	10
Stage 2	New wine produced at the winery, stored in oak barrels	15
Stage 3	Fermented wine stored in wine bottles	20
Stage 4	Wine bottles distributed by the wholesaler	25
Stage 5	Retail price of bottled wine sold to consumer	30

a. Assuming that no intermediate inputs are used other than the ones named, what is the value added at each stage of production – Stage 1-5?

b. Using the value added approach, what is the total contribution to the GDP of this chain of production?

c. Using the expenditure approach, what is total contribution to the GDP of this good? Explain why the number you got in part c is (or is not) the same as that from part b.

3. The small economy of the United States of Sustainability has only three companies: a bicycle manufacturer, a wind energy producer, and an organic cheese company. The only costs these companies have are the cost of their inputs and wages. Assume there are no rents, no depreciation, and no net income payments from the foreign sector. Assume all the output is sold to consumers as final goods. The companies' profits = Value of output (total revenues) – total costs.

	Bicycle company	Wind energy company	Organic cheese company
Cost of inputs	$0	$0	$0
Wages	$50	$75	$25
Value of output (total revenues)	$100	$150	$50

a. Calculate the GDP of the United States of Sustainability using the income approach.

b. Calculate the GDP of the United States of Sustainability using the spending approach.

c. Calculate the GDP of the United States of Sustainability using the value-added approach.

4. Assume a simple economy produces only two goods, corn and wheat. In the first year 100 bushels of corn are produced, and sold for $3 a bushel. Also in the first year, 50 bushels of wheat are produced, and sold for $5 a bushel. In the second year, 110 bushels of corn are produced, and sold for $3.50, while 55 bushels of wheat are produced, and sold for $5.50.

a. Calculate the nominal GDP in year 1 and 2.

b. Using the constant-dollar approach, calculate the real GDP in year 1 and 2. Take year 1 as the base year.

c. Calculate the growth in real GDP between years 1 and 2 (with year 1 as the base year).

d. Calculate a constant weight price index for the second year, using the first year as the base.

e. What is the growth rate of prices (inflation rate) from the first to the second year?

Self Test

1. A non-profit charity which provides support to low-income families is included by the BEA in the

A. household and institutions sector
B. business sector
C. government sector
D. foreign sector
E. both a and c

2. Which of the following would *not* be included in the households and institutions sector?

A. A non-profit hospital
B. The University of Michigan
C. The National Manufacturers Alliance, a non-profit institution serving for-profit manufacturers.
D. The Museum of Fine Art
E. The United Autoworkers, a trade union for the employees of automobile manufacturers.

3. Which of the following non-financial capital stocks are included in GDP?

A. Natural capital, manufactured capital, human capital, and social capital.
B. Natural capital, and manufactured capital.
C. Human capital, and social capital.
D. Manufactured capital and some intellectual capital.
E. None of the above.

4. Which of the following is *not* included as a fixed asset in the national accounts?

A. Office equipment
B. Factories and office buildings
C. Houses and apartment buildings
D. Computer software
E. Inventories

5. Which of the following would *not* be included in the measure of U.S. GDP in the current year?

A. A new machine, made in the U.S. and purchased that year for the Ford motor company assembly line.
B. A Ford automobile newly produced that year in the U.S.
C. A Ford automobile, newly produced that year in the U.S. but unsold and sitting in a warehouse.
D. Three shares of Ford motor company stock purchased that year in the U.S.
E. The steel produced and sold that year to make a new Ford automobile.

6. Which of the following would *not* be counted as an addition in the measure of the U.S. GDP in the current year?

A. A car produced and sold in the U.S. by the Japanese-owned Toyota company.
B. A car produced in the U.S. by the U.S.-owned Ford motor company, and sold in Japan.
C. Restaurant meals in the U.S. sold to Canadian tourists visiting the U.S.
D. Restaurant meals in Canada sold to U.S. tourists visiting Canada.
E. A car produced in the U.S. by the Japanese-owned Toyota company, and sold in Canada.

Use the following table to answer the question #7, assuming that no intermediate inputs are used other than the ones named:

Stage of production	**Sales value of material**
Wheat grown by a farmer	$0.50
Wheat milled by the miller	$0.75
Bread made by the baker	$1.00
Bread sold by a distributor	$3.50
Retail price of bread to the consumer	$4.00

7. What is the value added at all stages of the production process of the bread as described in the accompanying table?

A. $0.50
B. $1.00
C. $4.00
D. $7.50
E. $9.75

8. Assume the government is trying to measure the value of production of a non-profit institution providing non-market services in a community. The cost of office supplies used per year is $5,000. The payroll expenses are $150,000 per year. The institution owns its own building, which if it rented out would cost $12,000 per year. The value of services production that would be imputed for this non-profit institution would be

A. $12,000
B. 150,000
C. $155,000
D. at least $167,000
E. It is impossible to calculate the value of services produced by this non-profit institution if its services are not sold on the market.

9. Assume the following for a particular owner-occupied household: The value of the services of the house, based on the imputed rental value, is estimated to be $1500 per month. A gardener is hired for the upkeep of the grounds, and is paid $200 a month. The cleaning, cooking, and childcare are all done by the mother, who also has a part-time paid job outside the home. If she were to hire a cleaning service she estimates she would have to pay $500 a month, and if she were to hire a nanny or babysitter she would have to pay $800 a month. What would be the value of the services produced in this household as currently measured by the BEA?

A. $200
B. $1,500
C. $1,700
D. $3,000
E. None of the value of services produced in this household would be included.

10. In 2020, how much of GDP was produced by the business sector, according to the BEA?

A. 33%
B. 50%
C. 65%
D. 75%
E. 90%

11. In order to measure GDP by the spending approach, to highlight the portions that are considered to be consumption vs. investment, which identity should be used?

A. GDP = Household and institution spending + Business spending + Net foreign sector spending + Government spending
B. GDP = Personal consumption + Private investment + Net exports + Government consumption
C. GDP = Personal consumption + Private investment + Net exports + Government consumption + Government investment
D. a and c
E. none of the above.

12. Which of the following would be included in the income approach to measure GDP?

A. Wages and benefits, profits, rents
B. Wages and benefits, profits, investment spending
C. Wages and benefits, rents, investment spending, consumption spending
D. The value added in production
E. None of the above.

13. Which of the following would *not* be included in the U.S. GDP, as measured by the income approach?

A. The wages earned by workers at a German company located in the U.S.
B. The profits earned by a German company from its plant located in the U.S.
C. The profits earned by a U.S. company from its plant located in China.
D. The rents earned by a U.S. landlord with rental properties.
E. The interest payments earned by a U.S. bank from its loans.

14. Which of the following is a price index?

A. GPI
B. PPI
C. CPI
D. REI
E. Both b and c.

15. The price index that is most frequently reported in the news is the

A. Consumer price index (CPI)
B. Producer price index (PPI)
C. Earnings index
D. The GDP deflator
E. Export price index

16. The GDP deflator is measured as:

A. Nominal GDP divided by real GDP
B. Real GDP divided by nominal GDP
C. Real GDP multiplied by nominal GDP
D. The rate of change of nominal GDP
E. The rate of change of real GDP

17. The rule of 72 measures

A. A country's annual growth rate of GDP.
B. A country's growth rate over a short period of time.
C. The number of years it will take for a country's GDP to grow by 72 percent.
D. The number of years it will take for a country's GDP to double if it grows at a constant rate.
E. How much a country's GDP will grow over a 72 year period.

18. In recent years, which of the following characterizes the U.S.'s economic situation?

A. The U.S.'s net exports are positive.
B. The U.S. has high savings rate.
C. The U.S. imports more than it exports.
D. Both b and c.
E. None of the above.

19. (from Appendix) The chained dollar method in calculating the growth rate of real GDP uses a

A. price index
B. Fisher price index
C. quality index
D. Fisher quantity index
E. none of the above.

20. (from Appendix) The Fisher quantity index and chain-type quantity index for measuring real GDP growth rates

A. provide a unique average number for estimated growth
B. use a reference year equal to 100
C. involve complicated mathematical calculations
D. are not very accurate for years far away from the reference year
E. all of the above.

Answers to Active Review Questions

1. Bureau of Economic Analysis (BEA)
2. foreign
3. households and institutions
4. fixed assets (or fixed manufactured capital)
5. consumer durables
6. inventory
7. value, final, newly, country, time.
8. imputation
9. national income (NI)

10. real (GDP)
11. True.
12. True.
13. False, such an agency would be included in the business sector.
14. False, the GDP deflator measures the average price of goods produced while the CPI measures the average price of goods consumed in the economy.
15. True.
16. The idea for the national accounts came during the Great Depression (1930s) in the U.S., when decision-makers wanted to get a better sense of by how much economic production had fallen. Economist Simon Kuznets was commissioned to produce the national accounts.
17. The business sector produced about 75% of GDP, whereas the household and institutions sector produced about 13.2%, and the government sector produced about 11.8% of the total GDP.
18. It depends on who the non-profit organizations serve. The non-profit organizations serving households are placed in the household and institutions sector. Those non-profit organizations serving business are put in the business sector.
19. National non-financial assets mainly include only manufactured capital. Recently some forms of intellectual capital, such as computer software and knowledge created through research and development, have been added.
20. Fixed assets and inventories.
21. The three approaches are: the production approach, the spending approach, and the income approach.
22. To measure the value of services produced by governments and non-profit institutions, the government usually uses a method of imputation, by measuring the value of inputs used (the cost of intermediate goods, payroll costs, etc.). It does not measure the value of the services produced by households (aside from the services of owner-occupied houses and any services that are paid).
23. The BEA made the switch from the constant-dollar method to the chained-dollar method, because the latter has increased the accuracy of the GDP growth calculations by yielding one unique estimated growth rate between any two years. With the constant- dollar method, the growth estimate depends on which year is used as the base year.
24. Because we want to give greater emphasis to prices at which many transactions are made, and less emphasis to the prices of relatively minor goods and services.
25. Because people tend to buy cheaper substitutes instead of the good whose price is quickly rising. But the constant-weight index includes the same quantities of the expensive goods.
26. The GDP deflator measures the average prices of goods and services produced in the economy. Mathematically, it is represented as:

$$GDP\ \ deflator = \frac{Nominal\ \ GDP}{Real\ \ GDP}$$

27. The simplifying assumptions are: 1) the household and institutions sector contains only households. 2) only the business sector invests; the household and institutions sector and the government sectors are assumed to only consume 3) only the business sector produces

Answers to Problems

1.
   a. Not counted
   b. Consumption
   c. Not counted
   d. Investment
   e. Consumption
   f. Net Exports
   g. Not counted
   h. Not counted
   i. Investment
   j. Investment
   k. Government investment

2.
   a. Stage 1 = $10
      Stage 2 = ($15-$10) = $5
      Stage 3 = ($20 - $15) = $5
      Stage 4 = ($25-$20) = $5
      Stage 5 = ($30 - $25) = $5
   b. Total contribution to the GDP of this chain of production = value added at each of the five stages of production. Using part (a), we can add the value at each stage as: $10 + 5 + 5 + 5 + 5 = $30
   c. The expenditure approach also yields a value = $30 (the retail price of the bottled wine sold to the consumer). In a simple economy, the value of GDP from the value added approach = value from the expenditure approach = value from the incomes approach.

3.
   a. Using the income approach, where GDP = wages + profits. Calculating the profits for each company:
      Profits for the bicycle company = $100 -50 = $50
      Profits for the wind energy company = $150 – 75 = $75
      Profits for the organic cheese company = $50 – 25 = $25.
      So GDP = ($50 + $75 + $25) + ($50 + $75 + $25) = $300.
   b. Using the spending approach, GDP = $100 + $150 + $50 = $300.
   c. Using the value-added approach:
      The value added of the bicycle company = $100– 0 = $100
      The value added of the wind company = $150 – 0 = $150
      The value added of the cheese company = $50 – 0 = $50.
      So GDP = $100 + $150 + $50 = $300.

4.

a. Nominal GDP in Year 1 = (100 × $3) + (50 × $5) = $550
Nominal GDP in Year 2 = (110 × $3.50) + (55 × $5.50) = $687.50

b. The real GDP in year 1 = nominal GDP in year 1 = $550
The real GDP in year 2 = (110 × $3) + (55 × $5) = $605

c. Growth in real GDP = 10%

d. The constant weight price index =
[(100 × $3.50) + (50 × $5.50)]/[(100 × $3) + (50 × $5)] ×100 = 113.636

e. The inflation rate = [(113.636 - 100)/100] × 100 =13.636%

Answers to Self Test Questions

1. A
2. C
3. D
4. E
5. D
6. D
7. C
8. D
9. C
10. D
11. C
12. A
13. C
14. E
15. A
16. A
17. D
18. C
19. D
20. E