

Chapter 5

Macroeconomic Measurement: The Current Approach

Macroeconomics In Context (Goodwin, et al.)

Chapter Overview

In this chapter, you will be introduced to a fairly 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 explains what has been included in the measurement of the GDP, and what has been excluded. The chapter highlights how the production and investment undertaken in the “household and institutions” and government sectors have historically been deemphasized in national accounting, and how these have been completely ignored in common abstract representations of the macroeconomy. You will learn 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.
8. Identify the saving identity in a closed economy, and in an open economy; define the Net Domestic Product (NDP); and define 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

Bureau of Economic Analysis (BEA)	open economy
National Income and Product Accounts (NIPA)	Net exports
United Nations System of National Accounts (SNA)	national income (NI)
households and institutions sector (BEA definition)	nominal GDP
business sector (BEA definition)	real GDP
government sector (BEA definition)	base year
foreign sector (BEA definition)	index number
fixed assets (BEA)	consumer price index (CPI)
inventories	implicit price deflator (GDP deflator)
consumer durable goods	rule of 72
gross domestic product (GDP) (BEA definition)	net national product (NNP)
final good	traditional macroeconomic model
intermediate good	consumption (C)
value-added	investment (I)
imputation	government spending (G)
identity (accounting identity)	net exports (NX)
closed economy	<i>From Appendix:</i>
	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. In 2003, the BEA began including consumer durable goods in its measure of the U.S. manufactured capital stock and in its measure of investment.
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 2006? (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 in 1996 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 is the saving identity in a closed economy? And in an open economy?

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. A 2002 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's 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. Calculate the growth rate of nominal GDP between years 1 and 2.
- c. Using the constant-dollar approach, calculate the real GDP in year 1 and 2. Take year 1 as the base year.
- d. Calculate the growth in real GDP between years 1 and 2 (with year 1 as the base year).
- e. Calculate a constant weight price index for the second year, using the first year as the base.
- f. 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?
- Natural capital, manufactured capital, human capital, and social capital.
 - Natural capital, and manufactured capital.
 - Human capital, and social capital.
 - Manufactured capital only.
 - None of the above.
4. Which of the following is *not* included as a fixed asset in the national accounts?
- Office equipment
 - Factories and office buildings
 - Houses and apartment buildings
 - Computer software
 - Inventories
5. Which of the following would *not* be included in the measure of U.S. GDP in the current year?
- A new machine, made in the U.S. and purchased that year for the Ford motor company assembly line.
 - A Ford automobile newly produced that year in the U.S.
 - A Ford automobile, newly produced that year in the U.S. but unsold and sitting in a warehouse.
 - Three shares of Ford motor company stock purchased that year in the U.S.
 - 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 car produced and sold in the U.S. by the Japanese-owned Toyota company.
 - A car produced in the U.S. by the U.S.-owned Ford motor company, and sold in Japan.
 - Restaurant meals in the U.S. sold to Canadian tourists visiting the U.S.
 - Restaurant meals in Canada sold to U.S. tourists visiting Canada.
 - 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 2006, how much of GDP was produced by the business sector, according to the BEA?

- a. 33%
- b. 50%
- c. 66%
- d. 77%
- 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. $\text{GDP} = \text{Household and institution spending} + \text{Business spending} + \text{Net foreign sector spending} + \text{Government spending}$
- b. $\text{GDP} = \text{Personal consumption} + \text{Private investment} + \text{Net exports} + \text{Government consumption}$
- c. $\text{GDP} = \text{Personal consumption} + \text{Private investment} + \text{Net exports} + \text{Government consumption} + \text{Government investment}$
- 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, profits, rents
- b. Wages, profits, investment spending
- c. Wages, 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?
- The wages earned by a secretary working in the U.S.
 - The profits earned by a German company from its plant located in the U.S.
 - The profits earned by a U.S. company from its plant located in China.
 - The rents earned by a U.S. landlord with rental properties.
 - The interest payments earned by a U.S. bank from its loans.
14. Which of the following is a price index?
- GPI
 - HDI
 - PPI
 - REI
 - None of the above
15. The price index that is most frequently reported in the news is the
- Consumer price index (CPI)
 - Producer price index (PPI)
 - Earnings index
 - Implicit price deflator (The GDP deflator)
 - Export price index
16. The rule of 72 measures
- A country's annual growth rate of GDP.
 - A country's growth rate over a short period of time.
 - The number of years it will take for a country's GDP to grow by 72 percent.
 - The number of years it will take for a country's GDP to double if it grows at a constant rate.
 - How much a country's GDP will grow over a 72 year period.
17. In recent years, which of the following characterizes the U.S.'s economic situation?
- The U.S.'s net exports are positive.
 - The U.S. lends more to foreign countries than what it borrows from them.
 - The U.S. imports more than it exports, and finances this by borrowing more from foreign countries than what it lends to them.
 - The U.S. imports more goods from foreign countries, but also provides more lending to foreign countries than what it borrows from them.
 - None of the above.

18. In the traditional macroeconomic model's basic identity, $Y = C + I + G + NX$, which of the following is true?

- a. The household sector is assumed to only engage in consumption spending, C.
- b. The business sector is assumed to engage in investment, I.
- c. The government sector is assumed to only engage in government (consumption) spending, G.
- d. Neither the household sector nor the government sector is assumed to engage in investment or production.
- e. All 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. The 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, while the BEA did start including them in the measure of the manufactured capital stock in 2003, consumer durables are still excluded in the measure of investment.
15. True.
16. The idea for the national accounts came during the 1930s depression in the U.S., when decision-makers wanted to get a better sense of by how much economic production had fallen. Simon Kuznets was commissioned to produce the national accounts.
17. The business sector produced slightly more than 77% of GDP, whereas the household and institutions sector, and the government sector were each estimated to have contributed about 11% 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. Only manufactured capital is included.
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. In a closed economy, $\text{Saving} = \text{Investment}$. In an open economy, $\text{Saving} = \text{Investment} + \text{Net exports}$.
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. C
 - c. Not counted
 - d. I
 - e. C

- f. NX (exports)
- g. Not counted
- h. Not counted
- i. I
- j. I
- k. G

2.

- a. Stage 1 = \$10; stage 2 = \$5; stage 3 = \$5; stage 4 = \$5; stage 5 = \$5
- b. $\$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 $\text{GDP} = \text{wages} + \text{profits}$. 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 $\text{GDP} = (\$50 + \$75 + \$25) + (\$50 + \$75 + \$25) = \$300$.
- b. Using the spending approach, $\text{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 ; and the value added of the cheese company = $\$50 - 0 = \50 . So $\text{GDP} = \$100 + \$150 + \$50 = \300 .

4.

- a. Nominal GDP in Year 1 = $(100 \times \$3) + (50 \times \$5) = \$550$
Nominal GDP in Year 2 = $(110 \times \$3.50) + (55 \times \$5.50) = \$687.50$
- b. Growth rate of nominal GDP = 25%
- c. The real GDP in year 1 = nominal GDP in year 1 = \$550
The real GDP in year 2 = $(110 \times \$3) + (55 \times \$5) = \$605$
- d. Growth in real GDP = 10%
- e. The constant weight price index =
 $[(100 \times \$3.50) + (50 \times \$5.50)] / [(100 \times \$3) + (50 \times \$5)] \times 100 = 113.636$
- f. The inflation rate = $[(113.636 - 100) / 100] \times 100 = 13.636\%$

Answers to Self Test Questions

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