

# Chapter 2

## Measuring Macroeconomic Data

### ■ Chapter Outline, Overview, and Teaching Tips

#### Chapter Outline

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Real Versus Nominal Interest Rates

The Important Distinction Between Real and Nominal Interest Rates

**Chapter Overview and Teaching Tips**

This chapter examines how economists define and measure the most important data in macroeconomics. Some instructors will want to cover this material in detail in class, but others will prefer to just cover the main points and let students read the chapter on their own as background.

There is no way around it: National income accounting is not the most exciting of topics. Yet it is important, as the preview to the chapter indicates. Students need to be exposed to a basic concept like Gross Domestic Product and how it is measured. Similarly, they need to understand what the data on unemployment, the consumer price index (CPI), inflation, and real interest rates means and how measurement of this data is not always completely straightforward.

Although the material in this chapter can be dry, discussing in class the Policy and Practice cases in the chapter, “Can GDP Buy Happiness?” and “Policy and Overstatements of the Cost of Living,” liven up the material. It also helps students recognize that understanding and measuring macroeconomic data is important to getting policy right.

This chapter introduces “Macroeconomics in the News” boxes, which contain news items and data that are reported daily in the press. These boxes help explain what data are reported on regularly, how to find it, and how to read it. They encourage students to start paying more attention to the data that feature so prominently in macroeconomics.

**■ Answers to End of Chapter Review Questions and Problems****Answers to Review Questions****Measuring Economic Activity: National Income Accounting**

1. The fundamental identity of national income accounting states that Total Production = Total Expenditure = Total Income. Its significance is that macroeconomists can define and measure gross domestic product in three ways: by totaling either the value added in production or the expenditures to buy goods and services or the incomes earned by households, business firms, and government.

**Measuring GDP: The Production Approach**

2. GDP is defined as the *market value* of all *final* goods and services *newly produced* in the economy during a *fixed period* of time. When a market value or price is not available for a good or service, its contribution to the value of total output is either ignored—as in the case of most household services and underground economic activity, imputed—as with the value of the services homeowners enjoy by living in their houses, or considered to be equal to its cost of production—as is the case with the provision of government services, such as national defense and education. The value of intermediate goods and services that go into the production of final goods and services is included in value of the final products and, therefore, is not counted separately because doing so would result in double counting

and cause GDP to overstate the amount of economic activity. GDP likewise omits purchases of used goods and imports, again to avoid overstating the value of the current time period's production of goods and services.

3. A flow measure is a quantity per period of time and a stock measure is an amount at a given point in time. For example, your car's speedometer, by telling you how fast you are driving in miles *per* hour, provides you a flow measure associated with a period of time. Its odometer gives you a stock measure of how many miles the car has been driven up to a particular point in time. GDP measures the value of final goods and services produced during a given time period; thus, it is a flow measure that indicates how much economic activity occurred per period of time.
4. Intermediate goods and services are used up completely in the production of final goods and services during a given time period. Because this is so, their value is completely incorporated into the value of those final goods and services and is not counted separately. This is not the case with capital goods and inventories. A capital good is a final good that is produced during a given time period and is then available to use in the production of other goods and services during one or more future time periods. It is not completely used up during the time period in which it is produced, and therefore, it is not treated the same way an intermediate good is. Inventory investment, the change in business firms' holdings of raw materials, unfinished goods, and unsold finished goods, represents the current production of both intermediate and final goods and services during a given time period that, like capital goods, will be available to help produce more goods and services in future time periods. Because both capital goods and investment in inventories represent production in the current time period that can be used to assist in future production of goods and services, they are counted in the current time period's GDP.

### Measuring GDP: The Expenditure Approach

5. According to the national income identity, GDP ( $Y$ ) can be measured by summing consumption expenditure ( $C$ ), investment expenditure ( $I$ ), government purchases of goods and services ( $G$ ), and net exports ( $NX$ ). Consumption expenditure includes consumer durable goods, nondurable goods, and services. Investment expenditure includes business fixed investment (capital goods), inventory investment, and residential investment. Government purchases include spending on currently produced goods and services by federal, state, and local governments but do not include transfers such as payments for Social Security and unemployment insurance benefits. Net exports equal exports minus imports, so goods and services that domestic households, business firms, and governments purchase that are produced elsewhere are subtracted from GDP and not counted as domestic production.

### Measuring GDP: The Income Approach

6. The major income items in national income are employee compensation, proprietors' income, rental income of persons, corporate profits, and net interest. The total of these income categories does not equal the GDP because depreciation, which is treated as an expense and therefore reduces proprietors' income and corporate profits, is not income for anyone else. The same is true of indirect business taxes. Furthermore, a country's national income includes income its residents earn from productive activities in other countries, which do not contribute to the country's GDP and excludes income nonresidents earn from their productive activities in the country that do contribute to its GDP. Adjusting national income by adding in depreciation, indirect business taxes, and factor income paid to the rest of the world, subtracting factor income received from the rest of the world, and adjusting for the

(relatively small) statistical discrepancy that arises from measuring GDP in two different ways—the production approach and the income approach—reconciles the two approaches.

### Real Versus Nominal GDP

7. Variables measured in terms of dollars or other monetary units, such as GDP and its various income and expenditure components, can be measured using either current market prices or the prices of a base year. The *nominal* value of a variable is measured using current market prices and will change when either current market price or quantity changes. Therefore, a change in a variable's nominal value gives no information about whether or how much market price or quantity has changed. The measure of a *real* value, however, always uses the prices of a base year. Thus a variable's real value changes only when quantity changes and is unaffected by changes in current market prices. For that reason, real GDP rises only when the output of final goods and services rises and falls only when output falls and thus is a better measure of changes in economic activity and well-being.
8. The GDP deflator is a measure of the price level obtained by dividing nominal GDP by real GDP for a given time period. The personal consumption expenditure deflator measure of the price level uses just consumption expenditure rather than total GDP, so it is nominal personal consumption expenditure divided by real personal consumption expenditure for a given time period.

### Measuring Inflation

9. The consumer price index (CPI) is a widely followed measure of the average prices of the goods and services a typical urban consumer purchases. The Bureau of Labor Statistics (BLS) conducts periodic expenditure surveys to determine the items in a typical urban consumer's "basket of goods and services" and then collects data to determine the average cost of purchasing those items each month. This cost is compared to the cost of purchasing those same items in a base year whose index value is set to 100. The CPI figure reported each month, then, tells how high prices are relative to the base year. The percentage changes in the CPI from month to month measure the rate of increase in the price level—the inflation rate.

### Measuring Unemployment

10. The unemployment rate, calculated monthly by the BLS, measures the fraction of civilians who want to work but do not have jobs. To estimate this fraction, the BLS surveys about 60,000 households each month and classifies people aged 16 and older as either employed (if they worked full time or part time or were temporarily away from their jobs), unemployed (if they did not work but looked for a job within the past four weeks or were laid off and waiting to be recalled), or not in the labor force (full-time students, retirees, people who choose to stay at home, and discouraged workers who would like to work but have not looked for a job within the past four weeks). Together the employed and unemployed make up the (civilian) labor force. The unemployment rate is the number of unemployed people divided by the labor force.

### Measuring Interest Rates

11. A nominal interest rate is the interest rate stated on a loan or other financial instrument that is not adjusted for inflation. The nominal interest rate on a loan, for example, indicates how much money the borrower will pay in interest to the lender, but it does not measure that interest payment in real terms. It does not measure how much purchasing power the borrower will pay the lender. The real interest rate provides this measure because it adjusts for inflation. According to the Fisher equation, the real interest rate equals the nominal interest rate minus the expected inflation rate. This is an *ex ante* real interest rate because it indicates how well a lender expects to do in real terms at the time

the loan is made. An ex post real interest rate, for which the actual inflation rate is subtracted from the nominal interest rate, measures how well the lender actually did in real terms after the fact.

## Answers to Problems

### Measuring Economic Activity: National Income Accounting

1. It is not correct to assume that a household's total income will equal its total expenditure. This might happen as a particular case, but in general, households choose either not to spend all their income (i.e., to save) or to spend more than their total income (i.e., to accumulate debt). This conclusion is the same if we consider a firm (rather than a household) that produces any good or service: Its income does not necessarily equal its expenditure. However, when we consider all economic agents together (i.e., firms, households, and the government), it is true that total income equals total expenditure. Note that this conclusion does not imply that income must equal expenditure for all firms, households, and the government individually. This result is obtained by observing that each transaction has a buyer and a seller. Consequently, the value of that transaction represents income for one party and expenditure for the other, independently of which agent buys or sells the particular good or service.

### Measuring GDP: The Production Approach

2.
  - a. According to the production approach, which measures GDP by adding the value added from each firm, GDP will increase in this case. This is interpreted as good news, as this measure is intended to measure economic activity.
  - b. We cannot say that both countries are better off for sure. We can say that economic activity has increased in both countries, but GDP cannot measure, by definition, many important aspects of human welfare (including our perceptions about the environment). Theoretically, it is possible that the impact of pollution is so negative that it actually decreases the quality of life in these countries. We can say for sure that the inhabitants of Utopia will benefit more from this increase in economic activity than the inhabitants of Pandora, who value their environment twice as much. Because individual preferences about issues like environmental protection are inherently difficult to measure, these considerations are often left out of the discussion and most policymakers focus only on the GDP measure when evaluating alternative policies.
  - c. In this alternative scenario, inhabitants of Utopia will not benefit as much from the increased economic activity if it undermines one of their fundamental values: a more equal income distribution. As before, it might even be the case that inhabitants of Pandora will suffer a lot from observing a more skewed income distribution, but they will always benefit more from this situation than their counterparts in Utopia.

### Measuring GDP: The Expenditure Approach

3.
  - a. A household purchase of a home built in 2005 will not affect GDP because only currently produced goods and services are considered by the GDP measure. Counting previously produced goods will overestimate GDP, as these goods were already counted the year they were produced.
  - b. A household purchase of a newly built dishwasher will count toward GDP and will be included in consumption expenditure (as durable goods expenditure).
  - c. A farmer's purchase of a new tractor will be included in GDP as private investment because the farmer is adding to his or her machinery stock. This transaction will be considered fixed investment.

- d. An individual receipt of any type of transfer from the government (including tax credits) is not included in GDP because this transaction is not meant to pay for any currently produced good or service.
- e. A U.S. Department of Defense purchase of equipment could be considered government consumption or government investment. In this case, however, the helicopters are manufactured in another country, and therefore, this transaction will not affect GDP.

### Measuring GDP: The Income Approach

- 4. a. To calculate other income, subtract the figures for employee compensation and corporate profits from national income: Other income =  $\$14,313 - \$8,737 - \$2,021 = \$3,555$  billion.
- b. Net factor income is the difference between gross national product, which measures the value of total income earned by U.S. residents from production that takes place anywhere in the world, and gross domestic product, which measures the income earned by anyone in the world from production that takes place in the United States. Thus, net factor income is  $\$16,772 - \$16,535 = \$237$  billion.

### Real Versus Nominal GDP

- 5. a. Lucia is right. In order to properly assess whether a country and its residents are better off, one has to consider the evolution of real GDP, not nominal GDP. Real and nominal GDP might describe the same changes in economic activity, but this happens only under particular circumstances. Nominal GDP might increase even if the quantity of goods and services does not change or if it decreases (this last situation requires a significant enough increase in the price level). A decrease in the quantity of goods and services produced in an economy clearly does not make individuals better off. Mario is not considering the effect that price changes will have on nominal GDP and, therefore, might be making a mistake. Under the particular assumption that prices are not changing, then it is safe to use either nominal or real GDP to measure changes in economic activity and income.
- b. It is possible for Mario and Lucia to be worse off if the increase in prices described by Lucia is greater than the increase in their income. If their wages increased by 2 percent during these two years, and groceries and rent increased by 5 percent, then they would be unable to buy the same quantity of goods and services as two years ago. Usually all prices change at different rates, and situations as the one described happen quite often. It is also important to note that both nominal and real GDP are broad measures of economic activity and income and, therefore, should not be used to describe particular individual's cases.

### Measuring Inflation

- 6. a. If transportation services for the typical U.S. household increase by 10 percent, one can calculate the change in CPI caused by this price change, assuming that no other price has changed. The CPI change can be calculated as:  $10\% \times 15\% = 1.5\%$ .
- b. According to the previous information, you will probably not spend 15 percent of your monthly wage in transportation. This means that your consumption pattern does not match the consumption pattern of the typical household. This usually results in over- or under-estimation of changes in your true cost of living as measured by changes in the CPI. In this case, even if the CPI is showing an increase in the cost of living, your cost of living has probably not changed by much; definitely less than 1.5 percent. A more interesting case involves the indexation of Social Security payments to the elderly (i.e., retirees). Social security payments are updated to consider changes

in the cost of living, as measured by changes in the CPI. However, the elderly spend a higher percentage of their income on medical services (a category that has experienced a significant price increase lately) than the typical household. This results in an underestimation of the true cost of living for the elderly as measured by the CPI.

7. There are at least two problems that the current CPI methodology faces when measuring the change in the cost of living derived from this scenario. One of them involves the introduction of new goods and the corresponding increase in consumer welfare. The consumer basket is a list of many goods and services that is updated every few years (sometimes as long as 10 years) and often misses the introduction of new varieties of goods. The other problem is how to value quality improvements. Maybe some individuals value this new feature by more than the increase in the new iPhone's price. In that case the CPI will overestimate the change in the true cost of living for these individuals. These situations present difficult challenges to the BLS and remind us of the limitations of such measures.

### Measuring Unemployment

8. a. Labor force = unemployed + employed = 7 + 88 = 95  
 b. Labor force participation rate = labor force / adult population = 95 / 140 = 67.9%  
 c. Unemployment rate = unemployed / labor force = 7 / 95 = 7.37%
9. The 3 million individuals who are unemployed and decide not to look for a job anymore are no longer considered "unemployed." These individuals are not part of the labor force anymore (they are neither employed nor unemployed). Everything else the same, both the labor force and the labor force participation rate decrease. The new unemployment rate is:  $(7 - 3)/(88 + 7 - 3) = 4/92 = 4.35\%$ . This simple exercise shows the limitations of measures of unemployment because many people become discouraged during exceptionally long recessions. Policymakers might observe a decreasing unemployment rate and interpret that as a good sign, but the decrease might be created by people leaving the labor force. The BLS constructs other measures of unemployment for policymakers and the public in general to have a better description of labor market conditions in the United States.

### Measuring Interest Rates

10. a. Ex ante real interest rate = nominal interest rate – expected inflation rate = 8%.  
 b. Ex post real interest rate = nominal interest rate – actual inflation rate = less than 8%. An increase in actual inflation hurts the lender in real terms because it receives fixed nominal payments (loan installments) during a time in which prices are increasing at a rate higher than expected.  
 c. As a borrower, you benefit from higher inflation rates, as the purchasing power of your fixed payments decreases over time. The ex post real interest rate calculation indicates precisely that: because of higher than expected inflation rates, the true cost of borrowing has decreased.

## ■ Answers to Data Analysis Problems

1. a. For 2013:Q1, GDP = \$15,984.1 billion and GNP = \$16,231.1 billion; net factor income = GDP – GNP = –\$247 billion.  
 b. Because net factor income is negative, the amount paid to U.S. residents by foreigners is less than the amount paid by U.S. residents to foreigners, and hence, foreign production by U.S. firms is larger than U.S. production by foreign firms.
2. a. 2013:Q1 = 116.45; 2012:Q1 = 114.6.

- b. Inflation rate =  $100 \times (116.45 - 114.6)/114.6 = 1.62\%$ .
  - c. Nominal GDP growth = 3.27%; real GDP growth = 1.62%. They are related in that the growth rate in real GDP plus inflation rate equals (approximately) the growth rate in nominal GDP.
3. For June 2013, UNRATE = 7.6%, CIVPART = 63.5% and CLF16OV = 155,835,000. The number of people not in the labor force =  $CLF16OV/CIVPART - CLF16OV = 89,574,449$ . The number of unemployed =  $UNRATE \times CLF16OV = 11,843,460$ . Number of employed =  $CLF16OV - UNRATE \times CLF16OV = 143,991,540$ . The adult population is given as  $CLF16OV/CIVPART = 245,409,449$ , thus the employment ratio equals  $143,991,540/245,409,449 = 58.7\%$
4. a. Market participants expected the inflation rate on average to be higher than the nominal interest rate over that same period, thus the real interest rate, as represented by the difference between the treasury and TIPS yields, was negative.
- b. The difference between the pairs represents expected inflation over the relevant bond horizon. Calculations for July 9, 2013, are shown below.

9-Jul-13	Nominal	TIPS	Difference (Inflation Expectations)
5 Year	1.50	-0.36	1.86
7 Year	2.08	0.14	1.94
10 Year	2.65	0.59	2.06
20 Year	3.36	1.18	2.18
30 Year	3.64	1.40	2.24

- c. The difference, which roughly represents inflation expectations is fairly constant over the various horizons, but grows slightly as you move further out. In this case, market participants expect average inflation to be somewhat lower in the near term but average a bit more than 2 percent at 10, 20, and 30 years out.

## ■ Data Sources, Related Articles, and Discussion Questions

### A. For information About *Policy and Practice: Can GDP Buy Happiness?*

#### Data Source

The United Nations' HDI ranking: <http://hdr.undp.org/en/statistics/>. You can use this resource to compare the situation of a “Low Human Development” country and a “Very High Human Development” country (click on the name of a country to obtain the information).

#### Related Article

OECD Newsroom, “OECD welcomes experts’ call on need for new measures of social progress”: [http://www.oecd.org/document/11/0,3343,en\\_21571361\\_44315115\\_43684683\\_1\\_1\\_1\\_1,00.html](http://www.oecd.org/document/11/0,3343,en_21571361_44315115_43684683_1_1_1_1,00.html). This press release outlines the procedures followed by the OECD commission in charge of reviewing and improving current national statistics.

### Discussion Questions

1. Propose alternative factors to be included in a more comprehensive measure of human satisfaction. How would you suggest these factors should be measured?
2. Suppose national statistics measure other aspects of human life, like gender inequality or access to freedom of religion. Do you think these statistics can be used to compare countries' achievements in these areas? Why or why not?

Answer 1: Alternative factors might include the quality of the environment, gender disparity, domestic violence, racism, and many other aspects of human life that affect our well-being. Potentially, some of these factors can be measured using relatively objective statistics. As an example, political scientists study by which means some countries make sure that a given percentage of their legislators are women. In general, though, most of these measures are controversial because the degree of gender disparity in a society cannot be fully described by the percentage of female participants in a legislative body.

Answer 2: Even if a national statistic could accurately incorporate (i.e., correctly measure) other aspects of human life, different cultures usually have different perceptions about most of these aspects. As a consequence, cross-countries comparisons of these statistics could be meaningless. One could argue that all cultures place the same value on access to basic needs such as healthcare, housing, and education. But the case is not that strong when one considers topics like income distribution, the environment, freedom of religion, gender disparity, etc. You can check this by realizing how different people have different opinions about what is more important in life. Then imagine a whole country or a given culture! This is one of the reasons as to why the GDP measure is still used to compare countries; it is far from perfect, but it is quite difficult to improve it.

### **B. For information About *Policy and Practice: Policy and Overstatements of the Cost of Living***

#### **Data Source**

The Bureau of Labor Statistics: <http://www.bls.gov/bls/inflation.htm>. Here you can find the most updated information about inflation in the U.S. economy.

#### **Related Article**

Greenspan, Alan, "Bias in the Consumer Price Index": <http://www.federalreserve.gov/boarddocs/testimony/1997/19970304.htm>. In this speech, then Federal Reserve Chairman Alan Greenspan commented on the CPI bias and its implications for economic policy.

#### **Discussion Question**

Do you think that the "chained CPI" is a perfect measure of the cost of living? Why or why not?

You can read more about changes introduced in the CPI methodology at the BLS site: <http://www.bls.gov/cpi/cpisupqa.htm>.

Answer: Although the "chained CPI" represents an improvement over the standard CPI, it is not a perfect measure of the cost of living. The "chained CPI" methodology tries to incorporate the fact that individuals substitute away from more expensive goods when possible. Even if one could argue that this effect is entirely captured by the "chained CPI" methodology, other aspects of measuring the cost of living are still left out (e.g., changes in quality).

## C. For Information About Unemployment

### Data Source

The Bureau of Labor Statistics, “International Labor Comparisons”:  
[http://www.bls.gov/fls/intl\\_unemployment\\_rates\\_monthly.htm](http://www.bls.gov/fls/intl_unemployment_rates_monthly.htm). This report compares unemployment rates and other employment indicators across countries for the 2008–2010 period. This information can be used to put in perspective the effect of the recent international financial crisis in different countries.

### Related Article

Bluestone, Barry, et al., “After the Recovery: Help Needed”:  
<http://www.encore.org/files/research/JobsBluestonePaper3-5-10.pdf>. This article discusses the implications of future demographic trends and their effect on the U.S. job market. Employment data and the current and future availability of jobs is a recurrent topic in macroeconomics. This article makes an interesting point, noting that it might be possible for the United States to suffer a shortage of workers in the future.

### Discussion Question

According to the BLS, the female (20 years and older) labor force participation rate increased from around 32 percent in the early 1950s to around 60 percent in 2010. Provide alternative explanations for this phenomenon.

Answer: The female labor force participation rate has been increasing since the early 1950s in the United States. Many cultural and technological aspects determined this transition: Some claim that WWII helped, in no small part, to introduce women into the labor market. Some sources assert that the extensive use of electronic appliances in households freed women’s time and allowed women to participate in the labor market. Finally, some sources claim that changes in cultural attitudes toward women’s role in the society determined this transition. For a graphic representation of this measure, go to:  
<http://www.bls.gov/webapps/legacy/cpsatab1.htm>, then click on the “women, 20 yrs and over, participation rate” box and then “retrieve data.” You will receive data for the last 10 years, but you can change it, and ask the Website for a graphical representation, clicking the “include graphs” box.