Solutions for Macroeconomics 13th Edition by Dornbusch

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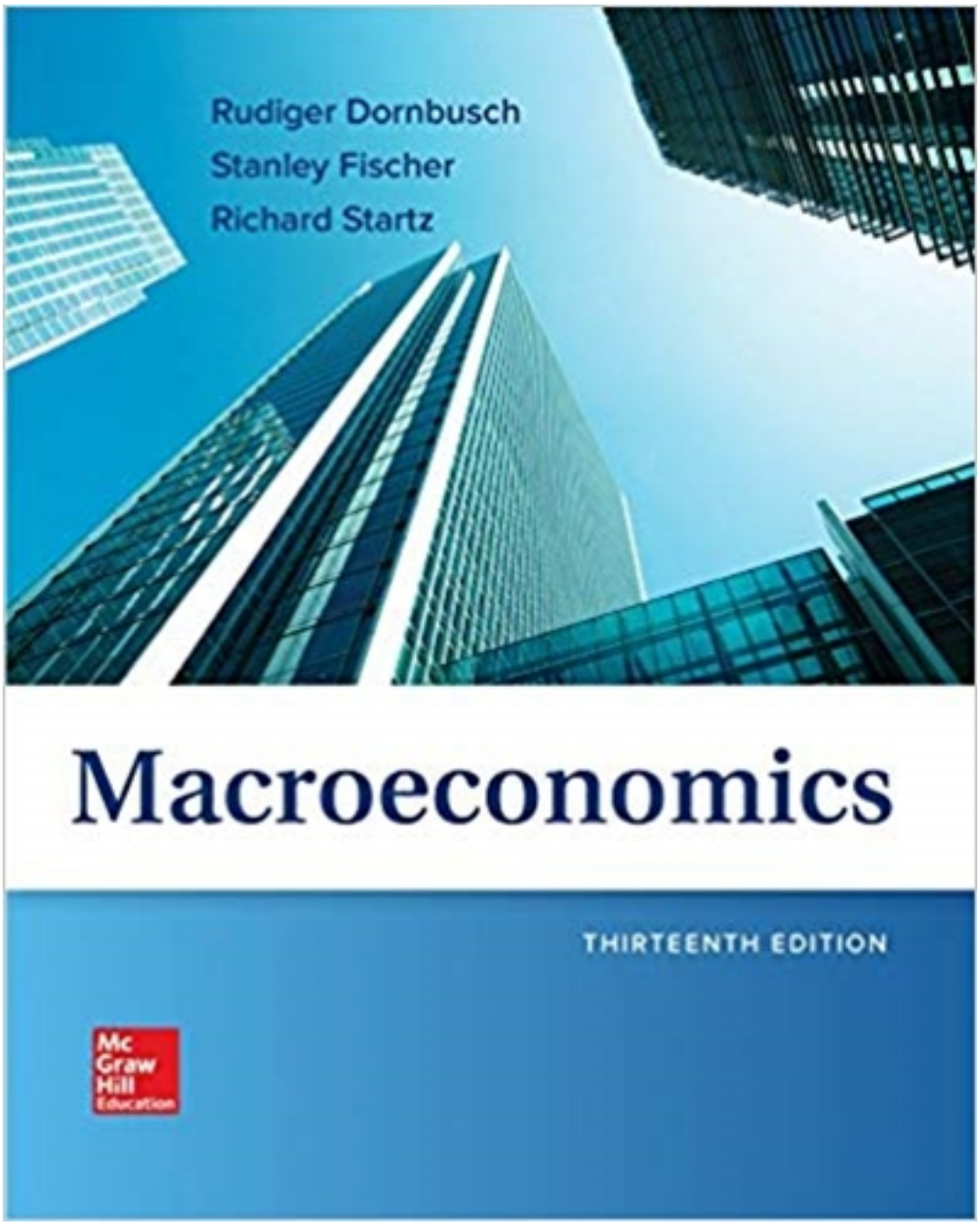

Solutions

CHAPTER 2

NATIONAL INCOME ACCOUNTING

Chapter Outline

- Real and nominal GDP
- The composition of GDP
- The value added approach
- The expenditure approach
- Price indexes
- Core inflation
- The unemployment rate
- Exchange rates
- Real and nominal interest rates

Changes from the Previous Edition

All figures and tables in this chapter have been updated, as has the data in the History Speaks Box 2-2. Just before History Speaks 2-1, 2-2 What More Do We Know has been added ("For Adults Only.") New What More Do We Know 2-3 has been added ("One Billion Prices").

Introduction to the Material

Chapter 2 examines the meaning of gross domestic product (GDP), the basic measure of a nation's economic performance. The difference between gross domestic product (GDP) and gross national product (GNP) arises since part of a country's output is produced by foreign-owned factors of production. This difference is fairly small for the U.S., but it is important to stress this distinction, since in some other countries, such as Ireland and Switzerland, the difference is substantial. While the concepts are similar, current international comparisons often use GNI (gross national income) rather than GNP.

Explaining GDP in terms of factor payments will help in the study of aggregate supply and economic growth. The aggregate production function shows the factors of production (inputs, such as labor and capital) that contribute to the production of final goods and services (output). Dividing GDP into its four main spending components—consumption (C), investment (I), government purchases (G) and net exports (NX)—will help in the study of aggregate demand.

The use and derivation of important identities in this chapter provides a basic understanding of the relationship between various macroeconomic variables. In discussing these relationships, instructors should point out the ambiguities in cause and effect that are often present in macroeconomics. This is especially true when it comes to the relationship between private domestic saving, private domestic investment, the budget surplus and the trade surplus. An in-depth discussion of these relationships will, of course, have to be delayed until later. Nonetheless, students will find it exciting and motivating to see that even the simple equations presented here can be used to address some rather complex real world problems.

It is particularly important to point out that the following two equations

$$Y \equiv C + I + G + NX \quad \text{and} \quad S - I \equiv (G + TR - TA) + NX$$

are treated as national income identities here but will also be used as equilibrium conditions in later chapters, with the second equation slightly redefined.

It is not always easy to measure inflationary trends accurately, especially since the prices of some goods can be volatile. Therefore, policy makers often look at the trend of core inflation, which excludes energy and food prices. Alternative measures of inflation, such as the GDP-deflator, the consumer price index (CPI), the personal consumption expenditure deflator (PCE), and the producer price index (PPI), are discussed, along with some of the problems that come with measuring inflation. A brief discussion of the usefulness and shortcomings of these different measures of inflation should point out why the price indexes do not always change at the same rate even though their rates of change over long time spans tend to be fairly similar. The PPI measures price increases at an early stage of production from a market basket that includes raw materials and semi-finished goods. The CPI measures the average price increase of a market basket of goods and services that an average urban household might consume. The personal consumption expenditure deflator (PCE) is a chain-weighted index measuring inflation in consumer purchases, based on the consumer sector of the national income account. The GDP-deflator is the most comprehensive measure and includes all goods and services currently produced within a country. Unfortunately, early estimates of GDP—and thus the GDP-deflator—tend to be fairly unreliable due to measurement problems.

Another measure that can give an indication of how well a nation is performing economically is the unemployment rate, that is, the fraction of the labor force that is currently out of work but actively looking for a job or waiting to be recalled from a layoff. However, the official rate of unemployment does not necessarily show the real impact of a downturn in the economy, which is why the Bureau of Labor Statistics also looks at alternative measures, such as discouraged workers, workers who are only marginally attached to the labor force, and those who work part-time because full-time work is not available to them.

The distinction between real and nominal interest rates is also very important. Nominal interest rates represent the actual rate of return on financial instruments as they are stated in the newspapers. However, a financial investor should be interested much more in the real rate of return, that is, the stated interest rate adjusted for inflation. Very few financial instruments guarantee a real rate of return and the U.S. government has only recently started to issue inflation-indexed government bonds.

Financial investors seeking good yields from foreign securities also have to pay attention to the exchange rate, that is, the price paid to buy foreign currency. While an in-depth discussion of the importance of exchange rates will have to be delayed, instructors still may want to point out Figure 2-7, that shows an inverse relationship between the GDP-deflator and the value of the U.S. dollar.

As it becomes increasingly important for students to know how to access statistical data that are useful in interpreting the performance of the economy, Section 2-9 provides some links for obtaining data and students should be encouraged to make use of them.

Suggestions for Lecturing

Instructors should start this chapter by giving students the definition of GDP as the market value of all final goods and services currently produced within a country in a given time period (usually a year) and why the exact definition is useful. This can be done by asking them to explain how certain events may affect the value of GDP (for suggestions look under "Additional Problems" below).

In discussing the concept of GDP, instructors should make it clear that early data reports on GDP tend to be unreliable, since much of the data used to prepare them is based on estimates rather than direct measurement. In addition, some data, such as unreported activity, may never enter the GDP figure. As Section 2-4 points out, part of actual economic activity (as represented in the official GDP figure) cannot be measured adequately and estimates of how much activity is unaccounted for in the GDP figure vary greatly. A discussion of the underground economy is always of interest to students. The fact that some of the estimates are based on currency holdings seems reasonable to them, since they are quite aware from watching movies that many illegal transactions (for example, those involving illegal drugs) require large sums of cash. However, few of them would suspect that many businesses that require cash payments for their goods and services might also underreport their income to avoid taxes. A discussion of whether the volunteer services of a candy striper or the services provided by a homemaker in raising his or her children should be counted in the official measurement of GDP will also prove to be very stimulating.

When asked to give estimates of the current GDP or the proportions of its main components (consumption, investment, government purchases and net exports) students often give values far from those indicated in Table 2-1. Figure 2-1 also deserves some attention since it shows not only these four components as percentage of GDP, but also the payments to the factors of production as percentages of GDP. This can lead to a useful discussion of the expenditure approach versus the value added approach to calculating GDP.

A discussion of actual, potential, real and nominal GDP, the GDP-deflator, the CPI and the PPI can be incorporated into the discussion of other important economic indicators. Relating the discussion of economic indicators to current news reports on economic issues may prove to be very interesting to students. Instructors who choose to devote some time to the discussion of economic indicators in Chapter 1 may find it helpful to assign Chapter 2 simultaneously. As many of today’s students lack familiarity with economic data and do not read newspapers on a regular basis, assigning tasks that involve looking up economic data on the web often works best. The web sites listed in Section 2-9 are very useful in this regard. A worthwhile assignment requiring a data search is to ask students to make a comparison between the performance of the U.S. economy and that of another country of their choice.

Some time should be spent on the discussion of the differences between the GDP-deflator, the PCE, the CPI, and the PPI, and their respective usefulness as economic indicators. The GDP-deflator is a lagging economic indicator, as is the PCE, while the CPI is coinciding and the PPI is leading. The difficulties of measuring quality improvements, innovations, or the substitutability of goods should also be discussed. There is a great deal of discussion of how well the CPI actually measures the true cost of living. Since many contracts have cost-of-living adjustments (COLAs) that are based on the CPI, an overstatement of inflation by the CPI can be very costly.

When discussing measurements for inflation, it is important to mention the difference between nominal and real interest rates. Some instructors may want to mention the Fisher equation, named after Irving Fisher, who analyzed the linkage between inflation and interest rates. It states that the nominal interest rate (i) is the expected real rate of interest (r^e) plus the expected rate of inflation (π^e), or

$$i = r^e + \pi^e.$$

From this we can conclude that in the long run, when all adjustments have occurred, the real interest rate is equal to the nominal interest rate minus the rate of inflation, that is,

$$r = i - \pi.$$

Even at this early stage in the semester some instructors may want to attempt to give students at least a rudimentary understanding of how the unemployment rate is calculated or why the unemployment rate in the U.S. has been lower than that of many European countries in recent years (even though the opposite was true in the 1960s or 1970s). Similarly, a brief explanation of why the exchange rate between the currencies of two particular countries may not necessarily give much indication of whether specific goods are more or less expensive in these two countries may be appropriate. However, since these two issues are explained in much more detail in later chapters, instructors pressed for time may want to disregard these issues at this time. Instructors should also give some attention to Figure 2-9, which shows alterative measures to the official unemployment rate, as official numbers may not accurately represent the impact of an economic downturn on individuals' well-being.

As important as national income accounting is in assessing the performance of the economy, some instructors may want to leave much of the material up to students to read on their own, given the shortness of the semester and the amount of material still to be covered. However, a few national income accounting identities should be derived. If this is done in conjunction with a circular flow diagram, instructors can start out with the equation

$$Y \equiv C$$

and gradually extend the diagram (and the corresponding equations) with additional injections and leakages up to the point where

$$Y \equiv C + I + G + NX.$$

This way it can be shown that the first equation is equivalent to

$$S \equiv 0,$$

while the latter is equivalent to

$S + TA - TR \equiv I + G + NX.$

Other instructors may want to choose only an algebraic approach, starting with the following equations:

(1) $GDP - D \equiv NDP$ (2) $I_g - I_n \equiv D$ (3) $I_n \equiv \Delta K.$

Equations (1) and (2) show that depreciation (D) is the difference between GDP and NDP; it is also the difference between gross investment (I_g) and net investment (I_n). Equation (3) shows that only net investment adds to a nation's capital stock (K). If we subtract indirect taxes from NDP, we get national income (Y) which has four spending categories, bringing us to the most fundamental national income accounting identity:

(4) $Y \equiv C + I + G + NX.$

Since (5) $YD \equiv Y - TA + TR$ and

(6) $YD \equiv C + S$ we get

(7) $Y \equiv C + S + TA - TR.$

Equation (7) can be combined with Equation (4) to derive

(8) $I + G + NX \equiv S + TA - TR,$

that is, total injections equal total leakages. It should be noted here that net exports is defined as $NX = X - Q$, where exports (X) is an injection and imports (Q) a leakage. Similarly, $TA - TR$ can be viewed as "net taxes," since taxes (TA) is a leakage, whereas government transfer payments (TR) is an injection.

Equation (8) can now be manipulated into

(9) $S - I \equiv (G + TR - TA) + NX$ or (9a) $S - I = BD + NX$ where

(10) $(G + TR - TA) \equiv BD$ is the budget deficit, and

(11) $NX \equiv X - Q$ represents net exports = exports - imports.

Equation (9a) can then be manipulated into

(9b) $S - I \equiv BD - TD$

In other words, this identity states that the difference between private domestic saving (S) and private domestic investment (I) is equal to the difference between the budget deficit (BD) and the trade deficit (TD). It therefore implies that an increase in the budget deficit (unless accompanied by an equal increase in private domestic saving) will lead to the crowding out of private domestic investment and/or net exports. The equation can therefore be used to explain the development of the "twin deficits" in the early 1980s. Finally, it can be explained why the decrease in U.S. budget deficits that led to budget surpluses in the late 1990s was not accompanied by a decrease in trade deficits. Many students are worried that the U.S. has moved from being the largest creditor nation to being the largest debtor nation in the world. A brief discussion of whether we should be concerned by this fact and whether foreign ownership of assets in the U.S. actually helps to maintain domestic jobs can be useful here, but a more in-depth discussion of these issues should probably be left for later.

Some instructors may want to use Figure 2-6, which shows the federal debt as a percentage of GNP from 1790-2012 and indicates periods of recession and war, as a way to solicit student views on what factors may have caused significant increases in the national debt and at what point a large national debt may become a concern to policy makers.

Since later chapters use the concept of the budget surplus (BS) when discussing fiscal policy, some instructors may actually prefer to use the following equation rather than equation (10).

(10a) $BS \equiv TA - G - TR$,

Multiplying equation (9b) by –1, we can obtain the following equation

(9c) $I - S = BS - NX$ or (9d) $NX = S + BS - I$,

which states that if national saving is not sufficient to finance private domestic investment (I), then funds have to be borrowed from abroad, causing net exports (NX) to become negative. National saving consists of private domestic saving (S) and government saving, which is positive if the government runs a budget surplus.

A distinction between government purchases (G) and government expenditures (G + TR) should also be made, as many students are not aware that transfer payments (TR) are treated separately from government purchases (G). Transfer payments do not immediately affect GDP, since no productive activity takes place when these payments are made; however, GDP will be impacted later through an increase in consumption as these transfer payments are eventually spent.

Additional Readings

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Houston, Joel, "The Underground Economy: A Troubling Issue for Policy Makers," *Business Review*, FRB of Philadelphia, September/October, 1987.
Landefeld, S., Seskin, E., and Fraumeni, B., "Taking the Pulse of the Economy: Measuring GDP," *Journal of Economic Perspectives*, Spring 2008.
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Nordhaus, William, "Quality Change in Price Indexes," *Journal of Economic Perspectives*, Winter, 1998.
Pollak, Robert, "The Consumer Price Index: A Research Agenda and Three Proposals," *Journal of Economic Perspectives*, Winter, 1998.
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Uchitelle, Louis, "Seizing Intangibles from the GDP," *The New York Times*, April 9, 2006.

Learning Objectives

- Students should become familiar with the four main components of spending as well as their magnitude relative to GDP.
- Students should become familiar with the relative importance of the factor payments (labor and capital).
- Students should gain an understanding of the difficulties that arise in accurately measuring GDP, the unemployment rate, and the rate of inflation.
- Students should become familiar with the basic national income accounting identities presented in the text.
- Students should gain an understanding of the relationships between private domestic saving, private domestic investment, the budget deficit, and the trade deficit, and the complexity of issues that are associated with the interrelationships among these variables.
- Students should be able to differentiate between the three price indexes discussed, that is, the GDP-deflator, the PCE, the CPI, and the PPI.
- Students should be able to differentiate between real and nominal interest rates.

Solutions to Problems in the Textbook

Conceptual Problems

1. Government transfer payments (TR) do not arise out of any production activity and are thus not counted in the value of GDP. If the government hired the people who receive transfer payments, then their wages would be counted as part of government purchases (G), which is counted in GDP. Therefore GDP would rise even if these workers were paid to do nothing, as government purchases are measured on a cost basis.

2.a. If the firm buys a car for an executive's use, the purchase counts as investment (I). However, if the firm pays the executive a higher salary and she then buys a car, the purchase of her car is counted as consumption (C). In either case, GDP will increase.

2.b. The services that a homemaker provides are not counted in GDP (regardless of their value). However, if an individual officially hires his or her spouse to perform household duties at a certain wage rate, the wages earned will be counted in GDP and GDP will increase.

2.c. If you buy a German car, consumption (C) will increase but net exports (NX = X - Q) will decrease. Overall GDP will increase by the value added at the foreign car dealership, since the import price is likely to be less than the sales price. If you buy a new American car, consumption and thus GDP will increase by the full value of the car. (Note: If the car you buy comes out of last year's inventory at the car dealership, then the increase in C will also be partially offset by a decline in I due to a change in inventory, and GDP will only increase by the value added.)

3. GDP is the market value of all final goods and services currently produced within the country. The U.S. GDP includes the value of the Hondas produced by a Japanese-owned assembly plant that is located in the U.S., but it does not include the value of Nike shoes that are produced by an American-owned shoe factory located in Malaysia.

GNP is the market value of all final goods and services currently produced using assets owned by domestic residents. Here the value of the Hondas produced by a Japanese-owned Honda plant in the U.S. is not counted in GNP but the value of the Nike shoes by the American-owned shoe plant in Malaysia is.

Neither is necessarily a better measure of the output of a nation. The actual values of the GDP and GNP for the U.S. are fairly close.

4. NDP (net domestic product) is defined as GDP minus depreciation. Depreciation measures the value of the capital that wears out during the production process and has to be replaced. Therefore NDP comes closer to measuring the net amount of goods produced in this country. If this is what you want to measure, then NDP should be used.

5. Increases in real GDP do not necessarily mean increases in people's welfare. For example, if the population of a country increases proportionally more than real GDP, then the population of the country is on average worse off. Also some increases in output come from events that reduce peoples' welfare. For example, increased pollution may cause more lung cancer, and the treatment of the lung cancer will contribute to GDP. Similarly, an increase in crime may lead to overtime work for police officers, whose increased salary will increase GDP. But the welfare of the people in the country will not have increased in either of these cases. On the other hand, GDP also does not always accurately measure quality improvements in goods or services (faster computers or improved health care) that improve people's welfare.

6. The CPI (consumer price index) and the PPI (producer price index) are both measured by looking at a certain market basket. The CPI's basket contains mostly finished goods and services that consumers tend to buy regularly. The PPI's basket contains raw materials and semi-finished goods, that is, it measures costs to the producer of a good. The CPI is a concurrent economic indicator, whereas the PPI is a leading economic indicator; so if you want to assess current inflation, you need to look at the CPI, but if you want to assess the possibility of future inflation, you need to look at the PPI.

7. The GDP-deflator is a price index that covers the average price increase of all final goods and services currently produced within an economy. It is defined as the ratio of nominal GDP to real GDP. Nominal GDP is measured in current dollars, while real GDP is measured in so-called base-year dollars. Early estimates of the GDP-deflator tend to be unreliable, but the GDP-deflator is a more comprehensive price index than the CPI or PPI (both of which are based on fixed market baskets). This is true for two reasons: first it measures a much wider cross-section of goods and services; second, a fixed market basket cannot account for people substituting away from goods whose relative prices have changed, while the GDP-deflator, which includes all final goods and services produced within the country, can.

8. If nominal GDP has suddenly doubled, it is most likely due to an increase in the average price level. To calculate how much real output (GDP) has changed, the first thing you would want to check is how much the GDP-deflator has changed. If nominal GDP and the GDP-deflator have both doubled, then real GDP should remain unchanged.

9. Assume the loan you made yields you an annual nominal return of 7%. If the rate of inflation is 3%, then your rate of return in real terms is only 4%. If, on the other hand, the inflation rate is 10%, then you will actually get a negative real rate of return, that is, your yield will now be -3%. One way to get protection against such a loss of purchasing power is to adjust the interest rate for inflation, that is, to index the loan. In other words, you can require that, in

addition to a specified interest rate of the loan, the borrower also has to pay an inflation premium equal to the percentage change in the CPI. In this case, a specified positive real rate of return can be guaranteed.

Technical Problems

1. The text calculates the change in real GDP in 2009 prices in the following way:

$[RGDP_{12} - RGDP_{09}]/RGDP_{09} = [3.50 - 1.50]/1.50 = 1.33 =$ **133%.**

To calculate the change in real GDP in 2012 prices, we first have to calculate the GDP of 2009 in 2012 prices. Thus, we take the quantities consumed in 2009 and multiply them by the prices of 2012, as follows:

Beer	1 at \$2.00 =	\$2.00
Skittles	1 at \$0.75 =	\$0.75
Total		\$2.75

The change in real GDP can now be calculated as [6.25 - 2.75]/2.75 = 1.27 = **127%.**

We can see that the growth rate of real GDP calculated this way is roughly the same as the growth rate calculated above.

2.a. The relationship between private domestic saving, private domestic investment, the budget deficit, and net exports is shown by the following identity:

$S - I \equiv (G + TR - TA) + NX.$

Therefore, if we assume that transfer payments (TR) remain constant, an increase in taxes (TA) has to be offset either by an increase in government purchases (G), an increase in net exports (NX), or a decrease in the difference between private domestic saving (S) and private domestic investment (I).

2.b. From the equation

$YD \equiv C + S$

it follows that an increase in disposable income (YD) will be reflected in an increase in consumption (C), saving (S), or both.

2.c. From the equation YD ≡ C + S it follows that when either consumption (C) or saving (S) increases, disposable income (YD) must increase as well.

3.a. Since depreciation is defined as $D = I_g - I_n = 800 - 200 = 600$ ==>

NDP = GDP - D = 6,000 - 600 = **5,400.**

3.b. From $GDP = C + I_g + G + NX$ ==> $NX = GDP - C - I_g - G$ ==>

NX = 6,000 - 4,000 - 800 - 1,100 = **100.**

3.c. BS = TA - G - TR ==> (TA - TR) = BS + G

==> (TA - TR) = 30 + 1,100 = **1,130**

3.d. YD = Y - (TA - TR) = 6,000 - 1,130 = **4,870**

3.e. S = YD - C = 4,870 - 4,000 = **870**

4.a. S = YD - C = 5,100 - 3,800 = **1,300**

4.b. From S - I = (G + TR - TA) + NX ==> I = S - (G + TR - TA) - NX = 1,300 - 200 - (-100)

== > I = **1,200**.

4.c. From Y = C + I + G + NX ==> G = Y - C - I - NX ==>

G = 6,000 - 3,800 - 1,200 - (-100) = **1,100**.

Also: YD = Y - TA + TR ==> TA - TR = Y - YD = 6,000 - 5,100 ==> TA - TR = 900

From BS = TA - TR - G ==> G = (TA - TR) - BS = 900 - (-200) ==> G = 1,100.

5. According to Equation (2) in the text, the value of total output (in billions of dollars) can be calculated as: Y = labor payments + capital payments + profits = \$6 + \$2 + \$0 = **\$8.**

6.a. Since nominal GDP is defined as the market value of all final goods and services currently produced in this country, we can only measure the value of the final product (bread), and therefore we get \$2 million (since 1 million loaves are sold at \$2 each).

6.b. An alternative way of measuring GDP is to calculate all the value added at each step of production. The total value of the ingredients used by the bakeries can be calculated as:

1,200,000 pounds of flour ($1 per pound)	=	1,200,000
100,000 pounds of yeast ($1 per pound)	=	100,000
100,000 pounds of sugar ($1 per pound)	=	100,000
100,000 pounds of salt ($1 per pound)	=	100,000
	=	1,500,000

Since $2,000,000 worth of bread is sold, the total value added at the bakeries is **$500,000**.

7. If the CPI increases from 2.1 to 2.3 in the course of one year, the rate of inflation can be calculated in the following way:

rate of inflation = (2.3 - 2.1)/2.1 = 0.095 = **9.5%.**

The CPI often overstates inflation, since it is calculated by using a fixed market basket of goods and services. But the fixed weights in the CPI's market basket cannot capture the tendency of consumers to substitute away from goods whose relative prices have increased. Quality improvements in goods also often are not adequately taken into account. Therefore, the CPI will overstate the increase in consumers' expenditures.

8. The real interest rate (r) is defined as the nominal interest rate (i) minus the rate of inflation (π). Therefore the nominal interest rate is the real interest rate plus the rate of inflation, or

$i = r + \pi = 3\% + 4\% =$ **7%.**

Empirical Problems

1. All the values obtained for GNP and NNP are based on the formulas given in the second row of the table and correspond with the actual numbers reported by www.bea.gov.

	GDP	Income receipts from ROW	Income payments to ROW	GNP	Depreciation (consumption of fixed capital)	NNP
	1	2	3	4=1+2-3	5	6=4-5
2010	15,231.7	751.2	535.7	15,447.2	2,399.1	13,048.1
2011	15,818.7	812.0	539.7	16,091.0	2,483.9	13,419.0
2012	16,420.3	829.8	572.8	16,677.3	2,575.0	14,102.3

2. U.S. real GDP growth in the year 2012 was 2.2 percent. The growth rate of the population in the U.S. that year was 0.8 percent. Since real output grew by more than the population, U.S. real GDP per capita increased by about 0.5 percent (2.2% - 0.8% = 1.4%) in 2012.

Additional Problems

1. "If a house that was built ten years ago is sold today, the level of economic activity will rise." Comment on this statement.

This statement would only be true if a realtor was involved in the sale of the house, as the realtor would have provided a current service for which he or she would be paid. Transactions involving existing assets such as residential housing do not create economic activity in an amount equal to the value of the sale. New home construction, on the other hand, is included in the calculation of the current year's GDP as it does represent current economic activity.

2. Explain the initial effect of each of the following events on GDP.
(a) You sell your used car to a friend.
(b) The value of your AT&T stock holdings decreases.
(c) You buy a piece of land with the intention of building a new house.
(d) A sports card dealer sells a Derek Jeter rookie card for $50.
(e) A German tourist drinks Canadian beer in an American restaurant.

a. GDP will not change, since a used car is not part of current production. (Only if you sell the car through a dealer will GDP increase by the value of the services rendered.)

b. A loss in stock values means a loss in wealth; therefore GDP is not directly affected. Your income (and thus GDP) would only be affected if your dividend payments decrease.

c. When you use savings to buy land, a transfer of wealth takes place and GDP is not affected. However, if a real estate agent receives a commission, then GDP will go up by the value of the services rendered.

d. When the card dealer sells the rookie card, inventory decreases, so investment goes down. But selling the card to a customer increases consumption, so GDP increases but only by the value added by the dealer for the services rendered.

e. GDP will increase by the value added in the restaurant. If the beer was imported from Canada for $1.80 and sold (exported) to a German tourist for $3.75, then net exports will increase by $1.95.

3. How will each of the following events affect GDP and why?
(a) Hurricane Katrina destroys large parts of New Orleans.
(b) You sell your old macroeconomics textbook to another student.
(c) You sell your holdings of IBM stock.
(d) Your local car dealership reduces its inventory by offering price reductions.
(e) A retired worker gets an increase in Social Security benefits.

a. When a hurricane destroys property, wealth is affected, not income (or GDP). However, if a significant amount of the capital stock is destroyed and/or many people die, then less can be produced later, leading to a decrease in GDP. On the other hand, the rebuilding of destroyed property results in increased economic activity that will lead to a rise in GDP.

b. The sale of your textbook to another student will not constitute an official market transaction, since you probably will not report your income to the IRS. In addition, the textbook has already been used and is not part of current production. Therefore GDP will not be affected.

c. The sale of existing stock holdings is a transfer of wealth and, as such, does not affect GDP. Any fees that you may have to pay your broker for his or her services, however, constitute payment for services rendered. GDP will increase by that amount.

d. Inventory changes are counted as part of investment. A reduction in business inventories will lower the level of investment (I) and thus GDP. However, the sales of the cars will count as consumption (C) if consumers buy them, or investment (I) if firms buy them. Thus the net effect on GDP depends on the value added, that is, the difference between the cost of the cars to the dealership and the sales price of the cars.

e. Transfer payments that do not arise from productive activity are not counted in GDP. Thus GDP will not be affected when Social Security benefits are paid. Only later, when these payments are spent, will consumption increase.

4. If nominal GDP in Germany increased by 2.8% last year, but U.S. GDP increased by 4.2%, can we conclude that the welfare of U.S. citizens increased by more than that of German citizens? Why or why not?

A country's nominal GDP is not a good measure of the economic welfare of its people, since nominal GDP can change solely due to inflation. Only if real GDP grows faster than population, will real income per capita increase. But real GDP per capita still does not take into account changes in income distribution, changes in environmental quality, or leisure, all of which influence the economic welfare of the people in a country. Therefore we cannot say whether the welfare of the people in the U.S. has increased more than that of the people in Germany.

5. Comment on the following statement:
"Any accumulation of inventories by firms is not included when measuring GDP."

National income accounts do include changes in inventories when measuring investment. Inventories rise when production exceeds sales, but fall if production falls short of demand. These changes must be allowed to affect investment. But if investment is affected, so is GDP. Otherwise total economic activity will be over- or underestimated to the extent that inventory changes are not accounted for.

6. Comment on the following statement:
"Real per-capita GDP is a good measure of economic welfare."

Real GDP per capita is an imperfect measure of economic welfare as it does not include non-market activities which affect well being, such as the value of household services, volunteer work, the loss of natural wilderness areas resulting from economic development, pollution, and so on. In spite of these limitations, however, real GDP per capita still does provide some measure of economic welfare.

7. Assume a Hyundai dealership in Chicago bought 30 Hyundais from Korea at a cost of $15,000 per car in September of 2012. By December 31, 2013 they had sold 20 of the Hyundais at a price of $18,000 each. The remaining Hyundais were sold in January of 2014 at a price of $16,000 each. How exactly does this affect the GDP in the U.S. in 2013 and 2014, and which categories of GDP (C, I, G, or NX) are affected?

2013: $\Delta NX = -(30*15{,}000) = -450{,}000$
$\Delta C = +(20*18{,}000) = +360{,}000$
$\Delta I = +(10*15{,}000) = +150{,}000$

$\Delta GDP = +60{,}000$

Check: The value added in 2013 is 20*3,000 = **60,000.**

2014: $\Delta C = +(10*16{,}000) = +160{,}000$
$\Delta I = -(10*15{,}000) = -150{,}000$

$\Delta GDP = +10{,}000$

Check: The value added in 2014 is 10*1,000 = **10,000.**

8. Assume last year's real GDP was $7,000 billion, this year's nominal GDP is $8,820 billion, and the GDP-deflator for this year is 120. What was the growth rate of real GDP?

RGDP(1) = [NGDP(1)/GDP-deflator]*100 = [8,820/120]*100 = 7,350

Since RGDP(0) = 7,000 it follows that the growth rate of RGDP is

y = [7,350 - 7,000]/7,000 = 0.05 = 5%.

9. Assume real GDP in 2000 was $7,000 billion, nominal GDP in 2004 was $8,316 billion, and the GDP-deflator has increased from 100 to 110 between 2000 and 2004. What is the average annual growth rate of real GDP from 2000 to 2004? Do you think the welfare of all people in the country has increased during that time? Why or why not?

RGDP = (NGDP/deflator)*100 = (8,316/110)*100 = 7,560

Growth rate of GDP = (7,560 – 7,000)/7,000 = 560/7,000 = 0.08 = 8%

Therefore real GDP has grown 8% in four years, or at an average annual growth rate of 2%.

An increase in a country's GDP is not a good measure of an increase in the economic welfare of its people. For example, nominal GDP can change solely due to inflation, and real GDP has to grow faster than the population for real income per capita, and thus living standards, to increase. But real GDP per capita still does not take into account changes in the distribution of income, changes in environmental quality, or changes in leisure, all of which influence peoples' economic welfare.

10. Calculate the values for government purchases (G), private domestic saving (S), and investment (I) from the following information. Show all your work.

national income	**Y = 11,500**	**budget surplus**	**BuS = -1,470**
disposable income	**YD = 9,450**	**net exports**	**NX = - 730**
consumption	**C = 7,540**		

From YD = C + S ==> S = YD - C = 9,450 - 7,540 = **1,910**

From I - S = BuS - NX ==> I - 1,910 = - 1,470 – (- 750) ==> **I = 1,170**

From Y = C + I + G + NX ==> G = Y - C - I - NX = 11,500 - 7,540 - 1,170 - (- 730) = **3,520**

11. From the following information calculate the value of government purchases (G), consumption (C), and private domestic investment (I) (all variables are in billions of dollars).

national income	**Y**	**= 6,000**	**tax revenues**	**TA**	**= 1,500**
private domestic saving	**S**	**= 1,000**	**transfer payments**	**TR**	**= 700**
net exports	**NX**	**= - 120**	**budget deficit**	**BuD**	**= 230**

From YD = Y - TA + TR ==> YD = 6,000 - 1,500 + 700 ==> YD = 5,200.

From YD = C + S ==> C = YD - S = 5,200 - 1,000 = **4,200.**

From S - I = BuD - TD ==> 1,000 - I = 230 - 120 ==> **I = 890.**

From Y = C + I + G + NX ==> G = Y - C - I - NX

==> G = 6,000 - 4,200 - 890 + 120 = **1,030.**

Check: BuS = TA - TR - G ==> -230 = 1,500 - 700 - G ==> **G = 1,030.**

12. Assume the government cuts its purchases by $120 billion. As a result, the budget deficit shrinks by $40 billion, disposable personal income decreases by $80 billion, private domestic saving decreases by $10 billion, and the trade deficit decreases by $15 billion. By how much have consumption(C), private domestic investment (I), and national income (Y) changed?

From I - S = BuS - NX ==> I = S + BuS - NX ==> $\Delta I = \Delta S + \Delta BuS - \Delta NX$

==> ΔI = - 10 + 40 - 15 = **+ 15.**

From YD = C + S ==> $\Delta C = \Delta YD - \Delta S$ = - 80 – (-10) = **- 70.**

From Y = C + I + G + NX ==> $\Delta Y = \Delta C + \Delta I + \Delta G + \Delta NX$

==> ΔY = - 70 + 15 - 120 + 15 = **- 160**.

13. Calculate the values for government purchases (G), private domestic saving (S), and private domestic investment (I) from the following information (all variables are in billions of dollars).

national income	**Y**	**= 5,200**	**budget deficit**	**BuD**	**= 150**
disposable income	**YD**	**= 4,400**	**trade deficit**	**TD**	**= 110**
consumption	**C**	**= 4,100**			

From YD = C + S ==> S = YD - C = 4,400 - 4,100 = **300.**

From S - I = BuD - TD ==> 300 - I = 150 - 110 ==> **I = 260.**

From Y = C + I + G + NX ==> G = Y - C - I - NX

==> G = 5,200 - 4,100 - 260 + 110 = **950.**

14. Comment on the following statement:
"A country that spends more than its total national income must have a trade deficit."

National income is defined as Y = C + I + G + NX. The four main components of aggregate demand are consumption (C), investment (I), government purchases (G) and net exports (NX). But if spending on consumption, investment, and government purchases is greater than national income, it follows that net exports (NX = X - Q) must be negative, that is, imports (Q) must exceed exports (X), and the country must have a trade deficit.

15. Will an increase in the federal budget surplus necessarily lead to a decrease in the foreign trade deficit? Why or why not?

The equation I - S = BS - NX states that the difference between private domestic investment and private domestic saving is equal to the difference between the budget surplus and the trade surplus. If the budget surplus increases (or the budget deficit decreases), then domestic interest rates are likely to decrease. This will cause an outflow of funds, depreciating the value of the domestic currency and making domestic goods more competitive on world markets. Therefore we will see an increase in the trade surplus (or a decrease in the trade deficit). However, this does not necessarily always happen, since the other two variables in this equation, namely private domestic investment and private domestic saving, may also change. For example, if there is a significant increase in investment spending due to the lower interest rates, then we may not see a change in the trade surplus.

16. In the early 1980s, the U.S. changed from being one of the biggest creditor nations to being the biggest debtor nation in the world. Explain how this happened.

In the early 1980s, the U.S. changed from a creditor nation to a debtor nation, as its competitiveness in foreign markets decreased. A variety of factors contributed to this change, including a decrease in productivity growth, emphasis on short-term profits by U.S. corporations, and lack of long-term planning and research and development. However, to a large extent the low private domestic savings rate, combined with huge federal budget deficits were also responsible. From S - I = BuD - TD, we can see that if the budget deficit increases and private domestic saving is not adequate to finance it, then either private

domestic investment has to decrease or the U.S. has to borrow funds from abroad, which will then lead to a trade deficit. The increased borrowing needs by the U.S. government in the early 1980s caused U.S. interest rates to increase, which led to an inflow of funds from abroad. This led to a sharp appreciation in the value of the U.S. dollar, making U.S. goods less competitive on world markets. While U.S. corporations sold fewer export goods on world markets, U.S. consumers developed a taste for imported goods. The result was a trade imbalance.

17. Comment on the following statement:
"High budget deficits ultimately lead to foreign trade deficits."

From S + TA - TR = I + G + NX ==> S - I = - (TA - G - TR) - (-NX) = BuD - TD, that is, the difference between private domestic saving and private domestic investment is equal to the difference between the budget deficit and the trade deficit. In the early 1980's the size of the U.S. federal budget deficit increased sharply. Private domestic saving remained low and thus interest rates increased. High U.S. interest rates attracted funds from abroad, which drove the value of the U.S. dollar up, making U.S. goods less competitive on world markets. Thus the increase in the budget deficit in the 1980's was largely responsible for the increase in the trade deficit. However, an increase in the budget deficit does not necessarily increase the trade deficit, since the other two variables in this equation, namely private domestic investment and private domestic saving, may also be affected. As long as we can finance the increase in the budget deficit domestically, a trade deficit is not inevitable. Instead private domestic saving may increase or private domestic investment may be crowded out.

18. True or False? Why?
"The PCE measures the cost of buying a fixed bundle of consumer goods."

False. The Consumer Price Index (CPI) measures the cost of buying a market basket of consumer goods. The personal consumption expenditure deflator (PCE) is a chain-weighted index measuring inflation in consumer purchases, based on the consumer sector of the national income account.

19. Do the CPI and the GDP-deflator always show the same increase in the inflation rate?

The GDP-deflator measures the average price increase of all final goods and services that are currently produced in an economy. These goods differ from year to year depending on what is produced. The CPI measures only the average cost increase of a specified market basket of goods and services. The CPI also includes prices of import goods that the GDP-deflator does not include. Thus, when import prices go up, the CPI will most likely increase more than the GDP-deflator.

20. Briefly describe the advantages and disadvantages of using the GDP-deflator, the CPI, and the PPI as economic indicators.

The GDP-deflator is probably the most useful price index for macroeconomists, since it measures the average price level of all goods and services currently produced in a country. It does not include imported goods or used goods, and early estimates are often unreliable and have to be revised repeatedly. The GDP-deflator is the most complete of the price indexes, but it is a lagging indicator.

The consumer price index (CPI) measures the average price level of a fixed market basket of goods and services purchased by an average urban wage earner. Not all goods and services are reflected in this market basket and substitution among these goods is not possible. Therefore the CPI is not a perfect measure for inflation. However, the CPI is easily available on a monthly basis, is fairly reliable, and is a concurrent indicator.

The producer price index (PPI) measures the average price level of a fixed market basket of raw materials and intermediate goods up to the retail stage, but it does not include services. The PPI is relatively easily available on a monthly basis and is used to show future price trends. Thus it is a leading indicator. One has to be careful to avoid double counting, since the PPI deals with intermediate goods. The PPI does not necessarily correspond with the CPI, since firms can't always shift higher producer prices onto consumers.

21. Comment on the following statement:
"Someone who is not actively looking for work is not really unemployed."

The answer to this question is student specific. The official unemployment rate only includes those in the labor force who are actively looking for work. Therefore an individual who has become so discouraged about finding a job that he or she is no longer actively looking for one is not officially counted as unemployed. However, one could argue that if the economy is so bad that jobs are almost impossible to find, a person may as well give up looking until economic conditions improve. This individual is not officially counted as unemployed but is nonetheless jobless. The Bureau of Labor Statistics therefore also measures alternative types of unemployment, including discouraged workers such as the one described above, workers who are only marginally attached to the labor force, and those who work part-time because they are unable to find full time employment.

22. Comment on the following statement:
"If the number of unemployed workers in the country stays the same but the number of people living in the country increases, the unemployment rate will decrease."

The unemployment rate is defined as the number of unemployed (those out of work and either actively looking for a job or waiting to be recalled from a layoff) divided by the total work force. It is not clear whether the new residents of the country will become part of the

work force (either working or unemployed) or not. Thus we cannot tell what happens to the unemployment rate in this situation.

23. Assume a government bond pays you a fixed interest rate of 5.5% per year and the average annual rate of inflation is 4.4%. What is your real rate of return? How would this real rate of return change if inflation increased to 6.4%?

The real interest rate is defined as the nominal interest rate minus the inflation rate, that is,

$$r = i - \pi$$

Therefore your real rate of return is

$$r = 5.5\% - 4.4\% = 1.1\%$$

if the inflation rate is 4.4%. But if the inflation rate increases to 6.4%, then your real rate of return will be negative, that is,

$$r = 5.5\% - 6.4\% = -0.9\%.$$

24. Assume you are a banker and you'd like a 4% real rate of return on your loans. If you expect that the inflation rate will average about 6% over the next thirty years, what is the most likely rate you would charge your customers for a thirty year fixed rated mortgage? How would your answer change if you expected a 4% average inflation rate over the length of the mortgage? Explain your answers.

The Fisher equation states that the nominal interest rate is the expected real rate of interest (r^e) plus the expected rate of inflation (π^e), or

$$i = r^e + \pi^e.$$

In other words, if you expected an inflation rate of 6%, you would charge your customers a 10% mortgage interest rate since

$$i = 4\% + 6\% = 10\%.$$

But if you expected only a 4% inflation rate, you would charge your customers a mortgage interest rate of

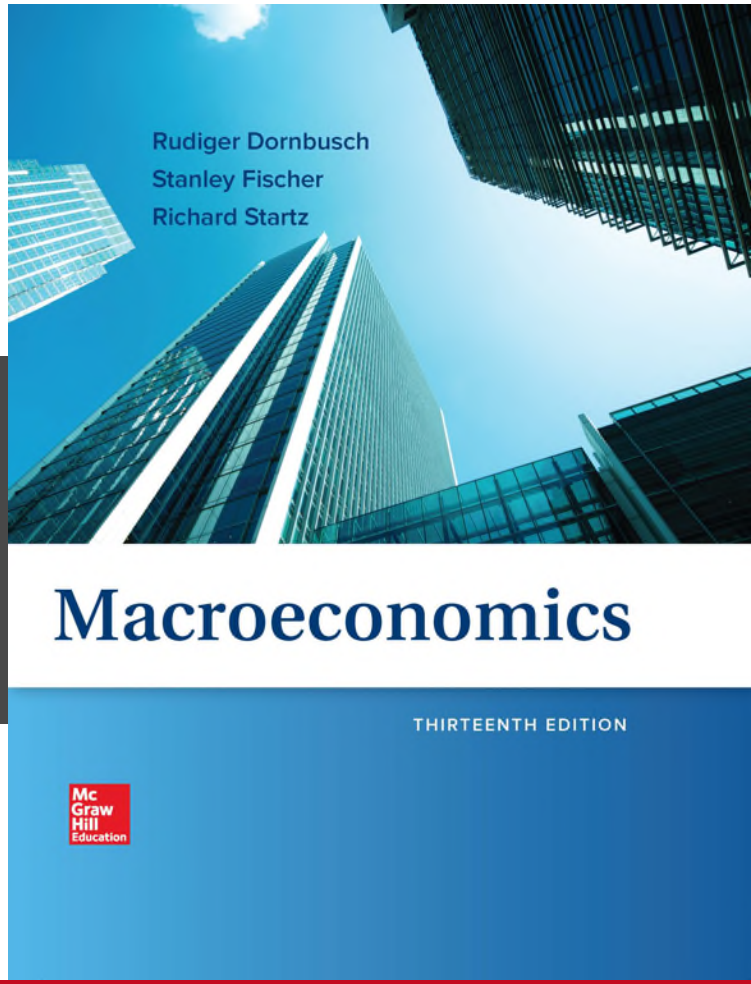
$$i = 4\% + 4\% = 8\%.$$

25. Comment on the following statement:
"If a British tourist can buy one U.S. dollar for 0.65 British pounds and a Japanese tourist can by one U.S. dollar for 130 Japanese yen, we can conclude that, on average, goods in Japan are about 200% more expensive than in Great Britain."

The price of U.S. dollar in another currency does not give any indication of whether goods in that country are more or less expensive than in the U.S.; it simply means that these currencies are exchanged at a certain rate. Similarly, the fact that the British pound is worth more than the Japanese yen when it comes to buying one U.S. dollar does not imply that product prices in Japan, on average, are more expensive than product prices in Great Britain.

Chapter 2

National Income Accounting



Introduction

- Why do we study the national income accounts?
  1. National income accounting provides formal structure for macro theory models
  2. Introduces statistics that characterize the economy

- Output defined in two ways
  1. Production side: output = payments to workers (wages), capital (interest and dividends)
  2. Demand side: output = purchases by different sectors of the economy

- Output typically measured as GDP = value of all final goods and services produced within a country over a particular period of time

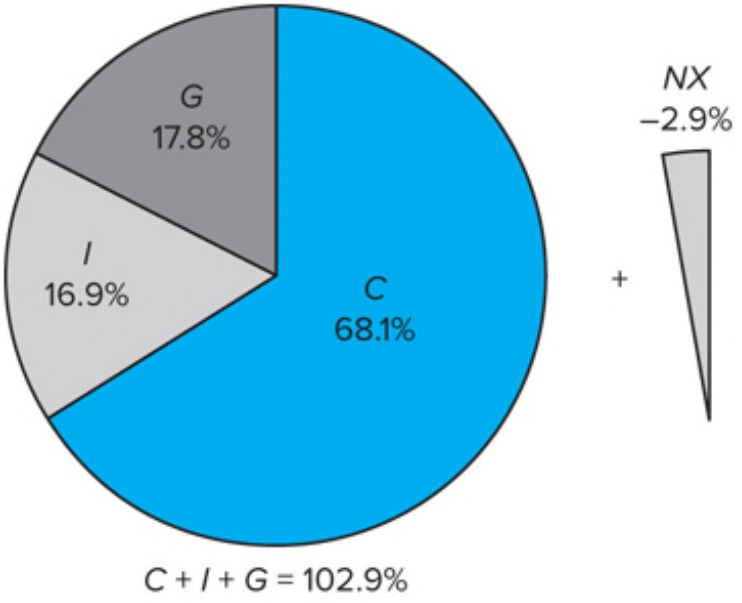
Production function

- The production side of the economy transforms inputs (labor, capital) into output (GDP)
  - Inputs = factors of production
  - Payments to these factors = factor payments

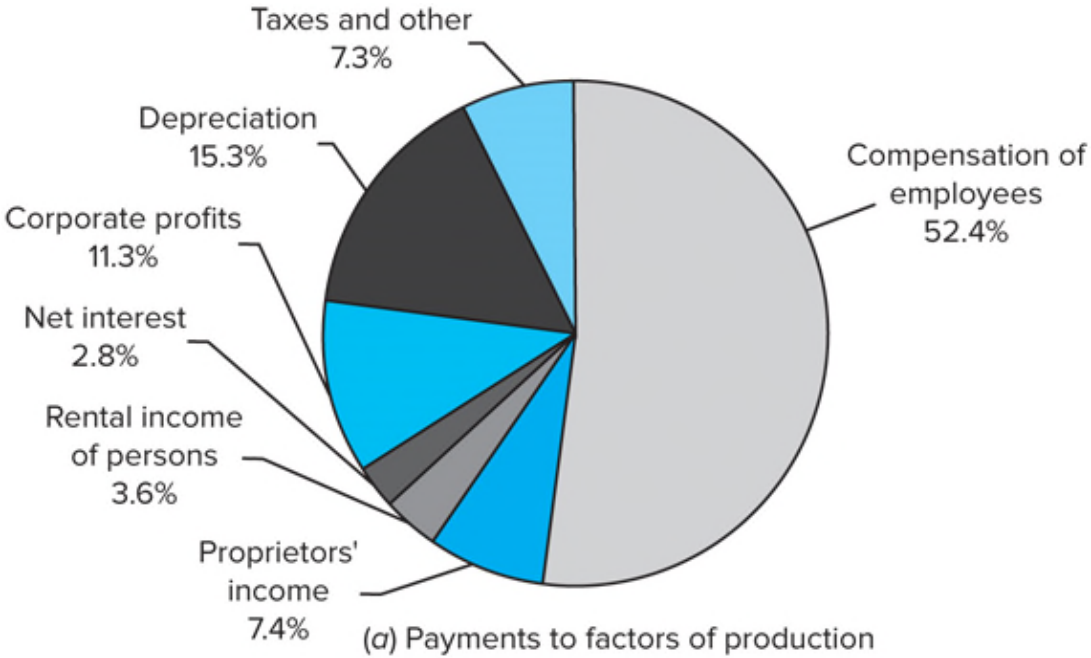
- The relationship between inputs and outputs defined by the production function $\rightarrow$

  where Y = output, N = labor, K = capital
  - "Output is a function of labor and capital," where the functional form can be defined in various ways
  - For example: corn = *f* (land, labor, seed, machines)

GDP to factor payments



(*b*) Components of demand for output



(*a*) Payments to factors of production

Components of demand

- Total demand for domestic output is made up of four components:
  1. Consumption spending by households (C)
  2. Investment spending by firms (I)
  3. Government spending (G)
  4. Foreign demand for our net exports (NX)

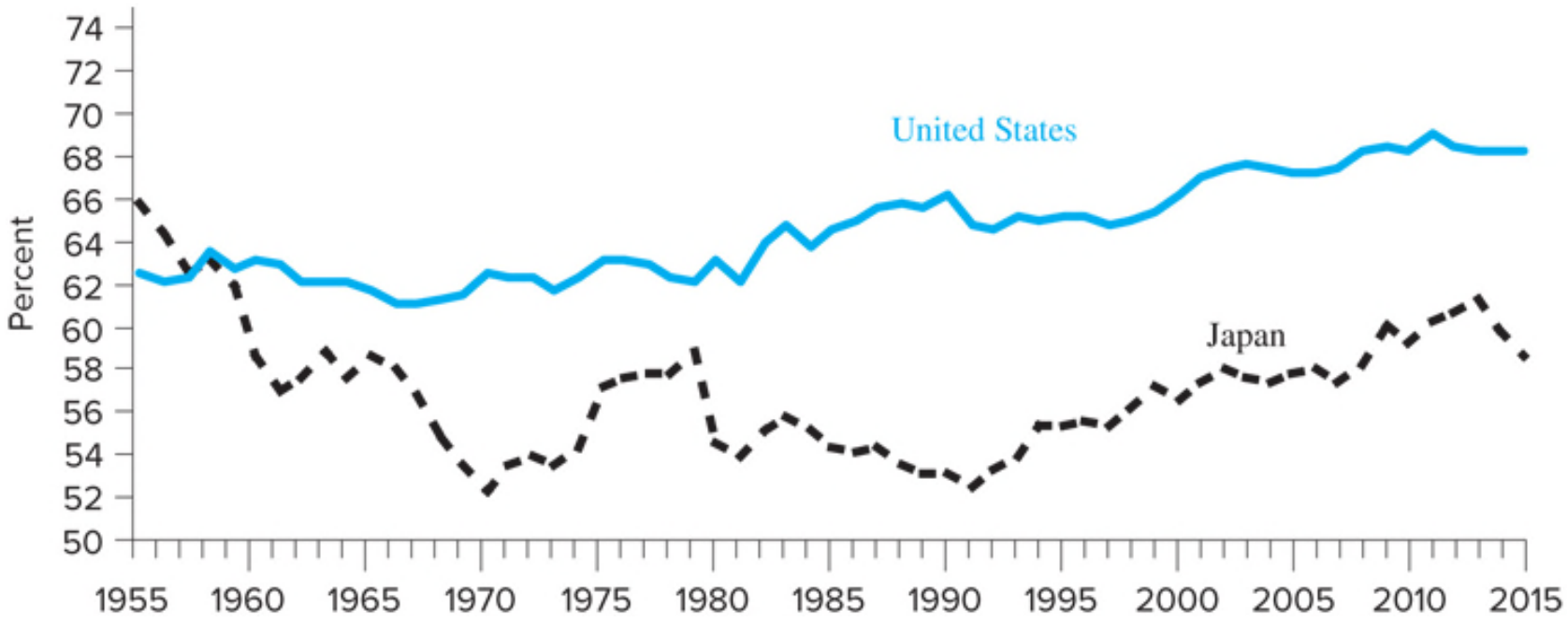
- The fundamental national income accounting identity is

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

Consumption

- Consumption refers to the purchases of goods and services by the household sector
- Includes spending on durable (ex. Cars), non-durable (ex. Food), and services (ex. Medical services)
- Consumption is the primary component of demand
  - Typically accounts for ~70% of total demand in the US
- Consumption as a share of GDP varies by country

Consumption



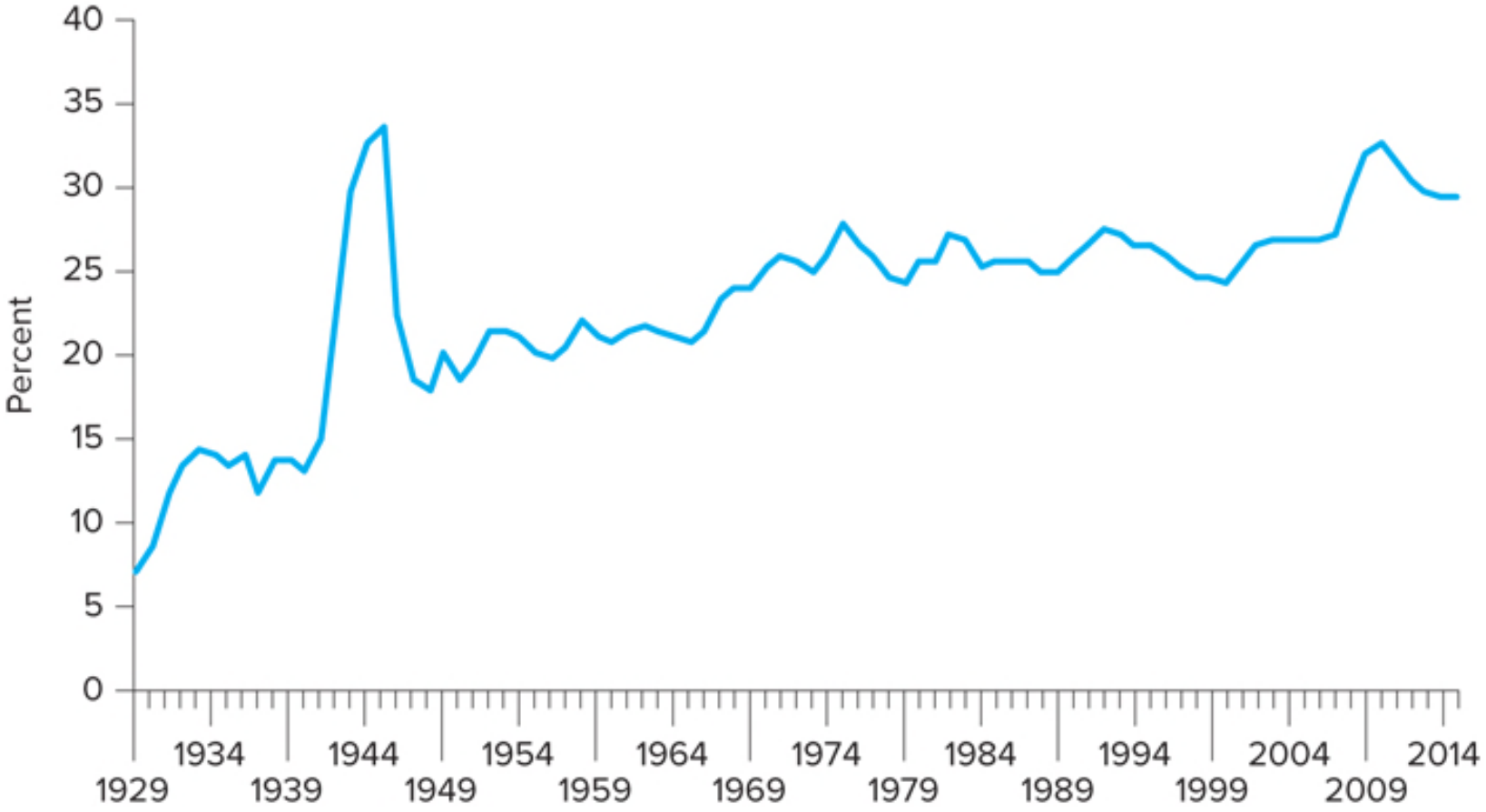
Government

- Government purchases of goods and services include national defense expenditures and salaries of government employees

- Government also makes transfer payments = payments made to people without their providing a current service in exchange
  - Ex. Social Security payments

- Transfer payments are NOT included in GDP since not a part of current production

Government



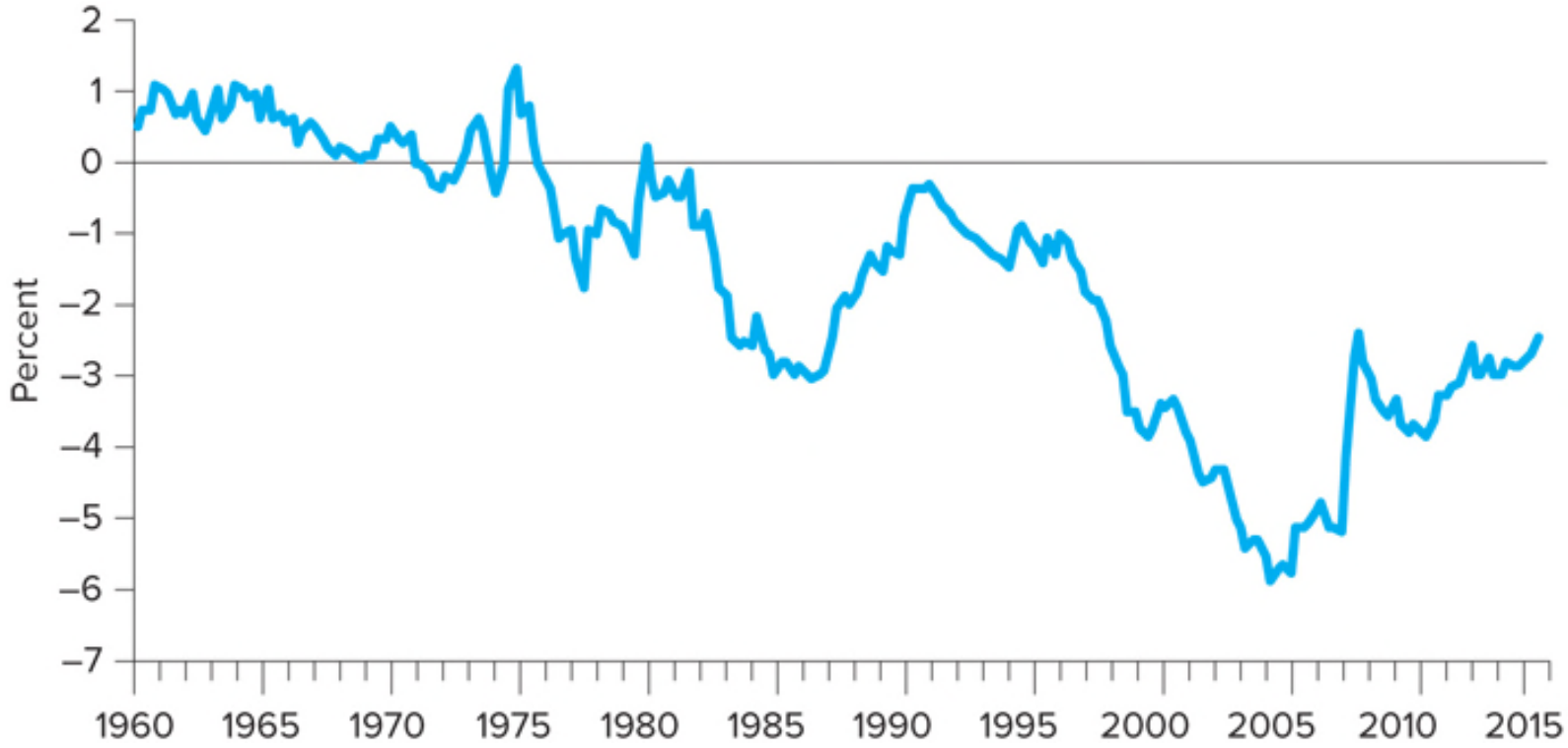
Investment

- Investment = additions to the physical stock of capital (i.e. building machinery, construction of factories, additions to firms inventories)
- In the national income accounts, investment associated with *business sector's* adding to the physical stock of capital, including inventories
  - Household's building up of inventories is considered consumption, although new home constructions considered part of I, not C
- Gross investment included in GDP measure, which is net investment plus depreciation

Net exports

- Accounts for domestic purchases of foreign goods (imports) and foreign purchases of domestic goods (exports) $\rightarrow$ NX = Exports – Imports
- Subtract imports from GDP since accounting for total demand for domestic production
- NX can be >, <, or = 0
- U.S. net exports has been negative since the 1980's $\rightarrow$ trade deficit

Net exports



Some identities: A simple economy

- Assume national income equals GDP → use terms income and output interchangeably (convenience)
- Begin with a simple economy: closed economy with no public sector → output expressed as $Y \equiv C + I$ (4)
- Only two things can do with income: consume and save → national income expressed as $Y \equiv C + S$ (5), where S is private savings
- Combine (4) and (5): $\underbrace{C + I}_{demand} \equiv Y \equiv \underbrace{C + S}_{income}$ (6)
- Rearrange (6) s.t. $I \equiv Y - C \equiv S$ (7), or investment = savings in the simple economy

Some identities: Adding G and NX

- When adding the government and the foreign sector, the fundamental identity becomes $Y \equiv C + I + G + NX$ (8)
- Disposable income, YD, is what consumers split between C and S when have a public sector, or $YD = Y + TR - TA$ (9), where TR = transfer payments and TA = taxes $\rightarrow$ $YD \equiv C + S$ (10)
- If rearrange (9) and substitute (8) for Y, then
  $YD - TR + TA \equiv C + I + G + NX$ (11)
- Substituting (10) into (11):
  $C + S - TR + TA \equiv C + I + G + NX$ (12)
- Rearranging: $S - I \equiv (G + TR - TA) + NX$ (13)

S, I, Government Budget, and Trade

$$S - I \equiv \underbrace{(G + TR - TA)}_{\text{Budget Deficit}} + \underbrace{NX}_{\text{Trade Surplus}}$$

- G + TR is total government expenditures and TA is government income → difference between expenditures and income is the government budget deficit

Saving (S)	Investment (I)	Budget Deficit (BD)	Net Exports (NX)
1,000	1,000	0	0
1,000	850	150	0
1,000	900	0	100
1,000	950	150	-100

Table 2-2 The Budget Deficit, Trade, Saving, and Investment
(Billions of Dollars)

S, I, Government Budget, and Trade

- Excess of savings over investment (S > I) in the private sector is equal to the government budget deficit plus the trade surplus

- Any sector that spends more than it receives in income has to borrow to pay for the excess spending

- Private sector can dispose of savings in three ways:
    1. Make loans to the government
    2. Private sector can lend to foreigners
    3. Private sector can lend to firms who use the funds for I

Measuring GDP

- GDP = value of final goods and services currently produced within a country over a period of time

- Final goods and services → NO DOUBLE COUNTING

- Goods and services currently (in the time period being considered) produced & excludes transactions involving used goods

- Goods and services produced within a country, regardless of the ownership/nationality of the producing firm

Problems with measuring GDP

- There are three major criticisms of the GDP measure:
  1. Omits non-market goods and services
  2. No accounting for “bads” such as crime and pollution
  3. No correction for quality improvements

- Despite these drawbacks, GDP is still considered one of the best economic indicators for estimating growth in an economy

Nominal vs. real GDP

- NGDP is the value of output in a given period measured in current dollars

- NGDP in 2007 is the sum of the value of all outputs measured in 2007 dollars:

$$NGDP_{2007} = \sum_{i=1}^{N} P_i^{2007} * Q_i^{2007}$$

- Changes in NGDP could be purely due to changes in prices → if GDP is to be used as a measure of output, need to control for prices

Nominal vs. real GDP

- RGDP is the value of output in constant dollars → scaled by a based year price, so that any change in GDP is due to change in production, not prices

- If P^B is the price in the base year for good i, RGDP in 2007 is:

$$RGDP_{2007} = \sum_{i=1}^{N} P_i^B * Q_i^{2007}$$

vs.

$$NGDP_{2007} = \sum_{i=1}^{N} P_i^{2007} * Q_i^{2007}$$

Nominal vs real GDP

	2009 Nominal GDP		2016 Nominal GDP	2016 Real GDP*
Beer	1 at $1.00	$1.00	2 at $2.00 $4.00	2 at $1.00 $2.00
Skittles	1 at $0.50	0.50	3 at $0.75 2.25	3 at $0.50 1.50
		$1.50	$6.25	$3.50

Table 2-3 Real and Nominal GDP, an Illustration
*Measured in 2009 prices.

Inflation and prices

- Inflation, Π, is the rate of change of prices: $\Pi_t = \frac{P_t - P_{t-1}}{P_{t-1}}$
- Additionally, $P_t = P_{t-1} + (P_{t-1} * \Pi)$, or today's price equals last year's price, adjusted for inflation
- If $\Pi > 0$, prices are increasing over time $\rightarrow$ inflation
- If $\Pi < 0$, prices are decreasing over time $\rightarrow$ deflation
- How do we measure prices?
  - For the macroeconomy, need a measure of overall prices (price index)
  - Most common indexes are CPI, PPI, and the GDP deflator

Price index: GDP deflator

- GDP deflator is the ratio of NGDP in a given year to RGDP of that year
- GDP deflator is based on a calculation involving all goods produced in the economy and is a widely based price index that is frequently used to measure inflation
- Measures the change in prices between the base year and the current year
- Ex. If NGDP in 2012 is $6.25 and RGDP in 2012 is $3.50, then the GDP deflator for 2012 is $6.25/$3.50 = 1.79 → prices have increased by 79% since the base year

Price index: CPI

- CPI measures the cost of buying a fixed basket of goods and services representative of the purchases of urban consumers
- Measure of the cost of living for the average household
- Differs from GDP deflator in three ways:
    1. CPI measures prices of a more limited basket of goods and services (only household goods and services)
    2. The bundle of goods in the consumer basket is fixed, while that of the deflation is allowed to vary
    3. CPI includes prices of imports, while GDP deflator only considers those goods produced within the U.S.

Price index: PPI

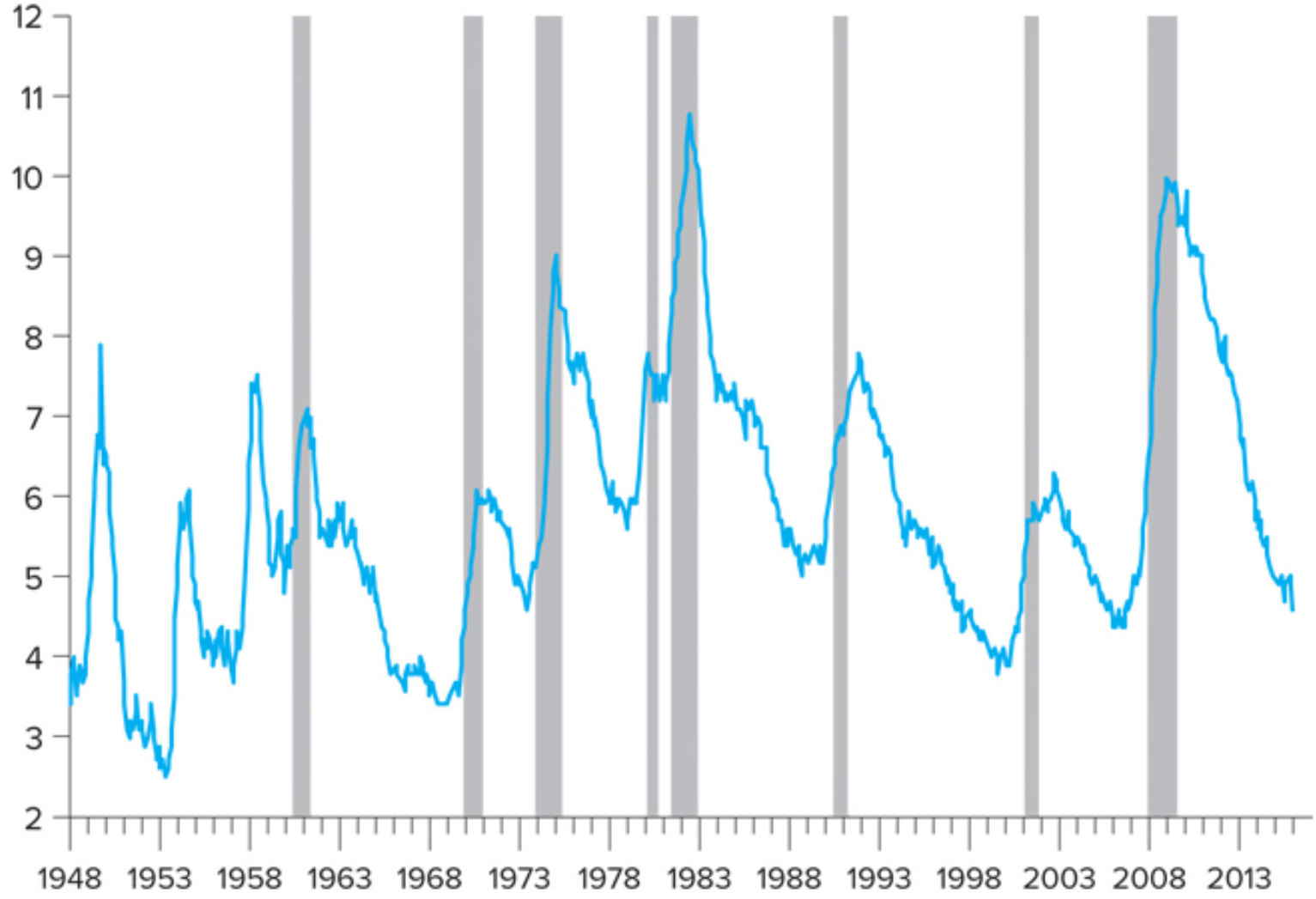
- PPI measures the cost of buying a fixed basket of goods and services representative of a firm
- Captures the cost of production for a typical firm
- Market basket includes raw materials and semi-finished goods
- PPI is constructed from prices at an earlier stage of the distribution process than the CPI
- PPI signals changes to come in the CPI and is thus closely watched by policymakers

Over long periods of time, the two measures yield similar values and trends for inflation

Unemployment

- The unemployment rate measures the fraction of the workforce that is out of work and looking for a job or expecting a recall from a layoff
- Important indicator of well-being of an economy/households
- Optimal unemployment rates differ from country to country
- Optimal unemployment rate linked to the potential level of output for a given economy (see Figure 2-8)

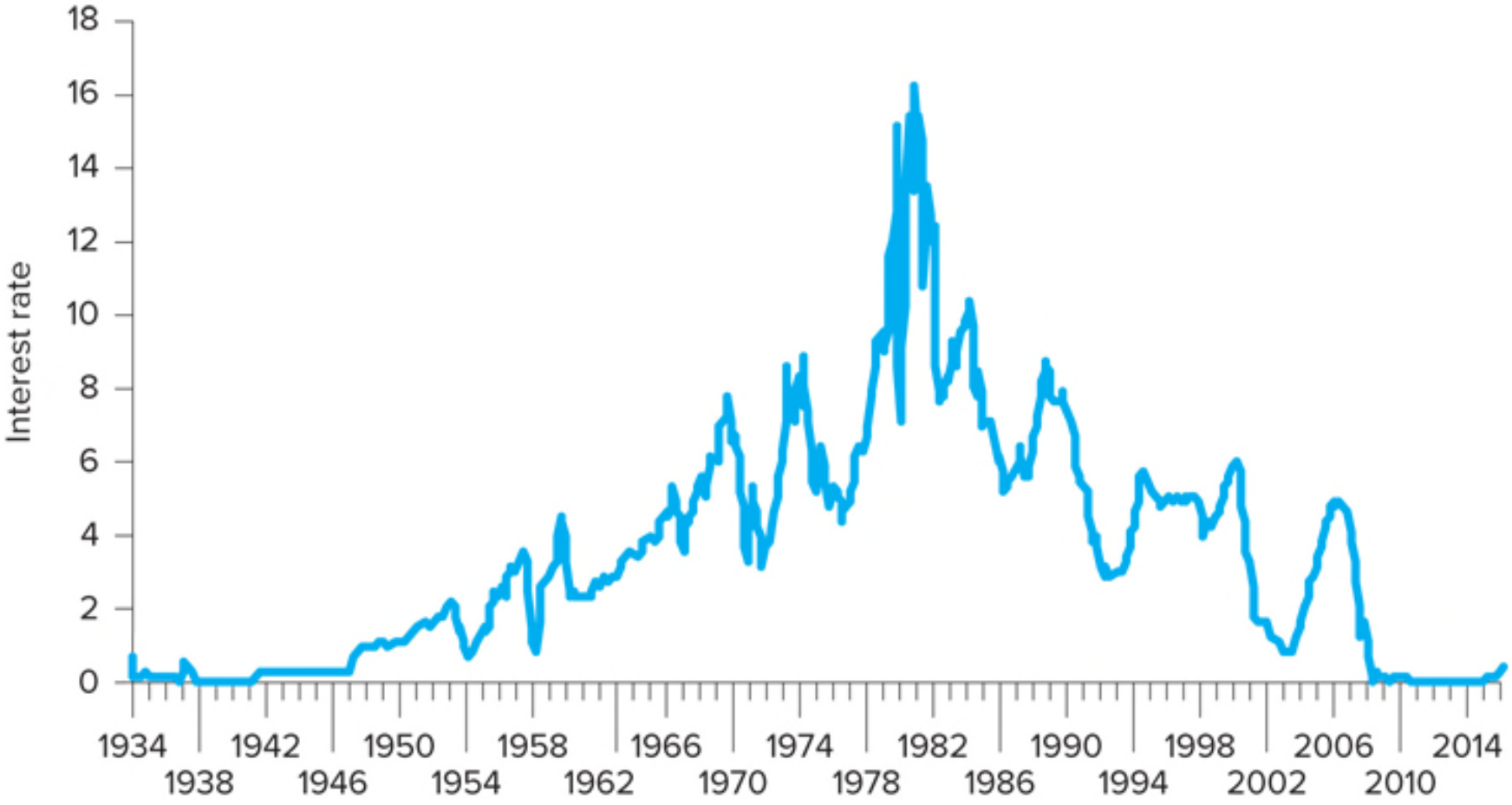
Unemployment



Interest rates

- Interest rate = rate of payment on a loan or other investment over and above the principle repayment in terms of an annual percentage
- Cost of borrowing money OR benefit of lending money
- Nominal interest rate = return on an investment in current dollars
- Real interest rate = return on an investment, adjusted for inflation
- If R is the nominal rate, and r is the real rate, then we can define the nominal rate as: $R = r + \Pi$

Interest rates



Exchange rate

- Each country has its own currency in which prices are quoted
- In the U.S. prices are quoted in U.S. dollars, while in Canada prices are quoted in Canadian dollars and most of Europe uses the euro
- Exchange rate = the price of a foreign currency
  - Ex. The British pound is worth U.S. $1.53 (Feb. 2013)
- Floating exchange rate → price of a currency is determined by supply and demand
- Fixed exchange rate → price of a currency is fixed