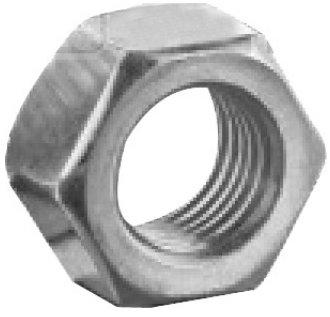


MODULE 7
Inflation

Learning Objectives:

- *Understand inflation*
- *Use terminology related to inflation*
- *Choose a base year*
- *Calculate constant dollars*
- *Choose a deflator*

We use the term **inflation** to indicate the declining purchase power of money over time. The general reason for inflation is that the quantity of money seeking to purchase goods and services increases faster than the quantity of goods and services offered for purchase. Because there are many complexities, such as the speed at which money passes from one purchase to the next, inflation is best measured by tracking the actual purchase price of typical goods—called a **market basket**—repeatedly over time. Doing this allows for construction of an **index**, that is, a series of numbers associated with dates that show the change in the price from a base point. At the base point, the value is set at 1, 100%, or sometimes 100. If it is 100, the value means 100%, so if you take the actual purchase price of all the goods in the market basket and divide it by the actual purchase price on the base date (the date when the base point is set), the result is 1 or 100%.[1] Values on subsequent dates tend to be higher because the purchase price of a market basket tends to go up. Sometimes earlier dates are also shown, based on either historical data or estimation, and these values typically will be smaller because the purchase price of the market basket was less. The index that most readers hear about from popular news sources is the **Consumer Price Index** for All Urban Consumers, usually abbreviated as **CPI**. As the full title indicates, it is focused on urban consumer prices, meaning the prices of goods and services that members of a household in a city or suburb might purchase.

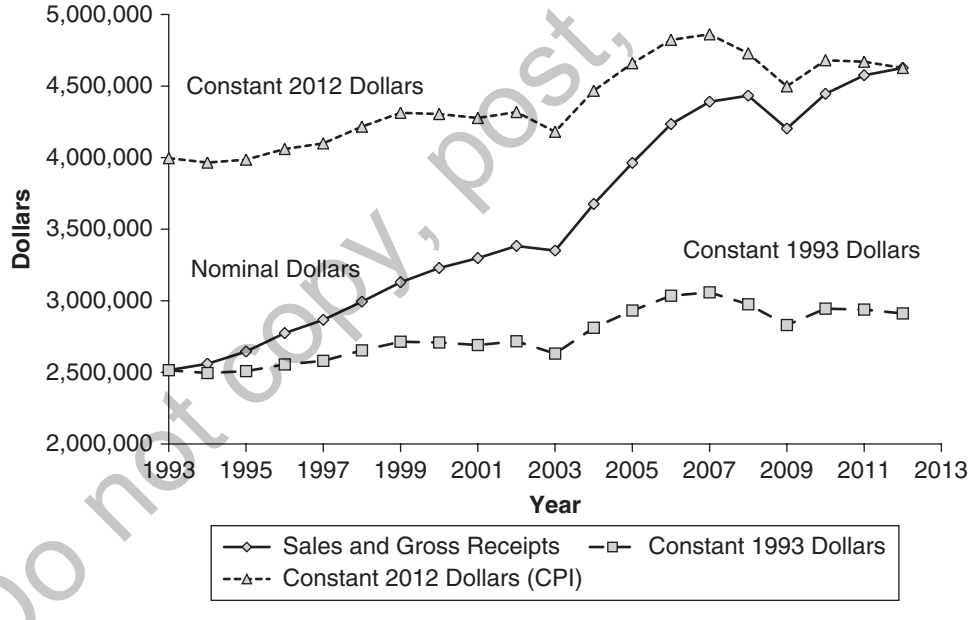
1. Actual estimation may be more complex because of the use of statistical methods.

Nominal Versus Constant or Real Dollars

The dollars subject to inflation (i.e., those in the actual world used for actual purchases) are sometimes called **nominal dollars**, which means that they are perceived to reflect the value of a dollar on the date that they are used. Comparing amounts of money available (revenue or appropriations) or spent in the form of these dollars at different times is confusing. That's because we cannot distinguish between the effects of inflation and the effects of other changes on the expenditure side and the revenue side. These might include, for example, differences in demand or efficiency on the expenditure side or differences in population or tax rates on the revenue side. To correct this, we make calculations using **constant dollars**, also sometimes called **real dollars**. Constant dollars start with nominal dollars and are then adjusted using an index.

Figure 7.1 shows a comparison between nominal dollars and constant dollars. The series is sales and gross receipts "tax" for Alabama as reported by the US Census Bureau.[2] The central solid line that rises from $2.5 million to a little more than $4.5 million is nominal dollars. The flatter dotted lines above and below the solid line both show constant dollars and, in fact, are roughly

FIGURE 7.1
Alabama Revenues in Constant Dollars and Nominal Dollars (1993–2012)



Sources: US Census Bureau, 2013, http://www.census.gov/govs/statetax/.

2. Data are from http://www.census.gov/govs/statetax/, accessed July 16, 2013. There is a separate report for each year.

the same except for their levels (height) on the chart.[3] They are at different levels on the chart because they have different base years,[4] but first, there is a difference between either of these and the nominal series. On the left side, we see that the nominal series grows every year until 2003, when it drops slightly. In the constant series, after a drop in 1994, the series grows until 1999 and stays roughly flat until 2003, when it takes a sharp drop. Both series then grow until 2007, with the constant series growing at a slower rate. The nominal series continues to grow into 2008 at a slower rate; then it takes a sharp drop in 2009. It then recovers slightly above its former level in 2010 and continues to grow. The constant series begins to drop sharply in 2008 and 2009, partly recovers in 2010, and then continues to slowly decline.

These two views of the series tell very different stories. The nominal series grows in almost all years, rapidly recovers from declines, has almost doubled over the last two decades, and is growing as of the last date represented on the graph. The constant series has grown in 9 of 19 intervals, saw most of its growth between 2003 and 2007, has grown less than 20% over the last two decades, and is currently in modest decline. The constant series provides a more realistic understanding of the changes in the purchasing power of Alabama's revenue from this source. Thus, for many purposes, a first step to effective analysis may involve converting nominal dollars to constant dollars.

Base Year

Figure 7.1 shows two constant series that reflect the need for the analyst to make a choice. In the calculation (math) of constant dollars, the **base year**—meaning the year when the constant dollars and the nominal dollars have the same value—used in producing the constant series is arbitrary. But the choice is not. For many purposes, an analysis is conducted to communicate something specific. The message might be "If the value of money were what it was in 1993, we would only have $2.9 million (1993) in taxes right now. Real revenue has declined for four of the last five years. We need to find a new revenue source." This is a largely backward-looking message aimed at telling a story about constant dollars and revenue-related policy implications. Here, where the emphasis is on storytelling and not on estimation for the current period, the use of the earlier base year may be appropriate.

For other purposes, the main goal of the conversion of nominal dollars to constant dollars is to aid in estimation for the current period or the near future. When making estimates for the present, it is unhelpful to have dollar values that are substantially out-of-date. While the conversion to constant dollars will take away anything from the data that pushes values up to the near future, estimates that are in the near to current base period are still much more useful than those in substantially eroded dollars. Consequently, the base year should be the most recent year for which data and an appropriate index are available. If absolute precision is required, estimates made in this form may be projected into future years using assistance from projected index values; however, such inflating of estimates may be subject to rules in many budget environments. Where the user is uncertain which approach to use, the most recent period's base should be preferred.

3. They also differ because the higher series includes a larger multiplicative factor, which in this case is the ratio of the index in the base year divided by the index in each comparative year. With a larger multiplicative factor, the series has wider variation.

4. The base year is the year when the constant dollars and the nominal dollars are the same value, further explained below.

Calculation of Constant Dollars

The calculation of constant dollars is straightforward. The formula is as follows:

$$C_t = N_t \times \frac{I_B}{I_t}$$

This formula says that constant dollars in a time period, C_t, are found by multiplying the nominal dollars for that time period, N_t, by the fraction in which the numerator is the base year index value, I_B, and the denominator is the periodic index number, I_t.

This calculation is shown in Table 7.1. In the spreadsheet labeled *Tables, Data,Worksheets-M07.xlsx*, represented by Table 7.1, "Sales and Gross Receipts" is in column B, CPI is column C, row 4 contains 1993 data, and row 23 contains 2012 data. We used rounding to eliminate the unnecessary and sometimes confusing long decimal results generated, but often not revealed, by spreadsheet formats.

The Excel formula used for the Constant 2012 Dollars column for 1993 is as follows:

=ROUND($B4*C$23/C4,0)

This formula can be used to select any base year by changing the row number after the $ sign in the numerator of the fraction.

TABLE 7.1
Alabama Revenue in Nominal Dollars (CPI) and Constant Dollars, With CPI (1993–2012)

Year	Sales and Gross Receipts ($)	CPI	Constant 2012 Dollars ($)
1993	2,514,799	144.475	3,996,594
1994	2,559,992	148.225	3,965,488
1995	2,645,405	152.383	3,985,980
1996	2,773,974	156.858	4,060,459
1997	2,866,477	160.525	4,100,013
1998	2,993,580	163.008	4,216,590
1999	3,129,368	166.583	4,313,258
2000	3,228,445	172.192	4,304,868
2001	3,297,746	177.042	4,276,814
2002	3,383,068	179.867	4,318,557
2003	3,350,223	184.000	4,180,568
2004	3,675,562	188.908	4,467,380
2005	3,962,816	195.267	4,659,663
2006	4,233,895	201.558	4,823,025
2007	4,390,386	207.344	4,861,728
2008	4,433,108	215.254	4,728,643
2009	4,203,283	214.567	4,497,852
2010	4,445,480	218.085	4,680,285
2011	4,575,127	224.935	4,670,093
2012	4,626,357	229.604	4,626,357

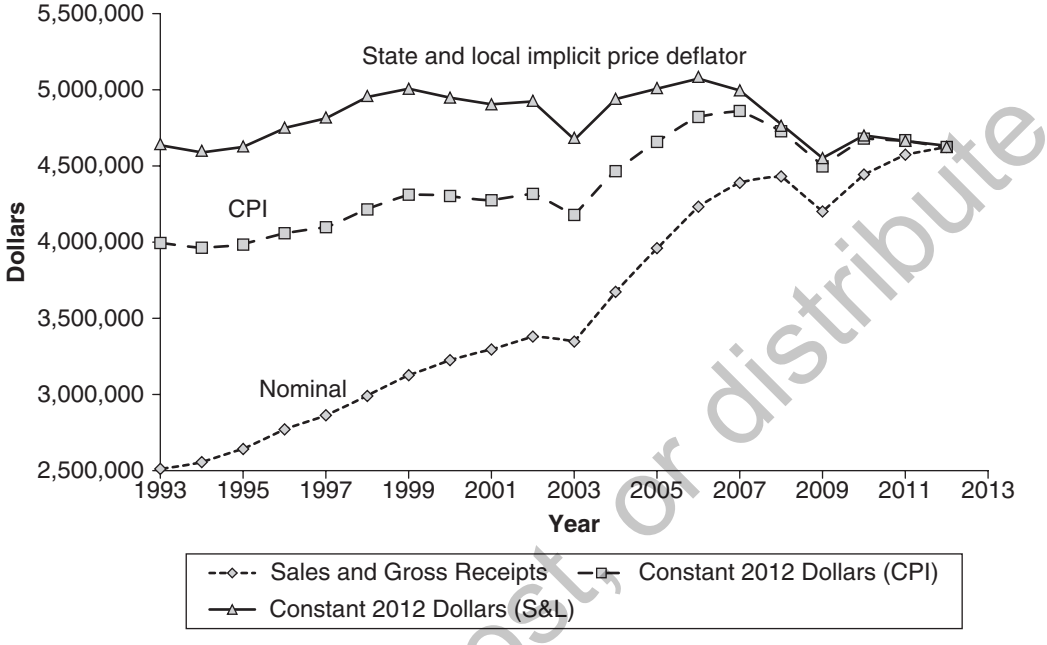
Sources: US Census Bureau, 2013, http://www.census.gov/govs/statetax/; Federal Reserve Bank of St. Louis, http://research.stlouisfed.org/fred2/.

Deflators and Indexes

This demonstration uses CPI because it is the most common price index that users know. However, governments are not typical urban consumers. The US Bureau of Economic Analysis computes a consumption expenditures **price deflator** for urban governments. The series label is A829RD3A086NBEA, and it can be downloaded from the Federal Reserve Bank of St. Louis at http://research.stlouisfed.org/fred2/series/A829RD3A086NBEA/.

Figure 7.2 shows the data series shown in Figure 7.1 with nominal dollars, constant dollars calculated using CPI, and constant dollars calculated using the state and local implicit price deflator. This deflator more specifically shows how inflation affects governmental spending power based on what governments purchase. Based on this calculation of constant dollars, any limited gains in revenue have been entirely eroded away in recent years. While analyses using CPI may be important for communicating how taxes affect the burden experienced by taxpayers

FIGURE 7.2
Comparing the Indexes



Sources: US Census Bureau, 2013.

(the data should also be adjusted to reflect per-capita or per-household information), analyses using the price deflator reflect the ability of the government to purchase goods and services with the money it has acquired. When selecting a deflator or index, the analyst should be careful to select the one that is most appropriate for the intended purpose.

Summary

Inflation is the declining purchasing power of money over time. The dollars subject to inflation, meaning those in the actual world used for actual purchases, are sometimes called nominal dollars, while real dollars are those adjusted for inflation using an index. The most commonly used index is the CPI, or Consumer Price Index. An index used by government is the US Bureau of Economic Analysis's index, which computes a consumption expenditures price deflator for governments that reflects government spending power based on what government bodies typically purchase.

Assignments

1. Define the following:
   a. Nominal dollars
   b. Constant dollars

2. Lake City's park gazebo is available for residents to rent for picnics and other gatherings. You have been tasked with building a compelling financial story to convince the city council to raise the rental rates. The rental revenue history is shown in Table 7.2, along with the CPI for each of the years.

TABLE 7.2
Lake City: Park Gazebo Revenues and CPI (1984–2012)

Year	Rental Revenue	CPI	Year	Rental Revenue	CPI	Year	Rental Revenue	CPI
1984	$ 13,366.55	103.933	1994	$ 21,099.88	148.225	2004	$ 33,056.72	188.908
1985	$ 14,564.45	107.600	1995	$ 22,435.85	152.383	2005	$ 36,661.23	195.267
1986	$ 15,487.57	109.692	1996	$ 23,575.86	156.858	2006	$ 39,770.85	201.558
1987	$ 16,363.24	113.617	1997	$ 24,924.04	160.525	2007	$ 41,430.22	207.344
1988	$ 17,161.30	118.275	1998	$ 26,636.09	163.008	2008	$ 40,823.03	215.254
1989	$ 18,000.50	123.942	1999	$ 28,247.11	166.583	2009	$ 37,668.88	214.567
1990	$ 18,379.25	130.658	2000	$ 29,829.21	172.192	2010	$ 36,647.82	218.085
1991	$ 18,768.42	136.167	2001	$ 30,719.85	177.042	2011	$ 39,649.70	224.935
1992	$ 19,026.90	140.308	2002	$ 30,417.06	179.867	2012	$ 40,892.75	229.604
1993	$ 20,145.73	144.475	2003	$ 30,927.76	184.000			

   a. Calculate 2012 constant dollars for the rental revenue.
   b. Calculate 1984 constant dollars for the rental revenue.
   c. Create a line graph displaying the nominal dollars, 2012 constant dollars, and 1984 constant dollars across all years of data.
   d. How would you use these data to create a compelling financial argument to increase rental rates? Would you use all of the data?

3. A member of Lake City's town council—who has been on the city council for almost 25 years, remembers everything, and has a particular fondness for the park—questions the data you have presented. He presents you with a newspaper clipping from 1996 that claims the revenue in 1984 was just under $20,000 per year. Back at your desk, you tackle your new task of determining where this "under $20,000 per year" figure came from as well as how to explain nominal dollars and constant dollars to this member of the town council.
   a. Using the same nominal dollars as in assignment 2, add a column and calculate 1995 constant dollars.
   b. Add the 1995 constant dollars data to your graph.
   c. Using this graph, write a simple explanation about nominal dollars and the use of different base years to create constant dollars. The explanation should be no more than a page and written for an audience that does not have a financial background.

4. Big East City's Public Works Department is asking for an additional $100,000 for sign repairs in the next budget cycle because its costs have increased by at least that much since 1995. The department has provided you with the information in Table 7.3. Big East City has adjusted funding for each of its departments every year to keep up with the buying power of money.

TABLE 7.3
Big East City: Expenditures for Sign Repairs and Price Deflator (1995–2012)

Year	Sign Repair Expenditures	Price Deflator for Urban Gov't	Year	Sign Repair Expenditures	Price Deflator for Urban Gov't
1995	134,486	72.258	2004	223,622	94.062
1996	144,489	73.812	2005	248,757	100.000
1997	151,584	75.219	2006	286,331	105.276
1998	161,148	76.320	2007	300,483	111.112
1999	175,015	79.036	2008	288,316	117.666
2000	193,276	82.482	2009	247,011	116.763
2001	201,670	85.019	2010	229,100	119.579
2002	203,733	86.810	2011	241,111	124.001
2003	206,568	90.425	2012	247,783	126.465

a. Calculate 2012 constant dollars for the expenditures.

b. Calculate 1995 constant dollars for the expenditures.

c. Create a line graph displaying the nominal dollars, 2012 constant dollars, and 1995 constant dollars across all years of data.

d. Based on the data provided and the calculations you have completed above, does the Public Works Department's request make sense? How much additional funding do you think it might need?

Additional Readings

Ammons, D. N. (2008). *Tools for decision making: A practical guide for local government.* Thousand Hills, CA: SAGE.

Kumaranayake, L. (2000). The real and the nominal? Making inflationary adjustments to cost and other economic data. *Health Policy and Planning, 15*(2), 230–234.