



# CBO's Projections of Demographic, Economic, and Other Trends

**T**he long-term budget estimates in this report depend on projections by the Congressional Budget Office for a host of demographic, economic, and other variables. CBO refers to that collection of projections as its economic benchmark, a measure that is consistent with the agency's baseline economic and budgetary projections for the ensuing 10 years. Beyond 2025, the economic benchmark generally reflects historical trends; it does not incorporate the extent to which economic output and interest rates would change if federal debt as a percentage of gross domestic product (GDP) or marginal tax rates changed after 2025, as is projected to occur under current law. (For average values from 2015 through 2040, see Table A-1. Projected annual values for the major demographic and economic variables for the next 75 years are included in the supplemental data for this report, available online at [www.cbo.gov/publication/50250](http://www.cbo.gov/publication/50250).)

## Demographic Variables

The size and composition of the U.S. population in coming decades will affect federal tax revenues and spending as well as the overall performance of the economy. Among other effects, demographic changes will influence the size of the labor force and the number of beneficiaries of such federal programs as Medicare and Social Security. Population projections include estimates of rates of fertility, immigration, and mortality. (CBO uses projections published by the Social Security trustees for fertility rates but makes its own projections of immigration and mortality rates.) CBO anticipates that the total U.S. population will increase from 325 million at the beginning of 2015 to 394 million in 2040.

## Fertility

CBO has adopted the intermediate (midrange) estimates of fertility rates published by the Social Security Administration in 2014.<sup>1</sup> Those values imply an average fertility rate of 2.0 children per woman between 2015 and 2040. (The Social Security trustees' report defines the fertility rate as the average number of children that a woman would have in her lifetime if, at each age of her life, she experienced the birth rate observed or assumed for that year and if she survived her entire childbearing period.)

## Immigration

For its economic benchmark, CBO projects that after 2025, net annual immigration (the net result of people leaving and entering the United States) will equal 3.2 immigrants for every 1,000 members of the U.S. population, a ratio that is consistent with the data for most of the past two centuries.<sup>2</sup> On that basis, CBO projects, net annual immigration to the United States will amount to 1.2 million people in 2026 and 1.3 million in

1. See Social Security Administration, *The 2014 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds* (July 2014), Table V.A1, [www.ssa.gov/oact/tr/2014](http://www.ssa.gov/oact/tr/2014).
2. The ratio equals the estimated average net flow of immigrants between 1821 and 2002; see 2003 Technical Panel on Assumptions and Methods, *Report to the Social Security Advisory Board* (October 2003), p. 28, <http://go.usa.gov/38pbH> (PDF, 450 KB). That ratio also was published in 2011 Technical Panel on Assumptions and Methods, *Report to the Social Security Advisory Board* (September 2011), p. 64, <http://go.usa.gov/38pE3> (PDF, 6.3 MB). For more details about U.S. immigration, see Congressional Budget Office, *Description of the Immigrant Population—2013 Update* (May 2013), [www.cbo.gov/publication/44134](http://www.cbo.gov/publication/44134).

**Table A-1.****Values for Demographic and Economic Variables Underlying CBO's Long-Term Budget Projections**

	Average Annual Values		
	2015-2025	2015-2040	2031-2040
Demographic Variables			
Fertility rate (Children per woman)	2.0	2.0	2.0
Immigration rate (Per 1,000 people in the U.S. population)	4.0	3.6	3.2
Rate of mortality decline (Percent, adjusted for age and sex)	1.2	1.2	1.2
Economic Variables (Percent)			
Growth of the labor force	0.6	0.5	0.4
Growth of average hours worked	-0.1	-0.1	*
Unemployment			
Unemployment rate	5.4	5.4	5.3
Natural rate of unemployment	5.3	5.1	5.0
Earnings as a share of compensation	81	81	80
Inflation			
Growth of the CPI-U	2.3	2.3	2.4
Growth of the GDP deflator	1.9	2.0	2.0
Interest rates			
Real rates			
On 10-year Treasury notes and the OASDI trust funds	2.0	2.2	2.3
On all federal debt held by the public	0.9	1.5	2.0
Nominal rates			
On 10-year Treasury notes and the OASDI trust funds	4.2	4.5	4.7
On all federal debt held by the public	3.2	3.9	4.4
Growth of productivity			
Total factor productivity	1.4	1.3	1.3
Labor productivity	1.8	1.8	1.8
Growth of real earnings per worker	1.6	1.4	1.4
Growth of GDP			
Real GDP	2.3	2.2	2.2
Nominal GDP	4.3	4.3	4.2

Source: Congressional Budget Office.

Note: CPI-U = consumer price index for all urban consumers; GDP = gross domestic product; OASDI = Old-Age, Survivors, and Disability Insurance (Social Security); \* = between -0.05 percent and zero.

2040. Estimates of authorized and unauthorized immigration over the long term are subject to a great deal of uncertainty, however, and the number of immigrants could be higher or lower than CBO projects. Over the past 50 years, net annual immigration (averaged over five-year periods) has varied from almost 7 to fewer than 2 immigrants per 1,000 members of the U.S. population.<sup>3</sup>

3. 2011 Technical Panel on Assumptions and Methods, *Report to the Social Security Advisory Board* (September 2011), p. 70, <http://go.usa.gov/38pE3> (PDF, 6.3 MB).

### Mortality

Demographers have concluded that mortality rates have declined steadily in the United States for at least the past half century. (Mortality rates measure the number of deaths per thousand people in a population. Historically, declines in mortality rates have varied among age groups, but for simplicity, CBO projects the same rate of decline for all ages.) In the absence of compelling reasons to expect that trends will differ in the future, CBO projects that mortality rates will continue to fall at the same pace exhibited over the 60 years from 1950 to 2010; that is, at

an average rate of 1.2 percent per year.<sup>4</sup> That extrapolation of past trends suggests that the average life expectancy for someone born in 2040 will be 82.6 years\*; in contrast, CBO estimates an average life expectancy of 79.2 years for someone born in 2015. Similarly, CBO projects that someone who turns 65 in 2040 can be expected to live another 21.8 years, on average, or 2.4 years longer than someone turning 65 in 2015 is expected to live. Those figures represent averages for all people of a given age and sex in those years.

CBO's projections also incorporate differences in mortality on the basis of age, sex, marital status, education, and lifetime household earnings. (For people under 30, the mortality projections reflect only age and sex.) CBO expects that future increases in life expectancy will be larger for people with higher lifetime earnings than for those with lower earnings—an assessment that is consistent with patterns of past increases.<sup>5</sup> Today, on average, a 65-year-old man whose household is in the highest one-fifth (quintile) of the distribution of lifetime earnings will

live more than three years longer, CBO projects, than a man of the same age whose household is in the lowest quintile of lifetime earnings; for women, that difference in life span is more than a year. CBO projects that by 2040, men in households with high lifetime earnings will live more than five years longer than men in households with low lifetime earnings; the corresponding difference for women will be almost three years.

## Economic Variables

For the 2015–2025 period, CBO's benchmark projections of economic variables—such as the size of the labor force, inflation, interest rates, and earnings per worker—match the values in the agency's January 2015 economic forecast (which underlies the agency's most recent 10-year budget projections).<sup>6</sup> Beyond 2025, the economic benchmark generally reflects the experience of the past few decades, adjusted to account for projected demographic developments and an assumption that the ratio of debt to GDP and effective marginal tax rates will remain stable.<sup>7</sup> Thus, it does not incorporate the extent to which economic output and interest rates would change if federal debt as a percentage of GDP or if marginal tax rates changed after 2025, as is projected to occur under current law. Rather, the benchmark is governed by the assumption that federal debt held by the public will be kept at 78 percent of GDP (the percentage at the end of 2025, according to CBO's baseline budget projections) and that effective marginal tax rates on income from labor and capital will remain constant at their 2025 levels. (Chapter 6 presents some estimates of the economic effects of projected deficits and marginal tax rates under CBO's extended baseline and some alternative policies.)

## The Labor Market

Benchmark projections for the labor market include estimates of the growth of the labor force, the average number of hours that people work, the rate of unemployment, the share of total compensation that people receive in the form of earnings, and the share of those earnings that is subject to Social Security payroll taxes. Those factors affect the amount of tax revenues that the government

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4. That projection is greater than the 0.8 percent average annual decline projected in the Social Security trustees' 2014 report but less than the 1.3 percent average annual decline that is consistent with methods recommended by the Social Security Advisory Board's 2011 Technical Panel on Assumptions and Methods. The panel's recommendation reflects a belief that the decrease in mortality rates will be larger in the future than in the past because of a decline in tobacco use. However, because of uncertainty about the possible effects of many other factors in the future, such as obesity rates and advancements in medical technology, CBO has based its mortality projections on a simple extrapolation of past trends. For additional discussion, see Joyce Manchester, "Why CBO Changed Its Approach to Projecting Mortality," *CBO Blog* (September 24, 2013), [www.cbo.gov/publication/44598](http://www.cbo.gov/publication/44598). For further discussion of mortality patterns in the past and methods for projecting mortality, see 2011 Technical Panel on Assumptions and Methods, *Report to the Social Security Advisory Board* (September 2011), pp. 55–64, <http://go.usa.gov/38pE3> (PDF, 6.3 MB). For additional background, see Hilary Waldron, "Literature Review of Long-Term Mortality Projections," *Social Security Bulletin*, vol. 66, no. 1 (September 2005), pp. 16–30, <http://go.usa.gov/XKKGk>; and John R. Wilmoth, *Overview and Discussion of the Social Security Mortality Projections*, Working Paper (Social Security Advisory Board, 2003 Technical Panel on Assumptions and Methods, May 2005), <http://go.usa.gov/38dce> (PDF, 480 KB).
  5. For more information about mortality differences among groups with different earnings, see Congressional Budget Office, *Growing Disparities in Life Expectancy* (April 2008), [www.cbo.gov/publication/41681](http://www.cbo.gov/publication/41681); and Julian P. Cristia, *The Empirical Relationship Between Lifetime Earnings and Mortality*, Working Paper 2007-11 (Congressional Budget Office, August 2007), [www.cbo.gov/publication/19096](http://www.cbo.gov/publication/19096).

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6. See Congressional Budget Office, *The Budget and Economic Outlook: 2015 to 2025* (January 2015), Chapter 2, [www.cbo.gov/publication/49892](http://www.cbo.gov/publication/49892).
  7. Those budgetary assumptions allow for relatively stable long-term economic projections.

[\*Value corrected on June 23, 2015]

collects and the amount of federal spending on Social Security and certain other federal programs.

**Growth of the Labor Force.** The number of workers is expected to increase more slowly in coming decades than in past years. Although the labor force expanded at an average rate of 1.7 percent annually between 1970 and 2007 (the most recent peak in the business cycle), CBO projects slower average growth—about 0.5 percent a year—for the 2015–2040 period.

That slowdown is expected to result both from more workers' exiting the labor force and from fewer workers' entering it. The number projected to leave the labor force is anticipated to increase compared with past decades as the older members of the baby-boom generation have begun reaching retirement age (although the average age at which people leave the labor force to retire has increased slightly in recent decades). At the same time, fewer workers are projected to enter the labor force than in past decades for two main reasons: First, birth rates have declined (the average fertility rate was more than three children per woman in the 1950s and 1960s, compared with fewer than two children today), and second, the increased participation of women in the labor force has leveled off over the past several years.

Despite those trends, however, increases in longevity will cause participation in the labor force to be slightly greater than it would be otherwise, CBO anticipates. CBO expects that the average person will work three months longer for each additional year of life expectancy in the coming decades. Thus, if life expectancy is four years longer for one cohort of workers than for an earlier group, the longer-lived cohort would work an average of one extra year (everything else being equal). CBO's projections also reflect the view that older people with more education will stay in the labor force longer than those with less education because people with more education are both more likely to be in the labor force when they enter their 60s and less likely to claim Social Security benefits at an early age.

Over the 1970–2007 period, the population of people ages 20 to 64 grew by an average of 1.3 percent per year, but the labor force grew by 1.7 percent per year, mainly because of large increases in the participation rate of women (a factor that was only partly offset by a decline in the participation rate of men). Over the next decade, the gap between those growth rates will narrow, CBO

projects, with the population between the ages of 20 and 64 increasing by about 0.4 percent a year and the labor force growing by about 0.6 percent a year, on average. That narrowing reflects partially offsetting effects: The increased propensity of people who are age 65 or older to continue to work and the positive effects of the strengthening labor market on participation more than offset the negative effects on participation from the reduction in people's incentive to work that results from the Affordable Care Act and the structure of the tax code. From 2015 to 2040, the labor force is projected to increase at a rate of about 0.5 percent a year, on average, which is slightly faster than the average annual growth of about 0.4 percent that is projected for the population between the ages of 20 and 64 because of increased labor force participation at older ages.

**Average Hours Worked.** Different subgroups of the labor force work different numbers of hours, on average. For instance, men tend to work more hours than women do, and people between the ages of 30 and 40 tend to work more hours than do people between the ages of 50 and 60. CBO's projections are based on the assumption that those differences among groups will remain stable. However, CBO also expects that over the long term, the composition of the labor force will shift toward certain groups (such as older workers) that tend to work less, slightly reducing the average number of hours worked by the labor force as a whole. CBO estimates that by 2040, the average number of hours per worker will be about 2 percent less than it is today.

**The Unemployment Rate.** In January 2015, CBO projected that the unemployment rate would decline from 5.7 percent at the end of 2014 to 5.3 percent at the end of 2017. That projected improvement through 2017 reflects CBO's expectation that the economic expansion will strengthen in the next few years and that the effects of certain structural factors that have contributed to higher unemployment—such as the stigma attached to long-term unemployment and the possible erosion of unemployed workers' job skills—will diminish.<sup>8</sup> The projections for 2018 and 2019 are largely based on the transition to a period when the relationship between the unemployment rate and the natural rate of unemployment is expected to match its historical average. (The natural rate of

8. See Congressional Budget Office, *The Slow Recovery of the Labor Market* (February 2014), [www.cbo.gov/publication/45011](http://www.cbo.gov/publication/45011).

unemployment is the rate that results from all sources other than fluctuations in overall demand related to the business cycle.) As a result, the unemployment rate is projected to increase to 5.5 percent by 2020, when the natural rate of unemployment is expected to be 5.3 percent.<sup>9</sup>

CBO projects that in 2020 and later, the average unemployment rate will be about one-quarter of a percentage point higher than the natural rate of unemployment. That projection is based not on a forecast of specific cyclical movements in the economy but rather on CBO's estimate that the unemployment rate has been roughly that much higher than the natural rate since the end of World War II, on average, and has been higher than the natural rate in each of the past five business cycles.

After 2025, the average unemployment rate is projected to decline as the natural rate of unemployment slowly moves downward, continuing its previous trend as structural factors continue to fade. The natural and actual rates of unemployment are projected to decrease to 5.0 percent and 5.3 percent, respectively, by 2028 and then to remain at those levels.

**Earnings as a Share of Compensation.** Workers' total compensation consists of taxable earnings and nontaxable benefits, such as paid leave and employers' contributions to health insurance and pensions. Over the years, the share of total compensation paid in the form of earnings has slipped—from about 90 percent in 1960 to about 80 percent in 2014—mainly because the cost of health insurance has grown more quickly than has total compensation.<sup>10</sup>

Looking ahead, CBO expects that health care costs will continue to rise more rapidly than earnings, a trend that by itself would further decrease the proportion of compensation that workers receive as earnings. However, the Affordable Care Act imposed an excise tax on some employment-based health insurance plans that have premiums above a specific threshold. Some employers and workers will respond to that tax—which is scheduled to take effect in 2018—by shifting to less expensive plans, thereby reducing the share of compensation composed of

health insurance premiums and increasing the share composed of earnings. CBO projects that the effects of the excise tax on the mix of compensation will roughly offset the effects of rising costs for health care for a few decades; after that, the effects of rising health care costs will outweigh the effects of the excise tax.<sup>11</sup> As a result, in CBO's benchmark, the share of compensation that workers receive as earnings is projected to remain near 80 percent through 2040. (For more about the projected effects of the excise tax, see Chapter 5; for a discussion of projected changes in the costs of health care, see Chapter 2.)

**Share of Earnings Below the Taxable Maximum.** Most workers are in jobs that are covered by Social Security—their earnings are subject to Social Security payroll taxes. (A small segment of the workforce, mostly people who work for some state and local governments and members of the clergy, have jobs that are excluded from such coverage.) Covered earnings are expected to be about 85 percent of all earnings in 2015. Social Security payroll taxes are levied only on covered earnings up to a maximum annual amount (\$118,500 in 2015). Earnings below that amount are taxed at a combined rate of 12.4 percent, split between the employer and employee (self-employed workers pay the full amount), and no tax is paid on earnings above the cap. The taxable maximum has remained a nearly constant proportion of the average wage since the mid-1980s, but because earnings have grown more for higher earners than for others, the portion of covered earnings on which Social Security taxes are paid has fallen from 90 percent in 1983 to 81 percent now. CBO expects that unequal growth in earnings to continue at least for the next decade, and therefore the portion of earnings subject to Social Security tax is projected to fall to about 79 percent by 2025 and to decline slightly thereafter.

## Inflation

CBO's economic benchmark includes projections of the rate of inflation in the prices of various categories of goods and services, as measured by the annual rate of

9. See Congressional Budget Office, *The Budget and Economic Outlook: 2015 to 2025* (January 2015), pp. 30 and 50, [www.cbo.gov/publication/49892](http://www.cbo.gov/publication/49892).

10. For more details, see Congressional Budget Office, *How CBO Projects Income* (July 2013), [www.cbo.gov/publication/44433](http://www.cbo.gov/publication/44433).

11. CBO anticipates that the effects of the excise tax on the taxable share of compensation will diminish over time, both because it expects that most people will continue to want a significant amount of health insurance and because the Affordable Care Act set minimum amounts of coverage for health insurance plans. Therefore, the number of additional people moving to less expensive insurance plans will eventually dwindle.



change in the consumer price index for urban wage earners and clerical workers (CPI-W) and in the consumer price index for all urban consumers (CPI-U). CBO projects that inflation will average 2.3 percent over the 2015–2040 period. The projected long-term rate is similar to the average rate of inflation since 1990, a period in which growth in the CPI-U averaged 2.6 percent a year.

The annual inflation rate for all final goods and services produced in the economy, as measured by the rate of increase in the GDP deflator, is projected to average 0.4 percentage points less than the annual increase in the consumer price indexes over the long term.<sup>12</sup> The GDP deflator grows more slowly than the consumer price indexes because of the different methods used to calculate them and also because it is based on the prices of a different set of goods and services.

### Interest Rates

CBO's economic benchmark includes projections of various interest rates that the federal government pays to borrow money, such as the rate on 10-year Treasury notes, the average rate on federal debt held by the public, and the average rate on holdings of the Social Security trust funds.

After considering several factors, including slower growth of the labor force, CBO expects real (inflation-adjusted) interest rates on federal borrowing to be lower in the future than they have been, on average, in the past few decades. For example, the real interest rate on 10-year Treasury notes (calculated by subtracting the rate of increase in the CPI-U from the nominal yield on those notes) averaged roughly 3.1 percent between 1990 and 2007.<sup>13</sup> From 2015 to 2040, that rate is projected to average 2.2 percent. But in the later years of the projection period, it is projected to be 2.3 percent.

**Factors Affecting Interest Rates.** Using past trends as a starting point for projecting interest rates over the long term requires analysts to make judgments about which

periods to consider. Real interest rates were very low in the 1970s because of an unexpected surge in inflation, and those rates were quite high in the 1980s as inflation declined unexpectedly rapidly.<sup>14</sup> Interest rates also fell sharply during the financial crisis and recession that began in 2007. To avoid using those possibly less representative periods, CBO examined average interest rates and their determinants between 1990 and 2007 and then considered how different those determinants might be over the long term.

In CBO's assessment, the following factors will probably reduce interest rates on government securities relative to their 1990–2007 average:

- The labor force is projected to grow much more slowly in the future than it has for the past few decades. If everything else remains equal, slower growth in the labor force will raise the amount of capital per worker in the long term, reducing the return on capital and therefore also reducing the return on alternative investments, such as government bonds.<sup>15</sup>
- The share of total income received by high-income households is expected to remain larger in the future than it has been during the past few decades. Higher-income households tend to save a greater proportion of income, so that the difference in the distribution of income will increase the total amount of savings available for investment (other things being equal), also increasing the amount of capital per worker.
- Total factor productivity—real output per unit of combined labor and capital services—will grow slightly more slowly in the future than it has in recent decades, CBO projects. For a given rate of investment, lower productivity growth reduces both the return on capital and interest rates (all else being equal).

12. Final goods and services include goods and services bought by consumers, those purchased for investment, and those purchased by governments, as well as net exports.

13. Farther back, the real interest rate on 10-year Treasury notes averaged 3.2 percent between 1970 and 2007 and 2.9 percent between 1953 and 2007. For comparisons of historical real rates, past rates are calculated using the CPI Research Series Using Current Methods.

14. Although real interest rates are calculated by subtracting inflation rates from nominal interest rates, inflation can still affect them. If lenders set nominal interest rates assuming that inflation will be a certain percentage and it ends up being much higher, real interest rates will be lower than lenders intended. If inflation ends up being lower than expected, the opposite will occur.

15. For more information about the relationship between the growth of the labor force and interest rates, see Congressional Budget Office, *How Slower Growth in the Labor Force Could Affect the Return on Capital* (October 2009), [www.cbo.gov/publication/41325](http://www.cbo.gov/publication/41325).

- The risk premium—the additional return that investors require to hold assets that are riskier than Treasury securities—will probably remain higher in the future than it was, on average, in the 1990–2007 period. Financial markets were already showing less appetite for risk in the early 2000s, so the risk premium was higher toward the end of that 18-year period than the average over the whole 1990–2007 period. In addition, CBO expects, the demand for low-risk assets will be stronger in the wake of the financial crisis, in part because of the ways in which financial institutions have responded to oversight from regulators.

At the same time, in CBO's assessment, the following factors will tend to increase interest rates on government securities relative to their 1990–2007 average:

- If current laws do not change, federal debt will be much larger as a percentage of GDP than it was before 2007. CBO's economic benchmark is built on the assumption that the ratio of debt to GDP after 2025 will remain at its 2025 value—78 percent—which is almost twice as high as the 40 percent average seen over the 1990–2007 period.<sup>16</sup> Higher federal debt tends to crowd out private investment in the long term, reducing the amount of capital per worker and increasing both the return on capital and interest rates.
- Net inflows of capital from other countries will be smaller as a percentage of GDP in the future than they have been, on average, in recent decades, CBO projects. In the 1990s and early to mid-2000s, rapid economic growth and high rates of saving in various nations with emerging market economies led to large flows of capital from those countries to the United States. As those nations' economies continue to grow, however, their consumption will probably increase relative to their saving—because markets for those countries' debt will develop and because average citizens will tend to receive more of the gains from economic growth—and their demand for domestic investment will rise. That combination of changes will reduce capital flows to the United States, decreasing domestic investment and the amount of capital per worker and increasing rates of return. (Those

developments are consistent with CBO's projection that the United States' trade deficit, the gap between its imports and its exports, will be narrower in the future as a percentage of GDP than it has been for the past few decades.)

- The capital share of income—the percentage of total income that is paid to owners of capital—which has been on an upward trend for the past few decades, will remain higher than its average of recent decades, CBO projects. Although it is expected to decline somewhat over the next decade from its current, historically high level, the factors that appear to have contributed to its rise (such as technological change and globalization) are likely to persist, keeping it above the historical average. A larger share of income accruing to owners of capital will directly boost the return on capital and thus interest rates, in CBO's estimation.
- The retirement of the baby-boom generation and slower growth of the labor force will reduce the number of workers in their prime saving years relative to the number of older people drawing down their savings. The result will be a decrease in the total amount of savings available for investment (all else being equal), which will tend to reduce the amount of capital per worker and thereby push up interest rates. (CBO estimates that this effect will only partially offset the effect on savings of increased income inequality, leaving a net increase in savings available for investment.)

Other factors not listed here will have smaller—and largely offsetting—effects on interest rates on federal borrowing over the long term, CBO estimates.

CBO also relies on information from financial markets in projecting interest rates over the long term. For example, the current interest rate on 30-year Treasury bonds implies a forecast of interest rates on shorter-term securities 30 years into the future. Incorporating that information tends to reduce interest rates that CBO projects compared with rates implied by the analysis of factors described above.

**Projections of Interest Rates.** Although some of the factors mentioned above have received considerable attention from researchers, others have not. The effects on interest rates of the growth of the labor force and the amount of federal debt, for example, can be quantified

16. See Chapter 6 for a discussion of the ways that the budgetary policies that would be in place under the extended baseline would affect the economy in the long term.

using available data, theoretical models, and estimates from the research literature. But the extent to which other factors will affect interest rates is more difficult to quantify. For example, changes such as shifting preferences for high-risk rather than low-risk assets are not directly observable. And factors such as the distribution of income are observable, but models and empirical estimates offer little guidance for quantifying their effects on interest rates. Moreover, prices in financial markets do not definitively indicate investors' expectations about interest rates over the long term, in part because most of the government's outstanding debt securities have maturities that are much shorter than the 25-year period that is the focus of CBO's long-term projections.

With those considerable sources of uncertainty, CBO relied on its own economic models, the economics research literature, and other information to guide assessments of the influence of different factors on interest rates in the future. Nevertheless, its projections ultimately reflect CBO's judgment.

The estimates and assumptions that underlie the economic benchmark suggest that the inflation-adjusted interest rate on 10-year Treasury notes will be about 1 percentage point lower in the coming decades than its average of 3.1 percent for the 1990–2007 period. Therefore, CBO projects, the real interest rate on 10-year Treasury notes (adjusted for the rate of increase in the CPI-U) will rise in the next few years from its current, extraordinarily low level of 1.7 percent to average 2.2 percent over the 2015–2040 period.

The average interest rate on all federal debt held by the public tends to be a little lower than the rate on 10-year Treasury notes because interest rates are generally lower on shorter-term debt than on longer-term debt, and the average maturity of federal debt is expected to remain at less than 10 years. Thus, CBO projects, the average real interest rate on all federal debt held by the public (adjusted for the rate of increase in the CPI-U) will be 1.5 percent over the 2015–2040 period. (The average interest rate on all federal debt is projected to rise more slowly than the 10-year rate because only a portion of federal debt matures each year.) CBO generally uses the average interest rate on all federal debt as a discount rate when it calculates the present value of future streams of total federal revenues and outlays in its long-term projections, as it does in estimating the fiscal gap described in Chapter 1.<sup>17</sup>

The Social Security trust funds hold special-issue bonds that generally earn interest rates that are higher than the average interest rate on federal debt. Therefore, in projecting the balances in the trust funds and calculating the present value of future streams of revenues and outlays for those funds, CBO uses an interest rate that averages 2.2 percent from 2015 to 2040 and 2.3 percent in the later years of the projection.

Combining CBO's projections of average real interest rates with its projection of inflation as measured by the growth of the CPI-U produces estimates of average nominal interest rates. Over the 2015–2040 period, nominal rates are projected to average 4.5 percent on 10-year Treasury notes and 3.9 percent on all federal debt held by the public.

### Output

In its economic benchmark, CBO projects that real GDP will grow fairly quickly over the next few years, reflecting a recovery in aggregate demand. Thereafter, real GDP is projected to grow at a pace that reflects increases in the capital stock, productivity, and the supply of labor.

**Capital Stock.** Over the next decade, growth in the nation's stock of capital will be driven by economic output, national saving, and international capital flows, CBO estimates. For simplicity, CBO projects that after 2025, the capital stock will expand at a pace that is sufficient to maintain a constant rate of return on capital. That projection is consistent with CBO's projection that the average real interest rate on all federal debt held by the public will be 2.0 percent in the long term (after 2029).

**Productivity.** Total factor productivity is projected to increase at an average annual rate of 1.3 percent from 2015 to 2040—a growth rate that is slightly slower than the average rate of 1.4 percent seen over the period since 1950. CBO expects productivity to grow more slowly in coming decades partly because increases in average educational attainment, which contribute to

17. The present value of a flow of revenues or outlays over time is a single number that expresses that flow in terms of an equivalent sum received or paid at a specific time. The present value depends on a rate of interest (known as the discount rate) that is used to translate past and future cash flows into current dollars. The lower the discount rate, the higher the present value of the future flows.



workers' skills, have slowed since 1980.<sup>18</sup> That effect will be partly offset, however, by the aging of the labor force over the next few decades, as better health and longer life spans cause people to stay in the workforce longer than previous cohorts did. An older workforce will be composed of more highly educated workers, because workers with higher educational attainment tend to remain in the labor force longer.

Another factor that is projected to slow the growth of total factor productivity is a lower projected amount of federal investment. Under the assumptions used for these projections, the government's nondefense discretionary spending is projected to decline over the next decade to a much smaller percentage of GDP than it has averaged in the past. Since the 1980s, about half of such spending has consisted of federal investment in physical capital (such as roads), education and training, and research and development.<sup>19</sup> Those forms of investment contribute to total factor productivity, CBO estimates, so as the economy adjusts to smaller amounts of federal investment (consistent with less nondefense discretionary spending as a percentage of GDP), the growth rate of total factor productivity is projected to be dampened slightly.

18. CBO calculates total factor productivity as the portion of growth in output that is not accounted for by growth in hours worked and in capital services. Therefore, when an increase in workers' skills makes each hour of work more productive, CBO measures that effect as an increase in total factor productivity. Various researchers have examined trends in workers' skills and the effect of those trends on future economic growth; that research has not reached a consensus about the size of the effect. For example, see David M. Byrne, Stephen D. Oliner, and Daniel E. Sichel, *Is the Information Technology Revolution Over?* Finance and Economics Discussion Series Paper 2013-36 (Board of Governors of the Federal Reserve System, March 2013), <http://go.usa.gov/XXNR>; John Fernald, *Productivity and Potential Output Before, During, and After the Great Recession*, Working Paper 2012-18 (Federal Reserve Bank of San Francisco, September 2012), <http://tinyurl.com/pk8b666> (PDF, 480 MB); Robert J. Gordon, *Is U.S. Economic Growth Over? Faltering Innovation Confronts the Six Headwinds*, Policy Insight 63 (Center for Economic Policy Research, September 2012), <http://tinyurl.com/p57pzt5>; and Claudia Goldin and Lawrence F. Katz, *The Race Between Education and Technology: The Evolution of U.S. Educational Wage Differentials, 1890 to 2005*, Working Paper 12984 (National Bureau of Economic Research, March 2007), [www.nber.org/papers/w12984](http://www.nber.org/papers/w12984).

19. See Congressional Budget Office, *Federal Investment* (December 2013), [www.cbo.gov/publication/44974](http://www.cbo.gov/publication/44974).

**Supply of Labor.** Total hours worked will increase at an average annual rate of 0.4 percent between 2015 and 2040, CBO estimates, on the basis of the projections of the size of the labor force, average hours worked, and unemployment.

The growth rates projected for the labor supply, the capital stock, and total factor productivity are consistent with CBO's projection of the average growth of labor productivity (real output per hour worked): 1.8 percent annually over the 2015–2040 period. Trends in prices, in the growth of nonwage compensation (such as employment-based health insurance), and in average hours worked imply that real earnings per worker will grow more slowly than labor productivity—by an average of 1.6 percent a year over the 2015–2025 period and by 1.4 percent a year over the 2015–2040 period.<sup>20</sup>

**Real GDP.** CBO's projection of the growth rate of real GDP—an annual average of 2.2 percent over the 2015–2040 period—is much slower than the rate of economic growth seen in the past few decades (3.1 percent), primarily because of the slowdown that CBO anticipates in the growth of the labor force. Moreover, as the fraction of the population that is of working age shrinks, per capita real GDP is expected to increase more slowly than in the past—at an average annual rate of 1.5 percent over the 2015–2040 period, compared with 2.1 percent during the 40 years before the start of the 2007–2009 recession.

Just as the unemployment rate is projected to be about one-quarter of a percentage point higher than the natural rate of unemployment in the long term, total GDP is projected to be one-half of a percent lower than its potential (maximum sustainable) amount. That projection is based on CBO's estimate that actual GDP has been roughly that much lower than potential GDP, on average, since the end of World War II and has been lower than potential GDP, on average, in each of the past five business cycles. Those outcomes reflect the fact that actual output has fallen short of CBO's estimate of potential output during and after economic downturns to

20. Trends in prices are important in projecting those measures because real earnings per worker are calculated here using the CPI-U, and real output per hour is calculated using the GDP deflator. CBO projects that the CPI-U will grow 0.4 percentage points faster per year than will the GDP deflator over the long term.

a larger extent and for longer periods than actual output has exceeded potential output during economic booms.

If the real interest rates were adjusted to reflect the rate of increase in the GDP price index instead of the CPI-U, the real interest rate on all federal debt held by the public over the next 25 years would average 1.9 percent. Thus, during the next 25 years as a whole, the growth rate of GDP—at 2.2 percent—is projected to exceed the average real interest rate on federal debt. (Beyond 2025, the average interest rate on federal debt is projected to be only slightly higher than the growth rate of GDP.) When the interest rate is about the same as the growth rate of GDP, the ratio of debt to GDP would remain steady over time if the federal budget, excluding interest payments, was in balance.

## Other Trends

In addition to projecting the demographic and economic trends that underlie the economic benchmark, CBO also projects other trends as it develops its long-term budget projections. CBO has produced its own projection of the rate at which people will qualify for Social Security's Disability Insurance program in coming decades as well as projections of enrollment in Medicaid.

### Disability

One variable that affects the federal budget is the rate of disability incidence, defined here as the rate at which people will become eligible for Social Security's Disability Insurance program. CBO projects that an average of 5.6 per thousand people who have worked long enough to qualify for disability benefits, but who are not yet receiving them, will qualify for the program each year after 2025. (That projection accounts for changes in the age and sex makeup of the population, relative to its composition in 2000.) CBO's estimate is based on analysis of past trends and on recommendations by the Social Security Technical Panel on Assumptions and Methods.<sup>21</sup>

21. See Congressional Budget Office, *The 2013 Long-Term Budget Outlook* (September 2013), p. 17, [www.cbo.gov/publication/44521](http://www.cbo.gov/publication/44521).

### Medicaid Enrollment

To implement the formulaic approach it used to project Medicaid enrollment over the long term, CBO adopted the assumption that the number of elderly and disabled Medicaid beneficiaries would grow with the overall population, with adjustments for changes in the age distribution of the population. The agency also projected that the number of beneficiaries who are children and non-disabled adults would increase more slowly than the population overall, reflecting the assumption that growth in earnings will reduce the number of people whose income is below the most common threshold for eligibility for those groups—in many states that threshold is 138 percent of the federal poverty guidelines. Because earnings are projected to grow faster than prices, on average, and because poverty guidelines are indexed to prices, over time fewer people are projected to have income below the eligibility threshold in their state.

In the past, many states have used Medicaid's flexible program rules to increase or decrease spending in various ways. Under current law, for example, states with income eligibility criteria below 138 percent of the federal poverty guidelines for nonelderly adults can expand coverage for that group. They also can increase enrollment in the program by adopting administrative policies and procedures that simplify the enrollment process and expand program benefits by covering more optional services. (Such mechanisms also may be used to shrink program spending when states are facing fiscal constraints.) More generally, states can apply for waivers of Medicaid program requirements to enable them to change program eligibility criteria and covered benefits in other ways. (The Secretary of Health and Human Services has the authority to waive some Medicaid program requirements through certain research and demonstration projects or through consolidated State Innovation Waivers that include Medicaid-related components.) For these projections, therefore, CBO assumed that, over time, states would make changes in their Medicaid programs that offset roughly half of the effect of earnings growth on eligibility. As a result, the total number of people enrolled in Medicaid is projected to be roughly constant after 2035.