Congressional Budget Office

FEBRUARY 2015

Why CBO Projects That Actual Output Will Be Below Potential Output on Average

Overall economic activity often is measured as the market value of the economy's total output of goods and services—the nation's gross domestic product (GDP). For many reasons, GDP rises in some periods and falls in others, but those fluctuations occur around a rising path that is determined by growth in three particular factors in the economy: labor, capital, and productivity. The maximum sustainable output of the economy given those factors is defined by the Congressional Budget Office as potential output, or potential GDP. (Analyses of potential output, including CBO's, focus on the quantity of output, adjusted to remove the effects of inflation.) Potential GDP is not the nation's productive maximum, as would occur if all factors in the economy were employed to their fullest extent, but rather it is the maximum output that can be achieved over a prolonged period without straining productive capacity and thus increasing the risk that inflation will rise above the Federal Reserve's goal.

GDP has never equaled potential output for a sustained period. Instead, there usually is a gap (expressed as a percentage of GDP) between the economy's actual and potential output. Typically, that gap is negative during economic recessions and early in subsequent recoveries, when actual output is less than potential (see Figure 1). The gap has been positive, however—and in some cases substantially so—during later phases of economic expansions. CBO's estimate of the output gap provides a measure of the slack or the overheating in the economy, and that assessment in turn can provide useful information to policymakers as they consider the economic consequences of various actions.

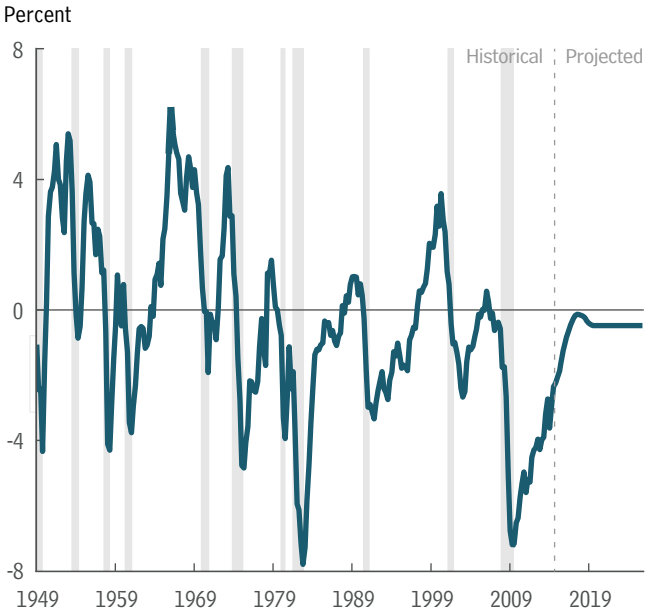
CBO's projections of potential output guide its projections of actual output. For roughly the first half of its 10-year projection period (which currently runs through 2025), CBO projects the growth of actual output by estimating both the potential and the cyclical components of economic activity. For the latter part of the projection period, however, CBO does not estimate cyclical components. Instead, it projects that actual output will grow at the same rate as potential output but remain about one-half of one percent below potential, on average. According to CBO's analysis, from 1961 to 2009, the nation's actual output was below its potential by about that amount, on average, and below its potential, on average, during each of the past five complete business cycles (since 1975).[1]

1. The term business cycle describes fluctuations in overall economic activity that are accompanied by fluctuations in the unemployment rate, investment, interest rates, income, and other variables. Over a complete cycle, real (inflation-adjusted) activity rises to a peak and then falls until it reaches a trough, and then starts to rise again—defining a new cycle. Business cycles are irregular, varying in frequency, magnitude, and duration, but despite those variations, actual GDP tends to fall below potential GDP during recessions and tends to exceed it during the later stages of each business cycle, indicating that the economy may be overheating. By convention, business cycle peaks and troughs are identified after the fact by the National Bureau of Economic Research.

Notes: All years are calendar years. Some values are expressed as fractions to indicate numbers rounded to amounts greater than one tenth of a percentage point. The vertical bars in figures indicate the duration of recessions, which extend from the peak of a business cycle to its trough. Supplemental data for this analysis are available on CBO's website (www.cbo.gov/publication/49890).

Figure 1.

CBO's Estimates of the Output Gap



Sources: Congressional Budget Office; Bureau of Economic Analysis.

Notes: The output gap equals the difference between actual or projected GDP and CBO's estimate of potential GDP (the maximum sustainable output of the economy). The output gap is expressed as a percentage of potential GDP.

Data are quarterly. Historical data are plotted through the third quarter of 2014; projections are plotted through 2025.

GDP = gross domestic product.

How Does CBO Define and Estimate Potential Output?

Potential GDP is an estimate of the maximum sustainable amount of output that the economy can produce using available workers and capital (equipment, structures, intellectual property products, inventories, and land). It is not a technical ceiling on production that cannot be breached: Output can temporarily exceed its potential but only by straining productive capacity and increasing the risk that inflation will rise above the Federal Reserve's goal. Output also can fall below potential, creating slack—leaving workers and capital underused or idle and increasing the risk that inflation will fall below the Federal Reserve's goal.

CBO estimates potential output from data on capital, labor, productivity, and actual GDP; by means of statistical and other modeling methods for assessing cyclical influences and long-term trends in the economy; and through analyses of the economic effects of federal tax and spending policies that are embodied in current law.[2] CBO regularly updates its projections of potential output by incorporating updated and revised data, improving its methodology, and revising its estimates of the effects of current-law policies to reflect recent legislation.[3]

CBO estimates trend growth rates for many of the inputs used to project potential output by adjusting observed inputs for the influence of the business cycle (and, within some cycles, for unusual structural shifts in the economy) and then using changes in the adjusted inputs to estimate constant growth rates for each business cycle. The inputs' cyclical components are estimated by means of an analysis of the relationship between each input and the unemployment gap (that is, the gap between the actual unemployment rate and CBO's estimate of the underlying long-term rate of unemployment).[4] The resulting cyclically adjusted inputs include estimates of the potential labor force and potential total factor productivity—the average amount of real (inflation-adjusted) output per unit of combined labor and capital services, in which the latter is the flow of services available for production from the stock of capital.[5]

Analysts outside of CBO use a variety of methods to cyclically adjust the data series they use to estimate

2. For additional information, see *CBO's Method for Estimating Potential Output: An Update* (August 2001), www.cbo.gov/publication/13250. The agency uses data from external sources, including the national income and product accounts published by the Bureau of Economic Analysis and labor force and productivity data from the Bureau of Labor Statistics.

3. CBO's most recent projections of potential output can be found in Congressional Budget Office, *The Budget and Economic Outlook: 2015 to 2025* (January 2015), www.cbo.gov/publication/49892. For a discussion of recent changes in projections, see Congressional Budget Office, *Revisions to CBO's Projection of Potential Output Since 2007* (February 2014), www.cbo.gov/publication/45150.

4. The underlying long-term rate of unemployment incorporates long-lasting structural factors, such as unemployment that results from the normal turnover of jobs. Like potential GDP, the underlying rate is not observable and must be estimated.

5. CBO does not cyclically adjust the flow of services from the capital stock. Those services are defined to equal the maximum sustainable flow of services that could be provided if the entire capital stock was being used.

potential output.[6] Some use statistical techniques that mechanistically distinguish cyclical components from the potential components of growth; others use multiple-step methods that, like CBO's, link developments in potential GDP to developments in the underlying components of economic activity. Different techniques can yield quite different estimates for any given period, although the most widely used methods yield estimates that follow similar patterns over history.

What Is the Output Gap?

The output gap measures the extent to which GDP exceeds or falls below its potential. Potential GDP depends largely on the potential labor force and potential total factor productivity, both of which tend to grow more smoothly that their actual counterparts. Potential GDP therefore grows more smoothly than actual GDP, which can vary sharply from quarter to quarter. Moreover, the growth of actual output tends to vary systematically over business cycles, typically exhibiting an above-average pace during expansions and shrinking during recessions. As a consequence, the output gap varies systematically over the business cycle as well. The gap shrinks and then becomes negative when the economy falls into a recession; during periods of recovery and expansion, the gap generally turns positive again.

As measured by CBO's methodology, the output gap is defined as the difference between actual and potential output, and it is not constrained to equal zero, on average, over a particular business cycle. Indeed, the output gap has never averaged zero over an entire business cycle; instead, it has remained notably positive or negative, on average, for lengthy periods. Those deviations from zero stem from a combination of shocks to the economy, the effects of fiscal and monetary policies, and other influences.

As a rule, a negative output gap (that is, when actual output falls below its potential) occurs when unemployment rises above its sustainable level to yield a positive unemployment gap, as people who want to work cannot find jobs. Conversely, a positive output gap (when actual output rises above its potential) occurs when unemployment falls below its sustainable level to yield a negative unemployment gap, as businesses employ an unusually high share of the labor force.

Consistent with the extensive literature on the subject, CBO's estimate of the output gap is typically about twice as large as its estimate of the unemployment gap, and it is of the opposite sign; that relationship is known as Okun's law.[7] Therefore, consistent with CBO's estimate of the output gap between 1961 and 2009, the agency estimates that the unemployment rate was above its sustainable rate by about one-quarter of one percentage point, on average, during that period and, in fact, that the unemployment rate was above its sustainable rate, on average, during each of the past five complete business cycles (see Figure 2).

How Has the Average Output Gap Varied Over Time?

Actual GDP has been roughly one-half of one percent lower than potential GDP, on average, over the seven complete business cycles between 1961 and 2009 (see Table 1). (The table is based on the data that underpin CBO's January 2015 economic projections, but the same general relationship is evident in data available in the recent past.)[8] Output has been lower than its potential, on average, during each of the five complete business cycles from 1975 to 2009—about 1¼ percent lower, on average, over that period. By contrast, output was higher than its potential, on average, between 1949 and 1975.

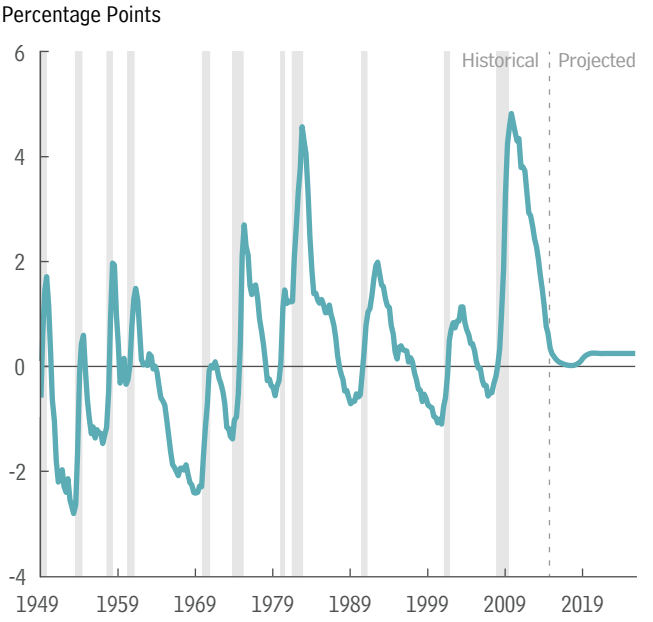
6. Those methods include statistical filtering, econometrics (including vector autoregression), and more complex general equilibrium economic modeling. For surveys, see Claudio Borio, Piti Disyatat, and Mikael Juselius, *Rethinking Potential Output: Embedding Information About the Financial Cycle*, BIS Working Paper 404 (Bank of International Settlements, February 2013), www.bis.org/publ/work404.htm; Susanto Basu and John G. Fernald, "What Do We Know (and Not Know) About Potential Output?" *Federal Reserve Bank of St. Louis Review*, vol. 91, no. 4 (July/August 2009), pp. 187–213, http://tinyurl.com/kwjg9uo; and Congressional Budget Office, *A Summary of Alternative Methods for Estimating Potential GDP* (March 2004), www.cbo.gov/publication/15384.

7. For additional information, see Congressional Budget Office, *CBO's Method for Estimating Potential Output: An Update* (August 2001), www.cbo.gov/publication/13250, p. 11.

8. See Congressional Budget Office, *The Budget and Economic Outlook: 2015 to 2025* (January 2015), www.cbo.gov/publication/49892.

Figure 2.

CBO's Estimates of the Unemployment Gap



Sources: Congressional Budget Office; Bureau of Labor Statistics.

Notes: The unemployment gap equals the actual or projected rate of unemployment minus the underlying long-term rate of unemployment.

Data are quarterly. Historical data are plotted through the third quarter of 2014; projections are plotted through 2025.

The output gap also has been negative more often than positive: Between 1961 and 2009, it was negative during 63 percent and positive during 37 percent of all quarters; those figures shift to 74 percent and 26 percent, respectively, between 1975 and 2009. By contrast, during the period from 1949 to 1975, output exceeded its potential far more often than it fell short.

From the trough of the most recent business cycle (in the second quarter of 2009) through the third quarter of 2014, CBO estimates, the output gap has been consistently negative, averaging -4.7 percent. With the most recent period incorporated, the average output gap for the period from 1961 to the third quarter of 2014 is -0.9 percent, and the average since 1949 is -0.5 percent.

In its January 2015 projections, CBO estimated that the output gap was about -2 percent in the fourth quarter of 2014 and would be -0.5 percent at the end of 2019, with an average slightly greater than -0.7 percent for the period. With the additional years of projected negative output gaps, the average output gaps from 1949 through 2019 and from 1961 through 2019 are about the same as the average gaps through the third quarter of 2014.

How Does CBO Interpret an Average Negative Output Gap?

The causes of the average shortfall of output relative to its potential during recent business cycles, and during the past half-century as a whole, are not entirely clear. One possibility is that the economy has not adapted as well to bad shocks as it has to good ones. For example, prices and wages may tend to move more quickly in response to shortages in goods and services than in response to slack in the economy.[9] If, say, prices for investment goods—equipment and nonresidential structures, for example—rise quickly in response to a boost in demand, those increases curtail demand for investment in goods going forward and thus help to move output back down toward its potential. If, in contrast, prices are relatively unresponsive (or "sticky") when demand is weak, prices of investment goods do not fall quickly enough to spur demand when output falls short of its potential.

The increasing share of the services sector in overall output also could be playing a role. Unlike manufactured goods, most services are difficult to export and therefore cannot assist in an export-led recovery. Moreover, most services cannot be produced in anticipation of their sale during a period when demand is stronger, so services contribute less than manufacturing does to an inventory-led recovery. Indeed, the evidence suggests that when the economy experiences a bad shock that leads to a recession, the increased role of the services sector leads to a slower recovery. Although those same factors logically imply that the greater dominance of the services sector

9. See Alessandro Barattieri, Susanto Basu, and Peter Gottschalk, "Some Evidence on the Importance of Sticky Wages," *American Economic Journal: Macroeconomics*, vol. 6, no. 1 (January 2014), pp. 70–101, http://tinyurl.com/ojw6nlp; Mary C. Daly and Bart Hobijn, *Downward Nominal Wage Rigidities Bend the Phillips Curve*, Working Paper 2013-08 (Federal Reserve Bank of San Francisco, 2014), http://tinyurl.com/ljxbpll (PDF, 913 KB); Truman F. Bewley, *Why Wages Don't Fall During a Recession* (Harvard University Press, 1999); David Card and Dean Hyslop, "Does Inflation 'Grease the Wheels of the Labor Market'?" in Christina D. Romer and David H. Romer, eds., *Reducing Inflation: Motivation and Strategy* (University of Chicago Press, 1997), pp. 71–122, http://papers.nber.org/books/rome97-1; Shulamit Kahn, "Evidence of Nominal Wage Stickiness From Microdata," *American Economic Review*, vol. 87, no. 5 (December 1997), pp. 993–1008, http://tinyurl.com/m4l5lyc.

Table 1.

Output Gaps Over Various Periods Measured From Business Cycle Troughs

	Average Output Gap (Percentage of Potential Output)	Quarters With Negative Output Gap (Percent)
	Multiple Business Cycles	
1961–Q1 to 2009–Q1	-0.44	63
1961–Q1 to 2014–Q3	-0.87	67
1949–Q4 to 2009–Q1	-0.12	57
1949–Q4 to 1974–Q4	1.37	35
1975–Q1 to 2009–Q1	-1.22	74
1949–Q4 to 2014–Q3	-0.51	61
1949–Q4 to 1974–Q4	1.37	35
1975–Q1 to 2014–Q3	-1.70	77
	Single Business Cycles	
2001–Q4 to 2009–Q1	-1.30	90
1991–Q1 to 2001–Q3	-0.47	60
1982–Q4 to 1990–Q4	-1.19	70
1980–Q3 to 1982–Q3	-3.88	100
1975–Q1 to 1980–Q2	-1.50	73
1970–Q4 to 1974–Q4	0.80	41
1961–Q1 to 1970–Q3	1.76	33
1958–Q2 to 1960–Q4	-1.19	73
1954–Q2 to 1958–Q1	1.43	25
1949–Q4 to 1954–Q1	2.59	17

Source: Congressional Budget Office based on data from the National Bureau of Economic Research.

Note: In this table, business cycles are measured from the quarter in which a trough occurs to the last quarter before the succeeding trough. The dates of business cycle peaks and troughs are conventionally determined by the National Bureau of Economic Research. See National Bureau of Economic Research, "U.S. Business Cycle Expansions and Contractions" (accessed February 3, 2015), www.nber.org/cycles.html.

also should make recessions less frequent and shallower, the evidence on that point is weak.[10]

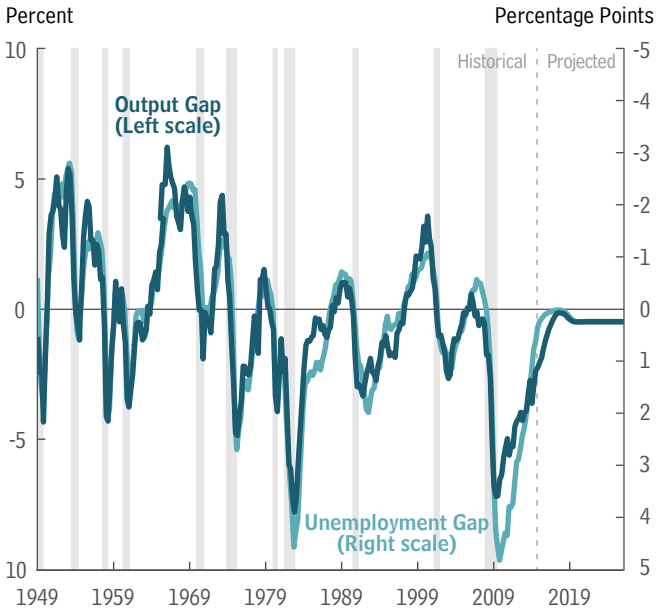
Other possible explanations for the average negative output gap involve the role of monetary policy. One argument is that the Federal Reserve's policies to reduce inflation in the 1980s and 1990s included (along with other steps) actions that reduced the demand for goods and services to such an extent that a negative average output gap was generated during that period. Those actions may indeed be the reason that the output gap averaged about -1.1 percent over the business cycles from 1980 to 2001. However, that argument does not explain why the output gap has been negative, on average, during other periods over the past 50 years in which the inflation rate at the end of a period was close to the inflation rate at its beginning.

A different line of argument is that monetary policy is more effective for reining in demand than it is for strengthening it. That point is particularly salient when interest rates are close to zero. To influence economic activity, the Federal Reserve usually generates changes in the federal funds rate (the interest rate that financial institutions charge one another for overnight loans), and those changes typically affect the financial system more generally. In particular, the Federal Reserve usually can boost demand for goods and services by reducing the federal funds rate. That change can in turn spur lower interest rates elsewhere, expanded availability of credit,

10. See Martha L. Olney and Aaron Pacitti, *Goods, Services, and the Pace of Economic Recovery*, Berkeley Economic History Laboratory Working Paper Series WP2013-04 (University of California, 2013), http://tinyurl.com/lg5cmjn (PDF, 941 KB).

Figure 3.

CBO's Estimates of the Output Gap and the Unemployment Gap



Sources: Congressional Budget Office; Bureau of Economic Analysis; Bureau of Labor Statistics.

Notes: The output gap equals the difference between actual or projected GDP and CBO's estimate of potential GDP (the maximum sustainable output of the economy). The output gap is expressed as a percentage of potential GDP. The unemployment gap (shown on the right-hand scale, which is inverted) equals the actual or projected rate of unemployment minus the underlying long-term rate of unemployment.

Data are quarterly. Historical data are plotted through the third quarter of 2014; projections are plotted through 2025.

GDP = gross domestic product.

higher prices for corporate equities and other assets, and a lower exchange rate between the U.S. dollar and other currencies.

However, nominal interest rates cannot in fact fall below zero (this is known as the zero lower bound)—a constraint that has come into play since the end of 2008. Since that time, the federal funds rate has been set close to zero, and the historical relationships between that rate, economic activity, and the rate of inflation have suggested that the Federal Reserve would have preferred to set it even lower if that were possible. In confronting the zero lower bound, the Federal Reserve has turned to non-traditional policies—including its large purchases of long-term securities issued by the U.S. Treasury and by government-sponsored enterprises—to try to hold down longer-term interest rates. Those policies have not been powerful enough to push output quickly back up to its potential, however, and the result has been the significant negative output gap of the past several years. Nevertheless, the argument about the effectiveness of monetary policy does not explain why the output gap averaged about -0.5 percent between 1961 and 2009: The federal funds rate was not constrained by the zero lower bound until the end of 2008.

A different sort of explanation for the average negative output gap is that CBO may be systematically overstating potential output and therefore mismeasuring the difference between actual and potential output. Even if that were true, it would still be appropriate to project that actual output will be less than CBO's estimate of potential output, on average, in order to maintain consistency with that historical relationship. More fundamentally, though, there is no clear evidence that CBO has systemically overstated potential output. For example, at times when the unemployment rate has been close to CBO's estimate of the underlying long-term rate of unemployment—in 1987, 1997, and 2005, for instance—conditions in labor markets have appeared to be sustainable without generating wage pressures that would have pushed inflation above the Federal Reserve's goal.

Those examples suggest that CBO has not systemically mismeasured the difference between the unemployment rate and the underlying long-term rate of unemployment and therefore has not systematically mismeasured the difference between output and potential output (which is based on the difference between those unemployment rates) (see Figure 3). Rather, the differences between actual output and CBO's estimate of potential output appear to contain valuable information about slack in the economy over time. Alternative models of potential output that impose an average output gap that is considerably closer to zero may fail to fully reflect the economy's tendency to exhibit slack and therefore may not provide appropriate guidance for the formulation of fiscal and monetary policy responses to economic developments.[11]

11. For example, the methodology underlying statistical filtering methods, such as the Hodrick-Prescott filter, yields estimates of the output gap that average considerably closer to zero over extended periods.

How Does CBO Project Potential GDP and the Output Gap?

CBO projects potential output by projecting its components: potential labor, capital services, and potential total factor productivity. For those variables, CBO's projections over the next decade are based mainly on its estimates of trends during the most recent full business cycle and the as-yet-incomplete current cycle. CBO's projections account for historical patterns (adjusting for the influence of business cycles on the labor market and productivity), federal fiscal policies under current law, and projected changes in demographics and other factors.

For the first part of CBO's 10-year projection, forecasts of the economy are based on forecasts of cyclical developments as well as potential output. For the second half of the projection period, however, the projections are based only on estimates of potential output and related data series. In particular, CBO forecasts that output will grow at the agency's estimate of the growth of potential output in those years, but that output will be, on average, one-half of one percent short of its potential level. CBO chose that shortfall because it is approximately consistent with the average gap over the complete business cycles (measured trough to trough) that occurred in the half-century from 1961 to 2009—a period during which the economy experienced substantial structural shifts, supply shocks, and policy changes, and which thus reflects a wide variety of conditions. It excludes the highly unusual period of weak recovery since 2009, reflecting CBO's judgment that the zero lower bound will not typically constrain monetary policy during the projection period. Certainly, fluctuations will continue to occur, and the actual output gap will be positive for some extended periods and negative for others, but CBO does not attempt to predict the timing or magnitude of such cyclical fluctuations for more than five years into the future.

What Are the Implications for Other Elements of CBO's Economic Projections?

CBO's projection of an output gap that is, on average, negative has implications for its projections of other economic variables in the second half of the 10-year projection period. One is that the labor market is anticipated to experience some slack, on average, over the period. CBO's projection of the unemployment rate for those years is about one-quarter of a percentage point higher than its projection of the underlying long-term rate of unemployment. That is, CBO expects that, on average, the U.S. economy will experience a positive unemployment gap that is approximately one-half as large in absolute magnitude as the output gap. That projection is consistent with observations of the historical relationship between unemployment gaps and output gaps. Second, CBO expects that, on average, elevated unemployment will lead slightly more people than otherwise to decide not to seek work, resulting in a smaller labor force. A third implication is that the combination of fewer workers and diminished economic activity, on average, will result in slightly lower rates of investment and, over time, a slightly smaller capital stock.

In addition, the slack in the economy will lead to interest rates that are somewhat lower, on average, than would be the case if the economy was operating at potential. CBO projects that the Federal Reserve will maintain a slightly lower federal funds rate, on average, because policymakers generally respond to output and unemployment gaps. A lower federal funds rate, in turn, will tend to lead other interest rates to be lowered as well.

Although CBO estimates that significant slack in the economy puts downward pressure on inflation, the relationship is imprecise and, in recent decades, has been weak—partly because of firmly held beliefs by consumers and businesses that inflation will remain roughly stable over time. As a result, the small average output gap in the second half of CBO's 10-year projection does not have a notable effect on its projection of inflation.

What Are the Implications for CBO's Projections of the Federal Budget?

The output gap that is built into CBO's projections has little net effect on the size of the cumulative federal deficit that the agency projects for the next decade because of two effects that, in the current fiscal setting, happen to largely offset one another. On the one hand, the gap results in slightly lower projected economic activity than would otherwise occur, all else being equal, and so it also results in slightly lower projected income for businesses and workers, on average. Those lower incomes, in turn, imply smaller federal tax revenues. Similarly, with economic output and the labor market projected to exhibit a small amount of slack, on average, federal benefits are projected to be slightly greater than they would be otherwise. On the other hand, the lower average interest rates

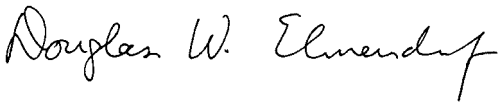
that result from the Federal Reserve's response to slack in the economy also modestly reduce the governments' interest payments (and have other smaller budgetary effects). According to CBO's "rules of thumb" (which give a sense of the way differences in economic variables, if applied in isolation, would affect CBO's budget projections), those effects on revenues and outlays are roughly offsetting, given the amount of federal debt that CBO projects for the next decade under current law.[12]

12. See Congressional Budget Office, *The Budget and Economic Outlook: 2015 to 2025* (January 2015), Appendix C, www.cbo.gov/publication/49892.

Each year, the Congressional Budget Office issues a series of reports on the state of the budget and the economy. This document provides background information that helps to explain the economic projections included in those reports. In keeping with CBO's mandate to provide objective, impartial analysis, this report makes no recommendations.

Robert Shackleton of CBO's Macroeconomic Analysis Division wrote the report with guidance from Robert Arnold and Wendy Edelberg. Kim Kowalewski and Benjamin Page of CBO, Jan Hatzius of Goldman Sachs, and Mark Zandi of Moody's Analytics provided comments. (The assistance of external reviewers implies no responsibility for the final product, which rests solely with CBO.)

Jeffrey Kling and Robert Sunshine reviewed the report, Kate Kelly edited it, and Leah Loversky and Jeanine Rees prepared it for publication. The report is available on CBO's website (www.cbo.gov/publication/49890).



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