CBO

An Evaluation of CBO's Past Deficit and Debt Projections

Percentage of Gross Domestic Product

Errors in CBO's Budget-Year Deficit Projections

— Deficit Error ■ Outlay Error ■ Revenue Error

SEPTEMBER 2019

At a Glance

In this report, the Congressional Budget Office analyzes the baseline projections of deficits and debt held by the public that it has made each spring since 1984. Each of those projections spans the current year (that is, the fiscal year already under way) and five or 10 subsequent years. In this report, CBO reviews its projections for the first and fifth of those subsequent years. The former is called the budget year, and the latter is referred to as the sixth year of the projection period (counting the current year as the first).

CBO's analysis led to these conclusions:

- On average, CBO has slightly overestimated deficits for the budget year (which typically begins about six months after a spring baseline is released) and slightly underestimated deficits for the sixth year. CBO has likewise overestimated debt held by the public at the end of the budget year and underestimated it at the end of the sixth year, on average.

- Overall, CBO's sixth-year projections have been less accurate than its budget-year projections. The sixth-year projections that CBO has made since 2000 have been more accurate than those made in the 1980s and 1990s.

- The dispersion of errors has been much larger for debt projections than for deficit projections because errors in annual debt projections compound over multiyear projections. As a result, greater uncertainty surrounds the debt projections.

- An analysis of past projections indicates that there is a two-thirds chance that, under current law, debt at the end of the budget year would be within 1.7 percent of gross domestic product (GDP) above or below the baseline projection and that debt at the end of the sixth year would be within about 8.6 percent of GDP above or below the baseline projection.

- For years in which CBO could make a comparison, CBO's and the Administration's projection errors were close in size, followed similar patterns, and were larger for years in which recessions began.

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Notes

Unless otherwise indicated, all years referred to in this report are federal fiscal years, which run from October 1 to September 30 and are designated by the calendar year in which they end.

Numbers in the text and tables may not add up to totals because of rounding.

Some of the figures in this report use shaded vertical bars to indicate periods of recession. A recession extends from the peak of a business cycle to its trough.

This analysis was completed in mid-July and does not reflect the historical revision to gross domestic product made by the Bureau of Economic Analysis on July 26, 2019.

Supplemental data are posted along with this report on CBO's website.

An Evaluation of CBO's Past Deficit and Debt Projections

Summary

The Congressional Budget Office regularly publishes baseline projections of federal revenues, spending, deficits, and debt held by the public under the assumption that current laws generally do not change. Those projections typically underlie the budget resolutions prepared by the House and Senate Budget Committees, as well as CBO's cost estimates for proposed legislation, and can also be useful to policymakers seeking to identify and address budgetary trends.

CBO routinely assesses its past estimates to refine its methods and improve its projections. For this analysis, CBO reviewed the baseline projections of deficits and debt held by the public that it made each spring beginning in 1984. Each of those projections spans the current year (that is, the fiscal year already under way) and either five or 10 subsequent years. In this report, CBO reviews its projections for the first and fifth of those subsequent years. The former is called the budget year and typically begins about six months after a spring baseline is released; the latter is referred to as the sixth year of the projection period (counting the current year as the first).

Because CBO does not incorporate the effects of possible legislative changes into its baseline projections, this report focuses on differences between projected and actual deficits that result from nonlegislative factors, such as economic conditions and technical factors. (The effects of legislative changes on deficits and debt are analyzed in Appendix A.) To make the differences easier to compare across years, CBO measured the errors as a percentage of gross domestic product (GDP).

How Do CBO's Projections Compare With Actual Outcomes?

In evaluating its projections, CBO focused on three characteristics.

- **Centeredness,** or the tendency of a set of projections to not err in the same direction, as measured by the average error:

    On average, CBO has overestimated deficits by 0.2 percent of GDP for the budget year and underestimated deficits by 0.1 percent of GDP for the sixth year (see Table 1). In its debt projections, CBO has overestimated by an average of 0.3 percent of GDP for the budget year and underestimated by 0.6 percent of GDP for the sixth year. (Measured in terms of GDP in 2018, which was $20.2 trillion, 0.1 percent was $20 billion, 0.2 percent was $40 billion, and so on.)

- **Accuracy,** or how close projected values are to actual amounts, as measured by the average absolute error and the root mean square error (RMSE):

    The average absolute error of CBO's budget-year and sixth-year projections—that is, the average of all errors without regard to whether they are positive or negative—exceeds the average error because overestimates and underestimates do not offset each other for that measure, as they do in the calculation of average errors. For deficits, the average absolute error in CBO's budget-year projections was 1 percent of GDP, compared with 2 percent of GDP for the sixth-year projections. (In 2018, 1 percent of GDP was about $200 billion.) For debt, the average absolute error in CBO's budget-year projections was 1.7 percent of GDP, compared with 7.1 percent of GDP for the sixth-year projections. The errors in CBO's projections of debt held by the public for both the budget year and the sixth year have been larger than those in its deficit projections because the errors in the projections of debt are largely the

Table 1.

Summary Measures of Errors in CBO's Projections of Deficits and Debt

Percentage of Gross Domestic Product

		Centeredness	Accuracy		Dispersion
	Average Actual Deficit or Debt	**Average Error**	**Average Absolute Error**	**Root Mean Square Error**	**Two-Thirds Spread of Errors**
Deficit Projections					
Budget-year projections	-3.1	0.2	1.0	1.3	2.1
Sixth-year projections	-3.0	-0.1	2.0	2.5	3.8
Debt Projections					
Budget-year projections	48.6	0.3	1.7	2.3	3.3
Sixth-year projections	49.9	-0.6	7.1	8.8	17.2

Source: Congressional Budget Office.

For the average errors, a negative number is an underestimate, and a positive number is an overestimate.

Measures are based on the 34 budget-year projections made for 1985 to 2018 and the 30 sixth-year projections made for 1989 to 2018. (Both sets of projections were made beginning in 1984.)

cumulative effect of multiple years of errors in deficit projections.[1]

For deficits, the RMSE of CBO's projections was 1.3 percent of GDP for the budget year and 2.5 percent of GDP for the sixth year. For the projections of debt, the RMSE was 2.3 percent of GDP for the budget year and 8.8 percent of GDP for the sixth year.

- **Dispersion**, or the size of the range of the projection errors, as indicated by the two-thirds spread of errors:

  The two-thirds spread of errors in CBO's deficit and debt projections is larger for the sixth-year projections than for the budget-year ones. In addition, the two-thirds spread of errors for CBO's debt projections is significantly larger than that for projected deficits—again, because errors in projections of debt held by the public compound each year.

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1. Other factors—collectively labeled "other means of financing" and not directly included in the budget totals—also affect the government's debt. Those factors include the cash flows associated with federal credit programs, such as student loans, as well as changes in the government's cash balances.

What Factors Have Contributed to Differences Between CBO's Projections and Actual Outcomes?

Two factors that have a significant bearing on the differences between CBO's projections and actual deficits are whether a projection was made at the start of a recession and whether the errors in revenue and outlay projections had offsetting effects. Errors in the budget-year projections of the deficit were significantly larger when they were made during years near the beginning of economic downturns (see Figure 1). Those larger errors occurred mostly because CBO overestimated revenues for the following years. And the sixth-year deficit projections CBO made for 1989 to 2002, when the outlay and revenue errors compounded, tended to have larger errors than those made for 2009 to 2018, when the outlay and revenue errors tended to offset each other. Overall, for both the budget-year and sixth-year projections, the outlay errors and the revenue errors have partly offset each other, on average, leading to smaller errors in the deficit projections (see Table 2).

How Do CBO's Projections Compare With Those of the Administration?

To assess its estimates, CBO compared its budget-year projections with those of the Administration. For years in which CBO could make a comparison, CBO's and the Administration's projection errors were close in size, followed similar patterns, and were larger for years near the beginning of economic downturns. CBO could not

Figure 1.

Deficit and Debt Errors in CBO's Budget-Year and Sixth-Year Projections

Percentage of Gross Domestic Product

Deficit Errors

Debt Errors

Source: Congressional Budget Office.

Budget-year projections are for 1985 to 2018; sixth-year projections are for 1989 to 2018. (Both sets of projections were made beginning in 1984.)

A positive number means that the deficit or amount of debt was smaller than CBO projected; a negative number means the opposite.

Table 2.

Contribution of Outlay and Revenue Errors to Deficit Errors in CBO's Budget-Year and Sixth-Year Projections

Percentage of Gross Domestic Product

	Average Error	Average Absolute Error	Root Mean Square Error
Budget-Year Projections			
Deficit error	0.2	1.0	1.3
Outlay error	0.4	0.5	0.6
Revenue error	-0.1	0.8	1.1
Sixth-Year Projections			
Deficit error	-0.1	2.0	2.5
Outlay error	0.7	1.2	1.4
Revenue error	-0.8	1.7	2.0

Source: Congressional Budget Office.

For the average errors, a negative number is an underestimate, and a positive number is an overestimate.

Measures are based on the 34 budget-year projections made for 1985 to 2018 and the 30 sixth-year projections made for 1989 to 2018. (Both sets of projections were made beginning in 1984.)

compare errors for certain years or for longer periods because of limitations in the available data.

Background

CBO constructs its baseline projections of federal outlays and revenues—and the resulting deficits and debt held by the public—under the assumption that current laws will generally remain unchanged.[2] Those projections are

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2. CBO constructs its baseline in accordance with provisions set forth in the Congressional Budget and Impoundment Control Act of 1974 and the Balanced Budget and Emergency Deficit Control Act of 1985, as amended by the Balanced Budget Act of 1997. Section 257 of the Deficit Control Act specifies some exceptions to the requirement that baseline projections reflect the assumption that current laws remain unchanged. For example, the law requires CBO to project discretionary funding for future years on the basis of the most recent appropriations, with adjustments for inflation. The law also requires that CBO's baseline incorporate the assumption that expiring excise taxes dedicated to trust funds will be extended. In addition, the law requires CBO to assume full funding of entitlement authority. Another exception relates to mandatory programs whose authorization expires during the baseline period. All such programs that predate the Balanced Budget Act and have outlays greater than $50 million in the year in which they expire are assumed to continue in CBO's baseline projections. For mandatory programs established after 1997, continuation is

not intended to predict budgetary outcomes. Rather, they reflect CBO's best assessment about what the economy and the budget would look like in future years under existing laws. That approach allows the baseline to serve as a benchmark against which the effects of proposed legislation or alternative policies can be measured. CBO generally releases its baseline budget projections three times a year: near the beginning of the calendar year, in the spring (to coincide with the agency's estimate of the effects of the President's budgetary proposals), and in late summer.

A deficit results when outlays exceed revenues, but revenues that exceed outlays result in a surplus. In 30 of the 34 years examined in this analysis, the federal government has incurred a deficit. For that reason, this report refers to the projection of a surplus or deficit as a deficit projection.

To make projections of outlays, revenues, deficits, and debt comparable over different periods, CBO divides those projections by projected GDP for each year. Similarly, the projection errors examined in this report are presented in percentage points of GDP. Over the 1985–2018 period analyzed in this report, outlays averaged 20.4 percent of GDP, revenues averaged 17.3 percent of GDP, deficits averaged 3.1 percent of GDP, and debt held by the public averaged 48.6 percent of GDP.

CBO's Method for Assessing Its Projections

CBO routinely assesses its past estimates—periodically issuing reports examining its economic, revenue, and outlay projections—to refine its methods and improve the accuracy of its future projections.[3] This report focuses on projections made for the second year of each projection period (often called the budget year), which usually begins about six months after a baseline is released, and for the sixth year.

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   assessed on a program-by-program basis, in consultation with the House and Senate Budget Committees. For more details, see Congressional Budget Office, *How CBO Prepares Baseline Budget Projections* (February 2018), www.cbo.gov/publication/53532.

3. For more details, see Congressional Budget Office, *CBO's Economic Forecasting Record: 2019 Update* (forthcoming), www.cbo.gov/publication/55505, *The Accuracy of CBO's Baseline Estimates for Fiscal Year 2018* (December 2018), www.cbo.gov/publication/54872, *An Evaluation of CBO's Past Outlay Projections* (November 2017), www.cbo.gov/publication/53328, and *CBO's Revenue Forecasting Record* (November 2015), www.cbo.gov/publication/50831.

This analysis of deficit and debt projections uses estimates that CBO released in the spring of each year. That time frame was selected because the budgetary effects of legislation being considered by the Congress are typically measured in relation to those estimates. CBO chose to focus on evaluating its budget-year and sixth-year projections because the sample size of errors for longer projection periods was too small. (CBO did not extend its baseline beyond six years until late 1995.)

To assess its past projections of deficits and debt, CBO compared projected amounts, adjusted to reflect subsequent legislation, with actual deficits and debt. To adjust the projections of deficits and debt to include the effects of subsequent legislation, this analysis relies on the legislative changes to CBO's budget projections that are described in the annual *Budget and Economic Outlook* and updates to that report that are published each year. Typically, those changes reflect CBO's estimates of costs or savings around the time the relevant legislation was enacted. The actual budgetary effects of legislation, however, may well have differed from those estimates. If so, those differences are reflected in this analysis as errors in the baseline projections.[4] (For more details, see Appendix B.)

Like CBO's previous analyses of its forecasts and projections, this evaluation of the agency's deficit and debt projections focuses on three characteristics: centeredness, accuracy, and dispersion.

Centeredness

CBO aims to provide a baseline projection of deficits that is centered—in other words, one that is equal to the actual amount, on average. To measure centeredness, CBO uses the average error (the arithmetic mean of the projection errors), which is the simplest measure of the tendency of a set of projections to err in a particular direction. If a set of deficit projections is centered, then

overestimates in some years will in all likelihood be offset by underestimates in other years.

Although useful, the average error provides an imperfect assessment on its own because the positive values of overestimates offset the negative values of underestimates. For example, a number of projections with small errors in both directions that largely offset one another would produce a small average error. But so, too, would relatively large overestimates and underestimates, as long as they were approximately the same size and counterbalanced one another. To overcome that limitation, CBO also examines the accuracy and dispersion of its projections.

Accuracy

The accuracy of a set of projections is the degree to which projected values differ from actual outcomes. In its evaluations of forecast and projection accuracy, CBO uses two standard measures of accuracy: the average absolute error and the root mean square error. The average absolute error is the arithmetic mean of the errors without regard to the sign of the error. (The negative signs are removed from underestimates before averaging, so errors in different directions do not offset one another.) The RMSE also measures the size of errors without regard to direction, but by squaring the errors, that measure weights larger errors more heavily.[5]

Dispersion

CBO's primary measure of dispersion is the two-thirds spread of errors. It is calculated as the difference between the minimum and maximum errors after removing the largest (most positive) and the smallest (most negative) one-sixth of the errors. Two-thirds spreads that are larger imply greater variability in projection errors, whereas those that are smaller imply a narrower range of errors. If CBO's past errors are a guide to its future ones, then the two-thirds spread of CBO's historical errors can be used to explain the uncertainty surrounding CBO's

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4. For example, CBO's initial estimate of the 10-year costs of Medicare Part D (the prescription drug program) was too high; actual costs turned out to be much smaller than CBO had estimated, because of lower-than-expected enrollment and slower growth in national drug spending. As a result, the effect of that legislation on the deficit appears larger in this analysis than it actually was. See Congressional Budget Office, *Competition and the Cost of Medicare's Prescription Drug Program* (July 2014), www.cbo.gov/publication/45552. In most cases, however, the actual effects of legislation cannot be clearly identified.

5. The RMSE is calculated by squaring the projection errors, averaging those squares, and taking the square root of that average. The mean square projection error is equal to the square of the statistical bias in the errors plus the variance (that is, the square of the standard deviation) of the errors. Because the projection errors in this assessment are measured as a percentage of GDP, the RMSE measurement reported here is often referred to as the root mean square percentage error. Likewise, the average absolute error reported in this assessment is often referred to as the average absolute percentage error.

Table 3.

Measures of the Centeredness of CBO's Deficit Projections

Percentage of Gross Domestic Product

	Average Projected Deficit	Average Actual Deficit	Average Projection Error	Share of Overestimates (Percent)
Budget-Year Projections	-3.4	-3.1	0.2	71
Sixth-Year Projections	-2.9	-3.0	-0.1	53

Source: Congressional Budget Office.

For the average errors, a negative number is an underestimate, and a positive number is an overestimate.

Measures are based on the 34 budget-year projections made for 1985 to 2018 and the 30 sixth-year projections made for 1989 to 2018. (Both sets of projections were made beginning in 1984.)

projections. For instance, if the two-thirds spread of deficit projection errors is 4 percent of GDP and CBO projects a deficit of 3 percent of GDP, then there is a two-thirds chance that the actual deficit under current law would turn out to be between 1 percent and 5 percent of GDP (in other words, within 2 percentage points in either direction).

Assessing CBO's Deficit Projections

CBO's projections of deficits for the budget year have been slightly too high, on average, whereas its projections for the sixth year have been slightly too low (see Table 3). Projections for the budget year have been closer to actual outcomes than those for the sixth year, primarily because changes in the economy and various other factors are more difficult to anticipate over longer time horizons.

Budget-Year Projections

CBO's budget-year projections of deficits have generally been too high. The largest errors in CBO's deficit projections, however, have been underestimates for years at the beginning of economic downturns (see Figure 2). Errors in CBO's budget-year projections of revenues have contributed more to deficit projection errors than errors in projections of outlays.

Centeredness. In the budget-year projections that CBO made for 1985 to 2018, the agency was more likely to overestimate total deficits (excluding the effects of legislative changes) than to underestimate them. CBO overestimated deficits in 24 of those 34 projections, with an average error equal to 0.2 percent of GDP.[6] For comparison, deficits during those years averaged 3.1 percent of GDP.

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6.   For comparison, GDP was $20.2 trillion in 2018; 0.1 percent of that amount was $20 billion, 0.2 percent was $40 billion, and so on. One percentage point of GDP was about $200 billion.

Accuracy. That relatively small average error of 0.2 percent of GDP does not capture the substantial amount of offsetting that occurred between the overestimates and underestimates of deficits in CBO's projections. For the budget-year projections CBO made for 1985 to 2018, the average absolute error was 1.0 percent of GDP, and the RMSE was 1.3 percent of GDP.

Dispersion. The two-thirds spread of errors for the budget-year projections was 2.1 percent of GDP, ranging from an underestimate of 0.7 percent of GDP to an overestimate of 1.5 percent of GDP. On the basis of those historical errors, CBO estimates that there is a two-thirds chance that, under current law, future budget-year deficits would be within a range that is 1.1 percent of GDP above or below the baseline projection.

Deficit Errors Near the Beginning of Economic Downturns. Unanticipated economic downturns led to some significant underestimates of budget-year deficits. When the budget-year projection was released in a year that marked the beginning of an economic downturn (1990, 2001, or 2008), the average deficit error was nearly 3 percent of GDP, greatly exceeding the average error of 0.5 percent of GDP for all other projection years (see Figure 3). That dramatically larger error at the start of downturns was caused by overestimates of revenues that averaged more than 2.5 percent of GDP. (For all other projections, by contrast, the average revenue error was a slight underestimate of 0.1 percent of GDP.)

In 2001, for example, CBO projected that revenues in 2002 (after adjusting for the effects of legislation) would equal $2.15 trillion. That amount overestimated actual revenues, which totaled $1.85 trillion, by nearly 3 percent of GDP. The reason for that overestimate

Figure 2.

Contribution of Outlay and Revenue Errors to Deficit Errors in CBO's Budget-Year Projections

Percentage of Gross Domestic Product
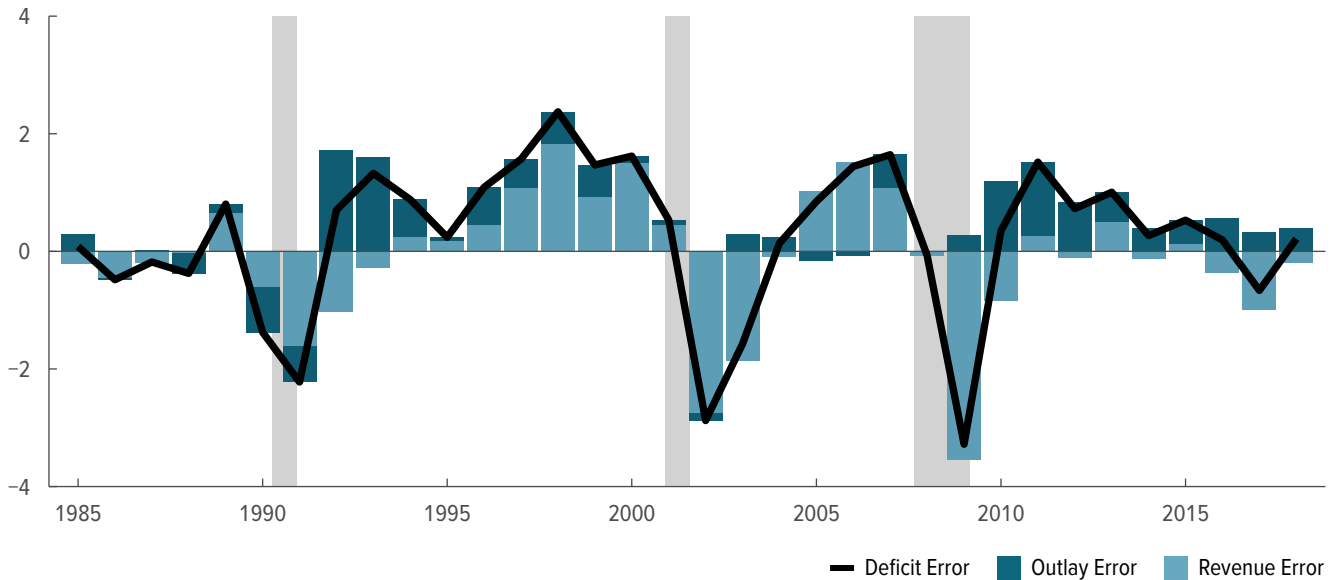
Source: Congressional Budget Office.

Budget-year projections are for 1985 to 2018. (Those projections were made beginning in 1984.)

Revenue and outlay errors are shown in terms of their contribution to the deficit error. For example, a revenue overestimate is shown as a deficit underestimate, and an outlay overestimate is shown as a deficit overestimate.

was the recession that began in March 2001 and lasted through November 2001—a recession that CBO had not predicted in preparing its economic forecast in 2001. As a result of that recession, economic activity in 2002 was weaker than CBO had anticipated, which in turn resulted in less tax revenue. The largest decrease was in individual income taxes, which generated nearly $200 billion less than projected. Although the recession occurred in 2001, the effects on revenues were greatest in the following year. That is because lags between economic activity and the payment of taxes cause the largest shortfalls in revenues to occur after a recession has already begun.

Sixth-Year Projections

CBO's sixth-year deficit projections have been more centered but less accurate than its budget-year projections. For the past 10 years, revenue and outlay errors have tended to partially offset each other. Overall, errors in CBO's sixth-year projections of revenues have contributed more to deficit projection errors than errors in projections of outlays have (see Figure 4). Errors in the

sixth-year deficit projections have tended to have the same sign as those for the year before—that is, underestimates have typically been followed by underestimates, and overestimates by overestimates.

Centeredness. Of the 30 sixth-year projections that CBO evaluated, 16 were overestimates (exceeding actual deficits) and 14 were underestimates. On average, the sixth-year projections underestimated actual deficits by 0.1 percent of GDP, a smaller error than that for the budget-year projections. (Actual deficits during those years averaged 3.0 percent of GDP.)

Accuracy. As with the budget-year projections, offsetting effects of underestimates and overestimates resulted in the small average error in CBO's sixth-year projections of deficits. Measures of accuracy that ignore those offsetting effects show that the longer-term projections were, as expected, much less accurate than the budget-year projections. For the sixth-year projections made for 1989 to 2018, the average absolute error was 2.0 percent of GDP, and the RMSE was 2.5 percent of GDP.

Figure 3.

Deficit Errors in CBO's Budget-Year Projections Produced Near the Beginning of Economic Downturns
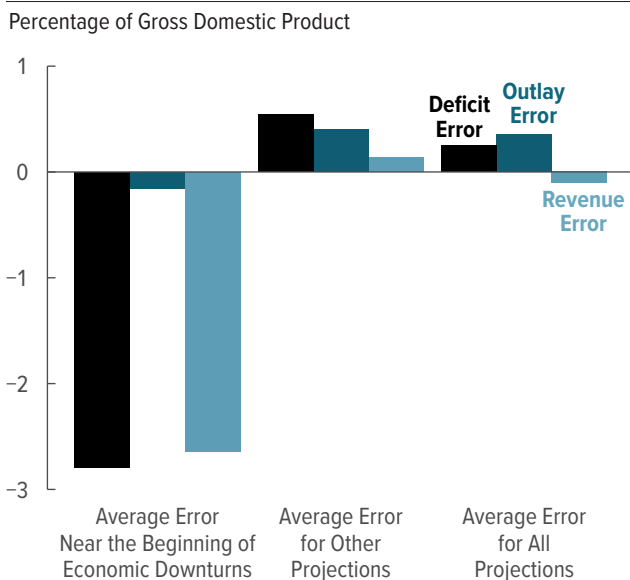
Percentage of Gross Domestic Product

Source: Congressional Budget Office.

Budget-year projections are for 1985 to 2018. (Those projections were made beginning in 1984.)

The projections produced near the beginning of economic downturns include those published near the beginning of calendar years 1990, 2001, and 2008 (for fiscal years 1991, 2002, and 2009, respectively).

Revenue and outlay errors are shown in terms of their contribution to the deficit error. For example, a revenue overestimate is shown as a deficit underestimate, and an outlay overestimate is shown as a deficit overestimate.

Dispersion. The two-thirds spread of the sixth-year projection errors was 3.8 percent of GDP, ranging from an underestimate of 2.4 percent of GDP to an overestimate of 1.4 percent of GDP. Analysis of past projections indicates that future sixth-year deficits have a two-thirds chance of falling within 1.9 percent of GDP above or below the baseline projection if current laws generally remained unchanged.

Recent Improvement in Deficit Projections. CBO's sixth-year deficit projections have improved in accuracy over the period examined in this analysis. For the projections that CBO made for 1989 to 2002, the outlay and revenue errors compounded, resulting in an absolute error equal to 3.1 percent of GDP, on average. For the projections that CBO made for years since 2009,

however, the outlay and revenue errors tended to offset each other, resulting in a substantially smaller average absolute error (1.1 percent of GDP).

That pattern stems from two primary factors. First, economic growth was slower than expected after the 2007–2009 recession. CBO did not anticipate such a prolonged recovery and thus overestimated economic growth (and the resulting revenues).[7] Second, since 1997, CBO has tended to overestimate total outlays, largely because of overestimates of net interest outlays. Although such spending made up only about 8 percent of all outlays over the 1997–2016 period, it accounted for roughly 70 percent of the total difference between estimated outlays and actual amounts.[8] The slow recovery also contributed in part to the lower-than-expected interest rates that caused CBO to overestimate net interest outlays.

Serial Correlation in CBO's Projection Errors

Past analyses of CBO's projections have demonstrated that some of CBO's projection errors are positively serially correlated—that is, they tend to have the same direction as the error in the year before.[9] That correlation may be a result of how CBO constructs its baseline. In many cases, the agency generally expects that historical trends will prevail until there is clear evidence of a change or that as-yet-unknown factors causing outlays and revenues to deviate from historical trends will dissipate gradually over a projection period.[10] Several consecutive deviations from past trends may be needed for CBO to recognize that the trend in a particular outlay category or revenue source is changing, however, and adjust its projections accordingly.

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7. For more details, see Congressional Budget Office, *CBO's Economic Forecasting Record: 2019 Update* (forthcoming), www.cbo.gov/publication/55505.

8. See Congressional Budget Office, *An Evaluation of CBO's Past Outlay Projections* (November 2017), www.cbo.gov/publication/53328.

9. See Rudolph G. Penner, "Federal Revenue Forecasting," in Penner, ed., *Handbook of Government Budget Forecasting* (Taylor & Francis, 2008); and Alan J. Auerbach, "On the Performance and Use of Government Revenue Forecasts," *National Tax Journal*, vol. 52, no. 4 (December 1999), pp. 767–782, http://tinyurl.com/pqxq8an.

10. See Congressional Budget Office, *How CBO Prepares Baseline Budget Projections* (February 2018), www.cbo.gov/publication/53532.

Figure 4.

Contribution of Outlay and Revenue Errors to Deficit Errors in CBO's Sixth-Year Projections

Percentage of Gross Domestic Product
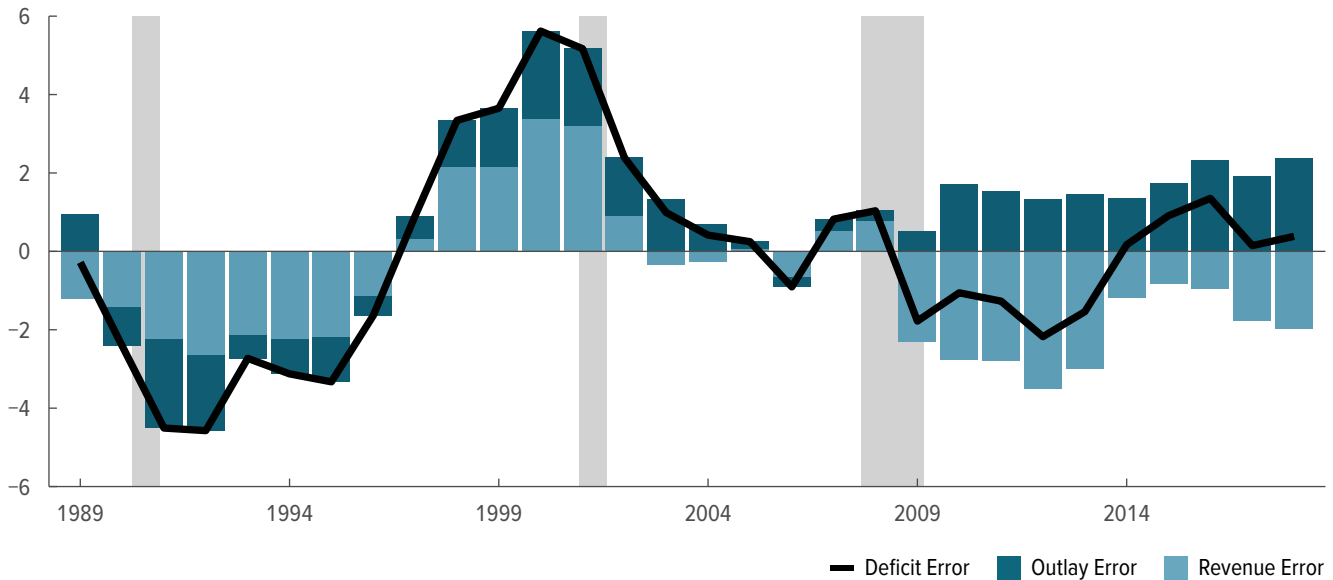
Source: Congressional Budget Office.

Sixth-year projections are for 1989 to 2018. (Those projections were made beginning in 1984.)

Revenue and outlay errors are shown in terms of their contribution to the deficit error. For example, a revenue overestimate is shown as a deficit underestimate, and an outlay overestimate is shown as a deficit overestimate.

An analysis of the serial correlation in CBO's projection errors indicates that the budget-year projections of deficits are influenced less by the previous year's projection and thus may incorporate new information better than the sixth-year projections.[11] That finding suggests that CBO's shorter-term projections are more responsive to short-term changes, but its long-term projections, which rely more on historical trends, take longer to reflect new information.

That is true for CBO's projections of net interest outlays. CBO has overestimated interest rates since 1997, causing the agency's projections of interest costs to be too high.

Errors for the projections of net interest outlays made for budget years have been considerably smaller than those made for sixth years, however. That outcome is partly a result of errors in projections of interest rates over longer periods, but it also reflects the slow incorporation of lower-than-expected actual interest rates into the sixth-year projections. As interest rates turned out to be lower than projected, CBO adjusted its sixth-year projections downward but not by enough, because those forecasts incorporated the agency's assessment that interest rates would rise toward historical levels.

To address that serial correlation, CBO could incorporate new data more quickly into its longer-term projections of revenues and outlays. That approach would probably make projections more responsive to new information and less anchored to long-term historical trends. Although that approach would lessen serial correlation in projection errors, it would make CBO's baseline budget projections more volatile, resulting in larger changes from one baseline to the next. That approach also might make the projections less accurate. CBO has found that in the

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11. To test for serial correlation, CBO calculated the Durbin-Watson statistic for the projection errors. For errors in the sixth-year deficit projections, the Durbin-Watson value was 0.33, which indicates positive serial correlation. That means an overestimate in one year was likely to be followed by an overestimate in the next year or, conversely, an underestimate was likely to be followed by another underestimate. For the budget-year projection errors, the Durbin-Watson value was 1.24, which suggests little positive serial correlation. (The statistic always results in a value between zero and 4. Values close to zero indicate positive serial correlation, whereas values close to 4 indicate negative serial correlation. Values close to 2 indicate no serial correlation.)

Table 4.

Measures of the Centeredness of CBO's Debt Projections

Percentage of Gross Domestic Product

	Average Projected Debt	Average Actual Debt	Average Projection Error	Share of Overestimates (Percent)
Budget-Year Projections	48.8	48.6	0.3	62
Sixth-Year Projections	49.4	49.9	-0.6	40

Source: Congressional Budget Office.

For the average errors, a negative number is an underestimate, and a positive number is an overestimate.

Measures are based on the 34 budget-year projections made for 1985 to 2018 and the 30 sixth-year projections made for 1989 to 2018. (Both sets of projections were made beginning in 1984.)

case of income taxes, weighting historical trends more heavily has tended to minimize forecast errors.[12]

Assessing CBO's Debt Projections

Like its deficit projections, CBO's projections of debt held by the public for the budget year have been too high, on average, whereas its projections for the sixth year have been too low. Because the errors in CBO's sixth-year projections of debt largely represent the cumulative effects of six years of errors in the deficit projections, the average absolute error of 7.1 percent of GDP for those debt projections has been much larger than the absolute error of 2.0 percent of GDP for the sixth-year deficit projections.

Budget-Year Projections

Although CBO has tended to overestimate debt held by the public for the budget year, its largest errors in budget-year projections of debt have been underestimates that were made near the beginning of economic downturns.

Centeredness. In the 34 projections for the budget year that CBO made for 1985 to 2018, the agency overestimated the amount of debt held by the public 62 percent of the time (21 overestimates compared with 13 underestimates). The average error in projections made for those years was an overestimate of 0.3 percent of GDP. For comparison, debt held by the public during those years averaged 48.6 percent of GDP (see Table 4).

Accuracy. The small average error in CBO's projections of debt is the result of larger but offsetting underestimates and overestimates. Focusing on just the size of the errors, CBO finds that the average absolute error for the budget-year projections of debt held by the public was 1.7 percent of GDP, and the RMSE was 2.3 percent of GDP. The average absolute error was larger for the budget-year projections of debt than for the projections of deficits because the debt projections reflected errors in deficit projections for both the current year and the budget year.

Dispersion. The two-thirds spread of the budget-year projection errors of debt was 3.3 percent of GDP, ranging from an underestimate of 1.1 percent of GDP to an overestimate of 2.2 percent of GDP. Analysis of past projections indicates that there is a two-thirds chance that debt at the end of a budget year will be within 1.7 percent of GDP above or below the baseline projection if current laws generally remained unchanged.

Debt Errors Near the Beginning of Economic Downturns. In CBO's budget-year projections, large overestimates of revenues near the beginning of economic downturns triggered underestimates of debt. When the budget-year projection was released in a year that marked the beginning of an economic downturn (1990, 2001, or 2008), the average error was an underestimate of 5.4 percent of GDP. For all other projection years, the average error was an overestimate of 0.8 percent of GDP.

Sixth-Year Projections

CBO's sixth-year debt projections have been less centered and less accurate than its budget-year projections.

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12. See Congressional Budget Office, *Improving CBO's Methodology for Projecting Individual Income Tax Revenues* (February 2011), www.cbo.gov/publication/22007.

Table 5.

An Example of the Effects of Compounding Deficit Errors on Debt

Percentage of Gross Domestic Product

	2011 (Current year)	2012 (Budget year)	2013 (Third year)	2014 (Fourth year)	2015 (Fifth year)	2016 (Sixth year)	Sum of Deficit Projection Errors	Six-Year Debt Projection Error
Deficit Errors in CBO's March 2011 Baseline Projections	0.6	0.7	1.1	1.1	1.5	1.4	6.4	6.3

Source: Congressional Budget Office.

Compared with its sixth-year deficit projections, CBO's projections of debt for the sixth year have been much less accurate—again, because of the compounding of annual errors over time.

Centeredness. The majority of the 30 sixth-year projections that CBO made for 1989 to 2018 underestimated the amount of debt held by the public. The average error of the sixth-year projections was an underestimate of 0.6 percent of GDP.

Accuracy. That relatively small average error does not reflect the accuracy of CBO's projections, because large overestimates and underestimates offset each other during the years included in this analysis. For the sixth-year projections of debt, the average absolute error was 7.1 percent of GDP, and the RMSE was 8.8 percent of GDP.

Dispersion. Just as the errors in the sixth-year debt projections—expressed as a percentage of GDP—are much larger than those in the deficit projections for that year, the two-thirds spread of the sixth-year projection errors is much larger. Ignoring the highest and lowest one-sixth of the values, the error in the sixth-year debt projections ranged from an underestimate of 9.4 percent of GDP to an overestimate of 7.9 percent of GDP, resulting in a two-thirds spread of 17.2 percent of GDP. Analysis of past projections indicates that debt at the end of the sixth year has a two-thirds chance of being within about 8.6 percent of GDP above or below the baseline projection if current laws generally remained unchanged.

Debt Errors Compound Over Longer-Term Projections. The average absolute errors for the sixth-year debt projections are much larger than those for the deficit projections because they are largely the cumulative effect of several years of errors in deficit projections, and the errors in those several years have often been in the same direction. In the same way that the effects of legislation must be applied cumulatively in the debt projection, the errors in each year of the sixth-year debt projection affect the accuracy of the entire projection. An error in the first year of the debt projection will make the starting point of the debt projection in the second year incorrect. Thus, a string of consecutive deficit errors in the same direction (either several underestimates or overestimates in a row) will compound, and the final year of the sequence will have a debt error that is roughly equal to the sum of the deficit errors in each year. For example, for the projections that CBO made in March 2011, the sum of the six deficit errors (for the current year, the budget year, and the following four years) roughly equals the error for the sixth-year debt projection (see Table 5).

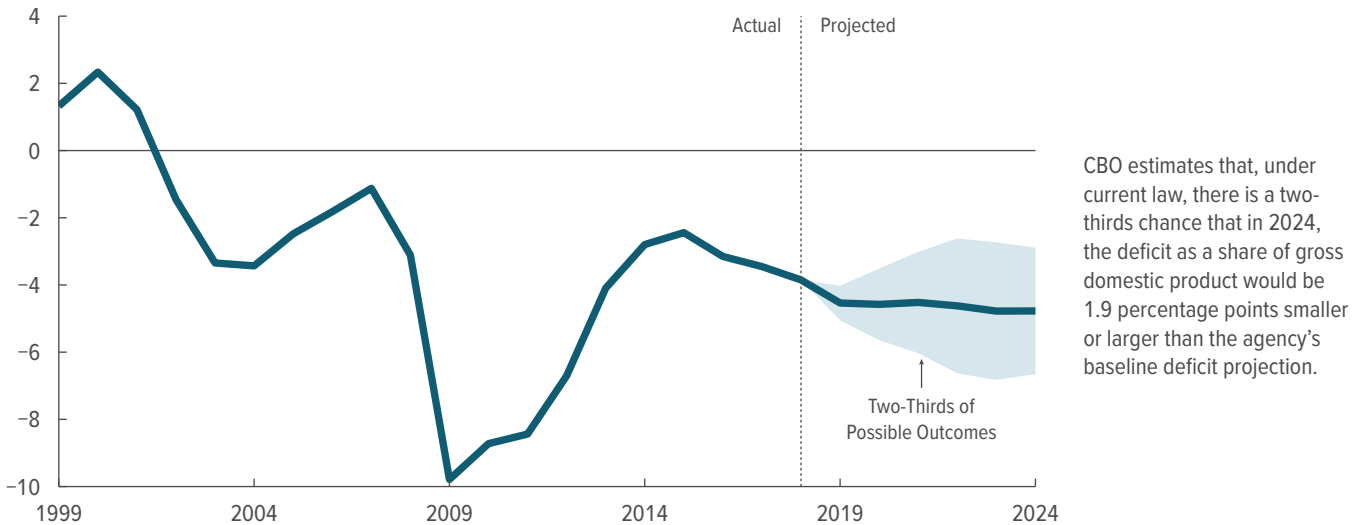## Comparing CBO's and the Administration's Deficit Projections

In addition to evaluating its own record, CBO compared its budget-year projections with those released by the Administration's Office of Management and Budget (OMB). For years for which comparable projections are available—1992 to 2017—CBO's deficit errors have been similar to OMB's errors for budget-year projections. CBO's average error over that period was 0.46 percent of GDP, and the Administration's was 0.53 percent of GDP—a difference that would have been about $15 billion in 2018. The average absolute errors for both the Administration's and CBO's projections were 1.1 percent of GDP. Over the 1992–2017 period, the annual deficit averaged 2.9 percent of GDP.

The Administration publishes baseline projections when it submits its budget to the Congress. In many years of the period analyzed in this report, the Administration published an adjusted baseline that incorporated the estimated effects on outlays and revenues of certain proposals that had not yet been enacted, along with

Figure 5.

Uncertainty of CBO's Deficit Projections

Percentage of Gross Domestic Product

CBO estimates that, under current law, there is a two-thirds chance that in 2024, the deficit as a share of gross domestic product would be 1.9 percentage points smaller or larger than the agency's baseline deficit projection.

Source: Congressional Budget Office.

The shaded area around CBO's baseline deficit projection, which encompasses two-thirds of possible outcomes, is based on the errors in CBO's one-, two-, three-, four-, five-, and six-year projections of the deficit for fiscal years 1985 to 2018.

Actual outcomes will be affected by legislation enacted in future years. The effects of future legislation are not reflected in this figure.

When October 1 (the first day of the fiscal year) falls on a weekend, certain payments that would have ordinarily been made on that day are instead made at the end of September and thus are shifted into the previous fiscal year. All projections presented here have been adjusted to exclude the effects of those timing shifts.

other adjustments. To make projections that included those adjustments comparable to its own baseline projections, CBO removed those adjustments from the Administration's estimates. Additionally, CBO removed outlays related to Fannie Mae and Freddie Mac from both sets of baseline projections.[13]

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13. The Administration treats Fannie Mae and Freddie Mac as nongovernmental organizations and records payments between the Treasury and the two entities on a cash basis. By contrast, CBO projects the budgetary impact of the two entities' operations in future years as if they were being conducted by a federal agency because of the degree of management and financial control that the government exercises over them. CBO therefore estimates the net lifetime costs—specifically, the subsidy costs adjusted for market risk—of the guarantees that those entities will issue and of the loans that they will hold and shows those costs as federal outlays in the year of issuance. However, to provide CBO's most accurate estimate of what the Treasury will ultimately report as the federal deficit for the current year, CBO's baseline includes an estimate of the cash receipts from the two entities to the Treasury for 2019. See Congressional Budget Office, *Fannie Mae, Freddie Mac, and the Federal Role in the Secondary Mortgage Market* (December 2010), www.cbo.gov/publication/21992, and *CBO's Budgetary Treatment of Fannie Mae and Freddie Mac* (January 2010), www.cbo.gov/publication/41887.

CBO was able to compare only its budget-year baseline projections with those of the Administration. In the *Analytical Perspectives* volume that it publishes annually along with the budget, the Administration provides information on differences between its budget-year baseline projections and actual outlays and revenues for broad categories in the budget. That comparison allows CBO to isolate which differences are attributable to legislative changes and which are attributable to errors in OMB's budget-year projections. The Administration does not provide comparable baseline estimates or the detail necessary to make its sixth-year projections comparable with CBO's projections.

Quantifying the Uncertainty in CBO's Deficit and Debt Projections
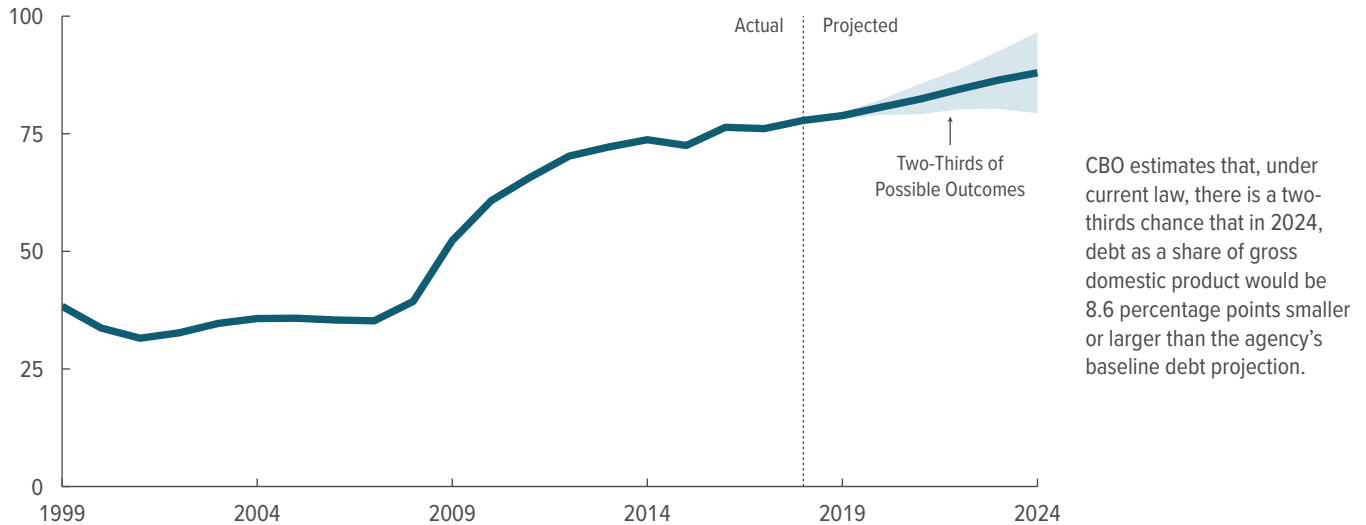
This analysis of errors in deficit and debt projections allows CBO to better quantify the uncertainty in its baseline projections. Beginning in its 2019 *Budget and Economic Outlook*, CBO presented a range of deficit and debt projections based on historical errors in its baseline

Figure 6.

Uncertainty of CBO's Debt Projections

Percentage of Gross Domestic Product

Actual   Projected

Two-Thirds of
Possible Outcomes

CBO estimates that, under current law, there is a two-thirds chance that in 2024, debt as a share of gross domestic product would be 8.6 percentage points smaller or larger than the agency's baseline debt projection.

Source: Congressional Budget Office.

The shaded area around CBO's baseline debt projection, which encompasses two-thirds of possible outcomes, is based on the errors in CBO's one-, two-, three-, four-, five-, and six-year projections of the deficit for fiscal years 1985 to 2018.

Actual outcomes will be affected by legislation enacted in future years. The effects of future legislation are not reflected in this figure.

When October 1 (the first day of the fiscal year) falls on a weekend, certain payments that would have ordinarily been made on that day are instead made at the end of September and thus are shifted into the previous fiscal year. All projections presented here have been adjusted to exclude the effects of those timing shifts.

projections.[14] The intent of presenting that range is to emphasize the uncertainty inherent in budget projections and to attempt to quantify and help readers better understand the magnitude of that uncertainty.

Uncertainty of Deficit Projections

For deficits, the range and the uncertainty are larger for sixth-year projections than for budget-year projections.[15] In its August 2019 baseline, CBO projected a deficit of 4.6 percent of GDP in 2020 (the budget-year projection) and 4.8 percent of GDP in 2024 (the sixth-year projection). (For those projections, outlays have been adjusted

to remove the effects of shifts in the timing of certain payments.) Analysis of past projections indicates that there is a two-thirds chance that, if current laws generally remained unchanged, the deficit would be between 3.5 percent and 5.6 percent of GDP in 2020. For 2024, the range is larger—between 2.9 percent and 6.7 percent of GDP (see Figure 5).

Uncertainty of Debt Projections

Again, the range and the uncertainty of CBO's debt projections is much larger for the sixth-year projections than for the budget-year ones. In CBO's August 2019 baseline, debt held by the public is projected to equal 81 percent of GDP in 2020 (the budget year) and 88 percent of GDP in 2024 (the sixth year). Analysis of past projections indicates that, if current laws generally remained unchanged, there is a two-thirds chance that the debt would be between 79 percent and 82 percent of GDP in 2020 and between 79 percent and 97 percent of GDP in 2024 (see Figure 6).

14. See Congressional Budget Office, *The Budget and Economic Outlook: 2019 to 2029* (January 2019), www.cbo.gov/publication/54918.

15. Figures 5 and 6 rely on the two-thirds spread of historical projection errors for the current year through the sixth year. Numeric values for those two-thirds spreads, along with the average errors, average absolute errors, and the RMSEs for each projection year, are available in Appendix C.

The Effects of Legislation on Budgetary Outcomes

The Congressional Budget Office's baseline projections are not intended to predict budgetary outcomes. Rather, they reflect CBO's best assessment of what the economy and the budget would look like in future years under existing laws. That approach allows the baseline to serve as a benchmark against which the effects of proposed legislation or alternative policies can be measured. This report focuses on analyzing how well CBO has projected deficits and debt after adjusting the projections to account for the estimated effects of legislation (including associated debt-service effects) enacted after a projection was published. (That is the same approach used in CBO's analyses of its revenue and outlay projections.)

This appendix examines how legislation altered deficits and debt compared with CBO's projections under then-existing laws.[1]

Effects of Legislation on Deficits and Debt

For the years covered by this analysis—1985 to 2018—legislation enacted after CBO's projections were published substantially increased both deficits and debt, on net. Those increases are concentrated in projections covering the most recent 20 years.

Relative to the sixth-year deficit projections made for the 1989–1998 period, legislative changes *decreased* the deficit by an average of 2 percent of gross domestic product (GDP), CBO estimates. During that period, major legislation that reduced deficits and debt included the following:

- **The 1990 budget agreement.** That package of spending decreases and tax increases was estimated

to reduce the deficit by a total of $423 billion from 1991 to 1995.[2]

- **The Omnibus Budget Reconciliation Act of 1993.** That law was estimated to reduce deficits by a total of $386 billion from 1994 to 1998.[3]

Relative to the sixth-year projections made for 1999 and later, however, legislative changes have *increased* the deficit for the sixth year by an estimated 3.4 percent of GDP, on average (see Figure A-1).

Over the past two decades, legislation that has increased deficits and debt included the following:

- **The tax cuts that were enacted in 2001 and 2003.** Those tax cuts were estimated at the time of enactment to cost $1.6 trillion over 10 years.[4]

- **The American Recovery and Reinvestment Act.** That law, enacted in response to the 2007–2009 recession, was estimated to cost nearly $700 billion from 2009 to 2019.[5]

- **The 2017 tax act.** Provisions of that law were estimated to increase the deficit by $136 billion

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1. Like all the analyses presented in this report, this appendix relies on the estimates of legislative changes that are incorporated into CBO's baseline updates and reported with each baseline revision. Those effects are generally based on the cost estimate that was prepared when the legislation was considered. To the extent that those initial cost estimates for legislation misestimate the actual budgetary effects of legislation, those differences are reflected as economic or technical changes to subsequent baselines.

2. This estimate (and those in the following bullets) does not include changes in debt-service costs. See Table III-3 in Congressional Budget Office, *The Budget and Economic Outlook* (January 1991), www.cbo.gov/publication/18225.

3. See Table 2-2 in Congressional Budget Office, *The Budget and Economic Outlook: An Update* (September 1993), www.cbo.gov/publication/18231.
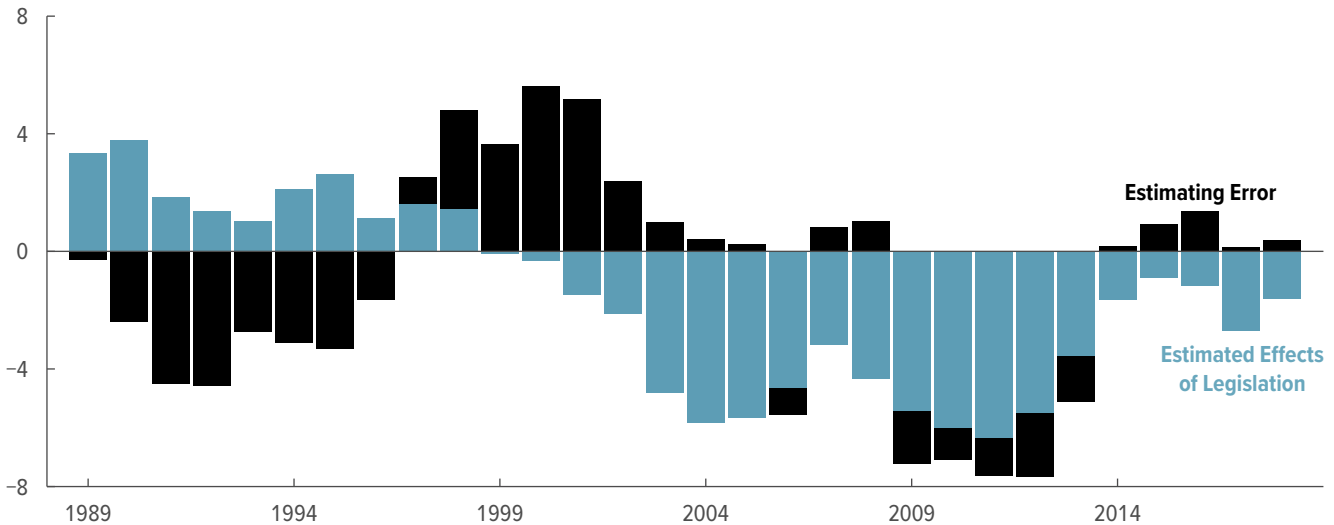
4. See Table 1-8 in Congressional Budget Office, *The Budget and Economic Outlook: An Update* (August 2003), www.cbo.gov/publication/14691, and Summary Table 1 in Congressional Budget Office, *The Budget and Economic Outlook: Fiscal Years 2003–2012* (January 2002), www.cbo.gov/publication/13504.

5. See Congressional Budget Office, *A Preliminary Analysis of the President's Budget and an Update of CBO's Budget and Economic Outlook* (March 2009), www.cbo.gov/publication/41166.

Figure A-1.

Estimating Errors and the Estimated Effects of Legislation on Deficits in the Sixth Year

Percentage of Gross Domestic Product

Source: Congressional Budget Office.

The estimating error is the difference between actual and projected deficits, excluding the effects of subsequent legislation.

For the estimating errors, a negative value is an underestimate, and a positive value is an overestimate. For the effects of legislation, a negative value is an increase in the deficit, and a positive value is a decrease in the deficit.

in 2018 (and by a total of $1.5 trillion over the 2018–2027 period).[6]

The estimated increases in deficits and debt caused by legislation are the net result of both increases in outlays and decreases in revenues.[7] For the sixth year of each 10-year period, about 54 percent of the increase in deficits estimated to come from legislation is the result of

increases in outlays, whereas 46 percent of the increase is caused by reductions in revenues.

Comparing the Effects of Legislation With Projection Errors

Legislation that was enacted after baseline projections were made is the main reason that actual deficits differed from the amounts CBO projected under current law. CBO's budget-year projection error was an overestimate of 0.2 percent of GDP, on average, but legislation boosted the deficit by an estimated average of 0.8 percent of GDP (see Table A-1). As a result, deficits exceeded CBO's original projections under current law by, on average, 0.5 percent of GDP annually. For the sixth-year projections, CBO underestimated the deficit by an average of 0.1 percent of GDP, and legislation boosted the deficit by an average of 1.6 percent of GDP, CBO estimates.

Legislation also is the main reason that actual amounts of debt held by the public differed from CBO's projections under current law. Debt increased by an average of 0.9 percent of GDP for the budget year and by an

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6. See Congressional Budget Office, cost estimate for the conference agreement on H.R. 1, a bill to provide for reconciliation pursuant to Titles II and V of the Concurrent Resolution on the Budget for Fiscal Year 2018 (December 2017), www.cbo.gov/publication/53415.

7. This analysis incorporates all enacted legislation, including legislation for which changes to revenues and outlays were offsetting, yielding no net effect on the deficit. An example is the Agriculture Improvement Act of 2018 (Public Law 115-334, often called the 2018 farm bill), which was estimated to increase both outlays and revenues by $70 million over the 2019–2028 period, thus having no net effect on the deficit. See Congressional Budget Office, *Direct Spending and Revenue Effects for the Conference Agreement on H.R. 2* (attachment to a letter to the Honorable K. Michael Conaway, December 11, 2018), www.cbo.gov/publication/54880.

Table A-1.

Projections of Deficits and Debt Compared With Actual Outcomes, Including the Effects of Legislation

Percentage of Gross Domestic Product

	Estimated Effects of Legislation	Average Projection Error	Difference Between Actual and Projected Deficits, Including Effects of Legislation
Deficit Projections			
Budget-year projections	-0.8	0.2	-0.5
Sixth-year projections	-1.6	-0.1	-1.7
Debt Projections			
Budget-year projections	-0.9	0.3	-0.6
Sixth-year projections	-6.0	-0.6	-6.6

Source: Congressional Budget Office.

For the effects of legislation, a negative number is an increase in deficits and debt. For the average errors and the difference between actual and projected deficits, a negative number is an underestimate, and a positive number is an overestimate.

Measures are based on the 34 budget-year projections made for 1985 to 2018 and the 30 sixth-year projections made for 1989 to 2018. (Both sets of projections were made beginning in 1984.)

average of 6.0 percent of GDP for the sixth year as a result of legislation, according to CBO's estimates. CBO's projection errors, made under the assumption that current laws would generally remain unchanged, were an overestimate of 0.3 percent of GDP for the budget year and an underestimate of 0.6 percent of GDP for the sixth year, on average.

Details on CBO's Method for Assessing Its Projections

To assess its past projections of deficits and debt, the Congressional Budget Office compared them with actual amounts recorded in the budget and attempted to determine the sources of any differences between the two. Because the agency intentionally does not incorporate the effects of possible legislative changes into its baseline projections, this report focuses on the differences between projected and actual deficits that result from economic or technical factors only. This appendix provides additional details on the data that CBO used for this analysis and how the agency calculated differences between actual and projected amounts.

Sources of Data
Since its inception, CBO has regularly published baseline budget projections. However, the number of years covered by those projections has expanded over time. Between 1984 (the earliest year included in this evaluation) and April 1995, CBO's projections covered the current year and the next five fiscal years. Since that time, the agency's baseline projections have covered the fiscal year in progress and the following 10 fiscal years. For example, in May 2018 CBO released projections of deficits for fiscal year 2018 (the current year), 2019 (the budget year), and each of the next nine years. The Treasury Department reports the actual deficit each October, shortly after the fiscal year ends (see Figure B-1). Those actual amounts are subject to later revisions, which are typically small.

This analysis used estimates from the deficit and debt projections that CBO released each spring (generally around March). The agency used those estimates primarily because the budgetary effects of legislation being considered by the Congress are typically measured in relation to them.

Because CBO did not extend its baseline beyond six years until late 1995 and because this analysis includes actual data through 2018, the number of projections that can be considered drops off precipitously for longer projection periods. For that reason, CBO chose to evaluate

its budget-year and sixth-year projections in this report, of which it had 34 and 30, respectively. (If the agency had chosen to evaluate its seventh-year projections, by contrast, only 17 would have been available.) For longer projection periods, errors are probably larger than those for the sixth-year projections; once the number of observations is large enough, CBO will evaluate the centeredness, accuracy, and dispersion of those projections.
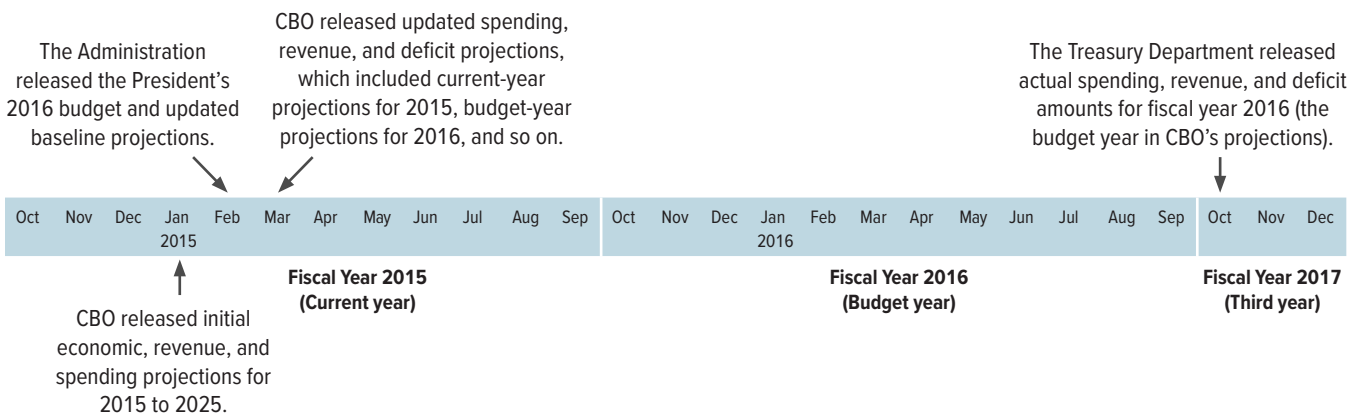
When CBO updates its baseline, the agency divides the changes in projected deficits into three categories: legislative, economic, and technical.

- Legislative changes are the estimated effects of new laws enacted since the last set of baseline projections was completed.

- Economic changes are those that result from an update to CBO's economic forecast. The agency typically updates its economic forecast—which includes projections of gross domestic product (GDP), interest rates, the unemployment rate, and other factors that affect the budget—twice a year (typically in winter and summer).

- Any updates to projections that are neither legislative nor economic are classified as technical changes. Examples include changes stemming from modeling improvements, the incorporation of new demographic information, recent administrative actions or judicial decisions, and updated data from federal agencies or other sources.

The legislative effects that are incorporated into CBO's baseline updates are reported with each baseline revision and are generally based on the cost estimate that was prepared when the legislation was considered. CBO does not normally revisit its initial estimates of the budgetary effects of legislation. Rather, any subsequent revisions related to programs affected by that legislation are classified as economic or technical changes to the baseline.

Figure B-1.

Sample Timeline for Measuring Errors in CBO's Projections of Deficits for the Budget Year

The Administration released the President's 2016 budget and updated baseline projections.

CBO released updated spending, revenue, and deficit projections, which included current-year projections for 2015, budget-year projections for 2016, and so on.

The Treasury Department released actual spending, revenue, and deficit amounts for fiscal year 2016 (the budget year in CBO's projections).

| Oct | Nov | Dec | Jan 2015 | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan 2016 | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |

Fiscal Year 2015 (Current year)   **Fiscal Year 2016 (Budget year)**   **Fiscal Year 2017 (Third year)**

CBO released initial economic, revenue, and spending projections for 2015 to 2025.

Source: Congressional Budget Office.

Dates for the budget-year projection in 2015 were used in the timeline above merely for illustrative purposes. The timelines for measuring estimates for forecasts for all budget-year projections are similar, although the President's budget has occasionally been released in months other than February.

Calculating Differences Between Projected and Actual Deficits

Before comparing its baseline projections with actual deficits reported by the Treasury, CBO adjusted the projections to account for the estimated effects of legislation enacted after they were made. Such adjustments isolate the differences between projected and actual amounts that stem from nonlegislative factors, which CBO attempts to account for in its projections.

The agency also adjusted its baseline projections and the actual amounts reported to remove outlays related to Fannie Mae and Freddie Mac, two institutions that help finance the majority of mortgages in the United States. CBO accounts for the activities of those institutions differently than the executive branch, so the projections and the reported amounts are not comparable.[1]

After making those two adjustments, CBO calculated the errors in its projections by subtracting the adjusted projections from actual deficits and dividing that difference

by actual GDP for each year.[2] In those calculations, deficits are expressed as negative numbers. Calculating the projection errors relative to GDP makes the deficit errors easier to compare across years. Moreover, scaling outlay and revenue errors to GDP helps to illustrate how those errors contribute to deficit errors.[3] Thus, the errors are expressed as percentages of GDP, with negative values representing underestimates and positive values, overestimates.

For example, in March 2016, CBO released baseline projections for 2016 through 2026. The agency projected that outlays in the budget year, 2017, would total nearly $4.1 trillion under current law (excluding outlays related to Fannie Mae and Freddie Mac) and that revenues would total $3.5 trillion, with a projected deficit of $547 billion. After adjusting those March 2016 projections to account for the estimated $19 billion increase in outlays that resulted from legislation enacted into law after the baseline was completed, the projected deficit

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1. Since 2008, when the federal government placed Fannie Mae and Freddie Mac into conservatorship, CBO and the budget committees have considered the activities of those two institutions to be governmental. In CBO's view, transactions between Fannie Mae and Freddie Mac and the Treasury should be considered intragovernmental. In contrast, the executive branch considers Fannie Mae and Freddie Mac to be outside the federal government for budgetary purposes and thus records cash transactions between them and the Treasury as increases or decreases in federal spending.

2. Actual GDP reflects the latest revisions to GDP as of this report's publication.

3. In its analysis of its revenue (or outlay) forecasting record, CBO used actual revenues (or actual outlays) as the denominator in its error calculations. By contrast, outlay and revenue errors are presented relative to actual GDP in this report to allow for comparison with each other and to show how each contributes to the deficit error. Additionally, in this report, revenue and outlay errors are described in terms of their effect on the deficit: For example, a revenue overestimate is shown as a deficit underestimate, and an outlay overestimate is shown as a deficit overestimate.

Table B-1.

An Example of the Adjustments Made to CBO's Deficit and Debt Projections to Account for the Effects of Legislation

Billions of Dollars

	2011 (Current year)	2012 (Budget year)	2013 (Third year)	2014 (Fourth year)	2015 (Fifth year)	2016 (Sixth year)
March 2011 Baseline Projection of Deficit	-1,388	-1,073	-686	-510	-535	-632
March 2011 Baseline Projection of Debt	10,363	11,516	12,311	12,919	13,554	14,282
Estimated Effects of Subsequent Legislation Enacted in Each Period						
March 2011 to August 2011	-3	21	48	68	85	99
August 2011 to January 2012	0	-39	66	115	130	143
January 2012 to March 2012	0	-100	-43	-41	8	38
March 2012 to August 2012	0	-2	*	5	7	6
August 2012 to February 2013	0	*	-330	-344	-309	-358
February 2013 to May 2013	0	0	0	0	0	0
May 2013 to February 2014	0	0	-8	-45	-21	9
February 2014 to April 2014	0	0	0	-8	-4	-1
April 2014 to August 2014	0	0	0	*	-4	1
August 2014 to January 2015	0	0	0	0	-82	28
January 2015 to March 2015	0	0	0	0	-1	-1
March 2015 to August 2015	0	0	0	0	-9	-19
August 2015 to January 2016	0	0	0	0	0	-164
January 2016 to March 2016	0	0	0	0	0	*
March 2016 to August 2016	0	0	0	0	0	0
August 2016 to February 2017	0	0	0	0	0	0
Total Deficit Adjustments	**-3**	**-120**	**-267**	**-248**	**-200**	**-218**
Total Cumulative Debt Adjustments	**-3**	**-123**	**-390**	**-638**	**-838**	**-1,056**
Adjusted March 2011 Projection of Deficit	**-1,391**	**-1,193**	**-954**	**-758**	**-735**	**-850**
Adjusted March 2011 Projection of Debt	**10,366**	**11,639**	**12,701**	**13,557**	**14,392**	**15,338**

Source: Congressional Budget Office.

The periods identified for the legislation correspond to intervals between successive baseline projections, which CBO typically publishes three times a year (in January, March, and August). In 2013, CBO published only two baseline projections, in February and May.

* = between -$500 million and $500 million.

rose to $566 billion. (No adjustment was made for revenues because they did not change.) That projection was $128 billion less than the actual deficit in 2017. Dividing that amount ($128 billion) by the GDP in 2017 ($19.3 trillion) yields a projection error of negative 0.7 percent (an underestimate).

Calculating Differences Between Projected and Actual Debt Held by the Public

To assess its past projections of debt held by the public, CBO compared them with actual amounts recorded in the budget and attempted to determine the sources of any differences between the two. Again, the analysis focuses on differences between projected and actual debt held by the public that result from nonlegislative factors only. CBO calculated the errors in its projections by

subtracting actual debt from the adjusted projections and dividing that difference by actual GDP for each year.

The adjustment for the effects of legislation on CBO's debt projections differs from the adjustment for its deficit projections. For CBO's deficit projections, the effects of legislation and the value of those effects are applied to individual years (see Table B-1). For the sixth-year projection made in March 2011, for example, legislation increased the deficit by an estimated $218 billion. For debt, by contrast, the effects of subsequent legislation are cumulative across all six projection years, so the estimated increase in debt resulting from legislation totals $1,056 billion—boosting the projected debt from $14.3 trillion to $15.3 trillion. That adjustment ignores the minimal effect on the debt caused by larger or smaller interest costs as a result of larger or smaller deficits.

Measures of the Centeredness, Accuracy, and Dispersion of CBO's Deficit and Debt Projections for the Current Year Through the Sixth Year

This appendix provides data on measures of centeredness, accuracy, and dispersion for the first six years of the Congressional Budget Office's deficit and debt projections (see Table C-1). Those measures show a decrease in accuracy and an increase in dispersion as the projection period extends an additional year into the future. To illustrate the ranges of uncertainty surrounding those deficit and debt projections (shown in Figure 5 on page 12 and Figure 6 on page 13, respectively), CBO calculated the two-thirds spread of errors for the first six years of the projection.

Table C-1.

Measures of the Centeredness, Accuracy, and Dispersion of CBO's Deficit and Debt Projections for the Current Year Through the Sixth Year

Percentage of Gross Domestic Product

	Current Year	Budget Year	Third Year	Fourth Year	Fifth Year	Sixth Year
Deficit Projections						
Average error	0.3	0.2	0.1	*	-0.1	-0.1
Average absolute error	0.5	1.0	1.4	1.6	1.8	2.0
Root mean square error	0.6	1.3	1.7	2.0	2.3	2.5
Two-thirds spread of errors	1.0	2.1	3.0	4.0	4.1	3.8
Debt Projections						
Average error	0.2	0.3	0.2	0.1	-0.2	-0.6
Average absolute error	0.7	1.7	2.9	4.3	5.6	7.1
Root mean square error	0.9	2.3	4.0	5.5	7.0	8.8
Two-thirds spread of errors	1.5	3.3	6.5	8.5	12.3	17.2

Source: Congressional Budget Office.

The projections included here are those made beginning in 1984 for which actual data were available. A current-year projection is for the fiscal year in which it is published, a budget-year projection is for the fiscal year beginning eight or nine months after it is published, a third-year projection is for the fiscal year starting one year and eight or nine months after it is published, and so on.

* = between zero and 0.05 percent.

List of Tables and Figures

About This Document

Each winter, the Congressional Budget Office issues a report on the state of the budget and the economy, which is often updated in the spring and in the summer. The first set of updated projections typically serves as the basis for CBO's estimates of legislation, as well as the Congress's budget resolution for the year to come. This document provides background information on the centeredness, accuracy, and dispersion of the deficit and debt projections included in those reports. In keeping with CBO's mandate to provide objective, impartial analysis, the report makes no recommendations.

Phillip L. Swagel
Director
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