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Budgetary Implications of Economic Scenarios with Higher and Lower Interest Rates

ABSTRACT This paper illustrates how the Congressional Budget Office's (CBO's) July 2021 baseline budget projections would have differed if the agency had used two alternative economic scenarios. The high-sixth scenario is based on the average values of projections for several variables—including inflation and the growth of gross domestic product after removing the effects of inflation (real GDP)—from the six *Blue Chip* forecasters (about one-sixth of the total) with the highest average interest rate projections. The low-sixth scenario is based on the average values of projections for the same variables from the six *Blue Chip* forecasters with the lowest average interest rate projections. Using its simplified model of how macroeconomic changes would affect the federal budget, the CBO found that projected deficits would be \$2.1 trillion larger from 2022 to 2031 under the high-sixth scenario (totaling \$13.8 trillion) than under the low-sixth scenario (\$11.7 trillion). Despite a greater amount of debt in dollar terms under the high-sixth scenario, federal debt held by the public as a percentage of GDP would total about 101 percent at the end of 2031 under both scenarios.

Alternative forecasts of economic variables can have large effects on the Congressional Budget Office's (CBO's) projections of the budget. For its source of alternative forecasts in this analysis, the CBO used those from private-sector economists as reported in *Blue Chip Economic Indicators* in

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March 2022.¹ The CBO regularly shows its forecast in relation to the middle two-thirds of the range of the *Blue Chip* forecasts; that range reflects some of the uncertainty about the economic projections.

To produce alternative budget estimates starting with the data from the *Blue Chip* forecasters, the CBO added projections of macroeconomic variables from a statistical model and then used a simplified budget model. This paper reports the CBO's projections of economic and budgetary outcomes under two scenarios with divergent paths for interest rates.

1. Data the CBO Used from *Blue Chip* Forecasters

For calendar years 2022 and 2023, the CBO used values of projections for eight variables made by the thirty-eight *Blue Chip* forecasters whose complete interest rate projections were reported: the three-month Treasury bill rate, the ten-year Treasury note rate, the unemployment rate, growth of real GDP (adjusted to remove the effects of inflation), growth of real personal consumption expenditures, growth of real nonresidential fixed investment, inflation as measured by the GDP price index, and inflation as measured by the consumer price index for all urban consumers (CPI-U).

To determine the highest and lowest interest rate projections, the CBO calculated the average of the projections for three-month and ten-year Treasury rates and then sorted those averages first by the values for 2022 and then by the values for 2023. For each economic variable, the 2022 value in the high-sixth scenario was the average among the six forecasters with the highest interest rate projections. Similarly, the 2022 value in the low-sixth scenario was the average among the six forecasters with the lowest interest rate projections. The 2023 values under both scenarios were calculated in the same way for that year.

For projections of interest rates and inflation for 2024 to 2031, *Blue Chip Economic Indicators* reports averages for the top ten and bottom ten forecasters rather than projections for each forecaster and does not report which forecasters are included in those averages. (The rank order of forecasters changes from year to year.) The CBO used the information on the average for the highest ten and the lowest ten interest rate and inflation projections by *Blue Chip* forecasters for the high-sixth and low-sixth scenarios, respectively. For interest rates, the CBO used the three-month Treasury bill rate and the ten-year Treasury note rate. For inflation, the CBO used measures

1. Wolters Kluwer, "Blue Chip Publications," <https://www.wolterskluwer.com/en/solutions/vitalaw-law-firms/blue-chip>.

based on the GDP price index and the CPI-U. Thus, for 2024, for example, the average of the highest ten projections only roughly approximates the 2024 projections of interest rates by the six forecasters whose forecasts were used for 2022 and 2023 in the high-sixth scenario. For the highest ten projections, *Blue Chip Economic Indicators* reports a single average value for 2029 to 2033, and the CBO used that value for each year from 2029 to 2031 in the high-sixth scenario. For the lowest ten projections, the CBO used the analogous value in the low-sixth scenario.

For projections of real GDP growth rates and unemployment rates for 2024 to 2031, the CBO used information from the *Blue Chip* consensus (the average of all *Blue Chip* forecasters) for both the high-sixth and low-sixth scenarios. The CBO used those rates because the rates for 2022 and 2023 for both scenarios were similar to the *Blue Chip* consensus in those years, and the rates for the specific forecasters used in the scenarios for 2023 were not available for later years. For the consensus, *Blue Chip Economic Indicators* reports a single average value for 2029 to 2033, and the CBO used that value for each year from 2029 to 2031.

II. How the CBO Projected Additional Macroeconomic Variables from a Statistical Model

To obtain the full set of economic variables needed for budget estimates, the CBO augmented data from the *Blue Chip* forecasters with projections from a statistical model that draws on historical correlations between macroeconomic variables to produce conditional forecasts. As targets for that model, the agency used data on actual values for 2021 when available and values from the *Blue Chip* forecasters described in the previous section.

The CBO projected values for 2022 to 2031 for ten additional macroeconomic variables that are used in its simplified budget model: the federal funds rate (the rate that financial institutions charge each other for overnight loans of their monetary reserves), payroll employment, the number of people in the labor force, wages and salaries, nominal gross national product (GNP), nominal private nonresidential fixed investment in equipment, nominal potential GDP (the maximum sustainable output of the economy), real potential GDP, inflation as measured by the consumer price index for food at home, and inflation as measured by the consumer price index for medical care.

In addition, the CBO projected values for 2024 to 2031 for the growth of real personal consumption expenditures and the growth of real nonresidential fixed investment. The projections of those variables for 2022

and 2023 were derived from the *Blue Chip* forecasts as discussed in the previous section.

The CBO adapted its approach to conditional forecasting from that used by the staff of the Federal Reserve Bank of New York, who have used a Bayesian vector autoregression (BVAR) and the Kalman filter (or smoother) for a similar purpose.² Bayesian techniques are particularly well suited to estimating parameters in a large system of equations given a limited amount of data. The modeling is structured, for example, so that a projection of a variable at a given point in time is more likely to be influenced by recent data than by older data. The structure prevents the estimation from explaining historical data very well while having a poor ability to forecast beyond the data used for estimation—which would be the case if the estimation process overfit the parameters. The approach is very flexible, and the staff of the Federal Reserve Bank of New York found that it generated reasonable conditional forecasts. The Kalman filter fills out the projection of all the variables over the entire forecast period around a projection of any subset of those variables in any period—essentially starting with the *Blue Chip* forecasts discussed above and imputing forecasts of additional variables.

III. How the CBO Estimated the Effects of Macroeconomic Changes on the Federal Budget

Using its budgetary feedback model (BFM) and some baseline projection methods, the CBO analyzed the effects of macroeconomic changes on the federal budget under the high-sixth and low-sixth scenarios relative to its July 2021 baseline.³

The eighteen variables described in the previous two sections are used by a component of the BFM that generates projections of related variables used in the budget projections. For example, those variables include income as measured in the national income and product accounts (NIPAs), the employment cost index, and interest rates on Treasury securities over a full range of maturities (determined using the federal funds rate, the three-month Treasury bill rate, and the ten-year Treasury note rate as a basis).

2. See Crump and others (2021). Using the approach outlined in that paper, the CBO conducted its Bayesian analysis using the Minnesota prior, in which economic variables follow independent random-walk processes potentially with drift. The factors setting the tightness of that prior were estimated on the basis of the amount of data relative to the number of parameters in the model.

3. At the time this paper was written, the CBO had not yet published updated economic and budget projections in 2022; see CBO (2022) for that update.

The BFM provides a unified framework to approximate the budgetary feedback that would be arrived at by using a wider array of the CBO's budgetary models.⁴ Because the agency's baseline projection method better captures the budgetary effects arising from larger changes in interest rates and inflation than the BFM does, the agency used its baseline projection method to estimate some of those costs.

III.A. Revenues

To estimate effects on revenues, the CBO generally estimates changes to macroeconomic variables as measured in the NIPAs. The relationship between changes in certain NIPA measures and changes in revenues may be straightforward. For example, as wages and salaries, corporate profits, and imports increase, so do the receipts from income and payroll taxes and customs duties. The BFM applies estimated marginal tax rates appropriate for NIPA measures, which differ from the effective marginal tax rates on corresponding taxable income used in the CBO's specialized models. When a component of taxable income is not directly measured in the NIPAs, one or more alternative NIPA measures are used as proxies. For example, the BFM derives an estimate of the change in profits from S corporations from a combination of the NIPA measures for proprietors' income, domestic corporate profits, and estimates from the CBO's full modeling of the share of domestic corporate profits that represents S corporations' profits. Certain taxes, such as those on capital gains or inherited property, are sensitive to changes in the stock market and other asset values, but those macroeconomic changes are not directly measured in NIPA accounting. The BFM uses changes in nominal GDP to approximate how macroeconomic changes would affect revenues from the estate tax and capital gains.

III.B. Spending

To estimate effects on federal spending, the CBO considered how the three broad categories of outlays in the budget—discretionary, mandatory, and net interest—would respond to changes in macroeconomic variables. Discretionary spending is calculated according to statutory requirements using a weighted average of the employment cost index and the GDP deflator. (For those calculations, the CBO used its baseline projection methods.)

4. For a description of how the BFM is constructed, what parameter values it incorporates, how the CBO uses the model, and its limitations, see Frentz and others (2020). For a simpler interactive tool based on the BFM, see CBO, "Workbook for How Changes in Economic Conditions Might Affect the Federal Budget, June 2021," <https://www.cbo.gov/publication/57191>.

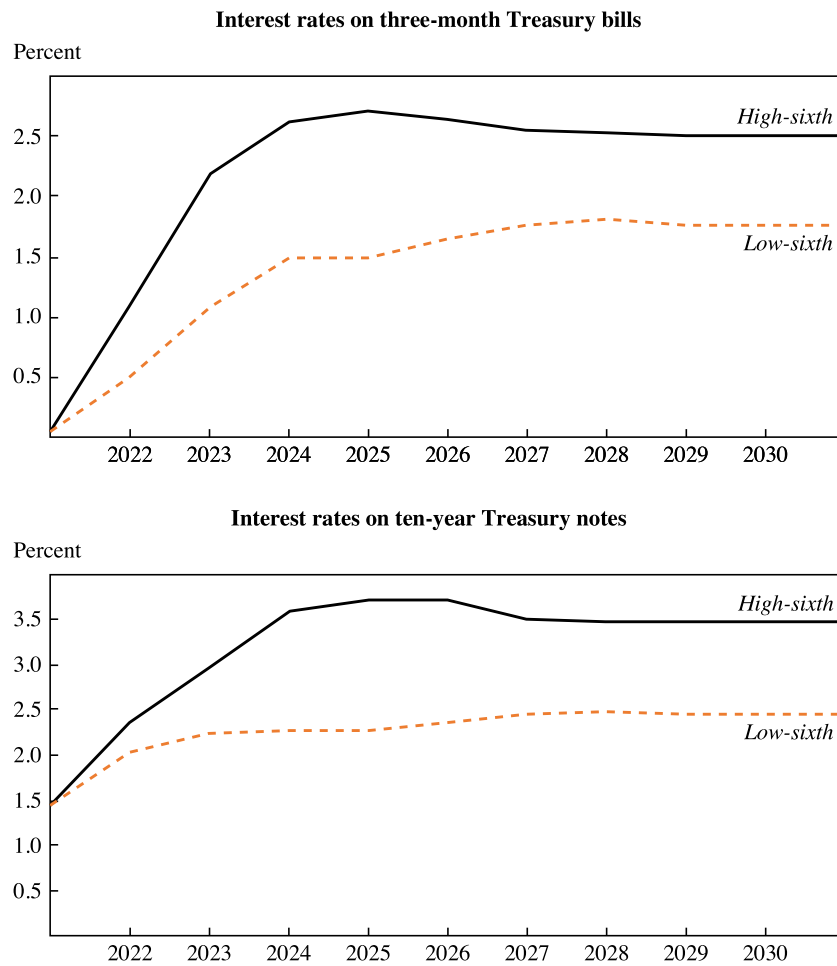
Mandatory spending consists of federal noninterest spending that is not generally governed by the annual appropriation process. Outlays for mandatory programs usually depend on the number of program participants and the level of spending per participant, which is often tied directly to changes in the macroeconomy. The estimates reflect changes in eight components of the budget: Social Security, other indexed entitlements, Medicare, Medicaid, unemployment compensation, the Supplemental Nutrition Assistance Program (SNAP), refundable tax credits, and child nutrition programs. (To calculate Social Security spending, the CBO used its baseline projection methods.) Although changes in the macroeconomy could affect other programs, the BFM does not include those effects because the CBO estimates they are approximately zero, on average.

To estimate spending for net interest in this analysis, the CBO used its baseline projection method, which better captures the effects of larger changes in interest rates than the BFM does. The stock of federal debt at the beginning of a projection period, along with the additional debt (generally the amount of annual projected deficits), substantially determines the amount of outstanding debt in each year. In addition, the CBO projected the characteristics of debt that the Treasury would issue to finance annual deficits—for example, the time to maturity, whether interest rates are fixed or floating, and whether the interest payments include an adjustment for inflation. The CBO used estimates of interest rates related to those characteristics to determine the amounts of interest that the Treasury would pay on outstanding debt.

IV. Economic Projections under the Scenarios

The high-sixth and low-sixth scenarios group the forecasts with the highest and lowest projections of interest rates (see figure 1). For example, these are the forecasts made in March 2022 for the calendar year average of interest rates on three-month Treasury bills: the highest one-sixth of *Blue Chip* forecasts, taken together, averages 1.1 percent in 2022 and 2.2 percent in 2023; and the lowest one-sixth of *Blue Chip* forecasts, taken together, averages 0.5 percent in 2022 and 1.1 percent in 2023.

The CBO does not interpret the differences in average interest rates between the high-sixth and low-sixth scenarios as representing possible forecast errors of interest rates. One measure of such possible errors is the two-thirds spread—that is, the difference between the 17th percentile and the 83rd percentile—of the CBO’s errors over two years. In the CBO’s

Figure 1. Interest Rates

Sources: Congressional Budget Office; Federal Reserve; Wolters Kluwer, *Blue Chip Economic Indicators*, vol. 47, no. 3 (March 11, 2022).

Note: The CBO constructed the high-sixth and low-sixth scenarios based on the average values of projections from the six *Blue Chip* forecasters (about one-sixth of the total) with the highest and lowest average interest rate projections, respectively, for 2022 and 2023.

Table 1. Economic Projections

<i>Percent</i>	<i>2022</i>	<i>2023</i>	<i>2024</i>	<i>2025</i>	<i>Total 2026–2031</i>
Interest rate on three-month Treasury bills					
High-sixth scenario	1.1	2.2	2.6	2.7	2.5
Low-sixth scenario	0.5	1.1	1.5	1.5	1.8
Interest rate on ten-year Treasury notes					
High-sixth scenario	2.4	3.0	3.6	3.7	3.5
Low-sixth scenario	2.0	2.3	2.3	2.3	2.4
Inflation as measured by the GDP price index					
High-sixth scenario	5.2	3.3	2.6	2.5	2.3
Low-sixth scenario	4.7	2.3	1.9	1.8	1.8
Real GDP growth					
High-sixth scenario	3.7	2.6	2.1	2.0	1.9
Low-sixth scenario	3.2	2.4	2.1	2.0	1.9
Unemployment rate					
High-sixth scenario	3.6	3.3	3.6	3.7	3.9
Low-sixth scenario	3.7	3.7	3.6	3.7	3.9

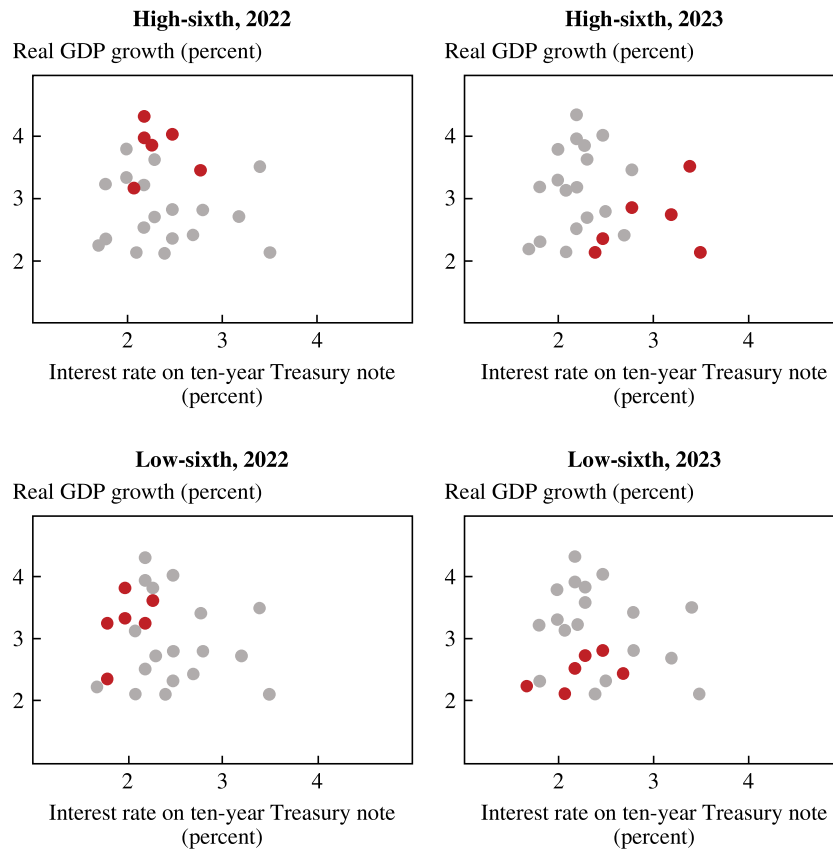
Sources: Congressional Budget Office; Wolters Kluwer, *Blue Chip Economic Indicators*, vol. 47, no. 3 (March 11, 2022).

Note: Data are annual averages for calendar years. The CBO constructed the high-sixth and low-sixth scenarios based on the average values of projections from the six *Blue Chip* forecasters (about one-sixth of the total) with the highest and lowest average interest rate projections, respectively, for 2022 and 2023.

forecasts of the three-month Treasury bill rate from 1981 to 2019, that spread was 2.3 percentage points (CBO 2021b).

Rather than illustrating how large the forecast errors might be, the range of *Blue Chip* forecasts illustrates how different the CBO's forecast might have been. Historically, the CBO's forecasts have been within the middle two-thirds of the range of *Blue Chip* forecasts for most variables in most years. The CBO generally aims for its forecasts to be in the middle of a range of likely outcomes, and large forecast errors arise when outcomes are far from that middle.

In contrast to the differences between the scenarios' projections of interest rates, the projections of unemployment rates and real GDP growth rates for 2022 and 2023 are similar in the two scenarios, in the CBO's assessment (see table 1). For example, the projection of the unemployment rate for 2022 is 3.6 percent in the high-sixth scenario and 3.7 percent in the low-sixth scenario. That similarity indicates that the differences in interest rate forecasts are not simply the result of differences in the projected strength of the economy across the board. Taken individually, projections from the *Blue Chip* forecasters that contributed to each scenario show a variety of relationships between interest rates and real GDP growth for 2022 and also

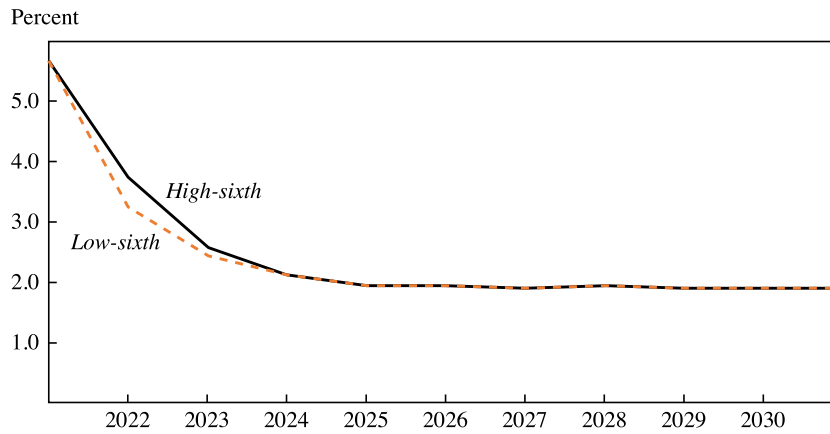
Figure 2. Real GDP Growth and Interest Rates

Sources: Congressional Budget Office; Bureau of Economic Analysis; Federal Reserve; Wolters Kluwer, *Blue Chip Economic Indicators*, vol. 47, no. 3 (March 11, 2022).

Note: The data points represent forecasts by each *Blue Chip* forecaster. The CBO constructed the high-sixth and low-sixth scenarios based on the average values of projections from the six *Blue Chip* forecasters (about one-sixth of the total) with the highest and lowest average interest rate projections, respectively, for 2022 and 2023.

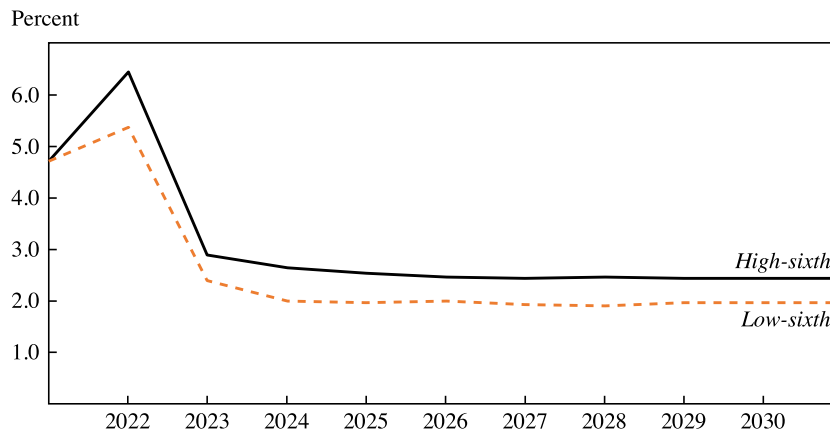
for 2023 (see figure 2). Taken together, the forecasts that constitute the high-sixth scenario project slightly faster GDP growth for 2022 and 2023 than those that make up the low-sixth scenario (see figure 3).

By constructing the scenarios using the same real GDP growth rates and unemployment rates for 2024 to 2031, the CBO was able to focus the analysis on the differences between the scenarios in interest rates and the associated rates of inflation—which also are higher in the high-sixth scenario than in the low-sixth scenario (see figure 4).

Figure 3. Real GDP Growth

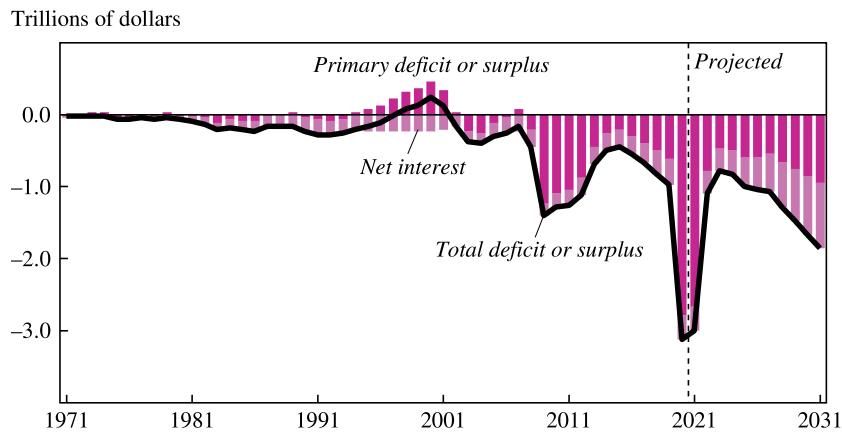
Sources: Congressional Budget Office; Bureau of Economic Analysis; Wolters Kluwer, *Blue Chip Economic Indicators*, vol. 47, no. 3 (March 11, 2022).

Note: The CBO constructed the high-sixth and low-sixth scenarios based on the average values of projections from the six *Blue Chip* forecasters (about one-sixth of the total) with the highest and lowest average interest rate projections, respectively, for 2022 and 2023.

Figure 4. Inflation as Measured by the Consumer Price Index for All Urban Consumers

Sources: Congressional Budget Office; Bureau of Labor Statistics; Wolters Kluwer, *Blue Chip Economic Indicators*, vol. 47, no. 3 (March 11, 2022).

Note: The CBO constructed the high-sixth and low-sixth scenarios based on the average values of projections from the six *Blue Chip* forecasters (about one-sixth of the total) with the highest and lowest average interest rate projections, respectively, for 2022 and 2023.

Figure 5. Deficits in CBO's July 2021 Baseline Budget Projections

Source: Congressional Budget Office.

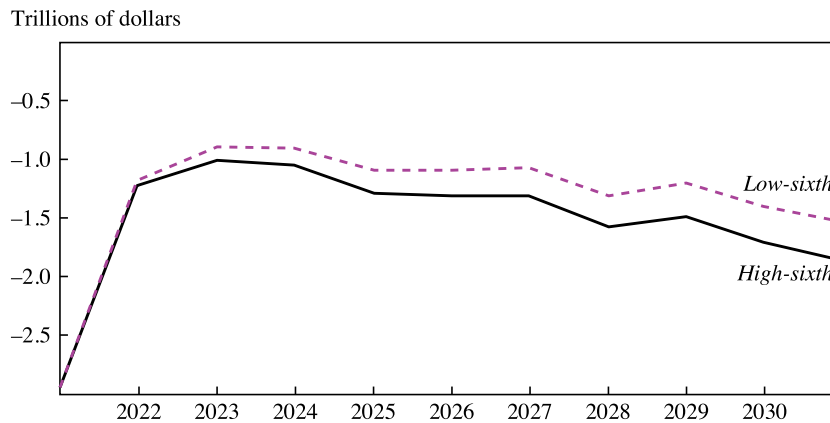
V. Deficit Projections under the Scenarios

In the CBO's July 2021 baseline budget projections, total deficits were projected to grow substantially over the 2022–2031 period (CBO 2021a). Much of that growth stemmed from projected increases in spending for net interest (see figure 5).

If the CBO had used the economic projections in the high-sixth scenario to underlie its July 2021 budget projections, the deficit would be larger in every year of the projection period than if the agency had used the projections in the low-sixth scenario (see figure 6 and table 2). Over the ten-year period, total deficits would be \$2.1 trillion larger under the high-sixth scenario than under the low-sixth scenario, the CBO projects.

Those larger deficits are the result of effects on revenues and mandatory spending that largely offset each other and effects on net interest costs. Under the high-sixth scenario, revenues increase more mainly because of higher taxable income, and noninterest spending increases more primarily because of cost-of-living adjustments for benefit programs and higher prices for the purchase of goods and services by the federal government.

Net interest costs are higher under the high-sixth scenario mostly because of the higher interest rates on debt issued by the Treasury. One way to assess the burden to the government of net interest is to measure the cost as a percentage of GDP—2.9 percent in the high-sixth scenario and 2.1 percent in the low-sixth scenario in 2031 (see figure 7).

Figure 6. Deficits under the High-Sixth and Low-Sixth Scenarios

Source: Congressional Budget Office.

Note: CBO constructed the high-sixth and low-sixth scenarios based on the average values of projections from the six *Blue Chip* forecasters (about one-sixth of the total) with the highest and lowest average interest rate projections, respectively, for 2022 and 2023.

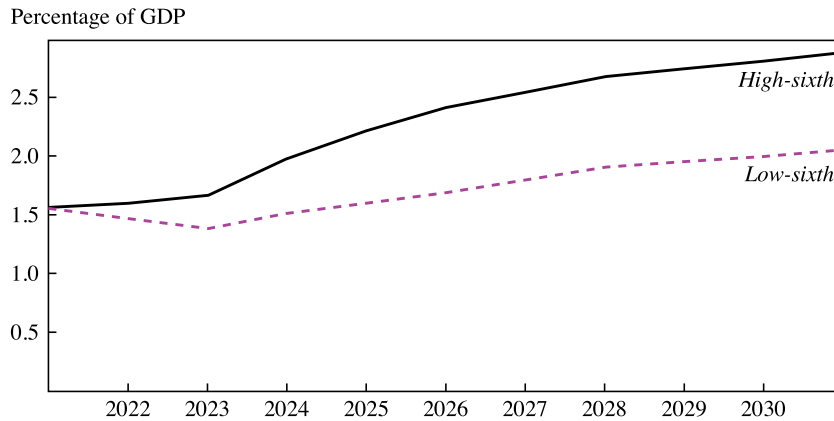
Table 2. Cumulative Budgetary Effects of the High-Sixth Scenario Relative to the Low-Sixth Scenario from 2022 to 2031

Trillions of dollars	Increase (–) or decrease in the deficit
Revenue effects	1.6
Noninterest spending effects	–1.5
Net interest spending effects	–2.2
Total	–2.1

Source: Congressional Budget Office.

The budgetary implications of the two scenarios are uncertain. For example, because changes in revenues and noninterest outlays roughly offset each other for a given change in inflation in this analysis, primary deficits are not very sensitive to changes in inflation. However, the change in primary deficits could be larger or smaller than the CBO's estimates for a given change in inflation—depending, for instance, on the types of goods and services for which inflation is strongest and how taxable income may change as a result.

Higher interest rates projected by *Blue Chip* forecasters and the associated higher inflation projected by those forecasters are the two main factors leading to the larger deficits, on net, in the high-sixth scenario than in

Figure 7. Net Interest Spending

Source: Congressional Budget Office.

Note: The CBO constructed the high-sixth and low-sixth scenarios based on the average values of projections from the six *Blue Chip* forecasters (about one-sixth of the total) with the highest and lowest average interest rate projections, respectively, for 2022 and 2023.

the low-sixth scenario. The remainder of this section describes the ways that higher interest rates and inflation affect the CBO's budget estimates.

V.A. Revenues

Larger increases in wage rates and prices generally lead to greater labor income, profits, and other nominal income, which in turn generate larger collections of individual income taxes, payroll taxes, and corporate income taxes. Revenues from the Federal Reserve's remittances to the Treasury are affected by changes in interest rates.

Many provisions in the individual income tax system—including the income thresholds for the tax brackets—are adjusted, or indexed, for inflation. Therefore, the share of taxpayers' income that is taxed at certain rates does not change very much when income increases because of higher inflation, so tax collections tend to rise roughly proportionally with income under those circumstances. However, not all parameters of the individual income tax system are indexed for inflation. For example, the income thresholds for the surtax on investment income are fixed in nominal dollars, so if income rose because of inflation, the surtax would apply to a larger share of taxpayers' income.

For the payroll tax, rates mostly stay the same when earnings change, with two main exceptions—when earnings reach the maximum amount

subject to the Social Security tax (although that maximum amount rises, after a lag, with average wages in the economy) and when they reach the threshold for the additional Medicare tax. Higher wage growth thus leads to a roughly proportional increase in payroll tax revenues, the CBO estimates.

Similarly, nearly all corporate profits are taxed at a single statutory rate of 21 percent. Consequently, an increase in profits resulting from higher inflation generates a roughly proportional increase in corporate tax revenues.

Finally, higher nominal interest rates would first reduce and then increase revenues from the Federal Reserve's remittances to the Treasury. If, over the next ten years, all interest rates were higher than the CBO projects, the Federal Reserve's remittances over the next few years would be smaller than projected because higher interest payments on deposits that banks hold at the central bank would outstrip the additional earnings from interest on its Treasury holdings. Over time, however, the current holdings in the portfolio would mature and be replaced with higher-yielding investments; as a result, the Federal Reserve's remittances would be larger in later years.

V.B. Mandatory Spending

Higher inflation would increase the cost of several mandatory spending programs, the CBO estimates. Benefits for many mandatory programs are automatically adjusted each year to reflect increases in prices. Specifically, benefits paid for Social Security, federal employees' retirement programs, disability compensation for veterans, SNAP, Supplemental Security Income, child nutrition programs, and the refundable portion of the earned income tax credit, among others, are adjusted (with a lag) for changes in the consumer price index, one of its components, or another measure of inflation.

Many of Medicare's payment rates are also adjusted annually for inflation. Spending for some other programs, such as Medicaid, is not formally indexed to changes in prices but nevertheless tends to grow when inflation rises because the costs of providing benefits under those programs increase as wages and prices rise. In addition, to the extent that benefit payments in retirement and disability programs are linked to participants' preenrollment wages, higher wages would boost future outlays for those programs.

V.C. Discretionary Spending

As specified in law, the CBO's projections of spending for discretionary programs reflect the assumption that discretionary budget authority provided in appropriation acts in future years will match current funding, with adjustments for inflation. Hence, higher inflation would increase the CBO's

Table 3. Debt and GDP Projections

	<i>High-sixth scenario</i>	<i>Low-sixth scenario</i>	<i>CBO's July 2021 baseline</i>
<i>Debt as a percentage of GDP</i>			
Debt in 2021	103	103	103
Debt in 2026	97	98	100
Debt in 2031	101	101	106
<i>Debt and GDP growth</i>			
Growth in debt from 2021 to 2031 (%)	63	54	56
Growth in GDP from 2021 to 2031 (%)	66	56	50
Ratio of the debt growth rate to the GDP growth rate	0.96	0.96	1.11

Source: Congressional Budget Office.

Note: Data are for fiscal years. Debt is measured as debt held by the public. The CBO constructed the high-sixth and low-sixth scenarios based on the average values of projections from the six *Blue Chip* forecasters (about one-sixth of the total) with the highest and lowest average interest rate projections, respectively, for 2022 and 2023.

projections of such spending. The agency estimated the increase by adjusting discretionary budget authority to account for changes in wage and price indexes. Congressional decisions about annual appropriations would ultimately determine spending for discretionary programs.

V.D. Net Interest Costs

Higher inflation and interest rates would boost net interest spending in dollar terms. As the Treasury replaced maturing securities and increased its borrowing to cover deficits, the budgetary effects of higher interest rates would mount. Higher inflation would also make outstanding inflation-indexed securities more costly for the federal government. Moreover, greater deficits would increase federal debt, boosting interest costs further.

VI. Debt Projections under the Scenarios

Debt that the Treasury issues to the public is larger in the high-sixth scenario than in the low-sixth scenario owing to the larger budget deficits that stem mainly from higher net interest costs. Despite a greater amount of debt in dollar terms, federal debt held by the public as a percentage of GDP would be about the same at the end of 2031 under the two scenarios. That outcome would occur because the ratio of the growth rate of debt to the growth rate of nominal GDP would be roughly the same in the two scenarios (see table 3).

The higher inflation in the high-sixth scenario affects not only the amount of debt but also how burdensome that debt is. When inflation exceeds the rates expected when debt is issued at a fixed interest rate, some of the value of that debt (and its purchasing power) is transferred from lenders to borrowers. As a result, borrowers can spend a smaller share of their income repaying money they borrowed in the past when income rises with inflation, as it does in this analysis. Similarly, the federal government, as a borrower, can use a smaller share of the revenues it collects to pay holders of Treasury securities that mature, without changing tax rates. In that sense, the debt burden to the government is smaller when inflation is higher.

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