A

CBO

REPORT

CBO's Economic Forecasting Record

An evaluation of the economic forecasts
CBO made from January 1976 through January 2003

October 2005

The Congress of the United States ■ Congressional Budget Office

Preface

The Congressional Budget Office (CBO) regularly publishes evaluations of the accuracy of its economic and budget forecasts. Those evaluations help guide CBO's efforts to improve its forecasts and also assist Members of Congress in their use of CBO's estimates.

This report was prepared by Christopher Williams with the assistance of Andrew Gisselquist, Ben Umansky, and colleagues in the Macroeconomic Analysis Division, under the direction of John Peterson and Robert Dennis. Janey Cohen edited the report, Maureen Costantino prepared it for publication, Lenny Skutnik produced the printed copies, and Annette Kalicki and Simone Thomas produced the electronic version for CBO's Web site (www.cbo.gov).

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CBO's Economic Forecasting Record

Since publishing its first macroeconomic forecast in 1976, the Congressional Budget Office (CBO) has compiled a forecasting track record comparable in quality with that of the *Blue Chip* consensus (an average of private-sector forecasters) as well as that of the incumbent Administrations during that time. In particular, CBO's accuracy for two-year forecasts made between 1982 and 2003 did not differ markedly either from that of the survey or from that of the Administration over those years. The accuracy of CBO's five-year projections also was similar to that of the *Blue Chip* consensus and of the various Administrations (see Table 1 on page 11). Comparing CBO's forecasts with those of the *Blue Chip* consensus suggests that when CBO's economic predictions missed by the largest margin, those inaccuracies probably reflected problems that all forecasters had in predicting turning points in the business cycle.

Sources and Choice of Data for the Evaluation

The data employed in this evaluation were compiled using forecasts published early in the years from 1976 through 2003. (Two-year average forecasts published in 2004 and in early 2005 could not be included in this evaluation because the latest full-year historical data are for 2004.) For all years except 1981, CBO's forecasts were based on the calendar year forecasts published early each year (or from related files of unpublished forecasts for some variables in some years). The Administrations' forecasts were taken from the budget documents for all years except 1981.[1] Where possible, *Blue Chip* consensus forecasts were taken from those published in the same month as CBO's forecasts. Although the *Blue Chip* publishes forecasts every month, in only two months of the year—March and October—do forecasts extend out more than two years, and those longer-term forecasts are published, on average, four months after CBO's forecast is completed. Also limiting the analysis are the shorter history of the *Blue Chip*'s two-year forecasts, which began in 1982, and their narrower scope. (The *Blue Chip*'s forecasts do not include a number of important series, most notably wages and salaries, that are vital for budget projections.) The appendix to this report gives further details on the choice of historical time-series data as well as on the sources of forecast data for the comparisons.

Measuring the Quality of Forecasts

Like earlier studies of economic forecasts, this evaluation focused on two aspects of the quality of CBO's forecasts: statistical bias and accuracy. Other desirable characteristics—such as the efficiency of a forecast, which is discussed later—are harder to assess definitively and would require a larger sample than is available for CBO's forecasts.

Bias

The statistical bias of a forecast is the tendency of the forecast to be overly pessimistic or optimistic. CBO's evaluation used the mean error (the arithmetic average of the forecast errors) to measure statistical bias. The mean error is the simplest and most widely used measure of forecast bias. Because it is a simple average, however, underestimates and overestimates offset each other in calculating it. As a result, the mean error imperfectly measures the quality of a forecast—a small mean error would result either if all the errors were small or if all the errors were large but the overestimates and underestimates happened to balance each other out.

Accuracy

The accuracy of a forecast is the degree to which its values are narrowly dispersed around actual outcomes. Measures of accuracy more clearly reflect the usual meaning of fore-

1. The Administration's forecast made in early 1981 came from the Reagan Administration's revisions to President Carter's last budget. The corresponding CBO forecast of March 1981 was taken from CBO's published analysis of President Reagan's budget proposals and reflected the continuation of current tax and spending policies as contained in the budget resolution.

cast quality than does the mean error because overestimates and underestimates do not offset each other in these measures. CBO's evaluation used two measures of accuracy. The mean absolute error (the average of the forecasts' errors without regard to arithmetic sign) indicates the average difference between forecasts and actual values without regard to whether individual forecasts are overestimates or underestimates. The root mean square error (calculated by first squaring the errors, then taking the square root of the arithmetic average of the squared errors) also shows the size of the error without regard to sign, but it gives greater weight to larger errors. Because small errors typically are inconsequential, the root mean square error usually gives the best indication of accuracy.

Alternative Measures of Forecast Quality

Studies by analysts outside CBO have used measures that are somewhat more elaborate than the mean error to test for statistical bias in CBO's forecasts. Those studies have generally concluded, as does this evaluation, that CBO's short-term economic forecasts do not contain a statistically significant bias.[2]

A number of other methods have been developed to evaluate a forecast's "efficiency," or the extent to which a particular forecast could have been improved by using additional information that was available when the forecast was made.[3] A simple method is comparing a forecast with the *Blue Chip* consensus forecast, which represents a wide variety of economic forecasters and thus reflects a broader blend of sources and methods than can be expected from any single forecaster. As such, the consensus forecast may produce better forecasts than any single forecaster.[4] In this evaluation, the *Blue Chip* predictions serve as a proxy for an efficient forecast. The fact that CBO's forecasts are about as accurate as the *Blue Chip*'s is a rough indication of their efficiency.

Some researchers contend that the economic forecasters, in general, do not use all the information available to them to forecast downturns in the business cycle and, as a result, makes avoidable systematic errors in forecasting those business cycles.[5] Such critics point to the ability of certain leading indicators to predict recessions. Nevertheless, it is unclear how the information in such indicators can be reliably translated into economic forecasts.

Limitations of Forecast Evaluations

Elaborate measures and methods do not necessarily produce reliable indicators of a forecast's quality when the sample of observations is small, as is the case with CBO's sample of only 28 two-year observations. Small samples present three main problems in evaluating forecasts. First, they reduce the reliability of statistical tests that are based on the assumption that the errors in the forecast follow a normal (bell-shaped) distribution. The more elaborate measures of forecast quality all make such an assumption about the hypothetical ideal forecast with which the actual forecasts are being compared. Second, in small samples, individual errors in a forecast can have an unduly large influence on the measures. Third, the small sample means that CBO's track record indicates only weakly the

2. Another approach to testing a forecast for bias is based on linear regression analysis of actual values against forecast values. For details of that method, see J. Mhncer and V. Zarnowitz, "The Evaluation of Economic Forecasts," in J. Mincer, ed., *Economic Forecasts and Expectations* (New York: National Bureau of Economic Research, 1969). That approach is not used here because of the small size of the sample. However, previous studies that have used it to evaluate the short-term forecasts of CBO and the Administration have not been able to reject the hypothesis that those forecasts are unbiased. See, for example, M.T. Belongia, "Are Economic Forecasts by Government Agencies Biased? Accurate?" *Review,* Federal Reserve Bank of St. Louis, vol. 70, no. 6 (November/December 1988), pp. 15-23. For a more recent and more elaborate study of forecast bias that included CBO's forecasts among a sizable sample, see David Laster, Paul Bennett, and In Sun Geoum, *Rational Bias in Macroeconomic Forecasts*, Staff Report No. 21 (New York: Federal Reserve Bank of New York, March 1997).

3. For studies that have examined the relative efficiency of CBO's economic forecasts, see Belongia, "Are Economic Forecasts by Government Agencies Biased?"; and S.M. Miller, "Forecasting Federal Budget Deficits: How Reliable Are U.S. Congressional Budget Office Projections?" *Applied Economics,* vol. 23 (December 1991), pp. 1789-1799. Although both studies identify series that might have been used to make CBO's forecasts more accurate, they rely on statistics that assume a larger sample than is available. Moreover, although statistical tests can identify sources of inefficiency in a forecast after the fact, they generally do not indicate how such information could be used to improve forecasts when they are being made.

4. See, for example, Andy Bauer and others, "Forecast Evaluation with Cross-Sectional Data: The *Blue Chip* Surveys," *Economic Review,* Federal Reserve Bank of Atlanta (Spring 2003), pp. 17-31; and Henry Townsend, "A Comparison of Several Consensus Forecasts," *Business Economics* (January 1996).

5. See R. Fildes and H. Stekler, "The State of Macroeconomic Forecasting," pp. 435-468, and K.D. West, "Comments on 'The State of Macroeconomic Forecasting'," pp. 495-497, both in *Journal of Macroeconomics,* vol. 24 (December 2002).

possible direction or size of forecasting inaccuracies in the future.

Apart from the general caveat that should attend any conclusions based on statistical analysis, there are several reasons for viewing any evaluation of CBO's forecasts with particular caution:

- The procedures and purposes of the CBO, *Blue Chip*, and Administration economic forecasts differ and have changed over the past two decades, and they may change again. For example, in the late 1970s, CBO characterized its medium-term projections as a goal for the economy; it now considers them to be projections of what will prevail, on average, if the economy continues to reflect historical trends and fiscal policies are unchanged. In contrast, the underlying policy assumptions in the *Blue Chip* forecasts are not clear, for either the short run or the medium term. The *Blue Chip* is a survey, and the various forecasters often do not state their assumptions about fiscal policy. Last, the various Administration forecasts normally include the projected economic effects of their respective policy proposals, whereas CBO's forecasts assume current policy.[6]

- An institution's track record in forecasting may not indicate its future abilities because of changes in personnel or methods.

- Inaccuracies in a forecast increase when the economy is more volatile and when economic trends change. All three groups of forecasters—CBO, the *Blue Chip* survey, and the Administration—made relatively large errors when forecasting for periods that included turning points in the business cycle and for the late 1990s, when the sustainable growth rate of the economy apparently increased.

- Revisions of the national accounts may mean that institutions forecast one concept while the statistical agencies ultimately report the outcome for a materially different concept. A quantitatively important case in point was the addition of software expenditures to business fixed investment—and hence to GDP—in the comprehensive revision of the national income and product accounts in October 1999.

6. The role of current-policy or current-law assumptions in CBO's economic forecasts is explored in Congressional Budget Office, *What Is a Current-Law Economic Baseline?* (June 2, 2005).

The Effects of Business Cycles and Changes in the Trend Rate of Productivity Growth

As the track record shows, forecasters collectively tend to err during periods that include either turning points in the business cycle or significant shifts in the trend rate of productivity growth. For example, most forecasters overestimated the economy's growth rate in forecasts they made just before the two back-to-back recessions of the early 1980s. That pattern was repeated in the forecasts they made just before the more moderate recession of the early 1990s. In addition, during the mid- to late 1970s, forecasters continued to assume that the productivity trend of the previous two decades would prevail. In retrospect, however, the productivity trend of the 1970s and 1980s was significantly lower than that of the 1950s and 1960s. Because forecasters in the 1970s expected the previous trend to return, their forecasts of real output in the mid- to late 1970s turned out to be too optimistic. Partly for the same reason, forecasters repeatedly underestimated inflation in the late 1970s.

The years from 1995 to 2000 were a mirror image of the forecasting experience of the late 1970s. Partly because forecasters underestimated the trend rate of productivity growth beginning in 1996, they underpredicted the economy's growth rate and overpredicted inflation. As the economy continued to outperform expectations, analysts put more effort into investigating the possible causes of the increase in productivity growth. Those investigations focused on the possible contribution of the so-called new economy—especially the better flow of information among producers and between producers and consumers, which improved productivity and lowered inventories. Productivity growth has held up very well through the 2001 recession, subsequent recovery, and expansion to date, suggesting that the strong performance of U.S. productivity in the late 1990s was not simply a transient feature of the economic boom.

CBO's Forecasting Record

This analysis evaluates CBO's macroeconomic forecasts, which cover two-year and five-year periods. Because the budget reports that the Administration and CBO publish each winter focus on budget projections for the fiscal year

that begins in the following October, an economic forecast that is accurate not only for the months leading up to that budget year but also for the budget year itself will provide the basis for a more accurate forecast of the budget's bottom line (the annual deficit or surplus)—hence the interest in the two-year period. The five-year period is used to examine the accuracy of longer-term projections of several variables that are important for CBO's budget projections.

CBO has analyzed elsewhere the overall uncertainty of its budget projections, which depend on the accuracy of its economic projections. "Rules of thumb" for estimating the effects on budget projections of alternative assumptions about various macroeconomic variables appear in Appendix A of CBO's *The Budget and Economic Outlook: Fiscal Years 2006 to 2015* (January 2005).[7]

Two-Year Forecasts

Historically, the accuracy of CBO's two-year forecasts, as measured by the root mean square error, has been very similar to the accuracy of the forecasts of the *Blue Chip* consensus and the Administration.

Growth in Real Output. The accuracy of CBO's forecasts closely matched that of the *Blue Chip* consensus for the two-year forecasts made between 1982 and 2003. CBO's root mean square error was 1.2, as was that for the *Blue Chip* consensus (see Table 2 on page 12). In addition, the two sets of errors were highly positively correlated; when CBO's error was relatively large, the *Blue Chip*'s error also was large and in the same direction. In fact, the two sets of forecast errors differed by more than 0.1 percentage point in only nine of the 22 forecasts made during those years. CBO was closer to the actual value in six of those forecasts and the *Blue Chip* in three. (CBO's forecasts, which were published in the same month as the *Blue Chip* forecasts with which they were compared, were normally completed nearly two months earlier to provide time for the budget projections to be prepared.) Overall, CBO's forecasts were about as accurate as those of the Administration.

As noted earlier, forecast errors tend to be larger at turning points in the business cycle and when there are shifts in major economic trends. That tendency can be clearly seen in the forecasts of real output growth by comparing the large errors for 1979 through 1983—when the economy went through its most turbulent recessionary period of the postwar era—with the smaller errors recorded for the mid-expansion years from 1985 to 1987. More recently, the recession of 2001 and slow recovery in 2002 account for the overpredictions made by all three forecasters in 2000 and 2001.

All three forecasters underpredicted two-year real, or inflation-adjusted, gross domestic product (GDP) growth in every year between 1992 and 1999, with errors approaching or exceeding 2 percentage points for the two-year forecasts made between 1996 and 1999. About a fourth of that apparent pessimism resulted from subsequent revisions to the national income and product accounts (NIPAs), including important definitional changes (see Box 1). Yet leaving those data revisions aside, the underpredictions made between 1996 and 1999 still reflect the failure to foresee important economic developments. What CBO and other forecasters missed was the investment boom of the late 1990s, which deepened the capital stock and thereby boosted labor productivity and real economic growth.

Growth in Nominal Output. The records of CBO and the *Blue Chip* in forecasting two-year growth in nominal output are also quite similar overall (see Table 3 on page 14). Again, the two forecasts are positively correlated. Of the 22 forecasts made between 1982 and 2003, the *Blue Chip*'s error was smaller (by more than 0.1 percentage point) than CBO's seven times; CBO had the smaller error four times; and the two forecasters recorded virtually identical errors 11 times. The accuracies for the entire period, as measured by the root mean square error, are almost identical.

CBO's projections of nominal output were about as accurate as those of the Administration, both since 1982 and over the longer interval between 1976 and 2003.

CPI Inflation. CBO was about as successful as the *Blue Chip* in forecasting the two-year average growth in the consumer price index, or CPI (see Table 4 on page 16). CBO was more than 0.1 percentage point closer to the actual value in eight of the 22 periods, the *Blue Chip* was closer in three periods, and the two forecasters had essentially matching errors in 11 periods.

7. See also Congressional Budget Office, *The Uncertainty of Budget Projections: A Discussion of Data and Methods* (February 2005).

Box 1.

How Data Revisions May Affect the Interpretation of Forecast Errors

Data revisions can be an important factor in explaining forecast errors. If revisions change trends incorporated into history, forecasts made on the basis of pre-revision trends are likely to be inaccurate. The Bureau of Economic Analysis's (BEA's) comprehensive revisions published in October 1999 increased the two-year growth rates for real gross domestic product (GDP) over most of the historical period; in particular, rates went up by about 0.4 percentage points, on average, for the 1992-1998 period. That upward revision in growth rates stemmed largely from redefining software spending as investment in the accounts as well as adopting new price series for various categories of consumption. The upward revision to the growth of real output was accompanied by a downward revision to the growth of the GDP price index over the same period. In addition to making the mean forecast error less informative, those revisions distort the reliability of the statistical measures of accuracy.

By contrast, BEA's latest comprehensive revision to the national income and product accounts (NIPAs)—in December 2003—did not significantly affect the historical pattern of any of the variables used in this analysis of forecast accuracy. Real GDP growth from 1976 to 2002 (the period used in this analysis) was revised upward, on average, by about 0.05 percentage points, and the greatest revision for any two-year span was +0.3 percentage points for the 1991-1992 period. The revision also had small effects on the growth of the GDP price index and nominal GDP. Although the revision had a significant impact on income shares in 2002—taxable income as a share of GDP was revised upward by 0.3 percentage points—in general, CBO's view of the history of income shares did not change. Hence, the December 2003 revisions did not have a significant effect on this evaluation of forecasts.

The three-year NIPA revisions released in July 2005 changed the patterns of errors for forecasts of NIPA variables for the years 2002 through 2004. Growth of real GDP was revised down, but because the price index for gross domestic purchases was revised up, the downward revisions to nominal GDP were small. A vivid illustration of the way that revisions to historical data change forecast performance is given by the two-year forecast for real GDP growth over 2002 and 2003. Prior to the latest revision, CBO's forecast error was reported as zero, while *Blue Chip* and the Administration had underpredicted growth. After the revision, the forecast errors for the *Blue Chip* and the Administration largely disappeared, and CBO turns out to have overpredicted real growth for the period by 0.3 percentage points, as currently measured.

The variability of oil prices caused both CBO and the *Blue Chip* to err in forecasting inflation. They overestimated future inflation in the 1982-1986 period as well as in the 1997-1998 period, partly because of the rapid drop in oil prices early in 1986 and in 1997 to 1998. Conversely, the sharp rise in oil prices in 2000 and again in 2003 caused both forecasters to underestimate inflation in the two-year-ahead forecasts published in early 1999 and 2000 as well as those published in 2003.

The accuracy of CBO's forecasts of inflation was virtually the same as the Administration's in the period since 1982 and over the longer period since 1976.

Nominal Interest Rates. For the 1982-2003 forecasts of nominal short-term interest rates, CBO's record was slightly worse than the *Blue Chip*'s as measured by the root mean square error (see Table 5 on page 18). Both CBO and the *Blue Chip* tended to overestimate rates slightly (the forecasters' mean errors over that period were 0.6 percentage points and 0.5 percentage points, respectively). CBO was more than 0.1 percentage point closer to the actual value in seven of the 22 periods, and the *Blue Chip* was closer six times.

The overall accuracy of CBO's forecasts of long-term interest rates for the 1984-2003 period was very close to

that of the *Blue Chip* forecasts (see Table 6 on page 20). CBO was more than 0.1 percentage point closer to the actual value in six of the 20 periods, the *Blue Chip* was closer in five periods, and the two forecasters had essentially identical errors in nine periods. Since 1991, CBO has been closer for five forecasts and the *Blue Chip* for one.

CBO's forecasts of long-term interest rates were more accurate than those of the Administration, but there was no significant difference between the accuracy of the two government forecasters for short-term rates.

Real Short-Term Interest Rates. *Blue Chip* and CBO had about the same accuracy, using the root mean square error, in estimating short-term interest rates adjusted for inflation in the 1982-2003 period (see Table 7 on page 22). CBO's forecasts were closer to the actual value in four of the 22 periods, the *Blue Chip*'s were closer in 11, and the two registered similar errors in seven periods.

CBO's forecast accuracy was similar to that of the Administration for the period since 1982; CBO was slightly more accurate than the Administration for the 1976-1981 period.

The Difference Between the Growth of the CPI and the GDP Price Index. The difference in the forecasted growth rates of the two major price indexes, the CPI and the GDP price index, is important for budget projections. The growth of the GDP price index is a major determinant in forecasting the growth of nominal GDP and, therefore, the growth of income subject to federal tax. All else being equal, the faster the projected growth of the GDP price index, the faster the projected growth of revenues. The growth of the consumer price index affects forecasts of outlays because a number of programs are indexed to the CPI. The CPI projection, however, also affects projections of revenues because elements of the personal tax code, such as tax brackets, are indexed to the CPI. In general, the faster the growth of the CPI, the faster the growth of outlays and the slower the growth of revenues. Therefore, if the growth of the GDP price index is forecast to be large relative to that of the CPI, the projection of the deficit will be smaller than if the GDP price index is assumed to grow much less rapidly than the CPI.

The mean error statistics indicate a downward bias to CBO's forecast of the difference between the growth of the CPI and the growth of the GDP price deflator for forecasts made through 1999 (see Table 8 on page 24). A similar bias is evident in the forecasts of the *Blue Chip* and of the Administration. The apparent bias in those forecasts can be explained in large part by changes in the national income accounts. Most notably, in a conceptual and methodological change implemented in 1999, business spending on software was added to investment and therefore to GDP (previously business software spending was considered a purchase of an intermediate good). Because the price index for software purchases has been growing much less rapidly than all other prices on average, the addition of software caused a downward revision of the historical data for the growth of the GDP price index. Hence, the forecasts made before 2000 had been based on a pattern of historical growth in the GDP price index that was higher than is currently reported.

The accuracy of CBO's forecast of the difference between the two indexes two years ahead was the same as that of the *Blue Chip* consensus (see Table 8). CBO was more accurate than the *Blue Chip* (by more than 0.1 percentage point) in four of the 22 periods, the *Blue Chip* was more accurate in three periods, and the two forecasters had essentially identical errors in 15 periods.

CBO was about as accurate as the Administration during both the 1976-2003 and 1982-2003 periods.

Taxable Income. One of the greatest sources of error in budget projections is in forecasting taxable income. The errors in the first step of such forecasting, the forecast of nominal GDP growth, were discussed above. The errors in the second step—the forecast of the relationship of major components of taxable income to nominal GDP (particularly the "high-tax" income share of GDP)—are discussed here. The most important component of taxable income for revenue projections currently is wages and salaries, followed by the book profits of corporations. Because the *Blue Chip* does not forecast wages and salaries, CBO's forecast record cannot be compared with that of the private-sector survey in this respect.

The accuracy of CBO's and the Administration's forecasts of the two-year change in the combined share of wages and salaries and book profits in GDP has been almost identical for the period since 1980 (see Table 9 on page 26). Moreover, the pattern of errors has been similar: both forecasters experienced a string of underpredictions of the change in the income share in the forecasts

they made between 1994 and 1999. Both forecasters made large errors by overpredicting the increase in the share in the forecasts they made in 2001, 2002, and 2003.

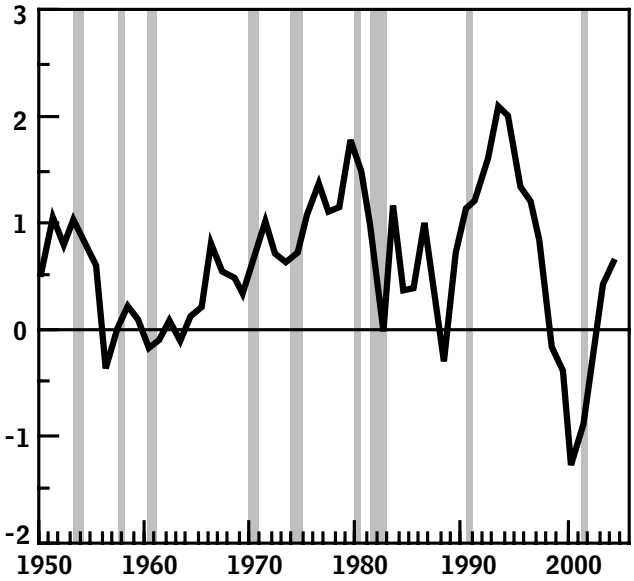
Three factors contributed to the string of underpredictions of taxable income growth in the mid- to late-1990s and to the overpredictions in the most recent forecasts. The first factor was the difference between measures of total income and total product in the national income and product accounts. In principle, those two aggregate measures of economic activity should be equal, but in practice they are not, because the Bureau of Economic Analysis must use different primary sources to estimate income, on the one hand, and product, on the other. The statistical discrepancy in the NIPAs measures the difference between the estimates of product and income; between 1994 and 2000, total income grew faster than total product—that is, the statistical discrepancy fell and then became more negative (see Figure 1). More recently, the statistical discrepancy has turned positive again. The discrepancy is essentially impossible to forecast, since it reflects errors in estimating. If those errors were predictable, BEA would try to correct them. At this point, it is impossible to tell to what degree changes in the discrepancy have caused forecasters to err in their forecasts of income.

A second source of difficulty in forecasting taxable income is the recent variability in the part of labor income that is not subject to tax. Throughout most of the post-World War II period, the nontaxable part of labor income rose as a share of total labor compensation because employers and employees preferred to substitute untaxed noncash, or fringe, benefits (such as employer-paid insurance premiums and pension contributions) for taxable wages and salaries. But between 1994 and 1999, that trend reversed (see Figure 2). The share of total labor compensation that is not taxed declined, while the share of compensation that is taxed increased. That turnaround stemmed from changes in the way health care is provided and from the rise in the stock market (which reduced the necessity for employers to contribute to defined-benefit pension plans). Since 2001, however, the trend appears to have reversed again, with the nontaxable share of labor income rising sharply. During this period, legislative changes have temporarily reduced the payments that firms would otherwise have been required to make to fund defined-benefit pensions, further complicating the comparison of forecast and outcome.[8]

Figure 1.

Statistical Discrepancy in the National Income and Product Accounts

(Percentage of GDP)



Sources: Congressional Budget Office; Department of Commerce, Bureau of Economic Analysis.

Notes: The shaded vertical bars indicate periods of recession. The bars extend from the peak to the trough of each recession.

The statistical discrepancy is the measure of national product minus the measure of national income. When the discrepancy is positive, total income (as measured in the national income and product accounts) is less than the corresponding measure of the economy's total product.

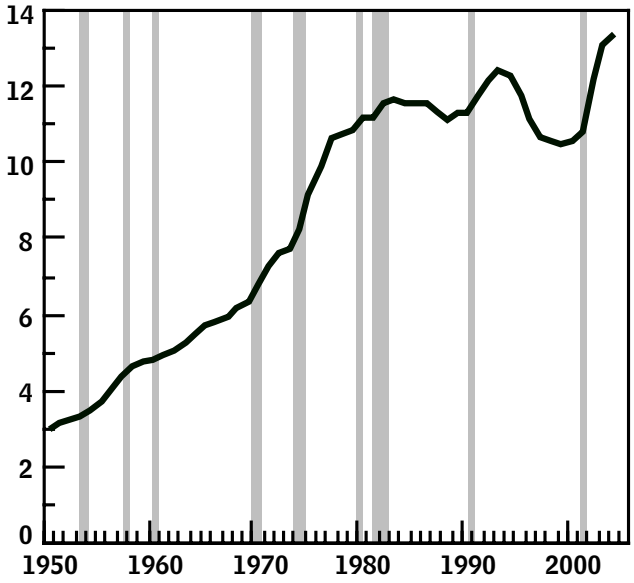
A third factor, which affected forecasts made in January 2001 and 2002, was the change to tax rules for the depreciation of capital goods made in legislation enacted in 2002 and 2003. By allowing more depreciation than previously, the changes caused corporate book profits to be lower relative to economic profits (because more depreciation could be written off as a business expense) than usual. Forecasters in 2001 did not incorporate that effect for 2002, so forecasts of book profits were too high for that year.

8. The implications for CBO's baseline forecasts of subsequent legislative changes are discussed in Congressional Budget Office, *What Is a Current-Law Economic Baseline?* Further details about the treatment of contributions to defined-benefit pension plans are outlined in Box 2-2 of Congressional Budget Office, *The Budget and Economic Outlook: An Update* (August 2005).

Figure 2.

Fringe Benefits

(Percentage of total labor compensation)



Sources: Congressional Budget Office; Department of Commerce, Bureau of Economic Analysis.

Notes: The shaded vertical bars indicate periods of recession. The bars extend from the peak to the trough of each recession.

Fringe benefits are employers' contributions for employees' pension and insurance funds.

Five-Year Projections

CBO's economic projections were about as accurate as those of the *Blue Chip* and the Administration in all the series examined. The *Blue Chip*'s five-year economic projections (published twice a year) are generally prepared about four months after the CBO forecasts with which they are compared. While the CBO projections are constrained to assume no change in fiscal policy and the Administration's forecasts generally assume the Administration's proposals are enacted, the *Blue Chip* forecasters are free to make their best projections for future fiscal policy. That freedom and additional months of data do not seem to translate into a forecasting edge, however.

Real Output. CBO's projections of medium-term growth in real output were about as accurate as the *Blue Chip*'s in the period since 1979 (see Table 10 on page 28). As with the errors in the two-year forecasts, the errors in the five-year projections of the two forecasters were highly positively correlated, with both forecasters posting similarly large errors for the same years (1979 as well as 1994 through 1997). The mean errors for the 1979-2000 period indicate that both forecasters had a very similar downward bias (they predicted lower growth, on average, than what actually occurred) of 0.3 percentage points and 0.4 percentage points, respectively. In the five-year-ahead projections made between 1992 and 2000, both CBO and the *Blue Chip* underpredicted long-term growth because of the surprisingly strong economy of the late 1990s and, to a lesser extent, the upward revisions to BEA's estimates of the rate of growth previously discussed.

The accuracy of CBO's projections was also similar to that of the Administration's.

Nominal Output. The accuracy of the CBO and the *Blue Chip* forecasts of the growth of nominal output has been identical for the period since 1982 (see Table 11 on page 30). The accuracy was slightly less than that for the growth of real output because the forecasters' errors in their projections of the inflation rate for the price index of output added to their errors in forecasting real output.

Inflation Measures. The difference between the two major inflation measures is even more important for five-year budget projections than for two-year forecasts. The mean error statistics indicate a slightly larger downward bias than in the two-year case, and the projections of the difference in the growth of the CPI and the GDP price index over five-year horizons were too low in virtually all of the periods (see Table 12 on page 32). As with CBO, the *Blue Chip* and the Administration have also tended to forecast too high a rate of growth in the GDP price measure relative to the CPI measure of prices. At least 0.2 percentage points of the apparent forecast bias before 1999 stem from the addition of software spending to the national accounts in 1999.

Even after the errors are adjusted for the effect of the revisions, a slight downward bias remains for all three forecasters. That bias indicates that projections of the relationship between those two price measures tend to contribute to optimistic budget projections. While all of the projections showed a similar bias, CBO's forecast accuracy record is about the same as that of the *Blue Chip* and slightly better than that of the Administration.

Taxable Income. The final five-year projection record examined here is that of the change in the sum of wages

and salaries and corporate book profits expressed as a share of output. (As with the two-year forecast, these are the most important income components for revenue projections.) CBO's projections are less accurate than those of the Administration (see Table 13 on page 34). Compared with the Administration's projections, CBO's five-year forecasts of these important components of the tax base were insufficiently pessimistic in the early 1980s but then too pessimistic in 1996 and 1997. As with some other variables, the errors of both forecasters show alternating periods of optimism and pessimism and are positively correlated. The projections made for five-year periods covering the years from 1994 through 1999 indicated less growth in the tax base relative to GDP than actually occurred. Difficulties in forecasting the statistical discrepancy and the nontaxable component of labor income are major sources of errors in five-year projections as well as in two-year forecasts. (Three factors contributing to errors in CBO's forecasts of taxable income were discussed above in the context of the two-year horizon.)

Table 1.

Summary Measures of Forecast Performance

(Percentage points)

	CBO	*Blue Chip*[a]	Administration
	Two-Year Averages		
Growth Rate for Real Output (1982-2003)			
Mean error	-0.5	-0.6	-0.4
Mean absolute error	1.0	1.0	1.1
Root mean square error	1.2	1.2	1.3
Growth Rate for Nominal Output (1982-2003)			
Mean error	0.1	0.1	0.3
Mean absolute error	1.1	1.0	1.1
Root mean square error	1.3	1.2	1.4
Inflation in the Consumer Price Index (1982-2003)			
Mean error	0.4	0.4	0.3
Mean absolute error	0.6	0.7	0.7
Root mean square error	0.8	0.9	0.9
Nominal Interest Rate on Three-Month Treasury Bills (1982-2003)			
Mean error	0.6	0.5	0.2
Mean absolute error	1.1	1.0	1.1
Root mean square error	1.4	1.2	1.3
Nominal Long-Term Interest Rate (1984-2003)			
Mean error	0.3	0.4	-0.1
Mean absolute error	0.7	0.6	0.8
Root mean square error	0.7	0.7	1.0
Real Interest Rate on Three-Month Treasury Bills (1982-2003)			
Mean error	0.1	0.1	-0.1
Mean absolute error	0.9	0.9	1.0
Root mean square error	1.2	1.1	1.2
Difference Between Inflation in the CPI and the GDP Price Index (1982-2003)			
Mean error	-0.2	-0.2	-0.3
Mean absolute error	0.3	0.4	0.4
Root mean square error	0.4	0.4	0.5
Change in Wage and Salary Disbursements Plus Corporate Book Profits as a Share of Output (1980-2003)			
Mean error	0.2	*	0.4
Mean absolute error	1.0	*	0.9
Root mean square error	1.2	*	1.2

Continued

Table 1.

Continued

(Percentage points)

	CBO	*Blue Chip* [a]	Administration
	Five-Year Averages		
Growth Rate for Real Output (1979-2000)			
Mean error	-0.3	-0.4	0
Mean absolute error	0.6	0.6	0.8
Root mean square error	0.9	0.8	0.9
Growth Rate for Nominal Output (1982-2000)			
Mean error	0.4	0.6	0.6
Mean absolute error	0.8	0.8	0.8
Root mean square error	1.0	1.0	1.0
Difference Between Inflation in the CPI and the GDP Price Index (1983-2000)			
Mean error	-0.3	-0.4	-0.5
Mean absolute error	0.4	0.4	0.5
Root mean square error	0.4	0.5	0.6
Change in Wage and Salary Disbursements Plus Corporate Book Profits as a Share of Output (1980-2000)			
Mean error	0	*	0.2
Mean absolute error	1.7	*	1.3
Root mean square error	2.2	*	1.8

Sources: Congressional Budget Office; Office of Management and Budget; Aspen Publishers, Inc., *Blue Chip Economic Indicators*; Department of Commerce, Bureau of Economic Analysis.

Notes: The values reported here are derived from Tables 2 through 13. Errors are projected values minus actual values; thus, a positive error is an overestimate.

* = not applicable.

a. *Blue Chip* is the average of approximately 50 private-sector forecasters.

Table 2.

CBO, Administration, and *Blue Chip* Forecasts of Two-Year Average Growth Rates for Real Output

(By calendar year, in percent)

	Actual				CBO		*Blue Chip*[e]		Administration	
	1972 Dollars[a]	1982 Dollars[b]	1987 Dollars[c]	Chain-Type Annual-Weighted Index	Forecast	Error[d]	Forecast	Error[d]	Forecast	Error[d]
Real GNP										
1976-1977	6.7	4.8	4.8	5.1	6.2	1.1	*	*	5.9	0.9
1977-1978	5.2	5.0	4.7	5.1	5.5	0.4	*	*	5.1	0.1
1978-1979	3.9	3.9	3.8	4.5	4.7	0.3	*	*	4.7	0.3
1979-1980	1.3	1.1	1.1	1.6	2.7	1.2	*	*	2.9	1.3
1980-1981	1.1	0.9	0.5	1.0	0.5	-0.5	*	*	0.5	-0.5
1981-1982	0.2	-0.3	-0.4	0.2	2.1	1.9	*	*	2.6	2.4
1982-1983	0.7	0.5	0.7	1.2	2.1	0.9	2.0	0.8	2.7	1.4
1983-1984	5.2	5.2	4.9	5.7	3.4	-2.3	3.5	-2.2	2.6	-3.1
1984-1985	*	5.1	4.4	5.4	4.7	-0.7	4.3	-1.1	4.7	-0.7
1985-1986	*	3.0	2.8	3.5	3.3	-0.2	3.2	-0.3	3.9	0.4
1986-1987	*	3.1	2.9	3.3	3.1	-0.1	3.0	-0.3	3.7	0.4
1987-1988	*	3.9	3.5	3.8	2.9	-0.9	2.8	-0.9	3.3	-0.5
1988-1989	*	3.5	3.3	3.9	2.4	-1.4	2.1	-1.7	3.0	-0.9
1989-1990	*	1.7	2.0	2.8	2.5	-0.3	2.2	-0.6	3.2	0.4
1990-1991	*	*	0.3	0.9	2.0	1.2	1.9	1.1	2.8	1.9
1991-1992	*	*	0.7	1.5	1.6	0.1	1.2	-0.3	1.4	-0.1
Real GDP[f]										
1992-1993	*	*	2.7	3.0	2.6	-0.4	2.3	-0.7	2.2	-0.8
1993-1994	*	*	3.6	3.3	2.9	-0.4	3.0	-0.3	2.9	-0.4
1994-1995	*	*	*	3.3	2.8	-0.5	2.8	-0.4	2.9	-0.3
1995-1996	*	*	*	3.1	2.4	-0.7	2.6	-0.5	2.6	-0.5
1996-1997	*	*	*	4.1	1.9	-2.1	2.1	-2.0	2.2	-1.8
1997-1998	*	*	*	4.3	2.1	-2.2	2.2	-2.1	2.1	-2.2
1998-1999	*	*	*	4.3	2.3	-2.0	2.4	-1.9	2.2	-2.1
1999-2000	*	*	*	4.1	2.0	-2.1	2.3	-1.7	2.2	-1.9
2000-2001	*	*	*	2.2	3.2	1.0	3.3	1.1	3.0	0.8
2001-2002	*	*	*	1.2	2.9	1.7	3.0	1.8	3.2	2.1
2002-2003	*	*	*	2.2	2.4	0.3	2.2	0	2.2	0.1
2003-2004	*	*	*	3.5	3.0	-0.4	3.2	-0.3	3.2	-0.2

Continued

Table 2.

Continued

(By calendar year, in percent)

	Actual									
	1972 Dollars[a]	1982 Dollars[b]	1987 Dollars[c]	Chain-Type Annual-Weighted Index	CBO		*Blue Chip*[e]		Administration	
					Forecast	Error[d]	Forecast	Error[d]	Forecast	Error[d]
Statistics for 1976-2003										
Mean error	*	*	*	*	*	-0.3	*	*	*	-0.1
Mean absolute error	*	*	*	*	*	1.0	*	*	*	1.0
Root mean square error	*	*	*	*	*	1.2	*	*	*	1.3
Statistics for 1982-2003										
Mean error	*	*	*	*	*	-0.5	*	-0.6	*	-0.4
Mean absolute error	*	*	*	*	*	1.0	*	1.0	*	1.1
Root mean square error	*	*	*	*	*	1.2	*	1.2	*	1.3

Sources: Congressional Budget Office; Office of Management and Budget; Aspen Publishers, Inc., *Blue Chip Economic Indicators*; Department of Commerce, Bureau of Economic Analysis.

Notes: Actual values are for the two-year growth rates for real gross national product (GNP) and real gross domestic product (GDP) last reported by the Bureau of Economic Analysis (BEA), not the first reported values. Forecast values are for the average annual growth of real GNP or GDP over the two-year period. The forecasts were issued in the first half of the initial year of the period or in December of the preceding year.

* = not applicable.

a. Data for 1972-dollar GNP and GDP are available only through the third quarter of 1985.

b. Data for 1982-dollar GNP and GDP are available only through the third quarter of 1991.

c. Data for 1987-dollar GNP and GDP are available only through the second and third quarters, respectively, of 1995.

d. Errors (which are in percentage points) are forecast values minus actual values; thus, a positive error is an overestimate. The chain-type annual-weighted index of actual GNP or GDP was used to calculate the errors.

e. Two-year forecasts for the *Blue Chip* consensus were not available until 1982.

f. With BEA's 1992 benchmark revision, GDP replaced GNP as the central measure of national output.

Table 3.

Comparison of CBO, Administration, and *Blue Chip* Forecasts of Two-Year Average Growth Rates for Nominal Output

(By calendar year, in percent)

		CBO		*Blue Chip*[b]		Administration	
	Actual	Forecast	Error[a]	Forecast	Error[a]	Forecast	Error[a]
GNP							
1976-1977	11.5	13.1	1.7	*	*	12.3	0.8
1977-1978	12.1	10.8	-1.3	*	*	11.2	-1.0
1978-1979	12.5	10.9	-1.6	*	*	11.2	-1.3
1979-1980	10.4	11.0	0.5	*	*	10.4	-0.1
1980-1981	10.4	9.7	-0.7	*	*	9.5	-0.8
1981-1982	8.0	12.1	4.1	*	*	11.9	4.0
1982-1983	6.3	9.7	3.4	9.5	3.2	9.8	3.5
1983-1984	9.8	8.2	-1.6	9.0	-0.9	8.0	-1.8
1984-1985	9.0	9.9	0.9	9.6	0.6	9.6	0.6
1985-1986	6.2	7.6	1.3	7.4	1.2	8.2	1.9
1986-1987	5.8	7.1	1.3	6.7	0.9	7.7	1.8
1987-1988	7.0	6.5	-0.5	6.4	-0.5	6.9	-0.1
1988-1989	7.6	6.3	-1.3	6.1	-1.5	6.8	-0.9
1989-1990	6.7	6.8	0.1	6.6	-0.1	7.1	0.4
1990-1991	4.6	6.1	1.5	6.0	1.4	7.1	2.5
1991-1992	4.4	5.7	1.3	5.2	0.8	5.6	1.2
GDP[c]							
1992-1993	5.4	5.7	0.3	5.5	0.2	5.4	0
1993-1994	5.6	5.3	-0.3	6.0	0.4	5.3	-0.3
1994-1995	5.4	5.6	0.2	5.6	0.2	5.7	0.3
1995-1996	5.1	5.2	0.1	5.7	0.6	5.6	0.4
1996-1997	6.0	4.7	-1.3	4.5	-1.4	5.1	-0.9
1997-1998	5.8	4.6	-1.2	4.6	-1.2	4.7	-1.0
1998-1999	5.6	4.5	-1.2	4.5	-1.1	4.2	-1.5
1999-2000	5.9	3.9	-2.0	4.1	-1.8	4.0	-1.9
2000-2001	4.5	4.9	0.3	5.1	0.6	4.9	0.4
2001-2002	3.3	5.2	1.9	5.1	1.8	5.4	2.1
2002-2003	4.1	4.2	0.1	4.0	-0.1	4.2	0.1
2003-2004	5.9	4.8	-1.1	5.0	-0.9	4.7	-1.2

Continued

Table 3.

Continued

(By calendar year, in percent)

		CBO		*Blue Chip*[b]		Administration	
	Actual	Forecast	Error[a]	Forecast	Error[a]	Forecast	Error[a]
Statistics for 1976-2003							
Mean error	*	*	0.2	*	*	*	0.3
Mean absolute error	*	*	1.2	*	*	*	1.2
Root mean square error	*	*	1.5	*	*	*	1.5
Statistics for 1982-2003							
Mean error	*	*	0.1	*	0.1	*	0.3
Mean absolute error	*	*	1.1	*	1.0	*	1.1
Root mean square error	*	*	1.3	*	1.2	*	1.4

Sources: Congressional Budget Office; Office of Management and Budget; Aspen Publishers, Inc., *Blue Chip Economic Indicators*; Department of Commerce, Bureau of Economic Analysis.

Notes: Actual values are for the two-year growth rates for gross national product (GNP) and gross domestic product (GDP) last reported by the Bureau of Economic Analysis (BEA), not the first reported values. Forecast values are for the average annual growth of nominal GNP or GDP over the two-year period. The forecasts were issued in the first half of the initial year of the period or in December of the preceding year.

* = not applicable.

a. Errors (which are in percentage points) are forecast values minus actual values; thus, a positive error is an overestimate.

b. Two-year forecasts for the *Blue Chip* consensus were not available until 1982.

c. With BEA's 1992 benchmark revision, GDP replaced GNP as the central measure of national output.

Table 4.

CBO, Administration, and *Blue Chip* Forecasts of Two-Year Average Inflation in the Consumer Price Index

(By calendar year, in percent)

	Actual		CBO		*Blue Chip*[b]		Administration	
	CPI-U	CPI-W	Forecast	Error[a]	Forecast	Error[a]	Forecast	Error[a]
1976-1977	6.1	6.1	7.1	1.0	*	*	6.1	0
1977-1978	7.0	7.0	4.9	-2.1	*	*	5.2	-1.8
1978-1979	9.4	9.5	5.8	-3.7	*	*	6.0	-3.5
1979-1980	12.4	12.5	8.1	-4.3	*	*	7.4	-5.0
1980-1981	11.9	11.9	10.1	-1.8	*	*	10.5	-1.4
1981-1982	8.2	8.1	10.4	2.1	*	*	9.7	1.6
1982-1983	4.6	4.5	7.2	2.6	7.2	2.6	6.6	2.1
1983-1984	3.8	3.3	4.7	1.0	4.9	1.1	4.7	1.5
1984-1985	3.9	3.5	4.9	1.0	5.2	1.3	4.5	1.0
1985-1986	2.7	2.5	4.1	1.4	4.3	1.6	4.2	1.7
1986-1987	2.8	2.6	3.8	1.2	3.8	1.0	3.8	1.2
1987-1988	3.8	3.8	3.9	0.1	3.6	-0.2	3.3	-0.5
1988-1989	4.4	4.4	4.7	0.3	4.3	-0.1	4.2	-0.2
1989-1990	5.1	5.0	4.9	-0.1	4.7	-0.4	3.7	-1.3
1990-1991	4.8	4.6	4.1	-0.7	4.1	-0.7	3.9	-0.7
1991-1992	3.6	3.5	4.2	0.6	4.4	0.8	4.6	1.1
1992-1993	3.0	2.9	3.4	0.4	3.5	0.5	3.1	0.1
1993-1994	2.8	2.7	2.8	0.1	3.3	0.6	2.8	0.1
1994-1995	2.7	2.7	2.8	0.1	3.0	0.3	3.0	0.3
1995-1996	2.9	2.9	3.2	0.4	3.4	0.6	3.1	0.3
1996-1997	2.6	2.6	2.9	0.3	2.8	0.2	2.9	0.3
1997-1998	1.9	1.8	2.9	1.0	2.9	1.0	2.7	0.8
1998-1999	1.9	1.8	2.3	0.5	2.4	0.5	2.1	0.3
1999-2000	2.8	2.8	2.5	-0.2	2.2	-0.6	2.2	-0.5
2000-2001	3.1	3.1	2.4	-0.6	2.5	-0.6	2.5	-0.6
2001-2002	2.2	2.0	2.8	0.6	2.5	0.4	2.6	0.5
2002-2003	1.9	1.8	2.1	0.2	2.0	0.1	2.0	0.1
2003-2004	2.5	2.4	2.2	-0.2	2.2	-0.2	2.1	-0.3

Continued

Table 4.

Continued

(By calendar year, in percent)

	Actual		CBO		*Blue Chip*[b]		Administration	
	CPI-U	CPI-W	Forecast	Error[a]	Forecast	Error[a]	Forecast	Error[a]
Statistics for 1976-2003								
Mean error	*	*	*	0	*	*	*	-0.1
Mean absolute error	*	*	*	1.0	*	*	*	1.0
Root mean square error	*	*	*	1.5	*	*	*	1.5
Statistics for 1982-2003								
Mean error	*	*	*	0.4	*	0.4	*	0.3
Mean absolute error	*	*	*	0.6	*	0.7	*	0.7
Root mean square error	*	*	*	0.8	*	0.9	*	0.9

Sources: Congressional Budget Office; Office of Management and Budget; Aspen Publishers, Inc., *Blue Chip Economic Indicators*; Department of Labor, Bureau of Labor Statistics.

Notes: Values are for the average annual growth of the consumer price index (CPI) over the two-year period. Before 1978, the Bureau of Labor Statistics published only one consumer price index series, now known as the CPI-W (the price index for urban wage earners and clerical workers). In January 1978, the bureau began to publish a second, broader consumer price index series, the CPI-U (the price index for all urban consumers). For most years since 1979, CBO forecast the CPI-U; from 1986 through 1989, however, CBO forecast the CPI-W. The Administration forecast the CPI-W until 1992, when it switched to the CPI-U. *Blue Chip* forecast the CPI-U for the entire period. The forecasts were issued in the first half of the initial year of the period or in December of the preceding year.

* = not applicable.

a. Errors (which are in percentage points) are forecast values minus actual values; thus, a positive error is an overestimate.

b. Two-year forecasts for the *Blue Chip* consensus were not available until 1982.

Table 5.

CBO, Administration, and *Blue Chip* Forecasts of Two-Year Average Nominal Interest Rates on Three-Month Treasury Bills

(By calendar year, in percent)

	Actual		CBO		*Blue Chip*[b]		Administration	
	New Issue	Secondary Market	Forecast	Error[a]	Forecast	Error[a]	Forecast	Error[a]
1976-1977	5.1	5.1	6.2	1.1	*	*	5.5	0.4
1977-1978	6.2	6.2	6.4	0.2	*	*	4.4	-1.8
1978-1979	8.6	8.6	6.0	-2.6	*	*	6.1	-2.5
1979-1980	10.8	10.7	8.3	-2.4	*	*	8.2	-2.6
1980-1981	12.8	12.7	9.5	-3.2	*	*	9.7	-3.1
1981-1982	12.4	12.3	13.2	0.9	*	*	10.0	-2.4
1982-1983	9.7	9.6	12.6	3.0	11.3	1.6	11.1	1.4
1983-1984	9.1	9.1	7.1	-2.0	7.9	-1.2	7.9	-1.1
1984-1985	8.5	8.5	8.7	0.3	9.1	0.5	8.1	-0.4
1985-1986	6.7	6.7	8.5	1.8	8.5	1.8	8.0	1.3
1986-1987	5.9	5.9	6.7	0.9	7.1	1.2	6.9	1.0
1987-1988	6.2	6.2	5.6	-0.6	5.7	-0.5	5.5	-0.7
1988-1989	7.4	7.4	6.4	-0.9	6.1	-1.2	5.2	-2.1
1989-1990	7.8	7.8	7.5	-0.3	7.5	-0.3	5.9	-1.9
1990-1991	6.5	6.4	7.0	0.6	7.1	0.7	6.0	-0.4
1991-1992	4.4	4.4	6.8	2.4	6.4	2.0	6.2	1.8
1992-1993	3.2	3.2	4.7	1.5	4.6	1.4	4.5	1.3
1993-1994	3.6	3.6	3.4	-0.2	3.8	0.2	3.4	-0.2
1994-1995	4.9	4.9	3.9	-1.0	3.6	-1.3	3.6	-1.3
1995-1996	5.3	5.2	5.9	0.7	6.1	0.9	5.7	0.4
1996-1997	5.0	5.0	4.8	-0.2	5.0	0	4.7	-0.3
1997-1998	4.9	4.9	5.0	0.1	5.1	0.2	4.8	-0.1
1998-1999	4.7	4.7	5.2	0.5	5.1	0.4	4.9	0.2
1999-2000	5.2	5.2	4.5	-0.7	4.3	-0.9	4.2	-1.0
2000-2001	4.6	4.6	5.5	0.9	5.6	1.0	5.2	0.6
2001-2002	2.5	2.5	4.8	2.4	5.4	2.9	5.8	3.3
2002-2003	1.3	1.3	3.3	2.0	2.7	1.4	2.8	1.5
2003-2004	1.2	1.2	2.4	1.3	2.2	1.1	2.4	1.3

Continued

Table 5.

Continued

(By calendar year, in percent)

	Actual		CBO		*Blue Chip*[b]		Administration	
	New Issue	Secondary Market	Forecast	Error[a]	Forecast	Error[a]	Forecast	Error[a]
Statistics for 1976-2003								
Mean error	*	*	*	0.2	*	*	*	-0.3
Mean absolute error	*	*	*	1.2	*	*	*	1.3
Root mean square error	*	*	*	1.5	*	*	*	1.6
Statistics for 1982-2003								
Mean error	*	*	*	0.6	*	0.5	*	0.2
Mean absolute error	*	*	*	1.1	*	1.0	*	1.1
Root mean square error	*	*	*	1.4	*	1.2	*	1.3

Sources: Congressional Budget Office; Office of Management and Budget; Aspen Publishers, Inc., *Blue Chip Economic Indicators*; Federal Reserve Board.

Notes: Values are for the geometric averages of the three-month Treasury bill rates for the two-year period. The actual values are published by the Federal Reserve Board as the rate on new issues (reported on a bank-discount basis) and the secondary-market rate. CBO forecast the secondary-market rate; the Administration forecast the new-issue rate. *Blue Chip* alternated between the two rates, forecasting the new-issue rate from 1982 to 1985, the secondary-market rate from 1986 to 1991, and the new-issue rate again beginning in 1992. The forecasts were issued in the first half of the initial year of the period or in December of the preceding year.

* = not applicable.

a. Errors (which are in percentage points) are forecast values minus actual values; thus, a positive error is an overestimate.

b. Two-year forecasts for the *Blue Chip* consensus were not available until 1982.

Table 6.

CBO, Administration, and *Blue Chip* Forecasts of Two-Year Averages for Nominal Long-Term Interest Rates

(By calendar year, in percent)

	Actual		CBO		*Blue Chip*		Administration	
	10-Year Note	Corporate Aaa Bond	Forecast	Error[a]	Forecast	Error[a]	Forecast	Error[a]
1984-1985	11.5	12.0	11.9	-0.1	12.2	0.2	9.7	-1.8
1985-1986	9.1	10.2	11.5	1.3	11.8	1.7	10.6	1.5
1986-1987	8.0	9.2	8.9	0.9	9.9	0.8	8.7	0.7
1987-1988	8.6	9.5	7.2	-1.4	8.7	-0.8	6.6	-2.0
1988-1989	8.7	9.5	9.4	0.7	9.8	0.3	7.7	-1.0
1989-1990	8.5	9.3	9.1	0.6	9.5	0.3	7.7	-0.8
1990-1991	8.2	9.0	7.7	-0.5	8.7	-0.3	7.2	-1.0
1991-1992	7.4	8.5	7.8	0.4	8.7	0.3	7.3	-0.1
1992-1993	6.4	7.7	7.1	0.7	8.4	0.7	6.9	0.5
1993-1994	6.5	7.6	6.6	0.2	8.2	0.6	6.6	0.2
1994-1995	6.8	7.8	5.9	-0.9	7.1	-0.7	5.8	-1.0
1995-1996	6.5	7.5	7.3	0.8	8.6	1.1	7.5	1.0
1996-1997	6.4	7.3	6.2	-0.1	6.2	-0.1	5.4	-0.9
1997-1998	5.8	6.9	6.2	0.4	6.4	0.6	6.0	0.2
1998-1999	5.5	6.8	6.0	0.6	5.9	0.5	5.8	0.4
1999-2000	5.8	7.3	5.2	-0.6	5.0	-0.8	4.9	-0.9
2000-2001	5.5	7.4	6.3	0.8	6.3	0.8	6.1	0.6
2001-2002	4.8	6.8	5.1	0.3	5.4	0.6	5.8	1.0
2002-2003	4.3	6.1	5.2	0.9	5.3	1.0	5.1	0.8
2003-2004	4.1	5.6	4.8	0.7	4.8	0.7	4.6	0.5
Statistics for 1984-2003								
Mean error	*	*	*	0.3	*	0.4	*	-0.1
Mean absolute error	*	*	*	0.7	*	0.6	*	0.8
Root mean square error	*	*	*	0.7	*	0.7	*	1.0

Sources: Congressional Budget Office; Office of Management and Budget; Aspen Publishers, Inc., *Blue Chip Economic Indicators*; Federal Reserve Board.

Notes: Actual values are for the geometric averages of the 10-year Treasury note rates or Moody's corporate Aaa bond rates for the two-year period as reported by the Federal Reserve Board. CBO forecast the 10-year Treasury note rate in all years except 1984 and 1985, when it forecast the corporate Aaa bond rate. The Administration forecast the 10-year note rate, but *Blue Chip* forecast the corporate Aaa bond rate through 1995 and then switched to the 10-year Treasury note rate. Data are only available beginning in 1984 because not all of the forecasters published long-term rate projections before then. The forecasts were issued in the first half of the initial year of the period or in December of the preceding year.

* = not applicable.

a. Errors (which are in percentage points) are forecast values minus actual values; thus, a positive error is an overestimate.

Table 7.

CBO, Administration, and *Blue Chip* Forecasts of Two-Year Average Real Interest Rates on Three-Month Treasury Bills

(By calendar year, in percent)

	Actual									
	New Issue		Secondary Market		CBO		*Blue Chip*[b]		Administration	
	CPI-U	CPI-W	CPI-U	CPI-W	Forecast	Error[a]	Forecast	Error[a]	Forecast	Error[a]
1976-1977	-0.9	-0.9	-0.9	-0.9	-0.8	0.1	*	*	-0.6	0.3
1977-1978	-0.8	-0.7	-0.8	-0.7	1.5	2.2	*	*	-0.8	-0.1
1978-1979	-0.7	-0.8	-0.7	-0.8	0.2	1.0	*	*	0.1	0.9
1979-1980	-1.4	-1.5	-1.4	-1.5	0.2	1.7	*	*	0.7	2.2
1980-1981	0.8	0.9	0.7	0.8	-0.5	-1.2	*	*	-0.7	-1.6
1981-1982	3.8	4.0	3.7	3.9	2.6	-1.2	*	*	0.3	-3.7
1982-1983	4.8	4.9	4.7	4.9	5.0	0.3	3.8	-1.0	4.2	-0.8
1983-1984	5.1	5.7	5.1	5.6	2.2	-2.9	2.9	-2.3	3.1	-2.6
1984-1985	4.4	4.9	4.4	4.8	3.6	-0.8	3.6	-0.8	3.4	-1.4
1985-1986	3.9	4.1	3.9	4.1	4.2	0.3	4.0	0.1	3.6	-0.4
1986-1987	3.1	3.2	3.0	3.2	2.8	-0.4	3.2	0.1	3.0	-0.3
1987-1988	2.3	2.4	2.3	2.3	1.7	-0.7	2.0	-0.3	2.1	-0.2
1988-1989	2.8	2.9	2.8	2.9	1.7	-1.2	1.8	-1.0	1.0	-1.9
1989-1990	2.6	2.6	2.6	2.6	2.5	-0.1	2.7	0.2	2.1	-0.6
1990-1991	1.6	1.7	1.5	1.7	2.8	1.2	2.9	1.3	2.0	0.3
1991-1992	0.8	0.9	0.7	0.9	2.5	1.8	1.9	1.2	1.5	0.6
1992-1993	0.2	0.4	0.2	0.3	1.3	1.1	1.1	0.8	1.3	1.1
1993-1994	0.8	0.9	0.8	0.9	0.5	-0.3	0.5	-0.4	0.6	-0.3
1994-1995	2.1	2.2	2.1	2.1	1.0	-1.1	0.5	-1.6	0.6	-1.5
1995-1996	2.3	2.3	2.3	2.3	2.6	0.3	2.6	0.3	2.5	0.1
1996-1997	2.3	2.4	2.3	2.4	1.8	-0.5	2.1	-0.3	1.7	-0.6
1997-1998	2.9	3.1	2.9	3.1	2.0	-0.9	2.1	-0.8	2.1	-0.9
1998-1999	2.8	2.9	2.8	2.9	2.8	0	2.6	-0.2	2.7	-0.1
1999-2000	2.4	2.3	2.4	2.3	1.9	-0.5	2.1	-0.3	2.0	-0.4
2000-2001	1.5	1.5	1.5	1.5	3.0	1.5	3.0	1.5	2.6	1.1
2001-2002	0.3	0.5	0.3	0.4	2.0	1.7	2.8	2.5	3.1	2.8
2002-2003	-0.6	-0.5	-0.6	-0.5	1.2	1.8	0.7	1.3	0.8	1.4
2003-2004	-1.3	-1.2	-1.3	-1.2	0.2	1.5	0	1.3	0.3	1.6

Continued

Table 7.

Continued

(By calendar year, in percent)

	Actual									
	New Issue		Secondary Market		CBO		*Blue Chip*[b]		Administration	
	CPI-U	CPI-W	CPI-U	CPI-W	Forecast	Error[a]	Forecast	Error[a]	Forecast	Error[a]
Statistics for 1976-2003										
Mean error	*	*	*	*	*	0.2	*	*	*	-0.2
Mean absolute error	*	*	*	*	*	1.0	*	*	*	1.1
Root mean square error	*	*	*	*	*	1.2	*	*	*	1.4
Statistics for 1982-2003										
Mean error	*	*	*	*	*	0.1	*	0.1	*	-0.1
Mean absolute error	*	*	*	*	*	0.9	*	0.9	*	1.0
Root mean square error	*	*	*	*	*	1.2	*	1.1	*	1.2

Sources: Congressional Budget Office; Office of Management and Budget; Aspen Publishers, Inc., *Blue Chip Economic Indicators*; Department of Labor, Bureau of Labor Statistics; Federal Reserve Board.

Notes: Values are for the appropriate three-month Treasury bill rate discounted by the respective forecast for inflation as measured by the change in the consumer price index. CBO forecast the secondary-market rate, whereas the Administration forecast the new-issue rate. *Blue Chip* alternated between the two rates, forecasting the new-issue rate from 1982 to 1985, the secondary-market rate from 1986 to 1991, and the new-issue rate again beginning in 1992. Moreover, for most years since 1979, CBO forecast the CPI-U (the consumer price index for all urban consumers); from 1986 through 1989, however, CBO forecast the CPI-W (the consumer price index for urban wage earners and clerical workers). The Administration forecast the CPI-W until 1992, when it switched to the CPI-U. *Blue Chip* forecast the CPI-U for the entire period. All forecasts were issued in the first half of the initial year of the period or in December of the preceding year.

* = not applicable.

a. Errors (which are in percentage points) are forecast values minus actual values; thus, a positive error is an overestimate.

b. Two-year forecasts for the *Blue Chip* consensus were not available until 1982.

Table 8.

CBO, Administration, and *Blue Chip* Forecasts of the Difference Between Two-Year Average Inflation in the CPI and in the GNP or GDP Price Index

(By calendar year, in percent)

	Actual		CBO		*Blue Chip*[b]		Administration	
	CPI-U	CPI-W	Forecast	Error[a]	Forecast	Error[a]	Forecast	Error[a]
1976-1977	0	0	0.6	0.5	*	*	0.2	0.1
1977-1978	0.4	0.3	-0.1	-0.5	*	*	-0.5	-0.8
1978-1979	1.8	1.8	-0.1	-1.9	*	*	-0.1	-1.9
1979-1980	3.7	3.8	0.1	-3.6	*	*	0.2	-3.6
1980-1981	2.7	2.6	1.0	-1.7	*	*	1.6	-1.1
1981-1982	0.5	0.4	0.7	0.1	*	*	0.6	0.3
1982-1983	-0.4	-0.5	-0.2	0.2	-0.1	0.3	-0.3	0.2
1983-1984	-0.1	-0.6	0.1	0.2	-0.4	-0.3	-0.5	0.2
1984-1985	0.5	0.1	0.1	-0.5	0.1	-0.4	-0.2	-0.3
1985-1986	0.1	-0.1	0.0	-0.1	0.2	0.1	0.1	0.2
1986-1987	0.3	0.1	-0.1	-0.2	0.2	-0.1	0	-0.1
1987-1988	0.8	0.7	0.4	-0.3	0.2	-0.6	-0.1	-0.8
1988-1989	0.8	0.8	1.0	0.2	0.4	-0.4	0.5	-0.2
1989-1990	1.3	1.2	0.7	-0.5	0.4	-0.9	0.0	-1.2
1990-1991	1.1	1.0	0.2	-1.0	0.2	-1.0	-0.2	-1.2
1991-1992	0.7	0.6	0.2	-0.5	0.4	-0.3	0.4	-0.1
1992-1993	0.7	0.6	0.4	-0.3	0.4	-0.3	0	-0.7
1993-1994	0.6	0.5	0.5	-0.1	0.4	-0.1	0.5	-0.1
1994-1995	0.6	0.6	0.2	-0.5	0.3	-0.3	0.3	-0.3
1995-1996	0.9	0.9	0.5	-0.4	0.4	-0.5	0.3	-0.6
1996-1997	0.9	0.8	0.3	-0.6	0.5	-0.4	0.1	-0.7
1997-1998	0.6	0.4	0.5	0	0.6	0	0.1	-0.4
1998-1999	0.6	0.5	0.3	-0.3	0.3	-0.3	0.2	-0.4
1999-2000	1.0	1.0	0.6	-0.3	0.5	-0.5	0.4	-0.5
2000-2001	0.8	0.8	0.8	0	0.8	-0.1	0.7	-0.1
2001-2002	0.1	0	0.6	0.5	0.5	0.4	0.6	0.4
2002-2003	0	-0.1	0.4	0.4	0.3	0.3	0.1	0
2003-2004	0.2	0.1	0.6	0.4	0.5	0.4	0.7	0.6

Continued

Table 8.

Continued

(By calendar year, in percent)

	Actual		CBO		*Blue Chip* [b]		Administration	
	CPI-U	CPI-W	Forecast	Error[a]	Forecast	Error[a]	Forecast	Error[a]
Statistics for 1976-2003								
Mean error	*	*	*	-0.4	*	*	*	-0.5
Mean absolute error	*	*	*	0.6	*	*	*	0.6
Root mean square error	*	*	*	0.9	*	*	*	0.9
Statistics for 1982-2003								
Mean error	*	*	*	-0.2	*	-0.2	*	-0.3
Mean absolute error	*	*	*	0.3	*	0.4	*	0.4
Root mean square error	*	*	*	0.4	*	0.4	*	0.5

Sources: Congressional Budget Office; Office of Management and Budget; Aspen Publishers, Inc., *Blue Chip Economic Indicators*; Department of Labor, Bureau of Labor Statistics.

Notes: Values are for the difference between the average annual growth of the consumer price index (CPI) and average annual growth of the gross national product (GNP) or gross domestic product (GDP) price index over the two-year period. The GNP price index is used for data before 1993, and the GDP price index is used thereafter. Before 1978, the Bureau of Labor Statistics published only one consumer price index series, now known as the CPI-W (the price index for urban wage earners and clerical workers). In January 1978, the bureau began to publish a second, broader consumer price index series, the CPI-U (the price index for all urban consumers). For most years since 1979, CBO forecast the CPI-U; from 1986 through 1989, however, CBO forecast the CPI-W. The Administration forecast the CPI-W until 1992, when it switched to the CPI-U. *Blue Chip* forecast the CPI-U for the entire period. The forecasts were issued in the first half of the initial year of the period or in December of the preceding year.

* = not applicable.

a. Errors are forecast values minus actual values; thus, a positive error is an overestimate.

b. Two-year forecasts for the *Blue Chip* consensus were not available until 1982.

Table 9.

CBO and Administration Forecasts of the Two-Year Change in Wage and Salary Disbursements Plus Corporate Book Profits as a Share of Output

(By calendar year, as a percentage of GNP or GDP)

		CBO		Administration	
	Actual	Forecast	Error[a]	Forecast	Error[a]
1980-1981	-3.2	-0.6	2.5	-1.3	1.8
1981-1982	-3.3	-2.6	0.7	-1.2	2.1
1982-1983	-2.0	-1.8	0.3	-1.7	0.3
1983-1984	-1.0	0	0.9	-1.0	-0.1
1984-1985	-0.6	-0.2	0.4	-0.2	0.5
1985-1986	-0.8	-0.6	0.2	-0.8	0
1986-1987	1.4	1.0	-0.3	0.8	-0.5
1987-1988	2.7	0.9	-1.8	1.4	-1.3
1988-1989	-0.3	0.6	0.9	0.4	0.7
1989-1990	-1.2	0.4	1.6	0.7	1.9
1990-1991	-0.2	0.7	0.9	1.4	1.6
1991-1992	-0.1	0.1	0.2	-0.1	0.1
1992-1993	-0.1	1.0	1.1	1.4	1.4
1993-1994	-0.4	0.5	0.9	0.5	0.9
1994-1995	1.3	0.2	-1.1	0.4	-0.8
1995-1996	1.8	-0.3	-2.1	-0.6	-2.4
1996-1997	1.0	-0.3	-1.4	0.8	-0.2
1997-1998	0.5	-0.6	-1.1	0	-0.5
1998-1999	0.3	-0.2	-0.5	0.2	-0.1
1999-2000	0.9	-0.1	-1.1	0	-1.0
2000-2001	-0.8	-0.5	0.3	-0.8	0
2001-2002	-2.1	-0.4	1.7	-0.8	1.3
2002-2003	-0.8	0.1	0.9	0.6	1.3
2003-2004	0	1.1	1.2	1.6	1.6
Statistics for 1980-2003					
Mean error	*	*	0.2	*	0.4
Mean absolute error	*	*	1.0	*	0.9
Root mean square error	*	*	1.2	*	1.2

Sources: Congressional Budget Office; Office of Management and Budget; Department of Commerce, Bureau of Economic Analysis.

Notes: The forecasts were issued in the first half of the initial year of the period or in December of the preceding year. For the forecasts made between 1980 and 1991, gross national product was used to calculate the shares; for the forecasts made in 1992 and later, gross domestic product was used. The *Blue Chip* does not forecast wages and salaries.

* = not applicable.

a. Errors (which are in percentage points) are forecast values minus actual values; thus, a positive error is an overestimate.

Table 10.

CBO, Administration, and *Blue Chip* Projections of Five-Year Average Growth Rates for Real Output

(By calendar year, in percent)

	1972 Dollars[a]	1982 Dollars[b]	1987 Dollars[c]	Chain-Type Annual-Weighted Index	CBO		*Blue Chip*[e]		Administration	
					Forecast	Error[d]	Forecast	Error[d]	Forecast	Error[d]
Real GNP										
1976-1980	4.2	3.4	3.3	3.8	5.7	1.9	*	*	6.2	2.4
1977-1981	3.1	2.8	2.6	3.1	5.3	2.2	*	*	5.1	2.0
1978-1982	1.6	1.4	1.2	1.8	4.8	3.0	*	*	4.8	3.0
1979-1983	1.3	1.0	1.1	1.6	3.8	2.2	3.1	1.5	3.8	2.2
1980-1984	2.1	1.9	1.7	2.3	2.4	0.1	2.5	0.2	3.0	0.7
1981-1985	*	2.6	2.4	3.1	2.8	-0.3	3.0	-0.1	3.8	0.7
1982-1986	*	2.7	2.6	3.3	3.0	-0.3	2.7	-0.5	3.9	0.6
1983-1987	*	4.0	3.7	4.4	3.6	-0.8	3.5	-0.9	3.5	-0.9
1984-1988	*	4.1	3.7	4.3	4.0	-0.3	3.5	-0.8	4.3	0
1985-1989	*	3.3	3.1	3.6	3.4	-0.3	3.4	-0.3	4.0	0.3
1986-1990	*	2.8	2.7	3.3	3.3	0.1	3.1	-0.1	3.8	0.5
1987-1991	*	*	2.0	2.6	2.9	0.4	2.7	0.1	3.5	0.9
1988-1992	*	*	1.9	2.5	2.6	0	2.5	0	3.2	0.7
1989-1993	*	*	1.7	2.2	2.3	0.1	2.6	0.3	3.2	1.0
1990-1994	*	*	1.9	2.3	2.3	0	2.4	0.1	3.0	0.7
1991-1995	*	*	*	2.4	2.3	-0.1	2.0	-0.4	2.5	0.1
Real GDP[f]										
1992-1996	*	*	*	3.2	2.6	-0.6	2.5	-0.8	2.7	-0.6
1993-1997	*	*	*	3.5	2.8	-0.7	2.8	-0.7	2.8	-0.7
1994-1998	*	*	*	3.8	2.7	-1.1	2.8	-1.0	2.8	-1.0
1995-1999	*	*	*	3.9	2.4	-1.5	2.5	-1.3	2.6	-1.3
1996-2000	*	*	*	4.1	2.0	-2.1	2.1	-2.0	2.3	-1.8
1997-2001	*	*	*	3.5	2.1	-1.4	2.3	-1.2	2.2	-1.3
1998-2002	*	*	*	2.9	2.1	-0.8	2.3	-0.6	2.2	-0.7
1999-2003	*	*	*	2.6	2.2	-0.4	2.6	-0.1	2.2	-0.4
2000-2004	*	*	*	2.6	2.9	0.3	3.2	0.6	2.8	0.2

Continued

Table 10.

Continued

(By calendar year, in percent)

	Actual									
	1972 Dollars[a]	1982 Dollars[b]	1987 Dollars[c]	Chain-Type Annual-Weighted Index	CBO		*Blue Chip*[e]		Administration	
					Forecast	Error[d]	Forecast	Error[d]	Forecast	Error[d]
Statistics for 1976-2000										
Mean error	*	*	*	*	*	0	*	*	*	0.3
Mean absolute error	*	*	*	*	*	0.8	*	*	*	1.0
Root mean square error	*	*	*	*	*	1.2	*	*	*	1.2
Statistics for 1979-2000										
Mean error	*	*	*	*	*	-0.3	*	-0.4	*	0
Mean absolute error	*	*	*	*	*	0.6	*	0.6	*	0.8
Root mean square error	*	*	*	*	*	0.9	*	0.8	*	0.9

Sources: Congressional Budget Office; Office of Management and Budget; Aspen Publishers, Inc., *Blue Chip Economic Indicators*; Department of Commerce, Bureau of Economic Analysis.

Notes: Actual values are for the five-year growth rates for real gross national product (GNP) and gross domestic product (GDP) last reported by the Bureau of Economic Analysis (BEA), not the first reported values. Projected values are for the average growth of real GNP or GDP over the five-year period. The majority of the projections were issued in the first quarter of the initial year of the period or in December of the preceding year.

* = not applicable.

a. Data for 1972-dollar GNP and GDP are available only through the third quarter of 1985.

b. Data for 1982-dollar GNP and GDP are available only through the third quarter of 1991.

c. Data for 1987-dollar GNP and GDP are available only through the second and third quarters, respectively, of 1995.

d. Errors (which are in percentage points) are projected values minus actual values; thus, a positive error is an overestimate. The chain-type annual-weighted index of actual GNP or GDP was used to calculate the errors.

e. Five-year projections for the *Blue Chip* consensus were not available until 1979.

f. With BEA's 1992 benchmark revision, GDP replaced GNP as the central measure of national output.

Table 11.

CBO, Administration, and *Blue Chip* Projections of Five-Year Average Growth Rates for Nominal Output

(By calendar year, in percent)

		CBO		*Blue Chip*[b]		Administration	
	Actual	Forecast	Error[a]	Forecast	Error[a]	Forecast	Error[a]
GNP							
1976-1980	11.3	12.3	1.0	*	*	12.0	0.6
1977-1981	11.4	10.6	-0.8	*	*	10.5	-0.9
1978-1982	9.9	10.7	0.8	*	*	10.6	0.7
1979-1983	9.1	11.3	2.2	*	*	9.6	0.6
1980-1984	8.9	11.3	2.5	*	*	11.3	2.5
1981-1985	8.5	11.8	3.3	*	*	11.3	2.8
1982-1986	7.2	9.8	2.6	9.7	2.4	9.7	2.5
1983-1987	7.6	8.2	0.6	9.0	1.4	8.5	0.9
1984-1988	7.5	9.0	1.5	9.1	1.6	8.9	1.4
1985-1989	6.8	7.7	0.9	7.8	1.0	8.1	1.3
1986-1990	6.6	7.5	0.9	7.0	0.4	7.4	0.8
1987-1991	6.1	6.9	0.8	6.6	0.5	6.9	0.8
1988-1992	6.0	6.6	0.6	6.6	0.6	6.7	0.7
1989-1993	5.5	6.6	1.1	6.9	1.5	6.5	1.0
1990-1994	5.2	6.3	1.2	6.4	1.2	6.9	1.7
1991-1995	5.0	6.1	1.2	5.9	1.0	6.4	1.4
GDP[c]							
1992-1996	5.4	5.8	0.4	5.9	0.4	6.0	0.5
1993-1997	5.6	5.1	-0.4	6.0	0.5	5.1	-0.4
1994-1998	5.6	5.4	-0.2	5.8	0.1	5.7	0.1
1995-1999	5.6	5.2	-0.4	5.6	0.0	5.5	0
1996-2000	5.8	4.8	-1.0	4.5	-1.3	5.1	-0.7
1997-2001	5.3	4.7	-0.6	4.9	-0.4	4.9	-0.4
1998-2002	4.7	4.4	-0.3	4.7	0	4.3	-0.4
1999-2003	4.6	4.3	-0.4	4.5	-0.2	4.2	-0.4
2000-2004	4.8	4.6	-0.3	5.2	0.4	4.8	-0.1

Continued

Table 11.

Continued

(By calendar year, in percent)

		CBO		*Blue Chip*[b]		Administration	
	Actual	Forecast	Error[a]	Forecast	Error[a]	Forecast	Error[a]
Statistics for 1976-2000							
Mean error	*	*	0.7	*	*	*	0.7
Mean absolute error	*	*	1.0	*	*	*	1.0
Root mean square error	*	*	1.3	*	*	*	1.2
Statistics for 1982-2000							
Mean error	*	*	0.4	*	0.6	*	0.6
Mean absolute error	*	*	0.8	*	0.8	*	0.8
Root mean square error	*	*	1.0	*	1.0	*	1.0

Sources: Congressional Budget Office; Office of Management and Budget; Aspen Publishers, Inc., *Blue Chip Economic Indicators*; Department of Commerce, Bureau of Economic Analysis.

Notes: Actual values are for the five-year growth rates for gross national product (GNP) and gross domestic product (GDP) last reported by the Bureau of Economic Analysis (BEA), not the first reported values. Projected values are for the average annual growth of nominal GNP or GDP over the five-year period. The projections were issued in the first half of the initial year of the period or in December of the preceding year.

* = not applicable.

a. Errors (which are in percentage points) are projected values minus actual values; thus, a positive error is an overestimate.

b. Five-year projections for the *Blue Chip* consensus were not available until 1982.

c. With BEA's 1992 benchmark revision, GDP replaced GNP as the central measure of national output.

Table 12.

Comparison of CBO, Administration, and *Blue Chip* Projections of the Difference Between Five-Year Average Inflation in the CPI and in the GNP or GDP Price Index

(By calendar year, in percent)

	Actual		CBO		*Blue Chip*[b]		Administration	
	CPI-U	CPI-W	Forecast	Error[a]	Forecast	Error[a]	Forecast	Error[a]
1976-1980	1.6	1.6	0.2	-1.4	*	*	0.0	-1.6
1977-1981	1.8	1.8	0	-1.8	*	*	-0.3	-2.1
1978-1982	1.8	1.7	0	-1.7	*	*	-0.1	-1.8
1979-1983	1.5	1.4	0	-1.5	*	*	0.1	-1.4
1980-1984	1.0	0.7	0.4	-0.6	*	*	0.6	-0.1
1981-1985	0.3	0.0	0.4	0.2	*	*	-0.1	-0.1
1982-1986	0.0	-0.3	0.1	0.1	*	*	-0.2	0.1
1983-1987	0.2	-0.1	0	-0.2	-0.1	-0.3	-0.2	-0.1
1984-1988	0.5	0.2	0	-0.5	0.1	-0.4	-0.1	-0.3
1985-1989	0.5	0.5	0	-0.6	0.1	-0.5	0.1	-0.4
1986-1990	0.8	0.6	0.1	-0.5	-0.1	-0.8	0.0	-0.7
1987-1991	1.0	0.9	0.3	-0.6	0.2	-0.8	-0.1	-0.9
1988-1992	0.9	0.8	0.6	-0.2	0.3	-0.6	0.2	-0.6
1989-1993	0.9	0.8	0.5	-0.3	0.2	-0.7	0.0	-0.8
1990-1994	0.8	0.7	0.3	-0.5	0.2	-0.6	-0.1	-0.8
1991-1995	0.7	0.6	0.1	-0.5	0.4	-0.2	0.2	-0.4
1992-1996	0.7	0.7	0.4	-0.3	0.4	-0.4	0.0	-0.8
1993-1997	0.7	0.7	0.5	-0.3	0.4	-0.3	0.5	-0.3
1994-1998	0.7	0.6	0.4	-0.3	0.3	-0.3	0.4	-0.3
1995-1999	0.7	0.7	0.6	-0.2	0.4	-0.3	0.2	-0.5
1996-2000	0.8	0.8	0.2	-0.6	0.4	-0.4	0.1	-0.7
1997-2001	0.7	0.6	0.4	-0.3	0.5	-0.2	0.1	-0.6
1998-2002	0.5	0.4	0.3	-0.2	0.2	-0.3	0.1	-0.4
1999-2003	0.5	0.4	0.6	0.1	0.4	-0.1	0.3	-0.2
2000-2004	0.3	0.3	0.8	0.5	0.6	0.2	0.6	0.3

Continued

Table 12.

Continued

(By calendar year, in percent)

	Actual		CBO		*Blue Chip*[b]		Administration	
	CPI-U	CPI-W	Forecast	Error[a]	Forecast	Error[a]	Forecast	Error[a]
Statistics for 1976-2000								
Mean error	*	*	*	-0.5	*	*	*	-0.6
Mean absolute error	*	*	*	0.6	*	*	*	0.6
Root mean square error	*	*	*	0.7	*	*	*	0.8
Statistics for 1983-2000								
Mean error	*	*	*	-0.3	*	-0.4	*	-0.5
Mean absolute error	*	*	*	0.4	*	0.4	*	0.5
Root mean square error	*	*	*	0.4	*	0.5	*	0.6

Sources: Congressional Budget Office; Office of Management and Budget; Aspen Publishers, Inc., *Blue Chip Economic Indicators*; Department of Labor, Bureau of Labor Statistics.

Notes: Values are for the difference between the average annual growth of the consumer price index (CPI) and average annual growth of the gross national product (GNP) or gross domestic product (GDP) price index over the five-year period. The GNP price index is used for data before 1993, and the GDP price index is used thereafter. Before 1978, the Bureau of Labor Statistics published only one consumer price index series, now known as the CPI-W (the price index for urban wage earners and clerical workers). In January 1978, the bureau began to publish a second, broader consumer price index series, the CPI-U (the price index for all urban consumers). For most years since 1979, CBO forecast the CPI-U; from 1986 through 1989, however, CBO forecast the CPI-W. The Administration forecast the CPI-W until 1992, when it switched to the CPI-U. *Blue Chip* forecast the CPI-U for the entire period. The forecasts were issued in the first half of the initial year of the period or in December of the preceding year.

* = not applicable.

a. Errors (which are in percentage points) are projected values minus actual values; thus, a positive error is an overestimate.

b. Five-year projections for the *Blue Chip* consensus were not available until 1983.

Table 13.

CBO and Administration Projections of the Five-Year Change in Wage and Salary Disbursements Plus Corporate Profits as a Share of Output

(By calendar year, as a percentage of GNP or GDP)

		CBO		Administration	
	Actual	Forecast	Error[a]	Forecast	Error[a]
1980-1984	-5.4	1.0	6.4	-1.1	4.3
1981-1985	-4.7	-2.6	2.2	-1.9	2.8
1982-1986	-3.0	-0.4	2.6	-3.3	-0.3
1983-1987	0	-0.6	-0.5	-0.3	-0.2
1984-1988	1.7	0.0	-1.7	0.3	-1.4
1985-1989	0.6	-1.1	-1.6	-0.1	-0.7
1986-1990	1.1	0.8	-0.3	0.6	-0.5
1987-1991	1.2	2.3	1.1	1.7	0.6
1988-1992	-0.4	0.7	1.1	1.1	1.5
1989-1993	-1.6	0.2	1.7	1.5	3.1
1990-1994	-0.4	0.5	0.9	1.9	2.3
1991-1995	0.9	-0.3	-1.2	0.8	-0.1
1992-1996	1.5	1.2	-0.4	1.6	0.0
1993-1997	2.0	0.7	-1.3	0.7	-1.3
1994-1998	2.0	-0.4	-2.3	0.1	-1.8
1995-1999	2.7	-0.9	-3.6	-1.0	-3.7
1996-2000	1.7	-1.6	-3.3	1.0	-0.7
1997-2001	0.1	-1.6	-1.7	-0.2	-0.3
1998-2002	-1.4	-0.9	0.5	-0.2	1.2
1999-2003	-0.9	-0.3	0.6	-0.5	0.4
2000-2004	-1.6	-1.2	0.4	-1.9	-0.3
Statistics for 1980-2000					
Mean error	*	*	0	*	0.2
Mean absolute error	*	*	1.7	*	1.3
Root mean square error	*	*	2.2	*	1.8

Sources: Congressional Budget Office; Office of Management and Budget; Aspen Publishers, Inc., *Blue Chip Economic Indicators*; Department of Commerce, Bureau of Economic Analysis.

Notes: The forecasts were issued in the first half of the initial year of the period or in December of the preceding year. For the forecasts made between 1980 and 1991, gross national product was used to calculate the shares; for the forecasts made in 1992 and later, gross domestic product was used. The *Blue Chip* does not forecast wages and salaries.

* = not applicable.

a. Errors (which are in percentage points) are projected values minus actual values; thus, a positive error is an overestimate.

APPENDIX

Choosing Sources of Historical and Forecast Data

Evaluating the Congressional Budget Office's (CBO's) forecasting record entails compiling the basic historical and forecast data for growth in real (inflation-adjusted) and nominal output, inflation in the consumer price index (CPI), interest rates, and taxable income.

Selection of Historical Data

Which historical data to use for the evaluation was limited by the availability of actual data and the nature of the forecast variables examined. Although CBO, the Administration, and the *Blue Chip* consensus all published the same measure for real output growth, selecting a historical series was difficult because of periodic benchmark revisions to the actual data.[1] By comparison, not all of the forecasters published the same measures for CPI inflation and interest rates, but the selection of historical data for those series was clear-cut.

Growth in Real and Nominal Output

Historical two-year averages of growth in real output were developed from calendar year averages of the quarterly chain-type annual weighted indexes of real gross national product (GNP) and real gross domestic product (GDP) published by the Bureau of Economic Analysis (BEA). The fact that several real GNP and GDP series were discontinued because of periodic benchmark revisions meant that they were unsuitable historical series. For example, during the 1976-1985 period, the three forecasters published estimates for a measure of growth in real GNP that was based on 1972 prices, which was the measure published by BEA at that time. In late 1985, however, BEA discontinued the 1972-dollar series and began to publish GNP on a 1982-dollar basis. As a result, an official series of values for GNP growth in 1972 dollars is not available for the years after 1984, and actual two-year average growth rates are not available to compare with the forecasts made in early 1984 and 1985.

From 1986 to 1991, forecasters published estimates of growth in real GNP based on 1982 prices. BEA revised the benchmark again in the second half of 1991: it discontinued the 1982-dollar GNP and began to publish GNP on a 1987-dollar basis. Consequently, the historical annual series for 1982-dollar GNP is available only through 1990, and actual two-year average growth rates are not available for the forecasts made in early 1990 and 1991. The forecasters then published estimates of growth in real GDP on a 1987-dollar basis until 1995, when BEA made another switch, late in the year, to a chain-weighted measure of GDP. Therefore, the historical annual series for 1987-dollar GDP ends with the 1994 annual value, and actual two-year average growth rates are not available for the forecasts made in early 1994 and 1995.

By periodically updating the series to reflect more recent prices, BEA's benchmark revisions yield a measure of real output that is more relevant for analyzing contemporary movements in real growth. But the process makes it difficult to evaluate forecasts of real growth produced over a period of years in series that are later discontinued. This comparison avoids the difficulties presented by periodic revisions of the data by using BEA's chain-type annual-weighted index of real GNP or GDP throughout the data series.[2]

1. Before 1992, CBO, the Administration, and the *Blue Chip* consensus survey used gross national product to measure output. Beginning in early 1992, however, all three forecasters began to publish forecasts and projections of gross domestic product instead.

2. For a discussion of that index, see Congressional Budget Office, *The Economic and Budget Outlook: An Update* (August 1995), pp. 71-73.

Historical two-year averages for growth of nominal GNP and GDP were developed from calendar year averages of the quarterly values published by BEA.

CPI Inflation

CBO calculated two-year averages of inflation in the consumer price index from calendar year averages of monthly data published by the Bureau of Labor Statistics. Before 1978, the bureau published only one consumer price index series, now known as the CPI-W (the price index for urban wage earners and clerical workers). In January 1978, however, the bureau began to publish a second, broader consumer price index series, the CPI-U (the price index for all urban consumers). CBO's comparison of forecasts uses both series.

Until 1992, the Administration published its forecasts for the CPI-W, the measure used to index most of the federal government's spending for entitlement programs. In contrast, for all but four of its forecasts since 1979 (1986 through 1989), CBO based its inflation forecast on the CPI-U, a more widely cited measure of inflation and the one now used to index federal income tax brackets. The *Blue Chip* consensus has always published its forecast for the CPI-U. Although annual fluctuations in the CPI-U and CPI-W are virtually indistinguishable, the indexes differ in some years. For that reason, CBO used historical data for both series to evaluate the alternative forecasting records.

Interest Rates

CBO used monthly data published by the Board of Governors of the Federal Reserve System to calculate two-year averages of nominal short- and long-term interest rates.

The forecasts of short-term interest rates were compared using historical values for two measures of the interest rate on three-month Treasury bills: the new-issue rate and the secondary-market rate. The Administration forecasts the new-issue rate, which corresponds to the price of three-month bills auctioned by the Department of the Treasury—that is, it reflects the interest actually paid on that debt. CBO forecasts the secondary-market rate, which corresponds to the price of the three-month bills traded outside the Treasury auctions. Such transactions occur continually in markets that involve many more traders than do Treasury auctions. Thus, the secondary-market rate provides an updated evaluation of short-term federal debt by the wider financial community. *Blue Chip* has alternated between those two rates; it published the new-issue rate from 1982 to 1985, switched to the secondary-market rate during the 1986-1991 period, and then returned to the new-issue rate beginning in 1992. Clearly, there is no reason to expect the two rates to differ persistently; indeed, the differences between their calendar year averages are minuscule.

CBO likewise compared the various forecasts of long-term interest rates using historical values for two measures of long-term rates: the 10-year Treasury note rate and Moody's Aaa corporate bond rate. A comparison of forecasts is not possible before 1984 because not all of the forecasters published projections of long-term interest rates before then. For forecasts made in early 1984 and 1985, CBO projected the Aaa corporate bond rate. Beginning with its early 1986 forecast, however, CBO switched to the 10-year Treasury note rate. The Administration has always published its projection for the 10-year Treasury note rate, but *Blue Chip* published the Aaa corporate bond rate until January 1996, when it switched to the 10-year Treasury rate.

CBO calculated separate historical values for real short-term interest rates using the nominal short-term interest rate and the inflation rate appropriate for each forecaster. In each case, the two-year average nominal short-term interest rate was discounted by the two-year average rate of inflation. The resulting real short-term interest rates were similar.

Taxable Income

Through its direct influence on projections of federal revenues, the forecast for taxable income plays a critical role in determining the accuracy of budget projections. The income measure examined here—wage and salary disbursements—focuses on the source of income to which tax receipts are most sensitive. In addition, because a proportion of other types of income is not taxed (because, for instance, the income derives from assets held in nontaxable accounts), the effective tax rate on wages and salaries exceeds the corresponding rate on other income.

Historical estimates of taxable income are subject to substantial statistical revisions that do not, however, have much of an implication for projections of revenues as long as the revisions are carried forward into the forecast. For that reason, the accuracy of taxable income projections is measured using the forecast change in the share of taxable income in GDP.

Sources of Forecast Data

For every measure except taxable income, this evaluation used the calendar year forecasts and projections that CBO has published early each year since 1976, coinciding with the publication of the Administration's annual budget proposals. The Administration's forecasts were taken from its budget in all but one case: the forecast made in early 1981 came from the Reagan Administration's revisions of President Carter's last budget. The corresponding CBO forecast was taken from CBO's published analysis of President Reagan's budget proposals. That CBO baseline forecast did not include the economic effects of the new Administration's fiscal policy proposals but did assume the continuation of the tax and spending policies of the Second Concurrent Resolution on the Budget for Fiscal Year 1981, including a 10 percent personal income tax cut and accelerated depreciation.[3]

The average two-year forecasts in the *Blue Chip* consensus survey, which are published monthly, were taken from those published in the same month as CBO's forecasts. Because the *Blue Chip* consensus did not begin publishing its two-year forecasts until the middle of 1981, the first such forecast available for this comparison was published in early 1982. Average five-year projections, however, are published by *Blue Chip* only twice a year, and those publication dates do not correspond to the times that forecasts are necessary for budgeting. All but one of its five-year projections used in this evaluation were published in March; the 1980-1984 projection of real output was published in May. Therefore, the *Blue Chip* medium-term forecasts were prepared about four months after CBO made its medium-term projections.

Because CBO has published forecasts for wages and salaries regularly only since 1985, some of the CBO forecasts for wages and salaries that are used here were taken from CBO's files of unpublished forecasts.

3. Another exceptional case occurred in early 1993, when the Clinton Administration adopted CBO's economic assumptions as the basis for its budget. As a result, the errors for the early 1993 forecast are the same for CBO and the Administration.