

CBO REPORT

CBO's Economic Forecasting Record

**A Supplement to
*The Budget and Economic Outlook:
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**CONGRESSIONAL BUDGET OFFICE
SECOND AND D STREETS, SW
WASHINGTON, DC 20515**

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Since publishing its first macroeconomic forecast in 1976, the Congressional Budget Office (CBO) has compiled a forecasting track record comparable in quality with those of a sizable sample of private-sector forecasters as well as five Administrations. CBO's misestimates for two-year forecasts made between 1982 and 1999 did not differ markedly either from those of the Administration or from the average of the 50 or so forecasts that have made up the *Blue Chip* survey over the years. Comparing CBO's forecasts with those of the *Blue Chip* consensus suggests that when CBO's economic predictions missed the mark by a margin wide enough to contribute to sizable misestimates of the surplus or deficit, those inaccuracies probably reflected limitations that confronted all forecasters. That result is not surprising because all forecasters, when making their predictions, have the same basic information available about the state of the economy, which they may then interpret differently. Moreover, CBO examines other forecasts when constructing its own; in turn, CBO's forecast may affect others in a similar way.

Overview

For forecasts looking two years ahead—those that are most important for the budget year being considered by the Congress—CBO has been slightly more accurate than the various Administrations over the past two decades (see Table 1). The differences between the two forecasters are small, however, especially when compared with the size of the forecast misestimates. Furthermore, for the past six two-year forecasts analyzed here, there has been virtually no difference in overall forecast accuracy between CBO and the Administration. Also, CBO's forecasts have

been about as accurate as the *Blue Chip*'s average forecasts in general.

For longer-run budget planning, the accuracy of five-year forecasting is important. CBO's inaccuracies in five-year projections of growth rates for real (inflation-adjusted) and nominal (current-dollar) output were similar to those of the various Administrations and the *Blue Chip* consensus. For projections made between 1976 and 1996, CBO's record of forecasting real growth is slightly better than the Administration's and the *Blue Chip*'s, but the Administration and the *Blue Chip* projected real growth slightly more accurately for the last half of the 1990s.

CBO's forecasts of real growth over the long run have alternated between periods of optimism and pessimism. The five-year forecasts produced during the late 1970s turned out to be too optimistic, averaging about 2 percentage points a year too high. Forecasts from the early 1980s, in contrast, were too pessimistic by a little less than half a percentage point. Forecasts from the late 1980s were overly optimistic again, but the projections made between 1992 and 1996 have been too pessimistic by more than a percentage point on average. (The five-year forecast from January 1996 is the most recent one that can be compared with actual results.)

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 major economic trends. For example, most forecasters overestimated the economy's growth rate and underestimated inflation in forecasts they made just before and during the back-to-back recessions of the early 1980s. That pattern was repeated, albeit to a lesser degree, in the forecasts they made just prior to the more moderate recession of the early 1990s. In

addition, during the middle 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 felt that the previous trend would recur, their forecasts of real output in the middle to late 1970s turned out to be too optimistic.

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 since 1996, they underpredicted the economy's growth rate and overpredicted inflation. To be sure, 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 has permitted improved productivity, lower inventories, and greater customer satisfaction. However, it is too soon to draw unambiguous conclusions about the role of the new economy from the historical evidence. Because the reasons for the phenomenal economic performance of those five years are not yet fully understood, the uncertainty about the next few years may be larger than indicated by the average misestimates of the past two decades.

CBO also underestimated taxable income in its forecasts for the 1995-2000 period, which in turn has contributed to revenue projections far below what actually occurred. However, underestimates of real growth account for only part of those underpredictions. Projections of taxable income were pessimistic not only because projections of nominal output were too low, but because the projected relationship of taxable income to output—the taxable-income share—was too small. Income categories in the national income and product accounts that are used for projecting revenues—primarily book profits, and wages and salaries—grew much more rapidly between 1995 and 2000 than did nominal output, but CBO's forecasts failed to anticipate that increase in the taxable-income share of output.

Sources of Data for the Evaluation

Evaluating CBO's forecasting record requires compiling the basic historical and forecast data for growth in nominal and real output, inflation in the consumer price index (CPI), interest rates, and taxable income. Although each of those data series has an important influence on budget projections, an accurate forecast of the two-year average growth in real output is the critical economic factor in accurately estimating the surplus or deficit for the upcoming budget year. The data were compiled using forecasts published early in the years from 1976 through 1999. (Two-year average forecasts published in early 2000 and 2001 could not be included in this evaluation because actual values for 2001 were not available in time to be included in this document.)

Selection of Historical Data

Which historical data to use for the evaluation was dictated by the availability of actual data and the nature of the individual forecasts 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 in 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 his-

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.

torical 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.² 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 one of BEA's alternative measures of real GNP and GDP, the chain-type annual-weighted index.³

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 Treasury Department—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. As a result, the

2. With the 1992 benchmark revision, GDP replaced GNP as the central measure of national output.

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

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 that year. 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 using the inflation rate appropriate for each forecaster. In each case, the two-year average nominal interest rate was discounted by the two-year average rate of inflation. The resulting real short-term interest rates were similar. Because there is no agreed-upon method for calculating real long-term interest rates, they were not included in the evaluation.

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 distributions plus the book value of corporate profits—combines the two sources of income to which tax receipts are most sensitive. Considering wages and profits together is appropriate because the effective rates of taxation on wages (including payroll and income taxes) and on corporate profits are nearly the same. In addition,

those tax rates exceed the rate at which other income sources (such as interest income) are taxed.

Although the level of taxable income is the factor that most directly affects federal revenues, historical estimates of that level are subject to substantial statistical revision. As a result, using the *level* of taxable income would distort the comparison of forecasts. Instead, the forecasts are presented here as *changes* in taxable income as a share of total income; the historical revisions, carried forward consistently to projections, should not affect projections of revenues. Moreover, the change in taxable income as a share of total income is closer to the concept that macroeconomists consider when they construct their forecasts.

Sources of Forecast Data

For everything except taxable income, this evaluation used the calendar year forecasts and projections that CBO has published early each year since 1976, timed to coincide with the publication of the Administration's 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 forecast did not include the economic effects of the new Administration's fiscal policy proposals.⁴

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 two or three times a year. All but one of its five-year projections used in this

4. 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 misestimates for the early 1993 forecast are the same for CBO and the Administration.

evaluation were published in March; the 1980-1984 projection of real output was published in May.

Some of the CBO forecasts for wages, salaries, and corporate profits that are used here were not published in CBO's annual reports. Instead, they were taken from CBO's files of unpublished forecasts. CBO has published forecasts for wages and salaries regularly since 1985 but has published forecasts for book profits only in recent reports.

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 extent to which the forecast can be expected to differ from what actually occurs. 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 series of forecasts is the degree to which their values are narrowly dispersed around actual outcomes. Measures of accuracy more clearly reflect the usual meaning of forecast quality than does the mean error. 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 distance 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.

Other Measures of Forecast Quality

The three statistical indicators described above are not the only measures of a forecast's quality. Studies by analysts outside CBO have used measures that are slightly 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.⁵

A number of other methods have been developed to evaluate a forecast's "efficiency." Efficiency indicates the extent to which a particular forecast could have been improved by using additional information that was available to the forecaster when the forecast was made.⁶ The *Blue Chip* consensus fore-

5. Another approach to testing a forecast for bias is based on linear regression analysis of actual and forecast values. For details of that method, see J. Mincer 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).

6. 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.

casts represent a wide variety of economic forecasters and thus reflect a broader blend of sources and methods than can be expected from any single forecaster. In this evaluation, the *Blue Chip* predictions can therefore 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.

Such elaborate measures and methods, however, are not necessarily reliable indicators of a forecast's quality when the sample of observations is small, as is the case with CBO's sample of only 24 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 underlying population of errors in the forecast follows a normal 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 misestimates in a forecast can have an unduly large influence on the measures. The mean error, for example, can fluctuate in its arithmetic sign when a single observation is added to a small sample. Third, the small sample means that CBO's track record cannot be used in a statistically reliable way to indicate either the direction or the size of forecasting inaccuracies in the future.

Apart from the general caveat that should attend any statistical conclusions, there are several reasons for viewing any evaluation of CBO's forecasts with particular caution. First, the procedures and purposes of CBO's and the Administration's economic forecasts have changed over the past two decades and may change again. For example, in the late 1970s, CBO characterized its long-term projections as a goal for the economy; it now considers them to be a projection of what will prevail, on average, if the economy continues to reflect historical trends. Unlike CBO's projections, the Administration's have always included the projected economic effects of its own policy proposals. Second, an institution's track re-

cord in forecasting may not indicate its future abilities because of changes in personnel or methods. Third, inaccuracies in a forecast increase when the economy is more volatile and when economic trends change. All three groups of forecasters—CBO, the Administration, and the *Blue Chip* survey—made exceptionally large misestimates when forecasting for periods that included turning points in the business cycle and for the past few years, when the sustainable growth of the economy apparently increased.

CBO's Forecasting Record

This analysis evaluates the Congressional Budget Office's macroeconomic forecasts over 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—hence the interest in the two-year period. The five-year period is used to examine the accuracy of longer-term projections of growth in real and nominal output.

This analysis does not consider how assumptions about key economic factors can affect federal budget projections. "Rules of thumb" for estimating the effects of changes in various macroeconomic variables appear in Appendix A of CBO's *The Budget and Economic Outlook: Fiscal Years 2003-2012* (January 2002).

Two-Year Forecasts

Historically, the Congressional Budget Office's two-year forecasts are slightly more accurate than the Administration's and suffer from slightly less statistical bias. In most cases, however, the differences are small. Moreover, CBO's forecasts are about as accurate as those of the *Blue Chip* consensus.

Growth in Real Output. For the two-year forecasts made between 1976 and 1999, CBO had a slightly

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.

better record than did the Administration in predicting growth in real output (see Table 2). CBO was closer to the actual value in 11 of the 24 forecasts made between 1976 and 1999, the Administration was closer in nine periods, and the two had identical errors in four periods. CBO's predictions of real growth made between 1982 and 1999 were, on average, as accurate as those of the *Blue Chip* consensus.

As noted earlier, forecast misestimates tend to be larger during periods of economic turmoil or upheaval. 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 later years. Similarly, the business cycle accounts for the large errors in the predictions made in the 1989-1991 period. During that time, the Congressional Budget Office's errors were only slightly larger than those of the *Blue Chip* consensus.

All three forecasters underpredicted two-year real GDP growth in every year since 1992. Much of that apparent pessimism, however, results from recent revisions in the national income and product accounts; the BEA benchmark revisions published in November 1999 increased the two-year growth rates for real GDP over most of the historical period, especially the past two decades. The upward revision in growth rates stemmed largely from including software spending as investment in the accounts as well as adopting new price series for various categories of consumption. In addition to making the mean forecast error less informative, those revisions distort the reliability of the statistical measures of accuracy. Nevertheless, even after accounting for the latest revisions, the underpredictions of economic growth since 1996 appear significant.

Growth in Nominal Output. The records of CBO and the Administration in forecasting two-year growth in nominal output are quite similar (see Table 3). Of the 24 forecasts made between 1976 and 1999, the Administration recorded the smaller error 13 times, CBO had the smaller error 10 times, and the two forecasters recorded identical errors once. CBO's mean error and root mean square error for that period are similar to the Administration's.

Over the shorter interval between 1982 and 1999, the bias and accuracy of CBO's forecasts of two-year growth in nominal output are nearly identical to those of the *Blue Chip* consensus.

CPI Inflation. CBO and the Administration also had very similar records in forecasting the two-year average growth in the consumer price index (see Table 4). Both underestimated future inflation in their forecasts for 1977 through 1980 and overestimated it for 1981 through 1986. Their average measures of bias and accuracy were virtually identical. CBO was closer to the actual value in eight of the 24 periods, the Administration was closer in 11 periods, and the two forecasters had matching errors in five periods. For the 1982-1999 period, CBO's forecasts of inflation were as accurate as those of the Administration and the *Blue Chip* consensus.

Nominal Interest Rates. For the 1976-1999 forecasts, CBO's record was about as accurate as the Administration's for nominal short-term interest rates over a two-year period (see Table 5). On average, the Administration tended to underestimate those rates, whereas CBO's mean error was zero over that period.

CBO and the Administration were each closer to the actual value in 11 of the 24 periods and had identical errors twice. Between 1982 and 1999, however, the root mean square error of CBO's forecasts was slightly above those of the Administration and the *Blue Chip* consensus, meaning that CBO made a few relatively large errors (such as those in 1982, 1983, and 1991).

For the 1984-1999 forecasts of long-term interest rates, CBO did somewhat better than the Administration (see Table 6). The Administration tended to underestimate rates, and its mean error was slightly larger than CBO's. In addition, the Administration's forecasts were less accurate on average than CBO's. CBO was closer to the true value in 10 of the 16 periods, the Administration was closer in five periods, and the two forecasters had identical errors in one period.

The Congressional Budget Office's forecasts of long-term interest rates were about as accurate as those of the *Blue Chip* consensus. Both CBO and *Blue Chip* tended to overestimate long-term rates.

CBO had a mean error of 0.2 percentage points compared with 0.3 percentage points for *Blue Chip*.

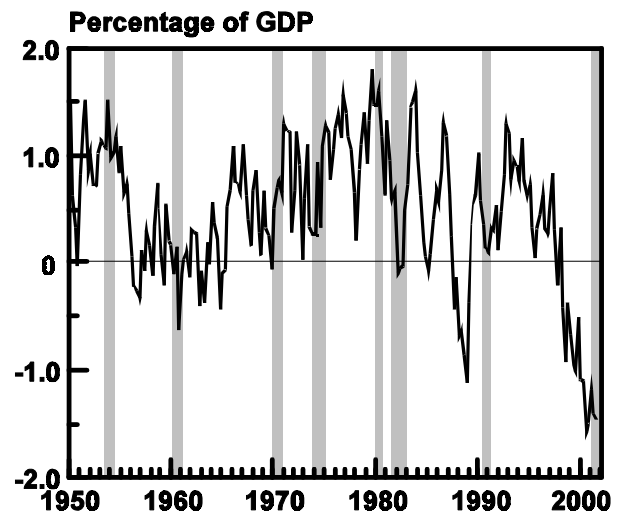
Real Short-Term Interest Rates. For the forecasts made in 1976 through 1999, CBO had a slight edge over the Administration in estimating short-term interest rates adjusted for inflation (see Table 7). Again, the Administration was more likely than CBO to underestimate interest rates. Both forecasters recorded similar mean absolute and root mean square errors. CBO's forecasts were closer to the actual value in 13 of the 24 periods, the Administration's were closer in eight, and the two registered identical errors in three periods. For forecasts made between 1982 and 1999, CBO's errors were generally similar in both direction and magnitude to those of the *Blue Chip* consensus.

Taxable Income. One of the greatest sources of error in budget projections is error in forecasting taxable income. On average, both CBO and the Administration have been too optimistic in their projections of the two major components of taxable income—wages and salaries, and corporate profits (see Table 8). (The *Blue Chip* consensus does not forecast wages and salaries.) Since 1994, however, both CBO and the Administration have significantly underestimated the growth of wages and profits relative to output. Apart from the usual difficulties associated with forecasting GDP, two other factors contribute to the misestimates.

The first is the degree to which total income has exceeded total product in the national income and product accounts (NIPAs). In principle, those two aggregate measures of economic activity should be equal, but in practice they are not, largely because the Bureau of Economic Analysis, which publishes the NIPAs, must use different primary sources to estimate total income, on one hand, and total product, on the other. The statistical discrepancy in the NIPAs measures the difference between total product and total income; between 1997 and 2000, the excess of total income over total product grew (see Figure 1).

Changes in that discrepancy present a problem for forecasters. If they have assumed, in line with historical experience, that the discrepancy will revert toward zero and that it mainly results from mis-measurements on the income side, they will have

Figure 1.
Statistical Discrepancy in the National Income and Product Accounts

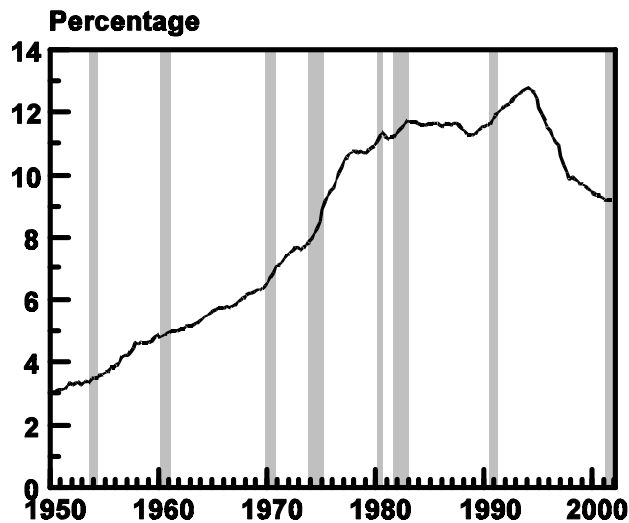


SOURCES: Congressional Budget Office; Department of Commerce, Bureau of Economic Analysis.

been more apt to understate income in recent years. At this point, it is impossible to tell exactly how much the discrepancy has caused forecasters to err in their forecasts of income, but the sheer size of the imbalance in recent years compounds the importance of each forecaster's assumptions about how to predict the discrepancy. Forecasters' use of alternative and mutually exclusive assumptions for resolving that imbalance—each assumption is as reasonable as the next—could broaden the dispersion of forecasts of total income in coming years.

A second source of difficulty in forecasting taxable income as a share of output was the reversal in the last half of the 1990s of another long-standing trend. Throughout the postwar period, nonwage labor income rose as a share of total labor compensation, a trend that many analysts believe reflects an increased tendency by employers to substitute fringe benefits (such as employer-paid insurance premiums and pension contributions) for wages and salaries as a means of compensating their workforce. But beginning in 1994, that trend appears to have reversed (see Figure 2). Because nonwage labor income is not taxed, the decline in its share of total labor compensation has had the effect of increasing the share of

Figure 2.
Nonwage Labor Income as a Share of
Total Labor Compensation



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

compensation that is taxed (namely, wages and salaries). That turnaround was relatively unpredictable and as yet is imperfectly understood. However, one important component of nonwage labor income—employers' health insurance premiums—is no longer growing more slowly than wages. Thus, the future trend in nonwage labor income is not likely to continue to decline.

Five-Year Projections

In projecting real growth for the more distant future, measured here as five years ahead, the Administration's errors were larger than CBO's (see Table 9). Although that comparative advantage for CBO does not directly affect the estimates of the surplus for the budget year, accuracy in the longer term is obviously important for budgetary planning over several years.

Neither the Administration nor CBO, however, considers its projections to be its best guess about the year-to-year course of the economy. The Administration's projections each year are based on the adoption of the President's budget as submitted, and for most years, CBO has considered its projections an indication of the average future performance of the economy if major historical trends continue. Neither institution attempts to anticipate cyclical fluctuations within the projection period.

CBO's projections of longer-term growth in real output were closer to the actual values than the Administration's were in 13 of the 21 forecasts. The Administration's projections showed an upward bias of 0.5 percentage points compared with an upward bias of 0.1 percentage points for CBO. Those biases occurred in part because the projections made in early 1976 through 1979, which CBO and the Administration presented as target rates of growth, did not incorporate the recessions of 1980 and 1982. Through the subsequent years of expansion until the 1990-1991 recession, the upward bias was much smaller in CBO's projections. In the five-year-ahead projection made between 1992 and 1996, both CBO and the Administration underpredicted long-term growth. The reasons are 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.

Those underpredictions of real growth also resulted in underestimates of long-run growth in nominal output, but the errors for nominal growth were smaller than those for real growth (see Table 10). That is because most forecasters have overestimated the inflation rate in recent years. Between 1976 and 1996, CBO and the Administration appear to have done equally well in forecasting five-year growth in nominal output. Moreover, as the record since 1982 shows, both forecasters compared well with the *Blue Chip* consensus.

Table 1.
Summary Measures of Forecast Performance (In percentage points)

	CBO	Administration	Blue Chip
Two-Year Averages			
Growth Rate for Real Output (1982-1999)			
Mean error	-0.7	-0.5	-0.8
Mean absolute error	1.0	1.1	1.0
Root mean square error	1.3	1.4	1.2
Growth Rate for Nominal Output (1982-1999)			
Mean error	0	0.2	0.1
Mean absolute error	1.1	1.2	1.0
Root mean square error	1.4	1.5	1.3
Inflation in the Consumer Price Index (1982-1999)			
Mean error	0.5	0.4	0.6
Mean absolute error	0.7	0.8	0.8
Root mean square error	0.9	1.0	1.0
Nominal Interest Rate on Three-Month Treasury Bills (1982-1999)			
Mean error	0.3	-0.1	0.3
Mean absolute error	1.0	0.9	0.9
Root mean square error	1.3	1.1	1.1
Nominal Long-Term Interest Rate (1984-1999)			
Mean error	0.2	-0.3	0.3
Mean absolute error	0.6	0.9	0.6
Root mean square error	0.7	1.0	0.7
Real Interest Rate on Three-Month Treasury Bills (1982-1999)			
Mean error	-0.2	-0.5	-0.3
Mean absolute error	0.8	0.8	0.7
Root mean square error	1.0	1.0	0.9
Change in Wage and Salary Disbursements Plus Corporate Book Profits as a Share of Output (1980-1999)			
Mean error	0	0.2	*
Mean absolute error	1.0	0.9	*
Root mean square error	1.2	1.1	*
Five-Year Averages			
Growth Rate for Real Output (1979-1996)			
Mean error	-0.2	0.2	-0.3
Mean absolute error	0.6	0.9	0.6
Root mean square error	0.9	1.0	0.8
Growth Rate for Nominal Output (1982-1996)			
Mean error	0.6	0.8	0.8
Mean absolute error	1.0	1.0	1.0
Root mean square error	1.1	1.2	1.2

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 10.

* = not applicable.

Table 2.
Comparison of CBO, Administration, and *Blue Chip* Forecasts of Two-Year Average Growth Rates for Real Output (By calendar year, in percent)

	Actual				CBO		Administration		Blue Chip ^e	
	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	5.2	6.2	1.0	5.9	0.8	*	*
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	1.1	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	0.1	2.1	2.0	2.6	2.5	*	*
1982-1983	0.7	0.5	0.7	1.1	2.1	1.1	2.7	1.6	2.0	1.0
1983-1984	5.2	5.2	4.9	5.7	3.4	-2.3	2.6	-3.0	3.5	-2.2
1984-1985	*	5.1	4.4	5.3	4.7	-0.6	4.7	-0.6	4.3	-1.0
1985-1986	*	3.0	2.8	3.3	3.3	0	3.9	0.6	3.2	-0.2
1986-1987	*	3.1	2.9	3.2	3.1	-0.1	3.7	0.5	3.0	-0.2
1987-1988	*	3.9	3.5	3.8	2.9	-0.9	3.3	-0.5	2.8	-0.9
1988-1989	*	3.5	3.3	3.9	2.4	-1.4	3.0	-0.9	2.1	-1.7
1989-1990	*	1.7	2.0	2.7	2.5	-0.2	3.2	0.5	2.2	-0.5
1990-1991	*	*	0.3	0.7	2.0	1.4	2.8	2.1	1.9	1.3
1991-1992	*	*	0.7	1.2	1.6	0.4	1.4	0.2	1.2	0
Real GDP^f										
1992-1993	*	*	2.7	2.9	2.6	-0.3	2.2	-0.6	2.3	-0.5
1993-1994	*	*	3.6	3.3	2.9	-0.4	2.9	-0.4	3.0	-0.3
1994-1995	*	*	*	3.3	2.8	-0.5	2.9	-0.4	2.8	-0.5
1995-1996	*	*	*	3.1	2.4	-0.7	2.6	-0.5	2.6	-0.5
1996-1997	*	*	*	4.0	1.9	-2.0	2.2	-1.7	2.1	-1.9
1997-1998	*	*	*	4.4	2.1	-2.2	2.1	-2.3	2.2	-2.2
1998-1999	*	*	*	4.2	2.3	-1.8	2.2	-2.0	2.4	-1.8
1999-2000	*	*	*	4.1	2.0	-2.1	2.2	-1.9	2.3	-1.8
Statistics for 1976-1999										
Mean error	*	*	*	*	*	-0.3	*	-0.2	*	*
Mean absolute error	*	*	*	*	*	1.0	*	1.1	*	*
Root mean square error	*	*	*	*	*	1.2	*	1.4	*	*
Statistics for 1982-1999										
Mean error	*	*	*	*	*	-0.7	*	-0.5	*	-0.8
Mean absolute error	*	*	*	*	*	1.0	*	1.1	*	1.0
Root mean square error	*	*	*	*	*	1.3	*	1.4	*	1.2

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, 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.

- Data for 1972-dollar GNP and GDP are available only through the third quarter of 1985.
- Data for 1982-dollar GNP and GDP are available only through the third quarter of 1991.
- Data for 1987-dollar GNP and GDP are available only through the second and third quarters, respectively, of 1995.
- 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 in calculating the errors.
- Two-year forecasts for the *Blue Chip* consensus were not available until 1982.
- With the 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)

	Actual	CBO		Administration		<i>Blue Chip</i> ^b	
		Forecast	Error ^a	Forecast	Error ^a	Forecast	Error ^a
GNP							
1976-1977	11.6	13.1	1.6	12.3	0.7	*	*
1977-1978	12.2	10.8	-1.4	11.2	-1.0	*	*
1978-1979	12.5	10.9	-1.7	11.2	-1.4	*	*
1979-1980	10.5	11.0	0.5	10.4	-0.1	*	*
1980-1981	10.4	9.7	-0.7	9.5	-0.8	*	*
1981-1982	7.9	12.1	4.2	11.9	4.0	*	*
1982-1983	6.2	9.7	3.5	9.8	3.6	9.5	3.3
1983-1984	9.7	8.2	-1.5	8.0	-1.7	9.0	-0.8
1984-1985	8.9	9.9	0.9	9.6	0.7	9.6	0.7
1985-1986	6.1	7.6	1.5	8.2	2.1	7.4	1.3
1986-1987	5.9	7.1	1.2	7.7	1.8	6.7	0.8
1987-1988	7.1	6.5	-0.6	6.9	-0.3	6.4	-0.7
1988-1989	7.6	6.3	-1.3	6.8	-0.9	6.1	-1.5
1989-1990	6.7	6.8	0.1	7.1	0.4	6.6	-0.1
1990-1991	4.5	6.1	1.6	7.1	2.6	6.0	1.5
1991-1992	4.3	5.7	1.4	5.6	1.3	5.2	1.0
GDP^c							
1992-1993	5.3	5.7	0.4	5.4	0.1	5.5	0.2
1993-1994	5.7	5.3	-0.3	5.3	-0.3	6.0	0.4
1994-1995	5.6	5.6	0	5.7	0.1	5.6	0.1
1995-1996	5.2	5.2	0	5.6	0.3	5.7	0.5
1996-1997	6.0	4.7	-1.3	5.1	-1.0	4.5	-1.5
1997-1998	6.0	4.6	-1.5	4.7	-1.3	4.6	-1.4
1998-1999	5.6	4.5	-1.1	4.2	-1.4	4.5	-1.0
1999-2000	6.0	3.9	-2.1	4.0	-2.0	4.1	-1.9
Statistics for 1976-1999							
Mean error	*	*	0.1	*	0.2	*	*
Mean absolute error	*	*	1.3	*	1.2	*	*
Root mean square error	*	*	1.6	*	1.6	*	*
Statistics for 1982-1999							
Mean error	*	*	0	*	0.2	*	0.1
Mean absolute error	*	*	1.1	*	1.2	*	1.0
Root mean square error	*	*	1.4	*	1.5	*	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 gross national product (GNP) and gross domestic product (GDP) last reported by the Bureau of Economic Analysis, 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 the 1992 benchmark revision, GDP replaced GNP as the central measure of national output.

Table 4.
Comparison of CBO, Administration, and *Blue Chip* Forecasts of Two-Year Average Inflation in the Consumer Price Index (By calendar year, in percent)

	Actual		CBO		Administration		<i>Blue Chip</i> ^b	
	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	6.6	2.1	7.2	2.6
1983-1984	3.8	3.3	4.7	1.0	4.7	1.5	4.9	1.1
1984-1985	3.9	3.5	4.9	1.0	4.5	1.0	5.2	1.3
1985-1986	2.7	2.5	4.1	1.4	4.2	1.7	4.3	1.6
1986-1987	2.8	2.6	3.8	1.2	3.8	1.2	3.8	1.0
1987-1988	3.9	3.8	3.9	0.1	3.3	-0.5	3.6	-0.2
1988-1989	4.4	4.4	4.7	0.3	4.2	-0.2	4.3	-0.1
1989-1990	5.1	5.0	4.9	-0.1	3.7	-1.3	4.7	-0.4
1990-1991	4.8	4.6	4.1	-0.7	3.9	-0.7	4.1	-0.7
1991-1992	3.6	3.5	4.2	0.6	4.6	1.1	4.4	0.8
1992-1993	3.0	2.9	3.4	0.5	3.1	0.2	3.5	0.5
1993-1994	2.8	2.7	2.8	0.1	2.8	0.1	3.3	0.6
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	3.1	0.3	3.4	0.6
1996-1997	2.6	2.6	2.9	0.3	2.9	0.3	2.8	0.2
1997-1998	1.9	1.8	2.9	1.0	2.7	0.8	2.9	1.0
1998-1999	1.9	1.8	2.3	0.5	2.1	0.3	2.4	0.5
1999-2000	2.8	2.8	2.5	-0.2	2.2	-0.5	2.2	-0.6
Statistics for 1976-1999								
Mean error	*	*	*	0	*	-0.1	*	*
Mean absolute error	*	*	*	1.1	*	1.1	*	*
Root mean square error	*	*	*	1.6	*	1.6	*	*
Statistics for 1982-1999								
Mean error	*	*	*	0.5	*	0.4	*	0.6
Mean absolute error	*	*	*	0.7	*	0.8	*	0.8
Root mean square error	*	*	*	0.9	*	1.0	*	1.0

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.

- Errors (which are in percentage points) are forecast values minus actual values; thus, a positive error is an overestimate.
- Two-year forecasts for the *Blue Chip* consensus were not available until 1982.

Table 5.
Comparison of 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		Administration		<i>Blue Chip</i> ^b	
	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	11.1	1.4	11.3	1.6
1983-1984	9.1	9.1	7.1	-2.0	7.9	-1.1	7.9	-1.2
1984-1985	8.5	8.5	8.7	0.3	8.1	-0.4	9.1	0.5
1985-1986	6.7	6.7	8.5	1.8	8.0	1.3	8.5	1.8
1986-1987	5.9	5.9	6.7	0.9	6.9	1.0	7.1	1.2
1987-1988	6.2	6.2	5.6	-0.6	5.5	-0.7	5.7	-0.5
1988-1989	7.4	7.4	6.4	-0.9	5.2	-2.1	6.1	-1.2
1989-1990	7.8	7.8	7.5	-0.3	5.9	-1.9	7.5	-0.3
1990-1991	6.5	6.4	7.0	0.6	6.0	-0.4	7.1	0.7
1991-1992	4.4	4.4	6.8	2.4	6.2	1.8	6.4	2.0
1992-1993	3.2	3.2	4.7	1.5	4.5	1.3	4.6	1.4
1993-1994	3.6	3.6	3.4	-0.2	3.4	-0.2	3.8	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	5.7	0.4	6.1	0.9
1996-1997	5.0	5.0	4.8	-0.2	4.7	-0.3	5.0	0
1997-1998	4.9	4.9	5.0	0.1	4.8	-0.1	5.1	0.2
1998-1999	4.7	4.7	5.2	0.5	4.9	0.2	5.1	0.4
1999-2000	5.3	5.2	4.5	-0.7	4.2	-1.0	4.3	-0.9
Statistics for 1976-1999								
Mean error	*	*	*	0	*	-0.6	*	*
Mean absolute error	*	*	*	1.2	*	1.2	*	*
Root mean square error	*	*	*	1.5	*	1.5	*	*
Statistics for 1982-1999								
Mean error	*	*	*	0.3	*	-0.1	*	0.3
Mean absolute error	*	*	*	1.0	*	0.9	*	0.9
Root mean square error	*	*	*	1.3	*	1.1	*	1.1

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.

- Errors (which are in percentage points) are forecast values minus actual values; thus, a positive error is an overestimate.
- Two-year forecasts for the *Blue Chip* consensus were not available until 1982.

Table 6.
Comparison of CBO, Administration, and *Blue Chip* Forecasts of Two-Year Averages
for Nominal Long-Term Interest Rates (By calendar year, in percent)

	Actual		CBO		Administration		Blue Chip	
	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	9.7	-1.8	12.2	0.2
1985-1986	9.1	10.2	11.5	1.3	10.6	1.5	11.8	1.7
1986-1987	8.0	9.2	8.9	0.9	8.7	0.7	9.9	0.8
1987-1988	8.6	9.5	7.2	-1.4	6.6	-2.0	8.7	-0.8
1988-1989	8.7	9.5	9.4	0.7	7.7	-1.0	9.8	0.3
1989-1990	8.5	9.3	9.1	0.6	7.7	-0.8	9.5	0.3
1990-1991	8.2	9.0	7.7	-0.5	7.2	-1.0	8.7	-0.3
1991-1992	7.4	8.5	7.8	0.4	7.3	-0.1	8.7	0.3
1992-1993	6.4	7.7	7.1	0.7	6.9	0.5	8.4	0.7
1993-1994	6.5	7.6	6.6	0.2	6.6	0.2	8.2	0.6
1994-1995	6.8	7.8	5.9	-0.9	5.8	-1.0	7.1	-0.7
1995-1996	6.5	7.5	7.3	0.8	7.5	1.0	8.6	1.1
1996-1997	6.4	7.3	6.2	-0.1	5.4	-0.9	6.2	-0.1
1997-1998	5.8	6.9	6.2	0.4	6.0	0.2	6.4	0.6
1998-1999	5.5	6.8	6.0	0.6	5.8	0.4	5.9	0.5
1999-2000	5.8	7.3	5.2	-0.6	4.9	-0.9	5.0	-0.8
Statistics for 1984-1999								
Mean error	*	*	*	0.2	*	-0.3	*	0.3
Mean absolute error	*	*	*	0.6	*	0.9	*	0.6
Root mean square error	*	*	*	0.7	*	1.0	*	0.7

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 beginning in 1996. 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.
Comparison of CBO, Administration, and *Blue Chip* Forecasts of Two-Year Average Real Interest Rates on Three-Month Treasury Bills (By calendar year, in percent)

	Actual				CBO		Administration		<i>Blue Chip</i> ^b	
	New Issue		Secondary Market		Forecast	Error ^a	Forecast	Error ^a	Forecast	Error ^a
	CPI-U	CPI-W	CPI-U	CPI-W						
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	4.2	-0.8	3.8	-1.0
1983-1984	5.1	5.7	5.1	5.6	2.2	-2.9	3.1	-2.6	2.9	-2.3
1984-1985	4.4	4.9	4.4	4.8	3.6	-0.8	3.4	-1.4	3.6	-0.8
1985-1986	3.9	4.1	3.9	4.1	4.2	0.3	3.6	-0.4	4.0	0.1
1986-1987	3.0	3.2	3.0	3.2	2.8	-0.4	3.0	-0.3	3.2	0.2
1987-1988	2.3	2.4	2.3	2.3	1.7	-0.6	2.1	-0.2	2.0	-0.3
1988-1989	2.8	2.9	2.8	2.9	1.7	-1.2	1.0	-1.9	1.8	-1.1
1989-1990	2.6	2.6	2.6	2.6	2.5	-0.2	2.1	-0.6	2.7	0.2
1990-1991	1.6	1.7	1.5	1.7	2.8	1.2	2.0	0.3	2.9	1.3
1991-1992	0.8	0.9	0.7	0.9	2.5	1.8	1.5	0.6	1.9	1.2
1992-1993	0.2	0.4	0.2	0.3	1.3	1.0	1.3	1.1	1.1	0.8
1993-1994	0.8	0.9	0.8	0.9	0.5	-0.3	0.6	-0.3	0.5	-0.4
1994-1995	2.1	2.1	2.1	2.1	1.0	-1.1	0.6	-1.5	0.5	-1.6
1995-1996	2.3	2.3	2.3	2.3	2.6	0.3	2.5	0.1	2.6	0.3
1996-1997	2.4	2.4	2.3	2.4	1.8	-0.5	1.7	-0.6	2.1	-0.3
1997-1998	2.9	3.1	2.9	3.1	2.0	-0.9	2.1	-0.9	2.1	-0.8
1998-1999	2.8	2.9	2.8	2.9	2.8	0	2.7	-0.1	2.6	-0.2
1999-2000	2.4	2.3	2.4	2.3	1.9	-0.5	2.0	-0.5	2.1	-0.3
Statistics for 1976-1999										
Mean error	*	*	*	*	*	-0.1	*	-0.5	*	*
Mean absolute error	*	*	*	*	*	0.9	*	0.9	*	*
Root mean square error	*	*	*	*	*	1.1	*	1.3	*	*
Statistics for 1982-1999										
Mean error	*	*	*	*	*	-0.2	*	-0.5	*	-0.3
Mean absolute error	*	*	*	*	*	0.8	*	0.8	*	0.7
Root mean square error	*	*	*	*	*	1.0	*	1.0	*	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; 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.
Comparison of 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, in percent)

	Actual	CBO		Administration	
		Forecast	Error ^a	Forecast	Error ^a
1980-1981	-3.2	-0.6	2.5	-1.3	1.9
1981-1982	-3.3	-2.6	0.7	-1.2	2.1
1982-1983	-1.9	-1.8	0.1	-1.7	0.2
1983-1984	-0.8	0	0.8	-1.0	-0.2
1984-1985	-0.5	-0.2	0.3	-0.2	0.4
1985-1986	-0.7	-0.6	0.1	-0.8	-0.1
1986-1987	1.2	1.0	-0.2	0.8	-0.4
1987-1988	2.5	0.9	-1.6	1.4	-1.1
1988-1989	-0.4	0.6	1.0	0.4	0.8
1989-1990	-1.2	0.4	1.5	0.7	1.9
1990-1991	-0.1	0.7	0.7	1.4	1.5
1991-1992	0	0.1	0	-0.1	-0.1
1992-1993	0	1.0	1.0	1.4	1.4
1993-1994	-0.3	0.5	0.9	0.5	0.9
1994-1995	1.2	0.2	-1.0	0.4	-0.8
1995-1996	1.7	-0.3	-2.0	-0.6	-2.3
1996-1997	1.0	-0.3	-1.3	0.8	-0.2
1997-1998	0.2	-0.6	-0.9	0	-0.2
1998-1999	0.4	-0.5	-0.8	0.2	-0.2
1999-2000	1.6	-0.1	-1.7	0.7	-0.9
Statistics for 1980-1999					
Mean error	*	*	0	*	0.2
Mean absolute error	*	*	1.0	*	0.9
Root mean square error	*	*	1.2	*	1.1

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 in calculating 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 9.
Comparison of CBO, Administration, and *Blue Chip* Projections of Five-Year Average Growth Rates for Real Output (By calendar year, in percent)

	Actual			Chain-Type Annual- Weighted Index	CBO		Administration		<i>Blue Chip</i> ^e	
	1972 Dollars ^a	1982 Dollars ^b	1987 Dollars ^c		Projection	Error ^d	Projection	Error ^d	Projection	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	1.5	3.8	2.2	3.8	2.3	3.1	1.6
1980-1984	2.1	1.9	1.7	2.2	2.4	0.2	3.0	0.8	2.5	0.3
1981-1985	*	2.6	2.4	3.0	2.8	-0.2	3.8	0.8	3.0	0
1982-1986	*	2.7	2.6	3.2	3.0	-0.2	3.9	0.7	2.7	-0.4
1983-1987	*	4.0	3.7	4.3	3.6	-0.7	3.5	-0.8	3.5	-0.8
1984-1988	*	4.1	3.7	4.3	4.0	-0.3	4.3	0	3.5	-0.8
1985-1989	*	3.3	3.1	3.6	3.4	-0.2	4.0	0.4	3.4	-0.2
1986-1990	*	2.8	2.7	3.2	3.3	0.1	3.8	0.6	3.1	-0.1
1987-1991	*	*	2.0	2.5	2.9	0.4	3.5	1.0	2.7	0.2
1988-1992	*	*	1.9	2.4	2.6	0.2	3.2	0.8	2.5	0.1
1989-1993	*	*	1.7	2.1	2.3	0.2	3.2	1.1	2.6	0.5
1990-1994	*	*	1.9	2.2	2.3	0.1	3.0	0.8	2.4	0.2
1991-1995	*	*	*	2.3	2.3	0	2.5	0.2	2.0	-0.3
Real GDP^f										
1992-1996	*	*	*	3.2	2.6	-0.6	2.7	-0.5	2.5	-0.7
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	*	*	*	3.8	2.4	-1.4	2.6	-1.2	2.5	-1.3
1996-2000	*	*	*	4.1	2.0	-2.1	2.3	-1.8	2.2	-1.9
Statistics for 1976-1996										
Mean error	*	*	*	*	*	0.1	*	0.5	*	*
Mean absolute error	*	*	*	*	*	0.9	*	1.1	*	*
Root mean square error	*	*	*	*	*	1.2	*	1.3	*	*
Statistics for 1979-1996										
Mean error	*	*	*	*	*	-0.2	*	0.2	*	-0.3
Mean absolute error	*	*	*	*	*	0.6	*	0.9	*	0.6
Root mean square error	*	*	*	*	*	0.9	*	1.0	*	0.8

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

NOTES: 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, 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.

- Data for 1972-dollar GNP and GDP are available only through the third quarter of 1985.
- Data for 1982-dollar GNP and GDP are available only through the third quarter of 1991.
- Data for 1987-dollar GNP and GDP are available only through the second and third quarters, respectively, of 1995.
- 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 in calculating the errors.
- Five-year projections for the *Blue Chip* consensus were not available until 1979.
- With the 1992 benchmark revision, GDP replaced GNP as the central measure of national output.

Table 10.
Comparison of CBO, Administration, and *Blue Chip* Projections of Five-Year Average Growth Rates for Nominal Output (By calendar year, in percent)

	Actual	CBO		Administration		<i>Blue Chip</i> ^b	
		Projection	Error ^a	Projection	Error ^a	Projection	Error ^a
GNP							
1976-1980	11.4	12.3	0.9	12.0	0.5	*	*
1977-1981	11.5	10.6	-0.9	10.5	-1.0	*	*
1978-1982	9.9	10.7	0.8	10.6	0.7	*	*
1979-1983	9.0	11.3	2.2	9.6	0.6	*	*
1980-1984	8.8	11.3	2.5	11.3	2.5	*	*
1981-1985	8.4	11.8	3.4	11.3	2.9	*	*
1982-1986	7.1	9.8	2.6	9.7	2.6	9.7	2.5
1983-1987	7.6	8.2	0.6	8.5	0.9	9.0	1.4
1984-1988	7.5	9.0	1.5	8.9	1.4	9.1	1.6
1985-1989	6.8	7.7	0.9	8.1	1.3	7.8	1.0
1986-1990	6.6	7.5	0.9	7.4	0.8	7.0	0.4
1987-1991	6.1	6.9	0.8	6.9	0.8	6.6	0.5
1988-1992	5.9	6.6	0.7	6.7	0.8	6.6	0.7
1989-1993	5.4	6.6	1.2	6.5	1.1	6.9	1.5
1990-1994	5.1	6.3	1.2	6.9	1.8	6.4	1.3
1991-1995	4.9	6.1	1.2	6.4	1.5	5.9	1.0
GDP^c							
1992-1996	5.5	5.8	0.3	6.0	0.5	5.9	0.4
1993-1997	5.7	5.1	-0.5	5.1	-0.5	6.0	0.4
1994-1998	5.7	5.4	-0.3	5.7	-0.1	5.8	0
1995-1999	5.6	5.2	-0.4	5.5	-0.1	5.6	-0.1
1996-2000	5.9	4.8	-1.1	5.1	-0.9	4.5	-1.4
Statistics for 1976-1996							
Mean error	*	*	0.9	*	0.9	*	*
Mean absolute error	*	*	1.2	*	1.1	*	*
Root mean square error	*	*	1.4	*	1.3	*	*
Statistics for 1982-1996							
Mean error	*	*	0.6	*	0.8	*	0.8
Mean absolute error	*	*	1.0	*	1.0	*	1.0
Root mean square error	*	*	1.1	*	1.2	*	1.2

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, 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.

- Errors (which are in percentage points) are projected values minus actual values; thus, a positive error is an overestimate.
- Five-year projections for the *Blue Chip* consensus were not available until 1982.
- With the 1992 benchmark revision, GDP replaced GNP as the central measure of national output.



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