EVALUATING CBO'S RECORD OF ECONOMIC FORECASTS

July 30, 1999

Congress of the United States
Congressional Budget Office

NOTES

Unless otherwise indicated, all years referred to in this report are calendar years.

The figures in this report use shaded vertical bars to indicate periods of recession. Those bars extend from the peak to the trough of the recession.

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

Preface

T his report supplements the Congressional Budget Office's (CBO's) *The Economic and Budget Outlook: An Update* (July 1, 1999). In accordance with CBO's mandate to provide objective and impartial analysis, it contains no recommendations.

The analysis was prepared by Matthew Salomon under the direction of Robert Dennis, Kim J. Kowalewski, and John F. Peterson. Ezra Finkin and Michael Simpson provided research assistance. Leah Mazade edited the report, and Sherry Snyder proofread it. Kathryn Quattrone prepared the report for final publication, and Laurie Brown prepared the electronic versions for CBO's World Wide Web site (www.cbo.gov).

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Evaluating CBO's Record of Economic Forecasts

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 errors for forecasts looking two years ahead that were made between 1982 and 1997 did not differ markedly from either those of the Administration or the central tendency of the 50 or so forecasts that have made up the *Blue Chip* survey over the years. Comparing CBO's forecasts with that survey suggests that when CBO's economic predictions missed the mark by a margin wide enough to contribute to sizable misestimates of the deficit or surplus, those errors 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, and CBO's forecast in turn may affect others in a similar way.

Because forecasters have underestimated real growth and overestimated inflation in recent years, CBO focused on the errors in its forecasts made in early 1996 and early 1997. (See the appendix for sources of the data used in the evaluation and details of CBO's track record.) As it turns out, CBO's errors in those forecasts were, in most cases, quite similar to those of the Administration and the *Blue Chip* fore-casters. Those conclusions echo the findings of studies of earlier periods by CBO and by other government and academic reviewers.

Measuring the Quality of Forecasts

Following earlier studies of economic forecasts, the evaluation of CBO's forecasts focused on two aspects of their quality: 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* to measure statistical bias. That statistic—the arithmetic average of all the forecast errors—is the simplest and most widely used measure of forecast bias. Because the mean error 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 forecast's 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 all 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

In addition to the three statistical indicators noted above, there are many other measures of a forecast's quality. To test for statistical bias in CBO's forecasts, studies by analysts outside CBO have used measures that are slightly more elaborate than the mean error. Those studies have generally concluded, as does this evaluation, that CBO's short-term economic forecasts do not contain a statistically significant bias.[1]

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 at the forecaster's disposal when the forecast was made.[2] The *Blue Chip* consensus forecasts 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, such as the 21 observations that make up the sample of CBO's two-year forecasts. Small samples present three main problems for evaluating forecasts. First, small samples 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 errors in the 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 future forecasting errors.

Apart from the general caveat that should attend any statistical conclusions, several other reasons argue for viewing any evaluation of CBO's forecasts with particular caution. First, the procedures and purposes of CBO's and the Administration's forecasts have

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1.   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).

2.   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 can be used to improve forecasts when they are being made.

changed over the past 20 years and may change again in the future. For example, in the late 1970s, CBO characterized its long-term projections as a goal for the economy; it now considers its projections to be 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 their own policy proposals. Second, an institution's track record in forecasting may not be indicative of its future abilities because of changes in personnel or methods. Finally, errors in a forecast increase when the economy is more volatile. All three groups of forecasters—CBO, the Administration, and the *Blue Chip* survey—made exceptionally large errors when forecasting for periods that included turning points in the business cycle.

CBO's Forecasting Record

Over the years, the average differences between the forecasts of CBO, the Administration, and the *Blue Chip* consensus have tended to be small. Recently, all three groups of forecasters underestimated economic growth and overestimated price inflation. As a result, the net effects of those misestimates on the errors in the forecasts of nominal output have been smaller than would be implied by either of the two misestimates alone.

Summary Measures of Forecast Quality

In evaluating its forecasting record, CBO considered how well it had done over both two- and five-year periods. The two-year period is of special importance. Both the Administration's and CBO's winter budget publications focus on budget projections for the fiscal year that begins the following October. An economic forecast that is accurate for the budget year itself will provide the basis for more accurate budget projections. CBO also used a five-year period in its evaluation to examine the accuracy of longer-term projections of growth in nominal and real (adjusted for inflation) output.

Overall, forecasts by CBO, the Administration, and the *Blue Chip* consensus are quite similar for the

two-year horizon (see Table 1).[3] Although the margin is slight, CBO's mean absolute errors are smaller than the Administration's for growth in nominal and real output, inflation, and long-term interest rates. Over the five-year horizon, CBO, the Administration, and the *Blue Chip* consensus all tended toward optimism in their projections for growth of nominal and real output. CBO's projections for real growth over the long term appear comparable in accuracy with those of the *Blue Chip* survey.

In no case, however, do the differences among the three forecasts appear to be large enough to be statistically significant. The small number of forecasts available for analysis makes it difficult to distinguish meaningful differences in their quality from those that might arise randomly. Indeed, other descriptive statistics that are less sensitive to the small size of the sample tend to support the conclusion that the differences between the CBO, Administration, and *Blue Chip* forecasts are purely random.[4] In any case, the statistics presented here should not be construed as reliable indicators of the future quality of any of the forecasters.

Forecasts Made in Early 1996 and 1997

In recent years, the economy has grown at a rate in excess of CBO's estimate of its potential even as the rate of inflation has declined. That pattern, which in some respects is the converse of the stagflation that plagued the United States in the 1970s, surprised analysts. As a result, most forecasters underestimated the rate of economic growth and overestimated inflation for the 1996-1998 period.

The forecasts of CBO, the Administration, and the *Blue Chip* consensus for those years were no different in that regard. In the forecasts made in early 1996 and 1997, CBO, the Administration, and the *Blue Chip* survey all underestimated the two-year growth in real gross domestic product (GDP) by more than 1.5 percentage points, on average. At the same

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3. More detailed information is presented in Tables A-1 through A-9 in the appendix.

4. Pairwise comparisons of the forecast errors using the Mann-Whitney-Wilcoxon U test supported that conclusion in all instances.

Table 1.
Summary Measures of CBO, Administration, and *Blue Chip* Forecasting Performance
(In percentage points)

	CBO	Administration	*Blue Chip*
Average Error for Two-Year Forecasts			
Growth of Nominal Output			
Mean error	0.4	0.6	0.4
Mean absolute error	1.0	1.1	1.0
Root mean square error	1.4	1.5	1.2
Growth of Real Output			
Mean error	-0.2	0	-0.3
Mean absolute error	0.8	1.0	0.8
Root mean square error	1.1	1.3	1.0
Inflation in the Consumer Price Index			
Mean error	0.6	0.5	0.6
Mean absolute error	0.7	0.8	0.8
Root mean square error	0.9	1.0	1.0
Interest Rates			
Three-month Treasury bills—nominal			
Mean error	0.4	-0.1	0.4
Mean absolute error	1.0	1.0	0.9
Root mean square error	1.3	1.2	1.1
Ten-year Treasury notes—nominal			
Mean error	0.2	-0.3	0.3
Mean absolute error	0.6	0.9	0.6
Root mean square error	0.8	1.1	0.7
Three-month Treasury bills—real			
Mean error	-0.2	-0.6	-0.3
Mean absolute error	0.9	0.8	0.8
Root mean square error	1.1	1.1	1.0
Change in Wage and Salary Disbursements			
Plus Corporate Book Profits as a Share of Output			
Mean error	0	0.2	n.a.
Mean absolute error	1.0	1.0	n.a.
Root mean square error	1.3	1.2	n.a.
Average Error for Five-Year Projections			
Growth of Nominal Output			
Mean error	1.3	1.3	0.9
Mean absolute error	1.4	1.3	0.9
Root mean square error	1.6	1.6	1.1
Growth of Real Output			
Mean error	0.3	0.7	0.2
Mean absolute error	0.5	0.9	0.5
Root mean square error	0.8	1.1	0.6

SOURCES: Calculations by the Congressional Budget Office using data from CBO; Office of Management and Budget; Aspen Publishers, Inc.,
Blue Chip Economic Indicators; Department of Commerce, Bureau of Economic Analysis; Department of Labor, Bureau of Labor
Statistics; and the Federal Reserve Board.

NOTES: The calculations include two-year forecasts made between 1982 and 1997 except for the 10-year rate on Treasury notes (which covered the
1984-1997 period) and the change in wage and salary disbursements plus corporate book profits (which covered the 1980-1997 period).
For the five-year projections, calculations for growth of nominal and real output covered 1982 to 1994 and 1979 to 1994, respectively. For
additional details on those calculations, see the appendix.

n.a. = not available.

time, all the forecasters overestimated rates of inflation—in forecasts made in early 1997, they overestimated two-year inflation in the consumer price index by significant magnitudes ranging from 0.8 percentage points (the Administration) to 1 percentage point (CBO and *Blue Chip*). By contrast, errors in the 1996 and 1997 forecasts for nominal interest rates were generally small in comparison with other historical periods.

The net result of the pessimistic forecasts of growth and inflation in the 1996-1998 period has been an underestimate of total nominal GDP (see Figure 1 on page 7). However, because the underestimate of real growth was partly offset by the overestimate of inflation, forecasters underestimated the rate of two-year growth in nominal GDP by about half as much as they underestimated growth in real output. CBO's errors in forecasting nominal GDP growth have not been extraordinary in recent years—they have been within the central tendency of the forecasts that make up the *Blue Chip* consensus (see Figure 2). That suggests that most private-sector forecasters interpreted the economic data in 1996 and 1997 in the same way that CBO forecasters did. Indeed, all the forecasters in the *Blue Chip* survey underestimated two-year GDP growth in 1996, and all but one (the Conference Board) underestimated growth in 1997.

Although the forecast errors for nominal GDP in 1996 and 1997 were not particularly large, CBO's forecasts in those years were much too pessimistic about the share of GDP that represented wages and salaries and corporate book profits. That share is particularly important for budget projections because those two income components form the basis of forecasts of revenues. In recent years, the share exhibited unusual movements—after generally declining for four decades and then apparently stabilizing in the late 1980s, wages and profits began to rise rapidly as a share of GDP in 1996 and have risen every year since then (see Figure 3). CBO underestimated the two-year change in that share by just over 1.5 percentage points, on average, while the Administration's underestimates averaged just under 1 percentage point.

Those underestimates contributed to an underestimate of combined federal revenues for a given level of total GDP.[5]

Part of CBO's underestimate resulted from misestimates of corporate profits. Traditionally, corporate profits have been one of the least predictable components of national income, and recent experience has been no exception. CBO slightly overestimated the two-year growth in corporate profits in its 1996 forecast and then underestimated that growth in its 1997 forecast. In neither case, however, did CBO's forecasts depart significantly from the central tendency of the *Blue Chip* forecasters (see Figure 4).

Perhaps more fundamental to understanding the recent errors in forecasting taxable income 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 the one hand, and total product, on the other. The statistical discrepancy in the NIPAs measures the difference between total product and total income; in recent years, the excess of total income over total product has widened and gives no indication of narrowing (see Figure 5).

The widening of the discrepancy presents a problem for forecasters who must make assumptions about the future course of the discrepancy. If a forecaster has assumed, in line with historical experience, first, that the discrepancy will revert toward zero and second, that most of the discrepancy is due to mismeasurements on the income side, then that forecaster will have 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

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5. The overall effect of errors in economic assumptions on recent estimates of federal revenues has been relatively small. See Congressional Budget Office, *The Economic and Budget Outlook: Fiscal Years 2000-2009* (January 1999), pp. 50-51.

err in their income-side forecasts, but the sheer size of the imbalance in recent years compounds the importance of each forecaster's assumptions about how to forecast the discrepancy. Forecasters' use of alternative and mutually exclusive assumptions for resolving that imbalance—each assumption as reasonable as the next—could broaden the dispersion of forecasts of total income in coming years.

An additional source of difficulty in forecasting taxable income as a share of GDP has been the reversal in another long-standing trend, that of nonwage labor income (employer-paid insurance premiums, pension contributions, and other fringe benefits). Although total labor compensation (nonwage income plus wages and salaries) has remained relatively stable as a share of nominal output in recent years, nonwage labor income has begun to decline as a share of total compensation. The decline began in 1995; its effect has been to increase the share of compensation that is taxed at a higher rate, that is, wages and salaries (see Figure 6). Once again, that turnaround was relatively unpredictable and as yet is imperfectly understood.

Figure 1.
Actual and Forecast Two-Year Average Rates of Growth for Nominal Output
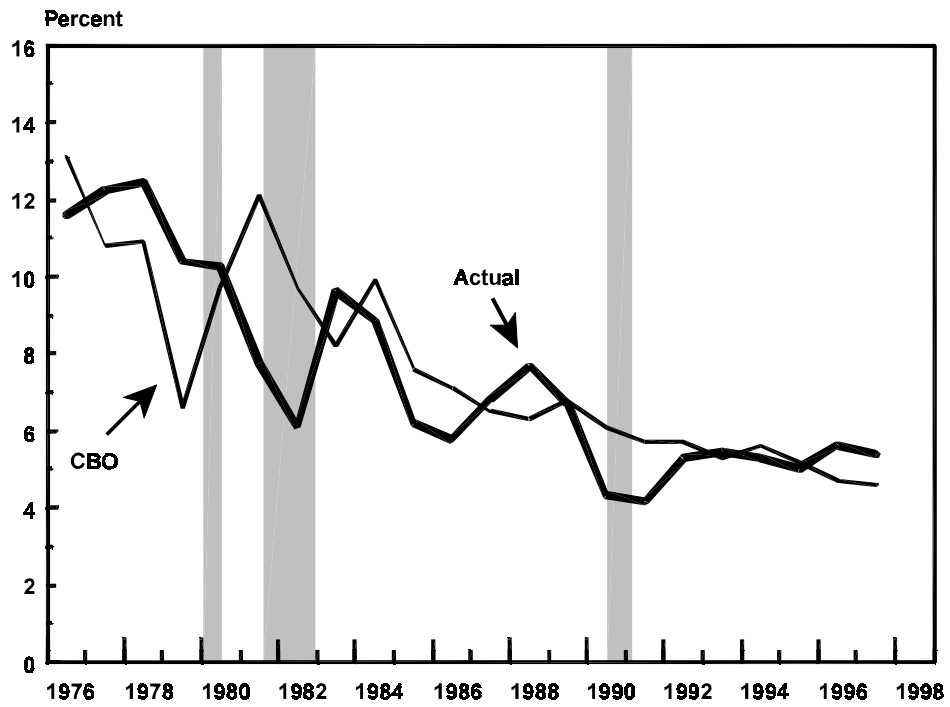
SOURCES: Congressional Budget Office; Department of Commerce, Bureau of Economic Analysis.

Figure 2.
Distribution of Errors by *Blue Chip* Forecasters in Forecasting Two-Year Average Growth of GDP
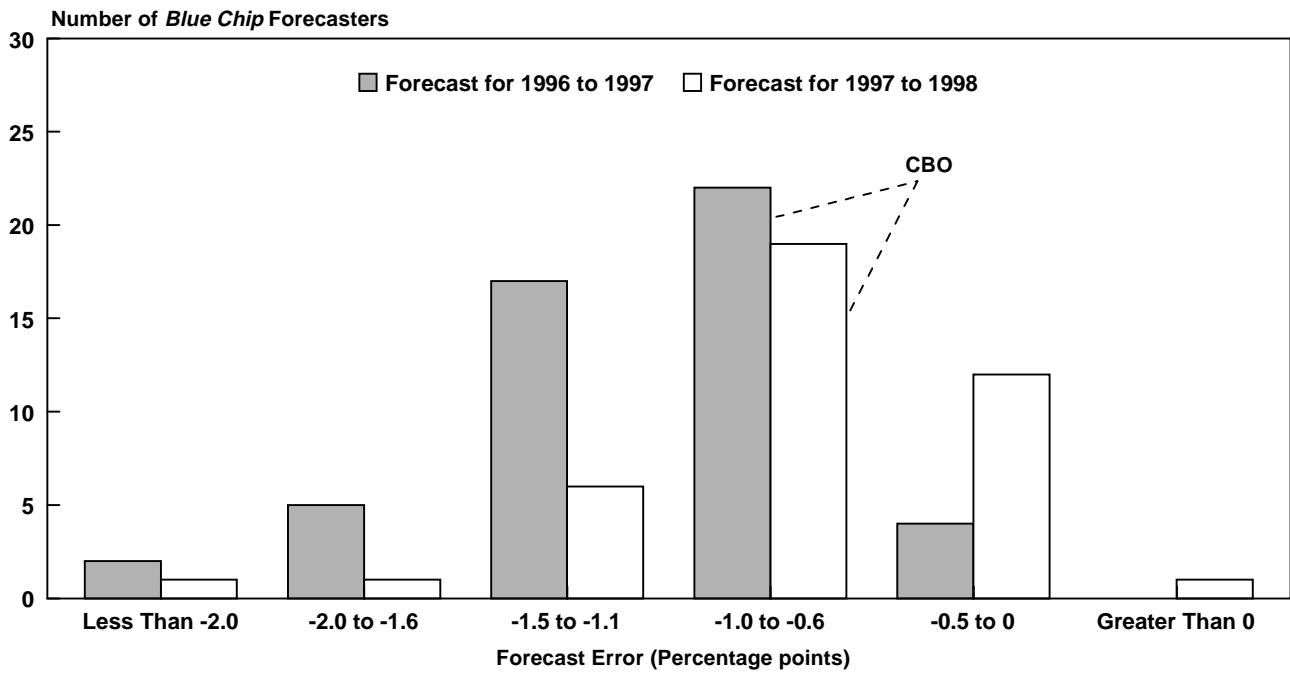
Number of *Blue Chip* Forecasters

Forecast Error (Percentage points)

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

NOTES: The forecast error is defined as the predicted minus the actual rate of growth.

The survey included 50 forecasts for 1996 to 1997 and 40 forecasts for 1997 to 1998.

Figure 3.
Wage and Salary Disbursements Plus Corporate Book Profits
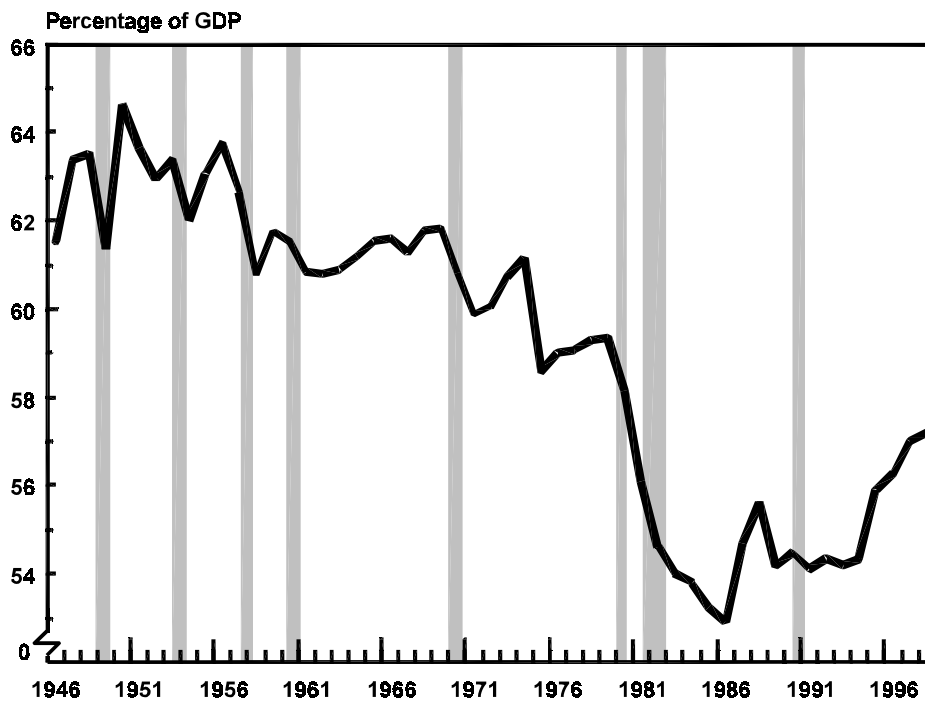
SOURCES: Congressional Budget Office; Department of Commerce, Bureau of Economic Analysis.

Figure 4.
Distribution of Errors by *Blue Chip* Forecasters in Forecasting Two-Year
Average Growth in Corporate Profits
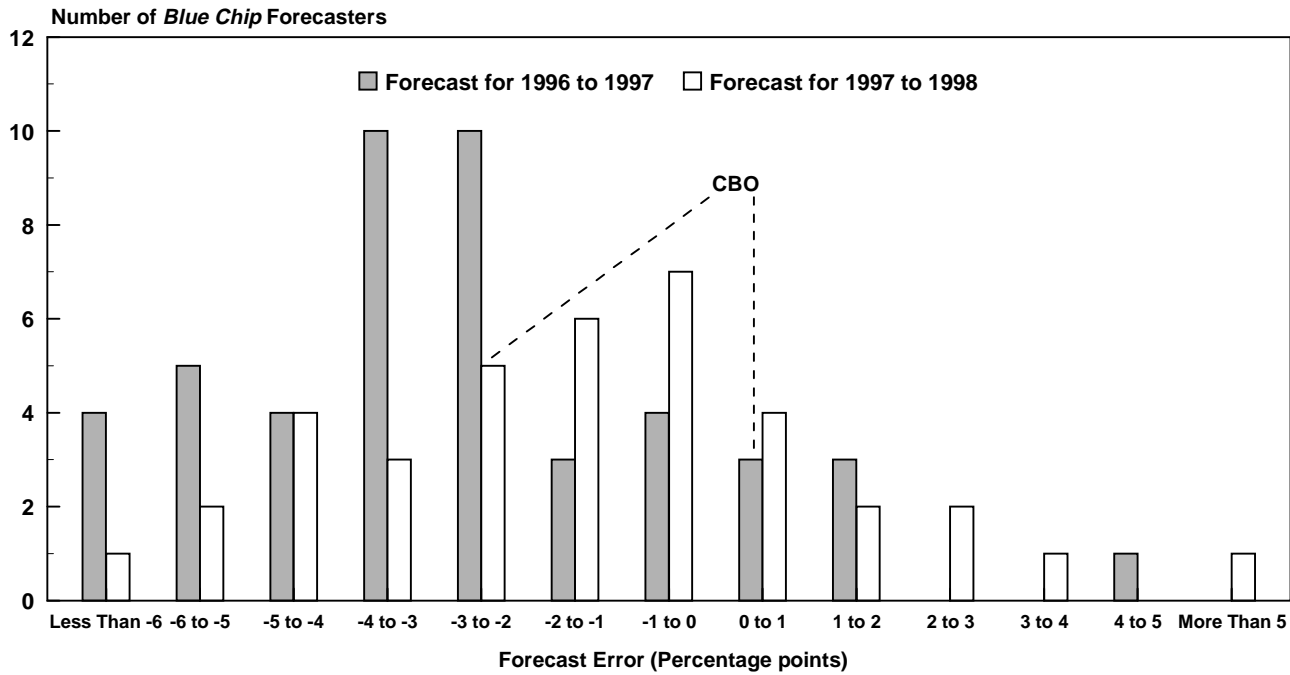
Number of *Blue Chip* Forecasters

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

NOTES: Corporate profits equal the book value of corporate profits with adjustments for inventory and capital consumption.

The forecast error is defined as the predicted minus the actual rate of growth.

The survey included 47 forecasts for 1996 to 1997 and 37 forecasts for 1997 to 1998.

Figure 5.
Statistical Discrepancy
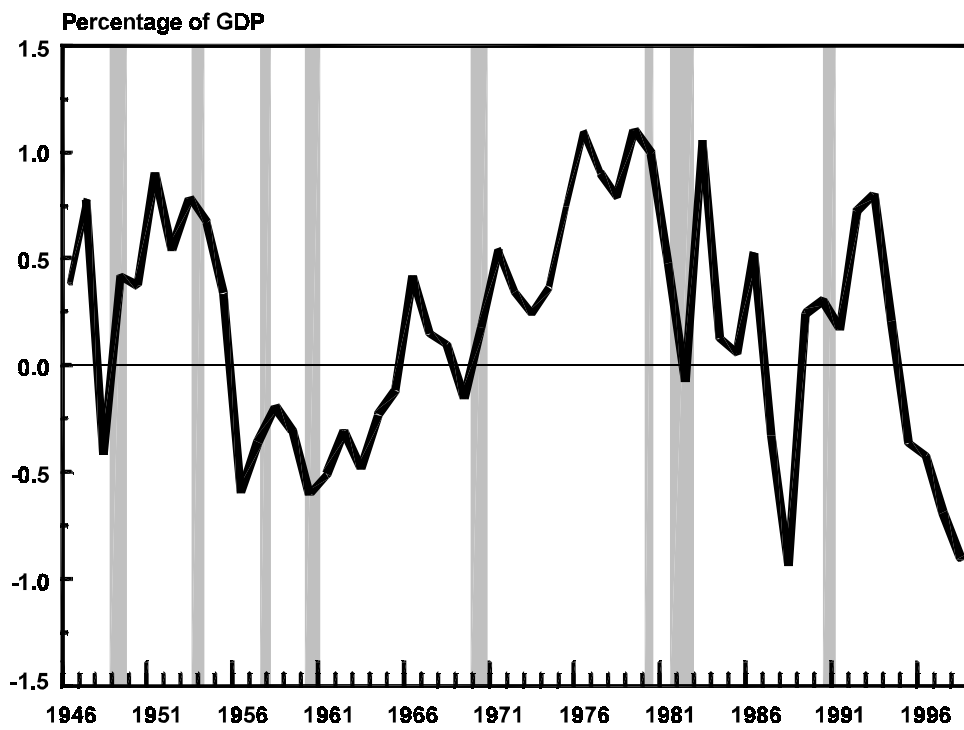
SOURCES: Congressional Budget Office; Department of Commerce, Bureau of Economic Analysis.

NOTE: The statistical discrepancy is defined in the national income and product accounts as the difference between total product and total income.

Figure 6.
Wage and Salary Disbursements
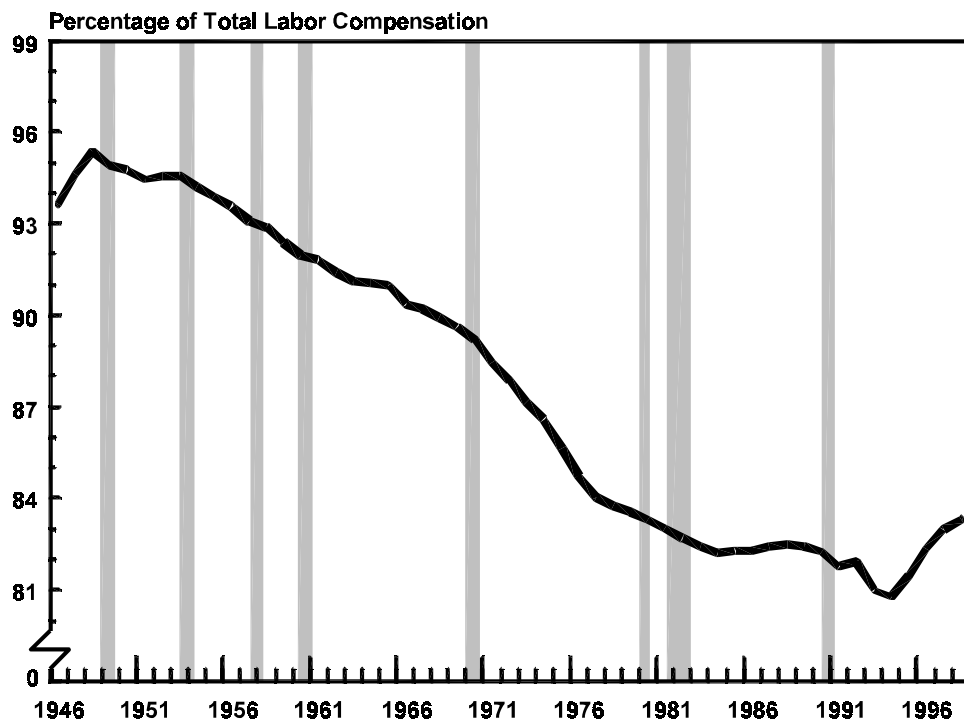
SOURCES: Congressional Budget Office; Department of Commerce, Bureau of Economic Analysis.

NOTE: In the national income and product accounts, total labor compensation equals wage and salary disbursements plus nonwage labor income.

Appendix:
Sources of Data for the Evaluation

E valuating the forecasting record of the Congressional Budget Office requires compiling the basic historical and forecast data for growth in real output, inflation in the consumer price index, interest rates, and taxable income (see Tables A-1 through A-9). Although each of those series has an important influence on budget projections, an accurate forecast of the two-year average growth in real output is the most critical economic factor in accurately estimating the deficit or surplus for the upcoming budget year. Two-year average forecasts published in early 1998 and 1999 could not be included in this evaluation because historical values for 1999 and 2000 are, of course, not yet available. The data were therefore compiled using forecasts published early in the years 1976 through 1997.

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 *Blue Chip* 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 Nominal and Real 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 and real gross domestic product 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 the time. In late 1985, however, BEA discontinued the 1972-dollar series and began to publish GNP on a 1982-

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1. Before 1992, CBO, the Office of Management and Budget, 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.

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 for series that are subsequently discontinued. The difficulties presented by periodic revisions of the data are avoided here by using one of BEA's alternative measures of real GNP and GDP, the chain-type annual-weighted index.[3]

CPI Inflation

Two-year averages of inflation in the consumer price index were calculated 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, it 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 used both series.

Until 1992, the Administration published its forecasts for the CPI-W, the measure used to index most of the federal government's expenditures for entitlement programs. By 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 of the CPI-U. Although both the CPI-U and CPI-W may be forecast with the same relative ease, and annual fluctuations in the two series are virtually indistinguishable, they differ in some years. For that reason, CBO used historical data for both series to evaluate the alternative forecast records.

Interest Rates

Two-year averages of nominal short- and long-term interest rates were developed from calendar year averages of monthly data published by the Board of Governors of the Federal Reserve System.

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. Because such transactions occur continually in markets that involve many more traders than do Treasury auctions, the secondary-market rate provides an updated evaluation of the 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,

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

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

and then returned to the new-issue rate 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* has published the Aaa corporate bond rate.

CBO calculated separate historical values for real short-term interest rates using the nominal short-term interest rate and 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 very 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 the projection for federal revenues, the forecast for taxable income plays a critical role in determining the accuracy of the deficit projection. 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. Because the effective rates of tax on wages (including payroll and income taxes) and corporate profits are nearly the same and because those tax rates exceed the rate at which other income sources (such as interest income) are taxed, it is appropriate to consider wages and profits together.

Although the level of taxable income is the factor that most directly affects federal revenues, historical estimates of the levels of income are subject to substantial statistical revision. As a result, using the *levels* of taxable income would distort the forecast comparison. 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 shares formulation is closer to the concept that macroeconomists consider when they construct their forecasts.

Sources of Forecast Data

With the exception of the measures of taxable income, the evaluation used calendar year forecasts and projections—which 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 of 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 consensus 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 evaluation were published in March; the 1980-1984 projection was published in May.

Since 1985, the Congressional Budget Office has regularly included projections of economic profits and

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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 errors for the early 1993 forecast are virtually the same for CBO and the Administration.

wage and salary disbursements in *The Economic and Budget Outlook*. Because book profits more closely reflect the corporate profits tax base than do economic profits, forecasts of book profits were extracted from CBO's unpublished forecast files. Unpublished CBO forecasts are used for both profits and wages for the 1980-1984 period.

Table A-1.
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		*Blue Chip*	
		Forecast	Error	Forecast	Error	Forecast	Error
GNP							
1976-1977	11.6	13.1	1.5	12.3	0.7	a	a
1977-1978	12.2	10.8	-1.4	11.2	-1.1	a	a
1978-1979	12.5	10.9	-1.6	11.2	-1.3	a	a
1979-1980	10.4	11.0	0.6	10.4	0	a	a
1980-1981	10.3	9.7	-0.6	9.5	-0.8	a	a
1981-1982	7.7	12.1	4.4	11.9	4.2	a	a
1982-1983	6.1	9.7	3.6	9.8	3.7	9.5	3.4
1983-1984	9.6	8.2	-1.4	8.0	-1.6	9.0	-0.7
1984-1985	8.8	9.9	1.0	9.6	0.8	9.6	0.8
1985-1986	6.2	7.6	1.4	8.2	2.0	7.4	1.3
1986-1987	5.8	7.1	1.3	7.7	1.9	6.7	1.0
1987-1988	6.8	6.5	-0.4	6.9	0	6.4	-0.4
1988-1989	7.7	6.3	-1.4	6.8	-0.9	6.1	-1.6
1989-1990	6.7	6.8	0.1	7.1	0.4	6.6	-0.1
1990-1991	4.3	6.1	1.8	7.1	2.8	6.0	1.7
1991-1992	4.2	5.7	1.5	5.6	1.4	5.2	1.1
GDP[b]							
1992-1993	5.3	5.7	0.4	5.4	0.1	5.5	0.3
1993-1994	5.5	5.3	-0.1	5.3	-0.1	6.0	0.6
1994-1995	5.3	5.6	0.3	5.7	0.4	5.6	0.4
1995-1996	5.0	5.2	0.2	5.6	0.6	5.7	0.7
1996-1997	5.6	4.7	-0.9	5.1	-0.6	4.5	-1.1
1997-1998	5.4	4.6	-0.8	4.7	-0.7	4.6	-0.8
Statistics for 1976-1997							
Mean error	*	*	0.4	*	0.5	*	*
Mean absolute error	*	*	1.2	*	1.2	*	*
Root mean square error	*	*	1.6	*	1.6	*	*
Statistics for 1982-1997							
Mean error	*	*	0.4	*	0.6	*	0.4
Mean absolute error	*	*	1.0	*	1.1	*	1.0
Root mean square error	*	*	1.4	*	1.5	*	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 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. Errors (which are in percentage points) are forecast values minus actual values; thus, a positive error is an overestimate.

   * = not applicable.

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

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

Table A-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*	
	1972 Dollars	1982 Dollars	1987 Dollars	Chain-Type Annual-Weighted Index	Forecast	Error	Forecast	Error	Forecast	Error
GNP										
1976-1977	6.7	4.8	4.8	5.1	6.2	1.1	5.9	0.8	a	a
1977-1978	5.2	5.0	4.7	5.0	5.5	0.5	5.1	0.1	a	a
1978-1979	3.9	3.9	3.8	4.2	4.7	0.5	4.7	0.5	a	a
1979-1980	1.3	1.1	1.1	1.4	2.7	1.4	2.9	1.5	a	a
1980-1981	1.1	0.9	0.5	0.9	0.5	-0.3	0.5	-0.3	a	a
1981-1982	0.2	-0.3	-0.4	-0.1	2.1	2.2	2.6	2.7	a	a
1982-1983	0.7	0.5	0.7	0.8	2.1	1.3	2.7	1.9	2.0	1.2
1983-1984	5.2	5.2	4.9	5.4	3.4	-2.0	2.6	-2.7	3.5	-1.9
1984-1985	b	5.1	4.4	5.1	4.7	-0.3	4.7	-0.4	4.3	-0.8
1985-1986	b	3.0	2.8	3.1	3.3	0.3	3.9	0.9	3.2	0.1
1986-1987	b	3.1	2.9	2.9	3.1	0.3	3.7	0.8	3.0	0.1
1987-1988	b	3.9	3.5	3.4	2.9	-0.5	3.3	-0.1	2.8	-0.5
1988-1989	b	3.5	3.3	3.6	2.4	-1.2	3.0	-0.6	2.1	-1.5
1989-1990	b	1.7	2.0	2.3	2.5	0.2	3.2	0.9	2.2	-0.1
1990-1991	b	c	0.3	0.2	2.0	1.9	2.8	2.6	1.9	1.8
1991-1992	b	c	0.7	0.8	1.6	0.8	1.4	0.6	1.2	0.4
GDP[d]										
1992-1993	b	c	2.7	2.5	2.6	0.1	2.2	-0.3	2.3	-0.2
1993-1994	b	c	3.6	2.9	2.9	0	2.9	0	3.0	0.2
1994-1995	b	c	e	2.9	2.8	-0.1	2.9	0.1	2.8	0
1995-1996	b	c	e	2.9	2.4	-0.4	2.6	-0.2	2.6	-0.2
1996-1997	b	c	e	3.7	1.9	-1.7	2.2	-1.4	2.1	-1.6
1997-1998	b	c	e	3.9	2.1	-1.8	2.1	-1.8	2.2	-1.7
Statistics for 1976-1997										
Mean error	*	*	*	*	*	0.1	*	0.3	*	*
Mean absolute error	*	*	*	*	*	0.9	*	1.0	*	*
Root mean square error	*	*	*	*	*	1.1	*	1.3	*	*
Statistics for 1982-1997										
Mean error	*	*	*	*	*	-0.2	*	0	*	-0.3
Mean absolute error	*	*	*	*	*	0.8	*	1.0	*	0.8
Root mean square error	*	*	*	*	*	1.1	*	1.3	*	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 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. 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.

    * = not applicable.

a. Two-year forecasts for the *Blue Chip* consensus were not available until 1982.
b. Data for 1972-dollar GNP and GDP are available only through the third quarter of 1985.
c. Data for 1982-dollar GNP and GDP are available only through the third quarter of 1991.
d. With the 1992 benchmark revision, GDP replaced GNP as the central measure of national output.
e. Data for 1987-dollar GNP and GDP are available only through the second and third quarters, respectively, of 1995.

Table A-3.
Comparison of CBO, Administration, and *Blue Chip* Forecasts of Two-Year Average Inflation Rates in the Consumer Price Index (By calendar year, in percent)

	Actual		CBO		Administration		*Blue Chip*	
	CPI-U	CPI-W	Forecast	Error	Forecast	Error	Forecast	Error
1976-1977	6.1	6.1	7.1	1.0	6.1	0	a	a
1977-1978	7.0	7.0	4.9	-2.1	5.2	-1.8	a	a
1978-1979	9.4	9.5	5.8	-3.7	6.0	-3.5	a	a
1979-1980	12.4	12.5	8.1	-4.3	7.4	-5.0	a	a
1980-1981	11.9	11.9	10.1	-1.8	10.5	-1.4	a	a
1981-1982	8.2	8.1	10.4	2.1	9.7	1.6	a	a
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
Statistics for 1976-1997								
Mean error	*	*	*	0	*	-0.1	*	*
Mean absolute error	*	*	*	1.2	*	1.2	*	*
Root mean square error	*	*	*	1.6	*	1.7	*	*
Statistics for 1982-1997								
Mean error	*	*	*	0.6	*	0.5	*	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, however, 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. Errors (which are in percentage points) are forecast values minus actual values; thus, a positive error is an overestimate.

   * = not applicable.

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

Table A-4.
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		*Blue Chip*	
	New Issue	Secondary Market	Forecast	Error	Forecast	Error	Forecast	Error
1976-1977	5.1	5.1	6.2	1.1	5.5	0.4	a	a
1977-1978	6.2	6.2	6.4	0.2	4.4	-1.8	a	a
1978-1979	8.6	8.6	6.0	-2.6	6.1	-2.5	a	a
1979-1980	10.8	10.7	8.3	-2.4	8.2	-2.6	a	a
1980-1981	12.8	12.7	9.5	-3.2	9.7	-3.1	a	a
1981-1982	12.4	12.3	13.2	0.9	10.0	-2.4	a	a
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
Statistics for 1976-1997								
Mean error	*	*	*	0	*	-0.6	*	*
Mean absolute error	*	*	*	1.2	*	1.3	*	*
Root mean square error	*	*	*	1.6	*	1.6	*	*
Statistics for 1982-1997								
Mean error	*	*	*	0.4	*	-0.1	*	0.4
Mean absolute error	*	*	*	1.0	*	1.0	*	0.9
Root mean square error	*	*	*	1.3	*	1.2	*	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. Errors (which are in percentage points) are forecast values minus actual values; thus, a positive error is an overestimate.

* = not applicable.

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

Table A-5.
Comparison of CBO, Administration, and *Blue Chip* Forecasts of Two-Year Average Interest Rates on Ten-Year Treasury Notes (By calendar year, in percent)

| | Actual | | CBO | | Administration | | *Blue Chip* | |
	10-Year Note	Corporate Aaa Bond	Forecast	Error	Forecast	Error	Forecast	Error
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
Statistics for 1984-1997								
Mean error	*	*	*	0.2	*	-0.3	*	0.3
Mean absolute error	*	*	*	0.6	*	0.9	*	0.6
Root mean square error	*	*	*	0.8	*	1.1	*	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. The Administration forecast the 10-year note rate, but *Blue Chip* forecast the corporate Aaa bond 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. Errors (which are in percentage points) are forecast values minus actual values; thus, a positive error is an overestimate.

* = not applicable.

Table A-6.
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 | | *Blue Chip* | |
| | New Issue | | Secondary Market | | | | | | | |
	CPI-U	CPI-W	CPI-U	CPI-W	Forecast	Error	Forecast	Error	Forecast	Error
1976-1977	-0.9	-0.9	-0.9	-0.9	-0.8	0.1	-0.6	0.3	a	a
1977-1978	-0.8	-0.7	-0.8	-0.7	1.5	2.2	-0.8	-0.1	a	a
1978-1979	-0.7	-0.8	-0.7	-0.8	0.2	1.0	0.1	0.9	a	a
1979-1980	-1.4	-1.5	-1.4	-1.5	0.2	1.7	0.7	2.2	a	a
1980-1981	0.8	0.9	0.7	0.8	-0.5	-1.2	-0.7	-1.6	a	a
1981-1982	3.8	4.0	3.7	3.9	2.6	-1.2	0.3	-3.7	a	a
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	2.2	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	-0.8	2.1	-0.8
Statistics for 1976-1997										
Mean error	*	*	*	*	*	-0.1	*	-0.5	*	*
Mean absolute error	*	*	*	*	*	1.0	*	1.0	*	*
Root mean square error	*	*	*	*	*	1.2	*	1.3	*	*
Statistics for 1982-1997										
Mean error	*	*	*	*	*	-0.2	*	-0.6	*	-0.3
Mean absolute error	*	*	*	*	*	0.9	*	0.8	*	0.8
Root mean square error	*	*	*	*	*	1.1	*	1.1	*	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; 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. The forecasts were issued in the first half of the initial year of the period or in December of the preceding year. Errors (which are in percentage points) are forecast values minus actual values; thus, a positive error is an overestimate.

CPI-U = consumer price index for all urban consumers; CPI-W = consumer price index for urban wage earners and clerical workers; * = not applicable.

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

Table A-7.
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	Forecast	Error
1980-1981	-3.1	-0.6	2.5	-1.3	1.8
1981-1982	-3.3	-2.6	0.7	-1.2	2.1
1982-1983	-1.9	-1.8	0.2	-1.7	0.3
1983-1984	-0.7	0	0.7	-1.0	-0.3
1984-1985	-0.5	-0.2	0.3	-0.2	0.4
1985-1986	-0.6	-0.6	0	-0.8	-0.2
1986-1987	1.6	1.0	-0.6	0.8	-0.8
1987-1988	2.7	0.9	-1.8	1.4	-1.3
1988-1989	-0.6	0.6	1.2	0.4	0.9
1989-1990	-1.2	0.4	1.6	0.7	1.9
1990-1991	-0.1	0.7	0.7	1.4	1.5
1991-1992	0	0.1	0.1	-0.1	0
1992-1993	0.1	1.0	0.9	1.4	1.3
1993-1994	0	0.5	0.5	0.5	0.5
1994-1995	1.7	0.2	-1.5	0.4	-1.3
1995-1996	1.9	-0.3	-2.2	-0.6	-2.6
1996-1997	1.1	-0.3	-1.5	0.8	-0.3
1997-1998	0.9	-0.6	-1.6	0	-0.9
Statistics for 1980-1997					
Mean error	*	*	0	*	0.2
Mean absolute error	*	*	1.0	*	1.0
Root mean square error	*	*	1.3	*	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. Errors (which are in percentage points) are forecast values minus actual values; thus, a positive error is an overestimate. 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.

* = not applicable.

Table A-8.
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		*Blue Chip*	
		Forecast	Error	Forecast	Error	Forecast	Error
GNP							
1976-1980	11.4	12.3	0.9	12.0	0.6	a	a
1977-1981	11.4	10.6	-0.8	10.5	-0.9	a	a
1978-1982	9.8	10.7	0.9	10.6	0.8	a	a
1979-1983	8.9	11.3	2.4	9.6	0.7	a	a
1980-1984	8.7	11.3	2.6	11.3	2.6	a	a
1981-1985	8.3	11.8	3.5	11.3	3.0	a	a
1982-1986	7.1	9.8	2.7	9.7	2.7	9.7	2.6
1983-1987	7.5	8.2	0.7	8.5	1.0	9.0	1.5
1984-1988	7.4	9.0	1.6	8.9	1.5	9.1	1.7
1985-1989	6.7	7.7	0.9	8.1	1.3	7.8	1.1
1986-1990	6.5	7.5	0.9	7.4	0.9	7.0	0.4
1987-1991	6.0	6.9	0.9	6.9	0.9	6.6	0.6
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	1.6
1990-1994	5.0	6.3	1.4	6.9	2.0	6.4	1.4
1991-1995	4.8	6.1	1.3	6.4	1.6	5.9	1.1
GDP[b]							
1992-1996	5.3	5.8	0.5	6.0	0.7	5.9	0.6
1993-1997	5.4	5.1	-0.3	5.1	-0.3	6.0	0.7
1994-1998	5.4	5.4	0.1	5.7	0.3	5.8	0.4
Statistics for 1976-1994							
Mean error	*	*	1.2	*	1.1	*	*
Mean absolute error	*	*	1.3	*	1.2	*	*
Root mean square error	*	*	1.5	*	1.5	*	*
Statistics for 1982-1994							
Mean error	*	*	1.3	*	1.3	*	0.9
Mean absolute error	*	*	1.4	*	1.3	*	0.9
Root mean square error	*	*	1.6	*	1.6	*	1.1

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

   * = not applicable.

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

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

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

	Actual				CBO		Administration		*Blue Chip*	
	1972 Dollars	1982 Dollars	1987 Dollars	Chain-Type Annual-Weighted Index	Projection	Error	Projection	Error	Projection	Error
GNP										
1976-1980	4.2	3.4	3.3	3.7	5.7	2.0	6.2	2.5	a	a
1977-1981	3.1	2.8	2.6	3.0	5.3	2.3	5.1	2.1	a	a
1978-1982	1.6	1.4	1.2	1.6	4.8	3.2	4.8	3.2	a	a
1979-1983	1.3	1.0	1.1	1.3	3.8	2.5	3.8	2.5	3.1	1.8
1980-1984	2.1	1.9	1.7	2.0	2.4	0.4	3.0	1.0	2.5	0.5
1981-1985	b	2.6	2.4	2.7	2.8	0	3.8	1.1	3.0	0.3
1982-1986	b	2.7	2.6	2.9	3.0	0.1	3.9	1.0	2.7	-0.1
1983-1987	b	4.0	3.7	3.9	3.6	-0.3	3.5	-0.5	3.5	-0.5
1984-1988	b	4.1	3.7	3.9	4.0	0	4.3	0.3	3.5	-0.5
1985-1989	b	3.3	3.1	3.2	3.4	0.1	4.0	0.7	3.4	0.1
1986-1990	b	2.8	2.7	2.9	3.3	0.5	3.8	0.9	3.1	0.3
1987-1991	b	c	2.0	2.1	2.9	0.8	3.5	1.4	2.7	0.6
1988-1992	b	c	1.9	2.0	2.6	0.5	3.2	1.2	2.5	0.5
1989-1993	b	c	1.7	1.7	2.3	0.6	3.2	1.5	2.6	0.8
1990-1994	b	c	1.9	1.7	2.3	0.6	3.0	1.2	2.4	0.7
1991-1995	b	c	d	1.9	2.3	0.4	2.5	0.6	2.0	0.0
GDP[e]										
1992-1996	b	c	d	2.8	2.6	-0.2	2.7	-0.2	2.5	-0.4
1993-1997	b	c	d	3.1	2.8	-0.3	2.8	-0.3	2.8	-0.3
1994-1998	b	c	d	3.4	2.7	-0.7	2.8	-0.6	2.8	-0.6
Statistics for 1976-1994										
Mean error	*	*	*	*	*	0.7	*	1.0	*	*
Mean absolute error	*	*	*	*	*	0.8	*	1.2	*	*
Root mean square error	*	*	*	*	*	1.2	*	1.5	*	*
Statistics for 1979-1994										
Mean error	*	*	*	*	*	0.3	*	0.7	*	0.2
Mean absolute error	*	*	*	*	*	0.5	*	0.9	*	0.5
Root mean square error	*	*	*	*	*	0.8	*	1.1	*	0.6

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. 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.

    * = not applicable.

a.   Five-year forecasts for the *Blue Chip* consensus were not available until 1979.

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

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

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

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