NEWS OR NOISE?
AN ANALYSIS OF GNP REVISIONS

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ABSTRACT

This paper studies the nature of the errors in preliminary GNP data. It first documents that these errors are large. For example, suppose the prelimimary estimate indicates that real GNP did not change over the recent quarter; then one can be only 80 percent confident that the final estimate (annual rate) will be in the range from -2.8 percent to +2.8 percent. The paper also documents that the revisions in GNP data are not forecastable. This finding implies that the preliminary estimates are the efficient given available information. Hence, the Bureau of Economic Analysis appears to follow efficient statistical procedures in making its preliminary estimates.

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GNP is probably the most closely watched economic series. Almost all observers--economists, policymakers, and the press--consider it the primary measure of the health of the macroeconomy. Estimates of GNP, therefore, receive much attention. The purpose of this article is to examine the size and nature of the revisions in GNP estimates.

In the first section, we briefly describe both the major sources of the data used to estimate GNP and the timing of the GNP revisions. We also describe the data analyzed in the remainder of the article.

We discuss the magnitude of GNP revisions in the second section. We show that the informational content of the early estimates is much less than one might suppose. In particular, the standard deviation of the revision of quarterly real GNP growth is over 2 percentage points at an annual rate. Thus, a preliminary estimate of 1-percent growth in GNP is not significantly different from a growth rate of 4 percent.

In the third section, we examine whether early estimates of GNP are efficient forecasts of the "final" figure and find that they are. Moreover, this conclusion applies to subsequent estimates: At the time of each revision, the new figure is generally the best available estimate of the final value.
Data and revision schedule

BEA assembles the national income and product accounts (NIPA's) from disparate private and public sources. Data sources range from the many censuses and surveys of the Bureau of the Census and Bureau of Labor Statistics to reports from individual private companies. The data are assembled by BEA according to specific rules and procedures based on the definition of the components of the NIPA's.

BEA periodically revises the NIPA's. For the 1975-82 period covered by this study, the first estimate of GNP for a given quarter was made approximately 15 days before the end of the quarter. This estimate, referred to as the

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"flash" or "minus-15-day" estimate, was released to the public beginning in September 1983 and since then was referred to in BEA's discussion of the NIPA's in the Survey.

The first estimate of GNP for a given quarter to appear with component detail (for example, in the NIPA tables of the Survey) is made approximately 15 days after the end of the quarter. It is referred to as the "preliminary" or "15-day" estimate and is based on incomplete source data. For example, incomplete source data makes it impossible for BEA to construct an estimate of corporate profits at the time of the preliminary estimate; consequently, the preliminary NIPA's do not contain a complete income side or provide an estimate of the statistical discrepancy.[1] The next estimate is made approximately 45 days after the end of the quarter to which they apply; it is referred to as the "first revision" or "45-day" estimate. This estimate is based on more source data than the preliminary figures; for example, the first estimate of corporate profits is available in the 45-day estimate (except in the first quarter). The "second revision" is made approximately 75 days after the end of the quarter. During the period covered by this study, this "75-day" estimate for a quarter was prepared simultaneously with the flash estimate for the following quarter.

Following the 75-day estimate, the estimates remain unrevised until the following July. Each July, BEA revises the entire set of NIPA estimates for the preceding 3 years. These revisions reflect new source data that BEA has

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[1]For the 15-day estimate, there are 3 months of source data only for personal consumption expenditures on goods and business purchases of autos and trucks. Only 2 of the 3 months of data are available for most components of investment, government outlays, and the trade balance. See "Business Situation," Survey, January 1982, p. 1, for example. For a detailed discussion of when the data become available, see Robert P. Parker, "Revisions of the Initial Estimates of Quarterly Gross National Product of the United States, 1968-83," Bureau of Economic Analysis, Washington, DC, 1984.

received since the previous July.[2]

BEA periodically overhauls the NIPA's; these benchmark revisions take place approximately once every 5 years and reflect both statistical (data) changes and conceptual or definitional changes. The statistical revisions are based on data from ongoing efforts, such as the census of manufacturing, that are available less often than annually (for example, quinquennially for the census of manufacturing). Statistical revisions are also based on sources of data that were unavailable for the previous benchmark. For example, the 1980 benchmark revision used newly developed price data for national defense purchases.[3]

Not all the revisions that occur when the NIPA's are benchmarked are purely statistical. BEA occasionally changes the definition of GNP components and thus the coverage of GNP. For example, if BEA decided to include the product of homemakers in GNP, this change would be definitional rather than statistical. In this study, we abstract from definitional changes.

Our aim in this article is to characterize the statistical revisions of the estimates. To abstract from definitional changes, we use series that BEA maintains for constant-dollar (real) and current-dollar (nominal) GNP on the basis of consistent definitions. NIPA benchmark revisions were released in January 1976 and in December 1980. Our series use consistent 1980 benchmark definitions. Using these series, we analyze estimates from the fourth quarter of 1975 through the fourth quarter of 1982.

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[2]Data available for the July revision include the Census Bureau's annual surveys of merchant wholesale and retail trade, housing, manufacturing, and State and local government, and the Internal Revenue Service's tabulation of business tax returns. For example, see "The U.S. National Income and Product Accounts: Revised Estimates," Survey 62 (July 1982): 5.

[3]"The U.S. National Income and Product Accounts of the United States: An Introduction to the Revised Estimates for 1929-80," Survey 60 (December 1980): 10.

We analyze the annualized quarter-to-quarter growth rate, rather than the level, of GNP. Use of the growth rate rather than the level eliminates the strong trend in the series. We analyze five estimates of the growth rate of GNP: The flash (minus 15-day), the preliminary (15-day), the first revision (45-day), the second revision (75-day), and the final (the most recent). The timing of these estimates--which we denote Y1, Y2, Y3, Y4, and Y5, respectively--is summarized in table 1. For the first four of these estimates, the 75-day estimate of the previous quarter's GNP is the most up-to-date base figure for computing the growth rate. The ratio of the flash, 15-day, 45-day, and 75-day estimates to the 75-day estimate for the previous quarter is, therefore, used to compute the growth rates Y1, Y2, Y3, and Y4. An exception to this procedure occurs to deal with the July revision of the NIPA's. In July, contemporaneously with the 15-day estimate for the second quarter, BEA revises estimates for the preceding 3 years. Hence, for the second-quarter computation of Y2, Y3, and Y4, the base is the July-revised figure for the first quarter.[4] The final growth rates, Y5, are computed with estimates as of February 1985.

The magnitude of the revisions

Table 2 presents the mean and standard deviation of each growth rate of nominal and real GNP; the standard deviations of the revisions of the growth rates are given in table 3. The standard deviation of the growth rate of nominal GNP ranges from 4.0 percent when measured with the flash (Y1) to 5.7

4There are two further exceptions to this procedure. First, in 1980, the revision that usually would have been made in July was incorporated in the benchmark revision released in December. Hence, for the second quarter of 1980, the growth rates Y2, Y3, and Y4, are based on the 75-day estimate of first-quarter GNP. Moreover, the base for Y4 in the third quarter of 1980 is the second quarter of 1980 estimate released in December. Second, no July revision was made in 1981, so for the second quarter of 1981, the growth rates Y2, Y3, and Y4 are also based on the 75-day estimate of the preceding quarter.

percent when measured with the final (Y5). The standard deviation of the
revisions range from a low of 0.6 percentage point for the change from the
45-day to 75-day estimate (Y4 - Y3) to a high of 3.1 percentage points for
the flash to final (Y5 - Y1). The standard deviations of the revisions are
thus large relative to the standard deviations of the growth rates themselves.

This finding implies that an estimated growth rate is associated with a
large confidence interval. For example, the standard deviation of the revision
from the 15-day to the final estimates (Y5 - Y2) is 2.7 percentage points. If
the 15-day estimate of the growth rate is 5.0 percent, then one can only be
68 percent confident that the final estimate will be in the range from 2.3
percent to 7.7 percent. The 95-percent confidence interval is from -0.4
percent to 10.4 percent.[6]

A similar picture emerges for real GNP. Again, the standard deviations
for the revisions are large. For example, the standard deviation of the
revision from the 15-day to the final estimates (Y5 - Y2) is 2.2 percentage
points. If the 15-day estimate indicates no growth, the probability that
the final estimate will indicate that growth exceeds 2.0 percent is 18 percent.
News or noise: The informational content of GNP revisions

We begin this section with a simple theoretical discussion of data
revision.[7] Our aim is to distinguish two polar characterizations of the
process of data revision. For ease of exposition, and in order to prevent
confusion with BEA's terminology, estimates that are subject to subsequent
revision will be referred to as "provisional" estimates.

5All percent changes are expressed at annual rates.

6This discussion of the confidence intervals presumes that the revisions are
normally distributed, with zero mean.

7For a formal treatment, see N. Gregory Mankiw, David E. Runkle, and Matthew
D. Shapiro, "Are Preliminary Announcements of the Money Stock Rational Fore-
casts?" Journal of Monetary Economics, 14 (July 1984): 15-27.

Two characterizations of data revision.--At one extreme, a provisional
estimate of the growth rate of GNP can be regarded as an observation of the
revised series, but one that is measured with error; subsequent estimates
reduce or eliminate this measurement error, or "noise," by drawing on larger
or more representative samples, correcting clerical mistakes, etc. At the
other extreme, the provisional estimate can be regarded as an efficient
forecast of the revised series, i.e., a forecast that reflects all available
data; subsequent estimates reduce or eliminate the forecast error by
incorporating new data, or "news."

Whether the revisions reflect errors of measurement or errors generated
by efficient forecasts depends on how BEA assembles the provisional estimates.
If BEA assembles the NIPA's by piecing together the source data without
taking account of the time-series correlations and cross-correlations of the
components of GNP and other data, then we would expect the revisions to
behave as measurement errors. If, instead, BEA uses optimal statistical
procedures to assemble the NIPA's, then we would expect the revisions to
behave as errors generated by efficient forecasts. In fact, BEA need not
use an overt statistical procedure to deal with the problem of incomplete
source data. There is clearly substantial scope for judgment in constructing
the NIPA's. Expert judgment, as well as sophisticated statistical procedures,
could be used to generate efficient forecasts.

These two characterizations of the provisional estimates have very
different implications for the properties of the revision.

Statistical implications of the two characterizations.--Because the
NIPA's are successively revised, an intermediate estimate serves simultaneously
as a revision of previous estimates and as a provisional estimate for subsequent
revisions. Thus, for example, Y3 is a revision of Y1 and Y2, but a provisional
estimate of Y4 and Y5. If the provisional estimate differs from the revised

value by a measurement error, then the revision is uncorrelated with the revised value, but correlated with data available when the provisional estimate is made. In particular, the revision is correlated with the provisional estimate itself. Conversely, if the provisional estimate of GNP growth is an efficient ("rational") forecast of revised GNP growth, then the revision is correlated with revised GNP growth but uncorrelated with data available at the time of the provisional estimate.

By examining the correlations of the revisions with data available before and after the provisional estimates, we can characterize the informational content of the revisions. Before doing so, we observe that there is a further implication of the two hypotheses based on the variance rather than the cross-correlation of the series. If the provisional estimates are efficient forecasts of the subsequent estimates, then the variance of the subsequent estimates increases. Efficient forecasts are necessarily smoother than the object being forecast. Conversely, if the revisions are measurement errors, then the variances should be falling as time goes on. Table 2 gives the standard deviation of the level of nominal and real GNP growth for the various estimates. For both the nominal and real series, the variability of the growth rates increases with subsequent estimates. Hence, the variability of the growth rates is consistent with the hypothesis that the earlier estimates are efficient forecasts of subsequent estimates.

As discussed above, correlation between the revision and the provisional estimate would be evidence for the measurement error hypothesis; correlation between the revision and the revised estimate would be evidence for the efficient forecast hypothesis. Table 4 presents those correlations for the growth rates of nominal and real GNP. The four incremental revisions are listed in the rows of the tables and the successive estimates are listed in the columns. Absolute values of $\underline{t}$ statistics for the correlation coefficients,

under the hypothesis that there is no correlation, are given in parentheses.
Each panel of the table is divided into two triangles. The lower triangle
presents the correlation of the revisions with earlier provisional estimates;
under the null hypothesis that the revisions are errors generated by efficient
forecasts, these correlations should be zero. The upper triangle gives the
correlations of the revision with the current and subsequent estimates;
under the hypothesis of measurement error, these should be zero.

The evidence in table 4 concerning the growth rate of nominal GNP is
consistent with the efficient forecast characterization and inconsistent with
the measurement error characterization of the revisions. The correlations in
the lower triangle of the top panel of the table are all small and none is
statistically significantly different from zero. On the other hand, the
correlations in the upper triangle of the table are large and strongly
statistically significant. Hence, one cannot reject the hypothesis that the
revisions are errors generated by efficient forecasts and can strongly reject
the hypothesis that they are pure measurement errors.

The correlations for the revision Y4 - Y3 (the 75-day estimate minus the
45-day estimate) is an exception to the rejection of the measurement error
characterization. None of the estimates is correlated with this revision.
Note from table 3 that the standard deviation of this revision is very small.
Because this revision is typically minor, there is essentially no variation
for either set of tests to capture.

For real GNP, the correlations shown in the bottom panel of table 4
tell essentially the same story. The correlations in the lower triangle are
small compared to those in the upper triangle. Again, none of the correlations

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8The t statistic of the correlation coefficient is identical to the t
statistic of the slope coefficient of the regression of the column on the
row or of the row on the column.

in the lower triangle is statistically significantly different from zero.
The characterization of the revisions of the real growth rate is somewhat
less decisive than that for the nominal growth rate.

Efficiency of the forecasts.--Our examination of the variance and the
cross-correlations of the estimates and the revisions supports the characteri-
zation that the revisions are errors generated by efficient forecasts and
rejects the characterization that they are measurement errors. If the revisions
are efficient forecast errors, then other data available at the time of the
provisional estimate should also be uncorrelated with the revision. If the
revision is regressed on variables that reflect other data available at the
time of the provisional estimate, all such variables should be jointly
insignificant. Candidates for such variables include prior provisional
estimates, the constant, seasonal dummies, lagged values of the growth rate,
and macroeconomic variables. Although the NIPA estimates are seasonally
adjusted, seasonal dummies could be relevant if BEA's revisions are seasonal.
The macroeconomic variables we considered were the rate on 3-month Treasury
bills and the return on the stock market as measured by the change in the
Standard and Poor's Composite Stock Index. These were measured as of the
middle month of the quarter under study so that they would be known at the
time of all the estimates of GNP growth.

For regressions of the revision of both nominal and real GNP growth,
neither the financial variables nor the seasonal dummies were statistically
significant. This result was obtained whether or not the level of the
provisional estimate was included in the regression. Because none of the
coefficients was statistically significant, we do not report the details of
these regressions. The absence of any relationship, however, is a potentially
important finding. It indicates that observed financial variables do not
contain information about GNP that is not already reflected in BEA's estimates.

Because the small size of our sample reduces the power of these tests, these results should not be overemphasized.

Table 5 gives the regressions of the various revisions of nominal GNP growth on a constant, the provisional estimate, and the lagged growth rate. The lagged growth rate is measured by Y4, which is known at the time of the provisional estimates. The equations are estimated from the second quarter of 1976 to the fourth quarter of 1982 to allow for the lag. Under the null hypothesis that the revisions are errors generated by efficient forecasts, all the coefficients in these regressions--including the constant--should be zero. We have already seen from our study of the correlation matrix that this hypothesis is not rejected for the slope coefficients of the equations without the lagged growth rate. In the table, we report F statistics for the hypothesis that all the coefficients, including the constant, are zero.

The results reported in table 5 are broadly consistent with the hypothesis that the revisions reflect new information. The revision from the minus-15-day to the 15-day estimate shows weak evidence of forecastability in equation 5.2, but not equation 5.1. The revision from the 15-day to the 45-day estimate is completely unforecastable (equations 5.3 and 5.4). Indeed, the $\overline{R^2}$ for equation 5.4 is negative and the F statistic is small. This result is striking given that the source data for many components is only available for 2 of the 3 months when the 15-day estimate is made (see footnote 1). Hence, the estimates behave as if BEA follows an efficient statistical procedure in projecting the unavailable data. Of course, we have only tried a limited number of variables, so our results do not preclude the existence of other variables that do forecast the revisions.

For the regressions of Y4 - Y3, reported in equations 5.5 and 5.6, the revision is forecastable. Both the constant and the lagged growth rate are statistically significant. The significantly positive constant implies that,

on average, the revisions of GNP are positive from Y3 to Y4. We have already

seen in table 3 that this revision is qualitatively different from the others.

The size of the revisions are substantially smaller than the others. Hence,

it is possible that this rejection of the hypothesis is a statistical artifact.

In any case, this revision is fairly minor.

The revisions from the 75-day to the final estimate are, again, unforecastable

(equations 5.7 and 5.8). This revision spans several years and reflects, for

example, data from the Census Bureau's annual and quinquennial surveys. The

unforecastability of the revisions is strong evidence that the 75-day estimate

is an efficient forecast of the final estimate.

Users of the NIPA's may be more concerned with how a provisional estimate

predicts the final estimate (Y5) rather than the intermediate estimates.

Equations 5.9-5.16 present evidence that the total revisions of nominal GNP

growth are unforecastable. All variables in all equations are statistically

insignificant. The idiosyncratic forecastability of Y4 - Y3 mentioned above

is not evident in the total revisions. Therefore, at any point in time,

BEA's most recent estimate of GNP growth is an efficient predictor of the

final estimate.

The analagous results for real GNP growth are reported in table 6.

They are qualitatively similar to those for nominal GNP growth.

Nordhaus has studied the efficiency of forecast errors for a wide range

of forecasting activities ranging from projections of nuclear generating

capacity to macroeconomic projections based on econometric models.[9] He finds

that the revisions are typically positively correlated, which, of course,

implies the forecasts are not efficient. This positive correlation implies

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[9]William Nordhaus, "Forecasting Efficiency: Concepts and Applications,"
Cowles Foundation Discussion Paper No. 774, (New Haven: 1985).

forecasters only correct errors gradually. Table 7 presents regressions
of revisions of BEA's estimates of GNP on previous revisions. From these,
we can judge whether BEA's estimates share the slow correction of errors
than Nordhaus finds generic.

The regressions reported in table 7 show no significant positive
correlation of the revisions. The only departure from efficiency of forecasts
occurs in the constant of the 75-day estimate (Y4), which was already discussed.
In equations 7.4 and 7.8, we report the regression of the revision from the
45-day to the final (Y5 - Y3) on the revision from the 15-day to the 45-day
(Y3 - Y2) for nominal and real GNP growth. Examining these revisions should
provide a powerful test of efficiency because they exclude the flash (Y1),
which was released to the public during only part of the sample period, and
because they exclude the Y4 - Y3 revision, which has very low variance. In
these equations, the coefficient of the previous revision is indeed positive,
but not significantly so. Equivalently, the $\bar{R}^2$ statistics are low. Hence,
BEA does not appear to share with other forecasters the slow correction of
errors.

We also considered estimates for two different periods. First, we
considered estimates beginning in 1968. These estimates did yield some
rejections of the efficient forecast hypothesis, yet we suspect those results
may be misleading. The pre-1976 estimates were expressed in 1958 dollars and
have been benchmarked twice. Our estimates used BEA's correction to place
them on 1980 benchmark definitions, expressed in 1972 dollars. Hence, these
rejections, which we do not report, may well be due to bias in the definitional
corrections or to the shift in base years. Alternatively, one could argue
that BEA's estimation techniques have improved since the earlier period.[10]

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[10]Finally, one could argue that our failure to reject in our sample is
caused by having too few observations. This argument does not appear to be

Second, we also extended the sample through the second quarter of 1985. These results were qualitatively the same as those reported here for 1976-82. The very recent estimates are based on "final" estimates made only shortly after the provisional estimates. Consequently, recent "final" revisions may, themselves, be revised substantially. To avoid this problem, we report the results for the sample ending in 1982.

Conclusion

We conclude, with the exceptions noted, that the revisions of GNP growth, both nominal and real, are more like unforecastable new information than like measurement error. Both Zellner and Cole provide evidence that the revisions of GNP are serially correlated, but serial correlation of the revisions is entirely consistent with their being unforecastable.[11] The revised values are unavailable for quarters or years after the provisional announcement; efficient forecasting, therefore, does not imply that these forecast errors should be uncorrelated. Hence, serial correlation of the revisions is not evidence against the hypothesis of efficient forecasts.[12] Cole's finding, along with that of Jaszi, that the average of the revision errors is nonzero

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warranted: The rejections in the early estimates are based on the same number of observations, which indicates we have enough observations to have statistical power.

[11] Arnold Zellner, "A Statistical Analysis of Provisional Estimates of Gross National Product and Its Components, of Selected National Income Components, and of Personal Savings," Journal of the American Statistical Association, 53 (March 1958): 59. Rosanne Cole, Errors in Provisional Estimates of Gross National Product, (New York: National Bureau of Economic Research, 1969), pp. 19 ff.

[12] Such serial correlation would not make our estimated regression coefficients inconsistently estimated. It could, however, make our standard errors inconsistent. We have, however, found no evidence of serial correlation in our residuals, so our standard errors appear to be valid.

could be evidence that the provisional estimates are biased.[13] If, as we

found for Y4 - Y3, the conditional mean of the revisions were statistically

significantly nonzero, that would be evidence of bias. Yet in general we

find no evidence for such bias.

Our findings have important consequences for the use of the provisional

estimates of GNP by forecasters, policymakers, and economic agents. If the

revisions were measurement errors rather than efficient forecast errors,

users of the provisional estimates should use statistical signal extraction

procedures to best estimate the underlying value.[14] Our findings suggest,

however, that there is limited scope for using other observed data to improve

the estimate of the underlying value of GNP.[15]

Our characterization of the provisional GNP estimates is the opposite

of that of the preliminary money stock data. Preliminary announcements of

the money stock data are better characterized as observations of the true

series measured with error than as efficient forecasts.[16] These differing

[13]Cole, Errors in Provisional Estimates, p. 20, and George Jaszi, "The Quarterly National Income and Product Accounts of the United States, 1942-1962," in Studies in Short-term National Accounts and Long-term Growth, Income and Wealth: Series XI, (London: Bowes and Bowes, 1965), p. 125.

[14]See Philip E. Howery, "The Use of Preliminary Data in Econometric Forecasting," Review of Economics and Statistics, 60 (May 1978): 193-200, Philip E. Howery, "Data Revision, Reconstruction, and Prediction: An Application to Inventory Investment," Review of Economics of Statistics, 66 (August 1984): 386-393, and William Conrad and Carol Corredo, "Application of Kalman Filtering to Revision of Monthly Retail Sales Estimates," Journal of Economic Dynamics and Control, 1 (May 1979): 177-198.

[15]One might wonder why we are not able to forecast the revisions of aggregate GNP when Howrey ("The Use of Preliminary Data") is able to do so for inventory investment, a component of GNP. There are likely to be errors in the components of GNP that wash out in the aggregate. Jaszi finds evidence for this claim, calling it the "guardian angel of national income estimators" ("Quarterly National Income and Product Accounts," p. 126). Of course, a failure to find a forecastable component to the revision error could be due to a lack of statistical power.

[16]See Mankiw, Runkle, and Shapiro, "Preliminary Announcements of the Money Stock."

characterizations may be attributable to the qualitative difference in the procedures for estimating the money stock and estimating GNP. BEA does exercise judgment in estimating GNP. Specifically, BEA staff meets to evaluate and adjust the estimates before they are released.[17] The Federal Reserve has a dual role of estimating and controlling the monetary aggregates. Consequently, it may be reluctant to exercise discretion in constructing its estimates.

17Parker, "Revisions of the Initial Estimates," p. 14.

Table 1.--Schedule of GNP Estimates

Name of estimate		Timing of estimate	Variable name
Flash estimate	Minus-15-day estimate	15 days before end of quarter	Y1
Preliminary estimate	15-day estimate	15 days after end of quarter	Y2
First revision	45-day estimate	45 days after end of quarter	Y3
Second revision	75-day estimate	75 days after end of quarter	Y4
Final	....	February 1985	Y5

Table 2.--Means and Standard Deviations of GNP Growth Rates

[Percent, at annual rates]

	Y1	Y2	Y3	Y4	Y5
Growth of GNP in current dollars:					
Mean......................................	9.0	9.0	9.3	9.7	9.9
Standard deviation........................	4.0	4.6	4.9	4.9	5.7
Growth of GNP in constant (1972) dollars:					
Mean......................................	1.7	2.0	2.2	2.5	2.4
Standard deviation........................	3.8	4.0	4.2	4.1	4.6

Estimation period: 1976:I-1982:IV

Table 3.--Standard Deviations of Revisions in GNP Growth Rates

[Percentage points, at annual rates]

From:	To:			
	Y2	Y3	Y4	Y5
	GNP in current dollars			
Y1..........	1.2	1.9	1.9	3.1
Y2..........	....	1.1	1.2	2.7
Y3..........	....	....	.6	2.0
Y4..........	....	....	....	2.0
	GNP in constant (1972) dollars			
Y1..........	1.0	1.3	1.4	2.2
Y2..........	....	.7	.9	2.2
Y3..........	....	....	.5	1.8
Y4..........	....	....	....	1.8

Estimation period: 1976:I-1982:IV

Table 4.--Correlations Between GNP Growth Rates and Revisions

Revision	Growth rate				
	Y1	Y2	Y3	Y4	Y5
Current dollars					
Y2 - Y1....	0.35 (1.92)	/**/0.57 (3.50)	/**/0.59 (3.77)	/**/0.60 (3.79)	/**/0.51 (3.06)
Y3 - Y2....	.15 (.77)	.21 (1.09)	/*/.42 (2.38)	/*/.42 (2.39)	/**/.50 (2.92)
Y4 - Y3....	-.17 (.89)	-.16 (.83)	-.16 (.80)	-.04 (.22)	-.05 (.27)
Y5 - Y4....	.19 (.97)	.17 (.86)	.24 (1.27)	.24 (1.26)	/**/.55 (3.40)
Constant (1972) dollars					
Y2 - Y1....	0.11 (.58)	0.35 (1.89)	/*/0.38 (2.12)	/*/0.37 (2.04)	0.21 (1.12)
Y3 - Y2....	.09 (.44)	.15 (.79)	.32 (1.69)	.31 (1.67)	/*/.42 (2.37)
Y4 - Y3....	-.08 (.41)	-.10 (.53)	-.11 (.55)	.02 (.09)	.01 (.07)
Y5 - Y4....	.08 (.41)	.00 (.00)	.06 (.32)	.06 (.32)	/*/.44 (2.50)

*Significant at the 5-percent level.
**Significant at the 1-percent level.
Figures in parentheses are absolute values of t statistics.
Estimation period: 1976:I-1982:IV

Table 5.--Regressions of Revisions on Growth Rates of GNP in Current Dollars

Incremental revisions

	Y2-Y1	Y2-Y1	Y3-Y2	Y3-Y2	Y4-Y3	Y4-Y3	Y5-Y4	Y5-Y4
Equation....	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8
Intercept...	-0.95 (1.80)	-0.24 (.41)	-0.19 (.40)	-0.48 (.75)	*/0.50 (2.16)	**/1.05 (4.14)	-0.73 (.86)	-1.57 (1.43)
Y1.........	.10 (1.92)	**/-.13 (2.62)	...	...	...	...	...	...
Y2.........	...	...	.05 (1.05)	.04 (.91)	...	...	...	...
Y3.........	...	...	...	...	-.02 (.79)	.00 (.26)	...	...
Y4.........	...	...	...	...	...	...	.09 (1.20)	.08 (1.04)
Y4-1.......	...	*/-.10 (2.28)	...	.03 (.70)	...	**/-.07 (3.37)	...	.10 (1.19)
R^2........	.09	.22	.00	-.02	-.01	.28	.02	.03
SEE........	1.12	1.03	1.15	1.16	.57	.48	1.99	1.97
F..........	1.85	*/3.18	1.25	.98	**/5.18	**/8.67	.83	1.03

Total revisions

	Y5-Y1	Y5-Y1	Y5-Y2	Y5-Y2	Y5-Y3	Y5-Y3	Y5-Y4	Y5-Y4
Equation....	5.9	5.10	5.11	5.12	5.13	5.14	5.15	5.16
Intercept...	-1.16 (.83)	-0.87 (.51)	-0.13 (.11)	-0.68 (.45)	-0.19 (.23)	-0.40 (.35)	-0.73 (.86)	-1.57 (1.43)
Y1.........	.21 (1.50)	.23 (1.50)	...	...	...	...	...	...
Y2.........	...	...	.10 (.89)	.09 (.76)	...	...	...	...
Y3.........	...	...	...	...	.08 (.95)	.07 (.86)	...	...
Y4.........	...	...	...	...	...	...	.09 (1.20)	.08 (1.04)
Y4-1.......	...	-.04 (.32)	...	.07 (.58)	...	.03 (.28)	...	.10 (1.19)
R^2........	.05	.01	-.01	-.04	.00	-.04	.02	.03
SEE........	2.98	3.03	2.71	2.74	2.06	2.10	1.99	1.97
F..........	1.99	1.31	1.51	1.09	1.30	.86	.83	1.03

* Significant at the 5-percent level.
** Significant at the 1-percent level.
Figures in parentheses are absolute values of t statistics.
Estimation period: 1976:II-1982:IV

Table 6.--Regressions of Revisions on Growth Rates of GNP in Constant (1972) Dollars

	Incremental revisions								Total revisions							
	Y2-Y1	Y2-Y1	Y3-Y2	Y3-Y2	Y4-Y3	Y4-Y3	Y5-Y4	Y5-Y4	Y5-Y1	Y5-Y1	Y5-Y2	Y5-Y2	Y5-Y3	Y5-Y3	Y5-Y4	Y5-Y4
Equation....	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	6.10	6.11	6.12	6.13	6.14	6.15	6.16
Intercept...	.23 (1.15)	.43 (2.03)	.14 (.90)	.17 (.99)	/**/.34 (2.93)	/**/.50 (4.75)	-.12 (.30)	-.25 (.57)	0.58 (1.28)	0.85 (1.70)	0.40 (.86)	0.45 (.85)	0.22 (.55)	0.25 (.55)	-0.12 (.30)	-0.25 (.57)
Y1........	.02 (.42)	.07 (1.28)	...	...	...	...	...	...	.04 (.38)	.10 (.85)	...	...	...	...	...	...
Y2........	...	...	.02 (.57)	.02 (.67)	...	...	...	...	...	...	-.01 (.11)	-.01 (.05)	...	...	...	...
Y3........	...	...	...	...	-.01 (.51)	.01 (.44)	...	...	...	...	...	...	-.01 (.07)	.00 (.03)	...	...
Y4........	...	...	...	...	...	...	.01 (.08)	-.01 (.08)	...	...	...	...	...	...	.01 (.08)	-.01 (.08)
$Y4_{-1}$....	...	/*/-.10 (2.15)	...	-.02 (.43)	...	/**/-.08 (3.61)	...	.06 (.72)	...	-.14 (1.24)	...	-.02 (.19)	...	-.01 (.15)	...	.06 (.72)
$\bar{R}^2$....	-.03	.10	-.03	-.06	-.03	.30	-.04	-.06	-.03	-.01	-.04	-.08	-.04	-.04	-.04	-.06
SEE......	.97	.91	.71	.72	.54	.44	1.79	1.81	2.17	2.15	2.20	2.25	1.87	1.91	1.79	1.81
F........	1.10	2.37	.96	.68	/*/4.66	/**/8.94	.05	.20	1.27	1.38	.41	.27	.17	.12	.05	.20

*Significant at the 5-percent level.
**Significant at the 1-percent level.
Figures in parentheses are absolute values of t statistics.
Estimation period: 1976:II-1982:IV

Table 7.--Regressions of Revisions on Previous Revisions

	Current dollars				Constant (1972) dollars			
	Y3-Y2	Y4-Y3	Y5-Y4	Y5-Y3	Y3-Y2	Y4-Y3	Y5-Y4	Y5-Y3
Equation....	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8
Intercept...	0.27 (1.24)	/**/0.34 (3.04)	0.23 (.49)	0.35 (.90)	0.12 (.88)	/**/0.32 (2.96)	-0.11 (.27)	0.07 (.19)
Y2-Y1.......	.29 (1.53)	...	...	...	.19 (1.36)	...	...	...
Y3-Y2.......	...	-.01 (.14)	...	.63 (1.90)	...	-.03 (.23)	...	.82 (1.64)
Y4-Y3.......	...	...	-.15 (.21)	...	...	...	.01 (.02)	...
$\bar{R}^2$.........	.05	-.04	-.04	.09	.03	-.04	-.04	.06
SEE.........	1.12	.57	2.04	1.96	.69	.54	1.79	1.78
F...........	1.90	/*/4.76	.12	2.74	1.77	/*/4.52	.05	1.53

*Significant at the 5-percent level.
**Significant at the 1-percent level.
Figures in parentheses are absolute values of $\underline{t}$ statistics.
Estimation period: 1976:I-1982:IV