

# Gross Domestic Product

## Revisions and Source Data

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THE Bureau of Economic Analysis (BEA) estimates of gross domestic product (GDP) are among the most widely scrutinized indicators of U.S. economic activity. In particular, BEA's first quarterly estimates of GDP draw wide attention from policymakers, academics, investment professionals, the media, and others. These first quarterly estimates provide an early estimate of broad economic activity and are produced using a wide mix of source data—preliminary survey results, various indicators, trade industry data, and more—that are later revised to reflect more complete information.

The goal of this article is to explain the relationship between the first three quarterly GDP estimates and the source data that each of these estimates incorporates. This article also illustrates that the differences between the quarterly GDP estimates and the first annual revision estimate, which incorporates higher quality source data, are relatively small. Thus, the earliest quarterly estimates of GDP present a general picture of the economy—growth, trends, and component activity—that changes relatively little through subsequent revisions.

The estimates of GDP for each quarter are published in a series of releases (table 1). For any given quarter, the “advance” estimate of GDP is released toward the end of the first month after the quarter ends. The “preliminary” estimate is released toward the end of the second month after the quarter ends. And the “final” estimate is released toward the end of the third month.

The two later estimates incorporate progressively more up-to-date source data. These three quarterly estimates are referred to by BEA as the “current quarterly” estimates and attract the most attention from the public. Previous BEA studies of revisions have indicated that the current quarterly estimates of GDP are reliable.<sup>1</sup>

In addition, BEA releases “annual revision estimates” of GDP in series. These revisions revise quarterly and annual GDP estimates for the previous 3 years. The first annual revision estimate is usually released in July of the following year.<sup>2</sup> The first annual revision estimate for the year 2005, for example, will be released in July 2006. The first annual revision incorporates revised monthly or quarterly source data and new annual data. The second and third annual revision estimates follow in successive years. These revisions incorporate newly available and revised annual data.

After the third annual revision estimate, the estimates of GDP—both quarterly and annual—are generally not revised until the next comprehensive revision. Comprehensive revisions, which occur about every 5 years, incorporate even more detailed source data from various economic censuses.

### Source data types

To calculate GDP and other measures in the national income and product accounts (NIPAs), BEA relies on a wide range of source data, including measures of retail sales, manufacturers' shipments, inventories, value of construction put in place, employment, international trade flows of goods and services, revenue of services industries, and estimates of government outlays. These

**Table 1. Release Schedule for the Successive Estimates of Gross Domestic Product for the Fourth Quarter of 2004**

Advance estimate .....	January 2005
Preliminary estimate .....	February 2005
Final estimate .....	March 2005
First annual estimate .....	July 2005
Second annual estimate .....	July 2006
Third annual estimate .....	July 2007

1. For example, see Dennis J. Fixler and Bruce T. Grimm, “Reliability of the NIPA Estimates of U.S. Economic Activity” *SURVEY OF CURRENT BUSINESS* 85 (February 2005): 8–19; <[www.bea.gov/bea/articles/2005/02February/0205\\_NIPAs.pdf](http://www.bea.gov/bea/articles/2005/02February/0205_NIPAs.pdf)>.

2. The first annual revision estimate follows the early annual estimate for a given year. This estimate is an average of the year's four quarters. It is released with the “advance” quarterly estimate of GDP for the fourth quarter, usually in January of the following year, and it is revised with the release of the preliminary and final estimates for the fourth quarter.

source data are available at different frequencies—for example, inventory data are available monthly and annually.

To derive the quarterly estimates of most GDP components, BEA relies on “expenditure data” in current dollars. Typically, these data are then adjusted to conform with NIPA concepts and definitions, using one of four methods: Commodity flow, retail control, perpetual inventory, or fiscal year analysis.<sup>3</sup>

In some cases, BEA relies on other methods to derive appropriate expenditure data, including a straightforward “physical quantity times price” method. For example, to derive personal consumption expenditures for gasoline, the number of gallons and the average prices from the Energy Information Administration (EIA) are multiplied to obtain current-dollar estimates. In other cases, if the monthly or quarterly data are available but are not as comprehensive or as reliable as annual source data, BEA uses the annual data to extrapolate or interpolate an estimate of expenditures. In some cases, the extrapolation and interpolation are based on trends.

Estimates of imports and exports of goods and services (as well as some other foreign transactions) are based on the international transactions accounts.

### Source data categories and successive estimates

In this article, BEA categorizes the source data used for GDP and NIPA estimates according to quality, availability, and use (table 2) The four categories are as follows:

- **Revised data.** These data are based on revised estimates of monthly or quarterly source data; they are presumed to be more accurate than preliminary data.
- **Monthly or quarterly data.** These data include either monthly data for all 3 months of a quarter or data for a complete quarter.
- **Monthly and trend-based data.** These data typically include 2 months of source data but limited or no data for the third month, necessitating a calculation for the third month.<sup>4</sup>

3. For more details, see “Updated Summary Methodologies,” SURVEY 85 (November 2005): 11–28; <[www.bea.gov/bea/articles/2005/11November/1105\\_NIPAMeth.pdf](http://www.bea.gov/bea/articles/2005/11November/1105_NIPAMeth.pdf)>.

4. Information on the assumptions used for unavailable source data is provided in a technical note that is on BEA’s Web site <[www.bea.gov](http://www.bea.gov)> as part of the advance GDP release. In addition, on the day of the release of personal income and outlays after the release of the advance estimates, more detailed information is posted on BEA’s Web site; under “Gross Domestic Product” and “Supplemental Estimates,” see “Key source data and assumptions for advance estimates.”

- **Trend-based data.** These data are typically calculated by BEA from previous estimates and trends, using moving averages of various lengths, regressions, and judgment by BEA economists.

The advance estimates are based on source data in the last three categories. The most common types of source data are “monthly or quarterly data” and “monthly and trend-based data.” These two categories account for about 75 percent of the source data used to calculate the advance estimates (table 3 and chart 1). Trend-based data account for the remainder.

**Table 3. Shares of Sources for the Successive GDP Estimates for the Third Quarter of 2003**  
[Percent]

Sources	Advance estimates	Preliminary estimates	Final estimates	First annual estimates
Trend-based data .....	25.1	22.6	20.9	5.6
Monthly data and trend-based data...	29.7	1.7	1.2	.....
Monthly or quarterly data.....	45.3	6.6	8.4	.....
Revised data .....	.....	69.2	69.5	47.2
Annual data.....	.....	.....	.....	47.2

The preliminary and final estimates are based on source data in all four categories. However, most of the “monthly and trend-based data” are replaced by revised data, which are generally considered more accurate. About 77 percent of the source data for the final estimates are revised data or “monthly or quarterly data.” About 21 percent of the source data for the final estimate is trend-based data, down from 25 percent for the advance estimates.

The estimate of new residential structures offers an example of source data changes from the advance estimate to the final quarterly estimate. The advance estimate of new residential structures incorporates 2 months of source data and an assumption for the third month; the source data is categorized as “monthly and trend-based data.” The preliminary estimate is based on revised data for the first and second months and newly available data for the third month; the source data are categorized as revised data. The final estimate is based on data for the second and third months that are further revised; the source data is also categorized as revised data.

### Annual revisions

The first annual revision estimate of GDP includes revisions to the quarterly estimates for the previous year in addition to new annual estimates. By the time the first annual revision estimates are calculated and released, much of the data used to calculate the advance quarterly estimates have been replaced with higher quality data.

Table 2. Sources for the Successive Estimates of Quarterly Gross Domestic Product

GDP component	Advance estimates	Preliminary estimates	Final estimates	First annual estimates
<b>Personal consumption expenditures</b>				
<b>Goods</b>				
Motor vehicles .....	Monthly data and trend-based data	Monthly or quarterly data	Monthly or quarterly data	Revised data
Other durable and nondurable goods .....	Monthly or quarterly data	Revised data	Revised data	Revised data
<b>Services</b>				
Housing (housing stock) .....	Monthly or quarterly data	Revised data	Revised data	Revised data
Household operation				
Electricity and natural gas .....	Trend-based data	Monthly data and trend-based data	Monthly data and trend-based data	Annual data
Telephone .....	Trend-based data	Monthly data and trend-based data	Monthly data and trend-based data	Annual data
Other .....	Trend-based data	Trend-based data	Trend-based data	Annual data
Transportation				
Motor vehicle leasing .....	Monthly data and trend-based data	Monthly or quarterly data	Monthly or quarterly data	Annual data
Airlines .....	Monthly or quarterly data	Monthly or quarterly data	Monthly or quarterly data	Annual data
Other .....	Trend-based data	Trend-based data	Trend-based data	Annual data
Medical care .....	Trend-based data	Trend-based data	Trend-based data	Annual data
Recreation				
Motion picture admissions .....	Monthly or quarterly data	Monthly or quarterly data	Monthly or quarterly data	Annual data
Cable television .....	Trend-based data	Monthly or quarterly data	Revised data	Annual data
Casino gambling .....	Monthly data and trend-based data	Monthly data and trend-based data	Monthly or quarterly data	Annual data
Other .....	Trend-based data	Trend-based data	Trend-based data	Annual data
Personal care .....	Trend-based data	Trend-based data	Trend-based data	Annual data
Personal business				
Brokerage .....	Monthly data and trend-based data	Monthly or quarterly data	Monthly or quarterly data	Annual data
Bank service charges .....	Trend-based data	Trend-based data	Monthly or quarterly data	Annual data
Imputed interest of commercial banks .....	Trend-based data	Trend-based data	Monthly or quarterly data	Annual data
Legal services .....	Trend-based data	Trend-based data	Monthly or quarterly data	Annual data
Other .....	Trend-based data	Trend-based data	Trend-based data	Annual data
Education and research .....	Trend-based data	Trend-based data	Trend-based data	Annual data
Religious and welfare .....	Trend-based data	Trend-based data	Trend-based data	Annual data
Net foreign travel .....	Monthly data and trend-based data	Revised data	Revised data	Revised data
<b>Nonresidential fixed investment</b>				
<b>Structures</b>				
Construction put-in-place .....	Monthly data and trend-based data	Revised data	Revised data	Revised data
Petroleum and natural gas .....	Monthly or quarterly data	Monthly or quarterly data	Monthly or quarterly data	Revised data
<b>Equipment and software</b>				
Unit auto and truck sales .....	Monthly or quarterly data	Monthly or quarterly data	Monthly or quarterly data	Revised data
Business shares of auto and truck sales .....	Monthly data and trend-based data	Monthly or quarterly data	Monthly or quarterly data	Revised data
Manufacturers' shipments of nondefense capital goods, excluding aircraft .....	Monthly or quarterly data	Revised data	Revised data	Revised data
Shipments of civilian aircraft .....	Monthly data and trend-based data	Revised data	Revised data	Revised data
Exports and imports of capital goods .....	Monthly data and trend-based data	Revised data	Revised data	Revised data
<b>Residential fixed investment</b>				
<b>Structures</b>				
Construction put-in-place .....	Monthly data and trend-based data	Revised data	Revised data	Revised data
<b>Brokers' commissions</b>				
Sales of new homes .....	Monthly or quarterly data	Revised data	Revised data	Revised data
Sales of existing homes .....	Monthly or quarterly data	Revised data	Revised data	Revised data
<b>Change in private inventories</b>				
Wholesale and retail trade and nondurable-manufacturing inventories .....	Monthly data and trend-based data	Revised data	Revised data	Revised data
Durable-manufacturing inventories .....	Monthly or quarterly data	Revised data	Revised data	Revised data
Other .....	Trend-based data	Monthly data and trend-based data	Monthly data and trend-based data	Annual data
<b>Net exports of goods and services</b>				
Exports				
Goods .....	Monthly data and trend-based data	Revised data	Revised data	Revised data
Services .....	Monthly data and trend-based data	Revised data	Revised data	Annual data
Imports				
Goods .....	Monthly data and trend-based data	Revised data	Revised data	Revised data
Services .....	Monthly data and trend-based data	Revised data	Revised data	Annual data
<b>Government consumption expenditures and gross investment</b>				
Federal .....	Monthly or quarterly data	Revised data	Revised data	Annual data
State and local				
Compensation (employment) .....	Monthly or quarterly data	Revised data	Revised data	Annual data
Structures (construction put-in-place) .....	Monthly data and trend-based data	Revised data	Revised data	Revised data
Other .....	Trend-based data	Trend-based data	Trend-based data	Trend-based data

Many of the quarterly estimates in the first annual revision are based on source data that cover a full year (annual data) and are then either interpolated or extrapolated using source data that cover either months or quarters.<sup>5</sup> The monthly or quarterly source data are often the same as those used to calculate the current quarterly estimates, with revisions, if necessary, to make them consistent with the annual data and with updated seasonal adjustments.

Annual source data often contain additional or more complete information than the quarterly or monthly source data. For example, the first annual revision estimates for personal consumption expendi-

5. In the interpolation process, the annual estimates are interpolated using quarterly or monthly source data that generally retain patterns of the annual source data; the quarterly estimates are interpolated in ways that retain the annual totals.

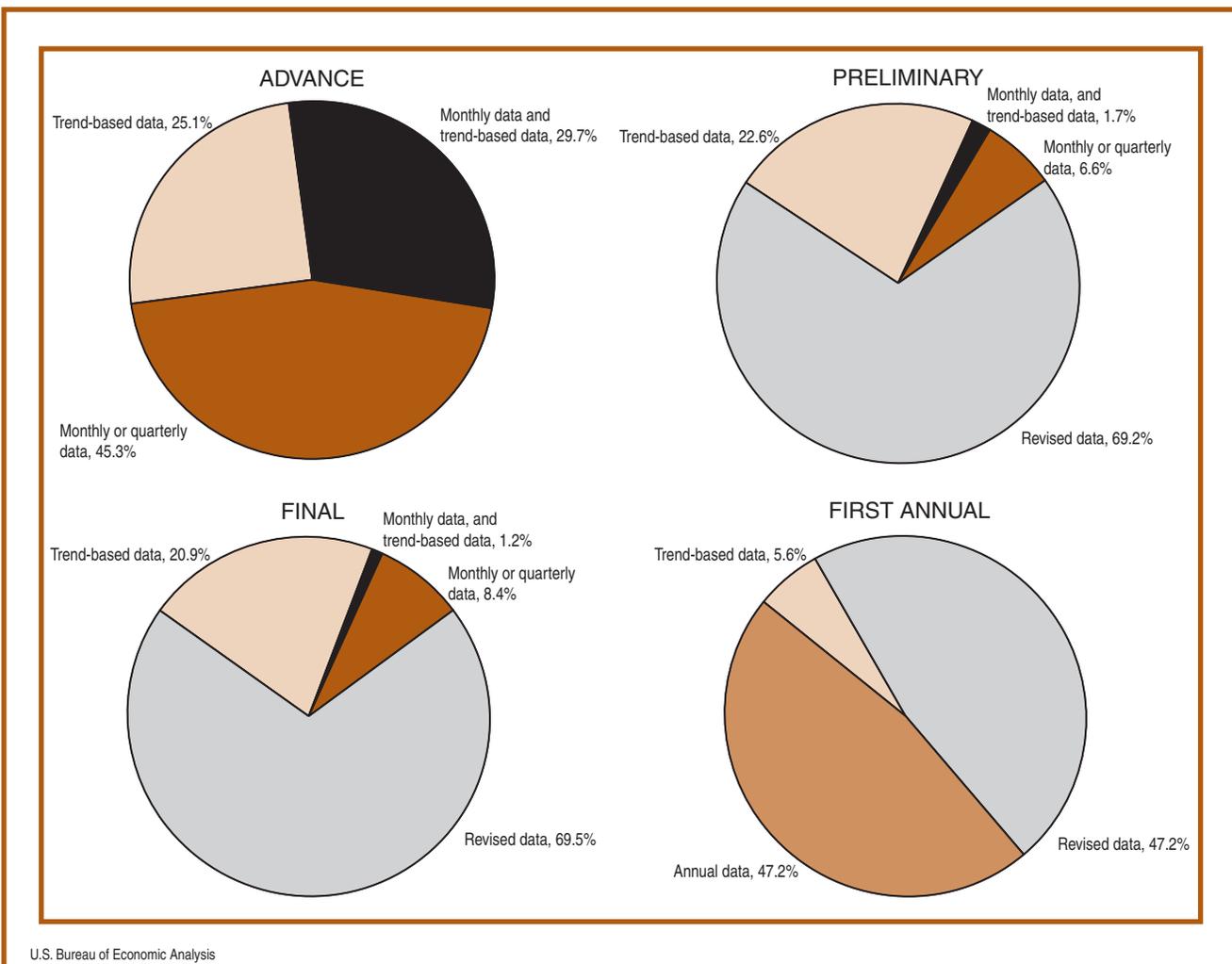
tures for electricity are based on 3 months of source data for each quarter as well as on annual estimates from the EIA.

Nearly half of the first annual revision estimates are based on source data that are not available when the final quarterly estimates are prepared. Another 25 percent of the source data are revised data. Only about 6 percent of the source data used for the first annual estimates are either trend-based data or are unrevised monthly or quarterly source data.

The second and third annual revision estimates incorporate more new or revised annual source data as well as some further revised monthly and quarterly data. These annual revision estimates also incorporate revised seasonal adjustment factors, which depend on seasonal patterns that change over time.

In addition, BEA releases a comprehensive revision

**Chart 1. Shares of Source Data for the Quarterly GDP Estimates**



about every 5 years.<sup>6</sup> In years when comprehensive revisions are published, no annual revision is published.

### Current quarterly and first annual revision comparison

The current quarterly estimates receive the most attention from policymakers and business analysts because they are the first estimates published for a specific quarter and are thus considered highly topical. In 1983–2002, the current quarterly estimates of GDP growth in current dollars ranged from –1.2 percent to 13.9 percent.

To assess the magnitude of revisions to current-dollar GDP growth estimates, one can compare the three current quarterly estimates among themselves and compare the three current quarterly growth estimates to the first annual revision growth estimate. These comparisons allow one to assess the impact of the source data flow because the first annual revision estimate reflects higher quality source data, mainly more up-to-date annual data and revised quarterly data.<sup>7</sup> This estimate also features revisions to seasonal adjustments that are typically smaller than the revisions to the later estimates. In addition, the effects of revisions due to changes in definitions or methodologies are smaller than the revisions to the later estimates.

Overall, the magnitude of revisions to these growth rates is small. What's more, the revisions from the current quarterly estimates to the latest estimates, which are considered the most accurate, are similar to the revisions from the three annual estimates to the latest estimates.<sup>8</sup>

**Mean revisions.** Even though the source data used for the advance estimates are updated with more timely and more reliable data for the preliminary and final estimates, the average revisions from the advance estimate to the later estimates are rather modest. The mean revisions from the advance estimate to both the preliminary and final estimates of current-dollar GDP are 0.15 percentage point (table 4). The mean revision from the preliminary estimate to the final estimate of current-dollar GDP is negligible.

The mean revision from the advance estimate to the first annual estimate of GDP is 0.21 percentage point. The mean revisions of the preliminary and final esti-

mates to the first annual revision estimate of GDP are both just 0.06 percentage point. The 0.06-percentage-point mean revisions reflect the incorporation of comprehensive revisions into some of the first annual estimates; the comprehensive revisions have historically raised both the levels and the rates of growth of GDP. There are no significant biases; none of the mean revisions is statistically significantly different from zero.

**Mean absolute revision (MAR).** The mean revision without regard to sign of the advance estimate to the preliminary estimate of GDP is 0.54 percentage point. The MAR from the advance estimate to the final estimate is 0.70 percentage point. The MAR from the preliminary estimate to the final estimate is 0.28 percentage point.

The MARs from the current quarterly estimates to the first annual estimates of GDP range from 0.86 to 1.08 percentage points. In comparison, the MARs of the current quarterly estimates to the second and third annual revisions range from 1.12 to 1.18 percentage points. Thus, the MARs of revisions from the current quarterly estimates to the later estimates that incorporate annual source data (as well as comprehensive revisions in some instances) are substantially larger than the MARs from the earlier to the later current quarterly estimates.<sup>9</sup>

Previous BEA studies of GDP estimates have found that the current quarterly estimates are reliable. An analysis of GDP estimates for 1983–2002, for example, found that 98 percent of the time, these estimates successfully indicated the direction of change in real GDP; that 74 percent of the time, these estimates indicated whether real GDP was accelerating or decelerating; and that more than 60 percent of the time, when the estimates were more than one standard deviation higher or lower than the mean, later estimates found they remained similarly removed from the mean.

9. For a discussion of the performance of the advance, preliminary, and final estimates, see Allan H. Young, "Reliability and Accuracy of the Quarterly Estimates, SURVEY 73 (October 1993): 29–43; <[www.bea.gov/beat/articles/National/NIPA/1993/1093od.pdf](http://www.bea.gov/beat/articles/National/NIPA/1993/1093od.pdf)>.

**Table 4. Mean and Mean Absolute Revisions to the Successive Estimates of Current-Dollar GDP for 1983–2002**

[Percentage points]

	Preliminary estimates	Final estimates	First annual estimates
<b>Mean revisions</b>			
Advance estimates .....	0.15	0.15	0.21
Preliminary estimates .....		0.00	0.06
Final estimates .....			0.06
<b>Mean absolute revisions</b>			
Advance estimates .....	0.54	0.70	1.08
Preliminary estimates .....		0.28	0.87
Final estimates .....			0.86

6. These estimates are "benchmarked" to BEA's benchmark input-output accounts, which are also released about every 5 years. Comprehensive revisions include changes in definitions and methodologies that incorporate new measures or techniques or that incorporate data from new sources.

7. The first annual revision estimates are also used as the standard in BEA's scoring of its reliability of GDP estimates; the results are reported to the Office of Management and Budget.

8. See Dennis J. Fixler, "Revisions to GDP Estimates in the U.S." (paper presented at the Organisation for Economic Co-operation and Development Workshop on Revisions, Paris, October 7, 2004); <[www.bea.gov/beat/papers.htm](http://www.bea.gov/beat/papers.htm)>.