An Overview of BEA's Source Data and Estimating Methods for Quarterly GDP

by

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Introduction

This paper provides an overview of the source data and the estimating methods used by the Bureau of Economic Analysis (BEA) to prepare the quarterly estimates of the U.S. gross domestic product (GDP). When BEA prepares its first estimates of quarterly GDP, a wide mix of source data are used. In some cases, these data are not as complete or as detailed as desired. Over time, more complete and detailed data are received that are more consistent with the concepts and framework of the national accounts. Consequently, BEA has a regular schedule for revising its estimates to reflect the most accurate source data and to incorporate the most appropriate estimating methods. This paper describes the various source data and estimating methods used to prepare the current- and constant-price estimates of quarterly GDP; it describes how these data and methods change over the course of a GDP revision cycle.

The paper consists of three sections. The first section discusses source data and the role that source data play in determining BEA's release and revision schedules. The second section discusses methods used to prepare the current-price GDP estimates, including general estimating methods and special procedures used to estimate particular components of quarterly GDP. The third section describes the methods used by BEA to prepare the constant-price GDP estimates, including price and volume indexes, chained-dollar estimates, and contributions to constant-price GDP growth growth.

I. Source Data

Source data are the information BEA uses to prepare estimates, and estimating methods are the steps BEA takes to transform these data into estimates. The national income and product accounts (NIPAs) are built up from a wide range of source data using a variety of estimating

methods. The interaction of source data and estimating methods determines the accuracy and reliability of the accounts and sets the statistical limits for estimating relevant measures.

The source data that BEA uses are collected from a variety of sources and, with few exceptions, for purposes other than the preparation of BEA's estimates. Data collected by Federal Government agencies provide the backbone of the estimates; these data are supplemented by data from trade associations, businesses, international organizations, and other sources. The Government data are from a number of agencies, mainly the Commerce Department's Bureau of the Census, the Labor Department's Bureau of Labor Statistics, the Internal Revenue Service and other agencies of the Treasury Department, the Office of Management and Budget, and the Agriculture Department. Some of the Government-collected data, referred to as "administrative" data, are byproducts of government functions such as education programs, tax collection, defense, and regulation. Nonadministrative data, sometimes referred to as "general purpose" or "statistical" data, include the periodic economic and population censuses and a wide range of sample surveys, such as those that collect data on manufacturing, farm activity, and prices. Of the relatively few data items that BEA collects, most refer to international transactions. These include international trade in services and direct investment (both by foreign residents in the United States and by U.S. residents in foreign countries).

The source data available to BEA are not always ideal from the point of view of preparing the national economic accounts. BEA must develop estimating methods to transform the data. The estimating methods adjust the best available data to the concepts needed for the accounts, fill gaps in coverage of the source data, and make adjustments to the source data to obtain the needed time of recording and valuation.

Source data as determinants of initial release and revision schedules

Because source data are the essential material underlying BEA's estimates, they largely determine the schedules for the initial release of the estimates and the schedules on which they are revised. One factor is the speed with which the source data first become available. A second is whether or not the source data are part of a program that, over time, provides more complete or otherwise better coverage—for example, if the sample is larger for annual than quarterly surveys or if the amount of detail is larger for annual surveys.

For the first, or "advance," quarterly estimate of GDP, the availability of the monthly series on sales, shipments, and trade in goods from the Census Bureau (along with the time it takes BEA to process it) determines the release date. Once these data become available, the initial estimate of each major component of GDP can be based on at least 2 months of source data or on reliable BEA projections.

In general, the most comprehensive source data for the expenditure components of GDP are available at the 5-year intervals associated with the economic censuses conducted by the Census Bureau. The economic census data are used to "benchmark" BEA's estimates for the quinquennial census years—for example, 1987, 1992, and 1997. The related annual surveys are drawn from a sample of establishments covered in the census and provide less detailed data than the census. A smaller sample provides monthly data for most of the annual surveys. These monthly data are used to produce the monthly and quarterly estimates of several components of GDP. These estimates are revised when more reports become available from the monthly samples, when data from the annual surveys become available, and when data from the economic census become available; thus, based on available source data, a given component of GDP may be revised as many as six times over a 5-year period.

Estimating schedule

GDP estimates for each quarter are prepared on a schedule that calls for three successive "current" estimates—"advance," "preliminary," and " final"—and for subsequent estimates prepared as part of annual and comprehensive NIPA revisions. The advance estimate is prepared about 1 month after the end of the quarter. For most components, the estimate is based on source data for either 2 or 3 months of the quarter. In most cases, however, the source data for the second and third months of the quarter are not final and are subject to revision by the issuing agencies. Where source data are not available, the estimate is based primarily on BEA projections.

One month later, the "advance" estimate is replaced by the "preliminary" estimate, which is typically based on source data for all 3 months of the quarter. However, in some instances, the source data used for the "preliminary" estimates, particularly the data for the third month of the quarter, are subject to further revision.

One month later, the "preliminary" estimate is replaced by the "final" estimate, which incorporates revisions in source data for the third month of the quarter and quarterly source data for some components.

Each quarterly estimate is subject to three successive annual revisions (customarily released in July). The first annual revision incorporates further revisions in the monthly or quarterly source data and introduces some annual source data. The second and third annual revisions incorporate a broad range of annual source data. Each quarterly estimate is also subject to one or more comprehensive revisions, in which information from the economic and demographic censuses is incorporated.

Source data categories and successive quarterly estimates

The source data used to estimate quarterly GDP can be grouped into four general categories based on their quality, availability, and use (table 1.). 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.

- 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 2 and chart1). Trend-based data account for the remainder.

Table 1. Sources for the Successive Estimates of Quarterly Gross Domestic Product

GDP component	Advance estimates	Preliminary estimates	Final estimates	First annual estimates
Personal consumption expenditures				
Goods				
Vehicles	Monthly and trend-based data	Monthly or quarterly data	Monthly or quarterly data	Revised data
Other goods	Monthly or quarterly data	Revised data	Revised data	Revised data
Services				
Housing (housing stock)	Monthly or quarterly data	Revised data	Revised data	Revised data
Household operation				
Electricity and natural gas	Trend-based data	Monthly and trend-based data	Monthly and trend-based data	Annual data
Telephone	Trend-based data	Monthly or quarterly data	Monthly or quarterly data	Annual data
Other	Trend-based data	Trend-based data	Trend-based data	Annual data
Transportation				
Motor vehicle leasing	Monthly and trend-based data	Monthly or quarterly data	Monthly or quarterly data	Revised data
Airlines	Monthly or quarterly data	Monthly or quarterly data	Monthly or quarterly data	Revised 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 and trend-based data	Monthly 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 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 and trend-based data	Revised data	Revised data	Revised data
Nonresidential fixed investment				
Structures				
Construction put-in-place	Monthly 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
Equipment and software				
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 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 and trend-based data	Revised data	Revised data	Revised data
Exports and imports of capital goods	Monthly and trend-based data	Revised data	Revised data	Revised data
Residential fixed investment				
Structures				
Construction put-in-place	Monthly and trend-based data	Revised data	Revised data	Revised data
Single-family housing starts	Monthly or quarterly data			
Brokers' commissions				
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
Change in private inventories				
Wholesale and retail trade and nondurable manufacturing inventories	Monthly 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 and trend-based data	Monthly and trend-based data	Annual data
Net exports of goods and services				
Exports of goods	Monthly and trend-based data	Revised data	Revised data	Revised data
Imports of goods	Monthly and trend-based data	Revised data	Revised data	Revised data
Exports of services	Monthly and trend-based data	Revised data	Revised data	Annual data
Imports of services	Monthly and trend-based data	Revised data	Revised data	Annual data
Government consumption expenditures and gross investment				
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 and trend-based data	Revised data	Revised data	Revised data
Other	Trend-based data	Trend-based data	Trend-based data	Trend-based data

**Table 2. Shares of Sources for the Successive
GDP Estimates for the Third Quarter of 2003**
(Percent)

	Advance estimates	Preliminary estimates	Final estimates	First annual estimates
Trend-based data………………	25.1	22.6	20.9	5.6
Monthly 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.
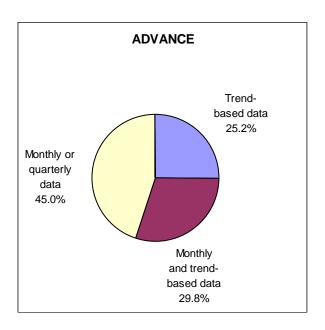
However, most of the "monthly and trend-based data" are replaced by revised data, which are

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

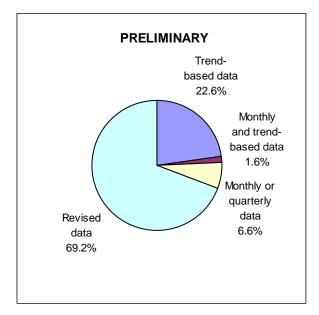estimate is trend-based data, down from 25 percent for the advance estimates.

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 two 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.
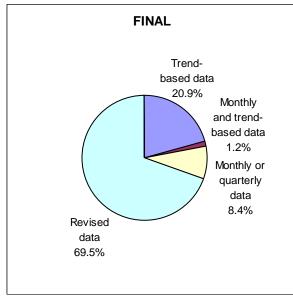
Table 3 presents the key source data used by BEA to prepare the advance estimates of

quarterly GDP and its major components for the second quarter of 2006. It also identifies key

assumptions made by BEA in instances where the required source data were not available, such

as for the components of net exports of goods and services for June 2006. BEA attempts to be as

transparent as possible about the assumptions it makes when source data are not available, for example, table 3 was posted to BEA's Web site immediately following second-quarter release to quantity the assumptions made when source data were unavailable.

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

ADVANCE

Trend-based data
25.2%

Monthly or quarterly data
45.0%

Monthly and trend-based data
29.8%

PRELIMINARY

Trend-based data
22.6%

Monthly and trend-based data
1.6%

Monthly or quarterly data
6.6%

Revised data
69.2%

FINAL

Trend-based data
20.9%

Monthly and trend-based data
1.2%

Monthly or quarterly data
8.4%

Revised data
69.5%

FIRST ANNUAL

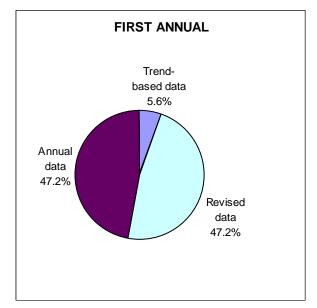Trend-based data
5.6%

Annual data
47.2%

Revised data
47.2%

Table 3.--Key Source Data and Assumptions for the Quarterly Current-Dollar Estimates of the Gross Domestic Product for the Second Quarter of 2006						
[in billions of dollars, seasonally adjusted, except where noted]						
	April	May	June	2006QII	Source	Source for Seasonal
GROSS DOMESTIC PRODUCT............................	....	....	....	13,193.9	NIPA	....
Personal consumption expenditures.......................	9,182.2	9,233.6	9,269.0	9,228.3	NIPA	....
1. Domestic new autos......................................	63.5	63.6	61.6	62.9	NIPA	....
Retail sales (millions of units at annual rate).	5.6	5.4	5.3	5.4	Ward's	BEA
Average unit value (dollars)...	20,038.0	20,056.0	20,050.0 *	20,047.0 *	JD Pow er	BEA
Consumer share of new auto purchases (percent)....	60.3	62.0	61.4 #	61.2 #	Polk-BEA	BEA
2. Imported new autos	43.3	45.2	46.0	44.8	NIPA	....
Retail sales (millions of units at annual rate)…	2.3	2.4	2.4	2.4	Ward's	BEA
Average unit value (dollars)....	27,783.0	27,726.0	28,561.0 *	28,024.0 *	JD Pow er	BEA
Consumer share of new auto purchases (percent)....	60.3	62.0	61.4 #	61.2 #	Polk-BEA	BEA
3. Light trucks, new and used.......................................	199.8	192.1	195.9	195.9	NIPA	....
Retail sales (millions of units at annual rate)…	8.7	8.3	8.4	8.5	Ward's	BEA
Average unit value (dollars)....	27,699.0	27,931.0	28,060.0 *	27,894.0 *	JD Pow er	BEA
Consumer share of new light truck purchases (percent)	55.9	56.3	57.0 #	56.4 #	Polk-BEA	BEA
4. Used Autos..	61.6	57.1	56.9	58.6	NIPA	....
5. Gasoline and oil..	329.3	341.9	336.7	336.0	NIPA	....
Motor gasoline supplied (millions of barrels per day)..	9.3	9.2 *	9.1 *	9.2 *	EIA	BEA
CPI, motor fuel (1982-84=100)....	230.3	241.7	239.3	237.1	BLS	BLS
6. Other goods..	3,071.0	3,084.9	3,100.6	3,085.5	NIPA	....
Retail and food services sales less automobile and other motor vehicle dealers, and building materials, and garden equipment, and supplies	263,292.0	265,544.0 *	266,625.0 *	795,461.0 *	Census	Census
7. Housing services......................................	1,361.2	1,370.5	1,379.0	1,370.3	NIPA	....
Housing stock..	109.2	109.3 *	109.5 *	109.3 *	BEA	....
CPI, rent of primary residence (1982-84=100)…	222.9	223.6	224.6	223.7	BLS	BLS
8. Electricity..	142.1	144.4	146.5	144.3	NIPA	....
Sales of electricity to ultimate residential customers (millions of dollars)	123.4 #	125.5 #	127.2 #	376.2 #	EIA	BEA
CPI, electricity (1982-94=100)..........................	168.9	168.0	169.6	168.8	BLS	BLS
9. Natural gas..	61.4	65.2	60.2	62.3	NIPA	....
Sales of gas to ultimate residential customers (millions of dollars)	6,157.2 #	6,544.9 #	6,041.4 #	18,743.4 #	EIA	BEA
CPI, utility natural gas (1982-84=100)....	222.8	220.9	208.4	217.4	BLS	BLS
10. Telephone...	137.2	137.3	137.9	137.5	NIPA	....
Local service revenues (millions of dollars)..........	4,737.3 *	4,750.9 *	4,764.5 *	14,252.8 *	SEC	BEA
11. Other services..	3,711.9	3,731.3	3,747.7	3,730.3	NIPA	....
Gross private domestic investment.......................	....	....	....	2,237.5	NIPA	....
Fixed investment...	....	....	....	2,177.7	NIPA	....
Nonresidential...	....	....	....	1,378.3	NIPA	....
Structures..	....	....	....	399.8	NIPA	....

	April		May		June		2006QII		Source	Source for Seasonal
Table 3.-- continued										
12. Commercial and healthcare, manufacturing, power and										
communication, and other structures…	....		....		....		290.5		NIPA	....
Value of new nonresidential construction put in place (annual rate)..	289.0	*	288.2	*	288.6	#	288.6	#	Census	Census
NOTE.-Other structures excludes brokers' commissions and net										
purchases of used structures.										
13. Oil and gas well drilling and exploration.....	....		....		....		103.4		NIPA	....
Drilling footage (millions of feet)........................	....		....		....		70.1	*	API	BEA
Cost per foot (dollars)......................................	....		....		....		34.6	*	BEA	BEA
14. Other...	....		....		....		5.9		NIPA	....
Equipment and software...................................	....		....		....		978.5		NIPA	....
15. Motor vehicles...	....		....		....		136.9		NIPA	....
Retail sales - see personal consumption expenditures, items 1 through 3.										
Average unit value - see personal consumption expenditures, items 1 through 3.										
Business share of new motor vehicle purchases (percent):										
Autos...	38.2		36.4		37.3	#	37.3	#	Polk-BEA	BEA
Light trucks...	42.2		41.9		41.2	#	41.8	#	Polk-BEA	BEA
16. Aircraft..	....		....		....		12.3		NIPA	....
Manufacturers' shipments of complete aircraft (millions of dollars)....	2,253.0		2,834.0	*	3,228.0	#	8,315.0	#	Census	BEA
17. Other...	....		....		....		829.4		NIPA	....
Manufacturers' shipments of nondefense capital goods other										
than aircraft (millions of dollars).......................	61,329.0		61,313.0	*	61,181.0	*	183,823.0	*	Census	Census
NOTE.-NIPA purchases of equipment and software and the Census										
shipments series differ primarily because the NIPA series covers only business										
purchases on capital account, including purchases of imported equipment.										
The Census series includes some current-account purchases, mainly										
parts; includes purchases by government, rest of the world, and persons;										
and excludes imported equipment.										
Residential...	....		....		....		799.4		NIPA	....
18. Permanent site...	....		....		....		499.8		NIPA	....
Value of new residential construction put in place (annual rate)..	506.4	*	498.5	*	490.9	#	498.6	#	Census	Census
Single family structures..	449.4	*	441.8	*	435.1	#	442.1	#	Census	Census
Multifamily structures...............................	57.0	*	56.7	*	55.9	#	56.5	#	Census	Census
1-unit structures started (thousands at annual rate).....	1,524.0		1,590.0		1,486.0	*	1,533.0	*	Census	Census
NOTE.-The value of single family structures put in place is estimated										
by Census using data on the number of 1-unit structures started in the current										
and earlier months; the value of multifamily structures put in place is										
directly measured.										
19. Manufactured homes	....		....		....		7.6		NIPA	....
Manufacturers' shipments (thousands of units at annual rate)............	113.9		124.0		109.7	#	115.8	#	IBTS	BEA
20. Other...	....		....		....		292.0		NIPA	....

Table 3.--continued						

	April	May	June	2006QII	Source	Source for Seasonal
Change in private inventories.............................	....	....	....	59.7	NIPA	....
Farm...	....	....	....	5.6	NIPA	....
Construction, mining, and utilities..........................	....	....	....	9.4	NIPA	....
21. Manufacturing and trade (excludes						
nonmerchant wholesalers).............................	34.3	45.6	35.9	38.6	NIPA	....
Manufacturing...	32.9	-17.6	-1.1	4.8	NIPA	....
Merchant wholesalers......................................	36.8	19.5	21.2	25.8	NIPA	....
Retail..	-35.5	43.8	15.8	8.0	NIPA	....
Motor vehicle dealers.....................................	-30.2	21.8	-4.9	-4.4	NIPA	....
Other retail..	-5.3	22.0	20.7	12.4	NIPA	....
Nonmerchant wholesalers.................................	....	....	....	-1.5	NIPA	....
Other industries..	....	....	....	7.6	NIPA	....
Change in inventories (at monthly and quarterly rates):						
Manufacturing and trade...	8.7	11.4 *	8.7 #	28.8 #	Census	Census
Manufacturing...	4.4	0.8 *	2.5 #	7.7 #	Census	Census
Durable goods……………………………….......	3.2	1.8 *	1.8 *	6.9 *	Census	Census
Nondurable goods...	1.2	-1.0 *	0.7 #	0.9 #	Census	Census
Merchant wholesalers......................................	4.8	3.1 *	3.9 #	11.8 #	Census	Census
Motor vehicle & motor vehicle parts & supplies.....	1.3	-0.5 *	0.4 #	1.2 #	Census	Census
Other wholesalers...	3.5	3.7 *	3.5 #	10.7 #	Census	Census
Retail..	-0.5	7.5 *	2.3 #	9.3 #	Census	Census
Motor vehicle and parts dealers........................	-1.0	5.0 *	-0.3 #	3.7 #	Census	Census
Other retail..	0.5	2.5 *	2.5 #	5.5 #	Census	Census
NOTE-NIPA estimates of change in inventories for retail motor vehicle dealers						
are primarily based on trade source data on units produced and sold.						
22. Inventory valuation adjustment: Manufacturing and trade...................	-45.7	-55.5	-68.2	-56.5	NIPA	....
PPI, farm products (2000=100)..........................	112.7 *	111.8 *	114.1 *	112.9 *	BLS	BEA
PPI, petroleum products (2000=100).................	223.3 *	230.1 *	249.0 *	234.1 *	BLS	BEA
PPI, industrial commodities (2000=100).............	124.8 *	126.1 *	126.4 *	125.8 *	BLS	BEA
Refiners' crude oil						
acquisition cost (2000=100).............................	219.4	227.4 #	220.7 #	222.5 #	EIA	BEA
23. Unit change in motor vehicle inventories (millions of units):						
Autos..	0.0	0.0	-0.1 #	-0.1 #	Ward's-BEA	....
Light trucks..	-0.6	0.7	0.7 #	0.3 #	Ward's-BEA	BEA
Net exports of goods and services...........................	....	....	....	-783.1	NIPA	....
Exports..	....	....	....	1,437.4	NIPA	....
24. Goods...	....	....	....	1,009.2	NIPA	....
U.S. exports of goods, international-transactions-accounts basis						
(annual rate)...	982.0	1,010.5 *	1,011.8 #	1,001.4 #	Census-BEA	Census-BEA
Agricultural goods..	68.6	74.4 *	73.0 #	72.0 #	Census-BEA	Census-BEA
Nonagricultural goods......................................	913.4	936.2 *	938.8 #	929.5 #	Census-BEA	Census-BEA
Of which: Capital goods, except automotive...…	399.4	409.1 *	408.0 #	405.5 #	Census-BEA	Census-BEA

	April		May		June		2006QII		Source	Source for Seasonal
25. Services..	....		....		....		428.3		NIPA	....
Imports...	....		....		....		2,220.6		NIPA	....
26. Goods..	....		....		....		1,875.1		NIPA	....
U.S. imports of goods, international-transactions-accounts basis										
(annual rate)..	1,816.8		1,851.6	*	1,873.7	#	1,847.4	#	Census-BEA	Census-BEA
Petroleum and products.................................	286.2		334.7	*	328.6	#	316.5	#	Census-BEA	Census-BEA
Nonpetroleum goods......................................	1,530.6		1,516.9	*	1,545.1	#	1,530.9	#	Census-BEA	Census-BEA
Of which: Capital goods, except automotive......	414.2		416.3	*	424.8	#	418.4	#	Census-BEA	Census-BEA
27. Services...	....		....		....		345.5		NIPA	....
Government consumption expenditures and gross investment..	....		....		....		2,511.3		NIPA	
Federal..	....		....		....		921.8		NIPA	....
28. National defense..	....		....		....		617.5		NIPA	....
DOD military outlays (not seasonally adjusted)....	38.0		39.8		46.6		124.3	*	DT	

NOTE.-NIPA national defense consumption expenditures and gross
investment differs from DOD military outlays from the Monthly
Treasury Statement primarily because of coverage and timing. The DOD
series does not cover defense atomic energy-related expenditures by the
Department of Energy or consumption of general government fixed capital; the
NIPA series covers these expenditures. The DOD series records all transactions
on a checks-issued basis; the NIPA series outlays reflect equipment
gross investment on a delivery basis and compensation on an accrual basis.
The NIPA series are also adjusted to remove seasonal variation.

	April		May		June		2006QII		Source	Source for Seasonal
29. Nondefense..	....		....		....		304.2		NIPA	....
Outlays other than DOD military (not seasonally adjusted)......	158.3		195.7		197.3	#	551.3	#	DT	....

NOTE.-NIPA nondefense consumption expenditures and gross investment
differs from outlays other than DOD from the Monthly Treasury Statement
primarily because of coverage. The outlays series covers expenditures--
outlays for goods, services, and structures from business and rest of the world and
compensation of Federal Government employees--as well as government
social benefits, grants-in-aid to state and local governments, other current transfer
payments to the rest of the world, interest paid, and subsidies. They also
cover defense atomic energy-related expenditures by the Department of
Energy, which are classified as NIPA national defense consumption expenditures. The outlays
series does not include consumption of general government fixed capital and the
NIPA series does. The NIPA series are also adjusted to remove seasonal variation.

	April		May		June		2006QII		Source	Source for Seasonal
State and local......................................	....		....		....		1,589.5		NIPA	....
Consumption expenditures..................................	....		....		....		1,281.1		NIPA	....
30. Compensation of general government employees........	....		....		....		907.7		NIPA	....
Employment (thousands)...............................	19,213.9		19,234.1	*	19,265.7	*	19,237.9	*	BLS	BLS
Employment cost index (December 2005 = 100)............................	....		....		101.2		....		BLS	....

NOTE-Employment cost index for wages and salaries is
published for the months of March, June, September, and December.

Table 3.--continued							
	April		**May**		**June**	**2006QII**	**Source**	**Source for Seasonal**

	April		May		June		2006QII		Source	Source for Seasonal
Gross investment..	....		....		....		308.4		NIPA	....
31. Structures...	....		....		....		253.1		NIPA	....
Value of new construction put in place (annual rate)......	245.1	*	247.1	*	246.1	#	246.1	#	Census	Census
32. Equipment...	....		....		....		55.4		NIPA	....

\# Assumptions for missing source data.

* Estimate subject to revision.

Abbreviations

AGA	- American Gas Association	EIA - Energy Information Administration
API	- American Petroleum Institute	IBTS - Institute for Building Technology & Safety
BEA	- Bureau of Economic Analysis	JD Power - J.D. Power and Associates, Power Information Network
BLS	- Bureau of Labor Statistics	NIPA - National income and product accounts
Census	- Bureau of the Census	Polk - R. L. Polk & Company
CPI	- Consumer Price Index - All urban consumers	PPI - Producer Price Index
DOD	- Department of Defense	SEC -Securities and Exchange Commission
DT	- Department of Treasury	Ward's -Ward's Automotive Reports

   This table shows advance quarterly estimates of GDP and its major expenditure components along with the key source data and assumptions used by BEA in preparing the estimates. (GDP estimates are identified by the entry of "NIPA" as the source agency.) The table also shows the source agency and the source of seasonal adjustment. In a few instances, series are derived by BEA by a major reworking of the source data. For these series, both the source agency and BEA are identified as the source agency. Monthly NIPA estimates are shown for some components.

   Assumptions for missing source data are indicated by an octothorp (#). Estimates that are subject to revision by a source agency are identified by an asterisk (*). GDP and components, including the series shown on each numbered line, are at annual rates. For other series, the units in which the source data are shown generally correspond to those used by the source agency.

   For the most recent quarter, individual GDP components are calculated using the quarterly change in the latest available source data, after making adjustments to convert the source data to NIPA concepts. Note that the change in private inventories is calculated using the latest change in the change in inventories.

   For more information, or to provide comments or suggestions, write to the National Income and Wealth Division (BE-54), Bureau of Economic Analysis, U.S. Department of Commerce, Washington, DC 20230 or call (202) 606-9700.

II. Estimating Methods for Current-Price GDP

General methods

To derive the quarterly current-price estimates for most GDP components, BEA relies on "expenditure data" in current prices. Typically, these data are adjusted to conform to NIPA concepts and definitions, then they are used as indicator series to prepare the quarterly estimates.

Three general types of adjustments for concepts and definitions are made. The first consists of adjustments needed to obtain the proper concept. For example, Internal Revenue Service *Corporate Returns* data include estimates of depreciation (consumption of fixed capital); however, these estimates are based on historical-cost valuation and tax service lives. BEA replaces these estimates with ones based on current-cost valuation and economic service lives. The second type of adjustment involves filling gaps in coverage. For example, Census Bureau censuses and surveys of trade do not include inventories of nonmerchant wholesalers. BEA estimates the change in the inventories of these wholesalers to provide full coverage for the change in private inventories component of GDP. The third type of adjustment involves time of recording and valuation. For example, data on imports from Canada, as received by the Census Bureau in a data exchange with Canada, are often valued at the point of manufacture. BEA adds the cost of inland transport to provide the valuation at the point of foreign export to be consistent with other trade data.

The adjusted monthly or quarterly data are used as indicator series to estimate the components of quarterly GDP. Generally, monthly and quarterly data are not as comprehensive or as reliable as annual source data, so BEA interpolates and extrapolates the annual data using the monthly or quarterly indicator series. Specifically, for periods for which annual data exist, quarterly estimates are forced to average to the annual totals; the quarterly pattern is estimated by

interpolation techniques. For estimates beyond the period covered by annual estimates, including those for the most recent or current quarter, estimates are made by extrapolation. In some cases, this involves making estimates based on trends in the indicator series.

Finally, quarterly and monthly NIPA estimates are seasonally adjusted at the detailed series level when the series demonstrate statistically significant seasonal patterns. For most of the series that are seasonally adjusted by the source agency, BEA adopts the corresponding seasonal adjustment factors. Seasonal adjustment removes from the time series the average effect of variations that normally occur at about the same time and in about the same magnitude each year—for example, weather and holidays. After seasonal adjustment, cyclical and other short term changes in the economy stand out more clearly.

Special procedures

In some cases, BEA also uses other methods to prepare the current-price estimates of quarterly GDP. These methods include the commodity-flow method, the retail control method, the fiscal year analysis method, and a procedure for estimating the change in private inventories.

Commodity-flow method

The "commodity-flow method" involves estimating values based on various measures of output. In general, this method is used to derive GDP estimates in economic census years for various components of consumer spending, equipment and software, and the commodity detail for state and local government consumption expenditures and gross investment. An abbreviated form of this method is used to prepare estimates of investment in equipment in nonbenchmark

years, and an even more abbreviated form is used to prepare the current quarterly estimates of investment in equipment.

For a detailed component of investment in equipment, the first step in the commodity-flow method is to convert domestic shipments—the value of shipments of a commodity produced by domestic firms at producers' prices—to net supply, by adding imports and subtracting exports, government purchases, and change in inventories. Net supply is then allocated among intermediate purchases and consumer spending, based primarily on relationships from the most recent economic census. Investment in equipment (prior to adjustments for transportation costs and wholesale and retail trade margins) is then computed as the difference between net supply and the sum of business intermediate purchases and consumer spending.

Retail control method

The "retail control method" uses retail sales data, compiled by the Census Bureau, to estimate annual and quarterly consumer spending on goods in nonbenchmark years. In general, product-based data on consumer spending are not available in nonbenchmark years; the retail control method converts industry-based retail sales data to estimates of consumer spending by product. The method applies to most consumer goods, except motor vehicles, tobacco products, gasoline and oil, and prescription drugs.

The method involves three broad steps. First, a retail control—that is, a control total—is estimated based on retail sales data from the Census Bureau's monthly and annual surveys. Second, detailed (product-based) estimates of consumer goods are prepared using relationships

based on data on retail sales by kind of business from the most recent economic census. Finally, the detailed estimates are adjusted to sum to the retail control.

Fiscal year analysis method

The "fiscal year analysis method" is used to estimate annual and quarterly estimates of consumption expenditures and gross investment by the Federal Government. The estimates of expenditures are calculated by budgetary program; that is, by activity by a single line item or a group of line items in the *Budget of the U.S. Government*. For most programs, BEA adjusts budget outlays to make them compatible with the NIPAs and classifies the expenditures in the appropriate NIPA category—such as current transfer payments and interest payments—with nondefense consumption expenditures and gross investment determined residually. When a fiscal year analysis is completed, the detailed array of NIPA expenditures by program and by type of expenditure provides a set of control totals for the quarterly estimates.

Change in private inventories

For most industries, current-dollar estimates of the change in private inventories are prepared by re-valuing Census Bureau data to a current-cost basis. The Census Bureau inventories are on a "book value" basis the values reported in company reports. They reflect a mix of accounting methods that differ in assumptions about when goods enter and leave inventories.

Book values are re-valued to a current-cost basis by the following 4-step procedure. First, the Census estimates are separated into LIFO (those based on the last-in-first-out method) and non-LIFO inventories using ratios developed from relevant surveys. Second, current-period

inventory price indexes for non-LIFO book values are constructed. These indexes are essentially a weighted average of price indexes for the commodities held in inventory with the weights reflecting the actual mix of these commodities. Third, inventory acquisition-cost indexes are constructed. These indexes are prepared by applying a turnover pattern to the average-of-the period inventory price index. This pattern reflects the turnover ratio—that is, the ratio of ending inventories to the cost of goods sold. The final step involves summing the current-dollar changes in LIFO and non-LIFO inventories. Here, the value of the change in LIFO inventories is equal to the change in their book values. The value of the change in non-LIFO inventories is calculated as the change in non-LIFO book values divided (deflated) by the acquisition-cost index multiplied (reflated) by the average-of-the-period inventory price index.

III. Estimating Methods for Constant-Price GDP

General methods

BEA uses three methods to estimate constant-price (inflation-adjusted) GDP. The "deflation method" is used for most components of GDP. For this method, a volume index is derived by dividing the current-price index by an appropriate price index that has the reference year—currently 2000—equal to 100. The result is then multiplied by 100. The "quantity extrapolation method" uses volume indexes that are obtained by using a volume indicator to extrapolate from the reference-year value of 100. The "direct valuation method" uses volume indexes that are obtained by multiplying the reference-year price by actual volume data for the index period. The result is then expressed as an index with the reference year equal to 100.

Volume and price indexes

BEA's chain-type volume and price indexes, in combination with the current-price estimates, provide users with the basic data series from which all other analytical tables and presentations of the NIPAs are derived.

Changes in current-price GDP measure the changes in the market value of the goods, services, and structures produced in the economy in a particular period. These changes can be decomposed into volume and price components that, in turn, can be expressed as index numbers with the reference year—at present, the year 2000—equal to 100. These are referred to as "chain-type" indexes. Percent changes in constant-price GDP and its components are equal to the percent changes of the volume indexes; percent changes in prices are equal to the percent changes of the price indexes.

The annual changes in volumes and prices in the NIPAs are calculated using a Fisher formula that incorporates weights from 2 adjacent years. For example, the 2003–04 change in constant-price GDP uses prices for 2003 and 2004 as weights, and the 2003–04 change in prices uses volumes for 2003 and 2004 as weights. These annual changes are "chained" (multiplied) together to form time series of volume and price indexes. Quarterly changes in volumes and prices are calculated using a Fisher formula that incorporates weights from two adjacent quarters; quarterly indexes are adjusted for consistency to the annual indexes before percent changes are calculated.[1]

The Fisher formula produces percent changes in volumes and prices that are not affected by the choice of reference year. In addition, the use of the Fisher formula has several other advantages over fixed-weighted measures: (1) It eliminates substitution bias in constant-price

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[1] For more details, see Appendix 1, "Basic Formulas for Calculating Chain-Type Quantity and Price Indexes."

GDP growth that tends to cause an understatement of growth for periods before the reference year and an overstatement of growth for periods after the reference year; (2) it eliminates the distortion of growth in components and in industries that result from the fixed-weighted indexes; and (3) it eliminates the anomalies that arise from using recent-period price weights to measure periods in the past when a far different set of prices prevailed.

BEA also prepares another price index, the implicit price deflator (IPD), which is calculated as the ratio of the current-price value to the corresponding chained-dollar value, multiplied by 100. The values of the IPD are very close to the values of the corresponding chain-type price index for all periods.

Chained-dollar measures

BEA also prepares measures of constant-price GDP and its components in a dollar-denominated form, designated "chained (2000) dollar estimates." For GDP and most other series, these estimates are computed by multiplying the current-price value in 2000 by a corresponding volume index number and then dividing by 100. For example, if a current-price GDP component equaled $100 in 2000 and if constant-price output for this component increased 15 percent by 2004, then the chained (2000) dollar value of this component in 2004 would be $115 (= $100 x 115/100).

The chained (2000) dollar estimates provide measures to calculate the percent changes for GDP and its components that are consistent with those calculated from the chain-type volume indexes; any differences will be small and due to rounding. For most components of GDP, the chained-dollar estimates also provide rough approximations of their relative importance and of their contributions to constant-price GDP growth for years close to 2000. However, for some

components—such as computers and other high-tech equipment with rapid growth in constant-price sales and falling prices—chained-dollar levels (as distinct from chain-weighted indexes and percent changes) overstate the relative importance of such components to GDP growth.

In addition, chained-dollar values for the detailed GDP components will not necessarily sum to the chained-dollar estimate of GDP (or any intermediate aggregate) because the relative prices used as weights for any period other than the reference year differ from those used for the reference year. BEA provides a measure of the extent of such differences by showing a "residual" line on chained-dollar tables that indicates the difference between GDP (and other major aggregate) and the sum of the most detailed components in the table.

For periods close to the reference year, when there usually has not been much change in the relative prices that are used as the weights for calculating the chain-type index, the residuals tend to be small, and the chained (2000) dollar estimates can be used to approximate the contributions to growth and to aggregate the detailed estimates. However, it is preferable to use the exact contributions estimates that are described in the next section.

Some exceptions to the above methodology have to be made for a few components of GDP. When the components of an aggregate include large negative values, the Fisher formula may require taking the square root of a negative number. For these aggregates, another method for calculating chained dollars must be used. The inability to calculate a particular Fisher volume index (for example, change in private inventories) because of negative values usually does not extend to the calculation of higher level aggregates (for example, volume indexes for gross private domestic investment and for GDP can be computed). The calculation of contributions to percent change is not affected by negative values, so they can be calculated for all components.

Two principal methodologies are used for the cases where the Fisher formula cannot be used. In the first, constant-price values are calculated as the sum of, or the difference between, chained-dollar series measuring flows. For example, this methodology is used to derive estimates of net exports of goods and services. In the second methodology, chained-dollar series are calculated as the difference between end of period and beginning of period chain-weighted stocks. This methodology is used to estimate the change in private inventories.

Contributions

For periods further from the reference year, the residual tends to become larger, and the chained-dollar estimates are less useful for analyses of contributions to growth. For this reason, BEA also shows contributions of major components to the percent change in constant-price GDP (and to the percent change in other major aggregates) that use exact formulas for attributing growth.[2]

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[2] For more details, see Appendix 2 "Calculation of Component Contributions to the Change in GDP and Other Major Aggregates."

Appendix 1: Formulas for Calculating Chain-type Quantity and Price Indexes

This appendix shows the basic calculations used to prepare annual and quarterly chain-type quantity and price indexes.

Annual indexes

The formula used to calculate the annual change in real GDP and other components of output and expenditures is a Fisher index (Q_t^F) that uses weights for 2 adjacent years (years *t-1* and *t*).

The formula for real GDP in year t relative to its value in year *t-1* is

$$Q_t^F = \sqrt{\frac{\sum p_{t-1} q_t}{\sum p_{t-1} q_{t-1}} \times \frac{\sum p_t q_t}{\sum p_t q_{t-1}}},$$

where the *p*'s and *q*'s represent prices and quantities of detailed components in the 2 years.

Because the first term in the Fisher formula is a Laspeyres quantity index (Q_t^L), or

$$Q_t^L = \frac{\sum p_{t-1} q_t}{\sum p_{t-1} q_{t-1}},$$

and the second term is a Paasche quantity index (Q_t^P), or

$$Q_t^P = \frac{\sum p_t q_t}{\sum p_t q_{t-1}},$$

the Fisher formula can also be expressed for year *t* as the geometric mean of these indexes as follows:

$$Q_t^F = \sqrt{Q_t^L \times Q_t^P}.$$

The percent change in real GDP (or in a GDP component) from year *t-1* to year *t* is calculated as *100(Q_t^F - 1.0).*

Similarly, price indexes are calculated using the Fisher formula

which is the geometric mean of a Laspeyres price index (P_t^L) and a Paasche price index (P_t^P), or $P_t^F = \sqrt{P_t^L \times P_t^P}$

The chain-type quantity index value for period t is $I_t^F = I_{t-1}^F \times Q_t^F$, and the chain-type price index is calculated analogously. Chain-type real output and price indexes are presented with the reference year (b) equal to 100; that is, $I_b = 100$.

The current-dollar change from year t-1 to year t expressed as a ratio is equal to the product of the Fisher price and quantity indexes:

$$\frac{\sum p_t q_t}{\sum p_{t-1} q_{t-1}} = \sqrt{\frac{\sum p_t q_{t-1}}{\sum p_{t-1} q_{t-1}} \times \frac{\sum p_t q_t}{\sum p_{t-1} q_t}} \times \sqrt{\frac{\sum p_{t-1} q_t}{\sum p_{t-1} q_{t-1}} \times \frac{\sum p_t q_t}{\sum p_t q_{t-1}}} = P_t^F \times Q_t^F.$$

Quarterly indexes

The same formulas are used to calculate the quarterly indexes except that quarterly data are substituted for annual data.

All quarterly chain-type indexes for completed years that have been included in an annual or comprehensive revision are adjusted so that the quarterly indexes average to the corresponding annual index. When an additional year is completed between annual revisions, the annual index is computed as the average of the quarterly indexes, so no adjustment is required to make the quarterly and annual indexes consistent. For example, until the 2007 annual revision was released, the chain-type indexes for the year 2006 were computed as the average of the four quarterly indexes for 2006.

Chained-dollar estimates

The chained-dollar value CD_t^F is calculated by multiplying the index value by the reference year current-dollar value ($\sum p_b q_b$) and dividing by 100. For period t,

$$CD_t^F = \sum p_b q_b \times I_t^F / 100.$$

Implicit price deflators

The implicit price deflator IPD_t^F for period t is calculated as the ratio of the current-dollar value to the corresponding chained-dollar value, multiplied by 100, as follows:

$$IPD_t^F = \frac{\sum p_t q_t}{CD_t^F} \times 100.$$

Appendix 2: Calculation of Component Contributions to the Change in GDP and Other Major Aggregates

The contributions to percent change in a real aggregate, such as real GDP, provide a measure of the composition of growth in the aggregate that is not affected by the nonadditivity of its components. This property makes contributions to percent change a valuable tool for economic analysis. The contribution to percent change ($C\%_{\Delta_{i,t}}$) in an aggregate in period t that is attributable to the quantity change in component i is defined by the formula

$$C\%\Delta_{i,t} = 100 \times \frac{((p_{i,t}/P_t^F) + p_{i,t-1}) \times (q_{i,t} - q_{i,t-1})}{\sum_j ((p_{j,t}/P_t^F) + p_{j,t-1}) \times q_{j,t-1}},$$

where

P_t^F is the Fisher price index for the aggregate in period t relative to period t-1;

$p_{i,t}$ is the price of the component i in period t; and

$q_{i,t}$ is the quantity of the component i in period t.

The summation with subscript j in the denominator includes all the deflation level components of the aggregate. Contributions of subaggregates (such as PCE goods) to the percent change of the aggregate (say, PCE or GDP) are calculated by summing the contributions of all the deflation level components contained in the subaggregate. For annual estimates, no adjustments are required for contributions to sum exactly to the percent change in the aggregate. For quarterly estimates, adjustments are required to offset the effects of adjustments made to published aggregates and their quarterly percent change: namely, conforming quarterly estimates to average to the corresponding annual estimates, and expressing percent change at annual rate. The same formula is used for both annual and quarterly estimates of contributions to percent change in all periods. The only variation in the method of calculation is that when the annual contributions for the most recent year are first calculated, they are based on a weighted average of the quarterly contributions until the next annual revision.

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