DEPARTMENT OF HEALTH & HUMAN SERVICES Public Health Service

National Institutes of Health
Bethesda, Maryland 20892

DATE: February 1, 2010
SUBJECT: Biomedical Research and Development Price Index (BRDPI): Fiscal Year 2009 Update and Projections for FY 2010-FY 2015

Summary

- The Bureau of Economic Analysis (BEA) in the U.S. Department of Commerce estimates a 3.4 percent increase in the BRDPI for Fiscal Year (FY) 2009. The BEA staff also revised last year's preliminary estimate for FY 2008 upwards from 4.4 percent to 4.7 percent.
- It is projected that the BRDPI may increase by 3.1 percent during FY 2010; 3.2 percent for FY 2011; 3.4 percent for FY 2012; and 3.5 percent during each of FY 2013, FY 2014, and FY 2015. The out-year projections follow the pattern of general inflation projected by the U.S. Office of Management and Budget (OMB) for each year from FY 2010 through FY 2015.

Definition of the BRDPI

The BRDPI measures changes in the weighted-average of the prices of all the inputs (e.g., personnel services, various supplies, and equipment) purchased with the NIH budget to support research. The weights used to construct the index reflect the actual pattern (or the proportion) of total NIH expenditures on each of the types of inputs purchased. Theoretically, the annual change in the BRDPI indicates how much NIH expenditures would need to increase, without regard to efficiency gains or changes in government priorities, to compensate for the average increase in prices due to inflation and to maintain NIH-funded research activity at the previous year's level.

Background on the BRDPI Estimation Process

The BEA developed the BRDPI in the early 1980s. Under an interagency agreement with the NIH, each December, the BEA provides an estimate of the BRDPI for the most recently completed fiscal year (in December 2009 it was for FY 2009). This estimate is referred to as "preliminary" because the initial data on prices available to the BEA in December are often revised during the following year. Consequently, each December the BEA also provides a revised estimate for the prior fiscal year (e.g., the estimate for FY 2008 was revised in December 2009).

The Office of the Director, NIH projects future year values based on a methodology described below. An updated table of BRDPI annual estimates and future-year projections is typically posted on the NIH website each year shortly after the release of the President's budget in early February. See http://officeofbudget.od.nih.gov/gbiPriceIndexes.html, or use the search engine at http://www.nih.gov/ to find "BRDPI."

The FY 2009 Update

This year, the BEA estimated a 3.4 percent increase in the BRDPI for FY 2009. Based on final data, the BEA revised the estimated BRDPI increase for FY 2008 upwards from 4.4 percent to 4.7 percent.

The realized 3.4 percent increase for FY 2009 is lower than the 3.8 percent increase originally projected for FY 2009 last January. Much of the difference between the projected and realized increase in the BRDPI for FY 2009 is attributable to the pattern of general inflation. In December 2008, the OMB projected an increase of 2.4 percent during FY 2009 for the Gross Domestic Product (GDP) price index, which drives the BRDPI projection. The more recently published historical data now indicates the GDP price index grew by only 1.5 percent during FY 2009. If the realized increase of 1.5 percent for the GDP price index had been accurately projected in December 2008, then the forecasting methodology described below would have projected growth for the BRDPI of 3.3 percent during FY 2009—very close to the realized increase of 3.4 percent.

The 3.4 percent increase for FY 2009 is the lowest increase in the BRDPI since the 3.3 percent increase for FY 2002. This smaller increase is a result of a general slowdown in the rate of price growth. For most of the 45 expenditure categories that make up the BRDPI, the corresponding subprice index increased at a slower rate during FY 2009 than during FY 2008. The notable exceptions are the prices for Federal civilian pay, wage board pay, commissioned officer pay and Federal personnel benefits. These increases are easily explained by the total pay increase for Federal employees in the Washington, DC-Maryland-Northern VA area. Effective January 2008, the total pay increase was 4.49 percent over the 2007 calendar year pay scale. Effective January 2009, the total pay increase was slightly larger at 4.78 percent. The relatively generous pay increase for calendar year 2009 was likely based on comparisons with recent pay increases in the private sector, before the economy entered into a severe recession at the end of calendar year 2008. The scheduled increase for January 2010 is only 2.42 percent (OPM Salary Table 2010-DCB), reflecting a slower growth in private sector salaries during 2009. The reduced growth in Federal employee compensation will contribute to a lower growth in the BRDPI during FY 2010.

Projections for FY 2010-2015

Projections of future annual changes in the BRDPI reflect two considerations. The first is the expected general rate of inflation of prices for the U.S. economy. The second is the expected relationship between the general rate of inflation and changes in the BRDPI. NIH defers judgments on the general rate of inflation to OMB. We use the most recently issued OMB projections of the annual rate of growth of the GDP Price Index: 0.9 percent during FY 2010; 1.1 percent for FY 2011; 1.6 percent for FY 2012; followed by a slight increase to 1.7 percent growth for FY 2013, FY 2014, and FY 2015. The decrease in projected annual rates of inflation followed by a slight increase appears to anticipate general economic forecasts of a soft economy over the next few years followed by a slight recovery.

The historical relationship between the BRDPI and the GDP Price Index is summarized by a statistically estimated linear equation (by ordinary least squares regression) that relates the annual percent change in the BRDPI to the annual percent change in the GDP Price Index.

Using the data for the most recent ten years (FY 2000 through FY 2009) the estimated equation is:

(Projected annual percent change in the BRDPI)
= 2.71 + 0.41 x (annual percent change in GDP Price Index).

The forecasted value for the change in the GDP Price Index is inserted into the equation above to derive the projected value of the increase in the BRDPI for each future year. Using this methodology it is projected that the BRDPI may increase by 3.1 percent during FY 2010; 3.2 percent for FY 2011; 3.4 percent for FY 2012; and 3.5 percent for FY 2013, FY 2014, and FY 2015. The out-year projections follow the pattern of general inflation projected by OMB.

Forecasting the future path of price changes is an inherently imprecise exercise. We cannot expect estimated projections of growth in the GDP Price Index to be realized exactly each year. Likewise, because the complex relationship between the general rate of inflation and the BRDPI increase is approximated with a simple linear equation, year-to-year deviations are inevitable. However, we strive for an unbiased process—i.e., the projections miss high as frequently as they miss low.

We made no adjustments to the annual growth rates projected by the equation. We have no reason to expect the increase in the BRDPI will exceed or fall short of the historical relationship between growth in the BRDPI and growth in the GDP Price Index over the next few years.

Summary Tables

Table A depicts values of the annual percent change in the GDP Price Index and the BRDPI for FY 1980 through FY 2009. Table B includes projected values of the BRDPI and the GDP Price Index for FY 2010 through FY 2015.

For the convenience of the reader, Table C illustrates how to translate annual changes into annual levels of the BRDPI. After designating a reference year, for which the value of the BRDPI is specified as 100, projections of the annual levels of the BRDPI can be constructed using the following recursive relationship:

BRDPI (for year t) = BRDPI (for year t-1) x [1 + {Annual Percent Change (for year t)}]

In Table C, the calculations are presented for FY 1989 through FY 1992 using FY 1989 as the reference year (1989 = 100). To calculate the value for FY 1991, for example, the formula would be: 110.5 = 105.4 x 1.048. In other words, to derive the BRDPI value for FY 1991 (110.5), start with the FY 1990 BRDPI value (105.4) and multiply by one plus the annual change for FY 1991 (1+ [4.8/100] =1.048).

Attachments

ATTACHMENTS

1. **Supplementary Tables**
2. **References to BEA Price Index Methodology**
3. **Modification of the Methodology Used to Estimate the BRDPI**

TABLE A		
HISTORICAL ANNUAL PERCENT CHANGES		
Fiscal Year	GDP Price Index	BRDPI
Col.(1)	Col.(2)	Col.(3)
1980	8.8%	9.8%
1981	9.9%	10.4%
1982	6.8%	8.6%
1983	4.4%	6.2%
1984	3.7%	5.9%
1985	3.2%	5.6%
1986	2.3%	4.2%
1987	2.7%	5.3%
1988	3.2%	5.0%
1989	3.9%	5.2%
1990	3.7%	5.4%
1991	3.8%	4.8%
1992	2.6%	4.4%
1993	2.2%	3.4%
1994	2.1%	3.9%
1995	2.1%	3.5%
1996	1.9%	2.6%
1997	1.8%	2.8%
1998	1.3%	3.4%
1999	1.3%	3.2%
2000	2.0%	3.7%
2001	2.4%	3.3%
2002	1.6%	3.3%
2003	2.1%	3.5%
2004	2.6%	3.7%
2005	3.3%	3.9%
2006	3.4%	4.6%
2007	2.9%	3.8%
2008	2.3%	4.7%
2009	1.5%	3.4%

TABLE B

PROJECTED ANNUAL PERCENT CHANGES

Fiscal Year	GDP Price Index	BRDPI
Col.(1)	Col.(2)	Col.(3)
2010	0.9%	3.1%
2011	1.1%	3.2%
2012	1.6%	3.4%
2013	1.7%	3.5%
2014	1.7%	3.5%
2015	1.7%	3.5%

TABLE C

Conversion of Annual Changes into Annual Levels

Fiscal Year	Annual Percent Change	[1+(Percent Change/100)]	Previous Year Value			Annual Level BRDPI
Col.(1)	Col.(2)	Col.(3)	Col.(4)			Col.(5)
1989						100.0
1990	5.4%	1.054	*	100.0	=	105.4
1991	4.8%	1.048	*	105.4	=	110.5
1992	4.4%	1.044	*	110.5	=	115.4

References to BEA Price Index Methodology

Robert P. Parker and Eugene P. Seskin, "Annual Revision of the National Income and Product Accounts: Annual Estimates 1993-96, Quarterly Estimates 1993:1-1997:1," Survey of Current Business, 77, No. 8 (August 1997), pp 6-35.

J. Steven Landefeld and Robert P. Parker, "Preview of the Comprehensive Revision of the National Income and Product Accounts: BEA's New Featured Measures of Output and Prices," Survey of Current Business, 75, No. 7 (July 1995), pp 31-38.

Allan H. Young, "Alternative Measures of Change in Real Output and Prices, Quarterly Estimates for 1959-1992," Survey of Current Business, 73, No.11 (March 1993), pp 31-41.

Allan H. Young, "Alternative Measures of Change in Real Output and Prices," Survey of Current Business, 72, No. 4 (April 1992), pp 32-48.

Jack E. Triplett, "Economic Theory and BEA's Alternative Quantity and Price Indexes," Survey of Current Business, 73, No. 4 (April 1992), pp 49-52.

Modification of the Methodology Used to Estimate the BRDPI

As stated in the memo above, the weights used to construct the BRDPI reflect the actual pattern (or the proportion) of total NIH expenditures spent on each of the types of inputs purchased with the NIH budget (e.g., personnel services, various supplies, and equipment). In fact, the use of weights specific to the NIH budget is what distinguishes the BRDPI from other price indexes designed to reflect different patterns of expenditures.

Until FY 2006, the BEA estimated the BRDPI using a fixed weight (or Laspeyres) index. This type of index compares prices over several years using a fixed set of weights based on the composition of expenditures in a single, specified base year (say 1993 or 2003).

Beginning with the revised estimate for FY 2005 (published in December 2006) the BEA now estimates the BRDPI using a Fisher chain-weighted index methodology. The chain-weighted methodology improves the accuracy of the BRDPI and is consistent with the methodology BEA adopted in 1996 to estimate the Gross Domestic Product and its component series. For the interested reader, five articles in BEA's publication, *Survey of Current Business*, discuss the reasons BEA now uses the chain-weighted methodology. (See the references to BEA Price Index Methodology in the attachment below.)

In less technical terms, the move to chain weighting means primarily that the expenditure weights used to estimate the BRDPI will be updated each year. Also, when estimating the growth of the BRDPI between two consecutive years (say 2005 and 2006) the Fisher Price Index reflects the average experience of two slightly different indexes: the first index uses first year weights (e.g., 2005) to estimate average growth in prices; the second index uses second year weights (e.g., 2006) to develop the estimate. To estimate growth over several years, the consecutive year indexes are multiplied, or chained. (As an analogy, think of calculating compound growth on your retirement portfolio over ten years as the mix of stocks and bonds changes from year to year.)

By contrast, to the chain weighting methodology, the previously used fixed-weight (or Laspeyres) index approach can result in a "substitution bias" that tends to overstate price increases for periods after the base year and understate price increases for periods before the base year. This bias occurs because use of the fixed-weight index implicitly assumes the composition of the items being priced does not change over time. In fact, the mix of items purchased and included in a price index tends to shift over the years. The shift in purchases may be a response to changes in relative prices and to advances in technology which provide new opportunities and new tools for investigation (e.g., more computers and automated test equipment and fewer laboratory assistants).

During periods close to the base year, differences in the composition are usually fairly small, and a fixed-weight index provides a good approximation. Farther away from the base period, however, larger differences in expenditure composition are likely. Consequently, weighting formulas that allow for changes in composition over time provide a better measure of both year-to-year price changes and long-term trends.

In response to BEA recommendations, in past years the expenditure weights used to estimate the BRDPI were updated, or rebased, occasionally to overcome the problem of substitution bias. In the BRDPI Table of Annual Values listed on the NIH website and in the attached Table A, the values of the BRDPI for FY 1999-2004 are constructed using the FY 2003 expenditure weights; the FY 1991-1998 values are based on FY 1993 weights; the FY 1986-1990 values are based on FY 1988 weights; and the FY 1979-1985 values are based on FY 1984 weights. The pre-1979 values of the BRDPI were estimated using a preliminary methodology with a less-detailed set of expenditure weights. As a result of the less precise methodology, the pre-1979 values are not likely to be as accurate as the later year values.