

Consumer Price Index Research Series Using Current Methods

The Bureau of Labor Statistics (BLS) has made numerous improvements to the Consumer Price Index (CPI)¹ over the past quarter-century to make the series more accurate. However, historical price index series are not adjusted to reflect these improvements. This article presents an estimate of the CPI-U² from 1978 to 1998 that incorporates most of the improvements made over that time span into the entire series. The new measure is called the *CPI research series using current methods* (CPI-U-RS).

The CPI-U-RS was constructed by adjusting the component indexes of the national CPI-U at the level of the item, such as new vehicles. Then the component indexes were aggregated by using the official CPI-U base-period expenditure weights to form the all-items CPI-U-RS. Component indexes were adjusted directly; individual prices were not used to recompute those indexes. The CPI-U-RS provides an annual inflation series that adjusts only for specified changes in BLS methodology. The measure should help answer the question of the degree to which the measured rate of inflation has been affected by improvements made by BLS.

¹The Consumer Price Index (CPI) is the most widely used measure of inflation in the United States. Annual cost-of-living adjustments for Social Security recipients and Federal and military retirees; the annual change in Federal income tax brackets, along with personal exemption and standard deduction amounts; and the calculation of key economic indicators are based on the CPI.

²Consumer Price Index for All Urban Consumers.

Methodological Improvements

The CPI-U-RS differs from the CPI-U in that the CPI-U-RS is adjusted to incorporate estimates of what the measured rate of inflation would have been had improvements to the CPI-U been made earlier. Eleven improvements were made to the CPI since 1978 for which estimates of historical effects were included in the CPI-U-RS.

1. *Use of rental equivalence to measure changes in homeowner costs.*

(Implemented in 1983.) The homeownership component of the CPI-U was changed from the cost of the purchase of a home to the value of rental services. For the CPI-U-RS, rental equivalence was imputed for the period 1978-82 by changes in the CPI residential rent index.

2. *Quality adjustment of used-car prices.* (Implemented in 1987.) Prices of used cars were adjusted for differences in quality after changeovers to new models, similar to adjustment in new-car prices to reflect changes in quality first undertaken in 1967. The used-car index of the CPI-U-RS was adjusted downward for the years 1978-86 by estimating the general distribution of model years within the used-car sample in each of those years and then estimating the effect of quality adjustments applied to new cars of the same model years.

3. *Quality adjustment of sampled housing units to reflect aging.* (Implemented in 1988.) The CPI-U-RS incorporates an estimate of the effect of the aging housing stock by adjusting the residential rent and owners' equivalent rent indexes upward by about 0.3 percent per year from 1978 to 1987.

4. *Quality adjustment of apparel prices.* (Implemented in 1991.) Regression models were used to adjust apparel

prices for changes in quality when new clothing lines are introduced. Using a BLS study that estimated the effect of changes in quality over the last 6 months of 1991, the Bureau adjusted all of the CPI-U-RS apparel commodity indexes from 1978 to 1990 upward by about 0.4 percent per year.

5. *Treating shifts between brand-name and generic drugs as price changes.* (Implemented in 1995.) A new procedure was introduced that allows a generic drug to be priced when the corresponding brand-name drug loses its patent protection. This change is estimated to have reduced the prescription drug index between 1993 and 1997 by an average 0.4 percent per year. The CPI-U-RS prescription drug index was adjusted downward from 1978 to 1994 based on the number of generic drugs entering the market each year (relative to the number for the 1993-97 period).

6. *Changes in shelter formulas in 1995.* (Implemented in 1995.) The composite estimator approach that used a weighted average of 1- and 6-month changes in rent was replaced by a 6-month chain estimator. This methodological improvement affected both the residential rent and owners' equivalent rent indexes. Also, the formula for calculating the owners' equivalent rent index was modified to eliminate an upward-drift tendency. The CPI-U-RS was adjusted for these two improvements in the shelter component between 1991 and 1995 by substituting an experimental Laspeyres consumer price index called the CPI-U-XL for the CPI-U. The effect was to adjust the residential rent index by an average of 0.1 percent per year during this period. The CPI-U-RS applied this adjustment for the years 1978-90. The average downward adjustment of the owners' equivalent rent index from 1991 to 1995 was 0.6 percent per year and applied for the years 1987-90. From 1978 to 1986, the owners'

equivalent rent index was subject only to the downward bias resulting from the use of composite estimation; therefore, the index was adjusted upward by about 0.1 percent per year for the CPI-U-RS.

7. *Quality adjustment of personal-computer prices.* (Implemented in 1998.) Estimates based on an analysis of 1998 data indicate that this improvement effectively lowered the personal-computer index by about 6.5 percent per year. The CPI-U-RS uses this figure to adjust the personal-computer component downward from 1987 to 1997.

8. *Elimination of automobile finance charges.* (Implemented in 1998.) Automobile finance charges were dropped because they did not reflect a cost of current consumption. The CPI-U-RS eliminates the automobile finance charges index from 1978 to 1997.

9. *Quality adjustment of television prices.* (Implemented in 1999.) BLS research indicates that the television index would have been about 0.1 percent lower each year with the quality adjustments applied from August 1993 to August 1997. The CPI-U-RS estimates the effect of this improvement on the index from 1977 to 1998 by adjusting the index down by 0.1 percent per year.

10. *Eliminating functional form bias and accounting for consumer substitution within CPI item categories.* (Implemented in 1995, 1996, and 1999.) The CPI-U-RS uses estimates derived from the experimental CPI using geometric means (CPI-U-XG) to account for both functional form bias and consumer substitution within item categories. Eliminated in 1995 and 1996 was the upward bias in measured price changes that occurs during the period immediately following the

introduction of new item samples into the CPI. New "seasoning" procedures were used instead. Since January 1999, a geometric-mean formula has been used to address consumer substitution within item categories

11. *Treating mandated pollution measures as price increases.* (Implemented in 1999.) From 1967 to 1998, federally mandated improvements in emissions were treated as improvements in quality. In 1999, they began to be treated as price increases instead. The CPI-U-RS is adjusted upward by removing the environmental quality adjustments made to the motor vehicle and gasoline indexes from 1978 to 1998.

12. *Improvements made to the CPI from 1978 to 1998 and not incorporated into the CPI-U-RS.* If the effect of the improvement on the rate of growth of the index could not be estimated or was believed to be negligible, BLS did not make adjustments to the CPI-U-RS. Examples of such improvements were

- C updating expenditure weights and area samples in the CPI revisions of 1978, 1987, and 1998.
- C improving the treatment of airline discount fares in 1991.
- C improving the methods for pricing hospital services in 1997.
- C changing the treatment of utility rebates in 1999.

13. *Limitations of the CPI-U-RS.* Most adjustments to the CPI-U-RS were based on BLS research that estimated the effect of methodological changes to the CPI over a relatively short period. For example, apparel indexes for the CPI-U-RS from 1978 to 1990 are adjusted based on studies of the effect of the improvement during the last 6 months of 1991. Whereas there is confidence about the *direction* of the adjustment, the *size* of the adjustment is subject to question.

CPI for all urban consumers (CPI-U) and CPI research series using current methods (CPI-U-RS), all items and major groups, percent changes, December to December, 1978-98

Year	Index	All items	Food and beverages	Housing	Apparel	Transportation	Medical care	Entertainment	Other goods and services	Recreation	Education and communication
1978	CPI-U	9.0	11.6	10.0	3.1	7.7	8.8	5.7	6.4	-	-
	CPI-U-RS	7.8	11.0	7.4	2.1	7.5	8.8	5.2	6.2	-	-
1979	CPI-U	13.3	10.0	15.2	5.5	18.3	10.1	6.9	7.8	-	-
	CPI-U-RS	10.7	9.5	9.5	4.5	18.5	9.7	6.3	7.5	-	-
1980	CPI-U	12.5	10.1	13.7	6.8	14.6	9.9	9.7	10.1	-	-
	CPI-U-RS	10.7	9.5	9.9	5.8	15.6	10.0	9.0	9.9	-	-
1981	CPI-U	8.9	4.3	10.2	3.5	10.9	12.5	7.2	9.9	-	-
	CPI-U-RS	8.3	3.8	9.8	2.7	10.5	12.2	6.6	9.6	-	-
1982	CPI-U	3.8	3.2	3.6	1.6	1.8	11.0	5.6	12.1	-	-
	CPI-U-RS	5.0	2.7	6.7	.8	2.0	10.8	5.1	11.9	-	-
1983	CPI-U	3.8	2.7	3.5	2.9	3.9	6.4	4.0	7.9	-	-
	CPI-U-RS	3.7	2.1	3.6	1.9	4.2	6.2	3.2	7.7	-	-
1984	CPI-U	3.9	3.8	4.3	2.0	3.1	6.1	4.2	6.0	-	-
	CPI-U-RS	3.7	3.2	4.4	1.0	2.7	5.9	3.7	5.9	-	-
1985	CPI-U	3.8	2.8	4.3	2.8	2.6	6.8	3.1	6.3	-	-
	CPI-U-RS	3.7	2.3	4.4	1.9	2.8	6.5	2.6	6.0	-	-
1986	CPI-U	1.1	3.7	1.7	.9	-5.9	7.7	3.4	5.5	-	-
	CPI-U-RS	1.0	3.3	2.0	.1	-6.2	7.5	2.7	5.3	-	-
1987	CPI-U	4.4	3.5	3.7	4.8	6.1	5.8	4.0	6.1	-	-
	CPI-U-RS	4.0	3.0	3.4	3.8	5.9	5.5	3.4	5.9	-	-
1988	CPI-U	4.4	5.1	4.0	4.7	3.0	6.9	4.6	7.0	-	-
	CPI-U-RS	3.9	4.5	3.6	3.6	2.5	6.6	3.9	6.7	-	-
1989	CPI-U	4.6	5.5	3.9	1.0	4.0	8.5	5.1	8.2	-	-
	CPI-U-RS	4.2	5.0	3.5	-.1	3.7	8.2	4.5	7.9	-	-
1990	CPI-U	6.1	5.3	4.5	5.1	10.4	9.6	4.3	7.6	-	-
	CPI-U-RS	5.8	4.6	4.0	4.1	10.6	9.3	3.6	7.4	-	-
1991	CPI-U	3.1	2.5	3.4	3.4	-1.5	7.9	3.9	8.0	-	-
	CPI-U-RS	2.5	2.0	2.6	2.1	-1.5	7.7	3.4	7.8	-	-
1992	CPI-U	2.9	1.6	2.6	1.4	3.0	6.6	2.8	6.5	-	-
	CPI-U-RS	2.6	1.2	2.1	-.1	3.2	6.5	2.3	6.3	-	-
1993	CPI-U	2.7	2.7	2.7	.9	2.4	5.4	2.8	2.7	-	-
	CPI-U-RS	2.3	2.1	2.4	-.7	2.4	5.1	2.4	2.3	-	-
1994	CPI-U	2.7	2.7	2.2	-1.6	3.8	4.9	2.3	4.2	-	-
	CPI-U-RS	2.4	2.1	1.9	-2.4	4.4	4.8	1.4	3.9	-	-
1995	CPI-U	2.5	2.1	3.0	.1	1.5	3.9	3.3	4.3	-	-
	CPI-U-RS	2.3	1.9	2.8	-1.3	1.3	3.7	2.7	4.2	-	-
1996	CPI-U	3.3	4.2	2.9	-.2	4.4	3.0	2.9	3.6	-	-
	CPI-U-RS	3.1	3.8	2.8	-1.0	4.7	2.9	2.0	3.5	-	-
1997	CPI-U	1.7	1.6	2.4	1.0	-1.4	2.8	1.4	5.2	-	-
	CPI-U-RS	1.5	1.5	2.2	.0	-1.5	2.7	.8	5.1	-	-
1998	CPI-U	1.6	2.3	2.3	-.7	-1.7	3.4	-	8.8	1.2	.7
	CPI-U-RS	1.4	1.9	2.3	-2.4	-1.7	3.2	-	8.2	.7	3.0
Dec. 1977 to Dec. 1998	CPI-U	163.9	142.5	172.5	62.0	136.5	316.3	134.3 ¹	301.8
	CPI-U-RS	141.2	119.6	143.2	29.1	137.7	299.9	107.9 ¹	282.5
Average annual difference, Dec. 1977- Dec. 1998		.45	.49	.57	1.10	-.03	.20	.62	.25

¹Entertainment was dropped as a major group in December 1997; number represents percent change from December 1977 through December 1997. Note: Dash indicates not a major group that year. From 1978 to 1998, there were seven major groups in the CPI. In 1998, entertainment was dropped as a major group, and two major groups were added: recreation, and education and communication.

Results

Over the 21-year period of the study (December 1977 to December 1998), the CPI-U-RS increased 141.2 percent, compared with 163.9 percent for the CPI-U (see table). These figures represent an average annual increase of 4.28 percent for the CPI-U-RS and 4.73 percent for the CPI-U. From 1978 to 1982, the CPI-U-RS increased about 1 percent more slowly, on average, than the CPI-U—primarily because of the use of rental equivalence in the CPI-U-RS. The difference between the two measures was only 0.1 percent per year between 1983—when rental equivalence was introduced into the CPI-U—and 1986. Since 1986, the difference has typically remained around 0.3 to 0.4 percent per year.

Food and beverages. The difference between the CPI-U and the CPI-U-RS was consistently between 0.5 and 0.6 percent per year between 1978 and 1994. After 1994, when the food-at-home components of the CPI-U were improved to eliminate the functional-form bias, the average difference between the two measures fell to 0.2 percent per year.

Housing. The difference between the CPI-U and CPI-U-RS varied significantly by period. From 1977 to 1982, the difference—1.9 percent per year—is explained by the inclusion of an estimate for rental equivalence in the CPI-U-RS (only included in the CPI-U from 1983 forward). From 1983 to 1986, the difference, -0.15 percent per year, is caused by the elimination of composite estimation and the quality adjustment of shelter units to reflect aging in the CPI-U-RS. Since 1987, the difference in housing measures was consistently positive, averaging between 0.3 and 0.4 percent per year.

Apparel. From 1978 to 1990, the annual difference between the CPI-U and CPI-U-RS apparel indexes was consistently around 1.0 percent. After 1991, the average annual difference between the two indexes was 1.4 percent. This substantial gap reflects the large downward adjustment to the CPI-U-RS caused by using the geometric-mean formula.

Transportation. The annual average difference between the CPI-U and CPI-U-RS transportation components between 1978 and 1998 was near zero because various changes roughly offset each other. Downward adjustments to the CPI-U-RS resulted from incorporating the effects of changes in quality of used cars; upward adjustments occurred because automobile finance charges were deleted, and mandated pollution controls were no longer considered a change in quality.

Medical care. The average annual difference between the CPI-U and CPI-U-RS for the medical care component was 0.2 percent per year. This relatively small difference occurs because although medical care commodities were subjected to the geometric-mean formula, most medical services were not.

Entertainment. The annual difference between the CPI-U and CPI-U-RS for entertainment averaged 0.6 percent from 1978 to 1997, reflecting the downward adjustment made to the CPI-U-RS from the estimate of the likely effect of the geometric-mean formula.

Other goods and services. The annual average difference between the CPI-U and CPI-U-RS for the other goods and services component between 1978 and 1998 was 0.25 percent, also reflecting the downward adjustment made to the CPI-U-RS from the estimate of the

effect of the geometric-mean formula. Because the CPI-U does not incorporate methodological changes retroactively, BLS developed the CPI-U-RS for researchers who are interested in using current and consistent methods of estimating consumer inflation over the 1978-98 period. The CPI-U-RS includes an estimate of most improvements made over time to the CPI.

The CPI-U-RS is subject to revision. When an improvement is made to the CPI and an effect of that change can be estimated, the CPI-U-RS will be revised so that earlier years incorporate that improvement. In addition, if a better method of adjusting the CPI-U-RS for past improvements is found, the CPI-U-RS will be revised to reflect the new technique.

Source: Stewart, K.J. and Reed, S.B., 1999, Consumer price index research series using current methods, 1978-98, *Monthly Labor Review* 122(6):29-38.