United States General Accounting Office

GAO

Report to the Ranking Minority Member, Committee on Finance U.S. Senate

February 2000

CONSUMER PRICE INDEX

Update of Boskin Commission's Estimate of Bias

GAO/GGD-00-50

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United States General Accounting Office
Washington, D.C. 20548

General Government Division

B-284299

February 1, 2000

The Honorable Daniel Patrick Moynihan
Ranking Minority Member
Committee on Finance
United States Senate

Dear Senator Moynihan:

The Consumer Price Index (CPI) is the principal measure of trends in consumer prices and inflation in the United States, according to the Bureau of Labor Statistics (BLS), which publishes the CPI.[1] The CPI significantly affects federal revenues and spending because automatic cost-of-living adjustments to federal tax brackets and many federal benefit programs are calculated based on changes in the CPI. In December 1996, the Advisory Commission to Study the CPI, which was appointed by the Senate Finance Committee, issued a report estimating that the CPI overstates changes in the cost of living by 1.1 percentage points annually. (The Advisory Commission is commonly referred to as "the Boskin Commission," after its chairman Michael J. Boskin.) The Commission's report also included the Congressional Budget Office's estimate that such an overstatement—that is, bias— in the CPI would cause a $1.07 trillion rise in the national debt by the year 2008.

This report responds to your request that we obtain an update from the five former Boskin Commission members of the Commission's estimate of the CPI bias. You asked for an updated estimate because of recent reports of changes BLS has made in the methodology for calculating the CPI.

As agreed with your office, our objectives were to

- identify the methodological changes BLS made to the CPI since December 1996, when the Boskin Commission issued its final report; and
- obtain the opinions of the five former Boskin Commission members on how much of the bias in the CPI that the Commission estimated in its December 1996 report remains after recent methodological changes to the CPI.

[1]BLS is a part of the U.S. Department of Labor.

As further agreed, we did not attempt to assess the validity of the Boskin Commission's 1996 estimate or the validity of the estimates former Commission members gave for this report.

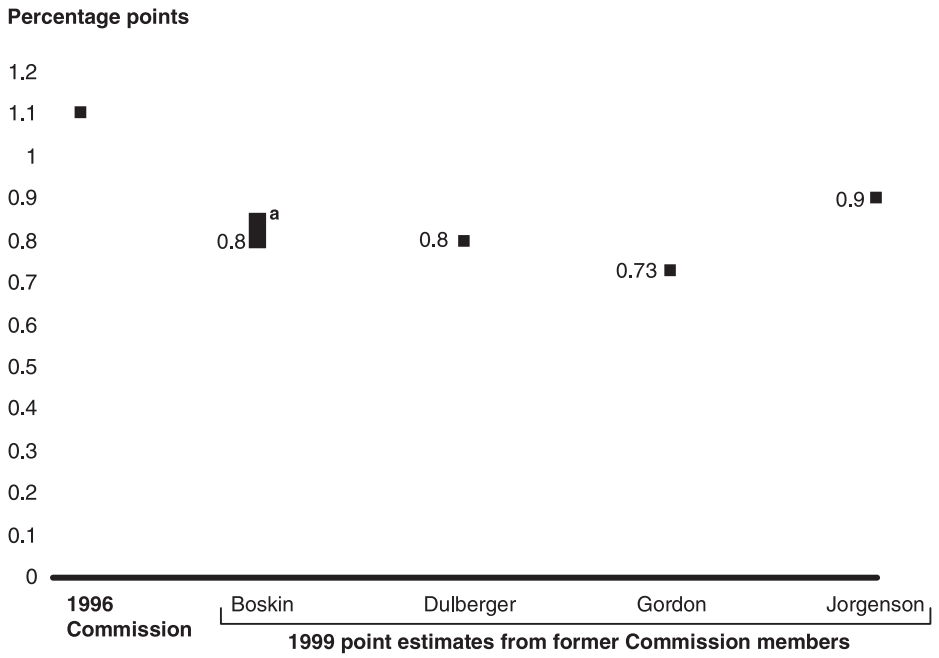
Results in Brief

Between December 1996, when the Boskin Commission issued its final report estimating that the CPI overstates the cost-of-living by 1.1 percentage points annually, and June 1999, when we began this review, BLS had made seven methodological changes that affected the calculation of the CPI. In addition, as of June 1999, BLS had announced three methodological changes that had not yet been implemented.

Four former members of the Boskin Commission—Michael J. Boskin, Ellen R. Dulberger, Robert J. Gordon, and Dale Jorgenson—responded to our questions about the extent to which recent methodological changes in the CPI have reduced its overstatement of the changes in the cost of living—that is, bias—as defined in the Commission's December 1996 report.[2] Although all four of these former Boskin Commission members said that the seven methodological changes made to the CPI have reduced some of the bias in the CPI, they had different responses regarding the extent of the remaining bias. As shown in figure 1, their point estimates of the remaining bias varied from 0.73 to 0.9 percentage points annually after taking into account those seven changes.

[2]One former Commission member, Zvi Griliches, was not able to respond to our questions due to the illness that led to his death in November 1999. We greatly appreciate the assistance Dr. Griliches gave us on various GAO reviews in the past.

Figure 1: Former Boskin Commission Members' Point Estimates for the Remaining Bias in the CPI, Considering the Seven Methodological Changes in Effect as of June 1999



[a]Dr. Boskin gave the range of 0.8 to 0.85 for his point estimate of the remaining bias because he believes the bias cannot be estimated precisely.

Source: Former Boskin Commission members' responses to GAO questions in 1999 and the Boskin Commission's December 1996 report.

The former Boskin Commission members believe that most of the remaining bias is due to what the Commission referred to as "new products/quality change bias." According to the Commission, this type of bias occurs when new products are not included in the CPI or when they are included after a long delay, which results in the CPI not capturing price decreases that often occur after a product is introduced in the marketplace. Further, according to the Commission, new products/quality change bias occurs when the CPI does not adequately measure the portion of a price increase that is due to an improvement in the quality of a product or service instead of to an increase in the cost of living.

Background

The CPI is a widely used indicator of inflation. BLS calculates the CPI each month based on a complex methodology that uses prices collected on a wide range of goods and services from outlets throughout urban areas in the United States. The CPI significantly affects the U.S. budget because automatic cost-of-living adjustments in federal income tax brackets, federal retirees' pensions, and various federal programs, such as Social Security and food stamps, are linked to changes in the CPI.

Although the CPI is used to make cost-of-living adjustments, it is not, technically, a cost-of-living index. A true cost-of-living index would measure the change in the cost of obtaining a fixed level of economic well-being or utility—something that is not clearly defined. What the CPI measures is clearly defined; it measures the change in prices of a market basket of goods and services purchased directly by urban consumers. These goods and services fall into eight major groups, including food and beverages, housing, apparel, transportation, medical care, recreation, education and communication, and other goods and services that people buy for day-to-day living. (See app. I for more background information on the CPI.)

In June 1995, out of concern that the CPI may have been inaccurately measuring cost-of-living increases, the U.S. Senate Finance Committee created the Advisory Commission to Study the Consumer Price Index. The Commission was tasked with determining how effectively the CPI measured the cost of living and inflation and recommending ways to improve the CPI. Appointed to the Commission were five economists, including Michael J. Boskin, Ellen R. Dulberger, Robert J. Gordon, Zvi Griliches, and Dale Jorgenson.

In December 1996, the Boskin Commission issued its final report,[3] which took the position that different sources of bias in the CPI methodology were causing the CPI to overestimate cost-of-living increases by approximately 1.1 percentage points per year.[4] An underlying reason for the bias, according to the Commission, was that the CPI was based on prices of a fixed market basket of goods and services of fixed quantities from a fixed set of outlets. This resulted in the CPI not taking into account how consumers substitute one item or outlet for another, that is, respond to price increases and opportunities to pay less for goods and services by changing what they purchase and where they shop.

In addition, the Commission reported that the CPI was biased because BLS did not promptly include new products in the CPI and, therefore, did not measure price changes in many new products. According to the Commission, because the price of a product often decreases after its introduction in the marketplace, delays in including new products in the

[3]Final Report of the Advisory Commission to Study the Consumer Price Index, Committee on Finance, United States Senate, December 4, 1996.

[4]The Boskin Commission issued an interim report on September 15, 1995, which estimated the CPI's overstatement of the cost of living to be 1.5 percentage points per year. However, the Commission's final report revised this estimate, in part, to take into account the effect of methodological changes that had been made to the CPI since issuance of the interim report.

CPI prevent the CPI from measuring these price decreases. Further, the Commission said that the CPI often erroneously attributed price increases to inflation instead of to quality improvements—advances in products and services that have affected peoples' lives. For example, the Commission said that the CPI was biased because it did not estimate how much of the increase in medical care costs was due to more successful surgeries and more effective drugs or the replacement of surgery with drugs. Table 1 shows the sources and estimated amounts of bias reported by the Boskin Commission.

Table 1: The Boskin Commission's December 1996 Estimates of Bias in the CPI

Sources of bias		Commission's December 1996 estimate of bias (percentage points annually)
Commission's name for bias	**Description of bias: Inability of the CPI methodology to adequately account for —**	
Upper level substitution	Consumers purchasing an item from one BLS category of goods (called an "item stratum") instead of a preferred higher priced item in a different item stratum—for example, renting a video instead of going out to see a movie.	0.15
Lower level substitution	Consumers purchasing an item different from a preferred higher priced item from the same item stratum—for example, purchasing lower priced granny smith apples instead of their normally purchased red delicious apples.	0.25
New products/quality change	Price changes in new products not included in the CPI, price decreases in products before they are included in the CPI, and changes in the quality of products.	0.60
New outlets	Consumers changing where they make purchases in order to get a better price—for example, shopping at a warehouse store instead of a department store.	0.10
Total		1.10
Plausible range		0.80 – 1.60

Source: Boskin Commission's December 1996 report and descriptions by GAO based on that report.

The Commission gave 1.1 percentage points annually as the point estimate of the bias in the CPI and reported that the plausible range for the bias was from 0.8 to 1.6 percentage points annually. The implication of the Commission's estimate is that the cost of living may have been increasing less than the CPI, decreasing when the CPI showed little or no increase, or decreasing more than the CPI when it showed a decrease.

Although the Boskin Commission's estimate of bias in the CPI was controversial, many economists agreed that the CPI probably overstated the level of inflation. However, many believed that there was insufficient data to make an estimate of bias.[5] BLS agreed with the Commission's estimate of upper level substitution bias but stated that the estimates for lower level substitution and new outlets bias may be too high. BLS expressed skepticism about the Commission's estimate of new products/quality change bias and noted that the evidence the Commission used for this estimate was sparse and that the Commission did not have a well-defined methodology for deriving its estimate. In response, the members of the Commission said that future research might find that some parts of the Commission's estimate were too high, but it might also find that other parts were too low.

Scope and Methodology

To identify all the methodological changes made to the CPI since December 1996 when the Boskin Commission issued its final report, we obtained a list of methodological changes from BLS in June 1999. BLS' list of 10 changes included all methodological changes that took effect for the CPI calculation between December 1996 and June 1999 and all methodological changes announced before June 1999 that were not yet effective. In addition, BLS provided brief descriptions of the methodological changes; reference materials; and, where available, an estimate of the effect of the changes on the CPI and/or subindexes of the CPI.

To obtain the opinions of the five former Boskin Commission members on how much of the bias in the CPI that the Commission estimated in its December 1996 report remains after recent methodological changes to the CPI, we sent the Commission members a questionnaire. The questionnaire included information provided by BLS on the 10 methodological changes made since December 1996 or announced to take effect in the future. It asked for estimates of the extent to which the Commission's estimate of bias could be reduced or increased as a result of each methodological change. In addition, for each methodological change that the former Commission members believed may have reduced or increased the bias, the questionnaire asked which source of bias may have been affected. (See app. II for a copy of the questionnaire sent to the Commission members.) We also provided the former Commission members copies of all the reference material provided by BLS.

[5]Most of the disagreement with the Boskin Commission's estimate focused on the Commission's estimate of new product/quality change bias.

Our questionnaire did not ask the former Commission members about methodological changes that took effect for the CPI calculation before December 1996 because (1) the Commission issued its final report in December 1996 and (2) its final report took into account methodological changes that had been made to the CPI since the Commission's September 1995 Interim Report.

Four former members of the Boskin Commission responded to our questionnaire. The fifth former Commission member did not respond due to illness.

We conducted follow-up telephone interviews with all the respondents to obtain clarification on their questionnaire responses where needed. Information obtained during follow-up interviews indicated that in some cases, there was some misunderstanding about the meaning of some of the questions in the questionnaire. Therefore, in some cases, our report is based on the responses to questions asked in the follow-up interviews instead of the responses to the questionnaire. Because our objective was to obtain the expert opinion of the former members of the Boskin Commission, we did not attempt to validate their responses or estimates.

We conducted our work in Washington, D.C., from June 1999 through December 1999 in accordance with generally accepted government auditing standards.

Methodological Changes to CPI Since Boskin Commission Report

Between December 1996, when the Boskin Commission issued its final report, and June 1999, when we began this review, BLS had made seven methodological changes that affected the calculation of the CPI. In addition, as of June 1999, BLS had announced three methodological changes that had not yet been implemented.[6]

In addition to the seven completed and three planned methodological changes, BLS implemented a major revision of the CPI in January 1998. BLS implements major revisions roughly every 10 years to keep the CPI current and accurate. In the 1998 major revision, as with major revisions in the past, a new market basket of goods and services was introduced into the CPI. The 1998 major revision made other changes, including changes in geographic areas from which prices are collected. Since BLS considers

[6] Our review did not cover an additional methodological change involving the adjustment of prices for audio and video products that BLS implemented in January 2000. This change had not been announced as of June 1999 when we obtained from BLS the list of methodological changes used for this review.

major revisions to be part of the established CPI methodology, it did not include the 1998 major revision in its list of methodological changes.

The seven methodological changes already completed as of June 1999 are the following:

- Changes in the Methods for Pricing of Hospital Services (hospital services pricing):[7] In January 1997, BLS redefined its categories – called "item strata" — of goods and services related to hospital services for which it collects information on price changes. For example, BLS eliminated the item strata for hospital rooms and created a new item strata for hospital services. According to BLS, it did this in order to gather data on price changes for treatments, even if aspects of the treatments had changed. For example, BLS wanted to be able to compare the price of a treatment, even if the treatment changed from being given on an inpatient basis to an outpatient basis. BLS did not provide an estimate of the annual effect of this change on the CPI.

- Adjustment of Personal Computer Prices (personal computer pricing): In January 1998, BLS implemented a new method for measuring changes in personal computer prices. The new method decomposes the price of personal computers into implicit prices for each important feature and component. According to BLS, the new method enables BLS to adjust for quality improvements in new models when it measures price increases. BLS did not estimate the annual effect of this change on the overall CPI, but it estimated that the change lowered the rate of growth in the personal computer index by approximately 6.5 percent in 1998.

- Accounting for Consumer Substitution within CPI Categories (implementation of the geometric mean estimator): In January 1999, BLS began using a new formula called the geometric mean estimator to combine the prices collected on items each month into indexes for the various item strata. (For example, apples and chicken each have their own item stratum, and BLS calculates indexes for price changes in the item strata.[8]) The geometric mean estimator replaced a formula called the arithmetic mean estimator in most item strata. The geometric mean estimator takes into account that from one period to the next consumers may change the quantity that they purchase of a particular item within an

[7]BLS announced before issuance of the Boskin Commission's December 1996 report that it planned to make this change to hospital services pricing.

[8]See appendix I for a description of how the indexes for the item strata are used to develop the CPI.

item stratum because of a change in the relative price of the item.

The item strata for which the geometric mean estimator is being used represent approximately 61 percent of the consumer spending covered by the CPI. They include all item strata in the "food and beverages," "apparel," and "other goods and services" major groups. According to BLS, the geometric mean is not being used for some item strata in the other major groups because consumers are less likely to respond to price increases in those item strata by making item substitutions and thereby changing the quantity that they purchase. Therefore, BLS is not using the geometric mean estimator in certain item strata, such as rent of primary residence, electricity, cable television, physicians' services, and eyeglasses and eye care.

BLS estimated that implementation of the geometric mean estimator will reduce the rate of growth of the CPI by approximately 0.2 percentage point per year.

- Adjustment of Television Prices (television pricing): In January 1999, BLS implemented a new method for measuring changes in television prices. The new method decomposes the price of televisions into implicit prices for each important feature and component. According to BLS, the new method enables BLS to adjust for quality improvements in new models when it measures price increases. BLS did not estimate the annual effect of this change on the overall CPI, but it estimated that the change would have lowered the rate of growth in the television index by approximately 0.1 percent per year during the period August 1993 to August 1997.

- Changes to the Treatment of Utility Refunds: In January 1999, BLS began disregarding earlier periods' utility refunds that appear in a consumer's current bill. Under the previous method for gathering prices for utilities, the refund amount was subtracted from the consumer's current bill, and the price used in the CPI calculation could have been as low as zero. BLS did not provide an estimate of the annual effect of this change on the CPI. However, according to BLS, the change will not affect the long-run rate of growth of the CPI.

- Treating Mandated Pollution Control Measures as Price Increases: In January 1999, BLS began treating price increases due to legislatively mandated modifications to goods and services for pollution control purposes as price increases. Before this change, such price increases were regarded as a change in quality and were excluded from the CPI. BLS did not provide an estimate of the annual effect of this change on the CPI.

However, according to BLS, any effect will be an increase in the CPI, and the extent of the increase will depend on what future requirements for pollution controls are implemented.

- Revision of the Housing Estimation System:[9] In January 1999, BLS implemented a new housing sample of rental units and an estimation method for homeowners' housing costs, which uses only data on rental units. Before this change, the housing sample included owner-occupied and rental units, and homeowners' housing costs were estimated from the costs experienced by renters whose units were comparable to owner-occupied units in the housing sample. BLS did not provide an estimate of the annual effect of this change on the CPI.

The three planned methodological changes that were not implemented for the CPI calculation as of June 1999 are the following:

- Change from Area- to Item-Based Rotation Procedures (sample rotation procedures):[10] BLS has changed the process for updating the samples of outlets where it selects items for price collection. The new samples are selected according to expenditure category, such as televisions and soups. The old process updated outlet and item samples by geographic area. In part because of the large number of outlets and items covered, the process of sample rotation takes several years to complete. According to BLS, the first outlets and items selected under the new sample rotation procedures were used in the CPI for October 1999.

According to BLS, this change will enable it to introduce new goods into the CPI in a more timely fashion. BLS did not provide an estimate of the annual effect of this change on the CPI.

- Reduction of the Average Age of Expenditure Weights (age of expenditure weights): According to BLS, it has begun work to enable the future implementation of a methodological change that will result in more timely information being used when the component of the CPI calculation referred to as "expenditure weights" is updated (the frequency of the updates is the subject of the methodological change discussed below). Expenditure weights are used to determine the extent to which price changes on certain goods will affect the overall CPI. Expenditure weights

[9]BLS announced before issuance of the Boskin Commission's December 1996 report that it planned to make this revision of the housing estimation system.

[10] BLS announced before issuance of the Boskin Commission's December 1996 report that it planned to make this change in sample rotation procedures.

represent, in essence, the proportion of the typical consumer's expenditures that are spent on an item or category of goods. Therefore, if ground beef had an expenditure weight of one-third of 1 percent, that would mean that according to CPI data, one-third of 1 percent of the typical consumer's expenditures are made for ground beef.

BLS is increasing the size of the sample of consumers surveyed to collect the data used to develop expenditure weights. According to BLS, this methodological change, along with system enhancements, will reduce the average age of the data for developing expenditure weights from 3-½ years to 2 years beginning with the CPI for January 2002. BLS did not provide an estimate of the annual effect of this change on the CPI.

- Increased Frequency of Expenditure Weights Updates (expenditure weights updates): Beginning with the release of the CPI for January 2002, BLS plans to update expenditure weights every 2 years. Expenditure weights have been updated roughly every 10 years when BLS implemented a major revision of the CPI. BLS did not provide an estimate of the annual effect of this change on the CPI.

Former Boskin Commission Members' Responses on Remaining Bias in the CPI

All four former Boskin Commission members said that the methodological changes had reduced some of the bias in the CPI. However, they had different responses on the extent of the remaining bias. Their responses about how the methodological changes affected the different sources of bias identified by the Commission indicated that they share the view that (1) lower level substitution bias has been greatly reduced and (2) new products/quality change bias is still the largest source of bias in the CPI.

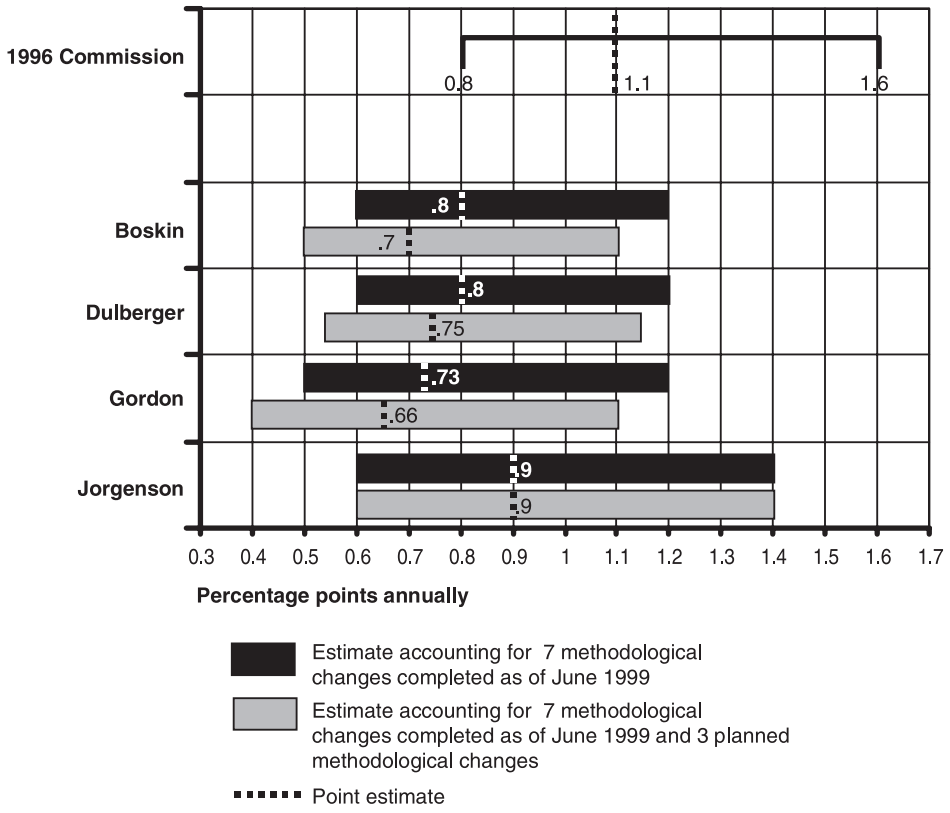
Total Remaining Bias

Of the estimates of remaining bias in the CPI, taking into consideration the seven methodological changes that were already effective as of June 1999, Dr. Jorgenson had the highest point estimate—0.9 percentage point—and the widest plausible range—from 0.6 to 1.4 percentage points. Dr. Gordon had the lowest point estimate—0.73 percentage point—and a plausible range from 0.5 to 1.2 percentage points. The point and plausible range estimates of Drs. Boskin and Dulberger fell between those of Drs. Jorgenson and Gordon.

Drs. Boskin, Dulberger, and Jorgenson all provided 0.6 percentage point as the lowest point in the plausible range for remaining bias, taking into consideration the seven methodological changes that were already effective as of June 1999. Drs. Boskin, Dulberger, and Gordon all provided 1.2 percentage points as the highest point in the plausible range. Figure 2 shows the former members' point and plausible range estimates of

remaining CPI bias taking into consideration (1) the seven methodological changes already effective as of June 1999; and (2) the combination of the seven methodological changes already effective as of June 1999 and the three planned methodological changes.

Figure 2: Former Boskin Commission Members' Point and Plausible Range Estimates of the Remaining Bias in the CPI



Note: Dr. Boskin gave a range for his point estimate for each grouping of changes because he believes the bias cannot be estimated precisely. He gave 0.8 to 0.85 as the range for his point estimate accounting for the seven completed changes and 0.7 to 0.75 as the range for his point estimate accounting for the combination of the completed and planned changes.

Source: Former Boskin Commission members' responses to GAO questions in 1999 and the Boskin Commission's December 1996 report.

Dr. Boskin said his estimates reflect his view that the remaining bias is about three-quarters of the 1.1 percentage points bias originally estimated by the Commission. Further, Dr. Boskin and Dr. Dulberger stated that they could not estimate how much reduction in bias could be attributed to some of the methodological changes. Dr. Boskin said that he did not provide a specific estimate when methodological changes likely reduced the bias by less than 0.1 percentage point. In part, to compensate for the reductions they could not provide specific estimates for, Dr. Boskin's and

Dr. Dulberger's point estimates for the remaining bias in the CPI show a greater amount of bias reduction than the total of the specific estimates they made for individual methodological changes.

Dr. Boskin said that when the Boskin Commission developed its estimate of bias, it took into account the changes BLS had announced it was planning to make. Therefore, according to Dr. Boskin, the 1.1 percentage points estimate should not be reduced as a result of the changes BLS had announced but not completed before December 1996.[11]

Dr. Gordon said that he used estimates published by the President's Council of Economic Advisers as the basis for some of his estimates of bias reduction due to individual methodological changes.[12] Dr. Gordon said that when the Boskin Commission developed its estimate of bias, it did not take into account the changes BLS had announced it was planning to make. Therefore, he believes the 1.1 percentage points estimate should be reduced as a result of some of the changes BLS had announced but not completed before December 1996. Also, unlike the estimates of the other former Commission members, Dr. Gordon's point estimate for remaining bias incorporated an amount for bias reduction that he attributed to the 1998 major revision.

Dr. Jorgenson's estimates of remaining bias take into account only the bias reduction—0.2 percentage point—due to the implementation of the geometric mean estimator. Dr. Jorgenson said that he was not willing to make estimates for individual methodological changes when BLS had not estimated how the methodological changes would affect the CPI.

Reduction in Bias Categorized by Source of Bias

As discussed in the background section, the Boskin Commission's December 1996 report attributed the bias in the CPI to four different sources. For each methodological change that the former Boskin Commission members said had or would affect the Commission's estimate of bias, we asked the former Boskin Commission members to identify the source of bias affected. We also asked them to estimate how much of the bias would be reduced or increased by the methodological changes.

[11]These changes were changes in hospital services pricing, revision of the housing estimation system, and changes in sample rotation procedures.

[12]Economic Report of the President, Transmitted to the Congress February 1999 Together with the Annual Report of the Council of Economic Advisers, U.S. Government Printing Office, 1999, p. 94.

Table 2 summarizes, by source of bias, the four former Commission members' responses about the effect of methodological changes on the bias in the CPI.

Table 2: Responses of Four Former Boskin Commission Members Regarding the Effect of 10 Methodological Changes to the CPI by Source of Bias

Source of bias	Boskin Commission's December 1996 estimate of bias (percentage point annually)	Responses of former commission members regarding amount of bias reduced by 10 methodological changes
Upper level substitution	0.15	Different responses were provided. Dr. Gordon estimated a 0.12 reduction. The others said they could not estimate the amount of reduction. Dr. Boskin indicated that the reduction would be less than 0.10, and Dr. Dulberger said the reduction would be very small.
Lower level substitution	0.25	All estimated a 0.2 reduction due to implementation of the geometric mean estimator.
New products/quality change	0.60	Different responses were provided. Dr. Gordon estimated a 0.12 reduction due to four different changes. The others said they could not estimate the amount of reduction. Drs. Boskin and Dulberger indicated the reduction would be small. All said changes in personal computer and television pricing may have affected this bias.
New outlets	0.10	All said no reduction occurred.

Source: Former Boskin Commission members' responses to GAO questions in 1999 and the Boskin Commission's December 1996 report.

Upper Level Substitution Bias

The former Boskin Commission members provided different responses about the effect of methodological changes related to upper level substitution bias. Unlike Drs. Boskin, Dulberger, and Jorgenson, Dr. Gordon stated that the Commission's 0.15 percentage point estimate for upper level substitution bias can be reduced by 0.1 due to the 1998 major revision to the CPI.[13] Dr. Gordon also said an additional 0.02 percentage point would be eliminated due to the change in expenditure weights updates planned to go into effect for the CPI calculation in January 2002. Therefore, according to Dr. Gordon, the remaining upper level substitution bias will be approximately 0.03 percentage point annually.

Drs. Boskin and Dulberger said that the planned methodological change on expenditure weights updates will reduce upper level substitution bias. Both said they could not estimate the extent of the reduction, but Dr. Boskin indicated the reduction would be less than 0.10 percentage point,

[13]Page 44 of the Boskin Commission's December 1996 report states: "The BLS is preparing for a benchmark revision in January 1998, when the CPI will incorporate new expenditure weights … However, BLS will retain the modified Laspeyres formula, so that our estimates of bias will carry over to the revised CPI."

and Dr. Dulberger said the reduction would be very small. Dr. Jorgenson said he could not estimate how the expenditure weights updates change would affect upper level substitution bias or whether the effect would be an increase or a decrease in upper level substitution bias. The former Commission members did not identify any other methodological changes that would affect upper level substitution bias.

Lower Level Substitution Bias

All four former Boskin Commission members agreed that implementation of the geometric mean estimator eliminated about 0.2 percentage point of lower level substitution bias. This indicates that only about 0.05 remains of the 0.25 percentage point of annual bias attributed to lower level substitution bias by the Boskin Commission's December 1996 report.

New Products/Quality Change Bias

The four former Boskin Commission members gave somewhat different responses regarding the details of changes related to new products/quality change bias. However, none believed that new products/quality change bias has been significantly reduced. Drs. Boskin, Dulberger, and Gordon indicated that new products/quality change bias has been slightly reduced. Dr. Jorgenson said he could not estimate the effect of any of the methodological changes related to new products/quality change bias and did not know if the changes increased or decreased new products/quality change bias.

All four former Boskin Commission members responded that methodological changes in personal computer and television pricing may have had an effect on new products/quality change bias. Dr. Gordon estimated that changes in personal computer and television pricing reduced new products/quality change bias by 0.04 and 0.02 percentage points annually, respectively. (Dr. Gordon said he based his estimate for changes in personal computer prices on an estimate made by the Council of Economic Advisers.) Drs. Boskin and Dulberger said they could not estimate the effect of these changes individually, but they indicated that the changes had slightly reduced new products/quality change bias. Dr. Jorgenson said he could not estimate the effect of the changes.

Drs. Boskin, Dulberger, and Gordon noted that BLS' estimate of the effect of the methodological change in personal computer pricing appears very low in light of other estimates of the extent to which personal computer prices have been declining. Dr. Dulberger questioned how BLS was using the results from the new methodology to adjust personal computer prices. Similarly, for the methodological change in television pricing, Drs. Boskin, Dulberger, and Gordon noted that BLS' estimate of the effect of this methodological change on the television subindex was too low. Drs.

Boskin and Gordon cited a BLS research paper that showed the change would have a much greater effect, and Dr. Dulberger stated that there looks like there may be a problem or error in BLS' estimate. In response to the former Commission members' comments, BLS stated that it made the estimates for personal computers and televisions that were included in our questionnaire by comparing the subindexes calculated without the respective methodological changes with the subindexes calculated with the methodological changes. BLS said that for these estimates, it used data from specific time periods—1998 for personal computers and August 1993 to August 1997 for televisions—and the effect of the changes may be different in other time periods.

Dr. Gordon attributed a 0.01 percentage point reduction in new products/quality change bias to the change in hospital services pricing. He based his estimate of 0.01 percentage point on estimates by the Council of Economic Advisers. Drs. Boskin, Dulberger, and Jorgenson did not attribute any reduction in bias to hospital services pricing. Drs. Boskin and Dulberger said that the Commission knew that the methodological change in hospital services pricing was about to be made and took any potential reduction of bias into account when it developed its December 1996 estimate.

Dr. Gordon said that the planned change in sample rotation procedures will reduce new products/quality change bias by about 0.05 percentage point. He based this estimate on an estimate by the Council of Economic Advisers. The other three former members did not believe this change reduced the 1.1 percentage points estimated bias. Dr. Boskin said that the Commission knew BLS planned to change its sample rotation procedures. Therefore, he said, the Commission took into account any reduction in bias that might occur due to this change when it developed its estimate of 1.1 percentage points bias.

New Outlets Substitution Bias

None of the recent methodological changes addressed outlet substitution bias, according to the former Boskin Commission members.

Agency Comments

We provided copies of a draft of this report to BLS, the Office of Management and Budget, and each of the former Boskin Commission members for their review and comment.

In a letter dated January 18, 2000, the Commissioner of BLS stated that BLS does not believe it is currently possible to produce reliable estimates of bias in the CPI. She stated that the measurement issues considered by the Boskin Commission are complex and that there is considerable

uncertainty attached to the Boskin Commission's estimates, especially those relating to new products/quality change bias. The BLS Commissioner said that BLS has been at the forefront of price measurement research and operational innovation and has introduced many important improvements in CPI methods over time. She said that BLS plans to produce an additional index beginning in 2002 that will more completely account for consumer response to relative price change. She also said that BLS will continue to develop and evaluate potential improvements to CPI methods and to implement any that can further improve the accuracy of the CPI. The BLS Commissioner's letter is reprinted in appendix III. The Office of Management and Budget did not provide any comments on this report.

In a letter dated January 13, 2000, Dr. Boskin commented about the difficulty of measuring price changes, the importance of some of the methodological changes, and the good job BLS has been doing in the last few years in improving the CPI. He said that a sizable bias remains in the CPI, which he hopes will be reduced by future improvements, but that some bias is inevitable. Further, Dr. Boskin said that making the necessary improvements in the CPI will be difficult, will require resources, but will produce benefits far exceeding their cost. Dr. Boskin's letter is reprinted in appendix IV. Dr. Dulberger provided technical comments; changes were made in the report, where appropriate.

As agreed with your office, unless you announce the contents of this report earlier, we plan no further distribution until 30 days after the date of the report. At that time, we will send copies of this report to Senator William Roth, Chairman of the Senate Committee on Finance; and Representative Bill Archer, Chairman, and Representative Charles B. Rangel, Ranking Minority Member, House Committee on Ways and Means. We will also send copies to the Honorable Jacob J. Lew, Director of the Office of Management and Budget; the Honorable Alexis Herman, Secretary of Labor; the Honorable Katharine G. Abraham, Commissioner of BLS; and other interested parties. We will also make this report available to others on request.

If you have any questions regarding this report, please contact me or Kathy Peyman at 202-512-8676. Key contributors to this assignment were Kathleen Scholl and Martin de Alteriis.

Sincerely yours,

Nancy R. Kingsbury
Acting Assistant Comptroller General

Contents

Abbreviations

BLS	Bureau of Labor Statistics
CEX	Consumer Expenditure Survey
CPI	Consumer Price Index
CPI-U	Consumer Price Index for All Urban Consumers
CPI-W	Consumer Price Index for Urban Wage Earners and Clerical Workers

Background Information on the Consumer Price Index

The Bureau of Labor Statistics (BLS) produces the Consumer Price Index (CPI) by measuring the average change over time in the prices paid by urban consumers for a market basket of consumer goods and services. The selection of items for the market basket is determined from detailed records of purchases made by thousands of individuals and families, as reported on periodic surveys. The items selected for the market basket, such as potatoes, are to be priced each month at specific retail outlets, such as grocery stores and supermarkets, in urban areas throughout the country. According to BLS, in 1999, price takers collected the prices of about 96,000 items (goods and services) in 87 urban areas of the country. These prices were collected from about 30,000 retail and service establishments and from about 27,000 landlords and tenants, who provided data on housing units.

The CPI is used as a measure of price changes to make economic decisions in the private and public sectors. According to BLS, the CPI has three major uses:

Economic indicator of inflation: The administration, Congress, and the Federal Reserve use trends in the CPI as an aid to formulating fiscal and monetary policies. Business and labor leaders as well as private citizens use the CPI as a guide to making economic decisions.

Escalator for wages, benefit payments, and tax brackets: Collective bargaining units use the CPI to adjust the wages of workers. Also, it is the basis for automatic changes in some federal benefit payments. For example, in December 1998, as a result of changes in the CPI, payments to 44 million Social Security beneficiaries and 6.6 million Supplemental Security Income recipients were adjusted for inflation. The benefits of approximately 18 million food stamp recipients in 1999 were affected by changes in the CPI. Payments to millions of railroad, military, and federal civilian retirees and survivors are also affected by changes in the CPI. The CPI is also used to adjust key elements of the individual income tax to limit the extent to which individuals must pay higher taxes solely because of inflation. For example, the amount allowed for personal exemption, the amount of the standard deduction, and tax brackets are adjusted annually according to changes in the CPI.

Deflator of selected economic statistical data series: The CPI is used to adjust selected economic statistical series for price changes and to translate these series into inflation-free dollars. Examples of data series that are adjusted by the CPI include retail sales, hourly and weekly earnings, and components of the National Income and Product Accounts.

The CPI was initiated during World War I, when rapid increases in the prices of goods and services, particularly in shipbuilding centers where workers were demanding wage adjustments, made such an index essential for calculating cost-of-living adjustments. In 1921, BLS began regular publication of an index representing the expenditures of urban wage and clerical workers, which was then called the Cost-of-Living Index. The name of the index was changed to the CPI following controversy during World War II over the index's validity as a measure of the cost of living. According to BLS, the CPI has always been a measure of the changes in prices for goods and services purchased for family living.[1]

Major revisions have been made to the CPI about once each decade to update the market basket, with the most recent revision occurring in January 1998. Because consumers' buying habits change, new studies were made of what goods and services consumers were purchasing; and major revisions to the CPI were made in 1940, 1953, 1964, 1978, and 1987 as well as 1998. In the 1978 major revision, BLS began publication of a new index for all urban consumers—the CPI-U. According to BLS, the CPI-U, which represents the expenditures of about 87 percent of the population, takes into account the buying patterns of professional employees, part-time workers, the self-employed, the unemployed, and retired people as well as those previously covered in the CPI. BLS has continued publication of the older index, the CPI-W, which represents the expenditures of urban wage and clerical workers or about 32 percent of the population.

Construction of the CPI

BLS begins construction of the CPI by selecting a collection of goods and services usually bought by urban consumers. The collection of goods and services, called items, is known as the market basket. The CPI market basket is developed from detailed expenditure information that is provided by thousands of families and individuals who participate in the Consumer Expenditure Survey (CEX), which is conducted for BLS by the Bureau of the Census over several years. For example, the 1998 CPI revision was based on CEX data collected from 1993 through 1995, from about 36,000 individuals and families. BLS uses expenditure data from the CEX to select the categories of items from which it selects specific, unique commodity and service items to be priced for the CPI.

[1] According to BLS, it has used a cost-of-living conceptual framework in making decisions about constructing the CPI. A cost-of-living index would measure changes over time in the amount that consumers need to spend to reach a certain utility level or standard of living. According to BLS, a complete cost-of-living index would go beyond the items included in the CPI's market basket and take into account other governmental or environmental factors, such as crime and water quality, that affect consumers' well-being.

BLS measures price changes each month by checking the prices of the items in the market basket and then comparing the aggregate costs of the market basket with those for the previous month. BLS price takers obtain prices for most of the items by visiting or contacting thousands of retailers, service providers, and landlords and tenants each month.

Classification of Market Basket Items

BLS classified all CEX expenditure items into 211 item strata, which are arranged into eight major groups: (1) food and beverages; (2) housing; (3) apparel; (4) transportation; (5) medical care; (6) recreation; (7) education and communication; and (8) other goods and services, such as haircuts and tobacco smoking products. Taxes that are directly associated with the prices of specific goods and services, such as sales and excise taxes, are also included.[2]

Expenditure Weights of Market Basket Items

Expenditure weights are used to give proportionate emphasis for price changes of one item in relation to other items in the CPI. Expenditure weights allow the CPI to distinguish between items that have a major impact on consumers and to provide appropriate emphases to price changes associated with these items. For example, if ground beef were assigned a weight representing about one-third of 1 percent of the expenditures of the typical urban consumer; and if beef steaks, such as sirloin and rib steaks, were assigned a smaller weight representing about one-tenth of 1 percent, then the price changes of ground beef would have about 3 times as much impact on the overall CPI as similar price changes for beef steaks.

Weights derived from consumers' expenditures, as reported in the CEX, are assigned to the 211 item strata. To compute the weights, BLS first totals the amount spent on an item stratum, such as white bread, during the base weighting period by CEX respondents, whom BLS refers to as consumer units.[3] BLS then divides that total by the number of consumer units, which results in an average expenditure per unit. Next, the average expenditures per unit are weighted with data from the Decennial Census to represent the U.S. urban population. To do so, the average expenditures per unit are multiplied by certain factors to represent the geographic

[2]The CPI includes various governmental-charged user fees, such as water and sewerage charges, auto registration fees, and vehicle tolls. Taxes not directly associated with the purchase of consumer goods and services, such as income and Social Security taxes, are excluded. In addition, the CPI does not include investment items, such as stocks, bonds, real estate, and life insurance, because they relate to savings, not daily living expenses.

[3]The CEX collects data from "consumer units," which are defined by BLS as either financially independent, unrelated individuals or groups of individuals who pool their resources to make joint consumption decisions.

dispersion of the urban population. Finally, these nationwide urban expenditures on the market basket items are totaled into an aggregate amount. The 211 expenditure weights are the percentages of this aggregate amount that are spent on each of the 211 item strata (e.g., white bread).

Expenditure weights remain fixed until the next major revision of the CPI and serve as a benchmark from which price comparisons are calculated. The weights of the components for the 1998 major revision are those derived from the 1993 through 1995 CEX.

Collecting Prices of Market Basket Items

Each month, BLS price takers visit or call thousands of retail stores, service establishments, rental units, and doctors' offices all over the United States. Each month, they record the prices of about 80,000 items.[4]

To determine which retail outlets its price takers should visit to obtain monthly price quotations for nonrent items, BLS sponsors the continuing Point-of-Purchase Survey (POPS), which is conducted by the Bureau of the Census. The survey respondents are asked if they purchased any items in an expenditure category of items, such as televisions and soups, and, if so, the names of all the outlets where they made their purchases. BLS uses the results from the survey to select outlets from which to collect prices on items to be included in the CPI market basket.

BLS price takers visit each selected retail outlet to initially select items that will be priced either monthly or bimonthly. For each outlet, categories of items are selected for pricing. Using probability selection methods that are based on revenues and volume information that is provided by the retail outlet, BLS price takers use a table of random numbers to select for pricing a unique item within the specified categories.

BLS collects rent prices for rental units in a different manner from that used to identify and price other items in the market basket. BLS uses monthly price changes of rental units in the CPI housing survey for the residential rent and homeowners' equivalent rent items in the CPI housing component.[5] Residential rent and homeowners' equivalent rent are estimated from approximately 27,000 rented units. Each month, BLS price takers obtain information from rental units on the rent for the current month, the previous month, and the services that the landlord provides.

[4]Prices are not collected monthly on all items in the CPI. Some are collected bimonthly, and rent information is collected every 6 months for housing units.

[5]BLS determines the value of owner-occupied housing by using a rental equivalent method, which estimates the amount of rent that would be paid if the owner-occupied housing were rented.

These data are used to measure changes in rent prices for residential rent as well as homeowners' equivalent rent.

Replacement of Market Basket Items No Longer Available for Pricing

BLS price takers attempt to collect price information for the same item (e.g., 1 dozen pink carnations, with greenery, wrapped in paper, and not delivered) as during their previous visit to the retail outlet or rental unit. However, in many instances, an identical item is not available for purchase in each subsequent visit. In these situations, price takers are to follow certain procedures to make a substitution—selection of a new version (replacement) that is similar to the old version of the item that is no longer available.[6]

In selecting a substitution the price takers are to follow specific guidance for choosing the new version. In general, the price taker is to select the item with specifications most consistent with the old version.[7] After the price taker selects a new version and records the information about the item, the information is sent to BLS headquarters in Washington, D.C., where it is coded, entered into computer systems, verified, and examined by commodity analysts.

Adjustments by Commodity Analysts

Commodity analysts review the information collected by the price takers to determine if the original item and its substitution are comparable. Generally, when the two items are considered comparable, the difference between the prices of the items is used in the calculation of the CPI. However, if the commodity analysts find dissimilarities between the original item and its substitution, they may make a price adjustment to account for the dissimilarities. The adjustments are made to avoid counting in the CPI (as inflation or deflation) any price changes due to a difference in the quality, size, or quantity of the original item and its substitute.

Commodity analysts make two types of adjustments—direct and indirect. Analysts make direct adjustments when they have data on the ways the original and substitution items differ and have information with which to assess the value of those differences. To make these adjustments, the analysts use the specific cost of a quality change that can be estimated either by the manufacturers of the items or by the use of statistical models,

[6]Price takers in the CPI housing survey return to the same address in each collection period and record information about the residential unit at that address. Substitutions do not take place between residential units as they do elsewhere in the CPI. However, adjustments are made to make the current unit similar to what it was at the prior price collection.

[7]BLS has different procedures for the price takers to follow to bring into the CPI new products or services from the POPS that are not substitutions for items that are in the market basket.

which BLS calls hedonic regressions. Direct adjustments are also made when an item's size or quantity changes.

Indirect adjustments are made when the commodity analysts do not have sufficient data to make direct adjustments. Indirect adjustments impute the pure price change from the original item to its substitution by averaging the rates of price changes experienced by the same type of items in the CPI.[8]

Calculating the index

Following the review and adjustment of individual prices by the commodity analysts, the prices are aggregated into lower level indexes, such as "funeral expenses." Then the lower level indexes are aggregated into higher level indexes, such as the overall "all-items" indexes for the CPI-U and CPI-W. To aggregate the prices, BLS uses the geometric mean and the Laspeyres arithmetic mean formulas. Basically, a number of lower level indexes are calculated from price data, and these indexes are then combined to form higher level indexes.

Lower level indexes

Each month BLS calculates approximately 7,000 monthly lower level indexes that BLS refers to as item stratum indexes.[9] These indexes measure the price change for a single item stratum in a geographic area, such as watches in St. Louis, or dental services in Pittsburgh. Most of the lower level indexes are calculated with the geometric means formula. The rest of the lower level indexes are constructed with the Laspeyres arithmetic mean formula. The weights used in the lower level index calculations come from the continuing POPS.

BLS uses the geometric mean formula in lower level indexes that represent approximately 61 percent of total consumer spending. In contrast to the arithmetic mean formula that uses fixed (constant over time) quantity weights, the geometric mean formula employs a set of fixed expenditure proportions as weights in the calculation. This difference recognizes that consumers alter the quantities of goods or services within the lower-level index. For example, the geometric mean is used to calculate the "ice cream and related products" lower level index to allow for the changes in purchases that consumers make when the price of ice cream increases (or decreases) in relation to the price of frozen yogurt. The geometric mean

[8] For additional information about how commodity analysts decide whether to make adjustments and the adjustment methods they use, see our report, Consumer Price Index: Impact of Commodity Analysts' Decicionmaking Needs to Be Assessed (GAO/GGD-99-84, June 15, 1999).

[9] Lower level indexes are calculated for each of BLS' 186 priced item strata in each of 38 geographic regions. Including unpriced item strata, there are a total of 8,018 lower level indexes.

formula also treats price increases and decreases symmetrically so that if a price increases one month and then decreases by the same amount the next month, the index will essentially be at the same level as it was before the price initially increased.

Generally, the Laspeyres arithmetic mean formula is used in lower level indexes in the categories of shelter services, utilities and government charges, and medical services. These are the categories in which, according to BLS, consumers have a limited ability to make substitutions in their purchases. For example, for utilities and government charges, consumers would have to move to different localities to change their purchases because these services are provided by regulated monopolies or local governments.

Higher level indexes

The Laspeyres formula uses lower level index numbers and fixed-quantity weights to calculate various higher level indexes. These higher level indexes are weighted averages of various subsets of the lower level indexes, or, in the case of the U.S. city average all-items index, a weighted average of all 8,018 lower level indexes. Examples of higher level indexes include those for regions, such as the south or midwest; and indexes for expenditure categories, such as footwear or bakery products. The weights in calculations of the higher level indexes are the quantities of the goods and services that were purchased at the time the CPI market basket was established, which are the quantities purchased by urban consumers from 1993 through 1995. The resulting index numbers can be compared over time to indicate how much more (or less) it costs consumers to purchase the items in that index.

Questionnaire Sent to the Former Members of the Boskin Commission

GAO U.S. General Accounting Office

Survey of Former Members of the Advisory Commission to Study the CPI

INSTRUCTIONS

On the following pages are brief descriptions of 10 methodological changes to the Consumer Price Index (CPI) that, according to the Bureau of Labor Statistics (BLS), were made or announced between December 1996 and June 10, 1999. Also included for each change is the date the change became effective for the CPI calculation, the citations for reference material from BLS, and, when available, an estimate from BLS of the annual effect of the change on the CPI. Following the descriptions are questions about how the December 1996 estimate of the Advisory Commission to Study the Consumer Price Index can be adjusted to account for the methodological changes.

BLS had announced the methodological changes, which are numbered 1, 7 and 8, before the Commission issued its December 1996 report. For each of those changes, a question is included about whether BLS' announced change affected the Commission's estimate of bias. If the Commission adjusted its estimate of bias because it expected BLS to make any of the other methodological changes, please note this in the appropriate comment section(s). The questions for changes 8, 9, and 10, which are not yet effective for the CPI calculation, are somewhat different from the questions for the other changes. Also, the last page includes two summary questions.

Please review the descriptions and related information and respond to the questions following each description and the two summary questions on the last page. You may either return the completed questionnaire in the accompanying envelope, fax your responses to Kathy Peyman at fax (202) 512-4516, or provide your answers over the telephone to Kathy Peyman at (202) 512-9536 or Kathleen Scholl at (202) 512-7262. We would appreciate receiving your responses by August 30, 1999. If we do not hear from you by then, we will call you during the week of August 30 – September 3 to obtain your responses.

If you have any questions, please call Kathy Peyman on (202) 512-9536 or Kathleen Scholl on (202) 512-7262.

1. Changes in the Methods for Pricing of Hospital Services

Date change became effective for CPI calculation: January 1997 (Note: This change was announced before issuance of the December 1996 report of the Advisory Commission to Study the Consumer Price Index.)

Description of change:
The hospital services item strata were reclassified to reflect shifts in the mix and importance of medical treatments. According to BLS, the items for which prices are collected were redefined to improve the capacity to reflect changes in the costs associated with how treatments are delivered, regardless of where they are given within the hospital. According to BLS, the change also will increase the sample representation of third-party payment rates.

BLS estimate of annual effect of change on CPI: No estimate.

Reference material:
"Changing the Hospital and Related Services Component of the Consumer Price Index," CPI Detailed Report, June 1996, pp. 7-8.
Elaine M. Cardenas, "Revision of the CPI Hospital Services Component," Monthly Labor Review, December 1996, pp. 40-48.

Questions:

1.a. Did the methodology that BLS previously used for pricing of hospital and related services contribute to the Commission's estimate of bias in the CPI of 1.1 percentage points annually?

[ ] Yes ➜ Go to question 1.c. [ ] No ➜ Go to question 1.b.

1.b. If no, was this because BLS had already announced that it was changing the methodology?

[ ] Yes ➜ Go to question 1.e. [ ] No ➜ Go to question 1.e.

1.c. If yes in 1.a., what category of bias in the Commission's estimate did the methodology contribute to? *(Check only one.)*

[ ] Upper level substitution (estimated bias: 0.15 percentage points)
[ ] Lower level substitution (estimated bias: 0.25 percentage points)
[ ] New products/quality change (estimated bias: 0.60 percentage points)
[ ] New outlets (estimated bias: 0.10 percentage points)

1.d. If yes in 1.a., by how much, can the Commission's estimate of 1.1 percentage points of annual bias be reduced (-) or increased (+) as a result of the change?

-_____ percentage point(s) per year [ ] No change

OR

+_____ percentage point(s) per year [ ] Cannot estimate amount of change

1.e. What other comments, if any, would you like to make about this change?

2. Adjustment of Personal Computer Prices

Date change became effective for CPI calculation: January 1998

Description of change:
BLS implemented a regression procedure that decomposes the price of personal computers into implicit prices for each important feature and component of the computer. This regression model provides an estimate of the value of each of the significant features and components of the computers for which prices are collected. The model allows the capture of price change that may occur as new models replace old ones in the market place without counting the value of quality improvements as price increases.

BLS estimate of annual effect of change on CPI: No estimate has been made of the future impact of the change on the overall CPI. However, BLS analysis indicates that the change lowered the personal computer index by approximately 6.5 percent in 1998.

Reference material:
"Using a Hedonic Model in the Consumer Price Index to Adjust Personal Computer Prices for Changes in Quality," CPI Detailed Report, June 1997, p. 18.
Kenneth J. Stewart and Stephen B. Reed, "Consumer Price Index Research Series Using Current Methods, 1978-98," Monthly Labor Review, June 1999, p. 32.

Questions:

2.a. Did the methodology that BLS previously used for adjusting the prices of personal computers contribute to the Commission's estimate of bias in the CPI of 1.1 percentage points annually?

[ ] Yes ➜ Go to question 2.b. [ ] No ➜ Go to question 2.d.

2.b. If yes in 2.a., what category of bias in the Commission's estimate did the methodology contribute to? *(Check only one.)*

[ ] Upper level substitution (estimated bias: 0.15 percentage points)
[ ] Lower level substitution (estimated bias: 0.25 percentage points)
[ ] New products/quality change (estimated bias: 0.60 percentage points)
[ ] New outlets (estimated bias: 0.10 percentage points)

2.c. If yes in 2.a., by how much, can the Commission's estimate of 1.1 percentage points of annual bias be reduced (-) or increased (+) as a result of the change?

- _____ percentage point(s) per year [ ] No change

OR

+_____ percentage point(s) per year [ ] Cannot estimate amount of change

2.d. What other comments, if any, would you like to make about this change?

3. Accounting for Consumer Substitution Within CPI Categories

Date change became effective for CPI calculation: January 1999

Description of change:
BLS introduced a new formula for calculating the basic components of the CPI. The new formula, the geometric mean estimator, is used in index categories that comprise approximately 61 percent of total consumer spending represented by the CPI-U. The remaining index categories continue to be calculated using an arithmetic mean. A geometric mean provides a method of accounting for the effect of consumer responses to changes in relative prices among items within a category, such as apples or new vehicles.

BLS estimate of annual effect of change on CPI: Reduces the annual change in the all items CPI-U by approximately 0.2 percentage point per year.

Reference material:
"Planned Change in the Consumer Price Index Formula," CPI Detailed Report, April 1998, pp. 6-8.
Kenneth V. Dalton, John S. Greenlees, and Kenneth J. Stewart, " Incorporating a Geometric Mean Formula Into the CPI," Monthly Labor Review, October 1998, pp. 3-7.

Questions:

3.a. Did the arithmetic mean methodology that BLS previously used contribute to the Commission's estimate of bias in the CPI of 1.1 percentage points annually?

[ ] Yes ➜ Go to question 3.b. [ ] No ➜ Go to question 3.d.

3.b. If yes in 3.a., what category of bias in the Commission's estimate did the methodology contribute to? *(Check only one.)*

[ ] Upper level substitution (estimated bias: 0.15 percentage points)
[ ] Lower level substitution (estimated bias: 0.25 percentage points)
[ ] New products/quality change (estimated bias: 0.60 percentage points)
[ ] New outlets (estimated bias: 0.10 percentage points)

3.c. If yes in 3.a., by how much, can the Commission's estimate of 1.1 percentage points of annual bias be reduced (-) or increased (+) as a result of the change?

- _____ percentage point(s) per year **OR** [ ] No change

+_____ percentage point(s) per year [ ] Cannot estimate amount of change

3.d. What other comments, if any, would you like to make about this change?

4. Adjustment of Television Prices

Date change became effective for CPI calculation: January 1999

Description of change:
BLS implemented a regression procedure that decomposes the price of television sets into implicit prices for each important feature and component. This regression model provides an estimate of the value of each of the significant features and components of the sets for which prices are collected. The model allows the capture of price change that may occur as new models replace old ones in the market place without counting the value of quality improvements as price increases.

BLS estimate of annual effect of change on CPI: No estimate has been made of the future impact of the change on the overall CPI. However, BLS analysis found that when the change was applied to television data for the period between August 1993 and August 1997, the change lowered the television index for that period by approximately 0.1 percent per year.

Reference material:
"Using a Hedonic Model to Adjust Television Prices in the Consumer Price Index for Changes in Quality," CPI Detailed Report, June 1998, p. 5.
Kenneth J. Stewart and Stephen B. Reed, "Consumer Price Index Research Series Using Current Methods, 1978-98," Monthly Labor Review, June 1999, p. 32.

Questions:

4.a. Did the methodology that BLS previously used for adjusting television prices contribute to the Commission's estimate of bias in the CPI of 1.1 percentage points annually?

[ ] Yes ➜ Go to question 4.b. [ ] No ➜ Go to question 4.d.

4.b. If yes in 4.a., what category of bias in the Commission's estimate did the methodology contribute to? *(Check only one.)*

[ ] Upper level substitution (estimated bias: 0.15 percentage points)
[ ] Lower level substitution (estimated bias: 0.25 percentage points)
[ ] New products/quality change (estimated bias: 0.60 percentage points)
[ ] New outlets (estimated bias: 0.10 percentage points)

4.c. If yes in 4.a., by how much, can the Commission's estimate of 1.1 percentage points of annual bias be reduced (-) or increased (+) as a result of the change?

- _____ percentage point(s) per year
OR
+_____ percentage point(s) per year

[ ] No change
[ ] Cannot estimate amount of change

4.d. What other comments, if any, would you like to make about this change?

5. Changes to the Treatment of Utility Refunds

Date change became effective for CPI calculation: January 1999

Description of change:
BLS changed its treatment of refunds for electricity, natural gas, or other utility services when the refunds are based on earlier periods' utility consumption amounts. Under the new procedure, the CPI will disregard any refund for past excess charges when it appears on residential customer bills as a separate refund credit that is subtracted from the charges for the current billing period's usage. The movement of the CPI utility indexes will reflect all changes in rates—generally in the month they are effective. The CPI utility indexes will continue to reflect current period credits that are based on current period consumption, such as those associated with purchased gas or fuel.

BLS estimate of annual effect of change on CPI: No estimate. According to BLS, the change will not affect the long-run rate of growth of the CPI.

Reference material:
"Improvements to CPI Procedures for Handling Utility Refunds," CPI Detailed Report, July 1998, p. 5.

Questions:

5.a. Did the methodology that BLS previously used to handle utility refunds contribute to the Commission's estimate of bias in the CPI of 1.1 percentage points annually?

[ ] Yes ➜ Go to question 5.b. [ ] No ➜ Go to question 5.d.

5.b. If yes in 5.a., what category of bias in the Commission's estimate did the methodology contribute to? *(Check only one.)*

[ ] Upper level substitution (estimated bias: 0.15 percentage points)
[ ] Lower level substitution (estimated bias: 0.25 percentage points)
[ ] New products/quality change (estimated bias: 0.60 percentage points)
[ ] New outlets (estimated bias: 0.10 percentage points)

5.c. If yes in 5.a., by how much, can the Commission's estimate of 1.1 percentage points of annual bias be reduced (-) or increased (+) as a result of the change?

- _____ percentage point(s) per year

OR

+_____ percentage point(s) per year

[ ] No change

[ ] Cannot estimate amount of change

5.d. What other comments, if any, would you like to make about this change?

6. Treating Mandated Pollution Control Measures as Price Increases

Date change became effective for CPI calculation: January 1999

Description of change:
Modifications to goods and services made solely for the purpose of meeting air pollution standards that do not otherwise provide direct value to consumer are no longer treated as quality improvements in the CPI. Price increases associated with such modifications are reflected as increases in the index.

BLS estimate of annual effect of change on CPI: No estimate. According to BLS, any effect will be an increase in the CPI and the extent of the increase will depend on what future requirements for pollution controls are implemented.

Reference material:
Dennis Fixler, "Treatment of Mandated Pollution Control Measures in the CPI," CPI Detailed Report, September 1998, pp. 4-7.

Questions:

6.a. Did the methodology that BLS previously used, which treated mandated pollution control measures as quality improvements, contribute to the Commission's estimate of bias in the CPI of 1.1 percentage points annually?

[ ] Yes ➜ Go to question 6.b. [ ] No ➜ Go to question 6.d.

6.b. If yes in 6.a., what category of bias in the Commission's estimate did the methodology contribute to? *(Check only one.)*

[ ] Upper level substitution (estimated bias: 0.15 percentage points)
[ ] Lower level substitution (estimated bias: 0.25 percentage points)
[ ] New products/quality change (estimated bias: 0.60 percentage points)
[ ] New outlets (estimated bias: 0.10 percentage points)

6.c. If yes in 6.a., by how much, can the Commission's estimate of 1.1 percentage points of annual bias be reduced (-) or increased (+) as a result of the change?

- _____ percentage point(s) per year [ ] No change

OR

+_____ percentage point(s) per year [ ] Cannot estimate amount of change

6.d. What other comments, if any, would you like to make about this change?

7. Revision of the Housing Estimation System

Date change became effective for CPI calculation: January 1999 (Note: This change was announced before issuance of the December 1996 report of the Advisory Commission to Study the Consumer Price Index.)

Description of change:
BLS implemented the housing portion of the multiyear CPI major revision process. These changes were directed at the major shelter indexes, "rent of primary residence" and "owners' equivalent rent of primary residence". In addition to introducing a new housing unit sample based on the 1990 Decennial Census, the CPI shifted to a different estimation method for homeowner shelter costs. According to BLS, the new estimation method is an improvement over the prior method.

BLS estimate of annual effect of change on CPI: No estimate.

Reference material:
"Revisions of the CPI Housing Sample and Estimation Process," CPI Detailed Report, October 1998, p. 4.
Frank Ptacek and Robert M. Baskin, "Revision of the CPI Housing Sample and Estimators," Monthly Labor Review, December 1996, pp. 31-39.

Questions:

7.a. Did the methodology that BLS previously used for the housing estimation system contribute to the Commission's estimate of bias in the CPI of 1.1 percentage points annually?

[ ] Yes ➜ Go to question 7.c. [ ] No ➜ Go to question 7.b.

7.b. If no, was this because BLS had already announced that it was changing the methodology?

[ ] Yes ➜ Go to question 7.e. [ ] No ➜ Go to question 7.e.

7.c. If yes in 7.a., what category of bias in the Commission's estimate did the methodology contribute to? *(Check only one.)*

[ ] Upper level substitution (estimated bias: 0.15 percentage points)
[ ] Lower level substitution (estimated bias: 0.25 percentage points)
[ ] New products/quality change (estimated bias: 0.60 percentage points)
[ ] New outlets (estimated bias: 0.10 percentage points)

7.d. If yes in 7.a., by how much, can the Commission's estimate of 1.1 percentage points of annual bias be reduced (-) or increased (+) as a result of the change?

- _____ percentage point(s) per year [ ] No change

OR

+_____ percentage point(s) per year [ ] Cannot estimate amount of change

7.e. What other comments, if any, would you like to make about this change?

8. Change from Area- to Item-Based Sample Rotation Procedures

Date change became effective for CPI calculation: Not effective. (Note: This change was announced before issuance of the December 1996 report of the Advisory Commission to Study the Consumer Price Index.)

Description of change:
As part of the multiyear CPI major revision process, BLS plans to change how it updates the sample of outlets and items associated with the continuing Point-of-Purchase survey. Rotation will be made by expenditure category rather than by geographic area. Some items and outlets will be reselected in every geographic area each quarter. According to BLS, this will enable new goods to be introduced into the CPI in a more timely fashion.

BLS estimate of annual effect of change on CPI: No estimate.

Reference material:
Robert Cage, "New Methodology for Selecting CPI Outlet Samples," Monthly Labor Review, December 1996, pp. 49-61. The article was also reprinted in CPI Detailed Report, July 1997, pp. 5-17.

Questions:

8.a. Did the methodology for sample rotation that BLS is replacing contribute to the Commission's estimate of bias in the CPI of 1.1 percentage points annually?

[ ] Yes ➜ Go to question 8.c. [ ] No ➜ Go to question 8.b.

8.b. If no, was this because BLS had already announced that it was changing the methodology?

[ ] Yes ➜ Go to question 8.e. [ ] No ➜ Go to question 8.e.

8.c. If yes in 8.a., what category of bias in the Commission's estimate did the methodology contribute to? *(Check only one.)*

[ ] Upper level substitution (estimated bias: 0.15 percentage points)
[ ] Lower level substitution (estimated bias: 0.25 percentage points)
[ ] New products/quality change (estimated bias: 0.60 percentage points)
[ ] New outlets (estimated bias: 0.10 percentage points)

8.d. If yes in 8.a., by how much, can the Commission's estimate of 1.1 percentage points of annual bias be reduced (-) or increased (+) as a result of the change?

- _____ percentage point(s) per year [ ] No change

OR

+_____ percentage point(s) per year [ ] Cannot estimate amount of change

8.e. What other comments, if any, would you like to make about this change?

9. Reduction of the Average Age of Expenditure Weights

Date change became effective for CPI calculation: Not effective.

Description of change:

Beginning in 1999 the sample size for the Consumer Expenditure Survey was increased such that only 2 years of data, rather than 3, will be required to update the consumer expenditure weights in the CPI. Also, the computer processing system for weight updates is being changed, so that new expenditure weights can be incorporated into the CPI one year after the end of the reference period. According to BLS, these two changes will reduce the average age of expenditure weights when they are first used in the CPI from 3 ½ years to 2 years.

BLS estimate of annual effect of change on CPI: No estimate.

Reference material:
None

Questions:

9.a. Did the methodology that BLS is replacing to reduce the average age of expenditure weights contribute to the Commission's estimate of bias in the CPI of 1.1 percentage points annually?

[ ] Yes ➜ Go to question 9.b. [ ] No ➜ Go to question 9.d.

9.b. If yes in 9.a., what category of bias in the Commission's estimate did the methodology contribute to? *(Check only one.)*

[ ] Upper level substitution (estimated bias: 0.15 percentage points)
[ ] Lower level substitution (estimated bias: 0.25 percentage points)
[ ] New products/quality change (estimated bias: 0.60 percentage points)
[ ] New outlets (estimated bias: 0.10 percentage points)

9.c. If yes in 9.a., by how much, can the Commission's estimate of 1.1 percentage points of annual bias be reduced (-) or increased (+) as a result of the change?

- _____ percentage point(s) per year [ ] No change

OR

+_____ percentage point(s) per year [ ] Cannot estimate amount of change

9.d. What other comments, if any, would you like to make about this change?

10. Increased Frequency of Expenditure Weights Updates

Date change became effective for CPI calculation: Not effective.

Description of change:

BLS plans to update expenditure weights at 2-year intervals, rather than roughly every 10 years as had been the past practice. CPI expenditure weights will be updated to the 1999 through 2000 period effective with release of CPI data for January 2002, to the 2001 through 2002 period effective with the data for January 2004, and so on. Taken together with the planned acceleration of expenditure weight updates, BLS reports that expenditure weight data will be, on average, 2 years old when introduced into the CPI and 4 years old when replaced. By contrast, the current 1993 through 1995 expenditure weights were, on average 3 ½ years old when first introduced in January 1998, and they replaced weights were about 15 years old.

BLS estimate of annual effect of change on CPI: No estimate.

Reference material:
"Scheduled Updates for Expenditure Weights in the Consumer Price Index," CPI Detailed Report, February 1999, pp. 5-6.

Questions:

10.a. Did the frequency of expenditure weights updates that BLS previously used contribute to the Commission's estimate of bias in the CPI of 1.1 percentage points annually?

[ ] Yes ➜ Go to question 10.b. [ ] No ➜ Go to question 10.d.

10.b. If yes in 10.a., what category of bias in the Commission's estimate did the methodology contribute to? *(Check only one.)*

[ ] Upper level substitution (estimated bias: 0.15 percentage points)
[ ] Lower level substitution (estimated bias: 0.25 percentage points)
[ ] New products/quality change (estimated bias: 0.60 percentage points)
[ ] New outlets (estimated bias: 0.10 percentage points)

10.c. If yes in 10.a., by how much, can the Commission's estimate of 1.1 percentage points of annual bias be reduced (-) or increased (+) as a result of the change?

- _____ percentage point(s) per year [ ] No change

OR

+_____ percentage point(s) per year [ ] Cannot estimate amount of change

10.d. What other comments, if any, would you like to make about this change?

Summary Questions

The Commission's December 1996 report estimated the overall bias in the CPI to be within a range of 0.8 to 1.6 percentage points per year, and 1.1 percentage points was the point estimate within this range. Considering your responses to the previous questions, what do you believe is the remaining bias in the CPI . . .

11.a. If only changes that are already effective for the CPI calculation are considered?

Point estimate___ . ___ percentage point(s) per year

Range ___ . ___ to ___ . ___ percentage point(s) per year

11.b. If all of the above changes, including those not yet effective for the CPI calculation, are considered?

Point estimate___ . ___ percentage point(s) per year

Range ___ . ___ to ___ . ___ percentage point(s) per year

12. What other comments, if any, would you like to make about anything covered in this questionnaire?

Thank you very much for your responses to this survey.

Comments From the Bureau of Labor Statistics

U. S. Department of Labor

Commissioner
Bureau of Labor Statistics
Washington, D.C. 20212

JAN 18 2000

Ms. Nancy R. Kingsbury
Acting Assistant Comptroller
General
General Government Division
General Accounting Office
Washington, D.C. 20548

Dear Ms. Kingsbury:

Thank you for the opportunity to comment on your draft report, "Consumer Price Index: Update of Boskin Commission's Estimate of Bias."

In June 1997, in response to a letter addressed to me from Jim Saxton, then Chairman of the Joint Economic Committee, the Bureau of Labor Statistics (BLS) issued a paper entitled "Measurement Issues in the Consumer Price Index." That paper described the measurement objective of the Consumer Price Index (CPI), and discussed the BLS response to the estimates of bias put forward in the final report of the Advisory Commission to Study the Consumer Price Index. Were we to be asked today for our reaction to the Advisory Commission's bias estimates, our comments would be generally similar. The measurement issues considered by the Advisory Commission are complex and there is considerable uncertainty attached to the magnitude of many bias components. This is particularly true of bias resulting from quality change and the introduction of new goods. Because of this uncertainty, we do not believe that it is currently possible to produce reliable estimates of bias in the CPI.

The BLS has a history of being in the forefront of price measurement research and operational innovation, and many important improvements in CPI methods have been introduced over time. The recent changes discussed in the draft report, such as the adoption of the geometric mean estimator to address lower-level substitution and the extension of hedonic techniques to account for the effects of quality change, follow in a long line of methodological

Ms. Nancy R. Kingsbury--2

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improvements. Historically, some of the major changes have included the introduction of annual adjustments for new automobile quality differences in 1967, the implementation of a systematic method for replacing outlets and items in 1981, the shift to a rental equivalence or flow of services approach in the measurement of homeowners' costs in 1983, and the introduction of hedonic models for apparel quality adjustment in 1991. I also should note that we have announced plans to produce a new index beginning in 2002 that will be a complement to the CPI-U and CPI-W. The new index will more completely account for consumer response to relative price change.

The BLS will continue to develop and evaluate potential improvements in CPI methods and to implement any we identify that can further improve the accuracy of the index.

Sincerely yours,

Katharine Abraham

KATHARINE G. ABRAHAM
Commissioner

Comments From Dr. Michael J. Boskin

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January 13, 2000

Ms. Nancy R. Kingsbury
Acting Assistant Comptroller General
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GAO
441 G St., NW
Washington, DC 20548

Dear Ms. Kingsbury:

I appreciate the enormous effort of Kathleen Scholl and Kathy Peyman in updating the CPI Advisory Commission's estimate of bias. The structure of the study required many specific quantitative judgments, some of which were more straightforward than others.

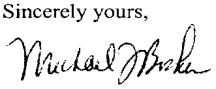
I write now because I believe it would be useful to provide a more qualitative overview of the issue. First, measuring the change in prices in our large, complex, dynamic economy is neither simple nor straightforward, a fact we repeatedly emphasized in our original report, but which has gotten regrettably little attention. Second, as the recent change to using the geometric mean for about 60% of the categories showed when BEA backcast it to 1978 in revising real GDP, (some of) these improvements are not just minor technical niceties; they can be consequential enough to effect measured history. And third, my impression is that the BLS has been doing a good job the last few years in improving the CPI. I believe the atmosphere of cooperation between the BLS and its staff and academic and private sector experts has been far more cooperative since its initial (in my view) overreaction to the CPI Advisory Commission Report.

Certainly, a sizeable upward bias remains in the CPI, but hopefully future improvements (some planned or underway) will whittle away at the bias. However, some bias in a real time CPI is probably inevitable whatever BLS does.

Finally, the necessary practical improvements will be neither quick nor easy. They will demand intellectual, organizational and financial resources. But the social benefit cost ratio from the improved quality of the statistics even a modest investment could produce is likely to be quite high.

Again, I appreciate the considerable effort GAO has undertaken.

Sincerely yours,



Michael J. Boskin

MJB:vb

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Consumer Price Index: Impact of Commodity Analysts' Decisionmaking Needs to Be Assessed (GAO/GGD-99-84, June 15, 1999).

Bureau of Labor Statistics: Making the CPI More Reflective of Current Consumer Spending (GAO/T-GGD-98-115, Apr. 29, 1998).

Consumer Price Index: More Frequent Updating of Market Basket Expenditure Weights Is Needed (GAO/GGD/OCE-98-2, Oct. 9, 1997).

Consumer Price Index: Cost-of-Living Concepts and the Housing and Medical Care Components (GAO/GGD-96-166, Aug. 26, 1996).

Economic Statistics: Status Report on the Initiative to Improve Economic Statistics (GAO/GGD-95-98, July 7, 1995).

Economic Statistics: Measurement Problems Can Affect the Budget and Economic Policymaking (GAO/GGD-95-99, May 2, 1995).

Prescription Drug Prices: Official Index Overstates Producer Price Inflation (GAO/HEHS-95-90, Apr. 28, 1995).

Developing a Consumer Price Index for the Elderly (GAO/T-GGD-87-22, June 29, 1987).

Stabilizing Social Security—Which Wage Measure Would Best Align Benefit Increases With Revenue Increases? (GAO/IMTEC-85-13, Aug. 27, 1985).

Funds Needed to Develop CPI Quality Control System (GAO/GGD-83-32, Apr. 1, 1983).

A CPI for Retirees Is Not Needed Now but Could Be in the Future (GAO/GGD-82-41, June 1, 1982).

A Consumer Price Index for Retirees and Alternatives for Controlling Indexing (Testimony, Apr. 20, 1982).

Measurement of Homeownership Costs in the Consumer Price Index Should Be Changed (GAO/PAD-81-12, Apr. 16, 1981).

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