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## Measurement Problems with the CPI

*The Consumer Price Index (CPI) is not a perfect measure of price inflation. It has many shortcomings, most of which are easier to describe than they are to fix.*

The use of price indexes in the United States can be traced back to the Revolutionary War. In response to rapid wartime price inflation, officials in Massachusetts tied the pay of soldiers to the increase in the price of a selection of goods typically purchased by soldiers. This "market basket" consisted of fixed amounts of corn, beef, wool, and leather. The basic idea was simple: to measure changes in the price of things people buy and to give them enough extra money to compensate for price inflation, thus allowing them to continue buying the same things and, in this sense, maintain their "standard of living."

The Consumer Price Index (CPI) serves the same purpose today. It, too, originated in wartime. It was developed by the Bureau of Labor Statistics (BLS) during World War I at the request of Woodrow Wilson, in order to help negotiate wage increases in shipbuilding and other war-related industries. This "cost-of-living" index, as it was then called, initially measured the changes in the prices of a selection of goods and services purchased by families surveyed in 92 industrial areas in 1917-19. After the war the index continued to be published and it was sometimes used to settle wage disputes in private industry in the 1920s.

As price inflation became a chronic feature of the U.S. economy following World War II, the CPI was increasingly used, formally or informally, to index wages, pensions, and other dollar-denominated payments and contracts. The acceleration of price inflation in the 1970s prompted Congress to enact legislation that used the CPI as the basis for automatic cost-of-living increases in Social Security and other government payments. In the 1980s, parts of the Federal tax code were similarly indexed to the CPI, including the personal exemption and tax brackets.

The huge and increasing impact of indexing on the Federal budget led the Sen-

ate Finance Committee last year to appoint an advisory commission of economists, led by Michael Boskin, the former chief of President Bush's Council of Economic Advisors, to study the CPI. The commission presented its findings earlier this month in a report entitled "Toward a More Accurate Measure of the Cost of Living." The report describes many problems with the calculation of the CPI, all of which are familiar to economists, who have long recognized that the CPI is not a perfect measure of price inflation or the cost of living.

Over the decades the CPI has undergone many updates and modifications in an effort to improve it. For example, by the 1930s it was evident that the original wartime market basket of goods and services used to compute the index was out of date, and the basket was updated in 1940 to reflect the more recent buying habits of consumers. In the 1950s, the price survey used to compute the CPI was expanded to include medium and small cities. In the 1960s, purchases by single people living alone were added to those by families of two or more persons in computing the index.

In 1978, the BLS introduced a second index that was intended to represent the buying habits of even more people. The original index, which still is computed and is known as the CPI-W, covers urban wage earners and clerical workers, who currently account for only one third of the U.S. population. The second index, the CPI-U, extends coverage of spending habits to professional and managerial workers, the self-employed, the unemployed, retirees, and other consumers. This group is representative of about 80 percent of the population. The remaining fifth of the

population, whose buying habits are not taken into account in the calculation of either index, consists primarily of individuals living in rural areas.

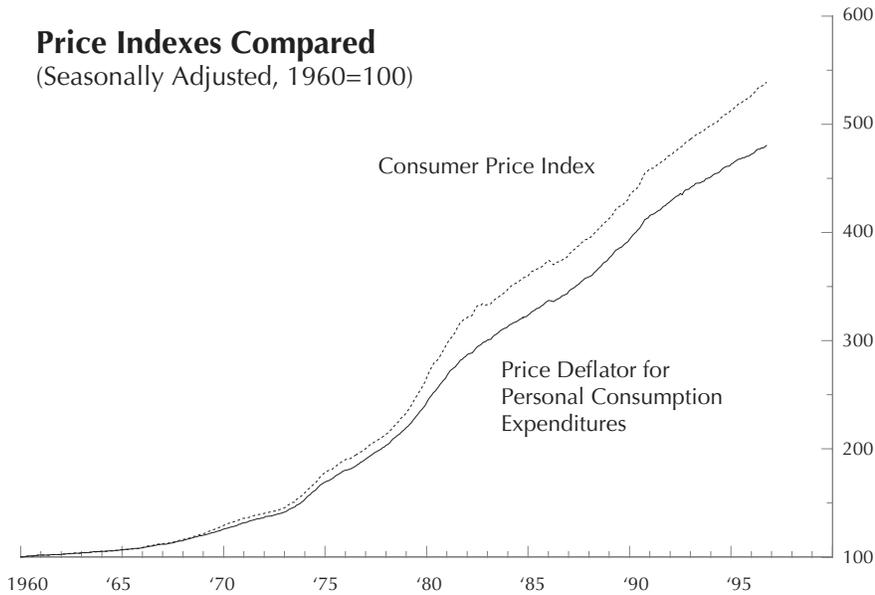
The most frequently cited criticism is that the market basket of items used to calculate the CPI is too rigid. The market basket currently is comprised of 400 or so items, whose prices are averaged together to get the "average price level." Since people spend more on some items than others (for example, rent vs. magazines), some items are given a greater weight in calculating this average. The selected items and the weights assigned to them are based on a survey of consumer expenditures. Buying habits change over time, and new surveys have updated the market basket every 10 years or so. The current basket has been used since 1987 and is based on the spending habits of consumers surveyed in 1982, 1983, and 1984. It is scheduled to be updated again in 1998, using spending surveys from the mid-90s.

One problem with keeping the market basket fixed for so long is that consumers do not buy the same things in the same relative quantities year after year, thus the fixed weights assigned to each item become less relevant over time. In particular, when prices change consumers tend to buy more of the items that have become relatively cheaper and less of the items that have become relatively dear. The level of satisfaction (the "standard of living") they achieve, for a given outlay, will be more than it would be if they continued to consume things in the same fixed proportions, but the latter is what the CPI assumes. Because the CPI does not take this substitution effect into account, it overstates price inflation. It presumes that consumers continue buying the same quantity of an item even if its price increases relative to other things, thus it gives a larger weight to price increases than is warranted by actual buying patterns.

*Season's Greetings and Best Wishes for the New Year*

## Price Indexes Compared

(Seasonally Adjusted, 1960=100)



Source: Departments of Commerce and Labor.

A second problem is that in theory the CPI measures the change in the price of items of constant quality, but in practice this is difficult to do because the quality of goods and services changes over time. If the price of a television set increases due to the introduction of a remote control or better picture quality, that should not count as a price increase in the CPI. The problem of adjusting for quality becomes more difficult when it is not clear whether a price increase is due solely to improved quality. And sometimes the quality of an item improves but there is no corresponding price increase, or its price may even decrease (as has happened with many electronic products in recent years). In short, assigning a dollar value to quality improvement is quite subjective.

According to the commission's report, the CPI fails to adequately account for quality improvements in many items, thus creating another source of upward bias in the CPI. For example, no quality adjustment is made for used cars, even though used cars last longer, get better fuel economy, and require less maintenance now than they did in the past. With respect to housing, the CPI apparently is not adequately adjusted for amenities that are increasingly common in new houses, such as central air conditioning, fireplaces, or more elaborate kitchens and bathrooms.

The largest sources of quality bias are thought to be electronics and medical care. In both categories, quality changes have been rapid but especially difficult to measure. For example, few people would trade the health care available today for that of 20 years ago. They would rather heart sur-

gery be done by today's doctors using today's technology, because the risk from surgery is smaller and the likely outcome, in terms of life expectancy, relief from pain, and quality of life, is better. But it is far from clear how to adjust an increase in the price of heart surgery for this type of quality improvement. Similarly, suppose an increase in the price of an X-ray is accompanied by better technology that allows doctors to detect and treat illnesses earlier. A quality-adjusted price index for X-rays should take this into account and perhaps show no price change. In practice, it is difficult and costly to estimate the dollar value of better outcomes from medical care. The consensus among economists is that the CPI understates such quality improvements, and thus the rapid increase in medical care prices in recent decades is partly a statistical illusion.

On the other hand, the CPI may overstate quality improvements, and thereby understate price increases, for some products. Higher purchase prices for new cars, for example, are netted out of the CPI if they are attributable to the introduction of safety and pollution-control devices mandated by the Government. However, since consumers do not have the option of buying new cars without these mandated features, it is not clear whether they view them as a quality improvement that genuinely offsets the price increase. Still, most economists would agree with the report's assertion that, on balance, the average quality of goods and services has increased *more* over the years than traditional quality measures used in the CPI indicated.

Yet another potential source of upward bias is in how the price index accounts for the appearance of new items and the dis-

appearance of old ones. The mix of items included in different spending categories, such as home entertainment products, is sometimes updated to include new products, such as CD players. However, there often is a long lag between the introduction of new product in the market and its addition to the CPI market basket. The VCR and personal computer were first included in the CPI in 1987, years after their introduction in the market. The cellular phone will not be included in the CPI until 1998. The difficulty is that price decreases are often largest in the first few years after a product is introduced. By waiting so long to add them to the market basket, the CPI misses these price decreases and thus overstates price inflation.

The Boskin report cites other likely sources of upward bias in the CPI. For example, items sold at discount stores such as Wal-Mart usually cost less than the same items sold at department stores, but in the CPI this price difference is attributed to a lower quality of service and therefore does not count as price decrease. Many buyers probably feel that the difference in service is negligible and that discount stores enable them to achieve the same level of satisfaction for less money. Similarly, the report notes that prior to 1995, the CPI treated generic and brand-name drugs as two distinct items, thus the introduction of less expensive generic drugs did not equate to a price decrease. In an effort to correct for this bias, the CPI now treats generic and brand-name drugs as equivalent items.

In addition, the people who collect price data for the CPI do not work on holidays or weekends, which is when many stores have sales and when many consumers increasingly do their shopping. Moreover, sale markdowns, mail-in rebates, senior-citizen/student/membership discounts, tie-ins such as frequent flier miles, and other complex pricing practices have become more common in recent years. These complicate the task of measuring prices, and it is far from clear that the Labor Department's price surveyors and statisticians are adequately measuring how much they reduce effective prices.

### What Does This Mean?

The report estimates that the overall bias in the CPI is currently 1.1 percentage points. This implies that if the CPI increases by 3.3 percent, as it did during the past 12 months, the actual rate of price inflation is only 2.2 percent.

This does not imply, as some news reports have suggested, that all the economic series that are reported in inflation-ad-









justed dollars, such as GDP, national income, and productivity have been correspondingly underestimated. Most of these aggregate statistics are deflated using price indexes which were developed for the national income and product accounts and which differ from the CPI in several respects. For example, in the price index used to adjust personal consumption expenditures (PCE, the largest component of GDP) only net purchases of used cars are included, *i.e.*, purchases of vehicles from other consumers are not included (because such purchases do not add to GDP). This means that used cars are given a much smaller weight in the “PCE deflator” than in the CPI.

Also, the effective weights of the items included in the PCE deflator continuously change to reflect changes in spending patterns as well as price changes. Consequently, if consumers curtail their purchases of a given item in response to a price increase, the index may understate the impact on their cost of living. In other words, just as the CPI is biased toward exaggerating price inflation, the PCE deflator is biased toward understatement with respect to the effect of changes in spending patterns (but the issue of quality changes affects both series).

The difference between the two is small in any given year. The CPI increased 2.7

percent in 1995 and the PCE deflator increased 2.1 percent. Since 1960, the CPI has increased 4.7 percent each year, on average, compared to 4.4 percent for the PCE deflator. For purposes of indexing payments, however, the cumulative effect of small differences is significant. Since 1960, the price level as measured by the PCE deflator has increased 380 percent, versus 435 percent as measured by the CPI. Had these figures been used to index a Social Security benefit that was \$100 in 1960, the inflation-adjusted benefit would now be \$480 using the PCE deflator or \$535 using the CPI.

The Boskin commission recommends that the Labor Department make a number of changes in the calculation of the CPI. These include abandoning the fixed-weight market basket in favor of a basket that is frequently updated to reflect current spending patterns; creating a separate price index that would be revised regularly to reflect new data and better measurement techniques (the CPI is the only important economic statistic that is never revised); and, in general, spending more time and money studying ways to reduce bias in the index. To this end, the report recommends that Congress appropriate more money for improving price data and enact “the legislation necessary for the Departments of Commerce and Labor to

share information.” Another suggestion is a sad commentary on the present state of graduate economics education: the economics profession “should treat training in data collection, data analysis, and interpretation more seriously and give it more space and attention in the standard curriculum.” (Many doctoral dissertations nowadays are a Greek-alphabet soup of abstract mathematics with no analysis of data.)

With respect to Federal programs and the tax code, the report suggests that Congress adjust for overindexing by subtracting an amount (say, 1.1 percentage points) from the current CPI-based indexing. This is an implicit acknowledgment that many of the measurement problems with the CPI are easier to describe than they are to statistically measure or fix. Many of the CPI’s limitations could be overcome only at prohibitive cost.

There will never be a perfect measure of price inflation. In addition to technical problems, any price index based on the average buying habits of a group of consumers will differ from many individuals’ experience, because individual spending patterns vary with income, family size, age, location, and individual tastes and preferences. The commission’s proposed changes are sensible, however, and would reduce the imperfections of the CPI. □

## BUSINESS-CYCLE CONDITIONS

*As the new year approaches, the economy will continue to expand. Overall, most of leading indicators appear to be or are clearly expanding and with low unemployment, no apparent inflationary pressures, and stable short-term interest rates, there is little to suggest that economic growth will not persist in the months ahead.*

Four of our twelve primary leading indicators are at their highs for the cycle. The *index of 500 common stock prices* reached a new high, as did *new orders for consumer goods and materials*, *contracts and orders for plant and equipment*, and the *ratio of manufacturing and trade sales to inventories* (all dollar-denominated series are reported in constant dollars). Although not at new highs, the *3-month percent change in sensitive materials price* and *initial claims for state unemployment insurance* (inverted) are clearly expanding as well. Thus, half of the leading indicators are clearly expanding.

Despite another decrease in October, the *M2 money supply* remains appraised as probably expanding. In a December 5th speech that temporarily rattled the stock market, Federal Reserve Chairman Alan Greenspan made some passing remarks about the recent role of the money supply

aggregates in determining Fed policy. He said that, although it is too soon to tell, there are some indications that the relationship of the money supply to interest rates and income, which broke down in 1991, may be coming back on track. As discussed in earlier *Research Reports*, this relationship broke down in the early 90s when investors moved money from CDs to equity mutual funds. Still, he cautioned that even if the relationship resumes, the Fed probably will not rely heavily on money supply aggregates in the making monetary policy.

The *average workweek in manufacturing* also remains appraised as probably expanding. Revised figures show that the base data for the average workweek has been unchanged for the past 3 months at 41.7 hours per week.

Due to further declines in the *index of new housing permits*, its cyclical status

has become indeterminate. It had been appraised as probably expanding. Although it increased during November, there still is no apparent cyclical trend for *vendor performance*, the percentage of purchasing managers reporting slower deliveries from their suppliers.

The remaining two leading indicators, the *M1 money supply* and the *3-month percent change in consumer debt*, both decreased and remain appraised as clearly contracting. The latter is at its lowest level since July 1993.

Overall, 80 percent (8 out of 10) of the leading indicators with apparent cyclical trends are expanding. This is slightly lower than last month’s 82 percent. The small decrease this month in the percentage of leaders expanding is due to the downgrade of the appraisal for the index of housing permits. Still, the leaders indicate that continued expansion is likely during the month ahead. AIER’s cyclical score confirms this. The cyclical score, AIER’s separate statistical measure of the leading indicators, increased 3 points this month to 72 points from last month’s revised score of 69. This puts both the percentage of leaders expanding and the cyclical score well within the ranges that signal continued growth.

Five of the six primary roughly coincident indicators are at new highs. *Nonagricultural employment* reached a new historical high in November, as did the *index of industrial production*. Much of the increase in industrial production was due to a rebound in the production of motor vehicles and motor vehicle parts at strike-affected GM plants. A surge in utility output, due to colder weather, also contributed to the gain in industrial production.

*Manufacturing and trade sales* also are at new highs. There was no change in the *ratio of civilian employment to the working-age population* from the historically high 63.4 percent reached last month. For the past 5 months, the employment-population ratio has been above 63.2, the level reached in January 1990 just before it began to contract cyclically. *Gross domestic product* (quarterly), the value of all goods and services produced within the nation's borders, is at a new high as well.

The only coincident indicator not to reach a new high this month was *personal income in manufacturing*. The two-month moving average of seasonally adjusted income decreased at an annual rate of \$2 billion from last month's new cyclical high. The series' cyclical status, however, remains appraised as clearly expanding.

Overall, 100 percent (6 out of 6) of the coincident indicators with apparent cyclical trends are expanding. Because the coincident indicators cover a wide range of economic activity, their strength suggests that the economy's vigor is broadly based, and according to the leading indicators we can expect more of the same in the months ahead.

The lagging indicators, which tend to turn cyclically after the coinciders have turned, strengthened slightly this month. However, only one, *manufacturing and trade inventories*, reached a new high. Sometimes, rising inventories are evidence that production is increasing faster than warranted by sales. However, given that manufacturing and trade sales are at a new high and the reported ratio of manufacturing and trade sales to inventories is at a 17-year high, there is little indication that the recent increase in inventories is excessive. Inventories are appraised as clearly expanding. Although it did not reach a new high, *commercial and industrial loans* also is appraised as clearly expanding.

The *ratio of consumer debt to personal income* increased in October to 18 percent, but the increase was not enough to indicate a clearly expanding trend. Thus, the series remains appraised as probably expanding. The *average duration of unemployment* (inverted) is now also prob-

ably expanding. Its cyclical status had been indeterminate, but the recent increase to 16.3 weeks was sufficient to suggest that the series is expanding.

There are no apparent cyclical trends in the remaining two lagging indicators. The *percent change from a year earlier in manufacturing labor cost per unit of output* decreased again this month — indicating that labor cost pressures are not evident in the manufacturing sector. The *composite of short-term interest rates* remained unchanged at 5.34 percent.

Overall, 100 percent (4 out of 4) of the lagging indicators with apparent cyclical

trends are expanding. This late in an expansion, the current upward trends in the lagging indicators are typical. We would not expect the laggings to weaken until several months after the coincident indicators do so. The lagging indicators also offer clues as to whether the bottlenecks that could stifle economic growth are developing. Currently, this does not appear to be happening. Short-term rates are low, there is little evidence of wage pressure in the manufacturing sector, and inventories appear to be under control. These are all favorable indications that the economy will continue to expand. □

### Statistical Indicators of Business-Cycle Changes

Change in Base Data				Primary Leading Indicators	Cyclical Status		
Aug.	Sep.	Oct.	Nov.		Oct.	Nov.	Dec.
-	-	-		M1 money supply	-	-	-
+	+ <sup>r</sup>	-		M2 money supply	+?	+?	+?
+	+	-		Change in sensitive materials prices	+?	+	+
-	+	+		New orders for consumer goods	+	+	+
-	+	-		Contracts and orders for plant and equipment	+	+	+
-	-	-		Index of new housing permits	+?	+?	?
-	+			Ratio of manufacturing and trade sales to inventories	+	+	+
+	-	+	+	Vendor performance	?	?	?
+	+	+	+	Index of common stock prices (constant purchasing power)	+	+	+
+	nc <sup>f</sup>	nc <sup>f</sup>	nc	Average workweek in manufacturing	+?	+?	+?
+	-	+		Initial claims for unemployment insurance (inverted)	+	+	+
-	-	-		Change in consumer debt	-	-	-
				Percentage expanding cyclically	82	82	80
				<b>Primary Roughly Coincident Indicators</b>			
+	-	+	+	Nonagricultural employment	+	+	+
+	+	-	+	Index of industrial production	+	+	+
+	-	-		Personal income in manufacturing	+	+	+
-	+			Manufacturing and trade sales	+	+	+
-	+	+	-	Civilian employment to population ratio	+	+	+
+	+			Gross domestic product (quarterly)	+	+	+
				Percentage expanding cyclically	100	100	100
				<b>Primary Lagging Indicators</b>			
-	+	+	+	Average duration of unemployment (inverted)	+?	?	+?
+	+			Manufacturing and trade inventories	+	+	+
-	+	-		Commercial and industrial loans	+	+	+
-	-	+		Ratio of consumer debt to personal income	+	+?	+?
+	nc <sup>f</sup>	-		Change in labor cost per unit of output, manufacturing	?	?	?
-	+	-	nc	Composite of short-term interest rates	?	?	?
				Percentage expanding cyclically	100	100	100

nc No change. <sup>r</sup> Revised.

Under "Change in Base Data," plus and minus signs indicate increases and decreases from the previous month or quarter and blank spaces indicate data not yet available. Under "Cyclical Status," plus and minus signs indicate expansions or contractions of each series as currently appraised; question marks indicate doubtful status when shown with another sign and indeterminate status when standing alone.

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