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## Core CPI: Excluding Food, Energy . . . and Used Cars?

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*Although used car prices represent only a small portion of the consumer price index, their extreme volatility has had a major impact on the measured inflation rate. To explain this relationship, the authors describe how used cars are treated in the CPI and explore what might cause the wide swings in used car prices.*

Traditionally, policymakers and financial markets have regarded the “core” consumer price index (CPI) as a key inflation indicator. The core CPI, a special index published by the Bureau of Labor Statistics (BLS), excludes the volatile prices of food and energy. In excluding these components, BLS recognizes that prices that swing dramatically in response to unusual shifts in weather and other unforeseen events could skew assessments of underlying inflation trends.

In August 1995, the Congressional Budget Office refined its analysis of inflation by adopting a separate definition of core inflation: it excluded used cars in addition to food and energy from the overall CPI.<sup>1</sup> The motive was once again to minimize the potentially distorting effects of unusually volatile prices. Over the preceding year, wide swings in the rate of change of used car prices had whipsawed the traditional measure of core inflation.

In 1995, used car prices represented only 1.32 percent of the CPI. Nonetheless, their impact on the measured inflation rate has been substantial: core inflation accelerated to 3.8 percent by March 1995 and decelerated to around 2.8 percent by July (Chart 1). However, when used cars are excluded, the level of core inflation reached in March was nearly 0.3 percentage point lower, while the level reached in July was about

0.15 percentage point higher.<sup>2</sup> For such a small component to have such a considerable influence on the CPI, its price changes must be both large and volatile. Indeed, monthly percentage changes in used car prices went from an annual rate of 27 percent in March 1995 to -5 percent in June and then back to 10 percent in January 1996.

What is behind this extreme price volatility? In this edition of *Current Issues*, we discuss how used cars are treated in the CPI and explore the causes of these wide swings in the rate of change of used car prices. We contend that the used car component of the index is so volatile because it is derived from wholesale auction prices rather than retail transaction prices. Accordingly, we believe that switching to retail transaction prices for used cars would eliminate much of this volatility. Until such a change is made, the traditional measure of core inflation could remain vulnerable to serious distortions.

### Used Cars in the CPI

Conceptually, the CPI is intended to measure changes in the price of goods and services of a constant quality. Price increases attributed to improvements in quality are not regarded as inflation, since the higher price brings with it higher value or greater utility to the consumer. Measuring pure price change for used cars is

a more complicated endeavor than for most other goods and services because used cars depreciate over time. To measure pure price change, BLS must estimate the rate of depreciation and evaluate actual price movements relative to that rate. In addition, the quality of cars has been improving over time, complicating the estimation of depreciation.

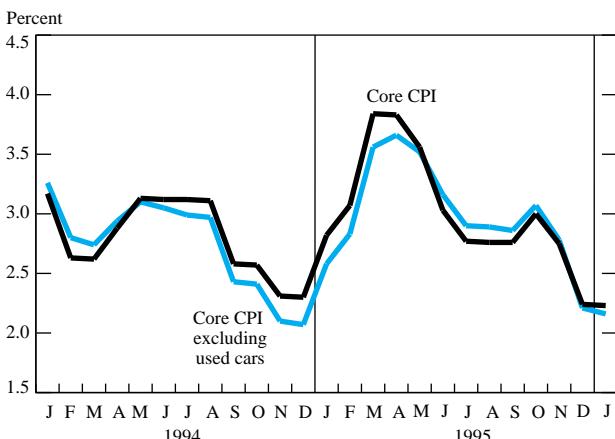
**Defining and Pricing Used Cars in the CPI.** The CPI is a composite index, with price data for numerous products and services assigned a weight representing their relative importance in the typical consumer's consumption expenditures. Used cars represent a relatively small proportion of those expenditures and so are assigned a relatively small weight (1.32 percent of the CPI in 1995, or 1.71 percent of the core CPI).<sup>3</sup> As defined by BLS, that weight reflects net consumer purchases of used cars—that is, used car imports and used cars purchased by the consumer sector from the business and government sectors, plus car dealers' profits on sales of used cars. The weight does not reflect consumer purchases of used cars from other consumers, even when a car dealer acts as intermediary, because they are transfers of assets within the consumer sector, which are not covered by the CPI.<sup>4</sup>

Because the used cars sold by business and government fleets account for most of these net sales, they form the universe from which BLS draws a sample of 350 combinations of make, model, and options.<sup>5</sup> This sample consists of models ranging in age from two to six years, with the bulk between two and three years old; the sample is updated for the new model year between September and November.

## Chart 1

## Core CPI with and without Used Cars

### Three-Month Moving Average of the Monthly Percentage Change in Prices at an Annual Rate



Source: U.S. Department of Labor, Bureau of Labor Statistics.

BLS obtains the raw price data for this sample from the *Official Used Car Trade-In Guide*, or “Blue Book,” published by the National Automobile Dealers Association (NADA). Each month, the Blue Book lists average wholesale auction prices from roughly 170 dealer-only auctions held across the United States each week.<sup>6</sup> Prices are listed for a wide array of makes, models, and options, as well as for three broad categories of overall condition—clean, average, and rough. BLS uses prices from the clean category, the condition of most cars coming out of the business and government fleets.<sup>7</sup>

## Measuring Depreciation and Improvements in

**Quality.** Inflation for used cars is determined by the rate of change of these observed auction prices relative to the rate of depreciation. If the rate of change of the observed price is greater (less) than the rate of depreciation, the price on a constant-quality basis has increased (fallen).

BLS estimates the rate of depreciation as the percentage difference in price between consecutive vintages of the same model. For example, if in March 1996 the average auction price of a 1994 Zebra XL was \$10,000 while the average auction price of a comparably equipped 1993 Zebra XL was \$9,000, at that point in time the 1993 Zebra XL was depreciating at a rate of 10 percent per year. If the observed price of the 1993 Zebra XL was declining at a 7.5 percent annual rate, on a constant-quality basis the price would actually have been rising.

BLS accounts for improvements in the quality of used cars by modifying the procedure for estimating the rate of depreciation.<sup>8</sup> This modification begins with the percentage increase in price attributed to improvements in quality when the model was introduced as a new car. For example, suppose that when the 1994 Zebra XL was introduced, its manufacturer's suggested retail price (MSRP) was 10 percent above the MSRP of the 1993 Zebra XL when it was introduced. Suppose further that BLS attributed half of that price increase, or 5 percent, to improvements in quality. That percentage quality adjustment is assumed to remain constant over the entire period that the vehicle remains in the used car sample. Under those assumptions, the estimated rate of depreciation of the 1993 Zebra XL is half that of the above example, or 5 percent. In that case, if the observed price is declining at a 7.5 percent annual rate, then on a constant-quality basis the price is actually falling.

BLS divides quality improvements into two categories: innovations and upgrades of standard equipment, such as anti-lock braking systems, stainless steel exhaust systems, more efficient engines, and more durable paints; and equipment and modifications required to meet federally mandated safety, fuel effi-

ciency, and emissions standards. BLS has estimated that on average the MSRP of 1996 models rose by \$495 over the 1995 models, of which \$193—or 39 percent—was attributed to quality improvements.<sup>9</sup> Changes designed to satisfy federal mandates represented \$105—or 54 percent—of the total quality improvements.<sup>10</sup>

As the BLS estimates suggest, the portion of price increases attributed to quality improvements tends to be substantial. It can reasonably be argued that the adjustments BLS makes to prices of both new and used cars overstate quality improvements and, therefore, understate the true rate of inflation. As noted earlier, the CPI is intended to measure the change in price of goods and services that provide the typical consumer a constant level of utility. Although federally mandated safety, fuel efficiency, and emissions standards benefit society as a whole, the amount of additional utility they provide to individual consumers is uncertain.<sup>11</sup>

### Trends in the Used Car Market

Clearly, measuring pure price change for used cars is a complex endeavor. But what makes the rate of change of used car prices so volatile? To answer that question, we examine recent trends in the used car market. We find that there has been dramatic growth in demand over the past decade. As we will see, this growth in demand has contributed to fundamental changes in the underlying institutional setting of the supply side of the used car market. We suspect that these changes have resulted in greater volatility in wholesale auction prices for used cars.

**Price and Sales Volume.** The performance of car prices suggests that in recent years the demand for used cars has strengthened relative to supply. Since the 1990-91 recession, used car prices have consistently

increased at a faster rate than new car prices, rising by 36 percent compared with only 13 percent for new cars (Chart 2).

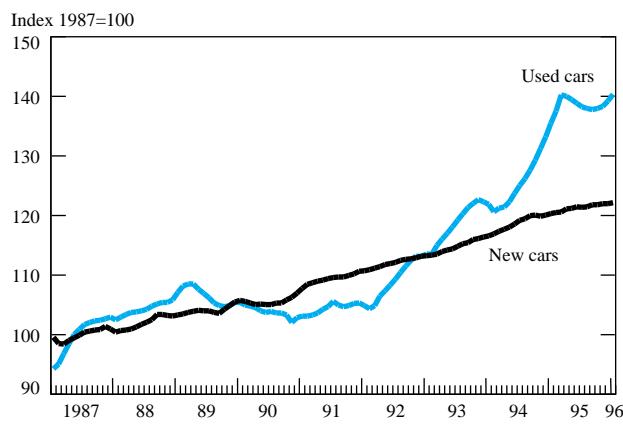
These price trends indicate that a fundamental shift of consumer demand from new to used cars has been under way for some time. Additional evidence is provided by per capita sales of used light vehicles (autos and light trucks), which have been rising over the past two decades while per capita sales of new light vehicles have been falling (Chart 3).<sup>12</sup> Indeed, market research has revealed an increased willingness to purchase a used vehicle, particularly among luxury car buyers.<sup>13</sup> Purchasing a two- or three-year-old car is a way of moving up a notch or two in the car market for the same monthly payments as a lower grade new car.

Numerous other factors have contributed to this fundamental shift in consumer behavior:

**Durability.** Cars and light trucks built in recent years are generally regarded as more durable and reliable than those produced a decade ago. Automobile survival rates have been steadily rising and warranties on new vehicles have gotten longer and more comprehensive.<sup>14</sup> These developments have reduced the risk of purchasing a used vehicle.

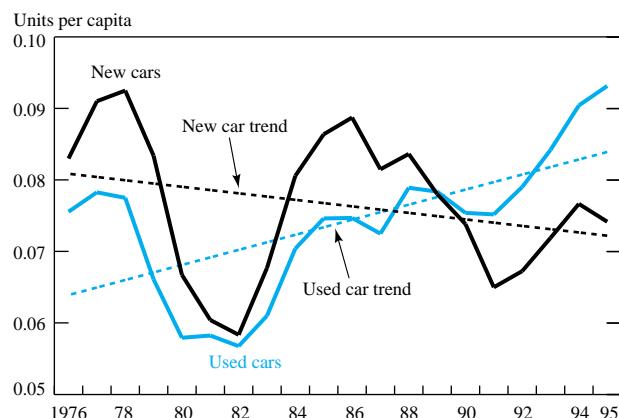
**Affordability.** It is often argued that new cars are less affordable now than in the past. But the truth of this claim depends on how one measures affordability. The typical purchase price of a new car has risen substantially more than median family income over the past two decades. The monthly principal and interest payments on the loans to finance these purchases, however,

**Chart 2**  
**Levels of New and Used Car Prices**



Source: U.S. Department of Labor, Bureau of Labor Statistics.

**Chart 3**  
**New and Used Light Vehicle Sales**



Source: National Automobile Dealers Association.

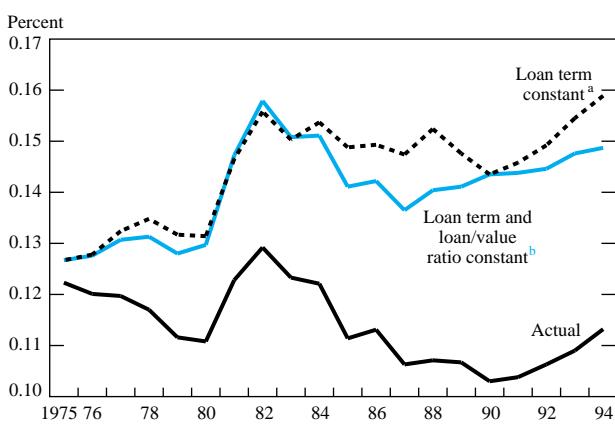
Notes: Annual sales volumes are divided by the civilian noninstitutional population aged sixteen and over. New car sales include retail and fleet sales of autos and light trucks. Used car sales include retail and wholesale sales by franchised new car dealers.

have been stable or declining as a percentage of median family income because of an increase in the average loan term from around thirty-six to nearly sixty months (Chart 4). Loan-to-value ratios have also risen over the past two decades, boosting monthly payments but reducing the amount of cash needed upon purchase.<sup>15</sup> One thing is clear: the longer terms and higher loan-to-value ratios have reduced the amount of equity that the typical car owner has in his or her vehicle. This development in turn has contributed to the rise of leasing and the increase in used car sales.

**Leasing.** Leasing has increased dramatically over the past decade, resulting in a vast supply of relatively low-mileage, late-model used cars. In 1994, leases represented one-third of retail deliveries of new cars, up from about 12 percent a decade earlier.<sup>16</sup> At the same time, the average length of new car leases has declined, while early terminations have increased. In many cases, the original manufacturer's warranty is still in effect on vehicles returned to the lessor at the expiration of the lease term ("off lease" vehicles).<sup>17</sup>

**Information.** Much more information on used vehicles is now readily available to consumers. For example, in addition to publishing its *Used Car Buying Guide*, Consumer Reports offers a 900 number through which consumers can obtain current information on used car prices, model reliability, and repair records. Armed with such information, consumers are better able to assess the relative value of the wide array of used cars on the market and have greater confidence that they are

**Chart 4**  
**Principal and Interest Payments for Typical New Car Purchase**  
Percentage of Median Family Income



Source: Board of Governors of the Federal Reserve System.

Note: Payments reported are based on characteristics of loans made by auto finance companies.

<sup>a</sup> Constant at 1975 value of thirty-six months.

<sup>b</sup> Constant at 1975 value of .865.

paying a fair price. In addition, many financial planners advise their clients to purchase a two- or three-year-old car to avoid the rapid depreciation that occurs during the first few years of a new car's life.<sup>18</sup>

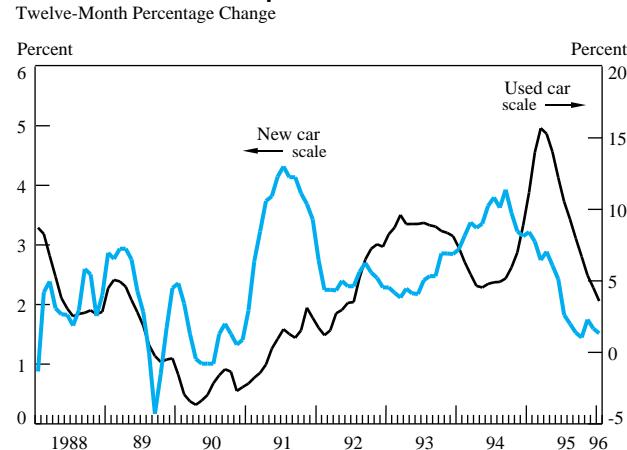
### Explaining Used Car Price Volatility

The long-run rise in demand undoubtedly helps to account for much of the rapid increase in used car prices relative to new car prices. We contend that this same phenomenon has been associated with changes in the institutional setting of the used car market. These changes have given the wholesale auctions, the basis of used car prices in the CPI, more of the qualities of a spot commodity market, where prices often move sharply in response to imbalances in producers' inventories of raw materials. Indeed, the rate of increase of used car prices is roughly three times more volatile than the rate of increase of new car prices (Chart 5).<sup>19</sup>

A decade or so ago, used car sales were dominated by dealers who sold used cars exclusively; they were not a major part of a typical new car dealer's operation. Aside from a few mint condition units, most cars taken in trade by new car dealers were wholesaled to used car dealers or sold at wholesale auctions. Because they received most of the used cars they needed through trade-ins, new car dealers were not very active on the buy side of those auctions.

Over the past ten years, however, increased consumer demand for used cars has fundamentally changed the used car market. Franchised new car dealers have sought and captured much of the growth of the used car market, typically selling more used cars than new ones and earning greater profits from used car sales.<sup>20</sup> Trade-ins and lease terminations are the source of

**Chart 5**  
**New and Used Car Components of the CPI**  
Twelve-Month Percentage Change



Source: U.S. Department of Labor, Bureau of Labor Statistics.

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roughly two-thirds of their retail used car sales. The wholesale auctions remain a secondary source but now account for roughly 25 percent of new car dealers' greatly expanded retail used car sales volume.<sup>21</sup>

These proportions are, of course, averages. What is most important for our argument is that their fluctuations over time can have pronounced effects on used car prices. When sales of new cars are relatively strong, the volume of trade-ins and off-lease cars coming onto new car dealers' used car lots increases. As a result, new car dealers are likely increasing the volume of vehicles sent to the wholesale auctions for sale. At the same time, new car dealers are less aggressive bidders on the demand side of those auctions because they need fewer cars from this source. With increased supply and decreased demand, the rate of increase of wholesale auction prices tends to decelerate.

When sales of new cars fall, the process reverses: dealers supply fewer used cars to the auctions while becoming more aggressive bidders on the demand side of the market. Thus, wholesale auction prices exhibit much greater volatility than the retail transaction prices of those vehicles because they are influenced by temporary imbalances in dealers' inventories of used cars.

In light of the considerable volatility of the wholesale auction prices, we believe that BLS might want to explore our hypothesis by collecting data on actual retail transaction prices of used cars from new car dealers. Although BLS already gathers data on retail transaction prices of new cars from those dealers, collecting the used car data would no doubt add to the cost of compiling the CPI. But if our hypothesis is correct, using retail transaction prices would reduce the volatility of the used car component of the CPI, making the traditional measure of core inflation a more reliable indicator.

## Conclusion

By explaining how BLS derives the used car component of the CPI, our discussion highlights just some of the practical problems faced by those charged with constructing an index to measure pure price change. In the case of used cars, this is a particularly daunting task since observed used car prices must be adjusted for both depreciation and improvements in quality. We also demonstrate how the extreme volatility of the used car component has skewed the traditional measure of core inflation, introducing a potentially serious distortion to a widely followed gauge of inflation trends in the U.S. economy. However, we believe that the collection of actual retail transaction prices of used cars—rather than the use of wholesale auction prices—would significantly dampen that volatility.

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## Notes

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1. Congressional Budget Office (1995).
2. Prior to the revisions of the 1995 data, first published in February 1996, the effect of the used car component was nearly 0.50 percentage point in March 1995 and 0.25 percentage point in July 1995.
3. The CPI is a "fixed-weight" price index. Currently, weights for each category of expenditure are based on consumer buying patterns in 1982-84.
4. See Kellar (1988).
5. Information on the universe of cars sold from the business and government fleets is obtained from Runzheimer, a management consulting firm located in Rochester, Wisconsin. The sample was updated in April 1994.
6. For an interesting and thorough description of these auctions, see Genesove (1993).
7. According to the National Automobile Dealers Association, the Blue Book price data control for mileage. This adjustment is important because as leasing has grown as a share of retail deliveries of new cars, the typical mileage of two- and three-year-old cars sold at these auctions has declined.
8. The current methodology was introduced in 1987. Previously, used car prices were not quality-adjusted.
9. The change in the MSRP cannot be expressed in percentage terms because, as a general practice, BLS does not disclose the average MSRP of the sample of new cars on which the quality adjustment estimates are based. One reason cited is that the sample of models used for evaluating quality changes differs each year.
10. The decision to treat the manufacturer's cost of equipment and modifications required to meet federal safety, fuel efficiency, and emissions standards as improvements in quality rather than increases in price was made by the Office of Management and Budget in 1971.
11. For additional discussion, see Gordon (1990) and Pollak (1989).
12. The new vehicle sales series includes fleet sales and retail deliveries. Although a fleet sale is recorded when a car leaves the factory floor and may be delivered directly to the fleet customer, such sales are officially recorded as a sale of a franchised new car dealer. The used vehicle sales series includes both retail and wholesale sales of used vehicles by franchised new car dealers. The inclusion of the wholesale sales does not result in serious double counting; it is a proxy for the retail sales of dealers who sell used cars exclusively.
13. "Driven Only on Sunday" (1995).
14. The survival rate is the percentage of a model-year fleet still in operation after a specified number of years. For example, NADA reports that 60 percent of all 1979 models were still in operation after twelve years, compared with 40 percent of 1966 models. Of course, this result could be influenced by economic as well as technical factors.
15. The purchase price and financing terms presented are for new car purchases financed by the auto finance subsidiaries of the big three domestic auto manufacturers (Chrysler, Ford, and General Motors).

16. CNW Marketing Research, Bandon, Oregon.
17. Although increased leasing has contributed to the long-term increase in used car sales, higher used car prices have fueled the move toward leasing. One of the key variables determining the monthly lease payments is the assumed residual value of the vehicle at the end of the lease period. The rapid rise of used car prices has allowed lessors to be fairly aggressive in their projections of residual value, thus reducing monthly payments.
18. Wood (1994) found that contrary to popular opinion, in percentage terms the loss in value that a car undergoes after it is driven off a dealer's lot increases with the car's age.
19. Between January 1988 and January 1996, there is no statistically significant trend in the twelve-month percentage change of either the new or the used car component of the CPI. The ratio of the standard error of the twelve-month percentage change over the mean twelve-month percentage change is 1.06 for used cars, compared with 0.37 for new cars.
20. NADA (1993).
21. NADA (1995).

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