. . . Projecting Consumer Expenditures on Automobiles

Consumer spending on automobiles is one of the largest and most volatile components of personal consumption expenditures. To gauge the strength of this demand, unit auto sales and retail auto sales are closely watched as early indicators of overall spending and economic activity. This capsule examines the relationship between unit sales and retail sales of autos and their link with consumer spending on autos as measured in the *National Income and Product Accounts*. Our analysis suggests only a weak link between unit sales and retail car sales. Moreover, changes in retail sales of autos convey little information about changes in consumer spending on autos in real terms. In contrast, unit sales are much more closely associated with consumer spending on autos, and therefore appear to be a reliable indicator of consumer auto demand.

Demand for automobiles is measured in three ways: unit sales, retail sales, and real personal consumption expenditures (PCE). Unit sales data count the number of new domestic and foreign passenger cars sold. Retail auto sales data estimate the value of sales by automotive dealers. Personal consumption expenditures data measure the inflation-adjusted spending by consumers on new cars.

These three figures are released at different times each month. Unit sales precede the Census Bureau's advance retail sales report by about a week, and the Bureau of Economic Analysis's nominal and real consumption spending releases by more than two and six weeks, respectively. Since unit sales data are available shortly after the end of the month and then every ten days, they often form the basis for projecting movements in both retail sales and consumer expenditures on cars

On the whole, movements in unit sales accurately indicate the simple change in direction for both retail sales and consumption. Unit sales and retail sales of autos move together about 75 percent of the time while unit sales and consumer spending on autos move together about 85 percent of the time. In months of declining unit sales, however, the link between unit and retail sales weakens while the relationship between unit sales and consumer expenditures remains strong. When unit sales fall, retail auto sales follow only about half of the time, slightly above the correlation predicted by chance. In contrast, consumer spending on autos falls about three-fourths of the time when unit sales drop.

Statistical analysis also indicates a quantitative relationship between unit and retail automobile sales Movements in unit sales explain just under 60 percent of the total variation in the growth of current dollar retail sales of autos. An increase of 10 percent in unit sales seems to be associated with a 4 to 5 percent rise in retail motor vehicle sales.[1]

These results do not improve substantially when real retail auto sales replace nominal sales or when any time trend is removed from the retail data. In both cases, unit sales explain less than two-thirds of the variation in retail car sales. In fact, unit sales gains correspond to even smaller estimated increases in retail auto sales after the retail sales data are adjusted for inflation or the rising trend over time in sales volume.

In contrast, statistical analysis yields a good fit between unit sales and real consumer expenditures on new autos. Changes in unit sales explain about 90 percent of the variation in new car spending. Furthermore, a ten percentage point gain in unit sales implies a similar gain in real personal consumption of autos.[2]

Given the weak association between retail sales and unit sales and the good relationship between unit sales and consumer expenditures, it is not surprising that retail sales are not very tightly related to consumer auto expenditures. Statistically, changes in nominal and real retail car sales explain only about 60 percent of the growth in real expenditures on automobiles.

A careful look at the definitions of the automobile sales measures explains why unit sales and PCE on new cars are more closely related to each other than to retail auto sales. A unit sale records the title transfer to a new car, and real PCE on new cars measures the dollar value of the units which are sold to consumers. In fact, the Bureau of Economic Analysis calculates personal automobile expenditures by multiplying the average new car purchase price, in constant dollars and adjusted for quality changes, by the number of units estimated to have been bought by households Changes unrelated to movements in unit sales are accounted for by shifts in business' and government's share of unit purchases, price changes, and product mix shifts not yet incorporated in the average purchase price paid by consumers Retail "automobile" sales data, however, include sales of used cars, parts, light trucks, motorcycles, and motor-

[1] See Footnote 2 for the regression results

[2] The equations were estimated from January 1967 to September 1985 and were corrected for autocorrelation using the Cochrane-Orcutt procedure The equations are

$$\begin{aligned} RETAIL &= \underset{(4\,80)}{0\,71} + \underset{(17\,70)}{0\,43}\ UNITS \\ \bar{R}^2 &= 0\,58 \quad Rho = -0\,26 \quad S\,E = 2\,8 \end{aligned}$$

$$\begin{aligned} PCECAR &= \underset{(1\,63)}{0\,22} + \underset{(44\,23)}{1\,04}\ UNITS \\ \bar{R}^2 &= 0\,90 \quad Rho = -0\,42 \quad S\,E = 2\,8 \end{aligned}$$

where RETAIL is the one-month percentage change in retail sales by motor vehicle and miscellaneous automotive dealers, PCECAR is the one-month percentage change in real personal consumption expenditures on new foreign and domestic automobiles, and UNITS is the one-month percentage change in new domestic and foreign unit passenger car sales T-statistics are reported in parentheses, the UNITS coefficients are significant at the 5 percent level of significance

boats. Sales of new cars make up only about half of retail automobile sales. In addition, retail sales are not adjusted for inflation when first reported [3] Therefore, any movements in retail automobile sales due to inflation or sales of non-automobile items will be neither foreshadowed by the unit sales data nor reflected in consumer spending on autos.

[3] See Joann Martens, "Do Unit Sales Predict Car Sales?", Federal Reserve Bank of New York, Unpublished Working Paper No 8508 (November 1985), for details on these measures

In sum, this analysis finds that movements in retail auto sales are not very tightly linked to changes in consumer spending on automobiles. The weakness of the relationship suggests that analysts should be cautious in deriving implications for real auto expenditures from real auto sales data. In contrast, unit sales can be a valuable early indicator for both the direction and the magnitude of changes in consumer expenditures on new cars and perhaps for the overall tone of the economy.

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