period over which auto loans are made, thus minimizing short-term storms in income and cash flow. Indeed, paralleling the trend of new-owner auto sales. For example, the U.S. auto stock has been on the decline for several years, and a sudden reversal in this trend may not be sustainable.

However, the cyclical willingness of consumers to retain older cars that shall be replaced by more gas-efficient, lower gas prices would increase the demand for new autos to replace aging automobiles. In 1974, imports accounted for nearly $0.14 below that of July 1982 and 1983. In January 1983, the average retail price per gallon of gasoline fell to $1.16, nearly $0.14 below that of July 1982 and its lowest level in three years. Many oil-market analysts anticipate continued gasoline price increases until summer. In addition to the necessary conditions of income growth and gasoline price increases, another decline in relative prices of new autos would contribute to a sustained auto recovery. For the 1983 model year, General Motors announced an average price increase of only 1.9 percent over similar 1982 models, while the prices of Ford Motor Company products increased less than 1 percent over the last model year. More importantly, given the recognition of user-cost importance to new-auto demand, the path of interest rates enters into the prognosis for new-car sales in 1983. Consumer lending rates have fallen since autumn 1982, and a continuation of this trend certainly improves prospects for auto sales in 1983.

In conclusion, the variables for an auto recovery in 1983 are in place, and most market analysts appear to agree (see table 2). The least optimistic forecast calls for total 1983 auto sales of 8.8 million units, an increase of 10 percent from the 1982 sales performance of 8.0 million autos, but below pre-1980 sales. On the more optimistic side, some auto sales forecasts for 1983 are above the 10 million unit level, which would represent one of the stronger auto recoveries in many years. An average of 43 market forecasters yields an expected 9.3 million unit sales pace for the 1983 calendar year, about 16 percent improvement over the unit-sales performance for 1982 and a decided gain from the dismal auto markets of the past three years. Predicting the future is a hazardous business, particularly in today's auto market. The strength of such forecasts resides precarious in the ability of labor markets to improve real consumer incomes during the year. Throwing this caution aside, it would appear that auto dealers should enjoy the 1983 sales year, with even stronger sales to follow.

An Aging Auto Stock

Changes in the pattern of consumer auto buying have drastically altered the profile of the U.S. auto market (see table 1). The small-car market share of total domestic sales rose from 17.8 percent in 1974 to 63.5 percent in 1982. Foreign competitors seem to hold an advantage in the personal-luxury segment of the auto market. In 1974, imports captured 15.9 percent of the U.S. new-car market, a share that has since risen to almost 28 percent.

The demand for new cars results from two general sources: (1) additions to the stock of autos (new ownership) and (2) replacement of the existing auto stock. Additions to the auto stock result from changes in taste, in real personal income, and especially in demographic characteristics. An increase in the population driving age, such as the aging of the baby-boom cohort, expands the rate of additions to the auto stock. Stories of the 1980s, as imports consistently have captured a greater share of the shrinking new-car auto market, compounding the sales decline of U.S. autos is a corresponding drop in the capacity utilization rate of U.S. motor vehicle industries; this measure fell from 99 percent in 1977 to approximately 60 percent in 1982.

Total employment in these industries declined nearly 27 percent over the same period, and since the late 1970s, total employment has been on a permanent or approximately 60 percent in 1982.

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While demographic occurrences have been identified and hence auto purchases in terms of impact on new-car sales, the replacement demand for autos has behaved more erratically in recent years. The number of existing cars affects the frequency of auto replacement in that a larger stock of existing cars generates a larger replacement demand. Yet, consumers can vary the timing of auto replacement, within broad limits, by exercising their option to retain their current autos. Replacement demand, for new cars, sensitive to both trend and cyclical variations in economic activity, is consequently more difficult to predict.

Perhaps the most dramatic feature of the changing U.S. auto market is the speed at which the auto stock has aged—a consequence of weakening auto replacement demand. Between 1974 and 1982, the average age of the U.S. auto stock rose from 5.7 years to 7.2 years. Some market analysts argue that this aging stems from improvements in automobile mobility and changes in driving laws (such as lowered speed limits), which closely link the interest component of user costs to consumer lending rates. New car loan rates have risen to average quarterly peaks of 14.8 percent in 1980, 15.9 percent in 1981, and 15.8 percent in 1982. A high real rate of interest raises the user costs to consumers and hence reduces new-car demand. Interest rates increase, however, the user cost of all durable goods rises. Other durable goods compete for a share of household wealth, and some studies have argued that a shift from other durable goods expenditures into new-car markets occur as interest rates rise. The net result of rising user costs on new-car demand from both price and interest rate sources is negative but small relative to the sensitivity of income to new-car demand.

A related issue to the cost considerations of buying a new car is affordability. While a car might be desired as a given income-stream and over the life-cost, the periodic monthly payments might be too prohibitive for certain household budgets to absorb. One way consumers can reduce the affordability constraint is to lengthen the borrowing period.
While demographic occurrences have been both individual and hence have varied in terms of impact on new-car sales, the replacement demand for autos has behaved far more erratically in recent years. The number of existing cars affects the frequency of auto replacement in that a larger stock of existing cars generates a larger replacement demand. Yet, consumers can vary the timing of auto replacement, within broad limits, by exercising their option to retain their current autos. Replacement demand for autos, sensitive to both trend and cyclical variations in economic activity, is consequently more difficult to predict. Perhaps the most dramatic feature of the changing U.S. auto market is the speed at which the auto stock has aged—a consequence of weakening auto replacement demand. Between 1974 and 1982, the average age of the U.S. auto stock rose from 5.7 years to 7.2 years. Some market analysts argue that this aging stems from improvements in auto mobile quality and changes in driving laws (such as lowered speed limits), which have increased new-car durability. Analysts also argue that cyclical influences have played an important role in the auto stock aging process. The cyclical component of replacement demand for new cars is often termed unfulfilled, or pent-up, as a consequence of weakening auto sales. The link in income causes an increase in demand for new cars, which, in turn, causes an increase in demand for new auto sales. The income elasticities of new-car sales can be expressed in terms of impact on new-car sales, the replacement demand for autos, and the overall auto stock during periods of unfulfilled, or pent-up, demand.

### Table 1: The U.S. Auto Market: 1974-82

<table>
<thead>
<tr>
<th>Year</th>
<th>New-car sales millions</th>
<th>Import car age in years</th>
<th>Age of domestic cars</th>
<th>Average price dollars</th>
<th>CPI average new-car price</th>
<th>Average new-car price as a percent of income</th>
<th>Loan repayments in months</th>
</tr>
</thead>
<tbody>
<tr>
<td>1974</td>
<td>8.9</td>
<td>15.9</td>
<td>5.7</td>
<td>4,390</td>
<td>4,390</td>
<td>12.6</td>
<td>35.7</td>
</tr>
<tr>
<td>1975</td>
<td>8.6</td>
<td>18.3</td>
<td>6.0</td>
<td>4,370</td>
<td>4,368</td>
<td>13.1</td>
<td>37.6</td>
</tr>
<tr>
<td>1976</td>
<td>10.1</td>
<td>14.8</td>
<td>5.7</td>
<td>4,570</td>
<td>5,068</td>
<td>13.0</td>
<td>38.8</td>
</tr>
<tr>
<td>1977</td>
<td>11.2</td>
<td>18.6</td>
<td>6.2</td>
<td>4,730</td>
<td>5,374</td>
<td>13.3</td>
<td>40.7</td>
</tr>
<tr>
<td>1978</td>
<td>13.3</td>
<td>17.3</td>
<td>6.3</td>
<td>4,670</td>
<td>5,712</td>
<td>14.2</td>
<td>43.0</td>
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<tr>
<td>1979</td>
<td>10.1</td>
<td>21.3</td>
<td>6.9</td>
<td>4,440</td>
<td>6,980</td>
<td>14.8</td>
<td>45.2</td>
</tr>
<tr>
<td>1980</td>
<td>9.0</td>
<td>25.2</td>
<td>6.6</td>
<td>3,730</td>
<td>6,691</td>
<td>14.8</td>
<td>44.7</td>
</tr>
<tr>
<td>1981</td>
<td>8.5</td>
<td>27.3</td>
<td>6.9</td>
<td>3,780</td>
<td>7,100</td>
<td>15.9</td>
<td>45.2</td>
</tr>
<tr>
<td>1982</td>
<td>8.0</td>
<td>27.9</td>
<td>7.2</td>
<td>9,750</td>
<td>7,369</td>
<td>15.8</td>
<td>46.0</td>
</tr>
</tbody>
</table>

#### Nominal increases in car prices

- 1974: 7.2 years
- 1975: 7.2 years
- 1976: 7.2 years
- 1977: 7.2 years
- 1978: 7.2 years
- 1979: 7.2 years
- 1980: 7.2 years
- 1981: 7.2 years
- 1982: 7.2 years

These years reflect a period of relatively constant auto stock aging. The cyclical component of replacement demand for new cars has been relatively constant.

#### Income and Demand

Income elasticities of new-car sales can be expressed in terms of impact on new-car sales, the replacement demand for autos, and the overall auto stock during periods of unfulfilled, or pent-up, demand. Decision to buy autos is based on current and past earnings, these models distribute the impact of income over the past 15 years. From a price perspective, it is necessary to hold the mix and quality of the new-car market constant to calculate the influence of price changes. Although this procedure (reflected in CPI measured new-car prices) gives a more precise indication of changes in new-car prices, the differences between these two price measures are insignificant over the recent past. The consumer price index (CPI) during the past 15 years. From a price perspective, it is necessary to hold the mix and quality of the new-car market constant to calculate the influence of price changes. Although this procedure (reflected in CPI measured new-car prices) gives a more precise indication of changes in new-car prices, the differences between these two price measures are insignificant over the recent past. The user cost approach includes measures of the market rate of interest to represent the earnings opportunities foregone when a person makes a cash outlay for a car. Currently, about 75 percent of new-car purchases are financed, which closely limits the interest component of user costs to consumer lending rates. New car loan rates have risen to average quarterly peaks of 14.8 percent in 1980, 15.9 percent in 1981, and 15.8 percent in 1982. A high real rate of interest raises the user to consumers and hence reduces new-car demand. If interest rates increase, the user cost of all durable goods rises. Other durable goods compete for a share of household wealth, and some studies have argued that a shift from other durable goods expenditures into new-car markets occurs as interest rates rise. The net result of rising user costs on new-car demand from both price and interest rate sources is negative but small relative to the sensitivity of income to new-car demand. A related issue to the cost considerations of buying a new car is affordability. While a car might be desirable at a given income-stream and over the life of the car, vintage years, payments might be too prohibitive for certain household budgets to absorb. One way consumers can reduce the affordability constraint is to lengthen the borrowing period.
While demographic occurrences have been on the increase and hence on the demand for new cars, the replacement demand for autos has behaved more erratically in recent years. The number of existing cars affects the frequency of auto replacement in that a larger stock of existing cars generates a larger replacement demand. Yet, consumers can vary the timing of auto replacement, within broad limits, by exercising their option to retain their current autos. Replacement demand for new cars, sensitive to both trend and cyclical variations in economic activity, is consequently more difficult to predict.

Perhaps the most dramatic feature of the changing U.S. auto market is the speed at which the auto stock has aged—a consequence of weakening auto demand. Between 1974 and 1980, the average age of the U.S. auto stock rose from 5.7 years to 7.2 years. Some market analysts argue that this aging stems from improvements in auto mobile quality and changes in driving laws—such as lowered speed limits—which have increased new-car durability. Analysts also argue that cyclical influences have played an important role in the auto stock aging process. The cyclical component of replacement demand for new cars is often termed involuntary replacement demand, or auto demand. U.S. consumers seem to respond to what they perceive as a temporary phenomenon in the economy by postponing new-car purchases beyond trend levels. Proponents of pent-up demand scenarios expect that an economic recovery that revives consumer confidence potentially could flood new-car markets with replacement auto demand as buyers revert to a long-run sales path. In the forefront of these cyclical determinants of replacement demand, new-car sales are real personal incomes.

Income and Demand

Auto analysts long have regarded income as an important influence in the determination of auto sales. In the language of economics, auto sales are income elastic, i.e., a 1 percent decline in income causes more than a 1 percent decline in new-car sales. The link between income and new-car sales has never been precisely established. In the U.S. new-car market, models for new cars assumed that the variable considered by consumers in the purchase of a new car was the current level of real disposable personal income. Early estimates of income elasticities based on current levels of per capita income fall within the range of 1.5 to 4.6; in other words, a 1 percent increase (decrease) in the current level of real personal income has been associated with a 1.5 percent to 4.6 percent increase (decrease) in the total volume of new-car sales. A sizable range of income elasticities arises from differences in estimation sampling intervals, methodology, and variable specification in estimated models.

More recently, economists have argued that consumers are more likely to buy automobiles on an lifelong earnings stream, or a consumer’s permanent income. Permanent income, commonly measured by distributive method, is a consequence of weakening auto demand, is comprising their option to retain their current autos.

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period over which auto loans are made, thus minimizing short-term strains on auto demand to changes in gasoline costs. This trend has led to an increase in the number of personal vehicles per household, thereby increasing the overall demand for cars, especially the smaller, less fuel-efficient models. Consequently, even if energy prices increase, the demand for new cars will remain high, as consumers continue to purchase new vehicles to replace their older models.

5. Taller, "The Demand for Cars . . ." p. 188.

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period over which auto loans are made, thus minimizing short-term swings on income and cash flow. Indeed, parallel changes in the auto stock is a factor in the maturity of average new-car loans from roughly 36 months in 1974 to 46 months in 1980 (see table 2). An aggregate increase in borrowing maturities for new-car loans gives households partial relief from rising interest rates and new-car prices, although total user costs on average will increase over the life of the loan.

Although not actually considered user costs, the operating costs of automobiles, particularly gasoline prices, are discussed at length in the auto-demand literature. Over the past several years, from the most part, the evidence supports what economic theory would predict. Increases in the price of gasoline tend to reduce the overall demand for cars, especially the demand for larger, less fuel-efficient models. Consequently, energy price increases have contributed to the number of smaller, foreign autos currently mushed to the market. In sum, American consumers to retain older cars should stabilize this aging behavior does not appear likely. However, the cyclical willingness of consumers to retain older cars stabilizes the demand for new cars on an average will increase over the life of the car.

A prerequisite for recovery in auto sales is persistent real income growth throughout the year. As labor markets firm, the prospects for such income strengthening are improving. Moreover, the strength in the 1983 new-car market requires moderation in the pace of gasoline price advances. Although political events in the Middle East and the decisions of OPEC are uncertain, the current state of the oil markets suggests that energy supplies would be abundant in 1983. In January 1983, the average retail price per gallon of gasoline fell to $1.16, nearly $0.14 below that of July 1982 and its lowest level in three years. Many oil-market analysts anticipate continuing gasoline price reductions until summer.

In addition to the necessary conditions of income strength and gasoline price reductions, another decline in relative prices of new cars would contribute to a sustained auto recovery. For the 1983 model year, General Motors announced an average price increase of only 1.9 percent over 1982 models, while the prices of Ford Motor Company products increased less than 1 percent over the last model year. More importantly, given the recognition of user-cost importance to new-car demand, the path of interest rates enters into the prognosis for new-car sales in 1983. Consumer lending rates have fallen since autumn 1982, and a sudden reversal in this trend would probably dampen the recovery even further. Therefore, the trend of new-owner auto sales. For total auto sales (domestic and foreign) have fallen from the highs of over 11 million units in 1977 to a dismal average of 8.5 million units since 1980.

The sales performance of U.S. autos has been a function of the business stories of the 1980s, as imports consistently have captured a greater share of the shrinking new-car market. The dominance of foreign models to the sales dive of U.S. autos is a corresponding dip in the capacity utilization rate of U.S. motor vehicle industries; this measure fell from 99 percent in 1977 to approximately 60 percent in 1982. Total employment in these industries declined nearly 27 percent over the same period. With output and employment, it has been difficult for market analysts to predict the level of auto sales in 1983. After examining the sources of new-car demand, we still question whether the recent weakness in the auto industry is temporary or whether it will persist as a long-run downward adjustment that could continue indefinitely. Until recent years, auto sales were influenced primarily by changes in the population, the existing stock of autos, real disposable income, and gasoline prices.

Since the late 1970s, the U.S. auto market has been characterized by weak growth. Total auto sales (domestic and foreign) have fallen from the highs of over 11 million units in 1977 to a dismal average of 8.5 million units since 1980.

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