An Analysis of the Automobile Market: Modeling the Long-Run Determinants of the Demand for Automobiles. Volume III - Appendices to the Wharton EFA Automobile Demand Model

Wharton EFA, Inc.
Philadelphia, PA

Prepared for

Transportation Systems Center
Cambridge, MA

Dec 79

U.S. Department of Commerce
National Technical Information Service
NTIS

REPORT NO. DOT-TSC-NHTSA-79-49.III

DOT-HS-804 855

AN ANALYSIS OF THE AUTOMOBILE MARKET: MODELING THE LONG-RUN DETERMINANTS OF THE DEMAND FOR AUTOMOBILES

Volume III - Appendices to the Wharton EFA Automobile Demand Model

George R. Schink
Colin J. Loxley

WHARTON EFA, INC.
One University City
4025 Chestnut Street
Philadelphia PA 19104

DECEMBER 1979
FINAL REPORT

Prepared for

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
Office of Research and Development
Washigton DC 20590

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
DOT-HS-804 855		PB80 166580

4. Title and Subtitle
AN ANALYSIS OF THE AUTOMOBILE MARKET: MODELING OF THE LONG-RUN DETERMINANTS OF THE DEMAND FOR AUTOMOBILES, Volume III - Appendices to the Wharton EFA Automobile Demand Model

5. Report Date: December 1979

6. Performing Organization Code:

7. Author(s): George R. Schink, Colin J. Loxley

8. Performing Organization Report No.: DOT-TSC-NHTSA-79-49.III

9. Performing Organization Name and Address
Wharton Econometric Forecasting Associates, Inc.*
4025 Chestnut Street
Philadelphia, Pennsylvania 19104

10. Work Unit No. (TRAIS): HS027/0404

11. Contract or Grant No.: DOT-TSC-1072

12. Sponsoring Agency Name and Address
U.S. Department of Transportation
National Highway Traffic Safety Administration
Office of Research and Development
Washington DC 20590

13. Type of Report and Period Covered
Final Report
September 1975 - March 1977

14. Sponsoring Agency Code:

15. Supplementary Notes
*Under contract to: U.S. Department of Transportation
Research and Special Programs Administration
Transportation Systems Center
Cambridge MA 02142

16. Abstract

An econometric model is developed which provides long-run policy analysis and forecasting of annual trends, for U.S. auto stock, new sales, and their composition by auto size-class. The concept of "desired" (equilibrium) stock is introduced. "Desired stock" and its composition by size-class are related to numerous economic and demographic variables using cross-section data. Among them is a new "capitalized cost per mile" measure, which expresses all costs over time relative to miles driven, discounted back to the present. New registrations, total and by class, and scrappage are found to be strongly related to "desired" stock relative to actual stock, with other influences operating as "speed of adjustment" factors. Fuel efficiency is analyzed in detail, relating mpg by class to physical vehicle characteristics and technological developments. Purchase prices and options expenditures are analyzed and all cost measures distinguished by foreign vs domestic origin as well as by size-class. Volume I summarizes and describes the study, and contains a forecast through 2000. Volume II contains extensive simulation analysis, with public policy implications. Volume III contains data and methodology appendices.

17. Key Words
Automobiles, Long-Run Forecasting, U.S. Demand, Annual Stock, New Sales, Scrappage, Fuel Efficiency, Auto Costs

18. Distribution Statement
DOCUMENT IS AVAILABLE TO THE PUBLIC THROUGH THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VIRGINIA 22161

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	274	

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

PREFACE

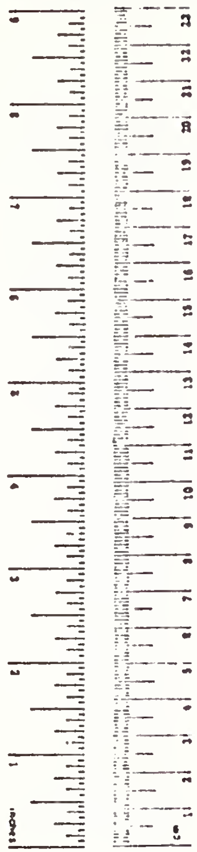
A research undertaking of this magnitude required the concerted efforts of many people, each of whose contributions were essential to its successful completion. The entire project was overseen by the project director, George R. Schink, who also conceived the overall structure of the model. James Savitt helped develop the approach employed, and assisted in the initial data gathering effort and equation estimation. Arthur Doud supervised the work of preparing data bases and computer systems, as well as having the main responsibilty for the international modeling effort. The exogenous projections for the model's forecasts were primarily developed by Sonia Klein. The final report was written and revised by Colin Loxley, who also was responsible for the forecast and simulation analysis. The prinicpal research assistant throughout was Brenda McCowan. Most of the typing for the final report was performed by Renee Scott. Finally, the authors wish to acknowledge the help of the TSC personnel Ron Mauri and Bob Mellman, whose critical reviews undoubtedly improved the final report. This report was originated under the Transportation Energy Efficiency Program (TEEP) at the Transportation Systems Center (TSC), under the sponsorship of the U.S. Department of Transportation, Office of the Secretary (DOT/OST). Work was completed under sponsorship of the U.S. Department of Transportation, National Highway Traffic Safety Administration (DOT/NHTSA).

METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

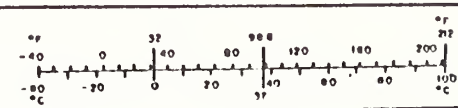
Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



CONTENTS

LIST OF TABLES

LIST OF TABLES (CONTINUED)

LIST OF TABLES (CONTINUED)

APPENDIX A 1 DOCUMENTATION OF DATA SOURCES AND METHODS

A 1.1 INTRODUCTION

This appendix is divided into three major subsections. The first presents a general overview of the WEFA data base while the second describes the sources for the basic data series. Finally, the third subsection presents a description of the size class definitions used and summarizes the methods used to construct those series needed for model estimation and not directly available from existing sources.

A 1.2. OVERVIEW OF THE DATA BASE

In the course of this project, Wharton EFA has assembled a massive and unique data base for the U.S. auto market. While it was not our primary purpose to construct such a data base, it was necessary that such a data base be constructed to support the model specification developed during the first three months of the project.

The U.S. auto market (and auto industry) is exceptionally well documented, but these data were not organized conveniently for our purposes. Since the quality of a model is limited by the quality of the data on which its estimation is based, we devoted much time and effort to carefully collecting, analysing, and organizing these data series. The end result is a data base containing detailed data on the

number of cars registered for 2234 different domestic cars (1947 to 1974) and 982 different foreign cars (1948 to 1974). For each of these domestic and foreign cars we have assembled data on base sticker prices, options prices, percent of options installed, weight of options, and curb weight and engine characteristics. In addition, a complete file on the number of new cars registered by state was assembled and matched with the U.S. total file for 1969 through 1972.

The WEFA model specification also required the collection of a large number of series for the U.S. and by state on income, prices, demographic characteristics, and transportation system characteristics.

The cross-section data base currently contains in excess of 600 data series while the time series data base contains in excess of 1200 data series (including aggregations of the auto data but not the model specific data).

A 1.3 SOURCES FOR BASIC DATA SERIES

A 1.3.1 AUTO DATA

The series for new registrations, cars in operation (the auto stock series used), and scrappage are all R.L. Polk and Co. data obtained either directly from R.L. Polk and Co. or from published material (either as shown in various issues of Automotive News Almanac

or as shown in various issues of Wards Yearbook). Data on auto characteristics (base sticker prices, base curb weight, percent of installed options, weight of installed options, price of installed options, and engine characteristics including number of cylinders and displacement) were obtained from various issues of Wards Yearbook and Automotive News Almanac.[1/] The extent of this data is best illustrated by examining Tables A 1-1 (for domestic cars) and A 1-2 (foreign cars), pps. A1-72 and A1-76. These tables lay out the basic series contained in the WEFA auto registration and characteristics files as well as constructed series which are discussed in subsequent parts of this section. The domestic file contains data for 2234 individual autos while the foreign file contains data for 982 individual autos.

In addition, WEFA has the R.L. Polk and Co. state registration data (covering the 50 states, Washington, D.C and the Federal Government) for 1969 through 1972. These data match the U.S. total (in terms of number of cars included) over the same time period.

A 1.3.2 OTHER DATA

In addition to the substantial auto data base described above, WEFA has assembled large cross-section (1970-1972, for 50 states and D.C.) and

---

1/ These data (excluding base prices) for foreign cars prior to 1959 were obtained from a large assortment of British and U.S. auto magazines.

time series (1948-1974) data bases. These data bases include the various measures of price, economic, demographic, and transportation system variables required to support both the cross-section and time series equation estimation and model simulation work described elsewhere in the report. Without dwelling on specific series, the basic sources by type of data are as follows:

Income and some price data: Bureau of Economic Analysis

Consumer price data: Bureau of Labor Statistics

Demographic data: Bureau of the Census

Transportation System Data: Federal Highway Administration and Bureau of the Census

Foreign Price Data: OECD Data Bank

Gasoline Price Data: Platts Oil Handbook

A1.4 SIZE CLASS DEFINITIONS AND METHODOLOGY FOR DETERMINING MODEL ESTIMATION DATA

A1.4.1 SIZE CLASS DEFINITIONS

As described in Chapter 3 the five size classes are distinguished according to wheel base, this being a concise, unambiguous and easily compiled relative measure of passenger capacity and "roominess". The results of this classification scheme for 1972 may be seen as make and model listings by size for domestic cars in Table A 1-3, page A1-78, and for foreign cars in Table A 1-4, page A1-80.

Turning to the exceptions and special cases,[1] for domestics the most important violation of the general rules centers around the shift of the largest Chevrolet, Ford, and Plymouth cars from mid-size cars to full-size cars which competed actively in the same market with Pontiac, Oldsmobile, Buick, Mercury, Dodge, and Chrysler full-size cars. Beginning with Chevrolet in 1959, these three makes introduced full-size cars (Ford followed in 1960 while Plymouth only became fully competitive in the full-size market in 1964.[2] To avoid an abrupt shift in the shares and to allow for a recognition lag on the part of consumers that, for example, the full-sized Chevrolet was essentially the same car as the full-sized Pontiac part of the full-sized new registrations by Chevrolet, Ford, and Plymouth were allocated to the mid-size class. The specific allocation of full-size to mid-size by year is as follows: 6/7 in 1959; 5/7 in 1960; 4/7 in 1961; 3/7 in 1962; 2/7 in 1963; and 1/7 in 1964. While this allocation scheme is clearly arbitrary, we felt that the abrupt shift was totally inappropriate given that consumers take time to adjust to the upgrading of a product.

The other exceptions for domestic cars are minor by comparison and are as follows:

1. Corvair is classified as a subcompact even though its wheel-

---

1/ To repeat, the general rules are: Subcompact: up to 100 inch wheelbase; Compact: 100+ to 111; Mid-Size: 111+ to 118; Full-Size: over 118; Luxury: classified by price.

2/ Plymouth brought out a full-size model in 1961, but didn't offer the full range of full-size models until 1964.

base was greater than 100 inches (reviewing the sales literature from the period, it is clear that it was GM's intent to use the Corvair to compete with VW).

2. Mercury cars in the early 1950's had a wheelbase which was shorter than full-size cutoff, but Mercury was kept in the full-size class.

There are a few other minor exceptions, but they involve too few cars to merit enumeration.

For foreign cars, the major problem centers around the fact that the registration detail for imports does not distinguish models. Thus, we have one number for Audi with no split between the tax (subcompact) and the 100LS (compact). Imports are thus classified by make, e.g. all Audi sales are classified as "compacts". The makes listed under foreign compacts in Table A 1-4 were, for most of the time period, the major entrants in the compact market and (with the exception of the Citroen Masserati) were always classified as compacts.[1/] The major questionable entrant in the luxury group (on a strict price basis, especially in the earlier years) is the Alfa Romeo, with Porsche falling slightly below the cut-off point in the early 1960's and late 1950's. Since these two cars are anything but utilitarian transportation, and have always been substantially more ex-

---

1/ While all Peugeot and Saab models belong in this group on the basis of the wheelbase criterion, problems (in addition to the Audi problem discussed in the text) include large wheelbase Citroens and the Volvo 164 which belongs in the luxury group.

pensive than the Triumph or MG sports cars included under subcompacts (which is the only other place to put the Alfa Romeo and Porsche), we elected to always include these cars in the luxury group. It should be noted that no foreign cars are included in the mid-size or full-size classes.1/

Table A 1-5, page A1-81, presents the number of new registrations and market share by size class for the five domestic classes, while Table A 1-6, page A1-82, presents the same statistics for the three foreign car categories and Table A 1-7, page A1-83, presents these statistics for combined domestic and foreign (total) cars.

Domestic subcompacts accounted for a very minor share of the U.S. market prior to 1970,2/ and prior to 1959, the compact share of the domestic market was also very small. The mid-size (intermediate in Table) class falls rapidly from 1959 to 1965 primarily due to the movement of the largest Chevrolet, Ford, and Plymouth from the mid-size to full-size category. The luxury class share increases fairly steadily throughout the period.

The largest market share with the foreign car group is the subcompact group. The compact share has been fairly stable since 1960 but exhibits a noticeable increase in 1972, 1973, and 1974. In the earlier years, the share held by luxury cars in total foreign cars was fairly sub-

---

1/ A very few foreign cars could have been included in these classes. However, none were imported in any substantial numbers, leading to very small proportions being involved. We therefore chose to classify them down as compacts (Citroen in a few years) or up as luxury cars (source of the English cars of the early fifties).

2/ Between 1947 and 1969, the cars included in domestic subcompacts are the following: (1) Crosley; (2) Nash Rambler and Rambler American (100 inch wheelbase); (3) Henry J; (4) Allstate; (5) Corvair; and (6) King Midget.

stantial, but fell sharply in 1957 as VW began to market seriously in the U.S. Since 1958, the luxury share has been quite stable.

Turning to the total market share table, one of the more interesting features is the sharp upsurge in the subcompact share during the 1959 through 1961 period due largely to the sharp increase in foreign subcompact sales. The remaining categories essentially follow the same pattern as observed for the domestic cars as domestics dominate (or are the sole members) of these groups.

Table A 1-8, page A1-84, shows the domestic new registration's share for each of the five size classes. The erratic movements in the domestic share of subcompacts prior to 1970 is due in large part to the small number of domestic cars. Starting in 1970, when the U.S. auto makers first decided to compete in this market, the domestic share of subcompacts has risen steadily, attaining a high of 48.22% in 1974. The domestic share of the compact market has declined slowly but fairly steadily from a recent high of 98.17% in 1962 to a recent low of 92.50% in 1974. In addition, foreign luxury cars have made significant gains in the luxury market: the domestic share of luxury cars was 96.32% in 1965 and it fell to 88.21% in 1974.

A 1.4.2 ESTIMATION OF MILES PER GALLON

Fuel efficiencies by class are critical variables in the model.

Not only are they a prerequisite for evaluation of gasoline costs, but their future trends are also of concern in their own right, given present concerns with energy use. Estimates of miles per gallon for each class and by foreign and domestic within classes are therefore required.

The approach used in this study begins by estimating relationships based upon data for a sample of individual autos. Given this data, we can estimate miles per gallon for each model sold in a particular year, using its known characteristics of weight, engine size, etc. The sales-weighted (harmonic) mean MPG is then computed for all models in a particular class, yielding the class MPG. It is these mileage data that are used to estimate the equations for the class relationships used in the model to project MPG by class.1/

At the outset of this study, we had planned to use MPG estimates developed by T.C. Austin and H.H. Hellman for the EPA.2/ The authors presented estimates of fuel economy (MPG) for 1957 through 1975 by inertial weight classes. These estimates were based on very small samples for the earlier years, and the authors caution that these early results are possibly subject to large errors. Close examination of the results (See Table 1 in the Austin and Hellman Study) reveals rather erratic variations over time and across classes. Since a reasonable MPG estimate is

---

2/ See Thomas C. Austin and Karl H. Hellman, Passenger Car Fuel Economy - Trends and Influencing Factors, Society of Automotive Engineers Reprint No. 730790.

1/ Due to the averaging process the parameters estimated for model data cannot be directly applied to class data.

essential to compute cost per vehicle mile properly, we investigated alternative potential sources for MPG estimates. The various auto magazines have not been consistent until very recently in their techniques of measuring MPG in their road tests. The only source which has been quite consistent in its testing and reporting procedures is Consumer Reports.

Data from 723 individual road tests were collected from all issues (1950-1975) of Consumer Reports magazine.[1/] The data collected included city driving MPG, highway driving MPG, curb weight, engine displacement, horsepower, axle ratio, transmission type, number of cylinders, manufacturer and make, and body type (sedan or station). While Consumer Reports generally tests a "representative" sample of cars each year, it is not exhaustive. To obtain estimates of MPG for those cars not explicitly considered, we therefore estimated equations for city and highway driving MPG (MPGC and MPGH, respectively) in accordance with the methodology outlined herein.

Austin and Hellman experimented with equation specifications for MPG involving engine horsepower (HP), inertial weight (IW), engine displacement (DISP), axle ratio (AR), compression ratio (CR), revolutions per minute, per mile, per hour in top gear (N/V), and NO_x emission

---

1/ For the earlier years, Consumer Reports, conducted some tests without providing complete information. As a result, some of these earlier tests were excluded from the analysis. The sample size of 723 is after these exclusions.

level in grams per mile (NOX). They specified an equation involving up to ten terms which is as follows:

$$MPG = a_0 + a_1 (1/IW) + a_2 (HP/IW) + a_3 (HP/DISP) + a_4 (AR) + a_5 (HP) + a_6 (DISP) + a_7 (CR^4 - 1)/(CR^4) + a_8 (N/V) + a_9 (DISP)(N/V) + a_{10}(NOX)$$

where the a_i (i=0, 1, ..., 10) are coefficients to be estimated.

The estimated results for this equation 1/ indicate that only inertial weight (IW), displacement (DISP), and horsepower (HP) are statistically significant in explaining MPG from the list of variables considered, and that inertial weight (IW) alone produced a correlation coefficient of 0.9277 versus 0.9475 when all ten variables were included. However, their data included only 1973 model cars for which the relationship between all these factors might be quite close. Austin and Hellman consider as a potentially important factor, but do not include in their equation specification, transmission type (automatic, manual, or overdrive).

While we agree generally with Austin and Hellman on the list of relevant variables to be included in MPG equations, we had a strong a priori view that the form of the basic equation should be multiplicative (log-linear) rather than linear, as follows:

1/ Austin and Hellman, op. cit., p.14.

$$MPG = A\ (IW)^{\alpha_1}\ (DISP)^{\alpha_2}\ (HP)^{\alpha_3}\ldots$$

where

IW = Inertial weight,

DISP = Engine displacement,

HP = Engine horsepower

In estimating the equations, we tried both the linear and log-linear forms and the latter form fit the data better.

In specifying our equations, we considered inertial weight (IW), engine displacement (DISP), engine horsepower (HP), axle ratio (AR), type of transmission (DUMATR for automatic and DUMODR for overdrive), and number of cylinders (DUM4CYL for 4 or less cylinders and DUM6CYL for 6 cylinders). Early experimentation indicated the axle ratio (AR) was insignificant so this variable was dropped. We also found that only one of the engine size measures could be included in the equation (either displacement (DISP) or horsepower (HP)). Since the former variable was most significant when included alone and remained significant when horsepower (HP) was introduced, we elected to exclude horsepower (HP) from the equations. The transmission type dummy variables (DUMATR and DUMODR) and the number of cylinders dummies (DUM4CYL and DUM6CYL) also were significant in explaining MPG.1/

Table A 1-9, page A1-85, presents the estimated equations for city driving MPG (MPGC) and highway driving MPG (MPGH). Our results confirm

---

1/ The overdrive dummy was relevant only for the highway driving MPG equation.

the basic finding of Austin and Hellman that inertial weight (IW) is the most important factor in determining MPG, but engine displacement (DISP) is also an important factor. Both inertial weight (IW) and engine displacement (DISP) have stronger negative influences on city driving MPG (MPGC) than on highway driving MPG (MPGH). An automatic transmission reduces MPGC by 3.2% and MPGH by 5.3% while an overdrive increases MPGH by 7.6%. Four and six cylinder engines increase MPG (vis-a-vis mileage for an 8 or more cylinder engine) for both city and highway driving.

The time shift dummies were introduced to capture technological factors such as engine and transmission efficiency improvements (positive effects), the increased installation of unaccounted-for options such as power steering and air conditioning (negative effects), and the introduction of pollution controls (negative effects). These shifts tend to coincide quite closely to major model offering changes. These time shift dummies suggest that these other factors caused city driving MPG to fall slightly between 1954 and 1955, decline very slowly through 1966, and then fall sharply in 1967.[1/] These shift dummies suggest a very modest "efficiency increase" in city driving MPG in 1975. For highway driving MPG, the time shift dummies suggest a modest but steady improvement in MPG through 1966, where the trend reverses, reaching its minimum value

1/ Part of this fall is due to a change in the Consumer Reports city test, causing MPGC to be 8-10% higher, 1960-66, i.e. about half the dummy variable shift. The dummy variable shifts can be seen in the changes in the dummy coefficients relative to the 1972 base.

in 1972. No perceptible improvement in MPGH was found between 1973 and 1975.

We had initially hoped to make use of some of the EPA MPG data for 1973 onward, but these data are inconsistent with the Consumer Reports data both in terms of levels (being consistently higher, especially for city drivers) and in terms of year to year movement (as a result of the changes in the EPA methods of calculating MPG from the emissions data). Table A 1-10, page A1-87, presents some comparisons of the Consumer Reports and EPA MPG estimates for 1975. Given the discrepancies between the Consumer Reports and EPA MPG data, the equations presented in Table A 1-10 were used to estimate city and highway driving MPG data for 1947 to 1974.

To use these equations, data was collected on curb weight, displacement, percent with installed automatics, percent with installed overdrive, percent with 4 cylinder or less engines, and percent with 6 cylinder engines for each domestic and foreign car reported in the R.L. Polk and Co. new registrations data.[1/] The equations were then applied to each auto in the file (2234 domestic cars and 982 foreign cars) to generate estimates for city and highway MPG for that car. Then individual new car registration data were aggregated into the 8 basic size classes (5 domestic and 3 foreign)[2/]. Sales weighted means for the

---

1/ Displacement and curb weight rate were collected for cars with 4, 6, and 8 cylinder engines installed. Since more than one engine displacement is offered for many of the cylinder sizes, the "typical" engine for the number of cylinders was collected as described in Section (i.e. ends) was collected.

2/ The definition of these classes is given in Section A 1.4.1, page A1-4.

city and highway estimates of MPG (MPGC and MPGH, respectively) were computed for each class (see Table A 1-11, page A1-88), as well as sales weighted averages for the basic determinants of these MPG estimates:[1/] curb weight and engine displacement (see Table A 1-12, page A1-89); fractions of cars with automatic transmission, and overdrive (see Table A 1-13, page A1 - 90); and fractions with 4 (or less) cylinder engines and with 6 cylinder engines (see Table A 1-14, page A1 - 91).

A 1.4.3 COST PER MILE

The cost per mile measure originated for this study is of critical importance as a major influence on both total autos demand and its distribution by class and by domestic versus foreign origin.

As discussed in Chapter 3, there are three elements that enter the conceptual basis for cost per mile:

-- The stream of expenditures must be put onto the same scale, and thereby compared to, the stream of services. This means that the costs and benefits (miles driven) over time must be capitalized i.e. discounted back to present value terms.

-- The costs considered are all those incurred over the economic life of the vehicle and not solely those faced by the new car buyer, i.e. the relevant costs are those incurred by all owners of the vehicle. The cost per mile measure might therefore be characterized as a "social" or "society" cost.

-- All costs of purchase and operation should enter into the calculation in proportion to their relative importance so that the appropriate weight is given to their economic significance.

1/ Required for the equation estimates by class as previously discussed.

The computational problems involved derive directly from these three principles. There is, first, the question of the "appropriate" discount-rate, second, whether (or how) the purchase-trade in-resale question should be addressed, and third, (related to the above) the treatment of purchase cost vs. operating costs.

The discount rate choice is, inevitably, somewhat arbitrary. Since future costs are projected at current levels (i.e., no inflationary expectations are incorporated) it should be a "real" discount rate. The rate should reflect the consumer's willingness to sacrifice present consumption for the future benefits expected from the "capital good" purchased. We examined the implicit real interest rate that consumers have been willing to pay for mortgages, and found (for 1972, the "equilibrium" year) this to be around 5%.

In terms of our computed cost per mile figures the discount rate can vary over a fairly wide band without substantially altering the estimates--or, more importantly, their relative positions. The discount rate is of more significance in, for example, assigning importance to the gasoline cost component. Therefore, if the model were found to be unrealistically insensitive to gasoline cost, this would indicate the discount rate was too high.

Let the discount rate be denoted as R1 (where R1 is converted from percentage terms to a fraction), then costs incurred in year i are dis-

counted thus:

$$\text{Discounted Cost}_i = COST_i/(1 + R1)^i = COST_i * (T1)^i$$

where

$$T1 = 1/(1+R1)$$

The car is assumed to have an economic life of 10 years, hence i takes the values 0 through 9.

The purchase and interest costs were analyzed as follows. The purchaser must pay the complete purchase cost of the car (PUTOT) - including the base list price plus extra options plus transportation plus taxes. In addition, there is a finance charge that depends upon the fraction of this total that is borrowed (FRACFIN), the period financed, and the installment rate (R2).

Since we are concerned with the cost to all owners, over the economic life of the car, the methodology adopted is to suppose that the vehicle is resold each year. Thus the first buyer pays interest on the financed fraction of the new car price. In the next year the second buyer pays interest on the new financed portion of the <u>one year old</u> price, and so on. This can also be interpreted as one purchaser, who, each year, renegotiates his auto financing, paying off each year an amount exactly equal to the car's economic depreciation and financing successively smaller amounts. So long as the used car market and financing sources are relatively 'perfect' markets, this approach

has the vehicle owner in equilibrium in each year. The finance costs in year i may therefore be represented as:

$$\text{Finance Cost}_i = \text{PUTOT} * \text{FRACFIN}_i * \text{PR}_i * \text{R2}_i$$

where: PUTOT = New car purchase cost

FRACFIN_i = Fraction financed in year i

PR_i = Price of car age i relative to PUTOT

The new car cost, PUTOT, is taken from the basic auto data and is an endogenous variable predicted by the model. The PR_i values are the average price relatives, across all classes, for the years 1969-72, determined from the price "decay" factors estimated for the used car price analysis (see later in this appendix). These values are given in Table A1-15, page A1-92, (PR_0 is, of course equal to one). The price relatives have remained fairly stable over time (according to our admittedly very limited information) and there is no data on interstate differences, thus they are constants.

The evidence on fraction financed comes from two sources. The Federal Reserve Bulletin, September, 1973, p. 643, Table 2, gives the average amounts financed for new cars from June 1971 to July 1973. The values range from an average of $3,054 for the second half of 1971 to an average of $3,231 for the first half of 1973. The National Commission on Consumer Finance, Technical Studies, Vol. III, p. 42, Table 1007-1, gives a figure for mid-1971 of $2,975 for new cars. These values for 1971

are remarkably consistent and suggest a reasonable accuracy.

Comparing these values to our PUTOT estimates we find a ratio of about 0.75 over this period.[1/] For used cars, the same Federal Reserve Bulletin source gives $1600 for mid-71 and $1800 for mid-73. Comparing these to our average used car price estimates, we observe a lower figure of 0.60 - 0.65. In evaluating these data we must take account of the fact that some cars will not be financed at all. For new cars, it would appear that only a fairly small proportion are completely unfinanced, but for used cars - especially older ones - quite substantial proportions may be unfinanced.

Given the limited data available we have elected to apply a declining FRACFIN as indicated in Table A1-15, page A1-92. Granted, these proportions are somewhat arbitrary but some assumption must be made until such time as a thorough study of automobile financing is performed. These fractions are held constant over time and across states (the Consumer Finance Commisssion study did suggest some interstate variation but we elected to ignore this for simplicity).

For auto finance rates we again have the two sources of the Federal Reserve Bulletin and the Consumer Finance Commission Study. Turning first to the cross-sectional analysis, the data are for mid-71 while our cross-sectional year is 1972. On the basis of the Federal Reserve

---

1/ Note that the Federal Reserve ratios given in the same table relate to <u>dealer</u> cost only.

Bulletin data (see above) for mid-71 and mid-72 the commercial bank rates by state [1/] were adjusted downwards by 0.95, and the finance company rates by 0.98.[2/] The relative importance of banks versus finance companies for auto loans does vary by state. Fortunately the commission study has data on the ratio of new auto purchased paper to total new auto credit extended and this ratio is used to weight the finance company rate and one minus this is the weight for the commercial bank rate. Algebraically, we therefore have:

$$R2_{1972} = PRCHP/CR * (APRFIN * .98) + (1.0 - PRCHP/CR) * (APRCOMM * .95)$$

where:

$R2_{1972}$: Mean Average Percentage Rates, by State, for New Autos, 1972.

PRCHP: Volume of New Auto Purchased Paper, by State

CR: Total New Auto Credit Extended, by State

APRFIN: Mean Average Percentage Rates, by State, for New Autos, Finance Companies, Mid-1971.

APRCOMM: Mean Average Percentage Rates, by State, for New Autos, Commercial Banks, Mid-1971.

For the time-series analysis we only have consistent data from the Federal Reserve Bulletin from January 1972 through April 1976. For this period the available evidence suggests a roughly equal distribution between commercial bank loans and finance company loans, and we therefore averaged

1/ $3,000, 36 month loan, mean APR, page 44, Table 1008-1.

2/ Mean APR, page 49, Table 1011-1. Where not reported was equated to the bank rate plus 2% (2% was the average difference between the two).

the two for the new car mean APR.

Fortunately we were very successful in relating this consumer installment credit rate to Moody's Total Corporate Bond rate in order to obtain a complete time series (relationships were estimated both monthly and quarterly). The estimated equation and some of the annual estimates resulting are given in Table A1-16, page A1-93. Comparison with other rates - such as mortgage rates - (allowing for a faster response to inflation and a risk premium) suggest these values are reasonable.

Finally, we have allowed for the fact that much higher interest rates are charged on used autos than new. Once again, data are scarce and some arbitrary assumptions had to be made. Fortunately, since both FRACFIN and PR decline strongly over the age of the car, the importance of these assumptions becomes progressively less important. We have elected to increase the rate (R2) by 1% for each year of the car's age for the first 6 years, then setting it at the maximum permissible rate for the remaining three years of its economic life. For time-series use, the maximum rate was assumed to average 20 %. Rate ceilings by state are given in the Commission study referenced earlier, where no value was given, a rate of 22% was used.

Now we turn to operating costs. In the cross-sectional analysis these are divided into three groups: fuel costs, repair costs, and other. The latter includes insurance, tires, motor oil, and parking,

garaging, and tolls. Unfortunately there is no state data for these components.

Repair costs are estimated by assuming that interstate differences are primarily due to labor costs. For the U.S. in 1972 about half of repair costs were labor. We therefore computed a relative labor cost, using wages per man year for auto repair shops and garages in the state divided by the same for the U.S., gave this a weight of 50%, and weighted a constant (across states) parts index by 50%. The result is our estimated repair cost index.

The final direct operating cost category is fuel costs. Miles driven in a year are divided by MPG, and multiplied by the per gallon gasoline price, where the latter varies across states.[1/] Operating costs by state (cross-sectional) can therefore be written as:

$$\text{Operating Costs}_i^j = \text{REPIN}^j * \text{REP}_i + \text{OTH}_i + (\text{MILES}_i/\text{MPG}_i^j) * \text{PGAS}^j$$

where:

Superscript j refers to state j

Subscript i refers to age of car

REPIN = Repair Index

REP = Average Repair Cost

1/ A fixed distribution of mileage is assumed. While miles driven in a year undoubtedly does vary by state we have no data for this - as noted previously. MPG by class does vary by state because of different proportions of urban and highway driving.

OTP = Average Insurance, Tires, Oil, etc., Cost

MILES = Miles Driven

MPG = Miles Per Gallon

PGAS = Retail Price of Gasoline

In the time-series analysis each component of operating cost is distinguished. In computing the historical values for costs each component's 1972 value was indexed by the appropriate consumer price index, rebased to 1972 = 1.0.

The complete calculation of capitalized cost per mile can therefore be written as (omitting size class identification for clarity):

$$CPMCAP_t = (PCCAP_t + OCCAP_t)/MICAP_t$$

where:

$$MICAP_t = \sum_{i=0}^{9} MILES_i / (1+R1_t)^i$$

$$PCCAP_t = PUTOT_t * (1 + \sum_{i=0}^{9} PR_i * FRACFIN_i * R2_{i,t}/(1+R1_t)^i)$$

$$OCCAP_t = \sum_{i=0}^{9} (MILES_i * PRGAS_t/MPG_{i,t} + \alpha 1_i * CPREP_t$$
$$+ \alpha 2_i * CPPKG_t + \alpha 3_i * CPINS_t + \alpha 4_i * CPTIR_t$$
$$+ \alpha 5_i * CPOIL_t)/(1+R1_t)^i$$

Definitions of Terms and Assumptions:

$MILES_i$ = Total Miles Driven in Car's ith year
(Assumed constant over time, across size classes and across states)

Thus cost per mile is a fixed-weight cost index for the average car.

i =	0	1	2	3	4	5	6	7	8	9
MILES = (Thous.)	14.5	13.0	11.5	11.0	9.5	9.5	9.0	8.3	7.6	7.1

$PUTOT_t$ = Total Purchase Cost, New Car
(Includes all costs, including taxes)

PR_i = Price Relative, Car Aged i Years to New
(Averaged across all size classes, constant over time and across states)

$FRACFIN_i$ = Fraction of Purchase Cost Financed in Car's ith year
(Assumed constant over time, across size classes, and across states)

$R1_t$ = Discount Factor
(5% used for Cross-Section)

$R2_{i,t}$ = Consumer Installment Rate, Car's ith year
(Variation by age of car assumed)

$PRGAS_t$ = Retail Gasoline Price
(Includes taxes, varies by state)

$\alpha1_i$ = Repair Cost in Car's ith year, 1972 1/
(Varies by constructed labor cost index across states)

$CPREP_t$ = Consumer Price Index, Repairs, 1972=1.0
(Assumes same rate of change across size-classes)

$\alpha2_i$ = Parking, Toll and Garage Costs in Car's ith Year, 1972
(Assumed constant across size-classes and states)

$CPPKG_t$ = Consumer Price Index, Parking, 1972=1.0
(See above)

$\alpha3_i$ = Insurance Costs in Car's ith Year, 1972
(Assumed constant across states)

$CPINS_t$ = Consumer Price Index, Insurance, 1972=1.0
(See above)

1/ All 1972 operating cost base data is from L.L. Liston and C.L. Gauthier, Cost of Operating An Automobile, U.S. Department of Transportation, Federal Highway Administration, Office of Highway Planning, Highway Statistics Division, April 1972.

$\alpha 4_i$ = Tire Costs in Car's ith Year, 1972
(Assumed constant across states)

$CPTIR_t$ = Consumer Price Index, Tires, 1972=1.0
(See above)

$\alpha 5_i$ = Oil Costs in Car's ith Year, 1972

$CPOIL_t$ = Consumer Price Index, Oil, 1972=1.0
(See above)

The data for operating cost components by size class and year of operation is given in Table A1-17, page A1-94. The 1972 capitalized costs per mile across states by class are given in Table A1-18, page A1-97 and the capitalized costs per mile over time by class are given in Table A1-19, page A1-99. Data and methods for purchase prices and their components are detailed in the next section.

A1.4.4 NEW CAR PRICES

There are many components to the total new car purchase cost (PUTOT) that are required for each of our eight size-classes. We begin with the base purchase and options prices. Our source data are the listed base sticker prices and options prices,[1] which we have not attempted to adjust for any discounts. These detailed statistics have been aggregated by sales-weighting up to the eight classes for analysis.

The first necessary step was to obtain estimates of these prices and expenditures that were consistent both across classes and over

---

[1] See Section A1.3.1 for sources

time. The data consist of prices including installed options. But the number and type of options that were "standard" have varied widely between classes and over time - tending to show a steady upward trend for each class.

Therefore, in order to obtain comparable, consistent estimates, the value of all installed options - both "standard" and "extras"-was computed and subtracted from the initial base price to derive a base purchase price for a "stripped" vehicle in a given class. The revised estimates of base prices by class are given in Table A1-20, page A1-100.

This "stripped" base price should more acurately reflect changes over time in the cost of the car itself - and not merely the addition of more standard features - and differences in cost between sizes. Likewise, the series on expenditures for options now reflect the total spent in addition to the "stripped" base price. These revised data for options expenditures by class are given in Table A1-21, page A1-101.

A further series was computed for each class, the cost of a fixed "package" of all options that could be installed. The reason for this was simple: increased expenditures on options reflect two things: greater consumer demand for more features and increases in the cost of

---

1/ The purchase price is thus estimated as the sum of the base "stripped" price plus all options expenditures.

the options available. Since the "maximum installed options" values relate to a fixed physical combination, increases in these values reflect rising costs only - it is, therefore, a pure "price" variable.[1/] These maximum options prices by class are given in Table A1-22, page A1-102.

Finally, there was insufficient data on options for foreign cars to fully implement this approach. It was therefore decided to assume that expenditures on options were the same as the corresponding domestic class. Many of the options on foreign cars are produced in the U.S. and/or purchased from the same suppliers as U.S. companies. This assumption of "competitive equality" thus seems reasonable.

A1.4.5 TRANSPORTATION CHARGES

The next essential element in total delivered new car price to be considered is the data for transportation charges over time and for states in 1972. Since our definition of size classes does not exactly conform with any published definition, we needed transportation charges for specific makes and models which could be merged with our registrations file on a car by car basis, and then sales-weight averaged.

After a thorough search for data which came as close as possible to meeting our needs, we determined that the data on transportation charges (for domestic and foreign cars) prepared by the Automobile Invoice

---

[1/] The maximum options price series is purely an intermediate variable used in analyzing the consumer's actual options expenditures. See Appendix A2 for its use.

Service (AIS)[1] were the most reliable and consistent available. They were kind enough to supply us with complete data on transportation charges for domestic cars by make and model for 76 cities from 1972 through 1976 (1972 is as far back as this extensive compilation extends). In addition, they supplied us with as much earlier transportation data as could be obtained from their back files, for Ford and Chevrolet Automobiles (all size classes) back to 1956 for the western region.[2] They also supplied us with data on estimated transportation charges for foreign subcompact cars for 41 cities for 1967 through 1972. These data are not model specific.

The first step in processing these data on transportation charges (both domestic and foreign) was to convert the city estimates into state estimates. Since the cities covered in the domestic and foreign data are not the same (more specifically, the cities included for the foreign transportation data are not strictly a subset of the cities included for the domestic transportation data), the following process was repeated for each of the two sets of data:

1) For states with more than one city included, the city transportation charges were weighted by the SMSA population (or population of the county where the city was located for non SMSA's) and a weighted average was computed. In a few cases

---

1/ Automobile Invoice Service is a division of Gousha/A Times Mirror Company, 2001 The Alameda, P.O. Box #6227, San Jose, California, 95150.

2/ The only files which had been kept relatively consistently were for the western regions. Also, these values represented maximum charges.

cities not in the state but essentially contiguous with a city in the state were included in the average using as a weight the relevant population weight for the city within the state.

2) For states with no city present in the data, we used averages of rates for cities essentially the same distance from Detroit (in the case of domestics) or from the nearest port of entry (for foreign cars). In some cases, averages for cities whose average distance from the relevant point were equal were used.

Having determined the weighting scheme for computing the averages by state, the individual make and model transportation charges were examined (for domestics only) to see if there was a pattern involved so that the make and model data could be collapsed (without any loss of information) to a relatively small number of classes (denoted as transportation classes). In fact, the transportation charges can be grouped into 11 classes without any loss of information as follows:

1. All subcompact cars except specialty compacts (like Mustang II).
2. Compact sedans and compact specialty cars (like the Pontiac Firebird).
3. Compact wagons.
4. Mid-size sedans
5. Mid-size wagons
6. Low-priced full-size sedans (Ford, Chevrolet, Plymouth, and Dodge).

Note: Dodge moves to the higher priced full-size group 1970 and earlier. For some reason, transportation charges on the AMC Ambassador are high priced full-size rates.)

7. Low-priced full-size wagons

8. High-priced full-size sedans and wagons (all full-size cars not in group 6 or 7 and not luxury cars.

9. Specialty subcompact cars (like Mustang II).

10. Luxury cars (Cadillac, Lincoln, Imperial, Thunderbird, Packard).

11. Corvette (same rate applied to Shelby Cobra).

Table A1-23, page A1-103 presents the estimates for these classes for domestic cars by state in 1972 (excluding specialty subcompacts which were not sold in 1972). These charges were assigned to each car (according to its classification) and sales weighted averages by the five domestic size classes were computed for each state.

Given that we only have an estimate of foreign subcompact transportation charges, once the estimates by state were completed (as discussed above), no further processing was necessary. The estimated foreign imported subcompact car transportation charges by state for 1972 are shown in Table A1-24, page A1-105. After having reviewed these numbers and consulted with Automobile Invoice Service, it was determined that these estimates were biased downward, primarily because no transportation charge increases for foreign imports were reported from 1967 to 1972 while transportation charges on domestic cars had risen dramatically.

Therefore, these numbers were uniformly scaled upward by the ratio of U.S. average domestic subcompact transportation charges in 1972 over U.S. average imported subcompact transportation charges for 1972 (or by 78 over 59). Transportation charges by state for foreign compacts and foreign luxury cars were estimated by adding the difference between these transportation charges for domestic cars and domestic subcompacts by state to the estimated imported subcompact charge for the state. For the time series estimates, the foreign freight charges were set equal to the corresponding estimated domestic rate.

In estimating the time series data for domestic auto transportation changes by transportation class, numerous sources were used and the resulting estimates were a healthy mix of limited information and reasoned judgement. For 1972 through 1974 we were able to construct sales weighted estimates based on the city data supplied to us by Auto Invoice Service (see above). For the earlier years, the information used is much more limited.

In constructing the transportation estimates for 1972, we calculated the ratio of specific city data to the national average for a selected subset of cities for which we had transportation charges data for the earlier years. In 1972, New York City transportation charges are 97.26% of average U.S. transportation charges. Given this ratio,

and transportation charges data for New York by make and model for 1967 through 1970, the transportation charges by class were computed for New York City from 1967 to 1970 and divided by 0.9726 to form the average U.S. estimate.

Selected data was available for earlier years for New York and other cities and given the Ford and Chevrolet estimates for the West Coast (1956 to 1970) which were supplied to us by the Auto Invoice Service, the remaining transportation charges back to 1956 were estimated using constant ratios (based on the 1972 calculations) and a substantial amount of judgement, since the various estimates (based on the various ratios) of the U.S. average transportation charges were not consistent. For 1955 back, the 1956 rates were held constant.

The results of these calculations are shown in Table A1-25, page A1-106. While the earlier data (prior to 1967) are estimated by rather imprecise methods, we believe that better estimates would (for our purposes) be too costly to construct for whatever potential gain in accuracy is achievable.

A1.4.6 PURCHASE TAXES

From the plethora of tax rates levied at both the local and state levels we require some 'average' rate for the U.S. over time

and for states in 1972. The state and local tax rates on new auto purchases from 1963 to 1974 by state, were collected from various issues of Automotive Fleet magazine.1/ Interpolation of data prior to 1963 was done by taking the 1963 value as the base, and increasing or decreasing it in proportion to the movement of the general sales tax rate for the state or local area concerned.2/ (These rates appear in Table A1-26, page A1-107, as TXRSAUTOY72 and TXRLAUTOY72).

The "total" rate by state was then computed two ways. First, the state and local rates were simply summed (TXRAUTOY72). Second the local taxes were weighted by the percentage of total local administrative units levying the tax 3/ and added to the statewide rates. A correction was also made in cases where the taxes are not additive. The results of these computations also appear in Table A1-26 as TXRLWTDAUTOY72 and TXRWTDAUTOY72. These weighted averages were felt to be more appropriate and so were used, although the differences are minor.

The U.S. total rate for state and local taxes was computed by weighting the rates for each state by its share of total new car registrations in each year and summing across states. This was done for both the weighted and unweighted versions of taxes. These variables appear in Table A1-27, page A1-109 . Again, the weighted average was felt to be the

---

1/ "State Automobile Insurance, Registration and Tax Facts," Automotive Fleet, various issues, 1963-1975.

2/ State and Local Taxes--An Information Report, U.S. Advisory Commission on Intergovernmental Relations. Table 5, State General Sales Tax Rates as of January 1, 1952 through 1968.

3/ Ibid.; State and Local Sales Taxes, Table 18, Local Retail Sale Taxes by State, Selected Features, p. 52.

most appropriate (TXRWTDAUTO).

A1.4.7 END OF YEAR STOCK

For model purposes measures of the stock of cars in operation at the end of the year are needed, since our analysis is in calendar year terms. A mid-year stock estimate, for the first of July each year, is compiled by R.J.Polk and Co. In the time-series work a simple moving average was taken:

$$OPMVUAYEND_t = (OPMVUAY_t + OPMVUAY_{t+1})/2$$

where:

$OPMVUAYEND_t$ = End of Year Stock, Year t.

$OPMVUAY_t$ = Mid-Year Stock, Year t.

These year-end stock estimates appear in Table A1-28, page A1-110, along with the basic data for OPMVUAY and new registrations (OMVUANR).

End of year stock by state for 1972 could not be estimated in this fashion because we lacked mid-year stock by state for 1973. Therefore, the national time series data (estimated above) was analyzed by regression analysis. In doing this the end of year stock figures were adjusted by half of total new registrations in order to allow (in the next step) for the sales variations that exist between states. The constructed variable is termed YEND-R, where:

YEND-R = OPMVUAYEND - 0.5 OMVUANR

OMVUANR = U.S. New Car Registrations

The estimated relationship for this variable was:

$$\text{YEND-R} = \underset{(535.8)}{0.961122} * \text{OPMVUAY}$$

$\bar{R}^2 = .999$ S.E.E. = .56152 D.W. = 1.712

Period: 1948-73

We then estimate end-of-year stocks by state using:

$$\text{OPMVUAYEND72E}_j = 0.961122 \text{ OPMVUAY72}_j + 0.5 \text{ OPMVUANRY72}_j$$

where:

OPMVUAYENDY72E_j = Estimated 1972 End of Year Stock, State j.

OPMVUAY72_j = Mid-Year 1972 Stock, State j

OMVUANRY72_j = 1972 New Car Registrations, State j.

These estimates were then summed across states, and scaled by the U.S. ratio to this sum so as to yield consistency with the U.S. total:

$$\text{SCALE} = \text{OPMVUAYEND}_{1972} \Big/ \sum_{j=1}^{51} \text{OPMVUAYENDY72E}$$

(j=1, ..., 51; 50 states plus Washington, D.C.)

$$\text{OPMVUAYENDY72}_j = (\text{SCALE}) * (\text{OPMVUAYENDY72E}_j)$$

The adjusted estimates, as well as OPMVUAY72 and OMVUANRY72, are presented

in Table A1-29, page A1-111.

A1.4.8 STOCK BY VINTAGE AND SIZE CLASS

Having estimated year-end cars in operation by the method described above, we are faced with three problems: decomposing this stock into its vintage-year composition for the total stock; constructing series for the number of cars in operation at year-end for domestic and foreign cars disaggregated by size class; and estimating the vintage year composition of these disaggregated stock series. These various stock series are required to be consistent with the total cars in operation and with each other in the following ways:

1. The sum of the vintage year components of the stock over all vintages must equal total end-of-year stock.

2. The sum of year-end stocks for domestic and foreign stocks disaggregated by size class across all domestic and foreign size classes must equal total end-of-year stock.

3. For each vintage year component, the sum of the components of the disaggregated stocks across all domestic and foreign size classes must equal the corresponding vintage year component of the total stock.

4. The sum over all vintages of the vintage year components of the stocks disaggregated by domestic and foreign size classes must equal total stock disaggregated by domestic and foreign size classes.

Before stating these constraints in algebraic form, let us define

the following symbols:

K_t = Total number of cars in operation at the end of year t

N_t = Total numbers of new cars registered during year t

S_t = Total number of cars scrapped during the year t

K_t^c = Number of cars of class c (c=1,...,8) in operation at the end of year t

N_t^c = Number of new cars registered of class c (c=1,...,8) during year t

S_t^c = Number of cars of class c (c=1,...,8) scrapped during year t

$KV_{i,t}$ = Total number of cars of vintage i (i=0,1,...,20)[1] in operation at the end of year t

$KV_{i,t}^c$ = Number of cars of class c (c=1,...,8) of vintage i (i=0,1,...,20)[1] in operation at the end of year t

The four consistency constraints stated above can be expressed in terms of the symbols defined as follows:

1) $K_t = \sum_{i=0}^{20} KV_{i,t}$

2) $K_t = \sum_{c=1}^{8} K_t^c$

3) $KV_{i,t} = \sum_{c=1}^{8} KV_{i,t}^c$ for i=0,...,20.

4) $K_t^c = \sum_{i=0}^{20} KV_{i,t}^c$ for c=1,..,8.

1/ We are assuming that no cars older than 20 years old are in operation, which is not strictly true but not an unreasonable cutoff point given that we must assume a finite life.

While R.L. Polk and Co. have prepared annual estimates of total cars in operation by vintage since the early 1950's, they have not prepared estimates disaggregated by size class until 1975.[1/] We could have used the R.L. Polk and Co. estimates of cars in operation by vintage year for the total stock, but we chose not to take this approach for the following reasons:

1. R.L. Polk and Co. state that the earlier data is inconsistent conceptually (includes a large number of light trucks) with the more recent data. While they have attempted to clean up the total stocks, they have not gone back and adjusted the vintage components.

2. The earlier data on vintage year composition of the total stock, again according to R.L. Polk and Co., is much less reliable than the more recent data.

3. If we used these data, we would have to deal with the messy (and irrelevant for our purposes) problems of "lemon vintage years" and "good vintage years". For example, the 1958 and 1959 cars exhibited a higher scrappage rate than would be expected throughout the period (given annual scrappage and their age in any given year).

4. We would still have to come up with an alternative approach for the disaggregated stocks.

Before indicating how we implemented our solution to estimating the stocks disaggregated by vintage and size class, let us outline the nature of our solution. First, let us define various "survival probabilities" as follows:

1/ The stock was disaggregated by nameplate, but this disaggregation was not useful to us.

(a) P_i = probability

that an i year old car will survive until the end of the current year given that it has survived until the end of the previous year (i=0,1,...,20)

(b) q_i = probability

that an i year old car will not survive until the end of current year given that it has survived until the end of the previous year (i=0,1,...,20)

$= 1 - P_i$ for i=0,1,...,20

(c) $PSE_i = \prod_{j=0}^{i} P_j$ for i=0,1,...,20

= probability of a car surviving until the end of the ith year of its life

(d) $PDE_i = q_i$ for i=0

$= (q_i)\ (PSE_{i-1})$ for i=1,...,20

= probability of a car being scrapped during the ith year of its life

(e) $PDEC_i = \sum_{j=0}^{i} PDE_j$ for i=1,...,20

= probability of a car being scrapped by the end of the ith year of its life

$= 1 = PSE_i$ for i=0,1,...,20

The reader should note that the last three probabilities defined above (PSE_i, PDE_i, and $PDEC_i$) are survival and scrappage probabilities based

on current year "transitional" probabilities (p_i and q_i). Therefore, two interpretations of the last three probabilities are possible. Using PSE_i as an example:

(1) PSE_i could be interpreted as the probability that a car sold this year will be in operation i years from now.

(2) PSE_i could be interpreted as the probability that a car sold i years ago will still be in operation at the end of the current year provided that the p_i's have been constant for the last i years.

Since constant p_i's would require constant scrappage rates by vintage over time (which is not a viable assumption) we clearly have to modify the above definition of the p_i's to allow variation over time.

However, let us first consider how we can make use of these "survival" probabilities in defining stocks disaggregated by vintage and size class which satisfy the four consistency constraints. Using the second interpretation of PSE_i given above (namely that PSE_i is the probability that a car sold i years ago will still be in operation at the end of the current year), if N denotes the number of new registrations, we can define the various stock components as follows:

(1) $KV_{i,t} = PSE_i * N_{t-i}$ for i=0,1,...,20.

(2) $KV^c_{i,t} = PSE_i * N^c_{t-i}$ for $i=0,\ldots,20$ and $c=1,\ldots,8$

(3) $K^c_t = \sum_{i=0}^{20} KV^c_{i,t}$ for $c=1,\ldots,8$

If the P_i's have been constant over the last 20 years (which we admit is an unrealistic assumption and will be modified later in this section), then it will be true (if we reinterpret the p_i's as the fraction of i year old cars which will survive until the end of the current year given that they survived until the start of the current year)1/ that the sum of the $KV_{i,t}$'s over i will equal K_t, or:

(4) $K_t = \sum_{i=0}^{20} KV_{i,t}$, and

since the sum of new registrations over all classes in any year equals total new registrations, or:

(5) $N_{t-i} = \sum_{c=1}^{8} N^c_{t-i}$ for $i=0,1,\ldots,20$.

it follows that:

(6) $K_t = \sum_{c=1}^{8} K^c_{i,t}$ for $i=0,1,\ldots,20$.

(7) $KV_{i,t} = \sum_{c=1}^{8} KV^c_{i,t}$ for $i=0,1,\ldots,20$.

1/ Even if we don't make this interpretation of the p_i's, relationship (4) will hold in an expected value sense.

Therefore, by defining a set of p_i's and corresponding PSE_i's, we can construct stock series disaggregated by vintage and size class which satisfy the four consistency constraints. We will also relax the constraint of constant p_i's over time, but since the procedure requires the definition of "normal" p_i's, let us first review how these series were constructed.

Using the table of cars still in operation by model year published in the 1975 Automotive News Almanac (obtained from R.L. Polk and Co.)[1/], we calculated the fraction (probability) of cars which survived from July to July by vintage year. There are sufficient data in this table to construct 5 complete series of the following form.

Period of Life	EST 1	EST 5	AVR (1 to 5)
6-18	--	--	---
18-30	--	--	---
30-42	--	--	---
42-54	--	--	---
54-66	--	--	---
---	--	--	---
---	--	--	---
---	--	--	---

where period life refers to months after end of model year. The AVR refers to an average of the five estimates. The averages of these data were then converted from mid-year to end-of-year fractions (probabilities) as

1/ The table gives registrations by year model for 1959 (model years 1940-59), 1960 (1941-60), etc. through 1974 (1955-74).

follows:

$$P_1 = AVR_{6-18}$$

$$P_2 = (AVR_{6-18} + AVR_{18-30}) / 2$$

$$P_3 = (AVR_{18-30} + AVR_{30-34}) / 2 \text{ etc.}$$

where AVR_{i-j} is the average fraction surviving from i to j months after the end of the model year (given that the car survived until the beginning of the ith month after the end of the model year).

The value for P_0 was abritrarily set at 0.998 (0.2% of new cars do not survive until the end of the year in which they are sold). The results of the calculations are shown in Table A1-30, page A1-112. The values for P_{12} through P_{20} are equal to a rounded average of the data computed via the formulas given above for P_{12} to P_{14} (which is as far back as the actual data goes). The original data was fluctuating around the 0.7 value for these three years. The PSE_i series falls to 0.012 by the end of the 20th year and PSE_{21} is zero (or q_{21}) since we are assuming no cars more than 20 years old are on the road. It is interesting to note that the year with the highest probability of a car being scrapped (PDE_i) is the 10th year with the 11th and 9th years being the next highest.

Having obtained the estimates of "normal" vintage year survival (scrappage) probabilities (shown in Table A1-30), we must now define "actual" survival (scrappage) probabilities for each year t which satisfy the four consistency constraints for each year.

Since the solution involves first finding a set of probabilities which satisfy the first constraint for the first year (t=1) and then modifying these initial probabilities in each subsequent year, let us consider the problem of finding a set of probabilities which satisfies the first constraint for the first year, or find $PSE_{i,1}$ such that, for, the first year stock, K_1:

$$(8)\ K_1 = \Sigma(PSE_{i,1}) * (N_{1-i})$$

(from definition (c))

where:

$$(9)\ PSE_{i,1} = \prod_{j=0}^{i} P_{j,1} \quad \text{for } i=0,1,\ldots,20$$

(from definition (c))

$$(10)\ P_{i,1} = 1 - (q_i)\,(\gamma_1)$$

(from definitions (a) and (b))

We are making a strong assumption in constructing the first year survival probabilities; namely, that the survival probabilities have been constant

and equal to first year survival probabilities ($P_{i,1}$ for i=0,1,...,20) for the last 20 years. However, this assumption is necessary to estimate a value for γ, and is relaxed for subsequent years.

The constant γ can be thought of as a scrappage adjustment factor. If scrappage is equal to the "normal" scrappage rates (q_i, i=0, 1,...,20.) then γ will equal one. If scrappage is higher than the "normal" rate, then γ will be greater than one, while, if scrappage is less than the "normal" rate, γ will be less than one. We are assuming that changes in scrappage rates are proportional to the fraction normally scrapped (q_i, i=0,1,...,20) i.e. a scalar change across all rates. This assumption means that when the scrappage rates are, for example, above the normal rate, that the scrappage rate increases by more in absolute terms for cars which "normally" have a higher scrappage rate.

To obtain a solution for γ, we rewrite the formula for PSE_i, using (9) and (10), above, as follows:

$$(11)\quad PSE_{i,1} = \prod_{j=0}^{i} (1 - q_j \gamma_1)$$

Then substituting (11) into (8), we obtain:

$$(12)\quad K_1 = \sum_{i=0}^{20} \prod_{j=0}^{i} (1 - q_j \gamma_1) * N_{1-i}$$

Now, by definition, scrappage is equal to the "given" (defined) scrappage from the surviving 21 year old cars plus the difference between the

cumulative total of new registration over 20 years and the actual existing stock.

Thus:

$$(13)\quad S_1 = (PSE_{20,1})(N_{1-21}) + \sum_{i=0}^{20} N_{1-i} - K_1$$

$$= (PSE_{20,1})(N_{1-21}) + q_0\ \gamma_1\ N_1 + \sum_{i=0}^{20} N_{1-i} * (1 - \prod_{j=1}^{i} (1 - q_j \gamma_1))$$

--where $q_0\ \gamma_1\ N_1$ is the first year scrappage.

However, from definition (3), $PDEC_i$, we can also write total scrappage as:

$$(14)\quad S_1 = (PSE_{20,1})(N_{1-21}) + \gamma_1\ PDEC_{i,1} * N_{1-i}$$

$$= (PSE_{20,1})(N_{1-21}) + q_0\ \gamma_1\ N_1 + \sum_{i=1}^{20} \gamma_1\ PDE_{i,1} * N_{1-i}$$

(again, employing definition (e))

Comparing (13) and (14):

$$(15)\quad \gamma_1 * (PDE_{i,1}) = 1 - \prod_{j=1}^{i} (1 - q_j\ \gamma_1) \qquad (i = 1,\ldots,20)$$

But definition (d) states that

$$\gamma_1\ PDE_{i,0} = \gamma_1\ q_i\ \ PSE_{i-1,1} \qquad (i = 1,\ldots,20)$$

Therefore

$$(16)\quad 1 - \prod_{j=1}^{i} (1 - q_j\ \gamma_1) = \gamma_1\ q_i\ PSE_{i-1,1}$$

and therefore

$$(17)\ S_1 = (PSE_{20,1})\ (N_{1-21}) + q_0\ \gamma_1 N_1 + \sum_{i=1}^{20}\ 1\ q_i\ PSE_{i-1,1} * N_{1-i}$$

Collecting γ_1 terms, and reordering (noting that γ_1 can be moved outside the summation):

$$(18)\ \gamma_1 = \frac{S_1 - (PSE_{20,1})\ (N_{1-21})}{q_0\ N_1 + \sum_{i=1}^{20} (q_i)(PSE_{i-1,1})(N_{1-i})}$$

Similarly γ_2 can be obtained as follows:

$$\gamma_2 = \frac{S_2 - (PSE_{20,1})\ (N_{2-21})}{q_0\ \ N_2 + \sum_{i=1}^{20}(q_i)\ (PSE_{i-1,1})\ (N_{2-i})}$$

The values for $P_{i,2}$ and $PSE_{i,2}$ (for i=0,1,...,20) are given by the following:

$$P_{i,2} = 1 - (\gamma_2)\ (q_i) \text{ for } i=0,1,...,20$$

$$PSE_{0,2} = P_{0,2}$$

$$PSE_{i,2} = (P_{i,2})\ (PSE_{i-1,1}) \text{ for } i=1,...,20.$$

The corresponding general expression for γ_t, $P_{i,t}$, and $PSE_{i,t}$

(t=2,...) are as follows:

$$\gamma_t = \frac{S_t - (PSE_{20,t-1})(N_{t-21})}{q_0 \ N_t + \sum_{i=1}^{20} (q_i)(PSE_{i-1,\ t-1})(N_{t-i})} \qquad (t=2,\ldots)$$

$$P_{i,t} = 1 - (\gamma_t)(q_i) \text{(for } i=0,1,\ldots,20, \text{ and } t=2,\ldots)$$

$$PSE_{o,t} = P_{o,t} \text{ (for } t=2,\ldots), \text{ and}$$

$$PSE_{i,t} = (P_{i,t})(PSE_{i-1,t-1}) \text{(for } i=1,\ldots,20, \text{ and } t=2,\ldots).$$

These scrappage probabilities (fractions) satisfy the logical constraints that once a car has been scrapped it stays scrapped (no rebirths) and that for a car to be scrapped during the current year it must have survived until the beginning of the current year.

Table A1-31, page A1-113, presents estimates for γ_t (shown in the table under the smbol SPNEADJ) and the $PSE_{i,t}$ (shown in table as SPSEi, for i=0,1,...,20) for 1953 through 1974. Examining SPNEADJ, we can see that the low post WW II scrappage rates carry over into 1953 and 1954, then SPNEADJ rises sharply for 1955 through 1957 which were strong new car sales years, falls sharply in the 1958 recession, climbs slowly through 1965, fluctuates around a value of one from 1965 through 1973 (increasing in strong new car sales years), and falls sharply in the 1974 recession.

Cars in operation at year-end by size class are computed as [1]

$$K_t^c = \sum_{i=0}^{20} (PSE_{i,t}) (N_{t-i}^c) \text{(for } c=1,\ldots,8)$$

The results of this calculation are shown in Table A1-32, page A1-116. Table A1-33, page A1 , shows these stocks aggregated in the five major classes (total subcompacts, total compacts, domestic mid-size cars, domestic mid-size cars, domestic full-size cars, and total luxury cars).

A1.4.9 USED CAR PRICES

Included in the model is an analysis of the used car market. This feeds back into the rest of the model by affecting scrappage via used car prices. The data we require are prices by vintage and size-class. However, the used car market is the worst documented segment of the U.S. auto industry. Thus a considerable amount of work was required. Two series are available which measure used car prices: (1) the consumer price index (CPI) for used cars; and (2) the Automotive News wholesale auction price (PUSEDW). The CPI is based on a limited sampling of types of used cars (primarily Ford and Chevrolet mid-size to full-size cars which isn't a bad choice if you are going to have a limited sample) in the two to five year old range.

---

[1] While total new registrations are published from 1921 to 1974, the size class breakout is only available from 1948 to 1974. The share for each of the 8 size classes from 1921 to 1947 was set equal to its 1948 to 1950 average value.

Despite any limitations to the CPI, it is more informative than the Automotive News wholesale auction price (PUSEDW) since the latter price varies with the mix and vintage of cars passing through this market. In a strong new car sales year, the wholesale auction market will do a large volume in recent vintage new car trade-ins while, in a slow new car sales year, relatively few of the newer vintage cars will enter the wholesale auction market.

Two other sources we consulted were the Red Book 1/ and the Used Car Guide of the NADA. 2/ In order to get as full a series of used car prices as possible we used selected cars in each class. Since prices of used cars by vintage vary throughout the year we used the July pricing guides wherever possible. We thus collected data from the N.A.D.A. Used Car Prices for a sample of domestic and foreign cars within each of the five size classes annually from 1958 to 1974.

There are two factors which could affect the reliability of the data. First our sample of cars was selected judgementally and for completeness of car type back as far as possible. Thus the sample is not random and may not be fully representative of all used cars sold. Second the dealers may or may not report their sales and prices accurately. Some people have suggested that there may be an incentive to report slight-

---

1/ Official Used Car Valuations published by National Market Reports, Inc., Chicago, Ill.

2/ Used Car Prices, published by the National Automobile Dealers Association, Washington, D.C.

ly inflated retail prices in order to "firm up" a price of some cars. In any event we have chosen to take the numbers as given and adjust them only where there are obvious jumps in the data.

Table A1-34, page A1-118, lists the cars in each class for which we gathered data. For each year and each car in the sample the used car guide lists the mean wholesale and retail prices of a zero year old car through a seven year used car if that car existed seven years previously. Thus, for each used car in each year there are eight pieces of data, one corresponding to each vintage price from the present back to seven years old.

We used the average reported retail price inclusive of a common set of options. For full size domestics, for example, the options include automatic transmission, power brakes, power steering, and air conditioning (an AM radio is considerer standard). In the most recent years the used car prices reported included these options. However, as one looks at the older editions of the particular car the average prices of those options must be added to the reported used car prices.

The prices of used cars in the analysis are net of any sales taxes or registration fees, since we are looking to explain relative movements in that market, rather than levels. A final point to be noted is that we used the Eastern Region editions of the used price guides. The prices in the other regions generally differ by a constant amount, and move in the

same direction as those in the Eastern Region.

In some cases where the car models came into existence during the sample period we had to splice the price series of one car with what seemed to be its closest predecessor in terms of basic physical specifications. In other cases, such as in certain subcompacts and compacts, we have put in the series as much as it exists and have not attempted any splicing. In constructing the sales weights for averaging purposes, where the car did not exist, the remaining cars and sales in the class were used to derive the share weights.

The annual used car price data for the cars shown in Table A1-34 were matched with the corresponding data in the new car file. The used car prices (vintage 1 to 7) were divided by the new car price (defined as base price + values of installed options + transportation charges) generating ratios equal to the value of a 1 to 7 year old car relative to a "comparable" new car.

The individual car ratios were then aggregated (using the weights also shown in Table A1-34) into average ratios by size class for domestic, foreign, and combined domestic and foreign autos. Since the sample size was relatively small, only the combined domestic and foreign ratios by size were used for the purposes of model estimation.

The end result of this procedure is a set of time series of data for each of the five size classes from 1958 to 1974 on the price of a

used car of vintage 1 to 7 years old relative to the current year's average new car price on the same class. For example, the full-size used car price relative can be written as follows:

$PU1FD_t/PNFD_t$ = Price of a one year old full-size car ($PU1FD_t$) relative to the price of a new full-size car ($PNFD_t$) where t=1958,...,1974.

$PU2FD_t/PNFD_t$
$PU3FD_t/PNFD_t$
$PU4FD_t/PNFD_t$
$PU5FD_t/PNFD_t$
$PU6FD_t/PNFD_t$
$PU7FD_t/PNFD_t$

= Same type of ratio for 2 to 7 year old full-size car prices relative to the new full-size price for t=1958,...,1974.

The values for these price relatives for full-size cars are shown for illustrative purposes in Table A1-35, page A1-119. The data for the other four size classes are similar except that the first year decline in price is substantially less for the smaller classes (particularly subcompacts and compacts).

To make use of all this price information but still keep the modeling effort manageable, it is necessary to reduce this array of price information to one or two data series. To accomplish this, one has to specify and estimate a functional relationship among the relative prices.

After analysing the price relatives shown in Table A1-35 as well as the price relatives for the other size classes, we adopted the following approach:

(1) Develop equations for the price of a one year old car relative to the new car price for each class (See Table A1-36, page A1-120, relatives by size class), and

(2) develop a one parameter functional relationship between the one year old price relative and the 2 to 7 year old price relatives.

The first concerns the estimation of behavioural relationships, and is therefore treated in detail in Appendix A2. The second part is handled by estimated identity relationships, and is therefore included here. After experimenting with a number of possible function forms, we decided to adopt an "exponential decay" type model for the relationship between the one year old price relative and the 2 to 7 year old price relatives. The basic model is as follows (using domestic full-size cars as an example):

$$\frac{PUiFD_t}{PU1FD_t} = \exp\{-(i-1)\ \lambda\ FD_1 t\} \quad \text{for } i=2,\ldots,7 \text{ and } t=1958,\ldots,1974$$

To implement this model, we were therefore required to estimate values of λ for each of the 5 size classes (ST,CT,MD,FD, and LT) for each year (1958,...,1974), which involved running 90 regressions. The results of these regressions were excellent for all classes in all years (the lowest $\bar{R}^2$ obtained in the 90 equations was 0.894). The estimated values

for the λ's are shown for each of the size classes in Table A1-37, page A1-121. Table A1-38, page A1-122, presents estimates of the two to seven year old price relatives for full-size domestic cars using the estimated λ_{FD} from Table A1-37 and the one year old price relative from Table A1-36. As can be seen by comparing Table A1-35, and Table A1-33, the estimates of λ_{FD} do very well in reproducing the original data on the two to seven year old price relatives. While we had originally planned to model the λ's (the $PU/NADT_{sc}$, sc = ST,CT, MD,FD,LT in Table A1-37) the movements over time for these decay factors exhibited no relationship to any reasonable set of variables. Therefore, they are specified exogenously.

We have estimated three average price measures. First the WEFA average one year old price, PUSED1TT67, is a weighted average of the one year old prices, using 1967 new registrations as weights. This may be compared to the consumer price index (also based on 1967) as illustrated in Table A1-39, page A1-123. A regression equation demonstrates the close correspondance.

$$\underset{}{\ln (CPI)} = \underset{(0.52)}{0.192142} + \underset{(12.13)}{0.57290} \ln (PUSEDITT67)$$

$\bar{R}^2 = 0.925$ SEE = 0.0217 D.W. = 2.07
Period of Fit: 1962-1974

The second is the WEFA average <u>traded</u> used car price (PUSEDR).

This is computed as a weighted average by vintage and by class. The requisite identities are therefore quite complex, and are detailed in Table A1-40, page A1-124.[1/] The definitions are given in the following table A1-41. This average can be compared to the ANWP figure, and as seen on Table A1-39, page A1-123, the correspondance is close.

Finally, the weighted average price for an old car was also computed (PUOLD). Again, these computations are detailed in Table A1-40. While the calculations for PUOLD and PUSEDR are intricate, the careful reader should find them largely self-explanatory.

A1.4.10 FAMILY UNITS BY STATE

For the cross-sectional analysis we require estimates of the number of family units for each state. Census Bureau estimates of the number of families and unrelated individuals for 1972 by state are not available. These variables were interpolated using ratios of the number of families and unrelated individuals by state in 1970 to resident population by state in 1970.

$$RF/P_j = \frac{NCFY70_j}{NPRY70_j}$$

$$RU/P_j = \frac{NPRUY70_j}{NPRY70_j}$$

1/ Trade-in proportions are taken from data supplied by General Motors Corporation.

$$NCFY72E_j = (RF/P_j)\ (NPRY72_j)$$

$$NPRUY72E_j = (RU/P_j)\ (NPRY72_j)$$

j = (1, 2,..., 51) for 50 states plus Washington, D.C.

NCFY70 = number of families by state, 1970

NCFY72 = number of families by state, 1972

NPRUY70 = number of unrelated individuals by state, 1970

NPRUY72 = number of unrelated individuals by state, 1972

NPRY70 = resident population by state, 1970

NPRY72 = resident population by state, 1972

NCFY72E = number of families by state, 1972, unadjusted to total

NPRUY72E = number of unrelated individuals by state, 1972, unadjusted to total

The resulting estimates by state were then forced to sum to the U.S. total for NCF and NPRU, for which 1972 census estimated do exist. This was done by multiplying each state estimated by the ratio of the census estimate for the U.S. total (NCF_{52}, and $NPRU_{52}$) to the sum of the state estimates.

$$ADJF = \frac{NCF_{52}}{\sum_{j=1}^{51} NCFY72E}$$

$$ADJU = \frac{NPRU_{52}}{\sum_{j=1}^{51} NCFY72E}$$

$$NCFY72_j = (ADJF)\ (NCFY72E_j)$$

$$NPRUY72_j = (ADJU)\ (NPRUY72E_j)$$

NCFY72 = number of families by state, 1972, adjusted

NPRUY72 = number of unrelated individuals by state, 1972, adjusted

The final estimates are presented in Table A1-42, page A1-131. They preserve the 1970 relationships between families and unrelated individuals, and the resident population of each state. That is, for the purposes of interpolation the distribution of families by state in 1972 depends on the distribution of resident population by state as estimated by the Bureau of the Census. The number of families by state depends on the census estimate of the total number of U.S. families for 1972 and the ratio of families to resident population in 1970. The same is true for unrelated individuals. Since these ratios are relatively stable, this should be a reasonably reliable method of interpolating the 1972 data.

A.1.4.11 CONSUMER PRICES BY STATE

A relative price index by state is required as a deflator for the cross-sectional analysis. Measures of relative consumer price levels by state do not ordinarily exist. We thus had to estimate this series.

The general method was to apply the index numbers in Index 4 of Table A1-43, page A1-132 , to the appropriate metropolitan and non-metropolitan areas of states, and weight them by the population in these areas.

Index 4 is a price index computed from budget data with fixed weights equal to the U.S. average quantities of items in the market basket for an urban family of four persons. It therefore measures only geographic differences in prices, and is a pure price index. These data are for the Fall of 1973, while what we require is an index for 1972. However, it may be argued that regional differences in price levels are stable enough to support the application of these price relatives to 1972. In any case this index is the only one available.

The first step in computing the index was to derive an index for the metropolitan area of each state, where metropolitan area is defined as the area inside SMSA's in that state. A price relative from Index 4 was assigned to each SMSA, or fraction thereof, in each state. The state SMSA index then becomes the weighted average of these price relatives for each state, where the weights are equal to the proportion of the state SMSA population in each SMSA.

$$PMET_j = \sum_{i=1}^{n_i} (WMET_{ij}) (P_{ij})$$

$$WMET_{ij} = \frac{POPMET_{ij}}{\sum_{i=1}^{n_i} POPMET_{ij}}$$

j = (1,2,...,50) representing 50 states and Washington, D.C.

i = (1,2,...,n)

n_i = number of SMSA's in $STATE_j$

$POPMET_{ij}$ = population in $SMSA_{ij}$

P_{ij} = price relative assigned to $SMSA_{ij}$

In those SMSA's for which an index number did not exist in Table A1-43, the index number for the SMSA closest to it in location and economic character was used. The result of this calculation appear in the column market "Weighted SMSA Index" in Table A1-44, page A1-133.

The second step in the derivation of this state index was to combine the state metropolitan index with the regional non-metropolitan index applicable to the state (also given in Table A1-43). Here, the SMSA index was weighted by the proportion of state population in SMSA's while the non-metropolitan index was weighted by the proportion not in SMSA's.

$$PCY72E_j = (W_j)\ (PMET_j) + (1-W_j)\ (PNONMET_j)$$

$$W_j = \frac{\sum_{i=1}^{n_i} POPMET_{ij}}{POP_j}$$

$PCY72E_j$ = unadjusted state index

$PNONMET_j$ = non-metropolitan price relative

POP_j = total state population

The results of this calculation appear in the column marked "State Index" in Table A1-44.

The third step was to compute the price relative for the U.S. total. This was done by taking a weighted average of the PCY72E in which the weights are proportional to the state's share of U.S. total resident population in 1972.

$$PCY72E_{52} = \sum_{j=1}^{51} (WUS_j)\,(PCY72E_j)$$

$$WUS_j = \frac{POP_j}{\sum_{j=1}^{51} POP_j}$$

This calculation involves a partial test of the methodology used in generating the state index numbers. This average should equal 100.0 if we are to have a proper index of relative prices. In this particular case, however, we can expect the average to be somewhat lower than 100. This is because Index 4 really applies only to the urban population. By weighting the non-metropolitan index by $(1-W_j)$, we have applied this index to the non-metropolitan non-urban population as well. Therefore the non-metropolitan index has more weight in our index than it had in computing the base for Index 4, and we can expect that $PCY72E_{52}$

will be below 100.0

This is in fact what happened, thus verifying our expectations and lending credence to our methodology ($PCY72E_{52}$ came out to be 98.1). Such a result is desirable, since we are trying to compute a price index applicable to the whole of each state. In theory we should include a separate index for the rural areas, but as none exists this is impossible.

The final step was to rebase the index by dividing by $PCY72E_{52}$. The index then became:

$$PCY72_j = \frac{PCY72E_j}{PCY72E_{52}}$$

$$j = (1,2,...,52)$$

The results are shown in Table A1-44, in the column marked "State Index Rebased".

A.1.4.12 INCOME DISTRIBUTION BY STATE

Since we hypothesized that income distribution would affect the size and composition of the desired stock, income distribution data by state were required. However, these were not available for 1972. We experimented with two series: the percentage of families with incomes over $10,000 in 1972 (PER10+Y72), and the percentage over $15,000 (PER15+Y72). These data were generated using the following estimated equa-

tions:

$$PER10+Y70 = \underset{(2.53)}{-12.5437} + \underset{(19.3)}{4.23918} (YPSP3Y70/FM$$

$$\underset{(2.16)}{-23.5547} DUMDC \underset{(0.65)}{-2.72981} NETTY70/FM$$

$\bar{R}^2 = .915$ S.E. = 2.871 D.W. = 1.270
Period of Fit: Cross Section - 50 States, Washington, D.C., U.S. Total.

$$PER15+Y70 = \underset{(4.86)}{-13.4602} + \underset{(25.07)}{3.06719} YPSP3Y70/FM$$

$$\underset{(0.65)}{-3.94634} DUMDC \underset{(3.50)}{-8.17623} NETTY70/FM$$

$\bar{R}^2 = .942$ S.E. -1.6053 D.W. = 1.618
Period of Fit: Cross Section - 50 States, Washington, D.C., U.S. Total

PER10+Y70 = percentage of families with incomes over $10,000 by state, 1970

PER15+Y70 = percentage of families with incomes over $15,000 by state, 1970

YPSP3Y70/FM = permanent disposable income per family, three year weights, (3,2,1) by state, 1970

NETTY70/FM = total employment per family, by state, 1970

DUMDC = dummy for Washington, D.C.

As one would expect, both PER10+ and PER15+ are a positive function of permanent disposable income per family. The negative sign on total em-

ployment per family may actually be due to a low wage rate. If the wage rate were low enough, it would cause a higher rate of employment per family as more family members are forced to seek work in order to support it, or are forced to remain in the family because they can't afford to move out on their own. In places where this is true the percentage of families with high incomes would probably be lower even though the employment rate per family were higher.

The observation for Washington D.C. was dummied out because the income distribution variable is a place of residence concept, while the income variable is a place of work concept. Since most of the more highly paid income earners do not live in the city, the income distribution is too low given the average income per family earned there.

These functions were actually used to project the change in PER10+ and PER15+. They were evaluated using 1972 values for the independent variables, and the difference between these 1972 estimates and the estimates given by the equations when using 1970 data was added to the actual 1970 values. This sum then became the estimated value for 1972.

PER10+Y72 = PER10+Y70 + (PER10+Y72E - PER10+Y70E)

PER15+Y72 = PER15+Y70 + (PER15+Y72E - PER15+Y72E)

(where the variables with the "E" on the end are estimates from the equations. Using estimates of the change instead of estimated levels reduces the probable errors).

The data gathered by this procedure is given in Table A1-45, page A1-135.

A.1.4.13 NON-AUTO TRAVEL

Despite much experimentation the only 'transportation system characteristic' variable that significantly affected desired auto stock was the series for means of travel to work, non-auto (MTWNA). We therefore report the data construction for this measure.

The data on means of travel to work exist only for the census years 1960 and 1970. For purposes of interpolating the non-auto component of these data into a complete time series, MTWNA was split into two variables.

MTWNAPT = persons travelling to work via non-auto public transportation

MTWNAOTH = persons travelling to work by other non-auto means

MTWNA = MTWNAPT + MTWNAOTH

The MTWNAPT time series was derived by interpolating and extrapolating its relationship to revenue passengers carried on public transit (RPUT) in 1960 and 1970, and then using this relationship to derive a time series for MTWNAPT from RPUT. MTWNAPT and RPUR are dissimilar units since the first involves some fractions of workers at the time of the census, while the second measures the number of passengers in a year. To put RPUT on a comparable basis with MTWNAPT, RPUT was divided by the number

of trips made in a year by a worker who uses public transportation to and from work. Assuming two trips per working day, and a two week vacation, this number is 500 trips. The resulting series was compared to the census data for MTWNA in 1960 and 1970.[1/]

$$RPUT/MTWNAPT_{1960} = \frac{\frac{(RPUT_{1960})}{500}}{MTWNA_{1960}} = 1.9267$$

$$RPUT/MTWNAPT_{1970} = \frac{\frac{(RPUT_{1970})}{500}}{MTWNA_{1970}} = 1.8212$$

The decline in this ratio is indicative of the long run decline in the use of public transportation for purposes other than travel to work. Given the post-war migration away from the central cities where most public transportation is located, this is a plausible result.

This ratio was then linearly interpolated between 1960 and 1970.

$$\frac{(RPUT/MTWNAPT_{1970} - RPUT/MTWNAPT_{1960})}{10} = -.01055$$

Thus the interpolated ratio declined by .01055 per year, which implies an increasing rate of decline. This process was extrapolated backwards in time to 1947 using the same constant difference. The results are seen in

[1/] Unfortunately the question on travel to work was not asked in the 1950 census, so that only two points of comparison exist.

Table A1-46, page A1-137 .

The logical limit in the fall of this ratio must be substantially above unity, since a value of unity would imply that public transit was used only for travel to work. It also seems likely that the process which has heretofore led to an increasing rate of decline in this ratio, may now have levelled off as it begins to approach the effective limit of its decline. Therefore a constant rate of decrease equal to the compound rate between 1960 and 1970 was assumed for the period 1971 to 1975. This rate was -0.56%. The resulting series of ratios (RPUT/MTWNAPT) were used to interpolate MTWNAPT by the following formula:

$$\mathrm{MTWNAPT} = \left(\frac{\mathrm{RPUT}}{500}\right)\left(\frac{1}{\mathrm{RPUT/MTWNAPT}}\right)$$

The interpolated series is again shown in Table A1-46. This series declines steadily over most of the period as it should given the behavior of RPUT. This decline is less than proportionate to the decline in RPUT since the reciprocal of RPUT/MTWNAPT is rising due to the decline in ridership for reasons other than travel to work. MTWNAPT does, however, begin to rise in 1974 and '75 due to the rise in RPUT caused by the addition of new rapid transit systems in Washington, D.C. and San Francisco. This seems a reasonable result.

The other component of MTWNA, MTWNAOTH, was derived by interpolating and extrapolating its relationship to total employment (NEHT) in

the two census years.

$$MTWNAOTH/NEHT_{1960} = \frac{MTWNAOTH_{1960}}{NEHT_{1960}} = .23535$$

$$MTWNAOTH/NEHT_{1970} = \frac{MTWNAOTH_{1970}}{NEHT_{1970}} = .13124$$

The interpretation of these ratios is more direct than in the case of RPUT/MTWNAPT. Here we may say that in 1969, 23.5 percent of workers travelled to work by means other than autos or public transportation, whereas only 13.1 percent did the same in 1970. This decline of 10.4 percentage point is due mostly to the decline in persons who worked at home, which fell by 42.4 percent, and those who walked only, which fell by 11.3 percent. This decline is indicative of the same trends as in the case of RPUT/MTWNAPT, namely migration to surburban areas.

Using the same method of linear interpolation for the years prior to 1970 as we did in the previous case, we obtained a constant decline in the ratio of .01042.

$$\frac{MTWNAOTH/NEHT_{1970} = MTWNAOTH/NEHT_{1960} = .01042}{10}$$

Though this difference is smaller than in the case of RPUT/MTWNAPT, it represents a higher <u>rate</u> of decline with a faster acceleration. This more

rapid rate is easy to justify when one thinks of the rapid disappearance of "mom and pop" stores where mom and pop lived upstairs, and the end of factory neighborhoods where the employees lived within walking distance to work.

A constant rate of decline in this ratio of -5.7% was used for the years 1971 to 1976. In this case the stabilization of the decline seems even more appropriate than in the last, since the changes which led to the decline of this ratio have probably had their largest impact already, and the ratio has become rather small (see Table A1-47, page A1-138).

The interpolation of MTWNAOTH is then the result of the following formula:

MTWNAOTH = (MTWNAOTH/NEHT) (NEHT)

The results are presented in Table A1-47. This series shows a large and rapid decline over the period, which is the required result. Some minor variations around this declining trend are caused by the cyclical movements of total employment. This result is also desired.

A.1.4.14 METROPOLITAN POPULATION

The percent of the population in metropolitan areas was found to have a significant impact on desired stock. For the cross-sectional data this index could be constructed fairly straightforwardly by collecting population for each SMSA and all fractions of SMSA's (where SMSA's cross

state lines) within each state from Current Population Reports estimates of the population of SMSA's and counties by state.[1/] These SMSA populations were then summed to get total population in SMSA's by state. The index of metropolitanization was computed by calculating the percentage of each state's total resident population that resides in SMSA's.

The metropolitan index time series was available in satisfactory form from 1970 onwards. The intercensal estimates of NPMET prior to 1970 were interpolated by assuming a constant compound growth rate between each census year. This interpolation was done because Census Bureau estimates do not exist for all years, and because those that do exist were not revised to reflect decennial census results.

The first step in the interpolation procedures was to compute the compound growth rates for the SMSA population:

$$NPMETNUM_{1960} = NPMETNUM_{1950}\ (1+r_1)^{10}$$

$$NPMETNUM_{1970} = NPMETNUM_{1960}\ (1+r_2)^{10}$$

NPMETNUM = U.S. population in SMSA's

r_1 = constant compound growth rate 195-1960

r_2 = constant compound growth rate 1960-1970

The above equations were solved for the growth rate r_1 and r_2, and these

---

[1/] U.S.Bureau of the Census, Current Population Reports, Series P-26, Nos. 52, 55, 56, 57, 59, 60, 61, 67-72, 74-78, 80-93, and series P-25, nos. 527, 530-532, 535.

rates were applied to $NPMETNUM_{1950}$ and $NPMETNUM_{1960}$ to obtain the intercensal estimates of NPMETNUM, 1950 to 1970. The solutions were:

r_1 = .029, or 2.9% compound growth rate

r_2 = .0213, or 2.13% compound growth rate

Values for NPMETNUM since 1970 were obtained from various current population reports estimates.[1/] The complete series is shown in Table A1-48, page A1-139.

The index of metropolitanization then becomes:

$$NPMET = \left(\frac{NPMETNUM}{NPR}\right) 100.$$

NPR = U.S. resident population

The index of metropolitanization (NPMET) is also listed in Table A1-48.

1/ U.S. Bureau of the Census, Current Population Reports, Series P-25, Nos. 618, 536, 505.

TABLE A 1-1

FORMAT FOR DOMESTIC CAR IMAGE FILE

4 Cards Per Logical Record

Columns	Symbol	Description
1-2	YEAR	2 digit year code (1974 = 74)
3-8	MMMB	6 digit manufacturer, make, model, and body style code
9	CRDNUM	Card Number = 1
10	CLS9	1 digit, 9 category classification code
11-12	CLST	2 digit transportation class code
13-14	CLSPRM	2 digit primary classification code
15-16	CLSSEC	2 digit secondary classification code
17-24	IREG	Up to an 8 digit number giving number of registrations before Oklahoma correction
25-32	IREGOK	Up to an 8 digit number giving number of registrations after Oklahoma correction
34-36	AUTOW	Weight of optional automatic (XXX.)
37-39	AIRW	Weight of optional air (XXX.)
41-72	NAME	32 character description of car (Alphanumeric)

TABLE A 1-1 (Cont.)

Card 2

Columns	Symbol	Description
1-2	YEAR	2 digit year code (1974 = 74)
3-8	MMMB	6 digit manufacturer, make, model, and body style code
9	CRDNUM	Card Number = 2
10-14	PBASE	Base price (XXXXXΛ)
15-19	POBT	Installed options value (XXXXXΛ)
20-24	PB+O	Price including installed options (XXXXXΛ)
25-29	PTRN	Transportation charges (XXXXXΛ)
30-34	PTAX	State and local taxes (XXXXXΛ)
35-39	PTOT	Total delivered price (XXXXXΛ)
40-43	MPGCA	Average city MPG (XXΛXX)
44-47	MPGHA	Average highway MPG (XXΛXX)
48-51	WB	Wheelbase (XXXΛX)
52-55	OPTWGH	Weight of all options (XXXXΛ)
56-59	CURBA	Average curb weight (XXXXΛ)
60-63	DISPA	Average displacement (XXXΛX)
64-67	FRACT4	Fraction with 4 or less cylinders (XΛXXX)
68-71	FRACT6	Fraction with 5-7 cylinders (XΛXXX)
72-75	FRACT8	Fraction with 8 or more cylinders (XΛXXX)

TABLE A 1-1 (Cont.)

Card 3

Columns	Symbol	Description
1-2	YEAR	2 digit year code (1974 = 74)
3-8	MMMB	6 digit manufacturer, make, model, and body style code
9	CRDNUM	Card Number = 3
10-13	AUTOF	Fraction with auto (X∧XXX)
14-17	ORF	Fraction with overdrive (X∧XXX)
18-21	AIRF	Fraction with air (X∧XXX)
22-25	PSTF	Fraction with power steering (X∧XXX)
26-29	PBF	Fraction with power brakes (X∧XXX)
30-33	FMF	Fraction with AM-FM radio (X∧XXX)
34-37	AMF	Fraction with AM radio (X∧XXX)
38-41	PSEF	Fraction with power seats (X∧XXX)
42-45	PWF	Fraction with power windows (X∧XXX)
46-49	PBDF	Fraction with optional power (X∧XXX) disk brakes with drum standard
50-52	AUTOP	Price of auto (XXX∧)
53-55	OPD	Price of overdrive (XXX∧)
56-58	AIRP	Price of air (XXX∧)
59-61	PSTP	Price of power steering (XXX∧)
62-64	PBP	Price of power brakes (XXX∧)
65-67	FMP	Price of AM-FM radio (XXX∧)
68-70	AMP	Price of AM radio (XXX∧)
71-73	PSEP	Price of power seats (XXX∧)
74-76	PWP	Price of power windows (XXX∧)

TABLE A 1-1 (Cont.)

Card 4

Columns	Symbol	Description
1-2	YEAR	2 digit year code (1974 = 74)
3-8	MMMB	6 digit manufacturer, make, model, and body style code
9	CRDNUM	Card Number = 4
10	NENG	Number of engine options (1, 2, or 3)
11-14	EIF	Fraction with 1st engine (X^XXX)
15-16	CYL1	Cylinders for 1st engine (XX^)
17-20	DISP1	Displacement for 1st engine (XXX^X)
21-24	CURB1	Curb weight (excluding options) (XXXX^) for 1st engine
25-28	MPGC1	City MPG for 1st engine (XX^XX)
29-32	MPGH1	Highway MPG for 1st engine (XX^XX)
33-36	E2	Fraction with 2nd engine (X^XXX)
37-38	C4L2	Cylinders for 2nd engine (XX^)
39-42	DISP2	Displacement for 2nd engine (XXX^X)
43-46	CURB2	Curb weight (excluding options) (XXXX^) for 2nd engine
47-50	MPGC2	City MPG for 2nd engine (XX^XX)
51-54	MPGH2	Highway MPG for 2nd engine (XX^XX)
55-58	E3	Fraction with 3rd engine (X^XXX)
59-60	C4L3	Cylinders for 3rd engine (XX^)
61-64	DISP3	Displacement for 3rd engine (XXX^X)
65-68	CURB3	Curb weight (excluding options) (XXXX^)
69-72	MPGC3	City MPG for 3rd engine (XX^XX)
73-76	MPGH3	Highway MPG for 3rd engine (XX^XX)

TABLE A 1-2

FORMAT FOR FOREIGN CAR IMAGE FILE

2 Cards Per Logical Record

Card 1

Columns	Symbol	Description
1-2	YEAR	2 digit year code (1974 = 74)
3-8	MMMB	6 digit manufacturer, make, model, and body style code
9	CRDNUM	Card Number = 1
10-11	CODE	2 digit classification code
12	CNTRY	1 digit country code
13-14	CLST	2 digit transportation class code
15-16	JRRP	2 digit final classification code
17-24	IREG	Up to 8 digit numbers giving number of new registrations before Oklahoma correction
25-32	IREGOK	Up to 8 digit numbers given number of new registrations after Oklahoma correction
34-36	GASC	Gasoline capacity (U.S. gallons) (XXAX)
37-39	WATC	Water capacity (U.S. quarts) (XXAX)
41-72	NAME	32 character description of car (Alphanumeric)

TABLE A 1-2 (Cont.)

Card 2

Columns	Symbol	Description
1-2	YEAR	2 digit year code (1974 = 74)
3-8	MMMB	6 digit manufacturing, make, model, and body style code
9	CRDNUM	Card Number = 2
10-14	PBASE	Base price (XXXXXΛ)
15-19	POBT	Installed options value (XXXXXΛ)
20-24	PB+O	Price including installed options (XXXXXΛ)
25-29	PTRN	Transportation charges (XXXXXΛ)
30-34	PTAX	State & Local Taxes (XXXXXΛ)
35-39	PTOT	Total delivered price (XXXXXΛ)
40-43	MPGCA	Average city MPG (XXΛXX)
44-47	MPGHA	Average highway MPG (XXΛXX)
48-51	WB	Wheelbase (XXXΛX)
52-55	OPTWGH	Weight of installed options (XXXXΛ)
56-59	CURBA	Curb weight (XXXXΛ)
60-63	DISPA	Displacement (XXXΛX)
64-65	CYL	Number of cylinders (XXΛ)
66-69	AUTOF	Fraction with auto (XΛXXX)
70-73	ODF	Fraction with overdrive (XΛXXX)
74-77	SHIPA	Shipping weight (XXXXΛ)

TABLE A 1-3

LISTING OF NAMEPLATES BY SIZE CLASS FOR DOMESTIC CARS IN 1972 SORTED IN DESCENDING ORDER BY NUMBER OF NEW REGISTRATIONS

CAR CLASS	ID CODE	NEW REGS	% OF CLASS	% IN CLASS	DESCRIPTION OF CAR
SUBCOMPACT	21010	407532	35.16	100,00	FORD PINTO
SUBCOMPACT	13020	268300	30,67	100,00	CHEV VEGA
SUBCOMPACT	21011	132391	15.18	100,00	FORD PINTO STAT WAGN
SUBCOMPACT	41010	101395	11.57	100,00	AMC GREMLIN
SUBCOMPACT	13021	65094	7,44	100,00	CHEV VEGA STAT WAGON
COMPACT	13030	322051	19,91	100,00	CHEV NOVA
COMPACT	32010	297006	18,39	100,00	PLYMOUTH VALIANT
COMPACT	21020	231304	14.30	100,00	FORD MAVERICK
COMPACT	33020	225406	13,93	100,00	DODGE DART
COMPACT	21130	116790	7.22	100,00	FORD MUSTANG
COMPACT	29010	67350	4.16	100,00	MERCURY COMET
COMPACT	15023	66966	4.14	100,00	PONTIAC VENTURA
COMPACT	41020	54900	3.39	100,00	HORNET
COMPACT	29080	48737	3.01	100,00	MERCURY COUGAR
COMPACT	13110	47677	2.94	100,00	CHEV CAMERO
COMPACT	41031	35152	2.17	100,00	HORNET SPORTABOUT WAGON
COMPACT	41060	26956	1.66	100,00	JAVELIN
COMPACT	33110	25457	1.57	100,00	DODGE CHALLENGER
COMPACT	15090	22118	1.37	100,00	PONTIAC FIREBIRD
COMPACT	32100	17350	1.07	100,00	PLYMOUTH BARRACUDA
COMPACT	14020	9968	0,62	100,00	OLDS OMEGA 173 MODEL)
MID-SIZE	13050	329120	14,86	100,00	CHEV CHEVELLE
MID-SIZE	21060	299630	13,51	100,00	FORD GRAN TORINO
MID-SIZE	34030	285592	12,90	100,00	OLDS CUTLASS
MID-SIZE	11030	205869	9,30	100,00	BUICK CENTURY /SKYLARK
MID-SIZE	11060	204620	9,24	100,00	CHEV MONTE CARLO
MID-SIZE	15030	176697	7,98	100,00	PONTIAC LEMANS
MID-SIZE	33040	137422	6.21	100,00	DODGE CORONET CHARGER
MID-SIZE	32120	129379	5,84	100,00	PLYMOUTH SATELLITE
MID-SIZE	29020	108774	4,91	100,00	MERCURY MONTEGO
MID-SIZE	21051	100075	4,52	100,00	FORD TORINO WAGN
MID-SIZE	21050	57311	2,59	100,00	FORD TORINO
MID-SIZE	13051	50574	2,28	100,00	CHEV CHEVELLE STAT WAGN
MID-SIZE	41080	36713	1.66	100,00	MATADOR
MID-SIZE	33051	22675	1.03	100,00	DODGE CORONET STAT WANG
MID-SIZE	32121	22666	1.02	100,00	PLYMOUTH SATELITE ST WGN
MID-SIZE	11031	14477	0,65	100,00	BUICK CENTURY S.W. (SKYLARK)
MID-SIZE	29021	13351	0,60	100,00	MERCURY MONTEGO STAT WAGN
MID-SIZE	15031	12651	0,57	100,00	PONTIAC LEMANS STAT WANG
MID-SIZE	41081	10639	0,48	100,00	MATADOR S W
FULL-SIZE	13080	575530	16,88	100,00	CHEV IMPALA
FULL-SIZE	21110	301840	8,85	100,00	FORD LTD
FULL-SIZE	21101	191591	5,62	100,00	FORD STATION WAGN
FULL-SIZE	13090	185025	5,43	100,00	CHEV CAPRICE
FULL-SIZE	21090	182760	5,36	100,00	FORD GALAXIE 500
FULL-SIZE	15060	180391	5,29	100,00	PONTIAC CATALINA
FULL-SIZE	13101	171709	5,04	100,00	CHEV STAT WAGN
FULL-SIZE	11090	168240	4,94	100,00	BUICK LESABRE
FULL-SIZE	32100	117006	3,43	100,00	PLYMOUTH FURY III
FULL-SIZE	14050	107731	3,16	100,00	OLDS DELTA ROYALE

TABLE A 1-3 (Cont.)

LISTING OF NAMEPLATES BY SIZE CLASS FOR DOMESTIC CARS IN 1972 SORTED IN DESCENDING ORDER BY NUMBER OF NEW REGISTRATIONS

CAR CLASS	ID CODE	NEW REGS	% IN CLASS	% IN CLASS	DESCRIPTION OF CAR
FULL-SIZE	10040	100729	3.05	100,00	OLDS DELTA 88
FULL-SIZE	15070	97839	2.87	100,00	PONTIAC GRAND PRIX
FULL-SIZE	20060	85863	2.52	100,00	MERCURY MARQUIS
FULL-SIZE	33120	82612	2.42	100.00	DODGE POLARA
FULL-SIZE	31020	77028	2.26	100,00	CHRYSLER NEWPORT
FULL-SIZE	15060	64417	1.89	100,00	PONTIAC GRAND VILLE
FULL-SIZE	32091	50167	1.47	100,00	PLYMOUTH STAT WAGN
FULL-SIZE	15081	42428	1.24	100,00	PONTIAC STAT WAGN
FULL-SIZE	13070	40803	1.20	100,00	CHEV BEL AIR
FULL-SIZE	32080	39148	1.16	100,00	PLYMOUTH GRAN COUPE/SEDAN
FULL-SIZE	21120	38725	1.14	100,00	FORD LTD BROUGHAM
FULL-SIZE	31030	38044	1.12	100,00	CHRYSLER NEWPORT CUSTOM
FULL-SIZE	15050	37535	1.10	100,00	PONTIAC BONNEVILLE
FULL-SIZE	10031	35660	1.05	100,00	OLDS CUTLASS STAT WAGN
FULL-SIZE	31032	33795	0.99	100,00	DODGE SPORTSMAN STAT WGN
FULL-SIZE	11090	31581	0.93	100,00	BUICK CENTURION/LESABRE
FULL-SIZE	01050	30267	0.89	100,00	AMBASSADOR
FULL-SIZE	24071	25486	0.75	100,00	MERCURY STAT WAGON
FULL-SIZE	24040	25453	0.75	100,00	MERCURY MONTEREY
FULL-SIZE	24050	24980	0.73	100,00	MERCURY MONTEREY CUSTOM
FULL-SIZE	32050	23269	0.68	100,00	PLYMOUTH FURY I
FULL-SIZE	21080	22405	0.66	100,00	FORD CUSTOM 500
FULL-SIZE	21160	22255	0.65	100,00	FORD CUSTOM
FULL-SIZE	33070	21811	0.64	100,00	DODGE MONACO
FULL-SIZE	21002	21287	0.62	100,00	FORD CLUB WAGON
FULL-SIZE	15100	20130	0.59	100,00	PONTIAC CATALINA BROUGHAM
FULL-SIZE	32130	19845	0.58	100,00	PLYMOUTH FURY II
FULL-SIZE	33161	19103	0.57	100,00	DODGE STAT WAGN
FULL-SIZE	13092	18009	0.53	100,00	CHEV NOVA SPORTVAN
FULL-SIZE	13100	15709	0.46	100,00	CHEV BISCAYNE
FULL-SIZE	01051	9986	0.29	100,00	AMBASSADOR STA WAGN
FULL-SIZE	111010	5172	0.15	100,00	CHECKER
LUXURY	12020	189105	19.98	100,00	CADILLAC DE VILLE
LUXURY	11060	169009	17.90	100,00	BUICK ELECTRA 225
LUXURY	14060	120410	12.72	100,00	OLDS 98
LUXURY	21150	56612	5.98	100,00	FORD THUNDERBIRD
LUXURY	22020	50210	5.30	100,00	LINCOLN CONT MARK 4
LUXURY	10080	47002	4.96	100,00	OLDS TORONADO
LUXURY	22010	45420	4.79	100,00	LINCOLN CONT
LUXURY	12050	40537	4.28	100,00	CADILLAC ELDORADO
LUXURY	11080	34306	3.62	100,00	BUICK RIVIERA
LUXURY	31050	29602	3.13	100,00	CHRYSLER NEW YORKER BROUGHAM
LUXURY	11071	29110	3.07	100,00	BUICK STATION WAGN
LUXURY	13120	26496	2.80	100,00	CHEV CORVETTE
LUXURY	14071	26325	2.78	100,00	OLDS STAT WAGN
LUXURY	12030	20102	2.12	100,00	CADILLAC FLEETWOOD 60
LUXURY	31061	18692	1.97	100,00	CHRYSLER STATION WAGN
LUXURY	31000	17260	1.82	100,00	CHRYSLER NEW YORKER
LUXURY	31070	14487	1.53	100,00	CHRYSLER IMPERIAL
LUXURY	12010	6993	0.74	100,00	CADILLAC CALAIS
LUXURY	12040	4001	0.42	100,00	CADILLAC 75&CHASSIS
LUXURY	31080	404	0.04	100,00	CHRYSLER 300 (71 MODEL)

TABLE A 1-4

LISTING OF NAMEPLATES BY SIZE CLASS FOR FOREIGN CARS IN 1972 SORTED IN DESCENDING ORDER BY NUMBER OF NEW REGISTRATIONS

CAR CLASS	ID CODE	NEW REGS	% OF CLASS	% IN CLASS	DESCRIPTION OF CAR
SUBCOMPACT	410000	439572	32,39	100,00	VOLKSWAGEN
SUBCOMPACT	421000	276019	20,37	100,00	TOYOTA
SUBCOMPACT	431000	185990	13,70	100,00	DATSUN
SUBCOMPACT	220000	87508	6,45	100,00	CAPRI
SUBCOMPACT	240000	65556	4,83	100,00	OPEL
SUBCOMPACT	540000	57486	4,24	100,00	FIAT
SUBCOMPACT	581000	48402	3,57	100,00	MAZDA
SUBCOMPACT	410001	40381	3,02	100,00	VOLKSWAGEN ST WGN
SUBCOMPACT	230000	33965	2,47	100,00	DODGE COLT
SUBCOMPACT	682000	31447	2,32	100,00	MG
SUBCOMPACT	685000	22601	1,67	100,00	TRIUMPH
SUBCOMPACT	550000	19049	1,40	100,00	HONDA
SUBCOMPACT	461000	15790	1,16	100,00	SUBARU
SUBCOMPACT	250000	14378	1,06	100,00	PLYMOUTH CRICKET
SUBCOMPACT	600000	11311	0,83	100,00	RENAULT
SUBCOMPACT	681000	1020	0,08	100,00	AUSTIN
SUBCOMPACT	671000	436	0,03	100,00	SIMCA
SUBCOMPACT	492000	10	0,00	100,00	NSU PRINZ
COMPACT	400000	53067	51,81	100,00	VOLVO
COMPACT	491000	28433	27,76	100,00	AUDI
COMPACT	451000	13901	13,57	100,00	SAAB
COMPACT	620000	4985	4,87	100,00	PEUGEOT
COMPACT	510000	1997	1,95	100,00	CITROEN
COMPACT	684000	48	0,05	100,00	ROVER
LUXURY	591000	40696	46,91	100,00	MERCEDES BENZ
LUXURY	630000	20000	23,19	100,00	PORSCHE
LUXURY	500000	14907	17,18	100,00	BMW
LUXURY	683000	5091	5,87	100,00	JAGUAR
LUXURY	470000	2225	2,56	100,00	ALFA ROMEO
LUXURY	270000	1239	1,43	100,00	PANTERA
LUXURY	570000	950	1,09	100,00	LOTUS
LUXURY	761010	691	0.00	100,00	MISC IMPORTS
LUXURY	651000	607	0,70	100,00	ROLLS ROYCE
LUXURY	510000	258	0,30	100,00	FERRARI
LUXURY	480000	11	0,01	100,00	ASTON MARTIN
LUXURY	652000	1	0,00	100,00	BENTLEY

TABLE A 1-5

MARKET SHARE BY CLASS FOR DOMESTIC CARS

YEAR	SUBCOMPACT NUMBER	SUBCOMPACT %SHARE	COMPACT NUMBER	COMPACT %SHARE	INTERMEDIATE NUMBER	INTERMEDIATE %SHARE	FULL SIZE NUMBER	FULL SIZE %SHARE	LUXURY NUMBER	LUXURY %SHARE	ALL CLASSES NUMBER	ALL CLASSES %SHARE	CONTROL NUMBER
1947	15834	0.50	23400	0.74	1603927	50.64	1329268	41.97	194700	6.15	3167231	100.00	3167231
1948	25406	0.73	21408	0.62	1678443	48.30	1520170	43.75	229398	6.60	3474819	100.00	3474819
1949	10175	0.21	28576	0.59	2593952	53.75	1945136	40.30	248352	5.15	4826091	100.00	4826091
1950	34733	0.55	33926	0.54	3456477	54.78	2529370	40.08	255092	4.04	6310102	100.00	6310102
1951	102736	2.04	26049	0.52	2732196	54.21	1911295	37.92	267467	5.31	5040043	100.00	5040043
1952	[illegible]	1.97	41016	0.99	2229310	53.99	1520004	36.81	257187	6.23	4129017	100.00	4129017
1953	[illegible]	0.70	59764	1.05	3217361	56.34	2083477	36.49	309665	5.42	5710028	100.00	5710028
1954	1125	0.02	63061	1.15	3265542	59.34	1893120	34.40	280025	5.09	5502865	100.00	5502865
1955	0	0.0	72227	1.02	3943037	55.45	2756153	38.75	339616	4.78	7111443	100.00	7111443
1956	0	0.0	68821	1.18	3489943	59.59	1910492	32.62	387810	6.62	5857061	100.00	5857061
1957	0	0.0	88540	1.53	3565901	61.74	1704382	29.51	416584	7.21	5775515	100.00	5775515
1958	42233	0.99	129508	3.03	2654864	62.09	1109232	25.94	340260	7.96	4275997	100.00	4275997
1959	[illegible]	2.52	452212	8.35	2938322	54.24	1452409	26.81	437532	8.08	5416961	100.00	5416961
1960	[illegible]	5.67	1053123	17.33	2451867	40.34	1793067	29.50	435321	7.16	6077865	100.00	6077865
1961	[illegible]	8.16	985557	18.00	1962451	35.84	1667372	30.45	413914	7.56	5476125	100.00	5476125
1962	[illegible]	6.13	1281766	19.42	2132059	32.31	2299337	34.84	481927	7.30	6599703	100.00	6599703
1963	[illegible]	4.90	1034847	14.43	2203782	30.73	3068055	42.78	510518	7.12	7171093	100.00	7171093
1964	[illegible]	2.56	1261638	16.64	2018179	26.62	3575269	47.16	532161	7.02	7581019	100.00	7581019
1965	[illegible]	2.39	1321071	15.11	2013122	23.02	4540707	51.93	660304	7.55	8744497	100.00	8744497
1966	[illegible]	1.07	1306523	15.65	2174200	26.04	4106031	49.17	674700	8.08	8350365	100.00	8350365
1967	[illegible]	0.33	1392013	18.37	1791709	23.64	3689925	48.69	679579	8.97	7578201	100.00	7578201
1968	13072	0.16	1438606	17.09	2278113	27.06	3934521	46.74	753709	8.95	8418095	100.00	8418095
1969	[illegible]	0.05	1648586	19.66	2053082	24.49	3847758	45.89	831005	9.91	8384907	100.00	8384907
1970	[illegible]	[illegible]	1707388	23.86	1799397	25.14	2726012	38.08	586227	8.19	7157243	100.00	7157243
1971	[illegible]	8.76	1550410	18.58	1889894	22.65	3316297	39.75	855839	10.26	8343013	100.00	8343013
1972	[illegible]	9.65	1598411	17.85	2188794	24.43	3370337	37.62	935827	10.45	8958392	100.00	8958392
1973	1117708	11.61	1954047	20.29	2470129	25.65	3105902	32.25	982819	10.20	9631082	100.00	9631082
1974	[illegible]	14.73	1503935	20.51	2258840	30.81	1835225	25.03	654044	8.92	7331946	100.00	7331946

TABLE A 1-6

MARKET SHARE BY CLASS FOR FOREIGN CARS

	SUBCOMPACT		COMPACT		INTERMEDIATE		FULL SIZE		LUXURY		ALL CLASSES		CONTROL
YEAR	NUMBER	%SHARE	NUMBER	%SHARE	NUMBER	%SHARE	NUMBER	%SHARE	NUMBER	%SHARE	NUMBER	%SHARE	NUMBER
1947	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
1948	14172	87.84	332	2.06	0	0.0	0	0.0	1629	10.10	16133	100.00	16133
1949	11935	97.42	11	0.09	0	0.0	0	0.0	305	2.49	12251	100.00	12251
1950	14649	89.67	355	2.17	0	0.0	0	0.0	1332	8.15	16336	100.00	16336
1951	18008	86.33	522	2.50	0	0.0	0	0.0	2330	11.17	20860	100.00	20860
1952	24286	82.67	866	2.95	0	0.0	0	0.0	4225	14.38	29377	100.00	29377
1953	22501	77.69	849	2.93	0	0.0	0	0.0	5611	19.37	28961	100.00	28961
1954	27189	83.40	492	1.51	0	0.0	0	0.0	4918	15.09	32599	100.00	32599
1955	51386	87.89	129	0.22	0	0.0	0	0.0	6950	11.89	58465	100.00	58465
1956	83066	84.60	4847	4.94	0	0.0	0	0.0	10274	10.46	98187	100.00	98187
1957	176495	85.33	16786	8.12	0	0.0	0	0.0	13546	6.55	206827	100.00	206827
1958	321658	84.98	31504	8.32	0	0.0	0	0.0	25355	6.70	378517	100.00	378517
1959	526879	86.44	55385	9.09	0	0.0	0	0.0	27275	4.47	609539	100.00	609539
1960	427461	85.70	43631	8.75	0	0.0	0	0.0	27693	5.55	498785	100.00	498785
1961	326466	86.22	28057	7.41	0	0.0	0	0.0	24099	6.36	378622	100.00	378622
1962	293014	86.39	23861	7.04	0	0.0	0	0.0	22285	6.57	339160	100.00	339160
1963	341202	88.48	22337	5.79	0	0.0	0	0.0	22085	5.73	385624	100.00	385624
1964	433323	89.51	26755	5.53	0	0.0	0	0.0	24053	4.97	484131	100.00	484131
1965	514503	90.36	29643	5.21	0	0.0	0	0.0	25269	4.43	569415	100.00	569415
1966	588522	89.42	38451	5.84	0	0.0	0	0.0	31150	4.73	658123	100.00	658123
1967	687344	88.21	52788	6.77	0	0.0	0	0.0	39088	5.02	779220	100.00	779220
1968	882749	89.55	56544	5.74	0	0.0	0	0.0	46474	4.71	985767	100.00	985767
1969	957984	90.24	53730	5.06	0	0.0	0	0.0	49903	4.70	1061617	100.00	1061617
1970	1098976	89.28	69666	5.66	0	0.0	0	0.0	62319	5.06	1230961	100.00	1230961
1971	1327426	89.23	89093	5.99	0	0.0	0	0.0	71094	4.78	1487613	100.00	1487613
1972	1342263	87.76	101304	6.63	0	0.0	0	0.0	85835	5.61	1529402	100.00	1529402
1973	1495783	86.97	128666	7.48	0	0.0	0	0.0	95464	5.55	1719913	100.00	1719913
1974	1159757	84.71	121955	8.91	0	0.0	0	0.0	87436	6.39	1369148	100.00	1369148

TABLE A 1-7

MARKET SHARE BY CLASS FOR TOTAL CARS

YEAR	SUBCOMPACT NUMBER	SUBCOMPACT %SHARE	COMPACT NUMBER	COMPACT %SHARE	INTERMEDIATE NUMBER	INTERMEDIATE %SHARE	FULL SIZE NUMBER	FULL SIZE %SHARE	LUXURY NUMBER	LUXURY %SHARE	ALL CLASSES NUMBER	ALL CLASSES %SHARE	CONTROL NUMBER
1947	15954	0,50	23400	0,74	1605929	50,69	1329268	41,97	194700	6,15	3167231	100,00	3167231
1948	39572	1,13	21740	0,62	1678403	48,08	1520170	43,55	231027	6,62	3490952	100,00	3490952
1949	22110	0,46	28587	0,59	2591852	53,61	1945136	40,20	248657	5,14	4838342	100,00	4838342
1950	49392	0,78	30281	0,54	3456977	54,64	2529379	39,98	256428	4,05	6326438	100,00	6326438
1951	121640	2,39	26571	0,53	2732196	53,99	1911295	37,77	269791	5,33	5060903	100,00	5060903
1952	105786	2,54	41802	1,01	222[illegible]10	53,61	1520004	36,55	261412	6,29	4158394	100,00	4158394
1953	62328	1,09	60613	1,06	321[illegible]1	56,06	2083077	36,35	315274	5,49	5730989	100,00	5730989
1954	28312	0,51	63553	1,15	3265512	58,99	1893124	34,20	284941	5,15	5535460	100,00	5535460
1955	51186	0,72	72356	1,01	3943447	55,00	2756153	38,44	346566	4,83	7169908	100,00	7169908
1956	81056	1,39	73668	1,24	3489774	58,60	1910492	32,08	398088	6,68	5955248	100,00	5955248
1957	176475	2,95	105310	1,76	3566011	59,61	1704382	28,49	430130	7,19	5982342	100,00	5982342
1958	363891	7,82	160912	3,46	2658460	57,08	1109232	23,83	365615	7,86	4654514	100,00	4654514
1959	663425	11,01	507597	8,42	2938122	48,76	1452349	24,10	464807	7,71	6026500	100,00	6026500
1960	771948	11,74	1096759	16,68	2451667	37,28	1793007	27,26	463018	7,04	6576650	100,00	6576650
1961	773277	13,21	1011610	17,31	1962451	33,52	1667392	28,48	438013	7,48	5854747	100,00	5854747
1962	697608	10,05	1305627	18,82	2132059	30,73	2299337	33,14	504212	7,27	6938863	100,00	6938863
1963	695113	9,20	1056980	13,99	2203762	29,16	3068055	40,60	532603	7,05	7556717	100,00	7556717
1964	627395	7,78	1288393	15,97	2018179	25,02	3575269	44,33	556214	6,90	8065150	100,00	8065150
1965	723816	7,77	1350710	14,50	2013122	21,61	4540707	48,75	685553	7,36	9313912	100,00	9313912
1966	677625	7,52	1344770	14,93	2174208	24,14	4106031	45,58	705854	7,84	9008488	100,00	9008488
1967	712310	8,52	1444806	17,29	1791769	21,44	3689925	44,15	718667	8,60	8357421	100,00	8357421
1968	857871	9,53	1435180	15,90	2178113	24,23	3930521	41,84	800173	8,51	9003862	100,00	9003862
1969	962264	10,17	1702316	18,02	2055042	21,73	3847954	40,73	880908	9,33	9406524	100,00	9406524
1970	1237245	14,75	1777014	21,18	1799297	21,45	2926012	34,88	648586	7,73	8388204	100,00	8388204
1971	2057896	20,93	1640007	16,68	1889490	19,22	3316297	33,73	926932	9,43	9830626	100,00	9830626
1972	2206049	21,00	1700155	16,21	2188799	20,87	3370330	32,14	1021662	9,74	10487794	100,00	10487794
1973	2615581	23,01	2081055	18,35	2470179	21,76	3105902	27,36	1078278	9,50	11350995	100,00	11350995
1974	2239878	25,74	1625871	18,69	2258840	25,96	1835225	21,09	741480	8,52	8701090	100,00	8701090

TABLE A 1-8

U.S. SHARE OF NEW REGISTRATIONS BY CLASS

YEAR	SUBCOMPACT	COMPACT	INTERMEDIATE	FULL SIZE	LUXURY	ALL CLASSES
1947	100,00	100,00	100,00	100,00	100,00	100,00
1948	60,19	98,07	100,00	100,00	99,29	99,54
1949	46,02	97,96	100,00	100,00	99,88	99,75
1950	70,34	98,96	100,00	100,00	99,48	99,74
1951	85,12	98,04	100,00	100,00	99,14	99,59
1952	77,04	97,93	100,00	100,00	98,38	99,29
1953	63,70	98,60	100,00	100,00	98,22	99,50
1954	3,47	99,23	100,00	100,00	98.27	99,41
1955	0,0	99,82	100,00	100,00	97,99	99,18
1956	0,0	93,42	100,00	100,00	97,42	98,55
1957	0,0	89,06	100,00	100,00	96,85	96,54
1958	11,61	80,02	100,00	100,00	93,07	91,87
1959	20,58	89,09	100,00	100,00	94,13	89,89
1960	40,63	96,02	100,00	100,00	94,02	92,42
1961	57,78	97,23	100,00	100,00	94,50	93,53
1962	53,00	98,17	100,00	100,00	95,58	95,11
1963	50,93	97,87	100,00	100,00	95,85	94,90
1964	30,70	97,92	100,00	100,00	95,68	94,00
1965	28,92	97,81	100,00	100,00	96,32	93,89
1966	13,15	97,14	100,00	100,00	95,59	92,69
1967	3,51	96,35	100,00	100,00	94,56	90,68
1968	1,75	96,22	100,00	100,00	94,20	89,52
1969	0,70	96,88	100,00	100,00	94,34	88,76
1970	11,17	96,08	100,00	100,00	90,39	85,33
1971	35,50	98,57	100,00	100,00	92,33	84,87
1972	39,18	94,94	100,00	100,00	91,60	85,02
1973	42,77	95,82	100,00	100,00	91,15	84,85
1974	48,22	92,50	100,00	100,00	88,21	84,26

TABLE A 1-9

CITY AND HIGHWAY DRIVING MPG EQUATIONS

I. CITY DRIVING MPG

$$\ln(\text{MPGC}) = \underset{(34.73)}{7.25543} - \underset{(14.91)}{0.470768} \ln(\text{IW}) - \underset{(9.79)}{0.191878} \ln(\text{DISP})$$

$$- \underset{(2.97)}{0.031764}\ \text{DUMATR} + \underset{(5.09)}{0.110129}\ \text{DUM4CYL} + \underset{(5.31)}{0.057034}\ \text{DUM6CYL}$$

$$+ \underset{(11.98)}{0.262096}\ \text{DUM50-54} + \underset{(12.88)}{0.215409}\ \text{DUM55-59} + \underset{(11.49)}{0.221525}\ \text{DUM60-65}$$

$$+ \underset{(1.83)}{0.035437}\ \text{DUM67-70} + \underset{(1.08)}{0.025392}\ \text{DUM71} - \underset{(0.11)}{0.002585}\ \text{DUM73}$$

$$- \underset{(0.04)}{0.000884}\ \text{DUM74} + \underset{(1.09)}{0.025943}\ \text{DUM75} + \underset{(8.99)}{0.218262}\ \text{DUM66}$$

$\bar{R}^2 = 0.917$ SEE = 0.09147 SAMPLE SIZE: 723

II. HIGHWAY DRIVING MPG

$$\ln(\text{MPGH}) = \underset{(32.00)}{6.57726} - \underset{(10.29)}{0.319598} \ln(\text{IW}) - \underset{(8.80)}{0.171588} \ln(\text{DISP})$$

$$- \underset{(4.96)}{0.053424}\ \text{DUMATR} + \underset{(3.79)}{0.076115}\ \text{DUMODR} + \underset{(5.17)}{0.111939}\ \text{DUM4CYL}$$

$$+ \underset{(3.28)}{0.035350}\ \text{DUM6CYL} - \underset{(2.50)}{0.030421}\ \text{DUM50-57} + \underset{(1.76)}{0.025458}\ \text{DUM58-59}$$

$$+ \underset{(6.18)}{0.068167}\ \text{DUM60-66} + \underset{(4.05)}{0.047334}\ \text{DUM67-70} + \underset{(1.64)}{0.028790}\ \text{DUM71}$$

$\bar{R}^2 = 0.875$ SEE = 0.09162 SAMPLE SIZE: 723

III. DEFINITION OF VARIABLES USED IN EQUATIONS

MPGC	=	City driving MPG
MPGH	=	Highway driving MPG
IW	=	Inertial weight (Curb weight + 300)

TABLE A 1-9 (Cont.)

DISP	= Engine displacement
DUMATR	= 1 if automatic transmission, 0 otherwise
DUMODR	= 1 if overdrive, 0 otherwise
DUM4CYL	= 1 if 4 or less cylinders, 0 otherwise
DUM6CYL	= 1 if 5, 6, or 7 cylinders, 0 otherwise (only 6 cylinder engines are in sample)
DUM50-54	= 1 in 1950 to 1954, 0 elsewhere
DUM55-59	= 1 in 1955 to 1959, 0 elsewhere
DUM60-65	= 1 in 1960 to 1965, 0 elsewhere
DUM66	= 1 in 1966, 0 elsewhere
DUM67-70	= 1 in 1967 to 1970, 0 elsewhere
DUM71	= 1 in 1971, 0 elsewhere
DUM73	= 1 in 1973, 0 elsewhere
DUM74	= 1 in 1974, 0 elsewhere
DUM75	= 1 in 1975, 0 elsewhere
DUM50-57	= 1 in 1950 to 1957, 0 elsewhere
DUM58-59	= 1 in 1958 to 1959, 0 elsewhere
DUM60-66	= 1 in 1960 to 1966, 0 elsewhere
DUM67-70	= 1 in 1967 to 1970, 0 elsewhere

TABLE A 1-10

A COMPARISON OF CONSUMER REPORTS AND EPA CITY AND HIGHWAY DRIVING MPG DATA (1975)

Description of Car	Consumer Reports 1/		EPA 2/	
	City	Highway	City	Highway
Subcompacts				
Toyota Corolla	16	32	21	33
Pinto	13	24	18	26
Gremlin	13	24	19	24
Astre	14	29	21	29
VW Rabbit	19	32	24	38
AMC Pacer	12	22	18	24
Honda Civic CVCC	21	33	27	39
Toyota Corona Wagon	15	30	19	28
VW Dasher Wagon	18	30	23	35
Datsun 710 Wagon	16	26	22	33
Ford Pinto Wagon	13	21	15	22
Compacts				
Audi 100LS	17	27	18	28
Peugeot 504	15	26	20	27
Volvo 244DL	12	24	16	26
Saab 99LE	16	28	21	27
Plymouth Valiant	10	21	18	23
Chevy Nova	12	19	16	21
Mercury Monarch	10	16	15	20
Ford Maverick	9	16	14	18
Mid-Size				
Buick Century	10	20	16	24
Chevelle	10	19	16	21
AMC Matador	10	16	15	21
Plymouth Fury	10	21	14	22
Full-Size				
Pontiac Catalina	8	17	12	17
Chevrolet Bel Air	9	17	12	18
Plymouth Gran Fury	9	18	12	17
Ford LTD	9	16	11	15

1/ Taken from various 1975 issues of Consumer Reports magazine.

2/ Gas Mileage Guide For New Car Buyers, 1975, U.S. Environmental Protection Agency, Washington, D.C. (2nd edition, January 1975).

Note: While not noted in the body of the table, the MPG figures (Consumer Reports and EPA) are for the same engine.

TABLE A1-11

SALES WEIGHTED AVERAGE CITY AND HIGHWAY MPG ESTIMATES (1958-1974) BY SIZE CLASS (DOMESTIC AND FOREIGN)

City Driving MPG (Miles Per Gallon)

	USSDMPGC	USSFMPGC	USCDMPGC	USCFMPGC	USMDMPGC	USFDMPGC	USLDMPGC	USLFMPGC
1958	14.33	21.10	13.04	17.31	11.18	9.73	9.00	15.39
1959	14.82	21.57	13.69	18.72	10.96	9.80	9.20	15.52
1960	14.78	20.87	13.98	18.36	10.81	9.66	8.96	15.17
1961	14.77	21.21	14.05	18.28	11.22	10.00	9.00	15.53
1962	14.81	21.00	13.72	17.92	11.56	10.00	9.00	14.91
1963	14.74	21.05	13.86	17.81	11.67	10.08	9.05	14.86
1964	14.70	21.04	13.32	16.45	11.50	10.12	8.93	14.60
1965	14.83	21.03	13.11	17.92	11.86	10.00	8.90	14.86
1966	14.69	19.76	12.76	17.59	11.19	9.88	8.74	14.11
1967	13.42	17.72	11.10	15.78	10.02	8.89	8.10	12.06
1968	13.41	17.08	11.02	15.47	9.78	8.82	8.43	12.88
1969	13.11	17.62	10.93	14.89	9.71	8.68	8.41	12.90
1970	15.01	17.23	11.01	14.77	9.55	8.70	7.95	12.78
1971	15.47	16.95	11.08	14.63	9.34	8.43	7.80	12.57
1972	14.72	16.40	10.41	14.30	8.93	8.15	7.60	11.70
1973	14.23	16.01	10.18	14.31	8.67	8.01	7.49	11.62
1974	13.53	15.77	10.11	14.18	8.73	7.96	7.45	11.58

Highway Driving MPG (Miles Per Gallon)

	USSDMPGH	USSFMPGH	USCDMPGH	USCFMPGH	USMDMPGH	USFDMPGH	USLDMPGH	USLFMPGH
1958	21.67	33.24	22.06	30.87	19.33	17.21	16.79	25.22
1959	24.87	33.73	22.19	30.12	19.00	17.32	16.51	25.56
1960	25.53	35.09	24.58	31.66	20.18	18.33	17.29	26.82
1961	25.48	35.50	24.53	31.50	20.65	18.82	17.32	26.95
1962	25.60	35.17	24.05	30.45	21.11	18.80	17.31	26.43
1963	25.54	35.24	24.12	30.78	21.25	18.91	17.18	25.41
1964	25.35	35.15	23.41	29.43	20.91	18.96	17.20	25.61
1965	25.45	35.07	21.08	30.89	20.82	18.75	17.15	25.43
1966	25.30	33.46	22.65	30.49	20.02	18.56	17.00	24.03
1967	24.54	32.13	21.22	29.24	19.62	17.88	16.67	24.13
1968	24.57	31.69	21.11	28.83	19.24	17.76	16.58	24.09
1969	24.80	31.83	20.97	27.94	19.11	17.55	15.51	24.19
1970	27.56	31.25	21.06	27.74	18.87	17.58	16.42	21.91
1971	26.13	30.53	20.97	27.19	18.33	16.99	16.01	23.35
1972	26.81	29.43	19.71	26.90	17.56	16.40	15.55	22.20
1973	26.15	28.92	19.41	26.38	17.22	16.23	15.42	21.17
1974	25.12	28.57	19.30	26.23	17.12	16.14	15.14	21.71

NOTE: USaaMPGC = City Driving MPG for size class aa

USaaMPGH = Highway Driving MPG for size class aa, and

aa = SD, SF, CD, DF, MD, FD, LD, LF (Domestic and Foreign Size Classes)

TABLE A 1-12

SALES WEIGHTED AVERAGE CURB WEIGHT AND ENGINE DISPLACEMENT (1958-1974)
BY SIZE CLASS (DOMESTIC AND FOREIGN)

Curb Weight (Pounds)

	USSDCURB	USSFCURB	USCDCURB	USCFCURB	USMDCURB	USFDCURB	USLDCURB	USLFCURB
1958	2755.	1966.	3323.	2257.	3781.	4399.	4625.	2329.
1959	2656.	1882.	3083.	2348.	3649.	4321.	4737.	[illegible]
1960	2599.	1886.	2889.	2325.	3861.	4274.	4721.	[illegible]
1961	2593.	1830.	2762.	2342.	3503.	4073.	4628.	[illegible]
1962	2595.	1854.	2610.	2376.	3317.	4029.	4619.	[illegible]
1963	2622.	1836.	2723.	2396.	3327.	3958.	4576.	[illegible]
1964	2575.	1854.	2777.	2362.	3325.	3949.	4603.	[illegible]
1965	2541.	1833.	2757.	2361.	3290.	3968.	4651.	[illegible]
1966	2568.	1985.	2865.	2421.	3374.	4013.	4687.	[illegible]
1967	2595.	2008.	2994.	2516.	3435.	4037.	4650.	[illegible]
1968	2513.	2090.	3071.	2627.	3529.	4059.	4672.	[illegible]
1969	2639.	2068.	3986.	2714.	3508.	4177.	4681.	[illegible]
1970	2264.	2129.	3064.	2750.	3613.	4182.	4730.	[illegible]
1971	2207.	2144.	3119.	2739.	3680.	4331.	4816.	[illegible]
1972	2307.	2151.	3125.	2609.	3800.	4405.	4827.	[illegible]
1973	2456.	2234.	3218.	2701.	4006.	4497.	4733.	[illegible]
1974	2608.	2309.	3341.	2742.	4050.	4565.	5032.	[illegible]

Engine Displacement (Cubic Inches)

	USSDDISP	USSFDISP	USCDDISP	USCFDISP	USMDDISP	USFDDISP	USLDDISP	USLFDISP
1958	195.6	76.7	200.1	86.5	271.8	363.2	369.3	[illegible]
1959	177.3	74.5	189.0	92.2	271.8	355.9	387.1	[illegible]
1960	158.4	75.1	171.5	89.0	274.6	347.7	395.5	[illegible]
1961	159.8	72.3	178.7	89.0	269.0	331.6	393.4	[illegible]
1962	159.3	77.2	192.6	95.4	255.8	335.4	394.8	[illegible]
1963	160.6	75.0	193.3	95.4	256.3	334.6	394.1	[illegible]
1964	164.0	74.8	215.1	134.7	271.0	329.6	407.8	[illegible]
1965	159.0	70.8	231.1	96.6	278.0	340.6	413.9	[illegible]
1966	163.9	84.9	236.5	98.2	290.2	350.1	420.9	[illegible]
1967	163.5	90.7	270.9	101.3	306.3	375.4	432.7	[illegible]
1968	163.5	92.0	270.4	101.5	321.1	383.1	447.6	[illegible]
1969	166.0	89.1	278.5	115.6	334.5	366.2	448.9	[illegible]
1970	156.5	93.6	272.9	115.6	337.2	380.6	455.2	[illegible]
1971	140.7	95.1	252.8	114.5	338.6	369.5	457.6	[illegible]
1972	142.8	97.6	260.2	116.6	345.0	351.8	457.0	[illegible]
1973	144.7	99.5	266.5	113.3	352.5	402.5	459.6	[illegible]
1974	152.2	100.7	264.8	113.4	337.1	401.0	455.7	[illegible]

NOTE: USccCURB = Curb weight in pounds for size class cc,
USccDISP = Engine displacement in cubic inches for size class cc, and
cc = SD, SF, CD, CF, MD, FD, LD, LF (Domestic and Foreign Size Classes).

TABLE A 1-13

SALES WEIGHTED AVERAGE FRACTION OF AUTOMATIC TRANSMISSIONS
AND OVERDRIVE UNITS INSTALLED (1958-1974) BY SIZE CLASS (DOMESTIC AND FOREIGN)

Fraction With Automatic Transmission

	USSDFAUTO	USSFFAUTO	USCDFAUTO	USCFFAUTO	USMDFAUTO	USFDFAUTO	USLDFAUTO	USLFFAUTO
1958	0,4540	0,0500	0,5230	0,3230	0,6883	0,9655	0,9656	0,5803
1959	0,4391	0,1391	0,4508	0,3508	0,6997	0,9292	0,9721	0,5997
1960	0,5004	0,1391	0,4062	0,3062	0,6915	0,8500	0,9658	0,5915
1961	0,5100	0,1391	0,5358	0,4358	0,7244	0,8336	0,9682	0,6244
1962	0,4557	0,1391	0,5742	0,4742	0,7391	0,8077	0,9682	0,6301
1963	0,4260	0,1260	0,6032	0,5032	0,7226	0,8405	0,9538	0,6228
1964	0,4697	0,1697	0,5809	0,4809	0,7367	0,9050	0,9628	0,6367
1965	0,5406	0,2306	0,6019	0,5019	0,7560	0,8891	0,9616	0,6560
1966	0,5710	0,2710	0,6508	0,5508	0,7709	0,9110	0,9623	0,6704
1967	0,6747	0,3737	0,6920	0,5920	0,8262	0,9010	0,9641	0,7262
1968	0,6929	0,3929	0,7221	0,6221	0,8500	0,9601	0,9600	0,7500
1969	0,7240	0,4260	0,7109	0,6109	0,8590	0,9785	0,9751	0,7574
1970	0,4576	0,4576	0,7563	0,6563	0,9016	0,9868	0,9720	0,8016
1971	0,4530	0,4530	0,8207	0,7207	0,9578	0,9995	0,9607	0,8578
1972	0,5050	0,5050	0,8779	0,7779	0,9713	0,9987	0,9870	0,8713
1973	0,5597	0,5597	0,8997	0,7997	0,9856	0,9981	0,9076	0,8856
1974	0,5757	0,5757	0,8935	0,7935	0,9800	0,9992	0,9808	0,8800

Fraction With Overdrive

	USSDFOD	USSFFOD	USCDFOD	USCFFOD	USMDFOD	USFDFOD	USLDFOD	USLFFOD
1958	0,2110	0,0323	0,2110	0,0323	0,0365	0,0004	0,0	0,0123
1959	0,0936	0,0308	0,1605	0,0308	0,0336	0,0031	0,0	0,0304
1960	0,0484	0,0238	0,0603	0,0238	0,0190	0,0097	0,0017	0,0238
1961	0,0336	0,0188	0,0350	0,0188	0,0161	0,0129	0,0	0,0188
1962	0,0320	0,0150	0,0345	0,0158	0,0116	0,0097	0,0	0,0158
1963	0,0306	0,0152	0,0075	0,0152	0,0281	0,0085	0,0	0,0152
1964	0,0	0,0050	0,0	0,0050	0,0070	0,0066	0,0	0,0050
1965	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
1966	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
1967	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
1968	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
1969	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
1970	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
1971	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
1972	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
1973	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
1974	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0

NOTE: USscFAUTO = Fraction with automatic transmissions for size class *sc*,
USscFOD = Fraction with overdrive for size class *sc*, and
sc = SD, SF, CD, CF, MD, FD, LD, LF (Domestic and Foreign Size Classes).

TABLE A 1-14

SALES WEIGHTED AVERAGE FRACTION OF FOUR CYLINDER AND SIX CYLINDER ENGINES INSTALLED (1958-1974) BY SIZE CLASS (DOMESTIC AND FOREIGN)

Fraction With 4 or Less Cylinders

	USSDF4CYL	USSFF4CYL	USCDF4CYL	USCFF4CYL	USMDF4CYL	USFDF4CYL	USLDF4CYL	USLFF4CYL
1958	0,0	0,9828	0,0	0,9905	0,0	0,0	0,0	0,5204
1959	0,0022	1,0000	0,0	0,9949	0,0	0,0	0,0	0,6970
1960	0,0006	1,0000	0,0	1,0000	0,0099	0,0	0,0	0,7152
1961	0,0003	1,0000	0,0026	1,0000	0,0551	0,0	0,0	0,7401
1962	0,0009	1,0000	0,0196	1,0000	0,0691	0,0	0,0	0,7190
1963	0,0004	1,0000	0,0030	1,0000	0,0391	0,0	0,0	0,2617
1964	0,0007	1,0000	0,0005	1,0000	0,0	0,0	0,0	0,2911
1965	0,0007	1,0000	0,0	1,0000	0,0	0,0	0,0	0,3006
1966	0,0317	0,9999	0,0	1,0000	0,0	0,0	0,0	0,0409
1967	0,0078	1,0000	0,0005	1,0000	0,0	0,0	0,0	0,1446
1968	0,0073	0,9789	0,0009	1,0000	0,0	0,0	0,0	0,1956
1969	0,0	0,9825	0,0035	1,0000	0,0	0,0	0,0	0,2358
1970	0,7128	0,9859	0,0	1,0000	0,0	0,0	0,0	0,2061
1971	0,9031	0,9869	0,0	0,9929	0,0	0,0	0,0	0,2075
1972	0,8841	0,9833	0,0	0,9995	0,0	0,0	0,0	0,2088
1973	0,8605	0,9850	0,0	1,0000	0,0	0,0	0,0	0,1824
1974	0,7866	0,9841	0,0	1,0000	0,0	0,0	0,0	0,2134

Fraction With 6 Cylinders (Actually 5, 6, or 7).

	USSDF6CYL	USSFF6CYL	USCDF6CYL	USCFF6CYL	USMDF6CYL	USFDF6CYL	USLDF6CYL	USLFF6CYL
1958	1,0000	0,0172	0,9168	0,0055	0,3261	0,0106	0,0	0,4781
1959	0,9978	0,0	0,0893	0,0056	0,3178	0,0775	0,0	0,2060
1960	0,9990	0,0	0,9373	0,0	0,4166	0,1481	0,0	0,2411
1961	0,9997	0,0	0,9659	0,0	0,3723	0,1923	0,0	0,2319
1962	0,9996	0,0	0,9250	0,0	0,3320	0,1597	0,0	0,2578
1963	0,9946	0,0	0,9267	0,0	0,3489	0,1455	0,0	0,7156
1964	0,9973	0,0	0,7252	0,0	0,3663	0,1315	0,0	0,6873
1965	0,9993	0,0	0,6932	0,0	0,3320	0,1061	0,0	0,6787
1966	0,9983	0,0001	0,6203	0,0	0,2493	0,0806	0,0	0,8986
1967	0,9922	0,0	0,4482	0,0	0,1893	0,0575	0,0	0,8424
1968	0,9927	0,0211	0,4685	0,0	0,1245	0,0402	0,0	0,7814
1969	1,0000	0,0175	0,4924	0,0	0,0982	0,0220	0,0	0,7508
1970	0,2872	0,0191	0,5424	0,0	0,0913	0,0152	0,0	0,7844
1971	0,0769	0,0151	0,5243	0,0071	0,0605	0,0088	0,0	0,7810
1972	0,0999	0,0167	0,5167	0,0005	0,0332	0,0023	0,0	0,7592
1973	0,1271	0,0150	0,4596	0,0000	0,0265	0,0025	0,0	0,7985
1974	0,2041	0,0159	0,5575	0,0000	0,1037	0,0054	0,0	0,7615

NOTE: USscF4CYL = Fraction with 4 or less cylinder engines for single class *sc*,
USscF6CYL = Fraction with 6 (5, 6, or 7) cylinder engines for single class *sc*, and
sc = SD, SF, CD, CF, MD, FD, LD, LF (Domestic and Foreign Size Classes).

TABLE A1-15

PARAMETERS FOR COST PER MILE

	Average Price Relatives, Car Aged i to New PR_i	Fraction Financed $FRACFIN_i$
i=0	1.0	.75
1	.77345	.75
2	.65625	.70
3	.52549	.65
4	.42183	.60
5	.33748	.50
6	.26640	.40
7	.21133	.35
8	.17580	.30
9	.15000	.25

TABLE A1-16

ESTIMATION OF CONSUMER INSTALLMENT RATE, NEW AUTOS

FRMCICR = 5.92465 + 0.662764 FRMCS
(21.4814) (20.5486)

$\bar{R}^2$ = 0.963 SEE = .11029 DW = 1.625
Quarterly Data, 1972.1 to 1976.1

Definitions.

FRMCICR: Consumer Installment Rate, New Autos.
FRMCS: Moody's Total Corporate Bond Rate.

ANNUAL ESTIMATES OF FRMCICR

1950	7.82	1971	11.19	
1954	8.02	1972	10.98	(10.98)
1958	8.68	1973	11.09	(11.15)
1962	8.98	1974	11.87	(11.80)
1966	9.47	1975	12.20	(12.24)
1970	11.56	1976 (3 Months)	12.05	(12.16)

Values in parentheses are data for 1972-76.

TABLE A1-17

OPERATING COST COMPONENTS BY SIZE CLASS AND YEAR OF OPERATION

I. Repair Costs

Year	Subcompact	Compact	Mid-Size	Full-Size	Luxury
1	$76.15	$79.41	$80.63	$81.84	$90.92
2	114.59	107.14	111.26	115.37	126.91
3	153.55	170.61	206.63	242.65	266.92
4	197.01	218.90	257.50	296.09	325.70
5	216.24	240.27	257.91	275.54	303.09
6	241.93	258.81	280.68	292.54	321.79
7	370.84	412.04	404.80	397.56	437.32
8	159.59	177.27	174.55	171.82	189.06
9	71.06	78.95	161.64	244.33	268.76
10	27.99	31.10	30.14	29.17	32.09

II. Parking, Tolls, and Other Miscellaneous

Year	Subcompact	Compact	Mid-Size	Full-Size	Luxury
1	$208.36	$208.36	$208.36	$208.36	$208.36
2	199.22	199.22	199.22	199.22	199.22
3	190.08	190.08	190.08	190.08	190.08
4	180.94	180.94	180.94	180.94	180.94
5	180.33	180.33	180.33	180.33	180.33
6	180.33	180.33	180.33	180.33	180.33
7	177.89	177.89	177.89	177.89	177.89
8	171.80	171.80	171.80	171.80	171.80
9	165.71	165.71	165.71	165.71	165.71
10	154.74	154.74	154.74	154.74	154.74

TABLE A1-17 (Cont.)

III. Insurance Costs

Year	Subcompact	Compact	Mid-Size	Full-Size	Luxury
1	$145.00	$155.00	$159.50	$164.00	$173.00
2	140.00	147.00	151.5	156.00	165.00
3	140.00	147.00	151.5	156.00	165.00
4	133.00	140.00	143.5	147.00	156.00
5	133.00	140.00	143.5	147.00	156.00
6	108.00	114.00	115.0	116.00	126.00
7	108.00	114.00	115.0	116.00	126.00
8	108.00	114.00	115.0	116.00	126.00
9	108.00	114.00	115.0	116.00	126.00
10	108.00	114.00	115.0	116.00	126.00

IV. Tires Including Taxes

Year	Subcompact	Compact	Mid-Size	Full-Size	Luxury
1	$14.96	$16.47	$17.38	$18.28	$18.28
2	13.37	14.76	16.02	17.29	17.29
3	11.82	13.05	19.30	25.54	25.54
4	33.41	36.88	42.35	47.82	47.82
5	33.08	36.52	41.93	47.34	47.34
6	37.48	41.38	45.16	48.94	48.94
7	35.96	39.70	47.14	54.59	54.59
8	60.07	66.32	66.98	67.63	67.63
9	53.39	58.94	57.90	56.87	56.87
10	40.24	44.42	44.88	45.35	45.35

TABLE A1-17 (Cont.)

V. Motor Oil Including Taxes

Year	Subcompact	Compact	Mid-Size	Full-Size	Luxury
1	$10.71	$10.71	$11.09	$11.47	$11.47
2	9.94	10.71	11.09	11.47	11.47
3	10.67	11.47	11.86	12.24	12.24
4	10.67	11.47	11.86	12.24	12.24
5	12.24	13.01	13.01	13.01	13.01
6	12.24	13.01	13.39	13.77	13.77
7	12.24	13.01	13.39	13.77	13.77
8	12.24	13.01	13.39	13.77	13.77
9	11.47	12.24	12.24	12.24	12.24
10	6.50	6.88	6.88	6.89	6.89

Source: Cost of Operating An Automobile by L.L. Liston and C.L. Gauthier, U.S. Department of Transportation, Federal Highway Administration, Office of Highway Planning, Highway Statistics Division, April 1972.

TABLE A1-18

COSTS PER MILE ACROSS STATES in 1972

	CPM72SDCAP	CPM72SFCAP	CPM72STCAP	CPM72CDCAP	CPM72CFCAP	CPM72CTCAP
DC	0,11405	0,11715	0,11589	0,13924	0,14857	0,14001
ME	0,10582	0,10856	0,10776	0,12428	0,13867	0,12623
NH	0,10632	0,10902	0,10819	0,12561	0,13778	0,12756
VT	0,10450	0,10694	0,10625	0,12192	0,13379	0,12394
MA	0,11039	0,11305	0,11223	0,13188	0,14357	0,13334
RI	0,11337	0,11583	0,11518	0,13565	0,14817	0,13713
CT	0,11453	0,11704	0,11622	0,13695	0,14832	0,13859
NY	0,11292	0,11607	0,11494	0,13436	0,14949	0,13548
NJ	0,11691	0,11782	0,11677	0,13735	0,15072	0,13879
PA	0,10866	0,11182	0,11063	0,12881	0,14331	0,12953
OH	0,10974	0,11386	0,11185	0,13005	0,14483	0,13038
IN	0,10680	0,11117	0,10883	0,12617	0,14162	0,12639
IL	0,11131	0,11542	0,11353	0,13254	0,14735	0,13311
MI	0,10748	0,11222	0,10946	0,12732	0,14370	0,12774
WI	0,10676	0,11061	0,10865	0,12573	0,13765	0,12566
MN	0,10903	0,11251	0,11085	0,12861	[illegible]	0,12936
IA	0,10700	0,11026	0,10877	0,12567	0,14073	0,12621
MO	0,10790	0,11188	0,11016	0,12744	0,14321	0,12762
ND	0,10230	0,10639	0,10470	0,11955	0,13784	0,11991
SD	0,10189	0,10605	0,10419	0,11917	0,13625	0,11978
NE	0,10675	0,11087	0,10925	0,12541	0,14256	0,12703
KS	0,10446	0,10779	0,10648	0,12330	0,13890	0,12399
DE	0,11024	0,11290	0,11178	0,13104	0,14417	0,13185
MD	0,11001	0,11318	0,11186	0,13214	0,14560	0,13199
VA	0,10610	0,11002	0,10840	0,12628	0,14003	0,12708
WV	0,10554	0,10906	0,10761	0,12368	0,13905	0,12391
NC	0,10592	0,10980	0,10838	0,12613	0,14165	0,12658
SC	0,10554	0,10959	0,10811	0,12518	0,14237	0,12507
GA	0,10725	0,11137	0,10999	0,12798	0,14417	0,12847
FL	0,10940	0,11290	0,11170	0,13133	0,14702	0,13189
KY	0,10657	0,11058	0,10890	0,12580	0,14252	0,12606
TN	0,10721	0,11111	0,10962	0,12728	0,14367	0,12776
AL	0,10642	0,11021	0,10872	0,12583	0,14352	0,12722
MS	0,10433	0,10740	0,10641	0,12357	0,14099	0,12384
AR	0,10336	0,10649	0,10540	0,12238	0,13880	0,12256
LA	0,10642	0,10952	0,10849	0,12569	0,14452	0,12710
TX	0,10743	0,10999	0,10905	0,12867	0,14356	0,12925
MT	0,10320	0,10750	0,10641	0,12136	0,13790	0,12213
ID	0,10443	0,10842	0,10734	0,12391	0,14167	0,12473
WY	0,10349	0,10774	0,10624	0,12229	0,13939	0,12327
CO	0,10632	0,11252	0,11105	0,12943	0,14479	0,13153
NM	0,10539	0,10951	0,10814	0,12562	0,14196	0,12637
AZ	0,10847	0,11174	0,11069	0,12962	0,14635	0,13043
UT	0,10723	0,11139	0,10989	0,12796	0,14200	0,12877
NV	0,11177	0,11591	0,11453	0,13542	0,15097	0,13644
WA	0,10997	0,11409	0,11277	0,13174	0,14698	0,13354
OR	0,10551	0,10906	0,10808	0,12531	0,14097	0,12785
CA	0,11067	0,11333	0,11250	0,13849	0,14689	0,13595
OK	0,10707	0,11029	0,10896	0,12741	0,14138	0,12511
AK	0,11038	0,11230	0,11175	0,13150	0,14331	0,13334
HI	0,10868	0,10860	0,10860	0,13091	0,14425	0,13123
US	0,10890	0,11228	0,11101	0,12971	0,14613	0,13053

TABLE A1-18 (Cont.)

	CPM72MDCAP	CPM72FCAP	CPM72LDCAP	CPM72LFCAP	CPM72LTCAP	CPM72TTCAP
DC	0,15892	0,17773	0,2[illegible]53	0,22606	0,22031	0,15890
ME	0,14367	0,15932	0,19730	0,20554	0,19603	0,13990
NH	0,14463	0,16031	0,19892	0,20619	0,19958	0,13962
VT	0,14075	0,15597	0,19371	0,19610	0,19424	0,13526
MA	0,15237	0,16926	0,20906	0,21017	0,20920	0,14896
RI	0,15695	0,17480	0,21918	0,22361	0,21973	0,15[illegible]
CT	0,15640	0,176[illegible]	0,21850	0,21742	0,21835	0,152[illegible]
NY	0,15496	0,17250	0,21631	0,22220	0,21068	0,15580
NJ	0,15908	0,17721	0,22093	0,22704	0,22143	0,15922
PA	0,14850	0,16527	0,20614	0,21985	0,20727	0,14777
OH	0,15005	0,16672	0,20452	0,22213	0,20531	0,15100
IN	0,14526	0,16146	0,19680	0,21489	0,19745	0,14773
IL	0,15238	0,16950	0,20810	0,22959	0,20900	0,15747
MI	0,14663	0,16311	0,20130	0,22291	0,20181	0,15091
WI	0,14394	0,16039	0,19498	0,20757	0,19552	0,14764
MN	0,14762	0,16426	0,20182	0,22065	0,20291	0,15099
IA	0,14481	0,16132	0,19637	0,21577	0,19712	0,14795
MO	0,14572	0,16323	0,19944	0,21594	0,20026	0,1[illegible]
ND	0,13698	0,15276	0,18625	0,21283	0,18684	0,142[illegible]
SD	0,13662	0,15237	0,18720	0,2[illegible]80	0,1[illegible]772	0,141[illegible]
NE	0,14499	0,16146	0,19762	0,22193	0,19859	0,14[illegible]
KS	0,14130	0,15748	0,19293	0,20556	0,19377	0,14[illegible]7
DE	0,15060	0,16777	0,20682	0,22319	0,20797	0,14986
MD	0,15060	0,16784	0,20824	0,22070	0,20964	0,14780
VA	0,14531	0,16165	0,19867	0,21299	0,19992	0,14241
WV	0,14286	0,15872	0,19725	0,21133	0,19801	0,13997
NC	0,14463	0,16102	0,19624	0,21656	0,19739	0,14065
SC	0,14457	0,16079	0,19724	0,22143	0,19848	0,14498
GA	0,14764	0,16432	0,20210	0,22402	0,20363	0,14741
FL	0,15094	0,16801	0,21056	0,23521	0,21246	0,15075
KY	0,14528	0,16167	0,19662	0,21291	0,19925	0,14536
TN	0,14703	0,16381	0,20199	0,21761	0,20256	0,14877
AL	0,14626	0,16283	0,19861	0,21827	0,19943	0,14753
MS	0,14263	0,15871	0,19337	0,21467	0,19398	0,14596
AR	0,14059	0,15659	0,19173	0,21357	0,19240	0,14417
LA	0,14643	0,16302	0,20085	0,21732	0,20165	0,14697
TX	0,14799	0,16476	0,20251	0,21820	0,20334	0,15152
MT	0,13957	0,15538	0,19120	0,20886	0,19207	0,13675
ID	0,1[illegible]299	0,15965	0,19776	0,20647	0,19842	0,13904
WY	0,13995	0,15594	0,19181	0,21315	0,19293	0,14139
CO	0,14837	0,16534	0,20563	0,21980	0,20635	0,14332
NM	0,14461	0,16097	0,19933	0,20469	0,19973	0,14120
AZ	0,14939	0,16673	0,20859	0,22171	0,20969	0,14690
UT	0,14793	0,16460	0,20488	0,21461	0,20584	0,14353
NV	0,15532	0,17262	0,21972	0,23720	0,22190	0,15447
WA	0,15232	0,16913	0,20830	0,21748	0,20930	0,14301
OR	0,14447	0,16049	0,20047	0,21016	0,20177	0,13710
CA	0,15410	0,17201	0,21642	0,2235[illegible]	0,21792	0,14553
OK	0,14638	0,16294	0,20190	0,21535	0,20232	0,14716
AK	0,15203	0,16813	0,21235	0,22732	0,21385	0,14155
HI	0,15139	0,16992	0,21720	0,21406	0,21625	0,12913
US	0,14933	0,16620	0,20579	0,21943	0,20668	0,14928

TABLE A1-19

NOMINAL COSTS PER MILE

	CPMSDCAP	CPMSFCAP	CPMCDCAP	CPMCFCAP	CPMMDCAP	CPMFDCAP	CPMLDCAP	CPMLFCAP
1958	0.07816	0.07097	0.08870	0.08350	0.09469	0.11166	0.13682	0.12086
1959	0.07941	0.07109	0.08895	0.08371	0.10099	0.11178	0.13809	0.12883
1960	0.08183	0.07220	0.08653	0.08908	0.09969	0.11085	0.14038	0.13319
1961	0.08280	0.07130	0.08608	0.08323	0.09918	0.10908	0.14170	0.13407
1962	0.08310	0.07328	0.08863	0.08690	0.09928	0.11107	0.14458	0.13900
1963	0.08366	0.07398	0.08752	0.08880	0.10087	0.11089	0.14505	0.14187
1964	0.08615	0.07087	0.09085	0.09056	0.10025	0.11171	0.14916	0.14383
1965	0.08865	0.07602	0.09588	0.09320	0.10219	0.11558	0.15126	0.14849
1966	0.09129	0.08117	0.09939	0.09837	0.10680	0.11981	0.15508	0.15059
1967	0.09553	0.08880	0.10628	0.10371	0.11265	0.12658	0.16253	0.15979
1968	0.09885	0.08685	0.11197	0.10863	0.12020	0.13366	0.16723	0.16278
1969	0.10358	0.09080	0.11526	0.11626	0.12609	0.14173	0.17713	0.17067
1970	0.10020	0.10175	0.12091	0.12697	0.13613	0.15152	0.18[illegible]25	0.18773
1971	0.10518	0.10655	0.12790	0.13666	0.14725	0.16359	0.202[illegible]7	0.19707
1972	0.10906	0.11205	0.12993	0.14038	0.14960	0.16651	0.20619	0.21295
1973	0.11634	0.12228	0.13786	0.15711	0.15916	0.17977	0.21606	0.25067
1974	0.13931	0.10267	0.15916	0.18233	0.18001	0.19685	0.24780	0.28981

CPMSDCAP = Nominal costs per mile for Domestic Subcompacts
CPMSFCAP = Nominal costs per mile for Foreign Subcompacts
CPMCDCAP = Nominal costs per mile for Domestic Compacts
CPMCFCAP = Nominal costs per mile for Foreign Compacts
CPMMDCAP = Nominal costs per mile for Midsize Domestics
CPMFDCAP = Nominal costs per mile for Fullsize Domestics
CPMLDCAP = Nominal costs per mile for Luxury Domestics
CPMLFCAP = Nominal costs per mile for Foreign Luxury Cars

TABLE A1-20

REVISED BASE PURCHASE PRICES BY CLASS (USxxPUBASE-2)

	USSDPUBASE-2	USSFPUBASE-2	USCDPUBASE-2	USCFPUBASE-2	USMDPUBASE-2	USFDPUBASE-2	USLDPUBASE-2	USLFPUBASE-2
1958	1949.27	1830.33	2378.60	2407.35	2685.67	3088.58	4438.18	3946.27
1959	2021.25	1791.58	2018.05	2373.70	2690.10	3020.49	4356.77	4335.19
1960	2150.77	1812.91	2280.05	2384.20	2658.66	2971.13	4371.36	4502.73
1961	2167.42	1791.45	2258.66	2100.48	2651.70	2937.59	4427.20	4587.18
1962	2138.10	1727.58	2274.27	2022.77	2577.72	2900.87	4459.31	4717.33
1963	2149.67	1821.73	2210.97	2515.28	2659.17	2866.02	4409.40	4799.27
1964	2249.00	1819.10	2296.97	2522.79	2523.10	2863.83	4601.49	4855.10
1965	2280.45	1795.13	2021.25	2599.67	2678.87	2889.39	4592.12	4969.72
1966	2269.31	1922.05	2262.28	2738.67	2508.03	2918.39	4475.02	5059.19
1967	2322.01	1937.87	2530.78	2794.22	2558.77	2967.28	4555.57	5051.16
1968	2368.55	2025.15	2640.22	2477.60	2715.38	3122.26	4606.06	4991.17
1969	2909.51	2171.37	2573.10	3032.57	2708.87	3206.71	4706.59	5072.29
1970	1995.20	2225.52	2505.00	3273.05	2894.84	3335.10	4919.65	5569.31
1971	2367.81	2203.49	2613.19	3503.52	3105.87	3562.34	5291.66	5722.71
1972	2101.27	2017.07	2098.48	3801.62	2997.57	3519.30	5337.20	6717.58
1973	2228.96	2712.56	2619.45	4259.01	3181.80	3652.57	5499.94	6535.21
1974	2750.36	3196.17	2929.26	4730.05	3399.21	3906.39	6169.36	7411.28

TABLE A1-21

TOTAL OPTIONS EXPENDITURES BY CLASS (US••PUOPT-2)

	USSDPUOPT-2	USSFPUOPT-2	USCDPUOPT-2	USCFPUOPT-2	USHDPUOPT-2	USFDPUOPT-2	USLDPUOPT-2	USLFPUOPT-2
1958	100.88	100.88	204.62	204.62	201.90	438.81	619.89	619.89
1959	101.88	101.88	152.49	152.49	207.95	431.52	665.37	665.37
1960	110.69	110.69	127.74	127.74	218.01	380.83	687.38	667.19
1961	119.29	119.29	130.81	130.81	228.31	361.38	710.09	734.09
1962	109.67	109.67	140.73	140.73	231.88	379.52	719.02	719.02
1963	106.70	106.70	140.10	140.10	205.84	388.06	737.10	737.10
1964	118.67	118.67	158.90	158.90	271.00	370.64	785.22	765.22
1965	134.80	134.80	181.09	181.09	294.46	453.60	829.77	827.77
1966	138.04	138.04	203.73	203.73	325.17	[illegible]	859.40	837.96
1967	157.96	157.96	263.57	263.57	385.48	548.20	911.44	911.49
1968	150.51	150.51	289.09	289.09	438.71	608.23	968.66	958.66
1969	159.49	159.49	316.08	316.08	491.97	698.78	1013.99	1013.99
1970	171.72	171.72	343.21	343.21	547.90	740.06	1068.37	1068.37
1971	177.60	177.60	405.16	405.16	669.50	655.08	1141.50	1141.50
1972	222.19	222.19	457.54	457.54	721.91	675.76	1137.70	1137.73
1973	272.24	272.24	469.86	469.86	765.15	895.19	1168.18	1186.16
1974	337.71	337.71	551.94	551.94	789.62	936.74	1155.90	1155.90

TABLE A1-22

MAXIMUM OPTIONS PRICES BY CLASS (USacPOPTM)

	USSDPOPTM	USCDPOPTM	USMDPOPTM	USFDPOPTM	USLDPOPTM
1958	1005.60	1037.08	1022.67	1189.79	1233.10
1959	919.65	906.13	1061.20	1173.10	1257.15
1960	802.37	870.75	960.05	1078.85	1233.50
1961	796.21	860.76	962.09	1061.52	1237.69
1962	800.12	882.58	931.27	1047.37	1197.96
1963	800.05	878.12	936.66	1060.27	1198.06
1964	922.21	871.01	955.01	1045.27	1208.29
1965	920.74	876.07	961.76	1044.65	1216.70
1966	911.05	915.80	969.98	1028.57	1202.98
1967	913.93	960.50	979.00	1033.23	1218.93
1968	925.55	980.26	1009.94	1061.30	1253.00
1969	950.76	1007.05	1041.15	1088.32	1258.01
1970	1015.26	1021.22	1059.86	1098.38	1309.73
1971	1016.08	1066.33	1129.97	1169.75	1347.13
1972	1006.19	1030.92	1117.70	1150.30	1313.60
1973	1012.37	1057.34	1127.76	1155.05	1336.92
1974	1009.86	1137.89	1169.94	1179.19	1295.00

TABLE A1-23

TRANSPORTATION CHARGES FOR DOMESTIC CARS BY STATE (1972)

STATE	SUB-ALL	COM-SDN	COM-WGN	MID-SDN	MID-WGN	LPF-SDN	LPF-WGN	UPF-ALL	LUX-ALL	VET-ALL	AVR-ALL
DC 1	30	95	95	104	106	114	118	130	125	134	110
ME 2	70	125	123	128	136	154	157	151	170	199	135
NH 3	72	115	118	118	126	138	144	144	150	154	125
VT 4	105	104	111	109	113	125	127	137	146	150	119
MA 5	69	110	119	122	129	145	149	145	155	172	120
RI 6	73	116	117	120	128	140	145	148	161	157	127
CT 7	76	110	107	118	122	134	138	147	150	160	124
NY 8	72	98	99	105	108	110	122	133	134	149	111
NJ 9	75	106	104	112	117	130	134	139	142	151	119
PA 10	72	92	91	97	101	100	112	120	123	136	107
OH 11	54	54	53	57	57	56	57	70	66	87	59
IN 12	59	60	59	64	64	62	64	84	70	56	67
IL 13	61	64	67	68	69	68	71	80	89	50	72
MI 14	22	22	24	24	24	25	25	28	33	90	25
WI 15	72	73	72	78	79	79	81	100	103	76	82
MN 16	96	115	103	120	122	133	136	161	151	106	120
IA 17	93	102	104	108	113	124	127	135	134	44	116
MO 18	97	104	104	109	115	127	130	135	138	28	118
ND 19	102	120	120	128	134	140	152	162	176	129	130
SD 20	105	133	150	143	157	175	183	161	213	142	153
NE 21	104	123	121	127	134	150	153	156	169	91	137
KS 22	105	126	126	132	139	155	157	160	176	71	141
DE 23	75	103	102	108	113	126	129	134	137	146	115
MD 24	80	95	95	104	106	114	110	130	125	134	110
VA 25	81	102	100	109	113	124	128	139	129	133	116
WV 26	82	75	65	83	87	89	93	106	101	106	89
NC 27	82	111	107	117	122	136	139	147	149	118	125
SC 28	82	116	113	123	127	145	146	145	169	125	132
GA 29	84	125	124	131	137	153	156	167	174	116	140
FL 30	85	151	151	156	166	189	193	186	205	159	155
KY 31	73	73	77	83	83	83	84	113	101	52	87
TN 32	85	102	100	110	114	124	126	137	142	50	117
AL 33	81	124	122	131	136	152	156	164	170	91	139
MS 34	89	140	136	139	148	169	174	166	181	90	149
AR 35	91	125	123	131	137	155	159	164	171	67	141
LA 36	88	148	147	143	159	179	184	180	190	102	159
TX 37	97	156	163	167	177	199	204	197	226	129	175
MT 38	105	158	184	189	198	230	233	224	263	173	197
ID 39	105	150	208	214	220	247	254	270	206	193	210
WY 40	105	158	181	186	196	226	229	218	236	179	193
CO 41	105	150	163	170	181	203	208	203	224	144	179
NM 42	105	150	190	190	201	230	235	223	258	162	197
AZ 43	105	150	209	215	228	251	261	265	287	193	219
UT 44	105	150	200	202	212	240	246	242	262	187	206
NV 45	105	158	208	217	229	253	263	271	289	193	221
WA 46	105	158	208	217	229	253	263	271	289	193	221
OR 47	105	158	208	217	229	253	263	271	289	193	221
CA 48	105	150	208	217	229	253	263	271	289	193	221
OK 49	93	142	140	146	154	171	175	179	197	84	156
AK 50	131	202	266	278	293	324	336	347	369	247	283
HI 51	201	304	335	417	440	406	505	521	558	371	424
US 52	78	105	112	117	123	134	138	146	153	119	124

TABLE A1-23 (Cont.)

KEY:

SUB-ALL = All subcompact cars.

COM-SDN = Compact sedans.

COM-WGN = Compact wagons.

MID-SDN = Midsize sedans.

MID-WGN = Midsize wagons

LPF-SDN = Low priced full-size sedans (e.g., Ford, Chevrolet, Plymouth, and Dodge).

LPF-WGN = Low priced full-size wagons (e.g., Ford, Chevrolet, Plymouth, and Dodge).

HPF-ALL = Expensive full-size cars; all full-size sedans and wagons not in low price group except Cadillac, Lincoln, Imperial and Thunderbird.

LUX-ALL = All luxury sedans.

VET-ALL = All corvettes.

AVR-ALL = Average across all classes.

TABLE A1-24

TRANSPORTATION CHARGES FOR IMPORTED SUBCOMPACT AUTOS BY STATE (1972)

STATE	AUTOFRGTAISY72
DC	30.500
ME	69.000
NH	60.000
VT	60.000
MA	46.000
RI	46.000
CT	34.000
NY	30.800
NJ	31.000
PA	32.700
OH	71.000
IN	75.000
IL	80.500
MI	79.000
WI	87.000
MN	100.50
IA	92.000
MO	89.400
ND	153.50
SD	135.00
NB	117.00
KS	95.000
DE	32.000
MD	31.000
VA	66.000
WV	72.500
NC	69.500
SC	70.000
GA	70.500
FL	98.900
KY	85.500
TN	56.000
AL	58.500
MS	46.000
AR	56.000
LA	31.000
TX	38.100
MT	135.00
ID	124.00
WY	147.00
CO	147.00
NM	120.00
AZ	79.000
UT	94.500
NV	68.000
WA	124.00
OR	103.50
CA	36.000
OK	62.500
AK	35.000
HI	36.000
US	59.117

TABLE A1-25

TRANSPORTATION CHARGES FOR DOMESTIC AND FOREIGN CARS OVER TIME (1947-1974)

YEAR	SUB-ALL	COM-SDN	COM-WGN	MID-SDN	MID-WGN	LPF-SDN	LPF-WGN	HPF-ALL	SUB-SPC	LUX-ALL	VET-ALL	FRG-SUB
1947	46	50	54	58	60	60	63	78	50	97	55	35
1948	46	50	54	58	60	60	63	76	50	97	55	35
1949	46	50	54	58	60	60	63	78	50	97	55	35
1950	46	50	54	58	60	60	63	78	50	97	55	35
1951	46	50	54	58	60	60	63	78	50	97	55	35
1952	46	50	54	58	60	60	63	78	50	97	55	35
1953	46	50	54	58	60	60	63	78	50	97	55	35
1954	46	50	54	58	60	60	63	78	50	97	55	35
1955	46	50	54	58	60	60	63	78	50	97	55	35
1956	46	50	54	58	60	60	63	78	50	97	55	35
1957	49	53	57	61	63	63	67	83	53	103	48	37
1958	50	54	58	62	64	64	68	84	54	105	59	38
1959	56	60	65	69	72	72	76	94	50	118	66	42
1960	56	60	65	69	72	72	76	94	60	118	66	42
1961	56	60	65	69	72	72	76	94	60	118	66	42
1962	56	60	65	69	72	72	76	94	60	118	66	42
1963	56	60	65	69	72	72	76	94	60	118	65	42
1964	56	60	65	69	72	72	76	94	60	118	66	42
1965	56	60	65	69	72	72	76	94	60	118	66	42
1966	56	60	65	69	72	72	76	94	60	118	66	42
1967	56	50	65	69	72	72	76	94	60	118	66	42
1968	62	66	71	77	80	82	86	102	66	122	76	47
1969	68	72	78	84	88	91	95	109	72	125	84	51
1970	78	85	91	96	109	104	108	120	85	132	97	59
1971	78	105	112	117	123	134	138	146	101	153	119	59
1972	78	105	112	117	123	134	138	146	101	153	119	59
1973	80	107	133	118	124	135	139	146	101	153	119	61
1974	84	118	133	131	134	140	154	168	114	159	141	64

KEY:

SUB-ALL = All subcompact cars.
COM-SDN = Compact sedans.
COM-WGN = Compact wagons.
MID-SDN = Midsize sedans.
MID-WGN = Mid-size wagons.

LPF-SDN = Low priced full-size sedans (e.g., Ford, Chevrolet, Plymouth, and Dodge).
LPF-WGN = Low priced full-size wagons (e.g., Ford, Chevrolet, Plymouth, and Dodge).

HPF-ALL = Expensive full-size cars; all full-size sedans and wagons not in low price group except Cadillac, Lincoln, Imperial and Thunderbird.
SUB-SPC = Specialty subcompacts (e.g., Mustang II).
LUX-ALL = All luxury sedans.
VET-ALL = All corvettes.
FRG-SUB = Foreign Subcompact Cars

TABLE A1-26

NEW AUTO SALES TAXES BY STATE, 1972
(Percent)

	TXRSAUTOY72 State	TXRLAUTOY72 Local	TXRAUTOY72 Total	TXRLWTDAUTOY72 Weighted Local	TXRWTDAUTOY72 Weighted Total
DC	4.0	0.0	4.0	0.00	4.00
MNE	5.0	0.0	5.0	0.00	5.00
NH	0.0	1.7	1.7	1.70	1.70
VERM	4.0	0.0	4.0	0.00	4.00
MASS	3.0	0.0	3.0	0.00	3.00
RI	5.0	0.0	5.0	0.00	5.00
CONN	7.0	0.0	7.0	0.00	7.00
NY	4.0	3.0	7.0	2.18	6.18
NJ	5.0	0.0	5.0	0.00	5.00
PENN	6.0	0.0	6.0	0.00	6.00
OHIO	4.0	0.5	4.5	0.02	4.02
IND	2.0	0.0	2.0	0.00	2.00
ILL	4.0	1.0	5.0	0.99	4.99
MICH	4.0	0.0	4.0	0.00	4.00
WISC	4.0	0.0	4.0	0.00	4.00
MINN	4.0	1.0	5.0	0.01	4.01
IOWA	3.0	0.0	3.0	0.00	3.00
MSSR	3.0	1.0	4.0	0.01	3.01
ND	4.0	0.0	4.0	0.00	4.00
SD	3.0	0.0	3.0	0.00	3.00
NEB	2.5	1.0	3.5	0.00	2.50
KAN	3.0	0.5	3.5	0.25	3.25
DELA	2.0	0.0	2.0	0.00	2.00
MYLD	4.0	0.0	4.0	0.00	4.00
VIRG	2.0	0.0	2.0	0.00	2.00
WV	5.0	0.0	5.0	0.00	5.00
NC	2.0	0.0	2.0	0.00	2.00
SC	4.0	0.0	4.0	0.00	4.00
GEOR	3.0	0.0	3.0	0.00	3.00
FL	4.0	0.0	4.0	0.00	4.00
KENT	5.0	0.0	5.0	0.00	5.00
TENN	3.5	1.5	5.0	1.26	4.76
ALAB	1.5	2.0	3.5	1.60	3.10
MSSP	3.0	0.0	3.0	0.00	3.00
ARK	3.0	0.0	3.0	0.00	3.00
LOUS	3.0	3.0	6.0	3.22	6.22
TEXS	4.0	0.0	4.0	0.00	4.00
MONT	1.5	0.0	1.5	0.00	1.50
IDA	3.0	0.0	3.0	0.00	3.00
WYO	3.0	0.0	3.0	0.00	3.00

TABLE A1-26 (Cont.)

	TXRSAUTOY72 State	TXRLAUTOY73 Local	TXRAUTOY72 Total	TXRLWTDAUTOY72 Weighted Local	TXRWTDAUTOY72 Weighted Total
COL	3.0	3.0	6.0	0.65	3.65
NM	2.0	0.5	2.5	0.05	2.05
ARIZ	3.0	2.0	5.0	0.90	3.90
UTAH	4.5	0.0	4.5	0.00	4.50
NEV	7.0	0.5	7.5	0.06	7.06
WASH	4.5	0.5	5.0	0.26	4.76
OREG	0.0	0.0	0.0	0.00	0.00
CALI	5.0	0.5	5.5	0.50	5.50
OKLA	2.0	2.0	4.0	0.83	2.83
ALAS	0.0	3.0	3.0	4.31	4.31
HAW	4.0	0.0	4.0	0.00	4.00

TABLE A1-27

STATE AND LOCAL TAX RATES ON NEW AUTOS--U.S.
(Percent)

	TXRSAUTO State	TXRLAUTO Local	TXRAUTO Total	TXRLWTDAUTO Weighted Local	TXRWTDAUTO Weighted Total
1946	1.17	0.31	1.48	0.25	1.42
1947	1.24	0.31	1.55	0.25	1.49
1948	1.24	0.31	1.55	0.25	1.49
1949	1.24	0.32	1.57	0.25	1.50
1950	1.24	0.32	1.57	0.25	1.50
1951	1.41	0.41	1.82	0.32	1.73
1952	1.44	0.41	1.85	0.32	1.76
1953	1.44	0.41	1.85	0.32	1.76
1954	1.51	0.41	1.92	0.32	1.83
1955	1.56	0.43	1.99	0.34	1.90
1956	1.70	0.43	2.13	0.34	2.04
1957	1.69	0.43	2.12	0.34	2.03
1958	1.71	0.43	2.14	0.34	2.05
1959	1.71	0.43	2.15	0.34	2.05
1960	1.81	0.44	2.25	0.35	2.16
1961	1.91	0.44	2.35	0.35	2.26
1962	2.07	0.44	2.51	0.35	2.42
1963	2.11	0.44	2.56	0.35	2.46
1964	2.19	0.45	2.64	0.36	2.55
1965	2.23	0.46	2.70	0.37	2.60
1966	2.79	0.48	3.27	0.39	3.17
1967	3.07	0.47	3.54	0.38	3.45
1968	3.47	0.40	3.87	0.29	3.75
1969	3.50	0.39	3.89	0.27	3.77
1970	3.60	0.59	4.19	0.28	3.89
1971	3.81	0.78	4.59	0.41	4.23
1972	3.85	0.63	4.48	0.43	4.28
1973	3.92	0.63	4.55	0.43	4.35
1974	3.99	0.73	4.72	0.48	4.47
1975	4.05	0.74	4.80	0.49	4.55

TABLE A1-28

INTERPOLATION OF END OF YEAR CARS IN OPERATION (OPMVUAYEND)
(Million Vehicles)

	OPMVUAYEND	OMPVUAY	OMVUANR
1947	28.744	27.521	3.1672
1948	31.349	29.968	3.4910
1949	34.326	32.731	4.8390
1950	37.219	35.922	6.3264
1951	39.143	38.516	5.0609
1952	40.986	39.770	4.1584
1953	43.294	42.202	5.7390
1954	45.882	44.387	5.5355
1955	48.591	47.378	7.1699
1956	50.618	49.804	5.9552
1957	51.962	51.432	5.9823
1958	53.789	52.492	4.6510
1959	56.095	55.087	6.0413
1960	57.978	57.103	6.5766
1961	59.857	58.854	5.8547
1962	62.176	60.860	6.9389
1963	64.772	63.493	7.5567
1964	67.495	66.051	8.0651
1965	70.102	68.940	9.3139
1966	72.116	71.264	9.0085
1967	74.163	72.963	8.3574
1968	76.926	75.358	9.4039
1969	79.471	78.495	9.5273
1970	81.792	80.448	8.4595
1971	84.788	83.137	9.9636
1972	88.122	86.439	10.608

TABLE A1-29

ESTIMATION OF END OF YEAR CARS IN OPERATION BY STATE
(Mill. Vehicles)

	OPMVUAYENDY72	OMPVUAY72	OMVUANRY72
DC	.37199	.37004	.034797
ME	.41254	.40627	.046478
NH	.33260	.32145	.049190
VT	.18961	.18451	.025633
MA	2.2757	2.2297	.28044
RI	.40893	.40353	.044328
CT	1.4285	1.4126	.14970
NY	6.3739	6.2246	.81909
NJ	3.3313	3.2605	.41423
PA	4.7758	4.6906	.56239
OH	4.9816	4.8350	.60141
IN	2.1568	2.1040	.28159
IL	4.7834	4.6313	.69187
MI	4.1865	4.0321	.64615
WI	1.8876	1.8632	.20446
MN	1.7650	1.7567	.16325
IA	1.3180	1.3094	.12644
MO	1.9453	1.9028	.24416
ND	.24867	.24580	.026650
SD	.28231	.28111	.025368
NS	.69644	.69029	.069964
KS	1.0741	1.0620	.11295
DE	.27371	.26823	.033382
MD	1.5428	1.4881	.23390
VA	1.8530	1.8046	.24768
WV	.67839	.66578	.030865
NC	2.1280	2.0848	.26058
SC	1.1730	1.1585	.12582
GA	2.0706	2.0217	.25690
FL	3.6028	3.5290	.44269
KY	1.3700	1.3611	.13162
TN	1.5898	1.5502	.20573
AL	1.6092	1.5923	.16693
MS	.84113	.82896	.093624
AR	.71079	.69617	.087440
LA	1.3562	1.3236	.17592
TX	4.7316	4.6175	.61436
MT	.28298	.28060	.025200
ID	.30902	.30877	.026275
WY	.14067	.13922	.014528
CO	1.1065	1.0912	.12199
NM	.40882	.40051	.050222
AZ	.85260	.84289	.08935
UT	.46000	.45650	.045122
NV	.26807	.26395	.03296
WA	1.5175	1.5155	.13062
OR	.97425	.96394	.10116
CA	9.4520	9.3444	.99582
OK	1.1722	1.1604	.12044
AK	.083584	.081753	.010595
HI	.33710	.33224	.037484
US	88.122	86.439	10.605

TABLE A1-30

ESTIMATED SURVIVAL PROBABILITIES
FOR CARS BY VINTAGE YEARS

	p_i	q_i	PSE_i	PDE_i	$PDEC_i$
0	.99800	.00200	.9980000	.0020000	.0020000
1	.99379	.00621	.9918024	.0061975	.0081976
2	.98859	.01141	.9804859	.0113164	.0195141
3	.98212	.01788	.9629548	.0175310	.0370452
4	.97268	.02732	.9366468	.0263079	.0633532
5	.95990	.04010	.8990872	.0375595	.1009128
6	.94010	.05990	.8452318	.0538553	.1547682
7	.90706	.09294	.7666759	.0785558	.2333241
8	.88297	.11703	.6769518	.0897240	.3230482
9	.82805	.17195	.5605499	.1164018	.4394501
10	.75339	.24661	.4223126	.1382372	.5776874
11	.71481	.28519	.3018732	.1204393	.6981268
12	.70000	.30000	.2113112	.0905619	.7886888
13	.70000	.30000	.1479178	.0633930	.8520822
14	.70000	.30000	.1035424	.0443753	.8964576
15	.70000	.30000	.0724796	.0310627	.9275204
16	.70000	.30000	.0507357	.0217438	.9492643
17	.70000	.30000	.0355149	.0152207	.9644851
18	.70000	.30000	.0248604	.0106544	.9751396
19	.70000	.30000	.0174022	.0074581	.9825978
20	.70000	.30000	.0121815	.0052206	.9878185

KEY:

p_i = Probability of a car surviving the ith year of its life given it survived until the end of year i-1 (beginning of year i); i=0,...,20.

q_i = Probability of a car not surviving the ith year of its life given it survived until the end of year i-1 (beginning of year i); i=0,...,20.

PSE_i = $\prod_{j=0}^{i} p_j$ for i=0,...,20

= Probability of a car surviving until the end of the ith year.

PDE_i = q_0 for i=0; $q_i \left(\prod_{j=0}^{i-1} p_j\right)$ for i=1,...,20.

= Probability of a car being scrapped during the ith year.

$PDEC_i$ = $\sum_{j=0}^{i} PDE_j$ for i=0,...,20

= Probability of a car being scrapped by the end of the ith year.

= 1 - PSE_i

TABLE A1-31

ESTIMATED SCRAPPAGE RATE ADJUSTMENT FACTORS AND FRACTION OF CARS WHICH SURVIVE EACH YEAR BY VINTAGE (1953-1974)

	SPNEADJ	SPSE0	SPSE1	SPSE2	SPSE3	SPSE4	SPSE5	SPSE6
1953	0,40836	0,99918	0,99665	0,99201	0,98076	0,97378	0,95783	0,93440
1954	0,67043	0,99866	0,99502	0,98903	0,98011	0,96673	0,94760	0,91936
1955	1,07658	0,99785	0,99198	0,98280	0,96799	0,95129	0,92499	0,88699
1956	0,97361	0,99805	0,99181	0,98396	0,96569	0,94419	0,91415	0,87105
1957	1,11939	0,99776	0,99111	0,97915	0,96133	0,93616	0,91180	0,85285
1958	0,63910	0,99872	0,99380	0,98389	0,96796	0,94454	0,91217	0,86728
1959	0,78009	0,99840	0,99388	0,98496	0,97016	0,94733	0,91500	0,86750
1960	0,88561	0,99823	0,99295	0,98584	0,96936	0,94669	0,91369	0,86606
1961	0,70730	0,99859	0,99389	0,98493	0,97140	0,95063	0,91984	0,87497
1962	0,76777	0,99806	0,99382	0,98514	0,97141	0,95102	0,92136	0,87750
1963	0,80347	0,99839	0,99148	0,98471	0,97099	0,95009	0,92038	0,87762
1964	0,82477	0,99835	0,99328	0,98413	0,97019	0,94911	0,91867	0,87491
1965	0,99610	0,99801	0,99217	0,98199	0,96661	0,94379	0,91120	0,86385
1966	1,00733	0,99790	0,99150	0,98030	0,96357	0,93890	0,90408	0,85392
1967	0,96575	0,99807	0,99192	0,98058	0,96337	0,93814	0,90253	0,85178
1968	1,01147	0,99798	0,99180	0,98047	0,96280	0,93675	0,90009	0,84785
1969	1,05302	0,99789	0,99103	0,97988	0,96201	0,93515	0,89719	0,84332
1970	0,90950	0,99818	0,99226	0,98116	0,96395	0,93011	0,90104	0,84831
1971	0,97895	0,99804	0,99211	0,98117	0,96399	0,93017	0,90128	0,84820
1972	0,98251	0,99803	0,99195	0,98099	0,96394	0,93811	0,90120	0,84824
1973	1,08697	0,99783	0,99130	0,97965	0,96192	0,93531	0,89722	0,84253
1974	0,82670	0,99835	0,99270	0,98193	0,96517	0,94020	0,90431	0,85279

KEY: SPNEADJ = Scrappage Rate Adjustment Factor which is current year scrappage rate relative to "Normal" scrappage rate (if scrappage rate is "Normal", SPNEADJ = 1; above "Normal", SPNEADJ > 1; below "Normal", SPNEADJ < 1).

SPSEi = Fraction of a car's vintage i which will survive the current year (i=0,...,20).

TABLE A1-31 (Cont.)

	SPSE7	SPSE8	SPSE9	SPSE10	SPSE11	SPSE12	SPSE13	SPSE14
1953	0.89894	0.85598	0.79587	0.71572	0.63237	0.55490	0.06692	0.02727
1954	0.87618	0.82041	0.75730	0.66429	0.57888	0.50518	0.44329	0.18894
1955	0.82718	0.76579	0.67505	0.55624	0.46033	0.37191	0.34202	0.30012
1956	0.80627	0.73310	0.63738	0.51297	0.40179	0.32500	0.27748	0.24212
1957	0.78843	0.70065	0.59200	0.46158	0.34921	0.26686	0.21644	0.18427
1958	0.80219	0.72205	0.62365	0.47069	0.37745	0.20226	0.21570	0.17494
1959	0.80440	0.72096	0.62520	0.50360	0.38779	0.20912	0.21620	0.16522
1960	0.79797	0.72103	0.61795	0.48866	0.37646	0.20473	0.21230	0.15876
1961	0.80950	0.73192	0.63334	0.51016	0.39008	0.29659	0.22431	0.16725
1962	0.81258	0.73676	0.63529	0.51542	0.39846	0.30023	0.22027	0.17264
1963	0.81201	0.73613	0.63497	0.50941	0.39577	0.30241	0.22787	0.17325
1964	0.80979	0.73363	0.63174	0.59582	0.39459	0.29705	0.22758	0.17144
1965	0.79491	0.71539	0.60797	0.47655	0.36213	0.27317	0.20804	0.15958
1966	0.77961	0.69602	0.58631	0.45064	0.33379	0.24813	0.18710	0.14310
1967	0.77728	0.69149	0.58077	0.44667	0.32657	0.23719	0.17624	0.13295
1968	0.77170	0.68527	0.57123	0.43570	0.31782	0.22745	0.16522	0.12276
1969	0.76488	0.67661	0.56119	0.42289	0.30500	0.21792	0.15560	0.11302
1970	0.77203	0.68306	0.57079	0.43532	0.31320	0.22178	0.15810	0.11314
1971	0.77113	0.68350	0.56042	0.43299	0.31379	0.22122	0.15665	0.11167
1972	0.77075	0.68246	0.56809	0.43069	0.31166	0.22129	0.15601	0.11097
1973	0.76249	0.67270	0.55491	0.41583	0.29718	0.21003	0.14913	0.10514
1974	0.77779	0.68877	0.57708	0.44170	0.31778	0.22347	0.19790	0.11219

KEY: SPSEi = Fraction of a car's vintage i which will survive the current year (i=0,...,20).

TABLE A1-31 (Cont.)

	SPSE15	SPSE16	SPSE17	SPSE18	SPSE19	SPSE20
1953	0,37093	0,32099	0,28069	0,25312	0,22229	0,19596
1954	0,34133	0,29952	0,26282	0,23063	0,20237	0,17758
1955	0,26335	0,23109	0,20278	0,17774	0,15614	0,13701
1956	0,21246	0,18643	0,16359	0,14355	0,12597	0,11053
1957	0,16081	0,14111	0,12383	0,10866	0,09534	0,08366
1958	0,14894	0,12998	0,11406	0,10008	0,08782	0,07706
1959	0,13400	0,11409	0,09956	0,08736	0,07666	0,06727
1960	0,12132	0,09840	0,08378	0,07311	0,06415	0,05629
1961	0,12507	0,09558	0,07752	0,06600	0,05760	0,05054
1962	0,12873	0,09626	0,07356	0,05966	0,05000	0,04433
1963	0,13103	0,09770	0,07306	0,05583	0,04928	0,03835
1964	0,11038	0,07861	0,07153	0,05498	0,04202	0,03408
1965	0,12024	0,09142	0,06914	0,05153	0,03855	0,02946
1966	0,10734	0,08219	0,06269	0,04739	0,03532	0,02642
1967	0,10164	0,07766	0,05852	0,04447	0,03365	0,02509
1968	0,09260	0,07080	0,05410	0,04076	0,03099	0,02344
1969	0,08398	0,06335	0,04843	0,03701	0,02788	0,02120
1970	0,08217	0,06107	0,04607	0,03522	0,02691	0,02028
1971	0,07971	0,05805	0,04313	0,03244	0,02487	0,01901
1972	0,07675	0,05636	0,04094	0,03042	0,02295	0,01754
1973	0,07445	0,05307	0,03798	0,02759	0,02050	0,01546
1974	0,07706	0,05598	0,03971	0,02856	0,02075	0,01502

KEY: SPSEi = Fraction of a car's vintage i which will survive the current year (i=0,...,20).

TABLE A1-32

ESTIMATED NUMBER OF CARS IN OPERATION AT YEAR END DISAGGREGATED BY DOMESTIC AND FOREIGN SIZE CLASSES

(Millions of Units)

	OMPVUASDYEND	OPMVUASFYEND	OPMVUACDYEND	OPMVUACFYEND	OPMVUAMDYEND	OPMVUAFDYEND	OPMVUALDYEND	OPMVUALFYEND
1953	0,362	0,186	0,290	0,004	23,037	17,153	2,284	0,019
1954	0,347	0,164	0,336	0,004	24,765	17,835	2,409	0,021
1955	0,321	0,202	0,381	0,004	26,375	18,766	2,513	0,029
1956	0,298	0,272	0,426	0,008	27,802	19,030	2,694	0,018
1957	0,268	0,433	0,485	0,025	28,919	18,916	2,866	0,049
1958	0,292	0,763	0,595	0,056	30,073	18,909	3,056	0,074
1959	0,402	1,254	1,022	0,111	31,017	18,893	3,297	0,099
1960	0,712	1,654	2,035	0,153	30,934	18,881	3,485	0,124
1961	1,126	1,951	2,980	0,179	30,737	19,053	3,687	0,105
1962	1,440	2,199	4,201	0,200	30,355	19,693	3,918	0,162
1963	1,749	2,478	5,149	0,218	29,848	20,950	4,152	0,178
1964	1,942	2,825	6,289	0,218	28,963	22,663	4,380	0,195
1965	2,080	3,200	7,410	0,256	27,381	24,916	4,650	0,208
1966	2,078	3,549	8,433	0,278	25,902	26,700	4,900	0,225
1967	1,976	4,070	9,419	0,312	24,535	28,341	5,182	0,248
1968	1,865	4,676	10,443	0,344	23,680	30,191	5,503	0,275
1969	1,583	5,306	11,467	0,369	22,716	31,754	5,875	0,303
1970	1,612	6,098	12,511	0,412	22,103	32,683	6,048	0,345
1971	2,141	7,061	13,211	0,472	21,507	33,565	6,437	0,393
1972	2,722	8,002	13,800	0,582	21,339	34,298	6,873	0,454
1973	3,639	9,002	14,619	0,635	21,318	34,206	7,271	0,520
1974	4,605	9,807	15,261	0,735	21,892	33,582	7,443	0,588

KEY: OMPVUA*ac*YEND = Estimated Number of Cars in Operation at Year End for Size Class *ac*,

Where *ac* assumes the following values:

SD = Domestic Subcompat Cars
SF = Foreign Subcompact Cars
CD = Domestic Compact Cars
CF = Foreign Compact Cars
MD = Domestic Mid-Size Cars
FD = Domestic Full-Size Cars
LD = Domestic Luxury Cars
LF = Foreign Luxury Cars

TABLE A1-33

ESTIMATED NUMBER OF CARS IN OPERATION AT YEAR END
DISAGGREGATED BY SIZE CLASSES

	OPMVUASTYEND	OPMVUACTYEND	OPMVUAMDYEND	OPMVUAFDYEND	OPMVUALTYEND
1953	0,507	0,294	23,037	17,153	2,303
1954	0,511	0,340	24,765	17,835	2,432
1955	0,523	0,385	26,375	18,766	2,541
1956	0,570	0,434	27,802	19,080	2,731
1957	0,701	0,510	28,919	18,916	2,915
1958	1,035	0,651	30,073	18,900	3,130
1959	1,656	1,132	31,017	18,893	3,396
1960	2,366	2,188	30,934	18,881	3,609
1961	3,077	3,159	30,737	19,053	3,832
1962	3,689	4,401	30,353	19,653	4,080
1963	4,277	5,366	29,848	20,950	4,330
1964	4,767	6,527	28,963	22,663	4,575
1965	5,281	7,666	27,381	24,916	4,858
1966	5,677	8,712	25,902	26,700	5,125
1967	6,066	9,791	24,535	28,341	5,430
1968	6,541	10,787	23,680	30,141	5,777
1969	6,990	11,836	22,716	31,754	6,176
1970	7,731	12,923	22,103	32,643	6,393
1971	9,202	13,683	21,507	33,565	6,831
1972	10,774	14,382	21,339	34,298	7,329
1973	12,641	15,255	21,314	34,206	7,791
1974	14,412	15,996	21,892	33,542	8,082

KEY: OPMVUA*sc*YEND = Estimated Number of Cars in Operation at Year End for Size Class *sc*,

Where *sc* assumes the following values:
- ST = Total Subcompact Cars
- CT = Total Compact Cars
- MD = Domestic Mid-Size Cars
- FD = Domestic Full-Size Cars
- LT = Total Luxury Cars

TABLE A1-34

AUTOMOBILES ON WHICH USED CAR PRICE DATA WAS GATHERED

<u>Domestic Subcompacts</u> (.3745)

Pinto (.5689) Vega (.4311)

<u>Foreign Subcompacts</u> (.6255)

Datsun (.1883) MG (.0232) Toyota (.2800) Triumph (.0167)
Volkswagen (.4918)

<u>Domestic Compacts</u> (.9431)

Barracuda (.0352) Camaro (.0571) Dart (.3247) Hornet (.0557)
Maverick (.1847) Mustang (.0959) Nova (.2467)

<u>Foreign Compacts</u> (.0569)

Saab (1.0)

<u>Domestic Mid-Size</u> (1.0)

Chevelle (.5756) Coronet (.1411) Matador (.0214) Torino (.2619)

<u>Domestic Full-Size</u> (1.0)

Ambassador (.0128)	Chevrolet (.5922)	Ford (.2399)
	Impala (.756)	LTD (.613)
	Caprice (.244)	Galaxy (.387)

<u>Domestic Luxury</u> (.9196)

Cadillac (.7737) Lincoln (.1106) Corvette (.0282)

New Yorker (.0906)

<u>Foreign Luxury</u> (.0804)

Jaguar (.0594) Mercedes (.4751) Porsche (.4655)

Numbers in parentheses refer to the share of the car in its sub-class or the share of the foreign or domestic car in its class.

TABLE A1-35

PRICE OF ONE TO SEVEN YEAR OLD FULL-SIZE CARS RELATIVE TO A NEW FULL-SIZE CAR (1958-1974)

YEAR	PU1FD / PNFD	PU2FD / PNFD	PU3FD / PNFD	PU4FD / PNFD	PU5FD / PNFD	PU6FD / PNFD	PU7FD / PNFD
1958	.7041	.5342	.4244	.3064	.2246	.1452	.1096
1959	.6599	.5338	.4172	.3331	.2404	.1711	.0976
1960	.6630	.4788	.3976	.2968	.2213	[illegible]	.1002
1961	.6549	.5120	.3748	.3227	.2403	.1767	.1159
1962	.6546	.5358	.4431	.3081	.2525	.1576	.1169
1963	.6631	.5356	.4362	.3501	.2248	.1874	.1073
1964	.6903	.5383	.4303	.3504	.2727	.1643	.1338
1965	.6534	.5344	.4335	.3220	.2470	.1769	.0969
1966	.6350	.5040	.4035	.3065	.2172	.1610	.0884
1967	.6061	.4361	.3852	.2953	.2428	.1720	.1047
1968	.6019	.4841	.3752	.2956	.2246	.1727	.1213
1969	.5718	.4532	.3722	.2979	.2306	.1731	.1479
1970	.5689	.4524	.3775	.3035	.2368	.1855	.1347
1971	.5812	.4422	.3715	.2804	.2099	.1808	.1542
1972	.5910	.4440	.3455	.2747	.2178	.1593	.1355
1973	.5850	.4691	.3581	.3022	.2285	.1659	.1077
1974	.6444	.5088	.4087	.3262	.2585	.1949	.1379

TABLE A1-36.

CONSTRUCTED PRICE RELATIVES FOR ONE YEAR OLD CARS VERSUS NEW CARS OF THE SAME SIZE CLASS (1958-74)

	PU/NST	PU/NCT	PU/NMD	PU/NFD	PU/NLT
1958	.85714	.78307	.68546	.70413	.75232
1959	.85665	.78794	.62464	.65985	.75797
1960	.75604	.66403	.62953	.66297	.70755
1961	.76923	.66649	.60173	.65489	.72189
1962	.81171	.69194	.64163	.65460	.71719
1963	.86608	.65398	.63369	.66307	.72980
1964	.84165	.66494	.64548	.69030	.69318
1965	.82561	.67368	.67437	.65337	.67431
1966	.79116	.64105	.63624	.63495	.67998
1967	.72988	.62027	.63796	.60613	.65939
1968	.68935	.58525	.61553	.60192	.70612
1969	.74784	.61555	.64870	.57176	.69329
1970	.75672	.66205	.64463	.56890	.67388
1971	.79473	.67338	.62130	.58120	.69718
1972	.74233	.68245	.65435	.59101	.73492
1973	.71349	.70042	.62143	.58459	.66579
1974	.84755	.79745	.70879	.64436	.68337

Key: PU/NST = Price of a one year old Subcompact over the price of a new Subcompact.
PU/NCT = Price of a one year old Compact over the price of a new Compact.
PU/NMD = Price of a one year old Mid-Size over the price of a new Mid-Size.
PU/NFD = Price of a one year old Full-Size over the price of a new Full-Size.
PU/NLT = Price of a one year old Luxury over the price of a new Luxury.

TABLE A1-37

ESTIMATES OF PRICE DECAY FACTORS (λ's)
BY SIZE CLASS (1958-1974)

	PU/NADJST	PU/NADJCT	PU/NADJMD	PU/NADJFD	PU/NADJLT
1958	.17711	.28355	.26821	.30132	.31782
1959	.15711	.25884	.25330	.27947	.30438
1960	.16545	.29892	.27768	.29593	.31073
1961	.19094	.26316	.24272	.26851	.31050
1962	.17774	.28047	.22896	.26931	.30089
1963	.14905	.28502	.25990	.26967	.30003
1964	.14294	.26162	.26843	.26335	.27017
1965	.14299	.29732	.30003	.24795	.29369
1966	.15742	.30315	.30792	.28908	.28275
1967	.15318	.28209	.29221	.26127	.27852
1968	.14951	.24481	.26293	.25379	.28151
1969	.17800	.26854	.26967	.228[illegible]	.28652
1970	.17624	.24018	.23357	.22734	.26722
1971	.17043	.22122	.23247	.23449	.27290
1972	.19969	.21232	.23463	.25319	.28269
1973	.21888	.22267	.23092	.25710	.28087
1974	.21114	.20626	.21652	.24254	.26818

Key: PU/NADJST = Price Decay Factor for Subcompacts.
PU/NADJCT = Price Decay Factor for Compacts.
PU/NADJMD = Price Decay Factor for Mid-Size Cars.
PU/NADJFD = Price Decay Factor for Full-Size Cars.
PU/NADJLT = Price Decay Factor for Luxury Cars.

TABLE A1-38

ESTIMATES (BASED ON λ ESTIMATE) OF TWO TO SEVEN YEAR OLD FULL-SIZE DOMESTIC PRICE RELATIVE (1958-1974)

	PU02/NFD	PU03/NFD	PU04/NFD	PU05/NFD	PU06/NFD	PU07/NFD
1958	0.5209	0.3854	0.2851	0.2110	0.1561	0.1155
1959	0.4990	0.3773	0.2853	0.2158	0.1631	0.1234
1960	0.4931	0.3668	0.2729	0.2030	0.1510	0.1123
1961	0.5007	0.3828	0.2926	0.2237	0.1710	0.1308
1962	0.5001	0.3820	0.2918	0.2229	0.1703	0.1301
1963	0.5063	0.3867	0.2953	0.2255	0.1722	0.1315
1964	0.5305	0.4077	0.3133	0.2407	0.1850	0.1422
1965	0.5099	0.3979	0.3105	0.2423	0.1891	0.1476
1966	0.4755	0.3562	0.2667	0.1998	0.1496	0.1121
1967	0.4668	0.3594	0.2768	0.2131	0.1641	0.1264
1968	0.4670	0.3623	0.2811	0.2181	0.1692	0.1313
1969	0.4551	0.3623	0.2883	0.2295	0.1827	0.1454
1970	0.4532	0.3611	0.2876	0.2291	0.1825	0.1454
1971	0.4597	0.3636	0.2876	0.2275	0.1799	0.1423
1972	0.4588	0.3562	0.2765	0.2147	0.1666	0.1294
1973	0.4521	0.3496	0.2703	0.2090	0.1616	0.1250
1974	0.5056	0.3967	0.3113	0.2442	0.1916	0.1504

Key: PU02/NFD = Estimate of $\frac{PU2FD}{PNFD}$ PU04/NFD = Estimate of $\frac{PU4FD}{PNFD}$ PU06/NFD = Estimate of $\frac{PU6FD}{PNFD}$

PU03/NFD = Estimate of $\frac{PU3FD}{PNFD}$ PU05/NFD = Estimate of $\frac{PU5FD}{PNFD}$ PU07/NFD = Estimate of $\frac{PU7FD}{PNFD}$

TABLE A1-39

INDICES OF USED CAR PRICES, NEW CAR PRICES, AND NEW AUTO REGISTRATIONS
(All Indices Based To 1972 = 100)

YEAR	USED CAR PRICE INDICES CPI 1/	ANWP 2/	WEFA 3/ PUSED1TT67	WEFA 3/ AVERAGE	WEFA NEW CAR PRICE	NEW AUTO REGISTRATIONS
1952	90.0	--	---	---	59.9	39.2
1953	80.7	--	---	---	60.5	54.1
1954	68.7	--	---	---	60.9	52.2
1955	65.0	--	---	---	64.0	67.6
1956	62.5	--	---	---	69.1	56.1
1957	70.0	--	---	---	74.9	56.4
1958	72.6	--	87.9	67.4	79.8	43.8
1959	81.0	--	84.6	68.2	77.8	56.9
1960	75.7	65.9	79.7	67.9	75.6	62.0
1961	78.6	67.4	78.5	70.3	75.4	55.2
1962	85.8	71.8	79.7	72.1	82.9	65.4
1963	86.9	74.4	79.9	73.6	77.5	71.2
1964	90.6	75.5	81.3	77.1	77.9	76.0
1965	90.0	73.1	80.9	77.5	80.1	87.8
1966	87.8	73.6	79.7	74.3	81.8	84.9
1967	90.5	73.9	79.5	74.5	84.8	78.8
1968	92.9	79.9	83.0	80.3	89.4	88.7
1969	93.3	82.2	85.6	86.0	92.5	89.8
1970	94.4	83.5	89.2	90.6	92.4	79.8
1971	99.7	92.8	97.5	97.1	99.3	93.9
1972	100.0	100.0	100.0	100.0	100.0	100.0
1973	106.4	111.1	101.7	103.1	103.4	108.2
1974	111.0	123.6	121.9	124.3	110.9	87.5

1/ Bureau of Labor Statistics Consumer Price Index for Used Cars Rebased to 1972 = 100 (Code: 4111-2000)

2/ Automotive News Almanac Wholesale Auction Price for Used Cars Converted to 1972 = 100 index.

3/ Average Retail Price of Used Cars Computed from NADA Used Car Price Statistics converted to 1972 = 100 index.

TABLE A1-40

USED CAR MARKET IDENTITIES

I. Prices of New Cars (Price Excluding Taxes)

a) PNEWST = USSTPUB+O + USSTPUTRN

b) PNEWCT = USCTPUB+O + USCTPUTRN

c) PNEWMD = USMDPUB+O + USMDPUTRN

d) PNEWFD = USFDPUB+O + USFDPUTRN

e) PNEWLT = USLTPUB+O + USLTPUTRN

II. Prices of One Year Old Used Cars

a) PUSED1ST = PU/NST * PNEWST

b) PUSED1CT = PU/NCT * PNEWCT

c) PUSED1MD = PU/NMD * PNEWMD

d) PUSED1FT = PU/NFD * PNEWFD

e) PUSED1LT = PU/NLT * PNEWLT

III. New Car Trade-Ins By Vintage and Total

a) VOLUN01 = 0.1621 * OMVUANR * 0.5

b) VOLUN02 = 0.2141 * OMVUANR * 0.5

c) VOLUN03 = 0.1764 * OMVUANR * 0.5

d) VOLUN04 = 0.1407 * OMVUANR * 0.5

e) VOLUN05 = 0.1050 * OMVUANR * 0.5

f) VOLUN06 = 0.0805 * OMVUANR * 0.5

g) VOLUN07 = 0.0479 * OMVUANR * 0.5

h) VOLUN08 = 0.0347 * OMVUANR * 0.5

i) VOLUN09 = 0.0234 * OMVUANR * 0.5

j) VOLUN10 = 0.0152 * OMVUANR * 0.5

TABLE A1-40 (Cont.)

III. New Car Trade-Ins By Vintage and Total (Cont.)

k) VOLUN = VOLUN01 + VOLUN02 + VOLUN03 + VOLUN04 + VOLUN05 + VOLUN06 + VOLUN07 + VOLUN08 + VOLUN09 + VOLUN10

IV. Potential Used Car Market Entrants By Vintage and Total

a) VOLUP02 = SPSE2 * (OMVUANR(-1) * 0.1621) * 0.5

b) VOLUP03 = SPSE3 * (OMVUANR(-2) * 0.1621 + OMVUANR(-1) * 0.2141) * 0.5

c) VOLUP04 = SPSE4 * (OMVUANR(-3) * 0.1621 + OMVUANR(-2) * 0.2141
+ (OMVUANR(-1) * 0.1764) * 0.5

d) VOLUP05 = SPSE5 * (OMVUANR(-4) * 0.1621 + OMVUANR(-3) * 0.2141
+ OMVUANR(-2) * 0.1764 + OMVUANR(-1) * 0.1407) * 0.5

e) VOLUP06 = SPSE6 * (OMVUANR(-5) *0.1621 + OMVUANR(-4) * 0.2141
+ OMVUANR(-3) * 0.1764 + OMVUANR(-2) * 0.1407
+ OMVUANR(-1) * 0.1050) * 0.5

f) VOLUP07 = SPSE7 * (OMVUANR(-6) * 0.1621 + OMVUANR(-5) * 0.2141
+ OMVUANR(-4) * 0.1764 + OMVUANR(-3) * 0.1407
+ OMVUANR(-2) * 0.1050 + OMVUANR(-1) * 0.0805) * 0.5

g) VOLUP08 = SPSE8 * (OMVUANR(-7) * 0.1621 + OMVUANR(-6) * 0.2141
+ OMVUANR(-5) * 0.1764 + OMVUANR(-4) * 0.1407
+ OMVUANR(-3) * 0.1050 + OMVUANR(-2) * 0.0805
+ OMVUANR(-1) * 0.0479) * 0.5

h) VOLUP09 = SPSE9 * (OMVUANR(-8) * 0.1621 + OMVUANR(-7) * 0.2141
+ OMVUANR(-6) * 0.1764 + OMVUANR(-5) * 0.1407
+ OMVUANR(-4) * 0.1050 + OMVUANR(-3) * 0.0805
+ OMVUANR(-2) * 0.0479 + OMVUANR(-1) * 0.0347) * 0.5

i) VOLUP10 = SPSE10 * (OMVUANR(-9) * 0.1621 + OMVUANR(-8) * 0.2141
+ OMVUANR(-7) * 0.1764 + OMVUANR(-6) * 0.1407
+ OMVUANR(-5) * 0.1050 + OMVUANR(-4) * 0.0805
+ OMVUANR(-3) * 0.0479 + OMVUANR(-2) * 0.0347
+ OMVUANR(-1) * 0.0234) * 0.5

j) VOLUP = VOLUP02 + VOLUP03 + VOLUP04 + VOLUP05 + VOLUP06 + VOLUP07 +
VOLUP08 + VOLUP09 + VOLUP10

TABLE A1-40 (Cont.)

V. Fraction of Potential Used Car Market Entrants Actually In The Market

VOLUPF = (PURMVUUA - VOLUN)/VOLUP

VI. Total Transactions In Used Car Market By Vintage

a) VOLUT01 = VOLUN01

b) VOLUT02 = VOLUN02 + VOLUPF * VOLUP02

c) VOLUT03 = VOLUN03 + VOLUPF * VOLUP03

d) VOLUT04 = VOLUN04 + VOLUPF * VOLUP04

e) VOLUT05 = VOLUN05 + VOLUPF * VOLUP05

f) VOLUT06 = VOLUN06 + VOLUPF * VOLUP06

g) VOLUT07 = VOLUN07 + VOLUPF * VOLUP07

h) VOLUT08 = VOLUN08 + VOLUPF * VOLUP08

i) VOLUT09 = VOLUN09 + VOLUPF * VOLUP09

j) VOLUT10 = VOLUN10 + VOLUPF * VOLUP10

VII. Total Transactions In Used Car Market By Size Class

$$\text{VOLUT}sc = \sum_{i=1}^{10} (\text{SHR}sc\text{NR}(-i) * \text{VOLUT}i)$$

where sc = ST, CT, MD, FD, LT

and VOLUTi = VOLUT01, ..., VOLUT10 for i=1, ...,10

TABLE A1-40 (Cont.)

VIII. Average Price of Used Car Traded By Size Class and Total

a) $PUSEDR_{sc}$ = $PUSED1_{sc}$ *

$$\sum_{i=1}^{10} [SHRscNR(-i) * VOLUT_i * \exp -(i-1) * PU/NADJ_{sc})] / VOLUT_{sc}$$

where sc = ST, CT, MD, FD, LT,

and $VOLUT_i$ = VOLUT01, ..., VOLUT10 for i=1,...,10.

b) PUSEDR = (VOLUTST * PUSEDRST + VOLUTCT * PUSEDRCT + VOLUTMD * PUSEDRMD

+ VOLUTFD * PUSEDRFD + VOLUTLT * PUSEDRLT) / PURMVUUA

IX. Compute Expected Scrappage Weighted Average Price For An Old Car

a) Compute Expected ("Normal") Scrappage
By Vintage for Old Cars

SCOLD08 = 0.11703 * SPSE7(-1) * OMVUANR(-8)

SCOLD09 = 0.17195 * SPSE8(-1) * OMVUANR(-9)

SCOLD10 = 0.24661 * SPSE9(-1) * OMVUANR(-10)

SCOLD11 = 0.28619 * SPSE10(-1) * OMVUANR(-11)

SCOLD12 = 0.3 * SPSE11(-1) * OMVUANR(-12)

SCOLD13 = 0.3 * SPSE12(-1) * OMVUANR(-13)

SCOLD14 = 0.3 * SPSE13(-1) * OMVUANR(-14)

SCOLD15 = 0.3 * SPSE14(-1) * OMVUANR(-15)

SCOLD16 = 0.3 * SPSE15(-1) * OMVUANR(-16)

SCOLD17 = 0.3 * SPSE16(-1) * OMVUANR(-17)

SCOLD18 = 0.3 * SPSE17(-1) * OMVUANR(-18)

SCOLD19 = 0.3 * SPSE18(-1) * OMVUANR(-19)

SCOLD20 = 0.3 * SPSE19(-1) * OMVUANR(-20)

$$SCOLD = \sum_{i=08}^{20} SCOLD_i$$

TABLE A1-40 (Cont.)

b) Compute Weighted Average Price

$$PUOLD = \{ \sum_{i=08}^{20} (SCOLD_i) [\sum_{sc} SHR_{sc}NR(-i) * PUSED1_{sc} * \exp(-(i-1) * PU/NADT_{sc})]\} / SCOLD$$

where sc = ST, CT, MD, FD, LT

TABLE A1-141

Definitions For Used Car Market Identities

Symbol	Definition
OMUANR	Number of new cars registered during the year
OPMVUAYEND	Number of cars registered during the year
PNEW*sc*	Price of a new car of class *sc* where *sc* = ST, CT, MD, FD, LT
PU/N*sc*	Price of a one year old car of class *sc* relative to the price of a new car of class *sc* where *sc* = ST, CT, MD FD, LT
PU/NADJ*sc*	Exponential rate of decline for used car prices of vintage v = 2 ..., 10 for car of class *sc* where *sc* = ST, CT, MD, FD, LT
PURMVUAA	Number of used cars purchased during the year (i.e. used car market volume)
PUSED1*sc*	Price of a one year old car of class *sc* where *sc* = ST, CT, MD, FD, LT
PUSEDR	Average retail price of a used car.
PUSEDR*sc*	Average retail price for a used car of class *sc* where *sc* = ST, CT, MD, FD, LT
PUSEDW	Average wholesale price for a car traded in the wholesale market.
SHR*sc*NR	Share of new registrations for a car of class *sc* where *sc* = ST, CT, MD, FD, LT
SPSE*i*	Fraction of new cars registered *i* years ago are still in operation at the end of the current year (SPSE*i* = SPSE1, ..., SPSE10)
US*sc*PUB+O	Base plus options price for a new car of class *sc* where *sc* = ST, CD, MD, FD, LT
US*sc*PUTRN	Transportation charges for a new car of class *sc* where *sc* = ST, CT, MD, FD, LT

TABLE A1-41 (Cont.)

Symbol	Definition
VOLUN	Number of new to car car trade-ins
VOLUNi	Number of new to new car trade-ins which are cars of vintage i (VOLUNi = VOLUN01, ..., VOLUN10)
VOLUP	Number of cars which have been traded in by their original owners, have survived, and are potentially in the used car market.
VOLUPi	Vintage year breakdown of VOLUP (VOLUPi = VOLUP01, ..., VOL10) and $\text{VOLUP} = \sum_{i=1}^{10} \text{VOLUP}i$
VOLUPF	Fraction of VOLUP which is traded in the used car market.
VOLUTsc	Number of cars purchased in the used car market which are of class sc where sc = ST, CT, MD, FD, LT
VOLUTi	Number of cars purchased in the used car market which are of vintage i (VOLUTi = VOLUT01, ..., VOLUT10), and $\text{PURMVUUA} = \sum_{i=1}^{10} \text{VOLUT}i$

TABLE A1-42

NUMBER OF FAMILIES AND UNRELATED INDIVIDUALS BY STATE, 1970 AND 1972

	NCFY72	NCFY70	NPRUY72	NPRUY70	NPRY72	NPRY70
DC	.16518	.16348	.14624	.13192	.75200	75651
ME	.26086	.24815	.072771	.060393	1.0260	.99205
NH	.19604	.18383	.056320	.048131	.77400	.73768
VT	.11303	.10741	.033797	.029273	.46000	.44433
MA	1.4404	1.3910	.50268	.44243	5.7950	5.6892
RI	.24621	.23667	.066975	.058673	.96900	.94672
CT	.79269	.76765	.22918	.20228	3.0800	3.0317
NY	4.7188	4.6096	1.7126	1.5248	18.367	18.237
NJ	1.9162	1.8388	.50762	.44397	7.3490	7.1682
PA	3.0894	3.0111	.91512	.81291	11.905	11.794
OH	2.7533	2.6911	.78925	.70309	10.722	10.652
IN	1.3673	1.3217	.38194	.33650	5.2860	5.9137
IL	2.8733	2.7942	.93889	.83215	11.244	11.114
MI	2.2608	1903	.64576	.57018	9.0130	8.8751
WI	1.1220	1.0775	.35033	.30662	4.5260	4.4177
MN	.95419	.92133	.32609	.28697	3.8770	3.8050
IA	.74497	.71778	.22825	.20044	2.8840	2.8244
MO	1.2430	1.2048	.40198	.35509	4.7470	4.6765
ND	.15463	.14824	.038734	.038734	.63400	.61776
SD	.16819	.16194	.043220	.043220	.68000	.66551
NE	.39172	.37416	.11263	.11263	1.5280	1.4835
KS	.59705	.58185	.16733	.16733	2.2580	2.2466
DE	.14498	.13692	.034128	.034128	.57100	.54810
MD	1.0219	.97414	.26660	.26660	4.0480	3.9224
VA	1.2110	1.1623	.28661	.28661	4.7650	4.6485
WV	.47540	.45449	.10110	.10110	1.7950	1.7442
NC	1.3496	1.2925	.28410	.24796	5.2210	5.0821
SC	.66306	.62869	.12836	.11092	2.6380	2.5905
GA	1.2052	1.1498	.29782	.25895	4.7330	4.5896
FL	1.9923	1.8114	.69757	.56312	7.3470	6.7894
KY	.86153	.82522	.19694	.17193	3.3060	3.2157
TN	1.0806	1.0244	.24767	.21399	4.0720	3.9237
AL	.90886	.87466	.19484	.17089	3.5210	3.4442
MS	.55280	.53444	.12075	.10640	2.2560	2.2169
AR	.53611	.50520	.13226	.11359	2.0090	1.9233
LA	.91067	.87277	.22238	.19424	3.7360	3.6413
TX	2.9686	2.8181	.82213	.71132	11.504	11.197
MT	.18006	.17181	.057665	.050149	.71600	.69441
ID	.19326	.17945	.055090	.046622	.75500	.71257
WY	.089613	.084703	.026839	.023121	.34600	.33242
CO	.59565	.54716	.21449	.17958	2.3640	2.2073
NM	.26130	.24274	.062927	.053279	1.0760	1.0160
AZ	.49393	.43839	.15875	.12841	1.9630	1.7709
UT	.27007	.24974	.073025	.061545	1.1270	1.0593
NY	.13764	.12417	.056317	.046305	.53300	.48374
WA	.87898	.86254	.33179	.29674	3.4180	3.4092
OR	.57608	.54248	.21270	.18255	2.1850	2.0914
CA	5.2001	5.0013	2.2226	1.9483	20.411	19.953
OK	.71032	.67926	.21529	.18764	2.6330	2.5392
AK	.073319	.066670	.020497	.016987	.32500	.30038
HI	.18424	.17073	.055901	.047211	.81600	.76856
US	53.296	51.169	16.598	14.531	.20823	203.21

TABLE A1-43
Consumer Cost Index Data

Table 1. Standard budget and fixed weight indexes of family living costs, autumn 1973

Area	Standard budget indexes: Total costs (including income and social security taxes)	Standard budget indexes: Consumption costs	Fixed weight indexes: Consumption costs adjusted for climate[2]	Fixed weight indexes: Consumption costs not adjusted for climate[3]
	Index 1	Index 2	Index 3	Index 4
U.S. urban average costs	$12,526	$9,761	$9,774	$9,794
Urban United States	100	100	100	100
Metropolitan areas[4]	102	102	102	[illegible]
Nonmetropolitan areas[5]	90	93	91	91
Northeast:				
Boston, Mass.	118	115	114	[illegible]
Buffalo, N.Y.	105	104	102	101
Hartford, Conn.	109	112	109	103
Lancaster, Pa.	98	97	91	94
New York-Northeastern N.J.	114	113	112	112
Philadelphia, Pa.-N.J.	103	101	100	[illegible]
Pittsburgh, Pa.	97	97	94	94
Portland, Maine	101	102	100	100
Nonmetropolitan areas[5]	93	98	96	97
North Central:				
Cedar Rapids, Iowa	100	98	99	96
Champaign-Urbana, Ill.	103	103	103	102
Chicago, Ill.-Northwestern Ind.	105	106	106	105
Cincinnati, Ohio-Ky.-Ind.	96	97	96	95
Cleveland, Ohio	101	103	102	102
Dayton, Ohio	93	94	93	92
Detroit, Mich.	101	101	101	100
Green Bay, Wis.	99	96	95	95
Indianapolis, Ind.	101	102	101	100
Kansas City, Mo.-Kans.	93	93	93	97
Milwaukee, Wis.	105	101	101	100
North Central—Continued				
Minneapolis-St. Paul, Minn.	103	98	98	97
St. Louis, Mo.-Ill.	99	99	94	93
Wichita, Kans.	94	95	[illegible]	95
Nonmetropolitan areas[5]	93	93	93	92
South:				
Atlanta, Ga.	93	94	95	95
Austin, Tex.	87	83	[illegible]	91
Baltimore, Md.	99	99	93	99
Baton Rouge, La.	90	92	94	94
Dallas, Tex.	90	93	94	94
Durham, N.C.	96	95	95	97
Houston, Tex.	90	92	94	95
Nashville, Tenn.	92	95	95	96
Orlando, Fla.	90	92	94	97
Washington, D.C.-Md.-Va.	103	102	[illegible]	[illegible]
Nonmetropolitan areas[5]	85	86	89	90
West:				
Bakersfield, Calif.	93	94	98	94
Denver, Colo.	96	94	95	95
Los Angeles-Long Beach, Calif.	95	100	[illegible]	101
San Diego, Calif.	97	95	94	94
San Francisco-Oakland, Calif.	105	107	107	109
Seattle-Everett, Wash.	100	103	102	104
Nonmetropolitan areas[5]	92	93	91	90
Honolulu, Hawaii	119	115	115	115
Anchorage, Alaska	131	129	[illegible]	129

[1] Calculated from costs of standard budget market basket for urban family of 4 persons. Indexes reflect differences in average prices and variations in budget quantity weights associated with differences in food consumption patterns, climate, availability of public transportation, and life styles in metropolitan and nonmetropolitan areas. Shelter is based on weighted average costs for owned homes purchased 6 years ago (a weight of 75 percent) and rental units in middle third of distribution of units that met budget specifications. Total cost indexes also reflect differences in Federal, State and local income tax requirements.

[2] Calculated from costs of a climatic adjusted constant market basket for urban family of four persons. Index reflects differences in average price levels and climatic requirements.

[3] Calculated from costs of constant market basket for urban family of 4 persons. No adjustments were made for climate. Therefore, index reflects only differences in average price levels.

[4] As defined in 1960–61. For a detailed description of these geographical boundaries see Standard Metropolitan Statistical Areas, Executive Office of the President, Bureau of the Budget, 1967.

[5] Places with 2,500 to 50,000 inhabitants.

This table reproduced from Mark K. Sherwood, "Family Budgets and Geographic Differences in Price Levels," Monthly Labor Review, Vol. 98, No. 4 (April, 1975) P. 10.

TABLE A1-44

CALCULATION OF 1972 RELATIVE PRICE INDEX BY STATE

	Weighted SMSA Index	Percent State Pop. in SMSA's	Non-Metropolitan Index	State Index Before Rebasing	State Index Rebased
Washington, D.C.	102.000	100.0		102.0	104.0
Maine	100.000	28.206	97	97.8	99.7
New Hampshire	100.000	30.129	97	97.9	99.8
Vermont		0.0	97	97.0	98.9
Massachusetts	113.022	76.975	97	112.5	114.7
Rhode Island	111.500	80.681	97	108.7	110.9
Connecticut	109.909	84.896	97	108.0	110.1
New York	107.006	88.940	97	105.9	108.0
New Jersey	107.068	93.799	97	106.4	108.5
Pennsylvania	96.394	80.860	94	95.9	97.8
Ohio	97.589	30.288	92	96.5	98.4
Indiana	100.735	64.390	92	97.6	99.5
Illinois	104.164	80.610	92	101.8	103.8
Michigan	100.000	82.332	92	98.6	100.6
Wisconsin	98.897	58.064	92	96.0	97.9
Minnesota	97.000	63.167	92	95.2	97.1
Iowa	96.000	36.775	92	93.5	95.3
Missouri	97.621	64.341	92	95.6	97.5
North Dakota	95.000	12.271	92	92.4	94.2
South Dakota	95.000	14.294	92	92.4	94.2
Nebraska	95.000	44.109	92	93.3	95.1
Kansas	95.000	43.258	92	93.3	95.1
Delaware	100.000	69.719	89	96.7	98.6
Maryland	99.496	35.575	89	98.0	99.9
Virginia	98.540	65.743	89	95.3	97.1
West Virginia	95.500	37.309	89	91.2	93.0

TABLE A1-44 (Cont.)

	Weighted SMSA Index	Percent State Pop. in SMSA's	Non-Metropolitan Index	State Index Before Rebasing	State Index Rebased
North Carolina	97.000	45.347	89	92.6	94.4
South Carolina	96.500	47.715	89	92.6	94.4
Georgia	96.000	56.494	89	92.9	94.7
Florida	97.000	83.994	89	95.7	97.6
Kentucky	95.500	46.400	89	92.0	93.8
Tennessee	96.000	59.847	89	93.2	95.0
Alabama	94.000	61.797	89	92.1	93.9
Mississippi	94.000	20.722	89	90.0	91.8
Arkansas	94.000	38.366	89	90.9	92.7
Louisiana	94.000	62.546	89	92.1	93.9
Texas	93.621	76.719	89	92.5	94.3
Montana	95.000	24.469	90	91.2	93.0
Idaho	95.000	15.973	90	90.8	92.6
Wyoming	95.000	0.0	90	90.0	91.8
Colorado	95.000	72.250	90	93.6	95.4
New Mexico	95.000	33.336	90	91.7	93.5
Arizona	95.000	74.416	90	93.7	95.6
Utah	95.000	79.494	90	94.0	95.8
Nevada	94.500	80.675	90	93.6	95.4
Washington	104.000	72.220	90	100.1	102.1
Oregon	104.000	61.354	90	98.6	100.6
California	101.938	93.172	90	101.1	103.1
Oklahoma	94.500	55.195	89	92.0	93.8
Alaska	129.000	43.753	118	122.8	125.2
Hawaii	116.000	81.568	105	114.0	116.3
U.S. TOTAL	102.000	72.394	91	99.0	100.0

TABLE A1-45

INCOME DISTRIBUTION DATA FOR 1970 AND 1972, BY STATE AND U.S. TOTAL

	PER15+Y72	PER15+Y70	PER10+Y72	PER10+Y70
DC	29,538	25,100	53,446	47,700
ME	11,629	11,200	35,272	35,100
NH	17,785	17,300	48,152	47,600
VT	16,618	15,700	42,934	42,200
MA	25,790	25,200	56,157	56,100
RI	19,281	18,800	48,160	47,900
CT	30,362	31,100	61,182	63,100
NY	42,968	26,400	80,651	53,900
NJ	30,252	29,500	60,086	59,600
PA	18,347	18,200	45,682	46,400
OH	22,498	21,600	53,311	52,400
IN	20,154	19,400	50,709	49,800
IL	25,931	26,400	54,775	56,700
MI	26,226	26,700	59,070	57,200
WI	20,303	19,700	50,602	50,400
MN	21,174	20,300	50,190	49,500
IA	15,730	16,200	41,513	42,800
MO	18,061	17,000	43,756	42,400
ND	16,126	12,800	38,592	34,200
SD	12,853	11,500	33,580	31,800
NE	16,123	14,900	40,955	39,300
KS	16,915	15,800	41,796	40,500
DE	23,000	22,300	52,311	51,400
MD	30,235	28,600	58,714	56,800
VA	22,188	19,700	47,279	43,600
WV	11,069	9,6000	31,296	29,700

TABLE A1-45 (Cont.)

	PER15+Y72	PER15+Y70	PER10+Y72	PER10+Y70
NC	13,486	11,500	36,382	33,700
SC	12,245	11,000	34,848	33,100
GA	16,875	15,100	40,664	37,900
FL	18,946	16,700	42,178	38,600
KY	12,669	11,600	34,121	32,500
TN	12,806	11,500	33,864	32,000
AL	12,924	11,200	33,504	31,200
MS	10,903	8,3000	26,559	24,700
AR	9,2555	8,0000	25,844	24,200
LA	13,024	12,700	34,140	33,600
TX	17,492	16,500	41,239	39,900
MT	14,742	13,600	40,154	36,400
ID	14,090	13,100	38,798	37,400
WY	16,509	15,600	43,495	42,200
CO	22,094	19,700	50,655	46,900
NM	14,990	14,800	36,019	35,800
AZ	20,151	18,600	46,810	44,400
UT	18,127	16,900	46,191	44,600
NV	26,062	25,200	55,499	54,600
WA	23,465	22,800	53,670	52,900
OR	19,058	18,000	47,473	46,200
CA	27,026	26,700	54,904	54,700
OK	13,870	12,900	35,353	34,100
AK	38,804	37,700	63,983	62,300
HI	34,316	32,600	60,628	58,600
US	22,380	20,600	49,580	47,200

TABLE A1-46

INTERPOLATION OF MTWNAPT

	RPUT/MTWNAPT (Ratio)	RPUT (Mill. Pass.)	MTWNAPT (Mill. Workers)
1947	2.0638	18287.0	17.721
1948	2.0533	17312.0	16.863
1949	2.0427	15251.0	14.932
1950	2.03222	13845.0	13.626
1951	2.0216	12881.0	12.743
1952	2.0111	12022.0	11.956
1953	2.0005	11036.0	11.033
1954	1.9900	9858.0	9.9075
1955	1.9794	9189.0	9.2844
1956	1.9689	8756.0	8.8943
1957	1.9583	8338.0	8.5153
1958	1.9478	7778.0	7.9865
1959	1.9372	7650.0	7.8978
1960	1.9267	7521.0	7.8071
1961	1.9161	7242.0	7.5589
1962	1.9056	7122.0	7.4748
1963	1.8950	6915.0	7.2980
1964	1.8845	6854.0	7.2741
1965	1.8739	6798.0	7.2553
1966	1.8634	6671.0	7.1600
1967	1.8528	6616.0	7.1414
1968	1.8423	6491.0	7.0466
1969	1.8317	6310.3	6.8899
1970	1.8212	5931.7	6.5141
1971	1.8110	5497.0	6.0707
1972	1.8008	5253.3	5.8344
1973	1.7907	5293.6	5.9123
1974	1.7807	5605.9	6.2963
1975	1.7707	5625.8	6.3543

TABLE A1-47

INTERPOLATION OF MTWNACTH

	MTWNAOTH/NEHT (Ratio)	NEHT (Thou. Empl.)	MTWNAOTH (Mill. Workers)
1947	.37069	57038.	21.143
1948	.36028	58343.	21.020
1949	.34987	57651.	20.170
1950	.33946	58918.	20.000
1951	.32904	59961.	19.730
1952	.31863	60250.	19.197
1953	.30823	61179.	18.857
1954	.29781	60109.	17.901
1955	.28740	62170.	17.868
1956	.27699	63799.	17.672
1957	.26658	64071.	17.080
1958	.25617	63036.	16.148
1959	.24576	64630.	15.883
1960	.23535	65778.	15.481
1961	.22493	65746.	14.788
1962	.21452	66702.	14.309
1963	.20411	67762.	13.831
1964	.19370	69305.	13.424
1965	.18329	71088.	13.030
1966	.17288	72895.	12.602
1967	.16247	74372.	12.083
1968	.15206	75920.	11.544
1969	.14165	77902.	11.035
1970	.13124	78627.	10.319
1971	.12487	79120.	9.8797
1972	.11786	81702.	9.6294
1973	.11110	84409.	9.3778
1974	.10479	85936.	9.0052
1975	.09883	84783.	8.3791

TABLE A1-48

CONSTRUCTION OF METROPOLITANIZATION INDEX (NPMET)

	NPMETNUM (Mill. Persons)	NPR (Mill. Persons)	NPMET (Percent)
1950	84.834	151.87	55.860
1951	87.292	153.98	56.690
1952	89.822	156.39	57.434
1953	92.425	158.96	58.145
1954	95.103	161.88	58.748
1955	97.859	165.07	59.284
1956	100.70	168.09	59.906
1957	103.61	171.19	60.526
1958	106.62	174.15	61.221
1959	109.71	177.13	61.933
1960	112.88	179.98	62.271
1961	115.29	182.99	63.005
1962	117.75	185.77	63.386
1963	120.27	188.48	63.807
1964	122.83	191.14	64.262
1965	125.45	193.53	64.824
1966	128.13	195.58	65.514
1967	130.86	197.46	66.274
1968	133.65	199.40	67.029
1969	136.51	[illegible].38	67.784
1970	[illegible]	203.81	68.406
1971	145.55	206.22	70.582
1972	151.69	208.[illegible]3	72.844
1973	154.05	209.86	73.4[illegible]4
1974	154.96	211.38	73.310

APPENDIX A 2 DISCUSSION OF MODEL EQUATIONS

A 2.1 REVIEW OF BASIC STRUCTURE

The WEFA Auto Demand Model is a long-run equilibrium model. Let us define the nature of this equilibrium and analyze departures from it. If all forces acting on the auto market were held constant, the model would tend towards an equilibrium state with actual stock constant and equal to desired stock, total registrations and scrappage constant and equal, and the class-shares of stock, new registrations, and scrappage, also constant and equal.

Now let the desired stock rise. This would (directly) occur due to a rise in income, a fall in auto operating or purchase costs, increases in licensed drivers, increasing urbanization or a decline in non-auto modes of commuting. New registrations would then increase sharply, and the scrappage rate would also fall. Thereafter, new registrations and total scrappage would oscillate more and more gradually about their new (higher) equilibrium levels.[1/]

Should a change occur which alters the composition of the desired stock, such as changes in auto costs, income and its distribution, family size, geographic shifts in population, or changes in age structure, then the new registrations and scrappage shares of the classes would

---

[1/] Actual stock may temporarily rise above desired but this tendency is extremely "damped".

shift. Again, the initial response would be proportionately greater than the initiating desired share changes.

Here the response is more complex because total desired stock also changes. Suppose a shift towards smaller cars occurs, then the average cost per mile of the desired stock is reduced, increasing desired stock and initiating the pattern of aggregate responses already outlined.

In certain cases there would be a disturbance from a different direction. For instance, an increase in the price of gasoline would reduce vehicle miles traveled. A fall in mileage per auto would tend to reduce scrappage, reducing new registrations commensurately. Conversely, increased mileage per vehicle would indirectly induce an increase in new car sales.

A 2.2 CROSS-SECTION EQUATION ESTIMATES

The equations for desired stock per family and desired shares by class for the five size categories were estimated cross-sectionally using 1972 data for 47 states, excluding Oklahoma, Alaska, Hawaii, and the District of Columbia. The data for Oklahoma are incomplete, and the others were excluded due to their special characteristics.

We elected to use 1972 as an "equilibrium" year. It was immediately prior to the oil crisis, and the economy was reasonably stable with moderate unemployment and inflation. Pollution control had yet to make a major impact, and smaller domestic cars had been present in the market for several years. Therefore we assumed actual stock (by state) was equal

to the desired level, and we approximated the desired shares by averaging new registrations shares for 1971-72.[1/]

The estimated equation for desired stock per family unit is presented on page A2-25. Estimates were also made in linear form,[2/] and with the percentage of families earning $15,000 or more in 1970 $ (PER15+) in "level" form as opposed to the "odds" formulation adopted. The "odds" variable yielded a slightly higher statistical significance.

Since we were concerned with an equilibrium relationship it seemed reasonable that a "permanent income" concept would be the most appropriate. This form implies that families gradually adjust to a given change in real disposable income [3/] The estimated relationship is positive as expected and statistically strong, the income elasticity being 0.56.

As discussed in Chapter 3 we hypothesized "income saturation", i.e., above a certain income level further increases in income would not cause a family to increase its stock at the previous rate.[4/] Therefore, PER15+ enters with a negative sign, moderating the effects of income fluctuations,[5/] the elasticity being roughly 0.13 (with the "odds" form the elasticity varies with PER15+, being higher than the coefficient when PER15+ is less than 50%).

[1/] More years would have been desirable but these would have been unrepresentative for smaller cars.

[2/] Throughout the estimation process linear forms were found to yield equivalent results to log-linear for almost all model equations.

[3/] The weights assigned to current-year and lagged income are 4, 3, 2, 1. Thus 40% of the adjustment to a given income change occurs in the year of the change, 30% the next year, etc.

[4/] We experimented with various levels, 10+, 15+, 25+. The 15+ was statistically superior.

[5/] PER15+ and income usually move in the same direction.

Our measure of combined purchase and operating costs, capitalized cost per mile, is used here as an equilibrium concept, being the average of the class costs per mile weighted by their desired shares, i.e., it is the desired fleet cost per mile. The sign is negative, as hoped, with a reasonable elasticity of 0.2. The statistical power is somewhat low, probably due to the fact that because of data limitations capitalized cost per mile by class has a somewhat limited variation across states.[1/]

Licensed drivers per family has a strong positive impact. More licensed family members implies a greater usefulness of additional cars. This variable is clearly significant in explaining variation across states, even after allowing for income levels.

Although we experimented with a variety of measures reflecting transportation system characteristics, only the numbers of people (per family) using non-auto transport to work (MTWNA) was found to be significant, albeit not overwhelmingly.[2/] Its elasticity is very low, only -0.05, so that very large movements in MTWNA/FM are required to significantly affect desired stock.

Finally, the metropolitan population is positively associated with desired stock. NPMET is defined as the percentage living in SMSA's, and this finding therefore reflects the large suburban populations, with a higher number of cars per family, resident in states with large conurbations.

We experimented a great deal with the specifications for the desired

---

[1/] See Appendix A1, Section A1.4.3, page A1-15.

[2/] It is, of course, quite likely that many factors not measurable for the cross-sectional analysis do have a significant impact.

shares by size-class. The "odds" form that we adopted for the dependent variables has the desired property that the predicted share will lie between 0 and 1. The greatest difficulty was experienced in modeling the small car shares. The approach we eventually adopted was to model the combined subcompact and compact share and then to estimate the subcompact part of the combined share.

This procedure not only produced a better 'fit' in the cross-section but also was much more reasonable when simulating over time. It is possible that this finding implies a closer substitution between subcompacts and compacts than, say, between compacts and midsize. Having adopted this approach for these classes we experimented with a similar treatment for mid-size and full-size, but this yielded very poor results.

The relative capitalized cost per mile term appearing in all the desired share equations (see page A2-25) is of the form own capitalized cost per mile relative to the desired share weighted average of all other classes' capitalized costs per mile. Thus in the case of subcompacts this reduces to a simple ratio of subcompact cost per mile to compact cost per mile.

In looking at the sensitivity to costs, it should be born in mind that changes in the capitalized cost per mile will be fairly small relative to initiating changes in, say, purchase prices or the price of gas.[1/]

In terms of elasticity (all of which are negative as expected, see page A2-4) we observe the greatest sensitivity for full-size, and subcom-

---

[1/] See Chapter 4.0.

pacts versus compacts, both having elasticities (evaluated at the mean share values) of over five. Next in magnitude come the combined small-car, and mid-size, with elasticities of 1.5 to 2. Finally, the luxury class has a very low cost elasticity of less than 0.5. The coefficients for luxury and the combined class have substantially lower statistical power than the others.

The second variable of critical overall importance is the relationship between income per family and average cost per mile. If all costs per mile increased in the same proportion across the board one might expect some "trading down" to take place. Equally, increasing incomes relative to costs implies increasing affluence. We would therefore expect full-size to the positively affected (conceivably, luxury could be also) and small-cars negatively affected. Mid-size is indeterminate 'a priori', because general inflation would imply gains from full-size but losses to compacts.

This is indeed the pattern we found (again, see page A2-27), with a full-size elasticity of +0.56, and for small-cars an elasticity of -0.74. Mid-size has a slight negative net effect (-0.13), and subcompacts has an elasticity just under half that for the joint small-car class (-0.27). This income effect was statistically significant everywhere except mid-size, where it is weak, and luxury, where it was completely insignificant.

The last economic activity variable to have an impact is income distribution--PER15+. It has two effects. First it tends to shift preferences from full-size to luxury, a logical result. Secondly, the greater the proportion of higher income families the larger the small car share. This again is logical, reflecting the second car status of many subcompact

and compacts cars (PER13+ was insignificant in the separate subcompact and compact equations initially tested).

Turning to the demographic effects, the proportion of families with three or four members tends to increase the mid-size share at the expense of full-size, these being almost exactly offsetting impacts. Full-size is positively affected by the proportion of families with five or more members, this relationship being somewhat weaker. The conclusion is intuitively appealing: larger families buy large cars, smaller families tend to prefer mid size cars.

For smaller cars we find the younger age group (from 20 to 29) positively effects the combined share, as well as a weaker preference for subcompacts within the small car share. Running costs and their "sportier" image may well be factors here. A little surprisingly, licensed drivers per family tends to increase subcompact's share relative to compact. This may indicate the purchase of more subcompacts as third cars. Finally, metropolitan residents have a slight preference for luxury cars (note that NPMET is not logarithmic because of being zero for a few states).

The regional dummy variables were persistently highly significant, irrespective of the numbers of types of economic and demographic variables we included in the specifications. They may partly reflect differing driving habits that we could not estimate due to data limitations; they may reflect cost differences that we were forced to assume away in computing cost per mile; or they may in fact accurately represent systematic regional taste differences.

We find New Englanders[1/] favor small cars but purchase fewer luxury,

---

1/ The regions used are the Census definitions. Using state abbreviations: New England is ME. NH, VT, MA, RI, CT; West South Central is AR, LA, TX; Mountain is MT, ID, WY, CO, NM, AZ, UT, NV, and Pacific is WA, OR, CA.

while West South Central buyers follow an opposite pattern. Mountain and Pacific Region residents are strongly biased towards small cars, especially subcompacts. Fewer mid-size cars are purchased in the Mountain Region.

A 2.3 TRANSLATION TO TIME-SERIES

Due to its importance, the estimation of the 'historical' values for desired stock and its composition was discussed in detail in Chapter 3. The adjustments made in the predicted shares were necessitated by the varying model offerings over the earlier period, while for the total stock we had to adjust for the asymetric influence assigned to PER15+.

What we might do at this point is to briefly analyze the imapcts over time of the determinants.

Both licensed drivers per family and commuting trends have reflected the automobile's increasingly important role in society, and have made modest contributions to the growth of desired stock per family. It is unlikely that either will play a very important future role.

A major positive influence has been permanent income, which has increased strongly from its 1958 low, falling in 1969-70 and again in 1974-75. Because of smaller families and more single individuals living separately, future family income growth may be less rapid than in the past. The offsetting impact of PER15+ only became very significant during the 1960s, after rising rapidly from very low 1950s levels. It may also be expected to grow at quite modest rates.

A significant offset to income has come from rising real average capitalized cost per mile. Costs by class have risen by amounts varying from over 75% to over 100%, significantly more than the 70% rise in overall consumer prices, especially during the 1970s. Moderate continued growth in real auto costs would seem probable.

The metropolitan population has risen from 60% in 1958 to 73% in 1974, making a not-insignificant contribution to desired stock growth. Like licensed drivers per family, the scope for continued growth is limited.

All classes have tended to share fairly equally in cost increases, with imports substantially outpacing domestics (their costs per mile were initially lower). Taking the period as a whole, therefore, relative costs have probably been fairly neutral on balance.

The same is essentially the case for income relative to costs, although, like relative costs, short-run swings have undoubtedly caused large shifts in class shares.

The proportion of families with five or more members rose through the mid-1960s, favoring larger cars. Since then it has fallen sharply, and will continue to do so. Families with 3 or 4 members fell slowly throughout the sample period. The same trends reducing the larger family share may stablize this decline, limiting full-size growth.

Finally, the population between 20 and 29 years old grew strongly throughout most of the period, spurring small-car sales. We already know that by 1995 this population group will have substantially declined,

tending to reduce the small-car shares.

A 2.4 TIME SERIES EQUATION ESTIMATES

A 2.4.1 NEW REGISTRATIONS AND SCRAPPAGE

The philosophy behind the equation specifications for both new sales and scrappage is that these variables should closely respond to movements in desired stock, if the latter is indeed a meaningful concept (as estimated by the desired stock equation).[1/]

One would also expect that a 1% change in desired stock would induce greater than 1% changes in both new sales and scrappage. The other variables included in the equation are primarily "speed of adjustment" factors.

The equations for total new registrations and scrappage are presented on page A2-30. In both cases the dependent variable is expressed as a "rate". New sales are scaled by the previous year stock less current year scrappage, while scrappage is correspondingly scaled by previous stock plus current new sales.[2/] This technique thus represents each flow relative to the stock that it is augmenting or decreasing.

Clearly new registrations and scrappage are highly simultaneous. Simultaneous estimation, however, yielded results indistinguishable from

---

[1/]Scrappage tends to move inversely to, and new car sales parallel, movements in desired stock. ("ceteris paribus").

[2/]Scrappage less "given" (predetermined) scrappage is estimated. Surviving cars over 20 years old are automatically scrapped.

ordinary least squares. This characteristic was, happily, a common occurrence whenever we applied two- or three-stage least squares techniques to model equations.

In both cases the principal determinant is desired stock relative to actual stock excluding the dependent variable. Thus the rate of new car sales and the rate of scrappage are functions of the 'gap' between desired and actual stock. Both new sales and scrappage respond strongly to movements in desired stock, with elasticities (positive and negative, respectively) of just under 4.

New registrations also fluctuate in response to income variation--current year income relative to permanent income. The high coefficient is misleading--since current real disposable income per family has a weight of 40% in the denominator only a sharp change in income relative to past trends will substantially affect the new-car sales rate.

Finally, consumer resistance to sharp increases in purchase prices is indicated by the price index of current to lagged prices (holding the sales-mix constant) which has an elasticity of -1.3.

The scrappage rate is strongly affected by the average age of stock, as it must be, and a strong influence is also exerted by changes in vehicle miles traveled per auto. Increasing utilization of the stock thus increases scrappage, with the largest effects occurring with 1 and 2 year lags.

Purely cyclical effects derive from the remaining two variables. The scrappage rate falls slightly when unemployment rises; and if old

car prices rise relative to a scrap metal price index, the rate is again slightly reduced.

As noted in Chapter 3, the philosophy behind the new registrations shares equations is simple. Sales by class respond directly to changes in desired stock shares at a rate proportional to the divergence between actual and desired stock. Although simple in concept, these specifications were statistically very successful and possess interesting dynamic properties.

The equations are presented on page A2-32. Note that the TMscK-SC terms are defined analogously to the denominator for total new regis- -tions discussed above, i.e., they are last year's stock less current sc -g- for the class as a share of the total. We estimate the functions using as the dependent variable the difference (in logs: the ratio) between the new sales share and the desired stock share, since in equilibrium these must be equal. Transferred to the RHS this constrains the coefficient to be one.

Holding the shares of stock less scrappage hypothetically constant, we see that the initial response to a desired share change is substantially greater than one for each class. For small perturbations (since both are in "odds" form) the elasticities are equal to the coefficients. Therefore, a 1% increase in the desired share would induce a 1.4% increase in the samll car new sales share, a 1.7% increase for subcompacts' share of small car sales, 1.7% also for luxury, 1.8% for full-size, and a 1.9% increase in the mid-size new sales share.

Initially there would be no real change in the share of previous stock less scrappage, but this would then rise with increased new car sales, progressively reducing the gap between actual and desired stock shares and thus moderating the new car sales response. Typically new car sales will overshoot the equilibrium point, so that the adjustment pattern to a one time shift in desired share is a damped oscillation about the new equilibrium share.

Scrappage by class and hence scrappage shares are computed by identity given new registrations and the scrappage rates that were developed (see Appendix A1), since these rates are equal across classes.

As regards the division between foreign and domestics, the behavioral relationships estimated were judged to be inadequate for forecasting purposes. Our first approach was to estimate the domestic share of the size-class (for subcompacts, compacts, and luxury) with our 1972 cross-section data.

Reasonable results were obtained but these produced unacceptable time series simulations. The estimated desired domestic subcompacts share went to zero for 1968 back, and jumped to 50% for 1973; domestic compact's share fell to under 20% for 1968 back then rose to 99% in 1974; and the domestic luxury share lies consistently below the actual sales share, falling as low as 71% in 1968 (when the sales share was 93%). These equations are presented on page A2-34.

We considered that this approach was conceptually invalid as well as empirically unworkable. Domestics and foreign cars compete in

terms of actual sales to the consumer who has already decided to purchase a particular size-class vehicle. It therefore may not be theoretically sound to estimate a "desired" domestic share.

Therefore, time-series equations were estimated for the domestic shares of new registrations by class. Here we found tremendous instability in terms of the behavioral content. Domestic shares--especially for subcompacts--have undergone such wide fluctuations that it appears impossible to sustain the hypothesis underlying time-series regression analysis: vis. that there exists a stable underlying set of economic relationships.

We did obtain equations that fit the sample period (see page A2-36), and which looked reasonable in terms of relative costs per mile, and the use of variables attempting to capture the changes in model offerings for subcompacts (the lack of domestics pre-1970), and service facilities for compacts and luxury (the dealership variables).

The elasticities with respect to the included exogenous variables proved to be the stumbling blocks. Very small changes in assumptions produced huge swings in the shares, making these equations unmanageable and their implied content dubious. These equations were therefore reluctantly discarded. The marketplace competition between foreign and domestics has changed so radically in nature from the 1950s and 1960s that we cannot capture the economic determinants.

A 2.4.2 VEHICLE MILES TRAVELED

Our approach here is to estimate vehicle miles per family in terms of the utilization of the stock, that is, VMT does not (directly)

determine the size of the stock or additions to it, but does involve its intensity of use. In this case we must deal with the age distribution of the stock, since newer cars are driven more miles than old ones and running costs, gasoline and repairs especially, also vary by vintage. The VMT equation is given on page A2-39.

To allow for the impact of a changing age distribution we took our estimates of mileage by vintage for 1972 used in computing the capitalized costs per mile.[1/] These constant mileage weights were then applied to the estimates of mid-year stock by vintage over time and summed to obtain an index of vehicle miles (WTDMVINT). This reflects variations in mileage due solely to fluctuations in age-composition. It is an index that equals the actual 1972 mileage (VMT/WTDMVINT = 1.0 in 1972), and it diverges above actual VMT prior to and after 1972.

The real gas cost per mile for the fleet is computed using a vintage-weighted fleet fuel efficiency measure, AVMPGVINT. We first computed average class mpg as a weighted sum of city and highway, the weights varying over time (urban driving has increased its share steadily). Then we used new registrations in the year of sale to weight each class to form an overall average by vintage. Thus, for 1974, the ten year old vintage class weights were the 1964 levels of new registrations.[2/]

[1/] Note that data on mileage by vintage do not exist over time. The 1972 mileage per vintage was increased slightly to align the total. We also had to impute annual mileage for cars 11-20 years old.

[2/] Note that scrappage rates are perforce assumed equal across classes. We do not know to what extent mpg falls solely due to age.

Finally, these averages were weighted by each vintages' share in that year to obtain the fleet average over the entire period. The overall average therefore reflects changes in city and highway mpg by class, changes in the urban fraction of total mileage, changes in fleet composition by class, and changes in the stock age-distribution.

Real gas cost per mile has a strong negative impact on mileage per family, the elasticity being -0.24.[1/] We also estimated a repair cost variable--along similar lines to AVMPGVINT--but this proved to be insignificant, probably because they vary as much with time as with mileage--at least for the 'typical' family.

Once again we found an interaction between income and income distribution. This time the results indicate that mileage per family tends to be positively related to income distribution and negatively affected by the level of income. Since PER15+ normally will respond more rapidly to current income change than RDIP4/FM, the net effect of an income increase will usually be positive (and vice-versa).

A 2.4.3 MILES PER GALLON

The relationships for miles per gallon by class are estimated in the same fashion as those estimated using model-specific data. Our estimates of mpg by class are regressed on the class-average inertial weight, engine displacement, transmission type, and fraction of the

---

[1/] One would expect gas price increases to induce a movement towards small cars, slowly increasing AVMPGVINT.

class with 4 or 6 cylinders. The equations are run across all classes, over the period 1948-74,[1/] using a "stacked" regression technique which constrains the coefficients to be the same across classes (see page A2-40).

The results are very close (as expected) to the initial model-specific estimates.[2/] The predicted class mpg's are appropriately weighted to yield average mpg by class, domestic mpg, foreign mpg, and average new and existing fleet mpg.

Also estimated are very simple "linking" equations between our estimates of actual driving mpg (derived from Consumer Reports) and the EPA "laboratory test" measure. Since we wished to infer EPA results from our class mpg estimates, the equations are estimated with the latter as the dependent variable (no "causation" is implied!)

We used data for all cars tested by the EPA and Consumer Reports for 1975 and 1976 that had the same engine and transmission.[3/] We then translate these equations directly by substituting our class mpg projections for the independent variable to yield EPA projections by class, adjusting the intercept in the case of significant variations by class.

The results are reasonable (see page A2-43), with the higher EPA city estimates clearly indicated, and some small (but significant) divergences between classes, with elasticities (evaluated at the mean) of virtually one in both equations. These relationships are limited. The

---

[1/] Except domestic subcompacts for 1955-57 when none were sold.

[2/] See Appendix A1.

[3/] Although the sample is primarily limited by the number of Consumer Reports tests, the EPA did not always test every engine size.

sample may not be very representative--Consumer Reports tends to focus on more "utilitarian" models, rarely reviewing luxury or 'sportier' cars. The EPA fails to indicate what, if any, optional equipment (or type of tire) was on the vehicle. Note also that the model data only cover two years.[1/]

The class city and highway EPA estimates are similarly aggregated to yield the same measures as the original mpg values. We also project an average for domestics computed using a constant 55% urban driving fraction.

A 2.4.4 NEW CAR PRICES

In the model we distinguish the four price components: the 'stripped' lease purchase, plus options expenditures, plus transportation, plus sales taxes. The average tax rate is projected exogenously, but the others are predicted endogenously using the estimated behavioural relationships discussed in this section. Like any other endogenous variables, these prices may be exogenised if desired.

The base and options prices for domestics were viewed as mark-ups over cost. A production cost index (PINPUTA) was developed, being a weighted sum of input prices where the weights are the 1972 input-output coefficients for the autos sector.

We elected to model the average[2/] base and options prices across all classes. The prices by class showed a strong tendency toward propor-

1/ We found no change in the relationship between 1975 and 1976. Note that the EPA procedures prior to 1975 were very different.

2/ Fixed-weighted by the 1972 new registrations shares.

tional movements over time. There tend to be unique year to year competitive forces that will temporarily restrain price increases for a class, but ultimately each must cover its production costs, and make its contribution to overhead and profits.

The results were very reasonable (page A2-45). For base prices the elasticity is very slightly below unity, which is the hypothesized result. Further, prices are also affected by the change in costs, with an elasticity of 0.43. This may reasonably be interpreted as an "expectations" effect. If the rate of inflation accelerates, prices are increased slightly more in order to anticipate faster inflation.

For the options price the cost index shows an equally strong relationship. The elasticity of 0.76 reflects the fact that options prices have tended to fall relative to other costs. The class prices for both are driven off the two averages by percentage ratios which are essentially fixed or exogenously specified. Thus future changes in relative class positions may be simulated.

For foreign base prices we constructed a weighted index of export prices and used this as the independent variable. The export price indices for the major importers, Japan, Germany, Italy, France, U.K., and Sweden, were weighted by their annual shares of imports. Here the price elasticities were allowed to vary by class (page A2-46). For subcompacts the elasticity was 0.7, for compacts 0.9, and for luxury 1.05, which seems a reasonable relative ordering.

Consumers expenditures on options were estimated in a classical

demand approach as determined by income and prices. The general form adopted for these equations used our permanent income per family measure as the income term, and the fixed weighted average maximum options price relative to the overall consumer price index was used as the price variable.

In each case the dependent variable is the ratio of options expenditures by class relative to the class maximum options price. These "shares" are estimated in "odds" form so that actual expenditures may never exceed the maximum options cost. Unless some completely new options are added in the future, making our estimated 'maximum' obsolete, these values should represent a ceiling for expenditures.

Permanent income is significant in each case, with coefficients ranging from 1.7 to 2.9 - subcompacts being the highest. In most cases RDIP4/FM was marginally superior to current period income (RDI/FM). Since a common specification was considered desirable it was adopted for all equations. Almon Lags on RDI/FM were less successful in terms of statistical power when tested for each class.

The average 'real' maximum options price was everywhere highly significant, with coefficients ranging from 4.6 (for subcompacts) to 6.0 (for mid-size). Again, we used the average price in the interests of having a consistent specification across classes.

Interestingly enough, after allowing for the sometimes limited offerings (and sales) in the earlier part of the sample period (subcompacts and compacts especially, of course), the average price

series was statistically at least as good as the 'own' price series for all the classes, supporting the previous observations made above.

Since the dependent variables are "odds" the elasticities are not readily apparent. For subcompacts, the income elasticity is 2.5 and the price elasticity is -3.9. An additional variable that is required for subcompacts was PER15+. This effect can be interpreted in a similar fashion as previously. Its elasticity is -0.7. When tested for the other classes, PER15+ was not found appropriate, an interesting result.

The income elasticities for compacts, mid-size, full-size, and luxury were 1.4, 1.1, 0.9, and 0.6 respectively. The corresponding price elasticities are -3.6,-3.7, -2.7, and -1.2, respectively. These results seem reasonable.

The final components of pre-tax total purchase costs are transportation charges. These were estimated for each class as a straightforward function of the U.S. price index for transportation. For the subcompact, compact, and luxury classes the estimation was constrained such that the price elasticities were equal for foreign and domestic costs, thus the joint estimation leaves only the intercept free to vary (See page A 2-56).

In each case the relationship with the transportation index was very strong. The elasticities all lie between one and two: from lows of 1.19 and 1.15 for subcompacts and luxury, respectively, to the essentially equal levels of 1.8, 1.6, and 1.7 for compacts, mid-size, and full-size.

A 2.4.5 USED CAR PRICES

Given the limitations of the data, and the size of the modeling effort involved in estimating prices by vintage, our approach was to simplify the problem as much as possible. Our fundamental hypothesis is that prices by vintage for a particular class should move together. As discussed in Appendix A.1, we were able to develop a one-parameter exponential decay function that generates successive price relatives of the form:

$$PR_i = \text{(Price of Vehicle Aged i/Price of Vehicle Aged i-1)}$$
$$\text{for } i = 2, \ldots, 20)$$

In this way, given estimates of new car prices and the one-year price relative to new, successive prices by vintage can be generated. From these prices we estimate by identity the average price of old cars, PUOLD, which enters the scrappage equation (see Appendix A1 for details; 'old' is defined as aged 8 years or more).

As an intermediate step we estimated a function for the volume of used car transactions, PURMVUA. Since only seven years data existed the weak statistical results were not surprising (see page A2-59). Nevertheless, we were able to relate PURMVUA (relative to current stock) to the change in new registrations (increased new car sales should initially imply increased used car transations) and to the trend in new car sales (sustained high new car demand replaces used car purchases).

The predicted values for PURMVUA were used to estimate the one

year old price relative equations. We wanted to insure that the price-relative equations were not badly affected by the weak PURMVUA equation. This procedure prevents the price-relatives from being distorted by actual PURMVUA movements that we could not predict with the equation.

Our hypothesis with respect to the price-relative equations[1/] is that a high level of used car transactions relative to new car sales should (ceteris paribus) tend to push used car prices up in an equilibrating response. The positive signs were therefore expected, (page A2-59), but the high statistical power is somewhat surprising in view of the poor quality of the PURMVUA equation.

A second influence could come from new car prices. Increasing new car prices would lower the price-relatives, unless sufficient new car purchasers were driven into the used car market to induce a larger percentage change in used car prices. We find that new car prices have a positive effect for subcompacts and compacts, but a negative impact for the larger cars. This implies that buyers of larger cars are less sensitive to price increases than small-car buyers, a reasonable result. Finally, for compact and mid-size, there is a third effect: if the new car sales share increases, the user car price tends to rise.[2/]

The final equation estimated relates the Automotive News average wholesale price to our vintage-weighted average used car price, PUSEDR,

---

[1/] The price-relatives are in "odds" form so that predicted values must lie between 0 and 1.

[2/] Note that there is very little variation for mid-size. Hence the standard error is low despite the low $\bar{R}^2$.

which is computed by identity given prices by vintage. The close relationship is an encouraging result for our methodology.

A 2.4.6 INCOME DISTRIBUTION

Income distribution was found to have a strong and pervasive influence on the market for automobiles. In order to ensure that projections of the proportion of families with real incomes of $15,000 or more were consistent with projections of income levels an equation relating the two was incorporated into the model coding (see page A2-63).

Several different forms were estimated. The one finally adopted represents PER15+ (in "odds" form) as a simple function of current and lagged real disposable income per family unit. To some extent the predicted levels trend through some of the historical fluctuations in PER15+, hence the modest Durbin-Watson statistic. However, the income elasticities are clearly appropriate in relative ordering, and this form yielded by far the most reasonable historical simulations.[1/]

[1/] The elasticities with respect to PER15+ are slightly less than the log coefficients.

TABLE A 2-1

DESIRED STOCK AND SHARE EQUATIONS

I. Desired Stock Per Family

$$\ln(\text{KEND/FM}) = \underset{(2.40)}{-1.90959} + \underset{(3.13)}{0.563344}\ \ln(\text{RDIP4/FM}) \underset{(1.92)}{-0.100994}\ \ln(\text{PER15+}/(100-\text{PER15+})) - \underset{(.84)}{0.199527}$$

$$\ln(\text{CPMTTCAP/PC}) + \underset{(3.07)}{0.421187}\ \ln(\text{LD/FM}) - \underset{(1.48)}{0.0536642}\ \ln(\text{MTWNA/FM}) + \underset{(1.61)}{0.0990056}\ (\text{NPMET}/100)$$

$\bar{R}^2 = 0.461$ SEE = 0.0596

II. Combined Share of Subcompacts and Compacts

$$\ln\left(\frac{\text{SHRSC}}{1-\text{SHRSC}}\right) = \underset{(1.62)}{2.63851} - \underset{(1.52)}{2.75703}\ \ln(\text{CPMSC/T-SC}) - \underset{(2.91)}{1.16875}\ \ln(\text{YDI/FM/CT*Q}) + \underset{(2.88)}{0.378345}\ \ln(\text{PER15+})$$

$$+ \underset{(1.79)}{0.540311}\ \ln(\text{NP20.29/FM}) + \underset{(6.06)}{0.445103}\ (\text{DUMNEW}) - \underset{(2.07)}{0.228363}\ (\text{DUMWSC}) + \underset{(3.93)}{0.321488}$$

$$(\text{DUMNTN}) + \underset{(4.46)}{0.559391}\ (\text{DUMPAC})$$

$\bar{R}^2 = 0.755$ SEE = 0.1591

Notes: All equations are estimated over 47 states excluding Oklahoma, Alaska, Hawaii, and the District of Columbia. Variable definitions are presented on page A 2-28, 29.

TABLE A 2-1 (Cont.)

III. Share of Subcompacts in Combined Subcompacts and Compact Share

$$\ln\left(\frac{SHRS/SC}{1-SHRS/SC}\right) = \underset{(.71)}{0.665464} - \underset{(5.55)}{11.9101} \ln(CPMS/C) - \underset{(2.73)}{0.599591} \ln(YDI/FM/SC{*}Q) + \underset{(0.86)}{0.225044}$$

$$\ln(NP20/29/FM) + \underset{(2.67)}{0.702456} \ln(LD/FM) + \underset{(5.68)}{0.321199}(DUMMTN) + \underset{(5.31)}{0.494263}(DUMPAC)$$

$$\bar{R}^2 = 0.792 \qquad SEE = 0.1315$$

IV. Mid-Size Share

$$\ln\left(\frac{SHRM}{1-SHRM}\right) = \underset{(0.39)}{0.211039} - \underset{(4.57)}{1.98095} \ln(CPMM/T\text{-}M) - \underset{(1.31)}{.161133} \ln(YDI/FM/CT{*}Q) + \underset{(4.73)}{0.785861}$$

$$\ln(FM3{+}4/FM) + \underset{(4.01)}{0.162809}(DUMNEW) - \underset{(3.65)}{0.125991}(DUMMTN)$$

$$\bar{R}^2 = 0.683 \qquad SEE = 0.0779$$

V. Full-Size Share

$$\ln\left(\frac{SHRF}{1-SHRF}\right) = -\underset{(1.63)}{1.84714} - \underset{(12.81)}{8.84702} \ln(CPMF/T\text{-}F) + \underset{(3.01)}{0.831944} \ln(YDI/FM/CT{*}Q) - \underset{(6.11)}{0.506012}$$

$$\ln(PER15{+}) - \underset{(3.52)}{0.771159} \ln(FM3{+}4/FM) + \underset{(1.11)}{0.158820} \ln(FM5{+}/FM)$$

$$\bar{R}^2 = 0.865 \qquad SEE = 0.1070$$

Notes: All equations are estimated over 47 states excluding Oklahoma, Alaska, Hawaii, and the District of Columbia. Variable definitions are presented on page A 2-28, 29.

TABLE A 2-1 (Cont.)

VI. Luxury Share

$$\ln\left(\frac{SHRL}{1-SHRL}\right) = -\underset{(9.26)}{2.88455} - \underset{(0.72)}{0.467677}\ \ln\,(CPML/T\text{-}L) + \underset{(2.12)}{0.209938}\ \ln\,(PER15+) + \underset{(1.52)}{0.00183016}\,(NPMET)$$

$$-\underset{(4.66)}{0.298623}\,(DUMNEW) + \underset{(2.20)}{0.203160}\,(DUMWSC)$$

$\bar{R}^2 = 0.519$ SEE = 0.1383

Elasticities for Desired Share Equations

E.G. A 1% increase in CPMSC/T-SC would reduce SHRSC by 1.74% (not % points).

	1	2	3	4	5	6	7	8
	CPMX/T-X	YDI/FM/CT*Q	PER15+	NP20.29/FM	LD/FM	FM3+4/FM	FM5+/FM	NPMET
SHRSC	-1.74	-0.74	+0.24	0.34	---	---	---	---
SHRS/SC	[illegible].27	-0.27	---	0.10	0.31	---	---	---
SHRM	-1.59	-0.13	---	---	---	0.63	---	---
SHRF	-5.91	0.56	-0.34	---	---	-0.51	0.11	---
SHRL	-0.43	---	0.19	---	---	---	---	0.01

Notes: All equations are estimated over 47 states excluding Oklahoma, Alaska, Hawaii, and the District of Columbia. Variable definitions are presented on page A 2-28, 29.

TABLE A 2-1 (Cont.)

Symbol	Definitions
CPMF/T-F	Cost Per Mile for Full-Size Cars Over Desired Share Weighted Cost Per Mile for All Other Classes
CPML/T-1	Cost Per Mile for Luxury Cars Over Desired Share Weighted Cost Per Mile for All Other Classes
CPMM/T-M	Cost Per Mile for Mid-Size Cars Over Desired Share Weighted Cost Per Mile for All Other Classes
CPMSC/T-SC	Cost Per Mile for Combined Subcompact and Compact Cars (Weighted by Desired Shares) Over Desired Share Weighted Cost Per Mile for All Other Classes
CPMS/C	Cost Per Mile for Subcompacts Over Cost Per Mile for Compacts
CPMTTCAP	Desired Share Weighted Cost Per Mile (Includes all Classes: Domestic and Foreign)
DUMNEW	Dummy for New England States (Equals 1.0 for Mountain; 0.0 otherwise)
DUMMTN	Dummy for Mountain States (Equals 1.0 for Mountain; 0.0 otherwise)
DUMPAC	Dummy for Pacific States (Equals 1.0 for Pacific; 0.0 otherwise)
DUMWSC	Dummy for West South Central States (Equals 1.0 for West South Central; 0.0 otherwise)
FM	Number of Family Units (Equals number of families plus number of unrelated individuals)
FM3+4/FM	Number of 3 and 4 Member Families Over Number of Family Units
FM5+/FM	Number of 5 or more Member Families Over Number of Family Units
KEND/FM	Number of Cars In Operation At Year End Over Number of Family Units
LD/FM	Number of Licensed Drivers Over Number of Family Units
MTWNA/FM	Number of Persons Not Using An Automobile To Travel To Work Over Number of Family Units

TABLE A 2-1 (Cont.)

Symbol	Definitions
NPMET	Percentage of Population Living in SMSA's
NP20.29/FM	Number of Persons in Resident Population Between 20 and 29 Years Old Over Number of Family Units
PC	Consumer Price Index, All Items (Note: Is Divided by 125.3 to convert from 1967 = 100 base to 1972 = 1.0 base)
PER15+	Percentage of Families (Excluding Unrelated Individuals)Earning $15,000 or more in 1970 dollars
RDI/FM	Permanent Real Disposable Income: Weighted Average of Current and Lagged Disposable Income (4, 3, 2, 1 weights) Deflated by The Current Year Consumer Price Index
YDI/FM/CT*Q	$ Disposable Income Over Number of Family Units Over Fixed Weighted Cost Per Mile (Cost per mile for subcompacts and compacts, cost per mile for mid-size, cost per miles for full-size, and cost per mile for luxury where weights are desired share in U.S. Market for 1972)
YDI/FM/SC*Q	$ Disposable Income Over Number of Family Units Over Fixed Weighted Cost Per Mile for Subcompacts and Compacts (Weights are desired U.S. shares in 1972)
SHRF	Desired Share of Full-Size Cars
SHRL	Desired Share of Luxury Cars
SHRM	Desired Share of Mid-Size Cars
SHRSC	Desired Combined Share of Compact and Subcompact Cars
SHRS/SC	Desired Share of Subcompact Cars in Total Subcompact and Compact Cars

TABLE A 2-2

TOTAL NEW REGISTRATIONS AND SCRAPPAGE

I. New Registrations (OMVUANR)

$$\left(\frac{\text{OMVUANR}}{\text{OPMVUAYEND(-1)} - \text{SCMVUA}}\right) = + \underset{(9.90)}{3.79294} \left(\frac{\text{KEND*AY}}{\text{OPMVUAYEND(-1)} - \text{SCMVUA}}\right) - \underset{(2.49)}{0.255190}\ \text{DUMAUTOS}$$

$$+ \underset{(8.30)}{6.03907} \left(\frac{\text{RDI/FM}}{\text{RDIP4/FM}}\right) - \underset{(3.45)}{1.26683} \left(\frac{\text{PUTOTNRL}}{\text{PUTOTNR(-1)}}\right) - \underset{(35.2)}{2.9151}$$

$\bar{R}^2 = 0.864$ SEE = 0.0473 D.W. = 2.28

Period of Fit: 1954-1974

II. Total Auto Scrappage (SCMVUA)

$$ln \left(\frac{\text{SCMVUA} - \text{SCMVAGIV}}{\text{OPMVUAYEND(-1)} + \text{OMVUANR}}\right) = \underset{(7.99)}{-6.98289} \underset{(4.50)}{-3.82763}\ ln \left(\frac{\text{KEND*AY}}{\text{OPMVUAYEND(-1)} + \text{OMVUANR}}\right)$$

$$+ \underset{(5.32)}{2.91080}\,ln\ (\text{AVAGE 0-20}) - \underset{(2.20)}{.145089}\ ln \left(\frac{\text{PUOLD}}{\text{PSCRAPAV}}\right) \underset{(4.33)}{-.338149}\ ln\ (\text{NRUT})$$

$$+ \sum_{i=0}^{2} a_i\ ln \left(\frac{\text{VMT/K}}{\text{VMT/K(-1)}}\right)_{-i}$$

$$a_0 = \underset{(2.42)}{2.23399},\quad a_1 = \underset{(3.60)}{4.19538},\quad a_2 = \underset{(2.86)}{3.45071}$$

$\bar{R}^2 = .923$ S.E. = .0462 DW = 2.60

Period of Fit: 1958-1974

Note: For definitions see page A 2-31

TABLE A 2-2 (Cont.)

Definitions:

AVAGE0-20	-	Average Age of Stock, Vintages 0 through 20
DUMAUTOS	-	Strike Dummy Variable
KEND*AY	-	Desired Stock
NRUT	-	Unemployment Rate
OMVUANR	-	New Registrations
OPMVUAYEND	-	Year-End Stock of Cars in Operation
PSCRAPAV	-	Scrap-Metal Price
PUOLD	-	Average Price of Old Cars
PUTOTNR	-	New Car Price, Average, Weighted by Previous Year Sales
PUTOTNRL	-	Previous Year Average New Car Price, Sales Weighted
RDI/FM	-	Real Disposable Income Per Family
RDIP4/FM	-	Permanent Family Income

TABLE A 2-3

SHARE OF NEW REGISTRATIONS EQUATIONS

I. Combined Subcompact and Compact New Registrations Share (SHRSCTNR)

$$\ln\left(\frac{SHRSCTNR}{1 - SHRSCTNR}\right) = \ln\left(\frac{SHRSC*A}{1 - SHRSC*A}\right) + \underset{(3.97)}{0.0598815}$$

$$- \underset{(16.61)}{0.400553}\left[\ln\left(\frac{(TMSCTK\text{-}SC)}{1 - (TMSCTK\text{-}SC)}\right) - \ln\left(\frac{SHRSC*A}{1 - SHRSC*A}\right)\right]$$

$\bar{R}^2 = 0.932$ SEE = 0.0483 D.W. = 0.83

Period Fit: 1954-1974

II. Subcompact Share in Combined Subcompact and Compact New Registrations (SHRS/SCTNR)

$$\ln\left(\frac{SHRS/SCTNR}{1 - SHRS/SCTNR}\right) = \ln\left(\frac{SHRS/SC*A}{1 - SHRS/SC*A}\right) + \underset{(0.27)}{0.00275211}$$

$$- \underset{(21.41)}{0.699549}\left[\ln\left(\frac{(TMS/SCTK\text{-}SC)}{1 - (TMS/SCTK\text{-}SC)}\right) - \ln\left(\frac{SHRS/SC*A}{1 - SHRS/SC*A}\right)\right]$$

$\bar{R}^2 = 0.958$ SEE = 0.0453 D.W. = 1.39

Period of Fit: 1954-1974

III. Mid-Size Car New Registration Share (SHRMDNR)

$$\ln\left(\frac{SHRMDNR}{1 - SHRMDNR}\right) = \ln\left(\frac{SHRM*A}{1 - SHRM*A}\right) - \underset{(0.66)}{0.00198516}$$

$$- \underset{(82.94)}{0.873077}\left[\ln\left(\frac{(TMMDK\text{-}SC)}{1 - (TMMDK\text{-}SC)}\right) - \ln\left(\frac{SHRM*A}{1 - SHRM*A}\right)\right]$$

$\bar{R}^2 = 0.997$ SEE = 0.0101 D.W. = 1.26

Period of Fit: 1954-1974

Note: For definitions, see page A 2-33

TABLE A 2-3(Cont.)

IV. Full-Size Car New Registrations Share (SHRFDNR): Constrained Form

$$ln\left(\frac{SHRFDNR}{1 - SHRFDNR}\right) = ln\left(\frac{SHRF*A}{1 - SHRF*A}\right) - \underset{(3.06)}{0.0115806}$$

$$- \underset{(47.12)}{0.826937}\left[ln\left(\frac{(TMFDK\text{-}SC)}{1 - (TMFDK\text{-}SC)}\right) - ln\left(\frac{SHRF*A}{1 - SHRF*A}\right)\right]$$

$\bar{R}^2 = 0.991$ SEE = 0.0168 D.W. = 1.05
Period of Fit: 1954-1974

V. Luxury Car New Registrations Share (SHRLTNR)

$$ln\left(\frac{SHRLTNR}{1 - SHRLTNR}\right) = ln\left(\frac{SHRL*A}{1 - SHRL*A}\right) + \underset{(0.37)}{0.000264892}$$

$$- \underset{(105.00)}{0.713064}\left[ln\left(\frac{(TMLTK\text{-}SC)}{1 - (TMLTK\text{-}SC)}\right) - ln\left(\frac{SHRL*A}{1 - SHRL*A}\right)\right]$$

$\bar{R}^2 = 0.998$ SEE = 0.0021 D.W. = 1.33
Period of Fit: 1954-1974

Definitions:

SHR*sc*NR = Share of New Registrations, Class *sc*,
sc = S/SCT, SCT, MD, FD, LT.

SHR*sc**A = Desired Stock Share, Class *sc*.

TM*sc*K-SC = Share of Stock, Class *sc*, after scrappage, shares adjusted to sum to one. Thus:

$$TM_{sc}K\text{-}SC = SHR_{sc}K\text{-}SC / \sum_{sc} SHR_{sc}K\text{-}SC$$

where

SHR*sc*K-SC = (OPMVUA*sc*YEND(-1) - SCMVUA*sc*)/ (OPMVUAYEND(-1) - SCMVUA) = Previous class stock less this year's class scrappage relative to total previous stock less total current scrappage.

TABLE A 2-4

DESIRED DOMESTIC SHARE BY SIZE CLASS EQUATIONS 1/

I. Domestic Share of Subcompacts

$$\ln\left(\frac{SHRSD}{1-SHRSD}\right) = \underset{(5.77)}{31.2613} \quad \underset{(6.00)}{-33.2971}\ (CPMSD/SF)$$

$$\underset{(2.87)}{+0.0775879}\ (RETD/F) \quad \underset{(4.52)}{+0.00567794}\ (NPMET)$$

$$\underset{(4.29)}{-0.343468}\ (DUMMTN) \quad \underset{(2.67)}{-0.302802}\ (DUMPAC)$$

$\bar{R}^2 = 0.668$ SEE = 0.1779

II. Domestic Share of Compacts

$$\ln\left(\frac{SHRCD}{1-SHRCD}\right) = \underset{(4.47)}{36.4223} \quad \underset{(4.01)}{-37.2060}\ (CMPCD/CF)$$

$$\underset{(0.45)}{+0.0254892}\ (RETD/F) \quad \underset{(1.25)}{+0.00515098}\ (NPMET)$$

$$\underset{(2.53)}{-0.773341}\ (DUMNEW) \quad \underset{(4.07)}{-0.745386}\ (DUMMTN)$$

$$\underset{(4.67)}{-1.28567}\ (DUMPAC)$$

$\bar{R}^2 = 0.738$ SEE = 0.4140

1/ All equations are estimated over 47 states excluding Oklahoma, Alaska, Hawaii, and the District of Columbia

TABLE A 2-4 (Cont.)

III. Domestic Share of Luxury Cars

$$\ln\left(\frac{SHRLD}{1-SHRLD}\right) = \underset{(4.70)}{10.8575} \; \underset{(3.69)}{-8.99660}\,(CPMLD/LF)$$

$$\underset{(2.57)}{+0.109161}\,(RETD/F) \; \underset{(1.93)}{-0.378342}\,(DUMNEW)$$

$$\underset{(1.74)}{-0.234846}\,(DUMMTN) \; \underset{(2.90)}{-0.613182}\,(DUMPAC)$$

$\bar{R}^2 = 0.730$ SEE = 0.31095

IV. Elasticities for Domestic Share Equations

	SHRSD	SHRCD	SHRLD
1. Domestic Cost Per Mile to Foreign Cost Per Mile	-20.325	-1.266	-0.509
2. Ratio of Total to Foreign Dealerships	0.146	0.003	0.020
3. Percent of Population in SMSA's	0.205	0.011	----

Definitions:

SHRSD = Domestic Share of Subcompacts
SHRCD = Domestic Share of Compacts
SHRLD = Domestic Share of Luxury Cars

TABLE A 2-5

DOMESTIC SHARE EQUATIONS

I. Subcompacts

$$\ln(\text{SHRSDNR}/1-\text{SHRSDNR}) = \underset{(2.16)}{12.7018} - \underset{(3.33)}{12.4014} \ln(\text{CPMSD/SF})$$

$$+ \underset{(13.88)}{2.10092} \ln(\text{MODWTDSD/SF}) + \underset{(4.81355)}{0.912208} \text{NPMET}$$

$$+ \underset{(1.66)}{3.72615} \ln(\text{NP20.29/FM}) - \underset{(6.71)}{28.3427} \ln(\text{NPRCOLL4+})$$

$\bar{R}^2 = 0.949$ SEE = .380 D.W. = 2.408
Period: 1959-1974

Definitions:

CPMSD/SF	Cost Per Mile, Ratio, Subcompact Domestic to Foreign
MODWTDSD/SF	Sales-Weighted Models Index, Ratio, Subcompact Domestic to Foreign
NPMET	Percent of Population in SMSA's.
NP20.29/FM	Number of Persons Aged 20 to 29 Years Per Family
NPRCOLL4+	Percent of Population Over 25 With 4 or More Years of College
SHRSDNR	Domestic Share of Subcompact New Registrations

TABLE A 2-5 (Cont.)

II. Compacts

$$
\begin{aligned}
ln\ (SHRCDNR) = \ & \underset{(3.81)}{48.3103} - \underset{(3.41)}{7.79166}\ ln\ (CPMCD/CF) \\
& + \underset{(7.62)}{1.01743}\ ln\ (DLRSWTDCD/CF) - \underset{(2.33)}{0.201210}\ NPMET \\
& - \underset{(1.79)}{4.48652}\ ln\ (NPRCOLL4+) + \underset{(2.57)}{2.54281}\ ln\ (NP20.29/FM) \\
& + \underset{(2.38)}{10.9696}\ ln\ (PRPAC/R)
\end{aligned}
$$

$\bar{R}^2 = 0.936$ SEE = .172 DW = 1.878
Period: 1958-1974

Definitions: (See previous page)

CPMCD/CF	Cost Per Mile, Ratio, Compact Domestic to Foreign
DLRSWTDCD/CF	Sales-Wegithed Dealers Index, Ratio, Compact Domestic to Foreign
PRPAC/R	Percent of Population in Pacific Region
SHRCDNR	Domestic Share of Compact New Registrations

TABLE A 2-5 (Cont.)

III. Luxury

$$ln\,(SHRLDNR/1\text{-}SHRLDNR) = -\underset{(2.74)}{52.2319} - \underset{(3.86)}{4.13072}\,ln\,(NPRCOLL4+)$$

$$+\underset{(2.70)}{0.855848}\,ln\,(DLRSWTDLD/LF) - \underset{(2.99)}{38.3084}\,ln\,(NPRENC/R)$$

$$+\sum_{i=0}^{3} a_i\,ln\left(\frac{\frac{FM}{RDI}}{\frac{RDI}{FM_{-1}}}\right)_{-i}$$

$a_0 = \underset{(2.41)}{3.45612}$; $a_1 = \underset{(3.16)}{2.61378}$; $a_2 = \underset{(1.98)}{1.75698}$; $a_3 = \underset{(1.26)}{0.885720}$

$\bar{R}^2 = 0.868$ SEE = .128 DW = 2.755
Period: 1958-1974

Definitions: (See previous pages)

DLRSWTDLD/LF	Sales-Weighted Dealers Index, Ratio, Luxury Domestic to Foreign
NPRENC/R	Fraction of Population in East North Central Region
RDI/FM	Real Disposable Income Per Family
SHRLDNR	Domestic Share of Luxury New Registrations

TABLE A 2-6

VEHICLE MILES TRAVELED

$$ln\ (VMT/FM) = ln\ (WTDMVINT/FM) + \underset{(1.19)}{0.418327} - \underset{(3.07)}{0.206013}\ ln\ (PRGAS/AVMPGVINT/PC)$$

$$+ \underset{(5.59)}{0.118999}\ ln\ (PER15+/100 - PER15+)$$

$$- \underset{(3.42)}{0.467538}\ ln\ (RDIP4/FM)$$

$\bar{R}^2 = 0.852$ SEE = .014 DW = 1.662

Definitions:

AVMPGVINT	Vintage-Weighted Average Fleet Miles Per Gallon
PER15+	Percentage of Families with Real Incomes of $15,000 or More (1970$)
PC	Consumer Price Index, Total, 1972 = 1.0
PRGAS	Retail Gasoline Price Per Gallon Including Taxes
RDIP4/FM	Permanent Income Per Family, Weighted (4, 3, 2, 1) Sum of Current and Lagged Real Disposable Family Income
VMT/FM	Vehicle Miles Traveled Per Family by Car
WTDMVINT/FM	Constant (1972) Mileage-Weighted Sum of Vehicle Miles by Vintage

TABLE A 2-7

RE-ESTIMATED CITY AND HIGHWAY MPG EQUATIONS

I. City Driving MPG

$$US\mathit{sc}MPGC = \text{Exp } \underset{(665.0)}{7.24861} - \underset{(246.2)}{.470887}\ ln\ (US\mathit{sc}CURB + 300.) - \underset{(137.5)}{.191061}\ ln\ (US\mathit{sc}DISP) - \underset{(28.8)}{.0302763}\ (US\mathit{sc}FAUTO)$$

$$+ \underset{(78.1)}{.114732}\ (US\mathit{sc}F4CYL) + \underset{(72.0)}{.0593937}\ (US\mathit{sc}F6CYL) + \underset{(175.7)}{.163961}\ DUM48.54 + \underset{(189.7)}{.153868}\ DUM55.59$$

$$+ \underset{(163.1)}{.124279}\ DUM60.65 + \underset{(124.1)}{.120481}\ DUM66 + \underset{(48.8)}{.0370749}\ DUM67.70 + \underset{(29.5)}{.0280063}\ DUM71 + \underset{(1.16)}{.00109948}\ DUM74$$

$$- \underset{(1.54)}{.00145807}\ DUM73 \quad *$$

$$(1.0 + EFFC. / 100.0 + EFFC\mathit{sc} / 100.0)$$

where sc = SD, SF, CD, CF, MD, FD, LD, LF.

$\bar{R}^2 = 1.000$ SEE = 0.0019

TABLE A 2-7(Cont.)

11. <u>Highway Driving MPG</u>

$$US\mathit{sc}MPGH = \text{Exp}\ \underset{(192.0)}{6.6096} - \underset{(57.0)}{.329301}\ \ln\ (US\mathit{sc}CURB + 300.0) - \underset{(39.3)}{.165243}\ \ln\ (US\mathit{sc}DISP) - \underset{(13.7)}{.043105}\ (US\mathit{sc}AUTO)$$

$$+ \underset{(16.9)}{.0687791}\ (US\mathit{sc}FOD) + \underset{(27.7)}{.123554}\ (US\mathit{sc}F4CYL) + \underset{(16.3)}{.0410251}\ (US\mathit{sc}F6CYL) - \underset{(10.6)}{.0210599}\ DUM48.57$$

$$+ \underset{(14.7)}{.029719}\ DUM58.59 + \underset{(46.6)}{.071787}\ DUM60.66 + \underset{(31.1)}{.0487147}\ DUM67.70 + \underset{(13.1)}{.0304012}\ DUM71 \quad *$$

$$(1.0 + EFFH / 100.0 + EFFH\mathit{sc} / 100.0)$$

where sc = SD, SF, CD, CF, MD, FD, LD, LF.

$\bar{R}^2 = 0.999$ SEE = 0.0057

TABLE A 2-7 (Cont.)

Definitions:

US*sc*MPGC = City Driving MPG for cars of class *sc*

US*sc*MPGH = Highway Driving MPG for class of class *sc*

US*sc*CURB = Curb Weight for cars of class *sc*

US*sc*DISP = Engine Displacement for cars of class *sc*

US*sc*FAUTO = Fraction of cars of class *sc* with automatic transmissions installed

US*sc*FOD = Fraction of cars of class *sc* with overdrive units installed

US*sc*F4CYL = Fractions of cars of class *sc* with 4 cyclinder engines installed

DUM_{yy} = Dummy equals 1 in year *yy*, 0 otherwise

$DUM_{yy.zz}$ = Number equals 1 from year *yy* to year *zz*, 0 otherwise

Size classes *sc* = SD, SF, CD, CF, MD, FD, LD, LF

EFFC = Multiplicative efficiency parameter (measured in %) to be used in the forecast period analysis to introduce across the board increases in MPGC due to technological improvements.

EFF_{ss} = Same as EFFC but applies to specific size class *ss* where *ss* = ST, CT, MD, FD, LT (Note: same improvement enforced for domestic and foreign members of a class)

EFFH = Same purpose as EFFC but for highway MPG

$EFFH_{ss}$ = Same as EFFH but applies to specific size class *ss* (see $EFFC_{ss}$ for size class definitions)

TABLE A 2-8

E.P.A. MILES PER GALLON EQUATIONS

Definitions: See End of Table

I. City

$$EPA_{sc}MPGC = \underset{(1.23)}{1.35252} + \underset{(14.91)}{1.3276}\ US_{sc}MPGC - \underset{(3.37)}{1.9589}\ (sc = SF,\ CF,\ LF\ \text{only})$$

$$= \underset{(1.14)}{0.782185}\ (sc = FD\ \text{only})$$

$\bar{R}^2 = 0.872$ SEE = 1.504
Estimated across 59 observations for 1975-76

II. Highway

$$EPA_{sc}MPGH = \underset{(0.09)}{0.147894} + \underset{(13.04)}{1.03287}\ US_{sc}MPGH + \underset{(1.63)}{1.59013}\ (sc = SF,\ SD\ \text{only})$$

$$+ \underset{(1.45)}{1.14248}\ (sc = CF,\ CD\ \text{only})$$

$\bar{R}^2 = 0.876$ SEE = 2.207

III. Averages

$$EPATDMPG_\chi = 1 \Big/ \sum_{sc=1}^{5} \frac{N_{sc}}{N_{TD}} \Big/ EPA_{sc}MPG_\chi$$

For sc = SD, CD, MD, FD, LD; χ = C, H.

$$EPATDMPG = 1 / [(VMTU/VMT)/EPATDMPGC + (1 - VMTU/VMT)/EPATDMPGH]$$

(The same expressions hold for $EPATFMPG_\chi$, EPATFMPG)

TABLE A 2-8 (Cont.

III. Averages, Cont.

$$EPATTMPG = 1 / [(\frac{N_{TD}}{N_{TT}}) / EPATDMPG + (\frac{N_{TD}}{N_{TT}}) / EPATFMPG]$$

$$EPATDMPG\text{-}FW = 1 / (0.55 / EPATDMPGC + 0.45 / EPATDMPGH)$$

Definitions:

EPA*sc*MPGC	City Per Gallon, Class *sc*, E.P.A. Estimate
EPA*sc*MPGH	Highway Miles Per Gallon, Class *sc*, E.P.A. Estimate
MS*sc*MPGC	City Miles Per Gallon, Class *sc*, Consumer Reports-W.E.F.A. Estimate
US*sc*MPGH	Highway Miles Per Gallon, Class *sc*, Consumer Reports-W.E.F.A. Estimate
N_{sc}	New Registrations, Class *sc*.
sc	= TD = Total Domestic
sc	= TF = Total Foreign
sc	= TT = Total All Classes
EPATDMPG-FW	Fixed-Weighted EPA Average MPG
VMTU	Vehicle Miles Travelled, Urban
VMT	Vehicle Miles Travelled

TABLE A 2-9

NEW CAR PRICE EQUATIONS

DOMESTIC: (Definitions: see end of table)

I. Average Domestic Base Purchase Price, Excluding Options, All Classes

$$\ln(\text{USTDPUBASEFW}) = \underset{(13.3650)}{3.58927} + \underset{(16.2937)}{0.978764}\ \ln(\text{PINPUTA})$$

$$+ \underset{(4.74923)}{0.0152688}\ \text{DUM58.63} + \underset{(1.90291)}{0.425313}\ \Delta\ln(\text{PINPUTA})$$

$\bar{R}^2 = 0.964$ SEE = 0.015174 1958-1974

II. Average Domestic Price for All Options, All Classes

$$\ln(\text{USTDPOPTMFW}) = \underset{(13.1164)}{3.53466} + \underset{(12.7053)}{0.757187}\ \ln(\text{PINPUTA})$$

$$+ \underset{(9.14247)}{0.132609}\ \text{DUM 58.59}$$

$\bar{R}^2 = 0.919$ SEE = 0.017197 1958-1974

III. Domestic Base Purchase Price, Excluding Options, by Class

Subcompacts:

USSDPUBASE-2 = $(BP_S/\text{SUM1})$ USTDPUBASEFW

Compacts:

USCDPUBASE-2 = $(BP_C/\text{SUM1})$ USTDPUBASEFW

Midsize:

USMDPUBASE-2 = $(BP_M/\text{SUM1})$ USTDPUBASEFW

Fullsize:

USFDPUBASE-2 = $(BP_F/\text{SUM1})$ USTDPUBASEFW

Luxury:

USLDPUBASE-2 = $(BP_L/\text{SUM1})$ USTDPUBASEFW

$$\text{SUM1} = .092BP_S + .182BP_C + .236BP_M + .386BP_F + .104BP_L$$

TABLE A 2-9 (Cont.)

IV. Domestic Price for All Options, by Class

Subcompacts:

$USSDPOPTM = (OP_S/SUM2)\ \ USTDPOPTMFW$

Compacts:

$USCDPOPTM = (OP_C/SUM2)\ \ USTDPOPTMFW$

Midsize:

$USMDPOPTM = (OP_M/SUM2)\ \ USTDPOPTMFW$

Fullsize:

$USFDPOPTM = (OP_F/SUM2)\ \ USTDPOPTMFW$

Luxury:

$USLDPOPTM = (OP_L/SUM2)\ \ USTDPOPTMFW$

$$SUM2 = .0920P_S \quad +.1820P_C \quad +.2360P_M \quad +.3860P_F \quad +.1040P_L$$

FOREIGN:

Foreign Base Purchase Price, Excluding Options, By Class

Subcompacts:

$$\ln(USSFPUBASE\text{-}2) = \underset{(21.0455)}{4.47528} \; + \underset{(15.347)}{0.694836} \ln(IMPCOST)$$

$$- \underset{(3.20585)}{0.0596612}\ DUM58.65$$

$\bar{R}^2 = 0.969$ SEE = 0.02983 1958-1974

TABLE A 2-9 (Cont.)

Foreign Base Purchase Price, Excluding Options, By Class, Continued

Compacts:

$$ln\ (USCFPUBASE\text{-}2) = \underset{(21.2241)}{4.04827} \ \underset{(21.4359)}{+0.870526}\ ln\ (IMPCOST)$$

$$\underset{(5.92270)}{-0.100992}\ DUM58.65 \ \underset{(2.08793)}{-0.0597245}\ DUM61$$

$\bar{R}^2 = 0.986$ SEE = 0.026756 1958-1974

Luxury:

$$ln\ (USLFPUBASE\text{-}2) = \underset{(14.4073)}{3.77860} \ \underset{(18.3237)}{+1.05045}\ ln\ (IMPCOST)$$

$\bar{R}^2 = 0.955$ SEE = 0.048495 1958-1974

TABLE A 2-9 (Cont.)

VARIABLE DEFINITIONS, NEW CAR PRICES

USSDPUBASE-2	Subcompact Domestic Base Price
USCDPUBASE-2	Compact Domestic Base Price
USMDPUBASE-2	Midsize Domestic Base Price
USEDPUBASE-2	Fullsize Domestic Base Price
USLDPUBASE-2	Luxury Domestic Base Price
USTDPUBASEFW	Fixed-Weight Average Domestic Base Price
USSDPOPTM	Subcompact Domestic Price of Maximum Installed Options
USCDPOPTM	Compact Domestic Price of Maximum Installed Options
USMDPOPTM	Midsize Domestic Price of Maximum Installed Options
USFDPOPTM	Fullsize Domestic Price of Maximum Installed Options
USLDPOPTM	Luxury Domestic Price of Maximum Installed Options
USTDPOPTMFW	Fixed-Weight Average Price of Maximum Installed Options
USSFPUBASE-2	Subcompact Foreign Base Price
USCFPUBASE-2	Compact Foreign Base Price
USLFPUBASE-2	Luxury Foreign Base Price
PINPUTA	Fixed-Weight Index of Input Costs, Autos
IMPCOST	Weighted Average of Foreign Car Export Price Index
DUM58-63	=4.0,1958; -3.0,1962; -2,1963. =0.0 other years
DUM58.59	=1.0,1958 - 59. =0.0 other years
DUM58.65	=1.0, 1958 - 65. =0.0 other years

TABLE A 2-9 (Cont.)

BP_S	Base Purchase Price Ratio, Subcompacts/Fixed-Weight Average
BP_C	Base Purchase Price Ratio, Compacts/Fixed-Weight Average
BP_M	Base Purchase Price Ratio, Mid-Size/Fixed-Weight Average
BP_F	Base Purchase Price Ratio, Fullsize/Fixed-Weight Average
OP_S	Maximum Installed Options Price Ratio, Subcompacts/Fixed-Weight Average
OP_C	Maximum Installed Options Price Ratio, Compacts/Fixed-Weight Average
OP_M	Maximum Installed Options Price Ratio, Midsize/Fixed-Weight Average
OP_F	Maximum Installed Options Price Ratio, Fullsize/Fixed-Weight Average
OP_L	Maximum Installed Options Price Ratio, Luxury/Fixed-Weight Average

TABLE A 2-10

EXPENDITURES FOR OPTIONS INSTALLED

I. Subcompacts

$$\ln\,(\text{ODDSDOPT}) = \underset{(7.14)}{27.4189} - \underset{(7.39)}{4.63344}\,\ln\,(\text{USTDPOPTMFW/PC})$$

$$- \underset{(2.32)}{0.853868}\,\ln\,(\text{PER15+}) + \underset{(2.83)}{0.335403}\,\text{DUM58}$$

$$+ \underset{(3.42)}{0.288755}\,\text{DUM59.61} + \underset{(2.40)}{2.92711}\,\ln\,(\text{RDIP4/FM})$$

$\bar{R}^2 = 0.950$ S.E.E. = 0.0823 D.W. = 2.210

Period: 1958-1974

$$\text{ODDSDDPT} = \left(\frac{\text{USSDPUOPT-2/USSDPOPTM}}{1.0 - (\text{USSDPUOPT-2/USSDPOPTM})}\right)$$

Elasticities:

USTDPOPTMFW/PC	-3.94
RDIP4/FM	2.49
PER15+	-0.73

Note: For definitions, see page A 2-55.

TABLE A 2-10 (Cont.)

II. Compacts

$$\ln (\text{ODDCDOPT}) = \underset{(8.28)}{28.919} - \underset{(13.01)}{4.74632} \ln (\text{USTDPOPTMFW/PC})$$

$$+ \underset{(8.63)}{1.08065} \text{ DUM58} + \underset{(5.49)}{0.672234} \text{ DUM59} + \underset{(3.41)}{1.79413} \ln (\text{RDIP4/FM})$$

$\bar{R}^2 = 0.970$ S.E.E. = 0.1014   D.W. = 1.219

Period: 1958-1974

$$\text{ODDCDOPT} = \left(\frac{\text{USCDPUUOT-2/USCDPOPTM}}{1.0 - (\text{USCDPUOPT-2/USCDPOPTM})}\right)$$

Elasticities:

USTDPOPTMFW/PC	-3.63
RDIP4/FM	1.37

Note: For definitions, see page A 2-55.

TABLE A 2-10 (Cont.)

III. Mid-Size

$$ln\ (ODDMDOPT) = \underset{(6.84)}{38.5568} - \underset{(10.14)}{5.96986}\ ln\ (USTDPOPTMFW/PC)$$

$$+ \underset{(3.54)}{0.715813}\ DUM58 + \underset{(4.06)}{0.802432}\ DUM59$$

$$+ \underset{(1.98)}{1.68008}\ ln\ (RDIP4/FM)$$

$\bar{R}^2 = 0.951$ S.E.E. = 0.1636 D.W. = 1.035

Period: 1958-1974

$$ODDMDOPT = \left(\frac{USMDPUOPT\text{-}2/USMDPOPTM}{1.0 - (USMDPUOPT\text{-}2/USMDPOPTM)}\right)$$

Elasticities:

USTDPOPTMFM/PC	-3.73
RDIP4/FM	1.05

Note: For definitions, see page A 2-55.

TABLE 2-10 (Cont.)

IV. Full-Size

$$\ln(\text{ODDFDOPT}) = \underset{(5.66)}{37.6617} - \underset{(8.43)}{5.86341} \ln(\text{USTDPOPTMFW/PC})$$

$$+ \underset{(4.34)}{1.03641}\ \text{DUM58} + \underset{(3.88)}{0.90639}\ \text{DUM59}$$

$$+ \underset{(2.00)}{2.00039} \ln(\text{RDIP4/FM})$$

$\bar{R}^2 = 0.930$ S.E.E. 0.1933 D.W. = 0.911

Period: 1958-1974

$$\text{ODDFDOPT} = \left(\frac{\text{USFDPUOPT-2/USFDPOPTM}}{1.0 - (\text{USFDPUOPT-2/USFDPOPTM})}\right)$$

Elasticities:

USTDPOPTMFW/PC	-2.69
RDIP4/FM	0.92

Note: For definitions, see page A 2-55.

TABLE A 2-10 (Cont.)

V. Luxury

$$ln\ (ODDLDOPT) = \underset{(8.64)}{31.0341} - \underset{(12.96)}{4.86213}\ ln\ (USTDPOPTMFW/PC)$$

$$+ \underset{(3.44)}{0.443425}\ DUM58 + \underset{(3.62)}{0.456031}\ DUM59$$

$$+ \underset{(4.03)}{2.17749}\ ln\ (RDIP4/FM)$$

$\bar{R}^2 = 0.977$ S.E.E. = 0.10431 D.W. = 1.135

$$ODDLDOPT = \left(\frac{USLDPUOPT\text{-}2/USLDPOPTM}{1.0 - (USLDPUOPT\text{-}2/USLDPOPTM)}\right)$$

Elasticities:

USTDPOPTMFW/PC	-1.22
RDIP4/FM	0.55

Note: For definitions, see page A 2-55.

Definitions:

US*sc*PUOPT-2	Cost of Options Purchases, Class *sc*, *sc* = SD, CD, MD, FD, LD
US*sc*POPTM	Maximum Cost of Options, Class *sc*
PC	Consumer Price Index, All Items, 1972 = 1.0
RDIP4/FM	Real Disposable Income Per Family Unit
PER15+	Percentage of Families with Real Incomes of $15,000 or more
USTDPOPTMFW	Fixed-Weighted Average Maximum Cost of Options
DUM58	= 1.0, 1985 = 0.0, Otherwise
DUM59	= 1.0, 1959 = 0.0, Otherwise
DUM59.61	= 1.0, 1959-61 = 0.0, Otherwise

TABLE A 2-11

TRANSPORTATION CHARGES BY CLASS

(Definitions: see end of Table)

I. Subcompacts

$$\left.\begin{array}{l} ln\ (\text{USSFPUTRN}) = \underset{(4.88828)}{-1.07380} \\[1em] ln\ (\text{USSDPUTRN}) = \underset{(4.91860)}{-1.08046} \end{array}\right] + \underset{(24.0193)}{1.18913}\ ln\ (\text{PXRGT})$$

$$\underset{(3.42713)}{-0.0578934}\ \text{DUM65.67} \quad \underset{(3.82865)}{-0.104719}\ \text{DUM58}$$

$\bar{R}^2 = 0.959$ SEE = 0.035960 1958-1974

II. Compacts

$$\left.\begin{array}{l} ln\ (\text{USCFPUTRN}) = \underset{(16.9167)}{-3.71638} \\[1em] ln\ (\text{USCDPUTRN}) = \underset{(16.7230)}{-3.67384} \end{array}\right] + \underset{(36.[illegible]08)}{1.81[illegible]14}\ ln\ (\text{PXRGT})$$

$$\underset{(2.60438)}{-0.0439986}\ \text{DUM65.67} \quad \underset{(2.83753)}{-0.0776173}\ \text{DUM58}$$

$\bar{R}^2 = 0.980$ SEE = 0.035963 1958-1974

III. Mid-Size

$$ln\ (\text{USMDPUTRN}) = \underset{(9.31492)}{-2.70790} + \underset{(24.7648)}{1.61989}\ ln\ (\text{PXRGT})$$

$$\underset{(2.93481)}{-0.104544}\ \text{DUM58} \quad \underset{(3.94944)}{-0.0794565}\ \text{DUM64.67}$$

$\bar{R}^2 = 0.982$ SEE = 0.032823 1958-1974

TABLE A 2-11 (Cont.)

IV. Full-Size

$$\ln\text{(USFDPUTRN)} = \underset{(8.39677)}{-2.96414} + \underset{(21.6823)}{1.71061} \ln\text{(FXRGT)}$$

$$+\underset{(3.35893)}{0.0912733}\ \text{DUM58.60} \quad \underset{(3.13423)}{-0.0727867}\ \text{DUM64.67}$$

$$\bar{R}^2 = 0.978 \qquad \text{SEE} = 0.034977 \qquad 1958\text{-}1974$$

V. Luxury

$$\left.\begin{array}{l} \ln\text{(USLFPUTRN)} = \underset{(1.91375)}{-.0.349289} \\ \ln\text{(USLDPUTRN)} = \underset{(1.66225)}{-0.303386} \end{array}\right] + \underset{(28.0423)}{1.14735} \ln\text{(PXRGT)}$$

$$\underset{(2.03501)}{-0.0273104}\ \text{DUM65.67} + \underset{(4.62970)}{0.0656844}\ \text{DUM59.61}$$

$$\bar{R}^2 = 0.969 \qquad \text{SEE} = 0.027302 \qquad 1958\text{-}1974$$

TABLE A 2-11 (Cont.)

VARIABLE DEFINITIONS, TRANSPORTATION CHARGES

USSDPUTRN	Subcompact, Domestic, Transportation Charges
USCDPUTRN	Compacts, Domestic, Transportation Charges
USMDPUTRN	Midsize, Domestic, Transportation Charges
USFDPUTRN	Fullsize, Domestic, Transportation Charges
USLDPUTRN	Luxury, Domestic, Transportation Charges
USSFPUTRN	Subcompacts, Foreign, Transportation Charges
USCFPUTRN	Compacts, Foreign, Transportation Charges
USLFPUTRN	Luxury, Foreign, Transportation Charges
PXRGT	Price Index of Transportation Sector, 1972-100.
DUM58	=1.0,1958 =0.0, other years
DUM58.60	=1.0, 1958-60 =0.0, other years
DUM59.61	=1.0, 1959-61 =0.0, other years
DUM64.67	=1.0, 1964.67 =0.0, other years
DUM65.67	=1.0, 1965-67 =0.0, other years

TABLE A 2-12

USED CAR MARKET EQUATIONS

I. Number of Used Cars Purchased (PURMVUUA)

$$\ln\left(\frac{\text{PURMVUA}}{\text{OPMVUAYEND}}\right) = \underset{(55.02)}{-1.82062} + \underset{(1.97)}{0.434827}\ \Delta\ln\ (\text{OMVUANR})$$

$$-\underset{(1.54)}{0.553048}\ \ln\left(\frac{\text{OMVUANR} + \text{OMVUANR}(-1)}{\text{OMVUANR}(-2) + (\text{OMVUANR}(-3)}\right)$$

$\bar{R}^2 = 0.382$ SEE = 0.0723 DW = 2.89

Period of Fit: 1968-1974

II. Average Wholesale Price for Used Cars (PUSEDW)

$$\ln\ (\text{PUSEDW}) = \underset{(0.05)}{-0.0180144} + \underset{(18.34)}{1.04679}\ \ln\ (\text{PUSEDR})$$

$\bar{R}^2 = 0.960$ SEE = 0.0368 DW = 1.52

Period of Fit: 1960-1974

III. Price of a One Year Old Subcompact Relative To A New Subcompact (PU/NST)

$$\ln\left(\frac{\text{PU/NST}}{1 - \text{PU/NST}}\right) = \underset{(5.20)}{0.780082} + \underset{(4.48)}{0.559134}\ \text{DUM63.65} \quad -\underset{(3.46)}{0.436451}\ \text{DUM67.68}$$

$$-\underset{(2.09)}{0.246608}\ \text{DUM69.74} + \underset{(4.91)}{1.62353}\ \ln\left(\frac{\text{PURMVUA}}{\text{OMVUANR}}\right)$$

$$+\underset{(2.22)}{2.38565}\left[\ \Delta\ln\ (\text{PNEWST})\ \right] * \text{DUM69.74}$$

$\bar{R}^2 = 0.800$ SEE = 0.1515 DW = 1.97

Period of Fit: 1958-1974

For definitions, see end of table.

TABLE A 2-12 (Cont.)

IV. Price of a One Year Old Compact Relative To A New Compact (PU/NCT)

$$ln\left(\frac{PU/NCT}{1 - PU/NCT}\right) = \underset{(3.89)}{0.386129} \quad \underset{(4.39)}{-0.462438} \text{ DUM67.68}$$

$$+\underset{(3.00)}{0.928899}\ ln\ \left(\frac{PURMVUA}{OMVUANR}\right) \quad +\underset{(4.11)}{3.51931}\ \Delta ln\ (PNEWCT)$$

$$+\underset{(2.63)}{0.365782}\ ln\ \left(\frac{SHRCTNR}{SHRCTNR(-1)}\right)$$

$\bar{R}^2 = 0.783$ SEE = 0.1361 DW = 2.08
Period of Fit: 1958-1974

V. Price of a One Year Mid-Size Relative To A New Mid-Size (PU/NMD)

$$ln\left(\frac{PU/NMD}{1 - PU/NMD}\right) = \underset{(8.41)}{0.559941} \quad \underset{(2.04)}{-0.212865} \text{ DUM61} \quad \underset{(1.57)}{-0.176421} \text{ DUM68}$$

$$+\underset{(1.64)}{0.336964}\ ln\ \left(\frac{PURMVUA}{OMVUANR}\right) \quad \underset{(1.66)}{-1.23833}\ \Delta ln\ (PNEWMD)$$

$$+\underset{(2.31)}{0.543911}\ ln\ \left(\frac{SHRMDNR}{SHRMDNR(-1)}\right)$$

$\bar{R}^2 = 0.309$ SEE = 0.0984 DW = 2.14
Period of Fit: 1958-1974

For definitions, see end of table.

VI. Price of a One Year Full-Size Relative To A New Full-size (PU/NFD)

$$ln\left(\frac{PU/NFD}{1 - PU/NFD}\right) = \underset{(1.89)}{0.146425} \; \underset{(2.84)}{-0.303990}\ DUM59 \; \underset{(4.16)}{+0.370710}\ DUM64$$

$$\underset{(4.15)}{+0.309486}\ DUM65.66 \; \underset{(2.58)}{-0.221708}\ DUM70 \; \underset{(5.96)}{+1.30431}\ ln\left(\frac{PURMVUA}{OMVUANR}\right)$$

$$\underset{(4.73)}{-3.41949}\ \Delta ln\ (PNEWFD)$$

$\bar{R}^2 = 0.802$ SEE = 0.0813 DW = 2.14
Period of Fit: 1958-1974

VII. Price of a One Year Old Luxury Car Relative To A New Luxury Car (PU/NLT)

$$ln\left(\frac{PU/NLT}{1 - PU/NLT}\right) + \underset{(13.85)}{0.655544} \; \underset{(2.98)}{-0.204294}\ DUM67 \; \underset{(3.05)}{+0.212233}\ DUM72$$

$$+ \underset{(6.25)}{0.785318}\ ln\left(\frac{PURMVUA}{OMVUANR}\right) - \underset{(3.59)}{2.07655}\ \Delta ln\ (PNEWLT)$$

$\bar{R}^2 = 0.786$ SEE = 0.0663 DW = 2.24
Period of Fit: 1957-1974

For definitions, see end of table.

TABLE A 2-12 (Cont.)

VIII. Elasticities For One Year Old Price Relative Equations:

Size Class (*sc*)	$\left(\frac{PURMVUA}{OMVUANR}\right)$	$\left(\frac{PNEWsc}{PNEWsc}\right)_{-1}$	$\left(\frac{SHRscNR}{SHRscNR}\right)_{-1}$
ST	0.33	0.48	---
CT	0.29	1.10	0.11
MD	0.12	-0.44	0.19
FD	0.48	-1.26	---
LT	0.21	-0.63	---

Definitions:

OMVUANR = Number of New Registrations

OPMVUAYEND = Year-End Stock of Cars in Operation

PNEW*sc* = New Car Purchase Price for Class *sc*

PU/N*sc* = Ratio of One Year Old Price to New Price, Class *sc*, *sc* = ST, CT, MD, FD, LT

PURMVUA = Number of Used Cars Purchased

PUSEDR = Age and Class-Weighted Average Used

PUSEDW = Automotive News Average Wholesale Used Car Price

SHR*sc*NR = Share of New Registrations in for Class *sc*

TABLE A2-13

INCOME DISTRIBUTION EQUATION

$$\ln\,(\text{PER15+}/100-\text{PER15+}) = \underset{(26.7)}{-12.9870} + \underset{(2.22)}{1.15395}\,\ln\,(\text{RDI/FM}) + \underset{(9.83)}{1.25588}\,\ln\,(\text{RDI/FM})(-1) + \underset{(8.27)}{1.19145}\,\ln\,(\text{RDI/FM})(-2)$$

$$+\ \underset{(3.96)}{0.960663}\,\ln\,(\text{RDI/FM})(-3) + \underset{(2.89)}{0.563511}\,\ln\,(\text{RDI/FM})(-4)$$

$\bar{R}^2 = 0.967$ S.E.E. = 0.1124 D.W. 0.749

Period: 1954-19,4

(Second-degree Almon Lag, constrained to zero at far end)

Definitions:

PER15+ = Percentage of Family Units with Real Disposable Incomes of $15,000 or more

RDI/FM = Real Disposable Income Per Family Unit

APPENDIX A 3 EXOGENOUS ASSUMPTIONS

A 3.1 INTRODUCTION

This appendix contains all the exogenous inputs data used for the baseline forecasts, together with a brief indication of sources and methods used in their preparation. The data are presented in tables at the end of the appendix.

A 3.2 SOURCES AND METHODS

A 3.2.1 DEMOGRAPHIC INPUTS

Projections of the total resident population of the United States for all ages (NPR) and for selected age groups (NPR20.29, NPR16.74) were taken directly from U.S. Bureau of the Census, Current Population Reports, Series, P-25, No. 601, "Projections of the Population of the United States: 1975 to 2050", October 1975. This publication presents three series of projections which start with the estimated July 1, 1974 population and assume a slight reduction in future mortality and an annual net immigration of 400,000 per year. They differ only in their assumptions about future fertility. For purposes of this study, Series III was selected, which assumes an ultimate level of completed cohort fertility (average number of lifetime births per woman) of 1.7.

Since the population projections include Armed Forces overseas, a constant is subtracted for all years to obtain a projection of residential population. Estimates of Armed Forces overseas by age group for

July 1, 1974 are given in Table K of the CPR. For series NPR and NPR16.74, the constant subtracted was 519,000 and for NPR20.29, the adjustment was 318,000.

The NPR20.29 series is a direct exogenous input to the model. The NPR16.74 estimates were used to project the total labor force beyond 1985 (see following section), and to project the number of licensed drivers, LDMV. The relationship employed was estimated:

$$ln\left(\frac{LDMV}{NPR16.74} / \left(1.0 - \frac{LDMV}{NPR16.74}\right)\right) = \underset{(-31.2)}{-\ 2.43308} + \underset{(46.4)}{0.0580339}\ TIME$$

$\bar{R}^2 = 0.989$ S.E.E. 0.045081 D.W. = 0.509
Period: 1950-1974 (TIME = 50 in 1950)

The NPR estimates were used as a consistency check, and also to project the numbers of families (NCF) and unrelated individuals (NPRU) for 1991-2000.

The projections of the number of families and unrelated individuals (and of average family size) are based on U.S. Bureau of the Census, Current Population Reports, Series P-25, No. 607, "Projection of the Number of Households and Families: 1975-1990," August 1975. This publication presents three series of household and family projections, and the lowest series, C, was selected for forecast purposes. A constant adjustment factor of 3,000,000 persons in each year was added to the total of secondary individuals, since the number of secondary individuals under the age of 14 is not included in the Census Bureau Projections.

Average size of family (NCFMAVG) is based on the III-C projections,

which combine the Series C projections of number of families and the series III population projections. The total population and family population projections are consistent in concept. They differ in coverage, since the one refers to resident population and NCF and NPRU are based on population projections which exclude members of the Armed Forces living in the United States in military barracks.

For NPRU estimates, 1991-2000, we continued the slow upward trend in the ratio NPRU/NPR, which the Census data indicate is rising at a declining rate. From a 1975 ratio of 0.0898 the Census projects an increase to 0.1025 by 1990, which we extended to 0.1045 in 1995 and 0.1055 by 2000.

For NCF, 1991-2000, the slow downward trend in NCFMAVG was similarly extended, from 3.39 in 1975 and 2.97 in 1990 to 2.91 in 1995 and 2.87 by 2000. Then we used the identity:

$$NCF = (NPR - NPRU) \;/\; \left(\frac{3.45}{3.39} * NCFMAVG\right)$$

- where the 3.45/3.39 factor adjusts for the statistical discrepancy present in the Census data.

The family size inputs (FM5+/FM, FM3+4/FM) are projected on the basis of NCFMAVG. First we derived the proportion of families with 3 or more members (3+) from the estimated relationship:

$$\ln\,(N3+ \;/\; (1.0 - N3+)) = \underset{(5.70)}{-\,2.70826} + \underset{(7.18)}{2.62809}\,\ln\,(NCFMAVG) + \underset{(1.84)}{1.49329}\,\Delta \ln\,(NCFMAVG)$$

$\bar{R}^2 = 0.788$ S.E.E. = 0.0343 D.W. = 1.122
Period: 1960-74

Then we derived the proportion of families with 5 or more members relative to N3+:

$$ln\left(\frac{N5+}{N3+} / \left(1.0 - \frac{N5+}{N3+}\right)\right) = \underset{(6.71)}{-\,5.05061} + \underset{(6.13)}{3.55659}\ ln\ (NCFMAVG)$$

$$\underset{(1.84)}{-\,3.57923}\ \Delta\ ln\ (NCFMAVG)$$

$\bar{R}^2 = 0.788$ S.E.E. = 0.0343 D.W. = 1.122
Period: 1960-74

From the first relationship we obtain estimates of FM3+/NCF, and the second and the first together yield FM5+/NCF. Multiplying through by NCF/NCF+NPRU yields FM5+/FM and FM3+/FM, and subtraction of the former from the latter yields FM3+4/FM.

The percentage of the population living in metropolitan areas in the United States increased from 55.9 percent in 1950 to 62.7 percent in 1960, 68.4 percent in 1970, and 73.3 percent in 1974. The projections of NPMET assume that the combined effect of the creation of new SMSA's and migration out of SMSA's will result in approximately eighty percent of the population residing in metropolitan areas in 1990. A semi-log function was fitted:

$$NPMET = 73.310 + 2.343629\ Ln\ (YEAR)$$

where YEAR = 0 in 1973, the constant = NPMET (1974), and the slope = (NPMET (1990) - NPMET (1974)) / Ln (Period) or (79.95 - 73.310) / Ln (17). A projected value of NPMET was then calculated for each year. Since the estimated NPMET showed virtually no change after 1990, it was left at 80%.

Four regional variables for population are projected: NPRNEW/R, NPRWSC/R, NPRMTN/R, and MPRPAC/R. The latest available regional projections are those published in Current Population Reports, Series P-25, No. 477 (March 1972), which give estimates for 1975, 1980, 1985, and 1990. The absolute numbers are based on population projections in CPR, P-25, No. 470, November 1971. These projections are now obsolete in the light of new projections in the October 1975 study. For this reason only proportions, by region, to total population were computed. The regional projections used were based on the E population series, which assumes an ultimate fertility rate of 2.11, and the Series I migration rate, which assumes continuation of 1960-1970 gross migration trends to 1990. At the time this study was completed, the 1970 census material had not been fully analyzed.

CPR P-20, No. 292, March 1976 "Population Profile of the United States: 1975" was used to establish the regional proportions for April 1, 1970 (Census), July 1, 1974 and July 1, 1975 (preliminary). It was apparent that the Series I-E projections for 1975 were already outdated when compared with the recent July 1, 1975 survey. The following procedures was therefore adopted.

The change in proportions 1975-1980 of the Series I-E projections was applied to the July 1, 1975 estimated proportions to give a revised projection for 1980, based on 1975 actuals. The change in proportions 1980-1985 was then applied to the revised 1980 numbers to estimate 1985. Finally, the change in proportions 1985-1990 of the Series I-E projections was then applied to the revised 1985 series to obtain 1990 estimates. In sum, the estimated shifts between regions 1975-1990 in the Series I-E

projections were applied to actual (but preliminary) figures for regional proportions on July 1, 1975, rather than to the 1975 proportions originally projected. Projected proportions for the intermediate years were obtained by interpolation.

Three variables required projection for the travel to work variable, MTWNA. The growth rate of public transit passengers relative to employment (GRPUT/NER) is continued at its 1975 value. The growth-rate in transit passengers relative to passengers traveling to work by transit is assumed to continue the slow decline projected for 1971-75. Finally, non-auto, non-transit travel to work relative to employment is also assumed to continue to fall at the 1971-75 rate.[1/]

A 3.2.2. ECONOMIC INPUTS

The general economic forecasts have been discussed previously. Here we concentrate on the projections for the variables not explicitly forecast by the Wharton Annual Long-Term Econometric Model.

Personal income, taxes, transfers, employment and the unemployment rate are all taken directly from the forecast through 1985. After 1985 real growth was assumed to persist at 3% p.a. General inflation was assumed to run at 3.5% p.a. through 1990, then fall to 3.0%. The levels of employment and unemployment were projected consistent with the labor force projection, which assumes a slowdown in participation growth, the labor force being 67% of NPR16.74 for 1990 onwards.

The maximum passbook savings rate (the discount rate) is a straightforward assumption, while the installment credit rate is estimated from

---

1/ The net result of these assumptions and the numbers of family units, MTWNA/FM, shows a slow, steady decline over the period 1975-1993, from 0.1957 to 0.1715, then recovers to 0.1810 by 2000.

the equation presented in Appendix A2, which links it to Moody's Bond Rate (FRMCS) - this is projected to fall to 6.1% for 1986-91, and 6.0% thereafter.

The overall consumer price index (PC) was linked to the overall consumer expenditures price deflator (PDCE), the estimated relationship being:

$$\underset{}{ln}\ (PC) = -\underset{(2.13)}{0.0794606} + \underset{(127.7)}{1.0664}\ ln\ (PDCE)$$

$\bar{R}^2 = 0.999$ S.E.E. = 0.0057 D.W. = 0.88
Period: 1960-75

The index for repair and maintenance (PCAR) was similarly linked to the same deflator:

$$ln\ (PCAR) = -\underset{(12.7)}{1.24869} + \underset{(56.5)}{1.34035}\ ln\ (PDCE) - \underset{(3.44)}{0.754232}\ \Delta\ ln\ (PDCE)$$

$\bar{R}^2 = 0.996$ S.E.E. = 0.0173 D.W. = 0.707
Period: 1960-75

The index for parking (PCAP) was linked to the consumer expenditures on transportation services deflator (PDCEST):

$$ln\ (PCAP) = -\underset{(3.37)}{0.388362} + \underset{(43.0)}{1.16917}\ ln\ (PDCEST) - \underset{(2.65)}{0.462602}\ \Delta\ ln\ (PDCEST)$$

$\bar{R}^2 = 0.995$ S.E.E. = 0.0169 D.W. = 1.533
Period: 1960-75

Also linked to the same deflator is the index for insurance (PCAI), with dummy variables introduced to account for the introduction of "no fault" insurance:

$$ln\ (PCAI) = -\underset{(5.80)}{2.08983} + \underset{(18.5)}{1.48283}\ ln\ (PDCEST) + \underset{(0.90)}{0.390086}\ \Delta\ ln\ (PDCEST)$$

$$+ \underset{(5.97)}{0.258437}\ DUMINS - \underset{(1.23)}{0.0631625}\ DUMINS72 - \underset{(1.71)}{0.0942298}\ DUMINS73$$

$\bar{R}^2 = 0.983$ S.E.E. = 0.0387 D.W. = 0.932
Period: 1956-75

The consumer price index for motor oil (PCMO) is linked to PDCE:

$$ln\ (PCMO) = -\ 0.185291 + 1.08512\ ln\ (PDCE)$$
$$\qquad\qquad (1.51) \qquad\quad (39.5)$$

$\bar{R}^2 = 0.990$ S.E.E. = 0.0188 D.W. = 1.141
Period: 1960-75

The consumer price index of tires and tubes has shown very slow upward movement over the past twenty-five years. Indeed, even in 1973, the tires and tube CPI declined by 4.6 percent, while the overall CPI rose by 6.2 percent. The increase between 1973 and 1974 was a relatively modest 7.1 percent, in view of the inflation in other industrial products. It has been assumed that prices in the period 1976-1979 will rise moderately as an effect of the recent wage settlement in the rubber industry. After that, retail tire prices should rise by 3.0 - 3.5 percent a year to the end of the forecast period.

The overall weighted-average purchase tax-rate (TXRWTDAUTO) has been assumed to continue to increase at its 1971-75 rate of growth of 1.84% p.a. All other tax-rates incorporated here, and the automobile strike dummy, are of course set to zero for the baseline.

The domestic input price index is solved for given the solutions for each input price index (32 distinct indices), obtained from the Wharton Annual Long-Term Model, and the fixed input-output coefficient weights.

The foreign auto export price index was projected at 9% and 4% rates of growth for 1976-77 on the basis of Automotive News data and analysis. In line with current expectations concerning world trade in-

flation, we felt that foreign producers would probably be faced with somewhat higher rates of inflation than the domestic industry. Therefore, 7% inflation was assumed for 1978-79, 6% for 1980, 4.5% for 1981-90, and 4% thereafter.

The transportation services output price index is obtained directly from the Annual Model, and is then extended for 1986 onwards at an assumed rate of 2.5%. The steel scrap price is projected purely by assumption.

Finally, the retail price of gasoline is projected after distinguishing its two components: the pre-tax price and taxes. Since the taxes have not been on an ad valorem basis we have projected taxes as an addition, not a rate, using the long-term historical rate of increase of 2.5%. For the base price (PRGAS-TX), the projection is linked to the deflator for personal consumption expenditures on gasoline and oil (PDCENG), using the estimated equation:

$$\ln(\text{PRGAS} - \text{TX}) = \underset{(26.3)}{-\,7.32127} + \underset{(20.8)}{1.29065}\ln(\text{PDCENG}) \underset{(2.71)}{-\,0.564968}\,\Delta\ln(\text{PDCENG}) + \underset{(3.12)}{0.145454}\,\text{DUM74}$$

$\bar{R}^2 = 0.995$ S.E.E. = 0.0131 D.W. = 2.306

Period: 1961-74

The PDCENG index is assumed to rise at a rate of 5% p.a. for 1986-91, and by 4% p.a. thereafter.

A 3.2.3 AUTO CHARACTERISTICS

The projections of physical characteristics by class of vehicle have

already been extensively discussed in Chapter 4. The only points that might be stressed are the dominant role of weight and displacement, and their interdependence. One should not be arbitrarily changed without adjusting the other. The further point to be made is that these projections relate not only to what might be technically feasible, but also to what consumers will be willing to purchase.

Included in the "characteristics" category we also project the urban driving fraction of total vehicle miles. Historically this has risen by a remarkably stable 1% p.a. since 1953, the only significant deviation being the unusually sharp increase in 1972. Since a decline in the rate of urbanization growth is anticipated, we have slowly trended the urban driving growth downwards throughout the period.

Finally, we have the exogenized parameter values, which are mostly extended using 1974 values. Included here are the used car price exponential decay rates and the domestic class price relatives.

TABLE A 3-1

TABLES OF EXOGENOUS INPUTS, BASELINE

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2.01 DEMOGRAPHIC VARIABLES

LINE	ITEM		1975	1976	1977	1978	1979	1980
1	NUMBER OF FAMILIES	MILL FAMILIES	56,197	57,108	58,117	59,105	60,102	61,080
2		%GROWTH	2,08	1,62	1,77	1,70	1,69	1,63
3								
4	NUMBER OF UNREL. INDIVIDUALS	MILL PERS	19,105	19,512	19,886	20,270	20,652	21,035
5		%GROWTH	2,79	2,11	1,92	1,93	1,88	1,85
6								
7	FRACTION OF FAMILIES WITH 3 OR 4 PERS.		0,304	0,306	0,306	0,306	0,307	0,305
8		%GROWTH	-0,39	0,56	0,07	-0,01	0,46	-0,64
9								
10	FRACTION OF FAMILIES WITH 5+ PERSONS		0,156	0,149	0,143	0,137	0,132	0,127
11		%GROWTH	-4,39	-4,53	-4,05	-4,19	-3,78	-3,82
12								
13	FRACTION OF POP. 20 TO 29 YEARS OLD		0,476	0,484	0,481	0,481	0,481	0,481
14		%GROWTH	1,07	1,79	-0,71	0,07	0,01	0,01
15								
16	PERCENT OF POP. IN METROPOLITAN AREAS		74,93	75,88	76,56	77,08	77,51	77,87
17		%GROWTH	2,21	1,27	0,89	0,68	0,55	0,47
18								
19	FRACTION OF POP. IN NEW ENGLAND REGION		0,057	0,057	0,057	0,057	0,057	0,057
20		%GROWTH	-0,41	0,02	0,02	0,02	0,02	0,02
21								
22	FRACTION OF POP. IN E.N. CENTRAL REGION		0,192	0,192	0,192	0,192	0,192	0,192
23		%GROWTH	-0,82	-0,05	-0,05	-0,05	-0,05	-0,05
24								
25	FRACTION OF POP. IN MOUNTAIN REGION		0,045	0,045	0,046	0,046	0,046	0,046
26		%GROWTH	1,33	0,33	0,33	0,33	0,33	0,33
27								
28	FRACTION OF POP. IN PACIFIC REGION		0,132	0,133	0,134	0,135	0,136	0,137
29		%GROWTH	0,66	0,66	0,66	0,66	0,66	0,66
30								
31	FRACTION OF POP. IN W.S. CENTRAL REGION		0,098	0,098	0,098	0,099	0,098	0,098
32		%GROWTH	0,76	0,01	0,01	0,01	0,01	0,01
33								
34	GROWTH RATE, PASSENGERS / EMPLOYMENT		1,017	1,017	1,017	1,017	1,017	1,017
35		%GROWTH	-2,23	0,0	0,0	0,0	0,0	0,0
36								
37	GROWTH RATE, PASS / PUBLIC TRANS M.T.W.		0,994	0,994	0,994	0,994	0,994	0,994
38		%GROWTH	-0,04	0,0	0,0	0,0	0,0	0,0
39								
40	GROWTH RATE, OTHER M.T.W. / EMPLOYMENT		0,943	0,943	0,943	0,943	0,943	0,943
41		%GROWTH	-0,02	0,0	0,0	0,0	0,0	0,0
42								
43	NUMBER OF LICENSED DRIVERS	MILL PERS	128,44	131,46	134,57	137,50	140,34	143,05
44		%GROWTH	2,40	2,35	2,37	2,18	2,07	1,93

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2,01 DEMOGRAPHIC VARIABLES

LINE	ITEM		1981	1982	1983	1984	1985	1986
1	NUMBER OF FAMILIES	MILL FAMILIES	62,077	63,093	64,071	65,012	65,894	66,752
2		%GROWTH	1,63	1,64	1,55	1,47	1,36	1,30
3								
4	NUMBER OF UNREL, INDIVIDUALS	MILL PERS	21,406	21,747	22,085	22,412	22,737	23,017
5		%GROWTH	1,76	1,59	1,55	1,48	1,45	1,23
6								
7	FRACTION OF FAMILIES WITH 3 OR 4 PERS,		0,306	0,306	0,305	0,307	0,304	0,305
8		%GROWTH	0,39	-0,12	-0,17	0,37	-0,78	0,35
9								
10	FRACTION OF FAMILIES WITH 5+ PERSONS		0,122	0,117	0,113	0,110	0,107	0,103
11		%GROWTH	-3,95	-3,40	-3,48	-2,99	-3,02	-3,07
12								
13	FRACTION OF POP, 20 TO 29 YEARS OLD		0,480	0,478	0,473	0,468	0,460	0,450
14		%GROWTH	-0,17	-0,58	-0,91	-1,20	-1,69	-2,23
15								
16	PERCENT OF POP, IN METROPOLITAN AREAS		78,18	78,46	78,71	78,93	79,13	79,32
17		%GROWTH	0,40	0,35	0,31	0,28	0,26	0,24
18								
19	FRACTION OF POP, IN NEW ENGLAND REGION		0,057	0,057	0,057	0,057	0,057	0,057
20		%GROWTH	0,03	0,03	0,03	0,03	0,03	0,03
21								
22	FRACTION OF POP, IN E,N, CENTRAL REGION		0,192	0,192	0,192	0,192	0,191	0,191
23		%GROWTH	-0,03	-0,03	-0,03	-0,03	-0,03	-0,03
24								
25	FRACTION OF POP, IN MOUNTAIN REGION		0,046	0,046	0,046	0,047	0,047	0,047
26		%GROWTH	0,28	0,28	0,28	0,28	0,28	0,23
27								
28	FRACTION OF POP, IN PACIFIC REGION		0,138	0,138	0,139	0,140	0,141	0,142
29		%GROWTH	0,57	0,57	0,57	0,57	0,57	0,49
30								
31	FRACTION OF POP, IN W,S, CENTRAL REGION		0,098	0,098	0,098	0,098	0,098	0,098
32		%GROWTH	-0,00	-0,00	-0,00	-0,00	-0,00	-0,01
33								
34	GROWTH RATE, PASSENGERS / EMPLOYMENT		1,017	1,017	1,017	1,017	1,017	1,017
35		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
36								
37	GROWTH RATE, PASS / PUBLIC TRANS M,T,W,		0,994	0,994	0,994	0,994	0,994	0,994
38		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
39								
40	GROWTH RATE, OTHER M,T,W, / EMPLOYMENT		0,943	0,943	0,943	0,943	0,943	0,943
41		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
42								
43	NUMBER OF LICENSED DRIVERS	MILL PERS	145,57	147,85	149,95	151,93	153,87	155,90
44		%GROWTH	1,76	1,57	1,42	1,32	1,28	1,32

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2.01 DEMOGRAPHIC VARIABLES

LINE	ITEM		1987	1988	1989	1990	1991	1992
1	NUMBER OF FAMILIES	MILL FAMILIES	67,581	68,382	69,185	69,947	70,611	71,179
2		%GROWTH	1,24	1,19	1,17	1,10	0,95	0,80
3								
4	NUMBER OF UNREL. INDIVIDUALS	MILL PERS	23,288	23,554	23,824	24,088	24,342	24,561
5		%GROWTH	1,18	1,14	1,15	1,11	1,05	0,90
6								
7	FRACTION OF FAMILIES WITH 3 OR 4 PERS.		0,305	0,304	0,303	0,305	0,302	0,303
8		%GROWTH	-0,18	-0,21	-0,24	0,39	-0,81	0,35
9								
10	FRACTION OF FAMILIES WITH 5+ PERSONS		0,101	0,098	0,096	0,094	0,092	0,090
11		%GROWTH	-2,49	-2,52	-2,56	-1,98	-1,98	-2,04
12								
13	FRACTION OF POP. 20 TO 29 YEARS OLD		0,437	0,424	0,412	0,402	0,392	0,381
14		%GROWTH	-2,76	-2,94	-2,81	-2,52	-2,37	-2,81
15								
16	PERCENT OF POP. IN METROPOLITAN AREAS		79,49	79,66	79,81	79,95	80,00	80,00
17		%GROWTH	0,22	0,20	0,19	0,18	0,06	0,0
18								
19	FRACTION OF POP. IN NEW ENGLAND REGION		0,057	0,057	0,057	0,057	0,057	0,057
20		%GROWTH	0,03	0,03	0,03	0,03	0,0	0,0
21								
22	FRACTION OF POP. IN E.N. CENTRAL REGION		0,191	0,191	0,191	0,191	0,191	0,191
23		%GROWTH	-0,03	-0,03	-0,03	-0,03	-0,03	-0,03
24								
25	FRACTION OF POP. IN MOUNTAIN REGION		0,047	0,047	0,047	0,047	0,047	0,047
26		%GROWTH	0,23	0,23	0,23	0,23	0,0	0,0
27								
28	FRACTION OF POP. IN PACIFIC REGION		0,142	0,143	0,144	0,144	0,144	0,144
29		%GROWTH	0,49	0,49	0,49	0,49	0,0	0,0
30								
31	FRACTION OF POP. IN W.S. CENTRAL REGION		0,098	0,098	0,098	0,098	0,098	0,098
32		%GROWTH	-0,01	-0,01	-0,01	-0,01	0,0	0,0
33								
34	GROWTH RATE, PASSENGERS / EMPLOYMENT		1,017	1,017	1,017	1,017	1,017	1,017
35		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
36								
37	GROWTH RATE, PASS / PUBLIC TRANS M.T.W.		0,994	0,994	0,994	0,994	0,994	0,994
38		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
39								
40	GROWTH RATE, OTHER M.T.W. / EMPLOYMENT		0,943	0,943	0,943	0,943	0,943	0,943
41		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
42								
43	NUMBER OF LICENSED DRIVERS	MILL PERS	157,96	159,71	161,21	162,62	163,95	165,16
44		%GROWTH	1,32	1,11	0,94	0,87	0,82	0,74

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2,01 DEMOGRAPHIC VARIABLES

LINE	I T E M		1993	1994	1995	1996	1997	1998
1	NUMBER OF FAMILIES	MILL FAMILIES	71,728	72,258	72,776	73,276	73,767	74,243
2		%GROWTH	0,77	0,74	0,72	0,69	0,67	0,65
3								
4	NUMBER OF UNREL, INDIVIDUALS	MILL PERS	24,772	24,977	25,151	25,318	25,453	25,583
5		%GROWTH	0,86	0,83	0,70	0,66	0,53	0,51
6								
7	FRACTION OF FAMILIES WITH 3 OR 4 PERS,		0,303	0,302	0,302	0,301	0,301	0,300
8		%GROWTH	-0,17	-0,18	-0,15	-0,16	-0,13	-0,14
9								
10	FRACTION OF FAMILIES WITH 5+ PERSONS		0,089	0,088	0,086	0,085	0,084	0,083
11		%GROWTH	-1,36	-1,37	-1,36	-1,36	-1,35	-1,36
12								
13	FRACTION OF POP, 20 TO 29 YEARS OLD		0,369	0,357	0,347	0,338	0,330	0,325
14		%GROWTH	-3,20	-3,22	-2,90	-2,63	-2,29	-1,62
15								
16	PERCENT OF POP, IN METROPOLITAN AREAS		80,00	80,00	80,00	80,00	80,00	80,00
17		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
18								
19	FRACTION OF POP, IN NEW ENGLAND REGION		0,057	0,057	0,057	0,057	0,057	0,057
20		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
21								
22	FRACTION OF POP, IN E,N, CENTRAL REGION		0,191	0,191	0,191	0,191	0,191	0,191
23		%GROWTH	-0,03	-0,03	-0,03	-0,03	-0,03	-0,03
24								
25	FRACTION OF POP, IN MOUNTAIN REGION		0,047	0,047	0,047	0,047	0,047	0,047
26		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
27								
28	FRACTION OF POP, IN PACIFIC REGION		0,144	0,144	0,144	0,144	0,144	0,144
29		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
30								
31	FRACTION OF POP, IN W,S, CENTRAL REGION		0,098	0,098	0,098	0,098	0,098	0,098
32		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
33								
34	GROWTH RATE, PASSENGERS / EMPLOYMENT		1,017	1,017	1,017	1,017	1,017	1,017
35		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
36								
37	GROWTH RATE, PASS / PUBLIC TRANS M,T,W,		0,994	0,994	0,994	0,994	0,994	0,994
38		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
39								
40	GROWTH RATE, OTHER M,T,W, / EMPLOYMENT		0,943	0,943	0,943	0,943	0,943	0,943
41		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
42								
43	NUMBER OF LICENSED DRIVERS	MILL PERS	166,33	167,53	168,77	170,09	171,42	172,77
44		%GROWTH	0,71	0,72	0,74	0,78	0,78	0,79

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2.01 DEMOGRAPHIC VARIABLES

LINE	ITEM		1999	2000
1	NUMBER OF FAMILIES	MILL FAMILIES	74,705	74,903
2		%GROWTH	0,62	0,27
3				
4	NUMBER OF UNREL. INDIVIDUALS	MILL PERS	25,708	25,803
5		%GROWTH	0,49	0,37
6				
7	FRACTION OF FAMILIES WITH 3 OR 4 PERS.		0,300	0,301
8		%GROWTH	-0,15	0,49
9				
10	FRACTION OF FAMILIES WITH 5+ PERSONS		0,082	0,081
11		%GROWTH	-1,37	-0,75
12				
13	FRACTION OF POP. 20 TO 29 YEARS OLD		0,320	0,317
14		%GROWTH	-1,35	-1,03
15				
16	PERCENT OF POP. IN METROPOLITAN AREAS		80,00	80,00
17		%GROWTH	0,0	0,0
18				
19	FRACTION OF POP. IN NEW ENGLAND REGION		0,057	0,057
20		%GROWTH	0,0	0,0
21				
22	FRACTION OF POP. IN E.N. CENTRAL REGION		0,191	0,191
23		%GROWTH	-0,03	-0,03
24				
25	FRACTION OF POP. IN MOUNTAIN REGION		0,047	0,047
26		%GROWTH	0,0	0,0
27				
28	FRACTION OF POP. IN PACIFIC REGION		0,144	0,144
29		%GROWTH	0,0	0,0
30				
31	FRACTION OF POP. IN W.S. CENTRAL REGION		0,098	0,098
32		%GROWTH	0,0	0,0
33				
34	GROWTH RATE. PASSENGERS / EMPLOYMENT		1,017	1,017
35		%GROWTH	0,0	0,0
36				
37	GROWTH RATE. PASS / PUBLIC TRANS M.T.W.		0,994	0,998
38		%GROWTH	0,0	0,0
39				
40	GROWTH RATE. OTHER M.T.W. / EMPLOYMENT		0,943	0,943
41		%GROWTH	0,0	0,0
42				
43	NUMBER OF LICENSED DRIVERS	MILL PERS	174,13	175,47
44		%GROWTH	0,79	0,77

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2,02 ECONOMIC VARIABLES

LINE	ITEM		1975	1976	1977	1978	1979	1980
1	GENERAL:							
2	PERSONAL INCOME	BILL CURR $	1249,70	1376,10	1520,00	1686,70	1826,30	1975,90
3		%GROWTH	8,23	10,11	10,46	10,97	8,28	8,19
4								
5	PERSONAL INCOME TAXES	BILL CURR $	168,80	194,50	222,80	261,30	289,10	325,20
6		%GROWTH	-1,38	15,23	14,55	17,28	10,64	12,49
7								
8	TRANSFER PAYMENTS	BILL CURR $	175,20	191,10	207,00	225,30	239,90	257,40
9		%GROWTH	24,82	9,08	8,32	8,84	6,48	7,29
10								
11	EMPLOYMENT	THOU PERSONS	84783,	87448,	90029,	93468,	95586,	97153,
12		%GROWTH	-1,34	3,14	2,95	3,82	2,27	1,64
13								
14	UNEMPLOYMENT RATE		8,50	7,70	7,20	6,10	5,30	5,20
15		%GROWTH	51,79	-9,41	-6,49	-15,28	-13,11	-1,89
16								
17								
18	INTEREST RATES:							
19								
20	MAXIMUM PASSBOOK SAVINGS	PERCENT	5,50	5,50	5,50	5,50	5,50	5,50
21		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
22								
23	CONSUMER INSTALL. CREDIT RATE,							
24	NEW AUTOS	PERCENT	12,19	11,82	11,36	11,03	10,83	10,76
25		%GROWTH	3,39	-3,04	-3,92	-2,92	-1,80	-0,61
26								
27								
28	CONSUMER PRICE INDICES:							
29								
30	TOTAL	1967=100	161,2	169,4	179,4	188,8	200,5	211,3
31		%GROWTH	9,14	5,10	5,88	5,27	6,19	5,37
32								
33	AUTO REPAIRS	1967=100	176,6	193,5	207,1	221,9	237,8	255,3
34		%GROWTH	12,63	9,58	7,05	7,11	7,18	7,38
35								
36	AUTO INSURANCE PREMIUMS	1967=100	145,9	161,6	179,9	196,3	219,5	238,6
37		%GROWTH	5,65	10,75	11,31	9,15	11,79	8,71
38								
39	TIRES	1967=100	126,3	132,0	139,9	146,9	153,5	158,9
40		%GROWTH	6,67	4,51	5,98	5,00	4,49	3,52
41								
42	MOTOR OIL	1967=100	155,3	163,7	173,5	182,8	194,0	205,0
43		%GROWTH	6,74	5,42	5,99	5,37	6,10	5,46
44								
45	PARKING FEES	1967=100	172,1	189,1	205,7	222,1	240,6	259,5
46		%GROWTH	8,31	9,85	8,79	8,01	8,30	7,86

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2.02 ECONOMIC VARIABLES

LINE	ITEM		1981	1982	1983	1984	1985	1986
1	GENERAL:							
2	PERSONAL INCOME	BILL CURR $	2144.50	2311.40	2485.70	2671.00	2868.50	3054.70
3		%GROWTH	8.53	7.78	7.54	7.45	7.39	6.50
4								
5	PERSONAL INCOME TAXES	BILL CURR $	365.10	406.80	446.70	489.20	530.00	565.10
6		%GROWTH	12.27	11.42	9.81	9.51	8.34	6.62
7								
8	TRANSFER PAYMENTS	BILL CURR $	274.60	295.00	318.30	342.40	371.20	395.00
9		%GROWTH	6.68	7.43	7.90	7.57	8.41	6.41
10								
11	EMPLOYMENT	THOU PERSONS	98807.	100118.	101293.	102530.	103737.	105244.
12		%GROWTH	1.70	1.33	1.17	1.22	1.18	1.45
13								
14	UNEMPLOYMENT RATE		4.90	4.90	5.10	5.10	5.20	5.10
15		%GROWTH	-5.77	0.0	4.08	0.0	1.96	-1.92
16								
17								
18	INTEREST RATES:							
19								
20	MAXIMUM PASSBOOK SAVINGS	PERCENT	5.50	5.50	5.50	5.50	5.50	5.50
21		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
22								
23	CONSUMER INSTALL. CREDIT RATE.							
24	NEW AUTOS	PERCENT	10.70	10.56	10.43	10.23	10.10	9.97
25		%GROWTH	-0.62	-1.29	-1.25	-1.91	-1.30	-1.31
26								
27								
28	CONSUMER PRICE INDICES:							
29								
30	TOTAL	1967=100	220.6	230.2	241.0	251.0	261.2	271.0
31		%GROWTH	4.39	4.40	4.65	4.17	4.07	3.76
32								
33	AUTO REPAIRS	1967=100	271.3	286.3	302.7	319.6	336.3	353.0
34		%GROWTH	6.24	5.55	5.70	5.61	5.21	4.97
35								
36	AUTO INSURANCE PREMIUMS	1967=100	254.1	271.6	290.7	307.0	324.0	340.7
37		%GROWTH	6.49	6.88	7.05	5.62	5.52	5.16
38								
39	TIRES	1967=100	164.4	170.2	176.2	182.3	188.7	194.4
40		%GROWTH	3.46	3.53	3.53	3.46	3.51	3.02
41								
42	MOTOR OIL	1967=100	214.1	223.7	234.3	244.2	254.3	264.1
43		%GROWTH	4.46	4.48	4.73	4.24	4.14	3.82
44								
45	PARKING FEES	1967=100	275.6	290.6	306.5	321.7	336.1	350.4
46		%GROWTH	6.20	5.46	5.46	4.97	4.49	4.23

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2,02 ECONOMIC VARIABLES

LINE	I T E M		1987	1988	1989	1990	1991	1992
1	GENERAL:							
2	PERSONAL INCOME	BILL CURR $	3253,50	3465,00	3690,20	3930,10	4165,90	4415,80
3		%GROWTH	6,50	6,50	6,50	6,50	6,00	6,00
4								
5	PERSONAL INCOME TAXES	BILL CURR $	602,40	642,10	684,50	729,70	774,20	821,40
6		%GROWTH	6,60	6,59	6,60	6,60	6,10	6,10
7								
8	TRANSFER PAYMENTS	BILL CURR $	420,20	447,10	475,70	506,20	537,10	569,80
9		%GROWTH	6,38	6,40	6,40	6,41	6,10	6,09
10								
11	EMPLOYMENT	THOU PERSONS	106702,	108184,	109365,	110496,	111072,	111668,
12		%GROWTH	1,39	1,39	1,11	1,02	0,52	0,54
13								
14	UNEMPLOYMENT RATE		4,90	4,60	4,30	4,00	4,00	3,90
15		%GROWTH	-3,92	-6,12	-6,52	-6,98	0,0	-2,50
16								
17								
18	INTEREST RATES:							
19								
20	MAXIMUM PASSBOOK SAVINGS	PERCENT	5,50	5,50	5,50	5,50	5,50	5,50
21		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
22								
23	CONSUMER INSTALL, CREDIT RATE,							
24	NEW AUTOS	PERCENT	9,97	9,97	9,97	9,97	9,90	9,90
25		%GROWTH	0,0	0,0	0,0	0,0	-0,66	0,0
26								
27								
28	CONSUMER PRICE INDICES:							
29								
30	TOTAL	1967=100	281,1	291,6	302,4	313,7	323,8	334,2
31		%GROWTH	3,73	3,71	3,73	3,74	3,21	3,20
32								
33	AUTO REPAIRS	1967=100	369,7	387,1	405,2	424,3	443,1	461,0
34		%GROWTH	4,73	4,70	4,69	4,72	4,43	4,04
35								
36	AUTO INSURANCE PREMIUMS	1967=100	358,4	377,3	396,9	417,9	435,7	455,2
37		%GROWTH	5,21	5,25	5,19	5,30	4,27	4,46
38								
39	TIRES	1967=100	200,2	206,2	212,4	218,8	225,4	232,1
40		%GROWTH	2,98	3,00	3,01	3,01	3,02	2,97
41								
42	MOTOR OIL	1967=100	274,1	284,4	295,2	306,5	316,5	326,8
43		%GROWTH	3,80	3,78	3,79	3,80	3,27	3,26
44								
45	PARKING FEES	1967=100	364,7	379,7	395,2	411,5	427,0	442,0
46		%GROWTH	4,10	4,10	4,09	4,11	3,76	3,51

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2,02 ECONOMIC VARIABLES

LINE	ITEM		1993	1994	1995	1996	1997	1998
1	GENERAL:							
2	PERSONAL INCOME	BILL CURR $	4680,80	4961,60	5259,30	5574,90	5909,40	6264,00
3		%GROWTH	6,00	6,00	6,00	6,00	6,00	6,00
4								
5	PERSONAL INCOME TAXES	BILL CURR $	871,50	924,70	981,10	1041,00	1104,50	1171,80
6		%GROWTH	6,10	6,10	6,10	6,11	6,10	6,09
7								
8	TRANSFER PAYMENTS	BILL CURR $	604,60	641,50	680,60	722,10	766,20	812,90
9		%GROWTH	6,11	6,10	6,10	6,10	6,11	6,09
10								
11	EMPLOYMENT	THOU PERSONS	112169,	112064,	113463,	114256,	114835,	115630,
12		%GROWTH	0,45	0,62	-,53	0,70	0,51	0,69
13								
14	UNEMPLOYMENT RATE		3,80	3,70	3,60	3,50	3,50	3,40
15		%GROWTH	-2,56	-2,63	-2,70	-2,78	0,0	-2,86
16								
17								
18	INTEREST RATES:							
19								
20	MAXIMUM PASSBOOK SAVINGS	PERCENT	5,50	5,50	5,50	5,50	5,50	5,50
21		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
22								
23	CONSUMER INSTALL, CREDIT RATE,							
24	NEW AUTOS	PERCENT	9,90	9,90	9,90	9,90	9,70	9,90
25		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
26								
27								
28	CONSUMER PRICE INDICES:							
29								
30	TOTAL	1967=100	345,0	355,9	367,4	379,1	391,3	403,8
31		%GROWTH	3,23	3,18	3,21	3,19	3,22	3,19
32								
33	AUTO REPAIRS	1967=100	479,7	499,2	519,3	540,3	562,1	584,9
34		%GROWTH	4,06	4,05	4,03	4,04	4,04	4,05
35								
36	AUTO INSURANCE PREMIUMS	1967=100	475,4	496,9	519,0	542,4	566,6	592,1
37		%GROWTH	4,45	4,50	4,47	4,51	4,46	4,50
38								
39	TIRES	1967=100	239,1	246,3	253,6	261,3	269,1	277,2
40		%GROWTH	3,02	3,01	2,96	3,04	2,99	3,01
41								
42	MOTOR OIL	1967=100	337,6	348,5	359,9	371,6	383,7	396,2
43		%GROWTH	3,30	3,24	3,27	3,25	3,28	3,25
44								
45	PARKING FEES	1967=100	457,4	473,5	490,2	507,4	525,3	543,6
46		%GROWTH	3,50	3,51	3,52	3,52	3,52	3,52

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2.02 ECONOMIC VARIABLES

LINE	ITEM		1999	2000
1	GENERAL:			
2	PERSONAL INCOME	BILL CURR $	6639.80	7038.20
3		%GROWTH	6.00	6.00
4				
5	PERSONAL INCOME TAXES	BILL CURR $	1243.30	1319.20
6		%GROWTH	6.10	6.10
7				
8	TRANSFER PAYMENTS	BILL CURR $	862.50	915.10
9		%GROWTH	6.10	6.10
10				
11	EMPLOYMENT	THOU PERSONS	116427.	117128.
12		%GROWTH	0.69	0.60
13				
14	UNEMPLOYMENT RATE		3.30	3.20
15		%GROWTH	-2.94	-3.03
16				
17				
18	INTEREST RATES:			
19				
20	MAXIMUM PASSBOOK SAVINGS	PERCENT	5.50	5.50
21		%GROWTH	0.0	0.0
22				
23	CONSUMER INSTALL, CREDIT RATE,			
24	NEW AUTOS	PERCENT	9.90	9.90
25		%GROWTH	0.0	0.0
26				
27				
28	CONSUMER PRICE INDICES:			
29				
30	TOTAL	1967=100	416.8	430.0
31		%GROWTH	3.21	3.18
32				
33	AUTO REPAIRS	1967=100	608.5	633.1
34		%GROWTH	4.04	4.04
35				
36	AUTO INSURANCE PREMIUMS	1967=100	618.5	646.1
37		%GROWTH	4.45	4.47
38				
39	TIRES	1967=100	285.5	294.0
40		%GROWTH	2.99	2.98
41				
42	MOTOR OIL	1967=100	409.1	422.4
43		%GROWTH	3.27	3.24
44				
45	PARKING FEES	1967=100	562.8	582.6
46		%GROWTH	3.51	3.50

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2,03 ECONOMIC VARIABLES

LINE	ITEM		1975	1976	1977	1978	1979	1980
1	AUTO TAXES:							
2								
3	PURCHASE TAX, ALL CLASSES	PERCENT	4,59	4,62	4,71	4,80	4,88	4,97
4		%GROWTH	1,57	1,84	1,84	1,84	1,84	1,84
5								
6	SUBCOMPACT	RATE	0,0	0,0	0,0	0,0	0,0	0,0
7		%GROWTH						
8								
9	COMPACT	RATE	0,0	0,0	0,0	0,0	0,0	0,0
10		%GROWTH						
11								
12	MID-SIZE	RATE	0,0	0,0	0,0	0,0	0,0	0,0
13		%GROWTH						
14								
15	FULL SIZE	RATE	0,0	0,0	0,0	0,0	0,0	0,0
16		%GROWTH						
17								
18	LUXURY	RATE	0,0	0,0	0,0	0,0	0,0	0,0
19		%GROWTH						
20								
21								
22	OWNERSHIP TAX, ALL CLASSES	RATE	0,0	0,0	0,0	0,0	0,0	0,0
23		%GROWTH						
24								
25	SUBCOMPACT	RATE	0,0	0,0	0,0	0,0	0,0	0,0
26		%GROWTH						
27								
28	COMPACT	RATE	0,0	0,0	0,0	0,0	0,0	0,0
29		%GROWTH						
30								
31	MID-SIZE	RATE	0,0	0,0	0,0	0,0	0,0	0,0
32		%GROWTH						
33								
34	FULL SIZE	RATE	0,0	0,0	0,0	0,0	0,0	0,0
35		%GROWTH						
36								
37	LUXURY	RATE	0,0	0,0	0,0	0,0	0,0	0,0
38		%GROWTH						
39								
40								
41	AUTOMOBILE STRIKE DUMMY		0,0	0,0	0,0	0,0	0,0	0,0

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2,03 ECONOMIC VARIABLES - CONTINUED

LINE	I T E M		1981	1982	1983	1984	1985	1986
1	AUTO TAXES:							
2								
3	PURCHASE TAX; ALL CLASSES	PERCENT	5,07	5,16	5,25	5,35	5,45	5,55
4		%GROWTH	1,84	1,85	1,84	1,84	1,84	1,84
5								
6	SUBCOMPACT	RATE	0,0	0,0	0,0	0,0	0,0	0,0
7		%GROWTH						
8								
9	COMPACT	RATE	0,0	0,0	0,0	0,0	0,0	0,0
10		%GROWTH						
11								
12	MID-SIZE	RATE	0,0	0,0	0,0	0,0	0,0	0,0
13		%GROWTH						
14								
15	FULL SIZE	RATE	0,0	0,0	0,0	0,0	0,0	0,0
16		%GROWTH						
17								
18	LUXURY	RATE	0,0	0,0	0,0	0,0	0,0	0,0
19		%GROWTH						
20								
21								
22	OWNERSHIP TAX; ALL CLASSES	RATE	0,0	0,0	0,0	0,0	0,0	0,0
23		%GROWTH						
24								
25	SUBCOMPACT	RATE	0,0	0,0	0,0	0,0	0,0	0,0
26		%GROWTH						
27								
28	COMPACT	RATE	0,0	0,0	0,0	0,0	0,0	0,0
29		%GROWTH						
30								
31	MID-SIZE	RATE	0,0	0,0	0,0	0,0	0,0	0,0
32		%GROWTH						
33								
34	FULL SIZE	RATE	0,0	0,0	0,0	0,0	0,0	0,0
35		%GROWTH						
36								
37	LUXURY	RATE	0,0	0,0	0,0	0,0	0,0	0,0
38		%GROWTH						
39								
40								
41	AUTOMOBILE STRIKE DUMMY		0,0	0,0	0,0	0,0	0,0	0,0

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2.03 ECONOMIC VARIABLES - CONTINUED

LINE	ITEM		1987	1988	1989	1990	1991	1992
1	AUTO TAXES:							
2								
3	PURCHASE TAX, ALL CLASSES	PERCENT	5.65	5.76	5.86	5.97	6.08	6.19
4		%GROWTH	1.89	1.84	1.84	1.85	1.84	1.84
5								
6	SUBCOMPACT	RATE	0.0	0.0	0.0	0.0	0.0	0.0
7		%GROWTH						
8								
9	COMPACT	RATE	0.0	0.0	0.0	0.0	0.0	0.0
10		%GROWTH						
11								
12	MID-SIZE	RATE	0.0	0.0	0.0	0.0	0.0	0.0
13		%GROWTH						
14								
15	FULL SIZE	RATE	0.0	0.0	0.0	0.0	0.0	0.0
16		%GROWTH						
17								
18	LUXURY	RATE	0.0	0.0	0.0	0.0	0.0	0.0
19		%GROWTH						
20								
21								
22	OWNERSHIP TAX, ALL CLASSES	RATE	0.0	0.0	0.0	0.0	0.0	0.0
23		%GROWTH						
24								
25	SUBCOMPACT	RATE	0.0	0.0	0.0	0.0	0.0	0.0
26		%GROWTH						
27								
28	COMPACT	RATE	0.0	0.0	0.0	0.0	0.0	0.0
29		%GROWTH						
30								
31	MID-SIZE	RATE	0.0	0.0	0.0	0.0	0.0	0.0
32		%GROWTH						
33								
34	FULL SIZE	RATE	0.0	0.0	0.0	0.0	0.0	0.0
35		%GROWTH						
36								
37	LUXURY	RATE	0.0	0.0	0.0	0.0	0.0	0.0
38		%GROWTH						
39								
40								
41	AUTOMOBILE STRIKE DUMMY		0.0	0.0	0.0	0.0	0.0	0.0

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2,03 ECONOMIC VARIABLES - CONTINUED

LINE	ITEM		1993	1994	1995	1996	1997	1998
1	AUTO TAXES:							
2								
3	PURCHASE TAX: ALL CLASSES	PERCENT	6,31	6,42	6,54	6,66	6,78	6,91
4		%GROWTH	1,84	1,84	1,84	1,84	1,84	1,80
5								
6	SUBCOMPACT	RATE	0,0	0,0	0,0	0,0	0,0	0,0
7		%GROWTH						
8								
9	COMPACT	RATE	0,0	0,0	0,0	0,0	0,0	0,0
10		%GROWTH						
11								
12	MID-SIZE	RATE	0,0	0,0	0,0	0,0	0,0	0,0
13		%GROWTH						
14								
15	FULL SIZE	RATE	0,0	0,0	0,0	0,0	0,0	0,0
16		%GROWTH						
17								
18	LUXURY	RATE	0,0	0,0	0,0	0,0	0,0	0,0
19		%GROWTH						
20								
21								
22	OWNERSHIP TAX: ALL CLASSES	RATE	0,0	0,0	0,0	0,0	0,0	0,0
23		%GROWTH						
24								
25	SUBCOMPACT	RATE	0,0	0,0	0,0	0,0	0,0	0,0
26		%GROWTH						
27								
28	COMPACT	RATE	0,0	0,0	0,0	0,0	0,0	0,0
29		%GROWTH						
30								
31	MID-SIZE	RATE	0,0	0,0	0,0	0,0	0,0	0,0
32		%GROWTH						
33								
34	FULL SIZE	RATE	0,0	0,0	0,0	0,0	0,0	0,0
35		%GROWTH						
36								
37	LUXURY	RATE	0,0	0,0	0,0	0,0	0,0	0,0
38		%GROWTH						
39								
40								
41	AUTOMOBILE STRIKE DUMMY		0,0	0,0	0,0	0,0	0,0	0,0

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2.03 ECONOMIC VARIABLES - CONTINUED

LINE	I T E M		1999	2000
1	AUTO TAXES:			
2				
3	PURCHASE TAX: ALL CLASSES	PERCENT	7.04	7.17
4		%GROWTH	1.84	1.8[illegible]
5				
6	SUBCOMPACT	RATE	0.0	0.0
7		%GROWTH		
8				
9	COMPACT	RATE	0.0	0.0
10		%GROWTH		
11				
12	MID-SIZE	RATE	0.0	0.0
13		%GROWTH		
14				
15	FULL SIZE	RATE	0.0	0.0
16		%GROWTH		
17				
18	LUXURY	RATE	0.0	0.0
19		%GROWTH		
20				
21				
22	OWNERSHIP TAX: ALL CLASSES	RATE	0.0	0.0
23		%GROWTH		
24				
25	SUBCOMPACT	RATE	0.0	0.0
26		%GROWTH		
27				
28	COMPACT	RATE	0.0	0.0
29		%GROWTH		
30				
31	MID-SIZE	RATE	0.0	0.0
32		%GROWTH		
33				
34	FULL SIZE	RATE	0.0	0.0
35		%GROWTH		
36				
37	LUXURY	RATE	0.0	0.0
38		%GROWTH		
39				
40				
41	AUTOMOBILE STRIKE DUMMY		0.0	0.0

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2.04 ECONOMIC VARIABLES

LINE	ITEM		1975	1976	1977	1978	1979	1980
1	(OTHER COSTS AND PRICES)							
2								
3	DOM. AUTO INPUT PRICE INDEX	1972=100	126.1	134.8	143.0	152.6	161.9	170.5
4		%GROWTH	13.71	6.90	6.08	6.71	6.09	5.31
5								
6	FOR. AUTO EXPORT PRICE INDEX	1970=100	186.4	203.1	211.3	226.1	241.9	256.4
7		%GROWTH	12.03	8.96	4.04	7.00	6.99	5.99
8								
9	TRANSPORTATION PRICE INDEX	1972=100	121.7	123.8	126.4	130.0	136.8	142.5
10		%GROWTH	7.91	1.73	2.10	2.85	5.23	4.17
11								
12	RETAIL GASOLINE PRICE	$/GAL	0.561	0.585	0.626	0.683	0.733	0.786
13		%GROWTH	6.21	4.39	6.96	9.14	7.32	7.23
14								
15	STEEL SCRAP PRICE	$/GROSS TN	70.83	75.08	79.58	84.36	89.42	94.79
16		%GROWTH	-33.32	6.00	5.99	6.01	6.00	6.01

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2.04 ECONOMIC VARIABLES - CONTINUED

LINE	ITEM		1981	1982	1983	1984	1985	1986
1	(OTHER COSTS AND PRICES)							
2								
3	DOM. AUTO INPUT PRICE INDEX	1972=100	177.0	183.2	190.2	197.0	203.8	211.3
4		%GROWTH	3.81	3.50	3.82	3.58	3.45	3.68
5								
6	FOR. AUTO EXPORT PRICE INDEX	1970=100	268.0	280.0	292.6	305.8	319.6	333.9
7		%GROWTH	4.52	4.48	4.50	4.51	4.51	4.47
8								
9	TRANSPORTATION PRICE INDEX	1972=100	147.0	152.1	157.5	162.1	166.3	170.5
10		%GROWTH	3.16	3.47	3.55	2.92	2.59	2.53
11								
12	RETAIL GASOLINE PRICE	$/GAL	0.843	0.903	0.965	1.031	1.102	1.172
13		%GROWTH	7.22	7.11	6.82	6.84	6.90	6.34
14								
15	STEEL SCRAP PRICE	$/GROSS TON	99.53	104.50	109.73	115.21	120.97	125.81
16		%GROWTH	5.00	4.99	5.00	4.99	5.00	4.00

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2.04 ECONOMIC VARIABLES - CONTINUED

LINE	I T E M		1987	1988	1989	1990	1991	1992
1	(OTHER COSTS AND PRICES)							
2								
3	DOM. AUTO INPUT PRICE INDEX	1972=100	219,2	227,3	235,7	244,4	252,9	261,8
4		%GROWTH	3,74	3,70	3,70	3,69	3,48	3,52
5								
6	FOR. AUTO EXPORT PRICE. INDEX	1970=100	349,0	364,7	381,1	398,2	414,2	430,7
7		%GROWTH	4,52	4,50	4,50	4,49	4,02	3,98
8								
9	TRANSPORTATION PRICE INDEX	1972=100	174,7	179,1	183,6	188,1	192,9	197,7
10		%GROWTH	2,46	2,52	2,51	2,45	2,55	2,49
11								
12	RETAIL GASOLINE PRICE	$/GAL	1,241	1,315	1,394	1,477	1,557	1,632
13		%GROWTH	5,93	5,95	6,04	5,95	5,39	4,84
14								
15	STEEL SCRAP PRICE	$/GROSS TN	130,85	136,08	141,52	147,18	153,07	159,19
16		%GROWTH	4,01	4,00	4,00	4,00	4,00	4,00

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2,04 ECONOMIC VARIABLES - CONTINUED

LINE	ITEM		1993	1994	1995	1996	1997	1998
1	(OTHER COSTS AND PRICES)							
2								
3	DOM, AUTO INPUT PRICE INDEX	1972-100	271,0	280,4	290,3	299,8	309,7	320,0
4		%GROWTH	3,51	3,47	3,53	3,27	3,30	3,33
5								
6	FOR, AUTO EXPORT PRICE INDEX	1970=100	448,0	465,9	484,5	503,9	524,0	545,0
7		%GROWTH	4,02	4,00	3,99	4,00	3,99	4,01
8								
9	TRANSPORTATION PRICE INDEX	1972=100	202,6	207,7	212,9	218,2	223,6	229,2
10		%GROWTH	2,48	2,52	2,50	2,49	2,47	2,50
11								
12	RETAIL GASOLINE PRICE	$/GAL	1,712	1,796	1,888	1,976	2,073	2,175
13		%GROWTH	4,89	4,90	4,08	4,88	4,90	4,95
14								
15	STEEL SCRAP PRICE	$/GROSS TON	165,56	172,18	179,07	186,23	193,68	201,43
16		%GROWTH	4,00	4,00	4,00	4,00	4,00	4,00

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2.04 ECONOMIC VARIABLES - CONTINUED

LINE	ITEM		1999	2000
1	OTHER COSTS AND PRICES:			
3	DOM. AUTO INPUT PRICE INDEX	1972=100	330.5	341.4
4		%GROWTH	3.28	3.30
6	FOR. AUTO EXPORT PRICE INDEX	1970=100	566.8	589.5
7		%GROWTH	4.00	4.00
9	TRANSPORTATION PRICE INDEX	1972=100	235.0	240.8
10		%GROWTH	2.53	2.47
12	RETAIL GASOLINE PRICE	$/GAL	2.282	2.394
13		%GROWTH	4.89	4.95
15	STEEL SCRAP PRICE	$/GROSS TON	209.49	217.87
16		%GROWTH	4.00	4.00

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2,05 AUTO CHARACTERISTICS

LINE	I T E M		1975	1976	1977	1978	1979	1980
1	CURB WEIGHTS							
2								
3	SUBCOMPACT, DOMESTIC	POUNDS	2726.	2668.	2580.	2520.	2450.	2375.
4		%GROWTH	1,04	-2,13	-3,30	-2,33	-2,78	-3,06
5								
6	SUBCOMPACT, FOREIGN	POUNDS	2300.	2250.	2250.	2200.	2200.	2150.
7		%GROWTH	-0,38	-2,17	0,0	-2,22	0,0	-2,27
8								
9	COMPACT, DOMESTIC	POUNDS	3102.	3280.	3230.	3200.	3070.	2940.
10		%GROWTH	-1,15	-0,67	-1,52	-0,93	-4,06	-4,23
11								
12	COMPACT, FOREIGN	POUNDS	2800.	2750.	2750.	2700.	2700.	2650.
13		%GROWTH	0,29	-1,79	0,0	-1,82	0,0	-1,85
14								
15	MID-SIZE	POUNDS	4019.	3960.	3820.	3700.	3600.	3500.
16		%GROWTH	-0,46	-1,96	-3,54	-3,14	-2,70	-2,78
17								
18	FULL SIZE	POUNDS	4517.	4280.	4020.	3900.	3840.	3770.
19		%GROWTH	-1,49	-5,25	-6,07	-2,99	-1,54	-1,82
20								
21	LUXURY, DOMESTIC	POUNDS	4916.	4680.	4420.	4300.	4240.	4170.
22		%GROWTH	-1,07	-5,95	-5,56	-2,71	-1,40	-1,65
23								
24	LUXURY, FOREIGN	POUNDS	3200.	3200.	3200.	3200.	3150.	3150.
25		%GROWTH	-1,20	0,0	0,0	0,0	-1,56	0,0
26								
27	ENGINE DISPLACEMENT							
28								
29	SUBCOMPACT, DOMESTIC	CUBIC INCHES	164,5	162,4	158,0	151,2	142,1	133,0
30		%GROWTH	9,53	-1,28	-2,71	-4,30	-6,02	-6,40
31								
32	SUBCOMPACT, FOREIGN	CUBIC INCHES	98,9	94,5	92,3	88,0	88,0	87,0
33		%GROWTH	-1,81	-4,45	-2,33	-4,66	0,0	-1,14
34								
35	COMPACT, DOMESTIC	CUBIC INCHES	257,4	254,8	248,0	240,0	222,6	205,8
36		%GROWTH	-9,62	-1,01	-2,67	-3,23	-7,25	-7,55
37								
38	COMPACT, FOREIGN	CUBIC INCHES	112,0	111,0	110,0	109,0	108,0	106,0
39		%GROWTH	-1,24	-0,89	-0,90	-0,91	-0,92	-1,85
40								
41	MID-SIZE	CUBIC INCHES	329,5	324,5	318,0	296,0	279,0	262,5
42		%GROWTH	-2,55	-1,52	-2,00	-6,92	-5,74	-5,91
43								
44	FULL SIZE	CUBIC INCHES	391,9	377,0	359,8	335,4	318,7	301,6
45		%GROWTH	-2,28	-3,80	-4,56	-6,78	-4,98	-5,37
46								
47	LUXURY, DOMESTIC	CUBIC INCHES	461,1	445,0	418,0	395,6	377,4	350,6
48		%GROWTH	0,31	-3,49	-6,07	-5,36	-4,60	-0,98
49								
50	LUXURY, FOREIGN	CUBIC INCHES	179,2	176,0	172,8	169,6	163,8	160,7
51		%GROWTH	-2,47	-1,79	-1,82	-1,85	-3,42	-1,89

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2.05 AUTO CHARACTERISTICS

LINE	ITEM		1981	1982	1983	1984	1985	1986
1	CURB WEIGHT							
3	SUBCOMPACT, DOMESTIC	POUNDS	2300.	2250.	2200.	2150.	2100.	2070.
4		%GROWTH	-3.16	-2.17	-2.22	-2.27	-2.33	-1.43
6	SUBCOMPACT, FOREIGN	POUNDS	2150.	2100.	2100.	2050.	2050.	2000.
7		%GROWTH	0.0	-2.33	0.0	-2.38	0.0	-2.44
9	COMPACT, DOMESTIC	POUNDS	2800.	2725.	2650.	2575.	2500.	2460.
10		%GROWTH	-4.76	-2.68	-2.75	-2.83	-2.91	-1.60
12	COMPACT, FOREIGN	POUNDS	2600.	2550.	2500.	2450.	2400.	2350.
13		%GROWTH	-1.89	-1.92	-1.96	-2.00	-2.04	-2.08
15	MID-SIZE	POUNDS	3400.	3300.	3200.	3100.	3000.	2960.
16		%GROWTH	-2.86	-2.94	-3.03	-3.13	-3.23	-1.33
18	FULL SIZE	POUNDS	3700.	3580.	3460.	3330.	3200.	3160.
19		%GROWTH	-1.86	-3.24	-3.35	-3.76	-3.90	-1.25
21	LUXURY, DOMESTIC	POUNDS	4100.	3950.	3800.	3650.	3500.	3460.
22		%GROWTH	-1.68	-3.66	-3.80	-3.95	-4.11	-1.14
24	LUXURY, FOREIGN	POUNDS	3100.	3100.	3050.	3050.	3000.	3000.
25		%GROWTH	-1.59	0.0	-1.61	0.0	-1.64	0.0
27	ENGINE DISPLACEMENT							
29	SUBCOMPACT, DOMESTIC	CUBIC INCHES	124.2	117.0	110.0	107.5	105.0	103.5
30		%GROWTH	-6.62	-5.80	-5.98	-2.27	-2.33	-1.43
32	SUBCOMPACT, FOREIGN	CUBIC INCHES	86.0	85.0	84.0	83.0	82.0	81.0
33		%GROWTH	-1.15	-1.16	-1.18	-1.19	-1.20	-1.22
35	COMPACT, DOMESTIC	CUBIC INCHES	189.0	177.1	165.6	154.5	150.0	147.6
36		%GROWTH	-8.16	-6.30	-6.49	-6.70	-2.91	-1.60
38	COMPACT, FOREIGN	CUBIC INCHES	104.0	102.0	100.0	98.0	96.0	94.0
39		%GROWTH	-1.89	-1.92	-1.96	-2.00	-2.04	-2.08
41	MID-SIZE	CUBIC INCHES	246.5	231.0	216.0	201.5	195.0	192.4
42		%GROWTH	-6.10	-6.29	-6.49	-6.71	-3.23	-1.33
44	FULL SIZE	CUBIC INCHES	286.8	268.5	250.9	233.1	224.0	221.2
45		%GROWTH	-4.91	-6.38	-6.55	-7.09	-3.90	-1.25
47	LUXURY, DOMESTIC	CUBIC INCHES	340.3	316.0	294.5	273.8	262.5	259.5
48		%GROWTH	-5.10	-7.14	-6.80	-7.03	-4.13	-1.14
50	LUXURY, FOREIGN	CUBIC INCHES	158.0	155.0	153.8	152.5	151.3	150.0
51		%GROWTH	-1.68	-1.90	-0.77	-0.85	-0.79	-0.86

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2,05 AUTO CHARACTERISTICS

LINE	I T E M		1987	1988	1989	1990	1991	1992
1	CURB WEIGHT:							
2								
3	SUBCOMPACT, DOMESTIC	POUNDS	2040,	2000,	1950,	1900,	1900,	1900,
4		%GROWTH	-1,45	-1,96	-2,50	-2,56	0,0	0,0
5								
6	SUBCOMPACT, FOREIGN	POUNDS	2000,	1950,	1950,	1900,	1900,	1900,
7		%GROWTH	0,0	-2,50	0,0	-2,56	0,0	0,0
8								
9	COMPACT, DOMESTIC	POUNDS	2420,	2380,	2340,	2300,	2300,	2300,
10		%GROWTH	-1,63	-1,65	-1,68	-1,71	0,0	0,0
11								
12	COMPACT, FOREIGN	POUNDS	2300,	2250,	2200,	2200,	2200,	2200,
13		%GROWTH	-2,13	-2,17	-2,22	0,0	0,0	0,0
14								
15	MID-SIZE	POUNDS	2920,	2880,	2840,	2800,	2800,	2800,
16		%GROWTH	-1,35	-1,37	-1,39	-1,41	0,0	0,0
17								
18	FULL SIZE	POUNDS	3120,	3080,	3040,	3000,	3000,	3000,
19		%GROWTH	-1,27	-1,28	-1,30	-1,32	0,0	0,0
20								
21	LUXURY, DOMESTIC	POUNDS	3420,	3380,	3340,	3300,	3300,	3300,
22		%GROWTH	-1,16	-1,17	-1,18	-1,20	0,0	0,0
23								
24	LUXURY, FOREIGN	POUNDS	2950,	2950,	2900,	2900,	2900,	2900,
25		%GROWTH	-1,67	0,0	-1,69	0,0	0,0	0,0
26								
27	ENGINE DISPLACEMENT:							
28								
29	SUBCOMPACT, DOMESTIC	CUBIC INCHES	102,0	100,0	97,5	95,0	95,0	95,0
30		%GROWTH	-1,45	-1,96	-2,50	-2,56	0,0	0,0
31								
32	SUBCOMPACT, FOREIGN	CUBIC INCHES	80,0	80,0	80,0	80,0	80,0	80,0
33		%GROWTH	-1,23	0,0	0,0	0,0	0,0	0,0
34								
35	COMPACT, DOMESTIC	CUBIC INCHES	145,2	142,8	140,4	138,0	138,0	138,0
36		%GROWTH	-1,63	-1,65	-1,68	-1,71	0,0	0,0
37								
38	COMPACT, FOREIGN	CUBIC INCHES	92,0	90,0	88,0	88,0	88,0	88,0
39		%GROWTH	-2,13	-2,17	-2,22	0,0	0,0	0,0
40								
41	MID-SIZE	CUBIC INCHES	189,8	187,2	184,6	182,0	182,0	182,0
42		%GROWTH	-1,35	-1,37	-1,39	-1,41	0,0	0,0
43								
44	FULL SIZE	CUBIC INCHES	218,4	215,6	212,8	210,0	210,0	210,0
45		%GROWTH	-1,27	-1,28	-1,30	-1,32	0,0	0,0
46								
47	LUXURY, DOMESTIC	CUBIC INCHES	256,5	253,5	250,5	247,5	247,5	247,5
48		%GROWTH	-1,16	-1,17	-1,18	-1,20	0,0	0,0
49								
50	LUXURY, FOREIGN	CUBIC INCHES	148,8	147,5	146,3	145,0	145,0	145,0
51		%GROWTH	-0,80	-0,87	-0,81	-0,89	0,0	0,0

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2.05 AUTO CHARACTERISTICS

LINE	ITEM		1993	1994	1995	1996	1997	1998
1	CURB WEIGHT							
2								
3	SUBCOMPACT, DOMESTIC	POUNDS	1900.	1900.	1900.	1900.	1900.	1900.
4		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
5								
6	SUBCOMPACT, FOREIGN	POUNDS	1900.	1900.	1900.	1900.	1900.	1900.
7		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
8								
9	COMPACT, DOMESTIC	POUNDS	2300.	2300.	2300.	2300.	2300.	2300.
10		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
11								
12	COMPACT, FOREIGN	POUNDS	2206.	2200.	2200.	2200.	2200.	2200.
13		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
14								
15	MID-SIZE	POUNDS	2800.	2800.	2800.	2800.	2800.	2800.
16		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
17								
18	FULL SIZE	POUNDS	3000.	3000.	3000.	3000.	3000.	3000.
19		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
20								
21	LUXURY, DOMESTIC	POUNDS	3300.	3300.	3300.	3300.	3300.	3300.
22		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
23								
24	LUXURY, FOREIGN	POUNDS	2900.	2900.	2900.	2900.	2900.	2900.
25		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
26								
27	ENGINE DISPLACEMENT							
28								
29	SUBCOMPACT, DOMESTIC	CUBIC INCHES	95.0	95.0	95.0	95.0	95.0	95.0
30		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
31								
32	SUBCOMPACT, FOREIGN	CUBIC INCHES	80.0	80.0	80.0	80.0	80.0	80.0
33		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
34								
35	COMPACT, DOMESTIC	CUBIC INCHES	138.0	138.0	138.0	138.0	138.0	138.0
36		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
37								
38	COMPACT, FOREIGN	CUBIC INCHES	88.0	88.0	88.0	88.0	88.0	88.0
39		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
40								
41	MID-SIZE	CUBIC INCHES	182.0	182.0	182.0	182.0	182.0	182.0
42		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
43								
44	FULL SIZE	CUBIC INCHES	210.0	210.0	210.0	210.0	210.0	210.0
45		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
46								
47	LUXURY, DOMESTIC	CUBIC INCHES	247.5	247.5	247.5	247.5	247.5	247.5
48		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
49								
50	LUXURY, FOREIGN	CUBIC INCHES	145.0	145.0	145.0	145.0	145.0	145.0
51		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2.05 AUTO CHARACTERISTICS

LINE	ITEM		1999	2000
1	CURB WEIGHT			
3	SUBCOMPACT, DOMESTIC	POUNDS	1900.	1900.
4		%GROWTH	0.0	0.0
6	SUBCOMPACT, FOREIGN	POUNDS	1900.	1900.
7		%GROWTH	0.0	0.0
9	COMPACT, DOMESTIC	POUNDS	2300.	2300.
10		%GROWTH	0.0	0.0
12	COMPACT, FOREIGN	POUNDS	2200.	2200.
13		%GROWTH	0.0	0.0
15	MID-SIZE	POUNDS	2800.	2800.
16		%GROWTH	0.0	0.0
18	FULL SIZE	POUNDS	3000.	3000.
19		%GROWTH	0.0	0.0
21	LUXURY, DOMESTIC	POUNDS	3300.	3300.
22		%GROWTH	0.0	0.0
24	LUXURY, FOREIGN	POUNDS	2900.	2900.
25		%GROWTH	0.0	0.0
27	ENGINE DISPLACEMENT			
29	SUBCOMPACT, DOMESTIC	CUBIC INCHES	95.0	95.0
30		%GROWTH	0.0	0.0
32	SUBCOMPACT, FOREIGN	CUBIC INCHES	80.0	80.0
33		%GROWTH	0.0	0.0
35	COMPACT, DOMESTIC	CUBIC INCHES	138.0	138.0
36		%GROWTH	0.0	0.0
38	COMPACT, FOREIGN	CUBIC INCHES	88.0	88.0
39		%GROWTH	0.0	0.0
41	MID-SIZE	CUBIC INCHES	182.0	182.0
42		%GROWTH	0.0	0.0
44	FULL SIZE	CUBIC INCHES	210.0	210.0
45		%GROWTH	0.0	0.0
47	LUXURY, DOMESTIC	CUBIC INCHES	247.5	247.5
48		%GROWTH	0.0	0.0
50	LUXURY, FOREIGN	CUBIC INCHES	145.0	145.0
51		%GROWTH	0.0	0.0

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2,06 AUTO CHARACTERISTICS

LINE	ITEM		1975	1976	1977	1978	1979	1980
1	FRACTION WITH AUTOMATIC TRANSMISSION							
2								
3	SUBCOMPACT, DOMESTIC	FRACTION	0,590	0,583	0,578	0,575	0,570	0,560
4		%GROWTH	2,48	-1,19	-0,86	-0,52	-0,87	-1,75
5								
6	SUBCOMPACT, FOREIGN	FRACTION	0,576	0,576	0,576	0,576	0,576	0,576
7		%GROWTH	0,00	0,0	0,0	0,0	0,0	0,0
8								
9	COMPACT, DOMESTIC	FRACTION	0,915	0,914	0,911	0,909	0,890	0,850
10		%GROWTH	2,40	-0,11	-0,33	-0,22	-3,19	-4,55
11								
12	COMPACT, FOREIGN	FRACTION	0,794	0,794	0,794	0,794	0,794	0,794
13		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
14								
15	MID-SIZE	FRACTION	0,995	0,995	0,995	0,995	0,998	0,992
16		%GROWTH	1,08	0,0	0,0	0,0	-0,10	-0,20
17								
18	FULL SIZE	FRACTION	0,999	0,999	0,999	0,999	0,998	0,997
19		%GROWTH	-0,02	0,0	0,0	0,0	-0,10	-0,10
20								
21	LUXURY, DOMESTIC	FRACTION	0,985	0,985	0,965	0,985	0,985	0,785
22		%GROWTH	0,02	0,0	0,0	0,0	0,0	0,0
23								
24	LUXURY, FOREIGN	FRACTION	0,884	0,884	0,884	0,884	0,884	0,884
25		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
26								
27	FRACTION WITH OVERDRIVE							
28								
29	SUBCOMPACT, DOMESTIC	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
30		%GROWTH						
31								
32	SUBCOMPACT, FOREIGN	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
33		%GROWTH						
34								
35	COMPACT, DOMESTIC	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
36		%GROWTH						
37								
38	COMPACT, FOREIGN	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
39		%GROWTH						
40								
41	MID-SIZE	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
42		%GROWTH						
43								
44	FULL SIZE	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
45		%GROWTH						
46								
47	LUXURY, DOMESTIC	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
48		%GROWTH						
49								
50	LUXURY, FOREIGN	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
51		%GROWTH						

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2,06 AUTO CHARACTERISTICS - CONTINUED

LINE	I T E M		1981	1982	1983	1984	1985	1986
1	FRACTION WITH AUTOMATIC TRANSMISSION							
2								
3	SUBCOMPACT, DOMESTIC	FRACTION	0,550	0,550	0,550	0,550	0,550	0,550
4		%GROWTH	-1,79	0,0	0,0	0,0	0,0	0,0
5								
6	SUBCOMPACT, FOREIGN	FRACTION	0,576	0,576	0,576	0,576	0,576	0,576
7		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
8								
9	COMPACT, DOMESTIC	FRACTION	0,800	0,800	0,800	0,800	0,800	0,800
10		%GROWTH	-4,76	0,0	0,0	0,0	0,0	0,0
11								
12	COMPACT, FOREIGN	FRACTION	0,794	0,794	0,794	0,794	0,794	0,794
13		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
14								
15	MID-SIZE	FRACTION	0,990	0,990	0,990	0,990	0,990	0,990
16		%GROWTH	-0,20	0,0	0,0	0,0	0,0	0,0
17								
18	FULL SIZE	FRACTION	0,995	0,995	0,995	0,995	0,995	0,995
19		%GROWTH	-0,20	0,0	0,0	0,0	0,0	0,0
20								
21	LUXURY, DOMESTIC	FRACTION	0,985	0,985	0,985	0,985	0,985	0,985
22		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
23								
24	LUXURY, FOREIGN	FRACTION	0,884	0,884	0,884	0,884	0,884	0,884
25		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
26								
27	FRACTION WITH OVERDRIVE							
28								
29	SUBCOMPACT, DOMESTIC	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
30		%GROWTH						
31								
32	SUBCOMPACT, FOREIGN	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
33		%GROWTH						
34								
35	COMPACT, DOMESTIC	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
36		%GROWTH						
37								
38	COMPACT, FOREIGN	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
39		%GROWTH						
40								
41	MID-SIZE	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
42		%GROWTH						
43								
44	FULL SIZE	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
45		%GROWTH						
46								
47	LUXURY, DOMESTIC	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
48		%GROWTH						
49								
50	LUXURY, FOREIGN	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
51		%GROWTH						

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2,05 AUTO CHARACTERISTICS - CONTINUED

LINE	I T E M		1987	1988	1989	1990	1991	1992
1	FRACTION WITH AUTOMATIC TRANSMISSION:							
2								
3	SUBCOMPACT, DOMESTIC	FRACTION	0,550	0,550	0,550	0,550	0,550	0,550
4		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
5								
6	SUBCOMPACT, FOREIGN	FRACTION	0,576	0,576	0,576	0,576	0,576	0,576
7		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
8								
9	COMPACT, DOMESTIC	FRACTION	0,800	0,800	0,800	0,800	0,800	0,800
10		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
11								
12	COMPACT, FOREIGN	FRACTION	0,798	0,798	0,798	0,798	0,798	0,798
13		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
14								
15	MID-SIZE	FRACTION	0,990	0,990	0,990	0,990	0,990	0,790
16		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
17								
18	FULL SIZE	FRACTION	0,995	0,995	0,995	0,995	0,995	0,995
19		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
20								
21	LUXURY, DOMESTIC	FRACTION	0,985	0,985	0,985	0,985	0,985	0,985
22		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
23								
24	LUXURY, FOREIGN	FRACTION	0,884	0,884	0,884	0,884	0,884	0,884
25		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
26								
27	FRACTION WITH OVERDRIVE:							
28								
29	SUBCOMPACT, DOMESTIC	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
30		%GROWTH						
31								
32	SUBCOMPACT, FOREIGN	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
33		%GROWTH						
34								
35	COMPACT, DOMESTIC	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
36		%GROWTH						
37								
38	COMPACT, FOREIGN	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
39		%GROWTH						
40								
41	MID-SIZE	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
42		%GROWTH						
43								
44	FULL SIZE	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
45		%GROWTH						
46								
47	LUXURY, DOMESTIC	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
48		%GROWTH						
49								
50	LUXURY, FOREIGN	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
51		%GROWTH						

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2,06 AUTO CHARACTERISTICS - CONTINUED

LINE	ITEM		1993	1994	1995	1996	1997	1998
1	FRACTION WITH AUTOMATIC TRANSMISSION							
2								
3	SUBCOMPACT, DOMESTIC	FRACTION	0,550	0,550	0,550	0,550	0,550	0,550
4		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
5								
6	SUBCOMPACT, FOREIGN	FRACTION	0,576	0,576	0,576	0,576	0,576	0,576
7		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
8								
9	COMPACT, DOMESTIC	FRACTION	0,800	0,800	0,800	0,800	0,800	0,800
10		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
11								
12	COMPACT, FOREIGN	FRACTION	0,798	0,798	0,798	0,798	0,798	0,798
13		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
14								
15	MID-SIZE	FRACTION	0,990	0,990	0,990	0,990	0,990	0,990
16		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
17								
18	FULL SIZE	FRACTION	0,995	0,995	0,995	0,995	0,995	0,995
19		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
20								
21	LUXURY, DOMESTIC	FRACTION	0,985	0,985	0,985	0,985	0,985	0,985
22		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
23								
24	LUXURY, FOREIGN	FRACTION	0,888	0,888	0,888	0,888	0,888	0,888
25		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
26								
27	FRACTION WITH OVERDRIVE							
28								
29	SUBCOMPACT, DOMESTIC	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
30		%GROWTH						
31								
32	SUBCOMPACT, FOREIGN	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
33		%GROWTH						
34								
35	COMPACT, DOMESTIC	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
36		%GROWTH						
37								
38	COMPACT, FOREIGN	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
39		%GROWTH						
40								
41	MID-SIZE	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
42		%GROWTH						
43								
44	FULL SIZE	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
45		%GROWTH						
46								
47	LUXURY, DOMESTIC	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
48		%GROWTH						
49								
50	LUXURY, FOREIGN	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
51		%GROWTH						

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2.06 AUTO CHARACTERISTICS - CONTINUED

LINE	ITEM		1999	2000
1	FRACTION WITH AUTOMATIC TRANSMISSION			
2				
3	SUBCOMPACT, DOMESTIC	FRACTION	0.550	0.550
4		%GROWTH	0.0	0.0
5				
6	SUBCOMPACT, FOREIGN	FRACTION	0.576	0.576
7		%GROWTH	0.0	0.0
8				
9	COMPACT, DOMESTIC	FRACTION	0.800	0.800
10		%GROWTH	0.0	0.0
11				
12	COMPACT, FOREIGN	FRACTION	0.790	0.790
13		%GROWTH	0.0	0.0
14				
15	MID-SIZE	FRACTION	0.990	0.990
16		%GROWTH	0.0	0.0
17				
18	FULL SIZE	FRACTION	0.995	0.995
19		%GROWTH	0.0	0.0
20				
21	LUXURY, DOMESTIC	FRACTION	0.985	0.985
22		%GROWTH	0.0	0.0
23				
24	LUXURY, FOREIGN	FRACTION	0.880	0.880
25		%GROWTH	0.0	0.0
26				
27	FRACTION WITH OVERDRIVE			
28				
29	SUBCOMPACT, DOMESTIC	FRACTION	0.0	0.0
30		%GROWTH		
31				
32	SUBCOMPACT, FOREIGN	FRACTION	0.0	0.0
33		%GROWTH		
34				
35	COMPACT, DOMESTIC	FRACTION	0.0	0.0
36		%GROWTH		
37				
38	COMPACT, FOREIGN	FRACTION	0.0	0.0
39		%GROWTH		
40				
41	MID-SIZE	FRACTION	0.0	0.0
42		%GROWTH		
43				
44	FULL SIZE	FRACTION	0.0	0.0
45		%GROWTH		
46				
47	LUXURY, DOMESTIC	FRACTION	0.0	0.0
48		%GROWTH		
49				
50	LUXURY, FOREIGN	FRACTION	0.0	0.0
51		%GROWTH		

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2.07 AUTO CHARACTERISTICS

LINE	ITEM		1975	1976	1977	1978	1979	1980
1	FRACTION WITH 4 CYLINDERS:							
3	SUBCOMPACT, DOMESTIC	FRACTION	0.628	0.641	0.656	0.665	0.690	0.720
4		%GROWTH	-20.17	2.07	2.34	1.37	3.76	4.35
6	SUBCOMPACT, FOREIGN	FRACTION	0.988	0.988	0.988	0.988	0.988	0.988
7		%GROWTH	-0.00	0.0	0.0	0.0	0.0	0.0
9	COMPACT, DOMESTIC	FRACTION	0.0	0.0	0.005	0.010	0.040	0.070
10		%GROWTH				100.00	300.00	75.00
12	COMPACT, FOREIGN	FRACTION	1.000	1.000	1.000	1.000	1.000	1.000
13		%GROWTH	0.00	0.0	0.0	0.0	0.0	0.0
15	MID-SIZE	FRACTION	0.0	0.0	0.0	0.0	0.0	0.0
16		%GROWTH						
18	FULL SIZE	FRACTION	0.0	0.0	0.0	0.0	0.0	0.0
19		%GROWTH						
21	LUXURY, DOMESTIC	FRACTION	0.0	0.0	0.0	0.0	0.0	0.0
22		%GROWTH						
24	LUXURY, FOREIGN	FRACTION	0.213	0.213	0.213	0.213	0.213	0.213
25		%GROWTH	-0.02	0.0	0.0	0.0	0.0	0.0
27	FRACTION WITH 6 CYLINDERS:							
29	SUBCOMPACT, DOMESTIC	FRACTION	0.273	0.263	0.253	0.250	0.248	0.244
30		%GROWTH	33.73	-3.66	-3.80	-1.19	-0.80	-1.61
32	SUBCOMPACT, FOREIGN	FRACTION	0.016	0.016	0.016	0.016	0.016	0.016
33		%GROWTH	0.21	0.0	0.0	0.0	0.0	0.0
35	COMPACT, DOMESTIC	FRACTION	0.576	0.582	0.583	0.583	0.620	0.660
36		%GROWTH	3.32	1.04	0.17	0.0	6.35	6.45
38	COMPACT, FOREIGN	FRACTION	0.0	0.0	0.0	0.0	0.0	0.0
39		%GROWTH	0.0					
41	MID-SIZE	FRACTION	0.052	0.0	0.0	0.0	0.080	0.160
42		%GROWTH	-49.87	0.0				100.00
44	FULL SIZE	FRACTION	0.005	0.006	0.007	0.007	0.008	0.009
45		%GROWTH	-7.85	20.00	16.67	0.0	14.29	12.50
47	LUXURY, DOMESTIC	FRACTION	0.0	0.0	0.0	0.0	0.0	0.0
48		%GROWTH						
50	LUXURY, FOREIGN	FRACTION	0.762	0.762	0.762	0.762	0.762	0.762
51		%GROWTH	-0.00	0.0	0.0	0.0	0.0	0.0

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2,07 AUTO CHARACTERISTICS - CONTINUED

LINE	ITEM		1981	1982	1983	1984	1985	1986
1	FRACTION WITH 4 CYLINDERS							
2								
3	SUBCOMPACT, DOMESTIC	FRACTION	0,750	0,750	0,750	0,750	0,750	0,750
4		%GROWTH	4,17	0,0	0,0	0,0	0,0	0,0
5								
6	SUBCOMPACT, FOREIGN	FRACTION	0,984	0,984	0,984	0,984	0,984	0,984
7		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
8								
9	COMPACT, DOMESTIC	FRACTION	0,100	0,100	0,100	0,100	0,100	0,100
10		%GROWTH	42,86	0,0	0,0	0,0	0,0	0,0
11								
12	COMPACT, FOREIGN	FRACTION	1,000	1,000	1,000	1,000	1,000	1,000
13		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
14								
15	MID-SIZE	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
16		%GROWTH						
17								
18	FULL SIZE	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
19		%GROWTH						
20								
21	LUXURY, DOMESTIC	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
22		%GROWTH						
23								
24	LUXURY, FOREIGN	FRACTION	0,213	0,213	0,213	0,213	0,213	0,213
25		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
26								
27	FRACTION WITH 6 CYLINDERS							
28								
29	SUBCOMPACT, DOMESTIC	FRACTION	0,240	0,240	0,240	0,240	0,240	0,240
30		%GROWTH	-1,64	0,0	0,0	0,0	0,0	0,0
31								
32	SUBCOMPACT, FOREIGN	FRACTION	0,016	0,016	0,016	0,016	0,016	0,016
33		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
34								
35	COMPACT, DOMESTIC	FRACTION	0,700	0,700	0,700	0,700	0,700	0,700
36		%GROWTH	6,06	0,0	0,0	0,0	0,0	0,0
37								
38	COMPACT, FOREIGN	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
39		%GROWTH						
40								
41	MID-SIZE	FRACTION	0,250	0,250	0,250	0,250	0,250	0,250
42		%GROWTH	56,25	0,0	0,0	0,0	0,0	0,0
43								
44	FULL SIZE	FRACTION	0,010	0,010	0,010	0,010	0,010	0,010
45		%GROWTH	11,11	0,0	0,0	0,0	0,0	0,0
46								
47	LUXURY, DOMESTIC	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
48		%GROWTH						
49								
50	LUXURY, FOREIGN	FRACTION	0,762	0,762	0,762	0,762	0,762	0,762
51		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2.07 AUTO CHARACTERISTICS - CONTINUED

LINE	ITEM		1987	1988	1989	1990	1991	1992
1	FRACTION WITH 4 CYLINDERS							
2								
3	SUBCOMPACT, DOMESTIC	FRACTION	0,750	0,750	0,750	0,750	0,750	0,750
4		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
5								
6	SUBCOMPACT, FOREIGN	FRACTION	0,984	0,984	0,984	0,984	0,984	0,984
7		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
8								
9	COMPACT, DOMESTIC	FRACTION	0,100	0,100	0,100	0,100	0,100	0,100
10		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
11								
12	COMPACT, FOREIGN	FRACTION	1,000	1,000	1,000	1,000	1,000	1,000
13		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
14								
15	MID-SIZE	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
16		%GROWTH						
17								
18	FULL SIZE	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
19		%GROWTH						
20								
21	LUXURY, DOMESTIC	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
22		%GROWTH						
23								
24	LUXURY, FOREIGN	FRACTION	0,213	0,213	0,213	0,213	0,213	0,213
25		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
26								
27	FRACTION WITH 6 CYLINDERS							
28								
29	SUBCOMPACT, DOMESTIC	FRACTION	0,280	0,280	0,280	0,280	0,280	0,280
30		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
31								
32	SUBCOMPACT, FOREIGN	FRACTION	0,016	0,016	0,016	0,016	0,016	0,016
33		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
34								
35	COMPACT, DOMESTIC	FRACTION	0,700	0,700	0,700	0,700	0,700	0,700
36		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
37								
38	COMPACT, FOREIGN	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
39		%GROWTH						
40								
41	MID-SIZE	FRACTION	0,250	0,250	0,250	0,250	0,250	0,250
42		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
43								
44	FULL SIZE	FRACTION	0,010	0,010	0,010	0,010	0,010	0,010
45		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
46								
47	LUXURY, DOMESTIC	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
48		%GROWTH						
49								
50	LUXURY, FOREIGN	FRACTION	0,762	0,762	0,762	0,762	0,762	0,762
51		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2.07 AUTO CHARACTERISTICS - CONTINUED

LINE	ITEM		1993	1994	1995	1996	1997	1998
1	FRACTION WITH 4 CYLINDERS							
3	SUBCOMPACT, DOMESTIC	FRACTION	0,750	0,750	0,750	0,750	0,750	0,750
4		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
6	SUBCOMPACT, FOREIGN	FRACTION	0,984	0,984	0,984	0,984	0,984	0,984
7		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
9	COMPACT, DOMESTIC	FRACTION	0,100	0,100	0,100	0,100	0,100	0,100
10		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
12	COMPACT, FOREIGN	FRACTION	1,000	1,000	1,000	1,000	1,000	1,000
13		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
15	MID-SIZE	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
16		%GROWTH						
18	FULL SIZE	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
19		%GROWTH						
21	LUXURY, DOMESTIC	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
22		%GROWTH						
24	LUXURY, FOREIGN	FRACTION	0,213	0,213	0,213	0,213	0,213	0,213
25		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
27	FRACTION WITH 6 CYLINDERS							
29	SUBCOMPACT, DOMESTIC	FRACTION	0,240	0,240	0,240	0,240	0,240	0,240
30		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
32	SUBCOMPACT, FOREIGN	FRACTION	0,016	0,016	0,016	0,016	0,016	0,016
33		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
35	COMPACT, DOMESTIC	FRACTION	0,700	0,700	0,700	0,700	0,700	0,700
36		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
38	COMPACT, FOREIGN	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
39		%GROWTH						
41	MID-SIZE	FRACTION	0,250	0,250	0,250	0,250	0,250	0,250
42		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
44	FULL SIZE	FRACTION	0,010	0,010	0,010	0,010	0,010	0,010
45		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
47	LUXURY, DOMESTIC	FRACTION	0,0	0,0	0,0	0,0	0,0	0,0
48		%GROWTH						
50	LUXURY, FOREIGN	FRACTION	0,762	0,762	0,762	0,762	0,762	0,762
51		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0

TABLE 2.07 AUTO CHARACTERISTICS - CONTINUED

LINE	ITEM		1999	2000
1	FRACTION WITH 4 CYLINDERS:			
2				
3	SUBCOMPACT, DOMESTIC	FRACTION	0,750	0,750
4		%GROWTH	0,0	0,0
5				
6	SUBCOMPACT, FOREIGN	FRACTION	0,987	0,988
7		%GROWTH	0,0	0,0
8				
9	COMPACT, DOMESTIC	FRACTION	0,100	0,100
10		%GROWTH	0,0	0,0
11				
12	COMPACT, FOREIGN	FRACTION	1,000	1,000
13		%GROWTH	0,0	0,0
14				
15	MID-SIZE	FRACTION	0,0	0,0
16		%GROWTH		
17				
18	FULL SIZE	FRACTION	0,0	0,0
19		%GROWTH		
20				
21	LUXURY, DOMESTIC	FRACTION	0,0	0,0
22		%GROWTH		
23				
24	LUXURY, FOREIGN	FRACTION	0,213	0,213
25		%GROWTH	0,0	0,0
26				
27	FRACTION WITH 6 CYLINDERS:			
28				
29	SUBCOMPACT, DOMESTIC	FRACTION	0,240	0,240
30		%GROWTH	0,0	0,0
31				
32	SUBCOMPACT, FOREIGN	FRACTION	0,016	0,016
33		%GROWTH	0,0	0,0
34				
35	COMPACT, DOMESTIC	FRACTION	0,700	0,700
36		%GROWTH	0,0	0,0
37				
38	COMPACT, FOREIGN	FRACTION	0,0	0,0
39		%GROWTH		
40				
41	MID-SIZE	FRACTION	0,250	0,250
42		%GROWTH	0,0	0,0
43				
44	FULL SIZE	FRACTION	0,010	0,010
45		%GROWTH	0,0	0,0
46				
47	LUXURY, DOMESTIC	FRACTION	0,0	0,0
48		%GROWTH		
49				
50	LUXURY, FOREIGN	FRACTION	0,762	0,762
51		%GROWTH	0,0	0,0

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2.08 AUTO CHARACTERISTICS

LINE	ITEM		1975	1976	1977	1978	1979	1980
1	CITY DRIVING, URBAN MILES / TOTAL		0,553	0,558	0,563	0,568	0,573	0,577
2		%GROWTH	0,99	0,90	0,90	0,89	0,88	0,70
3								
4								
5	EXPONENTIAL DECAY RATE, USED CAR PRICES							
6								
7	SUBCOMPACT		0,211	0,211	0,211	0,211	0,211	0,211
8		%GROWTH	-0,07	0,0	0,0	0,0	0,0	0,0
9								
10	COMPACT		0,206	0,206	0,206	0,206	0,206	0,206
11		%GROWTH	-0,13	0,0	0,0	0,0	0,0	0,0
12								
13	MID-SIZE		0,217	0,217	0,217	0,217	0,217	0,217
14		%GROWTH	0,22	0,0	0,0	0,0	0,0	0,0
15								
16	FULL SIZE		0,243	0,243	0,243	0,243	0,243	0,243
17		%GROWTH	0,19	0,0	0,0	0,0	0,0	0,0
18								
19	LUXURY		0,268	0,268	0,268	0,268	0,268	0,268
20		%GROWTH	-0,07	0,0	0,0	0,0	0,0	0,0

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2.08 AUTO CHARACTERISTICS - CONTINUED

LINE	ITEM		1981	1982	1983	1984	1985	1986
1	CITY DRIVING, URBAN MILES / TOTAL		0.582	0.585	0.590	0.595	0.599	0.603
2		%GROWTH	0.87	0.69	0.68	0.85	0.67	0.67
3								
4								
5	EXPONENTIAL DECAY RATE, USED CAR PRICES							
6								
7	SUBCOMPACT		0.211	0.211	0.211	0.211	0.211	0.211
8		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
9								
10	COMPACT		0.206	0.206	0.206	0.206	0.206	0.206
11		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
12								
13	MID-SIZE		0.217	0.217	0.217	0.217	0.217	0.217
14		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
15								
16	FULL SIZE		0.243	0.243	0.243	0.243	0.243	0.243
17		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
18								
19	LUXURY		0.268	0.268	0.268	0.268	0.268	0.268
20		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2.08 AUTO CHARACTERISTICS - CONTINUED

LINE	ITEM		1987	1988	1989	1990	1991	1992
1	CITY DRIVING, URBAN MILES / TOTAL		0.607	0.610	0.618	0.6	0.621	0.629
2		%GROWTH	0.66	0.49	0.66	0.t5	0.89	0.48
3								
4								
5	EXPONENTIAL DECAY RATE, USED CAR PRICES							
6								
7	SUBCOMPACT		0.211	0.211	0.211	0.211	0.211	0.211
8		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
9								
10	COMPACT		0.206	0.206	0.206	0.206	0.206	0.206
11		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
12								
13	MID-SIZE		0.217	0.317	0.217	0.217	0.217	0.217
14		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
15								
16	FULL SIZE		0.243	0.243	0.243	0.243	0.243	0.243
17		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
18								
19	LUXURY		0.268	0.268	0.268	0.268	0.268	0.268
20		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2,08 AUTO CHARACTERISTICS - CONTINUED

LINE	ITEM		1993	1994	1995	1996	1997	1998
1	CITY DRIVING, URBAN MILES / TOTAL		0,627	0,630	0,633	0,635	0,638	0,640
2		%GROWTH	0,48	0,48	0,48	0,32	0,47	0,31
3								
4								
5	EXPONENTIAL DECAY RATE, USED CAR PRICES							
6								
7	SUBCOMPACT		0,211	0,211	0,211	0,211	0,211	0,211
8		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
9								
10	COMPACT		0,206	0,206	0,206	0,206	0,206	0,206
11		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
12								
13	MID-SIZE		0,217	0,217	0,217	0,217	0,217	0,217
14		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
15								
16	FULL SIZE		0,243	0,243	0,243	0,243	0,243	0,243
17		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
18								
19	LUXURY		0,268	0,268	0,268	0,268	0,268	0,268
20		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2.0A AUTO CHARACTERISTICS - CONTINUED

LINE	ITEM		1999	2000
1	CITY DRIVING, URBAN MILES / TOTAL		0.643	0.645
2		%GROWTH	0.47	0.31
3				
4				
5	EXPONENTIAL DECAY RATE, USED CAR PRICES			
6				
7	SUBCOMPACT		0.211	0.211
8		%GROWTH	0.0	0.0
9				
10	COMPACT		0.206	0.206
11		%GROWTH	0.0	0.0
12				
13	MID-SIZE		0.217	0.217
14		%GROWTH	0.0	0.0
15				
16	FULL SIZE		0.243	0.243
17		%GROWTH	0.0	0.0
18				
19	LUXURY		0.268	0.268
20		%GROWTH	0.0	0.0

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2.09 AUTO CHARACTERISTICS

LINE	I T E M		1975	1976	1977	1978	1979	1980
1	DOMESTIC CLASS BASE PRICE / AVERAGE							
2								
3	SUBCOMPACT	RATIO	0,744	0,744	0,744	0,744	0,744	0,744
4		%GROWTH	0,01	0,0	0,0	0,0	0,0	0,0
5								
6	COMPACT	RATIO	0,792	0,792	0,792	0,792	0,792	0,792
7		%GROWTH	-0,04	0,0	0,0	0,0	0,0	0,0
8								
9	MID-SIZE	RATIO	0,917	0,917	0,917	0,917	0,917	0,917
10		%GROWTH	0,00	0,0	0,0	0,0	0,0	0,0
11								
12	FULL SIZE	RATIO	1,030	1,030	1,030	1,030	1,030	1,030
13		%GROWTH	0,04	0,0	0,0	0,0	0,0	0,0
14								
15	LUXURY	RATIO	1,669	1,669	1,669	1,669	1,669	1,669
16		%GROWTH	0,02	0,0	0,0	0,0	0,0	0,0
17								
18								
19	DOM, CLASS MAX, OPTIONS PRICE / AVERAGE							
20								
21	SUBCOMPACT	RATIO	0,900	0,900	0,900	0,900	0,900	0,900
22		%GROWTH	-3,27	0,0	0,0	0,0	0,0	0,0
23								
24	COMPACT	RATIO	0,950	0,950	0,950	0,950	0,950	0,950
25		%GROWTH	-1,31	0,0	0,0	0,0	0,0	0,0
26								
27	MID-SIZE	RATIO	0,990	0,990	0,990	0,990	0,990	0,990
28		%GROWTH	0,03	0,0	0,0	0,0	0,0	0,0
29								
30	FULL SIZE	RATIO	1,020	1,020	1,020	1,020	1,020	1,020
31		%GROWTH	0,52	0,0	0,0	0,0	0,0	0,0
32								
33	LUXURY	RATIO	1,170	1,170	1,170	1,170	1,170	1,170
34		%GROWTH	0,80	0,0	0,0	0,0	0,0	0,0

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2.07 AUTO CHARACTERISTICS - CONTINUED

LINE	ITEM		1981	1982	1983	1984	1985	1986
1	DOMESTIC CLASS BASE PRICE / AVERAGE							
2								
3	SUBCOMPACT	RATIO	0.744	0.744	0.744	0.744	0.744	0.744
4		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
5								
6	COMPACT	RATIO	0.792	0.792	0.792	0.792	0.792	0.792
7		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
8								
9	MID-SIZE	RATIO	0.917	0.917	0.917	0.917	0.917	0.917
10		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
11								
12	FULL SIZE	RATIO	1.030	1.030	1.030	1.030	1.030	1.030
13		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
14								
15	LUXURY	RATIO	1.669	1.669	1.669	1.669	1.669	1.669
16		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
17								
18								
19	DOM. CLASS MAX. OPTIONS PRICE / AVERAGE							
20								
21	SUBCOMPACT	RATIO	0.900	0.900	0.900	0.900	0.900	0.900
22		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
23								
24	COMPACT	RATIO	0.950	0.950	0.950	0.950	0.950	0.950
25		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
26								
27	MID-SIZE	RATIO	0.990	0.990	0.990	0.990	0.990	0.990
28		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
29								
30	FULL SIZE	RATIO	1.020	1.020	1.020	1.020	1.020	1.020
31		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
32								
33	LUXURY	RATIO	1.170	1.170	1.170	1.170	1.170	1.170
34		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2,09 AUTO CHARACTERISTICS - CONTINUED

LINE	ITEM		1987	1988	1989	1990	1991	1992
1	DOMESTIC CLASS BASE PRICE / AVERAGE							
2								
3	SUBCOMPACT	RATIO	0,744	0,744	0,744	0,744	0,744	0,744
4		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
5								
6	COMPACT	RATIO	0,792	0,792	0,792	0,792	0,792	0,792
7		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
8								
9	MID-SIZE	RATIO	0,917	0,917	0,917	0,917	0,917	0,917
10		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
11								
12	FULL SIZE	RATIO	1,030	1,030	1,030	1,030	1,030	1,030
13		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
14								
15	LUXURY	RATIO	1,669	1,669	1,669	1,669	1,669	1,669
16		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
17								
18								
19	DOM, CLASS MAX, OPTIONS PRICE / AVERAGE							
20								
21	SUBCOMPACT	RATIO	0,900	0,500	0,900	0,900	0,900	0,900
22		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
23								
24	COMPACT	RATIO	0,950	0,950	0,950	0,950	0,950	0,950
25		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
26								
27	MID-SIZE	RATIO	0,970	0,990	0,990	0,990	0,990	0,990
28		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
29								
30	FULL SIZE	RATIO	1,020	1,020	1,020	1,020	1,020	1,020
31		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
32								
33	LUXURY	RATIO	1,170	1,170	1,170	1,170	1,170	1,170
34		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2,09 AUTO CHARACTERISTICS - CONTINUED

LINE	ITEM		1993	1994	1995	1996	1997	1998
1	DOMESTIC CLASS BASE PRICE / AVERAGE							
2								
3	SUBCOMPACT	RATIO	0,744	0,744	0,744	0,744	0,744	0,744
4		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
5								
6	COMPACT	RATIO	0,792	0,792	0,792	0,792	0,792	0,792
7		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
8								
9	MID-SIZE	RATIO	0,917	0,917	0,917	0,917	0,917	0,917
10		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
11								
12	FULL SIZE	RATIO	1,030	1,030	1,030	1,030	1,030	1,030
13		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
14								
15	LUXURY	RATIO	1,669	1,669	1,669	1,669	1,669	1,669
16		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
17								
18								
19	DOM, CLASS MAX, OPTIONS PRICE / AVERAGE							
20								
21	SUBCOMPACT	RATIO	0,900	0,900	0,900	0,900	0,900	0,900
22		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
23								
24	COMPACT	RATIO	0,950	0,950	0,950	0,950	0,950	0,950
25		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
26								
27	MID-SIZE	RATIO	0,990	0,990	0,990	0,990	0,990	0,990
28		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
29								
30	FULL SIZE	RATIO	1,020	1,020	1,020	1,020	1,020	1,020
31		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
32								
33	LUXURY	RATIO	1,170	1,170	1,170	1,170	1,170	1,170
34		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2,09 AUTO CHARACTERISTICS - CONTINUED

LINE	ITEM		1999	2000
1	DOMESTIC CLASS BASE PRICE / AVERAGE			
2				
3	SUBCOMPACT	RATIO	0,799	0,799
4		%GROWTH	0,0	0,0
5				
6	COMPACT	RATIO	0,792	0,792
7		%GROWTH	0,0	0,0
8				
9	MID-SIZE	RATIO	0,917	0,917
10		%GROWTH	0,0	0,0
11				
12	FULL SIZE	RATIO	1,030	1,030
13		%GROWTH	0,0	0,0
14				
15	LUXURY	RATIO	1,669	1,669
16		%GROWTH	0,0	0,0
17				
18				
19	DOM, CLASS MAX, OPTIONS PRICE / AVERAGE			
20				
21	SUBCOMPACT	RATIO	0,900	0,900
22		%GROWTH	0,0	0,0
23				
24	COMPACT	RATIO	0,950	0,950
25		%GROWTH	0,0	0,0
26				
27	MID-SIZE	RATIO	0,990	0,990
28		%GROWTH	0,0	0,0
29				
30	FULL SIZE	RATIO	1,020	1,020
31		%GROWTH	0,0	0,0
32				
33	LUXURY	RATIO	1,170	1,170
34		%GROWTH	0,0	0,0

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2.10 FUEL CONSUMPTION EFFICIENCY FACTORS

LINE	ITEM		1975	1976	1977	1978	1979	1980
1	CITY EFFICIENCY FACTOR; ALL CLASSES		3,000	6,000	8,500	11,000	12,000	13,000
2		%GROWTH		100,00	41,67	29,41	9,09	8,33
3								
4	SUBCOMPACT, DOMESTIC		1,000	2,000	3,000	4,000	5,000	6,000
5		%GROWTH		100,00	50,00	33,33	25,00	20,00
6								
7	SUBCOMPACT, FOREIGN		0,0	0,0	0,0	0,0	0,0	0,0
8		%GROWTH						
9								
10	COMPACT, DOMESTIC		1,000	2,000	3,000	4,000	5,000	6,000
11		%GROWTH		100,00	50,00	33,33	25,00	20,00
12								
13	COMPACT, FOREIGN		0,0	0,0	0,0	0,0	0,0	0,0
14		%GROWTH						
15								
16	MID-SIZE		1,000	2,000	3,000	4,000	5,000	6,000
17		%GROWTH		100,00	50,00	33,33	25,00	20,00
18								
19	FULL SIZE		1,000	2,000	3,000	4,000	5,000	6,000
20		%GROWTH		100,00	50,00	33,33	25,00	20,00
21								
22	LUXURY, DOMESTIC		1,000	2,000	3,000	4,000	5,000	6,000
23		%GROWTH		100,00	50,00	33,33	25,00	20,00
24								
25	LUXURY, FOREIGN		0,0	0,0	0,0	0,0	0,0	0,0
26		%GROWTH						
27								
28	HIGHWAY EFFICIENCY FACTOR; ALL CLASSES		3,000	6,000	8,500	11,000	12,000	13,000
29		%GROWTH		100,00	41,67	29,41	9,09	8,33
30								
31	SUBCOMPACT, DOMESTIC		1,000	2,000	3,000	4,000	5,000	6,000
32		%GROWTH		100,00	50,00	33,33	25,00	20,00
33								
34	SUBCOMPACT, FOREIGN		0,0	0,0	0,0	0,0	0,0	0,0
35		%GROWTH						
36								
37	COMPACT, DOMESTIC		1,000	2,000	3,000	4,000	5,000	6,000
38		%GROWTH		100,00	50,00	33,33	25,00	20,00
39								
40	COMPACT, FOREIGN		0,0	0,0	0,0	0,0	0,0	0,0
41		%GROWTH						
42								
43	MID-SIZE		1,000	2,000	3,000	4,000	5,000	6,000
44		%GROWTH		100,00	50,00	33,33	25,00	20,00
45								
46	FULL SIZE		1,000	2,000	3,000	4,000	5,000	6,000
47		%GROWTH		100,00	50,00	33,33	25,00	20,00
48								
49	LUXURY, DOMESTIC		1,000	2,000	3,000	4,000	5,000	6,000
50		%GROWTH		100,00	50,00	33,33	25,00	20,00
51								
52	LUXURY, FOREIGN		0,0	0,0	0,0	0,0	0,0	0,0
53		%GROWTH						

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2,10 FUEL CONSUMPTION EFFICIENCY FACTORS

LINE	ITEM		1981	1982	1983	1984	1985	1986
1	CITY EFFICIENCY FACTOR: ALL CLASSES		14,000	15,000	16,000	17,000	18,000	19,000
2		%GROWTH	7,69	7,14	6,67	6,25	5,88	5,56
3								
4	SUBCOMPACT, DOMESTIC		6,000	6,000	6,000	6,000	6,000	6,000
5		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
6								
7	SUBCOMPACT, FOREIGN		0,0	0,0	0,0	0,0	0,0	0,0
8		%GROWTH						
9								
10	COMPACT, DOMESTIC		6,000	6,000	6,000	6,000	6,000	6,000
11		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
12								
13	COMPACT, FOREIGN		0,0	0,0	0,0	0,0	0,0	0,0
14		%GROWTH						
15								
16	MID-SIZE		6,000	6,000	6,000	6,000	6,000	6,000
17		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
18								
19	FULL SIZE		6,000	6,000	6,000	6,000	6,000	6,000
20		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
21								
22	LUXURY, DOMESTIC		6,000	6,000	6,000	6,000	6,000	6,000
23		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
24								
25	LUXURY, FOREIGN		0,0	0,0	0,0	0,0	0,0	-0,0
26		%GROWTH						
27								
28	HIGHWAY EFFICIENCY FACTOR: ALL CLASSES		14,000	15,000	16,000	17,000	18,000	19,000
29		%GROWTH	7,69	7,14	6,67	6,25	5,88	5,56
30								
31	SUBCOMPACT, DOMESTIC		6,000	6,000	6,000	6,000	6,000	6,000
32		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
33								
34	SUBCOMPACT, FOREIGN		0,0	0,0	0,0	0,0	0,0	0,0
35		%GROWTH						
36								
37	COMPACT, DOMESTIC		6,000	6,000	6,000	6,000	6,000	6,000
38		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
39								
40	COMPACT, FOREIGN		0,0	0,0	0,0	0,0	0,0	0,0
41		%GROWTH						
42								
43	MID-SIZE		6,000	6,003	6,000	6,000	6,000	6,000
44		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
45								
46	FULL SIZE		6,000	6,000	6,000	6,000	6,000	6,000
47		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
48								
49	LUXURY, DOMESTIC		6,000	6,010	6,000	6,000	6,000	6,000
50		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
51								
52	LUXURY, FOREIGN		0,0	0,0	0,0	0,0	0,0	0,0
53		%GROWTH						

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2.10 FUEL CONSUMPTION EFFICIENCY FACTORS

LINE	ITEM		1987	1988	1989	1990	1991	1992
1	CITY EFFICIENCY FACTOR: ALL CLASSES		20,000	21,000	22,000	23,000	24,000	25,000
2		%GROWTH	5.26	5.00	4.76	4.55	4.35	4.17
3								
4	SUBCOMPACT, DOMESTIC		6,000	6,000	6,000	6,000	6,000	6,000
5		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
6								
7	SUBCOMPACT, FOREIGN		0.0	0.0	0.0	0.0	0.0	0.0
8		%GROWTH						
9								
10	COMPACT, DOMESTIC		6,000	6,000	6,000	6,000	6,000	6,000
11		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
12								
13	COMPACT, FOREIGN		0.0	0.0	0.0	0.0	0.0	0.0
14		%GROWTH						
15								
16	MID-SIZE		6,000	6,000	6,000	6,000	6,000	6,000
17		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
18								
19	FULL SIZE		6,000	6,000	6,000	6,000	6,000	6,000
20		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
21								
22	LUXURY, DOMESTIC		6,000	6,000	6,000	6,000	6,000	6,000
23		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
24								
25	LUXURY, FOREIGN		0.0	0.0	0.0	0.0	0.0	0.0
26		%GROWTH						
27								
28	HIGHWAY EFFICIENCY FACTOR: ALL CLASSES		20,000	21,000	22,000	23,000	24,000	25,000
29		%GROWTH	5.26	5.00	4.76	4.55	4.35	4.17
30								
31	SUBCOMPACT, DOMESTIC		6,000	6,000	6,000	6,000	6,000	6,000
32		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
33								
34	SUBCOMPACT, FOREIGN		0.0	0.0	0.0	0.0	0.0	0.0
35		%GROWTH						
36								
37	COMPACT, DOMESTIC		6,000	6,000	6,000	6,000	6,000	6,000
38		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
39								
40	COMPACT, FOREIGN		0.0	0.0	0.0	0.0	0.0	0.0
41		%GROWTH						
42								
43	MID-SIZE		6,000	6,000	6,000	6,000	6,000	6,000
44		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
45								
46	FULL SIZE		6,000	6,000	6,000	6,000	6,000	6,000
47		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
48								
49	LUXURY, DOMESTIC		6,000	6,000	6,000	6,000	6,000	6,000
50		%GROWTH	0.0	0.0	0.0	0.0	0.0	0.0
51								
52	LUXURY, FOREIGN		0.0	0.0	0.0	0.0	0.0	0.0
53		%GROWTH						

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2,10 FUEL CONSUMPTION EFFICIENCY FACTORS

LINE	ITEM		1993	1994	1995	1996	1997	1998
1	CITY EFFICIENCY FACTOR; ALL CLASSES		26,000	27,000	28,000	29,000	30,000	31,000
2		%GROWTH	4,00	3,85	3,70	3,57	3,45	3,33
3								
4	SUBCOMPACT, DOMESTIC		6,000	6,000	6,000	6,000	6,000	6,000
5		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
6								
7	SUBCOMPACT, FOREIGN		0,0	0,0	0,0	0,0	0,0	0,0
8		%GROWTH						
9								
10	COMPACT, DOMESTIC		6,000	6,000	6,000	6,000	6,000	6,000
11		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
12								
13	COMPACT, FOREIGN		0,0	0,0	0,0	0,0	0,0	0,0
14		%GROWTH						
15								
16	MID-SIZE		6,000	6,000	6,000	6,000	6,000	6,000
17		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
18								
19	FULL SIZE		6,000	6,000	6,000	6,300	6,000	6,000
20		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
21								
22	LUXURY, DOMESTIC		6,000	6,000	6,000	6,000	6,000	6,000
23		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
24								
25	LUXURY, FOREIGN		0,0	0,0	0,0	0,0	0,0	0,0
26		%GROWTH						
27								
28	HIGHWAY EFFICIENCY FACTOR; ALL CLASSES		26,000	27,000	28,000	29,000	30,000	31,000
29		%GROWTH	4,00	3,85	3,70	3,57	3,45	3,33
30								
31	SUBCOMPACT, DOMESTIC		6,000	6,000	6,000	6,000	6,000	6,000
32		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
33								
34	SUBCOMPACT, FOREIGN		0,0	0,0	0,0	0,0	0,0	0,0
35		%GROWTH						
36								
37	COMPACT, DOMESTIC		6,000	6,000	6,000	6,000	6,000	6,000
38		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
39								
40	COMPACT, FOREIGN		0,0	0,0	0,0	0,0	0,0	0,0
41		%GROWTH						
42								
43	MID-SIZE		6,000	6,000	6,000	6,000	6,000	6,000
44		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
45								
46	FULL SIZE		6,000	6,000	6,000	6,000	6,000	6,000
47		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
48								
49	LUXURY, DOMESTIC		6,000	6,000	6,000	6,000	6,000	6,000
50		%GROWTH	0,0	0,0	0,0	0,0	0,0	0,0
51								
52	LUXURY, FOREIGN		0,0	0,0	0,0	0,0	0,0	0,0
53		%GROWTH						

ASSUMPTIONS FOR EXOGENOUS VARIABLES 1975 - 2000

TABLE 2.10 FUEL CONSUMPTION EFFICIENCY FACTORS

LINE	ITEM		1999	2000
1	CITY EFFICIENCY FACTOR: ALL CLASSES		32,000	33,000
2		%GROWTH	3.23	3.13
3				
4	SUBCOMPACT, DOMESTIC		6,000	6,000
5		%GROWTH	0.0	0.0
6				
7	SUBCOMPACT, FOREIGN		0.0	0.0
8		%GROWTH		
9				
10	COMPACT, DOMESTIC		6,000	6,000
11		%GROWTH	0.0	0.0
12				
13	COMPACT, FOREIGN		0.0	0.0
14		%GROWTH		
15				
16	MID-SIZE		6,000	6,000
17		%GROWTH	0.0	0.0
18				
19	FULL SIZE		6,000	6,000
20		%GROWTH	0.0	0.0
21				
22	LUXURY, DOMESTIC		6,000	6,000
23		%GROWTH	0.0	0.0
24				
25	LUXURY, FOREIGN		0.0	0.0
26		%GROWTH		
27				
28	HIGHWAY EFFICIENCY FACTOR: ALL CLASSES		32,000	33,000
29		%GROWTH	3.23	3.13
30				
31	SUBCOMPACT, DOMESTIC		6,000	6,000
32		%GROWTH	0.0	0.0
33				
34	SUBCOMPACT, FOREIGN		0.0	0.0
35		%GROWTH		
36				
37	COMPACT, DOMESTIC		6,000	6,000
38		%GROWTH	0.0	0.0
39				
40	COMPACT, FOREIGN		0.0	0.0
41		%GROWTH		
42				
43	MID-SIZE		6,000	6,000
44		%GROWTH	0.0	0.0
45				
46	FULL SIZE		6,000	6,000
47		%GROWTH	0.0	0.0
48				
49	LUXURY, DOMESTIC		6,000	6,000
50		%GROWTH	0.0	0.0
51				
52	LUXURY, FOREIGN		0.0	0.0
53		%GROWTH		

APPENDIX A4

REPORT OF NEW TECHNOLOGY

The work performed under this contract has not led to any new inventions; the resulting econometric model is, however, both innovative and state of the art. It provides long run policy analysis and forecasting of annual trends in the U.S. automobile market, given various policy options and alternative socio-economic futures.

END
DATE
FILMED
6-26-80
NTIS