The Development of a Highway Revenue Forecasting Model
for Indiana

Final Report

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<p>This report present a state highway revenue forecasting model developed for Indiana Department of Transportation. The package provides both long range annual forecasts as well as short range monthly forecasts of highway revenues by source. An important feature of the model is its ability to adopt new parameters and input data in order to avoid obsolescence. The model can be used to determine expected amounts of revenues under existing taxation structures as well as to assess impacts of possible changes.</p>					
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Executive Summary

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Introduction

State transportation agencies are facing challenges arising from cost uncertainties resulting from economic instability; escalation of construction, maintenance, and operating costs; and erosion of revenues due to instability of some of the revenue bases, in particular motor fuel taxes, resulting from vehicular technological advancements. Proposed shifts in revenue sources from federal to state and local governments would further add to these challenges. Under such circumstances the agencies are realizing: (a) the need to develop and periodically update forecasts for a variety of revenue sources for planning and budgeting purposes; and (b) that they must do so under constraints of limited data, technical skills and budget resources.

The primary purpose of this study was to develop a computerized highway revenue forecasting model for the Indiana Department of Transportation (INDOT) which could provide both long-term and short-term forecast of highway revenues by source. An exhaustive literature review, extensive data collection, and analyses of revenue and travel-related data were conducted to develop the regression and other models which form the basis of the computerized system. The final system is responsive to socio-economic, technological, and legislative policy changes.

Indiana Highway Revenues and Their Disbursement

Major sources of highway revenue are federal aid, motor fuel taxes, vehicle registration fees, driver license fees, and revenue

bonds. For 1991 38 % of INDOT's total highway revenues were from federal-aid and 2 % from other miscellaneous sources. The remaining portion is made up of motor fuel taxes, vehicle registration fees, and driver license fees. In 1987, Indiana joined International Registration Plan (IRP) which was aimed at distributing fairly the registration fees paid by the long-haul heavy trucks (above 26,000 lbs and/or having more than two axles) among the different states whose highway facilities were used.

The distribution of highway revenues in Indiana center around two major accounts, the Motor Vehicle Highway Account (MVHA) and the Highway Road and Street Fund (HRSF). Other revenue accounts include the Special Distribution (SD), State Highway Road Construction & Improvement Fund (SHCF), and the Motor Carrier Regulation Fund (MCRF). Highway revenues are distributed to these funds according to legislated ratios.

Long-Term Highway Revenue Forecasting Methodology

This study disaggregates total revenues into the revenues obtained from the six major sources--registration fees, driver licenses, gasoline tax, special fuel tax, diesel surtax, and motor carrier fuel use tax. The revenues from each source can be further separated into component parts (tax rate and revenue base). Figures 1 and 2 indicate the overall structure of how vehicle registration revenues are estimated. The overall procedure to obtain the annual VMT by different vehicle categories is shown in Figure 3. Fleet fuel efficiency is based on the consideration

Figure 1. Overall Procedure to Compute Automobile, Truck, Bus, and Motorcycle Registration Revenues and Driver License Revenues

Figure 2. Overall Procedure to Compute Tractor, Trailer, and Semitrailer Registration Revenues

Figure 3. Overall Procedure to Compute Annual VMT by Different Vehicle Categories

of vehicle sales and scrappage rates, and technological factors affecting the fuel efficiency of new vehicles. Figures 4, 5 and 6 indicate the computational procedure for estimating fleet fuel efficiencies of automobiles, trucks, and tractors respectively. The fleet fuel efficiency of buses for the purpose of this study has been assumed to be same as that of tractors. The VMT and fleet fuel efficiencies are used to compute the fuel consumption. The overall structure for estimating motor fuel tax revenues is shown in Figure 7.

The most widely used short-term forecasting method is the decomposition method. The basic aim in the decomposition method is to find the seasonality existent in the revenue or other data; and thus, distribute the annual forecast to monthly estimates using the seasonal factors computed. Such an approach has been adopted for determining the monthly forecasts in this study. Short-term forecasts are made using an alternative approach which uses: a) trend projections of the seasonally adjusted data; and b) the seasonal factors. The trend projections are made using time periods.

Modeling

Several linear regression, non-linear regression and other models were established for vehicle registrations, vehicle sales, vehicle scrappage, vehicle travel, and vehicle fleet fuel efficiency. Demographic data used in developing relationships were total population, driving age population (above 16 years old),

NOTE: NI IS PROPORTION OF AUTOMOBILE IN ITH AGE COHORT
 RVTI IS RELATIVE VEHICLE USE BY AUTOMOBILE IN ITH AGE COHORT
 EFFI IS THE FUEL EFFICIENCY OF AUTOMOBILE IN ITH AGE COHORT

Figure 4. Procedure to Compute Fleet Fuel Efficiency of Automobiles

NOTE: NI IS PROPORTION OF TRUCK IN ITH AGE COHORT
 RVTI IS RELATIVE VEHICLE USE BY TRUCK IN ITH AGE COHORT
 EFFI IS THE FUEL EFFICIENCY OF TRUCK IN ITH AGE COHORT

Figure 5. Procedure to Compute Fleet Fuel Efficiency of Trucks

NOTE: NI IS PROPORTION OF TRACTOR IN ITH AGE COHORT
 RVTI IS RELATIVE VEHICLE USE BY TRACTOR IN ITH AGE COHORT
 EFFI IS FUEL EFFICIENCY OF TRACTOR IN ITH AGE COHORT

Figure 6. Procedure to Compute Fleet Fuel Efficiency of Tractors

Figure 7. Overall Procedure to Compute Motor Fuel Tax Revenues

young age population (population between 16 years and 25 years old), and less than driving age population (less than 16 years old). Economic variables used in this study are per capita income in 1982 dollars in Indiana, gross state product in thousands of 1982 dollars, national Consumer Price Inflation (CPI) index, national Gross National Product (GNP) implicit price deflator, and gasoline price in dollars. The established linear and non-linear regression relationships have R^2 (most above 0.80) and F-values (most above 3.0) indicating that the dependent variables correlate very well with independent variables, and that the independent variables are significant. These models are then integrated into a computerized program, INDOTREV, which uses an input file "DATA" to provide forecasts. The computerized model provides both short and long term forecasts and offers the users the ability to conduct sensitivity analyses. Being menu driven, the system is user friendly. The updating (which is most essential in any forecasting process) of the program can be performed by just updating the "DATA" file. The process of updating the "DATA" file is discussed in detail in Chapter 8 of this report. The flexibility of updating prevents the obsolescence of the model. As the new data becomes available the user can update both the relationships used and the input data through the "DATA" file. The SHORTREV program computes new seasonal factors and trend equations as the new data is entered in the files--GASIN (gasoline data file), SPFIN (special fuel data file), STAXIN (diesel surtax data file), MCFUTIN (motor carrier fuel use tax data file), REGIN (vehicle license fee data file), and

IRPIN (IRP data file). The SHORTREV program provides forecasts for six months in future from the last month in the respective data files.

Results

Nearly all of the revenue estimations were within 5% error, and the total revenue estimation (without revenues from sources such as federal reimbursement, general funds, etc.) was within 1% error. Somewhat less reliable segments were the estimation of IRP revenues, Motor Carrier Fuel Use Tax (MCFUT) revenues and Diesel Surtax revenues. Much of this had to do with the data limitations in studying the underlying phenomena behind the revenue generation from these sources. The forecasts of short-term gasoline and special fuel gallonage were within 10 % error for most of the months. For other categories, MCFUT and diesel surtax the variability of short-term forecasts from observed values was much more than found in the other two motor fuel tax categories essentially due to inadequate data. The quarterly estimations obtained by the execution of the SHORTREV program were within 10% for all revenue sources except MCFUT and IRP. The long-term results indicate that overall highway revenues are going to increase 23.8 % in current dollars by the year 2005. For the same period, registration revenues (excluding IRP revenues) are going to increase by 31.3 % in current dollars, gasoline revenues by 27.34%, special fuel revenues, as well as MCFUT and motor carrier surtax revenues by 14.39%. Thus we see that the revenues from vehicles

Figure 8. Forecasts of Highway Revenues at State and Local Levels

Figure 9. Forecasts of Motor Fuel Revenues

Figure 10. Forecast of Registration and IRP Revenues

Figure 11. Forecasts of Revenues in Various Funds

contributing the most damage to the facilities is going to increase the least. Total state highway revenues will reach about \$843.2 million in 2005. Figure 8 indicates the forecast of highway revenues at state and local levels. Forecasts of motor fuel highway revenues are shown in Figure 9. Forecasts of registration and IRP revenues are shown in Figure 10. Figure 11 indicates revenue forecasts for the various funds in future.

Short-term highway revenue forecasts for the years 1991 and 1992 as obtained by executing INDOTREV program are shown in Table 1 of this report. The short-term results obtained by executing SHORTREV program are shown in Tables 2 and 3. The effects of increasing the tax rates for different revenue sources as of 1991 are presented in Table 4. A penny increase in gasoline tax can generate more than \$25 million; whereas, the same increase in special fuel tax fetches only additional \$6.3 million. An increase in the automobile registration fee of \$1 produces a revenue increase almost 90 times that resulting from increasing the registration fee of non-farm tractors above 78,000 lbs by \$5.

Table 1. Short-Term Highway Revenue Forecasts
for Indiana, 1991-1992

Month	Registration Fees Revenue		Driver License Revenue	
	1991	1992	1991	1992
J	2571	2615		
F	2259	2298	367	368
M	8881	9034	314	314
A	23224	23695	395	396
M	9660	9827	422	422
J	6856	6974	417	418
J	8959	9113	426	427
A	6700	6815	477	478
S	7167	7291	446	447
O	5609	5706	469	470
N	6388	6498	477	478
D	5142	5230	383	383
			395	395
	Gasoline Tax Revenue		Special Fuel Tax Revenue	
	1991	1992	1991	1992
J	34628	34888		
F	27767	27976	6428	6490
M	29727	29951	8399	8480
A	32341	32584	8399	8480
M	29074	29293	9427	9521
J	36588	36863	9085	9172
J	35281	35546	7628	7701
A	34628	34888	9684	9778
S	34954	35217	8656	8739
O	33321	33571	8570	8653
N	33321	33571	8142	8220
D	30708	30938	10027	10124
			8228	8307
	Motor Carrier Fuel Use Tax Rev.		Diesel Surtax Revenue	
	1991	1992	1991	1992
J	1028	1038		
F	1491	1506	7142	7211
M	2468	2492	3513	3547
A	758	766	9273	9362
M	1928	1947	4147	4187
J	836	844	4780	4826
J	424	428	7084	7152
A	1748	1765	1843	1861
S	1260	1272	4550	4594
O	1273	1285	6335	6397
N	424	428	6163	6222
D	1800	1817	5184	5234
			9158	9246

Table 2. Validation of Forecasts from "SHORTREV"

Year	Month	Vehicle License Fees		Gasoline Revenues	
		Estimated	Actual	Estimated	Actual
1991	JAN	3591070	2679042	36122231	33255441
1991	FEB	3071357	6403422	28515681	30007716
1991	MAR	11876329	9678798	30857179	27139507
1991	APR	31291735	18603313	33427838	32502471
1991	MAY	12984898	13797928	30023112	32941916
1991	JUN	9284509	13358768	37851808	35529035
		Special Fuel Revenues		Diesel Surtax Revenues	
		Estimated	Actual	Estimated	Actual
1991	JAN	6165744	7802452	11967777	1579677
1991	FEB	8546465	10552249	4948390	2400850
1991	MAR	8597732	5703076	13325442	12201246
1991	APR	9671982	8448516	6012074	2873156
1991	MAY	9363750	9051821	7051128	6695545
1991	JUN	7823569	8312538	10489833	2530437

Table 3. Short-Term Forecasts Using "SHORTREV"

Year	Month	Vehicle License Fees		Gasoline Revenues	
		Estimated	Actual	Estimated	Actual
1991	JUL	12674607		36359952	
1991	AUG	9496767		35745766	
1991	SEP	10229339		36171900	
1991	OCT	7987542		34330813	
1991	NOV	9121820		34595754	
1991	DEC	7366113		31946918	
		Special Fuel Revenues		Diesel Surtax Revenues	
		Estimated	Actual	Estimated	Actual
1991	JUL	10065615		1950959	
1991	AUG	8993414		4895776	
1991	SEP	8949771		6868311	
1991	OCT	8542809		6711283	
1991	NOV	10489610		5678632	
1991	DEC	8689893		10183585	

Table 4. Effects of Tax Rate Increases on
Revenues Generated, 1991

Major Parameter	Action	Effect on Revenue Generated (Increase in 1000s of \$)
Gasoline Tax	Increase by 1 cent	25114
Special Fuel Tax	Increase by 1 cent	6321
Diesel Surtax	Increase by 1 cent	4445
Automobile Registration fee	Increase by \$ 1	3302
Registration fees of Non-Farm Tractors > 78,000 lb	Increase by \$ 5	37

CHAPTER 1

INTRODUCTION

Forecasting of revenues is a critical element in highway management. Both short and long term forecasts are important in making management decisions. Short term revenue forecasts are necessary to allow appropriate cash flow management, while long term forecasts are needed for multi-year highway improvement programs. In addition, for the purpose of strategic planning it is imperative that a tool be available that can be used to estimate future revenues under various socio-economic and policy scenarios.

In the period of relative stability of fuel supply and pricing, the forecasting of revenues was comparatively simple. However, in recent years the volatility associated with fuel supply and pricing, as well as changes in vehicular technology resulting in improved fuel economy have made highway revenue forecasting a more difficult task. A simple projection of past trends is no longer a valid approach to predict future revenues. A more systematic approach that involves monitoring of vehicle registration, travel, fleet fuel economy and other related factors is now necessary to forecast highway revenues on a periodic basis.

In this study a highway revenue forecasting model is developed for Indiana Department of Transportation (INDOT) which provides forecasts of highway revenues by revenue source. The model is capable of making both long-term and short-term highway revenue forecasts. It takes into consideration relevant socio-economic, technological and appropriate legislative policy variables in making the forecast. The model is not only able to forecast revenues at state and local levels that can be expected under existing taxation policies, but is also capable of generating revenue estimates under different possible taxation scenarios.

In Chapter 2, a review of existing highway revenue forecasting studies and practices at state level is carried out. The highway revenue forecasting methodology that has been adopted for the Indiana Department of Transportation in this study is discussed in Chapter 3. Data requirements, data sources, and use of data in making forecasts for population, licensed drivers, registrations, vehicle-mix, vehicle fleet fuel efficiency, and state-wide vehicle travel are discussed in Chapter 4.

Chapter 5 provides a discussion on the model relationships used for forecasting different elements of highway revenues. These relationships form the basis of the computer model developed in this study. The structure of the computer model, "INDOTREV", and a user guide which describes input, output, menus and screens related to the operation of the model are

described in Chapter 6. Structure and operation of "SHORTREV" is also detailed in that chapter.

Chapter 7 presents both the long-term and the short-term highway revenue forecasts for the Indiana Department of Transportation. The means or steps of updating the model to prevent its obsolescence in the future are detailed in Chapter 8. Significant conclusions and recommendations are presented in Chapter 9.

CHAPTER 2

LITERATURE REVIEW

State transportation departments (DOTs) are facing challenges which are arising from recent shifts in revenue sources from: federal to state and local governments and the private sector; cost uncertainties resulting from economic instability; escalation of construction, maintenance, and operating costs; and erosion of revenues due to instability of some of the revenue bases, in particular motor fuel taxes. Under such circumstances DOTs are realizing: a) the need to develop and periodically update forecasts for a variety of revenue sources for planning and budgeting purposes; and b) that they must do so under constraints of limited data, technical skills and budget resources. Towards this goal several state DOTs devoted resources to developing transportation revenue forecasting processes and procedures in the 1980s, and will continue to build on and refine them into the 1990s and beyond. This chapter discusses some of the past studies conducted examining Indiana's highway revenues, and revenue forecasting models utilized by other states.

State Highway Funding Sources

States generate funds for highway construction, maintenance, and operation from a number of sources. These include "user fees" (i.e. motor-fuel taxes, vehicle registration fees, license fees, sales and franchise taxes, tolls, and vehicle and parts taxes), and "non-user" sources such as general funds and bonds. The basis for registration of vehicles, motor fuel taxation, and weight-distance taxes differs significantly across states. These differences are detailed in the literature [46,50,51,52]. Knowledge of the highway revenue sources and the basis of taxation for each source is important in highway revenue estimation.

Past Highway Revenue Related Studies for Indiana

A study on state highway finance and user taxation in Indiana was conducted in 1976 [32]. Population forecast was the basic element to the state highway revenue forecasting methodology adopted in this study. The forecast of Indiana population growth was an input into both vehicle registration and vehicle miles of travel projections. To forecast the population, the Cohort Survival Method of projection was used. The Cohort Survival Method is a demographic technique which analyzes changes in the components of population change: births, deaths, and migration. This method uses separate projections for births, deaths and net migration to derive the future population. The projections are made by age-sex

groupings. For projecting vehicles per capita, a power curve was used with a limiting value of 0.750 for vehicles per capita for 1995. The population projections and estimation of vehicles per capita were used to project vehicle registrations. Vehicle miles of travel (VMT) was predicted using a regression equation which related VMT to population and Indiana per capita income in 1975 dollars. Using projections of vehicle registrations and vehicle miles of travel the revenues were estimated based on some assumptions regarding average miles per gallon consumed per vehicle, tax rates and fees.

In 1979 a much more comprehensive study was conducted which developed a methodology and a computer model for evaluating the impacts of energy prices, national economy, and public policies on state highway financing and performance in Indiana [30]. The model developed utilized the national energy and economic forecasts developed by Data Resources, Inc. (DRI) along with a set of possible highway policy options, and simulated their effect on factors such as vehicle fuel efficiency, commercial and non-commercial vehicle-miles of travel, fuel consumption, revenue generation, highway maintenance and capital expenditures, and other related factors which were crucial to the determination of future highway performance. The basic approach of the auto fleet fuel efficiency modeling procedure used in this study is to categorize the auto fleet by model year and apply a cohort

survival technique to annually project the auto population by age. The model has provisions for considering survival rate changes, relative auto usage by model year, and the fuel efficiencies achieved by new model automobiles. The VMT prediction was done using an equation which required the assumption of an annual growth rate and the estimation of the demand elasticity of VMT with respect to fuel price. A separate technique was used to forecast commercial VMT which estimated future changes in commercial VMT indirectly, by assuming that the change in total commercial VMT is proportional to the change in motor-truck intercity ton-miles. The equation used to estimate commercial VMT: a) assumed that the growth rate in intracity ton-miles was the same as the growth rate in intercity ton-miles; and b) required the projection of both motor-truck intercity ton-miles and the average load carried index. A regression model was used to predict statewide motor truck intercity ton-miles using the independent variables--national business index (1967=100) and Indiana steel production in millions of tons.

In 1983 a study was conducted to assess the consequences of Indiana's participation in a reciprocity agreement with other jurisdictions through the International Registration Plan (IRP) [40]. The primary consequences examined were the fiscal impact of changes in truck registration decisions, and the impact on the trucking industry in Indiana. The method of calculating revenues from IRP involves: a) dividing base miles

traveled in each state by total miles traveled in all jurisdictions for the preceding year; b) determining the total fees required under the laws of each jurisdiction for full registration of each vehicle; and c) multiplying the amount obtained for each state from (b) by the quotient for that state from (a). Most jurisdictions compute base miles as the sum of in-jurisdiction miles and miles in non-IRP jurisdictions. Others consider only in-state miles as base miles. The study at that time found that if base miles are computed with Indiana miles plus non-IRP miles then Indiana would gain by participating in IRP, but could expect a loss if the base miles computed included only Indiana miles. Indiana has since joined IRP.

In 1985, a very detailed Indiana highway cost allocation study was finished [41]. The study developed cost-responsibilities and revenue contributions of various vehicle classes. The results of the revenue attribution analysis provided percentages contributed by individual vehicle classes. The findings of the study were used in revising highway financing/funding policies in Indiana [42]. Several proposed taxation revision schemes were evaluated in terms of equity of revenue contribution to cost responsibilities for various user groups. These schemes involved the revision of fuel tax rates and registration fees, as well as the imposition of a new weight-distance tax. The adopted tax package included: an increased gasoline tax rate, a motor

carrier fuel surcharge; an increase in registration fees; and a new user fee of \$ 50 per year for commercial vehicles. The user fee of \$ 50 per year, however, was subsequently repealed. The full potential of the procedure developed in this study to analyze the effects of various highway taxation options on user equity cannot be realized without good estimation of highway revenues.

Highway Revenue Forecasting in Kentucky

In a study done in 1985, regression analysis was selected as the primary means of forecasting highway-user revenues for Kentucky [35]. Emphasis was placed on historical trends, and a data base of highway-related and socio-economic variables was developed to determine the relationship between these variables and highway-user revenues. The database contained data for the period 1964 through 1984. Of the numerous equations and models that were developed to represent historical trends and forecast future trends, nine sequential models were recommended for use in predicting future highway revenues. The first related total annual motor vehicle registrations in thousands to total personal income in millions of 1972 dollars. The second predicted total annual vehicle-miles of travel (VMT) in millions based on: a) total annual motor-vehicle registrations in thousands; and b) average retail price of fuel in cents per gallon. The third estimated total annual fuel consumption in millions of gallons

using: a) total annual vehicle-miles of travel in millions; and b) an assumed value of average fleet fuel efficiency. The fourth equation calculates total annual fuel tax revenues in thousand dollars on the basis of: a) total annual fuel consumption in millions of gallons; b) the fuel tax rate for two-axle vehicles in dollars per gallon; c) the fuel tax rate for vehicles having more than two axles in dollars per gallon; and d) an assumption regarding the ratio of total fuel consumed by two-axle vehicles and that by more than two-axle vehicles. Total annual vehicle registration fees in thousand dollars is estimated by a fifth equation based on total annual motor-vehicle registrations in thousands. Total annual usage taxation in thousand dollars is estimated based on total personal income in millions of 1972 dollars by a sixth equation. The seventh equation determines total annual weight-distance tax in thousand dollars based on total annual vehicle-miles of travel in millions. The eighth equation relates annual miscellaneous revenues in thousand dollars to total personal income in millions of 1972 dollars. The ninth, and final, equation sums up the individual revenue values to determine the total highway revenues. Thus, there are only three exogeneous variables--income, fuel price, and fuel taxation rates--used in the whole forecasting process.

Highway Revenue Forecasting in Oregon

Oregon DOT uses econometric models for prediction of

registrations are a function of: a) lagged recreational vehicle registrations; b) recreational vehicle sales; and c) lagged error term. Mobile home registrations are a function of employment in the lumber and wood products in the state. All other vehicle registrations are forecasted using time series models.

Operator licenses are function of: a) instruction permits; and b) out-of-state licenses surrendered to the Motor Vehicles Division. Driver license renewals are a function of: a) lagged sum of original licenses; and b) renewal operator licenses. All other licensing transactions are forecasted using econometric and time series models. Other revenues are forecasted using time series models or the forecasts are provided by the operating division.

Highway Revenue Forecasting in Washington

State and national economic forecasts are the basis for the transportation revenue forecasts in the Washington DOT [57]. Key economic indicators used are: state real per capita income; state driver age population; state average passenger car fuel efficiency; real price of motor fuel, state real personal income, and U.S. industrial production (wood products). Other economic indicators used are: U.S. real personal income; U.S. real per capita income; U.S. auto sales; state highway vehicle registrations, U.S. consumer price index, and U.S. implicit price deflator.

Revenues are comprised of taxes on motor fuels and motor vehicle licenses, permits and fees. Fuel tax estimation is based on fuel tax rate and fuel consumption. Gasoline consumption estimation is based on: state real per capita income; state driver age population; average passenger car fuel efficiency; and U.S. real price of gasoline. Diesel consumption is related to state real personal income. Licenses, permits and fees are calculated using the fee structure and vehicle registration estimates. For registration estimates state real personal income and size of specific segments of state population are used. The model estimates average fleet value based on Washington state personal income data and national short-term interest rates. Personal income data are predicted by the Economic and Revenue Forecast Council and the national short term interest rates are predicted by Data Resources, Inc. (DRI). The number of driver license renewals and number of original licenses are forecast using population projections. The model learns from new and revised data and applies this knowledge in its portrayal of the relationships among variables. Hence model recalibrates its parameters (mathematical coefficients).

Highway Revenue Forecasting in Wisconsin

WisDOT uses a multiple time series framework for determining:
 a) gasoline demand; b) automobile sales; c) truck sales; d) demand for special fuel; and e) highway construction cost

inflation [58,59]. The procedure used in forecasting motor vehicle registration fees consists of three steps. First, fiscal year forecasts are made for automobile and truck sales. Second, scrappage of the existing fleet is estimated, again on a fiscal year basis. Vehicle registrations in a given future fiscal year are then derived by subtracting estimated scrappage from forecast sales and adding the result to the number of registrations from the preceding year. As a third step, average fees per vehicle are applied to estimated registrations. This results in the forecast of motor vehicle registration revenues.

Econometric models of auto and truck sales have been estimated from quarterly data. The models are of a form known more specifically as transfer functions. A benefit of this type of formulation is that the disturbance structure (ignored in most econometric models) is explicitly modeled, leading to more reliable estimates of the parameters of the model and improved forecasts. Data on vehicle sales is obtained from R.L. Polk and company, while information on economic input variables is provided by Data Resources, Incorporated (DRI). The model for automobile sales includes variables relating to: population aged 18 to 64; real disposable income per capita; unemployment; the real cost of owning and operating a vehicle; and consumer expectations. Variables in the truck sales model include: real personal income; unemployment; and the real cost of owning and operating a vehicle. Vehicle scrappage is

estimated as a percentage of the base number of registrations. The percentage used represents an average scrappage rate over the preceding five to seven years. Differing rates are developed for autos and trucks. The rates are 7.1 percent per year for autos and 5.4 percent per year for trucks. Data on the base number of vehicle registrations is updated at the end of each fiscal year, and reflects the number of registrations processed during that year.

Gasoline demand is assumed to be a function of real gasoline price, real disposable income, the fleet of gasoline-powered vehicles (auto and light trucks), and fleet fuel efficiency. Dummy variables are introduced for the effects that the 1973-74 oil embargo and the 1979 fuel shortage had on a gasoline demand (consumption). Fuel efficiency series are adjusted to account for quarterly temperature variations.

Highway Revenue Forecasting in Virginia

The highway revenue forecasting model developed in 1981 for Virginia DOT was an econometric model, and was based on a series of regression relationships that described the influence of future socio-economic conditions on vehicle-related user fee revenues [22]. The model was developed under the assumption that population and economic factors are the major forces that affect travel behavior, vehicle ownership, and vehicle use. The model consists of five basic submodels: economy; population; vehicle-miles of travel; vehicle

registrations; and new and used vehicle purchases. Total personal income in the state was used as the main economic parameter and was forecast based on total personal stock in manufacturing. An average annual growth rate for future population and household size was assumed. Total vehicle miles of travel in Virginia was disaggregated into three travel groups: 1) travel by in-state households; 2) travel by out-of-state households; and 3) travel by trucks. Travel by each of these groups was considered a function of two major factors, the cost of transportation and the income available to pay for these costs. These factors included variables such as: average cost per mile; overall CPI; total personal income; mean household income; and the number of households in the state. Total travel by in-state households was related to average cost per mile and average household income. Travel by out-of-state households was related to the ratio of average cost per mile to average household income. Truck travel was related to the ratio of personal income to the consumer price index.

Total vehicle registration was disaggregated into three mutually exclusive categories within the model: 1) vehicle registration (which includes automobiles, buses, and trucks); 2) motorcycles; and 3) trailers. Vehicle registration (excluding motorcycles and trailers) was related to personal income. Automobiles, buses, and trucks were related empirically by proportion. Motorcycles were related to driving age population and average household income. Trailers were

related to the number of households and average household income. The new and used vehicle purchases submodel contains four important equations which directly relate to sales tax revenues. They are the sale price of new and used vehicles, and the number of new and used vehicles purchased. The price of new vehicles was related to the overall CPI. The price of used vehicles was related to price of new vehicles and the model year. The number of new vehicles purchased was related to average household income and the CPI for gasoline. The number of used vehicles purchased was related to the price of used vehicles and average household income. The model has the capability of identifying the potential impact of changes in the fee structures. The model illustrates the impact of increased gas tax on consumption of gasoline with the help of an equation which incorporates the tax hikes into the CPI for gasoline, a parameter which influences the gasoline consumption.

In another paper [21] the impact of Virginia's participation in the International Truck Registration Plan (IRP) on its truck registration revenues is discussed. The projection of future revenues was based on the estimated number of trucks using Virginia's highways. The estimated number of trucks is calculated by dividing the projected truck miles of travel by average miles per truck (assumed 16,500 miles). Considering that all trucks are registered under the IRP, and that the average fee paid by participating truck

owners is equivalent to the average fee (\$ 50) currently assessed on registered trucks, the possible revenue obtained by the department was calculated. In order to assess the potential effects of IRP participation, the revenues were adjusted by the percentage of participation.

In a more recent survey [60] the Virginia DOT indicated that the demand for motor fuel is indirectly estimated based on the demand for travel. The demand for travel is modeled as a function of: a) the price of motor fuel relative to all prices; and b) real per capita disposable income. Dummy variables are used to account for seasonality and one time aberrations. It should be noted that consumers require time to adjust travel patterns to price and income changes. To forecast fuel consumption the modeling procedure uses relative prices, real income, dummy variables and a lagged fuel consumption parameter. The use of a lagged dependent variable in estimating and forecasting of fuel consumption has a drawback. Generally, with a lagged dependent variable forecast variances are repeated and compounded in future periods.

The extent of heavy truck travel is assumed to depend on the demand for freight transportation which, in turn, depends on the level of economic activity, strikes, etc. Revenues from heavy trucks are estimated directly as a function of a moving average real GNP, a strike dummy variable, a dummy variable to reflect changes in procedures regarding refunds and the excise

tax, and some seasonal dummy variables. Real GNP is used as a proxy for economic activity since the demand for freight is more likely to be a function of national than local activity. Quarterly data are used in forecasting.

For vehicle sales, regression analysis is used to determine and extrapolate a historical relationship between a Virginia data series and its national counterpart. The use tax rate is 3% of the sale price of a motor vehicle or a \$ 35 whichever is greater. Total taxable vehicle titles are estimated as a function of: a) consumer expenditures for new cars; b) new and used trucks; c) used cars; and d) quarterly dummy variables included to account for seasonality.

New vehicle titles are estimated as a function of: a) the ratio of Virginia's disposable income to national disposable income (to capture variations in new vehicle titles not explained by national new car sales); b) the effective interest rate for new car loans; c) national new car sales; and d) seasonal dummy variables. Average price of a new vehicle titled in Virginia is estimated as a function of: a) the average price of a new vehicle sold nationally; and b) quarterly dummy variables.

Reno et al. 1981

Reno et al. [38] in a NCHRP study developed a general procedure for forecasting state transportation revenues which was applied to six states. Major emphasis was placed on

forecasts of the principal determinants of revenue: motor fuel consumption; motor vehicle registrations; and licensed drivers. The forecasts of motor fuel consumption were found to be highly sensitive to fuel price, federal automobile and light truck fuel economy standards, numbers of registered vehicles, percentage of automobiles and light trucks, and the potential saturation of the number of vehicles per person of driving age.

Registrations of vehicles were found to be sensitive to levels of income and to the state of the economy. Forecasts of licensed drivers in each state were prepared from forecasts of future state population by age and sex. Registrations of light duty vehicles (automobiles/trucks registered at less than 10,000 lbs) were forecast in an integrated manner (automobiles and trucks less than 10,000 lbs combined) using forecasts of future population, income, and gasoline prices. Registrations of trucks carrying more than 10,000 lbs were forecast as a state share of the national forecasts of trucks of various weight classes.

Gasoline consumption was forecast on the basis of the forecasts of registered vehicles of each type, the future fuel efficiency (miles per gallon) of each type of vehicle, and the average mileage of each type of vehicle. The procedure used forecasts average miles per vehicle (for automobiles and light trucks) based on gasoline prices in the future compared to past price levels. The gasoline consumption forecasts for each

type of vehicle were summed to determine the forecast of total gasoline consumption. Diesel fuel consumption by heavier long distance trucks was assumed to be dependent both on the number of registered vehicles in a state and on out-of-state and through-travel. Diesel fuel consumption by these vehicles was therefore forecast as a share of national level forecasts of diesel consumption. Additional policies which may impact revenues in some states such as: changes in speed limits and levels of enforcement; changes in the proportion of persons traveling by carpool, vanpool, or public transit; and the exemption of gasohol from taxation were also examined.

In another study [39] estimates and forecasts of the numerous highway-related indicators which are essential in the estimation of Highway Trust Fund revenues were developed. The indicators included: vehicle population; vehicle weight; vehicle sales; vehicle prices; fuel efficiency; and annual miles of travel. These variables were compiled for 38 vehicle categories based on vehicle type, axle configuration and registered weight. Each of the 38 vehicle categories were further disaggregated by fuel type (gasoline or diesel).

The truck Inventory and Use Survey (TIUS) was used to obtain data for numbers of trucks. Automobile data used was the R.L. Polk and Company estimates as contained in the Motor Vehicle Manufacturer's Association (MVMA) Facts and Figures. The breakdown by size was based on data for model years in Automotive News. Highway Statistics was used as a source for

estimated buses, trailers and motorcycles. VMT data and average annual miles per vehicle was obtained from TIUS. CAFE standards, TIUS, EPA MPG data, and several special studies on the estimation of fuel efficiency were used for developing fuel efficiency parameters for each vehicle category. Disaggregate fuel efficiencies by highway functional class were also determined.

Forecasts of future light duty vehicles (autos and two-axle/four-tire single unit trucks) are made based upon projected changes in disposable income and driving age population. Breakdowns of autos versus light trucks are forecast based upon fuel prices and the relationship between federal auto and light truck fuel economy standards. The forecasts of all trucks over 26,000 lbs are made based upon economic activity (as reflected by GNP), fuel prices, and scrappage rates for trucks over 26,000 lbs. The breakdown by vehicle class within each weight category is based on the trends by model year in TIUS. VMT for automobiles and light trucks (2-axle / single unit / four tire trucks) is forecast as a function of total stocks and average annual miles per vehicle. The average annual miles per vehicle is a function of average fuel cost per mile (fuel; price in constant dollar terms divided by average miles per gallons for the light duty fleet). This formulation indicates that average miles per vehicle will decline whenever fuel price rises faster than average light duty fuel efficiency due to fleet turnover.

Total VMT by heavy trucks (over 26,000 lbs.) is considered to grow at a rate which is influenced by the growth of GNP.

TRANSFINANCE

TRANSFINANCE [2] is a computer program that performs a number of financial functions that are typically required by transportation planners in the public and private sectors. These functions include: gas tax revenue projections; general obligation bond, revenue bond and construction loan amortization tables; and road construction cost estimates. The program is designed using LOTUS 1-2-3. The forecasts are made at national level. For forecasting gasoline tax revenue, the program first projects the gasoline sales and then, using the current tax rates (or some assumed tax rate for future), computes and provides gasoline tax revenue projections. The projections are made using: a) linear regression with population as the independent variable and gasoline sales as the dependent variable; and b) a growth rate method where future gasoline sales is dependent on base year gasoline sales and the average annual growth rate of gasoline sales. The program generates the following information regarding gasoline tax revenues: i) gas tax revenue projections by year; ii) revenue generated by 1 cent of gas tax; iii) gas tax revenue received by government for each gallon of consumption; iv) total gas tax revenue projection; v) total gas tax revenue projection in present value; vi) revenue available for capital

examined include motor fuel taxes, vehicle registration fees, sales taxes and payroll taxes. There are descriptions of several case studies.

Studies on Heavy Vehicle Registrations

While intrastate motor vehicle owners can avoid road user taxes only through tax evasion, firms engaged in interstate commerce have wide discretion in determining where to register their vehicles. The annual number of heavy vehicle registrations in a state is a function of the derived demand for transport services in that state and the total registration cost differential (inclusive of registration fees, ad-valorem taxes, sales taxes and property taxes) between that state and any other contiguous states connected by a motor carrier route. This basic concept was modeled in a study [37] using a regression equation where the annual number of heavy vehicles registered in a state was used as dependent variable and the independent variables used were: a) the registration fee differential calculated for the state; b) a dummy variable representing whether the state is a member of a revenue sharing compact such as IRP; c) a dummy variable representing whether or not property tax must be paid on heavy vehicles registered in the state; d) the state sales tax rate on heavy vehicles per 1,000 dollars; e) a dummy variable representing whether or not more than one major carrier route passes through the state; and f) the state manufacturing

product. The result obtained suggested that the primary factor in the determination of heavy vehicle registrations in any state is the demand for transport services in that state, as indicated by the level of state manufacturing product. The state registration fee and other domicile-determined motor vehicle taxes represented less than 2 percent of the total annual cost of operating a heavy vehicle. Thus, the study concluded that given the level of demand for transport services, there would be little or no discernible impact on the number of registrations in response to registration fee differentials among states.

Other Studies on Motor Fuel Consumption

Yang [54] determines per capita gasoline demand (consumption) as a function of the real price of gasoline, the gross domestic product per capita income, the per capita stock of vehicles, and one period lagged per capita gasoline demand (consumption) using regression analysis. The short run elasticity of the gasoline demand per capita to above mentioned variables is also found.

In another paper [17] the specification and econometric estimation of a policy- and technology-sensitive long-range state-level model of highway gasoline demand is discussed. The model was developed by Oak Ridge National Laboratory for the Energy Information Administration and it integrates three major elements: a) demand for travel; b) demand for vehicles

used to accomplish that travel; and c) technology by which those vehicles transform motor fuel into travel. Given exogenous variables that include new-vehicle prices and characteristics, the demand for new vehicles by vehicle class is determined. Next, given existing state fleet compositions, new-car prices, and other variables, state used-vehicle holdings are determined by class and vintage. Based on fleet composition, historical and exogenously specified data on vehicle fuel efficiencies, and state characteristics, fleet fuel efficiency is determined. Finally, fleet composition, fuel efficiencies, and other variables such as gasoline price determine the state gasoline demand. In the model used, vehicle supply is represented by means of scrappage functions and used-vehicle demand is represented by equations that determine used-vehicle prices. Vehicle scrappage is determined by a combination of physical deterioration, accident, and market conditions based on Parks' interpretation [61] of scrappage as a stochastic process. The logistic equation used is a function of prices of used cars, repairs, and age. In another article [16], the scrappage and survival rates of passenger cars and light trucks in the U.S. are also determined using logistic function, but the function is primarily based on the age of the vehicle and has no economic parameters.

There are very few comprehensive studies on estimation of highway diesel fuel consumption. A regional econometric model

for long-range forecasting of diesel fuel use by heavy trucks based on the theory of production was developed by Greene for Oak Ridge National Laboratory [18]. A logistic scrappage model is used to estimate: a) total heavy truck stocks; and b) diesel-engine heavy truck stocks. Input demand equations are estimated for new heavy truck demand and regional highway diesel fuel demand. New heavy truck demand is found to be: a) elastic with respect to GNP; b) inelastic with respect to its own price; and c) extremely sensitive to short-term GNP trends. Short-run price elasticity of diesel fuel demand is found to be very small. The unadjusted diesel fuel consumption is calculated based on present stock, price, and regional income. In the forecasting model unadjusted diesel fuel use is adjusted for changes in fleet fuel efficiency by assuming that fuel efficiency has an elasticity of -1.0 after correcting for its effect on fuel cost per mile. The heavy truck model deals with heavy truck stock at the national level and fuel demand at the regional level. The scrappage model used is a simple logistic function of the estimated market value of a n-year-old truck in a given year. It is assumed that an increase in new truck prices will raise the value of all trucks and retard scrappage. NLIN procedure of SAS was used to estimate the parameters of the equation. The asymptotic scrappage rate for cars is 0.28, for light trucks is 0.13, and for heavy truck is 0.14. Scrappage rates for trucks less than five years old are extremely sensitive to new truck prices but these scrappage

rates are so low (0.01) that even relatively large percentage of changes are quite small in absolute magnitude.

Short-term Highway Revenue Forecasting Studies

Short-term highway revenue forecasting studies have been primarily restricted to that of short-run estimation of gasoline demand. Hartmann et al. [20] reviews some of the techniques used to forecast short-term demand for gasoline and describes in detail one. The studies reviewed estimated gasoline demand on monthly or quarterly basis, and on the national or the Petroleum Administration for Defense Districts (PADD) level. However, the structure of the models varied. For example, in one case demand for gasoline was regressed on 11 monthly dummy variables and real price of gasoline. While in another case, a log linear model regressed gasoline demand on income, the retail price index for gasoline, and 12-month lag demand. The following three-step methodology was used to forecast monthly gasoline demand in this paper: i) specify the annual relationship between gasoline demand and exogeneous variables such as national income, price of motor gasoline, automobile fleet efficiency, and stock of motor vehicles; ii) calculate the annual level of gasoline demand based on the above relationships and the assumptions about price, stock, and efficiency; and iii) forecast a monthly distribution of gasoline demand. The monthly distribution is estimated by development of factors called seasonal factors and are based

on the decomposition of a monthly time series data into trend, seasonal, and irregular/error components. In general, any monthly time series can be assumed to be the product of the trend of the series, a seasonal component, and an irregular or error component. The Bureau of the Census X-11 MULT Seasonal Adjustment Program [63] was used to derive seasonal factors.

Wilhelmi [53] developed a three-equation model of fuel demand. The first equation forecasts gasoline gallonage. The second equation forecasts diesel gallonage. The third equation is an identity that defines total fuel gallonage. Each forecast is by quarter on a seasonally adjusted annual basis. The quarterly forecasts are averaged to yield annual forecasts for 8 years. The annual forecast is then spread to months with seasonal adjustments for the current fiscal year. A tax rate is determined and a revenue forecast is developed. Variables for business cycles, recession, lumber and wood products, and retail trade were dropped from consideration because it was decided that those variables would be more difficult to forecast correctly during an 8-year period than the dependent variable, diesel fuel. An indirect model is used to estimate the demand for vehicle miles traveled (VMT), that is the transportation service provided, and then fuel consumption is estimated by dividing VMT by average miles per gallon of the fleet. Estimates of total VMT are available from the state DOT and are developed from traffic counts by automatic traffic recorders spread throughout the state. Tax

reports that specified gallons of fuel taxed were a more consistent data source than gallonage derived from VMT. This decision was based on the knowledge that forecasting gallonage derived from VMT implies the need to estimate changes in fleet miles per gallon by season under varying weather conditions.

A model of fuel demand simulates either a static or a dynamic process. A static form of the model infers that all the adjustment of the dependent variable to changes in the independent variables occurs in one period. A dynamic form of model assumes the response of the dependent variable to changes in independent variables occurs over a period of time. It was decided that the model should be of dynamic form. The equation chosen to estimate fuel consumption in Washington State can be classified as a dynamic, state adjustment, direct-fuel consumption model. In developing the forecast equation, 13 different gasoline demand equations were analyzed. All of the equations were estimated over 40 quarters of observed data by the ordinary least-squares procedure. Ten of the 13 equations were eliminated from consideration as the forecast equation. The three reasons for elimination were: i) possible auto-correlation of error terms; ii) nonsignificant variables included in the equation; and iii) inclusion of seasonal dummy variables in the equation.

Gallons of gasoline in Washington State per driving age population quarterly at a seasonally adjusted annual rate was related to: the relative price of gasoline; a moving

average over four quarters of the implicit price deflator for personal consumption nondurables gasoline and oil divided by the implicit price deflator for personal consumption; miles per gallon; moving average over 14 quarters of Environmental Protection Agency (EPA) MPG for new cars adjusted for actual on-the-road experience; gasoline crisis indicator variable set at 1 during (year:quarter) 1973:4; 1974:1 and 2; and 1979:2,3, and 4, and at 0 all other times; and personal income (a moving average over four quarters at a seasonally adjusted annual rate of personal income for Washington State residents in 1972 constant dollars per driving age population). The gasoline price elasticity estimated by this equation was -0.36.

Gallons of diesel in Washington State by quarter at a seasonally adjusted annual rate is related to personal income (a moving average over four quarters at a seasonally adjusted annual rate of personal income in Washington State in 1972 constant dollars). Using seasonal factors, a monthly forecast is derived for the current fiscal year. The seasonal factors were estimated using the seasonal adjustment procedure commonly known as Census X-11 variant. The gasoline seasonal factors differed both in size and in rank order from those used in the short-term energy outlook model of national gasoline use. The study indicates that this difference is not inappropriate because: a) weather patterns in Washington State are somewhat different from national weather patterns; and b) the Spearman rank correlation coefficient (0.7) was large

enough to indicate a significant degree of similarity between rankings, although rankings were not equivalent.

The immediacy of energy concerns in late 1970s warranted a closer attention to near-term series analyses of gasoline consumption patterns. Towards this goal Cervero [6] developed an autoregressive integrated moving average (ARIMA) model for forecasting monthly highway energy consumption in the United States using data from the 1977-83 period. Distinct secular and seasonal factors, revolving around 1- and 6-month cycles, emerged from the time series analysis that offered a practical basis for short-term energy forecasting. Efforts to incorporate the intervening effects of the 1979 oil supply disruption on U.S. highway gasoline consumption found that its impacts on the underlying secular, seasonal and stochastic processes behind usage patterns were fairly inconsequential. Comparable short-range models should be integrated into state-level planning programs to closely track possible futures at more disaggregate levels. ARIMA model limitations stem from the fact that they are relatively simplistic in structure. ARIMA models are univariate and consequently offer no causal explanations of the series behavior. Thus, the relative influences of price, income and other explanatory variables on gasoline consumption are not explicitly considered by these models. Nor are they capable of conducting "what if" sensitivity analysis (e.g. If gasoline prices doubled, what would be fuel consumption consequences?). Short-run

forecasting of highway fuel consumption deserves a place along side of long-term econometric modeling as we continue to face uncertainties over the nation's energy and economic future.

CHAPTER 3

ADOPTED HIGHWAY REVENUE FORECASTING METHODOLOGY

The procedures and practices of forecasting highway revenues at the state level have been discussed in the previous chapter. The first step in highway revenue prediction should be an understanding of the different highway revenue sources and the basis on which charges are made. Hence this chapter first outlines and describes the different highway revenue sources in Indiana. Next, the structure for disbursement of highway revenues from different sources to different funds in Indiana is illustrated. Finally, the basic methodology to predict revenues from different highway revenue sources in Indiana, as adopted in this research study, is presented.

Indiana Highway Revenues and their Disbursement

A description of the highway revenue sources in Indiana is provided in Table 3.1. The sources of highway revenue consist primarily of the motor fuel taxes, registration fees, and driver license fees. Gasoline tax was the earliest adopted tax in Indiana (1923) on a gallonage basis which was changed in the 1980s to an ad valorem tax (with a threshold and a

Table 3.1 Description of Highway Revenue Sources in Indiana

Revenue Source	Description
Gasoline/Gasohol Tax	Tax on gasoline/gasohol purchased in Indiana. Paid by the wholesaler. Costs passed on to the retailer and final consumer.
Special Fuel Tax	Tax on diesel fuel purchased and consumed in Indiana. Tax is paid by consumer at the pump. Collected from retailer. Trucking companies file quarterly claims for reimbursement of taxes paid on diesel fuel consumed out-of-state.
Diesel Surtax	Add-on tax charged on all diesel fuel consumed by motor carriers in Indiana. Collected from trucking companies. Excess Road Tax credits may be used to offset on a dollar-for-dollar basis.
Motor Carrier Fuel Use Tax (Road Tax)	Tax on motor fuel consumed by trucks in Indiana, but purchased elsewhere. Collected from trucking companies. Credit earned for each gallon of fuel purchased in Indiana. Applies to (a) trucks having more than two (2) axles, (b) trucks having a gross weight greater than 26000 lbs, and (c) vehicle used in combination if the gross weight of the combination is greater than 26000 lbs.
Passenger Vehicle Registration	Flat fee paid to register autos and light trucks (under 7000 lbs). Assessed annually on vehicle owners, and collected on a 10-month cycle.
Truck Registration	Weight-based fee paid to register heavy trucks (over 7000 lbs). Assessed annually on truck owners. Trucks over 16,000 lbs - Assessed in Feb. Trucks under 16,000 lbs. Commercially Owned - Assessed in Jan. Individually Owned - Assessed on 10-month cycle
International Registration Plan	Reciprocal agreement on motor carrier registration fees. Applies to (a) power units having 3 or more axles regardless of weight, (b) vehicles having a gross weight in excess of 26,000 lbs, and (c) vehicles used in combination when the gross weight of the combination exceeds 26,000 lbs.
Drivers License Fee	License to operate a motor vehicle in Indiana. Various types of licenses (for varying terms) available.

ceiling) to keep up with the adverse economic changes. Special fuel tax is based on the consumption of diesel fuel by highway vehicles. In 1985, a surcharge tax was levied on fuel consumption by heavy vehicles. Soon after in 1986, another tax called the Motor Carrier Fuel Use Tax (MCFUT) was adopted in order to address the issue of in-state and out-of-state diesel fuel purchases, and in-state and out-of-state diesel fuel consumption, which was a cause of concern after the cost-allocation study indicated that heavy vehicles (above 26,000 lbs) were greatly underpaying their share of highway revenues. Another important change which resulted from the findings of the cost allocation study was the restructuring and increasing of vehicle registration fees (especially truck and tractor registrations). The registration fees for trucks, tractors, and buses are based on gross registered vehicle weight. In 1987, Indiana joined the International Registration Plan (IRP) [45] which was aimed at distributing fairly the registration fees paid by the long-haul heavy trucks (above 26,000 lbs and/or having more than two axles) among the different states whose highway facilities were used.

The Indiana system of funding highway activities includes two major accounts, Motor Vehicle Highway Account (MVHA) and the Highway Road and Street Fund (HRSF). Among other accounts are the Special Distribution (SD), the State Highway Road Construction & Improvement Fund (SHCF), and the Motor Carrier Regulation Fund (MCRF). Highway revenues are distributed to

the different funds according to legislated ratios. The distribution of gasoline tax revenues and special tax revenues are shown in Figures 3.1 and 3.2. Figure 3.3 illustrates the distribution of Motor Carrier Surtax and Motor Carrier Fuel Use Tax revenues. Driver license and IRP revenues are gathered in MVHA; whereas, registration fees are distributed to the MVHA, as well as the HRSF (Figure 3.4). The receipt and disbursement structures of MVHA and HRSF are shown in Figures 3.5 and 3.6. The structure of the State Highway Fund (SHF) is shown in Figure 3.7.

Long-Term Highway Revenue Forecasting Methodology

Highway revenues generated are dependent on numerous demographic, economic, technological, and legislative factors. Highway revenues are largely dependent on travel demand. Travel demand is made up of needs for: a) personal mobility; and b) commodity/goods movement. Two major parameters which reflect travel demand and in turn the need for personal mobility or commodity transportation are: a) vehicle ownership; and b) vehicle use. Vehicle ownership could be indicated by vehicle registrations. Personal vehicle registrations is dependent on population, as well as economic influences which affect individual income. The extent of industrial and commercial development (reflecting the level of economic activity) stimulates demand on freight/goods movement which in turn increases the need for heavy truck and tractor

Figure 3.1 Distribution of Gasoline Tax Revenues

Figure 3.2 Distribution of Special Fuel Tax Revenues

Figure 3.3 Distribution of Motor Carrier Surtax Revenues and Motor Carrier Fuel Use Tax Revenues

Figure 3.4 Distribution of Revenues from Registration, IRP, and Driver License

Figure 3.5 Flow of Funds through MVHA

Figure 3.6 Flow of Funds through HRSF

Figure 3.7 Structure of SHF

registration (a vehicle category which is recently being favored more and more for freight transportation). Automobiles and light duty trucks are most widely used to satisfy the personal mobility need. The use of vehicles is dependent on increased travel demand spurred by economically favorable climate and low fuel prices. Since the backbone of the highway revenue funding is motor fuel taxation in conjunction with travel demand, attention should also be paid to the fuel source and the technology which provides the energy for motion of the vehicle. Thus, in estimation of highway revenues: a) vehicle ownership/registration; b) vehicle use; and c) vehicular technology used to convert fuel to energy to power the vehicle need to be considered. In addition, legislative actions are responsible for changing the taxation rates, as well as disbursement ratios. Consideration of such factors should not be ignored if accurate and reliable forecasts need to be made in the future.

This study disaggregates total revenues into the revenues obtained from the six major categories: registration fees; driver licenses; gasoline tax; special fuel tax; motor carrier surtax; and motor carrier fuel use tax. The revenues for each of these categories are separated into their component tax rate and revenue base. Four important factors which have been considered in estimating the value of the revenue bases are: a) population forecasts; b) economic forecasts; c) fleet fuel efficiency projections (which should reflect the composition

of vehicle fleet, as well as vehicular technological advancement); and d) estimation of vehicle-miles of travel (VMT). This study groups the vehicles into five categories: automobiles; motorcycles; trucks; tractors; and buses. In addition, for registration revenue estimation, trailers and semitrailers are also considered. For trucks, tractors, trailers, and semitrailers there is further disaggregation into farm and non-farm categories. Figures 3.8 and 3.9 indicate the overall structure of how vehicle registration revenues are estimated. Personal vehicle travel with automobiles and a significant portion of trucks is estimated based on economic parameters affecting individual income and expenditures for travel (especially gasoline prices). Freight vehicle travel is understood to be a function of an indicator which would represent the overall economy of the state such as gross state product. The procedures to obtain the annual VMT by different vehicle categories are shown in Figure 3.10. Fleet fuel efficiency is based on the consideration of vehicle sales and scrappage, and technological factors as denoted by the vehicle fuel efficiency. Figures 3.11, 3.12, and 3.13 indicate the computational procedure for estimating fleet fuel efficiencies for automobiles, trucks, and tractors respectively. The fleet fuel efficiency of buses, for the purpose of this study, has been assumed to be same as that of tractors. VMT and fleet fuel efficiencies are used to compute fuel consumption. The overall structure for estimating all

Figure 3.8 Overall Procedure to Compute Automobile, Truck, Bus, and Motorcycle Registration Revenues and Driver License Revenues

Figure 3.9 Overall Procedure to Compute Tractor, Trailer, and Semitrailer Registration Revenues

Figure 3.10 Overall Procedure to Compute Annual VMT by Different Vehicle Categories

NOTE: NI IS PROPORTION OF AUTOMOBILE IN ITH AGE COHORT
 RVTI IS RELATIVE VEHICLE USE BY AUTOMOBILE IN ITH AGE COHORT
 EFFI IS THE FUEL EFFICIENCY OF AUTOMOBILE IN ITH AGE COHORT

Figure 3.11 Procedure to Compute Fleet Fuel Efficiency of Automobiles

NOTE: NI IS PROPORTION OF TRUCK IN ITH AGE COHORT
 RVTI IS RELATIVE VEHICLE USE BY TRUCK IN ITH AGE COHORT
 EFFI IS THE FUEL EFFICIENCY OF TRUCK IN ITH AGE COHORT

Figure 3.12 Procedure to Compute Fleet Fuel Efficiency of Trucks

NOTE: NI IS PROPORTION OF TRACTOR IN ITH AGE COHORT
 RVTI IS RELATIVE VEHICLE USE BY TRACTOR IN ITH AGE COHORT
 EFFI IS FUEL EFFICIENCY OF TRACTOR IN ITH AGE COHORT

Figure 3.13 Procedure to Compute Fleet Fuel Efficiency of Tractors

motor fuel tax revenues is shown in Figure 3.14. The procedure adopted is able to respond to changes in demography, economy, vehicular technology, and legislative initiatives.

Short-Term Highway Revenue Forecasting Methodology

The short-term revenue forecasting has not been widely practiced in state DOTs. Wisconsin does have a quarterly gasoline consumption estimation procedure. There are several short-term forecasting techniques available [28,29]. They can be broadly categorized as: a) smoothing methods such as moving averages, exponential smoothing; b) decomposition methods such as trend fitting, ratio-to-moving average, classical decomposition methods, Census II decomposition method; and c) autoregressive/moving average (ARMA) time series methods such as the Box-Jenkins method. The most widely used method is the decomposition method as indicated in the literature review chapter. The basic aim in the decomposition method is to find the seasonality existent in the revenue data; and thus, distribute the annual forecasts to different months using the seasonal factors computed using one of the decomposition methods. Such an approach has been adopted for determining the monthly forecasts in this study.

Figure 3.14 Overall Procedure to Compute Motor Fuel Tax Revenues

CHAPTER 4

DATA REQUIREMENTS, SOURCES, AND USE

Highway revenue forecasting adopted in this study, as discussed in the previous chapter, is dependent on exogenous as well as endogenous data which are described in detail in this chapter. Sources for the data items are listed in Table 4.1. Identification and knowledge of data sources is vital to the users of the highway revenue forecasting model developed in this study for the purposes.

Exogenous data are referred to those which are not collected by INDOT, the Indiana Department of Revenue and/or the Indiana Bureau of Motor Vehicles. Examples of such data are socio-economic data, vehicles in operation data, vehicle travel data, vehicle fuel efficiency by model year, and relative travel by different vehicles by model year. Endogenous data are those collected regularly by the state agencies and include: vehicle registrations; vehicle registration fees; motor fuel consumption; motor fuel tax rates; highway revenues by tax source (i.e. licenses, registrations and motor fuel taxes) and disbursement ratios. Exogenous data are those over which INDOT has little control; whereas, endogenous data related to taxation and disbursement

Table 4.1 Data Sources

Data/Information	Source
Socio-economic:	
Population Projections	Indiana State Board of Health
Total Population	Indiana Business Research Center,
Driving Age Population	Indiana University
Young Age (15-24 yr)	U.S. Bureau of Census
Population	Woods & Poole Economics (W&P), Inc.
Old Age Population	"1987 Indiana State Profile"
Less than Driving Age	
Population	
Per capita Income	Indiana Factbook 1989
(Indiana)	U.S. Department of Commerce
Gross State Product	Indiana Factbook 1989
(Indiana)	U.S. Department of Commerce
Gasoline Price	Penwell Publishers, "Oil and
(Indianapolis)	Natural Gas"
Consumer Price Inflation (CPI)	Survey of Current Business
Index (National)	Bureau of Labor Statistics, U.S.
	Department of Labor
	Oak Ridge National Laboratory,
	"Transportation Energy Data Book",
	Edition 10
Gross National Product (GNP)	Survey of Current Business
Implicit Price Deflator	Bureau of Labor Statistics, U.S.
(National)	Department of Labor
	Oak Ridge National Laboratory,
	"Transportation Energy Data Book",
	Edition 10
Licensed Drivers:	Highway Statistics
Vehicle Registrations:	
Automobiles (Indiana)	INDOT, Bureau of Motor Vehicles
Buses (Indiana)	Highway Statistics
School Buses	
Church Buses	
Intracity Buses	
Intercity Buses	
Single Unit Trucks (Indiana)	
Non-Farm	
Farm	
Truck Tractors/Combination	
(Indiana)	
Trucks	
Non-Farm	
Farm	
Trailers (Indiana)	
Semitrailers (Indiana)	
Vehicle in Operation:	R.L. Polk and Company
Automobiles (Indiana)	
Trucks (Indiana)	

Table 4.1 Data Sources (continued)

Data/Information	Source
Vehicle Sales:	
Automobiles (Indiana)	R.L. Polk Company
Trucks (Indiana)	MVMA, "Facts and Figures"
Vehicle Travel:	
Automobiles--Average Annual Miles of Travel per Vehicle (National)	Highway Statistics
Single-Unit Trucks--Average Annual Miles of Travel per Vehicle (National)	Highway Statistics
Combination Truck--Average Annual Miles of Travel per Vehicle (National)	Highway Statistics
Bus--Average Annual Miles of Travel per vehicle (National)	Highway Statistics
Motorcycle--Average Annual Miles of Truck--Annual Miles of Travel (Indiana)	Highway Statistics
Truck--Average Annual Miles of Travel per Vehicle (Indiana)	Truck Inventory and Use Survey
	Truck Inventory and Use Survey
Vehicle Fuel Efficiency:	
Automobiles (National)	Oak Ridge National Laboratory,
Motorcycles (National)	"Transportation Energy Data Book"
Single-Unit Trucks (National)	Highway Statistics
Combination-Truck (National)	
Buses (National)	
Relative Travel by Aged Vehicles:	
Automobiles	Oak Ridge National Laboratory,
Single-Unit Trucks	"Transportation Energy Data Book"
Combination Trucks	
Fuel Consumption:	
Gasoline	INDOT, Department of Revenue
Special Fuel	INDOT, Division of Planning and Budgeting
	Highway Statistics

Table 4.1 Data Sources (continued)

Data/Information	Source
Vehicle Registration Fees:	INDOT, Bureau of Motor Vehicles
Automobiles	
Motorcycle	
Bus	
Church Bus	
School Bus	
Intracity Bus	
Intercity Bus	
Trucks (graduated by gross weight)	
Non-farm	
Farm	
Tractors (graduated by gross weight)	
Non-farm	
Farm	
Trailers (graduated by gross weight)	
Farm	
Non-Farm	
Semitrailers (graduated by gross weight)	
Farm	
Non-Farm	
Motor Fuel Tax Rates:	INDOT, Department of Revenue Highway Statistics
Gasoline	
Special Fuel	
Motor Carrier Fuel Use Tax	
Diesel Surtax	
Highway Revenues: (Annual and Monthly)	INDOT, Bureau of Motor Vehicles INDOT, Division of Planning
Driver License Revenues	
Vehicle Registration Revenues	
International Registration	
Plan Revenues	
Gasoline Revenues	
Special Fuel Revenues	
Diesel Surtax Revenues	
Motor Carrier Fuel Use Tax Revenues	
Fund Structure (Types of Funds)	INDOT, Division of Planning and Budgeting
Disbursement Structure/Ratios	INDOT, Division of Planning and Budgeting

are within the control of the state agencies. Thus, by observing changes in exogenous variables which affect some of the endogenous variables such as registrations and motor fuel consumption, the State can restructure or change taxation policies and disbursement ratios to achieve desired funding levels.

Demographic Data

Demographic data such as total population, driving age population (above 16 years old), young age population (population between 15 years and 25 years old), and less than driving age population (less than 16 years old) have been considered in this study. Among the sources of population data used are: a) Indiana County Population Projections 1985-2020 [63]; b) 1987 Indiana State Profile by Woods and Poole Economics, Inc. [64]; c) 1989 Indiana Factbook [65]; and d) Census of Population by U.S. Department of Commerce, and Bureau of Census [49]. The Indiana County Population Projections 1985-2020 provides the most accurate projection. This data is also available on-line through the Economic Development Information Network (EDIN) maintained by the Indiana University Business Research Center. However, all sources are important. The model developed in this study has Indiana population projections until 2005 as an input based on the values found in the various above-mentioned literature, and does not do any population projections. This is

of such indices in the appendix of the annual Transportation Energy Books [14] and could be an useful source.

Vehicle Registrations and Licensed Drivers

The data on vehicle registrations and number of licensed drivers can be obtained from the Bureau of Motor Vehicles, [67] as well as from Highway Statistics [68]. However, the disaggregated data on truck, tractor, trailer, semitrailer, and bus registrations by gross registered vehicle weights can be obtained only from the former source. The data on registration fees and registration revenues collected every year can also be collected from Bureau of Motor Vehicles. Data from 1976 to 1989 for vehicle registrations by different weight groups, associated fees and revenue collections are presented in several tables in Appendix A. The proportion of different weight groups to total registrations along with the registration fees for those weight groups are used to arrive at an average registraion fee for the whole vehicle category under consideration such as that for trucks, tractors, and trailers.

Vehicle Sales and Vehicles in Operation

Data on automobiles and trucks in operation are provided by R.L. Polk and Company [36] for each state, as well as for the entire U.S. The information provided also indicates the numbers by different manufacturer's models and by age. A

sample sheet is shown in Appendix A (Figures A.1 and A.2). In addition, the Motor Vehicle Manufacturers Association (MVMA) [34] and the Truck Inventory and Use Survey (TIUS) published by the Census of Transportation [7,8,9,10,11,12] provide information on truck registrations and use. The former provides data usually on the national level; whereas, the latter provides information every five years on the national, as well as state levels. TIUS also provides information on truck stock by model year or age. From the above mentioned sources, vehicle stock information by age for automobiles, trucks, and tractors were developed. Certain manufacturers have always specialized in heavy trucks (a large part of which are tractors) and continue to do so. These are Mack, White, Freightliner, Kenworth, Peterbilt, Diamond-Reo, and International (see Figure A.2) [18]. All trucks from these manufacturers were considered to be tractors and the rest were assumed to be trucks for this study. This assumption was used in developing the scrappage rates for trucks and tractors as a function of their age. The sales are provided by the MVMA [34] on a national level only. The sales data for this study was derived on the basis of the number of automobiles, trucks, and tractors in the first age cohort (i.e. less than or equal to 1 year old).

Vehicle Travel

Total annual vehicle miles of travel for each state are provided in Highway Statistics [68]. In addition, the average

annual miles of travel per vehicle are provided based on a national level data for vehicle categories such as automobiles, single-unit trucks, combination trucks, buses, and motorcycles. TIUS [7,8,9, 10,11,12] provides such information for trucks at five year intervals. The single unit trucks were considered trucks as denoted in this study. The combination trucks were considered tractors as denoted in this study. This information in conjunction with the vehicle registration and vehicles in operation information was used to derive historical vehicle-miles of travel information for the vehicle categories: automobiles; trucks; tractors; buses; and motorcycles. Another feature related to vehicle travel, relative vehicle travel (RVT) by vehicles of different ages within a vehicle category, was of interest in this study. Relative vehicle travel signifies how much more or less the vehicles in ith age group travel per year compared to the average miles per vehicle in that category. RVT information on automobiles was obtained from the Oak Ridge National Laboratory Transportation Energy Books [14,19,24]; whereas, that for trucks was obtained from TIUS [7,8,9,10,11,12].

Vehicle Fuel Efficiency

Information on vehicle fuel efficiency is provided in Oak Ridge National Laboratory's Transportation Energy Books [14,19,24], or some specialized studies [25,38,69]. The values for trucks were taken as that provided for single-unit trucks

in the literature. The values for combination trucks were used for tractors and buses.

Motor Fuel Consumption, Tax Rates and Revenues

Information on motor fuel (gasoline and special fuel) consumption, tax rates, and motor fuel revenues are provided in Highway Statistics [68], and are also obtainable from Division of Policy and Budget within INDOT.

Others

In addition, information regarding the disbursement structures, other legislative initiatives, IRP revenues, and miscellaneous revenues can be found from the Division of Policy and Budget within INDOT.

CHAPTER 5

HIGHWAY REVENUE FORECASTING MODEL RELATIONSHIPS

This chapter describes the statistical and other relationships which form the basis of the long-term, as well as short-term forecasts. These relationships have been developed using the data discussed in the previous chapter. The assumptions used in deriving the relationships are also discussed. The discussion of long-term forecasting has been separated from that of short-term. However, as was mentioned in Chapter 3, the short-term forecasts are interlinked to the long-term forecasts in that the annual forecasted revenues are disaggregated into monthly forecasts using seasonal factors.

Long-Term Highway Revenue Forecasting**Vehicle Registration Forecast Equations**

Vehicles used primarily for personal travel are automobiles, motorcycles, and a significant portion of trucks. Number of vehicles used for personal travel is largely dependent on the income of individuals. Hence, a good indicator of personal vehicle registration (autos and light trucks) is real per capita income. Motorcycles are also used for personal travel. However, it should be noted that

where,

NFTRACT is number of non-farm tractors registered in Indiana

FTRACT is number of farm tractors registered in Indiana

TRAILER is number of trailers (farm and non-farm) registered in Indiana

NFSEMTR is number of non-farm semitrailers registered in Indiana

FSEMTR is number of farm semitrailers registered in Indiana

FEEINC is the percentage increase in the registration fees of non-farm truck

IRP is the dummy variable for the introduction of International Registration Plan in Indiana

GSP82 is the gross state product in Indiana in thousands of 1982 dollars

The number of buses registered in Indiana is small. Nevertheless, a model was developed to predict bus registrations. Bus registration was found to correlate best with the driving age population as this group consists of common users of all buses, and is the group with the greatest propensity for travel. Among the driving age population those with low incomes and of old age are most likely to patronize the bus system. However, these factors were not incorporated into the final regression equation used to estimate bus registrations. Driving age population was determined to be sufficiently effective indicator since bus registrations represent only a very small portion of total vehicle registration revenues. The relationship obtained is shown below:

$$\text{BUSREG} = -35909 + 12.64116 * \text{DPOP} \quad [5.10]$$

$$(-3.4581) \quad (4.2980) \quad (R^2 = 0.5734; F = 18.4726)$$

Note: Values in the brackets below coefficients are their t-values;

where,

BUSREG is number of buses (total of school buses, church buses, intracity buses, and intercity buses) registered in Indiana

DPOP is the driving age population in Indiana

Vehicle Travel Forecast Equations

Personal vehicle travel per year is made up of annual miles traveled by: a) automobiles; b) light duty trucks; and c) motorcycles. The two major parameters affecting personal vehicle travel are gasoline price and the per capita income. These vehicles are primarily gasoline-driven; and hence, gasoline consumption is highly dependent on personal vehicle travel.

$$\text{AUTOVMT} = 9649.517 - 21.819 \cdot \text{GASP82} + 1.855419 \cdot \text{PCI82} \quad [5.11]$$

(4.6875) (-3.5101) (10.8258)

($R^2 = 0.9037$; $F = 76.0385$)

$$\text{SUVMT} = -9824.668 + 1.743573 \cdot \text{PCI82} \quad [5.12]$$

(-7.6619) (14.4558) ($R^2 = 0.9286$; $F = 208.97$)

$$\text{MCVMT} = -494.3567 + 0.04394 \cdot \text{PCI82} + 0.001753 \cdot \text{MCYCLE} \quad [5.13]$$

(-5.0038) (5.4350) (6.2681)

($R^2 = 0.7872$; $F = 30.6017$)

Note: Values in the brackets below coefficients represent their t-values;

where,

AUTOVMT is annual automobile miles of travel (in millions) in Indiana

SUVMT is annual truck miles of travel (in millions) in Indiana

MCVMT is annual motorcycle miles of travel (in millions) in Indiana

GASP82 is gasoline price in Indiana in 1982 dollars

PCI82 is per capita income in Indiana in 1982 dollars

MCYCLE is number of motorcycles registered in Indiana

A large part of annual commercial VMT is that associated with use of tractors for goods movement. This type of the vehicular travel is also the major consumer of special fuels. The tractor population comprises: a) non-farm tractors registered in Indiana; b) non-farm tractors that have joined IRP, are not registered in Indiana, but use Indiana highways for transporting goods; and c) farm tractors registered in Indiana. The tractor population we denote by COMBREG. Thus, commercial VMT depends on this variable COMBREG and the gross state product. However, as we saw previously, since tractor registrations are, to a large extent, related to the gross state product, it is necessary to include only one of the two variables: COMBREG or GSP. The variable COMBREG showed a better correlation. The relationship thus obtained is shown below.

$$\text{COMBVMT} = -1964.889426 + 0.107787 \cdot \text{COMBREG} \quad [5.14]$$

(-2.5067) (5.8865)

($R^2 = 0.7062$; $F = 34.6512$)

Note: Values in the brackets below the coefficients represent their t-values;

where,

COMBVMT is the vehicle miles of travel associated with the tractors in Indiana
 COMBREG is the population of tractors using the highways of Indiana

The total bus miles of travel (BUSVMT) was estimated as follows:

$$\text{BUSVMT} = \text{BUSAVGM} * \text{BUSREG} \quad [5.15]$$

where,

PCI82 = per capita income in 1982 \$ in Indiana

BUSAVGM = average miles traveled by a bus with the premise that bus operation is dependent on ridership which in turn is affected by personal income, the variable BUSAVGM was computed by using the following equation

$$\text{BUSAVGM} = 3070.090368 - 1.86897 \cdot \text{PCI82} \quad [5.15]$$

(7.2417) (-4.6859)

($R^2 = 0.567$; $F = 21.9574$)

Note: Values in the brackets below the coefficients represent their t-values.

Vehicle Fleet Fuel Efficiency Determination

This exercise is carried out for three vehicle groups: automobiles; trucks; and tractors. The first step in determining fleet fuel efficiency is determining the proportion of vehicles by age cohort (NI). Vehicle stock information is collected by R.L. Polk and Company. Scrappage rates are developed from historical information on the vehicles in operation. New vehicle sales figures are also taken from R. L. Polk and Company data. Vehicle stock, scrappage rates and sales estimations are then used to obtain the proportion of vehicles by age (NI). The second step is the estimation of relative miles of travel (RVT) for these different age cohorts. For this purpose, a total of ten vehicle age cohorts is considered. This is so because the information in the literature regarding the relative miles of travel by vehicles in the different age cohorts are provided for only ten cohorts. Next, model year fuel efficiencies are

obtained. The underlying equation in determining the fleet fuel efficiency is given below.

$$(1/FEFF_K) = (C_{IK}/EFF_{IK} + \dots + C_{IK}/EFF_{IK} \dots + C_{NK}/EFF_{NK}) \quad [5.17]$$

where,

$FEFF_K$	is the fleet fuel efficiency of the vehicle category K
EFF_{IK}	is the fuel efficiency of the vehicle in vehicle category K and age cohort I
K	is the type of vehicle category (automobile, truck, or tractor)
I	is the age cohort which is 1 to 10
N_{IK}	is the proportion of vehicle type K in age cohort I
RVT_{IK}	is the relative miles of travel by vehicle type K in age cohort I
C_{IK}	is $N_{IK} * RVT_{IK}$
N	is 10 as information on RVT_{IK} were obtainable for only 10 age cohorts

For determination of N_{IK} , R.L. Polk data on automobiles and trucks for 17 age cohorts was used. A sample sheet of R.L. Polk data for automobiles and trucks is shown in Figures A.1 and A.2. The information on the trucks were divided into two segments, one to represent largely trucks and the other to represent primarily tractors. The trucks manufactured by Mack, White, Freightliner, Kenworth, Peterbilt, Diamond-Reo, and International were used as a sample containing primarily tractors since these manufacturers specialize in tractors. In recent years these seven manufacturers have accounted for approximately half of all the heavy truck/tractor population. It is assumed that the scrappage rates for a subset of tractors should be applicable to the universe of tractors; and hence, the proportion by age obtained for this population of

tractors should be applicable to the whole. Thus the remaining trucks in the R.L. Polk data were considered to be largely trucks and the scrappage rates thus developed were assumed to be applicable to all trucks. New sales estimations were based on the assumption that the first cohort in the R.L. Polk data represents the sales in that particular year. However, some modification was done to this when final sales figures for the year were obtained. The R.L. Polk data indicates the fleet as of July 1 of the year; and thus, the first cohort is not truly representative of the total new sales figure during the calendar year. Thus, on the assumption that current model year vehicles are not scrapped in the subsequent year, the number of vehicles in the second age cohort of the subsequent year was assumed to be representative of the total sales in the current year. The sales data thus obtained was related to economic parameters: per capita income (for automobiles and trucks); and gross state product (for tractors). The relationships thus obtained are shown below.

$$\text{SUSALES} = -307615.5 + 34.140098 * \text{PCI82} \quad [5.18]$$

$$(-4.6322) \quad (5.7666) \quad (R^2 = 0.782; F = 33.25)$$

$$\text{AUTOSALES} = 152997.8 + 1.585399 * \text{SUSALES} \quad [5.19]$$

$$(6.6443) \quad (5.4508) \quad (R^2 = 0.761; F = 29.71)$$

$$\text{COMBSALES} = -11660.6 + 0.000222 * \text{GSP82} \quad [5.20]$$

$$(-3.5516) \quad (4.8975) \quad (R^2 = 0.719; F = 23.98)$$

Note: Values in the brackets below the coefficients represent their t-values;

where,

SUSALES is the sales of the second category of vehicles derived from R.L. Polk data which we indicate as largely trucks, as denoted in this study
 AUTOSALES is the sales of the automobiles
 COMBSALES is the sales of the third category of vehicles derived from R.L. Polk data which we indicate as representative of the tractor fleet.

Historical data (1980-1989) was used to develop scrappage rates for different age cohorts for the three different vehicle categories considered. The latest vehicle stock information available (1989) was used to develop the future stocks. The scrappage rates for the first two categories were developed using the general expression shown below which relates the scrappage of a vehicle to its age.

$$\text{SCRAPRATE}(\text{Age}) = 1/[A_1 + \exp(-(A_2 + A_3 * \text{AGE}))] \quad [5.21]$$

This expression represents a logistic curve, and has been found by several researchers to fit the scrappage data very well [16,61,71]. The estimation of the parameters A_1 , A_2 , and A_3 was done using Marquardt's Non-Linear estimation technique using the statistical software package STATGRAPHICS [44]. For the automobiles category the scrappage function thus obtained is shown below.

$$\text{ASCRA}P = 1/[4.5823352 + \exp(-(-7.55099 + 0.54340377 * \text{AAGE}))] \quad [5.22]$$

($R^2 = 0.906$; $F = 843.8645$)

where,

ASCRA P is the scrappage function of aged automobiles
 AAGE is the age of the automobiles

For the single unit truck category, the scrappage function

found is given below.

$$\text{SUSCRAP} = 1/[9.44299 + \exp(-6.05456 + 0.402226 * \text{SUAGE})] \quad [5.23]$$

$$(R_2 = 0.660208 ; F = 300.5854)$$

where,

SUSCRAP is the scrappage function of the aged trucks
 SUAGE is the age of the trucks

A proper scrappage function using the data for the tractor category could not be obtained due to several changes occurring such as losing the share of the tractors manufactured by the aforementioned manufacturers, as well as the introduction of IRP. Thus, it was difficult to distinguish whether the decrease in tractors in different cohorts was because of decreasing trucking activity, or decreasing share of the tractors manufactured by specialized manufacturers in the total tractor population, or whether the decrease in a cohort from one year to another was due to scrappage alone. Thus the relationship obtained was a very weak one (very low R^2). Hence, for this category scrappage rates taken from available literature [14,19,24] were used. These scrappage rates were developed based on the heavy truck fleet at national level; and thus, we assume that the composition of heavy truck/tractor fleet in Indiana is approximately same as that at national level. The scrappage rates for different age cohorts for the tractor category are shown in Table 5.1. Relative vehicle travel by age cohorts as mentioned in the previous chapter, was taken from literature: Oak Ridge

Table 5.1 Scrappage and Survival Rates for Tractors

Age (Years)	Scrappage Rate ^a	Survival Rate ^b
2	0.2	99.7
3	0.7	99.0
4	1.6	97.4
5	3.0	94.5
6	4.5	90.2
7	6.2	84.6
8	7.8	78.1
9	9.1	70.9
10	10.2	63.7
11	11.2	56.6
12	11.9	49.8
13	12.4	43.6
14	12.9	38.0
15	13.2	33.0
16	13.4	28.6
17	13.6	24.7

Source [14,19]

- a) Percentage of vehicles of a certain type in a given age class that are retired from use (lacking registration) in a given year.
- b) The probability that a vehicle of a certain type in a given age class will be "in use" (registered) in a given year.

National Laboratory's Transportation Energy Book [14]; and TIUS [12]. Table 5.2 shows the values used in fleet fuel efficiency estimation. The vehicle fuel efficiencies for different years, as used in the estimations, were taken from the literature mentioned and are shown in Table 5.3. For motorcycles a fuel efficiency of 50 miles per gallon was used.

Fuel Consumption Estimation

Fuel consumption estimation is done by dividing VMT of each vehicle category by its respective fleet fuel efficiency as obtained using the procedure outlined above. All fuel consumption by automobiles and motorcycles was considered to be gasoline consumption; whereas, only 96% of the fuel consumption by trucks was considered to be gasoline consumption. Fuel consumed by tractors, buses and the remaining 4% of the truck fuel consumption constituted special fuel consumption. Fuel consumption was estimated in millions of gallons.

Highway Revenue Estimations

Registration revenue estimates are obtained by using the procedure outlined in Chapter 3 (Figures 3.8 and 3.9). For trucks, tractors, buses, and trailers the estimation of registration revenues involves computation of average registration fees using the relationships shown below.

$$ANTF = NTF_1 * NTP_1 + \dots + NTF_I * NTP_I + \dots + NTF_N * NTP_N \quad [5.24]$$

Table 5.2 Relative Vehicle Travel (RVT), 1987

Age (Years)	Automobiles ^a	Trucks ^b	Tractors ^c
1	1.24	1.67	2.15
2	1.22	1.52	2.26
3	1.19	1.26	2.54
4	1.08	1.13	2.32
5	1.03	1.11	2.15
6	0.97	0.95	1.78
7	0.94	0.93	1.30
8	0.86	0.85	1.50
9	0.84	0.79	1.04
10	0.82	0.55	0.40

a) Source [14]

b) Source [12,14]

c) Source [12]

The values have been derived based on information in the sources mentioned.

Table 5.3 Vehicle Fuel Efficiency by Year

Year	Automobiles ^a	Trucks ^b	Tractors ^c
1978	18.0	11.6	5.2
1979	19.0	11.8	5.2
1980	20.0	12.3	5.4
1981	22.0	12.5	5.3
1982	24.0	12.8	5.3
1983	26.0	12.8	5.2
1984	27.0	12.9	5.2
1985	27.5	12.9	5.2
1986	26.0	12.9	5.2
1987	26.0	12.9	5.2
1988	26.0	12.9	5.3
1989	26.5	12.9	5.4
1990	27.5		
1991	27.5		

a) Source [14]

b) Source [12,14,68]

c) Source [12,14,68]

$$\begin{aligned}
 AFTF &= FTF_1*FTP_1 + \dots + FTF_I*FTP_I + \dots + FTF_N*FTP_N & [5.25] \\
 ATRUCKF &= ANTF*PNT + AFTF*PFT & [5.26] \\
 ANTRF &= NTRF_1*NTRP_1 + \dots + NTRF_I*NTRP_I + \dots + NTRF_N*NTRP_N & [5.27] \\
 AFTRF &= FTRF_1*FTRP_1 + \dots + FTRF_I*FTRP_I + \dots + FTRF_N*FTRP_N & [5.28] \\
 ANTLF &= NTLF_1*NTLP_1 + \dots + NTLF_I*NTLP_I + \dots + NTLF_N*NTLP_N & [5.29] \\
 AFTLF &= FTLF_1*FTLP_1 + \dots + FTLF_I*FTLP_I + \dots + FTLF_N*FTLP_N & [5.30] \\
 ATRAILF &= ANTLF*PNTL + AFTLF*PFTL & [5.31] \\
 ABUSF &= BUSF_1*BUSP_1 + \dots + BUSF_I*BUSP_I + \dots + BUS_N*BUSP_N & [5.32]
 \end{aligned}$$

where,

ANTF	is the average fee for non-farm trucks
N _{TFI}	is the registration fee of the non-farm trucks in the Ith weight group (1989 values given in Table A.8 used)
N _{TPI}	is the proportion of the non-farm truck in the Ith weight group (1989 values given in Table A.9 used)
AFTF	is the average fee for farm trucks
F _{TFI}	is the registration fee of the farm truck in the Ith weight group (1989 values given in Table A.13 used)
F _{TPI}	is the proportion of farm truck in the Ith weight group (1989 values given in Table A.14 used)
ATRUCKF	is the average fee for truck
PNT	is the proportion of truck that is non-farm
PFT	is the proportion of truck that is farm
ANTRF	is the average fee for non-farm tractor
N _{TRFI}	is the registration fee of the non-farm tractor in the Ith weight group (1989 values given in Table A.18 used)
N _{TRPI}	is the proportion of the non-farm tractor in the Ith weight group (1989 values given in Table A.19 used)
AFTRF	is the average fee for farm tractor
F _{TRFI}	is the registration fee of the farm tractor in the Ith weight group (1989 values given in Table A.23 used)
F _{TRPI}	is the proportion of farm tractor in the Ith weight group (1989 values given in Table A.24 used)
ANTLF	is the average fee for non-farm trailers
N _{TLFI}	is the registration fee of the non-farm trailers in the Ith weight group (1989 values given in Table A.30 used)
N _{TLPI}	is the proportion of the non-farm trailers in the Ith weight group (1989 values given in Table A.32 used)
AFTLF	is the average fee for farm trailers
F _{TLFI}	is the registration fee of the farm trailers in the Ith weight group (1989 values given in Table A.30 used)
F _{TLPI}	is the proportion of farm trailers in the Ith weight group (1989 values given in Table A.32 used)

ATRAILF is the average fee for trailers
 PNT is the proportion of trailers that is non-farm
 PFT is the proportion of trailers that is farm
 ABUSF is the average fee for buses
 BUSF_I is the registration fee of the Ith type buses (1989 values given in Table A.26 used)
 BUSP_I is the proportion of the Ith type buses (1989 values given in Table A.27 used)

Total registration revenues are obtained by the relationship shown below.

$$\begin{aligned}
 \text{REGREV} = & (\text{AUTO} * \text{AFEE} + \text{MCYCLE} * \text{MFEE} + \text{TRUCK} * \text{ATRUCKF} + \\
 & \text{NFTRACT} * \text{ANTRF} + \text{FTRACT} * \text{AFTRF} + \\
 & \text{TRAILER} * \text{ATRAILF} + \text{NFSEMITR} * \text{NFSF} \\
 & + \text{FSEMITR} * \text{FSF} + \text{BUSREG} * \text{ABUSF}) * (1 + \text{MISC})
 \end{aligned}
 \quad [5.33]$$

where,

AUTO is the number of passenger cars registered in Indiana (from equation 5.1)
 AFEE is the average automobile registration fee (1989 values given in Table A.4 used)
 MCYCLE is number of motorcycles registered in Indiana (from equation 5.2)
 MFEE is the registration fee for motorcycles (1989 values given in Table A.4 used)
 TRUCK is the number of trucks registered in Indiana (from equation 5.3)
 ATRUCKF is the average fee for truck (equation 5.26)
 NFTRACT is number of non-farm tractors registered in Indiana (from equation 5.5)
 ANTRF is the average fee for non-farm tractor (from equation 5.27)
 FTRACT is the number of farm tractors registered in Indiana (from equation 5.6)
 AFTRF is the average fee for farm tractor (from equation 5.28)
 TRAILER is numbers of trailers registered in Indiana (from equation 5.7)
 ATRAILF is the average fee for trailers (from equation 5.31)
 NFSEMITR is the number of non-farm semitrailers registered in Indiana (from equation 5.8)
 NFSF is the average fee for non-farm semitrailers (1989 values given in Table A.30 used)
 FSEMITR is the number of farm semitrailers registered in Indiana (from equation 5.9)
 FSF is the average fee for farm semitrailers (1989

	values given in Table A.30 used)
BUSREG	is the number of buses registered in Indiana (from equation 5.10)
ABUSF	is the average fee for buses (from equation 5.32)
MISC	is taken as 4.0 % or 0.04 based on the proportion of miscellaneous revenues to the remaining total registration revenues

Motor fuel tax revenues are computed based on the tax rates given in Table A.54, and the gasoline and special fuel consumption estimated through the procedure discussed above. The gallonage base for the motor carrier fuel use tax (MCFUT) is calculated by multiplying the special fuel gallons by a historical proportion of MCFUT gallons to special fuel gallons (Table A.58). Similarly, the gallonage base for the diesel surtax revenue computation was obtained by multiplying the special fuel gallons by a historical proportion of diesel surtax gallons to special fuel gallons (Table A.58). The revenues from each motor fuel tax category are the product of the base gallonage multiplied by the corresponding tax rate.

Highway Revenue Disbursement

The disbursement of highway revenues to various funds is done according to the ratios and structure outlined and described in Chapter 3. In addition, the model provides a scheme for calculating revenues at state and local levels.

Short-Term Highway Revenue Forecasting

The method chosen for developing short-term forecasts was the seasonal decomposition method. Developed first in the

1920s, seasonal decomposition method is still to a great extent the most commonly used decomposition procedure. STATGRAPHICS (a statistical software package) was used to perform the seasonal decomposition of the monthly data. The seasonal decomposition procedure as offered by the software package allows one to perform a classic decomposition of a time series using the multiplicative ratio-to-moving-average method, or additive difference-from-moving average method [44]. For this study purposes, the multiplicative ratio-to-moving-average method was used to obtain the seasonal factors for different month.

The items that were considered for short term forecasting were: registration fee revenues; driver license revenues; gasoline tax; special fuel tax; motor carrier fuel use tax; and diesel surtax. A limitation was encountered in the data on motor fuel tax revenues. Only two and half years (30 months) of data was available. Moreover, the data was not in aggregate terms but separated into MVHA, HRSF, and SHF totals only. Thus, using: a) disbursement structure information; b) tax rates; and c) an assumption regarding the split of gasoline tax revenues and special fuel tax revenues in the special distribution account, monthly gallonage data was estimated for each of the four different motor fuel taxes. The short term forecasts of gallonage for each of these four tax sources were made and then multiplied by the present tax rates to obtain the monthly revenue forecasts. For registration and

driver license forecasts, monthly data from 1982 to 1989, as obtained from the Bureau of Motor Vehicles [67], were used to estimate future monthly revenues. The seasonal factors obtained for these six tax sources are shown in Table 5.4.

In addition, the seasonal factors for gasoline gallonage and special fuel gallonage were obtained using data from Highway Statistics [68]. The data used was for the period 1973 to 1988 (192 months). The seasonal factors obtained using this data are shown in Table 5.5.

Moreover, in order to determine the effects of the monthly changes in gasoline price a regression was performed with gasoline gallonage (as obtained from Highway Statistics [68]) as dependent variables and 11 dummy variables (for different months with January as base month) and gasoline price as independent variables. The results of the regression are displayed in Table 5.6.

Table 5.4 Seasonal Factors for Major Tax Sources Using INDOT Data

Month	Registration Fees	Driver License Fees
J	35.66	88.34
F	213.84	75.50
M	341.07	95.14
A	160.56	101.43
M	98.14	100.34
J	96.57	102.52
J	89.36	114.77
A	52.63	107.32
S	40.45	112.84
O	36.52	114.77
N	24.90	92.04
D	10.28	94.97
	Gasoline Gallonage	Special Fuel Gallonage
J	94.00	80.40
F	104.71	87.10
M	79.18	86.36
A	93.06	94.22
M	91.99	90.65
J	73.94	92.12
J	84.21	213.05
A	127.30	108.36
S	120.14	90.81
O	114.49	90.95
N	107.61	71.83
D	109.37	94.13
	Motor Carrier Fuel Use Tax Gallonage	Diesel Surtax Gallonage
J	97.68	58.21
F	-87.78	300.25
M	340.47	30.49
A	116.21	193.75
M	37.21	25.45
J	408.41	50.33
J	-125.61	144.58
A	29.33	2.58
S	151.78	9.44
O	-13.47	30.48
N	212.58	168.70
D	32.54	185.71

Table 5.5 Seasonal Factors for Gasoline and Special Fuel Gallonage Using Highway Statistics Data

Month	Gasoline Gallonage	Special Fuel Gallonage
J	88.31	96.53
F	82.82	87.31
M	95.04	98.51
A	99.44	98.83
M	102.65	101.94
J	104.21	103.60
J	106.89	100.90
A	111.51	100.73
S	103.23	104.48
O	104.75	110.39
N	97.27	99.99
D	103.88	96.80

Table 5.6 Results of Regressing Monthly Gasoline Gallons on Gasoline Price

Independent Variable	Coefficient	Standard Error	t-value	Sig. Level
CONSTANT	224366.80	7813.2701	28.7161	0.0000
FEB	-12675.78	8489.4624	-1.4931	0.1372
MARCH	12954.13	8489.5399	1.5259	0.1288
APRIL	22778.01	8489.8299	2.6830	0.0080
MAY	30933.60	8494.2416	3.6417	0.0004
JUNE	32929.08	8492.2863	3.8775	0.0001
JULY	39545.68	8492.4064	4.6566	0.0000
AUGUST	48400.74	8493.6769	5.6984	0.0000
SEPT	30478.39	8492.4438	3.5889	0.0004
OCT	33673.11	8491.1377	3.9657	0.0001
NOV	18161.62	8491.4387	2.1388	0.0338
DEC	30762.07	8490.8231	3.6230	0.0004
GASPRICE	-345.88	56.6985	-6.1003	0.0000

$$R^2 = 0.3634 ; \quad F = 10.0844$$

CHAPTER 6

USE OF HIGHWAY REVENUE FORECASTING MODEL, "INDOTREV"

Structure of "INDOTREV"

The structure of "INDOTREV" is described through the use of several figures. The overall structure of the model is depicted in Figure 6.1 which indicates that the user is first presented with a "WELCOME" screen (Figure 6.6), and then with a "FORECAST YEAR SELECTION" menu (Figure 6.7). Upon the selection of a forecast year, the user is presented with "FORECAST HORIZON" menu (Figure 6.8) which presents the user with a choice of long-term (annual) forecast or short-term (monthly) forecast. How the "FORECAST HORIZON" menu is related to the "LONG-TERM" menu and its sub-menus is shown in Figure 6.2. Similarly, Figure 6.3 shows the relation of the "FORECAST-HORIZON" menu to the "SHORT-TERM" menu and its sub-menus. However, it should be mentioned that short-term forecasts are dependent on the long-term forecasts, and hence, the user should calculate the yearly revenues for the forecast year before calculating the monthly revenues in forecast year. The reason for adopting this approach in INDOTREV modeling has been outlined in Chapter 3. If the user chooses long-term forecast, then he is taken to the "LONG-TERM" menu (Figure

6.9). If a short-term forecast is also desired then the user is guided to the "SHORT-TERM" menu (Figure 6.39). The procedural control between the "LONG-TERM" menu and its sub-menus ("ASSUMPTIONS MENU" and "REVSUM MENU") are indicated by Figures 6.4 and 6.5. Basically, the "ASSUMPTIONS MENU" allows the user to view the assumptions used in making the forecast as well as change the assumptions if so desired. The "REVSUM MENU" provides revenue summaries both overall and by individual fund. The next section details the operation of the model using 1991 as the forecast year.

"INDOTREV" - User's Guide

Use of the model is illustrated by showing the different screens the user will encounter while operating the model to make both the annual and monthly forecast for 1991. The first step in the use of the model is to make copies of the files "INDOTREV.EXE" and "DATA" in a separate directory. This requirement of separate directory is not mandatory but will establish a separate disk storage location for revenue forecasting use only. After copies are made, the user can go to that directory and type "INDOTREV" at the prompt. The first screen is the "WELCOME" screen as shown in Figure 6.6. After reading the screen, the user should hit <RETURN> as is indicated on the screen. Next, the "FORECAST YEAR SELECTION" is presented as depicted in Figure 6.7. Since the forecast year to be chosen is 1991 the user should type 2 and hit

<RETURN>. At the end of the session the user will come back to this menu and at that time the user should type 17 to exit the program. Upon hitting <RETURN> after typing 2, the user is taken to the "FORECAST HORIZON MENU" (Figure 6.8). The user has to make choice 1 at this time, as long-term revenues must be calculated first. Upon typing 1 and hitting <RETURN>, the user is guided to "LONG-TERM MENU" which provides options such as reviewing assumptions, calculating revenues, displaying revenue summaries, printing results, and exiting to the "FORECAST HORIZON MENU". It is important to note that any time the user alters values for non-forecasted items such as title fees, miscellaneous revenues, revenues from general fund or federal reimbursement, the option "Calculate Revenues" should be chosen. This recomputes the totals using the new values which the user just input. This recalculation is quite rapid. Thus it is very useful in analyzing scenarios by changing socioeconomic factors, fuel efficiencies, proportions of trucks by weight groups, etc. and determining the impacts on revenues. Upon choosing 1 when in the "LONG TERM MENU", the user is taken to the sub-menu "ASSUMPTIONS" (Figure 6.10). Thus the user can view the assumptions made regarding socioeconomic variables (Figure 6.11), registration fees (Figure 6.12), proportional distribution by weight in vehicle categories (Figure 6.20), vehicle fleet fuel efficiency (Figure 6.27), fuel tax rates (Figure 6.31), and revenue disbursement structure (Figure 6.32).

The Registration fee sub-menu of the Assumptions sub-menu contains choices 1 thru 7 for registration fees for: 1) non-farm trucks (Figure 6.13); 2) farm trucks (Figure 6.14); 3) non-farm tractors (Figure 6.15); 4) farm tractors (Figure 6.16); 5) trailers (Figure 6.17); 6) buses (Figure 6.18); and 7) other vehicles including passenger cars, motorcycles, and so on (Figure 6.19).

There is a sub-menu for proportional distribution by weight class within vehicle categories. This sub-menu is also under the sub-menu "ASSUMPTIONS" and provides choices 1 thru 6 for proportional distribution within: 1) non-farm trucks (Figure 6.20); 2) farm trucks (Figure 6.21); 3) non-farm tractors (Figure 6.22); 4) farm tractors (Figure 6.23); 5) trailers (Figure 6.24); and 6) buses (Figure 6.25).

There is also a vehicle fleet fuel efficiency sub-menu within the sub-menu "ASSUMPTIONS" and it contains choices 1 thru 3 for fleet fuel efficiency for: 1) automobiles (Figure 6.28); 2) trucks (Figure 6.29); and 3) tractors and buses (Figure 6.30).

On completion of review of the assumptions, the user is next expected to choose 2 "Calculate Yearly Revenues" to recalculate revenues based on the assumptions made. After calculating results, the next choice could be either 3 or 4, depending on whether the user is interested in just viewing the revenue summaries on the screen or wants to print results to the file "LRESULT" on the disk.

The "REVSUM" sub-menu which allows the user to review the revenue summaries on the screen contains choices 1 thru 5. The options are: 1) Overall revenue summary (Figure 6.34); 2) MVHA revenue summary (Figure 6.35); 3) HRSF revenue summary (Figure 6.36); 4) State Highway Fund revenue summary (Figure 6.37); and 5) Local revenues (Figure 6.38). Once the review of revenues has been complete, the user can return to the "LONG-TERM MENU" by typing 6. Next, the user should exit the "LONG-TERM MENU" by typing 5. To make short-term forecasts the user should choose 2 in the "FORECAST HORIZON MENU".

In the short-term menu (Figure 6.39), the user should initially select option 1. Monthly revenues must be calculated before they can be displayed or printed. Thereafter, the user can choose 2, 3, 4, 5, 6, or 7 depending on whether he intends to review short-term forecasts of: 2) registration revenues (Figure 6.40); 3) driver license revenues (Figure 6.41); 4) gasoline tax revenues (Figure 6.42); 5) special fuel tax revenues (Figure 6.43); 6) motor carrier fuel use tax revenues (Figure 6.44); or 7) diesel surtax revenues (Figure 6.45). The output files for 1991 long-term and short-term revenue forecasts, "LRESULT" and "SRESULT", are shown in Figures 6.46 and 6.47.

Printing Saved Results

Since the long-term results are printed in file "LRESULT", the user has to end the session before printing results. Results are displayed on the screen when the user chooses the option

Figure 6.1 Overall Structure of "INDOTREV"

Figure 6.2: Procedural Control between "FORECAST HORIZON" menu and "LONG-TERM" menu and its sub-parts

Figure 6.3: Procedural Control between "FORECAST HORIZON" menu and "SHORT-TERM" menu and its sub-parts

Figure 6.4: Procedural Control between "LONG-TERM" menu and its sub-menu "ASSUMPTIONS"

Figure 6.5: Procedural Control between "LONG-TERM" menu and its sub-menu "REVSUM"

WELCOME TO

"INDOTREV"

INDIANA HIGHWAY REVENUE FORECASTING MODEL

Developed by

Amiy Varma and Kumares C. Sinha

at Purdue University

for

Indiana Department of Transportation (INDOT)

January 1991

Hit RETURN to continue.....

Figure 6.6: "WELCOME" Screen

WELCOME TO SELECTION OF FORECAST YEAR MENU
THE MODEL CAN PROVIDE FORECAST FOR FOLLOWING YEARS

1. 1990
2. 1991
3. 1992
4. 1993
5. 1994
6. 1995
7. 1996
8. 1997
9. 1998
10. 1999
11. 2000
12. 2001
13. 2002
14. 2003
15. 2004
16. 2005
17. EXIT THE PROGRAM

Hit RETURN after entering your choice: 2 or 17

Figure 6.7 "FORECAST YEAR" menu

WELCOME TO THE FORECAST HORIZON MENU
THE MODEL PROVIDES FORECASTS FOR BOTH LONG AND SHORT TERM

LONG TERM IMPLIES YEARLY REVENUE FORECASTS
SHORT TERM IMPLIES MONTHLY REVENUE FORECASTS

IT SHOULD BE HOWEVER NOTED THAT THE YEARLY FORECAST
SHOULD BE OBTAINED BEFORE MONTHLY FORECAST CAN BE MADE.
HENCE THE USER IS ADVISED TO CHOOSE LONG TERM OPTION FIRST
AND THEN CHOOSE SHORT TERM OPTION INORDER TO OBTAIN MONTHLY
FORECAST FOR THE YEAR IN QUESTION.

1. LONG TERM
2. SHORT TERM
3. EXIT TO FORECAST YEAR MENU

Hit RETURN after entering your choice: 1 or 2 or 3

Figure 6.8 "FORECAST HORIZON" menu

WELCOME TO LONG TERM MENU

THE MODEL CAN INDICATE THE ASSUMPTIONS IT IS USING
IF YOU CHOOSE THE ASSUMPTIONS OPTION.
THE MODEL WILL PROVIDE REVENUE SUMMARIES IF YOU CHOOSE
REVENUE SUMMARIES OPTION.
THE MODEL WILL PRINT THE REVENUE SUMMARIES AND
ASSUMPTIONS IN THE FILE "LRESULT" WHEN YOU USE
PRINT OPTION.
HOWEVER, USER SHOULD NOTE THAT "CALCULATE REVENUES"
OPTION SHOULD BE SELECTED BEFORE SELECTING EITHER
REVENUE SUMMARY OPTION OR PRINT OPTION

1. ASSUMPTIONS
2. CALCULATE YEARLY REVENUES
3. DISPLAY REVENUE SUMMARIES
4. PRINT LONG TERM (YEARLY) REVENUES IN "LRESULT"
5. EXIT TO FORECAST HORIZON MENU

Hit RETURN after indicating your choice: 1 or 2 or 3 or 4 or 5

Figure 6.9 "LONG-TERM" menu

WELCOME TO ASSUMPTIONS MENU

1. SOCIOECONOMIC VARIABLES
2. REGISTRATION FEES FOR DIFFERENT VEHICLES
3. PROPORTION OF VEHICLES BY WEIGHT AND TYPE
4. VEHICLE FLEET FUEL EFFICIENCY PARAMETERS
5. FUEL TAX RATES
6. REVENUE DISBURSEMENT STRUCTURE
7. EXIT TO LONG-TERM MENU

Hit RETURN after indicating your choice: 1, 2,3,4,5,6,or 7

Figure 6.10 "ASSUMPTIONS" sub-menu of "LONG-TERM" menu

SOCIOECONOMIC VARIABLE		1991
1: TOTAL POPULATION (IN 1000s).....		5619
2: DRIVING AGE POPULATION (IN 1000s).....		4263
3: YOUNG AGE (15-24 YR) POPULATION (IN 1000s).....		759
4: LESS THAN DRIVING AGE POPULATION (IN 1000s).....		1356
5: PER CAPITA INCOME (IN 1982\$).....		12936.50
6: GROSS STATE PRODUCT (IN 1000S 1982\$).....		79973280
7: GASOLINE PRICE (IN 1982\$).....		104.30
8: CONSUMER PRICE INFLATION(CPI) INDEX.1982...		1.33
9: GNP IMPLICIT PRICE DEFLATOR..1982.....		1.31

You can always make changes to these assumed values.

If changes to be made enter (y or n): n

Figure 6.11 "SOCIO" screen of "ASSUMPTIONS" sub-menu

REGISTRATION FEES MENU
THIS MENU INDICATES THE REGISTRATION FEES USED IN
COMPUTING REGISTRATION REVENUES

1. NON-FARM TRUCKS REGISTRATION FEES
2. FARM TRUCK REGISTRATION FEES
3. NON-FARM TRACTOR REGISTRATION FEES
4. FARM TRACTOR REGISTRATION FEES
5. TRAILER REGISTRATION FEES
6. BUS REGISTRATION FEES
7. OTHER VEHICLE REGISTRATION FEES
8. EXIT TO LONG TERM MENU

Hit Return After Indicating Your Choice: 1,2,3,4,5,6,7, or 8

Figure 6.12 "REGFEE" sub-menu of "ASSUMPTIONS" sub-menu

NON-FARM TRUCK REGISTRATION FEES			
1: 7000 lbs:	18.9900	8: 36000 lbs:	399.0400
2: 9000 lbs:	38.8400	9: 42000 lbs:	487.7500
3: 11000 lbs:	68.8200	10: 48000 lbs:	607.7100
4: 16000 lbs:	129.0500	11: 54000 lbs:	703.0400
5: 20000 lbs:	168.4900	12: 60000 lbs:	787.9600
6: 26000 lbs:	228.2700	13: 66000 lbs:	832.3000
7: 30000 lbs:	287.0400	14: > 66 Kips:	926.6000

You can make changes to these fees.

If changes to be made enter (y or n): n

Figure 6.13 Non-Farm Truck Registration Fee Screen

FARM TRUCK REGISTRATION FEES			
1: 7000 lbs:	0.0000	8: 36000 lbs:	186.0200
2: 9000 lbs:	0.0000	9: 42000 lbs:	224.2000
3: 11000 lbs:	33.8500	10: 48000 lbs:	289.1900
4: 16000 lbs:	62.8400	11: 54000 lbs:	336.9000
5: 20000 lbs:	79.1000	12: 60000 lbs:	369.0000
6: 26000 lbs:	108.2800	13: 66000 lbs:	402.6000
7: 30000 lbs:	139.1000	14: > 66 Kips:	444.7300

You can make changes to these fees.
 If changes to be made enter (y or n): n

Figure 6.14 Farm-truck Registration Fee Screen

NON-FARM TRACTOR REGISTRATION FEES			
1: 20000 lbs:	158.9600	8: 60000 lbs:	781.3100
2: 26000 lbs:	294.2700	9: 66000 lbs:	819.9800
3: 30000 lbs:	371.4700	10: 72000 lbs:	936.4700
4: 36000 lbs:	479.2700	11: 74000 lbs:	990.8700
5: 42000 lbs:	537.0400	12: 76000 lbs:	1081.9800
6: 48000 lbs:	636.8600	13: 78000 lbs:	1152.3000
7: 54000 lbs:	699.1900	14: > 78 Kips:	1280.0000

You can make changes to these fees.
 If changes to be made enter (y or n): y

(a)

NON-FARM TRACTOR REGISTRATION FEES			
1: 20000 lbs:	158.9600	8: 60000 lbs:	781.3100
2: 26000 lbs:	294.2700	9: 66000 lbs:	819.9800
3: 30000 lbs:	371.4700	10: 72000 lbs:	936.4700
4: 36000 lbs:	479.2700	11: 74000 lbs:	990.8700
5: 42000 lbs:	537.0400	12: 76000 lbs:	1081.9800
6: 48000 lbs:	636.8600	13: 78000 lbs:	1152.3000
7: 54000 lbs:	699.1900	14: > 78 Kips:	1280.0000

You can make changes to these fees.
 If changes to be made enter (y or n): y
 Enter the # - 1 through 14, corresp. to the value to be changed: 14

(b)

NON-FARM TRACTOR REGISTRATION FEES			
1: 20000 lbs:	158.9600	8: 60000 lbs:	781.3100
2: 26000 lbs:	294.2700	9: 66000 lbs:	819.9800
3: 30000 lbs:	371.4700	10: 72000 lbs:	936.4700
4: 36000 lbs:	479.2700	11: 74000 lbs:	990.8700
5: 42000 lbs:	537.0400	12: 76000 lbs:	1081.9800
6: 48000 lbs:	636.8600	13: 78000 lbs:	1152.3000
7: 54000 lbs:	699.1900	14: > 78 Kips:	1285.0000

You can make changes to these fees.
 If changes to be made enter (y or n): y
 Enter the # - 1 through 14, corresp. to the value to be changed: 14
 For further changes enter (y or n): n

(c)

Figure 6.15 Non-Farm Tractor Registration Fee Screen

FARM TRACTOR REGISTRATION FEES			
1: 20000 lbs:	71.0200	8: 60000 lbs:	316.5100
2: 26000 lbs:	140.9200	9: 66000 lbs:	385.7800
3: 30000 lbs:	184.9500	10: 72000 lbs:	425.0100
4: 36000 lbs:	194.7700	11: 74000 lbs:	465.6500
5: 42000 lbs:	234.1500	12: 76000 lbs:	505.5300
6: 48000 lbs:	296.8800	13: 78000 lbs:	546.6400
7: 54000 lbs:	301.5000	14: > 78 Kips:	588.8000

You can make changes to these fees.
 If changes to be made enter (y or n): n

Figure 6.16 Farm-Tractor Registration Fee Screen

TRAILER REGISTRATION FEES			
1: 3k (nf):	5.5900	8: > 22k (nf):	221.6100
2: 5k (nf):	14.2400	9: 7k (f):	0.0000
3: 7k (nf):	20.0900	10: 9k (f):	0.0000
4: 9k (nf):	24.6500	11: 12k (f):	32.7600
5: 12k (nf):	66.7800	12: 16k (f):	52.0400
6: 16k (nf):	105.8700	13: 22k (f):	79.3800
7: 22k (nf):	164.0400	14: >22k (f):	103.8100

You can make changes to these fees.
 If changes to be made enter (y or n): n

Figure 6.17 Trailer Registration Fee Screen

BUS REGISTRATION FEES	
1: SCHOOL BUS.....	18.04
2: CHURCH BUS.....	18.28
3: BUS A.....	143.74
4: BUS C.....	27.66
5: BUS D.....	34.87

You can always make changes to these assumed or estimated values.

If changes to be made enter (y or n): n

Figure 6.18 Bus Registration Fee Screen

 REGISTRATION FEES FOR OTHER VEHICLES

1: PASSENGER CAR.....	10.9300
2: MOTORCYCLE.....	10.9200
3: HOUSECAR.....	18.9100
4: NON-FARM SEMITRAILER.....	28.0500
5: FARM SEMITRAILER.....	12.3100

You can always make changes to these assumed or estimated values.

Changes to be made ? Enter -(y or n): y

 (a)

 REGISTRATION FEES FOR OTHER VEHICLES

1: PASSENGER CAR.....	10.9300
2: MOTORCYCLE.....	10.9200
3: HOUSECAR.....	18.9100
4: NON-FARM SEMITRAILER.....	28.0500
5: FARM SEMITRAILER.....	12.3100

You can always make changes to these assumed or estimated values.

Changes to be made ? Enter -(y or n): y

Enter the # - 1 through 5, corresp. to the value to be changed: 1

 (b)

 REGISTRATION FEES FOR OTHER VEHICLES

1: PASSENGER CAR.....	11.9300
2: MOTORCYCLE.....	10.9200
3: HOUSECAR.....	18.9100
4: NON-FARM SEMITRAILER.....	28.0500
5: FARM SEMITRAILER.....	12.3100

You can always make changes to these assumed or estimated values.

Changes to be made ? Enter -(y or n): y

Enter the # - 1 through 5, corresp. to the value to be changed: 1

For further changes enter (y or n): n

 (c)

Figure 6.19 Other Vehicle Registration Fee Screen

WELCOME TO
PROPORTIONAL DISTRIBUTION OF REGISTERED VEHICLE MENU

1. NON-FARM TRUCKS (PROPORTION BY WEIGHT)
2. FARM TRUCKS (PROPORTION BY WEIGHT)
3. NON-FARM TRACTOR TRUCKS (PROPORTION BY WEIGHT)
4. FARM TRACTOR TRUCKS (PROPORTION BY WEIGHT)
5. TRAILERS (NON-FARM (nF) & FARM (f))(PROPORTION BY WEIGHT)
6. BUSES (PROPORTION BY TYPE)
7. EXIT TO LONG-TERM MENU

Hit RETURN after indicating your choice: 1,2,3,4,5,6, or 7

Figure 6.20 "REGPROP" sub-menu of "ASSUMPTIONS" sub-menu

NON-FARM TRUCKS: PROPORTION BY WEIGHT			
1:	7000 lbs:	0.8887	
2:	9000 lbs:	0.0295	
3:	11000 lbs:	0.0240	
4:	16000 lbs:	0.0153	
5:	20000 lbs:	0.0089	
6:	26000 lbs:	0.0163	
7:	30000 lbs:	0.0060	
8:	36000 lbs:	0.0021	
9:	42000 lbs:	0.0012	
10:	48000 lbs:	0.0023	
11:	54000 lbs:	0.0014	
12:	60000 lbs:	0.0003	
13:	66000 lbs:	0.0006	
14:	> 66 Kips:	0.0034	

You can make changes to these fees.
If changes to be made enter (y or n): n

Figure 6.21 Non-farm Truck Proportional Distribution Screen

FARM TRUCKS: PROPORTION BY WEIGHT			
1:	7000 lbs:	0.0000	
2:	9000 lbs:	0.0000	
3:	11000 lbs:	0.2025	
4:	16000 lbs:	0.1861	
5:	20000 lbs:	0.0842	
6:	26000 lbs:	0.2869	
7:	30000 lbs:	0.1022	
8:	36000 lbs:	0.0235	
9:	42000 lbs:	0.0325	
10:	48000 lbs:	0.0609	
11:	54000 lbs:	0.0119	
12:	60000 lbs:	0.0034	
13:	66000 lbs:	0.0039	
14:	> 66 Kips:	0.0020	

You can make changes to these fees.
If changes to be made enter (y or n): n

Figure 6.22 Farm-Truck Proportional Distribution Screen

NON-FARM TRACTORS: PROPORTION BY WEIGHT			
1: 20000 lbs:	0.0488	8: 60000 lbs:	0.0864
2: 26000 lbs:	0.0256	9: 66000 lbs:	0.0373
3: 30000 lbs:	0.0251	10: 72000 lbs:	0.0830
4: 36000 lbs:	0.0467	11: 74000 lbs:	0.1012
5: 42000 lbs:	0.0759	12: 76000 lbs:	0.0514
6: 48000 lbs:	0.0878	13: 78000 lbs:	0.0325
7: 54000 lbs:	0.1635	14: > 78 Kips:	0.1350

You can make changes to these fees.
 If changes to be made enter (y or n): n

Figure 6.23 Non-Farm Tractors Proportional Distribution Screen

FARM TRACTORS: PROPORTION BY WEIGHT			
1: 20000 lbs:	0.0235	8: 60000 lbs:	0.0186
2: 26000 lbs:	0.0066	9: 66000 lbs:	0.0208
3: 30000 lbs:	0.0060	10: 72000 lbs:	0.0891
4: 36000 lbs:	0.0066	11: 74000 lbs:	0.1262
5: 42000 lbs:	0.0120	12: 76000 lbs:	0.1071
6: 48000 lbs:	0.0169	13: 78000 lbs:	0.1033
7: 54000 lbs:	0.0339	14: > 78 Kips:	0.4295

You can make changes to these fees.
 If changes to be made enter (y or n): n

Figure 6.24 Farm Tractor Proportional Distribution Screen

TRAILERS: PROPORTION BY WEIGHT			
1: 3k (nf):	0.8635	8: > 22k (nf):	0.0040
2: 5k (nf):	0.0351	9: 7k (f):	0.0000
3: 7k (nf):	0.0447	10: 9k (f):	0.0000
4: 9k (nf):	0.0201	11: 12k (f):	0.6162
5: 12k (nf):	0.0168	12: 16k (f):	0.2503
6: 16k (nf):	0.0098	13: 22k (f):	0.0942
7: 22k (nf):	0.0060	14: >22k (f):	0.0393

You can make changes to these fees.
 If changes to be made enter (y or n): n

Figure 6.25 Trailer Proportional Distribution Screen

BUSES: PROPORTION BY TYPE	
1: SCHOOL BUS.....	0.4193
2: CHURCH BUS.....	0.3923
3: BUS A.....	0.0032
4: BUS C.....	0.1240
5: BUS D.....	0.0611

You can always make changes to these assumed or estimated values.

If changes to be made enter (y or n): n

Figure 6.26 Bus Proportional Distribution Screen

WELCOME TO VEHICLE FLEET FUEL EFFICIENCY MENU

1. AUTOMOBILE FLEET FUEL EFFICIENCY PARAMETERS
2. SINGLE UNIT TRUCKS FLEET FUEL EFFICIENCY PARAMETERS
3. TRACTORS AND BUSES FLEET FUEL EFFICIENCY PARAMETERS
4. EXIT TO LONG-TERM MENU

Hit RETURN after indicating your choice: 1,2,3, or 4

Figure 6.27 "FLEETEFF" sub-menu of "ASSUMPTIONS" sub-menu

FLEET FUEL EFFICIENCY PARAMETERS: AUTOMOBILE						
AGE	NI	RVTI	MOD. YR	EFF.	MOD. YR	EFF.
1	1: 0.081	11: 1.240	1978	21: 18.000	1992	35: 27.500
2	2: 0.079	12: 1.220	1979	22: 19.000	1993	36: 28.000
3	3: 0.063	13: 1.190	1980	23: 20.000	1994	37: 28.000
4	4: 0.069	14: 1.080	1981	24: 22.000	1995	38: 28.000
5	5: 0.074	15: 1.030	1982	25: 24.000	1996	39: 28.000
6	6: 0.084	16: 0.970	1983	26: 26.000	1997	40: 28.000
7	7: 0.078	17: 0.940	1984	27: 27.000	1998	41: 28.300
8	8: 0.075	18: 0.860	1985	28: 27.500	1999	42: 28.300
9	9: 0.050	19: 0.840	1986	29: 26.000	2000	43: 28.300
>=10	10: 0.346	20: 0.820	1987	30: 26.000	2001	44: 28.700
			1988	31: 26.000	2002	45: 28.700
			1989	32: 26.500	2003	46: 28.700
			1990	33: 27.500	2004	47: 28.700
			1991	34: 27.500	2005	48: 28.700

You can always make changes to these assumed values.

If changes to be made enter (y or n): n

Figure 6.28 Automobile Fleet Fuel Efficiency Screen

FLEET FUEL EFFICIENCY PARAMETERS: SU TRUCKS						
AGE	NI	RVTI	MOD. YR	EFF.	MOD. YR	EFF.
1	1: 0.083	11: 1.670	1978	21: 11.600	1992	35: 12.900
2	2: 0.080	12: 1.520	1979	22: 11.800	1993	36: 12.900
3	3: 0.084	13: 1.260	1980	23: 12.300	1994	37: 12.900
4	4: 0.078	14: 1.130	1981	24: 12.500	1995	38: 12.900
5	5: 0.072	15: 1.110	1982	25: 12.800	1996	39: 12.900
6	6: 0.073	16: 0.950	1983	26: 12.800	1997	40: 12.900
7	7: 0.064	17: 0.930	1984	27: 12.900	1998	41: 12.900
8	8: 0.052	18: 0.850	1985	28: 12.900	1999	42: 12.900
9	9: 0.035	19: 0.790	1986	29: 12.900	2000	43: 12.900
>=10	10: 0.380	20: 0.550	1987	30: 12.900	2001	44: 12.900
			1988	31: 12.900	2002	45: 12.900
			1989	32: 12.900	2003	46: 12.900
			1990	33: 12.900	2004	47: 12.900
			1991	34: 12.900	2005	48: 12.900

You can always make changes to these assumed values.

If changes to be made enter (y or n): n

Figure 6.29 Truck Fleet Fuel Efficiency Screen

FLEET FUEL EFFICIENCY PARAMETERS: TRACTORS & BUSES						
AGE	NI	RVTI	MOD. YR	EFF.	MOD. YR	EFF.
1	1: 0.016	11: 2.150	1978	21: 5.400	1992	35: 5.500
2	2: 0.049	12: 2.260	1979	22: 5.400	1993	36: 5.600
3	3: 0.040	13: 2.540	1980	23: 5.400	1994	37: 5.600
4	4: 0.088	14: 2.320	1981	24: 5.400	1995	38: 5.600
5	5: 0.078	15: 2.150	1982	25: 5.400	1996	39: 5.700
6	6: 0.074	16: 1.780	1983	26: 5.400	1997	40: 5.700
7	7: 0.046	17: 1.300	1984	27: 5.400	1998	41: 5.800
8	8: 0.059	18: 1.500	1985	28: 5.400	1999	42: 5.800
9	9: 0.079	19: 1.040	1986	29: 5.400	2000	43: 5.900
>=10	10: 0.476	20: 0.400	1987	30: 5.400	2001	44: 5.900
			1988	31: 5.400	2002	45: 5.900
			1989	32: 5.400	2003	46: 5.900
			1990	33: 5.400	2004	47: 6.000
			1991	34: 5.500	2005	48: 6.000

You can always make changes to these assumed values.

If changes to be made enter (y or n): n

Figure 6.30 Tractor and Bus Fleet Fuel Efficiency Screen

MOTOR FUEL TAX RATES

1: GASOLINE TAX (IN \$/GAL).....	0.150
2: SPECIAL FUEL TAX. (\$/GAL).....	0.160
3: DIESEL SURTAX.....	0.110
4: MOTOR CARRIER FUEL USE TAX.....	0.160

You can always make changes to these assumed values.

If changes to be made enter (y or n): y

(a)

MOTOR FUEL TAX RATES

1: GASOLINE TAX (IN \$/GAL).....	0.150
2: SPECIAL FUEL TAX. (\$/GAL).....	0.160
3: DIESEL SURTAX.....	0.110
4: MOTOR CARRIER FUEL USE TAX.....	0.160

You can always make changes to these assumed values.

If changes to be made enter (y or n): y

Enter the # - 1 through 4, corresp. to the value to be changed: 1

(b)

MOTOR FUEL TAX RATES

1: GASOLINE TAX (IN \$/GAL).....	0.160
2: SPECIAL FUEL TAX. (\$/GAL).....	0.160
3: DIESEL SURTAX.....	0.110
4: MOTOR CARRIER FUEL USE TAX.....	0.160

You can always make changes to these assumed values.

If changes to be made enter (y or n): y

Enter the # - 1 through 4, corresp. to the value to be changed: 1

For further changes enter (y or n): n

(c)

Figure 6.31 "FUEL TAX" Screen

EXISTING REVENUE DISTRIBUTION/ALLOCATION SCHEME
THE LABELS INDICATE "SOURCE-->SINK"

1: BGAS--> SD.....\$	25000000		
2: SPF--> SD.....\$	25000000		
3: NSPF->HRSF.....	0.250	10:DS->MCRF.....	0.090
4: NSPF->MVHA.....	0.750	11:SD->SHF.....	0.400
5: GAS->SHCF.....	0.067	12:SD->LOCAL.....	0.600
6: NGAS->HRSF.....	0.250	13:HRSF->SHF.....	0.550
7: NGAS->MVHA.....	0.750	14:HRSF->LOCAL...	0.450
8: DS->SHF.....	0.455	15:NMVHA->SHF....	0.530
9: DS->MVHA.....	0.455	16:NMVHA->LOCAL..	0.470

However you can make changes to these fees.
If changes to be made enter (y or n): n

Figure 6.32 "GENDIS" Screen

WELCOME TO REVENUE SUMMARY MENU
THIS MENU PROVIDES YOU REVENUE SUMMARY BY DIFFERENT
REVENUE SOURCE, BY DIFFERENT FUNDS, AND AT STATE AND
LOCAL LEVELS.

1. OVERALL REVENUE SUMMARY BY REVENUE SOURCE
2. MVHA REVENUE SUMMARY BY REVENUE SOURCE
3. HRSF REVENUE SUMMARY BY REVENUE SOURCE
4. STATE HIGHWAY FUND REVENUE SUMMARY
5. LOCAL HIGHWAY REVENUES
6. EXIT TO LONG TERM MENU

Hit RETURN after indicating your choice: 1,2,3,4,5, or 6

Figure 6.33 "REVSUM" sub-menu of "LONG-TERM" menu

HIGHWAY REVENUES FROM MAJOR REVENUE SOURCES (1000\$)

A. MOTOR FUELS:	
1: GASOLINE-----	382046
2: SPECIAL FUEL-----	102529
3: DIESEL SURTAX-----	49342
4: MOTOR CARRIER FUEL TAX----	15379
B. MOTOR VEHICLE REGISTRATIONS:	
5: TOTAL-----	93651
6: PASSENGER CARS-----	35404
7: TRUCKS-----	40087
8: TRACTORS-----	7462

You can make changes to these forecast values
If changes to be made enter (y or n): n

Figure 6.34 "ALLREV" Screen

MOTOR VEHICLE HIGHWAY FUND:
REVENUES (1000\$\$)

1: GASOLINE-----	248587
2: SPECIAL FUEL-----	58147
3: DIESEL SURTAX-----	22451
4: VEHICLE REGISTRATION-----	83943
5: DRIVER LICENSE-----	4711
6: IRP REVENUE-----	57050
7: TITLE FEES-----	0
8: GENERAL FUND REIMBURSEMENTS-----	0
9: FEDERAL REIMBURSEMENTS-----	0
10: MISCELLANEOUS REVENUES-----	0
EXPENSES (1000\$\$)	
11: BMV APPROPRIATIONS-----	0
12: STATE POLICE OPERATING EXPENSES-----	0
13: MOTOR FUEL DIVISION-----	0
14: HIGHWAY SAFETY PLAN-----	0
15: MISCELLANEOUS EXPENSES-----	0
NET MVHA REVENUE (1000\$\$)	
16: NET MVHA REVENUE-----	469258

You can make changes to these forecast values.
If changes to be made enter (y or n): n

Figure 6.35 "MVHAREV" Screen

HRSF		HRSF AND OTHER FUNDS (1000\$\$)	
1: GASOLINE-----	82862	SPECIAL DIST.ACCOUNT	
2: SPECIAL FUEL--	19382	5:GASOLINE-----	25000
3: VEH. REG.-----	9708	6:SPECIAL FUEL--	25000
4: TITLE FEE-----	0		
STATE HIGHWAY CONSTRUCTION FUND			
7: GASOLINE-----	25597		
MOTOR CARRIER REGULATION FUND			
8: DIESEL SURTAX-	4441		
MOTORCYCLE SAFETY FUND			
9: MCYCLE. RES---	164		

You can make changes to these forecast values.
If changes to be made enter (y or n): n

Figure 6.36 "HRSFREV" Screen

STATE HIGHWAY ACCOUNT (1000\$e)	
1: MVHA.....	236780
2: HRSF.....	61574
3: MOTOR CARRIER FUEL USE TAX...	15379
4: SPECIAL DISTRIBUTION.....	20000
5: DIESEL SURTAX.....	22451
6: FEDERAL REIMBURSEMENT.....	0
7: MISCELLANEOUS.....	0
8: GENREV1.....	0
9: GENREV2.....	0
10: GENREV3.....	0
11: TOTAL STATE HIGHWAY ACT.....	356183

You can make changes to these forecast values.
 If changes to be made enter (y or n): n

Figure 6.37 "SHFREV" Screen

LOCAL REVENUES (1000\$e)

1: MVHA.....	209974
2: HRSF.....	50379
3: Special Distribution....	30000
4: Total Local Revenues....	290353

You can make changes to these forecast values.
 If changes to be made enter (y or n): n

Figure 6.38 "LREV" Screen

WELCOME TO SHORT TERM MENU

IT IS TO BE NOTED THAT THE SHORT TERM FORECASTS ARE ESSENTIALLY COMPUTED BY MULTIPLYING THE MONTHLY AVERAGES OF THE YEARLY REVENUES AS FOUND IN LONG TERM ANALYSIS AND FORECASTS BY THE SEASONAL INDICES COMPUTED BY ANALYZING MONTHLY DATA. THE FORECASTS ARE PROVIDED ONLY IN AGGREGATE TERMS BY REVENUE SOURCE.

HOWEVER USER SHOULD NOTE THAT OPTION 1 HAS TO CHOSEN FIRST BEFORE OTHER OPTIONS CAN BE CHOSEN.

1. CALCULATE SHORT TERM REVENUES
2. REGISTRATION REVENUES
3. DRIVER LICENSE REVENUES
4. GASOLINE TAX REVENUES
5. SPECIAL FUEL TAX REVENUES
6. MOTOR CARRIER FUEL USE TAX REVENUES
7. DIESEL SURTAX REVENUES
8. PRINT SHORT-TERM REVENUES IN THE FILE "SRESULT".
9. EXIT TO FORECAST HORIZON MENU

Hit RETURN after indicating your choice: 1,2,3,4,5,6,7,8 or 9

Figure 6.39 "SHORT-TERM" menu

1991-SHORT-TERM (MONTHLY) REVENUES:REGISTRATION FEES			
MONTH	SEASONAL INDICES		REVENUE
J	1:	35.66	13: 2753
F	2:	213.84	14: 16507
M	3:	341.04	15: 26328
A	4:	160.56	16: 12394
M	5:	98.14	17: 7576
J	6:	96.57	18: 7454
J	7:	89.36	19: 6898
A	8:	52.63	20: 4063
S	9:	40.45	21: 3122
O	10:	36.52	22: 2819
N	11:	24.90	23: 1922
D	12:	10.28	24: 794

You can always make changes to these assumed or estimated values.
If changes to be made enter (y or n): n

Figure 6.40 "GENSHT" Registration Screen

1991-SHORT-TERM (MONTHLY) REVENUES:DRIVER LICENSES			
MONTH	SEASONAL INDICES		REVENUE
J	1:	88.34	13: 346
F	2:	75.50	14: 296
M	3:	95.14	15: 323
A	4:	101.43	16: 398
M	5:	100.34	17: 394
J	6:	102.52	18: 402
J	7:	114.77	19: 450
A	8:	107.32	20: 421
S	9:	112.84	21: 443
O	10:	114.77	22: 450
N	11:	92.04	23: 361
D	12:	94.97	24: 372

You can always make changes to these assumed or estimated values.
If changes to be made enter (y or n): n

Figure 6.41 "GENSHT" Driver License Screen

The Highway Revenue Summary for the Year--1991

Socioeconomic Variables Used and their Values

Demographic Variables:

Total Population (in 1000s)..... 5619
 Driving Age Population (in 1000s)..... 4263
 Young Age (15-24 yrs) Population (in 1000s).. 759
 Less than Driving Age Population (in 1000s).. 1356

Economic Variables

Per Capita Income (in 1982\$)..... 12936.50
 Gross State Product (in 1000s in 1982 \$).. 79973280
 Gasoline Price (in 1982 \$) in \$/gallon.... 104.300

Highway Revenues (in 1000\$) by Major Revenue Sources

A. Motor Fuels:');

Gasoline..... 382046
 Special Fuel..... 102529
 Diesel Surtax..... 49342
 Motor Carrier Fuel Use tax.. 15379

B. Motor Vehicle Registrations:

Total..... 93651
 Passenger Cars..... 35404
 Trucks..... 40087
 Tractors..... 7462

Revenue Summary (in 1000\$) for Motor Vehicle Highway Fund

Gasoline tax..... 248587
 Special fuel tax..... 58147
 Diesel Surtax..... 22451
 Vehicle Registrations..... 83943
 Driver Licenses..... 4711
 IRP Revenue..... 57050

Revenue Summary (in 1000\$) for HRSF and Other Funds

HRSF

Gasoline..... \$ 82862
 Special Fuel.... \$ 19382
 Vehicle Reg..... \$ 9708

Special Dist. Account

Gasoline.....\$ 25000000
 Special Fuel...\$ 25000000

State Highway Construction Fund

Gasoline..... \$ 25597

Motor Carrier Regulation Fund

Diesel surtax... \$ 4441

State Highway Fund: Revenue Summary (in 1000\$)

MVHA.....\$ 236780
 HRSF.....\$ 61574
 Special Distribution Account.....\$ 20000
 Motor Carrier Fuel Use Tax.....\$ 15379
 Diesel Surtax.....\$ 22451
 Total State Highway Fund Revenue...\$ 356183
 (without Misc., Gen. Fund, FHWA Reim.)

Local Highway Revenues (in 1000\$)

MVHA..... \$ 209974
 HRSF..... \$ 50379
 Special Distribtuion..... \$ 30000
 Total Local Revenues..... \$ 290353

Figure 6.46 Sample of Output File -- "LRESULT"

 SHORT TERM HIGHWAY REVENUES 1991

REGISTRATION FEES

MONTH	SEASONAL INDICES	REVENUE
J	35.66	2753
F	213.84	16507
M	341.07	26328
A	160.56	12394
M	98.14	7576
J	96.57	7454
J	89.36	6898
A	52.63	4063
S	40.45	3122
O	36.52	2819
N	24.90	1922
D	10.28	794

DRIVER LICENSES

MONTH	SEASONAL INDICES	REVENUE
J	88.34	346
F	75.50	296
M	95.14	373
A	101.43	398
M	100.34	394
J	102.52	402
J	114.77	450
A	107.32	421
S	112.84	443
O	114.77	450
N	92.04	361
D	94.97	372

GASOLINE TAX

MONTH	SEASONAL INDICES	REVENUE
J	88.31	28115
F	82.82	26368
M	95.04	30258
A	99.44	31659
M	102.65	32681
J	104.21	33178
J	106.89	34031
A	111.51	35502
S	103.23	32866
O	104.75	33349
N	97.27	30968
D	103.88	33072

Figure 6.47 Sample of Output File -- "SRESULT"

SPECIAL FUEL TAX		
MONTH	SEASONAL INDICES	REVENUE
J	96.53	8248
F	87.31	7460
M	98.51	8417
A	98.83	8444
M	101.94	8710
J	103.60	8852
J	100.90	8621
A	100.73	8606
S	104.48	8927
O	110.39	9432
N	99.99	8543
D	96.80	8271

MOTOR CARRIER FUEL USE TAX		
MONTH	SEASONAL INDICES	REVENUE
J	97.68	1183
F	-87.78	-1070
M	340.47	4151
A	116.21	1417
M	37.87	460
J	408.41	4959
J	-125.61	-1531
A	29.33	359
S	151.78	1854
O	-13.47	-164
N	212.58	2585
D	32.54	395

DIESEL SURTAX		
MONTH	SEASONAL INDICES	REVENUE
J	58.21	2301
F	300.25	11878
M	30.49	1205
A	193.75	7674
M	25.45	1006
J	50.33	1990
J	144.58	5721
A	2.58	102
S	9.44	374
O	30.48	1207
N	168.70	6681
D	185.71	7342

Figure 6.47 Sample of Output File -- "SRESULT" (continued)

"Display Revenues". Results are printed in the file "LRESULT" when the user chooses the option "Print Results". After ending the session, the user can survey the file "LRESULT" using any word processor and print it using the same word processor. The program stores the result in ASCII format; and thus, all word processing software will be able to read, as well as print this file. If the user intends to save the results after getting a printed copy, it is advised that the user should rename the "LRESULT" file to another name, preferably one which indicates the year of forecast. Short-term results are stored in "SRESULT" file. This particular file can also be read and printed by any word processing software. Here also, if the user intends to store the results after making a hard copy it is advised that the name of the file "SRESULT" be changed. Renaming a file can be done by using a simple DOS command. For example, after executing the model for both long-term and short-term forecasts for 1991 and printing the files "LRESULT" and "SRESULT" the user may change the names of these files. At the prompt (assuming the user is in the "C" drive and the "INDOTREV" directory) the following command can be typed at the prompt "C:\INDOTREV>".

```
C:\INDOTREV> rename lresult 11991
```

"rename" is a DOS command used to change the names of the files. "lresult" is the file we want to rename, and we want to rename it as "11991" to indicate that it contains the annual forecasts for 1991. Thus, the newly created file "11991" will

now contain the annual revenue forecast for 1991. Similarly, the "SRESULT" file name can be changed by typing the following at the prompt:

```
C:\INDOTREV> rename sresult s1991
```

Now the file "s1991" will contain the monthly forecasts for 1991.

Structure and Use of "SHORTREV"

The "SHORTREV" program has been developed to provide an ongoing, automatic forecast of revenues from the six principal tax sources without consideration of influencing socioeconomic and technological factors. The only dependent variable is the time. The structure of "SHORTREV" is shown in Figure 6.48. The input files used by "SHORTREV" are: a) GASIN (gasoline tax data file); b) SPFIN (special fuel tax data file); c) STAXIN (diesel surtax data file); d) MCFUTIN (motor carrier fuel use tax data file); e) REGIN (vehicle license fee data file); and f) IRPIN (IRP data file). These data files contain information by month and year for motor fuel gallonage, and vehicle license fees revenue and IRP revenue. Updating these input data files can be done using any word processor. However, when saving this updated data, it is advised that it be saved in the ASCII format because that is the format in which the "SHORTREV" reads these data file. Save the "SHORTREV.EXE" and the six input data files in a separate directory, say SHORTREV, to denote it contains programs for the short-term

Figure 6.48 Structure of "SHORTREV"

revenue forecast. Thus one has to move to that directory to start the execution. At the prompt C:\SHORTREV>, use the following command to start the execution:

```
C:\SHORTREV> SHORTREV
```

This initiates the execution. Three screens are presented to the user. One which welcomes the user. A second which tells the user to prepare all the input files before going any further with the execution. A third which asks the user for tax rates. Internally, the "getarray" procedure reads the gallonage and revenue data from respective files. Next, the "maverage" procedure computes the 12-month moving average. The "ratio" procedure smooths the data. Using these ratios, the seasonal factors are computed. The procedure "sfactor" computes the seasonal factors, as well as the seasonally adjusted data. This seasonally adjusted data is used by the "regress" procedure to compute the trend. The trend and seasonal factors are used to make forecasts for six months in future. This is done by the "forecast" procedure which also prints the results.

The program stores the result in the file "SHORTOUT". As is the case with INDOTREV result files, here also the files can be renamed to denote the appropriate time frame. However, it is not necessary to do so. The forecasts are for six months in future for each of the categories from the last month in the respective data files. A sample of the output file "SHORTOUT" is shown in Figure 6.49.

Short-Term Highway Revenue Forecast
GASOLINE TAX REVENUES

Month	Seasonal Factors
1	1.06
2	0.85
3	0.91
4	0.99
5	0.89
6	1.12
7	1.08
8	1.06
9	1.07
10	1.02
11	1.02
12	0.94

Forecast for next six months is:

Period	Year	Month	Revenue
73	1991	7	36359952
74	1991	8	35745766
75	1991	9	36171900
76	1991	10	34330813
77	1991	11	34595754
78	1991	12	31946918

SPECIAL FUEL TAX REVENUES

Month	Seasonal Factors
1	0.75
2	0.98
3	0.98
4	1.10
5	1.06
6	0.89
7	1.13
8	1.01
9	1.00
10	0.95
11	1.17
12	0.96

Forecast for next six months is:

Period	Year	Month	Revenue
73	1991	7	10065615
74	1991	8	8993414
75	1991	9	8949771
76	1991	10	8542809
77	1991	11	10489610
78	1991	12	8689893

Figure 6.49. Sample Output File - "SHORTOUT"

DIESEL SURTAX REVENUES

Month	Seasonal Factors
1	1.24
2	0.61
3	1.61
4	0.72
5	0.83
6	1.23
7	0.32
8	0.79
9	1.10
10	1.07
11	0.90
12	1.59

Forecast for next six months is:

Period	Year	Month	Revenue
68	1991	7	1950959
69	1991	8	4895776
70	1991	9	6868311
71	1991	10	6711283
72	1991	11	5678632
73	1991	12	10183585

MCFUT REVENUES

Month	Seasonal Factors
1	0.80
2	1.16
3	1.92
4	0.59
5	1.50
6	0.65
7	0.33
8	1.36
9	0.98
10	0.99
11	0.33
12	1.40

Forecast for next six months is:

Period	Year	Month	Revenue
65	1991	7	188758
66	1991	8	702725
67	1991	9	459152
68	1991	10	420934
69	1991	11	123584
70	1991	12	460431

Figure 6.49. Sample Output File - "SHORTOUT"(continued)

VEHICLE LICENSE REVENUES

Month	Seasonal Factors
1	0.33
2	0.29
3	1.14
4	2.99
5	1.24
6	0.88
7	1.15
8	0.86
9	0.92
10	0.72
11	0.82
12	0.66

Forecast for next six months is:

Period	Year	Month	Revenue
61	1991	7	12674607
62	1991	8	9496767
63	1991	9	10229339
64	1991	10	7987542
65	1991	11	9121820
66	1991	12	7366113

IRP REVENUES

Month	Seasonal Factors
1	0.27
2	0.62
3	1.79
4	1.82
5	1.43
6	2.19
7	1.95
8	0.75
9	0.47
10	0.46
11	0.15
12	0.09

Forecast for next six months is:

Period	Year	Month	Revenue
56	1991	7	9910666
57	1991	8	3873981
58	1991	9	2474914
59	1991	10	2429890
60	1991	11	786241
61	1991	12	513261

Thank You for Using "SHORTREV" Program

Figure 6.49. Sample Output File - "SHORTOUT"(continued)

CHAPTER 7

HIGHWAY REVENUE FORECASTING MODEL, "INDOTREV": RESULTS

The highway revenue forecasts presented in this chapter are the results obtained by executing the model, "INDOTREV", the operation of which was detailed in the previous chapter. The methodology and model relationships on which the model is based was outlined and described in Chapters 3 and 5. The data sets used to arrive at the relationships were discussed in Chapter 4.

Validation of the Model

The validation of long-term highway revenue forecast results is presented in Table 7.1. Nearly every item estimated was within 5% error, and the total revenue estimate was within 1% error. Hence, the predictive ability of the model appears to be quite reliable. Somewhat less reliable segments are the estimation of IRP revenues, Motor Carrier Fuel Use Tax (MCFUT) revenues and Diesel Surtax revenues. Much of this has to do with the data limitations in studying the underlying phenomena behind the revenue generation from these sources. IRP revenue estimation requires a detailed data intensive study, the like of which was done in 1983 [40]. Since such data was not

Table 7.1 Validation of Long-Term Highway Revenue Forecasts
(Revenues in 1000 \$)

	Observed 1989	Estimated 1989	% Error
Major Revenue Sources:			
Registration and IRP	142322	146951	+3.2
Registration	88866	90529	+1.9
Automobiles	34522	34326	-0.6
Trucks and Tractors	43040	44272	+2.8
IRP	53456	56422	+5.5
Driver License	5023	4977	-0.9
Motor Fuels	542307	540692	-0.3
Gasoline	370589	372471	+0.5
Special Fuel	102082	100996	-1.1
Motor Carrier Fuel Use Tax	15796	15149	-4.1
Diesel Surtax	53840	52076	-3.3
Major Highway Funds:			
MVHA	464532	465090	-0.1
HRSF	104186	109045	+4.9
SD	50000	50000	0.0
MCRF	5026	4687	-3.3
SHCF	24706	24956	+1.0
SHF	354493	351628	-0.8
Levels of Government:			
State	384045	381271	-0.7
Local (County & City)	286972	284628	-0.8
Total Highway Revenues	671017	665899	-0.8

available, the IRP estimation was based on an estimation of the number of non-farm tractors using Indiana highways and the average registration fees paid by the tractors registered in Indiana. Mileage ratios and other parameters which were available in the earlier detailed IRP study were absent in this study. The two motor carrier fuel tax sources (MCFUT and diesel surtax) were also difficult to estimate due to limited current data availability. Thus, these revenue estimates were based on gallonage computations derived as a proportion of special fuel consumption. This proportioning involves broad approximation; and hence, results do not match very well. However, it can be seen from Table 7.1 that results obtained for MCFUT revenues from this procedure are better than that for diesel surtax.

Since the data sets for short-term gallonage, as obtained from INDOT, were few and of questionable accuracy, the seasonal factors obtained by using the data from Highway Statistics were used in making short-term gallonage forecasts for gasoline tax and special fuels tax. The forecasts of short-term gallonage were within 10 % error for most months. For other tax sources, MCFUT and diesel surtax, the seasonal factors as obtained from the 30 month data provided by INDOT was used. The variability of short-term forecasts from observed values for these two revenue sources was much greater than found for gasoline and special fuels due essentially to the problem of inadequate data. The seasonal factors developed

for the various revenue sources do require updating as future year data becomes available.

Highway Revenue Forecasts

The long-term highway revenue forecasts from 1990 to 2005 are presented in Table 7.2. The long-term results indicate that overall highway revenues are going to increase 24.4 % in current dollars by the year 2005. For the same period, registration revenues (excluding IRP) are going to increase by 31.3 % in current dollars, gasoline revenues by 28.34 %, special fuel revenues, as well as MCFUT and diesel surtax revenues by 14.4%. Thus, we see that fuel tax revenues from vehicle categories contributing the most damage to highway facilities are going to increase the least. Total highway revenues will be \$843.2 million in 2005.

Short-term highway revenue forecasts for the years 1990 and 1991 are shown in Table 7.3. The short-term revenue forecasts indicate that most of the registration revenue is received during the months of February, March, and April. INDOT receives \$28,000 to \$35,000 in revenues from the gasoline tax, and \$7,300 to \$9,400 from the special fuels tax during a month. Highest gasoline tax collections are generally received during the month of August; whereas, the highest special fuels tax collection month is October. There is quite a bit of monthly variability in receipts from both MCFUT and diesel surtax. The results obtained by executing "SHORTREV" are shown in Tables 7.6 and 7.7. While the variability in

Table 7.2 Long-Term Highway Revenue Forecasts
(Revenues in 1000 \$)

	1991	1995	2000	2005
Major Revenue Sources:				
Registration and IRP	150537	159618	172899	185568
Registration	93487	100450	110773	120838
Automobiles	35404	37467	40007	42617
Trucks and Tractors	47549	52519	59124	65472
IRP	57050	59045	62126	64730
Driver License	4988	5029	5147	5279
Motor Fuels	579396	588440	636862	685476
Gasoline	392011	410047	448616	491699
Special Fuel	102844	106464	112344	115645
Motor Carrier Fuel	15427	17034	17975	18503
Use Tax				
Diesel Surtax	69114	54895	57927	59629
Major Highway Funds:				
MVHA	472190	503475	553399	598356
HRSF	114355	120186	131908	144022
SD	50000	50000	50000	50000
MCRF	6220	4941	5213	5367
SHCF	26265	27473	30057	32944
SHF	380029	381994	413560	444426
Levels of Government:				
State	421514	414408	448830	482737
Local (County & City)	289929	309222	334715	360475
Total Highway Revenues	679933	723630	783545	843212

Table 7.3 Short-Term Highway Revenue Forecasts
for Indiana, 1991-1992

Month	Registration Fees Revenue		Driver License Revenue	
	1991	1992	1991	1992
J	2571	2615		
F	2259	2298	367	368
M	8881	9034	314	314
A	23224	23695	395	396
M	9660	9827	422	422
J	6856	6974	417	418
J	8959	9113	426	427
A	6700	6815	477	478
S	7167	7291	446	447
O	5609	5706	469	470
N	6388	6498	477	478
D	5142	5230	383	383
			395	395
	Gasoline Tax Revenue		Special Fuel Tax Revenue	
	1991	1992	1991	1992
J	34628	34888		
F	27767	27976	6428	6490
M	29727	29951	8399	8480
A	32341	32584	8399	8480
M	29074	29293	9427	9521
J	36588	36863	9085	9172
J	35281	35546	7628	7701
A	34628	34888	9684	9778
S	34954	35217	8656	8739
O	33321	33571	8570	8653
N	33321	33571	8142	8220
D	30708	30938	10027	10124
			8228	8307
	Motor Carrier Fuel Use Tax Rev.		Diesel Surtax Revenue	
	1991	1992	1991	1992
J	1028	1038		
F	1491	1506	7142	7211
M	2468	2492	3513	3547
A	758	766	9273	9362
M	1928	1947	4147	4187
J	836	844	4780	4826
J	424	428	7084	7152
A	1748	1765	1843	1861
S	1260	1272	4550	4594
O	1273	1285	6335	6397
N	424	428	6163	6222
D	1800	1817	5184	5234
			9158	9246

monthly revenues is quite high, when analyzed as quarterly sums, the variability is considerably reduced. This is due primary to the timing of motor fuel tax refunds payments. If the forecast projects high revenues for a month and actual revenues collected are much lower, it is often because a lot of refunds were paid out during that month. It is difficult to capture the impact of refunds in monthly forecasts because the timing of refunds is driven by the Department of Revenue's administrative efficiency in processing tax payments and refund claims.

Sensitivity of Forecasts

The changes in major dependent variables such as vehicle registrations, vehicle travel, vehicle sales, and others due to the changes in influencing parameters are indicated through the discussion of elasticity values developed based on the multiple regression equations in Chapter 5. The concept used in developing the elasticity values is that used by Saha and Fricker [71]. Table 7.4 indicates the elasticity values and makes remarks concerning their effects.

The effects of increasing the rates for each type of tax, as of 1991, are presented in Table 7.5. A penny increase in gasoline tax can generate more than \$25 million dollars; whereas, the same increase in special fuels tax fetches only an additional \$6.3 million. An increase in the automobile registration fee of \$1 produces an increase in revenues almost

90 times greater than would result by increasing the registration fees of non-farm tractors above 78,000 lbs by \$5. The effects of changes in economic factors (gross domestic product and per capita income) are shown in Figures 7.1 and 7.2.

Table 7.4 Elasticity Values and Their Implications

Dependent Variable	Independent Variable	Elasticity Value	Equation	Remark
Monthly Gasoline Gallonage (in 1000s)	Gasoline Price in Cents per Gallon	-0.00905	Table 5.6	1 % increase in gasoline price results in 0.00905 % in reduction in monthly highway gasoline gallonage
Automobile Registration	Per capita income in 1982 \$	0.68815	Eq. 5.1	1 % increase in per capita income results in 0.6882 % increase in automobile registration
Motorcycle Registration	Young Age Population	0.3467	Eq. 5.2	1 % increase in young age population results in 0.3467 % increase in motorcycle registration
Truck Registration	Per capita income in 1982 \$	1.246	Eq. 5.3	1 % increase in per capita income results in 1.246 % increase in truck registrations
Tractor Registration (non-farm)	Gross State Product in 1000s of 1982 \$	0.603	Eq. 5.5	1 % increase in gross state product results in 0.603 % increase in non-farm tractor registration
Tractor Registration (farm)	Gross State Product in 1000s of 1982 \$	5.295	Eq. 5.6	1 % increase in gross state product results in 5.295 % increase in farm tractor registration
Trailer Registration	Gross State Product in 1000s of 1982 \$	1.032	Eq. 5.7	1 % increase in gross state product results in 1.032 % increase in trailer registration
Semi-Trailer (non-farm)	Tractor (non-farm)	0.308	Eq. 5.8	1 % increase in non-farm tractors results in 0.308 % increase in non-farm semi-trailers
Semi-Trailer (farm)	Tractor (farm)	1.009	Eq. 5.9	1 % increase in farm tractors results in 1.009 % increase in farm semi-trailers
Automobile VMT	Gasoline Price in 1982 cents	-0.0845	Eq. 5.11	1 % increase in gasoline price results in 0.0845 % reduction in automobile VMT

Table 7.4 Elasticity Values and Their Implications
(continued)

Dependent Variable	Independent Variable	Elasticity Value	Equation	Remark
Automobile VMT	Per Capita Income in 1982 \$	0.7275	Eq. 5.11	1 % increase in per capita income results in 0.7275 % increase in automobile VMT
Tractor VMT	Tractor Registration	1.5419	Eq. 5.14	1 % increase in tractor registration results in 1.5419 % increase in tractor VMT
Average Miles per bus	Per capita income in 1982 \$	-1.819	Eq. 5.15	1 % increase in per capita income results in 1.819 % decrease in average miles per bus
Light Duty Vehicle Sales	Per capita income in 1982 \$	0.436	Eq. 5.19	1 % increase in per capita income results in 0.436 % increase in light duty vehicle sales
Heavy Duty Vehicle Sales	Gross State Product in 1000s of 1982 \$	3.657	Eq. 5.20	1 % increase in gross state product results in 3.657 % increase in heavy duty vehicle sales

Table 7.5 Effects of Tax Rate Increases on
Revenues Generated, 1991

Major Parameter	Action	Effect on Revenue Generated (Increase in 1000s of \$)
Gasoline Tax	Increase by 1 cent	25114
Special Fuel Tax	Increase by 1 cent	6321
Diesel Surtax	Increase by 1 cent	4445
Automobile Regis- tration fee	Increase by \$ 1	3302
Registration fees of Non-Farm Tractors > 78,000 lb	Increase by \$ 5	37

Figure 7.1 Effect of Change in Per Capita Income on Highway Revenues

Figure 7.2 Effect of Change in Gross State Product on Highway Revenues

Table 7.6 Validation of Forecasts from "SHORTREV"

Year	Month	Vehicle License Fees		Gasoline Revenues	
		Estimated	Actual	Estimated	Actual
1991	JAN	3591070	2679042	36122231	33255441
1991	FEB	3071357	6403422	28515681	30007716
1991	MAR	11876329	9678798	30857179	27139507
1991	APR	31291735	18603313	33427838	32502471
1991	MAY	12984898	13797928	30023112	32941916
1991	JUN	9284509	13358768	37851808	35529035
		Special Fuel Revenues		Diesel Surtax Revenues	
		Estimated	Actual	Estimated	Actual
1991	JAN	6165744	7802452	11967777	1579677
1991	FEB	8546465	10552249	4948390	2400850
1991	MAR	8597732	5703076	13325442	12201246
1991	APR	9671982	8448516	6012074	2873156
1991	MAY	9363750	9051821	7051128	6695545
1991	JUN	7823569	8312538	10489833	2530437

Table 7.7 Short-Term Forecasts Using "SHORTREV"

Year	Month	Vehicle License Fees		Gasoline Revenues	
		Estimated	Actual	Estimated	Actual
1991	JUL	12674607		36359952	
1991	AUG	9496767		35745766	
1991	SEP	10229339		36171900	
1991	OCT	7987542		34330813	
1991	NOV	9121820		34595754	
1991	DEC	7366113		31946918	
		Special Fuel Revenues		Diesel Surtax Revenues	
		Estimated	Actual	Estimated	Actual
1991	JUL	10065615		1950959	
1991	AUG	8993414		4895776	
1991	SEP	8949771		6868311	
1991	OCT	8542809		6711283	
1991	NOV	10489610		5678632	
1991	DEC	8689893		10183585	

CHAPTER 8

HIGHWAY REVENUE FORECASTING MODEL, "INDOTREV": UPDATING

To prevent obsolescence of the forecasting model, data, derived data, and model relationships need to be updated periodically. Towards that goal, this chapter discusses how the model could be updated as the new data becomes available. For updating the model the user needs to understand the contents of the file "DATA". Keeping the "DATA" file updated will ensure credible results from the execution of the model.

The contents of data file, as it currently exists, are shown in Table 8.1. There are 368 lines in the "DATA" file. What each number in each line represents is explained using Table 8.2.

Socioeconomic Variables

As was mentioned in Chapter 4, the demographic data used in this study was total population, driving age population, young age population, and less than driving age population. Lines L18 to L34 provide values of these data for years 1989 through 2005 (see Table 8.2). Thus, as the new or more credible population estimates become available it should replace the values provided in these lines. The literature and sources of information to be referred were mentioned in Chapter 4.

Among the economic data used are per capita income in 1982 dollars, gross state product in thousands of 1982 dollars, gasoline price in 1982 cents per gallon, CPI (1982=100), and GNP Implicit Price Deflator (1982=100). These data for years 1989 through 2005 are placed on lines L35 to L51.

Vehicle Registration Fees and their Proportional Distribution by Weight and Type

The 1989 registration fees and proportions of the total fleet for non-farm trucks are on lines L52 to L65, for farm trucks lines L66 to L79, for non-farm tractors lines L80 to L93, for farm tractors lines L94 to L107, and for trailers lines L108 to L121. Line L122 provides 1989 values of registration fees for different types of buses. Registration fees for passenger cars, motorcycle, housecar, and semitrailers are given on line L123. The proportional distribution of the total bus fleet by type (1989 data) is shown on line L124. Motor fuel tax rates are on line L125. As was mentioned in Chapter 4 these are endogenous data that is obtainable within the State of Indiana; and hence, these values should be replaced regularly as new data becomes available.

Vehicle-Mix by Age

The proportional distribution of automobiles, trucks, and tractors into 10 age cohorts for 1989 through 2005 are given

on lines L126 to L295. These proportions were obtained using the procedure outlined and described in Chapter 5. With the availability of new R.L. Polk data and the outlined procedure these values can be updated easily.

Relative Vehicle Travel

Relative vehicle travel by vehicle category (automobiles, trucks, and tractors) in ten different age cohorts are placed on lines L296 to L305. The literature mentioned in Chapters 4 and 5 should be referred for updating these values.

Vehicle Fuel Efficiency

Vehicle fuel efficiency for each vehicle category (automobiles, trucks, and tractors) are taken from the literature mentioned in Chapter 4. That literature should be referred to determine if the values provided on lines L306 to L333 need any updating.

Disbursement Structure

The disbursement ratios used are those illustrated in Chapter 3 through various figures. These values have been placed on lines L334 to L336. If any future legislative action changes these ratios they should be updated.

Vehicle Registration Equations

Vehicle registration equations are discussed in detail in Chapter 5. The coefficients of these equations are given on lines L338 to L341. As new data becomes available these relationships should be re-evaluated and these values could be replaced with new coefficients.

Vehicle Travel Equations

The vehicle travel equations are also described in detail in Chapter 5. The coefficients of the equations are given on lines L342 and L343. As new data becomes available these relationships should be re-evaluated and these values could be replaced with new coefficients.

Seasonal Factors

Lines L345 through L356 provide seasonal factors for registration revenues, driver license revenues, and gasoline consumption. Lines L357 to L368 provide the same for special fuel consumption, MCFUT gallons, and diesel surtax gallons. As new monthly data becomes available, it should be included in the analysis using the seasonal decomposition method, and the seasonal factors on the above mentioned lines in "DATA" file should be updated. Analysis using SHORTREV program will facilitate this process.

Table 8.1 Contents of "DATA" File

L1:	1989				
L2:	1990				
L3:	1991				
L4:	1992				
L5:	1993				
L6:	1994				
L7:	1995				
L8:	1996				
L9:	1997				
L10:	1998				
L11:	1999				
L12:	2000				
L13:	2001				
L14:	2002				
L15:	2003				
L16:	2004				
L17:	2005				
L18:	5575	4254	792	1321	
L19:	5602	4243	767	1359	
L20:	5619	4263	759	1356	
L21:	5636	4270	742	1366	
L22:	5653	4278	735	1375	
L23:	5670	4291	720	1372	
L24:	5685	4298	711	1387	
L25:	5700	4326	713	1374	
L26:	5715	4343	720	1372	
L27:	5729	4363	722	1364	
L28:	5744	4383	729	1361	
L29:	5758	4399	731	1359	
L30:	5775	4424	733	1351	
L31:	5792	4443	741	1349	
L32:	5809	4467	749	1342	
L33:	5826	4486	752	1340	
L34:	5844	4512	760	1332	
L35:	12395.9	77273760.0	76.51	1.271	1.265
L36:	12694.2	78623520.0	108.80	1.308	1.292
L37:	12936.5	79973280.0	104.30	1.331	1.329
L38:	13185.3	81323040.0	104.00	1.371	1.369
L39:	13441.3	82672800.0	104.00	1.415	1.408
L40:	13704.8	84022560.0	103.00	1.447	1.439
L41:	13981.3	85372320.0	103.00	1.481	1.476
L42:	14236.7	88071840.0	103.00	1.521	1.506
L43:	14492.9	89480989.0	103.00	1.562	1.521
L44:	14752.5	90890139.0	103.00	1.612	1.583
L45:	15012.9	92299288.0	103.00	1.652	1.638
L46:	15268.6	93708438.0	103.00	1.691	1.681
L47:	15529.1	95117587.0	103.00	1.734	1.712
L48:	15799.1	96526737.0	103.00	1.772	1.761
L49:	16061.5	97935886.0	103.00	1.812	1.801
L50:	16324.8	99345036.0	103.00	1.854	1.832
L51:	16590.5	100754000.0	103.00	1.891	1.887
L52:	18.99	0.8887			
L53:	38.84	0.0295			
L54:	68.82	0.0240			
L55:	129.05	0.0153			

Table 8.1 Contents of "DATA" File (continued)

L56:	168.49	0.0089
L57:	228.27	0.0163
L58:	287.04	0.0060
L59:	399.04	0.0021
L60:	487.75	0.0012
L61:	607.71	0.0023
L62:	703.04	0.0014
L63:	787.96	0.0003
L64:	832.30	0.0006
L65:	926.60	0.0034
L66:	0.00	0.00
L67:	0.00	0.00
L68:	33.85	0.2025
L69:	62.84	0.1861
L70:	79.10	0.0842
L71:	108.28	0.2869
L72:	139.10	0.1022
L73:	186.02	0.0235
L74:	224.20	0.0325
L75:	289.19	0.0609
L76:	336.90	0.0119
L77:	369.10	0.0034
L78:	402.60	0.0039
L79:	444.73	0.0020
L80:	158.96	0.0488
L81:	294.27	0.0256
L82:	371.47	0.0251
L83:	479.27	0.0467
L84:	537.04	0.0759
L85:	636.86	0.0878
L86:	699.19	0.1635
L87:	781.31	0.0864
L88:	819.98	0.0373
L89:	936.47	0.0830
L90:	990.87	0.1012
L91:	1081.98	0.0514
L92:	1152.30	0.0325
L93:	1280.00	0.1350
L94:	71.02	0.0235
L95:	140.92	0.0066
L96:	184.95	0.0060
L97:	194.77	0.0066
L98:	234.15	0.0120
L99:	296.88	0.0169
L100:	301.56	0.0339
L101:	316.51	0.0186
L102:	385.78	0.0208
L103:	425.01	0.0891
L104:	465.85	0.1262
L105:	505.53	0.1071
L106:	546.64	0.1033
L107:	588.80	0.4295
L108:	5.59	0.8635
L109:	14.24	0.0351
L110:	20.09	0.0447

Table 8.1 Contents of "DATA" File (continued)

L111:	24.65	0.0201			
L112:	66.78	0.0168			
L113:	105.87	0.0098			
L114:	164.04	0.0060			
L115:	221.61	0.0040			
L116:	0.0	0.0			
L117:	0.0	0.0			
L118:	32.76	0.6162			
L119:	52.04	0.2503			
L120:	79.38	0.0942			
L121:	103.81	0.0393			
L122:	10.93	10.92	18.91	28.05	12.31
L123:	18.04	18.28	143.74	27.66	34.87
L124:	0.4193	0.3923	0.0032	0.1240	0.0611
L125:	0.15	0.16	0.11	0.16	
L126:	0.063	0.091	0.028		
L127:	0.070	0.085	0.086		
L128:	0.075	0.079	0.077		
L129:	0.085	0.081	0.070		
L130:	0.081	0.072	0.045		
L131:	0.079	0.059	0.059		
L132:	0.054	0.041	0.079		
L133:	0.050	0.032	0.080		
L134:	0.058	0.030	0.063		
L135:	0.386	0.430	0.403		
L136:	0.079	0.084	0.023		
L137:	0.063	0.088	0.039		
L138:	0.070	0.082	0.090		
L139:	0.075	0.075	0.079		
L140:	0.084	0.077	0.073		
L141:	0.080	0.068	0.046		
L142:	0.077	0.055	0.060		
L143:	0.052	0.038	0.080		
L144:	0.047	0.029	0.084		
L145:	0.372	0.404	0.422		
L146:	0.081	0.083	0.016		
L147:	0.079	0.080	0.049		
L148:	0.063	0.084	0.040		
L149:	0.069	0.078	0.088		
L150:	0.074	0.072	0.078		
L151:	0.084	0.073	0.074		
L152:	0.078	0.064	0.046		
L153:	0.075	0.052	0.059		
L154:	0.050	0.035	0.079		
L155:	0.346	0.380	0.476		
L156:	0.083	0.081	0.027		
L157:	0.081	0.079	0.027		
L158:	0.079	0.077	0.049		
L159:	0.063	0.080	0.046		
L160:	0.069	0.074	0.099		
L161:	0.073	0.068	0.086		
L162:	0.082	0.069	0.081		
L163:	0.075	0.059	0.050		
L164:	0.071	0.047	0.061		
L165:	0.326	0.365	0.561		

Table 8.1 Contents of "DATA" File (continued)

L166:	0.084	0.080	0.049
L167:	0.082	0.078	0.038
L168:	0.080	0.076	0.026
L169:	0.078	0.074	0.044
L170:	0.062	0.076	0.041
L171:	0.068	0.070	0.090
L172:	0.072	0.064	0.075
L173:	0.079	0.064	0.071
L174:	0.071	0.054	0.045
L175:	0.287	0.342	0.529
L176:	0.088	0.079	0.063
L177:	0.086	0.077	0.066
L178:	0.084	0.075	0.036
L179:	0.082	0.073	0.026
L180:	0.079	0.070	0.043
L181:	0.063	0.072	0.041
L182:	0.068	0.066	0.085
L183:	0.070	0.059	0.071
L184:	0.076	0.059	0.068
L185:	0.305	0.368	0.505
L186:	0.091	0.078	0.055
L187:	0.089	0.076	0.075
L188:	0.087	0.074	0.068
L189:	0.085	0.072	0.035
L190:	0.082	0.070	0.026
L191:	0.080	0.067	0.042
L192:	0.062	0.068	0.039
L193:	0.066	0.062	0.082
L194:	0.068	0.055	0.069
L195:	0.289	0.378	0.506
L196:	0.095	0.078	0.049
L197:	0.093	0.076	0.064
L198:	0.090	0.074	0.077
L199:	0.088	0.071	0.066
L200:	0.085	0.069	0.032
L201:	0.083	0.066	0.024
L202:	0.079	0.063	0.039
L203:	0.061	0.064	0.036
L204:	0.064	0.057	0.074
L205:	0.262	0.383	0.543
L206:	0.097	0.077	0.044
L207:	0.095	0.075	0.067
L208:	0.093	0.073	0.065
L209:	0.090	0.071	0.075
L210:	0.088	0.068	0.061
L211:	0.085	0.066	0.061
L212:	0.081	0.062	0.031
L213:	0.077	0.059	0.024
L214:	0.058	0.059	0.036
L215:	0.236	0.390	0.560
L216:	0.099	0.076	0.062
L217:	0.097	0.074	0.069
L218:	0.094	0.072	0.068
L219:	0.092	0.070	0.062
L220:	0.089	0.068	0.066

Table 8.1 Contents of "DATA" File (continued)

L221:	0.086	0.065	0.054
L222:	0.083	0.062	0.030
L223:	0.078	0.058	0.023
L224:	0.072	0.055	0.035
L225:	0.210	0.399	0.531
L226:	0.100	0.076	0.063
L227:	0.097	0.074	0.065
L228:	0.095	0.072	0.035
L229:	0.093	0.070	0.027
L230:	0.090	0.067	0.043
L231:	0.087	0.065	0.041
L232:	0.083	0.062	0.095
L233:	0.079	0.058	0.061
L234:	0.073	0.054	0.048
L235:	0.202	0.403	0.525
L236:	0.101	0.075	0.065
L237:	0.099	0.073	0.065
L238:	0.097	0.072	0.058
L239:	0.095	0.069	0.025
L240:	0.092	0.067	0.026
L241:	0.089	0.064	0.052
L242:	0.085	0.061	0.039
L243:	0.080	0.058	0.072
L244:	0.075	0.054	0.079
L245:	0.186	0.407	0.516
L246:	0.103	0.075	0.059
L247:	0.101	0.073	0.044
L248:	0.099	0.071	0.077
L249:	0.096	0.069	0.056
L250:	0.094	0.067	0.042
L251:	0.091	0.064	0.034
L252:	0.087	0.061	0.039
L253:	0.082	0.057	0.046
L254:	0.076	0.054	0.074
L255:	0.173	0.409	0.533
L256:	0.104	0.075	0.049
L257:	0.102	0.073	0.064
L258:	0.100	0.071	0.063
L259:	0.098	0.069	0.077
L260:	0.095	0.066	0.061
L261:	0.092	0.064	0.061
L262:	0.088	0.061	0.041
L263:	0.083	0.057	0.024
L264:	0.077	0.053	0.036
L265:	0.160	0.411	0.540
L266:	0.106	0.074	0.056
L267:	0.103	0.072	0.063
L268:	0.101	0.071	0.068
L269:	0.099	0.068	0.062
L270:	0.096	0.066	0.067
L271:	0.093	0.063	0.053
L272:	0.089	0.060	0.030
L273:	0.085	0.057	0.033
L274:	0.079	0.053	0.041
L275:	0.149	0.416	0.537

Table 8.1 Contents of "DATA" File (continued)

L276:	0.107	0.074	0.053
L277:	0.105	0.072	0.061
L278:	0.102	0.070	0.069
L279:	0.100	0.068	0.061
L280:	0.097	0.066	0.066
L281:	0.094	0.063	0.043
L282:	0.090	0.060	0.029
L283:	0.086	0.057	0.044
L284:	0.079	0.053	0.043
L285:	0.139	0.417	0.531
L286:	0.108	0.074	0.053
L287:	0.106	0.072	0.061
L288:	0.103	0.070	0.069
L289:	0.101	0.068	0.061
L290:	0.098	0.066	0.066
L291:	0.095	0.063	0.043
L292:	0.091	0.060	0.029
L293:	0.087	0.056	0.044
L294:	0.080	0.053	0.043
L295:	0.131	0.417	0.531
L296:	1.24	1.67	2.15
L297:	1.22	1.52	2.26
L298:	1.19	1.26	2.54
L299:	1.08	1.13	2.32
L300:	1.03	1.11	2.15
L301:	0.97	0.95	1.78
L302:	0.94	0.93	1.30
L303:	0.86	0.85	1.50
L304:	0.84	0.79	1.04
L305:	0.82	0.55	0.40
L306:	18.0	11.6	5.2
L307:	19.0	11.8	5.3
L308:	20.0	12.3	5.2
L309:	22.0	12.5	5.3
L310:	24.0	12.8	5.3
L311:	26.0	12.8	5.4
L312:	27.0	12.9	5.4
L313:	27.5	12.9	5.4
L314:	26.0	12.9	5.4
L315:	26.0	12.9	5.4
L316:	26.0	12.9	5.4
L317:	26.5	12.9	5.4
L318:	27.5	12.9	5.4
L319:	27.5	12.9	5.5
L320:	27.5	12.9	5.5
L321:	28.0	12.9	5.6
L322:	28.0	12.9	5.6
L323:	28.0	12.9	5.6
L324:	28.0	12.9	5.6
L325:	28.0	12.9	5.7
L326:	28.3	12.9	5.7
L327:	28.3	12.9	5.8
L328:	28.3	12.9	5.8
L329:	28.7	12.9	5.8
L330:	28.7	12.9	5.9

Table 8.1 Contents of "DATA" File (continued)

L331:	28.7	12.9	5.9				
L332:	28.7	12.9	6.0				
L333:	28.7	12.9	6.0				
L334:	25000000.0	25000000.0	0.25	0.75	0.067		
L335:	0.25	0.75	0.455	0.455	0.09		
L336:	0.40	0.60	0.55	0.45	0.53	0.47	
L337:	902976.4	180.59001	-59049.92	83.755614			
L338:	22912.859397	-39279.02	0.000308	-4687.31053	0.00008		
L339:	-8158.80	0.00373	39757.907369	0.486001	-10.92511	0.984929	
L340:	-35909	12.64116	-233248.7	0.411148			
L341:	0.96	0.04	0.98	0.02	0.04		
L342:	9649.5177	-21.8189	1.8554	-11217.67	8.3979	1.792019	
L343:	-494.357	0.044	0.00175	-1964.89	0.1078	0.0	30707.1 -1.869
L344:	0.90	1.30	0.85	0.15			
L345:	35.66		88.34		88.31		
L346:	213.84		75.50		82.82		
L347:	341.07		95.14		95.04		
L348:	160.56		101.43		99.44		
L349:	98.14		100.34		102.65		
L350:	96.57		102.52		104.21		
L351:	89.36		114.77		106.89		
L352:	52.63		107.32		111.51		
L353:	40.45		112.84		103.23		
L354:	36.52		114.77		104.75		
L355:	24.90		92.04		97.27		
L356:	10.28		94.97		103.88		
L357:	96.53		97.68		58.21		
L358:	87.31		-87.78		300.25		
L359:	98.51		340.47		30.49		
L360:	98.83		116.21		193.75		
L361:	101.94		37.87		25.45		
L362:	103.60		408.41		50.33		
L363:	100.90		-125.61		144.58		
L364:	100.73		29.33		2.58		
L365:	104.48		151.78		9.44		
L366:	110.39		-13.47		30.48		
L367:	99.99		212.58		168.70		
L368:	96.80		32.54		185.71		
L369:	0.0	0.0	0.0	0.0			
L370:	0.0	0.0	0.0	0.0	0.0		
L371:	0.0	0.0	0.0				
L372:	0.0	0.0	0.0				

Table 8.2 Description or Organization of "DATA" FILE

L1:	year 1989	
L2:	year 1990	
L3:	year 1991	
L4:	year 1992	
L5:	year 1993	
L6:	year 1994	
L7:	year 1995	
L8:	year 1996	
L9:	year 1997	
L10:	year 1998	
L11:	year 1999	
L12:	year 2000	
L13:	year 2001	
L14:	year 2002	
L15:	year 2003	
L16:	year 2004	
L17:	year 2005	
L18:	tpop, dpop, ypop, lpop	for 1989
L19:	----do----	for 1990
L20:	----do----	for 1991
L21:	----do----	for 1992
L22:	----do----	for 1993
L23:	----do----	for 1994
L24:	----do----	for 1995
L25:	----do----	for 1996
L26:	----do----	for 1997
L27:	----do----	for 1998
L28:	----do----	for 1999
L29:	----do----	for 2000
L30:	----do----	for 2001
L31:	----do----	for 2002
L32:	----do----	for 2003
L33:	----do----	for 2004
L34:	----do----	for 2005
L35:	pci82, gsp82, gasp82, cpi82, gnpdef82	for 1989
L36:	----do----	for 1990
L37:	----do----	for 1991
L38:	----do----	for 1992
L39:	----do----	for 1993
L40:	----do----	for 1994
L41:	----do----	for 1995
L42:	----do----	for 1996
L43:	----do----	for 1997
L44:	----do----	for 1998
L45:	----do----	for 1999
L46:	----do----	for 2000
L47:	----do----	for 2001
L48:	----do----	for 2002
L49:	----do----	for 2003
L50:	----do----	for 2004
L51:	----do----	for 2005
L52:	snfee, snprop	for 7000 lb
L53:	----do----	for 9000 lb
L54:	----do----	for 11000 lb
L55:	----do----	for 16000 lb

Note: tpop--total population
 dpop--driving age population
 ypop--young age population
 lpop--less the driving age popln.

Note: pci82 is per capita income in 1982 \$
 gsp82 is gross state product in
 1000s of 1982 \$
 gasp82 is gasoline price at Indiana-
 polis in 1982 cents
 cpi82 is consumer price inflation
 (CPI) index in 1982 cpi
 gnpdef82 is the GNP Implicit price
 deflator in 1982 GNPdef

Note: snfee is registration fees of
 non-farm trucks
 snprop is proportion of this
 weight group non-farm

Table 8.2 Description or Organization of "DATA" File
(continued)

L56:	---do---	for 20000 lb	truck to the total
L57:	---do---	for 26000 lb	non-farm trucks
L58:	---do---	for 30000 lb	
L59:	---do---	for 36000 lb	
L60:	---do---	for 42000 lb	
L61:	---do---	for 48000 lb	
L62:	---do---	for 54000 lb	
L63:	---do---	for 60000 lb	
L64:	---do---	for 66000 lb	
L65:	---do---	for >66000 lb	
L66:	sftee, sfprop	for 7000 lb	
L67:	---do---	for 9000 lb	
L68:	---do---	for 11000 lb	Note: sftee: is registration fees of
L69:	---do---	for 16000 lb	farm truck
L70:	---do---	for 20000 lb	sfprop: is proportion of this
L71:	---do---	for 26000 lb	weight group farm truck
L72:	---do---	for 30000 lb	to total farm trucks
L73:	---do---	for 36000 lb	
L74:	---do---	for 42000 lb	
L75:	---do---	for 48000 lb	
L76:	---do---	for 54000 lb	
L77:	---do---	for 60000 lb	
L78:	---do---	for 66000 lb	
L79:	---do---	for >66000 lb	
L80:	conftee, confprop	for 20000 lb	
L81:	---do---	for 26000 lb	Note: conftee is registration fees
L82:	---do---	for 30000 lb	for non-farm tractors
L83:	---do---	for 36000 lb	confprop is proportion of this
L84:	---do---	for 42000 lb	weight group to the
L85:	---do---	for 48000 lb	total non-farm
L86:	---do---	for 54000 lb	tractors
L87:	---do---	for 60000 lb	
L88:	---do---	for 66000 lb	
L89:	---do---	for 72000 lb	
L90:	---do---	for 74000 lb	
L91:	---do---	for 76000 lb	
L92:	---do---	for 78000 lb	
L93:	---do---	for >78000 lb	
L94:	coffee, cofprop	for 20000 lb	
L95:	---do---	for 26000 lb	Note: coffee is registration fees
L96:	---do---	for 30000 lb	for farm tractors
L97:	---do---	for 36000 lb	cofprop is proportion of this
L98:	---do---	for 40000 lb	weight group to the
L99:	---do---	for 48000 lb	total farm tractors
L100:	---do---	for 54000 lb	
L101:	---do---	for 60000 lb	
L102:	---do---	for 66000 lb	
L103:	---do---	for 72000 lb	
L104:	---do---	for 74000 lb	
L105:	---do---	for 76000 lb	
L106:	---do---	for 78000 lb	
L107:	---do---	for >78000 lb	
L108:	trnffee, trnfprop	for 3000 lb	
L109:	---do---	for 5000 lb	Note: trnffee is reg. fee for non-
L110:	---do---	for 7000 lb	farm trailers

Table 8.2 Description or Organization of "DATA" File
(continued)

L111: ---do---	for 9000 lb	trnfprop	is proportion of this
L112: ---do---	for 12000 lb		weight group to the
L113: ---do---	for 16000 lb		total non-farm
L114: ---do---	for 20000 lb		trailers
L115: ---do---	for >22000 lb		
L116: trffee, trfprop	for 7000 lb	Note: trffee	is reg. fee for farm
L117: ---do---	for 9000 lb		trailers
L118: ---do---	for 12000 lb	trfprop	is proportion of this
L119: ---do---	for 16000 lb		weight group to the
L120: ---do---	for 22000 lb		total farm trailer
L121: ---do---	for >22000 lb		
L122: sbfee, cbfee, bafee, bcfee, bdfee		Note: sbfee:	school bus
L123: pcfee, mcfee, hcfee, nstfee, fstfee			reg. fee
L124: sbprop, cbprop, baprop, bcprop, bdprop		cbfee:	church bus
L125: gtax, spftax, dstax, mcfut			reg. fee
L126: ani, lni, hni for 1 yr in 1989		bafee:	bus A reg.
L127: ---do---	2 yr --do--		fee
L128: ---do---	3 yr --do--	bcfee:	bus C reg.
L129: ---do---	4 yr --do--		fee
L130: ---do---	5 yr --do--	bdfee:	bus D reg.
L131: ---do---	6 yr --do--		fee
L132: ---do---	7 yr --do--	pcfee:	pass. car
L133: ---do---	8 yr --do--		reg. fee
L134: ---do---	9 yr --do--	mcfee:	motorcycle
L135: ---do---	>10 yr --do--		reg. fee
L136: ---do---	1 yr in 1990	hcfee:	housecar
L137: ---do---	2 yr --do--		reg. fee
L138: ---do---	3 yr --do--	nstfee:	avg. non-
L139: ---do---	4 yr --do--		farm semi-trailer
L140: ---do---	5 yr --do--		reg. fee
L141: ---do---	6 yr --do--	fstfee:	avg. farm
L142: ---do---	7 yr --do--		semitrailer
L143: ---do---	8 yr --do--		reg. fee
L144: ---do---	9 yr --do--	sbprop:	proportion
L145: ---do---	>10 yr --do--		of school bus to
L146: ---do---	1 yr in 1991		total buses
L147: ---do---	2 yr --do--	cbprop:	proportion
L148: ---do---	3 yr --do--		of church
L149: ---do---	4 yr --do--		bus to total
L150: ---do---	5 yr --do--		bus
L151: ---do---	6 yr --do--	baprop:	proportion
L152: ---do---	7 yr --do--		of bus A to
L153: ---do---	8 yr --do--		total bus
L154: ---do---	9 yr --do--	bcprop:	proportion
L155: ---do---	>10 yr --do--		of Bus C to
L156: ---do---	1 yr in 1992		total bus
L157: ---do---	2 yr --do--	bdprop:	proportion
L158: ---do---	3 yr --do--		of Bus D to total bus
L159: ---do---	4 yr --do--	gtax:	gasoline tax
L160: ---do---	5 yr --do--	spftax:	special fuel
L161: ---do---	6 yr --do--		tax
L162: ---do---	7 yr --do--	dstax:	diesel
L163: ---do---	8 yr --do--		surtax
L164: ---do---	9 yr --do--	mcfut:	motor
L165: ---do---	>10 yr --do--		carrier fuel

Table 8.2 Description or Organization of "DATA" File
(continued)

L166: ---do---	1 yr in 1993	
L167: ---do---	2 yr --do--	use tax
L168: ---do---	3 yr --do---	ani: proportion of
L169: ---do---	4 yr --do---	of automobiles by age
L170: ---do---	5 yr --do---	lni: proportion of
L171: ---do---	6 yr --do---	trucks by age
L172: ---do---	7 yr --do---	hni: proportion of
L173: ---do---	8 yr --do---	tractors by
L174: ---do---	9 yr --do---	age
L175: ---do---	>10 yr --do---	
L176: ---do---	1 yr in 1994	
L177: ---do---	2 yr --do---	
L178: ---do---	3 yr --do---	
L179: ---do---	4 yr --do---	
L180: ---do---	5 yr --do---	
L181: ---do---	6 yr --do---	
L182: ---do---	7 yr --do---	
L183: ---do---	8 yr --do---	
L184: ---do---	9 yr --do---	
L185: ---do---	>10 yr --do---	
L186: ---do---	1 yr in 1995	
L187: ---do---	2 yr --do---	
L188: ---do---	3 yr --do---	
L189: ---do---	4 yr --do---	
L190: ---do---	5 yr --do---	
L191: ---do---	6 yr --do---	
L192: ---do---	7 yr --do---	
L193: ---do---	8 yr --do---	
L194: ---do---	9 yr --do---	
L195: ---do---	>10 yr --do---	
L196: ---do---	1 yr in 1996	
L197: ---do---	2 yr --do---	
L198: ---do---	3 yr --do---	
L199: ---do---	4 yr --do---	
L200: ---do---	5 yr --do---	
L201: ---do---	6 yr --do---	
L202: ---do---	7 yr --do---	
L203: ---do---	8 yr --do---	
L204: ---do---	9 yr --do---	
L205: ---do---	>10 yr --do---	
L206: ---do---	1 yr in 1997	
L207: ---do---	2 yr --do---	
L208: ---do---	3 yr --do---	
L209: ---do---	4 yr --do---	
L210: ---do---	5 yr --do---	
L211: ---do---	6 yr --do---	
L212: ---do---	7 yr --do---	
L213: ---do---	8 yr --do---	
L214: ---do---	9 yr --do---	
L215: ---do---	>10 yr --do---	
L216: ---do---	1 yr in 1998	
L217: ---do---	2 yr --do---	
L218: ---do---	3 yr --do---	
L219: ---do---	4 yr --do---	
L220: ---do---	5 yr --do---	

Table 8.2 Description or Organization of "DATA" File
(continued)

L221: ---do---	6 yr --do--
L222: ---do---	7 yr --do--
L223: ---do---	8 yr --do--
L224: ---do---	9 yr --do--
L225: ---do---	>10 yr --do--
L226: ---do---	1 yr in 1999
L227: ---do---	2 yr --do--
L228: ---do---	3 yr --do--
L229: ---do---	4 yr --do--
L230: ---do---	5 yr --do--
L231: ---do---	6 yr --do--
L232: ---do---	7 yr --do--
L233: ---do---	8 yr --do--
L234: ---do---	9 yr --do--
L235: ---do---	>10 yr --do--
L236: ---do---	1 yr in 2000
L237: ---do---	2 yr --do--
L238: ---do---	3 yr --do--
L239: ---do---	4 yr --do--
L240: ---do---	5 yr --do--
L241: ---do---	6 yr --do--
L242: ---do---	7 yr --do--
L243: ---do---	8 yr --do--
L244: ---do---	9 yr --do--
L245: ---do---	>10 yr --do--
L246: ---do---	1 yr in 2001
L247: ---do---	2 yr --do--
L248: ---do---	3 yr --do--
L249: ---do---	4 yr --do--
L250: ---do---	5 yr --do--
L251: ---do---	6 yr --do--
L252: ---do---	7 yr --do--
L253: ---do---	8 yr --do--
L254: ---do---	9 yr --do--
L255: ---do---	>10 yr --do--
L256: ---do---	1 yr in 2002
L257: ---do---	2 yr --do--
L258: ---do---	3 yr --do--
L259: ---do---	4 yr --do--
L260: ---do---	5 yr --do--
L261: ---do---	6 yr --do--
L262: ---do---	7 yr --do--
L263: ---do---	8 yr --do--
L264: ---do---	9 yr --do--
L265: ---do---	>10 yr --do--
L266: ---do---	1 yr in 2003
L267: ---do---	2 yr --do--
L268: ---do---	3 yr --do--
L269: ---do---	4 yr --do--
L270: ---do---	5 yr --do--
L271: ---do---	6 yr --do--
L272: ---do---	7 yr --do--
L273: ---do---	8 yr --do--
L274: ---do---	9 yr --do--
L275: ---do---	>10 yr --do--

Table 8.2 Description or Organization of "DATA" File
(continued)

L276:	---do---	1 yr in 2004	
L277:	---do---	2 yr --do--	
L278:	---do---	3 yr --do---	
L279:	---do---	4 yr --do---	
L280:	---do---	5 yr --do--	
L281:	---do---	6 yr --do--	
L282:	---do---	7 yr --do--	
L283:	---do---	8 yr --do--	
L284:	---do---	9 yr --do---	
L285:	---do---	>10 yr --do--	
L286:	---do---	1 yr in 2005	
L287:	---do---	2 yr --do--	
L288:	---do---	3 yr --do---	
L289:	---do---	4 yr --do---	
L290:	---do---	5 yr --do--	
L291:	---do---	6 yr --do--	
L292:	---do---	7 yr --do--	
L293:	---do---	8 yr --do--	
L294:	---do---	9 yr --do---	
L295:	---do---	>10 yr --do--	
L296:	arvt, lrvt, hrvt	1 yr	Note: arvt: relative miles of travel per year by automobiles in different age groups lrvt: --do- for trucks hrvt: --do- for tractors
L297:	---do---	2 yr	
L298:	---do---	3 yr	
L299:	---do---	4 yr	
L300:	---do---	5 yr	
L301:	---do---	6 yr	
L302:	---do---	7 yr	
L303:	---do---	8 yr	
L304:	---do---	9 yr	
L305:	---do---	>10 yr	
L306:	aeff, leff, heff	1978	Note aeff: Model yr fuel efficiencies for automobiles leff: ---do-- for trucks heff: ---do-- for tractors
L307:	---do---	1979	
L308:	---do---	1980	
L309:	---do---	1981	
L310:	---do---	1982	
L311:	---do---	1983	
L312:	---do---	1984	
L313:	---do---	1985	
L314:	---do---	1986	
L315:	---do---	1987	
L316:	---do---	1988	
L317:	---do---	1989	
L318:	---do---	1990	
L319:	---do---	1991	
L320:	---do---	1992	
L321:	---do---	1993	
L322:	---do---	1994	
L323:	---do---	1995	
L324:	---do---	1996	
L325:	---do---	1997	
L326:	---do---	1998	
L327:	---do---	1999	
L328:	---do---	2000	
L329:	---do---	2001	
L330:	---do---	2002	

Table 8.2 Description or Organization of "DATA" File
(continued)

L331: ---do----	2003	
L332: ---do----	2004	
L333: ---do----	2005	
L334: pbsr, psr, pnhr, pnmr, pgsr		
L335: pnghr, pngmr, pdsr, pdmr, pdmcr		
L336: psdr, psdlr, phsr, phlr, pmsr, pmlr		
L337: boareg, blareg, bosureg, blsureg		
L338: boconreg, blconreg,, b2conreg, bocofreg, blcofreg		
L339: botrreg, bltrreg, bosnreg, blsnreg, bosfreg, blsfreg		
L340: bobreg, blbreg, bomreg, blmreg		
L341: psnreg, psfreg, pnfr, pftr, pmisc		
L342: boavm, blavm, b2avm, bosuvm, blsuvm, b2suvm		
L343: bomcvm, blmcvm, b2mcvm, bocovm, blcovm, b2covm, bobvm, blbvm		
L344: pdlic, licrev, pstax, pmcfut		
L345: rsi, dsi, gsi for Jan		
L346: ---do---	for Feb	Note: pbsr: amt of gas tax into
L347: ---do---	for March	special dist account
L348: ---do---	for April	psr: amt of sp. fuel tax
L349: ---do---	for May	into sp. dist account
L350: ---do---	for June	pnhr: prop. of remaining sp.
L351: ---do---	for July	fuel to HRSF
L352: ---do---	for August	pnmr: proportion of remaining
L353: ---do---	for Sept	sp. fuel to MVHA
L354: ---do---	for Oct	pgsr: proportion of gas tax
L355: ---do---	for Nov	to SHCF
L356: ---do---	for Dec	pnghr: proportion of remaining
L357: ssi, mcsi, sursi for Jan		gas tax to HRSF
L358: ---do---	for Feb	pngmr: proportion of remaining
L359: ---do---	for March	gas tax to MVHA
L360: ---do---	for April	pdsr: proportion of diesel
L361: ---do---	for May	surtax to SHF
L362: ---do---	for June	pdmr: proportion of diesel
L363: ---do---	for July	surtax to MVHA
L364: ---do---	for August	pdmcr: proportion of diesel
L365: ---do---	for Sept	surtax to MCRF
L366: ---do---	for Oct	psdsr: proportion of special
L367: ---do---	for Nov	dist. fund to SHF
L368: ---do---	for Dec	psdlr: proportion of special
L369: mvtit, mvgf, mvfr, mvmiscr		dist. fund to local
L370: mvexp1, mvexp2, mvexp3, mvexp4, mvexp5		phsr: proportion of HRSF
L371: hrtit, shffhwa, shfmisc		funds to SHF
L372: genrev1, genrev2, genrev3		phlr: proportion of HRSF
		funds to local
		pmsr: proportion of MVHA
		funds to SHF
		pmlr: proportion of MVHA
		to local
		boareg: bo coeff of areg
		equation
		blareg: bl coeff of areg
		equation

Table 8.2 Description or Organization of "DATA" File
(continued)

Note:

b2conreg: b2 coeff of non-farm tractor reg
 bocofreg: b0 coeff of farm tractor reg
 blcofreg: b1 coeff of farm tractor reg
 botrreg: b0 coeff of trailer reg
 bltrreg: b1 coeff of trailer reg
 bosnreg: b0 coeff of non-farm semi trailer reg
 blsnreg: b1 coeff of non-farm semi trailer reg
 bosfreg: b0 coeff of farm semi trailer reg
 blsfreg: b1 coeff of farm semi trailer reg
 bobreg: b0 coeff of bus reg
 blbreg: b1 coeff of bus reg
 bomreg: b0 coeff of motorcycle reg
 blmreg: b1 coeff of motorcycle reg
 psnreg: proportion of trucks that are non-farm trucks
 pefreg: proportion of truck that are farm trucks
 pnftr: proportion of trailers that are non-farm
 pftr: proportion of trailers that are farm
 pmisc: misc. rev. as a proportion of total registration fee revenues
 boavm: b0 coeff of auto vmt equation
 blavm: b1 coeff of auto vmt equation
 b2avm: b2 coeff of auto vmt equation
 bosuvm: b0 coeff of truck vmt equation
 blsuvm: b1 coeff of truck vmt equation
 b2suvm: b2 coeff of truck vmt equation
 bomcvm: b0 coeff of motorcyvle vmt equation
 blmcvm: b1 coeff of motorcycle vmt equation
 b2mcvm: b2 coeff of motorcycle vmt equation
 bocovm: b0 equation of tractor vmt equation
 blcovm: b1 equation of tractor vmt equation
 b2covm: b2 equation of tractor vmt equation
 bobvm: b0 equation of avg. miles per year per bus equation
 blbvm: b1 equation of avg. miles per year per bus equation
 pdlic: licensed drivers per driving age population
 licrev: driver license revenues per licensed drivers
 mvexp: off the top expenses from MVHA
 pstax: diesel surtax revenue as a proportion of special fuel tax rev.
 pmcfut: MCFUT revenue as a proportion of special fuel tax revenues
 rsi: seasonal indices for short-term forecast of registration rev.
 dsi: seasonal indices for short-term forecast of driver license rev
 gsi: seasonal indices for short-term forecast of gasoline consumption
 ssi: seasonal indices for short-term forecast of Sp. fuel consumption
 mcsi: seasonal indices for short-term forecast of MCFUT gallons
 susi: seasonal indices for short-term forecast of Diesel Surtax gal.
 mvtit: title revenues in mvha
 mvgf: general fund reimbursement into mvha
 mvfr: federal reimbursement into mvha
 mvmiscr: miscellaneous revenue in mvha
 mvexp1: bmv appropriations from mvha
 mvexp2: state police operating expenses
 mvexp3: motor fuel division expenses from mvha
 mvexp4: highway safety plan expenses from mvha
 mvexp5: miscellaneous expenses from mvha
 hrtit: title fee into hrsf
 shffhwa: federal highway reimbursement into shf
 shfmisc: miscellaneous revenue in shf
 genrev1, genrev2, genrev3--three general revenue sources

Editing Input Files

INDOTREV uses DATA as its input file while SHORTREV uses GASIN,SPFIN,STAXIN,MCFUTIN,REGIN,IRPIN files as input files. All these files can be edited using any wordprocessing software, including DOS editor. What is important is that, at the completion of updating, these files should be saved in ASCII format as the two programs read data from the input files in ASCII format. Do not change the form or structure of these files. Updating the "DATA" file permanently changes the factors. On-line change, made on the screen, only temporarily change factors. Once the execution of the program is over, the on-line changes are lost. Each data item in "DATA" file can be understood by going through Tables 8.1 and 8.2 of this chapter. The input files used for SHORTREV program is self-explanatory.

CHAPTER 9

CONCLUSIONS AND RECOMMENDATIONS

The primary purpose of this study was to develop a computerized highway revenue forecasting model for the Indiana Department of Transportation (INDOT) which could provide both long-term and short-term forecasts of highway revenues by revenue source. After an exhaustive literature review and extensive data collection, analyses of revenue and travel related data were conducted to develop regression and other equations which form the foundation of the computerized system. The system is responsive to socio-economic, technological, and legislative policy changes.

Surveys of various DOTs, including INDOT, indicated that there is a distinct need for developing and periodically updating revenue forecasts for planning, budgeting and scheduling purposes. One of the important concerns raised was the potential obsolescence of the model over time. Major sources of highway revenue are federal aid, motor fuel taxes, vehicle registration fees, driver license fees, and bonds. For 1991 38% of INDOT's total highway revenues were from federal-aid and 2% from other miscellaneous sources. The remaining portion is made up of motor fuel taxes, vehicle registration fees, and

driver license fees. The model developed does not provide forecasts of revenues from federal-aid or the various miscellaneous sources.

Among the forecasting techniques used for long-term highway revenue forecasting are trend projections, growth factor models, linear regression models, non-linear regression models, simulation models, econometric models, and time series methods. Short-term forecasting has historically been done using either the moving average method, the smoothing method, the classical seasonal decomposition method, or the Box-Jenkins method. This study primarily developed and used regression and non-linear regression models for long-term forecasting and applied the multiplicative ratio and classical decomposition method for short-term forecasting.

Attention must be paid to the relevance, adequacy, accuracy, and availability of source data used as inputs for forecasting. One of the primary problems faced with regression models is multicollinearity. Hence, the registration, sales, and travel equations developed use, at the most, two influencing variables. Extensive statistical analyses were done in variable selection. The socioeconomic variables used in the study are: real gross state product for registration, sales, and travel of commercial vehicles; real per capita income (in Indiana) for registration, sales, and travel of vehicles used for personal mobility. Real gasoline price was also used for estimating automobile vehicle miles of travel.

These data are relevant, adequate, available, and accurate. However, the projections of the future values for this source data were made based on trends and some judicious assumptions. The study discusses in detail the sources and uses of this data in Chapters 4 and 5. The model provides the flexibility of incorporating better values for the input data used for making forecasts.

This study disaggregates total highway revenues into the revenues obtained from the six major categories: registration fees; driver license fees; gasoline tax; special fuels tax; motor carrier fuel use tax; and diesel surtax. The model developed not only forecasts revenue collections, but also performs the disbursement of the receipts into the various legislated funds using the ratios mandated by legislative action. Thus, the model can respond to changes in these ratios as prompted by new legislative actions. Among the various funds the three major funds are: the Motor Vehicle Highway Account (MVHA); the Highway and Road Street Fund (HRSF); and the State Highway Fund (SHF). Other funds are the Motor Carrier Regulation Fund (MCRF) and the State Highway Road Construction Improvement Fund (SHCF). The model also calculates the split of highway revenues between the state and local levels.

A 15 year profile of vehicle registrations in Indiana indicates: an increase of 20 % in passenger cars; a decrease of 31 % in motorcycles; an increase of 40 % in non-farm

trucks; a decrease of 9.6 % in farm trucks; a decrease of 10 % in non-commercial buses; an increase of 94 % in commercial buses; a decrease of 86 % in non-farm tractors; an increase of 400 % in farm tractors; an increase of 39.6 % in trailers; and a decrease of 23.5 % in semi-trailers. The decrease in non-farm tractors is essentially due to Indiana's joining the International Registration Plan (IRP) in 1987. As a result many non-farm tractors now register outside of Indiana. This has resulted in a decrease in Indiana registration revenues. From 1976 to 1986, there was an increase of 55 % in Indiana registration revenue. Between 1986 and 1989 the registration revenue declined by 23%. However, when one includes IRP in total registration revenue, the collection actually shows a 20.5% increase during the 1986 to 1989 time frame. Indiana's registration fees increased three times during the 15 year period of 1976-89. The most perceptible increases were for the registration of non-farm tractors, primarily to address the issue of equity based on cost responsibility.

In past decade, the proportion of new vehicles to the total fleet increased from 3.6% to 6.0%. More and more vehicles in the fleet are becoming fuel efficient. However, the fleet fuel efficiency has improved at a decreasing rate since the mid 1980s. The fleet fuel efficiency of light duty vehicles will likely level off in the 1990s and beyond. However, an improvement in fleet fuel efficiency of heavy duty vehicle is expected, especially because of the thrust to

improve the particulate and NOx emission characteristics of these vehicles in response to the new air quality standards.

In the last 15 years the overall vehicle miles of travel in Indiana increased by 28% and is around 52 billion at present. The truck and tractor vehicle miles of travel increased by 34.5%; whereas, tractor vehicle miles alone increased by only 18%. More and more light duty trucks are being used for personal travel in comparison to passenger cars, while commercial travel is done primarily by tractors. Most of the light duty vehicles (automobiles and trucks less than 10,000 lbs) are gasoline driven, while most of the heavy duty vehicles (used for commercial purposes) are diesel powered.

Indiana's population increased by only 2.3 % in last 15 years. The demographic profile indicates that the proportion of young age population (16-25 yrs) decreased, and that of greater than 65 yrs increased. Thus, the population is aging. Real gross state product (in 1982 dollars) grew 16.5% between 1976 and 1987, real per capita income (in 1982 dollars) increased by 18.5% during the same period. Real gasoline prices continued to decrease from 1982 through 1989. In 1990, because of the gulf war, prices rebounded to over \$1.20/gallon in current dollars. The yearly average gasoline price for 1990 (in 1982 dollars) was \$0.93/gallon which is about a 22% increase over the price in 1989. It is believed that the economy will start picking up slowly by the end of 1991 and

1992 will continue to show slow economic growth. Thereafter, it is assumed that economy will do well.

The regression equations can be considered reliable. All have a high R^2 (most above 0.80) and high F values (most above 3.0) indicating that the dependent variables correlate very well with independent variables and that independent variables are significant. Since at the most two independent variables were used in any equation, the problem of multicollinearity was minimized.

The computerized system, INDOTREV, integrates all these equations with other procedural set ups and provides a menu driven environment which makes the system user friendly. The system provides the capability to perform sensitivity analysis. The updating mechanism is simple, involving only the updating of the "DATA" file which the computer model uses to make forecast. Not only the input data can be updated but also the relationships used in the regression equations can be updated.

A comparison with the actual values of 1989 indicated that nearly all of the individual revenue estimates were within 5% error and the total revenue estimate was within 1% error. Hence, the predictive ability of the model appears quite good. Somewhat less reliable segments of the model are the estimates of IRP revenues, Motor Carrier Fuel Use Tax (MCFUT) revenues, and Diesel Surtax revenues. Much of this has to do with historical data limitations in studying the

underlying phenomena impacting revenue generation from these tax sources. The forecasts of short-term gasoline and special fuel taxes were within 10% error for most months. The variability of short-term forecasts of MCFUT and diesel surtax from observed values was much greater than that found for gasoline and special fuels, essentially due to the problem of inadequate data. The long-term results indicate that overall highway revenues are going to increase 24.4 % in current dollars by the year 2005. Assuming the continuation of current tax structure and other trends, the total highway revenue is estimated to be \$843.2 million in 2005. Between 1991 and 2005, registration revenues (excluding IRP revenues) are going to increase by 31.3 % in current dollars, gasoline revenues by 28.34 %, special fuel revenues including MCFUT and diesel surtax by 14.39%. Thus, we see that fuel tax revenues from vehicle categories contributing the most damage to highway facilities are going to increase the least.

The short-term revenue forecasts indicate that most of the registration revenue is received during the months of February, March, and April. INDOT receives \$28,000 to \$35,000 in revenues from the gasoline tax and \$7,300 to \$9,400 from the special fuel tax during a month. Highest gasoline tax collections are generally received during the month of August; whereas, the highest special fuels tax collection month is October. There is quite a bit of variability from month to month in receipts from both MCFUT and diesel surtax.

The effects of increasing the rates for each type of tax, as of 1991, are presented in Table 7.5. A penny increase in gasoline tax can generate more than \$25 million dollars; whereas, the same increase in special fuel tax fetches only an additional \$6.3 million. An increase in the automobile registration fee of \$1 produces an increase in revenues almost 90 times greater than would result by increasing the registration fees of non-farm tractors above 78,000 lbs by \$5.

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APPENDIX A. DATA AND INTERMEDIATE RESULTS

Table A.1 Past Vehicle Registrations in Indiana

Vehicle Registrations											
Year	Passenger Cars		Motorcycle		Buses		Housecar		Truck		
					Non-Comm.	Comm.			Non-Farm	Farm	Total
1970	2264994		80200								
1971	2280405		87166								
1972	2418556		100652								
1973	2521384		122741								
1974	2534976		144727								
1975	2564527		142179								
1976	2641051		140397		5845	289	56765	676191	46063	722254	
1977	2729130		152844		7493	143	63980	724755	46060	770815	
1978	2809359		154000		8754	278	67270	790823	46572	837395	
1979	2840464		166796		9159	331	65233	819778	46684	866462	
1980	2846134		179587		8591	368	63560	818730	46651	865381	
1981	2862663		171465		8771	434	62691	811792	47128	858920	
1982	2849651		159892		8670	470	62005	808478	46440	854918	
1983	2827343		138861		8901	499	60149	800842	44722	845564	
1984	2898290		135503		8527	507	58680	808984	45111	854095	
1985	2973487		133232		8465	549	57566	837591	44739	882330	
1986	3031756		124218		8080	480	56937	856683	43514	900197	
1987	3015865		104603		8553	487	53661	870693	42342	913035	
1988	3052002		104133		8082	561	53921	905973	41268	947241	
1989	3157878		96729		8176	562	53551	949672	41663	991335	
Year	Tractors			Total Trucks & Trailers		Semi-Trailers		Farm Tractor		Special Machinery	
	Non-Farm	Farm	Total	Trucks & Trailers		Trailer		Tractor			
1976	41076		41076	763330	216657	51136	1537	16378			
1977	41641		41641	812456	222326	55590	1341	17564			
1978	44709		44709	882104	229874	65203	1253	18252			
1979	47533		47533	913995	235698	61189	1098	18360			
1980	45779		45779	911160	242273	66282	1158	19546			
1981	45117	365	45482	904402	253937	59490	1034	20299			
1982	42604	592	43196	898114	259151	64371	906	20705			
1983	42394	714	43108	888672	259106	56974	688	19327			
1984	45784	906	46690	900785	264258	67920	624	20061			
1985	46726	1062	47788	930118	272510	61243	542	19818			
1986	43587	1312	44899	945096	276318	67957	472	19341			
1987	8294	1541	9835	922870	283372	47701	413	18726			
1988	7586	1543	9129	956370	293720	49294	365	18479			
1989	5822	1830	7652	998987	302469	39084	327	18593			

Source: [67]

Table A.2 Past Vehicle Registration Revenues in Indiana

Year	Pass.Car	Motor-Cycle	Bus Non-Comm.	Bus Comm.	Housecar Non-Farm	Truck Farm	Total
1976	29368487	741296	91780	29632	879827	10014978	12247168
1977	30238760	807016	120235	11592	899576	10259764	12561564
1978	31127698	814660	142976	23095	1003170	10958728	13344336
1979	31642769	880683	149002	36844	983630	11390807	13836205
1980	31649010	948219	143319	40736	955687	11165359	13662606
1981	31546546	1548329	176846	61429	1174604	13633771	16928147
1982	30234797	1376670	171438	70546	1142847	12887237	16121292
1983	29941562	1217811	171357	75884	1103876	12580293	15753192
1984	30721874	1178876	166438	78408	1080370	12877174	16082409
1985	31429758	1160450	165533	80865	1058710	13191560	16383800
1986	31954708	1081939	157889	78394	1044237	18135702	22565391
1987	32796488	1141241	166532	64625	1012100	16840612	21176201
1988	33343602	1136691	157821	75514	1019198	17103760	21408378
1989	34521881	1056757	158743	77731	1012534	18458919	22935655

	Non-Farm	Tractor Farm	Total	Total Truck &	Trailer	Semitrailer
1976	16815633		16815633	29062801	1768180	1203741
1977	17049600		17049600	29611164	1874280	1359470
1978	18401509		18401509	31745845	1969303	1849520
1979	19813965		19813965	33650170	2074056	1596286
1980	19254209		19254209	32916815	2003814	1885000
1981	23955127	88248	24043375	40971522	2089710	1878929
1982	26268744	163200	26431944	42553236	1968027	2157839
1983	26129986	198005	26327991	42081183	1987995	1733813
1984	28895735	243543	29139278	45221687	2044893	2324553
1985	29794573	292141	30086714	46470514	2121773	1844683
1986	38199733	490389	38690122	61255513	3023504	2313437
1987	6023067	589436	6612503	27788704	3087744	1388387
1988	5683463	661574	6345037	27753415	3259023	1446269
1989	4656272	909672	4746944	27682599	3417922	1068478

	Farm Tractor	Special Machinery	Miscellaneous Registration	Total Registration
1976	3932	73701	4257875	76391469
1977	3335	78400	3265694	77299921
1978	3132	82134	4438890	83016125
1979	2745	82620	3934289	85279307
1980	2895	87957	3900049	84834360
1981	2429	90412	3985946	96598493
1982	1634	78759	3969656	96506618
1983	1240	73393	4223428	95327240
1984	1126	76167	4706105	100564319
1985	982	74928	3200158	100725747
1986	856	73214	3429735	118109532
1987	742	70549	3121207	84988543
1988	656	69606	3279016	86639704
1989	588	69999	3403233	91865988

Source: [67]

Table A.3 Proportional Distribution of Registrations and Registration Revenues in Past

Proportional Distribution of Truck & Tractor Registrations						
Year	Truck			Tractor		
	Non-Farm	Farm	Total	Non-Farm	Farm	Total
1976	0.8858	0.0603	0.9461	0.0539	0.0000	0.0539
1977	0.8921	0.0567	0.9488	0.0512	0.0000	0.0512
1978	0.8965	0.0528	0.9493	0.0507	0.0000	0.0507
1979	0.8969	0.0511	0.9480	0.0520	0.0000	0.0520
1980	0.8986	0.0512	0.9498	0.0502	0.0000	0.0502
1981	0.8976	0.0521	0.9497	0.0499	0.0004	0.0503
1982	0.9002	0.0517	0.9519	0.0474	0.0007	0.0481
1983	0.9012	0.0503	0.9515	0.0477	0.0008	0.0485
1984	0.8981	0.0501	0.9482	0.0508	0.0010	0.0518
1985	0.9005	0.0481	0.9486	0.0502	0.0012	0.0514
1986	0.9065	0.0460	0.9525	0.0461	0.0014	0.0475
1987	0.9435	0.0459	0.9894	0.0090	0.0016	0.0106
1988	0.9473	0.0432	0.9905	0.0079	0.0016	0.0095
1989	0.9506	0.0417	0.9923	0.0058	0.0019	0.0077

Proportional Distribution of Registration Revenues								
Year	Pass. Car	Motor-Cycle	Bus		Housecar	Truck		
			Non-Comm.	Comm.		Non-Farm	Farm	Total
1976	0.3844	0.0097	0.0012	0.0004	0.0115	0.1311	0.0292	0.1603
1977	0.3912	0.0104	0.0016	0.0001	0.0116	0.1327	0.0298	0.1625
1978	0.3750	0.0098	0.0017	0.0003	0.0121	0.1320	0.0287	0.1607
1979	0.3710	0.0103	0.0017	0.0004	0.0115	0.1336	0.0287	0.1623
1980	0.3731	0.0112	0.0017	0.0005	0.0113	0.1316	0.0294	0.1610
1981	0.3266	0.0160	0.0018	0.0006	0.0122	0.1411	0.0341	0.1752
1982	0.3133	0.0143	0.0018	0.0007	0.0118	0.1335	0.0335	0.1670
1983	0.3141	0.0128	0.0018	0.0008	0.0116	0.1320	0.0333	0.1653
1984	0.3055	0.0117	0.0017	0.0008	0.0107	0.1280	0.0319	0.1599
1985	0.3120	0.0115	0.0016	0.0008	0.0105	0.1310	0.0317	0.1627
1986	0.2706	0.0092	0.0013	0.0007	0.0088	0.1535	0.0375	0.1910
1987	0.3859	0.0134	0.0020	0.0008	0.0119	0.1982	0.0510	0.2492
1988	0.3849	0.0131	0.0018	0.0009	0.0118	0.1974	0.0497	0.2471
1989	0.3758	0.0115	0.0017	0.0008	0.0110	0.2009	0.0487	0.2496

Proportional Distribution of Registration Revenues									
Year	Tractor			Total Trailer	Semi-Farm Special Misc.				
	Non-Farm	Farm	Total		Tractor	Farm	Tractor	Mach.	
1976	0.2201	0.0000	0.2201	0.3804	0.0158	0.000051	0.0010	0.0557	
1977	0.2206	0.0000	0.2206	0.3831	0.0176	0.000043	0.0010	0.0422	
1978	0.2217	0.0000	0.2217	0.3824	0.0223	0.000038	0.0010	0.0535	
1979	0.2323	0.0000	0.2323	0.3946	0.0187	0.000032	0.0010	0.0461	
1980	0.2270	0.0000	0.2270	0.3880	0.0222	0.000034	0.0010	0.0460	
1981	0.2480	0.0009	0.2489	0.4241	0.0195	0.000025	0.0009	0.0413	
1982	0.2722	0.0017	0.2739	0.4409	0.0224	0.000017	0.0008	0.0411	
1983	0.2741	0.0021	0.2765	0.4418	0.0182	0.000013	0.0008	0.0443	
1984	0.2873	0.0024	0.2897	0.4496	0.0231	0.000011	0.0008	0.0468	
1985	0.2958	0.0029	0.2987	0.4614	0.0183	0.000010	0.0007	0.0318	
1986	0.3234	0.0042	0.3276	0.5186	0.0196	0.000007	0.0006	0.0290	
1987	0.0709	0.0069	0.0778	0.3270	0.0163	0.000009	0.0008	0.0367	
1988	0.0656	0.0076	0.0732	0.3203	0.0167	0.000008	0.0008	0.0378	
1989	0.0507	0.0099	0.0606	0.3102	0.0116	0.000006	0.0008	0.0370	

Table A.4 Past Vehicle Registration fees in Indiana

Year	Pass. Car	Motor- Cycle	Average Registration Fees				Truck	
			Non-Comm.	Bus Comm.	Housecar	Non-Farm	Farm	
1976	11.12	5.28	15.70	102.53	15.50	14.81	48.46	
1977	11.08	5.28	16.05	81.06	14.06	14.16	49.97	
1978	11.08	5.29	16.33	83.07	14.91	13.86	51.22	
1979	11.14	5.28	16.27	111.31	15.08	13.89	52.38	
1980	11.12	5.28	16.68	110.69	15.04	13.64	53.53	
1981	11.02	9.03	20.16	141.54	18.74	16.79	69.90	
1982	10.61	8.61	19.77	150.10	18.43	15.94	69.64	
1983	10.59	8.77	19.25	152.07	18.35	15.71	70.95	
1984	10.60	8.70	19.52	154.65	18.41	15.92	71.05	
1985	10.57	8.71	19.55	147.30	18.39	15.75	71.35	
1986	10.54	8.71	19.54	163.32	18.34	21.17	101.80	
1987	10.87	10.91	19.47	132.70	18.86	19.34	102.39	
1988	10.93	10.92	19.53	134.61	18.90	18.88	104.31	
1989	10.93	10.92	19.42	138.31	18.91	19.44	107.45	
	Tractor		Trailer	Semitrailer	Farm Tractor	Special Machinery		
	Non-Farm	Farm						
1976	409.38		8.16	23.54	2.50	4.50		
1977	409.44		8.43	24.46	2.49	4.46		
1978	411.58		8.57	28.37	2.50	4.50		
1979	416.85		8.80	26.09	2.50	4.50		
1980	420.59		8.27	28.44	2.50	4.50		
1981	530.96	241.78	8.23	31.58	2.35	4.45		
1982	616.58	275.68	7.59	33.52	1.80	3.80		
1983	616.36	277.32	7.67	30.43	1.80	3.80		
1984	631.13	268.81	7.74	34.22	1.80	3.80		
1985	637.64	275.09	7.79	30.12	1.81	3.78		
1986	876.40	373.77	10.94	34.04	1.81	3.79		
1987	726.20	382.50	10.90	29.11	1.80	3.77		
1988	749.20	428.76	11.10	29.34	1.80	3.77		
1989	799.77	497.09	11.30	27.34	1.80	3.76		

Source: [67]

Table A.5 Past Truck Registrations and Registration Revenues

Year	Trucks					
	Registrations			Registration Revenues		
	Non-Farm	Farm	Total	Non-Farm	Farm	Total
1976	676191	46063	722254	18369765	2232190	20601955
1977	724755	46060	770815	19219050	2301800	21520850
1978	790823	46572	837395	20752389	2385608	23137997
1979	819778	46684	866462	21642417	2445398	24087815
1980	818730	46651	865381	21468970	2497247	23966216
1981	811792	47128	858920	26600484	3294376	29894861
1982	808478	46440	854918	25448970	3234055	28683023
1983	800842	44722	845564	25059336	3172899	28232234
1984	808984	45111	854095	25510686	3205235	28715921
1985	837591	44739	882330	26309457	3192240	29501697
1986	856683	43514	900197	31646455	4429689	36076144
1987	870693	42342	913035	31191674	4335589	35527262
1988	905973	41268	947241	32196899	4304618	36501518
1989	949672	41663	991335	34441409	4476736	38919145

Proportional Distributions

	Registrations		Registration Revenues	
	Non-Farm	Farm	Non-Farm	Farm
1976	0.9362	0.0638	0.8917	0.1083
1977	0.9402	0.0598	0.8930	0.1070
1978	0.9444	0.0556	0.8969	0.1031
1979	0.9461	0.0539	0.8985	0.1015
1980	0.9461	0.0539	0.8958	0.1042
1981	0.9451	0.0549	0.8898	0.1102
1982	0.9457	0.0543	0.8872	0.1128
1983	0.9471	0.0529	0.8876	0.1124
1984	0.9472	0.0528	0.8884	0.1116
1985	0.9493	0.0507	0.8918	0.1082
1986	0.9517	0.0483	0.8772	0.1228
1987	0.9536	0.0464	0.8780	0.1220
1988	0.9564	0.0436	0.8821	0.1179
1989	0.9580	0.0420	0.8850	0.1150

Source: [67]

Table A.6 Past Non-Farm Truck Registrations

Year	Registered Gross Vehicle Weight						
	7000 lbs	9000 lbs	11000 lbs	16000 lbs	20000 lbs	26000 lbs	30000 lbs
1976	565944	23417	25899	15804	10971	19319	4250
1977	608964	28270	26048	15956	10677	19451	4609
1978	667043	32743	26449	16842	10658	20251	5018
1979	692078	35079	26357	17521	10491	20419	5452
1980	693238	34827	25902	17589	9798	19803	5681
1981	692046	33625	25212	15593	9442	18744	5768
1982	693445	33040	24347	14332	8945	17780	5849
1983	689262	32254	23602	13596	8490	16924	6004
1984	696251	32258	23849	14215	8142	16815	6268
1985	723346	32418	24153	14424	8238	16720	6647
1986	746247	30482	23441	14006	8162	15671	6933
1987	765111	29252	22747	14213	8177	15194	5885
1988	801247	28252	22469	14378	8354	15051	6030
1989	843967	27977	22787	14498	8486	15513	5741
	36000 lbs	42000 lbs	48000 lbs	54000 lbs	60000 lbs	66000 lbs	66000+ lbs
1976	1492	2139	3170	998	305	690	1793
1977	1471	2124	3233	1050	302	641	1959
1978	1642	2116	3511	1155	335	668	2392
1979	1690	2092	3674	1199	360	643	2723
1980	1660	1933	3441	1172	355	606	2725
1981	1678	1852	3202	1090	370	626	2544
1982	1735	1747	2932	1059	346	603	2318
1983	1785	1672	2795	1098	374	633	2353
1984	1938	1688	2872	1132	340	648	2568
1985	2047	1612	2924	1182	350	628	2902
1986	2216	1528	2864	1293	315	581	2944
1987	1875	1181	2328	1133	265	538	2794
1988	1879	1140	2240	1201	303	523	2906
1989	1991	1172	2201	1288	311	543	3197

Source: [67]

Table A.7 Past Non-Farm Truck Registration Revenues

Year	Registered Gross Vehicle Weight						
	7000 lbs	9000 lbs	11000 lbs	16000 lbs	20000 lbs	26000 lbs	30000 lbs
1976	8392950	529224	997112	984589	1061993	2248732	722500
1977	9000488	633248	1000243	997250	1032466	2264096	778921
1978	9838889	741302	1014055	1045888	1028497	2356001	843024
1979	10298121	799801	1012109	1095063	1015529	2381876	921388
1980	10350043	797538	989456	1099313	959224	2315961	965770
1981	13003544	968400	1220261	1510962	1151924	2747870	1240120
1982	12599896	931728	1158917	1378738	1081003	2590013	1252271
1983	12516998	908918	1123455	1303856	1025592	2464134	1286057
1984	12671768	912579	1142367	1364640	980297	2448264	1344486
1985	13157664	913863	1152098	1381819	991031	2424400	1418470
1986	13551846	1156792	1572891	1813777	1375297	3582391	1984918
1987	14391738	1130590	1559307	1831345	1380686	3470158	1683110
1988	15135556	1097308	1546317	1852893	1411325	3434036	1736459
1989	16026933	1086627	1568201	1870967	1429806	3541153	1647897
Year	Registered Gross Vehicle Weight						
	36000 lbs	42000 lbs	48000 lbs	54000 lbs	60000 lbs	66000 lbs	66000+ lbs
1976	323764	564696	995380	363771	117456	283521	784079
1977	319207	562860	1015162	382515	116059	263195	853340
1978	356314	559470	1102454	419034	127635	275483	1044347
1979	366730	556472	1157310	437755	140616	266974	1192674
1980	365200	514178	1090797	428249	136817	249793	1206630
1981	458094	618568	1264790	500419	180523	326396	1408613
1982	470879	584896	1153742	485446	167845	311510	1282086
1983	481236	559618	1104025	500468	177052	327894	1280032
1984	527717	564130	1128983	510306	165852	337154	1412143
1985	554737	537441	1153226	534619	169855	324425	1595810
1986	801749	679960	1519352	794807	206483	404376	2201818
1987	679500	525061	1229463	696852	172820	369014	2072030
1988	689593	512863	1204560	751250	199035	381984	2243723
1989	795763	571643	1337570	905516	245056	451939	2962340

Source: [67]

Table A.8 Past Non-Farm Truck Average Registration Fee

Year	Registered Gross Vehicle Weight						
	7000 lbs	9000 lbs	11000 lbs	16000 lbs	20000 lbs	26000 lbs	30000 lbs
1976	14.83	22.60	38.50	62.30	96.80	116.40	170.00
1977	14.78	22.40	38.40	62.50	96.70	116.40	169.00
1978	14.75	22.64	38.34	62.10	96.50	116.34	168.00
1979	14.88	22.80	38.40	62.50	96.80	116.65	169.00
1980	14.93	22.90	38.20	62.50	97.90	116.95	170.00
1981	18.79	28.80	48.40	96.90	122.00	146.60	215.00
1982	18.17	28.20	47.60	96.20	120.85	145.67	214.10
1983	18.16	28.18	47.60	95.90	120.80	145.60	214.20
1984	18.20	28.29	47.90	96.00	120.40	145.60	214.50
1985	18.19	28.19	47.70	95.80	120.30	145.00	213.40
1986	18.16	37.95	67.10	129.50	168.50	228.60	286.30
1987	18.81	38.65	68.55	128.85	168.85	228.39	286.00
1988	18.89	38.84	68.82	128.87	168.94	228.16	287.97
1989	18.99	38.84	68.82	129.05	168.49	228.27	287.04
Year	36000 lbs	42000 lbs	48000 lbs	54000 lbs	60000 lbs	66000 lbs	66000+ lbs
1976	217.00	264.00	314.00	364.50	385.10	410.90	437.30
1977	217.00	265.00	314.00	364.30	384.30	410.60	435.60
1978	217.00	264.40	314.00	362.80	381.00	412.40	436.60
1979	217.00	266.00	315.00	365.10	390.60	415.20	438.00
1980	220.00	266.00	317.00	365.40	385.40	412.20	442.80
1981	273.00	334.00	395.00	459.10	487.90	521.40	553.70
1982	271.40	334.80	393.50	458.40	485.10	516.60	553.10
1983	269.60	334.70	395.00	455.80	473.40	518.00	544.00
1984	272.30	334.20	393.10	450.80	487.80	520.30	549.90
1985	271.00	333.40	394.40	452.30	485.30	516.60	549.90
1986	361.80	445.00	530.50	614.70	655.50	696.00	747.90
1987	362.40	444.59	528.12	615.05	652.15	685.90	741.60
1988	367.00	449.88	537.75	625.52	656.88	730.37	772.10
1989	399.68	487.75	607.71	703.04	787.96	832.30	926.60

Table A.9 Proportional Distribution of Non-Farm Truck Registrations in Past

Year	Registered Gross Vehicle Weight						
	7000 lbs	9000 lbs	11000 lbs	16000 lbs	20000 lbs	26000 lbs	30000 lbs
1976	0.8370	0.0346	0.0383	0.0234	0.0162	0.0286	0.0063
1977	0.8402	0.0390	0.0359	0.0220	0.0147	0.0268	0.0064
1978	0.8435	0.0414	0.0334	0.0213	0.0135	0.0256	0.0063
1979	0.8442	0.0428	0.0322	0.0214	0.0128	0.0249	0.0067
1980	0.8467	0.0425	0.0316	0.0215	0.0120	0.0242	0.0069
1981	0.8525	0.0414	0.0311	0.0192	0.0116	0.0231	0.0071
1982	0.8577	0.0409	0.0301	0.0177	0.0111	0.0220	0.0072
1983	0.8607	0.0403	0.0295	0.0170	0.0106	0.0211	0.0075
1984	0.8606	0.0399	0.0295	0.0176	0.0101	0.0208	0.0077
1985	0.8636	0.0387	0.0288	0.0172	0.0098	0.0200	0.0079
1986	0.8711	0.0356	0.0274	0.0163	0.0095	0.0183	0.0081
1987	0.8787	0.0336	0.0261	0.0163	0.0094	0.0175	0.0068
1988	0.8844	0.0312	0.0248	0.0159	0.0092	0.0166	0.0067
1989	0.8887	0.0295	0.0240	0.0153	0.0089	0.0163	0.0060
Year	36000 lbs	42000 lbs	48000 lbs	54000 lbs	60000 lbs	66000 lbs	66000+ lbs
1976	0.0022	0.0032	0.0047	0.0015	0.0005	0.0010	0.0027
1977	0.0020	0.0029	0.0045	0.0014	0.0004	0.0009	0.0027
1978	0.0021	0.0027	0.0044	0.0015	0.0004	0.0008	0.0030
1979	0.0021	0.0026	0.0045	0.0015	0.0004	0.0008	0.0033
1980	0.0020	0.0024	0.0042	0.0014	0.0004	0.0007	0.0033
1981	0.0021	0.0023	0.0039	0.0013	0.0005	0.0008	0.0031
1982	0.0021	0.0022	0.0036	0.0013	0.0004	0.0007	0.0029
1983	0.0022	0.0021	0.0035	0.0014	0.0005	0.0008	0.0029
1984	0.0024	0.0021	0.0036	0.0014	0.0004	0.0008	0.0032
1985	0.0024	0.0019	0.0035	0.0014	0.0004	0.0007	0.0035
1986	0.0026	0.0018	0.0033	0.0015	0.0004	0.0007	0.0034
1987	0.0022	0.0014	0.0027	0.0013	0.0003	0.0006	0.0032
1988	0.0021	0.0013	0.0025	0.0013	0.0003	0.0006	0.0032
1989	0.0021	0.0012	0.0023	0.0014	0.0003	0.0006	0.0034

Table A.10 Proportional Distribution of Non-Farm Truck
Registration Revenues in Past

Year	Registered Gross Vehicle Weight						
	7000 lbs	9000 lbs	11000 lbs	16000 lbs	20000 lbs	26000 lbs	30000 lbs
1976	0.4569	0.0288	0.0543	0.0536	0.0578	0.1224	0.0393
1977	0.4683	0.0329	0.0520	0.0519	0.0537	0.1178	0.0405
1978	0.4741	0.0357	0.0489	0.0504	0.0496	0.1135	0.0406
1979	0.4758	0.0370	0.0468	0.0506	0.0469	0.1101	0.0426
1980	0.4821	0.0371	0.0461	0.0512	0.0447	0.1079	0.0450
1981	0.4888	0.0364	0.0459	0.0568	0.0433	0.1033	0.0466
1982	0.4951	0.0366	0.0455	0.0542	0.0425	0.1018	0.0492
1983	0.4995	0.0363	0.0448	0.0520	0.0409	0.0983	0.0513
1984	0.4967	0.0358	0.0448	0.0535	0.0384	0.0960	0.0527
1985	0.5001	0.0347	0.0438	0.0525	0.0377	0.0921	0.0539
1986	0.4282	0.0366	0.0497	0.0573	0.0435	0.1132	0.0627
1987	0.4614	0.0362	0.0500	0.0587	0.0443	0.1113	0.0540
1988	0.4701	0.0341	0.0480	0.0575	0.0438	0.1067	0.0539
1989	0.4653	0.0316	0.0455	0.0543	0.0415	0.1028	0.0478
	36000 lbs	42000 lbs	48000 lbs	54000 lbs	60000 lbs	66000 lbs	66000+ lbs
1976	0.0176	0.0307	0.0542	0.0198	0.0064	0.0154	0.0427
1977	0.0166	0.0293	0.0528	0.0199	0.0060	0.0137	0.0444
1978	0.0172	0.0270	0.0531	0.0202	0.0062	0.0133	0.0503
1979	0.0169	0.0257	0.0535	0.0202	0.0065	0.0123	0.0551
1980	0.0170	0.0239	0.0508	0.0199	0.0064	0.0116	0.0562
1981	0.0172	0.0233	0.0475	0.0188	0.0068	0.0123	0.0530
1982	0.0185	0.0230	0.0453	0.0191	0.0066	0.0122	0.0504
1983	0.0192	0.0223	0.0441	0.0200	0.0071	0.0131	0.0511
1984	0.0207	0.0221	0.0443	0.0200	0.0065	0.0132	0.0554
1985	0.0211	0.0204	0.0438	0.0203	0.0065	0.0123	0.0607
1986	0.0253	0.0215	0.0480	0.0251	0.0065	0.0128	0.0696
1987	0.0218	0.0168	0.0394	0.0223	0.0055	0.0118	0.0664
1988	0.0214	0.0159	0.0374	0.0233	0.0062	0.0119	0.0697
1989	0.0231	0.0166	0.0388	0.0263	0.0071	0.0131	0.0860

Table A.11 Past Farm Truck Registrations

Year	Registered Gross Vehicle Weight					
	11000 lbs	16000 lbs	20000 lbs	26000 lbs	30000 lbs	36000 lbs
1976	10109	8677	6170	15340	2547	779
1977	10102	8728	5664	15021	2954	779
1978	9650	8898	5436	15315	3284	835
1979	9360	9093	5052	15326	3504	853
1980	8988	9366	4711	15046	3797	904
1981	9269	9188	4637	15045	3890	960
1982	9312	8745	4423	14737	3970	936
1983	9092	8299	4087	13946	4106	928
1984	9175	8144	4098	13981	4218	978
1985	9168	7950	3968	13740	4269	1002
1986	8919	7661	3870	13112	4309	981
1987	8493	7588	3708	12624	4278	971
1988	8466	7486	3505	12020	4204	964
1989	8436	7754	3510	11955	4260	980
	42000 lbs	48000 lbs	54000 lbs	60000 lbs	66000 lbs	66000+ lbs
1976	1346	872	91	59	52	21
1977	1387	1139	126	66	68	26
1978	1502	1334	145	68	71	34
1979	1562	1553	183	75	84	39
1980	1581	1798	215	91	101	53
1981	1608	1997	252	107	116	59
1982	1621	2102	291	120	135	48
1983	1473	2156	311	127	136	61
1984	1502	2294	351	147	147	76
1985	1512	2366	379	146	153	86
1986	1460	2427	414	134	147	80
1987	1420	2460	430	126	164	80
1988	1334	2455	468	135	154	77
1989	1352	2537	495	140	162	82

Source: [67]

Table A.12 Past Farm Truck Registration Revenues

Year	Registered Gross Vehicle Weight					
	11000 lbs	16000 lbs	20000 lbs	26000 lbs	30000 lbs	36000 lbs
1976	192273	264128	283450	864562	209593	79372
1977	192443	267862	260034	851390	246895	80214
1978	183350	271745	249893	866982	274378	86339
1979	178308	278519	231432	865919	297490	88610
1980	171491	288379	215905	850099	317050	93410
1981	222085	438176	267230	1062779	411562	123648
1982	216504	411627	249900	1025695	415262	119621
1983	212025	391381	233613	981798	432362	119990
1984	213044	383012	233053	975874	439516	124108
1985	211872	372855	223994	956304	443122	127054
1986	296468	486474	307278	1423963	600244	166280
1987	287318	475919	290559	1360741	593145	165750
1988	286489	474987	279349	1311622	588644	169037
1989	285559	487261	277641	1294487	592566	182300
Year	42000 lbs	48000 lbs	54000 lbs	60000 lbs	66000 lbs	66000+ lbs
1976	169206	129405	15197	11092	9880	4032
1977	176676	173139	21420	12540	13804	5382
1978	189823	203021	25709	12852	14342	7174
1979	197140	237454	31879	13500	17388	7761
1980	200629	273476	37496	17472	20604	11236
1981	258888	382625	55188	25680	29464	17051
1982	254173	399800	65795	28728	33750	13200
1983	234060	415892	69788	30594	34680	16714
1984	232209	435631	77360	34457	36603	20368
1985	232092	447174	82546	34326	38403	22498
1986	296380	611604	121757	41687	49539	28016
1987	289538	623118	126635	37989	56285	28592
1988	281087	641418	144284	43646	54793	29262
1989	303118	733675	166766	51674	65221	36468

Source: [67]

Table A.13 Past Farm Truck Average Registration Fee

Year	Registered Gross Vehicle Weight					
	11000 lbs	16000 lbs	20000 lbs	26000 lbs	30000 lbs	36000 lbs
1976	19.02	30.44	45.94	56.36	82.29	101.89
1977	19.05	30.69	45.91	56.68	83.58	102.97
1978	19.00	30.54	45.97	56.61	83.55	103.40
1979	19.05	30.63	45.81	56.50	84.90	103.88
1980	19.08	30.79	45.83	56.50	83.50	103.33
1981	23.96	47.69	57.63	70.64	105.80	128.80
1982	23.25	47.07	56.50	69.60	104.60	127.80
1983	23.32	47.16	57.16	70.40	105.30	129.30
1984	23.22	47.03	56.87	69.80	104.20	126.90
1985	23.11	46.90	56.45	69.60	103.80	126.80
1986	33.24	63.50	79.40	108.60	139.30	169.50
1987	33.83	62.72	78.36	107.79	138.65	170.70
1988	33.84	63.45	79.70	109.12	140.02	175.35
1989	33.85	62.84	79.10	108.28	139.10	186.02
	42000 lbs	48000 lbs	54000 lbs	60000 lbs	66000 lbs	66000+ lbs
1976	125.71	148.40	167.00	188.00	190.00	192.00
1977	127.38	152.01	170.00	190.00	203.00	207.00
1978	126.38	152.19	177.30	189.00	202.00	211.00
1979	126.21	152.90	174.20	180.00	207.00	199.00
1980	126.90	152.10	174.40	192.00	204.00	212.00
1981	161.00	191.60	219.00	240.00	254.00	289.00
1982	156.80	190.20	226.10	239.40	250.00	275.00
1983	158.90	192.90	224.40	240.90	255.00	274.00
1984	154.60	189.90	220.40	234.40	249.00	268.00
1985	153.50	189.00	217.80	235.11	251.00	261.60
1986	203.00	252.00	294.10	311.10	337.00	350.20
1987	203.90	253.30	294.50	301.50	343.20	357.40
1988	210.71	261.27	308.30	323.30	355.80	380.02
1989	224.20	289.19	336.90	369.10	402.60	444.73

Table A.16 Past Non-Farm Tractor Registrations

Year	Registered Gross Vehicle Weight						
	20000 lbs	26000 lbs	30000 lbs	36000 lbs	42000 lbs	48000 lbs	54000 lbs
1976	545	288	477	788	1476	1151	2146
1977	600	272	451	746	1491	1080	2074
1978	513	235	400	734	1451	1084	2270
1979	478	224	385	648	1400	1098	2424
1980	386	192	300	579	1207	1036	1926
1981	362	191	303	577	1004	952	1796
1982	337	184	293	479	976	919	1591
1983	305	163	297	445	990	874	1503
1984	310	183	301	461	1006	841	1642
1985	339	178	271	450	953	943	1722
1986	321	187	274	494	905	914	2081
1987	278	172	185	270	478	476	961
1988	283	155	175	267	478	492	940
1989	284	149	146	272	442	511	952
Year	60000 lbs	66000 lbs	72000 lbs	74000 lbs	76000 lbs	78000 lbs	78000+ lbs
1976	5201	830	3854	24320*			
1977	5406	914	3026	25581*			
1978	5994	1031	2805	28192*			
1979	6290	1106	2699	30781*			
1980	6063	1145	2124	30821*			
1981	5196	1237	1649	31850*			
1982	4173	1305	2183	6164	1826	1313	20861
1983	3741	1530	1966	5024	2292	1479	21785
1984	3435	1791	2278	4419	2076	1624	25417
1985	2966	2001	2018	3767	1955	1684	27479
1986	2286	2224	1898	2783	1699	1501	26020
1987	561	257	621	772	374	285	2604
1988	513	216	568	630	306	243	2320
1989	503	217	483	589	299	189	786
Year	74000+ lbs	Total Non-Farm Tractors					
1976	24320	41076					
1977	25581	41641					
1978	28192	44709					
1979	30781	47533					
1980	30821	45779					
1981	31850	45117					
1982	30164	42604					
1983	30580	42394					
1984	33580	45784					
1985	34885	46726					
1986	32003	43587					
1987	4035	8294					
1988	3499	7586					
1989	1863	5822					

Source: [67]

* also includes non-farm tractors greater than 74000 lbs in gross vehicle weight

Table A.17 Past Non-Farm Tractor Registration Revenues

Year	Registered Gross Vehicle Weight						
	20000 lbs	26000 lbs	30000 lbs	36000 lbs	42000 lbs	48000 lbs	54000 lbs
1976	42238	45158	96674	199285	408793	372924	754319
1977	44640	42677	91228	185657	415631	350870	725900
1978	40835	36096	80860	185922	402362	349698	790641
1979	37619	34944	78244	163750	389900	353545	849467
1980	30687	29933	60855	146892	337115	340326	676739
1981	37286	37474	77738	181351	352434	387940	790958
1982	34543	36542	73610	150430	342478	377341	704018
1983	31232	31850	75328	137639	345411	356242	658464
1984	31651	35923	76117	145584	349384	342623	714763
1985	35358	35920	68465	141525	328309	383895	747004
1986	48920	52304	97007	213877	438563	509829	1243835
1987	41911	48033	63984	117582	229115	264228	565577
1988	43061	44208	63345	118078	230018	279426	573955
1989	45145	43846	54235	130361	237372	325435	665629
	60000 lbs	66000 lbs	72000 lbs	74000 lbs	76000 lbs	78000 lbs	78000+ lbs
1976	1933056	326522	1735225	10901440*			
1977	2006004	359933	1350655	11476404*			
1978	2219578	408895	1263372	12623250*			
1979	2306040	438308	1213740	13948410*			
1980	2288661	451245	960048	13931708*			
1981	2474491	612934	934653	18067868*			
1982	1982676	657720	1200432	3499919	1119155	886800	15203080
1983	1761300	760410	1078548	2860666	1404538	991522	15636837
1984	1627056	896575	1257684	2529436	1296670	1091490	18500780
1985	1402028	1000900	1122008	2180716	1223635	1133837	19990973
1986	1482014	1564362	1428435	2265640	1466747	1380170	26008031
1987	364089	175017	457131	609749	315484	249871	2521297
1988	337472	154583	439445	516997	268674	231098	2383104
1989	392999	177936	452315	583622	323512	217785	1006080
	74000+ lbs	Total Non-Farm Tractor					
1976	11901440	16815633					
1977	11476404	17049600					
1978	12623249	18401509					
1979	13948410	19813965					
1980	13931708	19254209					
1981	18067868	23955127					
1982	20708954	26268744					
1983	20893562	26129986					
1984	23418375	28895735					
1985	24529160	29794573					
1986	31120587	38199733					
1987	3696400	6023067					
1988	3399872	5683463					
1989	2130999	4656272					

Source: [67]

* also includes revenues from the registration of non-farm tractors greater than 74000 lbs in gross vehicle weight

Table A.18 Past Non-Farm Tractor Average Registration Fees

Year	Registered Gross Vehicle Weight						
	20000 lbs	26000 lbs	30000 lbs	36000 lbs	42000 lbs	48000 lbs	54000 lbs
1976	77.50	156.80	202.67	252.90	276.96	324.00	351.50
1977	74.40	156.90	202.28	248.87	278.76	324.88	350.00
1978	79.60	153.60	202.15	253.30	277.30	322.60	348.30
1979	78.70	156.00	203.23	252.70	278.50	321.99	350.44
1980	79.50	155.90	202.85	253.70	279.30	328.50	351.37
1981	103.00	196.20	256.56	314.30	351.03	407.50	440.40
1982	102.50	198.60	251.23	314.05	350.90	410.60	442.50
1983	102.40	195.40	253.63	309.30	348.90	407.60	438.10
1984	102.10	196.30	252.88	315.80	347.30	407.40	435.30
1985	104.30	201.80	252.64	314.50	344.50	407.10	433.80
1986	152.40	279.70	354.04	432.95	484.60	557.80	597.71
1987	150.76	279.26	345.86	435.49	479.32	555.10	588.53
1988	152.16	285.21	361.97	442.24	481.21	567.94	610.59
1989	158.96	294.27	371.47	479.27	537.04	636.86	699.19
	60000 lbs	66000 lbs	72000 lbs	74000 lbs	76000 lbs	78000 lbs	78000+ lbs
1976	371.67	393.40	450.24	448.25	a)	a)	a)
1977	371.07	393.80	446.35	448.63	a)	a)	a)
1978	370.30	396.60	450.40	447.76	a)	a)	a)
1979	366.62	396.30	449.70	453.15	a)	a)	a)
1980	377.48	394.10	452.00	452.02	a)	a)	a)
1981	476.23	495.50	566.80	567.28	a)	a)	a)
1982	475.12	504.00	549.90	567.80	612.90	675.40	728.78
1983	470.81	497.00	548.60	569.40	612.80	670.40	717.78
1984	473.67	500.60	552.10	572.40	624.60	672.10	727.89
1985	472.70	500.20	556.00	578.90	625.90	673.30	727.50
1986	648.30	703.40	752.60	814.10	863.30	919.50	999.54
1987	649.00	681.00	736.12	789.83	843.54	876.74	968.24
1988	657.84	715.66	773.67	820.63	878.02	951.02	1027.20
1989	781.31	819.98	936.47	990.87	1081.98	1152.30	1280.00

a) Non-farm tractors above 74000 lbs in gross vehicle weight were registered at the same fee as shown for 74000 lbs

Table A.19 Proportional Distribution of Non-Farm Tractor Registrations in Past

Year	Registered Gross Vehicle Weight							
	20000 lbs	26000 lbs	30000 lbs	36000 lbs	42000 lbs	48000 lbs	54000 lbs	
1976	0.0133	0.0070	0.0116	0.0192	0.0359	0.0280	0.0522	
1977	0.0144	0.0065	0.0108	0.0179	0.0358	0.0259	0.0498	
1978	0.0115	0.0053	0.0089	0.0164	0.0325	0.0242	0.0508	
1979	0.0101	0.0047	0.0081	0.0136	0.0295	0.0231	0.0510	
1980	0.0084	0.0042	0.0066	0.0126	0.0264	0.0226	0.0421	
1981	0.0080	0.0042	0.0067	0.0128	0.0223	0.0211	0.0398	
1982	0.0079	0.0043	0.0069	0.0112	0.0229	0.0216	0.0373	
1983	0.0072	0.0038	0.0070	0.0105	0.0234	0.0206	0.0355	
1984	0.0068	0.0040	0.0066	0.0101	0.0220	0.0184	0.0359	
1985	0.0073	0.0038	0.0058	0.0096	0.0204	0.0202	0.0369	
1986	0.0074	0.0043	0.0063	0.0113	0.0208	0.0210	0.0477	
1987	0.0335	0.0207	0.0223	0.0326	0.0576	0.0574	0.1159	
1988	0.0373	0.0204	0.0231	0.0352	0.0630	0.0649	0.1239	
1989	0.0488	0.0256	0.0251	0.0467	0.0759	0.0878	0.1635	
	60000 lbs	66000 lbs	72000 lbs	74000 lbs	76000 lbs	78000 lbs	78000+ lbs	74000+ lbs
1976	0.1266	0.0202	0.0938	0.5921*	0.0000	0.0000	0.0000	0.5921
1977	0.1298	0.0219	0.0727	0.6143*	0.0000	0.0000	0.0000	0.6143
1978	0.1341	0.0231	0.0627	0.6306*	0.0000	0.0000	0.0000	0.6306
1979	0.1323	0.0233	0.0568	0.6476*	0.0000	0.0000	0.0000	0.6476
1980	0.1324	0.0250	0.0464	0.6733*	0.0000	0.0000	0.0000	0.6733
1981	0.1152	0.0274	0.0365	0.7059*	0.0000	0.0000	0.0000	0.7059
1982	0.0979	0.0306	0.0512	0.1447	0.0429	0.0308	0.4896	0.7081
1983	0.0882	0.0361	0.0464	0.1185	0.0541	0.0349	0.5139	0.7213
1984	0.0750	0.0391	0.0498	0.0965	0.0453	0.0355	0.5552	0.7321
1985	0.0635	0.0428	0.0432	0.0806	0.0418	0.0360	0.5881	0.7472
1986	0.0524	0.0510	0.0435	0.0638	0.0390	0.0344	0.5970	0.7343
1987	0.0676	0.0310	0.0749	0.0931	0.0451	0.0344	0.3140	0.4861
1988	0.0676	0.0285	0.0749	0.0830	0.0403	0.0320	0.3058	0.4607
1989	0.0864	0.0373	0.0830	0.1012	0.0514	0.0325	0.1350	0.3202

* also includes non-farm tractors greater than 74000lbs in gross vehicle weight

Table A.20 Proportional Distribution of Non-Farm Tractor
Registration Revenues in Past

Year	Registered Gross Vehicle Weight				
	20000 lbs	26000 lbs	30000 lbs	36000 lbs	42000 lbs
1976	0.0025	0.0027	0.0057	0.0119	0.0243
1977	0.0026	0.0025	0.0054	0.0109	0.0244
1978	0.0022	0.0020	0.0044	0.0101	0.0219
1979	0.0019	0.0018	0.0039	0.0083	0.0197
1980	0.0016	0.0016	0.0032	0.0076	0.0175
1981	0.0016	0.0016	0.0032	0.0076	0.0147
1982	0.0013	0.0014	0.0028	0.0057	0.0130
1983	0.0012	0.0012	0.0029	0.0053	0.0132
1984	0.0011	0.0012	0.0026	0.0050	0.0121
1985	0.0012	0.0012	0.0023	0.0048	0.0110
1986	0.0013	0.0014	0.0025	0.0056	0.0115
1987	0.0070	0.0080	0.0106	0.0195	0.0380
1988	0.0076	0.0078	0.0111	0.0208	0.0405
1989	0.0097	0.0094	0.0116	0.0280	0.0510
	48000 lbs	54000 lbs	60000 lbs	66000 lbs	72000 lbs
1976	0.0222	0.0449	0.1150	0.0194	0.1032
1977	0.0206	0.0426	0.1177	0.0211	0.0792
1978	0.0190	0.0430	0.1206	0.0222	0.0687
1979	0.0178	0.0429	0.1164	0.0221	0.0613
1980	0.0177	0.0351	0.1189	0.0234	0.0499
1981	0.0162	0.0330	0.1033	0.0256	0.0390
1982	0.0144	0.0268	0.0755	0.0250	0.0457
1983	0.0136	0.0252	0.0674	0.0291	0.0413
1984	0.0119	0.0247	0.0563	0.0310	0.0435
1985	0.0129	0.0251	0.0471	0.0336	0.0377
1986	0.0133	0.0326	0.0388	0.0410	0.0374
1987	0.0439	0.0939	0.0604	0.0291	0.0759
1988	0.0492	0.1010	0.0594	0.0272	0.0773
1989	0.0699	0.1430	0.0844	0.0382	0.0971
	74000 lbs	76000 lbs	78000 lbs	78000+ lbs	74000+ lbs
1976	0.6483*	0.0000	0.0000	0.0000	0.6483
1977	0.6731*	0.0000	0.0000	0.0000	0.6731
1978	0.6860*	0.0000	0.0000	0.0000	0.6860
1979	0.7040*	0.0000	0.0000	0.0000	0.7040
1980	0.7236*	0.0000	0.0000	0.0000	0.7236
1981	0.7542*	0.0000	0.0000	0.0000	0.7542
1982	0.1332	0.0426	0.0338	0.5788	0.7883
1983	0.1095	0.0538	0.0379	0.5984	0.7996
1984	0.0875	0.0449	0.0378	0.6403	0.8104
1985	0.0732	0.0411	0.0381	0.6710	0.8233
1986	0.0593	0.0384	0.0361	0.6808	0.8147
1987	0.1012	0.0524	0.0415	0.4186	0.6137
1988	0.0910	0.0473	0.0407	0.4193	0.5982
1989	0.1253	0.0695	0.0468	0.2161	0.4577

* also includes non-farm tractors greater than 74000 lbs in gross vehicle weight

Table A.21 Past Farm Tractor Registrations

	Registered Gross Vehicle Weight							
Year	20000 lbs	26000 lbs	30000 lbs	36000 lbs	42000 lbs	48000 lbs	54000 lbs	
1981	12	0	3	4	10	8	14	
1982	15	4	5	4	15	8	15	
1983	17	5	7	5	17	16	16	
1984	18	8	10	8	23	15	21	
1985	21	12	8	11	19	17	28	
1986	19	14	8	12	21	26	44	
1987	25	16	8	12	22	26	52	
1988	29	11	11	12	20	26	49	
1989	43	12	11	12	22	31	62	
	60000 lbs	66000 lbs	72000 lbs	74000 lbs	76000 lbs	78000 lbs	78000+ lbs	74000+ lbs
1981	19	15	13	267*				267
1982	27	22	64	129	58	34	192	413
1983	33	21	81	163	77	36	220	496
1984	38	17	102	206	111	56	273	646
1985	42	30	103	196	141	90	344	771
1986	46	35	129	197	174	118	469	958
1987	38	33	142	213	187	155	612	1167
1988	35	33	145	206	173	152	641	1172
1989	34	38	163	231	196	189	786	1402

Source: [67]

* also includes farm tractors greater than 74000 lbs in gross vehicle weight

Table A.22 Past Farm Tractor Registration Revenues

Year	Registered Gross Vehicle Weight						
	20000 lbs	26000 lbs	30000 lbs	36000 lbs	42000 lbs	48000 lbs	54000 lbs
1981	596	0	460	565	1795	1465	2803
1982	752	363	657	484	2414	1461	2684
1983	778	467	919	725	2681	2608	2795
1984	859	778	1181	1048	3664	2818	4026
1985	993	1037	918	1775	3038	2922	5368
1986	1378	1828	1471	2461	4803	6152	12504
1987	1891	2046	1286	2685	4677	6295	14974
1988	2298	1555	1964	2708	4878	7060	14509
1989	3054	1691	2034	2337	5151	9203	18697
	60000 lbs	66000 lbs	72000 lbs	74000 lbs	76000 lbs	78000 lbs	78000+ lbs
1981	4231	3595	3153	69586*			
1982	5789	4997	16602	34959	15860	10285	65894
1983	7479	4611	20031	45037	21850	11333	76692
1984	8443	3586	25327	52866	31235	17786	89926
1985	9167	6275	26481	52871	40791	26145	114359
1986	12250	10760	43925	73481	67599	47129	204648
1987	11758	10581	47608	78706	71154	63325	272450
1988	10473	10838	54962	83123	75710	68464	323032
1989	10761	14660	69277	107611	99084	103315	462797

Source: [67]

* also includes revenues from the registration of farm tractors greater than 74000 lbs in gross vehicle weight.

Table A.23 Past Farm Tractor Average Registration Fees

Year	Registered Gross Vehicle Weight						
	20000 lbs	26000 lbs	30000 lbs	36000 lbs	42000 lbs	48000 lbs	54000 lbs
1981	49.67		153.33	141.30	179.50	183.12	200.21
1982	50.15	90.69	131.45	121.00	160.90	182.59	178.91
1983	45.74	93.30	131.28	145.00	157.70	163.00	174.69
1984	47.74	97.22	118.10	131.00	159.30	187.88	191.71
1985	47.30	86.39	114.78	161.40	159.90	171.87	191.72
1986	72.50	130.60	183.84	205.10	228.70	236.63	284.18
1987	75.62	127.89	160.69	223.79	212.57	242.13	287.97
1988	79.24	141.32	178.59	225.65	243.90	271.52	296.10
1989	71.02	140.92	184.95	194.77	234.15	296.88	301.56
Year	60000 lbs	66000 lbs	72000 lbs	74000 lbs	76000 lbs	78000 lbs	78000+ lbs
1981	222.69	239.67	242.50	260.62	a)	a)	a)
1982	214.42	227.13	259.40	271.00	273.44	302.50	343.20
1983	226.63	219.59	247.30	276.30	283.76	314.80	348.60
1984	222.19	210.94	248.30	256.63	281.40	317.60	329.40
1985	218.25	209.17	257.10	269.75	289.30	290.50	332.44
1986	266.31	307.43	340.50	373.00	388.50	399.40	436.35
1987	309.42	320.64	335.27	369.51	380.50	408.55	445.18
1988	299.23	328.43	379.05	403.51	437.63	450.42	503.95
1989	316.51	385.78	425.01	465.85	505.53	546.64	588.80

a) Farm tractors above 74000 lbs in gross vehicle weight were registered at the same fee as shown for 74000 lbs

Table A.24 Proportional Distribution of Farm Tractor Registrations in Past

Year	Registered Gross Vehicle Weight							
	20000 lbs	26000 lbs	30000 lbs	36000 lbs	42000 lbs	48000 lbs	54000 lbs	
1981	0.0329	0.0000	0.0082	0.0110	0.0274	0.0219	0.0384	
1982	0.0253	0.0068	0.0084	0.0068	0.0253	0.0135	0.0253	
1983	0.0238	0.0070	0.0098	0.0070	0.0238	0.0224	0.0224	
1984	0.0199	0.0088	0.0110	0.0088	0.0254	0.0166	0.0232	
1985	0.0198	0.0113	0.0075	0.0104	0.0179	0.0160	0.0264	
1986	0.0145	0.0107	0.0061	0.0091	0.0160	0.0198	0.0335	
1987	0.0162	0.0104	0.0052	0.0078	0.0143	0.0169	0.0337	
1988	0.0188	0.0071	0.0071	0.0078	0.0130	0.0169	0.0318	
1989	0.0235	0.0066	0.0060	0.0066	0.0120	0.0169	0.0339	
	60000 lbs	66000 lbs	72000 lbs	74000 lbs	76000 lbs	78000 lbs	78000+ lbs	74000+ lbs
1981	0.0521	0.0411	0.0356	0.7315*	0.0000	0.0000	0.0000	0.7315
1982	0.0456	0.0372	0.1081	0.2179	0.0980	0.0574	0.3243	0.6976
1983	0.0462	0.0294	0.1134	0.2283	0.1078	0.0504	0.3081	0.6947
1984	0.0419	0.0188	0.1126	0.2274	0.1225	0.0618	0.3013	0.7130
1985	0.0395	0.0282	0.0970	0.1846	0.1328	0.0847	0.3239	0.7260
1986	0.0351	0.0267	0.0983	0.1502	0.1326	0.0899	0.3575	0.7302
1987	0.0247	0.0214	0.0921	0.1382	0.1213	0.1006	0.3971	0.7573
1988	0.0227	0.0214	0.0940	0.1335	0.1121	0.0985	0.4154	0.7596
1989	0.0186	0.0208	0.0891	0.1262	0.1071	0.1033	0.4295	0.7661

* also includes farm tractors greater than 74000 lbs in gross vehicle weight

Table A.25 Proportional Distribution of Farm Tractor
Registration Revenues in Past

Year	Registered Gross Vehicle Weight				
	20000 lbs	26000 lbs	30000 lbs	36000 lbs	42000 lbs
1981	0.0068	0.0000	0.0052	0.0064	0.0203
1982	0.0046	0.0022	0.0040	0.0030	0.0148
1983	0.0039	0.0024	0.0046	0.0037	0.0135
1984	0.0035	0.0032	0.0048	0.0043	0.0150
1985	0.0034	0.0035	0.0031	0.0061	0.0104
1986	0.0028	0.0037	0.0030	0.0050	0.0098
1987	0.0032	0.0035	0.0022	0.0046	0.0079
1988	0.0035	0.0023	0.0030	0.0041	0.0074
1989	0.0034	0.0019	0.0022	0.0026	0.0057
Year	48000 lbs	54000 lbs	60000 lbs	66000 lbs	72000 lbs
1981	0.0166	0.0318	0.0479	0.0407	0.0357
1982	0.0090	0.0164	0.0355	0.0306	0.1017
1983	0.0132	0.0141	0.0378	0.0233	0.1012
1984	0.0116	0.0165	0.0347	0.0147	0.1040
1985	0.0100	0.0184	0.0314	0.0215	0.0906
1986	0.0125	0.0255	0.0250	0.0219	0.0896
1987	0.0107	0.0254	0.0199	0.0180	0.0808
1988	0.0107	0.0219	0.0158	0.0164	0.0831
1989	0.0101	0.0206	0.0118	0.0161	0.0762
Year	74000 lbs	76000 lbs	78000 lbs	78000+ lbs	74000+ lbs
1981	0.7885	0.0000	0.0000	0.0000	0.7885
1982	0.2142	0.0972	0.0630	0.4038	0.7782
1983	0.2275	0.1103	0.0572	0.3873	0.7824
1984	0.2171	0.1283	0.0730	0.3692	0.7876
1985	0.1810	0.1396	0.0895	0.3915	0.8016
1986	0.1498	0.1378	0.0961	0.4173	0.8011
1987	0.1335	0.1207	0.1074	0.4622	0.8239
1988	0.1256	0.1144	0.1035	0.4883	0.8318
1989	0.1183	0.1089	0.1136	0.5088	0.8495

Table A.26 Past Bus Registrations, Fees, and Revenues

Year	School Bus	Church Bus	Registrations						Total Bus
			Bus A	Bus C	Bus D	Intra Bus	Comm. Bus*	Non-Comm. Bus*	
1976	3652	1971	232	222	57	5902	289	5845	6134
1977	3678	3224	140	591	3	7496	143	7493	7636
1978	3607	4307	270	840	8	8754	278	8754	9032
1979	3946	4236	298	977	33	9159	331	9159	9490
1980	3506	4074	345	1011	23	8591	368	8591	8959
1981	3554	4024	407	1193	27	8771	434	8771	9205
1982	3470	3947	464	1253	6	8670	470	8670	9140
1983	3823	3927	478	1151	21	8901	499	8901	9400
1984	3571	3816	491	1140	16	8527	507	8527	9034
1985	3553	3744	531	1168	18	8465	549	8465	9014
1986	3377	3592	464	1111	16	8080	480	8080	8560
1987	3802	3579	470	1172	17	8553	487	8553	9040
1988	3541	3511	536	1030	25	8082	561	8082	8643
1989	3664	3428	534	1084	28	8176	562	8176	8738

	Average Registration Fee				
	School Bus	Church Bus	Bus A	Bus C	Bus D
1976	15.12	15.36	122.75	28.28	20.22
1977	15.07	14.86	82.36	28.61	20.25
1978	15.11	15.04	85.12	28.20	14.06
1979	14.72	14.97	121.20	28.15	22.00
1980	15.12	15.10	116.58	28.49	22.41
1981	18.94	18.86	149.06	28.21	28.17
1982	18.46	18.36	151.75	27.88	22.00
1983	17.64	18.38	157.93	27.57	18.80
1984	18.11	18.38	159.07	27.74	19.09
1985	18.28	18.22	151.68	27.70	18.03
1986	18.30	18.29	168.39	27.36	16.30
1987	18.10	18.27	136.93	27.57	15.82
1988	18.34	18.29	139.77	27.81	23.97
1989	18.04	18.28	143.74	27.66	34.87

	Registration Revenues						
	School Bus	Church Bus	Bus A	Bus C	Bus D	Comm. Bus*	Non-Comm. Bus*
1976	55222	30279	28479	6279	1153	29632	91780
1977	55425	47900	11531	16910	61	11592	120235
1978	54501	64791	22982	23685	113	23095	142976
1979	58075	63426	36118	27502	726	36844	149003
1980	53007	61507	40220	28805	516	40736	143319
1981	67298	75893	60668	33656	761	61429	176846
1982	64054	72456	70414	34929	132	70546	171438
1983	67449	72172	75489	31736	395	75884	171357
1984	64671	70141	78103	31627	306	78408	166438
1985	64957	68228	80541	32348	325	80865	165533
1986	61793	65700	78134	30396	261	78394	157889
1987	68833	65392	64356	32308	269	64625	166532
1988	64949	64226	74915	28647	599	75514	157821
1989	66093	62669	76755	29981	976	77731	158743

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Table A.27 Proportional Distribution of Bus Registrations and Registration Revenues in Past

Year	Proportional Distributions Registrations				Registration Revenues	
	Intracity	Intercity	Comm.	Non-Comm.	Comm.	Non-Comm.
1976	0.9622	0.0378	0.0471	0.9529	0.2441	0.7559
1977	0.9817	0.0183	0.0187	0.9813	0.0879	0.9121
1978	0.9701	0.0299	0.0308	0.9692	0.1391	0.8609
1979	0.9686	0.0314	0.0349	0.9651	0.1982	0.8018
1980	0.9615	0.0385	0.0411	0.9589	0.2213	0.7787
1981	0.9558	0.0442	0.0471	0.9529	0.2578	0.7422
1982	0.9492	0.0508	0.0514	0.9486	0.2915	0.7085
1983	0.9491	0.0509	0.0531	0.9469	0.3069	0.6931
1984	0.9456	0.0544	0.0561	0.9439	0.3202	0.6798
1985	0.9411	0.0589	0.0609	0.9391	0.3282	0.6718
1986	0.9458	0.0542	0.0561	0.9439	0.3318	0.6682
1987	0.9480	0.0520	0.0539	0.9461	0.2796	0.7204
1988	0.9380	0.0620	0.0649	0.9351	0.3236	0.6764
1989	0.9389	0.0611	0.0643	0.9357	0.3287	0.6713

	Proportional Distribution of Intracity Bus Registrations			
	School Bus	Church Bus	Bus A	Bus C
1976	0.6188	0.3340	0.0097	0.0376
1977	0.4907	0.4301	0.0004	0.0788
1978	0.4117	0.4916	0.0009	0.0959
1979	0.4293	0.4608	0.0036	0.1063
1980	0.4070	0.4730	0.0027	0.1174
1981	0.4040	0.4574	0.0031	0.1356
1982	0.4000	0.4549	0.0007	0.1444
1983	0.4285	0.4401	0.0024	0.1290
1984	0.4180	0.4467	0.0019	0.1334
1985	0.4188	0.4414	0.0021	0.1377
1986	0.4171	0.4437	0.0020	0.1372
1987	0.4436	0.4176	0.0020	0.1368
1988	0.4368	0.4331	0.0031	0.1271
1989	0.4466	0.4178	0.0034	0.1321

Table A.28 Past Trailer and Semitrailer Registrations

Year	Semitrailer			Trailer			Total of Semitrailer and Trailer
	Non-Farm	Farm	Total	Non-Farm	Farm	Total	
1976	51136	0	51136	216657	0	216657	267793
1977	55590	0	55590	222326	0	222326	277916
1978	65203	0	65203	228655	1219	229874	295077
1979	61189	0	61189	233732	1966	235698	296887
1980	66282	0	66282	239888	2385	242273	308555
1981	59100	390	59490	251096	2841	253937	313427
1982	63808	563	64371	256056	3095	259151	323522
1983	56305	669	56974	255737	3369	259106	316080
1984	67051	869	67920	260711	3547	264258	332178
1985	60225	1018	61243	268788	3722	272510	333753
1986	66725	1232	67957	272400	3918	276318	344275
1987	46194	1507	47701	279284	4088	283372	331073
1988	47692	1602	49294	289297	4423	293720	343014
1989	37316	1768	39084	297630	4839	302469	341553

Proportional Distributions of Total Semitrailer and Trailer

	Trailers		Semitrailers	
	Non-Farm	Farm	Non-Farm	Farm
1976	0.8090	0.0000	0.1910	0.0000
1977	0.8000	0.0000	0.2000	0.0000
1978	0.7749	0.0041	0.2210	0.0000
1979	0.7873	0.0066	0.2061	0.0000
1980	0.7775	0.0077	0.2148	0.0000
1981	0.8011	0.0091	0.1886	0.0012
1982	0.7915	0.0096	0.1972	0.0017
1983	0.8091	0.0107	0.1781	0.0021
1984	0.7849	0.0107	0.2019	0.0026
1985	0.8054	0.0112	0.1804	0.0031
1986	0.7912	0.0114	0.1938	0.0036
1987	0.8436	0.0123	0.1395	0.0046
1988	0.8434	0.0129	0.1390	0.0047
1989	0.8714	0.0142	0.1093	0.0052

Table A.29 Past Trailer and SemiTrailer Registration Revenues

Non-Farm Trailer Registered Weight								
Year	3000 lbs	5000 lbs	7000 lbs	9000 lbs	12000 lbs	16000 lbs	22000 lbs	22000+ lbs
1976	186750	11595	9481		4691	2213	1158	769
1977	189795	12063	10715		5240	2463	1247	803
1978	194688	12206	11795		5366	2468	1293	839
1979	199183	11945	12187		5613	2518	1382	904
1980	212661	7521	10014		5184	2369	1315	824
1981	222017	7962	11071	0	5353	2505	1358	830
1982	226827	8080	10805	924	4966	2398	1270	786
1983	225739	8044	10783	1741	4922	2380	1332	796
1984	229630	8102	10869	2482	4939	2516	1330	843
1985	236518	8215	11041	3122	4949	2604	1366	973
1986	239073	8546	11225	3729	4816	2605	1403	1003
1987	244103	9086	11720	4442	4749	2654	1528	1002
1988	251422	9667	12509	5271	4882	2796	1670	1080
1989	257016	10436	13300	5985	4986	2919	1788	1200

Farm Trailer Registered Weight				
	12000 lbs	16000 lbs	22000 lbs	22000+ lbs
1978	632	346	178	63
1979	1078	523	270	95
1980	1338	607	331	109
1981	1634	694	373	140
1982	1817	744	386	148
1983	1978	829	397	165
1984	2115	872	400	160
1985	2250	900	395	177
1986	2400	949	396	173
1987	2543	998	387	160
1988	2755	1081	420	167
1989	2982	1211	456	190

Non-Farm Semitrailers		Farm Semitrailers	
1-year	2-year	1-year	2-year
1976	51136		
1977	53630	1960	
1978	52940	12263	
1979	55205	5984	
1980	54212	12070	
1981	53067	6033	382
1982	51776	12032	556
1983	51029	5276	662
1984	52546	14505	861
1985	55025	5200	1017
1986	52509	14216	1232
1987	43465	2729	1500
1988	44774	2918	1598
1989	37316	0	1768

Source: [67]

Table A.30 Past Average Registration Fees of Trailers and Semitrailers

Non-Farm Trailer Registered Weight								
Year	3000 lbs	5000 lbs	7000 lbs	9000 lbs	12000 lbs	16000 lbs	22000 lbs	22000+ lbs
1976	4.34	11.09	14.86		52.10	80.10	122.00	162.90
1977	4.34	11.09	14.88		52.30	80.65	124.02	161.90
1978	4.31	11.00	14.90		52.50	81.02	124.27	161.10
1979	4.32	11.21	15.06		52.90	81.90	125.40	164.50
1980	4.32	11.10	14.90		52.70	81.89	126.00	161.60
1981	4.19	11.10	15.01		53.30	82.43	127.10	164.30
1982	3.75	10.60	14.53	17.25	52.70	81.97	126.80	163.60
1983	3.74	10.59	14.49	17.56	52.60	81.69	126.20	162.90
1984	3.75	10.59	14.50	17.92	52.60	81.68	126.10	162.00
1985	3.75	10.58	14.46	17.95	52.60	81.75	125.30	160.50
1986	5.68	14.37	20.28	24.82	67.03	105.60	162.80	217.50
1987	5.58	14.25	20.10	24.65	66.86	105.14	163.40	222.46
1988	5.58	14.28	20.14	24.87	67.01	105.91	164.11	222.20
1989	5.59	14.24	20.09	24.65	66.78	105.87	164.04	221.61

Farm Trailer Registered Weight				
	12000 lbs	16000 lbs	22000 lbs	22000+ lbs
1978	24.02	37.58	54.82	75.05
1979	25.50	38.95	59.69	73.76
1980	25.59	39.58	60.08	75.53
1981	25.91	40.11	61.54	78.60
1982	25.64	39.62	60.20	78.66
1983	25.69	39.67	61.10	76.87
1984	25.74	40.23	61.13	77.20
1985	25.67	40.08	60.69	78.53
1986	32.92	52.06	79.52	105.19
1987	32.92	51.67	78.85	107.32
1988	32.91	51.70	79.44	106.56
1989	32.76	52.04	79.38	103.81

Non-Farm Semitrailers		Farm Semitrailers	
1-year	2-year	1-year	2-year
1976	23.54		
1977	23.54		
1978	23.47		
1979	23.55		
1980	23.75		
1981	28.55	12.85	29.38
1982	27.87	12.66	28.78
1983	27.73	12.45	28.89
1984	27.80	12.20	28.91
1985	27.74	12.24	29.00
1986	27.86	12.11	28.86
1987	27.82	12.24	28.85
1988	28.03	12.24	28.88
1989	28.05	12.31	28.88

Source: [67]

Table A.31 Revenues from Registered Trailers and Semitrailers in Past

Year	Non-Farm Trailer Registered Weight							
	3000 lbs	5000 lbs	7000 lbs	9000 lbs	12000 lbs	16000 lbs	22000 lbs	22000+ lbs
1976	810495	128589	140888	0	244401	177261	141276	125270
1977	823710	133779	159439	0	274052	198641	154653	130006
1978	839105	134266	175746	0	281715	199957	160681	135163
1979	860471	133903	183536	0	296928	206224	173303	148708
1980	918696	83483	149209	0	273197	193997	165690	133158
1981	930251	88378	166176	0	285315	206487	172602	136369
1982	850601	85648	156997	15939	261708	196564	161036	128590
1983	844264	85186	156246	30572	258897	194422	168098	129668
1984	861113	85800	157601	44477	259791	205507	167713	136566
1985	886943	86915	159653	56040	260317	212877	171160	156167
1986	1357935	122806	227643	92554	322816	275088	228408	218153
1987	1362095	129476	235572	109495	317518	279042	249675	221903
1988	1402935	138045	251931	131090	327143	296124	274064	239976
1989	1436719	148609	267197	147530	332965	309035	293304	265932

	Farm Trailer Registered Weight			
	12000 lbs	16000 lbs	22000 lbs	22000+ lbs
1978	15180	13002	9757	4728
1979	27489	20370	16116	7007
1980	34239	24025	19886	8232
1981	42336	27836	22954	11004
1982	46587	29477	23237	11641
1983	50814	32886	24256	12683
1984	54440	35080	24452	12352
1985	57757	36072	23972	13899
1986	79008	49404	31489	18197
1987	83715	51566	30514	17171
1988	90667	55887	33364	17795
1989	97690	63020	36197	19723

	Non-Farm SemiTrailers		Farm SemiTrailers	
	1-year	2-year	1-year	2-year
1976	1203741	0	0	0
1977	1262450	97020	0	0
1978	1242502	607019	0	0
1979	1300078	296208	0	0
1980	1287535	597465	0	0
1981	1515063	358722	4909	235
1982	1442997	707602	7039	201
1983	1415034	310334	8242	202
1984	1460779	853039	10504	231
1985	1526394	305812	12448	29
1986	1462901	835616	14920	0
1987	1209196	160629	18360	202
1988	1255015	171578	19560	116
1989	1046714	0	21764	0

Data Source: [67]

Table A.32 Proportional Distribution of Trailer and
Semitrailer Registrations in Past

Year	Proportional Distributions of Non-Farm Trailer Registrations							
	3000 lbs	5000 lbs	7000 lbs	9000 lbs	12000 lbs	16000 lbs	22000 lbs	22000+ lbs
1976	0.8620	0.0535	0.0438	0.0000	0.0217	0.0102	0.0053	0.0035
1977	0.8537	0.0543	0.0482	0.0000	0.0236	0.0111	0.0056	0.0036
1978	0.8514	0.0534	0.0516	0.0000	0.0235	0.0108	0.0057	0.0037
1979	0.8522	0.0511	0.0521	0.0000	0.0240	0.0108	0.0059	0.0039
1980	0.8865	0.0314	0.0417	0.0000	0.0216	0.0099	0.0055	0.0034
1981	0.8842	0.0317	0.0441	0.0000	0.0213	0.0100	0.0054	0.0033
1982	0.8858	0.0316	0.0422	0.0036	0.0194	0.0094	0.0050	0.0031
1983	0.8827	0.0315	0.0422	0.0068	0.0192	0.0093	0.0052	0.0031
1984	0.8808	0.0311	0.0417	0.0095	0.0189	0.0097	0.0051	0.0032
1985	0.8799	0.0306	0.0411	0.0116	0.0184	0.0097	0.0051	0.0036
1986	0.8777	0.0314	0.0412	0.0137	0.0177	0.0096	0.0052	0.0037
1987	0.8740	0.0325	0.0420	0.0159	0.0170	0.0095	0.0055	0.0036
1988	0.8691	0.0334	0.0432	0.0182	0.0169	0.0097	0.0058	0.0037
1989	0.8635	0.0351	0.0447	0.0201	0.0168	0.0098	0.0060	0.0040

Proportional Distributions of Farm Trailer Registrations

	12000 lbs	16000 lbs	22000 lbs	22000+ lbs
1978	0.5185	0.2838	0.1460	0.0517
1979	0.5483	0.2660	0.1373	0.0483
1980	0.5610	0.2545	0.1388	0.0457
1981	0.5751	0.2443	0.1313	0.0493
1982	0.5871	0.2404	0.1247	0.0478
1983	0.5871	0.2461	0.1178	0.0490
1984	0.5963	0.2458	0.1128	0.0451
1985	0.6045	0.2418	0.1061	0.0476
1986	0.6126	0.2422	0.1011	0.0442
1987	0.6221	0.2441	0.0947	0.0391
1988	0.6229	0.2444	0.0950	0.0378
1989	0.6162	0.2503	0.0942	0.0393

Proportional Distributions of Registrations

	Non-Farm Semitrailer		Farm Semitrailer	
	1-year	2-year	1-year	2-year
1976	1.0000	0.0000		
1977	0.9647	0.0353		
1978	0.8119	0.1881		
1979	0.9022	0.0978		
1980	0.8179	0.1821		
1981	0.8979	0.1021	0.9795	0.0205
1982	0.8114	0.1886	0.9876	0.0124
1983	0.9063	0.0937	0.9895	0.0105
1984	0.7837	0.2163	0.9908	0.0092
1985	0.9137	0.0863	0.9990	0.0010
1986	0.7869	0.2131	1.0000	0.0000
1987	0.9409	0.0591	0.9954	0.0046
1988	0.9388	0.0612	0.9975	0.0025
1989	1.0000	0.0000	1.0000	0.0000

Table A.33 Miscellaneous Registration Items and Revenues

Year	Redeclared Weight	Transfer	Number of Items				30-day Permit	48-hr Permit	90-day Permit
			Public Safety Fee	Personal License Plate (PLP) Application					
1976	4366	510491	4449736						309
1977	3670	532841	4611822	4125					237
1978	3487	537264	4797248	7572					171
1979	3091	455920	4793886	8763	3692				159
1980	3257	385507	4751965	11194	12571				120
1981	2690	383122	4758478	12052	12493	2661			74
1982	2897	372880	4739419	11905	12304	2857			75
1983	3158	392333	4695813	13945	12756	3003			90
1984	3301	421542	4838294	16156	15726	2832			118
1985	2666	420929	4903142	17818	17682	2525			43
1986	2380	470807	5040993	20174	18443	2389			25
1987	1508	398188	4874812	21416	17058	2175			26
1988	1397	417831	4976400	23334	18001	2232			12
1989	1693	414628	5131400	24029	20301	2321			12
Revenues									
	Red.Wt.	Transfer	Public Safety	PLP Appln.	30-day Permit	48-hr Permit	90-day Permit	Others	Total Misc.
1976	163549	1020982	1112434				6025	1954885	4257875
1977	141798	1064810	1152943	152625			4352	749166	3265694
1978	142627	1074535	1199312	280164			3335	1738917	4438890
1979	132769	911819	1198470	324231	35074		3100	1328826	3934289
1980	153903	771004	1187991	414181	119424		2340	1251206	3900049
1981	153032	766255	1192518	445924	118293	3143	410	1305372	3985947
1982	203969	745745	1184854	440522	110481	2660	1425	1280000	3969656
1983	241697	784647	1173953	515965	114573	2775	1707	1388111	4223428
1984	286316	843067	1209573	597772	141421	2614	2233	1623109	4706105
1985	211794	842007	1225745	659266	158931	2332	815	99269	3200159
1986	251200	941605	1260248	746438	165625	2185	473	61961	3429735
1987	114460	797607	1218705	793243	152347	1936	492	42417	3121207
1988	118287	835690	1244100	863469	161047	1984	228	54211	3279016
1989	161468	829256	1282850	889010	181652	2077	228	56692	3403233
Average Registration Fee									
	Red.Wt.	Transfer	Public Safety	PLP Appln.	30-day Permit		48-hr Permit		90-day Permit
1976	37.46	2.00	0.25						19.50
1977	38.64	2.00	0.25	37.00					18.36
1978	40.90	2.00	0.25	37.00					19.50
1979	42.95	2.00	0.25	37.00	9.50				19.50
1980	47.25	2.00	0.25	37.00	9.50				19.50
1981	56.89	2.00	0.25	37.00	9.47		1.18		19.05
1982	70.41	2.00	0.25	37.00	8.98		0.93		19.00
1983	76.53	2.00	0.25	37.00	8.98		0.92		18.97
1984	86.74	2.00	0.25	37.00	8.99		0.92		18.92
1985	79.44	2.00	0.25	37.00	8.99		0.92		18.95
1986	105.55	2.00	0.25	37.00	8.98		0.91		18.92
1987	75.90	2.00	0.25	37.04	8.93		0.89		18.92
1988	84.67	2.00	0.25	37.00	8.95		0.89		19.00
1989	95.37	2.00	0.25	37.00	8.95		0.89		19.00

Data Source: [67]

Table A.34 Proportional Distribution of Miscellaneous Registration Revenues

Year	Red.Wt.	Transfer	Public Safety	PLP Appln.	30-day Permit	48-hr Permit	90-day Permit	Others
1976	0.0384	0.2398	0.2613	0.0000	0.0000	0.0000	0.0014	0.4591
1977	0.0434	0.3261	0.3530	0.0467	0.0000	0.0000	0.0013	0.2294
1978	0.0321	0.2421	0.2702	0.0631	0.0000	0.0000	0.0008	0.3917
1979	0.0337	0.2318	0.3046	0.0824	0.0089	0.0000	0.0008	0.3378
1980	0.0395	0.1977	0.3046	0.1062	0.0306	0.0000	0.0006	0.3208
1981	0.0384	0.1922	0.2992	0.1119	0.0297	0.0008	0.0004	0.3275
1982	0.0514	0.1879	0.2985	0.1110	0.0278	0.0007	0.0004	0.3224
1983	0.0572	0.1858	0.2780	0.1222	0.0271	0.0007	0.0004	0.3287
1984	0.0608	0.1791	0.2570	0.1270	0.0301	0.0006	0.0005	0.3449
1985	0.0662	0.2631	0.3830	0.2060	0.0497	0.0007	0.0003	0.0310
1986	0.0732	0.2745	0.3674	0.2176	0.0483	0.0006	0.0001	0.0181
1987	0.0367	0.2555	0.3905	0.2541	0.0488	0.0006	0.0002	0.0136
1988	0.0361	0.2549	0.3794	0.2633	0.0491	0.0006	0.0001	0.0165
1989	0.0474	0.2437	0.3770	0.2612	0.0534	0.0006	0.0001	0.0167
	Total Registration Revenues		Miscellaneous Registration Revenues		Miscellaneous Registration Revenue as a Proportion of Total Registration Revenues			
1976	76391469		4257875		0.0557			
1977	77299921		3265694		0.0422			
1978	83016125		4438890		0.0535			
1979	85279307		3934289		0.0461			
1980	84834360		3900049		0.0460			
1981	96598493		3985947		0.0413			
1982	96506618		3969656		0.0411			
1983	95327240		4223428		0.0443			
1984	100564319		4706105		0.0468			
1985	100725747		3200159		0.0318			
1986	118109532		3429735		0.0290			
1987	84988543		3121207		0.0367			
1988	86639704		3279016		0.0378			
1989	91865988		3403233		0.0370			

Table A.35 Driver License Revenues

Year	Learner Permits	4 yr. Photo Operator	Revenues		Total Licenses
			Photo Duplicate Amend	Others	
1976	118034			3869176	3987209
1977	110322	3086870	205815	812827	4215833
1978	115115	3787341	238242	268450	4409147
1979	102139	3107472	228526	406325	3844462
1980	101557	3833353	220450	272911	4428270
1981	89249	3547553	224970	714436	4576207
1982	91298	3861185	228216	436452	4617150
1983	89207	3375228	243504	639783	4347722
1984	91540	3624855	263736	693886	4674016
1985	93541	3699035	272896	812672	4878144
1986	95382	3854500	281545	485815	4717241
1987	91291	3482587	305479	633853	4513209
1988	89897	3813727	357010	762430	5023063
1989	86873	3884262	354491	884078	5209704

Numbers

	Learners Permit	4 yr. Photo Operator	Photo Duplicate Amend
1976	145967		
1977	142118	713683	137210
1978	141760	878845	158828
1979	134764	726345	152351
1980	125243	888320	146967
1981	113999	825800	150162
1982	107667	893857	152144
1983	114590	785545	162336
1984	114131	840632	175824
1985	117182	859195	187931
1986	119979	894945	187697
1987	116752	810046	203653
1988	112720	884686	238007
1989	108451	900467	236321

	Learners Permit	4 yr. Photo Operator	Photo Duplicate Amend
1976	0.81		
1977	0.78	4.33	1.50
1978	0.81	4.31	1.50
1979	0.76	4.28	1.50
1980	0.81	4.32	1.50
1981	0.78	4.30	1.50
1982	0.85	4.32	1.50
1983	0.78	4.30	1.50
1984	0.80	4.31	1.50
1985	0.80	4.31	1.45
1986	0.79	4.31	1.50
1987	0.78	4.30	1.50
1988	0.80	4.31	1.50
1989	0.80	4.31	1.50

Table A.36 Proportional Distribution of Driver License Revenues and License Revenues per Licensed Drivers

Proportional Distribution of Revenues				
Year	Learner Permit	4 yr. Photo Operator	Photo Duplicate Amend	Others
1976	0.0296	0.0000	0.0000	0.9704
1977	0.0262	0.7322	0.0488	0.1928
1978	0.0261	0.8590	0.0540	0.0609
1979	0.0266	0.8083	0.0594	0.1057
1980	0.0229	0.8657	0.0498	0.0616
1981	0.0195	0.7752	0.0492	0.1561
1982	0.0198	0.8363	0.0494	0.0945
1983	0.0205	0.7763	0.0560	0.1472
1984	0.0196	0.7755	0.0564	0.1485
1985	0.0192	0.7583	0.0559	0.1666
1986	0.0202	0.8171	0.0597	0.1030
1987	0.0202	0.7716	0.0677	0.1404
1988	0.0179	0.7592	0.0711	0.1518
1989	0.0167	0.7456	0.0680	0.1697

Licensed Drivers		Driver License Revenues per Licensed Drivers
1976	3445290	1.16
1977	3474158	1.21
1978	3529895	1.25
1979	3591167	1.07
1980	3631457	1.22
1981	3495306	1.31
1982	3345254	1.38
1983	3550785	1.22
1984	3574337	1.31
1985	3597585	1.36
1986	3761193	1.25
1987	3590173	1.26
1988	3613714	1.39
1989	3694828	1.41

Table A.37 Passenger Cars in Operation in Indiana in Past

	1980	1981	1982	1983	1984
1984					148000
1983				102000	159000
1982			85000	147000	153000
1981		118000	185000	186000	189000
1980	122000	198000	196000	195000	197000
1979	245000	242000	239000	236000	238000
1978	261000	258000	254000	250000	251000
1977	262000	259000	254000	248000	246000
1976	225000	221000	215000	207000	200000
1975	173000	168000	161000	151000	142000
1974	216000	205000	189000	172000	151000
1973	242000	222000	198000	175000	146000
1972	189000	169000	147000	128000	105000
1971	131000	113000	96000	82000	66000
1970	113000	96000	80000	68000	55000
1969	91000	75000	62000	51000	42000
1968	70000	57000	48000	40000	136000
1967	49000	41000	35000	119000	
1966	42000	36000	103000		
1965	31000	82000			
1964	60000				
Total	2520000	2559000	2547000	2557000	2625000
	1985	1986	1987	1988	1989
1989					120000
1988				126000	120000
1987			152000	210000	215000
1986		165000	234000	242000	244000
1985	155000	221000	222000	228000	232000
1984	223000	223000	221000	224000	226000
1983	158000	158000	156000	157000	155000
1982	152000	151000	148000	145000	143000
1981	185000	182000	176000	172000	167000
1980	192000	186000	180000	174000	164000
1979	231000	224000	213000	205000	192000
1978	241000	229000	215000	200000	182000
1977	232000	215000	195000	177000	153000
1976	182000	159000	141000	123000	97000
1975	123000	103000	90000	75000	57000
1974	123000	97000	82000	67000	49000
1973	117000	90000	76000	62000	213000
1972	84000	65000	55000	203000	
1971	52000	40000	178000		
1970	43000	157000			
1969	147000				
Total	2640000	2666000	2734000	2791000	2809000

Source: [36]

Table A.38 Proportional Distribution of Automobiles in Operation by Age

	1980	1981	1982	1983	1984
1984					0.056
1983				0.04	0.061
1982			0.033	0.057	0.058
1981		0.046	0.073	0.073	0.072
1980	0.048	0.077	0.077	0.076	0.075
1979	0.097	0.095	0.094	0.092	0.091
1978	0.104	0.101	0.099	0.1	0.096
1977	0.104	0.101	0.1	0.097	0.093
1976	0.089	0.086	0.084	0.081	0.076
1975	0.069	0.066	0.063	0.059	0.054
1974	0.086	0.08	0.074	0.067	0.058
1973	0.096	0.084	0.078	0.068	0.056
1972	0.075	0.066	0.058	0.05	0.04
1971	0.052	0.044	0.038	0.032	0.025
1970	0.045	0.038	0.031	0.027	0.021
1969	0.036	0.029	0.024	0.02	0.016
1968	0.028	0.022	0.019	0.016	0.052
1967	0.019	0.016	0.014	0.047	
1966	0.017	0.014	0.04		
1965	0.012	0.032			
1964	0.024				
	1985	1986	1987	1988	1989
1989					0.043
1988				0.045	0.043
1987			0.056	0.075	0.077
1986		0.062	0.086	0.087	0.087
1985	0.059	0.083	0.087	0.082	0.08
1984	0.084	0.084	0.081	0.08	0.08
1983	0.06	0.059	0.057	0.056	0.055
1982	0.058	0.057	0.054	0.052	0.051
1981	0.07	0.068	0.064	0.062	0.059
1980	0.073	0.07	0.066	0.062	0.058
1979	0.088	0.084	0.078	0.073	0.068
1978	0.091	0.086	0.079	0.072	0.065
1977	0.088	0.081	0.071	0.063	0.054
1976	0.069	0.06	0.052	0.044	0.035
1975	0.047	0.039	0.033	0.027	0.02
1974	0.047	0.036	0.03	0.024	0.017
1973	0.044	0.034	0.028	0.022	0.076
1972	0.032	0.024	0.02	0.073	
1971	0.02	0.015	0.065		
1970	0.016	0.059			
1969	0.056				

Table A.39 Trucks in Operation in Indiana in Past

	1980	1981	1982	1983	1984
1984					49000
1983				34000	54000
1982			25000	41000	42000
1981		22000	39000	40000	40000
1980	33000	43000	43000	42000	43000
1979	106000	105000	104000	102000	103000
1978	107000	106000	105000	103000	103000
1977	93000	92000	92000	90000	89000
1976	73000	72000	72000	70000	69000
1975	52000	51000	51000	49000	47000
1974	68000	66000	64000	61000	57000
1973	63000	61000	60000	55000	51000
1972	51000	49000	47000	44000	41000
1971	37000	34000	33000	31000	28000
1970	34000	32000	30000	28000	25000
1969	39000	35000	33000	30000	28000
1968	29000	26000	25000	23000	103000
1967	27000	24000	23000	91000	
1966	23000	21000	81000		
1965	17000	67000			
1964	59000				
Total	913000	907000	928000	942000	972000
	1985	1986	1987	1988	1989
1989					67000
1988					108000
1987				71000	100000
1986			65000	99000	103000
1985	61000	62000	100000	102000	91000
1984	74000	87000	87000	90000	75000
1983	54000	73000	73000	74000	52000
1982	42000	53000	52000	52000	40000
1981	40000	41000	41000	41000	38000
1980	43000	39000	38000	38000	39000
1979	100000	40000	40000	39000	88000
1978	100000	97000	93000	92000	84000
1977	86000	96000	91000	88000	68000
1976	86000	81000	74000	72000	47000
1975	65000	59000	54000	51000	30000
1974	44000	40000	35000	33000	34000
1973	52000	46000	40000	37000	154000
1972	46000	40000	35000	32000	
1971	36000	40000	28000	133000	
1970	25000	32000	28000		
1969	23000	22000	121000		
1968	114000	116000			
Total	1004000	1025000	1068000	1143000	1217000

Derived from information from Source: [36]

Table A.40 Proportional Distribution of Trucks in Operation
by Age in Indiana in Past

	1980	1981	1982	1983	1984
1984					0.05
1983				0.036	0.056
1982			0.026	0.044	0.043
1981		0.024	0.042	0.042	0.041
1980	0.036	0.047	0.046	0.045	0.044
1979	0.116	0.116	0.112	0.108	0.106
1978	0.117	0.117	0.113	0.109	0.106
1977	0.102	0.101	0.099	0.096	0.092
1976	0.08	0.079	0.078	0.074	0.071
1975	0.057	0.056	0.055	0.052	0.048
1974	0.074	0.073	0.069	0.065	0.059
1973	0.069	0.067	0.065	0.058	0.052
1972	0.056	0.054	0.051	0.047	0.042
1971	0.041	0.037	0.036	0.033	0.029
1970	0.037	0.035	0.032	0.03	0.026
1969	0.043	0.039	0.036	0.032	0.029
1968	0.032	0.029	0.027	0.024	0.106
1967	0.03	0.026	0.025	0.097	
1966	0.025	0.023	0.087		
1965	0.019	0.074			
1964	0.065				
	1985	1986	1987	1988	1989
1989					0.055
1988				0.062	0.089
1987			0.061	0.087	0.082
1986		0.06	0.094	0.089	0.085
1985	0.061	0.085	0.081	0.079	0.075
1984	0.074	0.071	0.068	0.065	0.062
1983	0.054	0.052	0.049	0.045	0.043
1982	0.042	0.04	0.038	0.036	0.033
1981	0.04	0.038	0.036	0.033	0.031
1980	0.043	0.04	0.037	0.034	0.032
1979	0.1	0.095	0.087	0.08	0.072
1978	0.1	0.094	0.085	0.077	0.069
1977	0.086	0.079	0.069	0.063	0.056
1976	0.065	0.058	0.051	0.045	0.039
1975	0.044	0.039	0.033	0.029	0.025
1974	0.052	0.045	0.037	0.032	0.028
1973	0.046	0.039	0.033	0.028	0.127
1972	0.036	0.031	0.026	0.116	
1971	0.025	0.021	0.113		
1970	0.023	0.113			
1969	0.114				

Table A.41 Tractors in Operation in Indiana in Past

	1980	1981	1982	1983	1984
1984					3900
1983					3000
1982			1300	1900	2100
1981		1900	3400	3400	3500
1980	2400	3200	3200	3200	3300
1979	7500	7400	7000	6900	7200
1978	6700	6500	6200	6000	6000
1977	6100	6000	5900	5700	5700
1976	3900	3800	3700	3500	3600
1975	5100	4900	4700	4300	4400
1974	6900	6600	6300	5700	5500
1973	7000	6900	6300	5500	5300
1972	5500	5100	4500	4100	4000
1971	4800	4100	3800	3400	3300
1970	4000	3400	3100	2800	2700
1969	3700	3300	3000	2700	2600
1968	3000	2700	2600	2300	14500
1967	3600	3100	2800	12800	
1966	3100	2500	11990		
1965	2400	10400			
1964	10500				
Total	87000	82000	80000	70000	80000
	1985	1986	1987	1988	1989
1989					4600
1988					5100
1987				3200	5000
1986		4200	3600	4800	4600
1985	5000	5800	4700	5400	4900
1984	5300	5200	5700	5400	4000
1983	2900	2700	4900	4400	2200
1982	2100	2000	2400	2200	1700
1981	3400	2000	1800	1700	2600
1980	3300	3200	2900	2600	2600
1979	6800	3000	2700	2600	2600
1978	5700	6300	5500	5200	4600
1977	5400	5300	4700	4100	3700
1976	5400	5000	4700	4100	3700
1975	3400	5000	4000	3500	3200
1974	3800	2800	2500	2300	2200
1973	5000	3400	3200	2800	2600
1972	4700	4300	3800	3300	2900
1971	3400	4000	3600	3200	17500
1970	2900	2900	2600	15900	
1969	2400	2400	15800		
1968	14800	14200			
Total	80000	77000	74000	72000	74000

Derived from information from Source: [36]

Table A.42 Proportional Distribution of Tractors in Operation by Age

	1980	1981	1982	1983	1984
1984					0.05
1983				0.045	0.043
1982			0.035	0.028	0.03
1981		0.035	0.035	0.034	0.034
1980	0.04	0.029	0.029	0.029	0.031
1979	0.044	0.041	0.039	0.038	0.04
1978	0.041	0.039	0.039	0.038	0.038
1977	0.039	0.038	0.039	0.039	0.039
1976	0.036	0.035	0.036	0.035	0.037
1975	0.035	0.034	0.035	0.033	0.035
1974	0.037	0.036	0.036	0.035	0.036
1973	0.032	0.033	0.032	0.031	0.032
1972	0.032	0.031	0.032	0.031	0.033
1971	0.034	0.034	0.035	0.034	0.035
1970	0.032	0.03	0.031	0.03	0.032
1969	0.035	0.035	0.036	0.035	0.037
1968	0.032	0.032	0.035	0.034	0.036
1967	0.038	0.037	0.038	0.034	0.031
1966	0.039	0.036	0.034	0.035	
1965	0.036	0.031	0.035		
1964	0.032	0.034			
1963	0.036				
	1985	1986	1987	1988	1989
1989					0.037
1988				0.03	0.038
1987			0.04	0.037	0.038
1986		0.052	0.042	0.042	0.04
1985	0.055	0.045	0.044	0.042	0.038
1984	0.042	0.041	0.039	0.035	0.033
1983	0.045	0.043	0.038	0.035	0.034
1982	0.031	0.03	0.027	0.026	0.026
1981	0.034	0.032	0.03	0.027	0.027
1980	0.032	0.03	0.027	0.026	0.027
1979	0.039	0.037	0.033	0.032	0.031
1978	0.038	0.037	0.034	0.033	0.032
1977	0.039	0.038	0.034	0.032	0.032
1976	0.037	0.035	0.032	0.032	0.033
1975	0.035	0.033	0.033	0.031	0.032
1974	0.036	0.034	0.032	0.031	0.03
1973	0.031	0.03	0.029	0.029	0.032
1972	0.03	0.029	0.029	0.032	0.033
1971	0.034	0.031	0.034	0.033	
1970	0.032	0.032	0.034		
1969	0.035	0.036			
1968	0.036				

Table A.43 Trucks in Indiana--Comparative Summary: 1987 and Earlier Years

	1963	1967	1972	1977	1982	1987
1. Total trucks (in 1000s)	386	408	553	746.9	907.9	1076.6
2. Vehicle Size (percentages of total trucks)						
Light (L)	71.9	65.5	57.0	81.7	83.0	89.4
Medium (M)	9.9	20.9	25.3	6.9	4.4	2.6
Light-Heavy (LH)	10.1	5.2	8.3	4.1	5.7	2.7
Heavy-Heavy (HH)	8.1	8.4	9.4	7.3	6.8	5.3
3. Annual Mileages (percentages of total trucks)						
< 5000 miles	29.0	..	28.0	22.7	29.6	25.1
< 6000 miles		..	44.2			
5000 to 9999 miles	32.5	..	30.4	23.8	26.8	25.4
6000 to 9999 miles		..	18.5			
10000 to 19999 miles	23.1	25.6	27.0	36.3	30.8	33.4
20000 to 29999 miles	6.0	5.2	8.1	9.2	7.0	9.9
>= 30000 miles	9.4	6.5	6.5	7.9	5.8	6.2
4. Year Model (percentages of total trucks)						
1 to 2 years old	12.7	19.0	11.0	19.7	10.7	16.6
3 to 4 years old	12.9	17.5	18.7	16.3	14.3	17.0
Over 4 years old	74.4	63.5	70.3	64.0	75.0	66.4
5. Truck Type (percentage of total trucks)						
SU trucks, total	..	81.0	94.7	95.1	93.9	95.7
SU, 2-axle	..	69.3	90.3	93.1	92.4	94.7
SU, 3-axle	..	11.7	4.4	2.0	1.5	1.0
Combinations	..	19.0	5.3	4.8	6.1	4.3
Combinations, 3 axle	..	3.2	0.7	0.3	0.7	0.5
Combinations, 4 or more axles	..	15.8	4.6	3.5	5.5	3.7
Combinations, 4 axles	..	..	..	1.6	2.2	0.8
Combinations, 5 or more axles	..	..	..	2.9	3.3	2.9
6. Area/Range of Operation (percentages of total truck)						
Local	86.6	80.9	90.6	87.7	89.3	80.0
Short-range	10.4	11.4	7.3	9.1	7.5	11.2
Long-range	3.0	7.7	2.1	3.2	3.2	4.1
7. Fuel Type (percentages of total truck)						
Gasoline	97.3	87.8	95.3	94.6	94.0	93.7
Diesel & LPG	2.7	12.2	4.7	5.4	5.9	6.3

Source: [7,8,9,10,11,12]

Table A.44 Number of Trucks in Indiana (in thousands) in Various Classifications

	1972	1977	1982	1987
Total Annual miles	553	746.7	907.9	1076.6
Less than 5000	155	169.3	268.6	270.7
5000 to 9999	168	177.9	243.6	273.2
10000 to 19999	149	271.2	279.5	359.4
20000 to 29999	45	69.1	63.8	106.5
30000 to 49999	17	35.0	27.1	38.2
50000 to 74999	10	13.2	10.8	11.3
75000 or more	9	11.2	14.5	17.3
Range of Operation				
Local	476	631.0	735.5	861.7
Short-range	38	65.7	61.5	120.4
Long-range	11	22.8	26.0	43.9
Off-the Road	..	24.1	75.7	44.4
Base of Operation (Percentage of miles traveled in base-of-operation State)				
Less than 25 percent	..	18.7	666.0	837.4
25 to 49 percent	..	17.9	30.4	58.7
50 to 74 percent	..	63.9	28.4	29.5
75 to 100 percent	..	645.0	30.9	47.6
Vehicle Size				
Light	315	610.1	753.5	962.2
Medium	140	51.2	40.1	27.7
Light-Heavy	46	31.0	52.2	29.1
Heavy-Heavy	52	54.6	62.0	57.5
Average Weight (pounds)				
Less than 6001	..	380.2	679.3	896.7
6001 to 10000	..	229.9	74.1	65.5
10000 to 14000	..	26.9	15.7	16.0
14001 to 16000	..	13.9	12.4	6.1
16001 to 19500	..	10.3	12.1	5.7
19501 to 26000	..	31.0	52.2	29.1
26001 to 33000	..	11.2	11.1	10.6
33001 to 40000	..	4.1	6.6	6.5
40001 to 50000	..	8.0	11.1	8.3
50001 to 60000	..	7.5	9.3	7.7
60001 to 80000	..	23.3	23.9	23.9
80001 to 100000	..	0.3	0.1	0.4
100001 to 130000	..	.1	(Z)	(Z)
130000 or more	..	.1	(Z)	0.2

Table A.44 Number of Trucks in Indiana (in thousands) in Various Classifications (continued)

Classifications	1972	1977	1982	1987
Year Model				
1 to 2 year	61	147.3		
3 to 4 year	103	121.9		
5 to 6 year	98	131.3		
7 to 8 year	99	94.3		
9 to 10 year	57	74.5	133.8	180.9
More than 10 yr	135	177.7	215.9	389.8
1 year	..	59.3	48.2	81.1
2 year	..	88.0	49.0	98.2
3 year	..	46.1	37.2	105.0
4 year	..	75.8	92.5	77.6
5 year	..	69.2	123.2	50.5
6 year	..	62.1	70.6	35.1
7 year	..	47.7	87.7	27.2
8 year	..	46.6	49.6	31.2
9 year	..	35.3	83.9	96.0
10 year and more	..	216.9	265.8	474.7
Miles per gallon				
Less than 5	..	54.5	28.8	19.2
5 to 6.9	..	30.4	80.1	63.0
7 to 8.9	..	54.4	86.3	67.4
9 to 11.9	..	127.0	223.5	186.5
12 to 14.9	..	214.9	170.0	275.3
15 to 19.9	..	185.9	147.2	264.8
20 or more	..	35.1	66.7	198.4
Engine				
Gasoline	498	706.5	853.1	1008.3
Diesel	..	38.2	51.2	67.9
LPG or other	..	2.1	2.3	0.4
Diesel and LPG	25	40.3	53.5	68.3
Truck Type and Axle Arrangement				
Total Trucks	553	746.9	907.9	1076.6
Single-Unit trucks	524	710.9	852.1	1030.6
2 axles	499	695.6	838.9	1019.4
3 axles or more	24	15.3	13.3	11.2
Combinations	30	35.0	55.7	46.1
3 axles	4	2.5	6.0	5.5
4 axles	10	11.7	20.0	9.1
5 axles or more	16	20.8	29.7	31.5
Pickups, Panels, Vans, Utilities, and Station Wagons				
Total	354	599.3	720.4	928.7
Pickups	312	463.6	537.5	643.5
Panels or vans	33	124.7	121.2	53.2
Utilities	..	..	48.1	153.3
Station Wagons	..	..	13.6	61.0

Source: [7,8,9,10,11,12]

Table A.45 Truck-Miles (in millions) in Various Classifications

	1972	1977	1982	1987
Total Truck	6253	9719.7	10203.2	13075.9
Annual miles				
Less than 5000	336	349.7	564.5	511.8
5000 to 9999	1065	1242.0	1649.3	1832.7
10000 to 19999	1850	3439.6	3425.8	4455.7
20000 to 29999	980	1566.9	1440.5	2418.8
30000 to 49999	620	1232.4	971.3	1358.0
50000 to 74999	584	770.4	641.7	691.0
75000 or more	818	1118.8	1510.1	1807.9
Range of Operation				
Local	4122	6493.6	7072.6	8758.9
Short-range	1163	1722.9	1165.2	2052.5
Long-range	724	1334.6	1579.8	2045.4
Off-the Road	..	143.8	346.7	198.0
Base of Operation (Percentage of miles traveled in base-of-operation State)				
Less than 25 percent	..	865.0	6094.4	8731.8
25 to 49 percent	..	535.2	530.5	999.7
50 to 74 percent	..	1297.1	720.3	767.6
75 to 100 percent	..	7020.5	1267.8	1680.5
Vehicle Size				
Light	2964	6713.2	6870.8	9878.3
Medium	1225	590.4	298.0	262.6
Light-Heavy	335	323.7	436.5	254.5
Heavy-Heavy	1729	2092.4	2597.8	2680.6
Average Weight (pounds)				
Less than 6001	..	3807.8	6004.4	9143.4
6001 to 10000	..	2905.4	866.4	734.9
10000 to 14000	..	407.1	101.1	112.9
14001 to 16000	..	105.3	97.4	73.6
16001 to 19500	..	78.0	99.6	76.0
19501 to 26000	..	323.7	436.5	254.5
26001 to 33000	..	127.2	122.6	183.6
33001 to 40000	..	84.8	112.8	171.1
40001 to 50000	..	186.4	355.7	260.7
50001 to 60000	..	339.5	585.5	467.9
60001 to 80000	..	1321.9	1414.5	1580.2
80001 to 100000	..	26.2	6.8	11.9
100001 to 130000	..	1.3	(Z)	(Z)
130000 or more	..	5.0	(Z)	5.3

Table A.45 Truck-Miles (in millions) in Various Classifications (continued)

	1972	1977	1982	1987
Year Model				
1 yr to 2 yr	1108	2852.4		
3 yr to 4 yr	1852	2193.2		
5 yr to 6 yr	1133	1805.9		
7 yr to 8 yr	892	1172.7		
9 yr to 10 yr	429	761.5	1172.0	1954.5
> 10 yr	839	933.7	1102.4	2540.9
1 year	..	1133.9	975.8	1186.0
2 year	..	1718.5	941.9	1881.2
3 year	..	816.1	813.2	1796.2
4 year	..	1377.1	1332.5	1471.2
5 year	..	982.0	1648.9	823.8
6 year	..	823.9	895.5	563.8
7 year	..	527.8	830.5	392.1
8 year	..	644.9	489.7	466.4
9 year	..	368.0	757.7	1102.9
10 or more years	..	934.0	1156.7	3392.5
Miles per gallon				
Less than 5	..	1696.1	880.5	569.7
5 to 6.9	..	699.8	2002.4	2157.7
7 to 8.9	..	597.7	697.6	684.2
9 to 11.9	..	1524.9	1760.4	1508.4
12 to 14.9	..	2592.5	1429.1	2540.4
15 to 19.9	..	1747.4	1468.6	2845.7
20 or more	..	335.6	840.1	2769.8
Engine				
Gasoline	4624	7750.3	7529.6	10020.9
Diesel	..	1950.4	2634.8	3048.3
LPG or other	..	19.0	27.2	6.7
Diesel and LPG	1306	1969.4	2662.0	3055.0
Truck Type and Axle Arrangement				
Total (all trucks)	6253	9719.7	10203.2	13075.9
Single-Unit trucks	4779	7861.0	7610.7	10514.7
2 axles	4508	7666.2	7475.9	10364.3
3 axles or more	271	194.8	134.9	150.5
Combinations	1475	1858.8	2592.5	2561.2
3 axles	127	67.5	97.1	105.1
4 axles	469	488.8	617.3	335.3
5 axles or more	827	1302.5	1878.1	2120.7
Pickups, Panels, Vans, Utilities, and Station Wagons				
Total (all trucks)	6253	9719.7	10203.2	13075.9
Total	3320	6756.3	6690.2	9569.2
Pickups	2753	4859.2	4597.4	6590.2
Panels or vans	426	1703.8	1482.5	2276.5
Utilities	..	..	384.0	537.2
Station Wagons	..	..	226.3	165.2

Source: [7,8,9,10,11,12]

Table A.46 Average miles per truck (in thousands) in Various Classifications

	1972	1977	1982	1987
Total Trucks	11.3	13.0	11.2	12.1
Annual miles				
All trips	11.3	13.0	11.2	12.1
Less than 5000	2.2	2.1	2.1	1.9
5000 to 9999	6.3	7.0	6.8	6.7
10000 to 19999	12.4	12.7	12.3	12.4
20000 to 29999	21.9	22.7	22.6	22.7
30000 to 49999	35.8	35.2	35.8	35.5
50000 to 74999	61.3	58.3	59.6	61.0
75000 or more	91.3	99.8	104.1	104.4
Range of Operation				
Local	8.7	10.3	9.6	10.2
Short-range	30.5	26.2	19.0	17.0
Long-range	65.6	58.5	60.8	46.6
Off-the Road	..	6.0	4.6	4.5
Base of Operation (Percentage of miles traveled in base-of-operation State)				
Less than 25 percent	..	46.4	9.2	10.4
25 to 49 percent	..	29.8	17.5	17.0
50 to 74 percent	..	20.3	24.8	26.0
75 to 100 percent	..	10.9	41.0	35.3
Vehicle Size				
Light	9.4	11.0	9.1	10.3
Medium	8.8	11.5	7.4	9.5
Light-Heavy	7.3	10.4	8.4	8.7
Heavy-Heavy	33.3	38.3	41.9	46.6
Average Weight (pounds)				
Less than 6001	..	10.0	8.8	10.2
6001 to 10000	..	12.6	11.7	11.2
10000 to 14000	..	15.1	6.4	7.1
14001 to 16000	..	7.6	7.9	12.1
16001 to 19500	..	7.6	8.2	13.3
19501 to 26000	..	10.4	8.4	8.7
26001 to 33000	..	11.3	11.1	17.3
33001 to 40000	..	20.7	17.1	26.5
40001 to 50000	..	23.2	32.0	31.5
50001 to 60000	..	45.1	63.3	60.5
60001 to 80000	..	56.8	59.3	66.1
80001 to 100000	..	78.3	53.1	33.1
100001 to 130000	..	15.7	(Z)	(Z)
130000 or more	..	60.0	(Z)	24.0

Table A.46 Average miles per truck (in thousands) in Various Classifications (continued)

Classifications	1972	1977	1982	1987
Year Model				
1 yr to 2 yrs	18.2	19.3	19.7	
3 yrs to 4 yrs	17.9	18.0	16.5	
5 yrs to 6 yrs	11.6	13.8	13.1	
7 yrs to 8 yrs	9.0	12.4	9.6	
9 yrs to 10 yrs	7.5	10.2	8.8	10.8
More than 10 yrs	6.2	5.3	5.1	6.5
1 year	..	19.1	20.2	14.6
2 year	..	19.5	19.2	19.1
3 year	..	17.7	21.9	17.1
4 year	..	18.2	14.4	18.9
5 year	..	14.2	13.4	16.3
6 year	..	13.3	12.7	16.1
7 year	..	11.1	9.5	14.4
8 year	..	13.9	9.9	15.0
9 year	..	10.4	9.0	11.5
10 year and more	..	6.1	5.7	7.1
Miles per gallon				
Less than 5	..	31.1	30.6	29.7
5 to 6.9	..	23.0	25.0	34.3
7 to 8.9	..	11.0	8.1	10.1
9 to 11.9	..	12.0	7.9	8.1
12 to 14.9	..	12.1	8.4	9.2
15 to 19.9	..	9.4	10.0	10.7
20 or more	..	9.6	12.6	14.0
Engine				
Gasoline	9.3	11.0	8.8	9.9
Diesel	..	51.0	51.5	44.9
LPG or other	..	8.9	12.0	16.8
Diesel and LPG	53.1	48.9	49.8	44.7
Truck Type and Axle Arrangement				
Single-Unit trucks				
2 axles	9.1	11.1	8.9	10.2
3 axles or more	9.0	11.0	8.9	10.2
Combinations	11.1	12.7	10.1	13.4
3 axles	50.4	52.5	46.5	55.6
4 axles	35.0	26.9	16.2	19.1
5 axles or more	46.1	41.7	30.9	36.8
Pickups, Panels, Vans, Utilities, and Station Wagons	59.6	62.0	63.0	67.3
Total (all trucks)	11.3	13.0	11.2	12.1
Pickups	9.4	11.3	9.3	10.3
Panels or vans	8.8	10.5	8.6	10.2
Utilities	13.1	13.7	12.2	11.0
Station Wagons	..	..	8.0	8.8
	..	..	16.7	9.4

Source: [7,8,9,10,11,12]

Table A.47 Number of Trucks (in thousands) in Various Classifications (excluding pickups, panels, utilities, and station wagons)

	1972	1977	1982	1987
Total Trucks	198	147.6	187.5	148.0
Annual miles				
Less than 5000	74	49.6	78.7	53.2
5000 to 9999	44	30.8	32.7	24.0
10000 to 19999	40	23.8	30.2	24.5
20000 to 29999	12	10.9	12.1	10.0
30000 to 49999	11	12.5	8.7	10.6
50000 to 74999	8	8.7	10.6	8.3
75000 or more	9	11.2	14.5	17.3
Range of Operation				
Local	162	97.1	116.3	91.9
Short-range	20	20.5	22.5	23.6
Long-range	11	18.2	17.9	21.6
Off-the Road	..	10.2	26.5	9.0
Base of Operation				
(Percentage of miles traveled in base-of-operation State)				
Less than 25 percent	..	11.4	129.9	108.7
25 to 49 percent	..	7.4	5.6	5.8
50 to 74 percent	..	15.5	8.1	8.3
75 to 100 percent	..	112.7	16.1	15.8
Vehicle Size				
Light	22	25.9	36.4	34.0
Medium	79	36.2	40.1	27.3
Light-Heavy	46	30.2	48.9	29.3
Heavy-Heavy	52	54.6	62.0	57.5
Average Weight (pounds)				
Less than 6001	..	7.8	10.2	13.2
6001 to 10000	..	18.1	26.2	20.8
10000 to 14000	..	13.8	15.7	15.5
14001 to 16000	..	12.3	12.4	6.1
16001 to 19500	..	10.1	12.1	5.7
19501 to 26000	..	30.9	48.9	29.1
26001 to 33000	..	11.2	11.1	10.6
33001 to 40000	..	4.1	6.6	6.5
40001 to 50000	..	8.0	11.1	8.3
50001 to 60000	..	7.5	9.3	7.7
60001 to 80000	..	23.3	23.9	23.9
80001 to 100000	..	0.3	0.1	0.4
100001 to 130000	..	0.1	(Z)	(Z)
13000 or more	..	0.1	(Z)	0.2

Table A.47 Number of Trucks (in thousands) in Various Classifications (excluding pickups, panels, utilities, and station wagons) (continued)

Classifications	1972	1977	1982	1987
Year Model				
1 yr and 2 yrs	17			
3 yrs and 4 yrs	32			
5 yrs and 6 yrs	33			
7 yrs and 8 yrs	24			
9 yrs and 10 yrs	24	16.7	24.4	20.8
More than 10 years	69	48.5	84.5	76.7
1 year	..	6.4	4.9	5.5
2 year	..	8.5	5.4	9.1
3 year	..	10.2	7.3	7.9
4 year	..	18.6	15.1	7.3
5 year	..	11.1	12.7	3.9
6 year	..	12.7	12.0	5.5
7 year	..	8.7	11.8	5.3
8 year	..	6.4	9.4	6.1
9 year	..	9.7	13.6	9.0
10 year and more	..	55.5	95.3	88.5
Miles per gallon				
Less than 5	..	48.1	28.8	19.2
5 to 6.9	..	25.9	63.4	59.8
7 to 8.9	..	28.8	31.6	28.4
9 to 11.9	..	15.4	31.7	27.0
12 to 14.9	..	13.5	7.2	9.7
15 to 19.9	..	4.1	1.5	2.7
20 or more	..	0.5	0.2	0.7
Engine				
Gasoline	167	107.4	136.4	92.1
Diesel	..	38.1	47.6	55.4
LPG or other	..	2.0	2.1	0.4
Diesel and LPG	25	40.1	49.7	55.8
Truck Type and Axle Arrangement				
Single-Unit trucks				
2 axles	169	111.6	143.9	103.4
3 axles or more	149	96.3	130.7	92.3
Combinations	20	15.3	13.3	11.2
3 axles	29	29.0	43.6	44.6
4 axles	4	4.0	3.8	4.0
5 axles or more	10	10.0	10.1	9.1
	16	16.0	29.8	31.5

Source: [7,8,9,10,11,12]

Table A.48 Truck-Miles (in millions) in Various Classifications (excluding pickups, panels, vans)

	1972	1977	1982	1987
Total Truck Annual miles	2931	2963.5	3513	3506.8
Less than 5000	144	90.9	143.5	97.7
5000 to 9999	279	202.9	226.1	159.3
10000 to 19999	504	307.6	398.6	319.7
20000 to 29999	275	248.6	278.4	229.7
30000 to 49999	404	475.2	321.4	394.8
50000 to 74999	507	519.7	634.9	497.7
75000 or more	818	1118.8	1510.1	1807.9
Range of Operation				
Local	1344	904.2	1104.4	867.9
Short-range	801	769.4	776.2	823.3
Long-range	724	1238.5	1496.6	1774.3
Off-the Road	..	43.7	96.9	30.6
Base of Operation (Percentage of miles traveled in base-of-operation State)				
Less than 25 percent	..	734.8	1329.0	1271.4
25 to 49 percent	..	468.1	179.6	292.6
50 to 74 percent	..	564.3	481.5	497.2
75 to 100 percent	..	1195.4	1181.9	1222.9
Vehicle Size				
Light	263	175.8	312.5	309.7
Medium	608	373.8	298.0	262.0
Light-Heavy	334	321.5	304.7	254.5
Heavy-Heavy	1726	2092.4	2597.8	2680.6
Average Weight (pounds)				
Less than 6001	..	19.6	74.5	103.5
6001 to 10000	..	156.2	237.9	206.1
10000 to 14000	..	201.3	101.1	112.4
14001 to 16000	..	98.1	97.4	73.6
16001 to 19500	..	74.4	99.6	76.0
19501 to 26000	..	321.5	304.7	254.5
26001 to 33000	..	127.2	122.6	183.6
33001 to 40000	..	84.8	112.8	171.1
40001 to 50000	..	186.4	355.7	260.7
50001 to 60000	..	339.5	585.5	467.9
60001 to 80000	..	1329.9	1414.5	1580.2
80001 to 100000	..	26.2	6.8	11.9
100001 to 130000	..	1.3	(Z)	(Z)
130000 or more	..	5.0	(Z)	5.3

Table A.48 Truck-Miles (in millions) in Various
Classifications (excluding pickups, panels, vans)
(continued)

	1972	1977	1982	1987
Year Model				
1 yr and 2 yrs	462			
3 yrs and 4 yrs	903			
5 yrs and 6 yrs	534			
7 yrs and 8 yrs	342			
9 yrs and 10 yrs	211			
More than 10 yrs	479	243.6	352.2	419.1
1 year	..	237.9	547.7	638.2
2 year	..	347.5	292.4	282.7
3 year	..	325.2	243.9	484.6
4 year	..	247.5	354.6	472.3
5 year	..	596.6	558.0	400.0
6 year	..	356.9	441.2	197.4
7 year	..	313.2	388.8	232.7
8 year	..	167.4	175.9	163.5
9 year	..	127.5	158.3	216.3
10 year and more	..	162.2	203.2	222.4
	..	319.3	696.7	834.9
Miles per gallon				
Less than 5	..	1625.7	880.5	569.7
5 to 6.9	..	661.3	1879.8	2129.5
7 to 8.9	..	267.8	250.8	365.6
9 to 11.9	..	104.9	231.5	316.7
12 to 14.9	..	97.2	49.4	85.8
15 to 19.9	..	17.8	7.1	31.9
20 or more	..	2.6	1.2	7.6
Engine				
Gasoline	1528	996.7	938.1	720.5
Diesel	..	1949.6	2538.4	2779.6
LPG or other	..	17.2	24.7	6.7
Diesel and LPG	1305	1966.8	2563.1	2786.3
Truck Type and Axle Arrangement				
Single-Unit trucks	1457	1104.8	1086.6	957.7
2 axles	1235	910.0	951.7	807.3
3 axles or more	222	194.8	99.8	150.5
Combinations	1475	1858.8	2426.4	2549.0
3 axles	127	67.5	92.6	92.9
4 axles	469	488.8	455.7	335.3
5 axles or more	827	1302.5	1878.1	2120.7

Source: [7,8,9,10,11,12]

Table A.49 Average miles per trucks (in thousands) in Various Classifications (excluding pickups, panels, vans, and others)

	1972	1977	1982	1987
Total Truck	14.8	20.1	18.7	23.7
Annual miles				
Less than 5000	2.0	1.8	1.8	1.8
5000 to 9999	6.3	6.6	6.9	6.6
10000 to 19999	12.5	12.9	13.2	13.0
20000 to 29999	22.4	22.8	23.0	22.9
30000 to 49999	37.5	37.9	37.1	37.3
50000 to 74999	61.5	59.7	59.8	59.7
75000 or more	91.3	99.8	104.1	104.4
Range of Operation				
Local	8.3	9.3	9.5	9.4
Short-range	40.3	37.6	34.5	34.9
Long-range	65.6	68.1	83.6	82.0
Off-the Road	..	4.3	3.7	3.4
Base of Operation (Percentage of miles traveled in base-of-operation State)				
Less than 25 percent	..	64.6	10.2	11.7
25 to 49 percent	..	63.6	32.1	50.5
50 to 74 percent	..	36.4	59.7	60.0
75 to 100 percent	..	10.6	73.3	77.5
Vehicle Size				
Light	12.0	6.8	8.6	9.1
Medium	7.7	10.3	7.4	9.6
Light-Heavy	7.3	10.4	6.2	8.7
Heavy-Heavy	33.4	38.3	41.9	46.6
Average Weight (pounds)				
Less than 6001	..	2.5	7.3	7.8
6001 to 10000	..	8.6	9.1	9.9
10000 to 14000	..	14.6	6.4	7.2
14001 to 16000	..	8.0	7.9	12.1
16001 to 19500	..	7.3	8.2	13.3
19501 to 26000	..	10.4	6.2	8.7
26001 to 33000	..	11.3	11.1	17.3
33001 to 40000	..	20.7	17.1	26.5
40001 to 50000	..	23.2	32.0	31.5
50001 to 60000	..	45.1	63.3	60.5
60001 to 80000	..	56.8	59.3	66.1
80001 to 100000	..	78.3	53.1	33.1
100001 to 130000	..	15.7	(2)	(2)
130000 or more	..	60.0	(2)	24.0

Table A.49 Average miles per trucks (in thousands) in Various Classifications (excluding pickups, panels, vans, and others) (continued)

Classifications	1972	1977	1982	1987
Year Model				
1 yr and 2 yrs	27.7			
3 yrs and 4 yrs	28.0			
5 yrs and 6 yrs	16.4			
7 yrs and 8 yrs	14.5			
9 yrs and 10 yrs	8.9			
More than 10 yrs	6.9			
1 year	..	54.7	59.6	51.0
2 year	..	38.3	44.9	53.5
3 year	..	24.3	48.3	60.1
4 year	..	32.1	37.0	55.1
5 year	..	32.1	34.7	51.0
6 year	..	24.7	32.4	42.2
7 year	..	19.3	14.9	30.9
8 year	..	20.1	16.9	35.5
9 year	..	16.8	15.0	24.6
10 year and more	..	11.6	13.8	9.4
Miles per gallon				
Less than 5	..	33.8	30.6	29.7
5 to 6.9	..	25.5	29.6	35.6
7 to 8.9	..	9.3	7.9	12.9
9 to 11.9	..	6.8	7.3	11.7
12 to 14.9	..	7.2	6.9	8.8
15 to 19.9	..	4.3	4.7	12.0
20 or more	..	5.3	4.6	11.3
Engine				
Gasoline	9.2	9.3	6.9	7.8
Diesel	53.2	51.1	53.3	50.2
LPG or other	14.2	8.4	11.6	16.8
Truck Type and Axle Arrangement				
Single-Unit trucks	8.6	9.9	7.5	9.3
2 axles	8.3	9.5	7.3	8.8
3 axles or more	10.8	12.7	10.1	13.4
Combinations	50.4	51.6	55.7	57.2
3 axles	35.0	27.0	24.4	23.2
4 axles	46.1	41.7	45.1	36.8
5 axles or more	59.6	61.9	63.0	67.3

Table A.50 Projected Population for Indiana in 1000s

Year	Total Population	Driving Age Population	Young Age Population (16-25)	Less than Driving Age Population
1989	5575	4254	792	1321
1990	5602	4243	767	1359
1991	5619	4263	759	1356
1992	5636	4270	742	1366
1993	5653	4278	735	1375
1994	5670	4291	720	1372
1995	5685	4298	711	1387
1996	5700	4326	713	1374
1997	5715	4343	720	1372
1998	5729	4363	722	1364
1999	5744	4383	729	1361
2000	5758	4399	731	1359
2001	5775	4424	733	1351
2002	5792	4443	741	1349
2003	5809	4467	749	1342
2004	5826	4486	752	1340
2005	5844	4512	760	1332

Table A.51 Projected Economy of Indiana

Year	Per Capita Income in 1982 \$	Gross State Product in 1000s of 1982 \$	Gasoline Price in 1982 cents	CPI (1982= 100)	GNP Implicit Price Deflator (1982=100)
1989	12395.9	77273760.0			
1990	12694.2	78623520.0	76.51	1.271	1.265
1991	12936.5	79973280.0	108.80	1.308	1.292
1992	13185.3	81323040.0	104.30	1.331	1.329
1993	13441.3	82672800.0	104.00	1.371	1.369
1994	13704.8	84022560.0	104.00	1.415	1.408
1995	13981.3	85372320.0	103.00	1.447	1.439
1996	14236.7	88071840.0	103.00	1.481	1.476
1997	14492.9	89480989.0	103.00	1.521	1.506
1998	14752.5	90890139.0	103.00	1.562	1.521
1999	15012.9	92299288.0	103.00	1.612	1.583
2000	15268.6	93708438.0	103.00	1.652	1.638
2001	15529.1	95117587.0	103.00	1.691	1.681
2002	15799.1	96526737.0	103.00	1.734	1.712
2003	16061.5	97935886.0	103.00	1.772	1.761
2004	16324.8	99345036.0	103.00	1.812	1.801
2005	16590.5	100754000.0	103.00	1.854	1.832
				1.891	1.887

Table A.52 Proportional Distribution of Automobiles in Operation by Age in Future

Age	1989	1990	1991	1992	1993	1994
1	0.063	0.079	0.081	0.083	0.084	0.088
2	0.070	0.063	0.079	0.081	0.082	0.086
3	0.075	0.070	0.063	0.079	0.080	0.084
4	0.085	0.075	0.069	0.063	0.078	0.082
5	0.081	0.084	0.074	0.069	0.062	0.079
6	0.079	0.080	0.084	0.073	0.068	0.063
7	0.054	0.077	0.078	0.082	0.072	0.068
8	0.050	0.052	0.075	0.075	0.079	0.070
9	0.058	0.047	0.050	0.071	0.071	0.076
10 & older	0.386	0.372	0.346	0.326	0.287	0.305
	1995	1996	1997	1998	1999	2000
1	0.091	0.095	0.097	0.099	0.100	0.101
2	0.089	0.093	0.095	0.097	0.097	0.099
3	0.087	0.090	0.093	0.094	0.095	0.097
4	0.085	0.088	0.090	0.092	0.093	0.095
5	0.082	0.085	0.088	0.089	0.090	0.092
6	0.080	0.083	0.085	0.086	0.087	0.089
7	0.062	0.079	0.081	0.083	0.083	0.085
8	0.066	0.061	0.077	0.078	0.079	0.080
9	0.068	0.064	0.058	0.072	0.073	0.075
10 & older	0.289	0.262	0.236	0.210	0.202	0.186
	2001	2002	2003	2004	2005	
1	0.103	0.104	0.106	0.107	0.108	
2	0.101	0.102	0.103	0.105	0.106	
3	0.099	0.100	0.101	0.102	0.103	
4	0.096	0.098	0.099	0.100	0.101	
5	0.094	0.095	0.096	0.097	0.098	
6	0.091	0.092	0.093	0.094	0.095	
7	0.087	0.088	0.089	0.090	0.091	
8	0.082	0.083	0.085	0.086	0.087	
9	0.076	0.077	0.079	0.079	0.080	
10 & older	0.173	0.160	0.149	0.139	0.131	

Table A.53 Proportional Distribution of Single-Unit Trucks
by Age in Future

Age	1989	1990	1991	1992	1993	1994
1	0.091	0.084	0.083	0.081	0.080	0.079
2	0.085	0.088	0.080	0.079	0.078	0.077
3	0.079	0.082	0.084	0.077	0.076	0.075
4	0.081	0.075	0.078	0.080	0.074	0.073
5	0.072	0.077	0.072	0.074	0.076	0.070
6	0.059	0.068	0.073	0.068	0.070	0.072
7	0.041	0.055	0.064	0.069	0.064	0.066
8	0.032	0.038	0.052	0.059	0.064	0.059
9	0.030	0.029	0.035	0.047	0.054	0.059
10 & Older	0.430	0.404	0.380	0.365	0.342	0.368
	1995	1996	1997	1998	1999	2000
1	0.078	0.078	0.077	0.076	0.076	0.075
2	0.076	0.076	0.075	0.074	0.074	0.073
3	0.074	0.074	0.073	0.072	0.072	0.072
4	0.072	0.071	0.071	0.070	0.070	0.069
5	0.070	0.069	0.068	0.068	0.067	0.067
6	0.067	0.066	0.066	0.065	0.065	0.064
7	0.068	0.063	0.062	0.062	0.062	0.061
8	0.062	0.064	0.059	0.058	0.058	0.058
9	0.055	0.057	0.059	0.055	0.054	0.054
10 & Older	0.378	0.383	0.390	0.399	0.403	0.407
	2001	2002	2003	2004	2005	
1	0.075	0.075	0.074	0.074	0.074	
2	0.073	0.073	0.072	0.072	0.072	
3	0.071	0.071	0.071	0.070	0.070	
4	0.069	0.069	0.068	0.068	0.068	
5	0.067	0.066	0.066	0.066	0.066	
6	0.064	0.064	0.063	0.063	0.063	
7	0.061	0.061	0.060	0.060	0.060	
8	0.057	0.057	0.057	0.057	0.056	
9	0.054	0.053	0.053	0.053	0.053	
10 & Older	0.409	0.411	0.416	0.417	0.417	

Table A.54 Motor Fuel Tax Rates in Indiana
(in cents per gallon)

Gasoline/ Gasohol	Special Fuel	Diesel Surtax	MCFUT	Effective Date
2	-	-	-	July 1, 1923
3	-	-	-	July 1, 1925
4	-	-	-	July 1, 1929
6	6	-	-	March 15, 1957
8	8	-	-	April 1, 1969
8.5	8.5	-	-	July 1, 1980
10.5	10.5	-	-	June 1, 1981
11.1	11.1	-	-	January 1, 1982
14.0	15.0	8	-	June 1, 1985
14.0	15.0	8	15.0	July 1, 1986
15.0	16.0	11	16.0	January 1, 1988

Source: [67,68]

Table A.55 Gasoline Price at Indianapolis (Yearly Averages)
(dollars per gallon)

Year	Gasoline Price in Current Dollars	Gasoline Price in 1982 Dollars ^a
1972	0.3400	0.7834
1973	0.3967	0.8624
1974	0.5420	1.0607
1975	0.5901	1.0575
1976	0.6170	1.0458
1977	0.6571	1.0463
1978	0.6706	0.9920
1979	0.8666	1.1524
1980	1.2008	1.4077
1981	1.3740	1.4586
1982	1.2973	1.2973
1983	1.2620	1.2229
1984	1.2127	1.1281
1985	1.1810	1.0601
1986	0.8511	0.7492
1987	0.8760	0.7436
1988	0.8987	0.7330

Source: [70]

Table A.56 Gasoline Price at Indianapolis (Monthly Averages)
(current dollars per gallon)

Year	Month	Gasoline Price	Year	Month	Gasoline Price	Year	Month	Gasoline Price
1972	J	0.3750	1976	J	0.6090	1980	J	1.1080
	F	0.3490		F	0.5990		F	1.1830
	M	0.3590		M	0.5920		M	1.2130
	A	0.3640		A	0.5940		A	1.2180
	M	0.3730		M	0.6090		M	1.2180
	J	0.3490		J	0.6270		J	1.2180
	J	0.3630		J	0.6290		J	1.2180
	A	0.3840		A	0.6390		A	1.2180
	S	0.3320		S	0.6350		S	1.2030
	O	0.3570		O	0.6310		O	1.1980
	N	0.3190		N	0.6240		N	1.2060
	D	0.3590		D	0.6210		D	1.2250
1973	J	0.3570	1977	J	0.6210	1981	J	1.3330
	F	0.3740		F	0.6340		F	1.4150
	M	0.3790		M	0.6460		M	1.4140
	A	0.3840		A	0.6590		A	1.4030
	M	0.3990		M	0.6650		M	1.3940
	J	0.3990		J	0.6710		J	1.3760
	J	0.3990		J	0.6710		J	1.3700
	A	0.3990		A	0.6710		A	1.3700
	S	0.3990		S	0.6710		S	1.3680
	O	0.4090		O	0.6630		O	1.3580
	N	0.4290		N	0.6610		N	1.3550
	D	0.4380		D	0.6560		D	1.3470
1974	J	0.4950	1978	J	0.6540	1982	J	1.3170
	F	0.4840		F	0.6470		F	1.2950
	M	0.4990		M	0.6460		M	1.2470
	A	0.5490		A	0.6530		A	1.2150
	M	0.5690		M	0.6620		M	1.2690
	J	0.5690		J	0.6690		J	1.3490
	J	0.5690		J	0.6750		J	1.3640
	A	0.5690		A	0.6720		A	1.3390
	S	0.5690		S	0.6860		S	1.3280
	O	0.5390		O	0.6860		O	1.2990
	N	0.5420		N	0.6960		N	1.2780
	D	0.5490		D	0.7030		D	1.2510
1975	J	0.5570	1979	J	0.7070	1983	J	1.2200
	F	0.5590		F	0.7230		F	1.1910
	M	0.5620		M	0.7410		M	1.1660
	A	0.5690		A	0.7630		A	1.2540
	M	0.5710		M	0.7940		M	1.2940
	J	0.5870		J	0.8380		J	1.3000
	J	0.6110		J	0.8900		J	1.3070
	A	0.6190		A	0.9430		A	1.3050
	S	0.6190		S	0.9730		S	1.3020
	O	0.6130		O	0.9860		O	1.2890
	N	0.6090		N	1.0080		N	1.2710
	D	0.6090		D	1.0510		D	1.2340

Table A.56 Gasoline Price at Indianapolis (Monthly Averages)
(current dollars per gallon) (continued)

Year	Month	Gasoline Price	Year	Month	Gasoline Price	Year	Month	Gasoline Price
1984	J	1.2130	1985	J	1.1105	1986	J	1.1420
	F	1.2370		F	1.1170		F	0.9840
	M	1.2390		M	1.1260		M	0.8270
	A	1.2630		A	1.1650		A	0.8530
	M	1.2580		M	1.2020		M	1.1620
	J	1.2380		J	1.2280		J	0.8490
	J	1.1970		J	1.2230		J	0.7300
	A	1.1840		A	1.2300		A	0.8210
	S	1.1940		S	1.1850		S	0.7730
	O	1.2000		O	1.1860		O	0.7460
	N	1.1750		N	1.2080		N	0.7620
	D	1.1560		D	1.2020		D	0.7600
1987	J	0.8340	1988	J	0.8410			
	F	0.8120		F	0.8650			
	M	0.8340		M	0.8800			
	A	0.8550		A	0.9390			
	M	0.8810		M	0.9700			
	J	0.8900		J	0.9230			
	J	0.9110		J	0.9800			
	A	0.9220		A	0.9670			
	S	0.9210		S	0.9220			
	O	0.9020		O	0.8840			
	N	0.8670		N	0.9390			
	D	0.8540		D	0.8860			

Source: [70]

Table A.57 Monthly Data for Registration and Driver License Revenues (in dollars)

Year	Month	Registration	Driver License	Year	Month	Registration	Driver License
1982	J	554054	758046	1983	J	2495713	401883
	F	12967496	323052		F	19547140	26780
	M	26446216	423098		M	32600268	343175
	A	17778852	253311		A	10473069	329198
	M	15623996	457733		M	8709775	365895
	J	6643428	458733		J	9163989	431699
	J	7522993	494167		J	5472456	319161
	A	4219372	368161		A	2424076	395061
	S	1687629	503739		S	1551673	385353
	O	1437077	337685		O	1042569	390251
	N	1150192	363724		N	1322080	375427
	D	632228	324197		D	524431	342841
1984	J	6921331	403926	1985	J	3485097	447971
	F	20836453	363022		F	19171152	223501
	M	24416849	263114		M	24386027	362076
	A	13303195	377439		A	16959765	380409
	M	10385927	468278		M	10436435	399917
	J	9036330	365350		J	9766482	344928
	J	7982689	464128		J	7080990	494761
	A	2870488	391160		A	3050214	601708
	S	1297539	358190		S	2529667	367973
	O	1805084	539361		O	1946598	531512
	N	791439	302439		N	1192114	316146
	D	577450	399347		D	721206	407244
1986	J	4057499	380985	1987	J	1731371	332982
	F	23048677	327380		F	10120222	240923
	M	27049506	310401		M	25369495	351777
	A	23082397	418673		A	9575104	429775
	M	8535731	393877		M	5767736	335227
	J	8339516	397068		J	4807072	380453
	J	10429386	506946		J	6750751	412719
	A	5452191	282583		A	5279642	360408
	S	4523613	505169		S	5083622	544098
	O	1361955	451833		O	4998771	359053
	N	1324554	318920		N	4253142	431242
	D	904508	423408		D	1251615	334554
1988	J	789798	221328				
	F	13223607	349371				
	M	24111673	537221				
	A	7713389	378219				
	M	5535353	411819				
	J	7644110	452190				
	J	5389944	445330				
	A	5803985	526084				
	S	5406896	388019				
	O	7005779	543465				
	N	3137493	409007				
	D	877677	361010				

Source: [67]

Table A.58 Monthly Gallonage Data for Different Motor Fuel Taxes (in thousands)

Year	Month	Gasoline Gallons	Special Fuel Gallons	MCFUT ^a Gallons	Diesel Surtax Gallons
1986	J	14143	183813	-17793	58379
	A	225857	53373	7180	1868
	S	199143	51154	54713	4231
	O	191257	52227	1433	5247
	N	177657	34400	20287	3242
	D	189286	49973	2433	142088
1987	J	198522	44053	1587	1154
	F	197171	44213	-33193	198379
	M	146400	43280	53467	1923
	A	177314	47386	0	100302
	M	185971	49546	2307	11374
	J	94086	41600	44720	15412
	J	327057	56613	-7200	86593
	A	218850	67594	807	604
	S	232829	51720	-6313	3836
	O	226114	52227	-2587	19341
	N	218657	48426	21080	125962
	D	223886	60773	2767	16538
1988	J	171300	47700	9625	42577
	F	229220	50600	7069	61758
	M	175680	51450	4931	21878
	A	202480	56575	17881	69391
	M	191387	51500	3019	11409
	J	211120	63650	6875	26733
	J	213627	50100	10831	44196
	A	204280	68713	5125	25134
	S	205147	50976	4725	25295
	O	225813	67245	8838	47213
	N	202533	56325	17044	69491
	D	210293	60725	5144	31688

Table A.59 Monthly Data for Highway Use Gasoline and Special Fuel Consumption (thousands of gallons)

Year	Month	Gasoline	Special Fuel	Year	Month	Gasoline	Special Fuel
1973	J	226136	33024	1977	J	219901	36032
	F	204921	31299		F	203754	35569
	M	224567	33486		M	242857	40948
	A	228087	31453		A	251834	37841
	M	243241	33562		M	239896	38860
	J	229648	31429		J	232907	38212
	J	229101	29293		J	236378	35940
	A	248378	32598		A	237737	38166
	S	219424	31153		S	217889	39557
	O	237779	35801		O	229443	41597
	N	215528	32711		N	238050	41319
	D	225662	32516		D	244346	39696
1974	J	203832	31363	1978	J	243088	31098
	F	181918	26650		F	189448	30698
	M	204925	32879		M	218379	35341
	A	216939	32215		A	228381	32659
	M	224302	32407		M	243872	33539
	J	217478	31565		J	261347	32979
	J	236063	31961		J	267035	31019
	A	234479	31836		A	258987	32940
	S	205856	31814		S	263676	34140
	O	234039	36520		O	244070	35901
	N	213489	31897		N	266116	35661
	D	224453	28108		D	252452	34260
1975	J	208097	31218	1979	J	224589	44350
	F	186614	29229		F	233597	31638
	M	207482	29190		M	234101	35613
	A	223313	30976		A	248086	37038
	M	234252	29784		M	247352	48488
	J	223696	29388		J	221552	45525
	J	243098	29636		J	222937	52988
	A	226621	30368		A	227868	49750
	S	216219	33518		S	212612	58950
	O	230724	36451		O	228974	72625
	N	212666	31260		N	223772	43113
	D	231503	31910		D	231536	29788
1976	J	209184	33494	1980	J	213987	48263
	F	195232	33053		F	211618	56580
	M	230878	38062		M	195853	45865
	A	238728	35165		A	207959	61775
	M	227118	36114		M	212388	46597
	J	241301	35523		J	224309	46960
	J	243348	33379		J	205980	45839
	A	244000	35452		A	229144	32007
	S	227677	36759		S	229345	46479
	O	236329	38690		O	200862	34952
	N	232433	38378		N	75087	47568
	D	252563	36888		D	331053	64330

Table A.59 Monthly Data for Highway Use Gasoline and Special Fuel Consumption (thousands of gallons) (continued)

Year	Month	Gasoline	Special Fuel	Year	Month	Gasoline	Special Fuel
1981	J	245517	48063	1985	J	157125	
	F	196229	51498		F	148638	
	M	178857	46890		M	193496	
	A	193806	48265		A	196891	
	M	112211	47997		M	219199	
	J	212694	43000		J	223563	
	J	174829	44049		J	233506	
	A	249581	43720		A	237384	
	S	265506	56196		S	210955	
	O	244669	48475		O	214592	
	N	274786	60991		N	196406	
	D	190557	45026		D	193013	
1982	J	148759	51180	1986	J	169764	
	F	146154	48215		F	155199	
	M	190513	50176		M	201909	
	A	202899	45706		A	200653	
	M	227351	45000		M	222753	
	J	187722	70264		J	226520	
	J	216747	52086		J	238072	
	A	226756	40611		A	246109	
	S	198176	47204		S	219238	
	O	198993	63390		O	225515	
	N	195730	37337		N	204671	
	D	196450	44239		D	200904	
1983	J	113661	71326	1987	J	172295	
	F	149286	36300		F	172821	
	M	183296	52577		M	208070	
	A	202595	47646		A	209648	
	M	225949	47640		M	234901	
	J	225205	48683		J	224904	
	J	247202	44347		J	245949	
	A	243671	50871		A	254630	
	S	208069	53547		S	234112	
	O	208287	58118		O	238320	
	N	189118	50347		N	220959	
	D	184783	50791		D	213857	
1984	J	159006	47025	1988	J	186789	
	F	151309	44748		F	171972	
	M	183302	54210		M	214039	
	A	189315	55989		A	219331	
	M	213371	63103		M	239703	
	J	216258	63956		J	238116	
	J	226602	67015		J	245789	
	A	241276	71355		A	243407	
	S	211928	62676		S	226739	
	O	219145	64810		O	232295	
	N	201584	59617		N	214039	
	D	192443	56913		D	213510	

Source: [68]

Table A.60 Monthly Vehicle License Fees and IRP Revenues

MONTH	YEAR	MVHALIC\$	HRSF-S\$	HRSF-L\$	HRSF\$	TOTAL.LIC	IRP
JUL	1986	8452580	594305	486251	1080556	9533136	0
AU		11107626	498785	408171	906956	12014582	0
S		7159893	425445	348096	773541	7933434	0
O		5896313	324630	265609	590239	6486552	0
N		3127564	328406	268698	597104	3724668	0
D		2655075	320504	262236	582740	3237815	115260
JAN	1987	2325317	248647	203440	452087	2777404	290715
F		1990511	219216	179364	398580	2389091	706516
MR		5167241	368200	301255	669455	5836696	1456037
AP		25056449	1911723	1564139	3475862	28532311	2610733
MY		11883219	800132	654660	1454792	13338011	2118790
JUN		6065933	326520	267155	593675	6659608	3725452
JUL		7033614	547862	448256	996118	8029732	2073613
AU		7661018	560404	458517	1018921	8679939	1830595
S		5982768	392991	321541	714532	6697300	421849
O		6160181	448003	366552	814555	6974736	2214554
N		6635675	519261	424856	944117	7579792	385801
D		4430739	339867	278077	617944	5048683	331991
JAN	1988	3884369	287193	234979	522172	4406541	433926
F		1464842	177100	144904	322004	1786846	1384786
MR		4642753	427378	349675	777053	5419806	2362774
AP		27614707	2401024	1964479	4365503	31980210	2779544
MY		8587733	681799	557838	1239637	9827370	3458017
JUN		7612837	548997	449183	998180	8611017	4535196
JUL		22230004	659444	539550	1198994	23428998	2242814
AU		6608379	379964	310883	690847	7299226	1705139
S		7253873	509809	417121	926930	8180803	1424952
O		5580616	362709	296766	659475	6240091	781801
N		7338856	500021	409113	909134	8247990	274801
D		6044661	450588	368665	819253	6863914	311035
JAN	1989	2471474	218297	178610	396907	2868381	860808
F		4459876	162730	133146	295876	4755752	1563870
MR		9840222	993852	813151	1807003	11647225	18699373
AP		23480526	2158302	1765883	3924185	27404711	4271171
MY		10732995	766312	629437	1395749	12128744	3726484
JUN		7231622	586866	480163	1067029	8298651	6671324
JUL		7280020	587704	480849	1068553	8348573	19541251
AU		6387533	490128	401014	891142	7278675	2122440
S		7634223	615151	503305	1118456	8752679	2122123
O		7434084	448196	366706	814902	8248986	459573
N		6374975	467307	379887	847194	7222169	391192
D		6112047	481714	394129	875843	6987890	299454
JAN	1990	2355338	258697	211661	470358	2825696	2144855
F		1647438	210811	172482	383293	2030731	3395438
MR		17013144	1414954	1157690	2572644	19585788	1801365
AP		20244964	1611337	1318367	2929704	23174668	13074979
MY		9007224	681507	557596	1239103	10246327	6858888
JUN		8592693	643507	553018	1196525	9789218	10350508
JUL		4393701	383563	313825	697388	5091089	5746171
AU		8314592	537863	440069	977932	9292524	2005344
S		10538500	756952	619324	1376276	11914776	1894487
O		5372218	406726	332775	739501	6111719	669957
N		6911551	458921	375481	834402	7745953	660293
D		5198936	452704	370394	823098	6022034	190198

Source: [73]

Table A.61 Monthly Gasoline Revenue and Gallonage Data

MONTH	YEAR	MVHA \$	SP.DIST\$	HRSF-ST \$	HRSF-LO\$	HWY.C.F.\$
JUL	1985	8410474	24999575	1694372	1386305	0
AU		22472946	0	4211375	3445671	0
S		22399100	425	4168614	3410684	0
O		19505941	0	3592343	2939190	0
N		23278746	0	4386797	3589197	0
D		18964305	0	3498700	2862573	0
JAN	1986	24054873	0	4417889	3614636	0
F		15882179	0	2921501	2390319	0
MR		20359423	0	3737560	3058004	0
AP		23296055	0	4271726	3495049	0
MY		21636772	0	4254126	3480602	0
JUN		19288356	0	3558390	2911410	0
JUL		7027528	25000000	1341418	1097377	0
AU		23906879	0	4439283	3632141	0
S		23311844	0	4300852	3518879	0
O		21209928	0	3938542	3222493	0
N		22462476	0	4137310	3384868	0
D		22191086	0	4081060	3338698	0
JAN	1987	23501154	0	4315369	3530756	0
F		17719712	0	3285355	2688018	0
MR		20460062	0	3779480	3092301	0
AP		21524581	0	4027567	3295282	0
MY		11593544	0	2219772	1816177	0
JUN		34043468	0	6295886	5151179	0
JUL		5388753	25000000	1026291	839693	0
AU		24257860	0	4481472	3666658	0
S		23697570	0	4352537	3561167	0
O		22882706	0	4208163	3443042	0
N		23513354	0	4317737	3532694	0
D		18303505	0	3361041	2749943	0
JAN	1988	24896070	0	4567118	3736733	0
F		19850772	0	3640190	2978337	0
MR		22649556	0	4176594	3417213	0
AP		21102480	0	3947245	3230403	2052114
MY		23419666	0	4353643	3562997	2263351
JUN		23551059	0	4400839	3601622	2287888
JUL		5165587	25000000	963137	788099	2287313
AU		23563060	0	4339683	3551572	2256093
S		25337904	0	4656105	3810530	2420658
O		22714586	0	4175751	3417411	2170806
N		23592793	0	4336953	3549338	2254842
D		21933614	0	4045035	3310434	2102746
JAN	1989	24238699	0	4459747	3649833	2318513
F		20528722	0	3779052	3092756	1964636
MR		20381391	0	3737111	3058431	1942832
AP		22403931	0	4146628	3393577	2155729
MY		19885365	0	3709922	3036179	1928697
JUN		26126410	0	4812805	3938773	1324653
JUL		459402	31263997	112859	92363	2293689
AU		28484400	-6263997	5258015	4302947	2285743
S		24675187	-6365	4533019	3709797	2362969
O		26515986	0	4873637	3988557	2527318
N		23336289	0	3787903	3099998	1969237
D		20494675	0	4260461	3486738	2214908
JAN	1990	24177891	0	4446693	3639148	2311725
F		21380659	0	3922886	3210467	2039411
MR		19835295	0	3637029	2976524	1890801

Table A.61 Monthly Gasoline Revenue and Gallonage Data
(continued)

MONTH	YEAR	MVHA \$	SP.DIST\$	HRSF-ST\$	HRSF-LO\$	HWY.C.F.\$
AP		23167433	0	4269181	3493874	2219442
MY		23008144	0	4246137	3475015	2207462
JUN		24525587	0	4502592	3684895	2340786
JUL		5799029	25000000	1067686	873609	2341637
AU		24670086	0	4532113	3709056	2356133
S		25285046	0	4643175	3799948	2413872
O		22289564	0	4097343	3360507	2132785
N		24125466	0	4420393	3609687	2363342
D		23523017	0	4311875	3528814	2241637
JAN	1991	23338136	0	4278167	3501228	2224113
F		21245909	0	3897745	3189892	2026341
MR		19222171	0	3531636	2890271	1836010
AP		22956759	0	4225093	3457744	2201391
MY		23164731	0	4251880	3479714	2210447
JUN		25003825	0	4585718	3752925	2384001
MONTH	YEAR	TOTAL \$	REFUND \$	TAX RATE	TOTAL GAL	REFUND GAL
JUL	1985	36490726	43072	0.14	260648043	307657
AU		30129992	183352	0.14	215214229	1309657
S		29978823	179287	0.14	214134450	1280621
O		26037474	109852	0.14	185981957	784657
N		31254740	423371	0.14	223248143	3024079
D		25325578	110191	0.14	180896986	787079
JAN	1986	32087398	163522	0.14	229195700	1168014
F		21193999	153240	0.14	151385707	1094571
MR		27154987	76509	0.14	193964193	546493
AP		31062830	206660	0.14	221877357	1476143
MY		29371500	44310	0.14	209796429	316500
JUN		25758156	24734	0.14	183986829	176671
JUL		34466323	338348	0.14	246188021	2416771
AU		31978303	188597	0.14	228416450	1347121
S		31131575	45254	0.14	222368393	323243
O		28370963	312044	0.14	202649736	2228886
N		29984654	101319	0.14	214176100	723707
D		29610844	145868	0.14	211506029	1041914
JAN	1987	31347279	110977	0.14	223909136	792693
F		23693085	230666	0.14	169236321	1647614
MR		27331843	225263	0.14	195227450	1609021
AP		28847430	55649	0.14	206053071	397493
MY		15629493	28586	0.14	111639236	204186
JUN		45490533	41388	0.14	324932379	295629
JUL		32254737	12857	0.14	230390979	91836
AU		32405990	84	0.14	231471357	600
S		31611274	413119	0.14	225794814	2950850
O		30533911	62025	0.14	218099364	443036
N		31363785	55104	0.14	224027036	393600
D		24414489	265529	0.14	174389207	1896636

Table A.61 Monthly Gasoline Revenue and Gallonage Data
(continued)

MONTH	YEAR	TOTAL \$	REFUNDS	TAX RATE	TOTAL GAL.	REFUND GAL.
JAN	1988	33199921	75909	0.14	237142293	542207
F		26469299	41421	0.14	189066421	295864
MR		30243363	263721	0.14	216024021	1883721
AP		30332242	195967	0.15	202214947	1306447
MY		33599657	101127	0.15	223997713	674180
JUN		33841408	100270	0.15	225609387	668467
JUL		34204136	106561	0.15	228027573	710407
AU		33710408	109491	0.15	224736053	729940
S		36225197	194221	0.15	241501313	1294807
O		32478554	82978	0.15	216523693	553187
N		33733926	89303	0.15	224892840	595353
D		31391829	110025	0.15	209278860	733500
JAN	1989	34666792	176161	0.15	231111947	1174407
F		29365166	40996	0.15	195767773	273307
MR		29119765	82060	0.15	194131767	547067
AP		32099865	194044	0.15	213999100	1293627
MY		28560163	170843	0.15	190401087	1138953
JUN		36202641	122916	0.15	241350940	819440
JUL		34222310	9829	0.15	228148733	65527
AU		34067108	238437	0.15	227114053	1589580
S		35274607	128500	0.15	235164047	856667
O		37905498	83819	0.15	252703320	558793
N		32193427	50000	0.15	214622847	333333
D		30456782	124767	0.15	203045213	831780
JAN	1990	34575457	80626	0.15	230503047	537507
F		30553423	86584	0.15	203689487	577227
MR		28339649	1040911	0.15	188930993	6939407
AP		33149930	220966	0.15	220999533	1473107
MY		32936758	12817	0.15	219578387	85447
JUN		35053860	927195	0.15	233692400	6181300
JUL		35081961	25215	0.15	233879740	168100
AU		35267388	155944	0.15	235115920	1039627
S		36142041	97859	0.15	240946940	652393
O		31880199	44636	0.15	212534660	297573
N		34518888	144668	0.15	230125920	964453
D		33605343	119305	0.15	224035620	795367
JAN	1991	33341644	86203	0.15	222277627	574687
F		30359887	352171	0.15	202399247	2347807
MR		27480088	340581	0.15	183200587	2270540
AP		32840987	338516	0.15	218939913	2256773
MY		33106772	164856	0.15	220711813	1099040
JUN		35726469	197434	0.15	238176460	1316227

Source: [73]

Table A.62 Monthly Special Fuel Revenue and Gallonage Data

MONTH	YEAR	MVHA \$	SPDIST\$	HRSF-S\$	HRSF-L\$	TOTAL \$
JUL	1985	0	6884791	0	0	6884791
AU		0	6667348	0	0	6667348
S		0	7330781	0	0	7330781
O		2571506	4117080	471443	365363	7525392
N		5729034	0	1050323	859355	7638712
D		5506901	0	1009599	826035	7342535
JAN	1986	5329436	0	977063	799340	7105839
F		5590573	0	1028296	832899	7451768
MR		5497940	0	1007956	824691	7330587
AP		6002559	0	1100469	900496	8003524
MY		6195373	0	1135818	929306	8260497
JUN		5968608	0	1094219	895270	7958097
JUL		130449	7889347	23996	19487	8063279
AU		128548	7524407	24295	18554	7695804
S		63625	7762474	12486	8723	7847308
O		4456077	1818191	817532	667827	7759627
N		6387079	5582	1175811	953216	8521688
D		5662572	0	1045198	842326	7550096
JAN	1987	5723809	0	1049365	858571	7631745
F		5688737	0	1040526	851340	7580603
MR		5836952	0	1072440	895032	7804424
AP		6271271	0	1149733	940691	8361695
MY		5733469	0	1051136	860020	7644625
JUN		6375757	0	1168889	956364	8501010
JUL		77813	8117699	14266	11672	8221450
AU		73277	7741413	13434	10991	7839115
S		65062	7958638	11928	9759	8045387
O		5447158	1182250	998646	817074	8445128
N		6887099	0	1262635	1033065	9182799
D		5893834	0	1080536	884075	7858445
JAN	1988	6065957	0	1112851	910514	8089322
F		6174276	0	1132326	926449	8233051
MR		6788837	0	1244620	1018326	9051783
AP		6178523	0	1132729	926778	8238030
MY		7613235	0	1399977	1145436	10158648
JUN		6015651	0	1102343	901917	8019911
JUL		-22691	9796744	-4160	788099	10557992
AU		62859	8372727	11524	3551572	11998682
S		1822208	6830528	334447	3810530	12797713
O		6999093	0	1283167	3417412	11699672
N		7287755	0	1336088	3549338	12173181
D		6859518	0	1257578	3310434	11427530
JAN	1989	7014168	0	1285931	3649833	11949932
F		6330391	0	1160572	3092756	10583719
MR		7466068	0	1368779	3058431	11893278
AP		8213718	0	1505848	3393577	13113143
MY		7170094	0	1314526	3036179	11520799
JUN		7158112	0	1312687	398773	8869572
JUL		-78000	9903837	-14325	-11700	9799812
AU		101737	8762489	18651	15260	8898137
S		3076448	6333673	564040	461467	10435628
O		7079192	0	1297852	1061878	9438922
N		7456054	0	1366943	1118408	9941405
D		7401986	0	1357031	1110298	9869315

Table A.62 Monthly Special Fuel Revenue and Gallonage Data
(continued)

MONTH	YEAR	MVHA \$	SPDIST\$	HRSF-S\$	HRSF-L\$	TOTAL \$
JAN	1990	6068442	0	1112548	910266	8091256
F		7429886	0	1362146	1114483	9906515
MR		8314559	0	1524336	1247184	11086079
AP		7007143	0	1284643	1051071	9342857
MY		8489908	0	1556483	1273486	11319877
JUN		7775909	0	1425583	1166386	10367878
JUL		84843	10174129	15554	12726	10287252
AU		50838	9846645	9320	7625	9914428
S		4390780	4979226	804976	658616	10833598
O		7446549	0	1365200	1116982	9928731
N		8560416	0	1569867	1284437	11414720
D		7803627	0	1430664	1170544	10404835
JAN	1991	7019837	0	1286970	1052975	9359782
F		8614087	0	1579249	1292112	11485448
MR		7433066	0	1362728	1114960	9910754
AP		7858175	0	1444598	1179326	10482099
MY		7683743	0	1738053	1152561	10574357
JUN		7812168	0	1099663	1167709	10079540
MONTH	YEAR	TOTAL_REF\$	TAX RATE	TOTAL.GAL	REF.GAL	NET.GAL
JUL	1985	0	0.15	45898607	0	45898607
AU		0	0.15	44448987	0	44448987
S		0	0.15	48871873	0	48871873
O		0	0.15	50169280	0	50169280
N		0	0.15	50924747	0	50924747
D		219885	0.15	48950233	1465900	47484333
JAN	1986	141420	0.15	47372260	942800	46429460
F		1044722	0.15	49678453	6964813	42713640
MR		165501	0.15	48870580	1103340	47767240
AP		118928	0.15	53356827	792853	52563973
MY		782254	0.15	55069980	5215027	49854953
JUN		3774102	0.15	53053980	25160680	27893300
JUL		86323	0.15	53755193	575487	53179707
AU		339938	0.15	51305360	2266253	49039107
S		943284	0.15	52315387	6288560	46026827
O		939185	0.15	51730847	6261233	45469613
N		3263862	0.15	56811253	21759080	35052173
D		795311	0.15	50333973	5302073	45031900
JAN	1987	7624002	0.15	50878300	50826680	51620
F		1158176	0.15	50537353	7721173	42816180
MR		2956097	0.15	52029493	19707313	32322180
AP		603202	0.15	55744633	4021347	51723287
MY		978151	0.15	50964167	6521007	44443160
JUN		2453600	0.15	56673400	16357333	40316067
JUL		89622	0.15	54809667	597480	54212187
AU		575899	0.15	52260767	3839327	48421440
S		1196967	0.15	53635913	7979780	45656133
O		3255425	0.15	56300853	21702833	34598020
N		677219	0.15	61218660	4514793	56703867
D		2074650	0.15	52389633	13831000	38558633
JAN	1988	2091766	0.15	53928813	13945107	39983707
F		2602775	0.15	54887007	17351833	37535173
MR		2226872	0.15	60345220	14845813	45499407
AP		1250303	0.16	51487688	7814394	43673294

Table A.62 Monthly Special Fuel Revenue and Gallonage Data
(continued)

MONTH	YEAR	TOTAL_REF\$	TAX RATE	TOTAL.GAL	REF.GAL	NET.GAL
MY	1988	1625191	0.16	63491550	10157444	53334106
JUN		1483073	0.16	50124444	9269206	40855238
JUL		1664627	0.16	65987450	10403919	55583531
AU		1598062	0.16	74991763	9987888	65003875
S		2068239	0.16	79985706	12926494	67059213
O		2105976	0.16	73122950	13162350	59960600
N		822161	0.16	76082381	5138506	70943875
D		790895	0.16	71422063	4943094	66478969
JAN	1989	1715696	0.16	74687075	10723100	63963975
F		633685	0.16	66148244	3960531	62187713
MR		1536461	0.16	74332988	9602881	64730106
AP		1649087	0.16	81957144	10306794	71650350
MY		3830264	0.16	72004994	23939150	48065844
JUN		1272115	0.16	55434825	7950719	47484106
JUL		1392865	0.16	61248825	8705406	52543419
AU		1247983	0.16	55613356	7799894	47813463
S		2619760	0.16	65222675	16373500	48849175
O		1508515	0.16	58993263	9428219	49565044
N		318455	0.16	62133781	1990344	60143438
D		2471611	0.16	61683219	15447569	46235650
JAN	1990	2950081	0.16	50570350	18438006	32132344
F		754560	0.16	61915719	4716000	57199719
MR		2454841	0.16	69287994	15342756	53945238
AP		1350641	0.16	58392856	8441506	49951350
MY		1421791	0.16	70749231	8886194	61863038
JUN		550099	0.16	64799238	3438119	61361119
JUL		865787	0.16	64295325	5411169	58884156
AU		4257022	0.16	61965175	26606388	35358788
S		4556582	0.16	67709988	28478638	39231350
O		2790679	0.16	62054569	17441744	44612825
N		767695	0.16	71342000	4798094	66543906
D		3783146	0.16	65030219	23644663	41385556
JAN	1991	1557330	0.16	58498638	9733313	48765325
F		933199	0.16	71784050	5832494	65951556
MR		4207678	0.16	61942213	26297988	35644225
AP		2033583	0.16	65513119	12709894	52803225
MY		1522536	0.16	66089731	9515850	56573881
JUN		1767002	0.16	62997125	11043763	51953363

Source: [73]

Table A.63 Monthly Diesel Surtax Revenue and Gallonage Data

MONTH	YEAR	MVHA \$	HWYFUND\$	MCRF \$	TOTAL \$	TAX RATE\$	TOTAL.GAL
JUL	1985	0	0	0	0	0.08	0
AU		0	0	0	0	0.08	0
S		0	0	0	0	0.08	0
O		0	0	0	0	0.08	0
N		0	0	0	0	0.08	0
D		519011	458123	0	977134	0.08	12214175
JAN	1986	813486	813486	0	1626972	0.08	20337150
F		0	0	0	0	0.08	0
MR		0	0	0	0	0.08	0
AP		0	0	0	0	0.08	0
MY		550121	931335	0	1481456	0.08	18518200
JUN		2506509	2125296	0	4631805	0.08	57897563
JUL		103704	103704	0	207408	0.08	2592600
AU		117839	117839	0	235678	0.08	2945975
S		191176	191176	0	382352	0.08	4779400
O		118397	118397	0	236794	0.08	2959925
N		5213287	5213287	0	10426574	0.08	130332175
D		923	923	0	1846	0.08	23075
JAN	1987	7221493	4956223	0	12177716	0.08	152221450
F		69592	2334861	0	2404453	0.08	30055663
MR		2194843	2194843	0	4389686	0.08	54871075
AP		1870132	1870132	0	3740264	0.08	46753300
MY		561491	561491	0	1122982	0.08	14037275
JUN		3152353	3152353	0	6304706	0.08	78808825
JUL		21661	21661	0	43322	0.08	541525
AU		448899	833423	0	1282322	0.08	16029025
S		705870	705870	0	1411740	0.08	17646750
O		4586183	4586183	0	9172366	0.08	114654575
N		618760	618760	0	1237520	0.08	15469000
D		4684357	4684357	0	9368714	0.08	117108925
JAN	1988	368125	368124	0	736249	0.08	9203113
F		1639860	1255337	0	2895197	0.08	36189963
MR		3480094	3480094	0	6960188	0.08	87002350
AP		563898	563898	107379	1235175	0.11	11228864
MY		1338396	1338396	256532	2933324	0.11	26666582
JUN		2217829	2217829	431931	4867589	0.11	44250809
JUL		1480537	1480537	289159	3250233	0.11	29547573
AU		1043857	1043857	200925	2288639	0.11	20805809
S		4175103	4175103	821400	9171606	0.11	83378236
O		2557965	1823770	393563	4775298	0.11	43411800
N		692990	1427185	282300	2402475	0.11	21840682
D		2281823	2281823	451349	5014995	0.11	45590864
JAN	1989	2703711	2703711	534800	5942222	0.11	54020200
F		495357	495357	97982	1088696	0.11	9897236
MR		3493499	3493499	691021	7678019	0.11	69800173
AP		2366212	2366212	468042	5200466	0.11	47276964
MY		4951798	4951798	979503	10883099	0.11	98937264
JUN		1259853	1259953	249201	2769007	0.11	25172791

Table A.63 Monthly Diesel Surtax Revenue and Gallonage Data
(continued)

MONTH	YEAR	MVHA \$	SHF \$	MCRF \$	TOTAL \$	TAX RATE\$	TOTAL GAL.
JUL		918019	912159	187445	2017623	0.11	18342027
AU		1257810	1257273	248797	2763880	0.11	25126182
S		3124078	3129938	612089	6866105	0.11	62419136
O		2080982	2080882	411622	4573486	0.11	41577145
N		273862	273862	54170	601894	0.11	5471764
D		5677175	5677175	1122957	12477307	0.11	113430064
JAN	1990	3037097	1942228	330776	5310101	0.11	48273645
F		902833	1997702	448550	3349085	0.11	30446227
MR		4604109	4604109	910702	10118920	0.11	91990182
AP		1551000	1551000	306791	3408791	0.11	30989009
MY		701519	701519	138762	1541800	0.11	14016364
JUN		498173	527357	104312	1129842	0.11	10271291
JUL		852232	852232	168573	1873037	0.11	17027609
AU		6268216	6268216	1239866	13776298	0.11	125239073
S		4150777	4150776	821032	9122585	0.11	82932591
O		2376807	2376807	470137	5223751	0.11	47488645
N		1215575	1215575	240443	2671593	0.11	24287209
D		5027039	5027039	994359	11048437	0.11	100440336
JAN	1991	639809	784661	155207	1579677	0.11	14360700
F		1171331	1026479	203040	2400850	0.11	21825909
MR		5551567	5551567	1098112	12201246	0.11	110920418
AP		1308737	1305548	258871	2873156	0.11	26119600
MY		3196340	2866962	632243	6695545	0.11	60868591
JUN		1000030	1332599	197808	2530437	0.11	23003973

Source: [73]

Table A.64 Monthly MCFUT Revenue and Gallonage Data

MONTH	YEAR	MCFUT \$	TAX_RATE	MCFUT GAL.
JUL	1985	518649	0.15	3457660
AU		1649754	0.15	10998360
S		82271	0.15	548473
O		170454	0.15	1136360
N		6712510	0.15	44750067
D		-517977	0.15	-3453180
JAN	1986	-486647	0.15	-3244313
F		8025377	0.15	53502513
MR		810283	0.15	5401887
AP		657459	0.15	4383060
MY		7044415	0.15	46962767
JUN		-2668632	0.15	-17790880
JUL		1076033	0.15	7173553
AU		8207719	0.15	54718127
S		214885	0.15	1432567
O		3042826	0.15	20285507
N		379307	0.15	2528713
D		223633	0.15	1490887
JAN	1987	-4978845	0.15	-33192300
F		8021110	0.15	53474067
MR		-2666715	0.15	-17778100
AP		-1927532	0.15	-12850213
MY		6708391	0.15	44722607
JUN		-4082081	0.15	-27213873
JUL		120892	0.15	805947
AU		-948000	0.15	-6320000
S		379531	0.15	2530207
O		3162266	0.15	21081773
N		435039	0.15	2900260
D		2973778	0.15	19825187
JAN	1988	270702	0.15	1804680
F		895871	0.15	5972473
MR		2860742	0.15	19071613
AP		487024	0.16	3043900
MY		1096844	0.16	6855275
JUN		1732518	0.16	10828238
JUL		961179	0.16	6007369
AU		617237	0.16	3857731
S		3003224	0.16	18770150
O		1338079	0.16	8362994
N		822929	0.16	5143306
D		1832649	0.16	11454056
JAN	1989	1811972	0.16	11324825
F		877439	0.16	5483994
MR		2470882	0.16	15443013
AP		1726601	0.16	10791256
MY		2469174	0.16	15432338
JUN		714586	0.16	4466163
JUL		401748	0.16	2510925
AU		1264635	0.16	7903969
S		1918962	0.16	11993513
O		1027303	0.16	6420644
N		414756	0.16	2592225
D		3509359	0.16	21933494

Table A.64 Monthly MCFUT Revenue and Gallonage Data
(continued)

MONTH	YEAR	MCFUT \$	TAX_RATE	MCFUT GAL.
JAN	1990	2023899	0.16	12649369
F		460082	0.16	2875513
MR		2927989	0.16	18299931
AP		968922	0.16	6055763
MY		497811	0.16	3111319
JUN		386107	0.16	2413169
JUL		407737	0.16	2548356
AU		2503375	0.16	15646094
S		1743228	0.16	10895175
O		1220989	0.16	7631181
N		640576	0.16	4003600
D		2675276	0.16	16720475
JAN	1991	499453	0.16	3121581
F		713121	0.16	4457006
MR		2929441	0.16	18309006
AP		757402	0.16	4733763
MY		2142811	0.16	13392569
JUN		494576	0.16	3091100

NATIONAL VEHICLE REGISTRATION SERVICE

PASSENGER CARS IN OPERATION AS OF JULY 1, 1981

MAKE	JULY 1 TOTALS										1980 TOTALS									
	81	80	79	78	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61
AMERICAN MOTORS	61350	18958	3180	3180	3603	4341	6199	4608	9405	6982	4671	1924	1844	773	877	2785				
BUICK	206419	12224	18263	17888	20965	22287	18616	13100	11762	17840	13172	8661	8944	4275	2961	2265	5407			
CADILLAC	60246	2502	3381	6118	6348	6456	6005	4934	4314	5063	3875	2221	1754	1519	995	775	1680			
CHEVROLET	620044	23666	49878	54878	58866	60648	52637	41776	52892	51183	40499	28820	24566	18126	10618	9895	24123			
CHRYSLER	63933	1384	3621	7179	8201	8865	8478	5305	2694	4675	3509	2180	1862	1707	1067	1094	1752			
DODGE	115556	5433	7879	9324	10418	8534	7174	9546	11212	8748	6085	4696	3956	3222	2356	2232	4210			
FORD	444280	13748	24542	42019	45987	42562	39180	31741	41488	40075	32588	26335	16645	10133	9221	7838	6012	18476		
IMPERIAL	1772							181	260	276	216	143	104	102	84	70	172			
LINCOLN	25186	858	1043	3581	3788	3881	2431	1848	1707	2117	1386	708	447	495	174	174	470			
MERCURY	98732	4418	5605	11459	12174	10041	8689	7146	7283	8027	8632	3816	2366	2292	1730	1040	667	2361	2	
OLDSMOBILE	246881	18037	23644	30273	32271	38458	27567	18929	17988	24305	17542	10954	10147	6773	4673	3515	2603	4403		
PLYMOUTH	128871	7425	8034	8550	9404	9987	9015	7648	12681	14365	10604	7470	5723	4603	3850	2638	2379	4899		
PONTIAC	198842	8127	12428	20838	21599	23238	17189	11504	12282	18455	12522	8495	8116	6693	4878	3915	2745	3511		
IMPORTS *	238870	17687	32640	26650	24423	19476	18016	11374	20425	15905	12748	11834	7630	6189	4072	2846	1855	5769	2	
MISC. DOMESTIC	4048	230	336	255	208	182	135	124	127	111	88	108	73	100	89	1711	2			
TOTALS	2558042	118111	198083	242306	258377	258668	220921	167502	204933	221601	168801	112992	95958	75036	57366	40932	35132	81535	6	

*EXCLUDES DOMESTIC SPONSORED

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Figure A.1 R.L. Polk Data: Sample Sheet for Automobiles

MAKE	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67
CHEVROLET	360879	22977	17752	10753	13040	14820	36990	39715	39560	26680	17994	20001	17032	14964	10541	10040	51132		
DIAMOND REG	717	2	9																
DOODGE	50537	7208	8307	4269	2750	3350	8534	7720	11242	5405	4833	5420	4524	2077	1752	1000	6536		
FORD	354010	19303	25513	20000	12801	14090	36795	35076	28301	23604	14874	19096	17506	13272	9251	8405	41651		
FREIGHT- LINER	6110	1352	1074	373	295	335	504	305	309	219	193	231	109	102	80	50	91		
GMC	90409	6150	6032	3100	3515	3851	9100	8632	6942	4052	3107	3944	3606	2932	2052	1321	10159		
INTER- NATIONAL	55034	1007	2269	1634	1119	1710	4509	3782	3656	2429	2000	3845	3573	2551	2550	1934	12000		
JEEP	29508	1249	1523	1077	785	1452	4432	3905	2113	1524	043	1043	659	419	302	280	1014		
KENWORTH	5156	809	753	370	306	304	405	430	305	151	169	250	211	145	76	45	56		
MACK	6954	532	554	218	352	532	809	659	519	206	302	340	323	269	170	143	771		
PETERBILT	2903	347	492	191	157	197	202	247	220	99	100	177	102	89	59	33	67		
PLYMOUTH	7413	2290	1360	220	206	407	750	399	557	305	311	261							
WHITE	3217	272	190	55	36	76	129	350	193	163	129	232	232	145	113	102	527		
MISC.	54979	5104	7376	3897	4180	3995	3475	3015	2225	2037	1509	2306	2400	1920	1226	790	1024		
TOTALS	1003907	83470	79354	56352	44069	43454	106923	103740	91234	60426	47477	50514	35076	26017	25010	29106			

APPENDIX B. PROGRAM LISTING OF THE MODEL, "INDOTREV"

```

Program indotrev (input, output);

      uses
crt,Turbo3,ufueltax,ugendis,uallrev,umvharev,uhrsfrev,ushfrev,ulrev;

{-----}
      label 10,20,30,40,55,60,400,500,5000;
{-----}

      type

      ilar17 = array[1..17] of longint;
      iar17 = array[1..17] of integer;
      rar17 = array[1..17] of real;
      rar14 = array[1..14] of real;
      rar5 = array[1..5] of real;
      rar10 = array[1..10] of real;
      rar28 = array[1..28] of real;
      rar12 = array[1..12] of real;
      a5str46 = array[1..5] of string[46];
      a7str46 = array[1..7] of string[46];
      a14str46 = array[1..14] of string[46];
      a14str63 = array[1..63] of string[63];
      a12str33 = array[1..12] of string[33];
      car12 = array [1..12] of char;
      str46 = string[46];
      str14 = string[14];
      str70 = string[70];
      str48 = string[48];
      str49 = string[49];
      str51 = string[51];
      str32 = string[32];
      str65 = string[65];
      str40 = string[40];
      str45 = string[45];
      str58 = string[58];
      str34 = string[34];
      str28 = string[28];
      str27 = string[27];
      input = string[14];
      rar1710 = array[1..17,1..10] of real;
      str5 = string[5];
{-----}

      var

ininitial,loutinitial,soutinitial:text;
      Ldesname,Sdesname: string[14];
      dummy:char;
      j,year,k,i,fy,ai,fh,li,si:integer;
      fyear,tpop,dpop,ypop,lpop : iar17;
      pci82,gsp82,gasp82,cpi82,gnpdef82: rar17;
      sngtrkf,sfgtrkf,sngtrkp,sfgtrkp,cngtrkf,cngtrkp:rar14;
      cfgtrkf,cfgtrkp,trgtrkf,trgtrkp:rar14;
      vofv,bofvf,bofvp:rar5;
      gastr,spftr,surtr,mcfutr:real;
      ani,lmi,hni:rar1710;
      arvt,lrvt,hvrt:rar10;
      aeff,leff,heff:rar28;
      pbsr,psar,pnhr,pnmr,pgsr,pnghr,pngmr,pdar,pdmr,pdmcr:real;
      psdr,psdlr,phsr,phlr,pmsr,pmlr:real;
      rgshtv1,dgshtv1,gshtv1,sgshtv1,mgshv1,dsgshv1:rar12;
      sgtrks,cogtrks,trgtrks:a7str46;

```

```

      vofs,bofs:a5str46;
      vfs:a14str63;
      vsht:a12str33;
      vfsb:str70;
      gtr,sftr,mcsr,mcfr,totalregr,pcar,ttruck,ttrac:real;
      gtmvhar,sftmvhar,mcsmvhar,mvharegr,mvhalicr,irpmvhar:real;
      gthrsfr,sfthrsfr,hrsfreg,gtedr,sftrdr,gtshcfr,mcsmcfr:real;
      mvhashfr,hrsfshfr,mcftshfr,sdshfr,mcsshfr,totalshfr:real;
      mvhalocalr,hrsflocalr,sdlocalr,totallocalr:real;
      month:car12;
      tgshtsb,rtgshtsa,dtgshtsa,gtgshtsa:str48;
      sptgshtsa,mctgshtsa,surtgshtsa:str48;
      rsi,rsrev,dsi,dsrev,gsi,gsrev,spsi,sparev:rar12;
      mcsi,mcsrev,sursi,sursrev:rar12;
      pfeeinc,atreg,sureg,combnfreg,combnfregi,combifreg,trailreg:real;
      strailnfreg,strailfreg,busreg,mcreg,housecar,sunreg,sufreg:real;
      nftrailer,ftrailer,feesunreg,feesufreg,feenftail,feeftrail:real;
      feebusreg,feecnreg,feecfreg:real;
      ttrail,tmcycle,thcar,nfst,fst:real;
      ptotalregr,atvmt,suvmt,mcvmt,combvmt,busaavm,busvmt,dlic:real;
      pavgafe,pavglfe,pavghfe,avgafe,avglfe,avghfe:real;
      sd,hasuregrev,hfeesunreg,hfeenftreg:real;
      totalhrsfr,totalmvhar,netmvha:real;
      gtadj,sftadj:real;
      ceffi:integer;
      stitle:str27;
      pistate,irptrk,boareg,blareg,bosureg,blsureg:real;
      boconreg,blconreg,b2conreg,bocofreg,blcofreg:real;
      botrreg,bltrreg,bosnreg,blsnreg,bosfreg,blsfreg:real;
      bobreg,blbreg,bomreg,bimreg,psnreg,psfreg,pnfr,pftr:real;
      pmisc,boavm,blavm,b2avm,bosvm,blsvm,b2svm:real;
      bomcvm,blmcvm,b2mcvm,bocovm,blcovm,b2covm,bobvm,blbvm:real;
      pdlic,drevplic,mvexp,ptax,pmcfut:real;
      ln:str5;
      mvttit,mvgf,mvfr,mvmiscr,mvexp1,mvexp2,mvexp3,mvexp4,mvexp5:real;
      hrtit,hrcmyreg,shffhwa,shfmisc,genrev1,genrev2,genrev3:real;
      totalrev:real;
      {-----}
      procedure socio (i,year:integer;
        var tpop, dpop, ypop, lpop : iar17;
        var pci82, gsp82, gasp82, cpi82, gnpdef82:rar17);
        var
          soi:integer;
          ch:char;
          stits,tpops,dpops,ypops,lpops: str46;
          pci82s,gsp82s,gasp82s,cpi82s,gnpdef82s: str46;
        begin
          clrscr;
          begin
            SOCIOECONOMIC VARIABLE
            stits:= '1: TOTAL POPULATION (IN 1000s).....';
            tpops:= '2: DRIVING AGE POPULATION (IN 1000s).....';
            dpops:= '3: YOUNG AGE (15-24 YR) POPULATION (IN 1000s).';
            ypop:= '4: LESS THAN DRIVING AGE POPULATION(IN 1000s).';
            lpops:= '5: PER CAPITA INCOME (IN 1982$).....';
            pci82s:= '6: GROSS STATE PRODUCT (IN 1000S 1982$).....';
            gsp82s:= '7: GASOLINE PRICE (IN 1982$ ).....';
            gasp82s:= '8: CONSUMER PRICE INFLATION(CPI) INDEX.1982...';
            cpi82s:= '9: GNP IMPLICIT PRICE DEFLATOR..1982.....';
            gnpdef82s:=
          end
          clrscr;

```



```

    gotoxy(2,1);write(stits);gotoxy(2,36);write(year);
        gotoxy(2,3);write(tpops);
        gotoxy(2,4);write(dpops);
    gotoxy(2,5);write(ypops);gotoxy(2,6);write(lpops);
    gotoxy(2,7);write(pci82s);gotoxy(2,8);write(gsp82s);
        gotoxy(2,9);write(gasp82s);
    gotoxy(2,10);write(cpi82s);gotoxy(2,11);write(gnpdef82s);
        gotoxy(50,3);write(tpop[i]);
    gotoxy(50,4);write(dpop[i]);gotoxy(50,5);write(ypop[i]);
        gotoxy(50,6);write(lpop[i]);
    gotoxy(50,7);write(pci82[i]:7:2);gotoxy(50,8);write(gsp82[i]:10:0);
        gotoxy(50,9);write(gasp82[i]:6:2);
    gotoxy(50,10);write(cpi82[i]:6:2);gotoxy(50,11);write(gnpdef82[i]:6:2);

        gotoxy(2, 13);
    writeln('You can always make changes to these assumed values.');
```

```

        gotoxy(2, 15);
    write('if changes to be made enter (y or n): ');
        read (Kbd, ch);
        if ( (ch='y') or (ch='Y')) then
            repeat
                gotoxy(67,17);
                write(' ');
                gotoxy(2,17);
            write('Enter the # - 1 through 10, corresp. to the value to be
                changed:');
                read (soi);
                Case soi of
                    1: begin gotoxy(50,3);read(tpop[i]);end;
                    2: begin gotoxy(50,4);read(dpop[i]);end;
                    3: begin gotoxy(50,5);read(ypop[i]);end;
                    4: begin gotoxy(50,6);read(lpop[i]);end;
                    5: begin gotoxy(50,7);read(pci82[i]);end;
                    6: begin gotoxy(50,8);read(gsp82[i]);end;
                    7: begin gotoxy(50,9);read(gasp82[i]);end;
                    8: begin gotoxy(50,10);read(cpi82[i]);end;
                    9: begin gotoxy(50,11);read(gnpdef82[i]);end;
                end; {case soi}

                gotoxy(2,19);
            write('For further changes enter (y or n):');
                read (kbd, ch);
                until ( (ch <> 'y') and (ch <> 'Y'));
                end;
            end; {procedure socio}
{-----}

    procedure trkfeep (year:integer;
        tgrks: str46;
        gtrks:a7str46;
        var gtrk:rar14);

        var
            gi: integer;
            ch:char;

        begin
            ClrScr;
            gotoxy(2,5);write(tgrks,year);gotoxy(2,6);write(gtrks[1]);
                gotoxy(2,7);write(gtrks[2]);
                gotoxy(2,8);write(gtrks[3]);gotoxy(2,9);write(gtrks[4]);
                gotoxy(2,10);write(gtrks[5]);gotoxy(2,11);write(gtrks[6]);

```

```

gotoxy(2,12);write(gtrk[7]);gotoxy(15,6);write(gtrk[1]:9:4);
gotoxy(15,7);write(gtrk[2]:9:4);gotoxy(15,8);write(gtrk[3]:9:4);
gotoxy(15,9);write(gtrk[4]:9:4);gotoxy(15,10);write(gtrk[5]:9:4);
gotoxy(15,11);write(gtrk[6]:9:4);
gotoxy(15,12);write(gtrk[7]:9:4);
gotoxy(49,6);write(gtrk[8]:9:4);gotoxy(49,7);write(gtrk[9]:9:4);
gotoxy(49,8);write(gtrk[10]:9:4);
gotoxy(49,9);write(gtrk[11]:9:4);
gotoxy(49,10);write(gtrk[12]:9:4);
gotoxy(49,11);write(gtrk[13]:9:4);
gotoxy(49,12);write(gtrk[14]:9:4);

```

```

gotoxy(2,14);
write('You can make changes to these fees. ');
gotoxy(2,15);
write('if changes to be made enter (y or n): ');
read(kbd, ch);
if ( (ch='y') or (ch='Y') ) then
repeat
gotoxy(67,16);
write(' ');
gotoxy(2,16);
write('Enter the # - 1 through 14, corresp. to the value to be
changed: ');
read(gi);
Case gi of
1: begin gotoxy(15,6);read(gtrk[1]);end;
2: begin gotoxy(15,7);read(gtrk[2]);end;
3: begin gotoxy(15,8);read(gtrk[3]);end;
4: begin gotoxy(15,9);read(gtrk[4]);end;
5: begin gotoxy(15,10);read(gtrk[5]);end;
6: begin gotoxy(15,11);read(gtrk[6]);end;
7: begin gotoxy(15,12);read(gtrk[7]);end;
8: begin gotoxy(49,6);read(gtrk[8]);end;
9: begin gotoxy(49,7);read(gtrk[9]);end;
10: begin gotoxy(49,8);read(gtrk[10]);end;
11: begin gotoxy(49,9);read(gtrk[11]);end;
12: begin gotoxy(49,10);read(gtrk[12]);end;
13: begin gotoxy(49,11);read(gtrk[13]);end;
14: begin gotoxy(49,12);read(gtrk[14]);end;
end; {case gi}

```

```

gotoxy(2,17);
write('For further changes enter (y or n): ');
read(kbd, ch);
until ( (ch <> 'y') and (ch <> 'Y') );
end; {procedure trkfeep}

```

```

{-----}
procedure othfee( year:integer;
tofs:str46;
ofs:a5str46;
var ofv:rar5);

var
ofi: integer;
ch:char;

begin
ClrScr;
gotoxy(2,1);write(tofs,year);gotoxy(2,3);write(ofs[1]);
gotoxy(2,4);write(ofs[2]);

```

```

gotoxy(2,5);write(ofs[3]);gotoxy(2,6);write(ofs[4]);
      gotoxy(2,7);write(ofs[5]);
gotoxy(50,3);write(ofv[1]:9:4);gotoxy(50,4);write(ofv[2]:9:4);
      gotoxy(50,5);write(ofv[3]:9:4);
gotoxy(50,6);write(ofv[4]:9:4);gotoxy(50,7);write(ofv[5]:9:4);

      gotoxy(2, 10);
writeln('You can always make changes to these assumed or estimated
      values. ');
      gotoxy (2, 12);
write('if changes to be made enter (y or n): ');
      read (Kbd, ch);
      if ( (ch='y') or (ch='Y')) then
        repeat
          gotoxy (67,14);
          write(' ');
          gotoxy(2,14);
write('Enter the # - 1 through 5, corresp. to the value to be
      changed:');
          read (ofi);
          Case ofi of
1: begin gotoxy(50,3);read(ofv[1]);end;
2: begin gotoxy(50,4);read(ofv[2]);end;
3: begin gotoxy(50,5);read(ofv[3]);end;
4: begin gotoxy(50,6);read(ofv[4]);end;
5: begin gotoxy(50,7);read(ofv[5]);end;
          end; {case ofi}

      gotoxy(2,16);
write('For further changes enter (y or n):');
      read (kbd, ch);
      until ( (ch <> 'y') and (ch <> 'Y'));
      end;
{-----}
      procedure geneff(i:integer;
        vehicle:str14;
        var effv1:rar1710;
        var effv2: rar10;
        var effv3: rar28);

        var
          effi: integer;
          ch:char;
          effs:a14str63;
          vfsb:str70;

        begin
          vfsb:= 'AGE      NI      RVTI  MOD. YR      EFF.  MOD. YR
          EFF.';

          effs[1]:= ' 1      1:      11:      1978      21:      1992
          effs[2]:= ' 2      2:      12:      1979      22:      1993
          effs[3]:= ' 3      3:      13:      1980      23:      1994
          effs[4]:= ' 4      4:      14:      1981      24:      1995
          effs[5]:= ' 5      5:      15:      1982      25:      1996
          effs[6]:= ' 6      6:      16:      1983      26:      1997

```

```

    effs[7]:= ' 7      7:      17:      40: ';      1984      27:      1998
    effs[8]:= ' 8      8:      18:      41: ';      1985      28:      1999
    effs[9]:= ' 9      9:      19:      42: ';      1986      29:      2000
    effs[10]:= '>=10 10:      20:      43: ';      1987      30:      2001
    effs[11]:= '          44: ';      1988      31:      2002
    effs[12]:= '          45: ';      1989      32:      2003
    effs[13]:= '          46: ';      1990      33:      2004
    effs[14]:= '          47: ';      1991      34:      2005
    effs[14]:= '          48: ';

    ClrScr;
    gotoxy(2,1);write('FLEET FUEL EFFICIENCY PARAMETERS: ',vehicle);
    gotoxy(2,2);write(vfab);
    gotoxy(2,3);write(effs[1]);gotoxy(2,4);write(effs[2]);
    gotoxy(2,5);write(effs[3]);gotoxy(2,6);write(effs[4]);
    gotoxy(2,7);write(effs[5]);gotoxy(2,8);write(effs[6]);
    gotoxy(2,9);write(effs[7]);gotoxy(2,10);write(effs[8]);
    gotoxy(2,11);write(effs[9]);gotoxy(2,12);write(effs[10]);
    gotoxy(2,13);write(effs[11]);gotoxy(2,14);write(effs[12]);
    gotoxy(2,15);write(effs[13]);gotoxy(2,16);write(effs[14]);
    gotoxy(10,3);write(effv1[1,1]:6:3);gotoxy(10,4);write(effv1[1,2]:6:3);
    gotoxy(10,5);write(effv1[1,3]:6:3);gotoxy(10,6);write(effv1[1,4]:6:3);
    gotoxy(10,7);write(effv1[1,5]:6:3);gotoxy(10,8);write(effv1[1,6]:6:3);
    gotoxy(10,9);write(effv1[1,7]:6:3);gotoxy(10,10);write(effv1[1,8]:6:3);
    gotoxy(10,11);write(effv1[1,9]:6:3);gotoxy(10,12);write(effv1[1,10]:6:3);
    gotoxy(22,3);write(effv2[1]:6:3);gotoxy(22,4);write(effv2[2]:6:3);
    gotoxy(22,5);write(effv2[3]:6:3);gotoxy(22,6);write(effv2[4]:6:3);
    gotoxy(22,7);write(effv2[5]:6:3);gotoxy(22,8);write(effv2[6]:6:3);
    gotoxy(22,9);write(effv2[7]:6:3);gotoxy(22,10);write(effv2[8]:6:3);
    gotoxy(22,11);write(effv2[9]:6:3);gotoxy(22,12);write(effv2[10]:6:3);
    gotoxy(43,3);write(effv3[1]:6:3);gotoxy(43,4);write(effv3[2]:6:3);
    gotoxy(43,5);write(effv3[3]:6:3);gotoxy(43,6);write(effv3[4]:6:3);
    gotoxy(43,7);write(effv3[5]:6:3);gotoxy(43,8);write(effv3[6]:6:3);
    gotoxy(43,9);write(effv3[7]:6:3);gotoxy(43,10);write(effv3[8]:6:3);
    gotoxy(43,11);write(effv3[9]:6:3);gotoxy(43,12);write(effv3[10]:6:3);
    gotoxy(43,13);write(effv3[11]:6:3);gotoxy(43,14);write(effv3[12]:6:3);
    gotoxy(43,15);write(effv3[13]:6:3);gotoxy(43,16);write(effv3[14]:6:3);
    gotoxy(65,3);write(effv3[15]:6:3);gotoxy(65,4);write(effv3[16]:6:3);
    gotoxy(65,5);write(effv3[17]:6:3);gotoxy(65,6);write(effv3[18]:6:3);
    gotoxy(65,7);write(effv3[19]:6:3);gotoxy(65,8);write(effv3[20]:6:3);
    gotoxy(65,9);write(effv3[21]:6:3);gotoxy(65,10);write(effv3[22]:6:3);
    gotoxy(65,11);write(effv3[23]:6:3);gotoxy(65,12);write(effv3[24]:6:3);
    gotoxy(65,13);write(effv3[25]:6:3);gotoxy(65,14);write(effv3[26]:6:3);
    gotoxy(65,15);write(effv3[27]:6:3);gotoxy(65,16);write(effv3[28]:6:3);

    gotoxy(2, 18);
    writeln('You can always make changes to these assumed values. ');
    gotoxy(2, 20);
    write('if changes to be made enter (y or n): ');
    read (Kbd, ch);
    if ( (ch='y') or (ch='Y')) then
        repeat
            gotoxy(67,22);

```

```

        write('
                gotoxy(2,22);
write('Enter the # -1 through 49, corresp. to the value to be
        changed:');
        read (effi);
        Case effi of

1: begin gotoxy(10,3);read(effv1[i,1]);end;
2: begin gotoxy(10,4);read(effv1[i,2]);end;
3: begin gotoxy(10,5);read(effv1[i,3]);end;
4: begin gotoxy(10,6);read(effv1[i,4]);end;
5: begin gotoxy(10,7);read(effv1[i,5]);end;
6: begin gotoxy(10,8);read(effv1[i,6]);end;
7: begin gotoxy(10,9);read(effv1[i,7]);end;
8: begin gotoxy(10,10);read(effv1[i,8]);end;
9: begin gotoxy(10,11);read(effv1[i,9]);end;
10: begin gotoxy(10,12);read(effv1[i,10]);end;
11: begin gotoxy(22,3);read(effv2[1]);end;
12: begin gotoxy(22,4);read(effv2[2]);end;
13: begin gotoxy(22,5);read(effv2[3]);end;
14: begin gotoxy(22,6);read(effv2[4]);end;
15: begin gotoxy(22,7);read(effv2[5]);end;
16: begin gotoxy(22,8);read(effv2[6]);end;
17: begin gotoxy(22,9);read(effv2[7]);end;
18: begin gotoxy(22,10);read(effv2[8]);end;
19: begin gotoxy(22,11);read(effv2[9]);end;
20: begin gotoxy(22,12);read(effv2[10]);end;
21: begin gotoxy(43,3);read(effv3[1]);end;
22: begin gotoxy(43,4);read(effv3[2]);end;
23: begin gotoxy(43,5);read(effv3[3]);end;
24: begin gotoxy(43,6);read(effv3[4]);end;
25: begin gotoxy(43,7);read(effv3[5]);end;
26: begin gotoxy(43,8);read(effv3[6]);end;
27: begin gotoxy(43,9);read(effv3[7]);end;
28: begin gotoxy(43,10);read(effv3[8]);end;
29: begin gotoxy(43,11);read(effv3[9]);end;
30: begin gotoxy(43,12);read(effv3[10]);end;
31: begin gotoxy(43,13);read(effv3[11]);end;
32: begin gotoxy(43,14);read(effv3[12]);end;
33: begin gotoxy(43,15);read(effv3[13]);end;
34: begin gotoxy(43,16);read(effv3[14]);end;
35: begin gotoxy(65,3);read(effv3[15]);end;
36: begin gotoxy(65,4);read(effv3[16]);end;
37: begin gotoxy(65,5);read(effv3[17]);end;
38: begin gotoxy(65,6);read(effv3[18]);end;
39: begin gotoxy(65,7);read(effv3[19]);end;
40: begin gotoxy(65,8);read(effv3[20]);end;
41: begin gotoxy(65,9);read(effv3[21]);end;
42: begin gotoxy(65,10);read(effv3[22]);end;
43: begin gotoxy(65,11);read(effv3[23]);end;
44: begin gotoxy(65,12);read(effv3[24]);end;
45: begin gotoxy(65,13);read(effv3[25]);end;
46: begin gotoxy(65,14);read(effv3[26]);end;
47: begin gotoxy(65,15);read(effv3[27]);end;
48: begin gotoxy(65,16);read(effv3[28]);end;
        end;{case effi}
        gotoxy(2,24);
write('For further changes enter (y or n):');
        read (kbd, ch);
        until ( (ch <> 'y') and (ch <> 'Y'));
        end;
{-----}

```

```

procedure gensht( year:integer;
                 stitle:str27;
                 var gshtv1,gshtv2:rar12);

type

al2str45 = array[1..12] of string[45];

var
  gshti: integer;
  ch: char;
  subtitle: str45;
  gshts: al2str45;

begin
  subtitle := 'MONTH          SEASONAL INDICES          REVENUE  ';
  gshts[1]:= ' J          1:          13:          ';
  gshts[2]:= ' F          2:          14:          ';
  gshts[3]:= ' M          3:          15:          ';
  gshts[4]:= ' A          4:          16:          ';
  gshts[5]:= ' M          5:          17:          ';
  gshts[6]:= ' J          6:          18:          ';
  gshts[7]:= ' J          7:          19:          ';
  gshts[8]:= ' A          8:          20:          ';
  gshts[9]:= ' S          9:          21:          ';
  gshts[10]:= ' O         10:          22:          ';
  gshts[11]:= ' N         11:          23:          ';
  gshts[12]:= ' D         12:          24:          ';

  clrscr;
  gotoxy(2,1);write(year,'-SHORT-TERM (MONTHLY) REVENUES:',stitle);
  gotoxy(2,2);write(subtitle);
  gotoxy(2,3);write(gshts[1]);gotoxy(2,4);write(gshts[2]);
  gotoxy(2,5);writeln(gshts[3]);gotoxy(2,6);writeln(gshts[4]);
  gotoxy(2,7);writeln(gshts[5]);gotoxy(2,8);writeln(gshts[6]);
  gotoxy(2,9);writeln(gshts[7]);gotoxy(2,10);writeln(gshts[8]);
  gotoxy(2,11);writeln(gshts[9]);gotoxy(2,12);writeln(gshts[10]);
  gotoxy(2,13);writeln(gshts[11]);gotoxy(2,14);writeln(gshts[12]);
  gotoxy(15,3);write(gshtv1[1]:6:2);gotoxy(15,4);write(gshtv1[2]:6:2);
  gotoxy(15,5);write(gshtv1[3]:6:2);gotoxy(15,6);write(gshtv1[4]:6:2);
  gotoxy(15,7);write(gshtv1[5]:6:2);gotoxy(15,8);write(gshtv1[6]:6:2);
  gotoxy(15,9);write(gshtv1[7]:6:2);gotoxy(15,10);write(gshtv1[8]:6:2);
  gotoxy(15,11);write(gshtv1[9]:6:2);gotoxy(15,12);write(gshtv1[10]:6:2);
  gotoxy(15,13);write(gshtv1[11]:6:2);gotoxy(15,14);write(gshtv1[12]:6:2);
  gotoxy(37,3);write(gshtv2[1]:19:0);gotoxy(37,4);write(gshtv2[2]:19:0);
  gotoxy(37,5);write(gshtv2[3]:19:0);gotoxy(37,6);write(gshtv2[4]:19:0);
  gotoxy(37,7);write(gshtv2[5]:19:0);gotoxy(37,8);write(gshtv2[6]:19:0);
  gotoxy(37,9);write(gshtv2[7]:19:0);gotoxy(37,10);write(gshtv2[8]:19:0);
  gotoxy(37,11);write(gshtv2[9]:19:0);gotoxy(37,12);write(gshtv2[10]:19:0);
  gotoxy(37,13);write(gshtv2[11]:19:0);gotoxy(37,14);write(gshtv2[12]:19:0);

  gotoxy(2, 16);
  writeln('You can always make changes to these assumed or estimated
          values. ');
  gotoxy (2, 18);
  write('if changes to be made enter (y or n): ');
  read (Kbd, ch);
  if ( (ch='y') or (ch='Y')) then
    repeat

```

```

        gotoxy (67,20);
        write(' ');
        gotoxy(2,20);
write('Enter the # -1 through 24, corresp. to the value to be
        changed:');
        read (gshti);
        Case gshti of

1: begin gotoxy(15,3);read(gshtv1[1]);end;
2: begin gotoxy(15,4);read(gshtv1[2]);end;
3: begin gotoxy(15,5);read(gshtv1[3]);end;
4: begin gotoxy(15,6);read(gshtv1[4]);end;
5: begin gotoxy(15,7);read(gshtv1[5]);end;
6: begin gotoxy(15,8);read(gshtv1[6]);end;
7: begin gotoxy(15,9);read(gshtv1[7]);end;
8: begin gotoxy(15,10);read(gshtv1[8]);end;
9: begin gotoxy(15,11);read(gshtv1[9]);end;
10: begin gotoxy(15,12);read(gshtv1[10]);end;
11: begin gotoxy(15,13);read(gshtv1[11]);end;
12: begin gotoxy(15,14);read(gshtv1[12]);end;
13: begin gotoxy(37,3);read(gshtv2[1]);end;
14: begin gotoxy(37,4);read(gshtv2[2]);end;
15: begin gotoxy(37,5);read(gshtv2[3]);end;
16: begin gotoxy(37,6);read(gshtv2[4]);end;
17: begin gotoxy(37,7);read(gshtv2[5]);end;
18: begin gotoxy(37,8);read(gshtv2[6]);end;
19: begin gotoxy(37,9);read(gshtv2[7]);end;
20: begin gotoxy(37,10);read(gshtv2[8]);end;
21: begin gotoxy(37,11);read(gshtv2[9]);end;
22: begin gotoxy(37,12);read(gshtv2[10]);end;
23: begin gotoxy(37,13);read(gshtv2[11]);end;
24: begin gotoxy(37,14);read(gshtv2[12]);end;
        end; {case rep}

        gotoxy(2,22);
write('For further changes enter (y or n):');
        read (kbd, ch);
        until ( (ch <> 'y') and (ch <> 'Y'));
        end;{procedure gensht}

{*****}
        procedure regfee(year:integer;
            sqtrks,cogtrks,trgtrks:a7str46;
            var
            sngtrkf,sfgtrkf,cngtrkf,cfgrkf,trgtrkf:rar14;
            vofs,bofs:a5str46;
            var vofv,bofvf:rar5);

            var
            rfi:integer;
            sntgtrks,sftgtrks,cntgtrks,cftgtrks,trtgtrks:str46;
            tbofs,tvofs:str46;

            begin
                clrscr;
                writeln('      REGISTRATION FEES MENU');
writeln('THIS MENU INDICATES THE REGISTRATION FEES USED IN');
                writeln('COMPUTING REGISTRATION REVENUES');
                writeln;
                writeln('1. NON-FARM TRUCKS REGISTRATION FEES');
                writeln('2. FARM TRUCK REGISTRATION FEES');
                writeln('3. NON-FARM TRACTOR REGISTRATION FEES');

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        writeln('4. FARM TRACTOR REGISTRATION FEES');
        writeln('5. TRAILER REGISTRATION FEES');
        writeln('6. BUS REGISTRATION FEES');
        writeln('7. OTHER VEHICLE REGISTRATION FEES');
        writeln('8. EXIT TO LONG TERM MENU');
        writeln;
        writeln('Hit Return After Indicating Your Choice');
        read(rfi);

        case rfi of
            1:begin
                entgtrks:='
                    NON-FARM TRUCK REGISTRATION FEES ';
                trkfeep(year,entgtrks,sgtrks,engtrkf);
                end;
            2:begin
                sftgtrks:='
                    FARM TRUCK REGISTRATION FEES ';
                trkfeep(year,sftgtrks,sgtrks,sfgtrkf);
                end;
            3:begin
                cntgtrks:='
                    NON-FARM TRACTOR REGISTRATION FEES ';
                trkfeep(year,cntgtrks,cogtrks,cngtrkf);
                end;
            4:begin
                cftgtrks:='
                    FARM TRACTOR REGISTRATION FEES ';
                trkfeep(year,cftgtrks,cogtrks,cfgtrkf);
                end;
            5:begin
                trtgtrks:='
                    TRAILER REGISTRATION FEES ';
                trkfeep(year,trtgtrks,trgtrks,trgtrkf);
                end;
            6:begin
                tbofs:='
                    BUS REGISTRATION FEES ';
                othfee(year,tbofs,bofs,bofvf);
                end;
            7:begin
                tvofs:='
                    REGISTRATION FEES FOR OTHER VEHICLES ';
                othfee(year,tvofs,vofs,vofv);
                end;
            8:end; {case rfi }
        end;
        {*****}
        procedure regprop( year:integer;
            sgtrks,cogtrks,trgtrks:a7str46;
            var sngtrkp,sfgtrkp,cngtrkp,cfgtrkp,trgtrkp:rar14;
            bofs: a5str46;
            var bofvp:rar5);

            var
                rpi:integer;
                ch:char;
            entgtrksp,sftgtrksp,cntgtrksp,cftgtrksp,trtgtrksp,tbofsp: str46;

            begin
                clrscr;
                writeln('
                    WELCOME TO
                    PROPORTIONAL DISTRIBUTION OF REGISTERED VEHICLE MENU');
                writeln;
                writeln;
                writeln('1. NON-FARM TRUCKS (PROPORTION BY WEIGHT)');
                writeln('2. FARM TRUCKS (PROPORTION BY WEIGHT)');
                writeln('3. NON-FARM TRACTOR TRUCKS (PROPORTION BY WEIGHT)');
                writeln('4. FARM TRACTOR TRUCKS (PROPORTION BY WEIGHT)');

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writeln('5. TRAILERS (NON-FARM (nF) & FARM (f)) (PROPORTION BY
      WEIGHT)');
writeln('6. BUSES (PROPORTION BY TYPE)');
writeln('7. EXIT TO LONG-TERM MENU');
      writeln;
writeln('Hit RETURN after indicating your choice:');
      read(rpi);
      case rpi of
        1:begin
          sntgtrksp:='      NON-FARM TRUCKS: PROPORTION BY WEIGHT ';
            trkfeep(year,sntgtrksp,sgtrks,sngtrkp);
          end;
        2:begin
          sftgtrksp:='      FARM TRUCKS: PROPORTION BY WEIGHT ';
            trkfeep(year,sftgtrksp,sgtrks,sfgtrkp);
          end;
        3:begin
          cntgtrksp:='      NON-FARM TRACTORS: PROPORTION BY WEIGHT ';
            trkfeep(year,cntgtrksp,cogtrks,cngtrkp);
          end;
        4:begin
          cftgtrksp:='      FARM TRACTORS: PROPORTION BY WEIGHT ';
            trkfeep(year,cftgtrksp,cogtrks,cfgtrkp);
          end;
        5:begin
          trtgtrksp:='      TRAILERS: PROPORTION BY WEIGHT ';
            trkfeep(year,trtgtrksp,trgtrks,trgtrkp);
          end;
        6:begin
          tbofsp:='      BUSES: PROPORTION BY TYPE ';
            othfee(year,tbofsp,bofs,bofvp);
          end;
        7:end;{case rpi}
      end;
      {*****}
      procedure fleeteff(i:integer;
        ani,lni,hni: rar1710;
        arvt,lrvt,hrvt:rar10;
        aeff,leff,heff:rar28);

        var
          aefft,lefft,hefft:str70;
          fi:integer;
          vehicle:str14;

        begin
          clrscr;
          writeln(' WELCOME TO VEHICLE FLEET FUEL EFFICIENCY MENU');
          writeln;
          writeln('1. AUTOMOBILE FLEET FUEL EFFICIENCY PARAMETERS');
          writeln('2. SINGLE UNIT TRUCKS FLEET FUEL EFFICIENCY PARAMETERS');
          writeln('3. TRACTORS AND BUSES FLEET FUEL EFFICIENCY PARAMETERS');
          writeln('4. EXIT TO LONG-TERM MENU');
          writeln('Hit RETURN after indicating your choice: ');
          read(fi);

          case fi of
            1:begin
              vehicle:= ' AUTOMOBILE  ';
              geneff(i,vehicle,ani,arvt,aeff);
            end;
            2:begin

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        vehicle:= ' SU TRUCKS  ';
        geneff(i,vehicle,lni,lrvt,leff);
        end;
    3:begin
        vehicle:= 'TRACTORS & BUS';
        geneff(i,vehicle,hni,hrvt,heff);
        end;
    4:end;{case fi}
    end;
{*****}
    procedure assumptions (i,year: integer;
        var tpop,dpop,ypop,lpop: iar17;
        var pci82,gsp82,gasp82,cpi82,gnpdef82: rar17;
        var sgtrks,cogtrks,trgtrks: a7str46;
        var sngtrkf,sfgtrkf,cngtrkf,cfgtrkf,trgtrkf:rar14;
        var sngtrkp,sfgtrkp,cngtrkp,cfgtrkp,trgtrkp:rar14;
        var vofs,bofs: a5str46;
        var vofv,bofvf,bofvp: rar5;
        var vfsb: str70;
        var vfs: a14str63;
        var ani,lni,hni: rar1710;
        var arvt,lrvt,hrvt:rar10;
        var aeff,leff,heff: rar28;
        var gastr,spftr,surtr,mcfutr:real;
        var pbsr,psr,pnhr,pnmr,pgr,pnghr,pngmr:real;
        var pdsr,pdmr,pdmcr,pdsr,pdldr:real;
        var phsr,phlr,pmsr,pmlr:real);

        var
            ai:integer;
            ch:char;

        begin
            clrscr;
            writeln('WELCOME TO ASSUMPTIONS MENU');
            writeln;
            writeln('1. SOCIOECONOMIC VARIABLES');
            writeln('2. REGISTRATION FEES FOR DIFFERENT VEHICLES');
            writeln('3. PROPORTION OF VEHICLES BY WEIGHT AND TYPE');
            writeln('4. VEHICLE FLEET FUEL EFFICIENCY PARAMETERS');
            writeln('5. FUEL TAX RATES');
            writeln('6. REVENUE DISBURSEMENT STRUCTURE');
            writeln('7. EXIT TO LONG-TERM MENU');
            writeln('Hit RETURN after indicating your choice:');
            read(ai);
            case ai of
                1:begin
                    socio(i,year,tpop,dpop,ypop,lpop,pci82,gsp82,gasp82,cpi82,gnpdef82);
                    end;
                2:begin
                    regfee(year,sgtrks,cogtrks,trgtrks,sngtrkf,sfgtrkf,cngtrkf,
                        cfgtrkf,trgtrkf,vofs,bofs,vofv,bofvf);
                    end;
                3:begin
                    regprop(year,sgtrks,cogtrks,trgtrks,sngtrkp,sfgtrkp,cngtrkp,
                        cfgtrkp,trgtrkp,bofs,bofvp);
                    end;
                4:begin
                    fleeteff(i,ani,lni,hni,arvt,lrvt,hrvt,aeff,leff,heff);
                    end;
                5:begin

```

```

        fueltax(year,gastr,spftr,surtr,mcfutr);
        end;
        6:begin
gendis(pbsr,psr,pnhr,pnmr,pgsr,pnghr,pngmr,pdsr,pdmr,pdmcr,
        psdr,psdlr,phsr,phlr,pmsr,pmlr);
        end;
        7:end; {case ai of}
        end;
    {-----}
    procedure revcalc(var pfeeinc,atreg,sureg,combnfreg,combnfregi:real;
        var combfreg,trailreg:real;
        var strailnfreg,strailfreg,busreg,mcreg,housecar,sunreg,sufreg:real;
        var nftrailer,ftrailer,feesunreg,feesufreg,feenftail,feeftrail:real;
        var feebusreg,feecnreg,feecfreg:real;
        var pcar,ttruck,ttrac,ttrail,tmcycle,thcar,nfst,fst:real;
        var
ptotalregr,totalregr,atvmt,suvmt,mcvmt,combvmt,busaavm,busvmt,dlic:real;
        var pavgafe,pavglfe,pavghfe,avgafe,avglfe,avghfe:real;
        var gtr,sftr,mcsr,mcfr:real;
        var gastr,spftr,surtr,mcfutr:real;
        var sd,sdlocalr,sdshfr,hrsfreg,hregrev,hfeesunreg,hfeenftreg:real;
        var mvharegr,totalhrsfr,hrsflocalr,hrsfshfr:real;
        var mvhalic,irpmvhar,totalmvhar,netmvha,mvhashfr,mvhalocalr:real;
        var totalshfr,totallocalr:real;
        var pbsr,psr,pnhr,pnmr,pgsr,pnghr,pngmr,pdsr,pdmr,pdmcr,psdr:real;
        var psdlr,phsr,phlr,pmsr,pmlr:real;
        var gtshcfr,gtadr,gtadj,gthrsfr,gtmvhar,sftrdr,sftadj,sfthrsfr:real;
        var sftmvhar,mcsmcfr,mcsmvhar,mcsshfr:real;
        var pci82,gsp82,gasp82:rar17;
        var lpop,ypop:iar17;
        var sngtrkp,sfgtrkp,trgtrkp,sngtrkf,sfgtrkf,trgtrkf:rar14;
        var cngtrkp,cfgtrkp,cngtrkf,cfgtrkf:rar14;
        var bofvp,bofvf,vofv:rar5;
        i,fy:integer;
        var ceffi:integer;
        ani:rar1710;
        arvt:rar10;
        lni:rar1710;
        lrvt:rar10;
        hni:rar1710;
        hrvt:rar10;
        aeff,leff,heff:rar28;
        pistate,irptrk,boareg,blareg,bosureg,blsureg:real;
        boconreg,blconreg,b2conreg,bocofreg,blcofreg:real;
        botrreg,bltrreg,bosnreg,blanreg,bosfreg,blsfreg:real;
        bobreg,blbreg,bomreg,blmreg,psnreg,psfreg,pnfr,pftr:real;
        pmisc,boavm,blavm,b2avm,bosuvbm,blsuvbm,b2suvbm:real;
        bomcvm,blmcvm,b2mcvm,bocovm,blcovm,b2covm,bobvm,blbvm:real;
        pdlic,drevplic,ptax,pmcfut:real;
        var mvtit,mvgf,mvfr,mvmisc:real;
        var mvexpl,mvexp2,mvexp3,mvexp4,mvexp5:real;
        var hrtit,hrcyreg,shffhwa,shfmisc:real;
        var genrev1,genrev2,genrev3:real);
        var
            kk,k,kount:integer;
            coirp,mcsrcon,mcfrcon:real;
            hfeetrnfreg,hfeecnreg,irpvm,ptrk:real;
            hfeesunreg1,hfeesunreg2,hfeesunreg3,hfeesunreg4,hfeesunreg5:real;
            hfeetrnfreg1,hfeetrnfreg2,hfeetrnfreg3:real;
            hfeecnreg1,hfeecnreg2,hfeecnreg3,hfeecnreg4,hfeecnreg5:real;
            hrsfreg1,hrsfrgr2:real;

```

```

aci, lci, hci: real;

begin
  clrscr;
  pfeeinc := 0.0;
  coirp := 1.0;
  aci := 0.0;
  lci := 0.0;
  hci := 0.0;
  atreg := boareg + blareg * pci82[i];
  sureg := bosureg + blsureg * pci82[i];
  combnfreg := boconreg + blconreg * coirp + b2conreg * gsp82[i];
  combnfregi := boconreg + b2conreg * gsp82[i];
  combfreg := bocofreg + blcofreg * gsp82[i];
  irpmvhar := combnfregi * feecnreg * 1.5 / 1000.0;
  trailreg := botrreg + bltrreg * gsp82[i];
  strailnfreg := bosnreg + blsnreg * combnfreg;
  strailfreg := bosfreg + blsfreg * combfreg;
  busreg := bobreg + blbreg * dpop[i];
  mcreg := bomreg + blmreg * ypop[i] * 1000;
  housecar := 1.12 * mcreg;
  sunreg := psnreg * sureg;
  sufreg := psfreg * sureg;
  nftrailer := pnftr * trailreg;
  ftrailer := pftr * trailreg;
  feesunreg := 0.0;
  feesufreg := 0.0;
  feenftrail := 0.0;
  feefttrail := 0.0;
  feebusreg := 0.0;
  feecnreg := 0.0;
  feecfreg := 0.0;
  for k := 1 to 14 do
    begin
      feesunreg := sngtrkp[k] * sngtrkf[k] + feesunreg;
      feesufreg := sfgrtkp[k] * sfgrtkf[k] + feesufreg;
    end;
    for k := 1 to 8 do
      feenftrail := trgtrkp[k] * trgtrkf[k] + feenftrail;
    for k := 11 to 14 do
      feefttrail := trgtrkp[k] * trgtrkf[k] + feefttrail;
    for k := 1 to 5 do
      feebusreg := bofvp[k] * bofvf[k] + feebusreg;
    for k := 1 to 14 do
      begin
        feecnreg := cngtrkp[k] * cngtrkf[k] + feecnreg;
        feecfreg := cfgtrkp[k] * cfgtrkf[k] + feecfreg;
      end;
    pcar := atreg * vofv[1] / 1000.0;
    ttruck := (sunreg * feesunreg + sufreg * feesufreg) / 1000.0;
    ttrac := (combnfreg * feecnreg + combfreg * feecfreg) / 1000.0;
    ttrail := (nftrailer * feenftrail + ftrailer * feefttrail) / 1000.0;
    hrmcyreg := (mcreg * 2.0) / 1000.0;
    tmcycle := ((mcreg * vofv[2]) / 1000.0) - hrmcyreg;
    thcar := (housecar * vofv[3]) / 1000.0;
    nfst := (strailnfreg * vofv[4]) / 1000.0;
    fst := (strailfreg * vofv[5]) / 1000.0;
    ptotalregr := pcar + ttruck + ttrac + ttrail + tmcycle + thcar + nfst + fst;
    totalregr := (1 + pmisc) * ptotalregr;
    atvmt := boavm + blavm * gsp82[i] + b2avm * pci82[i];
    suvmt := bosuvm + blsuvm * gsp82[i] + b2suvm * pci82[i];
    mcvmt := bomcvm + blmcvm * pci82[i] + b2mcvm * mcreg;

```

```

combvmt := bocovm + blcovm*(combnfregi+combfreg) + b2covm*gsp82[i];
busaavm := bobvm + blbvm * pci82[i];
busvmt := busreg*busaavm/1000000.0;
dlic := pdlic*dpop[i]*1000;

{fuel efficiencies calculations}
for k := 1 to 10 do
begin
aci := aci + ani[i,k]*arvt[k];
lci := lci + lni[i,k]*lrvt[k];
hci := hci + hni[i,k]*hrvt[k];
end;

for k := 1 to 10 do
begin
arvt[k] := arvt[k]/aci;
lrvt[k] := lrvt[k]/lci;
hrvt[k] := hrvt[k]/hci;
end;

pavgafe := 0.0; pavglfe := 0.0; pavghfe := 0.0;
for k := 1 to 10 do
begin
ceffi := 12-k+i;
pavgafe := pavgafe+ani[i,k]*arvt[k]/aeff[ceffi];
pavglfe := pavglfe+lni[i,k]*lrvt[k]/leff[ceffi];
pavghfe := pavghfe+hni[i,k]*hrvt[k]/heff[ceffi];
avgafe := 1.0/pavgafe;
avglfe := 1.0/pavglfe;
avghfe := 1.0/pavghfe;
end;

gtr := 1.18*(((atvmt/avgafe)+(mcvmt/50.0)+(suvmt/avglfe))*gastr*1000.0);
sftr := ((busvmt+combvmt)/avghfe)*spftr*1000.0;
mcftr := pmcfut*(sftr/spftr)*mcfutr;
mcsr := pstax*(sftr/spftr)*surtr;
mcsr := mcsr + pstax*(mcftr/mcfutr)*surtr;
gtehcfr := gtr*pgsr;
gtsdr := pbsr/1000.0;
gtadj := gtr - gtehcfr - gtsdr;
gthrsfr := pnghr*gtadj;
gtmvhar := pngmr*gtadj;
sftsdr := psr/1000.0;
sftadj := sftr - sftsdr;
sfthrsfr := pnhr*sftadj;
sftmvhar := pnmr*sftadj;
mcsmcrfr := pdmcr*mcsr;
mcsmvhar := pdmr*mcsr;
mcshsfr := pdsr*mcsr;
sd := gtsdr+sftsdr;
sdlocalr := psdlr*sd;
sdshfr := psdsr*sd;
hfeesunreg1 := sngtrkp[1]*3.50+sngtrkp[2]*0.0+sngtrkp[3]*19.50;
hfeesunreg2 := sngtrkp[4]*29.50+sngtrkp[5]*49.50+sngtrkp[6]*44.50;
hfeesunreg3 := sngtrkp[7]*64.50+sngtrkp[8]*24.50+sngtrkp[9]*74.50;
hfeesunreg4 := sngtrkp[10]*124.50+sngtrkp[11]*174.50+sngtrkp[12]*199.50;
hfeesunreg5 := sngtrkp[13]*224.50+sngtrkp[14]*249.50;
hfeesunreg:=
hfeesunreg1+hfeesunreg2+hfeesunreg3+hfeesunreg4+hfeesunreg5;

hfeetrnfreg1 := trgtrkp[1]*1.50+trgtrkp[2]*3.50+trgtrkp[3]*4.50;
hfeetrnfreg2 := trgtrkp[4]*0.0+trgtrkp[5]*18.50+trgtrkp[6]*24.50;

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      hfeetrnfreg3 := trgtrkp[7]*59.50;
      hfeetrnfreg := hfeetrnfreg1+hfeetrnfreg2+hfeetrnfreg3;

      hfeecnreg1 := cngtrkp[1]*34.50+cngtrkp[2]*44.50+cngtrkp[3]*64.50;
      hfeecnreg2 := cngtrkp[4]*84.50+cngtrkp[5]*94.50+cngtrkp[6]*122.50;
      hfeecnreg3 := cngtrkp[7]*102.50+cngtrkp[8]*109.50+cngtrkp[9]*134.50;
      hfeecnreg4 := cngtrkp[10]*184.50+cngtrkp[11]*199.50+cngtrkp[12]*199.50;
      hfeecnreg5 := cngtrkp[13]*199.50+cngtrkp[14]*199.50;
      hfeecnreg := hfeecnreg1+hfeecnreg2+hfeecnreg3+hfeecnreg4+hfeecnreg5;

      hrsfregr1 := mcreg*2.50+housecar*5.50+hfeesunreg*sunreg;
      hrsfregr2 := hfeetrnfreg*nftrailer+hfeecnreg*combnfreg;
      hrsfregr := (hrsfregr1+hrsfregr2)/1000.0;

      totalhrsfr := hrsfregr+gthrsfr+sfthrsfr+hrtit;
      hrsflocalr := phlr*totalhrsfr;
      hrsfshfr := phsr*totalhrsfr;
      mvhalicr := drevplic*pdlic*dpop[i]*1000.0/1000.0;
      mvharegr := totalregr-hrsfregr;
      irpmvhar := combnfregi*feecnreg/1000.0;
      totalmvhar := mvharegr+mvhalicr+mcsmvhar+gtmvhar+sftmvhar+irpmvhar;
      totalmvhar := totalmvhar+mvtit+mvgf+mvfr+mvmiscr;
      netmvha := totalmvhar-mvexp1-mvexp2-mvexp3-mvexp4-mvexp5;
      mvhashfr := pmsr*netmvha;
      mvhalocalr := pmlr*netmvha;
      totalshfr := mvhashfr+hrsfshfr+mcftsr+mcsshfr+sdshfr+shffhwa+shfmisc;
      totalshfr := totalshfr+genrev1+genrev2+genrev3;
      totallocalr := hrsflocalr+mvhalocalr+sdlocalr;
      end;{procedure revcalc}

{-----}
      procedure revsum (year:integer;

      var gtr,sftr,mcsr,mcftsr,totalregr,pcar,ttruck,ttrac:real;
      var gtmvhar,sftmvhar,mcsmvhar,mvharegr,mvhalicr,irpmvhar:real;
      var gthrsf,sfthrsf,hrsfregr,gtedr,sftr,gtshcfr,mcsmcfr:real;
      var mvhashfr,hrsfshfr,mcftshfr,sdshfr,mcsshfr,totalshfr:real;
      var mvhalocalr, hrsflocalr, sdlocalr,totallocalr:real;
      var mvtit,mvgf,mvfr,mvmiscr:real;
      var mvexp1,mvexp2,mvexp3,mvexp4,mvexp5:real;
      var hrtit,hrmcyrreg,shffhwa,shfmisc:real;
      var genrev1,genrev2,genrev3,netmvha:real);

      var
      ri: integer;

      begin
      clrscr;
      writeln('          WELCOME TO REVENUE SUMMARY MENU');
      writeln('THIS MENU PROVIDES YOU REVENUE SUMMARY BY DIFFERENT');
      writeln('REVENUE SOURCE, BY DIFFERENT FUNDS, AND AT STATE AND');
      writeln('LOCAL LEVELS. ');
      writeln;
      writeln('1. OVERALL REVENUE SUMMARY BY REVENUE SOURCE');
      writeln('2. MVHA REVENUE SUMMARY BY REVENUE SOURCE');
      writeln('3. HRSF REVENUE SUMMARY BY REVENUE SOURCE');
      writeln('4. STATE HIGHWAY FUND REVENUE SUMMARY');
      writeln('5. LOCAL HIGHWAY REVENUES');
      writeln('6. EXIT TO LONG TERM MENU');
      writeln;
      writeln('Hit RETURN after indicating your choice:');
      read(ri);

```

```

        case ri of
          1:begin
            allrev(year,gtr,sftr,mcsr,mcftr,totalregr,pcar,ttruck,ttrac);
          end;
          2:begin
            mvharev(year,gtmvhar,sftmvhar,mcsmvhar,mvharegr,mvhalicr,irpmvhar,
              mvtit,mvgf,mvfr,mvmiscr,mvexpl,mvexp2,mvexp3,mvexp4,mvexp5,
              netmvha);
          end;
          3:begin
            hrsfrev(year,gthrsfr,sfthrsfr,hrsfregr,gtcdr,sfcdsr,gtshcfr,mcsmcfr,
              hrtit,hrmcyreg);
          end;
          4:begin
            shfrev(year,mvhashfr,hrsfshfr,mcftshfr,sdshfr,mcsshfr,totalshfr,
              shffhwa,shfmisc,genrev1,genrev2,genrev3);
          end;
          5:begin
            lrev(year,mvhalocalr,hrsflocalr,sdlocalr,totallocalr);
          end;
        6:end;(case ri of)
      end; {procedure revsum}
    {*****}
    begin {main program}

      {initialization}
      Assign(ininitial,'DATA');
      Reset(ininitial);

      {read the years from the file "DATA"}
      for j := 1 to 17 do
        readln(ininitial,ln,fyear[j]);
      {read socioeconomic variables from the file "DATA"}
      for j := 1 to 17 do
        readln(ininitial,ln,tpop[j],dpop[j],ypop[j],lpop[j]);
      for j := 1 to 17 do
        readln(ininitial,ln,pci82[j],gsp82[j],gasp82[j],cpi82[j],gnpdef82[j]);

      {read registration fees and proportion values}
      for j:= 1 to 14 do
        readln(ininitial,ln,sngtrkf[j],sngtrkp[j]);
      for j:= 1 to 14 do
        readln(ininitial,ln,sfgtrkf[j],sfgtrkp[j]);
      for j:= 1 to 14 do
        readln(ininitial,ln,cngtrkf[j],cngtrkp[j]);
      for j:= 1 to 14 do
        readln(ininitial,ln,cfgtrkf[j],cfgtrkp[j]);
      for j:= 1 to 14 do
        readln(ininitial,ln,trgtrkf[j],trgtrkp[j]);
      {read other vehicle registration fees}
      readln(ininitial,ln,vofv[1],vofv[2],vofv[3],vofv[4],vofv[5]);
      {read bus registration fees and proportion by type}
      readln(ininitial,ln,bofvf[1],bofvf[2],bofvf[3],bofvf[4],bofvf[5]);
      readln(ininitial,ln,bofvp[1],bofvp[2],bofvp[3],bofvp[4],bofvp[5]);
      {read motor fuel tax rates}
      readln(ininitial,ln,gastr,spftr,surtr,mcfutr);
      {read relative proportion of aged vehicles and their
        relative miles}
      for j := 1 to 17 do
        begin
          for k := 1 to 10 do
            begin

```

```

        readln(ininitial,ln,ani[j,k],lni[j,k],hni[j,k]);
        end;
    end;
    for j := 1 to 10 do
        readln(ininitial,ln,arvt[j],lrvt[j],hrvt[j]);
        for j:= 1 to 28 do
            {read model yr fuel efficiencies of auto, light and heavy trucks}
            readln(ininitial,ln,aeff[j],leff[j],heff[j]);
            {read the disbursement ratios}
            readln(ininitial,ln,pbsr,psr,pnhr,pnmr,pgsr);
            readln(ininitial,ln,pnghr,pngmr,pdsr,pdmr,pdmc);
            readln(ininitial,ln,psdr,psdir,phsr,phlr,pmsr,pmlr);
            readln(ininitial,ln,boareg,blareg,bosureg,blsureg);
            readln(ininitial,ln,boconreg,blconreg,b2conreg,bocofreg,blcofreg);
            readln(ininitial,ln,botrreg,bltrreg,bosnreg,blsnreg,bosfreg,blsfreg);
            readln(ininitial,ln,bobreg,blbreg,bomreg,blmreg);
            readln(ininitial,ln,psnreg,psfreg,pnfr,pftr,pftr,pmisc);
            readln(ininitial,ln,boavm,blavm,b2avm,bosvm,blsvm,b2svm);
            readln(ininitial,ln,bomcvm,blmcvm,b2mcvm,bocvm,blcvm,b2cvm,bobvm,blbv
                m);
            readln(ininitial,ln,pdlic,drevplic,pstax,pmcft);
            {read seasonal indices for short term forecast of revenues}
            for i:= 1 to 12 do
                readln(ininitial,ln,rsi[i],dsi[i],gsi[i]);
            end;
            for i:= 1 to 12 do
                readln(ininitial,ln,spsi[i],mcsi[i],sursi[i]);
                readln(ininitial,ln,mvfit,mvgf,mvfr,mvmisc);
            end;
            readln(ininitial,ln,mvexp1,mvexp2,mvexp3,mvexp4,mvexp5);
            readln(ininitial,ln,hrtit,shffhwa,shfmisc);
            readln(ininitial,ln,genrev1,genrev2,genrev3);
            close(ininitial);
            pistate := 0.0;
            irptrk := 0.0;
        }
        {-----}
        {construction of screen for fees, proportions, and efficiencies}
        sgtrks[1]:= '1: 7000 lbs: 8: 36000 lbs: ';
        sgtrks[2]:= '2: 9000 lbs: 9: 42000 lbs: ';
        sgtrks[3]:= '3: 11000 lbs: 10: 48000 lbs: ';
        sgtrks[4]:= '4: 16000 lbs: 11: 54000 lbs: ';
        sgtrks[5]:= '5: 20000 lbs: 12: 60000 lbs: ';
        sgtrks[6]:= '6: 26000 lbs: 13: 66000 lbs: ';
        sgtrks[7]:= '7: 30000 lbs: 14: > 66 Kips: ';

        cogtrks[1]:= '1: 20000 lbs: 8: 60000 lbs: ';
        cogtrks[2]:= '2: 26000 lbs: 9: 66000 lbs: ';
        cogtrks[3]:= '3: 30000 lbs: 10: 72000 lbs: ';
        cogtrks[4]:= '4: 36000 lbs: 11: 74000 lbs: ';
        cogtrks[5]:= '5: 42000 lbs: 12: 76000 lbs: ';
        cogtrks[6]:= '6: 48000 lbs: 13: 78000 lbs: ';
        cogtrks[7]:= '7: 54000 lbs: 14: > 78 Kips: ';

        trgtrks[1]:= '1: 3k (nf): 8: > 22k (nf): ';
        trgtrks[2]:= '2: 5k (nf): 9: 7k (f): ';
        trgtrks[3]:= '3: 7k (nf): 10: 9k (f): ';
        trgtrks[4]:= '4: 9k (nf): 11: 12k (f): ';
        trgtrks[5]:= '5: 12k (nf): 12: 16k (f): ';
        trgtrks[6]:= '6: 16k (nf): 13: 22k (f): ';
        trgtrks[7]:= '7: 22k (nf): 14: >22k (f): ';

        vofs[1]:= '1: PASSENGER CAR.....';
        vofs[2]:= '2: MOTORCYCLE.....';
        vofs[3]:= '3: HOUSECAR.....';
        vofs[4]:= '4: NON-FARM SEMITRAILER.....';

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vofs[5]:= '5: FARM SEMITRAILER.....';
bofs[1]:= '1: SCHOOL BUS.....';
bofs[2]:= '2: CHURCH BUS.....';
bofs[3]:= '3: BUS A.....';
bofs[4]:= '4: BUS C.....';
bofs[5]:= '5: BUS D.....';

{WELCOME MESSAGE}
clrscr;
writeln('      WELCOME TO                                ');
writeln('      "INDOTREV"                                ');
writeln('      INDIANA HIGHWAY REVENUE FORECASTING MODEL  ');
writeln('      Developed by                                ');
writeln('      Amiy Varma and Kumares C. Sinha            ');
writeln('      at Purdue University                       ');
writeln('      for                                          ');
writeln('      Indiana Department of Transportation (INDOT) ');
writeln('      January 1991                               ');
writeln('Hit RETURN to continue.....');
read(dummy);

{fyear;Which forecast year the user is interested in?}
10:Clrscr;
writeln('WELCOME TO SELECTION OF FORECAST YEAR MENU');
writeln('THE MODEL CAN PROVIDE FORECAST FOR FOLLOWING YEARS');
writeln;
writeln(' 1. 1990');
writeln(' 2. 1991');
writeln(' 3. 1992');
writeln(' 4. 1993');
writeln(' 5. 1994');
writeln(' 6. 1995');
writeln(' 7. 1996');
writeln(' 8. 1997');
writeln(' 9. 1998');
writeln('10. 1999');
writeln('11. 2000');
writeln('12. 2001');
writeln('13. 2002');
writeln('14. 2003');
writeln('15. 2004');
writeln('16. 2005');
writeln('17. EXIT THE PROGRAM');
writeln;
writeln('Hit RETURN after entering your choice:');
readln(fy);

Case fy of

```

```

1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16:begin
    i := fy + 1;
    year := fyear[i];
    goto 20;
end;
17:begin
    goto
    5000
end;
end; {of case of fy}

{-----}
20:Clrscr;
    writeln('WELCOME TO THE FORECAST HORIZON MENU');
    writeln('THE MODEL PROVIDES FORECASTS FOR BOTH LONG AND SHORT TERM');
    writeln;
    writeln('LONG TERM IMPLIES YEARLY REVENUE FORECASTS');
    writeln('SHORT TERM IMPLIES MONTHLY REVENUE FORECASTS');
    writeln;
    writeln('IT SHOULD BE HOWEVER NOTED THAT THE YEARLY FORECAST');
    writeln('SHOULD BE OBTAINED BEFORE MONTHLY FORECAST CAN BE MADE. ');
    writeln('HENCE THE USER IS ADVISED TO CHOOSE LONG TERM OPTION FIRST');
    writeln('AND THEN CHOOSE SHORT TERM OPTION INORDER TO OBTAIN MONTHLY');
    writeln('FORECAST FOR THE YEAR IN QUESTION. ');
    writeln;
    writeln(' 1. LONG TERM');
    writeln(' 2. SHORT TERM');
    writeln(' 3. EXIT TO FORECAST YEAR MENU');
    writeln;
    writeln('Hit RETURN after entering your choice: ');
    read(fh);

    case fh of
    1: begin goto 30;end;
    2: begin goto 40;end;
    3:begin goto 10;end;
    end; {case fh}

30:Clrscr;
    writeln('WELCOME TO LONG TERM MENU');
    writeln;
    writeln('THE MODEL CAN INDICATE THE ASSUMPTIONS IT IS USING');
    writeln('IF YOU CHOOSE THE ASSUMPTIONS OPTION. ');
    writeln('THE MODEL WILL PROVIDE REVENUE SUMMARIES IF YOU CHOOSE');
    writeln('REVENUE SUMMARIES OPTION');
    writeln('THE MODEL WILL PRINT THE REVENUE SUMMARIES AND');
    writeln('ASSUMPTIONS IN THE FILE "LRESULT" WHEN YOU USE');
    writeln('PRINT OPTION');
    writeln('HOWEVER, USER SHOULD NOTE THAT "CALCULATE REVENUES"');
    writeln('OPTION SHOULD BE SELECTED BEFORE SELECTING EITHER');
    writeln('REVENUE SUMMARY OPTION OR PRINT OPTION');
    writeln;
    writeln;
    writeln('1. ASSUMPTIONS');
    writeln('2. CALCULATE YEARLY REVENUES');
    writeln('3. DISPLAY REVENUE SUMMARIES');
    writeln('4. PRINT LONG TERM (YEARLY) REVENUES IN "LRESULT"');
    writeln('5. EXIT TO FORECAST HORIZON MENU');
    writeln;
    writeln('Hit RETURN after indicating your choice: ');
    read(li);

```

Case 11 of

```

1: begin
assumptions(i, year, tpop, dpop, ypop, lpop, pci82, gsp82, gasp82,
            cpi82, gnpdef82,
            sgtrks, cogtrks, trgtrks,
            sngtrkf, sfgrtkf, cngtrkf, cfgrtkf, trgtrkf,
            sngtrkp, sfgrtkp, cngtrkp, cfgrtkp, trgtrkp,
            vofs, bofs, vofv, bofvf, bofvp,
            vfsb, vfa,
            ani, lni, hni, arvt, lrvt, hrvt,
            aeff, leff, heff,
            gastr, spftr, surtr, mcfutr,
            pbsr, psr, pnhr, pnmr, pgsr, pnghr, pngmr,
            pdsr, pdmr, pdmcr, pdsr, psdlr,
            phsr, phlr, pmsr, pmlr);
goto 30;
end;

2: begin
revcalc(pfeeinc, atreg, sureg, combnfreg, combnfreg1, combfreg,
        trailreg,
        strailnfreg, strailfreg, busreg, mcreg, housecar, sunreg, sufreg,
        nftrailer, ftrailer, feesunreg, feesufreg, feenftrail, feeftail,
        feebusreg, feecnreg, feecfreg,
        pcar, ttruck, ttrac, ttrail, tmcycle, thcar, nfst, fst,
        ptotalregr, totalregr, atvmt, suvmt, mcvm, combvmt, busaavm, busvmt,
        dlic, pavgafe, pavglfe, pavghfe, avgafe, avglfe, avghfe,
        gtr, sfr, mcsr, mcftr,
        gastr, spftr, surtr, mcfutr,
        sd, sdlocalr, sdshfr, hrsfreg, hsauregrev, hfeesunreg, hfeenftrreg,
        mvharegr, totalhrsfr, hrsflocalr, hrsfshfr,
        mvhalicr, irpmvhar, totalmvhar, netmvha, mvhashfr, mvhalocalr,
        totalshfr, totallocalr,
        pbsr, psr, pnhr, pnmr, pgsr, pnghr, pngmr, pdsr, pdmr, pdmcr, pdsr,
        psdlr, phsr, phlr, pmsr, pmlr,
        gtshefr, gtsdr, gtadj, gthrsfr, gtmvhar, sftsdr, sftadj, sfthrsfr,
        sftmvhar, mcsmcfr, mcsmvhar, mcsshfr,
        pci82, gsp82, gasp82,
        lpop, ypop,
        sngtrkp, sfgrtkp, trgtrkp, sngtrkf, sfgrtkf, trgtrkf,
        cngtrkp, cfgrtkp, cngtrkf, cfgrtkf,
        bofvp, bofvf, vofv, i, fy, ceffi,
        ani, arvt, lni, lrvt, hni, hrvt,
        aeff, leff, heff,
        pistate, irptrk, boareg, blareg, bosureg, blsureg,
        boconreg, blconreg, b2conreg, bocofreg, blcofreg,
        botrreg, bltrreg, bosnreg, blsnreg, bosfreg, blsfreg,
        bobreg, blbreg, bomreg, blmreg, penreg, psfreg, pnfr, pftr,
        pmisc, boavm, blavm, b2avm, bosuvm, blsuvm, b2suvm,
        bomcvm, blmcvm, b2mcvm, bocovm, blcovm, b2covm, bobvm, blbvm,
        pdlic, drevplic, pstax, pmcfut,
        mvtit, mvgrf, mvfr, mvmiscr,
        mvexpl, mvexp2, mvexp3, mvexp4, mvexp5,
        hrtit, hrncyreg, shffhwa, shfmisc,
        genrev1, genrev2, genrev3);

irpmvhar := (combnfreg1*feecnreg/1000.0)*1.5;
goto 30;
end;

3: begin

```

```

                                revsum(year,
                                gtr,sftr,mcsr,mcfr,totalregr,pcar,ttruck,ttrac,
                                gtmvhar,sftmvhar,mcsmvhar,mvharegr,mvhalicr,irpmvhar,
                                gthrefr,sfthrsfr,hrsfregr,gtedr,sftedr,gtshcfr,mcsmcfr,
                                mvhashfr,hrsfshfr,mcfr,sdshfr,mcshfr,totalsfr,
                                mvhalocalr,hrsflocalr,edlocalr,totallcalr,
                                mvtit,mvgf,mvfr,mvmiscr,
                                mvexpl,mvexp2,mvexp3,mvexp4,mvexp5,
                                hrtit,hrmcyreg,shffhwa,shfmisc,
                                genrev1,genrev2,genrev3,netmvha);

                                goto 30;
                                end;

                                4:begin
                                Assign(loutinitial,'lresult');
                                Rewrite(loutinitial);
                                writeln(loutinitial,'The Highway Revenue Summary for the Year--',year);
                                writeln(loutinitial);
                                writeln(loutinitial);
                                writeln(loutinitial,' Socioeconomic Variables Used and their Values');
                                writeln(loutinitial);
                                writeln(loutinitial,'Demographic Variables:');
                                writeln(loutinitial,'Total Population (in
                                1000s).....',tpop[i]);
                                writeln(loutinitial,'Driving Age Population (in
                                1000s).....',dpop[i]);
                                writeln(loutinitial,'Young Age (15-24 yrs) Population (in
                                1000s)..',ypop[i]);
                                writeln(loutinitial,'Less than Driving Age Population (in
                                1000s)..',lpop[i]);
                                writeln(loutinitial);
                                writeln(loutinitial,'Economic Variables');
                                writeln(loutinitial,'Per Capita Income (in 1982$).....',pci82[i]:10:2);
                                writeln(loutinitial,'Gross State Product (in 1000s in 1982
                                $).....',gsp82[i]:19:0);
                                writeln(loutinitial,'Gasoline Price(in 1982 $) in
                                $/gallon..',gasp82[i]:5:3);
                                writeln(loutinitial);
                                writeln(loutinitial,'Highway Revenues (in 1000$s) by Major Revenue
                                Sources');
                                writeln(loutinitial);
                                writeln(loutinitial,'A. Motor Fuels:');
                                writeln(loutinitial,' Gasoline..... ',gtr:19:0);
                                writeln(loutinitial,' Special Fuel..... ',sftr:19:0);
                                writeln(loutinitial,' Diesel Surtax..... ',mcsr:19:0);
                                writeln(loutinitial,' Motor Carrier Fuel Use tax.. ',mcfr:19:0);
                                writeln(loutinitial,'B. Motor Vehicle Registrations:');
                                writeln(loutinitial,' Total..... ',totalregr:19:0);
                                writeln(loutinitial,' Passenger Cars..... ',pcar:19:0);
                                writeln(loutinitial,' Trucks..... ',ttruck:19:0);
                                writeln(loutinitial,' Tractors..... ',ttrac:19:0);
                                writeln(loutinitial);
                                writeln(loutinitial);
                                writeln(loutinitial,'Revenue Summary (in 1000$s) for Motor Vehicle
                                Highway Fund');
                                writeln(loutinitial);
                                writeln(loutinitial,'Gasoline tax..... ',gtmvhar:19:0);
                                writeln(loutinitial,'Special fuel tax..... ',sftmvhar:19:0);
                                writeln(loutinitial,'Diesel Surtax..... ',mcsmvhar:19:0);
                                writeln(loutinitial,'Vehicle Registrations..... ',mvharegr:19:0);
                                writeln(loutinitial,'Driver Licenses..... ',mvhalicr:19:0);

```

```

writeln(loutinitial,'IRP Revenue..... ',irpmvhar:19:0);
writeln(loutinitial,'Net MVHA Revenue..... ',netmvha:19:0);
    writeln(loutinitial);
    writeln(loutinitial,'Revenue Summary (in 1000$s) for HRSF and Other
    Funds');
    writeln(loutinitial);
    writeln(loutinitial,'HRSF',', 'Special
    Dist. Account');
    writeln(loutinitial,' Gasoline..... ',gthrsfr:14:0,'
    ', 'Gasoline..... ',gtsdr:14:0);
    writeln(loutinitial,' Special Fuel.... ',sftthrsfr:14:0,' ', 'Special
    Fuel... ',sftsdr:14:0);
    writeln(loutinitial,' Vehicle Reg..... ',hrsfrgr:14:0);
    writeln(loutinitial,' Total..... ',totalhrsfr:14:0);
    writeln(loutinitial,' State Highway Construction Fund');
    writeln(loutinitial,' Gasoline..... ',gtschfr:14:0);
    writeln(loutinitial,' Motor Carrier Regulation Fund');
    writeln(loutinitial,' Diesel surtax... ',mcsmcfr:14:0);
    writeln(loutinitial,' Motorcycle Safety Fund');
    writeln(loutinitial,' Motorcycle Registration... ',hrmcyr:14:0);
    writeln(loutinitial);
    writeln(loutinitial,' State Highway Fund: Revenue Summary (in 1000$s)');
    writeln(loutinitial);
    writeln(loutinitial,' MVHA.....
    ',mvhashfr:19:0);
    writeln(loutinitial,' HRSF.....
    ',hrsfrshfr:19:0);
    writeln(loutinitial,' Special Distribution Account..... ',sdshfr:19:0);
    writeln(loutinitial,' Motor Carrier Fuel Use Tax..... ',mcfr:19:0);
    writeln(loutinitial,' Diesel Surtax.....
    ',mcsshfr:19:0);
    writeln(loutinitial,' Total State Highway Fund Revenue...
    ',totalshfr:19:0);
    writeln(loutinitial);
    writeln(loutinitial);
    writeln(loutinitial,' Local Highway Revenues (in 1000$s)');
    writeln(loutinitial);
    writeln(loutinitial,' MVHA..... ',mvhalocalr:19:0);
    writeln(loutinitial,' HRSF..... ',hrsfrlocalr:19:0);
    writeln(loutinitial,' Special Distribtuion..... ',sdlocalr:19:0);
    writeln(loutinitial,' Total Local Revenues..... ',totallocalr:19:0);
    writeln(loutinitial);
    totalrev := gtr+sftr+mcsr+mcfr+totalregr;
    totalrev := totalrev+mvtit+mvfr+mvmscr+hrtit+hrmcyr;
    totalrev := totalrev-mvexp1-mvexp2-mvexp3-mvexp4-mvexp5;
    writeln(loutinitial,' Total Highway Revenue.... ',totalrev:19:0);
    close(loutinitial);
    goto 30;
    end;

    5:begin
    goto 20;
    end;
    end; {case 11 of}

    40:
    clrscr;
    tgshtsb := 'Month      Seasonal Indices      Revenue      ';
    writeln ('          WELCOME TO SHORT TERM MENU');
    writeln;
    writeln('IT IS TO BE NOTED THAT THE SHORT TERM FORECASTS ARE');
    writeln('ESSENTIALLY COMPUTED BY MULTIPLYING THE MONTHLY');

```

```

writeln('AVERAGES OF THE YEARLY REVENUES AS FOUND IN LONG TERM');
writeln('ANALYSIS AND FORECASTS BY THE SEASONAL INDICES COMPUTED');
writeln('BY ANALYZING MONTHLY DATA. THE FORECASTS ARE PROVIDED');
  writeln('ONLY IN AGGREGATE TERMS BY REVENUE SOURCE.');
```

writeln;

```

writeln('HOWEVER USER SHOULD NOTE THAT OPTION 1 HAS TO CHOSEN');
  writeln('FIRST BEFORE OTHER OPTIONS CAN BE CHOSEN.');
```

writeln;

```

  writeln('1. CALCULATE SHORT TERM REVENUES');
  writeln('2. REGISTRATION REVENUES');
  writeln('3. DRIVER LICENSE REVENUES');
  writeln('4. GASOLINE TAX REVENUES');
  writeln('5. SPECIAL FUEL TAX REVENUES');
  writeln('6. MOTOR CARRIER FUEL USE TAX REVENUES');
  writeln('7. DIESEL SURTAX REVENUES');
writeln('8. PRINT SHORT-TERM REVENUES IN THE FILE "SRESULT."');
  writeln('9. EXIT TO FORECAST HORIZON MENU');
```

writeln;

```

writeln('Hit RETURN after indicating your choice: ');
  read(si);
```

```

      Case si of
        1:begin
          for i := 1 to 12 do
            rsrev[i] := (totalregr*rsi[i]/1200.0);
          for i := 1 to 12 do
            dsrev[i] := (mvhalicr*dsi[i]/1200.0);
          for i := 1 to 12 do
            gsrev[i] := (gtr*gsi[i]/1200.0);
          for i := 1 to 12 do
            spsrev[i] := (sftr*spsi[i]/1200.0);
          for i := 1 to 12 do
            mcsrev[i] := (mcftr*mcsi[i]/1200.0);
          for i := 1 to 12 do
            sursrev[i] := (mcsr*sursi[i]/1200.0);
          goto 40;
        end;

        2:begin
          stitle:='REGISTRATION FEES';
          gensht(year,stitle,rsi,rsrev);
          goto 40;
        end;

        3:begin
          stitle:='DRIVER LICENSES';
          gensht(year,stitle,dsi,dsrev);
          goto 40;
        end;

        4:begin
          stitle:=' GASOLINE TAX';
          gensht(year,stitle,gsi,gsrev);
          goto 40;
        end;

        5:begin
          stitle:=' SPECIAL FUEL TAX';
          gensht(year,stitle,spsi,spsrev);
          goto 40;
        end;

        6:begin
          stitle:='MOTOR CARRIER FUEL USE TAX';
          gensht(year,stitle,mcsi,mcsrev);
          goto 40;
        end;
```

```

end;
7:begin
stitle:='DIESEL SURTAX';
gensht(year,stitle,sursi,sursrev);
goto 40
end;
8:begin
month[1]:='J'; month[2]:='F'; month[3]:='M'; month[4]:='A';
month[5]:='M'; month[6]:='J'; month[7]:='J'; month[8]:='A';
month[9]:='S'; month[10]:='O'; month[11]:='N'; month[12]:='D';
Assign(soutinitial,'SRESULT');
Rewrite(soutinitial);
writeln(soutinitial,'Short Term Highway Revenues',year);
writeln(soutinitial);
writeln(soutinitial,'Registration Fees');
writeln(soutinitial,'Month Seasonal Indices Revenue');
for j := 1 to 12 do
writeln(soutinitial,month[j],',',rsi[j]:6:2,',',rsrev[j]:19:0);
writeln(soutinitial);
writeln(soutinitial,'Driver Licenses');
writeln(soutinitial,'Month Seasonal Indices Revenue');
for j := 1 to 12 do
writeln(soutinitial,month[j],',',dsi[j]:6:2,',',dsrev[j]:19:0);
writeln(soutinitial);
writeln(soutinitial);
writeln(soutinitial,'Gasoline Tax');
writeln(soutinitial,'Month Seasonal Indices Revenue');
for j := 1 to 12 do
writeln(soutinitial,month[j],',',gsi[j]:6:2,',',gsrev[j]:19:0);
writeln(soutinitial);
writeln(soutinitial,'Special Fuel');
writeln(soutinitial,'Month Seasonal Indices Revenue');
for j := 1 to 12 do
writeln(soutinitial,month[j],',',spsi[j]:6:2,',',spsrev[j]:19:0);
writeln(soutinitial);
writeln(soutinitial,'Motor Carrier Fuel Use Tax');
writeln(soutinitial,'Month Seasonal Indices Revenue');
for j := 1 to 12 do
writeln(soutinitial,month[j],',',mcsi[j]:6:2,',',mcsrev[j]:19:0);
writeln(soutinitial);
writeln(soutinitial);
writeln(soutinitial,'Diesel Surtax');
writeln(soutinitial,'Month Seasonal Indices Revenue');
for j := 1 to 12 do
writeln(soutinitial,month[j],',',sursi[j]:6:2,',',sursrev[j]:19:0);
close(soutinitial);
goto 40;
end;
9:begin
goto 20
end;
end; {case si of}
5000: end. {main program}

```

APPENDIX C. PROGRAM LISTING OF THE SUPPLEMENT, "SHORTREV"


```

Program shortrev (input, output);
uses crt,Turbo3;
label 5000;

type
  rar = array[1..240] of real;
  iar = array[1..240] of integer;
  ral2 = array[1..12] of real;
  ra30 = array[1..30] of real;

var
  ginf,sinf,stinf,minf,rinf,iinf,outf:text;
  gp,sp,stp,mp,rp,ip:iar;
  gy,sy,sty,my,ry,iy:iar;
  gs,ss,sts,ms,rs,is:iar;
  gd,sd,std,md,rd,id:rar;
  gmv,smv,stmv,mmv,xmv,imv:rar;
  gr,ar,str,mr,rr,ir:rar;
  value: integer;
  gi,si,sti,mi,ri,ii:integer;
  i,j,l,gm,gn:integer;
  gsi,ssi,stoi,msi,rsi,isi:ral2;
  gad,sad,stad,mad,rad,iad:rar;
  ga,gb,sa,sb,sta,stab,ma,mb,ra,rb,ia,ib:real;
  gtax,ntax,stattax,mtax,rtax,itax:real;

{*****}

procedure welcome;
var
  dummy : char;
begin {procedure welcome}

  clrscr;
  writeln('                WELCOME TO                ');
  writeln;
  writeln;
  writeln('                "SHORTREV"                ');
  writeln;
  writeln('SUPPLEMENT TO INDIANA HIGHWAY REVENUE FORECASTING MODEL');
  writeln;
  writeln('                Developed by                ');
  writeln;
  writeln('                Amiy Varma and Kumares C. Sinha                ');
  writeln;
  writeln('                at Purdue University                ');
  writeln;
  writeln('                for                ');
  writeln;
  writeln('                Indiana Department of Transportation (INDOT)                ');
  writeln;
  writeln('                January, 1991                ');
  writeln;
  writeln('Hit RETURN to continue.....');

```

```

    read(dummy)

end; {procedure welcome}

{*****}

procedure makesure (var value:integer);

var
    dummy: char;

begin {procedure makesure}
    Clrscr;
    writeln('Before Starting With This Supplement You');
    writeln('Should Make Sure That You Have Created the');
    writeln('Following Files:');
    writeln;
    writeln('    GASIN- A file containing monthly gasoline data');
    writeln('    SPFIN- A file containing monthly special fuel data');
    writeln('    STAXIN- A file containing monthly surtax data');
    writeln('    MCFUTIN- A file conatining monthly MCFUT data');
    writeln('    REGIN- A file conatining monthly Vehicle License Fees');
    writeln('    IRPIN- A file conatining monthly IRP data');
    writeln;
    writeln('If all these files are created then Input 1, indicating');
    writeln('all files have been created, otherwise Input 0, indicating');
    writeln('that you should exit the program and create these files. ');
    writeln;
    writeln('Enter Your Choice: ');
    read(value)
end; {procedure makesure}

{*****}

procedure medial(dsF: ra30;
                n : integer;
                var avg:real);

var
    j :integer;
    max,min,sum:real;

begin {procedure medial}

    max := dsf[1];
    min := dsf[1];
    sum := 0.0;
    for j := 1 to n do
        begin
            if (dsf[j] > max) then
                max := dsf[j];
            if (dsf[j] < min) then
                min := dsf[j];
            sum := sum + dsf[j]
        end; {for loop}
    if (n < 3) then
        begin
            avg := (sum-max-min)/(n-2);
        end
    else

```

```

begin
  avg := sum/n;
end;
end; {procedure medial}
{*****}

procedure getarray( var finf:text;
                   var dp,dy,ds:iar;
                   var dd:rar;
                   var ind:integer);

begin {procedure getarray}
  readln(finf);
  readln(finf);
  ind := 0;
  while not eof(finf) do
    begin
      ind := ind + 1;
      readln(finf,dp[ind],dy[ind],ds[ind],dd[ind])
    end
  end; {procedure getarray}

  {*****}
  procedure maverage( ind: integer;
                    dd : rar;
                    var dmrv: rar);

  var
    i,k,j,gm: integer;
    sum:real;

  begin
    {find 12-month moving averages and the ratios}
    i := 1;
    k := ind-11;
    while (i <= k) do
      begin
        sum := 0.0;
        gm := 11 + i;
        for j := i to gm do
          begin
            sum := dd[j] + sum;
          end; {for loop}
        l := i+6;
        dmrv[l] := sum/12.0;
        i := i + 1;
      end {while loop}
    end; {procedure maverage}

    {*****}
    procedure ratio(ind: integer;
                  dd,dmrv: rar;
                  var dr: rar);

  var
    gn,j:integer;

  begin {procedure ratio}
    gn := ind-5;
    for j:= 7 to gn do
      begin

```

```

        dr[j] := dd[j]/dmv[j];
    end {for loop}
end; {procedure ratio}

{*****}

procedure taxrate(var gtax,stax,stattax,mtax:real);

var
    tax:real;

begin {procedure taxrate}
    clrscr;
    writeln;
    writeln;
    writeln('Please input the current gasoline taxrate');
    writeln('in cents per gallon and Press Enter: ');
    read(tax);
    gtax := tax/100.0;
    clrscr;
    writeln;
    writeln;
    writeln('Please input the current special fuel taxrate');
    writeln('in cents per gallon and Press Enter: ');
    read(tax);
    stax := tax/100.0;
    clrscr;
    writeln;
    writeln;
    writeln('Please input the current diesel surtax taxrate');
    writeln('in cents per gallon and Press Enter: ');
    read(tax);
    stattax := tax/100.0;
    clrscr;
    writeln;
    writeln;
    writeln('Please input the current MCFUT taxrate');
    writeln('in cents per gallon and Press Enter: ');
    read(tax);
    mtax := tax/100.0;
end; {procedure taxrate}

{*****}

procedure sfactor(ind:integer;
                 ds: iar;
                 dd: rar;
                 dr: rar;
                 var dsi: ral2;
                 var dad: rar);

var
    dn1,dn2,dn3,dn4,dn5,dn6,dn7,dn8,dn9,dn10,dn11,dn12:integer;
    dn,j,i:integer;
    ds1,ds2,ds3,ds4,ds5,ds6,ds7,ds8,ds9,ds10,ds11,ds12:ra30;
    mavg1,mavg2,mavg3,mavg4,mavg5,mavg6,mavg7,mavg8,mavg9:real;
    mavg10,mavg11,mavg12:real;
    total1,total2,total,adjf:real;
    dummy: char;

begin {procedure sfactor}

```

```

dn := ind-5;
dn1 := 0;
dn2 := 0;
dn3 := 0;
dn4 := 0;
dn5 := 0;
dn6 := 0;
dn7 := 0;
dn8 := 0;
dn9 := 0;
dn10 := 0;
dn11 := 0;
dn12 := 0;

```

```

{calculate seasonal factors}
for j := 7 to dn do

```

```

begin
  case ds[j] of
    1: begin
      dn1 := dn1+1;
      ds1[dn1] := dr[j];
    end;
    2: begin
      dn2 := dn2+1;
      ds2[dn2] := dr[j];
    end;
    3: begin
      dn3 := dn3+1;
      ds3[dn3] := dr[j];
    end;
    4: begin
      dn4 := dn4+1;
      ds4[dn4] := dr[j];
    end;
    5: begin
      dn5 := dn5+1;
      ds5[dn5] := dr[j];
    end;
    6: begin
      dn6 := dn6+1;
      ds6[dn6] := dr[j];
    end;
    7: begin
      dn7 := dn7+1;
      ds7[dn7] := dr[j];
    end;
    8: begin
      dn8 := dn8+1;
      ds8[dn8] := dr[j];
    end;
    9: begin
      dn9 := dn9+1;
      ds9[dn9] := dr[j];
    end;
    10: begin
      dn10 := dn10+1;
      ds10[dn10] := dr[j];
    end;
    11: begin
      dn11 := dn11+1;
      ds11[dn11] := dr[j];
    end;
  end;
end;

```

```

12: begin
    dn12 := dn12+1;
    ds12[dn12] := dr[j];
end;
end; {case}
end; {for loop}

{calculate medial average}
medial(ds1,dn1,mavg1);
medial(ds2,dn2,mavg2);
medial(ds3,dn3,mavg3);
medial(ds4,dn4,mavg4);
medial(ds5,dn5,mavg5);
medial(ds6,dn6,mavg6);
medial(ds7,dn7,mavg7);
medial(ds8,dn8,mavg8);
medial(ds9,dn9,mavg9);
medial(ds10,dn10,mavg10);
medial(ds11,dn11,mavg11);
medial(ds12,dn12,mavg12);

{adjust the medial averages to get the seasonal indices}

total1 := mavg1+mavg2+mavg3+mavg4+mavg5+mavg6;
total2 := mavg7+mavg8+mavg9+mavg10+mavg11+mavg12;
total := total1+total2;
adjf := 12/total;
dsi[1] := mavg1*adjf;
dsi[2] := mavg2*adjf;
dsi[3] := mavg3*adjf;
dsi[4] := mavg4*adjf;
dsi[5] := mavg5*adjf;
dsi[6] := mavg6*adjf;
dsi[7] := mavg7*adjf;
dsi[8] := mavg8*adjf;
dsi[9] := mavg9*adjf;
dsi[10] := mavg10*adjf;
dsi[11] := mavg11*adjf;
dsi[12] := mavg12*adjf;

{find seasonally adjusted data}
for i := 1 to ind do
begin
    case ds[i] of
        1: begin
            dad[i] := dd[i]/dsi[1];
        end;
        2: begin
            dad[i] := dd[i]/dsi[2];
        end;
        3: begin
            dad[i] := dd[i]/dsi[3];
        end;
        4: begin
            dad[i] := dd[i]/dsi[4];
        end;
        5: begin
            dad[i] := dd[i]/dsi[5];
        end;
        6: begin

```

```

        dad[i] := dd[i]/dsi[6];
    end;
7: begin
    dad[i] := dd[i]/dsi[7];
    end;
8: begin
    dad[i] := dd[i]/dsi[8];
    end;
9: begin
    dad[i] := dd[i]/dsi[9];
    end;
10: begin
    dad[i] := dd[i]/dsi[10];
    end;
11: begin
    dad[i] := dd[i]/dsi[11];
    end;
12: begin
    dad[i] := dd[i]/dsi[12];
    end;
end; {case}
end; {for loop}

end; {procedure sfactor}

{*****}

procedure regress( ind:integer;
                   dp :iar;
                   dad:rar;
                   var da,db:real);

var

    sxy,sx,sy,sx2:real;
    i:integer;

begin
    sxy := 0.0;
    sx := 0.0;
    sy := 0.0;
    sx2 := 0.0;

    for i := 1 to ind do

        begin
            sxy := sxy + dp[i]*dad[i];
            sx := sx + dp[i];
            sy := sy + dad[i];
            sx2 := sx2 + dp[i]*dp[i];
        end;

        db := (ind*sxy - sx*sy)/(ind*sx2 - sx*sx);
        da := (sy - db*sx)/ind;
    end;
{*****}
procedure forecast(var outf:text;
                   ind:integer;
                   dd:rar;
                   dp,dy,ds:iar;
                   dsi:ral2;
                   db,da,tax:real);

```

```

var
  nn,fn,j,k,index:integer;
begin {procedure forecast}
  {find projections for next six months}
  nn := ind+1;
  fn := ind+6;
  for j := nn to fn do
    begin
      k := j-1;
      if (ds[k] = 12) then
        begin
          dp[j] := j;
          dy[j] := dy[k]+1;
          ds[j] := 1;
          dd[j] := (da + db*dp[j])*dsi[1];
        end
      else
        begin
          dp[j] := j;
          dy[j] := dy[k];
          ds[j] := ds[k]+1;
          index := ds[j];
          dd[j] := (da + db*dp[j])*dsi[index];
        end
      end; {for loop}
    {print results}
    writeln(outf);
    writeln(outf, '      ', ' Month      ', '      ', 'Seasonal Factors');
    for j := 1 to 12 do
      begin
        writeln(outf, '      ', j:12, '      ', dsi[j]:12:2);
      end;
    writeln(outf);
    writeln(outf);
    writeln(outf, 'Forecast for next six months is:');
    writeln(outf);
    writeln(outf, 'Period', '      ', 'Year', '      ', 'Month', '      ', 'Revenue');
    for k := nn to fn do
      begin
        dd[k] := dd[k]*tax;
        writeln(outf, dp[k]:6, '      ', dy[k]:4, '      ', ds[k]:5, '      ', dd[k]:12:0);
      end;
    writeln(outf);
    writeln(outf)
  end; {procedure forecast}

  {***** MAIN PROGRAM *****}
begin {main program}
  {initialization of files}
  Assign(ginf, 'GASIN');
  Reset(ginf);
  Assign(sinf, 'SPFIN');
  Reset(sinf);
  Assign(stinf, 'STAXIN');
  Reset(stinf);

```



```

Assign(minf, 'MCFUTIN');
Reset(minf);
Assign(rinf, 'REGIN');
Reset(rinf);
Assign(iinf, 'IRPIN');
Reset(iinf);
Assign(outf, 'SHORTOUT');
Rewrite(outf);
{*****}
welcome;
makesure(value);
if (value = 1) then
  begin
    {*****}

    {read data}
    getarray(ginf, gp, gy, gs, gd, gi);
    getarray(sinf, sp, sy, ss, sd, si);
    getarray(stinf, stp, sty, sts, std, sti);
    getarray(minf, mp, my, ms, md, mi);
    getarray(rinf, rp, ry, rs, rd, ri);
    getarray(iinf, ip, iy, is, id, ii);

    {*****}

    {calculate moving average}
    maverage(gi, gd, gmv);
    maverage(si, sd, smv);
    maverage(sti, std, stmv);
    maverage(mi, md, mmv);
    maverage(ri, rd, rmv);
    maverage(ii, id, imv);

    {*****}
    {calculate ratios}
    ratio(gi, gd, gmv, gr);
    ratio(si, sd, smv, sr);
    ratio(sti, std, stmv, str);
    ratio(mi, md, mmv, mr);
    ratio(ri, rd, rmv, rr);
    ratio(ii, id, imv, ir);

    {*****}

    {calculate seasonal factors}
    sfactor(gi, gs, gd, gr, gsi, gad);
    sfactor(si, ss, sd, sr, ssi, sad);
    sfactor(sti, sts, std, str, stsi, stad);
    sfactor(mi, ms, md, mr, msi, mad);
    sfactor(ri, rs, rd, rr, rsi, rad);
    sfactor(ii, is, id, ir, isi, iad);

    {*****}

    {calculate trend equation}
    regress(gi, gp, gad, ga, gb);
    regress(si, sp, sad, sa, sb);
    regress(sti, stp, stad, sta, stb);
    regress(mi, mp, mad, ma, mb);
    regress(ri, rp, rad, ra, rb);
    regress(ii, ip, iad, ia, ib);
  
```

```

{*****}
{forecast and printout}
taxrate(gtax, stax, sttax, mtax);
writeln(outf, 'Short-Term Highway Revenue Forecast');
writeln(outf);
writeln(outf, '          GASOLINE TAX REVENUES          ');
writeln(outf);
forecast(outf, gi, gd, gp, gy, gs, gsi, gb, ga, gtax);
writeln(outf);
writeln(outf);
writeln(outf, '          SPECIAL FUEL TAX REVENUES          ');
writeln(outf);
forecast(outf, si, sd, sp, sy, ss, ssi, sb, sa, stax);
writeln(outf);
writeln(outf);
writeln(outf, '          DIESEL SURTAX REVENUES          ');
writeln(outf);
forecast(outf, sti, std, stp, sty, sts, stsi, stb, sta, sttax);
writeln(outf);
writeln(outf);
writeln(outf, '          MCFUT REVENUES          ');
writeln(outf);
forecast(outf, mi, md, mp, my, ms, msi, mb, ma, mtax);
writeln(outf);
writeln(outf);
writeln(outf, '          VEHICLE LICENSE REVENUES          ');
writeln(outf);
rtax := 1.0;
forecast(outf, ri, rd, rp, ry, rs, rsi, rb, ra, rtax);
writeln(outf);
writeln(outf);
writeln(outf, '          IRP REVENUES          ');
writeln(outf);
itax := 1.0;
forecast(outf, ii, id, ip, iy, is, isi, ib, ia, itax);
writeln(outf);
writeln(outf);
writeln(outf, 'Thank You for Using "SHORTREV" Program');
{*****}
end
else
begin
  writeln('Reexecute after preparing the input files!!!');
end;
{closure of files}
Close(ginf);
Close(outf)
end. {main program}

```

Figure 10. Forecast of Registration and IRP Revenues