Three Applications of Input-Output Modeling

by
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Presentations

"Ethanol in High-Octane Gasoline," presented to the International Institute for Applied Systems Analysis Input-Output Task Force Meeting, September 30, 1983.

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ABSTRACT

Title of Dissertation: Three Applications of Input-Output Modeling

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A consistent set of equations that describe an economy were first theorized by Walras in his general equilibrium system, and first specified in an empirically workable form, known as input-output, by Leontief. The internal, inter-industry consistency of an input-output model gives the model applicability to the full range of macroeconomic, microeconomic, and public policy questions. This dissertation presents three new applications of input-output modeling, one addressing each of the previously mentioned fields of economics.

The first application answers the public policy question of how industrial pollution abatement costs are distributed across income classes. This study is based on the assumption that industrial polluters pass the full annual cost of abatement through to their customers. By using input-output tables to track abatement costs from industries in which they were incurred through to final goods industries, this study measures the abatement costs per dollar of final goods produced for each of 78 industries. A

cross-sectional study of personal consumption expenditures is then used to determine the percentage of income that each income class paid, indirectly, for industrial pollution abatement. Alternatively, the calculations are done in terms of percentage of personal consumption expenditures, to see if the costs are distributed more regressively than previous studies suggest. The findings of this study indicate that a much greater percentage of the income and a slightly greater percentage of the total expenditure of lower income classes pay for industrial pollution abatement than is true of upper income classes.

The second application looks at the long run profitability of building a plant to produce ethanol from corn for use as an octane booster in super gasoline. The approach taken was to build a sub-model that is driven by the 78 sector INFORUM input-output model. Consideration is given in the sub-model to the ethanol plant efficiencies, federal and state subsidies, the price of crude oil, and the price and availability of corn, soy, and wheat. The results from the sub-model are then fed back into the INFORUM model to make certain the forecasts are consistent. The findings of this study are: (1) the profitable use of ethanol as an octane booster is highly dependent on the price of crude oil and the level of federal and state tax subsidies for ethanol use; and (2) predicted

levels of ethanol production will not raise the price of corn to the point of making ethanol unprofitable to produce.

The final application presents an input-output model designed to provide forecasts of personal consumption expenditures, producers' durable equipment purchases, government purchases, construction purchases, exports, imports, inventory change, and output at the 425 sector level consistent with the forecast of the more comprehensive 78 sector INFORUM model. Sectoral detail on the output, or real, side of the more comprehensive model is constrained to 78 sectors by the lack of data on the income, or price, side of the model. Given a full 78 sector forecast, econometrically estimated equations are used to produce forecasts of each of the seven final demands at the 425 sector level. Consistency is maintained between each of the detailed and aggregate final demand types by the use of across equation constraints, or by scaling the detailed forecast. Forecasts of output are then obtained by passing the sum of the final demands through a 425 sector input-output matrix. While consistency of the aggregate and detailed outputs is not mathematically guaranteed, the differences are only minor.

For my family, but especially for Tricia

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Chapter 1

Overview of Study

The internal interindustry consistency of input-output models makes them applicable to a wide range of macroeconomic, microeconomic, and public policy questions. Yet, input-output modelers, like most economic modelers, are regularly faced with the question of how to apply fairly general models to solve particular problems. Many of the problems are solved easily, or with a minimum of effort, but a few require additional modeling. This dissertation presents three such application models which draw upon a general input-output model. These applications are designed to answer: (1)the public policy question, "Who pays for industrial pollution abatement? " (2)the microeconomic question, "Will it be profitable in the long run to build a plant to produce ethanol for use as an octane booster? " and (3)the economic modeling question, "How can more detailed sectoral forecasts be obtained without sacrificing the good forecasting properties of a more aggregate model?" Each of the three applications is presented as a separate essay, linked to the others only in theme and in the use of the INFORUM 78-sector input-output model.

To answer these questions, substantial use is made of the INFORUM 78-sector input-output (I-O) model, called LIFT. LIFT is a 78-sector

input-output and macroeconomic model that is closed with respect to income. As the phrase "closed with respect to income" implies, LIFT determines income endogenously. This particular feature insures that the LIFT forecasts of product final demands and outputs are consistent with forecast prices and income, a feature important in both the second and third applications.

The first application, presented in chapter 2, addresses the question of who pays for industrial pollution abatement. Previous studies to address this question simply assumed that industrial abatement costs were distributed across income classes in proportion to consumption expenditures because of difficulties in following the interindustry flow of products. Rather than assuming a distribution, this study attempts to measure the distribution of industrial abatement costs across income classes for the years 1973 and 1977. The first step in measuring the distribution is to pass the vector of pollution abatement costs per dollar of output through the I-O matrix to determine the abatement costs per dollar of output for each of the 78 I-O sectors. More specifically, the vector of abatement costs is multiplied by the I-O total requirements matrix, calculated as $(I - A)^{-1}$. Then by using the consumption pattern for each of 20 income classes obtained from a cross-sectional study used in developing LIFT's consumption functions, together with the results of the first step, it is simple to determine both the percentage of income and the percentage of expenditure each income class pays, indirectly, for industrial pollution abatement. Because the analysis is both static and historical, there is no need for

the forecasting properties of the LIFT model. Instead, information that went into LIFT is used without involving the whole model.

The second of the three essays looks at the long-run profitability of building a plant to produce ethanol for use as an octane booster. In this application, LIFT is used as a driver for a sub-model that provided greater detail for the agriculture and corn milling sectors. Consideration is given in the sub-model to the ethanol plant efficiencies, federal and state subsidies, the price of crude oil, and the price and availability of corn, soy, and wheat. The key to the accuracy of the sub-model is the ability of LIFT to produce long term forecasts of outputs and prices that are consistent with an exogenously specified crude oil price. Previous studies, which have lacked the ability to produce consistent long term economy-wide forecasts, have either assumed agricultural prices to be constant and focused on ethanol production, or assumed ethanol production to be profitable and focused on the agricultural effects of large scale ethanol production. The current study is the only one which combines determination of profitable ethanol production with the agricultural price effects in a single long-term framework.

The final essay presents one answer to the question of how best to provide greater sectoral detail in an I-O model, without sacrificing the good forecasting properties of a more aggregate model. LIFT has relatively stable final demand functions and is closed with respect to income, both highly desirable properties for a long-term model.

However, sectoral detail on the output side of LIFT is constrained to 78 sectors by the lack of data on the income side. In order to take advantage of these properties, the 425 sector Detailed Output Model (DOM) is constructed with links to LIFT such that the detailed forecasts of personal consumption expenditures, producers' durable equipment, government purchases, construction purchases, imports, exports, inventory change, and outputs will be consistent with the more aggregate LIFT forecast. By requiring that the detailed forecasts of final demands sum to the LIFT final demands, the detailed forecasts of final demands and outputs should be consistent with the price/income forecast of LIFT. Thus, none of the good forecasting properties of LIFT are lost, while substantially greater detail is obtained. DOM provides LIFT with forecasts of the coefficients of the I-O matrix and several other matrices because the matrices are best forecast at the more detailed level and because this procedure helps maintain consistency in the final demand forecasts. Once forecast at the DOM level of detail, these matrices are aggregated to the LIFT level and used in making LIFT forecasts. This 'friendly' linking of the two models should help both produce better forecasts.

Before turning to the specific applications, it should again be noted that each application presented is written as a separate essay. Hence, some of the descriptive material is repeated in each chapter. Also, for readers who are unfamiliar with the workings of an I-O model, it may be best to read chapter 4, which describes the basic workings of an I-O model, before reading chapters 2 and 3.

Chapter 2
Who Pays For Industrial Pollution Abatement?

This study addresses the question "Who pays for industrial pollution abatement, the rich or the poor?" When an electric utility is required to install a new particle precipitator in its smoke stack, who ultimately bears most of the cost of the precipatator, high income or low income people? Some electricity is sold directly to consumers. The distribution of the direct sales to consumers portion of abatement costs is easily determined by looking at the relative percentages of income the rich and the poor spend on electricity. However, some of the electricity is sold to copper smelters, and the smelters sell copper ingot to wire drawers (who also buy electricity), who sell some wire to refrigerator producers, who sell refrigerators to households. Not only must all the intermediate flows for electricity be followed, but, all intermediate flows for all products must be followed to the final consumers to determine fully who pays for industrial pollution abatement. In answering this question, detailed measurements of the distribution of industrial pollution abatement costs across twenty income classes, as a percentage of consumers's income and expenditures, are made for the years 1973 and 1977. Three factors: the magnitude and distribution of abatement costs across industries, the input-output matrices, and the consumption patterns by product of the twenty income classes, determine the distribution of the abatement cost burden. These estimates, summarized in Tables 2.3-2.7, were made under the assumption that each industry passes its full abatement costs into the prices it charges for the goods or services produced, and therefore that the

burden is ultimately borne by the final consumers.

Abatement costs for each firm include only the costs of abating pollution generated by the firm, and not the cost of abatement equipment built into the goods the firm produces. Thus, the cost of abatement equipment built into automobiles is not counted as abatement expenditures made by automobile manufacturers. Instead, these abatement costs appear as abatement costs incurred by the purchasers of the goods. If purchased by a consumer, the cost of abatement equipment in a car is counted as a direct purchase of abatement equipment by the consumer and is of no concern in this study. However, if a firm purhcases a car, the abatement equipment is then included as part of the purchasing firm's abatement costs.

Measuring the distribution of the burden of pollution abatement has been attempted in several ways for various portions of total abatement costs. Although these studies generally handled other portions of total abatement costs well, none has directly measured the distribution of industrial abatement costs, largely because of difficulties in tracing out the interindustry effects. The interindustry movements of products, and the abatement costs implicit in the products, is vital to measuring the distribution of costs among final consumers, because most abatement occurs at a very basic level of production (Steel) rather than at the final goods level (Household appliances). If the majority of costs were incurred by consumer goods manufacturers, the costs could be assigned directly to the consumers of the various products. However, this is not the case, and the input-output matrix is necessary to allocate the abatement costs to consumer products industries.

The industrial abatement cost burden is unlikely to be distributed in proportion to income, given that spending rates and market baskets differ across income classes. If the costs of all goods contained the same percentage of pollution abatement costs, low income groups would spend a greater percentage of their income on abatement, because they spend a larger fraction of their income than do upper income groups. However, the implicit abatement content of goods does vary across industries, and the market basket consumed by low income groups tends to contain a greater percentage of high abatement costs necessities (such as electricity), and a smaller percentage of low abatement cost services, than does the market basket consumed by high income groups. Thus, both because spending rates and market baskets differ across income classes, the burden of abatement costs is likely to be distributed in a regressive manner.

Section two of this paper will review how previous attempts at measuring the distribution of abatement costs handled the industrial costs. In section three the method and data used in this study will be discussed, while the results will be presented in section four.

Section 2: Previous Studies

Because of the difficulties in tracing the interindustry effects, several recent articles have assumed that industrial abatement costs are distributed in proportion to personal consumption expenditures. While this assumption allocates the costs in a regressive manner, it misstates the true distribution to the extent that income groups purchase different market baskets of goods with varying implicit levels of

abatementcost. Studies by Gianessi, Peskin, and Wolff (11) and Gianessi and Peskin (10) make exactly this assumption. A third study, by Dorfman and Snow(8), makes basically the same assumption with the exception of the abatement costs of electrical utilities. [1] Electrical utilities' abatement costs were assumed to be distributed slightly more regressively than the general personal consumption expenditure pattern. This assumption certainly holds if only direct consumption is considered but, it is unclear whether the assumption holds when all interindustry effects are considered. Dorfman and Snow reported attempts to measure the interindustry price effects, but found them to be too widely diffused over all commodities to draw any conclusions. While Dorfman and Snow's method is an improvement over Gianessi and Peskin's, it still has the same basic flaw, the assumption of similar market baskets across income classes.[2] Other than the handling of industrial pollution abatement costs, these studies generally were quite good, with interesting approaches to measuring the distribution of the non-industrial costs.

Lake, Hanneman and Oster (12) attempted to forecast the change in welfare brought about by the Water Pollution Control Act Amendments of 1972, under the assumption that the provisions of the act were met as stated. The Strategic Environmental Assessment System (SEAS) model, a collection of several models including the INFORUM input-output model, was used to measure the price changes given forecasts of abatement costs. A price model was run to provide forecasts of price changes caused by abatement costs; the forecasts were then fed into the input-output framework to measure interindustry effects. [3]

Assuming that all abatement costs were accounted for, there are still several problems with the Lake, Hanneman, and Oster study. One problem, one that introduced a regressive bias, was the omission of the abatement costs of service industries, on which upper income classes spend a greater percentage of income. [5] While service sectors have relatively small abatement costs, they do have some impact on the overall distribution, and should not be overlooked. A second problem, one with the forecasting technique, was that no industrial production process changes were permitted, and thus the abatement costs were overestimated. [4] The probable effect of this assumption was to increase the regressive bias, making the distribution look more regressive than it actually is. The focus of the Lake, Hanneman, and Oster study is the manufacturing sectors which have high abatement costs, costs which are distributed regressively. By not allowing process change, they are implicitly maintaining or increasing the measured regresivity of the distribution. A third problem, one of clarity, is that the report is not specific on how the price changes were determined. Because the report discusses the effects of various market structures on price changes, it would seem that more was done than simply to pass the increased costs into prices, but exactly how the price changes were determined is not clear.

Section 3. Method and Data

This study attempts to measure directly the distribution of industrial abatement costs across twenty income classes by using

published abatement cost data, INFORUM's 78 sector input-output tables, INFORUM's investment matrix, and the 1972 Bureau of Labor Statistics cross-sectional consumer expenditure survey. All of the annual abatement costs are assumed to be passed through into the prices of products. This assumption makes the price changes easy to trace out in the input-output framework described below. When the consumer purchases a good, he presumably pays for the full costs of producing that good, including any abatement costs. The industrial abatement cost burden borne by each consumer then is determined by his particular consumption pattern, given the abatement costs for producing each good. It should be noted that no attempt is made to measure the change in the welfare of consumers caused by the price changes attributable to industrial pollution abatement. In addition, no effort is made to calculate what the price changes would have been had all environmental standards been met.

The assumption of full pass through of pollution abatement costs is a reasonable long-term assumption. In the long run, each firm must cover all costs and earn a normal return on investment or exit the industry. Without full cost pass through, competitive firms will earn sub-normal profits and will eventually leave the industry until those that remain can earn normal profits. Two alternatives to this assumption are: greater than or less than full cost pass through. In an oligopolistic industry, it is possible that the increase in costs will bring about a price increase greater than the increase necessary simply to cover costs. The Lake, Hanneman, and Oster study discusses this possibility more fully. A price increase covering less than 100

percent of costs is possible, perhaps likely, in highly competive industries with the capacity for overproduction. Agriculture is the industry that best fits this description, particularly for crops that have a price support system. By assuming simple cost pass through into prices, the problems associated with market power and perfect competition are avoided but, an error of unknown direction and magnitude is introduced for each sector with either problem. This error is discussed in more detail below.

It is expected that abatement costs will be distributed in a regressive manner, as a percentage of income and as a percentage of expenditure. The differences in spending rates and market baskets across income classes, as described above, underlie this expectation. Previous studies, other than the Urban Systems report, have considered only the spending-rate differences when allocating the burden in proportion to consumption expenditures. Use of the cross-sectional study will capture both the spending-rate and the market-basket differences. In order to assure that the distribution is at least as regressive as is shown, every effort was made to understate the regressive nature of the distribution, particularly in cases where the data are questionable.

The percentage of each income group's income (or expenditure) that pays for the costs of industrial pollution abatement implicit in goods purchased is calculated by the following method.

$$PY_i = P\ (I-A^*)^{-1}\ CY_i$$

and

$$PE_i = P\ (I-A^*)^{-1}\ CE_i$$

where:

$i = 1,2,\ldots,20$ signifying the income class; 1=lowest income, 20= highest income

PY_i = the percentage of income of income class i that pays for industrial pollution abatement

PE_i = the percentage of total personal consumption expenditures that pay for industrial pollution abatement

P = a vector containing pollution abatement costs for each of the 78 INFORUM sectors divided by the output of the respective industry

$(I-A^*)^{-1}$ = a "total requirements" matrix, modified to include capital costs per unit of output (discussed below)

CY_i = a vector containing the purchases from each industry by income class i as a percentage of income

CE_i = a vector containing the purchases from each industry by income class i as a percentage of expenditures

The percentage of income or expenditure each income class spends on pollution abatement is calculated for total abatement costs, and for each of four component parts: payments to governments for pollution abatement, air pollution abatement, water pollution abatement, and solid waste disposal costs. This division permits examination of the distribution of costs for each of these types of abatement expenditures individually. Hence, the equations that fully describe the model are:

$$PY_{ki} = P_k\ (I-A^*)^{-1}\ CY_i$$

and

$$PE_{ik} = P_k\ (I-A^*)^{-1}\ CE_i$$

where:

$k = 1,2,3,4,5$

1 = total abatement costs (sum of 2 - 5)
2 = payments to government
3 = air pollution abatement costs
4 = water pollution abatement costs

5 = solid waste disposal costs

PY_{ki} = the percentage of income of income class i that pays for industrial pollution abatement of type k

PE_{ki} = percentage of total personal comsumption expenditures that pay for industrial pollution abatement of type k

P_k = a vector containing the abatement-cost-to-output ratio for each of the 78 INFORUM sectors for each of the five types of abatement costs k

The other variables are as described above.

An element, Aij, of an input-output coefficient matrix, or A matrix, shows the percentage of the output of industry j that is purchased as an intermediate flow from industy i. The standard total requirements matrix, $(I-A)^{-1}$, shows what production is necesary, from each industry listed as a row, to produce a dollar of output of any industry listed as a column. An element, Rij, of the total requirements matrix shows the output of industry i necessary to make a dollar's worth of industry j's output. The difference between Aij and Rij is that the Aij describes only the direct purchases from industry i by industry j, where Rij includes the direct purchases as well as that portion of purchases by each other industry which is eventually sold to industry j. For example, the electric utility (row) to the auto industry (column) Rij includes the direct sales of electricity to autos, the sales to steel manufacturers that go into autos, the sales to iron ore mining which go into making the steel which, in turn, goes into producing the autos, and that portion of sales to all other industries which is later sold to the auto manufacturing sector.

Capital goods necessary to produce output are not considered in the A matrix, but are considered in the investment, or 'B', matrix. The B matrix indicates the industry composition of the investment purchases

for each of the investment sectors. An element, Bij, shows the percentage of investment of sector j that comes from industry i. The INFORUM B matrix has only 55 investment sectors (columns) with 78 industry sellers (rows). For this study, INFORUM's 55 investment sectors were spread to 78 sectors, by placing the same column of the 55 order B matrix in each of the 78 industry columns that were aggregated to form that investment sector. For example, sectors 2,3, and 5 of the 78 industry detail made up sector 3 of the 55 investment sectors. To form the 78 sector B matrix, column 3 of the 55 order B matrix was put in columns 2,3, and 5 of the 78 sector matrix.

From the fact that capital flows are not considered in the A matrix, it follows that the standard total requirements matrix, $(I-A)^{-1}$, also accounts for only the intermediate flow of materials. Thus, if the pollution abatement vectors for 1973 and 1977 were multiplied by standard total requirements matrices, the abatement costs implicit in the capital goods used in the production process by each sector would be missed. Augmented A matrices, ones that include the capital costs per unit of output, were constructed for the years 1972 and 1977 as follows: $A^* = A + B^*$, where A is a standard A matrix, and B^* is a B matrix, scaled so that each column sums to the depreciation-to-output ratio for that sector. [6] Note that the depreciation figures did not include depreciation on pollution abatement equipment, costs already accounted for in the pollution vector. [7] Using the A^* matrices for 1972 and 1977, "capital-included" total requirements matrices were calculated, $(I-A^*)^{-1}$.

The three major sources for the pollution abatement data were The

Survey of Current Business (SCB) of June, 1978 and the Current Industrial Report: Pollution Abatement Cost and Expenditures (PACE) for 1973 and 1977. The PACE reports provide annual operating and maintenance costs (direct operating expenses, depreciation, and interest on loans) for the manufacturing industries, at the five digit Standard Industrial Classification (SIC) level, with detail for the abatement costs for air pollution, water pollution, solid waste disposal, and payments to government. When aggregated from the five digit SIC to the 78 sector level, the manufacturing data account for 40 of the 78 sectors.[8]

Investment in pollution abatement equipment data are available from the SCB at an aggregated level for 27 of the non-manufacturing sectors. These sectors are primarily services, mining, and utilities (except electric). The aggregates were allocated to the individual sectors in proportion to the output of the sectors involved. For example, if 10 million dollars is the aggregate total to be divided among three sectors, and the output of the sectors is 200, 300, and 500 million dollars per year, the costs would be allocated 2 million dollars to the first sector, 3 million to the second, and 5 million to the third. To move from investment in pollution abatement equipment to an operating and maintenance (O+M) estimate, the investment figures were multiplied by the ratio of O+M to investment for all the manufacturing sectors. This total was then allocated to air, water, solid, and government payments in the same proportions as the total for all manufacturing sectors: 7 percent to payments to government, 41 percent to air, 35 percent to water, and 17 percent to solid waste disposal. Manipulating

the data in this way is probably not unreasonable, because the abatement costs for these sectors are very small, together making up less than nine percent of total abatement investment in either year. A test run using double the abatement costs obtained by the described method reduced the regressive nature of the distribution only slightly. Thus, the results are not heavily dependent on the abatement costs for these sectors.

Of the 78 sectors, the PACE reports provided data on 40 manufacturing sectors, and the SCB added 27 service, mining, and utility (except electric) sectors. Of the remaining sectors, nine had no applicable abatement data, while the agriculture and electric utilites sectors had no single consistent source for all the data. The main difficulty with the agriculture sector is that the federal government pays between 20 and 90 percent of farmers' abatement costs, depending on the size of the farm and typical crops grown.[9] (There is an upper limit on the actual dollar amount the government will pay to an individual farmer.) Prices of agricultural products probably reflect only that portion of the costs that farmers paid for themselves, and not the government's share. Hence, the agricultural abatement costs used for 1973 and 1977 are "best guesses" at the true costs that farmers paid.[10] Because low income classes spend a greater percentage of income on food and agricultural products, the "best guess" at agricultural abatement costs were chosen on the low side of the reasonable range of estimates to avoid introducing a regressive bias to the study.

Electric utilities is a sector of particular importance when discussing pollution abatement, because it accounts for between 20 and

45 percent of all industrial abatement costs. No single data source provided cost estimates that were consistent with data for the other sectors. Estimates for 1977 annual costs range from 2 to 5 billion dollars, while estimates of investment in abatement equipment ranged from 1.5 to 3.4 billion dollars. The 1977 base case value of slightly more than 3 billion dollars is obtained by multiplying the investment figure in the SCB by the Environmental Protection Agency's (EPA) estimated operating cost to investment ratio for electric utilities. (The results of measuring the distribution using this figure are given in Tables 4.2, 4.4, 4.7, and 4.8.) Both the Council on Environmental Quality (CEQ) 1978 report (9) and the EPA estimate that the abatement costs for electric utilities in 1977 were approximately 5 billion dollars. However, cost estimates for other industries from both of these sources are higher than those in the PACE report used for this study. Thus, for consistancy and to minimize the estimated regressivity the lower figure was chosen for the base value.

An intermediate step in measuring the distribution of costs is to calculate each sector's abatement costs per dollar of output, which is done by multiplying the pollution abatement vector by the capital included total requirements matrix. This step yields the total abatement costs per dollar of purchase for each of the 78 industries, including in the total both direct and indirect abatement costs. For example, the abatement costs per dollar of purchase of motor vehicles includes not only abatement costs incurred at the final assembly level, but also the abatement costs for the steel, electricity, and other materials used in producing the component parts of the vehicle. The

remaining step in calculating the distribution of abatement costs by income class is to multiply the results of the first step by the vector of consumption purchases for each income class.

The final data needed for the distribution measurement are consumption purchases from each sector by each of the twenty income classes. Unfortunately, detailed cross-sectional consumption studies are not available for any year after 1972. A 1972 BLS study does provide consumption expenditures on 50 categories of goods along with income and taxes paid, for approximately 8000 households. (7800 of the observations were used.) Household income was divided by the number of persons in the household producing the family's per capita income. On the basis of per capita income, the households were divided into twenty income classes, which shall be referred to as ventiles. The vectors of household consumption, for all households falling into each income class, are summed and divided by the total number of persons in that ventile. An average, per-capita consumption vector was calculated for each of the income classes, by summing the consumption vectors for all people in the income class and dividing by the number of people in that class.

At this point, the consumption vectors are vectors of 1972 consumption, and unless the assumption is made that the consumption pattern remains the same, the vectors need to be 'moved up' to become 1973 and 1977 vectors. Data are available on the movement of income for each of the ventiles for the years 1972 - 1977, so what is needed is a determination of how the consumption vectors changed in response to a change in income.[11] Engel curves, curves which relate consumption of a

good to income, provide the desired measure. Piece-wise linear Engel curves for the same 50 consumption goods as given in the cross-sectional study were estimated by Paul Devine as part of his doctoral dissertation.[12] Using the available change in income data, the consumption of each good by each income class was moved up the appropriate Engel curve to construct 1973 and 1977 consumption vectors. (Note: Using the Engel curves assumes constant relative prices, an assumption which may be reasonable for 1973 but perhaps not for 1977.) The final step in preparing the consumption data was to pass the 1973 and 1977 consumption vectors through a bridge table to disaggregate the 50 consumption goods to the 78 input-output sectors, producing consumption vectors for each income class at the desired input-output sector level for 1973 and 1977.

Section 4: Results

The two major findings of this study were as expected: abatement costs per dollar of output range from nearly zero for some service sectors to about 5.4 percent for electricity in 1977, and the distribution of abatement costs across income classes is fairly regressive. Indirect payments for industrial pollution abatement range from .227 to 1.16 percent of income for the highest and lowest income groups respectively in 1977 (.153 to .77 percent for 1973). Contrary to earlier studies' assumptions, the costs are also distributed regressively when measured as a percentage of expenditure, ranging from .44 for high income groups to .54 for low income groups in 1977 (.307 to .372 percent for 1973).

Tables 2.1 and 2.2 list the direct abatement costs per dollar of output for each industry for the years 1973 and 1977 respectively. Also given is the allocation of direct abatement costs per dollar of output into its four component parts. Direct abatement costs range from 4.43 cents per dollar of output for electric utilities, through .140 for motor vehicles, to 0.01 for several service sectors.

With the exception of a few sectors , such as utilities (except electric), petroleum refining, all mining sectors, and air transportation, the abatement costs per dollar of output rose between 1973 and 1977. Tighter standards and greater compliance with environmental standards were the main reasons for the increasing costs per dollar of output. Abatement technology certainly improved during the period 1973 to 1977 decreasing abatement costs per dollar of output but, for most sectors the stricter standards and increased compliance more than offset this decrease. Improving abatement technology may be the explanation for the declining cost sectors, though for the mining sectors and utilities the problem may be lack of precise data.

Total abatement costs per dollar of output, the intermediate step result, for 1973 and 1977 are listed in Tables 2.3 and 2.2. In most sectors, the effect of the input-output calculations on the 1977 direct costs is to raise abatement costs per dollar of output by 18 (electric utilities) to 4000 (Eating and drinking establishments, Automotive repair) percent. The sectors with the largest percentage increases in moving from direct to total abatement costs were generally the service and consumer oriented sectors. One major exception to this rule is the electric utility sector, which had only a small percentage change.

Industries with high abatement costs per unit of output are easily read from Tables 2.3 and 2.2, and are generally the basic manufacturing industries such as: Paper, Plastics, Agricultural fertilizers, Chemicals, Copper, Steel, Petroleum refining, and Electric utilities. Service sectors such as Retail trade, Real estate, and Business services have relatively low abatement costs. Most final assembly industries, such as Motor vehicles, Ships and boats, Household appliances, and Computers, fall in the middle range of abatement costs. [11]

For a majority of sectors, air pollution abatement costs are the largest percentage of total abatement costs, followed by water, solids, and payments to the government. In sectors such as Copper, Steel, Stone, clay, and glass, and Other nonferrous metals, air pollution abatement costs are more than twice those for water. Water pollution abatement costs are greater than those for air in industries that produce or use large amounts of chemicals such as: Paper, Printing and publishing, Other chemicals, and Agricultural fertilizers. Industries that use vast quantities of chemicals also are the sectors with the largest solid waste disposal costs, costs associated with disposal of unwanted chemicals.

The distribution of the abatement cost burden across income classes became only slightly more regressive between 1973 and 1977. Tables 2.5 and 2.6 display the distribution of the burden for 1973, measured as a percentage of income and expenditure respectively. Tables 2.7 and 2.8 provide the same information for 1977. In 1973, .77 percent of the income of an average person in the lowest income class paid for the

abatement costs implicit in purchased goods, compared with .157 for the highest income class. By 1977 the high income percentage had increased to .227, but the low income percentage moved up to 1.16, a greater relative change for the lower income class. As a percentage of expenditure, the highest income ventile experienced an increase from .31 to .44 percent, compared to .37 to .54 for the lowest income ventile. The measured distributions for each of the four types of abatement costs, air, water, solids, and payments to government, are regressive, though not perfectly so.

Payments to government has the most regressive distribution of the four types of abatement costs, followed by water, solid waste, and air. A quick look back at table 2.3 and 2.4 makes it easy to see why payments to government are distributed regressively; the only sectors with significant payments to government are Textiles, Knitting, Food, Shoes, Paper, Electricity, and Other chemicals. Food, clothing, shoes, and electricity are essentials of life, and are goods on which low income classes spend a much greater percentage of their incomes than do high income classes. Similarly for water, the sectors with the highest abatement costs are sectors providing life's necessities. Air pollution abatement costs are the costs spread most evenly across all sectors, which explains why they have the least regressive distribution.

Alternate Electricity Cost Runs

Due to the large proportion of all industrial abatement costs that are incurred by Electric utilities and the uncertainty as to the exact costs incurred, the distribution of the costs across income classes is

also measured with two alternate levels of Electric utilities abatement costs. The two cost levels chosen represent the high and low end of the range of estimated costs for Electric utilities. Tables 2.9 and 2.10 display the results of the intermediate calculation of total abatement costs per dollar of output and the distribution calculated as a percentage of expenditures respectively, based on an abatement costs estimate taken from the Council on Environmental Quality (CEQ) report of 1978. Tables 2.11 and 2.12 present the results for a somewhat lower abatement cost estimate. Surprisingly, there is little or no effect on the distribution, despite lower income classes spending a greater percentage of their expenditures on electricity than do upper income classes. (The distribution becomes only slightly more regressive as the abatement costs for Electric utilities increase.) The reason for this apparent discrepancy can be found in comparing Table 2.4 with Tables 2.9 and 2.11, which display the abatement costs per dollar of output for each industry. Sectors most strongly affected by the increase in Electric utilities abatement costs are the service sectors, on which higher income classes spend a greater percentage of their expenditures than do lower income classes. For example, in the CEQ run, total abatement costs per dollar of output for Food and tobacco was 8 percent above that in the base case (Table 2.4), while total abatement costs were up by 17 and 24 percent respectively in the Eating and drinking establishments and Finance and Insurance sectors. As a result of the increase in indirect abatement costs of services, the upper income groups feel the increase in abatement costs as much (percentage wise) as low income groups. The abatement costs for Electric utilities are then

only important in determining the level of total abatement costs and not the distribution of costs when calculated as a percentage of expenditure. Of course, when calculated as a percentage of income, the larger the abatement costs the more regressive the distribution, because of the savings rate differences. This result is contrary to the Dorfman and Snow (8) assumption of Electric utilities abatement costs being distributed more regressively than general consumption goods.

When completing a study of this nature, two questions need to be asked: First, are there any systematic biases in the study? And second, what if anything, can be concluded from the work? One previously acknowledged bias is that the abatement costs were chosen to minimize the regressivity of the distribution in cases where the data were least reliable, mainly in agriculture and electricity. A second bias exists if firms raised their prices by more or less than was necessary to offset the increase in costs caused by the abatement regulations. Were all firms to have raised their prices by more than costs, all the price changes listed in tables 2.3 and 2.4 would be understated, as would the regressivity of the distribution. Conversely, if firms did not pass through all costs, the bias would likely be in the opposite direction. Of course, the assumption of simple cost pass-through could be valid in general, with the exception of only a few sectors. In this case, the effect on the distribution is dependent on which income classes spend a greater percentage of their income on those sectors whose price changes were more or less than in proportion to costs. Third, a 'quality' bias exists in this study; if high income

groups purchase more expensive, higher quality goods, that do not use proportionately more materials or abatement than the lower quality goods. For example, a person from a high income class may spend twice as much for a car as a low income person. By the method used in this study, the high income person paid twice as much pollution abatement as the low income person. However, the car may not be twice as large, and therefore would not contain twice as much steel, electricity, rubber, or abatement. To the extent that such a quality bias exists, this study overstates the abatement payments by high income groups and understates abatement payments by low income groups, and thereby underestates the regressivity of the distribution.

In answer to the second question, this study has shown that the distribution of industrial abatement costs is more regressive than most other studies suggest. In addition, because every effort was made to understate the regressivity of the distribution, the true distribution is quite likely to be more regressive than is reported here. This study has also provided some weak evidence that indicates the regressivity of the distibution is increasing over time, measured as a percentage of income. These findings, in turn, imply that the distribution of total abatment costs is very probably more regressive than most of the other studies report, putting an even greater burden on the lower income classes. As indicated by this study, 1.16 percent of the income of a typical person in the lowest income class paid for industrial pollution abatement implicit purchased goods, as compared to 0.23 percent of a typical person in the highest income classes.

In considering these findings, the lack of reliable data for some

sectors as well as the assumption of simple abatement costs being passed through into prices should be kept in mind. The lack of reliable data for the Electric utilities and Agriculture sectors are particular problems because of the impact they can have on the magnitude and, for agriculture, distribution of the costs. By providing a framework by which to measure the distribution of industrial abatement costs, this paper has moved one step towards a more accurate assessment of the distribution of the effects of current pollution abatement policy. Obviously, there is more work that can be done in the area of measuring the distribution of costs, as well as the distribution of benefits.

Table 2.1 Abatement Costs per dollar of output in 1973
Direct Costs Only

(1.00 means 1 cent of every $ purchase goes for pollution abatement)

SEC.	TITLE	TOTAL	GOVERN.	AIR	WATER	SOLID
1	AGRICULTURE,FORE	0.08257	0.00248	0.01651	0.06192	0.00165
2	IRON ORE MINING	0.24226	0.02059	0.09521	0.08091	0.04554
3	NONFERROUS METAL	0.16722	0.01421	0.06572	0.05585	0.03144
4	COAL MINING	0.27688	0.02353	0.10881	0.09248	0.05205
5	NATURAL GAS EXTR	0.39129	0.03326	0.15378	0.13069	0.07356
6	CRUDE PETROLEUM	0.26310	0.02236	0.10340	0.08788	0.04946
7	NON-METALLIC MIN	0.20696	0.01759	0.08133	0.06912	0.03891
8	CONSTRUCTION	0.05280	0.00449	0.02075	0.01763	0.00993
9	FOOD & TOBACCO	0.13953	0.03958	0.02788	0.04031	0.03182
10	TEXTILES, EXC. K	0.11851	0.03458	0.02098	0.03886	0.02409
11	KNITTING	0.10419	0.04268	0.01130	0.03013	0.02008
12	APPAREL, HOUSEHO	0.00000	0.00000	0.00000	0.00000	0.00000
13	PAPER	0.68538	0.05129	0.18401	0.32171	0.12775
14	PRINTING & PUBLI	0.05716	0.01218	0.01624	0.00312	0.02593
15	AGRICULTURAL FER	1.11365	0.00975	0.52270	0.39397	0.18723
16	OTHER CHEMICALS	0.74466	0.03814	0.24638	0.34741	0.11207
17	PETROLEUM REFINI	0.95685	0.00623	0.54528	0.34983	0.05552
18	FUEL OIL	0.00000	0.00000	0.00000	0.00000	0.00000
19	RUBBER PRODUCTS	0.18531	0.02364	0.06618	0.02364	0.07280
20	PLASTIC PRODUCTS	0.15948	0.01595	0.03606	0.02982	0.07696
21	SHOES AND LEATHE	0.10383	0.02213	0.01532	0.03234	0.03404
22	LUMBER	0.20244	0.02477	0.04921	0.04029	0.08818
23	FURNITURE	0.10565	0.01761	0.04002	0.00880	0.03922
24	STONE, CLAY, GLA	0.49662	0.02165	0.31283	0.05221	0.10994
25	FERROUS METALS	0.71483	0.02009	0.38714	0.22557	0.08203
26	COPPER	0.41018	0.00784	0.27121	0.09078	0.04035
27	OTHER NONFERROUS	0.43847	0.03625	0.27141	0.08279	0.04752
28	METAL PRODUCTS	0.13709	0.02005	0.04318	0.04147	0.03273
29	ENGINES AND TURB	0.10975	0.01335	0.03708	0.02521	0.03411
30	AGRICULTURAL MAC	0.08930	0.01488	0.02381	0.01935	0.03126
31	CONSTR,MINING,OI	0.08955	0.00746	0.02879	0.01919	0.03412
32	METALWORKING MAC	0.06679	0.01590	0.02120	0.00742	0.02226
33	SPECIAL INDUSTRY	0.10428	0.01112	0.02920	0.03476	0.02920
34	MISC NON-ELECTRI	0.07828	0.01220	0.02745	0.01220	0.02643
35	COMPUTERS	0.06120	0.01224	0.01224	0.01496	0.02176
36	OTHER OFFICE EQU	0.07718	0.01029	0.02573	0.02058	0.02058
37	SERVICE INDUSTRY	0.16848	0.02106	0.02106	0.02771	0.09976
38	COMMUNIC EQ, ELE	0.11992	0.01947	0.02180	0.05217	0.02687
39	ELEC INDL APP &	0.19272	0.01416	0.03933	0.05664	0.08259

Table 2.1 continued

SEC.	TITLE	TOTAL	GOVERN.	AIR	WATER	SOLID
40	HOUSEHOLD APPLIA	0.17220	0.02719	0.05309	0.04791	0.04402
41	MISC ELECTRICAL	0.15576	0.02431	0.04772	0.04322	0.04052
42	TV SETS,RADIOS,P	0.04935	0.01234	0.00617	0.00617	0.02467
43	MOTOR VEHICLES	0.12424	0.01212	0.03635	0.03557	0.04021
44	AEROSPACE	0.09220	0.01474	0.02021	0.03621	0.02063
45	SHIPS, BOATS	0.13104	0.01139	0.02089	0.02849	0.06837
46	OTHER TRANSP. EQ	0.07884	0.01342	0.01845	0.02348	0.02684
47	INSTRUMENTS	0.13072	0.01626	0.01188	0.05504	0.04753
48	MISC. MANUFACTUR	0.11858	0.01482	0.04681	0.02106	0.03666
49	RAILROADS	0.09867	0.00839	0.03878	0.03296	0.01855
50	TRUCKING, HWY PA	0.02031	0.00173	0.00798	0.00678	0.00382
51	WATER TRANSPORT	0.02205	0.00187	0.00866	0.00736	0.00414
52	AIR TRANSPORT	0.10726	0.00912	0.04215	0.03582	0.02016
53	PIPELINE	0.02756	0.00234	0.01083	0.00921	0.00518
54	TRANSPORTAION SE	0.02788	0.00237	0.01096	0.00931	0.00524
55	COMMUNICATIONS S	0.02437	0.00207	0.00958	0.00814	0.00458
56	ELECTRIC UTILILI	3.23055	0.27460	1.26961	1.07900	0.60734
57	GAS UTILITY	0.19735	0.01677	0.07756	0.06591	0.03710
58	WATER AND SANITA	0.03063	0.00260	0.01204	0.01023	0.00576
59	WHOLESALE TRADE	0.02798	0.00238	0.01100	0.00935	0.00526
60	RETAIL TRADE	0.02837	0.00241	0.01115	0.00947	0.00533
61	EATING & DRINKIN	0.02863	0.00243	0.01125	0.00956	0.00538
62	FINANCE & INSURA	0.02659	0.00226	0.01045	0.00888	0.00500
63	REAL ESTATE	0.00000	0.00000	0.00000	0.00000	0.00000
64	OWNER-OCCUPIED H	0.02629	0.00223	0.01033	0.00878	0.00494
65	HOTELS; REPAIRS	0.02831	0.00241	0.01113	0.00946	0.00532
66	BUSINESS SERVICE	0.02800	0.00238	0.01100	0.00935	0.00526
67	AUTOMOBILE REPAI	0.02972	0.00253	0.01168	0.00993	0.00559
68	MOVIES AND AMUSE	0.02685	0.00228	0.01055	0.00897	0.00505
69	MEDICINE,EDUCATI	0.00000	0.00000	0.00000	0.00000	0.00000
70	FED & S&L GOVT E	0.00000	0.00000	0.00000	0.00000	0.00000
71	NON COMPETITIVE	0.00000	0.00000	0.00000	0.00000	0.00000
72	DOMESTIC SERVANT	0.02889	0.00246	0.01135	0.00965	0.00543
73	UNIMPORTANT INDU	0.00000	0.00000	0.00000	0.00000	0.00000
74	SCRAPS AND USED	0.00000	0.00000	0.00000	0.00000	0.00000
75	REST OF THE WORL	0.00000	0.00000	0.00000	0.00000	0.00000
76	GOVERNMENT INDUS	0.00000	0.00000	0.00000	0.00000	0.00000
77	INFORUM STAT. DI	0.00000	0.00000	0.00000	0.00000	0.00000
78	NIPA STAT. DISC	0.00000	0.00000	0.00000	0.00000	0.00000

Table 2.2 Abatement Costs per dollar of output in 1977
Direct Costs Only

(1.00 means 1 cent of every $ purchase goes for pollution abatement)

SEC.	TITLE	TOTAL	GOVERN.	AIR	WATER	SOLID
1	AGRICULTURE,FORE	0.24792	0.00389	0.03886	0.20206	0.00311
2	IRON ORE MINING	0.07907	0.00546	0.03266	0.02720	0.01376
3	NONFERROUS METAL	0.07443	0.00514	0.03074	0.02560	0.01295
4	COAL MINING	0.07521	0.00519	0.03106	0.02587	0.01309
5	NATURAL GAS EXTR	0.07528	0.00519	0.03109	0.02590	0.01310
6	CRUDE PETROLEUM	0.07528	0.00519	0.03109	0.02590	0.01310
7	NON-METALLIC MIN	0.07564	0.00522	0.03124	0.02602	0.01316
8	CONSTRUCTION	0.01021	0.00070	0.00422	0.00351	0.00178
9	FOOD & TOBACCO	0.17686	0.05340	0.02929	0.05321	0.04096
10	TEXTILES, EXC. K	0.16876	0.04662	0.02617	0.05807	0.03790
11	KNITTING	0.14053	0.06436	0.01395	0.03647	0.02575
12	APPAREL, HOUSEHO	0.00000	0.00000	0.00000	0.00000	0.00000
13	PAPER	1.04134	0.07913	0.26280	0.54232	0.15669
14	PRINTING & PUBLI	0.06123	0.01221	0.01424	0.00366	0.03092
15	AGRICULTURAL FER	1.38336	0.00697	0.40856	0.75266	0.21517
16	OTHER CHEMICALS	1.01995	0.03845	0.27268	0.52882	0.18018
17	PETROLEUM REFINI	0.93060	0.00550	0.59026	0.27997	0.05497
18	FUEL OIL	0.00000	0.00000	0.00000	0.00000	0.00000
19	RUBBER PRODUCTS	0.20114	0.01953	0.07290	0.02604	0.08202
20	PLASTIC PRODUCTS	0.17742	0.01696	0.03557	0.03846	0.08643
21	SHOES AND LEATHE	0.21049	0.07244	0.01504	0.05604	0.06697
22	LUMBER	0.16961	0.00716	0.04714	0.03974	0.07579
23	FURNITURE	0.14517	0.01701	0.06256	0.00911	0.05710
24	STONE, CLAY, GLA	0.62230	0.02234	0.41139	0.06296	0.12533
25	FERROUS METALS	1.17357	0.02300	0.69528	0.29840	0.15703
26	COPPER	1.01312	0.01210	0.87672	0.08250	0.04290
27	OTHER NONFERROUS	0.64378	0.01624	0.47635	0.09902	0.05123
28	METAL PRODUCTS	0.16508	0.02716	0.04302	0.04967	0.04523
29	ENGINES AND TURB	0.19389	0.01855	0.06679	0.06494	0.04360
30	AGRICULTURAL MAC	0.12546	0.01451	0.04779	0.01963	0.04353
31	CONSTR,MINING,OI	0.11719	0.01270	0.03002	0.02656	0.04734
32	METALWORKING MAC	0.05786	0.01736	0.00868	0.00723	0.02459
33	SPECIAL INDUSTRY	0.12105	0.01333	0.02888	0.02665	0.05220
34	MISC NON-ELECTRI	0.09090	0.01767	0.02345	0.02345	0.02827
35	COMPUTERS	0.06508	0.02662	0.00444	0.01701	0.01701
36	OTHER OFFICE EQU	0.14783	0.01945	0.04279	0.04668	0.03890
37	SERVICE INDUSTRY	0.17152	0.02339	0.01646	0.03205	0.09962
38	COMMUNIC EQ, ELE	0.12936	0.02259	0.01560	0.05944	0.03173
39	ELEC INDL APP &	0.15223	0.01983	0.04610	0.04717	0.03913

Table 2.2 continued

SEC.	TITLE	TOTAL	GOVERN.	AIR	WATER	SOLID
40	HOUSEHOLD APPLIA	0.17304	0.02788	0.03941	0.04807	0.05768
41	MISC ELECTRICAL	0.18641	0.02757	0.05275	0.05934	0.04735
42	TV SETS,RADIOS,P	0.09426	0.01158	0.01488	0.02977	0.03969
43	MOTOR VEHICLES	0.13986	0.01662	0.04039	0.04081	0.04220
44	AEROSPACE	0.10867	0.01961	0.01865	0.04051	0.03022
45	SHIPS, BOATS	0.23861	0.01679	0.04316	0.07554	0.10312
46	OTHER TRANSP. EQ	0.11859	0.01860	0.02442	0.02790	0.04651
47	INSTRUMENTS	0.17453	0.01939	0.03483	0.06530	0.05501
48	MISC. MANUFACTUR	0.09841	0.01761	0.02745	0.01398	0.03885
49	RAILROADS	0.07327	0.00506	0.03026	0.02521	0.01275
50	TRUCKING, HWY PA	0.01696	0.00117	0.00700	0.00583	0.00295
51	WATER TRANSPORT	0.01714	0.00118	0.00708	0.00590	0.00298
52	AIR TRANSPORT	0.03507	0.00242	0.01449	0.01207	0.00610
53	PIPELINE	0.01637	0.00113	0.00676	0.00563	0.00285
54	TRANSPORTAION SE	0.01710	0.00118	0.00706	0.00588	0.00298
55	COMMUNICATIONS S	0.01030	0.00071	0.00425	0.00354	0.00179
56	ELECTRIC UTILILI	4.43832	0.03384	2.62239	1.74826	0.03384
57	GAS UTILITY	0.06017	0.00415	0.02485	0.02070	0.01047
58	WATER AND SANITA	0.01071	0.00074	0.00443	0.00369	0.00186
59	WHOLESALE TRADE	0.01022	0.00071	0.00422	0.00352	0.00178
60	RETAIL TRADE	0.01023	0.00071	0.00423	0.00352	0.00178
61	EATING & DRINKIN	0.01024	0.00071	0.00423	0.00352	0.00178
62	FINANCE & INSURA	0.01026	0.00071	0.00424	0.00353	0.00179
63	REAL ESTATE	0.00000	0.00000	0.00000	0.00000	0.00000
64	OWNER-OCCUPIED H	0.01021	0.00070	0.00422	0.00351	0.00178
65	HOTELS; REPAIRS	0.01026	0.00071	0.00424	0.00353	0.00179
66	BUSINESS SERVICE	0.01027	0.00071	0.00424	0.00353	0.00179
67	AUTOMOBILE REPAI	0.01022	0.00071	0.00422	0.00352	0.00178
68	MOVIES AND AMUSE	0.01051	0.00073	0.00434	0.00362	0.00183
69	MEDICINE,EDUCATI	0.00000	0.00000	0.00000	0.00000	0.00000
70	FED & S&L GOVT E	0.00000	0.00000	0.00000	0.00000	0.00000
71	NON COMPETITIVE	0.00000	0.00000	0.00000	0.00000	0.00000
72	DOMESTIC SERVANT	0.01013	0.00070	0.00418	0.00348	0.00176
73	UNIMPORTANT INDU	0.00000	0.00000	0.00000	0.00000	0.00000
74	SCRAPS AND USED	0.00000	0.00000	0.00000	0.00000	0.00000
75	REST OF THE WORL	0.00000	0.00000	0.00000	0.00000	0.00000
76	GOVERNMENT INDUS	0.00000	0.00000	0.00000	0.00000	0.00000
77	INFORUM STAT. DI	0.00000	0.00000	0.00000	0.00000	0.00000
78	NIPA STAT. DISC	0.00000	0.00000	0.00000	0.00000	0.00000

Table 2.3 Total Abatement Costs per dollar of output in 1973

(1.00 means 1 cent of every $ purchase goes for pollution abatement)

SEC.	TITLE	TOTAL	GOVERN.	AIR	WATER	SOLID
1	AGRICULTURE,FORE	0.38768	0.02092	0.13363	0.18529	0.04783
2	IRON ORE MINING	0.60403	0.04599	0.24782	0.20114	0.10909
3	NONFERROUS METAL	0.49639	0.03696	0.20256	0.16728	0.08958
4	COAL MINING	0.61078	0.04719	0.24897	0.20119	0.11341
5	NATURAL GAS EXTR	0.51265	0.04181	0.20433	0.17065	0.09586
6	CRUDE PETROLEUM	0.45262	0.03568	0.18276	0.14954	0.08463
7	NON-METALLIC MIN	0.58382	0.04363	0.24087	0.19384	0.10549
8	CONSTRUCTION	0.10048	0.00753	0.04168	0.03256	0.01871
9	FOOD & TOBACCO	0.46278	0.06665	0.14149	0.17085	0.08384
10	TEXTILES, EXC. K	0.63784	0.07894	0.19986	0.24832	0.11049
11	KNITTING	0.61395	0.09395	0.18174	0.22923	0.10884
12	APPAREL, HOUSEHO	0.32957	0.03968	0.10671	0.12450	0.05860
13	PAPER	1.26963	0.09282	0.38432	0.55723	0.23435
14	PRINTING & PUBLI	0.38961	0.03754	0.12732	0.13626	0.08868
15	AGRICULTURAL FER	1.85184	0.03938	0.83307	0.66725	0.31200
16	OTHER CHEMICALS	1.24231	0.06783	0.43875	0.54353	0.19131
17	PETROLEUM REFINI	1.40055	0.03506	0.73437	0.50368	0.12741
18	FUEL OIL	0.00219	0.00018	0.00090	0.00067	0.00044
19	RUBBER PRODUCTS	0.56286	0.05064	0.20353	0.17320	0.13628
20	PLASTIC PRODUCTS	0.63957	0.04686	0.21102	0.22146	0.15927
21	SHOES AND LEATHE	0.37118	0.04698	0.10665	0.13020	0.08726
22	LUMBER	0.55808	0.05271	0.18361	0.15322	0.16855
23	FURNITURE	0.46918	0.04580	0.18369	0.12810	0.11152
24	STONE, CLAY, GLA	0.84153	0.04476	0.46066	0.16196	0.17409
25	FERROUS METALS	1.28107	0.05053	0.65557	0.40840	0.16654
26	COPPER	1.08152	0.04137	0.62753	0.27713	0.13546
27	OTHER NONFERROUS	1.09592	0.08185	0.60385	0.26623	0.14321
28	METAL PRODUCTS	0.65263	0.04733	0.29381	0.20426	0.10752
29	ENGINES AND TURB	0.51144	0.03721	0.23127	0.14635	0.09658
30	AGRICULTURAL MAC	0.46372	0.03748	0.19746	0.13587	0.09292
31	CONSTR,MINING,OI	0.44934	0.02758	0.19883	0.13091	0.09203
32	METALWORKING MAC	0.33791	0.03218	0.14917	0.09104	0.06551
33	SPECIAL INDUSTRY	0.41854	0.02978	0.17419	0.13488	0.07967
34	MISC NON-ELECTRI	0.43350	0.03271	0.19587	0.12279	0.08211
35	COMPUTERS	0.25841	0.03020	0.08959	0.07836	0.06031
36	OTHER OFFICE EQU	0.39080	0.03256	0.15581	0.12407	0.07831
37	SERVICE INDUSTRY	0.54060	0.04460	0.18601	0.14078	0.17038
38	COMMUNIC EQ, ELE	0.35864	0.03926	0.11985	0.13074	0.06923
39	ELEC INDL APP &	0.54158	0.03622	0.20022	0.16429	0.14079

Table 2.3 continued

SEC.	TITLE	TOTAL	GOVERN.	AIR	WATER	SOLID
40	HOUSEHOLD APPLIA	0.57080	0.05316	0.22740	0.17676	0.11342
41	MISC ELECTRICAL	0.55637	0.05270	0.22950	0.16587	0.10820
42	TV SETS,RADIOS,P	0.36158	0.04072	0.12385	0.11076	0.08636
43	MOTOR VEHICLES	0.53715	0.03989	0.21924	0.16371	0.11435
44	AEROSPACE	0.31291	0.03343	0.11216	0.10815	0.05868
45	SHIPS, BOATS	0.47715	0.03401	0.17543	0.13766	0.12813
46	OTHER TRANSP. EQ	0.52545	0.04196	0.22385	0.16150	0.10192
47	INSTRUMENTS	0.41055	0.03655	0.12700	0.14971	0.09741
48	MISC. MANUFACTUR	0.50831	0.04254	0.20773	0.15280	0.10592
49	RAILROADS	0.28101	0.02016	0.11839	0.09340	0.04914
50	TRUCKING, HWY PA	0.15027	0.00961	0.06504	0.05129	0.02435
51	WATER TRANSPORT	0.27020	0.01684	0.11791	0.09040	0.04496
52	AIR TRANSPORT	0.30025	0.02003	0.12906	0.10344	0.04770
53	PIPELINE	0.52652	0.04557	0.20520	0.17923	0.09670
54	TRANSPORTAION SE	0.62775	0.04593	0.25224	0.20035	0.12923
55	COMMUNICATIONS S	0.08597	0.00727	0.03331	0.02927	0.01613
56	ELECTRIC UTILILI	3.83330	0.32054	1.51722	1.28202	0.71352
57	GAS UTILITY	0.57786	0.04779	0.22880	0.18998	0.11133
58	WATER AND SANITA	0.21925	0.01621	0.08867	0.07337	0.04102
59	WHOLESALE TRADE	0.11458	0.00881	0.04540	0.03988	0.02050
60	RETAIL TRADE	0.14448	0.01149	0.05705	0.04957	0.02637
61	EATING & DRINKIN	0.28022	0.03159	0.09603	0.10172	0.05088
62	FINANCE & INSURA	0.12347	0.01028	0.04735	0.04265	0.02319
63	REAL ESTATE	0.06493	0.00468	0.02657	0.02228	0.01141
64	OWNER-OCCUPIED H	0.06257	0.00468	0.02474	0.02162	0.01153
65	HOTELS; REPAIRS	0.23265	0.01815	0.09090	0.08099	0.04261
66	BUSINESS SERVICE	0.17011	0.01431	0.06324	0.05861	0.03400
67	AUTOMOBILE REPAI	0.29064	0.02202	0.11797	0.09085	0.05987
68	MOVIES AND AMUSE	0.14849	0.01172	0.05696	0.05325	0.02657
69	MEDICINE,EDUCATI	0.14246	0.01113	0.05420	0.05151	0.02561
70	FED & S&L GOVT E	0.15308	0.01057	0.06207	0.05422	0.02620
71	NON COMPETITIVE	0.00000	0.00000	0.00000	0.00000	0.00000
72	DOMESTIC SERVANT	0.02889	0.00246	0.01135	0.00965	0.00543
73	UNIMPORTANT INDU	0.47016	0.03748	0.18855	0.15565	0.08851
74	SCRAPS AND USED	0.02272	0.00181	0.00911	0.00752	0.00428
75	REST OF THE WORL	0.00000	0.00000	0.00000	0.00000	0.00000
76	GOVERNMENT INDUS	0.00000	0.00000	0.00000	0.00000	0.00000
77	INFORUM STAT. DI	0.00000	0.00000	0.00000	0.00000	0.00000
78	NIPA STAT. DISC	0.00000	0.00000	0.00000	0.00000	0.00000

Table 2.4 Total Abatement Costs per dollar of output in 1977

(1.00 means 1 cent of every $ purchase goes for pollution abatement)

SEC.	TITLE	TOTAL	GOVERN.	AIR	WATER	SOLID
1	AGRICULTURE,FORE	0.82930	0.02366	0.25433	0.48607	0.06525
2	IRON ORE MINING	0.58751	0.01738	0.30625	0.20884	0.05505
3	NONFERROUS METAL	0.48209	0.01564	0.23974	0.17544	0.05129
4	COAL MINING	0.44877	0.01624	0.22534	0.15611	0.05109
5	NATURAL GAS EXTR	0.25418	0.01065	0.12362	0.08891	0.03103
6	CRUDE PETROLEUM	0.29380	0.01291	0.14273	0.09982	0.03836
7	NON-METALLIC MIN	0.54441	0.01920	0.27795	0.18837	0.05897
8	CONSTRUCTION	0.09407	0.00399	0.04540	0.03099	0.01370
9	FOOD & TOBACCO	0.77494	0.08564	0.24514	0.33833	0.10581
10	TEXTILES, EXC. K	1.06770	0.09552	0.35794	0.45773	0.15658
11	KNITTING	0.98175	0.12399	0.32398	0.39224	0.14162
12	APPAREL, HOUSEHO	0.55272	0.04740	0.19971	0.22934	0.07629
13	PAPER	2.03331	0.12642	0.64644	0.97927	0.28070
14	PRINTING & PUBLI	0.65206	0.04464	0.23316	0.26427	0.10969
15	AGRICULTURAL FER	2.53240	0.03142	0.83758	1.29761	0.36584
16	OTHER CHEMICALS	1.90634	0.06723	0.64528	0.90465	0.28943
17	PETROLEUM REFINI	1.33753	0.01908	0.79607	0.42383	0.09867
18	FUEL OIL	0.00171	0.00010	0.00083	0.00051	0.00027
19	RUBBER PRODUCTS	0.89429	0.04764	0.34901	0.32245	0.17459
20	PLASTIC PRODUCTS	1.09371	0.05066	0.39025	0.44168	0.21119
21	SHOES AND LEATHE	0.63665	0.10610	0.17433	0.22229	0.13394
22	LUMBER	0.71941	0.02591	0.27907	0.25521	0.15958
23	FURNITURE	0.75706	0.04296	0.34593	0.22451	0.14435
24	STONE, CLAY, GLA	1.21075	0.04192	0.70313	0.27262	0.19277
25	FERROUS METALS	2.17184	0.04655	1.25403	0.60919	0.26232
26	COPPER	2.40410	0.04036	1.88929	0.34266	0.13384
27	OTHER NONFERROUS	1.85075	0.04474	1.24059	0.42196	0.14226
28	METAL PRODUCTS	1.05659	0.05089	0.54786	0.31224	0.14566
29	ENGINES AND TURB	0.92450	0.04213	0.47938	0.27446	0.12865
30	AGRICULTURAL MAC	0.78156	0.03730	0.40004	0.21636	0.12808
31	CONSTR,MINING,OI	0.75873	0.03287	0.38060	0.21671	0.12814
32	METALWORKING MAC	0.55876	0.03272	0.28865	0.15728	0.08026
33	SPECIAL INDUSTRY	0.68244	0.03119	0.32992	0.20197	0.11955
34	MISC NON-ELECTRI	0.70215	0.03703	0.36390	0.20589	0.09752
35	COMPUTERS	0.40290	0.04696	0.16885	0.12885	0.05823
36	OTHER OFFICE EQU	0.68928	0.04377	0.30041	0.23256	0.11261
37	SERVICE INDUSTRY	0.81441	0.04638	0.37036	0.21936	0.17840
38	COMMUNIC EQ, ELE	0.56308	0.04204	0.23318	0.20547	0.08236
39	ELEC INDL APP &	0.72849	0.03902	0.36287	0.22447	0.10215

Table 2.4 continued

SEC.	TITLE	TOTAL	GOVERN.	AIR	WATER	SOLID
40	HOUSEHOLD APPLIA	0.86193	0.05318	0.39327	0.27040	0.14507
41	MISC ELECTRICAL	0.90055	0.05323	0.43854	0.28007	0.12932
42	TV SETS,RADIOS,P	0.58725	0.03870	0.23137	0.20852	0.11044
43	MOTOR VEHICLES	0.83981	0.04597	0.40066	0.25468	0.13880
44	AEROSPACE	0.47795	0.03779	0.20524	0.16189	0.07347
45	SHIPS, BOATS	0.83429	0.03845	0.35213	0.26521	0.17862
46	OTHER TRANSP. EQ	0.83002	0.04522	0.40220	0.23996	0.14139
47	INSTRUMENTS	0.67992	0.04062	0.28292	0.23769	0.11864
48	MISC. MANUFACTUR	0.76043	0.04407	0.34239	0.24996	0.12343
49	RAILROADS	0.41914	0.01466	0.21567	0.14317	0.04565
50	TRUCKING, HWY PA	0.22117	0.00733	0.11554	0.07491	0.02341
51	WATER TRANSPORT	0.41646	0.01181	0.22342	0.13844	0.04282
52	AIR TRANSPORT	0.31512	0.01146	0.16269	0.10744	0.03357
53	PIPELINE	0.76378	0.03207	0.38505	0.27504	0.07164
54	TRANSPORTAION SE	0.74396	0.03661	0.34771	0.25439	0.10542
55	COMMUNICATIONS S	0.13262	0.00477	0.06589	0.05059	0.01137
56	ELECTRIC UTILILI	5.40408	0.04772	3.17474	2.11190	0.06973
57	GAS UTILITY	0.34079	0.01717	0.15967	0.11569	0.04830
58	WATER AND SANITA	0.32023	0.01179	0.15653	0.11533	0.03662
59	WHOLESALE TRADE	0.15771	0.00582	0.07684	0.05991	0.01514
60	RETAIL TRADE	0.21884	0.00526	0.11635	0.08442	0.01281
61	EATING & DRINKIN	0.42799	0.03221	0.16552	0.18261	0.04765
62	FINANCE & INSURA	0.14543	0.00598	0.06851	0.05660	0.01433
63	REAL ESTATE	0.09457	0.00250	0.04897	0.03543	0.00768
64	OWNER-OCCUPIED H	0.05691	0.00266	0.02433	0.02177	0.00816
65	HOTELS; REPAIRS	0.34418	0.01259	0.16625	0.13108	0.03426
66	BUSINESS SERVICE	0.23039	0.01204	0.09783	0.08868	0.03179
67	AUTOMOBILE REPAI	0.43563	0.02128	0.21053	0.13869	0.06522
68	MOVIES AND AMUSE	0.19896	0.00693	0.09169	0.08301	0.01732
69	MEDICINE,EDUCATI	0.23695	0.00844	0.11032	0.09531	0.02287
70	FED & S&L GOVT E	0.28743	0.00891	0.14142	0.10863	0.02848
71	NON COMPETITIVE	0.00000	0.00000	0.00000	0.00000	0.00000
72	DOMESTIC SERVANT	0.01013	0.00070	0.00418	0.00348	0.00176
73	UNIMPORTANT INDU	0.89949	0.04803	0.39987	0.32189	0.12977
74	SCRAPS AND USED	0.14990	0.00800	0.06664	0.05364	0.02163
75	REST OF THE WORL	0.00000	0.00000	0.00000	0.00000	0.00000
76	GOVERNMENT INDUS	0.00000	0.00000	0.00000	0.00000	0.00000
77	INFORUM STAT. DI	0.00000	0.00000	0.00000	0.00000	0.00000
78	NIPA STAT. DISC	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE 2.5. Percentage of Income Purchasing Industrial Pollution For Each of Twenty Income Classes in 1973 (per Capita)

INCOME CLASS		TOTAL	GOVERN.	AIR	WATER	SOLID
LOW	1	0.7698379	0.0707862	0.2925688	0.2704021	0.1360959
	2	0.5030183	0.0458066	0.1920112	0.1759886	0.0892258
	3	0.4352887	0.0391253	0.1659329	0.1536864	0.0765471
	4	0.3983367	0.0350693	0.1539341	0.1395181	0.0698237
	5	0.3583829	0.0316935	0.1382149	0.1252225	0.0632592
	6	0.3396222	0.0299483	0.1310026	0.1187303	0.0599482
	7	0.3280363	0.0287728	0.1269308	0.1143375	0.0580050
	8	0.3196132	0.0276069	0.1243716	0.1111591	0.0564843
	9	0.3074413	0.0268163	0.1191939	0.1070735	0.0543682
	10	0.2914546	0.0253982	0.1130473	0.1015270	0.0514901
	11	0.2928575	0.0253892	0.1136836	0.1018117	0.0519805
	12	0.2747292	0.0237751	0.1066754	0.0957101	0.0485761
	13	0.2716877	0.0234233	0.1057231	0.0944386	0.0481118
	14	0.2630455	0.0223554	0.1030163	0.0913487	0.0463334
	15	0.2510311	0.0215241	0.0978103	0.0872375	0.0444671
	16	0.2443841	0.0209009	0.0954722	0.0847353	0.0432851
	17	0.2299182	0.0196931	0.0896933	0.0797777	0.0407622
	18	0.2204415	0.0187557	0.0862175	0.0765066	0.0389685
	19	0.2002290	0.0169763	0.0783860	0.0692426	0.0356319
HIGH	20	0.1573628	0.0133812	0.0613614	0.0545014	0.0281240

TABLE 2.6 Percentage of Expenditure Purchasing Industrial Pollution For Each of Twenty Income Classes in 1973 (per Capita)

INCOME CLASS		TOTAL	GOVERN.	AIR	WATER	SOLID
LOW	1	0.3725442	0.0342552	0.1415815	0.1308545	0.0658603
	2	0.3685175	0.0335585	0.1406698	0.1289314	0.0653679
	3	0.3640934	0.0327261	0.1387931	0.1285497	0.0640272
	4	0.3624607	0.0319108	0.1400701	0.1269525	0.0635351
	5	0.3600229	0.0318385	0.1388474	0.1257955	0.0635487
	6	0.3527616	0.0311069	0.1360708	0.1233237	0.0622675
	7	0.3491303	0.0306230	0.1350929	0.1216899	0.0617349
	8	0.3468006	0.0299552	0.1349511	0.1206147	0.0612891
	9	0.3573533	0.0311698	0.1385446	0.1244565	0.0631947
	10	0.3470566	0.0302435	0.1346138	0.1208957	0.0613130
	11	0.3452060	0.0299276	0.1340046	0.1200106	0.0612721
	12	0.3404641	0.0294638	0.1321998	0.1186108	0.0601989
	13	0.3427050	0.0295460	0.1333584	0.1191242	0.0606879
	14	0.3433548	0.0291807	0.1344678	0.1192380	0.0604793
	15	0.3366031	0.0288613	0.1311520	0.1169752	0.0596251
	16	0.3375123	0.0288657	0.1318541	0.1170257	0.0597798
	17	0.3333083	0.0285487	0.1300267	0.1156523	0.0590921
	18	0.3327698	0.0283128	0.1301505	0.1154913	0.0588253
	19	0.3262562	0.0276614	0.1277233	0.1128250	0.0580591
HIGH	20	0.3072125	0.0261235	0.1197932	0.1064006	0.0549052

TABLE 2.7 Percentage of Income Purchasing Industrial Pollution For Each of Twenty Income Classes in 1977 (per Capita)

INCOME CLASS		TOTAL	GOVERN.	AIR	WATER	SOLID
LOW	1	1.1591	0.0624	0.5258	0.4606	0.1103
	2	0.7306	0.0381	0.3349	0.2882	0.0693
	3	0.6296	0.0323	0.2865	0.2511	0.0597
	4	0.5711	0.0286	0.2639	0.2244	0.0542
	5	0.5140	0.0255	0.2384	0.2016	0.0485
	6	0.4868	0.0241	0.2257	0.1911	0.0460
	7	0.4712	0.0238	0.2176	0.1834	0.0464
	8	0.4562	0.0224	0.2126	0.1767	0.0446
	9	0.4412	0.0218	0.2052	0.1716	0.0427
	10	0.4188	0.0207	0.1946	0.1628	0.0407
	11	0.4214	0.0209	0.1955	0.1629	0.0422
	12	0.3956	0.0196	0.1834	0.1533	0.0393
	13	0.3908	0.0192	0.1818	0.1509	0.0389
	14	0.3766	0.0183	0.1758	0.1447	0.0378
	15	0.3609	0.0178	0.1676	0.1390	0.0366
	16	0.3501	0.0173	0.1630	0.1344	0.0355
	17	0.3307	0.0164	0.1536	0.1270	0.0337
	18	0.3160	0.0155	0.1472	0.1212	0.0320
	19	0.2883	0.0141	0.1344	0.1099	0.0299
HIGH	20	0.2270	0.0112	0.1052	0.0867	0.0239

TABLE 2.8 Percentage of Expenditure Purchasing Industrial Pollution For Each of Twenty Income Classes in 1977 (per Capita)

INCOME CLASS		TOTAL	GOVERN.	AIR	WATER	SOLID
LOW	1	0.5419	0.0292	0.2458	0.2154	0.0516
	2	0.5358	0.0280	0.2456	0.2114	0.0508
	3	0.5257	0.0270	0.2393	0.2097	0.0499
	4	0.5192	0.0260	0.2399	0.2040	0.0493
	5	0.5169	0.0257	0.2397	0.2028	0.0488
	6	0.5064	0.0251	0.2348	0.1988	0.0478
	7	0.5022	0.0254	0.2319	0.1955	0.0495
	8	0.4954	0.0243	0.2309	0.1918	0.0484
	9	0.5130	0.0253	0.2386	0.1995	0.0496
	10	0.4981	0.0246	0.2315	0.1936	0.0484
	11	0.4953	0.0246	0.2298	0.1915	0.0495
	12	0.4882	0.0241	0.2263	0.1892	0.0485
	13	0.4901	0.0241	0.2280	0.1892	0.0488
	14	0.4888	0.0238	0.2282	0.1878	0.0490
	15	0.4814	0.0237	0.2236	0.1854	0.0488
	16	0.4817	0.0238	0.2243	0.1849	0.0488
	17	0.4768	0.0236	0.2215	0.1831	0.0487
	18	0.4747	0.0233	0.2212	0.1821	0.0481
	19	0.4663	0.0229	0.2175	0.1777	0.0483
HIGH	20	0.4401	0.0218	0.2040	0.1681	0.0463

Table 2.9 Total Abatement Costs per dollar of output in 1977
HIGH ABATEMENT COSTS FOR ELECTRIC UTILITIES
(1.00 means 1 cent of every $ purchase goes for pollution abatement)

SEC.	TITLE	TOTAL	GOVERN.	AIR	WATER	SOLID
1	AGRICULTURE,FORE	0.88233	0.02441	0.28698	0.50497	0.06600
2	IRON ORE MINING	0.73469	0.01945	0.39686	0.26129	0.05712
3	NONFERROUS METAL	0.58408	0.01707	0.30252	0.21179	0.05272
4	COAL MINING	0.53249	0.01741	0.27687	0.18594	0.05226
5	NATURAL GAS EXTR	0.29724	0.01125	0.15012	0.10425	0.03164
6	CRUDE PETROLEUM	0.33599	0.01350	0.16870	0.11485	0.03895
7	NON-METALLIC MIN	0.65092	0.02069	0.34351	0.22632	0.06047
8	CONSTRUCTION	0.10255	0.00411	0.05062	0.03401	0.01382
9	FOOD & TOBACCO	0.83494	0.08648	0.28208	0.35972	0.10666
10	TEXTILES, EXC. K	1.18616	0.09718	0.43086	0.49995	0.15824
11	KNITTING	1.08753	0.12547	0.38909	0.42994	0.14311
12	APPAREL, HOUSEHO	0.62635	0.04843	0.24504	0.25558	0.07733
13	PAPER	2.15073	0.12807	0.71872	1.02112	0.28235
14	PRINTING & PUBLI	0.71533	0.04553	0.27210	0.28682	0.11058
15	AGRICULTURAL FER	2.65888	0.03320	0.91544	1.34269	0.36761
16	OTHER CHEMICALS	2.01682	0.06878	0.71328	0.94402	0.29099
17	PETROLEUM REFINI	1.39912	0.01994	0.83399	0.44578	0.09954
18	FUEL OIL	0.00189	0.00010	0.00094	0.00058	0.00027
19	RUBBER PRODUCTS	0.98497	0.04892	0.40483	0.35476	0.17586
20	PLASTIC PRODUCTS	1.20729	0.05226	0.46017	0.48216	0.21278
21	SHOES AND LEATHE	0.69062	0.10685	0.20755	0.24152	0.13470
22	LUMBER	0.78163	0.02678	0.31737	0.27739	0.16045
23	FURNITURE	0.83341	0.04403	0.39292	0.25172	0.14542
24	STONE, CLAY, GLA	1.32613	0.04354	0.77415	0.31374	0.19439
25	FERROUS METALS	2.32446	0.04870	1.34798	0.66358	0.26446
26	COPPER	2.52786	0.04209	1.96547	0.38677	0.13557
27	OTHER NONFERROUS	2.04872	0.04752	1.36245	0.49251	0.14504
28	METAL PRODUCTS	1.15117	0.05222	0.60607	0.34595	0.14699
29	ENGINES AND TURB	1.00327	0.04324	0.52788	0.30254	0.12976
30	AGRICULTURAL MAC	0.84909	0.03825	0.44160	0.24043	0.12903
31	CONSTR,MINING,OI	0.82824	0.03385	0.42338	0.24148	0.12912
32	METALWORKING MAC	0.62545	0.03365	0.32970	0.18104	0.08119
33	SPECIAL INDUSTRY	0.74866	0.03212	0.37068	0.22557	0.12048
34	MISC NON-ELECTRI	0.77594	0.03806	0.40932	0.23219	0.09856
35	COMPUTERS	0.45583	0.04771	0.20143	0.14771	0.05897
36	OTHER OFFICE EQU	0.75207	0.04465	0.33907	0.25494	0.11349
37	SERVICE INDUSTRY	0.88553	0.04738	0.41414	0.24470	0.17940
38	COMMUNIC EQ, ELE	0.63068	0.04299	0.27480	0.22956	0.08331
39	ELEC INDL APP &	0.80408	0.04008	0.40940	0.25141	0.10321

Table 2.9 continued

SEC.	TITLE	TOTAL	GOVERN.	AIR	WATER	SOLID
40	HOUSEHOLD APPLIA	0.93976	0.05427	0.44119	0.29814	0.14616
41	MISC ELECTRICAL	0.98969	0.05448	0.49342	0.31184	0.13057
42	TV SETS,RADIOS,P	0.65159	0.03960	0.27097	0.23145	0.11134
43	MOTOR VEHICLES	0.91282	0.04699	0.44560	0.28070	0.13982
44	AEROSPACE	0.53688	0.03861	0.24152	0.18290	0.07429
45	SHIPS, BOATS	0.90759	0.03948	0.39724	0.29133	0.17965
46	OTHER TRANSP. EQ	0.90444	0.04626	0.44801	0.26648	0.14243
47	INSTRUMENTS	0.74235	0.04149	0.32135	0.25994	0.11952
48	MISC. MANUFACTUR	0.83552	0.04513	0.38862	0.27672	0.12449
49	RAILROADS	0.48708	0.01562	0.25750	0.16738	0.04660
50	TRUCKING, HWY PA	0.24486	0.00767	0.13012	0.08335	0.02375
51	WATER TRANSPORT	0.46942	0.01256	0.25602	0.15731	0.04357
52	AIR TRANSPORT	0.34186	0.01183	0.17915	0.11696	0.03395
53	PIPELINE	0.95969	0.03482	0.50564	0.34486	0.07439
54	TRANSPORTAION SE	0.82420	0.03774	0.39710	0.28299	0.10655
55	COMMUNICATIONS S	0.17153	0.00531	0.08984	0.06446	0.01192
56	ELECTRIC UTILILI	8.43719	0.09030	5.04177	3.19282	0.11232
57	GAS UTILITY	0.38288	0.01776	0.18558	0.13069	0.04889
58	WATER AND SANITA	0.37927	0.01262	0.19287	0.13637	0.03744
59	WHOLESALE TRADE	0.19132	0.00630	0.09752	0.07188	0.01562
60	RETAIL TRADE	0.30054	0.00641	0.16664	0.11353	0.01396
61	EATING & DRINKIN	0.50136	0.03324	0.21068	0.20876	0.04868
62	FINANCE & INSURA	0.18147	0.00648	0.09069	0.06944	0.01484
63	REAL ESTATE	0.12071	0.00287	0.06506	0.04475	0.00805
64	OWNER-OCCUPIED H	0.06182	0.00273	0.02735	0.02351	0.00823
65	HOTELS; REPAIRS	0.42705	0.01375	0.21726	0.16062	0.03542
66	BUSINESS SERVICE	0.26256	0.01249	0.11763	0.10014	0.03224
67	AUTOMOBILE REPAI	0.48733	0.02201	0.24235	0.15712	0.06595
68	MOVIES AND AMUSE	0.24828	0.00763	0.12205	0.10059	0.01801
69	MEDICINE,EDUCATI	0.29549	0.00927	0.14636	0.11617	0.02369
70	FED & S&L GOVT E	0.35158	0.00981	0.18091	0.13149	0.02938
71	NON COMPETITIVE	0.00000	0.00000	0.00000	0.00000	0.00000
72	DOMESTIC SERVANT	0.01013	0.00070	0.00418	0.00348	0.00176
73	UNIMPORTANT INDU	0.98696	0.04926	0.45371	0.35306	0.13099
74	SCRAPS AND USED	0.16447	0.00821	0.07561	0.05883	0.02183
75	REST OF THE WORL	0.00000	0.00000	0.00000	0.00000	0.00000
76	GOVERNMENT INDUS	0.00000	0.00000	0.00000	0.00000	0.00000
77	INFORUM STAT. DI	0.00000	0.00000	0.00000	0.00000	0.00000
78	NIPA STAT. DISC	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE 2.10 Percentage of Expenditure Purchasing Industrial Pollution For Each of Twenty Income Classes in 1977 (per Capita)
HIGH ABATEMENT COSTS FOR ELECTRIC UTILITIES

INCOME CLASS		TOTAL	GOVERN.	AIR	WATER	SOLID
LOW	1	0.6715	0.0310	0.3256	0.2615	0.0534
	2	0.6652	0.0298	0.3253	0.2575	0.0527
	3	0.6515	0.0287	0.3167	0.2545	0.0516
	4	0.6428	0.0278	0.3160	0.2480	0.0510
	5	0.6428	0.0274	0.3172	0.2477	0.0505
	6	0.6294	0.0268	0.3104	0.2426	0.0496
	7	0.6175	0.0270	0.3028	0.2366	0.0511
	8	0.6109	0.0259	0.3020	0.2330	0.0500
	9	0.6346	0.0270	0.3135	0.2428	0.0513
	10	0.6151	0.0263	0.3035	0.2353	0.0500
	11	0.6083	0.0261	0.2993	0.2317	0.0511
	12	0.5999	0.0257	0.2951	0.2290	0.0501
	13	0.6022	0.0257	0.2970	0.2291	0.0504
	14	0.5989	0.0253	0.2960	0.2271	0.0505
	15	0.5891	0.0253	0.2898	0.2238	0.0503
	16	0.5892	0.0253	0.2905	0.2232	0.0503
	17	0.5823	0.0251	0.2864	0.2207	0.0501
	18	0.5803	0.0247	0.2862	0.2198	0.0496
	19	0.5681	0.0243	0.2801	0.2140	0.0497
HIGH	20	0.5344	0.0231	0.2621	0.2017	0.0476

Table 2.11 Total Abatement Costs per dollar of output in 1977
LOW ABATEMENT COSTS FOR ELECTRIC UTILITIES
(1.00 means 1 cent of every $ purchase goes for pollution abatement)

SEC.	TITLE	TOTAL	GOVERN.	AIR	WATER	SOLID
1	AGRICULTURE,FORE	0.79270	0.02667	0.22319	0.46899	0.07388
2	IRON ORE MINING	0.48593	0.02573	0.21981	0.16141	0.07900
3	NONFERROUS METAL	0.41171	0.02142	0.17984	0.14258	0.06788
4	COAL MINING	0.39100	0.02098	0.17618	0.12914	0.06471
5	NATURAL GAS EXTR	0.22447	0.01309	0.09833	0.07503	0.03804
6	CRUDE PETROLEUM	0.26468	0.01530	0.11794	0.08622	0.04522
7	NON-METALLIC MIN	0.47091	0.02524	0.21539	0.15405	0.07630
8	CONSTRUCTION	0.08821	0.00447	0.04041	0.02826	0.01508
9	FOOD & TOBACCO	0.73353	0.08904	0.20990	0.31900	0.11558
10	TEXTILES, EXC. K	0.98594	0.10223	0.28836	0.41956	0.17586
11	KNITTING	0.90876	0.12999	0.26186	0.35816	0.15883
12	APPAREL, HOUSEHO	0.50190	0.05157	0.15647	0.20561	0.08828
13	PAPER	1.95228	0.13308	0.57748	0.94143	0.29981
14	PRINTING & PUBLI	0.60840	0.04823	0.19600	0.24388	0.11998
15	AGRICULTURAL FER	2.44511	0.03860	0.76330	1.25686	0.38642
16	OTHER CHEMICALS	1.83010	0.07350	0.58039	0.86906	0.30741
17	PETROLEUM REFINI	1.29502	0.02257	0.75989	0.40398	0.10870
18	FUEL OIL	0.00158	0.00011	0.00072	0.00045	0.00030
19	RUBBER PRODUCTS	0.83171	0.05279	0.29575	0.29323	0.18935
20	PLASTIC PRODUCTS	1.01532	0.05710	0.32354	0.40508	0.22967
21	SHOES AND LEATHE	0.59941	0.10916	0.14263	0.20490	0.14273
22	LUMBER	0.67646	0.02944	0.24252	0.23516	0.16970
23	FURNITURE	0.70438	0.04729	0.30109	0.19991	0.15678
24	STONE, CLAY, GLA	1.13112	0.04846	0.63536	0.23545	0.21154
25	FERROUS METALS	2.06651	0.05521	1.16440	0.56002	0.28715
26	COPPER	2.31868	0.04737	1.81660	0.30278	0.15398
27	OTHER NONFERROUS	1.71412	0.05597	1.12431	0.35817	0.17447
28	METAL PRODUCTS	0.99133	0.05625	0.49231	0.28177	0.16105
29	ENGINES AND TURB	0.87013	0.04660	0.43312	0.24908	0.14147
30	AGRICULTURAL MAC	0.73496	0.04113	0.36038	0.19461	0.13907
31	CONSTR,MINING,OI	0.71077	0.03682	0.33977	0.19431	0.13945
32	METALWORKING MAC	0.51274	0.03650	0.24948	0.13579	0.09111
33	SPECIAL INDUSTRY	0.63675	0.03494	0.29103	0.18063	0.13032
34	MISC NON-ELECTRI	0.65123	0.04121	0.32056	0.18212	0.10953
35	COMPUTERS	0.36638	0.04996	0.13777	0.11180	0.06684
36	OTHER OFFICE EQU	0.64594	0.04733	0.26353	0.21232	0.12283
37	SERVICE INDUSTRY	0.76532	0.05042	0.32859	0.19644	0.18997
38	COMMUNIC EQ, ELE	0.51642	0.04587	0.19348	0.18369	0.09336
39	ELEC INDL APP &	0.67632	0.04331	0.31847	0.20011	0.11445

Table 2.11 continued

SEC.	TITLE	TOTAL	GOVERN.	AIR	WATER	SOLID
40	HOUSEHOLD APPLIA	0.80821	0.05759	0.34756	0.24532	0.15774
41	MISC ELECTRICAL	0.83903	0.05828	0.38619	0.25135	0.14382
42	TV SETS,RADIOS,P	0.54285	0.04235	0.19358	0.18779	0.12091
43	MOTOR VEHICLES	0.78943	0.05011	0.35778	0.23116	0.15068
44	AEROSPACE	0.43728	0.04113	0.17063	0.14290	0.08306
45	SHIPS, BOATS	0.78371	0.04261	0.30908	0.24160	0.19055
46	OTHER TRANSP. EQ	0.77866	0.04944	0.35850	0.21598	0.15350
47	INSTRUMENTS	0.63683	0.04416	0.24626	0.21757	0.12880
48	MISC. MANUFACTUR	0.70860	0.04833	0.29829	0.22576	0.13565
49	RAILROADS	0.37226	0.01851	0.17577	0.12128	0.05670
50	TRUCKING, HWY PA	0.20483	0.00868	0.10163	0.06728	0.02727
51	WATER TRANSPORT	0.37992	0.01482	0.19232	0.12138	0.05144
52	AIR TRANSPORT	0.29667	0.01297	0.14699	0.09882	0.03792
53	PIPELINE	0.62858	0.04318	0.26998	0.21192	0.10352
54	TRANSPORTAION SE	0.68859	0.04116	0.30058	0.22854	0.11848
55	COMMUNICATIONS S	0.10578	0.00697	0.04304	0.03806	0.01770
56	ELECTRIC UTILILI	3.31089	0.21972	1.39331	1.13457	0.56329
57	GAS UTILITY	0.31174	0.01956	0.13495	0.10213	0.05514
58	WATER AND SANITA	0.27949	0.01514	0.12185	0.09631	0.04622
59	WHOLESALE TRADE	0.13452	0.00773	0.05710	0.04908	0.02061
60	RETAIL TRADE	0.16245	0.00989	0.06836	0.05809	0.02610
61	EATING & DRINKIN	0.37736	0.03637	0.12242	0.15897	0.05959
62	FINANCE & INSURA	0.12057	0.00802	0.04735	0.04499	0.02019
63	REAL ESTATE	0.07653	0.00398	0.03362	0.02701	0.01193
64	OWNER-OCCUPIED H	0.05352	0.00294	0.02145	0.02018	0.00896
65	HOTELS; REPAIRS	0.28698	0.01729	0.11757	0.10438	0.04775
66	BUSINESS SERVICE	0.20819	0.01387	0.07894	0.07831	0.03703
67	AUTOMOBILE REPAI	0.39995	0.02422	0.18016	0.12204	0.07364
68	MOVIES AND AMUSE	0.16492	0.00973	0.06272	0.06712	0.02535
69	MEDICINE,EDUCATI	0.19655	0.01176	0.07594	0.07645	0.03239
70	FED & S&L GOVT E	0.24315	0.01255	0.10374	0.08796	0.03892
71	NON COMPETITIVE	0.00000	0.00000	0.00000	0.00000	0.00000
72	DOMESTIC SERVANT	0.01013	0.00070	0.00418	0.00348	0.00176
73	UNIMPORTANT INDU	0.83912	0.05299	0.34850	0.29370	0.14400
74	SCRAPS AND USED	0.13984	0.00883	0.05808	0.04895	0.02400
75	REST OF THE WORL	0.00000	0.00000	0.00000	0.00000	0.00000
76	GOVERNMENT INDUS	0.00000	0.00000	0.00000	0.00000	0.00000
77	INFORUM STAT. DI	0.00000	0.00000	0.00000	0.00000	0.00000
78	NIPA STAT. DISC	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE 2.12 Percentage of Expenditure Purchasing Industrial Pollution For Each of Twenty Income Classes in 1977 (per Capita)
LOW ABATEMENT COSTS FOR ELECTRIC UTILITIES

INCOME CLASS		TOTAL	GOVERN.	AIR	WATER	SOLID
LOW	1	0.4525242	0.0365352	0.1697445	0.1736138	0.0726523
	2	0.4465099	0.0353178	0.1696181	0.1697030	0.0718956
	3	0.4389274	0.0340903	0.1654061	0.1691272	0.0703227
	4	0.4338510	0.0330524	0.1672688	0.1641266	0.0694267
	5	0.4299702	0.0327983	0.1657442	0.1621900	0.0692634
	6	0.4215940	0.0320308	0.1625677	0.1591666	0.0678514
	7	0.4225733	0.0319188	0.1641238	0.1583086	0.0682490
	8	0.4156915	0.0308351	0.1630649	0.1546213	0.0671986
	9	0.4290550	0.0321932	0.1671913	0.1603074	0.0693847
	10	0.4173411	0.0312439	0.1627736	0.1559048	0.0674457
	11	0.4173320	0.0309650	0.1633989	0.1550705	0.0679295
	12	0.4111773	0.0304780	0.1607687	0.1532463	0.0667116
	13	0.4127449	0.0304418	0.1621750	0.1530709	0.0670840
	14	0.4128947	0.0300402	0.1635927	0.1523825	0.0669101
	15	0.4071465	0.0298526	0.1603248	0.1507013	0.0662963
	16	0.4075521	0.0298470	0.1611616	0.1502621	0.0663102
	17	0.4040789	0.0296047	0.1595611	0.1491177	0.0658239
	18	0.4017763	0.0292533	0.1591662	0.1481041	0.0652828
	19	0.3960885	0.0286619	0.1576607	0.1449383	0.0648579
HIGH	20	0.3750175	0.0271180	0.1486307	0.1376718	0.0616251

ENDNOTES

1
Dorfman and Snow [5, p. 114]

2
This paper assumes that the other studies recognize that abatement costs do vary across industries.

3
Lake, Hanneman, and Oster [8, p.196]

4
Lake, Hanneman, and Oster [8, p.196]

5
Lake, Hanneman, and Oster [8, p.212.]

6
1972 matrices were used for the 1973 calculations.

7
The depreciation figures for the INFORUM investment sectors were developed by Dr. Anthony Barbera.

8
Data was not available for sector 12 (Apparel); sector 18's(Fuel Oil) costs are all in sector 17 (Petroleum refining.)

9
Council on Environmental Quality (9), p. 443.

10
No source could provide the data in the same form as the PACE reports (14 & 15) or the Survey of Current Business article (18). Most published reports do not discuss the magnitude of the abatement costs for all the agricultural sectors, thereby avoiding the data problems. The best source available was unpublished Environmental Protection Agency data, which indicated that the agricultural abatement costs for 1977 were somewhere between 400 and 600 million dollars. The figure chosen was 50 percent of the 650 million dollar figure, or 325 million dollars.

11
For a more complete description the Engel curves see Paul Devine's dissertation, chapter 2.

12
Pollution abatement for the auto industry do not include the costs costs of the pollution abatement equipment built into the cars.

References

(1) Almon, Clopper, "The INFORUM Interindustry Macro Model With an Application to the Effects of Protection," INFORUM Working Paper US - 51, 1983.

(2) Almon, Clopper, Jr., Buckler, Margaret B., Horwitz, Lawrence M., and Reimbold, Thomas C., 1985: Interindustry Forecasts of the American Economy, Lexington, MA, Lexington Books, 1974.

(3) Barbera, A.J., A Study of the Determinants of Factor Demand by Industry, Unpublished Ph.D. dissertation, 1982.

(4) Baulmol, W.J., and Oates, Wallace E., The Theory of Environmental Policy, Englewood Cliffs, NJ, Prentice Hall, 1975.

(5) Baulmol, W.J. and Oates, Wallace E., Economics, Environmental Policy and The Quality of Life, Engelwood Cliffs, NJ, Prentice Hall, 1979.

(6) The Cost of Clean Air and Water, U.S. Environmental Protection Agency, Washington, Government Printing Office, 1979.

(7) Devine, Paul, Forecasting Personal Consumption Expenditures from Cross-section and Time series Data, Unpublished Ph.D. dissertation, 1983.

(8) Dorfman, Nancy S. and Snow, Arthur, "Who Will Pay for Pollution Control?" National Tax Journal, March, 1975, pp. 101-115.

(9) Environmental Quality: The Ninth Annual Report of the Council on Environmental Quality, Council on Environmental Quality, Washington DC, U.S. Government Printing Office, 1978.

(10) Gianessi, Leonard P., and Peskin, Henry M., "The Distribution of the Costs of Federal Water Pollution Control Policy," Land Economics, February, 1980, pp. 85-102.

(11) Gianessi, Leonard P., Peskin, Henry M., and Wolff, Edward, "The Distributional Effects of Uniform Air Pollution Policy in the United States," Quarterly Journal of Economics, May, 1979, pp. 281-301.

(12) Lake, Elizabeth E., Hanneman, William M., and Oster, Sharon M., Who Pays for Clean Water? The Distribution of Water Pollution Control Costs, Boulder, CO, Westview Press, 1979.

(13) Leontief, Wassily, "Environmental Repercussions and the Economic Structure: An Input-Output Approach," The Review of Economics and Statistics, August, 1970, pp. 262-271.

(14) Peskin, H.M., Portney, P.R., and Knesse, A.V., Environmental Regulation and The U.S. Economy, Baltimore, MD, Johns Hopkins University Press, 1981.

(15) Pollution Abatement Costs and Expenditures 1973, U.S. Bureau of the Census, Washington DC, U.S. Government Printing Office, 1976.

(16) Pollution Abatement Costs and Expenditures 1977, U.S. Bureau of the Census, Washington DC, U.S. Government Printing Office, 1979.

(17) Portney, Paul R., Ed., Current Issues in U.S. Environmental Policy, Baltimore, MD, Johns Hopkins University Press, 1978.

(18) Rutledge, G.L., Dreiling, F.J., and Dunlap, B.C., "Capital Expenditures by Business for Pollution Abatement 1973-77 and Planned 1978", Survey of Current Business, June 1978, pp 33-38.

THREE APPLICATIONS OF INPUT-OUTPUT MODELING

by

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Chapter 3

The Long-Run Profitability of Ethanol in High-Octane Gasoline

It is often necessary when using an input-output model to address a problem to build a sub-model to provide additional detail for sectors of interest. This study uses a sub-model, driven by the 78 sector INFORUM input-output model, to examine the long-run profitability of building a plant to produce ethanol from corn for use as an octane booster in super (high-octane unleaded) gasoline. The effects of ethanol production on agricultural production and pricing are also examined based on classical supply and demand modeling of agricultural price determination.

In this study, the long-run profitability of ethanol production was found to be highly dependent on future movements of the real price of crude oil and the real value of federal and state subsidies for ethanol use in gasoline. At current nominal subsidy levels, with a constant real price of crude oil, ethanol can be produced profitably through 1995, though the profit margin declines throughout the period as the real value of the subsidies decline. For the relatively low levels of ethanol production (less than 2 billion gallons) predicted by the model, the effects on agricultural prices is minimal. Ethanol production of 3 to 5 billion gallons has a moderate impact on corn price, while the impact could be more considerable for volumes of 10 to 15 billion gallons.

Historical Perspective

Ethanol, or ethyl alcohol, is obtained by the fermentation of carbohydrates. Knowledge of the fermentation process to obtain alcohol dates back as far as recorded history, when its only use was in alcoholic beverages. Alcoholic beverages are still the major market for ethanol, though it is also used as an industrial solvent and a fuel. The simple requirement of a carbohydrate to ferment implies that virtually any plant, from grasses to fruits and grains, could be used to produce ethanol. As a result, climatic and soil differences will not prohibit the production of ethanol in a country with unused arable land. In the United States, the climate is not suitable for growing sufficient quantities of sugarcane, the most efficient crop for ethanol production, to use sugarcane as the primary feedstock in producing ethanol. However, the United States does have the capacity for growing corn, the second most efficient major crop for ethanol production. (Sugarcane is 60 percent more efficient than corn when measured in gallons per acre terms.[1])

Prior to the widespread use of petroleum fuels, ethanol was used in limited quantities as a source of heat and light. The advent of cheap petroleum fuels eliminated ethanol as a source of fuel except in times of petroleum shortages. Henry Ford, a supporter of fuel ethanol, had cars built with carburetors that permitted any combination of ethanol and gasoline to be used as fuel. This practice was short-lived because of the ready availability of cheap gasoline. The first major use of ethanol came in Europe during the 1940's and throughout World War II, when it was produced from corn, potatoes, and sugar beets. Once the war

ended, petroleum supplies were again available, and ethanol use again disappeared.

The 1974 oil embargo drew the world's attention to the importance of energy, and the potential economic power of oil exporting countries. Brazil, hit hard by the increase in world oil prices, began an ethanol fuel program in 1975, with the stated purpose of energy independence by 1990. The Brazilian government helped to finance distilleries and agricultural (sugarcane) projects to supply them. By 1979, 14 percent of Brazil's automotive fuel was ethanol, with expectations of 2 to 3 times that volume being produced by 1985. The United States moved more slowly than Brazil, finally passing in 1978 an exemption to the federal gasoline tax for fuel containing ten percent ethanol. This execmption, therefore, amounts to a 40 cent per gallon subsidy for ethanol.

The 1979 oil shock, which doubled real oil prices, increased interest in alternative fuels in general, and in ethanol in particular. Gasohol, a blend of 10 percent ethanol and 90 percent gasoline, was seen as a way to use a plentiful resource, farmland, to combat a lack of oil reserves. Several corn-belt states, Florida, and California granted exemptions similar to the federal gasoline tax exemption, adding incentive for ethanol use. The marketing of gasohol spread quickly, but also faded quickly for a lack of economic incentives to users and because of problems with water absorption by the fuel. Ethanol has an affinity for water so strong that the presence of water in storage or shipping tanks draws the alcohol out of the gasohol. During the period when gasohol was widely marketed, this problem was not given proper consideration; and a large volume of ruined or weak fuel was sold to

consumers. Sales of gasohol, marketed as such, are currently limited to a few mid-western (corn producing) states.

A new potential market for ethanol has grown out of the energy conservation efforts of the late 1970's and early 1980's. The engines in the smaller, more fuel efficient, cars built since 1979 require higher octane gasoline as the engines get older. Ethanol, with an effective octane rating between 105 and 115 and substantial subsidies, might be profitably produced for use as an alternative to oil-derivative octane boosters in super-unleaded gasoline. Virtually all of the super unleaded gasoline currently sold in California contains ethanol, but is not marketed as gasohol.[2] It is the impact of a long-run continuation and spread of this use for ethanol that this study addresses.

Outline of Study

Measuring the profitability of ethanol production or the rather narrow effects ethanol production would have on the economy is impossible in the framework of INFORUM's aggregate I-O model, called LIFT. Both of the corn milling processes that can be used to produce ethanol (wet and whole corn milling) fall into the three digit Standard Industrial Classification 204, which is only a portion of the LIFT sector 9, Food and Tobacco. In 1977, Lift sector 9 had a total output of 208.4 billion dollars, of which all of corn milling accounted for less than 1.5%. In addition, all of agriculture comprises only a single LIFT sector, while the impact of large volume of ethanol production would be limited to corn and a few other crops that might lose land to corn production if relative prices change.

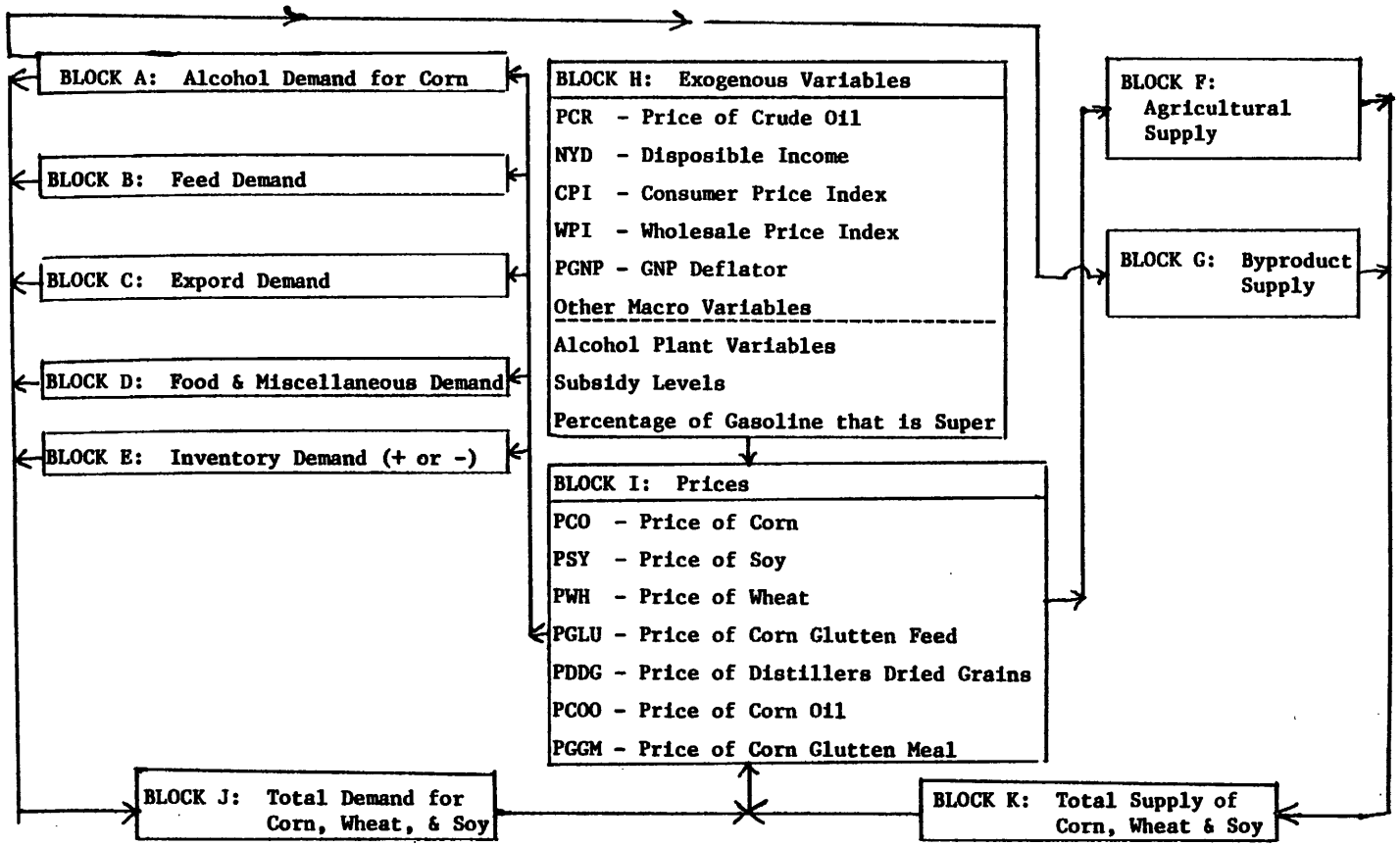

BLOCK A: Alcohol Demand for Corn
BLOCK B: Feed Demand
BLOCK C: Expord Demand
BLOCK D: Food & Miscellaneous Demand
BLOCK E: Inventory Demand (+ or -)
BLOCK H: Exogenous Variables
PCR - Price of Crude Oil
NYD - Disposible Income
CPI - Consumer Price Index
WPI - Wholesale Price Index
PGNP - GNP Deflator
Other Macro Variables
Alcohol Plant Variables
Subsidy Levels
Percentage of Gasoline that is Super
BLOCK I: Prices
PCO - Price of Corn
PSY - Price of Soy
PWH - Price of Wheat
PGLU - Price of Corn Glutten Feed
PDDG - Price of Distillers Dried Grains
PCOO - Price of Corn Oil
PGGM - Price of Corn Glutten Meal
BLOCK F: Agricultural Supply
BLOCK G: Byproduct Supply
BLOCK J: Total Demand for Corn, Wheat, & Soy
BLOCK K: Total Supply of Corn, Wheat & Soy

FIGURE 3.1

The Corn Alcohol Model (CAM), a sub-model of the LIFT model, was constructed to give the sectoral detail necessary for calculating the price at which ethanol would be profitable to produce. In addition to the ethanol production detail, additional detail was provided for the agriculture sector, so the effects of ethanol production on crop prices could be examined. In order to keep the model a manageable size, the agricultural detail was limited to three crops -- corn, soybeans, and wheat -- which might significantly affect the cost or feel the impacts of ethanol production. There are three links by which ethanol production will impact upon the pricing of the three crops. First, ethanol production is an additional demand for corn, which will raise the equilibrium price. Second, because the three crops are substitutes in production, relative acreage shares may shift. Finally, ethanol production produces by-products which can substitute for corn and soy in certain uses.

The by-products must be carefully considered, not just because of their use as a corn and soy substitute, but because of their major influence on the profitability on ethanol production. For example, in 1981 the net value of the by-products from one gallon of ethanol by the wet corn milling process was 85.6 cents, which accounted for 59.7 percent of the corn input cost based on the production process described below. In this study, the prices of the by-products depend only on the prices for corn and soy.

Figure 3.1, a flow diagram of the CAM model, shows the basic supply and demand structure of the model. On the left side of Figure 3.1 are the demands for the crops including: ethanol demand for corn, animal

feed demand, export demand, food and miscellaneous demand, and inventory demand. Note that, while it is included on the demand side of the model, inventory demand can have either a positive or negative sign. On average, inventories will be a positive demand for the crops, but in years of undersupply or excess demand inventory levels will fall, thus offsetting some portion of the other demands. The right hand side of Figure 3.1 shows the two sources of supply: the agricultural supply and the by-products equivalenced to corn and soy. In the upper center of Figure 3.1 are the exogenous variables, while in the lower center are the prices of the crops and by-products which are used to equate the supply and demands for each crop.

The model begins its solution process for each year by reading the values of the exogenous variables, block H of Figure 3.1. Those exogenous variables which are taken from LIFT are listed above the dotted line, while those variables that are wholely exogenous are listed below the line. A complete listing of the exogenous variables and description of how they were forecasted is given in section 3.3 of this study.

The next step in solving the model is to take a first guess at the three crop prices for the first year of the projection. From the crop prices, the by-product prices are calculated, as is described in section 3.6.

Given the crop prices, the by-product prices, and the engineering data on ethanol production costs, the price of ethanol can be calculated. The quantity of ethanol demanded, and therefore the amount of corn used for ethanol, is determined by three things: the total

consumption of gasoline, the percentage of total gasoline usage that requires octane boosting, and the fraction of super that uses ethanol as an octane booster. Block A of Figure 3.1, the ethanol side of CAM, is described in detail in section 3.4.

Blocks B, C, D and E of Figure 3.1 depict the other four demands: feed, exports, food, and inventory change respectively. The feed demand equations estimate the demand for corn to be fed to animals directly as a function of feed prices, thereby avoiding dealing with fluctuations in the livestock market. (A livestock model could be built to replace the feed demand equations, if better short-term forecasts of feed demand are desired.) Export demand equations were specified rather than estimated, in order to get strong price elasticities and to allow the growth rates for export demand to be specified exogenously. Inventory equations were included to increase the short-term stability of the model. Since very little soy is directly consumed by humans, food and miscellaneous demand equations were estimated just for corn and wheat. Functional forms and parameter estimates for feed, export, inventory change, and food demands are given in section 3.5.

Development of the supply side of CAM, blocks F and G of Figure 3.1, involved estimating the supply of crops given each year and equivalencing the by-products of ethanol production to corn and soy.[3] It should be noted that the supply of the crops grown each year does not depend on any contemporaneous prices because the crops are planted before the prices for the current period were known, and little can be done after the crops are in the ground to change the yield. Thus, the agricultural supply of each crop is constant while the model is solving

for a particular year, though it may change from year to year. By-product supply -- the supply of corn gluten feed, corn gluten meal, corn oil, and distillers dried grains equivalenced to corn and soy -- does vary with ethanol production during the solution process. Also, note that the by-product supply includes only the incremental by-products that result from the production of fuel ethanol, which avoids detailed modeling of other milling processes.

After a pass through the model, total supply and demand for the crops, blocks J and K of Figure 3.1 respecitively, have been determined based on the initial guess at the price. If supply equals demand for each crop, the initially guessed prices are the equilibrium ones for that year. When one or more of the crops has unequal supply and demand, the model adjusts its guess of those crop prices and makes another pass through all the equations of the model. Prices are raised if demand is greater than supply, and lowered if demand is less than supply. This price adjustment continues until supply equals demand for each crop; then the model continues on to the following year, beginning again with the values of the exogenous variables and a first guess at prices. The exact workings of this process are described in section 3.7 of this study.

Results of LIFT/CAM simulations are presented in secton 3.8. The simulations are based on three oil price scenarios: a flat real price, a steadily growing real price, and a fluctuating real price. Other simulations presented in section 3.8 are based on exogenous shocks to endogenous variables of the CAM model, such as a crop failure. Concluding remarks are given in section 3.9.

3.2 Review of Literature

Many recent studies have addressed particular aspects of the short- and long- run effects of ethanol production. Four studies, those by Brown (5), Breimyer (4), Cheremisinoff (6), and Paul (10) discuss the feasibility and cost of ethanol production in technical and theoretic manner. The other two studies to be reviewed here are simulation studies that examine the impact of increased ethanol production on crop and ethanol prices.

A 1979 study by Cheremisinoff (6) provides a good review of the literature on technical problems associated with ethanol production. All studies looking at ethanol assume that the technical problems, such as water affinity and regulatory restrictions, are solved with little effort. Cheremisinoff's study looks at the possibility of blending 5 percent ethanol with 95 percent gasoline for all gasoline produced in the United States. Ethanol is assumed to be produced from sugarcane, corn, and other grains in various regions. The projected price of ethanol is somewhat higher than that of this and other studies, perhaps due to the choice of sugarcane as the major feedstock for ethanol production. The relatively small acreage in the United States suitable for production of sugarcane and quotas limiting imports makes it a more expensive feedstock than corn. Cheremisinoff's study, as is the case with most of the technical studies, does not attempt to simulate or forecast the effect of his projected volume of ethanol on crop prices.

A good review of ethanol programs in New Zealand, Australia, South

Africa, Kenya, and the Sudan is provided in the paper by Brown (5). Brown's study arrives at an ethanol price of $1.00 a gallon if corn is priced at $2.44 per bushel. Brown focuses only on the relationship between the price of gasoline and corn for determining ethanol profitability, ignoring all other input costs and the decline in the real value of subsidy levels. By ignoring other input costs, such as coal, electricity, and labor, Brown overstates the effect a change in the price of gasoline has on the profitability of ethanol production.

The study by Breimyer (4) is one of several which looks at the rationale for ethanol production in terms of energy efficiency. According to Breimyer, ethanol should only be produced if the ethanol provides more energy than is necessary to produce the ethanol. Since ethanol production does provide a net 2 to 5 percent increase in energy, Breimyer and others who follow this line of reasoning would approve of production of ethanol for use as a fuel. However, the requirement of a net energy increase ignores all economic precepts for determination of value. (No octane booster with a crude oil base could meet this requirement.)

An extremely good review of the literature on the cost of ethanol production is given in the study by J. K. Paul(10). The cost of producing ethanol from all potential feedstocks under numerous assumptions is discussed in detail. Ethanol production cost was found to range between $1.07 and $1.31 per gallon based on $2.50 per bushel corn. However, none of the studies reviewed attempted to forecast the cost of producing ethanol into the future, or the effects of ethanol production on crop prices.

Two simulation studies, one by Meekhoff, Tyner, and Holland (9) and one by Webb (12) have simulated the effects of ethanol production (from corn) on crop prices. Meekhoff, Tyner, and Holland used the FEEDSIM model to look at the effects of producing 1 to 4 billion gallons of ethanol annually through 1985. The results of their simulations suggest that for the 1 to 4 billion gallons of ethanol the agricultural effects are relatively minor, but that for greater volumes the impact could be more substantial. As a result of 4 billion gallons of ethanol, 7 to 10 million acres would be planted in corn, while 1 to 3 million less would be planted in soy. Exports of corn would fall 200 - 300 million bushels per year, and annual carryovers would drop by 30 percent from the zero ethanol case. Despite these interesting results, the Meekhoff study has ignored the question of whether ethanol continues to be profitable to produce given its effect on agricultural prices, and, in particular, on the prices of the by-products of ethanol production.

The Webb (12) study used the NIRAP, National Interregional Agricultural Projection, simulation model to examine the effects of producing 10 billion gallons of ethanol annually. Webb finds that the supply curve for ethanol rises 3.65 percent per billion gallons of ethanol, and the price of corn rises by 4 percent per billion gallons of ethanol. The price effect on corn is actually smaller than that in the Meekhoff study, which looked at much smaller quantities of ethanol production. Like the Meekhoff study, the Webb article has assumed that ethanol will continue to be profitable to produce in doing the simulations.

No previous study has looked at ethanol profitability for the long

run. Those studies which address ethanol profitability fail to look at the long-run problems of increased agricultural prices and falling subsidy values. Those studies which attempt to simulate the long-run agricultural effects fail to address the question of ethanol profitability directly.

3.3. Exogenous Variables and the Link to LIFT Model

One might wonder what the value of the I-O model is when CAM contains all the detail important to addressing the questions of interest in this study. The answer is that given a crude oil scenario, LIFT provides a set of prices, a macroeconomic forecast, and an index of gasoline consumption, all consistent with that crude oil price scenario.

Forecasting prices in the LIFT model is done in three steps. First, income by industry is forecast. Second, income by industry is passed through a product-industry bridge to get value added per unit of output for each product. Finally, based on the input-output coefficient table, prices are obtained by summing the value added of all products used directly or indirectly in producing each product. A slightly more descriptive explanation of price determinaton is given in Almon (1), while a complete description is given in Matthew Hyle's Ph.D. dissertation (8).

The ability to produce price forecasts consistant with various crude oil scenarios is important to the CAM model, because the plant cost data (steam coal, electricity, labor, freight, etc.) are moved by LIFT price forecasts for relevant sectors. Without the ability to factor the full effects of a change in crude oil price into all other

prices, ethanol could appear to be profitable when, in fact, it is not.

For the exogenous variables that are not available in the LIFT model, forecasted values were provided by the corporate sponsors of this study. Two of these exogenous variables, ethanol production cost parameters and the profitability/use reaction function described in the next section, were left constant throughout the forecast period, although provisons were made for altering them if forecasts are available. Leaving these values constant implicitly assumes that no change in plant efficiency or reaction time of refiners occurs, which probably errs on the side of underproducing ethanol. Other exogenous variables for which forecasts were supplied include: the federal and state subsidy levels, the percentage of gasoline that required octane boosting, and export growth rates. Three of the simulations presented in secton 3.8 are based on varying the supplied forecasts of these exogenous variables.

3.4. Ethanol Production

Ethanol can be mixed in a nine-to-one ratio with gasoline in a refinery or at a shipping terminal to boost the octane rating of regular unleaded gasoline three points, producing unleaded super.[4] An effective octane rating of 105-115 and some good refinery properties make ethanol a good octane booster at the refinery. On the other hand, a single refinery typically supplies products for several states with different subsidy levels. These state-specific subsidies make ethanol blending at the pipeline terminal more likely to be profitable. Blending at terminals in states with subsidies sufficiently high to make ethanol

profitable spares the refiner from the problems of keeping super-ethanol unleaded gasoline separated from super-nonethanol gasoline. Blending at the terminal also reduces the chances of ethanol/gasoline as a result of water contamination.

In the CAM model, no explicit cost analysis was done on competitive octane boosters such as MTBE (tertiory butyl alcohol), toluene, and methanol. All non-ethanol octane boosters, except MTBE, are simple derivatives of crude oil, and their prices are linked to the price of crude oil and gasoline. (MTBE is only partially a crude oil derivative.) Some amount of these octane boosters are produced as coproducts while refining gasoling, but the quantities produced are not sufficient to meet octane booster demand. The refinery process can be altered to produce large quantities of octane boosters in a separate run from that in which gasoline is produced. In either case, the price of the octane boosters are closely linked to the price of the crude oil entering the refinery. Hence, when CAM determines the cost effectiveness of ethanol as an octane booster by looking at the ratio of the price of ethanol to the price of gasoline, it is implicity considering all other octane boosters.

The basic assumption of the alcohol side of CAM is that refiners will switch to ethanol as an octane booster once they perceive the switch to be profitable. The breakeven point, the point at which the refiner can profitably use ethanol (at the terminal), is reached when the ratio of the price of ethanol to the gate price of gasoline at the refinery plus shipping costs to the terminal, federal and state tax subsidies, and value of the increase in octane falls to 1.00.

RATIO(t) = PALC / (PGASS + SHIP + FED + STATE + OCTPRE)

where:

PALC	=	the price of ethanol (net of by-products)
PGASS	=	the gate price of gasoline
SHIP	=	the shipping savings for blending at the terminal
FED	=	the federal subsidy for use of ethanol in gasoline
STATE	=	the state subsidy for use of ethanol in gasoline
OCTPRE	=	the value of the octane increase gained by ethanol blending

Set-up time and other change-over costs make it unlikey that all refiners would begin use of ethanol once the breakeven point is reached. The changeover rate would depend on how far below 1.00 RATIO was, how long RATIO had been below 1.00, and on what percentage of refiners had already made the switch to ethanol use. In addition, it was felt that refiners would switch away from ethanol use more quickly than they began using it. To model this, a "profitability/use" reaction function was specified, having the previously described properties, to determine the fraction of super gasoline (FRAC) that would use ethanol as an octane booster each year. This reaction function, determining the fraction of super gasoline made with ethanol (with $0.0 < FRAC < 1.00$) is as follows:

$$FRAC(T) = \begin{cases} 0 & \text{if } FRAC(T-1) = 0 \text{ and } RATIO > 1.00 \\ FRAC(T-1) + D * (1-FRAC(T-1)) * (1.00/RATIO)^{B} * G(T) & \text{if } RATIO < 1.00 \\ FRAC(T-1) - 2.0 * D * (1-FRAC(T-1)) * (RATIO/1.00)^{B} * G(T) & \text{if } FRAC(T-1) > 0 \text{ and } RATIO > 1.00 \end{cases}$$

and

$$G(T) = \begin{cases} A & \text{if } FRAC(T-1) < A \\ FRAC(T-1) & \text{if } A < FRAC(T-1) < 1.00 \end{cases}$$

where: $0 < FRAC(T) < 1.0$

FRAC is the fraction of super gasoline made with ethanol
A is a parameter specified to be 0.1
B is a parameter specified to be 4.0
D is a parameter specified to be 0.225
1.00 is the threshold RATIO where the use of ethanol first becomes profitable.
RATIO is the ratio of PALC/(PGASS + FED40 + STATE + OCTPRE + SHIPP)
FED40 is the 40 cent federal subsidy for ethanol use in gasoline
STATE is the 'average' state subsidy ('average' is described later)
OCTPRE is the value of the octane increase when using ethanol
SHIPP is the shipping costs to ship gasoline from the refinery to the terminals

The parameters A, B, and D were chosen to give the function the following properties:[5]

1) At any RATIO less than or equal to 1.00, the fraction of super unleaded gasoline made with ethanol (FRAC) will eventually reach 1.00.

2) The change-over occurs more and more rapidly as RATIO drops further and further below 1.00.

3) Should RATIO rise above 1.00, refiners will move away from ethanol use twice as fast as they began its use.

4) The fraction of ethanol must be able to start at, leave, and if necessary return to 0.00. The use of the A parameter in the G function allows FRAC to start at and leave 0.0. If the A term in the G function was 0.0, FRAC would never change from 0.0 because G(t) would always be 0.0.

Should the profitability ratio rise above 1.00, refiners should respond by shifting to other octane boosters. It is assumed in this study that ethanol producers price ethanol at the calculated price required for profitability. While unrealistic in the event of falling levels of production, this assumption is appropriate here because the focus of this study is on the volume of ethanol that is profitably sold. As was expressed in the reaction function presented above, refiners are assumed to respond to a profitability ratio above 1.00 by shifting away from using ethanol twice as fast as they began its use. Refiners shift away from ethanol use more quickly than they began to use it for two reasons. First, use of ethanol required learning a new technology, while returning to the previous method of operations does not. Second, refiners are capable of producing other octane boosters within the refinery, allowing the refiners to be self sufficient in terms of octane boosters. (Also, if the refiners are running the refinery under capacity, producing the octane internally increases capacity utilization.)

If the profitability ratio rises above 1.00, ethanol producers have the following three choices for production strategy: close the plant, operate with reduced prices and profits, or switch the plant to production of potable ethanol, industrial alcohol, or high fructose corn

syrup. Closing the plant is unlikely as long as the variable costs of production are covered. Selling industrial or potable ethanol would seem to be a fairly simple solution, except both of these markets currently have some excess capacity. Production of high fructose corn syrup is a reasonable alternative, and several recently constructed plants have the capacity to produce either product. The most likely short run solution, however would be a reduction in the price of ethanol to levels that keep refiners using ethanol as an octane booster. Price reduction is not a viable long-run solution because ethanol producers could not continue to earn a significantly smaller return on investment than is available in other industries.

The curves this function for FRAC creates over time could be called logistic curves if they did not begin at zero. It is the G-function which allows FRAC(T) to move away from zero by substituting A into the function when FRAC(T-1) is less than A. Two examples of what this "S-curve" would look like under different assumptions about the value of RATIO follow. In the first example, it was assumed that RATIO would start at exactly the break-even point of 1.00 in 1977 and remain there for 19 years. Example two shows RATIO at 1.00 from 1977 through 1983 and at 0.70 thereafter. In example one, FRAC rises slowly, reaching 67.11% in 1995, while FRAC jumps to 100% in example two by 1989.

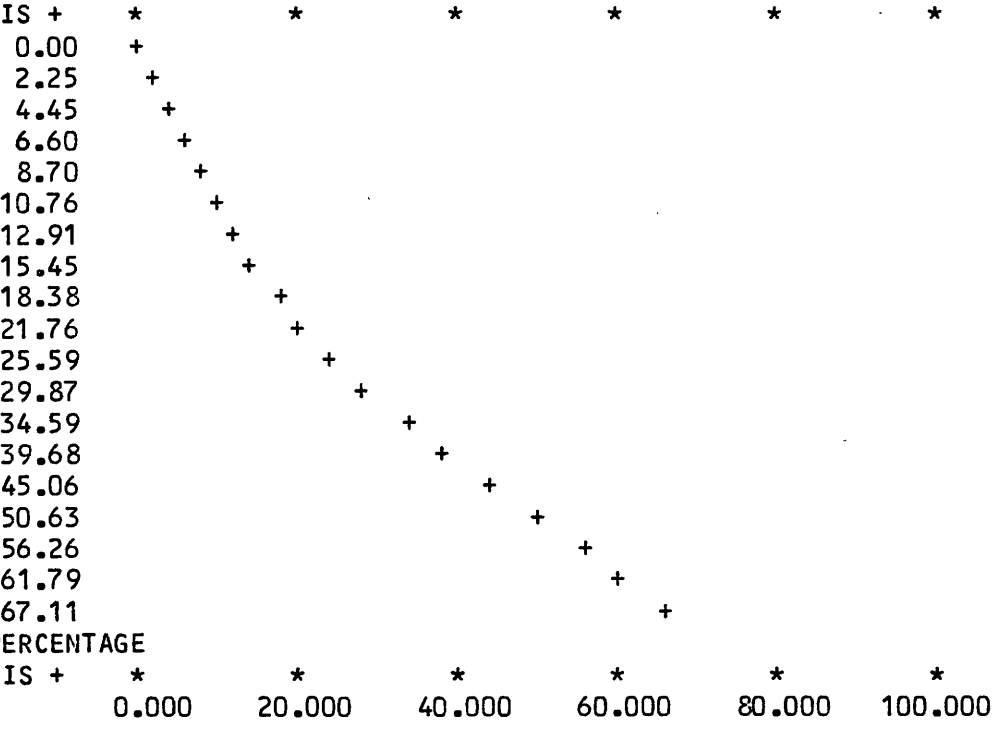
S-CURVE WHEN:
A = 0.100 B = 4.000 D = 0.225

THE RATIO OF THE PRICE OF ALCOHOL TO THE PRICE OF GAS

1977	1.600	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1986	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1995	1.000								

PERCENTAGE OF SUPER GASOLINE THAT WAS PRODUCED USING ALCOHOL

DATE	PERCENTAGE IS
77	0.00
78	2.25
79	4.45
80	6.60
81	8.70
82	10.76
83	12.91
84	15.45
85	18.38
86	21.76
87	25.59
88	29.87
89	34.59
90	39.68
91	45.06
92	50.63
93	56.26
94	61.79
95	67.11



S-CURVE WHEN :
A = 0.100 B = 4.000 D = 0.225

THE RATIO OF THE PRICE OF ALCOHOL TO THE PRICE OF GAS

1977	1.600	1.000	1.000	1.000	1.000	1.000	0.700	0.700	0.700
1986	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
1995	0.700								

PERCENTAGE OF SUPER GASOLINE THAT WAS PRODUCED USING ALCOHOL

DATE	PERCENTAGE IS	*	*	*	*	*	*
77	0.00	+					
78	2.25	+					
79	4.45	+					
80	6.60	+					
81	8.70	+					
82	10.76	+					
83	20.30		+				
84	36.39			+			
85	59.42				+		
86	83.40					+	
87	97.17						+
88	99.91						+
89	100.00						+
90	100.00						+
91	100.00						+
92	100.00						+
93	100.00						+
94	100.00						+
95	100.00						+
DATE	PERCENTAGE IS	*	*	*	*	*	*
		0.000	20.000	40.000	60.000	80.000	100.000

Even though FRAC can rise to 1.00 in the S-curve function, the true fraction of super gasoline made with ethanol cannot rise above 0.50 to 0.60, the percentage which would supply all the states with substantial subsidies for super ethanol. The S-curve function assumes that all states have identical subsidy levels, leaving it to the user to recognize 60% as the true upper limit. To the extent that FRAC rises above 0.60 in forecasting, CAM is simply forecasting the potential market for ethanol should all states adopt identical subsidies. (The exact size and structure is discussed below.)

The price of alcohol, the numerator in RATIO, is calculated as a required price, that is, the price at which a sufficient return on investment is earned after all costs and values of by-products are considered. Required prices are calculated for both the wet and whole corn milling processes, with PALC set equal to the price of wet-corn milled alcohol which is generally the lower of the two. This pricing assumption implies that the supply curve for fuel ethanol is perfectly elastic at the required price, and that firms set price equal to marginal cost. While reasonable as a long-term assumption, it is not reasonable in forecasting year to year changes. However, the assumption of marginal cost pricing allows the model to forecast the maximum market size, an important factor in making investment decisions. Firms are unlikely to enter the market or expand capacity if there is not room for the additional capacity to profitably enter the market. In addition, if this pricing assumption is not made another decision function would have to be developed to determine when entry into the market would occur.[6]

The current (1982) costs, exclusive of the cost of corn, for a wet-corn milling plant of 50 million-gallon capacity in dollars per gallon assumed for this study are: .091 for steam coal, .082 for electricity, .155 for depreciation, .065 for labor, .353 for other costs, (chemicals, overhead, etc.), .05 for sales costs, .10 for freight, and .223 for return on investment. For a whole-corn milling plant the assumed costs are: .073 for steam coal, .065 for electricty, .113 for depreciation, .050 for labor, .314 for other costs, .05 for sales costs, .10 for freight, and .159 for return on investment.[7] In forecasting, each of these costs is moved by the price index of the appropriate INFORUM output, or, in the case of labor costs, employment sector.

Using the wet-corn milling process, production of one gallon of ethanol takes .4348 bushels of corn, as compared to .3922 bushels by the whole-corn process. A wet-corn milling plant produces 5.86 pounds of corn gluten feed (CGF), 1.65 pounds of corn gluten meal (CGM), and 0.8 pounds of corn oil per gallon of ethanol produced. For a whole-corn milling plant, the sole by-product is 6.59 pounds of distiller's dried grain (DDG) per gallon of ethanol. Determination of by-product values, along with the method for equivalencing by-products to corn and soy, is described in section 3.6. The required price for a gallon of alcohol is the sum of all the listed costs for either type of plant, minus the total value of the by-products produced by that type of plant.

In the simulations presented below, it was assumed that wet-corn milling capacity available for ethanol production would grow at eight percent per year from a base of 300 million gallons in 1982, the same

rate total wet-corn milling capacity for all other uses is projected to grow by. Production of ethanol is divided between wet and whole-corn milling by assuming that all the wet milling capacity is used before any whole-corn milling is done, and that whole-corn milling produces the remainder of ethanol demanded. This assumption is based on wet-corn milling having higher fixed and lower incremental costs. Thus, if 400 million gallons were to be produced in 1983, 324 million gallons would be produced by wet milling and 76 million gallons by whole-corn milling. The quantity of corn used in alcohol production is:

```
Corn in wet milling   = 324 mg / 2.3 gal per bu. = 140.87 million bu.
Corn in whole milling = 76 mg / 2.55 gal per bu. =  29.80 million bu.
                                                   --------
                        Total corn used in ethanol = 171.27
```

In addition, the following by-products would be produced:

```
QCGF = 324 gallons * 5.86 lbs/gal = 1.8986  billion lbs
                                            corn gluten feed

QCGM = 324 gallons * 1.65 lbs/gal = 0.5346  billion lbs
                                            corn gluten meal

QCOO = 324 gallons * 0.81 lbs/gal = 0.2624  billion lbs corn oil
QDDG = 76  gallons * 6.59 lbs/gal = 0.5000  billion lbs
                                            distillers dried grains
```

These by-products, except corn oil, are equivalanced to corn and soy, as is described in section 3.6.

Because the focus of CAM is fuel ethanol production, other corn milling industries, such as high-fructose corn syrup and potable spirits manufacturing, are not explicitly analyzed. The demand for corn by these industries is considered along with food and other demands for corn, described below, while the by-products from these industries are

not dealt with at all. Although the quantity of by-products from the high-fructose corn syrup and potable spirits industries is significant in absolute terms, it is small relative to the total animal feed market in which the by-products are sold. When the by-products are considered as corn and soy equivalents, as described in section 3.6, they make up less than one percent of the corn feed market, and less than ten percent of the soy feed market for each of years 1977 to 1980.

The refiners' gate price of gasoline, plus the costs of shipping the gasoline to the terminal, the value of the increased octane number, and the tax subsidies make up the divisor of RATIO. LIFT's index of producers' prices for refinery products moves the historical values of refiners' gate price of gasoline. The octane premium and shipping costs, each nominally worth 5 cents per gallon in 1982, are moved over the forecast period by the crude oil price index and the price index for freight shipping respectively.

Current federal statutes provide for a 50 cent per gallon tax subsidy for use of ethanol as a fuel extender and/or octane booster. In addition to the federal subsidy, several states have tax subsidies of varying sizes, the largest of which are listed in Table 3.1. Because the model lacks a way to handle all the different state subsidies, an average state subsidy weighted by current sales of gasoline-ethanol blended fuel was calculated. This subsidy averages 46 cents per gallon of ethanol in states which account for 50 to 60 percent of total gasoline consumption. It was thought likely by the corporate sponsor that the average state subsidies would drop a few cents per gallon of ethanol over the forecast period due to sunset laws and repeals or

reductions in individual states subsidy levels. Conversely, the federal subsidy was assumed to continue past its statutory limit of 1992 to at least 1995, the final year of CAM's forecast. Arguments could be made for most any subsidy scheme, hence in simulating the model the effect of varying the average subsidy levels is examined closely.

Three factors determine the total volume of ethanol used as an octane booster: the total consumption of gasoline, the share of super in total consumption, and the fraction of super made with ethanol. Taking the three in reverse order, the fraction of super made with ethanol is determined by the S-curve function using the ratio of the price of alcohol to the price of gasoline plus subsidies, shipping, and octane premium, as described above. Presently, the proportion of super gasoline in total gasoline sales is 20%. However, cars built since 1974 have shown increasing octane needs as they age, and it is expected that octane requirements of new cars will climb slowly as even more efficient engines are built. Consequently, the proportion of super in total gasoline sales is projected to grow to 33% by 1990 and to 35% by 1995.

Total gasoline consumption is forecast by moving known historical vaues with an index of petroleum refining output (less sales to fuel oil and less inventory change) from the LIFT model. By using the LIFT forecast, three relevant influences on the gasoline market are given explicit consideration that could not be gotten from simple regression equations. First, the growing volume of imported gasoline should reduce the size of the octane-booster market. Second, declines in the A-matrix coefficient in the refined products row reduce the volume of gasoline used at the intermediate level of production. Finally, the equation for

Table 3.1 1982 State Subsidies for Ethanol Use in Motor Fuel
In cents per gallon, except where otherwise noted

Alaska	8.0	Michigan	5.0
Arkansas	6.5	Montana	7.0
California	4.0	Nebraska	5.0
Colorado	5.0	New Hapmshire	5.0
Florida	5.0	New Mexico	10.0
Hawaii	4.0	North Dakota	4.0
Idaho	4.0	Oklahoma	6.5
Illinois	3.0 %	Texas	5.0
Indiana	4.0 %	Utah	5.0
Iowa	5.0	Virginia	8.0
Louisiana	8.0	Wyoming	4.0

Note: Ethanol is not used in all states with subsidies.
% is percentage of sale price

personal consumption expenditures on gasoline in the LIFT model include variables that capture the effect of the changing demographic structure of the population of the U.S. on consumption of gasoline.

As a result of refineries being built overseas, in the Caribbean, and in Mexico, the United States is importing more gasoline, gasoline which is unlikely to have used ethanol as an octane booster. Oil-derivative octane boosters are relatively cheap for oil exporters to produce, because for most, oil is a cheap commodity. Hence, few, if any, would consider use of ethanol as an octane booster, and as imports grow the size of the potential ethanol market shrinks.

At the intermediate stage of production, consumption of refined products is determined by the output of sectors that use gasoline and the size of the A-matrix coefficients for the refined products row. In the LIFT model, the A-matrix coefficients for the petroleum refined

products decline by 0.81% per year between 1982 and 1987, and by approximately 0.51% per year thereafter. Despite the decline in the size of the coefficients, total intermediate consumption of gasoline rises as the growth in output of most sectors is greater than the decline in the coefficients. The A-matrix coefficient change equations were estimated in the standard INFORUM across-the-row change form as described in Almon (2). In any year, this procedure changes all the coefficients in a row in the same proprotion; it does not take prices into consideration. Note that, because prices are not in the coefficient change equations, the only way a jump (up) in the price of oil can affect gasoline use at the intermediate level is by depressing the output of sectors which use gasoline.

Personal consumption expenditures (PCE) for gasoline were estimated as part of a 78-commodity system of equations. The study, by Paul Devine (7), incorporated the distribution of income across income classes, the age structure of the population, other demographic changes in the population, and relative prices in predicting consumption expenditures. Neither cross-sectional nor time-series data alone could have provided all these effects, so a combination of the two was used.

Figure 3.2 presents the estimated adult equivalency weights and piecewise linear Engel curve estimated for gasoline consumption from the cross-sectional study. The weight of 1.0 was assigned to adults 31-40, and weights for other age groups were estimated. The weight of 0.5 given to children age 0-5 implies that a child of that age leads to the use of about half as much gasoline as does an adult of age 31-40. (By comparison the weight of children 0-5 years old for physician services

is 1.3, while their weight for educational tuition is -0.5.) Use of the adult equivalency weights is how the age structure of the population is taken into consideration. Note that the increase in the percentage of the population over age 65 should have the effect of reducing consumption of gasoline, given the 0.7 weight of people over age 65.

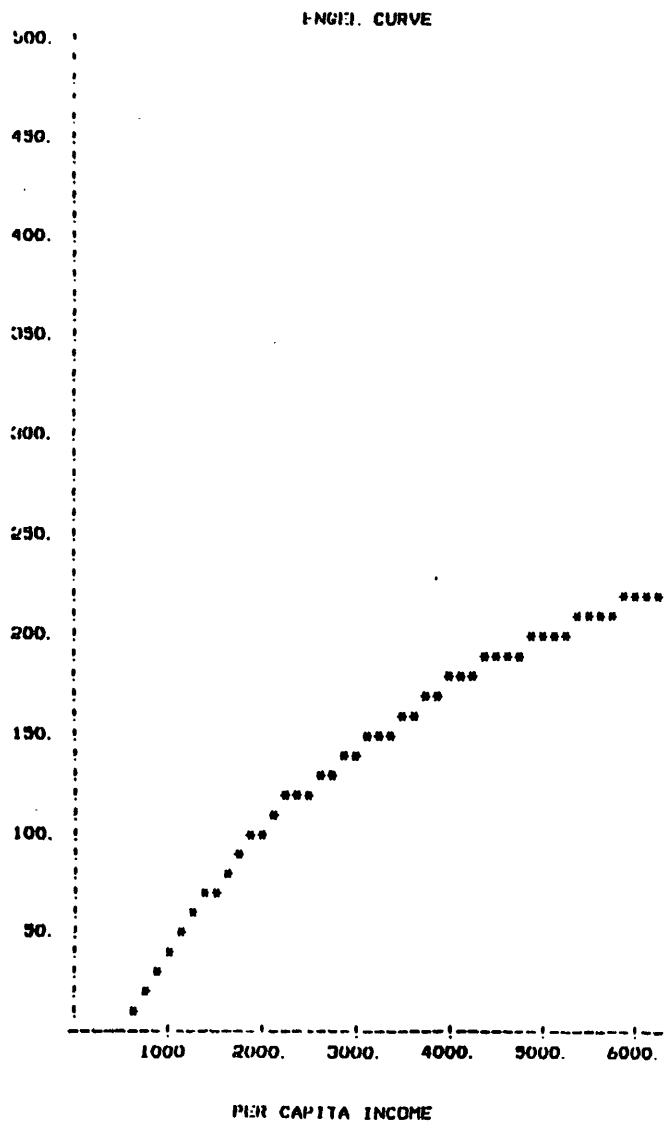
The piecewise-linear Engel curve provides information on how the distribution of income affects gasoline consumption. From Figure 3.2 it can be seen that as per capita income increases consumption of gasoline will increase, but at a declining rate. Thus, people with lower incomes have a higher income elasticity for gasoline consumption than do people with higher incomes. In forecasting with the LIFT model, the distribution of income is forecast, which through the Engel curves affects consumption expenditures.

For the time series estimation, each of the 78 commodities were classified to fit in one of 27 subgroups that make up ten groups. This grouping scheme allows individual commodities within a subgroup to be complements or substitutes, and each of the subgroups in a group to be complements or substitutes. In addition, for each individual commodity an income, an own price, and several cross price elasticities are estimated. The income elasticity for gasoline and oil is 0.555, while the own price elasticity is -0.293. Although no miles-per-gallon variable is used in the gasoline equation, the fit is quite good, including the period from 1978-1981 where gasoline consumption dropped significantly. The fit of the gasoline equation is presented in Figure 3.3.

A bridge matrix is used to match the 78 order consumption

Figure 3.2

EQUATION #38 GASOLINE AND OIL



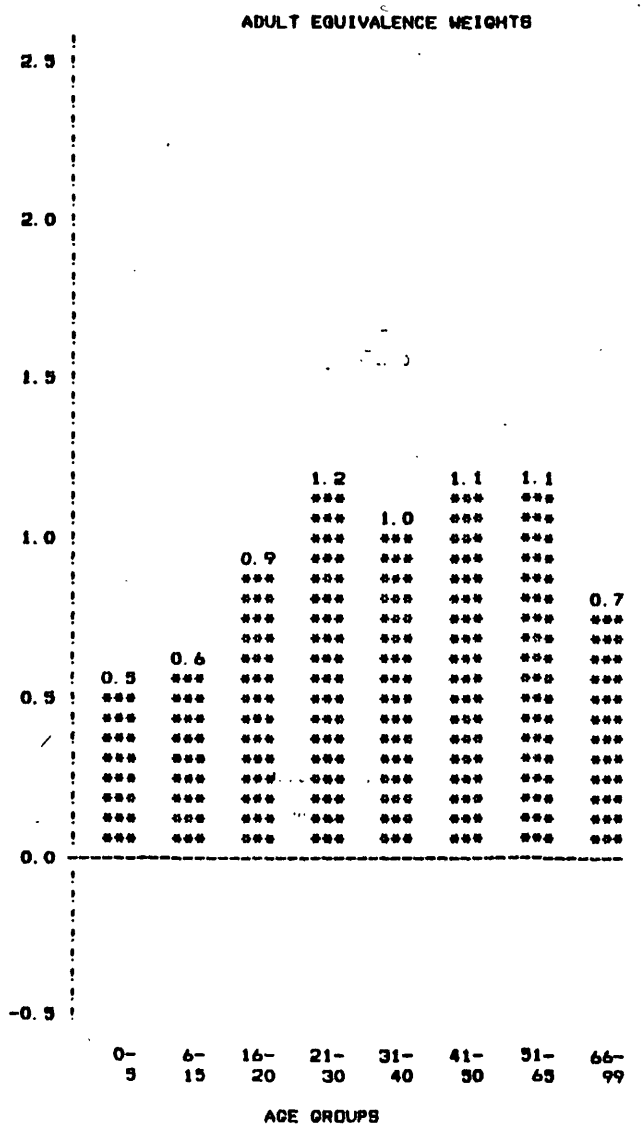
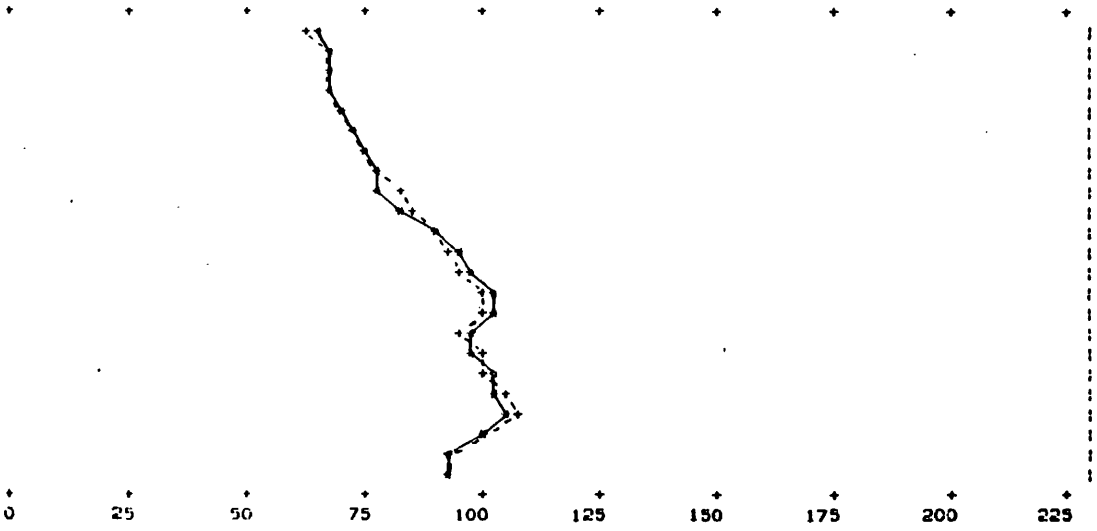


Figure 3.3 Regression Fit of Gasoline and Oil Personal Consumption Expenditures

YEAR	PREDICT	ACTUAL
1959	84.01	88 44
1960	89.62	90 27
1961	90.97	89 67
1962	91.09	91 83
1963	95 52	93 04
1964	97 81	96 16
1965	100 27	99 36
1966	105 72	104 15
1967	109.55	105 02
1968	113 83	112 90
1969	120.11	119 93
1970	125.53	126 82
1971	128 93	131 97
1972	134 89	135 88
1973	136 86	136 13
1974	129 33	130 13
1975	133 63	132 86
1976	135 7/	137 02
1977	140 56	140 13
1978	144 93	141 16
1979	135 04	134 98
1980	124 35	125 00
1981	123.50	123 84



1972 = 100%

the 78 LIFT output sectors. The forecast of personal consumption of gasoline is passed through this matrix to allocate the purchases to the appropriate input-output sectors.

3.5 Demands for Corn, Soy, and Wheat

This section presents the functional forms and parameter estimates for the equations predicting the demands for corn, soy, and wheat. Two-stage least squares is the appropriate estimation technique to use for the demand equations, because of the systems problem of demands for the crops depending on the prices, and the prices depending on demand. The simultaneous systems bias for these equations is believed to be quite small, as the coefficients from the two stage least squares procedure were quite close to the ordinary least squares estimate.[8] For simplicity, the ordinary least squares estimates were used.

Feed Demand for Corn, Soy, and Wheat

For the CAM model, no attempt was made to develop a livestock model.[9] Consequently, for forecasting purposes, it was necessary to generate feed equations independently of any knowledge of livestock numbers. Because the size of livestock herds depend ultimately on prices and income, the omission of the livestock herds should not affect the long-term value of the model, though it may increase errors one or two years ahead.

Per capita feed demand for each of the three crops was estimated as a function of the real prices of all three crops and real per capita

income. The results are as follows:

CCOPC=16.21 - 1.57 PCOCPI - 1.83 PCOCPI(T-1) + .001 PSYCPI + 0.87 PWHCPI
(10.25)(-11.09) (-3.95) (0.00) (2.91)

+ 1.13 NYDPCD(T-1)
(3.77)

RSQ = .804 RBARSQ = .760 D.W. = 1.56 AAPE = 4.34 PERIOD = 54-81

CSYPC = -1.57 - 0.28 PSYCPI + 1.26 NYDPCD(t-1) + 0.20 PWHCPI(T-1)
(-3.79) (-3.70) (15.90) (2.50)

- 0.21 PCOCPI(T-1)
(-1.73)

RSQ = .957 RBARSQ = .949 D.W. = 0.935 AAPE = 5.19 PERIOD = 54-80

CWFEPC = 0.87 - 0.09 PWHCPI + 0.39 PCOCPI + 0.04 NYDPCD(T-1)
(2.78) (-29.08) (2.25) (0.68) (-0.02)

- 0.001 PSYCPI -0.34 PWHCPI(T-1)
(-0.02) (-4.50)

RSQ= .764 RBARSQ = .701 D.W. = 1.42 AAPE = 41.25 PERIOD = 54-78

where:
CCOPC = corn fed to animals/U.S. population
CSYPC = soy fed to animals/U.S. population
CWFEPC = wheat fed to animals/U.S. population
PCOCPI = price of corn/personal consumption deflator
PSYCPI = price of soy/personal consumption deflator
PWHCPI = price of wheat/personal consumption deflator
NYDPCD = real disposable income per capita
D.W. = Durbin Watson statistic
AAPE = average absolute percentage error
PERIOD = period over which the equation was estimated

Soft constraints were applied to the own price terms in the corn and wheat equations to get slightly higher own price elasticities than in the unconstrained form. A 'soft constraint' is one that is not required to hold exactly, that is, one that trades off fit to the data to gain conformity to the desired value for the coefficient.[10] All the

variables in the first equation have the expected sign: an increase in the real price of corn decreases its consumption, an increase in the real prices of the other crops increases corn consumption, and increasing real income increases consumption. One price term in each other equation has the wrong sign. In the wheat equation, the coefficient on the price of soy, PSYCPI, has the wrong sign, but is very small and insignificant. The sign on the price of corn, PCOCPI(T-1), in the soy equation is negative and the coefficient is significant at the ten percent level. It is possible that the unexpected sign results from a high price of corn last period reducing the stock of cattle to be fed.

Export Demand

The export functions were specified exogenously after attempts were made to estimate them in several forms. None of the estimated forms had reasonable price elasticities, and all showed too much growth in export demand. Hence, it was felt the export functions would have to be specified exogenously. The specified functions are made up of three multiplicative terms: a constant, a price factor, and a growth factor. The full export functions are :

EXCO(T) = NACO * XCO(T) * GRCO(T)

EXSY(T) = NASY * XSY(T) * GRSY(T)

EXWH(T) = NAWH * XWH(T) * GRWH(T)

where :

EXCO = the exports of corn in billions of bushels
EXSY = the exports of soy in billions of bushels
EXWH = the exports of wheat in billions of bushels
XCO = the export price term for corn

XSY = the export price term for soy
XWH = the export price term for wheat
NACO = the export constant term for corn
NASY = the export constant term for soy
NAWH = the export constant term for wheat
GRCO = the growth factor for the exports of corn
GRSY = the growth factor for the exports of soy
GRWH = the growth factor for the exports of wheat

The price factors have -1.0 price elasticities in their specified forms, which are:

$$XCO = (PCO / PIM72)^{-1}$$

$$XSY = (PSY / PIM72)^{-1}$$

$$XWH = (PWH / PIM72)^{-1}$$

where :

PCO = the price of corn in $/bu
PSY = the price of soy in $/bu
PWH = the price of wheat in $/bu
PIM72 = the implicit price deflator for non-petroleum merchandise imports to the United States.

The price of imports is used as a measure of the ability of other nations to pay for the crops they import from the United States. It is, in effect, an index of the prices we pay for what they export. This measure of ability to pay was chosen to avoid the data problems associated with analyzing other countries' data and exchange rate problems. The specified forms say that if the price of a crop goes up relative to the price of United States imports, less of that crop will be exported by the United States.

The constant terms for the crops were chosen as the reciprocals of the price term in a base year:

NACO = 1 / XCO(80)

NASY = 1 / XSY(80)

NAWH = 1 / NAWH(79)

In the forecast period, the growth factor for each crop is what the exports of that crop would be if there were no change in the price of the crop relative to the price of imports since the base year. The growth factors for the historical period were calculated from the export functions as follows:

GRCO(T) = EXCO(T) / (NACO * XCO(T))

GRSY(T) = EXSY(T) / (NASY * XSY(T))

GRWH(T) = EXWH(T) / (NAWH * XWH(T))

The calculation of the historical growth indices provided a basis for choosing the growth rates for the forecast period. The base-case choices for the growth factors were that exports of corn would grow at four percent per year, soy at 5.5 percent, and wheat at 3.5 percent beginning in 1981 for corn and soy and 1980 for wheat. Small adjustments were made in the growth rates for corn and soy for 1981 and 1982 to reflect recent developments in the export markets, with the prescribed growth rates beginning in 1983. The growth index for corn in 1981 would have been 2.22 had the adjustment not been made, which would have underpredicted the preliminary figure for export of corn. By changing the value of the index in 1981 to 2.65 the model predicts exports of corn fairly close to preliminary reported values. In the case of soy, using the 8.5 percent growth in the index would lead an underprediction of soy exports in 1981 and an over prediction in 1982. Therefore, the values of the index were changed from .890 and .966 in 1981 and 1982 to .908 and .878, giving better predictions of soy exports for those years. Alternate assumptions about the growth rates for

exports are easily substituted into the model for simulation purposes.

Inventory Demands

Inventory demands for grains are different from the other demands in that they can be positive or negative. Positive values for inventory demands indicate that inventories are being built up (increasing total demand for the crops), while negative values mean inventories are being drawn down (decreasing total demand). What is really meant by inventory demands is the addition to or subtraction from the previous inventory level, also called inventory change. The estimated equations predict the inventory levels rather than inventory changes, making it necessary to calculate the inventory changes by subtracting the previous period's level of inventories from the current level.

The inventory changes appear quite small in simple forecasts, but are an important stabilizing force in the model. Without the inventory equations, and given certain additional assumptions, the CAM model can diverge in the traditional 'cobweb' fashion. With the inventory equations, even radical supply and demand shifts do not cause the model to diverge. In the event of decreased supply (crop failure) or increased demand (jump in exports), inventory demand will be negative, as inventory levels are drawn down. In CAM, this appears as a net reduction of demand for the crops, rather than an increase in the supply of crops, though the effect is the same. Inventories move in the opposite direction in the case of increased supply, holding the excess supply till the following years.

The equations explaining the inventory demand for corn and soy were

estimated with the respective quantities produced and the respective prices relative to the PCE deflator (called the CPI) as independent variables. In addition, the lagged value of the quantity of corn produced and time are independent variables in the corn equation. Due to very poor fit in other forms, the equation for the inventory of wheat used a lagged dependent variable as an independent variable in the estimation, along with the price of wheat relative to the CPI. The results of the estimations were as follows:

$$\underset{}{CACO(T)} = \underset{(8.83)}{1.874} - \underset{(-14.76)}{0.46\ PCOCPI(T)} + \underset{(2.79)}{0.23\ QCO(T)} + \underset{(2.93)}{.27\ QCO(T-1)} - \underset{(-7.52)}{0.10\ TIME(T)}$$

RSQ = .806 RBARSQ = .770 D.W. = .851 AAPE = 15.3 PERIOD = 55-80

$$\underset{}{CASY(T)} = \underset{(1.18)}{0.07} - \underset{(-1.80)}{0.024\ PSYCPI(T)} + \underset{(6.26)}{0.16\ QSY(T)}$$

RSQ = .631 RBARSQ = .599 D.W. = 1.12 AAPE = 49.3 PERIOD = 55-80

$$\underset{}{CAWH(T)} = \underset{(3.39)}{0.492} - \underset{(-4.70)}{0.087\ PWHCPI(T)} + \underset{(5.38)}{0.76\ CAWH(T-1)}$$

RSQ = .548 RBARSQ = .507 D.W. = 1.135 AAPE = 23.9 PERIOD = 55-79

where:

CACO = inventory level of corn (CA stands for CArry over) in bill. bu.
CASY = inventory level of soy in bill. bu.
CAWH = inventory level of wheat in bill. bu.
PCOCPI = price of corn deflated by the CPI, actually the PCE deflator
PSYCPI = price of soy deflated by the CPI, actually the PCE deflator
PWHCPI = price of wheat deflated by the CPI
CPI = the PCE deflator
QSY = the quantity of soy produced in bill. bu.
TIME = a variable whose values are: 1949=1.0, 1950=2.0, ...

QCO = the quantity of corn produced in bill. bu.

It was initially thought that the inventory levels would have to be constrained to keep them in a 'reasonable' range. The range was defined for each crop in terms of the inventory to use ratio for that crop, with the values 1.5 times the historical high and .667 times the historical low as the limits of the range. A check was added to the program to warn if the inventory to use ratio for any crop went out of the prescribed range, but in running the model all values remained well within the designated ranges.

Food and Miscellaneous Demands for Corn and Wheat

For corn, the major parts of food and miscellaneous demand are food demand (for corn food and beverage) and seed demand. The only other sizable use is the production of industrial alcohol from corn. For wheat, the food demand is the largest portion of domestic consumption, with seed as the only miscellaneous demand. On the other hand, food demand for corn is only a small portion of domestic consumption (about ten percent).

The appropriate specification for the food demand equations is to estimate the per capita consumption of the crops. This specification was used for the corn demand; because of estimation difficulties, however, the wheat equation was left as total consumption rather than per capita consumption. Real disposable income and the respective prices relative to the CPI are the explanatory variables for these equations. (The CPI used for estimation is moved by the PCE deflator in the forecast.) The estimation results were as follows:

$$CCOFPC(T) = \underset{(1.25)}{0.355} - \underset{(-11.00)}{0.19}\ PCOCPI(T) + \underset{(7.32)}{0.411}\ NYDPCD(T)$$

RSQ = .698 RBARSQ = .672 D.W. = .279 AAPE = 9.50 PERIOD = 55-80

$$CWHF(T) = \underset{(6.82)}{0.410} - \underset{(-1.79)}{0.013}\ PWHCPI(T) + \underset{(4.66)}{0.047}\ NYDPCD(T)$$

RSQ = .621 RBARSQ = .586 D.W. = .443 AAPE = 4.20 PERIOD = 55-79

where:

CCOFPC = human consumption of corn per capita
CWHF = human consumption of wheat in bill. bu.
NYDPCD = real disposable income per capita
PCOCPI = price of corn deflated by the CPI
PWHCPI = price of wheat deflated by the CPI
CPI = the consumer price index

In both equations the variables have the expected signs. Higher prices of the grains lead to reduced human consumption, and higher real income leads to increased consumption of the grains.

3.6 Supplies of Corn, Soy, and Wheat[11]

In this section the two sources of supply, agricultural and by-products equivalenced to corn and soy, are presented.

Agricultural Supply

As the three most important cash crops in the United States, corn, wheat,and soy were fairly obvious choices for examination in the CAM model. Besides competing for land, corn and soy are also the major sources for animal feed. Wheat was added because its production area overlaps the production areas of the other two crops; some land planted

in wheat could be planted in corn, and vice-versa. In addition, wheat also may serve as an alternate feed grain due to its high nutritional content, and has been used as such in periods of oversupply.

In the CAM model, the quantity of each of the three crops grown each year is determined in five steps. First, total acres planted in the three crops is determined. Second, the percentages of total acres planted in corn, soy, and wheat are determined which, when multiplied by total acres planted, gives the number of acres planted in each crop. The third step is to determine the number of acres harvested in each of the three crops, based on the number of acres planted. Next, the crop yields are calculated, based on the number of acres planted and a time trend. Finally, the output identity is: quantity grown is equal to acres harvested multiplied by the yield per acre.

A. Acreage planted. A single equation was estimated for total combined acreage planted in corn, soy, and wheat. For corn and soy, an equation was estimated to give its share of total acreage, leaving wheat's acreage as a residual. The estimated equations, each depending on three years of lagged prices, were as follows:

```
APCO8 = .984 - .147 PSYCO(T-1) - .127 PSYCO(T-2) - .105 PSYCO(T-3)
       (18.7) (-4.00)           (-8.72)           (-2.94)

   RSQ = .807  RBARSQ = .784  D.W. = .979  AAPE = 3.98   PERIOD = 52-80

APSY8 = .958 - .401 PCOSY(T-1) - .299 PCOSY(T-2) -.196 PCOSY(T-3)
       (20.77) (-4.88)           (-8.14)          (-3.04)

   -.070 PWHSY(T-1) - .053 PWHSY(T-2) -.032 PWHSY(T-3)
   (-1.23)           (-.75)           (-.51)

   RSQ = .926  RBARSQ = .906  D.W. = .738  AAPE = 9.33  PERIOD = 52-80
```

APWH8 = 1.00 - APCO8 - APSY8

where:

APCO8 = percentage of AP3 planted in corn
AP3 = total acreage planted in corn, soybeans, and wheat
PSY = price of soybeans in dollars per bushel
PCO = price of corn in dollars per bushel
APSY8 = percentage of AP3 planted in soybeans
APWH8 = percentage of AP3 planted in wheat
PWH = price of wheat in dollars per bushel

$PCOSY = (PCO/PSY)^{.5}$

$PWHSY = (PWH/PSY)^{.5}$

$PSYCO = (PSY/PCO)^{.5}$

The three period lag of relative prices in these equations was chosen because farmers adjust only gradually to new price relationships. Soft constraints were applied to require the coefficients on the relative price terms to decline linearly in absolute size.

Given the share of total acres planted in each crop, total acres planted is needed to determine the number of acres planted in each crop. Total acres planted, AP3, was regressed on the lagged price index of the three crops and time, with the following results:

AP3 = 28.20 + 24.41 P3R + 4.40 TIME
(2.25) (4.66) (14.83)

RSQ = .942 RBARSQ = .934 D.W. = 1.05 AAPE = 2.87 PERIOD = 62-79

where:

AP3 = sum of acres planted in corn, soy, and wheat
P3R = price index of prices for crops in the previous year defined as
P3R = NUM / DEN / NPPF(T-1) and,
NUM = PCO(t) * QCO(t) + PSY(t) * QSY(t) + PWH(t) * QWH(t)
DEN = PCO(72) * QCO(t) + PSY(72) * QSY(t) + PWH(72) * QWH(t)
NPPF = price index of farmer's costs

The Durbin-Watson statistic for the corn feed demand equation (1.05) indicates that there may be a problem with auto-correlation, correlation of error terms. Given the auto-correlation problem and a large miss in the last year of fit for the equation (11.55), the statistical procedure called the rho adjustment was performed on the forecast from this equation. An approximation for statistic rho is: rho = (2.0 - 1.07) / 2.0 = 0.465. Rho is used to calculate a term to be added to the forecast produced by the estimated equation. The terms to be added to the forecasted values are calculated as follows:

Forecast period 1. adj. term = $0.465^{1.0} * 11.55 = 5.37$

Forecast period 2. adj. term = $0.465^{2.0} * 11.55 = 2.50$

Forecast period 3. adj. term = $0.465^{3.0} * 11.55 = 1.16$

Forecast period N. adj. term = $0.465^{N} * 11.55 = ...$

B. Acres Harvested. Acres harvested should depend upon the expected price at the time of harvest, variable costs associated with harvesting, acreage planted, and the effects of weather. Weather data that is both reasonable and reliable is, however, unavailable. Acreage planted turned out to be the only important variable in the equations, presumably because once planted, only the variable costs of harvesting need to be covered to make it profitable to do so. The results of the estimation were as follows:

$$AHCO(T) = -.17 + .859\ APCO(T) - .001\ TIME(T)$$
$$(-0.08)\quad (32.9)\qquad (-0.04)$$

RSQ = .978 RBARSQ = .976 DW = 1.42 AAPE = 1.10 PERIOD = 52-79

$$AHSY(T) = -.81 + .933\ APSY(T) + .12\ TIME(T)$$
$$(-5.01)\quad (45.75)\qquad (3.37)$$

RSQ = .999 RBARSQ = .999 DW = 1.69 AAPE = .76 PERIOD = 52-79

$$AHWH(T) = .157 + .874\ APWH(T) + .037\ TIME(T)$$
$$(0.06)\quad (21.2)\qquad (0.76)$$

RSQ = .951 RBARSQ = .947 DW = 1.19 AAPE = 2.81 PERIOD = 52-79

where,

AHCO is corn acreage harvested in millions of acres,
AHSY is soybean acreage harvested in millions of acres, and
AHWH is wheat acreage harvested in millions of acres.

C. Crop Yields. Crop yields are generally found to be functions of weather, the quality of land planted, and inputs such as fertilizers and pesticides used during the growing season. Again, weather series were not used because of a lack of data. Acreage planted should also be an indicator of yield, as a large number of acres devoted to a particular crop often means a large proportion of marginal land is used for that crop, reducing the average yield. The explanatory power of the acreage planted proved to be sufficiently strong that only it and time (a proxy for technology improvements) were used in the yield equations. The results of the estimation of yield equations were as follows:

$$YCO(T) = 52.0 + 2.29\ TIME(T) - .324\ APCO(T)$$
$$(4.51)\quad (18.1)\qquad (-2.19)$$

RSQ = .930 RBARSQ = .924 DW = 1.73 AAPE = 5.36 PERIOD = 52-80

$$YSY(T) = \underset{(28.5)}{18.6} + \underset{(9.67)}{.367}\ TIME(T) - \underset{(-0.76)}{.008}\ APSY(T)$$

RSQ = .812 RBARSQ = .796 DW = 1.87 AAPE = 4.30 PERIOD = 52-80

$$YWH(T) = \underset{(24.9)}{22.8} + \underset{(15.6)}{.575}\ TIME(T) - \underset{(-10.3)}{.103}\ APWH(T)$$

RSQ = .895 RBARSQ = .887 DW = 2.02 AAPE = 4.67 PERIOD = 52-80

where,

YCO = corn yield in bu. per acre
YSY = soybean yield in bu. per acre
YWH = wheat yield in bu. per acre

By definition, the output of each of the three crops is simply the product of acres harvested and yield per acre. Once determined for a year, the agricultural supply of each of the crops remains constant during the model's solution process for that year.

By-product Supply

The by-products dealt with in this model are only the by-products from fuel-ethanol production. By-products from other products and other processes are assumed to continue to be sold into their current markets. This simplifies the model by avoiding forecasting the outputs of every other corn-milled product, each of which produces a slightly different combination of by-products.

Calculation of Crop Equivalents of By-products

In order to keep the model reasonably simple, it was decided that the by-products, other than corn oil, should be converted to corn and soy on the basis of their protein and caloric content. Once

equivalenced to corn and soy the by-products then add to the total supply of these crops, and are assumed to be sold as feed for cattle or as an export. Corn oil is assumed to continue to be sold in its current markets, largely for human consumption.

In order to equivalence a feed product to corn and soymeal, two simultaneous equations are solved to find the amount of soymeal (S) and corn (C) which would contain the same protein and calories. It can be seen in Table 3.2 that DDGS are 27 percent protein and contain 1335 calories per pound. The solution to the equations:

$$\begin{matrix} \text{soy} \\ \begin{bmatrix} 44.0 \\ 1205 \end{bmatrix} \end{matrix} S + \begin{matrix} \text{corn} \\ \begin{bmatrix} 8.5 \\ 1610 \end{bmatrix} \end{matrix} C = \begin{matrix} \text{DDGS} \\ \begin{bmatrix} 27.0 \\ 1335 \end{bmatrix} \end{matrix} \begin{matrix} \text{percent protein} \\ \text{calories/pound} \end{matrix}$$

indicates that one pound of DDGS contains the same protein and calories as .530 pounds of soymeal plus .432 pounds of corn. The results for the other by-products are also listed in Table 3.2. The net effect of the physical equivalencing of the by-products is that for each bushel of corn used in ethanol approximately 0.20 bushels of soy equivalent and 0.12 bushels of corn equivalent by-products are produced.

In order to compare the calculated equivalence weights with historical evidence, the prices of the various products were regressed on the prices of soymeal and corn. To guarantee linear homogeneity -- that is, to guarantee that a doubling of the price of both soybean meal and corn would double the price of the particular feed product in the regression -- the regression was forced through the origin by omitting the intercept term. The calculated prices were obtained from the formula

Table 3.2. Protein and Caloric Content** of Selected Feed Products and Their Corn/Soymeal Equivalence Weights.

Feed Product	Protein	Calories	Linear Mix Method		Regression*	
	percent	per lb.	soy	corn	soy	corn
Soy Meal	44.0	1205	1.000	0.000	1.000	0.000
Corn	8.5	1610	0.000	1.000	0.000	1.000
Wheat Midds	15.5	1160	0.249	0.534	0.225	0.516
DDG	27.0	1335	0.530	0.432	0.394	0.668
CGF	21.0	1075	0.407	0.363	0.316	0.564
CGM	62.0	1810	1.393	0.081	N/A	N/A

*Based on the results of the following regression for the period 1970-1979

$P^i = a*PSOY + b*PCORN$

** Source : Annual edition of Feedstuffs

P^i = aPSOY + bPCORN where:
P^i = the price per ton of feed product i,
PSOY = the price per ton of soybean meal, and
PCORN = the price per ton of corn. (PCO is price per bushel)

The coefficients a and b in the equations above may be obtained either by calculation from the linear mix method or from the regression of the price of the feed product on the prices of soymeal and corn. The regression coefficients are the preferred set of coefficients because they represent the actual market valuation of the feed by-products. However, the regression coefficients shown in Table 3.2 are not the exact set of coefficients used in the model. A slightly modified form of the equation was estimated using the price of soybeans rather than soymeal as an independent variable, because the price of soymeal is not otherwise used in the model. In addition, the price of corn per bushel was used rather than the price per pound, and the equation was estimated over the period 1951 to 1979. Results from the modified form regressions appear in Table 3.3.

Economic theory would suggest that the various feed products would sell at a price approximating the cost of obtaining the same nutritional values from soymeal and corn, the primary sources of feed nutrition. It might be expected that these secondary products would sell at a slight discount due to the fact that farmers are more familiar with the use of the major feed products. In fact, this appears to be the case for most of the by-product feeds. Exceptions were observed, as in the cases of distillers dried grains with solubles (DDGS) and corn gluten feed, both of which sold at a slight premium over their equivalent value of soy and

corn.

Table 3.3 Regression Results for the Prices of By-products.
Pi = a PSY + b PCO

By-product	a coef. (t-stat)	b coef. (t-stat)	RSQ	RBARSQ	DW	AAPE
PGLU	15.49 (5.51)	5.27 (0.82)	.836	.830	2.408	10.22
PDDG	16.46 (4.87)	12.80 (1.66)	.807	.800	2.000	10.22
PCOO	3.92 (4.62)	3.75 (1.93)	.839	.833	2.117	13.23

NOTE : Due to a lack of data on the price of corn gluten meal, its price was set by the following formula :
PCGM = 2.3 * PGLU

The premium paid for DDGS might be explained, in part, by the fact that DDGS contain an high level of fat. This high level of fat makes DDGS an excellent feed for dairy cattle and young beef cattle. Also present in DDGS is some yeast -- a high-quality feed product by virtue of its essential amino acid content and some fiber. These extras make up what is commonly referred to as factor X, for which DDGS are valued higher than is warranted by their nominal nutritional values.

Only in very recent years, has corn gluten feed also sold well above its feed value, measured in terms of energy and protein content. This is probably due to the fact that the European Community has exempted certain feed products, including CGF, from the usually-high

tariffs on feed products, and wet millers have pushed aggressively to market this product in Europe. Consequently, since about 1979, most of the CGF produced in the United States has been sold in Europe.

Until recently, corn oil sold at a considerable premium over saturated oils, the most important of which is soybean oil. Recently the prices for all oils have dropped, and the premium for corn oil has decreased leaving corn oil priced close to its "floor" price, that of soy oil. The equation to predict the price of corn oil did not produce forecasts showing this dramatic drop in prices. Hence, it was necessary to put a "fix" on the price of corn oil, decreasing its value by 35 percent from the value predicted by the equation. This fix begins in 1982, bringing 1982 predicted price into the range in which the annual average should fall.

3.7 Solution Process for the Model

The model is solved in an iterative manner, beginning each year with a guess at the price of each crop. Given the crop prices, the model solves for the by-product prices and the total supply and demand for each crop at those prices, based on the previously discussed equations. Next, the percentage excess demand for each crop is calculated as:

EDCO = (QCOD - QCOS) / QCOD

EDSY = (QSYD - QSYS) / QSYD

EDWH = (QWHD - QWHS) / QWHD

Positive percentage excess demand for a crop indicates the price should

be raised to lower the demand for the crop, while negative excess demand indicates the price should be lowered. Moving the price of a crop by the percentage of excess demand for that crop would be too large a step, creating excess demand with the opposite sign on the following iteration. Hence, the adjustment to price is only a fraction of the percentage excess demand of that crop. (The chosen fraction was 0.10.)

$$PCO(T) = PCO(T) + 0.10 * EDCO * PCO(T)$$

$$PSY(T) = PSY(T) + 0.10 * EDSY * PSY(T)$$

$$PWH(T) = PWH(T) + 0.10 * EDWH * PWH(T)$$

Based on the new price estimates, all the demands and by-product supplies are recalculated, as the model goes through another iteration. The model iterates until the change in the price of each crop is less than one cent per bushel before continuing to the following year.

The solution process is actually somewhat recursive. Supply of crops grown is determined based only on previous years' prices, and is therefore constant during each year's iterations. Demand must equal supply for equilibrium, therefore, except for the by-product supply, the iterations are necessary only to solve for prices and the specific composition of total demand.

3.8 Simulations of the CAM Model

This section presents the results of two types of simulation runs of the CAM model. The first set of simulations examines the effect of varying crude oil prices on ethanol production. For these simulations, three exogenously chosen crude oil price scenarios were run through the

LIFT model, the results of which were then passed to the CAM model. In the second set of simulations, other exogenous assumptions of CAM were changed, altering either the cost of producing or the demand for ethanol.

Given the importance of crude oil prices to ethanol profitability, the model was simulated under the BASE, VARY, and HIGH crude oil price scenarios shown in Table 3.4. The nominal price of crude oil in the base case, BASE, was chosen so that the real price would remain constant after 1983. This price path implicitly assumes that the recently volatile oil market finds an equilibrium with neither buyers nor sellers gaining significant advantage over the other. In order to see the effect of rising real oil prices, the HIGH oil scenario's nominal oil price was chosen so the real oil price would rise one to one-and-a-half percent faster than the general inflation rate in the United States. In the VARY oil scenario, the nominal price path was specified with the intention of having the real price of oil fluctuate dramatically. The real price of oil falls sharply between 1983 and 1985, jumps in "oil shock" fashion between 1985 and 1990, before falling mildly between 1990 and 1995.

Although the focus of these runs is the effect of crude oil prices, other exogenous assumptions used in running the LIFT model will also affect the results of the simulations. Constant dollar federal government purchases in the short term (1982-84) were assumed to reflect the current Congressional plan, that is, defense spending increasing 4.5 to 5.0 percent annually, while non-defense spending falls slightly. In

Table 3.4 Nominal Crude Oil Prices for Simulations
In Dollars per Barrel

	YEARS OF FORECAST									
CASE	77	82	83	84	85	86	87	88	90	95
BASE	11.0	30.4	29.5	31.8	34.4	37.2	40.1	43.3	50.5	70.0
HIGH	11.0	30.4	27.9	23.7	23.7	35.5	53.3	61.2	68.8	70.0
VARY	11.0	30.4	29.5	31.7	34.1	36.6	38.9	41.3	46.0	60.5

the longer term, the growth in defense spending is assumed to slow, while non-defense spending is assumed to recover from the Reagan cuts. Real state and local government expenditures were assumed to grow slightly faster than 1.5 percent per year until 1987, and slightly below 1.5 percent per year thereafter. The money supply, as defined by M2, was assumed to grow at a constant eight percent per year between 1982 and 1995. A fourth assumption was that the ratio of foreign to domestic prices would remain constant over the forecast period. A final assumption, made only for the HIGH and VARY cases, is that interest rates in the LIFT model would be exactly the same as were predicted in the BASE run.

Each of these assumptions, except the interest rate assumption, provide LIFT with exogenous information necessary to produce a forecast. However, how reasonable each of these individual assumptions is depends heavily on the other assumptions made. For example, it would be unreasonable to assume a constant ratio of foreign to domestic prices if

one assumed that M2 would grow at 100 percent per year unless it is assumed that all other countries have similar growth in M2. While a more complete description of the workings of the LIFT model and its assumptions is available in Almon (1), a brief description of the reasoning behind the assumptions made for these simulations follows.

The primary reason for keeping each of the previously mentioned assumptions constant across runs is to separate the effects of the change in oil prices from secondary effects brought on by reactions to the change in oil prices. In addition, by ignoring secondary effects no effort is required to determine the magnitude of response. For example, assuming the interest rates of BASE case will exist in the HIGH and VARY cases is unrealistic given the impact of oil prices on the inflation rate and the impact of the inflation rate on interest rates. However, given the assumption of constant M2 growth across the runs and the uncertain responsiveness of interest rates to changes in the inflation rate, the assumption is not unreasonable.

In the same vein, assuming constant eight percent growth in M2 keeps the effect of changes in oil price from being amplified or dampened by changes in monetary policy. The assumption is quite reasonable for the BASE and HIGH runs where the oil price paths are smooth trends, and necessary for VARY run due to the current lack of a fully developed model of Federal Reserve Board policy.

Given that the LIFT model is not a global model, an assumption about the ratio of foreign to domestic prices is necessary. Assuming constant relative foreign to domestic prices is reasonable because most of the United States' major trading partners are also importers of crude

oil. Note that constant relative foreign to domestic prices along with constant foreign demands implies that exports by the United States will be constant across the three LIFT runs. Thus, though the United States may experience a recession brought on by a jump in oil prices, no other country experiences a recession sufficiently strong to change their demand for U.S. exports.

Assuming constant government purchases across the three LIFT runs is unrealistic if one believes that the difference in oil prices will impact significantly on general economic conditions. Certainly, transfer payments such as unemployment benefits and welfare payments would increase if the "oil shock" price increase of VARY case causes a recession. Despite these problems the assumption was made for two reasons. First, predicting the size and timing of the government's response is extremely difficult; and second, the government's response would serve to cloud the effects of the changes in oil price.

BASE Case: A Flat Real Price of Crude Oil

Table 3.5 presents the results of the run of the LIFT model using the BASE case assumptions. The forecast calls for modest economic growth, with constant dollar Gross National Product (GNP) growing at 2.58 percent per year over the 1982 to 1995 period. A look at the growth rates for GNP, on the second page of Table 3.5, shows the cyclical nature of the LIFT model's forecast. GNP grows strongly from 1982 to 1985, weakly from 1985 to 1987, and repeats the strong growth then slow growth cycle, dampened slightly, by 1992. Real disposable per capita income averages 1.91 percent growth per year over the 1982 - 1995

period, but moves in the same cyclical pattern as GNP. Of the five components of GNP listed in Table 3.5, only government purchases, which were exogenously set, do not exhibit the cyclical pattern. As one would expect, personal consumption expenditures (PCE) lead in the cycle and show less fluctuation than GNP. In contrast, Gross Private Domestic Investment (INV) lags the cycle slightly and moves more volatilely than PCE or GNP. Exports and Imports follow the lagged PCE cycle, fluctuating more than PCE but less than INV. The unemployment rate follows the cycle, falling from 9.76 percent in 1982 to 5.67 percent in 1985, climbing back to 6.60 percent in 1987, before falling to 3.39 percent in 1995.

Inflation, as measured by the PCE deflator, averages 5.46 percent per year for the 1982 - 1995 period. For the 1982 to 1984 period the inflation rate is only 4.3 percent, while it runs at roughly 6 percent from 1984 to 1990 and 5.5 percent from 1990 to 1995. Among the inputs important to determining the cost of producing ethanol the annual price changes over the 1982 - 1995 period were: 6.14 percent for steam coal, 4.30 percent for electricity, and roughly 5.50 percent for freight, sales, and other costs. Labor compensation grew slightly faster than the general inflation rate because of the growth in productivity. With the exception of 1982 and 1983 interest rates follow the inflation rate maintaining reasonable real rates of interest. The ex-post real rates of interest are quite high in 1982 and 1983, due to the rapid decline in inflation. (Note: More complete tables including output, imports, exports, inventory change, and personal consumption expenditures by input-output sector are available, but were not printed to save space.)

HIGH : A Rising Real Price of Crude Oil

The results of running the LIFT model under the HIGH assumptions are very similar to the results of BASE in the general growth rates and in the cyclical pattern. As Table 3.6 illustrates, the economy grew more slowly over the full 1982 - 1995 period, and as a result unemployment remained higher. The effect on the inflation rate was to increase it an average of 0.15 percent per year over the BASE values.

VARY : A Fluctuating Real Price of Crude Oil

The VARY run, displayed in Table 3.7 provides more of a contrast to BASE than did VARY, due to the erratic movements of the real price of oil. The initial drop in oil price brings about more economic growth, lower unemployment, and less inflation than was forecast under BASE. The near tripling of the nominal price of oil between 1986 and 1988 brings about an inflationary recession. Real GNP grows by 0.88 percent in 1986, falls by 0.6 percent in 1987, and is essentially constant in 1988 before recovering to modest levels of growth between 1988 and 1995. Inflation, as measured by the PCE deflator, rises to 10.5 and 11.9 percent in 1986 and 1987, 2.8 and 4.8 percentage points higher than the corresponding years of the BASE run. Of the prices passed through to the CAM model, the prices for steam coal and electricity move more than the general inflation rate during the oil price decrease and subsequent increase. Each of the other prices of interest moves very much like the PCE deflator. As the real price of crude falls in the 1990's the economy recovers to moderate, 2.5 percent per year, growth. In 1995,

constant dollar GNP is 31.5 billion dollars lower under the VARY run than in BASE, while the unemployment is 1.5 percent higher.

CAM Simulations

The forecast produced by the CAM model under the base assumptions (BASE run of LIFT, no exogenous shocks, and state subsidies falling from 46 to 38 cents per gallon) is presented in Table 3.8 (first entry for each variable). After recovering from 1982 lows, the prices of the three crops relative to the PCE deflator remain fairly stable over the forecast period. Total acreage planted in the three crops continues to grow, but the rate of growth slows from 3.1 percent in 1984 to 1.6 percent in 1995. As a result of the growth in total acres planted, the number of acres planted in each crop grows, although the relative shares continue to shift.

Consumption of gasoline per capita grows, but at less than 0.4 percent per year for the full range of the forecast. Total gasoline consumption then grows at 1.2 percent per year, 0.4 percent from the increase in per capita consumption and 0.8 percent from growth in population. The fraction of super gasoline that used ethanol as an octane booster rose from 23.6 percent in 1982 to 98 percent in 1995. As a result, the quantity of ethanol profitably produced rose from 415 million gallons to 3.809 billion gallons.

At first glance, the forecast appears to be a profitable one for ethanol producers, with relatively stable crop prices, growing per capita consumption of gasoline, and a steadily growing volume of ethanol. However, the position of ethanol producers grows more tenuous

with each year as the profitability ratio (RATIO), the ratio of the price of alcohol to the price of gasoline plus subsidies, rises from a low of .750 in 1982 to .994 in 1995. Noting again that RATIO must be less than or equal to 1.00 for profitable production of ethanol, the .994 RATIO in 1995 implies that ethanol plants must be running at the level of efficiency of the plant's input parameters to be profitable. The major reason for the rising RATIO is a fall in the real value of the federal and state subsidies. The value in 1982 dollars of the subsidies given in 1995 is 42 cents, which if given in 1982 would yield a RATIO of 0.975. An additional reason for the rising RATIO is the increase in the price of corn caused by the use of corn for ethanol production.

In comparison to the no-ethanol case also presented in Table 3.8 (last entry), the 1995 BASE case prices per bushel for corn, wheat, and soy, are 54 cents higher, 38 cents lower, and 12 cents higher respectively. Soy's price is lower due to the increased supply of soy equivalent by-products. An additional 10 million acres is planted in corn, of which 8 million acres came from soy, 1 million from wheat, and 1 million from increased total acreage planted. These results, along with the effects on each of the demands, except inventory demand of corn, are right in line with those of the Meekhoff, Tyner, and Holland (9) study. The quantity produced term in the inventory equations lead to a higher inventory level in this study than in the Meekhoff study.

Table 3.8 (second entry per variable) also presents the comparative results of the CAM model run under the HIGH and BASE oil price scenarios. As was the case with the LIFT runs, the difference between

the VARY and BASE results are small but significant. The higher price of crude oil, by increasing the general inflation rate, increases the production costs for ethanol. However, this increase in production cost is of a smaller percentage than the increase in crude oil prices. Hence, the RATIO is lower in the BASE case than in HIGH case. Ethanol production is roughly equivalent in the two runs, as the lower RATIO and higher FRAC in the HIGH case are offset by the lesser consumption of gasoline. Quantity supplied, quantity demanded, and the price of each of the three crops were virtually identical in the two runs, except the price of soy was slightly higher under the HIGH price, hence this information was not included in Table 3.8.

The importance of the HIGH case lies in the demonstration of the size of the real price increase necessary to make ethanol profitable for the long run. An annual 2.25 percent increase in the real price of crude oil will keep the profitability ratio constant after 1985.

Table 3.8 (third entry per variable) presents the results of the CAM model run under the VARY and BASE assumptions. The two variables most affected by the change in the oil price are the consumption of gasoline and the profitability ratio (through the price of gasoline), which have offsetting effects on ethanol production. As the price of oil falls between 1983 and 1985, the consumption of gasoline rises relative to BASE values, increasing the potential market for ethanol. Ethanol production falls slightly (relative to BASE) during this period because the profitability ratio is higher, thereby providing less incentive to use ethanol. Production of ethanol remained profitable

during this period although, had the fall in oil price continued for an additional year, the profitability ratio would have risen above 1.00. During the 1986 - 1990 oil price increase, the movement of the profitability ratio is again stronger than the fall in the consumption of gasoline, bringing ethanol production to levels above those of the BASE case.

The nominal prices of the three crops are all higher in the VARY case, as are all nominal prices. Relative to the PCE deflator, the three crop prices are essentially the same for each year of the forecast as they were in the BASE case. As a result of the constant real prices of crops and the only minor differences in ethanol production, the quantities of the three crops produced are also within one to two percent of the values predicted in the BASE case.

Simulations Changing Exogenous Assumptions of the CAM Model

Among the variables totally exogenous to the CAM model are: the percentage of gasoline that is super grade, the effects of weather on crop yields, the demands for the crops by other countries, and the size of the federal and state subsidies. The following group of simulations examines the effects of changing each of these assumptions.

Increased Octane Demand Simulation

Since 1979, cars built with smaller fuel efficient engines have demonstrated a need for higher octane gasoline as the engines age. This trend is expected to continue, implying that a growing percentage of gasoline will be super grade and, as a result, the demand for octane

boosters will grow. In the BASE case, the percentage of gasoline that is assumed to be super grade grows from 14 percent in 1982 to 33 percent in 1990, remaining flat thereafter. Table 3.9 (second entry) presents the results of CAM if the fraction that is super grade grows from 14 to 48 percent of all gasoline. If the price of corn remained at the base run level, ethanol production would increase in direct proportion to the increase in octane demand. However, increasing ethanol production increases the demand for corn, and thereby increases the price of corn. Higher prices of corn yield higher profitability ratios and lower fractions of super gasoline made with alcohol, which partially offset the increase in market size. Ethanol production is greater in the increased octane demand case than in the base case, as the increase in market size outweighs the decline in the fraction of super using ethanol as an octane booster. Ethanol production rises to a full 1.5 billion gallons above the 1992 base case value, before falling in 1995 as a result of the profitability ratio rising above 1.00.

The increasing price of corn has the effect of increasing the percentage of total acres planted in corn, as well as increasing total acres planted. Relative to 1995 base case values, total acres planted is 0.5 million acres higher in 1995; soy acreage is 2.8 million acres lower; and wheat acreage is 0.2 million acres lower. Despite the lower soy acreage, the price of soy is lower than in the base case, due to the increase in production of soy equivalent by-products.

When the increased octane demand assumption was run using the HIGH oil price scenario, profitable ethanol production in 1995 reached 5.5 billion gallons. Although the 5.5 billion gallons of ethanol were

profitably produced, the profitability ratio was close to 1.00. For all super gasoline, in the high octane demand case, to be produced using ethanol, the price of crude oil would have to grow roughly 4.25 percent faster than the general inflation rate.

Crop Failure Simulation

The yields of the corn and soy crops sold during the calendar year 1981 were 18 percent lower than the previous year's yields as a result of severe weather. Ethanol production remains constant despite the poor crop yields because 1981 also a year of a substantial oil price increase, and because the response of the price of corn was small due to inventory reduction. Table 3.9 third entry presents the results of CAM run with an even harsher crop failure imposed in 1986.

As is shown in Table 3.9, the effects of a one year drop in yields, relative to the base case, of corn and soy of 25 and 15 percent respectively are felt only short term. By 1995, the effects of the 1986 crop failure are largely unnoticeable, as all the major variables of the model are equivalent to the base case values.

The immediate impact of the crop failure is the increase in prices of corn and soy of 38 and 17 percent respectively over the 1984 base values. Use of corn and soy for each purpose falls, with inventories and exports bearing most of the reduction. By-product values jump up by an average of 22 percent, not enough to keep ethanol profitable to produce in 1986. Ethanol production falls to a level 770 million gallons lower than the base case values.

In 1987, total acres planted in the three crops increases by 9.9

million acres. Corn is planted on 8.4 million of those acres, wheat on an additional 3.4 million acres, while soy acreage falls by 2.0 million acres. Nominal prices of the three crops fall in 1987 as a result of the increase in agricultural supply, with corn's price falling sufficiently to make ethanol production profitable again. Lower prices, in turn, brings about a reduction in acreage planted in 1988 and a corresponding increase in prices. This cycle dampens out by 1992, returning to the base case path for all variables.

Grain Deal Simulation

Should severe weather overseas cause major crop failures, demand for U.S. produced crops would jump in much the same manner as occurred in 1972-73 during the so-called "Russian grain deal." Exports of corn, wheat and soy increased by 0.6, 0.1, and 0.6 billion bushels during the 1972-73 grain-deal period. By manipulating the exogenous growth factors the effects of a similar grain deal can be simulated. The results of such a simulation, with a grain deal of the same magnitude as the 1972-73 deal occurring in 1985, are presented in Table 3.9 as the final entry per variable.

The effects of the increase in exports are the same for each of the crops: the price increases, reducing the other demands for the crop. Inventory levels drop by 47, 20, and 41 percent between 1984 and 1985 for corn, soy, and wheat respectively, supplying large portions of the increase in exports.

The required price of alcohol rises only 3 cent per gallon from the base case value in 1985, despite a 35 percent increase in the price of

corn. Ethanol production is only slightly lower than the base case value, as a result of the 3 cents per gallon price difference. Rising by-product values account for the small change in alcohol price, as the value of all the by-products rise at least 48 percent over the base case values. Note that the prices of the by-products are more closely linked to the price of soy, which rose 53 percent over the 1985 base value, than to the price of corn.

In 1986, total acres planted rises to a level 28.3 million acres above the base case value. Only 6.3 million additional acres are planted in corn, while 8.7 million are planted in soy and 13.3 million in wheat. This shift in acreage planted brings about a greater fall in the price of soy than in the price of wheat, which through the by-product values, causes a rise in the price and a decline in production of ethanol. Between 1987 and 1990 the prices of the three crops return to the base case values, as does the volume of ethanol produced. The effects of the grain deal on 1985 values are negligible.

In this simulation, there is no feedback from the increase in crop prices to the general inflation rate, as was the case for the other simulations presented in this section. The effect of this assumption, assuming the price of crude continued to move with the GNP deflator, is to understate ethanol production by a small margin. Ethanol production would be understated because the change in the inflation rate would have more impact on the price of gasoline than on the price of alcohol. If the price of crude did not move with this change in inflation, the effect would be exactly the opposite, with ethanol production overstated because costs of production were understated. In either case, the

effect on the general inflation rate would be fairly small and only last for a few years at most.

Subsidy Level Simulations

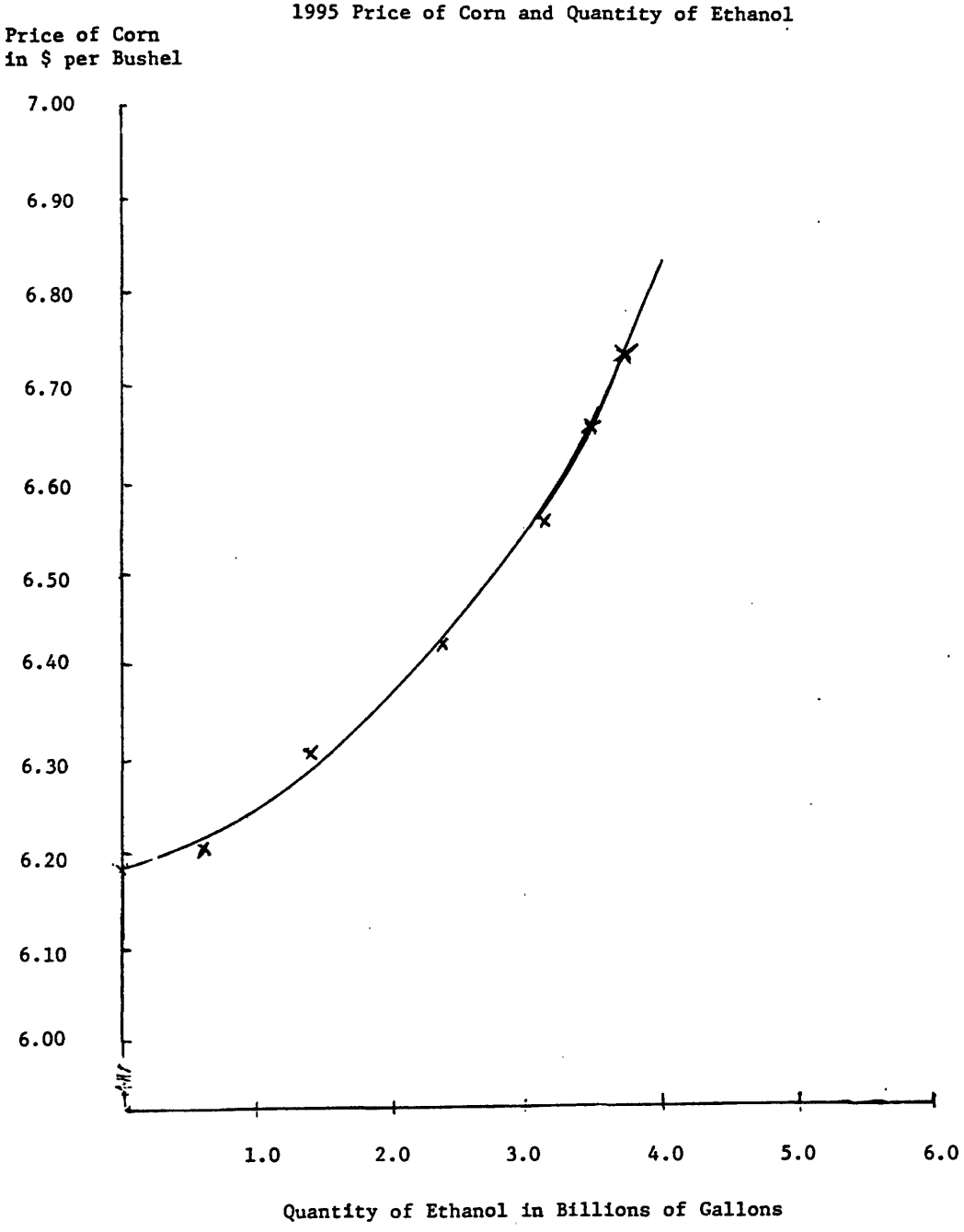
The final set of simulations, presented in Table 3.10, show the effect of different state subsidy levels on ethanol price and production. These simulations will also trace out the long-run impact of ethanol production on the price of corn, as well as examining the effects of having the profitability ratio climb above 1.00. The scenarios presented in Table 3.10, labled forty, thirty, twenty, ten, and zero, assume that the average state subsidy drops from 46 cents per gallon to 40, 30, 20, 10, and zero cents per gallon respectively in 1983, remaining at the new value for the remainder of the forecast.

From the runs presented in Table 3.10, and other subsidy levels not presented, the long-run effect of ethanol production on the price of corn is: 3 cents per bushel for the first half billion gallons, 6 cents per bushel for the second half billion gallons, 14 cents ber bushel for the second billion gallons, 18 cents per bushel for the third billion gallons, and 24 cents per bushel for the fourth billion gallons. The curve representing this impact is presented as Figure 3.4.

The impact of ethanol production on the price of soy is somewhat ambiguous, as two forces work in opposite directions. First, as the price of corn rises it draws land away from soy, which should raise the price of soy. Second, the production of ethanol generates by-products most of which are equivalenced to soy, which increases soy supply and reduces its price. The second effect is the stronger for the 40, 30,

Table 3.4

1995 Price of Corn and Quantity of Ethanol



20, and 10 cent subsidy levels presented here.

For wheat, the only impact of ethanol production is the reduction in land planted in wheat, which raises the price of wheat. The impacts are small, only 12 cents per bushel and 0.8 million acres lost to corn production for a 3.8 billion gallon differential in ethanol production.

Subsidy levels of ten and zero cents per gallon bring about profitability ratios greater than 1.00, and falling ethanol production during the forecast period. In both of these cases it can be seen that a profitability ratio above 1.00 will bring about a reduction in the quantity of ethanol. The reduction in ethanol produced increases the supply of corn available for other uses, which decreases the price of corn. The fall in the price of corn then makes ethanol profitable in the following year. For example, the RATIO during 1985 and 1986 of the ten cent subsidy run is 1.005, causing a fall in the quantity of ethanol. As a result, ethanol is profitable again in 1987. The process repeats again with the profitability ratio above 1.00 for 1988 and 1989, making production in 1990 profitable.

3.9 Summary and Conclusions

This study examines the long-run profit potential for producing fuel ethanol, using corn as a feedstock. The model built to address this question explicitly considered the ethanol plant costs, subsidies for ethanol use, and the impacts of ethanol production on agricultural prices. A macroeconomic forecast, and a set of prices consistent with that forecast, necessary to drive the detailed model are supplied by the

INFORUM input-output model.

If the real price of crude oil remains constant (or falls), the long-run outlook for ethanol production is somewhat mixed. Substantial federal and state subsidies make ethanol profitable through 1995, barring any exogenous shocks to the market. With the fairly low profitability ratio, firms currently producing ethanol should certainly be earning substantial profits. However, in the forecast the declining real value of the subsidies raise the profitablility ratio to the breakeven point by 1995. A continuation of this trend, evident in the base run (Table 3.8), would leave ethanol unprofitable to produce after 1996. In addition, as the ratio rises towards 1.00 the size of market shock necessary to make ethanol unprofitable diminishes. By 1990, the magnitude of the crop failure necessary to make ethanol unprofitable is half that of the crop failure simulation presented in Table 3.9 Similarly, a smaller rise in grain exports relative to base case values will bring about the same result as the grain deal simulation depicted in Table 3.9.

In the absence of subsidies denoted in real terms, higher real prices of crude oil are necessary for long term profitability of fuel ethanol. With the projected subsidy levels of the base case, a 2.25 percent per year increase in the real price of crude oil will maintain ethanol's profitability at its current level throughout the forecast period. Any increase in the price of oil beyond the 2.25 percent per year will hasten the switch to use of ethanol in gasoline by increasing the economic return for making the switch.

It would take a real increase of 45 to 55 percent in the price of

oil for ethanol to be profitable without any federal or state subsidies. Should such an increase occur, ethanol might well be used in the refinery process, rather than being blended at shipping terminals in states with subsidies. At this oil price level, ten percent blending of ethanol with gasoline might begin, putting a much greater strain on farm prices and production capacity than does use in only super grade gasoline.

As shown in Figure 3.4, the effect of ethanol production on the price of corn grows with the quantity of ethanol produced. The maximum volume of ethanol produced under the base octane demand assumptions is 3.8 billion gallons in 1995, requiring 1.53 billion bushels of corn. Although the price of corn rises by 55 cents per bushel, the 1.53 billion bushels of corn are shifted to ethanol production without causing massive dislocations in the corn, soy, or wheat markets. The net disappearance of crops is somewhat less than the indicated 1.53 billion bushels of corn, due to the of equivalencing the by-products to corn and soy. An additional 0.18 billion bushels of 'corn' and 0.306 billion bushels of 'soy' are available as a result of ethanol production, which hold down the price increase in corn and bring about a fall in the price of soy. In sum, the effects, on agricultural prices and supplies, of producing up to 4.0 billion gallons of ethanol are sufficiently small to keep ethanol profitable to produce.

ENDNOTES

1

See Paul (8) p. 11.

2

California's strict air quality standards add an additional incentive for the use of ethanol, which burns cleaner the other octane boosters.

3

No crop price support programs are included in the model because of extremely severe data problems, and because there is no way to forecast future support prices.

4

Up to 15 percent ethanol can be used in gasoline before major engine modifications are necessary.

5

The plant efficiency parameters were provided by the corporate sponsors of this research.

6

Other pricing decisions have been used in looking at other aspects of the model's forecasting properties. For example, when looking at a falling price of crude (after a large rise in crude prices), the price was set at the price of wet-corn milled ethanol minus any return on investment to examine how long firms would remain in the industry.

7

The values of A, B, and D were specified by the corporate sponsers of this research.

8

The variables used in the first stage estimation were: lagged income and lagged prices of the crops relative to the PCE deflator.

9

Stephen Silver has developed a suitable livestock model, but the two models have, as yet, not been linked.

10

For a more complete description of 'soft' constraints, see Almon (1) Chapter 4, pp. 5-7.

11

I am indebted to Stephen Silver for the development of the supply side of the CAM model, and for providing much of the information given in this section.

References

(1) Almon, Clopper, "The INFORUM Interindustry Macro Model With an Application to the Effects of Protection," INFORUM Working Paper US - 51, 1983.

(2) Almon, Clopper, Jr., 'Building Models for Economic Forecasting,' Unpublished manuscript, 1982.

(3) Almon, Clopper, Jr., Buckler, Margaret B., Horwitz, Lawrence M., and Reimbold, Thomas C., 1985: Interindustry Forecasts of the American Economy, Lexington, MA, Lexington Books, 1974.

(4) Breimyer, Harold F., "Preparing for the Contingency of Intense Pressure on U.S. Food-Producing Resources," NPA Report No. 192 (Jan., 1982).

(5) Brown, Lester R., "Food or Fuel: New Competition for the World's Cropland," Worldwatch Paper, no. 35, (March, 1980).

(6) Cheremisinoff, Nicholas P., Gasohol for Energy Production, Ann Arbor, Michigan: Ann Arbor Science Publishers, 1979.

(7) Devine, Paul, Forecasting Personal Consumption Expenditures from Cross-section and Time series Data, Unpublished Ph.D. dissertation, 1983.

(8) Hyle, Mathew, "An Interindustry Forecasting Model for Prices and Factor Incomes for the U.S.", unfinished Ph.D. dissertation.

(9) Meekhof, R.L., W.E. Tyner, and F.D. Holland, "U.S. Agricultural Policy and Gasohol: A Policy Simulation." American Journal of Agricultural Economics, (Aug., 1980) pp.408-15.

(10) Paul, J.K., ed., Ethyl Alcohol Production and Use as a Motor Fuel, Park Ridge, New Jersey: Noyes Data Corporation, 1979.

(11) Silver, Stephen J., A Feed and Livestock Model of the United States with an Application to the Possible Effects on U.S. Agriculture of Large-Scale Corn Alcohol Production, Unpublished Ph.D. dissertation,1983.

(12) Webb, S.B., "The Impact of Increased Alcohol Production on Agriculture: A Simulation Study," American Journal of Agricultural Economics, (Aug. 1981) pp. 532-37.

Appendix A

Simulation Tables

BASE NOV .. AT 11PM TABLE 1. GROSS NATIONAL PRODUCT (1972$) (1.2) Table 3.5 PAGE S- 1

	1977	1981	1982	1983	1984	1985	1986	1987	1990	1995
Gross National Product	1372 68	1493 61	1482.43	1535 39	1568.39	1598.77	1632.87	1666.71	1810 73	1949.04
Personal Consumption Expenditures	863 06	939 03	938.28	967 40	988.99	1009.49	1036 52	1062.10	1156.06	1241.13
Durables	137 93	138 92	136.80	140 19	143.14	145 43	150.10	154.62	172 91	180.55
Non-durables	333 84	359 25	359 08	368 07	374.90	380 75	388.65	396.46	424.94	450.61
Services	391.29	440 85	442.40	459.14	470.95	483.32	497.77	511.01	558 21	609.97
Gross Private Domestic Investment	213 62	212.83	202.68	224.54	229.25	235.83	244.15	249.77	278.86	284.39
Structures	99 65	95.06	91 24	105.94	107.37	109.79	114.23	111.73	122.09	124.10
Residential	59 12	44.26	38 38	59.04	56.81	55 50	57.97	55.69	61.64	60.69
Non-residential	40 53	50 80	52 87	46.89	50 56	54.29	56.25	56.04	60.46	63 21
Producers' durable equipment	101 63	112 81	107 94	112 00	114.13	118.32	122.69	130.02	146.52	152.74
Inventory change	12 34	4.97	3.50	6 60	7.75	7.73	7.24	8.01	10.25	7.55
Exports of goods & services	115 05	164.37	152 10	152 50	156.04	154 69	151.56	150.90	169.05	200.52
Merchandise (producers' prices)	60.42	78.23	74 80	75.54	76.50	75.99	73.51	73.67	82.98	100 27
Transportation, trade , services	25 62	33 48	33 29	33 94	34 61	34.84	34.50	34.87	38.40	44.70
Rest of world	29.00	52 65	44 01	43.02	44.92	43.86	43.56	42.35	47.66	55.54
Imports of goods & services	91 44	106.93	100.87	105.65	109.11	112.64	118.94	123.24	135.97	145.32
Merchandise(domestic port price)	66 76	68.86	67.74	71.35	73.33	76.00	79.53	83.16	93.08	101.52
Petroleum & natural gas	9.30	7.33	7.39	7.57	7.68	7.79	7.93	8 10	8.46	9.13
Transportation, trade, services	17 83	18.91	18.62	20.16	20.37	21.05	22.02	22.73	24.04	25.02
Rest of world	6 84	19.16	14.51	14.14	15.41	15.59	17.39	17.35	18.85	18.78
Government Purchases	272 39	284.32	290 24	296.60	303.23	311.39	319.57	327.18	342.73	368 33
Federal	100.70	106 23	108 77	111.77	115.07	120.55	126.03	130.93	138.32	146.90
Defense	65.17	73.12	77.32	81.53	85.74	89.94	94.15	97.77	101.35	107.31
Compensation of employees	31 90	32.03	32 54	33.04	33.55	34.06	34.57	34.49	34 26	33.88
Structures	1.64	1.66	1.77	1.90	1.99	2.12	2.23	2.34	2.44	2 64
Other	31 63	39.43	43.02	46.59	50.19	53.77	57.35	60.94	64.64	70.78
Non-defense	35 53	33.11	31.45	30.24	29.34	30.61	31.88	33.15	36.98	39.59
Compensation of employees	16.60	15.13	14.37	14.07	14.07	14.44	14.81	15.19	16.30	18.17
Structures	3.67	3.94	3.94	3.94	3.98	4.10	4.21	4.31	4.61	5.01
Other	15 26	14 04	13.14	12.23	11.28	12.06	12.86	13.66	16.06	16.41
State and local	171 68	178 09	181 46	184 82	188.16	190.84	193.54	196.26	204.41	221.43
Education	70.89	73.44	73.59	73.74	73.89	74.82	75.75	76.68	79.48	84.70
Compensation of employees	53.22	55.98	56.35	56.73	57.11	57.48	57.86	58.23	59.36	61.24
Structures	6.51	6.77	6.88	6.99	7.04	7.36	7.75	8 22	9.08	11.05
Other	11 16	10 69	10.36	10.02	9.74	9.98	10.15	10.23	11.04	12 40
Other	100 80	104 65	107.87	111.08	114.26	116.02	117.79	119.58	124.93	136.73
Compensation of employees	44.58	47.41	47.78	48.16	48.54	48.91	49.29	49.66	50.79	55.87
Structures	18 18	19 38	19 13	19.32	20.34	21.47	22.21	22.45	23.47	25.98
Other	38 04	37 86	40.97	43.60	45.39	45.63	46.29	47.46	50.67	54.88
Addenda.										
Unemployment rate	7 00	8 22	10.16	9.45	9 35	9.37	9.07	8 91	6.41	6 01
GNP / Civilian jobs	20 40	20 20	20 17	20 45	20.58	20.67	20.74	20.84	21 23	21.66
(GNP-Govt) / Private jobs	18 58	18.44	18 30	18 60	18 69	18.73	18.75	18.80	19.23	19.62
PCE deflator	1.40	1 96	2.10	2 24	2.39	2.57	2.78	2.96	3 51	4.69
Index, unit compensation, mfg	100 05	143 20	154 85	168.57	180.43	197.01	214.24	226.96	272.54	368 20
Index, unit compensation, oth	100 00	144 97	155 07	167 82	180.64	196.05	213.76	228 25	274.96	370 91
M2 (billions of CUR$)	1234 40	1743.75	1888 98	2046 31	2216.74	2401 37	2601.37	2818 03	3582 41	5344.33
Disp income per capita (1972$)	4267 30	4540 75	4451 56	4569 52	4632.55	4683 79	4760 77	4823 88	5111 59	5359 94
Savings rate	5 94	6 42	7 07	7 55	7.61	7 61	7 52	7 39	7 34	8 48
AAA Corporate bond rate	8 02	14 17	11 54	9 25	9 26	8.92	9 61	9 72	9.69	8 57

BASE [illegible] AT 11PM

TABLE 1 GROSS NATIONAL PRODUCT (1972$) (1 2) Table 3.5 PAGE 6- 2
SUMMARY OF ANNUAL GROWTH RATES

	72- 81	81- 82	82- 83	83- 84	84- 85	85- 86	86- 87	87- 90	90- 95	82- 95
Gross National Product	2 11	-0.75	3 51	2 13	1 92	2 11	2.05	2 76	1 47	2.11
Personal Consumption Expenditures	2 11	-0.08	3 06	2.21	2 05	2.64	2 44	2.83	1 42	2.15
Durables	0 18	-1 54	2.44	2.09	1.58	3 16	2.97	3 73	0 86	2 13
Non-durables	1 83	-0.05	2 48	1 84	1.55	2 05	1.99	2.31	1 17	1 75
Services	2 98	0 35	3 71	2.54	2.59	2.95	2.63	2.94	1.77	2.47
Gross Private Domestic Investment	-0.09	-4 89	10 24	2 07	2.83	3 47	2.27	3 67	0.39	2 61
Structures	-1 18	-4 09	14 93	1.35	2.23	3.96	-2.20	2.96	0 33	2.37
Residential	-7 24	-14.26	43.08	-3.86	-2.33	4.36	-4.01	3.38	-0.25	3 55
Non-residential	5.65	3 99	-11 99	7.54	7.11	3.56	-0.38	2.53	0.89	1.37
Producers' durable equipment	2 61	-4.41	3 70	1 88	3.60	3.63	5.80	3.98	0.83	2.67
Inventory change	-22 74	-35.01	63.42	15.98	-0.25	-6.59	10.20	8 22	-6.13	5.90
Exports of goods & services	8 92	-7 75	0.26	2.30	-0.87	-2.04	-0.44	3.79	3.41	2.13
Merchandise (producers' prices)	6 46	-4.49	0 98	1.27	-0.67	-3.33	0.23	3 97	3.78	2 25
Transportation, trade, services	6 68	-0.57	1.95	1.95	0.65	-0 99	1.09	3.21	3.04	2 27
Rest of world	14.91	-17.93	-2 28	4 33	-2.40	-0.68	-2.81	3 94	3.06	1.79
Imports of goods & services	3 91	-5.84	4 63	3 22	3.18	5.44	3.55	3.28	1.33	2.81
Merchandise(domestic port price)	0 78	-1.64	5.19	2.75	3.57	4.54	4.46	3.76	1.73	3 11
Petroleum & natural gas	-5 97	0.87	2 32	1.56	1.33	1.86	2.07	1 46	1.53	1.63
Transportation, trade, services	1 46	-1.55	7 99	1 02	3.29	4.49	3.17	1 87	0.80	2 28
Rest of world	25.74	-27.82	-2 59	8.60	1.15	10.94	-0.19	2.75	-0.07	1.98
Government Purchases	1 07	2.06	2 17	2.21	2.66	2.59	2.35	1.55	1.44	1 83
Federal	1 34	2 37	2 72	2.91	4.65	4.45	3.81	1.83	1.20	2.31
Defense	2.88	5.59	5.30	5.03	4.79	4.57	3.78	1.20	1.14	2 52
Compensation of employees	0 10	1.57	1 55	1.52	1.50	1.48	-0.22	-0.22	-0.22	0.31
Structures	0 28	6 79	6.84	4 81	6.19	5.17	4.73	1.47	1.56	3.08
Other	5.51	8.70	7.98	7.45	6.87	6.46	6.07	1.96	1.82	3.83
Non-defense	-1 77	-5.15	-3 92	-3.04	4.25	4.08	3.92	3.64	1.37	1.77
Compensation of employees	-2 32	-5.14	-2 13	0.00	2.61	2.55	2.48	2.37	2.16	1.80
Structures	1 77	-0 13	0.09	1 07	2.98	2 61	2.35	2.23	1.69	1 86
Other	-2 08	-6.62	-7.16	-8.08	6.68	6.36	6.05	5.41	0.43	1.71
State and local	0.92	1.88	1.83	1.79	1.42	1.40	1.39	1.36	1.60	1.53
Education	0.88	0.20	0.20	0.21	1.25	1 23	1.22	1.20	1.27	1 08
Compensation of employees	1 26	0.67	0 66	0.66	0.66	0.65	0.65	0.64	0 62	0.64
Structures	0 98	1 58	1 66	0.75	4.37	5.16	5.84	3.34	3.94	3 66
Other	-1 07	-3 17	-3 35	-2.79	2.46	1.63	0.83	2.53	2.32	1.38
Other	0 94	3.04	2 93	2 82	1.52	1.51	1.51	1 46	1.81	1.82
Compensation of employees	1.54	0.79	0 78	0.78	0.77	0.77	0.76	0.75	1.91	1 20
Structures	1.60	-1.32	1 02	5.13	5.42	3.37	1.08	1.48	2.04	2.36
Other	-0 12	7 88	6.24	4.02	0.54	1 43	2.50	2 18	1.60	2.25
Addenda										
Unemployment rate	4 00	21.26	-7 27	-1 07	0 18	-3.24	-1.71	-11.00	-1.28	-4 04
GNP / Civilian jobs	-0 24	-0 15	1 38	0.60	0.48	0.34	0.46	0.61	0 41	0 55
(GNP-Govt) / Private jobs	-0 19	-0.75	1 59	0.50	0.23	0.09	0 26	0 76	0.40	0.54
PCE deflator	8 51	7.05	6 13	6.64	7.42	7.70	6.22	5 74	5 79	6 17
Index, unit compensation, mfg	8 96	7 82	8 49	6.80	8.79	8.38	5.77	6.10	6.02	6 66
Index, unit compensation, oth	9 22	7 01	7.90	7.36	8 19	8 65	6.56	6 21	5 99	6 71
M2 (billions of CUR$)	8 64	8 00	8 00	8 00	8 00	8 00	8 00	8 00	8.00	8.00
Disp income per capita (1972$)	1 55	-1 98	2 62	1 37	1.10	1 63	1.32	1 93	0 95	1 43
Savings rate	1 04	9 64	6 59	0 80	-0 11	-1 14	-1.74	-0 22	2 88	1 40
AAA Corporate bond rate	14 32	-20 51	-22 11	0 02	-3 66	7 42	1 13	-0 09	-2 46	-2 99

BASE MAR 12 AT 11PM

TABLE 2 PRICE INDEXES AND FINANCIAL VARIABLES

Table 2.5

	1977	1981	1982	1983	1984	1985	1986	1987	1990	1995
IMPLICIT DEFLATORS (1972 = 100)										
Gross National Product	1 40	1 96	2 13	2 27	2 43	2 62	2.83	3.02	3 60	4.80
Personal consumption expenditures	1 40	1.96	2 10	2 24	2.39	2.57	2.78	2.96	3 51	4 69
Residential structures	1 58	2 31	2 51	2 67	2.89	3.14	3 42	3.68	4 48	6.19
Non-residential structures	2 78	3 81	4 03	4.67	4.95	5 31	5.81	6.30	7 65	10.86
Producers' durable equipment	1 41	1 97	2 09	2.22	2.35	2 54	2.74	2.89	3 38	4.41
Exports, merchandise	1 76	2 48	2 62	2.77	2.94	3 16	3 40	3.58	4.20	5 50
Imports, merchandise	2 24	3 68	3 51	3.70	3.93	4.23	4.54	4.78	5 60	7.32
Federal defense	1 42	2 12	2 24	2 39	2.54	2.73	2.95	3.13	3.69	4.89
Federal non-defense	1 42	2 07	2 23	2.38	2.56	2.76	2.99	3.20	3 83	5.22
State & local education	1.48	2 15	2 29	2 42	2.59	2.79	3.01	3.20	3.79	5.05
State & local other govt	1 46	2 15	2 31	2.47	2.65	2.87	3 11	3.34	4.01	5.46
COMPENSATION PER MAN-HOUR INDEXES										
Manufacturing	100 05	143 20	154 85	168.57	180.43	197.01	214.24	226.96	272.54	368 20
Non-manufacturing	100 00	144.57	155 07	167.82	180.64	196.05	213.76	228.25	274.96	370.91
LABOR PRODUCTIVITY (GNP/JOBS)	20 40	20.20	20 17	20 45	20.58	20 67	20.74	20.84	21 23	21.66
ENERGY PRICE INDEXES										
Domestic crude oil ($/bbl)	8 57	32 27	31 57	33.49	35.81	38.64	41.80	44.47	52.91	70.50
Foreign crude oil ($/bbl)	13.33	35 26	31 58	33.50	35.82	38.65	41.81	44.49	52.93	70.53
FINANCIAL VARIABLES										
AAA Corporate bond rate	8.02	14.17	11.54	9.25	9.26	8.92	9.61	9.72	9.69	8 57
Commercial paper rate	5 61	14.76	9.16	8.03	9.25	8.99	10.59	9.87	9.91	8 27
Mortgage rate	8 80	14 17	11 82	9 31	9.42	8.89	9.53	10 21	10.13	9.23
Interest rate on Federal debt										
Average rate paid by S&L govt	5 69	8.13	8.08	8 03	6 99	5.98	6.23	6 15	6.48	5.71
Average rate received by S&L govt	14.18	11 37	9 53	8 10	8.21	7.98	8.44	8.48	8 46	7.79
Real rate of interest (ex ante)	2.57	2 57	2 57	2.57	2.57	2.57	2.57	2.57	2.57	2.57
M2 (billions of current$)	1234.40	1743.75	1888 98	2046 31	2216.74	2401.37	2601.37	2818 03	3582 41	5344.33
Ratio of M2 to real GNP	0.90	1 18	1 29	1.35	1.43	1.52	1.61	1.71	2.00	2 77
Ratio of M2 to nominal GNP	0 64	0 59	0 60	0.59	0.58	0.57	0.56	0.56	0.55	0 57
Savings rate	5 94	6 42	7 07	7.55	7.61	7.61	7.52	7 39	7 34	8.48

BASE [illegible] Table 3.5 PAGE S- 4

TABLE 2 PRICE INDEXES AND FINANCIAL VARIABLES
SUMMARY OF ANNUAL GROWTH RATES

	77- 81	81- 82	82- 83	83- 84	84- 85	85- 86	86- 87	87- 90	90- 95	82- 95
IMPLICIT DEFLATORS (1972 = 100)										
Gross National Product	8 48	8 13	6 21	6.84	7 62	7 95	6 38	5 81	5 77	6 25
Personal consumption expenditures	8 51	7 05	6 13	6 64	7.42	7.70	6.22	5 74	5.79	6 17
Residential structures	9 52	8.28	5 99	8.20	8.15	8.61	7.39	6.53	6.47	6.94
Non-residential structures	7 90	5 67	14 66	-5 87	7.00	9.07	8.11	6.46	7 00	7.62
Producers' durable equipment	8 08	5.66	6 23	5.94	7 52	7.58	5.19	5 24	5.36	5.77
Exports, merchandise	8 54	5 42	5 78	5.75	7.20	7.35	5.36	5.27	5 39	5.71
Imports, merchandise	12.46	-4 70	5 22	6 05	7.26	7.05	5.28	5.25	5.35	5.64
Federal defense	9 96	5.61	6 34	6.27	7.35	7.45	5.89	5.58	5.63	6.01
Federal non-defense	9 35	7.47	6 65	7.31	7.67	7.96	6.67	6.02	6.18	6 55
State & local education	9 42	6 34	5 13	7.00	7.32	7.60	6.13	5.65	5.75	6 07
State & local other govt	9 68	7.24	6 44	7.19	7.92	8.27	6.86	6 15	6.17	6 61
COMPENSATION PER MAN-HOUR INDEXES										
Manufacturing	8.96	7 82	8 49	6.80	8.79	8.38	5.77	6 10	6.02	6.66
Non-manufacturing	9 22	7.01	7 90	7.36	8.19	8.65	6.56	6.21	5.99	6 71
LABOR PRODUCTIVITY (GNP/JOBS)	-0.24	-0.15	1 38	0.60	0.48	0.34	0.46	0.61	0.41	0.55
ENERGY PRICE INDEXES										
Domestic crude oil ($/bbl)	33 15	-2 19	5 90	6 70	7.61	7.86	6 21	5.79	5.74	6.18
Foreign crude oil ($/bbl)	24 31	-11.03	5.90	6 70	7.61	7.86	6.21	5 79	5.74	6.18
FINANCIAL VARIABLES										
AAA Corporate bond rate	14 22	-20.51	-22 11	0.02	-3.66	7.42	1.13	-0 09	-2.46	-2.29
Commercial paper rate	24 17	-47 63	-13 16	14.13	-2.90	16.34	-6.95	0.11	-3.62	-0.79
Mortgage rate	11 91	-18 13	-23.83	1.15	-5.81	6.98	6.87	-0.26	-1.87	-1.91
Interest rate on Federal debt										
Average rate paid by S&L govt	8 92	-0.57	-0.60	-13 92	-15.55	4.00	-1.27	1.75	-2 51	-2 67
Average rate received by S&L govt	-5 52	-17.61	-16 28	1.30	-2.83	5.62	0.43	-0.08	-1.63	-1 55
Real rate of interest (ex ante)										
M2 (billions of current$)	8 64	8 00	8 00	8.00	8.00	8.00	8 00	8 00	8.00	8.00
Ratio of M2 to real GNP	6 67	8.67	4.66	5 80	6.17	5 99	6.08	5.24	6.47	5.91
Ratio of M2 to nominal GNP	-2 00	0 67	-1.82	-0.95	-1.48	-1.93	-0.32	-0.55	0.75	-0.34
Savings rate	1 94	9.64	6 59	0.82	-0.11	-1.14	-1.74	-0.22	2.88	1.40

HIGH [illegible] TABLE 1 GROSS NATIONAL PRODUCT (1972$) (1.2) Table 36 PAGE 8-- 1

	1977	1981	1982	1983	1984	1985	1986	1987	1990	1995
Gross National Product	1372 68	1493 61	1474 06	1513 41	1547 22	1578 91	1615.53	1649.88	1797 39	1939.21
Personal Consumption Expenditures	863 06	939 03	930 05	953 18	974.62	995.26	1023.30	1050.44	1146.55	1236 83
Durables	137 93	138 92	135 31	136 14	139.35	141.79	146.71	151.63	170 55	179.80
Non-durables	333 84	359 25	355 20	362 87	369.75	375 74	383.92	392 16	421.17	448 26
Services	391 29	440.85	439 54	454 17	465.52	477.73	492.67	506 64	554 83	608.77
Gross Private Domestic Investment	213 62	212 83	202 16	216 03	222.87	231.74	242.48	248 37	280 28	285.01
Structures	99 65	95 06	91 24	100.94	104.99	108 55	114.57	111.97	122 73	123 98
Residential	59 12	44 26	38 38	53 52	55.66	54 83	57.86	53.23	61.74	60.48
Non-residential	40 53	50 80	52 87	45 43	49 33	53.72	56.71	56 74	60 98	63.50
Producers' durable equipment	101 63	112 81	108 03	109 99	111.06	115 53	120.62	128.40	147 26	153 40
Inventory change	12 34	4 97	2 88	5.14	6.82	7.66	7.29	8.00	10 30	7.62
Exports of goods & services	115 05	164 37	152 37	151.19	153.73	151.51	148.42	147.07	164 26	195 18
Merchandise (producers' prices)	60 42	78.23	74 36	74 73	75.37	74 62	71.84	71.58	80 53	97.51
Transportation, trade, services	25 62	33 48	33 17	33 72	34.30	34 46	34.03	34.29	37 72	43.94
Rest of world	29 00	52 65	44 84	42 74	44.06	42.44	42.55	41.21	46.01	53.74
Imports of goods & services	91 44	106.93	100 74	103.64	107.24	111.02	118.24	123.18	136.44	146.13
Merchandise(domestic port price)	66 76	69 86	67.21	69.68	71.88	74.96	78.90	82 87	93.42	102.11
Petroleum & natural gas	9 30	7 33	7 31	7.45	7.57	7.68	7.83	8.00	8.37	9.05
Transportation, trade, services	17 83	18 91	18 35	19 87	20.19	20 90	21.91	22.74	24.02	25.01
Rest of world	6.84	19 16	15.19	14.09	15.16	15.16	17.43	17.57	18.99	19.01
Government Purchases	272 39	284 32	290 24	296 60	303.24	311.40	319.58	327.18	342.74	368 33
Federal	100 70	106.23	108 77	111.77	115.07	120.55	126.03	130.93	138.32	146.90
Defense	65.17	73 12	77 32	81 53	85.74	89.94	94.18	97.77	101.35	107.31
Compensation of employees	31 90	32 03	32 54	33.04	33.55	34.06	34.57	34 49	34.26	33.88
Structures	1 64	1.66	1 77	1.90	1.99	2.12	2.23	2.34	2.44	2.64
Other	31 63	39 43	43.02	46 58	50.19	53.77	57.35	60.94	64.64	70.78
Non-defense	35 53	33 11	31 45	30 24	29.34	30.61	31.88	33.15	36 98	39.59
Compensation of employees	16 60	15.13	14 37	14 07	14.07	14.44	14.81	15.19	16 30	18.17
Structures	3 67	3.94	3 94	3 94	3.98	4.10	4.21	4.31	4.61	5 01
Other	15 26	14.04	13 14	12 24	11.29	12.07	12.86	13.65	16 06	16 41
State and local	171.68	178 09	181 47	184 83	188.17	190.85	193.55	196.26	204.41	221.43
Education	70.89	73 44	73 59	73.74	73.89	74.82	75.75	76.68	79 48	84.70
Compensation of employees	53 22	55.98	56.35	56.73	57.11	57 48	57.86	58 23	59.36	61.24
Structures	6 51	6 77	6 88	6 98	7.04	7.35	7.75	8.22	9.08	11 06
Other	11 16	10 69	10 36	10.03	9.75	9.99	10.15	10 23	11.04	12 40
Other	100.80	104 65	107.88	111 09	114.27	116.03	117.79	119.58	124.93	136 74
Compensation of employees	44 58	47.41	47 78	48.16	48.54	48 91	49.29	49.66	50.79	55.87
Structures	18 18	19 38	19 09	19 11	20 04	21.19	22 12	22.45	23.39	25.63
Other	38.04	37.86	41.01	43.82	45.70	45 92	46.39	47.46	50.75	55.04
Addenda										
Unemployment rate	7 00	8 22	10 50	10 49	10.38	10.28	9.83	9.63	6 97	6 35
GNP / Civilian jobs	20 40	20 20	20 13	20 38	20.52	20.62	20.69	20.78	21 18	21 61
(GNP-Govt) / Private jobs	18 58	18.44	18 25	18 49	18.60	18 64	18 66	18.71	19 17	19 56
PCE deflator	1 40	1 96	2 14	2.28	2.45	2.63	2 84	3.03	3 59	4 79
Index, unit compensation, mfg	100 05	143 20	155 88	170 25	182.89	199 08	217 02	230 50	276 07	372 00
Index, unit compensation, oth	100 00	144 57	155 70	169 00	182.44	197 76	215.80	231 05	277 88	374.13
$B (billions of GNP$)	1234 40	1743 75	1888 98	2046 31	2216.74	2401 37	2601.37	2818 03	3582 41	5344 33
Disp income per capita (1972$)	4262 30	4549 75	4410 24	4496 05	4559 14	4610 65	4694 00	4764 66	5061 19	5324 35
Savings rate	5 94	6 42	7 03	7 44	7 51	7 48	7 40	7 27	7 21	8.22
AAA corporate bond rate	8 02	14 17	11 95	9 62	9 31	8 70	9 55	9 01	9 73	8 72

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TABLE 1 GROSS NATIONAL PRODUCT (1972$) (1.2) Table 36 PAGE 5-2
SUMMARY OF ANNUAL GROWTH RATES

	80- 81	81- 82	82- 83	83- 84	84- 85	85- 86	86- 87	87- 90	90- 95	82- 95
Gross National Product	2 11	-1 32	3 63	2 21	2 03	2 29	2.10	2 85	1.52	2.11
Personal Consumption Expenditures	2 11	-0 96	3 46	2 22	2 10	2 78	2 62	2 92	1 52	2 19
Durables	0 18	-2 64	9 61	2 33	1 74	3 41	3.30	3 92	1 06	2 19
Non-durables	1 83	-1 13	2 14	1.68	1.61	2 15	2.12	2.38	1 25	1 79
Services	2 98	-0 30	3 28	2 47	2.59	3 08	2.80	3.03	1.86	2 51
Gross Private Domestic Investment	-0 09	-5 15	6 66	3.10	3 90	4 53	2.40	4.03	0 33	2 64
Structures	-1 18	-4 09	10 10	3 93	3.34	5.39	-2.30	3.06	0.20	2 35
Residential	-7 24	-14 26	36 92	0 27	-1 51	5.38	-4.66	3.72	-0 41	3 50
Non-residential	5 65	3 99	-15 16	8 23	8 54	5.41	0.06	2.41	0.81	1.41
Producers' durable equipment	2 61	-4 32	1 80	0.97	3 95	4 31	6.25	4 57	0.82	2 70
Inventory change	-22 74	-54 60	57 90	28 30	11.60	-4.95	9.34	8 41	-6 01	7.49
Exports of goods & services	8 92	-7 58	-0 78	1 67	-1.45	-2 06	-0.91	3.69	3.45	1 90
Merchandise (producers' prices)	6 46	-5 08	0 50	0 86	-1.01	-3.79	-0.37	3 93	3.83	2.03
Transportation, trade, services	6.68	-0 93	1 66	1 70	0.46	-1.24	0.76	3 18	3 05	2.16
Rest of world	14 91	-16.06	-4 81	3.04	-3.74	0.25	-3.21	3.68	3.10	1 39
Imports of goods & services	3 91	-5.96	2 83	3.41	3.47	6 30	4.09	3.41	1.37	2.86
Merchandise(domestic port price)	0 78	-2 43	3 60	3 12	4.19	5 12	4.92	3.99	1.78	3 22
Petroleum & natural gas	-5 97	-0 24	1 88	1 63	1.42	1.93	2.12	1.51	1.55	1.64
Transportation, trade, services	1 46	-3 01	8 00	1 58	3.44	4.75	3.69	1 83	0 80	2 38
Rest of world	25 74	-23.23	-7 51	7.34	-0.01	13.95	0.78	2.60	0.02	1 72
Government Purchases	1 07	2.06	2 17	2 21	2.66	2.59	2.35	1.55	1.44	1.83
Federal	1 34	2.37	2 72	2 91	4.65	4.44	3.81	1 83	1.20	2 31
Defense	2 88	5.59	5.30	5.03	4.79	4.57	3 78	1 20	1.14	2 52
Compensation of employees	0 10	1.57	1 55	1.52	1.50	1.48	-0.22	-0.22	-0.22	0.31
Structures	0 28	6 79	7 16	4 60	6.01	5.24	4.78	1.46	1.55	3.07
Other	5 51	8 70	7.97	7 46	6.88	6.45	6.07	1.96	1.82	3 83
Non-defense	-1 77	-5.15	-3.92	-3 04	4.25	4.07	3.92	3.64	1.37	1.77
Compensation of employees	-2 32	-5 14	-2 13	0.00	2 61	2 55	2.48	2.37	2.16	1.80
Structures	1 77	-0.13	0 03	0 99	3.01	2.73	2.41	2.20	1 67	1.86
Other	-2.08	-6.62	-7 14	-8 05	6.67	6 32	6.03	5.42	0.43	1.71
State and local	0 92	1 88	1 84	1.79	1.42	1.40	1.39	1.36	1 60	1 53
Education	0 88	0 20	0 20	0.21	1.25	1.23	1.22	1 20	1 27	1 03
Compensation of employees	1 26	0 67	0.66	0.65	0.66	0.65	0.65	0.64	0.62	0 64
Structures	0 98	1.58	1 55	0.77	4.40	5.24	5.84	3.33	3.93	3 65
Other	-1 07	-3 17	-3 26	-2.80	2.43	1 57	0.83	2.54	2 33	1.59
Other	0 94	3.04	2.94	2.82	1.52	1 51	1.50	1 46	1.81	1 82
Compensation of employees	1 54	0.79	0 78	0 78	0.77	0 77	0.76	0 75	1 91	1 20
Structures	1 60	-1.53	0 14	4 74	5.60	4.26	1.49	1 37	1.98	2 33
Other	-0 12	7 98	6.63	4 20	0.49	1 01	2.30	2.23	1.62	2 26
Addenda										
Unemployment rate	4 00	24 56	-0 09	-1.04	-1.03	-4 44	-2 05	-10.80	-1 85	-3 87
CNP / Civilian jobs	-0 24	-0 35	1 23	0.68	0 46	0 36	0.43	0 64	0 40	0 55
(CNP-Govt) / Private jobs	-0 19	-1 05	1 31	0.61	0.22	0.13	0 23	0.81	0 41	0.53
PCE deflator	8 91	8 67	6 63	6 78	7.32	7.71	6.35	5.67	5 76	6 20
Index, unit compensation, mfg	8 96	8 49	8 82	7 16	8.48	8 63	6 03	6 01	5 97	6 69
Index, unit compensation, oth	9 22	7 41	8 20	7 65	8 06	8 73	6.83	6 15	5 95	6 74
NP (billions of EUR$)	8 64	8 00	8 00	8 00	8 00	8.00	8 00	8 00	8 00	8 00
Disp income per capita (1972$)	1 55	-2 92	1 93	1 39	1.12	1.79	1 49	2 01	1 01	1 45
Savings rate	1 71	9 10	5 67	0 94	-0 38	-1 08	-1 75	-0 32	2 64	1 20
AAA corporate bond rate	14 [illegible]	17 03	-1 71	-3 07	-6 79	7 36	2 64	-1 26	-2 10	-0 49

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TABLE [illegible] PRICE INDEXES AND FINANCIAL VARIABLES

Table 3.6

	1980	1981	1982	1983	1984	1985	1986	1987	1990	1995
IMPLICIT DEFLATORS (1972 = 100)										
Gross National Product	1.80	1.96	2.16	2.31	2.47	2.67	2.89	3.08	3.67	4.88
Personal consumption expenditures	1.80	1.96	2.14	2.28	2.45	2.63	2.84	3.03	3.59	4.79
Residential structures	1.98	2.31	2.54	2.72	2.94	3.19	3.48	3.76	4.56	6.29
Non-residential structures	2.78	3.81	4.08	4.79	5.07	5.41	5.91	6.41	7.77	11.01
Producers' durable equipment	1.81	1.97	2.11	2.26	2.40	2.59	2.79	2.94	3.43	4.48
Exports, merchandise	1.76	2.48	2.66	2.83	3.00	3.22	3.47	3.66	4.28	5.59
Imports, merchandise	2.24	3.68	3.64	3.84	4.08	4.38	4.69	4.94	5.76	7.53
Federal defense	1.92	2.12	2.29	2.45	2.61	2.81	3.02	3.21	3.79	5.01
Federal non-defense	1.92	2.07	2.25	2.42	2.61	2.81	3.05	3.26	3.90	5.30
State & local education	1.98	2.15	2.33	2.47	2.65	2.85	3.07	3.27	3.87	5.14
State & local other govt	1.96	2.15	2.35	2.52	2.71	2.93	3.18	3.41	4.10	5.56
COMPENSATION PER MAN-HOUR INDEXES										
Manufacturing	100.05	143.20	155.88	170.25	182.69	199.08	217.02	230.50	276.07	372.00
Non-manufacturing	100.00	144.57	155.70	169.00	182.44	197.76	215.80	231.05	277.88	374.13
LABOR PRODUCTIVITY (GNP/JOBS)	20.40	20.20	20.13	20.38	20.52	20.62	20.69	20.78	21.18	21.61
ENERGY PRICE INDEXES										
Domestic crude oil ($/bbl)	8.57	32.27	35.82	38.00	40.66	43.86	47.40	50.29	59.66	79.49
Foreign crude oil ($/bbl)	13.33	35.26	35.83	38.01	40.67	43.88	47.42	50.31	59.68	79.52
FINANCIAL VARIABLES										
AAA Corporate bond rate	8.02	14.17	11.95	9.62	9.31	8.70	9.55	9.81	9.73	8.72
Commercial paper rate	5.61	14.76	10.11	8.28	9.22	8.65	10.75	10.19	10.03	8.44
Mortgage rate	8.80	14.17	11.82	9.74	9.42	8.67	9.33	10.14	10.16	9.37
Interest rate on Federal debt										
Average rate paid by S&L govt	5.69	8.13	8.19	8.18	7.17	6.04	6.22	6.09	6.50	5.83
Average rate received by S&L govt	14.18	11.37	9.74	8.34	8.23	7.83	8.41	8.53	8.47	7.68
Real rate of interest (ex ante)	2.57	2.57	2.57	2.57	2.57	2.57	2.57	2.57	2.57	2.57
M2 (billions of current$)	1234.40	1743.75	1888.98	2046.31	2216.74	2401.37	2601.37	2818.03	3582.41	5344.33
Ratio of M2 to real GNP	0.90	1.18	1.29	1.37	1.45	1.54	1.63	1.73	2.02	2.79
Ratio of M2 to nominal GNP	0.64	0.59	0.59	0.59	0.58	0.57	0.56	0.55	0.55	0.57
Savings rate	5.94	6.42	7.03	7.44	7.51	7.48	7.40	7.27	7.21	8.22

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PRICE INDEXES AND FINANCIAL VARIABLES — Table 26 — Page 5- 4
SUMMARY OF ANNUAL GROWTH RATES

	7- 81	81- 82	82- 83	83- 84	84- 85	85- 86	86- 87	87- 90	90- 95	82- 95
IMPLICIT DEFLATORS (1972 = 100)										
Gross National Product	6 47	9 42	6 71	6.95	7 56	8 00	6 56	5 75	5 74	6.28
Personal consumption expenditures	8 91	8 67	6 63	6 78	7 32	7 71	6 35	5.67	5 76	6 20
Residential structures	9 52	9 34	6 93	7 91	8 16	8 65	7 60	6.45	6 42	6 98
Non-residential structures	7 90	6 77	16 13	5.68	6.52	8 71	8 19	6 44	6 96	7 64
Producers' durable equipment	8 38	7 06	6 75	6 08	7 26	7 60	5.33	5.14	5 33	5 78
Exports, merchandise	8 84	7 10	6 23	5 85	6 99	7.40	5 50	5 17	5.36	5 71
Imports, merchandise	12 46	-1 15	5 36	5 99	7.09	6 88	5 10	5.15	5 36	5 59
Federal defense	9 96	7 61	6 89	6 41	7 23	7 50	5.99	5.49	5 59	6 03
Federal non-defense	9 35	8 60	7 38	7 32	7 62	8 00	6 83	5 94	6 14	6 59
State & local education	9 42	7 95	5 80	6 86	7 27	7 65	6.29	5 56	5 71	6 03
State & local other govt	9 68	8 68	7 13	7.18	7.86	8 31	7.03	6.08	6 13	6 65
COMPENSATION PER MAN-HOUR INDEXES										
Manufacturing	8 96	8 49	8 82	7 16	8 48	8 63	6.03	6 01	5.97	6 69
Non-manufacturing	9 22	7.41	8 20	7 65	8.06	8 73	6.83	6 15	5 95	6 74
LABOR PRODUCTIVITY (GNP/JOBS)	-0 24	-0.35	1 23	0 68	0.46	0.36	0.43	0 64	0 40	0 55
ENERGY PRICE INDEXES										
Domestic crude oil ($/bbl)	33 15	10 44	5 91	6.77	7.60	7 76	5.92	5.69	5 74	6.13
Foreign crude oil ($/bbl)	24 31	1.60	5 91	6.77	7.60	7 76	5.92	5.69	5.74	6 13
FINANCIAL VARIABLES										
AAA Corporate bond rate	14 22	-17 03	-21 71	-3 29	-6 79	9 36	2.64	-0.26	-2.18	-2 42
Commercial paper rate	24 17	-37 80	-19.92	10 67	-6.35	21 77	-5.38	-0.54	-3.44	-1.39
Mortgage rate	11.91	-18 13	-19 33	-3.33	-8.33	7 27	8.37	0.08	-1.63	-1.79
Interest rate on Federal debt										
Average rate paid by S&L govt	8 92	0 82	-0 15	-13 18	-17.15	2 93	-2 12	2.18	-2 20	-2.62
Average rate received by S&L govt	-5 52	-15.50	-15 50	-1.36	-4 98	7 18	1.46	-0.23	-1 45	-1.63
Real rate of interest (ex ante)										
M2 (billions of current$)	8 64	8.00	8 00	8 00	8 00	8 00	8.00	8 00	8 00	8 00
Ratio of M2 to real GNP	6 67	9.16	5.57	5.74	6.05	5 81	6.05	5.16	6 43	5.91
Ratio of M2 to nominal GNP	-2.00	-0 05	-1.45	-1.15	-1.53	-2 16	-0 53	-0 57	0 74	-0.37
Savings rate	1 94	9.10	5 67	0 94	-0.38	-1 08	-1.75	-0 32	2.64	1.20

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TABLE 1 GROSS NATIONAL PRODUCT (1972$) (1.2) Table 3.7 PAGE S- 1

	1981	1982	1983	1984	1985	1986	1987	1988	1990	1995
Gross National Product	1508.19	1503.84	1566.58	1656.84	1732.89	1712.57	1680.01	1695.57	1881.12	2057.74
Personal Consumption Expenditures	939.03	954.87	1006.12	1052.26	1093.26	1078.43	1059.24	1080.51	1195.27	1301.59
Durables	138.92	141.90	156.72	167.62	175.60	163.59	154.84	161.98	193.02	203.07
Non-durables	359.25	363.89	378.06	391.57	404.00	396.37	385.98	392.31	427.17	450.74
Services	440.85	449.09	470.34	493.07	513.66	518.46	518.42	526.22	575.08	648.17
Gross Private Domestic Investment	272.23	205.40	221.71	261.89	293.07	280.19	258.69	246.10	314.08	341.40
Structures	95.05	91.49	100.16	119.61	134.02	122.96	105.50	98.09	135.68	133.10
Residential	44.36	40.01	49.77	63.80	71.92	61.88	50.72	47.05	70.98	65.34
Non-residential	50.69	51.48	50.39	55.81	62.10	61.08	54.79	51.04	64.70	67.76
Producers' durable equipment	122.31	112.73	113.65	128.23	144.24	149.89	152.07	145.17	162.78	198.79
Inventory change	4.87	1.18	7.89	14.05	14.81	7.34	1.12	2.84	15.61	9.51
Exports of goods & services	166.00	161.15	153.52	158.27	162.90	161.18	160.59	164.06	173.62	206.96
Merchandise (producers' prices)	79.39	73.70	76.73	80.65	82.07	79.79	78.91	81.41	88.25	105.17
Transportation, trade, services	33.54	33.29	34.14	35.20	35.94	35.63	35.69	36.69	39.18	49.57
Rest of world	53.07	54.16	42.65	42.42	44.90	45.76	45.99	45.96	46.19	56.22
Imports of goods & services	105.40	105.28	108.13	116.11	125.01	123.27	121.40	123.73	141.91	163.67
Merchandise(domestic port price)	68.91	68.32	73.70	80.52	86.44	83.90	81.40	83.13	98.52	110.45
Petroleum & natural gas	7.43	7.55	7.75	8.03	8.29	8.09	7.81	7.88	8.30	8.92
Transportation, trade, services	18.69	18.98	20.52	21.77	22.62	21.82	21.90	23.10	25.99	34.11
Rest of world	17.79	17.99	13.91	13.82	15.95	17.55	18.10	17.50	17.40	19.11
Government Purchases	286.29	287.70	294.36	300.53	308.67	316.04	322.88	328.64	340.07	371.07
Federal	108.48	110.27	113.52	116.33	121.14	125.96	130.20	133.31	139.53	154.74
Defense	72.70	78.50	83.01	86.76	90.52	94.27	97.45	99.49	103.58	113.62
Compensation of employees	32.03	32.54	33.04	33.55	34.06	34.57	34.49	34.41	34.26	33.88
Structures	1.66	1.77	1.88	1.96	2.10	2.23	2.38	2.41	2.42	2.63
Other	39.01	44.20	48.09	51.25	54.36	57.48	60.58	62.67	66.90	77.31
Non-defense	35.78	31.77	30.52	29.57	30.63	31.69	32.75	33.82	35.95	40.92
Compensation of employees	15.13	14.37	14.07	14.07	14.44	14.81	15.19	15.56	16.30	18.17
Structures	4.06	3.95	3.99	4.07	4.25	4.42	4.55	4.66	4.90	5.55
Other	16.59	13.45	12.46	11.42	11.93	12.45	13.02	13.60	14.75	17.21
State and local	177.81	177.43	180.84	184.20	187.53	190.08	192.68	195.32	200.53	216.33
Education	73.13	73.02	73.26	73.50	73.73	74.25	74.77	75.30	76.35	79.65
Compensation of employees	55.98	56.35	56.73	57.11	57.48	57.86	58.23	58.61	59.36	61.24
Structures	6.74	6.52	6.69	6.85	7.09	7.43	7.84	8.06	8.47	10.07
Other	10.41	10.15	9.84	9.54	9.16	8.96	8.70	8.63	8.52	8.34
Other	104.68	104.41	107.58	110.70	113.80	115.83	117.91	120.03	124.18	136.67
Compensation of employees	47.41	47.78	48.16	48.54	48.91	49.29	49.66	50.04	50.79	55.87
Structures	19.36	18.90	20.58	23.61	27.39	30.17	31.53	32.01	35.04	42.65
Other	37.90	37.72	38.84	38.56	37.49	36.37	36.72	37.98	38.35	38.16
Addenda:										
Unemployment rate	7.60	9.48	8.27	5.54	3.45	5.93	8.97	10.02	5.17	3.97
GNP / Civilian jobs	20.41	20.46	20.73	21.00	21.19	21.16	21.11	21.24	21.82	22.39
(GNP-Govt) / Private jobs	18.65	18.69	18.97	19.30	19.49	19.36	19.17	19.26	19.98	20.47
PCE deflator	1.96	2.07	2.10	2.16	2.26	2.49	2.82	3.01	3.21	4.18
Index, unit compensation, mfg	144.40	152.38	161.36	171.13	181.31	199.28	220.42	234.21	258.83	347.30
Index, unit compensation, oth	140.40	149.17	157.90	168.67	180.38	194.85	213.91	229.67	256.83	348.53
M2 (billions of CUR$)	1743.79	1888.98	2046.31	2216.74	2401.37	2601.37	2818.03	3052.73	3582.41	5344.33
Disp income per capita (1972$)	4537.61	4555.01	4813.22	5034.15	5169.29	5123.75	4980.78	4990.94	5407.92	5773.56
Savings rate	6.46	6.80	8.16	8.92	8.97	9.89	9.85	9.07	8.77	10.11
AAA corporate bond rate	11.13	13.70	9.42	7.27	7.37	9.11	10.23	10.40	7.65	7.72

VARy [illegible] TABLE 1 GROSS NATIONAL PRODUCT (11/28) (1 2) Table 3.7 PAGE [illegible]
SUMMARY OF ANNUAL GROWTH RATES

	81- 82	82- 83	83- 84	84- 85	85- 86	86- 87	87- 88	88- 90	90- 95
Gross National Product	-0 29	4 09	5 60	4 49	-1.18	-1 92	0.92	5.19	1.79
Personal Consumption Expenditures	1 67	5 13	4 58	3 62	-1.37	-1 80	1.99	5 05	1 71
Durables	2 12	9 94	6 72	4 65	-7.08	-5.50	4.51	8.76	1.02
Non-durables	1 28	3 82	3 91	3.13	-1 91	-2 66	1.63	4.26	1 07
Services	1 85	4 62	4 72	4 09	0.93	-0 01	1.49	4.44	2.39
Gross Private Domestic Investment	-7 88	7 64	16 66	11.25	-4.49	-7 98	-4.99	12.20	1.67
Structures	-3 82	9.05	17 79	11 38	-8.61	-15.31	-7.29	16.22	-0.38
Residential	-10 31	21.83	24 83	11.97	-15.03	-19.89	-7.51	20 56	-1.66
Non-residential	1 54	-2 15	10 22	10.69	-1.66	-10.88	-7.09	11.86	0 92
Producers' durable equipment	-8 15	0.81	12 07	11.77	3.84	1 44	-4.64	5.72	4.00
Inventory change	-142 13	190 47	57.65	5.24	-70.23	-187.64	92.60	85.28	-9.92
Exports of goods & services	-2 97	-4.85	3 05	2.88	-1 06	-0.36	2.14	2.83	3.51
Merchandise (producers' prices)	-7.45	4 03	4 99	1 74	-2.81	-1.12	3.13	4.03	3.51
Transportation, trade, services	-0 76	2.54	3 06	2 06	-0.86	0.18	2.76	3.28	3.02
Rest of world	2 05	-23 91	-0.54	5.68	1.90	0.51	-0.08	0.26	3.93
Imports of goods & services	-0 11	2.67	7 12	7.39	-1.40	-1.53	1.90	6.86	2.85
Merchandise(domestic port price)	-0 87	7 58	8 85	7 10	-2.99	-3 03	2.11	8 49	2.29
Petroleum & natural gas	1 57	2.69	3 53	3 22	-2.52	-3.50	0.93	2.57	1.45
Transportation, trade, services	1 53	7.80	5 92	3 82	-3.58	0 36	5.33	5.89	5.44
Rest of world	1.09	-25.68	-0 66	14.34	9.56	3.10	-3.42	-0.27	1.88
Government Purchases	0 49	2.29	2 07	2 67	2.36	2.14	1.77	1.71	1.74
Federal	1 64	2.91	2 44	4 06	3.90	3.31	2.36	2.28	2.07
Defense	7 68	5.58	4.42	4.24	4.07	3.31	2.08	2.02	1.88
Compensation of employees	1 57	1.55	1.52	1 50	1.48	-0.22	-0.22	-0.22	-0.22
Structures	6 59	5.80	4.42	6.62	5.93	6.54	1.34	0.27	1.65
Other	12.47	8.44	6.37	5.90	5.58	5.25	3.39	3.27	2.89
Non-defense	-11 89	-4.02	-3 17	3 53	3.41	3.30	3.20	3.05	2.59
Compensation of employees	-5 14	-2.13	0 00	2.61	2.55	2.48	2.42	2.34	2.16
Structures	-2 67	1.01	2.07	4.37	3.83	2.89	2.32	2.50	2.50
Other	-21.01	-7.64	-8.67	4.34	4.29	4.42	4.41	4.05	3.08
State and local	-0 21	1.90	1 84	1.79	1.35	1.36	1.36	1.32	1.52
Education	-0.15	0.33	0.32	0.32	0.70	0.70	0.70	0 69	0.85
Compensation of employees	0 67	0 66	0 66	0 66	0.65	0.65	0.64	0 64	0.62
Structures	-3 35	2 58	2 41	3 37	4.77	5.31	2.84	2.45	3.47
Other	-2 57	-3.09	-3 10	-4.01	-2.21	-2 96	-0.87	-0 60	-0.43
Other	-0 25	2.99	2.86	2.76	1.77	1.78	1.78	1.70	1.92
Compensation of employees	0 79	0 78	0 78	0.77	0.77	0.76	0.75	0.75	1.91
Structures	-2 41	8.50	13 73	14.86	9.67	4.39	1.50	4.53	3.93
Other	-0.48	2 92	-0 74	-2.80	-3.05	0.97	3.38	0.48	-0.10
Addenda:									
Unemployment rate	22 16	-13.66	-40 08	-47.47	54.28	41.42	11.03	-33.05	-5 31
CNP / Civilian jobs	0 25	1 28	1 33	0 87	-0.11	-0 24	0 59	1 35	0.51
(CNP-Govt) / Private jobs	0 18	1.47	1.77	0.97	-0.71	-0.96	0.44	1.85	0.48
PCE deflator	5 41	1 56	2 90	4 18	9.85	12.39	6.50	3 21	5 32
Index, unit compensation, mfg	5 38	5 73	5 88	5 78	9.45	10 08	6 07	5 00	5 88
Index, unit compensation, oth	6 06	5.68	6 60	6 71	7.72	9 33	7.11	5 59	6 11
M2 (billions of CUR$)	8 00	8 00	8 00	8 00	8.00	8 00	8 00	8.00	8 00
Disp income per capita (1972$)	0 38	5 51	4 49	3 04	-1 27	-2.83	0 20	4 01	1 31
Savings rate	5 80	18 24	0 93	0 76	9 55	-0 39	-8 29	-1.70	3 01
AAA Corporate bond rate	-3 38	-37 42	-25 90	1 32	21 25	11 54	1 62	-15 35	0 65

	1981	1982	1983	1984	1985	1986	1987	1988	1990	1995
IMPLICIT DEFLATORS (1972 = 100)										
Gross National Product	1.98	2.11	2.17	2.25	2.36	2.60	2.91	3.11	3.34	4.40
Personal consumption expenditures	1.96	2.07	2.10	2.16	2.26	2.49	2.82	3.01	3.21	4.18
Residential structures	2.33	2.49	2.54	2.63	2.78	3.09	3.47	3.73	3.97	5.36
Non-residential structures	3.83	4.01	4.37	4.57	4.80	5.50	6.56	7.32	7.44	10.63
Producers' durable equipment	2.00	2.08	2.13	2.19	2.29	2.53	2.85	3.02	3.21	4.21
Exports, merchandise	2.51	2.61	2.65	2.73	2.84	3.15	3.57	3.78	4.00	5.20
Imports, merchandise	3.77	3.54	3.46	3.51	3.59	4.20	4.96	5.15	5.42	7.07
Federal defense	2.12	2.21	2.26	2.14	2.22	2.50	2.87	3.04	3.23	4.23
Federal non-defense	2.08	2.22	2.29	2.25	2.37	2.62	2.94	3.15	3.38	4.52
State & local education	2.19	2.30	2.33	2.39	2.49	2.78	3.14	3.32	3.49	4.55
State & local other govt	2.16	2.29	2.35	2.43	2.56	2.85	3.25	3.49	3.74	5.08
COMPENSATION PER MAN-HOUR INDEXES										
Manufacturing	144.40	152.38	161.36	171.13	181.31	199.28	220.42	234.21	258.83	347.30
Non-manufacturing	140.40	149.17	157.90	168.67	180.38	194.85	213.91	229.67	256.83	348.53
LABOR PRODUCTIVITY (GNP/JOBS)	20.41	20.46	20.73	21.00	21.19	21.16	21.11	21.24	21.82	22.39
ENERGY PRICE INDEXES										
Domestic crude oil ($/bbl)	32.27	30.65	25.90	23.74	20.69	34.20	55.42	56.64	56.26	74.22
Foreign crude oil ($/bbl)	35.28	30.66	25.91	23.75	20.70	34.21	55.44	56.66	56.28	74.25
FINANCIAL VARIABLES										
AAA Corporate bond rate	14.17	13.70	9.42	7.27	7.37	9.11	10.23	10.40	7.65	7.90
Commercial paper rate	14.76	11.90	7.30	5.92	7.47	9.94	11.10	10.01	7.04	6.95
Mortgage rate	14.17	14.61	10.55	7.57	7.69	9.13	9.92	11.27	7.95	8.66
Interest rate on Federal debt										
Average rate paid by S&L govt	8.13	8.88	8.13	7.07	5.44	5.30	5.78	6.51	5.92	5.67
Average rate received by S&L govt	11.37	10.97	8.11	6.86	7.04	8.27	8.92	8.95	7.10	7.39
Real rate of interest (ex ante)	2.57	2.57	2.57	2.57	2.57	2.57	2.57	2.57	2.57	2.57
M2 (billions of current$)	1743.75	1888.98	2046.31	2216.74	2401.37	2601.37	2818.03	3052.73	3582.41	5344.33
Ratio of M2 to real GNP	1.17	1.27	1.33	1.36	1.40	1.53	1.69	1.82	1.93	2.62
Ratio of M2 to nominal GNP	0.58	0.59	0.60	0.59	0.59	0.58	0.58	0.58	0.57	0.59
Savings rate	6.42	6.80	8.16	8.92	8.99	9.89	9.85	9.07	8.77	10.19

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TABLE 3 PRICE INDEXES AND FINANCIAL VARIABLES
SUMMARY OF ANNUAL GROWTH RATES

Table 3.7 PAGE 5- 4

	81- 82	82- 83	83- 84	84- 85	85- 86	86- 87	87- 88	88- 90	90- 95
IMPLICIT DEFLATORS (1972 = 100)									
Gross National Product	6.33	2.54	3.77	4.89	9.52	11.38	6.45	3.60	5.52
Personal consumption expenditures	5.41	1.56	2.90	4.18	9.85	12.39	6.50	3.21	5.32
Residential structures	6.60	2.06	3.24	5.81	10.53	11.68	7.02	3.12	6.01
Non-residential structures	4.64	8.57	4.45	5.07	13.45	17.70	11.03	0.77	7.15
Producers' durable equipment	3.69	2.34	2.90	4.58	9.93	11.78	5.90	3.03	5.40
Exports, merchandise	3.95	1.59	2.81	4.15	10.40	12.41	5.60	2.90	5.24
Imports, merchandise	-6.10	-2.52	1.56	2.32	15.57	16.75	3.72	2.54	5.31
Federal defense	4.34	2.12	-5.52	3.64	11.77	13.85	6.03	3.02	5.38
Federal non-defense	6.33	3.13	-1.57	5.06	10.05	11.56	7.00	3.50	5.81
State & local education	4.98	1.21	2.37	4.32	10.95	12.30	5.59	2.55	5.30
State & local other govt	5.90	2.63	3.44	5.03	11.05	12.87	7.14	3.49	6.11
COMPENSATION PER MAN-HOUR INDEXES									
Manufacturing	5.38	5.73	5.88	5.78	9.45	10.08	6.07	5.00	5.88
Non-manufacturing	6.06	5.68	6.60	6.71	7.72	9.33	7.11	5.59	6.11
LABOR PRODUCTIVITY (GNP/JOBS)	0.25	1.28	1.33	0.87	-0.11	-0.24	0.59	1.35	0.51
ENERGY PRICE INDEXES									
Domestic crude oil ($/bbl)	-5.15	-16.84	-8.71	-13.75	50.26	48.29	2.18	-0.34	5.54
Foreign crude oil ($/bbl)	-14.04	-16.84	-8.71	-13.75	50.26	48.29	2.18	-0.34	5.54
FINANCIAL VARIABLES									
AAA Corporate bond rate	-3.38	-37.42	-25.90	1.32	21.25	11.54	1.62	-15.35	0.65
Commercial paper rate	-21.51	-48.87	-20.97	23.32	28.57	10.95	-10.30	-17.62	-0.24
Mortgage rate	3.06	-32.54	-33.18	1.56	17.15	8.29	12.76	-17.44	1.70
Interest rate on Federal debt									
Average rate paid by S&L govt	8.85	-8.83	-13.92	-26.21	-2.55	8.58	11.88	-4.72	-0.87
Average rate received by S&L govt	-3.61	-30.14	-16.82	2.58	16.10	7.65	0.27	-11.57	0.78
Real rate of interest (ex ante)									
M2 (billions of current$)	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
Ratio of M2 to real GNP	8.34	3.94	2.27	3.51	8.87	9.87	7.31	2.60	6.16
Ratio of M2 to nominal GNP	2.07	1.40	-1.40	-1.30	-0.30	-1.35	0.65	-0.79	0.71
Savings rate	5.80	18.24	8.93	0.76	9.55	-0.39	-8.29	-1.70	3.01

TABLE 3.8

CAM *** BASE RUN ***
CAM *** HIGH ***
CAM *** VARY ***
CAM *** NO ETHANOL PRODUCED RUN ***

		1977	1980.	1981.	1982.	1983.	1984.	1985.	1987.	1990.	1992.	1995.
PCO	PRICE OF CORN (4 BU)	2.150	2.524	3.299	2.449	2.883	3.385	3.762	4.378	5.084	5.695	6.735
		2.150	2.524	3.299	2.449	2.883	3.386	3.766	4.394	5.139	5.761	6.829
		2.150	2.524	3.299	2.449	2.866	3.259	3.582	4.594	5.264	5.983	6.956
		2.150	2.524	3.275	2.413	2.773	3.163	3.462	4.021	4.638	5.218	6.191
PCOCPI	PRICE OF CORN / CPI ($/BU)	2.150	1.953	2.345	1.649	1.868	2.097	2.189	2.225	2.229	2.227	2.221
		2.150	1.953	2.345	1.649	1.868	2.096	2.187	2.221	2.217	2.214	2.200
		2.150	1.953	2.345	1.649	1.869	2.083	2.183	2.242	2.116	2.187	2.205
		2.150	1.953	2.328	1.625	1.798	1.959	2.014	2.044	2.033	2.041	2.041
QCOS	TOTAL SUPPLY OF CORN (BBU)	6.285	7.947	6.651	8.115	8.139	7.751	8.015	9.012	9.755	10.368	11.111
		6.285	7.947	6.651	8.115	8.139	7.751	8.015	9.016	9.764	10.382	11.112
		6.285	7.947	6.651	8.115	8.138	7.741	7.962	8.909	9.874	10.399	11.073
		6.285	7.947	6.648	8.071	8.009	7.481	7.526	8.316	8.842	9.391	10.057
QCO	SUPPLY OF CORN GROWN (BBU)	6.285	7.942	6.643	8.097	8.102	7.688	7.919	8.883	9.591	10.194	10.926
		6.285	7.942	6.643	8.097	8.102	7.688	7.920	8.886	9.599	10.207	10.928
		6.285	7.942	6.643	8.097	8.102	7.683	7.880	8.787	9.709	10.218	10.889
		6.285	7.942	6.643	8.064	8.009	7.481	7.526	8.316	8.842	9.391	10.057
APCOS	% OF LAND PLANTED IN CORN	0.402	0.349	0.369	0.377	0.376	0.367	0.359	0.380	0.370	0.367	0.357
		0.402	0.349	0.369	0.377	0.376	0.367	0.359	0.381	0.370	0.368	0.357
		0.402	0.349	0.369	0.377	0.376	0.366	0.357	0.374	0.377	0.371	0.356
		0.402	0.349	0.369	0.376	0.372	0.354	0.337	0.351	0.334	0.332	0.322
APCO	ACRES PLANTED IN CORN (HMAC	0.845	0.815	0.848	0.860	0.828	0.834	0.844	0.931	0.953	0.982	1.001
		0.845	0.815	0.848	0.860	0.828	0.834	0.844	0.932	0.954	0.984	1.001
		0.845	0.815	0.848	0.860	0.828	0.834	0.838	0.918	0.969	0.985	0.996
		0.845	0.815	0.848	0.856	0.818	0.805	0.789	0.853	0.856	0.881	0.898
AHCO	ACRES HARVESTED CORN (HMAC)	0.715	0.724	0.730	0.737	0.709	0.715	0.723	0.799	0.817	0.842	0.858
		0.715	0.724	0.730	0.737	0.709	0.715	0.723	0.799	0.818	0.844	0.858
		0.715	0.724	0.730	0.737	0.709	0.715	0.719	0.787	0.830	0.845	0.854
		0.715	0.724	0.730	0.734	0.701	0.690	0.676	0.731	0.733	0.755	0.770
YCO	YIELD OF CORN (HBU/AC)	0.879	1.097	0.910	1.099	1.142	1.075	1.095	1.112	1.174	1.211	1.273
		0.879	1.097	0.910	1.099	1.142	1.075	1.095	1.112	1.174	1.210	1.273
		0.879	1.097	0.910	1.099	1.142	1.075	1.097	1.117	1.169	1.209	1.275
		0.879	1.097	0.910	1.099	1.142	1.085	1.113	1.138	1.206	1.243	1.307
QCOFO	SUPPLY OF CORN EQUIV (BBU)	0.000	0.005	0.008	0.018	0.037	0.063	0.095	0.129	0.164	0.174	0.185
		0.000	0.005	0.008	0.018	0.037	0.063	0.095	0.130	0.165	0.175	0.185
		0.000	0.005	0.008	0.018	0.036	0.057	0.082	0.122	0.165	0.180	0.185
		0.000	0.005	0.005	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000

TABLE 3.8

		1980	1981	1982	1983	1984	1985	1987	1990	1992	1995
[illegible]	[illegible]	7.992	6.736	7.813	8.329	7.876	8.211	9.075	9.853	10.438	11.180
		7.992	6.736	7.813	8.328	7.877	8.212	9.091	9.871	10.451	11.180
		7.992	6.736	7.813	8.320	7.863	8.152	9.005	9.940	10.465	11.146
		7.992	6.722	7.758	8.138	7.584	7.707	8.357	8.929	9.445	10.107
[illegible]	[illegible]	5.248	4.932	5.232	5.635	5.841	6.070	6.420	7.018	7.279	7.615
		5.246	4.932	5.232	5.635	5.841	6.069	6.421	7.021	7.276	7.595
		5.248	4.932	5.232	5.629	5.808	6.006	6.368	6.932	7.343	7.602
		5.248	4.899	5.141	5.348	5.397	5.420	5.522	5.855	6.020	6.245
[illegible]	[illegible]	0.675	0.711	0.616	0.640	0.658	0.669	0.697	0.764	0.796	0.846
		0.675	0.711	0.616	0.640	0.658	0.667	0.696	0.761	0.791	0.838
		0.675	0.711	0.616	0.641	0.665	0.684	0.693	0.719	0.802	0.838
		0.675	0.711	0.617	0.643	0.664	0.677	0.705	0.774	0.805	0.855
[illegible]	[illegible]	4.519	4.139	4.441	4.669	4.650	4.620	4.675	4.922	5.058	5.241
		4.519	4.139	4.441	4.669	4.651	4.619	4.671	4.915	5.053	5.232
		4.519	4.139	4.441	4.669	4.659	4.645	4.690	4.869	5.071	5.240
		4.519	4.139	4.456	4.705	4.732	4.743	4.816	5.082	5.215	5.390
[illegible]	[illegible]	0.054	0.082	0.176	0.327	0.532	0.782	1.048	1.331	1.424	1.529
		0.054	0.082	0.176	0.326	0.533	0.782	1.054	1.345	1.433	1.525
		0.054	0.082	0.176	0.319	0.484	0.678	0.996	1.345	1.470	1.524
		0.054	0.049	0.067	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[illegible]	[illegible]	0.314	-0.584	0.248	0.196	-0.301	-0.206	0.148	-0.023	0.054	0.020
		0.314	-0.584	0.248	0.196	-0.301	-0.205	0.148	-0.019	0.057	0.019
		0.314	-0.584	0.248	0.196	-0.295	-0.219	0.134	0.040	-0.004	0.012
		0.314	-0.584	0.251	0.195	-0.312	-0.263	0.106	-0.059	0.036	0.006
[illegible]	[illegible]	2.430	2.390	2.333	2.497	2.336	2.347	2.507	2.858	3.106	3.545
		2.430	2.390	2.333	2.497	2.336	2.349	2.512	2.869	3.118	3.566
		2.430	2.390	2.333	2.496	2.350	2.365	2.503	2.967	3.126	3.531
		2.430	2.407	2.366	2.595	2.500	2.550	2.729	3.133	3.389	3.856
[illegible]	[illegible]	1.618	1.034	1.282	1.478	1.177	0.971	1.172	1.280	1.360	1.422
		1.618	1.034	1.282	1.478	1.178	0.972	1.175	1.289	1.372	1.433
		1.618	1.034	1.282	1.478	1.183	0.964	1.121	1.370	1.402	1.423
		1.618	1.034	1.285	1.481	1.168	0.906	0.977	1.021	1.046	1.077

TABLE 3.8

		19[illegible]	1980	1981	1982	1983.	1984.	1985.	1987.	1990.	1992.	1995.
[illegible]COI	PSY / PLO	[illegible]	2 481	2 341	2.834	2 715	2.633	2 487	2 591	2.614	2.731	2.781
		[illegible]	2 481	2 341	2.834	2 715	2 633	2 488	2.583	2.603	2.729	2 774
		[illegible]	2 481	2 341	2.834	2 719	2.671	2 553	2 561	2 622	2 749	2.757
		[illegible]	2 481	2 540	2.900	2.922	2.904	2.773	2.872	2.926	3 046	3 100
	PRICE + [illegible] ($/BU)	[illegible]	6 250	7 780	6.957	7.821	8.907	9.353	11.346	13.288	15.553	18 727
		[illegible]	6.250	7 780	6.957	7 820	8.911	9 357	11.354	13.375	15.721	18 942
		[illegible]	6 250	7.780	6.957	7.785	8.702	9 133	11.761	13 802	16.445	17 175
		[illegible]	6·250	7 820	7 019	8 098	9.181	9 587	11 551	13.569	15.896	19.190
[illegible] CPI	PRICE + SOY / CPI ($/BU)	[illegible]	4 845	5.536	4.671	5.072	5.520	5.448	5.767	5.827	6.084	6.175
		[illegible]	4.845	5.536	4.671	5.071	5.519	5.440	5.738	5.771	6.040	6.101
		[illegible]	4 845	5 536	4.671	5.082	5.565	5.573	5.741	5.548	6.011	6 079
		[illegible]	4 845	5.564	4.713	5.252	5.689	5.584	5.871	5.950	6.218	6 328
[illegible]S	TOTAL [illegible] PLY OF SOY (BBU)	1 289	2.282	1.863	2.061	2.032	2.128	2 304	2.394	2.750	2.951	3 294
		1.289	2.282	1.863	2.061	2 032	2.128	2.304	2.393	2.750	2.945	3.288
		1.289	2.282	1.863	2.061	2 031	2.120	2.296	2.441	2.677	2.902	3.309
		1 289	2.282	1.855	2.049	1.993	2.102	2.287	2.375	2.729	2 920	3.254
[illegible]	SUPPLY OF SOY GROWN (BBU)	1.289	2 270	1 844	2.023	1.965	2.021	2 150	2.189	2.489	2.671	2.992
		1.289	2.270	1.844	2.023	1.965	2.021	2.150	2.187	2.487	2.664	2 986
		1 289	2.270	1.844	2.023	1.965	2.022	2.162	2.245	2.414	2.614	3.007
		1 289	2 270	1.844	2.034	1.993	2.102	2.287	2.375	2.729	2.920	3.254
[illegible]EY8	[illegible] AP3 PLANTED IN SOY	0 239	0.307	0 306	0.273	0.278	0.287	0.293	0.279	0.292	0.296	0.306
		0 239	0.307	0.306	0.273	0.278	0.287	0.293	0.279	0.292	0.295	0.306
		0. 239	0.307	0 306	0.273	0.278	0.288	0.296	0.286	0.284	0.291	0.308
		0 239	0.307	0.306	0.274	0.283	0.300	0.315	0.306	0.325	0.328	0.337
[illegible]SY	ACRES PLANTED IN SOY (HMAC)	0 503	0 717	0.702	0.621	0.613	0.654	0.689	0.683	0.752	0.790	0.859
		0 503	0.717	0.702	0.621	0 613	0.654	0.689	0.682	0.752	0.788	0.857
		0 503	0.717	0.702	0.621	0 613	0.654	0.693	0.702	0.728	0.772	0.864
		0. 503	0.717	0.702	0.625	0.622	0.682	0.736	0.745	0.831	0.870	0 941
[illegible]HSY	ACRES HARVESTED SOY (HMAC)	0 494	0 705	0.688	0.613	0.607	0.646	0.680	0.677	0.745	0.763	0.851
		0 494	0.705	0.688	0.613	0.607	0.646	0.680	0.676	0.745	0.781	0.850
		0 494	0 705	0.688	0.613	0.607	0.647	0.684	0.694	0.722	0.766	0.856
		0 494	0.705	0.688	0.616	0.615	0.673	0.724	0.735	0.819	0.858	0.927
[illegible]S	YIELD OF SOY (HBU/AC)	0 261	0.322	0.268	0.330	0.324	0.313	0.316	0.324	0.334	0.341	0.352
		0 261	0 322	0.268	0 330	0.324	0.313	0.316	0.324	0.334	0.341	0.352
		0 261	0 322	0.268	0.330	0.324	0.313	0.316	0.323	0.334	0.341	0.351
		0 261	0 322	0 268	0.330	0.324	0.313	0.316	0.323	0.333	0.340	0.351
[illegible]EQ	SHIFT OF SOY EQUIV (BBU)	0 000	0.012	0 019	0.038	0 067	0 106	0.154	0.205	0.260	0.280	0.302
		0 000	0 012	0.019	0.038	0 067	0.106	0.154	0.206	0 263	0.281	0.301
		0 000	0.012	0 019	0.038	0.066	0.097	0 134	0.195	0 263	0.288	0.301
		0.000	0.012	0 011	0.015	0.000	0.000	0 000	0.000	0.000	0.000	0.000

TABLE 3.8

PAGE 4

			1980	1981	1982	1983	1984	1985	1987	1990	1992	1995
D	TOTAL DEMAND (BBU)	1.308	2.248	1.869	2.036	2.059	2.151	2.328	2.415	2.770	2.969	3.311
		1.290	2.248	1.869	2.036	2.059	2.151	2.329	2.413	2.771	2.964	3.304
		1.268	2.248	1.869	2.036	2.056	2.143	2.321	2.462	2.697	2.919	3.325
		1.298	2.248	1.863	2.027	2.016	2.124	2.310	2.394	2.748	2.938	3.270
	[illegible] OF SOY + SOIY (BBU)	0.866	1.235	1.116	1.213	1.229	1.293	1.372	1.425	1.581	1.676	1.780
		0.866	1.235	1.116	1.213	1.229	1.274	1.370	1.419	1.571	1.664	1.759
		0.866	1.235	1.116	1.213	1.229	1.274	1.381	1.454	1.473	1.633	1.782
		0.866	1.233	1.114	1.211	1.217	1.284	1.367	1.424	1.579	1.673	1.774
INV	ADDITION TO SOY IN INV (BBU)	-0.142	0.185	-0.041	-0.034	-0.019	-0.002	0.022	0.003	0.013	0.015	0.012
		-0.142	0.185	-0.041	-0.034	-0.019	-0.002	0.022	0.003	0.014	0.015	0.013
		-0.142	0.185	-0.041	-0.034	-0.019	-0.003	0.022	0.011	0.006	0.007	0.016
		-0.142	0.185	-0.041	-0.033	-0.020	0.007	0.032	0.001	0.018	0.014	0.013
SY	[illegible] OF SOY (BBU)	0.964	0.828	0.793	0.856	0.848	0.859	0.934	0.986	1.176	1.278	1.519
		0.964	0.828	0.793	0.856	0.848	0.859	0.936	0.991	1.186	1.284	1.532
		0.964	0.826	0.793	0.856	0.816	0.852	0.918	0.996	1.217	1.279	1.527
		0.964	0.828	0.789	0.849	0.819	0.834	0.912	0.969	1.152	1.251	1.483
SY	CARRYOVER OF SOY FROM T (BBU)	0.103	0.359	0.318	0.284	0.266	0.264	0.286	0.285	0.331	0.354	0.403
		0.103	0.359	0.318	0.284	0.266	0.264	0.286	0.285	0.332	0.354	0.404
		0.103	0.359	0.318	0.284	0.265	0.263	0.285	0.294	0.326	0.346	0.408
		0.103	0.359	0.318	0.285	0.266	0.273	0.305	0.312	0.366	0.390	0.441

TABLE 3.8

		1979	1980	1981	1982	1983	1984	1985.	1987.	1990.	1992.	1995.
PWH	[illegible]	[illegible]	3.946	4.726	4.405	4.816	5.005	5.238	6.031	7.010	7.794	9.229
		[illegible]	3.946	4.726	4.405	4.816	5.006	5.244	6.060	7.100	7.903	9.399
		[illegible]	3.946	4.726	4.405	4.769	4.859	5.050	6.276	7.458	8.275	9.494
		[illegible]	3.946	4.726	4.406	4.816	4.985	5.208	5.995	6.933	7.704	9.108
[illegible]CPI	PRICE WHEAT CPI ($/BU)	[illegible]	3.057	3.358	2.957	3.125	3.103	3.052	3.066	3.074	3.049	3.044
		[illegible]	3.057	3.358	2.957	3.125	3.102	3.050	3.064	3.064	3.037	3.028
		[illegible]	3.057	3.358	2.957	3.127	3.110	3.082	3.064	2.999	3.026	3.010
		[illegible]	3.057	3.357	2.958	3.126	3.091	3.034	3.048	3.040	3.014	3.004
[illegible]S	TOTAL [illegible] OF WHEAT (BBU)	[illegible]	2.368	2.266	2.428	2.385	2.489	2.598	2.730	2.956	3.127	3.386
		[illegible]	2.368	2.266	2.428	2.385	2.489	2.598	2.731	2.957	3.128	3.386
		[illegible]	2.368	2.266	2.428	2.385	2.488	2.594	2.732	2.955	3.123	3.383
		[illegible]	2.368	2.266	2.426	2.383	2.485	2.593	2.729	2.965	3.141	3.407
[illegible]WH	SUPPLY OF WHEAT (BBU)	[illegible]	2.368	2.266	2.428	2.385	2.489	2.598	2.730	2.956	3.127	3.386
		[illegible]	2.368	2.266	2.428	2.385	2.489	2.598	2.731	2.957	3.128	3.386
		[illegible]	2.368	2.266	2.428	2.385	2.488	2.594	2.732	2.955	3.123	3.383
		[illegible]	2.368	2.266	2.426	2.383	2.485	2.593	2.729	2.965	3.141	3.407
[illegible]HB	[illegible] PLANTED IN WHEAT	[illegible]	0.344	0.325	0.350	0.346	0.346	0.347	0.341	0.338	0.337	0.336
		[illegible]	0.344	0.325	0.350	0.346	0.346	0.347	0.341	0.338	0.337	0.337
		[illegible]	0.344	0.325	0.350	0.346	0.346	0.347	0.340	0.339	0.338	0.336
		[illegible]	0.344	0.325	0.350	0.346	0.346	0.348	0.343	0.341	0.341	0.341
[illegible]WH	[illegible] PLANTED WHEAT (HMAC)	[illegible]	0.803	0.745	0.798	0.761	0.788	0.815	0.834	0.870	0.900	0.943
		[illegible]	0.803	0.745	0.798	0.761	0.788	0.815	0.834	0.870	0.901	0.943
		[illegible]	0.803	0.745	0.798	0.761	0.787	0.814	0.835	0.870	0.899	0.942
		[illegible]	0.803	0.745	0.796	0.760	0.786	0.813	0.834	0.874	0.906	0.951
[illegible]WH	[illegible] HARVESTED WHEAT(HMAC)	[illegible]	0.709	0.664	0.711	0.679	0.703	0.727	0.745	0.777	0.804	0.843
		[illegible]	0.709	0.664	0.711	0.679	0.703	0.727	0.745	0.777	0.804	0.843
		[illegible]	0.709	0.664	0.711	0.679	0.703	0.726	0.745	0.777	0.803	0.842
		[illegible]	0.709	0.664	0.710	0.679	0.701	0.726	0.744	0.780	0.809	0.850
[illegible]	[illegible] WHEAT (HBU/AC)	[illegible]	0.334	0.341	0.342	0.351	0.354	0.357	0.367	0.380	0.389	0.402
		[illegible]	0.334	0.341	0.342	0.351	0.354	0.357	0.367	0.380	0.389	0.402
		[illegible]	0.334	0.341	0.342	0.351	0.354	0.357	0.367	0.380	0.389	0.402
		[illegible]	0.334	0.341	0.342	0.351	0.354	0.357	0.367	0.380	0.388	0.401

TABLE 3.8

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		1980	1981	1982	1983	1984.	1985.	1987.	1990.	1992.	1995.
[illegible]	TOTAL DEMAND FOR WHEAT (BBU)	2.343	2.314	2.407	2.406	2.499	2.622	2.743	2.972	3.140	3.397
		2.343	2.314	2.407	2.406	2.499	2.622	2.743	2.974	3.140	3.397
		2.343	2.314	2.407	2.405	2.496	2.617	2.749	2.968	3.131	3.396
		2.343	2.313	2.401	2.399	2.494	2.619	2.739	2.981	3.152	3.417
[illegible]	CONSUMPTION OF WHEAT (BBU)	0.664	0.664	0.673	0.685	0.696	0.701	0.709	0.732	0.742	0.756
		0.664	0.664	0.673	0.685	0.696	0.701	0.709	0.731	0.739	0.753
		0.664	0.664	0.673	0.685	0.699	0.708	0.703	0.710	0.744	0.753
		0.664	0.664	0.673	0.685	0.697	0.702	0.709	0.733	0.742	0.757
[illegible]	CONSUMPTION WHEAT AS FEED (BBU)	0.187	0.113	0.155	0.079	0.130	0.142	0.158	0.168	0.179	0.185	0.193
		0.187	0.113	0.155	0.079	0.130	0.142	0.158	0.167	0.178	0.185	0.191
		0.187	0.113	0.155	0.079	0.130	0.141	0.157	0.167	0.170	0.185	0.196
		0.187	0.113	0.154	0.077	0.123	0.129	0.143	0.153	0.163	0.171	0.179
[illegible]INV	ADDITIONS TO WHEAT INVEN (BBU)	0.065	0.003	-0.024	0.017	-0.002	0.001	0.005	0.002	-0.000	0.002	0.001
		0.065	0.003	-0.024	0.017	-0.002	0.001	0.005	0.002	0.001	0.002	0.001
		0.065	0.003	-0.024	0.017	-0.002	0.000	0.002	0.004	0.005	0.001	0.001
		0.065	0.003	-0.023	0.017	-0.002	0.002	0.006	0.003	0.001	0.003	0.002
[illegible]H	EXPORT OF WHEAT (BBU)	1.124	1.563	1.517	1.637	1.593	1.660	1.758	1.863	2.061	2.211	2.447
		1.124	1.563	1.517	1.637	1.593	1.660	1.759	1.865	2.065	2.214	2.451
		1.124	1.563	1.517	1.637	1.591	1.656	1.750	1.875	2.083	2.202	2.447
		1.124	1.563	1.518	1.637	1.592	1.667	1.768	1.874	2.084	2.236	2.480
[illegible]H	CARRYOVER OF WHEAT FROM T (BBU)	1.177	0.928	0.905	0.922	0.920	0.920	0.925	0.929	0.933	0.936	0.940
		1.177	0.928	0.905	0.922	0.920	0.921	0.926	0.929	0.934	0.939	0.944
		1.177	0.928	0.905	0.922	0.920	0.920	0.922	0.925	0.944	0.948	0.953
		1.177	0.928	0.905	0.922	0.920	0.921	0.928	0.933	0.940	0.946	0.952
[illegible]	TOTAL ACRES PLANTED (HMAC)	2.103	2.334	2.295	2.278	2.202	2.276	2.348	2.448	2.575	2.673	2.803
		2.103	2.334	2.295	2.278	2.202	2.276	2.348	2.448	2.576	2.672	2.802
		2.103	2.334	2.295	2.278	2.202	2.275	2.345	2.454	2.566	2.656	2.802
		2.103	2.334	2.295	2.277	2.201	2.273	2.339	2.431	2.560	2.657	2.790

TABLE 3.8

MACRO VARIABLES

		1977	1980	1981.	1982.	1983.	1984.	1985.	1987.	1990.	1992.	1995.
POP	POPULATION (MM)	2.202	2.277	2.297	2.318	2.340	2.362	2.384	2.428	2.491	2.530	2.583
		2.202	2.277	2.297	2.318	2.340	2.362	2.384	2.428	2.491	2.530	2.583
		2.202	2.277	2.297	2.318	2.340	2.362	2.384	2.428	2.491	2.530	2.583
		2.202	2.277	2.297	2.318	2.340	2.362	2.384	2.428	2.491	2.530	2.583
CPI	CONSUMER PRICE INDEX	1.000	1.292	1.405	1.491	1.540	1.612	1.715	1.966	2.279	2.555	3.031
		1.000	1.292	1.405	1.491	1.540	1.613	1.718	1.977	2.316	2.601	3.103
		1.000	1.292	1.405	1.491	1.530	1.562	1.637	2.047	2.486	2.734	3.153
		1.000	1.292	1.405	1.491	1.540	1.612	1.715	1.966	2.279	2.555	3.031
WPI	WHOLESALE PRICE INDEX	0.999	1.275	1.426	1.527	1.586	1.665	1.774	2.039	2.380	2.674	3.177
		0.999	1.275	1.426	1.527	1.586	1.665	1.776	2.047	2.409	2.713	3.235
		0.999	1.275	1.426	1.527	1.579	1.624	1.710	2.109	2.554	2.827	3.284
		0.999	1.275	1.426	1.527	1.586	1.665	1.774	2.039	2.380	2.674	3.177
PGNP	GNP DEFLATOR	0.999	1.275	1.426	1.527	1.586	1.665	1.774	2.039	2.380	2.674	3.177
		0.999	1.275	1.426	1.527	1.586	1.665	1.776	2.047	2.409	2.713	3.235
		0.999	1.275	1.426	1.527	1.579	1.624	1.710	2.109	2.554	2.827	3.284
		0.999	1.275	1.426	1.527	1.586	1.665	1.774	2.039	2.380	2.674	3.177
NYDPC	NOMINAL INCOME PER CAPITA	5.966	8.013	8.833	9.490	10.247	11.108	11.971	14.061	17.403	20.000	24.650
		5.966	8.013	8.833	9.489	10.248	11.105	11.964	14.114	17.608	20.210	24.986
		5.966	8.013	8.833	9.490	10.200	10.855	11.672	14.366	17.757	21.498	25.384
		5.966	8.013	8.833	9.490	10.247	11.108	11.971	14.061	17.403	20.000	24.650
NYDPCD	PERSONAL INC. / CPI	5.966	6.202	6.287	6.365	6.654	6.891	6.980	7.152	7.636	7.828	8.133
		5.966	6.202	6.287	6.364	6.654	6.885	6.964	7.139	7.603	7.770	8.052
		5.966	6.202	6.287	6.365	6.667	6.949	7.130	7.018	7.143	7.863	8.051
		5.966	6.202	6.287	6.365	6.654	6.891	6.980	7.152	7.636	7.828	8.133
NPPF	INDEX OF FARMERS COSTS	1.009	1.288	1.441	1.543	1.603	1.682	1.792	2.060	2.405	2.702	3.210
		1.009	1.288	1.441	1.543	1.603	1.682	1.795	2.068	2.434	2.741	3.269
		1.009	1.288	1.441	1.543	1.595	1.641	1.728	2.131	2.581	2.856	3.318
		1.009	1.288	1.441	1.543	1.603	1.682	1.792	2.060	2.405	2.702	3.210

TABLE 3.8 **PAGE 8**

ALCOHOL SIZE … TABLES

Variable	Description	[illegible]	1980	1981	1982.	1983	1984.	1985.	1987.	1990.	1992.	1995.
[illegible]GAS	CONSUMP [illegible] GASOLINE (BBRL)	[illegible]	2.356	2.358	2.323	2.395	2.467	2.497	2.543	2.639	2.699	2.808
		2.940	2.356	2.358	2.323	2.392	2.467	2.490	2.536	2.618	2.671	2.769
		2.940	2.356	2.358	2.323	2.402	2.513	2.571	2.458	2.471	2.664	2.743
		2.940	2.356	2.358	2.323	2.395	2.467	2.497	2.543	2.639	2.699	2.808
[illegible]GASPC	CONS [illegible] OF GAS/APOP (BRL)	11.[illegible]	10.351	10.267	10.019	10.233	10.443	10.474	10.476	10.593	10.668	10.872
		11.532	10.351	10.267	10.019	10.223	10.443	10.445	10.447	10.509	10.559	10.719
		11.[illegible]	10.351	10.267	10.019	10.263	10.640	10.786	10.122	9.922	10.531	10.620
		11.532	10.351	10.267	10.019	10.233	10.443	10.474	10.476	10.593	10.668	10.872
[illegible]	PRICE O[illegible] FUDE INDEX	1.000	2.346	2.910	2.666	2.631	2.827	3.041	3.469	4.102	4.620	5.395
		1.000	2.346	2.910	2.666	2.631	2.836	3.068	3.576	4.508	5.161	6.243
		1.000	2.346	2.910	2.666	2.488	2.114	2.114	4.753	6.136	6.179	6.243
		1.000	2.346	2.910	2.666	2.631	2.827	3.041	3.469	4.102	4.620	5.395
[illegible]GAS	PRICE O[illegible] GAS ETH BLEND($/GAL)	0.479	0.918	1.134	0.997	1.046	1.122	1.207	1.365	1.596	1.782	2.070
		0.479	0.918	1.134	0.997	1.046	1.125	1.216	1.400	1.728	1.957	2.345
		0.479	0.918	1.134	0.997	1.000	0.890	0.904	1.782	2.256	2.289	2.351
		0.479	0.918	1.133	0.995	1.039	1.111	1.193	1.349	1.576	1.760	2.045
[illegible]GASR	PROD PR[illegible] INDEX REFIN GAS	0.936	1.968	2.436	2.143	2.234	2.390	2.561	2.901	3.405	3.817	4.434
		0.936	1.968	2.436	2.143	2.234	2.397	2.582	2.986	3.728	4.248	5.109
		0.936	1.968	2.436	2.143	2.120	1.823	1.823	3.923	5.024	5.058	5.109
		0.936	1.968	2.436	2.143	2.234	2.390	2.561	2.901	3.405	3.817	4.434
[illegible]SS	GATE PRIC[illegible] GASOLINE ($/GAL)	0.415	0.872	1.079	0.949	0.990	1.059	1.134	1.285	1.508	1.691	1.964
		0.415	0.872	1.079	0.949	0.990	1.062	1.144	1.323	1.652	1.882	2.263
		0.415	0.872	1.079	0.949	0.939	0.807	0.807	1.738	2.226	2.241	2.263
		0.415	0.872	1.079	0.949	0.990	1.059	1.134	1.285	1.508	1.691	1.964
[illegible]ALC	GUAN A[illegible] AS OCT BOAST (BGAL)	0.000	0.125	0.189	0.415	0.797	1.319	1.953	2.625	3.334	3.561	3.809
		0.000	0.125	0.189	0.415	0.797	1.321	1.954	2.641	3.368	3.584	3.799
		0.000	0.125	0.189	0.415	0.778	1.197	1.687	2.491	3.369	3.679	3.798
		0.000	0.125	0.112	0.155	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[illegible]ALC	ALC FROM WET MILL (BGAL)	0.000	0.125	0.189	0.300	0.324	0.350	0.377	0.440	0.555	0.647	0.815
		0.000	0.125	0.189	0.300	0.324	0.350	0.377	0.440	0.555	0.647	0.815
		0.000	0.125	0.189	0.300	0.324	0.350	0.377	0.440	0.555	0.647	0.815
		0.000	0.125	0.112	0.155	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[illegible]ALC	ALC FROM WHOLE CORN(BGAL)	0.000	0.000	0.000	0.115	0.473	0.969	1.576	2.185	2.779	2.914	2.994
		0.000	0.000	0.000	0.115	0.473	0.971	1.577	2.201	2.813	2.937	2.984
		0.000	0.000	0.000	0.115	0.454	0.847	1.310	2.051	2.814	3.032	2.983
		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

TABLE 2.8

		1977	1980	1981.	1982.	1983	1984.	1985.	1987.	1990.	1992.	1995.
FRAC	FRAC [illegible] GAS MADE WITH ALC	.000	0.097	0.147	0.236	0.360	0.490	0.601	0.768	0.912	0.952	0.979
		0.000	0.097	0.147	0.236	0.360	0.490	0.603	0.775	0.928	0.968	0.990
		0.000	0.097	0.147	0.236	0.350	0.436	0.504	0.754	0.983	0.996	0.999
		0.000	0.097	0.055	0.079	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RATIO	RATIO [illegible] ALC TO PTOT-L	1.220	0.808	0.798	0.750	0.757	0.796	0.844	0.886	0.925	0.948	0.994
		1.220	0.808	0.798	0.750	0.757	0.795	0.841	0.876	0.887	0.895	0.917
		1.220	0.808	0.798	0.750	0.773	0.879	0.952	0.769	0.757	0.820	0.933
		1.220	0.808	1.018	0.969	1.337	1.333	1.361	1.343	1.302	1.265	1.268
PTOTAL	PGASS+SUBSIDIES ($/GAL)	0.867	1.657	2.038	1.907	2.049	2.125	2.207	2.354	2.579	2.740	3.043
		0.867	1.657	2.038	1.907	2.049	2.128	2.217	2.394	2.731	2.941	3.359
		0.867	1.657	2.038	1.907	1.996	1.859	1.862	2.831	3.338	3.323	3.360
		0.867	1.657	1.588	1.457	1.109	1.185	1.267	1.434	1.679	1.880	2.183
PGASS	GATE PRICE GASOLINE ($/GAL)	0.415	0.872	1.079	0.949	0.990	1.059	1.134	1.285	1.508	1.691	1.964
		0.415	0.872	1.079	0.949	0.990	1.062	1.144	1.323	1.652	1.882	2.263
		0.415	0.872	1.079	0.949	0.939	0.807	0.807	1.738	2.226	2.241	2.263
		0.415	0.872	1.079	0.949	0.990	1.059	1.134	1.285	1.508	1.691	1.964
OCTPRE	OCTANE PREMIUM ($/GAL)	0.018	0.042	0.052	0.048	0.047	0.051	0.054	0.062	0.073	0.083	0.096
		0.018	0.042	0.052	0.048	0.047	0.051	0.055	0.064	0.081	0.092	0.112
		0.018	0.042	0.052	0.048	0.044	0.038	0.038	0.085	0.110	0.110	0.112
		0.018	0.042	0.052	0.048	0.047	0.051	0.054	0.062	0.073	0.083	0.096
SHIPP	SHIPPING SAVINGS ($/GAL)	0.034	0.043	0.046	0.050	0.052	0.055	0.058	0.067	0.077	0.086	0.102
		0.034	0.043	0.046	0.050	0.052	0.055	0.058	0.067	0.078	0.087	0.104
		0.034	0.043	0.046	0.050	0.052	0.054	0.057	0.068	0.083	0.092	0.105
		0.034	0.043	0.046	0.050	0.052	0.055	0.058	0.067	0.077	0.086	0.102
STATE	STATE SUBSIDY ($/GAL)	0.000	0.300	0.460	0.460	0.460	0.460	0.460	0.440	0.420	0.380	0.380
		0.000	0.300	0.460	0.460	0.460	0.460	0.460	0.440	0.420	0.380	0.380
		0.000	0.300	0.460	0.460	0.460	0.460	0.460	0.440	0.420	0.380	0.380
		0.000	0.300	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
FED40	FEDERAL SUBSIDY ($/GAL)	0.400	0.400	0.400	0.400	0.500	0.500	0.500	0.500	0.500	0.500	0.500
		0.400	0.400	0.400	0.400	0.500	0.500	0.500	0.500	0.500	0.500	0.500
		0.400	0.400	0.400	0.400	0.500	0.500	0.500	0.500	0.500	0.500	0.500
		0.400	0.400	0.400	0.400	0.010	0.010	0.010	0.010	0.010	0.010	0.010

TABLE 3.8

		1980	1981	1982	1983.	1984.	1985	1987	1990.	1992.	1995.
[illegible]	PRICE [illegible]	1.058	1.338	1.627	1.430	1.551	1.692	1.863	2.085	2.386	2.596	3.024
		1.058	1.338	1.627	1.430	1.551	1.692	1.866	2.097	2.421	2.632	3.081
		1.058	1.338	1.627	1.430	1.543	1.635	1.772	2.176	2.527	2.725	3.136
		1.058	1.338	1.616	1.411	1.483	1.579	1.724	1.926	2.186	2.378	2.768
PWALC1	PRICE [illegible] ILL ALC ($/GAL)	1.058	1.373	1.647	1.430	1.551	1.692	1.863	2.085	2.386	2.596	3.024
		1.058	1.373	1.647	1.430	1.551	1.692	1.866	2.097	2.421	2.632	3.081
		1.058	1.373	1.647	1.430	1.543	1.635	1.772	2.176	2.527	2.725	3.136
		1.058	1.373	1.635	1.411	1.483	1.579	1.724	1.926	2.186	2.378	2.768
PWALC	PRICE AT MILL - ROI	0.912	1.187	1.439	1.207	1.320	1.449	1.604	1.787	2.039	2.206	2.560
		0.912	1.187	1.439	1.207	1.320	1.449	1.606	1.798	2.069	2.236	2.609
		0.912	1.187	1.439	1.207	1.312	1.398	1.523	1.868	2.154	2.312	2.656
		0.912	1.187	1.426	1.188	1.251	1.336	1.465	1.629	1.838	1.988	2.304
[illegible]WALC1	PRICE [illegible] G.E COMP ALC ($/GAL)	1.117	1.338	1.627	1.433	1.567	1.725	1.890	2.144	2.466	2.717	3.186
		1.117	1.338	1.627	1.433	1.567	1.726	1.892	2.155	2.499	2.753	3.242
		1.117	1.338	1.627	1.433	1.558	1.669	1.804	2.236	2.603	2.857	3.297
		1.117	1.338	1.616	1.417	1.514	1.633	1.772	2.008	2.295	2.532	2.971
[illegible]WALC	PRICE [illegible]HOLE COMP - ROI	1.014	1.206	1.478	1.274	1.402	1.552	1.705	1.932	2.219	2.439	2.856
		1.014	1.206	1.478	1.274	1.402	1.553	1.708	1.942	2.249	2.471	2.906
		1.014	1.206	1.478	1.274	1.394	1.500	1.626	2.017	2.337	2.563	2.956
		1.014	1.206	1.468	1.258	1.349	1.460	1.588	1.796	2.048	2.254	2.640

TABLE 3.B

		1979	1980	1981	1982	1983.	1984.	1985	1987	1990.	1992.	1995.
PCOC	PRICE INDEX FOR STEAM COAL	0.986	1.105	1.165	1.276	1.316	1.368	1.464	1.712	2.029	2.321	2.835
		0.986	1.105	1.165	1.276	1.316	1.369	1.467	1.724	2.068	2.359	2.909
		0.986	1.105	1.165	1.276	1.308	1.325	1.400	1.799	2.196	2.439	2.912
		0.986	1.105	1.165	1.276	1.316	1.368	1.464	1.712	2.029	2.321	2.835
PCEL	PRICE INDEX FOR ELECTRICITY	0.995	1.327	1.436	1.504	1.526	1.565	1.635	1.835	2.028	2.249	2.632
		0.995	1.327	1.436	1.504	1.526	1.567	1.641	1.850	2.073	2.301	2.713
		0.995	1.327	1.436	1.504	1.512	1.497	1.539	1.960	2.273	2.418	2.753
		0.995	1.327	1.436	1.504	1.526	1.565	1.635	1.835	2.028	2.249	2.632
PLAB	PRICE INDEX FOR LABOR	1.000	1.304	1.441	1.521	1.632	1.707	1.828	2.140	2.482	2.811	3.388
		1.000	1.304	1.441	1.521	1.632	1.708	1.833	2.154	2.525	2.845	3.460
		1.000	1.304	1.441	1.521	1.626	1.675	1.777	2.214	2.687	2.976	3.508
		1.000	1.304	1.441	1.521	1.632	1.707	1.828	2.140	2.482	2.811	3.388
POTH	PRICE INDEX FOR OTHER COSTS	0.999	1.275	1.426	1.527	1.586	1.665	1.774	2.039	2.380	2.674	3.177
		0.999	1.275	1.426	1.527	1.586	1.665	1.776	2.047	2.409	2.713	3.235
		0.999	1.275	1.426	1.527	1.579	1.624	1.710	2.109	2.554	2.827	3.284
		0.999	1.275	1.426	1.527	1.586	1.665	1.774	2.039	2.380	2.674	3.177
PFRT	PRICE INDEX FOR FREIGHT	0.997	1.241	1.347	1.445	1.516	1.600	1.693	1.934	2.246	2.501	2.960
		0.997	1.241	1.347	1.445	1.516	1.601	1.695	1.944	2.277	2.533	3.018
		0.997	1.241	1.347	1.445	1.511	1.571	1.650	1.967	2.408	2.674	3.053
		0.997	1.241	1.347	1.445	1.516	1.600	1.693	1.934	2.246	2.501	2.960

TABLE 3.8

		1979	1980.	1981	1982	1983	1984.	1985.	1987.	1990	1992.	1995.
[illegible]	PRICE [illegible] FOR 94 PB COSTS	[illegible]	1 275	1 426	1.527	1 586	1 665	1.774	2.037	2.380	2.674	3.177
		[illegible]	1 275	1 426	1.527	1.586	1.665	1.776	2 047	2.409	2.713	3.235
		[illegible]	1 275	1.426	1.527	1.579	1.624	1.710	2.109	2.554	2 827	3.284
		[illegible]	1 275	1 426	1.527	1 586	1.665	1 774	2.039	2.380	2.674	3.177
PBLO	THE PRICE OF BLC S (H$/TON)	1 212	1.434	1 702	1.461	1.654	1 897	2.018	2.426	2.836	3.287	3.942
		1 212	1.434	1 702	1.461	1.654	1.898	2.019	2.429	2.857	3.323	3.990
		1 212	1 434	1.702	1 461	1 646	1.847	1.959	2.522	2.944	3.471	4.044
		1 212	1.434	1 705	1.467	1.686	1.914	2 019	2.414	2.825	3.283	3.949
PCLO	THE PRICE OF CGF (H$/TON)	0 913	1 030	1 379	1.209	1.362	1.557	1.646	1.987	2.325	2.708	3.255
		0 913	1.030	1.379	1.209	1.362	1.558	1.646	1.989	2.342	2.738	3.293
		0.913	1 030	1.379	1.209	1.356	1 519	1.602	2.063	2.415	2.862	3.336
		0 913	1 030	1 384	1.217	1.399	1.588	1.666	2.000	2.345	2.737	3.298
PCOM	THE PRICE OF CGM (H$/TON)	2.100	2.369	3.171	2.780	3.132	3.581	3.785	4.571	5.348	6.230	7.487
		2.100	2.369	3.171	2.780	3.132	3.582	3.787	4.575	5.386	6.297	7.575
		2 100	2 369	3.171	2.780	3.118	3.493	3.685	4.744	5.553	6.582	7.673
		2 100	2.369	3.182	2.798	3.218	3.651	3.832	4.601	5.394	6.294	7.586
PCOO	THE PRICE OF CORN OIL ($/LB)	0.307	0 263	0.238	0.238	0.269	0.309	0.330	0.396	0.463	0.535	0.642
		0 307	0.263	0.238	0.238	0.269	0.309	0.330	0.396	0.466	0.541	0.649
		0 307	0 263	0.238	0.238	0.268	0.301	0.320	0.412	0.480	0.565	0.658
		0.307	0.263	0.238	0.238	0.274	0.311	0.328	0.392	0.459	0.532	0.640

TABLE 3.8

QUANTITY OF BY-PRODUCTS

			1979	1980	1981	1982	1983.	1984.	1985.	1987.	1990.	1992.	1995.
QDFG	QUANTITY DDG'S	(BLBS)	0.000	0.000	0.000	0.760	3.120	6.385	10.384	14.399	18.315	19.204	19.731
			0.000	0.000	0.000	0.760	3.115	6.397	10.392	14.505	18.540	19.352	19.666
			0.000	0.000	0.000	0.760	2.990	5.584	8.632	13.516	18.541	19.979	19.660
			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
QCGM	QUANTITY CGM	(BLBS)	0.000	0.206	0.313	0.495	0.535	0.577	0.622	0.726	0.916	1.068	1.345
			0.000	0.206	0.313	0.495	0.535	0.577	0.622	0.726	0.916	1.068	1.345
			0.000	0.206	0.313	0.495	0.535	0.577	0.622	0.726	0.916	1.068	1.345
			0.000	0.206	0.185	0.256	0.000	0.000	0.000	0.000	0.000	0.000	0.000
QCGF	QUANTITY CGF	(BLBS)	0.000	0.731	1.110	1.758	1.899	2.051	2.209	2.578	3.252	3.791	4.776
			0.000	0.731	1.110	1.758	1.899	2.051	2.209	2.578	3.252	3.791	4.776
			0.000	0.731	1.110	1.758	1.899	2.051	2.209	2.578	3.252	3.791	4.776
			0.000	0.731	0.658	0.908	0.000	0.000	0.000	0.000	0.000	0.000	0.000
QCOO	QUAN CORN OIL	(BLBS)	0.000	0.101	0.153	0.243	0.262	0.283	0.305	0.356	0.450	0.524	0.660
			0.000	0.101	0.153	0.243	0.262	0.283	0.305	0.356	0.450	0.524	0.660
			0.000	0.101	0.153	0.243	0.262	0.283	0.305	0.356	0.450	0.524	0.660
			0.000	0.101	0.091	0.126	0.000	0.000	0.000	0.000	0.000	0.000	0.000

BU = BUSHEL
BBU = BILLION BUSHELS
MAC = MILLION ACRES
HMAC = HUNDRED MILLION ACRES
HBU = HUNDRED BUSHELS PER ACRE
LB = POUND
BLBS = BILLIONS OF POUNDS
HB = HUNDREDS OF DOLLARS
BBL = BARRELS
MBRL = MILLION BARRELS
BBRL = BILLION BARRELS
MGAS = MILLION GALLONS
BGAL = BILLION GALLONS

TABLE 3.9

PCO	PRICE OF CORN ($/BU)	2.150	2.524	3.099	2.449	2.883	3.385	3.762	4.378	5.084	5.695	6.735
		2.150	2.524	3.299	2.449	2.896	3.399	3.773	4.483	5.263	5.955	6.885
		2.150	2.524	3.299	2.449	2.883	3.385	3.770	3.997	5.113	5.700	6.680
		2.150	2.524	3.299	2.449	2.883	3.385	6.029	4.696	5.059	5.766	6.735
PCPI	PRICE OF CORN / CPI ($/$)	2.150	1.953	2.345	1.649	1.868	2.097	2.189	2.225	2.229	2.227	2.221
		2.150	1.953	2.345	1.649	1.876	2.106	2.195	2.278	2.307	2.329	2.270
		2.150	1.953	2.345	1.649	1.868	2.097	2.193	2.038	2.240	2.227	2.203
		2.150	1.953	2.345	1.649	1.868	2.097	3.512	2.391	2.215	2.256	2.221
QCOS	TOTAL SUPPLY OF CORN (BBU)	6.285	7.947	6.651	8.115	8.139	7.751	8.015	9.012	9.755	10.368	11.111
		6.285	7.947	6.651	8.115	8.143	7.771	8.043	9.101	10.041	10.747	11.478
		6.285	7.947	6.651	8.115	8.139	7.750	8.017	9.549	9.508	10.206	11.171
		6.285	7.947	6.651	8.115	8.139	7.751	8.025	8.876	9.641	10.268	10.949
QCU	SUPPLY OF CORN GROWN (BBU)	6.285	7.942	6.643	8.097	8.102	7.688	7.919	8.883	9.591	10.194	10.926
		6.285	7.942	6.643	8.097	8.102	7.703	7.946	8.946	9.821	10.496	11.229
		6.285	7.942	6.643	8.097	8.102	7.687	7.922	9.449	9.364	10.043	10.992
		6.285	7.942	6.643	8.097	8.102	7.688	7.919	8.774	9.487	10.101	10.778
QHAC	% OF LAND PLANTED IN CORN	0.402	0.349	0.369	0.377	0.376	0.367	0.359	0.380	0.370	0.367	0.357
		0.402	0.349	0.369	0.377	0.376	0.367	0.361	0.384	0.381	0.381	0.369
		0.402	0.349	0.369	0.377	0.376	0.367	0.359	0.399	0.359	0.361	0.360
		0.402	0.349	0.369	0.377	0.376	0.367	0.359	0.350	0.364	0.364	0.351
QHAC	ACRES PLANTED IN CORN (MMAC	0.845	0.815	0.848	0.860	0.828	0.834	0.844	0.931	0.953	0.982	1.001
		0.845	0.815	0.848	0.860	0.828	0.836	0.848	0.941	0.984	1.022	1.038
		0.845	0.815	0.848	0.860	0.828	0.834	0.844	1.015	0.923	0.963	1.009
		0.845	0.815	0.848	0.860	0.828	0.834	0.844	0.916	0.939	0.970	0.983
QHAC	ACRES HARVESTED CORN (MMAC)	0.715	0.724	0.730	0.737	0.709	0.715	0.723	0.799	0.817	0.842	0.858
		0.715	0.724	0.730	0.737	0.709	0.717	0.726	0.806	0.844	0.876	0.890
		0.715	0.724	0.730	0.737	0.709	0.715	0.723	0.871	0.791	0.825	0.865
		0.715	0.724	0.730	0.737	0.709	0.715	0.723	0.785	0.805	0.832	0.843
QYU	YIELD OF CORN (HBU/AC)	0.879	1.097	0.910	1.099	1.142	1.075	1.095	1.112	1.174	1.211	1.273
		0.879	1.097	0.910	1.099	1.142	1.074	1.094	1.109	1.164	1.198	1.261
		0.879	1.097	0.910	1.099	1.142	1.075	1.095	1.085	1.184	1.217	1.271
		0.879	1.097	0.910	1.099	1.142	1.075	1.095	1.117	1.179	1.214	1.279
QEFQ	SUPPLY OF CORN EQUIV (EBU)	0.000	0.005	0.008	0.018	0.037	0.063	0.095	0.129	0.164	0.174	0.185
		0.000	0.005	0.008	0.018	0.041	0.068	0.098	0.154	0.220	0.251	0.250
		0.000	0.005	0.008	0.018	0.037	0.063	0.095	0.100	0.144	0.163	0.179
		0.000	0.005	0.008	0.018	0.037	0.063	0.106	0.102	0.154	0.167	0.172

TABLE 3.9

			1980	1981	1982	1983	1984.	1985	1987.	1990.	1992.	1995.
[illegible]	TOTAL [illegible]	[illegible]	7.992	6.738	7.813	8.329	7.876	8.211	9.075	9.859	10.438	11.180
		[illegible]	7.992	6.738	7.813	8.337	7.897	8.223	9.176	10.147	10.821	11.548
		[illegible]	7.992	6.738	7.813	8.329	7.875	8.201	9.318	9.666	10.386	11.213
		[illegible]	7.992	6.738	7.813	8.329	7.876	8.104	8.808	9.836	10.308	10.997
[illegible]	C[illegible]TION OF [illegible]	(BBU)	4.121	5.248	4.932	5.232	5.635	5.841	6.070	6.420	7.018	7.279	7.615
			4.121	5.248	4.932	5.232	5.658	5.868	6.082	6.581	7.383	7.763	8.062
			4.121	5.248	4.932	5.232	5.635	5.841	6.068	5.925	6.876	7.229	7.569
			4.121	5.248	4.932	5.232	5.635	5.841	5.597	5.997	7.007	7.197	7.527
[illegible]DF	[illegible] CONSUMP AS FOOD	(BBU)	0.550	0.675	0.711	0.616	0.640	0.658	0.669	0.697	0.764	0.796	0.846
			0.550	0.675	0.711	0.616	0.639	0.658	0.669	0.694	0.760	0.791	0.843
			0.550	0.675	0.711	0.616	0.640	0.658	0.669	0.705	0.764	0.796	0.847
			0.550	0.675	0.711	0.616	0.640	0.658	0.608	0.689	0.765	0.795	0.846
[illegible]FEED	[illegible] CONSUMP AS FEED	(BBU)	3.971	4.519	4.139	4.441	4.669	4.650	4.620	4.675	4.922	5.058	5.241
			3.971	4.519	4.139	4.441	4.666	4.644	4.613	4.641	4.858	4.974	5.193
			3.971	4.519	4.139	4.441	4.669	4.650	4.618	4.391	4.934	5.096	5.238
			3.971	4.519	4.139	4.441	4.669	4.650	4.123	4.464	4.985	5.032	5.257
[illegible]ALC	[illegible] CONSUMP FOR ALC	(BBU)	0.000	0.054	0.082	0.176	0.327	0.532	0.782	1.048	1.331	1.424	1.529
			0.000	0.054	0.082	0.176	0.353	0.567	0.800	1.246	1.765	2.017	2.026
			0.000	0.054	0.082	0.176	0.327	0.532	0.781	0.828	1.179	1.337	1.485
			0.000	0.054	0.082	0.176	0.327	0.532	0.865	0.844	1.257	1.370	1.424
[illegible]INV	ADDITION TO INV OF CORN	(BBU)	0.485	0.314	-0.584	0.248	0.196	-0.301	-0.206	0.148	-0.023	0.054	0.020
			0.485	0.314	-0.584	0.248	0.193	-0.298	-0.198	0.147	0.003	0.068	0.018
			0.485	0.314	-0.584	0.248	0.196	-0.301	-0.208	0.656	-0.054	0.051	0.070
			0.485	0.314	-0.584	0.248	0.196	-0.301	-0.816	0.478	-0.046	0.045	-0.074
[illegible]O	EXPORT OF CORN	(BBU)	1.684	2.430	2.390	2.333	2.497	2.336	2.347	2.507	2.858	3.106	3.545
			1.684	2.430	2.390	2.333	2.486	2.326	2.340	2.449	2.761	2.970	3.468
			1.684	2.430	2.390	2.333	2.497	2.336	2.342	2.737	2.844	3.106	3.574
			1.684	2.430	2.390	2.333	2.497	2.336	3.323	2.334	2.875	3.066	3.545
[illegible]O	CARRY [illegible]A OF CORN FROM T	(BBU)	0.884	1.618	1.034	1.282	1.478	1.177	0.971	1.172	1.280	1.360	1.422
			0.884	1.618	1.034	1.282	1.474	1.177	0.978	1.169	1.350	1.450	1.570
			0.884	1.618	1.034	1.282	1.478	1.177	0.969	0.805	1.249	1.355	1.421
			0.884	1.618	1.034	1.282	1.478	1.177	0.361	1.159	1.338	1.216	1.409

TABLE 39

			1980.	1981	1982	1983	1984.	1985.	1987.	1990.	1992.	1995.
PDI	FSY / PCD	3.167	2.481	2.361	2.834	2.715	2.633	2.489	2.591	2.614	2.731	2.781
		3.167	2.481	2.361	2.834	2.694	2.617	2.490	2.504	2.512	2.569	2.718
		3.167	2.481	2.361	2.834	2.715	2.630	2.488	3.093	2.569	2.710	2.835
		3.167	2.481	2.361	2.834	2.715	2.633	3.444	2.136	2.646	2.689	2.744
	PRICE SOY ($/BU)	6.609	6.250	7.780	6.957	7.821	8.907	9.353	11.346	13.288	15.553	18.727
		6.609	6.250	7.780	6.957	7.794	8.893	9.385	11.223	13.219	15.419	18.715
		6.609	6.250	7.780	6.957	7.821	8.899	9.367	12.389	13.122	15.432	18.942
		6.609	6.250	7.780	6.957	7.821	8.907	20.753	10.030	13.358	15.507	18.485
PSYCPI	PRICE OF SOY / CPI ($/BU)	5.810	4.845	5.536	4.671	5.072	5.520	5.448	5.767	5.827	6.084	6.175
		5.810	4.845	5.536	4.671	5.055	5.511	5.467	5.704	5.796	6.031	6.171
		6.810	4.845	5.536	4.671	5.072	5.515	5.456	6.303	5.753	6.036	6.246
		6.810	4.845	5.536	4.671	5.072	5.520	12.095	5.106	5.863	6.065	6.095
QSYS	TOTAL SUPPLY OF SOY (BBU)	1.289	2.282	1.863	2.061	2.032	2.128	2.304	2.394	2.750	2.951	3.294
		1.289	2.282	1.863	2.061	2.037	2.128	2.297	2.405	2.754	2.958	3.298
		1.289	2.282	1.863	2.061	2.032	2.129	2.302	2.296	2.778	2.989	3.262
		1.289	2.282	1.863	2.061	2.032	2.128	2.320	2.643	2.818	2.921	3.336
QSY	SUPPLY OF SOY GROWN (BBU)	1.289	2.270	1.844	2.023	1.965	2.021	2.150	2.189	2.489	2.671	2.992
		1.289	2.270	1.844	2.023	1.965	2.015	2.140	2.162	2.412	2.567	2.902
		1.289	2.270	1.844	2.023	1.965	2.023	2.148	2.132	2.546	2.725	2.968
		1.289	2.270	1.844	2.023	1.965	2.021	2.150	2.476	2.571	2.652	3.053
ACSYB	% OF AP3 PLANTED IN SOY	0.239	0.307	0.306	0.273	0.278	0.287	0.293	0.279	0.292	0.296	0.306
		0.239	0.307	0.306	0.273	0.278	0.286	0.292	0.275	0.282	0.282	0.296
		0.239	0.307	0.306	0.273	0.278	0.287	0.293	0.260	0.300	0.303	0.304
		0.239	0.307	0.306	0.273	0.278	0.287	0.293	0.298	0.302	0.294	0.313
ACSY	ACRES PLANTED IN SOY (HMAC)	0.503	0.717	0.702	0.621	0.613	0.654	0.689	0.683	0.752	0.790	0.859
		0.503	0.717	0.702	0.621	0.613	0.652	0.686	0.674	0.727	0.757	0.831
		0.503	0.717	0.702	0.621	0.613	0.654	0.689	0.663	0.771	0.808	0.852
		0.503	0.717	0.702	0.621	0.613	0.654	0.689	0.780	0.779	0.784	0.878
AHSY	ACRES HARVESTED SOY (HMAC)	0.494	0.705	0.688	0.613	0.607	0.646	0.680	0.677	0.745	0.783	0.851
		0.494	0.705	0.688	0.613	0.607	0.644	0.677	0.668	0.722	0.752	0.825
		0.494	0.705	0.688	0.613	0.607	0.646	0.680	0.659	0.763	0.799	0.844
		0.494	0.705	0.688	0.613	0.607	0.646	0.680	0.767	0.770	0.777	0.869
YSY	YIELD OF SOY (HSU/AC)	0.261	0.322	0.268	0.330	0.324	0.313	0.316	0.324	0.334	0.341	0.352
		0.261	0.322	0.268	0.330	0.324	0.313	0.316	0.324	0.334	0.341	0.352
		0.261	0.322	0.268	0.330	0.324	0.313	0.316	0.324	0.334	0.341	0.352
		0.261	0.322	0.268	0.330	0.324	0.313	0.316	0.323	0.334	0.341	0.351
QSYEQ	SUPPLY OF SOY EQIVS. (BBU)	0.000	0.012	0.019	0.038	0.067	0.106	0.154	0.205	0.260	0.280	0.302
		0.000	0.012	0.019	0.038	0.072	0.113	0.157	0.242	0.342	0.391	0.396
		0.000	0.012	0.019	0.038	0.067	0.106	0.154	0.164	0.232	0.263	0.294
		0.000	0.012	0.019	0.038	0.067	0.106	0.170	0.167	0.246	0.269	0.282

TABLE 3.9

			1977.	1980	1981	1982	1983.	1984.	1985.	1987.	1990	1992.	1995.
D	TOTAL	FEMALE (BBU)	1.[illegible]	2.248	1.869	2.036	2.059	2.151	2.328	2.415	2.770	2.969	3.311
			1.[illegible]	2.248	1.869	2.036	2.063	2.151	2.322	2.425	2.774	2.977	3.316
			1.[illegible]	2.248	1.869	2.036	2.059	2.152	2.325	2.291	2.799	3.007	3.278
			1.[illegible]	2.248	1.869	2.036	2.059	2.151	2.331	2.618	2.812	2.940	3.354
[illegible]	[illegible]	OF SOY + EQIV (BBU)	0.[illegible]	1.235	1.116	1.213	1.229	1.293	1.372	1.425	1.581	1.676	1.780
			0.866	1.235	1.116	1.213	1.231	1.294	1.370	1.429	1.580	1.676	1.777
			0.866	1.235	1.116	1.213	1.229	1.294	1.371	1.350	1.588	1.684	1.772
			0.866	1.235	1.116	1.213	1.229	1.293	0.865	1.497	1.587	1.676	1.788
[illegible]INV	ADD[illegible]ON TO SOY IN INV (BBU)		-0.142	0.185	-0.041	-0.034	-0.019	-0.002	0.022	0.003	0.013	0.015	0.012
			-0.142	0.185	-0.041	-0.034	-0.018	-0.003	0.021	-0.000	0.012	0.011	0.018
			-0.142	0.185	-0.041	-0.034	-0.019	-0.001	0.021	0.039	0.020	0.035	0.004
			-0.142	0.185	-0.041	-0.034	-0.019	-0.002	-0.137	0.007	0.056	-0.019	0.026
E=SY	E[illegible]PORT OF SOY (BBU)		0.564	0.828	0.793	0.856	0.848	0.859	0.934	0.986	1.176	1.278	1.519
			0.564	0.828	0.793	0.856	0.851	0.861	0.931	0.997	1.182	1.290	1.520
			0.564	0.828	0.793	0.856	0.848	0.860	0.933	0.902	1.191	1.289	1.502
			0.564	0.828	0.793	0.856	0.848	0.859	1.603	1.114	1.169	1.282	1.539
C=SY	CARR[illegible]OVER OF SOY FROM T (BBU)		0.103	0.359	0.318	0.284	0.266	0.264	0.286	0.285	0.331	0.354	0.403
			0.103	0.359	0.318	0.284	0.266	0.263	0.284	0.282	0.320	0.339	0.389
			0.103	0.359	0.318	0.284	0.266	0.264	0.286	0.263	0.342	0.364	0.397
			0.103	0.359	0.318	0.284	0.266	0.264	0.127	0.346	0.343	0.351	0.415

TABLE 3.9

NAME	1977	1980	1981	1982	1983.	1984.	1985.	1987.	1990.	1992.	1995.
PWH	PRICE OF WHEAT ($/BU)	231	3.946	4.728	4.405	4.816	5.005	5.238	6.031	7.010	7.794	9.229
		231	3.946	4.728	4.405	4.817	5.004	5.242	6.032	7.021	7.812	9.261
		231	3.946	4.728	4.405	4.816	5.005	5.243	5.807	6.955	7.776	9.231
		231	3.946	4.728	4.405	4.816	5.005	13.038	5.618	7.144	7.796	9.275
PWHCPI	PRICE OF WHEAT CPI ($/BU)	3.330	3.057	3.258	2.957	3.125	3.103	3.052	3.066	3.074	3.049	3.044
		3.330	3.057	3.358	2.957	3.125	3.103	3.054	3.067	3.079	3.056	3.054
		3.330	3.057	3.358	2.957	3.125	3.104	3.054	2.955	3.050	3.041	3.045
		3.330	3.057	3.358	2.957	3.125	3.103	7.597	2.859	3.132	3.051	3.059
QWHS	TOTAL SUPPLY OF WHEAT (BBU)	2.035	2.368	2.266	2.428	2.385	2.489	2.598	2.730	2.956	3.127	3.386
		2.035	2.368	2.266	2.428	2.385	2.490	2.599	2.735	2.959	3.132	3.380
		2.035	2.368	2.266	2.428	2.385	2.489	2.598	2.813	2.974	3.123	3.387
		2.035	2.368	2.266	2.428	2.385	2.489	2.598	2.933	2.938	3.159	3.382
QWH	SUPPLY OF WHEAT (BBU)	2.035	2.368	2.266	2.428	2.385	2.489	2.598	2.730	2.956	3.127	3.386
		2.035	2.368	2.266	2.428	2.385	2.490	2.599	2.735	2.959	3.132	3.380
		2.035	2.368	2.266	2.428	2.385	2.489	2.598	2.813	2.974	3.123	3.387
		2.035	2.368	2.266	2.428	2.385	2.489	2.598	2.933	2.938	3.159	3.382
APWHB	% ACRES PLANTED IN WHEAT	0.359	0.344	0.325	0.350	0.346	0.346	0.347	0.341	0.338	0.337	0.336
		0.359	0.344	0.325	0.350	0.346	0.346	0.347	0.341	0.337	0.336	0.335
		0.359	0.344	0.325	0.350	0.346	0.346	0.347	0.341	0.341	0.337	0.336
		0.359	0.344	0.325	0.350	0.346	0.346	0.347	0.351	0.334	0.342	0.336
APWH	ACRES PLANTED WHEAT (HMAC)	0.755	0.803	0.745	0.798	0.761	0.788	0.815	0.834	0.870	0.900	0.943
		0.755	0.803	0.745	0.798	0.761	0.788	0.816	0.836	0.872	0.902	0.941
		0.755	0.803	0.745	0.798	0.761	0.788	0.815	0.868	0.877	0.899	0.943
		0.755	0.803	0.745	0.798	0.761	0.788	0.815	0.919	0.863	0.913	0.942
AHWH	ACRES HARVESTED WHEAT(HMAC)	0.665	0.709	0.664	0.711	0.679	0.703	0.727	0.745	0.777	0.804	0.843
		0.665	0.709	0.664	0.711	0.679	0.703	0.728	0.746	0.778	0.806	0.841
		0.665	0.709	0.664	0.711	0.679	0.703	0.727	0.774	0.783	0.803	0.843
		0.665	0.709	0.664	0.711	0.679	0.703	0.727	0.819	0.771	0.815	0.842
YWH	YIELD WHEAT (HBU/AC)	0.306	0.334	0.341	0.342	0.351	0.354	0.357	0.367	0.380	0.389	0.402
		0.306	0.334	0.341	0.342	0.351	0.354	0.357	0.367	0.380	0.389	0.402
		0.306	0.334	0.341	0.342	0.351	0.354	0.357	0.363	0.380	0.389	0.402
		0.306	0.334	0.341	0.342	0.351	0.354	0.357	0.358	0.381	0.388	0.402

TABLE 3.9

		1979	1980	1981	1982	1983	1984	1985	1987	1990	1992	1995
[illegible]	TOTAL [illegible] FOR WHEAT (BBU)	2.343	2.343	2.314	2.407	2.406	2.499	2.622	2.743	2.972	3.140	3.397
		2.343	2.343	2.314	2.407	2.406	2.500	2.621	2.747	2.975	3.144	3.392
		2.343	2.343	2.314	2.407	2.406	2.499	2.620	2.800	2.994	3.146	3.395
		2.343	2.343	2.314	2.407	2.406	2.499	2.617	2.915	2.960	3.166	3.394
WHF	CONSUMPTION OF WHEAT (BBU)	0.666	0.664	0.664	0.673	0.685	0.696	0.701	0.709	0.732	0.742	0.756
		0.666	0.664	0.664	0.673	0.685	0.696	0.701	0.709	0.732	0.741	0.756
		0.666	0.664	0.664	0.673	0.685	0.696	0.701	0.711	0.732	0.742	0.756
		0.666	0.664	0.664	0.673	0.685	0.696	0.642	0.712	0.731	0.742	0.756
WHFE	CONSUMPTION OF WHEAT AS FEED (BBU)	0.187	0.113	0.155	0.079	0.130	0.142	0.158	0.168	0.179	0.185	0.193
		0.187	0.113	0.155	0.079	0.131	0.143	0.158	0.173	0.186	0.195	0.196
		0.187	0.113	0.155	0.079	0.130	0.142	0.158	0.142	0.181	0.185	0.191
		0.187	0.113	0.155	0.079	0.130	0.142	0.171	0.087	0.169	0.188	0.191
WHINV	ADDITION TO WHEAT INVEN (BBU)	0.065	0.003	-0.024	0.017	-0.002	0.001	0.005	0.002	-0.000	0.002	0.001
		0.065	0.003	-0.024	0.017	-0.002	0.001	0.005	0.002	-0.000	0.001	0.001
		0.065	0.003	-0.024	0.017	-0.002	0.001	0.005	0.014	0.003	0.003	0.001
		0.065	0.003	-0.024	0.017	-0.002	0.001	-0.389	0.118	0.036	0.027	0.011
EXUH	EXPORTS OF WHEAT (BBU)	1.124	1.563	1.517	1.637	1.593	1.660	1.758	1.863	2.061	2.211	2.447
		1.124	1.563	1.517	1.637	1.592	1.660	1.757	1.863	2.058	2.206	2.439
		1.124	1.563	1.517	1.637	1.593	1.660	1.756	1.933	2.078	2.217	2.447
		1.124	1.563	1.517	1.637	1.593	1.660	2.193	1.998	2.023	2.210	2.435
CANH	CARRYOVER OF WHEAT FROM T (BBU)	1.177	0.928	0.905	0.922	0.920	0.920	0.925	0.929	0.933	0.936	0.940
		1.177	0.928	0.905	0.922	0.920	0.920	0.925	0.928	0.932	0.934	0.938
		1.177	0.928	0.905	0.922	0.920	0.920	0.925	0.930	0.932	0.936	0.941
		1.177	0.928	0.905	0.922	0.920	0.920	0.531	0.641	0.798	0.859	0.903
APH	TOTAL ACRES PLANTED (HMAC)	2.103	2.334	2.295	2.278	2.202	2.276	2.348	2.448	2.575	2.673	2.803
		2.103	2.334	2.295	2.278	2.202	2.276	2.349	2.450	2.583	2.681	2.811
		2.103	2.334	2.295	2.278	2.202	2.276	2.348	2.547	2.571	2.669	2.804
		2.103	2.334	2.295	2.278	2.202	2.276	2.348	2.615	2.581	2.667	2.803

TABLE 3.9

MACRO VARIABLES

		RMS	1977.	1980.	1981.	1982.	1983.	1984.	1985.	1987.	1990.	1992.	1995.
MPOP	POPULATION (MM)		2.202	2.277	2.297	2.318	2.340	2.362	2.384	2.428	2.491	2.530	2.583
MCPI	CONSUMER PRICE INDEX		1.000	1.292	1.405	1.491	1.540	1.612	1.715	1.966	2.279	2.555	3.031
MWPI	WHOLESALE PRICE INDEX		0.999	1.275	1.426	1.527	1.586	1.665	1.774	2.039	2.380	2.674	3.177
MGNP	GNP DEFLATOR		0.999	1.275	1.426	1.527	1.586	1.665	1.774	2.039	2.380	2.674	3.177
MYDPC	NOMINAL INCOME PER CAPITA		5.966	8.013	8.833	9.490	10.247	11.108	11.971	14.061	17.403	20.000	24.650
MYDPCD	PERSONAL INC / CPI		5.966	6.202	6.287	6.365	6.654	6.891	6.980	7.152	7.636	7.828	8.133
MPFF	INDEX OF FARMERS COSTS		1.009	1.288	1.441	1.543	1.603	1.682	1.792	2.060	2.405	2.702	3.210

		RMS	1977.	1980.	1981.	1982.	1983.	1984.	1985.	1987.	1990.	1992.	1995.
ALCOHOL SIDE VARIABLES													
QGAS	CONSUMP OF GASOLINE (BBRL)		2.540	2.356	2.358	2.323	2.395	2.467	2.497	2.543	2.639	2.699	2.808
			2.540	2.356	2.358	2.323	2.395	2.467	2.497	2.543	2.639	2.699	2.808
			2.540	2.356	2.358	2.323	2.395	2.467	2.497	2.543	2.639	2.699	2.808
			2.540	2.356	2.358	2.323	2.395	2.467	2.497	2.543	2.639	2.699	2.808
QGASPC	CONSUMP OF GAS/NPOP (BRL)		11.532	10.351	10.267	10.019	10.233	10.443	10.474	10.476	10.593	10.668	10.872
			11.532	10.351	10.267	10.019	10.233	10.443	10.474	10.476	10.593	10.668	10.872
			11.532	10.351	10.267	10.019	10.233	10.443	10.474	10.476	10.593	10.668	10.872
			11.532	10.351	10.267	10.019	10.233	10.443	10.474	10.476	10.593	10.668	10.872
PGR	PRICE OF RUDE INDEX		1.000	2.346	2.910	2.666	2.631	2.827	3.041	3.469	4.102	4.620	5.395
			1.000	2.346	2.910	2.666	2.631	2.827	3.041	3.469	4.102	4.620	5.395
			1.000	2.346	2.910	2.666	2.631	2.827	3.041	3.469	4.102	4.620	5.395
			1.000	2.346	2.910	2.666	2.631	2.827	3.041	3.469	4.102	4.620	5.395
PGAS	PRICE OF GAS ETH BLEND($/GAL)		0.479	0.918	1.134	0.997	1.046	1.122	1.207	1.365	1.596	1.782	2.070
			0.479	0.918	1.134	0.997	1.047	1.123	1.207	1.370	1.604	1.793	2.076
			0.479	0.918	1.134	0.997	1.046	1.122	1.207	1.341	1.599	1.783	2.066
			0.479	0.918	1.134	0.997	1.046	1.122	1.187	1.390	1.594	1.785	2.073
PGASR	PROD PRICE INDEX REFIN GAS		0.936	1.968	2.436	2.143	2.234	2.390	2.561	2.901	3.405	3.817	4.434
			0.936	1.968	2.436	2.143	2.234	2.390	2.561	2.901	3.405	3.817	4.434
			0.936	1.968	2.436	2.143	2.234	2.390	2.561	2.901	3.405	3.817	4.434
			0.936	1.968	2.436	2.143	2.234	2.390	2.561	2.901	3.405	3.817	4.434
PGASS	GATE PRICE GASOLINE ($/GAL)		0.415	0.872	1.079	0.949	0.990	1.059	1.134	1.285	1.508	1.691	1.964
			0.415	0.872	1.079	0.949	0.990	1.059	1.134	1.285	1.508	1.691	1.964
			0.415	0.872	1.079	0.949	0.990	1.059	1.134	1.285	1.508	1.691	1.964
			0.415	0.872	1.079	0.949	0.990	1.059	1.134	1.285	1.508	1.691	1.964
QALC	QUAN ALC AS OCT BOAST. (BGAL)		0.000	0.125	0.189	0.415	0.797	1.319	1.953	2.625	3.334	3.561	3.809
			0.000	0.125	0.189	0.415	0.864	1.407	1.998	3.129	4.439	5.074	5.078
			0.000	0.125	0.189	0.415	0.797	1.318	1.951	2.064	2.945	3.338	3.698
			0.000	0.125	0.189	0.415	0.797	1.319	2.165	2.105	3.144	3.424	3.543

TABLE 3.9

PAGE 8

		1977	1980	1981	1982	1983	1984	1985	1987	1990	1992	1995
[illegible] C	FRAC [illegible] GAS MADE WITH ALC	[illegible] 000	0 097	0 147	0 235	0 360	0 490	0 601	0 768	0 912	0 952	0 979
		0 000	0 097	0 147	0 235	0 358	0 485	0 595	0 751	0 890	0 932	0 861
		0 000	0 097	0 147	0 235	0 360	0 489	0 600	0 604	0 805	0 892	0 950
		0 000	0 097	0 147	0 235	0 360	0 490	0 666	0 616	0 860	0 915	0 910
RATIO	RATIO [illegible] ALC TO MTOTAL	1 220	0 808	0 798	0 750	0 757	0 796	0 844	0 886	0 925	0 948	0 994
		1 220	0 808	0 798	0 750	0 761	0 800	0 845	0 908	0 955	0 989	1 013
		1 220	0 808	0 798	0 750	0 757	0 797	0 845	0 782	0 935	0 952	0 980
		1 220	0 808	0 798	0 750	0 757	0 796	0 752	0 989	0 918	0 960	1 001
MTOTAL	PGASS+[illegible] BSIDIES ($/GAL)	0 667	1 657	2 038	1 907	2 049	2 125	2 207	2 354	2 579	2 740	3 043
		0 667	1 657	2 038	1 907	2 049	2 125	2 207	2 354	2 579	2 740	3 043
		0 667	1 657	2 038	1 907	2 049	2 125	2 207	2 354	2 579	2 740	3 043
		0 667	1 657	2 038	1 907	2 049	2 125	2 207	2 354	2 579	2 740	3 043
PGASS	GAS [illegible] PRICE GASOLIN ($/GAL)	0 415	0 872	1 079	0 949	0 990	1 059	1 134	1 285	1 508	1 691	1 964
		0 415	0 872	1 079	0 949	0 990	1 059	1 134	1 285	1 508	1 691	1 964
		0 415	0 872	1 079	0 949	0 990	1 059	1 134	1 285	1 508	1 691	1 964
		0 415	0 872	1 079	0 949	0 990	1 059	1 134	1 285	1 508	1 691	1 964
	RMS	1977.	1980.	1981.	1982.	1983.	1984.	1985.	1987.	1990.	1992.	1995.
OCTPRE	OCTA[illegible] E PREMIUM ($/GAL)	0 018	0 042	0 052	0 048	0 047	0 051	0 054	0 062	0 073	0 083	0 096
		0 018	0 042	0 052	0 048	0 047	0 051	0 054	0 062	0 073	0 083	0 096
		0 018	0 042	0 052	0 048	0 047	0 051	0 054	0 062	0 073	0 083	0 096
		0 018	0 042	0 052	0 048	0 047	0 051	0 054	0 062	0 073	0 083	0 096
SHIPP	SHIP[illegible]NG SAVINGS ($/GAL)	0 034	0 043	0 046	0 050	0 052	0 055	0 058	0 067	0 077	0 086	0 102
		0 034	0 043	0 046	0 050	0 052	0 055	0 058	0 067	0 077	0 086	0 102
		0 034	0 043	0 046	0 050	0 052	0 055	0 058	0 067	0 077	0 086	0 102
		0 034	0 043	0 046	0 050	0 052	0 055	0 058	0 067	0 077	0 086	0 102
STATE	STATE SUBSIDY ($/GAL)	0 000	0 300	0 460	0 460	0 460	0 460	0 460	0 440	0 420	0 380	0 380
		0 000	0 300	0 460	0 460	0 460	0 460	0 460	0 440	0 420	0 380	0 380
		0 000	0 300	0 460	0 460	0 460	0 460	0 460	0 440	0 420	0 380	0 380
		0 000	0 300	0 460	0 460	0 460	0 460	0 460	0 440	0 420	0 380	0 380
FEDRO	FED[illegible]AL SUBSIDY ($/GAL)	0 400	0 400	0 400	0 400	0 500	0 500	0 500	0 500	0 500	0 500	0 500
		0 400	0 400	0 400	0 400	0 500	0 500	0 500	0 500	0 500	0 500	0 500
		0 400	0 400	0 400	0 400	0 500	0 500	0 500	0 500	0 500	0 500	0 500
		0 400	0 400	0 400	0 400	0 500	0 500	0 500	0 500	0 500	0 500	0 500

TABLE 3.8

		1977	1980	1981	1982.	1983	1984.	1985.	1987.	1990.	1992.	1995.
[illegible]C	PRICE [illegible] ALC ($/GAL	1.058	1.338	1.627	1.430	1.551	1.692	1.863	2.085	2.386	2.596	3.024
		1.058	1.338	1.627	1.430	1.559	1.699	1.864	2.137	2.463	2.711	3.083
		1.058	1.338	1.627	1.430	1.551	1.693	1.865	1.841	2.412	2.608	2.982
		1.058	1.338	1.627	1.430	1.551	1.692	1.659	2.328	2.367	2.629	3.047
FWALCT	PRICE [illegible] MILL ALC ($/GAL)	1.058	1.373	1.647	1.430	1.551	1.692	1.863	2.085	2.386	2.596	3.024
		1.058	1.373	1.647	1.430	1.559	1.699	1.864	2.137	2.463	2.711	3.083
		1.058	1.373	1.647	1.430	1.551	1.693	1.865	1.841	2.412	2.608	2.982
		1.058	1.373	1.647	1.430	1.551	1.692	1.659	2.335	2.367	2.629	3.047
FNALC	PRICE NET MILL - ROI	0.912	1.187	1.439	1.207	1.320	1.449	1.604	1.787	2.039	2.206	2.560
		0.912	1.187	1.439	1.207	1.327	1.456	1.605	1.839	2.115	2.320	2.620
		0.912	1.187	1.439	1.207	1.320	1.450	1.606	1.543	2.064	2.217	2.518
		0.912	1.187	1.439	1.207	1.320	1.449	1.400	2.037	2.019	2.239	2.583
FCALCT	PRICE [illegible]OLE CORN ALC ($/GAL)	1.117	1.338	1.627	1.433	1.567	1.725	1.890	2.144	2.466	2.717	3.186
		1.117	1.338	1.627	1.433	1.573	1.731	1.892	2.187	2.533	2.816	3.239
		1.117	1.338	1.627	1.433	1.567	1.726	1.892	1.958	2.484	2.724	3.155
		1.117	1.338	1.627	1.433	1.567	1.725	2.066	2.328	2.451	2.745	3.199
FCALC	PRICE [illegible]HOLE CORN - ROI	1.014	1.206	1.478	1.274	1.402	1.552	1.705	1.932	2.219	2.439	2.856
		1.014	1.206	1.478	1.274	1.408	1.558	1.708	1.975	2.285	2.538	2.909
		1.014	1.206	1.478	1.274	1.402	1.553	1.707	1.746	2.237	2.446	2.825
		1.014	1.206	1.478	1.274	1.402	1.552	1.882	2.116	2.204	2.467	2.869

RMS	1977.	1980.	1981.	1982.	1983.	1984.	1985.	1987.	1990.	1992.	1995.
PISC PRICE INDEX FOR STEAM COAL	0.986	1.105	1.165	1.276	1.316	1.368	1.464	1.712	2.029	2.321	2.835
PIEL PRICE INDEX FOR ELECTRICITY	0.995	1.327	1.436	1.504	1.526	1.565	1.635	1.835	2.028	2.249	2.632
PILAB PRICE INDEX FOR LABOR	1.000	1.304	1.441	1.521	1.632	1.707	1.828	2.140	2.482	2.811	3.388
PIOTH PRICE INDEX FOR OTHER COSTS	0.999	1.275	1.426	1.527	1.586	1.665	1.774	2.039	2.380	2.674	3.177
PIFRT PRICE INDEX FOR FREIGHT	0.997	1.241	1.347	1.445	1.516	1.600	1.693	1.934	2.246	2.501	2.960
PISAL PRICE INDEX FOR SALES COSTS	0.999	1.275	1.426	1.527	1.586	1.665	1.774	2.039	2.380	2.674	3.177

TABLE 3.9

		1979	1980.	1981.	1982.	1983.	1984.	1985.	1987.	1990.	1992.	1995.
[illegible]OC	THE [illegible] OF DDG'S (M$/TON)	1.212	1.434	1.702	1.461	1.654	1.897	2.018	2.426	2.836	3.287	3.942
		1.212	1.434	1.702	1.461	1.651	1.897	2.025	2.419	2.847	3.298	3.960
		1.212	1.434	1.702	1.461	1.654	1.896	2.022	2.552	2.812	3.267	3.971
		1.212	1.434	1.702	1.461	1.654	1.897	4.185	2.254	2.845	3.289	3.903
[illegible]LU	THE [illegible] OF CGF (M$/TON)	0.913	1.030	1.379	1.209	1.362	1.557	1.646	1.987	2.325	2.709	3.255
		0.913	1.030	1.379	1.209	1.359	1.555	1.651	1.974	2.324	2.701	3.261
		0.913	1.030	1.379	1.209	1.362	1.556	1.648	2.131	2.301	2.690	3.286
		0.913	1.030	1.379	1.209	1.362	1.557	3.532	1.803	2.336	2.705	3.218
[illegible]GM	THE [illegible] OF CGM (M$/TON)	2.100	2.369	3.171	2.780	3.132	3.581	3.785	4.571	5.348	6.230	7.487
		2.100	2.369	3.171	2.780	3.125	3.578	3.798	4.540	5.345	6.213	7.501
		2.100	2.369	3.171	2.780	3.132	3.578	3.791	4.902	5.292	6.186	7.557
		2.100	2.369	3.171	2.780	3.132	3.581	8.123	4.148	5.374	6.222	7.400
FOOD	THE [illegible] OF CORN OIL ($/LB)	0.307	0.263	0.238	0.238	0.269	0.309	0.330	0.396	0.463	0.535	0.642
		0.307	0.263	0.238	0.238	0.269	0.309	0.331	0.395	0.465	0.538	0.645
		0.307	0.263	0.238	0.238	0.269	0.309	0.330	0.414	0.459	0.532	0.646
		0.307	0.263	0.238	0.238	0.269	0.309	0.676	0.371	0.464	0.536	0.635

TABLE 2.9

				1979	1980	1981	1982.	1983	1984.	1985.	1987.	1990.	1992.	1995.
QUANTITY OF BY-PRODUCTS														
[illegible]	QUAN	DDG'S	(BLBS)	0.000	0.000	0.000	0.760	3.120	6.385	10.384	14.599	18.315	19.204	19.731
				0.000	0.000	0.000	0.760	3.561	6.963	10.686	17.722	25.598	29.174	28.093
				0.000	0.000	0.000	0.760	3.120	6.380	10.369	10.701	15.749	17.734	18.997
				0.000	0.000	0.000	0.760	3.120	6.385	11.786	10.973	17.064	18.298	17.975
[illegible]	QUANT	SGM	(BLBS)	0.000	0.206	0.313	0.495	0.535	0.577	0.622	0.726	0.916	1.068	1.345
				0.000	0.206	0.313	0.495	0.535	0.577	0.622	0.726	0.916	1.068	1.345
				0.000	0.206	0.313	0.495	0.535	0.577	0.622	0.726	0.916	1.068	1.345
				0.000	0.206	0.313	0.495	0.535	0.577	0.622	0.726	0.916	1.068	1.345
[illegible]	QUANT	CGF	(BLBS)	0.000	0.731	1.110	1.758	1.899	2.051	2.209	2.578	3.252	3.791	4.776
				0.000	0.731	1.110	1.758	1.899	2.051	2.209	2.578	3.252	3.791	4.776
				0.000	0.731	1.110	1.758	1.899	2.051	2.209	2.578	3.252	3.791	4.776
				0.000	0.731	1.110	1.758	1.899	2.051	2.209	2.578	3.252	3.791	4.776
[illegible]	QUAN	CORN OIL	(BLBS)	0.000	0.101	0.153	0.243	0.262	0.283	0.305	0.356	0.450	0.524	0.660
				0.000	0.101	0.153	0.243	0.262	0.283	0.305	0.356	0.450	0.524	0.660
				0.000	0.101	0.153	0.243	0.262	0.283	0.305	0.356	0.450	0.524	0.660
				0.000	0.101	0.153	0.243	0.262	0.283	0.305	0.356	0.450	0.524	0.660

BU = BUSHEL
BBU = BILLION BUSHELS
MAC = MILLION ACRES
HMAC = HUNDRED MILLION ACRES
HBU = HUNDRED BUSHELS PER ACRE
LB = POUND
BLBS = BILLIONS OF POUNDS
HB = HUNDREDS OF DOLLARS
BRL = BARRELS
MBRL = MILLION BARRELS
BBRL = BILLION BARRELS
MGAL = MILLION GALLONS
BGAL = BILLION GALLONS

TABLE 3.10

PAGE 1

*** BASE OIL ** 40 CENT STATE SUBSIDY ***
*** BASE OIL ** 30 CENT STATE SUBSIDY ***
*** BASE OIL ** 20 CENT STATE SUBSIDY ***
*** BASE OIL ** 10 CENT STATE SUBSIDY ***
*** BASE OIL ** 0 CENT STATE SUBSIDY ***

RNG		1977	1980.	1981.	1982.	1983.	1984.	1985.	1987.	1990.	1992.	1995.
PCOR	PRICE OF CORN ($/BU)	2.150	2.524	3.299	2.449	2.884	3.370	3.742	4.362	5.075	5.692	6.733
		2.150	2.524	3.299	2.449	2.875	3.349	3.702	4.327	5.043	5.672	6.657
		2.150	2.524	3.299	2.449	2.868	3.330	3.674	4.292	5.008	5.601	6.425
		2.150	2.524	3.299	2.449	2.862	3.314	3.651	4.180	4.805	5.353	6.202
		2.150	2.524	3.299	2.449	2.857	3.302	3.591	3.996	4.627	5.226	6.184
PCOCPI	PRICE OF CORN / CPI ($/BU)	2.150	1.953	2.345	1.649	1.869	2.087	2.177	2.217	2.225	2.226	2.220
		2.150	1.953	2.345	1.649	1.863	2.074	2.153	2.200	2.210	2.219	2.195
		2.150	1.953	2.345	1.649	1.858	2.063	2.137	2.182	2.195	2.190	2.119
		2.150	1.953	2.345	1.649	1.854	2.053	2.124	2.121	2.105	2.092	2.045
		2.150	1.953	2.345	1.649	1.851	2.045	2.092	2.028	2.027	2.044	2.039
QCUS	TOTAL SUPPLY OF CORN (BBU)	6.285	7.947	6.651	8.115	8.138	7.744	7.989	8.969	9.732	10.355	11.106
		6.285	7.947	6.651	8.115	8.136	7.727	7.948	8.899	9.667	10.305	11.048
		6.285	7.947	6.651	8.115	8.134	7.713	7.913	8.833	9.593	10.240	10.753
		6.285	7.947	6.651	8.115	8.132	7.701	7.882	8.725	9.426	9.843	10.311
		6.285	7.947	6.651	8.115	8.131	7.692	7.834	8.444	8.980	9.400	10.064
QCO	SUPPLY OF CORN GROWN (BBU)	6.285	7.942	6.643	8.097	8.102	7.684	7.899	8.847	9.573	10.183	10.922
		6.285	7.942	6.643	8.097	8.102	7.673	7.868	8.790	9.519	10.142	10.881
		6.285	7.942	6.643	8.097	8.102	7.664	7.841	8.737	9.459	10.089	10.645
		6.285	7.942	6.643	8.097	8.102	7.656	7.818	8.638	9.334	9.760	10.285
		6.285	7.942	6.643	8.097	8.102	7.650	7.800	8.417	8.967	9.395	10.064
APCOB	% OF LAND PLANTED IN CORN	0.402	0.349	0.369	0.377	0.376	0.366	0.358	0.379	0.369	0.367	0.357
		0.402	0.349	0.369	0.377	0.376	0.366	0.357	0.376	0.366	0.365	0.355
		0.402	0.349	0.369	0.377	0.376	0.365	0.355	0.373	0.364	0.363	0.346
		0.402	0.349	0.369	0.377	0.376	0.365	0.354	0.368	0.357	0.348	0.331
		0.402	0.349	0.369	0.377	0.376	0.364	0.353	0.356	0.340	0.332	0.322
APCO	ACRES PLANTED IN CORN (HMAC	0.845	0.815	0.848	0.860	0.828	0.834	0.841	0.926	0.950	0.981	1.000
		0.845	0.815	0.848	0.860	0.828	0.832	0.837	0.918	0.943	0.975	0.995
		0.845	0.815	0.848	0.860	0.828	0.831	0.833	0.911	0.935	0.968	0.967
		0.845	0.815	0.848	0.860	0.828	0.830	0.830	0.897	0.919	0.927	0.924
		0.845	0.815	0.848	0.860	0.828	0.829	0.827	0.866	0.871	0.882	0.899
AHCO	ACRES HARVESTED CORN (HMAC)	0.715	0.724	0.730	0.737	0.709	0.715	0.721	0.794	0.815	0.841	0.858
		0.715	0.724	0.730	0.737	0.709	0.713	0.717	0.787	0.809	0.836	0.853
		0.715	0.724	0.730	0.737	0.709	0.712	0.714	0.781	0.802	0.830	0.829
		0.715	0.724	0.730	0.737	0.709	0.711	0.711	0.769	0.788	0.795	0.792
		0.715	0.724	0.730	0.737	0.709	0.710	0.709	0.743	0.747	0.756	0.770

TABLE 2.10

		1977.	1980.	1981.	1982.	1983.	1984.	1985.	1987.	1990.	1992.	1995.
	[illegible] OF CORN (BBU)	1.279	1.097	0.910	1.099	1.142	1.075	1.096	1.114	1.175	1.211	1.273
		1.279	1.097	0.910	1.099	1.142	1.076	1.097	1.117	1.177	1.213	1.275
		1.279	1.097	0.910	1.099	1.142	1.076	1.098	1.119	1.180	1.215	1.284
		1.279	1.097	0.910	1.099	1.142	1.077	1.100	1.124	1.185	1.228	1.298
		1.279	1.097	0.910	1.099	1.142	1.077	1.100	1.133	1.201	1.243	1.306
[illegible]EO	[illegible] OF CORN EQUIV (BBU)	0.000	0.005	0.008	0.018	0.036	0.060	0.089	0.122	0.159	0.172	0.184
		0.000	0.005	0.008	0.018	0.033	0.054	0.080	0.109	0.148	0.163	0.167
		0.000	0.005	0.008	0.018	0.032	0.049	0.072	0.097	0.134	0.151	0.107
		0.000	0.005	0.008	0.018	0.030	0.045	0.064	0.086	0.092	0.082	0.026
		0.000	0.005	0.008	0.018	0.029	0.042	0.034	0.026	0.013	0.004	0.000
	RMS	1977.	1980.	1981.	1982.	1983.	1984.	1985.	1987.	1990.	1992.	1995.
[illegible]OD	TOTAL [illegible]PAND FOR CORN (BBU)	6.290	7.992	6.738	7.813	8.316	7.865	8.182	9.034	9.831	10.425	11.175
		6.290	7.992	6.738	7.813	8.311	7.847	8.148	8.963	9.771	10.375	11.107
		6.290	7.992	6.738	7.813	8.307	7.830	8.108	8.897	9.697	10.352	10.804
		6.290	7.992	6.738	7.813	8.303	7.816	8.074	8.922	9.586	10.010	10.359
		6.290	7.992	6.738	7.813	8.300	7.805	7.903	8.612	9.116	9.457	10.118
[illegible]CO	CONSU[illegible]TION OF CORN (BBU)	4.121	5.248	4.932	5.232	5.623	5.816	6.032	6.376	6.989	7.262	7.608
		4.121	5.248	4.932	5.232	5.609	5.781	5.976	6.292	6.910	7.200	7.498
		4.121	5.248	4.932	5.232	5.596	5.751	5.923	6.212	6.817	7.127	7.098
		4.121	5.248	4.932	5.232	5.585	5.725	5.877	6.179	6.552	6.678	6.516
		4.121	5.248	4.932	5.232	5.576	5.705	5.662	5.790	5.987	6.066	6.248
[illegible]COOF	CORN CONSUMP AS FOOD (BBU)	0.550	0.675	0.711	0.616	0.640	0.659	0.669	0.697	0.764	0.796	0.846
		0.550	0.675	0.711	0.616	0.640	0.659	0.671	0.698	0.765	0.797	0.847
		0.550	0.675	0.711	0.616	0.640	0.660	0.671	0.699	0.766	0.798	0.851
		0.550	0.675	0.711	0.616	0.640	0.660	0.672	0.702	0.770	0.803	0.854
		0.550	0.675	0.711	0.616	0.640	0.661	0.673	0.706	0.774	0.805	0.855
[illegible]COFD	CORN CONSUMP AS FEED (BBU)	3.571	4.519	4.139	4.441	4.669	4.654	4.628	4.684	4.926	5.060	5.242
		3.571	4.519	4.139	4.441	4.671	4.661	4.642	4.698	4.938	5.067	5.258
		3.571	4.519	4.139	4.441	4.673	4.668	4.653	4.713	4.951	5.084	5.318
		3.571	4.519	4.139	4.441	4.674	4.673	4.662	4.757	5.003	5.160	5.382
		3.571	4.519	4.139	4.441	4.675	4.677	4.677	4.826	5.074	5.214	5.394
[illegible]COALC	CORN CONSUMP FOR ALC (BBU)	0.000	0.054	0.082	0.176	0.315	0.503	0.734	0.995	1.298	1.406	1.521
		0.000	0.054	0.082	0.176	0.298	0.461	0.663	0.896	1.207	1.337	1.393
		0.000	0.054	0.082	0.176	0.283	0.424	0.598	0.800	1.100	1.245	0.929
		0.000	0.054	0.082	0.176	0.271	0.392	0.542	0.721	0.779	0.715	0.280
		0.000	0.054	0.082	0.176	0.261	0.367	0.312	0.258	0.139	0.047	0.000
[illegible]COINV	ADDITION TO INV OF CORN (BBU)	0.485	0.314	-0.584	0.248	0.196	-0.297	-0.210	0.142	-0.021	0.055	0.020
		0.485	0.314	-0.584	0.248	0.199	-0.296	-0.213	0.135	-0.021	0.057	0.023
		0.485	0.314	-0.584	0.248	0.201	-0.295	-0.217	0.127	-0.023	0.066	-0.010
		0.485	0.314	-0.584	0.248	0.203	-0.294	-0.221	0.112	0.007	0.025	-0.007
		0.485	0.314	-0.584	0.248	0.204	-0.293	-0.214	0.072	-0.013	0.007	0.010

TABLE 3.10

		1977.	1980.	1981.	1982.	1983.	1984.	1985.	1987.	1990.	1992.	1995.
[illegible]	[illegible]	1.684	2.430	2.390	2.333	2.496	2.346	2.360	2.516	2.863	3.107	3.546
		1.684	2.430	2.390	2.333	2.503	2.361	2.385	2.536	2.882	3.118	3.587
		1.684	2.430	2.390	2.333	2.510	2.374	2.403	2.557	2.902	3.159	3.716
		1.684	2.430	2.390	2.333	2.515	2.386	2.418	2.630	3.026	3.307	3.849
		1.684	2.430	2.390	2.333	2.519	2.394	2.455	2.750	3.142	3.384	3.860
[illegible]	CARRY [illegible] OF CORN FROM 1 (BBU)	0.684	1.618	1.034	1.282	1.478	1.181	0.971	1.159	1.272	1.353	1.421
		0.684	1.618	1.034	1.282	1.480	1.185	0.972	1.139	1.252	1.333	1.415
		0.684	1.618	1.034	1.282	1.483	1.188	0.971	1.123	1.230	1.318	1.361
		0.684	1.618	1.034	1.282	1.484	1.190	0.969	1.117	1.213	1.225	1.216
		0.684	1.618	1.034	1.282	1.486	1.192	0.978	1.083	1.066	1.066	1.087
	RMS	1977.	1980.	1981.	1982.	1983.	1984.	1985.	1987.	1990.	1992.	1995.
PSY/COE	PSY / P32	3.167	2.481	2.361	2.834	2.722	2.652	2.508	2.599	2.620	2.732	2.782
		3.167	2.481	2.361	2.834	2.736	2.678	2.541	2.620	2.636	2.742	2.830
		3.167	2.481	2.361	2.834	2.748	2.701	2.567	2.643	2.657	2.780	2.957
		3.167	2.481	2.361	2.834	2.759	2.721	2.590	2.700	2.806	2.914	3.098
		3.167	2.481	2.361	2.834	2.767	2.737	2.700	2.867	2.959	3.027	3.106
PSY	PRICE OF SOY ($/BU)	6.809	6.250	7.780	6.957	7.842	8.932	9.373	11.337	13.291	15.550	18.727
		6.809	6.250	7.780	6.957	7.859	8.964	9.393	11.338	13.287	15.553	18.840
		6.809	6.250	7.780	6.957	7.875	8.992	9.420	11.346	13.300	15.564	19.001
		6.809	6.250	7.780	6.957	7.888	9.016	9.444	11.269	13.471	15.579	19.217
		6.809	6.250	7.780	6.957	7.898	9.034	9.699	11.438	13.675	15.819	19.207
PSY/CPI	PRICE OF SOY / CPI ($/BU)	6.810	4.845	5.536	4.671	5.086	5.535	5.459	5.762	5.828	6.082	6.175
		6.810	4.845	5.536	4.671	5.097	5.555	5.471	5.762	5.826	6.083	6.213
		6.810	4.845	5.536	4.671	5.107	5.572	5.487	5.766	5.832	6.088	6.266
		6.810	4.845	5.536	4.671	5.116	5.587	5.501	5.728	5.907	6.095	6.337
		6.810	4.845	5.536	4.671	5.122	5.598	5.650	5.816	5.998	6.188	6.334
QDS	TOTAL SUPPLY OF SOY (BBU)	1.289	2.282	1.863	2.061	2.030	2.125	2.303	2.396	2.750	2.951	3.294
		1.289	2.282	1.863	2.061	2.027	2.121	2.301	2.396	2.750	2.950	3.282
		1.289	2.282	1.863	2.061	2.024	2.118	2.299	2.396	2.750	2.950	3.275
		1.289	2.282	1.863	2.061	2.022	2.115	2.297	2.413	2.737	2.964	3.255
		1.289	2.282	1.863	2.061	2.020	2.113	2.261	2.413	2.719	2.934	3.254
QS	SUPPLY OF SOY GROWN (BBU)	1.289	2.270	1.844	2.023	1.965	2.024	2.158	2.200	2.496	2.675	2.993
		1.289	2.270	1.844	2.023	1.965	2.028	2.170	2.220	2.513	2.687	3.006
		1.289	2.270	1.844	2.023	1.965	2.032	2.180	2.237	2.533	2.704	3.086
		1.289	2.270	1.844	2.023	1.965	2.035	2.189	2.270	2.580	2.818	3.191
		1.289	2.270	1.844	2.023	1.965	2.038	2.195	2.357	2.687	2.923	3.254

TABLE 3.10

			1980	1981	1982.	1983.	1984.	1985	1987	1990.	1992.	1995.
[illegible]YS	[illegible] PLANTED IN SOY	[illegible]	0.307	0.306	0.273	0.278	0.288	0.295	0.281	0.293	0.296	0.307
		[illegible]	0.307	0.306	0.273	0.278	0.288	0.296	0.283	0.295	0.298	0.308
		[illegible]	0.307	0.306	0.273	0.278	0.289	0.298	0.286	0.298	0.300	0.317
		[illegible]	0.307	0.306	0.273	0.278	0.290	0.299	0.291	0.304	0.314	0.330
		[illegible]	0.307	0.306	0.273	0.278	0.290	0.300	0.304	0.319	0.328	0.337
[illegible]SOY	[illegible] PLANTED IN SOY (MMAC)	0.503	0.717	0.702	0.621	0.613	0.655	0.692	0.686	0.754	0.791	0.860
		0.503	0.717	0.702	0.621	0.613	0.656	0.696	0.693	0.760	0.795	0.863
		0.503	0.717	0.702	0.621	0.613	0.658	0.699	0.699	0.767	0.801	0.868
		0.503	0.717	0.702	0.621	0.613	0.659	0.702	0.710	0.782	0.837	0.921
		0.503	0.717	0.702	0.621	0.613	0.660	0.705	0.739	0.817	0.871	0.941
[illegible]SOY	ACRES HARVESTED SOY (MMAC)	0.494	0.705	0.688	0.613	0.607	0.647	0.683	0.680	0.747	0.784	0.852
		0.494	0.705	0.688	0.613	0.607	0.649	0.686	0.686	0.753	0.788	0.855
		0.494	0.705	0.688	0.613	0.607	0.650	0.690	0.692	0.759	0.793	0.878
		0.494	0.705	0.688	0.613	0.607	0.651	0.693	0.702	0.773	0.827	0.909
		0.494	0.705	0.688	0.613	0.607	0.652	0.695	0.730	0.806	0.859	0.927
[illegible]C	[illegible]LD OF SOY (HBU/AC)	0.261	0.322	0.268	0.330	0.324	0.313	0.316	0.324	0.334	0.341	0.352
		0.261	0.322	0.268	0.330	0.324	0.313	0.316	0.323	0.334	0.341	0.351
		0.261	0.322	0.268	0.330	0.324	0.313	0.316	0.323	0.334	0.341	0.351
		0.261	0.322	0.268	0.330	0.324	0.313	0.316	0.323	0.334	0.341	0.351
		0.261	0.322	0.268	0.330	0.324	0.313	0.316	0.323	0.333	0.340	0.351
[illegible]SEQ	SUPPLY OF SOY EQIVS. (BBU)	0.000	0.012	0.019	0.038	0.065	0.101	0.145	0.195	0.254	0.276	0.301
		0.000	0.012	0.019	0.038	0.062	0.093	0.131	0.176	0.237	0.263	0.276
		0.000	0.012	0.019	0.038	0.059	0.086	0.119	0.158	0.217	0.246	0.189
		0.000	0.012	0.019	0.038	0.057	0.080	0.109	0.143	0.156	0.146	0.064
		0.000	0.012	0.019	0.038	0.055	0.075	0.065	0.056	0.032	0.011	0.000

		RMS	1977.	1980.	1981.	1982.	1983.	1984.	1985.	1987.	1990.	1992.	1995.
[illegible]SD	TOTAL SOY DEMANDED (BBU)		1.288	2.248	1.869	2.036	2.055	2.148	2.327	2.416	2.770	2.970	3.311
			1.288	2.248	1.869	2.036	2.052	2.144	2.326	2.417	2.771	2.969	3.299
			1.288	2.248	1.869	2.036	2.049	2.140	2.323	2.416	2.771	2.968	3.292
			1.288	2.248	1.869	2.036	2.047	2.138	2.321	2.432	2.756	2.978	3.272
			1.288	2.248	1.869	2.036	2.045	2.135	2.283	2.422	2.731	2.951	3.270
[illegible]PY	CONSUMP OF SOY + EQIV (BBU)		0.866	1.235	1.116	1.213	1.228	1.292	1.371	1.426	1.581	1.676	1.780
			0.866	1.235	1.116	1.213	1.227	1.291	1.371	1.427	1.582	1.677	1.777
			0.866	1.235	1.116	1.213	1.227	1.290	1.370	1.427	1.582	1.677	1.776
			0.866	1.235	1.116	1.213	1.226	1.289	1.370	1.432	1.578	1.680	1.773
			0.866	1.235	1.116	1.213	1.226	1.288	1.358	1.429	1.574	1.676	1.774
[illegible]INV	ADDITION TO SOY IN INV (BBU)		-0.142	0.185	-0.041	-0.034	-0.019	-0.001	0.023	0.003	0.013	0.015	0.012
			-0.142	0.185	-0.041	-0.034	-0.019	-0.001	0.025	0.003	0.013	0.014	0.012
			-0.142	0.185	-0.041	-0.034	-0.020	-0.001	0.026	0.003	0.014	0.013	0.018
			-0.142	0.185	-0.041	-0.034	-0.020	-0.000	0.027	0.007	0.018	0.022	0.019
			-0.142	0.185	-0.041	-0.034	-0.020	0.000	0.024	0.015	0.014	0.019	0.015

TABLE 3.10

		[illegible]	1980	1981	1982	1983.	1984.	1985	1987.	1990.	1992.	1995.
[illegible]Y	[illegible] OF [illegible] SOY [illegible]	[illegible]	0.828	0.793	0.856	0.846	0.857	0.932	0.987	1.176	1.279	1.519
		[illegible]	0.828	0.793	0.856	0.844	0.854	0.930	0.987	1.176	1.278	1.510
		0.564	0.828	0.793	0.856	0.842	0.851	0.928	0.986	1.175	1.278	1.498
		0.564	0.828	0.793	0.856	0.841	0.849	0.925	0.993	1.160	1.276	1.481
		0.564	0.828	0.793	0.856	0.840	0.847	0.901	0.978	1.142	1.257	1.481
[illegible]SY	CARR[illegible] OF SOY FROM [illegible] (BBU)	0.103	0.359	0.318	0.284	0.265	0.264	0.287	0.287	0.332	0.354	0.403
		0.103	0.359	0.318	0.284	0.265	0.264	0.289	0.290	0.335	0.356	0.404
		0.103	0.359	0.318	0.284	0.265	0.264	0.290	0.292	0.338	0.359	0.416
		0.103	0.359	0.318	0.284	0.265	0.264	0.291	0.298	0.344	0.377	0.431
		0.103	0.359	0.318	0.284	0.264	0.265	0.288	0.310	0.359	0.392	0.441

	RMS	1977.	1980.	1981.	1982.	1983.	1984.	1985.	1987.	1990.	1992.	1995.
[illegible]	PRICE [illegible] WHEAT ($/BU)	2.331	3.946	4.728	4.405	4.819	5.003	5.239	6.030	7.009	7.793	9.229
		2.331	3.946	4.728	4.405	4.818	5.002	5.233	6.027	7.002	7.788	9.227
		2.331	3.946	4.728	4.405	4.817	5.001	5.232	6.025	6.997	7.768	9.201
		2.331	3.946	4.728	4.405	4.817	5.000	5.231	5.994	6.944	7.711	9.145
		2.331	3.946	4.728	4.405	4.816	4.999	5.253	5.993	6.927	7.707	9.110
F[illegible]WHCPI	PRICE OF WHEAT / CPI ($/BU)	2.330	3.057	3.358	2.957	3.127	3.102	3.052	3.066	3.074	3.049	3.044
		2.330	3.057	3.358	2.957	3.126	3.102	3.048	3.064	3.071	3.047	3.043
		2.330	3.057	3.358	2.957	3.126	3.101	3.048	3.063	3.069	3.039	3.035
		2.330	3.057	3.358	2.957	3.125	3.101	3.047	3.046	3.045	3.016	3.016
		2.330	3.057	3.358	2.957	3.125	3.100	3.062	3.046	3.038	3.015	3.005
[illegible]S	TOTAL [illegible]PLY OF WHEAT (BBU)	2.035	2.368	2.266	2.428	2.385	2.489	2.597	2.730	2.956	3.127	3.386
		2.035	2.368	2.266	2.428	2.385	2.488	2.596	2.729	2.956	3.128	3.385
		2.035	2.368	2.266	2.428	2.385	2.488	2.595	2.729	2.956	3.129	3.385
		2.035	2.368	2.266	2.428	2.385	2.488	2.594	2.723	2.959	3.131	3.396
		2.035	2.368	2.266	2.428	2.385	2.487	2.593	2.718	2.965	3.139	3.406
[illegible]	SUPP[illegible] OF WHEAT (BBU)	2.035	2.368	2.266	2.428	2.385	2.489	2.597	2.730	2.956	3.127	3.386
		2.035	2.368	2.266	2.428	2.385	2.488	2.596	2.729	2.956	3.128	3.385
		2.035	2.368	2.266	2.428	2.385	2.488	2.595	2.729	2.956	3.129	3.385
		2.035	2.368	2.266	2.428	2.385	2.488	2.594	2.723	2.959	3.131	3.396
		2.035	2.368	2.266	2.428	2.385	2.487	2.593	2.718	2.965	3.139	3.406

TABLE 3.10

		1977.	1980.	1981.	1982.	1983.	1984.	1985.	1987.	1990.	1992.	1995.
[illegible]	[illegible] PLANTED TO WHEAT	[illegible]	0.344	0.325	0.350	0.346	0.346	0.347	0.341	0.338	0.337	0.336
		[illegible]	0.344	0.325	0.350	0.346	0.346	0.347	0.341	0.338	0.337	0.337
		[illegible]	0.344	0.325	0.350	0.346	0.346	0.347	0.341	0.338	0.337	0.337
		[illegible]	0.344	0.325	0.350	0.346	0.346	0.347	0.341	0.339	0.338	0.339
		[illegible]	0.344	0.325	0.350	0.346	0.346	0.347	0.340	0.341	0.341	0.341
[illegible]H	[illegible] PLANTED WHEAT (HMAC)	0.755	0.803	0.745	0.798	0.761	0.788	0.815	0.834	0.870	0.900	0.943
		0.755	0.803	0.745	0.798	0.761	0.787	0.814	0.834	0.870	0.901	0.943
		0.755	0.803	0.745	0.798	0.761	0.787	0.814	0.833	0.870	0.901	0.943
		0.755	0.803	0.745	0.798	0.761	0.787	0.814	0.831	0.871	0.902	0.947
		0.755	0.803	0.745	0.799	0.761	0.787	0.813	0.829	0.874	0.905	0.951
[illegible]HH	[illegible] HARVESTED WHEAT(HMAC)	0.665	0.709	0.664	0.711	0.679	0.703	0.727	0.744	0.777	0.804	0.843
		0.665	0.709	0.664	0.711	0.679	0.703	0.727	0.744	0.777	0.805	0.842
		0.663	0.709	0.664	0.711	0.679	0.702	0.726	0.744	0.777	0.805	0.842
		0.665	0.709	0.664	0.711	0.679	0.702	0.726	0.742	0.778	0.806	0.846
		0.665	0.709	0.664	0.711	0.679	0.702	0.726	0.740	0.780	0.808	0.849
[illegible]H	YIELD WHEAT (HBU/AC)	0.306	0.334	0.341	0.342	0.351	0.354	0.357	0.367	0.380	0.389	0.402
		0.306	0.334	0.341	0.342	0.351	0.354	0.357	0.367	0.380	0.389	0.402
		0.306	0.334	0.341	0.342	0.351	0.354	0.357	0.367	0.380	0.389	0.402
		0.306	0.334	0.341	0.342	0.351	0.354	0.357	0.367	0.380	0.389	0.401
		0.306	0.334	0.341	0.342	0.351	0.354	0.357	0.367	0.380	0.388	0.401

RMS		1977.	1980.	1981.	1982.	1983.	1984.	1985.	1987.	1990.	1992.	1995.
QWHD	TOTAL DEMAND FOR WHEAT (BBU)	2.042	2.343	2.314	2.407	2.405	2.499	2.621	2.742	2.972	3.140	3.397
		2.042	2.343	2.314	2.407	2.404	2.498	2.621	2.742	2.973	3.141	3.395
		2.042	2.343	2.314	2.407	2.404	2.497	2.620	2.741	2.973	3.145	3.395
		2.042	2.343	2.314	2.407	2.404	2.497	2.619	2.749	2.982	3.154	3.406
		2.042	2.343	2.314	2.407	2.404	2.497	2.606	2.740	2.982	3.151	3.416
[illegible]HF	CONSUMPTION OF WHEAT (BBU)	0.666	0.664	0.664	0.673	0.685	0.696	0.701	0.709	0.732	0.742	0.756
		0.666	0.664	0.664	0.673	0.685	0.696	0.701	0.709	0.732	0.742	0.756
		0.666	0.664	0.664	0.673	0.685	0.696	0.701	0.709	0.732	0.742	0.756
		0.666	0.664	0.664	0.673	0.685	0.696	0.701	0.710	0.733	0.742	0.756
		0.666	0.664	0.664	0.673	0.685	0.696	0.701	0.710	0.733	0.742	0.757
[illegible]HFE	CONSUMP OF WHEAT AS FEED (BBU)	0.187	0.113	0.155	0.079	0.130	0.141	0.157	0.167	0.178	0.185	0.193
		0.187	0.113	0.155	0.079	0.129	0.140	0.155	0.165	0.177	0.185	0.191
		0.187	0.113	0.155	0.079	0.129	0.139	0.153	0.164	0.176	0.182	0.183
		0.187	0.113	0.155	0.079	0.129	0.138	0.152	0.160	0.166	0.172	0.177
		0.187	0.113	0.155	0.079	0.128	0.137	0.149	0.159	0.161	0.170	0.178
[illegible]HINV	ADDITION TO WHEAT INVEN (BBU)	0.065	0.003	-0.024	0.017	-0.002	0.001	0.005	0.002	-0.000	0.002	0.001
		0.065	0.003	-0.024	0.017	-0.002	0.001	0.005	0.002	0.000	0.002	0.001
		0.065	0.003	-0.024	0.017	-0.002	0.001	0.005	0.002	0.000	0.002	0.001
		0.065	0.003	-0.024	0.017	-0.002	0.001	0.005	0.003	0.002	0.004	0.002
		0.065	0.003	-0.024	0.017	-0.002	0.001	0.004	0.004	0.002	0.003	0.002

TABLE 3.10

			1960	1981	1982	1983	1984	1985	1987	1990	1992	1995
[illegible]	[illegible]		1.524	1.563	1.517	1.637	1.592	1.661	1.758	1.864	2.061	2.211	2.447
			1.524	1.563	1.517	1.637	1.592	1.661	1.760	1.865	2.063	2.212	2.448
			1.524	1.563	1.517	1.637	1.592	1.661	1.760	1.865	2.065	2.219	2.455
			1.524	1.563	1.517	1.637	1.593	1.662	1.760	1.876	2.081	2.236	2.470
			1.524	1.563	1.517	1.637	1.593	1.662	1.752	1.876	2.086	2.236	2.479
[illegible]	CARRYOVER OF WHEAT FROM T (GSO)		1.177	0.928	0.905	0.922	0.920	0.920	0.925	0.929	0.933	0.936	0.940
			1.177	0.928	0.905	0.922	0.920	0.920	0.926	0.929	0.933	0.937	0.941
			1.177	0.928	0.905	0.922	0.920	0.921	0.926	0.929	0.934	0.938	0.942
			1.177	0.928	0.905	0.922	0.920	0.921	0.926	0.932	0.937	0.941	0.947
			1.177	0.928	0.905	0.922	0.920	0.921	0.925	0.931	0.939	0.944	0.952
[illegible]	TOTAL [illegible]PES PLANTED (HMAC)		2.103	2.334	2.295	2.278	2.202	2.276	2.348	2.447	2.575	2.673	2.803
			2.103	2.334	2.295	2.278	2.202	2.276	2.347	2.445	2.573	2.671	2.801
			2.103	2.334	2.295	2.278	2.202	2.276	2.346	2.443	2.572	2.670	2.798
			2.103	2.334	2.295	2.278	2.202	2.276	2.346	2.438	2.572	2.666	2.792
			2.103	2.334	2.295	2.278	2.202	2.275	2.345	2.435	2.562	2.658	2.790

MACRO VARIABLES

		RMS	1977.	1980.	1981.	1982.	1983.	1984.	1985.	1987.	1990.	1992.	1995.
[illegible]POP	POPULA[illegible] (HM)		2.202	2.277	2.297	2.318	2.340	2.362	2.384	2.428	2.491	2.530	2.583
[illegible]CPI	CONSUMER PRICE INDEX		1.000	1.292	1.405	1.491	1.540	1.612	1.715	1.966	2.279	2.555	3.031
[illegible]WPI	WHOLESALE PRICE INDEX		0.999	1.275	1.426	1.527	1.586	1.665	1.774	2.039	2.380	2.674	3.177
PGNP	GNP DEFLATOR		0.999	1.275	1.426	1.527	1.586	1.665	1.774	2.039	2.380	2.674	3.177
NYDPC	NOMINAL INCOME PER CAPITA		5.966	8.013	8.833	9.490	10.247	11.108	11.971	14.061	17.403	20.000	24.650
RYDPCD	PERSONAL INC. / CPI		5.966	6.202	6.287	6.365	6.654	6.891	6.980	7.152	7.636	7.828	8.133
[illegible]PFF	INDEX OF FARMERS COSTS		1.009	1.288	1.441	1.543	1.603	1.682	1.792	2.060	2.405	2.702	3.210

		RMS	1977.	1980.	1981.	1982.	1983.	1984.	1985.	1987.	1990.	1992.	1995.
ALCOHOL SIDE [illegible]ARIABLES													
[illegible]GS	CONSUMP[illegible] OF GASOLINE (BBRL)		2.540	2.356	2.358	2.323	2.395	2.467	2.497	2.543	2.639	2.699	2.808
[illegible]GASPC	CONSU[illegible] OF GAS/NPOP (BRL)		11.532	10.351	10.267	10.019	10.233	10.443	10.474	10.476	10.593	10.668	10.872
			11.532	10.351	10.267	10.019	10.233	10.443	10.474	10.476	10.593	10.668	10.872
			11.532	10.351	10.267	10.019	10.233	10.443	10.474	10.476	10.593	10.668	10.872
			11.532	10.351	10.267	10.019	10.233	10.443	10.474	10.476	10.593	10.668	10.872
			11.532	10.351	10.267	10.019	10.233	10.443	10.474	10.476	10.593	10.668	10.872

TABLE 3.10

		1977	1980	1981	1982.	1983.	1984.	1985.	1987	1990.	1992.	1995.
[illegible]	PRICE [illegible] E INDEX	1.000	2.346	2.910	2.666	2.631	2.827	3.041	3.469	4.102	4.620	5.395
GAS	PRICE [illegible] GAS ETH BLEND($/GAL)	0.479	0.918	1.134	0.997	1.046	1.121	1.206	1.365	1.596	1.782	2.070
		0.479	0.918	1.134	0.997	1.045	1.120	1.204	1.363	1.595	1.781	2.066
		0.479	0.918	1.134	0.997	1.045	1.119	1.203	1.362	1.593	1.778	2.056
		0.479	0.918	1.134	0.997	1.044	1.118	1.202	1.358	1.583	1.768	2.045
		0.479	0.918	1.134	0.997	1.044	1.118	1.197	1.349	1.575	1.761	2.044
PI SR	PROD PR[illegible] INDEX REFIN GAS	0.936	1.968	2.436	2.143	2.234	2.390	2.561	2.901	3.405	3.817	4.434
PGASS	GATE PR[illegible] GASOLINE ($/GAL)	0.415	0.872	1.079	0.949	0.990	1.059	1.134	1.285	1.508	1.691	1.964
CALC	QUAN. A[illegible] AS OCT BOAST. (BGAL)	0.000	0.125	0.189	0.415	0.768	1.246	1.832	2.490	3.251	3.516	3.790
		0.000	0.125	0.189	0.415	0.725	1.137	1.649	2.236	3.017	3.338	3.462
		0.000	0.125	0.189	0.415	0.687	1.042	1.485	1.993	2.745	3.105	2.281
		0.000	0.125	0.189	0.415	0.655	0.961	1.342	1.790	1.925	1.753	0.644
		0.000	0.125	0.189	0.415	0.630	0.898	0.753	0.610	0.320	0.108	0.000
FRAC	FRAC [illegible] E GAS MADE WITH ALC	0.000	0.097	0.147	0.236	0.347	0.462	0.563	0.728	0.889	0.940	0.974
		0.000	0.097	0.147	0.236	0.328	0.422	0.507	0.654	0.825	0.892	0.890
		0.000	0.097	0.147	0.236	0.311	0.387	0.457	0.583	0.751	0.830	0.586
		0.000	0.097	0.147	0.236	0.296	0.357	0.413	0.524	0.526	0.469	0.166
		0.000	0.097	0.147	0.236	0.285	0.334	0.232	0.178	0.088	0.029	0.000
RATIO	RATIO O[illegible] CALC TO PTOTAL	1.220	0.808	0.798	0.750	0.779	0.816	0.863	0.899	0.931	0.940	0.987
		1.220	0.808	0.798	0.750	0.818	0.851	0.897	0.933	0.964	0.973	1.007
		1.220	0.808	0.798	0.750	0.861	0.892	0.936	0.970	0.998	0.999	1.005
		1.220	0.808	0.798	0.750	0.910	0.937	0.980	0.999	1.000	1.000	1.003
		1.220	0.808	0.798	0.750	0.959	0.984	1.005	1.000	1.000	1.008	1.034
PTOTAL	PGASS+SUBSIDIES ($/GAL)	0.867	1.657	2.038	1.907	1.989	2.065	2.147	2.314	2.559	2.760	3.063
		0.867	1.657	2.038	1.907	1.889	1.965	2.047	2.214	2.459	2.660	2.963
		0.867	1.657	2.038	1.907	1.789	1.865	1.947	2.114	2.359	2.560	2.863
		0.867	1.657	2.038	1.907	1.689	1.765	1.847	2.014	2.259	2.460	2.763
		0.867	1.657	2.038	1.907	1.599	1.675	1.757	1.924	2.169	2.370	2.673
PGASS	GAT[illegible] RICE GASOLIN ($/GAL)	0.415	0.872	1.079	0.949	0.990	1.059	1.134	1.285	1.508	1.691	1.964
	RMS	1977	1980.	1981.	1982.	1983.	1984.	1985.	1987.	1990.	1992.	1995.
OCTPRE	OCTANE PREMIUM ($/GAL)	0.018	0.042	0.052	0.048	0.047	0.051	0.054	0.062	0.073	0.083	0.096
SHIPP	SHIPPING SAVINGS ($/GAL)	0.034	0.043	0.046	0.050	0.052	0.055	0.058	0.067	0.077	0.086	0.102

TABLE 3.10

		1980	1981	1982.	1983.	1984.	1985.	1987.	1990.	1992.	1995.
STATE	[illegible] SUBSIDY ($/GAL)	0.300	0.460	0.460	0.400	0.400	0.400	0.400	0.400	0.400	0.400
		0.300	0.460	0.460	0.300	0.300	0.300	0.300	0.300	0.300	0.300
		0.300	0.460	0.460	0.200	0.200	0.200	0.200	0.200	0.200	0.200
		0.300	0.460	0.460	0.100	0.100	0.100	0.100	0.100	0.100	0.100
		0.300	0.460	0.460	0.010	0.010	0.010	0.010	0.010	0.010	0.010
FEDSUB	FED. & SUBSIDY ($/GAL)	0.400	0.400	0.400	0.500	0.500	0.500	0.500	0.500	0.500	0.500
		0.400	0.400	0.400	0.500	0.500	0.500	0.500	0.500	0.500	0.500
		0.400	0.400	0.400	0.500	0.500	0.500	0.500	0.500	0.500	0.500
		0.400	0.400	0.400	0.500	0.500	0.500	0.500	0.500	0.500	0.500
		0.400	0.400	0.400	0.500	0.500	0.500	0.500	0.500	0.500	0.500
PALC	PRICE OF ALC ($/GAL)	1.058	1.338	1.627	1.430	1.550	1.684	1.853	2.079	2.382	2.595	3.023
		1.058	1.338	1.627	1.430	1.545	1.672	1.835	2.066	2.370	2.588	2.983
		1.058	1.338	1.627	1.430	1.540	1.662	1.822	2.051	2.395	2.559	2.877
		1.058	1.338	1.627	1.430	1.537	1.654	1.811	2.012	2.259	2.459	2.770
		1.058	1.338	1.627	1.430	1.534	1.648	1.765	1.925	2.170	2.388	2.764
PNGLCT	PRICE NET MILL ALC ($/GAL)	1.098	1.373	1.647	1.430	1.550	1.684	1.853	2.079	2.382	2.595	3.023
		1.098	1.373	1.647	1.430	1.545	1.672	1.835	2.066	2.370	2.588	2.983
		1.098	1.373	1.647	1.430	1.540	1.662	1.822	2.051	2.355	2.559	2.877
		1.098	1.373	1.647	1.430	1.537	1.654	1.811	2.012	2.259	2.459	2.770
		1.098	1.373	1.647	1.430	1.534	1.648	1.765	1.925	2.170	2.388	2.764
PNGLC	PRICE NET MILL - ROI	0.912	1.187	1.439	1.207	1.318	1.441	1.594	1.782	2.035	2.205	2.559
		0.912	1.187	1.439	1.207	1.313	1.429	1.576	1.768	2.023	2.197	2.519
		0.912	1.187	1.439	1.207	1.309	1.419	1.563	1.754	2.008	2.168	2.413
		0.912	1.187	1.439	1.207	1.305	1.411	1.552	1.715	1.911	2.068	2.306
		0.912	1.187	1.439	1.207	1.302	1.404	1.506	1.627	1.823	1.998	2.300
PCALCT	PRICE SINGLE CORN ALC ($/GAL)	1.117	1.338	1.627	1.433	1.566	1.719	1.882	2.139	2.463	2.717	3.185
		1.117	1.338	1.627	1.433	1.562	1.710	1.866	2.127	2.452	2.710	3.153
		1.117	1.338	1.627	1.433	1.559	1.702	1.856	2.114	2.439	2.683	3.063
		1.117	1.338	1.627	1.433	1.556	1.695	1.846	2.077	2.358	2.595	2.973
		1.117	1.338	1.627	1.433	1.554	1.690	1.813	2.003	2.285	2.539	2.967
PCALC	PRICE SINGLE CORN - ROI	1.014	1.206	1.478	1.274	1.401	1.546	1.697	1.927	2.216	2.438	2.855
		1.014	1.206	1.478	1.274	1.397	1.536	1.682	1.915	2.204	2.432	2.822
		1.014	1.206	1.478	1.274	1.394	1.528	1.671	1.902	2.191	2.405	2.732
		1.014	1.206	1.478	1.274	1.391	1.522	1.662	1.864	2.110	2.317	2.643
		1.014	1.206	1.478	1.274	1.389	1.516	1.629	1.791	2.037	2.261	2.637

TABLE 3.10

MNE	DESC	1980	1981	1982.	1983.	1984.	1985.	1987	1990.	1992.	1995.
PSTEC	PRICE INDEX FOR STEAM COAL	1.109	1.165	1.276	1.316	1.368	1.464	1.712	2.029	2.321	2.835
PSTEL	PRICE INDEX FOR ELECTRICITY	1.327	1.436	1.504	1.526	1.565	1.635	1.835	2.028	2.249	2.632
PSTLAB	PRICE INDEX FOR LABOR	1.304	1.441	1.521	1.632	1.707	1.828	2.140	2.482	2.811	3.388
PSTOTH	PRICE INDEX FOR OTHER COSTS	1.275	1.426	1.527	1.586	1.665	1.774	2.039	2.380	2.674	3.177
PSFRT	PRICE INDEX FOR FREIGHT	1.241	1.347	1.445	1.516	1.600	1.693	1.934	2.246	2.501	2.960
PSSAL	PRICE INDEX FOR SALES COSTS	1.275	1.426	1.527	1.586	1.665	1.774	2.039	2.380	2.674	3.177
PDDG	THE PRICE OF DDG'S (H$/TON)	1.212	1.434	1.702	1.461	1.658	1.899	2.019	2.422	2.835	3.286	3.942
		1.212	1.434	1.702	1.461	1.659	1.902	2.017	2.418	2.830	3.284	3.951
		1.212	1.434	1.702	1.461	1.661	1.904	2.018	2.415	2.828	3.276	3.948
		1.212	1.434	1.702	1.461	1.662	1.906	2.019	2.387	2.830	3.247	3.955
		1.212	1.434	1.702	1.461	1.663	1.907	2.054	2.393	2.841	3.271	3.951
PCGU	THE PRICE OF CGF (H$/TON)	0.913	1.030	1.379	1.209	1.365	1.560	1.648	1.985	2.325	2.708	3.255
		0.913	1.030	1.379	1.209	1.368	1.564	1.649	1.983	2.323	2.707	3.269
		0.913	1.030	1.379	1.209	1.370	1.567	1.651	1.983	2.323	2.705	3.281
		0.913	1.030	1.379	1.209	1.371	1.570	1.654	1.985	2.339	2.695	3.303
		0.913	1.030	1.379	1.209	1.373	1.572	1.691	1.982	2.362	2.725	3.301
PCGM	THE PRICE OF CGM (H$/TON)	2.100	2.369	3.171	2.780	3.140	3.588	3.789	4.565	5.348	6.228	7.486
		2.100	2.369	3.171	2.780	3.146	3.597	3.792	4.562	5.343	6.227	7.518
		2.100	2.369	3.171	2.780	3.150	3.604	3.798	4.560	5.343	6.222	7.547
		2.100	2.369	3.171	2.780	3.154	3.611	3.804	4.519	5.379	6.198	7.597
		2.100	2.369	3.171	2.780	3.157	3.616	3.888	4.558	5.432	6.267	7.591
PCOO	THE PRICE OF CORN OIL ($/LB)	0.307	0.263	0.238	0.238	0.270	0.310	0.330	0.395	0.462	0.535	0.641
		0.307	0.263	0.238	0.238	0.270	0.310	0.329	0.394	0.461	0.535	0.643
		0.307	0.263	0.238	0.238	0.270	0.310	0.329	0.394	0.461	0.533	0.641
		0.307	0.263	0.238	0.238	0.271	0.310	0.329	0.389	0.460	0.527	0.641
		0.307	0.263	0.238	0.238	0.271	0.311	0.335	0.389	0.461	0.531	0.640
	QUANTITY OF BY-PRODUCTS											
QDDG	QUANTITY DDG'S (BLBS)	0.000	0.000	0.000	0.760	2.924	5.903	9.588	13.507	17.765	18.908	19.606
		0.000	0.000	0.000	0.760	2.641	5.187	8.382	11.838	16.226	17.734	17.447
		0.000	0.000	0.000	0.760	2.393	4.562	7.299	10.233	14.434	16.199	9.660
		0.000	0.000	0.000	0.760	2.180	4.026	6.358	8.899	9.029	7.290	0.000
		0.000	0.000	0.000	0.760	2.014	3.614	2.481	1.120	0.000	0.000	0.000

TABLE 3.10

	1979	1980	1981	1982	1983	1984	1985	1987	1990	1992	1995
[illegible]	0.000	0.206	0.313	0.495	0.535	0.577	0.622	0.726	0.916	1.068	1.345
	0.000	0.206	0.313	0.495	0.535	0.577	0.622	0.726	0.916	1.068	1.345
	0.000	0.206	0.313	0.495	0.535	0.577	0.622	0.726	0.916	1.068	1.345
	0.000	0.206	0.313	0.495	0.535	0.577	0.622	0.726	0.916	1.069	1.063
	0.000	0.206	0.313	0.495	0.535	0.577	0.622	0.726	0.528	0.178	0.000
[illegible]	0.000	0.731	1.110	1.758	1.899	2.051	2.209	2.578	3.252	3.791	4.776
	0.000	0.731	1.110	1.758	1.899	2.051	2.209	2.578	3.252	3.791	4.776
	0.000	0.731	1.110	1.758	1.899	2.051	2.209	2.578	3.252	3.791	4.776
	0.000	0.731	1.110	1.758	1.899	2.051	2.209	2.578	3.252	3.791	3.776
	0.000	0.731	1.110	1.758	1.899	2.051	2.209	2.578	1.877	0.631	0.000
[illegible]	0.000	0.101	0.153	0.243	0.262	0.283	0.305	0.356	0.450	0.524	0.660
	0.000	0.101	0.153	0.243	0.262	0.283	0.305	0.356	0.450	0.524	0.660
	0.000	0.101	0.153	0.243	0.262	0.283	0.305	0.356	0.450	0.524	0.660
	0.000	0.101	0.153	0.243	0.262	0.283	0.305	0.356	0.450	0.524	0.522
	0.000	0.101	0.153	0.243	0.262	0.283	0.305	0.356	0.259	0.087	0.000

BU = BUSHEL
BBU = BILLION BUSHELS
MAC = MILLION ACRES
HMAC = HUNDRED MILLION ACRES
HBU = HUNDRED BUSHELS PER ACRE
LB = POUND
BLBS = BILLIONS OF POUNDS
H$ = HUNDREDS OF DOLLARS
BRL = BARRELS
MBRL = MILLION BARRELS
BBRL = BILLION BARRELS
MGAS = MILLION GALLONS
BGAL = BILLION GALLONS

Chapter 4

Detailed Input-Output Modeling

This chapter presents an application of the Input-Output (I-O) technique to forecast final demands and outputs of products in the U.S. economy at the 425 sector level of detail. Specifically, the detailed output model (DOM) produces forecasts of sales to personal consumption expenditures (PCE), producers' durable equipment (PDE), government pruchases, imports, exports, construction expenditures, inventory change, intermediate use, and output for each of 425 I-O sectors, all consistent with the forecasts of the INFORUM 78-sector interindustry macroeconomic model. To accomplish this task, the DOM model and the INFORUM I-O model are linked together, with each providing the other with information that it is best able to produce.

In doing any economic modeling, the appropriate level of aggregation is dependent on the intended purpose of the model. Obviously, there is no one correct level of aggregation. More aggregate I-O models, such as the INFORUM LIFT model, have two major advantages over more detailed models. First, they can be closed with respect to income, and second, they generally have more stable final demand functions. These advantages come at the sacrifice of industry detail, detail which is highly desirable for many business applications. To take an extreme example, all of Food and tobacco is in a single sector of the LIFT model, while there are 38 detailed sectors that comprise the same food and tobacco in the DOM model. A producer of pet food could

not derive much information about the future demand for pet food from the LIFT forecast where it is dwarfed by the outputs of processed vegetables, snack foods, meat products, and tobacco products. In order to gain the additional sectoral detail without losing the benefits of a more aggregate model, the DOM model was constructed with several direct links to the LIFT model. The LIFT model provides prices, income, and variables such as personal consumption expenditures and investment, that depend on prices and income. In return, DOM provides the information to LIFT where it has the advantage, that is, where additional detail is useful. As is described below, DOM provides LIFT with matrix coefficient change data. Through this 'friendly' linking of the two models, it is hoped that both will provide better forecasts. The link between the two models make it possible to achieve consistency in the sense that DOM final demands aggregate to the proper totals in LIFT.

The 78-sector INFORUM model (LIFT) is a comprehensive I-O model in that it forecasts not only product final demands, interindustry flows, and output, but also, product prices and factor incomes. Sectoral detail on the output, or real, side of the LIFT model is constrained to 78 sectors by the lack of data on the income side of the model. A more complete description of the LIFT model can be found in Almon (1).

In comparison to the LIFT model, DOM is a partial model, that is, it has only a real side, and no price or income determination capabilities. Thus, DOM is dependent on LIFT for foreign and domestic prices as well as income. In addition, without a price/income side DOM

cannot, on its own, assure that its product GNP forecast is consistent with any forecast of, say, disposable income. To insure such consistency, DOM is linked to LIFT, and the final demand forecasts of DOM model are forced to sum to the more aggregated LIFT values. Also, close but not perfect consistency can be achieved between the detailed and aggregate output forecasts. Table 4.1 presents the LIFT to DOM aggregation scheme, with sector titles.

Figure 4.1 presents a simple flow chart for the DOM. Block A, at the top of Figure 4.1, lists the variables which the DOM takes as exogenous from a LIFT forecast. These include prices and final demands.

Blocks B through F, the export, personal consumption expenditures (PCE), producers' durable equipment (PDE), government purchases (GOV), and construction blocks, list the final demands that are not determined simultaneously with output. Exports are determined as a function of foreign demands and foreign prices relative to domestic prices. The estimated form of the equations and a summary of the results are given in secton 4.3. PCE, PDE, and construction are determined by the use of variables forecast by LIFT, and bridge matrices. To forecast personal consumption expenditures (PCE) by I-O category, the LIFT forecast of PCE by consumption goods is passed through the "PCE bridge" matrix. For example, the PCE bridge allocates the retail value of a new car (one of the LIFt consumption categories) to these production and distribution sectors: 77 percent to Motor vehicles (384), 1 percent to Railroads (432), 1 percent to Trucking (434), less than 1 percent to Water transportation (435), 4.5 percent to Wholesale trade (445), and 16 percent to Retail trade (446). Similarly, producers' durable equipment

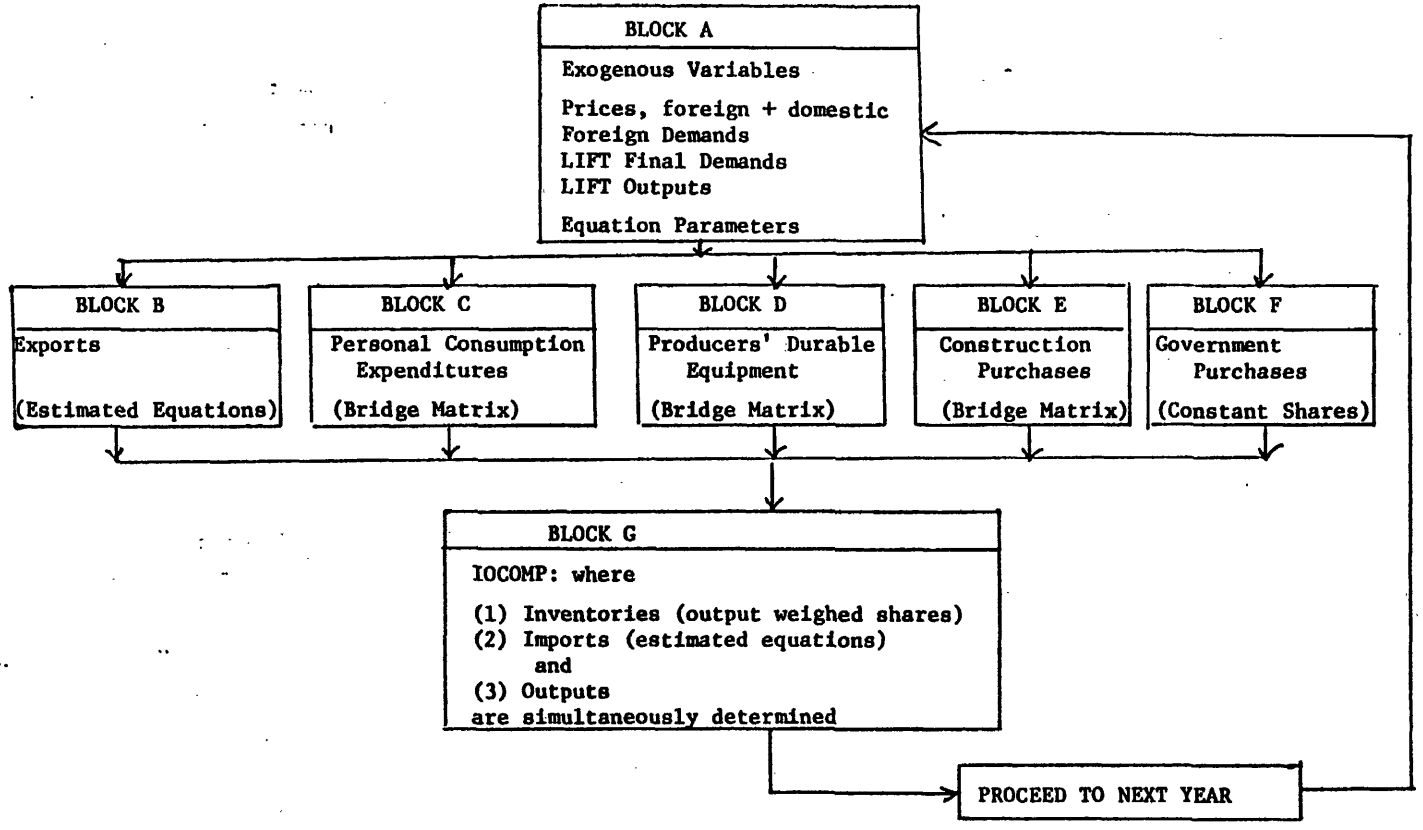


Figure 4.1: A Basic Flow Diagram of the Detailed Output Model

expenditures by I-O sector is determined by passing the LIFT forecast of investment by 58 investing industries through the so-called "B", or investment, matrix. To predict construction purchases by I-O sector, construction purchases by 31 construction types is passed through the construction materials, or C, matrix. Each of these matrices and a discussion of the way coefficients change are presented in sections 4.4, 4.5 and 4.6, respectively. Government purchases by I-O sector are determined in a simplified way due to a lack of time series data. The LIFT forecast of government purchases is split out to the detailed sectors in the 1977 proportions for each LIFT sector. This work is described in more detail in section 4.7.

Block G of Figure 4.1, labeled 'Output Computation,' is where the last two final demands -- inventory change and imports -- are determined, along with output, by using the iterative Seidel solution procedure. Both inventory change and imports depend on the current period's output, and therefore must be solved for simultaneously with output. Given the lack of reliable time-series data on inventory change, a simple weighting scheme was used to split the LIFT projections of inventory change to the detailed sectoral level. Each detailed sector is assigned, in proportion to its own output, a portion of the corresponding aggregate sector's inventory change. Equations to predict imports by I-O sector are simple functions of current output. More discussion of inventory change, imports and the output solution process is given in sections 4.8, 4.9, and 4.10 respectively. Once the Seidel process converges, the model continues on to the next year.

What is not shown in Figure 4.1 are the influences DOM has on LIFT.

The input-output, construction, and PCE bridge matrices, described in detail below, are forecast at the DOM level of detail, then aggregated for use in LIFT. Because these matrices are prepared outside both forecasting models, this link does not appear in Figure 4.1.

Before turning to a more complete description of the determination of the final demands, section 4.2 presents a review of the relevant I-O literature. Sections 4.3 through 4.10 describe the determinations of final demands and outputs, while a brief description of the forecasts DOM is capable of producing is given in section 4.11.

4.2 Review of the Literature

In the currently available body of economic literature, there is no presentation of an I-O model of comparable detail. In addition, there is no discussion of ways in which I-O models of different levels of aggregation could be linked to take advantage of the merits of both. Finally, the two major (non-INFORUM) I-O modeling groups -- Data Resources, Inc. and Wharton Economic Forecasting Associates -- generally do not publish or provide descriptions of the basic structure of their models. Data Resources has developed a detailed model that runs off of some 50 to 100 totals from the DRI macroeconomic model, but documentation as to its use of I-O techniques is unavailable. The single model that is available for review is the basic model of several years ago, as described in Almon (2).

The INFORUM model presented in Almon (2) was in several ways a model half way between LIFT and DOM. While the old model had more than twice the number of sectors as LIFT (185 to 78), it had less than half

the number of DOM (185 to 425). In addition, the 185 sector model had the final demand determination that the current LIFT model does, but it was not closed with respect to income. By providing more detail and by closing the model with respect to income, the LIFT/DOM combinations of models are great improvements over the 185 sector model. Other improvements are the result of several recent dissertations, cited below, which improved the method by which final demand components are determined.

4.3 - Exports

There are two types of export equations used in the LIFT model, one for merchandise and one for non-merchandise exports. Merchandise exports are explained with foreign demands and relative domestic-to-foreign price ratios with an estimated elasticity. Because time series data on foreign prices for service sectors are unavailable, the exports of non-merchandise sectors are simple linear functions of the lagged sum of merchandise exports and domestic prices. For a more detailed description of these functions, see Ralph Monaco's Ph.D. dissertation (8).

Similarly, in DOM, two types of export equations are used, one for merchandise and one for non-merchandise exports. The first type, used for merchandise sectors, has of the following form:

$$E_i = (a + b * O_{78}) \ PR_{78}^{N}$$

where

E_i = exports by detailed sector i.

O_{78} = foreign demand for the LIFT sector that corresponds to the detailed sector i.

PR_{78}^{N} = relative domestic to foreign prices, raised to the power N, for the LIFT sector that corresponds to detailed sector i. The price elasticities, N, are the ones estimated for the LIFT model.

a, b = estimated parameters.

For the nonmerchandise sectors, forecasts of the LIFT I-O sectors were split among the detailed sectors by using 'share' equations. The equations to predict the share of the LIFT sector exports assigned to each detailed sector were of the following form:

$$E_i / E_{78} = a + b * T$$

where:

E_{78} = exports of the LIFT sector that corresponds to detailed sector i

T = time trend; 1 in 1955, 2 in 1956, ...

In the second set of equations, constraints were applied across equations to insure that the shares would sum to 1.00. The constraints required that all the 'a' coefficients for the detailed sectors in a LIFT sector sum to 1.00, while the 'b' coefficients sum to 0.00. Results of the estimation are given in Table 4.2, presented at the end of the text.

Consistency between LIFT and DOM exports are insured for the service sectors by the use of the across equation constraints. No such consistency is to be expected from the equations of the first type. Hence, to obtain the desired consistency, the forecast values of exports

were scaled up or down by the same proportion to match the LIFT aggregates. This scaling procedure implies that the first set of equations determine relative rather than absolute levels of exports.

4.4 - Personal Consumption Expenditures

Consumption expenditures by I-O sector are forecast by passing a vector of expenditures by consumption category through a matrix which "bridges" from consumption categories to I-O products. The same method is used to forecast PCE by I-O sector for the LIFT model. Hence, as long as the bridge matrices are consistent, that is, if the detailed matrix can be aggregated to the LIFT matrix, the vectors of PCE by I-O sector will be consistent. (See list, Table 4.1)

Expenditures by consumption categories are forecast in the LIFT model, based on the work of Paul Devine (5). The study by Devine combined cross-section with time-series analysis to take into account the effects of income distribution and several demographic influences on consumption expenditues. For a more detailed discussion of the estimation technique and forecasting properties, see Devine's dissertation (5). A list of the 78 PCE categories is presented as Table 4.3.

The changing patterns of personal consumption cause shifts in the PCE bridge, or, D, matrix coefficients. To capture as much of the shifts as possible, equations were estimated for across-the-row coefficient change within the consumption bridge matrix.[1] Obviously, it would be preferable to estimate the change in each individual coefficient. However, at this extreme level of detail no time series of

matrices exist. Matrices were prepared for 1958, 1963, 1967, and 1972, but they were not necessarily prepared in a consistent manner. Hence, the across-the-row form of equation is the best available alternative. By using across-the-row equations, the data requirements are reduced from a time series on each coefficient to a single time series of PCE for each DOM sector. In forecasting, each coefficient in the row will be adjusted by the same percentage.

The form of the equation actually estimated was as follows:

$$PIO/CCI = a + b\ TIME$$

where:

PIO = PCE by DOM sector

CCI = constant coefficient indicated purchases (see below)

$$CCI = \sum_j d_{ij} * PCE_j$$

TIME = 1 in 1959, 2 in 1960, ...

"Constant coefficient indicated" purchases are the level that purchases would have been had all bridge-matrix coefficients remained at their 1977 value. The equations fit moderately well, as can be seen in Table 4.4, and add some forecasting power to the model.

Once the coefficient change equations have been applied to the D matrix to produce the forecast year's D matrix, there is one more step to be done before PCE by I-O sector is determined. After applying the coefficient change equations, the columns of the D matrix may or may not sum to 1.00. If the columns do not sum to 1.00, then the sum of PCE purchases by consumption categories will not equal the sum of purchases when categorized by DOM sectors. To eliminate this problem, the D

matrix columns were normalized, or scaled, so that the column sums again were equal to 1.00.

Consistency of forecasted PCE by I-O sector can be maintained by using consistent D matrices in both models. The 1977 matrices are consistent, that is the DOM D matrix can be aggregated to produce the LIFT matrix. In forecasting, this consistency can be maintained by simply determining the DOM D matrix for the appropriate number of years, and aggregating them to produce the forecasts of the LIFT D matrix. The forecasted LIFT D matrices are then used in producing the LIFT forecast necessary to run the DOM model.

There is a certain gap, called the 'INFORUM statistical discrepancy', between total PCE as determined by summing the NIPA categories and by summing PCE purchases by I-O sector. PCE by category is taken from the National Income and Product Accounts (NIPA). This NIPA PCE is derived from data on retail sales and is adjusted to the categories based on merchandise line sales shown in the Census of Business. A weakness in this approach is that, except for infrequent benchmarks of the NIPA's, it does not take into consideration information about what goods are produced. In contrast to the NIPA method, it is possible to produce "output-based" estimates of PCE by I-O sector. To do so, five-digit Standard Industrial Classifications product shipments are adjusted to include imports and exclude exports, and are then multiplied by a "PCE ratio." The "PCE ratio" is the share of the adjusted five-digit series sold to PCE in 1972, the last year for which a detailed I-O table is available from the Commerce Department. It would be pleasant to report that this "output-based" PCE is close to

the "bridged consumption" obtained by putting NIPA PCE through the D matrix. Unfortunately, that is not the case; for some sectors there are irreconcilable differences. To use the "bridged consumption" as final demand would make it impossible to calculate outputs consistent with the Census of Manufactures. Therefore, the difference between the two method of computing PCE, the statisical discrepancy, is added to each year's forecast of bridged consumption. The statistical discrepancy is the ratio of PIO, minus bridged PCE, to bridged PCE calculated from actual 1980 data multiplied by the forecast bridged PCE. Stated algebraically, forecast values of PIO are determined as follows:

PIO = BR + SD

where:

BR is bridged PCE

SD is the statistical discrepancy calculated as follows:

$$SD = ((PIO - BR) / BR)_{80} * BR_t$$

the 80 subscript indicates that the 1980 proportion be used for eve ry

subsequent year t.

4.5 - Producers' Durable Equipment[2]

Producers' durable equipment (PDE) sales by I-O sector are forecast in a manner similar to PCE. Forecasts of investment by 58 investment categories (listed in Table 4.2) are taken from the LIFT model forecast and passed through the investment, or "B", matrix. Once again, if the matrices are consistent, the forecasted PDE by I-O sector (EIO) will

also be consistent.

The equations which forecast investment in equipment by 58 investing industries were developed by Anthony Barbera as part of his Ph.D. dissertation (3). A list of the 58 investing sectors is given in Table 4.5. In the Barbera study, investment was jointly estimated with labor requirements based on a generalized Diewert cost function. In the LIFT model, the demands for capital equipment (V) are functions of relative input prices -- capital costs, labor costs, and energy prices -- and movements in industry demand. For a more detailed description of this work refer to Barbera's dissertation (3).

The investment, or "B" matrix, shows what percentage of the investment dollar each of the 58 investors spent on PDE sold by each of the 78 producing (I-O) sectors. If an element of the matrix, b_{ij}, were .05, it would mean that investing sector "j" spends five cents of each dollar invested on equipment from producing sector "i". The "B" matrix used for this study is a 1977 matrix, which is really an INFORUM update of the 1972 Bureau of Economic Analysis' 1972 Table.

There is no reason to believe that the relative shares of equipment purchased are constant over time, and, in fact, the data shows substantial changes in relative shares. For example, since 1958, computing equipment's share for each of the investing sectors has been growing rapidly, and the trend is likely to continue. Trends in the coefficients are incorporated in the model by the use of across-the-row coefficient change equations. These equations contain both a time trend and a cyclical variable in estimating coefficient change.

The equations to predict the coefficient change were estimated of

the form:

$$(EIO/CCI) = a + b\ TIME + c\ PCCI$$

where:

EIO = Producer's durable equipment sales by I-O sector
TIME = 1 in 1958, 2 in 1958, ...
CCI = The constant coefficient indicated use (described below)

The CCI for sector i in year T is

$$CCI_i = \sum_{j=1}^{57} b_{ij}\ V_{jt}$$

PCCI = percent change in the CCI from one period earlier.
V = investment by investment category j in time t

The results of the estimation are presented in Table 4.6.

As the name "constant coefficient indicator" (CCI) implies, the CCI is a measure of what PDE sales would have been had the B matrix coefficients remained constant at the 1977 values. The dependent variable for the equation is actual PDE divided by the constant coefficient indicated PDE, an index equal to 1.0 in 1977. For example, if the 1985 forecasted value of EIO / CCI is 1.1, then the average coefficient in that particular row is, by 1985, 10 percent above its 1977 value.

The PCCI term is a cyclical variable which allows sectoral growth in a particular industry to affect its overall share of PDE sales. The time trend use for estimating and forecasting is a typical time trend between 1958 and 1980. Time had a value of 1 in 1958, 2 in 1958, 3 in 1959, and so on. However, because the normal time trend predicted very large growth for several sectors, time was "slowed" gradually after 1980. Under normal conditions, time would have a value of 38 by 1995,

but using 'slow time' the 1995 value was only 34. The value of the slowed time trend for each year was gotten by the following formulae:

$$TT = 23 + (.974)^{T}$$

where:

T = the normal time trend, 20 in 1977, 21 in 1978, ..., 38 in 1995

TT = slow time

23 is the value of the normal time trend in 1980

Forecasts of the high growth sectors, particularly computers, are believed to be more reasonable using this 'slow time' function.

Once all the coefficients changes have been applied, the B matrix columns will, in general, not sum to 1.0. This implies that PDE sales will be greater or less than investment purchases, which makes no sense. Hence, all the columns are normalized (scaled) so that each column again sums to 1.00, and purchases will therefore equal sales. In running the model thus far, the scaling factors range from approximately 1.25 to .80, with a weighted average of about 1.05.

As was the case with PCE, consistency in the EIO will be maintained if matrices are always consistent. For PDE, the matrices are not consistent because the LIFT model is determining investment in an iterative manner. There is an investment-output loop in the LIFT model, which determines investment for each year using the Barbera equations. (Note once again, that one term in the Barbera equations is an industry demand term.) However, as investment changes in response to better guesses of output, the PCCI term changes, changing the LIFT B matrix coefficients. The use of the PCCI term in the coefficient change

equations gives LIFT some good cyclical properties.[5] Because the DOM B matrix coefficient change equations are believed to provide additional information, they are used to project the DOM B matrices. Then to maintain consistency, the detailed forecasts of PDE by DOM sector are simply scaled so that, when aggregated, they match the LIFT forecast. In the future, the DOM B matrix change equations may be put into the LIFT model to provide the maximum information while retaining the good cyclical properties of the current LIFT model.

A statistical discrepancy exists between available equipmemt investment data and equipment purchases by I-O sector data. This discrepancy is much smaller than the PCE discrepancy, because both sources begin with production data. The discrepancy arises from the treatment of the data and, in several cases, is reconcilable. In order that the I-O computations be consistent with the INFORUM I-O table's construction, the data should conform to the PDE purchases by I-O sector data. Because the equipment investment forecast is not consistent with the I-O data and because not all the differences are reconcilable, the statistical discrepancy is accounted for during each year of the forecast. The discrepancy vector is obtained by passing the 1980 investment vector through the "B" matrix, and dividing the result into actual PDE by I-O sector. For each year after 1980, the discrepancy vector is assumed to be the same proportion of the investment-bridged PDE purchases.

4.6 Construction

In the LIFT model, construction is forecast by 31 types of

construction listed in Table 4.7.[4] These projections are then passed through the construction, or C, matrix to determine purchases for construction by I-O sector. To produce the detailed forecast of sales to construction by I-O sector for the DOM model, the same forecast of 31 construction types was passed through the detailed "C" matrix. Again, consistency between the LIFT and DOM forecast is guaranteed as long as the matrices are consistent. Construction of the 1977 matrices insure consistency for that year. For each subsequent year, consistency is maintained despite coefficient change, by using the detailed matrix change equations to determine coefficient change for both DOM and LIFT. That is, the DOM "C" matrix for each year was aggregated to the LIFT sectoral level, and was then used in producing the LIFT forecast. The coefficient change equations used are the same equations as are used for "A" matrix coefficient change and are described in detail below. After the coefficient changes are applied the matrix is normalized, -- forcing the columns to sum to 1.00 -- so that construction purchases are equal to sales to construction.

4.7 - Government

Forecasts of government purchases by I-O sector are broken out into four types: federal defense, federal non-defense, state and local education, and state and local other. Unfortunately, no time series exists listing government purchases of these four types by I-O sector. Only the 1977 values are readily available from the development of the 1977 I-O matrix. Given the lack of data, what could be done with government purchases is quite limited.

In the LIFT model, the four types of government purchases are specified exogenously, and then passed through the government or "G" matrix to determine purchases by I-O sector. No coefficient change equations are estimated for the G matrix because the lack of time series data. Users have the option of specifying changes in the G matrix, but the coefficients otherwise remain constant from year to year.

For the DOM model, there are two ways which could be used to forecast government purchases by I-O sector. First, the four exogenously specified levels of purchases used in the LIFT model, could be passed through the 1977 detailed G matrix. The detailed and LIFT forecasts would then be consistent, because the matrices are consistent. Alternately, the LIFT forecast of government purchases by I-O sector could be split to the 425 sector level based on their 1977 shares. Consistency between DOM and LIFT is guaranteed as long as the shares sum to 1.00, which they do. Because the two methods are equivalent (with no coefficient change), the second method was chosen for the initial model construction for its computational ease. In the future, someone may wish to specify DOM's G matrix coefficients so the detailed G will have to be read in.

4.8 - Inventory Change

Inventory change forecasting, like government purchase forecasting, suffers from severe data problems. No reliable time series can be obtained for all 425 sectors, which implies that some sort of sharing scheme based on the LIFT model forecasts will have to be used. Simply splitting the LIFT aggregate sectors to the various detailed sectors on

the basis of their 1977 shares would be reasonable, but would not use all the information available. Instead, the 78-sector inventory change figures are split to the detailed sector level in proportion to detailed sector's share of the corresponding LIFT sector's output. Using this method allows shifts in relative shares of output to affect the relative shares of inventory change in the way one would expect. For example, an increase in the demand for Telephone and telegraph apparatus, DOM sector 343, would appear as an increase in the demand for Communications equipment and electronic components, sector 38, in the LIFT model. As a result of the change in demand, inventory levels would quite likely drop initially, and rise in the subsequent years. There is no reason to spread the changes in inventory levels across all the detailed sectors, as would be done if the sharing were done on the basis of the relative 1977 inventory change shares. When shared on the basis of current output, the increased share of output by Telephone and telegraph apparatus would give it a correspondingly larger share of inventory change. Because inventory change is dependent on current output, it is solved for simultaneously with output, as is described below in section 4.10.

This treatment of inventories has the glaring weakness of not taking into consideration the typical inventory to output ratio. For example, Fluid milk has an extremely low inventory to output ratio, while Cheese has a somewhat higher ratio. Yet, because the output of Fluid milk is generally larger, the inventory change predicted by the DOM model of milk would be larger than that for cheese. This problem exists to some extent for each of the LIFT sectors, but is probably most

severe for the LIFT Food and tobacco (9) and Agriculture, forestry, and fishery (1) sectors because they contain many dissimlar products. It is intended that an alternate treatment of inventory be developed, at least for the LIFT sectors that suggest such problems.

4.9 - Imports

The import equations in the LIFT model predict merchandise exports by I-O sector using domestic demands, time trends, and relative foreign to domestic prices. For the service sectors, imports are predicted using lagged merchandise imports and time trends. For a more detailed description of this work see Ralph Monaco's Ph.d. dissertation (8).

A similar distinction between merchandise and service sectors is made in estimating the DOM import equations. For the merchandise sectors, whose data is more reliable than the service sector data, the equations are of the following form:

$$M_i = (a + b\ D_i) * P_{78}^{N}$$

where:

M_i = imports of detailed sector i.

D_i = domestic demand for the products of sector i
(sum of final demands and intermediate flows minus exports)

P_{78}^{N} = foreign price index relative to the domestic producers' price index, raised to the power N. N is an estimated parameter of the 78 sector LIFT model.

a,b = estimated parameters.

The same data problems exist, only multiplied by the number of sectors, for the detailed non-merchandise sectors that exist for the LIFT model.

Hence, the following simple share equations were used to predict the share of each LIFT sector's imports that were assigned to the corresponding detailed sectors.

$$M_i / M_{78} = a + b * T$$

where:

M_{78} = imports of the LIFT sector that corresponds to sector i.

T = a time trend, equal to 1 in 1955, 2 in 1956, ...

Across equation constraints are applied to insure that the shares would sum to 1.00. The constraints force the 'a' coefficients to sum to 1.00, and the 'b' coefficients to sum to 0.00. Table 4.8 summarizes the results of the estimation, with a 'T' appearing next to the titles of the equations that were estimated using the share equation form.

Consistency between LIFT and DOM import forecasts is assured for the share equations by the use of constraints, but is not assured for merchandise imports. The forecasts of merchandise imports that make up a LIFT sector are scaled up or down by the same proportion so that the sum will match the LIFT aggregate.

4.10 - Output Computations

At the heart of an input-output model is a table of input-output coefficients, the "A" matrix. The A matrix shows the necessary intermediate flows to produce one dollar's worth of ouput for each of the I-O sectors. Each coefficient, a_{ij}, shows the percentage of the output of industry j that is purchased from industry i. For example, if

it takes five cents worth of Agricultural fertilizers to produce a dollar's work of a Grain, the coefficient for the Agricultural fertilizer row and Grains column would be .05. The sum of each column of the A matrix, with value added included, is 1.00 when valued in current prices.

The input-output computation begins with a measure of the previously determined final demands by I-O sector. This is obtained using the following formula:

$$(4.1) \quad F_i = \sum_{j=1}^{57} b_{ij} V_j + \sum_{j=1}^{31} c_{ij} S_j + \sum_{j=1}^{78} d_{ij} P_j + \sum_{j=1}^{4} G_{ij} + E_i$$

where

$i = 1, 2, \ldots 425$. The I-O sectors

F_i = final demand for I-O sector i

b_{ij} = the investment or B matrix, described above

c_{ij} = the construction matrix, described above

d_{ij} = the PCE bridge matrix

V_j = equipment purchases by industry j

S_j = construction of type j

P_j = personal consumption expenditures on good j

G_{ij} = government expenditures on sector i by each of the four government types (defense, non-defense, state and local education, and state and local other)

E_i = exports by sector i.

Note that the B, C, and D matrices all pertain to the appropriate year

of the forecast, and that the V, S, and C vectors are vectors taken from the LIFT forecast.

Given the calculation of F_i, outputs can then be computed using the appropriate A matrix. (How the A matrix is forecast is described below.) The output of each product, Q_1 .... Q_{425}, must satisfy the following equation:

$$(4.2) \quad Q_i = \sum_{j=1}^{425} a_{ij} Q_j + F_i - M_i + N_i$$

where: i represents the I-O sector

Q_i = the output of product i

M_i = the imports of product i

N_i = the inventory change of product i.

Verbally, equation 4.2 says that output of a product must not only cover the final demands -- F, M, and N -- but also the demand for its use as an intermediate good in producing other products. Solution of this set of simultaneous equations by way of the Seidel process yields the outputs, imports, and inventory change by I-O sector.[5]

Forecasting A and C Matrix Coefficient Change[6]

Input-Output coefficients change over time as a result of changing technology, government regulation, or changes in the relative prices. Over the past ten years, the coefficient for steel sales to auto manufactures has been falling, while the plastics and aluminum coefficients for sales to cars have been growing. This change is due

partly to a change in technology, and partly to a change in relative prices. Molded plastic parts are easier and cheaper to use for a car's interior. In addition, the use of plastic and aluminum, which are lighter than steel, increase the car's gas mileage, a change induced by the increase in the price of gasoline relative to all other goods during the mid 1970's and government miles-per-gallon restrictions. Government regulations can change coefficients more radically than severe price changes or changes in technology. The best example of such a government action was the banning of some pesticides with consequent dramatic drop in certain I-O coefficients.

Estimating the change in each and every individual coefficient is such an enormous task in terms of data collection and computer time that it was never seriously considered. Instead, the assumption is made that all coefficients in a row change in the same porportion. All of the 'across-the-row' coefficient change forecasts are fit to a logistic curve. All of the curves approach an asymptote, a floor or a ceiling, each at its own rate.[7]

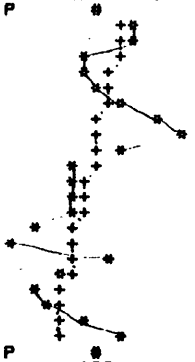
Besides the asymptote, the logistic curve function has the nice property of forecasting sales volume well, even when the fitted curve has a low R-square. Figure 4.2 shows the regresson fit and plot of actual and forecasted sales volume for sector 18, Chemical fertilizer mining. The R-squared for the fit is .244, while the R-square for the sales volume forecast is .916. The major drawback to the use of the logistic curve function is that it cannot fit a U-turn in the coefficient. In cases where a U-turn occurs in the historical coefficients, the forecast for the coefficient is exogenously specified.

FIGURE 4.2

18 CHEMICAL FERTILIZER MINING

PLOT OF HISTORICAL MARKET QUOTIENT (INTERM) RSQR = 0.244 AVER-QUOT = 1.1776 ASYM/AVER = 0.009 BEE =0.0050

1960	1.2537	1.2434	0.0103
1961	1.2506	1.2359	0.0147
1962	1.1683	1.2284	-0.0601
1963	1.1614	1.2210	-0.0597
1964	1.1972	1.2138	-0.0165
1965	1.2377	1.2066	0.0311
1966	1.3168	1.1994	0.1174
1967	1.3658	1.1924	0.1734
1968	1.2440	1.1854	0.0585
1969	1.1397	1.1786	-0.0389
1970	1.1474	1.1718	-0.0244
1971	1.1477	1.1651	-0.0174
1972	1.1331	1.1584	-0.0254
1973	1.0613	1.1519	-0.0906
1974	1.0234	1.1454	-0.1220
1975	1.2060	1.1390	0.0670
1976	1.1128	1.1326	-0.0198
1977	1.0754	1.1264	-0.0510
1978	1.0882	1.1202	-0.0320
1979	1.1695	1.1140	0.0554
1980	1.2288	1.1080	0.1208



69 = 100% 0 0 20 40 60 80 100 120 140 160 180 200

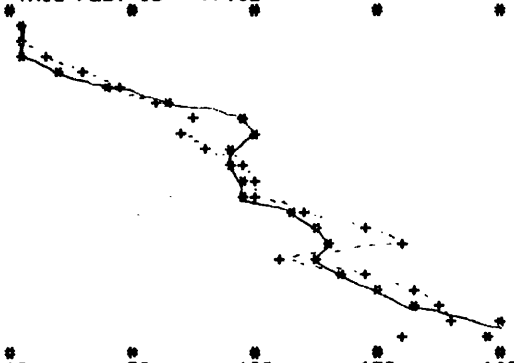
CURVE IN 1995 1.0243 RELATIVE TO AVER 0.8699

PARAMETERS	A(1,NP1)	A(2,NP1)	ASYMPTOTE	AVERAGE COEF	SION	LAST ERROR
	-0.00821	-0.00005	0.01023	1.17756	-1.00000	0.10257

AMI4 18 0 77 1.00000 78 1.01190 79 1.08747 80 1.14260 81 1.00832 82 1.00297 83 0.99769
84 0.99246 85 0.98728 86 0.98216 87 0.97709 88 0.97207 89 0.96711 90 0.96219
91 0.95733 92 0.95251 93 0.94774 94 0.94303 95 0.93836 96 0.93373 97 0.92915
98 0.92461 99 0.92012100 0.91568

PLOT OF HISTORICAL SALES VOLUME (INTERM) RSQ OF THIS PLOT IS 0.916

1960	1086.	1077.	9.
1961	1093.	1080.	13.
1962	1098.	1154.	-56.
1963	1194.	1255.	-61.
1964	1337.	1355.	-18.
1965	1503.	1465.	38.
1966	1712.	1559.	153.
1967	1755.	1532.	223.
1968	1687.	1608.	79.
1969	1670.	1727.	-57.
1970	1705.	1741.	-36.
1971	1711.	1737.	-26.
1972	1835.	1876.	-41.
1973	1902.	2064.	-162.
1974	1938.	2169.	-231.
1975	1921.	1814.	107.
1976	2004.	2040.	-36.
1977	2107.	2207.	-100.
1978	2196.	2260.	-64.
1979	2425.	2310.	115.
1980	2413.	2176.	237.



69 = 100% 0 0 20 40 60 80 100 120 140 160 180 200

The estimation was done on the ratio of actual intermediate use to 'constant coefficient indicated' use, rather than on actual coefficients. To get actual intermediate use, PCE, PDE, inventory change, and exports (minus imports), demands must be subtracted from output. The residual represents intermediate use plus construction and government purchases. Constant coefficient indicated use, as the name implies, show how much of the product would have been used at the intermediate level had the coefficients been constant at their 1977 values over the full historical period. The dependent variable for the estimation is given by:

$$W_i = U_i / I_i$$

where:

$$V_i = Q_i - \sum_{j=1}^{78} d_{ij} P_j - \sum_{j=1}^{57} b_{ij} V_j - E_i + M_i - N_i$$

$$I_i = \sum_{j=1}^{425} a_{ij} Q_j(t) + \sum_{j=1}^{78} c_{ij} S_j(t) + \sum_{j=1}^{4} G_{ji}$$

Other variables are as described above.

Table 4.10 shows the R-squares for the fit and the sales forecast, as well as the percentage change in the coefficients over the forecast period and the magnitude of the sales to intermediate use for each of the I-O sectors. The R-squared for the sales forecast is obtained by comparing actual sales to the sales predicted using the estimated parameters of the logistic curve.

Unlike PCE, PDE, and construction, consistency between the LIFT and DOM models cannot be insured simply by using consistent matrices. (In

this case, to check for consistency, the matrices must be aggregated by both row and column.) The output computations involve more than the simple 'vector times matrix' operation that is done for PCE, PDE, and construction, because each column of the detailed matrix that makes up a LIFT sector is different. These differences in coefficients cause the differences in computed outputs. Differences between aggregating the output forecast of the DOM model, and the LIFT forecast of output are relatively small, generally less than 3%. To insure as much consistency as possible, the forecast of the LIFT A matrix is obtained by aggregating the A matrix forecasts for the DOM model. It should be noted that the A matrix is not normalized after the coefficient changes have been applied. The A matrix columns should sum to 1.00 only in current prices. (For the LIFT model, the solution for prices insures that the columns, evaluated in current dollars, sum to 1.00.)

4.11 Forecasting with DOM

The forecasting process begins with forecasting the A, C, and D matrices at the DOM sectoral level using the functional forms described above. Any exogenous specifications of particular coefficients, or fixes, are then added to forecasted matrices. A fix on a particular coefficient could be applied if it were believed that technology would shift, or as a result of expected price changes. For example, if oil prices were specified to have another major price increase, it would be quite reasonable to specify declining coefficients in the petroleum and fuel oil rows, and increasing coefficients in other fuel rows.

Given the matrices and any fixes needed to produce the desired

simulation, LIFT is run. The resultant final demand forecasts from LIFT are then inputs to DOM. As the final step, DOM is run.

Table 4.10 presents one small sample of a DOM forecast. Pages 1-6 display the outputs, PCE, PDE, inventory changes, imports, and exports for the DOM sectors which make up LIFT sectors 36 through 42. Subtotals are given on each page at the LIFT level of sectoral detail. The dollar figures given are in billions of 1977 dollars.

Table 4.11 shows detailed breakdowns of sales by Lighting fixtures and equipment (366) and Storage batteries (375). From Table 4.11 it can be seen that 43.5 percent of the output of Lighting fixtures and equipment was sold as intermediate product, mainly to the 18 sectors listed under the heading "SALES TO INTERMEDIATE." Of the 1450.6 million (1977) dollars in sales to intermediate users, the largest share, 488.4 million dollars, went to Maintenance construction (20). Below the heading "SALES TO OTHER FINAL DEMAND," the particular final demands are listed. For example, exports of Lighting fixtures and equipment in 1977 were 149.6 million dollars. The same figure is given for Lighting fixtures and equipment on the export page of Table 4.10 (page 6).

4.12 Summary

The linked DOM and LIFT models provide a good way of forecasting final demands, intermediate flows, and outputs at the 425 sector level of aggregation. DOM provides LIFT with forecasts of coefficient change which, when aggregated to the LIFT sectors, will insure consistency of PCE and construction purchases by I-O type, and helps output forecasts to be as consistent as possible. LIFT, on the other hand, provides

forecasts of prices, incomes, PCE by consumption category, investment by industry, construction by industry, and other final demands by LIFT I-O sector. LIFT's more stable demand functions and price forecasting abilities make it better equipped to do this part of the forecast. Combined, the two models provide a very comprehensive forecast of the U.S. economy.

There are still several weaknesses in the LIFT/DOM system. The lack of reliable inventory data forces the DOM inventory change predictions to be over-simplified. In addition, the DOM level coefficient change equations should be used in the LIFT model to insure consistency of the PDE forecasts. This improvement will have a rather high cost in computer time when running the LIFT model. Other future work should include the elimination of the need for 'statistical discrepancy' vectors used in forecasting PCE and PDE by I-O sector. Finally, the DOM import and export functions could perhaps be improved with other functional forms.

ENDNOTES

1

I would like to thank Margaret Buckler for estimating the PCE bridge equations.

2

I would like to thank Stephen Pollock for his work in preparing the B matrix, and for estimating the coefficient change equations.

3

For more discussion of this point see Pollock (9).

4

For a description of the forms of equations used to estimate the construction, see Monaco (7).

5

For a more detailed description of the Seidel process, see Almon (2) pages 148-150.

6

I would like to thank Doug Meade for estimating the A matrix coefficient change equations, and for his careful inspection of the data.

7

The differential equation for the logistic curve is:

$$\frac{1}{c}\,\frac{dc}{dt} = b\,(a - c)$$

where
c = coefficient
a = asymptote toward which the coefficient is tending
b = constant ratio of the percentage change in c to the gap between a and c.

Almon (2) page 157.

References

(1) Almon, Clopper, "The INFORUM Interindustry Macro Model With an Application to the Effects of Protection," INFORUM Working Paper US - 51, 1983.

(2) Almon, Clopper, Jr., Buckler, Margaret B., Horwitz, Lawrence M., and Reimbold, Thomas C., 1985: Interindustry Forecasts of the American Economy, Lexington, MA, Lexington Books, 1974.

(3) Barbera, A.J., A Study of the Determinants of Factor Demand by Industry, Unpublished Ph.D. dissertation, 1982.

(4) Barker, Terence S., editor, Economic Structure and Policy with Applications to the British Economy, London, Chapman and Hall, 1978.

(5) Devine, Paul, Forecasting Personal Consumption Expenditures from Cross-section and Time series Data, Unpublished Ph.D. dissertation, 1983.

(6) Hyle, Mathew, "An Interindustry Forecasting Model for Prices and Factor Incomes for the U.S.", unfinished Ph.D. dissertation.

(7) Monacc, Ralph M., 'Construction Equations,' INFORUM research report US 32.

(8) Monaco, Ralph M., "Monetary Policy in an Interindustry Model", unfinished Ph.D. dissertation.

(9) Pollock, Stephen, "Estimating Coefficient Change in the PDE-Investment Bridge", INFORUM research report no. US 62.

Appendix A

Simulation Tables

Table 4.1 Comparison of LIFT and DOM Sectors
(DOM sectors indented)

1	AGRICULTURE,FORESTRY,FISHERY
	1 DAIRY FARM PRODUCTS
	2 POULTRY AND EGGS
	3 MEAT ANIMALS, OTH LIVESTK
	4 COTTON
	5 GRAINS
	6 TOBACCO
	7 FRUIT,VEGETABLES,OTH CROPS
	8 FORESTRY PRODUCTS
	9 FISHERY PRODUCTS
	10 AGR,FORESTRY+FISH SERVICES
2	IRON ORE MINING
	11 IRON ORES
3	NONFERROUS METALS MINING
	12 COPPER ORE
	13 OTHER NON-FERROUS ORES
4	COAL MINING
	14 COAL MINING
5	NATURAL GAS EXTRACTION
	15 NATURAL GAS EXTRACTION
6	CRUDE PETROLEUM
	16 CRUDE OIL EXTRACTION
7	NON-METALLIC MINING
	17 STONE AND CLAY MINING
	18 CHEMICAL FERTILIZER MINING
8	CONSTRUCTION
	19 NEW CONSTRUCTION
	20 MAINTENANCE CONSTRUCTION
9	FOOD & TOBACCO
	30 MEAT PACKING PLANTS
	31 SAUSAGES & OTH PREP MEATS
	32 POULTRY DRESSING PLANTS
	33 POULTRY & EGG PROCESSING
	34 CREAMERY BUTTER
	35 CHEESE, NATURAL & PROCESSED
	36 MILK, CONDENSED&EVAPORATED
	37 ICE CREAM & FROZEN DESSERTS
	38 FLUID MILK
	39 CANNED & CURED SEA FOODS
	40 CANNED SPECIALTIES
	41 CANNED FRUITS & VEGETABLES
	42 DEHYDRATED FOOD PRODUCTS
	43 PICKLES, SAUCES, SALAD DRESS
	44 FISH, FRESH OR FROZEN PKGD
	45 FROZEN FRUITS & VEGETABLES
	46 FLOUR & OTH GRAIN MILL PROD
	47 CEREAL PREPARATIONS

	48	BLENDED & PREPARED FLOUR
	49	DOG, CAT, & OTH PET FOOD
	50	PREPARED FEEDS, N.E.C.
	51	RICE MILLINGS
	52	WET CORN MILLING
	53	BREAD, CAKE, & RLTD PRODS
	54	COOKIES & CRACKERS
	55	SUGAR
	56	CONFECTIONERY PRODUCTS
	57	CHOCOLATE & COCOA PRODS
	58	CHEWING GUM
	59	MALT LIQUORS
	60	MALT
	61	WINES BRANDY & BRANDY SPIRITS
	62	DISTILLED LIQ, EXC BRANDY
	63	BOTTLED & CANNED SOFT DRINKS
	64	FLAVOR EXTRACTS & SIRUPS, NEC
	65	COTTONSEED OIL MILLS
	66	SOYBEAN OIL MILLS
	67	VEGETABLE OIL MILLS, NEC
	68	ANIMAL & MARINE FATS & OILS
	69	ROASTED COFFEE
	70	SHORTENING & COOKING OILS
	71	MANUFACTURED ICE
	72	MACARONI & SPAGHETTI
	73	FOOD PREPARATIONS, N.E.C.
	76	CIGARETTES
	77	CIGARS
	78	CHEWING & SMOKING TOBACCO
	79	TOBACCO STEM & REDRYING
10	TEXTILES, EXC. KNITS	
	82	BRDWOV FAB MILLS & FABRIC FIN
	83	NARROW FABRIC MILLS
	84	YARN MILLS & TEX FIN NEC
	85	THREAD MILLS
	86	FLOOR COVERINGS
	87	FELT GOODS N.E.C.
	88	LACE GOODS
	89	PADDING & UPHOLSTERY FILLING
	90	PROCESSED TEXTILE WASTE
	91	COATED FAB, NOT RUBBERIZED
	92	TIRE CORD & FABRIC
	93	CORDAGE & TWINE
	94	NONWOVEN FABRICS
	95	TEXTILE GOODS, N.E.C.
11	KNITTING	
	98	WOMENS HOSIERY, EXC SOCKS
	99	HOSIERY, N.E.C.
	100	KNIT OUTERWEAR MILLS
	101	KNIT UNDERWEAR MILLS

	102	KNITTING MILLS, N.E.C.
	103	KNIT FABRIC MILLS
12	APPAREL, HOUSEHOLD TEXTILES	
	104	APPAREL FROM PURCHASED MATLS
	105	CURTAINS & DRAPERIES
	106	HOUSEFURNISHINGS, N.E.C.
	107	TEXTILE BAGS
	108	CANVAS PRODUCTS
	109	PLEATING & STITCHING
	110	AUTO & APPAREL TRIMMINGS
	111	SCHIFFLI MACH EMBROIDERIES
	112	FAB TEXTILE PRODUCTS, NEC
13	PAPER	
	146	PULP MILLS
	147	PAPER MILLS, EXC BLDG PAPER
	148	PAPERBOARD MILLS
	149	ENVELOPES
	150	SANITARY PAPER PRODUCTS
	151	BUILDING PAPER & BOARD MILLS
	152	PAPER COATING & GLAZING
	153	BAGS, EXCEPT TEXTILES
	154	DIE-CUT PAPER & BOARD
	155	PRESSED & MOLDED PULP GOODS
	156	STATIONERY PRODUCTS
	157	CONVERTED PAPER PROD, NEC.
	158	PAPERBOARD CONTAINERS & BOXES
14	PRINTING & PUBLISHING	
	161	NEWSPAPERS
	162	PERIODICALS
	163	BOOK PUBLISHING
	164	BOOK PRINTING
	165	MISC. PUBLISHING
	166	COMMERCIAL PRINTING
	167	LITHOGRAPHIC PLATEMAKING & SE
	168	MANIFOLD BUSINESS FORMS
	169	BLANKBOOKS & LOOSELEAF BINDER
	170	GREETING CARD PUBLISHING
	171	ENGRAVING & PLATE PRINTING
	172	BOOKBINDING & RELATED WORK
	173	TYPESETTING
	174	PHOTOENGRAVING
	175	ELECTROTYPING & STEREOTYPING
15	AGRICULTURAL FERTILIZERS	
	179	FERTILIZERS, NITROG&PHOSPHATE
	180	FERTILIZERS MIXING ONLY
	181	AGRIC CHEMICALS, NEC
16	OTHER CHEMICALS	
	178	INDL CHEM, INORG & ORG
	182	GUM & WOOD CHEMICALS
	183	ADHESIVES & SEALANTS

184 EXPLOSIVES
185 PRINTING INK
186 CARBON BLACK
187 CHEMICAL PREPARATIONS,NEC
188 PLASTICS MATLS & RESINS
189 SYNTHETIC RUBBER
190 CELLULOSIC MAN-MADE FIBERS
191 NONCELLULOSIC FIBERS
192 DRUGS
193 SOAP & OTHER DETERGENTS
194 POLISHES & SANITATION GOODS
195 SURFACE ACTIVE AGENTS
196 TOILET PREPARATIONS
197 PAINTS & ALLIED PRODUCTS

17 PETROLEUM REFINING
200 PETROLEUM REFINING EXC FUEL O
202 PAVING MIXTURES & BLOCKS
203 ASPHALT FELTS & COATINGS

18 FUEL OIL
201 FUEL OIL (BEA235)

19 RUBBER PRODUCTS
206 TIRES & INNER TUBES
207 RUBBER & PLASTIC FOOTWEAR
208 RECLAIMED RUBBER
209 FABRICATED RUBBER PROD,NEC
211 RUBBER&PLASTIC HOSE&BELTING

20 PLASTIC PRODUCTS
210 MISC.PLASTIC PRODUCTS

21 SHOES AND LEATHER
214 LEATHER TANNING & FINISHING
215 FOOTWEAR CUT STOCK
216 SHOES, EXCEPT RUBBER
217 HOUSE SLIPPERS
218 LEATHER GLOVES & MITTENS
219 LUGGAGE
220 WOMENS HANDBAGS & PURSES
221 PERSONAL LEATHER GOODS
222 LEATHER GOODS, N.E.C.

22 LUMBER
115 LOGGING CAMPS & CONTRACTORS
116 SAWMILLS & PLANING MILLS, GEN
117 HRDWD DIM & FLOOR MILLS
118 SPEC PROD SAWMILLS NEC
119 MILLWORK
120 WOOD KITCHEN CABINETS
121 VENEER & PLYWOOD
122 STRUC WOOD MEMBERS, NEC
123 PREFAB WOOD BUILDINGS
124 WOOD PRESERVING
125 WOOD PALLETS & SKIDS

126 PARTICLEBOARD
127 WOOD PRODUCTS, N.E.C.
130 WOOD CONTAINERS
394 MOBILE HOMES

23 FURNITURE
131 WOOD HOUSEHOLD FURNITURE
132 HOUSEHOLD FURNITURE, NEC
133 WOOD TV & RADIO CABINETS
134 UPHOLSTERED HSHLD FURN
135 METAL HOUSEHOLD FURNITURE
136 MATTRESSES & BEDSPRINGS
137 WOOD OFFICE FURNITURE
138 METAL OFFICE FURNITURE
139 PUBLIC BUILDING FURNITURE
140 WOOD PARTITIONS & FIXTURES
141 METAL PARTITIONS & FIXTURES
142 BLINDS, SHADES, & DRAPE HRDWR
143 FURNITURE & FIXTURES, NEC

24 STONE, CLAY, GLASS
225 GLASS & GLASS PROD,NEC
226 GLASS CONTAINERS
227 CEMENT, HYDRAULIC
228 BRICK & STRUCTURAL CLAY TILE
229 CERAMIC WALL & FLOOR TILE
230 CLAY REFRACTORIES
231 STRUCTURAL CLAY PROD,NEC
232 VITREOUS PLUMBING FIXTURES
233 VITREOUS CHINA FOOD UTENSILS
234 FINE EARTHWARE FOOD UTENSILS
235 PORCELAIN ELEC SUPPLIES
236 POTTERY PRODUCTS, N.E.C.
237 CONCRETE BLOCK & BRICK
238 CONCRETE PRODUCTS, N.E.C.
239 READY-MIXED CONCRETE
240 LIME
241 GYPSUM PRODUCTS
242 CUT STONE & STONE PRODUCTS
243 ABRASIVE PRODUCTS
244 ASBESTOS PRODUCTS
245 GASKETS, PACK&SEAL DEVICES
246 MINERALS, GROUND OR TREATED
247 MINERAL WOOL
248 NONCLAY REFRACTORIES
249 NONMETAL MINERAL PROD, NEC

25 FERROUS METALS
252 BLAST FURNACES & STEEL MILLS
253 ELECTROMETALLURGICAL PRODUCTS
254 STEEL WIRE & RELATED PRODUCTS
255 COLD FINISHING OF STEEL SHAPE
256 STEEL PIPE & TUBES

257 IRON & STEEL FOUNDRIES
258 IRON & STEEL FORGINGS
259 METAL HEAT TREATING
260 PRIMARY METAL PROD,NEC

26 COPPER
261 PRIMARY COPPER
267 COPPER ROLLING & DRAWING
272 BRASS,BRONZE,COPPER CASTINGS

27 OTHER NONFERROUS METALS
262 PRIMARY LEAD
263 PRIMARY ZINC
264 PRIMARY ALUMINUM
265 PRIMARY NF METALS, NEC
268 ALUMINUM ROLLING & DRAWING
269 NONFERROUS ROLL & DRAW,NEC
270 NF WIRE DRAWING&INSULATING
271 ALUMINUM CASTINGS
273 NONFERROUS CASTINGS,NEC
274 NONFERROUS FORGINGS

28 METAL PRODUCTS
23 AMMUNITION, EXC. SMALL ARMS
25 SMALL ARMS
26 SMALL ARMS AMMUNITION
27 OTH ORDNANCE & ACCESS
277 METAL CANS
278 METAL BARRELS,DRUMS,PAILS
279 METAL SANITARY WARE
280 PLUMBING FIXTURES, ETC
281 HEATING EQUIP,EXC ELEC
282 FABRICATED STRUCTURAL METAL
283 METAL DOORS,SASH,TRIM
284 BOILER SHOPS
285 SHEET METAL WORK
286 ARCHITECTURAL METAL WORK
287 PREFAB METAL BUILDINGS
288 MISCELLANEOUS METAL WORK
289 SCREW MACH PROD,BOLTS,NUTS
290 AUTO STAMPINGS
291 CROWNS & CLOSURES
292 METAL STAMPINGS, N.E.C.
293 CUTLERY
294 HAND & EDGE TOOLS, NEC
295 HAND SAWS & SAW BLADES
296 HARDWARE, N.E.C.
297 PLATING & POLISHING
298 METAL COATING & ALLIED SERVIC
299 MISC FAB WIRE PROD
300 STEEL SPRINGS, EXC WIRE
301 PIPE,VALVES,PIPE FITTINGS
302 METAL FOIL & LEAF

303 FABRICATED METAL PROD,NEC

29 ENGINES AND TURBINES

306 STEAM ENGINES & TURBINES

307 INTERNAL COMBUST ENGINES,NEC

30 AGRICULTURAL MACHINERY

308 FARM MACHINERY & EQUIP.

309 LAWN & GARDEN EQUIP.

31 CONSTR,MINING,OILFIELD EQ

310 CONSTRUCTION MACH & EQUIP.

311 MINING MACH,EXC OIL FIELD

312 OIL FIELD MACHINERY

32 METALWORKING MACHINERY

317 MACH TOOLS, METAL CUTTING

318 MACH TOOLS, METAL FORMING

319 SPEC DIES,TOOLS,MACH TOOL ACC

320 POWER DRIVEN HAND TOOLS

321 ROLLING MILL MACHINERY

322 METALWORKING MACHINERY

33 SPECIAL INDUSTRY MACHINERY

323 FOOD PRODUCTS MACHINERY

324 TEXTILE MACHINERY

325 WOODWORKING MACHINERY

326 PAPER INDUSTRIES MACHINERY

327 PRINTING TRADES MACHINERY

328 SPECIAL INDL MACH,NEC

34 MISC NON-ELECTRICAL MACH.

313 ELEVATORS & MOVING STAIRWAYS

314 CONVEYERS & CONVEYING EQUIPME

315 HOIST, CRANES, & MONORAILS

316 INDL TRUCKS & TRACTORS

329 PUMPS & COMPRESSORS

330 BALL & ROLLER BEARINGS

331 BLOWERS & FANS

332 INDUSTRIAL PATTERNS

333 POWER TRANSMISSION EQUIPMENT

334 INDL FURNACES & OVENS

335 GENL INDL MACH, NEC

336 CARBURETORS,PISTONS,RINGS,VAL

337 NON-ELEC MACHINERY,NEC

35 COMPUTERS

338 ELECTRONIC COMPUTING EQUIPMEN

339 CALC & ACCOUNTING MACH

36 OTHER OFFICE EQUIPMENT

340 TYPEWRITERS

341 SCALES & BALANCES

342 OFFICE MACHINES, N.E.C.

37 SERVICE INDUSTRY MACHINERY

343 AUTOMATIC MERCHANDIS MACHINES

344 COMMERCIAL LAUNDRY EQUIPMENT

345 REFRIG & HEATING EQUIPMENT

	346	MEASUR & DISPENS PUMPS
	347	SERVICE IND MACH, NEC
38	COMMUNIC EQ, ELECTRONIC COMP	
	370	TELEPHONE & TELEGRAPH APPARAT
	371	RADIO & TV COMMUNIC EQUIPMENT
	372	ELECTRON TUBES
	373	SEMICONDUCTORS & RELATED DEVI
	374	ELECTRONIC COMPONENTS,NEC
39	ELEC INDL APP & DISTRIB EQ	
	350	INSTRUM TO MEASURE ELEC
	351	TRANSFORMERS
	352	SWITCHGEAR&SWITCHBOARD APPART
	353	MOTORS & GENERATORS
	354	INDUSTRIAL CONTROLS
	355	WELDING APPARTUS, ELECTRIC
	356	CARBON & GRAPHITE PRODUCTS
	357	ELEC INDL APPARATUS, NEC
40	HOUSEHOLD APPLIANCES	
	358	HOUSEHOLD COOKING EQUIPMENT
	359	HHLD REFRIG, FREEZERS
	360	HOUSEHOLD LAUNDRY EQUIPMENT
	361	ELEC HOUSEWARES & FANS
	362	HHLD VACUUM CLEANERS
	363	SEWING MACHINES
	364	HOUSEHOLD APPLIANCES,NEC
41	MISC ELECTRICAL EQ	
	365	ELECTRIC LAMPS
	366	LIGHTING FIXTURES & EQUIPMENT
	367	WIRING DEVICES
	375	STORAGE BATTERIES
	376	PRIMARY BATTERIES,DRY&WET
	377	X-RAY APPARATUS & TUBES
	378	ENGINE ELECTRICAL EQUIPMENT
	379	ELECTRICAL EQUIPMENT
42	TV SETS,RADIOS,PHONOGRAPHS	
	368	RADIO & TV RECEIVING SETS
	369	PHONOGRAPH RECORDS & TAPE
43	MOTOR VEHICLES	
	382	TRUCK & BUS BODIES
	383	TRUCK TRAILERS
	384	MOTOR VEHICLES
	385	MOTOR VEHICLE PTS&ACCESSORIES
44	AEROSPACE	
	22	COMPLETE GUIDED MISSILES
	386	AIRCRAFT
	387	AIRCRAFT,MISSILE ENGINES,ENG
	388	AIRCRAFT,MISSILE EQ,NEC
45	SHIPS, BOATS	
	389	SHIP BUILDING & REPAIRING
	390	BOAT BUILDING & REPAIRING

46 OTHER TRANSP. EQUIP.
- 24 TANKS & TANK COMPONENTS
- 391 RAILROAD EQUIPMENT
- 392 MOTORCYCLES,BICYLES,&PTS
- 393 TRAVEL TRAILERS & CAMPERS
- 395 TRANSPORTATION EQUIP,NEC

47 INSTRUMENTS
- 398 ENGINEER & SCI INSTRUMENTS
- 399 MECHANICAL MEASURING DEVICES
- 400 AUTOMAT TEMPERATURE CONTROLS
- 401 SURG & MED INSTRUMENTS
- 402 SURG APPLIANCES & SUPPLIES
- 403 DENTAL EQUIP & SUPPLIES
- 404 WATCHES, CLOCKS, & PARTS
- 405 LENSES, OPTICAL INSTRUMENTS
- 406 OPHTHALMIC GOODS
- 407 PHOTOGRAPHIC EQUIP&SUPPLIES

48 MISC. MANUFACTURING
- 408 JEWELRY, PRECIOUS METAL
- 409 JEWELERS MATL&LAPIDARY WORK
- 410 SILVERWARE & PLATED METAL
- 413 COSTUME JEWELRY
- 414 MUSICAL INSTRUMENTS
- 415 GAMES, TOYS, KIDS' VEHICLES
- 416 DOLLS
- 417 SPORT & ATHLETIC GOODS,NEC
- 418 PENS & MECHANICAL PENCILS
- 419 LEAD PENCILS & ART GOODS
- 420 MARKING DEVICES
- 421 CARBON PAPER & INK RIBBONS
- 422 ARTIFICIAL TREES & FLOWERS
- 423 BUTTONS
- 424 NEEDLES, PINS, & FASTENERS
- 425 BROOMS & BRUSHES
- 426 HARD SURFACE FLOOR COVERINGS
- 427 BURIAL CASKETS & VAULTS
- 428 SIGNS & ADVERTIS DISPLAYS
- 429 MANUFACTURING, N.E.C.

49 RAILROADS
- 432 RAILROADS

50 TRUCKING, HWY PASS TRANSIT
- 433 BUSSES AND LOCAL TRANSIT
- 434 TRUCKING

51 WATER TRANSPORT
- 435 WATER TRANSPORTATION

52 AIR TRANSPORT
- 436 AIRLINES

53 PIPELINE
- 437 PIPELINES

54 TRANSPORTAION SERVICES

438 FREIGHT FORWARDING

55 COMMUNICATIONS SERVICES
439 TELEPHONE AND TELEGRAPH
440 RADIO AND TV BROADCASTING

56 ELECTRIC UTILILITIES
441 ELECTRIC UTILITIES

57 GAS UTILITY
443 NATURAL GAS

58 WATER AND SANITATION
444 WATER AND SEWER SERVICES

59 WHOLESALE TRADE
445 WHOLESALE TRADE

60 RETAIL TRADE
446 RETAIL TRADE

61 EATING & DRINKING PLACES
442 EATING & DRINKING PLACES

62 FINANCE & INSURANCE
447 BANKS,CREDIT AGEN.,BROKERS
448 INSURANCE

63 REAL ESTATE
450 REAL ESTATE

64 OWNER-OCCUPIED HOUSING
449 OWNER-OCCUPIED DWELLINGS

65 HOTELS; REPAIRS EXC AUTO
451 HOTEL AND LODGING PLACES
452 PERSONAL + REPAIR SERVICES

66 BUSINESS SERVICES
453 BUSINESS SERVICES
454 ADVERTISING

67 AUTOMOBILE REPAIRS
455 AUTO REPAIR

68 MOVIES AND AMUSEMENTS
456 MOVIES + AMUSEMENTS

69 MEDICINE,EDUCATION,NPO
457 MEDICAL SERVICES
458 PRIVATE SCHOOLS + NPO

70 FED & S&L GOVT ENTERPRISES
459 POST OFFICE
460 FED, S&L GOV. ENTERPRISES

71 NON COMPETITIVE IMPORTS
461 NON-COMPETITIVE IMPORTS

72 DOMESTIC SERVANTS
462 DOMESTIC SERVANTS

73 UNIMPORTANT INDUSTRY
464 UNIMPORTANT IND.(DUMMY)

74 SCRAPS AND USED
463 SCRAP AND USED
465 USED CARS AND IVA

75 REST OF THE WORLD INDUSTRY
467 REST OF WORLD INDUSTRY

76 GOVERNMENT INDUSTRY
466 GOVERN. INDUSTRY
77 INFORUM STAT. DISCREPANCY
78 NIPA STAT. DISCREPANCY

TABLE 42 PAGE 1 Exports

SEC	TITLE	COEF 1	ELAS 1	COEF 2	ELAS 2	RSQUARE	MEAN VALUE
1	DAIRY FARM PRODU	48.552635	0.970	0.016056	0.030	0.000000	50.03496
2	POULTRY AND EGGS	-18.924824	-0.310	1.005438	1.310	0.774100	59.97739
3	MEAT ANIMALS, OT	-173.651215	-0.710	5.308999	1.710	0.636400	242.97482
4	COTTON	385.654724	0.300	11.440767	0.700	0.177200	1283.47388
5	GRAINS	-4029.845703	-0.680	126.436447	1.680	0.653100	5892.30762
7	FRUIT, VEGETABLES	-5288.111328	-1.370	116.360626	2.370	0.782600	3843.33936
8	FORESTRY PRODUCT	9.385857	0.120	0.842435	0.870	0.180000	75.49631
9	FISHERY PRODUCTS	-1.259183	-0.070	0.234764	1.070	0.394600	17.16399
10	AGR, FORESTRY+FIS	86.332382	2.040	-0.561565	-1.040	0.520700	42.26334
11	IRON ORES	-324.402710	-0.970	7.244164	1.970	0.691400	331.41461
12	COPPER ORE	-46.853218	-1.650	0.810684	2.650	0.133500	28.27341
13	OTHER NON-FERROU	-75.721436	-1.810	1.401648	2.810	0.662300	41.81775
14	COAL MINING	626.423218	0.470	7.582240	0.520	0.121500	1311.73877
15	NATURAL GAS EXTR	20.478138	0.190	1.221456	0.800	0.205600	105.04749
16	CRUDE OIL EXTRAC	-17.941360	-0.220	1.522256	1.220	0.124800	79.73119
17	STONE AND CLAY M	-202.029694	-0.560	7.086982	1.560	0.829000	358.60077
30	MEAT PACKING PLA	-232.323517	-0.350	11.669516	1.350	0.797800	647.94995
31	SAUSAGES & OTH P	58.285873	2.890	-0.391855	-1.890	0.420600	20.12428
32	POULTRY DRESSING	109.713318	1.660	-0.581125	-0.660	0.099900	65.87697
33	POULTRY & EGG PR	11.977385	1.090	-0.014136	-0.090	0.008200	10.91108
34	CREAMERY BUTTER	82.658859	3.170	-0.750544	-2.170	0.216000	26.04263
35	CHEESE, NATURAL	49.831421	3.210	-0.455229	-2.210	0.180300	15.49188
36	MILK, CONDENSED&	614.373291	2.150	-4.364328	-1.150	0.687900	285.15631
38	FLUID MILK	-4.990679	-0.840	0.144720	1.840	0.683700	5.92610
39	CANNED & CURED S	-35.956253	-0.420	1.608452	1.420	0.658000	85.37508
40	CANNED SPECIALTI	429.654175	3.950	-4.255513	-2.950	0.596000	108.64554
41	CANNED FRUITS &	178.436127	0.880	0.269382	0.110	0.008900	201.71167
42	DEHYDRATED FOOD	31.891506	0.230	1.405077	0.760	0.666700	137.88147
43	PICKLES, SAUCES,	-0.123839	0.000	0.240299	1.000	0.462100	18.00275
44	FISH, FRESH OR F	-314.445190	-2.090	6.162365	3.090	0.757900	150.40414
45	FROZEN FRUITS &	-127.168152	-1.530	2.396236	2.530	0.823700	82.99590
46	FLOUR & OTH GRAI	348.137634	1.580	-1.710792	-0.580	0.343800	219.08649
47	CEREAL PREPARATI	36.684921	0.750	0.161092	0.240	0.015400	48.83664
49	DOG, CAT, & OTH	-66.125229	-1.860	1.345628	2.860	0.481800	35.38036
50	PREPARED FEEDS,	-145.809937	-0.920	4.029317	1.920	0.109400	158.13593
51	RICE MILLINGS	-126.188477	-0.250	8.292732	1.250	0.753600	499.36224
52	WET CORN MILLING	-207.219971	-1.890	4.200848	2.890	0.834300	109.66518
53	BREAD, CAKE, & R	5.153134	0.400	0.100738	0.590	0.298100	12.75218
55	SUGAR	-62.925781	-2.350	1.188691	3.350	0.517300	26.74148
56	CONFECTIONERY PR	-65.583160	-1.590	1.416215	2.590	0.632400	41.24706
57	CHOCOLATE & COCO	-2.084294	-0.290	0.120970	1.290	0.655500	7.04093
58	CHEWING GUM	25.965816	1.670	-0.138104	-0.670	0.273400	15.54813
59	MALT LIQUORS	-17.962927	-2.770	0.316865	3.770	0.516400	6.33936
60	MALT	25.210545	2.050	-0.171552	-1.050	0.384100	12.26977
61	WINES BRANDY & B	-11.519934	-3.410	0.185889	4.410	0.676100	3.37477
62	DISTILLED LIQ, E	-34.026329	-1.410	0.769530	2.410	0.865700	24.02207
63	BOTTLED & CANNED	-41.587059	-2.980	0.736071	3.980	0.549600	13.93741
64	FLAVOR EXTRACTS	-34.655312	-0.430	1.506989	1.430	0.775800	79.02228
65	COTTONSEED OIL M	-3.129301	-0.020	1.736426	1.020	0.336800	127.85558
66	SOYBEAN OIL MILL	-776.237427	-0.790	23.260498	1.790	0.773100	978.38574
67	VEGETABLE OIL MI	-55.876297	-0.650	1.865034	1.650	0.505900	84.80991
68	ANIMAL & MARINE	101.464188	0.210	4.796499	0.780	0.456300	463.28137
69	ROASTED COFFEE	68.846451	0.610	0.579249	0.380	0.148700	112.54131
70	SHORTENING & COO	126.653870	0.990	0.010593	0.000	0.000000	127.45290

TABLE 4.2 PAGE 2

SEC	TITLE	COEF 1	ELAS 1	COEF 2	ELAS 2	RSQUARE	MEAN VALUE
72	MACARONI & SPAGH	1.235959	1.630	-0.006348	-0.630	0.021800	0.75712
73	FOOD PREPARATION	10.354259	0.120	0.974998	0.870	0.423700	83.90186
76	CIGARETTES	-257.733215	-0.810	7.631446	1.810	0.872700	317.93427
77	CIGARS	-3.037173	-0.900	0 081245	1.900	0.834400	3.35320
79	TOBACCO STEM & R	779.062988	0.870	1.500987	0.120	0.023200	892.28772
82	BRDWOV FAB MILLS	135.622833	0.200	6.522004	0.790	0.386900	658.83191
83	NARROW FABRIC MI	68.265839	1.430	-0.258971	-0.430	0.211500	47.49061
84	YARN MILLS & TEX	-106.434799	-1.510	2.201306	2 510	0.482300	70.15865
85	THREAD MILLS	-4.904088	-0.310	0.252900	1.310	0.559600	15.38412
86	FLOOR COVERINGS	-255.015259	-3.130	3 726870	4.130	0.712200	81.25722
87	FELT GOODS N.E.C	-6.379226	-1.250	0.142936	2.250	0.500900	5.08739
88	LACE GOODS	23.190903	2.700	-0.162057	-1.700	0.213900	8.56865
89	PADDING & UPHOLS	-28.780415	-2.380	0.452946	3.380	0.641200	12.08853
91	COATED FAB, NOT	-23.506721	-0.380	1.053838	1.380	0.607800	61.03442
92	TIRE CORD & FABR	-17.727890	-0.490	0.594128	1.490	0.106300	35.87975
93	CORDAGE & TWINE	1.973619	0.200	0.095805	0.790	0.424900	9.65930
94	NONWOVEN FABRICS	-61.750793	-1.410	1.168475	2.410	0.469600	43.67976
95	TEXTILE GOODS, N	-37.422195	-1.440	0.789050	2.440	0.508100	25.87708
98	WOMENS HOSIERY,	17.574505	2.200	-0.118593	-1.200	0.208800	7.97895
99	HOSIERY, N.E.C.	-2.028004	-0.200	0.127960	1.200	0.147000	9.74906
103	KNIT FABRIC MILL	3.631522	0.100	0.403807	0.900	0.392400	36.30411
104	APPAREL FROM PUR	80.750015	0.160	5.057650	0.830	0.454600	488.53723
105	CURTAINS & DRAPE	66.078140	3.220	-0.565035	-2.220	0.450800	20.52060
106	HOUSEFURNISHINGS	-156.148315	-1.100	3.269343	2.100	0.310700	141.06735
107	TEXTILE BAGS	22.864765	2.510	-0.170807	-1.510	0.383100	9.09300
108	CANVAS PRODUCTS	-7.391196	-1.080	0.175844	2.080	0.369900	6.78674
109	PLEATING & STITC	0.106163	0.010	0.072935	0.980	0.054700	6.73667
110	AUTO & APPAREL T	13.461241	1.120	-0.016101	-0.120	0.001600	11.99752
146	PULP MILLS	153.816498	0.160	11.140423	0.830	0.469500	938.84131
147	PAPER MILLS, EXC	22.821037	0.060	4.964466	0.930	0.402200	372.64880
148	PAPERBOARD MILLS	-167.186432	-0.320	9.705650	1.320	0.678600	516.73523
149	ENVELOPES	0.348481	0.230	0.016517	0.770	0.092800	1.51238
150	SANITARY PAPER P	-28.119946	-0.860	0 863173	1.860	0.473900	32.70467
151	BUILDING PAPER &	4.863352	0.440	0.084613	0.550	0.145400	10.82573
152	PAPER COATING &	-21.658859	-0.190	1.890692	1.190	0.821200	111.57132
153	BAGS, EXCEPT TEX	4.882409	0.200	0.271235	0.790	0.367300	23.99533
155	PRESSED & MOLDED	-5.219269	-2.310	0.085020	3.310	0.565500	2.25779
156	STATIONERY PRODU	44.684349	2.640	-0.393941	-1.640	0.652500	16.92480
157	CONVERTED PAPER	-26.748966	-0.310	1.573673	1.310	0.345200	84.14200
158	PAPERBOARD CONTA	0.151037	0.000	1.026224	0.990	0.544500	72.46529
161	NEWSPAPERS	10.552977	1.590	-0.054625	-0.590	0.259100	6.60408
162	PERIODICALS	5.473017	0.040	1.515634	0.950	0.788200	115.03934
163	BOOK PUBLISHING	35.885399	0.140	3 042575	0.860	0.624200	255.83548
165	MISC. PUBLISHING	-2.582848	-0.330	0.113326	1.330	0.055000	7.63648
166	COMMERCIAL PRINT	48.164948	0.340	1.262322	0.650	0.756400	139.41916
167	LITHOGRAPHIC PLA	7.732870	1.430	-0.027654	-0.430	0.287000	5.37825
168	MANIFOLD BUSINES	2.450839	0.950	0.001228	0.040	0.000800	2.55542
169	BLANKBOOKS & LOO	-1.818930	-0.270	0.097895	1.270	0.544600	6.51641
170	GREETING CARD PU	-0.929917	-0.180	0.070380	1.180	0.711000	5.06263
179	FERTILIZERS, NIT	-199.081268	-0.370	12.278795	1.370	0.660800	538.21216
180	FERTILIZERS MIXI	180.623169	5.820	-1.589460	-4.820	0.581800	31.02604
181	AGRIC CHEMICALS,	-3.872998	-0.010	4.247934	1.010	0.380000	251.19882
178	INDL CHEM, INORG	-43.542389	-0.010	50.127846	1.010	0.877900	3019.08350

TABLE H.2 PAGE 3

SEC	TITLE	COEF 1	ELAS 1	COEF 2	ELAS 2	RSQUARE	MEAN VALUE
182	GUM & WOOD CHEMI	81.454117	1.070	-0.092020	-0.070	0.038400	75.83205
183	ADHESIVES & SEAL	19.097561	0.340	0.584654	0.650	0.497400	54.81776
184	EXPLOSIVES	20.032085	0.750	0.109522	0.250	0.201200	26.72350
185	PRINTING INK	18.757118	0.970	0.009232	0.020	0.001800	19.32115
186	CARBON BLACK	94.136978	1.690	-0.629409	-0.690	0.816200	55.68242
187	CHEMICAL PREPARA	389.338074	0.750	2.077662	0.240	0.218400	516.27539
188	PLASTICS MATLS &	153.804077	0.170	11.519888	0.820	0.744500	857.62659
189	SYNTHETIC RUBBER	227.265137	0.720	1.390094	0.270	0.465100	312.19464
190	CELLULOSIC MAN-M	12.773880	0.270	0.551875	0.720	0.446200	46.49138
191	NONCELLULOSIC FI	-84.053528	-0.350	5.218641	1.350	0.754100	234.78616
192	DRUGS	6.534456	0.000	11.914150	0.990	0.703600	734.44495
193	SOAP & OTHER DET	38.858246	0.480	0.682683	0.510	0.421300	80.56763
194	POLISHES & SANIT	71.005783	1.130	-0.138082	-0.130	0.043500	62.56947
195	SURFACE ACTIVE A	-12.898243	-0.330	0.846013	1.330	0.698400	38.79005
196	TOILET PREPARATI	-14.243746	-0.170	1.567012	1.170	0.881800	81.49489
197	PAINTS & ALLIED	23.648060	0.260	1.091222	0.730	0.805100	90.31769
200	PETROLEUM REFINI	1013.769775	0.880	2.074858	0.110	0.365400	1142.95264
202	PAVING MIXTURES	2.279027	0.610	0.018174	0.380	0.024900	3.67919
203	ASPHALT FELTS &	13.348564	0.710	0.086628	0.280	0.178400	18.74215
206	TIRES & INNER TU	33.940544	0.190	2.073270	0.800	0.510400	174.43216
207	RUBBER & PLASTIC	-0.443789	-0.120	0.058126	1.120	0.668900	3.49504
208	RECLAIMED RUBBER	6.386437	2.110	-0.049728	-1.110	0.721500	3.01672
209	FABRICATED RUBBE	53.626442	0.410	1.105675	0.580	0.290300	128.55057
211	RUBBER&PLASTIC H	-5.516775	-0.090	0.907170	1.090	0.837300	55.95602
210	MISC. PLASTIC PRO	-226.388489	-0.470	10.738760	1.470	0.901300	477.02356
214	LEATHER TANNING	-94.783936	-0.980	2.216020	1.980	0.578800	96.69565
215	FOOTWEAR CUT STO	7.778213	1.470	-0.029134	-0.470	0.040800	5.26087
216	SHOES, EXCEPT RU	-22.523937	-1.040	0.511256	2.040	0.207500	21.65217
217	HOUSE SLIPPERS	-7.487715	-9.360	0.087991	10.360	0.283400	0.80000
218	LEATHER GLOVES &	-9.970243	-1.910	0.160175	2.910	0.334900	5.21428
219	LUGGAGE	-63.801285	-3.790	0.933112	4.790	0.667100	16.82608
220	WOMENS HANDBAGS	0.221773	0.060	0.039197	0.930	0.047600	3.60870
221	PERSONAL LEATHER	-4.140362	-2.260	0.069051	3.260	0.364200	1.82609
222	LEATHER GOODS, N	-13.155483	-1.870	0.233262	2.870	0.706600	7.00000
115	LOGGING CAMPS &	-392.398560	-0.680	13.818483	1.680	0.958500	573.68445
116	SAWMILLS & PLANI	-139.218689	-0.340	7.760693	1.340	0.875100	403.34985
117	HRDWD DIM & FLOO	8.043474	0.620	0.070555	0.380	0.051300	12.97618
118	SPEC PROD SAWMIL	18.715427	1.490	-0.088877	-0.490	0.173700	12.50179
119	MILLWORK	4.474257	0.200	0.253666	0.790	0.683800	22.20868
121	VENEER & PLYWOOD	-76.939011	-1.050	2.146116	2.050	0.832400	73.10106
123	PREFAB WOOD BUIL	-24.293781	-1.750	0.545512	2.750	0.493000	13.84429
125	WOOD PALLETS & S	3.160834	0.830	0.009058	0.160	0.059200	3.79411
126	PARTICLEBOARD	-5.325160	-0.860	0.164638	1.860	0.821900	6.18505
127	WOOD PRODUCTS, N	-8.065390	-0.170	0.778630	1.170	0.793300	46.37047
130	WOOD CONTAINERS	2.060504	0.410	0.041146	0.580	0.255600	4.93709
394	MOBILE HOMES	-3.300649	-0.120	0.354383	1.120	0.165900	27.28693
131	WOOD HOUSEHOLD F	45.535004	0.830	0.128890	0.160	0.026800	54.62849
132	HOUSEHOLD FURNIT	2.265169	0.270	0.083531	0.720	0.369700	8.15845
134	UPHOLSTERED HSHL	4.459966	0.300	0.118304	0.690	0.200600	14.59467
135	METAL HOUSEHOLD	16.534492	1.160	-0.032663	-0.160	0.067500	14.23002
136	MATTRESSES & BED	1.247172	0.180	0.077903	0.810	0.319000	6.74342
137	WOOD OFFICE FURN	-0.913384	-0.280	0.048720	1.280	0.128700	3.26026
138	METAL OFFICE FUR	21.406326	0.770	0.087393	0.220	0.076200	27.57206

TABLE 4.2 PAGE 4

SEC	TITLE		COEF 1	ELAS 1	COEF 2	ELAS 2	RSQUARE	MEAN VALUE
139	PUBLIC BUILDING		6.897756	1.160	-0.011587	-0.160	0.002300	5.90513
140	WOOD PARTITIONS		-0.446627	-0.090	0.056606	1.090	0.144300	4.51005
141	METAL PARTITIONS		8.729588	0.480	0.109090	0.510	0.187000	18.07498
142	BLINDS, SHADES,		2.419710	0.230	0.114925	0.770	0.215600	10.52792
143	FURNITURE & FIXT		-37.977531	-2.050	0.658796	3.050	0.538200	18.45936
225	GLASS & GLASS PR		-110.125839	-0.420	5.079890	1.420	0.911500	261.51233
226	GLASS CONTAINERS		40.879372	1.060	-0.033019	-0.060	0.006800	38.46375
227	CEMENT, HYDRAULI		-8.873871	-0.800	0.271401	1.800	0.564100	10.98149
228	BRICK & STRUCTUR		6.369979	1.620	-0.033382	-0.620	0.186000	3.92776
229	CERAMIC WALL & F		-1.032776	-0.760	0.032590	1.760	0.520300	1.35147
230	CLAY REFRACTORIE		65.176666	0.960	0.031484	0.030	0.002600	67.47997
231	STRUCTURAL CLAY		-1.364303	-1.240	0.032878	2.240	0.359600	1.09702
232	VITREOUS PLUMBIN		2.443104	0.260	0.091567	0.730	0.385500	9.14199
233	VITREOUS CHINA F		1.197226	0.360	0.029029	0.630	0.342000	3.32097
234	FINE EARTHWARE F		0.685704	0.280	0.023205	0.710	0.318700	2.38338
235	PORCELAIN ELEC S		-2.617179	-0.090	0.411473	1.090	0.859800	27.48568
236	POTTERY PRODUCTS		-5.625925	-0.640	0.197107	1.640	0.817300	8.79416
237	CONCRETE BLOCK &		4.212746	2.600	-0.035470	-1.600	0.388200	1.61783
238	CONCRETE PRODUCT		-18.739941	-3.020	0.264884	4.020	0.256700	6.20212
240	LIME		0.168572	0.030	0.064444	0.960	0.431600	4.88322
241	GYPSUM PRODUCTS		-11.286819	-1.510	0.256237	2.510	0.526800	7.45917
242	CUT STONE & STON		4.050336	1.370	-0.015052	-0.370	0.062600	2.94916
243	ABRASIVE PRODUCT		-4.388593	-0.040	1.317009	1.040	0.643400	91.96204
244	ASBESTOS PRODUCT		-9.936577	-0.230	0.726304	1.230	0.595500	43.19884
245	GASKETS, PACK&SE		-5.390958	-0.130	0.612792	1.130	0.575000	39.44009
246	MINERALS, GROUND		5.785214	0.480	0.071134	0.510	0.119700	11.84758
247	MINERAL WOOL		-19.451176	-0.550	0.748336	1.550	0.932900	35.29610
248	NONCLAY REFRACTO		-14.985739	-0.220	0.934052	1.220	0.486600	66.20966
249	NONMETAL MINERAL		7.321332	0.720	0.037998	0.270	0.037000	10.10122
252	BLAST FURNACES &		826.106201	0.570	8.608213	0.420	0.099200	1427.84253
253	ELECTROMETALLURG		46.785141	0.750	0.180087	0.240	0.021300	61.67899
254	STEEL WIRE & REL		9.293224	0.980	0.001561	0.010	0.000100	9.40231
257	IRON & STEEL FOU		-51.477280	-0.330	2.966874	1.330	0.415400	155.91489
258	IRON & STEEL FOR		17.604218	0.290	0.598166	0.700	0.494600	59.41755
260	PRIMARY METAL PR		-33.127747	-1.140	0.886282	2.140	0.830300	28.82565
261	PRIMARY COPPER	T	1.132553	1.470	-0.024388	-0.470	$0.69069	0.76674
267	COPPER ROLLING &	T	-0.184261	-0.890	0.026009	1.890	$0.68249	0.20588
272	BRASS, BRONZE, COP	T	0.005558	1.270	-0.000064	-0.270	$0.00609	0.00434
262	PRIMARY LEAD		-20.557667	-1.920	0.410119	2.920	0.207000	10.65615
263	PRIMARY ZINC		26.483387	2.290	-0.196426	-1.290	0.112800	11.53355
264	PRIMARY ALUMINUM		42.838554	0.240	1.766312	0.750	0.113500	177.27112
265	PRIMARY NF METAL		-77.556961	-0.410	3.480675	1.410	0.482500	187.35446
268	ALUMINUM ROLLING		-251.378387	-1.370	5.699051	2.370	0.845600	182.37189
269	NONFERROUS ROLL		-105.331131	-0.570	3.774072	1.570	0.686800	181.91049
270	NF WIRE DRAWING&		-152.648438	-1.330	3.512406	2.330	0.636000	114.67798
271	ALUMINUM CASTING		-14.090504	-1.280	0.328882	2.280	0.574500	10.94044
273	NONFERROUS CASTI		-20.549511	-1.810	0.357335	2.810	0.516700	11.30136
274	NONFERROUS FORGI		4.231106	0.300	0.128701	0.690	0.244500	14.02646
23	AMMUNITION, EXC.		272.489380	1.050	-0.210717	-0.050	0.003100	257.96356
25	SMALL ARMS		89.848953	0.980	0.018989	0.010	0.000400	91.15799
26	SMALL ARMS AMMUN		67.824142	1.110	-0.097785	-0.110	0.032600	61.08333
27	OTH ORDNANCE & A		80.827805	1.050	-0.055899	-0.050	0.006700	76.97440
271	METAL CANS		44.329933	1.100	-0.060747	-0.100	0.027800	40.14236

TABLE 4.2 PAGE 5

SEC	TITLE	COEF 1	ELAS 1	COEF 2	ELAS 2	RSQUARE	MEAN VALUE
278	METAL BARRELS, DR	14.907232	0.710	0.087538	0.280	0.063600	20.94168
279	METAL SANITARY W	5.855971	0.500	0.084710	0.490	0.336900	11.69545
280	PLUMBING FIXTURE	11.309568	0.520	0.146650	0.470	0.146000	21.41887
281	HEATING EQUIP, EX	5.753503	0.090	0.804861	0.900	0.730500	61.23647
282	FABRICATED STRUC	84.687286	0.720	0.465418	0.270	0.044300	116.77080
283	METAL DOORS, SASH	-15.265528	-0.550	0.617655	1.550	0.924900	27.31243
284	BOILER SHOPS	209.962708	0.500	3.029042	0.490	0.354500	418.76923
285	SHEET METAL WORK	18.542191	0.410	0.384638	0.580	0.221900	45.05716
286	ARCHITECTURAL ME	-4.234981	-0.490	0.184517	1.490	0.635500	8.48469
287	PREFAB METAL BUI	-89.919952	-1.410	2.228634	2.410	0.800100	63.71053
288	MISCELLANEOUS ME	-34.985664	-0.690	1.242198	1.690	0.859000	50.64507
289	SCREW MACH PROD,	11.856962	0.090	1.575076	0.900	0.653200	120.43451
290	AUTO STAMPINGS	-175.849701	-0.350	9.762568	1.350	0.766200	497.13123
291	CROWNS & CLOSURE	5.228571	0.210	0.274591	0.780	0.374400	24.15747
292	METAL STAMPINGS,	103.954803	1.360	-0.402432	-0.360	0.110400	76.21326
293	CUTLERY	-0.381875	-0.010	0.329829	1.010	0.785500	22.35485
294	HAND & EDGE TOOL	47.959236	0.250	2.005449	0.740	0.640100	186.20450
295	HAND SAWS & SAW	-2.989385	-0.160	0.315000	1.160	0.808200	18.72506
296	HARDWARE, N.E.C.	13.212027	0.100	1.713658	0.890	0.849900	131.34271
299	MISC FAB WIRE PR	-1.811528	-0.020	1.127470	1.020	0.707600	75.91042
300	STEEL SPRINGS, E	-19.094158	-1.330	0.408036	2.330	0.779600	14.35585
301	PIPE, VALVES, PIPE	29.971348	0.060	6.609595	0.930	0.729500	485.60260
302	METAL FOIL & LEA	-12.052900	-0.580	0.398053	1.580	0.749800	20.57870
306	STEAM ENGINES &	-139.295166	-0.290	9.013924	1.290	0.669400	476.50861
307	INTERNAL COMBUST	-34.780273	-0.040	13.020430	1.040	0.892500	854.73584
308	FARM MACHINERY &	-78.266357	-0.090	12.841055	1.090	0.817700	792.31238
309	LAWN & GARDEN EQ	134.210999	1.070	-0.137598	-0.070	0.011800	124.88239
310	CONSTRUCTION MAC	298.629028	0.110	33.213554	0.880	0.723500	2522.86816
311	MINING MACH, EXC	70.551697	0.280	2.602193	0.710	0.427700	244.81485
312	OIL FIELD MACHIN	-449.752502	-0.540	18.941982	1.540	0.785500	818.75098
317	MACH TOOLS, META	424.570435	1.000	-0.052511	0.000	0.000300	420.97821
318	MACH TOOLS, META	286.007507	1.040	-0.191187	-0.040	0.013600	272.92871
319	SPEC DIFS, TOOLS,	13.192240	0.070	2.363570	0.920	0.927600	174.87961
320	POWER DRIVEN HAN	49.787720	0.330	1.438001	0.660	0.489700	148.15860
321	ROLLING MILL MAC	37.918839	0.350	0.992518	0.640	0.174900	105.81514
322	METALWORKING MAC	93.311417	0.890	0.164289	0.100	0.061900	104.55011
323	FOOD PRODUCTS MA	43.932739	0.170	3.008035	0.820	0.655600	249.00092
324	TEXTILE MACHINER	157.795685	0.640	1.288959	0.350	0.278100	245.66852
325	WOODWORKING MACH	10.573021	0.130	1.001396	0.860	0.614400	78.84163
326	PAPER INDUSTRIES	125.657913	0.740	0.631082	0.250	0.298100	168.68097
327	PRINTING TRADES	-42.401505	-0.200	3.643032	1.200	0.947700	205.95660
328	SPECIAL INDL MAC	32.903664	0.030	12.790888	0.960	0.583900	904.90283
313	ELEVATORS & MOVI	0.420622	0.020	0.269755	0.970	0.735300	18.72956
314	CONVEYERS & CONV	48.419250	0.590	0.495663	0.410	0.607500	82.06113
315	HOIST, CRANES, &	7.582512	0.100	0.949654	0.890	0.474000	72.03789
316	INDL TRUCKS & TR	6.468320	0.030	2.690359	0.960	0.749600	189.06958
329	PUMPS & COMPRESS	-0.940234	0.000	10.271170	1.000	0.848900	696.18933
330	BALL & ROLLER BE	53.793777	0.300	1.781165	0.690	0.613000	174.68582
331	BLOWERS & FANS	13.096409	0.260	0.549041	0.740	0.846200	50.36121
333	POWER TRANSMISSI	91.221786	0.430	1.766182	0.560	0.430300	211.09689
334	INDL FURNACES &	31.749619	0.340	0.895112	0.650	0.432000	92.50307
337	NON-ELEC MACHINE	-119.825790	-1.490	2.948714	2.490	0.450000	80.31070
338	ELECTRONIC COMPU	-984.376465	-0.470	46.421890	1.470	0.884500	2077.79297

TABLE 4.2 PAGE 6

SEC	TITLE	COEF 1	ELAS 1	COEF 2	ELAS 2	RSQUARE	MEAN VALUE
339	CALC & ACCOUNTIN	-17.349758	-0.090	2.973707	1.090	0.501300	178.80756
340	TYPEWRITERS	1.885379	0.020	1.031956	0.970	0.816800	69.70374
341	SCALES & BALANCE	8.898491	0.290	0.331114	0.710	0.890600	30.65872
342	OFFICE MACHINES,	35.656075	0.290	1.291385	0.700	0.470000	120.52361
343	AUTOMATIC MERCHA	6.368082	0.270	0.252576	0.720	0.478400	23.16941
344	COMMERCIAL LAUND	20.264156	0.510	0.285833	0.480	0.622600	39.27776
345	REFRIG & HEATING	-46.870850	-0.060	11.136139	1.060	0.972800	693.90503
346	MEASUR & DISPENS	21.807114	0.740	0.113540	0.250	0.176600	29.35979
347	SERVICE IND MACH	-10.600157	-0.210	0.885473	1.210	0.477100	48.30151
370	TELEPHONE & TELE	-11.328634	-0.050	3.081974	1.050	0.842000	193.40390
371	RADIO & TV COMMU	335.782959	0.300	11.640265	0.690	0.755000	1109.03418
372	ELECTRON TUBES	66.928894	0.480	1.072212	0.510	0.377700	138.15491
373	SEMICONDUCTORS &	-882.385254	-1.330	23.210052	2.330	0.929400	659.43628
374	ELECTRONIC COMPO	-393.279480	-0.630	15.260284	1.630	0.892300	620.44666
350	INSTRUM TO MEASU	-163.309479	-0.460	7.680220	1.460	0.951700	350.12280
351	TRANSFORMERS	3.926282	0.040	1.213524	0.950	0.826100	85.05185
352	SWITCHGEAR&SWITC	36.684547	0.210	1.973806	0.780	0.655400	168.63596
353	MOTORS & GENERAT	-37.780243	-0.090	6.576585	1.090	0.846300	401.87268
354	INDUSTRIAL CONTR	30.928371	0.370	0.763349	0.620	0.647300	81.95917
355	WELDING APPARTUS	29.795444	0.320	0.938778	0.670	0.821300	92.55388
356	CARBON & GRAPHIT	0.694134	0.010	0.930928	0.980	0.801600	62.92785
357	ELEC INDL APPARA	-33.899765	-0.780	1.152644	1.780	0.920800	43.15597
358	HOUSEHOLD COOKIN	48.586189	0.910	0.067131	0.080	0.020700	52.93423
359	HHLD REFRIG, FRE	60.998039	0.690	0.412127	0.300	0.158600	87.69112
360	HOUSEHOLD LAUNDR	50.496742	0.760	0.239789	0.230	0.186200	66.02765
361	ELEC HOUSEWARES	4.905005	0.050	1.216813	0.940	0.898200	83.71689
362	HHLD VACUUM CLEA	-12.842522	-0.460	0.622545	1.460	0.918400	27.47920
363	SEWING MACHINES	89.305573	1.060	-0.084137	-0.060	0.047500	83.85608
364	HOUSEHOLD APPLIA	-41.123497	-0.700	1.539509	1.700	0.746200	58.58913
365	ELECTRIC LAMPS	-2.857837	-0.040	1.016788	1.040	0.835400	64.51038
366	LIGHTING FIXTURE	-20.643375	-0.270	1.433375	1.270	0.832900	74.32616
367	WIRING DEVICES	-56.787827	-0.270	3.967870	1.270	0.888500	206.10703
375	STORAGE BATTERIE	-20.714531	-0.620	0.815250	1.620	0.947200	33.30061
376	PRIMARY BATTERIE	-22.894295	-0.720	0.822234	1.720	0.865200	31.58354
377	X-RAY APPARATUS	-124.601959	-1.180	3.473710	2.180	0.889400	105.55185
378	ENGINE ELECTRICA	28.876850	0.150	2.332575	0.840	0.643700	183.42371
368	RADIO & TV RECEI	-61.211243	-0.210	5.211809	1.210	0.924500	282.88440
369	PHONOGRAPH RECOR	6.418489	0.140	0.553448	0.850	0.708000	42.95840
383	TRUCK TRAILERS	-32.706612	-0.540	1.214522	1.540	0.492100	59.73296
384	MOTOR VEHICLES	879.726440	0.250	41.763252	0.740	0.790600	3397.44531
385	MOTOR VEHICLE PT	2522.335938	0.650	16.068668	0.340	0.492100	3856.90771
22	COMPLETE GUIDED	110.817886	0.930	0.109579	0.060	0.001700	118.54131
386	AIRCRAFT	-1526.757813	-0.510	63.701256	1.510	0.846900	2963.09473
387	AIRCRAFT, MISSILE	171.337616	0.220	8.212399	0.770	0.705100	750.17163
388	AIRCRAFT, MISSILE	-323.148438	-0.220	25.218979	1.220	0.919700	1454.35938
389	SHIP BUILDING &	107.782227	0.710	0.573143	0.290	0.025800	151.85886
390	BOAT BUILDING &	-91.599152	-1.130	1.908216	2.130	0.541000	81.06638
24	TANKS & TANK COM	121.692291	0.400	2.485509	0.600	0.420300	303.98804
391	RAILROAD EQUIPME	228.686798	0.770	0.919639	0.220	0.048100	296.13617
392	MOTORCYCLES, BICY	-25.731777	-1.750	0.550926	2.750	0.765500	14.67505
393	TRAVEL TRAILERS	-22.325008	-1.160	0.565113	2.160	0.763800	19.12232
395	TRANSPORTATION E	-5.356079	-0.160	0.521469	1.160	0.563100	32.89027
398	ENGINEER & SCI I	263.581360	1.000	-0.015462	0.000	0.000100	262.54346

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SEC	TITLE		COEF 1	ELAS 1	COEF 2	ELAS 2	RSQUARE	MEAN VALUE
399	MECHANICAL MEASU		14.278769	0.020	9.969782	0.970	0.899800	683.52637
400	AUTOMAT TEMPERAT		43.075348	0.720	0.193529	0.270	0.121700	99.11626
401	SURG & MED INSTR		-30.060078	-0.170	3.038121	1.170	0.824000	173.88165
402	SURG APPLIANCES		-19.477627	-0.160	2.092535	1.160	0.787400	120.98926
404	WATCHES, CLOCKS,		-50.438896	-1.080	1.446197	2.080	0.606600	46.64085
405	LENSES, OPTICAL		-98.255173	-0.850	3.176658	1.850	0.715000	114.98627
406	OPHTHALMIC GOODS		-4.274678	-0.190	0.396883	1.190	0.946100	22.36713
407	PHOTOGRAPHIC EQU		-363.132751	-0.480	16.461468	1.480	0.948800	741.88611
408	JEWELRY, PRECIOU		135.494629	1.170	0.295038	-0.170	0.112400	115.54065
409	JEWELERS MATL&LA		-168.357819	-0.610	6.568012	1.610	0.851600	275.84943
410	SILVERWARE & PLA		8.064268	0.560	0.090568	0.430	0.098200	14.18999
413	COSTUME JEWELRY		-35.625168	-1.420	0.727893	2.420	0.723800	25.01636
414	MUSICAL INSTRUME		-40.008682	-0.490	1.798364	1.490	0.901100	81.61809
415	GAMES, TOYS, KID		-37.941971	-0.450	1.783593	1.450	0.853400	82.68584
416	DOLLS		1.830766	0.300	0.062891	0.690	0.485700	6.08420
417	SPORT & ATHLETIC		-48.073151	-0.290	3.104400	1.290	0.622500	161.88330
418	PENS & MECHANICA		13.376347	0.220	0.696819	0.770	0.742200	60.50356
419	LEAD PENCILS & A		2.406237	0.280	0.090602	0.710	0.536900	8.53382
420	MARKING DEVICES		11.468489	1.970	-0.067966	-0.970	0.147600	5.80618
421	CARBON PAPER & I		-15.093441	-0.830	0.490445	1.830	0.897500	18.07627
422	ARTIFICIAL TREES		-0.095357	-0.040	0.031819	1.040	0.167300	2.05664
423	BUTTONS		2.721223	0.520	0.036105	0.470	0.671000	5.16304
424	NEEDLES, PINS, &		-0.636549	-0.020	0.374278	1.020	0.796900	24.67655
425	BROOMS & BRUSHES		15.698296	1.130	-0.027436	-0.130	0.038200	13.84274
426	HARD SURFACE FLO		-3.073772	-0.060	0.597127	1.060	0.212300	46.67352
428	SIGNS & ADVERTIS		-2.867598	-0.400	0.146968	1.400	0.640100	7.07215
433	BUSSES AND LOCAL	T	-0.587364	-309.560	0.002812	22.230	=34.6445	0.00190
434	TRUCKING	T	1.587485	0.740	-0.001013	0.000	=330.350	2.11937
447	BANKS, CREDIT AGE	T	0.075217	0.990	0.000009	0.000	$0.00659	0.07534
448	INSURANCE	T	0.924783	1.000	-0.000009	0.000	$0.00659	0.92465
451	HOTEL AND LODGIN	T	0.981808	1.000	-0.003558	-0.020	$0.13749	0.97619
452	PERSONAL + REPAI	T	0.018193	0.190	0.003527	0.770	=1.37800	0.09319
453	BUSINESS SERVICE	T	0.952113	1.000	-0.000005	0.000	$0.01919	0.95205
454	ADVERTISING	T	0.047887	0.990	0.000005	0.000	$0.01919	0.04795
459	POST OFFICE	T	0.152176	0.990	0.000066	0.000	$0.07919	0.15307
460	FED, S&L GOV. EN	T	0.847824	1.000	-0.000066	0.000	$0.07919	0.84693

Table 4.3

1	NEW CARS
2	USED CARS
3	NEW & USED TRUCKS
4	TIRES & TUBES
5	AUTO ACCESSORIES & PARTS
6	FURNITURE,MATTRESSES,BEDSPRINGS
7	KITCHEN, HOUSEHOLD APPLIANCES
8	CHINA,GLASSWARE,TABLEWARE,UTENSILS
9	RADIO,TV,RECORDS,MUSICAL INSTRUMENTS
10	FLOOR COVERINGS
11	DURABLE HOUSEFURNISHINGS NEC
12	WRITING EQUIPMENT
13	HAND TOOLS
14	JEWELERY
15	OPHTHALMIC & ORTHOPEDIC APPLIANCES
16	BOOKS & MAPS
17	WHEEL GOODS & DURABLE TOYS
18	BOATS, REC VECH., & AIRCRAFT
19	FOOD, OFF PREMISE
20	FOOD ON PREMISE
21	ALCOHOL, OFF PREMISE
22	ALCOHOL, ON PREMISE
23	SHOES & FOOTWARE
24	WOMEN'S CLOTHING
25	MEN'S CLOTHING
26	LUGGAGE
27	GASOLINE & OIL
28	FUEL OIL & COAL
29	TOBACCO
30	SEMIDURABLE HOUSEFURNISHINGS
31	DRUG PREPARATIONS & SUNDRIES
32	TOILET ARTICLES & PREPARATIONS
33	STATIONERY & WRITING SUPPLIES
34	NONDURABLE TOYS & SPORT SUPPLIES
35	FLOWERS, SEEDS, POTTED PLANTS
36	LIGHTING SUPPLIES
37	CLEANING PREPARATIONS
38	HOUSEHOLD PAPER PRODUCTS
39	MAGAZINES & NEWSPAPER
40	OTHER NONDURABLES -- IDENTITY
41	OWNER OCCUPIED SPACE RENT
42	TENANT OCCUPIED SPACE RENT
43	HOTELS, MOTELS
44	OTHER HOUSING
45	ELECTRICITY
46	NATURAL GAS
47	WATER & OTH SANITARY SERVICES
48	TELEPHONE & TELEGRAPH

4.3 cont.

49 DOMESTIC SERVICES
50 HOUSEHOLD INSURANCE
51 OTH HHLD OPERATIONS:REPAIR
52 POSTAGE
53 AUTO REPAIR
54 BRIDGE, TOLLS, ETC
55 AUTO INSURANCE
56 TAXICABS
57 LOCAL PUBLIC TRANSPORT
58 INTERCITY RAILROAD
59 INTERCITY BUSES
60 AIRLINES
61 TRAVEL AGENTS,OTH TRANS SERVICES
62 LAUNDRIES & SHOE REPAIR
63 BARBERSHOPS & BEAUTY SHOPS
64 PHYSICIANS
65 DENTISTS & OTHER PROF SERVICES
66 PRIVATE HOSPITALS & SANITARIUMS
67 HEALTH INSURANCE
68 BROKERAGE & INVESTMENT COUNSELING
69 BANK SERVICE CHRG & SERV W/O PAYMENT
70 LIFE INSURANCE
71 LEGAL SERVICES
72 FUNERAL EXPENSES,OTH PERS BUSINESS
73 RADIO & TV REPAIR
74 MOVIES, THEATRE,SPEC SPORTS
75 OTHER RECREATIONAL SERVICES
76 EDUCATION
77 RELIGIOUS & WELFARE SERVICES
78 FOREIGN TRAVEL

TABLE 4.4 PAGE 1

SEC	SEC. TITLE		PARAM A	PARAM B		RSQ		1977 VALUE
2	POULTRY AND EGGS	EQN=	0.598	-0.01249	RSQ=	0.957	BAL PCEIO=	1694.0
7	FRUIT, VEGETABLES, OTH CROPS	EQN=	0.602	-0.00411	RSQ=	0.426	BAL PCEIO=	6068.0
9	FISHERY PRODUCTS	EQN=	0.568	0.00348	RSQ=	0.226	BAL PCEIO=	1181.0
30	MEAT PACKING PLANTS	EQN=	1.124	0.00034	RSQ=	-0.049	BAL PCEIO=	13164.0
32	POULTRY DRESSING PLANTS	EQN=	1.133	0.02085	RSQ=	0.853	BAL PCEIO=	3912.0
33	POULTRY & EGG PROCESSING	EQN=	1.111	0.05122	RSQ=	0.895	BAL PCEIO=	646.0
34	CREAMERY BUTTER	EQN=	0.734	-0.03500	RSQ=	0.000	BAL PCEIO=	465.0
36	MILK, CONDENSED&EVAPORATED	EQN=	0.873	-0.03362	RSQ=	0.870	BAL PCEIO=	1422.0
38	FLUID MILK	EQN=	0.840	-0.01410	RSQ=	0.610	BAL PCEIO=	9636 0
39	CANNED & CURED SEA FOODS	EQN=	0.924	-0.02590	RSQ=	0.867	BAL PCEIO=	849.0
40	CANNED SPECIALTIES	EQN=	1.094	0.00776	RSQ=	0.194	BAL PCEIO=	2174.0
42	DEHYDRATED FOOD PRODUCTS	EQN=	1.115	0.01913	RSQ=	0.528	BAL PCEIO=	685.0
44	FISH, FRESH OR FROZEN PKGD	EQN=	0.863	0.01297	RSQ=	0.602	BAL PCEIO=	731.0
45	FROZEN FRUITS & VEGETABLES	EQN=	1.076	0.03333	RSQ=	0.886	BAL PCEIO=	4886.0
46	FLOUR & OTH GRAIN MILL PROD	EQN=	0.807	-0.00956	RSQ=	0.652	BAL PCEIO=	655.0
48	BLENDED & PREPARED FLOUR	EQN=	0.873	0.01215	RSQ=	0.619	BAL PCEIO=	1318.0
49	DOG, CAT, & OTH PET FOOD	EQN=	1.054	0.04213	RSQ=	0.953	BAL PCEIO=	2822.0
50	PREPARED FEEDS, N.E.C.	EQN=	0.930	-0.00160	RSQ=	-0.007	BAL PCEIO=	137.0
51	RICE MILLINGS	EQN=	0.806	0.00276	RSQ=	-0.018	BAL PCEIO=	328.0
52	WET CORN MILLING	EQN=	0.825	0.00892	RSQ=	0.507	BAL PCEIO=	126.0
53	BREAD, CAKE, & RLTD PRODS	EQN=	0.937	-0.01947	RSQ=	0.923	BAL PCEIO=	7698.0
55	SUGAR	EQN=	0.920	-0.01938	RSQ=	0.638	BAL PCEIO=	1255.0
57	CHOCOLATE & COCOA PRODS	EQN=	0.747	0.01728	RSQ=	0.368	BAL PCEIO=	1024.0
61	WINES BRANDY & BRANDY SPIRITS	EQN=	1.089	0.02558	RSQ=	0.898	BAL PCEIO=	1548.0
62	DISTILLED LIQ, EXC BRANDY	EQN=	1.305	-0.00700	RSQ=	0.000	BAL PCEIO=	3569.0
63	BOTTLED & CANNED SOFT DRINKS	EQN=	1.061	0.02072	RSQ=	0.931	BAL PCEIO=	7687.0
64	FLAVOR EXTRACTS & SIRUPS, NEC	EQN=	0.902	0.02303	RSQ=	0.856	BAL PCEIO=	259.0
69	ROASTED COFFEE	EQN=	1.183	-0.03775	RSQ=	0.889	BAL PCEIO=	3702.0
70	SHORTENING & COOKING OILS	EQN=	1.093	0.01523	RSQ=	0.845	BAL PCEIO=	2000.0
72	MACARONI & SPAGHETTI	EQN=	0.867	0.01549	RSQ=	0.708	BAL PCEIO=	657.0
73	FOOD PREPARATIONS, N.E.C.	EQN=	1.233	0.01689	RSQ=	0.680	BAL PCEIO=	4588.0
78	CHEWING & SMOKING TOBACCO	EQN=	0.891	-0.02854	RSQ=	0.747	BAL PCEIO=	398.0
82	BRDWOV FAB MILLS & FABRIC FIN	EQN=	0.821	-0.03800	RSQ=	0.880	BAL PCEIO=	763.0
84	YARN MILLS & TEX FIN NEC	EQN=	0.927	-0.00488	RSQ=	0.125	BAL PCEIO=	212.0
86	FLOOR COVERINGS	EQN=	0.819	0.00016	RSQ=	-0.050	BAL PCEIO=	2216.0
94	NONWOVEN FABRICS	EQN=	0.836	-0.01445	RSQ=	0.140	BAL PCEIO=	182.0
98	WOMENS HOSIERY, EXC SOCKS	EQN=	1.364	0.01965	RSQ=	0.127	BAL PCEIO=	685.0
100	KNIT OUTERWEAR MILLS	EQN=	1.114	-0.00500	RSQ=	0.000	BAL PCEIO=	1789.0
101	KNIT UNDERWEAR MILLS	EQN=	1.094	-0.02000	RSQ=	0.000	BAL PCEIO=	565.0
103	KNIT FABRIC MILLS	EQN=	1.140	-0.00500	RSQ=	0.000	BAL PCEIO=	342.0
108	CANVAS PRODUCTS	EQN=	0.560	-0.02500	RSQ=	0.000	BAL PCEIO=	180.0
109	PLEATING & STITCHING	EQN=	0.779	0.03191	RSQ=	0.540	BAL PCEIO=	458.0
127	WOOD PRODUCTS, N.E.C.	EQN=	1.104	-0.00523	RSQ=	0.060	BAL PCEIO=	634.0
131	WOOD HOUSEHOLD FURNITURE	EQN=	0.929	0.00019	RSQ=	-0.049	BAL PCEIO=	3712.0
135	METAL HOUSEHOLD FURNITURE	EQN=	0.918	-0.01416	RSQ=	0.698	BAL PCEIO=	897.0
136	MATTRESSES & BEDSPRINGS	EQN=	0.933	-0.00785	RSQ=	0.311	BAL PCEIO=	1190.0
142	BLINDS, SHADES, & DRAPE HRDWR	EQN=	1.095	-0.01702	RSQ=	0.340	BAL PCEIO=	478.0
150	SANITARY PAPER PRODUCTS	EQN=	1.213	0.02569	RSQ=	0.749	BAL PCEIO=	3696.0
152	PAPER COATING & GLAZING	EQN=	1.190	0.00795	RSQ=	0.023	BAL PCEIO=	169.0
153	BAGS, EXCEPT TEXTILES	EQN=	1.434	0.02000	RSQ=	0.000	BAL PCEIO=	172.0
156	STATIONERY PRODUCTS	EQN=	0.917	0.00551	RSQ=	0.070	BAL PCEIO=	503.0

TABLE 4.4 PAGE 2

SEC	SEC. TITLE		PARAM A	PARAM B		RSQ		1977 VALUE
157	CONVERTED PAPER PROD, NEC.	EQN=	1.110	0.02016	RSQ=	0.330	BAL PCEIO=	486.0
158	PAPERBOARD CONTAINERS & BOXES	EQN=	1.290	0.02406	RSQ=	0.580	BAL PCEIO=	147.0
161	NEWSPAPERS	EQN=	1.211	0.00692	RSQ=	0.514	BAL PCEIO=	2998.0
162	PERIODICALS	EQN=	1.145	0.04000	RSQ=	0.000	BAL PCEIO=	1934.0
163	BOOK PUBLISHING	EQN=	0.926	-0.03636	RSQ=	0.870	BAL PCEIO=	2743.0
166	COMMERCIAL PRINTING	EQN=	0.883	-0.04870	RSQ=	0.870	BAL PCEIO=	240.0
169	BLANKBOOKS & LOOSELEAF BINDER	EQN=	0.902	0.00772	RSQ=	0.255	BAL PCEIO=	272.0
170	GREETING CARD PUBLISHING	EQN=	0.817	-0.01879	RSQ=	0.788	BAL PCEIO=	763.0
183	ADHESIVES & SEALANTS	EQN=	0.896	0.01514	RSQ=	0.556	BAL PCEIO=	208.0
192	DRUGS	EQN=	1.145	0.00861	RSQ=	0.499	BAL PCEIO=	6495.0
193	SOAP & OTHER DETERGENTS	EQN=	0.790	-0.00788	RSQ=	0.167	BAL PCEIO=	3674.0
194	POLISHES & SANITATION GOODS	EQN=	0.890	-0.00473	RSQ=	0.183	BAL PCEIO=	1799.0
197	PAINTS & ALLIED PRODUCTS	EQN=	0.862	-0.03185	RSQ=	0.815	BAL PCEIO=	154.0
207	RUBBER & PLASTIC FOOTWEAR	EQN=	0.866	-0.00497	RSQ=	-0.019	BAL PCEIO=	1147.0
210	MISC. PLASTIC PRODUCTS	EQN=	1.164	0.03649	RSQ=	0.778	BAL PCEIO=	1119.0
217	HOUSE SLIPPERS	EQN=	0.907	-0.06780	RSQ=	0.920	BAL PCEIO=	164.0
219	LUGGAGE	EQN=	0.679	-0.01230	RSQ=	0.334	BAL PCEIO=	614.0
221	PERSONAL LEATHER GOODS	EQN=	0.949	0.01399	RSQ=	0.565	BAL PCEIO=	401.0
222	LEATHER GOODS, N.E.C.	EQN=	0.560	-0.05000	RSQ=	0.000	BAL PCEIO=	143.0
225	GLASS & GLASS PROD. NEC	EQN=	0.861	-0.01209	RSQ=	0.556	BAL PCEIO=	974.0
234	FINE EARTHWARE FOOD UTENSILS	EQN=	0.782	-0.01047	RSQ=	0.219	BAL PCEIO=	234.0
236	POTTERY PRODUCTS, N.E.C.	EQN=	1.097	0.00057	RSQ=	-0.049	BAL PCEIO=	339.0
242	CUT STONE & STONE PRODUCTS	EQN=	0.924	-0.01974	RSQ=	0.680	BAL PCEIO=	153.0
281	HEATING EQUIP, EXC ELEC	EQN=	0.864	-0.03053	RSQ=	0.097	BAL PCEIO=	206.0
287	PREFAB METAL BUILDINGS	EQN=	1.209	0.02518	RSQ=	0.597	BAL PCEIO=	132.0
292	METAL STAMPINGS, N.E.C.	EQN=	0.835	-0.00400	RSQ=	0.000	BAL PCEIO=	726.0
293	CUTLERY	EQN=	0.834	-0.00850	RSQ=	0.344	BAL PCEIO=	644.0
294	HAND & EDGE TOOLS, NEC	EQN=	1.126	-0.04000	RSQ=	0.000	BAL PCEIO=	550.0
302	METAL FOIL & LEAF	EQN=	1.353	0.06555	RSQ=	0.828	BAL PCEIO=	294.0
303	FABRICATED METAL PROD, NEC	EQN=	1.152	0.01384	RSQ=	0.313	BAL PCEIO=	134.0
309	LAWN & GARDEN EQUIP.	EQN=	0.645	-0.02000	RSQ=	0.000	BAL PCEIO=	226.0
320	POWER DRIVEN HAND TOOLS	EQN=	1.064	-0.00604	RSQ=	0.023	BAL PCEIO=	397.0
325	WOODWORKING MACHINERY	EQN=	0.929	-0.03408	RSQ=	0.352	BAL PCEIO=	148.0
340	TYPEWRITERS	EQN=	0.851	0.01248	RSQ=	0.338	BAL PCEIO=	480.0
345	REFRIG & HEATING EQUIPMENT	EQN=	1.218	0.01348	RSQ=	0.124	BAL PCEIO=	614.0
358	HOUSEHOLD COOKING EQUIPMENT	EQN=	0.945	-0.00822	RSQ=	0.415	BAL PCEIO=	1059.0
360	HOUSEHOLD LAUNDRY EQUIPMENT	EQN=	0.852	-0.02000	RSQ=	0.000	BAL PCEIO=	1457.0
361	ELEC HOUSEWARES & FANS	EQN=	0.943	0.00518	RSQ=	0.087	BAL PCEIO=	1891.0
364	HOUSEHOLD APPLIANCES, NEC	EQN=	0.778	0.02134	RSQ=	0.871	BAL PCEIO=	772.0
365	ELECTRIC LAMPS	EQN=	1.063	0.00042	RSQ=	-0.048	BAL PCEIO=	706.0
366	LIGHTING FIXTURES & EQUIPMENT	EQN=	1.180	-0.03928	RSQ=	0.736	BAL PCEIO=	505.0
369	PHONOGRAPH RECORDS & TAPE	EQN=	0.835	-0.01997	RSQ=	0.326	BAL PCEIO=	979.0
371	RADIO & TV COMMUNIC EQUIPMENT	EQN=	1.264	-0.03325	RSQ=	0.249	BAL PCEIO=	128.0
374	ELECTRONIC COMPONENTS, NEC	EQN=	1.095	-0.00964	RSQ=	0.033	BAL PCEIO=	486.0
375	STORAGE BATTERIES	EQN=	0.898	-0.00147	RSQ=	-0.041	BAL PCEIO=	990.0
376	PRIMARY BATTERIES, DRY&WET	EQN=	0.825	0.00018	RSQ=	-0.050	BAL PCEIO=	529.0
379	ELECTRICAL EQUIPMENT	EQN=	1.099	0.00072	RSQ=	-0.049	BAL PCEIO=	317.0
386	AIRCRAFT	EQN=	1.094	-0.03173	RSQ=	0.051	BAL PCEIO=	433.0
392	MOTORCYCLES, BICYLES, &PTS	EQN=	1.193	0.02069	RSQ=	0.114	BAL PCEIO=	1381.0
395	TRANSPORTATION EQUIP, NEC	EQN=	1.640	-0.00981	RSQ=	-0.040	BAL PCEIO=	268.0
402	SURG APPLIANCES & SUPPLIES	EQN=	1.076	0.00786	RSQ=	0.150	BAL PCEIO=	539.0

TABLE 4.4 PAGE 3

SEC	SEC. TITLE		PARAM A	PARAM B		RSQ		1977 VALUE
404	WATCHES, CLOCKS, & PARTS	EQN=	1.108	-0.00497	RSQ=	0.080	BAL PCEIO=	1033.0
406	OPHTHALMIC GOODS	EQN=	1.181	0.01695	RSQ=	0.528	BAL PCEIO=	870.0
407	PHOTOGRAPHIC EQUIP&SUPPLIES	EQN=	0.944	0.01019	RSQ=	0.585	BAL PCEIO=	1913.0
410	SILVERWARE & PLATED METAL	EQN=	0.700	-0.05000	RSQ=	0.000	BAL PCEIO=	371.0
413	COSTUME JEWELRY	EQN=	1.092	-0.02512	RSQ=	0.579	BAL PCEIO=	857.0
416	DOLLS	EQN=	0.845	-0.01127	RSQ=	0.314	BAL PCEIO=	627.0
417	SPORT & ATHLETIC GOODS,NEC	EQN=	0.878	-0.01548	RSQ=	0.431	BAL PCEIO=	1855.0
418	PENS & MECHANICAL PENCILS	EQN=	0.465	0.00120	RSQ=	-0.029	BAL PCEIO=	413.0
422	ARTIFICIAL TREES & FLOWERS	EQN=	0.887	-0.00048	RSQ=	-0.050	BAL PCEIO=	110.0
424	NEEDLES, PINS, & FASTENERS	EQN=	1.107	-0.02715	RSQ=	0.335	BAL PCEIO=	139.0
425	BROOMS & BRUSHES	EQN=	0.947	0.00189	RSQ=	-0.032	BAL PCEIO=	246.0
426	HARD SURFACE FLOOR COVERINGS	EQN=	0.776	-0.01270	RSQ=	0.333	BAL PCEIO=	261.0
429	MANUFACTURING, N.E.C.	EQN=	0.807	-0.03444	RSQ=	0.816	BAL PCEIO=	809.0
445	WHOLESALE TRADE	EQN=	1.000	-0.00012	RSQ=	0.737	BAL PCEIO=	61180.0
446	RETAIL TRADE	EQN=	1.000	-0.00009	RSQ=	0.777	BAL PCEIO=	163896.0

Table 4.5

1 AGRICULTURE(1)
2 CRUDE OIL & GAS (5-6)
3 MINING (2-4,7)
4 CONSTRUCTION (8)
5 FOOD, TOBACCO (9)
6 TEXTILES (10)
7 KNITTING (11)
8 APPAREL & HHLD TEXTILES (12)
9 PAPER (13)
10 PRINTING (14)
11 AGRICULTURAL FERTILIZER (15)
12 OTHER CHEMICALS (16)
13 PETROLEUM REFINING (17)
14 RUBBER & PLASTIC PROD (19-20)
15 FOOTWEAR & LEATHER (21)
16 LUMBER (22)
17 FUNITURE (23)
18 STONE,CLAY & GLASS (24)
19 IRON & STEEL (25)
20 NON-FERROUS METALS (26-27)
21 METAL PRODUCTS (28)
22 ENGINES & TURBINES (29)
23 AGRICULTURAL MACHINERY (30)
24 BLANK
25 METALWORKING MACHINERY (32)
26 BLANK
27 SPECIAL IND MACH (33)
28 MISC NONELEC MACH (31,34)
29 COMPUTERS,OFFICE EQ (35-36)
30 SERVICE INDUSTRY MACH (37)
31 COMMUNIC EQ, ELECTRON COMP (38)
32 ELEC APP & DISTRIB EQ (39)
33 HOUSEHOLD APPLIANCES (40)
34 ELEC LIGHT & WIRING EQ (41)
35 TV SETS,RADIOS,PHONOGRAPH (42)
36 MOTOR VEHICLES (43)
37 AEROSPACE (44)
38 SHIPS & BOATS (45)
39 OTHER TRANSP EQ (46)
40 INSTRUMENTS (47)
41 MISC MANUFACTURING (48)
42 RAILROADS (49)
43 AIR TRANSPORT (52)
44 TRUCKING,OTH TRANSPORT (50-51,53-54)
45 COMMUNICATIONS SERVICES (55)
46 ELECTRIC UTILITIES (56)
47 GAS,WATER & SANITATION (57,58)
48 WHOLESALE & RETAIL TRADE (59,60)

4.5 cont.

49 FINANCE & INSURANCE (62)
50 REAL ESTATE (63)
51 HOTELS; REPAIRS EXC.AUTO (65)
52 BUSINESS SERVICES (66)
53 AUTO REPAIR (67)
54 MOVIES & AMUSEMENTS (68)
55 MEDICINE, EDUC, NPO (69)
56 PERSONAL AUTOS
57 SALES OF USED EQUIP

TABLE 4.6 B MATRIX COEFFICIENT CHANGE RESULTS

SEC	TITLE	RSQ	INTERCEPT -- ELAS		TIME --- ELAS		% CHANGE -- ELAS		1977 VALUE
13	OTHER NON-FERROUS ORES	0.942	-2.937273	2.593	0.144078	-1.590	0.067890	-0.003	431.00000
16	CRUDE OIL EXTRACTION	0.061	-0.096719	1.081	0.000046	-0.006	0.107623	-0.075	184.00000
22	COMPLETE GUIDED MISSILE	0.975	2.253208	2.759	-0.111887	-1.713	-0.410921	-0.047	103.00000
86	FLOOR COVERINGS	0.884	-1.767910	2.795	0.089683	-1.773	0.184105	-0.023	972.00000
87	FELT GOODS N.E.C.	0.839	1.083845	2.785	-0.052669	-1.692	-0.462130	-0.093	12.00000
127	WOOD PRODUCTS, N.E.C.	0.803	0.839429	2.972	-0.038883	-1.721	-0.953342	-0.251	8.00000
131	WOOD HOUSEHOLD FURNITUR	0.113	-0.097010	2.223	0.003914	-1.121	0.062281	-0.102	451.00000
132	HOUSEHOLD FURNITURE, NE	0.401	-0.554872	2.775	0.029226	-1.827	-0.145755	0.052	24.00000
134	UPHOLSTERED HSHLD FURN	0.805	-0.749556	2.962	0.039804	-1.966	-0.014442	0.004	393.00000
135	METAL HOUSEHOLD FURNITU	0.883	0.843170	2.743	-0.043023	-1.749	0.028961	0.007	74.00000
136	MATTRESSES & BEDSPRINGS	0.846	-0.757284	2.799	0.039036	-1.803	-0.017350	0.005	157.00000
137	WOOD OFFICE FURNITURE	0.068	-0.066909	1.267	0.002125	-0.503	-0.165034	0.236	424.00000
138	METAL OFFICE FURNITURE	0.906	0.647015	2.558	-0.031424	-1.553	-0.016394	-0.005	930.00000
139	PUBLIC BUILDING FURNITU	0.629	0.457866	2.420	-0.020216	-1.335	-0.258704	-0.084	308.00000
140	WOOD PARTITIONS & FIXTU	0.900	0.858525	2.681	-0.043529	-1.699	0.076395	0.018	680.00000
141	METAL PARTITIONS & FIXT	0.884	0.486617	3.379	-0.027474	-2.384	0.011585	0.006	1003.00000
142	BLINDS, SHADES, & DRAPE	0.799	0.954892	3.508	-0.055532	-2.550	0.150483	0.042	54.00000
143	FURNITURE & FIXTURES, N	0.077	-0.121980	1.028	-0.001240	0.131	0.280322	-0.158	581.00000
178	INDL CHEM, INORG & ORG	0.230	0.224514	9.027	-0.014337	-7.205	-0.386465	-0.822	370.00000
209	FABRICATED RUBBER PROD,	0.850	0.457664	4.896	-0.029568	-3.954	0.079461	0.058	56.00000
210	MISC. PLASTIC PRODUCTS	0.590	-1.479490	3.442	0.083662	-2.433	0.057213	-0.009	20.00000
260	PRIMARY METAL PROD, NEC	0.698	-0.608483	3.553	0.038907	-2.840	-0.682150	0.287	5.00000
270	NF WIRE DRAWING&INSULAT	0.765	0.546589	3.643	-0.031772	-2.647	0.006327	0.004	102.00000
278	METAL BARRELS, DRUMS, PAI	0.041	0.091783	0.507	0.008617	0.598	-0.398610	-0.105	21.00000
284	BOILER SHOPS	0.589	0.393742	2.037	-0.014356	-0.929	-0.299593	-0.109	2307.00000
285	SHEET METAL WORK	0.544	0.402655	1.919	-0.015075	-0.898	-0.074666	-0.021	233.00000
295	HAND SAWS & SAW BLADES	0.574	-0.253751	2.595	0.014752	-1.886	-0.420661	0.291	57.00000
301	PIPE, VALVES, PIPE FITTIN	0.563	0.513768	2.041	-0.019211	-0.954	-0.287760	-0.087	985.00000
303	FABRICATED METAL PROD, N	0.840	0.809761	2.589	-0.034574	-1.382	-0.628875	-0.208	245.00000
306	STEAM ENGINES & TURBINE	0.221	0.660387	1.520	-0.016818	-0.484	-0.303084	-0.036	1300.00000
307	INTERNAL COMBUST ENGINE	0.096	-0.067293	-106.878	0.004400	87.346	0.213872	20.532	574.00000
308	FARM MACHINERY & EQUIP.	0.173	-0.002068	0.053	-0.001844	0.592	-0.318478	0.354	7809.00000
309	LAWN & GARDEN EQUIP.	0.356	0.518147	1.833	-0.017192	-0.760	-0.303340	-0.073	1202.00000
310	CONSTRUCTION MACH & EQU	0.740	0.496912	2.062	-0.021562	-1.119	0.231480	0.056	6181.00000
311	MINING MACH, EXC OIL FIE	0.489	1.107101	1.825	-0.038308	-0.789	-0.246489	-0.036	901.00000
312	OIL FIELD MACHINERY	0.512	0.404848	3.116	-0.021316	-2.051	-0.144268	-0.065	1154.00000
314	CONVEYERS & CONVEYING E	0.329	0.106928	4.473	-0.004505	-2.355	-0.404805	-1.117	1353.00000
315	HOIST, CRANES, & MONORA	0.357	0.314759	1.619	-0.005834	-0.375	-0.717390	-0.244	382.00000
316	INDL TRUCKS & TRACTORS	0.169	0.213584	1.628	-0.007675	-0.731	0.206232	0.103	1346.00000
317	MACH TOOLS, METAL CUTTI	0.552	0.509140	1.956	-0.019860	-0.954	-0.009477	-0.002	2143.00000
318	MACH TOOLS, METAL FORMI	0.875	0.988631	2.267	-0.042204	-1.210	-0.392686	-0.057	764.00000
319	SPEC DIES, TOOLS, MACH TO	0.321	0.269455	2.434	-0.011146	-1.258	-0.348053	-0.175	2791.00000
320	POWER DRIVEN HAND TOOLS	0.689	-0.667802	1.854	0.022438	-0.779	0.460175	-0.075	863.00000
321	ROLLING MILL MACHINERY	0.915	1.761158	2.203	-0.076421	-1.195	-0.136542	-0.008	250.00000
322	METALWORKING MACHINERY	0.666	-0.696019	2.014	0.028041	-1.014	-0.002523	0.000	643.00000
323	FOOD PRODUCTS MACHINERY	0.634	0.370628	1.906	-0.013840	-0.890	-0.067635	-0.017	1291.00000
324	TEXTILE MACHINERY	0.851	0.622211	2.058	-0.025157	-1.040	-0.098017	-0.018	807.00000
325	WOODWORKING MACHINERY	0.637	0.850662	1.687	-0.027263	-0.676	-0.090412	-0.011	376.00000
326	PAPER INDUSTRIES MACHIN	0.939	1.491198	2.394	-0.066259	-1.330	-0.488294	-0.065	400.00000
327	PRINTING TRADES MACHINE	0.905	0.642644	3.477	-0.035378	-2.393	-0.222622	-0.084	886.00000
328	SPECIAL INDL MACH, NEC	0.759	1.439523	1.907	-0.052786	-0.874	-0.348980	-0.033	1415.00000

TABLE 4.6 B MATRIX COEFFICIENT CHANGE RESULTS

SEC	TITLE	RSQ	INTERCEPT --	ELAS	TIME ---	ELAS	% CHANGE --	ELAS	1977 VALUE
329	PUMPS & COMPRESSORS	0.912	0.346957	3.091	-0.018959	-2.111	0.037370	0.020	2314.00000
331	BLOWERS & FANS	0.397	-0.291506	4.165	0.020870	-3.728	-0.666602	0.562	562.00000
334	INDL FURNACES & OVENS	0.761	0.744150	2.116	-0.030563	-1.087	-0.194964	-0.030	519.00000
335	GENL INDL MACH, NEC	0.789	0.345489	3.967	-0.022132	-3.177	0.274713	0.209	1626.00000
337	NON ELEC MACHINERY, NEC	0.313	0.905394	1.959	-0.032121	-0.869	-0.700745	-0.090	68.00000
338	ELECTRONIC COMPUTING EQ	0.937	-1.257637	2.868	0.066267	-1.889	-0.111417	0.021	6152.00000
339	CALC & ACCOUNTING MACH	0.753	-0.864383	2.790	0.045035	-1.817	-0.106355	0.027	698.00000
340	TYPEWRITERS	0.030	-0.117635	1.081	0.002130	-0.245	-0.230283	0.164	576.00000
341	SCALES & BALANCES	0.294	-0.151794	4.683	0.008711	-3.359	0.156327	-0.324	209.00000
342	OFFICE MACHINES, N.E.C.	0.299	-0.261627	1.990	0.011625	-1.105	-0.191794	0.115	716.00000
343	AUTOMATIC MERCHANDIS MA	0.919	1.143116	2.841	-0.059451	-1.847	0.033005	0.006	286.00000
344	COMMERCIAL LAUNDRY EQUI	0.659	0.866604	2.059	-0.036329	-1.079	0.123772	0.020	152.00000
345	REFRIG & HEATING EQUIPM	0.509	0.356845	2.205	-0.015665	-1.210	0.011551	0.005	1386.00000
346	MEASUR & DISPENS PUMPS	0.937	1.427459	2.305	-0.061788	-1.247	-0.503077	-0.058	224.00000
347	SERVICE IND MACH, NEC	0.393	-0.271031	2.125	0.010744	-1.053	0.129490	-0.072	910.00000
350	INSTRUM TO MEASURE ELEC	0.694	0.659613	3.385	-0.037559	-2.409	0.052394	0.024	1368.00000
351	TRANSFORMERS	0.139	0.229313	1.661	-0.006910	-0.626	-0.095268	-0.035	1411.00000
352	SWITCHGEAR&SWITCHBOARD	0.724	0.565869	2.387	-0.025162	-1.327	-0.230747	-0.060	1252.00000
353	MOTORS & GENERATORS	0.458	0.196752	6.017	-0.012533	-4.791	-0.106935	-0.226	927.00000
354	INDUSTRIAL CONTROLS	0.085	0.148730	1.536	-0.003458	-0.447	-0.131423	-0.090	339.00000
355	WELDING APPARTUS, ELECT	0.116	0.048403	0.535	0.001724	0.238	0.337000	0.226	487.00000
357	ELEC INDL APPARATUS, NE	0.599	0.959024	1.992	-0.036646	-0.952	-0.302739	-0.041	337.00000
358	HOUSEHOLD COOKING EQUIP	0.539	0.604416	2.691	-0.029737	-1.655	-0.092679	-0.036	511.00000
359	HSLD REFRIG, FREEZERS	0.493	0.904605	2.429	-0.042127	-1.414	-0.064757	-0.015	536.00000
360	HOUSEHOLD LAUNDRY EQUIP	0.468	0.514069	3.518	-0.029684	-2.540	0.045464	0.021	36.00000
361	ELEC HOUSEWARES & FANS	0.238	0.310087	2.729	-0.015064	-1.657	-0.112950	-0.072	85.00000
362	HSLD VACUUM CLEANERS	0.138	-0.107291	3.099	0.008106	-2.926	-0.393959	0.828	28.00000
363	SEWING MACHINES	0.447	0.388483	44.867	-0.030292	-43.732	-0.020289	-0.136	132.00000
364	HOUSEHOLD APPLIANCES, NE	0.135	-0.314377	2.486	0.015851	-1.567	-0.117188	0.081	294.00000
366	LIGHTING FIXTURES & EQU	0.860	0.980998	2.274	-0.044298	-1.284	0.058360	0.009	76.00000
367	WIRING DEVICES	0.528	0.467948	2.630	-0.022874	-1.607	-0.080482	-0.023	25.00000
368	RADIO & TV RECEIVING SE	0.596	-0.700733	2.017	0.027948	-1.005	0.059554	-0.011	449.00000
370	TELEPHONE & TELEGRAPH A	0.723	0.339885	2.705	-0.017454	-1.736	0.043475	0.031	4654.00000
371	RADIO & TV COMMUNIC EQU	0.482	0.429798	2.880	-0.021565	-1.806	-0.135929	-0.074	2562.00000
374	ELECTRONIC COMPONENTS, N	0.155	-0.255412	2.236	0.008622	-0.943	0.351428	-0.292	26.00000
375	STORAGE BATTERIES	0.276	0.142084	80.932	-0.012092	-86.098	0.153362	6.166	228.00000
377	X-RAY APPARATUS & TUBES	0.804	-1.663447	1.908	0.061406	-0.880	0.378555	-0.028	1872.00000
382	TRUCK & BUS BODIES	0.635	-0.920226	1.739	0.029851	-0.705	0.314015	-0.034	2304.00000
383	TRUCK TRAILERS	0.202	0.132046	2.183	-0.008896	-1.838	0.639590	0.655	1698.00000
384	MOTOR VEHICLES	0.504	-0.250630	1.745	0.006552	-0.570	0.401379	-0.175	$27726 000
386	AIRCRAFT	0.346	0.399980	2.371	-0.015973	-1.183	-0.249770	-0.187	2329.00000
387	AIRCRAFT, MISSILE ENGINE	0.530	1.063853	3.534	-0.058741	-2.439	-0.181880	-0.095	175.00000
389	SHIP BUILDING & REPAIRI	0.179	0.067999	-0.786	-0.009901	1.431	-0.486493	0.355	1640.00000
390	BOAT BUILDING & REPAIRI	0.318	-0.357467	1.807	0.012691	-0.802	0.021724	-0.005	154.00000
391	RAILROAD EQUIPMENT	0.034	0.039861	0.544	0.002798	0.478	-0.020167	-0.022	2734.00000
392	MOTORCYCLES, BICYLES, &PT	0.371	-0.498722	28.901	0.036874	-26.711	0.267338	-1.190	49.00000
393	TRAVEL TRAILERS & CAMPE	0.351	-0.863386	2.119	0.036837	-1.130	-0.058428	0.011	24.00000
395	TRANSPORTATION EQUIP, NE	0.409	-0.512441	5.895	0.035152	-5.055	-0.216706	0.160	160.00000
398	ENGINEER & SCI INSTRUME	0.801	0.811965	3.531	-0.039733	-2.160	-1.241121	-0.371	706.00000
399	MECHANICAL MEASURING DE	0.318	0.236463	2.317	-0.009948	-1.219	-0.154694	-0.099	1687.00000

TABLE 4.6 B MATRIX COEFFICIENT CHANGE RESULTS

SEC	TITLE	RSQ	INTERCEPT -- ELAS		TIME --- ELAS		% CHANGE -- ELAS		1977 VALUE
401	SURG & MED INSTRUMENTS	0.916	-0.905732	3.459	0.054497	-2.602	-0.583183	0.142	1197.00000
402	SURG APPLIANCES & SUPPL	0.573	-0.428440	2.654	0.023902	-1.851	-0.499609	0.197	285.00000
403	DENTAL EQUIP & SUPPLIE	0.817	-0.649243	3.235	0.036988	-2.279	-0.139138	0.044	303.00000
404	WATCHES, CLOCKS, & PART	0.141	-0.039491	0.883	0.001306	-0.365	-0.340482	0.482	2.00000
405	LENSES, OPTICAL INSTRUM	0.960	-1.192234	3.281	0.067634	-2.326	-0.223160	0.046	974.00000
407	PHOTOGRAPHIC EQUIP&SUPP	0.910	-1.172832	2.759	0.061198	-1.800	-0.221017	0.040	3141.00000
414	MUSICAL INSTRUMENTS	0.722	0.448868	2.555	-0.021615	-1.538	-0.048211	-0.017	165.00000
417	SPORT & ATHLETIC GOODS,	0.015	0.066126	0.620	0.003085	0.361	0.033417	0.019	370.00000
428	SIGNS & ADVERTIS DISPLA	0.782	0.650925	2.146	-0.025079	-1.033	-0.459356	-0.112	490.00000
429	MANUFACTURING, N.E.C.	0.657	-0.827230	2.112	0.035610	-1.136	-0.143139	0.025	309.00000
432	RAILROADS	0.306	-0.019980	0.806	-0.001379	0.695	0.197241	-0.501	785.00000
434	TRUCKING	0.333	0.053341	2.601	-0.003130	-1.908	0.101062	0.307	1190.00000
435	WATER TRANSPORTATION	0.356	0.079545	2.225	-0.003405	-1.190	-0.020220	-0.034	37.00000
436	AIRLINES	0.897	-0.332617	2.706	0.017672	-1.797	-0.164319	0.091	173.00000
439	TELEPHONE AND TELEGRAPH	0.807	0.156906	4.955	-0.009518	-3.757	-0.067699	-0.198	2981.00000
445	WHOLESALE TRADE	0.619	-0.080497	2.507	0.003854	-1.500	0.003425	-0.007	$12115.898
446	RETAIL TRADE	0.263	-0.073852	0.958	-0.002017	0.327	0.324672	-0.286	5071.00000
452	PERSONAL + REPAIR SERVI	0.563	0.334897	2.073	-0.014151	-1.095	0.050865	0.022	266.00000
461	NON-COMPETITIVE IMPORTS	0.169	0.017979	3.784	-0.000950	-2.501	-0.031209	-0.284	17.00000
463	SCRAP AND USED	0.295	0.026057	-1.989	-0.003209	3.061	0.010724	-0.073	=6982.0000

Table 4.7

1	1 UNIT RES. STRUCTURES
2	2 OR MORE UNIT STRUCTURES
3	MOBILE HOMES
4	ADDITIONS & ALTERATIONS
5	HOTELS,MOTELS,DORMITORIES
6	INDUSTRIAL
7	OFFICES
8	STORES,RESTAURANTS,GARAGES
9	RELIGIOUS
10	EDUCATIONAL
11	HOSPITAL & INSTITUTIONAL
12	MISCELLANEOUS NR BLDG
13	FARM BLDG
14	MINING EXPLORATION SHAFTS & WELLS
15	RAILROADS
16	TELEPHONE & TELEGRAPH
17	ELECTRIC LIGHT & POWER
18	GAS & PETROLEUM PIPES
19	OTHER STRUCTURES
20	HIGHWAYS & STREETS
21	MILITARY FACILITIES
22	CONSERVATION
23	SEWER SYSTEMS
24	WATER SUPPLY FACILITIES
25	RESIDENTIAL (PUBLIC)
26	INDUSTRIAL (PUBLIC)
27	EDUCATIONAL (PUBLIC)
28	HOSPITAL (PUBLIC)
29	OTHER BUILDINGS (PUBLIC)
30	MISC. PUBLIC STRUCTURES
31	BROKER'S COMMISSION (RESID STRUC)

Imports

TABLE 45 PAGE 1

SEC	TITLE	COEF 1	ELAS 1	COEF 2	ELAS 2	RSQUARE	MEAN VALUE
2	POULTRY AND EGGS	31.498196	1.830	-0.002283	-0.830	0.051100	17.13155
3	MEAT ANIMALS, OT	1101.007324	2.010	-0.017025	-1.010	0.275100	547.28198
4	COTTON	-17.218067	-0.370	0.018047	1.370	0.080400	46.25523
5	GRAINS	141.982483	3.760	-0.004832	-2.760	0.635400	37.66737
6	TOBACCO	37.955215	0.930	0.001214	0.060	0.001500	40.75597
7	FRUIT, VEGETABLES	269.980530	0.290	0.034429	0.700	0.333000	902.49829
8	FORESTRY PRODUCT	42.918205	2.930	-0.008633	-1.930	0.102400	14.64487
9	FISHERY PRODUCTS	700.604858	0.450	0.627064	0.540	0.055100	1531.79126
10	AGR, FORESTRY+FIS	3.289148	0.030	0.010844	0.960	0.235100	99.47269
11	IRON ORES	342.551270	0.290	0.298729	0.710	0.369600	1181.40723
12	COPPER ORE	47.786049	0.790	0.007557	0.200	0.002700	60.08159
13	OTHER NON-FERROU	270.163818	0.870	0.027048	0.120	0.006100	307.18707
14	COAL MINING	-44.043121	-2.620	0.004494	3.620	0.292500	16.80440
15	NATURAL GAS EXTR	-2063.937500	-1.540	0.160667	2.540	0.871800	1334.43433
16	CRUDE OIL EXTRAC	12987.886719	-0.880	1.059811	1.880	0.072300	14692.17383
17	STONE AND CLAY M	-804.936401	-1.600	0.298413	2.600	0.427500	502.93018
30	MEAT PACKING PLA	-112.929581	-0.070	0.072631	1.070	0.420400	1537.17627
31	SAUSAGES & OTH P	-6.325688	-0.160	0.004069	1.160	0.176300	38.63080
32	POULTRY DRESSING	11.022120	1.720	-0.000965	-0.720	0.113100	6.37349
33	POULTRY & EGG PR	-1.103655	-0.350	0.005890	1.350	0.444000	3.08265
34	CREAMERY BUTTER	9.097799	4.400	-0.005924	-3.400	0.037100	2.06740
35	CHEESE, NATURAL	-50.084885	-0.290	0.057696	1.290	0.898700	169.69937
36	MILK, CONDENSED&	-1.911224	-3.290	0.000849	4.290	0.040200	0.58097
37	ICE CREAM & FROZ	49.206146	27.990	-0.021681	-26.990	0.419000	1.75772
38	FLUID MILK	18.983810	3.050	-0.000998	-2.050	0.415300	6.20586
39	CANNED & CURED S	616.049072	2.450	-0.333881	-1.450	0.271900	251.17502
40	CANNED SPECIALTI	-20.579075	-2.940	0.012160	3.940	0.398700	6.97811
41	CANNED FRUITS &	-915.775513	-2.500	0.215723	3.500	0.859500	365.75879
42	DEHYDRATED FOOD	-18.696243	-0.610	0.042499	1.610	0.429800	30.39748
43	PICKLES, SAUCES,	-19.083073	-1.870	0.016649	2.870	0.810200	10.16894
46	FLOUR & OTH GRAI	-103.583130	-3.820	0.044902	4.820	0.364600	27.10243
47	CEREAL PREPARATI	-7.114328	-1.690	0.006978	2.690	0.361500	4.19478
49	DOG, CAT, & OTH	6.602428	0.550	0.002257	0.440	0.053900	11.95044
50	PREPARED FEEDS,	10.922178	0.540	0.000951	0.450	0.016100	20.08981
51	RICE MILLINGS	4.014132	1.850	-0.002095	-0.850	0.048000	2.16241
52	WET CORN MILLING	41.231949	1.720	-0.013512	-0.720	0.479300	23.89182
53	BREAD, CAKE, & R	404.270508	13.060	-0.037187	-12.060	0.144700	30.94073
54	COOKIES & CRACKE	-48.256218	-1.410	0.029607	2.410	0.009800	34.18268
55	SUGAR	903.128418	0.750	0.081393	0.240	0.049200	1202.31934
56	CONFECTIONERY PR	119.337738	1.920	-0.014247	-0.920	0.122700	61.92582
57	CHOCOLATE & COCO	-1397.546631	-8.350	1.579378	9.350	0.756100	167.20456
58	CHEWING GUM	-10.431318	-1.940	0.025891	2.940	0.185900	5.36410
59	MALT LIQUORS	-176.834869	-1.540	0.050380	2.540	0.762500	114.82520
61	WINES BRANDY & B	-132.151855	-0.430	0.350149	1.430	0.934800	304.16443
62	DISTILLED LIQ, E	88.064178	0.130	0.124744	0.860	0.793000	660.14722
63	BOTTLED & CANNED	-77.660873	-7.580	0.011075	8.580	0.591500	10.24297
64	FLAVOR EXTRACTS	-14.390966	-0.610	0.018100	1.610	0.821900	23.52779
65	COTTONSEED OIL M	19.669579	1.540	-0.010119	-0.540	0.019700	12.69662
67	VEGETABLE OIL MI	-208.935944	-0.590	1.160419	1.590	0.192800	354.06885
68	ANIMAL & MARINE	43.386284	0.540	0.019895	0.450	0.015100	80.08011
69	ROASTED COFFEE	1169.972412	10.020	-0.148924	-9.020	0.549900	116.74268
72	MACARONI & SPAGH	-21.783131	-1.890	0.065317	2.890	0.890700	11.51125
73	FOOD PREPARATION	-3.549303	-0.030	0.019238	1.030	0.505900	110.09520

TABLE 4.8 PAGE 2

SEC	TITLE	COEF 1	ELAS 1	COEF 2	ELAS 2	RSQUARE	MEAN VALUE
76	CIGARETTES	-11.457531	-3.410	0.001782	4.410	0.145700	3.35269
77	CIGARS	51.269119	3.890	-0.082446	-2.890	0.865200	13.16474
78	CHEWING & SMOKIN	66.197205	4.720	-0.115078	-3.720	0.380400	14.02182
79	TOBACCO STEM & R	650.362671	2.640	-0.098294	-1.640	0.306300	245.76715
82	BRDWOV FAB MILLS	-1364.201660	-2.080	0.126453	3.080	0.720900	653.40564
83	NARROW FABRIC MI	-21.349094	-0.950	0.060355	1.950	0.493000	22.25059
84	YARN MILLS & TEX	3.966168	0.030	0.021567	0.960	0.187600	109.20261
85	THREAD MILLS	-23.029228	-3.080	0.065400	4.080	0.664700	7.47275
86	FLOOR COVERINGS	21.269817	0.160	0.036980	0.830	0.676600	125.78220
87	FELT GOODS N.E.C	1.763627	1.110	-0.001093	-0.110	0.003000	1.57824
88	LACE GOODS	18.440182	0.990	0.001534	0.000	0.000200	18.57684
90	PROCESSED TEXTIL	36.544289	1.610	-0.091808	-0.610	0.126100	22.59750
91	COATED FAB, NOT	-25.959282	-1.500	0.044967	2.500	0.514700	17.20076
92	TIRE CORD & FABR	1.001993	0.280	0.004217	0.710	0.029400	3.55294
93	CORDAGE & TWINE	39.974289	0.430	0.190068	0.560	0.040000	92.78838
94	NONWOVEN FABRICS	340.550720	1.850	-0.233690	-0.850	0.549900	183.87643
95	TEXTILE GOODS, N	79.300278	0.350	0.544502	0.640	0.480600	220.75250
99	HOSIERY, N.E.C.	-28.754108	-2.820	0.050936	3.820	0.794300	10.19496
103	KNIT FABRIC MILL	-6.408942	-0.270	0.012075	1.270	0.559700	23.46526
104	APPAREL FROM PUR	-7830.221680	-2.740	0.411863	3.740	0.827500	2856.89844
106	HOUSEFURNISHINGS	79.502609	0.550	0.020835	0.440	0.116000	143.97897
107	TEXTILE BAGS	1.936484	1.020	-0.000127	-0.020	0.000300	1.89535
111	SCHIFFLI MACH EM	5.790690	0.940	0.001965	0.050	0.001700	6.10518
112	FAB TEXTILE PROD	32.610611	0.420	0.039991	0.570	0.009000	76.69414
146	PULP MILLS	273.790833	0.260	0.323636	0.730	0.754400	1048.88550
147	PAPER MILLS, EXC	513.610352	0.280	0.131320	0.710	0.732900	1774.52271
148	PAPERBOARD MILLS	4.803654	0.300	0.002178	0.690	0.152000	15.80529
149	ENVELOPES	1.699741	1.510	-0.000595	-0.510	0.016800	1.12119
151	BUILDING PAPER &	23.417137	3.930	-0.031777	-2.930	0.118700	5.95472
152	PAPER COATING &	-103.986435	-3.110	0.057177	4.110	0.634600	33.42763
155	PRESSED & MOLDED	2.303345	0.250	0.030828	0.740	0.227200	8.94611
157	CONVERTED PAPER	-170.233887	-2.650	0.193237	3.650	0.876800	64.01958
158	PAPERBOARD CONTA	-6.295992	-0.850	0.001336	1.850	0.439600	7.37562
161	NEWSPAPERS	-49.290436	-4.040	0.005551	5.040	0.711500	12.18090
162	PERIODICALS	-41.693993	-2.020	0.014398	3.020	0.849400	20.59711
163	BOOK PUBLISHING	-216.945282	-1.620	0.078286	2.620	0.833200	133.46600
166	COMMERCIAL PRINT	-191.690430	-2.330	0.020280	3.330	0.850800	82.15459
167	LITHOGRAPHIC PLA	1.761404	1.480	-0.001106	-0.480	0.119000	1.18931
169	BLANKBOOKS & LOO	-6.347915	-0.280	0.032541	1.280	0.468400	22.62886
170	GREETING CARD PU	122.056046	7.320	-0.143111	-6.320	0.659200	16.65756
179	FERTILIZERS, NIT	-84.987793	-0.380	0.061102	1.380	0.732200	218.92618
180	FERTILIZERS MIXI	50.436058	1.780	-0.017668	-0.780	0.006000	28.25936
181	AGRIC CHEMICALS,	-31.227993	-0.520	0.034295	1.520	0.496800	59.21906
178	INDL CHEM, INORG	-1191.030029	-1.040	0.077043	2.040	0.844200	1141.63721
182	GUM & WOOD CHEMI	21.726349	0.900	0.005412	0.090	0.003900	23.92483
183	ADHESIVES & SEAL	-3.276468	-0.110	0.025076	1.110	0.526300	28.97562
184	EXPLOSIVES	-28.034172	-2.160	0.055368	3.160	0.177200	12.96618
185	PRINTING INK	2.177907	0.510	0.002084	0.480	0.022700	4.19997
186	CARBON BLACK	6.289524	1.100	-0.001413	-0.100	0.002800	5.67521
187	CHEMICAL PREPARA	-97.517075	-0.650	0.071491	1.650	0.775700	150.08188
188	PLASTICS MATLS &	-69.488205	-0.850	0.019964	1.850	0.848900	80.91794
189	SYNTHETIC RUBBER	-100.184006	-1.390	0.092014	2.390	0.858900	71.61008
190	CELLULOSIC MAN-M	-28.957382	-0.610	0.079195	1.610	0.245900	46.94978

TABLE 4A (CES3

SEC	TITLE	COEF 1	ELAS 1	COEF 2	ELAS 2	RSQUARE	MEAN VALUE
191	NONCELLULOSIC FI	77.187088	0.670	0.012373	0.320	0.105500	113.73488
192	DRUGS	-184.866150	-0.550	0.060985	1.550	0.953400	331.90100
193	SOAP & OTHER DET	-2.622924	-0.370	0.002442	1.370	0.422500	7.00916
194	POLISHES & SANIT	34.282738	1.950	-0.008065	-0.950	0.135400	17.51500
195	SURFACE ACTIVE A	-17.507710	-0.910	0.045008	1.910	0.943400	19.24412
196	TOILET PREPARATI	-6.415626	-0.200	0.008675	1.200	0.689800	31.82626
197	PAINTS & ALLIED	-9.352512	-2.170	0.002792	3.170	0.494300	4.29598
200	PETROLEUM REFINI	-1780.196533	-1.060	0.047495	2.060	0.921900	1669.20264
203	ASPHALT FELTS &	-40.989914	-3.500	0.029156	4.500	0.392200	11.68497
201	FUEL OIL (BEA235	-1825.235596	-0.400	0.337282	1.400	0.606600	4530.97852
206	TIRES & INNER TU	-776.625122	-1.840	0.181884	2.840	0.740800	420.90967
207	RUBBER & PLASTIC	622.084473	1.810	-0.441372	-0.810	0.091000	343.57843
208	RECLAIMED RUBBER	1.415314	1.180	-0.003852	-0.180	0.006300	1.19755
209	FABRICATED RUBBE	-8.816214	-0.460	0.007978	1.460	0.207900	18.90485
211	RUBBER&PLASTIC H	-81.969940	-2.720	0.091481	3.720	0.515200	30.11071
210	MISC. PLASTIC PRO	-138.901184	-0.320	0.040512	1.320	0.898200	434.62805
214	LEATHER TANNING	91.197098	0.490	0.060101	0.500	0.050400	182.58392
215	FOOTWEAR CUT STO	42.626450	2.660	-0.060970	-1.660	0.591600	15.97202
216	SHOES, EXCEPT RU	3892.708008	3.770	-0.701562	-2.770	0.286500	1030.15137
217	HOUSE SLIPPERS	5.544226	0.500	0.022065	0.490	0.030700	11.04041
218	LEATHER GLOVES &	-14.786745	-0.210	0.630191	1.210	0.086900	70.09723
219	LUGGAGE	-85.873352	-0.950	0.357951	1.950	0.580000	89.84961
220	WOMENS HANDBAGS	-186.302643	-1.150	0.992040	2.150	0.521500	160.78198
221	PERSONAL LEATHER	-14.865746	-0.270	0.260638	1.270	0.471000	54.01060
222	LEATHER GOODS, N	37.127968	1.150	-0.020792	-0.150	0.000700	32.12073
115	LOGGING CAMPS &	304.318237	3.080	-0.025957	-2.080	0.720500	98.69591
116	SAWMILLS & PLANI	-1163.966064	-0.830	0.277279	1.830	0.443400	1398.66724
117	HRDWD DIM & FLOO	68.511536	1.400	-0.023274	-0.400	0.038500	48.95090
118	SPEC PROD SAWMIL	86.468964	0.860	0.036689	0.140	0.037000	100.58138
119	MILLWORK	-46.677078	-1.280	0.029250	2.280	0.638400	36.29308
121	VENEER & PLYWOOD	313.000916	0.540	0.068714	0.450	0.251900	572.66675
126	PARTICLEBOARD	37.098030	1.210	-0.028220	-0.210	0.120400	30.56581
127	WOOD PRODUCTS, N	-130.468903	-0.510	0.205770	1.510	0.766700	251.86148
130	WOOD CONTAINERS	8.598650	1.430	-0.003634	-0.430	0.214800	5.97893
131	WOOD HOUSEHOLD F	-618.678833	-2.490	0.279747	3.490	0.837100	247.77170
136	MATTRESSES & BED	-5.038439	-2.480	0.004619	3.480	0.401600	2.02407
137	WOOD OFFICE FURN	-40.090248	-0.340	0.426956	1.340	0.847600	114.93184
225	GLASS & GLASS PR	-40.780731	-0.100	0.095415	1.100	0.780800	375.99872
226	GLASS CONTAINERS	-22.325970	-1.640	0.012430	2.640	0.653500	13.58690
227	CEMENT, HYDRAULI	-520.946777	-6.460	0.208032	7.460	0.592700	80.53650
228	BRICK & STRUCTUR	20.012325	2.530	-0.017564	-1.530	0.024900	7.88335
229	CERAMIC WALL & F	-116.243790	-1.360	0.887551	2.360	0.540900	84.88303
232	VITREOUS PLUMBIN	-20.459629	-3.150	0.083247	4.150	0.794300	6.48602
233	VITREOUS CHINA F	-35.006126	-0.310	1.029362	1.310	0.164000	111.02901
234	FINE EARTHWARE F	242.826630	2.830	-1.479929	-1.830	0.683800	85.63245
235	PORCELAIN ELEC S	23.864754	0.670	0.028631	0.330	0.049200	35.63226
236	POTTERY PRODUCTS	-220.394073	-1.710	1.497547	2.710	0.674200	128.53430
238	CONCRETE PRODUCT	-21.895496	-2.950	0.011356	3.950	0.655400	7.41112
239	READY MIXED CONC	1.471138	1.390	-0.000069	-0.390	0.742700	1.05190
240	LIME	-25.069221	-2.750	0.084257	3.750	0.759900	9.10832
241	GYPSUM PRODUCTS	-43.804855	-6.770	0.054757	7.770	0.591200	6.46179
242	CUT STONE & STON	33.488556	0.830	0.017125	0.160	0.001400	40.31457
243	ARRASIVE PRODUCT	-30.487144	-0.320	0.085735	1.320	0.858200	95.16663

TABLE 41 (Page 4)

SEC	TITLE	COEF 1	ELAS 1	COEF 2	ELAS 2	RSQUARE	MEAN VALUE
244	ASBESTOS PRODUCT	32.294678	0.840	0.005399	0.150	0.000600	38.21741
246	MINERALS, GROUND	-0.093335	0.000	0.015308	1.000	0.325200	11.41062
247	MINERAL WOOL	-28.270584	-3.060	0.027323	4.060	0.524900	9.21675
248	NONCLAY REFRACTO	-15.505573	-0.770	0.052043	1.770	0.830900	19.94219
249	NONMETAL MINERAL	6.709581	0.260	0.078673	0.730	0.798300	25.41999
252	BLAST FURNACES &	2092.965332	0.780	0.011835	0.210	0.001100	2663.47803
253	ELECTROMETALLURG	773.934937	3.500	-0.483903	-2.500	0.149500	220.74292
254	STEEL WIRE & REL	64.880310	0.900	0.003803	0.100	0.000900	72.05417
257	IRON & STEEL FOU	2.880433	0.160	0.001565	0.830	0.064100	17.60467
258	IRON & STEEL FOR	217.228210	5.640	-0.047908	-4.640	0.335200	38.47545
260	PRIMARY METAL PR	-22.700726	-0.990	0.077893	1.990	0.798500	22.81382
261	PRIMARY COPPER	1367.898193	1.910	-0.169226	-0.910	0.293700	716.08289
267	COPPER ROLLING &	246.624329	1.260	-0.013138	-0.260	0.015500	195.61545
262	PRIMARY LEAD	365.974548	2.060	-0.141238	-1.060	0.207300	177.48343
263	PRIMARY ZINC	469.396118	2.020	-0.315503	-1.020	0.088300	232.22031
264	PRIMARY ALUMINUM	265.398438	0.500	0.050734	0.490	0.260200	524.30945
265	PRIMARY NF METAL	-186.851898	-0.170	0.560386	1.170	0.490700	1049.45679
268	ALUMINUM ROLLING	61.917557	0.420	0.014825	0.570	0.216600	145.48779
269	NONFERROUS ROLL	-31.771751	-0.460	0.046440	1.460	0.171200	68.53333
270	NF WIRE DRAWING&	-148.666931	-1.440	0.047007	2.440	0.836500	103.05452
23	AMMUNITION, EXC.	9.244118	0.250	0.016657	0.740	0.865000	35.84669
25	SMALL ARMS	-15.016998	-0.200	0.165180	1.200	0.772400	73.69208
278	METAL BARRELS, DR	-91.820663	-2.610	0.145138	3.610	0.544700	35.15829
280	PLUMBING FIXTURE	11.138912	2.670	-0.007607	-1.670	0.269000	4.15745
281	HEATING EQUIP, EX	-182.148651	-4.380	0.169115	5.380	0.687900	41.57024
282	FABRICATED STRUC	-120.301041	-1.100	0.043212	2.100	0.292600	108.47446
284	BOILER SHOPS	-127.530930	-3.140	0.027949	4.140	0.622800	40.56917
289	SCREW MACH PROD,	-464.737949	-1.610	0.158281	2.610	0.420200	287.32428
290	AUTO STAMPINGS	-56.276634	-1.500	0.013091	2.500	0.539600	37.31917
291	CROWNS & CLOSURE	15.126143	4.240	-0.019425	-3.240	0.342900	3.56145
293	CUTLERY	-47.546333	-0.460	0.295053	1.460	0.848700	102.99498
294	HAND & EDGE TOOL	-294.788269	-1.720	0.280648	2.720	0.867800	171.24582
295	HAND SAWS & SAW	-5.614320	-0.240	0.113749	1.240	0.947900	23.32748
296	HARDWARE, N.E.C.	-192.877472	-1.840	0.073717	2.840	0.855600	104.57448
299	MISC FAB WIRE PR	194.973389	0.650	0.028247	0.340	0.005700	297.85742
300	STEEL SPRINGS, E	-145.048920	-1.030	0.536737	2.030	0.386000	140.24237
301	PIPE, VALVES, PIPE	-507.075012	-2.570	0.120489	3.570	0.828200	196.74167
302	METAL FOIL & LEA	27.627411	0.370	0.061322	0.620	0.382200	73.50310
306	STEAM ENGINES &	-42.669434	-0.550	0.047365	1.550	0.404300	77.47240
307	INTERNAL COMBUST	-404.990601	-1.350	0.142321	2.350	0.647700	299.90210
308	FARM MACHINERY &	-393.632751	-0.530	0.171171	1.530	0.924600	731.80750
309	LAWN & GARDEN EQ	163.600647	1.570	-0.041551	-0.570	0.209400	103.80141
310	CONSTRUCTION MAC	-1087.803467	-2.180	0.156742	3.180	0.840200	497.37146
317	MACH TOOLS, META	-389.578918	-1.110	0.255713	2.110	0.437200	349.05420
318	MACH TOOLS, META	72.027176	0.900	0.005539	0.090	0.000500	79.34914
319	SPEC DIES, TOOLS,	-349.885193	-2.460	0.077212	3.460	0.654600	142.09821
320	POWER DRIVEN HAN	-83.174194	-1.140	0.157740	2.140	0.898800	72.35738
321	ROLLING MILL MAC	56.272354	2.810	-0.059839	-1.810	0.459000	20.02043
322	METALWORKING MAC	15.105341	1.540	-0.007735	-0.540	0.064900	9.76217
323	FOOD PRODUCTS MA	-349.664917	-2.000	0.355522	3.000	0.744000	174.12708
324	TEXTILE MACHINER	148.507141	0.350	0.245522	0.640	0.041800	419.28571
325	WOODWORKING MACH	-34.833977	-0.520	0.173210	1.520	0.271000	66.74210
326	PAPER INDUSTRIES	264.783936	2.520	-0.160770	-1.520	0.162000	104.94405

TABLE 4.3 Page 3

SEC	TITLE		COEF 1	ELAS 1	COEF 2	ELAS 2	RSQUARE	MEAN VALUE
327	PRINTING TRADES		-116.340302	-0.770	0.245395	1.770	0.795500	149.69971
328	SPECIAL INDL MAC		74.896240	0.690	0.007760	0.310	0.003700	108.51912
313	ELEVATORS & MOVI		-2.943178	-0.570	0.013811	1.570	0.148400	5.08172
314	CONVEYERS & CONV		-11.716578	-0.530	0.022330	1.530	0.474600	21.93661
315	HOIST, CRANES, &		-90.439102	-1.480	0.156951	2.480	0.320000	60.97213
316	INDL TRUCKS & TR		-173.837128	-2.660	0.138450	3.660	0.739900	65.23318
329	PUMPS & COMPRESS		-349.399780	-1.800	0.129899	2.800	0.957900	193.80463
330	BALL & ROLLER BE		-277.346619	-1.500	0.215434	2.500	0.638500	184.29135
331	BLOWERS & FANS		-189.907959	-3.240	0.188401	4.240	0.454500	58.53714
332	INDUSTRIAL PATTE		-1.903436	-1.290	0.008724	2.290	0.341800	1.47212
333	POWER TRANSMISSI		-358.877502	-3.470	0.166695	4.470	0.586000	103.28029
334	INDL FURNACES &		12.076002	0.430	0.020377	0.560	0.016100	27.89668
338	ELECTRONIC COMPU		78.065018	0.310	0.024274	0.680	0.581800	249.46298
340	TYPEWRITERS		-41.770981	-0.260	0.276188	1.260	0.886300	155.43930
341	SCALES & BALANCE		-20.672615	-1.860	0.103134	2.860	0.786700	11.07449
342	OFFICE MACHINES,		-475.104614	-1.560	0.966500	2.560	0.869000	303.39032
343	AUTOMATIC MERCHA		-0.298172	-0.040	0.018833	1.040	0.110900	7.17647
344	COMMERCIAL LAUND		-10.235815	-0.540	0.114619	1.540	0.166100	18.82353
345	REFRIG & HEATING		-116.020584	-1.320	0.027254	2.320	0.812600	87.82352
370	TELEPHONE & TELE		-100.743301	-0.950	0.037115	1.950	0.926900	105.68622
371	RADIO & TV COMMU		-859.127808	-1.430	0.113103	2.430	0.600600	600.92664
372	ELECTRON TUBES		-28.153522	-0.420	0.069965	1.420	0.485400	66.29877
373	SEMICONDUCTORS &		-38.871162	-0.040	0.247930	1.040	0.958400	792.65625
374	ELECTRONIC COMPO		-511.318054	-1.380	0.145659	2.380	0.809300	370.21161
350	INSTRUM TO MEASU		42.096535	0.680	0.005543	0.310	0.968900	61.31847
351	TRANSFORMERS		-42.481628	-0.700	0.056729	1.700	0.803300	60.32600
353	MOTORS & GENERAT		-300.525085	-1.700	0.111841	2.700	0.700700	176.54846
355	WELDING APPARTUS		-49.681541	-2.280	0.076933	3.280	0.444100	21.70892
356	CARBON & GRAPHIT		-26.190639	-0.760	0.106590	1.760	0.735600	34.29702
359	HHLD REFRIG, FRE		-114.023727	-1.510	0.113656	2.510	0.690600	75.44098
360	HOUSEHOLD LAUNDR		-7.663796	-1.640	0.008182	2.640	0.158800	4.65171
361	ELEC HOUSEWARES		74.056656	2.590	-0.024278	-1.590	0.193100	28.55907
362	HHLD VACUUM CLEA		1.620891	0.250	0.010574	0.740	0.716600	6.40086
363	SEWING MACHINES		-141.029968	-0.820	1.406336	1.820	0.541900	171.72702
364	HOUSEHOLD APPLIA		-591.251587	-1.890	0.796901	2.890	0.833300	312.43384
365	ELECTRIC LAMPS		-73.819244	-1.040	0.103137	2.040	0.562800	70.82805
366	LIGHTING FIXTURE		-124.494324	-1.310	0.084231	2.310	0.853400	94.66399
367	WIRING DEVICES		-744.175903	-2.190	0.356688	3.190	0.579500	338.87537
375	STORAGE BATTERIE		-30.926224	-1.030	0.049076	2.030	0.729900	29.90844
376	PRIMARY BATTERIE		-15.731476	-0.550	0.091324	1.550	0.910800	28.21523
377	X-RAY APPARATUS		5.807261	0.060	0.123086	0.930	0.896300	93.48714
378	ENGINE ELECTRICA		-235.281982	-1.770	0.137790	2.770	0.425000	132.48883
368	RADIO & TV RECEI		-1407.244385	-0.760	0.997668	1.760	0.833500	1829.49341
369	PHONOGRAPH RECOR		-3.718212	-0.210	0.036233	1.210	0.934600	17.26254
384	MOTOR VEHICLES		-6515.082031	-0.840	0.300793	1.840	0.765400	7700.36426
385	MOTOR VEHICLE PT		-960.043701	-0.290	0.124874	1.290	0.793900	3307.38770
386	AIRCRAFT	T	0.357223	1.150	-0.003125	-0.150	$0.03079	0.31035
387	AIRCRAFT, MISSILE	T	0.019132	0.110	0.010237	0.880	$0.60069	0.17269
388	AIRCRAFT, MISSILE	T	0.608956	1.190	-0.006555	-0.190	$0.13009	0.51062
389	SHIP BUILDING &		-56.164482	-0.880	0.026680	1.880	0.790700	63.37733
24	TANKS & TANK COM		4.156961	1.270	-0.001123	-0.270	0.007400	3.25331
391	RAILROAD EQUIPME		-289.104187	-4.100	0.080931	5.100	0.514900	70.43393
392	MOTORCYCLES, BICY		-267.514771	-0.380	1.643319	1.380	0.917200	693.32642

SEC	TITLE		COEF 1	ELAS 1	COEF 2	ELAS 2	RSQUARE	MEAN VALUE
395	TRANSPORTATION E		-9.028908	-0.090	0.174382	1.090	0.380200	92.28699
398	ENGINEER & SCI I		3.184278	0.070	0.025449	0.930	0.133000	45.44163
399	MECHANICAL MEASU		-368.260498	-1.870	0.217423	2.870	0.874700	196.66061
401	SURG & MED INSTR		-22.099911	-0.500	0.056412	1.500	0.924600	43.69083
402	SURG APPLIANCES		-29.369854	-1.020	0.032803	2.020	0.948800	28.73899
403	DENTAL EQUIP &		-5.546288	-0.310	0.046127	1.310	0.897100	17.52248
404	WATCHES, CLOCKS,		-381.378906	-0.890	0.812492	1.890	0.657400	426.97992
405	LENSES, OPTICAL		9.528000	0.050	0.215216	0.950	0.921200	190.61786
406	OPHTHALMIC GOODS		-117.225159	-1.200	0.353315	2.200	0.729300	97.16010
407	PHOTOGRAPHIC EQU		-182.872833	-0.350	0.124860	1.350	0.890900	518.28162
408	JEWELRY, PRECIOU		493.060059	2.300	-0.171547	-1.300	0.042700	213.71344
410	SILVERWARE & PLA		166.431427	1.780	-0.133569	-0.780	0.198700	93.17151
413	COSTUME JEWELRY		34.919479	0.270	0.174155	0.720	0.700200	127.11536
414	MUSICAL INSTRUME		-164.782867	-1.310	0.408545	2.310	0.764300	125.69283
415	GAMES, TOYS, KID		-642.583130	-1.870	0.563188	2.870	0.837300	342.43195
416	DOLLS		-95.382523	-0.810	0.685972	1.810	0.465200	117.80579
417	SPORT & ATHLETIC		-336.260132	-1.070	0.362828	2.070	0.810800	312.79144
418	PENS & MECHANICA		-40.510574	-1.880	0.166202	2.880	0.949500	21.45267
419	LEAD PENCILS & A		-6.265385	-0.610	0.074437	1.610	0.840100	10.17875
422	ARTIFICIAL TREES		18.131027	0.170	0.645736	0.820	0.196400	104.85622
423	BUTTONS		15.157824	0.730	0.042771	0.260	0.009600	20.65851
424	NEEDLES, PINS, &		-33.052711	-0.460	0.170354	1.460	0.254400	70.64072
425	BROOMS & BRUSHES		-62.160461	-1.760	0.197686	2.760	0.828900	35.17856
426	HARD SURFACE FLO		-3.148686	-0.230	0.044673	1.230	0.510300	13.53753
428	SIGNS & ADVERTIS		-3.530194	-1.580	0.003764	2.580	0.275700	2.22380
453	BUSINESS SERVICE	T	0.199351	1.160	-0.002420	-0.240	$0.73169	0.14679
454	ADVERTISING	T	0.800665	0.930	0.002520	0.040	=.089700	0.85321

Table 4.9

SEC	TITLE	RSQ FIT	RSQ SALES	AVE. COEF.	1977 SALES
2	POULTRY AND EGGS	0.7100	0.884	1.1658	6167.0
3	MEAT ANIMALS, OTH L	0.0040	0.217	0.6450	24586.0
4	COTTON	0.7550	0.368	1.2411	1530.0
6	TOBACCO	0.2740	0.081	1.0247	2329.0
7	FRUIT,VEGETABLES,OT	0.2450	0.864	1.2388	14660.0
8	FORESTRY PRODUCTS	0.6230	-0.079	0.6068	3172.0
9	FISHERY PRODUCTS	0.0410	0.712	1.3415	2567.0
11	IRON ORES	0.2150	0.560	0.9186	3030.0
12	COPPER ORE	0.1410	0.557	1.0198	1747.0
13	OTHER NON-FERROUS O	0.8090	0.384	0.9055	1187.0
14	COAL MINING	0.7920	0.806	1.0369	11848.0
15	NATURAL GAS EXTRACT	0.4250	0.983	1.1711	24735.0
16	CRUDE OIL EXTRACTIO	0.2330	0.953	0.8873	61000.0
17	STONE AND CLAY MINI	0.6380	0.876	1.4900	5019.0
19	NEW CONSTRUCTION	0.9190	0.591	9.6645	95693.0
20	MAINTENANCE CONSTRU	0.0430	0.998	1.3189	21893.0
22	COMPLETE GUIDED MIS	0.6670	0.988	44.4119	4643.0
30	MEAT PACKING PLANTS	0.2190	0.720	1.0356	12561.0
31	SAUSAGES & OTH PREP	0.1240	0.684	0.4917	1198.0
32	POULTRY DRESSING PL	0.0750	0.912	1.0836	1791.0
33	POULTRY & EGG PROCE	0.8900	0.947	0.9106	431.0
34	CREAMERY BUTTER	0.9460	0.812	2.0104	620.0
35	CHEESE, NATURAL & P	0.0510	0.882	0.5012	928.0
36	MILK, CONDENSED&EVA	0.9150	0.832	0.9173	1204.0
37	ICE CREAM & FROZEN	0.9810	0.634	1.3520	826.0
38	FLUID MILK	0.1740	0.688	0.7810	3503.0
39	CANNED & CURED SEA	0.9480	0.206	1.7225	339.0
41	CANNED FRUITS & VEG	0.7770	0.924	1.1584	1667.0
42	DEHYDRATED FOOD PRO	0.0000	0.858	0.6999	352.0
45	FROZEN FRUITS & VEG	0.7610	0.923	1.1655	1073.0
46	FLOUR & OTH GRAIN M	0.5350	0.631	0.9533	2554.0
47	CEREAL PREPARATIONS	0.5600	0.884	1.4760	84.0
48	BLENDED & PREPARED	0.8430	0.936	1.1699	311.0
49	DOG, CAT, & OTH PET	0.1720	0.771	1.1351	265.0

SEC	TITLE	RSQ FIT	RSQ SALES	AVE. COEF.	1977 SALES
51	RICE MILLINGS	0.0800	0.421	1.0528	290.0
52	WET CORN MILLING	0.0980	0.896	0.7885	1450.0
53	BREAD, CAKE, & RLTD	0.9760	-0.468	1.1892	2157.0
54	COOKIES & CRACKERS	0.5850	0.693	1.0728	194.0
55	SUGAR	0.6000	0.585	0.7128	2646.0
56	CONFECTIONERY PRODU	0.1870	0.865	0.7328	604.0
59	MALT LIQUORS	0.7720	0.962	0.9212	2267.0
60	MALT	0.8910	0.555	1.3142	466.0
61	WINES BRANDY & BRAN	0.9180	0.980	0.8184	796.0
62	DISTILLED LIQ, EXC	0.0870	0.800	0.8939	1911.0
63	BOTTLED & CANNED SO	0.7850	0.975	0.8927	773.0
64	FLAVOR EXTRACTS & S	0.8710	0.979	0.8577	2221.0
65	COTTONSEED OIL MILL	0.7380	0.313	1.3632	465.0
66	SOYBEAN OIL MILLS	0.7120	0.897	0.8813	4880.0
67	VEGETABLE OIL MILLS	0.0780	0.519	1.0773	908.0
68	ANIMAL & MARINE FAT	0.1860	0.469	0.7731	1016.0
69	ROASTED COFFEE	0.9280	0.019	1.3819	1401.0
70	SHORTENING & COOKIN	0.4350	0.961	0.7289	1646.0
71	MANUFACTURED ICE	0.9300	0.831	1.5975	88.0
72	MACARONI & SPAGHETT	0.5730	0.897	0.9706	139.0
73	FOOD PREPARATIONS,	0.0160	0.878	1.1034	1653.0
77	CIGARS	0.4560	0.185	3.5683	18.0
79	TOBACCO STEM & REDR	0.5620	0.614	0.9430	2907.0
82	BRDWOV FAB MILLS &	0.8570	0.859	0.6847	11216.0
83	NARROW FABRIC MILLS	0.7600	0.429	1.3952	621.0
84	YARN MILLS & TEX FI	0.0390	0.961	0.8409	6243.0
85	THREAD MILLS	0.1390	0.912	1.1036	502.0
86	FLOOR COVERINGS	0.9030	0.968	1.8832	1531.0
87	FELT GOODS N.E.C.	0.7080	0.421	1.3413	140.0
89	PADDING & UPHOLSTER	0.4080	0.074	1.6919	251.0
90	PROCESSED TEXTILE W	0.1340	0.371	1.1473	189.0
91	COATED FAB, NOT RUB	0.0530	0.591	1.3460	975.0
92	TIRE CORD & FABRIC	0.0450	0.786	0.8636	868.0
93	CORDAGE & TWINE	0.6070	-0.086	1.3801	344.0
95	TEXTILE GOODS, N.E.	0.0640	0.097	0.9014	607.0
103	KNIT FABRIC MILLS	-0.0260	0.493	0.8378	3873.0

SEC	TITLE	RSQ FIT	RSQ SALES	AVE. COEF.	1977 SALES
106	HOUSEFURNISHINGS, N	0.5760	0.546	1.2587	736.0
107	TEXTILE BAGS	0.4350	0.053	1.4732	274.0
109	PLEATING & STITCHIN	0.3350	0.009	1.1628	121.0
110	AUTO & APPAREL TRIM	0.4890	0.890	0.8592	2158.0
111	SCHIFFLI MACH EMBRO	0.3170	0.836	0.9328	129.0
112	FAB TEXTILE PRODUCT	0.1020	0.776	1.4561	928.0
115	LOGGING CAMPS & CON	0.1460	0.798	0.8881	9789.0
116	SAWMILLS & PLANING	0.7930	0.839	1.7226	11787.0
117	HRDWD DIM & FLOOR M	0.9100	0.535	1.4474	859.0
119	MILLWORK	0.9390	0.933	12.4865	3693.0
120	WOOD KITCHEN CABINE	0.4220	0.921	3.8516	1557.0
121	VENEER & PLYWOOD	0.4140	0.942	1.9576	4584.0
122	STRUC WOOD MEMBERS,	0.7280	0.936	11.9215	768.0
123	PREFAB WOOD BUILDIN	0.6600	0.949	40.9987	1788.0
124	WOOD PRESERVING	0.0740	0.780	5.1516	879.0
125	WOOD PALLETS & SKID	0.9460	0.964	0.7244	632.0
126	PARTICLEBOARD	0.9470	0.970	0.7520	502.0
127	WOOD PRODUCTS, N.E.	0.0440	0.921	1.0609	1963.0
130	WOOD CONTAINERS	0.8110	0.640	1.7730	496.0
133	WOOD TV & RADIO CAB	0.0060	0.090	1.8187	306.0
140	WOOD PARTITIONS & F	0.3640	0.885	4.7436	392.0
141	METAL PARTITIONS &	0.1900	0.510	3.3399	188.0
143	FURNITURE & FIXTURE	0.2470	0.848	2.0361	40.0
146	PULP MILLS	0.4810	0.408	1.3493	2828.0
147	PAPER MILLS, EXC BL	0.0160	0.939	1.0017	14385.0
148	PAPERBOARD MILLS	0.2790	0.974	0.9933	5932.0
149	ENVELOPES	0.0390	0.970	1.2561	953.0
150	SANITARY PAPER PROD	0.3840	0.972	1.3911	923.0
151	BUILDING PAPER & BO	0.8360	0.283	1.9991	508.0
152	PAPER COATING & GLA	0.7700	0.910	1.2085	2624.0
153	BAGS, EXCEPT TEXTIL	0.1210	0.822	1.0276	3092.0
154	DIE-CUT PAPER & BOA	0.4530	0.835	1.4010	1040.0
155	PRESSED & MOLDED PU	0.1740	0.002	1.3677	183.0
156	STATIONERY PRODUCTS	0.3400	0.835	2.1147	125.0
157	CONVERTED PAPER PRO	0.0660	0.754	1.1958	1351.0
158	PAPERBOARD CONTAINE	0.0530	0.976	0.9922	12458.0

SEC	TITLE	RSQ FIT	RSQ SALES	AVE. COEF.	1977 SALES
161	NEWSPAPERS	0.1510	0.751	1.0293	9439.0
162	PERIODICALS	0.0770	0.836	0.9705	3363.0
163	BOOK PUBLISHING	0.8820	0.886	2.9056	2476.0
164	BOOK PRINTING	0.3530	0.747	1.0725	1896.0
165	MISC. PUBLISHING	0.3760	0.907	1.0012	1453.0
166	COMMERCIAL PRINTING	0.1060	0.959	1.0213	14111.0
167	LITHOGRAPHIC PLATEM	0.8700	0.938	0.7186	631.0
168	MANIFOLD BUSINESS F	0.7190	0.975	1.2075	2656.0
169	BLANKBOOKS & LOOSEL	0.0050	0.934	1.1522	767.0
171	ENGRAVING & PLATE P	0.3420	-0.191	1.4364	230.0
172	BOOKBINDING & RELAT	0.5690	0.503	1.5272	530.0
173	TYPESETTING	0.0080	0.781	0.9695	782.0
174	PHOTOENGRAVING	0.4490	0.007	1.9601	224.0
178	INDL CHEM, INORG &	0.0000	0.984	0.7898	30892.0
179	FERTILIZERS, NITROG	0.7190	0.961	0.7534	5880.0
180	FERTILIZERS MIXING	0.9020	0.898	1.0522	1454.0
181	AGRIC CHEMICALS, NE	0.0830	0.172	1.2310	2187.0
182	GUM & WOOD CHEMICAL	0.6700	0.530	0.9602	263.0
183	ADHESIVES & SEALANT	0.9010	0.985	1.0102	1645.0
184	EXPLOSIVES	0.3110	0.346	2.1983	672.0
185	PRINTING INK	0.1830	0.484	1.1167	908.0
187	CHEMICAL PREPARATIO	0.0840	0.630	1.1832	3339.0
188	PLASTICS MATLS & RE	0.9370	0.993	0.8728	10838.0
189	SYNTHETIC RUBBER	0.6740	0.967	0.9866	2168.0
190	CELLULOSIC MAN-MADE	0.6740	-0.076	1.0487	873.0
191	NONCELLULOSIC FIBER	0.9560	0.980	0.9226	5351.0
192	DRUGS	0.8970	0.984	1.2718	4990.0
193	SOAP & OTHER DETERG	0.6160	0.984	1.1913	1319.0
194	POLISHES & SANITATI	0.6460	0.915	0.8036	683.0
197	PAINTS & ALLIED PRO	0.6660	0.960	1.2286	5729.0
200	PETROLEUM REFINING	0.8920	0.969	1.0044	61066.0
201	FUEL OIL (BEA235)	0.6230	0.966	0.9247	24755.0
202	PAVING MIXTURES & B	0.1690	0.790	4.8450	1499.0
203	ASPHALT FELTS & COA	0.0970	0.827	2.0660	1796.0
206	TIRES & INNER TUBES	-0.0040	0.907	1.0917	5311.0
208	RECLAIMED RUBBER	0.7000	0.525	1.3769	56.0
209	FABRICATED RUBBER P	0.7510	0.909	1.2294	3380.0
210	MISC.PLASTIC PRODUC	0.9250	0.973	0.7415	22032.0
211	RUBBER&PLASTIC HOSE	0.3250	0.836	1.1906	1409.0

SEC	TITLE	RSQ FIT	RSQ SALES	AVE. COEF.	1977 SALES
214	LEATHER TANNING & F	0.8410	0.916	1.0082	1385.0
225	GLASS & GLASS PROD,	0.4790	0.986	0.9867	3851.0
226	GLASS CONTAINERS	0.4240	0.907	1.0155	3576.0
227	CEMENT, HYDRAULIC	0.9300	0.911	1.7640	3109.0
228	BRICK & STRUCTURAL	0.8370	0.251	18.8466	736.0
229	CERAMIC WALL & FLOO	0.5500	0.425	9.9106	346.0
230	CLAY REFRACTORIES	0.2040	0.749	1.4446	468.0
231	STRUCTURAL CLAY PRO	0.7280	0.049	12.6403	208.0
232	VITREOUS PLUMBING F	0.7010	0.864	5.4427	363.0
235	PORCELAIN ELEC SUPP	0.3900	0.656	2.7463	385.0
237	CONCRETE BLOCK & BR	0.8390	0.429	10.4760	1014.0
238	CONCRETE PRODUCTS,	0.2670	0.823	6.0193	2595.0
240	LIME	0.6150	0.874	0.9601	491.0
241	GYPSUM PRODUCTS	0.8260	0.802	5.2955	929.0
242	CUT STONE & STONE P	0.9050	0.571	14.7960	273.0
243	ABRASIVE PRODUCTS	0.2570	0.883	0.9375	1370.0
244	ASBESTOS PRODUCTS	0.5370	-0.068	2.4027	986.0
245	GASKETS, PACK&SEAL	0.7460	0.402	1.2990	1216.0
246	MINERALS, GROUND OR	0.6360	0.862	0.8818	999.0
247	MINERAL WOOL	0.0080	0.878	3.4751	1638.0
248	NONCLAY REFRACTORIE	0.5020	0.778	1.6752	736.0
249	NONMETAL MINERAL PR	0.5010	0.872	0.7562	322.0
252	BLAST FURNACES & ST	0.9490	0.906	1.0710	43602.0
253	ELECTROMETALLURGICA	0.7960	0.851	0.8928	1447.0
254	STEEL WIRE & RELATE	0.7470	0.895	1.0124	2290.0
255	COLD FINISHING OF S	0.9230	0.934	0.8204	2732.0
256	STEEL PIPE & TUBES	0.8030	0.834	0.9744	2453.0
257	IRON & STEEL FOUNDR	0.1000	0.894	1.1836	10719.0
258	IRON & STEEL FORGIN	0.6050	0.567	1.2408	3371.0
259	METAL HEAT TREATING	0.6750	0.872	0.8356	715.0
260	PRIMARY METAL PROD,	0.9470	0.969	0.7710	1004.0
261	PRIMARY COPPER	0.6770	0.855	0.5239	3380.0
262	PRIMARY LEAD	0.8280	0.688	0.7667	1555.0
263	PRIMARY ZINC	0.0840	0.584	0.8533	832.0
264	PRIMARY ALUMINUM	0.0980	0.918	0.7751	6081.0
265	PRIMARY NF METALS,	0.4620	0.796	0.8370	2938.0
267	COPPER ROLLING & DR	0.6760	0.525	1.3901	3837.0
268	ALUMINUM ROLLING &	0.8510	0.976	0.8364	6780.0
269	NONFERROUS ROLL & D	0.5370	0.164	0.9301	2706.0
270	NF WIRE DRAWING&INS	0.6700	0.979	1.7215	5862.0
271	ALUMINUM CASTINGS	0.5530	0.865	1.1823	2231.0
272	BRASS,BRONZE,COPPER	0.8330	0.555	1.3366	645.0
274	NONFERROUS FORGINGS	0.0150	0.724	1.2139	561.0
277	METAL CANS	0.2850	0.862	1.0488	7398.0
278	METAL BARRELS,DRUMS	0.7560	0.888	1.0962	982.0
279	METAL SANITARY WARE	0.8840	0.561	7.5273	384.0

SEC	TITLE	RSQ FIT	RSQ SALES	AVE. COEF.	1977 SALES
280	PLUMBING FIXTURES,	0.7800	0.887	3.3258	1082.0
282	FABRICATED STRUCTUR	0.7560	0.872	9.7513	4839.0
283	METAL DOORS,SASH,TR	0.8020	0.502	8.3301	2944.0
284	BOILER SHOPS	0.2240	0.941	2.9636	4094.0
285	SHEET METAL WORK	0.4460	0.860	4.5430	4414.0
286	ARCHITECTURAL METAL	0.1070	0.801	13.3199	942.0
287	PREFAB METAL BUILDI	0.9140	0.950	10.7562	1348.0
288	MISCELLANEOUS METAL	-0.0070	0.558	27.6428	1248.0
289	SCREW MACH PROD,BOL	0.7770	0.859	1.1985	5232.0
290	AUTO STAMPINGS	0.8640	0.960	1.1060	8595.0
291	CROWNS & CLOSURES	0.9280	-0.131	1.2984	528.0
292	METAL STAMPINGS, N.	0.9060	0.949	1.1697	3680.0
293	CUTLERY	0.1080	0.893	1.3355	204.0
294	HAND & EDGE TOOLS,	0.0010	0.941	1.4132	1591.0
295	HAND SAWS & SAW BLA	0.9180	0.971	0.9162	286.0
296	HARDWARE, N.E.C.	0.7030	0.976	1.2115	4682.0
297	PLATING & POLISHING	0.0140	0.944	0.9662	1844.0
298	METAL COATING & ALL	0.5610	0.846	0.7384	1559.0
299	MISC FAB WIRE PROD	0.8970	0.766	1.4234	4003.0
300	STEEL SPRINGS, EXC	0.0090	0.838	1.0746	810.0
301	PIPE,VALVES,PIPE FI	0.0080	0.982	2.3827	5759.0
302	METAL FOIL & LEAF	0.3810	0.898	0.8353	871.0
303	FABRICATED METAL PR	0.1250	0.831	1.0510	3024.0
307	INTERNAL COMBUST EN	0.8860	0.984	0.7138	5086.0
309	LAWN & GARDEN EQUIP	0.0240	0.719	0.8955	293.0
310	CONSTRUCTION MACH &	0.5910	0.881	0.8382	2000.0
311	MINING MACH,EXC OIL	0.2970	0.630	0.6777	389.0
312	OIL FIELD MACHINERY	0.0960	0.502	1.3459	936.0
313	ELEVATORS & MOVING	0.4550	0.117	3.4695	434.0
314	CONVEYERS & CONVEYI	0.4890	0.893	1.1817	346.0
315	HOIST, CRANES, & MO	-0.0290	0.394	2.4345	503.0
316	INDL TRUCKS & TRACT	0.4530	0.907	0.4734	143.0
317	MACH TOOLS, METAL C	0.2490	0.881	1.2047	633.0
319	SPEC DIES,TOOLS,MAC	0.3820	0.901	0.9747	3814.0
320	POWER DRIVEN HAND T	0.7200	0.903	1.5242	266.0
321	ROLLING MILL MACHIN	0.7460	0.775	1.1375	43.0
322	METALWORKING MACHIN	0.7470	0.892	0.8067	156.0
326	PAPER INDUSTRIES MA	0.5480	0.458	0.5675	153.0
329	PUMPS & COMPRESSORS	0.7740	0.946	0.9739	2820.0
330	BALL & ROLLER BEARI	0.1470	0.936	0.9438	2315.0
331	BLOWERS & FANS	0.3490	0.904	1.2433	871.0
333	POWER TRANSMISSION	0.4860	0.955	1.0316	2846.0
336	CARBURETORS,PISTONS	0.2530	0.436	1.6155	1420.0
337	NON-ELEC MACHINERY,	0.8540	0.952	0.7205	6176.0

SEC	TITLE	RSQ FIT	RSQ SALES	AVE. COEF.	1977 SALES
340	TYPEWRITERS	-0.3670	0.159	1.1855	28.0
342	OFFICE MACHINES, N.	0.7000	0.788	1.3184	119.0
343	AUTOMATIC MERCHANDI	0.7660	0.554	0.9840	74.0
344	COMMERCIAL LAUNDRY	0.1040	0.682	1.4348	40.0
347	SERVICE IND MACH, N	0.8410	0.952	2.8539	632.0
350	INSTRUM TO MEASURE	0.0890	0.917	1.3395	620.0
352	SWITCHGEAR&SWITCHBO	0.2290	0.843	1.9835	1947.0
353	MOTORS & GENERATORS	0.7120	0.932	1.1958	4028.0
354	INDUSTRIAL CONTROLS	0.5440	0.976	0.8292	1685.0
355	WELDING APPARTUS, E	0.2970	0.782	1.3544	514.0
356	CARBON & GRAPHITE P	0.1420	0.818	1.0021	604.0
357	ELEC INDL APPARATUS	0.4560	0.352	1.2748	340.0
364	HOUSEHOLD APPLIANCE	0.7010	0.962	1.3885	1101.0
366	LIGHTING FIXTURES &	0.0400	0.931	2.2733	2520.0
367	WIRING DEVICES	0.5760	0.948	1.9454	3229.0
368	RADIO & TV RECEIVIN	0.8470	0.973	1.1892	1255.0
370	TELEPHONE & TELEGRA	0.5250	0.915	0.8867	1450.0
371	RADIO & TV COMMUNIC	0.6420	0.954	3.2148	10994.0
372	ELECTRON TUBES	0.5320	0.662	1.7186	1198.0
373	SEMICONDUCTORS & RE	0.9620	0.975	0.6534	4509.0
374	ELECTRONIC COMPONEN	0.5120	0.953	0.8223	6400.0
375	STORAGE BATTERIES	0.3590	0.822	0.8832	985.0
378	ENGINE ELECTRICAL E	0.3060	0.830	0.9118	2586.0
379	ELECTRICAL EQUIPMEN	0.1640	0.639	1.2161	417.0
382	TRUCK & BUS BODIES	0.8000	0.934	0.4715	1163.0
385	MOTOR VEHICLE PTS&A	0.3510	0.945	0.9175	35951.0
387	AIRCRAFT,MISSILE EN	0.8450	0.914	1.9651	4261.0
388	AIRCRAFT,MISSILE EQ	0.8790	0.904	1.5075	4345.0
394	MOBILE HOMES	0.6090	0.809	58.4337	3098.0
398	ENGINEER & SCI INST	0.2830	0.525	3.0898	1016.0
399	MECHANICAL MEASURIN	0.4220	0.795	1.5780	1743.0
400	AUTOMAT TEMPERATURE	0.7230	0.791	1.6848	1062.0
401	SURG & MED INSTRUME	0.6420	0.906	1.2491	322.0
402	SURG APPLIANCES & S	0.4300	0.962	1.1530	1335.0
403	DENTAL EQUIP & SUP	0.6620	0.956	1.2079	358.0
404	WATCHES, CLOCKS, &	0.8110	0.929	0.4547	682.0
405	LENSES, OPTICAL INS	0.7890	0.924	2.4531	405.0
407	PHOTOGRAPHIC EQUIP&	0.9700	0.992	1.0456	4148.0
410	SILVERWARE & PLATED	0.7330	0.293	2.1390	143.0
419	LEAD PENCILS & ART	0.9220	0.883	3.6894	168.0
420	MARKING DEVICES	0.2210	0.641	2.3125	205.0
421	CARBON PAPER & INK	0.1050	0.867	1.4890	438.0

SEC	TITLE	RSQ FIT	RSQ SALES	AVE. COEF.	1977 SALES
422	ARTIFICIAL TREES &	0.3120	0.446	1.0295	202.0
423	BUTTONS	0.7190	0.393	1.3850	98.0
424	NEEDLES, PINS, & FA	0.0690	0.484	1.1168	531.0
425	BROOMS & BRUSHES	0.7050	0.973	1.4163	414.0
426	HARD SURFACE FLOOR	0.2480	0.811	2.0214	271.0
427	BURIAL CASKETS & VA	0.7430	0.925	0.8574	441.0
428	SIGNS & ADVERTIS DI	0.1200	0.064	1.1353	1162.0
429	MANUFACTURING, N.E.	0.4610	0.874	0.9353	1274.0
432	RAILROADS	0.8980	0.616	1.1147	12098.0
433	BUSSES AND LOCAL TR	0.9870	0.201	1.7174	4120.0
434	TRUCKING	0.9130	0.980	0.7758	29965.0
435	WATER TRANSPORTATIO	0.2650	0.695	0.7005	4998.0
436	AIRLINES	0.9020	0.939	0.6934	11272.0
437	PIPELINES	0.6020	0.923	1.2977	2866.0
438	FREIGHT FORWARDING	0.9790	0.431	1.4040	1803.0
439	TELEPHONE AND TELEG	0.9400	0.979	0.8724	28268.0
440	RADIO AND TV BROADC	0.0220	0.773	0.9547	8321.0
441	ELECTRIC UTILITIES	0.9380	0.987	0.7750	34743.0
442	EATING & DRINKING P	0.0940	0.926	0.9227	19020.0
443	NATURAL GAS	0.1100	0.831	0.6725	19159.0
444	WATER AND SEWER SER	0.5890	0.754	0.9769	3587.0
445	WHOLESALE TRADE	0.8080	0.971	0.9926	80659.0
446	RETAIL TRADE	0.7880	0.038	3.0016	16265.0
447	BANKS,CREDIT AGEN.,	0.0160	0.866	1.0790	21527.0
448	INSURANCE	0.0690	0.965	0.5272	17823.0
450	REAL ESTATE	0.6600	0.876	1.0916	79961.0
451	HOTEL AND LODGING P	0.6730	0.928	1.1811	5494.0
452	PERSONAL + REPAIR S	0.9360	0.184	1.2848	7240.0
453	BUSINESS SERVICES	0.9750	0.990	0.9339	98961.0
454	ADVERTISING	0.8880	0.922	1.1614	37948.0
455	AUTO REPAIR	0.0600	0.898	1.0682	17462.0
456	MOVIES + AMUSEMENTS	0.9480	0.980	0.5165	3738.0
457	MEDICAL SERVICES	0.9550	0.979	5.0915	17399.0
458	PRIVATE SCHOOLS + N	0.4250	0.823	0.9800	6659.0
459	POST OFFICE	0.4680	0.800	1.3432	9697.0
460	FED, S&L GOV. ENTER	0.9540	0.935	1.8503	4902.0
463	SCRAP AND USED	0.9010	0.929	0.8184	6352.0
464	UNIMPORTANT IND.(DU	0.5870	0.986	0.4980	4134.0

TABLE 4.1D SIMUL. RUN -- INFORUM BASE PAGE 1. OUTPUT BY PRODUCING SECTOR (1977$)

	1977	1979	1982	1983	1985	1987	1990	1995
HOUSEHOLD APPLIANCES	10.34	10.96	9.23	10.02	11.35	11.89	13.00	13.99
358 HOUSEHOLD COOKING EQUIPMENT	1.84	1.97	1.49	1.63	1.85	1.91	2.03	2.07
359 HHLD REFRIG, FREEZERS	1.95	2.13	1.67	1.81	2.03	2.11	2.27	2.38
360 HOUSEHOLD LAUNDRY EQUIPMENT	1.77	1.75	1.36	1.46	1.61	1.65	1.75	1.76
361 ELEC HOUSEWARES & FANS	2.46	2.45	2.16	2.34	2.68	2.84	3.18	3.52
362 HHLD VACUUM CLEANERS	0.73	0.81	0.66	0.70	0.80	0.84	0.93	1.02
363 SEWING MACHINES	0.14	0.13	0.08	0.09	0.10	0.11	0.13	0.16
364 HOUSEHOLD APPLIANCES, NEC	1.46	1.71	1.82	1.99	2.27	2.43	2.71	3.08
MISC ELECTRICAL EQ	17.09	16.58	15.96	16.90	19.31	19.37	20.89	22.93
365 ELECTRIC LAMPS	1.67	1.77	1.72	1.80	1.96	1.98	2.12	2.28
366 LIGHTING FIXTURES & EQUIPMENT	3.33	3.43	3.36	3.49	4.04	4.13	4.46	4.88
367 WIRING DEVICES	3.07	3.73	3.71	3.80	4.37	4.38	4.69	5.17
375 STORAGE BATTERIES	2.03	1.82	2.07	2.20	2.49	2.57	2.77	3.05
376 PRIMARY BATTERIES, DRY&WET	0.73	0.68	0.62	0.68	0.77	0.75	0.84	0.92
377 X-RAY APPARATUS & TUBES	2.22	1.17	1.06	1.31	1.57	1.45	1.64	1.92
378 ENGINE ELECTRICAL EQUIPMENT	3.37	3.26	2.82	2.98	3.40	3.40	3.60	3.88
379 ELECTRICAL EQUIPMENT	0.65	0.71	0.59	0.62	0.70	0.73	0.79	0.84
TV SETS, RADIOS, PHONOGRAPHS	6.03	6.45	5.66	6.12	7.03	7.54	8.50	9.47
368 RADIO & TV RECEIVING SETS	4.87	5.56	4.75	5.19	5.96	6.45	7.32	8.26
369 PHONOGRAPH RECORDS & TAPE	1.16	0.89	0.91	0.93	1.06	1.09	1.18	1.21
MOTOR VEHICLES	120.93	112.29	80.20	85.34	107.92	111.52	118.98	130.09
382 TRUCK & BUS BODIES	4.01	3.19	3.32	3.58	5.12	5.61	6.15	7.14
383 TRUCK TRAILERS	1.88	2.54	1.61	1.67	2.60	2.72	2.70	2.87
384 MOTOR VEHICLES	73.01	63.99	43.11	47.10	59.72	62.20	66.69	73.83
385 MOTOR VEHICLE PTS&ACCESSORIES	42.02	42.57	32.16	32.99	40.48	41.00	43.44	46.25
AEROSPACE	31.18	38.19	43.08	48.12	51.78	55.45	60.01	66.15
22 COMPLETE GUIDED MISSILES	4.89	5.02	7.17	7.33	7.35	8.01	8.95	10.39
386 AIRCRAFT	13.83	18.32	20.04	22.70	25.17	27.33	29.80	33.68
387 AIRCRAFT, MISSILE ENGINES, ENG	5.88	6.86	7.99	9.20	9.90	10.39	10.96	11.16
388 AIRCRAFT, MISSILE EQ, NEC	6.58	7.98	7.88	8.89	9.37	9.73	10.29	10.92
SHIPS, BOATS	8.20	8.95	9.21	9.78	11.21	12.40	13.83	15.58
389 SHIP BUILDING & REPAIRING	6.10	6.86	6.92	7.05	8.11	9.22	10.14	11.57
390 BOAT BUILDING & REPAIRING	2.10	2.09	2.28	2.73	3.10	3.18	3.69	4.01
OTHER TRANSP. EQUIP.	8.58	9.86	9.56	10.79	12.84	13.74	15.03	16.94
24 TANKS & TANK COMPONENTS	0.92	0.85	2.38	2.77	3.15	3.42	3.88	4.60
391 RAILROAD EQUIPMENT	4.45	6.55	4.83	5.15	6.09	6.56	6.44	6.85
392 MOTORCYCLES, BICYLES, &PTS	1.18	0.53	0.63	0.89	1.33	1.41	2.07	2.63
393 TRAVEL TRAILERS & CAMPERS	1.22	1.06	0.80	1.00	1.14	1.15	1.33	1.42
395 TRANSPORTATION EQUIP, NEC	0.82	0.86	0.92	0.97	1.14	1.20	1.31	1.43

TABLE 4.1@ SIMUL. RUN -- INFORUM BASE PAGE 2. PERSONAL CONSUMP. EXPEND. BY I/O SECTOR (1977$)

		1977	1979	1982	1983	1985	1987	1990	1995
	HOUSEHOLD APPLIANCES	7.19	7.49	6.45	6.59	7.45	7.88	8.68	9.29
358	HOUSEHOLD COOKING EQUIPMENT	1.06	1.15	0.91	0.93	1.04	1.09	1.19	1.24
359	HHLD REFRIG. FREEZERS	1.27	1.40	1.19	1.22	1.38	1.46	1.61	1.72
360	HOUSEHOLD LAUNDRY EQUIPMENT	1.46	1.44	1.16	1.17	1.29	1.34	1.42	1.41
361	ELEC HOUSEWARES & FANS	1.88	1.85	1.74	1.79	2.02	2.16	2.41	2.65
362	HHLD VACUUM CLEANERS	0.58	0.64	0.54	0.56	0.63	0.67	0.73	0.78
363	SEWING MACHINES	0.17	0.19	0.16	0.17	0.19	0.20	0.22	0.24
364	HOUSEHOLD APPLIANCES,NEC	0.77	0.81	0.74	0.77	0.89	0.97	1.11	1.25
	MISC ELECTRICAL EQ	3.42	3.71	3.59	3.72	4.13	4.36	4.78	5.21
365	ELECTRIC LAMPS	0.76	0.84	0.82	0.85	0.94	0.99	1.08	1.17
366	LIGHTING FIXTURES & EQUIPMENT	0.45	0.49	0.46	0.49	0.59	0.66	0.77	0.90
367	WIRING DEVICES								
375	STORAGE BATTERIES	0.96	0.97	0.97	0.99	1.06	1.11	1.18	1.25
376	PRIMARY BATTERIES,DRY&WET	0.56	0.64	0.57	0.59	0.67	0.70	0.77	0.83
377	X-RAY APPARATUS & TUBES								
378	ENGINE ELECTRICAL EQUIPMENT	0.36	0.37	0.43	0.44	0.47	0.49	0.52	0.56
379	ELECTRICAL EQUIPMENT	0.34	0.39	0.34	0.35	0.39	0.42	0.46	0.50
	TV SETS,RADIOS,PHONOGRAPHS	7.66	7.76	7.78	8.11	9.26	9.77	10.84	11.59
368	RADIO & TV RECEIVING SETS	6.68	7.06	7.03	7.34	8.40	8.89	9.90	10.64
369	PHONOGRAPH RECORDS & TAPE	0.98	0.70	0.74	0.77	0.86	0.88	0.95	0.95
	MOTOR VEHICLES	44.33	42.38	35.70	40.52	46.45	47.00	49.52	55.46
382	TRUCK & BUS BODIES								
383	TRUCK TRAILERS								
384	MOTOR VEHICLES	43.76	41.78	35.01	39.82	45.70	46.21	48.67	54.55
385	MOTOR VEHICLE PTS&ACCESSORIES	0.56	0.60	0.68	0.70	0.75	0.79	0.85	0.91
	AEROSPACE	0.43	0.78	0.99	1.22	1.38	1.40	1.63	1.74
22	COMPLETE GUIDED MISSILES								
386	AIRCRAFT	0.43	0.78	0.99	1.22	1.38	1.40	1.63	1.74
387	AIRCRAFT,MISSILE ENGINES,ENG								
388	AIRCRAFT,MISSILE EQ,NEC								
	SHIPS, BOATS	1.71	1.64	1.79	2.22	2.51	2.54	2.96	3.15
389	SHIP BUILDING & REPAIRING								
390	BOAT BUILDING & REPAIRING	1.71	1.64	1.79	2.22	2.51	2.54	2.96	3.15
	OTHER TRANSP. EQUIP.	3.06	2.71	2.63	2.93	3.29	3.40	3.82	4.03
24	TANKS & TANK COMPONENTS								
391	RAILROAD EQUIPMENT								
392	MOTORCYCLES,BICYLES,&PTS	1.58	1.42	1.56	1.65	1.86	1.96	2.17	2.31
393	TRAVEL TRAILERS & CAMPERS	1.18	0.99	0.74	0.93	1.04	1.04	1.21	1.27
395	TRANSPORTATION EQUIP,NEC	0.30	0.30	0.33	0.35	0.39	0.40	0.43	0.44

TABLE 4.10 SIMUL. RUN -- INFORUM BASE PAGE 3. PROD. DUR. EQUIP. BY I/O SECTOR (1977$)

	1977	1979	1982	1983	1985	1987	1990	1995
HOUSEHOLD APPLIANCES	1.62	1.65	1.25	1.26	1.51	1.59	1.58	1.56
358 HOUSEHOLD COOKING EQUIPMENT	0.51	0.55	0.44	0.44	0.51	0.53	0.52	0.50
359 HHLD REFRIG, FREEZERS	0.54	0.53	0.38	0.37	0.43	0.43	0.41	0.38
360 HOUSEHOLD LAUNDRY EQUIPMENT	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03
361 ELEC HOUSEWARES & FANS	0.08	0.08	0.07	0.07	0.09	0.10	0.10	0.10
362 HHLD VACUUM CLEANERS	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.03
363 SEWING MACHINES	0.13	0.12	0.08	0.08	0.11	0.11	0.09	0.08
364 HOUSEHOLD APPLIANCES, NEC	0.29	0.30	0.24	0.25	0.31	0.35	0.39	0.44
MISC ELECTRICAL EQ	2.20	1.61	1.56	1.73	2.07	2.22	2.33	2.59
365 ELECTRIC LAMPS								
366 LIGHTING FIXTURES & EQUIPMENT	0.08	0.07	0.07	0.06	0.08	0.08	0.07	0.07
367 WIRING DEVICES	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.01
375 STORAGE BATTERIES	0.23	0.18	0.18	0.18	0.22	0.23	0.22	0.23
376 PRIMARY BATTERIES, DRY&WET								
377 X-RAY APPARATUS & TUBES	1.87	1.33	1.30	1.46	1.75	1.89	2.02	2.28
378 ENGINE ELECTRICAL EQUIPMENT								
379 ELECTRICAL EQUIPMENT								
TV SETS, RADIOS, PHONOGRAPHS	0.45	0.43	0.38	0.42	0.55	0.62	0.70	0.84
368 RADIO & TV RECEIVING SETS	0.45	0.43	0.38	0.42	0.55	0.62	0.70	0.84
369 PHONOGRAPH RECORDS & TAPE								
MOTOR VEHICLES	31.73	33.77	24.26	25.80	34.36	37.77	39.40	42.80
382 TRUCK & BUS BODIES	2.30	1.87	1.50	1.61	2.36	2.76	3.06	3.62
383 TRUCK TRAILERS	1.70	2.37	1.46	1.56	2.37	2.50	2.45	2.55
384 MOTOR VEHICLES	27.72	29.52	21.29	22.64	29.62	32.51	33.89	36.63
385 MOTOR VEHICLE PTS&ACCESSORIES								
AEROSPACE	2.61	4.51	3.27	3.70	4.48	5.25	5.18	5.22
22 COMPLETE GUIDED MISSILES	0.10	0.12	0.11	0.10	0.10	0.10	0.12	0.12
386 AIRCRAFT	2.33	4.12	2.94	3.37	4.11	4.84	4.78	4.85
387 AIRCRAFT, MISSILE ENGINES, ENQ	0.18	0.26	0.22	0.23	0.27	0.31	0.28	0.26
388 AIRCRAFT, MISSILE EQ, NEC								
SHIPS, BOATS	1.79	2.31	2.20	2.12	2.75	3.34	3.59	3.99
389 SHIP BUILDING & REPAIRING	1.64	2.11	2.02	1.92	2.49	3.08	3.30	3.66
390 BOAT BUILDING & REPAIRING	0.15	0.20	0.18	0.20	0.26	0.27	0.29	0.33
OTHER TRANSP. EQUIP.	2.97	4.73	3.33	3.51	4.24	4.68	4.50	4.75
24 TANKS & TANK COMPONENTS								
391 RAILROAD EQUIPMENT	2.73	4.46	3.07	3.23	3.88	4.29	4.08	4.28
392 MOTORCYCLES, BICYLES, &PTS	0.05	0.06	0.06	0.07	0.09	0.10	0.11	0.13
393 TRAVEL TRAILERS & CAMPERS	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.02
395 TRANSPORTATION EQUIP, NEC	0.16	0.19	0.19	0.20	0.25	0.28	0.29	0.32

TABLE 4.1@ SIMUL. RUN -- INFORUM BASE PAGE 4. INVENTORY CHANGE BY I/O SECTOR (1977$)

		1977	1979	1982	1983	1985	1987	1990	1995
	HOUSEHOLD APPLIANCES	0.18	0.07	-0.51	0.08	0.20	0.11	0.15	0.10
358	HOUSEHOLD COOKING EQUIPMENT	0.03	0.01	-0.10	0.02	0.04	0.02	0.03	0.02
359	HHLD REFRIG, FREEZERS	0.03	0.01	-0.10	0.02	0.04	0.02	0.03	0.02
360	HOUSEHOLD LAUNDRY EQUIPMENT	0.03	0.01	-0.08	0.01	0.03	0.02	0.03	0.02
361	ELEC HOUSEWARES & FANS	0.04	0.02	-0.11	0.02	0.04	0.02	0.03	0.02
362	HHLD VACUUM CLEANERS	0.01	0.01	-0.04	0.01	0.01	0.01	0.01	0.01
363	SEWING MACHINES	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00
364	HOUSEHOLD APPLIANCES, NEC	0.02	0.01	-0.07	0.01	0.03	0.02	0.02	0.01
	MISC ELECTRICAL EQ	-0.25	0.04	-0.04	0.06	0.06	0.06	0.07	0.07
365	ELECTRIC LAMPS	0.02	0.00	-0.00	0.01	0.01	0.01	0.01	0.01
366	LIGHTING FIXTURES & EQUIPMENT	0.04	0.01	-0.01	0.01	0.01	0.01	0.01	0.01
367	WIRING DEVICES	0.04	0.01	-0.01	0.01	0.01	0.01	0.01	0.01
375	STORAGE BATTERIES	-0.09	0.00	-0.00	0.01	0.01	0.01	0.01	0.01
376	PRIMARY BATTERIES, DRY&WET	-0.03	0.00	-0.00	0.00	0.00	0.00	0.00	0.00
377	X-RAY APPARATUS & TUBES	-0.11	0.00	-0.00	0.01	0.01	0.01	0.01	0.01
378	ENGINE ELECTRICAL EQUIPMENT	-0.09	0.01	-0.01	0.01	0.01	0.01	0.01	0.01
379	ELECTRICAL EQUIPMENT	-0.02	0.00	-0.00	0.00	0.00	0.00	0.00	0.00
	TV SETS, RADIOS, PHONOGRAPHS	0.28	0.09	-0.01	0.01	0.18	0.13	0.14	0.10
368	RADIO & TV RECEIVING SETS	0.22	0.07	-0.01	0.01	0.14	0.11	0.11	0.08
369	PHONOGRAPH RECORDS & TAPE	0.06	0.02	-0.00	0.00	0.04	0.03	0.03	0.02
	MOTOR VEHICLES	5.91	-0.40	-1.70	-2.75	3.21	1.04	0.58	0.62
382	TRUCK & BUS BODIES	0.02	-0.01	-0.06	-0.09	0.10	0.03	0.02	0.02
383	TRUCK TRAILERS	0.01	-0.01	-0.03	-0.05	0.06	0.02	0.01	0.01
384	MOTOR VEHICLES	3.80	-0.24	-1.03	-1.68	1.95	0.63	0.36	0.38
385	MOTOR VEHICLE PTS&ACCESSORIES	2.08	-0.14	-0.58	-0.94	1.09	0.35	0.20	0.21
	AEROSPACE	0.08	0.09	-0.10	0.17	0.20	0.22	0.25	0.22
22	COMPLETE GUIDED MISSILES	0.02	0.01	-0.02	0.03	0.03	0.03	0.04	0.04
386	AIRCRAFT	-0.03	0.04	-0.04	0.07	0.08	0.09	0.10	0.09
387	AIRCRAFT, MISSILE ENGINES, ENG	0.03	0.02	-0.02	0.04	0.04	0.05	0.05	0.05
388	AIRCRAFT, MISSILE EQ, NEC	0.05	0.02	-0.02	0.04	0.05	0.05	0.06	0.05
	SHIPS, BOATS	0.01	0.01	-0.02	0.05	0.07	0.06	0.04	0.03
389	SHIP BUILDING & REPAIRING	0.01	0.01	-0.01	0.04	0.05	0.05	0.03	0.02
390	BOAT BUILDING & REPAIRING	0.00	0.00	-0.00	0.01	0.02	0.02	0.01	0.01
	OTHER TRANSP. EQUIP.	0.08	0.09	-0.03	0.08	0.14	0.12	0.07	0.06
24	TANKS & TANK COMPONENTS	0.05	0.01	-0.00	0.01	0.02	0.01	0.01	0.01
391	RAILROAD EQUIPMENT	-0.02	0.05	-0.02	0.05	0.08	0.07	0.04	0.04
392	MOTORCYCLES, BICYLES, &PTS	0.04	0.01	-0.00	0.01	0.01	0.01	0.01	0.01
393	TRAVEL TRAILERS & CAMPERS	-0.03	0.01	-0.00	0.01	0.02	0.02	0.01	0.01
395	TRANSPORTATION EQUIP, NEC	0.03	0.01	-0.00	0.01	0.01	0.01	0.01	0.00

TABLE 4.11 SIMULATION RUN -- INFORUM BA SELLER: 366 LIGHTING FIXTURES & EQUIPME MILLIONS OF 1977$

BUYER:	1977	1981	1985	1990	1995	77-81	81-95
	SALES TO INTERMEDIATE						
14 COAL MINING	26.5	34.7	39.7	45.6	52.3	6.66	2.94
20 MAINTENANCE CONSTRUCTIO	482.4	578.0	645.9	741.9	829.7	4.52	2.58
122 STRUC WOOD MEMBERS, NEC	12.9	21.6	31.6	37.2	41.6	12.91	4.70
210 MISC. PLASTIC PRODUCTS	33.1	42.4	50.5	58.9	66.8	6.23	3.24
252 BLAST FURNACES & STEEL	13.0	12.8	12.9	13.1	12.7	-0.31	-0.05
366 LIGHTING FIXTURES & EQU	61.8	64.5	74.8	82.5	90.4	1.07	2.41
371 RADIO & TV COMMUNIC EQU	8.6	10.6	12.9	14.9	17.6	5.43	3.60
384 MOTOR VEHICLES	405.9	297.0	367.3	416.3	466.8	-7.82	3.23
394 MOBILE HOMES	20.9	23.1	30.9	33.8	34.6	2.50	2.90
432 RAILROADS	15.6	17.5	18.6	19.9	21.1	2.80	1.35
439 TELEPHONE AND TELEGRAPH	31.5	63.5	74.2	89.7	102.0	17.49	3.39
441 ELECTRIC UTILITIES	14.8	19.1	22.3	26.0	29.0	6.52	2.96
444 WATER AND SEWER SERVICE	7.1	8.6	9.8	11.9	13.6	4.83	3.28
449 OWNER-OCCUPIED DWELLING	33.1	42.3	50.9	60.4	66.9	6.09	3.28
450 REAL ESTATE	31.8	39.7	46.1	51.6	55.8	5.55	2.44
455 AUTO REPAIR	165.4	196.9	228.5	257.6	275.9	4.35	2.41
458 PRIVATE SCHOOLS + NPO	7.2	9.3	10.5	12.3	13.8	6.46	2.82
464 UNIMPORTANT IND. (DUMMY)	24.9	29.1	33.6	38.1	42.1	3.92	2.65
SUM: INTERMEDIATE	1450.6	1582.0	1845.4	2107.5	2337.6	2.17	2.79
	SALES TO OTHER FINAL DEMAND						
PERSONAL CONSUMPTION, IO	446.8	468.3	591.0	768.5	903.8	1.17	4.70
PRODUCERS' DURABLE EQ, IO	76.0	71.0	76.5	74.0	66.4	-1.71	-0.48
INVENTORY CHANGE	36.7	11.8	11.9	13.3	13.8	-28.38	1.15
IMPORTS	-77.6	-193.6	-269.3	-410.6	-490.6	22.87	6.64
EXPORTS	149.6	197.8	189.0	173.0	213.7	6.99	0.55
DEFENSE	14.0	16.2	22.2	28.9	34.0	3.67	5.29
NON-DEFENSE FEDERAL	10.9	13.1	8.6	10.7	12.6	4.67	-0.31
S&L EDUCATION	8.0	7.4	6.6	6.1	6.0	-2.12	-1.48
S&L OTHER	7.1	6.9	7.7	8.6	9.4	-0.69	2.27
CONSTRUCTION, IO	1212.8	1299.8	1547.0	1675.5	1773.0	1.73	2.22
SUM: OTHER FINAL DEMAND	1884.2	1898.6	2191.1	2347.9	2542.2	0.19	2.09
OUTPUT	3334.8	3480.6	4036.5	4455.4	4879.8	1.07	2.41

TABLE 4.11 SIMULATION RUN -- INFORUM BA SELLER: 375 STORAGE BATTERIES MILLIONS OF 1977$

BUYER:		1977	1981	1985	1990	1995	77-81	81-95
		SALES TO INTERMEDIATE						
1	DAIRY FARM PRODUCTS	4.8	6.3	6.5	7.1	7.4	6.87	1.19
3	MEAT ANIMALS, OTH LIVES	11.7	16.6	17.4	19.3	20.6	8.75	1.55
5	GRAINS	31.6	52.2	54.2	61.5	68.3	12.51	1.93
7	FRUIT,VEGETABLES,OTH CR	10.1	16.4	17.6	20.0	22.6	12.25	2.28
20	MAINTENANCE CONSTRUCTIO	9.4	14.2	16.3	19.3	22.1	10.38	3.14
316	INDL TRUCKS & TRACTORS	4.6	6.2	7.2	7.3	8.1	7.28	1.94
375	STORAGE BATTERIES	98.2	102.7	120.5	134.2	147.6	1.12	2.59
382	TRUCK & BUS BODIES	5.1	6.4	9.2	11.6	14.0	6.09	5.53
384	MOTOR VEHICLES	378.9	350.5	444.2	517.8	595.4	-1.95	3.79
433	BUSSES AND LOCAL TRANSI	30.9	41.6	44.6	47.3	48.5	7.49	1.08
434	TRUCKING	39.1	64.4	77.8	94.6	110.2	12.46	3.83
436	AIRLINES	18.3	32.8	40.3	48.7	55.3	14.64	3.73
445	WHOLESALE TRADE	25.0	39.6	46.9	55.2	62.6	11.51	3.26
446	RETAIL TRADE	25.6	37.7	44.9	52.5	57.4	9.64	3.01
448	INSURANCE	4.2	6.8	7.8	9.1	10.1	12.13	2.84
450	REAL ESTATE	8.7	13.7	16.3	18.7	20.8	11.42	3.00
452	PERSONAL + REPAIR SERVI	7.2	10.1	11.0	12.1	12.5	8.38	1.53
453	BUSINESS SERVICES	11.9	34.7	42.2	51.2	59.2	26.65	3.82
455	AUTO REPAIR	6.8	10.2	12.1	14.1	15.5	10.22	2.97
460	FED, S&L GOV. ENTERPRIS	7.7	11.6	13.5	15.4	16.8	10.46	2.63
464	UNIMPORTANT IND. (DUMMY)	28.7	42.5	50.3	58.7	66.5	9.79	3.20
SUM:	INTERMEDIATE	780.2	938.1	1126.4	1306.4	1476.6	4.61	3.24
		SALES TO OTHER FINAL DEMAND						
	PERSONAL CONSUMPTION, IO	958.9	930.1	1063.3	1182.1	1254.8	-0.76	2.14
	PRODUCERS' DURABLE EQ, IO	227.5	205.2	219.2	223.2	229.8	-2.58	0.81
	INVENTORY CHANGE	-93.7	7.2	7.2	8.1	8.5	0.00	1.15
	IMPORTS	-27.3	-174.3	-168.8	-222.8	-245.1	46.31	2.43
	EXPORTS	74.1	99.9	96.4	90.4	113.5	7.47	0.91
	DEFENSE	66.0	76.4	104.5	136.3	160.3	3.67	5.29
	NON-DEFENSE FEDERAL	8.9	10.7	7.0	8.8	10.3	4.67	-0.31
	S&L EDUCATION	8.0	7.4	6.6	6.1	6.0	-2.12	-1.48
	S&L OTHER	14.1	13.7	15.4	17.2	18.9	-0.69	2.27
	CONSTRUCTION, IO	13.4	8.8	15.0	18.3	17.9	-10.57	5.06
SUM:	OTHER FINAL DEMAND	1250.0	1185.2	1365.9	1467.6	1574.8	-1.33	2.03
	OUTPUT	2030.2	2123.3	2492.2	2773.9	3051.4	1.12	2.59