1992 Duke Power Company IRP Forecast Data

INTEGRATED RESOURCE PLANNING
1992
FORECAST DATA

Contents

A. INTRODUCTION

This volume is a compilation of all the equations which constitute Duke's 1991 Long-Term Forecast. It is assumed that users of this document have a technical background in either econometrics or statistics.

All equations were developed using Wharton Econometric Forecasting Associates' proprietary econometric software, AREMOS. All variable names are defined immediately before or after each equation or set of equations. Several functions require further definition:

DIFF(var) The difference between the current value of a vairable and the preivous value of that variable.

DIFFYA(var) The difference between the present value of a variable and the value of the variable one year earlier.

DLOG(var) The difference from one period ago of the log of a variable.

var[-n] The value of the variable lagged n periods.

LOG(var) The logarithm (base e) of the variable.

This material is a transcription of actual computer outputs from AREMOS. Most of the diagnostics are self explanatory. Expressions containing 'AR' and 'MA' terms are the Cochran-Orcutt corrections for serial correlation and moving average terms, respectively.

All equations have quarterly periodicity unless otherwise noted. The length of in put variable series and the beginning and ending dates are in the form '66 periods from 1973Q3 to 1986Q4' which means the data is from the third quarter 1973 through the 4th quarter 1986.

DPSA is the acronym for the Duke Power service area.

Forecasting Details

Service Area Economic Details--Manufacturing Sector

The structure of the manufacturing sector of the service area economic model is based on demand and supply in the labor market. The service area employee-hours equation for each Standard Industrial Classification (SIC) represents labor demand. Each SIC equation has possible explanatory variables: service area real gross regional product; service area real average hourly earnings; national real user cost of capital; and national labor productivity. Each of the explanatory variables are for the particular SIC under consideration. The statistically significant explanatory variables are the ones included in the equation. The service area average hourly earnings for each SIC represents labor supply. The possible explanatory variables for the average hourly earnings equation for a specific SIC are: the national consumer price index; the service area employee-hours for the SIC under consideration; and national labor productivity for that SIC. Again, statistically significant explanatory variables are included in a particular average hourly earnings/labor supply equation.

The next equation considered is the service area total wage equation for a particular SIC. The explanatory variables for this equation are the service area employee-hours and the service area average hourly earnings for a particular SIC. The specification of these equations is usually log-linear to capture the implied multiplication of employee-hours and average hourly earning to arrive at total wages.

The final equation considered is the service area gross regional product for a particular SIC. At this point we consider the type of industry under consideration. An industry can be either an exporter to outside of the service area or an importer. If an industry is an exporter, then the industry within the service area is producing more of its product than is being used within the

region. The remainder of the product is being exported to locations outside of the service area. A classic example of this type of industry would be the textile industry. For these types of industries the explanatory variables would be the gross product originating for the SIC at the national level, which represents the industry's exporting to regions outside of the service area, the service area total wages relative to the national total wages for the particular SIC, wage rate of the service area relative to the nation for that particular SIC, the price of electricity for Duke Power service area relative to the nation, and the price of natural gas for Duke Power service area relative to the nation. These last three variables represent the cost of doing business in the service area relative to the nation. Conversely, the industry could be an importing industry which means the industry is not producing enough of its product to support the service area's demand for its product. This lack of production implies that the service area has to import more of this product from outside of the service area to satisfy its demand for the product. An example of this type of industry within the Duke Power service area would be paper and paper products (SIC26). The explanatory variables for this type of industry would be total gross regional product for the Duke Power service area (or some other variable which measures economic activity within the service area) and the same three variables which represent the cost of doing business in the service area relative to the nation as discussed earlier. For either an exporting or importing industry the only explanatory variables included in the equation are those which are statistically significant. Projections of all national variables are provided by WEFA. Then, the projections of all service area variables are solved simultaneously.

Because of the simultaneity, or cross relationships, contained within the model the estimation procedure used in this section of the service area economic model is two-staged least squares (2SLS).

Service Area Economic Details--Non-Manufacturing Sector

The non-manufacturing sector also originates in the labor market. The service area employment for thirty-three (33) groups of non-manufacturing SICs is the starting set of endogenous variables. The primary explanatory variable for these employment equations is either real gross regional product at the one-digit non-manufacturing SIC, total real gross regional product for the service area, or service area real disposable income depending on the non-manufacturing sector under consideration. Supplementary explanatory variables include the national real average hourly earnings at the approximate one-digit non-manufacturing SIC level; the national real user cost of capital at the same one-digit SIC level, national labor productivity at the one-digit SIC level, and service area population. Statistically significant variables are included in the equation.

The next group of equations to consider is the service area total wage equations at the approximate one-digit non-manufacturing SIC level. The explanatory variables for these equations are the service area employment at the one-digit level and national average hourly earnings at the one-digit level. As in the manufacturing sector, the specification of these equations is log-linear to reflect the implied multiplicative operation.

The final set of equations to consider is the service area gross regional product at the one-digit non-manufacturing SIC level. The primary explanatory variable for these equations are either total national real gross product originating or service area real gross regional product depending on whether the one-digit non-manufacturing industry is an exporter or an importer. The other explanatory variable is service area total wages for the one-digit SIC under consideration relative to national total wages for the same one-digit SIC. Only statistically significant terms are included in these equations. The projections of all national variables are provided by WEFA. Then, the projections of all

service area variables are solved simultaneously.

Service Area Economic Details--Personal Income

In order to compute total personal income for the service area the addition of the total wages is the necessary first step. Next, we need to add to these wages dividend,interest and rental income; transfer payments; and residence adjustment. Finally, we need to subtract personal contributions to social insurance. The result of these operations is total personal income.

The explanatory variable for service area dividend, interest, and rental income is the national variable measuring the same concept. The explanatory variables for service area transfer payments are national transfer payments and the service area unemployment rate relative to the national unemployment rate. The explanatory variable for the residence adjustment is total service area wages. The explanatory variables for service area personal contributions to social insurance are the personal contributions to social insurance for the nation and the service area wages relative to national wages. The projections of all national variables are provided by WEFA. Then, the projections of all service area variables are solved simultaneously.

Summary of Results from the Service Area Economic Model

The table below shows the historical and projected growth rates for certain aggregate outputs of the service area economic model.

Table of Gross Regional Product & Employment Growth Rates-Percent per Year

Sector	Indicator	78-89	89-05
Durable Goods	Employment	2.0	1.1
	Gross Product	7.7	3.2
Non-durable Goods	Employment	(0.5)	(0.2)
	Gross Product	2.9	2.6
Construction	Employment	3.4	1.6
	Gross Product	1.8	1.9
Transportation & Utilities	Employment	3.4	2.4
	Gross Product	3.9	2.9
Wholesale Trade	Employment	2.8	1.6
	Gross Product	4.1	2.4
Retail Trade	Employment	4.1	2.3
	Gross Product	3.5	2.5
Finance,Insurance & Real Estate	Employment	4.5	1.8
	Gross Product	2.2	1.8
Services	Employment	4.9	2.9
	Gross Product	4.6	2.1
Government	Employment	1.8	1.2
	Gross Product	2.5	1.9

The table below shows the same information for the four main indicators of economic growth in the service area, i.e., total real gross regional product, total real personal income, total employment, ard real price of electricity.

Table of Service Area Economic Indicators Growth Rates-Percent per Year

Indicator	78-89	89-05
Total Employment	2.5	1.8
Total Real Personal Income	4.0	2.9
Total Real Gross Regional Product	3.9	2.5
Real Price of Electricity	1.8	-0.6

These outputs of the service area economic model serve as primary inputs to the peak and energy models.

Peak Demand and Energy Model-Introduction

It is assumed by Duke Power Company that electricity demand and energy in the industrial and general service sector is a derived demand based on the traditional production function from basic economic theory. That is, electricity usage, either peak demand or energy, is a basic input to the production process of industries and the desired usage, or derived demand, of electricity within the industrial or general service sector is based on the production levels within that particular sector. Thus, within these two sectors electrical usage would primarily depend on a variable that represents the production levels, e.g., gross regional product, etc.

For the residential sector electricity usage is based on the theory of consumer demand where electricity is but one good which consumers choose from all possible goods and services available to the consumer. Therefore, from consumer demand theory the level of consumption depends on the level of income. So, the primary variable within the residential energy or demand sector would be real personal income.

Peak Demand Model Details

To better understand the system peak demand and to better align our econometric and end-use efforts a new approach was used in the 1991 Duke Power Forecast. Both the summer and winter peak model are split into equations for the different customer classes, i.e., residential, general service, textiles, industrial excluding textiles, the four municipal and cooperative participants of the Catawba sale, the municipal and cooperative non-participants of Catawba, traffic signals and outdoor lighting. The dependent variable is data from load research customer demand study of retail customers. This data consists of readings of the system demand by customer classes for the day of system peak and the days of the various class peak.

The equations for each class is obtained by ordinary least squares, some of which are corrected for serial correlation, with the demand at customer meter as the dependent variable. The demand readings from the load research study for the hours of 2 pm to 7 pm are used in the dependent variable for each customer class equation within the summer peak demand model. Also, the demand readings from the same study for the hours of 7 am to 10 am are used in the dependent variable for each customer class equation within the winter peak demand model. While using the appropriate independent variables, to be discussed later, a forecast of the various customer classes is produced at the customer meter. Then, a projected loss factor of the customer classes is applied to the projected customer class demand to arrive at the customer demand forecast at generation. The sum of the customer class demands at generation is the system peak demand for the particular season being analyzed.

The summer residential demand equation, specifically, has residential megawatts per customer as the dependent variable. The independent variables for the residential demand equation include the minimum morning temperature, the real price of electricity for the residential class, and the residential air conditioning

saturation multiplied by the temperature at the time of the corresponding megawatt/dependent variable.

The general service demand equation also has megawatts per customer as the dependent variable. The independent variables for the general service demand equation include the temperature at the time of the megawatt reading, the minimum morning temperature on the day under analysis, the real gross regional product for the non-manufacturing industries, and the real price of electricity for the general service class.

The summer textile demand equation has megawatts as the dependent variable. The independent variables for the textile demand equation include the real gross regional product for the textile industry, the temperature for the hour of the megawatt reading, and the minimum morning temperature for the day of the megawatt reading.

The industrial excluding textile summer demand model has megawatts as the dependent variable. The independent variables for this model include the real gross regional product for manufacturing excluding the textile industry, the real price of natural gas, and the real price of electricity for this class of customers.

The other equations for the summer peak demand model, i.e., Catawba participants, non-participants of Catawba, etc., have megawatts as the dependent variable. The independent variables for these equations include the minimum morning temperature for the day of the megawatt reading, real gross regional product, the temperature for the hour of the megawatt reading, and real disposable personal income.

The residential equation of the winter peak demand model has megawatts per customer as the dependent variable. The independent variables for the residential equation include residential electric water heating saturation, the residential saturation of heat pumps,

the temperature at 4 pm for the day before the particular megawatt reading, and the temperature at the hour of the megawatt reading.

There are two equations for the general service part of the winter peak demand model. The first equation has all electric general service total megawatts as the dependent variable. The independent variables for this equation include real gross regional product for the non-manufacturing sector, the real price of electricity for all electric customers in the general service class, and the real price of natural gas for commercial customers. The second equation has general service excluding all electric megawatts per customer as the dependent variable. The independent variables for this equation include real gross regional product for the non-manufacturing sector.

The textile equation for the winter peak demand model has total megawatts as the dependent variable. The independent variables for this equation include real gross regional product for the textile industry.

The industrial equation excluding textiles has total megawatts as the dependent variable. The independent variables include real gross regional product for the manufacturing sector excluding textiles.

The other equations for the winter peak demand model, i.e., Catawba participants, non-participants of Catawba, etc., have megawatts as the dependent variable. The independent variables for these equations include the minimum morning temperature for the day of the megawatt reading, real gross regional product, the temperature for the hour of the megawatt reading, and real disposable personal income.

In order to arrive at projections of the summer and winter peak demand models, the projections of service area economic variables are from the service area economic model; the projections of

national economic variables are supplied by WEFA; the projections of the price of electricity is supplied by the corporate financial model; the customer projections by class are supplied by the corresponding energy model; and the heating and cooling degree hours are projected by a thirty year historical average of these temperature measurements.

Residential Energy Model Details

The residential energy forecast is the sum of the products of number of customers forecast times average consumption per customer forecast for the two major divisions in the residential class: electric heating customers and non-electric heating customers. The explanatory variables for the total number of residential customers are service area population, real interest rates, and real disposable service area income. The equation for the electric heating customers has as its explanatory variables total residential customers and the real price of natural gas in the service area. The non-electric heating customer projection is the difference between the total customer projection and the electric heating customer projection.

The electric heating kilowatt hour per customer (KPC) equation has as it explanatory variables heating degree hours, cooling degree hours multiplied by the air conditioning saturation of electric heating customers, the real price of electricity for electric heating customers, and a decreasing trend variable starting in 1975 multiplied by heating degree hours. The non-electric KPC equation has heating degree hours multiplied by the saturation of electric water heating of non-electric heating customers, cooling degree hours multiplied by the air conditioning saturation of non-electric heating customers, and the real price of electricity for non-electricity for non-electric heating customers.

In order to project customers and KPC the projections of service area economic variables are from the service area economic model;

the projections of national economic variables are supplied by WEFA; the price of electricity is supplied by the corporate financial model; and the heating and cooling degree hours are projected by a thirty year historical average of these temperature measurements.

General Service Energy Model

To better understand our commercial class and to better align our econometric and end-use efforts a new approach was used in the 1991 Duke Power forecast for the general service energy model. This approach is based on using SIC codes to group energy sales into 12 different groups or commercial types. These groups are offices, transportation, retail trade, education, wholesale trade, restaurants, food stores, hotels, churches, amusement centers, medical services, and miscellaneous commercial. An equation with megawatt-hour sales as the dependent variable was developed for each commercial type.

The independent variables used for the above equations include real service area income, service area population, real gross regional product by commercial type, the real price of electricity by commercial type, the real price of natural gas, the prime interest rate, non-manufacturing employment by commercial type, and heating and cooling degree hours. Of these, the variables with the most impact are real service area income, real gross regional product, degree hours, the real price of electricity, and population.

However, numbers of customers were still forecasted for total electric heating, non-electric heating, and building construction categories. The customer forecasts were done because of interest in these variables. The independent variables in these equations include real gross regional product for the non-manufacturing sector, service area population, the prime interest rate, the real price of natural gas, and service area construction employment.

In order to project customers and megawatt-hours for this model the projections of service area economic variables are from the service area economic model; the projections of national economic variables are supplied by WEFA; the price of electricity is supplied by the corporate financial model; and the heating and cooling degree hours are projected by a thirty year historical average of these temperature measurements.

Industrial Energy Model

Industrial energy is projected for every two digit manufacturing SIC. Doing the projections separately allows each manufacturing industry to be analyzed completely. The industrial energy equations have as their primary explanatory variable the service area gross regional product for the particular SIC under consideration. Other variables used to explain the industrial energy sector include the real price of electricity, the real price of natural gas, and heating and cooling degree hours. Only the statistically significant variables are included in the equation under consideration.

In order to project industrial sales for a particular SIC, the projections for any national variable are supplied by WEFA; the projections of any service area economic variable are supplied from the service area economic model; and the heating and cooling degree hours are projected by a thirty year average of these temperature measurements.

Methodology Discussion

The general approach selected by Duke Power Company is to model peak demand and energy separately as opposed to modelling energy and load factor. Under the latter process the peak demand forecast is the multiplication of the energy and load factor. Duke Power Company selected its process over the energy/load factor approach for a variety of reasons, which are as follows. Since the load factor is energy divided by the peak demand multiplied by 8,760 (the number of hours in a year), this alternative process restricts the peak demand to have the same variables as inputs as in the energy equations when energy is multiplied through the load factor equation. Actually, the peak equation would be just a multiple of the energy equation under this alternative approach. Thus, the alternative approach implies that the one hour of peak demand for any year would be very similar to all 8,760 hours of demand for the year, and this implication may not be reasonable for all years. Duke contends that there is an uniqueness about the peak hour that causes it to be modelled independently. For example, Duke Power has found that the temperature responsiveness of the peak demand hour is vastly different than the average hour of a particular year. Also, the responsiveness of the peak demand hour to price is less than it is for energy. This appears to be reasonable since, at extreme temperatures for one hour, individuals would be less concerned with the price of electricity and more concerned with comfort.

Another reason to model peak demand and energy separately is consistency with econometric/economic theory. It is assumed by Duke Power Company that electricity demand or energy in the general service and industrial sectors is a derived demand based on the traditional production function from basic economic theory. That is, electricity usage, either peak demand or energy, is a basic input to the production process of industries and the desired usage, or derived demand, of electricity within the industrial and general service sectors is based on the production levels within that particular section. In the residential sector electricity usage is based on consumer demand theory where electricity is but one good which consumers choose from all possible goods and services available to the consumer. Thus, for all three customer classes the customers are demanding measurable units of electricity, e.g., megawatts or megawatt-hours, and the demand for these units can be easily represented in an econometric relationship consistent with either derived or consumer demand theory. But, the load factor is a value that cannot be explained by either derived or consumer demand theory. The load factor is a percentage measurement and is not considered to be a measurement that is demanded by any customer class. Therefore, the econometric representation of the load factor is highly uncertain and suspect in regards to derived and consumer demand theory.

However, there is a link between the peak demand and energy models because most of the same independent variables are used in both the

peak demand and energy models. Actually, there is little practical difference between modelling energy and load factor or energy and peak demand if the same independent variables are used within each set of modelling processes. Duke prefers the approach of allowing the relationships between the peak demand and energy with the independent variables to have full flexibility. This would provide direct statements about such things as the elasticities on peak demand. Duke does evaluate the load factor calculation to determine how reliable the peak demand and energy forecasts.

B: MANUFACTURING WAGE EQUATIONS

Wage Rates
Employee-Hours
Wages
Gross Product

MANUFACTURING WAGE RATES

FOOD PRODUCTS

WR20.TWO
Joint Two Stage Least Squares
QUARTERLY data for 54 periods from 1976Q3 to 1989Q4
Date: 2 FEB 1991

log(xwr20)

$$= \underset{(6.37822)}{0.20930} * \log(lp20155) - \underset{(6.68329)}{0.32502} * \log(.3*(em20h.16+em20h.18)+.4*em20h.17) + \underset{(69.5118)}{0.91253} * \log(pciu) + \underset{(2.35907)}{1.41646}$$

Sum Sq	0.0064	Std Err	0.0113	LHS Mean	1.7427
R Sq	0.9975	R Bar Sq	0.9974	F 3, 50	6735.98
D.W.(1)	0.9261	D.W.(4)	1.8527		

xwr20	=	average hourly earnings, food products, DPSA.
lp20155	=	labor productivity, food products, pdl starting at lag 15 with a length of 5 with even tails, US.
em20h	=	employee-hours, food products, DPSA.
pciu	=	consumer price index, urban consumers, US.

TOBACCO PRODUCTS

MFG91:WR21.TWO
Joint Two Stage Least Squares
QUARTERLY data for 80 periods from 1970Q1 to 1989Q4
Date: 26 DEC 1990

log(xwr21)

```
     =    - 0.56254 * log(em21h) + 0.93410 * log(ahemfn21$) + 7.86213
           (4.04495)               (101.773)                 (4.11419)

Sum Sq      0.0631   Std Err    0.0286   LHS Mean   2.0171
R Sq        0.9971   R Bar Sq   0.9970   F  2, 77  13138.5
D.W.( 1)    1.1557   D.W.( 4)   1.7524
```

xwr21 = average hourly earnings, tobacco products, DPSA.
em21h = employee-hours, tobacco products, DPSA.
ahemfn21$ = average hourly earnings, tobacco products, DPSA.

TEXTILE MILL PRODUCTS

MFG91:WR22.TWO
Joint Two Stage Least Squares
QUARTERLY data for 82 periods from 1969Q3 to 1989Q4
Date: 31 DEC 1990

log(xwr22)

```
     =    - 0.09571 * log(em22h) + 0.90717 * log(xwr23)
           (2.65386)               (33.3702)

          + 0.16505 * log(lp22.2) + 1.43664
           (6.21620)               (2.43391)
```

Sum Sq	0.0213	Std Err	0.0165	LHS Mean	1.5033
R Sq	0.9983	R Bar Sq	0.9982	F 3, 78	15246.8
D.W.(1)	0.4940	D.W.(4)	1.0071		

xwr22	=	average hourly earnings, textile mill products, DPSA.
em22h	=	employee-hours, textile mill products, DPSA.
xwr23	=	average hourly earnings, apparel products, DPSA.
lp22	=	labor productivity, textile products, DPSA.

MFG91:WR23.TWO
Joint Two Stage Least Squares
QUARTERLY data for 51 periods from 1977Q2 to 1989Q4
Date: 31 DEC 1990

log(xwr23)

=	1.05667 * log(ahemfn23$)	-	0.05891 * log(em23h.3)	+	0.66160
	(137.975)		(2.18648)		(1.67499)

Sum Sq	0.0039	Std Err	0.0090	LHS Mean	1.5285
R Sq	0.9975	R Bar Sq	0.9974	F 2, 48	9561.61
D.W.(1)	0.4011	D.W.(4)	1.5247		

XWR23 = exp(??)

LUMBER AND WOOD PRODUCTS

MFG91:WR24.TWO
Joint Two Stage Least Squares
QUARTERLY data for 50 periods from 1977Q3 to 1989Q4
Date: 31 DEC 1990

log(xwr24)

```
     =    - 0.08659 * log(.2*(em24h.15+em24h.18)+.3*(em24h.16+em24h.17))
           (5.36217)

          + 0.82809 * log(xwr25) + 0.23037 * log(pciu) + 0.40777
           (25.8135)               (6.27524)            (2.49443)
```

Sum Sq	0.0024	Std Err	0.0072	LHS Mean	1.7586
R Sq	0.9989	R Bar Sq	0.9988	F 3, 46	13539.9
D.W.(1)	0.3417	D.W.(4)	1.8587		

xwr24	=	average hourly earnings, lumber and wood products, DPSA.
em24h	=	employee-hours, lumber and wood products, DPSA.
xwr25	=	average hourly earnings, furniture and fixtures, DPSA.
pciu	=	consumer price index, urban consumers, DPSA.

FURNITURE AND FIXTURES

MFG91:WR25.TWO
Joint Two Stage Least Squares
QUARTERLY data for 50 periods from 1977Q3 to 1989Q4
Date: 31 DEC 1990

log(xwr25)

```
     =    0.95499 * log(xwr24) - 0.01453 * log(em25h)
         (84.9519)               (0.72237)

        + 0.16046 * log(lp25) - 0.20709
          (4.14287)             (0.76538)
```

Sum Sq	0.0034	Std Err	0.0086	LHS Mean	1.7615
R Sq	0.9984	R Bar Sq	0.9983	F 3, 46	9636.15
D.W.(1)	0.3002	D.W.(4)	0.9870		

xwr25	=	average hourly earnings, furniture and fixtures, DPSA.
xwr24	=	average hourly earnings, lumber and wood products, DPSA.
em25h	=	employee-hours, furniture and fixtures, DPSA.
lp25	=	labor productivity, furniture and fixtures, US.

PAPER AND PAPER PRODUCTS

WR26.TWO
Joint Two Stage Least Squares
QUARTERLY data for 53 periods from 1976Q4 to 1989Q4
Date: 2 FEB 1991

xwr26

```
     =    1.03644 * ahemfn26$ - 0.09867
         (112.282)              (1.11458)

Sum Sq      0.9482   Std Err     0.1364   LHS Mean    9.6164
R Sq        0.9960   R Bar Sq    0.9959   F  1, 51   12607.3
D.W.( 1)    0.2769   D.W.( 4)    0.8005
```

xwr26 = average hourly earnings, paper and paper products, DPSA.
ahemfn26$ = average hourly earnings, paper and paper products, DPSA.

PRINTING AND PUBLISHING

```
MFG91:WR27
Cochran-Orcutt
QUARTERLY data for 71 periods from 1972Q2 to 1989Q4
Date:  2 JAN 1991

log(xwr27)

     =    0.36365 * log(pciu34) + 0.49356 * log(ahemfn27$)
         (2.83398)                (2.91492)

         + 0.29562 * log(lp2743) - 1.89465
          (8.89949)                (7.78538)

Sum Sq      0.0031   Std Err     0.0069   LHS Mean    1.7922
R Sq        0.9996   R Bar Sq    0.9996   F  4, 66   42802.4
D.W.( 1)    2.1330   D.W.( 4)    2.1108

AR_0 =   + 0.67155 * AR_1
          (7.34883)
```

xwr27	=	average hourly earnings, printing and publishing, DPSA.
pciu34	=	consumer price index, urban consumers, pdl starting at lag 3 and a length of 4 with even tails, US.
ahemfn27$	=	average hourly earnings, print and publishing, US.
lp27	=	labor productivity, printing and publishing, pdl starting at lag 4 and a length of 3 with even tails.

CHEMICAL AND ALLIED PRODUCTS

MFG91:WR28.TWO
Joint Two Stage Least Squares
QUARTERLY data for 72 periods from 1972Q1 to 1989Q4
Date: 31 DEC 1990

log(xwr28)

```
     =    - 0.36561 * log(em28h) + 0.37556 * log(lp28)
           (5.98910)               ( 9.5147)

          + 0.95486 * log(pciu) + 1.52731
           (56.4122)              (1.93232)

Sum Sq      0.0259   Std Err    0.0195   LHS Mean   1.9559
R Sq        0.9976   R Bar Sq   0.9975   F  3, 68  9455.99
D.W.( 1)    0.7854   D.W.( 4)   1.7180
```

xwr28	=	average hourly earnings, chemical and allied products, DPSA.
em28h	=	employee-hours, chemical and allied products, DPSA.
lp28	=	labor productivity, chemical and allied products, US.
pciu	=	consumer price index, urban consumers, US.

PETROLEUM PRODUCTS & HIDES, SKINS, AND LEATHER

MFG91:WR2931
Cochran-Orcutt
QUARTERLY data for 83 periods from 1969Q2 to 1989Q4
Date: 2 JAN 1991

log(xwr2931)

```
     =    1.14432 * log(ahemfn2931) + 0.04871 * log(lp2931)
         (56.8652)                    (1.52043)

        - 0.00693 * log(em2931h) - 0.31058
         (0.70754)                 (1.94587)

Sum Sq      0.0060   Std Err     0.0088   LHS Mean    1.5623
R Sq        0.9996   R Bar Sq    0.9996   F  4, 78   47684.7
D.W.( 1)    1.9792   D.W.( 4)    1.7857

AR_0 =  + 0.80529 * AR_1
         (10.7856)
```

xwr2931 = average hourly earnings, petroleum products & hides, skins, and leather, DPSA.
ahemen2931= average hourly earnings, petroleum products & hides, skins, and leather, US.
lp2931 = labor productivity, petroleum products & hides, skins, and leather, US.
em2931h = employee-hours, petroleum products & hides, skins, and leather, DPSA.

RUBBER AND PLASTIC PRODUCTS

MFG91:WR30.TWO
Joint Two Stage Least Squares
QUARTERLY data for 57 periods from 1975Q4 to 1989Q4
Date: 31 DEC 1990

xwr30

$$= \underset{(18.0446)}{0.08938} * pciu + \underset{(4.54778)}{0.04039} * lp30$$

$$- \underset{(2.99726)}{0.00000} * .2*(em30h.5+em30h.8)+.3*(em30h.6+em30h.7) + \underset{(10.5712)}{1.45483}$$

Sum Sq	0.7962	Std Err	0.1226	LHS Mean	7.0324
R Sq	0.9959	R Bar Sq	0.9956	F 3, 53	4272.97
D.W.(1)	0.3781	D.W.(4)	1.4958		

xwr30	=	average hourly earnings, rubber and plastic products, DPSA.
pciu	=	consumer price index, urban consumers, US.
lp30	=	labor productivity, rubber and plastic products, US.
em30h	=	employee-hours, rubber and products, DPSA.

STONE , CLAY, AND GLASS PRODUCTS

MFG91:WR32.TWO
Joint Two Stage Least Squares
QUARTERLY data for 50 periods from 1977Q3 to 1989Q4
Date: 3 JAN 1991

log(xwr32)

```
     =    0.95586 * log(pciu)
         (57.7695)

        - 0.20575 * log(.2*(em32h.3+em32h.6)+.3*(em32h.4+em32h.5))
          (4.93078)

        + 0.38632 * log(.2*(lp32.4+lp32.7)+.3*(lp32.5+lp32.6)) - (6.45360)


          0.97092
         (2.25407)
```

Sum Sq	0.0118	Std Err	0.0160	LHS Mean	1.9795
R Sq	0.9949	R Bar Sq	0.9945	F 3, 46	2966.97
D.W.(1)	0.4302	D.W.(4)	2.0213		

xwr32	=	average hourly earnings, stone, clay and glass products, DPSA.
pciu	=	consumer price index, urban consumers, US.
em32h	=	employee-hours, stone, clay and glass products, DPSA.
lp32	=	labor productivity, stone, clay and glass products, US.

PRIMARY METAL PRODUCTS

MFG91:WR33
Cochran-Orcutt
QUARTERLY data for 54 periods from 1976Q3 to 1989Q4
Date: 31 DEC 1990

log(xwr33)

```
     =    1.00243 * log(xwr34) + 0.13916 * log(pciu88)
         (21.2255)               (3.54188)

        - 0.07666 * log(em33h.10) + 0.41300
         (4.26792)                  (2.30116)
```

Sum Sq	0.0054	Std Err	0.0108	LHS Mean	1.9719
R Sq	0.9983	R Bar Sq	0.9981	F 7, 46	3877.53
D.W.(1)	1.8708	D.W.(4)	2.0728		

```
AR_0 =  + 0.57254 * AR_1 - 0.41119 * AR_4 + 0.24296 * AR_7
         (5.41728)         (3.62298)        (1.82956)
        - 0.40728 * AR_8
         (2.81354)
```

xwr33	=	average hourly earnings, primary metal products, DPSA.
xwr34	=	average hourly earnings, fabricated metal products, DPSA.
pciu88	=	consumer price index, urban consumers, pdl starting at lag 8 with a length of 8 and even tails, US.
em33h	=	employee-hours, primary metal products, DPSA.

FABRICATED METAL PRODUCTS

```
MFG91:WR34
Cochran-Orcutt
QUARTERLY data for 67 periods from 1973Q2 to 1989Q4
Date:  3 JAN 1991

log(xwr34)

     =    0.33582 * log(pciu.1) + 0.59083 * log(xwr33.1)
         (4.35963)                (8.79952)

        - 0.06906 * log(em34h) + 0.05466 * log(lp34)
         (3.76500)               (1.53828)

Sum Sq      0.0051   Std Err    0.0092   LHS Mean    1.8109
R Sq        0.9992   R Bar Sq   0.9991   F  6, 60   12125.4
D.W.( 1)    2.0096   D.W.( 4)   2.3657

AR_0 =  + 0.79827 * AR_1 - 0.20482 * AR_2 - 0.00311 * AR_4
         (6.29278)         (1.53526)         (0.03355)
```

xwr34	=	average hourly earnings, fabricated metal products, DPSA.
pciu	=	consumer price index, urban consumers, US.
xwr33	=	average hourly earnings, primary metal products, DPSA.
em34h	=	employee-hours, fabricated metal products, DPSA.
lp34	=	labor productivity, fabricated metal products, US.

NON-ELECTRICAL MACHINERY

MFG91:WR35.TWO
Joint Two Stage Least Squares
QUARTERLY data for 68 periods from 1973Q1 to 1989Q4
Date: 3 JAN 1991

xwr35

```
     =    0.08497 * pciu - 0.00466 * lp3574
         (50.5285)         (3.43870)

        - 0.00000 * .3*(em35h.1+em35h.3)+.4*em35h.2 + 0.20474
          (2.64591)                                   (1.39049)

Sum Sq      0.6569   Std Err     0.1013   LHS Mean    6.5066
R Sq        0.9976   R Bar Sq    0.9975   F  3, 64   8973.97
D.W.( 1)    0.2590   D.W.( 4)    1.5727
```

xwr35	=	average hourly earnings, non-electrical machinery, DPSA.
pciu	=	consumer price index, urban consumers, US.
lp3574	=	labor productivity, non-electrical machinery, pdl starting at lag of 7 with length 4 and even tails, US.
em35h	=	employee-hours, non-electrical machinery, DPSA.

ELECTRICAL MACHINERY

```
WR36.TWO
Joint Two Stage Least Squares
QUARTERLY data for 63 periods from 1974Q2 to 1989Q4
Date:  2 FEB 1991

log(xwr36)

     =    0.66610 * log(pciu) + 0.44741 * log(ahemfd36$)
         (5.03231)              (3.46080)

        - 0.03192 * log(em36h.5) - 1.55069
          (1.13920)                (4.11250)

Sum Sq      0.0193   Std Err     0.0181   LHS Mean    1.8310
R Sq        0.9970   R Bar Sq    0.9968   F  3, 59  6525.83
D.W.( 1)    0.2401   D.W.( 4)    1.3051
```

```
xwr36      =    average hourly earnings, electrical machinery, DPSA.
pciu       =    consumer price index, urban consumers, US.
ahemfd36$  =    average hourly earnings, electrical machinery, US.
em36h      =    employee-hours, electrical machinery, DPSA.
```

TRANSPORTATION EQUIPMENT

WR37.TWO
Joint Two Stage Least Squares
QUARTERLY data for 63 periods from 1974Q2 to 1989Q4
Date: 2 FEB 1991

log(xwr37)

```
     =    1.03191 * log(pciu.1) + 0.09846 * log(lp37.1) - 3.08410
         (133.237)                (4.36335)               (42.8758)

Sum Sq      0.0141   Std Err    0.0153   LHS Mean   1.8521
R Sq        0.9977   R Bar Sq   0.9976   F  2, 60  12997.8
D.W.( 1)    0.3720   D.W.( 4)   1.0748
```

xwr37 = average hourly earnings, transportation equipment, DPSA.
pciu = consumer price index, urban consumers, US.
lp37 = labor productivity, transportation equipment, US.

INSTRUMENTS

MFG91:WR38
Cochran-Orcutt
QUARTERLY data for 56 periods from 1976Q1 to 1989Q4
Date: 3 JAN 1991

xwr38

```
     =     - 0.00000 * .2*(em38h.12+em38h.15)+.3*(em38h.13+em38h.14)
             (2.72758)

           + 0.03680 * lp38 + 0.07755 * pciu[-1] - 0.94361
             (2.94297)        (20.8806)            (1.81719)

Sum Sq      0.7419   Std Err    0.1206   LHS Mean   6.2122
R Sq        0.9950   R Bar Sq   0.9946   F  4, 51  2547.66
D.W.( 1)    2.2345   D.W.( 4)   1.7475

AR_0 =  + 0.72284 * AR_1
          (6.81101)
```

xwr38	=	average hourly earnings, instruments, DPSA.
em38h	=	employee-hours, instruments, DPSA.
lp38	=	labor productivity, instruments, US.
pciu	=	consumer price index, urban consumers, US.

MISCELLANEOUS PRODUCTS

MFG91:WR39
Cochran-Orcutt
QUARTERLY data for 84 periods from 1969Q1 to 1989Q4
Date: 3 JAN 1991

log(xwr39)

```
     =    0.35589 * log(pciu) + 0.73199 * log(ahemfd39$) - 1.09599
         (5.04459)              ( 9.6133)                 (5.48649)

Sum Sq      0.0012   Std Err     0.0038   LHS Mean    1.5834
R Sq        0.9999   R Bar Sq    0.9999   F  3, 80        NC
D.W.( 1)    2.0001   D.W.( 4)    1.9552

AR_0 =   + 0.93372 * AR_1
          (17.3813)
```

xwr39 = average hourly earnings, miscellaneous products, DPSA.
pciu = consumer price index, urban consumers, US.
ahemfd39$ = average hourly earnings, miscellaneous products, US.

MANUFACTURING EMPLOYEE-HOURS

SIC20-FOOD PRODUCTS

SIMMFG91:EM20H.TWO
Joint Two Stage Least Squares
QUARTERLY data for 54 periods from 1976Q3 to 1989Q4
Date: 2 FEB 1991

log(em20h)

```
     =    0.42638 * log(grp20dp/(pgpo20/100)) + 8.11178
         (21.3035)                                (29.3283)

Sum Sq      0.0329   Std Err     0.0252   LHS Mean   14.0035
R Sq        0.8974   R Bar Sq    0.8954   F  1, 52   454.735
D.W.( 1)    0.6561   D.W.( 4)    2.0485
```

em20h = employee-hours, food products, DPSA.
grp20dp = gross regional product, food products, DPSA.
pgpo20 = gross product deflator, food products, US.

SIC21-TOBACCO PRODUCTS

EM21H.TWO
Joint Two Stage Least Squares
QUARTERLY data for 80 periods from 1970Q1 to 1989Q4
Date: 26 DEC 1990

log(em21h)

```
     =    0.11816 * log(rucke2114) + 0.36189 * log(grp21dp/(pgpo21/100))
         (3.74361)                   (5.04147)

        - 0.04801 * log(xwr21/(ppi/100)) + 7.98501
         (1.52133)                         (6.90659)
```

Sum Sq	0.0974	Std Err	0.0358	LHS Mean	13.6422
R Sq	0.5084	R Bar Sq	0.4890	F 3, 76	26.1948
D.W.(1)	1.5993	D.W.(4)	2.1596		

em21h	=	employee-hours, tobacco products, DPSA.
rucke2114	=	real user cost of capital, tobacco products, pdl starting at lag 1 with a length of four with head constraints, US.
grp21dp	=	gross regional product, tobacco products, DPSA.
pgpo21	=	gross product deflator, tobacco products, US.
xwr21	=	average hourly earnings, tobacco products, DPSA.
ppi	=	total producer price index, US.

SIC22-TEXTILE PRODUCTS

EM22H.TWO
Joint Two Stage Least Squares
QUARTERLY data for 82 periods from 1969Q3 to 1989Q4
Date: 31 DEC 1990

log(em22h)

```
     =    0.90875 * log(grp22dp/(pgpo22/100))
         (10.4595)

        - 0.04098 * log(ucke22.1/(ppitpa.1/100)) - 0.92010 *log(lp22)
         (1.49847)                                 (14.8766)

        + 5.26707
         (4.37599)
```

Sum Sq	0.1357	Std Err	0.0417	LHS Mean	16.2680
R Sq	0.9190	R Bar Sq	0.9159	F 3, 78	295.049
D.W.(1)	0.7912	D.W.(4)	1.9598		

em22h	=	employee-hours, textile products, DPSA.
grp22dp	=	gross regional prodcut, testile products, DPSA.
pgpo22	=	gross product deflator, textile products, US.
ucke22	=	user cost of capital, textile products, US.
ppitpa	=	producer price index, textile and apparel products, US.
lp22	=	labor productivity, textile products, DPSA.

SIC23-APPAREL AND APPAREL PRODUCTS

EM23H.TWO
Joint Two Stage Least Squares
QUARTERLY data for 51 periods from 1977Q2 to 1989Q4
Date: 31 DEC 1990

em23h

```
     =     1.21955 * grp23dp/(pgpo23/100)
          (4.18202)

-634901*.2*((xwr23.5/(ppitpa.5/100))+(xwr23.8/(ppitpa.8/100)))+(7.88400)

.3*((xwr23.6/(ppitpa.6/100))+(xwr23.7/(ppitpa.7/100)))

       + 5698.16 * rpucke2393 + 3473808
         (6.39098)              (18.0855)
```

Sum Sq	2E+11	Std Err	71409.7	LHS Mean	2400751
R Sq	0.6275	R Bar Sq	0.6037	F 3, 47	26.3932
D.W.(1)	1.1837	D.W.(4)	1.8423		

em23h	=	employee-hours, apparel and apparel products, DPSA.
grp23dp	=	gross regional product, apparel and apparel products, DPSA.
pgpo23	=	gross product deflator, apparel and apparel products, US.
xwr23	=	average hourly earnings, apparel and apparel products, DPSA.
ppitpa	=	producer price index, textile and apparel products, US.
rpucke23	=	real user cost of capital, apparel and apparel products, US.

SIC24-LUMBER AND WOOD PRODUCTS

EM24H.TWO
Joint Two Stage Least Squares
QUARTERLY data for 50 periods from 1977Q3 to 1989Q4
Date: 31 DEC 1990

log(em24h)

```
     =    0.48966 * log(grp24dp/(pgpo24/100))
         (7.10082)

        + 0.25144 * log(rpucke24133)
          (6.33103)

        - 0.11585 * log(xwr24.1/(ppilwp.1/100))
          (1.47703)

        - 0.27907 *log(lp24.5)
            (1.97446)

        + 7.00754
        ( 9.9916)
```

Sum Sq	0.0870	Std Err	0.0440	LHS Mean	13.5218
R Sq	0.8949	R Bar Sq	0.8855	F 4, 45	95.7796
D.W.(1)	1.0987	D.W.(4)	2.4183		

em24h	=	employee-hours, lumber and wood products, DPSA.
grp24dp	=	gross regional product, lumber and wood products, DPSA.
pgpo24	=	gross product deflator, lumber and wood product, US.
rpucke24133	=	real user cost of capital, lumber and wood products, pdl starting at lag 13 with a length of 3 with even tails, US.
xwr24	=	average hourly earnings, lumber and wood products, DPSA.
ppilwp	=	producer price index, lumber and wood products, US.
lp24	=	labor productivity, lumber and wod products, US.

SIC25-FURNITURE AND FIXTURES

```
EM25H.TWO
Joint Two Stage Least Squares
QUARTERLY data for 50 periods from 1977Q3 to 1989Q4
Date: 31 DEC 1990

log(em25h)

     =    0.95432 * log(grp25dp/(pgpo25/100)) - 0.36998 * log(lp25)
         (9.45117)                                (1.93641)

                                  -        0   .   7   3   4   3   5        *
log(.2*((xwr25.10/(ppifhe.10/100))+(xwr25.13/(ppifhe.13/

100)))+.3*((xwr25.11/(ppifhe.11/100))+(xwr25.12/(ppifhe.12/100))))
          (4.76888)

        + 4.03608
          (4.07593)

Sum Sq      0.0625   Std Err     0.0369   LHS Mean  14.8822
R Sq        0.7534   R Bar Sq    0.7373   F  3, 46  46.8382
D.W.( 1)    1.0587   D.W.( 4)    1.5928
```

em25h	=	employee-hours, furniture and fixtures, DPSA.
grp25dp	=	gross regional product, furniture and fixtures, DPSA.
pgpo25	=	gross product deflator, furniture and fixtures, US.
lp25	=	labor productivity, furniture and fixtures, US.
xwr25	=	average hourly earnings, furniture and fixtures, DPSA.
ppifhe	=	producer price index, furniture and household durables, US.

SIC26-PAPER AND PAPER PRODUCTS

SIMMFG91:EM26H.TWO
Joint Two Stage Least Squares
QUARTERLY data for 53 periods from 1976Q4 to 1989Q4
Date: 2 FEB 1991

log(em26h)

```
     =    0.56698 * log(grp26dp/(pgpo26/100)) - 0.31100 * log(lp26)
         (5.70465)                                (2.26733)

        + 6.89591
         (7.98806)
```

Sum Sq	0.0183	Std Err	0.0191	LHS Mean	13.5230
R Sq	0.9018	R Bar Sq	0.8979	F 2, 50	229.626
D.W.(1)	1.5815	D.W.(4)	1.6500		

em26h	=	employee-hours, paper and paper products, DPSA.
grp26dp	=	gross regional product, paper and paper products, DPSA.
pgpo26	=	gross product deflator,paper and paper products, US.
lp26	=	labor productivity, paper and paper products, US.

SIC27-PRINTING AND PUBLISHING

```
MFG91:EM27H
Nonlinear Least Squares
QUARTERLY data for 72 periods from 1972Q1 to 1989Q4
Date:  2 JAN 1991

log(em27h)

     =    0.88822 * log(grp27dp/(pgpo27/100)) + 0.22899 * log(rpucke27)
         (35.0162)                                (5.34871)

        + 0.95887
         (3.48761)

Sum Sq      0.0510   Std Err     0.0274   LHS Mean   13.5006
R Sq        0.9850   R Bar Sq    0.9844   F  3, 68   1491.95
D.W.( 1)    1.5880   D.W.( 4)    1.6781

MA_0 =  + 0.65212 * MA_1
         (7.00221)
```

em27h = employee-hours, printing and publishing, DPSA.
grp27dp = gross regional product,printing and publishing, DPSA.
pgpo27 = gross product deflator, printing and publishing, US.
rpucke27 = real user cost of capital, printing and publishing, US

SIC28-CHEMICAL AND ALLIED PRODUCTS

MFG91:EM28H.TWO
Joint Two Stage Least Squares
QUARTERLY data for 72 periods from 1972Q1 to 1989Q4
Date: 31 DEC 1990

em28h

```
     =    1.20966 * grp28dp/(pgpo28/100) - 28795.4 * xwr28/(ppicap/100)
         (7.64367)                          (3.04856)

        - 41335.1 * lp28 + 1712896
         (6.18521)        (17.2602)
```

Sum Sq	3E+11	Std Err	62901.5	LHS Mean	1550964
R Sq	0.7659	R Bar Sq	0.7556	F 3, 68	74.1647
D.W.(1)	1.1396	D.W.(4)	1.4559		

em28h	=	employee-hours, chemical and allied products, DPSA.
grp28dp	=	gross regional product, chemical and allied products, DPSA.
pgpo28	=	gross product deflator, chemical and allied products, US.
xwr28	=	average hourly earnings, chemical and allied products, DPSA.
ppicap	=	producer price index, chemical and allied products, US.
lp28	=	labor productivity, chemical and allied products, US.

SIC2931-REFINED PETROLUEM PRODUCTS & HIDES, SKINS, AND LEATHER PRODUCTS

```
MFG91:EM2931H
Cochran-Orcutt
QUARTERLY data for 68 periods from 1973Q1 to 1989Q4
Date:  3 JAN 1991

log(em2931h)

     =    0.23051 * log(grp2931dp/(pgpo2931/100))
         (4.41979)

        - 0.86162 * log(.5*((xwr2931.14/(ppi2931.14/100))+(xwr2931.15/
         (3.17572)     (ppi2931.15/100))))

        + 0.26456 * log(rpucke2931) + 9.15229
         (2.35201)                   (12.9606)

Sum Sq      0.4290   Std Err    0.0825   LHS Mean  11.4498
R Sq        0.6794   R Bar Sq   0.6590   F  4, 63  33.3702
D.W.( 1)    2.0665   D.W.( 4)   1.9264

AR_0 =  + 0.42242 * AR_1
         (3.69350)
```

em2931h = employee-hours, refined petroleum products & hides, skins, and leather products, DPSA.

grp2931dp = gross regional product, refined petroleum products & hides, skins, and leather products, DPSA.

pgpo2931 = gross product deflator, refinded petroleum products & hides, skins, and leather products, US. xwr2931=average hourly earnings, refined petroleum products & hides, skins, and leather products, DPSA.

ppi2931 = producer price index, refined petroleum products & hides, skins, and leather products, US.

rpucke2931= real user cost of capital, refined petroleum products & hides, skins, and leather products, US.

SIC30-RUBBER AND RUBBER PRODUCTS

MFG91:EM30H.TWO
Joint Two Stage Least Squares
QUARTERLY data for 57 periods from 1975Q4 to 1989Q4
Date: 31 DEC 1990

log(em30h)

```
     =    0.98562 * log(grp30dp/(pgpo30/100)) - 0.84480 * log(lp30)
         (19.5557)                                (6.78397)

        + 3.32138
         (10.3010)
```

Sum Sq	0.1297	Std Err	0.0490	LHS Mean	13.8355
R Sq	0.9651	R Bar Sq	0.9638	F 2, 54	746.049
D.W.(1)	1.1361	D.W.(4)	1.2885		

em30h	=	employee-hours, rubber and rubber products, DPSA.
grp30dp	=	gross regional product, rubber and rubber products, DPSA.
pgpo30	=	gross product deflator, rubber and rubber products, US.
lp30	=	labor productivity, rubber and rubber products, US.

SIC32-STONE, CLAY, AND GLASS PRODUCTS

```
MFG91:EM32H.TWO
Joint Two Stage Least Squares
QUARTERLY data for 50 periods from 1977Q3 to 1989Q4
Date:  3 JAN 1991

log(em32h)

     =    1.25229 * log(grp32dp/(pgpo32/100))
         (9.30403)

        - 0.23677 * log(xwr32/(ppiind/100)) - 1.34836 * log(lp32)
          (1.19321)                           (5.02187)

        + 2.29530
          (2.37829)

Sum Sq      0.0910   Std Err     0.0445   LHS Mean  13.4930
R Sq        0.8290   R Bar Sq    0.8179   F  3, 46  74.3398
D.W.( 1)    0.5145   D.W.( 4)    1.3575
```

em32h	=	employee-hours, stone, clay, and glass products, DPSA.
grp32dp	=	gross regional product, stone, clay, and glass products, DPSA.
pgpo32	=	gross product deflator, stone, clay, and glass products, US.
xwr32	=	average hourly earnings, stone, clay and glass products, DPSA.
ppiind	=	producer price index, total industrial, US.
lp32	=	labor productivity, stone, clay, and glass products, US.

SIC33-PRIMARY METALS

MFG91:EM33H
Ordinary Least Squares
QUARTERLY data for 61 periods from 1974Q4 to 1989Q4
Date: 28 DEC 1990

log(em33h)

```
     =    0.85938 * log(grp33dp/(pgpo33/100))
         (19.9927)

        - 0.33635 * log(.2*((xwr33.8/(ppimmp.8/100))+(xwr33.11/
            (2.49734) /(ppimmp.11/100)))+.3*((xwr33.9/(ppimmp.9/100))+

        +(xwr33.10/ppimmp.10/100))))

        + 0.17657 * log(rpucke33) + 1.86142
         (2.60335)                 (5.83580)
```

Sum Sq	0.2564	Std Err	0.0671	LHS Mean	12.7480
R Sq	0.9543	R Bar Sq	0.9519	F 3, 57	396.906
D.W.(1)	0.8529	D.W.(4)	1.6492		

em33h	=	employee-hours, primary metals, DPSA.
grp33dp	=	gross regional product, primary metals, DPSA.
pgpo33	=	gross product deflator, primary metals, US.
xwr33	=	average hourly earnings, primary metals, DPSA.
ppimmp	=	producer price index, metal and metal products, US.
rpucke33	=	real user cost of capital, primary metals, US.

SIC34-FABRICATED METALS

MFG91:EM34H
Cochran-Orcutt
QUARTERLY data for 76 periods from 1971Q1 to 1989Q4
Date: 28 DEC 1990

log(em34h)

```
     =    0.72894 * log(grp34dp/(pgpo34/100))
         (39.8634)

        -  0.51795  *log(.2*((xwr34.7/(ppimmp.7/100))+(xwr34.10/(6.13869)
(ppimmp.10/100)))+.3*((xwr34.8/(ppimmp.8/100))+(xwr34.9/(ppimmp.9/100))))


        + 0.09733 * log(rpucke34) + 4.43476
         (2.91876)                  (15.0369)

Sum Sq      0.0634   Std Err    0.0303   LHS Mean  13.5638
R Sq        0.9846   R Bar Sq   0.9832   F  6, 69  734.180
D.W.( 1)    1.9456   D.W.( 4)   1.9154

AR_0 =  + 0.49941 * AR_1 + 0.19387 * AR_4 - 0.38790 * AR_8
         (4.99287)         (1.87561)         (3.83825)
```

em34h	=	employee-hours, fabricated metals, DPSA.
grp34dp	=	gross regional product, fabricated metals, DPSA.
pgpo34	=	gross product deflator, fabricated metals, US.
xwr34	=	average hourly earnings, fabricated metals, DPSA.
ppimmp	=	producer price index, metals and metal products, US.
rpucke34	=	real user cost of capital, fabricated metals, DPSA.

SIC35-NON-ELECTRICAL MACHINERY

```
MFG91:EM35H.TWO
Joint Two Stage Least Squares
QUARTERLY data for 68 periods from 1973Q1 to 1989Q4
Date:  3 JAN 1991

em35h

     =    0.28516 * grp35dp/(pgpo35/100)
         (19.9766)

       - 389568 * .143*((xwr35.5/(ppimae.5/100))+(xwr35.9/
           (7.10597) (ppimae.9/100)))+.229
         *((xwr35.6/(ppimae.6/100))+(xwr35.8/(ppimae.8/100)))+.256*
         xwr35.7/(ppimae.7/100)
       + 10190.1 * rpucke35 + 3660369
        (10.9982)            (9.47470)

Sum Sq       6E+11   Std Err   95314.1   LHS Mean  2203058
R Sq        0.9295   R Bar Sq   0.9262   F  3, 64  281.419
D.W.( 1)    0.9245   D.W.( 4)   1.7656
```

em35h	=	employee-hours, non-electrical machinery, DPSA.
grp35dp	=	gross regional product, non-electrcal machinery, DPSA.
pgpo35	=	gross product deflator, non-electrical machinery, US.
xwr35	=	average hourly earnings, non-electrical machinery, DPSA.
ppimae	=	producer price index, machinery, US.
rpucke35	=	real user cost of capital, non-electrical machinery, US.

SIC36-ELECTRICAL MACHINERY

```
EM36H.TWO
Joint Two Stage Least Squares
QUARTERLY data for 63 periods from 1974Q2 to 1989Q4
Date:  2 FEB 1991

log(em36h)

     =    0.78088 * log(grp36dp/(pgpo36/100)) - 0.51120 * log(lp36)
         (15.6911)                               (6.10060)

        - 0.29868 *log(.143*((xwr36.5/(ppimae.5/100))+
            (2.12634)(xwr36.9/(ppimae.9/100)))+
          .229*((xwr36.6/(ppimae.6/100))+(xwr36.8/(ppimae.8/100)))+.256
          *(xwr36.7/(ppimae.7/100)))
        + 5.71520
        (11.6897)

Sum Sq      0.0903   Std Err    0.0391   LHS Mean  14.2443
R Sq        0.9439   R Bar Sq   0.9410   F  3, 59  330.790
D.W.( 1)    0.9345   D.W.( 4)   1.5174
```

```
em36h     =    employee-hours, electrical machinery, DPSA.
grp36dp   =    gross regional product, electrical machinery, DPSA.
pgpo36    =    gross product deflator, electrical machinery, US.
lp36      =    labor productivity, electrical machinery, US.
xwr36     =    average hourly earnings, electrical machinery, DPSA.
ppimae    =    producer price index, machinery, US.
```

SIC37-TRANSPORTATION EQUIPMENT

EM37H.TWO
Joint Two Stage Least Squares
QUARTERLY data for 63 periods from 1974Q2 to 1989Q4
Date: 2 FEB 1991

em37h

```
     =    1.68200 * grp37dp/(pgpo37/100) + 641.420 * rpucke37114
         (55.7312)                          (3.70499)

        - 10555.0 * lp37 +  341402
         (9.10578)         (8.88093)

Sum Sq       4E+10   Std Err    24431.5   LHS Mean    427925
R Sq        0.9888   R Bar Sq    0.9882   F  3, 59   1729.13
D.W.( 1)    1.0483   D.W.( 4)    1.4048
```

em37h	=	employee-hours, transportation equipment, DPSA.
grp37dp	=	gross regional product, transportion equipment, DPSA.
pgpo37	=	gross product deflator, transportation equipment, US.
rpucke37114	=	real user cost of capital, transportation equipment, pdl starting at lag 11 with a length of 4 and even tails.
lp37	=	labor productivity, transportation equipment, US.

SIC38-INSTRUMENTS

MFG91:EM38H
Cochran-Orcutt
QUARTERLY data for 71 periods from 1972Q2 to 1989Q4
Date: 3 JAN 1991

log(em38h)

```
     =    0.60875 * log(grp38dp/(pgpo38/100)) + 5.24043
         (5.15271)                               (3.57305)

Sum Sq      0.1863   Std Err    0.0523   LHS Mean  12.7089
R Sq        0.9545   R Bar Sq   0.9531   F  2, 68  712.745
D.W.( 1)    1.9276   D.W.( 4)   1.9662

AR_0 =  + 0.85939 * AR_1
         (13.4572)
```

em38h = employee-hours, instruments, DPSA.
grp38dp = gross regional product, instruments, DPSA.
pgpo38 = gross product deflator, instruments, US.

SIC39-MISCELLANEOUS

```
MFG91:EM39H
Cochran-Orcutt
QUARTERLY data for 83 periods from 1969Q2 to 1989Q4
Date:  3 JAN 1991

log(em39h)

     =    0.32461 * log(grp39dp/(pgpo39/100)) + 8.55347
         (3.69114)                               (8.21286)

Sum Sq      0.1417   Std Err    0.0421   LHS Mean  12.2834
R Sq        0.9209   R Bar Sq   0.9190   F  2, 80  465.946
D.W.( 1)    1.8333   D.W.( 4)   2.2252

AR_0 =  + 0.94787 * AR_1
         (27.7195)
```

em39h = employee-hours, miscellaneous, DPSA.
grp39dp = gross regional product, miscellaneous, DPSA.
pgpo39 = gross product deflator, miscellaneous, US.

FOOD PRODUCTS

W20DP.TWO
Joint Two Stage Least Squares
QUARTERLY data for 54 periods from 1976Q3 to 1989Q4
Date: 2 FEB 1991

log(w20dp)

```
     =    1.17551 * log(em20h) + 0.91680 * log(xwr20) - 4.72597
         (9.42212)               (21.1928)              (2.81277)

Sum Sq      0.0506   Std Err    0.0315   LHS Mean  13.3330
R Sq        0.9885   R Bar Sq   0.9880   F  2, 51  2190.46
D.W.( 1)    0.7182   D.W.( 4)   1.7972
```

w20dp = wages, food products, DPSA.
em20h = employee-hours, food products, DPSA.
xwr20 = average hourly earnings, food products, DPSA.

TOBACCO PRODUCTS

MFG91:W21DP.TWO
Joint Two Stage Least Squares
QUARTERLY data for 80 periods from 1970Q1 to 1989Q4
Date: 26 DEC 1990

log(w21dp)

```
     =    0.96843 * log(em21h) + 1.00117 * log(xwr21) - 2.52222
         (3.34349)               (50.4507)              (0.63330)

Sum Sq      0.2581   Std Err     0.0579   LHS Mean  12.7088
R Sq        0.9869   R Bar Sq    0.9866   F  2, 77  2899.28
D.W.( 1)    0.7514   D.W.( 4)    1.2561
```

w21dp	=	wages, tobacco products, DPSA.
em21h	=	employee-hours, tobacco products, DPSA.
xwr21	=	average hourly earnings, tobacco products, DPSA.

TEXTILE MILL PRODUCTS

MFG91:W22DP.TWO
Joint Two Stage Least Squares
QUARTERLY data for 82 periods from 1969Q3 to 1989Q4
Date: 31 DEC 1990

log(w22dp)

```
     =    0.88954 * log(em22h) + 1.02701 * log(xwr22) - 1.14083
         (17.6014)               (56.4528)              (1.34600)
```

Sum Sq	0.0461	Std Err	0.0241	LHS Mean	14.8741
R Sq	0.9933	R Bar Sq	0.9932	F 2, 79	5879.42
D.W.(1)	1.0658	D.W.(4)	1.6027		

w22dp	=	wages, textile mill products, DPSA.
em22h	=	employee-hours, textile mill products, DPSA.
xwr22	=	average hourly earnings, textile mill products, DPSA.

APPAREL PRODUCTS

MFG91:W23DP.TWO
Joint Two Stage Least Squares
QUARTERLY data for 51 periods from 1977Q2 to 1989Q4
Date: 31 DEC 1990

log(w23dp)

```
     =    0.40132 * log(em23h) + 1.02899 * log(xwr23) + 6.25561
         (5.80539)               (59.6705)              (6.13935)

Sum Sq      0.0218   Std Err    0.0213   LHS Mean  13.7239
R Sq        0.9867   R Bar Sq   0.9862   F  2, 48  1783.45
D.W.( 1)    0.9992   D.W.( 4)   1.7585
```

w23dp = wages, apparel products, DPSA.
em23h = employee-hours, apparel products, DPSA.
xwr23 = average hourly earnings, apparel products, DPSA.

LUMBER AND WOOD PRODUCTS

MFG91:W24DP.TWO
Joint Two Stage Least Squares
QUARTERLY data for 50 periods from 1977Q3 to 1989Q4
Date: 31 DEC 1990

log(w24dp)

```
     =    0.57572 * log(em24h) + 0.98566 * log(xwr24) + 3.53507
         (13.8956)               (38.2312)              (6.70256)

Sum Sq      0.0299   Std Err     0.0252   LHS Mean  13.0533
R Sq        0.9915   R Bar Sq    0.9911   F  2, 47  2729.86
D.W.( 1)    1.1514   D.W.( 4)    1.7366
```

w24dp = wages, lumber and wood products, DPSA.
em24h = employee-hours, lumber and wood products, DPSA.
xwr24 = average hourly earnings, lumber and wood products, DPSA.

FURNITURE AND FIXTURES

MFG91:W25DP.TWO
Joint Two Stage Least Squares
QUARTERLY data for 50 periods from 1977Q3 to 1989Q4
Date: 31 DEC 1990

log(w25dp)

```
     =    0.56400 * log(em25h) + 1.16513 * log(xwr25) + 3.19204
         (12.1649)               (72.9114)              (4.69647)
```

Sum Sq	0.0217	Std Err	0.0215	LHS Mean	13.6380
R Sq	0.9935	R Bar Sq	0.9932	F 2, 47	3605.26
D.W.(1)	0.9022	D.W.(4)	1.7456		

w25dp = wages, furniture and fixtures, DPSA.
em25h = employee-hours, furniture and fixtures, DPSA.
xwr25 = average hourly earnings, furniture and fixtures, DPSA.

PAPER AND PAPER PRODUCTS

W26DP.TWO
Joint Two Stage Least Squares
QUARTERLY data for 53 periods from 1976Q4 to 1989Q4
Date: 2 FEB 1991

dlog(w26dp)

```
     =    0.09335 * dlog(em26h) + 0.67315 * dlog(xwr26) + 0.00930
         (0.42558)               (2.73045)               (2.13767)

Sum Sq      0.0130   Std Err     0.0161   LHS Mean    0.0196
R Sq        0.0554   R Bar Sq    0.0176   F  2, 50    1.4654
D.W.( 1)    2.2702   D.W.( 4)    1.4255
```

w26dp = wages, paper and paper products, DPSA.
em26h = employee-hours, paper and paper products, DPSA.
xwr26 = average hourly earnings, paper and paper products, DPSA.

PRINTING AND PUBLISHING

```
MFG91:W27DP
Nonlinear Least Squares
QUARTERLY data for 71 periods from 1972Q2 to 1989Q4
Date:  2 JAN 1991

log(w27dp)

     =    0.86843 * log(em27h) + 1.10768 * log(xwr27) - 1.21048
         (6.83406)               (12.5744)              (0.75585)

Sum Sq      0.0337   Std Err     0.0228   LHS Mean  12.5027
R Sq        0.9984   R Bar Sq    0.9983   F  5, 65  8289.71
D.W.( 1)    1.7713   D.W.( 4)    1.8951

AR_0 =  + 0.70172 * AR_1
         (7.76262)


MA_0 =  + 0.23442 * MA_4 + 0.27185 * MA_8
         (1.89244)         (2.17789)
```

w27dp = wages, printing and publishing, DPSA.
em27h = employee-hours, printing and publishing, DPSA.
xwr27 = average hourly earnings, printing and publishing, DPSA.

CHEMICAL AND ALLIED PRODUCTS

MFG91:W28DP.TWO
Joint Two Stage Least Squares
QUARTERLY data for 72 periods from 1972Q1 to 1989Q4
Date: 31 DEC 1990

log(w28dp)

```
     =    0.84112 * log(em28h) + 1.04324 * log(xwr28) - 0.29092
         (17.0187)               (117.756)              (0.41959)

Sum Sq      0.0344   Std Err     0.0223   LHS Mean  13.7364
R Sq        0.9976   R Bar Sq    0.9975   F  2, 69  14272.4
D.W.( 1)    1.1275   D.W.( 4)    1.3616
```

w28dp = wages, chemical and allied products, DPSA.
em28h = employee-hours, chemical and allied products, DPSA.
xwr28 = average hourly earnings, chemical and allied products, DPSA.

PETROLEUM PRODUCTS & HIDES, SKINS, AND LEATHER

MFG91:W2931DP
Nonlinear Least Squares
QUARTERLY data for 83 periods from 1969Q2 to 1989Q4
Date: 2 JAN 1991

log(w2931dp)

```
     =    0.07875 * log(em2931h) + 1.19845 * log(xwr2931) + 7.74736
         (2.16906)                 ( 9.5497)                (16.8821)

Sum Sq      0.0892   Std Err    0.0338   LHS Mean  10.5085
R Sq        0.9960   R Bar Sq   0.9958   F  4, 78  4880.98
D.W.( 1)    1.8781   D.W.( 4)   1.7741

AR_0 =  + 0.90373 * AR_1
         (17.0623)


MA_0 =  + 0.29377 * MA_4
         (2.55859)
```

w2931dp	=	wages, petroleum products & hides, skins, and leather, DPSA.
em2931h	=	employee-hours, petroleum products & hides, skins, and leather, DPSA.
xwr2931	=	average hourly earnings, petroleum products & hides, skins, and leather, DPSA.

RUBBER AND PLASTICS PRODUCTS

MFG91:W30DP.TWO
Joint Two Stage Least Squares
QUARTERLY data for 57 periods from 1975Q4 to 1989Q4
Date: 31 DEC 1990

log(w30dp)

```
     =    0.74566 * log(em30h) + 1.04851 * log(xwr30) + 0.91603
         (12.1438)               (19.0947)              (1.22149)

Sum Sq      0.0664   Std Err     0.0351   LHS Mean  13.2376
R Sq        0.9950   R Bar Sq    0.9949   F  2, 54  5426.84
D.W.( 1)    1.4114   D.W.( 4)    0.8407
```

w30dp = wages, rubber and plastic products, DPSA.
em30h = employee-hours, rubber and plastic products, DPSA.
xwr30 = average hourly earnings, rubber and plastic products, DPSA.

STONE, CLAY AND GLASS PRODUCTS

MFG91:W32DP
Ordinary Least Squares
QUARTERLY data for 72 periods from 1972Q1 to 1989Q4
Date: 20 DEC 1990

log(w32dp)

=	0.79898 * log(em32h)	+	1.07172 * log(xwr32)	-	0.05136
	(19.8767)		(94.7996)		(0.09661)

Sum Sq	0.0629	Std Err	0.0302	LHS Mean	12.6099
R Sq	0.9954	R Bar Sq	0.9952	F 2, 69	7405.46
D.W.(1)	0.9156	D.W.(4)	1.4061		

w32dp	=	wages, stone, clay and glass products, DPSA.
em32h	=	employee-hours, stone, clay and glass products, DPSA.
xwr32	=	average hourly earnings, stone, clay and glass products, DPSA.

PRIMARY METAL PRODUCTS

MFG91:W33DP
Cochran-Orcutt
QUARTERLY data for 67 periods from 1973Q2 to 1989Q4
Date: 31 DEC 1990

log(w33dp)

```
     =    0.44071 * log(em33h) + 1.38825 * log(xwr33) + 3.94336
         (7.13045)              (23.0492)              (5.71659)

Sum Sq      0.0588   Std Err     0.0313   LHS Mean  12.1190
R Sq        0.9975   R Bar Sq    0.9972   F  6, 60  3951.75
D.W.( 1)    1.8771   D.W.( 4)    1.9746

AR_0 =  + 0.92815 * AR_1 - 0.40388 * AR_2 + 0.21940 * AR_3
         (7.35793)         (2.48609)         (1.70329)
        - 0.14943 * AR_5
         (1.64168)
```

w33dp	=	wages, primary metal products, DPSA.
em33h	=	employee-hours, primary metal products, DPSA.
xwr33	=	average hourly earnings. primary metal products, DPSA.

FABRICATED METAL PRODUCTS

MFG91:W34DP
Nonlinear Least Squares
QUARTERLY data for 56 periods from 1976Q1 to 1989Q4
Date: 28 DEC 1990

log(w34dp)

```
     =    0.38816 * log(em34h) + 1.11712 * log(xwr34) + 5.63767
         (4.55716)               (15.6886)              (5.23403)

Sum Sq     0.0239   Std Err    0.0221   LHS Mean  13.0789
R Sq       0.9959   R Bar Sq   0.9954   F  6, 49  1979.82
D.W.( 1)   1.8336   D.W.( 4)   1.9533

AR_0 =  + 0.61987 * AR_1 + 0.17395 * AR_3 - 0.17400 * AR_8
         (5.20555)         (1.59423)         (2.21381)


MA_0 =  + 0.54190 * MA_2
         (3.99483)
```

w34dp = wages, fabricated metal products, DPSA.
em34h = employee-hours, fabricated metal products, DPSA.
xwr34 = average hourly earnings, fabricated metal products, DPSA.

NON-ELECTRICAL MACHINERY

MFG91:W35DP.TWO
Joint Two Stage Least Squares
QUARTERLY data for 68 periods from 1973Q1 to 1989Q4
Date: 3 JAN 1991

log(w35dp)

=	0.99426 * log(em35h)		+ 1.16867 * log(xwr35)		- 2.90955
	(9.7899)		(24.0896)		(2.07804)

Sum Sq	0.1569	Std Err	0.0491	LHS Mean	13.7246
R Sq	0.9924	R Bar Sq	0.9922	F 2, 65	4240.83
D.W.(1)	0.4373	D.W.(4)	1.2123		

w35dp	=	wages, non-electrical machinery, DPSA.
em35h	=	employee-hours, non-electrical machinery, DPSA.
xwr35	=	average hourly earnings, non-electrical machinery, DPSA.

ELECTRICAL MACHINERY

W36DP.TWO
Joint Two Stage Least Squares
QUARTERLY data for 63 periods from 1974Q2 to 1989Q4
Date: 2 FEB 1991

log(w36dp)

```
     =    0.77934 * log(em36h) + 1.12566 * log(xwr36) + 0.46048
         (9.04555)               (26.3265)              (0.39687)

Sum Sq      0.1781   Std Err     0.0545   LHS Mean  13.6227
R Sq        0.9874   R Bar Sq    0.9870   F  2, 60  2346.29
D.W.( 1)    0.4954   D.W.( 4)    1.0356
```

w36dp = wages, electrical machinery, DPSA.
em36h = employee-hours, electrical machinery, DPSA.
xwr36 = average hourly earnings, electrical machinery, DPSA.

TRANSPORTATION EQUIPMENT

W37DP.TWO
Joint Two Stage Least Squares
QUARTERLY data for 63 periods from 1974Q2 to 1989Q4
Date: 2 FEB 1991

log(w37dp)

```
     =    0.52531 * log(em37h) + 2.01024 * log(xwr37) + 1.46496
         (4.52424)               ( 9.5267)              (1.31900)
```

Sum Sq	0.8303	Std Err	0.1176	LHS Mean	11.9191
R Sq	0.9848	R Bar Sq	0.9843	F 2, 60	1941.60
D.W.(1)	0.5163	D.W.(4)	0.7156		

w37dp = wages, transportation equipment, DPSA.
em37h = employee-hours, transportation equipment, DPSA.
xwr37 = average hourly eqrnings, transportation, DPSA.

INSTRUMENTS

MFG91:W38DP
Cochran-Orcutt
QUARTERLY data for 67 periods from 1973Q2 to 1989Q4
Date: 3 JAN 1991

dlog(w38dp)

```
     =    0.14073 * dlog(em38h) + 0.02477
         (2.57638)                (5.57347)

Sum Sq      0.0476   Std Err    0.0273   LHS Mean   0.0272
R Sq        0.1751   R Bar Sq   0.1494   F  2, 64   6.7946
D.W.( 1)    1.8632   D.W.( 4)   2.2657

AR_0 =  + 0.24083 * AR_4
          (2.35881)
```

w38dp = wages, instruments, DPSA.
em38h = employee-hours, instruments, DPSA.
xwr38 = average hourly earnings, instruments, DPSA.

MISCELLANEOUS PRODUCTS

MFG91:W39DP
Cochran-Orcutt
QUARTERLY data for 77 periods from 1970Q4 to 1989Q4
Date: 3 JAN 1991

log(w39dp)

```
     =    0.30296 * log(em39h) + 0.94977 * log(xwr39) + 5.93339
        (3.27695)               (5.32661)               (5.15028)

Sum Sq      0.0966   Std Err     0.0369   LHS Mean  11.2179
R Sq        0.9919   R Bar Sq    0.9914   F  5, 71  1749.40
D.W.( 1)    1.9296   D.W.( 4)    1.8548

AR_0 =  + 0.86102 * AR_1 + 0.19213 * AR_4 - 0.13353 * AR_7
         (11.2875)         (1.92605)         (1.61225)
```

w39dp = wages, miscellaneous products, DPSA.
em39h = employee-hours, miscellaneous products, DPSA.
xwr39 = average hourly earnings, miscellaneous products, DPSA.

MANUFACTURING GROSS PRODUCT

FOOD PRODUCTS

GRP20DP.TWO
Joint Two Stage Least Squares
QUARTERLY data for 54 periods from 1976Q3 to 1989Q4
Date: 2 FEB 1991

diff(grp20dp)

=	18949.2	* diff(gpo20)	+ 3703.17		
	(8.06331)		(1.13369)		
Sum Sq	2E+10	Std Err	17559.9	LHS Mean	21660.4
R Sq	0.5556	R Bar Sq	0.5471	F 1, 52	65.0169
D.W.(1)	2.1165	D.W.(4)	1.2458		

grp20dp = gross product, food products, DPSA.
gpo20 = gross product, food products, US.

TOBACCO PRODUCTS

```
MFG91:GRP21DP.TWO
Joint Two Stage Least Squares
QUARTERLY data for 80 periods from 1970Q1 to 1989Q4
Date: 26 DEC 1990

grp21dp

     =    220741 * gpo21 + 14.9005 * w21dp/wb21
         (57.3844)         (19.8162)

        + 3063128 * (1-(xwr21.2/ahemtn21$.2))/(xwr21.2/ahemfn21$.2)
          (5.25889)

        - 3050724
          (19.6816)

Sum Sq       8E+11   Std Err    102841   LHS Mean  2052190
R Sq        0.9940   R Bar Sq   0.9938   F  3, 76  4230.47
D.W.( 1)    0.9690   D.W.( 4)   1.2501

grp21dp   =    gross product, tobacco products, DPSA.
gpo21     =    gross product, tobacco products, US.
w21dp     =    wages, tobacco products, DPSA.
wb21      =    wages, tobacco products, US.
xwr21     =    average hourly earnings, tobacco products, DPSA.
ahemfn21$ =    average hourly earnings, tobacco products, DPSA.
```

TEXTILE MILL PRODUCTS

MFG91:GRP22DP.TWO
Joint Two Stage Least Squares
QUARTERLY data for 82 periods from 1969Q3 to 1989Q4
Date: 31 DEC 1990

grp22dp

```
     =    270404 * gpo22 + 12.5040 * w22dp/wb22 + 44565.9 * rcell
         (297.963)         (19.6957)              (1.68496)

        - 3404044
         (19.7416)
```

Sum Sq	4E+10	Std Err	23504.5	LHS Mean	3910636
R Sq	0.9996	R Bar Sq	0.9996	F 3, 78	61016.2
D.W.(1)	1.0786	D.W.(4)	1.4447		

grp22dp	=	gross product, textile mill products, DPSA.
gpo22	=	gross product, textile mill products, US.
w22dp	=	wages, textile mill products, DPSA.
wb22	=	wages, textile mill products, US.
rcell	=	relative cost of electricity, DPSA to US, logistic structure.

APPAREL PRODUCTS

MFG91:GRP23DP.TWO
Joint Two Stage Least Squares
QUARTERLY data for 51 periods from 1977Q2 to 1989Q4
Date: 31 DEC 1990

grp23dp

```
     =    56476.9 * gpo23 + 17.7382 * w23dp/wb23 + 71755.6 * rcng1135
         (109.945)          (42.7850)              (5.06920)

       -  977579
         (47.3307)
```

Sum Sq	2E+09	Std Err	6225.98	LHS Mean	1146167
R Sq	0.9992	R Bar Sq	0.9991	F 3, 47	18612.5
D.W.(1)	0.8057	D.W.(4)	1.6428		

grp23dp	=	gross product, apparel products, DPSA.
gpo23	=	gross product, apparel products, US.
w23dp	=	wages, apparel products, DPSA.
wb23	=	wages, apparel products, US.
rcng1135	=	relative cost of natural gas, DPSA to US, logistic structure, pdl starting at lag 13 with a lag of 5 with even tails.

LUMBER AND WOOD PRODUCTS

MFG91:GRP24DP.TWO
Joint Two Stage Least Squares
QUARTERLY data for 50 periods from 1977Q3 to 1989Q4
Date: 31 DEC 1990

grp24dp

=	0.49901	* grp25dp +	520661	* rcngl154 +	292995	
	(22.1887)		(5.91913)		(7.04887)	

Sum Sq	6E+10	Std Err	35135.5	LHS Mean	757105
R Sq	0.9745	R Bar Sq	0.9734	F 2, 47	897.632
D.W.(1)	0.9009	D.W.(4)	1.7334		

grp24dp = gross product, lumber and wood products, DPSA.
grp25dp = gross product, furniture and fixtures, DPSA.
rcngl154 = relative cost of natural gas, DPSA to US, logistic structure, pdl starting at lag 15 with a lag of 4 with even tails.

FURNITURE AND FIXTURES

MFG91:GRP25DP.TWO
Joint Two Stage Least Squares
QUARTERLY data for 50 periods from 1977Q3 to 1989Q4
Date: 31 DEC 1990

grp25dp

=	97202.2	* gpo25 +	10.0878	* w25dp/wb25 -	977405
	(253.513)		(20.5444)		(21.6289)

Sum Sq	3E+09	Std Err	7973.95	LHS Mean	1144106
R Sq	0.9995	R Bar Sq	0.9995	F 2, 47	47188.2
D.W.(1)	0.6374	D.W.(4)	1.2729		

grp25dp	=	gross product, furniture and fixtures, DPSA.
gpo25	=	gross product, furniture and fixtures, US.
w25dp	=	wages, furniture and fixtures, DPSA.
wb25	=	wages, furniture and fixtures, US.

PAPER AND PAPER PRODUCTS

GRP26DP.TWO
Joint Two Stage Least Squares
QUARTERLY data for 53 periods from 1976Q4 to 1989Q4
Date: 2 FEB 1991

grp26dp

```
     =    37551.9 * gpo26 +  532862 * rcwg261 +  107791 * rcngl[-15]
         (78.6513)          (1.70283)           (3.50594)

        + 52039.5 * rcell[-7] -  129198
          (1.44618)             (5.71358)

Sum Sq       9E+09   Std Err    13996.3   LHS Mean    986372
R Sq        0.9986   R Bar Sq    0.9984   F  4, 48   8287.39
D.W.( 1)    1.2151   D.W.( 4)    1.6828
```

grp26dp	=	gross product, paper and paper products, DPSA.
gpo26	=	gross product, paper and paper products, US.
rcwg261	=	relative cost of labor, DPSA to US, paper and paper products, logistic structure.
rcngl	=	relative cost of natural gas, DPSA to US, logistic structure.
rcell	=	relative cost of electricity, DPSA to US, logistic structure.

PRINTING AND PUBLISHING

MFG91:GRP27DP
Cochran-Orcutt
QUARTERLY data for 57 periods from 1975Q4 to 1989Q4
Date: 2 JAN 1991

grp27dp/(pgpo27/100)

```
     =    0.00846 * rgrpdp +  100810 * rcell[-7] + 81789.6 *rcngl[-6]
         (21.7691)           (3.76754)             (2.98581)

        - 73433.6
         (2.42026)
```

Sum Sq	7E+09	Std Err	11833.2	LHS Mean	471810
R Sq	0.9845	R Bar Sq	0.9826	F 6, 50	529.288
D.W.(1)	1.9997	D.W.(4)	1.6149		

```
AR_0 =  + 0.59903 * AR_1 + 0.23474 * AR_3 - 0.31384 * AR_5
         (5.05339)         (1.74169)        (2.37046)
```

grp27dp	=	gross product, printing and publishing, DPSA.
pgpo27	=	gross product deflator, printing and publishing, US.
rgrpdp	=	real gross product, total, DPSA.
rcell	=	relative cost of electricity, DPSA to US, logistic structure.
rcngl	=	relative cost of natural gas, DPSA to US, logistic structure.

CHEMICAL AND ALLIED PRODUCTS

MFG91:GRP28DP.TWO
Joint Two Stage Least Squares
QUARTERLY data for 72 periods from 1972Q1 to 1989Q4
Date: 31 DEC 1990

grp28dp

=	34257.9	* gpo28 +	44.2582	* w28dp/wb28 -	1508184
	(94.4449)		(9.20071)		(10.1696)

Sum Sq	2E+11	Std Err	47628.7	LHS Mean	1783401
R Sq	0.9970	R Bar Sq	0.9969	F 2, 69	11370.0
D.W.(1)	0.4791	D.W.(4)	1.7118		

grp28dp	=	gross product, chemical and allied products, DPSA.
gpo28	=	gross product, chemical and allied products, US.
w28dp	=	wages, chemical and allied products, DPSA.
wb28	=	wages, chemical and allied products, US.

RUBBER AND PLASTIC PRODUCTS

MFG91:GRP30DP.TWO
Joint Two Stage Least Squares
QUARTERLY data for 57 periods from 1975Q4 to 1989Q4
Date: 31 DEC 1990

grp30dp

```
     =    40828.7 * gpo30 + 11.0984 * w30dp/wb30 +  191173 *
         (68.9438)          (15.7155)               (3.14670)

          rcwg30186

       +  117012 * rcngl83 -  570525
         (3.58885)           (16.2391)
```

Sum Sq	1E+10	Std Err	14870.7	LHS Mean	825460
R Sq	0.9984	R Bar Sq	0.9983	F 4, 52	8274.25
D.W.(1)	0.3176	D.W.(4)	1.1254		

grp30dp	=	gross product, rubber and plastic products, DPSA.
gpo30	=	gross product, rubber and plastic products, US.
w30dp	=	wages, rubber and plastic products, DPSA.
wb30	=	wages, rubber and plastic products, US.
rcwg30186	=	relative cost of labor, DPSA to US, rubber and plastic products, pdl starting at lag 18 with a lag of 6 and even tails, logistic structure.
rcngl83	=	relative cost of natural gas, DPSA to US, pdl starting at lag 8 with a lag 3 and even tails.

STONE, CLAY, AND GLASS PRODUCTS

MFG91:GRP32DP.TWO
Joint Two Stage Least Squares
QUARTERLY data for 50 periods from 1977Q3 to 1989Q4
Date: 3 JAN 1991

grp32dp

```
     =    26440.9 * gpo32 + 19.5761 * w32dp/wb32 + 52998.0 * rcngl154
         (20.3093)          (12.8301)               (2.18982)

       -  499339
         (26.7854)
```

Sum Sq	4E+09	Std Err	8733.80	LHS Mean	558087
R Sq	0.9978	R Bar Sq	0.9977	F 3, 46	7013.95
D.W.(1)	0.1353	D.W.(4)	0.9488		

grp32dp	=	gross product, stone, clay, and glass products, DPSA.
gpo32	=	gross product, stone, clay, and glass products, US.
w32dp	=	wages, stone, clay, and glass products, DPSA.
wb32	=	wages, stone, clay, and glass products, US.
rcngl154	=	relative cost of natural gas, DPSA to US, logistic structure, pdl starting at lag 15 with a lag of 4 and even tails.

```
Cannot find GRP33DP.TWO

MFG91:GRP33DP
Nonlinear Least Squares
QUARTERLY data for 71 periods from 1972Q2 to 1989Q4
Date: 31 DEC 1990

grp33dp

     =    0.08625 * grp34dp+grp35dp+grp36dp+grp37dp - 3019.95
         (20.4530)                                    (354.413)

Sum Sq       1E+10    Std Err    12803.5    LHS Mean    268767    Res Mean
464.539
R Sq        0.9933    R Bar Sq    0.9930    F  3, 67   3316.12    %RMSE
8.1791
D.W.( 1)    1.9488    D.W.( 4)    1.9863

AR_0 =  + 0.89803 * AR_1
         (14.3350)


MA_0 =  + 0.24979 * MA_1
         (1.96397)
```

grp33dp = gross product, primary metal products, DPSA.
grp34dp = gross product, fabricated metal products, DPSA.
grp35dp = gross product, non-electrical machinery, DPSA.
grp36dp = gross product, electrical machinery, DPSA.
grp37dp = gross product, transportation equipment, DPSA.

FABRICATED METALS

MFG91:GRP34DP
Cochran-Orcutt
QUARTERLY data for 63 periods from 1974Q2 to 1989Q4
Date: 28 DEC 1990

grp34dp

```
     =    0.24285 * grp35dp+grp36dp+grp37dp + 8444.59
         (23.8320)                            (0.29789)

Sum Sq       1E+10   Std Err   16158.6   LHS Mean   651815
R Sq        0.9969   R Bar Sq   0.9966   F  5, 57  3608.07
D.W.( 1)    2.0488   D.W.( 4)   1.5510

AR_0 =  + 0.80582 * AR_1 + 0.18732 * AR_4 + 0.55130 * AR_8
          (10.6199)        (1.77793)        (4.15391)
        - 0.70431 * AR_9
          (6.82938)
```

grp34dp = gross product, fabricated metal products, DPSA.
grp35dp = gross product, non-electrical machinery, DPSA.
grp36dp = gross product, electrical machinery, DPSA.
grp37dp = gross product, transportation equipment, DPSA.

NON-ELECTRICAL MACHINERY

```
MFG91:GRP35DP.TWO
Joint Two Stage Least Squares
QUARTERLY data for 68 periods from 1973Q1 to 1989Q4
Date:  3 JAN 1991

grp35dp

     =    14811.8 * gpo35 + 100.145 * w35dp/wb35 + 1231723 *
         (33.5300)          (29.2436)               (4.77373)

          rcwg35114

        - 1877700
          (13.3417)

Sum Sq       10E+1   Std Err    38780.6   LHS Mean   1304037
R Sq        0.9959   R Bar Sq    0.9957   F  3, 64   5160.34
D.W.( 1)    0.3705   D.W.( 4)    1.4026
```

```
grp35dp   =    gross product, non-electrical machinery, DPSA.
gpo35     =    gross product, non-electrical machinery, US.
w35dp     =    wages, non-electrical machinery, DPSA.
wb35      =    wages, non-electrical machinery, US.
rcwg35114 =    relative cost of labor, DPSA to US, logistic structure,
                  pdl starting at lag 1 with a length of 4 and even tails.
```

ELECTRICAL MACHINERY

GRP36DP.TWO
Joint Two Stage Least Squares
QUARTERLY data for 63 periods from 1974Q2 to 1989Q4
Date: 2 FEB 1991

grp36dp

=	23127.5	* gpo36 +	594667	* rcwg361 -	372871	
	(56.1311)		(2.75614)		(7.11422)	

Sum Sq	1E+11	Std Err	45972.1	LHS Mean	1145863
R Sq	0.9917	R Bar Sq	0.9914	F 2, 60	3571.81
D.W.(1)	0.2971	D.W.(4)	1.0040		

grp36dp	=	gross product, electrical machinery, DPSA.
gpo36	=	gross product, electrical machinery, US.
rcwg361	=	relative cost of labor, DPSA to US, electrical machinery, logistic structure.

TRANSPORTATION EQUIPMENT

GRP37DP.TWO
Joint Two Stage Least Squares
QUARTERLY data for 63 periods from 1974Q2 to 1989Q4
Date: 2 FEB 1991

grp37dp

=	6827.59	* gpo37 +	157265	* rcng124 -	228329	
	(28.1721)		(2.03470)		(7.33855)	

Sum Sq	8E+10	Std Err	36930.0	LHS Mean	265484
R Sq	0.9669	R Bar Sq	0.9658	F 2, 60	876.663
D.W.(1)	0.1582	D.W.(4)	0.5461		

grp37dp	=	gross product, transportation equipment, DPSA.
gpo37	=	gross product, transportation equipment, US.
rcng124	=	relative cost of natural gas, DPSA to US, logistic structure, pdl starting at lag 2 with a length of 4 and even tails.

INSTRUMENTS

```
MFG91:GRP38DP
Cochran-Orcutt
QUARTERLY data for 55 periods from 1976Q2 to 1989Q4
Date:  3 JAN 1991

grp38dp/(pgpo38/100)

     =    0.00546 * rgrpdp +  389377 * rcwg38155 -  235298
         (14.0773)           (6.63954)             (5.09580)

Sum Sq      1E+09   Std Err   5459.70   LHS Mean   255263
R Sq       0.9838   R Bar Sq   0.9814   F  7, 47  407.137
D.W.( 1)   1.7990   D.W.( 4)   1.9693

AR_0 =  + 0.69941 * AR_1 - 0.17889 * AR_2 + 0.37177 * AR_4
         (6.36984)         (1.64563)         (3.18222)
        - 0.54128 * AR_5 + 0.23317 * AR_8
         (5.02901)         (3.80929)
```

grp38dp = gross product, instruments, DPSA.
pgpo38 = gross product deflator, instruments, US.
rgrpdp = real gross product, total, DPSA.
rcwg38155 = relative cost of labor, DPSA to US, instruments, pdl starting at lag 5 with a length of 5 and even tails.

MISCELLANEOUS PRODUCTS

MFG91:GRP39DP
Cochran-Orcutt
QUARTERLY data for 62 periods from 1974Q3 to 1989Q4
Date: 3 JAN 1991

grp39dp

```
     =    0.00353 * rgrpdp + 34070.7 * rcell103 + 19196.6 * rcngl[-5]
         (14.7324)           (3.00830)            (2.81273)

       -  113511
          (6.31723)
```

Sum Sq	5E+08	Std Err	2820.91	LHS Mean	109152
R Sq	0.9957	R Bar Sq	0.9954	F 4, 57	3303.52
D.W.(1)	1.9861	D.W.(4)	2.0212		

```
AR_0 =  + 0.89171 * AR_1
         (12.8426)
```

grp39dp	=	gross product, miscellaneous products, DPSA.
rgrpdp	=	real gross product, total, DPSA.
rcell103	=	relative cost of electricity, DPSA to US, logistic structure, pdl starting at lag 10 with length 3 and even tails.
rcngl	=	relative cost of natural gas, DPSA to US, logistic structure.

C. NON-MANUFACTURING WAGE EQUATIONS

Wages
Employment
Gross Product

NON-MANUFACTURING WAGE EQUATIONS

Cochran-Orcutt
QUARTERLY data for 40 periods from 1980Q1 to 1989Q4
Date: 6 JAN 1991

log(agwdpx)

```
     =    1.19990 * log(em01beax) + 0.71552 * log(wrwaff) - 2.83283
         (7.68050)                  (2.68200)               (2.95020)

Sum Sq      0.0704   Std Err    0.0442   LHS Mean  11.8525
R Sq        0.9879   R Bar Sq   0.9869   F  3, 36  982.471
D.W.( 1)    1.4862   D.W.( 4)   2.2690

AR_0 =  + 0.75914 * AR_1
         (7.17244)
```

Ordinary Least Squares
QUARTERLY data for 48 periods from 1978Q1 to 1989Q4
Date: 15 JAN 1991

log(conwdpx)

```
     =    1.44396 * log(em15beax+em16beax+em17beax)
         (56.4795)

        + 0.96496 * log(ahecc$) - 4.76000
         (32.9671)                (18.0985)
```

Sum Sq	0.0205	Std Err	0.0213	LHS Mean	14.7009
R Sq	0.9960	R Bar Sq	0.9959	F 2, 45	5656.91
D.W.(1)	0.6036	D.W.(4)	2.1793		

```
Cochran-Orcutt
QUARTERLY data for 24 periods from 1984Q1 to 1989Q4
Date:  6 JAN 1991

log(fwdpx)

     =    1.18483 * log(emfarbeax) + 1.42882 * log(wrwaff) - 6.42699
         (6.14020)                   (11.3809)               (2.44293)

Sum Sq      0.0325   Std Err     0.0413   LHS Mean  13.2695
R Sq        0.8737   R Bar Sq    0.8471   F  4, 19  32.8498
D.W.( 1)    1.0726   D.W.( 4)    1.3216

AR_0 =  - 0.08557 * AR_3 - 0.32268 * AR_4
         (1.57115)         (6.07364)
```

```
Cochran-Orcutt
QUARTERLY data for 48 periods from 1978Q1 to 1989Q4
Date: 26 DEC 1990

log(firwdpx)

     =    0.92940 * log(emfirbeax) + 1.06016 * log(ahefi$)
         (4.04100)                   (2.98355)

        - 0.03760 * d82 + 1.35853
         (3.00868)       (0.53040)

Sum Sq      0.0122   Std Err     0.0168   LHS Mean  14.3524
R Sq        0.9977   R Bar Sq    0.9974   F  4, 43  4564.24
D.W.( 1)    1.6234   D.W.( 4)    1.5071

AR_0 =  + 0.93964 * AR_1
         (22.8426)
```

Cochran-Orcutt
QUARTERLY data for 60 periods from 1975Q1 to 1989Q4
Date: 26 DEC 1990

log(govwdpx)

```
     =    1.36540 * log(emgovbeax) + 0.91446 * log(wrwgov) - 7.52848
         (15.4973)                   (29.3386)               (7.49850)

Sum Sq      0.0083   Std Err     0.0122   LHS Mean  15.0993
R Sq        0.9990   R Bar Sq    0.9990   F  3, 56  19225.2
D.W.( 1)    1.0152   D.W.( 4)    2.2582

AR_0 =  + 0.75525 * AR_4
         (7.74063)
```

```
Cochran-Orcutt
QUARTERLY data for 48 periods from 1978Q1 to 1989Q4
Date: 15 JAN 1991

log(minwdpx)

     =    0.88632 * log(em10beax) + 0.82969 * log(ahemg14$)
         (1.63639)                  (1.79930)

        - 0.47310 * d8689 + 0.22855 * d85 + 2.64546
         (3.88123)          (2.48378)       (0.60516)

Sum Sq      0.3088   Std Err     0.0857   LHS Mean  11.3711
R Sq        0.8893   R Bar Sq    0.8761   F  5, 42  67.4741
D.W.( 1)    1.6521   D.W.( 4)    1.5233

AR_0 =  + 0.79104 * AR_1
         (7.28044)
```

```
Cochran-Orcutt
QUARTERLY data for 48 periods from 1978Q1 to 1989Q4
Date: 15 JAN 1991

log(rtrwdpx)

     =    1.18548 * log(emrtrbeax) + 0.90379 * log(ahewr$)
         (9.00978)                   (4.02827)

        - 0.09712 * d82 - 1.72215
         (9.32082)       (1.33108)

Sum Sq      0.0028   Std Err     0.0080   LHS Mean   15.1156
R Sq        0.9993   R Bar Sq    0.9992   F  4, 43   15593.6
D.W.( 1)    2.0745   D.W.( 4)    1.3093

AR_0 =  + 0.84181 * AR_1
         (7.68718)
```

Ordinary Least Squares
QUARTERLY data for 56 periods from 1976Q1 to 1989Q4
Date: 15 JAN 1991

log(serwdpx)

```
     =    1.12428 * log(emserbeax) + 0.91482 * log(aheser) - 0.88959
         (21.0035)                   (24.3491)               (1.43447)

Sum Sq      0.0296   Std Err     0.0236   LHS Mean  15.4958
R Sq        0.9974   R Bar Sq    0.9973   F  2, 53  10319.9
D.W.( 1)    0.3413   D.W.( 4)    1.4738
```

```
Cochran-Orcutt
QUARTERLY data for 72 periods from 1972Q1 to 1989Q4
Date: 26 DEC 1990

log(tpuwdpx)

     =    1.03863 * log(emtpubeax) + 1.09687 * log(ahergt$) + 0.18387
         (15.1769)                   (23.1975)                 (0.26040)

Sum Sq      0.0045   Std Err     0.0081   LHS Mean   14.5120
R Sq        0.9997   R Bar Sq    0.9997   F  3, 68   89921.4
D.W.( 1)    2.2381   D.W.( 4)    1.5604

AR_0 =  + 0.86404 * AR_1
          (12.1945)
```

Cochran-Orcutt
QUARTERLY data for 48 periods from 1978Q1 to 1989Q4
Date: 26 DEC 1990

log(wtrwdpx)

```
     =    1.31669 * log(em5051beax) + 1.36181 * log(ahewr$) - 3.13340
         (17.7907)                    ( 9.7906)              (4.05148)

Sum Sq      0.0031   Std Err    0.0084   LHS Mean  14.7054
R Sq        0.9992   R Bar Sq   0.9992   F  3, 44  19520.6
D.W.( 1)    1.8459   D.W.( 4)   1.5500

AR_0 =   + 0.87085 * AR_1
          (21.1427)
```

NON-MANUFACTURING GROSS REGIONAL PRODUCT

Cochran-Orcutt
QUARTERLY data for 56 periods from 1976Q1 to 1989Q4
Date: 30 JAN 1991

grpagdp

```
     =    0.01599 * grpdp +   2E+08 * agwdpx/totwage -  884115
         (11.9438)          (8.90553)                  (11.3845)

Sum Sq      3E+10   Std Err   25187.0   LHS Mean    631708
R Sq       0.9894   R Bar Sq   0.9888   F  3, 52  1623.32
D.W.( 1)   1.8766   D.W.( 4)   1.6726

AR_0 =  + 0.75405 * AR_1
         (8.73174)
```

Cochran-Orcutt
QUARTERLY data for 56 periods from 1976Q1 to 1989Q4
Date: 8 JAN 1991

grpcondp

```
     =    25119.9 * gpocon82 + 1748.90 * conwdpx/wb +    2E+07
         (8.82414)            (4.48513)               (0.01268)

Sum Sq       3E+11   Std Err    75154.9   LHS Mean   4689584
R Sq        0.9891   R Bar Sq    0.9883   F  4, 51   1160.44
D.W.( 1)    1.6706   D.W.( 4)    1.3452

AR_0 =  + 0.69324 * AR_1 + 0.30603 * AR_4
         (7.15721)         (2.71018)
```

Cochran-Orcutt
QUARTERLY data for 32 periods from 1982Q1 to 1989Q4
Date: 9 JAN 1991

grpfdp

```
     =    0.03660 * grpdp +   2E+08 * fwdpx/totwage - 2209796
         (7.44893)          (17.2589)                 (6.06584)

Sum Sq      2E+11   Std Err   81770.9   LHS Mean  2411830
R Sq       0.9793   R Bar Sq   0.9771   F  3, 28  441.974
D.W.( 1)   1.8048   D.W.( 4)   1.7518

AR_0 =  + 0.72260 * AR_1
          (5.45550)
```

```
Cochran-Orcutt
QUARTERLY data for 56 periods from 1976Q1 to 1989Q4
Date:  8 JAN 1991

grpfirdp

     =    0.03034 * grpdp +   5E+07 * firwdpx/totwage - 1296742
         (6.64985)          (10.1369)                   (2.42616)

Sum Sq       6E+10   Std Err    34812.0   LHS Mean   3049406
R Sq        0.9911   R Bar Sq    0.9902   F  5, 50   1117.65
D.W.( 1)    2.0910   D.W.( 4)    2.5982

AR_0 =  + 0.73812 * AR_1 + 0.90578 * AR_4 - 0.68980 * AR_5
         (8.09031)         (14.4589)         (6.85818)
```

Ordinary Least Squares
QUARTERLY data for 56 periods from 1976Q1 to 1989Q4
Date: 30 JAN 1991

grpgovdp

```
      =    498.822 * (nddpsay.4/pdice.4)/sapop.4
          (31.5723)

         + 8447084 * govwdpx/totwage - 1460120
           (1.40433)                  (2.04826)

Sum Sq       4E+11   Std Err   91212.2   LHS Mean  3888766
R Sq        0.9522   R Bar Sq   0.9504   F  2, 53  527.732
D.W.( 1)    1.5186   D.W.( 4)   0.8810
```

Cochran-Orcutt
QUARTERLY data for 48 periods from 1978Q1 to 1989Q4
Date: 8 JAN 1991

grpmindp

```
     =    0.00418 * grpdp +   1E+08 * minwdpx/totwage -  207784
         (3.38575)          (12.6113)                   (2.13163)

Sum Sq       2E+10   Std Err   22133.7   LHS Mean    369705
R Sq        0.9340   R Bar Sq   0.9296   F  3, 44   207.716
D.W.( 1)    1.8381   D.W.( 4)   1.8325

AR_0 =  + 0.73002 * AR_1
         (7.39573)
```

Cochran-Orcutt
QUARTERLY data for 48 periods from 1978Q1 to 1989Q4
Date: 8 JAN 1991

grprtrdp

```
     =    21.4136 * ndpsay/pdice +   7E+07 * rtrwdpx/totwage - 9949278
         (11.7790)                 (7.13716)                 (6.70667)

Sum Sq       4E+11   Std Err    90562.4   LHS Mean   7288830
R Sq        0.9946   R Bar Sq    0.9941   F  4, 43   1975.39
D.W.( 1)    1.7926   D.W.( 4)    1.5317

AR_0 =  + 0.53479 * AR_1 + 0.33877 * AR_4
         (4.84719)         (3.15789)
```

```
Cochran-Orcutt
QUARTERLY data for 40 periods from 1980Q1 to 1989Q4
Date:  8 JAN 1991

grpserdp

     =    23.6362 * nddpsay/pdice +   6E+07 * serwdpx/totwage - 8099526
         (3.88812)                  (4.46545)                  (2.80275)

Sum Sq       1E+12   Std Err     203523   LHS Mean     1E+07
R Sq       0.9901   R Bar Sq    0.9886   F  5, 34   679.732
D.W.( 1)   1.5238   D.W.( 4)    2.6307

AR_0 =  + 0.77479 * AR_1 + 0.74183 * AR_4 - 0.68533 * AR_5
         (6.08541)         (6.88914)         (4.65334)
```

```
G1RP91:GRPTPUDP
Cochran-Orcutt
QUARTERLY data for 48 periods from 1978Q1 to 1989Q4
Date:  8 JAN 1991

grptpudp

     =    0.08155 * grpdp +   3E+07 * tpuwdpx/totwage - 2480344
        (43.4061)          (4.03471)                    (5.18219)

Sum Sq       1E+11   Std Err   59107.8   LHS Mean  4901146
R Sq       0.9957    R Bar Sq   0.9952   F  5, 42  1954.50
D.W.( 1)   2.2077    D.W.( 4)   1.6204

AR_0 =  + 0.71877 * AR_1 + 0.70235 * AR_4 - 1.08423 * AR_5
          (9.28988)        (5.19459)        (8.24270)
```

```
GRP91:GRPWTRDP
Cochran-Orcutt
QUARTERLY data for 48 periods from 1978Q1 to 1989Q4
Date: 30 JAN 1991

grpwtrdp

     =    0.02493 * rgrpmfgdp[-1] + 0.54578 * grprtrdp
         (1.89369)                  (13.4325)

          +   7E+07 * wtrwdpx/totwage - 4082829
             (8.85683)                 (7.58174)

Sum Sq       1E+11   Std Err   50552.0   LHS Mean  4835754
R Sq        0.9962   R Bar Sq   0.9958   F  4, 43  2801.67
D.W.( 1)    2.0463   D.W.( 4)   1.2751

AR_0 =  + 0.75532 * AR_1
         (7.58591)
```

NON-MANUFACTURING EMPLOYMENT

Cochran-Orcutt
QUARTERLY data for 40 periods from 1980Q1 to 1989Q4
Date: 2 JAN 1991

em01beax

```
     =    0.01277 * grpagdp - 2660.22 * wrwaff.8/uckag.8
         (14.0986)            (2.83198)

        - 64.4620 * lpag[-3] + 8604.71
         (1.26575)             (5.56201)

Sum Sq     3880219   Std Err    332.962   LHS Mean   12833.6
R Sq        0.9874   R Bar Sq    0.9859   F  4, 35   683.096
D.W.( 1)    1.4858   D.W.( 4)    2.0144

AR_0 =  + 0.70255 * AR_1
         (5.27002)
```

```
Cochran-Orcutt
QUARTERLY data for 40 periods from 1980Q1 to 1989Q4
Date:  2 JAN 1991

em10beax

     =    0.00004 * ndpsay/pdice - 92.5360 * rwr14 + 1775.19
         (4.80682)                 (1.23985)         (4.07083)

Sum Sq      136622   Std Err   61.6040   LHS Mean  2784.76
R Sq        0.8860   R Bar Sq   0.8765   F  3, 36  93.2636
D.W.( 1)    1.9030   D.W.( 4)   2.1661

AR_0 =  + 0.58292 * AR_1
          (3.88328)
```

Ordinary Least Squares
QUARTERLY data for 48 periods from 1978Q1 to 1989Q4
Date: 15 JAN 1991

em15beax

```
     =    0.01052 * grpcondp - 73793.0 * ahecc$./uckcom.
         (25.4279)             (3.52869)

        - 415.108 * intmort[-6] - 618.830 * lpcon[-8] + 30144.2
         (3.91931)                (5.23854)             (6.70452)
```

Sum Sq	10E+0	Std Err	1488.56	LHS Mean	44084.7
R Sq	0.9655	R Bar Sq	0.9623	F 4, 43	300.883
D.W.(1)	1.4041	D.W.(4)	2.2578		

Cochran-Orcutt
QUARTERLY data for 56 periods from 1976Q1 to 1989Q4
Date: 29 DEC 1990

em16beax

```
      =     0.00224 * grpcondp - 45106.5 * ahecc$/uckcom
           (5.14985)             (2.83518)

          - 188.217 * intprime[-3] + 17246.0
           (2.33742)                 (5.71912)

Sum Sq       3E+07   Std Err   765.105   LHS Mean  20332.9
R Sq        0.8775   R Bar Sq   0.8678   F  4, 51  91.2959
D.W.( 1)    2.2188   D.W.( 4)   1.1174

AR_0 =   + 0.71644 * AR_1
           (6.91305)
```

Ordinary Least Squares
QUARTERLY data for 48 periods from 1978Q1 to 1989Q4
Date: 15 JAN 1991

em17beax

```
     =    0.00828 * grpcondp -  126121 * ahecc$.4/uckcom.4
          (5.59733)             (4.84783)

        - 661.560 * lpcon[-8] + 0.96134 * em15beax + 37962.7
          (4.00907)             (6.95433)            (6.84535)
```

Sum Sq	1E+08	Std Err	1741.22	LHS Mean	76891.3
R Sq	0.9863	R Bar Sq	0.9851	F 4, 43	775.385
D.W.(1)	1.3897	D.W.(4)	1.7807		

Ordinary Least Squares
QUARTERLY data for 44 periods from 1979Q1 to 1989Q4
Date: 2 JAN 1991

em4147beax

```
      =    0.00140 * grptpudp - 6305.98 * ahergt$/ucktpu
          (27.0363)             (1.77282)

         - 26.0283 * lptrn[-4] + 88.6240
          (1.61838)              (0.12002)

Sum Sq     1486013   Std Err    192.744   LHS Mean   5202.24
R Sq        0.9745   R Bar Sq    0.9726   F  3, 40   510.285
D.W.( 1)    0.7170   D.W.( 4)    1.5307
```

```
Cochran-Orcutt
QUARTERLY data for 48 periods from 1978Q1 to 1989Q4
Date:  2 JAN 1991

em42beax

     =    0.00064 * grpdp - 710.838 * ahergt$.16/ppi.16
         (58.0610)          (2.44973)

         - 18050.2 * tranrat + 30303.8
          (4.70869)           (8.20325)

Sum Sq       2E+07   Std Err    627.304   LHS Mean   46818.2
R Sq        0.9913   R Bar Sq    0.9903   F  5, 42   962.537
D.W.( 1)    2.0527   D.W.( 4)    1.9138

AR_0 =  + 0.45703 * AR_1 - 0.38940 * AR_2
          (3.14034)         (2.68613)
```

Ordinary Least Squares
QUARTERLY data for 48 periods from 1978Q1 to 1989Q4
Date: 2 JAN 1991

em45beax

```
      =    0.00043 * grpdp - 39340.9 * ahergt$.10/ucktpu.10
          (37.8514)          (4.67577)

           - 18593.0 * tranrat[-4] + 4613.06
            (3.38365)                (0.78512)
```

Sum Sq	2E+07	Std Err	656.040	LHS Mean	9193.52
R Sq	0.9790	R Bar Sq	0.9775	F 3, 44	683.125
D.W.(1)	0.4932	D.W.(4)	1.8092		

```
Ordinary Least Squares
QUARTERLY data for 48 periods from 1978Q1 to 1989Q4
Date:  2 JAN 1991

em48beax

     =    0.00011*grpdp -39394.9 * ahergc48$./uck48.- 35.7003 * lp48[-2]
         (3.63333)      (9.49107)                    (1.49273)

        - 2453.29 * d8485 - 2499.49 * dstrk + 23586.8
         (15.5003)         (5.90230)         (59.3716)

Sum Sq     5890670   Std Err   374.505   LHS Mean  22932.0
R Sq        0.8834   R Bar Sq   0.8695   F  5, 42  63.6137
D.W.( 1)    1.3002   D.W.( 4)   2.6341
```

Ordinary Least Squares
QUARTERLY data for 48 periods from 1978Q1 to 1989Q4
Date: 2 JAN 1991

em49beax

```
      =    0.00048*grpdp - 2806.25*ahergu49$.6/ppi.6 - 83.5149*lp49[-6]
          (8.51814)       (5.83797)                   (1.56640)

         + 37477.4
          (7.87729)
```

Sum Sq	6E+07	Std Err	1146.42	LHS Mean	27390.8
R Sq	0.7189	R Bar Sq	0.6997	F 3, 44	37.5006
D.W.(1)	0.5197	D.W.(4)	1.7558		

```
Cochran-Orcutt
QUARTERLY data for 48 periods from 1978Q1 to 1989Q4
Date:  3 JAN 1991

em5051beax

     =    0.00114 * rgrpmfgdp[-1] + 0.00701 * grprtrdp[-2]
         (3.90477)                  (6.86283)

       -  235295 * ahewr$/uckcom + 56224.9
         (4.49136)                 (14.1889)

Sum Sq       8E+07   Std Err    1358.46   LHS Mean    112837
R Sq        0.9876   R Bar Sq    0.9861   F  5, 42   668.689
D.W.( 1)    1.7961   D.W.( 4)    2.1361

AR_0 =  + 0.77538 * AR_1 - 0.24517 * AR_4
         (8.13420)         (2.45308)
```

```
Cochran-Orcutt
QUARTERLY data for 48 periods from 1978Q1 to 1989Q4
Date:  3 JAN 1991

em52beax

     =    2.04482 * (nddpsay.2/pdice.2)/sapop.2
         (3.44192)

        + 0.03294 * em15beax+em17beax - 906.774 * ahewr$/ppi
         (1.87726)                     (2.54230)

        + 2.19943 * sapop[-1] - 8883.69
         (2.00726)              (2.60420)

Sum Sq     3528610   Std Err   293.366   LHS Mean  17273.6
R Sq        0.9881   R Bar Sq   0.9863   F  6, 41  566.357
D.W.( 1)    2.0518   D.W.( 4)   1.9464

AR_0 =  + 0.44624 * AR_1 - 0.22400 * AR_4
         (3.80784)        (1.90784)
```

Cochran-Orcutt
QUARTERLY data for 40 periods from 1980Q1 to 1989Q4
Date: 3 JAN 1991

em53beax

```
     =    0.00144 * (nddpsay.4/pdice.4) -  169693 * ahewr$./uckcom.
         (6.10270)                         (2.27825)

        + 6880.31
         (0.72010)

Sum Sq       5E+07   Std Err   1137.88   LHS Mean  52282.2
R Sq        0.9669   R Bar Sq   0.9641   F  3, 36  350.502
D.W.( 1)    1.8877   D.W.( 4)   2.1356

AR_0 =   + 0.85736 * AR_1
          (11.6435)
```

```
Cochran-Orcutt
QUARTERLY data for 44 periods from 1979Q1 to 1989Q4
Date:  3 JAN 1991

em54beax

     =    0.00068 * (nddpsay.10/pdice.10) + 51.9194 * sapop
         (1.70941)                           (3.70239)

       -  102802 * ahewr$/uckcom -  180879
         (1.89423)                 (3.80834)

Sum Sq       3E+07   Std Err   872.631   LHS Mean  62237.2
R Sq        0.9915   R Bar Sq   0.9906   F  4, 39  1135.75
D.W.( 1)    1.9518   D.W.( 4)   2.4182

AR_0 =  + 0.82823 * AR_1
         (12.0142)
```

QUARTERLY data for 36 periods from 1981Q1 to 1989Q4
Date: 3 JAN 1991

em55beax

```
     =    4.62189 * (nddpsay.1/pcemvp.1)/sapop.1 + 16.0866 * newcar[-6]
         (22.5187)                                          (5.01701)

        - 59068.4 * ahewr$.5/uckcom.5 - 5740.86
         (1.92026)                     (4.35648)

Sum Sq      2E+07   Std Err   737.265   LHS Mean  40483.4
R Sq       0.9824   R Bar Sq   0.9807   F  3, 32  595.345
D.W.( 1)   1.4840   D.W.( 4)   2.0968
```

```
Cochran-Orcutt
QUARTERLY data for 64 periods from 1974Q1 to 1989Q4
Date:  4 JAN 1991

em56beax

     =     1.71518 * (nddpsay.2/pcecas.2)/sapop.2
          (4.16465)

          - 1124.53 * ahewr$.8/ppi.8 + 13925.1
           (1.68350)                   (2.86219)

Sum Sq       1E+07   Std Err   420.733   LHS Mean  20617.5
R Sq        0.9830   R Bar Sq   0.9821   F  3, 60  1154.59
D.W.( 1)    2.1653   D.W.( 4)   1.5896

AR_0 =   + 0.94842 * AR_1
          (20.9852)
```

Cochran-Orcutt
QUARTERLY data for 64 periods from 1974Q1 to 1989Q4
Date: 4 JAN 1991

em57beax

```
     =    0.97207 * (nddpsay.1/pcefhe.1)/sapop.1 + 5.68944 * sapop[-6]
         (5.14295)                                          (2.77663)

        - 17469.0 * ahewr$.14/uckcom.14 - 14087.3
         (1.41041)                       (1.99280)

Sum Sq    9094950   Std Err   392.622   LHS Mean  16854.0
R Sq       0.9895   R Bar Sq   0.9888   F  4, 59  1390.49
D.W.( 1)   1.9102   D.W.( 4)   2.0082

AR_0 =  + 0.63369 * AR_1
         (6.17595)
```

```
Cochran-Orcutt
QUARTERLY data for 56 periods from 1976Q1 to 1989Q4
Date:  4 JAN 1991

em58beax

     =    0.00132 * (nddpsay.4/pcefab.4) + 77.7701 * sapop
         (4.97632)                          ( 9.8789)

       -  136883 * ahewr$.16/uckcom.16 -  267527
         (3.25847)                       (10.7396)

Sum Sq       8E+07   Std Err   1277.55   LHS Mean    100775
R Sq        0.9976   R Bar Sq   0.9974   F  4, 51  5315.27
D.W.( 1)    1.9839   D.W.( 4)   2.4758

AR_0 =  + 0.56062 * AR_1
         (5.00547)
```

Cochran-Orcutt
QUARTERLY data for 56 periods from 1976Q1 to 1989Q4
Date: 4 JAN 1991

em59beax

```
     =    4.43357 * (nddpsay.2/pdice.2)/sapop.2 + 15.3002 * sapop[-8]
          (3.77399)                                (3.55631)

          - 3727.18 * ahewr$.6/ppi.6 - 31122.3
          (2.42648)                  (2.03375)

Sum Sq       3E+07   Std Err   755.141   LHS Mean  47905.0
R Sq        0.9864   R Bar Sq   0.9854   F  4, 51  928.082
D.W.( 1)    1.6392   D.W.( 4)   2.4724

AR_0 =  + 0.65013 * AR_1
         (6.04273)
```

```
Cochran-Orcutt
QUARTERLY data for 48 periods from 1978Q1 to 1989Q4
Date:  5 JAN 1991

em6061beax

      =    0.00138 * ndpsay/pdice - 86741.2 * ahefi$.4/uckcom.4
          (37.3451)                 (6.15795)

         - 173.133 * lpfir[-4] + 13064.8
          (2.52140)              (1.84121)

Sum Sq       1E+07   Std Err   563.369   LHS Mean  54190.6
R Sq        0.9958   R Bar Sq   0.9953   F  5, 42  1976.96
D.W.( 1)    1.8824   D.W.( 4)   2.2561

AR_0 =  + 0.83624 * AR_1 - 0.36448 * AR_4
          (9.04854)        (3.85270)
```

Ordinary Least Squares
QUARTERLY data for 44 periods from 1979Q1 to 1989Q4
Date: 5 JAN 1991

em6267beax

```
      =    0.00067 * ndpsay.1/pdice.1 - 13531.4 * ahefi$.6/uckcom.6
          (24.0057)                     (2.09069)

           - 164.826 * lpfir[-10] + 1612.08
            (3.08766)               (0.28052)

Sum Sq     6333010   Std Err   397.901   LHS Mean  16974.5
R Sq        0.9916   R Bar Sq   0.9909   F  3, 40  1565.77
D.W.( 1)    1.4173   D.W.( 4)   2.3399
```

```
Cochran-Orcutt
QUARTERLY data for 72 periods from 1972Q1 to 1989Q4
Date:  5 JAN 1991

em63beax

     =    4.34084 * (ndpsay/pdice)/sapop - 1177.28 * ahefi$/ppi
         (13.6919)                          (2.48602)

        - 63.7379 * lpfir[-1] - 2629.57
         (1.26930)             (0.47849)

Sum Sq       3E+07   Std Err   685.675   LHS Mean  27118.0
R Sq        0.9797   R Bar Sq   0.9785   F  4, 67  806.981
D.W.( 1)    1.7882   D.W.( 4)   2.0634

AR_0 =  + 0.69728 * AR_1
         (8.53345)
```

Cochran-Orcutt
QUARTERLY data for 48 periods from 1978Q1 to 1989Q4
Date: 5 JAN 1991

em65beax

```
     =    0.00039 * (ndpsay.1/pdice.1) + 10.0862 * sapop[-8]
         (3.70694)                       (2.56045)

        - 78.7873 * lpfir[-1] - 32482.9
         (2.54285)              (2.47681)

Sum Sq     3864674   Std Err    299.793   LHS Mean   20572.0
R Sq        0.9948   R Bar Sq    0.9943   F  4, 43   2053.78
D.W.( 1)    1.9450   D.W.( 4)    2.2185

AR_0 =  + 0.81584 * AR_1
         (7.96141)
```

```
Ordinary Least Squares
QUARTERLY data for 32 periods from 1982Q1 to 1989Q4
Date:  6 JAN 1991

em70beax

     =    0.05757 * (ndpsay.1/pdices.1) + 18.4683 * sapop[-6]
         (7.56059)                         (6.58056)

        - 30272.4*ahesvot$.4/uckcom.4 - 492.992 * lpser[-8] - 67792.7
         (4.25128)                     (2.06164)             (7.99819)

Sum Sq     1935010   Std Err   267.707   LHS Mean  23305.5
R Sq        0.9948   R Bar Sq   0.9941   F  4, 27  1300.67
D.W.( 1)    1.5062   D.W.( 4)   1.8721
```

```
Cochran-Orcutt
QUARTERLY data for 28 periods from 1983Q1 to 1989Q4
Date:  6 JAN 1991

em72beax

     =    32.8195 * sapop[-1] -  100809 * ahesvot$.8/uckcom.8
         (9.9839)               (4.61229)

        - 1403.05 * lpser[-12] - 68816.5
         (2.42094)              (3.98177)

Sum Sq     7351037   Std Err    578.047   LHS Mean  30396.3
R Sq        0.9377   R Bar Sq    0.9235   F  5, 22  66.1699
D.W.( 1)    1.9771   D.W.( 4)    2.2723

AR_0 =  + 0.56730 * AR_1 - 0.41193 * AR_4
         (4.29659)         (3.61850)
```

Ordinary Least Squares
QUARTERLY data for 48 periods from 1978Q1 to 1989Q4
Date: 6 JAN 1991

em7389beax

```
     =    0.00311 * grpdp -  359993 * ahesv73$.4/uckcom.4
         (10.2622)          (3.44976)

        - 8612.89 * lpser[-8] + 0.18081 * ndpsay.4/pdices.4 +  107308
         (3.04519)              (2.31222)                      (1.85736)

Sum Sq       6E+08   Std Err   3829.05   LHS Mean    143377
R Sq        0.9907   R Bar Sq   0.9898   F  4, 43  1146.17
D.W.( 1)    1.3696   D.W.( 4)   1.3378
```

Cochran-Orcutt
QUARTERLY data for 36 periods from 1981Q1 to 1989Q4
Date: 16 JAN 1991

em7576beax

```
     =    0.12021 * (nddpsay.1/pdices.1)
         (18.0500)

        - 17244.0 * ahesvot$.12/uckcom.12 + 6.78759 * newcar[-10]
         (1.25048)                           (2.79239)

        - 20549.9
         (8.53178)

Sum Sq     8631424   Std Err    527.668   LHS Mean   27463.7
R Sq        0.9831   R Bar Sq    0.9809   F  4, 31   450.982
D.W.( 1)    1.7833   D.W.( 4)    2.2359

AR_0 =  + 0.53150 * AR_1
         (3.02509)
```

```
Cochran-Orcutt
QUARTERLY data for 48 periods from 1978Q1 to 1989Q4
Date:  6 JAN 1991

em7884beax

      =     0.04672 * (nddpsay.1/pdices.1)
           (5.08223)

          - 17056.8 * ahesvot$.14/uckcom.14 - 1047.51 * lpser[-2]
           (1.53463)                          (2.80937)

          + 5141.96 * d8889 + 29334.2
           (7.89131)         (2.79474)

Sum Sq        1E+07   Std Err   587.548   LHS Mean  20277.7
R Sq         0.9748   R Bar Sq   0.9718   F  5, 42  324.348
D.W.( 1)     1.8216   D.W.( 4)   2.3525

AR_0 =   + 0.49985 * AR_1
          (3.23370)
```

Cochran-Orcutt
QUARTERLY data for 40 periods from 1980Q1 to 1989Q4
Date: 16 JAN 1991

em80beax

```
     =    0.11527 * (nddpsay.8/pdices.8) + 121.024 * sapop[-4]
         (1.83886)                          (4.60512)

        - 4510.38 * ahesv80$.4/ppi.4 -  410751
         (1.43934)                    (4.86260)

Sum Sq       6E+07   Std Err   1292.99   LHS Mean    120658
R Sq        0.9920   R Bar Sq   0.9911   F  4, 35   1087.84
D.W.( 1)    1.8643   D.W.( 4)   2.3381

AR_0 =  + 0.83435 * AR_1
          (11.1057)
```

```
Cochran-Orcutt
QUARTERLY data for 40 periods from 1980Q1 to 1989Q4
Date:  6 JAN 1991

em8183beax

     =    0.12774 * (nddpsay.4/pdices.4)+19.4926 * sapop[-1] - 95166.2
         (4.92050)                        (3.55450)            (6.60591)

Sum Sq     7218950   Std Err   454.154   LHS Mean  38379.4
R Sq        0.9952   R Bar Sq   0.9947   F  4, 35  1816.63
D.W.( 1)    2.1220   D.W.( 4)   2.3560

AR_0 =  + 0.81592 * AR_1 - 0.19999 * AR_4
          (7.19314)        (1.92523)
```

Ordinary Least Squares
QUARTERLY data for 32 periods from 1982Q1 to 1989Q4
Date: 5 JAN 1991

em82beax

```
      =    0.07226 * (ndpsay.4/pdices.4) + 37.6410 * sapop[-12]
          (13.0140)                         (21.3883)

           - 192.440 * ahesvot$./ppi. -  147578
            (1.58840)                  (28.9478)
```

Sum Sq	2909154	Std Err	322.333	LHS Mean	43403.2
R Sq	0.9976	R Bar Sq	0.9973	F 3, 28	3817.62
D.W.(1)	0.5956	D.W.(4)	2.1300		

```
Cochran-Orcutt
QUARTERLY data for 32 periods from 1982Q1 to 1989Q4
Date:  6 JAN 1991

emfarbeax

     =    0.00218 * grpfdp[-4] - 1194.14 * lpag + 79702.9
         (1.17985)               (3.38687)        ( 9.8594)

Sum Sq      2E+08   Std Err   2701.76   LHS Mean  51227.7
R Sq       0.7306   R Bar Sq   0.7017   F  3, 28  25.3073
D.W.( 1)   2.0828   D.W.( 4)   1.9854

AR_0 =  + 0.52364 * AR_1
          (3.27283)
```

Cochran-Orcutt
QUARTERLY data for 60 periods from 1975Q1 to 1989Q4
Date: 6 JAN 1991

emgovbeax

```
     =    0.00182*ndpsay.4/pdice.4 - 2198.45 * lpgov + 48.6984 * sapop
         (3.28832)                   (1.26781)         (2.50425)

        + 40569.9
          (0.62891)
```

Sum Sq	2E+08	Std Err	1688.96	LHS Mean	269688
R Sq	0.9950	R Bar Sq	0.9946	F 4, 55	2737.79
D.W.(1)	1.9847	D.W.(4)	2.4896		

```
AR_0 =  + 0.84072 * AR_1
          (13.4570)
```

NON-MANUFACTURING VARIABLE LIST REGIONAL ECONOMY

AGWDPX	=	Wages for the Agricultural Services industry, Duke Power service area, nominal.
CONWDPX	=	Wages for the Construction industry, Duke Power service area, nominal.
FWDPX	=	Wages for the Farm industry, Duke Power service area, nominal.
FIRWDPX	=	Wages for the Finance, Insurance and Real Estate industries, Duke Power service area, nominal.
GOVWDPX	=	Wages for the Government sector, Duke Power service area, nominal.
MINWDPX	=	Wages for the Mining industry, Duke Power service area, nominal.
RTRWDPX	=	Wages for the retail industry, Duke Power service area, nominal.
SERWDPX	=	Wages for the Service industry, Duke Power service area, nominal.
TPUWDPX	=	Wages for the Transportation and Public Utilities industry, Duke Power service area, nominal.
WTRWDPX	=	Wages for the Wholesale industry, Duke Power Service area, nominal.
GRPAGDP	=	Real Gross Regional Product for the Agricultural Services industry, Duke Power service area.
GRPCONDP	=	Real Gross Regional Product for the Construction industry, Duke Power service area.
GRPFDP	=	Real Gross Regional Product for the Farm industry, Duke Power service area.
GRPFIRDP	=	Real Gross Regional Product for the Finance, Insurance, and Real Estate industry, Duke Power service area.
GRPGOVDP	=	Real Gross Regional Product for the Government sector, Duke Power service area.
GRPMINDP	=	Real Gross Regional Product for the Mining industry, Duke Power service area.

GRPRTRDP	=	Real Gross Regional Product for the Retail industry, Duke Power service area.
GRPSERDP	=	Real Gross Regional Product for the Service industry, Duke Power service area.
GRPTPUDP	=	Real Gross Regional Product for the Transportation and Public Utilities industry, Duke Power service area.
GRPWTRDP	=	Real Gross Regional Product for the Wholesale industry, Duke Power service area.
GRPDP	=	Real Gross Regional Product , total of manufacturing and non-manufacturing output, Duke Power service area.
EMFARBEAX	=	Duke Power service area employment, Farm industry.
EMGOVBEAX	=	Duke Power service area employment, Government sector.
EM01BEAX	=	Duke Power service area employment, Agricultural Services industry.
EM10BEAX	=	Duke Power service area employment, Mining industry.
EM15BEAX	=	Duke Power service area employment, Building Construction, general contractors.
EM16BEAX	=	Duke Power service area employment, Heavy Construction industry.
EM17BEAX	=	Duke Power service area employment, Construction - Special Trade Contractors.
EM4147BEAX	=	Duke Power service area employment, Misc. Transportation services.
EM42BEAX	=	Duke Power service area employment, Motor Freight Transportation.
EM45BEAX	=	Duke Power service area employment, Air Transportation.
EM48BEAX	=	Duke Power service area employment, Communications.
EM49BEAX	=	Duke Power service area employment, Public Utilities.
EM5051BEAX	=	Duke Power service area employment, Wholesale.
EM52BEAX	=	Duke Power service area employment, Retail - Building Materials, Hardware, Garden Supply.
EM53BEAX	=	Duke Power service area employment, Retail - General Merchandise Stores.

EM54BEAX	=	Duke Power service area employment, Retail - Food Stores.
EM55BEAX	=	Duke Power service area employment, Retail - Auto Dealers, Gas Stations.
EM56BEAX	=	Duke Power service area employment, Retail - Apparel.
EM57BEAX	=	Duke Power service area employment, Retail - Home Furnishings.
EM58BEAX	=	Duke Power service area employment, Retail - Eating and Drinking Places.
EM59BEAX	=	Duke Power service area employment, Retail - Miscellaneous Retail.
EM6061BEAX	=	Duke Power service area employment, Banks and Credit Institutions.
EM6267BEAX	=	Duke Power service area employment, Security and Commodity Brokers.
EM63BEAX	=	Duke Power service area employment, Insurance industry.
EM65BEAX	=	Duke Power service area employment, Real Estate industry.
EM70BEAX	=	Duke Power service area employment, Hotels and Motels.
EM72BEAX	=	Duke Power service area employment, Personal Services.
EM7389BEAX	=	Duke Power service area employment, Business Services.
EM7576BEAX	=	Duke Power service area employment, Repair Services.
EM7884BEAX	=	Duke Power service area employment, Amusement, Motion Pictures and Museums.
EM80BEAX	=	Duke Power service area employment, Medical industry.
EM82BEAX	=	Duke Power service area employment, Education.
WRWAFF	=	Average weekly compensation per employee, Agricultural Services industry, national.
AHECC$	=	Average hourly earnings, Construction industry, national.
AHEFI$	=	Average hourly earnings, Finance, Insurance, and Real Estate, national.

AHEMG14$	=	Average hourly earnings, Mining, Non-metallic minerals, national.
AHEWR$	=	Average hourly earnings, Wholesale and Retail, national.
AHESER	=	Average hourly earnings, Services, national.
WRWGOV	=	Average weekly compensation per employee, Government, national.
AHERGT$	=	Average hourly earnings, Transportation and Public Utilities, national.
EMFIRBEAX	=	Duke Power service area employment, Finance, Insurance, Real Estate.
EMRTRBEAX	=	Duke Power service area employment, Retail.
EMSERBEAX	=	Duke Power service area employment, Services.
EMTPUBEAX	=	Duke Power service area employment, Transportation and Public Utilities.
D82	=	Dummy variable, equal to 1 for 1982, 0 elsewhere.
D8689	=	Dummy variable, equal to 1 for 1986 - 1989, 0 elsewhere.
D85	=	Dummy variable, equal to 1 for 1985, 0 elsewhere.
TOTWAGE	=	Total wages, Duke Power service area.
GPOCON82	=	Gross product of the construction industry, national.
WB	=	Total compensation, national.
SAPOP	=	Duke Power service area population.
NDPSAY	=	Nominal personal income, Duke Power service area.
NDDPSAY	=	Nominal disposable income, Duke Power service area.
PDICE	=	Personal consumption deflator.
RGRPMFGDP	=	Real gross regional product for the manufacturing sector, Duke Power service area.
LPAG	=	Labor productivity for the Agricultural Services industry, national.
LPGOV	=	Labor productivity for the government sector, national.

LPCON	=	Labor productivity for the construction industry, national.
LPTRN	=	Labor productivity for the transportation industry, national.
LP48	=	Labor productivity for the Communications industry, national.
LP49	=	Labor productivity for the Public Utilities industry, national.
LPFIR	=	Labor productivity for the Finance, Insurance and Real Estate industries, national.
LPSER	=	Labor productivity for the Services industries, national.
UCKAG	=	User Cost of capital, Agricultural Services industry, national.
UCKCOM	=	User Cost of capital, commercial, national.
UCK48	=	User Cost of capital, Communications industry, national.
UCKTPU	=	User Cost of capital, Transportation and Public Utilities industry, national.
DSTRK	=	Strike dummy variable.
INTPRIME	=	Real prime interest rate.
INTMORT	=	Real mortgage interest rate, national.
PPI	=	Producers Price Index.
TRANRAT	=	Real cost of transportation services.
D8485	=	Dummy variable, equal to 1 for 1984-1985, 0 elsewhere.
PCEMVP	=	Personal Consumption Expenditures deflator for motor vehicles and parts.
NEWCAR	=	New U.S. auto sales.
RWR14	=	Real average hourly wage rate, Nonmetallic mining industry, national.
AHERGC48$	=	Average hourly earnings, Communications industry, national.

AHERGU49$	=	Average hourly earnings, Public Utilities industry, national.
PCECAS	=	Personal consumption expenditure deflator, clothing and shoes.
PCEFHE	=	Personal consumption expenditure deflator, furniture and household equipment.
PCEFAB	=	Personal consumption expenditure deflator, food and beverages.
PDICES	=	Personal consumption expenditure deflator, services.
D8889	=	Dummy variable, equal to 1 for 1988-1989, 0 elsewhere.
AHESVOT$	=	Average hourly earnings, Other Services, national.
AHESV73$	=	Average hourly earnings, Business services, national.
AHESV80$	=	Average hourly earnings, health services, national.

D. OTHER INCOME COMPONENT EQUATIONS

Dividends, Interest, and Rent
Transfer Payments
Personal Contribution to Social Insurance
Residence Adjustment

DIVIDENDS, INTEREST, AND RENT

```
Log(Dividends, Interest and Rent for DPSA) =
                .12823*log(Personal Dividend Income for USA) +
                .86947*log(Personal Interest Income for USA) +
                .03962*log(Rental Income of Persons for USA) +
               9.7906

      AR TERM = .91274*AR(1)
       R SQR  = .9992
```

TRANSFER PAYMENTS

```
Log(Transfer Payments for DPSA) =
               1.02384*log(Transfer Payments to Persons for USA) +
                .02873*log(Ratio of Unemployment of DPSA to USA) +
               9.28155

      AR TERM = .74833*AR(1) + .59654*AR(4) - .61393*AR(5)
       R SQR  = .9997
```

PERSONAL CONTRIBUTIONS TO SOCIAL SECURITY

```
Log(Personal Contributions to Social Security for DPSA) =
             .98176*log(Personal contributions to social insurance for USA) +
             .90052*log(Ratio of wages in DPSA to wages for USA) +
            1.05800

      AR TERM = .76738*AR(1) + .71586*AR(4) - .70595*AR(5)
       R SQR  = .9998
```

RESIDENCE AJUSTMENT

```
Residence Adjustment=
           -.02434*(Wages in DPSA) +
       318119.

      AR TERM = .90459*AR(1) - .09359*AR(8) + .10213*AR(12)
       R SQR  = .9990
```

E. ENERGY & CUSTOMERS

General Service
Industrial
Residential
Other Sales

GENERAL SERVICE

Cochran-Orcutt
QUARTERLY data for 28 periods from 1984Q1 to 1990Q4
Date: 15 APR 1991

bckpc

```
   =     0.31703 * hdh + 0.20503 * cdh + 387.081
       (13.1906)       (5.09262)       (9.41397)

Sum Sq     39605.5   Std Err    41.4967   LHS Mean   719.694
R Sq        0.9570   R Bar Sq    0.9495   F  4, 23   127.969
D.W.( 1)    1.5123   D.W.( 4)    1.3727

AR_0 =  + 0.35654 * AR_1 + 0.35131 * AR_4
          (2.42231)        (4.01477)
```

Ordinary Least Squares
QUARTERLY data for 24 periods from 1985Q1 to 1990Q4
Date: 11 MAR 1991

gocu

```
  =     0.00158 * grpcondp - 404.651 * d1 + 601.008 * d3
       (9.07399)             (2.23068)      (3.31287)

      + 411.851 * d4 + 3414.42
        (2.27028)      (3.53866)
```

Sum Sq	1875577	Std Err	314.189	LHS Mean	12239.9
R Sq	0.8625	R Bar Sq	0.8335	F 4, 19	29.7879
D.W.(1)	0.5512	D.W.(4)	1.5442		

GS91:MWH54
Ordinary Least Squares
QUARTERLY data for 30 periods from 1983Q3 to 1990Q4
Date: 12 MAR 1991

mwh54

```
  =    5.31977 * hdh + 64.7359 * cdh - 6496.19 * pr54[-2]
     (2.53645)       (18.6609)       (2.11944)
     + 287.342 * gaspr1[-8] + 0.00314 * rdpsay +  101941
      (1.52522)               (20.7223)          (6.36704)

Sum Sq       3E+08   Std Err   3772.11   LHS Mean   278223
R Sq        0.9824   R Bar Sq   0.9788   F  5, 24  268.170
D.W.( 1)    1.4873   D.W.( 4)   2.0601
```

Ordinary Least Squares
QUARTERLY data for 30 periods from 1983Q3 to 1990Q4
Date: 6 MAR 1991

mwh58

```
  =     81.4865 * cdh - 12725.6 * pr58[-2] + 462.442 * gaspr1[-4]
       (38.4960)       (4.70037)             (2.18547)

      + 1.60889 * em58beax[-1] + 22991.5
       (22.3159)                 (1.28497)
```

Sum Sq	3E+08	Std Err	3700.98	LHS Mean	208894
R Sq	0.9903	R Bar Sq	0.9887	F 4, 25	636.000
D.W.(1)	1.9136	D.W.(4)	0.7184		

Ordinary Least Squares
QUARTERLY data for 30 periods from 1983Q3 to 1990Q4
Date: 16 MAR 1991

mwhamu

```
  =     4.13007 * hdh + 43.5511 * cdh + 0.00201 * rddpsay
       (4.02969)       (24.1626)       (24.0894)

      - 5223.29 * pramu[-2] - 6600.09
       (4.97431)              (0.88347)
```

Sum Sq	10E+0	Std Err	1955.93	LHS Mean	68809.5
R Sq	0.9860	R Bar Sq	0.9837	F 4, 25	438.996
D.W.(1)	1.4719	D.W.(4)	1.9357		

Cochran-Orcutt
QUARTERLY data for 26 periods from 1984Q3 to 1990Q4
Date: 23 MAR 1991

mwhchu

```
  =     25.5208 * hdh + 74.4516 * cdh + 0.00236 * rddpsay
       (8.81199)       (15.0711)       (6.10989)

      - 6818.97 * prchu[-2] - 5258.11
       (3.10276)              (0.17893)
```

Sum Sq	2E+08	Std Err	3194.02	LHS Mean	94664.6
R Sq	0.9780	R Bar Sq	0.9725	F 5, 20	177.836
D.W.(1)	1.4072	D.W.(4)	2.0603		

```
AR_0 =  + 0.44244 * AR_4
         (1.94727)
```

Ordinary Least Squares
QUARTERLY data for 31 periods from 1983Q2 to 1990Q4
Date: 28 MAR 1991

mwhoth

```
  =     54.0119 * hdh + 113.691 * cdh - 54063.6 * proth[-1]
       (6.51131)       (7.61230)       (6.49128)

      + 0.01088 * rdpsay +  241212
        (18.9060)          (4.11377)
```

Sum Sq	7E+09	Std Err	16908.7	LHS Mean	580315
R Sq	0.9501	R Bar Sq	0.9425	F 4, 26	123.854
D.W.(1)	1.8347	D.W.(4)	2.2316		

Ordinary Least Squares
QUARTERLY data for 30 periods from 1983Q3 to 1990Q4
Date: 22 MAR 1991

mwhrtr

```
  =    22.9411 * hdh + 142.461 * cdh - 27430.5 * prrtr[-2]
     (6.43599)       (22.3499)       (5.69768)

     + 0.00715 * rdpsay - 2637.85 * intprime + 66397.5
      (21.0097)          (2.06000)             (1.48627)
```

Sum Sq	1E+09	Std Err	6987.59	LHS Mean	334120
R Sq	0.9866	R Bar Sq	0.9838	F 5, 24	353.756
D.W.(1)	1.8841	D.W.(4)	1.5452		

```
Nonlinear Least Squares
QUARTERLY data for 44 periods from 1980Q1 to 1990Q4
Date:  3 APR 1991

t2cu

  =     0.31661 * rescus -  158863
       (16.8747)           ( 685900)

Sum Sq       7E+07   Std Err    1350.49   LHS Mean    230928
R Sq        0.9982   R Bar Sq    0.9980   F  4, 39   5449.40
D.W.( 1)    1.5526   D.W.( 4)    0.3686

AR_0 =  + 1.09337 * AR_1 - 0.24367 * AR_4
         (12.8512)         (2.21044)


MA_0 =  + 0.24842 * MA_4
         (1.00936)
```

```
Cochran-Orcutt
QUARTERLY data for 50 periods from 1978Q3 to 1990Q4
Date:  9 MAR 1991

diff(gacu)

  =    0.05384 * dggacuf - 69.9321 * gapr[-2] + 3.46705 * gaspr1[-8]
     (2.77335)           (1.67110)             (1.49446)

     + 114.679 * d1 + 118.322 * d4 + 265.384
      (4.89668)      (8.55916)      (1.25014)

Sum Sq      111487   Std Err   51.5213   LHS Mean  281.953
R Sq        0.7758   R Bar Sq   0.7385   F  7, 42  20.7657
D.W.( 1)    1.9900   D.W.( 4)   2.0853

AR_0 =  + 0.48430 * AR_1 + 0.33467 * AR_2
         (3.31355)         (2.32053)

GACU=GACU.1+(??)
```

```
Ordinary Least Squares
QUARTERLY data for 44 periods from 1980Q1 to 1990Q4
Date:  9 MAR 1991

diff(ggacu)

  =     0.00022 * dgrpnm[-4] + 33.9628 * dsapop[-3] - 64.0861 * dintp[-4]
      (3.06873)              (2.20728)              (1.86158)

     - 349.339 * d1 + 532.857 * d3 + 755.816
      (2.47626)       (4.36648)       (3.57296)

Sum Sq     3954538   Std Err    322.594   LHS Mean   1300.67
R Sq        0.6926   R Bar Sq    0.6521   F  5, 38   17.1201
D.W.( 1)    1.3015   D.W.( 4)    1.4711

GGACU=GGACU.1+(??)
```

Ordinary Least Squares
QUARTERLY data for 31 periods from 1983Q2 to 1990Q4
Date: 7 MAR 1991

mwh70

```
  =    23.6836 * hdh + 54.4540 * cdh + 2.66182 * em70beax
      (22.7389)       (30.2296)       (3.87837)

     - 4562.17 * pr70[-1] + 352.746 * gaspr1[-8] + 0.00090 * rdpsay
      (2.22067)             (3.12438)              (2.11809)

     - 45957.4
      (5.67371)
```

Sum Sq	9E+07	Std Err	1985.55	LHS Mean	96580.4
R Sq	0.9903	R Bar Sq	0.9878	F 6, 24	407.194
D.W.(1)	2.1268	D.W.(4)	1.9646		

Ordinary Least Squares
QUARTERLY data for 30 periods from 1983Q3 to 1990Q4
Date: 14 MAR 1991

mwh80

```
  =     6.80662 * hdh + 89.0797 * cdh - 11032.7 * pr80[-2]
      (4.36539)       (36.4975)       (5.88817)

     + 805.250 * gaspr[-4] + 281.313 * sapop - 1050196
       (4.04067)             (25.8785)         (17.8375)
```

Sum Sq	2E+08	Std Err	2655.97	LHS Mean	223582
R Sq	0.9957	R Bar Sq	0.9948	F 5, 24	1115.22
D.W.(1)	1.3952	D.W.(4)	2.3834		

Cochran-Orcutt
QUARTERLY data for 28 periods from 1984Q1 to 1990Q4
Date: 16 MAR 1991

mwhed

```
  =     22.6516 * hdh + 86.8844 * cdh + 5.31033 * em82beax + 71504.7
      (2.75393)       (5.44039)       (7.32008)             (1.77653)

Sum Sq       1E+09   Std Err   7303.39   LHS Mean   362814
R Sq        0.9599   R Bar Sq   0.9530   F  4, 23  137.791
D.W.( 1)    1.9205   D.W.( 4)   2.1848

AR_0 =  + 0.66481 * AR_4
         (5.36025)
```

Ordinary Least Squares
QUARTERLY data for 30 periods from 1983Q3 to 1990Q4
Date: 16 MAR 1991

mwhoff

```
  =     52.0235 * hdh + 209.761 * cdh + 0.01160 * grpdp
       (6.14630)       (16.3941)       (15.9851)

      - 46527.9 * proff[-2] + 2008.96 * gaspr[-4] - 10467.4 * intprime
        (4.16065)             (1.87888)             (4.09427)

      -  145095
        (1.21219)
```

Sum Sq	4E+09	Std Err	13932.0	LHS Mean	617378
R Sq	0.9867	R Bar Sq	0.9833	F 6, 23	285.118
D.W.(1)	1.5596	D.W.(4)	2.2264		

Cochran-Orcutt
QUARTERLY data for 27 periods from 1984Q2 to 1990Q4
Date: 29 MAR 1991

mwhtrp

```
  =     23.5789 * hdh + 45.5921 * cdh - 10635.8 * prtrp[-3]
       (4.73415)       (8.08594)       (2.60170)

      + 0.00392 * grpdp - 2795.08 * intprime[-2] + 1056.01 * gaspr[-4]
        ( 9.9477)         (2.86025)                 (1.76707)

      - 78166.0
       (1.39332)
```

Sum Sq	6E+08	Std Err	5643.60	LHS Mean	228380
R Sq	0.9765	R Bar Sq	0.9679	F 7, 19	112.868
D.W.(1)	1.4484	D.W.(4)	2.2593		

```
AR_0 =  - 0.71104 * AR_2
         (3.77284)
```

Ordinary Least Squares
QUARTERLY data for 30 periods from 1983Q3 to 1990Q4
Date: 23 MAR 1991

mwhwtr

```
  =     7.59847 * hdh + 38.0243 * cdh - 5921.58 * prwtr[-2]
      (5.60674)       (15.3951)       (3.05403)

     + 416.079 * gaspr1 + 0.01970 * grpwtrdp - 7341.27
       (1.73347)          (8.98929)            (0.34355)
```

Sum Sq	2E+08	Std Err	2730.49	LHS Mean	106994
R Sq	0.9681	R Bar Sq	0.9614	F 5, 24	145.501
D.W.(1)	1.3716	D.W.(4)	1.7396		

VARIABLE DEFINITIONS
GENERAL SERVICE

BCKPC	KWH per customer for the building construction customers.
HDH	Heating degree hours, cycle.
CDH	Cooling degree hours, cycle.
GACU	The number of electric heating customers. Rate schedule GA, plus G22 and electric heating time-of-day.
DGGACUF	Quarterly change in total general service customers, Excluding T2 & building construction customers.
GAPR	Electric heating price of electricity, real.
GASPR1	The 1st quarter price of natural gas, in cents per therm, for Piedmont Natural Gas Company, real. The 1st quarter price is repeated for each quarter of the year.
D1	Dummy variable, equal to 1 in first quarter, 0 elsewhere.
D3	Dummy variable, equal to 1 in third quarter, 0 elsewhere.
D4	Dummy variable, equal to 1 in fourth quarter, 0 elsewhere.
GGACU	Total general service customers, excluding T2 and building construction customers.
DGRPNM	Quarterly change in gross regional product for non-manufacturing in the Duke service area.
DSAPOP	Quarterly change in service area population.
DINTP	Quarterly change in real prime interest rate.
GOCU	Building construction customers, plus misc., cotton gins, and T1.
GRPCONDP	Gross regional product for the construction industry in the Duke service area.
MWH54	MWH sales to food stores, sic 54.
PR54	Price of electricity for sic 54 customers, real.
RDPSAY	Real personal income for the Duke Power service area.
MWH58	MWH sales to eating & drinking places, sic 58.

PR58	Price of electricity for sic 58 customers, real.
EM58BEAX	Employment in sic 58 industry for the Duke service area.
MWH70	MWH sales to the hotel/motel industry, sic 70, real.
EM70BEAX	Employment in the sic 70 industry, Duke service area.
PR70	Price of electricity for sic 70 customers, real.
MWH80	MWH sales to the medical industry, sic 80.
PR80	Price of electricity for sic 80 customers, real.
GASPR	Real quarterly price of natural gas, cents per therm, for Piedmont Natural Gas Company.
SAPOP	Duke Power service area population.
MWHAMU	MWH sales to the amusement industry. SIC 78, 79, 84.
RDDPSAY	Real disposable income for the Duke Power service area.
PRAMU	Price of electricity for the amusement customers, real.
MWHCHU	MWH sales to churches, SIC 86.
PRCHU	Price of electricity for churches, real.
MWHED	MWH sales to education industry, SIC 82, 83.
EM82BEAX	Employment in the education industry for the Duke area.
MWHOFF	MWH sales to offices.
GRPDP	Gross regional product for the Duke Power service area.
PROFF	Price of electricity for offices, real.
INTPRIME	Prime interest rate, real.
MWHOTH	MWH sales to the other parts of general service that are not forecasted separately.
PROTH	Price of electricity to the other customers.
MWHRTR	MWH sales to the retail industry.
PRRTR	Price of electricity to the retail industry, real.
MWHTRP	MWH sales to the transportation industry.
PRTRP	Price of electricity for the transportation industry.

MWHWTR	MWH sales to the wholesale industry.
PRWTR	Price of electricity for the wholesale customers, real.
GRPWTRDP	Gross regional product for the wholesale industry in the Duke service area.
T2CU	T2 customers.
RESCUS	Residential customers.
NOTE :	In the models, a variable that has a point followed by a number is lagged by that number. For example, the variable GASPR.4 is the variable GASPR lagged 4 periods.

INDUSTRIAL

```
MFGSLS91:GWH20
Cochran-Orcutt
QUARTERLY data for 61 periods from 1975Q4 to 1990Q4
Date: 21 FEB 1991

gwh20

  =    0.00013 * rgrp20dp + 0.00046 * cdh + 14.0500 * rprng2073
     (10.5780)             (2.87414)       (8.87229)

     - 6.17463 * d202 - 12.9165 * q1 + 18.4327 * q3 - 10.0450
      (1.33103)        (8.12498)      (5.97473)      (0.65669)

Sum Sq     2003.86   Std Err     6.2077   LHS Mean  174.193
R Sq        0.9821   R Bar Sq    0.9793   F  8, 52  355.923
D.W.( 1)    1.9451   D.W.( 4)    1.6292

AR_0 =  + 0.61168 * AR_1 - 0.21072 * AR_2
         (4.62314)        (1.55891)
```

gwh20	=	sales, gwh, food and food products,DPSA.
rgrp20dp	=	real GRP, food and food products, DPSA.
cdh	=	cooling degree hours.
rprng2073	=	real price of natural gas deflated by pgpo20.
d202	=	binary variable.
q1	=	quarterly binary variable.
q3	=	quarterly binary variable.

```
MFGSLS91:GWH22
Cochran-Orcutt
QUARTERLY data for 54 periods from 1977Q3 to 1990Q4
Date: 21 FEB 1991

diff(gwh22)

  =     0.00005 * diff(rgrp22dp)
       (1.56798)

      - 65.9186 * diff(texpr.1/(pgpo22.1/100)) - 0.00990 * diff(hdh)
       (1.67350)                                  (14.9364)

      + 73.1525 * diff(rprngdp22.11) + 0.18368
       (3.37072)                      (0.03440)

Sum Sq      186846   Std Err   62.3909   LHS Mean  -1.2198
R Sq        0.9404   R Bar Sq   0.9341   F  5, 48  151.343
D.W.( 1)    1.9635   D.W.( 4)   1.9750

AR_0 =  - 0.68095 * AR_6
          (6.00901)


gwh22    =     sales, gwh, textile mill products, DPSA.
rgrp22dp =     real grp, textile mill products, DPSA.
pgpo22   =     deflator for textile mill products.
hdh      =     heating degree hours.
rprngdp22=     price of natural gas deflated by pgpo22.
```

```
MFGSLS91:GWH24
Nonlinear Least Squares
QUARTERLY data for 58 periods from 1976Q3 to 1990Q4
Date: 27 FEB 1991

gwh24

  =     0.00011 * rgrp24dp + 0.00007 * hdh + 7.07212 * rprngdp2455
      (8.31388)             (1.97043)       (3.26751)

     + 1.54909 * q2 - 46.9017
       (1.27687)      (13.6018)

Sum Sq      841.749    Std Err      4.0416    LHS Mean   59.9771    Res Mean
0.8445
R Sq          0.9592    R Bar Sq    0.9525    F  8, 49   143.997    %RMSE
20.1991
D.W.( 1)    1.7454    D.W.( 4)    1.8775

AR_0 =  + 0.31761 * AR_2 + 0.25148 * AR_5
          (1.88093)        (1.66479)

MA_0 =  + 0.60422 * MA_1 + 0.35361 * MA_4
          (4.18047)        (2.43031)


gwh24       =   sales, gwh, lumber and wood products, DPSA.
rgrp24dp    =   real grp, lumber and wood products, DPSA.
hdh         =   heating degree hours.
rprngdp2455=    price of nat. gas deflated by pgpo24.
q2          =   quarterly binary variable.
```

```
MFGSLS91:GWH26
Cochran-Orcutt
QUARTERLY data for 50 periods from 1978Q3 to 1990Q4
Date: 27 FEB 1991

gwh26

  =    0.00035 * rgrp26dp + 0.00037 * cdh + 22.4626 * rprngdp26144
      (9.28569)            (1.28208)       (3.36569)

     - 52.1101 * oiefpr/(pgpo26/100) - 13.1016 * q1 - 6.78961 * q2
      (6.35673)                       (1.95118)      (1.45500)

     + 75.2000
      (2.29854)

Sum Sq    12219.1   Std Err   17.7005   LHS Mean  317.185
R Sq       0.9559   R Bar Sq   0.9446   F 10, 39  84.5349
D.W.( 1)   1.9190   D.W.( 4)   1.7755

AR_0 =  + 0.57670 * AR_1 + 0.28587 * AR_2 - 0.34796 * AR_3
         (3.91246)         (1.67158)        (2.02733)
     - 0.16586 * AR_5
      (1.21022)


gwh26        =  sales, gwh, paper and paper products, DPSA.
rgrp26dp     =  real grp, paper and paper products, DPSA.
cdh          =  cooling degree hours.
rprngdp26144=  price of nat gas deflated by pgpo26.
oiefpr       =  price of electricity, other industrial, DPSA.
q1           =  quarterly binary variable.
q2           =  quarterly binary variable.
```

```
MFGSLS91:GWH28X
Cochran-Orcutt
QUARTERLY data for 63 periods from 1975Q2 to 1990Q4
Date: 28 FEB 1991

gwh28x

  =     0.00005 * rgrp28dp - 0.00036 * hdh - 6.81374 * q2 + 64.1862
      (4.19481)             (6.64905)       (3.26995)      (2.38279)

Sum Sq     5610.22   Std Err     9.8350   LHS Mean   158.005
R Sq        0.9096   R Bar Sq    0.9034   F  4, 58   145.955
D.W.( 1)    1.9075   D.W.( 4)    1.8895

AR_0 =  + 0.82544 * AR_1
          (11.0522)


gwh28x  = sales, chemicals less man-made fibers, DPSA.
rgrp28dp= real grp, chemicals, DPSA.
hdh     = heating degree hours.
q2      = quarterly binary variable.
```

MFGSLS91:GWH32
Cochran-Orcutt
QUARTERLY data for 61 periods from 1975Q4 to 1990Q4
Date: 28 FEB 1991

gwh32

```
  =     0.00032 * rgrp32dp - 0.00034 * hdh + 4.14489 * rprngdp3213
       (11.8787)             (6.00950)       (1.21770)

      - 11.2743 * oiefpr.2/(pgpo32.2/100) + 0.00039 * cdh + 85.7616
       (2.37618)                           (3.40533)       (4.36022)

Sum Sq     3315.88   Std Err     7.8361   LHS Mean  226.310
R Sq        0.9575   R Bar Sq    0.9527   F  6, 54  202.595
D.W.( 1)    1.8243   D.W.( 4)    2.0614

AR_0 =   + 0.60374 * AR_1
          (5.51164)
```

gwh32	=	sales, gwh, stone, clay, and glass products, DPSA.
rgrp32dp	=	real grp, stone, clay, and glass products, DPSA.
hdh	=	heating degree hours.
rprngdp3213	=	price of nat gas deflated by pgpo32.
oiefpr	=	price of electricity, other industrial, DPSA.
pgpo32	=	stone, clay, and glass products deflator.
cdh	=	cooling degree hours.

MFGSLS91:GWH34
Cochran-Orcutt
QUARTERLY data for 52 periods from 1978Q1 to 1990Q4
Date: 28 FEB 1991

gwh34

```
  =     0.00010 * rgrp34dp + 0.00021 * cdh + 0.00003 * hdh
       (42.4683)             (1.95199)       (1.08729)

      + 4.30436 * rprngdp34 + 2.24656 * q3 - 17.2394
        (6.59708)             (1.32158)      (4.98826)

Sum Sq     485.374   Std Err     3.4407   LHS Mean  85.2075
R Sq        0.9737   R Bar Sq    0.9673   F 10, 41  151.798
D.W.( 1)    1.3608   D.W.( 4)    2.0550

AR_0 =  + 0.32132 * AR_1 - 0.12589 * AR_2 - 0.15067 * AR_6
          (2.67069)        (1.12591)        (1.76305)
      - 0.19849 * AR_8 - 0.25092 * AR12
        (2.36146)        (3.08504)
```

gwh34	=	sales, gwh, fabricated metals products, DPSA.
rgrp34dp	=	real grp, fabricated metals products, DPSA.
cdh	=	cooling degree hours.
hdh	=	heating degree hours.
rprngdp34	=	price of nat gas deflated by pgpo34.
q3	=	quarterly binary variable.

```
MFGSLS91:GWH36
Cochran-Orcutt
QUARTERLY data for 71 periods from 1973Q2 to 1990Q4
Date:  4 MAR 1991

gwh36

  =     0.00008 * rgrp36dp + 0.00049 * cdh + 162.894
      (3.35242)            (3.11453)       (2.22957)

Sum Sq     13697.7   Std Err    14.7453   LHS Mean  244.394
R Sq        0.9201   R Bar Sq    0.9112   F  7, 63  103.619
D.W.( 1)    1.9723   D.W.( 4)    1.9619

AR_0 =  + 0.59797 * AR_1 + 0.17571 * AR_3 - 0.22742 * AR_6
          (5.76992)        (1.51544)        (1.73817)
      + 0.16144 * AR_7 + 0.21505 * AR_9
        (1.22141)        (1.87164)


gwh36   = sales, gwh, electrical machinery, DPSA.
rgrp36dp= real grp, electrical machinery, DPSA.
cdh     = cooling degree hours.
```

```
MFGSLS91:GWH38
Nonlinear Least Squares
QUARTERLY data for 62 periods from 1975Q3 to 1990Q4
Date:  4 MAR 1991

gwh38

  =     0.00003 * rgrp38dp - 19.4975 * d38a - 9.06782 * d38b
      (2.13006)            (10.2177)        (7.07739)

     + 0.00019 * cdh - 3.01520 * oiefpr/(pgpo38/100) + 29.6864
       (9.14318)       (3.68121)                       (10.1026)

Sum Sq      227.376    Std Err      2.0460    LHS Mean   21.2358    Res Mean
0.1463
R Sq         0.9549    R Bar Sq     0.9491    F  7, 54   163.363    %RMSE
21.2349
D.W.( 1)    1.8739    D.W.( 4)     2.0110

AR_0 =  + 0.52371 * AR_2
          (3.93152)


MA_0 =  + 0.88624 * MA_1
          (8.54921)


gwh38    = sales, gwh, instruments, DPSA.
rgrp38dp= real grp, instruments, DPSA.
d38a     = binary variable.
d38b     = binary variable.
oiefpr   = price of electricity, other industrial, DPSA.
pgpo38   = deflator for instruments.
```

MFGSLS91:GWH21
Cochran-Orcutt
QUARTERLY data for 57 periods from 1976Q4 to 1990Q4
Date: 21 FEB 1991

gwh21

```
  =    0.00030 * cdh - 17.2952 * d212 + 16.7256 * q3 +  9.8968 * q4
      (1.88774)       (5.44107)        (5.86622)      (5.59237)

     + 7.91431 * rprngdp2174 - 19.1249 * oiefpr.2/(pgpo21.2/100)
      (5.99463)                (10.1445)

     - 0.00012 * hdh + 150.414
      (2.33888)       (25.2097)

Sum Sq     1438.32   Std Err     5.5319   LHS Mean  120.037
R Sq        0.9472   R Bar Sq    0.9371   F  9, 47  93.6874
D.W.( 1)    2.0022   D.W.( 4)    2.1182

AR_0 =  + 0.44843 * AR_1 - 0.18223 * AR_5
         (3.35769)        (1.31590)
```

gwh21	=	sales, gwh, tobacco products, DPSA.
cdh	=	cooling degree hours.
d212	=	binary variable.
q3	=	quarterly binary variable.
q4	=	quarterly binary variable.
rprngdp2174	=	price of nat. gas deflated by pgpo21.
oiefpr	=	price of electricity, other industrial, DPSA.
pgpo21	=	deflator for tobacco products.
hdh	=	heating degree hours.

MFGSLS91:GWH23
Cochran-Orcutt
QUARTERLY data for 62 periods from 1975Q3 to 1990Q4
Date: 21 FEB 1991

gwh23

```
  =    0.00005 * rgrp23dp + 0.00029 * cdh - 0.00018 * hdh
      (8.16536)            (3.33712)       (4.19119)

     - 5.87562 * q2 + 5.65579
      (4.72153)       (0.88281)

Sum Sq     934.916   Std Err     4.0859   LHS Mean   54.5529
R Sq        0.8202   R Bar Sq    0.8042   F  5, 56   51.0974
D.W.( 1)    1.8912   D.W.( 4)    1.7658

AR_0 =  + 0.21916 * AR_2
         (1.68278)
```

gwh23= sales, gwh, apparel products, DPSA.
cdh = cooling degree hours.
hdh = heating degree hours.
q2 = quarterly binary variable.

```
MFGSLS91:GWH25
Nonlinear Least Squares
QUARTERLY data for 54 periods from 1977Q3 to 1990Q4
Date: 27 FEB 1991

gwh25

  =    0.00008 * rgrp25dp + 0.00025 * hdh - 8.01806 * q1
      (7.51518)             (1.42417)       (1.85314)

     + 4.58032 * q2 + 9.11321 * q3 + 4.48584 * rprngdp25143
      (1.43972)      (1.97337)      (2.01448)

     - 3.92870 * gp3pr/(pgpo25/100) + 63.1255
      (1.01038)                       (10.2488)

Sum Sq     1042.92   Std Err     4.8672   LHS Mean  160.312
R Sq        0.9289   R Bar Sq    0.9144   F  9, 44  63.8670
D.W.( 1)    2.0059   D.W.( 4)    1.7636

AR_0 =  + 0.46061 * AR_2
         (2.34545)

MA_0 =  + 0.65679 * MA_1
         (4.04022)


gwh25        =  sales, gwh, furniture and hh products, DPSA.
rgrp25dp     =  real grp, furniture and hh products, DPSA.
hdh          =  heating degree hours.
q2           =  quarterly binary variable.
q3           =  quarterly binary variable.
rprngdp25143=  price of nat. gas deflated by pgpo25.
gp3pr        =  price of electricity, group 3, DPSA.
pgpo25       =  deflator for furniture and hh products.
```

MFGSLS91:GWH27
Cochran-Orcutt
QUARTERLY data for 39 periods from 1980Q2 to 1989Q4
Date: 28 FEB 1991

gwh27

```
  =    0.00012 * rgrp27dp + 0.00014 * cdh + 0.00015 * hdh
      (7.54441)             (1.08402)       (1.66115)

     - 7.70220 * q1 + 9.10060 * q3 + 7.24179 * rprngdp27184 - 34.7934
       (2.85984)      (4.05084)     (4.48320)                (10.2102)

Sum Sq     151.712   Std Err     2.3704   LHS Mean  63.9364
R Sq        0.9809   R Bar Sq    0.9731   F 11, 27  126.115
D.W.( 1)    1.9031   D.W.( 4)    1.7397

AR_0 =  + 0.52336 * AR_1 - 0.24623 * AR_2 + 0.27213 * AR_4
          (2.86582)        (1.32292)        (1.50687)
      - 0.32935 * AR_5 - 0.27143 * AR_8
        (1.71281)        (1.31129)
```

```
gwh27        =  sales, gwh, printing and publishing, DPSA.
rgrp27dp     =  real grp, printing and publishing, DPSA.
cdh          =  cooling degree hours.
hdh          =  heating degree hours.
q1           =  quarterly binary variable.
q3           =  quarterly binary variable.
rprngdp27184=  price of natural gas deflated by pgpo27.
```

MFGSLS91:GWH28M
Cochran-Orcutt
QUARTERLY data for 57 periods from 1976Q4 to 1990Q4
Date: 28 FEB 1991

gwh28m

```
  =  - 16.8054 * q1 + 20.4547 * q2 + 52.8511 * q3
       (4.34728)      (6.78034)      (13.7736)

     - 9.49204 * mmfpr.1/(pgpo28.1/100) + 1.44568 * jip282m + 254.527
       (1.62735)                          (5.84095)          (5.38615)

Sum Sq     6844.31   Std Err    11.9411   LHS Mean  406.041
R Sq        0.9261   R Bar Sq    0.9137   F  8, 48  75.1399
D.W.( 1)    1.8849   D.W.( 4)    2.0780

AR_0 =  + 0.47297 * AR_1 + 0.29339 * AR_2 + 0.15376 * AR_6
          (3.44027)        (2.21002)        (1.72260)
```

gwh28m = sales, gwh, man-made fibers, DPSA.
q1 = quarterly binary variable.
q2 = quarterly binary variable.
q3 = quarterly binary variable.
mmfpr = price of electricity, man-made fibers, DPSA.
pgpo28 = deflator for chemicals and allied products.
jip282m= industrial production index, man-made fibers.

MFGSLS91:GWH30
Cochran-Orcutt
QUARTERLY data for 42 periods from 1980Q3 to 1990Q4
Date: 28 FEB 1991

gwh30

```
  =     0.00029 * rgrp30dp - 23.8724 * q1 + 23.0803 * q3
      (33.3877)             (8.50748)      (8.48378)

     + 9.35330 * rprngdp30.7
       (3.93873)

     - 11.3304 * gp4pr.2/(pgpo30.2/100) + 46.5023
       (2.17098)                          (7.24802)

Sum Sq     2476.81   Std Err     8.6634   LHS Mean  351.814
R Sq        0.9866   R Bar Sq    0.9833   F  8, 33  303.205
D.W.( 1)    1.9900   D.W.( 4)    1.7897

AR_0 =  - 0.25617 * AR_2 - 0.27042 * AR_6 - 0.37312 * AR12
         (1.64344)         (1.75320)         (3.19656)
```

gwh30 = sales, gwh, rubber and plastic products, DPSA.
rgrp30dp= real grp, rubber and plastic products, DPSA.
q1 = quarterly binary variable.
q3 = quarterly binary variable.
rprngdp = price of nat gas deflated by pgpo30.
gp4pr = price of electricity, group 4, DPSA.
pgpo30 = rubber and plastic products deflator.

MFGSLS91:GWH33
Cochran-Orcutt
QUARTERLY data for 59 periods from 1976Q2 to 1990Q4
Date: 28 FEB 1991

gwh33

```
  =    0.00016 * rgrp33dp + 8.03231 * rprngdp3344
      (3.55177)             (1.91959)

     - 4.61514 * oiefpr/(pgpo33/100) + 104.222
      (1.31298)                        (1.97473)

Sum Sq     1655.06   Std Err     5.6416   LHS Mean  123.772
R Sq        0.9847   R Bar Sq    0.9830   F  6, 52  559.332
D.W.( 1)    2.0137   D.W.( 4)    2.0170

AR_0 =  + 0.73768 * AR_1 + 0.50485 * AR_4 - 0.28601 * AR_5
         (7.10679)         (3.85388)         (2.14770)
```

gwh33	=	sales, gwh, primary metals products, DPSA.
rgrp33dp	=	real grp, primary metals products, DPSA.
rprngdp3344	=	price of nat gas deflated by pgpo33.
oiefpr	=	price of electricity, other industrial, DPSA.
pgpo33	=	primary metals products deflator.

MFGSLS91:GWH35
Cochran-Orcutt
QUARTERLY data for 40 periods from 1981Q1 to 1990Q4
Date: 4 MAR 1991

gwh35

```
  =    0.00001 * rgrp35dp + 0.00172 * cdh - 11.6174 * q1
      (10.2932)             (6.45708)       (3.30118)

     - 9.02320 * q2 - 8.05465 * q3 + 11.7729 * rprngdp35114
      (1.94848)      (1.12870)      (11.4887)

     - 4.14616 * oiefpr.1/(pgpo35.1/100) + 183.096
      (11.4330)                           (67.5938)

Sum Sq     332.678   Std Err    3.3870   LHS Mean  278.385
R Sq        0.9942   R Bar Sq   0.9922   F 10, 29  498.289
D.W.( 1)    1.7347   D.W.( 4)   2.2965

AR_0 =  - 0.43541 * AR_2 - 0.15629 * AR_4 - 0.36200 * AR_6
         (3.92489)         (1.57081)        (3.54745)
```

gwh35	=	sales, gwh, non-electrical machinery, DPSA.
rgrp35dp	=	real grp, non-electrical machinery, DPSA.
cdh	=	cooling degree hours.
q1	=	quarterly binary variable.
q2	=	quarterly binary variable.
q3	=	quarterly binary variable.
rprngdp35114	=	price of nat gas deflated by pgpo35.
oiefpr	=	price of electricity, other industrial.
pgpo35	=	non-electrical machinery deflator.

```
MFGSLS91:GWH37
Cochran-Orcutt
QUARTERLY data for 46 periods from 1979Q3 to 1990Q4
Date:  4 MAR 1991

gwh37

  =     0.00019 * rgrp37dp + 0.00043 * cdh - 4.02341 * q1
       (18.6283)             (6.98667)       (2.78819)

      - 8.55167 * oiefpr.2/(pgpo37.2/100) + 2.11557 * rprngdp37184
       (4.70165)                           (1.56430)

      + 17.7153
       (2.81406)

Sum Sq     494.158   Std Err     3.6061   LHS Mean  62.9888
R Sq        0.9831   R Bar Sq    0.9799   F  7, 38  315.185
D.W.( 1)    1.9532   D.W.( 4)    1.9965

AR_0 =  + 0.37744 * AR_1 - 0.41717 * AR_5
         (2.57035)         (2.70282)


gwh37         =  sales, gwh, transportation equipment, DPSA.
rgrp37dp      =  real grp, transportation equipment, DPSA.
cdh           =  cooling degree hours.
oiefpr        =  price of electricity, other industrial, DPSA.
pgpo37        =  deflator for transportation equipment.
rprngdp37184=  price of nat gas deflated by pgpo37.
```

```
MFGSLS91:GWH39
Cochran-Orcutt
QUARTERLY data for 44 periods from 1980Q1 to 1990Q4
Date:  4 MAR 1991

gwh39

  =     0.00056 * rgrp39dp + 0.00022 * cdh - 39.7676
      (9.43194)            (3.22474)       (5.13297)

Sum Sq     1069.47   Std Err     5.2366   LHS Mean   34.8293
R Sq        0.9163   R Bar Sq    0.9077   F  4, 39   106.684
D.W.( 1)    1.7633   D.W.( 4)    1.4316

AR_0 =   + 0.74700 * AR_1 - 0.30361 * AR_5
         (7.24678)         (2.37590)


gwh39    = sales, gwh, misc. mfg. products, DPSA.
rgrp39dp= real grp, misc. mfg. products, DPSA.
cdh      = cooling degree hours.
```

RESIDENTIAL

The residential sales forecast is done by combining a short term "trend-following" forecast (that is, no economic variables in the method) with a long term forecast that uses four econometric models to forecast sales based on such variables as income, interest rates, and population.

The short term forecast (1991-1992) was prepared by using Box-Jenkins analysis on a history of customer counts and weather-corrected KWH sales per customer for the eight major groups in the residential class. The customer forecasts were then multiplied times the KWH sales per customer forecasts to obtain the short term sales forecast.

The long term forecast (1993-2005) was made by using four econometric models to forecast the following: number of DPC's total residential customers, number of DPC's electric heating customers, KWH per customer of DPC's electric heating customers, and KWH per customer of DPC's non-electric heating customers. These forecasts were then combined to obtain the long term sales forecast.
The actual variables and equations used to make the long term forecast are given below:

NUMBER OF DPC'S TOTAL RESIDENTIAL CUSTOMERS:

Ordinary Least Squares
QUARTERLY data for 67 periods from 1974Q2 to 1990Q4
Date: 11 MAR 1991

diff(rescus91)

```
  =    121.195 * diff(sapop91) - 554.686 * diff(intmort.1)
      (1.66543)                  (1.68950)

     + 0.00209 * diff(rdpsay.1) - 2246.73 * q1 + 3064.78 * q3
      (3.96545)                   (3.39743)      (4.80148)

     - 3670.70 * q4 + 5060.93
      (5.74267)      (5.29757)
```

Sum Sq	2E+08	Std Err	1802.17	LHS Mean	6638.88
R Sq	0.7450	R Bar Sq	0.7195	F 6, 60	29.2186
D.W.(1)	1.8286	D.W.(4)	1.3019		

rescus91 =	Total residential customers
sapop91 =	Service area population
intmort.1=	Real interest rates (lagged one period)
rdpsay.1 =	Real disposable service area income (lagged one period)
q1 =	Dummy variable for 1st quarter
q3 =	Dummy variable for 3rd quarter
q4 =	Dummy variable for 4th quarter

NUMBER OF DPC'S ELECTRIC HEATING CUSTOMERS:

```
Cochran-Orcutt
QUARTERLY data for 53 periods from 1977Q3 to 1990Q3
Date: 11 MAR 1991

diff(ehcu91)

  =     0.44190 * diff(rescus91) + 940.040 * q1 - 1572.52 * q1989q4
      (10.6833)                    (3.84289)      (1.86580)

      + 4274.64 * relresgas91[-5] + 1044.20
        (1.97858)                   (0.75197)

Sum Sq       4E+07   Std Err   910.003   LHS Mean  6708.34
R Sq        0.7911   R Bar Sq   0.7689   F  5, 47  35.5989
D.W.( 1)    2.1856   D.W.( 4)   1.6873

AR_0 =   + 0.59982 * AR_1
           (5.05764)
```

ehcu91	=	Electric heating customers
rescus91	=	Total residential customers
q1	=	Dummy variable for 1st quarter
q1989q4	=	Dummy variable for 4th quarter of 1989
relresgas91.5	=	real price of natural gas in 1982 $'s (lagged 5 periods)

KWH PER CUSTOMER OF DPC'S ELECTRIC HEATING CUSTOMERS:

Cochran-Orcutt
QUARTERLY data for 56 periods from 1977Q1 to 1990Q4
Date: 19 MAR 1991

ehkpc91

```
  =     4.95737 * hdh91 + 2.70842 * cdh91*ehac91
      (12.6653)          (7.38960)

    -220.657*rehp8291[-2]  - 1.09083 * ltrend*hdh91 + 3243.10
    (2.22548)                (5.89059)                 (6.05613)

Sum Sq     3047175   Std Err    246.867   LHS Mean  4312.57
R Sq        0.9732   R Bar Sq    0.9705   F  5, 50  362.964
D.W.( 1)    2.0310   D.W.( 4)    1.8765

AR_0 =   + 0.42775 * AR_4
          (3.08522)
```

ehkpc91	=	Electric heating kilowatt hours per customer
hdh91	=	Heating degree hours
cdh91	=	Cooling degree hours
ehac91	=	Air conditioning saturation of electric heating customers
rehp8291(-2)	=	Real price in cents per kwh for electric heating customers (lagged 2 periods)
ltrend	=	Trend variable starting in 1975; with annual change in ltrend decreasing over the years

KWH'S PER CUSTOMER OF DPC'S NON-ELECTRIC HEATING CUSTOMERS:

Cochran-Orcutt
QUARTERLY data for 60 periods from 1976Q1 to 1990Q4
Date: 19 MAR 1991

nehkpc91

```
  =     0.00347 * water*hdh91 + 2.87192 * nehac91*cdh91
      (6.87516)                (14.7839)

      - 40.6667 * rnehp8291 + 2187.12
       (2.50766)             (18.9178)

Sum Sq      178446    Std Err    57.4852   LHS Mean  2428.41
R Sq        0.9720    R Bar Sq    0.9694   F  5, 54  374.370
D.W.( 1)    1.9894    D.W.( 4)    2.4211

AR_0 =  - 0.18837 * AR_3 + 0.72040 * AR_4
         (2.07391)         (7.94434)
```

nehkpc91	=	Non-electric heating kilowatt hours per customer
water	=	Electric water heating saturation of non-electric customers
hdh91	=	Heating degree hours
ehac91	=	Air conditioning saturation of non-electric customers
cdh91	=	Cooling degree hours
rnehp8291	=	Real price in cents per kwh for non-electric customers

Non-participating Municipals
Same model as last year

Model: NPR
Dependent Variable: NPR

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	5	41425085957	8285017191.4	516.242	0.0001
Error	37	593802019.84	16048703.239		
C Total	42	42018887977			

Root MSE	4006.08328	R-square	0.9859
Dep Mean	216305.30233	Adj R-sq	0.9840
C.V.	1.85205		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	36674	10534.687180	3.481	0.0013
HEATING	1	3.408948	0.15111208	22.559	0.0001
COOLING	1	6.661770	0.19308524	34.502	0.0001
INCU6P	1	0.003509	0.00038027	9.227	0.0001
NPRPR_5	1	-8956.678472	4694.0869848	-1.908	0.0642
TOTPRI	1	40098	14705.308691	2.727	0.0097

Test of First and Second Moment Specification

DF: 20 Chisq Value: 12.693333989 Prob>Chisq: 0.8902

Durbin-Watson D	1.719
(For Number of Obs.)	43
1st Order Autocorrelation	0.122

Electric companies

Dependent Variable = ECMWH

Ordinary Least Squares Estimates

SSE	2.1837E9	DFE	43
MSE	50782908	Root MSE	7126.213
SBC	1001.961	AIC	992.6054
Reg Rsq	0.7812	Total Rsq	0.7812
Durbin-Watson	1.0882		

Variable	DF	B Value	Std Error	t Ratio	Approx Prob
Intercept	1	41450.017	7234	5.730	0.0001
HEATING	1	0.5898029624	0.252267	2.338	0.0241
COOLING	1	2.2529616088	0.331425	6.798	0.0001
RDDPSAY	1	0.0008424151	0.000186	4.533	0.0001
RMORT_2	1	-242609.352	39257	-6.180	0.0001

Estimates of the Autoregressive Parameters

Lag	Coefficient	Std Error	t Ratio
1	-0.72759856	0.15951834	-4.561222
2	0.29703249	0.19710423	1.506982
3	0.06814177	0.19618247	0.347339
4	-0.33662226	0.18833[illegible]	-1.787388
5	0.31824351	0.19618[illegible]	1.622181
6	0.21646366	0.19710[illegible]	1.098219
7	-0.28972463	0.15951[illegible]	-1.816246

Yule-Walker Estimates

SSE	8.5002E8	DFE	36
MSE	23611599	Root MSE	4859.177
SBC	986.3145	AIC	963.8601
Reg Rsq	0.8714	Total Rsq	0.9148

Variable	DF	B Value	Std Error	t Ratio	Approx Prob
Intercept	1	40811.882	8630	4.729	0.0001
HEATING	1	0.5765526658	0.218533	2.638	0.0122
COOLING	1	2.1578993592	0.175704	12.281	0.0001
RDDPSAY	1	0.0008796797	0.000207	4.242	0.0001
RMORT_2	1	-246966.451	45422	-5.437	0.0001

MPA Total Requirements

Dependent Variable = MPA

Ordinary Least Squares Estimates

SSE	7.4759E9	DFE	55
MSE	1.3593E8	Root MSE	11658.71
SBC	1284.532	AIC	1276.222
Reg Rsq	0.9912	Total Rsq	0.9912
Durbin-Watson	1.3238		

Variable	DF	B Value	Std Error	t Ratio	Approx Prob
Intercept	1	186703.858	9223.2	20.243	0.0001
MPAHEAT	1	0.0001045914	4.222E-6	24.772	0.0001
MPACOOL	1	0.0001977314	5.801E-6	34.088	0.0001
RDDPSAY	1	0.0096616802	0.000295	32.738	0.0001

Estimates of the Autoregressive Parameters

Lag	Coefficient	Std Error	t Ratio
1	-0.30247676	0.12658310	-2.389551
2	-0.27285521	0.13510529	-2.019575
3	0.24437309	0.12996319	1.880325
4	-0.26210116	0.12753411	-2.055144
10	-0.30641631	0.12234301	-2.504562
12	0.28046352	0.12639911	2.218860

Yule-Walker Estimates

SSE	4.0326E9	DFE	49
MSE	82297083	Root MSE	9071.774
SBC	1275.186	AIC	1254.41
Reg Rsq	0.9853	Total Rsq	0.9952

Variable	DF	B Value	Std Error	t Ratio	Approx Prob
Intercept	1	188443.001	16514	11.411	0.0001
MPAHEAT	1	0.0001092891	3.856E-6	28.343	0.0001
MPACOOL	1	0.000204481	5.552E-6	36.829	0.0001
RDDPSAY	1	0.0094809587	0.000443	21.409	0.0001

PMPA Total Requirements
Same model as last year

Model: PMPA
Dependent Variable: PMP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	5	102526894319	20505378864	648.224	0.0001
Error	41	1296959105	31633148.901		
C Total	46	103823853424			

Root MSE	5624.33542	R-square	0.9875
Dep Mean	302140.78723	Adj R-sq	0.9860
C.V.	1.86149		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	110865	15381.384781	7.208	0.0001
PMPHEAT	1	0.000100	0.00000417	24.038	0.0001
PMPCOOL	1	0.000187	0.00000555	33.696	0.0001
INCU6P	1	0.004013	0.00043377	9.252	0.0001
PMPPR_1	1	-14396	6971.4284177	-2.065	0.0453
TOTPR_3	1	12681	17610.772468	0.720	0.4756

Test of First and Second Moment Specification
DF: 20 Chisq Value: 21.054117849 Prob>Chisq: 0.3940

Durbin-Watson D	2.053
(For Number of Obs.)	47
1st Order Autocorrelation	-0.084

EMC Total Requirements

Dependent Variable = EMC

Ordinary Least Squares Estimates

SSE	2.358E10	DFE	58
MSE	4.0657E8	Root MSE	20163.7
SBC	1443.159	AIC	1432.443
Reg Rsq	0.9833	Total Rsq	0.9833
Durbin-Watson	1.3774		

Variable	DF	B Value	Std Error	t Ratio	Approx Prob
Intercept	1	181841.481	35064	5.186	0.0001
EMCHEAT	1	0.0001096099	4.323E-6	25.353	0.0001
EMCCOOL	1	0.0001078453	5.791E-6	18.621	0.0001
RDDPSAY	1	0.010326681	0.001087	9.499	0.0001
EMCPR_1	1	-22279.048	11798	-1.888	0.0640

Estimates of the Autoregressive Parameters

Lag	Coefficient	Std Error	t Ratio
1	-0.41961386	0.12267584	-3.420509
4	-0.62605434	0.10547267	-5.935702
5	0.34730582	0.12644644	2.746663

Yule-Walker Estimates

SSE	1.098E10	DFE	55
MSE	1.9963E8	Root MSE	14129.03
SBC	1409.734	AIC	1392.589
Reg Rsq	0.9562	Total Rsq	0.9922

Variable	DF	B Value	Std Error	t Ratio	Approx Prob
Intercept	1	142912.248	45544	3.138	0.0027
EMCHEAT	1	0.0001061688	4.671E-6	22.730	0.0001
EMCCOOL	1	0.0001000257	5.535E-6	18.071	0.0001
RDDPSAY	1	0.0105151689	0.001217	8.637	0.0001
EMCPR_1	1	-14880.530	12538	-1.187	0.2404

Saluda River Total Requirements

Dependent Variable = SAL

Ordinary Least Squares Estimates

SSE	3.9279E9	DFE	58
MSE	67723149	Root MSE	8229.408
SBC	1330.241	AIC	1319.526
Reg Rsq	0.9889	Total Rsq	0.9889
Durbin-Watson	1.7030		

Variable	DF	B Value	Std Error	t Ratio	Approx Prob
Intercept	1	48363.2589	13451	3.596	0.0007
SALHEAT	1	0.0001083357	3.766E-6	28.770	0.0001
SALCOOL	1	0.0001331113	5.052E-6	26.346	0.0001
INCU3P	1	0.0053118437	0.000384	13.833	0.0001
SALPR_1	1	-13155.3991	3970	-3.314	0.0016

Estimates of the Autoregressive Parameters

Lag	Coefficient	Std Error	t Ratio
1	-0.26906523	0.13158458	-2.044808
2	0.12729529	0.11476246	1.109207
3	0.13902915	0.11450523	1.214172
4	-0.54040009	0.11476246	-4.708858
5	0.28693452	0.13158458	2.180609

Yule-Walker Estimates

SSE	2.1474E9	DFE	53
MSE	40517039	Root MSE	6365.3
SBC	1314.622	AIC	1293.19
Reg Rsq	0.9886	Total Rsq	0.9939

Variable	DF	B Value	Std Error	t Ratio	Approx Prob
Intercept	1	34623.0435	13511	2.563	0.0133
SALHEAT	1	0.0001000217	4.589E-6	21.796	0.0001
SALCOOL	1	0.0001223573	5.544E-6	22.072	0.0001
INCU3P	1	0.005538052	0.00038	14.587	0.0001
SALPR_1	1	-10828.3381	3889	-2.784	0.0074

DEFINITIONS

NON-PARTICIPATING MUNICIPALS MODEL

Heating	-	hdh * ehsat
hdh	-	Net P&T heating degree hours, base = 65
eheat	-	Duke Power residential electric heating saturation
Cooling	-	cdh * acsat
cdh	-	net P&T cooling degree hours, base = 65
acsat	-	Duke Power residential air conditioning saturation
INCU6P	-	6 period moving average of RDDPSAY
rddpsay	-	real disposable DP service area income
NPRPR_5	-	RNPRPRCE lagged 5 quarters
rnprprce	-	real cents/kwh, non-participating municipals
TOTPR1	-	real price of natural gas, 1st quarter

ELECTRIC COMPANIES MODEL

HEATING	-	same as for non-participating municipals
COOLING	-	same as for non-participating municipals
RDDPSAY	-	same as for non-participating municipals
RMORT_2	-	real mortgage interest rate, lagged 2 quarters

MPA MODEL

MPAHEAT	-	mparescu * mhdh * ehsat
mparescu	-	MPA residential customers
mhdh	-	net calendar heating degree hours, base = 65
ehsat	-	same as for non-participating municipals
MPACOOL	-	mparescu * mcdh * acsat
mcdh	-	net calendar cooling degree hours, base = 65
acsat	-	same as for non-participating municipals
RDDPSAY	-	same as for non-participating municipals

PMPA MODEL

PMPHEAT	-	pmprescu * phdh * ehsat
pmprescu	-	PMPA residential customers
phdh	-	same as for MPA
ehsat	-	same as for non-participating municipals
PMPCOOL	-	pmprescu * pcdh * acsat
pcdh	-	same as for MPA
acsat	-	same as for non-participating municipals
INCU6P	-	same as for non-participating municipals
PMPPR_1	-	rpmpprce lagged 1 quarter
rpmpprce	-	real cents/kwh, PMPA
TOTPR_3	-	real price of natural gas, lagged 3 quarters

EMC MODEL

HEAT	-	emcrescu * chdh * ehsat
emcrescu	-	EMC residential customers
chdh	-	same as for MPA
ehsat	-	same as for non-participating municipals
EMCCOOL	-	emcrescu * ccdh * acsat
ccdh	-	same as for MPA
acsat	-	same as for non-participating municipals
RDDPSAY	-	same as for non-participating municipals
EMCPR_1	-	real cents/kwh, EMC

SALUDA MODEL

SALHEAT	-	salrescu * chdh * ehsat
salrescu	-	Saluda residential customers
chdh	-	same as for MPA
ehsat	-	same as for non-participating municipals
SALCOOL	-	salrescu * ccdh * acsat
ccdh	-	same as for MPA
acsat	-	same as for non-participating municipals
INCU3P	-	3 period moving average of RDDPSAY
SALPR_1	-	real cent/kwh. Saluda River

F. PEAK DEMAND EQUATIONS

Summer Peak
Winter Peak

SUMMER PEAKS

1991 Forecast: Summer Peaks- Residential Class

Dependent Variable = RESKWCU

Preliminary MSE = 0.012188

Estimates of the Autoregressive Parameters

Lag	Coefficient	Std Error	t Ratio
1	-0.52150727	0.09918793	-5.257769

Autoreg Procedure

Yule-Walker Estimates

SSE	1.001108	DFE	74
MSE	0.013528	Root MSE	0.116312
SBC	-87.1251	AIC	-113.994
Reg Rsq	0.7946	Total Rsq	0.8289

Variable	DF	B Value	Std Error	t Ratio	Approx Prob
Intercept	1	1.33986925	0.75866	1.766	0.0815
TEMPMIN	1	0.01978070	0.01028	1.925	0.0581
D1982	1	-0.16708394	0.07574	-2.206	0.0305
DUMA6	1	0.12873608	0.05136	2.507	0.0144
RESRP	1	-0.23111414	0.08244	-2.803	0.0065
ACSATT	1	0.02217841	0.00541	4.101	0.0001
HOUR3	1	-0.30256515	0.03798	-7.965	0.0001
HOUR4	1	-0.20270452	0.03198	-6.339	0.0001
HOUR6	1	0.10336065	0.04151	2.490	0.0150
HOUR7	1	0.28360401	0.04266	6.649	0.0001

RESKWCU= total resid Mw/ total resid customers
TEMPMIN= minimum morning temperature
D1982 = dummy variable =1 for 1982, =0 otherwise
DUMA6 = dummy variable =1 for 6 PM 1981-87
RESRP = resid price of electricity deflated by DPSA deflator
ACSATT = resid saturation of window and central units times TEMP
TEMP = temperature at a given hour
HOUR3 = dummy variable =1 for hour 3 PM, =0 otherwise
HOUR4 = dummy variable =1 for hour 4 PM, =0 otherwise
HOUR6 = dummy variable =1 for hour 6 PM, =0 otherwise
HOUR7 = dummy variable =1 for hour 7 PM, =0 otherwise

1991 Forecast: Summer Peak- Commercial Class

Dependent Variable = GSKWCU

Preliminary MSE = 0.073059

Estimates of the Autoregressive Parameters

Lag	Coefficient	Std Error	t Ratio
1	-0.59265231	0.09559033	-6.199919

Autoreg Procedure

Yule-Walker Estimates

SSE	5.581131	DFE	71
MSE	0.078607	Root MSE	0.28037
SBC	57.56554	AIC	33.62105
Reg Rsq	0.9360	Total Rsq	0.9474

Variable	DF	B Value	Std Error	t Ratio	Approx Prob
Intercept	1	1.47977783	2.0554	0.720	0.4739
TEMP	1	0.04686680	0.0103	4.533	0.0001
TEMPMIN	1	0.07316200	0.0285	2.571	0.0122
GRPNM6P	1	9.1703724E-8	1.257E-8	7.294	0.0001
DGA2	1	0.82091421	0.2467	3.327	0.0014
DGRPNM	1	7.2859151E-7	1.841E-7	3.958	0.0002
GS4P	1	-0.38293335	0.1896	-2.020	0.0471
HOUR6	1	-1.75158089	0.0828	-21.159	0.0001
HOUR5	1	-0.50300706	0.0711	-7.074	0.0001

GSKWCU = total commercial Mw/ G+GA customers
TEMP = temperature at a given hour
TEMPMIN= minimum morning temperature
GRPNM6P= non-manufacturing GRP in 6 period moving average
GRP = DPSA Gross Regional Product by SIC deflated by DPSA deflator
DGA2 = dummy variable =1 for 2 PM on July 17, 1980, =0 otherwise
DGRPNM = change from prior quarter of non-mfg GRP
GS4P = commercial price of electricity in 4 period moving average deflated by DPSA deflator

HOUR5= dummy variable =1 for hour 5 PM, =0 otherwise
HOUR6= dummy variable =1 for hour 6 PM, =0 otherwise

1991 Forecast: Summer Peaks- Industrial Class Textiles Schedule

Dependent Variable = TEXMW

Autoreg Procedure

Preliminary MSE = 620.2022

Estimates of the Autoregressive Parameters

Lag	Coefficient	Std Error	t Ratio
1	-0.54103531	0.11444559	-4.727446

Autoreg Procedure

Yule-Walker Estimates

SSE	36456.99	DFE	54
MSE	675.1295	Root MSE	25.98325
SBC	617.4692	AIC	598.181
Reg Rsq	0.7217	Total Rsq	0.8283

Variable	DF	B Value	Std Error	t Ratio	Approx Prob
Intercept	1	514.993965	160.15	3.216	0.0022
COIN	1	-52.850705	8.76	-6.036	0.0001
GRP224P	1	0.0001299459	0.000026	5.045	0.0001
DGRP22	1	0.000252	0.000131	1.925	0.0595
TEMP	1	1.593726	0.93	1.715	0.0920
TEMPMIN	1	6.232762	1.92	3.253	0.0020
HOUR6	1	-39.490146	12.79	-3.087	0.0032
HOUR5	1	-22.262943	7.46	-2.983	0.0043

TEXMW = total Mw in Textiles schedule
COIN = dummy variable =1 for day of system monthly peak, =0 otherwise
GRP224P= SIC 22 GRP in 4 period moving average
GRP = DPSA Gross Regional Product by SIC deflated by DPSA deflator
TEMP = temperature at a given hour
TEMPMIN= minimum morning temperature
HOUR5 = dummy variable =1 for hour 5 PM, =0 otherwise
HOUR6 = dummy variable =1 for hour 6 PM, =0 otherwise

1991 Forecast: Summer Peaks- Indusrial Class Other Industrial Schedule

Dependent Variable = OIMW

Ordinary Least Squares Estimates

SSE	80440.71	DFE	48
MSE	1675.848	Root MSE	40.93712
SBC	678.153	AIC	648.3731
Reg Rsq	0.9710	Total Rsq	0.9710
Durbin-Watson	2.0600		

Variable	DF	B Value	Std Error	t Ratio	Approx Prob
Intercept	1	864.617560	139.62	6.193	0.0001
TEMP	1	2.275072	1.43	1.590	0.1184
GRPOI6P	1	0.0000488391	2.547E-6	19.179	0.0001
DGRPOI	1	0.0000978775	0.000049	2.016	0.0494
D1985	1	-106.420875	19.80	-5.374	0.0001
D1987	1	95.124170	23.30	4.083	0.0002
JUL90	1	-99.451375	27.46	-3.622	0.0007
DNG4	1	512.501553	240.64	2.130	0.0383
HOUR11	1	322.067345	24.56	13.111	0.0001
HOUR12	1	292.665664	27.55	10.624	0.0001
HOUR2	1	285.475131	16.42	17.385	0.0001
HOUR3	1	232.854492	16.19	14.386	0.0001
HOUR4	1	122.556144	17.16	7.143	0.0001
HOUR6	1	-113.677297	22.41	-5.072	0.0001

OIMW = total Mw in Other Industrial schedule
GRPOI6P= total MFG GRP less SIC 22 GRP in 6 period moving average
GRP = DPSA Gross Regional Product by SIC deflated by DPSA deflator
D1985 = dummy variable =1 for 1985, =0 otherwise
D1987 = dummy variable =1 for 1987, =0 otherwise
Jul90 = dummy variable =1 for July 1990, =0 otherwise
DNG4 = change from prior quarter in price of natural gas deflated using DPSA deflator
HOUR11 = dummy variable =1 for hour 11 AM, =0 otherwise
HOUR12 = dummy variable =1 for hour 12 PM, =0 otherwise
HOUR2 = dummy variable =1 for hour 2 PM, =0 otherwise
HOUR3 = dummy variable =1 for hour 3 PM, =0 otherwise
HOUR4 = dummy variable =1 for hour 4 PM, =0 otherwise
HOUR6 = dummy variable =1 for hour 6 PM, =0 otherwise

1991 Forecast: Summer Peaks- Resale Class
(combined model for summer and winter)

Dependent Variable = RESALE

Ordinary Least Squares Estimates

SSE	1060.069	DFE	22
MSE	48.18495	Root MSE	6.941538
SBC	228.3752	AIC	215.4694
Reg Rsq	0.9711	Total Rsq	0.9711
Durbin-Watson	1.9652		

Variable	DF	B Value	Std Error	t Ratio	Approx Prob
Intercept	1	-154.646276	71.242	-2.171	0.0410
TEMPMIN	1	2.935996	0.964	3.044	0.0059
PD4	1	-1.597144	0.208	-7.686	0.0001
GRPM6S	1	8.25034E-6	4.775E-7	17.279	0.0001
GRPM6W	1	6.9264202E-6	4.58E-7	15.122	0.0001
DY	1	0.000012439	3.134E-6	3.969	0.0007
WIN	1	243.142244	71.815	3.386	0.0027
D1983	1	12.455644	5.337	2.334	0.0291
D1987	1	-16.196601	5.602	-2.891	0.0085

RESALE = total Mw in Resale schedule
TEMPMIN= minimum morning temperature for summer season
PD4 = prior day 4 PM temperature for winter season
GRPM6S = total manufacturing GRP in 6 period moving average times SUM
SUM = dummy variable =1 for summer season, =0 otherwise
GRPM6w = total manufacturing GRP in 6 period moving average times WIN
WIN = dummy variable =1 for winter season, =0 otherwise
DY = change from prior quarter in DPSA total real disposable income
D1983 = dummy variable =1 for 1983, =0 otherwise
D1987 = dummy variable =1 for 1987, =0 otherwise

1991 Forecast: Summer Peaks- Catawba Participants

Dependent Variable = MPA

Ordinary Least Squares Estimates

SSE	9250.761	DFE	28
MSE	330.3843	Root MSE	18.17648
SBC	308.2534	AIC	299.0952
Reg Rsq	0.9552	Total Rsq	0.9552
Durbin-Watson	2.2797		

Variable	DF	B Value	Std Error	t Ratio	Approx Prob
Intercept	1	-558.244336	100.70	-5.544	0.0001
TEMP	1	3.453198	0.76	4.565	0.0001
TEMPMIN	1	5.492948	1.47	3.725	0.0009
AUG	1	26.089254	7.51	3.475	0.0017
AUG86	1	-129.156485	19.30	-6.693	0.0001
Y6P	1	9.6030948E-6	4.191E-7	22.911	0.0001

MPA = total requirements for NC MPA#1 Catawba participant
TEMP = temperature at a given hour
TEMPMIN= minimum morning temperature
AUG = dummy variable =1 for August, =0 otherwise
AUG86 = dummy variable =1 for August 1986, =0 otherwise
Y6P = DPSA real disposable income in 6 period moving average

Dependent Variable = PMP

Ordinary Least Squares Estimates

SSE	1419.529	DFE	26
MSE	54.59728	Root MSE	7.388997
SBC	232.9615	AIC	224.1671
Reg Rsq	0.9652	Total Rsq	0.9652
Durbin-Watson	1.9302		

Variable	DF	B Value	Std Error	t Ratio	Approx Prob
Intercept	1	-288.704247	41.250	-6.999	0.0001
TEMP	1	1.651720	0.340	4.863	0.0001
TEMPMIN	1	2.362302	0.616	3.832	0.0007
AUG	1	9.211353	3.074	2.997	0.0059
AUG86	1	-43.873688	7.845	-5.592	0.0001
Y6P	1	4.4247028E-6	1.713E-7	25.826	0.0001

PMP = total requirements for SC PMPA Catawba participant
TEMP = temperature at a given hour
TEMPMIN= minimum morning temperature
AUG = dummy variable =1 for August, =0 otherwise
AUG86 = dummy variable =1 for August 1986, =0 otherwise
Y6P = DPSA real disposable income in 6 period moving average

1991 Forecast: Summer Peaks- Catawba Participants

Dependent Variable = EMC

Ordinary Least Squares Estimates

SSE	27072.04	DFE	28
MSE	966.8584	Root MSE	31.09435
SBC	344.7624	AIC	335.6043
Reg Rsq	0.9199	Total Rsq	0.9199
Durbin-Watson	2.2007		

Variable	DF	B Value	Std Error	t Ratio	Approx Prob
Intercept	1	-536.426461	118.80	-4.515	0.0001
TEMP	1	4.910076	1.22	4.037	0.0004
JUN	1	-43.263227	13.85	-3.123	0.0041
SEP	1	-48.692565	16.25	-2.997	0.0057
AUG86	1	-139.329718	31.91	-4.367	0.0002
Y6P	1	0.0000128361	7.44E-7	17.253	0.0001

EMC = total requirements for NC EMC Catawba participant
TEMP = temperature at a given hour
JUN = dummy variable =1 for June, =0 otherwise
SEP = dummy variable =1 for September, =0 otherwise
AUG86= dummy variable =1 for August 1986, =0 otherwise
Y6P = DPSA real disposable income in 6 period moving average

Dependent Variable = SAL

Ordinary Least Squares Estimates

SSE	6522.04	DFE	28
MSE	232.93	Root MSE	15.26204
SBC	274.8256	AIC	268.9627
Reg Rsq	0.9380	Total Rsq	0.9380
Durbin-Watson	1.4748		

Variable	DF	B Value	Std Error	t Ratio	Approx Prob
Intercept	1	-435.755969	60.675	-7.182	0.0001
TEMP	1	3.740801	0.605	6.182	0.0001
AUG86	1	-60.005378	15.516	-3.867	0.0006
Y6P	1	7.0817621E-6	3.524E-7	20.098	0.0001

SAL = total requirements for SC Saluda Rv Catawba participant
TEMP = temperature at a given hour
AUG86= dummy variable =1 for August 1986, =0 otherwise
Y6P = DPSA real disposable income in 6 period moving average

1991 Forecast: Summer Peak- Traffic Signals and Outdoor Lighting

1. Traffic signal load was forecasted by asumming a constant incremental growth of 0.2 Mw per year. T+TS schedule.

2. Outdoor lighting has no load at 5 PM. T2 schedule.

WINTER PEAKS

1991 Forecast: Winter Peaks- Residential Class

Dependent Variable = RESKWCU

Autoreg Procedure

Estimates of the Autoregressive Parameters

Lag	Coefficient	Std Error	t Ratio
1	-0.40793332	0.12456100	-3.274968
2	0.34002902	0.12456100	2.729819

Yule-Walker Estimates

SSE	1.081638	DFE	57
MSE	0.018976	Root MSE	0.137754
SBC	-43.9288	AIC	-65.9757
Reg Rsq	0.7977	Total Rsq	0.8461

Variable	DF	B Value	Std Error	t Ratio	Approx Prob
Intercept	1	3.04789339	0.16072	18.963	0.0001
PD4	1	-0.00733982	0.00340	-2.162	0.0349
TEMP	1	-0.02760876	0.00355	-7.779	0.0001
WKEND	1	-0.24946297	0.09947	-2.508	0.0150
WATK8	1	0.19240205	0.03625	5.308	0.0001
DUM7	1	-0.22537383	0.09987	-2.257	0.0279
D1987	1	-0.24897731	0.08145	-3.057	0.0034
EHK	1	0.24830609	0.09511	2.611	0.0115

RESKWCU= total resid Kw/ total resid customers
PD4 = prior day 4 PM temperature
TEMP = tempearture at a given hour
WKEND = dummy variable =1 for Saturday, =0 otherwise
WATK8 = resid electric water heating saturation times 1.0 Kw at hour 8 AM
DUM7 = dummy variable =1 for hour 7 AM in December, 1989, =0 otherwise
D1987 = dummy variable =1 for 1987, =0 otherwise
EHK = resid saturation of heat pumps times 4.7 Kw + other electric heating times 5.1 Kw

1991 Forecast: Winter Peaks- Commercial Class GA Schedule

Dependent Variable = GAMW

Estimates of the Autoregressive Parameters

Lag	Coefficient	Std Error	t Ratio
1	-0.60298945	0.09534926	-6.324008

Autoreg Procedure

Yule-Walker Estimates

SSE	82645.58	DFE	70
MSE	1180.651	Root MSE	34.3606
SBC	866.4292	AIC	834.9842
Reg Rsq	0.9057	Total Rsq	0.9311

Variable	DF	B Value	Std Error	t Ratio	Approx Prob
Intercept	1	480.328613	170.38	2.819	0.0063
COIN	1	18.758053	11.67	1.608	0.1124
TEMP	1	-3.694212	0.82	-4.495	0.0001
GRPNM6P	1	0.0000113714	2.493E-6	4.562	0.0001
D1980	1	-132.543875	36.36	-3.645	0.0005
GARP	1	-82.375609	31.09	-2.650	0.0099
NG4P	1	763.283928	310.26	2.460	0.0164
DGA1	1	-61.783313	15.07	-4.099	0.0001
DGA2	1	138.689047	31.55	4.395	0.0001
HOUR7	1	-182.604693	12.22	-14.946	0.0001
HOUR8	1	-107.614716	10.05	-10.712	0.0001
HOUR9	1	-29.978152	8.44	-3.551	0.0007

GAMW = total Mw for schedule GA
COIN = dummy variable =1 for day of system monthly peak, =0 otherwise
TEMP = tempearture at a given hour
GRPNM6P= non-manufacturing GRP in 6 period moving average
GRP = DPSA Gross Regional Product by SIC deflated by DPSA deflator
D1980 = dummy variable =1 for 1980, =0 otherwise
GARP = price of electricity to GA schedule deflated by DPSA deflator
NG4P = price of commercial natural gas deflated by DPSA deflator
DGA1 = dummy variable =1 for hour 7 AM 1981-1984, =0 otherwise
DGA2 = dummy variable =1 for hour 7 AM Feb 5,1980, =0 otherwise
HOUR7 = dummy variable =1 for hour 7 AM, =0 otherwise
HOUR8 = dummy variable =1 for hour 8 AM, =0 otherwise
HOUR9 = dummy variable =1 for hour 9 AM, =0 otherwise

1991 Forecast: Winter Peaks- Commercial Class G Schedule

Dependent Variable = GKWCU

Estimates of the Autoregressive Parameters

Lag	Coefficient	Std Error	t Ratio
1	-0.39303328	0.10836697	-3.626873

Autoreg Procedure
Yule-Walker Estimates

SSE	14.63337	DFE	72
MSE	0.203241	Root MSE	0.450823
SBC	135.6209	AIC	111.5537
Reg Rsq	0.9143	Total Rsq	0.9180

Variable	DF	B Value	Std Error	t Ratio	Approx Prob
Intercept	1	3.35971823	0.64698	5.193	0.0001
GRPNM6P	1	8.7256063E-8	1.405E-8	6.211	0.0001
DG1	1	-0.59814932	0.22183	-2.696	0.0087
DGA1	1	-0.49376133	0.20611	-2.396	0.0192
D1986	1	0.42293977	0.25218	1.677	0.0979
D1987	1	-0.51736126	0.25363	-2.040	0.0450
HOUR7	1	-1.13824546	0.13393	-8.499	0.0001
HOUR9	1	1.35916903	0.11664	11.652	0.0001
HOUR10	1	1.75222598	0.12821	13.666	0.0001

GKWCU = schedule G kw/ G customers
GRPNM6P= non-manufacturing GRP in 6 period moving average
GRP = DPSA Gross Regional Product by SIC deflated by DPSA deflator
DG1 = dummy variable =1 for hour 7 AM 1979- Jan 12,1981, =0 otherwise
DGA1 = dummy variable =1 for hour 7 AM 1981-1984, =0 otherwise
D1986 = dummy variable =1 for 1986, =0 otherwise
D1987 = dummy variable =1 for 1987, =0 otherwise
HOUR7 = dummy variable =1 for hour 7 AM, =0 otherwise
HOUR8 = dummy variable =1 for hour 8 AM, =0 otherwise
HOUR9 = dummy variable =1 for hour 9 AM, =0 otherwise
HOUR10 = dummy variable =1 for hour 10 AM, =0 otherwise

1991 Forecast: Winter Peaks- Industrial Class Textiles Schedule

Dependent Variable = TEXMW

Ordinary Least Squares Estimates

SSE	89603.55	DFE	37
MSE	2421.718	Root MSE	49.21095
SBC	459.8294	AIC	451.141
Reg Rsq	0.6480	Total Rsq	0.6480
Durbin-Watson	1.4911		

Variable	DF	B Value	Std Error	t Ratio	Approx Prob
Intercept	1	853.745834	109.60	7.790	0.0001
GRP22	1	0.0001163258	0.000024	4.810	0.0001
COIN	1	-42.860574	21.10	-2.031	0.0495
CTEMP	1	0.971523	0.41	2.378	0.0227
FRI	1	-60.413347	28.04	-2.155	0.0378

TEXMW= total Mw for Textiles schedule
GRP22= GRP for SIC 22
GRP = DPSA Gross Regional Product by SIC deflated by DPSA deflator
COIN = dummy variable =1 for day of system monthly peak, =0 otherwise
CTEMP= tempearture at a given hour if TEMP>45
FRI = dummy variable =1 for Friday, =0 otherwise

1991 Forecast: Winter Peaks- Industrial Class Other Industrial Schedule

Dependent Variable = OIMW

Ordinary Least Squares Estimates

SSE	103775.4	DFE	39
MSE	2660.908	Root MSE	51.58399
SBC	553.2242	AIC	534.306
Reg Rsq	0.9294	Total Rsq	0.9294
Durbin-Watson	1.7165		

Autoreg Procedure

Variable	DF	B Value	Std Error	t Ratio	Approx Prob
Intercept	1	883.211801	65.779	13.427	0.0001
GRPOI6P	1	0.0000476458	3.841E-6	12.405	0.0001
DGRPOI	1	0.0000485632	0.000017	2.815	0.0076
TUE	1	49.369045	19.099	2.585	0.0136
HOUR7	1	-234.073564	32.343	-7.237	0.0001
HOUR9	1	65.040137	24.180	2.690	0.0105
HOUR10	1	68.192214	33.949	2.009	0.0515
HOUR11	1	165.775052	24.176	6.857	0.0001
HOUR2	1	219.134672	22.868	9.582	0.0001
HOUR3	1	296.333860	54.595	5.428	0.0001

OIMW = total Mw for Manufacturing Other Industrial schedule
GRPOI6P= GRP for Manufacturing less schedule Textiles
GRP = DPSA Gross Regional Product by SIC deflated by DPSA deflator
DGRP = change in GRP Other Industrial
tue = dummy variable =1 for Tuesday, =0 otherwise
HOUR7 = dummy variable =1 for hour 7 AM, =0 otherwise
HOUR9 = dummy variable =1 for hour 9 AM, =0 otherwise
HOUR10 = dummy variable =1 for hour 10 AM, =0 otherwise
HOUR11 = dummy variable =1 for hour 11 AM, =0 otherwise
HOUR2 = dummy variable =1 for hour 2 PM, =0 otherwise
HOUR3 = dummy variable =1 for hour 3 PM, =0 otherwise

1991 Forecast: Winter Peaks 4 Catawba Participants

Dependent Variable = MPA

Ordinary Least Squares Estimates

SSE	5871.418	DFE	23
MSE	255.2791	Root MSE	15.97745
SBC	235.1204	AIC	229.9371
Reg Rsq	0.9051	Total Rsq	0.9051
Durbin-Watson	1.7495		

Variable	DF	B Value	Std Error	t Ratio	Approx Prob
Intercept	1	260.762480	25.325	10.297	0.0001
TEMP	1	-2.335311	0.591	-3.949	0.0006
PD4	1	-1.392406	0.535	-2.602	0.0159
Y6P	1	7.56524E-6	5.449E-7	13.884	0.0001

MPA = total Mw for NC MPA#1 Catawba participants
PD4 = prior day 4 PM temperature
TEMP= tempearture at a given hour
Y6P = DPSA real disposable income in 6 period moving average

Dependent Variable = PMP

Ordinary Least Squares Estimates

SSE	1014.999	DFE	21
MSE	48.33328	Root MSE	6.952214
SBC	176.4166	AIC	171.5411
Reg Rsq	0.9118	Total Rsq	0.9118
Durbin-Watson	1.5260		

Variable	DF	B Value	Std Error	t Ratio	Approx Prob
Intercept	1	105.060810	11.136	9.434	0.0001
TEMP	1	-1.131569	0.264	-4.290	0.0003
PD4	1	-0.798115	0.242	-3.293	0.0035
Y6P	1	3.2951191E-6	2.455E-7	13.423	0.0001

MPA = total Mw for SC PMPA Catawba participants
PD4 = prior day 4 PM temperature
TEMP= tempearture at a given hour
Y6P = DPSA real disposable income in 6 period moving average

Dependent Variable = EMC

Ordinary Least Squares Estimates

SSE	16831.14	DFE	24
MSE	701.2976	Root MSE	26.48202
SBC	260.2592	AIC	256.3717
Reg Rsq	0.9152	Total Rsq	0.9152
Durbin-Watson	1.9578		

Variable	DF	B Value	Std Error	t Ratio	Approx Prob
Intercept	1	143.866149	40.631	3.541	0.0017
TEMP	1	-7.381524	0.580	-12.731	0.0001
Y6P	1	0.000012663	8.941E-7	14.162	0.0001

EMC = total Mw for NC EMC Catawba participants
PD4 = prior day 4 PM temperature
TEMP= tempearture at a given hour
Y6P = DPSA real disposable income in 6 period moving average

Dependent Variable = SAL

Ordinary Least Squares Estimates

SSE	2039.354	DFE	23
MSE	88.66759	Root MSE	9.416347
SBC	206.5689	AIC	201.3856
Reg Rsq	0.9640	Total Rsq	0.9640
Durbin-Watson	2.4059		

Variable	DF	B Value	Std Error	t Ratio	Approx Prob
Intercept	1	-12.0955884	14.925	-0.810	0.4260
TEMP	1	-2.7443596	0.349	-7.874	0.0001
PD4	1	-0.5506240	0.315	-1.746	0.0942
Y6P	1	7.6646802E-6	3.211E-7	23.868	0.0001

SAL = total Mw for SC Saluda River Catawba participants
PD4 = prior day 4 PM temperature
TEMP= tempearture at a given hour
Y6P = DPSA real disposable income in 6 period moving average

1991 Forecast: Summer Peaks- Resale Class
(combined model for summer and winter)

Dependent Variable = RESALE

Ordinary Least Squares Estimates

SSE	1060.069	DFE	22
MSE	48.18495	Root MSE	6.941538
SBC	228.3752	AIC	215.4694
Reg Rsq	0.9711	Total Rsq	0.9711
Durbin-Watson	1.9652		

Variable	DF	B Value	Std Error	t Ratio	Approx Prob
Intercept	1	-154.646276	71.242	-2.171	0.0410
TEMPMIN	1	2.935996	0.964	3.044	0.0059
PD4	1	-1.597144	0.208	-7.686	0.0001
GRPM6S	1	8.25034E-6	4.775E-7	17.279	0.0001
GRPM6W	1	6.9264202E-6	4.58E-7	15.122	0.0001
DY	1	0.000012439	3.134E-6	3.969	0.0007
WIN	1	243.142244	71.815	3.386	0.0027
D1983	1	12.455644	5.337	2.334	0.0291
D1987	1	-16.196601	5.602	-2.891	0.0085

RESALE = total Mw in Resale schedule
TEMPMIN= minimum morning temperature for summer season
PD4 = prior day 4 PM temperature for winter season
GRPM6S = total manufacturing GRP in 6 period moving average times SUM
SUM = dummy variable =1 for summer season, =0 otherwise
GRPM6w = total manufacturing GRP in 6 period moving average times WIN
WIN = dummy variable =1 for winter season, =0 otherwise
DY = change from prior quarter in DPSA total real disposable income
D1983 = dummy variable =1 for 1983, =0 otherwise
D1987 = dummy variable =1 for 1987, =0 otherwise

1991 Winter Peak Forecast: Traffic Signals and Outdoor Lighting

1. Traffic Signal load was forecasted by assumming a constant incremental increase of 0.5 Mw per year. T+TS schedule.

2. Outdoor lighting was forecated by assumming that each T2 bill uses 0.166 Kw per bill. T2 demand is the product of Kw per bill times the number of customers (bills). T2 schedule.