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# MODEL DOCUMENTATION REPORT: MACROECONOMIC ACTIVITY MODULE (MAM) OF THE NATIONAL ENERGY MODELING SYSTEM

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# Update Information

This edition of the *Macroeconomic Activity Model (MAM) – Model Documentation 2008* reflects changes made to the MAM over the past year for the *Annual Energy Outlook 2008*. These changes include:

- Addition of driver variables for ethanol imports, the ethanol wholesale price, the corn price, consumption of ethanol in transportation and the price of ethanol in transportation.
- Updates to date ranges and programming code descriptions in the MAM source and input files.
- Updates to data for all the MAM models including factors used when assuming high or low economic growth or technology penetration.
- Re-specification and estimation of EIA's regional macroeconomic and commercial floorspace models.
- Removal of all policy-related code from the MAM source and input files used for the *Annual Energy Outlook 2008* reference case. Each policy will now have its own source and input files.
- Change of all classification references in the industrial output and employment by industry models to the U.S. Standard Industrial Classification (SIC) system to the North American Industry Classification System (NAICS).
- Change to the computation of Electronic and Electric Products (NAICS 334) and of Electric Equipment and Appliances (NAICS 335) manufacturing to reflect updates to Global Insight's Industrial Output and Employment by Industry models.
- Expansion of personal income in EIA's Regional Macroeconomic model to include wage and salary disbursements by government and the private sector and to include other personal income.

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## Purpose of This Report

The National Energy Modeling System (NEMS) is a comprehensive, mid-term energy forecasting and policy analysis tool used by the EIA. The NEMS projects energy supply, demand, prices, and environmental emissions, by region, given assumptions about the state of the economy, international markets, and energy policies. The Macroeconomic Activity Module (MAM) links the NEMS to the rest of the economy by providing projections of economic driver variables for use by the supply, demand, and conversion modules of the NEMS. The MAM's baseline economic forecast contains the initial economic assumptions used in the NEMS to help determine energy demand and supply. The MAM can also provide the NEMS with alternative economic assumptions representing a range of uncertainty about economic growth. Differing assumptions regarding the path of world oil prices or of the penetration of new technologies can also be modeled in the MAM. The resulting economic impacts of such assumptions are inputs to the remaining supply and demand modules of the NEMS. Outside of the Annual Energy Outlook setting, the MAM represents a system of linked modules capable of assessing the potential impacts on the economy of changes in energy events or of policy proposals as specified by a non-EIA requestor. These economic impacts result from assumptions about energy events resulting from policy proposals built into the NEMS. The linked modules of the NEMS then iterate to a solution..

This report documents the objectives and analytical approach of the MAM that is used to develop the Annual Energy Outlook for 2008 (AEO 2008). It serves as a reference document providing a description of the MAM used for the AEO 2008 production runs for model analysts, users, and the public. It also facilitates continuity in model development by providing documentation from which energy analysts can undertake model enhancement and modifications. This documentation report is divided into two separate components.

**Part A** presents the structural models comprising the MAM. These include:

1. Global Insight's model of the U.S. economy,
2. Global Insight's models of industrial output and of employment by industry and
3. Energy Information Administration's models of the regional economies.

**Part B** focuses on the MAM's interface with the NEMS. This section identifies the set of model levers and simulation rules used to operate the system. It also provides a discussion of three types of integrated simulations carried out with the NEMS. This section also views the MAM from the perspective of a programmer focusing on the ties that link the various models together to form the MAM and how the MAM communicates with the NEMS.

**Appendices A and B** provide detailed information on variable listings and sectoral definitions.

**Appendix C** provides a detailed listing of the equations for the regional models.

# Part A
# STRUCTURAL MODELS COMPRISING THE MAM

## 1. Modeling System Overview

Economic activity driving the National Energy Modeling System (NEMS) is determined by an economic modeling system comprised of three sets of models:

1. Global Insight's model of the U.S. economy,
2. Global Insight's industrial output and employment by industry models and
3. Energy Information Administration's (EIA) regional models.

Global Insight's model of the U.S. economy is the same model used by Global Insight, Inc. to produce its economic forecasts for the company's monthly assessment of the U.S. economy. The Global Insight U.S. model used for the AEO2008 is the US2006A version. EIA's industrial output and employment by industry models are derivatives of Global Insight's industrial output and employment by industry models. The models have been tailored in order to provide the industrial output and employment by industry detail required by the NEMS modeling system. EIA's regional models consist of models of economic activity, industrial output, employment by industry, and commercial floorspace. The first two models were developed during 2004 for use in the preparation of the Annual Energy Outlook (AEO) 2005. The regional models were re-estimated for the AEO 2008.

All of the MAM models are linked to provide a fully integrated approach to forecasting economic activity at the national, industrial and regional levels. Global Insight's model of the U.S. economy determines the national economy's growth path and the final demand mix. EIA's industrial output model ensures that supply by industry is consistent with the final demands (consumption, investment, government spending, exports and imports) forecasted in the U.S. model. Industrial output is the key driver of the employment forecast in EIA's employment by industry model. The employment by industry forecast also incorporates aggregate hours per week and productivity trends forecasted in the U.S. model. The employment by industry forecast is aligned with the aggregate employment forecast of the U.S. model. Key inputs to EIA's regional models include forecasts of national output, employment by industry, population, nation income and housing activity. EIA's regional models then forecast levels of industrial output, employment by industry, population, incomes, and housing activity for each of the nine Census Divisions. The sum of each of these concepts across the nine Census Divisions is aligned with the national totals forecasted by the U.S. model. Together, these models of the U.S. economy, industrial output, employment by industry and of regional economic activity constitute the Macroeconomic Activity Module (MAM) of the National Energy Modeling System (NEMS). Before the MAM can execute its suite of models though, it requires exogenous assumptions

regarding energy prices, consumption and domestic production. Over seventy energy prices and quantities are extracted from the output of the demand and supply modules of the NEMS. Transformations of the exogenous assumptions are necessary to map these inputs from the NEMS into more aggregated concepts in the MAM. After the appropriate transformations are done, the U.S., industrial output, employment by industry and regional models execute in sequence to produce a forecast of economic activity at the national, industrial and regional levels. Drawn from the forecast are economic driver variables that are then passed to the supply, demand and conversion modules of the NEMS. The NEMS then reacts to the new economic activity assumptions. Forecasts of energy prices and quantities based upon these new economic assumptions are then passed back to the MAM. A NEMS "cycle" is completed once all the modules of the NEMS solve. Cycles are repeated as the NEMS iterates to a stable solution.

There are a few industrial output and employment by industry concepts whose forecast in the MAM are determined by the NEMS. The MAM's forecast of industrial output for the five energy-related sectors are based upon growth rates extracted from the appropriate modules in the NEMS. The growth rates in output of petroleum refining, coal mining, oil and gas extraction, electric utilities and gas utilities are applied to the last historical value of the appropriate series in the MAM's industrial output model. A similar computation is done for employment by industry but for only two of the five energy sectors. Growth in employment is computed for coal mining and for oil and gas extraction using forecasts from the appropriate NEMS modules. These growth rates are then applied to the last historical value of the appropriate series in the MAM's employment by industry model.

## Global Insight's Model of the U.S. Economy

**Key Inputs:** National population by age cohort, total factor productivity, federal tax rates and nominal expenditures, money supply, energy prices and quantities and GDP of major and other important trading partners.
**Key Outputs:** Final demands (consumption, investment, government purchases, exports, imports), inflation, foreign exchange and interest rates, incomes, employment, federal and state/local government revenues and expenditures and balance of payments.

## Global Insight's Industrial Output Model

**Key Inputs:** Final demands, prices and productivity measures from Global Insight's model of the U.S. economy and input-output coefficient matrix.
**Key Outputs:** Real output value (defined by value of shipments or revenue) for sixty industrial and service sectors.

## Global Insight's Employment by Industry Model

**Key Inputs:** Industrial outputs from the industrial output model, capital service cost determinants, productivity measures and total employment from Global Insight's model of the U.S. economy.
**Key Outputs:** Employment for fifty-nine industrial and service sectors.

## Energy Information Administration's Regional Economic Activity Model

**Key Inputs:** National gross domestic product, wages, incomes, population, housing activity and prices from Global Insight's model of the U.S. economy. State population estimates and projections from the U.S. Bureau of the Census.
**Key Outputs:** Wages and salaries, personal income, disposable income, population and housing activity for the nine Census Divisions.

## Energy Information Administration's Regional Industrial Output and Employment by Industry Models

**Key Inputs:** National sectoral output, prices and employment from the industrial output and employment by industry models; regional gross product, disposable income, population, wages and salaries and housing activity from the regional economic activity model.
**Key Outputs:** Output value and employment for forty-five industrial output and service sectors for the nine Census Divisions.

## Energy Information Administration's Regional Commercial Floorspace Model

**Key Inputs:** Interest rates, real gross state product, real personal disposable income, floorspace removals and population.
**Key Outputs:** Commercial floorspace in million square feet for thirteen commercial floorspace types in each of the nine Census Divisions.

Each of these models is discussed below, with further detail presented in the Appendixes to this document.

# 2. Global Insight's Model of the U.S. Economy

## The Model's Theoretical Position

Econometric models built in the 1950s and 1960s were largely Keynesian income-expenditure systems that assumed a closed domestic economy. High computation costs involving statistical estimation and model manipulation, along with the underdeveloped state of macroeconomic theory, limited the size of the models and the richness of the linkages of spending to financial conditions, inflation, and international developments. Since that time, however, computer costs have fallen spectacularly; macroeconomic theory has also benefited from five decades of postwar data observation and from the intellectual attention of many eminent economists.

**An Econometric Dynamic Equilibrium Growth Model:** Global Insight's model of the U.S. economy strives to incorporate the best insights of many theoretical approaches to the business cycle: Keynesian, neoclassical, monetarist, supply-side and rational expectations. In addition, Global Insight's model of the U.S. economy embodies the major properties of the *long-term* growth models presented by James Tobin, Robert Solow, Edmund Phelps and others. This structure guarantees that short-run cyclical developments will converge to a robust long-run equilibrium.

In growth models, the expansion rates of technical progress, the labor force and the capital stock, both physical capital and human capital, determine the productive potential of an economy. Both technical progress and the capital stock are governed by investment, which in turn must be in balance with post-tax capital costs, available savings and the capacity requirements of current spending. As a result, monetary and fiscal policies will influence both the short- and the long-term characteristics of such an economy through their impacts on national saving and investment.

A modern model of output, prices and financial conditions is melded with the growth model to present detailed, short-run dynamics of the economy. In specific goods markets, the interactions of a set of supply and demand relations jointly determine spending, production, and price levels. Typically, the level of inflation-adjusted demand is driven by prices, income, wealth, expectations and financial conditions. The capacity to supply goods and services is keyed to a production function combining the basic inputs of labor hours, energy usage, and the capital stocks of business equipment and structures and government infrastructure. The "total factor productivity" of this composite of tangible inputs is driven by expenditures on research and development that produce technological progress.

Prices adjust in response to short-run gaps between current production and supply potential and to changes in the cost of inputs. Wages adjust to labor supply-demand gaps (indicated by a demographically-adjusted unemployment rate), current and expected inflation (with a unit long-run elasticity), productivity, tax rates and minimum wage legislation. The supply of labor

responds positively to the perceived availability of jobs, to the after-tax wage level and to the growth and age-gender mix of the population. Demand for labor is keyed to the level of output in the economy and to the productivity of labor, capital and energy. Because the capital stock does not change much in the short run, a higher level of output requires more employment and energy inputs. Such increases are not necessarily equal to the percentage increase in output because of the improved efficiencies typically achieved during an upturn. Tempering the whole process of wage and price determination is the exchange rate; a rise signals prospective losses of jobs and markets unless costs and prices are reduced.

For financial markets, the model predicts exchange rates, interest rates, stock prices, loans and investments interactively with the preceding GDP and inflation variables. The Federal Reserve sets the supply of reserves in the banking system and the fractional reserve requirements for deposits. Private sector demands to hold deposits are driven by national income, expected inflation and by the deposit interest yield relative to the yields offered on alternative investments. Banks and other thrift institutions, in turn, set deposit yields based on the market yields of their investment opportunities with comparable maturities and on the intensity of their need to expand reserves to meet legal requirements. In other words, the contrast between the supply and demand for reserves sets the critical short-term interest rate for interbank transactions, the federal funds rate. Other interest rates are keyed to this rate, plus expected inflation, Treasury borrowing requirements and sectoral credit demand intensities.

The old tradition in macroeconomic model simulations of exogenous fiscal policy changes was to hold the Federal Reserves supply of reserves constant at baseline levels. While this approach makes static analysis easier in the classroom, it sometimes creates unrealistic policy analyses when a dynamic model is appropriate. In Global Insight's model of the U.S. economy, "monetary policy" is defined by a set of targets, instruments and regular behavioral linkages between targets and instruments. The model user can choose to define unchanged monetary policy as unchanged reserves, or as an unchanged reaction function in which interest rates or reserves are changed in response to changes in such policy concerns as the price level and the unemployment rate.

**Monetarist Aspects:** The model pays due attention to valid lessons of monetarism by carefully representing the diverse portfolio aspects of money demand and by capturing the central bank's role in long-term inflationary trends.

The private sector may demand money balances as one portfolio choice among transactions media (currency, checkable deposits), investment media (bonds, stocks, short-term securities) and durable assets (homes, cars, equipment, structures). Given this range of choices, each asset's implicit and explicit yield must therefore match expected inflation, offset perceived risk and respond to the scarcity of real savings. Money balances provide benefits by facilitating spending transactions and can be expected to rise nearly proportionately with transactions requirements unless the yield of an alternative asset changes.

Now that even demand deposit yields can float to a limited extent in response to changes in Treasury bill rates, money demand no longer shifts quite as sharply when market rates change. Nevertheless, the velocity of circulation (the ratio of nominal spending to money demand) is still far from stable during a cycle of monetary expansion or contraction. Thus the simple monetarist link from money growth to price inflation or nominal spending is therefore considered invalid as a rigid short-run proposition.

Equally important, as long-run growth models demonstrate, induced changes in capital formation can also invalidate a naive long-run identity between monetary growth and price increases. Greater demand for physical capital investment can enhance the economy's supply potential in the event of more rapid money creation or new fiscal policies. If simultaneous, countervailing influences deny an expansion of the economy's real potential, the model *will* translate all money growth into a proportionate increase in prices rather than in physical output.

**Supply-Side Economics:** Since 1980, supply-side political economists have pointed out that the economy's growth potential is sensitive to the policy environment. They focused on potential labor supply, capital spending and savings impacts of tax rate changes. Global Insight's model of the U.S. economy embodies supply-side hypotheses to the extent supportable by empirical evidence embodied in the available data. This is considerable in the many areas that supply-side hypotheses share with long-run growth models. These features, however, have been fundamental ingredients of the model since 1976.

**Rational Expectations:** As the rational expectations school has pointed out, much of economic decision-making is forward looking. For example, the decision to buy a car or a home is not only a question of current affordability but also one of timing. The delay of a purchase until interest rates or prices decline has become particularly common since the mid-1970s when both inflation and interest rates were very high and volatile. Consumer sentiment surveys, such as those conducted by the University of Michigan Survey Research Center, clearly confirm this speculative element in spending behavior.

However, households can be shown to base their expectations, to a large extent, on their past experiences: they believe that the best guide to the future is an extrapolation of recent economic conditions and the changes in those conditions. Consumer sentiment about whether this is a "good time to buy" can therefore be successfully modeled as a function of recent levels and changes in employment, interest rates, inflation and inflation expectations. Similarly, inflation expectations (influencing financial conditions) and market strength expectations (influencing inventory and capital spending decisions) can be modeled as functions of recent rates of increase in prices and spending.

This largely retrospective approach is not, of course, wholly satisfactory to pure adherents of the rational expectations doctrine. In particular, this group argues that the announcement of macroeconomic policy changes would significantly influence expectations of inflation or growth prior to any realized change in prices or spending. If an increase in government expenditures is

announced, the argument purports, expectations of higher taxes to finance the spending might lead to lower consumer or business spending in spite of temporarily higher incomes from the initial government spending stimulus. A rational expectations theorist would thus argue that multiplier effects will tend to be smaller and more short-lived than a mainstream economist would expect.

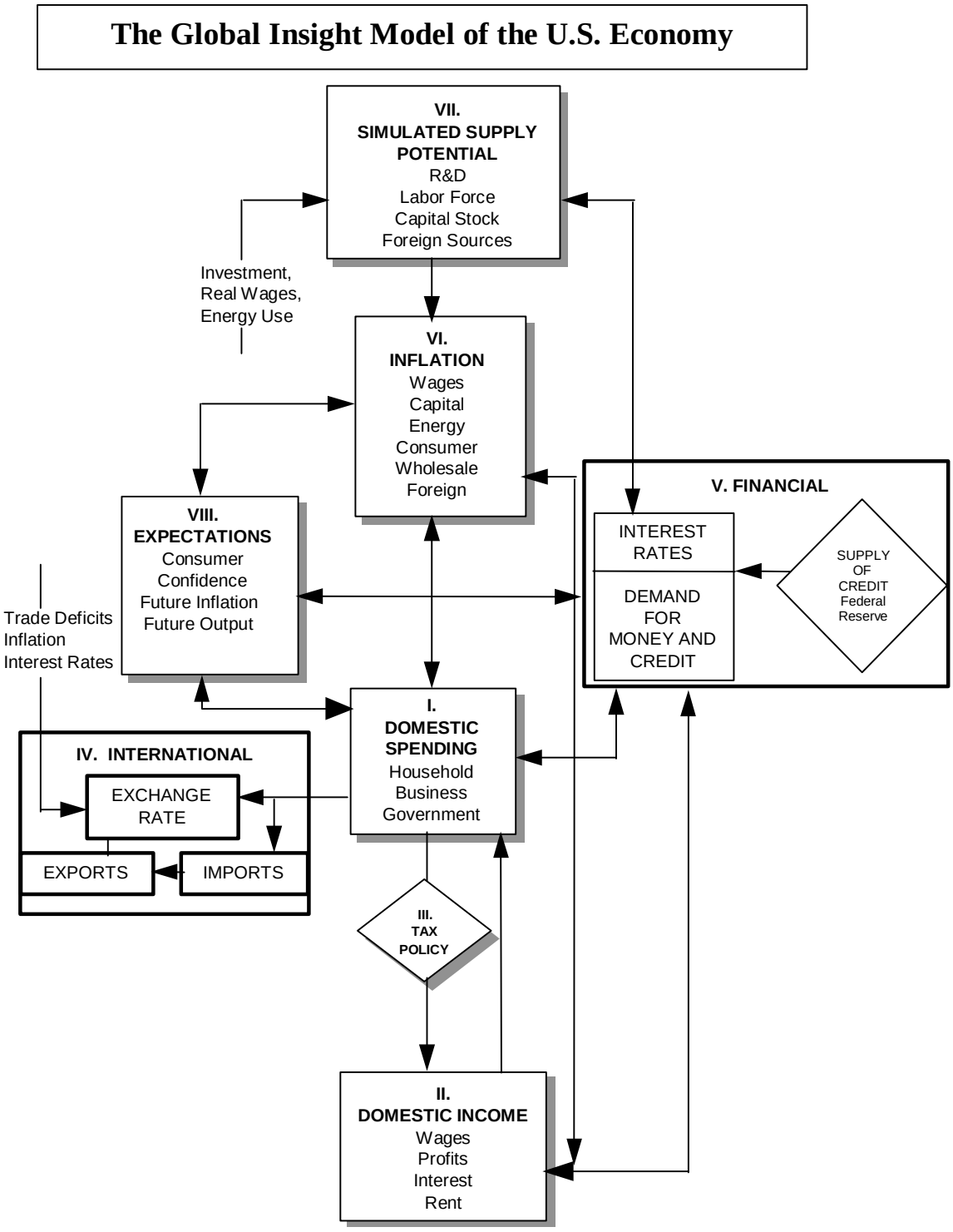
These propositions are subject to empirical evaluation. Global Insight's conclusions are that expectations do play a significant role in private sector spending and investment decisions; but, until change has occurred in the economy, there is very little room for significant changes in expectations in advance of an actual change in the variable about which the expectation is formed. The rational expectations school thus correctly emphasizes a previously understated element of decision-making, but exaggerates its significance for economic policy-making and model building.

Global Insight's model of the U.S. economy allows a choice in this matter. On the one hand, the user can simply accept Global Insight's judgments and let the model translate policy initiatives into initial changes in the economy, simultaneous or delayed changes in expectations, and subsequent changes in the economy. On the other hand, the user can manipulate the clearly identified expectations variables in the model, i.e., consumer sentiment, and inflation expectations. For example, if the user believes that fear of higher taxes would subdue spending; the user could reduce the consumer sentiment index.

**Theory as a Constraint:** The conceptual basis of each equation in Global Insight's model of the U.S. economy was thoroughly worked out before the regression analysis was initiated. The list of explanatory variables includes a carefully selected set of demographic and financial inputs. Each estimated coefficient was then thoroughly tested to be certain that it meets the tests of modern theory and business practice. This attention to equation specification and coefficient results has eliminated the "short circuits" that can occur in evaluating a derivative risk or an alternative policy scenario. Because each equation will stand up to a thorough inspection, Global Insight's model is a reliable analytical tool and can be used without excessive iterations. The model is not a black box: it functions like a personal computer spreadsheet in which each interactive cell has a carefully computed, theoretically consistent entry and thus performs logical computations simultaneously.

## Major Sectors

Global Insight's model of the U.S. economy captures the full simultaneity of the U.S. economy, forecasting over 1700 concepts spanning final demands, aggregate supply, prices, incomes, international trade, industrial detail, interest rates and financial flows. The chart below summarizes the structure of the eight interactive sectors (in Roman numerals). The following discussion presents the logic of each sector and significant interactions with other sectors.


The Global Insight Model of the U.S. Economy
VII.
SIMULATED SUPPLY
POTENTIAL
R&D
Labor Force
Capital Stock
Foreign Sources
Investment,
Real Wages,
Energy Use
VI.
INFLATION
Wages
Capital
Energy
Consumer
Wholesale
Foreign
V. FINANCIAL
INTEREST
RATES
DEMAND
FOR
MONEY AND
CREDIT
SUPPLY
OF
CREDIT
Federal
Reserve
VIII.
EXPECTATIONS
Consumer
Confidence
Future Inflation
Future Output
Trade Deficits
Inflation
Interest Rates
I.
DOMESTIC
SPENDING
Household
Business
Government
IV. INTERNATIONAL
EXCHANGE
RATE
EXPORTS
IMPORTS
III.
TAX
POLICY
II.
DOMESTIC INCOME
Wages
Profits
Interest
Rent

**Spending - Consumer:** The domestic spending (I), income (II) and tax policy (III) sectors model the central circular flow of behavior as measured by the national income and product accounts. If the rest of the model were "frozen", these blocks would produce a Keynesian system similar to the models pioneered by Tinbergen and Klein, except that neoclassical price factors have been imbedded in the investment and other primary demand equations.

Consumer spending on durable goods is divided into nine categories: light vehicles; used automobiles; motor-vehicle parts; other vehicles; computers; software; other household equipment and furnishings; ophthalmic and orthopedic products and "other". Spending on non-durable goods is divided into nine categories: three food categories, clothing and shoes, gasoline and oil, fuel oil and coal, tobacco, drugs and "other". Spending on services is divided into sixteen categories: housing, six household operation subcategories, four transportation categories, medical, recreation, two personal business service categories and "other". (see Table A1) In nearly all cases, real consumption expenditures are motivated by real income and the consumer price of a particular category relative to the prices of other consumer goods. Durable and semi-durable goods are also especially sensitive to current financing costs, and consumer speculation on whether it is a "good time to buy". The University of Michigan Survey of Consumer Sentiment monitors this last influence; with the index itself modeled as a function of current and lagged values of inflation, unemployment and the prime rate.

**Spending - Business Investment:** Business spending includes nine fixed investment categories for equipment and seven for construction: four information processing equipment categories, industrial equipment, three transportation equipment categories, other producers' durable equipment, four building categories, mines and wells and two public utility structures. (see Table A2) Equipment and business structures (non-utility, non-mining) spending components are determined by their specific effective post-tax capital costs, capacity utilization and replacement needs. The cost terms are sophisticated blends of post-tax debt and equity financing costs (offset by expected capital gains) and the purchase price of the investment good (offset by possible tax credits and depreciation-related tax benefits). This updates the well-known work of Dale Jorgenson, Robert Hall and Charles Bischoff.

Given any cost/financing environment, the need to expand capacity is monitored by recent growth in national goods output weighted by the capital intensity of such production. Public utility structure expenditures are motivated by similar concepts except that the output terms are restricted to utility output rather than total national goods output. Net investment in mining and petroleum structures responds to movements in real domestic oil prices and to oil and natural gas production.

Inventory demand is the most erratic component of GDP, reflecting the pro-cyclical, speculative nature of private sector accumulation during booms that is then drawn down during downturns. The forces that drive the five non-farm inventory categories are changes in spending, short-term interest rates and expected inflation, surges in imports and changes in capacity utilization or the speed of vendor deliveries. Unexpected increases in demand lead to an immediate draw down of

stocks that are then rebuilt over time; the reverse naturally holds for sudden reductions in final demand. Inventory demands are sensitive to the cost of holding the stock, measured by such terms as interest costs adjusted for expected price increases and by variables monitoring the presence of bottlenecks. The cost of a bottleneck that slows delivery times is lost sales: an inventory spiral can therefore be set in motion when all firms accelerate their accumulation during a period of strong growth but then try to deplete excessive inventories when the peak is past.

**Spending - Residential Investment:** The residential investment sector of the model includes two housing starts (single and multi-family starts) and three housing sales categories (new and existing single family sales and new single family units for sale). Housing starts and sales, in turn, drive investment demand in five GDP account categories: single family housing; multi-family housing; improvements; other residential structure and residential equipment. (see Table A3)

Residential construction is typically the first sector to contract in a recession and the first to rebound in a recovery. Moreover, the magnitude of the building cycle is a prominent determinant of the subsequent macroeconomic cycles. The housing sector of Global Insight's model of the U.S. economy explains new construction as a decision primarily based upon the after-tax cost of home ownership relative to disposable income. This cost is estimated as the product of the average new home price adjusted for changes in quality; and the mortgage rate, plus operating costs, property taxes and an amortized down payment. "Lever variables" allow the model user to specify the extent to which mortgage interest payments, property taxes and depreciation allowances (for rental properties) produce tax deductions that reduce the effective cost.

The equations also include a careful specification of demographic forces. After estimating changes in the propensity of specific age-gender groups to form independent households, the resulting "headship rates" are multiplied by corresponding population statistics to estimate the trend expansion of single- and multi-family households. The housing equations are then specified to explain current starts relative to the increase in trend households over the past year, plus pent-up demand and replacement needs. The basic phenomenon being scrutinized is therefore the proportion of the trend expansion in households whose housing needs are met by current construction. The primary determinants of this proportion are housing affordability, consumer confidence and the weather. Actual construction spending in the GDP accounts is the value of construction "put-in-place" in each period after the start of construction (with a lag of up to six quarters in the case of multi-family units), plus residential improvements and brokerage fees.

**Spending - Government:** The last sector of domestic demand for goods and services, that of the government, is largely exogenous (user-determined) at the federal level and endogenous (equation-determined) at the state and local level. The user sets the real level of federal non-defense and defense purchases (for compensation, consumption of fixed capital, Commodity

Credit Corporation inventory change, other consumption and gross investment), medical and non-medical transfer payments and medical and non-medical grants to state and local governments. The model calculates the nominal values through multiplication by the relevant estimated prices. Transfers to foreigners, wage accruals and subsidies (agricultural, housing and other) are also specified by the user, but in nominal dollars. One category of federal government spending – net interest payments – is determined within the model because of its dependence on the model's financial and tax sectors. Net federal interest payments are determined by the level of privately-held federal debt, short and long-term interest rates and the maturity of the debt. (see Table A4)

The presence of a large and growing deficit imposes no constraint on federal spending. This contrasts sharply with the state and local sector where legal requirements for balanced budgets mean that declining surpluses or emerging deficits produce both tax increases and reductions in spending growth. State and local purchases (for compensation, consumption of fixed capital, other consumption and construction) are also driven by the level of federal grants (due to the matching requirements of many programs), population growth and trend increases in personal income. (see Table A5)

**Income:** Domestic spending, adjusted for trade flows, defines the economy's value-added or gross national product (GNP) and gross domestic product (GDP). Because all value-added must accrue to some sector of the economy, the expenditure measure of GNP (GDP plus net exports of factor services) also determines the nation's gross income. The distribution of income among households, business, and government is determined in sectors II and III of the model.

Pre-tax income categories include private and government wages, corporate profits, interest, rent and entrepreneurial returns. Each pre-tax income category except corporate profits is determined by some combination of wages, prices, interest rates, debt levels and capacity utilization or unemployment rates. In some cases such as wage income, these are identities based on previously calculated wage rates, employment and hours per week.

Profits are logically the most volatile component of GNP on the income side. When national spending changes rapidly, the contractual arrangements for labor, borrowed funds and energy imply that the return to equity holders is a residual that will soar in a boom and collapse in a recession. The model reflects this by calculating wage, interest and rental income as thoroughly reliable near-identities (e.g., wages equal average earnings multiplied by hours worked) and then subtracting each non-profit item from national income to solve for profits. (see Tables A6 and A7)

**Taxes:** Since post-tax rather than pre-tax incomes drive expenditures, each income category must be taxed at an appropriate rate; the model therefore tracks personal, corporate, payroll and excise taxes separately. Users may set federal tax rates; tax revenues are then simultaneously forecast as the product of the rate and the associated pre-tax income components. However, the model automatically adjusts the effective average personal tax rate for variations in inflation and

income per household and the effective average corporate rate for credits earned on equipment, utility structures and R&D. Substitutions or additions of "flat" taxes and value-added taxes for existing taxes are accomplished with specific tax rates and new definitions of tax bases. As appropriate, these are aggregated into personal, corporate or excise tax totals.

State and local corporate profits and social insurance (payroll) tax rates are exogenous in the model, while personal income and excise taxes are fully endogenous: the U.S. model makes reasonable adjustments automatically to press the sector toward the legally-required approximate budget balance. The average personal tax rate rises with income and falls with the government-operating surplus. Property and sales taxes provide the bulk of state excise revenue and reflect changes in oil and natural gas production, gasoline purchases and retail sales, as well as revenue requirements. The feedback from expenditures to taxes and taxes to expenditures works quite well in reproducing both the secular growth of the state and local sector and its cyclical volatility. (see Table A8)

**International:** The international sector (IV) is a critical, fully simultaneous block that can either add or divert strength from the central circular flow of domestic income and spending. Depending on the prices of foreign output, the U.S. exchange rate and competing domestic prices, imports capture varying shares of domestic demand.

Depending on similar variables and the level of world gross domestic product, exports can add to domestic spending on U.S. production. The exchange rate itself responds to international differences in inflation, interest rates, trade deficits and capital flows between the U.S. and its competitors. In preparing forecasts, Global Insight's U.S. Economic Service and the World Service collaborate in determining internally consistent trade prices and volumes, interest rates and financial flows.

Eight categories of goods and one of services are modeled separately for both imports and exports, with one additional goods category for oil imports. (see Table A9) For example, export and import detail for business machines is included as a natural counterpart to the inclusion of the office equipment component of producers' durable equipment spending. The business machines detail allows more accurate analysis because computers are rapidly declining in effective quality-adjusted prices relative to all other goods, and because such equipment is rising rapidly in prominence as businesses push ahead with new production and information processing technologies.

Investment income flows are also explicitly modeled. The stream of huge current account deficits incurred by the U.S. has important implications for the U.S. investment income balance. As current account deficits accumulate, the U.S. net international investment position and the U.S. investment income balance deteriorate. U.S. foreign assets and liabilities are therefore included in the model, with the current account deficit determining the path of the net investment position.

The reactions of overseas prices, interest rates and GDP to U.S. development are robust and automatic. In the case of depreciation in the dollar, for example, U.S. activity may expand at the expense of foreign activity and U.S. inflation may rise while the rate in other countries slows.

**Financial:** The use of a detailed financial sector (V) and of interest rate and wealth effects in the spending equations recognizes the importance of credit conditions on the business cycle and on the long-run growth prospects for the economy.

Interest rates, the key output of this sector, are modeled as a term structure, pivoting off the federal funds rate. As noted earlier, the model gives the user the flexibility of using the supply of reserves as the key monetary policy instrument, reflecting the Federal Reserve's open market purchases or sales of Treasury securities, or using a reaction function as the policy instrument. If the supply of reserves is chosen as the policy instrument, the federal funds rate depends upon the balance between the demand and supply of reserves to the banking system. Banks and other thrift institutions demand reserves to meet the reserve requirements on their deposits and the associated (exogenous) fractional reserve requirements. The private sector in turn demands deposits of various types, depending on current yields, income, and expected inflation.

If the reaction function is chosen as the monetary policy instrument, the federal funds rate is determined in response to changes in such policy concerns as inflation and unemployment. The reaction function recognizes that monetary policy seeks to stabilize prices (or to sustain a low inflation rate) and to keep the unemployment rate as close to the natural rate as is consistent with the price objective. A scenario designed to display the impact of a fiscal policy change in the context of unchanged monetary policy is arguably more realistic when unchanged or traditional reactions to economic cycles are recognized, than when the supply of reserves is left unchanged.

Longer-term interest rates are driven by shorter-term rates as well as factors affecting the slope of the yield curve. In Global Insight's model of the U.S. economy, such factors include inflation expectations, government borrowing requirements and corporate financing needs. The expected real rate of return varies over time and across the spectrum of maturities. An important goal of the financial sector is to capture both the persistent elements of the term structure and to interpret changes in this structure. Twenty-four interest rates are covered in order to meet client needs regarding investment and financial allocation strategies. (see Table A10)

**Inflation:** Inflation (VI) is modeled as a carefully controlled, interactive process involving wages, prices and market conditions. Equations embodying a near accelerationist point of view produce substantial secondary inflation effects from any initial impetus such as a change in wage demands or a rise in foreign oil prices. Unless the Federal Reserve expands the supply of credit, real liquidity is reduced by any such shock. Given the real-financial interactions described above, this can significantly reduce growth. The process also works in reverse: a spending shock can significantly change wage-price prospects and then have important secondary impacts on financial conditions. Inspection of the simulation properties of Global Insight's model of the U.S. economy, including full interaction among real demands, inflation and financial conditions,

confirms that the model has moved towards a central position in the controversy between fiscalists and monetarists, and in the debates among neoclassicists, institutionalists and rational expectationists.

The principal domestic cost influences are labor compensation, non-farm productivity (output per hour) and foreign input costs. The latter are driven by the exchange rate, the price of oil and foreign wholesale price inflation. Excise taxes paid by the producer are an additional cost fully fed into the pricing decision. This set of cost influences drives *each* of the nineteen industry-specific producer price indexes, in combination with a demand pressure indicator and appropriately weighted composites of the other eighteen producer price indexes. In other words, the inflation rate of each industry price index is the reliably weighted sum of the inflation rates of labor, energy, imported goods and domestic intermediate goods; plus a variable markup reflecting the intensity of capacity utilization or the presence of bottlenecks. If the economy is in balance--with an unemployment rate near 5%, manufacturing capacity utilization steady near 80 to 85%, and foreign influences neutral--then prices will rise in line with costs and neither will show signs of acceleration or deceleration.

**Supply:** The first principle of the market economy is that prices and output are determined simultaneously by the factors underlying both demand and supply. As noted above, the "supply-siders" have not been neglected in Global Insight's model of the U.S. economy; indeed, substantial emphasis on this side of the economy (VII) was incorporated as early as 1976. In Global Insight's model of the U.S. economy, aggregate supply is estimated by a Cobb-Douglas production function that combines factor input growth and improvements in total factor productivity. Factor input equals a weighted average of labor, business fixed capital, public infrastructure and energy provided by the energy sector. Based upon each factor's historical share of total input costs, the elasticity of potential output with respect to labor is 0.65 (i.e., a 1% increase in the labor supply increases potential GDP 0.65%); the business capital elasticity is 0.26; the infrastructure elasticity is 0.025; and the energy elasticity is 0.07. Factor supplies are defined by estimates of the full employment labor force, the full employment capital stock, end-use energy demand and the stock of infrastructure. To avoid double-counting energy input, the labor and capital inputs are both adjusted to deduct estimates of the labor and capital that produce energy. Potential GDP is the sum of the aggregate supply concept derived from the production function, less net energy imports, plus housing services and the compensation of government employees. Total factor productivity depends upon the stock of research and development capital and trend technological change.

Taxation and other government policies influence labor supply and all investment decisions; thereby linking tax changes to changes in potential GDP. An expansion of potential GDP first reduces prices and then credit costs; thus spurring demand. Demand rises until it equilibrates with potential output. Therefore, the growth of aggregate supply is the fundamental constraint on the long-term growth of demand. Inflation, created by demand that exceeds potential GDP or by a supply-side shock or excise tax increase, raises credit costs and weakens consumer sentiment, thus putting the brakes on aggregate demand.

**Expectations:** The contributions to the model of the U.S. economy and its simulation properties of the rational expectations school are as rich as the data will support. Expectations (Sector VIII) impact several expenditure categories in Global Insight's model of the U.S. economy, but the principle nuance relates to the entire spectrum of interest rates. Shifts in price expectations or the expected capital needs of the government are captured through price expectations and budget deficit terms, with the former impacting the level of rates throughout the maturity spectrum, and the latter impacting intermediate and long-term rates, and hence affecting the shape of the yield curve. On the expenditure side, inflationary expectations impact consumption via consumer sentiment, while growth expectations affect business investment.

# 3. Global Insight's Industrial Output and Employment by Industry Models

## Industrial Output Model Overview

The industrial output model is a combination input-output/stochastic model of activity for sixty industries and service sectors in the U.S. The model forecasts the real value of shipments, or revenue, as a measure of output for each sector. The output level generated in the industrial output model reflects a level of domestic production that is consistent with the economic expenditures generated in Global Insight's model of the U.S. economy. Table A11 identifies the economic expenditure categories driving the industrial output model. Table A12 identifies the concept coverage of the model and the industry coverage of the model.

The industrial and services sectors are defined according to the North American Industry Classification System (NAICS). The industry details follow the manufacturing industries reported by the Department of Commerce in its monthly Manufacturers' Shipments, Inventories and Orders survey. Details are mostly three or four-digit NAICS aggregations with some dissaggregations beyond four digits. The non-manufacturing industries and the service sectors are two, three or four-digit NAICS aggregations.

The input-output block of the model translates macroeconomic forecasts from Global Insight's model of the U.S. economy into demand by industry. All other model concepts are projected by statistical equations and identities.

The model projections are at a quarterly frequency. Historical data supporting the model are, for the most part, monthly series released by various government agencies typically within a few months of the observation. All data, unless otherwise specified, are seasonally adjusted at annual rates.

## The Input-Output Block

Standard input-output analysis proceeds in two steps. First, the vector of economic expenditures from the macroeconomic model (the components of GDP) is converted into a vector of industrial deliveries to final demand. This conversion is represented for any time period as:

$$F = H * G$$

*Where*:
F = vector of industrial deliveries to final demand
H = benchmark bridge matrix recording the industrial composition of each expenditure category
G = vector of the real final expenditure components of GDP

A fixed bridge matrix, constructed from the 1992 input-output table that was based on the Standard Industrial Classification (SIC), is used in this step. The differences caused by the change in classification from SIC to NAICS are ignored in the current version. Once the final demand vector, F, has been calculated, standard input-output techniques are used to derive estimates of the industrial output required to produce this bill of goods for final use. According to the basic input-output model, intermediate inputs, industrial deliveries to final demand and gross output are related as follows:

$$A * X + F = X$$

*Where*:
A = matrix of direct input coefficients describing the amount of each input industry's product required per unit of industrial output
X = vector of gross output by industry

This equation can be considered an equilibrium condition; that is, total demand equals total supply. The product A * X is equal to intermediate demand, and F is equal to final demand. The sum of the two is total demand; which, in equilibrium, is equal to total supply or production.

Following standard input-output conventions, it is assumed that the technology of production as reflected by the matrix of direct input coefficients, A, remains relatively stable over time. In addition, production processes are assumed to be linear and exhibit constant returns to scale with no possibility for substitution among inputs. However, these restrictions apply for the calculation of demand by industry only; equations for actual shipments and production include factors that offset these restrictive assumptions statistically.

The basic input-output equation is then solved for output:

$$X = (I - A)^{-1} * F$$

This equation describes the relationship between final demand and industrial output levels that would be required to deliver this bill of goods under the restrictive assumptions detailed above. The vector X should equal total demand and supply for each industry, in equilibrium.

## Revenue/Output for Manufacturing Industries

Industry revenues are measured in billions of constant dollars and are available for each of the manufacturing industries in the model. The current dollar historical series are quarterly averages of the Department of Commerce's value of shipments data from its monthly Manufacturers' Shipments, Inventories and Orders survey that are converted to annual rates. Constant dollar historical values are the current dollar series deflated using each industry's price index. These indexes are computed outside of the model provided by Global Insight's U.S. Industry Service, which produces short-term industry forecasts. To attain consistency with the economic variables

in the macroeconomic model, industry revenues are converted into constant 2000 dollars after the model is run.

Constant dollar revenue by industry is modeled as a function of total demand from the input-output analysis, relative prices, cyclical variables and a time trend. The functional form used imposes a unitary elasticity on the demand term, which embodies most of the explanatory power of the equations. Generally, the economic expenditure categories from the macroeconomic model have incorporated in them the effect of changes in prices. However, a relative price variable is used in select industries to explicitly capture the industry-specific effect of changes in producer prices.

Additional non-demand terms are included in the equation used to explain patterns not well accounted for by the input-output model and its demand cyclicality and technological change indicators.

1. Macroeconomic variables feed down into the industrial output equations through demand, but these weighted demand terms are in most cases smoother and less cyclical than industrial production indexes. Therefore, cyclical variables, such as capacity utilization, housing starts, unemployment rate or interest rates, are included in most equations. Cyclical variables were chosen with care to reflect the appropriate business cycle for each industry.

2. The use of constant 1992 input-output tables in the construction of total demand becomes less accurate the further from the base year the estimates go. This is because shifts in relative prices for inputs, as well as other factor, can in the long run change the technological processes used to manufacture goods. To account for this slowly changing divergence between input-output coefficients and actual production processes, a time trend is used in many model equations that use input-output concepts.

log(R{ind}R / D{ind}R) = F(log(Cyclical variable), Other cyclical variables, log(Relative prices), Trend)

*Where*:
R{ind}R = constant dollar revenue, industry ind
D{ind}R = total input-output demand, industry ind
Trend = time trend variable

Output is measured in real dollars for all industries except two. Rapid increases in computer technology in the last two decades have led to sharp declines in the quality-adjusted price deflators for computer manufacturing (NAICS 3341) and semiconductor manufacturing (NAICS 334413). This in turn results in steep increases in the industries' real dollar output measures. This makes the real output value an inappropriate proxy for volume measure. Consequently, nominal dollars rather than real dollars are used to for these two sectors.

## Revenue/Output for Non-manufacturing Industries/Services

For non-manufacturing industries and services sectors, sales revenue is the main activity indicator available. Historical data are collected from the Bureau of Labor Statistics and other sources. The common criterion for the data is that conceptually it should be as close as possible to the measure of value of production or total gross output, rather than value added, and the current dollar measure is roughly equivalent to revenue.

Forecasts of non-manufacturing revenue are calculated from equations of the same form as the manufacturing revenue equations:

log(R{ind}R / D{ind}R) = F(log(Cyclical variable), Other cyclical variables, log(Relative prices), Trend)

*Where*:

R{ind}R = constant dollar revenue, industry or service sector ind
D{ind}R = total input output demand, industry or service sector ind
Trend = time trend variable

## Aggregation to the NEMS Sectors

The sectoral classification in the Macroeconomic Activity Module is more aggregate than Global Insight's classification. It comprises thirty-five industrial sectors and ten service sectors. Of the thirty-five industrial sectors, twenty-nine are manufacturing sectors and six are non-manufacturing industrial sectors. Five of the sectors are energy sectors. For these sectors, production forecasts are available from other NEMS modules and their forecasted growth rates are applied to the historical data in place of the MAM's model forecast.

One of the main users of the output values is the NEMS's Industrial Demand Module. In that module, the thirty-five industries are further aggregated into nineteen categories. Below is a list of the forty-five sectors maintained in the Macroeconomic Activity Module and their corresponding Industrial Demand categories. The concordance between Global Insight's codes and the forty-five sectors is presented in Table A12.

| NEMS Macroeconomic Activity Module | NEMS Industrial Demand Module |
|---|---|
| ***Manufacturing Industries:*** | |
| Food Products | Food Products |
| Beverage and Tobacco Products | Remaining Balance of Manufacturing |
| Textile Mills & Textile Products | Remaining Balance of Manufacturing |
| Apparel | Remaining Balance of Manufacturing |
| Wood Products | Wood Products |
| Furniture and Related Products | Remaining Balance of Manufacturing |
| Paper Products | Paper and Allied Products |
| Printing | Remaining Balance of Manufacturing |
| Basic Inorganic Chemicals | Inorganic Chemicals |
| Basic Organic Chemicals | Organic Chemicals |
| Plastic and Synthetic Rubber Materials | Resins |
| Agricultural Chemicals | Agricultural Chemicals |
| Other Chemical Products | Remaining Balance of Manufacturing |
| Petroleum Refineries * | Petroleum Refining |
| Other Petroleum and Coal Products | Remaining Balance of Manufacturing |
| Plastics and Rubber Products | Plastics and Rubber Products |
| Leather and Allied Products | Remaining Balance of Manufacturing |
| Glass & Glass Products | Glass and Glass Products |
| Cement Manufacturing | Cement |
| Other Non-metallic Mineral Products | Remaining Balance of Manufacturing |
| Iron & Steel Mills, Ferroalloy & Steel Products | Iron and Steel |
| Alumina & Aluminum Products | Aluminum |
| Other Primary Metals | Remaining Balance of Manufacturing |
| Fabricated Metal Products | Fabricated Metal Products |
| Machinery | Machinery |
| Other Electronic & Electric Products | Computer and Electronic Products |
| Transportation Equipment | Transportation Equipment |
| Measuring & Control Instruments | Electrical Equip., Appliances and Components |
| Miscellaneous Manufacturing | Remaining Balance of Manufacturing |
| ***Non-manufacturing Industries:*** | |
| Crop Production | Agriculture Production - Crops |
| Other Agriculture, Forestry, Fishing & Hunting | Other Agriculture including Livestock |
| Coal Mining * | Coal Mining |
| Oil & Gas Extraction & Support Activities * | Oil & Gas Extraction |
| Other Mining & Quarrying | Metal & Other Non-metallic Mining |
| Construction | Construction |

| NEMS Macroeconomic Activity Module | NEMS Industrial Demand Module |
|---|---|
| ***Services:*** | |
| Transportation & Warehousing | NA |
| Broadcasting & Telecommunications | NA |
| Electric Power Generation & Distribution * | NA |
| Natural Gas Distribution * | NA |
| Water, Sewage & Related System | NA |
| Wholesale Trade | NA |
| Retail Trade | NA |
| Finance & Insurance, Real Estate | NA |
| Other Services | NA |
| Public Administration | NA |

* Energy Sectors

## Employment by Industry Model Overview

The employment model determines employment in fifty-nine industries and service sectors in the U.S. (see Table A12), consistent with the forecast of non-farm employment (EEA) from the macroeconomic model. Industrial output, relative factor prices and productivity and average workweek trends are the key determinates of industrial employment. Real outputs in the industries are from the industrial model. Productivity trends, average workweek trends, labor compensation, capital service cost determinants, other factor prices and cyclical variables are determined in the macroeconomic model.

The basic behavioral equations in the employment model are the total manufacturing employment (EMF) and unconstrained employment (XXX_E{ind}) equations for each of the detailed industries (ind). Employment is based upon production theory. Consistent with production theory, the key determinant of employment by industry is industrial output. Both current and lagged output values enter in the employment specification, reflecting the tendency of firms to hire employees in response to lagged output growth and to layoff employees in response to lagged output declines. The labor-to-output ratio varies with changes in relative factor prices, productivity, the national average workweek, cyclical factors and technological change. Relative factor prices are represented by labor cost, capital cost, energy and other factor prices and interest rates. National productivity trends and industry-specific time trends are used to capture changes in the employment-to-output relationship due to technological advances. Change in the average length of the workweek also alters this relationship. Some industries' workweek tends to increase relative to the national average with declines in the cyclical unemployment rate and with increases in manufacturing capacity utilization rates. Both factors cause industries to increase their utilization of existing labor.

## Total Non-farm, Private Non-farm and Government Employment

Projections for total non-farm (EEA) and government federal and state and local employment (EG91 and EGSL) are established in the macroeconomic model. Private non-farm employment (EEAPIO) is determined by subtracting government employment from total non-farm employment.

EEAPIO = EEA - EG91 - EGSL

## Manufacturing Employment

Changes in total manufacturing employment are directly proportional to current and lagged changes in manufacturing output and inversely proportional to increases in current and lagged manufacturing productivity and the average manufacturing workweek. Output is measured in 2000 dollars for all industries except two (see Chapter 3).

dlog(EMF * Mfg Productivity) – dlog(Mfg Output) =
A + B1 * dlog(@movavg(Mfg Productivity(-1), 15) / Mfg Productivity)
+ B2 * dlog(@movavg(Mfg Output(-1), 3) / Mfg Output)

Or alternatively,

dlog(EMF) =
A + (1 – B2) * dlog(Mfg Output) + B2 * dlog(@movavg(Mfg Output(-1), 3))
+ (1 – B1) * dlog(Mfg Productivity)
+ B1 * dlog(@movavg(Mfg Productivity(-1), 15))

*Where*:

| | |
|---|---|
| EMF | = manufacturing employment |
| Mfg Output | = real dollar value of manufacturing output |
| Mfg Productivity | = labor productivity for the manufacturing sector, = JQPCMHM * HPMF |
| JQPCMHM | = index for output per hour in manufacturing |
| HPMF | = average weekly hours in manufacturing |
| *and* | |
| dlog(X) | = first difference of the logarithm, = log(X) – log(X(-1)) |
| (@movavg(X,n) | = n-period backward moving average, = (X + … + X(-n+1)) / n |

Employment in each manufacturing industry is first estimated independent of total manufacturing employment. Unconstrained manufacturing industry employment (XXX_E{ind}) is modeled as a function of current and lagged output, manufacturing productivity and average workweek, relative factor prices and such cyclical variables as the unemployment rate and capacity utilization rates (with the sum of the elasticities on current and lagged equal to 1.0).

dlog(XXX_E{ind} / (R{ind}R / Labor Productivity)) =
A + B1 * dlog(@movavg(Labor Productivity, lags) / Labor Productivity)
+ B2 * dlog(@movavg(R{ind}R, lags) / R{ind}R)
+ B3 * dlog(Relative factor prices)
+ B4 * d(Cyclical variable)

*Where*:

| | |
|---|---|
| XXX_E{ind} | = employment of industry ind |
| R{ind}R | = real dollar value of output of industry ind |
| Labor Productivity | = labor productivity |
| | = JQPCMHMD * HPMD for durable manufacturing industries |
| | or JQPCMHMN * HPMN for non-durable manufacturing industries |
| JQPCMHMD(N) | = index for output per hour in durable (non-durable) manufacturing |
| HPMD(N) | = average weekly hours in durable (non-durable) manufacturing |
| Relative factor prices | = Ratio of labor compensation in non-farm business and relevant producer prices or energy prices (for energy-intensive industries) |
| *and* | |
| d(X) | = first difference = X - X(-1) |
| dlog(X) | = first difference of the logarithm, = log(X) – log(X(-1)) |
| (@movavg(X,n) | = n-period backward moving average, = (X + … + X(-n+1)) / n |

Unconstrained manufacturing employment (XXX_EMF) is defined by summing unconstrained employment across the manufacturing industries.

The difference between the manufacturing employment total computed in the first step (EMF) and this unconstrained total (XXX_EMF) is defined as EMRESID. Employment in each manufacturing industry (E{ind}) is set equal to its unconstrained employment plus a share of the EMRESID.

EMRESID = EMF - XXX_EMF

E{ind} = XXX_E{ind} + (XXX_E{ind} / XXX_EMF) * EMRESID

This process ensures that the sum of the detailed manufacturing industries align with the aggregate EMF. The value of EMRESID is within one percent of EMF, indicating that the alignment process does not distort the forecast results in any significant way.

## Non-manufacturing Employment

Employment in each non-manufacturing industry or service sector is modeled in a two-step process similar to that for manufacturing industrial employment. That is, unconstrained non-manufacturing employment (XXX_E{ind}) is modeled as a function of current and lagged output, non-farm productivity and average workweek, relative factor prices, and such cyclical variables as the unemployment rate and capacity utilization rates (with the sum of the elasticities on current and lagged equal to 1.0).

dlog(XXX_E{ind} / (R{ind}R / (Labor Productivity))) =
A + B1 * dlog(@movavg(Labor Productivity, lags) / Labor Productivity)
+ B2 * dlog(@movavg(R{ind}R, lags) / R{ind}R)
+ B3 * dlog(Relative factor prices)
+ B4 * dlog(Cyclical variable)

*Where*:

| | |
|---|---|
| XXX_E{ind} | = employment of industry or service sector ind |
| R{ind}R | = real dollar value of output of industry or service sector ind |
| Labor Productivity | = labor productivity<br>= JQPCMHNF * HRNFPRI in general<br>or JQPCMHM * HPMF for industries producing inputs for manufacturing industries |
| JQPCMHNF | = index for output per hour in non-farm business |
| HRNFPRI | = average weekly hours in non-farm business |
| JQPCMHM | = index for output per hour in manufacturing |
| HPMF | = average weekly hours in manufacturing |
| Relative factor prices | = Ratio of labor compensation in non-farm business and relevant producer prices or energy prices (for energy-intensive industries) |

Unconstrained private non-farm employment (XXX_EEAPIO) is defined by summing unconstrained non-manufacturing employment by sector and total manufacturing employment.

The difference between total private non-farm employment and this unconstrained total (XXX_EEAPIO) is defined as EEAPRESID. Employment in each non-manufacturing industry (E{ind}) is set equal to its unconstrained employment plus a share of EEAPRESID.

EEAPRESID = EEAPIO - XXX_EEAPIO

E{ind} = XXX_E{ind} + EEAPRESID * (XXX_E{ind} / (XXX_EEAPIO - EMEMFG))

The value of EEAPRESID is within one percent of EEAPIO, indicating that raw results from the employment model match fairly well with the aggregated employment forecast from the macroeconomic model.

Total non-farm employment within the employment model (EEAIO) is defined as the sum of all employment other than agricultural employment. EEAIO should match the level of non-farm employment (EEA) derived in the macroeconomic model, except for rounding errors.

EEAIO = EMF + ENM + EMIN + E23 + EG91 + EGSL = EEA

*Where*:
EMF = manufacturing employment
ENM = sum of employment in the service sectors
EMIN = sum of employment in the mining sectors
E23 = employment in the construction sector
EG91 = federal employment
EGSL = state and local employment

## Aggregation to the NEMS Sectors

As in the case of industrial output, employment forecasts are also aggregated into the NEMS categories. The classification for employment is the same as that for output (see Page 21), except that the public sector is further disaggregated into categories – Federal Government, and State and Local Government.

Among the five energy sectors, employment forecasts for coal mining and for oil and gas extraction are available from other NEMS Modules. Their forecast growth rates are applied to the historical data in place of the macroeconomic model forecast.

# 4. Energy Information Administration's Regional Models

## Overview

Economic concepts beyond the national level are required in the NEMS demand modules. The level of regional detail is defined by the nine Census Divisions:

1. New England
2. Middle Atlantic
3. South Atlantic
4. East North Central
5. East South Central
6. West North Central
7. West South Central
8. Mountain
9. Pacific

A suite of regional models has been developed to provide the following concepts for each of the nine Census Divisions:

1. Macroeconomic variables – population, economic activity, prices and wages
2. Industry variables – output and employment by sector
3. Building variables – residential housing starts and commercial floorspace addition and stocks

The regional models are downstream models in the Macroeconomic Activity Module. That is, they are run after the national models, and there is no feedback mechanism to revise the national forecast based upon the regional results. Instead, an alignment process is introduced to scale the regional forecasts computed from the models so that the sum of the regional variables aligns to its respective national variable, if the latter exists in the national model. This "top-down" approach is adopted because only selected macroeconomic variables are covered in the regional models, and the national variables are used as explanatory variables. Without a complete regional economic framework, it is not appropriate to adopt a "bottom-up" approach for selected variables.

Detailed descriptions of the variables are listed in Tables A13-A15.

Detailed structural forms and coefficients for the regional models are presented in Appendix C.

## Macroeconomic Variables

The following macroeconomic concepts are forecast for each of the nine Census Divisions:

1. Population
2. Population Aged 16 and Over
3. Real Gross State Product
4. Real Personal Disposable Income
5. Personal Income Tax
6. Personal Income Tax Rate
7. Personal Income
8. Wage and Salary Disbursements
9. Manufacturing and Non-manufacturing Wages
10. Consumer Price Index

Forecasts of the two population variables are based on population projections published by the U.S. Census Bureau. The other variables are forecast in the regional macroeconomic model. The regional model is a quarterly model with historical data beginning as early as 1970. It uses inputs from the U.S. model and supplies outputs to the regional industrial output and employment models as well as the commercial floorspace model.

### Population

Forecasts of the population series are exogenous to the NEMS. For the AEO 2008, population forecasts are based upon the population *estimates* (2000 to 2004) and the population *projections* (through 2030) by state and by age as released in March and April 2005 respectively by the U.S. Census Bureau (source: http://www.census.gov/popest/datasets.html and http://www.census.gov/population/www/projections/projectionsagesex.html). The Census population projections were based upon an earlier population estimates, and so the 2004 data did not match the latest population estimates. Moreover, the aggregated state estimates did not match the national total from U.S. model, which includes armed forces stationed overseas.

To ensure consistency, the total population and population aged 16 and over by state through 2004 were compiled from the population estimates. A similar set was compiled for the population forecast. The forecast growth rates of the latter were applied onto the former to produce the preliminary forecast. The sum of the preliminary state forecast was then compared to the national total. Adjustments were then made to the state forecast so that they summed to the national total. The state series were then aggregated to the nine Census Divisions.

History through 2004:

$NP_i = \sum POP_E_{ij}$

$NP16Ai = \sum_{j>=16} POP_Eij$

2005 through 2030:

$NP_i = NP_i(-1) * \sum POP_F_{ij} / \sum POP_F_{ij}(-1)$

$NP16A_i = NP16A_i(-1) * \sum POP16A_F_{ij} / \sum POP16A_F_{ij}(-1)$

$NP_i = NP_i * NP / (\sum NP_i)$

$NP16A_i = NP16A_i * NP16A / (\sum NP16A_i)$

*Where*:

| | |
|---|---|
| i | = individual state |
| j | = age by year, = 0, 1, 2, … |
| $NP_i$ | = total state population |
| POP_E | = total population based on Census population estimates |
| POP_F | = total population based on Census population projections |
| NP | = total national population from Macroeconomic Model |
| $NP16A_i$ | = population 16 and over by state |
| POP16A_E | = population 16 and over based on Census population estimates |
| POP16A_F | = population 16 and over based on Census population projections |
| NP16A | = total national population 16 and over from Macroeconomic Model |

**Gross State Product**

Regional gross state product is in real per capita terms. The equations are in log form. There is an estimated equation for each of the nine Census Divisions. Explanatory variables include lags of own gross state product and national gross domestic product. The general form of the gross state product equations is:

$$\log(GSPRZNP_i/GDPRZN) = \sum b1_i * \log(GSPRZNP_i(-1)/ GDPRZN(-1)) + \sum b2_i * @movav(\log(GSPRZNP_i(-1)/ GDPRZN(-1)),3)$$

*Where*:

| | |
|---|---|
| i | = 1 to 9 Census Divisions |
| $b1_1$, $b1_2$ | = estimated coefficients for the explanatory variables in the equation for gross state product, regional |
| GDPRZN | = real per capita gross domestic product, billions of 2000 dollars, U.S. |
| $GSPRZNP_i$ | = real per capita gross state product, billions of 1996 dollars, regional |

Real gross state product data comes from the Regional Economic Accounts maintained by the Bureau of Economic Analysis. The historical gross state product data is at an annual interval beginning in 1986 and is measured in billions of 2000 dollars for all Census Divisions. Quadratic-match average is the method used in EViews to convert the frequency to quarterly from annual. The real gross domestic product data comes from Global Insight's model of the U.S. economy. Historical gross domestic product is at a quarterly interval beginning in 1959 and is measured in billions of chained 2000 dollars. Global Insight's source for real gross domestic product is the Bureau of Economic Analysis.

Total regional population including armed forces overseas comes from the Census Bureau. Historical regional total population is at an annual interval beginning in 1980. Quadratic-match average is the method used in EViews to convert the frequency to quarterly from annual. Total population comes from Global Insight's model of the U.S. economy. Its source is also the Census Bureau. Historical U.S. total population is at a quarterly interval beginning in 1959.

**Income and Taxes**

Regional disposable income is in real terms. Its equation is an identity in which nominal personal disposable income is deflated using a regional consumption deflator. There is an equation for each of the nine Census Divisions. The general form of the identity for real disposable income equations is:

$YPDR_i = YPD_i / ((JPC_{i,2006:3} / JPC_{2006:3}) * JPC)$
$JPC_i = YPD_i / YPDR_i$

*Where*:

| | |
|---|---|
| i | = 1 to 9 Census Divisions |
| JPC | = consumption deflator, index – 2000=1.00, national |
| $JPC_{2006:3}$ | = 2006:3 value of the consumption deflator, index – 2000=1.00, national |
| $JPC_i$ | = consumption deflator, index – 2000=1.00, regional |
| $JPC_{i,2006:3}$ | = 2006:3 value of the consumption deflator, index – 2000=1.00, regional |
| $YPD_i$ | = disposable income, billions of dollars, national |
| $YPDR_i$ | = real disposable income, billions of 2000 dollars, regional |

A regional consumption deflator is computed for each Census Division. Its value in 2006:3 is used to compute a regional consumption deflator time series over the forecast horizon given growth of the national series. The historical regional consumption deflator is computed using Census Division level data for nominal and real disposable incomes. The source for the income data is Bureau of Economic Analysis. The historical data is at a quarterly frequency beginning in 1970. The nominal series is measured in billions of dollars. The real series is in billions of 2000 dollars.

Nominal personal disposable income is personal income less taxes. The regional tax rate is computed by applying the growth of the national rate to the regional rate beginning in the third quarter of 2006.

$YPD_i = YP_i * (1 – (TAXRATE_{i,2006:3} / TAXRATE_{2006:3}) * TAXRATE)$

*Where*:

| | |
|---|---|
| i | = 1 to 9 Census Divisions |
| $YP_i$ | = personal income, billions of dollars, regional |
| $YPD_i$ | = disposable income, billions of dollars, regional |
| TAXRATE | = personal income tax rate, percent, national |
| $TAXRATE_{2006:3}$ | = 2006:3 value of personal income tax rate, percent, national |
| $TAXRATE_{i,2006:3}$ | = 2006:3 value of personal income tax rate, percent, regional |

Personal income is the sum of wage and salary disbursements by government and by the private sector plus income from other sources.

$YP_i = YPCOMPWSD_i + YPOTH_i$

*Where*:

| | |
|---|---|
| i | = 1 to 9 Census Divisions |
| $YP_i$ | = personal income, billions of dollars, regional |
| $YPCOMPWSD_i$ | = wage and salary disbursements, billions of dollars, regional |
| $YPOTH_i$ | = other personal income, billions of dollars, regional |

Other personal income for each of the Census Divisions is an identity. The current period's regional forecast is determined by the per capita growth of other personal income for the U.S.

$YPOTH_i = ((YPOTH_i(-1) / NP_i(-1)) * (YPOTH / NP) / (YPOTH(-1) / NP(-1))) * NP_i$

*Where*:

| | |
|---|---|
| i | = 1 to 9 Census Divisions |
| NP | = total population including armed forces overseas, millions of persons, national |
| $NP_i$ | = total regional population including armed forces overseas, millions of persons, regional |
| YPOTH | = other personal income, billions of dollars, national |
| $YPOTH_i$ | = other personal income, billions of dollars, regional |

Historical regional income data comes from Bureau of Economic Analysis. The historical income data is at a quarterly frequency beginning in 1970. Nominal series are measured in billions of dollars. Real series are measured in billions of 2000 dollars. National income data comes from Global Insight's model of the U.S. economy. Historical income is quarterly and begins in 1959. Its units are the same as those for regional income. Global Insight's source for income is the Bureau of Economic Analysis.

Total regional population including armed forces overseas comes from the Census Bureau. Historical regional total population is at an annual interval beginning in 1980. Quadratic-match average is the method used in EViews to convert the frequency to quarterly from annual. The regional population time series were extended back until the start of 1972 using historical data from Census Bureau. The national total population comes from Global Insight's model of the U.S. economy. Its source is also the Census Bureau. Historical U.S. total population is at a quarterly interval beginning in 1959.

The national personal income tax is the difference between personal and disposable incomes. The source for national personal and disposable incomes is Global Insight's model of the U.S.

economy. Historical personal and disposable incomes are at a quarterly interval beginning in 1959 and are measured in billions of dollars. Global Insight's source for personal and disposable incomes is the Bureau of Economic Analysis. The personal tax rate is the share of personal income paid in taxes. The historical regional tax rate is computed using the Census Division's personal and disposable incomes from Bureau of Economic Analysis. The historical data is at a quarterly frequency beginning in 1970 and is measured in billions of dollars for all Census Divisions.

$TAX = YP - YPD$
$TAXRATE = TAX / YP$

$TAX_i = YP_i - YPD_i$
$TAXRATE_i = TAX_i / YP_i$

*Where*:
i = 1 to 9 Census Divisions
TAX = personal income tax, billions of dollars, national
$TAX_i$ = personal income tax, billions of dollars, regional
TAXRATE = personal income tax rate, percent, national
$TAXRATE_i$ = personal income tax rate, percent, regional
YP = personal income, billions of dollars, national
$YP_i$ = personal income, billions of dollars, regional
YPD = disposable income, billions of dollars, national
$YPD_i$ = disposable income, billions of dollars, regional

**Wage and Salary Disbursements**

Regional wage and salary disbursements are the sum of government and private sector disbursements. Units are billions of dollars. There is an equation for each of the nine Census Divisions:

$YPCOMPWSD_i = YPCOMPWSDG_i + YPCOMPWSDP_i$

*Where*:
i = 1 to 9 Census Divisions
$YPCOMPWSD_i$ = wage and salary disbursements, billions of dollars, regional
$YPCOMPWSDG_i$ = wage and salary disbursements by government, billions of dollars, regional
$YPCOMPWSDP_i$ = wage and salary disbursements by private sector, billions of dollars, regional

The regional wage and salary disbursement by government is total government disbursements shared by regional population:

$YPCOMPWSDG_i = YPCOMPWSDG * NP_i / NP$

*Where*:

i = 1 to 9 Census Divisions
NP = total population including armed forces overseas, millions of persons, national
$NP_i$ = total regional population including armed forces overseas, millions of persons, regional
YPCOMPWSDG = wage and salary disbursements by government, billions of dollars, national
$YPCOMPWSDG_i$ = wage and salary disbursements by government, billions of dollars, regional

The regional wage and salary disbursement by the private sector is determined by the rate of growth of the employment cost index of private sector wages and salaries:

$$YPCOMPWSDP_i = b1_i * (((JECIWSP * MHRSNFP) / (JECIWSP(-1) * MHRSNFP(-1)) * (YPCOMPWSD_i(-1) - YPCOMPWSDG_i(-1)) + (JECIWSP(-1) * MHRSNFP) / (JECIWSP(-2) * MHRSNFP(-1)) * (YPCOMPWSD_i(-1) - YPCOMPWSDG_i(-1))) / 2)$$

*Where*:

i = 1 to 9 Census Divisions
$b1_i$ = estimated coefficient for the explanatory variable in the equation for wage and salary disbursements by the private sector, regional
JECIWSP = employment cost index, private sector wages and salaries, Dec. 2005 = 1.0, national
MHRSNFP = man-hours in private non-farm establishments, billions of hours, national
$YPCOMPWSD_i$ = wage and salary disbursements, billions of dollars, regional
$YPCOMPWSDG_i$ = wage and salary disbursements by government, billions of dollars, regional
$YPCOMPWSDP_i$ = wage and salary disbursements by private sector, billions of dollars, regional

Historical regional wage and salary disbursements data comes from Bureau of Economic Analysis. The historical disbursements data is at a quarterly frequency beginning in 1970 and is measured in billions of dollars for all Census Divisions. National wage and salary disbursements data comes from Global Insight's model of the U.S. economy. Historical disbursements data is at a quarterly interval beginning in 1959 and is measured in billions of dollars.

Data for the national employment cost index for private sector wages and salaries comes from Global Insight's model of the U.S. economy. Historical data begins in the first quarter of 1975. The original source of the employment cost index is the Bureau of Labor Statistics. The time

series for man-hours in private non-farm establishments begins in the first quarter of 1964. This data also originates from the Bureau of Labor Statistics.

Total regional population including armed forces overseas comes from the Census Bureau. Historical regional total population is at an annual interval beginning in 1980. Quadratic-match average is the method used in EViews to convert the frequency to quarterly from annual. The regional population time series were extended back until the start of 1972 using historical data from Census Bureau. The national total population comes from Global Insight's model of the U.S. economy. Its source is also the Census Bureau. Historical U.S. total population is at a quarterly interval beginning in 1959.

**Manufacturing and Non-manufacturing Wages**

Regional average annual manufacturing wages are in nominal terms. The equations are in log form. There is an estimated equation for each of the nine Census Divisions. The explanatory variable is the employment cost index for private sector wages and salaries. The general form of the average annual manufacturing wages equations is:

$dlog(RWM_i) = b1_i * dlog (JECIWSP*RWM_{i,1992})$

*Where*:

| | |
|---|---|
| i | = 1 to 9 Census Divisions |
| $b1_i$ | = estimated coefficient for the explanatory variable in the equation for average annual manufacturing wages in Census Division i |
| JECIWSP | = employment cost index for private sector wages and salaries, 1992=1.0, national |
| $RWM_i$ | = average annual manufacturing wages, thousands of dollars, regional |

Historical, regional, average annual manufacturing wage data comes from Bureau of Economic Analysis. The historical wage data is at a quarterly frequency beginning in 1970 and is measured in thousands of dollars for all Census Divisions. The employment cost index for private sector wages and salaries comes from Global Insight's model of the U.S. economy. The historical employment cost index is at a quarterly interval beginning in 1975 and is an index with 1992 = 1.0.

Regional average annual non-manufacturing wages are in nominal terms. The equations are in log form. There is an estimated equation for each of the nine Census Divisions. The explanatory variable is the employment cost index for private sector wages and salaries. The general form of the average annual non-manufacturing wages equations is:

$dlog(RWNM_i) = b1_i * dlog (JECIWSP*RWNM_{i,1992})$

*Where*:

| | |
|---|---|
| i | = 1 to 9 Census Divisions |
| $b1_i$ | = estimated coefficient for the explanatory variable in the equation for average annual manufacturing wages in Census Division i |
| JECIWSP | = employment cost index for private sector wages and salaries, 1992=1.0, national |
| $RWNM_i$ | = average annual non-manufacturing wages, thousands of dollars, regional |

Historical regional average annual non-manufacturing wage data comes from Bureau of Economic Analysis. The historical wage data is at a quarterly frequency beginning in 1970 and is measured in thousands of dollars for all Census Divisions. The index of total compensation in non-farm business comes from Global Insight's model of the U.S. economy. The historical total compensation is at a quarterly interval beginning in 1959 and is an index with 1992 = 1.0.

**Consumer Price Index**

There is an identity for each of the nine Census Divisions to compute a regional consumer price index. The base year for the index is 1982-84 = 1.0. The equation for the consumer price index is:

$CPI_i = CPIZ_i * CPI$

*Where:*

| | |
|---|---|
| i | = 1 to 9 Census Divisions |
| CPI | = consumer price index, all urban, 1982-84=1.0, national |
| $CPI_i$ | = consumer price index, all urban, 1982-84=1.0, regional |
| $CPIZ_i$ | = regional consumer price index relative to national, 2003:4 value, regional |

For each Census Division, a regional consumer price index relative to the national index is computed. The 2006:3 value of this series is the constant used to compute a regional consumer price index over the forecast horizon given growth in the national index. The source for the historical regional and national consumer price indices is Bureau of Labor Statistics. The historical data is at a quarterly frequency beginning in 1970 and equals 1.0 in the first quarter of 1980 for all Census Divisions. The source for the national consumer price index is Global Insight's model of the U.S. economy. The historical index is at a quarterly interval beginning in 1959, and the average of the index from 1982 to 1984 is 1.0. Global Insight's source for the

consumer price index is the Bureau of Labor Statistics.

## Industry Variables

The industry block of the Regional Model forecasts values of output and employment for thirty-five industrial sectors and ten service sectors for each of the nine Census Divisions. Table A14 lists the descriptions of the sectors and the corresponding North American Industry Classification System (NAICS) codes.

Historical value of shipments and employment data for the manufacturing sectors are from the Economic Census databases and Annual Survey of Manufacturing databases purchased from the U.S. Bureau of the Census. As for the non-manufacturing and service sectors, gross state product and employment data from the U.S. Bureau of Economic Analysis (http://www.bea.gov/regional/rims/) are used to supplement the value of output and employment data from the Economic Census, which covers all sectors.

### Output

The historical regional output data are in nominal terms. Converting them to real terms (that is, in constant 2000 dollars as in the national industry model) requires sectoral price information at the region level, which are not available to EIA. An alternative solution was used to compute the real value series using the nominal regional shares:

$$\text{Real Output Value}_{ir} = \frac{\text{Nominal Output Value}_{ir}}{\sum_{r} \text{Nominal Output Value}_{ir}} * \text{Real Output Value}_{iUS}$$

*Where*:
i = industrial or services sector
r = region (9 Census Divisions)

This implicitly assumes that the producer price indexes for the regions are the same as that for the nation in each sector.

The sectors are analyzed separately, in a pooled cross-sectional time-series framework. The regions are the members of the pooled variables. One equation is created for each sector, with the variables for all the nine Census Divisions serving as endogenous and explanatory variables. This allows the choice of estimating a common coefficient for an explanatory variable across all regions or having cross-section specific coefficients that are different for each region.

For each sector, the endogenous variable is the regional output share (the denominator, national output, is predetermined). The explanatory variables are the regional shares of macroeconomic variables (or the ratio of the regional to the national variable), national macroeconomic variables and time trend. The general structural form is:

$$\log(Output_r/Output_{US}) = a_r + \sum_j b_j * \log(X_{jr}/X_{jUS}) + \sum_k b_{kr} * \log(X_k) \text{ or } X_k$$

*Where*:

| | |
|---|---|
| r | = region (9 Census Divisions) |
| j | = 1, 2, … |
| k | = 1, 2, … |
| $X_{jr}$ | = pooled explanatory variable j for region r or for US |
| $X_k$ | = explanatory variable k, national |
| $a_i$ | = constant term for region r |
| $b_j$ | = coefficients for the pooled explanatory variable j |
| $b_{kr}$ | = coefficients for the explanatory variable k for region r |

Explanatory variables used in the output equations include:

1. Real Gross State Product (GSP) shares
2. Ratios of regional real GSP per capita or real disposable income per capita over national
3. Ratios of regional annual wages over national average (manufacturing or non-manufacturing/services)
4. Population shares
5. Housing start shares
6. National energy price indexes
7. Time trend

The rationale of the relation is that while regional output may follow the national trend, it is also affected by the region's relative advantages in size of economy, affluence, production cost, labor force availability, sensitivity to energy prices and capability/flexibility to adopt new technology and other changes, represented by a time trend variable. Not all of these variables are significant in every sector or within every Census Division, but in total they all have a substantial impact on a region's production activities.

Understandably, the regional forecast from the estimated equations does not add up to the national total. An alignment procedure is used to scale the preliminary forecast so that their sum aligns with the national total. The adjustment factor, measured by the percent deviation of the sum of the preliminary regional forecasts from the national total, is also an indication of how well the regional equations perform. Of the forty-five sectors, thirty-three have adjustment factors within two percent, eleven have factors between two and five percent, and one has adjustment factors between five and ten percent.

**Employment**

A set of pooled cross-sectional time-series regressions is developed to forecast regional employment by sector. The endogenous variable is the regional employment share (the denominator, national employment, is predetermined). The general structural form for private sector employment is:

$$\log(\text{Employment}_r/\text{Employment}_{US}) = a_r + \sum_j b_j * \text{2-year moving averages of } \log(X_{jr}/X_{jUS}) + b_{Tr} * \text{Time Trend}$$

*Where*:
r = region (9 Census Divisions)
j = 1, 2, …
$X_{ji}$ = pooled explanatory variable j for Census Division r or for the U.S.
$a_r$ = constant term for Census Division r
$b_j$ = coefficients for the pooled explanatory variable j
$b_{Tr}$ = coefficient for time trend for Census Division r

Explanatory variables used in the employment equations include:

1. Real value of output shares
2. Ratios of regional annual wages over national average (manufacturing or non-manufacturing/services)
3. Real GSP shares

The main explanatory variable is the regional output share. However, historical data indicate that output per employee is not the same across regions. Labor cost affects employment decisions. Employment for selected service sectors (distributional trade and business and personal services) is likely to depend on the region's economic activities. A time trend variable is included in some sectors to capture differences in adoption of technology and other productivity improvements. A two-year moving average of the explanatory variable is adopted to reflect the lagged effect in hiring.

For four sectors, an alternative specification was adopted either because the coefficient for the output share variable is insignificant or the forecast growth rates were not reasonable. The six sectors are petroleum refineries, other petroleum and coal products, other mining and quarrying, and three utility sectors. The alternate specification is:

$$\log(\text{Employment}_r/\text{Output}_r) = a_r + b * \log(\text{Employment}_{US}/\text{Output}_{US})$$

This form explains the labor productivity of the regions with the national labor productivity. The coefficient "b" is close to one (within five percent for all six sectors) and significant, statistics of the regression are acceptable and forecast growth rates are reasonable.

Regional employment shares for the federal government are forecast by trend, and those for state and local government are related to population shares and trend.

As in the case of output, the preliminary employment forecasts are also scaled so that their sum aligns with the national total for each sector. The adjustment factors for all except three sectors are below two percent. The three sectors have adjustment factors under three percent.

## Building Variables

Other regional variables required by the NEMS Demand Modules are housing starts and commercial floorspace stocks.

Housing Starts:

1. Single Family Housing Starts
2. Multi-Family Housing Starts
3. Mobile Home Shipments

Commercial floorspace (thousand square feet) types:

1. Stores – stores and restaurants
2. Warehouse – manufacturing and wholesale trade, public and federally-owned warehouses
3. Office – private, federal, and state and local offices
4. Automotive – auto service and parking garages
5. Manufacturing
6. Education – primary/secondary and higher education
7. Health – hospitals and nursing homes
8. Public – federal and state and local
9. Religious
10. Amusement
11. Miscellaneous, non-residential – transportation related and all other not elsewhere classified
12. Hotel – hotels and motels
13. Dormitories – educational and federally-owned (primarily military)

## Housing Starts

The regional residential housing forecast for single and multi-family housing starts and for mobile home shipments are done using shares supplied by the NEMS's Residential Module manager. The shares are derived from annual changes in regional population relative to that for the nation. Population is an exogenous assumption in all the MAM models. Starts and shipments are measured in millions of units. Beginning in 2002, there is an annual share value for single and for multi-family housing starts as well as for mobile home shipments in each of the nine Census Divisions. The shares are applied to the respective national total from Global Insight's model of the U.S. economy. Historical data for housing starts and mobile home shipments are quarterly and begin in 1959. The Census Bureau is Global Insight's source for single-family starts and mobile home shipments. Global Insight constructs multi-family housing starts. Since the frequency of the shares is annual and that for Global Insight's U.S. and EIA's regional models are quarterly, the shares are converted to a quarterly frequency. Constant-match average is the method used in EViews to convert the frequency to quarterly from annual.

## Commercial Floorspace

The COMFLR sub-module of the MAM contains three hundred and six equations of which one hundred and seventeen equations (thirteen commercial floorspace types in each of nine Census Divisions) are floorspace additions estimated using historical data beginning in the seventies. The remaining one hundred and eighty-nine equations are identities. Of the identities, one hundred and seventeen equations compute stocks by aggregating floorspace additions by floorspace type (thirteen types) within Census Division (nine Divisions). Another sixty-six equations sum additions, stocks and removals within Census Division (nine Divisions) and across Census Division by floorspace type (thirteen types). The final six identities sum additions, stocks and removals across Census Division and as a check across floorspace type. The sub-module forecasts both the additions and stocks of thirteen floorspace types in each of the nine Census Divisions. The units are thousand square feet of commercial floorspace at a quarterly interval. The quarterly additions are aggregated and the resulting annual stock solution is written to the NEMS common block as the reported annual floorspace forecast.

The commercial floorspace model is a stock adjustment model. The endogenous variable is the change in the addition of commercial floorspace in thousand square feet by floorspace type within Census Division. The explanatory variables include one period lags of own floorspace, the deviation from historical mean additions, the deviation from the trend in stocks, the change in stocks, per capital real income and of interest rates adjusted for inflation in the division. The general form of the estimated commercial floorspace equations is:

$$
\begin{aligned}
d(comflr_flw_{ij}) = \; & a_{ij} \\
& + b1_{ij} * d(comflr_flw_{ij}\ (-1)) \\
& + b2_{ij} * @mean((comflr_flw_{ij}),"1970q1\ 1999q4")-(comflr_flw_{ij}\ (-1)) \\
& + b3_{ij} * comflr_stk_trend_{ij}-@movav(comflr_stk_{ij},20) \\
& + b4_{ij} * d(comflr_stk_{ij}\ (-1)) \\
& + b5_{ij} * d(ypdr_{ij}/np_{ij}) \\
& + b6_{ij} * rmcorpaaa-@pc((@movav(cpi_{ij},3)))
\end{aligned}
$$

*Where*:

| | |
|---|---|
| i | = 1 to 9 Census Divisions |
| j | = 1 to 13 commercial floorspace types |
| $a_{ij}$ | = estimated constant for commercial floorspace j in Census Division i equation |
| $b1_{ij}$, etc. | = estimated coefficients for the explanatory variables in the equation for commercial floorspace j in Census Division i |
| $comflr_flw_{ij}$ | = additions to commercial floorspace j, thousand square feet, regional |
| $comflr_rem_{ij}$ | = removals of commercial floorspace j, thousand square feet, regional |
| $comflr_stk_{ij}$ | = stock of commercial floorspace j, thousand square feet, regional |
| $cpi_i$ | = consumer price index, 1982-84=1.00, regional |
| $np_i$ | = total regional population including armed forces overseas, millions of persons, regional |
| rmcorpaaa | = yield on Aaa-rated corporate bonds |
| $ypdr_i$ | = real disposable income, billions of 2000 dollars, regional |

# Part B
# THE MAM INTERFACE WITH THE NEMS

## 5. Integrated Simulations Using The MAM

This section first describes the types of integrated simulations of the Macroeconomic Activity Module (MAM) within the National Energy Modeling System (NEMS), followed by a discussion that briefly lays out the setup of the models constituting the MAM and the aspects that are common to all the simulations. As indicated above, the set of models is designed to run in a recursive manner. EIA's version of Global Insight's model of the U.S. economy, the macroeconomic model, provides forecasts of over 1700 concepts spanning final demands, aggregate supply, prices, incomes, international trade, industrial detail, interest rates and financial flows. The industrial output model takes the final demand projections from the macroeconomic model as inputs to provide projections of output for sixty sectors, covering the entire economy, at the three and sometimes four-digit NAICS code levels. The employment model takes the industrial output projections from the industry model and national wage rates, productivity trends and average workweek trends from the macroeconomic model to project employment in fifty-nine industries. The sum of non-farm employment is constrained to sum to the national total projected by the U.S. model. The regional model shares the national results of output and employment to the nine Census Divisions. The commercial floorspace model calculates regional floorspace for thirteen types of use by Census Division.

### Integrated Simulations of Alternative Energy Conditions or Events

Integrated forecasts of the NEMS center on estimating the state of the energy-economy system under a set of alternative energy conditions. Typically, the forecasts fall into the following four types of integrated NEMS simulations:

1. Reference case projection
2. Alternative world oil prices
3. Changes in or proposed energy fees or emissions permits
4. Proposed changes in Combined Average Fuel Economy (CAFE) standards

In these integrated NEMS simulations, forecast values for over two hundred and forty macroeconomic and demographic variables from MAM are passed to NEMS. After making any requisite transformations required by the simulation, the modules of NEMS solve for demand, supply and prices of energy over the forecast period. These energy prices and quantities are then returned to MAM and a new forecast, Scenario 1, is solved in the MAM's U.S., industrial output, employment by industry, regional and commercial floorspace models. Details of each type of integrated simulation are discussed below.

**Reference Projection:** The development of the MAM's reference case is an iterative process requiring many integrated simulations of the NEMS before global convergence is attained. But before the first integrated run can be done, it is necessary to create a baseline for the U.S. model. Modifications are made to Global Insight's model of the U.S. economy so that it includes EIA's assumption about the path of the world oil price. The results of this model solution become the preliminary baseline, Scenario 0, of the U.S. model.

At this point, the MAM is included in integrated simulations of the NEMS. Energy market conditions as supplied by the modules of the NEMS are assumptions exogenous to the U.S. model. The U.S. model is simulated using these assumptions. The resulting forecast is labeled "Scenario 1" in the EViews workfile. The MAM is a collection of models, with the U.S. model being the first to execute. Models of industrial output and employment by industry at the national level are solved sequentially using the U.S. model forecast. Simulations of regional models of economic activity, housing starts, commercial floorspace and of industrial output and employment by industry then follow. Once all the models of the MAM are solved, a subset of the forecast is written to the global data structure so that the modules of NEMS can react to these new economic assumptions. This is a "cycle" of the NEMS. Cycles are repeated until convergence factors are satisfied. At some point, following many runs of the NEMS, the reference case is declared to be frozen. The "Scenario 1" solution in the U.S. model then becomes the final baseline used as the starting point for analyzing policy proposals and changes in energy markets. These results are reported in the Annual Energy Outlook as the reference case.

**Alternative World Oil Prices:** Crude oil prices are determined in the international market and are influenced by production decisions in OPEC and non-OPEC nations. Two simulations are normally performed in conjunction with the reference forecast for the Annual Energy Outlook. These are based on a high oil price scenario and a low world oil price scenario. These high and low prices are based on different assumptions about the world's liquid market. For each of these cases, the MAM starts from the reference case, as explained above, and passes the values of the required macro variables to the modules of NEMS. The NEMS reacts to the alternative world oil price and various measures of economic activity. A new set of energy variables, including new oil prices, are passed back to the MAM, which then re-solves its series of models.

**Changes in or Proposed Energy Taxes or Emission Permits:** This class of simulations levies some kind of tax on an energy sector. It could be a per-unit tax (x-cents per gallon) or an ad-valorem tax (x% of revenues). It could be a tax on a fuel by type or on emissions by type. Since taxes are levied on an industry, prices are expected to rise in proportion to the tax. These taxes, if collected by the federal government, will change the budget deficit relative to the baseline. Since these taxes are not levied for revenue raising purposes, although the raising of revenue has also been considered in previous years, assumptions are made as to how these are returned to the economy. Generally, three alternative schemes are implemented. First, it can be assumed that taxes are retained within the business sector (grandfathered). Second, they can be returned to

households. Third, a fraction can be returned to the households while the remaining fraction is retained within the business sector. In practice, these alternative schemes have also included spending on government research and development projects as well as transfers to help ameliorate the impacts of the tax.

The grandfathered case is easiest to implement since the revenues stay in the business sector. Here, as in all simulations, reference scenario values for macroeconomic and demographic variables are passed to the NEMS. With increases in or introduction of new energy taxes, energy prices rise and quantities fall in the NEMS. These newly forecasted values are returned to the MAM. The increase in federal revenues due to energy taxes is also returned to the MAM. In this case the business sector retains all tax revenues.

In the case where revenues are returned to the consumers, the increased revenues are subtracted from corporate profits before taxes (ZB) by increasing Federal excise tax accruals other than for a value added tax (TXIMGFOTH) through the add factor associated with it (TXIMGFOTH_A). Second, the add factor associated with federal personal tax receipts (TXPGF_A) is either reduced by the same amount as the increase in the excise tax. Essentially these two procedures imply that the federal government takes the energy tax revenues away from the business sector as a lump sum amount and then returns them to consumers in the form of a lump sum.

In the case where a portion of the tax revenue is allowed to stay in the business sector and the remaining amount is returned to consumers, the add factor for TXIMGFOTH is increased by the amount that has to be returned to the consumers. Then the add factor for TXPGF is reduced by the same amount.

**Proposed Changes in CAFE Standards:** This class of simulations is based on changing (improving) the combined average fuel economy of new light vehicles relative to the baseline CAFE standards. Increases in the CAFE standards are associated with an increase in the cost of production of new light vehicles, which are calculated by the Transportation Module of the NEMS. This increased cost is passed to the MAM. The additional cost per new light vehicle is added to the reference average price of new light duty vehicles (PLVAVG).

Once the MAM solves its series of models using the new assumption, it writes its new forecast to the global data structure. The other modules of the NEMS read the new MAM and CAFE assumptions and solve. The resulting changes in energy prices and quantities along with the incremental cost for new light vehicles are returned to the MAM. The MAM uses the newly forecasted energy market assumptions to re-solve. This process continues until the NEMS forecast converges.

## Model Levers and Simulation Rules

Global Insight provides a series of levers and simulation tools in its models that permit change in key assumptions. All these levers and simulation rules are presented below along with a discussion of how they are modified in the MAM.

**Energy Prices and Quantities:** The projected values for energy prices and quantities appearing in the MAM's U.S. model are exogenous assumptions provided by the supply and demand modules of the NEMS. Similarly, forecasts of output for five energy-related industries and of employment in two energy-related industries are determined by the NEMS. The forecasted values of the following energy variables are exogenous to the MAM and are determined in the supply and demand modules of the NEMS:

**a. Production of Energy**

ENGDOMPETANG = Domestic production of petroleum & natural gas
ENGDOMO = Domestic production of energy excluding petroleum & natural gas

**b. End-use Demand for Energy**

DALLFUELS = Demand for all fuels
DENDUCOAL = End-use demand for coal (excludes electricity generation)
DENDUELC = Sales of electricity to ultimate consumers
DENDUNG = End-use demand for natural gas
DENDUPET = End-use demand for petroleum

**c. Consumer Spending on Energy**

CNEFACR = Real consumer spending on fuel oil & coal
CSVHOPGR = Real consumer spending on natural gas
CSVHOPER = Real consumer spending on electricity
CNEGAOR = Real consumer spending on gasoline & motor oil
QGASASF = Highway consumption of gasoline & special fuels

**d. Prices of Energy**

JPCNEFAC = Chained price index--consumer fuel oil & coal
JPCSVHOPE = Chained price index--household electricity
JPCSVHOPG = Chained price index--household natural gas
JPCNEGAO = Chained price index--consumer gasoline & oil
WPI051 = Producer price index--coal
WPI053 = Producer price index--gas fuels
WPI054 = Producer price index--electric power
WPI055 = Producer price index--utility natural gas
WPI0561 = Producer price index--crude petroleum
WPI057 = Producer price index--refined petroleum products
WPI0574 = Producer price index--residual petroleum fuels

POILIMP = Weighted average price of imported crude received in refinery inventories

**e. Industrial Production Indices**

IPSN2121 = Industrial production index--coal mining
IPSG211A3 = Industrial production index--oil & gas extraction & support activities

**f. Industry Output**

Though the output forecasts of the following energy-related industries are endogenously determined in the MAM's industrial output model, its values are overwritten. The MAM's forecasts are computed by applying the growth rates from the NEMS forecasts to the last historical data point in the MAM's industrial output model.

R2121R = Real Output of Coal Mining
R211R and R213R = Real Output of Oil and Gas Extraction and Support Activities
R32411R = Real Output of Petroleum Refining
R2211R = Real Output of Electric Utilities
R2212R = Real Output of Gas Utilities

**g. Employment**

Though the employment forecasts of the following energy-related industries are endogenously determined in the MAM's employment model, its values are overwritten. The MAM's forecasts are computed by applying the growth rates from the NEMS forecasts to the last historical data point in the MAM's employment model.

E2121 = Employment of Coal Mining Sector
E211 and E213 = Employment of Oil & Gas Extraction Sector

**Fiscal Policy Assumptions:** Unless mentioned otherwise, the MAM retains Global Insight's default settings for fiscal policy levers and assumptions.

**a. Federal Purchases**

Real federal government spending for each spending category is an exogenous input in the model. The price deflator associated with each of the goods categories reflects goods inflation in the private sector of the economy. Price deflators associated with the federal wage categories (JPGFMLCWSS and JPGFOCWSS) are closely tied to legislated pay increases; this pay increase concept explains 70-80% of the inflation in government wages while wage inflation in the private sector of the economy explains the remainder.

The determination of federal government pay increases (GFMLPAY and GFOPAY) is controlled by model lever GFPAYLEV. If GFPAYLEV is set to 1, federal government pay increases are specified exogenously by the model user (they should supply values for exogenous variables GFMLPAYEXO and GFOPAYEXO that are annual percent pay increases for the two categories

respectively). If GFPAYLEV is set to 0, federal government pay increases are modeled to rise with inflation as indicated by the chained price index of consumer purchases (JPC). The default value for GFPAYLEV is 1.0.

**b. Federal Transfer Payments**

The model lever JSSLEV allows users to simulate Congressional decisions to trim (negative annual percentage rate) or augment (positive annual percentage rate) the cost-of-living adjustment (COLA) on social security payments (YPTRFGFSISS) based upon CPI inflation. For example, setting the lever value to 1 increases the social security COLA by 1%. The default value for JSSLEV is 0.

**c. Personal Income Tax Rates**

Tax rates in the model are largely exogenous at the federal level and endogenous at the state and local level. However, the model lever TXINFLEV allows the user to raise personal income tax rates if consumer prices rise. If TXINFLEV is set to 0, changes in the federal personal income tax rate (RTXPGF) are controlled through the add factor RTXPGF_A. If TXINFLEV is set to 1, the tax rate is indexed to CPI inflation. The default value for TXINFLEV is 1. The add factor RTXPGF_A can be used to target search the full employment federal budget surplus (NETSAVGFFE).

**Monetary Policy Assumptions:** The model lever RMFFLEV gives the user the flexibility of using the supply of reserves as the key monetary policy instrument, reflecting the Federal Reserve's open market purchases or sales of Treasury securities, or of using a reaction function as the policy instrument. If RMFFLEV is set to 0, the model uses non-borrowed reserves as the monetary policy instrument and the federal funds rate is determined by the balance between the demand and supply of reserves existing in the banking system (equation RMFFRES). The Federal Reserve does not engage in an active policy to stabilize the economy. The federal funds rate is determined by the demand for federal funds existing in the banking system. If the lever is set to 1, the model uses a Federal Reserve reaction function. This is an econometrically estimated equation which models the past behavior of the Federal Reserve in setting the federal funds rate in response to changes in inflation and unemployment (equation RMFFRCT). This implies that the Federal Reserve targets interest rates trading off changes in inflation and the unemployment rate.

In the baseline forecast of Global Insight's model of the U.S. economy, both the RMFFRES equation and the RMFFRCT equation yield the same federal funds rate forecast. Therefore, setting the lever at any value will not alter these baseline projections. For policy simulations, setting the value anywhere between 0 and 1 reflects the model user's view about the degree of active monetary policy undertaken by the Federal Reserve. In the simulations described above the lever is set at 0.9 to allow for a fairly active monetary policy. This reflects the view that the Federal Reserve will act quickly to stabilize the economy in the case of energy events that have the potential to disrupt the economy significantly.

**Foreign Assumptions:** In general, Global Insight's default values are used. Exceptions are discussed below.

**a. Interest Rates**
The long-term government bond yield in rest-of-world industrial economies (RMGBLMTP) is exogenous and equal to its baseline value RMGBLMTPB if the model lever RMGBLMTPLEV is set to 0. If RMGBLMTPLEV is set to 1, this rate changes by the same amount as the rate on the 10-year U.S. Treasury note. If it is assumed that there is international monetary policy coordination between the United States and the other major industrial economies, then RMGBLMTPLEV should be set to 1. The default value for this lever is 0. This setting indicates that the interest rate differential between the U.S. and the rest-of-world industrial economies may differ.

**b. Foreign Prices**
Export and import demands are highly sensitive to changes in U.S. prices relative to foreign prices. While U.S. prices are modeled in considerable detail with a high level of sophistication, the prices of our major trading partners are largely exogenous assumptions in the model. At times, policy or event-related simulations can cause relative (U.S./foreign) prices to deviate significantly from baseline when foreign prices are fixed, causing trade volumes to respond strongly. In the case of a carbon tax that impacts our major trading partners to equal degrees, for example, relative prices should not be changing. Hence simple simulation rules have been added to the model that allow movements in the foreign prices relative to baseline levels.

**b.1. Producer Prices and Relative Prices.**
The model lever TRADEPLEV was introduced in order to negate any changes in relative prices on export and import demands. When TRADEPLEV is set to 1, export and import demands are determined by foreign output demand and relative (U.S./trading partner) prices. When TRADEPLEV is set to 0, relative prices are assumed to remain at baseline levels; export and import demands change from baseline levels only in response to changes in output, not relative prices. The default value for TRADEPLEV is 1.

The producer price index for the rest of the industrialized world (WPIWMTP) is both the key determinant of import prices and the key foreign price driving the U.S. exchange rate with industrialized countries. WPIWMTP is determined by one of two simulation rules based upon the value of the model lever WPIWLEV. If WPIWLEV is set to 0, foreign producer prices are changed relative to baseline levels with changes in imported oil prices (JPMGPET), U.S. merchandise export prices (JPXGXCPP), exchange rates (JEXCHMTP) and foreign economic activity (JGDPMTPR and JGDPOITPR). If WPIWLEV is set to 1, foreign producer prices move in line with U.S. merchandise export prices. The default value for WPIWLEV is 0.

**b.2. Exchange Rates.**
There are two nominal exchange rates in Global Insight's model of the U.S. economy. These are JEXCHMTP and JEXCHOITP and are defined as trade-weighted exchange rates (in U.S. $) for industrialized countries and for developing countries, respectively. In the MAM, these variables are set exogenously to their baseline projected values for all simulations.

**c. Foreign GDP**
There are two foreign real GDP variables in the macroeconomic model. These are real GDP in the rest of the industrialized world (JGDPMTPR) and real GDP in developing countries (JGDPOITPR). If the model levers corresponding to JGDPMTPR and JGDDPOITPR (JGDPMTPRLEV and JGDPOITPRLEV, respectively) are set to 0, they are exogenous. When JGDPMTPRLEV and JGDPOITPRLEV equals 1, both foreign real GDP concepts change in the same proportion as U.S. real GDP changes. The default values for JGDPMTPRLEV and JGDPOITPRLEV are 0. In the Alternative World Oil Price Simulations, discussed above, a GDP elasticity with respect to world oil price of 0.02 is assumed for the two foreign real GDPs. This implies that these GDPs change by 0.02 percent for every 1 percent change in the world oil price from the Reference Case. The value of 0.02 for the GDP elasticity with respect to world oil price is based on empirical research findings.

**Flowcharts of MAM**

The following seven flowcharts show the flow of information from the NEMS to the MAM and how the flows of energy and economic information are passed among the components of the MAM. This set of flowcharts identifies the tasks performed by each of the MAM's models and may not necessarily follow the actual programming sequence. The latter will be discussed in the next section, along with another set of flowcharts presenting the programming steps and subroutines.

Figure 1 summarizes the entire NEMS-MAM integrated system. The remaining six figures focus on the various forecasting models contained in the macroeconomic, industrial output, employment and regional models of the MAM. In each model, a reference economic forecasts using the structural models described in Part A was created and linked to the NEMS to initialize the system.

The MAM is best described as a feedback system that modifies the reference scenario given changes in energy events or policies. This applies to all NEMS runs including the reference and sensitivity cases of the Annual Energy Outlook. To do this, alternative NEMS values of energy prices and quantities are first transformed into concepts compatible to those in the MAM models. The growth rates of these alternative NEMS series are applied to the last historical value to create new energy forecasts. These new series are put into the model as predetermined variables, and a new scenario is run.

The models in the MAM are run sequentially. The macroeconomic model is the first to run with the new energy market assumptions. It is followed by the industrial output and employment models and finally by the regional models. The downstream models in the MAM depend upon the forecast of those models executed before it for predetermined variables. There is no feedback loop within MAM. That is, the forecast of an upstream model is not affected by the results of a downstream model in the same NEMS cycle. When one cycle of the MAM is complete, the forecast is written to the global data structure of the NEMS for use by it other modules.. Subsequent energy market forecasts from the NEMS are returned to the MAM, if model convergence criterions are not satisfied.

**Figure 1. Macroeconomic Activity Module Flow**

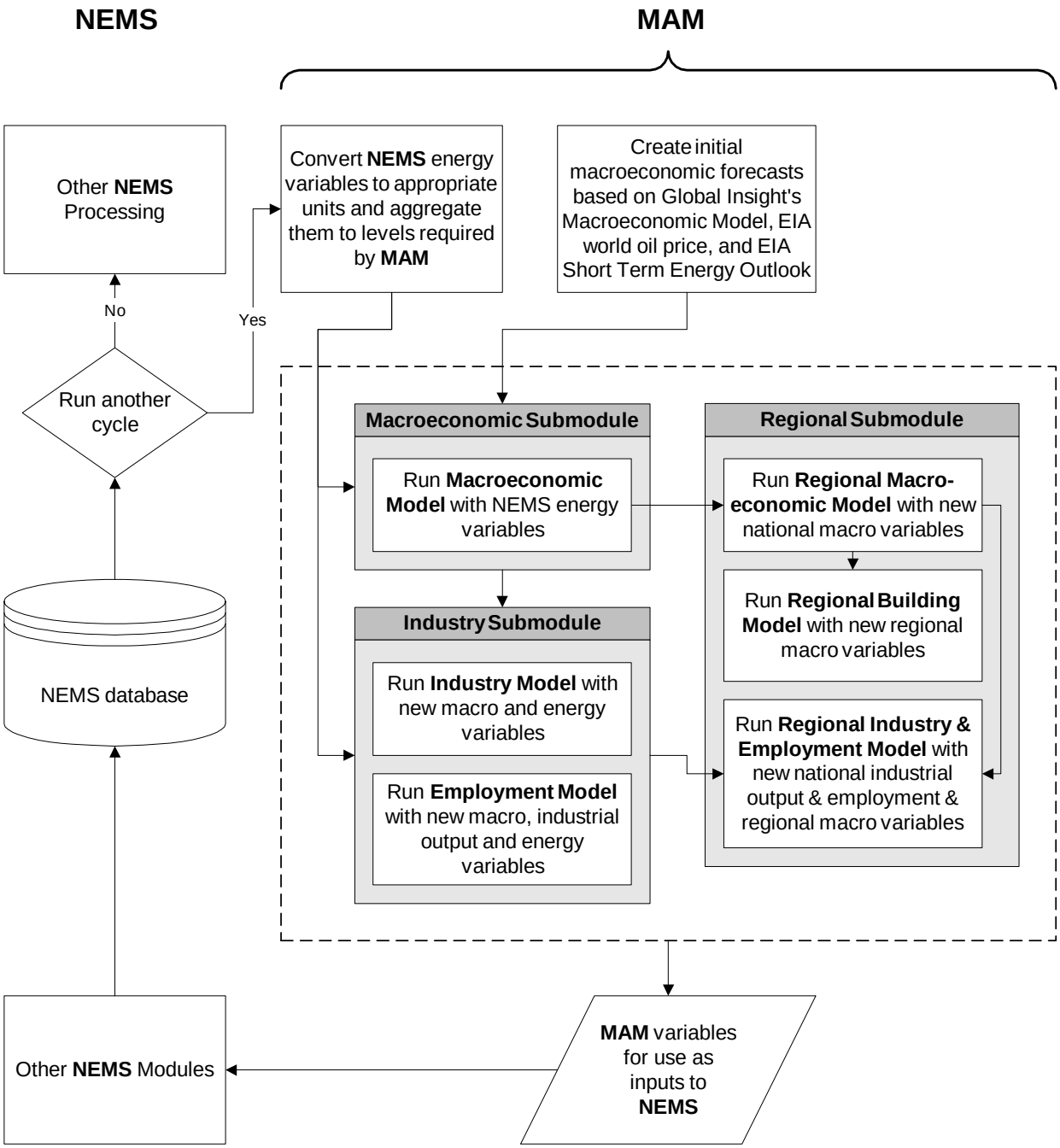


**Figure 2. Macroeconomic Sub-module Flow**

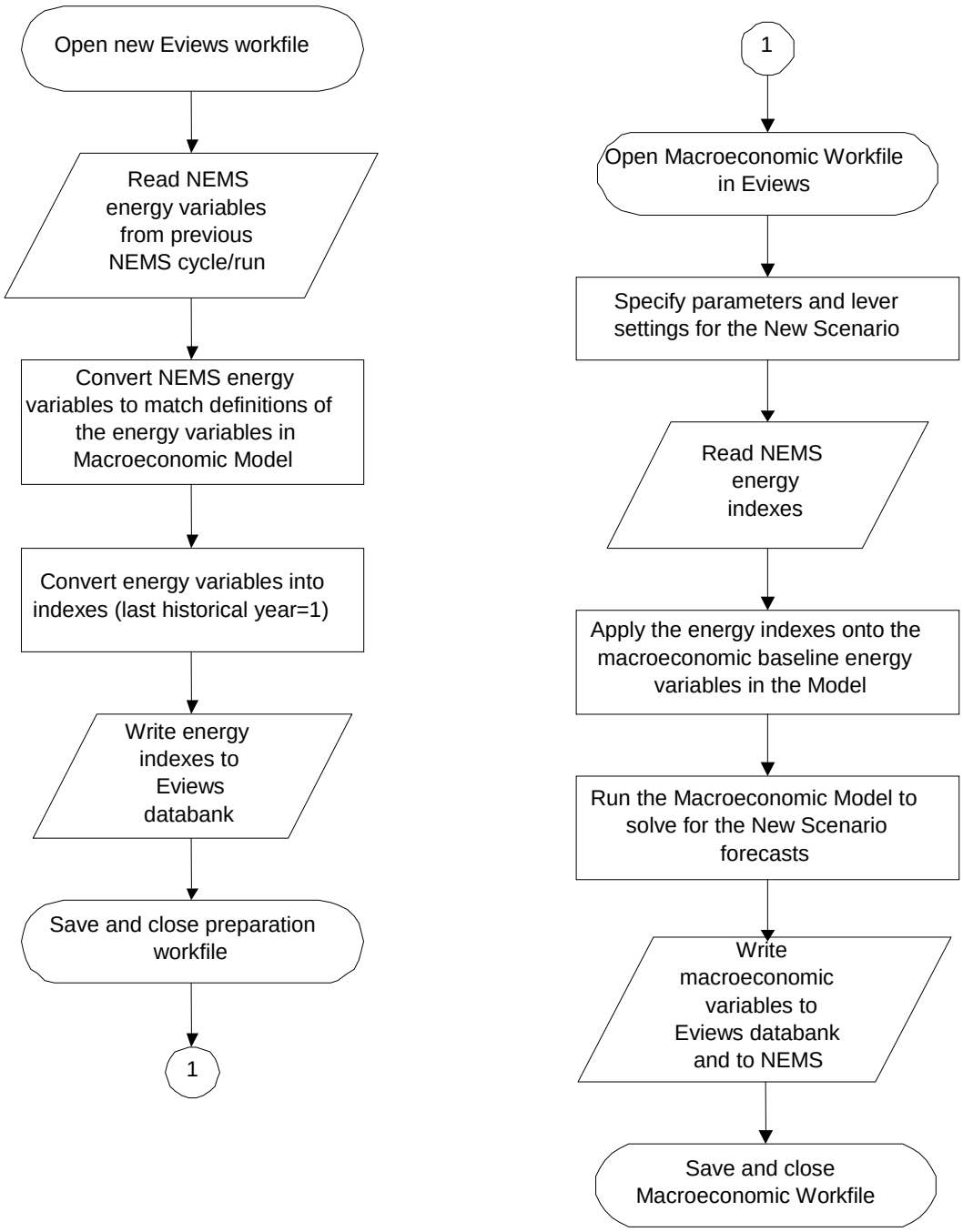
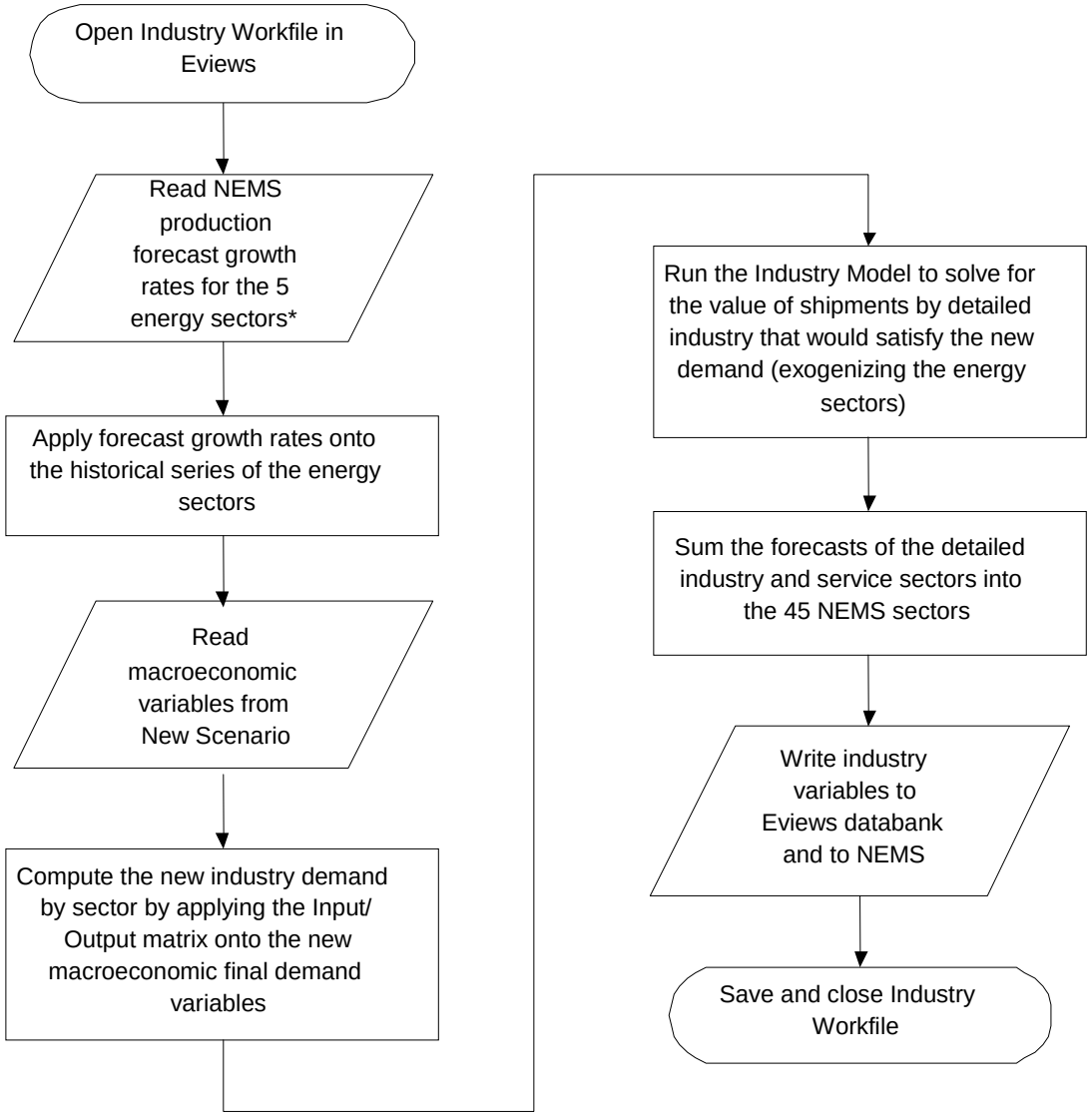
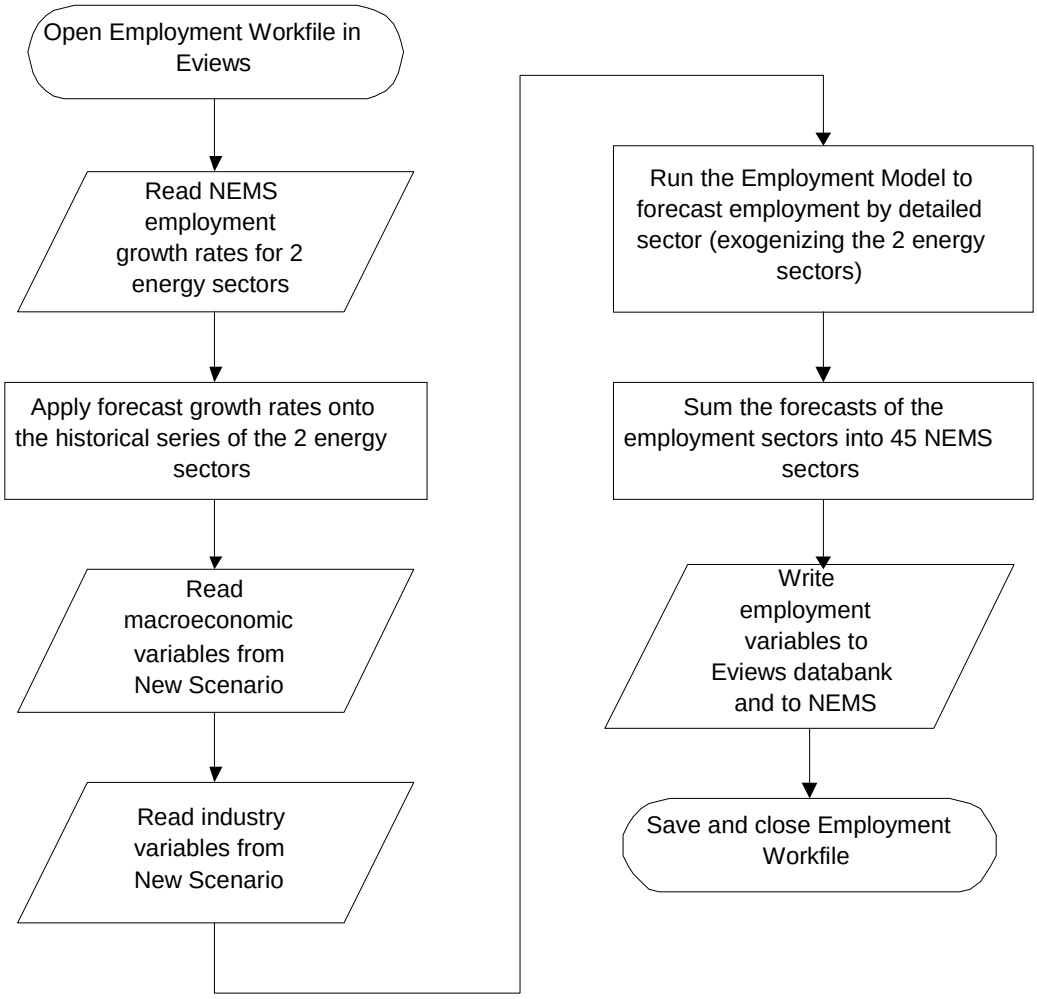


**Figure 3. Industry Sub-module – Industry Model**




*** Five energy sectors with NEMS production**
Coal
Oil and Gas
Petroleum
Electric
Gas

**Figure 4. Industry Sub-module – Employment by Industry Model**




*** Two energy sectors with NEMS employment**
Coal
Oil and Gas

**Figure 5. Regional Sub-module – Regional Macroeconomic Model**

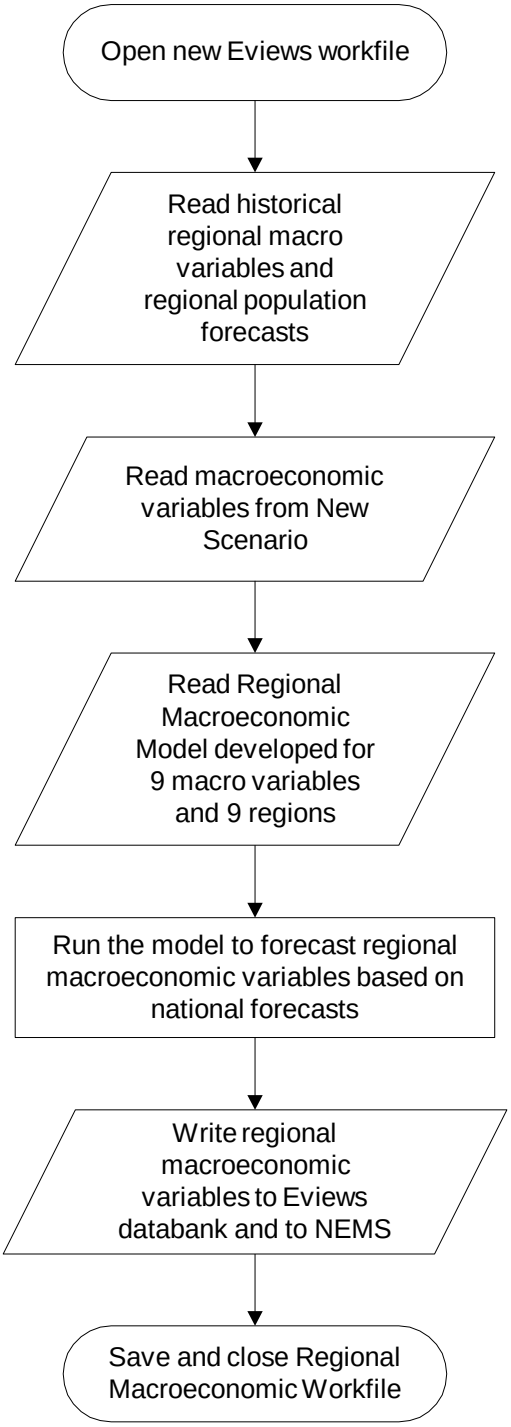


**Figure 6. Regional Sub-module – Regional Building Model**

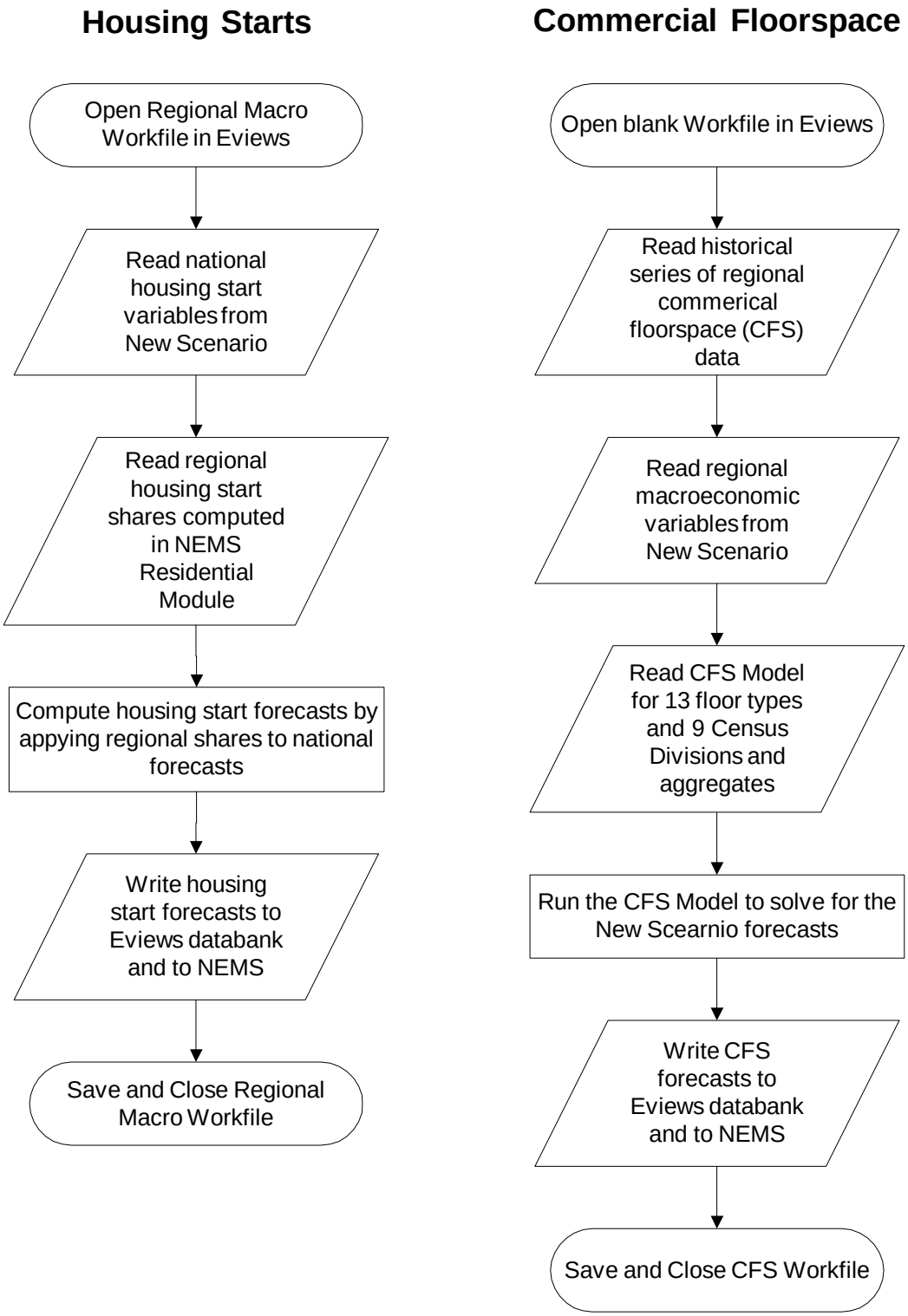
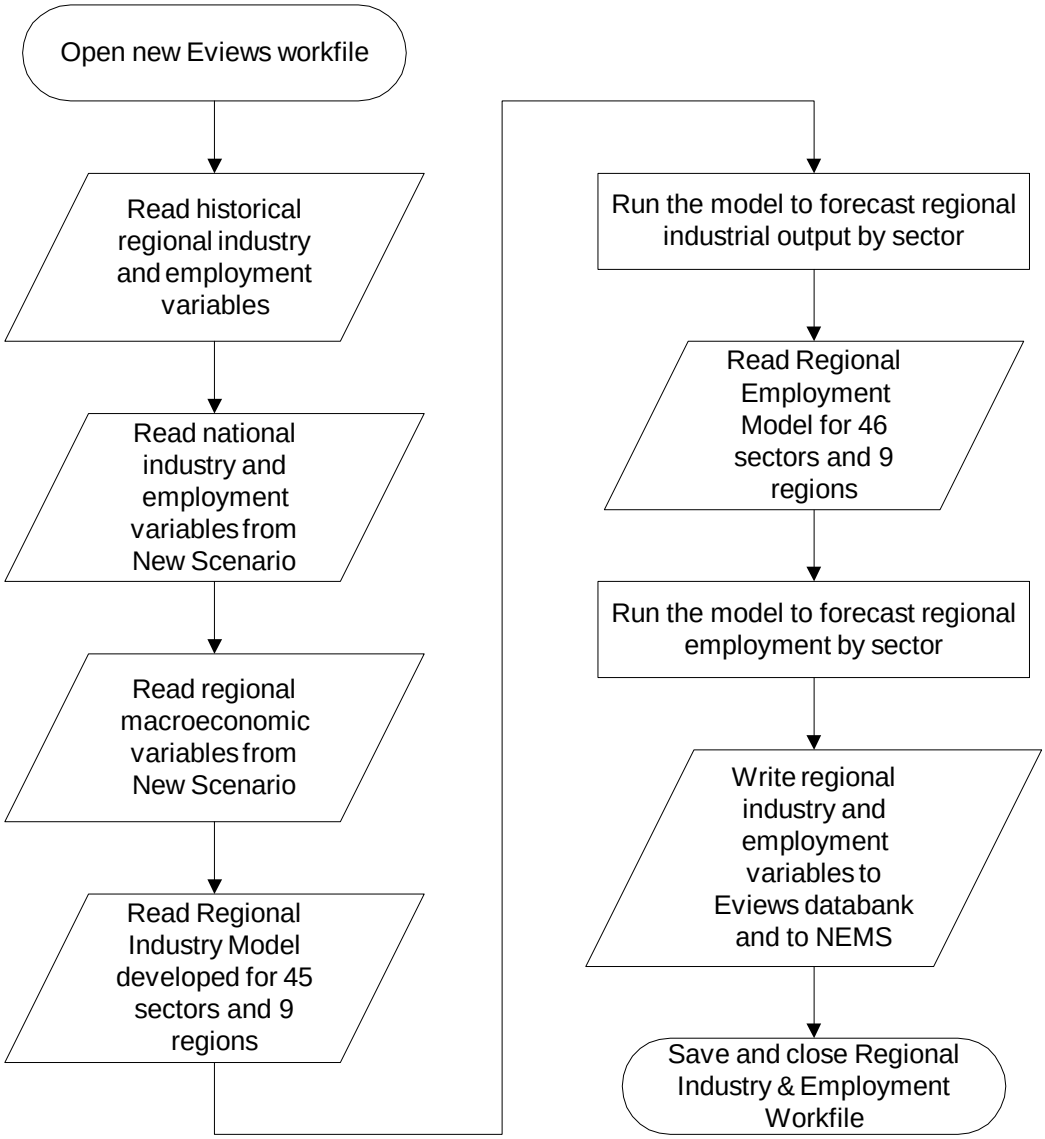


**Figure 7. Regional Sub-module – Regional Industry and Employment by Industry Model**

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# 6. Operation of MAM within NEMS

The Macroeconomic Activity Module (MAM) is one of a number of FORTRAN source files (also known as modules) that, after compiled and linked, compose the National Energy Modeling System (NEMS) executable. The MAM consists of nine subroutines used to read inputs, compute and apply shocks to the MAM models, simulate those models and write out the resulting forecast. Figure 7 diagrams the flow of control within the MAM.

### MAC Subroutine

All of the activities in the MAM are directed by the MAC subroutine, the driver subroutine. In addition to making calls on the remaining eight subroutines in the MAM, the MAC subroutine has two tasks of its own. It writes the MC_ENERGY output[1] spreadsheet of the NEMS energy prices and quantities that are the exogenous assumptions to the models in the MAM. This spreadsheet includes aggregates and components used to compute the assumptions. The values of the NEMS energy prices and quantities contained in the spreadsheet are read from the global data structure. All prices in the spreadsheet are reported in 2000 dollars. The second task done by the MAC subroutine is supplying the remaining modules and the report writer of the NEMS with the MAM results by writing model forecasts to the global data structure. Once this is complete, the MAC subroutine returns program control to the NEMS.

### READMAC Subroutine

As mentioned, the MAC subroutine is the driver and calls all the remaining subroutines in the MAM. The first subroutine called is named READMAC. This subroutine is called just once per run in the first iteration of the first year of a NEMS run. The READMAC subroutine opens and reads the contents of one input file. This is an input text file of the MAM parameter settings named MCPARMS (Table B2).

### DRTLINK Subroutine

The second subroutine called by the MAC is named DRTLINK. This subroutine is responsible for executing the suite of Global Insight's national and EIA's regional models. Like the READMAC subroutine, the DRTLINK subroutine executes only in the first iteration of the first year of a NEMS run. To execute though, the DRTLINK subroutine has an additional condition to satisfy. There are instances when the modeler does not want the forecast of the other NEMS modules affected by a change from the MAM's reference values. The presence of feedback is controlled with the NEMS parameter MACFDBK. When the feedback switch is set to zero, the

[1] Files that are "output" files reside in the NEMS simulation output directory. The NEMS directory names begin with the character "d" which is followed by a date key and a letter identifying the particular run done that day. Files that are "input" files reside within the input subdirectory of the NEMS output directory.

DRTLINK subroutine is not called. The value of the MACFDBK parameter is set in the NEMS scenario descriptor file (Table B2).

Much of what the DRTLINK subroutine does is preparation for executing the suite of Global Insight's national and EIA's regional models within Quantitative Micro Software's EViews software. The subroutine begins by computing exogenous assumptions using the NEMS energy prices and quantities read from the global data structure (Table B3). It then builds an EViews output program file called DRIVERS. The DRIVERS program file contains instructions written in the EViews programming language. The commands in this program file import exogenous assumptions, temporarily alter model structure, simulate Global Insight's and EIA's models and export forecast results. Program control is temporarily transferred to EViews as it executes the commands in the DRIVERS program file. The resulting model forecasts are written to the following six output spreadsheets:

1. EPMAC.WK1 – level of national level economic activity, industrial output and employment
2. MC_COMMFLR.WK1 – level of commercial floorspace by Census Division (Table B11)
3. MC_REGEMP.WK1 – level of employment by Census Division (Table B12)
4. MC_REGIO.WK1 – level of industrial output by Census Division (Table B13)
5. MC_REGMAC.WK1 – level of economic activity by Census Division (Table B10)
6. MC_VEHICLES.WK1 – national level of light truck sales by sales class (Table B8)

Once EViews completes execution of the DRIVERS program, control is returned to the DRTLINK subroutine. The DRTLINK subroutine reads the forecasts contained in each of the above spreadsheets. The forecasted values stored in the above output spreadsheet are in levels. Control is then returned to the MAC subroutine. The MAC subroutine then calls its third subroutine, INDUSTSUB.

**INDUSTSUB Subroutine**

The INDUSTSUB subroutine operates in a manner similar to that described for the MAC subroutine. Forecasted levels coming from Global Insight's model of industrial output are stored in the EPMAC spreadsheet. The resulting forecast covers thirty-five categories of industrial output and ten categories of services. The forecast is written to the MC_INDUSTRIAL spreadsheet (Table B8).

Five energy industries in the MAM are overwritten by calculated output based on the NEMS activity. These are:

1. Petroleum refining
2. Coal mining
3. Oil and gas extraction
4. Electric utilities and
5. Gas utilities

The MAM computes annual growth rates from the NEMS forecast of energy sector outputs (Table B6). Each of the growth rates is dynamically applied beginning with an initial historical value. The resulting time series becomes the industrial output forecast for the five energy industries.

**REGIONSUB Subroutine**

The REGIONSUB subroutine is the fourth subroutine called by the MAC subroutine. Because of the introduction to the MAM of EIA's regional models, the role of this subroutine has been greatly reduced. In past Annual Energy Outlooks (AEO), the REGIONSUB subroutine would share the national forecast out to the nine Census Divisions. Now, the REGIONSUB subroutine copies and aggregates EIA's regional model forecasts for export to the global data structure and for writes to the MC_REGIONAL spreadsheet (Table 11).

**EMPLOYMENT Subroutine**

The fifth subroutine called by the MAC subroutine is named EMPLOYMENT. This subroutine works just like the INDUSTSUB subroutine. Forecasted levels coming from Global Insight's model of employment by industry are written to the EPMAC output spreadsheet. The resulting forecast is for thirty-five categories of industrial and ten categories of service employment.

The NEMS supplies the forecast of employment for two of the five energy-related industries. These two industries are coal mining and oil and gas extraction. Their forecast is done just as it was for the energy-related industries in the model of industrial output. The NEMS supplies the forecasts, and the MAM computes annual growth rates that are dynamically applied beginning with an initial historical value for the respective variable. Employment forecasts for the three remaining energy industries are computed like those for all the other employment variables. Since the model of industrial output executes before the model of employment, the employment results for the remaining three energy sectors are affected by the NEMS industrial forecast. The five NEMS energy industries are:

1. Petroleum refining
2. Coal mining
3. Oil and gas extraction

4. Electric utilities and
5. Gas utilities

**COMFLR Subroutine**

The COMFLR subroutine is the sixth subroutine called by the MAC subroutine. This subroutine use to contain a model of commercial floorspace written in FORTRAN. The model has since been moved to EViews. As a result, the role of this subroutine has been greatly reduced. The COMFLR subroutine copies and aggregates the EViews model forecast in preparation for writes to the global data structure and to the MC_REGIONAL spreadsheet (Table B9).

**TRANC Subroutine**

The TRANC subroutine is the seventh subroutine called by the MAC subroutine. This subroutine copies light truck unit sales forecast in preparation for writes to the global data structure. Equations added to Global Insight's model of the U.S. economy share out total light truck sales by size class. Light trucks are vehicles with gross vehicle weight ratings of 14,000 pounds and less. Light truck sales are divided into the following size classes:

1. Unit Sales of Class 1 Light Trucks, 0 to 6000 lbs.
2. Unit Sales of Class 2 Light Trucks, 6001 to 10,000 lbs.
3. Unit Sales of Class 2a Light Trucks, 6001 to 8,500 lbs.
4. Unit Sales of Class 2b Light Trucks, 8,501 to 10,000 lbs.
5. Unit Sales of Class 3 Light Trucks, 10,001 to 14,000 lbs.

All unit sales of light trucks are measured in thousands of vehicles.

**MACOUTPUT Subroutine**

Once the TRANC subroutine has finished, program control is returned to the MAC subroutine. The MAC subroutine writes all of the MAM forecasts to the global data structure. That allows the other modules in the NEMS to use the forecasts including the report writer. The MAC subroutine then calls the final MAM subroutine, MACOUTPUT. The MACOUTPUT subroutine writes five output spreadsheets that record the activities of the MAM for a NEMS run. The five output spreadsheets are:

1. MC_COMMON - Contains forecast values of variables written to the global data structure from Global Insight's U.S. and EIA's regional models. These include forecasts of economic activity, industrial output, employment by industry and stocks of commercial floorspace. Table B14 indicates the MAM variables used by other NEMS Modules.

2. MC_NATIONAL - Contains the forecast of macroeconomic variables. The forecast is done using Global Insight's model of the U.S. economy. Table B5 lists the contents of the

MC_NATIONAL spreadsheet.

3. MC_INDUSTRIAL - Contains the forecast of industrial output for thirty-five manufacturing industries at the Census Division level as well as for the U.S. There is a U.S. forecast for the ten services. Table B8 lists the contents of the MC_INDUSTRIAL spreadsheet.

4. MC_EMPLOYMENT - Contains the forecasted employment values of the forty-five manufacturing and service industries. The forecast is done using the Employment Model. Table B7 lists the contents of the MC_EMPLOYMENT spreadsheet.

5. MC_REGIONAL - Contains the forecasted values of the regional variables by Census Division as well as for the U.S. EIA's regional models of economic activity, industrial output and employment by industry do the regional forecast. Table B9 lists the contents of the MC_REGIONAL spreadsheet.

Once the last spreadsheet is written, program control is returned to the MAC subroutine, which in turn returns program control to the NEMS.

**Figure 8. Flow of Control within MAM**

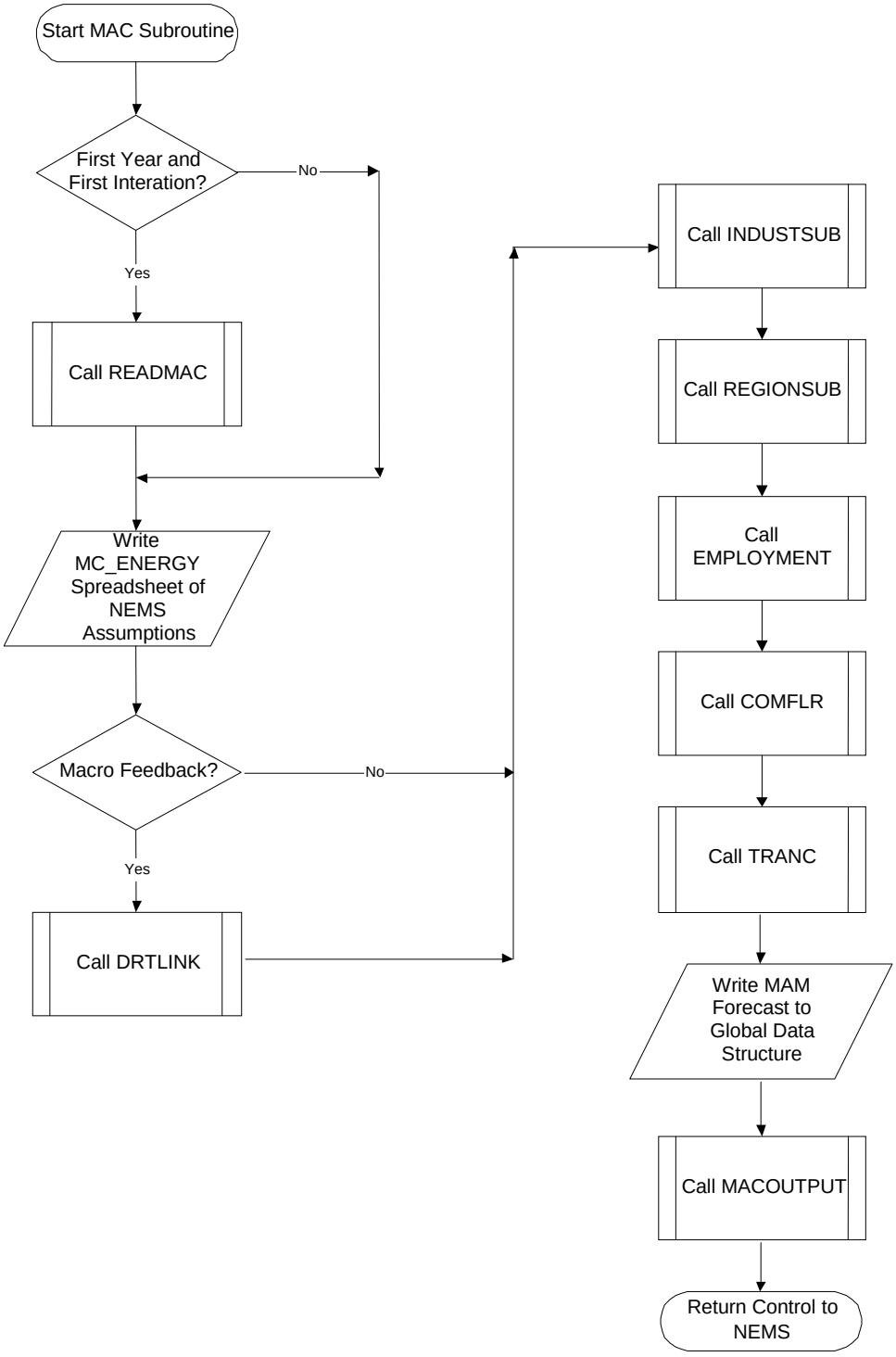


**Figure 9. Subroutine READMAC**

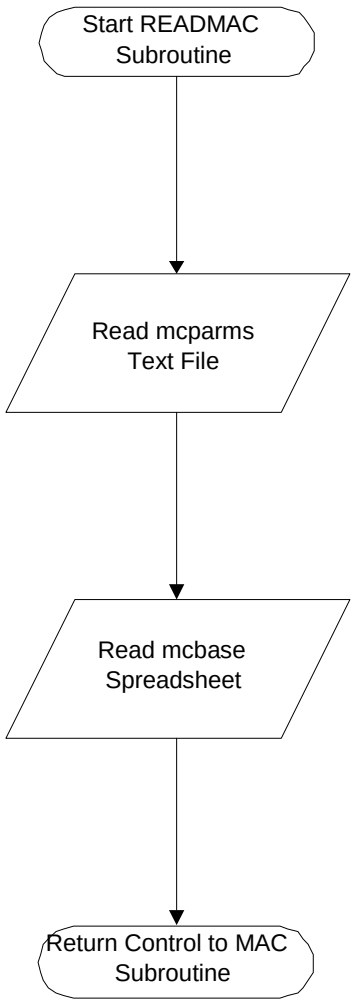


**Figure 10. Subroutine DRTLINK**

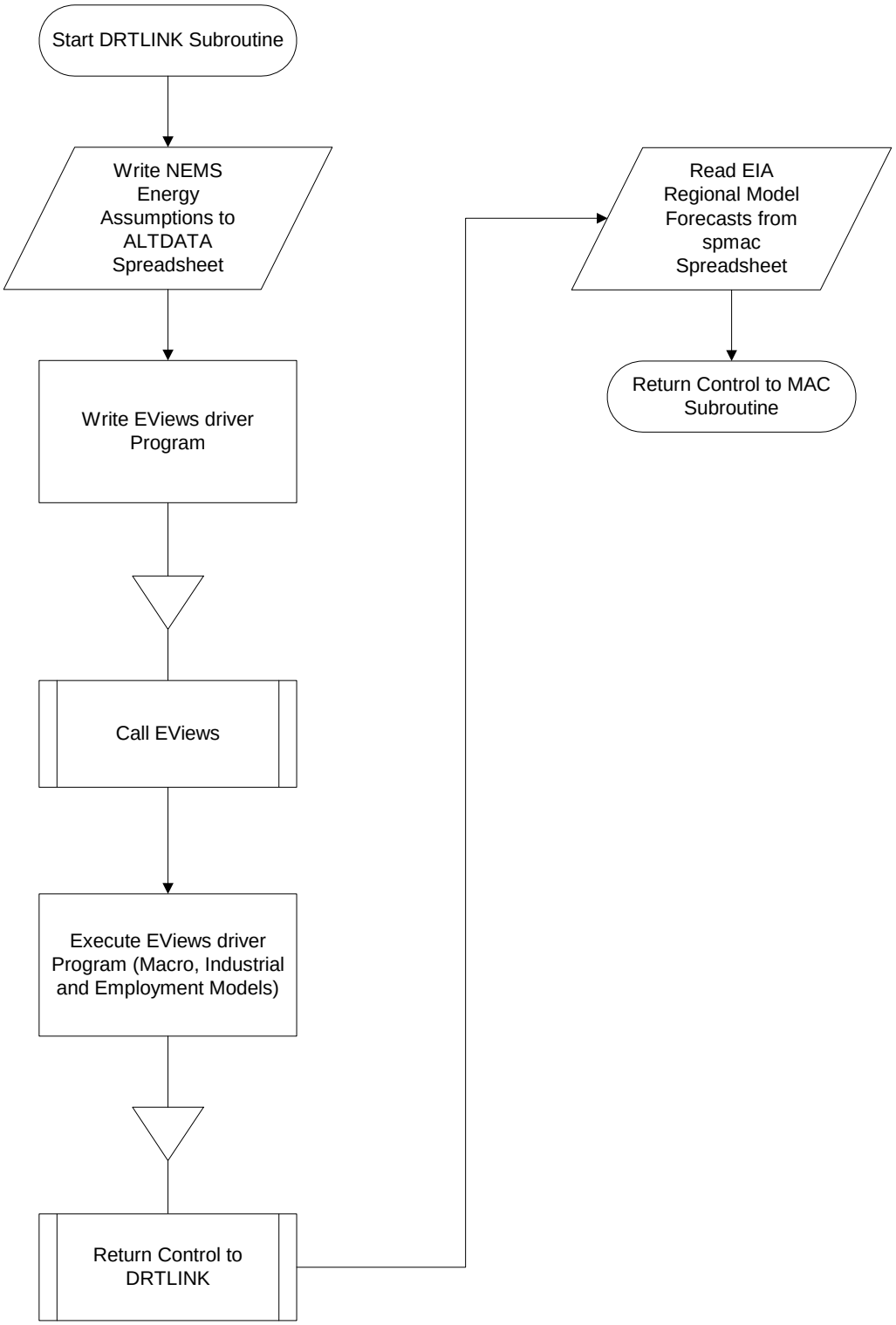


**Figure 11. Subroutine INDUSTSUB**

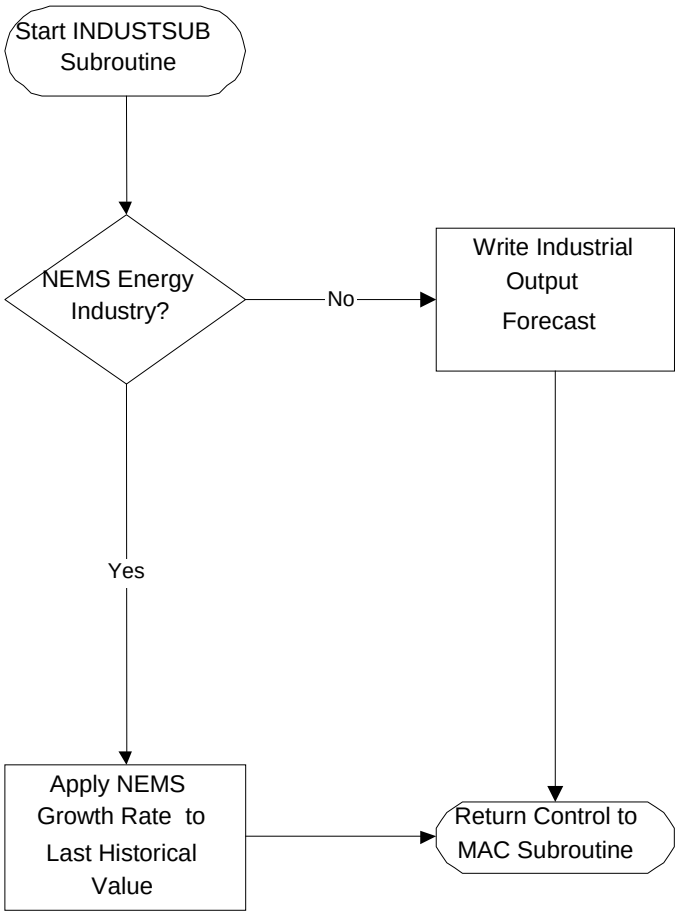


**Figure 12. Subroutine REGIONSUB**

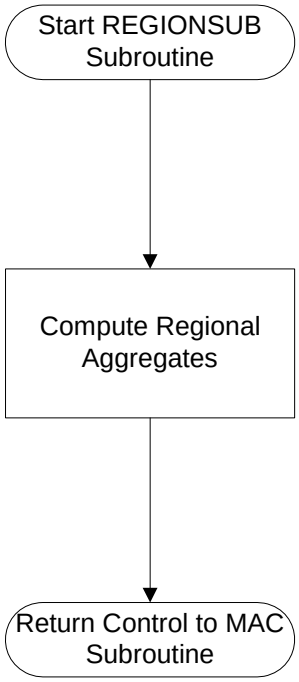


**Figure 13. Subroutine EMPLOYMENT**

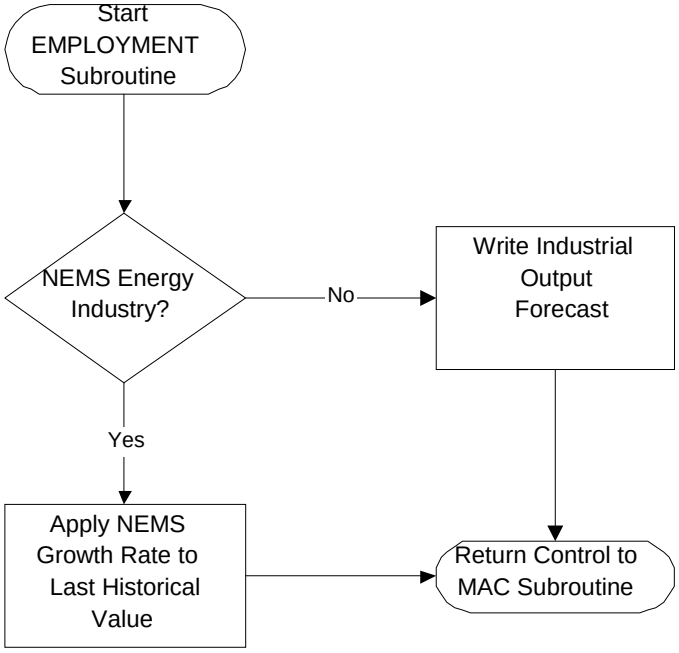


**Figure 14. Subroutine COMFLR**

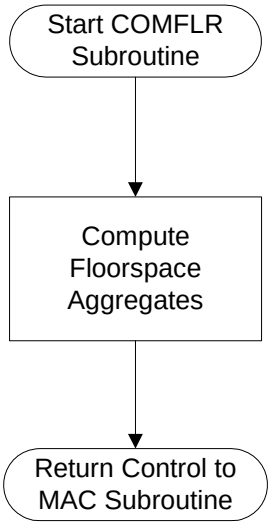


**Figure 15. Subroutine TRANC**

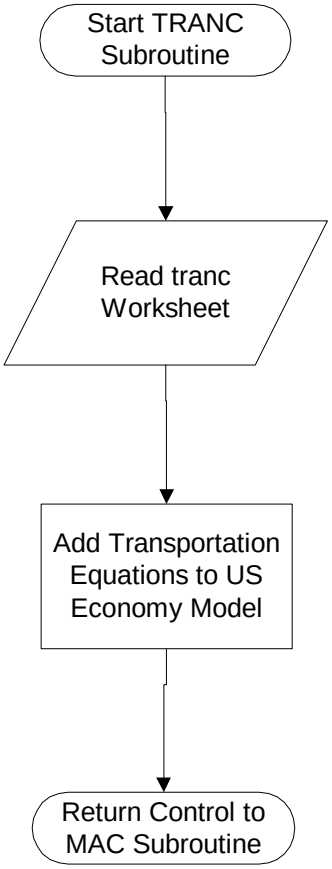
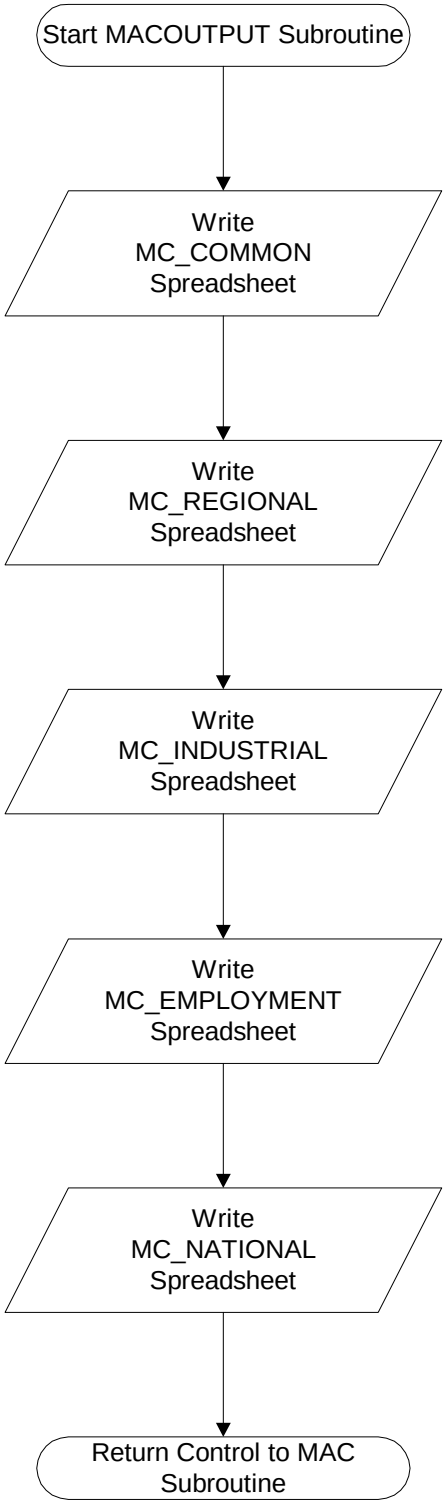


**Figure 16. Subroutine MACOUTPUT**



# Appendix A: VARIABLES AND CLASSIFICATIONS IN MAM MODELS

## Macroeconomic Model Detail

### Table A1. Real Personal Consumption Variables in the Global Insight Model of the U.S. Economy *

| | |
|---|---|
| Personal consumption expenditures | **CONSR** |
| Durables | **CDR** |
| Motor vehicles & parts | **CDMVR** |
| Light vehicles | CDMVLVR |
| Tires, tubes, accessories & parts | CDMVTTPR |
| Other motor vehicles & parts | CDMVOR |
| Used automobiles | CDMVPUNAR |
| Furniture and appliances | **CDFHER** |
| Computers and software | **CDFHEMAVCR** |
| Computers | CDFHEMAVCCPR |
| Software | CDFHEMAVCSWR |
| Furniture exc. computers & software | CDFHEXCASR |
| Other durable goods | **CDOR** |
| Medical devises | CDOOAOR |
| All other (1) | CDOOR |
| Nondurables | **CNR** |
| Food | **CNFR** |
| On-premise meals & beverages | CNFOUTR |
| Food for off-premise consumption | CNFHOMER |
| Food on farms, furnished free | CNFFREER |
| Clothing & shoes | CNCSR |
| Gasoline & motor oil | CNEGAOR |
| Fuel oil & coal | CNEFACR |
| Other nondurables | C**NOR** |
| Tobacco products | CNOTOBR |
| Prescription & over-the-counter drugs | CNODRUGR |
| All other (2) | CNOOR |
| Services | **CSVR** |
| Housing | CSVHSR |
| Household operation | **CSVHOPR** |
| Gas | CSVHOPGR |
| Electricity | CSVHOPER |
| Telephony | CSVHOPTR |
| Water & sewer | CSVHOPWASR |
| Domestic service | CSVHOPDOMR |
| Other household operation (3) | CSVHOPMSCR |

| | |
|---|---|
| Transportation | **CSVTSR** |
| Motor vehicle leases | CSVTSURPLLSR |
| Other user-operated transportation | CSVTSUOXLSER |
| Purchased local transportation | CSVTSPLR |
| Purchased intercity transportation | CSVTSPICR |
| Medical Care | CSVMR |
| Recreation | CSVRECR |
| Personal business services | **CSVOPBR** |
| Financial services furnished free | CSVOPBFREER |
| Other personal business services | CSVOPXBFREER |
| Other services (4) | CSVOOR |

* Variables denoted in bold are defined by identities.

(1) sports equipment, jewelry, boats, books, etc.
(2) toilet articles, semidurable house furnishings, cleaning stuff, toys, magazines, flowers, net foreign remittances, etc.
(3) insurance, postage, etc.
(4) education, personal care, net foreign travel, etc.

## Table A2. Real Business Investment Variables in the Global Insight Model of the U.S. Economy *

| | |
|---|---|
| Real private fixed nonresidential investment | **IFNRER** |
| Investment in nonresidential equipment and software | **IFNREER** |
| Information equipment | **IFNREEIPR** |
| Computer equipment | IFNREEIPCCR |
| Software | IFNREEIPCSR |
| Communications equipment | IFNREEIPCTR |
| Other information equipment (1) | IFNREEIPOR |
| Industrial equipment | IFNREEINDR |
| Transportation equipment | **IFNREETR** |
| Light vehicles | IFNREETLVR |
| Aircraft | IFNREETACR |
| Other transportation equipment (2) | IFNREETOR |
| Other equipment (3) | IFNREEOR |
| Investment in nonresidential structures | **IFNRESR** |
| Structures excluding public utility & mines | **IFNRESBAOR** |
| Nonfarm buildings | **IFNRESXFR** |
| Industrial | IFNRESMFGR |
| Commercial | IFNRESCMLR |
| Other nonfarm buildings (4) | IFNRESBOTHR |
| Other buildings (5) | IFNRESOTHR |
| Mines & wells | IFNRESMIR |
| Public utilities | **IFNRESPUR** |
| Public utilities exc. communications | IFNRESPUOR |
| Communications infrastructure | IFNRESPCR |
| Inventory investment (change in real stock of inventories) | **IIR** |
| Nonfarm inventories | **IINFR** |
| Manufacturing | IIMR |
| Wholesale trade | IIWR |
| Retail trade | **IIRTR** |
| Motor vehicles | IIRT441R |
| All other | IIRTX441R |
| Miscellaneous | **IIMISCR** |
| Construction, mining & utilities | IICMIUR |
| Other business | IIOR |
| Farm inventories | IIFR |

* Variables denoted in bold are defined by identities.

(1) copiers, instruments, office & accounting equipment
(2) buses, railroad equipment, ships
(3) furniture, farm equipment, electrical equipment, service industry machinery less sale of used stuff other than vehicles
(4) religious, educational, medical
(5) farm, brokers' commissions

## Table A3. Real Residential Investment Variables in the Global Insight Model of the U.S. Economy *

| | |
|---|---|
| Housing starts including mobile homes | **HUS** |
| Housing starts | **HUSPS** |
| Single-family starts | HUSPS1 |
| Multi-family starts | HUSPS2A |
| Mobile home shipments | HUSMFG |
| Housing sales | |
| New single-family homes sales | HU1NSOLD |
| New single-family homes for sale | HU1NFSALE |
| Sales of existing single-family home | HU1ESOLD |
| | |
| Real private fixed residential investment | **IFRER** |
| Structures | **IFRESR** |
| Permanent site structures | **IFRESPER** |
| Single family houses | IFRESPESFR |
| Multi-family structures | IFRESPEMFR |
| Other residential structures | **IPRESOR** |
| Manufactured homes | IFRESOMFGR |
| Improvements | IFRESOIMPR |
| Other structures | ICRESOOR |
| | |
| Equipment | IFREER |
| | |
| Nominal Costs of housing | |
| Average price of existing single-family homes | PHU1EAVGNS |
| Average price of constant-quality new home | PHU1NAVG96NS |
| Average price of new single-family homes | PHU1NAVGNS |
| Median price of new single-family homes | PHU1NMEDNS |
| 30-year fixed mortgage rate | RMMTG30CON |

* Variables denoted in bold are defined by identities.

## Table A4. Key Federal Government Expenditure Variables in the Global Insight Model of the U.S. Economy *

| | |
|---|---|
| Federal purchases of goods & services (real) | **GFR** |
| Defense | **GFMLR** |
| Consumption | **GFMLCR** |
| Personnel outlays | *GFMLWSSR* |
| Consumption of fixed capital | GFMLKFR |
| Other | *GFMLCOR* |
| Gross investment | *GFMLGIR* |
| Nondefense | **GFOR** |
| Consumption | **GFOCR** |
| Personnel outlays | *GFOWSSR* |
| Consumption of fixed capital | GFOCKFR |
| CCC inventory change | *GFOCINTNCCR* |
| Other | *GFOCOR* |
| Gross investment | *GFOGIR* |
| Interest, dividends, transfer payments, subsidies and accruals: | |
| Federal net interest payments | INTNETGF |
| Federal transfer payments | **TRFGF** |
| Transfers to resident persons | **YPTRFGF** |
| Non-cyclical component | **YPTRFGFFE** |
| Medicare payments | *YPTRFGFSIHI* |
| Social security payments | YPTRFGFSISS |
| Other | YPTRFGFFEO |
| Cyclical component | YPTRFGFO |
| Federal social benefits to rest of the world | *TRFGFSIRW* |
| Other federal transfer payments | **TRFGFO** |
| Grants-in-aid to state & local governments | **GFAIDSL** |
| Medicaid grants | **GFAIDSLSSMED** |
| Other | **GFAIDSLO** |
| Transfers to rest of the world | *TRFGFORW* |
| Subsidies | **SUBGF** |
| Agricultural programs | *SUBGFAG* |
| Housing subsidies | *SUBGFHSNG* |
| Other federal subsidies | *SUBGFOTH* |
| Wage accruals less disbursements (1) | *WALDGF* |

* Variables denoted in bold are defined by identities; variables denoted in italics are exogenous.

(1) Negative expenditure.

## Table A5. Key State & Local Government Expenditure Variables in the Global Insight Model of the U.S. Economy *

| | |
|---|---|
| State & local purchases of goods & services (real) | **GSLR** |
| Consumption | **GSLCR** |
| Personnel outlays | GSLCWSSR |
| Consumption of fixed capital | GSLCKFR |
| All else | GSLCOR |
| Gross investment | **GSLGIR** |
| Equipment | GSLGIER |
| Construction | GSLGISR |
| Interest, dividends, transfer payments, subsidies and accruals: | |
| Net interest payments | INTNETGSL |
| Transfers to individuals | **YPTRFGSL** |
| Medical | YPTRFGSLPAM |
| Non-medical | YPTRFGSLPAO |
| Subsidies less current surplus | *SUBLSURPGSL* |
| Wage accruals less disbursements (1) | *WALDGSL* |
| Dividends received | *YGSLADIV* |

* Variables denoted in bold are defined by identities; variables denoted in italics are exogenous.

(1) Negative expenditure.

## Table A6. Components of Nominal National Income in the Global Insight Model of the U.S. Economy *

GNP = YPCOMPWSD + TXIM + CKFCORP + CKFNCORP + CKFG + YRENTADJ + YPPROPADJNF + YPPROPADJF + ZB + INTNETBUS + YPCOMPSUPPAI + TXSIEC - SUBLSSURPG + TRFBUS + CKFADJCORP + IVACORP + WALD + STAT

| | |
|---|---|
| Gross National Product | **GNP** |
| Wage and salary disbursements | **YPCOMPWSD** |
| Private sector | YPCOMPWSDP |
| Government | YPCOMPWSDG |
| Excise tax receipts | **TXIM** |
| Federal | **TXIMGF** |
| State & local | **TXSIGSL** |
| Capital consumption allowances w/ adjustment | **CKF** |
| Private | **CKFP** |
| Corporate | CKFCORP |
| Non-corporate | CKFNCORP |
| Government | **CKFG** |
| Rental income | YRENTADJ |
| Proprietors' income | |
| Nonfarm | YPPROPADJNF |
| Farm | YPPROPADJF |
| Corporate Profits | **ZB** |
| Business interest payments | **INTNETBUS** |
| Other labor income | **YPCOMPSUPPAI** |
| Health insurance | YPCOMPSUPPAIHI |
| Other benefits | YPCOMPSUPPAIO |
| Employer-paid payroll taxes | **TXSIEC** |
| Federal | **TXSIECGF** |
| State & local | **TXSIECGSL** |
| Subsidies less current surplus | ***SUBLSSURPG*** |
| Federal enterprises | *SUBLSURPGF* |
| State & local government enterprises | *SUBLSURPGSL* |
| Transfer payments by business | TRFBUS |
| Adjustment for capital consumption allowance | CKFADJCORP |
| Corporate inventory valuation adjustment | IVACORP |
| Wage accruals less disbursements | ***WALD*** |
| Federal government | *WALDGF* |
| State & local government | *WALDGSL* |
| Private sector | *WALDPRI* |
| Statistical discrepancy | *STAT* |

* Variables denoted in bold are defined by identities; variables denoted in italics are exogenous.

## Table A7. Components of Nominal Personal Income in the Global Insight Model of the U.S. Economy *

YP = YCOMPWSD + YPCOMPSUPPAI + YPADIV + YPTRFGF + YPTRFGSL +YPAINT + YPTRFBUS + YPRENTADJ + YPPROPADJNF + YPPROPADJF - TXSIWC

| | |
|---|---|
| Personal income | **YP** |
| Wage and salary disbursements | **YPCOMPWSD** |
| Private sector | YPCOMPWSDP |
| Government | YPCOMPWSDG |
| Other labor income | **YPCOMPSUPPAI** |
| Health insurance | YPCOMPSUPPAIHI |
| Other benefits | YPCOMPSUPPAIO |
| Dividend payments to individuals | **YPADIV** |
| Transfer payments to residents | |
| Federal | **YPTRFGF** |
| Social Security | YPTRFGFSISS |
| Medicare | *YPTRFGFSIHI* |
| Other full-employment | YPTRFGFFEO |
| Remaining cyclical component | YPTRFGFO |
| State and Local | **YPTRFGSL** |
| Medical | YPTRFGSLPAM |
| All other | YPTRFGSLPAO |
| Personal interest income | YPAINT |
| Business transfers to individuals | YPTRFBUS |
| Rental income | YPRENTADJ |
| Proprietors' income | |
| Nonfarm | YPPROPADJNF |
| Farm | YPPROPADJF |
| Social insurance tax receipts from individuals | **TXSIWC** |

* Variables denoted in bold are defined by identities.

## Table A8. Key Variables in the Tax Sector of the Global Insight Model of the U.S. Economy *

| | |
|---|---|
| Federal tax receipts | **TXGF** |
| Personal | **TXPGF** |
| Corporate | **TXCORPGF** |
| Production and imports | **TXIMGF** |
| VAT | **TXIMGFVAT** |
| Other | TXIMGFOTH |
| From rest of the world | *TXRWGF* |
| | |
| State & local tax receipts | **TXGSL** |
| Personal | **TXPGSL** |
| Corporate | **TXCORPGSL** |
| Excise | TXIMGSL |
| | |
| Social insurance tax receipts | |
| Federal payroll | **TXSIGF** |
| State and local payroll | **TXSIGSL** |
| | |
| Federal average tax rates | |
| Personal | |
| Effective | RTXPGF |
| Marginal | *RTXPMARGF* |
| Corporate | |
| Statutory rate | *RTXCGFS* |
| Investment tax credits (marginal rates) | *RITC.* |
| Payroll | *RTXSIGF* |
| | |
| State & local average tax rates | |
| Personal | RTXPGSL |
| Corporate | *RTXCGSL* |
| Payroll | *RTXSIGSL* |

* Variables denoted in bold are defined by identities; variables denoted in italics are exogenous.

## Table A9. Key Variables in the Trade Sector of the Global Insight Model of the U.S. Economy *

| | |
|---|---|
| Real Exports | |
| Goods | **XGR** |
| Foods, feeds and beverages | XGFFBR |
| Industrial materials and supplies | XGINR |
| Capital goods except motor vehicles | **XGKR** |
| Aircraft | XGKCAEPR |
| Computer equipment | XGKCPPR |
| Other capital equipment | XGKOR |
| Motor vehicles & parts | XGAUTOR |
| Consumer goods except motor vehicles | XGCR |
| Miscellaneous goods | XGOR |
| Services | **XSVTOTR** |
| Travel | XSVTOUR |
| Other | XSVXTOUR |
| Real Imports | |
| Goods | **MGR** |
| Foods, feeds and beverages | MGFFBR |
| Industrial materials and supplies | **MGINAPETR** |
| Petroleum and products | MGPETR |
| Other | MGINR |
| Capital goods except motor vehicles | **MGKR** |
| Aircraft | MGKCAEPR |
| Computer equipment | MGKCPPR |
| Other capital equipment | MGKOR |
| Motor vehicles & parts | MGAUTOR |
| Consumer goods except motor vehicles | MGCR |
| Miscellaneous goods | MGOR |
| Services | **MSVTOTR** |
| Travel | MSVTOUR |
| Other | MSVXTOUR |
| Trade-weighted exchange rates | |
| With major trading partners | JEXCHMTP |
| With other important trading partners | JEXCHOITP |
| Prices | |
| Industrial countries | WPIWMTP |
| Developing countries | WPIWOITP |
| Lever controlling relative price impacts | *TRADEPLEV* |
| Lever controlling US price feedthroughs | *WPIWLEV* |
| Output | |
| Real trade-weighted GDP in other industrial countries | J*GDPMTPR* |
| Real trade-weighted GDP in developing countries | J*GDPOITPR* |
| Long-term government bond yield – major trading partners | *RMGBLMTP* |

* Variables denoted in bold are defined by identities; variables denoted in italics are exogenous.

## Table A10. Key Variables in the Financial Sector of the Global Insight Model of the U.S. Economy *

| | |
|---|---|
| Interest rates | |
| Federal funds rate | **RMFF** |
| Supply of reserve as instrument | RMFFRES |
| Reaction function as instrument | RMFFRCT |
| Treasury yield | |
| 3-month bill rate | RMTB3M |
| 6-month bill rate | RMTB6M |
| 1-year note yield | RMTCM1Y |
| 2-year note yield | RMTCM2Y |
| 5-year note yield | RMTCM5Y |
| 10-year note yield | RMTCM10Y |
| Long-term bond yield | RMTCM25AY |
| Other | |
| Prime rate | RMPRIME |
| 3-month CDs, secondary market | RMCD3SEC |
| 3-month commercial paper | RMCMLP3M |
| 3-month Eurodollar deposits | RMEUROD3M |
| Rate on commercial bank loans for new light vehicles | RMCBLV |
| New York Fed discount rate | RMDWPRIME |
| $11^{th}$ district cost of funds | RMCOF11D |
| 30-year mortgage rate | RMMTG30CON |
| Rate on existing-home mortgages | RMMTGEXIST |
| Yield on Aaa corporate bonds | RMCORPAAA |
| Yield on Baa corporate bonds | RMCORPBAA |
| Rate on Aa-rated public utility bonds | RMCORPUAA |
| Rate on Aaa-rated municipal bonds | RMMUNIAAA |
| Municipal bond buyer 20-bond index | RMMUNIBB20 |
| Other Financial Variables | |
| M1 money supply | **M1** |
| Currency and travelers' checks | M1CURATC |
| Checkable deposits | M1DCHK |
| M2 money supply | M2 |
| M3 money supply | M3 |
| Household net worth | **HHNETW** |
| Real estate & other nonfinancial assets | HHAO |
| Financial assets | **HHAF** |
| Equities | HHAFEQ |
| Money | HHAFM |
| Other | HHAFO |
| Household liabilities | HHLB |
| Home mortgages outstanding | MTGHO |
| Non-mortgage consumer credit | LCNMTGO |
| Business loans at commercial banks | LCBCAI |
| S&P 500 stock index | SP500 |
| Wilshire 5000 stock index | WL5000 |

* Variables denoted in bold are defined by identities; variables denoted in italics are exogenous.

# Industry and Employment Model Detail

## Table A11. Macroeconomic Expenditure Categories Driving the Industry Model

**Personal Consumption Expenditures**

| | |
|---|---|
| CDFHEMAVC | Consumer spending on computers & software |
| CDFHER | Real consumer spending on furniture and appliances |
| CDMVLVR | Real consumer spending on light vehicles |
| CDMVTTPR | Real consumer spending on tires |
| CDOR | Real consumer spending on other durables plus medical devices |
| CNCSR | Real consumer spending on clothing & shoes |
| CNEFACR | Real consumer spending on fuel oil & coal |
| CNEGAOR | Real consumer spending on gasoline & motor oil |
| CNFHOMER | Real consumer spending on food for off-premise consumption |
| CNFOUTR | Real consumer on-premise spending on meals and beverages |
| CNODRUGR | Real consumer spending on prescription & over-the-counter drugs |
| CNOTOBR | Real consumer spending on tobacco products |
| CNOR | Real consumer spending on other nondurable goods |
| CSVHOPUR | Real consumer spending on household operation, utilities |
| CSVHOPER | Real consumer spending on electricity |
| CSVHOPGR | Real consumer spending on natural gas |
| CSVHOPWASR | Real consumer spending on water & sewer service |
| CSVHOPTR | Real consumer spending on telephony |
| CSVHOPXUR | Real consumer spending on household operation, other than utilities |
| CSVHOPDOMR | Real consumer spending on domestic service |
| CSVHOPMSCR | Real consumer spending on other household operations |
| CSVHSR | Real consumer spending on housing |
| CSVMR | Real consumer spending on medical services |
| CSVOPBR | Real consumer spending on personal business services |
| CSVRECR | Real consumer spending on recreation services |
| CSVTSPICR | Real consumer spending on intercity transportation |
| CSVTSXPICR | Real consumer spending on transportation other than intercity |
| CSVTSPLR | Real consumer spending on purchased local transportation |
| CSVTSUOXLSER | Real consumer spending on other user-operated transportation |
| CSVTSURPLLSR | Real consumer spending on motor vehicle leases |
| CSVOOR | Real consumer spending on other services |

**Investment and Inventories**

| | |
|---|---|
| IFMVNATLR | Real gross investment purchases of light vehicles |
| IFNREEINDR | Real gross nonresidential investment in industrial equipment |
| IFNREEIPCC | Gross nonresidential investment in computer equipment |
| IFNREEIPCSR | Real gross nonresidential investment in software |
| IFNREEIPCTR | Real gross nonresidential investment in communications equipment |

| | |
|---|---|
| IFNREEIPOR | Real gross nonresidential investment in other information processing equipment |

**Investment and Inventories continued**

| | |
|---|---|
| IFNREETACR | Real gross nonresidential investment in aircraft |
| IFNREETOR | Real gross nonresidential investment in other transportation equipment |
| IFNREEOR | Real gross nonresidential investment in other equipment |
| IFSR | Real gross investment in all structures |
| IIR | Real change in stock of business inventories |

**Government Spending**

| | |
|---|---|
| GFMLGIR | Real federal defense gross investment |
| GFMLR | Real federal defense purchases of goods & services |
| GFOGIR | Real federal non-defense gross investment |
| GFOR | Real federal non-defense purchases of goods & services |
| GSLGIR | Real state & local gross investment |
| GSLR | Real state & local purchases of goods & services |

**Exports**

| | |
|---|---|
| XGAUTOR | Real exports of motor vehicles & parts |
| XGCR | Real exports of non-automotive consumer goods |
| XGFFBR | Real exports of foods, feeds & beverages |
| XGINR | Real exports of industrial materials & supplies |
| XGKCAEPR | Real exports of aircraft |
| XGKCPPR | Real exports of computer equipment |
| XGKOR | Real exports of other capital equipment |
| XGOR | Real exports of other goods |
| XSVTOTR | Real exports of services |

**Imports**

| | |
|---|---|
| MGAUTOR | Real imports of motor vehicles & parts |
| MGCR | Real imports of non-automotive consumer goods |
| MGFFBR | Real imports of foods, feeds & beverages |
| MGINR | Real imports of industrial supplies excl. petroleum |
| MGKCAEPR | Real imports of aircraft |
| MGKCPPR | Real imports of computer equipment |
| MGKOR | Real imports of other capital equipment |
| MGPETR | Real imports of petroleum & products |
| MGOR | Real imports of other goods |
| MSVTOTR | Real imports of services |

## Table A12. Detailed Sectoral Classification for Industry and Employment Models

In the Global Insight (GI) model, output value series has "R" as prefix, and real value series has "R" as suffix (e.g. R111R); employment series has "E" as prefix (e.g. E111). The MAM variable names for output values are prefixed with REV (e.g. REVIND1) and those for employment are prefixed with EMP (e.g. EMPIND1). They are placed into three NEMS variables - MC_REVIND (output of industrial sectors), MC_REVSER (output of services sectors) and MC_EMPNA (employment).

| GI Code | Description | NAICS (1997) codes | NEMS Sector |
|---|---|---|---|
| **Nonmanufacturing Industries** | | | |
| **Agriculture, Forestry, Fishing & Hunting** | | | |
| 111 | Crop Production | 111 | IND30 |
| 112 | Animal Production | 112 | IND31 |
| 113 | Forestry & Logging | 113 | IND31 |
| 11O | Agriculture, Other | 114, 115 | IND31 |
| **Mining** | | | |
| 211 | Oil & Gas Extraction | 211 | IND33 |
| 2121 | Coal Mining | 2121 | IND32 |
| 2122 | Metal Ore Mining | 2122 | IND34 |
| 2123 | Nonmetallic Mineral Mining | 2123 | IND34 |
| 213 | Support Activities For Mining | 213 | IND33 |
| **Construction** | | | |
| 23 | Construction | 23 | IND35 |
| **Manufacturing Industries** | | | |
| 311 | Food Products | 311 | IND1 |
| 312 | Beverage and Tobacco Products | 312 | IND2 |
| 313 | Textile Mills | 313 | IND3 |
| 314 | Textile Products | 314 | IND3 |
| 315 | Apparel | 315 | IND4 |
| 316 | Leather and Allied Products | 316 | IND17 |
| 321 | Wood Products | 321 | IND5 |
| 3221 | Pulp, Paper, and Paperboard Mills | 3221 | IND7 |
| 32221 | Paperboard Container Manufacturing | 32221 | IND7 |
| 322O | Other Paper Manufacturing | 32222 - 32229 | IND7 |
| 323 | Printing | 323 | IND8 |
| 32411 | Petroleum Refineries | 32411 | IND14 |
| 324O | Other Petroleum and Coal Products Manufacturing | 32412, 32419 | IND15 |
| 32511A9 | Basic Organic Chemicals | 32511, 32519 | IND10 |

| GI Code | Description | NAICS (1997) codes | NEMS Sector |
|---|---|---|---|
| **Manufacturing Industries continued** | | | |
| 32512T8 | Basic Inorganic Chemicals | 32512 - 32518 | IND9 |
| 3252 | Resins, Synthetic Rubber and Synthetic Fibers | 3252 | IND11 |
| 3253 | Pesticide, Fertilizer and Other Agricultural Chemicals | 3253 | IND12 |
| 3254T9 | Other Chemical Products | 3254 - 3259 | IND13 |
| 326 | Plastics and Rubber Products | 326 | IND16 |
| 3272 | Glass and Glass Products | 3272 | IND18 |
| 32731 | Cement | 32731 | IND19 |
| 327O | Other Nonmetallic Mineral Products | 3271, 32732 - 32739, 3274, 3279 | IND20 |
| 3311A2 | Iron and Steel Mills and Ferroalloy and Steel Products | 3311, 3312 | IND21 |
| 3313 | Alumina and Aluminum Products | 3313 | IND22 |
| 3314A5X1 | Other Primary Metals | 3314, 33152 | IND23 |
| 33151 | Ferrous Metal Foundries | 33151 | IND23 |
| 332 | Fabricated Metal Products | 332 | IND24 |
| 333 | Machinery | 333 | IND25 |
| 3341 | Computer and Peripheral Equipment | 3341 | IND26 |
| 334413 | Semiconductor and Related Devices | 334413 | IND26 |
| 334511 | Search and Navigation Instrument Manufacturing | 334511 | IND26 |
| 3345X11 | Electromedical, Measuring, and Control Instruments | 3345 less 334511 | IND26 |
| 334A5O | Other Electronic and Electrical Equipment, Appliance and Components | 3342 - 3344, 3346 | IND26 |
| 335 | Electric Equipment and Appliances | 335 | IND28 |
| 336 | Transportation Equipment | 336 | IND27 |
| 337 | Furniture and Related Products | 337 | IND6 |
| 339 | Miscellaneous Durable Products | 339 | IND29 |
| **Services** | | | |
| **Utilities** | | | |
| 2211 | Power Generation & Supply | 2211 | SER3 |
| 2212 | Natural Gas Distribution | 2212 | SER4 |
| 2213 | Water, Sewage & Related Systems | 2213 | SER5 |
| **Wholesale and Retail Trade** | | | |
| 42 | Sales: Wholesale Trade, (Includes Cost of Goods Sold) | 42 | SER6 |
| 44A5 | Total Retail Trade, (Includes Cost of Goods Sold) | 44, 45 | SER7 |
| **Transportation** | | | |
| 48A9 | Transportation and Warehousing | 48, 49 | SER1 |

| GI Code | Description | NAICS (1997) codes | NEMS Sector |
|---|---|---|---|
| **Other services** | | | |
| 5111 | Newspaper, book, and directory publishers | 5111 | SER9 |
| 5133 | Telecommunications | 5133 | SER2 |
| 513X33 | Radio and Television Broadcasting & Cable Networks | 513 less 5133 | SER2 |
| 52 | Finance and Insurance | 52 | SER8 |
| 53 | Real Estate and Rental And Leasing | 53 | SER8 |
| SERV | Other private services | 5112, 512, 514, 54 - 81 | SER9 |
| 921 | Federal Government | 921 | SER10 |
| 922A3 | State & Local Government | 922, 923 | SER10 |

**Notes:**

1. Employment code E11O covers both animal production and "other" (NAICS 112, 114 and 115).
2. The Employment Model adopts the forecasts series for federal government employees (EG91) and for state and local government employees (EGSL) from the U.S. Macroeconomic Model. The corresponding NEMS code is SER10 and SER11.

# Regional Model Detail

## Table A13. Economic Variables in the Regional Model

| Name | Description |
|---|---|
| CPI | Consumer Price Index, All Urban, 1982-84 = 1.0 |
| GSPR | Real Gross State Product, billions of chained 2000 dollars |
| RWM | Average Annual Manufacturing Wages, thousands of nominal $ |
| RWNM | Average Annual Non-Manufacturing Wages, thousands of nominal $ |
| YP | Personal Income, billions of nominal dollars |
| YPCOMPWSD | Wage & Salary Disbursements, billions of nominal dollars |
| YPCOMPWSDG | Wage & Salary Disbursements, Government, billions of nominal $ |
| YPCOMPWSDP | Wage & Salary Disbursements, Private, billions of nominal dollars |
| YPD | Personal Disposable Income, billions of dollars |
| YPDR | Real Disposable Personal Income, billions of chained 2000 dollars |
| YPDRZNP | Real per Capita Personal Disposable Income, billions of 2000 dollars |
| YPOTH | Other Personal Income, billions of dollars |
| NP | Total Population, Including Armed Forces Overseas, millions |
| HUSPS1 | Single-Family Housing Starts, millions of units |
| HUSPS2A | Multi-Family Housing Starts, millions of units |
| HUSMFG | Shipments of Mobile Homes, millions of units |
| KHUPS1 | Stock of Single-Family Housing, millions of units |
| KHUPS2A | Stock of Multi-Family Housing, millions of units |
| KHUMFG | Stock of Mobile Homes, millions of units |

## Table A14. Output and Employment Detail in the Regional Model

| NEMS Sector | Description | NAICS (1997) codes |
|---|---|---|
| ***Manufacturing Industries:*** | | |
| IND1 | Food Products | 311 |
| IND2 | Beverage and Tobacco Products | 312 |
| IND3 | Textile Mills & Textile Products | 313, 314 |
| IND4 | Apparel | 315 |
| IND5 | Wood Products | 321 |
| IND6 | Furniture and Related Products | 337 |
| IND7 | Paper Products | 322 |
| IND8 | Printing | 323 |
| IND9 | Basic Inorganic Chemicals | 32511, 32519 |
| IND10 | Basic Organic Chemicals | 32512 - 32518 |
| IND11 | Plastic and Synthetic Rubber Materials | 3252 |
| IND12 | Agricultural Chemicals | 3253 |
| IND13 | Other Chemical Products | 3254 - 3259 |
| IND14 | Petroleum Refineries | 32411 |
| IND15 | Other Petroleum and Coal Products | 32412, 32419 |
| IND16 | Plastics and Rubber Products | 326 |
| IND17 | Leather and Allied Products | 316 |
| IND18 | Glass & Glass Products | 3272 |
| IND19 | Cement Manufacturing | 32731 |
| IND20 | Other Nonmetallic Mineral Products | 327 less 3272 & 32731 |
| IND21 | Iron & Steel Mills, Ferroalloy & Steel Products | 3311, 3312 |
| IND22 | Alumina & Aluminum Products | 3313 |
| IND23 | Other Primary Metals | 3314, 3315 |
| IND24 | Fabricated Metal Products | 332 |
| IND25 | Machinery | 333 |
| IND26 | Electronic and Electric Products | 334 |
| IND27 | Transportation Equipment | 336 |
| IND28 | Electric Equipment and Appliances | 335 |
| IND29 | Miscellaneous Manufacturing | 339 |

| NEMS sector | Description | NAICS (1997) codes |
|---|---|---|
| ***Nonmanufacturing Industries:*** | | |
| IND30 | Crop Production | 111 |
| IND31 | Other Agriculture, Forestry, Fishing & Hunting | 112 - 115 |
| IND32 | Coal Mining | 2121 |
| IND33 | Oil & Gas Extraction & Support Activities | 211, 213 |
| IND34 | Other Mining & Quarrying | 2122, 2123 |
| IND35 | Construction | 23 |
| | | |
| ***Services:*** | | |
| SER1 | Transportation & Warehousing | 48, 49 |
| SER2 | Broadcasting & Telecommunications | 513 |
| SER3 | Electric Power Generation & Distribution | 2211 |
| SER4 | Natural Gas Distribution | 2212 |
| SER5 | Water, Sewage & Related System | 2213 |
| SER6 | Wholesale Trade | 42 |
| SER7 | Retail Trade | 44, 45 |
| SER8 | Finance & Insurance, Real Estate | 52, 53 |
| SER9 | Other Services | 51, 54 - 81 |
| SER10 | Public Administration | 921, 922, 923 |
| | Federal (Employment only) | 921 |
| | State and Local (Employment only) | 922, 923 |

## Table A15. Commercial Floorspace Types

| Code | Description |
|---|---|
| STORES | Stores and restaurants |
| WARE | Manufacturing and wholesale trade, public and federally-owned warehouses |
| OFFICE | Private, federal, and state and local offices |
| AUTO | Auto service and parking garages |
| MFG | Manufacturing |
| EDUC | Primary, secondary and higher education |
| HEALTH | Health - hospitals and nursing homes |
| PUB | Federal and state and local government |
| REL | Religious |
| AMUSE | Amusement |
| MISCNR | Miscellaneous, non-residential - transportation related and all other not elsewhere classified |
| HOTEL | Hotels and motels |
| DORM | Dormitories, educational and federally-owned (primarily military) |

# Appendix B: MAM Inputs and Outputs

## Introduction

Appendix B describes the inputs, parameters and files required for execution of the Direct Link, Industrial Output, Employment, Regional, Commercial Floorspace and Transportation sub-modules of the Macroeconomic Activity Module (MAM). This appendix also presents the primary outputs generated by MAM for the benefit of NEMS and of the MAM output files. As described in the main text of this volume, the Direct Link sub-module of MAM uses Global Insight's U.S. Macroeconomic Activity, Industrial Output and Employment models. The EIA staff and contract support developed the remaining models of the MAM. These include models of regional economic activity, industrial output and employment, changes to the regional stocks of commercial floorspace and unit sales of light trucks. Unlike Global Insight's models, the EIA models are not proprietary. Table B1 identifies the files that are used and are created by the MAM during the execution of the NEMS. It also indicates whether each file is an input or output file and describes its contents.

### Inputs

Table B2 describes the MAM parameters and controls specified at the start of a NEMS run. They include user-specified modeling switches and array dimensions used in MAM's FORTRAN source code. The user-specified switches enable the modeler to choose among alternative assumptions for the scenario.

### Inputs from NEMS

Before the MAM executes Global Insight's U.S. model in EViews, twenty-six energy prices and quantities are computed using inputs from the NEMS. These are energy assumptions exogenous to Global Insight's models. Table B3 lists and defines these energy assumptions. For each, the Global Insight model mnemonic is given along with its definition. The final column of Table B3 lists the NEMS variables used to calculate the corresponding Global Insight variable.

The MAM also calculates industrial gross output growth rates for the energy sectors (Petroleum Refining, Coal Mining, Oil & Gas Extraction, Electric Utilities, and Gas Utilities) based upon physical activity for the appropriate NEMS supply or conversion modules, and then applies them to the historical output series in the Industrial Output model. In the Employment model, employment forecast for two energy sectors (Coal Mining and Oil & Gas Extraction) are computed using growth rates extracted from the appropriate NEMS modules. Table B4 describes the NEMS variables used to calculate the growth rates for each sector.

### Outputs

Table B5 lists the U.S. macroeconomic variable outputs returned to the MAM from EViews. Annual data beginning in 1990 and forecast through 2030 are recorded in the spreadsheet named MC_NATIONAL.

Table B6 defines industrial gross output variables contained within the Industrial Output sub-module of the MAM. Forecast growth rates of the five energy industry sectors are replaced by the NEMS results. MC_INDUSTRIAL is a spreadsheet that presents the history and forecasts of industrial output by sector for the nine Census Divisions and for the United States.

Table B7 defines the employment variables contained in the Employment Submodule of the MAM. Forecast growth rates of two energy industrial sectors are replaced by the NEMS results. Historical and forecast data for the detailed industrial sectors and aggregates are shown in the MC_EMPLOYMENT spreadsheet.

Table B8 defines the light truck variables contained in the TRANC Submodule of the MAM. Annual data beginning in 1990 and forecast through 2030 are recorded in the spreadsheet named MC_VEHICLES.

Regional data and commercial floorspace data produced by the Regional Submodule and the Commercial Floorspace Submodule of the MAM are presented in the MC_REGIONAL spreadsheet. Table B9 describes the regions and variables contained in that spreadsheet. The same regional forecasts for economic activity, commercial floorspace, employment and industrial output contained in the MC_REGIONAL spreadsheet are also found in the MC_REGMAC, MC_COMMFLR, MC_REGEMP and MC_REGIO spreadsheets respectively. Table B10 describes the regions and variables contained in the output spreadsheet MC_REGMAC for EIA's regional economic activity model. Table B11 describes the regions and variables contained in the output spreadsheet MC_COMMFLR for EIA's regional commercial floorspace model. Table B12 describes the regions and variables contained in the output spreadsheet MC_REGEMP for EIA's regional employment model. Table B13 describes the regions and variables contained in the output spreadsheet MC_REGIO for EIA's regional industrial output model.

Table B14 lists the MACOUT common block variables referenced by other NEMS modules. The final column lists the referencing NEMS modules and submodules. A description of the module and submodule abbreviations follows Table B14.

## Table B1. MAM Input and Output Files

| Filename | Content | Input or Output |
|---|---|---|
| ALTDATA.WK1 | NEMS energy price and quantity data used as MAM drivers | Input |
| COMFLOOR.XLS | Data for EIA's commercial floorspace, regional, industrial output and employment models | Input |
| DRIVERS.PRG | Run-specific EViews program file | Input |
| DRVDATA.WF1 | EViews workfile of annual frequency | Input |
| EPMAC.WK1 | Forecast of macroeconomic, industrial output and employment models in levels | Input |
| EVIEWSDB.EDB | Intermediary database for workfiles of annual and quarterly frequency | Input |
| MC_COMMFLR.WK1 | Regional commercial floorspace model solution | Output |
| MC_COMMON.WK1 | MAM forecasts written to Global Data Structure. | Output |
| MC_DETAIL.WK1 | Detailed US macroeconomic model solution | Output |
| MC_EMPLOYMENT.WK1 | US employment model solution and base | Output |
| MC_ENERGY.WK1 | NEMS energy variables read from Global Data Structure | Output |
| MC_INDUSTRIAL.WK1 | US industrial model solution and base | Output |
| MC_NATIONAL.WK1 | US macroeconomic model solution, base and percent change from base | Output |
| MC_REGEMP.WK1 | Regional employment model solution | Output |
| MC_REGIO.WK1 | Regional industrial output model solution | Output |
| MC_REGIONAL.WK1 | Regional model solution and base | Output |
| MC_REGMAC.WK1 | Regional economic model solution and base | Output |
| MC_VEHICLES.WK1 | Light truck unit sales model solution | Output |
| MCCOMFLR.WF1 | Regional commercial floorspace model | Output |
| MCEVCODE.TXT | Generic EViews program file used to create run-specific drivers program file | Input |
| MCEVEPMD.WF1 | US employment model | Output |
| MCEVIOMD.WF1 | US industrial output model | Output |
| MCEVSUBS.PRG | EViews subroutines | Input |
| MCEVWORK.WF1 | US macroeconomic model | Output |
| MCHIGHLO.XLS | High and low economic activity model factors and transportation model size class data | Input |
| MCPARMS.TXT | Parameters | Input |
| MCREGIND.WF1 | Regional industrial output and employment models | Output |
| MCREGIONAL.WF1 | Regional economic model | Output |

**File Extension Key:**

| File Extension | File Type |
|---|---|
| EDB | EViews database |
| PRG | EViews program file |
| TXT | Text file |
| WF1 | EViews workfile |
| WK1 | Lotus 1-2-3 file |
| XLS | Microsoft Excel file |

## Table B2. MAM Input Controls and Parameters

| Parameter Name | Input Type (filename) | Input Description |
|---|---|---|
| CAFE | User-defined parameter (SCEDES) | Unit cost of automobiles under new CAFE standards, 0=No change from baseline, 1=factor cost determined by NEMS TRAN results |
| CONTROLTARGET=1 | MAM parameter (MCPARMS) | Commercial Floor Space model add factor switch; 1 = on, 0 = off |
| CFDIAGX=0 | MAM parameter (MCPARMS) | Commercial Floor Space model growth rate tables switch; 1 = on, 0 = off |
| EVVERS | Run-time option (SCEDES) | Version of EViews used in simulation; 6 = v.6, 5 = v.5 |
| EXM | Run-time option (SCEDES) | MAM Module Switch, 1 = on, 0 = off |
| MACFDBK | Run-time option (SCEDES) | Macroeconomic feedback lever, 1 = on, 0 = off |
| MACTAX | User-defined parameter (SCEDES) | Distribution of energy tax, 0=No distribution, other parameter values defined according to requirements of study |
| MAMLASTYR=41 | MAM parameter (MCPARMS) | MAM/EViews last year, 2030-1990+1 |
| MMAC | Run-time option (SCEDES) | Macroeconomic growth scenario: 1 = Low, 2 = Reference, 3 = High |
| MCNMFDVARS=59 | MAM parameter (MCPARMS) | Number of macroeconomic final demand variables |
| MCNMFLTYPE=14 | MAM parameter (MCPARMS) | Number of commercial floorspace types, including total |
| MCNMIND=35 | MAM parameter (MCPARMS) | Number of regionalized industry output variables |
| MCNMINV=216 | MAM parameter (MCPARMS) | Number of capital equipment variables |
| MCNMMAC=72 | MAM parameter (MCPARMS) | Number of non-regionalized macroeconomic variables |
| MCNMMACREG=57 | MAM parameter (MCPARMS) | Number of regionalized macroeconomic variables |
| MCNMNATREG=14 | MAM parameter (MCPARMS) | Number of regionalized macroeconomic variables |
| MCNMSERV=10 | MAM parameter (MCPARMS) | Number of non-regionalized service output variables |
| MCNUMMNF=29 | MAM parameter (MCPARMS) | Number of manufacturing industry variables |

| Parameter Name | Input Type (filename) | Input Description |
|---|---|---|
| MCNUMREGS=11 | MAM parameter (MCPARMS) | The nine Census Divisions, a placeholder for California (currently not in use), and the national total of all Census Divisions |
| NEMSENERGYNUM=210 | MAM parameter (MCPARMS) | Number of exogenous variables (aggregates and components) from NEMS |
| NUMEMPL=46 | MAM parameter (MCPARMS) | Number of Industrial Employment categories |
| NUMEPMAC=177 | MAM parameter (MCPARMS) | Number of solution variables returned to MAM from EViews |
| RMFFLEV=0.90 | MAM parameter (MCPARMS) | Federal Fund Rate Lever, 0=Rate determined by balance of reserve, 1=Rate determined in response to changes in inflation and unemployment |
| SCENNUM=76 | MAM parameter (MCPARMS) | Number of driver variables passed to EViews models from MAM |
| TTECH | User-defined parameter (SCEDES) | Technology scenario: 1 = Low, 2 = Reference, 3 = High |

## Table B3. NEMS Input Variables for MAM National Submodule

| MAM Variable Name | Definition | NEMS Variable Name and Source |
|---|---|---|
| CNEFACR | Consumption of Household Fuel Oil | QBLK Common Block:<br>QTPRS - Total Petroleum, Residential |
| CNEGAOR | Consumption of Consumer Gasoline and Oil | QBLK Common Block:<br>QMGTR - Motor Gasoline, Transportation<br>QDSTR - Distillate, Transportation<br>QETTR - Ethanol, Transportation |
| CSVHOPGR | Consumption of Household Natural Gas | QBLK Common Block:<br>QNGRS - Natural Gas, Residential |
| CSVHOPER | Consumption of Household Electricity | QBLK Common Block:<br>QELRS - Electricity, Residential |
| DALLFUELS | Demand for All Fuels - All Sectors | QBLK Common Block:<br>QTPAS – Total Petroleum, All Sectors<br>QNGAS - Natural Gas, All Sectors<br>QGPTR - Natural Gas, Pipeline, Transportation<br>QLPIN - Lease and Plant Fuel, Industrial<br>QCLAS - Coal, All Sectors<br>QMCIN - Metallurgical Coal, Industrial<br>QCIIN - Net Coal Coke Imports, Industrial<br>QUREL - Uranium, Electricity<br>QTRAS - Total Renewables, All Sectors<br>QSTRS - Solar Thermal, Residential<br>QGERS - Geothermal, Residential<br>QSTCM - Solar Thermal, Commercial<br>QPVCM - Photovoltaic, Commercial<br>QEIEL - Net Electricity Imports<br>QMETR - Methanol, Transportation<br>QHYTR - Liquid Hydrogen, Transportation |
| DENDUCOAL | End-Use Demand for Coal | QBLK Common Block:<br>QMCIN - Metallurgical Coal, Industrial<br>QCLAS - Coal, All Sectors<br>QCLEL - Coal, Electricity Generation<br>QCIIN - Net Coal Coke Imports, Industrial |
| DENDUELC | Electricity Sales to Ultimate Consumers | QBLK Common Block:<br>QELAS - Purchased Electricity, All Sectors |

| MAM Variable Name | Definition | NEMS Variable Name and Source |
|---|---|---|
| DENDUNG | End-Use Demand for Natural Gas | QBLK Common Block:<br>QNGAS - Natural Gas, All Sectors<br>QGPTR - Natural Gas, Pipeline, Transportation<br>QLPIN - Lease and Plant Fuel, Industrial<br>QNGEL - Natural Gas, Electricity |
| DENDUPET | End-Use Demand for Petroleum | QBLK Common Block:<br>QDSAS - Distillate, All Sectors<br>QDSEL - Distillate, Electricity<br>QKSAS - Kerosene, All Sectors<br>QJFTR - Jet Fuel, Transportation<br>QLGAS - Liquefied Petroleum Gases, All Sectors<br>QMGAS - Motor Gasoline, All Sectors<br>QPFIN - Petrochemical Feedstocks, Industrial<br>QRSAS - Residual Fuel, All Sectors<br>QRSEL - Residual Fuel, Electricity<br>QOTAS - Other Petroleum, All Sectors<br>QSGIN - Still Gas, Industrial<br>QPCIN - Petroleum Coke, Industrial<br>QASIN - Asphalt and Road Oil, Industrial |

| MAM Variable Name | Definition | NEMS Variable Name and Source |
|---|---|---|
| ENGDOMO | Domestic Production of Other Energy | QBLK Common Block:<br>QUREL - Uranium, Electricity<br>QTRAS - Total Renewables, All Sectors<br>QSTRS - Solar Thermal, Residential<br>QSTCM - Solar Thermal, Commercial<br>QETTR - Ethanol, Transportation<br>QPVCM - Photovoltaic, Commercial<br>QHYTR - Liquid Hydrogen, Transportation<br>QGERS - Geothermal, Residential<br>COALOUT Common Block:<br>CQSBB - Production of Coal<br>PMMRPT Common Block:<br>RFETHE85 - Production of E85<br>RFMETM85 - Production of M85<br>RFQDINPOT - Other Domestic Inputs to Refiners<br>PMMOUT Common Block:<br>RFCRDOTH - Other Crude Inputs<br>NGTDMREP Common Block:<br>OGPRSUP - Production of Supplemental Natural Gas<br>CONVFACT Common Block:<br>CFINPOT – Other inputs<br>CFNGC - Nat. Gas consumption and production |
| ENGDOMPETANG | Domestic Production of Petroleum and Natural Gas | PMMBLK Common Block:<br>RFQTDCRD - Production of Crude Oil<br>RFPQNGL - Production of Natural Gas Liquids<br>NGTDMREP Common Block:<br>OGPRDNG - Production of Dry Natural Gas |
| IPSG211A3 | Industrial Production Index, Oil and Gas Extraction | PMMBLK Common Block:<br>RFQTDCRD - Production of Crude Oil<br>RFPQNGL - Production of Natural Gas Liquids<br>CONVFACT Common Block:<br>CFNGC - Nat. Gas consumption and production<br>NGTDMREP Common Block:<br>OGPRDNG - Production of Dry Natural Gas |
| IPSN2121 | Industrial Production Index, Coal Mining | COALOUT Common Block:<br>Coal Production (East, West Miss) |
| JPCNEFAC | Personal Consumption Deflator, Household Fuel Oil | MPBLK Common Block:<br>PTPRS - Residential Total Petroleum Price |

| MAM Variable Name | Definition | NEMS Variable Name and Source |
|---|---|---|
| JPCNEGAO | Personal Consumption Deflator, Consumer Gasoline and Oil | AMPBLK Common Block:<br>PMGTR – Transportation Motor Gasoline Price<br>PDSTR – Transportation Distillate Price<br>PETTR – Transportation, Ethanol Price<br>QBLK Common Block:<br>QMGTR – Motor Gasoline, Transportation<br>QDSTR – Distillate, Transportation<br>QETTR - Ethanol, Transportation |
| JPCSVHOPE | Personal Consumption Deflator, Household Electricity | AMPBLK Common Block:<br>PELRS – Residential Purchased Electricity Price |
| JPCSVHOPG | Personal Consumption Deflator, Household Natural Gas | AMPBLK Common Block:<br>PNGRS – Residential Natural Gas Price |
| JQIND12 | Industrial Production Index - Coal Mining | COALOUT Common Block:<br>CQSBB - Production of Coal |
| JQIND13 | Industrial Production Index -Oil and Gas Extraction | PMMOUT Common Block:<br>RFQTDCRD - Production of Crude Oil<br>RFPQNGL - Production of Natural Gas Liquids<br>NGTDMREP Common Block:<br>OGPRDNG - Production of Dry Natural Gas |
| PNGHH | Henry Hub Cash Market Price of Natural Gas | NGTDMREP Common Block:<br>OGHHPRNG – Price of Natural Gas at Henry Hub |
| PNGWL | Average Wellhead Price of Natural Gas | NGTDMREP Common Block:<br>OGWPRNG – Natural Gas Wellhead Price |
| POILIMP | Weighted Average Price of Imported Crude | INTOUT Common Block:<br>IT_WOP - World Oil Price |
| QGASASF | Highway Consumption of Gasoline and Special Fuels | QBLK Common Block:<br>QMGTR - Motor Gasoline, Transportation<br>QDSTR - Distillate, Transportation<br>QETTR – Ethanol, Transportation |
| WPI051 | Producer Price Index - Coal | AMPBLK Common Block:<br>PCLIN - Industrial Purchased Coal Price |
| WPI053 | Producer Price Index - Gas Fuels | AMPBLK Common Block:<br>PNGIN – Industrial Purchased Natural Gas Price |

| MAM Variable Name | Definition | NEMS Variable Name and Source |
|---|---|---|
| WPI054 | Producer Price Index - Electric Power | AMPBLK Common Block:<br>PELRS - Residential Purchased Electricity Price<br>PELCM - Commercial Purchased Electricity Price<br>PELIN - Industrial Purchased Electricity Price<br>PELTR - Transportation Purchased Electricity Price<br>QBLK Common Block:<br>QELRS – Residential Purchased Electricity<br>QELCM – Commercial Purchased Electricity<br>QELIN – Industrial Purchased Electricity<br>QELTR – Transportation Purchased Electricity |
| WPI055 | Producer Price Index - Utility Natural Gas | AMPBLK Common Block:<br>PNGRS - Residential Natural Gas Price<br>PNGCM - Commercial Natural Gas Price<br>PNGIN - Industrial Natural Gas Price<br>PNGTR - Transportation Natural Gas Price<br>PNGEL - Natural Gas Price to Electric Generators<br>QBLK Common Block:<br>QNGRS – Residential Purchased Natural Gas<br>QNGCM – Commercial Purchased Natural Gas<br>QNGIN – Industrial Purchased Natural Gas<br>QNGTR – Transportation Purchased Natural Gas<br>QNGEL – Electricity, Natural Gas |
| WPI0561 | Producer Price Index - Crude Petroleum | INTOUT Common Block:<br>IT_WOP - World Oil Price |

| MAM Variable Name | Definition | NEMS Variable Name and Source |
|---|---|---|
| WPI057 | Producer Price Index - Refined Petroleum Products | AMPBLK Common Block:<br>PTPRS - Residential Total Petroleum Price<br>PDSCM - Commercial Distillate Price<br>PRSCM - Commercial Residual Fuel Price<br>PDSIN - Industrial Distillate Price<br>PRSIN - Industrial Residual Fuel Price<br>PDSTR - Transportation Distillate Price<br>PJFTR - Transportation Jet Fuel Price<br>PMGTR - Transportation Motor Gasoline Price<br>PRSTR - Transportation Residual Fuel Price<br>QBLK Common Block:<br>QTPRS - Residential Total Petroleum<br>QDSCM - Commercial Distillate<br>QRSCM - Commercial Residual Fuel<br>QDSIN - Industrial Distillate<br>QRSIN - Industrial Residual Fuel<br>QDSTR - Transportation Distillate<br>QJFTR - Transportation Jet Fuel<br>QMGTR - Transportation Motor Gasoline<br>QRSTR - Transportation Residual Fuel |
| WPI0574 | Producer Price Index - Residual Petroleum Fuels | AMPBLK Common Block:<br>PRSCM - Commercial Residual Fuel Price<br>PRSIN - Industrial Residual Fuel Price<br>PRSTR - Transportation Residual Fuel Price<br>QBLK Common Block:<br>QRSCM - Commercial Residual Fuel<br>QRSIN - Industrial Residual Fuel<br>QRSTR - Transportation Residual Fuel |

## Table B4. Energy Industry and Employment Growth Determined by NEMS Results

| MACOUT Common Block Name | Industry Sector Definition | NEMS Variable Name and Source |
|---|---|---|
| MC_EMPNA(34) | Employment, Coal Mining | COALOUT Common Block:<br>TOTMINERS – Number of coal miners |
| MC_EMPNA(35) | Employment, Oil and Gas Extraction | OGSMOUT Common Block:<br>OGJOBS – Number of jobs in oil and gas supply sector |
| MC_REVIND(14) | Output, Petroleum Refining | PMMOUT Common Block:<br>RFQPRDT - Total Petroleum Product Supplied<br>PMMRPT Common Block:<br>RFPQIPRDT - Total Imported Petroleum Products |
| MC_REVIND(32) | Output, Coal Mining | COALOUT Common Block:<br>CQSBB - Total Coal Production |
| MC_REVIND(33) | Output, Oil and Gas Extraction | PMMOUT Common Block:<br>RFQTDCRD - Total Crude Oil Production<br>RFPQNGL - Total Natural Gas Plant Liquids Production<br>OGPRDNG - Total Dry Natural Gas Production<br>OGPRSUP - Supplemental Natural Gas Production |
| MC_REVSER(3) | Output, Electric Utilities | UEFDOUT Common Block:<br>UGNTLNR - Total Electricity Generation |
| MC_REVSER(4) | Output, Gas Utilities | PMMOUT Common Block:<br>OGPRDNG - Total Dry Natural Gas Production |

## Table B5. MC_NATIONAL Output Variables

| MACOUT Common Block Name | Description |
|---|---|
| MC_GDPR | Gross Domestic Product, billions of chained 2000$ |
| MC_GDPFER | Gross Domestic Product at full employment, billions of chained 2000$ |
| MC_CONSR | Consumer Spending on all Goods & Services, billions of chained 2000$ |
| MC_IRC | Gross Private Domestic Investment, billions of chained 2000$ |
| MC_XR | Exports of Goods & Services, billions of chained 2000$ |
| MC_MR | Imports of Goods & Services, billions of chained 2000$ |
| MC_GR | Government Purchases of Goods & Services, billions of chained 2000$ |
| MC_CDR | Consumer Spending on Durable Goods, billions of chained 2000$ |
| MC_CNR | Consumer Spending on Nondurable Goods, billions of chained 2000$ |
| MC_CSVR | Consumer Spending on Services, billions of chained 2000$ |
| MC_IFNRESR | Gross Nonresidential Investment in Structures, billions of chained 2000$ |
| MC_IFRESR | Gross Residential Investment, billions of chained 2000$ |
| MC_IFNREER | Gross Nonresidential Investment in Equipment, billions of chained 2000$ |
| MC_IFREER | Gross Residential Investment in Equipment, billions of chained 2000$ |
| MC_IFXR | Gross Private Fixed Investment, billions of chained 2000$ |
| MC_IFNRER | Gross Private Fixed Nonresidential Investment, billions of chained 2000$ |
| MC_IFRER | Gross Private Fixed Residential Investment, billions of chained 2000$ |
| MC_XGFFBR | Exports, Foods, Feeds, & Beverages, billions of chained 2000$ |
| MC_XGINR | Exports, Industrial Supplies & Materials, billions of chained 2000$ |
| MC_XGKR | Exports, Capital Goods exc autos, billions of chained 2000$ |
| MC_XGAUTOR | Exports, Automotive Vehicles, Engines & Parts, billions of chained 2000$ |
| MC_XGCR | Exports, Consumer Goods except Automotive, billions of chained 2000$ |
| MC_XGR | Exports, Goods, billions of chained 2000$ |
| MC_XSVTOTR | Exports, Services, billions of chained 2000$ |
| MC_MGFFBR | Imports, Foods, Feeds, and Beverages, billions of chained 2000$ |
| MC_MGINAPETR | Imports, Industrial Supplies & Materials, billions of chained 2000$ |
| MC_MGKR | Imports, Capital Goods excl. Motor Vehicles, billions of chained 2000$ |
| MC_MGAUTOR | Imports, Motor Vehicles & Parts, billions of chained 2000$ |
| MC_MGCR | Imports, Non-automotive Consumer Goods, billions of chained 2000$ |
| MC_MSVTOTR | Imports, Services, billions of chained 2000$ |
| MC_IIR | Change in Real Stock of Business Inventories, billions of chained 2000$ |
| MC_GFMLR | Federal Defense Purchases of Goods and Services, billions of chained 2000$ |

| MACOUT Common Block Name | Description |
|---|---|
| MC_GDP | Gross Domestic Product, billions of nominal $ |
| MC_CONS | Consumer Spending on all Goods & Services, billions of nominal $ |
| MC_I | Gross Private Domestic Investment, billions of nominal $ |
| MC_GNPR | Gross National Product, billions of chained 2000$ |
| MC_JPGDP | Chain-Type Price Index, GDP, 2000 = 1.0 (1987 = 1.0 in MC_COMMON) |
| MC_RMTB3M | Discount Rate on 3-Month U.S. Treasury Bills |
| MC_RMMTG30CON | Conventional 30-Year Mortgage Commitment Rate |
| MC_RMCORPPUAA | Yield on AA Utility Bonds |
| MC_RMGBLUSREAL | Real Average Yield on U.S. Treasury Long-term Bonds |
| MC_JECIWSP | Employment Cost Index, Wages & Salaries, Private Sector, June 1989 = 1.0 |
| MC_SUVA | Unit Sales of Automobiles, Total, millions of units |
| MC_SUVLV | Unit Sales of Light Duty Vehicles, Domestic, millions of units |
| MC_SUVTL | Unit Sales of New Light Trucks, millions of units |
| MC_SUVTHAM | Unit Sales of Heavy and Medium Trucks, millions of units |
| MC_RUC | Unemployment Rate, All Civilian Workers |
| MC_WPI | Producer Price Index, All Commodities, 1982 = 1.0 |
| MC_WPI11 | Producer Price Index, Machinery & Equipment, 1982 = 1.0 |
| MC_WPI14 | Producer Price Index, Transportation Equipment, 1982 = 1.0 |
| MC_NLFC | Civilian Labor Force as Measured by the Household Survey, millions of persons |
| MC_RMFF | Effective Rate on Federal Funds |
| MC_WPI05 | Producer Price Index, Fuels, Related Products & Power, 1982 = 1.0 |
| MC_RMTCM10Y | Yield on 10-year Treasury Notes |
| MC_RMCORPBAA | Yield on Baa-Rated Corporate Bonds |
| MC_RLRMCORPPUAA | Real Yield on Baa-Rated Corporate Bonds |

## Table B6. MC_INDUSTRIAL Output Variables (Variables by Region)

### Regions:

| Census Division | Description |
|---|---|
| NENG | New England |
| MATL | Middle Atlantic |
| ENC | East North Central |
| WNC | West North Central |
| SATL | South Atlantic |
| ESC | East South Central |
| WSC | West South Central |
| MTN | Mountain |
| PAC | Pacific |
| US | United States |

### Variables:

| MACOUT Common Block Name | Description |
|---|---|
| MC_REVIND(1) | Production, Food Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(2) | Production, Beverage and Tobacco Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(3) | Production, Textile Mills & Textile Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(4) | Production, Apparel (Billions of Fixed 2000 Dollars) |
| MC_REVIND(5) | Production, Wood Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(6) | Production, Furniture and Related Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(7) | Production, Paper Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(8) | Production, Printing (Billions of Fixed 2000 Dollars) |
| MC_REVIND(9) | Production, Basic Inorganic Chemicals (Billions of Fixed 2000 Dollars) |
| MC_REVIND(10) | Production, Basic Organic Chemicals (Billions of Fixed 2000 Dollars) |
| MC_REVIND(11) | Production, Plastic and Synthetic Rubber Materials (Billions of Fixed 2000 Dollars) |
| MC_REVIND(12) | Production, Agricultural Chemicals (Billions of Fixed 2000 Dollars) |
| MC_REVIND(13) | Production, Other Chemical Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(14) | Production, Petroleum Refineries (Billions of Fixed 2000 Dollars) |
| MC_REVIND(15) | Production, Other Petroleum and Coal Products (Billions of Fixed 2000 Dollars) |

| MACOUT Common Block Name | Description |
|---|---|
| MC_REVIND(16) | Production, Plastics and Rubber Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(17) | Production, Leather and Allied Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(18) | Production, Glass & Glass Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(19) | Production, Cement Manufacturing (Billions of Fixed 2000 Dollars) |
| MC_REVIND(20) | Production, Other Nonmetallic Mineral Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(21) | Production, Iron & Steel Mills, Ferroalloy & Steel Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(22) | Production, Alumina & Aluminum Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(23) | Production, Other Primary Metals (Billions of Fixed 2000 Dollars) |
| MC_REVIND(24) | Production, Fabricated Metal Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(25) | Production, Machinery (Billions of Fixed 2000 Dollars) |
| MC_REVIND(26) | Production, Other Electronic & Electric Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(27) | Production, Transportation Equipment (Billions of Fixed 2000 Dollars) |
| MC_REVIND(28) | Production, Measuring & Control Instruments (Billions of Fixed 2000 Dollars) |
| MC_REVIND(29) | Production, Miscellaneous Manufacturing (Billions of Fixed 2000 Dollars) |
| MC_REVIND(30) | Production, Crop Production (Billions of Fixed 2000 Dollars) |
| MC_REVIND(31) | Production, Other Agriculture, Forestry, Fishing & Hunting (Billions of Fixed 2000 Dollars) |
| MC_REVIND(32) | Production, Coal Mining (Billions of Fixed 2000 Dollars) |
| MC_REVIND(33) | Production, Oil & Gas Extraction & Support Activities (Billions of Fixed 2000 Dollars) |
| MC_REVIND(34) | Production, Other Mining & Quarrying (Billions of Fixed 2000 Dollars) |
| MC_REVIND(35) | Production, Construction (Billions of Fixed 2000 Dollars) |
| MC_REVIND(36) | Production, Sum of All Chemicals (Billions of Fixed 2000 Dollars) |
| MC_REVIND(37) | Production, Sum of All Petroleum Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(38) | Production, Sum of All Nonmetallic Mineral Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(39) | Production, Sum of All Primary Metals (Billions of Fixed 2000 Dollars) |
| (Aggregate) | Production, Total Manufacturing Output (Billions of Fixed 1996 Dollars) |
| (Aggregate) | Production, Total Industrial Output (Billions of Fixed 1996 Dollars) |

## Table B7. MC_EMPLOYMENT Output Variables

| Employment Variable Name | Description |
|---|---|
| EMPIND1 | Food Products, millions of employees |
| EMPIND2 | Beverage and Tobacco Products, millions of employees |
| EMPIND3 | Textile Mills & Textile Products, millions of employees |
| EMPIND4 | Apparel, millions of employees |
| EMPIND5 | Wood Products, millions of employees |
| EMPIND6 | Furniture and Related Products, millions of employees |
| EMPIND7 | Paper Products, millions of employees |
| EMPIND8 | Printing, millions of employees |
| EMPIND9 | Basic Inorganic Chemicals, millions of employees |
| EMPIND10 | Basic Organic Chemicals, millions of employees |
| EMPIND11 | Plastic and Synthetic Rubber Materials, millions of employees |
| EMPIND12 | Agricultural Chemicals, millions of employees |
| EMPIND13 | Other Chemical Products, millions of employees |
| EMPIND14 | Petroleum Refineries, millions of employees |
| EMPIND15 | Other Petroleum and Coal Products, millions of employees |
| EMPIND16 | Plastics and Rubber Products, millions of employees |
| EMPIND17 | Leather and Allied Products, millions of employees |
| EMPIND18 | Glass & Glass Products, millions of employees |
| EMPIND19 | Cement Manufacturing, millions of employees |
| EMPIND20 | Other Nonmetallic Mineral Products, millions of employees |
| EMPIND21 | Iron & Steel Mills, Ferroalloy & Steel Products, millions of employees |
| EMPIND22 | Alumina & Aluminum Products, millions of employees |
| EMPIND23 | Other Primary Metals, millions of employees |
| EMPIND24 | Fabricated Metal Products, millions of employees |
| EMPIND25 | Machinery, millions of employees |
| EMPIND26 | Other Electronic & Electric Products, millions of employees |
| EMPIND27 | Transportation Equipment, millions of employees |
| EMPIND28 | Measuring & Control Instruments, millions of employees |
| EMPIND29 | Miscellaneous Manufacturing, millions of employees |
| EMPIND30 | Crop Production, millions of employees |
| EMPIND31 | Other Agriculture, Forestry, Fishing & Hunting, millions of employees |
| EMPIND32 | Coal Mining, millions of employees |

| Employment Variable Name | Description |
|---|---|
| EMPIND33 | Oil & Gas Extraction & Support Activities, millions of employees |
| EMPIND34 | Other Mining & Quarrying, millions of employees |
| EMPIND35 | Construction, millions of employees |
| EMPSER1 | Transportation & Warehousing, millions of employees |
| EMPSER2 | Broadcasting & Telecommunications, millions of employees |
| EMPSER3 | Electric Power Generation & Distribution, millions of employees |
| EMPSER4 | Natural Gas Distribution, millions of employees |
| EMPSER5 | Water, Sewage & Related System, millions of employees |
| EMPSER6 | Wholesale Trade, millions of employees |
| EMPSER7 | Retail Trade, millions of employees |
| EMPSER8 | Finance & Insurance, Real Estate, millions of employees |
| EMPSER9 | Other Services, millions of employees |
| EMPSER10 | Public Administration, Federal Government, millions of employees |
| EMPSER11 | Public Administration, State & Local Government, millions of employees |
| (Aggregate) | Total Manufacturing, millions of employees |
| (Aggregate) | Total Non-Manufacturing, millions of employees |
| (Aggregate) | Total Services, millions of employees |
| (Aggregate) | Total Nonfarm, millions of employees |

## Table B8. MC_VEHICLES Output Variables

| MACOUT Common Block Name | Description |
|---|---|
| MC_VEHICLES(1) | Unit Sales of Class 1 Light Trucks, 0 to 6000 lbs., Wards Communication, Thousands of Vehicles |
| MC_VEHICLES(2) | Unit Sales of Class 2 Light Trucks, 6001 to 10,000 lbs., Wards Communication, Thousands of Vehicles |
| MC_VEHICLES(3) | Unit Sales of Class 2a Light Trucks, 6001 to 8,500 lbs., ORNL, Thousands of Vehicles |
| MC_VEHICLES(4) | Unit Sales of Class 2b Light Trucks, 8,500 to 10,000 lbs., ORNL, Thousands of Vehicles |
| MC_VEHICLES(5) | Unit Sales of Class 3 Light Trucks, 10,000 to 14,000 lbs., Wards Communication, Thousands of Vehicles |
| (Aggregate) | Unit Sales of Classes 1, 2 and 3 Light Trucks, 0 to 14,000 lbs., Sum, Thousands of Vehicles. |

## Table B9. MC_REGIONAL Output Variables

### Regions:

| Census Division | Description |
|---|---|
| NENG | New England |
| MATL | Middle Atlantic |
| ENC | East North Central |
| WNC | West North Central |
| SATL | South Atlantic |
| ESC | East South Central |
| WSC | West South Central |
| MTN | Mountain |
| PAC | Pacific |
| US | United States |

### Variables:

| MACOUT Common Block Name | Description |
|---|---|
| MC_CPI | Consumer Price Index (All Urban) - All Items, 1982-84 = 1.0 |
| MC_YPDR | Disposable Personal Income, billions of chained 2000$ |
| MC_YPCOMPWSD | Wage & Salary Disbursements, billions of nominal $ |
| MC_YP | Personal Income, billions of nominal $ |
| MC_HUSMFG | Mobile Homes Shipments, millions of units |
| MC_HUSPS1 | Single-Family Housing Starts, Private including Farm, millions of units |
| MC_HUSPS2A | Multi-Family Housing Starts, Private including Farm, millions of units |
| MC_KHUMFG | Stock of Mobile Homes, millions of units |
| MC_KHUPS1 | Stock of Single-Family Housing, millions of units |
| MC_KHUPS2A | Stock of Multi-Family Housing, millions of units |
| MC_NP | Population Including Armed Forces Overseas, millions of persons |
| MC_NP16A | Population Aged 16 and Over, millions of persons |
| MC_RWM | Average Annual Manufacturing Wages, thousands of nominal $ |
| MC_RWNM | Average Annual Non-Manufacturing Wages, thousands of nominal $ |
| MC_COMMFLSP(2); AMUSE | Commercial Floorspace, Amusement, billion square feet |
| MC_COMMFLSP(3); AUTO | Commercial Floorspace, Automotive, billion square feet |
| MC_COMMFLSP(4); DORM | Commercial Floorspace, Dormitories, billion square feet |
| MC_COMMFLSP(5); EDUC | Commercial Floorspace, Education, billion square feet |

| MACOUT Common Block Name | Description |
|---|---|
| MC_COMMFLSP(6); HEALTH | Commercial Floorspace, Health, billion square feet |
| MC_COMMFLSP(7); HOTEL | Commercial Floorspace, Hotels and Motels, billion square feet |
| MC_COMMFLSP(8); MFG | Commercial Floorspace, Manufacturing billion square feet |
| MC_COMMFLSP(9); MISCNR | Commercial Floorspace, Miscellaneous Non-residential, billion square feet |
| MC_COMMFLSP(10); OFFICE | Commercial Floorspace, Offices, billion square feet |
| MC_COMMFLSP(11); PUB | Commercial Floorspace, Public Sector, billion square feet |
| MC_COMMFLSP(12); REL | Commercial Floorspace, Religious, billion square feet |
| MC_COMMFLSP(13); STORES | Commercial Floorspace, Stores and Restaurants, billion square feet |
| MC_COMMFLSP(14); WARE | Commercial Floorspace, Warehouses, billion square feet |
| MC_COMMFLSP(1); SUM | Total Commercial Floorspace, billion square feet |
| MC_EMPNA(1); EEA | Employment, Total Nonfarm (Millions of Persons) |
| MC_EMPNA(2); EMPIND35 | Employment, Construction (Millions of Persons) |
| MC_EMPNA(3); EMPSER10 | Employment, Federal Government (Millions of Persons) |
| MC_EMPNA(4); EMPSER8 | Employment, Financial, Insurance, Real Estate (Millions of Persons) |
| MC_EMPNA(5); EMPIND32T34 | Employment, Mining (Millions of Persons) |
| MC_EMPNA(6); EMPSER9 | Employment, Other Services (Millions of Persons) |
| MC_EMPNA(7); EMPSER11 | Employment, State & Local Government (Millions of Persons) |
| MC_EMPNA(8); EMPSER1T5 | Employment, Transportation, Communications & Public Utilities (Millions of Persons) |
| MC_EMPNA(9); EMPSER7 | Employment, Retail Trade (Millions of Persons) |
| MC_EMPNA(10); EMPSER6 | Employment, Furniture and Related Products (Millions of Persons) |
| MC_EMPNA(11); EMPIND5 | Employment, Wood Products (Millions of Persons) |
| MC_EMPNA(12); EMPIND6 | Employment, Furniture and Related Products (Millions of Persons) |
| MC_EMPNA(13); EMPIND18T20 | Employment, Nonmetallic Mineral Products (Millions of Persons) |
| MC_EMPNA(14); EMPIND21T23 | Employment, Primary Metal Industries (Millions of Persons) |
| MC_EMPNA(15); EMPIND24 | Employment, Fabricated Metal Products (Millions of Persons) |
| MC_EMPNA(16); EMPIND25 | Employment, Machinery (Millions of Persons) |
| MC_EMPNA(17); EMPIND26 | Employment, Other Electronic and Electric Products (Millions of Persons) |
| MC_EMPNA(18); EMPIND27 | Employment, Transportation Equipment (Millions of Persons) |
| MC_EMPNA(19); EMPIND28 | Employment, Measuring & Control Instruments (Millions of Persons) |
| MC_EMPNA(20); EMPIND29 | Employment, Miscellaneous Manufacturing (Millions of Persons) |
| MC_EMPNA(21); EMPIND1 | Employment, Food Products (Millions of Persons) |
| MC_EMPNA(22); EMPIND2 | Employment, Beverage and Tobacco Products (Millions of Persons) |
| MC_EMPNA(23); EMPIND3 | Employment, Textile Mills & Textile Products (Millions of Persons) |
| MC_EMPNA(24); EMPIND4 | Employment, Apparel (Millions of Persons) |

| MACOUT Common Block Name | Description |
|---|---|
| MC_EMPNA(25); EMPIND7 | Employment, Paper Products (Millions of Persons) |
| MC_EMPNA(26); EMPIND8 | Employment, Printing (Millions of Persons) |
| MC_EMPNA(27); EMPIND9T13 | Employment, Chemicals (Millions of Persons) |
| MC_EMPNA(28); EMPIND14T15 | Employment, Petroleum Products (Millions of Persons) |
| MC_EMPNA(29); EMPIND16 | Employment, Plastics and Rubber Products (Millions of Persons) |
| MC_EMPNA(30); EMPIND17 | Employment, Leather and Allied Products (Millions of Persons) |
| MC_EMPNA(31); EMPIND30T31 | Employment, Agriculture, Forestry, Fishing & Hunting, millions of persons |
| MC_REVIND(1) | Production, Food Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(2) | Production, Beverage and Tobacco Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(3) | Production, Textile Mills & Textile Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(4) | Production, Apparel (Billions of Fixed 2000 Dollars) |
| MC_REVIND(5) | Production, Wood Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(6) | Production, Furniture and Related Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(7) | Production, Paper Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(8) | Production, Printing (Billions of Fixed 2000 Dollars) |
| MC_REVIND(9) | Production, Basic Inorganic Chemicals (Billions of Fixed 2000 Dollars) |
| MC_REVIND(10) | Production, Basic Organic Chemicals (Billions of Fixed 2000 Dollars) |
| MC_REVIND(11) | Production, Plastic and Synthetic Rubber Materials (Billions of Fixed 2000 Dollars) |
| MC_REVIND(12) | Production, Agricultural Chemicals (Billions of Fixed 2000 Dollars) |
| MC_REVIND(13) | Production, Other Chemical Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(14) | Production, Petroleum Refineries (Billions of Fixed 2000 Dollars) |
| MC_REVIND(15) | Production, Other Petroleum and Coal Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(16) | Production, Plastics and Rubber Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(17) | Production, Leather and Allied Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(18) | Production, Glass & Glass Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(19) | Production, Cement Manufacturing (Billions of Fixed 2000 Dollars) |
| MC_REVIND(20) | Production, Other Nonmetallic Mineral Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(21) | Production, Iron & Steel Mills, Ferroalloy & Steel Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(22) | Production, Alumina & Aluminum Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(23) | Production, Other Primary Metals (Billions of Fixed 2000 Dollars) |
| MC_REVIND(24) | Production, Fabricated Metal Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(25) | Production, Machinery (Billions of Fixed 2000 Dollars) |

| MACOUT Common Block Name | Description |
|---|---|
| MC_REVIND(26) | Production, Other Electronic & Electric Products (Billions of Fixed 2000 Dollars) |
| MC_REVIND(27) | Production, Transportation Equipment (Billions of Fixed 2000 Dollars) |
| MC_REVIND(28) | Production, Measuring & Control Instruments (Billions of Fixed 2000 Dollars) |
| MC_REVIND(29) | Production, Miscellaneous Manufacturing (Billions of Fixed 2000 Dollars) |
| MC_REVIND(30) | Production, Crop Production (Billions of Fixed 2000 Dollars) |
| MC_REVIND(31) | Production, Other Agriculture, Forestry, Fishing & Hunting (Billions of Fixed 2000 Dollars) |
| MC_REVIND(32) | Production, Coal Mining (Billions of Fixed 2000 Dollars) |
| MC_REVIND(33) | Production, Oil & Gas Extraction & Support Activities (Billions of Fixed 2000 Dollars) |
| MC_REVIND(34) | Production, Other Mining & Quarrying (Billions of Fixed 2000 Dollars) |
| MC_REVIND(35) | Production, Construction (Billions of Fixed 2000 Dollars) |

## Table B10. MC_REGMAC Output Variables (Variables by Region)

### Regions:

| Census Division | Description |
|---|---|
| NENG | New England |
| MATL | Middle Atlantic |
| ENC | East North Central |
| WNC | West North Central |
| SATL | South Atlantic |
| ESC | East South Central |
| WSC | West South Central |
| MTN | Mountain |
| PAC | Pacific |
| US | United States |

### Variables:

| Economic Activity Variable Name | Description |
|---|---|
| CPI | Consumer Price Index (All Urban) - All Items, 1982-84 = 1.0 |
| YPDR | Disposable Personal Income, billions of chained 2000 dollars |
| YPCOMPWSD | Wage & Salary Disbursements, billions of nominal dollars |
| YP | Personal Income, billions of nominal dollars |
| HUSMFG | Mobile Homes Shipments, millions of units |
| HUSPS1 | Single-Family Housing Starts, Private including Farm, millions of units |
| HUSPS2A | Multi-Family Housing Starts, Private including Farm, millions of units |
| KHUMFG | Stock of Mobile Homes, millions of units |
| KHUPS1 | Stock of Single-Family Housing, millions of units |
| KHUPS2A | Stock of Multi-Family Housing, millions of units |
| NP | Population Including Armed Forces Overseas, millions of persons |
| NP16A | Population Aged 16 and Over |
| RWM | Average Annual Manufacturing Wages, thousands of nominal dollars |
| RWNM | Average Annual Non-Manufacturing Wages, thousands of nominal dollars |

## Table B11. MC_COMMFLR Output Variables (Variables by Region)

### Regions:

| Census Division | Description |
|---|---|
| ENC | East North Central |
| ESC | East South Central |
| MATL | Middle Atlantic |
| MTN | Mountain |
| NENG | New England |
| PAC | Pacific |
| SATL | South Atlantic |
| WNC | West North Central |
| WSC | West South Central |
| SUM | United States |

### Variables:

| Commercial Floorspace Variable Name | Description |
|---|---|
| STORES | Commercial Floorspace, Stores and Restaurants, billion square feet |
| WARE | Commercial Floorspace, Warehouses, billion square feet |
| OFFICE | Commercial Floorspace, Offices, billion square feet |
| AUTO | Commercial Floorspace, Automotive, billion square feet |
| MFG | Commercial Floorspace, Manufacturing billion square feet |
| EDUC | Commercial Floorspace, Education, billion square feet |
| HEALTH | Commercial Floorspace, Health, billion square feet |
| PUB | Commercial Floorspace, Public Sector, billion square feet |
| REL | Commercial Floorspace, Religious, billion square feet |
| AMUSE | Commercial Floorspace, Amusement, billion square feet |
| MISCNR | Commercial Floorspace, Miscellaneous Non-residential, billion square feet |
| HOTEL | Commercial Floorspace, Hotels and Motels, billion square feet |
| DORM | Commercial Floorspace, Dormitories, billion square feet |
| SUM | Total Commercial Floorspace, billion square feet |

## Table B12. MC_REGEMP Output Variables (Variables by Region)

### Regions:

| Census Division | Description |
|---|---|
| NENG | New England |
| MATL | Middle Atlantic |
| ENC | East North Central |
| WNC | West North Central |
| SATL | South Atlantic |
| ESC | East South Central |
| WSC | West South Central |
| MTN | Mountain |
| PAC | Pacific |
| US | United States |

### Variables:

| Employment Variable Name | Description |
|---|---|
| EEA | Employment, Total Nonfarm (Millions of Persons) |
| EMPIND35 | Employment, Construction (Millions of Persons) |
| EMPSER10 | Employment, Federal Government (Millions of Persons) |
| EMPSER8 | Employment, Financial, Insurance, Real Estate (Millions of Persons) |
| EMPIND32T34 | Employment, Mining (Millions of Persons) |
| EMPSER9 | Employment, Other Services (Millions of Persons) |
| EMPSER11 | Employment, State & Local Government (Millions of Persons) |
| EMPSER1T5 | Employment, Transportation, Communications & Public Utilities (Millions of Persons) |
| EMPSER7 | Employment, Retail Trade (Millions of Persons) |
| EMPSER6 | Employment, Furniture and Related Products (Millions of Persons) |
| EMPIND5 | Employment, Wood Products (Millions of Persons) |
| EMPIND6 | Employment, Furniture and Related Products (Millions of Persons) |
| EMPIND18T20 | Employment, Nonmetallic Mineral Products (Millions of Persons) |
| EMPIND21T23 | Employment, Primary Metal Industries (Millions of Persons) |
| EMPIND24 | Employment, Fabricated Metal Products (Millions of Persons) |
| EMPIND25 | Employment, Machinery (Millions of Persons) |
| EMPIND26 | Employment, Other Electronic and Electric Products (Millions of Persons) |

| Employment Variable Name | Description |
|---|---|
| EMPIND27 | Employment, Transportation Equipment (Millions of Persons) |
| EMPIND28 | Employment, Measuring & Control Instruments (Millions of Persons) |
| EMPIND29 | Employment, Miscellaneous Manufacturing (Millions of Persons) |
| EMPIND1 | Employment, Food Products (Millions of Persons) |
| EMPIND2 | Employment, Beverage and Tobacco Products (Millions of Persons) |
| EMPIND3 | Employment, Textile Mills & Textile Products (Millions of Persons) |
| EMPIND4 | Employment, Apparel (Millions of Persons) |
| EMPIND7 | Employment, Paper Products (Millions of Persons) |
| EMPIND8 | Employment, Printing (Millions of Persons) |
| EMPIND9T13 | Employment, Chemicals (Millions of Persons) |
| EMPIND14T15 | Employment, Petroleum Products (Millions of Persons) |
| EMPIND16 | Employment, Plastics and Rubber Products (Millions of Persons) |
| EMPIND17 | Employment, Leather and Allied Products (Millions of Persons) |
| EMPIND30T31 | Employment, Agriculture, Forestry, Fishing & Hunting, millions of persons |

## Table B13. MC_REGIO Output Variables (Variables by Region)

### Regions:

| Census Division | Description |
|---|---|
| NENG | New England |
| MATL | Middle Atlantic |
| ENC | East North Central |
| WNC | West North Central |
| SATL | South Atlantic |
| ESC | East South Central |
| WSC | West South Central |
| MTN | Mountain |
| PAC | Pacific |
| US | United States |

### Variables:

| Industrial Output Variable Name | Description |
|---|---|
| REVIND1 | Production, Food Products (Billions of Fixed 2000 Dollars) |
| REVIND2 | Production, Beverage and Tobacco Products (Billions of Fixed 2000 Dollars) |
| REVIND3 | Production, Textile Mills & Textile Products (Billions of Fixed 2000 Dollars) |
| REVIND4 | Production, Apparel (Billions of Fixed 2000 Dollars) |
| REVIND5 | Production, Wood Products (Billions of Fixed 2000 Dollars) |
| REVIND6 | Production, Furniture and Related Products (Billions of Fixed 2000 Dollars) |
| REVIND7 | Production, Paper Products (Billions of Fixed 2000 Dollars) |
| REVIND8 | Production, Printing (Billions of Fixed 2000 Dollars) |
| REVIND9 | Production, Basic Inorganic Chemicals (Billions of Fixed 2000 Dollars) |
| REVIND10 | Production, Basic Organic Chemicals (Billions of Fixed 2000 Dollars) |
| REVIND11 | Production, Plastic and Synthetic Rubber Materials (Billions of Fixed 2000 Dollars) |
| REVIND12 | Production, Agricultural Chemicals (Billions of Fixed 2000 Dollars) |
| REVIND13 | Production, Other Chemical Products (Billions of Fixed 2000 Dollars) |
| REVIND14 | Production, Petroleum Refineries (Billions of Fixed 2000 Dollars) |
| REVIND15 | Production, Other Petroleum and Coal Products (Billions of Fixed 2000 Dollars) |
| REVIND16 | Production, Plastics and Rubber Products (Billions of Fixed 2000 Dollars) |
| REVIND17 | Production, Leather and Allied Products (Billions of Fixed 2000 Dollars) |

| Industrial Output Variable Name | Description |
|---|---|
| REVIND18 | Production, Glass & Glass Products (Billions of Fixed 2000 Dollars) |
| REVIND19 | Production, Cement Manufacturing (Billions of Fixed 2000 Dollars) |
| REVIND20 | Production, Other Nonmetallic Mineral Products (Billions of Fixed 2000 Dollars) |
| REVIND21 | Production, Iron & Steel Mills, Ferroalloy & Steel Products (Billions of Fixed 2000 Dollars) |
| REVIND22 | Production, Alumina & Aluminum Products (Billions of Fixed 2000 Dollars) |
| REVIND23 | Production, Other Primary Metals (Billions of Fixed 2000 Dollars) |
| REVIND24 | Production, Fabricated Metal Products (Billions of Fixed 2000 Dollars) |
| REVIND25 | Production, Machinery (Billions of Fixed 2000 Dollars) |
| REVIND26 | Production, Other Electronic & Electric Products (Billions of Fixed 2000 Dollars) |
| REVIND27 | Production, Transportation Equipment (Billions of Fixed 2000 Dollars) |
| REVIND28 | Production, Measuring & Control Instruments (Billions of Fixed 2000 Dollars) |
| REVIND29 | Production, Miscellaneous Manufacturing (Billions of Fixed 2000 Dollars) |
| REVIND30 | Production, Crop Production (Billions of Fixed 2000 Dollars) |
| REVIND31 | Production, Other Agriculture, Forestry, Fishing & Hunting (Billions of Fixed 2000 Dollars) |
| REVIND32 | Production, Coal Mining (Billions of Fixed 2000 Dollars) |
| REVIND33 | Production, Oil & Gas Extraction & Support Activities (Billions of Fixed 2000 Dollars) |
| REVIND34 | Production, Other Mining & Quarrying (Billions of Fixed 2000 Dollars) |
| REVIND35 | Production, Construction (Billions of Fixed 2000 Dollars) |

## Table B14. MAM Variables Used by Other NEMS Modules

| MACOUT Common Block Name | Macroeconomic Variable Description | Referencing NEMS Module or Submodules |
|---|---|---|
| MC_COMMFLSP | Commercial Floor Space by Type of Building, billion square feet | COMM |
| MC_CPI | Consumer Price Index (All Urban) - All Items, 1982-84 = 1.0 | NGTDM<br>TRAN |
| MC_EMPNA | Employment by Industrial Sector, millions of employees | IND |
| MC_GDPR | Gross Domestic Product, billions of chained 2000$ | INTERCV<br>MAIN<br>RENEW<br>TRAN |
| MC_GFMLR | Federal Defense Purchases of Goods & Services, billions of chained 2000$ | TRAN |
| MC_GNPR | Gross National Product, billions of chained 2000$ | TRAN |
| MC_HUSMFG | Mobile Homes Shipments, millions of units | RESD |
| MC_HUSPS1 | Single-Family Housing Starts, millions of units | RESD |
| MC_HUSPS2A | Multi-Family Housing Starts, millions of units | RESD |
| MC_JECIWSP | Employment Cost Index, Wages & Salaries, Private Sector, June 1989 = 1.0 | NGTDM<br>UEFP |

| MACOUT Common Block Name | Macroeconomic Variable Description | Referencing NEMS Module or Submodules |
|---|---|---|
| MC_JPGDP | Chained Price Index, GDP, 2000 = 100.0 (1987 = 1.0 in MACOUT) | COALCDS<br>COALCPS<br>COMM<br>EPM<br>IND<br>NGHIST<br>NGPTM<br>NGTDM<br>REFETH<br>REFINE<br>REFRPT<br>RENEW<br>RESD<br>TRAN<br>TRANFRT<br>UDAT<br>UECP<br>EUEFD<br>UEFP<br>ULDSM<br>WELLAK<br>WELLCOST<br>WELLEXP<br>WELLIMP<br>WELLLNG<br>WELLOFF<br>WELLOGS<br>WELLUGR |
| MC_MR | Imports of Goods & Services, billions of chained 2000$ | TRAN |
| MC_NP | Population Including Armed Forces Overseas, millions of persons | COMM<br>RENEW<br>TRAN |
| MC_NP16A | Population Aged 16 and Over, millions of persons | RESD<br>TRAN |

| MACOUT Common Block Name | Macroeconomic Variable Description | Referencing NEMS Module or Submodules |
|---|---|---|
| MC_ REVIND | Gross Output by Industrial Sector, billions of fixed 2000$ | IND<br>TRAN<br>TRANFRT |
| MC_REVSER | Gross Output by Service Sector, billions of fixed 2000$ | TRAN<br>TRANFRT |
| MC_RLRMCORPPUAA | Real Yield on AA Utility Bonds (= Nominal Yield - inflation) | COALCPS<br>WELLOGS |
| MC_RMCORPBAA | Yield on Baa Rated Corporate Bonds | NGLNG<br>NGTDM<br>REFINE<br>UTIL |
| MC_RMCORPPUAA | Yield on AA Utility Bonds | COALCDS<br>NGPTM<br>NGTDM<br>UEFP |
| MC_RMGBLUSREAL | Real Average Yield on U.S. Treasury Long-term Bonds | COMM<br>NGTDM |
| MC_RMMTG30CON | Commitment Rate on Conventional 30-year Mortgage | RESD |
| MC_RMTB3M | Discount Rate on 3-Month U.S. Treasury Bills | UEFP |
| MC_RMTCM10Y | Yield on 10-year Treasury Notes | UEFP |
| MC_SUVA | Unit Sales of Automobiles, Total, millions of units | TRAN |
| MC_SUVTHAM | Unit Sales of New Heavy & Medium Trucks | TRANFRT |
| MC_VEHICLES | Unit Sales of Light Trucks by Size Class | TRAN<br>TRANFRT |
| MC_WPI11 | Producer Price Index, Machinery & Equipment, 1982 = 1.0 | UEFP |
| MC_WPI14 | Producer Price Index, Transportation Equipment, 1982 = 1.0 | COALCDS<br>COALCPS |
| MC_XGR | Exports, Goods, billions of chained 2000$ | TRAN |
| MC_XR | Exports of Goods & Services, billions of chained 2000$ | TRAN |
| MC_YPDR | Disposable Personal Income, billions of chained 2000$ | COMM<br>RESD<br>TRAN |

## NEMS Module/Sub-module Descriptions:

| | |
|---|---|
| COALCDS | Coal Market Module, Coal Distribution Submodule |
| COALCPS | Coal Market Module, Coal Production Submodule |
| COMM | Commercial Demand Module |
| EPM | Future Emission Policy Module |
| IND | Industrial Demand Module |
| INTERCV | Integrating Module, Inter-cycle |
| MAIN | Integrating Module, Main |
| NGHIST | Natural Gas Transmission & Distribution Module, Historical Processing Code |
| NGPTM | Natural Gas Transmission & Distribution Module, Pipeline Tariff Submodule |
| NGTDM | Natural Gas Transmission & Distribution Module, Main Module |
| REFETH | Petroleum Market Module, Refinery, Ethanol Supply Submodule |
| REFINE | Petroleum Market Module, Refinery Processes |
| REFRPT | Petroleum Market Module, Refinery Report Writer |
| RENEW | Renewable Fuels Module |
| RESD | Residential Demand Module |
| TRAN | Transportation Demand Module |
| TRANFRT | Transportation Demand Module, Freight Transport Submodule |
| UDAT | Electricity Market Module, Electricity Data Processing |
| UECP | Electricity Market Module, Electricity Capacity Planning Submodule |
| UEFD | Electricity Market Module, Electricity Fuel Dispatch Submodule |
| UEFP | Electricity Market Module, Finance and Pricing Submodule |
| ULDSM | Electricity Market Module, Load and Demand-Side Management Submodule |
| WELLCOST | Oil & Gas Supply Module, Cost Submodule |
| WELLEXP | Oil & Gas Supply Module, Drilling Submodule |
| WELLIMP | Oil & Gas Supply Module, Foreign Supply Submodule |
| WELLLNG | Oil & Gas Supply Module, Liquid Natural Gas Submodule |
| WELLOFF | Oil & Gas Supply Module, Offshore Supply Submodule |
| WELLOGS | Oil & Gas Supply Module, Main Module |
| WELLUGR | Oil & Gas Supply Module, Unconventional Gas Recovery Supply Submodule |

# Appendix C: Equations in Regional Sub-module

## Regional Macroeconomic Model

### *Endogenous Variables*:

| | |
|---|---|
| CPI_{R} | Consumer Price Index, all urban, 1982-84=1.0, regional |
| GDPRZNP | Real Gross Domestic Product, billions of 2000 dollars, national |
| GSPR_{R} | Real Gross State Product, billions of 2000 dollars, regional |
| GSPRZNP_{R} | Real Per Capita Gross State Product, billions of 2000 dollars per person, regional |
| RWM_{R} | Average Annual Manufacturing Wages, thousands of dollars, regional |
| RWNM_{R} | Average Annual Non-Manufacturing Wages, thousands of dollars, regional |
| TAX | Personal Income Tax, billions of dollars, national |
| TAXRATE | Personal Income Tax Rate, percent, national |
| YP_{R} | Personal Income, billions of dollars, regional |
| YPCOMPWSD_{R} | Wage and Salary Disbursements, billions of dollars, regional |
| YPCOMPWSDG_{R} | Wage and Salary Disbursements by Government, billions of dollars, regional |
| YPCOMPWSDP_{R} | Wage and Salary Disbursements by Private Sector, billions of dollars, regional |
| YPD_{R} | Personal Disposable Income, billions of dollars, regional |
| YPDR_{R} | Real Personal Disposable Income, billions of 2000 dollars, regional |
| YPDRZNP_{R} | Real Per Capita Personal Disposable Income, billions of 2000 dollars, regional |
| YPOTH_{R} | Other Personal Income, billions of dollars, regional |

Model description is in Chapter 7. Codes and descriptions of the regions are in Table B9.

### *Exogenous Variables*:

| | |
|---|---|
| CPI | Consumer Price Index, all urban, 1982-84=1.0, national |
| CPIZ_{R} | Regional Consumer Price Index Relative to National, 2006:3 value, regional |
| GDPR | Real Gross Domestic Product, billions of 2000 dollars, national |
| JECIWSP | Employment Cost Index, private-sector wages and salaries, Dec. 2005 = 1.0, national |
| JPC | Consumption Deflator, index – 2000=100, national |
| JPC_REL_{R} | Regional Consumption Deflator Relative to National, 2006:3 value, regional |
| MHRSNFP | Manhours in Private Nonfarm establishments, billions of hours, national |
| NP | Population, millions, national |
| NP_{R} | Population, millions, regional |

### *Exogenous Variables* continued:

| | |
|---|---|
| TAXRATE_REL_{R} | Regional Personal Income Tax Rate Relative to National, 2006:3 value, regional |
| YP | Personal Income, billions of dollars, national |
| YPCOMPWSD | Wage and Salary Disbursements, billions of dollars, national |
| YPCOMPWSDG | Wage and Salary Disbursements by Government, billions of dollars, national |
| YPD | Personal Disposable Income, billions of dollars, national |
| YPDR | Real Personal Disposable Income, billions of 2000 dollars, national |
| YPOTH | Other Personal Income, billions of dollars, national |

## *Equations:*

**CPI – Consumer Price Index**

CPI_{R} = (CPI_{R}$_{2006:3}$ / CPI$_{2006:3}$) * CPI

**GDPRZNP – Real Per Capita Gross Domestic Product**

GDPRZN = GDPR / NP

**GSPR – Real Gross State Product**

GSPR_{R} = GSPRZNP_{R} * NP_{R}

**GSPRZNP – Real Per Capita Gross State Product**

LOG(GSPRZNP_ENC/GDPRZN) = 0.990980265941*LOG(GSPRZNP_ENC(-1)/GDPRZN(-1))

LOG(GSPRZNP_ESC/GDPRZN) = 1.46680323263*LOG(GSPRZNP_ESC(-1)/GDPRZN(-1)) - 0.469882275667*@MOVAV(LOG(GSPRZNP_ESC(-1)/GDPRZN(-1)),3)

LOG(GSPRZNP_MATL/GDPRZN) = 0.999086219543*LOG(GSPRZNP_MATL(-1)/GDPRZN(-1))

LOG(GSPRZNP_MTN/GDPRZN) = 0.976791431897*LOG(GSPRZNP_MTN(-1)/GDPRZN(-1))

LOG(GSPRZNP_NENG/GDPRZN) = 1.00328987914*LOG(GSPRZNP_NENG(-1)/GDPRZN(-1))

LOG(GSPRZNP_PAC/GDPRZN) = 1.41799319265*LOG(GSPRZNP_PAC(-1)/GDPRZN(-1)) - 0.428824328309*@MOVAV(LOG(GSPRZNP_PAC(-1)/GDPRZN(-1)),3)

LOG(GSPRZNP_SATL/GDPRZN) = 0.985440804896*LOG(GSPRZNP_SATL(-1)/GDPRZN(-1))

LOG(GSPRZNP_WNC/GDPRZN) = 0.980335366615*LOG(GSPRZNP_WNC(-1)/GDPRZN(-1))

LOG(GSPRZNP_WSC/GDPRZN) = 0.991168976096*LOG(GSPRZNP_WSC(-1)/GDPRZN(-1))

**RWM - Average Annual Manufacturing Wages**

DLOG(RWM_ENC) = 0.9918994315*DLOG(JECIWSP*32.77017/0.655828)

DLOG(RWM_ESC) = 1.177423224*DLOG(JECIWSP*24.72309/0.655828)

**RWM - Average Annual Manufacturing Wages continued**

DLOG(RWM_MATL) = 1.093366995*DLOG(JECIWSP*32.13984/0.655828)

DLOG(RWM_MTN) = 1.151344582*DLOG(JECIWSP*28.92599/0.655828)

DLOG(RWM_NENG) = 1.186916815*DLOG(JECIWSP*34.08982/0.655828)

DLOG(RWM_PAC) = 1.218011301*DLOG(JECIWSP*33.45153/0.655828)

DLOG(RWM_SATL) = 1.184572143*DLOG(JECIWSP*26.20303/0.655828)

DLOG(RWM_WNC) = 1.025059977*DLOG(JECIWSP*28.21410/0.655828)

DLOG(RWM_WSC) = 1.190098655*DLOG(JECIWSP*29.01802/0.655828)

**RWNM - Average Annual Non-Manufacturing Wages**

DLOG(RWNM_ENC) = 0.937690676136*DLOG(JECIWSP*29.03567/0.655828)

DLOG(RWNM_ESC) = 1.004856531*DLOG(JECIWSP*22.89468/0.655828)

DLOG(RWNM_MATL) = 0.903028812383*DLOG(JECIWSP*31.899385/0.655828)

DLOG(RWNM_MTN) = 0.957312469737*DLOG(JECIWSP*25.76705/0.655828)

DLOG(RWNM_NENG) = 0.978636335532*DLOG(JECIWSP*30.71001/0.655828)

DLOG(RWNM_PAC) = 0.929884205791*DLOG(JECIWSP*30.71001/0.655828)

DLOG(RWNM_SATL) = 1.06757679121*DLOG(JECIWSP*23.50618/0.655828)

DLOG(RWNM_WNC) = 1.00749148114*DLOG(JECIWSP*25.27567/0.655828)

DLOG(RWNM_WSC) = 1.24612881044*DLOG(JECIWSP*31.43247/0.655828)

**TAX – Personal Income Tax**

TAX = YP - YPD

**TAXRATE – Personal Income Tax Rate**

TAXRATE = TAX / YP

**YP – Personal Income**

YP_{R} = YPCOMPWSD_{R} + YPOTH_{R}

**YPCOMPWSD - Wage and Salary Disbursements**

YPCOMPWSD_{R} = YPCOMPWSDP_{R} + YPCOMPWSDG_{R}

**YPCOMPWSDG - Wage and Salary Disbursements by Government**

YPCOMPWSDG_{R} = YPCOMPWSDG * NP_{R} / NP

**YPCOMPWSDP - Wage and Salary Disbursements by Private Sector**

YPCOMPWSDP_{R} = 1.00247431731294 * (((JECIWSP * MHRSNFP) / (JECIWSP(-1) * MHRSNFP(-1)) * (YPCOMPWSD_{R}(-1) - YPCOMPWSDG_{R}(-1)) + (JECIWSP(-1) * MHRSNFP) / (JECIWSP(-2) * MHRSNFP(-1)) * (YPCOMPWSD_{R}(-1) - YPCOMPWSDG_{R}(-1))) / 2)

**YPD – Personal Disposable Income**

YPD_{R} = YP_{R} * (1 - (TAXRATE_REL_{R} * TAXRATE))

**YPDR – Real Personal Disposable Income**

YPDR_{R} = YPD_{R} / (JPC_REL_{R} * JPC)

**YPDRZNP – Real Per Capita Personal Disposable Income**

YPDRZNP_{R} = YPDR_{R} / NP_{R}

**YPOTH – Other Personal Income**

YPOTH_{R} = ((YPOTH_{R}(-1) / NP_{R}(-1)) * (YPOTH / NP) / (YPOTH(-1) / NP(-1))) * NP_{R}

# Regional Commercial Floorspace Model

## *Endogenous Variables*:

$Comflr_{ij}$ Commercial floorspace j, thousand square feet, Census Division i

The thirteen commercial floorspace types, j, are:

1. Stores - stores and restaurants
2. Warehouse - manufacturing and wholesale trade, public and federally-owned warehouses
3. Office - private, federal, and state and local offices
4. Automotive - auto service and parking garages
5. Manufacturing
6. Education - primary/secondary and higher education
7. Health - hospitals and nursing homes
8. Public - federal and state and local
9. Religious
10. Amusement
11. Miscellaneous, non-residential - transportation related and all other nec
12. Hotel - hotels and motels
13. Dormitories - educational and federally-owned (primarily military)

The nine Census Divisions, i, are:

1. New England
2. Middle Atlantic
3. South Atlantic
4. East North Central
5. East South Central
6. West North Central
7. West South Central
8. Mountain
9. Pacific

Model description is in Chapter 6.

## *Exogenous Variables*:

| | |
|---|---|
| COMFLR_REM_{R} | Commercial floorspace removals, thousand square feet, regional |
| COMFLR_STK_{R}_TREND | Commercial floorspace stock trend, thousand square feet, regional |
| CPI_{R} | Consumer price index, 1982-84=1.00, regional |
| GSPR_{R} | Real Gross State Product, billions of 2000 dollars, regional |
| NP_{R} | Population, millions, regional |
| RMCORPAAA | Yield on Aaa-rated corporate bonds, percent, national |
| YPDR_{R} | Real Personal Disposable Income, billions of 2000 dollars, |

regional

## *Equations:*

**AMUSE Amusement**

D(AMUSE_FLW_ENC) = 355.726653505 - 0.429805024902*D(AMUSE_FLW_ENC(-1)) + 0.177820004785*(@MEAN((AMUSE_FLW_ENC),"1970q1 1999q4")-(AMUSE_FLW_ENC(-1))) + 0.0013442668214*(AMUSE_STK_ENC_TREND-@MOVAV(AMUSE_STK_ENC,20)) + 230.066267084*D(YPDR_ENC/NP_ENC) - 49.7816184407*(RMCORPAAA-@PC((@MOVAV(CPI_ENC,3)))) + [AR(1)=-0.346024889565,AR(2)=-0.404691736677]

D(AMUSE_FLW_ESC) = 67.3569919431 - 0.0665611057578*D(AMUSE_FLW_ESC(-1)) + 0.231996661551*(@MEAN((AMUSE_FLW_ESC),"1970q1 1999q4")-(AMUSE_FLW_ESC(-1))) + 0.0110421730295*(AMUSE_STK_ESC_TREND-@MOVAV(AMUSE_STK_ESC,20)) + 19.7689160915*D(YPDR_ESC(-1)/NP_ESC(-1)) - 17.3028340271*(RMCORPAAA-@PC((@MOVAV(CPI_ESC,3)))) - 1408986.12496*D(AMUSE_STK_ESC(-1)/AMUSE_STK_SUM(-1))

D(AMUSE_FLW_MATL) = 265.696670075 - 0.127288790854*D(AMUSE_FLW_MATL(-1)) + 0.745482345876*(@MEAN((AMUSE_FLW_MATL),"1970q1 1999q4")-(AMUSE_FLW_MATL(-1))) + 0.0114060327473*(AMUSE_STK_MATL_TREND-@MOVAV(AMUSE_STK_MATL,20)) + 424.852730545*D(YPDR_MATL/NP_MATL) - 50.0638708367*(RMCORPAAA-@PC((@MOVAV(CPI_MATL,3))))

D(AMUSE_FLW_MTN) = -311.923567092 - 0.253842125118*D(AMUSE_FLW_MTN(-1)) + 0.643649704703*(@MEAN((AMUSE_FLW_MTN),"1970q1 1999q4")-(AMUSE_FLW_MTN(-1))) + 0.00442216883307*AMUSE_STK_MTN_TREND + 313.713476406*D(YPDR_MTN/NP_MTN) - 23.8076486777*(RMCORPAAA-@PC((@MOVAV(CPI_MTN,3))))

D(AMUSE_FLW_NENG) = 125.676019619 - 0.260368502905*D(AMUSE_FLW_NENG(-1)) + 0.663957107621*(@MEAN((AMUSE_FLW_NENG),"1970q1 1999q4")-(AMUSE_FLW_NENG(-1))) + 0.0226132162917*(AMUSE_STK_NENG_TREND-@MOVAV(AMUSE_STK_NENG,20)) - 26.1739070459*(RMCORPAAA-@PC((@MOVAV(CPI_NENG,3))))

D(AMUSE_FLW_PAC) = 202.377578977 - 0.149417360689*D(AMUSE_FLW_PAC(-1)) + 0.692470494172*(@MEAN((AMUSE_FLW_PAC),"1970q1 1999q4")-(AMUSE_FLW_PAC(-1))) + 0.00132060174595*AMUSE_STK_PAC_TREND + 55.1963302477*D(YPDR_PAC/NP_PAC) - 73.3737161829*(RMCORPAAA-@PC((@MOVAV(CPI_PAC,3))))

D(AMUSE_FLW_SATL) = -546.980266358 - 0.281626538016*D(AMUSE_FLW_SATL(-1)) + 0.484245864846*(@MEAN((AMUSE_FLW_SATL),"1970q1 1999q4")-(AMUSE_FLW_SATL(-1))) + 0.00267390194283*AMUSE_STK_SATL_TREND + 9.81615763695*D(YPDR_SATL(-1)/NP_SATL(-1)) - 45.6597865545*(RMCORPAAA-@PC((@MOVAV(CPI_SATL,3))))

D(AMUSE_FLW_WNC) = 238.269182499 - 0.085328423191*D(AMUSE_FLW_WNC(-1)) + 0.426229550268*(@MEAN((AMUSE_FLW_WNC),"1970q1 1999q4")-(AMUSE_FLW_WNC(-1))) + 0.00934248488092*(AMUSE_STK_WNC_TREND-@MOVAV(AMUSE_STK_WNC,20)) - 35.8156713483*(RMCORPAAA-@PC((@MOVAV(CPI_WNC,3)))) - 1042732.11267*D(AMUSE_STK_WNC(-1)/AMUSE_STK_SUM(-1))

D(AMUSE_FLW_WSC) = -960.904202509 - 0.0087163111197*D(AMUSE_FLW_WSC(-1)) + 0.808155929898*(@MEAN((AMUSE_FLW_WSC),"1970q1 1999q4")-(AMUSE_FLW_WSC(-1))) + 0.0854478361149*(AMUSE_STK_WSC_TREND-@MOVAV(AMUSE_STK_WSC,20)) + 267.395506897*D(YPDR_WSC(-1)/NP_WSC(-1))

**AUTO Automotive; auto service and parking garages**

D(AUTO_FLW_ENC) = 504.089512399 - 0.204662318584*D(AUTO_FLW_ENC(-1)) + 0.507562062356*(@MEAN((AUTO_FLW_ENC),"1970q1 1999q4")-(AUTO_FLW_ENC(-1))) + 0.0231210078016*(AUTO_STK_ENC_TREND-@MOVAV(AUTO_STK_ENC,20)) + 647.30133162*D(YPDR_ENC(-1)/NP_ENC(-1)) - 106.687268664*(RMCORPAAA-@PC((@MOVAV(CPI_ENC,3))))

D(AUTO_FLW_ESC) = 50.7215497322 - 0.417559349572*D(AUTO_FLW_ESC(-1)) + 0.190728534849*(@MEAN((AUTO_FLW_ESC),"1970q1 1999q4")-(AUTO_FLW_ESC(-1))) + 0.000193728374547*(AUTO_STK_ESC_TREND-@MOVAV(AUTO_STK_ESC,20)) + 776.83316964*D(YPDR_ESC(-1)/NP_ESC(-1)) - 12.3768935924*(RMCORPAAA-@PC((@MOVAV(CPI_ESC,3)))) + [AR(1)=-0.228120277191,AR(2)=-0.397910030629]

D(AUTO_FLW_MATL) = 434.70993284 - 0.184703542705*D(AUTO_FLW_MATL(-1)) + 0.671015333291*(@MEAN((AUTO_FLW_MATL),"1970q1 1999q4")-(AUTO_FLW_MATL(-1))) + 0.00756890616693*(AUTO_STK_MATL_TREND-@MOVAV(AUTO_STK_MATL,20)) + 45.1309199751*D(YPDR_MATL(-1)/NP_MATL(-1)) - 52.9924313767*(RMCORPAAA-@PC((@MOVAV(CPI_MATL,3))))

D(AUTO_FLW_MTN) = 287.522102755 + 0.571032900686*D(AUTO_FLW_MTN(-1)) + 0.116941069142*(@MEAN((AUTO_FLW_MTN),"1970q1 1999q4")-(AUTO_FLW_MTN(-1))) + 0.00507534459778*(AUTO_STK_MTN_TREND-@MOVAV(AUTO_STK_MTN,20)) - 18345.7153678*D(AUTO_FLW_MTN(-1)/AUTO_FLW_SUM(-1)) + 491.68430539*D(YPDR_MTN/NP_MTN) - 43.0825467368*(RMCORPAAA-@PC((@MOVAV(CPI_MTN,3)))) + [AR(1)=-0.409936317514,AR(2)=-0.394300146048,AR(3)=-0.300295556753]

D(AUTO_FLW_NENG) = 432.367074946 - 0.0249761306786*D(AUTO_FLW_NENG(-1)) + 0.764861916993*(@MEAN((AUTO_FLW_NENG),"1970q1 1999q4")-(AUTO_FLW_NENG(-1))) + 0.0637845341741*(AUTO_STK_NENG_TREND-@MOVAV(AUTO_STK_NENG,20)) + 672.523293762*D(YPDR_NENG/NP_NENG) - 101.665926615*(RMCORPAAA-@PC((@MOVAV(CPI_NENG,3))))

D(AUTO_FLW_PAC) = 397.306670439 - 0.272954975057*D(AUTO_FLW_PAC(-1)) + 0.276594527046*(@MEAN((AUTO_FLW_PAC),"1970q1 1999q4")-(AUTO_FLW_PAC(-1))) + 0.00886480141746*(AUTO_STK_PAC_TREND-@MOVAV(AUTO_STK_PAC,20)) + 27.2075404826*D(YPDR_PAC(-1)/NP_PAC(-1)) - 68.5905532305*(RMCORPAAA-@PC((@MOVAV(CPI_PAC,3))))

D(AUTO_FLW_SATL) = -3.16507282611 - 0.179845423853*D(AUTO_FLW_SATL(-1)) + 0.0674408663375*(@MEAN((AUTO_FLW_SATL),"1970q1 1999q4")-(AUTO_FLW_SATL(-1))) + 0.00351750812842*(AUTO_STK_SATL_TREND-AUTO_STK_SATL(-1)) + 1344.2139481*D(YPDR_SATL(-1)/NP_SATL(-1)) - 19.3059424235*(RMCORPAAA-@PC((@MOVAV(CPI_SATL,3)))) + 695.57256491*AUTO_FLW_SATL_DUM + [AR(1)=-0.488513297596,AR(2)=-0.175354768735]

D(AUTO_FLW_WNC) = 836.201356656 - 0.0322566916186*D(AUTO_FLW_WNC(-1)) + 0.802059078864*(@MEAN((AUTO_FLW_WNC),"1970q1 1999q4")-(AUTO_FLW_WNC(-1))) + 0.032601615945*(AUTO_STK_WNC_TREND-@MOVAV(AUTO_STK_WNC,20)) + 797.92034955*D(YPDR_WNC(-1)/NP_WNC(-1)) - 133.508589522*(RMCORPAAA-@PC((@MOVAV(CPI_WNC,3))))

D(AUTO_FLW_WSC) = -502.948877939 - 0.206577140951*D(AUTO_FLW_WSC(-1)) + 0.30278878999*(@MEAN((AUTO_FLW_WSC),"1970q1 1999q4")-(AUTO_FLW_WSC(-1))) + 0.0292586214043*(AUTO_STK_WSC_TREND-@MOVAV(AUTO_STK_WSC,20)) + 781.630821642*D(YPDR_WSC/NP_WSC)

**DORM Dormitories; educational and federally-owned (primarily military)**

D(DORM_FLW_ENC) = -9.9964728471 + 0.265051434034*D(DORM_FLW_ENC(-1)) + 1.67804161158*(@MEAN((DORM_FLW_ENC),"1970q1 1999q4")-(DORM_FLW_ENC(-1))) + 0.110189883729*(DORM_STK_ENC_TREND-@MOVAV(DORM_STK_ENC,20)) + 0.0169314199601*D(EDUC_STK_ENC(-1)) + 161.609071943*D(YPDR_ENC/NP_ENC) - 16.2817411723*(RMCORPAAA-@PC((@MOVAV(CPI_ENC,3)))) + [AR(1)=0.472025340077]

D(DORM_FLW_ESC) = -38.7398165278 + 0.0383004574592*D(DORM_FLW_ESC(-1)) + 1.08392409768*(@MEAN((DORM_FLW_ESC),"1970q1 1999q4")-(DORM_FLW_ESC(-1))) + 0.0299346287015*(DORM_STK_ESC_TREND-@MOVAV(DORM_STK_ESC,20)) + 0.0142259852881*D(EDUC_STK_ESC(-1)) + 2.70332399528*YPDR_ESC(-1)/NP_ESC(-1) - 7.75226237627*(RMCORPAAA-@PC((@MOVAV(CPI_ESC,3))))

D(DORM_FLW_MATL) = -368.093547863 + 0.064960310738*D(DORM_FLW_MATL(-1)) + 0.979973326159*(@MEAN((DORM_FLW_MATL),"1970q1 1999q4")-(DORM_FLW_MATL(-1))) + 0.0657162829237*(DORM_STK_MATL_TREND-@MOVAV(DORM_STK_MATL,20)) + 0.018130425415*D(EDUC_STK_MATL(-1)) + 13.3684088388*YPDR_MATL(-1)/NP_MATL(-1) - 10.5859556756*(RMCORPAAA-@PC((@MOVAV(CPI_MATL,3))))

D(DORM_FLW_MTN) = -136.351451211 + 0.208162738615*D(DORM_FLW_MTN(-1)) + 0.858783985604*(@MEAN((DORM_FLW_MTN),"1970q1 1999q4")-(DORM_FLW_MTN(-1))) + 0.0869732185579*(DORM_STK_MTN_TREND-@MOVAV(DORM_STK_MTN,20)) + 0.0215295488588*D(EDUC_STK_MTN(-1)) - 572051.345349*D(DORM_STK_MTN(-1)/SUM_STK_MTN(-1))

D(DORM_FLW_NENG) = -2.68074519252 + 0.0447014746591*D(DORM_FLW_NENG(-1)) + 1.08134697588*(@MEAN((DORM_FLW_NENG),"1970q1 1999q4")-(DORM_FLW_NENG(-1))) + 0.0750061576382*(DORM_STK_NENG_TREND-@MOVAV(DORM_STK_NENG,20)) + 0.0269550019291*D(EDUC_STK_NENG(-1)) + 92.9520106123*D(YPDR_NENG(-1)/NP_NENG(-1)) - 11.7053660122*(RMCORPAAA-@PC((@MOVAV(CPI_NENG,3))))

D(DORM_FLW_PAC) = 28.0896269793 + 0.0367192911217*D(DORM_FLW_PAC(-1)) + 1.03371245518*(@MEAN((DORM_FLW_PAC),"1970q1 1999q4")-(DORM_FLW_PAC(-1))) + 0.0937916386044*(DORM_STK_PAC_TREND-@MOVAV(DORM_STK_PAC,20)) + 0.00640700997231*D(EDUC_STK_PAC(-1)) + 55.718473278*D(YPDR_PAC/NP_PAC) - 6.85155039718*(RMCORPAAA-@PC((@MOVAV(CPI_PAC,3))))

D(DORM_FLW_SATL) = 4.77785379506 + 0.121659490874*D(DORM_FLW_SATL(-1)) + 1.21447960224*(@MEAN((DORM_FLW_SATL),"1970q1 1999q4")-(DORM_FLW_SATL(-1))) + 0.0598449749076*(DORM_STK_SATL_TREND-@MOVAV(DORM_STK_SATL,20)) + 0.0194511962356*D(EDUC_STK_SATL(-1)) + 279.699765334*D(YPDR_SATL(-1)/NP_SATL(-1)) - 41.4569285991*(RMCORPAAA-@PC((@MOVAV(CPI_SATL,3))))

D(DORM_FLW_WNC) = 118.569176382 - 0.135991295337*D(DORM_FLW_WNC(-1)) + 0.974602190068*(@MEAN((DORM_FLW_WNC),"1970q1 1999q4")-(DORM_FLW_WNC(-1))) + 0.0398767712733*(DORM_STK_WNC_TREND-@MOVAV(DORM_STK_WNC,20)) + 0.000773301048989*D(EDUC_STK_WNC) + 30.9586233631*D(YPDR_WNC(-1)/NP_WNC(-1)) - 17.6594175465*(RMCORPAAA-@PC((@MOVAV(CPI_WNC,3))))

D(DORM_FLW_WSC) = -63.6550020539 + 0.00287415271543*D(DORM_FLW_WSC(-1)) + 0.919073066469*(@MEAN((DORM_FLW_WSC),"1970q1 1999q4")-(DORM_FLW_WSC(-1))) + 0.0179242021953*(DORM_STK_WSC_TREND-@MOVAV(DORM_STK_WSC,20)) + 0.0114738249723*D(EDUC_STK_WSC(-1)) + 168.130621448*D(YPDR_WSC(-1)/NP_WSC(-1)) - 11.8707857885*(RMCORPAAA-@PC((@MOVAV(CPI_WSC,3)))) - 768755.192121*D(DORM_STK_WSC(-1)/SUM_STK_WSC(-1))

**EDUC Education; primary/secondary and higher education**

D(EDUC_FLW_ENC) = 332.977493344 - 0.383268027415*D(EDUC_FLW_ENC(-1)) + 0.0919058679277*(@MEAN((EDUC_FLW_ENC),"1970q1 1999q4")-(EDUC_FLW_ENC(-1))) + 0.00563960678724*(EDUC_STK_ENC_TREND-@MOVAV(EDUC_STK_ENC,20)) + 1058.2299405*D(YPDR_ENC/NP_ENC) - 71.7674754224*(RMCORPAAA-@PC((@MOVAV(CPI_ENC,3)))) + [AR(1)=-0.0303450439651,AR(2)=-0.4966996052,AR(3)=-0.121737985886]

D(EDUC_FLW_ESC) = -122.279213479 - 0.256669391349*D(EDUC_FLW_ESC(-1)) + 0.439114688258*(@MEAN((EDUC_FLW_ESC),"1970q1 1999q4")-(EDUC_FLW_ESC(-1))) + 0.0235395714234*(EDUC_STK_ESC_TREND-@MOVAV(EDUC_STK_ESC,40)) + 744.605025723*D(YPDR_ESC(-1)/NP_ESC(-1)) - 77.6221460253*(RMCORPAAA-@PC((@MOVAV(CPI_ESC,3))))

D(EDUC_FLW_MATL) = -66.550074994 - 0.242877935481*D(EDUC_FLW_MATL(-1)) + 0.187069931269*(@MEAN((EDUC_FLW_MATL),"1970q1 1999q4")-(EDUC_FLW_MATL(-1))) + 0.00889074977921*(EDUC_STK_MATL_TREND-@MOVAV(EDUC_STK_MATL,20)) + 177.037075407*D(YPDR_MATL(-1)/NP_MATL(-1)) - 23.2528545526*(RMCORPAAA-@PC((@MOVAV(CPI_MATL,3)))) + [AR(1)=-0.311477015398,AR(2)=-0.292930987074]

D(EDUC_FLW_MTN) = 987.493332953 + 0.0773630634174*D(EDUC_FLW_MTN(-1)) + 0.612212180064*(@MEAN((EDUC_FLW_MTN),"1970q1 1999q4")-(EDUC_FLW_MTN(-1))) - 0.00516894883966*(EDUC_STK_MTN_TREND-@MOVAV(EDUC_STK_MTN,20)) + 804.988913729*D(YPDR_MTN(-1)/NP_MTN(-1)) - 112.122431459*(RMCORPAAA-@PC((@MOVAV(CPI_MTN,3))))

D(EDUC_FLW_NENG) = 59.2110719998 - 0.320386693353*D(EDUC_FLW_NENG(-1)) + 0.190835601435*(@MEAN((EDUC_FLW_NENG),"1970q1 1999q4")-(EDUC_FLW_NENG(-1))) + 0.0111021588635*(EDUC_STK_NENG_TREND-@MOVAV(EDUC_STK_NENG,20)) + 152.683221793*D(YPDR_NENG/NP_NENG) - 26.9749671709*(RMCORPAAA-@PC((@MOVAV(CPI_NENG,3)))) + [AR(1)=-0.11707284321,AR(2)=-0.298271948453]

D(EDUC_FLW_PAC) = 756.586998321 - 0.034123653888*D(EDUC_FLW_PAC(-1)) + 0.442705294778*(@MEAN((EDUC_FLW_PAC),"1970q1 1999q4")-(EDUC_FLW_PAC(-1))) + 0.0177444898098*(EDUC_STK_PAC_TREND-@MOVAV(EDUC_STK_PAC,20)) + 364.155121691*D(YPDR_PAC(-1)/NP_PAC(-1)) - 156.230172026*(RMCORPAAA-@PC((@MOVAV(CPI_PAC,3))))

D(EDUC_FLW_SATL) = 238.166302982 - 0.602673779499*D(EDUC_FLW_SATL(-1)) + 0.0670791056333*(@MEAN((EDUC_FLW_SATL),"1970q1 1999q4")-(EDUC_FLW_SATL(-1))) + 0.00710265875463*(EDUC_STK_SATL_TREND-@MOVAV(EDUC_STK_SATL,20)) + 396.569259604*D(YPDR_SATL(-1)/NP_SATL(-1)) - 75.1769050709*(RMCORPAAA-@PC((@MOVAV(CPI_SATL,3)))) + [AR(1)=-0.0143977239657,AR(2)=-0.528786625249]

D(EDUC_FLW_WNC) = 136.840378421 - 0.600827565444*D(EDUC_FLW_WNC(-1)) + 0.12651491658*(@MEAN((EDUC_FLW_WNC),"1970q1 1999q4")-(EDUC_FLW_WNC(-1))) + 0.00873483643923*(EDUC_STK_WNC_TREND-@MOVAV(EDUC_STK_WNC,20)) + 218.959946903*D(YPDR_WNC/NP_WNC) - 38.8518768924*(RMCORPAAA-@PC((@MOVAV(CPI_WNC,3)))) + [AR(1)=-0.104207584584,AR(2)=-0.464671983585]

D(EDUC_FLW_WSC) = 438.650928964 - 0.463913164052*D(EDUC_FLW_WSC(-1)) + 0.137797264893*(@MEAN((EDUC_FLW_WSC),"1970q1 1999q4")-(EDUC_FLW_WSC(-1))) + 0.00220394706206*(EDUC_STK_WSC_TREND-@MOVAV(EDUC_STK_WSC,20)) - 57.7327893591*(RMCORPAAA-@PC((@MOVAV(CPI_WSC,3)))) + [AR(1)=-0.0737976352137,AR(2)=-0.477908691443]

**HEALTH Health; hospitals and nursing homes**

D(HEALTH_FLW_ENC) = 10.2229122592 - 0.0908536643354*D(HEALTH_FLW_ENC(-1)) + 0.261583855523*(@MEAN((HEALTH_FLW_ENC),"1970q1 1999q4")-(HEALTH_FLW_ENC(-1))) + 0.00428527072724*(HEALTH_STK_ENC_TREND-@MOVAV(HEALTH_STK_ENC,20)) + 1102.70733964*D(YPDR_ENC(-1)/NP_ENC(-1)) - 27.2575825235*(RMCORPAAA-@PC((@MOVAV(CPI_ENC,3)))) + [AR(1)=-0.421126266893,AR(2)=-0.442923547176,AR(3)=-0.172127808964]

D(HEALTH_FLW_ESC) = 86.5378531382 + 0.12343188848*D(HEALTH_FLW_ESC(-1)) + 0.335843581032*(@MEAN((HEALTH_FLW_ESC),"1970q1 1999q4")-(HEALTH_FLW_ESC(-1))) + 0.00526566311649*(HEALTH_STK_ESC_TREND-@MOVAV(HEALTH_STK_ESC,20)) + 73.7759421711*D(YPDR_ESC(-1)/NP_ESC(-1)) - 17.0245441341*(RMCORPAAA-@PC((@MOVAV(CPI_ESC,3)))) + [AR(1)=-0.720217896205,AR(2)=-0.432785498176]

D(HEALTH_FLW_MATL) = 51.7819288176 + 0.043005359072*D(HEALTH_FLW_MATL(-1)) + 0.950034769721*(@MEAN((HEALTH_FLW_MATL),"1970q1 1999q4")-(HEALTH_FLW_MATL(-1))) + 0.0178437735792*(HEALTH_STK_MATL_TREND-@MOVAV(HEALTH_STK_MATL,20)) + 159.196251419*D(YPDR_MATL/NP_MATL) - 64.934230344*(RMCORPAAA-@PC((@MOVAV(CPI_MATL,3))))

D(HEALTH_FLW_MTN) = -45.3219802842 - 0.461908284012*D(HEALTH_FLW_MTN(-1)) + 0.157124819158*(@MEAN((HEALTH_FLW_MTN),"1970q1 1999q4")-(HEALTH_FLW_MTN(-1))) + 0.0180039940982*(HEALTH_STK_MTN_TREND-@MOVAV(HEALTH_STK_MTN,20)) + 554.159466776*D(YPDR_MTN/NP_MTN) - 17.0611920456*(RMCORPAAA-@PC((@MOVAV(CPI_MTN,3)))) + [AR(1)=-0.318021487613,AR(2)=-0.28752466603]

D(HEALTH_FLW_NENG) = 203.284354928 - 0.274261191952*D(HEALTH_FLW_NENG(-1)) + 0.578034212637*(@MEAN((HEALTH_FLW_NENG),"1970q1 1999q4")-(HEALTH_FLW_NENG(-1))) + 0.0148410297295*(HEALTH_STK_NENG_TREND-@MOVAV(HEALTH_STK_NENG,20)) - 37.5078648331*(RMCORPAAA-@PC((@MOVAV(CPI_NENG,3))))

D(HEALTH_FLW_PAC) = -449.085195399 - 0.25454729476*D(HEALTH_FLW_PAC(-1)) + 0.330682166123*(@MEAN((HEALTH_FLW_PAC),"1970q1 1999q4")-(HEALTH_FLW_PAC(-1))) + 0.0290539612121*(HEALTH_STK_PAC_TREND-@MOVAV(HEALTH_STK_PAC,20)) + 10.526637831*YPDR_PAC(-1)/NP_PAC(-1) - 39.651614697*(RMCORPAAA-@PC((@MOVAV(CPI_PAC,3)))) + [AR(1)=-0.198154735461,AR(2)=-0.454758488342]

D(HEALTH_FLW_SATL) = -50.5174868458 - 0.464337306451*D(HEALTH_FLW_SATL(-1)) + 0.125543376746*(@MEAN((HEALTH_FLW_SATL),"1970q1 1999q4")-(HEALTH_FLW_SATL(-1))) + 0.0107540638648*(HEALTH_STK_SATL_TREND-@MOVAV(HEALTH_STK_SATL,20)) + 1054.27572566*D(YPDR_SATL/NP_SATL) - 44.7612250839*(RMCORPAAA-@PC((@MOVAV(CPI_SATL,3)))) + [AR(1)=-0.00763896843654,AR(2)=-0.376087127573]

D(HEALTH_FLW_WNC) = -651.151503009 - 0.0949045817139*D(HEALTH_FLW_WNC(-1)) + 0.885274684309*(@MEAN((HEALTH_FLW_WNC),"1970q1 1999q4")-(HEALTH_FLW_WNC(-1))) + 0.0591579263724*(HEALTH_STK_WNC_TREND-@MOVAV(HEALTH_STK_WNC,20)) + 343.471139111*D(YPDR_WNC(-1)/NP_WNC(-1))

D(HEALTH_FLW_WSC) = -356.795528561 - 0.199890608566*D(HEALTH_FLW_WSC(-1)) + 0.513211335042*(@MEAN((HEALTH_FLW_WSC),"1970q1 1999q4")-(HEALTH_FLW_WSC(-1))) + 0.0460592686197*(HEALTH_STK_WSC_TREND-@MOVAV(HEALTH_STK_WSC,20)) + 136.104695714*D(YPDR_WSC(-1)/NP_WSC(-1)) - 54.7430050239*(RMCORPAAA-@PC((@MOVAV(CPI_WSC,3))))

**HOTEL Hotel; hotels and motels**

D(HOTEL_FLW_ENC) = -819.916403896 - 0.0926708520314*D(HOTEL_FLW_ENC(-1)) + 0.734710137503*(@MEAN((HOTEL_FLW_ENC),"1970q1 1999q4")-(HOTEL_FLW_ENC(-1))) + 0.12445654278*(HOTEL_STK_ENC_TREND-@MOVAV(HOTEL_STK_ENC,20)) + 9.43931940326*YPDR_ENC(-1)/NP_ENC(-1) - 118.213054803*(RMCORPAAA-@PC((@MOVAV(CPI_ENC,3))))

D(HOTEL_FLW_ESC) = -479.003963356 - 0.191881486388*D(HOTEL_FLW_ESC(-1)) + 0.254762701444*(@MEAN((HOTEL_FLW_ESC),"1970q1 1999q4")-(HOTEL_FLW_ESC(-1))) + 0.0293089330909*(HOTEL_STK_ESC_TREND-@MOVAV(HOTEL_STK_ESC,20)) + 21.3130017722*YPDR_ESC(-1)/NP_ESC(-1) - 6.93152849016*(RMCORPAAA-@PC((@MOVAV(CPI_ESC,3)))) + [AR(1)=-0.345352488232,AR(2)=-0.30069834016]

D(HOTEL_FLW_MATL) = 114.140217204 - 0.13607031518*D(HOTEL_FLW_MATL(-1)) + 0.124216884156*(@MEAN((HOTEL_FLW_MATL),"1970q1 1999q4")-(HOTEL_FLW_MATL(-1))) + 0.0183445466514*(HOTEL_STK_MATL_TREND-HOTEL_STK_MATL(-1)) - 62.7332015127*D(YPDR_MATL/NP_MATL) - 15.5036919327*(RMCORPAAA-@PC((@MOVAV(CPI_MATL,3)))) + [AR(1)=-0.611255638416,AR(2)=-0.338041902313]

D(HOTEL_FLW_MTN) = 315.539407125 - 0.202159363091*D(HOTEL_FLW_MTN(-1)) + 0.390225565956*(@MEAN((HOTEL_FLW_MTN),"1970q1 1999q4")-(HOTEL_FLW_MTN(-1))) + 0.0146408483248*(HOTEL_STK_MTN_TREND(-1)-@MOVAV(HOTEL_STK_MTN,12)) - 46.4510916497*(RMCORPAAA-@PC((@MOVAV(CPI_MTN,3))))

D(HOTEL_FLW_NENG) = 20.7113320428 - 0.279858284432*D(HOTEL_FLW_NENG(-1)) + 0.521223908277*(@MEAN((HOTEL_FLW_NENG),"1970q1 1999q4")-(HOTEL_FLW_NENG(-1))) + 0.0593353273792*(HOTEL_STK_NENG_TREND-@MOVAV(HOTEL_STK_NENG,20)) + 144.943215837*D(YPDR_NENG(-1)/NP_NENG(-1)) - 33.1635955046*(RMCORPAAA-@PC((@MOVAV(CPI_NENG,3))))

D(HOTEL_FLW_PAC) = -102.336478109 - 0.281974640098*D(HOTEL_FLW_PAC(-1)) + 0.172466804361*(@MEAN((HOTEL_FLW_PAC),"1970q1 1999q4")-(HOTEL_FLW_PAC(-1))) + 0.0233850613192*(HOTEL_STK_PAC_TREND-@MOVAV(HOTEL_STK_PAC,20)) + 69.8238897534*D(YPDR_PAC(-1)/NP_PAC(-1)) - 43.6886957843*(RMCORPAAA-@PC((@MOVAV(CPI_PAC,3)))) + [AR(1)=-0.23379800684,AR(2)=-0.341176916609]

D(HOTEL_FLW_SATL) = -87.1948064699 - 0.409043133183*D(HOTEL_FLW_SATL(-1)) + 0.370457727238*(@MEAN((HOTEL_FLW_SATL),"1970q1 1999q4")-(HOTEL_FLW_SATL(-1))) + 0.0643772131002*(HOTEL_STK_SATL_TREND-@MOVAV(HOTEL_STK_SATL,20)) + 348.427882435*D(YPDR_SATL(-1)/NP_SATL(-1)) - 216.87272421*(RMCORPAAA-@PC((@MOVAV(CPI_SATL,3))))

D(HOTEL_FLW_WNC) = -404.160803581 + 0.123005770092*D(HOTEL_FLW_WNC(-1)) + 0.43425385813*(@MEAN((HOTEL_FLW_WNC),"1970q1 1999q4")-(HOTEL_FLW_WNC(-1))) + 0.0667189066016*(HOTEL_STK_WNC_TREND-@MOVAV(HOTEL_STK_WNC,20)) + 158.698743156*D(YPDR_WNC(-1)/NP_WNC(-1)) - 4.09571330428*(RMCORPAAA-@PC((@MOVAV(CPI_WNC,3)))) + [AR(1)=-0.620067263286,AR(2)=-0.250165909164]

D(HOTEL_FLW_WSC) = -306.696608715 - 0.524321192249*D(HOTEL_FLW_WSC(-1)) + 0.172404138717*(@MEAN((HOTEL_FLW_WSC),"1970q1 1999q4")-(HOTEL_FLW_WSC(-1))) + 0.0245357598084*(HOTEL_STK_WSC_TREND-@MOVAV(HOTEL_STK_WSC,20)) + 393.771484627*D(YPDR_WSC/NP_WSC) + [AR(1)=-0.00394571792493,AR(2)=-0.194478943553]

**MFG Manufacturing**

D(MFG_FLW_ENC) = -1028.03321784 - 0.471920640663*D(MFG_FLW_ENC(-1)) + 0.497735664763*(@MEAN((MFG_FLW_ENC),"1970q1 1999q4")-(MFG_FLW_ENC(-1))) + 0.0201684112526*(MFG_STK_ENC_TREND-@MOVAV(MFG_STK_ENC,20)) + 98.757661244*YPDR_ENC(-1)/NP_ENC(-1) - 198.544110086*(RMCORPAAA-@PC((@MOVAV(CPI_ENC,3)))) + [AR(1)=0.40542915658,AR(2)=-0.389781671535,AR(3)=0.360589575476]

D(MFG_FLW_ESC) = -501.596979526 - 0.172449648534*D(MFG_FLW_ESC(-1)) + 0.484993042555*(@MEAN((MFG_FLW_ESC),"1970q1 1999q4")-(MFG_FLW_ESC(-1))) + 0.0345425209521*(MFG_STK_ESC_TREND-@MOVAV(MFG_STK_ESC,20)) + 357.397888521*D(YPDR_ESC(-1)/NP_ESC(-1)) - 3.85125906653*(RMCORPAAA-@PC((@MOVAV(CPI_ESC,3))))

D(MFG_FLW_MATL) = -881.05145672 - 0.138478056082*D(MFG_FLW_MATL(-1)) + 0.248638694048*(@MEAN((MFG_FLW_MATL),"1970q1 1999q4")-(MFG_FLW_MATL(-1))) + 0.00579331881399*(MFG_STK_MATL_TREND-@MOVAV(MFG_STK_MATL,12)) - 2602241.25366*D(MFG_STK_MATL(-1)/MFG_STK_SUM(-1))

D(MFG_FLW_MTN) = 604.72790726 + 0.0209710710827*D(MFG_FLW_MTN(-1)) - 0.119275852959*(@MEAN((MFG_FLW_MTN),"1970q1 1999q4")-(MFG_FLW_MTN(-1))) + 0.0350581951848*(MFG_STK_MTN_TREND-@MOVAV(MFG_STK_MTN,20)) - 11608837.121*D(MFG_STK_MTN(-1)/MFG_STK_SUM(-1))

D(MFG_FLW_NENG) = -42.8731914421 - 0.140386235684*D(MFG_FLW_NENG(-1)) + 0.107723381456*(@MEAN((MFG_FLW_NENG),"1970q1 1999q4")-(MFG_FLW_NENG(-1))) + 0.00730442784556*(MFG_STK_NENG_TREND-@MOVAV(MFG_STK_NENG,20)) + 201.448504209*D(YPDR_NENG(-1)/NP_NENG(-1)) + [AR(1)=-0.60793397738,AR(2)=-0.459136418495]

D(MFG_FLW_PAC) = -108.879322703 - 0.361608886895*D(MFG_FLW_PAC(-1)) + 0.135267150774*(@MEAN((MFG_FLW_PAC),"1970q1 1999q4")-(MFG_FLW_PAC(-1))) + 0.00568081998076*(MFG_STK_PAC_TREND-@MOVAV(MFG_STK_PAC,20)) + 577.692187572*D(YPDR_PAC(-1)/NP_PAC(-1)) - 15.7585115361*(RMCORPAAA-@PC((@MOVAV(CPI_PAC,3))))

D(MFG_FLW_SATL) = -5.65308081709 - 0.151790948521*D(MFG_FLW_SATL(-1)) + 0.16454732454*(@MEAN((MFG_FLW_SATL),"1970q1 1999q4")-(MFG_FLW_SATL(-1))) + 0.0380350483848*(MFG_STK_SATL_TREND-@MOVAV(MFG_STK_SATL,12)) - 7632374.85693*D(MFG_STK_SATL(-1)/MFG_STK_SUM(-1))

D(MFG_FLW_WNC) = -202.332395033 - 0.364458944378*D(MFG_FLW_WNC(-1)) + 0.112806718761*(@MEAN((MFG_FLW_WNC),"1970q1 1999q4")-(MFG_FLW_WNC(-1))) + 0.027273302009*(MFG_STK_WNC_TREND-@MOVAV(MFG_STK_WNC,20)) - 6256605.21112*D(MFG_STK_WNC(-1)/MFG_STK_SUM(-1)) + [AR(1)=0.140179811373,AR(2)=-0.467220917637,AR(3)=0.0356285470597,AR(4)=-0.195513312546]

D(MFG_FLW_WSC) = 147.116833399 - 0.46792688115*D(MFG_FLW_WSC(-1)) - 0.179850363939*(@MEAN((MFG_FLW_WSC),"1970q1 1999q4")-(MFG_FLW_WSC(-1))) + 0.0102945990699*(MFG_STK_WSC_TREND-@MOVAV(MFG_STK_WSC,20)) - 7073709.76715*D(MFG_STK_WSC(-1)/MFG_STK_SUM(-1))

**MISCNR Miscellaneous, non-residential transportation related and all other nec**

D(MISCNR_FLW_ENC) = -283.084889351 - 0.269918247594*D(MISCNR_FLW_ENC(-1)) + 0.439963157153*(@MEAN((MISCNR_FLW_ENC),"1970q1 1999q4")-(MISCNR_FLW_ENC(-1))) + 0.0191185520414*(MISCNR_STK_ENC_TREND-@MOVAV(MISCNR_STK_ENC,20))

D(MISCNR_FLW_ESC) = -140.437857377 - 0.159673752443*D(MISCNR_FLW_ESC(-1)) + 0.598202262434*(@MEAN((MISCNR_FLW_ESC),"1970q1 1999q4")-(MISCNR_FLW_ESC(-1))) + 0.0301163552085*(MISCNR_STK_ESC_TREND-@MOVAV(MISCNR_STK_ESC,20))

D(MISCNR_FLW_MATL) = -247.029437114 - 0.303896226616*D(MISCNR_FLW_MATL(-1)) + 0.618297108007*(@MEAN((MISCNR_FLW_MATL),"1970q1 1999q4")-(MISCNR_FLW_MATL(-1))) + 0.018254445287*(MISCNR_STK_MATL_TREND-@MOVAV(MISCNR_STK_MATL,20)) + 226.727316396*D(YPDR_MATL(-1)/NP_MATL(-1))

D(MISCNR_FLW_MTN) = -1275.00081075 - 0.0624909567103*D(MISCNR_FLW_MTN(-1)) + 0.999991795506*(@MEAN((MISCNR_FLW_MTN),"1970q1 1999q4")-(MISCNR_FLW_MTN(-1))) + 0.154969364887*(MISCNR_STK_MTN_TREND-@MOVAV(MISCNR_STK_MTN,20)) + 532.756931802*D(YPDR_MTN/NP_MTN)

D(MISCNR_FLW_NENG) = -110.044553524 - 0.128641787768*D(MISCNR_FLW_NENG(-1)) + 0.776653749051*(@MEAN((MISCNR_FLW_NENG),"1970q1 1999q4")-(MISCNR_FLW_NENG(-1))) + 0.0338275829633*(MISCNR_STK_NENG_TREND-@MOVAV(MISCNR_STK_NENG,20)) + 51.4239170825*D(YPDR_NENG(-1)/NP_NENG(-1))

D(MISCNR_FLW_PAC) = -92.9510702685 + 0.03391816295*D(MISCNR_FLW_PAC(-1)) + 0.011856526324*(@MEAN((MISCNR_FLW_PAC),"1970q1 1999q4")-(MISCNR_FLW_PAC(-1))) + 0.00503959000756*(MISCNR_STK_PAC_TREND-@MOVAV(MISCNR_STK_PAC,20)) - 161787.706237*D(MISCNR_STK_PAC(-1)/MISCNR_STK_SUM(-1)) + [AR(1)=-0.431931175617,AR(2)=-0.339155400775]

D(MISCNR_FLW_SATL) = -393.230192495 - 0.445341550572*D(MISCNR_FLW_SATL(-1)) + 0.324128828323*(@MEAN((MISCNR_FLW_SATL),"1970q1 1999q4")-(MISCNR_FLW_SATL(-1))) + 0.0238972951606*(MISCNR_STK_SATL_TREND-@MOVAV(MISCNR_STK_SATL,20)) - 116761.164161*D(MISCNR_STK_SATL(-1)/MISCNR_STK_SUM(-1)) + [AR(1)=-0.214341071293,AR(2)=-0.390607385481]

D(MISCNR_FLW_WNC) = -152.695212514 - 0.177181736884*D(MISCNR_FLW_WNC(-1)) + 0.609661539051*(@MEAN((MISCNR_FLW_WNC),"1970q1 1999q4")-(MISCNR_FLW_WNC(-1))) + 0.0244149037305*(MISCNR_STK_WNC_TREND-@MOVAV(MISCNR_STK_WNC,20)) + 88.9114465272*D(YPDR_WNC(-1)/NP_WNC(-1))

D(MISCNR_FLW_WSC) = -1422.56206423 - 0.159481198828*D(MISCNR_FLW_WSC(-1)) + 0.738927506051*(@MEAN((MISCNR_FLW_WSC),"1970q1 1999q4")-(MISCNR_FLW_WSC(-1))) + 0.0703182129586*(MISCNR_STK_WSC_TREND-@MOVAV(MISCNR_STK_WSC,40)) + 22880.9683737*D(MISCNR_STK_WSC(-1)/MISCNR_STK_SUM(-1))

**OFFICE Office; private, federal, and state and local offices**

D(OFFICE_FLW_ENC) = -1282.57066288 - 0.244342618666*D(OFFICE_FLW_ENC(-1)) + 0.0982305425189*(@MEAN((OFFICE_FLW_ENC),"1970q1 1999q4")-(OFFICE_FLW_ENC(-1))) + 0.0299365759933*(OFFICE_STK_ENC_TREND-@MOVAV(OFFICE_STK_ENC,20)) - 1823357.16189*D(OFFICE_STK_ENC(-1)/SUM_STK_ENC(-1)) + [AR(1)=-0.317932495757,AR(2)=-0.244481752088]

D(OFFICE_FLW_ESC) = -271.862371692 - 0.204447023023*D(OFFICE_FLW_ESC(-1)) + 0.651775980596*(@MEAN((OFFICE_FLW_ESC),"1970q1 1999q4")-(OFFICE_FLW_ESC(-1))) + 0.0983510986626*(OFFICE_STK_ESC_TREND-@MOVAV(OFFICE_STK_ESC,20)) + 215.379163025*D(YPDR_ESC(-1)/NP_ESC(-1)) - 94.3629599788*(RMCORPAAA-@PC((@MOVAV(CPI_ESC,3))))

D(OFFICE_FLW_MATL) = 125.579440805 - 0.226273259178*D(OFFICE_FLW_MATL(-1)) + 0.0525635606649*(@MEAN((OFFICE_FLW_MATL),"1970q1 1999q4")-(OFFICE_FLW_MATL(-1))) + 0.0126639273877*(OFFICE_STK_MATL_TREND-OFFICE_STK_MATL(-1)) - 24.1723030153*(RMCORPAAA-@PC((@MOVAV(CPI_MATL,3)))) + [AR(1)=-0.311057722931,AR(2)=-0.42399772688]

D(OFFICE_FLW_MTN) = -551.990721444 - 0.274943698774*D(OFFICE_FLW_MTN(-1)) + 0.214214092985*(@MEAN((OFFICE_FLW_MTN),"1970q1 1999q4")-(OFFICE_FLW_MTN(-1))) + 0.0237572727194*(OFFICE_STK_MTN_TREND-@MOVAV(OFFICE_STK_MTN,20))

D(OFFICE_FLW_NENG) = -203.083257698 - 0.131342749393*D(OFFICE_FLW_NENG(-1)) + 0.150449169398*(@MEAN((OFFICE_FLW_NENG),"1970q1 1999q4")-(OFFICE_FLW_NENG(-1))) + 0.0166741844591*(OFFICE_STK_NENG_TREND-@MOVAV(OFFICE_STK_NENG,20)) + [AR(1)=-0.385584160615,AR(2)=-0.239043878259]

D(OFFICE_FLW_PAC) = -15.1553120133 - 0.669654745778*D(OFFICE_FLW_PAC(-1)) + 0.0488004530233*(@MEAN((OFFICE_FLW_PAC),"1970q1 1999q4")-(OFFICE_FLW_PAC(-1))) + 0.0103179146055*(OFFICE_STK_PAC_TREND-OFFICE_STK_PAC(-1)) + [AR(1)=-0.0529975005382,AR(2)=-0.271876758627]

D(OFFICE_FLW_SATL) = -82.8686945305 - 0.387484277721*D(OFFICE_FLW_SATL(-1)) + 0.0446455949868*(@MEAN((OFFICE_FLW_SATL),"1970q1 1999q4")-(OFFICE_FLW_SATL(-1))) + 0.00849158117769*(OFFICE_STK_SATL_TREND-OFFICE_STK_SATL(-1)) + 1188.60131777*D(YPDR_SATL/NP_SATL)

D(OFFICE_FLW_WNC) = -1448.8609866 - 0.174464833343*D(OFFICE_FLW_WNC(-1)) + 0.466804798435*(@MEAN((OFFICE_FLW_WNC),"1970q1 1999q4")-(OFFICE_FLW_WNC(-1))) + 0.0531208745302*(OFFICE_STK_WNC_TREND-@MOVAV(OFFICE_STK_WNC,20)) + 53.1015634674*YPDR_WNC(-1)/NP_WNC(-1) - 27.4377350403*(RMCORPAAA-@PC((@MOVAV(CPI_WNC,3))))

D(OFFICE_FLW_WSC) = 18.3258251982 + 0.13408007229*D(OFFICE_FLW_WSC(-1)) + 0.0189736463432*(@MEAN((OFFICE_FLW_WSC),"1970q1 1999q4")-(OFFICE_FLW_WSC(-1))) + 0.00590856492005*(OFFICE_STK_WSC_TREND-OFFICE_STK_WSC(-1)) + [AR(1)=-0.705971247093,AR(2)=-0.348638942791]

**PUB Public; federal and state and local**

D(PUB_FLW_ENC) = 380.558604512 - 0.126821908479*D(PUB_FLW_ENC(-1)) + 0.64013967871*(@MEAN((PUB_FLW_ENC),"1970q1 1999q4")-(PUB_FLW_ENC(-1))) + 0.0241978429623*(PUB_STK_ENC_TREND-@MOVAV(PUB_STK_ENC,20)) + 561.787835022*D(YPDR_ENC/NP_ENC) - 83.71778478*(RMCORPAAA-@PC((@MOVAV(CPI_ENC,3))))

D(PUB_FLW_ESC) = 541.672716567 + 0.028513027167*D(PUB_FLW_ESC(-1)) + 0.955618251207*(@MEAN((PUB_FLW_ESC),"1970q1 1999q4")-(PUB_FLW_ESC(-1))) + 0.00877134104371*(PUB_STK_ESC_TREND-@MOVAV(PUB_STK_ESC,20)) + 155.146176472*D(YPDR_ESC(-1)/NP_ESC(-1)) - 70.9735363466*(RMCORPAAA-@PC((@MOVAV(CPI_ESC,3))))

D(PUB_FLW_MATL) = 511.427577987 + 0.0206518469194*D(PUB_FLW_MATL(-1)) + 0.84568194363*(@MEAN((PUB_FLW_MATL),"1970q1 1999q4")-(PUB_FLW_MATL(-1))) + 0.0348577412993*(PUB_STK_MATL_TREND-@MOVAV(PUB_STK_MATL,20)) + 347.719866472*D(YPDR_MATL(-1)/NP_MATL(-1)) - 109.90326453*(RMCORPAAA-@PC((@MOVAV(CPI_MATL,3))))

D(PUB_FLW_MTN) = 12.1107278852 + 0.00407284655755*D(PUB_FLW_MTN(-1)) + 0.179136373112*(@MEAN((PUB_FLW_MTN),"1970q1 1999q4")-(PUB_FLW_MTN(-1))) + 0.00188551530937*PUB_STK_MTN_TREND + 89.0391261778*D(YPDR_MTN(-1)/NP_MTN(-1)) - 13.5776061422*(RMCORPAAA-@PC((@MOVAV(CPI_MTN,3)))) + [AR(1)=-0.435630972619,AR(2)=-0.325501411979]

D(PUB_FLW_NENG) = 190.356907625 - 0.200195393432*D(PUB_FLW_NENG(-1)) + 0.63314221649*(@MEAN((PUB_FLW_NENG),"1970q1 1999q4")-(PUB_FLW_NENG(-1))) + 0.0306729507212*(PUB_STK_NENG_TREND-@MOVAV(PUB_STK_NENG,20)) + 184.40269359*D(YPDR_NENG/NP_NENG) - 36.0961843243*(RMCORPAAA-@PC((@MOVAV(CPI_NENG,3))))

D(PUB_FLW_PAC) = 681.724169109 - 0.0802036690124*D(PUB_FLW_PAC(-1)) + 0.878407549698*(@MEAN((PUB_FLW_PAC),"1970q1 1999q4")-(PUB_FLW_PAC(-1))) + 0.0411578991883*(PUB_STK_PAC_TREND-@MOVAV(PUB_STK_PAC,20)) + 268.935825816*D(YPDR_PAC/NP_PAC) - 139.843292543*(RMCORPAAA-@PC((@MOVAV(CPI_PAC,3))))

D(PUB_FLW_SATL) = -2218.35596524 + 0.0705996182691*D(PUB_FLW_SATL(-1)) + 1.07531122788*(@MEAN((PUB_FLW_SATL),"1970q1 1999q4")-(PUB_FLW_SATL(-1))) + 0.0966905750392*(PUB_STK_SATL_TREND-@MOVAV(PUB_STK_SATL,40)) + 354.729474225*D(YPDR_SATL(-1)/NP_SATL(-1)) - 131.667451094*(RMCORPAAA-@PC((@MOVAV(CPI_SATL,3))))

D(PUB_FLW_WNC) = 945.09869776 + 0.119056188967*D(PUB_FLW_WNC(-1)) + 1.21119821727*(@MEAN((PUB_FLW_WNC),"1970q1 1999q4")-(PUB_FLW_WNC(-1))) - 0.00774042951328*(PUB_STK_WNC_TREND-@MOVAV(PUB_STK_WNC,20)) + 230.027775337*D(YPDR_WNC(-1)/NP_WNC(-1)) - 116.61872973*(RMCORPAAA-@PC((@MOVAV(CPI_WNC,3)))) + [AR(1)=0.183000845068,AR(2)=0.44081407303]

D(PUB_FLW_WSC) = 478.167231467 - 0.0946228256422*D(PUB_FLW_WSC(-1)) + 0.477204392795*(@MEAN((PUB_FLW_WSC),"1970q1 1999q4")-(PUB_FLW_WSC(-1))) + 0.0121876354854*(PUB_STK_WSC_TREND-@MOVAV(PUB_STK_WSC,20)) + 35.3470663413*D(YPDR_WSC(-1)/NP_WSC(-1)) - 68.9498580199*(RMCORPAAA-@PC((@MOVAV(CPI_WSC,3))))

**REL Religious**

D(REL_FLW_ENC) = 134.75617807 + 43979.3813359*(((((@ELEM(REL_STK_ENC,"1999:4")/@ELEM(REL_STK_ENC,"1970:1"))^(4/119))-1)-@PCHA(REL_STK_ENC(-1))) + 5.49843789436*D(YPDR_ENC(-1)/NP_ENC(-1)) - 17.5457936813*(RMCORPAAA-@PC((@MOVAV(CPI_ENC,3))))

D(REL_FLW_ESC) = 263.532395019 - 0.179996115902*D(REL_FLW_ESC(-1)) + 1.96751032632*(@MEAN((REL_FLW_ESC),"1970q1 1999q4")-(REL_FLW_ESC(-1))) - 65084.9530703*(((((@ELEM(REL_STK_ESC,"1999:4")/@ELEM(REL_STK_ESC,"1970:1"))^(4/119))-1)-@PCHA(REL_STK_ESC(-1))) + 59.2931229909*D(YPDR_ESC(-1)/NP_ESC(-1)) - 34.1516659516*(RMCORPAAA-@PC((@MOVAV(CPI_ESC,3))))

D(REL_FLW_MATL) = 98.8734498148 - 0.075235844649*D(REL_FLW_MATL(-1)) + 0.755519051114*(@MEAN((REL_FLW_MATL),"1970q1 1999q4")-(REL_FLW_MATL(-1))) - 0.00810557425092*(REL_STK_MATL_TREND-@MOVAV(REL_STK_MATL,20)) - 19.2530355678*D(YPDR_MATL(-1)/NP_MATL(-1)) - 23.9872727285*(RMCORPAAA-@PC((@MOVAV(CPI_MATL,3))))

D(REL_FLW_MTN) = -126.219936543 - 0.107095294628*D(REL_FLW_MTN(-1)) + 0.591827711912*(@MEAN((REL_FLW_MTN),"1970q1 1999q4")-(REL_FLW_MTN(-1))) + 0.0498990471662*(REL_STK_MTN_TREND-@MOVAV(REL_STK_MTN,20)) + 29.5841039329*D(YPDR_MTN(-1)/NP_MTN(-1))

D(REL_FLW_NENG) = 44.2695233509 - 0.117552549965*D(REL_FLW_NENG(-1)) + 0.787698409778*(@MEAN((REL_FLW_NENG),"1970q1 1999q4")-(REL_FLW_NENG(-1))) + 0.0096493138026*(REL_STK_NENG_TREND-@MOVAV(REL_STK_NENG,20)) + 4.20610190807*D(YPDR_NENG(-1)/NP_NENG(-1)) - 2.64491154477*(RMCORPAAA-@PC((@MOVAV(CPI_NENG,3))))

D(REL_FLW_PAC) = -143.590623428 - 0.118863666981*D(REL_FLW_PAC(-1)) + 0.52443834533*(@MEAN((REL_FLW_PAC),"1970q1 1999q4")-(REL_FLW_PAC(-1))) + 0.0516996385759*(REL_STK_PAC_TREND-@MOVAV(REL_STK_PAC,40)) + 20.0659366078*D(YPDR_PAC(-1)/NP_PAC(-1)) - 6.15146270403*(RMCORPAAA-@PC((@MOVAV(CPI_PAC,3))))

D(REL_FLW_SATL) = 102.862111465 - 0.558664029327*D(REL_FLW_SATL(-1)) + 0.435468980712*(@MEAN((REL_FLW_SATL),"1970q1 1999q4")-(REL_FLW_SATL(-1))) - 36872.3353108*(((((@ELEM(REL_STK_SATL,"1999:4")/@ELEM(REL_STK_SATL,"1970:1")) ^(4/119))-1)-@PCHA(REL_STK_SATL(-1))) + 473.814224494*D(YPDR_SATL(-1)/NP_SATL(-1)) - 16.7929204284*(RMCORPAAA-@PC(((@MOVAV(CPI_SATL,3)))) + [AR(1)=0.00191583253936,AR(2)=-0.40061654781]

D(REL_FLW_WNC) = 28.9139036156 - 0.511225087747*D(REL_FLW_WNC(-1)) + 0.610343536586*(@MEAN((REL_FLW_WNC),"1970q1 1999q4")-(REL_FLW_WNC(-1))) - 21116.4666112*(((((@ELEM(REL_STK_WNC,"1999:4")/@ELEM(REL_STK_WNC,"1970:1")) ^(4/119))-1)-@PCHA(REL_STK_WNC(-1))) + 46.1543386603*D(YPDR_WNC/NP_WNC) - 4.04368786558*(RMCORPAAA-@PC(((@MOVAV(CPI_WNC,3)))) + [AR(1)=-0.0942134842386,AR(2)=-0.44718706977]

D(REL_FLW_WSC) = 67.3017956321 - 0.254516896007*D(REL_FLW_WSC(-1)) + 0.520264582528*(@MEAN((REL_FLW_WSC),"1970q1 1999q4")-(REL_FLW_WSC(-1))) + 0.0471124344242*(REL_STK_WSC_TREND-@MOVAV(REL_STK_WSC,20)) + 29.9036850242*D(YPDR_WSC(-1)/NP_WSC(-1)) - 23.6113901182*(RMCORPAAA-@PC(((@MOVAV(CPI_WSC,3))))

**STORES Stores; stores and restaurants**

D(STORES_FLW_ENC) = 1020.74869727 - 0.383757982855*D(STORES_FLW_ENC(-1)) + 0.221164081554*(@MEAN((STORES_FLW_ENC),"1970q1 1999q4")-(STORES_FLW_ENC(-1))) + 0.0102151430854*(STORES_STK_ENC_TREND-@MOVAV(STORES_STK_ENC,20)) + 678.09008442*D(YPDR_ENC(-1)/NP_ENC(-1)) - 198.649161106*(RMCORPAAA-@PC(((@MOVAV(CPI_ENC,3)))) + [AR(1)=-0.180503668632,AR(2)=-0.352040138272]

D(STORES_FLW_ESC) = -157.847920028 - 0.304045525546*D(STORES_FLW_ESC(-1)) + 0.303835086574*(@MEAN((STORES_FLW_ESC),"1970q1 1999q4")-(STORES_FLW_ESC(-1))) + 0.0243904545136*(STORES_STK_ESC_TREND-@MOVAV(STORES_STK_ESC,20)) + 222.344969081*D(YPDR_ESC/NP_ESC) - 51.7501751995*(RMCORPAAA-@PC(((@MOVAV(CPI_ESC,3))))

D(STORES_FLW_MATL) = 852.454293882 - 0.197127869419*D(STORES_FLW_MATL(-1)) + 0.35008948719*(@MEAN((STORES_FLW_MATL),"1970q1 1999q4")-(STORES_FLW_MATL(-1))) + 0.0100524596905*(STORES_STK_MATL_TREND-@MOVAV(STORES_STK_MATL,20)) + 172.043444919*D(YPDR_MATL(-1)/NP_MATL(-1)) - 145.688809143*(RMCORPAAA-@PC(((@MOVAV(CPI_MATL,3))))

D(STORES_FLW_MTN) = 408.174464817 - 0.467479154611*D(STORES_FLW_MTN(-1)) + 0.105408088809*(@MEAN((STORES_FLW_MTN),"1970q1 1999q4")-(STORES_FLW_MTN(-1))) + 0.00658120130535*(STORES_STK_MTN_TREND-STORES_STK_MTN) + 1362.82233508*D(YPDR_MTN(-1)/NP_MTN(-1)) - 59.0269489564*(RMCORPAAA-@PC(((@MOVAV(CPI_MTN,3))))

D(STORES_FLW_NENG) = 775.394574663 - 0.139769576231*D(STORES_FLW_NENG(-1)) + 0.709437476779*(@MEAN((STORES_FLW_NENG),"1970q1 1999q4")-(STORES_FLW_NENG(-1))) + 0.0428799348717*(STORES_STK_NENG_TREND-@MOVAV(STORES_STK_NENG,20)) + 52.2688736893*D(YPDR_NENG(-1)/NP_NENG(-1)) - 153.564399405*(RMCORPAAA-@PC((@MOVAV(CPI_NENG,3))))

D(STORES_FLW_PAC) = -2388.04753739 - 0.102657222684*D(STORES_FLW_PAC(-1)) + 0.535964330284*(@MEAN((STORES_FLW_PAC),"1970q1 1999q4")-(STORES_FLW_PAC(-1))) + 0.0662196752094*(STORES_STK_PAC_TREND-@MOVAV(STORES_STK_PAC,20)) + 18.0229154061*YPDR_PAC(-1)/NP_PAC(-1) - 249.852405919*(RMCORPAAA-@PC((@MOVAV(CPI_PAC,3))))

D(STORES_FLW_SATL) = 214.716003775 + 0.371844221075*D(STORES_FLW_SATL(-1)) + 0.108823235963*(@MEAN((STORES_FLW_SATL),"1970q1 1999q4")-(STORES_FLW_SATL(-1))) + 0.013403809765*(STORES_STK_SATL_TREND-@MOVAV(STORES_STK_SATL,20)) + 1358.90269788*D(YPDR_SATL(-1)/NP_SATL(-1)) - 203.451255257*(RMCORPAAA-@PC((@MOVAV(CPI_SATL,3)))) + [AR(1)=-1.01345988247,AR(2)=-0.535498725614]

D(STORES_FLW_WNC) = 1091.5375508 - 0.189972080004*D(STORES_FLW_WNC(-1)) + 0.635060160778*(@MEAN((STORES_FLW_WNC),"1970q1 1999q4")-(STORES_FLW_WNC(-1))) + 0.00605159544373*(STORES_STK_WNC_TREND-@MOVAV(STORES_STK_WNC,20)) + 532.617807081*D(YPDR_WNC(-1)/NP_WNC(-1)) - 155.248785118*(RMCORPAAA-@PC((@MOVAV(CPI_WNC,3))))

D(STORES_FLW_WSC) = -1205.10154764 - 0.346412269223*D(STORES_FLW_WSC(-1)) + 0.348534188655*(@MEAN((STORES_FLW_WSC),"1970q1 1999q4")-(STORES_FLW_WSC(-1))) + 0.0213553011646*(STORES_STK_WSC_TREND-@MOVAV(STORES_STK_WSC,20)) + 1368272.70418*D(STORES_STK_WSC(-1)/STORES_STK_SUM(-1)) - 196471.862445*D(STORES_STK_WSC(-1)/SUM_STK_WSC(-1))

**WARE Warehouse; manufacturing and wholesale trade, public and federally-owned warehouses**

D(WARE_FLW_ENC) = 1370.93505184 - 0.450187364913*D(WARE_FLW_ENC(-1)) + 0.216449422076*(@MEAN((WARE_FLW_ENC),"1970q1 1999q4")-(WARE_FLW_ENC(-1))) + 0.00163016321662*(WARE_STK_ENC_TREND-@MOVAV(WARE_STK_ENC,40)) + 384.688141749*D(YPDR_ENC/NP_ENC) - 209.040247248*(RMCORPAAA-@PC((@MOVAV(CPI_ENC,3))))

D(WARE_FLW_ESC) = 477.944978244 - 0.498305452968*D(WARE_FLW_ESC(-1)) + 0.203627197571*(@MEAN((WARE_FLW_ESC),"1970q1 1999q4")-(WARE_FLW_ESC(-1))) + 0.0167999811953*(WARE_STK_ESC_TREND-WARE_STK_ESC(-1)) + 622.964110552*D(YPDR_ESC/NP_ESC) - 69.4482809551*(RMCORPAAA-@PC((@MOVAV(CPI_ESC,3))))

D(WARE_FLW_MATL) = -36.3152264869 - 0.417738438358*D(WARE_FLW_MATL(-1)) + 0.108963518446*(@MEAN((WARE_FLW_MATL),"1970q1 1999q4")-(WARE_FLW_MATL(-1))) + 0.0238851325702*(WARE_STK_MATL_TREND-WARE_STK_MATL(-1)) + 221.773438837*D(YPDR_MATL/NP_MATL) - 6.7611265827*(RMCORPAAA-@PC((@MOVAV(CPI_MATL,3)))) + [AR(1)=-0.0414820291359,AR(2)=-0.364920305957]

D(WARE_FLW_MTN) = -697.693137387 - 0.233897213937*D(WARE_FLW_MTN(-1)) + 0.127844838193*(@MEAN((WARE_FLW_MTN),"1970q1 1999q4")-(WARE_FLW_MTN(-1))) + 0.0134294964301*(WARE_STK_MTN_TREND-WARE_STK_MTN(-1)) + 56.1965638882*YPDR_MTN(-1)/NP_MTN(-1) - 36.631671008*(RMCORPAAA-@PC((@MOVAV(CPI_MTN,3))))

D(WARE_FLW_NENG) = 96.0754776385 - 0.566578475873*D(WARE_FLW_NENG(-1)) + 0.0887055664953*(@MEAN((WARE_FLW_NENG),"1970q1 1999q4")-(WARE_FLW_NENG(-1))) + 0.0272924442802*(WARE_STK_NENG_TREND-WARE_STK_NENG(-1)) + 14.2523795677*D(YPDR_NENG/NP_NENG) - 16.2536915533*(RMCORPAAA-@PC((@MOVAV(CPI_NENG,3)))) + [AR(1)=-0.116902750562,AR(2)=-0.373843968615]

D(WARE_FLW_PAC) = -624.694789684 - 0.512737747291*D(WARE_FLW_PAC(-1)) + 0.0348004641203*(@MEAN((WARE_FLW_PAC),"1970q1 1999q4")-(WARE_FLW_PAC(-1))) + 0.0230866744291*(WARE_STK_PAC_TREND-WARE_STK_PAC(-1)) + 79.0073754907*YPDR_PAC(-1)/NP_PAC(-1) - 147.218350138*(RMCORPAAA-@PC((@MOVAV(CPI_PAC,3))))

D(WARE_FLW_SATL) = 606.982615188 - 0.422023768193*D(WARE_FLW_SATL(-1)) + 0.101797652343*(@MEAN((WARE_FLW_SATL),"1970q1 1999q4")-(WARE_FLW_SATL(-1))) + 0.0208465629547*(WARE_STK_SATL_TREND-WARE_STK_SATL(-1)) + 903.411312628*D(YPDR_SATL/NP_SATL) - 107.965067589*(RMCORPAAA-@PC((@MOVAV(CPI_SATL,3))))

D(WARE_FLW_WNC) = -151.626960836 - 0.494139583255*D(WARE_FLW_WNC(-1)) + 0.153024123394*(@MEAN((WARE_FLW_WNC),"1970q1 1999q4")-(WARE_FLW_WNC(-1))) + 0.0167638450535*(WARE_STK_WNC_TREND-WARE_STK_WNC(-1)) - 314590.96822*D(WARE_STK_WNC(-1)/WARE_STK_SUM(-1)) + [AR(1)=0.0110379631845,AR(2)=-0.389019664485]

D(WARE_FLW_WSC) = -42.3133895447 - 0.497292357084*D(WARE_FLW_WSC(-1)) + 0.0198992014049*(@MEAN((WARE_FLW_WSC),"1970q1 1999q4")-(WARE_FLW_WSC(-1))) + 0.00704939907752*(WARE_STK_WSC_TREND-WARE_STK_WSC(-1)) + 410.513213626*D(YPDR_WSC(-1)/NP_WSC(-1)) + [AR(1)=0.0749502245518,AR(2)=-0.373366705797]

# Regional Industry and Employment Model

## Regional Industry Output

### *Endogenous Variables:*

| | |
|---|---|
| REV{I}_{R} | Output in billions of real 2000 dollars for sector I, region R (e.g. REVIND1_ENC) |
| XREV{I}_{R} | Output in billions of real 2000 dollars for sector I, region R, equation estimate (e.g. XREVIND1_ENC) |

Codes and descriptions of the sectors are presented in Table A14. Codes and descriptions of the regions are in Table B6.

### *Exogenous Variables:*

| | |
|---|---|
| REV{I}_SUM | Output in billions of real 2000 dollars for sector I (national) |
| GSPR_{R} | Gross State Product in billions of real 2000 dollars for region R |
| GDPR_SUM | Gross Domestic Product in billions of real 2000 dollars (national) |
| HUSPS_{R} | Housing Starts (single-family and multifamily) in region R |
| HUSPS_SUM | Housing Starts (single-family and multifamily) (national) |
| NP_{R} | Population in million for region R |
| NP_SUM | Population in million (national) |
| RWM_{R} | Annual Wage for manufacturing sectors in dollars for region R |
| RWM_AVG | Average Annual Wage for manufacturing sectors in dollars (national) |
| RWNM_{R} | Annual Wage for nonmanufacturing/services sectors in dollars for region R |
| RWNM_AVG | Average Annual Wage for nonmanufacturing/services sectors in dollars (national) |
| WPI05 | Producer Price Index – fuel and power |
| WPI053 | Producer Price Index – natural gas |
| YPDR_{R} | Disposable Income in billions of real 2000 dollars for region R |
| YPDR_SUM | Disposable Income in billions of real 2000 dollars (national) |
| @TREND | Time Trend |

## *Equations:*

### Alignment process:

The alignment process takes the regional output shares of sector I computed from the equations and applied them onto the national output of sector I. This ensures that the sum of the nine regions aligns to the national total.

REV{I}_{R} = (XREV{I}_{R} / XREV{I}_SUM ) * REV{I}_SUM

*where:*
REV{I}_{R} = Output for sector I, region R
XREV{I}_{R} = Output for sector I, region R, equation estimate
XREV{I}_SUM = Sum of 9 regions' XREV{I}_{R}
REV{I}_SUM = Output for sector I (national)

### Detailed structural equations for X{I}_{R}:

**IND1 - Food Products**
LOG(XREVIND1_ENC/REVIND1_SUM) = 0.9292678928 - 2.384358785 +
0.3867543128*LOG((YPDR_ENC/NP_ENC)/(YPDR_SUM/NP_SUM)) -
0.2609837257*LOG(RWM_ENC/RWM_AVG) - 0.005234287412*@TREND

LOG(XREVIND1_ESC/REVIND1_SUM) = -0.4506832715 - 2.384358785 +
0.3867543128*LOG((YPDR_ESC/NP_ESC)/(YPDR_SUM/NP_SUM)) -
0.2609837257*LOG(RWM_ESC/RWM_AVG) + 0.003520878734*@TREND

LOG(XREVIND1_MATL/REVIND1_SUM) = 0.2968557861 - 2.384358785 +
0.3867543128*LOG((YPDR_MATL/NP_MATL)/(YPDR_SUM/NP_SUM)) -
0.2609837257*LOG(RWM_MATL/RWM_AVG) - 0.01314057947*@TREND

LOG(XREVIND1_MTN/REVIND1_SUM) = -0.9535096686 - 2.384358785 +
0.3867543128*LOG((YPDR_MTN/NP_MTN)/(YPDR_SUM/NP_SUM)) -
0.2609837257*LOG(RWM_MTN/RWM_AVG) + 0.01004774081*@TREND

LOG(XREVIND1_NENG/REVIND1_SUM) = -1.251492128 - 2.384358785 +
0.3867543128*LOG((YPDR_NENG/NP_NENG)/(YPDR_SUM/NP_SUM)) -
0.2609837257*LOG(RWM_NENG/RWM_AVG) - 0.007502240521*@TREND

LOG(XREVIND1_PAC/REVIND1_SUM) = 0.3509814779 - 2.384358785 +
0.3867543128*LOG((YPDR_PAC/NP_PAC)/(YPDR_SUM/NP_SUM)) -
0.2609837257*LOG(RWM_PAC/RWM_AVG) + 0.002761375061*@TREND

LOG(XREVIND1_SATL/REVIND1_SUM) = 0.3063021347 - 2.384358785 +
0.3867543128*LOG((YPDR_SATL/NP_SATL)/(YPDR_SUM/NP_SUM)) -
0.2609837257*LOG(RWM_SATL/RWM_AVG) + 0.002831290906*@TREND

LOG(XREVIND1_WNC/REVIND1_SUM) = 0.7163081127 - 2.384358785 +
0.3867543128*LOG((YPDR_WNC/NP_WNC)/(YPDR_SUM/NP_SUM)) -
0.2609837257*LOG(RWM_WNC/RWM_AVG) - 0.0007679082184*@TREND

LOG(XREVIND1_WSC/REVIND1_SUM) = 0.05596966411 - 2.384358785 +
0.3867543128*LOG((YPDR_WSC/NP_WSC)/(YPDR_SUM/NP_SUM)) -
0.2609837257*LOG(RWM_WSC/RWM_AVG) + 0.006443722833*@TREND

**IND2 - Beverage and Tobacco Products**
LOG(XREVIND2_ENC/REVIND2_SUM) = 0.4325996832 - 2.415056643 +
1.343423663*LOG((GSPR_ENC/NP_ENC)/(GSPR_SUM/NP_SUM)) -
0.2432377405*LOG(RWM_ENC/RWM_AVG) - 0.01944237113*@TREND

LOG(XREVIND2_ESC/REVIND2_SUM) = 0.7716496025 - 2.415056643 +
1.343423663*LOG((GSPR_ESC/NP_ESC)/(GSPR_SUM/NP_SUM)) -
0.2432377405*LOG(RWM_ESC/RWM_AVG) - 0.04092452279*@TREND

LOG(XREVIND2_MATL/REVIND2_SUM) = -0.03368610034 - 2.415056643 +
1.343423663*LOG((GSPR_MATL/NP_MATL)/(GSPR_SUM/NP_SUM)) -
0.2432377405*LOG(RWM_MATL/RWM_AVG) - 0.0175922892*@TREND

LOG(XREVIND2_MTN/REVIND2_SUM) = -0.4912089155 - 2.415056643 +
1.343423663*LOG((GSPR_MTN/NP_MTN)/(GSPR_SUM/NP_SUM)) -
0.2432377405*LOG(RWM_MTN/RWM_AVG) - 0.01014543709*@TREND

LOG(XREVIND2_NENG/REVIND2_SUM) = -1.542167333 - 2.415056643 +
1.343423663*LOG((GSPR_NENG/NP_NENG)/(GSPR_SUM/NP_SUM)) -
0.2432377405*LOG(RWM_NENG/RWM_AVG) - 0.00646027842*@TREND

LOG(XREVIND2_PAC/REVIND2_SUM) = 0.1659874025 - 2.415056643 +
1.343423663*LOG((GSPR_PAC/NP_PAC)/(GSPR_SUM/NP_SUM)) -
0.2432377405*LOG(RWM_PAC/RWM_AVG) + 0.01020404896*@TREND

LOG(XREVIND2_SATL/REVIND2_SUM) = 1.35428001 - 2.415056643 +
1.343423663*LOG((GSPR_SATL/NP_SATL)/(GSPR_SUM/NP_SUM)) -
0.2432377405*LOG(RWM_SATL/RWM_AVG) + 0.01696866843*@TREND

LOG(XREVIND2_WNC/REVIND2_SUM) = -0.3029871884 - 2.415056643 +
1.343423663*LOG((GSPR_WNC/NP_WNC)/(GSPR_SUM/NP_SUM)) -
0.2432377405*LOG(RWM_WNC/RWM_AVG) - 0.02396569734*@TREND

LOG(XREVIND2_WSC/REVIND2_SUM) = -0.354467161 - 2.415056643 +
1.343423663*LOG((GSPR_WSC/NP_WSC)/(GSPR_SUM/NP_SUM)) -
0.2432377405*LOG(RWM_WSC/RWM_AVG) - 0.001953254794*@TREND

**IND3 - Textile Mills & Textile Products**

LOG(XREVIND3_ENC/REVIND3_SUM) = -0.1979396269 - 1.923901526 +
0.5202845649*LOG(GSPR_ENC/GSPR_SUM) - 0.01488949086*@TREND

LOG(XREVIND3_ESC/REVIND3_SUM) = 1.118888279 - 1.923901526 +
0.5202845649*LOG(GSPR_ESC/GSPR_SUM) + 0.004745273953*@TREND

LOG(XREVIND3_MATL/REVIND3_SUM) = 0.4811383637 - 1.923901526 +
0.5202845649*LOG(GSPR_MATL/GSPR_SUM) + 0.002397307033*@TREND

LOG(XREVIND3_MTN/REVIND3_SUM) = -1.232823875 - 1.923901526 +
0.5202845649*LOG(GSPR_MTN/GSPR_SUM) + 0.01542035324*@TREND

LOG(XREVIND3_NENG/REVIND3_SUM) = 0.4745600659 - 1.923901526 +
0.5202845649*LOG(GSPR_NENG/GSPR_SUM) + 0.00459082497*@TREND

LOG(XREVIND3_PAC/REVIND3_SUM) = -0.6853414606 - 1.923901526 +
0.5202845649*LOG(GSPR_PAC/GSPR_SUM) + 0.02932956856*@TREND

LOG(XREVIND3_SATL/REVIND3_SUM) = 2.415305742 - 1.923901526 +
0.5202845649*LOG(GSPR_SATL/GSPR_SUM) - 0.00448018688*@TREND

LOG(XREVIND3_WNC/REVIND3_SUM) = -1.433521582 - 1.923901526 +
0.5202845649*LOG(GSPR_WNC/GSPR_SUM) + 0.02337013663*@TREND

LOG(XREVIND3_WSC/REVIND3_SUM) = -0.9402659064 - 1.923901526 +
0.5202845649*LOG(GSPR_WSC/GSPR_SUM) + 0.01316263152*@TREND

**IND4 - Apparel**
LOG(XREVIND4_ENC/REVIND4_SUM) = -1.03009843 - 1.205255308 +
0.8590175942*LOG((GSPR_ENC/NP_ENC)/(GSPR_SUM/NP_SUM)) -
0.6695526536*LOG(RWM_ENC/RWM_AVG) + 0.665875116*LOG(NP_ENC/NP_SUM)

LOG(XREVIND4_ESC/REVIND4_SUM) = 1.104507495 - 1.205255308 +
0.8590175942*LOG((GSPR_ESC/NP_ESC)/(GSPR_SUM/NP_SUM)) -
0.6695526536*LOG(RWM_ESC/RWM_AVG) + 0.665875116*LOG(NP_ESC/NP_SUM)

LOG(XREVIND4_MATL/REVIND4_SUM) = 1.105102941 - 1.205255308 +
0.8590175942*LOG((GSPR_MATL/NP_MATL)/(GSPR_SUM/NP_SUM)) -
0.6695526536*LOG(RWM_MATL/RWM_AVG) + 0.665875116*LOG(NP_MATL/NP_SUM)

LOG(XREVIND4_MTN/REVIND4_SUM) = -1.60082876 - 1.205255308 +
0.8590175942*LOG((GSPR_MTN/NP_MTN)/(GSPR_SUM/NP_SUM)) -
0.6695526536*LOG(RWM_MTN/RWM_AVG) + 0.665875116*LOG(NP_MTN/NP_SUM)

LOG(XREVIND4_NENG/REVIND4_SUM) = -0.6552144929 - 1.205255308 +
0.8590175942*LOG((GSPR_NENG/NP_NENG)/(GSPR_SUM/NP_SUM)) -
0.6695526536*LOG(RWM_NENG/RWM_AVG) + 0.665875116*LOG(NP_NENG/NP_SUM)

LOG(XREVIND4_PAC/REVIND4_SUM) = 0.7543515807 - 1.205255308 +
0.8590175942*LOG((GSPR_PAC/NP_PAC)/(GSPR_SUM/NP_SUM)) -
0.6695526536*LOG(RWM_PAC/RWM_AVG) + 0.665875116*LOG(NP_PAC/NP_SUM)

LOG(XREVIND4_SATL/REVIND4_SUM) = 0.8494556908 - 1.205255308 +
0.8590175942*LOG((GSPR_SATL/NP_SATL)/(GSPR_SUM/NP_SUM)) -
0.6695526536*LOG(RWM_SATL/RWM_AVG) + 0.665875116*LOG(NP_SATL/NP_SUM)

LOG(XREVIND4_WNC/REVIND4_SUM) = -0.8541593743 - 1.205255308 +
0.8590175942*LOG((GSPR_WNC/NP_WNC)/(GSPR_SUM/NP_SUM)) -
0.6695526536*LOG(RWM_WNC/RWM_AVG) + 0.665875116*LOG(NP_WNC/NP_SUM)

LOG(XREVIND4_WSC/REVIND4_SUM) = 0.3268833499 - 1.205255308 +
0.8590175942*LOG((GSPR_WSC/NP_WSC)/(GSPR_SUM/NP_SUM)) -
0.6695526536*LOG(RWM_WSC/RWM_AVG) + 0.665875116*LOG(NP_WSC/NP_SUM)

**IND5 - Wood Products**
LOG(XREVIND5_ENC/REVIND5_SUM) = -0.2695327567 - 0.01988778421 +
0.863385908*LOG(GSPR_ENC/GSPR_SUM) - 0.905672983*LOG(RWM_ENC/RWM_AVG) +
0.1563152799*LOG(HUSPS_ENC/HUSPS_SUM) + 0.01677453328*@TREND

LOG(XREVIND5_ESC/REVIND5_SUM) = 0.4889888667 - 0.01988778421 +
0.863385908*LOG(GSPR_ESC/GSPR_SUM) - 0.905672983*LOG(RWM_ESC/RWM_AVG) +
0.1563152799*LOG(HUSPS_ESC/HUSPS_SUM) + 0.01492598442*@TREND

LOG(XREVIND5_MATL/REVIND5_SUM) = -0.8846837167 - 0.01988778421 +
0.863385908*LOG(GSPR_MATL/GSPR_SUM) -
0.905672983*LOG(RWM_MATL/RWM_AVG) +
0.1563152799*LOG(HUSPS_MATL/HUSPS_SUM) + 0.008530805292*@TREND

LOG(XREVIND5_MTN/REVIND5_SUM) = 0.4608609449 - 0.01988778421 +
0.863385908*LOG(GSPR_MTN/GSPR_SUM) - 0.905672983*LOG(RWM_MTN/RWM_AVG)
+ 0.1563152799*LOG(HUSPS_MTN/HUSPS_SUM) - 0.03004377561*@TREND

LOG(XREVIND5_NENG/REVIND5_SUM) = -0.3181784483 - 0.01988778421 +
0.863385908*LOG(GSPR_NENG/GSPR_SUM) -
0.905672983*LOG(RWM_NENG/RWM_AVG) +
0.1563152799*LOG(HUSPS_NENG/HUSPS_SUM) - 0.00646870243*@TREND

LOG(XREVIND5_PAC/REVIND5_SUM) = 0.8922499845 - 0.01988778421 +
0.863385908*LOG(GSPR_PAC/GSPR_SUM) - 0.905672983*LOG(RWM_PAC/RWM_AVG) +
0.1563152799*LOG(HUSPS_PAC/HUSPS_SUM) - 0.0257534411*@TREND

LOG(XREVIND5_SATL/REVIND5_SUM) = -0.1085337486 - 0.01988778421 +
0.863385908*LOG(GSPR_SATL/GSPR_SUM) -

0.905672983*LOG(RWM_SATL/RWM_AVG) +
0.1563152799*LOG(HUSPS_SATL/HUSPS_SUM) + 0.008411647747*@TREND

LOG(XREVIND5_WNC/REVIND5_SUM) = -0.1031439358 - 0.01988778421 +
0.863385908*LOG(GSPR_WNC/GSPR_SUM) - 0.905672983*LOG(RWM_WNC/RWM_AVG)
+ 0.1563152799*LOG(HUSPS_WNC/HUSPS_SUM) + 0.007850267324*@TREND

LOG(XREVIND5_WSC/REVIND5_SUM) = -0.15802719 - 0.01988778421 +
0.863385908*LOG(GSPR_WSC/GSPR_SUM) - 0.905672983*LOG(RWM_WSC/RWM_AVG)
+ 0.1563152799*LOG(HUSPS_WSC/HUSPS_SUM) + 0.007207995155*@TREND

**IND6 - Furniture and Related Products**
LOG(XREVIND6_ENC/REVIND6_SUM) = 0.7546746968 - 1.820510922 +
0.9195373328*LOG((YPDR_ENC/NP_ENC)/(YPDR_SUM/NP_SUM)) +
0.2556219978*LOG(HUSPS_ENC/HUSPS_SUM) + 0.008194277274*@TREND

LOG(XREVIND6_ESC/REVIND6_SUM) = 0.5917068782 - 1.820510922 +
0.9195373328*LOG((YPDR_ESC/NP_ESC)/(YPDR_SUM/NP_SUM)) +
0.2556219978*LOG(HUSPS_ESC/HUSPS_SUM) + 0.0003360766299*@TREND

LOG(XREVIND6_MATL/REVIND6_SUM) = 0.2763997144 - 1.820510922 +
0.9195373328*LOG((YPDR_MATL/NP_MATL)/(YPDR_SUM/NP_SUM)) +
0.2556219978*LOG(HUSPS_MATL/HUSPS_SUM) - 0.0125166244*@TREND

LOG(XREVIND6_MTN/REVIND6_SUM) = -1.236450046 - 1.820510922 +
0.9195373328*LOG((YPDR_MTN/NP_MTN)/(YPDR_SUM/NP_SUM)) +
0.2556219978*LOG(HUSPS_MTN/HUSPS_SUM) + 0.01841918003*@TREND

LOG(XREVIND6_NENG/REVIND6_SUM) = -0.9230782522 - 1.820510922 +
0.9195373328*LOG((YPDR_NENG/NP_NENG)/(YPDR_SUM/NP_SUM)) +
0.2556219978*LOG(HUSPS_NENG/HUSPS_SUM) - 0.002434224079*@TREND

LOG(XREVIND6_PAC/REVIND6_SUM) = 0.197363471 - 1.820510922 +
0.9195373328*LOG((YPDR_PAC/NP_PAC)/(YPDR_SUM/NP_SUM)) +
0.2556219978*LOG(HUSPS_PAC/HUSPS_SUM) + 0.003882814279*@TREND

LOG(XREVIND6_SATL/REVIND6_SUM) = 0.7612129476 - 1.820510922 +
0.9195373328*LOG((YPDR_SATL/NP_SATL)/(YPDR_SUM/NP_SUM)) +
0.2556219978*LOG(HUSPS_SATL/HUSPS_SUM) - 0.007601158777*@TREND

LOG(XREVIND6_WNC/REVIND6_SUM) = -0.3714854757 - 1.820510922 +
0.9195373328*LOG((YPDR_WNC/NP_WNC)/(YPDR_SUM/NP_SUM)) +
0.2556219978*LOG(HUSPS_WNC/HUSPS_SUM) + 0.01786981822*@TREND

LOG(XREVIND6_WSC/REVIND6_SUM) = -0.05034393423 - 1.820510922 +
0.9195373328*LOG((YPDR_WSC/NP_WSC)/(YPDR_SUM/NP_SUM)) +
0.2556219978*LOG(HUSPS_WSC/HUSPS_SUM) - 0.01749559401*@TREND

**IND7 - Paper Products**

LOG(XREVIND7_ENC/REVIND7_SUM) = 0.5142953523 - 0.6187946792 + 0.7743860614*LOG(GSPR_ENC/GSPR_SUM) - 0.3205583703*LOG(RWM_ENC/RWM_AVG) + 0.0007476242448*@TREND

LOG(XREVIND7_ESC/REVIND7_SUM) = 0.707903116 - 0.6187946792 + 0.7743860614*LOG(GSPR_ESC/GSPR_SUM) - 0.3205583703*LOG(RWM_ESC/RWM_AVG) - 0.002930711449*@TREND

LOG(XREVIND7_MATL/REVIND7_SUM) = 0.005225673059 - 0.6187946792 + 0.7743860614*LOG(GSPR_MATL/GSPR_SUM) - 0.3205583703*LOG(RWM_MATL/RWM_AVG) - 0.004784047666*@TREND

LOG(XREVIND7_MTN/REVIND7_SUM) = -1.520826073 - 0.6187946792 + 0.7743860614*LOG(GSPR_MTN/GSPR_SUM) - 0.3205583703*LOG(RWM_MTN/RWM_AVG) + 0.02579538037*@TREND

LOG(XREVIND7_NENG/REVIND7_SUM) = 0.3231917693 - 0.6187946792 + 0.7743860614*LOG(GSPR_NENG/GSPR_SUM) - 0.3205583703*LOG(RWM_NENG/RWM_AVG) - 0.001740412658*@TREND

LOG(XREVIND7_PAC/REVIND7_SUM) = -0.04434560274 - 0.6187946792 + 0.7743860614*LOG(GSPR_PAC/GSPR_SUM) - 0.3205583703*LOG(RWM_PAC/RWM_AVG) - 0.009251019335*@TREND

LOG(XREVIND7_SATL/REVIND7_SUM) = 0.2300421222 - 0.6187946792 + 0.7743860614*LOG(GSPR_SATL/GSPR_SUM) - 0.3205583703*LOG(RWM_SATL/RWM_AVG) + 0.001920364827*@TREND

LOG(XREVIND7_WNC/REVIND7_SUM) = -0.1199860726 - 0.6187946792 + 0.7743860614*LOG(GSPR_WNC/GSPR_SUM) - 0.3205583703*LOG(RWM_WNC/RWM_AVG) + 0.006923305029*@TREND

LOG(XREVIND7_WSC/REVIND7_SUM) = -0.09550028471 - 0.6187946792 + 0.7743860614*LOG(GSPR_WSC/GSPR_SUM) - 0.3205583703*LOG(RWM_WSC/RWM_AVG) + 0.008335895908*@TREND

**IND8 - Printing**
LOG(XREVIND8_ENC/REVIND8_SUM) = 1.091212731 - 2.35179557 +
1.078550719*LOG((GSPR_ENC/NP_ENC)/(GSPR_SUM/NP_SUM)) -
0.9896354914*LOG(RWM_ENC/RWM_AVG)

LOG(XREVIND8_ESC/REVIND8_SUM) = -0.5396013656 - 2.35179557 +
1.078550719*LOG((GSPR_ESC/NP_ESC)/(GSPR_SUM/NP_SUM)) -
0.9896354914*LOG(RWM_ESC/RWM_AVG)

LOG(XREVIND8_MATL/REVIND8_SUM) = 0.6056514727 - 2.35179557 +
1.078550719*LOG((GSPR_MATL/NP_MATL)/(GSPR_SUM/NP_SUM)) -
0.9896354914*LOG(RWM_MATL/RWM_AVG)

LOG(XREVIND8_MTN/REVIND8_SUM) = -0.8691477041 - 2.35179557 +
1.078550719*LOG((GSPR_MTN/NP_MTN)/(GSPR_SUM/NP_SUM)) -
0.9896354914*LOG(RWM_MTN/RWM_AVG)

LOG(XREVIND8_NENG/REVIND8_SUM) = -0.4762846402 - 2.35179557 +
1.078550719*LOG((GSPR_NENG/NP_NENG)/(GSPR_SUM/NP_SUM)) -
0.9896354914*LOG(RWM_NENG/RWM_AVG)

LOG(XREVIND8_PAC/REVIND8_SUM) = 0.3081440993 - 2.35179557 +
1.078550719*LOG((GSPR_PAC/NP_PAC)/(GSPR_SUM/NP_SUM)) -
0.9896354914*LOG(RWM_PAC/RWM_AVG)

LOG(XREVIND8_SATL/REVIND8_SUM) = 0.2129016171 - 2.35179557 +
1.078550719*LOG((GSPR_SATL/NP_SATL)/(GSPR_SUM/NP_SUM)) -
0.9896354914*LOG(RWM_SATL/RWM_AVG)

LOG(XREVIND8_WNC/REVIND8_SUM) = 0.09756363166 - 2.35179557 +
1.078550719*LOG((GSPR_WNC/NP_WNC)/(GSPR_SUM/NP_SUM)) -
0.9896354914*LOG(RWM_WNC/RWM_AVG)

LOG(XREVIND8_WSC/REVIND8_SUM) = -0.4304398415 - 2.35179557 +
1.078550719*LOG((GSPR_WSC/NP_WSC)/(GSPR_SUM/NP_SUM)) -
0.9896354914*LOG(RWM_WSC/RWM_AVG)

**IND9 - Basic Inorganic Chemicals**
LOG(XREVIND9_ENC/REVIND9_SUM) = -0.05258632193 + 0.6374127737 +
1.342581618*LOG(GSPR_ENC/GSPR_SUM) + 0.09078748011*LOG(WPI053_1)

LOG(XREVIND9_ESC/REVIND9_SUM) = 1.628188599 + 0.6374127737 +
1.342581618*LOG(GSPR_ESC/GSPR_SUM) + 0.0116496784*LOG(WPI053_1)

LOG(XREVIND9_MATL/REVIND9_SUM) = -0.4515780077 + 0.6374127737 +
1.342581618*LOG(GSPR_MATL/GSPR_SUM) - 0.202557467*LOG(WPI053_1)

LOG(XREVIND9_MTN/REVIND9_SUM) = -0.4233889916 + 0.6374127737 +
1.342581618*LOG(GSPR_MTN/GSPR_SUM) + 0.3419714553*LOG(WPI053_1)

LOG(XREVIND9_NENG/REVIND9_SUM) = -0.6676914017 + 0.6374127737 +
1.342581618*LOG(GSPR_NENG/GSPR_SUM) + 0.1126299703*LOG(WPI053_1)

LOG(XREVIND9_PAC/REVIND9_SUM) = -0.7083667546 + 0.6374127737 +
1.342581618*LOG(GSPR_PAC/GSPR_SUM) - 0.3006304711*LOG(WPI053_1)

LOG(XREVIND9_SATL/REVIND9_SUM) = 0.0923861245 + 0.6374127737 +
1.342581618*LOG(GSPR_SATL/GSPR_SUM) - 0.142438929*LOG(WPI053_1)

LOG(XREVIND9_WNC/REVIND9_SUM) = -0.1861442613 + 0.6374127737 +
1.342581618*LOG(GSPR_WNC/GSPR_SUM) + 0.2884653104*LOG(WPI053_1)

LOG(XREVIND9_WSC/REVIND9_SUM) = 0.769181015 + 0.6374127737 +
1.342581618*LOG(GSPR_WSC/GSPR_SUM) + 0.2171651365*LOG(WPI053_1)

**IND10 - Basic Organic Chemicals**
LOG(XREVIND10_ENC/REVIND10_SUM) = 0.1447620653 + 0.3284813492 +
1.479716437*LOG(GSPR_ENC/GSPR_SUM) - 0.007634297575*LOG(WPI053_1)

LOG(XREVIND10_ESC/REVIND10_SUM) = 1.746554134 + 0.3284813492 +
1.479716437*LOG(GSPR_ESC/GSPR_SUM) - 0.06816701141*LOG(WPI053_1)

LOG(XREVIND10_MATL/REVIND10_SUM) = -0.1051290446 + 0.3284813492 +
1.479716437*LOG(GSPR_MATL/GSPR_SUM) - 0.2443858819*LOG(WPI053_1)

LOG(XREVIND10_MTN/REVIND10_SUM) = -1.007439736 + 0.3284813492 +
1.479716437*LOG(GSPR_MTN/GSPR_SUM) + 0.3180246729*LOG(WPI053_1)

LOG(XREVIND10_NENG/REVIND10_SUM) = -0.8623070174 + 0.3284813492 +
1.479716437*LOG(GSPR_NENG/GSPR_SUM) - 0.07261536433*LOG(WPI053_1)

LOG(XREVIND10_PAC/REVIND10_SUM) = -1.88599987 + 0.3284813492 +
1.479716437*LOG(GSPR_PAC/GSPR_SUM) - 0.4770143368*LOG(WPI053_1)

LOG(XREVIND10_SATL/REVIND10_SUM) = 0.03098302244 + 0.3284813492 +
1.479716437*LOG(GSPR_SATL/GSPR_SUM) - 0.1735801909*LOG(WPI053_1)

LOG(XREVIND10_WNC/REVIND10_SUM) = -0.4986547841 + 0.3284813492 +
1.479716437*LOG(GSPR_WNC/GSPR_SUM) + 0.1738386938*LOG(WPI053_1)

LOG(XREVIND10_WSC/REVIND10_SUM) = 2.43723123 + 0.3284813492 +
1.479716437*LOG(GSPR_WSC/GSPR_SUM) + 0.05850563095*LOG(WPI053_1)

**IND11 - Plastic and Synthetic Rubber Materials**
LOG(XREVIND11_ENC/REVIND11_SUM) = 0.6885079804 - 2.562656848 + 0.02579413893*LOG(WPI053_1)

LOG(XREVIND11_ESC/REVIND11_SUM) = 0.2519145151 - 2.562656848 - 0.1060145142*LOG(WPI053_1)

LOG(XREVIND11_MATL/REVIND11_SUM) = -0.2156202209 - 2.562656848 - 0.3392244331*LOG(WPI053_1)

LOG(XREVIND11_MTN/REVIND11_SUM) = -0.669395907 - 2.562656848 - 0.6031746238*LOG(WPI053_1)

LOG(XREVIND11_NENG/REVIND11_SUM) = -0.9124854302 - 2.562656848 - 0.1879581485*LOG(WPI053_1)

LOG(XREVIND11_PAC/REVIND11_SUM) = -0.7147281018 - 2.562656848 - 0.4212323601*LOG(WPI053_1)

LOG(XREVIND11_SATL/REVIND11_SUM) = 1.218084252 - 2.562656848 - 0.1378981584*LOG(WPI053_1)

LOG(XREVIND11_WNC/REVIND11_SUM) = -0.9306984395 - 2.562656848 - 0.2646810114*LOG(WPI053_1)

LOG(XREVIND11_WSC/REVIND11_SUM) = 1.284421352 - 2.562656848 + 0.4073558458*LOG(WPI053_1)

**IND12 - Agricultural Chemicals**
LOG(XREVIND12_ENC/REVIND12_SUM) = -0.6525790555 - 0.02884718955 + 1.073457188*LOG(GSPR_ENC/GSPR_SUM) + 0.2553994889*LOG(WPI053_1)

LOG(XREVIND12_ESC/REVIND12_SUM) = 0.2690298816 - 0.02884718955 + 1.073457188*LOG(GSPR_ESC/GSPR_SUM) - 0.01238315582*LOG(WPI053_1)

LOG(XREVIND12_MATL/REVIND12_SUM) = -1.622935285 - 0.02884718955 + 1.073457188*LOG(GSPR_MATL/GSPR_SUM) - 0.3554597454*LOG(WPI053_1)

LOG(XREVIND12_MTN/REVIND12_SUM) = 0.2639003259 - 0.02884718955 + 1.073457188*LOG(GSPR_MTN/GSPR_SUM) - 0.2474231805*LOG(WPI053_1)

LOG(XREVIND12_NENG/REVIND12_SUM) = -0.1364772412 - 0.02884718955 + 1.073457188*LOG(GSPR_NENG/GSPR_SUM) - 0.3349466468*LOG(WPI053_1)

LOG(XREVIND12_PAC/REVIND12_SUM) = -1.035739708 - 0.02884718955 + 1.073457188*LOG(GSPR_PAC/GSPR_SUM) - 0.130879713*LOG(WPI053_1)

LOG(XREVIND12_SATL/REVIND12_SUM) = 0.6130716357 - 0.02884718955 +
1.073457188*LOG(GSPR_SATL/GSPR_SUM) - 0.1906832045*LOG(WPI053_1)

LOG(XREVIND12_WNC/REVIND12_SUM) = 1.291833001 - 0.02884718955 +
1.073457188*LOG(GSPR_WNC/GSPR_SUM) + 0.1166890852*LOG(WPI053_1)

LOG(XREVIND12_WSC/REVIND12_SUM) = 1.009896446 - 0.02884718955 +
1.073457188*LOG(GSPR_WSC/GSPR_SUM) + 0.1553470194*LOG(WPI053_1)

**IND13 - Other Chemical Products**
LOG(XREVIND13_ENC/REVIND13_SUM) = 0.58121733 + 0.2328687244 +
1.195471421*LOG(GSPR_ENC/GSPR_SUM) - 0.002921923217*@TREND

LOG(XREVIND13_ESC/REVIND13_SUM) = -0.1003687849 + 0.2328687244 +
1.195471421*LOG(GSPR_ESC/GSPR_SUM) + 0.007035858452*@TREND

LOG(XREVIND13_MATL/REVIND13_SUM) = 0.6171880186 + 0.2328687244 +
1.195471421*LOG(GSPR_MATL/GSPR_SUM) + 0.0003437216522*@TREND

LOG(XREVIND13_MTN/REVIND13_SUM) = -0.3151852955 + 0.2328687244 +
1.195471421*LOG(GSPR_MTN/GSPR_SUM) - 0.01176785594*@TREND

LOG(XREVIND13_NENG/REVIND13_SUM) = 0.2554172233 + 0.2328687244 +
1.195471421*LOG(GSPR_NENG/GSPR_SUM) + 0.002464237698*@TREND

LOG(XREVIND13_PAC/REVIND13_SUM) = -0.6724501335 + 0.2328687244 +
1.195471421*LOG(GSPR_PAC/GSPR_SUM) + 0.005626397908*@TREND

LOG(XREVIND13_SATL/REVIND13_SUM) = -0.05577979611 + 0.2328687244 +
1.195471421*LOG(GSPR_SATL/GSPR_SUM) + 0.01189942404*@TREND

LOG(XREVIND13_WNC/REVIND13_SUM) = 0.2814271331 + 0.2328687244 +
1.195471421*LOG(GSPR_WNC/GSPR_SUM) - 0.0007505754505*@TREND

LOG(XREVIND13_WSC/REVIND13_SUM) = -0.591465695 + 0.2328687244 +
1.195471421*LOG(GSPR_WSC/GSPR_SUM) + 0.00444855504*@TREND

**IND14 - Petroleum Refineries**
LOG(XREVIND14_ENC/REVIND14_SUM) = 0.3331379611 - 1.633439347 +
0.4926511131*LOG(GSPR_ENC/GSPR_SUM) + 0.2408235222*LOG(WPI05_1)

LOG(XREVIND14_ESC/REVIND14_SUM) = 0.1564923708 - 1.633439347 +
0.4926511131*LOG(GSPR_ESC/GSPR_SUM) + 0.1262288942*LOG(WPI05_1)

LOG(XREVIND14_MATL/REVIND14_SUM) = 0.1149226636 - 1.633439347 +
0.4926511131*LOG(GSPR_MATL/GSPR_SUM) - 0.1598513426*LOG(WPI05_1)

LOG(XREVIND14_MTN/REVIND14_SUM) = -0.5848864249 - 1.633439347 +
0.4926511131*LOG(GSPR_MTN/GSPR_SUM) - 0.3861907953*LOG(WPI05_1)

LOG(XREVIND14_NENG/REVIND14_SUM) = -1.184864913 - 1.633439347 +
0.4926511131*LOG(GSPR_NENG/GSPR_SUM) - 0.3822980259*LOG(WPI05_1)

LOG(XREVIND14_PAC/REVIND14_SUM) = 0.7285637127 - 1.633439347 +
0.4926511131*LOG(GSPR_PAC/GSPR_SUM) - 0.1520187832*LOG(WPI05_1)

LOG(XREVIND14_SATL/REVIND14_SUM) = -1.373224806 - 1.633439347 +
0.4926511131*LOG(GSPR_SATL/GSPR_SUM) - 0.3571269765*LOG(WPI05_1)

LOG(XREVIND14_WNC/REVIND14_SUM) = -0.1841612906 - 1.633439347 +
0.4926511131*LOG(GSPR_WNC/GSPR_SUM) - 0.2624123558*LOG(WPI05_1)

LOG(XREVIND14_WSC/REVIND14_SUM) = 1.994020726 - 1.633439347 +
0.4926511131*LOG(GSPR_WSC/GSPR_SUM) + 0.05054160524*LOG(WPI05_1)

**IND15 - Other Petroleum and Coal Products**
LOG(XREVIND15_ENC/REVIND15_SUM) = 1.228082731 - 1.147116252 +
0.696394521*LOG(GSPR_ENC/GSPR_SUM) + 0.1021450892*LOG(WPI053_1)

LOG(XREVIND15_ESC/REVIND15_SUM) = -0.9867739627 - 1.147116252 +
0.696394521*LOG(GSPR_ESC/GSPR_SUM) + 0.05023182694*LOG(WPI053_1)

LOG(XREVIND15_MATL/REVIND15_SUM) = 0.6741976138 - 1.147116252 +
0.696394521*LOG(GSPR_MATL/GSPR_SUM) - 0.1586655149*LOG(WPI053_1)

LOG(XREVIND15_MTN/REVIND15_SUM) = -0.9327000596 - 1.147116252 +
0.696394521*LOG(GSPR_MTN/GSPR_SUM) - 0.2139231372*LOG(WPI053_1)

LOG(XREVIND15_NENG/REVIND15_SUM) = -1.211408227 - 1.147116252 +
0.696394521*LOG(GSPR_NENG/GSPR_SUM) - 0.1902657323*LOG(WPI053_1)

LOG(XREVIND15_PAC/REVIND15_SUM) = -0.1189290275 - 1.147116252 +
0.696394521*LOG(GSPR_PAC/GSPR_SUM) - 0.06413521785*LOG(WPI053_1)

LOG(XREVIND15_SATL/REVIND15_SUM) = -0.7919978308 - 1.147116252 +
0.696394521*LOG(GSPR_SATL/GSPR_SUM) - 0.12187984*LOG(WPI053_1)

LOG(XREVIND15_WNC/REVIND15_SUM) = 0.8134136824 - 1.147116252 +
0.696394521*LOG(GSPR_WNC/GSPR_SUM) + 0.1519761653*LOG(WPI053_1)

LOG(XREVIND15_WSC/REVIND15_SUM) = 1.326115081 - 1.147116252 +
0.696394521*LOG(GSPR_WSC/GSPR_SUM) + 0.03223667668*LOG(WPI053_1)

**IND16 - Plastics and Rubber Products**
LOG(XREVIND16_ENC/REVIND16_SUM) = 0.7998258634 - 0.3899937319 +
0.8775295232*LOG(GSPR_ENC/GSPR_SUM) -
0.3395651142*LOG(RWM_ENC/RWM_AVG) + 0.001253569329*@TREND

LOG(XREVIND16_ESC/REVIND16_SUM) = 0.5691689421 - 0.3899937319 +
0.8775295232*LOG(GSPR_ESC/GSPR_SUM) - 0.3395651142*LOG(RWM_ESC/RWM_AVG)
- 0.002969460759*@TREND

LOG(XREVIND16_MATL/REVIND16_SUM) = -0.1312952426 - 0.3899937319 +
0.8775295232*LOG(GSPR_MATL/GSPR_SUM) -
0.3395651142*LOG(RWM_MATL/RWM_AVG) - 0.0009535934304*@TREND

LOG(XREVIND16_MTN/REVIND16_SUM) = -1.154273102 - 0.3899937319 +
0.8775295232*LOG(GSPR_MTN/GSPR_SUM) -
0.3395651142*LOG(RWM_MTN/RWM_AVG) + 0.009777868169*@TREND

LOG(XREVIND16_NENG/REVIND16_SUM) = 0.0004297719274 - 0.3899937319 +
0.8775295232*LOG(GSPR_NENG/GSPR_SUM) -
0.3395651142*LOG(RWM_NENG/RWM_AVG) - 0.005601661125*@TREND

LOG(XREVIND16_PAC/REVIND16_SUM) = -0.2868385262 - 0.3899937319 +
0.8775295232*LOG(GSPR_PAC/GSPR_SUM) - 0.3395651142*LOG(RWM_PAC/RWM_AVG)
- 0.003035933449*@TREND

LOG(XREVIND16_SATL/REVIND16_SUM) = 0.02606046372 - 0.3899937319 +
0.8775295232*LOG(GSPR_SATL/GSPR_SUM) -
0.3395651142*LOG(RWM_SATL/RWM_AVG) + 0.003325516881*@TREND

LOG(XREVIND16_WNC/REVIND16_SUM) = 0.2045389464 - 0.3899937319 +
0.8775295232*LOG(GSPR_WNC/GSPR_SUM) -
0.3395651142*LOG(RWM_WNC/RWM_AVG) - 0.003018945196*@TREND

LOG(XREVIND16_WSC/REVIND16_SUM) = -0.027617117 - 0.3899937319 +
0.8775295232*LOG(GSPR_WSC/GSPR_SUM) -
0.3395651142*LOG(RWM_WSC/RWM_AVG) + 0.001029250965*@TREND

**IND17 - Leather and Allied Products**
LOG(XREVIND17_ENC/REVIND17_SUM) = 0.09299192289 + 0.1019719571 +
1.043112662*LOG(GSPR_ENC/GSPR_SUM)

LOG(XREVIND17_ESC/REVIND17_SUM) = -0.1047241141 + 0.1019719571 +
1.043112662*LOG(GSPR_ESC/GSPR_SUM)

LOG(XREVIND17_MATL/REVIND17_SUM) = 0.1035025378 + 0.1019719571 +
1.043112662*LOG(GSPR_MATL/GSPR_SUM)

LOG(XREVIND17_MTN/REVIND17_SUM) = 0.3520250331 + 0.1019719571 +
1.043112662*LOG(GSPR_MTN/GSPR_SUM)

LOG(XREVIND17_NENG/REVIND17_SUM) = 1.165531337 + 0.1019719571 +
1.043112662*LOG(GSPR_NENG/GSPR_SUM)

LOG(XREVIND17_PAC/REVIND17_SUM) = -0.9723766581 + 0.1019719571 +
1.043112662*LOG(GSPR_PAC/GSPR_SUM)

LOG(XREVIND17_SATL/REVIND17_SUM) = -0.6125536743 + 0.1019719571 +
1.043112662*LOG(GSPR_SATL/GSPR_SUM)

LOG(XREVIND17_WNC/REVIND17_SUM) = 0.3260479274 + 0.1019719571 +
1.043112662*LOG(GSPR_WNC/GSPR_SUM)

LOG(XREVIND17_WSC/REVIND17_SUM) = -0.3504443116 + 0.1019719571 +
1.043112662*LOG(GSPR_WSC/GSPR_SUM)

**IND18 - Glass & Glass Products**
LOG(XREVIND18_ENC/REVIND18_SUM) = 0.4996712811 + 1.229190746 +
1.64217706*LOG(GSPR_ENC/GSPR_SUM) + 0.3037340514*LOG(WPI05_1)

LOG(XREVIND18_ESC/REVIND18_SUM) = 1.108347185 + 1.229190746 +
1.64217706*LOG(GSPR_ESC/GSPR_SUM) + 0.1118568544*LOG(WPI05_1)

LOG(XREVIND18_MATL/REVIND18_SUM) = 0.08650346396 + 1.229190746 +
1.64217706*LOG(GSPR_MATL/GSPR_SUM) - 0.2719165722*LOG(WPI05_1)

LOG(XREVIND18_MTN/REVIND18_SUM) = -0.6064942455 + 1.229190746 +
1.64217706*LOG(GSPR_MTN/GSPR_SUM) - 0.6834821237*LOG(WPI05_1)

LOG(XREVIND18_NENG/REVIND18_SUM) = -0.5860863956 + 1.229190746 +
1.64217706*LOG(GSPR_NENG/GSPR_SUM) + 0.1066278278*LOG(WPI05_1)

LOG(XREVIND18_PAC/REVIND18_SUM) = -0.6251576435 + 1.229190746 +
1.64217706*LOG(GSPR_PAC/GSPR_SUM) - 0.5298384976*LOG(WPI05_1)

LOG(XREVIND18_SATL/REVIND18_SUM) = 0.1259332683 + 1.229190746 +
1.64217706*LOG(GSPR_SATL/GSPR_SUM) + 0.4429708709*LOG(WPI05_1)

LOG(XREVIND18_WNC/REVIND18_SUM) = 0.06595036781 + 1.229190746 +
1.64217706*LOG(GSPR_WNC/GSPR_SUM) + 0.1448263134*LOG(WPI05_1)

LOG(XREVIND18_WSC/REVIND18_SUM) = -0.06866728183 + 1.229190746 +
1.64217706*LOG(GSPR_WSC/GSPR_SUM) + 0.1518575988*LOG(WPI05_1)

**IND19 - Cement Manufacturing**

LOG(XREVIND19_ENC/REVIND19_SUM) = 0.3340642313 - 1.840026618 + 0.210693967*LOG(GSPR_ENC/GSPR_SUM) - 0.09449694344*LOG(WPI05_1)

LOG(XREVIND19_ESC/REVIND19_SUM) = -0.008671387723 - 1.840026618 + 0.210693967*LOG(GSPR_ESC/GSPR_SUM) + 0.07705989063*LOG(WPI05_1)

LOG(XREVIND19_MATL/REVIND19_SUM) = -0.09722123422 - 1.840026618 + 0.210693967*LOG(GSPR_MATL/GSPR_SUM) - 0.009120999154*LOG(WPI05_1)

LOG(XREVIND19_MTN/REVIND19_SUM) = -0.02955264483 - 1.840026618 + 0.210693967*LOG(GSPR_MTN/GSPR_SUM) + 0.0467506441*LOG(WPI05_1)

LOG(XREVIND19_NENG/REVIND19_SUM) = -1.499886249 - 1.840026618 + 0.210693967*LOG(GSPR_NENG/GSPR_SUM) - 0.4299667424*LOG(WPI05_1)

LOG(XREVIND19_PAC/REVIND19_SUM) = 0.323484774 - 1.840026618 + 0.210693967*LOG(GSPR_PAC/GSPR_SUM) + 0.06665394127*LOG(WPI05_1)

LOG(XREVIND19_SATL/REVIND19_SUM) = 0.1951561441 - 1.840026618 + 0.210693967*LOG(GSPR_SATL/GSPR_SUM) - 0.03246200825*LOG(WPI05_1)

LOG(XREVIND19_WNC/REVIND19_SUM) = 0.3946673619 - 1.840026618 + 0.210693967*LOG(GSPR_WNC/GSPR_SUM) + 0.04238022391*LOG(WPI05_1)

LOG(XREVIND19_WSC/REVIND19_SUM) = 0.3879590048 - 1.840026618 + 0.210693967*LOG(GSPR_WSC/GSPR_SUM) - 0.0361359241*LOG(WPI05_1)

**IND20 - Other Nonmetallic Mineral Products**

LOG(XREVIND20_ENC/REVIND20_SUM) = 0.1247684656 + 0.3336699684 + 0.9729919924*LOG(GSPR_ENC/GSPR_SUM) + 0.1581575498*LOG(HUSPS_ENC/HUSPS_SUM)

LOG(XREVIND20_ESC/REVIND20_SUM) = 0.3561008283 + 0.3336699684 + 0.9729919924*LOG(GSPR_ESC/GSPR_SUM) + 0.1581575498*LOG(HUSPS_ESC/HUSPS_SUM)

LOG(XREVIND20_MATL/REVIND20_SUM) = -0.2431152165 + 0.3336699684 + 0.9729919924*LOG(GSPR_MATL/GSPR_SUM) + 0.1581575498*LOG(HUSPS_MATL/HUSPS_SUM)

LOG(XREVIND20_MTN/REVIND20_SUM) = 0.1069618926 + 0.3336699684 + 0.9729919924*LOG(GSPR_MTN/GSPR_SUM) + 0.1581575498*LOG(HUSPS_MTN/HUSPS_SUM)

LOG(XREVIND20_NENG/REVIND20_SUM) = -0.2251904711 + 0.3336699684 +
0.9729919924*LOG(GSPR_NENG/GSPR_SUM) +
0.1581575498*LOG(HUSPS_NENG/HUSPS_SUM)

LOG(XREVIND20_PAC/REVIND20_SUM) = -0.4182648128 + 0.3336699684 +
0.9729919924*LOG(GSPR_PAC/GSPR_SUM) +
0.1581575498*LOG(HUSPS_PAC/HUSPS_SUM)

LOG(XREVIND20_SATL/REVIND20_SUM) = -0.1344407076 + 0.3336699684 +
0.9729919924*LOG(GSPR_SATL/GSPR_SUM) +
0.1581575498*LOG(HUSPS_SATL/HUSPS_SUM)

LOG(XREVIND20_WNC/REVIND20_SUM) = 0.3808572223 + 0.3336699684 +
0.9729919924*LOG(GSPR_WNC/GSPR_SUM) +
0.1581575498*LOG(HUSPS_WNC/HUSPS_SUM)

LOG(XREVIND20_WSC/REVIND20_SUM) = 0.05232279922 + 0.3336699684 +
0.9729919924*LOG(GSPR_WSC/GSPR_SUM) +
0.1581575498*LOG(HUSPS_WSC/HUSPS_SUM)

**IND21 - Iron & Steel Mills, Ferroalloy & Steel Products**
LOG(XREVIND21_ENC/REVIND21_SUM) = 1.41212137 + 0.1835951189 +
1.255339416*LOG(GSPR_ENC/GSPR_SUM) + 0.0871879248*LOG(WPI05_1)

LOG(XREVIND21_ESC/REVIND21_SUM) = 0.9182569785 + 0.1835951189 +
1.255339416*LOG(GSPR_ESC/GSPR_SUM) + 0.1894030512*LOG(WPI05_1)

LOG(XREVIND21_MATL/REVIND21_SUM) = 0.3936555013 + 0.1835951189 +
1.255339416*LOG(GSPR_MATL/GSPR_SUM) - 0.00647265593*LOG(WPI05_1)

LOG(XREVIND21_MTN/REVIND21_SUM) = -0.4712328736 + 0.1835951189 +
1.255339416*LOG(GSPR_MTN/GSPR_SUM) - 0.3920808371*LOG(WPI05_1)

LOG(XREVIND21_NENG/REVIND21_SUM) = -0.4906116643 + 0.1835951189 +
1.255339416*LOG(GSPR_NENG/GSPR_SUM) - 0.4573584082*LOG(WPI05_1)

LOG(XREVIND21_PAC/REVIND21_SUM) = -0.9911585636 + 0.1835951189 +
1.255339416*LOG(GSPR_PAC/GSPR_SUM) + 0.1156789754*LOG(WPI05_1)

LOG(XREVIND21_SATL/REVIND21_SUM) = -0.5294145077 + 0.1835951189 +
1.255339416*LOG(GSPR_SATL/GSPR_SUM) + 0.02237057468*LOG(WPI05_1)

LOG(XREVIND21_WNC/REVIND21_SUM) = -0.3992104976 + 0.1835951189 +
1.255339416*LOG(GSPR_WNC/GSPR_SUM) - 0.1526924668*LOG(WPI05_1)

LOG(XREVIND21_WSC/REVIND21_SUM) = 0.157594257 + 0.1835951189 +
1.255339416*LOG(GSPR_WSC/GSPR_SUM) + 0.6235679266*LOG(WPI05_1)

**IND22 - Alumina & Aluminum Products**
LOG(XREVIND22_ENC/REVIND22_SUM) = 0.3253205062 + 0.3583208472 +
1.21431439*LOG(GSPR_ENC/GSPR_SUM) + 0.1304996633*LOG(WPI05_1)

LOG(XREVIND22_ESC/REVIND22_SUM) = 1.744451449 + 0.3583208472 +
1.21431439*LOG(GSPR_ESC/GSPR_SUM) + 0.1877464094*LOG(WPI05_1)

LOG(XREVIND22_MATL/REVIND22_SUM) = -0.1367613019 + 0.3583208472 +
1.21431439*LOG(GSPR_MATL/GSPR_SUM) - 0.06016389251*LOG(WPI05_1)

LOG(XREVIND22_MTN/REVIND22_SUM) = -0.3576209414 + 0.3583208472 +
1.21431439*LOG(GSPR_MTN/GSPR_SUM) - 0.3238845489*LOG(WPI05_1)

LOG(XREVIND22_NENG/REVIND22_SUM) = -0.7719907022 + 0.3583208472 +
1.21431439*LOG(GSPR_NENG/GSPR_SUM) - 0.2734647691*LOG(WPI05_1)

LOG(XREVIND22_PAC/REVIND22_SUM) = -0.3940848315 + 0.3583208472 +
1.21431439*LOG(GSPR_PAC/GSPR_SUM) - 0.5381764294*LOG(WPI05_1)

LOG(XREVIND22_SATL/REVIND22_SUM) = -0.2052540715 + 0.3583208472 +
1.21431439*LOG(GSPR_SATL/GSPR_SUM) + 0.03005095398*LOG(WPI05_1)

LOG(XREVIND22_WNC/REVIND22_SUM) = -0.2589366588 + 0.3583208472 +
1.21431439*LOG(GSPR_WNC/GSPR_SUM) + 0.1258682896*LOG(WPI05_1)

LOG(XREVIND22_WSC/REVIND22_SUM) = 0.05487655231 + 0.3583208472 +
1.21431439*LOG(GSPR_WSC/GSPR_SUM) + 0.4486008307*LOG(WPI05_1)

**IND23 - Other Primary Metals**
LOG(XREVIND23_ENC/REVIND23_SUM) = 1.233709826 - 1.117778763 +
0.555455942*LOG(GSPR_ENC/GSPR_SUM) - 0.8743028709*LOG(RWM_ENC/RWM_AVG)
- 0.001307279113*@TREND

LOG(XREVIND23_ESC/REVIND23_SUM) = 0.1644585221 - 1.117778763 +
0.555455942*LOG(GSPR_ESC/GSPR_SUM) - 0.8743028709*LOG(RWM_ESC/RWM_AVG) +
0.001110279462*@TREND

LOG(XREVIND23_MATL/REVIND23_SUM) = 0.3025676619 - 1.117778763 +
0.555455942*LOG(GSPR_MATL/GSPR_SUM) -
0.8743028709*LOG(RWM_MATL/RWM_AVG) - 0.005043489701*@TREND

LOG(XREVIND23_MTN/REVIND23_SUM) = 0.1335006711 - 1.117778763 +
0.555455942*LOG(GSPR_MTN/GSPR_SUM) - 0.8743028709*LOG(RWM_MTN/RWM_AVG)
- 0.006588729755*@TREND

LOG(XREVIND23_NENG/REVIND23_SUM) = -0.1892422134 - 1.117778763 + 0.555455942*LOG(GSPR_NENG/GSPR_SUM) - 0.8743028709*LOG(RWM_NENG/RWM_AVG) + 0.001553012264*@TREND

LOG(XREVIND23_PAC/REVIND23_SUM) = -0.1421332051 - 1.117778763 + 0.555455942*LOG(GSPR_PAC/GSPR_SUM) - 0.8743028709*LOG(RWM_PAC/RWM_AVG) - 0.01710748903*@TREND

LOG(XREVIND23_SATL/REVIND23_SUM) = -0.983508234 - 1.117778763 + 0.555455942*LOG(GSPR_SATL/GSPR_SUM) - 0.8743028709*LOG(RWM_SATL/RWM_AVG) + 0.01419256004*@TREND

LOG(XREVIND23_WNC/REVIND23_SUM) = -0.3731989617 - 1.117778763 + 0.555455942*LOG(GSPR_WNC/GSPR_SUM) - 0.8743028709*LOG(RWM_WNC/RWM_AVG) + 0.003289839047*@TREND

LOG(XREVIND23_WSC/REVIND23_SUM) = -0.1461540673 - 1.117778763 + 0.555455942*LOG(GSPR_WSC/GSPR_SUM) - 0.8743028709*LOG(RWM_WSC/RWM_AVG) + 0.004811556828*@TREND

**IND24 - Fabricated Metal Products**

LOG(XREVIND24_ENC/REVIND24_SUM) = 1.28061388 - 2.407389428 + 0.9882429887*LOG((YPDR_ENC/NP_ENC)/(YPDR_SUM/NP_SUM)) - 0.002405073691*@TREND

LOG(XREVIND24_ESC/REVIND24_SUM) = -0.2084023903 - 2.407389428 + 0.9882429887*LOG((YPDR_ESC/NP_ESC)/(YPDR_SUM/NP_SUM)) + 0.004425183187*@TREND

LOG(XREVIND24_MATL/REVIND24_SUM) = 0.5581048562 - 2.407389428 + 0.9882429887*LOG((YPDR_MATL/NP_MATL)/(YPDR_SUM/NP_SUM)) - 0.02403032771*@TREND

LOG(XREVIND24_MTN/REVIND24_SUM) = -1.471173696 - 2.407389428 + 0.9882429887*LOG((YPDR_MTN/NP_MTN)/(YPDR_SUM/NP_SUM)) + 0.02703200474*@TREND

LOG(XREVIND24_NENG/REVIND24_SUM) = -0.2625005441 - 2.407389428 + 0.9882429887*LOG((YPDR_NENG/NP_NENG)/(YPDR_SUM/NP_SUM)) - 0.01122094177*@TREND

LOG(XREVIND24_PAC/REVIND24_SUM) = 0.1419074592 - 2.407389428 + 0.9882429887*LOG((YPDR_PAC/NP_PAC)/(YPDR_SUM/NP_SUM)) + 0.005102899121*@TREND

LOG(XREVIND24_SATL/REVIND24_SUM) = 0.1615587212 - 2.407389428 +
0.9882429887*LOG((YPDR_SATL/NP_SATL)/(YPDR_SUM/NP_SUM)) +
0.005497407784*@TREND

LOG(XREVIND24_WNC/REVIND24_SUM) = -0.1325533189 - 2.407389428 +
0.9882429887*LOG((YPDR_WNC/NP_WNC)/(YPDR_SUM/NP_SUM)) -
0.0004076662874*@TREND

LOG(XREVIND24_WSC/REVIND24_SUM) = -0.06755496711 - 2.407389428 +
0.9882429887*LOG((YPDR_WSC/NP_WSC)/(YPDR_SUM/NP_SUM)) +
0.01696874171*@TREND

**IND25 - Machinery**
LOG(XREVIND25_ENC/REVIND25_SUM) = 0.3335992231 + 1.275100579 +
1.561410815*LOG(GSPR_ENC/GSPR_SUM) - 1.003371182*LOG(RWM_ENC/RWM_AVG)

LOG(XREVIND25_ESC/REVIND25_SUM) = 0.4015076536 + 1.275100579 +
1.561410815*LOG(GSPR_ESC/GSPR_SUM) - 1.003371182*LOG(RWM_ESC/RWM_AVG)

LOG(XREVIND25_MATL/REVIND25_SUM) = -0.5567804511 + 1.275100579 +
1.561410815*LOG(GSPR_MATL/GSPR_SUM) -
1.003371182*LOG(RWM_MATL/RWM_AVG)

LOG(XREVIND25_MTN/REVIND25_SUM) = -0.1350195979 + 1.275100579 +
1.561410815*LOG(GSPR_MTN/GSPR_SUM) - 1.003371182*LOG(RWM_MTN/RWM_AVG)

LOG(XREVIND25_NENG/REVIND25_SUM) = 0.6129046553 + 1.275100579 +
1.561410815*LOG(GSPR_NENG/GSPR_SUM) -
1.003371182*LOG(RWM_NENG/RWM_AVG)

LOG(XREVIND25_PAC/REVIND25_SUM) = -0.2342184168 + 1.275100579 +
1.561410815*LOG(GSPR_PAC/GSPR_SUM) - 1.003371182*LOG(RWM_PAC/RWM_AVG)

LOG(XREVIND25_SATL/REVIND25_SUM) = -0.9716309571 + 1.275100579 +
1.561410815*LOG(GSPR_SATL/GSPR_SUM) -
1.003371182*LOG(RWM_SATL/RWM_AVG)

LOG(XREVIND25_WNC/REVIND25_SUM) = 0.6261012275 + 1.275100579 +
1.561410815*LOG(GSPR_WNC/GSPR_SUM) - 1.003371182*LOG(RWM_WNC/RWM_AVG)

LOG(XREVIND25_WSC/REVIND25_SUM) = -0.07646333672 + 1.275100579 +
1.561410815*LOG(GSPR_WSC/GSPR_SUM) - 1.003371182*LOG(RWM_WSC/RWM_AVG)

**IND26 - Other Electronic & Electric Products**
LOG(XREVIND26_ENC/REVIND26_SUM) = -1.163433904 + 5.419333007 +
0.8368591251*LOG(GSPR_ENC/GSPR_SUM) + 2.505231393*LOG(NP_ENC/NP_SUM)

LOG(XREVIND26_ESC/REVIND26_SUM) = 1.269417724 + 5.419333007 +
0.8368591251*LOG(GSPR_ESC/GSPR_SUM) + 2.505231393*LOG(NP_ESC/NP_SUM)

LOG(XREVIND26_MATL/REVIND26_SUM) = -1.385797217 + 5.419333007 +
0.8368591251*LOG(GSPR_MATL/GSPR_SUM) + 2.505231393*LOG(NP_MATL/NP_SUM)

LOG(XREVIND26_MTN/REVIND26_SUM) = 1.255245048 + 5.419333007 +
0.8368591251*LOG(GSPR_MTN/GSPR_SUM) + 2.505231393*LOG(NP_MTN/NP_SUM)

LOG(XREVIND26_NENG/REVIND26_SUM) = 1.912864839 + 5.419333007 +
0.8368591251*LOG(GSPR_NENG/GSPR_SUM) + 2.505231393*LOG(NP_NENG/NP_SUM)

LOG(XREVIND26_PAC/REVIND26_SUM) = -0.8847264354 + 5.419333007 +
0.8368591251*LOG(GSPR_PAC/GSPR_SUM) + 2.505231393*LOG(NP_PAC/NP_SUM)

LOG(XREVIND26_SATL/REVIND26_SUM) = -1.577113956 + 5.419333007 +
0.8368591251*LOG(GSPR_SATL/GSPR_SUM) + 2.505231393*LOG(NP_SATL/NP_SUM)

LOG(XREVIND26_WNC/REVIND26_SUM) = 0.8254035682 + 5.419333007 +
0.8368591251*LOG(GSPR_WNC/GSPR_SUM) + 2.505231393*LOG(NP_WNC/NP_SUM)

LOG(XREVIND26_WSC/REVIND26_SUM) = -0.2518596676 + 5.419333007 +
0.8368591251*LOG(GSPR_WSC/GSPR_SUM) + 2.505231393*LOG(NP_WSC/NP_SUM)

**IND27 - Transportation Equipment**
LOG(XREVIND27_ENC/REVIND27_SUM) = 1.284877007 - 0.1529035853 +
1.038165136*LOG(GSPR_ENC/GSPR_SUM) - 0.8820586582*LOG(RWM_ENC/RWM_AVG)

LOG(XREVIND27_ESC/REVIND27_SUM) = 0.5919344214 - 0.1529035853 +
1.038165136*LOG(GSPR_ESC/GSPR_SUM) - 0.8820586582*LOG(RWM_ESC/RWM_AVG)

LOG(XREVIND27_MATL/REVIND27_SUM) = -0.7910551043 - 0.1529035853 +
1.038165136*LOG(GSPR_MATL/GSPR_SUM) -
0.8820586582*LOG(RWM_MATL/RWM_AVG)

LOG(XREVIND27_MTN/REVIND27_SUM) = -0.4286617067 - 0.1529035853 +
1.038165136*LOG(GSPR_MTN/GSPR_SUM) - 0.8820586582*LOG(RWM_MTN/RWM_AVG)

LOG(XREVIND27_NENG/REVIND27_SUM) = -0.3552710901 - 0.1529035853 +
1.038165136*LOG(GSPR_NENG/GSPR_SUM) -
0.8820586582*LOG(RWM_NENG/RWM_AVG)

LOG(XREVIND27_PAC/REVIND27_SUM) = 0.07199759398 - 0.1529035853 +
1.038165136*LOG(GSPR_PAC/GSPR_SUM) - 0.8820586582*LOG(RWM_PAC/RWM_AVG)

LOG(XREVIND27_SATL/REVIND27_SUM) = -0.5216238646 - 0.1529035853 +
1.038165136*LOG(GSPR_SATL/GSPR_SUM) -
0.8820586582*LOG(RWM_SATL/RWM_AVG)

LOG(XREVIND27_WNC/REVIND27_SUM) = 0.6356687189 - 0.1529035853 +
1.038165136*LOG(GSPR_WNC/GSPR_SUM) -
0.8820586582*LOG(RWM_WNC/RWM_AVG)

LOG(XREVIND27_WSC/REVIND27_SUM) = -0.4878659757 - 0.1529035853 +
1.038165136*LOG(GSPR_WSC/GSPR_SUM) - 0.8820586582*LOG(RWM_WSC/RWM_AVG)

**IND28 - Measuring & Control Instruments**
LOG(XREVIND28_ENC/REVIND28_SUM) = 0.2027183351 - 0.6792090669 +
0.7682540722*LOG(GSPR_ENC/GSPR_SUM) - 1.627660944*LOG(RWM_ENC/RWM_AVG)

LOG(XREVIND28_ESC/REVIND28_SUM) = -1.683079772 - 0.6792090669 +
0.7682540722*LOG(GSPR_ESC/GSPR_SUM) - 1.627660944*LOG(RWM_ESC/RWM_AVG)

LOG(XREVIND28_MATL/REVIND28_SUM) = 0.1627977582 - 0.6792090669 +
0.7682540722*LOG(GSPR_MATL/GSPR_SUM) -
1.627660944*LOG(RWM_MATL/RWM_AVG)

LOG(XREVIND28_MTN/REVIND28_SUM) = 0.283279052 - 0.6792090669 +
0.7682540722*LOG(GSPR_MTN/GSPR_SUM) - 1.627660944*LOG(RWM_MTN/RWM_AVG)

LOG(XREVIND28_NENG/REVIND28_SUM) = 1.074030632 - 0.6792090669 +
0.7682540722*LOG(GSPR_NENG/GSPR_SUM) -
1.627660944*LOG(RWM_NENG/RWM_AVG)

LOG(XREVIND28_PAC/REVIND28_SUM) = 0.9541326113 - 0.6792090669 +
0.7682540722*LOG(GSPR_PAC/GSPR_SUM) - 1.627660944*LOG(RWM_PAC/RWM_AVG)

LOG(XREVIND28_SATL/REVIND28_SUM) = -0.3733043616 - 0.6792090669 +
0.7682540722*LOG(GSPR_SATL/GSPR_SUM) -
1.627660944*LOG(RWM_SATL/RWM_AVG)

LOG(XREVIND28_WNC/REVIND28_SUM) = -0.2073644039 - 0.6792090669 +
0.7682540722*LOG(GSPR_WNC/GSPR_SUM) -
1.627660944*LOG(RWM_WNC/RWM_AVG)

LOG(XREVIND28_WSC/REVIND28_SUM) = -0.4132098503 - 0.6792090669 +
0.7682540722*LOG(GSPR_WSC/GSPR_SUM) - 1.627660944*LOG(RWM_WSC/RWM_AVG)

**IND29 - Miscellaneous Manufacturing**
LOG(XREVIND29_ENC/REVIND29_SUM) = -0.3897564668 + 2.253569708 +
0.9070801746*LOG(GSPR_ENC/GSPR_SUM) + 1.06388147*LOG(NP_ENC/NP_SUM)

LOG(XREVIND29_ESC/REVIND29_SUM) = 0.5575544558 + 2.253569708 +
0.9070801746*LOG(GSPR_ESC/GSPR_SUM) + 1.06388147*LOG(NP_ESC/NP_SUM)

LOG(XREVIND29_MATL/REVIND29_SUM) = -0.3326699197 + 2.253569708 +
0.9070801746*LOG(GSPR_MATL/GSPR_SUM) + 1.06388147*LOG(NP_MATL/NP_SUM)

LOG(XREVIND29_MTN/REVIND29_SUM) = 0.4090976918 + 2.253569708 +
0.9070801746*LOG(GSPR_MTN/GSPR_SUM) + 1.06388147*LOG(NP_MTN/NP_SUM)

LOG(XREVIND29_NENG/REVIND29_SUM) = 1.36539255 + 2.253569708 +
0.9070801746*LOG(GSPR_NENG/GSPR_SUM) + 1.06388147*LOG(NP_NENG/NP_SUM)

LOG(XREVIND29_PAC/REVIND29_SUM) = -0.4879864142 + 2.253569708 +
0.9070801746*LOG(GSPR_PAC/GSPR_SUM) + 1.06388147*LOG(NP_PAC/NP_SUM)

LOG(XREVIND29_SATL/REVIND29_SUM) = -1.008724671 + 2.253569708 +
0.9070801746*LOG(GSPR_SATL/GSPR_SUM) + 1.06388147*LOG(NP_SATL/NP_SUM)

LOG(XREVIND29_WNC/REVIND29_SUM) = 0.3843662188 + 2.253569708 +
0.9070801746*LOG(GSPR_WNC/GSPR_SUM) + 1.06388147*LOG(NP_WNC/NP_SUM)

LOG(XREVIND29_WSC/REVIND29_SUM) = -0.4972734446 + 2.253569708 +
0.9070801746*LOG(GSPR_WSC/GSPR_SUM) + 1.06388147*LOG(NP_WSC/NP_SUM)

**IND30 - Crop Production**
LOG(XREVIND30_ENC/REVIND30_SUM) = 0.4233516976 - 2.422136649 +
0.002965078759*@TREND

LOG(XREVIND30_ESC/REVIND30_SUM) = -0.4099103014 - 2.422136649 -
0.01456534105*@TREND

LOG(XREVIND30_MATL/REVIND30_SUM) = -0.7932645098 - 2.422136649 +
0.004496149135*@TREND

LOG(XREVIND30_MTN/REVIND30_SUM) = -0.48673554 - 2.422136649 +
0.003249949817*@TREND

LOG(XREVIND30_NENG/REVIND30_SUM) = -1.236793003 - 2.422136649 -
0.002063021672*@TREND

LOG(XREVIND30_PAC/REVIND30_SUM) = 1.089340503 - 2.422136649 +
0.01180065644*@TREND

LOG(XREVIND30_SATL/REVIND30_SUM) = 0.5462481049 - 2.422136649 + 0.002544258949*@TREND

LOG(XREVIND30_WNC/REVIND30_SUM) = 0.7683587731 - 2.422136649 - 0.02519323902*@TREND

LOG(XREVIND30_WSC/REVIND30_SUM) = 0.09940427556 - 2.422136649 - 0.01498631752*@TREND

**IND31 - Other Agriculture, Forestry, Fishing & Hunting**
LOG(XREVIND31_ENC/REVIND31_SUM) = -0.6861337715 + 1.437733967 + 1.625847787*LOG(NP_ENC/NP_SUM)

LOG(XREVIND31_ESC/REVIND31_SUM) = 0.528546698 + 1.437733967 + 1.625847787*LOG(NP_ESC/NP_SUM)

LOG(XREVIND31_MATL/REVIND31_SUM) = -0.835677159 + 1.437733967 + 1.625847787*LOG(NP_MATL/NP_SUM)

LOG(XREVIND31_MTN/REVIND31_SUM) = 0.7309975002 + 1.437733967 + 1.625847787*LOG(NP_MTN/NP_SUM)

LOG(XREVIND31_NENG/REVIND31_SUM) = -0.1394774164 + 1.437733967 + 1.625847787*LOG(NP_NENG/NP_SUM)

LOG(XREVIND31_PAC/REVIND31_SUM) = -0.4857944116 + 1.437733967 + 1.625847787*LOG(NP_PAC/NP_SUM)

LOG(XREVIND31_SATL/REVIND31_SUM) = -0.5301164735 + 1.437733967 + 1.625847787*LOG(NP_SATL/NP_SUM)

LOG(XREVIND31_WNC/REVIND31_SUM) = 1.218407641 + 1.437733967 + 1.625847787*LOG(NP_WNC/NP_SUM)

LOG(XREVIND31_WSC/REVIND31_SUM) = 0.1992473931 + 1.437733967 + 1.625847787*LOG(NP_WSC/NP_SUM)

**IND32 - Coal Mining**
LOG(XREVIND32_ENC/REVIND32_SUM) = 0.830922657 - 1.41899083 + 0.8530734794*LOG(GSPR_ENC/GSPR_SUM) - 0.6314688682*LOG(WPI05_1)

LOG(XREVIND32_ESC/REVIND32_SUM) = 2.5240462 - 1.41899083 + 0.8530734794*LOG(GSPR_ESC/GSPR_SUM) - 0.2267469194*LOG(WPI05_1)

LOG(XREVIND32_MATL/REVIND32_SUM) = 0.6658386242 - 1.41899083 + 0.8530734794*LOG(GSPR_MATL/GSPR_SUM) + 0.4458404006*LOG(WPI05_1)

LOG(XREVIND32_MTN/REVIND32_SUM) = 2.170610948 - 1.41899083 +
0.8530734794*LOG(GSPR_MTN/GSPR_SUM) + 0.3274799932*LOG(WPI05_1)

LOG(XREVIND32_NENG/REVIND32_SUM) = -5.383577128 - 1.41899083 +
0.8530734794*LOG(GSPR_NENG/GSPR_SUM) - 4.383820694*LOG(WPI05_1)

LOG(XREVIND32_PAC/REVIND32_SUM) = -1.889970425 - 1.41899083 +
0.8530734794*LOG(GSPR_PAC/GSPR_SUM) + 0.8455382356*LOG(WPI05_1)

LOG(XREVIND32_SATL/REVIND32_SUM) = 1.726687786 - 1.41899083 +
0.8530734794*LOG(GSPR_SATL/GSPR_SUM) - 0.09927707729*LOG(WPI05_1)

LOG(XREVIND32_WNC/REVIND32_SUM) = -0.587236144 - 1.41899083 +
0.8530734794*LOG(GSPR_WNC/GSPR_SUM) + 0.1966852119*LOG(WPI05_1)

LOG(XREVIND32_WSC/REVIND32_SUM) = -0.05732251892 - 1.41899083 +
0.8530734794*LOG(GSPR_WSC/GSPR_SUM) + 0.2405743924*LOG(WPI05_1)

**IND33 - Oil & Gas Extraction & Support Activities**
LOG(XREVIND33_ENC/REVIND33_SUM) = -0.5771871062 - 3.586469481 -
0.6353548427*LOG(WPI053_1)

LOG(XREVIND33_ESC/REVIND33_SUM) = -0.6548317193 - 3.586469481 -
0.16693287*LOG(WPI053_1)

LOG(XREVIND33_MATL/REVIND33_SUM) = -1.52208377 - 3.586469481 +
0.7143051947*LOG(WPI053_1)

LOG(XREVIND33_MTN/REVIND33_SUM) = 1.563949292 - 3.586469481 +
0.06817813893*LOG(WPI053_1)

LOG(XREVIND33_NENG/REVIND33_SUM) = -2.640078702 - 3.586469481 +
0.1912769479*LOG(WPI053_1)

LOG(XREVIND33_PAC/REVIND33_SUM) = 1.63231816 - 3.586469481 -
0.2181436291*LOG(WPI053_1)

LOG(XREVIND33_SATL/REVIND33_SUM) = -1.07615084 - 3.586469481 +
0.3259133967*LOG(WPI053_1)

LOG(XREVIND33_WNC/REVIND33_SUM) = 0.1298091524 - 3.586469481 -
0.2750321414*LOG(WPI053_1)

LOG(XREVIND33_WSC/REVIND33_SUM) = 3.144255534 - 3.586469481 +
0.05760249255*LOG(WPI053_1)

**IND34 - Other Mining & Quarrying**
LOG(XREVIND34_ENC/REVIND34_SUM) = -0.07545613452 - 0.8995628766 + 0.6963798229*LOG(GSPR_ENC/GSPR_SUM)

LOG(XREVIND34_ESC/REVIND34_SUM) = -0.2397273619 - 0.8995628766 + 0.6963798229*LOG(GSPR_ESC/GSPR_SUM)

LOG(XREVIND34_MATL/REVIND34_SUM) = -0.8171994232 - 0.8995628766 + 0.6963798229*LOG(GSPR_MATL/GSPR_SUM)

LOG(XREVIND34_MTN/REVIND34_SUM) = 1.88281946 - 0.8995628766 + 0.6963798229*LOG(GSPR_MTN/GSPR_SUM)

LOG(XREVIND34_NENG/REVIND34_SUM) = -1.08501703 - 0.8995628766 + 0.6963798229*LOG(GSPR_NENG/GSPR_SUM)

LOG(XREVIND34_PAC/REVIND34_SUM) = -0.1904340362 - 0.8995628766 + 0.6963798229*LOG(GSPR_PAC/GSPR_SUM)

LOG(XREVIND34_SATL/REVIND34_SUM) = 0.2949662624 - 0.8995628766 + 0.6963798229*LOG(GSPR_SATL/GSPR_SUM)

LOG(XREVIND34_WNC/REVIND34_SUM) = 0.6575834098 - 0.8995628766 + 0.6963798229*LOG(GSPR_WNC/GSPR_SUM)

LOG(XREVIND34_WSC/REVIND34_SUM) = -0.4275351469 - 0.8995628766 + 0.6963798229*LOG(GSPR_WSC/GSPR_SUM)

**IND35 - Construction**
LOG(XREVIND35_ENC/REVIND35_SUM) = 0.4259502948 - 1.607551686 + 1.10625667*LOG((GSPR_ENC/NP_ENC)/(GSPR_SUM/NP_SUM)) + 0.3033160084*LOG(HUSPS_ENC/HUSPS_SUM) - 0.001499075584*@TREND

LOG(XREVIND35_ESC/REVIND35_SUM) = -0.42199375 - 1.607551686 + 1.10625667*LOG((GSPR_ESC/NP_ESC)/(GSPR_SUM/NP_SUM)) + 0.3033160084*LOG(HUSPS_ESC/HUSPS_SUM) + 0.008430092823*@TREND

LOG(XREVIND35_MATL/REVIND35_SUM) = 0.5535365606 - 1.607551686 + 1.10625667*LOG((GSPR_MATL/NP_MATL)/(GSPR_SUM/NP_SUM)) + 0.3033160084*LOG(HUSPS_MATL/HUSPS_SUM) - 0.01824197706*@TREND

LOG(XREVIND35_MTN/REVIND35_SUM) = -0.5361707344 - 1.607551686 + 1.10625667*LOG((GSPR_MTN/NP_MTN)/(GSPR_SUM/NP_SUM)) + 0.3033160084*LOG(HUSPS_MTN/HUSPS_SUM) + 0.0228227603*@TREND

LOG(XREVIND35_NENG/REVIND35_SUM) = -0.4951842629 - 1.607551686 +
1.10625667*LOG((GSPR_NENG/NP_NENG)/(GSPR_SUM/NP_SUM)) +
0.3033160084*LOG(HUSPS_NENG/HUSPS_SUM) + 0.001336511146*@TREND

LOG(XREVIND35_PAC/REVIND35_SUM) = 0.3698992132 - 1.607551686 +
1.10625667*LOG((GSPR_PAC/NP_PAC)/(GSPR_SUM/NP_SUM)) +
0.3033160084*LOG(HUSPS_PAC/HUSPS_SUM) - 0.001323919766*@TREND

LOG(XREVIND35_SATL/REVIND35_SUM) = 0.2718158815 - 1.607551686 +
1.10625667*LOG((GSPR_SATL/NP_SATL)/(GSPR_SUM/NP_SUM)) +
0.3033160084*LOG(HUSPS_SATL/HUSPS_SUM) + 0.006612330622*@TREND

LOG(XREVIND35_WNC/REVIND35_SUM) = -0.2174675491 - 1.607551686 +
1.10625667*LOG((GSPR_WNC/NP_WNC)/(GSPR_SUM/NP_SUM)) +
0.3033160084*LOG(HUSPS_WNC/HUSPS_SUM) + 0.006934907429*@TREND

LOG(XREVIND35_WSC/REVIND35_SUM) = 0.04961434632 - 1.607551686 +
1.10625667*LOG((GSPR_WSC/NP_WSC)/(GSPR_SUM/NP_SUM)) +
0.3033160084*LOG(HUSPS_WSC/HUSPS_SUM) - 0.003208571998*@TREND

**SER1 - Transportation & Warehousing**
LOG(XREVSER1_ENC/REVSER1_SUM) = 0.1116338834 - 0.362834415 +
0.8507704845*LOG(GSPR_ENC/GSPR_SUM) -
1.00852346*LOG(RWNM_ENC/RWNM_AVG) - 0.000294798935*@TREND

LOG(XREVSER1_ESC/REVSER1_SUM) = -0.1743372949 - 0.362834415 +
0.8507704845*LOG(GSPR_ESC/GSPR_SUM) -
1.00852346*LOG(RWNM_ESC/RWNM_AVG) + 0.009995468805*@TREND

LOG(XREVSER1_MATL/REVSER1_SUM) = 0.2898233675 - 0.362834415 +
0.8507704845*LOG(GSPR_MATL/GSPR_SUM) -
1.00852346*LOG(RWNM_MATL/RWNM_AVG) - 0.008886509352*@TREND

LOG(XREVSER1_MTN/REVSER1_SUM) = -0.1355707136 - 0.362834415 +
0.8507704845*LOG(GSPR_MTN/GSPR_SUM) -
1.00852346*LOG(RWNM_MTN/RWNM_AVG) - 0.009436512743*@TREND

LOG(XREVSER1_NENG/REVSER1_SUM) = -0.4959346544 - 0.362834415 +
0.8507704845*LOG(GSPR_NENG/GSPR_SUM) -
1.00852346*LOG(RWNM_NENG/RWNM_AVG) + 0.002291272367*@TREND

LOG(XREVSER1_PAC/REVSER1_SUM) = 0.2603511593 - 0.362834415 +
0.8507704845*LOG(GSPR_PAC/GSPR_SUM) -
1.00852346*LOG(RWNM_PAC/RWNM_AVG) - 0.004898133085*@TREND

LOG(XREVSER1_SATL/REVSER1_SUM) = -0.07243025082 - 0.362834415 +
0.8507704845*LOG(GSPR_SATL/GSPR_SUM) -
1.00852346*LOG(RWNM_SATL/RWNM_AVG) + 0.003419622618*@TREND

LOG(XREVSER1_WNC/REVSER1_SUM) = 0.0886284397 - 0.362834415 +
0.8507704845*LOG(GSPR_WNC/GSPR_SUM) -
1.00852346*LOG(RWNM_WNC/RWNM_AVG) - 0.002273027893*@TREND

LOG(XREVSER1_WSC/REVSER1_SUM) = 0.1278360639 - 0.362834415 +
0.8507704845*LOG(GSPR_WSC/GSPR_SUM) -
1.00852346*LOG(RWNM_WSC/RWNM_AVG) + 0.007182090404*@TREND

**SER2 - Broadcasting & Telecommunications**
LOG(XREVSER2_ENC/REVSER2_SUM) = 0.3993042607 - 1.200747858 +
0.4827110436*LOG(GSPR_ENC/GSPR_SUM) - 0.02204126621*@TREND

LOG(XREVSER2_ESC/REVSER2_SUM) = -0.09922504583 - 1.200747858 +
0.4827110436*LOG(GSPR_ESC/GSPR_SUM) - 0.0217557437*@TREND

LOG(XREVSER2_MATL/REVSER2_SUM) = 0.3769420438 - 1.200747858 +
0.4827110436*LOG(GSPR_MATL/GSPR_SUM) + 0.0001943660599*@TREND

LOG(XREVSER2_MTN/REVSER2_SUM) = -0.5492865929 - 1.200747858 +
0.4827110436*LOG(GSPR_MTN/GSPR_SUM) + 0.01822411385*@TREND

LOG(XREVSER2_NENG/REVSER2_SUM) = -0.1455696093 - 1.200747858 +
0.4827110436*LOG(GSPR_NENG/GSPR_SUM) - 0.0148787614*@TREND

LOG(XREVSER2_PAC/REVSER2_SUM) = 0.1768069862 - 1.200747858 +
0.4827110436*LOG(GSPR_PAC/GSPR_SUM) + 0.003370704107*@TREND

LOG(XREVSER2_SATL/REVSER2_SUM) = 0.319896027 - 1.200747858 +
0.4827110436*LOG(GSPR_SATL/GSPR_SUM) + 0.00767174954*@TREND

LOG(XREVSER2_WNC/REVSER2_SUM) = -0.1972698806 - 1.200747858 +
0.4827110436*LOG(GSPR_WNC/GSPR_SUM) + 0.001278342941*@TREND

LOG(XREVSER2_WSC/REVSER2_SUM) = -0.281598189 - 1.200747858 +
0.4827110436*LOG(GSPR_WSC/GSPR_SUM) + 0.01633132403*@TREND

**SER3 - Electric Power Generation & Distribution**
LOG(XREVSER3_ENC/REVSER3_SUM) = 0.1471345731 - 0.489002977 +
0.7926554152*LOG(NP_ENC/NP_SUM)

LOG(XREVSER3_ESC/REVSER3_SUM) = -0.239525588 - 0.489002977 +
0.7926554152*LOG(NP_ESC/NP_SUM)

LOG(XREVSER3_MATL/REVSER3_SUM) = 0.2195239952 - 0.489002977 + 0.7926554152*LOG(NP_MATL/NP_SUM)

LOG(XREVSER3_MTN/REVSER3_SUM) = -0.222741469 - 0.489002977 + 0.7926554152*LOG(NP_MTN/NP_SUM)

LOG(XREVSER3_NENG/REVSER3_SUM) = 0.1244678496 - 0.489002977 + 0.7926554152*LOG(NP_NENG/NP_SUM)

LOG(XREVSER3_PAC/REVSER3_SUM) = -0.1855740826 - 0.489002977 + 0.7926554152*LOG(NP_PAC/NP_SUM)

LOG(XREVSER3_SATL/REVSER3_SUM) = 0.1578843479 - 0.489002977 + 0.7926554152*LOG(NP_SATL/NP_SUM)

LOG(XREVSER3_WNC/REVSER3_SUM) = -0.1737026343 - 0.489002977 + 0.7926554152*LOG(NP_WNC/NP_SUM)

LOG(XREVSER3_WSC/REVSER3_SUM) = 0.1725330081 - 0.489002977 + 0.7926554152*LOG(NP_WSC/NP_SUM)

**SER4 - Natural Gas Distribution**

LOG(XREVSER4_ENC/REVSER4_SUM) = 0.1546076957 - 0.7735453087 + 0.8107997732*LOG(NP_ENC/NP_SUM)

LOG(XREVSER4_ESC/REVSER4_SUM) = -0.02026779091 - 0.7735453087 + 0.8107997732*LOG(NP_ESC/NP_SUM)

LOG(XREVSER4_MATL/REVSER4_SUM) = 0.8153671384 - 0.7735453087 + 0.8107997732*LOG(NP_MATL/NP_SUM)

LOG(XREVSER4_MTN/REVSER4_SUM) = 0.2215067655 - 0.7735453087 + 0.8107997732*LOG(NP_MTN/NP_SUM)

LOG(XREVSER4_NENG/REVSER4_SUM) = -0.3505248992 - 0.7735453087 + 0.8107997732*LOG(NP_NENG/NP_SUM)

LOG(XREVSER4_PAC/REVSER4_SUM) = -1.291563614 - 0.7735453087 + 0.8107997732*LOG(NP_PAC/NP_SUM)

LOG(XREVSER4_SATL/REVSER4_SUM) = -0.6989598727 - 0.7735453087 + 0.8107997732*LOG(NP_SATL/NP_SUM)

LOG(XREVSER4_WNC/REVSER4_SUM) = -0.48224536 - 0.7735453087 + 0.8107997732*LOG(NP_WNC/NP_SUM)

LOG(XREVSER4_WSC/REVSER4_SUM) = 1.652079937 - 0.7735453087 +
0.8107997732*LOG(NP_WSC/NP_SUM)

**SER5 - Water, Sewage & Related System**
LOG(XREVSER5_ENC/REVSER5_SUM) = -0.2021318938 - 0.5169200463 +
0.7861282388*LOG(NP_ENC/NP_SUM)

LOG(XREVSER5_ESC/REVSER5_SUM) = -0.2083237444 - 0.5169200463 +
0.7861282388*LOG(NP_ESC/NP_SUM)

LOG(XREVSER5_MATL/REVSER5_SUM) = 0.503121037 - 0.5169200463 +
0.7861282388*LOG(NP_MATL/NP_SUM)

LOG(XREVSER5_MTN/REVSER5_SUM) = -0.122508719 - 0.5169200463 +
0.7861282388*LOG(NP_MTN/NP_SUM)

LOG(XREVSER5_NENG/REVSER5_SUM) = -0.03313317786 - 0.5169200463 +
0.7861282388*LOG(NP_NENG/NP_SUM)

LOG(XREVSER5_PAC/REVSER5_SUM) = 0.2629215552 - 0.5169200463 +
0.7861282388*LOG(NP_PAC/NP_SUM)

LOG(XREVSER5_SATL/REVSER5_SUM) = -0.1206677888 - 0.5169200463 +
0.7861282388*LOG(NP_SATL/NP_SUM)

LOG(XREVSER5_WNC/REVSER5_SUM) = -0.1708225256 - 0.5169200463 +
0.7861282388*LOG(NP_WNC/NP_SUM)

LOG(XREVSER5_WSC/REVSER5_SUM) = 0.09154525731 - 0.5169200463 +
0.7861282388*LOG(NP_WSC/NP_SUM)

**SER6 - Wholesale Trade**
LOG(XREVSER6_ENC/REVSER6_SUM) = -0.2842049512 + 1.624483582 +
0.58525012*LOG(GSPR_ENC/GSPR_SUM) + 1.14871624*LOG(NP_ENC/NP_SUM) -
0.1132394701*LOG(RWNM_ENC/RWNM_AVG) + 0.004811096844*@TREND

LOG(XREVSER6_ESC/REVSER6_SUM) = 0.10398769 + 1.624483582 +
0.58525012*LOG(GSPR_ESC/GSPR_SUM) + 1.14871624*LOG(NP_ESC/NP_SUM) -
0.1132394701*LOG(RWNM_ESC/RWNM_AVG) + 0.005542744121*@TREND

LOG(XREVSER6_MATL/REVSER6_SUM) = -0.02750472163 + 1.624483582 +
0.58525012*LOG(GSPR_MATL/GSPR_SUM) + 1.14871624*LOG(NP_MATL/NP_SUM) -
0.1132394701*LOG(RWNM_MATL/RWNM_AVG) - 0.000610870811*@TREND

LOG(XREVSER6_MTN/REVSER6_SUM) = 0.1551885943 + 1.624483582 +
0.58525012*LOG(GSPR_MTN/GSPR_SUM) + 1.14871624*LOG(NP_MTN/NP_SUM) -
0.1132394701*LOG(RWNM_MTN/RWNM_AVG) - 0.007359187846*@TREND

LOG(XREVSER6_NENG/REVSER6_SUM) = 0.4432106161 + 1.624483582 +
0.58525012*LOG(GSPR_NENG/GSPR_SUM) + 1.14871624*LOG(NP_NENG/NP_SUM) -
0.1132394701*LOG(RWNM_NENG/RWNM_AVG) + 0.007862887885*@TREND

LOG(XREVSER6_PAC/REVSER6_SUM) = -0.1575087492 + 1.624483582 +
0.58525012*LOG(GSPR_PAC/GSPR_SUM) + 1.14871624*LOG(NP_PAC/NP_SUM) -
0.1132394701*LOG(RWNM_PAC/RWNM_AVG) - 0.004460950168*@TREND

LOG(XREVSER6_SATL/REVSER6_SUM) = -0.5389215238 + 1.624483582 +
0.58525012*LOG(GSPR_SATL/GSPR_SUM) + 1.14871624*LOG(NP_SATL/NP_SUM) -
0.1132394701*LOG(RWNM_SATL/RWNM_AVG) + 0.001218724317*@TREND

LOG(XREVSER6_WNC/REVSER6_SUM) = 0.3889935531 + 1.624483582 +
0.58525012*LOG(GSPR_WNC/GSPR_SUM) + 1.14871624*LOG(NP_WNC/NP_SUM) -
0.1132394701*LOG(RWNM_WNC/RWNM_AVG) + 0.004795209797*@TREND

LOG(XREVSER6_WSC/REVSER6_SUM) = -0.08324050772 + 1.624483582 +
0.58525012*LOG(GSPR_WSC/GSPR_SUM) + 1.14871624*LOG(NP_WSC/NP_SUM) -
0.1132394701*LOG(RWNM_WSC/RWNM_AVG) + 0.00363422545*@TREND

**SER7 - Retail Trade**
LOG(XREVSER7_ENC/REVSER7_SUM) = -0.6155678623 + 2.572927188 +
0.9375722882*LOG(GSPR_ENC/GSPR_SUM) + 1.164863321*LOG(NP_ENC/NP_SUM) -
0.3317370394*LOG(RWNM_ENC/RWNM_AVG) + 0.004661020912*@TREND

LOG(XREVSER7_ESC/REVSER7_SUM) = 0.5013090291 + 2.572927188 +
0.9375722882*LOG(GSPR_ESC/GSPR_SUM) + 1.164863321*LOG(NP_ESC/NP_SUM) -
0.3317370394*LOG(RWNM_ESC/RWNM_AVG) + 0.004006151401*@TREND

LOG(XREVSER7_MATL/REVSER7_SUM) = -0.5982428569 + 2.572927188 +
0.9375722882*LOG(GSPR_MATL/GSPR_SUM) + 1.164863321*LOG(NP_MATL/NP_SUM) -
0.3317370394*LOG(RWNM_MATL/RWNM_AVG) + 0.003459878849*@TREND

LOG(XREVSER7_MTN/REVSER7_SUM) = 0.9198440242 + 2.572927188 +
0.9375722882*LOG(GSPR_MTN/GSPR_SUM) + 1.164863321*LOG(NP_MTN/NP_SUM) -
0.3317370394*LOG(RWNM_MTN/RWNM_AVG) - 0.01946395388*@TREND

LOG(XREVSER7_NENG/REVSER7_SUM) = 0.69507388 + 2.572927188 +
0.9375722882*LOG(GSPR_NENG/GSPR_SUM) + 1.164863321*LOG(NP_NENG/NP_SUM) -
0.3317370394*LOG(RWNM_NENG/RWNM_AVG) + 0.003346287539*@TREND

LOG(XREVSER7_PAC/REVSER7_SUM) = -0.5640163022 + 2.572927188 +
0.9375722882*LOG(GSPR_PAC/GSPR_SUM) + 1.164863321*LOG(NP_PAC/NP_SUM) -
0.3317370394*LOG(RWNM_PAC/RWNM_AVG) - 0.003045056123*@TREND

LOG(XREVSER7_SATL/REVSER7_SUM) = -0.5551229356 + 2.572927188 +
0.9375722882*LOG(GSPR_SATL/GSPR_SUM) + 1.164863321*LOG(NP_SATL/NP_SUM) -
0.3317370394*LOG(RWNM_SATL/RWNM_AVG) - 0.004918829746*@TREND

LOG(XREVSER7_WNC/REVSER7_SUM) = 0.3653623982 + 2.572927188 +
0.9375722882*LOG(GSPR_WNC/GSPR_SUM) + 1.164863321*LOG(NP_WNC/NP_SUM) -
0.3317370394*LOG(RWNM_WNC/RWNM_AVG) + 0.005535577665*@TREND

LOG(XREVSER7_WSC/REVSER7_SUM) = -0.1486393745 + 2.572927188 +
0.9375722882*LOG(GSPR_WSC/GSPR_SUM) + 1.164863321*LOG(NP_WSC/NP_SUM) -
0.3317370394*LOG(RWNM_WSC/RWNM_AVG) + 1.98553936e-005*@TREND

**SER8 - Finance & Insurance, Real Estate**
LOG(XREVSER8_ENC/REVSER8_SUM) = 0.08156915829 + 0.1173786444 +
1.047895789*LOG(GSPR_ENC/GSPR_SUM) - 0.002590860838*@TREND

LOG(XREVSER8_ESC/REVSER8_SUM) = -0.02362955626 + 0.1173786444 +
1.047895789*LOG(GSPR_ESC/GSPR_SUM) - 0.004759941695*@TREND

LOG(XREVSER8_MATL/REVSER8_SUM) = -0.09017288141 + 0.1173786444 +
1.047895789*LOG(GSPR_MATL/GSPR_SUM) + 0.01355262036*@TREND

LOG(XREVSER8_MTN/REVSER8_SUM) = -0.003082796752 + 0.1173786444 +
1.047895789*LOG(GSPR_MTN/GSPR_SUM) - 0.006270325529*@TREND

LOG(XREVSER8_NENG/REVSER8_SUM) = 0.06405760136 + 0.1173786444 +
1.047895789*LOG(GSPR_NENG/GSPR_SUM) + 0.007697315763*@TREND

LOG(XREVSER8_PAC/REVSER8_SUM) = -0.07870951983 + 0.1173786444 +
1.047895789*LOG(GSPR_PAC/GSPR_SUM) - 0.005879610377*@TREND

LOG(XREVSER8_SATL/REVSER8_SUM) = -0.09890155958 + 0.1173786444 +
1.047895789*LOG(GSPR_SATL/GSPR_SUM) + 0.002516366904*@TREND

LOG(XREVSER8_WNC/REVSER8_SUM) = 0.2207358742 + 0.1173786444 +
1.047895789*LOG(GSPR_WNC/GSPR_SUM) - 0.004578862587*@TREND

LOG(XREVSER8_WSC/REVSER8_SUM) = -0.07186632 + 0.1173786444 +
1.047895789*LOG(GSPR_WSC/GSPR_SUM) - 0.00909293195*@TREND

**SER9 - Other Services**
LOG(XREVSER9_ENC/REVSER9_SUM) = 0.1453323934 - 0.7751261622 +
0.6786599473*LOG(GSPR_ENC/GSPR_SUM) - 0.001713863552*@TREND

LOG(XREVSER9_ESC/REVSER9_SUM) = -0.4160566156 - 0.7751261622 +
0.6786599473*LOG(GSPR_ESC/GSPR_SUM) + 0.004052732749*@TREND

LOG(XREVSER9_MATL/REVSER9_SUM) = 0.4111320739 - 0.7751261622 +
0.6786599473*LOG(GSPR_MATL/GSPR_SUM) - 0.008817858152*@TREND

LOG(XREVSER9_MTN/REVSER9_SUM) = -0.1251070422 - 0.7751261622 +
0.6786599473*LOG(GSPR_MTN/GSPR_SUM) + 0.001315200423*@TREND

LOG(XREVSER9_NENG/REVSER9_SUM) = -0.06410946439 - 0.7751261622 +
0.6786599473*LOG(GSPR_NENG/GSPR_SUM) - 0.001603678389*@TREND

LOG(XREVSER9_PAC/REVSER9_SUM) = 0.2698374403 - 0.7751261622 +
0.6786599473*LOG(GSPR_PAC/GSPR_SUM) - 0.0002119399688*@TREND

LOG(XREVSER9_SATL/REVSER9_SUM) = 0.131631621 - 0.7751261622 +
0.6786599473*LOG(GSPR_SATL/GSPR_SUM) + 0.007325322325*@TREND

LOG(XREVSER9_WNC/REVSER9_SUM) = -0.1927492837 - 0.7751261622 +
0.6786599473*LOG(GSPR_WNC/GSPR_SUM) + 0.001791212193*@TREND

LOG(XREVSER9_WSC/REVSER9_SUM) = -0.1599111228 - 0.7751261622 +
0.6786599473*LOG(GSPR_WSC/GSPR_SUM) + 0.003831866811*@TREND

**SER10 - Public Administration**
LOG(XREVSER10_ENC/REVSER10_SUM) = -0.230418604 + 0.2225910123 +
1.10857694*LOG(NP_ENC/NP_SUM) + 0.005437529334*@TREND

LOG(XREVSER10_ESC/REVSER10_SUM) = -0.03301832252 + 0.2225910123 +
1.10857694*LOG(NP_ESC/NP_SUM) + 0.002537959035*@TREND

LOG(XREVSER10_MATL/REVSER10_SUM) = 0.05307292107 + 0.2225910123 +
1.10857694*LOG(NP_MATL/NP_SUM) - 0.002805396722*@TREND

LOG(XREVSER10_MTN/REVSER10_SUM) = 0.2164760296 + 0.2225910123 +
1.10857694*LOG(NP_MTN/NP_SUM) - 0.007127344681*@TREND

LOG(XREVSER10_NENG/REVSER10_SUM) = -0.04469773806 + 0.2225910123 +
1.10857694*LOG(NP_NENG/NP_SUM) + 0.006323726185*@TREND

LOG(XREVSER10_PAC/REVSER10_SUM) = 0.06923032694 + 0.2225910123 +
1.10857694*LOG(NP_PAC/NP_SUM) - 0.002321088398*@TREND

LOG(XREVSER10_SATL/REVSER10_SUM) = 0.1545167976 + 0.2225910123 +
1.10857694*LOG(NP_SATL/NP_SUM) - 0.003886268293*@TREND

LOG(XREVSER10_WNC/REVSER10_SUM) = -0.08100095333 + 0.2225910123 +
1.10857694*LOG(NP_WNC/NP_SUM) + 0.005888551089*@TREND

LOG(XREVSER10_WSC/REVSER10_SUM) = -0.1041604573 + 0.2225910123 +
1.10857694*LOG(NP_WSC/NP_SUM) + 0.001655143975*@TREND

## Regional Employment

### *Endogenous Variables:*

| | |
|---|---|
| EMP{I}_{R} | Employment in millions for sector I, region R (e.g. EMPIND1_ENC) |
| XEMP{I}_{R} | Employment in millions for sector I, region R, equation estimate (e.g. XEMPIND1_ENC) |

Codes and descriptions of the sectors are presented in Table A14. Codes and descriptions of the regions are in Table B6.

### *Exogenous Variables:*

| | |
|---|---|
| EMP{I}_SUM | Employment in millions for sector I (national) |
| REV{I}_{R} | Output in billions of real 2000 dollars for sector I, region R |
| REV{I}_SUM | Output in billions of real 2000 dollars for sector I (national) |
| | |
| GSPR_{R} | Gross State Product in billions of real 2000 dollars for region R |
| GDPR_SUM | Gross Domestic Product in billions of real 2000 dollars (national) |
| NP_{R} | Population in million for region R |
| NP_SUM | Population in million (national) |
| RWM_{R} | Annual Wage for manufacturing sectors in dollars for region R |
| RWM_AVG | Average Annual Wage for manufacturing sectors in dollars (national) |
| RWNM_{R} | Annual Wage for nonmanufacturing/services sectors in dollars for region R |
| RWNM_AVG | Average Annual Wage for nonmanufacturing/services sectors in dollars (national) |
| @TREND | Time Trend |
| @MOVAV(X,2) | 2-year moving average of variable X |

## *Equations:*

### Alignment process:

The alignment process takes the regional employment shares of sector I computed from the equations and applied them onto the national employment of sector I. This ensures that the sum of the nine regions aligns to the national total.

EMP{I}_{R} = (XEMP{I}_{R} / XEMP{I}_SUM ) * EMP{I}_SUM

*where:*

| | |
|---|---|
| EMP{I}_{R} | Employment for sector I, region R |
| XEMP{I}_{R} | Employment for sector I, region R, equation estimate |
| XEMP{I}_SUM | Sum of 9 regions' XEMP{I}_{R} |
| EMP{I}_SUM | Employment for sector I (national) |

### Detailed structural equations for XEMP{I}_{R}:

**IND1 - Food Products**

LOG(XEMPIND1_ENC/EMPIND1_SUM) = -0.05649745835 - 1.344011497 + 0.8506634345*LOG(@MOVAV(REVIND1_ENC_0,2)/@MOVAV(REVIND1_SUM_0,2)) - 0.4736578864*LOG(@MOVAV(RWM_ENC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND1_ESC/EMPIND1_SUM) = 0.05356662274 - 1.344011497 + 0.8506634345*LOG(@MOVAV(REVIND1_ESC_0,2)/@MOVAV(REVIND1_SUM_0,2)) - 0.4736578864*LOG(@MOVAV(RWM_ESC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND1_MATL/EMPIND1_SUM) = 0.08145381294 - 1.344011497 + 0.8506634345*LOG(@MOVAV(REVIND1_MATL_0,2)/@MOVAV(REVIND1_SUM_0,2)) - 0.4736578864*LOG(@MOVAV(RWM_MATL,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND1_MTN/EMPIND1_SUM) = -0.1498392209 - 1.344011497 + 0.8506634345*LOG(@MOVAV(REVIND1_MTN_0,2)/@MOVAV(REVIND1_SUM_0,2)) - 0.4736578864*LOG(@MOVAV(RWM_MTN,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND1_NENG/EMPIND1_SUM) = 0.08221170033 - 1.344011497 + 0.8506634345*LOG(@MOVAV(REVIND1_NENG_0,2)/@MOVAV(REVIND1_SUM_0,2)) - 0.4736578864*LOG(@MOVAV(RWM_NENG,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND1_PAC/EMPIND1_SUM) = 0.1963215938 - 1.344011497 + 0.8506634345*LOG(@MOVAV(REVIND1_PAC_0,2)/@MOVAV(REVIND1_SUM_0,2)) - 0.4736578864*LOG(@MOVAV(RWM_PAC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND1_SATL/EMPIND1_SUM) = 0.08839188768 - 1.344011497 + 0.8506634345*LOG(@MOVAV(REVIND1_SATL_0,2)/@MOVAV(REVIND1_SUM_0,2)) - 0.4736578864*LOG(@MOVAV(RWM_SATL,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND1_WNC/EMPIND1_SUM) = -0.2876660031 - 1.344011497 +
0.8506634345*LOG(@MOVAV(REVIND1_WNC_0,2)/@MOVAV(REVIND1_SUM_0,2)) -
0.4736578864*LOG(@MOVAV(RWM_WNC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND1_WSC/EMPIND1_SUM) = -0.007942935132 - 1.344011497 +
0.8506634345*LOG(@MOVAV(REVIND1_WSC_0,2)/@MOVAV(REVIND1_SUM_0,2)) -
0.4736578864*LOG(@MOVAV(RWM_WSC,2)/@MOVAV(RWM_SUM,2))

**IND2 - Beverage and Tobacco Products**
LOG(XEMPIND2_ENC/EMPIND2_SUM) = 0.1963950524 - 1.796725342 +
0.2387792714*LOG(@MOVAV(REVIND2_ENC_0,2)/@MOVAV(REVIND2_SUM_0,2))

LOG(XEMPIND2_ESC/EMPIND2_SUM) = -0.1400915386 - 1.796725342 +
0.2387792714*LOG(@MOVAV(REVIND2_ESC_0,2)/@MOVAV(REVIND2_SUM_0,2))

LOG(XEMPIND2_MATL/EMPIND2_SUM) = 0.1374113759 - 1.796725342 +
0.2387792714*LOG(@MOVAV(REVIND2_MATL_0,2)/@MOVAV(REVIND2_SUM_0,2))

LOG(XEMPIND2_MTN/EMPIND2_SUM) = -0.1516593531 - 1.796725342 +
0.2387792714*LOG(@MOVAV(REVIND2_MTN_0,2)/@MOVAV(REVIND2_SUM_0,2))

LOG(XEMPIND2_NENG/EMPIND2_SUM) = -0.94447662 - 1.796725342 +
0.2387792714*LOG(@MOVAV(REVIND2_NENG_0,2)/@MOVAV(REVIND2_SUM_0,2))

LOG(XEMPIND2_PAC/EMPIND2_SUM) = 0.5725864612 - 1.796725342 +
0.2387792714*LOG(@MOVAV(REVIND2_PAC_0,2)/@MOVAV(REVIND2_SUM_0,2))

LOG(XEMPIND2_SATL/EMPIND2_SUM) = 0.7473683359 - 1.796725342 +
0.2387792714*LOG(@MOVAV(REVIND2_SATL_0,2)/@MOVAV(REVIND2_SUM_0,2))

LOG(XEMPIND2_WNC/EMPIND2_SUM) = -0.4164603302 - 1.796725342 +
0.2387792714*LOG(@MOVAV(REVIND2_WNC_0,2)/@MOVAV(REVIND2_SUM_0,2))

LOG(XEMPIND2_WSC/EMPIND2_SUM) = -0.001073383497 - 1.796725342 +
0.2387792714*LOG(@MOVAV(REVIND2_WSC_0,2)/@MOVAV(REVIND2_SUM_0,2))

**IND3 - Textile Mills & Textile Products**
LOG(XEMPIND3_ENC/EMPIND3_SUM) = -0.08431648937 - 0.7993777055 +
0.6845806555*LOG(@MOVAV(REVIND3_ENC_0,2)/@MOVAV(REVIND3_SUM_0,2))

LOG(XEMPIND3_ESC/EMPIND3_SUM) = 0.08448020071 - 0.7993777055 +
0.6845806555*LOG(@MOVAV(REVIND3_ESC_0,2)/@MOVAV(REVIND3_SUM_0,2))

LOG(XEMPIND3_MATL/EMPIND3_SUM) = 0.1030965839 - 0.7993777055 +
0.6845806555*LOG(@MOVAV(REVIND3_MATL_0,2)/@MOVAV(REVIND3_SUM_0,2))

LOG(XEMPIND3_MTN/EMPIND3_SUM) = -0.4739265988 - 0.7993777055 +
0.6845806555*LOG(@MOVAV(REVIND3_MTN_0,2)/@MOVAV(REVIND3_SUM_0,2))

LOG(XEMPIND3_NENG/EMPIND3_SUM) = -0.01059639077 - 0.7993777055 +
0.6845806555*LOG(@MOVAV(REVIND3_NENG_0,2)/@MOVAV(REVIND3_SUM_0,2))

LOG(XEMPIND3_PAC/EMPIND3_SUM) = 0.07484381259 - 0.7993777055 +
0.6845806555*LOG(@MOVAV(REVIND3_PAC_0,2)/@MOVAV(REVIND3_SUM_0,2))

LOG(XEMPIND3_SATL/EMPIND3_SUM) = 0.5667645194 - 0.7993777055 +
0.6845806555*LOG(@MOVAV(REVIND3_SATL_0,2)/@MOVAV(REVIND3_SUM_0,2))

LOG(XEMPIND3_WNC/EMPIND3_SUM) = -0.2953369228 - 0.7993777055 +
0.6845806555*LOG(@MOVAV(REVIND3_WNC_0,2)/@MOVAV(REVIND3_SUM_0,2))

LOG(XEMPIND3_WSC/EMPIND3_SUM) = 0.03499128507 - 0.7993777055 +
0.6845806555*LOG(@MOVAV(REVIND3_WSC_0,2)/@MOVAV(REVIND3_SUM_0,2))

**IND4 - Apparel**
LOG(XEMPIND4_ENC/EMPIND4_SUM) = -0.3856175709 - 1.116823231 +
0.5751000057*LOG(@MOVAV(REVIND4_ENC_0,2)/@MOVAV(REVIND4_SUM_0,2))

LOG(XEMPIND4_ESC/EMPIND4_SUM) = 0.5020581674 - 1.116823231 +
0.5751000057*LOG(@MOVAV(REVIND4_ESC_0,2)/@MOVAV(REVIND4_SUM_0,2))

LOG(XEMPIND4_MATL/EMPIND4_SUM) = 0.3830722698 - 1.116823231 +
0.5751000057*LOG(@MOVAV(REVIND4_MATL_0,2)/@MOVAV(REVIND4_SUM_0,2))

LOG(XEMPIND4_MTN/EMPIND4_SUM) = -0.6439781158 - 1.116823231 +
0.5751000057*LOG(@MOVAV(REVIND4_MTN_0,2)/@MOVAV(REVIND4_SUM_0,2))

LOG(XEMPIND4_NENG/EMPIND4_SUM) = -0.5549940737 - 1.116823231 +
0.5751000057*LOG(@MOVAV(REVIND4_NENG_0,2)/@MOVAV(REVIND4_SUM_0,2))

LOG(XEMPIND4_PAC/EMPIND4_SUM) = 0.3668124743 - 1.116823231 +
0.5751000057*LOG(@MOVAV(REVIND4_PAC_0,2)/@MOVAV(REVIND4_SUM_0,2))

LOG(XEMPIND4_SATL/EMPIND4_SUM) = 0.5349024341 - 1.116823231 +
0.5751000057*LOG(@MOVAV(REVIND4_SATL_0,2)/@MOVAV(REVIND4_SUM_0,2))

LOG(XEMPIND4_WNC/EMPIND4_SUM) = -0.1756977484 - 1.116823231 +
0.5751000057*LOG(@MOVAV(REVIND4_WNC_0,2)/@MOVAV(REVIND4_SUM_0,2))

LOG(XEMPIND4_WSC/EMPIND4_SUM) = -0.02655783681 - 1.116823231 +
0.5751000057*LOG(@MOVAV(REVIND4_WSC_0,2)/@MOVAV(REVIND4_SUM_0,2))

**IND5 - Wood Products**

LOG(XEMPIND5_ENC/EMPIND5_SUM) = 0.2775768542 - 0.8709234491 +
0.6185500732*LOG(@MOVAV(REVIND5_ENC_0,2)/@MOVAV(REVIND5_SUM_0,2))

LOG(XEMPIND5_ESC/EMPIND5_SUM) = 0.09772162104 - 0.8709234491 +
0.6185500732*LOG(@MOVAV(REVIND5_ESC_0,2)/@MOVAV(REVIND5_SUM_0,2))

LOG(XEMPIND5_MATL/EMPIND5_SUM) = -0.07093654636 - 0.8709234491 +
0.6185500732*LOG(@MOVAV(REVIND5_MATL_0,2)/@MOVAV(REVIND5_SUM_0,2))

LOG(XEMPIND5_MTN/EMPIND5_SUM) = -0.2279639153 - 0.8709234491 +
0.6185500732*LOG(@MOVAV(REVIND5_MTN_0,2)/@MOVAV(REVIND5_SUM_0,2))

LOG(XEMPIND5_NENG/EMPIND5_SUM) = -0.3291498585 - 0.8709234491 +
0.6185500732*LOG(@MOVAV(REVIND5_NENG_0,2)/@MOVAV(REVIND5_SUM_0,2))

LOG(XEMPIND5_PAC/EMPIND5_SUM) = 0.07998637569 - 0.8709234491 +
0.6185500732*LOG(@MOVAV(REVIND5_PAC_0,2)/@MOVAV(REVIND5_SUM_0,2))

LOG(XEMPIND5_SATL/EMPIND5_SUM) = 0.2756026594 - 0.8709234491 +
0.6185500732*LOG(@MOVAV(REVIND5_SATL_0,2)/@MOVAV(REVIND5_SUM_0,2))

LOG(XEMPIND5_WNC/EMPIND5_SUM) = -0.07073529674 - 0.8709234491 +
0.6185500732*LOG(@MOVAV(REVIND5_WNC_0,2)/@MOVAV(REVIND5_SUM_0,2))

LOG(XEMPIND5_WSC/EMPIND5_SUM) = -0.0321018934 - 0.8709234491 +
0.6185500732*LOG(@MOVAV(REVIND5_WSC_0,2)/@MOVAV(REVIND5_SUM_0,2))

**IND6 - Furniture and Related Products**
LOG(XEMPIND6_ENC/EMPIND6_SUM) = -0.1161321445 - 0.2352040396 +
0.8967118301*LOG(@MOVAV(REVIND6_ENC_0,2)/@MOVAV(REVIND6_SUM_0,2))

LOG(XEMPIND6_ESC/EMPIND6_SUM) = 0.07799469906 - 0.2352040396 +
0.8967118301*LOG(@MOVAV(REVIND6_ESC_0,2)/@MOVAV(REVIND6_SUM_0,2))

LOG(XEMPIND6_MATL/EMPIND6_SUM) = -0.0404670294 - 0.2352040396 +
0.8967118301*LOG(@MOVAV(REVIND6_MATL_0,2)/@MOVAV(REVIND6_SUM_0,2))

LOG(XEMPIND6_MTN/EMPIND6_SUM) = 0.03183049782 - 0.2352040396 +
0.8967118301*LOG(@MOVAV(REVIND6_MTN_0,2)/@MOVAV(REVIND6_SUM_0,2))

LOG(XEMPIND6_NENG/EMPIND6_SUM) = -0.1726587668 - 0.2352040396 +
0.8967118301*LOG(@MOVAV(REVIND6_NENG_0,2)/@MOVAV(REVIND6_SUM_0,2))

LOG(XEMPIND6_PAC/EMPIND6_SUM) = 0.02429434772 - 0.2352040396 +
0.8967118301*LOG(@MOVAV(REVIND6_PAC_0,2)/@MOVAV(REVIND6_SUM_0,2))

LOG(XEMPIND6_SATL/EMPIND6_SUM) = 0.2084775594 - 0.2352040396 +
0.8967118301*LOG(@MOVAV(REVIND6_SATL_0,2)/@MOVAV(REVIND6_SUM_0,2))

LOG(XEMPIND6_WNC/EMPIND6_SUM) = -0.09449984164 - 0.2352040396 +
0.8967118301*LOG(@MOVAV(REVIND6_WNC_0,2)/@MOVAV(REVIND6_SUM_0,2))

LOG(XEMPIND6_WSC/EMPIND6_SUM) = 0.0811606784 - 0.2352040396 +
0.8967118301*LOG(@MOVAV(REVIND6_WSC_0,2)/@MOVAV(REVIND6_SUM_0,2))

**IND7 - Paper Products**
LOG(XEMPIND7_ENC/EMPIND7_SUM) = 0.2658167093 - 0.4970947203 +
0.7926935732*LOG(@MOVAV(REVIND7_ENC_0,2)/@MOVAV(REVIND7_SUM_0,2))

LOG(XEMPIND7_ESC/EMPIND7_SUM) = -0.07478760554 - 0.4970947203 +
0.7926935732*LOG(@MOVAV(REVIND7_ESC_0,2)/@MOVAV(REVIND7_SUM_0,2))

LOG(XEMPIND7_MATL/EMPIND7_SUM) = 0.2050571904 - 0.4970947203 +
0.7926935732*LOG(@MOVAV(REVIND7_MATL_0,2)/@MOVAV(REVIND7_SUM_0,2))

LOG(XEMPIND7_MTN/EMPIND7_SUM) = -0.2895975622 - 0.4970947203 +
0.7926935732*LOG(@MOVAV(REVIND7_MTN_0,2)/@MOVAV(REVIND7_SUM_0,2))

LOG(XEMPIND7_NENG/EMPIND7_SUM) = 0.05677240279 - 0.4970947203 +
0.7926935732*LOG(@MOVAV(REVIND7_NENG_0,2)/@MOVAV(REVIND7_SUM_0,2))

LOG(XEMPIND7_PAC/EMPIND7_SUM) = -0.04628443827 - 0.4970947203 +
0.7926935732*LOG(@MOVAV(REVIND7_PAC_0,2)/@MOVAV(REVIND7_SUM_0,2))

LOG(XEMPIND7_SATL/EMPIND7_SUM) = 0.0814614009 - 0.4970947203 +
0.7926935732*LOG(@MOVAV(REVIND7_SATL_0,2)/@MOVAV(REVIND7_SUM_0,2))

LOG(XEMPIND7_WNC/EMPIND7_SUM) = -0.04541757532 - 0.4970947203 +
0.7926935732*LOG(@MOVAV(REVIND7_WNC_0,2)/@MOVAV(REVIND7_SUM_0,2))

LOG(XEMPIND7_WSC/EMPIND7_SUM) = -0.1530205221 - 0.4970947203 +
0.7926935732*LOG(@MOVAV(REVIND7_WSC_0,2)/@MOVAV(REVIND7_SUM_0,2))

**IND8 - Printing**
LOG(XEMPIND8_ENC/EMPIND8_SUM) = 0.286445067 - 1.319068064 +
0.6089168175*LOG(@MOVAV(REVIND8_ENC_0,2)/@MOVAV(REVIND8_SUM_0,2)) -
0.1907133378*LOG(@MOVAV(RWM_ENC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND8_ESC/EMPIND8_SUM) = -0.2027149515 - 1.319068064 +
0.6089168175*LOG(@MOVAV(REVIND8_ESC_0,2)/@MOVAV(REVIND8_SUM_0,2)) -
0.1907133378*LOG(@MOVAV(RWM_ESC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND8_MATL/EMPIND8_SUM) = 0.1769844127 - 1.319068064 +
0.6089168175*LOG(@MOVAV(REVIND8_MATL_0,2)/@MOVAV(REVIND8_SUM_0,2)) -
0.1907133378*LOG(@MOVAV(RWM_MATL,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND8_MTN/EMPIND8_SUM) = -0.2883088193 - 1.319068064 +
0.6089168175*LOG(@MOVAV(REVIND8_MTN_0,2)/@MOVAV(REVIND8_SUM_0,2)) -
0.1907133378*LOG(@MOVAV(RWM_MTN,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND8_NENG/EMPIND8_SUM) = -0.1724341858 - 1.319068064 +
0.6089168175*LOG(@MOVAV(REVIND8_NENG_0,2)/@MOVAV(REVIND8_SUM_0,2)) -
0.1907133378*LOG(@MOVAV(RWM_NENG,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND8_PAC/EMPIND8_SUM) = 0.1641833104 - 1.319068064 +
0.6089168175*LOG(@MOVAV(REVIND8_PAC_0,2)/@MOVAV(REVIND8_SUM_0,2)) -
0.1907133378*LOG(@MOVAV(RWM_PAC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND8_SATL/EMPIND8_SUM) = 0.1675243046 - 1.319068064 +
0.6089168175*LOG(@MOVAV(REVIND8_SATL_0,2)/@MOVAV(REVIND8_SUM_0,2)) -
0.1907133378*LOG(@MOVAV(RWM_SATL,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND8_WNC/EMPIND8_SUM) = 0.002664047935 - 1.319068064 +
0.6089168175*LOG(@MOVAV(REVIND8_WNC_0,2)/@MOVAV(REVIND8_SUM_0,2)) -
0.1907133378*LOG(@MOVAV(RWM_WNC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND8_WSC/EMPIND8_SUM) = -0.1343431861 - 1.319068064 +
0.6089168175*LOG(@MOVAV(REVIND8_WSC_0,2)/@MOVAV(REVIND8_SUM_0,2)) -
0.1907133378*LOG(@MOVAV(RWM_WSC,2)/@MOVAV(RWM_SUM,2))

**IND9 - Basic Inorganic Chemicals**
LOG(XEMPIND9_ENC/EMPIND9_SUM) = 0.1806920105 - 0.5240284617 +
0.7874170596*LOG(@MOVAV(REVIND9_ENC_0,2)/@MOVAV(REVIND9_SUM_0,2))

LOG(XEMPIND9_ESC/EMPIND9_SUM) = 0.3028648313 - 0.5240284617 +
0.7874170596*LOG(@MOVAV(REVIND9_ESC_0,2)/@MOVAV(REVIND9_SUM_0,2))

LOG(XEMPIND9_MATL/EMPIND9_SUM) = 0.08926241942 - 0.5240284617 +
0.7874170596*LOG(@MOVAV(REVIND9_MATL_0,2)/@MOVAV(REVIND9_SUM_0,2))

LOG(XEMPIND9_MTN/EMPIND9_SUM) = -0.1974268387 - 0.5240284617 +
0.7874170596*LOG(@MOVAV(REVIND9_MTN_0,2)/@MOVAV(REVIND9_SUM_0,2))

LOG(XEMPIND9_NENG/EMPIND9_SUM) = -0.140867002 - 0.5240284617 +
0.7874170596*LOG(@MOVAV(REVIND9_NENG_0,2)/@MOVAV(REVIND9_SUM_0,2))
LOG(XEMPIND9_PAC/EMPIND9_SUM) = -0.1323061232 - 0.5240284617 +
0.7874170596*LOG(@MOVAV(REVIND9_PAC_0,2)/@MOVAV(REVIND9_SUM_0,2))

LOG(XEMPIND9_SATL/EMPIND9_SUM) = 0.4148551474 - 0.5240284617 +
0.7874170596*LOG(@MOVAV(REVIND9_SATL_0,2)/@MOVAV(REVIND9_SUM_0,2))

LOG(XEMPIND9_WNC/EMPIND9_SUM) = -0.05653989235 - 0.5240284617 +
0.7874170596*LOG(@MOVAV(REVIND9_WNC_0,2)/@MOVAV(REVIND9_SUM_0,2))

LOG(XEMPIND9_WSC/EMPIND9_SUM) = -0.4605345524 - 0.5240284617 +
0.7874170596*LOG(@MOVAV(REVIND9_WSC_0,2)/@MOVAV(REVIND9_SUM_0,2))

**IND10 - Basic Organic Chemicals**
LOG(XEMPIND10_ENC/EMPIND10_SUM) = 0.3332640169 - 0.7958403849 +
0.6680561256*LOG(@MOVAV(REVIND10_ENC_0,2)/@MOVAV(REVIND10_SUM_0,2))

LOG(XEMPIND10_ESC/EMPIND10_SUM) = 0.3904651516 - 0.7958403849 +
0.6680561256*LOG(@MOVAV(REVIND10_ESC_0,2)/@MOVAV(REVIND10_SUM_0,2))

LOG(XEMPIND10_MATL/EMPIND10_SUM) = 0.2718137809 - 0.7958403849 +
0.6680561256*LOG(@MOVAV(REVIND10_MATL_0,2)/@MOVAV(REVIND10_SUM_0,2))

LOG(XEMPIND10_MTN/EMPIND10_SUM) = -0.5536080011 - 0.7958403849 +
0.6680561256*LOG(@MOVAV(REVIND10_MTN_0,2)/@MOVAV(REVIND10_SUM_0,2))

LOG(XEMPIND10_NENG/EMPIND10_SUM) = -0.383988223 - 0.7958403849 +
0.6680561256*LOG(@MOVAV(REVIND10_NENG_0,2)/@MOVAV(REVIND10_SUM_0,2))

LOG(XEMPIND10_PAC/EMPIND10_SUM) = -0.5102521892 - 0.7958403849 +
0.6680561256*LOG(@MOVAV(REVIND10_PAC_0,2)/@MOVAV(REVIND10_SUM_0,2))

LOG(XEMPIND10_SATL/EMPIND10_SUM) = 0.5284994936 - 0.7958403849 +
0.6680561256*LOG(@MOVAV(REVIND10_SATL_0,2)/@MOVAV(REVIND10_SUM_0,2))

LOG(XEMPIND10_WNC/EMPIND10_SUM) = -0.2712653383 - 0.7958403849 +
0.6680561256*LOG(@MOVAV(REVIND10_WNC_0,2)/@MOVAV(REVIND10_SUM_0,2))

LOG(XEMPIND10_WSC/EMPIND10_SUM) = 0.1950713086 - 0.7958403849 +
0.6680561256*LOG(@MOVAV(REVIND10_WSC_0,2)/@MOVAV(REVIND10_SUM_0,2))

**IND11 - Plastic and Synthetic Rubber Materials**
LOG(XEMPIND11_ENC/EMPIND11_SUM) = 0.3127704131 - 1.202139637 +
0.5717489788*LOG(@MOVAV(REVIND11_ENC_0,2)/@MOVAV(REVIND11_SUM_0,2))

LOG(XEMPIND11_ESC/EMPIND11_SUM) = 0.3563458284 - 1.202139637 +
0.5717489788*LOG(@MOVAV(REVIND11_ESC_0,2)/@MOVAV(REVIND11_SUM_0,2))

LOG(XEMPIND11_MATL/EMPIND11_SUM) = 0.2160358356 - 1.202139637 +
0.5717489788*LOG(@MOVAV(REVIND11_MATL_0,2)/@MOVAV(REVIND11_SUM_0,2))

LOG(XEMPIND11_MTN/EMPIND11_SUM) = -0.7567196809 - 1.202139637 +
0.5717489788*LOG(@MOVAV(REVIND11_MTN_0,2)/@MOVAV(REVIND11_SUM_0,2))

LOG(XEMPIND11_NENG/EMPIND11_SUM) = -0.3123619875 - 1.202139637 +
0.5717489788*LOG(@MOVAV(REVIND11_NENG_0,2)/@MOVAV(REVIND11_SUM_0,2))

LOG(XEMPIND11_PAC/EMPIND11_SUM) = -0.3631477244 - 1.202139637 +
0.5717489788*LOG(@MOVAV(REVIND11_PAC_0,2)/@MOVAV(REVIND11_SUM_0,2))

LOG(XEMPIND11_SATL/EMPIND11_SUM) = 0.9990516402 - 1.202139637 +
0.5717489788*LOG(@MOVAV(REVIND11_SATL_0,2)/@MOVAV(REVIND11_SUM_0,2))

LOG(XEMPIND11_WNC/EMPIND11_SUM) = -0.6365496728 - 1.202139637 +
0.5717489788*LOG(@MOVAV(REVIND11_WNC_0,2)/@MOVAV(REVIND11_SUM_0,2))

LOG(XEMPIND11_WSC/EMPIND11_SUM) = 0.1845753483 - 1.202139637 +
0.5717489788*LOG(@MOVAV(REVIND11_WSC_0,2)/@MOVAV(REVIND11_SUM_0,2))

**IND12 - Agricultural Chemicals**
LOG(XEMPIND12_ENC/EMPIND12_SUM) = -0.02623983669 - 1.575449304 +
0.3189617364*LOG(@MOVAV(REVIND12_ENC_0,2)/@MOVAV(REVIND12_SUM_0,2))

LOG(XEMPIND12_ESC/EMPIND12_SUM) = -0.03854604251 - 1.575449304 +
0.3189617364*LOG(@MOVAV(REVIND12_ESC_0,2)/@MOVAV(REVIND12_SUM_0,2))

LOG(XEMPIND12_MATL/EMPIND12_SUM) = -0.4139671056 - 1.575449304 +
0.3189617364*LOG(@MOVAV(REVIND12_MATL_0,2)/@MOVAV(REVIND12_SUM_0,2))

LOG(XEMPIND12_MTN/EMPIND12_SUM) = -0.159862476 - 1.575449304 +
0.3189617364*LOG(@MOVAV(REVIND12_MTN_0,2)/@MOVAV(REVIND12_SUM_0,2))

LOG(XEMPIND12_NENG/EMPIND12_SUM) = -0.4869668382 - 1.575449304 +
0.3189617364*LOG(@MOVAV(REVIND12_NENG_0,2)/@MOVAV(REVIND12_SUM_0,2))

LOG(XEMPIND12_PAC/EMPIND12_SUM) = -0.07205453529 - 1.575449304 +
0.3189617364*LOG(@MOVAV(REVIND12_PAC_0,2)/@MOVAV(REVIND12_SUM_0,2))

LOG(XEMPIND12_SATL/EMPIND12_SUM) = 0.7018523297 - 1.575449304 +
0.3189617364*LOG(@MOVAV(REVIND12_SATL_0,2)/@MOVAV(REVIND12_SUM_0,2))

LOG(XEMPIND12_WNC/EMPIND12_SUM) = 0.2512916452 - 1.575449304 +
0.3189617364*LOG(@MOVAV(REVIND12_WNC_0,2)/@MOVAV(REVIND12_SUM_0,2))

LOG(XEMPIND12_WSC/EMPIND12_SUM) = 0.2444928595 - 1.575449304 +
0.3189617364*LOG(@MOVAV(REVIND12_WSC_0,2)/@MOVAV(REVIND12_SUM_0,2))

**IND13 - Other Chemical Products**

LOG(XEMPIND13_ENC/EMPIND13_SUM) = 0.2002392615 - 0.7053040437 +
0.6899247813*LOG(@MOVAV(REVIND13_ENC_0,2)/@MOVAV(REVIND13_SUM_0,2))

LOG(XEMPIND13_ESC/EMPIND13_SUM) = -0.2715724207 - 0.7053040437 +
0.6899247813*LOG(@MOVAV(REVIND13_ESC_0,2)/@MOVAV(REVIND13_SUM_0,2))

LOG(XEMPIND13_MATL/EMPIND13_SUM) = 0.2473526066 - 0.7053040437 +
0.6899247813*LOG(@MOVAV(REVIND13_MATL_0,2)/@MOVAV(REVIND13_SUM_0,2))

LOG(XEMPIND13_MTN/EMPIND13_SUM) = -0.2101374042 - 0.7053040437 +
0.6899247813*LOG(@MOVAV(REVIND13_MTN_0,2)/@MOVAV(REVIND13_SUM_0,2))

LOG(XEMPIND13_NENG/EMPIND13_SUM) = 0.08722968386 - 0.7053040437 +
0.6899247813*LOG(@MOVAV(REVIND13_NENG_0,2)/@MOVAV(REVIND13_SUM_0,2))

LOG(XEMPIND13_PAC/EMPIND13_SUM) = 0.2302700367 - 0.7053040437 +
0.6899247813*LOG(@MOVAV(REVIND13_PAC_0,2)/@MOVAV(REVIND13_SUM_0,2))

LOG(XEMPIND13_SATL/EMPIND13_SUM) = -0.057482851 - 0.7053040437 +
0.6899247813*LOG(@MOVAV(REVIND13_SATL_0,2)/@MOVAV(REVIND13_SUM_0,2))

LOG(XEMPIND13_WNC/EMPIND13_SUM) = -0.1147267327 - 0.7053040437 +
0.6899247813*LOG(@MOVAV(REVIND13_WNC_0,2)/@MOVAV(REVIND13_SUM_0,2))

LOG(XEMPIND13_WSC/EMPIND13_SUM) = -0.1111721801 - 0.7053040437 +
0.6899247813*LOG(@MOVAV(REVIND13_WSC_0,2)/@MOVAV(REVIND13_SUM_0,2))

**IND14 - Petroleum Refineries**
LOG(XEMPIND14_ENC/EMPIND14_SUM) = 0.04475777821 - 1.789751708 +
0.2843296764*LOG(@MOVAV(REVIND14_ENC_0,2)/@MOVAV(REVIND14_SUM_0,2))

LOG(XEMPIND14_ESC/EMPIND14_SUM) = 0.1637515515 - 1.789751708 +
0.2843296764*LOG(@MOVAV(REVIND14_ESC_0,2)/@MOVAV(REVIND14_SUM_0,2))

LOG(XEMPIND14_MATL/EMPIND14_SUM) = -0.01933917124 - 1.789751708 +
0.2843296764*LOG(@MOVAV(REVIND14_MATL_0,2)/@MOVAV(REVIND14_SUM_0,2))

LOG(XEMPIND14_MTN/EMPIND14_SUM) = -0.45922727 - 1.789751708 +
0.2843296764*LOG(@MOVAV(REVIND14_MTN_0,2)/@MOVAV(REVIND14_SUM_0,2))

LOG(XEMPIND14_NENG/EMPIND14_SUM) = -0.562109515 - 1.789751708 +
0.2843296764*LOG(@MOVAV(REVIND14_NENG_0,2)/@MOVAV(REVIND14_SUM_0,2))
LOG(XEMPIND14_PAC/EMPIND14_SUM) = 0.6779526768 - 1.789751708 +
0.2843296764*LOG(@MOVAV(REVIND14_PAC_0,2)/@MOVAV(REVIND14_SUM_0,2))

LOG(XEMPIND14_SATL/EMPIND14_SUM) = -0.4338637802 - 1.789751708 +
0.2843296764*LOG(@MOVAV(REVIND14_SATL_0,2)/@MOVAV(REVIND14_SUM_0,2))

LOG(XEMPIND14_WNC/EMPIND14_SUM) = -0.4833387168 - 1.789751708 +
0.2843296764*LOG(@MOVAV(REVIND14_WNC_0,2)/@MOVAV(REVIND14_SUM_0,2))

LOG(XEMPIND14_WSC/EMPIND14_SUM) = 1.071416447 - 1.789751708 +
0.2843296764*LOG(@MOVAV(REVIND14_WSC_0,2)/@MOVAV(REVIND14_SUM_0,2))

**IND15 - Other Petroleum and Coal Products**
LOG(XEMPIND15_ENC/EMPIND15_SUM) = 0.8686126204 - 1.911476265 +
0.2298185265*LOG(@MOVAV(REVIND15_ENC_0,2)/@MOVAV(REVIND15_SUM_0,2))

LOG(XEMPIND15_ESC/EMPIND15_SUM) = -0.8016841915 - 1.911476265 +
0.2298185265*LOG(@MOVAV(REVIND15_ESC_0,2)/@MOVAV(REVIND15_SUM_0,2))

LOG(XEMPIND15_MATL/EMPIND15_SUM) = 0.503492564 - 1.911476265 +
0.2298185265*LOG(@MOVAV(REVIND15_MATL_0,2)/@MOVAV(REVIND15_SUM_0,2))

LOG(XEMPIND15_MTN/EMPIND15_SUM) = -0.8714817405 - 1.911476265 +
0.2298185265*LOG(@MOVAV(REVIND15_MTN_0,2)/@MOVAV(REVIND15_SUM_0,2))

LOG(XEMPIND15_NENG/EMPIND15_SUM) = -0.7637942449 - 1.911476265 +
0.2298185265*LOG(@MOVAV(REVIND15_NENG_0,2)/@MOVAV(REVIND15_SUM_0,2))

LOG(XEMPIND15_PAC/EMPIND15_SUM) = 0.1611014396 - 1.911476265 +
0.2298185265*LOG(@MOVAV(REVIND15_PAC_0,2)/@MOVAV(REVIND15_SUM_0,2))

LOG(XEMPIND15_SATL/EMPIND15_SUM) = 0.02176562657 - 1.911476265 +
0.2298185265*LOG(@MOVAV(REVIND15_SATL_0,2)/@MOVAV(REVIND15_SUM_0,2))

LOG(XEMPIND15_WNC/EMPIND15_SUM) = 0.1833000251 - 1.911476265 +
0.2298185265*LOG(@MOVAV(REVIND15_WNC_0,2)/@MOVAV(REVIND15_SUM_0,2))

LOG(XEMPIND15_WSC/EMPIND15_SUM) = 0.6986879012 - 1.911476265 +
0.2298185265*LOG(@MOVAV(REVIND15_WSC_0,2)/@MOVAV(REVIND15_SUM_0,2))

**IND16 - Plastics and Rubber Products**
LOG(XEMPIND16_ENC/EMPIND16_SUM) = 0.3636939824 - 1.485155163 +
0.747775564*LOG(@MOVAV(REVIND16_ENC_0,2)/@MOVAV(REVIND16_SUM_0,2)) -
0.4016636931*LOG(@MOVAV(RWM_ENC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND16_ESC/EMPIND16_SUM) = -0.130117157 - 1.485155163 +
0.747775564*LOG(@MOVAV(REVIND16_ESC_0,2)/@MOVAV(REVIND16_SUM_0,2)) -
0.4016636931*LOG(@MOVAV(RWM_ESC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND16_MATL/EMPIND16_SUM) = 0.1468732726 - 1.485155163 +
0.747775564*LOG(@MOVAV(REVIND16_MATL_0,2)/@MOVAV(REVIND16_SUM_0,2)) -
0.4016636931*LOG(@MOVAV(RWM_MATL,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND16_MTN/EMPIND16_SUM) = -0.2454207818 - 1.485155163 +
0.747775564*LOG(@MOVAV(REVIND16_MTN_0,2)/@MOVAV(REVIND16_SUM_0,2)) -
0.4016636931*LOG(@MOVAV(RWM_MTN,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND16_NENG/EMPIND16_SUM) = -0.07185415055 - 1.485155163 +
0.747775564*LOG(@MOVAV(REVIND16_NENG_0,2)/@MOVAV(REVIND16_SUM_0,2)) -
0.4016636931*LOG(@MOVAV(RWM_NENG,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND16_PAC/EMPIND16_SUM) = 0.1602262908 - 1.485155163 +
0.747775564*LOG(@MOVAV(REVIND16_PAC_0,2)/@MOVAV(REVIND16_SUM_0,2)) -
0.4016636931*LOG(@MOVAV(RWM_PAC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND16_SATL/EMPIND16_SUM) = -0.013077927 - 1.485155163 +
0.747775564*LOG(@MOVAV(REVIND16_SATL_0,2)/@MOVAV(REVIND16_SUM_0,2)) -
0.4016636931*LOG(@MOVAV(RWM_SATL,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND16_WNC/EMPIND16_SUM) = -0.05526578988 - 1.485155163 +
0.747775564*LOG(@MOVAV(REVIND16_WNC_0,2)/@MOVAV(REVIND16_SUM_0,2)) -
0.4016636931*LOG(@MOVAV(RWM_WNC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND16_WSC/EMPIND16_SUM) = -0.1550577395 - 1.485155163 +
0.747775564*LOG(@MOVAV(REVIND16_WSC_0,2)/@MOVAV(REVIND16_SUM_0,2)) -
0.4016636931*LOG(@MOVAV(RWM_WSC,2)/@MOVAV(RWM_SUM,2))

**IND17 - Leather and Allied Products**
LOG(XEMPIND17_ENC/EMPIND17_SUM) = 0.03996955281 - 0.6075653778 +
0.7376487319*LOG(@MOVAV(REVIND17_ENC_0,2)/@MOVAV(REVIND17_SUM_0,2))

LOG(XEMPIND17_ESC/EMPIND17_SUM) = -0.1214212844 - 0.6075653778 +
0.7376487319*LOG(@MOVAV(REVIND17_ESC_0,2)/@MOVAV(REVIND17_SUM_0,2))

LOG(XEMPIND17_MATL/EMPIND17_SUM) = 0.1343463525 - 0.6075653778 +
0.7376487319*LOG(@MOVAV(REVIND17_MATL_0,2)/@MOVAV(REVIND17_SUM_0,2))

LOG(XEMPIND17_MTN/EMPIND17_SUM) = -0.7782602764 - 0.6075653778 +
0.7376487319*LOG(@MOVAV(REVIND17_MTN_0,2)/@MOVAV(REVIND17_SUM_0,2))

LOG(XEMPIND17_NENG/EMPIND17_SUM) = 0.003682512296 - 0.6075653778 +
0.7376487319*LOG(@MOVAV(REVIND17_NENG_0,2)/@MOVAV(REVIND17_SUM_0,2))
LOG(XEMPIND17_PAC/EMPIND17_SUM) = 0.1437594348 - 0.6075653778 +
0.7376487319*LOG(@MOVAV(REVIND17_PAC_0,2)/@MOVAV(REVIND17_SUM_0,2))

LOG(XEMPIND17_SATL/EMPIND17_SUM) = 0.05755052857 - 0.6075653778 +
0.7376487319*LOG(@MOVAV(REVIND17_SATL_0,2)/@MOVAV(REVIND17_SUM_0,2))

LOG(XEMPIND17_WNC/EMPIND17_SUM) = 0.04569692736 - 0.6075653778 +
0.7376487319*LOG(@MOVAV(REVIND17_WNC_0,2)/@MOVAV(REVIND17_SUM_0,2))

LOG(XEMPIND17_WSC/EMPIND17_SUM) = 0.4746762524 - 0.6075653778 +
0.7376487319*LOG(@MOVAV(REVIND17_WSC_0,2)/@MOVAV(REVIND17_SUM_0,2))

**IND18 - Glass & Glass Products**
LOG(XEMPIND18_ENC/EMPIND18_SUM) = 0.3229881656 - 0.7389924616 +
0.6950158799*LOG(@MOVAV(REVIND18_ENC_0,2)/@MOVAV(REVIND18_SUM_0,2))

LOG(XEMPIND18_ESC/EMPIND18_SUM) = -0.1070448394 - 0.7389924616 +
0.6950158799*LOG(@MOVAV(REVIND18_ESC_0,2)/@MOVAV(REVIND18_SUM_0,2))

LOG(XEMPIND18_MATL/EMPIND18_SUM) = 0.2267725942 - 0.7389924616 +
0.6950158799*LOG(@MOVAV(REVIND18_MATL_0,2)/@MOVAV(REVIND18_SUM_0,2))

LOG(XEMPIND18_MTN/EMPIND18_SUM) = -0.319302505 - 0.7389924616 +
0.6950158799*LOG(@MOVAV(REVIND18_MTN_0,2)/@MOVAV(REVIND18_SUM_0,2))

LOG(XEMPIND18_NENG/EMPIND18_SUM) = -0.2820695529 - 0.7389924616 +
0.6950158799*LOG(@MOVAV(REVIND18_NENG_0,2)/@MOVAV(REVIND18_SUM_0,2))

LOG(XEMPIND18_PAC/EMPIND18_SUM) = 0.0887438482 - 0.7389924616 +
0.6950158799*LOG(@MOVAV(REVIND18_PAC_0,2)/@MOVAV(REVIND18_SUM_0,2))

LOG(XEMPIND18_SATL/EMPIND18_SUM) = 0.2122161141 - 0.7389924616 +
0.6950158799*LOG(@MOVAV(REVIND18_SATL_0,2)/@MOVAV(REVIND18_SUM_0,2))

LOG(XEMPIND18_WNC/EMPIND18_SUM) = -0.1380562184 - 0.7389924616 +
0.6950158799*LOG(@MOVAV(REVIND18_WNC_0,2)/@MOVAV(REVIND18_SUM_0,2))

LOG(XEMPIND18_WSC/EMPIND18_SUM) = -0.004247606421 - 0.7389924616 +
0.6950158799*LOG(@MOVAV(REVIND18_WSC_0,2)/@MOVAV(REVIND18_SUM_0,2))

**IND19 - Cement Manufacturing**
LOG(XEMPIND19_ENC/EMPIND19_SUM) = -0.005508577078 + 0.02292152609 +
1.010129008*LOG(@MOVAV(REVIND19_ENC_0,2)/@MOVAV(REVIND19_SUM_0,2))

LOG(XEMPIND19_ESC/EMPIND19_SUM) = 0.005616042213 + 0.02292152609 +
1.010129008*LOG(@MOVAV(REVIND19_ESC_0,2)/@MOVAV(REVIND19_SUM_0,2))

LOG(XEMPIND19_MATL/EMPIND19_SUM) = -0.0006216561423 + 0.02292152609 +
1.010129008*LOG(@MOVAV(REVIND19_MATL_0,2)/@MOVAV(REVIND19_SUM_0,2))

LOG(XEMPIND19_MTN/EMPIND19_SUM) = 0.004973261405 + 0.02292152609 +
1.010129008*LOG(@MOVAV(REVIND19_MTN_0,2)/@MOVAV(REVIND19_SUM_0,2))

LOG(XEMPIND19_NENG/EMPIND19_SUM) = 0.008256961999 + 0.02292152609 +
1.010129008*LOG(@MOVAV(REVIND19_NENG_0,2)/@MOVAV(REVIND19_SUM_0,2))

LOG(XEMPIND19_PAC/EMPIND19_SUM) = -0.004345359297 + 0.02292152609 +
1.010129008*LOG(@MOVAV(REVIND19_PAC_0,2)/@MOVAV(REVIND19_SUM_0,2))

LOG(XEMPIND19_SATL/EMPIND19_SUM) = -0.003863204745 + 0.02292152609 +
1.010129008*LOG(@MOVAV(REVIND19_SATL_0,2)/@MOVAV(REVIND19_SUM_0,2))

LOG(XEMPIND19_WNC/EMPIND19_SUM) = -0.002296055107 + 0.02292152609 +
1.010129008*LOG(@MOVAV(REVIND19_WNC_0,2)/@MOVAV(REVIND19_SUM_0,2))

LOG(XEMPIND19_WSC/EMPIND19_SUM) = -0.002211413249 + 0.02292152609 +
1.010129008*LOG(@MOVAV(REVIND19_WSC_0,2)/@MOVAV(REVIND19_SUM_0,2))

**IND20 - Other Nonmetallic Mineral Products**
LOG(XEMPIND20_ENC/EMPIND20_SUM) = 0.1493106412 - 1.244815564 +
0.7498998149*LOG(@MOVAV(REVIND20_ENC_0,2)/@MOVAV(REVIND20_SUM_0,2)) -
0.3066638651*LOG(@MOVAV(RWM_ENC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND20_ESC/EMPIND20_SUM) = -0.08577443078 - 1.244815564 +
0.7498998149*LOG(@MOVAV(REVIND20_ESC_0,2)/@MOVAV(REVIND20_SUM_0,2)) -
0.3066638651*LOG(@MOVAV(RWM_ESC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND20_MATL/EMPIND20_SUM) = 0.1024714342 - 1.244815564 +
0.7498998149*LOG(@MOVAV(REVIND20_MATL_0,2)/@MOVAV(REVIND20_SUM_0,2)) -
0.3066638651*LOG(@MOVAV(RWM_MATL,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND20_MTN/EMPIND20_SUM) = -0.1002233401 - 1.244815564 +
0.7498998149*LOG(@MOVAV(REVIND20_MTN_0,2)/@MOVAV(REVIND20_SUM_0,2)) -
0.3066638651*LOG(@MOVAV(RWM_MTN,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND20_NENG/EMPIND20_SUM) = -0.131510769 - 1.244815564 +
0.7498998149*LOG(@MOVAV(REVIND20_NENG_0,2)/@MOVAV(REVIND20_SUM_0,2)) -
0.3066638651*LOG(@MOVAV(RWM_NENG,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND20_PAC/EMPIND20_SUM) = 0.03801550189 - 1.244815564 +
0.7498998149*LOG(@MOVAV(REVIND20_PAC_0,2)/@MOVAV(REVIND20_SUM_0,2)) -
0.3066638651*LOG(@MOVAV(RWM_PAC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND20_SATL/EMPIND20_SUM) = 0.1389487387 - 1.244815564 +
0.7498998149*LOG(@MOVAV(REVIND20_SATL_0,2)/@MOVAV(REVIND20_SUM_0,2)) -
0.3066638651*LOG(@MOVAV(RWM_SATL,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND20_WNC/EMPIND20_SUM) = -0.1158282529 - 1.244815564 +
0.7498998149*LOG(@MOVAV(REVIND20_WNC_0,2)/@MOVAV(REVIND20_SUM_0,2)) -
0.3066638651*LOG(@MOVAV(RWM_WNC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND20_WSC/EMPIND20_SUM) = 0.004590476894 - 1.244815564 +
0.7498998149*LOG(@MOVAV(REVIND20_WSC_0,2)/@MOVAV(REVIND20_SUM_0,2)) -
0.3066638651*LOG(@MOVAV(RWM_WSC,2)/@MOVAV(RWM_SUM,2))

**IND21 - Iron & Steel Mills, Ferroalloy & Steel Products**
LOG(XEMPIND21_ENC/EMPIND21_SUM) = 0.3849765896 - 1.000244884 +
0.774597542*LOG(@MOVAV(REVIND21_ENC_0,2)/@MOVAV(REVIND21_SUM_0,2)) -
0.1913335742*LOG(@MOVAV(RWM_ENC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND21_ESC/EMPIND21_SUM) = -0.1244423644 - 1.000244884 +
0.774597542*LOG(@MOVAV(REVIND21_ESC_0,2)/@MOVAV(REVIND21_SUM_0,2)) -
0.1913335742*LOG(@MOVAV(RWM_ESC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND21_MATL/EMPIND21_SUM) = 0.2854372206 - 1.000244884 +
0.774597542*LOG(@MOVAV(REVIND21_MATL_0,2)/@MOVAV(REVIND21_SUM_0,2)) -
0.1913335742*LOG(@MOVAV(RWM_MATL,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND21_MTN/EMPIND21_SUM) = -0.1649458404 - 1.000244884 +
0.774597542*LOG(@MOVAV(REVIND21_MTN_0,2)/@MOVAV(REVIND21_SUM_0,2)) -
0.1913335742*LOG(@MOVAV(RWM_MTN,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND21_NENG/EMPIND21_SUM) = -0.08781747391 - 1.000244884 +
0.774597542*LOG(@MOVAV(REVIND21_NENG_0,2)/@MOVAV(REVIND21_SUM_0,2)) -
0.1913335742*LOG(@MOVAV(RWM_NENG,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND21_PAC/EMPIND21_SUM) = -0.247486105 - 1.000244884 +
0.774597542*LOG(@MOVAV(REVIND21_PAC_0,2)/@MOVAV(REVIND21_SUM_0,2)) -
0.1913335742*LOG(@MOVAV(RWM_PAC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND21_SATL/EMPIND21_SUM) = 0.1385819374 - 1.000244884 +
0.774597542*LOG(@MOVAV(REVIND21_SATL_0,2)/@MOVAV(REVIND21_SUM_0,2)) -
0.1913335742*LOG(@MOVAV(RWM_SATL,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND21_WNC/EMPIND21_SUM) = -0.06831974768 - 1.000244884 +
0.774597542*LOG(@MOVAV(REVIND21_WNC_0,2)/@MOVAV(REVIND21_SUM_0,2)) -
0.1913335742*LOG(@MOVAV(RWM_WNC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND21_WSC/EMPIND21_SUM) = -0.1159842162 - 1.000244884 +
0.774597542*LOG(@MOVAV(REVIND21_WSC_0,2)/@MOVAV(REVIND21_SUM_0,2)) -
0.1913335742*LOG(@MOVAV(RWM_WSC,2)/@MOVAV(RWM_SUM,2))

**IND22 - Alumina & Aluminum Products**
LOG(XEMPIND22_ENC/EMPIND22_SUM) = 0.2183113738 - 0.6232766976 +
0.7279893614*LOG(@MOVAV(REVIND22_ENC_0,2)/@MOVAV(REVIND22_SUM_0,2))

LOG(XEMPIND22_ESC/EMPIND22_SUM) = -0.02924102677 - 0.6232766976 +
0.7279893614*LOG(@MOVAV(REVIND22_ESC_0,2)/@MOVAV(REVIND22_SUM_0,2))

LOG(XEMPIND22_MATL/EMPIND22_SUM) = -0.09229726057 - 0.6232766976 +
0.7279893614*LOG(@MOVAV(REVIND22_MATL_0,2)/@MOVAV(REVIND22_SUM_0,2))

LOG(XEMPIND22_MTN/EMPIND22_SUM) = -0.0914831108 - 0.6232766976 +
0.7279893614*LOG(@MOVAV(REVIND22_MTN_0,2)/@MOVAV(REVIND22_SUM_0,2))

LOG(XEMPIND22_NENG/EMPIND22_SUM) = -0.3325159269 - 0.6232766976 +
0.7279893614*LOG(@MOVAV(REVIND22_NENG_0,2)/@MOVAV(REVIND22_SUM_0,2))

LOG(XEMPIND22_PAC/EMPIND22_SUM) = 0.1713611196 - 0.6232766976 +
0.7279893614*LOG(@MOVAV(REVIND22_PAC_0,2)/@MOVAV(REVIND22_SUM_0,2))

LOG(XEMPIND22_SATL/EMPIND22_SUM) = 0.2299039045 - 0.6232766976 +
0.7279893614*LOG(@MOVAV(REVIND22_SATL_0,2)/@MOVAV(REVIND22_SUM_0,2))

LOG(XEMPIND22_WNC/EMPIND22_SUM) = -0.1070875891 - 0.6232766976 +
0.7279893614*LOG(@MOVAV(REVIND22_WNC_0,2)/@MOVAV(REVIND22_SUM_0,2))

LOG(XEMPIND22_WSC/EMPIND22_SUM) = 0.03304851619 - 0.6232766976 +
0.7279893614*LOG(@MOVAV(REVIND22_WSC_0,2)/@MOVAV(REVIND22_SUM_0,2))

**IND23 - Other Primary Metals**
LOG(XEMPIND23_ENC/EMPIND23_SUM) = 0.7490662299 - 1.105486254 +
0.5622528494*LOG(@MOVAV(REVIND23_ENC_0,2)/@MOVAV(REVIND23_SUM_0,2))

LOG(XEMPIND23_ESC/EMPIND23_SUM) = 0.05815467262 - 1.105486254 +
0.5622528494*LOG(@MOVAV(REVIND23_ESC_0,2)/@MOVAV(REVIND23_SUM_0,2))
LOG(XEMPIND23_MATL/EMPIND23_SUM) = 0.2067205618 - 1.105486254 +
0.5622528494*LOG(@MOVAV(REVIND23_MATL_0,2)/@MOVAV(REVIND23_SUM_0,2))

LOG(XEMPIND23_MTN/EMPIND23_SUM) = -0.6764984976 - 1.105486254 +
0.5622528494*LOG(@MOVAV(REVIND23_MTN_0,2)/@MOVAV(REVIND23_SUM_0,2))

LOG(XEMPIND23_NENG/EMPIND23_SUM) = -0.2118385897 - 1.105486254 +
0.5622528494*LOG(@MOVAV(REVIND23_NENG_0,2)/@MOVAV(REVIND23_SUM_0,2))

LOG(XEMPIND23_PAC/EMPIND23_SUM) = 0.1698929667 - 1.105486254 +
0.5622528494*LOG(@MOVAV(REVIND23_PAC_0,2)/@MOVAV(REVIND23_SUM_0,2))

LOG(XEMPIND23_SATL/EMPIND23_SUM) = -0.05546423871 - 1.105486254 +
0.5622528494*LOG(@MOVAV(REVIND23_SATL_0,2)/@MOVAV(REVIND23_SUM_0,2))

LOG(XEMPIND23_WNC/EMPIND23_SUM) = 0.08193484438 - 1.105486254 +
0.5622528494*LOG(@MOVAV(REVIND23_WNC_0,2)/@MOVAV(REVIND23_SUM_0,2))

LOG(XEMPIND23_WSC/EMPIND23_SUM) = -0.3219679493 - 1.105486254 +
0.5622528494*LOG(@MOVAV(REVIND23_WSC_0,2)/@MOVAV(REVIND23_SUM_0,2))

**IND24 - Fabricated Metal Products**
LOG(XEMPIND24_ENC/EMPIND24_SUM) = 0.1557758865 - 0.418310267 +
0.8152424864*LOG(@MOVAV(REVIND24_ENC_0,2)/@MOVAV(REVIND24_SUM_0,2))

LOG(XEMPIND24_ESC/EMPIND24_SUM) = -0.1109400665 - 0.418310267 +
0.8152424864*LOG(@MOVAV(REVIND24_ESC_0,2)/@MOVAV(REVIND24_SUM_0,2))

LOG(XEMPIND24_MATL/EMPIND24_SUM) = 0.05801395519 - 0.418310267 +
0.8152424864*LOG(@MOVAV(REVIND24_MATL_0,2)/@MOVAV(REVIND24_SUM_0,2))

LOG(XEMPIND24_MTN/EMPIND24_SUM) = -0.08395934813 - 0.418310267 +
0.8152424864*LOG(@MOVAV(REVIND24_MTN_0,2)/@MOVAV(REVIND24_SUM_0,2))

LOG(XEMPIND24_NENG/EMPIND24_SUM) = -0.01441384005 - 0.418310267 +
0.8152424864*LOG(@MOVAV(REVIND24_NENG_0,2)/@MOVAV(REVIND24_SUM_0,2))

LOG(XEMPIND24_PAC/EMPIND24_SUM) = 0.08782934065 - 0.418310267 +
0.8152424864*LOG(@MOVAV(REVIND24_PAC_0,2)/@MOVAV(REVIND24_SUM_0,2))

LOG(XEMPIND24_SATL/EMPIND24_SUM) = -0.05386584953 - 0.418310267 +
0.8152424864*LOG(@MOVAV(REVIND24_SATL_0,2)/@MOVAV(REVIND24_SUM_0,2))

LOG(XEMPIND24_WNC/EMPIND24_SUM) = -0.04653109054 - 0.418310267 +
0.8152424864*LOG(@MOVAV(REVIND24_WNC_0,2)/@MOVAV(REVIND24_SUM_0,2))

LOG(XEMPIND24_WSC/EMPIND24_SUM) = 0.008091012388 - 0.418310267 +
0.8152424864*LOG(@MOVAV(REVIND24_WSC_0,2)/@MOVAV(REVIND24_SUM_0,2))

**IND25 - Machinery**
LOG(XEMPIND25_ENC/EMPIND25_SUM) = 0.6114767692 - 2.114572073 +
0.5648941366*LOG(@MOVAV(REVIND25_ENC_0,2)/@MOVAV(REVIND25_SUM_0,2)) -
0.4905617668*LOG(@MOVAV(RWM_ENC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND25_ESC/EMPIND25_SUM) = -0.2356946279 - 2.114572073 +
0.5648941366*LOG(@MOVAV(REVIND25_ESC_0,2)/@MOVAV(REVIND25_SUM_0,2)) -
0.4905617668*LOG(@MOVAV(RWM_ESC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND25_MATL/EMPIND25_SUM) = 0.207634194 - 2.114572073 +
0.5648941366*LOG(@MOVAV(REVIND25_MATL_0,2)/@MOVAV(REVIND25_SUM_0,2)) -
0.4905617668*LOG(@MOVAV(RWM_MATL,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND25_MTN/EMPIND25_SUM) = -0.4569773564 - 2.114572073 +
0.5648941366*LOG(@MOVAV(REVIND25_MTN_0,2)/@MOVAV(REVIND25_SUM_0,2)) -
0.4905617668*LOG(@MOVAV(RWM_MTN,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND25_NENG/EMPIND25_SUM) = -0.1379676214 - 2.114572073 +
0.5648941366*LOG(@MOVAV(REVIND25_NENG_0,2)/@MOVAV(REVIND25_SUM_0,2)) -
0.4905617668*LOG(@MOVAV(RWM_NENG,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND25_PAC/EMPIND25_SUM) = 0.0544376051 - 2.114572073 +
0.5648941366*LOG(@MOVAV(REVIND25_PAC_0,2)/@MOVAV(REVIND25_SUM_0,2)) -
0.4905617668*LOG(@MOVAV(RWM_PAC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND25_SATL/EMPIND25_SUM) = 0.02751998247 - 2.114572073 +
0.5648941366*LOG(@MOVAV(REVIND25_SATL_0,2)/@MOVAV(REVIND25_SUM_0,2)) -
0.4905617668*LOG(@MOVAV(RWM_SATL,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND25_WNC/EMPIND25_SUM) = 0.08365796974 - 2.114572073 +
0.5648941366*LOG(@MOVAV(REVIND25_WNC_0,2)/@MOVAV(REVIND25_SUM_0,2)) -
0.4905617668*LOG(@MOVAV(RWM_WNC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND25_WSC/EMPIND25_SUM) = -0.1540869148 - 2.114572073 +
0.5648941366*LOG(@MOVAV(REVIND25_WSC_0,2)/@MOVAV(REVIND25_SUM_0,2)) -
0.4905617668*LOG(@MOVAV(RWM_WSC,2)/@MOVAV(RWM_SUM,2))

**IND26 - Other Electronic & Electric Products**
LOG(XEMPIND26_ENC/EMPIND26_SUM) = 0.3631824009 - 1.268014865 +
0.4464315609*LOG(@MOVAV(REVIND26_ENC_0,2)/@MOVAV(REVIND26_SUM_0,2))

LOG(XEMPIND26_ESC/EMPIND26_SUM) = -0.2582219798 - 1.268014865 +
0.4464315609*LOG(@MOVAV(REVIND26_ESC_0,2)/@MOVAV(REVIND26_SUM_0,2))

LOG(XEMPIND26_MATL/EMPIND26_SUM) = 0.1456147811 - 1.268014865 +
0.4464315609*LOG(@MOVAV(REVIND26_MATL_0,2)/@MOVAV(REVIND26_SUM_0,2))

LOG(XEMPIND26_MTN/EMPIND26_SUM) = -0.3965571513 - 1.268014865 +
0.4464315609*LOG(@MOVAV(REVIND26_MTN_0,2)/@MOVAV(REVIND26_SUM_0,2))

LOG(XEMPIND26_NENG/EMPIND26_SUM) = -0.03815817041 - 1.268014865 +
0.4464315609*LOG(@MOVAV(REVIND26_NENG_0,2)/@MOVAV(REVIND26_SUM_0,2))

LOG(XEMPIND26_PAC/EMPIND26_SUM) = 0.3482036536 - 1.268014865 +
0.4464315609*LOG(@MOVAV(REVIND26_PAC_0,2)/@MOVAV(REVIND26_SUM_0,2))

LOG(XEMPIND26_SATL/EMPIND26_SUM) = 0.1471343807 - 1.268014865 +
0.4464315609*LOG(@MOVAV(REVIND26_SATL_0,2)/@MOVAV(REVIND26_SUM_0,2))

LOG(XEMPIND26_WNC/EMPIND26_SUM) = -0.1933614957 - 1.268014865 +
0.4464315609*LOG(@MOVAV(REVIND26_WNC_0,2)/@MOVAV(REVIND26_SUM_0,2))

LOG(XEMPIND26_WSC/EMPIND26_SUM) = -0.1178364191 - 1.268014865 +
0.4464315609*LOG(@MOVAV(REVIND26_WSC_0,2)/@MOVAV(REVIND26_SUM_0,2))

**IND27 - Transportation Equipment**
LOG(XEMPIND27_ENC/EMPIND27_SUM) = 0.5453181554 - 3.234444915 +
0.5651302595*LOG(@MOVAV(REVIND27_ENC_0,2)/@MOVAV(REVIND27_SUM_0,2)) -
1.016019688*LOG(@MOVAV(RWM_ENC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND27_ESC/EMPIND27_SUM) = -0.3561787064 - 3.234444915 +
0.5651302595*LOG(@MOVAV(REVIND27_ESC_0,2)/@MOVAV(REVIND27_SUM_0,2)) -
1.016019688*LOG(@MOVAV(RWM_ESC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND27_MATL/EMPIND27_SUM) = -0.01817280149 - 3.234444915 +
0.5651302595*LOG(@MOVAV(REVIND27_MATL_0,2)/@MOVAV(REVIND27_SUM_0,2)) -
1.016019688*LOG(@MOVAV(RWM_MATL,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND27_MTN/EMPIND27_SUM) = -0.3682330171 - 3.234444915 +
0.5651302595*LOG(@MOVAV(REVIND27_MTN_0,2)/@MOVAV(REVIND27_SUM_0,2)) -
1.016019688*LOG(@MOVAV(RWM_MTN,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND27_NENG/EMPIND27_SUM) = 0.09792463412 - 3.234444915 +
0.5651302595*LOG(@MOVAV(REVIND27_NENG_0,2)/@MOVAV(REVIND27_SUM_0,2)) -
1.016019688*LOG(@MOVAV(RWM_NENG,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND27_PAC/EMPIND27_SUM) = 0.4049561003 - 3.234444915 +
0.5651302595*LOG(@MOVAV(REVIND27_PAC_0,2)/@MOVAV(REVIND27_SUM_0,2)) -
1.016019688*LOG(@MOVAV(RWM_PAC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND27_SATL/EMPIND27_SUM) = -0.05883128193 - 3.234444915 +
0.5651302595*LOG(@MOVAV(REVIND27_SATL_0,2)/@MOVAV(REVIND27_SUM_0,2)) -
1.016019688*LOG(@MOVAV(RWM_SATL,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND27_WNC/EMPIND27_SUM) = -0.2086737363 - 3.234444915 +
0.5651302595*LOG(@MOVAV(REVIND27_WNC_0,2)/@MOVAV(REVIND27_SUM_0,2)) -
1.016019688*LOG(@MOVAV(RWM_WNC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMPIND27_WSC/EMPIND27_SUM) = -0.03810934649 - 3.234444915 +
0.5651302595*LOG(@MOVAV(REVIND27_WSC_0,2)/@MOVAV(REVIND27_SUM_0,2)) -
1.016019688*LOG(@MOVAV(RWM_WSC,2)/@MOVAV(RWM_SUM,2))

**IND28 - Measuring & Control Instruments**
LOG(XEMPIND28_ENC/EMPIND28_SUM) = 0.08037383355 - 1.133992596 +
0.5181429143*LOG(@MOVAV(REVIND28_ENC_0,2)/@MOVAV(REVIND28_SUM_0,2))

LOG(XEMPIND28_ESC/EMPIND28_SUM) = -0.6975434849 - 1.133992596 +
0.5181429143*LOG(@MOVAV(REVIND28_ESC_0,2)/@MOVAV(REVIND28_SUM_0,2))

LOG(XEMPIND28_MATL/EMPIND28_SUM) = 0.1050260781 - 1.133992596 +
0.5181429143*LOG(@MOVAV(REVIND28_MATL_0,2)/@MOVAV(REVIND28_SUM_0,2))

LOG(XEMPIND28_MTN/EMPIND28_SUM) = -0.1556299792 - 1.133992596 +
0.5181429143*LOG(@MOVAV(REVIND28_MTN_0,2)/@MOVAV(REVIND28_SUM_0,2))

LOG(XEMPIND28_NENG/EMPIND28_SUM) = 0.1648625988 - 1.133992596 +
0.5181429143*LOG(@MOVAV(REVIND28_NENG_0,2)/@MOVAV(REVIND28_SUM_0,2))

LOG(XEMPIND28_PAC/EMPIND28_SUM) = 0.4668243864 - 1.133992596 +
0.5181429143*LOG(@MOVAV(REVIND28_PAC_0,2)/@MOVAV(REVIND28_SUM_0,2))

LOG(XEMPIND28_SATL/EMPIND28_SUM) = 0.1774425792 - 1.133992596 +
0.5181429143*LOG(@MOVAV(REVIND28_SATL_0,2)/@MOVAV(REVIND28_SUM_0,2))

LOG(XEMPIND28_WNC/EMPIND28_SUM) = -0.1349891957 - 1.133992596 +
0.5181429143*LOG(@MOVAV(REVIND28_WNC_0,2)/@MOVAV(REVIND28_SUM_0,2))

LOG(XEMPIND28_WSC/EMPIND28_SUM) = -0.006366816337 - 1.133992596 +
0.5181429143*LOG(@MOVAV(REVIND28_WSC_0,2)/@MOVAV(REVIND28_SUM_0,2))

**IND29 - Miscellaneous Manufacturing**
LOG(XEMPIND29_ENC/EMPIND29_SUM) = 0.1181579541 - 0.5998493284 +
0.7337370738*LOG(@MOVAV(REVIND29_ENC_0,2)/@MOVAV(REVIND29_SUM_0,2))

LOG(XEMPIND29_ESC/EMPIND29_SUM) = -0.1748290734 - 0.5998493284 +
0.7337370738*LOG(@MOVAV(REVIND29_ESC_0,2)/@MOVAV(REVIND29_SUM_0,2))

LOG(XEMPIND29_MATL/EMPIND29_SUM) = 0.1269586395 - 0.5998493284 +
0.7337370738*LOG(@MOVAV(REVIND29_MATL_0,2)/@MOVAV(REVIND29_SUM_0,2))

LOG(XEMPIND29_MTN/EMPIND29_SUM) = -0.06734273473 - 0.5998493284 +
0.7337370738*LOG(@MOVAV(REVIND29_MTN_0,2)/@MOVAV(REVIND29_SUM_0,2))

LOG(XEMPIND29_NENG/EMPIND29_SUM) = -0.08535234744 - 0.5998493284 +
0.7337370738*LOG(@MOVAV(REVIND29_NENG_0,2)/@MOVAV(REVIND29_SUM_0,2))

LOG(XEMPIND29_PAC/EMPIND29_SUM) = 0.1128900206 - 0.5998493284 +
0.7337370738*LOG(@MOVAV(REVIND29_PAC_0,2)/@MOVAV(REVIND29_SUM_0,2))

LOG(XEMPIND29_SATL/EMPIND29_SUM) = 0.06730075362 - 0.5998493284 +
0.7337370738*LOG(@MOVAV(REVIND29_SATL_0,2)/@MOVAV(REVIND29_SUM_0,2))

LOG(XEMPIND29_WNC/EMPIND29_SUM) = -0.056484195 - 0.5998493284 +
0.7337370738*LOG(@MOVAV(REVIND29_WNC_0,2)/@MOVAV(REVIND29_SUM_0,2))

LOG(XEMPIND29_WSC/EMPIND29_SUM) = -0.0412990172 - 0.5998493284 +
0.7337370738*LOG(@MOVAV(REVIND29_WSC_0,2)/@MOVAV(REVIND29_SUM_0,2))

**IND30 - Crop Production**
LOG(XEMPIND30_ENC/EMPIND30_SUM) = 0.2688996064 - 0.9324249565 +
0.5999389412*LOG(@MOVAV(REVIND30_ENC_0,2)/@MOVAV(REVIND30_SUM_0,2))

LOG(XEMPIND30_ESC/EMPIND30_SUM) = 0.08316383685 - 0.9324249565 +
0.5999389412*LOG(@MOVAV(REVIND30_ESC_0,2)/@MOVAV(REVIND30_SUM_0,2))

LOG(XEMPIND30_MATL/EMPIND30_SUM) = -0.2314280909 - 0.9324249565 +
0.5999389412*LOG(@MOVAV(REVIND30_MATL_0,2)/@MOVAV(REVIND30_SUM_0,2))

LOG(XEMPIND30_MTN/EMPIND30_SUM) = -0.3097379792 - 0.9324249565 +
0.5999389412*LOG(@MOVAV(REVIND30_MTN_0,2)/@MOVAV(REVIND30_SUM_0,2))

LOG(XEMPIND30_NENG/EMPIND30_SUM) = -0.4776044301 - 0.9324249565 +
0.5999389412*LOG(@MOVAV(REVIND30_NENG_0,2)/@MOVAV(REVIND30_SUM_0,2))

LOG(XEMPIND30_PAC/EMPIND30_SUM) = 0.3051763861 - 0.9324249565 +
0.5999389412*LOG(@MOVAV(REVIND30_PAC_0,2)/@MOVAV(REVIND30_SUM_0,2))

LOG(XEMPIND30_SATL/EMPIND30_SUM) = 0.2026466442 - 0.9324249565 +
0.5999389412*LOG(@MOVAV(REVIND30_SATL_0,2)/@MOVAV(REVIND30_SUM_0,2))

LOG(XEMPIND30_WNC/EMPIND30_SUM) = 0.03089806719 - 0.9324249565 +
0.5999389412*LOG(@MOVAV(REVIND30_WNC_0,2)/@MOVAV(REVIND30_SUM_0,2))

LOG(XEMPIND30_WSC/EMPIND30_SUM) = 0.1279859595 - 0.9324249565 +
0.5999389412*LOG(@MOVAV(REVIND30_WSC_0,2)/@MOVAV(REVIND30_SUM_0,2))

**IND31 - Other Agriculture, Forestry, Fishing & Hunting**
LOG(XEMPIND31_ENC/EMPIND31_SUM) = 0.0930200715 - 1.014406497 +
0.5580016594*LOG(@MOVAV(REVIND31_ENC_0,2)/@MOVAV(REVIND31_SUM_0,2))

LOG(XEMPIND31_ESC/EMPIND31_SUM) = 0.214201838 - 1.014406497 +
0.5580016594*LOG(@MOVAV(REVIND31_ESC_0,2)/@MOVAV(REVIND31_SUM_0,2))

LOG(XEMPIND31_MATL/EMPIND31_SUM) = -0.07151571434 - 1.014406497 +
0.5580016594*LOG(@MOVAV(REVIND31_MATL_0,2)/@MOVAV(REVIND31_SUM_0,2))

LOG(XEMPIND31_MTN/EMPIND31_SUM) = -0.1941267892 - 1.014406497 +
0.5580016594*LOG(@MOVAV(REVIND31_MTN_0,2)/@MOVAV(REVIND31_SUM_0,2))

LOG(XEMPIND31_NENG/EMPIND31_SUM) = -0.5550438335 - 1.014406497 +
0.5580016594*LOG(@MOVAV(REVIND31_NENG_0,2)/@MOVAV(REVIND31_SUM_0,2))

LOG(XEMPIND31_PAC/EMPIND31_SUM) = -0.1117407417 - 1.014406497 +
0.5580016594*LOG(@MOVAV(REVIND31_PAC_0,2)/@MOVAV(REVIND31_SUM_0,2))

LOG(XEMPIND31_SATL/EMPIND31_SUM) = 0.1419342063 - 1.014406497 +
0.5580016594*LOG(@MOVAV(REVIND31_SATL_0,2)/@MOVAV(REVIND31_SUM_0,2))

LOG(XEMPIND31_WNC/EMPIND31_SUM) = 0.1416183557 - 1.014406497 +
0.5580016594*LOG(@MOVAV(REVIND31_WNC_0,2)/@MOVAV(REVIND31_SUM_0,2))

LOG(XEMPIND31_WSC/EMPIND31_SUM) = 0.3416526072 - 1.014406497 +
0.5580016594*LOG(@MOVAV(REVIND31_WSC_0,2)/@MOVAV(REVIND31_SUM_0,2))

**IND32 - Coal Mining**
LOG(XEMPIND32_ENC/EMPIND32_SUM) = 0.2941101249 - 0.7135889737 +
0.7505917169*LOG(@MOVAV(REVIND32_ENC_0,2)/@MOVAV(REVIND32_SUM_0,2))

LOG(XEMPIND32_ESC/EMPIND32_SUM) = 0.4424032593 - 0.7135889737 +
0.7505917169*LOG(@MOVAV(REVIND32_ESC_0,2)/@MOVAV(REVIND32_SUM_0,2))

LOG(XEMPIND32_MATL/EMPIND32_SUM) = 0.3238096153 - 0.7135889737 +
0.7505917169*LOG(@MOVAV(REVIND32_MATL_0,2)/@MOVAV(REVIND32_SUM_0,2))

LOG(XEMPIND32_MTN/EMPIND32_SUM) = -0.03380321211 - 0.7135889737 +
0.7505917169*LOG(@MOVAV(REVIND32_MTN_0,2)/@MOVAV(REVIND32_SUM_0,2))

LOG(XEMPIND32_NENG/EMPIND32_SUM) = -0.654133403 - 0.7135889737 +
0.7505917169*LOG(@MOVAV(REVIND32_NENG_0,2)/@MOVAV(REVIND32_SUM_0,2))

LOG(XEMPIND32_PAC/EMPIND32_SUM) = -0.3857824666 - 0.7135889737 +
0.7505917169*LOG(@MOVAV(REVIND32_PAC_0,2)/@MOVAV(REVIND32_SUM_0,2))

LOG(XEMPIND32_SATL/EMPIND32_SUM) = 0.3706098363 - 0.7135889737 +
0.7505917169*LOG(@MOVAV(REVIND32_SATL_0,2)/@MOVAV(REVIND32_SUM_0,2))

LOG(XEMPIND32_WNC/EMPIND32_SUM) = -0.3748091175 - 0.7135889737 +
0.7505917169*LOG(@MOVAV(REVIND32_WNC_0,2)/@MOVAV(REVIND32_SUM_0,2))

LOG(XEMPIND32_WSC/EMPIND32_SUM) = 0.01759536341 - 0.7135889737 +
0.7505917169*LOG(@MOVAV(REVIND32_WSC_0,2)/@MOVAV(REVIND32_SUM_0,2))

**IND33 - Oil & Gas Extraction & Support Activities**
LOG(XEMPIND33_ENC/EMPIND33_SUM) = -0.1385468037 - 2.538465232 +
0.1535953697*LOG(@MOVAV(REVIND33_ENC_0,2)/@MOVAV(REVIND33_SUM_0,2))

LOG(XEMPIND33_ESC/EMPIND33_SUM) = -0.3724404286 - 2.538465232 +
0.1535953697*LOG(@MOVAV(REVIND33_ESC_0,2)/@MOVAV(REVIND33_SUM_0,2))

LOG(XEMPIND33_MATL/EMPIND33_SUM) = -0.8943853824 - 2.538465232 +
0.1535953697*LOG(@MOVAV(REVIND33_MATL_0,2)/@MOVAV(REVIND33_SUM_0,2))

LOG(XEMPIND33_MTN/EMPIND33_SUM) = 0.7269459424 - 2.538465232 +
0.1535953697*LOG(@MOVAV(REVIND33_MTN_0,2)/@MOVAV(REVIND33_SUM_0,2))

LOG(XEMPIND33_NENG/EMPIND33_SUM) = -1.248888949 - 2.538465232 +
0.1535953697*LOG(@MOVAV(REVIND33_NENG_0,2)/@MOVAV(REVIND33_SUM_0,2))

LOG(XEMPIND33_PAC/EMPIND33_SUM) = 0.4274566698 - 2.538465232 +
0.1535953697*LOG(@MOVAV(REVIND33_PAC_0,2)/@MOVAV(REVIND33_SUM_0,2))

LOG(XEMPIND33_SATL/EMPIND33_SUM) = -0.496185395 - 2.538465232 +
0.1535953697*LOG(@MOVAV(REVIND33_SATL_0,2)/@MOVAV(REVIND33_SUM_0,2))

LOG(XEMPIND33_WNC/EMPIND33_SUM) = -0.1620247745 - 2.538465232 +
0.1535953697*LOG(@MOVAV(REVIND33_WNC_0,2)/@MOVAV(REVIND33_SUM_0,2))

LOG(XEMPIND33_WSC/EMPIND33_SUM) = 2.158069121 - 2.538465232 +
0.1535953697*LOG(@MOVAV(REVIND33_WSC_0,2)/@MOVAV(REVIND33_SUM_0,2))

**IND34 - Other Mining & Quarrying**
LOG(XEMPIND34_ENC/REVIND34_ENC_0) = 0.0638674388 - 0.1030524656 +
0.9543440638*LOG(EMPIND34_SUM/REVIND34_SUM_0)

LOG(XEMPIND34_ESC/REVIND34_ESC_0) = 0.2970351117 - 0.1030524656 +
0.9543440638*LOG(EMPIND34_SUM/REVIND34_SUM_0)

LOG(XEMPIND34_MATL/REVIND34_MATL_0) = 0.1837384344 - 0.1030524656 +
0.9543440638*LOG(EMPIND34_SUM/REVIND34_SUM_0)

LOG(XEMPIND34_MTN/REVIND34_MTN_0) = -0.3896901166 - 0.1030524656 +
0.9543440638*LOG(EMPIND34_SUM/REVIND34_SUM_0)

LOG(XEMPIND34_NENG/REVIND34_NENG_0) = 0.04484598303 - 0.1030524656 +
0.9543440638*LOG(EMPIND34_SUM/REVIND34_SUM_0)

LOG(XEMPIND34_PAC/REVIND34_PAC_0) = -0.3053218808 - 0.1030524656 +
0.9543440638*LOG(EMPIND34_SUM/REVIND34_SUM_0)

LOG(XEMPIND34_SATL/REVIND34_SATL_0) = -0.06285090199 - 0.1030524656 +
0.9543440638*LOG(EMPIND34_SUM/REVIND34_SUM_0)

LOG(XEMPIND34_WNC/REVIND34_WNC_0) = -0.103332981 - 0.1030524656 +
0.9543440638*LOG(EMPIND34_SUM/REVIND34_SUM_0)

LOG(XEMPIND34_WSC/REVIND34_WSC_0) = 0.2717089123 - 0.1030524656 +
0.9543440638*LOG(EMPIND34_SUM/REVIND34_SUM_0)

**IND35 - Construction**
LOG(XEMPIND35_ENC/EMPIND35_SUM) = 0.1438607337 - 0.8035004816 +
0.6478321704*LOG(@MOVAV(REVIND35_ENC_0,2)/@MOVAV(REVIND35_SUM_0,2))

LOG(XEMPIND35_ESC/EMPIND35_SUM) = -0.1071626975 - 0.8035004816 +
0.6478321704*LOG(@MOVAV(REVIND35_ESC_0,2)/@MOVAV(REVIND35_SUM_0,2))

LOG(XEMPIND35_MATL/EMPIND35_SUM) = -0.007785553074 - 0.8035004816 +
0.6478321704*LOG(@MOVAV(REVIND35_MATL_0,2)/@MOVAV(REVIND35_SUM_0,2))

LOG(XEMPIND35_MTN/EMPIND35_SUM) = -0.04147593508 - 0.8035004816 +
0.6478321704*LOG(@MOVAV(REVIND35_MTN_0,2)/@MOVAV(REVIND35_SUM_0,2))

LOG(XEMPIND35_NENG/EMPIND35_SUM) = -0.3385285132 - 0.8035004816 +
0.6478321704*LOG(@MOVAV(REVIND35_NENG_0,2)/@MOVAV(REVIND35_SUM_0,2))

LOG(XEMPIND35_PAC/EMPIND35_SUM) = 0.05658755174 - 0.8035004816 +
0.6478321704*LOG(@MOVAV(REVIND35_PAC_0,2)/@MOVAV(REVIND35_SUM_0,2))

LOG(XEMPIND35_SATL/EMPIND35_SUM) = 0.277481703 - 0.8035004816 +
0.6478321704*LOG(@MOVAV(REVIND35_SATL_0,2)/@MOVAV(REVIND35_SUM_0,2))

LOG(XEMPIND35_WNC/EMPIND35_SUM) = -0.08663537429 - 0.8035004816 +
0.6478321704*LOG(@MOVAV(REVIND35_WNC_0,2)/@MOVAV(REVIND35_SUM_0,2))

LOG(XEMPIND35_WSC/EMPIND35_SUM) = 0.1036580848 - 0.8035004816 +
0.6478321704*LOG(@MOVAV(REVIND35_WSC_0,2)/@MOVAV(REVIND35_SUM_0,2))

**SER1 - Transportation & Warehousing**
LOG(XEMPSER1_ENC/EMPSER1_SUM) = 0.2190753713 - 0.9487613099 +
0.5842958358*LOG(@MOVAV(REVSER1_ENC_0,2)/@MOVAV(REVSER1_SUM_0,2))

LOG(XEMPSER1_ESC/EMPSER1_SUM) = -0.155570268 - 0.9487613099 +
0.5842958358*LOG(@MOVAV(REVSER1_ESC_0,2)/@MOVAV(REVSER1_SUM_0,2))

LOG(XEMPSER1_MATL/EMPSER1_SUM) = 0.2021016279 - 0.9487613099 +
0.5842958358*LOG(@MOVAV(REVSER1_MATL_0,2)/@MOVAV(REVSER1_SUM_0,2))

LOG(XEMPSER1_MTN/EMPSER1_SUM) = -0.1614052349 - 0.9487613099 +
0.5842958358*LOG(@MOVAV(REVSER1_MTN_0,2)/@MOVAV(REVSER1_SUM_0,2))

LOG(XEMPSER1_NENG/EMPSER1_SUM) = -0.3064243857 - 0.9487613099 +
0.5842958358*LOG(@MOVAV(REVSER1_NENG_0,2)/@MOVAV(REVSER1_SUM_0,2))

LOG(XEMPSER1_PAC/EMPSER1_SUM) = 0.1322001532 - 0.9487613099 +
0.5842958358*LOG(@MOVAV(REVSER1_PAC_0,2)/@MOVAV(REVSER1_SUM_0,2))

LOG(XEMPSER1_SATL/EMPSER1_SUM) = 0.2220507447 - 0.9487613099 +
0.5842958358*LOG(@MOVAV(REVSER1_SATL_0,2)/@MOVAV(REVSER1_SUM_0,2))

LOG(XEMPSER1_WNC/EMPSER1_SUM) = -0.1139127208 - 0.9487613099 +
0.5842958358*LOG(@MOVAV(REVSER1_WNC_0,2)/@MOVAV(REVSER1_SUM_0,2))

LOG(XEMPSER1_WSC/EMPSER1_SUM) = -0.0381152876 - 0.9487613099 +
0.5842958358*LOG(@MOVAV(REVSER1_WSC_0,2)/@MOVAV(REVSER1_SUM_0,2))

**SER2 - Broadcasting & Telecommunications**
LOG(XEMPSER2_ENC/EMPSER2_SUM) = -0.01333908324 - 0.5268935066 +
0.7641958439*LOG(@MOVAV(REVSER2_ENC_0,2)/@MOVAV(REVSER2_SUM_0,2))

LOG(XEMPSER2_ESC/EMPSER2_SUM) = -0.1566277483 - 0.5268935066 +
0.7641958439*LOG(@MOVAV(REVSER2_ESC_0,2)/@MOVAV(REVSER2_SUM_0,2))

LOG(XEMPSER2_MATL/EMPSER2_SUM) = 0.07605198008 - 0.5268935066 +
0.7641958439*LOG(@MOVAV(REVSER2_MATL_0,2)/@MOVAV(REVSER2_SUM_0,2))

LOG(XEMPSER2_MTN/EMPSER2_SUM) = 0.02380667888 - 0.5268935066 +
0.7641958439*LOG(@MOVAV(REVSER2_MTN_0,2)/@MOVAV(REVSER2_SUM_0,2))

LOG(XEMPSER2_NENG/EMPSER2_SUM) = -0.1703081066 - 0.5268935066 +
0.7641958439*LOG(@MOVAV(REVSER2_NENG_0,2)/@MOVAV(REVSER2_SUM_0,2))

LOG(XEMPSER2_PAC/EMPSER2_SUM) = 0.06046143416 - 0.5268935066 +
0.7641958439*LOG(@MOVAV(REVSER2_PAC_0,2)/@MOVAV(REVSER2_SUM_0,2))

LOG(XEMPSER2_SATL/EMPSER2_SUM) = 0.1291722266 - 0.5268935066 +
0.7641958439*LOG(@MOVAV(REVSER2_SATL_0,2)/@MOVAV(REVSER2_SUM_0,2))

LOG(XEMPSER2_WNC/EMPSER2_SUM) = 0.000347712788 - 0.5268935066 +
0.7641958439*LOG(@MOVAV(REVSER2_WNC_0,2)/@MOVAV(REVSER2_SUM_0,2))

LOG(XEMPSER2_WSC/EMPSER2_SUM) = 0.05043490555 - 0.5268935066 +
0.7641958439*LOG(@MOVAV(REVSER2_WSC_0,2)/@MOVAV(REVSER2_SUM_0,2))

**SER3 - Electric Power Generation & Distribution**
LOG(XEMPSER3_ENC/REVSER3_ENC_0) = 0.08005131541 + 0.0844356338 +
1.015906298*LOG(EMPSER3_SUM/REVSER3_SUM_0)

LOG(XEMPSER3_ESC/REVSER3_ESC_0) = -0.03652615344 + 0.0844356338 +
1.015906298*LOG(EMPSER3_SUM/REVSER3_SUM_0)

LOG(XEMPSER3_MATL/REVSER3_MATL_0) = 0.09414872199 + 0.0844356338 +
1.015906298*LOG(EMPSER3_SUM/REVSER3_SUM_0)

LOG(XEMPSER3_MTN/REVSER3_MTN_0) = 0.133543823 + 0.0844356338 +
1.015906298*LOG(EMPSER3_SUM/REVSER3_SUM_0)

LOG(XEMPSER3_NENG/REVSER3_NENG_0) = -0.2786576869 + 0.0844356338 +
1.015906298*LOG(EMPSER3_SUM/REVSER3_SUM_0)

LOG(XEMPSER3_PAC/REVSER3_PAC_0) = -0.09952510102 + 0.0844356338 +
1.015906298*LOG(EMPSER3_SUM/REVSER3_SUM_0)

LOG(XEMPSER3_SATL/REVSER3_SATL_0) = 0.0667959762 + 0.0844356338 +
1.015906298*LOG(EMPSER3_SUM/REVSER3_SUM_0)

LOG(XEMPSER3_WNC/REVSER3_WNC_0) = 0.2194562418 + 0.0844356338 +
1.015906298*LOG(EMPSER3_SUM/REVSER3_SUM_0)

LOG(XEMPSER3_WSC/REVSER3_WSC_0) = -0.1792871369 + 0.0844356338 +
1.015906298*LOG(EMPSER3_SUM/REVSER3_SUM_0)

**SER4 - Natural Gas Distribution**
LOG(XEMPSER4_ENC/REVSER4_ENC_0) = 0.1568819622 - 0.03524447735 +
0.9503030814*LOG(EMPSER4_SUM/REVSER4_SUM_0)

LOG(XEMPSER4_ESC/REVSER4_ESC_0) = -0.1669307689 - 0.03524447735 +
0.9503030814*LOG(EMPSER4_SUM/REVSER4_SUM_0)

LOG(XEMPSER4_MATL/REVSER4_MATL_0) = -0.6679042912 - 0.03524447735 +
0.9503030814*LOG(EMPSER4_SUM/REVSER4_SUM_0)

LOG(XEMPSER4_MTN/REVSER4_MTN_0) = -0.02742924344 - 0.03524447735 +
0.9503030814*LOG(EMPSER4_SUM/REVSER4_SUM_0)

LOG(XEMPSER4_NENG/REVSER4_NENG_0) = 0.4264529712 - 0.03524447735 +
0.9503030814*LOG(EMPSER4_SUM/REVSER4_SUM_0)

LOG(XEMPSER4_PAC/REVSER4_PAC_0) = -0.02767287297 - 0.03524447735 +
0.9503030814*LOG(EMPSER4_SUM/REVSER4_SUM_0)

LOG(XEMPSER4_SATL/REVSER4_SATL_0) = 0.4835990358 - 0.03524447735 +
0.9503030814*LOG(EMPSER4_SUM/REVSER4_SUM_0)

LOG(XEMPSER4_WNC/REVSER4_WNC_0) = 0.6344020967 - 0.03524447735 +
0.9503030814*LOG(EMPSER4_SUM/REVSER4_SUM_0)

LOG(XEMPSER4_WSC/REVSER4_WSC_0) = -0.8113988893 - 0.03524447735 +
0.9503030814*LOG(EMPSER4_SUM/REVSER4_SUM_0)

**SER5 - Water, Sewage & Related System**
LOG(XEMPSER5_ENC/REVSER5_ENC_0) = -0.1419719375 - 0.1661675701 +
0.9545966974*LOG(EMPSER5_SUM/REVSER5_SUM_0)

LOG(XEMPSER5_ESC/REVSER5_ESC_0) = 0.2092781799 - 0.1661675701 +
0.9545966974*LOG(EMPSER5_SUM/REVSER5_SUM_0)

LOG(XEMPSER5_MATL/REVSER5_MATL_0) = -0.3313319307 - 0.1661675701 +
0.9545966974*LOG(EMPSER5_SUM/REVSER5_SUM_0)

LOG(XEMPSER5_MTN/REVSER5_MTN_0) = 0.3303556365 - 0.1661675701 +
0.9545966974*LOG(EMPSER5_SUM/REVSER5_SUM_0)

LOG(XEMPSER5_NENG/REVSER5_NENG_0) = 0.2539813704 - 0.1661675701 +
0.9545966974*LOG(EMPSER5_SUM/REVSER5_SUM_0)

LOG(XEMPSER5_PAC/REVSER5_PAC_0) = -0.4699967293 - 0.1661675701 +
0.9545966974*LOG(EMPSER5_SUM/REVSER5_SUM_0)

LOG(XEMPSER5_SATL/REVSER5_SATL_0) = 0.008851940593 - 0.1661675701 +
0.9545966974*LOG(EMPSER5_SUM/REVSER5_SUM_0)

LOG(XEMPSER5_WNC/REVSER5_WNC_0) = -0.1393243116 - 0.1661675701 +
0.9545966974*LOG(EMPSER5_SUM/REVSER5_SUM_0)

LOG(XEMPSER5_WSC/REVSER5_WSC_0) = 0.2801577817 - 0.1661675701 +
0.9545966974*LOG(EMPSER5_SUM/REVSER5_SUM_0)

**SER6 - Wholesale Trade**
LOG(XEMPSER6_ENC/EMPSER6_SUM) = 0.1354536208 - 1.185113106 +
0.4283514985*LOG(@MOVAV(REVSER6_ENC_0,2)/@MOVAV(REVSER6_SUM_0,2)) -
0.281472342*LOG(@MOVAV(RWNM_ENC,2)/@MOVAV(RWNM_SUM,2)) +
0.3227584446*LOG(@MOVAV(GSPR_ENC,2)/@MOVAV(GSPR_SUM,2))

LOG(XEMPSER6_ESC/EMPSER6_SUM) = -0.1212611932 - 1.185113106 +
0.4283514985*LOG(@MOVAV(REVSER6_ESC_0,2)/@MOVAV(REVSER6_SUM_0,2)) -
0.281472342*LOG(@MOVAV(RWNM_ESC,2)/@MOVAV(RWNM_SUM,2)) +
0.3227584446*LOG(@MOVAV(GSPR_ESC,2)/@MOVAV(GSPR_SUM,2))

LOG(XEMPSER6_MATL/EMPSER6_SUM) = 0.1249753337 - 1.185113106 +
0.4283514985*LOG(@MOVAV(REVSER6_MATL_0,2)/@MOVAV(REVSER6_SUM_0,2)) -
0.281472342*LOG(@MOVAV(RWNM_MATL,2)/@MOVAV(RWNM_SUM,2)) +
0.3227584446*LOG(@MOVAV(GSPR_MATL,2)/@MOVAV(GSPR_SUM,2))

LOG(XEMPSER6_MTN/EMPSER6_SUM) = -0.1170476017 - 1.185113106 +
0.4283514985*LOG(@MOVAV(REVSER6_MTN_0,2)/@MOVAV(REVSER6_SUM_0,2)) -
0.281472342*LOG(@MOVAV(RWNM_MTN,2)/@MOVAV(RWNM_SUM,2)) +
0.3227584446*LOG(@MOVAV(GSPR_MTN,2)/@MOVAV(GSPR_SUM,2))

LOG(XEMPSER6_NENG/EMPSER6_SUM) = -0.1981464572 - 1.185113106 +
0.4283514985*LOG(@MOVAV(REVSER6_NENG_0,2)/@MOVAV(REVSER6_SUM_0,2)) -
0.281472342*LOG(@MOVAV(RWNM_NENG,2)/@MOVAV(RWNM_SUM,2)) +
0.3227584446*LOG(@MOVAV(GSPR_NENG,2)/@MOVAV(GSPR_SUM,2))

LOG(XEMPSER6_PAC/EMPSER6_SUM) = 0.1447143569 - 1.185113106 +
0.4283514985*LOG(@MOVAV(REVSER6_PAC_0,2)/@MOVAV(REVSER6_SUM_0,2)) -
0.281472342*LOG(@MOVAV(RWNM_PAC,2)/@MOVAV(RWNM_SUM,2)) +
0.3227584446*LOG(@MOVAV(GSPR_PAC,2)/@MOVAV(GSPR_SUM,2))

LOG(XEMPSER6_SATL/EMPSER6_SUM) = 0.1005181361 - 1.185113106 +
0.4283514985*LOG(@MOVAV(REVSER6_SATL_0,2)/@MOVAV(REVSER6_SUM_0,2)) -
0.281472342*LOG(@MOVAV(RWNM_SATL,2)/@MOVAV(RWNM_SUM,2)) +
0.3227584446*LOG(@MOVAV(GSPR_SATL,2)/@MOVAV(GSPR_SUM,2))

LOG(XEMPSER6_WNC/EMPSER6_SUM) = -0.04293053818 - 1.185113106 +
0.4283514985*LOG(@MOVAV(REVSER6_WNC_0,2)/@MOVAV(REVSER6_SUM_0,2)) -
0.281472342*LOG(@MOVAV(RWNM_WNC,2)/@MOVAV(RWNM_SUM,2)) +
0.3227584446*LOG(@MOVAV(GSPR_WNC,2)/@MOVAV(GSPR_SUM,2))

LOG(XEMPSER6_WSC/EMPSER6_SUM) = -0.02627565722 - 1.185113106 +
0.4283514985*LOG(@MOVAV(REVSER6_WSC_0,2)/@MOVAV(REVSER6_SUM_0,2)) -
0.281472342*LOG(@MOVAV(RWNM_WSC,2)/@MOVAV(RWNM_SUM,2)) +
0.3227584446*LOG(@MOVAV(GSPR_WSC,2)/@MOVAV(GSPR_SUM,2))

**SER7 - Retail Trade**
LOG(XEMPSER7_ENC/EMPSER7_SUM) = 0.1619407818 - 1.59303156 +
0.5024032553*LOG(@MOVAV(REVSER7_ENC_0,2)/@MOVAV(REVSER7_SUM_0,2)) -
0.4461597168*LOG(@MOVAV(RWNM_ENC,2)/@MOVAV(RWNM_SUM,2)) +
0.2281815459*LOG(@MOVAV(GSPR_ENC,2)/@MOVAV(GSPR_SUM,2))

LOG(XEMPSER7_ESC/EMPSER7_SUM) = -0.1033047588 - 1.59303156 +
0.5024032553*LOG(@MOVAV(REVSER7_ESC_0,2)/@MOVAV(REVSER7_SUM_0,2)) -
0.4461597168*LOG(@MOVAV(RWNM_ESC,2)/@MOVAV(RWNM_SUM,2)) +
0.2281815459*LOG(@MOVAV(GSPR_ESC,2)/@MOVAV(GSPR_SUM,2))

LOG(XEMPSER7_MATL/EMPSER7_SUM) = 0.1146399495 - 1.59303156 +
0.5024032553*LOG(@MOVAV(REVSER7_MATL_0,2)/@MOVAV(REVSER7_SUM_0,2)) -
0.4461597168*LOG(@MOVAV(RWNM_MATL,2)/@MOVAV(RWNM_SUM,2)) +
0.2281815459*LOG(@MOVAV(GSPR_MATL,2)/@MOVAV(GSPR_SUM,2))

LOG(XEMPSER7_MTN/EMPSER7_SUM) = -0.156985427 - 1.59303156 +
0.5024032553*LOG(@MOVAV(REVSER7_MTN_0,2)/@MOVAV(REVSER7_SUM_0,2)) -
0.4461597168*LOG(@MOVAV(RWNM_MTN,2)/@MOVAV(RWNM_SUM,2)) +
0.2281815459*LOG(@MOVAV(GSPR_MTN,2)/@MOVAV(GSPR_SUM,2))

LOG(XEMPSER7_NENG/EMPSER7_SUM) = -0.1307468593 - 1.59303156 +
0.5024032553*LOG(@MOVAV(REVSER7_NENG_0,2)/@MOVAV(REVSER7_SUM_0,2)) -
0.4461597168*LOG(@MOVAV(RWNM_NENG,2)/@MOVAV(RWNM_SUM,2)) +
0.2281815459*LOG(@MOVAV(GSPR_NENG,2)/@MOVAV(GSPR_SUM,2))

LOG(XEMPSER7_PAC/EMPSER7_SUM) = 0.03629987163 - 1.59303156 +
0.5024032553*LOG(@MOVAV(REVSER7_PAC_0,2)/@MOVAV(REVSER7_SUM_0,2)) -
0.4461597168*LOG(@MOVAV(RWNM_PAC,2)/@MOVAV(RWNM_SUM,2)) +
0.2281815459*LOG(@MOVAV(GSPR_PAC,2)/@MOVAV(GSPR_SUM,2))

LOG(XEMPSER7_SATL/EMPSER7_SUM) = 0.1892339905 - 1.59303156 +
0.5024032553*LOG(@MOVAV(REVSER7_SATL_0,2)/@MOVAV(REVSER7_SUM_0,2)) -
0.4461597168*LOG(@MOVAV(RWNM_SATL,2)/@MOVAV(RWNM_SUM,2)) +
0.2281815459*LOG(@MOVAV(GSPR_SATL,2)/@MOVAV(GSPR_SUM,2))

LOG(XEMPSER7_WNC/EMPSER7_SUM) = -0.07535360319 - 1.59303156 +
0.5024032553*LOG(@MOVAV(REVSER7_WNC_0,2)/@MOVAV(REVSER7_SUM_0,2)) -
0.4461597168*LOG(@MOVAV(RWNM_WNC,2)/@MOVAV(RWNM_SUM,2)) +
0.2281815459*LOG(@MOVAV(GSPR_WNC,2)/@MOVAV(GSPR_SUM,2))

LOG(XEMPSER7_WSC/EMPSER7_SUM) = -0.03572394505 - 1.59303156 +
0.5024032553*LOG(@MOVAV(REVSER7_WSC_0,2)/@MOVAV(REVSER7_SUM_0,2)) -
0.4461597168*LOG(@MOVAV(RWNM_WSC,2)/@MOVAV(RWNM_SUM,2)) +
0.2281815459*LOG(@MOVAV(GSPR_WSC,2)/@MOVAV(GSPR_SUM,2))

**SER8 - Finance & Insurance, Real Estate**
LOG(XEMPSER8_ENC/EMPSER8_SUM) = 0.02923808364 - 3.205046333 +
0.8219506246*LOG(@MOVAV(REVSER8_ENC_0,2)/@MOVAV(REVSER8_SUM_0,2)) -
1.265991992*LOG(@MOVAV(RWNM_ENC,2)/@MOVAV(RWNM_SUM,2))

LOG(XEMPSER8_ESC/EMPSER8_SUM) = -0.3451830858 - 3.205046333 +
0.8219506246*LOG(@MOVAV(REVSER8_ESC_0,2)/@MOVAV(REVSER8_SUM_0,2)) -
1.265991992*LOG(@MOVAV(RWNM_ESC,2)/@MOVAV(RWNM_SUM,2))

LOG(XEMPSER8_MATL/EMPSER8_SUM) = 0.3690873634 - 3.205046333 +
0.8219506246*LOG(@MOVAV(REVSER8_MATL_0,2)/@MOVAV(REVSER8_SUM_0,2)) -
1.265991992*LOG(@MOVAV(RWNM_MATL,2)/@MOVAV(RWNM_SUM,2))

LOG(XEMPSER8_MTN/EMPSER8_SUM) = -0.1829401625 - 3.205046333 +
0.8219506246*LOG(@MOVAV(REVSER8_MTN_0,2)/@MOVAV(REVSER8_SUM_0,2)) -
1.265991992*LOG(@MOVAV(RWNM_MTN,2)/@MOVAV(RWNM_SUM,2))

LOG(XEMPSER8_NENG/EMPSER8_SUM) = 0.08239810769 - 3.205046333 +
0.8219506246*LOG(@MOVAV(REVSER8_NENG_0,2)/@MOVAV(REVSER8_SUM_0,2)) -
1.265991992*LOG(@MOVAV(RWNM_NENG,2)/@MOVAV(RWNM_SUM,2))

LOG(XEMPSER8_PAC/EMPSER8_SUM) = 0.2491451213 - 3.205046333 +
0.8219506246*LOG(@MOVAV(REVSER8_PAC_0,2)/@MOVAV(REVSER8_SUM_0,2)) -
1.265991992*LOG(@MOVAV(RWNM_PAC,2)/@MOVAV(RWNM_SUM,2))

LOG(XEMPSER8_SATL/EMPSER8_SUM) = 0.08681181504 - 3.205046333 +
0.8219506246*LOG(@MOVAV(REVSER8_SATL_0,2)/@MOVAV(REVSER8_SUM_0,2)) -
1.265991992*LOG(@MOVAV(RWNM_SATL,2)/@MOVAV(RWNM_SUM,2))

LOG(XEMPSER8_WNC/EMPSER8_SUM) = -0.2170729114 - 3.205046333 +
0.8219506246*LOG(@MOVAV(REVSER8_WNC_0,2)/@MOVAV(REVSER8_SUM_0,2)) -
1.265991992*LOG(@MOVAV(RWNM_WNC,2)/@MOVAV(RWNM_SUM,2))

LOG(XEMPSER8_WSC/EMPSER8_SUM) = -0.07148433133 - 3.205046333 +
0.8219506246*LOG(@MOVAV(REVSER8_WSC_0,2)/@MOVAV(REVSER8_SUM_0,2)) -
1.265991992*LOG(@MOVAV(RWNM_WSC,2)/@MOVAV(RWNM_SUM,2))

**SER9 - Other Services**
LOG(XEMPSER9_ENC/EMPSER9_SUM) = 0.2362856676 - 1.41335579 +
0.4299887092*LOG(@MOVAV(REVSER9_ENC_0,2)/@MOVAV(REVSER9_SUM_0,2)) -
0.2436841001*LOG(@MOVAV(RWNM_ENC,2)/@MOVAV(RWNM_SUM,2)) +
0.1752341442*LOG(@MOVAV(GSPR_ENC,2)/@MOVAV(GSPR_SUM,2)) -
0.003018729534*@TREND

LOG(XEMPSER9_ESC/EMPSER9_SUM) = -0.2491984242 - 1.41335579 +
0.4299887092*LOG(@MOVAV(REVSER9_ESC_0,2)/@MOVAV(REVSER9_SUM_0,2)) -
0.2436841001*LOG(@MOVAV(RWNM_ESC,2)/@MOVAV(RWNM_SUM,2)) +
0.1752341442*LOG(@MOVAV(GSPR_ESC,2)/@MOVAV(GSPR_SUM,2)) -
0.000323071724*@TREND

LOG(XEMPSER9_MATL/EMPSER9_SUM) = 0.1060415132 - 1.41335579 +
0.4299887092*LOG(@MOVAV(REVSER9_MATL_0,2)/@MOVAV(REVSER9_SUM_0,2)) -
0.2436841001*LOG(@MOVAV(RWNM_MATL,2)/@MOVAV(RWNM_SUM,2)) +
0.1752341442*LOG(@MOVAV(GSPR_MATL,2)/@MOVAV(GSPR_SUM,2)) -
0.001825163706*@TREND

LOG(XEMPSER9_MTN/EMPSER9_SUM) = -0.1701637832 - 1.41335579 +
0.4299887092*LOG(@MOVAV(REVSER9_MTN_0,2)/@MOVAV(REVSER9_SUM_0,2)) -
0.2436841001*LOG(@MOVAV(RWNM_MTN,2)/@MOVAV(RWNM_SUM,2)) +
0.1752341442*LOG(@MOVAV(GSPR_MTN,2)/@MOVAV(GSPR_SUM,2)) +
0.001459446721*@TREND

LOG(XEMPSER9_NENG/EMPSER9_SUM) = -0.1729528289 - 1.41335579 +
0.4299887092*LOG(@MOVAV(REVSER9_NENG_0,2)/@MOVAV(REVSER9_SUM_0,2)) -
0.2436841001*LOG(@MOVAV(RWNM_NENG,2)/@MOVAV(RWNM_SUM,2)) +
0.1752341442*LOG(@MOVAV(GSPR_NENG,2)/@MOVAV(GSPR_SUM,2)) -
0.003725753543*@TREND

LOG(XEMPSER9_PAC/EMPSER9_SUM) = 0.1303082441 - 1.41335579 +
0.4299887092*LOG(@MOVAV(REVSER9_PAC_0,2)/@MOVAV(REVSER9_SUM_0,2)) -
0.2436841001*LOG(@MOVAV(RWNM_PAC,2)/@MOVAV(RWNM_SUM,2)) +
0.1752341442*LOG(@MOVAV(GSPR_PAC,2)/@MOVAV(GSPR_SUM,2)) -
0.002232468167*@TREND

LOG(XEMPSER9_SATL/EMPSER9_SUM) = 0.1416786151 - 1.41335579 +
0.4299887092*LOG(@MOVAV(REVSER9_SATL_0,2)/@MOVAV(REVSER9_SUM_0,2)) -
0.2436841001*LOG(@MOVAV(RWNM_SATL,2)/@MOVAV(RWNM_SUM,2)) +
0.1752341442*LOG(@MOVAV(GSPR_SATL,2)/@MOVAV(GSPR_SUM,2)) +
0.005849234108*@TREND

LOG(XEMPSER9_WNC/EMPSER9_SUM) = -0.02530965792 - 1.41335579 +
0.4299887092*LOG(@MOVAV(REVSER9_WNC_0,2)/@MOVAV(REVSER9_SUM_0,2)) -
0.2436841001*LOG(@MOVAV(RWNM_WNC,2)/@MOVAV(RWNM_SUM,2)) +
0.1752341442*LOG(@MOVAV(GSPR_WNC,2)/@MOVAV(GSPR_SUM,2)) -
0.004675394095*@TREND

LOG(XEMPSER9_WSC/EMPSER9_SUM) = 0.003310654227 - 1.41335579 +
0.4299887092*LOG(@MOVAV(REVSER9_WSC_0,2)/@MOVAV(REVSER9_SUM_0,2)) -
0.2436841001*LOG(@MOVAV(RWNM_WSC,2)/@MOVAV(RWNM_SUM,2)) +
0.1752341442*LOG(@MOVAV(GSPR_WSC,2)/@MOVAV(GSPR_SUM,2)) -
0.0001527295149*@TREND

**SER10 - Federal Government**
LOG(XEMPSER10_ENC/EMPSER10_SUM) = -0.08282425897 - 1.100337057 +
0.5435041711*LOG(@MOVAV(REVSER10_ENC_0,2)/@MOVAV(REVSER10_SUM_0,2))

LOG(XEMPSER10_ESC/EMPSER10_SUM) = -0.1492518914 - 1.100337057 +
0.5435041711*LOG(@MOVAV(REVSER10_ESC_0,2)/@MOVAV(REVSER10_SUM_0,2))

LOG(XEMPSER10_MATL/EMPSER10_SUM) = -0.04187826395 - 1.100337057 +
0.5435041711*LOG(@MOVAV(REVSER10_MATL_0,2)/@MOVAV(REVSER10_SUM_0,2))

LOG(XEMPSER10_MTN/EMPSER10_SUM) = -0.02079194204 - 1.100337057 +
0.5435041711*LOG(@MOVAV(REVSER10_MTN_0,2)/@MOVAV(REVSER10_SUM_0,2))

LOG(XEMPSER10_NENG/EMPSER10_SUM) = -0.4604389362 - 1.100337057 +
0.5435041711*LOG(@MOVAV(REVSER10_NENG_0,2)/@MOVAV(REVSER10_SUM_0,2))

LOG(XEMPSER10_PAC/EMPSER10_SUM) = 0.1859035792 - 1.100337057 +
0.5435041711*LOG(@MOVAV(REVSER10_PAC_0,2)/@MOVAV(REVSER10_SUM_0,2))

LOG(XEMPSER10_SATL/EMPSER10_SUM) = 0.7381182741 - 1.100337057 +
0.5435041711*LOG(@MOVAV(REVSER10_SATL_0,2)/@MOVAV(REVSER10_SUM_0,2))

LOG(XEMPSER10_WNC/EMPSER10_SUM) = -0.2089964645 - 1.100337057 +
0.5435041711*LOG(@MOVAV(REVSER10_WNC_0,2)/@MOVAV(REVSER10_SUM_0,2))

LOG(XEMPSER10_WSC/EMPSER10_SUM) = 0.0401599037 - 1.100337057 +
0.5435041711*LOG(@MOVAV(REVSER10_WSC_0,2)/@MOVAV(REVSER10_SUM_0,2))

**SER11 - State and Local Government**
LOG(XEMPSER11_ENC/EMPSER11_SUM) = -0.4663383044 + 1.620744976 +
1.698639343*LOG(NP_ENC/NP_SUM) + 0.004629281695*@TREND

LOG(XEMPSER11_ESC/EMPSER11_SUM) = 0.2837073101 + 1.620744976 +
1.698639343*LOG(NP_ESC/NP_SUM) + 0.004283394147*@TREND

LOG(XEMPSER11_MATL/EMPSER11_SUM) = -0.32266591 + 1.620744976 +
1.698639343*LOG(NP_MATL/NP_SUM) + 0.001192862576*@TREND

LOG(XEMPSER11_MTN/EMPSER11_SUM) = 0.6688338963 + 1.620744976 +
1.698639343*LOG(NP_MTN/NP_SUM) - 0.01809351693*@TREND

LOG(XEMPSER11_NENG/EMPSER11_SUM) = 0.2956162047 + 1.620744976 +
1.698639343*LOG(NP_NENG/NP_SUM) + 0.006073288559*@TREND

LOG(XEMPSER11_PAC/EMPSER11_SUM) = -0.3851403359 + 1.620744976 +
1.698639343*LOG(NP_PAC/NP_SUM) + 0.001178129002*@TREND

LOG(XEMPSER11_SATL/EMPSER11_SUM) = -0.3319439663 + 1.620744976 +
1.698639343*LOG(NP_SATL/NP_SUM) - 0.006127573236*@TREND

LOG(XEMPSER11_WNC/EMPSER11_SUM) = 0.2673846279 + 1.620744976 + 1.698639343*LOG(NP_WNC/NP_SUM) + 0.006024869339*@TREND

LOG(XEMPSER11_WSC/EMPSER11_SUM) = -0.009453522397 + 1.620744976 + 1.698639343*LOG(NP_WSC/NP_SUM) - 0.0005724389581*@TREND