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

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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 EIA. 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 NEMS to the rest of the economy by providing projections of economic driver variables for use by the supply, demand, and conversion modules of NEMS. The derivation of the baseline macroeconomic forecast lays a foundation for the determination of the energy demand and supply forecast. MAM is used to present alternative macroeconomic growth cases to provide a range of uncertainty about the growth potential for the economy and its like consequences for the energy system. MAM is also able to address the macroeconomic impacts associated with changing energy market conditions, such as alternative world oil price assumptions. Outside of the AEO setting, MAM represents a system of linked modules which assess the potential impacts on the economy of changes in energy events or policy proposals specified by a non-EIA requestor. These economic impacts then feed back into NEMS for an integrated solution.

This report documents the objectives and analytical approach of the Macroeconomic Activity Module (MAM) used to develop the Annual Energy Outlook for 2005(AEO2005). It serves as a reference document providing a description of the MAM used for the AEO2005 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 MAM. These include:

- Global Insight Model of the U.S. Economy
- Global Insight Industry and Employment Models
- Energy Information Administration Regional Models

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

1. Modeling System Overview

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

- Global Insight Model of the U.S. Economy
- Global Insight Industry and Employment Models
- Energy Information Administration (EIA) Regional Models

The Global Insight Model of the U.S. Economy (Macroeconomic Model) is the same model used by Global Insight Inc. to generate the economic forecasts behind the company's monthly assessment of the U.S. economy. The Industry and Employment Models are derivatives of Global Insight's industry and employment models. The models have been tailored in order to provide the industry and employment detail required by the NEMS modeling system. The EIA Regional Models comprise the Regional Macroeconomic Model, Regional Industry and Employment Model, and the Regional Commercial Floorspace Model. The first two models were developed during 2004 for use in the preparation of the Annual Energy Outlook (AEO) 2005 and the third was reestimated.

The models are linked to provide a fully integrated approach to forecasting economic activity at the national, industry and regional levels. Global Insight's Macroeconomic Model determines the national economy's growth path and final demand mix. The Industry Model insures that supply by industry is consistent with the final demands (consumption, investment, government spending, exports and imports) generated in the Macroeconomic Model. Industry output is the key driver of employment by industry in the Employment Model. The employment forecasts also incorporate the aggregate hours per week and productivity trends established in the Macroeconomic Model, providing industry employment forecasts that are in line with the aggregate employment forecast generated in the Macroeconomic Model. National output and employment forecasts by industry, population, national income and housing activity forecasts at the national level then become key inputs to the Regional Models. The Regional Models determine the level of industry output and employment, population, incomes, and housing activity in each of nine Census regions. The sum of each of these concepts across the nine regions is constrained to sum to the national totals projected by the supporting models. Together, these models constitute the Macroeconomic Activity Module (MAM) within the National Energy Modeling System (NEMS).

Before the MAM executes its models, twenty-six energy prices and quantities are extracted from

the output of a NEMS simulation. These represent consumption of fuels and the prices paid for each fuel plus domestic production of energy commodities and constitute exogenous inputs in to the Macroeconomic Model. 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 forecasts for two energy sectors (Coal Mining and Oil & Gas Extraction) are computed using growth rates extracted from the appropriate NEMS modules. After the appropriate NEMS variables have been extracted, the three sets of models – Macroeconomic, Industry and Employment, and Regional – are run in sequence to generate a modified set of macroeconomic and sectoral outputs which flow back to NEMS. MAM and NEMS cycle until convergence is attained.

Global Insight Model of the U.S. Economy

Key Inputs: National demographics by age cohort, total factor productivity, federal tax rates and nominal expenditures, money supply, energy prices and quantities, 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 Industry Model

Key Inputs: Final demands, prices and productivity measures from the Global Insight Model of the U.S. Economy and input-output coefficient matrix.
Key Outputs: Real output value (defined by value of shipments or revenue) for 60 industrial and services sectors.

Global Insight Employment Model

Key Inputs: Industry outputs from the Industry Model, capital service cost determinants, productivity measures and total employment from the Global Insight Model of the U.S. Economy.
Key Outputs: Employment for 68 industrial and services sectors and aggregates.

Energy Information Administration Regional Macroeconomic Model

Key Inputs: National gross domestic product, wages, incomes, population, housing activity, and prices from the Global Insight Quarterly Model of the U.S. Economy. State population estimates and projections from the U.S. Bureau of the Census.
Key Outputs: Gross regional product, wages and salaries, personal income, disposable income, population, housing activity for 9 Census Divisions.

Energy Information Administration Regional Industry and Employment Model

Key Inputs: National sectoral output, prices and employment from the Industry and Employment Models. Regional gross product, disposable income, population, wages and salaries, housing activity from the Regional Macroeconomic Model.
Key Outputs: Output value and employment for 45 industrial and services sectors for 9 Census Divisions.

Energy Information Administration Regional Commercial Floorspace Model

Key Inputs: Interest rates, real disposable income per capita, consumer price indexes and population.
Key Outputs: Commercial floorspace in million square feet for 13 commercial floorspace types in each of 9 Census Divisions.

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

2. Global Insight 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 during estimation and 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; 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: The Global Insight Macroeconomic Model strives to incorporate the best insights of many theoretical approaches to the business cycle: Keynesian, neoclassical, monetarist, supply-side, and rational expectations. In addition, the Global Insight Macroeconomic Model 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 robust long-run equilibria.

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 the 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

positively responds to the perceived availability of jobs, to the after-tax wage level, and to the growth and age-sex mix of the population. Demand for labor is keyed to the level of output in the economy and the productivity of labor, capital, and energy. Because the capital stock is largely fixed 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 Reserve's 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 the Global Insight Macroeconomic Model, "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. The Global Insight Macroeconomic Model embodies supply-side hypotheses to the extent supportable by available data, and 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 goes, 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.

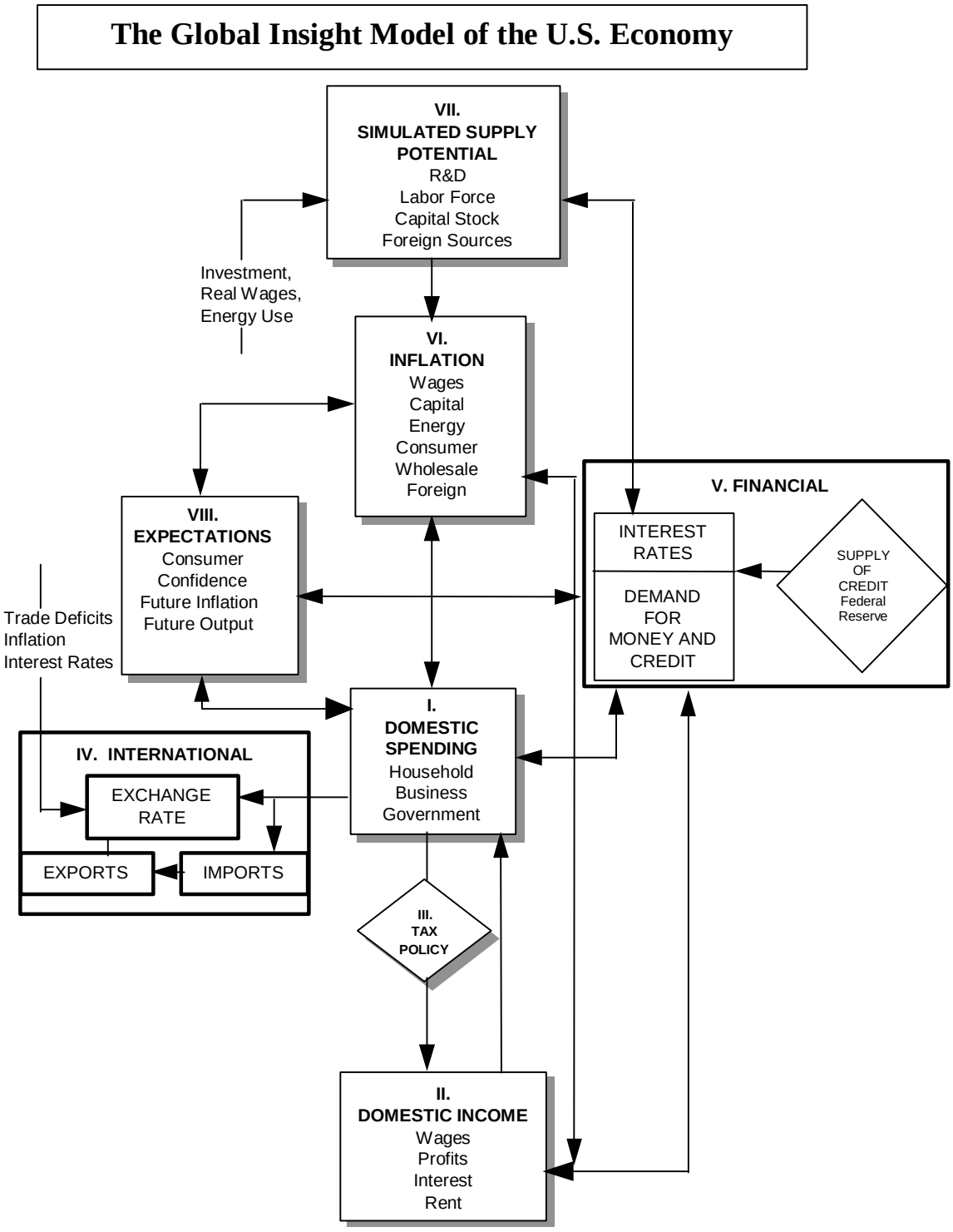
These propositions are subject to empirical evaluation. Global Insight's conclusions are that expectations do play a significant role in private sector spending and investment decisions; but, until change has occurred in the economy, there is very little room for significant changes in expectations in 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.

The Global Insight Macroeconomic Model 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 the Global Insight Macroeconomic Model 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, the Global Insight 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

The Global Insight Macroeconomic Model captures the full simultaneity of the U.S. economy, forecasting over 1600 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 nondurable 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 user price of a particular category relative to the prices of other consumer goods. Durable and semidurable 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 (non-utility, non-mining) structures 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 and decumulation during downturns. The forces that drive the five nonfarm 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 drawdown of

stocks and then a rebuilding process over the next year; 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 often the key to that of the subsequent macroeconomic cycle. The housing sector of the Global Insight Macroeconomic Model explains new construction as a decision primarily based on 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 the changes in the propensity for specific age-sex groups to form independent households, the resulting “headship rates" were multiplied by corresponding population statistics to estimate the trend expansion of single- and multi-family households. The housing equations were 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 nondefense 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 Macroeconomic 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 services category are separately modeled 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 so 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 a dollar depreciation, 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 instruction. 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 the Global Insight Macroeconomic Model, 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 the Global Insight Macroeconomic Model, including full interaction among real demands, inflation and financial

conditions, confirms that the model has moved toward central positions 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, nonfarm 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 80-85%, 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 the Global Insight Macroeconomic Model; indeed, substantial emphasis on this side of the economy (VII) was incorporated as early as 1976. In the Global Insight Macroeconomic Model, aggregate supply (or potential GDP excluding the energy sector) 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. Total factor productivity depends upon the stock of research and development capital and trend technological change.

Taxation and other government policies influences labor supply and all investment decisions, thereby linking tax changes to changes in potential GDP. An expansion of potential first reduces prices and then credit costs, and thus spurs demand. Demand rises until it equilibrates with the potential output. Thus, 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 Macroeconomic Model 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 the Global Insight Macroeconomic Model, but the principal 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 Industry and Employment Models

Industry Model Overview

The Industry Model is a combination input–output/stochastic model of activity for 60 industries and service sectors in the U.S. The model forecasts real value of shipments, or revenue, as a measure of output for each sector. The output level generated in the Industry Model reflects a level of domestic production that is consistent with the final demands generated in the Global Insight Macroeconomic Model. Table A11 identifies the final demand categories driving the Industry Model. Table A12 identifies the concept coverage of the model and the industry coverage of the model.

In the Annual Energy Outlook 2005, the sectoral classification of the value of output was changed from the Standard Industrial Classification (SIC) to the North American Industry Classification System (NAICS), and all historical series have been revised. The industry details follow the manufacturing industries reported by the Department of Commerce in its monthly Shipments, Inventories and Orders release, mostly three or four-digit NAICS aggregations with some dissaggregations beyond four digits. The nonmanufacturing industries and the service sectors are two, three or four-digit NAICS aggregations.

The input–output block of the model translates macroeconomic forecasts from the Global Insight Macroeconomic Model 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 real final expenditure components of GDP

A fixed bridge matrix, constructed from the 1992 input−output tables, 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 industry output
X = vector of gross output by industry

This equation can be considered an equilibrium condition that 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 1996 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 Shipments, Inventories and Orders release, which are then converted to annual rates. Constant−dollar historical values are the current−dollar series deflated using each industry's industry price index. They are computed outside the model by Global Insight's U.S. Industry Service which produces short-term industry forecasts.

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 in 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 selected industries to explicitly capture the industry-specific effect of changes in producer prices.

The additional, nondemand terms are included in the equation to explain the patterns not well accounted for by the input–output model and its demand indicators — cyclicality and technological change.

1. Macroeconomic variables feed down into the industry 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 farther 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 simple 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 1996 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 has resulted 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 Nonmanufacturing Industries/Services

For nonmanufacturing industries and services sectors, revenue is the main activity indicator available, and historical data are derived from a number of different sources. The common criterion for the data, however, is that conceptually it should be as close as possible to the measure of value of production for the manufacturing industries ― it always measures total gross output, rather than value added ― and the current−dollar measure is roughly equivalent to revenue.

Forecasts of nonmanufacturing 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 ind
D{ind}R = total input−output demand, industry ind
Trend = time trend variable

Aggregation to NEMS Sectors

The sectoral classification in the Macroeconomic Activity Module of the National Energy Modeling System (NEMS) is more aggregate than the Global Insight classification. It comprises 35 industrial sectors and 10 service sectors. Of the 35 industrial sectors, 29 are manufacturing sectors and 6 are nonmanufacturing industrial sectors. Five of the sectors are energy sectors. For these sectors, production forecasts are available from other NEMS modules and their forecast growth rates are applied to the historical data in place of the Global Insight forecasts.

One of the main users of the output values is the NEMS Industrial Demand Module. In that module, the 35 industries are further aggregated into 19 categories. Below is a list of the 45 sectors maintained in the Macroeconomic Activity Module and the corresponding Industrial Demand categories. The concordance between the Global Insight codes and the 45 sectors is presented in Table A12.

NEMS Macroeconomic Activity Module	NEMS Industrial Demand Module
Manufacturing Industries:	
Food Products	Food Products
Beverage and Tobacco Products	Balance of Manufacturing
Textile Mills & Textile Products	Balance of Manufacturing
Apparel	Balance of Manufacturing
Wood Products	Balance of Manufacturing
Furniture and Related Products	Balance of Manufacturing
Paper Products	Paper and Allied Products
Printing	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	Balance of Manufacturing
Petroleum Refineries *	Petroleum Refining
Other Petroleum and Coal Products	Balance of Manufacturing
Plastics and Rubber Products	Balance of Manufacturing
Leather and Allied Products	Balance of Manufacturing
Glass & Glass Products	Glass and Glass Products
Cement Manufacturing	Cement
Other Nonmetallic Mineral Products	Balance of Manufacturing
Iron & Steel Mills, Ferroalloy & Steel Products	Iron and Steel
Alumina & Aluminum Products	Aluminum
Other Primary Metals	Balance of Manufacturing
Fabricated Metal Products	Metal-Based Durables
Machinery	Metal-Based Durables
Other Electronic & Electric Products	Metal-Based Durables
Transportation Equipment	Metal-Based Durables
Measuring & Control Instruments	Metal-Based Durables
Miscellaneous Manufacturing	Balance of Manufacturing
Nonmanufacturing 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 Nonmetallic Mining
Construction	Construction

NEMS Macroeconomic Activity Module

Services:

Transportation & Warehousing
Broadcasting & Telecommunications
Electric Power Generation & Distribution *
Natural Gas Distribution *
Water, Sewage & Related System
Wholesale Trade
Retail Trade
Finance & Insurance, Real Estate
Other Services
Public Administration

* Energy Sectors

Employment Model Overview

The Employment Model determines employment in 59 industries and service sectors in the U.S. (see Table A12), consistent with the forecast of nonfarm employment (EEA) from the Macroeconomic Model. Industry output, relative factor prices, and productivity and average workweek trends are the key determinates of industry employment. Real outputs in the industries are from the Industry 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 equation (EMF) and unconstrained employment (XXX_E{ind}) 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 industry output. Both current and lagged output values enter in the employment specification, reflecting the tendency for hiring to lag output growth and layoffs to lag 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 increases in manufacturing capacity utilization rates, as both factors cause the industries to increase their utilization of existing laborers.

Total Nonfarm, Private Nonfarm, and Government Employment

Projections for total nonfarm (EEA) and government federal and state and local employment (EG91 and EGSL) are established in the Macroeconomic Model. Private nonfarm employment (EEAPIO) is determined by subtracting government employment from total nonfarm 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 1996 dollars for all industries except two (see Chapter 3).

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

Or alternatively,

dlog(EMF) =
A + (1 – B2) * dlog(Mfg Output) + B2 * dlog(@movag(Mfg Output(-1), 3))
+ (1 – B1) * dlog(Mfg Productivity)
+ B1 * dlog(@movag(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))
(@movag(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(@movag(Labor Productivity, lags) / Labor Productivity)
+ B2 * dlog(@movag(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 nondurable manufacturing industries
JQPCMHMD(N)	= index for output per hour in durable (nondurable) manufacturing
HPMD(N)	= average weekly hours in durable (nondurable) manufacturing
Relative factor prices	= Ratio of labor compensation in nonfarm 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))
(@movag(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 3 percent of EMF, indicating that the alignment process does not distort the forecast results in any significant way.

Nonmanufacturing Employment

Employment in each nonmanufacturing industry or service sector is modeled in a two-step process similar to that for manufacturing industry employment. That is, unconstrained nonmanufacturing employment (XXX_E{ind}) is modeled as a function of current and lagged output, nonfarm 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(@movag(Labor Productivity, lags) / Labor Productivity)
+ B2 * dlog(@movag(R{ind}R, lags) / R{ind}R)
+ B3 * dlog(Relative factor prices)
+ B4 * dlog(Cyclical variable)

where:

XXX_E{ind}	= employment of sector ind
R{ind}R	= real dollar value of output of sector ind
Labor Productivity	= labor productivity = JQPCMHNF * HRNFPRI in general or JQPCMHM * HPMF for industries producing inputs for manufacturing industries

JQPCMHNF = index for output per hour in nonfarm business
HRNFPRI = average weekly hours in nonfarm business
JQPCMHM = index for output per hour in manufacturing
HPMF = average weekly hours in manufacturing
Relative factor prices = Ratio of labor compensation in nonfarm business and relevant producer prices or energy prices (for energy-intensive industries)

Unconstrained private nonfarm employment (XXX_EEAPIO) is defined by summing unconstrained nonmanufacturing employment by sector and total manufacturing employment.

The difference between total private nonfarm employment and this unconstrained total (XXX_EEAPIO) is defined as EEAPRESID. Employment in each nonmanufacturing 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 2 percent of EEAPIO, indicating that raw results from the Employment Model match fairly well with the aggregated employment forecast from the Macroeconomic Model.

Total nonfarm employment within the employment model (EEAIO) is defined as the sum of all employment other than agricultural employment. EEAIO should match the level of nonfarm 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 NEMS Sectors

As in the case of industry output, employment forecasts are also aggregated into the NEMS categories. The classification for employment is the same as that for output (see Page xxx), 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 Oil and Gas Extraction are available from other NEMS Modules. Their forecast growth rates are applied to the historical data in place of the Global Insight forecasts.

4. Energy Information Administration Regional Models

Overview

Economic variables beyond the national level are required in the NEMS demand modules. The level of regional details 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 was developed to provide the following concepts for each of the nine Census Divisions (regions):

a. Macroeconomic variables – population, economic activities, prices and wages
b. Industry variables – output and employment by sector
c. Building variables – residential housing starts and commercial floorspace area

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 results based on 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 the 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:

d. Population
e. Population Aged 16 and Over
f. Real Gross State Product
g. Real Personal Disposable Income
h. Personal Income Tax
i. Personal Income Tax Rate
j. Personal Income
k. Wage and Salary Disbursements
l. Manufacturing and Nonmanufacturing Wages
m. 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, is a quarterly model with historical data beginning as early as 1970. It uses inputs from the US Macroeconomic model and supplies outputs to the Regional Industrial Output and Employment model as well as the Commercial Floorspace model.

Population

Forecasts of the population series are exogenous to NEMS. Recent historical state population data by age group are available from the U.S. Census Bureau (http://www.census.gov/popest/datasets.html), and earlier time series of state population consistent with the 2000 Census are computed by the U.S. Bureau of Economic Analysis (http://www.bea.gov/bea/regional/spi/). As for forecasts, national population projections in the U.S. Macroeconomic model are based on the interim projections published by the U.S. Census Bureau in April 2004 (http://www.census.gov/ipc/www/usinterimproj/usproj2000-2050.xls). However, state population projections consistent with the 2000 Census were not available when the Annual Energy Outlook 2005 was prepared. To forecast state population, the existing version of state population projections by age group for 2000, 2005, 2015 and 2025, released by the U.S. Census Bureau in 1996 and based on the 1990 Census, is used (http://www.census.gov/population/projections/state/stpjpop.txt and http://www.census.gov/population/projections/state/stpjage.txt, series A).

Since the old projections are quite outdated, a methodology is developed to reduce the inconsistencies between the old projections and the new Census data:

1. Assuming that the near term trend will continue, the state population for 2004 and 2005 is assumed to grow at the same rate as the compound annual growth rate for 2000-2003.

2. The compound annual growth rate for 2005-2015 is used to approximate the annual growth rates for 2006 through 2015, and that for 2015-2025 is used to approximate the annual growth rates for 2016 through 2025, at the state level. The 2006 growth rate is compared with the compound annual growth rate of 2000-2005. If the difference is greater than 0.2 percent point, then half of the difference is added to or subtracted from the projected growth rates.

3. The adjusted projected growth rates are then "smoothed" over the forecast period to remove erratic movements without changing the overall compound annual growth rate.

4. For California, projected growth rates are based on projections released by California's Department of Finance.

The state population forecasts are computed by applying the adjusted projected growth rates to the historical series. The forecasts are then adjusted so that the sum aligned to the national series. Finally, they are aggregated to the nine Census Divisions.

Population Aged 16 and Over

Historical series of Population Aged 16 and Over (NP16A) by state were computed from the state population by age group data published by the U.S. Census Bureau. Since the data before 2000 were based on earlier Census, they are scaled so that their sum aligns with the national series, which is consistent with the 2000 Census data. This implicitly assumes that the share of population aged 16 and over remains unchanged when the total population data is revised.

The state projection database downloaded from the U.S. Census Bureau has a different age categorization. Instead of population aged 16 and over, the share of population aged 18 and over (NP18A) is computed for each state. (Detailed data by state by age by year are also available, but the cost of processing overweighs the usefulness of the data.)

Since the state population forecasts have been revised, forecasts of NP18A are compiled by multiplying the old NP18A shares to the new state population forecasts. Assuming that NP16A grows at the same rate as NP18A, forecasts of NP16A are computed by applying the NP18A growth rates onto the historical series of NP16A. They are then adjusted to align to the national series from the U.S. Macroeconomic model and aggregated to the nine Census Divisions.

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:

$$\log(GSPR_i/NP_i) = a_i + \sum b1_{ik} * \log(GSPR_i(-k)/NP_i(-k)) + \sum b2_{ik} * \log(GDPR(-k)/NP(-k))$$

where:

i	= 1 to 9 Census Divisions
(-k)	= time lag of k quarters, where k=1,2,…,n
a_i	= estimated constant for gross state product in Census Division i equation
$b1_i$, etc.	= estimated coefficients for the explanatory variables in the equation for gross state product, Census Division i
GDPR	= real gross domestic product, billions of 2000 dollars, US
$GSPR_i$	= real gross state product, billions of 1996 dollars, Census Division i
NP	= total population including armed forces overseas, millions of persons, US
NP_i	= total regional population including armed forces overseas, millions of persons, Census Division i

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 1996 dollars for all Census Division regions. Quadratic-match average is the method used in EViews to convert the frequency to quarterly from annual. Real gross domestic product data comes from Global Insight's US macroeconomic model. 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. The regional population time series were extended back until the start of 1972 using historical data from Global Insight's Regional workfile[1]. The national total population comes from Global Insight's US macroeconomic model. Its source is also the Census Bureau. Historical, US total population is at a quarterly interval beginning in 1959.

Income and Taxes

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

$$YPDR_i = b1_i * \exp(\log(YPDR/NP) - \log(YPDR(-1)/NP(-1)) + \log(YPDR_i(-1)/NP_i(-1))) * NP_i$$

where:

i	= 1 to 9 Census Divisions

1 REG_0103 workfile; S&P/DRI Data Services; bank: ris/forecast/lt

$b1_i$ = estimated coefficient for the explanatory variable in the equation for disposable income in Census Division i
NP = total population including armed forces overseas, millions of persons, US
NP_i = total regional population including armed forces overseas, millions of persons, Census Division i
YPDR = real disposable income, billions of 2000 dollars, US
$YPDR_i$ = real disposable income, billions of 1996 dollars, Census Division i

Historical regional real disposable income data comes from Global Insight's Regional workfile. The historical disposable income data is at a quarterly frequency beginning in 1970 and is measured in billions of 1996 dollars for all Census Divisions. National real disposable income data comes from Global Insight's US Macroeconomic model. Historical disposable income is at a quarterly interval beginning in 1959 and is measured in billions of chained 2000 dollars. Global Insight's source for disposable 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 Global Insight's Regional workfile. The national total population comes from Global Insight's US Macroeconomic model. Its source is also the Census Bureau. Historical US total population is at a quarterly interval beginning in 1959.

Regional personal income is in nominal terms. There is an identity for each of the nine Census Divisions. Real disposable income forecasted from the above equation is inflated using the price index for consumer purchases. Personal income tax is then added to nominal disposable income. The equations for personal income are:

$TAX = YP - YPD$
$TAXRATE = TAX / YP$
$YP_i = YPDR_i * JPC_REL_i * JPC / (1 - (TAXRATE_REL_i * TAXRATE))$

where:
i = 1 to 9 Census Divisions
JPC = consumption deflator, index – 2000=100, US
JPC_REL_i = regional consumption deflator relative to national, 2003:4 value, Census Division i
TAX = personal income tax, billions of dollars, US
TAXRATE = personal income tax rate, percent, US
$TAXRATE_REL_i$ = regional personal income tax rate relative to national, 2003:4 value, Census Division i
YP = personal income, billions of dollars, US
YP_i = personal income, billions of dollars, Census Division i
YPD = disposable income, billions of dollars, US

$YPDR_i$ = real disposable income, billions of 1996 dollars, Census Division i

National personal income tax is the difference between personal and disposable income. The source for national personal and disposable incomes is Global Insight's US Macroeconomic model. 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. For each Census Division, a regional tax rate relative to the national rate is computed. The 2003:4 value is the constant used to compute a regional tax rate time series over the forecast horizon given the national rate. The historical regional tax rate is computed using Census Division personal and disposable incomes from Global Insight's Regional workfile. The historical data is at a quarterly frequency beginning in 1970 and is measured in billions of dollars for all Census Divisions. A regional consumption deflator is computed for each Census Division in much the same way as the tax rate so as to inflate real disposable income. For each Census Division, a regional consumption deflator relative to the national deflator is computed. The 2003:4 value is the constant used to compute a regional consumption deflator time series over the forecast horizon given the national series. The historical regional consumption deflator is computed using Census Division level nominal and real disposable incomes from Global Insight's Regional workfile. The historical data is at a quarterly frequency beginning in 1970. The nominal series is measured in billions of dollars for all Census Divisions. The real series is in billions of 1996 dollars.

Wage and Salary Disbursements

Regional wage and salary disbursements are a share of personal income in nominal per capita terms. There is an estimated equation for each of the nine Census Divisions. Explanatory variables include lags of own regional disbursements and of national disbursements as a share of personal income. The general form of the wage and salary disbursements equations is:

$$YPCOMPWSD_i/YP_i/NP_i = a_i + \sum b1_{ik} * YPCOMPWSD_i(-k)/YP_i(-k)/NP_i(-k) + \sum b2_{ik} * YPCOMPWSD(-k)/YP(-k)/NP(-k)$$

where:

i	= 1 to 9 Census Divisions
(-k)	= time lag of k quarters, where k=1,2,…,n
a_i	= estimated constant for wage and salary disbursements in Census Division i equation
$b1_i$, etc.	= estimated coefficients for the explanatory variables in the equation for wage and salary disbursements in Census Division i
NP	= total population including armed forces overseas, millions of persons, US
NP_i	= total regional population including armed forces overseas, millions of persons, Census Division i
YP	= personal income, billions of dollars, US

YP_i = personal income, billions of dollars, Census Division i
YPCOMPWSD = wage and salary disbursements, billions of dollars, US
$YPCOMPWSD_i$ = wage and salary disbursements, billions of dollars, Census Division i

Historical regional wage and salary disbursements data comes from Global Insight's Regional workfile. 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 US Macroeconomic model. Historical disbursements data is at a quarterly interval beginning in 1959 and is measured in billions of dollars. Global Insight's source for disposable income is the Bureau of Economic Analysis. Historical regional personal income data comes from Global Insight's Regional workfile. The historical income data is at a quarterly frequency beginning in 1970 and is measured in billions of dollars for all Census Divisions. National personal income data comes from Global Insight's US Macroeconomic model. Historical income data is at a quarterly interval beginning in 1959 and is measured in billions of dollars. Global Insight's source for personal 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 Global Insight's Regional workfile. The national total population comes from Global Insight's US Macroeconomic model. Its source is also the Census Bureau. Historical US total population is at a quarterly interval beginning in 1959.

Manufacturing and Nonmanufacturing 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. Explanatory variables include lags of own wages and an index of total compensation in nonfarm business. The general form of the average annual manufacturing wages equations is:

$$\log(RWM_i) = a_i + \sum b1_{ik} * \log(RWM_i(-k)) + \sum b2_{ik} * \log(JWSSNF(-k)) + b3_i * TIME$$

where:
i = 1 to 9 Census Divisions
(-k) = time lag of k quarters, where k=1,2,…,n
a_i = estimated constant for average annual manufacturing wages in Census Division i equation
$b1_i$, etc. = estimated coefficients for the explanatory variables in the equation for average annual manufacturing wages in Census Division i
JWSSNF = total compensation in nonfarm business, index 1992=1.0, US
RWM_i = average annual manufacturing wages, thousands of dollars, Census Division i
TIME = time trend, 1947:1 = 1

Historical regional average annual manufacturing wage data comes from Global Insight's Regional workfile. 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 nonfarm business comes from Global Insight's US Macroeconomic model. The historical total compensation is at a quarterly interval beginning in 1959 and is an index with 1992 = 1.0. Global Insight's source for disposable income is the Bureau of Labor Statistics.

Regional average annual nonmanufacturing wages are in nominal 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 wages and an index of total compensation in nonfarm business. The general form of the average annual nonmanufacturing wages equations is:

$$\log(RWNM_i) = a_i + \sum b1_{ik} * \log(RWNM_i(-k)) + \sum b2_{ik} * \log(JWSSNF(-k)) + b3_i * TIME$$

where:

i	= 1 to 9 Census Divisions
(-k)	= time lag of k quarters, where k=1,2,…,n
a_i	= estimated constant for average annual nonmanufacturing wages in Census Division i equation
$b1_i$, etc.	= estimated coefficients for the explanatory variables in the equation for average annual nonmanufacturing wages in Census Division i
JWSSNF	= total compensation in nonfarm business, index 1992=1.0, US
$RWNM_i$	= average annual nonmanufacturing wages, thousands of dollars, Census Division i
TIME	= time trend, 1947:1 = 1

Historical regional average annual nonmanufacturing wage data comes from Global Insight's Regional workfile. 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 nonfarm business comes from Global Insight's US Macroeconomic model. The historical total compensation is at a quarterly interval beginning in 1959 and is an index with 1992 = 1.0. Global Insight's source for disposable income is the Bureau of Labor Statistics.

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. The equation for 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, US
CPI_i	= consumer price index, all urban, 1982-84=1.0, Census Division i
$CPIZ_i$	= regional consumer price index relative to national, 2003:4 value, Census Division i

For each Census Division, a regional consumer price index relative to the national index is computed. The 2003:4 value of this series is the constant used to compute a regional consumer price index over the forecast horizon given the national index. The historical source for the regional and national consumer price indices used to compute the constants is Global Insight's Regional workfile. The historical data is at a quarterly frequency beginning in 1970 and equals 1 in the first quarter of 1980 for all Census Divisions. The source for the national consumer price index is Global Insight's US Macroeconomic model. The historical index is at a quarterly interval beginning in 1959, and the average of the index from 1982 to 1984 is 1. 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 value of output and employment for 35 industrial sectors and 10 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 nonmanufacturing and service sectors, gross state product and employment data from the U.S. Bureau of Economic Analysis (http://www.bea.gov/bea/regional/data.htm) 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 1996 dollars as in the national industry model) requires sectoral price information at the region level, which are not available to EIA. A second-best solution was used to compute the real value series using the nominal regional shares:

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

for sector i, region r

This implicitly assumes that the producer price indexes for the regions are the same as that for the national for 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 regions 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 variable to national), national macroeconomic variables and time trend. The general structural form is:

$$\log(\text{Output}_r/\text{Output}_{US}) = a_r + \sum b_j * \log(X_{jr}/X_{jUS}) + \sum_k b_{kr} * \log(X_k) \text{ or } X_k$$

where:
r = region (9 Census Divisions)
j = 1, 2, …
k = 1, 2, …
X_{jr} = pooled explanatory variable j for region r (or 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:

- Real Gross State Product (GSP) shares
- Ratios of regional real GSP per capita or real disposable income per capita over national
- Ratios of regional annual wages over national average (manufacturing or non-manufacturing/services)
- Population shares
- Housing start shares
- National energy price indexes
- 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 region, but in total they all have a substantial impact on a region's production activities.

Understandably, the forecast regional series computed from the estimated equations would not add up to the national total. An alignment procedure is used to scale the preliminary forecasts so that the sum of the regions for each sector 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 2 percent, eleven have factors between 2 to 5 percent, and one has adjustment factors between 5 to 10 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 region r or for US
a_r = constant term for region r
b_j = coefficients for the pooled explanatory variable j
b_{Tr} = coefficient for time trend for region r

Explanatory variables used in the employment equations include:

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

The main explanatory variable is 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 six 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 1 (within 5 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 2 percent. The three sectors have adjustment factors under 3 percent.

Building Variables

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

Housing Starts:

- Single Family Housing Starts
- Multi-Family Housing Starts
- 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 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 US Macroeconomic model. 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 US and EIA's Regional Macroeconomic models is 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 submodule of MAM contains 140 equations of which 117 equations (13 commercial floorspace types in each of 9 Census Divisions) are estimated using historical data beginning in the Seventies. The remaining twenty-three equations are identities that aggregate floorspace by Division (9 Divisions), across region by floorspace type (13 types) and across all regions for a national total. The submodule forecasts thirteen floorspace types in each of the nine Census Divisions. The model forecasts thousand square feet of commercial floorspace at a quarterly interval. Since commercial floorspace is a stock measure, the fourth quarter solution is provided to the NEMS common block as the reported annual floorspace forecast.

The endogenous variable is commercial floorspace in thousand square feet per capita by type. The floorspace equations are in log form. The explanatory variables include lags of own floorspace, regional floorspace, an interest rate, income, population and the time trend. The general form of the estimated commercial floorspace equations is:

$$\log(Commflrsp_{ij}/NP_i) = a_{ij} + b1_{ij} * Trend + \sum b2_{ijk} * \log(Commflrsp_{ij}/NP_i) + \sum b3_{ijk} * \log(Commflrsp_i/NP) + \sum b4_{ijk} * R1RMCORP_i(-k) + \sum b5_{ijk} * \log(PYPDR_i(-k)) + \sum b6_{ijk} * NP_i(-k)$$

$$Commflrsp_i = \sum_j Commflrsp_{ij}$$

where:

i	= 1 to 9 Census Divisions
j	= 1 to 13 commercial floorspace types
(-k)	= time lag of k quarters, where k=1,2,…,n
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
$Commflrsp_i$	= aggregate commercial floorspace, thousand square feet, Census Division i
$Commflrsp_{ij}$	= commercial floorspace j, thousand square feet, Census Division i
NP_i	= total regional population including armed forces overseas, millions of persons, Census Division i
$PYPDR_i$	= real disposable income on a per capita basis, billions of 2000 dollars, Census Division i
$R1RMCORP_i$	= average of yield on Aaa and Baa-rated corporate bonds adjusted for regional inflation, percent, Census Division i
Trend	= time trend

Part B
MAM INTERFACE WITH NEMS

5. Integrated Simulations Using 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 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. The Global Insight Macroeconomic Model of the U.S. Economy (Macroeconomic Model) provides forecasts of over 1600 concepts spanning final demands, aggregate supply, prices, incomes, international trade, industrial detail, interest rates and financial flows. The Industry Model takes the final demand projections from the Macroeconomic Model as inputs to provide projections of output and other key indicators for 60 sectors, covering the entire economy, at the three and sometimes four-digit SIC code levels. The Employment Model takes the industry output projections from the Industry Model and national wage rates, productivity trends and average workweek trends from the Macroeconomic Model to project employment in 59 industries. The sum of nonfarm employment is constrained to sum to the national total projected by the Macroeconomic 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 13 types of use by Census Division.

Integrated Simulations of Alternative Energy Conditions or Events

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

- Baseline Projection
- Alternative World Oil Prices
- Changes in or proposed Energy Fees or Emissions Permits

In these integrated NEMS simulations, forecast period baseline values for over 240 macroeconomic and demographic variables from MAM are passed to NEMS which takes these values and, after making the requisite changes as required by the simulation, solves for demand, supply and prices of energy for the forecast period. These energy prices and quantities are passed back to MAM and a new simulation, Scenario 1, is solved in the Macroeconomic Model,

the Industry Model, the Employment Model,the Regional Model, and the Commercial Floorspace Model. Details of each type of integrated simulation are discussed below.

Baseline Projection: In the Macroeconomic Model, the Global Insight baseline forecast is copied to Scenario 1. In this scenario the world oil price variable (POILIMP) is made exogenous and is set equal to the forecast from NEMS. The two nominal exchange rates are also made exogenous and are held at baseline values. The macroeconomic model is then solved. The solved values of the required macroeconomic variables are passed to the Industry Model which solves Scenario 1. The solved values of the variables from the Macroeconomic and Industry Models that are required by the Employment Model are then passed to the Employment Model which then solves Scenario 1. Regional detail is derived using shares derived from the Regional Model. The Commercial Floorspace Model derives the forecasts of floorspace by region by type. After the models are aligned in Scenario 1 the solved values of all the models that are required by NEMS are passed to NEMS. After NEMS is solved the changes in energy prices and quantities relative to their baseline values in NEMS are passed to MAM which re-solves Scenario 1 based on these changes. The final solution values for all the macroeconomic and demographic variables constitute the macroeconomic reference case which is reported in the Annual Energy Outlook.

Alternative World Oil Prices: Crude oil prices are determined largely by the international market and production in OPEC and non-OPEC nations. Two simulations are normally performed in conjunction with the baseline 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 for OPEC production. For each of these cases, MAM starts from the baseline case, as explained above, and passes the values of the required macro variables to NEMS. NEMS reacts to the alternative world oil prices. The energy variables are passed back to MAM which then solves for Scenario 1 in all its component models.

Changes in or Proposed Energy Taxes or Emission Permits: This class of simulations levies some kind of tax on the energy sector. It could be a unit tax (x-cents per gallon) or ad-valorem (x% of revenues). It could be a tax on a fuel by type or emissions by type. Since taxes are levied on an industry, prices are expected to rise proportionately 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 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.

The grandfathered case is easiest to implement since the revenues stay in the business sector. Here, as in all simulations, baseline values for macroeconomic and demographic variables are passed to NEMS. With increases in or introduction of new energy taxes, energy prices rise and

quantities fall in NEMS. These changes, relative to their baseline values, are passed to MAM . The increase in federal revenues due to energy taxes are also passed to MAM. In this case the business sector retains tax revenues, either fully or to the extent that the full-employment federal NIPA budget surplus (NETSAVGFFE) stays at baseline. In the former case, no change is required. In the latter case, Federal excise tax accruals other than for a value added tax (TXIMGFOTH) are adjusted through a target search procedure where the add factor associated with it (TXIMGFOTH_A) is solved so that NETSAVGFFE stays at baseline. After TXIMGFOTH_A has been determined Scenario 1 is solved.

In the case where revenues are returned to the consumers, either fully or to the extent that the federal government full employment budget surplus is kept at baseline, 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 excise tax, or determined in a target search procedure so that the full-employment federal NIPA budget surplus (NETSAVGFFE) stays at baseline. 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 the consumers in the form of a lump sum. Sometimes the simulation may call for a reduction in personal income tax rates (RTXPGF) to achieve the same objective. In that case the add factor associated with the personal average income tax rate (RTXPGF_A) is target searched. After TXIMGFOTH_A and TXPGF_A (or RTXPGF_A) have been determined Scenario 1 is solved in MAM.

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 or by a target-searched amount that keeps NETSAVGFFE at baseline. After these values have been determined Scenario 1 is rerun. In case the personal income tax rates are being reduced, RTXPGF_A is target searched instead of TXPGF_A.

Model Levers and Simulation Rules

In order to generate long-term alternatives and to assess alternative scenarios Global Insight provides a series of levers and simulation tools in the 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 MAM.

Energy Prices and Quantities: The projected values for energy prices and quantities appearing in the Global Insight Macroeconomic Model are taken from NEMS and thus these variables are considered to be exogenous inputs to the Macroeconomic Model. Similarly, movements in outputs of 5 energy industries and in two employment sectors are determined by NEMS. The

projected movements in the following energy variables appearing in the Macroeconomic Model are determined in 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

The projected movements in the following industries' outputs, appearing in the Industry Model, are endogenous to the Global Insight Industry Model. These values are overwritten based on the growth in activity in these sectors as determined in NEMS:

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

The projected employment in the following sectors are endogenous to the Global Insight Employment Model. These values are overwritten based on the growth in employment as determined in NEMS:

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

Fiscal Policy Assumptions: Unless mentioned, 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. As mentioned above, 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 the Global Insight Macroeconomic Model, both the RMFFRES equation and the RMFFRCT equation yield the same federal funds rate forecast, so that 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: Global Insight default values are generally used, with exceptions 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 model lever RMGBLMTPLEV is set to 0. When RMGBLMTPLEV is set to 1, however, this rate increases or decreases relative to baseline levels with the percentage point changes in the 10-year U.S. treasury notes. The default value for this lever is 0 for the forecast period.

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, prices of our major trading partners are largely exogenous assumptions in the model. At times, policy or shock 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 to allow movements in the foreign prices relative to baseline levels

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 in 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.

2. Exchange Rates. There are two nominal exchange rates in the Global Insight Macroeconomic Model. These are JEXCHMTP and JEXCHOITP and are defined as trade-weighted exchange rates (in U.S. $) for industrialized countries and developing countries, respectively. In MAM, these variables are set exogenously to their baseline projected values in 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). Both of these are exogenous in the Macroeconomic Models and reflect Global Insight's international forecasts.

Flowcharts of MAM

The following seven flowcharts show the flow of information from NEMS to MAM and how the flows of energy and economic information are passed among the components of MAM. This set of flowcharts identifies the tasks performed by each of the MAM Submodules 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 called.

Figure 1 summarizes the entire NEMS-MAM integrated system. The remaining six figures focus the various forecasting models contained in the Macroeconomic, Industry, and Regional submodules of MAM. In each model, a set of baseline economic forecasts using the structural models described in Part A was created and linked to NEMS to initialize the system.

MAM is best described as a feedback system that modifies the baseline given changes in energy events or policies. This applies to all NEMS runs including the Reference Case 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. These alternative NEMS series are turned into indexes (with 2004 value equals 1) or growth rates, and are applied to the 2004 value of the baseline series to create new energy forecasts. These new series are put into the model as predetermined variables and a new scenario is run.

Models in MAM are run serially. The Macroeconomic Model is the first to run with the new energy concepts, followed by the Industry and Employment Models, and the Regional Models. The forecasts for each model run are put into a database and are used as predetermined variables for other MAM models. There is no feedback loop within MAM. That is, the forecasts of an upstream model are not affected by the results of a downstream model in the same NEMS cycle. When one cycle of MAM run is completed, the forecasts are passed to other NEMS modules. Energy forecasts from NEMS are passed back to MAM if NEMS determines that another cycle needs to be run.

Figure 1. Macroeconomic Activity Module Flow

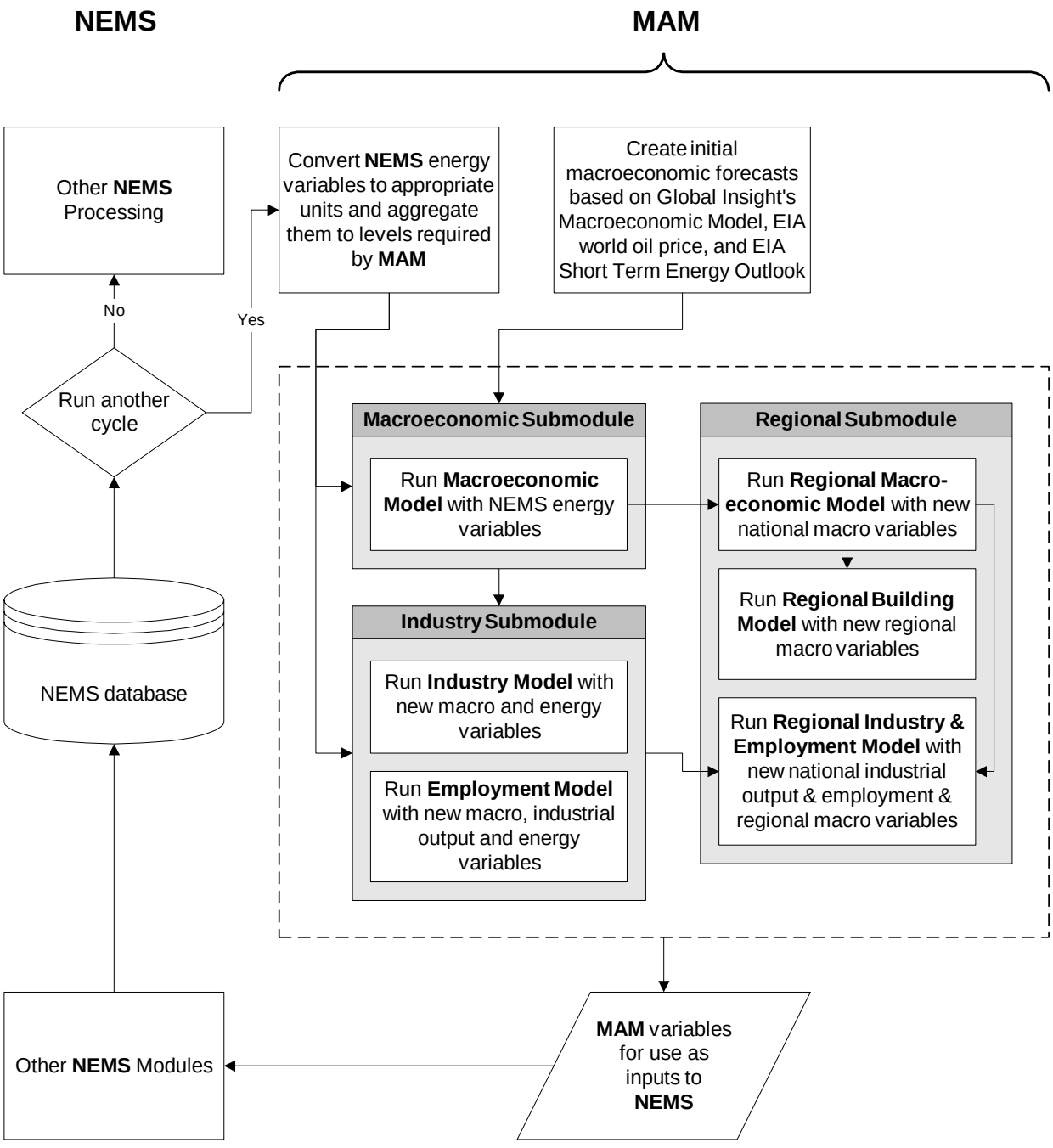


Figure 2. Macroeconomic Submodule Flow

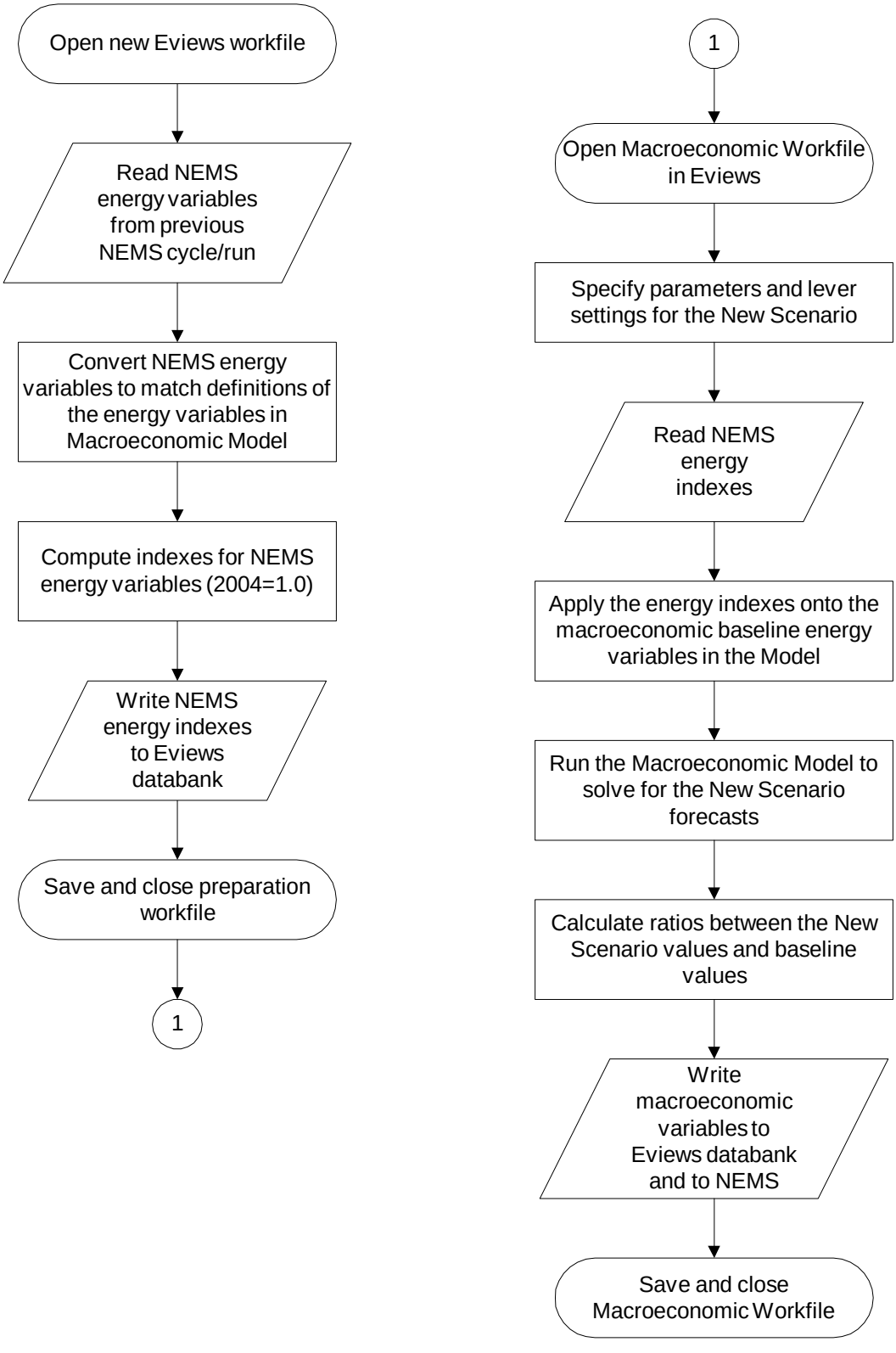
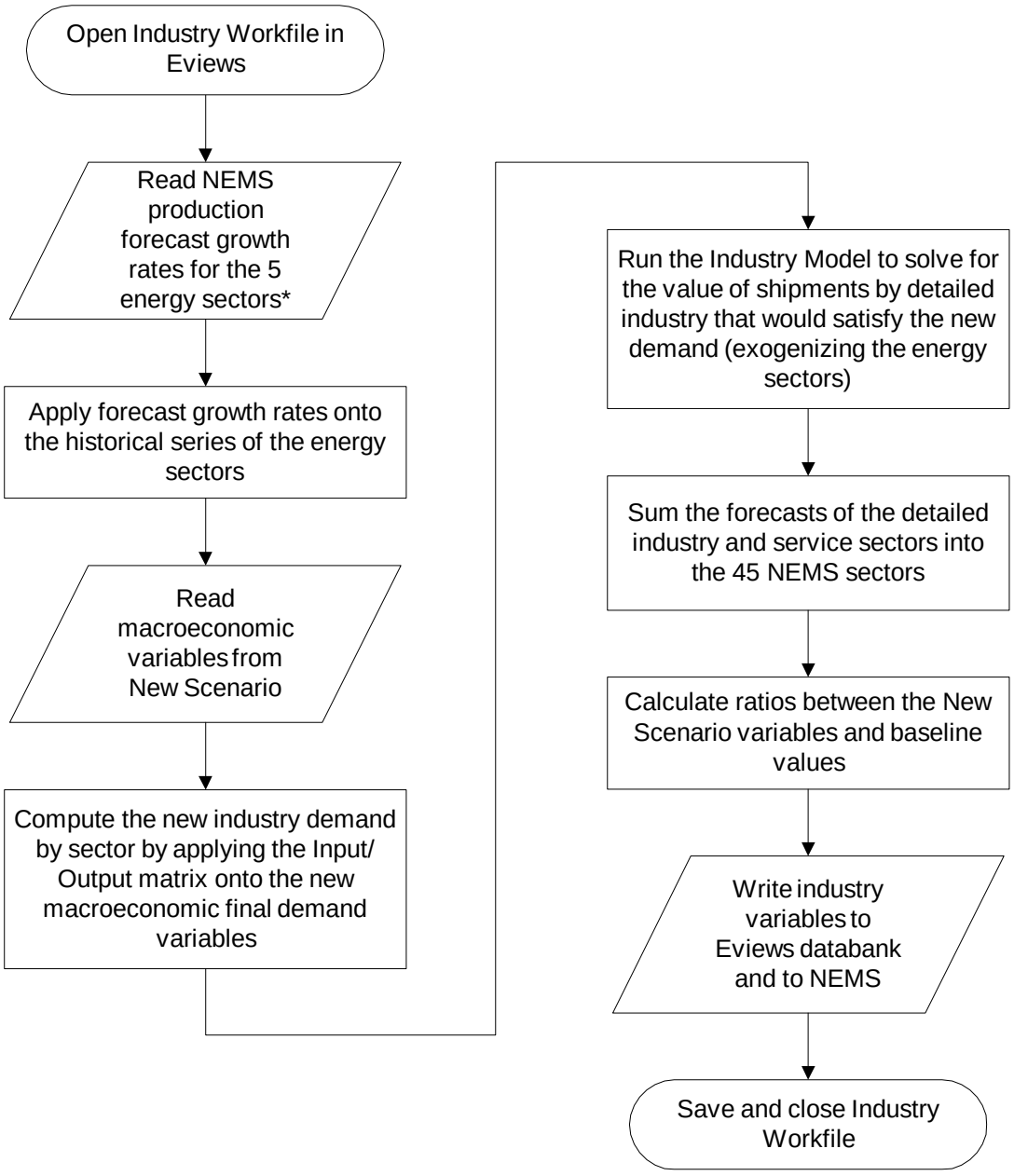
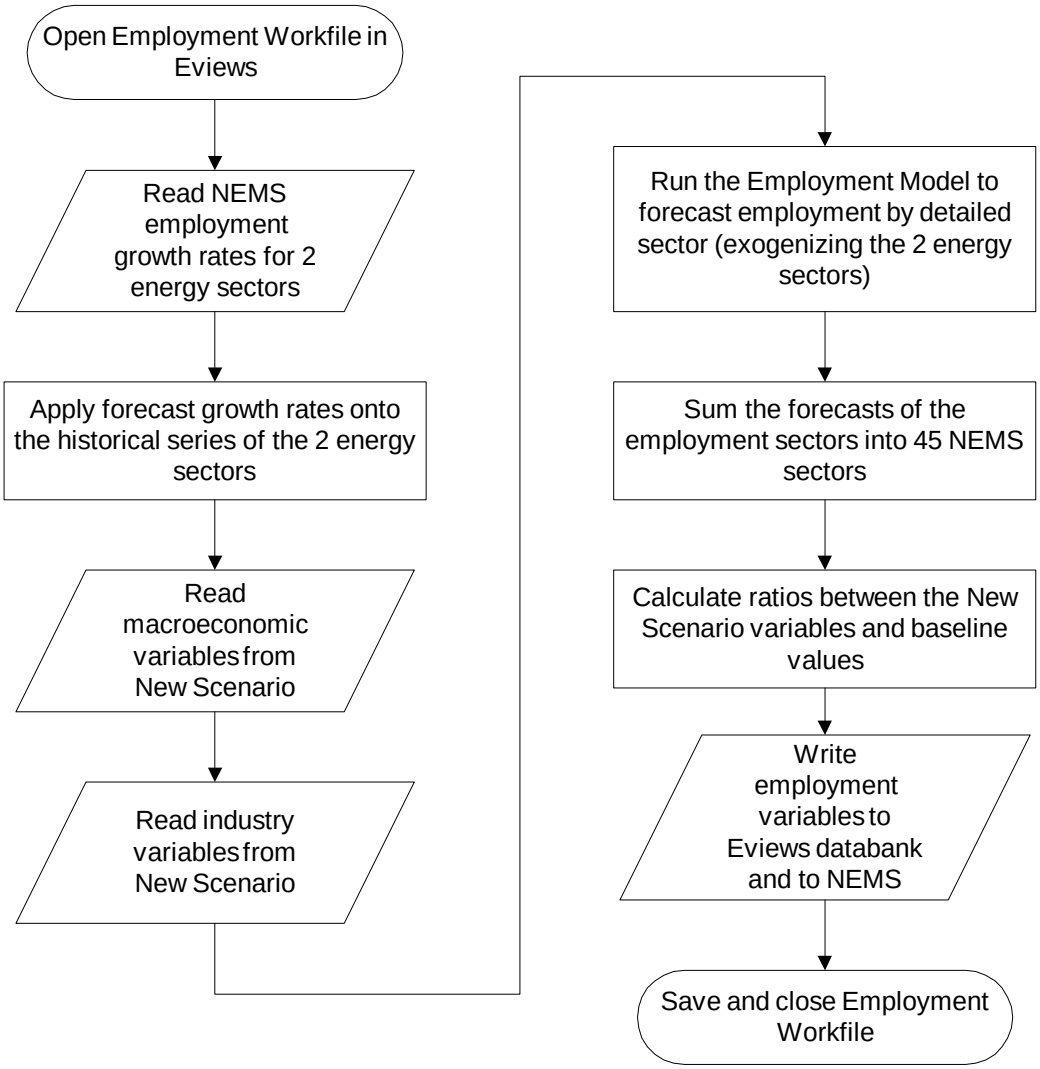


Figure 3. Industry Submodule – Industry Model



*** Five energy sectors with NEMS production estimates:**
Coal Mining
Oil and Gas Extraction
Petroleum Refining
Electric Utilities
Gas Utilities

Figure 4. Industry Submodule – Employment Model



*** Two energy sectors with NEMS employment estimates:**
Coal Mining
Oil and Gas Extraction

Figure 5. Regional Submodule – Regional Macroeconomic Model

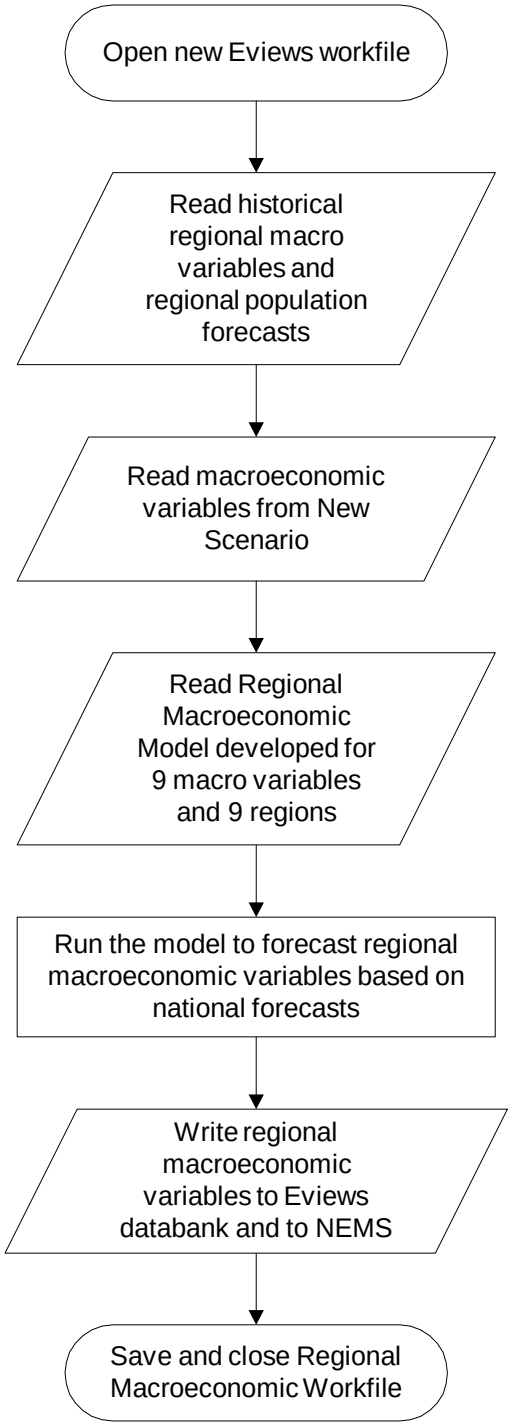


Figure 6. Regional Submodule – Regional Building Model

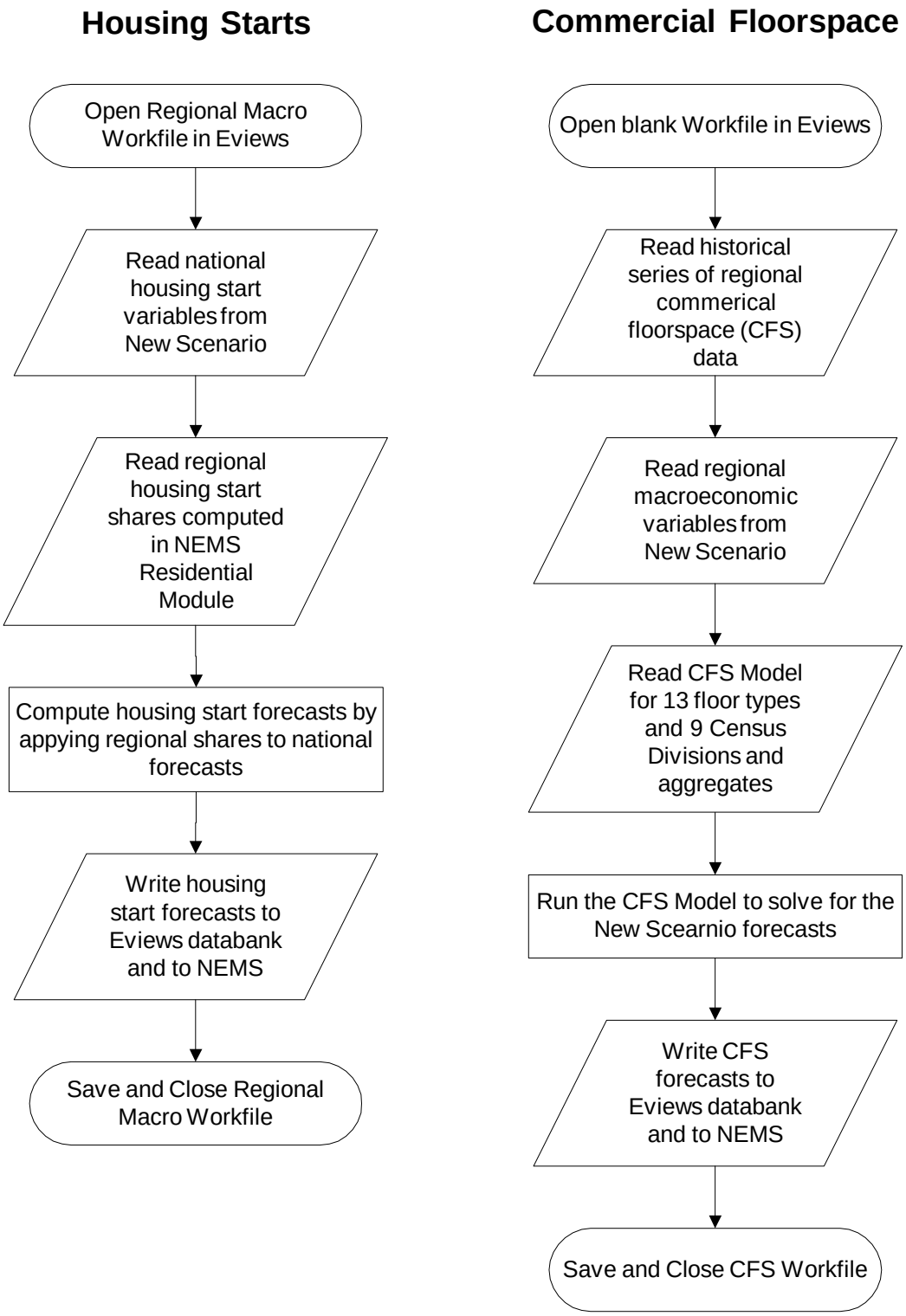
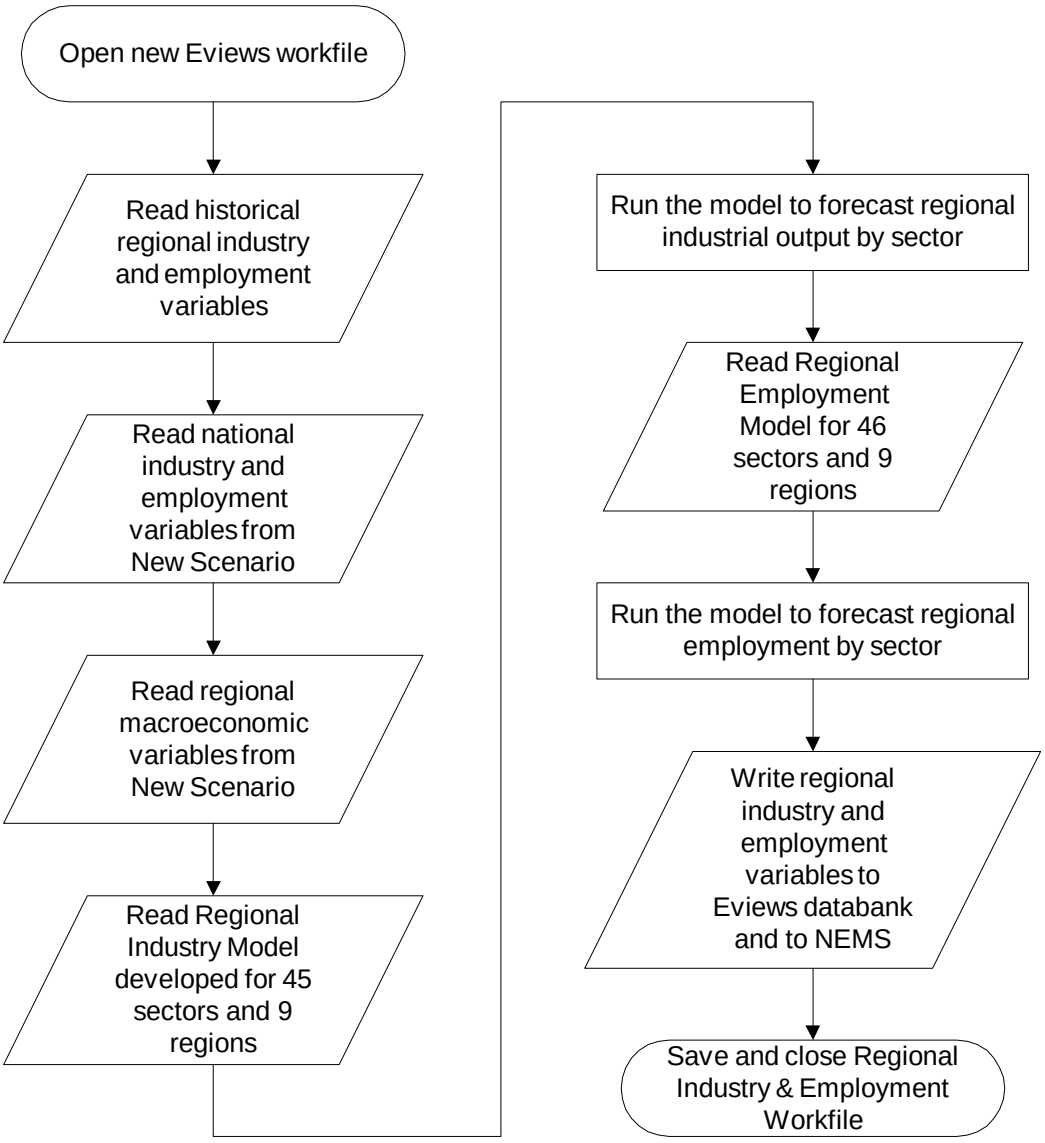


Figure 7. Regional Submodule – Regional Industry and Employment Model



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. 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 MAM.

MAC Subroutine

All of the activities in MAM are directed by the MAC subroutine, the driver subroutine. In addition to making calls on the remaining eight subroutines in MAM, the MAC subroutine has three tasks of its own. It writes the MC_ENERGY output[2] spreadsheet of NEMS energy prices and quantities that are the exogenous assumptions to the models in 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 completing the economic forecast by applying forecasted percent changes to baseline values. Finally, the MAC subroutine supplies the remaining modules and the report writer of 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 NEMS.

READMAC Subroutine

As mentioned, the MAC subroutine is the driver and calls all the remaining subroutines in 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 three input files. The first of these is an input text file of MAM parameter settings named MCPARMS (Table B2). The remaining two files are spreadsheets containing baseline values of MAM variables. The baselines are model forecasts given assumptions about the path of the world oil price. The input MCBASE spreadsheet (Table B3) contains baseline values from Global Insight's U.S. Macroeconomic Activity, Industrial Output and Employment models. These are the baseline values that forecasted percent changes are applied to to compute the MAM's national forecast. The input MCRGBASE spreadsheet (Table B4) contains baseline values from EIA's Regional models of economic activity, industrial output and employment. EIA's Regional models return actual forecasted values rather than percent changes to be applied to the data in the MCRGBASE spreadsheet. The baseline in the MCRGBASE spreadsheet is

[2] Files that are "output" files reside in the NEMS simulation output directory. 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.

used just as a point of reference.

DRTLINK Subroutine

The second subroutine called by MAC is named DRTLINK. This subroutine is responsible for executing the suites of Global Insight national and EIA 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 MAM's baseline values. The presence of feedback is controlled with the NEMS parameter MACFDBK. When the feedback switch is set to zero, the 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 suites of Global Insight national and EIA regional models within Quantitative Micro Software's EViews program. The subroutine begins by computing exogenous assumptions using NEMS energy prices and quantities read from the global data structure (Table B5). 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 the Global Insight and EIA suites of models and exports 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 – change from base for national level economic activity, industrial output and employment
2. MC_COMMFLR.WK1 – level of commercial floorspace by Census Division (Table B13)
3. MC_REGEMP.WK1 – level of employment by Census Division (Table B14)
4. MC_REGIO.WK1 – level of industrial output by Census Division (Table B15)
5. MC_REGMAC.WK1 – level of economic activity by Census Division (Table B12)
6. MC_VEHICLES.WK1 – national level of light truck sales by sales class (Table B10)

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 EPMAC output spreadsheet are percent change from baseline values. The baseline in this case is that for each of the three Global Insight national models. These percent changes are applied to the baselines contained in the MCBASE input spreadsheet (Table B3) to produce forecasts of U.S. economic activity, industrial outputs and of employment. The baseline values in the Global Insight models match those in the MCBASE input spreadsheet. The forecasts in the remaining five spreadsheets for commercial floorspace, regional employment, regional industrial output, regional economic activity and

national sales of light trucks are in levels. Control is then returned to the MAC subroutine.

Before continuing, the MAC subroutine completes the national economic forecast. It multiplies the baseline imported from the MCBASE spreadsheet by the forecasted percent changes imported from the EPMAC spreadsheet. The MAC subroutine then calls its third subroutine, INDUSTSUB.

INDUSTSUB Subroutine

The INDUSTSUB subroutine operates in a manner similar to that just described for the MAC subroutine. Forecasted percent changes from baseline values coming from Global Insight's Industrial Output model stored in the EPMAC spreadsheet are multiplied by the relevant baseline imported from the MCBASE input spreadsheet (Table B3). 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 MAM are overwritten by calculated output based on NEMS activity:

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 become 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 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. In this AEO, 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. It applies the forecasted percent changes coming from Global Insight's Employment model and stored in the EPMAC output spreadsheet to the relevant baseline imported from the MCBASE input spreadsheet (Table B3). The resulting forecast is for thirty-five categories of industrial and ten categories of service employment.

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 Industrial Output model. 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 Industrial Output model executes before the Employment model, 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 used 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 B11).

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 U.S. Macroeconomic model 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 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 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 and stocks of commercial floorspace. Table B16 indicates the MAM variables used by other NEMS Modules.

2. MC_NATIONAL - Contains the forecast of macroeconomic variables as well as the baseline and percent change from base. The forecast is done using Global Insight's U.S. Macroeconomic model. The baseline is imported from the MCBASE input spreadsheet (Table 3). Table B7 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. Baseline U.S. values are reported for manufacturing and services. EIA's Industrial Output model supplies the regional forecast. Baseline values are stored in the MCRGBASE spreadsheet (Table 4). Table B8 lists the contents of the MC_INDUSTRIAL spreadsheet.

4. MC_EMPLOYMENT - Contains the forecast and baseline employment values of the forty-five manufacturing and service industries. The forecast is done using the Employment Model. The baseline is imported from the MCBASE input spreadsheet. Table B9 lists the contents of the MC_EMPLOYMENT spreadsheet.

5. MC_REGIONAL - Contains the forecast and baseline values and the computed shares of the regional variables by Census Division as well as for the US. EIA's regional models of economic activity, industrial output and employment do the regional forecast. Baseline values are stored in the MCRGBASE input spreadsheet. Table B11 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 NEMS.

Flowcharts of MAM Subroutines

ure 8. Flow of Control within MAM

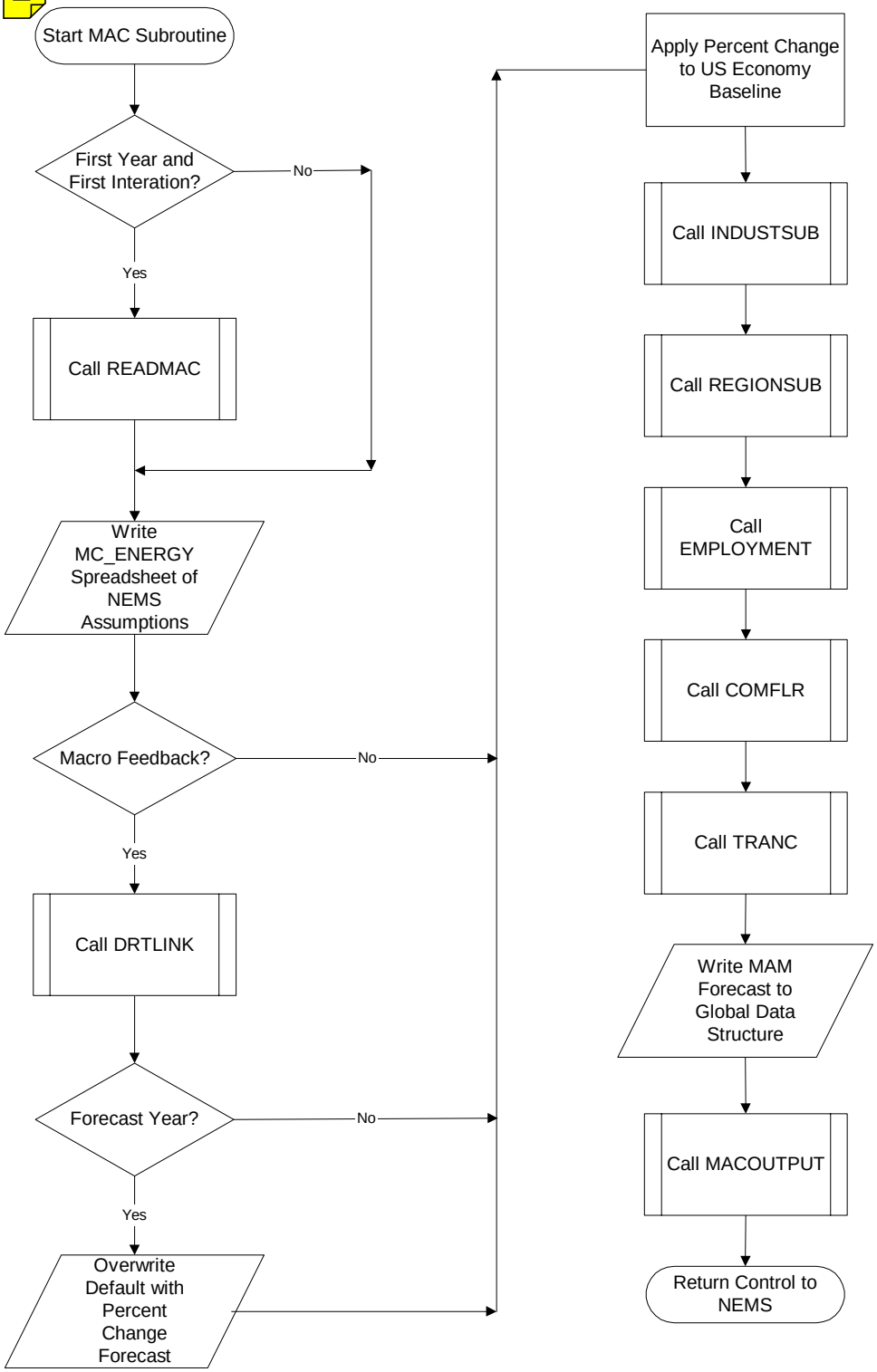


Figure 9. READMAC

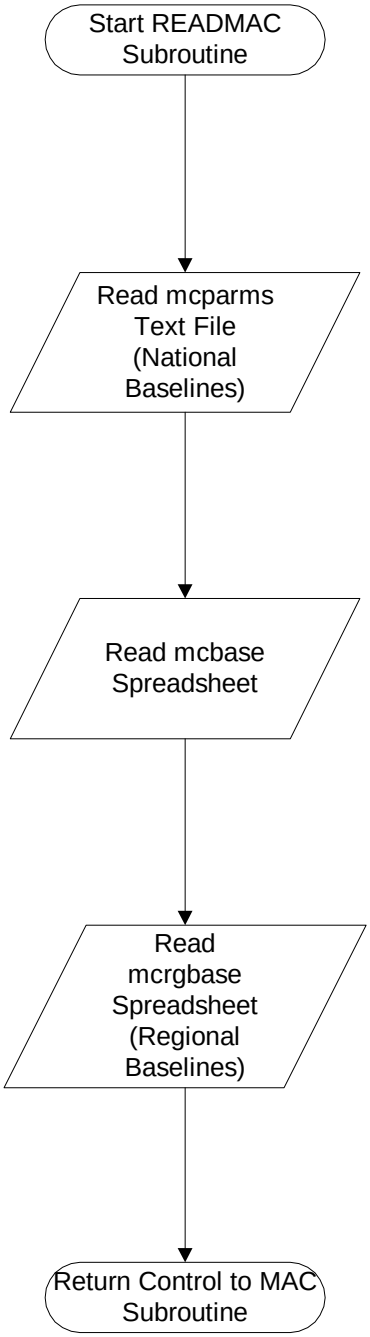
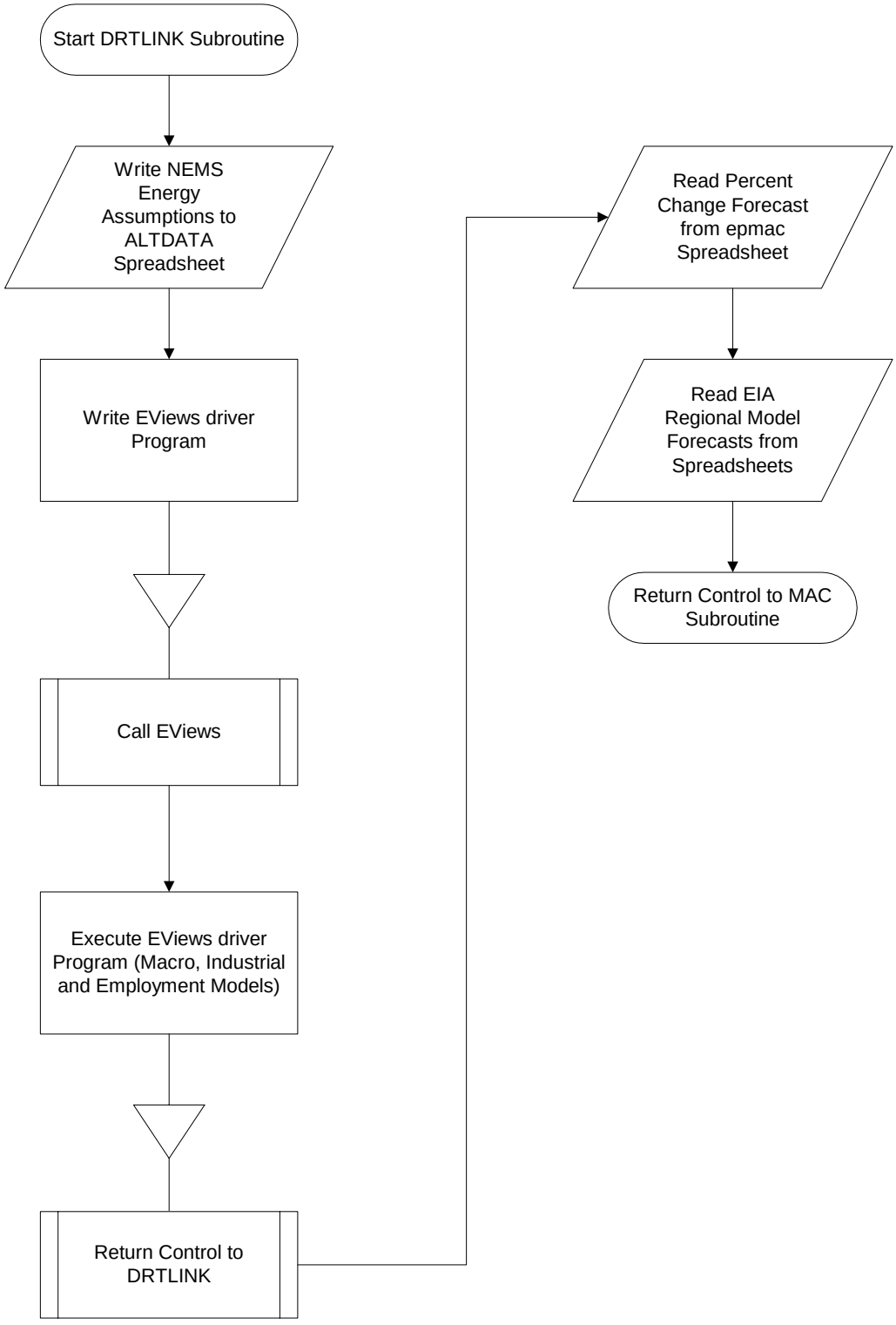


Figure 10. DRTLINK



ure 11. INDUSTSUB

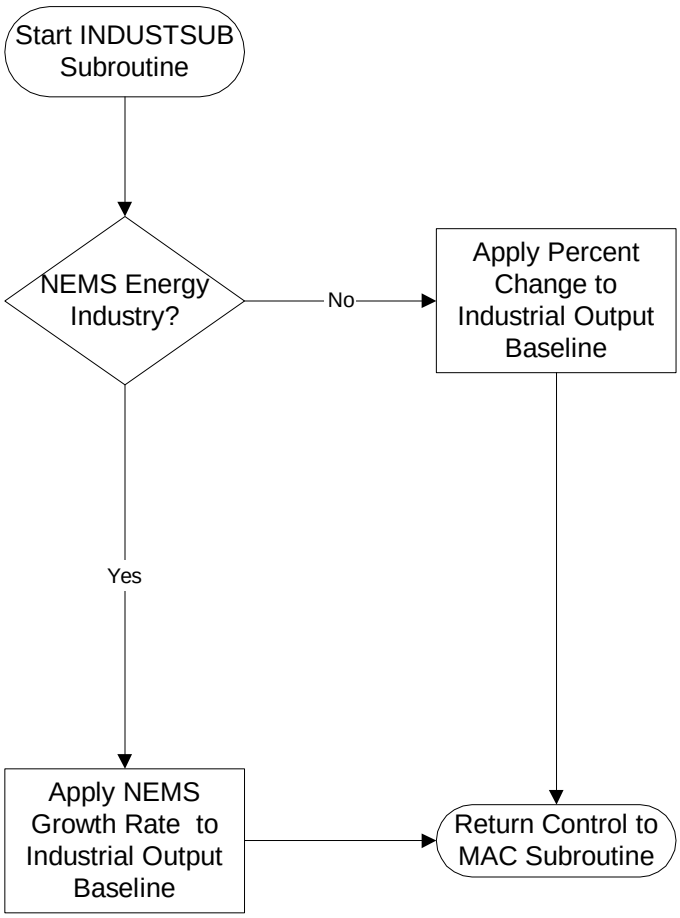


Figure 12. REGIONSUB

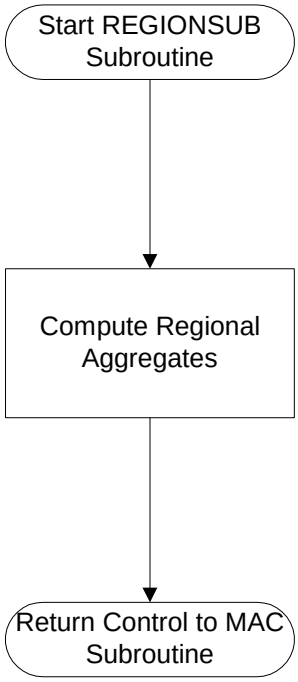


Figure 13. EMPLOYMENT

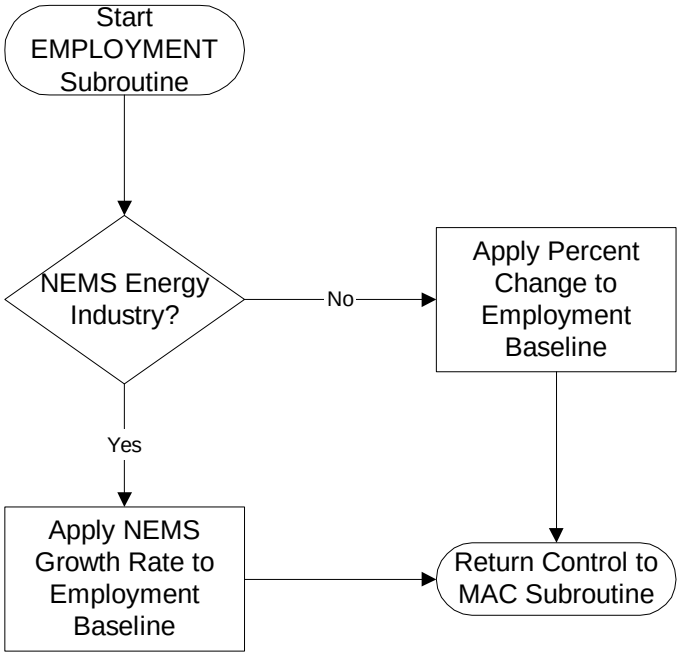


Figure 14. COMFLR

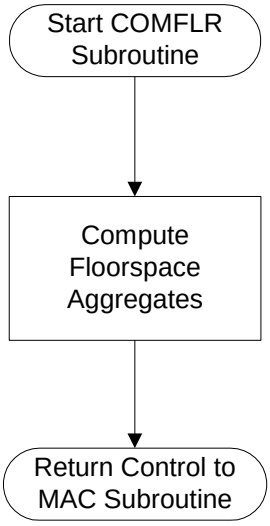
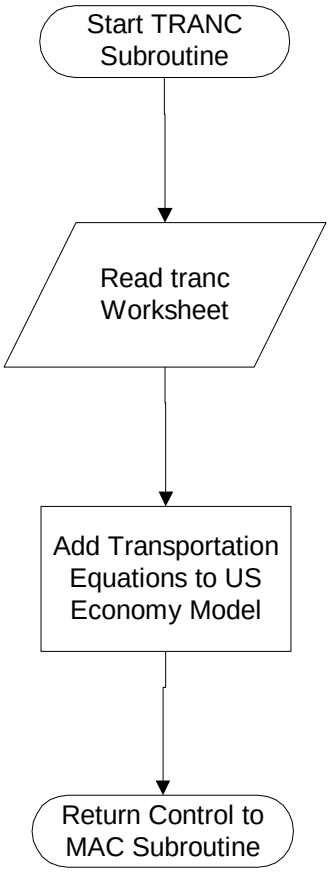
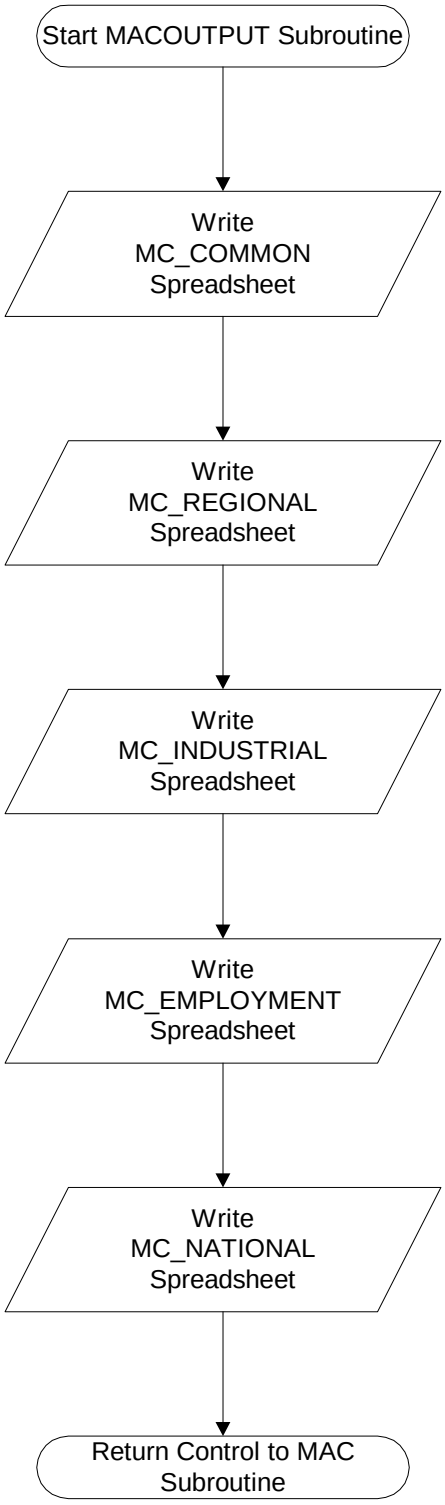


Figure 15. TRANC



ure 16. MACOUTPUT



Appendix A: STRUCTURAL 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	**CDFHER**
Computers and Software	**CDFHEMAVCR**
Computers	CDFHEMAVCCPR
Software	CDFHEMAVCSWR
Furniture exc. computers & software	CDFHEXCASR
Other durable goods	**CDOR**
Ophthalmic products	CDOOAOR
All other (1)	CDOOR
Nondurables	**CNR**
Food	**CNFR**
Purchased meals & beverages	CNFOUTR
Food for off-premise consumption	CNFHOMER
Food on farms, furnished free	CNFFREER
Clothing & shoes	CNCSR
Gasoline & 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

Own Transportation exc. leases	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 gross private fixed nonresidential investment	**IFIXR**
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 construction	**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. telecommunications	IFNRESPUOR
Telecommunications 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
Miscellanenous	**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	HU1NOFFER
Sales of existing single-family home	HU1ESOLD
Investment in residential construction	**IFRESR**
New housing construction	IFRESPER
Single family housing	IFRESPESR
Multi-family housing	IFRESPEMFR
Manufactured homes	IFRESOMFGR
Improvements	IFRESOIMPR
Other structure	ICRESOOR
Investment in residential 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	**GFR**
Defense	G**FMLR**
Consumption	**GFMLCR**
Personnel outlays	G*FMLWSSR*
Consumption of fixed capital	GFMLKFR
All else	*GFMLCOR*
Gross investment	*GFMLGIR*
Nondefense	**GFOR**
Consumption	**GFOCR**
Personnel outlays	G*FOWSSR*
Consumption of fixed capital	GFOCKFR
CCC inventory change	*GFOCINTNCCR*
All else	*GFOCOR*
Gross investment	*GFOGIR*
Interest, dividends, transfer payments, subsidies and accruals:	
Federal net interest payments	INTNETGF
Federal transfer payments	**TRFGF**
Transfers to individuals	**YPTRFGF**
Cyclical component	YPTRFGFO
Non-cyclical component	**YPTRFGFFE**
Medical	YPTRFGFSIHI
Social security payments	YPTRFGFSISS
Other	YPTRFGFFEO
Transfers to foreigners	*TRFGFORW*
Grants-in aid to state & local governments	**GFAIDSL**
Medicaid	**GFAIDSLSSMED**
Other	**GFAIDSLO**
Subsidies less current surplus	**SUBLSURPGF**
Agricultural programs	*SUBGFAG*
Housing programs	*SUBGFHSNG*
Other federal enterprises	*SUBGFO*
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	**GSLR**
Consumption	**GSLCR**
Personnel outlays	GSLCWSSR
Consumption of fixed capital	GSLCKFR
All else	GSLCOR
Gross investment	**GSLGIR**
Equipment	GSLGIER
Construction	GSLGIR
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	**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	**GFRCPTC**
Personal	**TXPGF**
Corporate	**TXCORPGF**
Payroll	**TXSIGF**
Excise	**TXIMGF**
VAT	**TXGFVAT**
Other	TXIMGFOTH
Federal tax rates	
Personal	
Effective	RTXPGF
Marginal	*RTXPMARGF*
Corporate	
Statutory rate	*RTXCGFS*
Investment tax credits (marginal rates)	*RITC...*
Payroll	*RTXSIGF*
State & local tax receipts	**TXGSL**
Personal	**TXPGSL**
Corporate	**TXCORPGSL**
Payroll	**TXSIGSL**
Excise	TXIMGSL
Property	TXIMGSLPROP
Federal grants-in aid to state & local governments	**GFAIDSL**
Medicaid	**GFAIDSLSSMED**
Other	GFAIDSLO
State & local tax rates	
Personal	RTXPGSL
Corporate	*RTXCGSL*
Payroll	*RTXSIGGSL*

* 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 *

Exports	
Goods	**XGR**
Food	XGFFBR
Industrial supplies	XGINR
Capital equipment other than motor vehicles	**XGKR**
Aircraft	XGKAEPR
Computers	XKCPPR
Other capital equipment	XGKOR
Motor vehicles & parts	XGAUTOR
Consumer goods other than motor vehicles	XGCR
Miscellaneous goods	XGOR
Services	**XSVTOTR**
Imports	
Goods	**MGR**
Food	MGFFBR
Industrial supplies	**MGINAPETR**
Petroleum and products	MGPETR
Other	MGINR
Capital equipment other than motor vehicles	**MGKR**
Aircraft	MGKCAEPR
Computers	MGKCPPR
Other capital equipment	MGKOR
Motor vehicles & parts	MGAUTOR
Consumer goods other than motor vehicles	MGCR
Miscellaneous goods	MGOR
Services	MSVTOTR
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	
Rest of industrialized world	*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	RMTB 6M
1-year bill 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
48-month auto loans	RMCBLV
New York Fed discount rate	RMDWPRIME
11^{th} district cost of funds	RMCOF11D
30-year mortgage rate	RMMTGCON
Effective rate on loans closed on existing homes	RMMTGEXIST
Moody Aaa industrial bonds	RMCORPAAA
Moody Baa industrial bonds	RMCORPBAA
AA public utility bonds	RMCORPUAA
Aaa-rated municipal bonds	RMMUNIAAA
Municipal bond buyer 20-bond index	RMMUNIBB20
Other Financial Variables	
M1	**M1**
Currency and travelers' checks	M1CURATC
Checkable deposits	M1DCHK
M2	M2
M3	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	LCNMTG0
Business loans at commercial banks	LCBCAI
S&P 500	SP500
Wilshire 5000	WL5000

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

Industry and Employment Model Detail

Table A11. Final Demand 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
IFNREETACR	Real gross nonresidential investment in aircraft

IFNREETOR	Real gross nonresidential investment in other transportation equipment
IFNREEOR	Real gross nonresidential investment in other equipment
IFRESR	Real gross residential investment
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).

GI Code	Description	NAICS (1997) codes	NEMS code
Nonmanufacturing Industries			
Agriculture, Forestry, Fishing & Hunting			
111	Crop Production	111	MFGO30
112	Animal Production	112	MFGO31
113	Forestry & Logging	113	MFGO31
11O	Agriculture, Other	114, 115	MFGO31
Mining			
211	Oil & Gas Extraction	211	MFGO33
2121	Coal Mining	2121	MFGO32
2122	Metal Ore Mining	2122	MFGO34
2123	Nonmetallic Mineral Mining	2123	MFGO34
213	Support Activities For Mining	213	MFGO33
Construction			
23	Construction	23	MFGO35
Manufacturing Industries			
311	Food Products	311	MFGO1
312	Beverage and Tobacco Products	312	MFGO2
313	Textile Mills	313	MFGO3
314	Textile Products	314	MFGO3
315	Apparel	315	MFGO4
316	Leather and Allied Products	316	MFGO17
321	Wood Products	321	MFGO5
3221	Pulp, Paper, and Paperboard Mills	3221	MFGO7
32221	Paperboard Container Manufacturing	32221	MFGO7
322O	Other Paper Manufacturing	32222 - 32229	MFGO7
323	Printing	323	MFGO8
32411	Petroleum Refineries	32411	MFGO14
324O	Other Petroleum and Coal Products Manufacturing	32412, 32419	MFGO15
32511A9	Basic Organic Chemicals	32511, 32519	MFGO10
32512T8	Basic Inorganic Chemicals	32512 - 32518	MFGO9
3252	Resins, Synthetic Rubber and Synthetic Fibers	3252	MFGO11
3253	Pesticide, Fertilizer and Other Agricultural Chemicals	3253	MFGO12
3254T9	Other Chemical Products	3254 - 3259	MFGO13

GI Code	Description	NAICS (1997) codes	NEMS code
326	Plastics and Rubber Products	326	MFGO16
3272	Glass and Glass Products	3272	MFGO18
32731	Cement	32731	MFGO19
327O	Other Nonmetallic Mineral Products	3271, 32732 - 32739, 3274, 3279	MFGO20
3311A2	Iron and Steel Mills and Ferroalloy and Steel Products	3311, 3312	MFGO21
3313	Alumina and Aluminum Products	3313	MFGO22
3314A5X1	Other Primary Metals	3314, 33152	MFGO23
33151	Ferrous Metal Foundries	33151	MFGO23
332	Fabricated Metal Products	332	MFGO24
333	Machinery	333	MFGO25
3341	Computer and Peripheral Equipment	3341	MFGO26
334413	Semiconductor and Related Devices	334413	MFGO26
334511	Search and Navigation Instrument Manufacturing	334511	MFGO28
3345X11	Electromedical, Measuring, and Control Instruments	3345 less 334511	MFGO28
334A5O	Other Electronic and Electrical Equipment, Appliance and Components	3342 - 3344, 3346, 335	MFGO26
336	Transportation Equipment	336	MFGO27
337	Furniture and Related Products	337	MFGO6
339	Miscellaneous Durable Products	339	MFGO29
Services			
Utilities			
2211	Power Generation & Supply	2211	NMFGO3
2212	Natural Gas Distribution	2212	NMFGO4
2213	Water, Sewage & Related Systems	2213	NMFGO5
Wholesale and Retail Trade			
42	Sales: Wholesale Trade, (Includes Cost of Goods Sold)	42	NMFGO6
44A5	Total Retail Trade, (Includes Cost of Goods Sold)	44, 45	NMFGO7
Transportation			
48A9	Transportation and Warehousing	48, 49	NMFGO1
Other			
5111	Newspaper, book, and directory publishers	5111	NMFGO9
5133	Telecommunications	5133	NMFGO2
513X33	Radio and Television Broadcasting & Cable Networks	513 less 5133	NMFGO2
52	Finance and Insurance	52	NMFGO8
53	Real Estate and Rental And Leasing	53	NMFGO8
SERV	Other services	5112, 512, 514, 54 - 81	NMFGO9

GI Code	Description	NAICS (1997) codes	NEMS code
921	Federal Government Enterprises	921	NMFGO10
922A3	State & Local Government Enterprises	922, 923	NMFGO10

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 NMFGO10 and NMFGO11.

Regional Model Detail

Table A13. Economic Variables in the Regional Model

Name	Description
NP	Total Population, Including Armed Forces Overseas, millions
NP16A	Population Aged 16 and Over, millions
GSPR	Real Gross State Product, billions of chained 2000 $
CPI	Consumer Price Index, All Urban, 1982-84 = 1.0
YP	Personal Income, billions of nominal $
YPCOMPWSD	Wage & Salary Disbursements, billions of nominal $
YPDR	Real Disposable Personal Income, billions of chained 2000 $
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
RWM	Average Annual Manufacturing Wages, thousands of nominal $
RWNM	Average Annual Non-Manufacturing Wages, thousands of nominal $

Table A14. Output and Employment Detail in the Regional Model

NEMS code	Description	NAICS (1997) codes
Manufacturing Industries:		
MFGO1	Food Products	311
MFGO2	Beverage and Tobacco Products	312
MFGO3	Textile Mills & Textile Products	313, 314
MFGO4	Apparel	315
MFGO5	Wood Products	321
MFGO6	Furniture and Related Products	337
MFGO7	Paper Products	322
MFGO8	Printing	323
MFGO9	Basic Inorganic Chemicals	32511, 32519
MFGO10	Basic Organic Chemicals	32512 - 32518
MFGO11	Plastic and Synthetic Rubber Materials	3252
MFGO12	Agricultural Chemicals	3253
MFGO13	Other Chemical Products	3254 - 3259
MFGO14	Petroleum Refineries	32411
MFGO15	Other Petroleum and Coal Products	32412, 32419
MFGO16	Plastics and Rubber Products	326
MFGO17	Leather and Allied Products	316
MFGO18	Glass & Glass Products	3272
MFGO19	Cement Manufacturing	32731
MFGO20	Other Nonmetallic Mineral Products	327 less 3272 & 32731
MFGO21	Iron & Steel Mills, Ferroalloy & Steel Products	3311, 3312
MFGO22	Alumina & Aluminum Products	3313
MFGO23	Other Primary Metals	3314, 3315
MFGO24	Fabricated Metal Products	332
MFGO25	Machinery	333
MFGO26	Other Electronic & Electric Products	334 less 3345, 335
MFGO27	Transportation Equipment	336
MFGO28	Measuring & Control Instruments	3345
MFGO29	Miscellaneous Manufacturing	339

NEMS code	Description	NAICS (1997) codes
Nonmanufacturing Industries:		
MFGO30	Crop Production	111
MFGO31	Other Agriculture, Forestry, Fishing & Hunting	112 - 115
MFGO32	Coal Mining	2121
MFGO33	Oil & Gas Extraction & Support Activities	211, 213
MFGO34	Other Mining & Quarrying	2122, 2123
MFGO35	Construction	23
Services:		
NMFGO1	Transportation & Warehousing	48, 49
NMFGO2	Broadcasting & Telecommunications	513
NMFGO3	Electric Power Generation & Distribution	2211
NMFGO4	Natural Gas Distribution	2212
NMFGO5	Water, Sewage & Related System	2213
NMFGO6	Wholesale Trade	42
NMFGO7	Retail Trade	44, 45
NMFGO8	Finance & Insurance, Real Estate	52, 53
NMFGO9	Other Services	51, 54 - 81
NMFGO10	Public Administration	921, 922, 923
	Federal (Employment only)	921
	State and Local (Employment only)	922, 923

Table A15. Commercial Floorspace Types

Code	Description
STOR	Stores and restaurants
WARE	Manufacturing and wholesale trade, public and federally-owned warehouses
OFFI	Private, federal, and state and local offices
AUTO	Auto service and parking garages
MFG	Manufacturing
EDU	Primary, secondary and higher education
HEAL	Health - hospitals and nursing homes
PUB	Federal and state and local government
REL	Religious
AMUS	Amusement
MISC	Miscellaneous, non-residential - transportation related and all other not elsewhere classified
HOTE	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 Submodules 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 Submodule of MAM uses Global Insight's U.S. Macroeconomic Activity, Industrial Output and Employment models. EIA staff and contract support developed the remaining models of 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 MAM during the execution of 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.

Table B3 lists the contents of the MCBASE input file. This spreadsheet contains the baseline values of all the national variables whose forecast are returned to MAM from EViews. The values contained in the MCBASE file are forecasts of all three Global Insight models; U.S. Macroeconomic Activity, Industrial Output and Employment; given an assumption about the path of the world oil price. During a NEMS simulation, ratios describing the deviations of the scenario results from the model baseline are computed, and are multiplied by the MCBASE values to produce the MAM's forecast. The values of the variables in the MCBASE file are national in scope, have an annual frequency and cover the period from 1990 through 2025.

Table B4 lists the contents of the MCRGBASE input file. This spreadsheet contains the baseline values of all the regional variables from 1990 through 2025. The file has 828 records, covering 92 variables for each of nine Census Divisions. EIA's Regional models for economic activity, industrial output and employment supply the baseline data. The Regional baseline is just that and is not used, as in the national model, to produce a forecast.

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 NEMS. These are energy assumptions exogenous to Global Insight's models. Table B5 lists and defines these energy assumptions. For each, the Global Insight model mnemonic is given along with its definition. The final column of Table B5 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 forecasts for two energy sectors (Coal Mining and Oil & Gas Extraction) are computed using growth rates extracted from the appropriate NEMS modules. Table B6 describes the NEMS variables used to calculate the growth rates for each sector.

Outputs

Table B7 lists the U.S. macroeconomic variable outputs returned to MAM from EViews. Annual data beginning in 1990 and forecast through 2025 are recorded in the spreadsheet named MC_NATIONAL.

Table B8 defines industrial gross output variables contained within the Industrial Output Submodule of 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 the industrial output by sector for the nine Census Divisions and for the United States.

Table B9 defines the employment variables contained in the Employment Submodule of 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 B10 defines the light truck variables contained in the TRANC Submodule of MAM. Annual data beginning in 1990 and forecast through 2025 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 MAM are presented in the MC_REGIONAL spreadsheet. Table B11 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 B12

describes the regions and variables contained in the output spreadsheet MC_REGMAC for EIA's regional economic activity model. Table B13 describes the regions and variables contained in the output spreadsheet MC_COMMFLR for EIA's regional commercial floorspace model. Table B14 describes the regions and variables contained in the output spreadsheet MC_REGEMP for EIA's regional employment model. Table B15 describes the regions and variables contained in the output spreadsheet MC_REGIO for EIA's regional industrial output model.

Table B16 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 B16.

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	Change from base for macroeconomic, industrial output and employment models	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
MCBASE.WK1	Macroeconomic, industrial output and employment bases	Input
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
MCRGBASE.WK1	Regional base variables	Input

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 (currently not used)	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, 2=factor cost endogenously determined in model
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, 1=Return to consumers, 2=Return to business
MMAC	Run-time option (SCEDES)	Macroeconomic growth scenario: 1 = Low, 2 = Reference, 3 = High
MCLHISYR = 2004	MAM parameter (MCPARMS)	Last historical year in the forecast
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 = 55	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
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 = 170	MAM parameter (MCPARMS)	Number of exogenous variables (aggregates and components) from NEMS
NUMEMPL = 46	MAM parameter (MCPARMS)	Number of Industrial Employment categories

Parameter Name	Input Type (filename)	Input Description
NUMEPMAC = 161	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 = 55	MAM parameter (MCPARMS)	Number of driver variables passed to EViews models from MAM

Table B3. MCBASE Input Variables

Row	Variable Name	Description	Source
1	ENGDOMPETANG	Domestic Production of Petroleum and Natural Gas, quadrillion BTUs	Macro
2	ENGDOMO	Domestic Production of Other Energy, quadrillion BTUs	Macro
3	DALLFUELS	Demand for All Fuels - All Sectors, quadrillion BTUs	Macro
4	DENDUCOAL	End-Use Demand for Coal, quadrillion BTUs	Macro
5	DENDUELC	Electricity Sales to Ultimate Consumers, quadrillion BTUs	Macro
6	DENDUNG	End-Use Demand for Natural Gas, quadrillion BTUs	Macro
7	DENDUPET	End-Use Demand for Petroleum, quadrillion BTUs	Macro
8	JQIND12	Industrial Production Index – Coal Mining, 1996=1.0	Macro
9	JQIND13	Industrial Production Index -Oil and Gas Extraction, 1996=1.0	Macro
10	QGASASF	Highway Consumption of Gasoline and Special Fuels, billions of gallons	Macro
11	CNEFACR	Consumption of Household Fuel Oil, billions of chained 2000 dollars	Macro
12	CSVVHOPGR	Consumption of Consumer Gasoline and Oil, billions of chained 2000 dollars	Macro
13	CSVVHOPER	Consumption of Household Electricity, billions of chained 2000 dollars	Macro
14	CNEGAOR	Consumption of Household Natural Gas, billions of chained 2000 dollars	Macro
15	JPCNEFAC	Personal Consumption Deflator, Household Fuel Oil, 1996=1.0	Macro
16	JPCSVHOPE	Personal Consumption Deflator, Household Electricity, 1996=1.0	Macro
17	JPCSVHOPG	Personal Consumption Deflator, Household Natural Gas, 1996=1.0	Macro
18	JPCNEGAO	Personal Consumption Deflator, Consumer Gasoline and Oil, 1996=1.0	Macro
19	WPI051	Producer Price Index – Coal, 1982=1.0	Macro
20	WPI053	Producer Price Index - Gas Fuels, 1982=1.0	Macro
21	WPI054	Producer Price Index - Electric Power, 1982=1.0	Macro
22	WPI055	Producer Price Index - Utility Natural Gas, 1982=1.0	Macro
23	WPI0561	Producer Price Index - Crude Petroleum, 1982=1.0	Macro
24	WPI057	Producer Price Index - Refined Petroleum Products, 1982=1.0	Macro
25	WPI0574	Producer Price Index - Residual Petroleum Fuels, 1982=1.0	Macro
26	POILIMP	Weighted Average Price of Imported Crude, dollars per barrel	Macro
27	CONSR	Consumer Spending on all Goods & Services, billions of chained 2000$	Macro

Row	Variable Name	Description	Source
28	CDR	Consumer Spending on Durable Goods, billions of chained 2000$	Macro
29	CDMVR	Consumer Spending on Motor Vehicles and Parts, billions of chained 2000$	Macro
30	CDFHER	Consumer Spending on Furniture, billions of chained 2000$	Macro
31	CDFHEMAVCR	Consumer Spending on Computers and Software, billions of chained 2000$	Macro
32	CDFHEXCASR	Consumer Spending on Furniture, exc Computers and Software, billions of chained 2000$	Macro
33	CDOOR	Consumer Spending on Other Durable Goods, billions of chained 2000$	Macro
34	CDOOAOR	Consumer Spending on Ophthalmic Products, billions of chained 2000$	Macro
35	IR	Gross Private Domestic Investment, Total, billions of chained 2000$	Macro
36	IFXR	Gross Private Fixed Investment, billions of chained 2000$	Macro
37	IFNRER	Gross Private Fixed Nonresidential Investment, billions of chained 2000$	Macro
38	IFNREER	Gross Nonresidential Investment in Equipment, billions of chained 2000$	Macro
39	IFNREETLVR	Gross Nonresidential Investment in Light Duty Vehicles, billions of chained 2000$	Macro
40	IFNREEIPCTR	Gross Nonresidential Investment in Communications Equipment, billions of chained 2000$	Macro
41	IFNREEIPCCR	Gross Nonresidential Investment in Computer Equipment, billions of chained 2000$	Macro
42	IFNREEIPCSR	Gross Nonresidential Investment in Software, billions of chained 2000$	Macro
43	IFNREEMISCR	Gross Nonresidential Investment in Miscellaneous Equipment, billions of chained 2000$	Macro
44	IFNRESR	Gross Nonresidential Investment in Structures, billions of chained 2000$	Macro
45	IFNRESBAOR	Gross Investment in Nonresidential Structures, Buildings and Other, billions of chained 2000$	Macro
46	IFNRESMIR	Gross Investment in Nonresidential Structures, Mining and Exploration, billions of chained 2000$	Macro
47	IFNRESPUR	Gross Investment in Nonresidential Structures, Public Utilities, billions of chained 2000$	Macro
48	IFRER	Gross Private Fixed Residential Investment, billions of chained 2000$	Macro
49	IFRESR	Gross Residential Investment, billions of chained 2000$	Macro

Row	Variable Name	Description	Source
50	IFREER	Gross Investment in Residential Equipment, billions of chained 2000$	Macro
51	GDPR	Gross Domestic Product, billions of chained 2000$	Macro
52	GDPFER	Gross Domestic Product at full employment, billions of chained 2000$	Macro
53	CONSR	Consumer Spending on all Goods & Services, billions of chained 2000$	Macro
54	IR	Gross Private Domestic Investment, Total, billions of chained 2000$	Macro
55	XR	Exports of Goods & Services, billions of chained 2000$	Macro
56	MR	Imports of Goods & Services, billions of chained 2000$	Macro
57	GR	Government Purchases of Goods & Services, billions of chained 2000$	Macro
58	CDR	Consumer Spending on Durable Goods, billions of chained 2000$	Macro
59	CNR	Consumer Spending on Nondurable Goods, billions of chained 2000$	Macro
60	CSVR	Consumer Spending on Services, billions of chained 2000$	Macro
61	IFNRESR	Gross Nonresidential Investment in Structures, billions of chained 2000$	Macro
62	IFRESR	Gross Residential Investment, billions of chained 2000$	Macro
63	IFNREER	Gross Nonresidential Investment in Equipment, billions of chained 2000$	Macro
64	IFREER	Gross Residential Investment in Equipment, billions of chained 2000$	Macro
65	IFXR	Gross Private Fixed Investment, billions of chained 2000$	Macro
66	IFNRER	Gross Private Fixed Nonresidential Investment, billions of chained 2000$	Macro
67	IFRER	Gross Private Fixed Residential Investment, billions of chained 2000$	Macro
68	XGFFBR	Exports, Foods, Feeds, & Beverages, billions of chained 2000$	Macro
69	XGINR	Exports, Industrial Supplies & Materials, billions of chained 2000$	Macro
70	XGKR	Exports, Capital Goods exc autos, billions of chained 2000$	Macro
71	XGAUTOR	Exports, Automotive Vehicles, Engines & Parts, billions of chained 2000$	Macro
72	XGCR	Exports, Consumer Goods except Automotive, billions of chained 2000$	Macro
73	XGR	Exports, Goods, billions of chained 2000$	Macro
74	XSVTOTR	Exports, Services, billions of chained 2000$	Macro

Row	Variable Name	Description	Source
75	MGFFBR	Imports, Foods, Feeds, and Beverages, billions of chained 2000$	Macro
76	MGINAPETR	Imports, Industrial Supplies & Materials, billions of chained 2000$	Macro
77	MGKR	Imports, Capital Goods excl. Motor Vehicles, billions of chained 2000$	Macro
78	MGAUTOR	Imports, Motor Vehicles & Parts, billions of chained 2000$	Macro
79	MGCR	Imports, Non-automotive Consumer Goods, billions of chained 2000$	Macro
80	MSVTOTR	Imports, Services, billions of chained 2000$	Macro
81	IIR	Change in Real Stock of Business Inventories, billions of chained 2000$	Macro
82	GFMLR	Federal Defense Purchases of Goods and Services, billions of chained 2000$	Macro
83	GDP	Gross Domestic Product, billions of nominal $	Macro
84	CONS	Consumer Spending on all Goods & Services, billions of nominal $	Macro
85	I	Gross Private Domestic Investment, billions of nominal $	Macro
86	GNPR	Gross National Product, billions of chained 2000$	Macro
87	JPGDP	Chained Price Index, GDP, 2000 = 100.0 (2000 = 1.0 in MC_COMMON)	Macro
88	RMTB3M	Discount Rate on 3-Month U.S. Treasury Bills	Macro
89	RMMTG30CON	Conventional 30-Year Mortgage Commitment Rate	Macro
90	RMCORPPUAA	Yield on AA Public Utility Bonds	Macro
91	RMGBLUSREAL	Real Average Yield on U.S. Treasury Long-term Bonds	Macro
92	JECIWSP	Employment Cost Index, Wages & Salaries, Private Sector, June 1989 = 1.0	Macro
93	SUVA	Unit Sales of Automobiles, Total, millions of units	Macro
94	SUVLV	Unit Sales of New Light Vehicles, millions of units	Macro
95	SUVTL	Unit Sales of New Light Trucks, millions of units	Macro
96	SUVTHAM	Unit Sales of Heavy and Medium Trucks, millions of units	Macro
97	RUC	Unemployment Rate, All Civilian Workers	Macro
98	WPI	Producer Price Index, All Commodities, 1982 = 1.0	Macro
99	WPI11	Producer Price Index, Machinery & Equipment, 1982 = 1.0	Macro
100	WPI14	Producer Price Index, Transportation Equipment, 1982 = 1.0	Macro
101	NLFC	Civilian Labor Force as Measured by the Household Survey, millions of persons	Macro
102	RMFF	Effective Rate on Federal Funds	Macro
103	WPI05	Producer Price Index, Fuels, Related Products & Power, 1982 = 1.0	Macro

Row	Variable Name	Description	Source
104	RMTCM10Y	Yield on 10-year Treasury Notes	Macro
105	RMCORPBAA	Yield on Baa-rated Corporate Bonds	Macro
106	CPI	Consumer Price Index (All Urban) - All Items, 1982-84 = 1.0	Macro
107	YPDR	Disposable Personal Income, billions of chained 2000$	Macro
108	YPCOMPWSD	Wage & Salary Disbursements, billions of nominal $	Macro
109	YP	Personal Income, billions of nominal $	Macro
110	HUSMFG	Mobile Homes Shipments, millions of units	Macro
111	HUSPS1	Single-Family Housing Starts, millions of units	Macro
112	HUSPS2A	Multi-Family Housing Starts, millions of units	Macro
113	KHUMFG	Stock of Mobile Homes, millions of units	Macro
114	KHUPS1	Stock of Single-Family Housing, millions of units	Macro
115	KHUPS2A	Stock of Multi-Family Housing, millions of units	Macro
116	NP	Population Including Armed Forces Overseas, millions of persons	Macro
117	NP16A	Population Aged 16 and Over, millions of persons	Macro
118	RWM_SUM	Average Annual Manufacturing Wages, thousands of nominal $	Regional
119	RWNM_SUM	Average Annual Non-Manufacturing Wages, thousands of nominal $	Regional
120	EEA	Total Nonfarm Employment, millions of persons	Macro
121	EC	Construction, millions of persons	Macro
122	EG91	Federal Government, millions of persons	Macro
123	EFIR	Financial, Insurance, Real Estate, millions of persons	Macro
124	EMIN	Mining, millions of persons	Macro
125	ESV	Other Services, millions of persons	Macro
126	EGSL	State & Local Government, millions of persons	Macro
127	ER	Transportation, Communications & Public Utilities, millions of persons	Macro
128	ETR	Retail Trade, millions of persons	Macro
129	ETW	Wholesale Trade, millions of persons	Macro
130	E24	Wood Products, millions of persons	Macro
131	E25	Furniture and Related Products, millions of persons	Macro
132	E32	Nonmetallic Mineral Products, millions of persons	Macro
133	E33	Primary Metal Industries, millions of persons	Macro
134	E34	Fabricated Metal Products, millions of persons	Macro
135	E35	Machinery, millions of persons	Macro
136	E36	Other Electronic and Electric Products, millions of persons	Macro

Row	Variable Name	Description	Source
137	E37	Transportation Equipment, millions of persons	Macro
138	E38	Measuring & Control Instruments, millions of persons	Macro
139	E39	Miscellaneous Manufacturing, millions of persons	Macro
140	E20	Food Products, millions of persons	Macro
141	E21	Beverage and Tobacco Products, millions of persons	Macro
142	E22	Textile Mills & Textile Products, millions of persons	Macro
143	E23	Apparel, millions of persons	Macro
144	E26	Paper Products, millions of persons	Macro
145	E27	Printing, millions of persons	Macro
146	E28	Chemicals, millions of persons	Macro
147	E29	Petroleum Products, millions of persons	Macro
148	E30	Plastics and Rubber Products, millions of persons	Macro
149	E31	Leather and Allied Products, millions of persons	Macro
150	IOMC_MFGO1	Production, Food & Kindred Products exc Beverages (SIC 20 less 208), millions of fixed 96$	Industry
151	IOMC_MFGO2	Production, Beverages & Tobacco Products (SIC 208, 21), millions of fixed 96$	Industry
152	IOMC_MFGO3	Production, Textile Mill Products (SIC 22), millions of fixed 96$	Industry
153	IOMC_MFGO4	Production, Apparel & Other Textiles (SIC 23), millions of fixed 96$	Industry
154	IOMC_MFGO5	Production, Lumber & Wood Products (SIC 24), millions of fixed 96$	Industry
155	IOMC_MFGO6	Production, Furniture & Fixtures (SIC 25), millions of fixed 96$	Industry
156	IOMC_MFGO7	Production, Paper & Allied Industries (SIC 26), millions of fixed 96$	Industry
157	IOMC_MFGO8	Production, Printing & Publishing (SIC 27), millions of fixed 96$	Industry
158	IOMC_MFGO9	Production, Inorganic Chemicals (SIC 281), millions of fixed 96$	Industry
159	IOMC_MFGO10	Production, Organic Chemicals (SIC 286), millions of fixed 96$	Industry
160	IOMC_MFGO11	Production, Plastic Materials & Synthetics (SIC 282), millions of fixed 96$	Industry
161	IOMC_MFGO12	Production, Agricultural Chemicals (SIC 287), millions of fixed 96$	Industry
162	IOMC_MFGO13	Production, Other Chemicals & Allied (SIC 28, nec), millions of fixed 96$	Industry
163	IOMC_MFGO14	Production, Petroleum Refining (SIC 291), millions of fixed 96$	Industry
164	IOMC_MFGO15	Production, Asphalt, Coal, & Miscellaneous Products (SIC 295, 299), millions of fixed 96$	Industry

Row	Variable Name	Description	Source
165	IOMC_MFGO16	Production, Rubber & Miscellaneous Plastic Products (SIC 30), millions of fixed 96$	Industry
166	IOMC_MFGO17	Production, Leather & Leather Products (SIC 31), millions of fixed 96$	Industry
167	IOMC_MFGO18	Production, Glass & Glass Products (SIC 321, 322, 323), millions of fixed 96$	Industry
168	IOMC_MFGO19	Production, Cement, Hydraulic (SIC 324), millions of fixed 96$	Industry
169	IOMC_MFGO20	Production, Other Stone, Clay, & Glass Products (SIC 32, nec), millions of fixed 96$	Industry
170	IOMC_MFGO21	Production, Blast Furnace & Basic Steel (SIC 331), millions of fixed 96$	Industry
171	IOMC_MFGO22	Production, Aluminum (SIC 3334, pt 3341, 3353-5), millions of fixed 96$	Industry
172	IOMC_MFGO23	Production, Other Primary Metals (SIC 33, nec), millions of fixed 96$	Industry
173	IOMC_MFGO24	Production, Fabricated Metal Products (SIC 34), millions of fixed 96$	Industry
174	IOMC_MFGO25	Production, Industrial Machinery & Equipment (SIC 35), millions of fixed 96$	Industry
175	IOMC_MFGO26	Production, Electronic & Other Electric Equipment (SIC 36), millions of fixed 96$	Industry
176	IOMC_MFGO27	Production, Transportation Equipment (SIC 37), millions of fixed 96$	Industry
177	IOMC_MFGO28	Production, Instruments & Related Products (SIC 38), millions of fixed 96$	Industry
178	IOMC_MFGO29	Production, Miscellaneous Manufacturing Industries (SIC 39), millions of fixed 96$	Industry
179	IOMC_MFGO30	Production, Agricultural Production, Crops (SIC 01), millions of fixed 96$	Industry
180	IOMC_MFGO31	Production, Other Agricultural Production Including Livestock (SIC 02, 07, 08, 09), millions of fixed 96$	Industry
181	IOMC_MFGO32	Production, Coal Mining (SIC 12), millions of fixed 96$	Industry
182	IOMC_MFGO33	Production, Oil & Gas Extraction (SIC 13), millions of fixed 96$	Industry
183	IOMC_MFGO34	Production, Metal & Other Mining (SIC 10, 14), millions of fixed 96$	Industry
184	IOMC_MFGO35	Production, Construction (SIC 15, 16, 17), millions of fixed 96$	Industry
185	IOMC_NMFGO1	Production, Transportation Services (SIC 40, 41, 42, 43, 44, 45, 46, 47), millions of fixed 96$	Industry
186	IOMC_NMFGO2	Production, Communications (SIC 48), millions of fixed 96$	Industry

Row	Variable Name	Description	Source
187	IOMC_NMFGO3	Production, Electric Utilities (SIC 491, part of 493), millions of fixed 96$	Industry
188	IOMC_NMFGO4	Production, Gas Utilities (SIC 496, part of 493), millions of fixed 96$	Industry
189	IOMC_NMFGO5	Production, Water & Sewer Services (SIC 494, 495, 496, 497, part of 493), millions of fixed 96$	Industry
190	IOMC_NMFGO6	Production, Wholesale Trade (SIC 50,51), millions of fixed 96$	Industry
191	IOMC_NMFGO7	Production, Retail Trade (SIC 52, 53, 54, 55, 56, 57, 59, 739), millions of fixed 96$	Industry
192	IOMC_NMFGO8	Production, Finance, Insurance, Real Estate (SIC 60, 61, 62, 63, 65, 66, 153), millions of fixed 96$	Industry
193	IOMC_NMFGO9	Production, Services (SIC 58, 70, 73, 75, 76, 78, 79, 80, 82, 83, 84, 86, 89), millions of fixed 96$	Industry
194	IOMC_NMFGO10	Production, Government Enterprises (SIC part of 41, 431), millions of fixed 96$	Industry
195	IOMC_MFGTOT	Production, All Manufacturing, millions of fixed 96$	Industry
196	IOMC_INDTOT	Production, All non-service Industries, millions of fixed 96$	Industry
197	IOMC_TOTOUT	Production, Total, millions of fixed 96$	Industry
198	EPMC_EMP1	Employment, Food & Kindred Products exc Beverages (SIC 20 less 208), millions of employees	Employment
199	EPMC_EMP2	Employment, Beverages & Tobacco Products (SIC 208, 21), millions of employees	Employment
200	EPMC_EMP3	Employment, Textile Mill Products (SIC 22), millions of employees	Employment
201	EPMC_EMP4	Employment, Apparel & Other Textiles (SIC 23), millions of employees	Employment
202	EPMC_EMP5	Employment, Lumber & Wood Products (SIC 24), millions of employees	Employment
203	EPMC_EMP6	Employment, Furniture & Fixtures (SIC 25), millions of employees	Employment
204	EPMC_EMP7	Employment, Paper & Allied Industries (SIC 26), millions of employees	Employment
205	EPMC_EMP8	Employment, Printing & Publishing (SIC 27), millions of employees	Employment
206	EPMC_EMP9	Employment, Inorganic Chemicals (SIC 281), millions of employees	Employment
207	EPMC_EMP10	Employment, Organic Chemicals (SIC 286), millions of employees	Employment
208	EPMC_EMP11	Employment, Plastic Materials & Synthetics (SIC 282), millions of employees	Employment

Row	Variable Name	Description	Source
209	EPMC_EMP12	Employment, Agricultural Chemicals (SIC 287), millions of employees	Employment
210	EPMC_EMP13	Employment, Other Chemicals & Allied (SIC 28, nec), millions of employees	Employment
211	EPMC_EMP14	Employment, Petroleum Refining (SIC 291), millions of employees	Employment
212	EPMC_EMP15	Employment, Asphalt, Coal, & Miscellaneous Products (SIC 295, 299), millions of employees	Employment
213	EPMC_EMP16	Employment, Rubber & Miscellaneous Plastic Products (SIC 30), millions of employees	Employment
214	EPMC_EMP17	Employment, Leather & Leather Products (SIC 31), millions of employees	Employment
215	EPMC_EMP18	Employment, Glass & Glass Products (SIC 321, 322, 323), millions of employees	Employment
216	EPMC_EMP19	Employment, Cement, Hydraulic (SIC 324), millions of employees	Employment
217	EPMC_EMP20	Employment, Other Stone, Clay, & Glass Products (SIC 32, nec), millions of employees	Employment
218	EPMC_EMP21	Employment, Blast Furnace & Basic Steel (SIC 331), millions of employees	Employment
219	EPMC_EMP22	Employment, Aluminum (SIC 3334, pt 3341, 3353-5), millions of employees	Employment
220	EPMC_EMP23	Employment, Other Primary Metals (SIC 33, nec), millions of employees	Employment
221	EPMC_EMP24	Employment, Fabricated Metal Products (SIC 34), millions of employees	Employment
222	EPMC_EMP25	Employment, Industrial Machinery & Equipment (SIC 35), millions of employees	Employment
223	EPMC_EMP26	Employment, Electronic & Other Electric Equipment (SIC 36), millions of employees	Employment
224	EPMC_EMP27	Employment, Transportation Equipment (SIC 37), millions of employees	Employment
225	EPMC_EMP28	Employment, Instruments & Related Products (SIC 38), millions of employees	Employment
226	EPMC_EMP29	Employment, Miscellaneous Manufacturing Industries (SIC 39), millions of employees	Employment
227	EPMC_EMP30	Employment, Agricultural Production, Crops (SIC 01), millions of employees	Employment
228	EPMC_EMP31	Employment, Other Agricultural Production Including Livestock (SIC 02, 07, 08, 09), millions of employees	Employment
229	EPMC_EMP32	Employment, Coal Mining (SIC 12), millions of employees	Employment

Row	Variable Name	Description	Source
230	EPMC_EMP33	Employment, Oil & Gas Extraction (SIC 13), millions of employees	Employment
231	EPMC_EMP34	Employment, Metal & Other Mining (SIC 10, 14), millions of employees	Employment
232	EPMC_EMP35	Employment, Construction (SIC 15, 16, 17), millions of employees	Employment
233	EPMC_NEMP1	Employment, Transportation Services (SIC 40, 41, 42, 43, 44, 45, 46, 47), millions of employees	Employment
234	EPMC_NEMP2	Employment, Communications (SIC 48), millions of employees	Employment
235	EPMC_NEMP3	Employment, Electric Utilities (SIC 491, part of 493), millions of employees	Employment
236	EPMC_NEMP4	Employment, Gas Utilities (SIC 492, part of 493), millions of employees	Employment
237	EPMC_NEMP5	Employment, Water & Sewer Services (SIC 494, 495, 496, 497, part of 493), millions of employees	Employment
238	EPMC_NEMP6	Employment, Wholesale Trade (SIC 50,51), millions of employees	Employment
239	EPMC_NEMP7	Employment, Retail Trade (SIC 52, 53, 54, 55, 56, 57, 59, 739), millions of employees	Employment
240	EPMC_NEMP8	Employment, Finance, Insurance, Real Estate (SIC 60, 61, 62, 63, 65, 66, 153), millions of employees	Employment
241	EPMC_NEMP9	Employment, Services (SIC 58, 70, 73, 75, 76, 78, 79, 80, 82, 83, 84, 86, 89), millions of employees	Employment
242	EPMC_NEMP10	Employment, Federal Government, millions of employees	Employment
243	EPMC_NEMP11	Employment, State & Local Government, millions of employees	Employment

Table B4. MCRGBASE Input 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

Variables:

Variable Name	Description
CPI	Consumer Price Index (All Urban) - All Items, 1982-84 = 1.0
YPDR	Disposable Personal Income, billions of chained 2000$
YPCOMPWSD	Wage & Salary Disbursements, billions of nominal $
YP	Personal Income, billions of nominal $
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, millions of persons
RWM	Average Annual Manufacturing Wages, thousands of nominal $
RWNM	Average Annual Non-Manufacturing Wages, thousands of nominal $
KAMUSE	Commercial Floorspace, Amusement, billion square feet
KAUTO	Commercial Floorspace, Automotive, billion square feet
KDORM	Commercial Floorspace, Dormitories, billion square feet

Variable Name	Description
KEDUC	Commercial Floorspace, Education, billion square feet
KHEALTH	Commercial Floorspace, Health, billion square feet
KHOTEL	Commercial Floorspace, Hotels and Motels, billion square feet
KMFG	Commercial Floorspace, Manufacturing billion square feet
KMISCNR	Commercial Floorspace, Miscellaneous Non-residential, billion square feet
KOFFICE	Commercial Floorspace, Offices, billion square feet
KPUB	Commercial Floorspace, Public Sector, billion square feet
KREL	Commercial Floorspace, Religious, billion square feet
KSTORES	Commercial Floorspace, Stores and Restaurants, billion square feet
KWARE	Commercial Floorspace, Warehouses, billion square feet
EEA	Employment, Total Nonfarm (Millions of Persons)
EMFGO35	Employment, Construction (Millions of Persons)
ENMFGO10	Employment, Federal Government (Millions of Persons)
ENMFGO8	Employment, Financial, Insurance, Real Estate (Millions of Persons)
EMFGO32T34	Employment, Mining (Millions of Persons)
ENMFGO9	Employment, Other Services (Millions of Persons)
ENMFGO11	Employment, State & Local Government (Millions of Persons)
ENMFGO1T5	Employment, Transportation, Communications & Public Utilities (Millions of Persons)
ENMFGO7	Employment, Retail Trade (Millions of Persons)
ENMFGO6	Employment, Wholesale Trade (Millions of Persons)
EMFGO5	Employment, Wood Products (Millions of Persons)
EMFGO6	Employment, Furniture and Related Products (Millions of Persons)
EMFGO18T20	Employment, Nonmetallic Mineral Products (Millions of Persons)
EMFGO21T23	Employment, Primary Metal Industries (Millions of Persons)
EMFGO24	Employment, Fabricated Metal Products (Millions of Persons)
EMFGO25	Employment, Machinery (Millions of Persons)
EMFGO26	Employment, Other Electronic and Electric Products (Millions of Persons)
EMFGO27	Employment, Transportation Equipment (Millions of Persons)
EMFGO28	Employment, Measuring & Control Instruments (Millions of Persons)
EMFGO29	Employment, Miscellaneous Manufacturing (Millions of Persons)
EMFGO1	Employment, Food Products (Millions of Persons)
EMFGO2	Employment, Beverage and Tobacco Products (Millions of Persons)
EMFGO3	Employment, Textile Mills & Textile Products (Millions of Persons)
EMFGO4	Employment, Apparel (Millions of Persons)

Variable Name	Description
EMFGO7	Employment, Paper Products (Millions of Persons)
EMFGO8	Employment, Printing (Millions of Persons)
EMFGO9T13	Employment, Chemicals (Millions of Persons)
EMFGO14T15	Employment, Petroleum Products (Millions of Persons)
EMFGO16	Employment, Plastics and Rubber Products (Millions of Persons)
EMFGO17	Employment, Leather and Allied Products (Millions of Persons)
MFGO1	Production, Food Products (Billions of Fixed 1996 Dollars)
MFGO2	Production, Beverage and Tobacco Products (Billions of Fixed 1996 Dollars)
MFGO3	Production, Textile Mills & Textile Products (Billions of Fixed 1996 Dollars)
MFGO4	Production, Apparel (Billions of Fixed 1996 Dollars)
MFGO5	Production, Wood Products (Billions of Fixed 1996 Dollars)
MFGO6	Production, Furniture and Related Products (Billions of Fixed 1996 Dollars)
MFGO7	Production, Paper Products (Billions of Fixed 1996 Dollars)
MFGO8	Production, Printing (Billions of Fixed 1996 Dollars)
MFGO9	Production, Basic Inorganic Chemicals (Billions of Fixed 1996 Dollars)
MFGO10	Production, Basic Organic Chemicals (Billions of Fixed 1996 Dollars)
MFGO11	Production, Plastic and Synthetic Rubber Materials (Billions of Fixed 1996 Dollars)
MFGO12	Production, Agricultural Chemicals (Billions of Fixed 1996 Dollars)
MFGO13	Production, Other Chemical Products (Billions of Fixed 1996 Dollars)
MFGO14	Production, Petroleum Refineries (Billions of Fixed 1996 Dollars)
MFGO15	Production, Other Petroleum and Coal Products (Billions of Fixed 1996 Dollars)
MFGO16	Production, Plastics and Rubber Products (Billions of Fixed 1996 Dollars)
MFGO17	Production, Leather and Allied Products (Billions of Fixed 1996 Dollars)
MFGO18	Production, Glass & Glass Products (Billions of Fixed 1996 Dollars)
MFGO19	Production, Cement Manufacturing (Billions of Fixed 1996 Dollars)
MFGO20	Production, Other Nonmetallic Mineral Products (Billions of Fixed 1996 Dollars)
MFGO21	Production, Iron & Steel Mills, Ferroalloy & Steel Products (Billions of Fixed 1996 Dollars)
MFGO22	Production, Alumina & Aluminum Products (Billions of Fixed 1996 Dollars)
MFGO23	Production, Other Primary Metals (Billions of Fixed 1996 Dollars)
MFGO24	Production, Fabricated Metal Products (Billions of Fixed 1996 Dollars)
MFGO25	Production, Machinery (Billions of Fixed 1996 Dollars)
MFGO26	Production, Other Electronic & Electric Products (Billions of Fixed 1996 Dollars)
MFGO27	Production, Transportation Equipment (Billions of Fixed 1996 Dollars)
MFGO28	Production, Measuring & Control Instruments (Billions of Fixed 1996 Dollars)

Variable Name	Description
MFGO29	Production, Miscellaneous Manufacturing (Billions of Fixed 1996 Dollars)
MFGO30	Production, Crop Production (Billions of Fixed 1996 Dollars)
MFGO31	Production, Other Agriculture, Forestry, Fishing & Hunting (Billions of Fixed 1996 Dollars)
MFGO32	Production, Coal Mining (Billions of Fixed 1996 Dollars)
MFGO33	Production, Oil & Gas Extraction & Support Activities (Billions of Fixed 1996 Dollars)
MFGO34	Production, Other Mining & Quarrying (Billions of Fixed 1996 Dollars)
MFGO35	Production, Construction (Billions of Fixed 1996 Dollars)

Table B5. NEMS Input Variables for MAM Submodule

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

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

MAM Variable Name	Definition	NEMS Variable Name and Source
ENGDOMO	Domestic Production of Other Energy	QBLK Common Block: QUREL - Uranium, Electricity QTRAS - Total Renewables, All Sectors QSTRS - Solar Thermal, Residential QSTCM - Solar Thermal, Commercial QETTR - Ethanol, Transportation QPVCM - Photovoltaic, Commercial QHYTR - Liquid Hydrogen, Transportation COALOUT Common Block: CQSBB - Production of Coal RESDREP Common Block: QGERS - Geothermal, Residential PMMRPT Common Block: RFETHE85 - Production of E85 RFMETM85 - Production of M85 RFQDINPOT - Other Domestic Inputs to Refiners PMMOUT Common Block: RFCRDOTH - Other Crude Inputs NGTDMREP Common Block: OGPRSUP - Production of Supplemental Natural Gas
ENGDOMPETANG	Domestic Production of Petroleum and Natural Gas	PMMBLK Common Block: RFQTDCRD - Production of Crude Oil RFPQNGL - Production of Natural Gas Liquids NGTDMREP Common Block: OGPRDNG - Production of Dry Natural Gas
JPCNEFAC	Personal Consumption Deflator, Household Fuel Oil	MPBLK Common Block: PTPRS - Residential Total Petroleum Price
JPCNEGAO	Personal Consumption Deflator, Consumer Gasoline and Oil	AMPBLK Common Block: PMGTR – Transportation Motor Gasoline Price PDSTR – Transportation Distillate Price QBLK Common Block: QMGTR – Motor Gasoline, Transportation QDSTR – Distillate, Transportation

MAM Variable Name	Definition	NEMS Variable Name and Source
JPCSVHOPE	Personal Consumption Deflator, Household Electricity	AMPBLK Common Block: PELRS – Residential Purchased Electricity Price
JPCSVHOPG	Personal Consumption Deflator, Household Natural Gas	AMPBLK Common Block: PNGRS – Residential Natural Gas Price
JQIND12	Industrial Production Index - Coal Mining	COALOUT Common Block: CQSBB - Production of Coal
JQIND13	Industrial Production Index -Oil and Gas Extraction	PMMOUT Common Block: RFQTDCRD - Production of Crude Oil RFPQNGL - Production of Natural Gas Liquids NGTDMREP Common Block: OGPRDNG - Production of Dry Natural Gas
POILIMP	Weighted Average Price of Imported Crude	INTOUT Common Block: IT_WOP - World Oil Price
QGASASF	Highway Consumption of Gasoline and Special Fuels	QBLK Common Block: QMGTR - Motor Gasoline, Transportation QDSTR - Distillate, Transportation
WPI051	Producer Price Index - Coal	AMPBLK Common Block: PCLIN - Industrial Purchased Coal Price
WPI053	Producer Price Index - Gas Fuels	NGTDMREP Common Block: OGWPRNG - Natural Gas Wellhead Price
WPI054	Producer Price Index - Electric Power	AMPBLK Common Block: PELRS - Residential Purchased Electricity Price PELCM - Commercial Purchased Electricity Price PELIN - Industrial Purchased Electricity Price PELTR - Transportation Purchased Electricity Price
WPI055	Producer Price Index - Utility Natural Gas	AMPBLK Common Block: PNGRS - Residential Natural Gas Price PNGCM - Commercial Natural Gas Price PNGIN - Industrial Natural Gas Price PNGTR - Transportation Natural Gas Price PNGEL - Natural Gas Price to Electric Generators

MAM Variable Name	Definition	NEMS Variable Name and Source
WPI0561	Producer Price Index - Crude Petroleum	INTOUT Common Block: IT WOP - World Oil Price
WPI057	Producer Price Index - Refined Petroleum Products	AMPBLK Common Block: PTPRS - Residential Total Petroleum Price PDSCM - Commercial Distillate Price PRSCM - Commercial Residual Fuel Price PDSIN - Industrial Distillate Price PRSIN - Industrial Residual Fuel Price PDSTR - Transportation Distillate Price PJFTR - Transportation Jet Fuel Price PMGTR - Transportation Motor Gasoline Price PRSTR - Transportation Residual Fuel Price
WPI0574	Producer Price Index - Residual Petroleum Fuels	AMPBLK Common Block: PRSCM - Commercial Residual Fuel Price PRSIN - Industrial Residual Fuel Price PRSTR - Transportation Residual Fuel Price

Table B6. 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: TOTMINERS – Number of coal miners
MC_EMPNA(35)	Employment, Oil and Gas Extraction	OGSMOUT Common Block: OGJOBS – Number of jobs in oil and gas supply sector
MC_MFGO(14)	Output, Petroleum Refining	PMMOUT Common Block: RFQPRDT - Total Petroleum Product Supplied PMMRPT Common Block: RFPQIPRDT - Total Imported Petroleum Products
MC_MFGO(32)	Output, Coal Mining	COALOUT Common Block: CQSBB - Total Coal Production
MC_MFGO(33)	Output, Oil and Gas Extraction	PMMOUT Common Block: RFQTDCRD - Total Crude Oil Production RFPQNGL - Total Natural Gas Plant Liquids Production OGPRDNG - Total Dry Natural Gas Production OGPRSUP - Supplemental Natural Gas Production
MC_NMFGO(3)	Output, Electric Utilities	UEFDOUT Common Block: UGNTLNR - Total Electricity Generation
MC_NMFGO(4)	Output, Gas Utilities	PMMOUT Common Block: OGPRDNG - Total Dry Natural Gas Production

Table B7. 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 B8. 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_MFGO(1)	Production, Food Products (Billions of Fixed 1996 Dollars)
MC_MFGO(2)	Production, Beverage and Tobacco Products (Billions of Fixed 1996 Dollars)
MC_MFGO(3)	Production, Textile Mills & Textile Products (Billions of Fixed 1996 Dollars)
MC_MFGO(4)	Production, Apparel (Billions of Fixed 1996 Dollars)
MC_MFGO(5)	Production, Wood Products (Billions of Fixed 1996 Dollars)
MC_MFGO(6)	Production, Furniture and Related Products (Billions of Fixed 1996 Dollars)
MC_MFGO(7)	Production, Paper Products (Billions of Fixed 1996 Dollars)
MC_MFGO(8)	Production, Printing (Billions of Fixed 1996 Dollars)
MC_MFGO(9)	Production, Basic Inorganic Chemicals (Billions of Fixed 1996 Dollars)
MC_MFGO(10)	Production, Basic Organic Chemicals (Billions of Fixed 1996 Dollars)
MC_MFGO(11)	Production, Plastic and Synthetic Rubber Materials (Billions of Fixed 1996 Dollars)
MC_MFGO(12)	Production, Agricultural Chemicals (Billions of Fixed 1996 Dollars)
MC_MFGO(13)	Production, Other Chemical Products (Billions of Fixed 1996 Dollars)
MC_MFGO(14)	Production, Petroleum Refineries (Billions of Fixed 1996 Dollars)
MC_MFGO(15)	Production, Other Petroleum and Coal Products (Billions of Fixed 1996 Dollars)

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

Table B9. MC_EMPLOYMENT Output Variables

MACOUT Common Block Name	Description
MC_EMPNA(21)	Food Products, millions of employees
MC_EMPNA(22)	Beverage and Tobacco Products, millions of employees
MC_EMPNA(23)	Textile Mills & Textile Products, millions of employees
MC_EMPNA(24)	Apparel, millions of employees
MC_EMPNA(11)	Wood Products, millions of employees
MC_EMPNA(12)	Furniture and Related Products, millions of employees
MC_EMPNA(25)	Paper Products, millions of employees
MC_EMPNA(26)	Printing, millions of employees
	Basic Inorganic Chemicals, millions of employees
MC_EMPNA(34)	Basic Organic Chemicals, millions of employees
	Plastic and Synthetic Rubber Materials, millions of employees
	Agricultural Chemicals, millions of employees
	Other Chemical Products, millions of employees
MC_EMPNA(36)	Petroleum Refineries, millions of employees
	Other Petroleum and Coal Products, millions of employees
MC_EMPNA(29)	Plastics and Rubber Products, millions of employees
MC_EMPNA(30)	Leather and Allied Products, millions of employees
	Glass & Glass Products, millions of employees
	Cement Manufacturing, millions of employees
	Other Nonmetallic Mineral Products, millions of employees
MC_EMPNA(37)	Iron & Steel Mills, Ferroalloy & Steel Products, millions of employees
MC_EMPNA(38)	Alumina & Aluminum Products, millions of employees
	Other Primary Metals, millions of employees
MC_EMPNA(15)	Fabricated Metal Products, millions of employees
MC_EMPNA(16)	Machinery, millions of employees
MC_EMPNA(17)	Other Electronic & Electric Products, millions of employees
MC_EMPNA(18)	Transportation Equipment, millions of employees
MC_EMPNA(19)	Measuring & Control Instruments, millions of employees
MC_EMPNA(20)	Miscellaneous Manufacturing, millions of employees
	Crop Production, millions of employees
	Other Agriculture, Forestry, Fishing & Hunting, millions of employees
MC_EMPNA(34)	Coal Mining, millions of employees

MACOUT Common Block Name	Description
MC_EMPNA(35)	Oil & Gas Extraction & Support Activities, millions of employees
	Other Mining & Quarrying, millions of employees
MC_EMPNA(2)	Construction, millions of employees
	Transportation & Warehousing, millions of employees
	Broadcasting & Telecommunications, millions of employees
	Electric Power Generation & Distribution, millions of employees
	Natural Gas Distribution, millions of employees
	Water, Sewage & Related System, millions of employees
MC_EMPNA(10)	Wholesale Trade, millions of employees
MC_EMPNA(9)	Retail Trade, millions of employees
MC_EMPNA(4)	Finance & Insurance, Real Estate, millions of employees
MC_EMPNA(6)	Other Services, millions of employees
MC_EMPNA(3)	Public Administration, Federal Government, millions of employees
MC_EMPNA(7)	Public Administration, State & Local Government, millions of employees
MC_EMPNA(32)	Total Manufacturing, millions of employees
MC_EMPNA(33)	Total Non-Manufacturing, millions of employees
	Total Services, millions of employees
MC_EMPNA(1)	Total Nonfarm, millions of employees

Table B10. 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 B11. 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); HEAL	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); MISC	Commercial Floorspace, Miscellaneous Non-residential, billion square feet
MC_COMMFLSP(10); OFFI	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); STOR	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); EMFGO35	Employment, Construction (Millions of Persons)
MC_EMPNA(3); ENMFGO10	Employment, Federal Government (Millions of Persons)
MC_EMPNA(4); ENMFGO8	Employment, Financial, Insurance, Real Estate (Millions of Persons)
MC_EMPNA(5); EMFGO32T34	Employment, Mining (Millions of Persons)
MC_EMPNA(6); ENMFGO9	Employment, Other Services (Millions of Persons)
MC_EMPNA(7); ENMFGO11	Employment, State & Local Government (Millions of Persons)
MC_EMPNA(8); ENMFGO1T5	Employment, Transportation, Communications & Public Utilities (Millions of Persons)
MC_EMPNA(9); ENMFGO7	Employment, Retail Trade (Millions of Persons)
MC_EMPNA(10); ENMFGO6	Employment, Furniture and Related Products (Millions of Persons)
MC_EMPNA(11); EMFGO5	Employment, Wood Products (Millions of Persons)
MC_EMPNA(12); EMFGO6	Employment, Furniture and Related Products (Millions of Persons)
MC_EMPNA(13); EMFGO18T20	Employment, Nonmetallic Mineral Products (Millions of Persons)
MC_EMPNA(14); EMFGO21T23	Employment, Primary Metal Industries (Millions of Persons)
MC_EMPNA(15); EMFGO24	Employment, Fabricated Metal Products (Millions of Persons)
MC_EMPNA(16); EMFGO25	Employment, Machinery (Millions of Persons)
MC_EMPNA(17); EMFGO26	Employment, Other Electronic and Electric Products (Millions of Persons)
MC_EMPNA(18); EMFGO27	Employment, Transportation Equipment (Millions of Persons)
MC_EMPNA(19); EMFGO28	Employment, Measuring & Control Instruments (Millions of Persons)
MC_EMPNA(20); EMFGO29	Employment, Miscellaneous Manufacturing (Millions of Persons)
MC_EMPNA(21); EMFGO1	Employment, Food Products (Millions of Persons)
MC_EMPNA(22); EMFGO2	Employment, Beverage and Tobacco Products (Millions of Persons)
MC_EMPNA(23); EMFGO3	Employment, Textile Mills & Textile Products (Millions of Persons)
MC_EMPNA(24); EMFGO4	Employment, Apparel (Millions of Persons)

MACOUT Common Block Name	Description
MC_EMPNA(25); EMFGO7	Employment, Paper Products (Millions of Persons)
MC_EMPNA(26); EMFGO8	Employment, Printing (Millions of Persons)
MC_EMPNA(27); EMFGO9T13	Employment, Chemicals (Millions of Persons)
MC_EMPNA(28); EMFGO14T15	Employment, Petroleum Products (Millions of Persons)
MC_EMPNA(29); EMFGO16	Employment, Plastics and Rubber Products (Millions of Persons)
MC_EMPNA(30); EMFGO17	Employment, Leather and Allied Products (Millions of Persons)
MC_EMPNA(31); EMFGO30T31	Employment, Agriculture, Forestry, Fishing & Hunting, millions of persons
MC_MFGO(1)	Production, Food Products (Billions of Fixed 1996 Dollars)
MC_MFGO(2)	Production, Beverage and Tobacco Products (Billions of Fixed 1996 Dollars)
MC_MFGO(3)	Production, Textile Mills & Textile Products (Billions of Fixed 1996 Dollars)
MC_MFGO(4)	Production, Apparel (Billions of Fixed 1996 Dollars)
MC_MFGO(5)	Production, Wood Products (Billions of Fixed 1996 Dollars)
MC_MFGO(6)	Production, Furniture and Related Products (Billions of Fixed 1996 Dollars)
MC_MFGO(7)	Production, Paper Products (Billions of Fixed 1996 Dollars)
MC_MFGO(8)	Production, Printing (Billions of Fixed 1996 Dollars)
MC_MFGO(9)	Production, Basic Inorganic Chemicals (Billions of Fixed 1996 Dollars)
MC_MFGO(10)	Production, Basic Organic Chemicals (Billions of Fixed 1996 Dollars)
MC_MFGO(11)	Production, Plastic and Synthetic Rubber Materials (Billions of Fixed 1996 Dollars)
MC_MFGO(12)	Production, Agricultural Chemicals (Billions of Fixed 1996 Dollars)
MC_MFGO(13)	Production, Other Chemical Products (Billions of Fixed 1996 Dollars)
MC_MFGO(14)	Production, Petroleum Refineries (Billions of Fixed 1996 Dollars)
MC_MFGO(15)	Production, Other Petroleum and Coal Products (Billions of Fixed 1996 Dollars)
MC_MFGO(16)	Production, Plastics and Rubber Products (Billions of Fixed 1996 Dollars)
MC_MFGO(17)	Production, Leather and Allied Products (Billions of Fixed 1996 Dollars)
MC_MFGO(18)	Production, Glass & Glass Products (Billions of Fixed 1996 Dollars)
MC_MFGO(19)	Production, Cement Manufacturing (Billions of Fixed 1996 Dollars)
MC_MFGO(20)	Production, Other Nonmetallic Mineral Products (Billions of Fixed 1996 Dollars)
MC_MFGO(21)	Production, Iron & Steel Mills, Ferroalloy & Steel Products (Billions of Fixed 1996 Dollars)
MC_MFGO(22)	Production, Alumina & Aluminum Products (Billions of Fixed 1996 Dollars)
MC_MFGO(23)	Production, Other Primary Metals (Billions of Fixed 1996 Dollars)
MC_MFGO(24)	Production, Fabricated Metal Products (Billions of Fixed 1996 Dollars)

MACOUT Common Block Name	Description
MC_MFGO(25)	Production, Machinery (Billions of Fixed 1996 Dollars)
MC_MFGO(26)	Production, Other Electronic & Electric Products (Billions of Fixed 1996 Dollars)
MC_MFGO(27)	Production, Transportation Equipment (Billions of Fixed 1996 Dollars)
MC_MFGO(28)	Production, Measuring & Control Instruments (Billions of Fixed 1996 Dollars)
MC_MFGO(29)	Production, Miscellaneous Manufacturing (Billions of Fixed 1996 Dollars)
MC_MFGO(30)	Production, Crop Production (Billions of Fixed 1996 Dollars)
MC_MFGO(31)	Production, Other Agriculture, Forestry, Fishing & Hunting (Billions of Fixed 1996 Dollars)
MC_MFGO(32)	Production, Coal Mining (Billions of Fixed 1996 Dollars)
MC_MFGO(33)	Production, Oil & Gas Extraction & Support Activities (Billions of Fixed 1996 Dollars)
MC_MFGO(34)	Production, Other Mining & Quarrying (Billions of Fixed 1996 Dollars)
MC_MFGO(35)	Production, Construction (Billions of Fixed 1996 Dollars)

Table B12. 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$
YPCOMPWSD	Wage & Salary Disbursements, billions of nominal $
YP	Personal Income, billions of nominal $
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, millions of persons
RWM	Average Annual Manufacturing Wages, thousands of nominal $
RWNM	Average Annual Non-Manufacturing Wages, thousands of nominal $

Table B13. 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
STOR	Commercial Floorspace, Stores and Restaurants, billion square feet
WARE	Commercial Floorspace, Warehouses, billion square feet
OFFI	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
HEAL	Commercial Floorspace, Health, billion square feet
PUB	Commercial Floorspace, Public Sector, billion square feet
REL	Commercial Floorspace, Religious, billion square feet
AMUS	Commercial Floorspace, Amusement, billion square feet
MISC	Commercial Floorspace, Miscellaneous Non-residential, billion square feet
HOTE	Commercial Floorspace, Hotels and Motels, billion square feet
DORM	Commercial Floorspace, Dormitories, billion square feet
SUM	Total Commercial Floorspace, billion square feet

Table B14. 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)
EMFGO35	Employment, Construction (Millions of Persons)
ENMFGO10	Employment, Federal Government (Millions of Persons)
ENMFGO8	Employment, Financial, Insurance, Real Estate (Millions of Persons)
EMFGO32T34	Employment, Mining (Millions of Persons)
ENMFGO9	Employment, Other Services (Millions of Persons)
ENMFGO11	Employment, State & Local Government (Millions of Persons)
ENMFGO1T5	Employment, Transportation, Communications & Public Utilities (Millions of Persons)
ENMFGO7	Employment, Retail Trade (Millions of Persons)
ENMFGO6	Employment, Furniture and Related Products (Millions of Persons)
EMFGO5	Employment, Wood Products (Millions of Persons)
EMFGO6	Employment, Furniture and Related Products (Millions of Persons)
EMFGO18T20	Employment, Nonmetallic Mineral Products (Millions of Persons)
EMFGO21T23	Employment, Primary Metal Industries (Millions of Persons)
EMFGO24	Employment, Fabricated Metal Products (Millions of Persons)
EMFGO25	Employment, Machinery (Millions of Persons)
EMFGO26	Employment, Other Electronic and Electric Products (Millions of Persons)

Employment Variable Name	Description
EMFGO27	Employment, Transportation Equipment (Millions of Persons)
EMFGO28	Employment, Measuring & Control Instruments (Millions of Persons)
EMFGO29	Employment, Miscellaneous Manufacturing (Millions of Persons)
EMFGO1	Employment, Food Products (Millions of Persons)
EMFGO2	Employment, Beverage and Tobacco Products (Millions of Persons)
EMFGO3	Employment, Textile Mills & Textile Products (Millions of Persons)
EMFGO4	Employment, Apparel (Millions of Persons)
EMFGO7	Employment, Paper Products (Millions of Persons)
EMFGO8	Employment, Printing (Millions of Persons)
EMFGO9T13	Employment, Chemicals (Millions of Persons)
EMFGO14T15	Employment, Petroleum Products (Millions of Persons)
EMFGO16	Employment, Plastics and Rubber Products (Millions of Persons)
EMFGO17	Employment, Leather and Allied Products (Millions of Persons)
EMFGO30T31	Employment, Agriculture, Forestry, Fishing & Hunting, millions of persons

Table B15. 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
MFGO(1)	Production, Food Products (Billions of Fixed 1996 Dollars)
MFGO(2)	Production, Beverage and Tobacco Products (Billions of Fixed 1996 Dollars)
MFGO(3)	Production, Textile Mills & Textile Products (Billions of Fixed 1996 Dollars)
MFGO(4)	Production, Apparel (Billions of Fixed 1996 Dollars)
MFGO(5)	Production, Wood Products (Billions of Fixed 1996 Dollars)
MFGO(6)	Production, Furniture and Related Products (Billions of Fixed 1996 Dollars)
MFGO(7)	Production, Paper Products (Billions of Fixed 1996 Dollars)
MFGO(8)	Production, Printing (Billions of Fixed 1996 Dollars)
MFGO(9)	Production, Basic Inorganic Chemicals (Billions of Fixed 1996 Dollars)
MFGO(10)	Production, Basic Organic Chemicals (Billions of Fixed 1996 Dollars)
MFGO(11)	Production, Plastic and Synthetic Rubber Materials (Billions of Fixed 1996 Dollars)
MFGO(12)	Production, Agricultural Chemicals (Billions of Fixed 1996 Dollars)
MFGO(13)	Production, Other Chemical Products (Billions of Fixed 1996 Dollars)
MFGO(14)	Production, Petroleum Refineries (Billions of Fixed 1996 Dollars)
MFGO(15)	Production, Other Petroleum and Coal Products (Billions of Fixed 1996 Dollars)
MFGO(16)	Production, Plastics and Rubber Products (Billions of Fixed 1996 Dollars)
MFGO(17)	Production, Leather and Allied Products (Billions of Fixed 1996 Dollars)

Industrial Output Variable Name	Description
MFGO(18)	Production, Glass & Glass Products (Billions of Fixed 1996 Dollars)
MFGO(19)	Production, Cement Manufacturing (Billions of Fixed 1996 Dollars)
MFGO(20)	Production, Other Nonmetallic Mineral Products (Billions of Fixed 1996 Dollars)
MFGO(21)	Production, Iron & Steel Mills, Ferroalloy & Steel Products (Billions of Fixed 1996 Dollars)
MFGO(22)	Production, Alumina & Aluminum Products (Billions of Fixed 1996 Dollars)
MFGO(23)	Production, Other Primary Metals (Billions of Fixed 1996 Dollars)
MFGO(24)	Production, Fabricated Metal Products (Billions of Fixed 1996 Dollars)
MFGO(25)	Production, Machinery (Billions of Fixed 1996 Dollars)
MFGO(26)	Production, Other Electronic & Electric Products (Billions of Fixed 1996 Dollars)
MFGO(27)	Production, Transportation Equipment (Billions of Fixed 1996 Dollars)
MFGO(28)	Production, Measuring & Control Instruments (Billions of Fixed 1996 Dollars)
MFGO(29)	Production, Miscellaneous Manufacturing (Billions of Fixed 1996 Dollars)
MFGO(30)	Production, Crop Production (Billions of Fixed 1996 Dollars)
MFGO(31)	Production, Other Agriculture, Forestry, Fishing & Hunting (Billions of Fixed 1996 Dollars)
MFGO(32)	Production, Coal Mining (Billions of Fixed 1996 Dollars)
MFGO(33)	Production, Oil & Gas Extraction & Support Activities (Billions of Fixed 1996 Dollars)
MFGO(34)	Production, Other Mining & Quarrying (Billions of Fixed 1996 Dollars)
MFGO(35)	Production, Construction (Billions of Fixed 1996 Dollars)

Table B16. 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 TRAN
MC_EMPNA	Employment by Industrial Sector, millions of employees	IND
MC_GDPR	Gross Domestic Product, billions of chained 2000$	INTERCV MAIN RENEW 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 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 COALCPS COMM EPM IND NGHIST NGPTM NGTDM REFETH REFINE REFRPT RENEW RESD TRAN TRANFRT UDAT UECP EUEFD UEFP ULDSM WELLAK WELLCOST WELLEXP WELLIMP WELLLNG WELLOFF WELLOGS WELLUGR
MC_MFGO	Gross Output by Manufacturing Sector, billions of fixed 96$	IND TRAN TRANFRT
MC_MR	Imports of Goods & Services, billions of chained 2000$	TRAN
MC_NMFGO	Gross Output by Non-Manufacturing & Service Sector, billions of fixed 96$	TRAN TRANFRT

MACOUT Common Block Name	Macroeconomic Variable Description	Referencing NEMS Module or Submodules
MC_NP	Population Including Armed Forces Overseas, millions of persons	COMM RENEW TRAN
MC_NP16A	Population Aged 16 and Over, millions of persons	RESD TRAN
MC_RLRMCORPPUAA	Real Yield on AA Utility Bonds (= Nominal Yield - inflation)	COALCPS WELLOGS
MC_RMCORPBAA	Yield on Baa Rated Corporate Bonds	NGLNG NGTDM REFINE UTIL
MC_RMCORPPUAA	Yield on AA Utility Bonds	COALCDS NGPTM NGTDM UEFP
MC_RMGBLUSREAL	Real Average Yield on U.S. Treasury Long-term Bonds	COMM 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 TRANFRT
MC_WPI11	Producer Price Index, Machinery & Equipment, 1982 = 1.0	UEFP
MC_WPI14	Producer Price Index, Transportation Equipment, 1982 = 1.0	COALCDS 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 RESD TRAN

NEMS Module/Submodule 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 Submodule

Regional Macroeconomic Model

Endogenous Variables:

CPI_{R}	Consumer Price Index, all urban, 1982-84=1.0, regional
GSPR_{R}	Real Gross State Product, billions of 2000 dollars, 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
YPDR_{R}	Real Personal Disposable Income, billions of 2000 dollars, regional

Model description is in Chapter 7. Codes and descriptions of the regions are in Table B4.

Exogenous Variables:

CPI	Consumer Price Index, all urban, 1982-84=1.0, national
CPIZ_{R}	Regional Consumer Price Index Relative to National, 2003:4 value, regional
GDPR	Real Gross Domestic Product, billions of 2000 dollars, national
JPC	Consumption Deflator, index – 2000=100, national
JPC_REL_{R}	Regional Consumption Deflator Relative to National, 2003:4 value, regional
JWSSNF	Total Compensation in Non-Farm Business, index 1992=1.0, national
NP	Population, millions, national
NP_{R}	Population, millions, regional
TAXRATE_REL_{R}	Regional Personal Income Tax Rate Relative to National, 2003:4 value, regional
TIME	Time Trend, 1947:1 = 1
YP	Personal Income, billions of dollars, national
YPCOMPWSD	Wage and Salary Disbursements, billions of dollars, national
YPD	Personal Disposable Income, billions of dollars, national
YPDR	Real Personal Disposable Income, billions of 2000 dollars, national

Equations:

GSPR – Real Gross State Product

LOG(GSPRZNP_ENC) = 0.6251962047*LOG(GSPRZNP_ENC(-1)) + 0.3654994548*LOG(GDPRZN(-1)) + [AR(1)=0.8975637406]

LOG(GSPRZNP_ESC) = 0.7651341413*LOG(GSPRZNP_ESC(-1)) + 0.2181093306*LOG(GDPRZN) + [AR(1)=0.7952275284]

LOG(GSPRZNP_MATL) = 0.6243043863*LOG(GSPRZNP_MATL(-1)) + 0.3816209577*LOG(GDPRZN(-1)) + [AR(1)=0.6180528621]

LOG(GSPRZNP_MTN) = 0.7166843583*LOG(GSPRZNP_MTN(-1)) + 0.2738831386*LOG(GDPRZN(-1)) + [AR(1)=0.9188951018]

LOG(GSPRZNP_NENG) = 0.6629887342*LOG(GSPRZNP_NENG(-1)) + 0.345623143*LOG(GDPRZN(-1)) + [AR(1)=0.9341551125]

LOG(GSPRZNP_PAC) = 0.7271338242*LOG(GSPRZNP_PAC(-1)) + 0.2732347397*LOG(GDPRZN(-1)) + [AR(1)=0.9090583086]

LOG(GSPRZNP_SATL) = 0.755023368*LOG(GSPRZNP_SATL(-1)) + 0.2374730433*LOG(GDPRZN(-1)) + [AR(1)=0.8915356828]

LOG(GSPRZNP_WNC) = 0.6365841423*LOG(GSPRZNP_WNC(-1)) + 0.3522524121*LOG(GDPRZN(-1)) + [AR(1)=0.8285505662]

LOG(GSPRZNP_WSC) = 0.7450057489*LOG(GSPRZNP_WSC(-1)) + 0.2464315678*LOG(GDPRZN(-1)) + [AR(1)=0.9004248834]

YPDR – Real Personal Disposable Income

YPDR_ENC = 0.9997636238*EXP(LOG(YPDR/NP)-LOG(YPDR(-1)/NP(-1))+LOG(YPDR_ENC(-1)/NP_ENC(-1)))*NP_ENC

YPDR_ESC = 1.000424899*EXP(LOG(YPDR/NP)-LOG(YPDR(-1)/NP(-1))+LOG(YPDR_ESC(-1)/NP_ESC(-1)))*NP_ESC

YPDR_MATL = 1.000434222*EXP(LOG(YPDR/NP)-LOG(YPDR(-1)/NP(-1))+LOG(YPDR_MATL(-1)/NP_MATL(-1)))*NP_MATL

YPDR_MTN = 0.9995983905*EXP(LOG(YPDR/NP)-LOG(YPDR(-1)/NP(-1))+LOG(YPDR_MTN(-1)/NP_MTN(-1)))*NP_MTN

YPDR_NENG = 1.001016183*EXP(LOG(YPDR/NP)-LOG(YPDR(-1)/NP(-1))+LOG(YPDR_NENG(-1)/NP_NENG(-1)))*NP_NENG

YPDR_PAC = 0.9998580714*EXP(LOG(YPDR/NP)-LOG(YPDR(-1)/NP(-1))+LOG(YPDR_PAC(-1)/NP_PAC(-1)))*NP_PAC

YPDR_SATL = 1.000186689*EXP(LOG(YPDR/NP)-LOG(YPDR(-1)/NP(-1))+LOG(YPDR_SATL(-1)/NP_SATL(-1)))*NP_SATL

YPDR_WNC = 1.000225063*EXP(LOG(YPDR/NP)-LOG(YPDR(-1)/NP(-1))+LOG(YPDR_WNC(-1)/NP_WNC(-1)))*NP_WNC

YPDR_WSC = 1.000149559*EXP(LOG(YPDR/NP)-LOG(YPDR(-1)/NP(-1))+LOG(YPDR_WSC(-1)/NP_WSC(-1)))*NP_WSC + [AR(1)=0.1514636232]

YP – Personal Income

TAX = YP - YPD
TAXRATE = TAX / YP
YP_{R} = YPDR_{R} * JPC_REL_{R} * JPC / (1 - (TAXRATE_REL_{R} * TAXRATE))

YPCOMPWSD - Wage and Salary Disbursements

YPCOMPWSD_ENC/YP_ENC/NP_ENC = 5.438489889*YPCOMPWSD/YP/NP + 1.356511465*YPCOMPWSD(-1)/YP(-1)/NP(-1) + [AR(1)=0.9872676361]

YPCOMPWSD_ESC/YP_ESC/NP_ESC = 13.36906581*YPCOMPWSD/YP/NP + [AR(1)=0.6943998446,AR(2)=0.3027479385]

YPCOMPWSD_MATL/YP_MATL/NP_MATL = 0.001355264148 + 0.8584724363*YPCOMPWSD_MATL(-1)/YP_MATL(-1)/NP_MATL(-1) - 1.670653892*YPCOMPWSD(-2)/YP(-2)/NP(-2) + 1.985947456*YPCOMPWSD(-3)/YP(-3)/NP(-3) + [AR(2)=0.4631261442]

YPCOMPWSD_MTN/YP_MTN/NP_MTN = 7.228498327*YPCOMPWSD(-1)/YP(-1)/NP(-1) + [AR(1)=0.9897934963,MA(1)=-0.3328484361,BACKCAST=1972:2]

YPCOMPWSD_NENG/YP_NENG/NP_NENG = 5.915580401*YPCOMPWSD(-1)/YP(-1)/NP(-1) + [AR(1)=0.9986517272,MA(1)=-0.1700880458,MA(2)=0.1779290881,BACKCAST=1972:2]

YPCOMPWSD_PAC/YP_PAC/NP_PAC = 4.040756433*YPCOMPWSD/YP/NP + 0.7394987621*YPCOMPWSD(-1)/YP(-1)/NP(-1) + [AR(1)=0.9897785098]

YPCOMPWSD_SATL/YP_SATL/NP_SATL = 0.9749166811*YPCOMPWSD_SATL(-1)/YP_SATL(-1)/NP_SATL(-1) + 3.78806732*YPCOMPWSD/YP/NP - 3.66021572*YPCOMPWSD(-1)/YP(-1)/NP(-1)

YPCOMPWSD_WNC/YP_WNC/NP_WNC = 0.9873557838*YPCOMPWSD_WNC(-1)/YP_WNC(-1)/NP_WNC(-1) + 18.88431144*YPCOMPWSD/YP/NP - 18.66914819*YPCOMPWSD(-1)/YP(-1)/NP(-1) + [MA(2)=0.3023258533,BACKCAST=1972:2]

YPCOMPWSD_WSC/YP_WSC/NP_WSC = 5.555659321*YPCOMPWSD/YP/NP + [AR(1)=1.471262549,AR(2)=-0.3024456269,AR(3)=-0.1708824662,MA(1)=-0.5446207089,BACKCAST=1972:4]

RWM - Average Annual Manufacturing Wages

LOG(RWM_ENC) = 2.772532829 + 0.5009541989*@MOVAV(LOG(JWSSNF(-1)),4) + 0.004387118824*TIME + [AR(1)=0.9241312802,MA(1)=-0.3365486621,BACKCAST=1975:2]

LOG(RWM_ESC) = 1.000970664*LOG(RWM_ESC(-1)) + 0.4899619123*LOG(JWSSNF(-1)) - 0.4917639708*@MOVAV(LOG(JWSSNF(-1)),4) + [MA(1)=-0.30520525,BACKCAST=1970:2]

LOG(RWM_MATL) = 1.003560834*LOG(RWM_MATL(-1)) - 0.008597816155*LOG(JWSSNF(-1)) + [AR(1)=-0.3338532211,AR(2)=-0.1785058238]

LOG(RWM_MTN) = 1.003674985*LOG(RWM_MTN(-1)) - 0.007953857458*LOG(JWSSNF(-1)) + [AR(1)=-0.1867951641]

LOG(RWM_NENG) = 0.1683809622 + 0.9571209843*LOG(RWM_NENG(-1)) + 0.04537606944*LOG(JWSSNF(-1)) + [AR(1)=-0.4454026045]

LOG(RWM_PAC) = 1.003539055*LOG(RWM_PAC(-1)) - 0.009357256969*LOG(JWSSNF(-1))

LOG(RWM_SATL) = 0.5798970706 + 0.7971948458*LOG(RWM_SATL(-1)) + 0.1634594609*LOG(JWSSNF(-1)) + 0.0005993180495*TIME

LOG(RWM_WNC) = 0.5066566273 + 0.8553936717*LOG(RWM_WNC(-1)) + 0.1321545683*LOG(JWSSNF) + [AR(2)=-0.7781271271,MA(1)=-0.1303329962,MA(2)=0.9838678603,BACKCAST=1970:4]

LOG(RWM_WSC) = 1.003609685*LOG(RWM_WSC(-1)) - 0.008657758661*LOG(JWSSNF(-1))

RWNM - Average Annual Non-Manufacturing Wages

LOG(RWNM_ENC) = 1.001817086*LOG(RWNM_ENC(-1)) + 0.4392538072*LOG(JWSSNF) - 0.4420165606*LOG(JWSSNF(-1)) + [AR(1)=-0.4445086578,AR(2)=0.3651889592,MA(2)=-0.4308649754,BACKCAST=1970:4]

LOG(RWNM_ESC) = 1.344883966 + 0.5158146243*@MOVAV(LOG(RWNM_ESC(-1)),4) + 0.3629444295*LOG(JWSSNF) + 0.0008468595249*TIME + [AR(1)=0.5020933779,MA(2)=0.280306136,BACKCAST=1971:2]

LOG(RWNM_MATL) = 0.3557934529 + 0.870383887*LOG(RWNM_MATL(-1)) + 0.09291469804*LOG(JWSSNF(-1)) + 0.00051224288*TIME + [AR(1)=-0.5356845583]

LOG(RWNM_MTN) = 0.7679308566 + 0.7602097121*LOG(RWNM_MTN(-1)) + 0.239236005*LOG(JWSSNF) + [AR(1)=0.975194789,MA(1)=-0.9687607541,MA(2)=0.3113847179,BACKCAST=1970:3]

LOG(RWNM_NENG) = 0.1937245111 + 0.9454029986*LOG(RWNM_NENG(-1)) + 0.0579381218*LOG(JWSSNF) + [AR(1)=0.8975890334,MA(1)=-1.261620979,MA(2)=0.4544771169,BACKCAST=1970:3]

LOG(RWNM_PAC) = 0.9658055968*LOG(RWNM_PAC(-1)) + 0.4058029971*LOG(JWSSNF) - 0.432632857*LOG(JWSSNF(-1)) + 0.0006492958161*TIME + [AR(1)=-0.4675103968]

LOG(RWNM_SATL) = 0.4807192269 + 0.8531203794*LOG(RWNM_SATL(-1)) + 0.1504716914*LOG(JWSSNF) + [AR(1)=-0.3981596056]

LOG(RWNM_WNC) = 1.001414299*LOG(RWNM_WNC(-1)) + 0.393332393*LOG(JWSSNF(-1)) - 0.395140447*@MOVAV(LOG(JWSSNF(-1)),4) + [AR(1)=-0.2255876783]

LOG(RWNM_WSC) = 0.77011319 + 0.7614628227*LOG(RWNM_WSC(-1)) + 0.23537661*LOG(JWSSNF) + [AR(1)=0.9669957102,MA(1)=-0.9952364758,MA(2)=0.3952115945,BACKCAST=1970:3]

CPI – Consumer Price Index

$CPI_i = CPIZ_i * CPI$

Regional Commercial Floorspace Model

Endogenous Variables:

$Commflrsp_{ij}$ 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:

NP_{R}	Population, millions, regional
PYPDR_{R}	Real Personal Disposable Income per Capita, billions of 2000 dollars, regional
R1RMCORP_{R}	Average Yield on Aaa and Baa-rated Corporate Bonds Adjusted for Inflation, percent, regional

Equations:

AMUS Amusement

LOG(ENC_AMUS/ENC_NP) = 0.2946922971 + 0.9632410068*LOG(ENC_AMUS(-1)/ENC_NP(-1)) + 0.01496281154*LOG(ENC_PYPDR(-1)) - 0.0003708325756*ENC_R1RMCORP(-1) - 0.02948208722*D(ENC_NP)

LOG(ESC_AMUS/ESC_NP) = 1.312331544 + 0.0002166404311*TREND + 0.6499926226*LOG(ESC_AMUS(-1)/ESC_NP(-1)) + 0.1506605735*LOG(ESC_SUM(-1)/ESC_NP(-1)) - 0.04113002371*D(ESC_NP)

LOG(MATL_AMUS/MATL_NP) = 0.7980449335 + 0.9146126022*LOG(MATL_AMUS(-1)/MATL_NP(-1)) - 0.008437731238*LOG(MATL_PYPDR(-1))

LOG(MTN_AMUS/MTN_NP) = 0.7129992294*LOG(MTN_AMUS(-1)/MTN_NP(-1)) + 0.1876916773*LOG(MTN_SUM(-1)/MTN_NP(-1)) + 0.1053498647*LOG(MTN_PYPDR(-1)) - 0.06844592042*D(MTN_NP)

LOG(NENG_AMUS/NENG_NP) = 0.9399148303*LOG(NENG_AMUS(-1)/NENG_NP(-1)) + 0.04409175152*LOG(NENG_SUM(-1)/NENG_NP(-1)) - 0.0003312032118*NENG_R1RMCORP(-1)

LOG(PAC_AMUS/PAC_NP) = 0.9999679001*LOG(PAC_AMUS(-1)/PAC_NP(-1)) + [AR(1)=0.4118000864]

LOG(SATL_AMUS/SATL_NP) = 1.000212104*LOG(SATL_AMUS(-1)/SATL_NP(-1)) - 0.0001380613665*SATL_R1RMCORP(-1)

LOG(WNC_AMUS/WNC_NP) = 0.3447821745 + 0.9575810856*LOG(WNC_AMUS(-1)/WNC_NP(-1)) + 0.01501741174*LOG(WNC_PYPDR(-1))

LOG(WSC_AMUS/WSC_NP) = 0.7100629613 + 0.0001123817503*TREND + 0.9215587576*LOG(WSC_AMUS(-1)/WSC_NP(-1)) - 0.04982014524*D(WSC_NP)

AUTO Automotive; auto service and parking garages

LOG(ENC_AUTO/ENC_NP) = -0.3800960088 + 0.9319991595*LOG(ENC_AUTO(-1)/ENC_NP(-1)) + 0.0821780356*LOG(ENC_SUM(-1)/ENC_NP(-1))

LOG(ESC_AUTO/ESC_NP) = 0.7812229864 + 0.9074398981*LOG(ESC_AUTO(-1)/ESC_NP(-1)) + 0.02980036355*LOG(ESC_PYPDR(-1)) - 0.03716083308*D(ESC_NP)

LOG(MATL_AUTO/MATL_NP) = 1.00013508*LOG(MATL_AUTO(-1)/MATL_NP(-1))

LOG(MTN_AUTO/MTN_NP) = 0.8340379208*LOG(MTN_AUTO(-1)/MTN_NP(-1)) + 0.1035742306*LOG(MTN_SUM(-1)/MTN_NP(-1)) + 0.1034911227*LOG(MTN_PYPDR(-1)) - 0.001902029593*MTN_R1RMCORP(-1)

LOG(NENG_AUTO/NENG_NP) = 0.0002275179435*TREND + 0.8480549572*LOG(NENG_AUTO(-1)/NENG_NP(-1)) + 0.114716554*LOG(NENG_SUM(-1)/NENG_NP(-1)) - 0.0003196384003*NENG_R1RMCORP(-1)

LOG(PAC_AUTO/PAC_NP) = 1.000315812*LOG(PAC_AUTO(-1)/PAC_NP(-1))

LOG(SATL_AUTO) = -0.000332892513*TREND + 0.9730082313*LOG(SATL_AUTO(-1)) + 0.05821365373*LOG(SATL_YPDR(-1)) + [AR(2)=0.374886414]

LOG(WNC_AUTO) = 1.195038384 + 0.0003717878092*TREND + 0.90147931*LOG(WNC_AUTO(-1)) - 0.0004460092495*WNC_R1RMCORP(-1)

LOG(WSC_AUTO/WSC_NP) = 1.000212161*LOG(WSC_AUTO(-1)/WSC_NP(-1)) + [AR(1)=0.5581028164,AR(2)=0.257353257]

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

LOG(ENC_DORM/ENC_NP) = -0.0002295852949*TREND + 0.8886022982*LOG(ENC_DORM(-1)/ENC_NP(-1)) + 0.07081132403*LOG(ENC_SUM(-1)/ENC_NP(-1))

LOG(ESC_DORM/ESC_NP) = 8.142749125 + [AR(1)=0.1534317347,AR(2)=0.8340805241,MA(1)=0.984962736,BACKCAST=1976:3]

LOG(MATL_DORM) = 1.000080103*LOG(MATL_DORM(-1)) + [AR(1)=0.2853309784,AR(4)=0.3688930924]

LOG(MTN_DORM/MTN_NP) = 0.459304359*LOG(MTN_SUM(-1)/MTN_NP(-1)) + [AR(1)=0.9975964803]

LOG(NENG_DORM/NENG_NP) = -9.34741488e-005*TREND + 0.900889674*LOG(NENG_DORM(-1)/NENG_NP(-1)) + 0.06648222027*LOG(NENG_SUM(-1)/NENG_NP(-1)) - 0.0002041754312*NENG_R1RMCORP(-1)

LOG(PAC_DORM) = 2.617221798 - 0.0004906590655*TREND + 0.6682628152*LOG(PAC_DORM(-1)) + 0.08707010834*LOG(PAC_SUM(-1))

LOG(SATL_DORM) = 1.000096218*LOG(SATL_DORM(-1))

LOG(WNC_DORM/WNC_NP) = 0.9998790537*LOG(WNC_DORM(-1)/WNC_NP(-1))

LOG(WSC_DORM) = 2.060360093 + 0.8168818535*LOG(WSC_DORM(-1)) + 0.002992326793*LOG(WSC_SUM(-1))

EDUC Education; primary/secondary and higher education

LOG(ENC_EDUC/ENC_NP) = 0.9942116178 + 0.0001767416337*TREND + 0.9937140259*LOG(ENC_EDUC(-1)/ENC_NP(-1)) - 0.07569751323*LOG(ENC_SUM(-1)/ENC_NP(-1)) - 0.0002079596569*ENC_R1RMCORP(-1) - 0.02236534575*D(ENC_NP) + [AR(1)=0.4996746448]

LOG(ESC_EDUC/ESC_NP) = 0.8128410864*LOG(ESC_SUM(-1)/ESC_NP(-1)) + 0.03335404393*LOG(ESC_PYPDR(-1)) + [AR(1)=1.217402909,AR(4)=-0.2343878858]

LOG(MATL_EDUC/MATL_NP) = 0.5708201609 + 0.9435582663*LOG(MATL_EDUC(-1)/MATL_NP(-1)) + [AR(1)=0.4391810586,AR(3)=0.4032870797]

LOG(MTN_EDUC/MTN_NP) = 0.8690594996 + 9.593294434e-005*TREND + 0.7926462085*LOG(MTN_EDUC(-1)/MTN_NP(-1)) + 0.1005752975*LOG(MTN_SUM(-1)/MTN_NP(-1)) - 0.08601360248*D(MTN_NP)

LOG(NENG_EDUC/NENG_NP) = 1.000045554*LOG(NENG_EDUC(-1)/NENG_NP(-1))

LOG(PAC_EDUC/PAC_NP) = 0.999965666*LOG(PAC_EDUC(-1)/PAC_NP(-1)) + [AR(1)=0.7223636689]

LOG(SATL_EDUC) = 1.000360932*LOG(SATL_EDUC(-1)) + [AR(1)=0.422564979,AR(3)=0.2123985834,AR(4)=0.2705321217]

LOG(WNC_EDUC) = 1.000280863*LOG(WNC_EDUC(-1)) + [AR(2)=0.7625596451]

LOG(WSC_EDUC/WSC_NP) = 1.000195068*LOG(WSC_EDUC(-1)/WSC_NP(-1)) + [AR(1)=0.5628273134,AR(2)=0.230499651]

HEAL Health; hospitals and nursing homes

LOG(ENC_HEAL/ENC_NP) = 0.0001715701315*TREND + 0.8741761848*LOG(ENC_HEAL(-1)/ENC_NP(-1)) + 0.07986486017*LOG(ENC_SUM(-1)/ENC_NP(-1)) + 0.0526478618*LOG(ENC_PYPDR(-1)) + 0.0002308433174*ENC_R1RMCORP(-1) - 0.03682105848*D(ENC_NP)

LOG(ESC_HEAL/ESC_NP) = 0.9512305772*LOG(ESC_HEAL(-1)/ESC_NP(-1)) + 0.03057905338*LOG(ESC_SUM(-1)/ESC_NP(-1)) + 0.02932959706*LOG(ESC_PYPDR(-1)) - 0.07954422714*D(ESC_NP)

LOG(MATL_HEAL/MATL_NP) = 0.9558439603 + 0.0002410668592*TREND + 0.8948457794*LOG(MATL_HEAL(-1)/MATL_NP(-1)) + [AR(1)=0.2424258615]

LOG(MTN_HEAL/MTN_NP) = 0.9212119509*LOG(MTN_HEAL(-1)/MTN_NP(-1)) + 0.04488443473*LOG(MTN_SUM(-1)/MTN_NP(-1)) + 0.05731442515*LOG(MTN_PYPDR(-1)) - 0.1163096683*D(MTN_NP)

LOG(NENG_HEAL/NENG_NP) = -0.9694574204 + 0.9944334011*LOG(NENG_HEAL(-1)/NENG_NP(-1)) + 0.08277432594*LOG(NENG_SUM(-1)/NENG_NP(-1))

LOG(PAC_HEAL/PAC_NP) = 0.0006824507045*TREND + 0.6952376192*LOG(PAC_HEAL(-1)/PAC_NP(-1)) + 0.2290798121*LOG(PAC_SUM(-1)/PAC_NP(-1)) - 0.0006888956523*PAC_R1RMCORP(-1) - 0.04330034934*LOG(PAC_PYPDR(-1))

LOG(SATL_HEAL/SATL_NP) = 0.79789134 + 0.9808817996*LOG(SATL_HEAL(-1)/SATL_NP(-1)) - 0.05765651038*LOG(SATL_SUM(-1)/SATL_NP(-1)) + 0.03030876647*LOG(SATL_PYPDR(-1)) + [AR(1)=0.2995149135]

LOG(WNC_HEAL/WNC_NP) = 0.9387685313*LOG(WNC_HEAL(-1)/WNC_NP(-1)) + 0.03973352182*LOG(WNC_SUM(-1)/WNC_NP(-1)) + 0.0290983227*LOG(WNC_PYPDR(-1)) + 1.081525986e-009*D(WNC_HEAL(-1))/D(WNC_NP(-1))

LOG(WSC_HEAL/WSC_NP) = -0.6908388281 + 0.9634569002*LOG(WSC_HEAL(-1)/WSC_NP(-1)) + 0.0837249435*LOG(WSC_SUM(-1)/WSC_NP(-1)) + [AR(1)=0.4186001489,AR(2)=0.3083068119]

HOTE Hotel; hotels and motels

LOG(ENC_HOTE/ENC_NP) = 1.000761257*LOG(ENC_HOTE(-1)/ENC_NP(-1)) + [AR(1)=0.2565351098,AR(3)=0.5057297785]

D(ESC_HOTE) = 808.7030825 + [AR(1)=0.9393419316,MA(1)=-0.6335069577,BACKCAST=1976:3]

LOG(MATL_HOTE/MATL_NP) = 1.000453657*LOG(MATL_HOTE(-1)/MATL_NP(-1)) + [AR(2)=0.2976591516,AR(3)=0.366508945]

LOG(MTN_HOTE/MTN_NP) = 0.8564610979*LOG(MTN_HOTE(-1)/MTN_NP(-1)) + 0.08215931406*LOG(MTN_SUM(-1)/MTN_NP(-1)) + 0.1184090874*LOG(MTN_PYPDR(-1)) - 0.08766250452*D(MTN_NP) + [AR(1)=0.3065485652]

LOG(NENG_HOTE/NENG_NP) = -0.0002461026191*TREND + 0.9170875768*LOG(NENG_HOTE(-1)/NENG_NP(-1)) + 0.0306479172*LOG(NENG_SUM(-1)/NENG_NP(-1)) + 0.1123729858*LOG(NENG_PYPDR(-1)) + 0.0007009466978*NENG_R1RMCORP(-1) - 0.1489160617*D(NENG_NP)

LOG(PAC_HOTE/PAC_NP) = -0.0002598797603*TREND + 0.9793375631*LOG(PAC_HOTE(-1)/PAC_NP(-1)) + 0.06653372318*LOG(PAC_PYPDR(-1)) + 4.708910207e-005*D(PAC_HOTE(-1)/PAC_NP(-1))

LOG(SATL_HOTE/SATL_NP) = -0.8866621459 + 0.9441434887*LOG(SATL_HOTE(-1)/SATL_NP(-1)) + 0.1130740056*LOG(SATL_SUM(-1)/SATL_NP(-1)) + [AR(1)=0.4477718448,AR(2)=0.4892826702]

LOG(WNC_HOTE/WNC_NP) = 0.09604241057 + 0.9894296932*LOG(WNC_HOTE(-1)/WNC_NP(-1)) + [AR(1)=0.2068282179,AR(2)=0.2680710521]

LOG(WSC_HOTE/WSC_NP) = -0.0004918709314*TREND + 0.951922108*LOG(WSC_HOTE(-1)/WSC_NP(-1)) + 0.1567785963*LOG(WSC_PYPDR(-1)) + 0.00146944629*WSC_R1RMCORP(-1) - 0.06535928311*D(WSC_NP) + [AR(1)=0.3302202472]

MFG Manufacturing

LOG(ENC_MFG/ENC_NP) = 6.061810334 - 0.0007861982276*TREND + 0.4070200694*LOG(ENC_SUM(-1)/ENC_NP(-1)) + [AR(1)=1.324838951,AR(3)=-0.3400456536]

LOG(ESC_MFG/ESC_NP) = 10.86092441 + [AR(1)=1.913729263,AR(2)=-0.9273940012,MA(1)=-0.5736723797,BACKCAST=1976:3]

D(MATL_MFG) = -1549.204089 + [AR(1)=0.8110752494,MA(1)=-0.4015328904,BACKCAST=1976:3]

LOG(MTN_MFG/MTN_NP) = -0.002910304957*TREND + 0.8462890124*LOG(MTN_SUM(-1)/MTN_NP(-1)) + [AR(1)=0.8053350532]

LOG(NENG_MFG/NENG_NP) = -0.002868641764*TREND + 0.8997365635*LOG(NENG_SUM(-1)/NENG_NP(-1)) + [AR(1)=0.9708019022]

LOG(PAC_MFG/PAC_NP) = 0.9986827016*LOG(PAC_MFG(-1)/PAC_NP(-1)) + 0.004341004025*LOG(PAC_PYPDR(-1)) - 0.01568077393*D(PAC_NP)

DLOG(SATL_MFG) = 0.7265443626*DLOG(SATL_MFG(-1)) + 0.1209109431*DLOG(SATL_SUM(-1)) - 4.983691351e-005*SATL_R1RMCORP(-1) + [AR(1)=-0.4843535585]

LOG(WNC_MFG) = 1.000071731*LOG(WNC_MFG(-1)) + [AR(1)=0.2964389217,AR(2)=0.2661243529]

LOG(WSC_MFG/WSC_NP) = 1.591032573 - 0.000683530738*TREND + 0.7025425947*LOG(WSC_MFG(-1)/WSC_NP(-1)) + 0.1367788526*LOG(WSC_SUM(-1)/WSC_NP(-1)) - 0.044721438*LOG(WSC_PYPDR(-1)) + [AR(1)=0.1965754336,AR(2)=0.5909639685]

MISC Miscellaneous, non-residential transportation related and all other nec

LOG(ENC_MISC/ENC_NP) = 0.0002788190009*TREND + 0.942772042*LOG(ENC_MISC(-1)/ENC_NP(-1)) + 0.03616847544*LOG(ENC_SUM(-1)/ENC_NP(-1))

LOG(ESC_MISC/ESC_NP) = 0.9449841523*LOG(ESC_MISC(-1)/ESC_NP(-1)) + 0.02528370115*LOG(ESC_SUM(-1)/ESC_NP(-1)) + 0.047720156*LOG(ESC_PYPDR(-1)) + [AR(1)=0.2631080418]

LOG(MATL_MISC/MATL_NP) = 0.950989332*LOG(MATL_MISC(-1)/MATL_NP(-1)) + 0.01897552046*LOG(MATL_SUM(-1)/MATL_NP(-1)) + 0.05132179623*LOG(MATL_PYPDR(-1)) - 0.0005370275687*MATL_R1RMCORP(-1)

LOG(MTN_MISC/MTN_NP) = 0.9731727678*LOG(MTN_MISC(-1)/MTN_NP(-1)) + 0.0190381787*LOG(MTN_SUM(-1)/MTN_NP(-1))

LOG(NENG_MISC/NENG_NP) = 0.000359893726*TREND + 0.9374713086*LOG(NENG_MISC(-1)/NENG_NP(-1)) + 0.03730977795*LOG(NENG_SUM(-1)/NENG_NP(-1))

LOG(PAC_MISC/PAC_NP) = 0.8946144619*LOG(PAC_MISC(-1)/PAC_NP(-1)) + 0.04742833315*LOG(PAC_SUM(-1)/PAC_NP(-1)) + 0.09950395595*LOG(PAC_PYPDR(-1)) - 0.03315129567*D(PAC_NP) + [AR(1)=0.3501288014]

LOG(SATL_MISC/SATL_NP) = 0.0002540463264*TREND + 0.9391031877*LOG(SATL_MISC(-1)/SATL_NP(-1)) + 0.03962824841*LOG(SATL_SUM(-1)/SATL_NP(-1))

LOG(WNC_MISC/WNC_NP) = 0.9459852578*LOG(WNC_MISC(-1)/WNC_NP(-1)) + 0.02270793998*LOG(WNC_SUM(-1)/WNC_NP(-1)) + 0.05536992561*LOG(WNC_PYPDR(-1))

LOG(WSC_MISC/WSC_NP) = 0.9693462316*LOG(WSC_MISC(-1)/WSC_NP(-1)) + 0.02088499713*LOG(WSC_SUM(-1)/WSC_NP(-1)) + [AR(1)=0.3386869875]

OFFI Office; private, federal, and state and local offices

LOG(ENC_OFFI/ENC_NP) = 1.000097342*LOG(ENC_OFFI(-1)/ENC_NP(-1)) + [AR(1)=0.5180341567,AR(3)=0.3569752531]

LOG(ESC_OFFI) = 1.000179333*LOG(ESC_OFFI(-1)) + [AR(1)=0.2600502325,AR(2)=0.2606133907]

LOG(MATL_OFFI) = 0.180529141 - 0.0001694655073*TREND + 0.9802871292*LOG(MATL_OFFI(-1)) + 0.03634979796*LOG(MATL_PYPDR(-1)) + 0.000189227005*MATL_R1RMCORP(-1) + [AR(1)=0.3424417828]

LOG(MTN_OFFI/MTN_NP) = -0.0006651181794*TREND + 0.8672541959*LOG(MTN_OFFI(-1)/MTN_NP(-1)) + 0.09220116301*LOG(MTN_SUM(-1)/MTN_NP(-1)) + 0.108940611*LOG(MTN_PYPDR(-1)) - 0.08989132341*D(MTN_NP) + [AR(1)=0.4116486672]

LOG(NENG_OFFI/NENG_NP) = -0.0002604094721*TREND + 0.9594364634*LOG(NENG_OFFI(-1)/NENG_NP(-1)) + 0.02476591145*LOG(NENG_SUM(-1)/NENG_NP(-1)) + 0.04733041766*LOG(NENG_PYPDR(-1)) + [AR(1)=0.3436578394]

LOG(PAC_OFFI/PAC_NP) = 0.1923833173 + 0.9817756287*LOG(PAC_OFFI(-1)/PAC_NP(-1)) + 2.226108191e-005*D(PAC_OFFI(-1)/PAC_NP(-1)) + [AR(1)=-0.4554832166]

DLOG(SATL_OFFI/SATL_NP) = 0.9689271334*DLOG(SATL_OFFI(-1)/SATL_NP(-1)) + [AR(1)=-0.2550483395]

LOG(WNC_OFFI/WNC_NP) = 1.00009131*LOG(WNC_OFFI(-1)/WNC_NP(-1)) + [AR(1)=0.5317983039,AR(3)=0.2964746763]

DLOG(WSC_OFFI/WSC_NP) = 0.9507733064*DLOG(WSC_OFFI(-1)/WSC_NP(-1)) + [AR(1)=-0.3066237911]

PUB Public; federal and state and local

LOG(ENC_PUB/ENC_NP) = 0.6836323319 + 0.0006129235626*TREND + 0.9097607893*LOG(ENC_PUB(-1)/ENC_NP(-1)) - 0.0007436936812*ENC_R1RMCORP(-1)

LOG(ESC_PUB/ESC_NP) = 0.883488465*LOG(ESC_PUB(-1)/ESC_NP(-1)) + 0.05014165805*LOG(ESC_SUM(-1)/ESC_NP(-1)) + 0.1216149165*LOG(ESC_PYPDR(-1)) - 0.0006851411432*ESC_R1RMCORP(-1)

D(MATL_PUB) = 0.2838046221*D(MATL_PUB(-1)) + 0.7613136764*MATL_YPDR(-1)

LOG(MTN_PUB/MTN_NP) = 0.8679679158*LOG(MTN_PUB(-1)/MTN_NP(-1)) + 0.0581416429*LOG(MTN_SUM(-1)/MTN_NP(-1)) + 0.1350701671*LOG(MTN_PYPDR(-1)) + [AR(1)=0.2737721249]

LOG(NENG_PUB/NENG_NP) = 0.0003287439112*TREND + 0.923113686*LOG(NENG_PUB(-1)/NENG_NP(-1)) + 0.04972825249*LOG(NENG_SUM(-1)/NENG_NP(-1)) - 0.001102913783*NENG_R1RMCORP(-1) + [AR(1)=0.2373867168,AR(2)=0.2522793124]

LOG(PAC_PUB/PAC_NP) = 1.000636465*LOG(PAC_PUB(-1)/PAC_NP(-1))

LOG(SATL_PUB/SATL_NP) = 2.757016974 + 0.0008647477257*TREND + 0.8657448128*LOG(SATL_PUB(-1)/SATL_NP(-1)) - 0.1379425312*LOG(SATL_SUM(-1)/SATL_NP(-1)) - 0.001233050585*SATL_R1RMCORP(-1)

LOG(WNC_PUB/WNC_NP) = 0.7297791088*LOG(WNC_SUM(-1)/WNC_NP(-1)) + [AR(1)=1.312608575,AR(3)=-0.3145804854]

LOG(WSC_PUB/WSC_NP) = 1.000865193*LOG(WSC_PUB(-1)/WSC_NP(-1)) + [AR(1)=0.4340273435]

REL Religious

LOG(ENC_REL/ENC_NP) = 1.000013886*LOG(ENC_REL(-1)/ENC_NP(-1)) - 5.670635211e-005*ENC_R1RMCORP(-1) - 0.01827560653*D(ENC_NP) + [AR(1)=0.3408843025]

LOG(ESC_REL/ESC_NP) = 1.791883238 - 0.001601431467*TREND + 0.6308482618*LOG(ESC_SUM(-1)/ESC_NP(-1)) + [AR(1)=0.9610805525]

LOG(MATL_REL/MATL_NP) = 0.9996759291*LOG(MATL_REL(-1)/MATL_NP(-1)) + [AR(1)=0.6306976981,AR(3)=0.2626035405]

LOG(MTN_REL/MTN_NP) = -0.001508954836*TREND + 0.667478334*LOG(MTN_REL(-1)/MTN_NP(-1)) + 0.2585187228*LOG(MTN_SUM(-1)/MTN_NP(-1)) + [AR(1)=0.6587940555]

LOG(NENG_REL/NENG_NP) = 0.9995883907*LOG(NENG_REL(-1)/NENG_NP(-1)) + [AR(1)=0.4030190387,AR(4)=0.354338415]

DLOG(PAC_REL,2) = 0 + [AR(1)=-0.4391872461]

LOG(SATL_REL/SATL_NP) = 0.9959865927*LOG(SATL_REL(-1)/SATL_NP(-1)) + 0.002827209706*LOG(SATL_SUM(-1)/SATL_NP(-1)) + [AR(1)=0.3682503632,AR(2)=0.2404055689]

LOG(WNC_REL/WNC_NP) = 0.2580791133 - 0.0005022992816*TREND + 0.8361720778*LOG(WNC_REL(-1)/WNC_NP(-1)) + 0.1031096944*LOG(WNC_SUM(-1)/WNC_NP(-1)) + 0.020328855*LOG(WNC_PYPDR(-1)) + [AR(1)=0.2647339728]

LOG(WSC_REL/WSC_NP) = 0.9997326081*LOG(WSC_REL(-1)/WSC_NP(-1)) + [AR(1)=0.613976166,AR(2)=0.243352476]

STOR Stores; stores and restaurants

LOG(ENC_STOR/ENC_NP) = 1.000242205*LOG(ENC_STOR(-1)/ENC_NP(-1)) - 0.0001617161748*ENC_R1RMCORP(-1) + [AR(1)=0.3736358375,AR(3)=0.324481297]

LOG(ESC_STOR/ESC_NP) = -2.41635664 + 0.0004666466679*TREND + 0.3355333681*LOG(ESC_STOR(-1)/ESC_NP(-1)) + 0.7487021386*LOG(ESC_SUM(-1)/ESC_NP(-1)) + 0.02940027996*LOG(ESC_PYPDR(-1)) - 0.08018053883*D(ESC_NP) + [AR(1)=0.5475723914]

LOG(MATL_STOR/MATL_NP) = 1.27504258 + 0.9900784214*LOG(MATL_STOR(-1)/MATL_NP(-1)) - 0.09838529398*LOG(MATL_SUM(-1)/MATL_NP(-1)) + 0.01192417302*LOG(MATL_PYPDR(-1)) - 0.0002110428084*MATL_R1RMCORP(-1) + [AR(1)=0.4298728952]

LOG(MTN_STOR/MTN_NP) = 0.7416497417*LOG(MTN_STOR(-1)/MTN_NP(-1)) + 0.2134134813*LOG(MTN_SUM(-1)/MTN_NP(-1)) + 0.04147988095*LOG(MTN_PYPDR(-1)) - 0.0004586105851*MTN_R1RMCORP(-1) - 0.1093581879*D(MTN_NP)

LOG(NENG_STOR/NENG_NP) = 1.000035688*LOG(NENG_STOR(-1)/NENG_NP(-1)) + [AR(1)=0.3557612895,AR(4)=0.2494106702]

LOG(PAC_STOR/PAC_NP) = 0.6918224792 + 0.930505826*LOG(PAC_STOR(-1)/PAC_NP(-1)) + 0.01149820247*LOG(PAC_PYPDR(-1)) - 0.01319108239*D(PAC_NP) + 3.249202202e-008*D(PAC_STOR(-1))/D(PAC_NP(-1))

LOG(SATL_STOR/SATL_NP) = 0.9112587986*LOG(SATL_STOR(-1)/SATL_NP(-1)) + 0.06951698519*LOG(SATL_SUM(-1)/SATL_NP(-1)) + 0.02618329913*LOG(SATL_PYPDR(-1)) + [AR(1)=0.3399004804,AR(2)=0.2813483631,AR(3)=0.2150911556]

LOG(WNC_STOR/WNC_NP) = 0.7488094088 + 0.9238936078*LOG(WNC_STOR(-1)/WNC_NP(-1)) + 0.01898348262*LOG(WNC_PYPDR(-1)) - 0.0001331041003*WNC_R1RMCORP(-1) + [AR(1)=0.2414403414]

LOG(WSC_STOR/WSC_NP) = 1.00017816*LOG(WSC_STOR(-1)/WSC_NP(-1)) + [AR(1)=0.5241015864,AR(2)=0.3581133598]

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

LOG(ENC_WARE/ENC_NP) = -0.6720173803 + 0.9074953899*LOG(ENC_WARE(-1)/ENC_NP(-1)) + 0.1255129496*LOG(ENC_SUM(-1)/ENC_NP(-1)) + 0.02161814473*LOG(ENC_PYPDR(-1)) - 0.0004211427443*ENC_R1RMCORP(-1) + [AR(1)=0.5476647435,AR(4)=0.2151861598]

DLOG(ESC_WARE/ESC_NP) = 0.0007705595278 + 0.4987079939*DLOG(ESC_WARE(-1)/ESC_NP(-1)) + 0.6335933318*DLOG(ESC_SUM(-1)/ESC_NP(-1)) + [AR(1)=-0.4167590313]

LOG(MATL_WARE/MATL_NP) = 0.06653326789 - 0.0001579471051*TREND + 0.9860301292*LOG(MATL_WARE(-1)/MATL_NP(-1)) + 0.02819697333*LOG(MATL_PYPDR(-1)) - 0.0002106091808*MATL_R1RMCORP(-1) + [AR(1)=0.2936443911]

LOG(MTN_WARE/MTN_NP) = 0.8331510411*LOG(MTN_WARE(-1)/MTN_NP(-1)) + 0.126482307*LOG(MTN_SUM(-1)/MTN_NP(-1)) + 0.05531459438*LOG(MTN_PYPDR(-1)) - 0.1355862855*D(MTN_NP)

LOG(NENG_WARE/NENG_NP) = -0.0002103727208*TREND + 0.9910348004*LOG(NENG_WARE(-1)/NENG_NP(-1)) + 0.03477374393*LOG(NENG_PYPDR(-1)) - 0.0003561518006*NENG_R1RMCORP(-1) + [AR(1)=0.2145960105]

LOG(PAC_WARE/PAC_NP) = 0.002403519465*TREND + 0.8240791307*LOG(PAC_SUM(-1)/PAC_NP(-1)) + [AR(1)=1.376343575,AR(3)=-0.4018194817]

LOG(SATL_WARE/SATL_NP) = 1.000422001*LOG(SATL_WARE(-1)/SATL_NP(-1)) + [AR(1)=0.6017528978,AR(2)=0.3262414328]

LOG(WNC_WARE/WNC_NP) = 0.7553236725*LOG(WNC_WARE(-1)/WNC_NP(-1)) + 0.2038704943*LOG(WNC_SUM(-1)/WNC_NP(-1)) + [AR(1)=0.6615501781,AR(2)=0.2636057513]

LOG(WSC_WARE/WSC_NP) = 1.000538645*LOG(WSC_WARE(-1)/WSC_NP(-1)) - 0.0004732588772*WSC_R1RMCORP + [AR(1)=0.6056312293,AR(2)=0.3138862369]

Regional Industry and Employment Model

Regional Industry Output

Endogenous Variables:

{I}_{R}	Output in billions of real 1996 dollars for sector I, region R (e.g. MFGO1_ENC)
X{I}_{R}	Output in billions of real 1996 dollars for sector I, region R, equation estimate (e.g. XMFGO1_ENC)

Codes and descriptions of the sectors are presented in Table A14. Codes and descriptions of the regions are in Table B4.

Exogenous Variables:

{I}_SUM	Output in billions of real 1996 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.

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

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

MFGO1 - Food Products
LOG(XMFGO1_ENC/MFGO1_SUM) = 0.9291359483 - 2.384405455 +
0.3849755476*LOG((YPDR_ENC/NP_ENC)/(YPDR_SUM/NP_SUM)) -
0.2601036713*LOG(RWM_ENC/RWM_AVG) - 0.005228341397*@TREND

LOG(XMFGO1_ESC/MFGO1_SUM) = -0.4508832676 - 2.384405455 +
0.3849755476*LOG((YPDR_ESC/NP_ESC)/(YPDR_SUM/NP_SUM)) -
0.2601036713*LOG(RWM_ESC/RWM_AVG) + 0.00352863456*@TREND

LOG(XMFGO1_MATL/MFGO1_SUM) = 0.2970913014 - 2.384405455 +
0.3849755476*LOG((YPDR_MATL/NP_MATL)/(YPDR_SUM/NP_SUM)) -
0.2601036713*LOG(RWM_MATL/RWM_AVG) - 0.01314670767*@TREND

LOG(XMFGO1_MTN/MFGO1_SUM) = -0.9536166343 - 2.384405455 +
0.3849755476*LOG((YPDR_MTN/NP_MTN)/(YPDR_SUM/NP_SUM)) -
0.2601036713*LOG(RWM_MTN/RWM_AVG) + 0.01004857318*@TREND

LOG(XMFGO1_NENG/MFGO1_SUM) = -1.251212625 - 2.384405455 +
0.3849755476*LOG((YPDR_NENG/NP_NENG)/(YPDR_SUM/NP_SUM)) -
0.2601036713*LOG(RWM_NENG/RWM_AVG) - 0.007507679561*@TREND

LOG(XMFGO1_PAC/MFGO1_SUM) = 0.3511636962 - 2.384405455 +
0.3849755476*LOG((YPDR_PAC/NP_PAC)/(YPDR_SUM/NP_SUM)) -
0.2601036713*LOG(RWM_PAC/RWM_AVG) + 0.002751628798*@TREND

LOG(XMFGO1_SATL/MFGO1_SUM) = 0.3063910249 - 2.384405455 +
0.3849755476*LOG((YPDR_SATL/NP_SATL)/(YPDR_SUM/NP_SUM)) -
0.2601036713*LOG(RWM_SATL/RWM_AVG) + 0.002834014371*@TREND

LOG(XMFGO1_WNC/MFGO1_SUM) = 0.7162012126 - 2.384405455 +
0.3849755476*LOG((YPDR_WNC/NP_WNC)/(YPDR_SUM/NP_SUM)) -
0.2601036713*LOG(RWM_WNC/RWM_AVG) - 0.0007595854061*@TREND

LOG(XMFGO1_WSC/MFGO1_SUM) = 0.05572934392 - 2.384405455 +
0.3849755476*LOG((YPDR_WSC/NP_WSC)/(YPDR_SUM/NP_SUM)) -
0.2601036713*LOG(RWM_WSC/RWM_AVG) + 0.006454635538*@TREND

MFGO2 - Beverage and Tobacco Products
LOG(XMFGO2_ENC/MFGO2_SUM) = 0.4187255949 - 2.416242134 +
1.343872389*LOG((GSPR_ENC/NP_ENC)/(GSPR_SUM/NP_SUM)) -
0.2415520182*LOG(RWM_ENC/RWM_AVG) - 0.01945410385*@TREND

LOG(XMFGO2_ESC/MFGO2_SUM) = 0.7755188273 - 2.416242134 +
1.343872389*LOG((GSPR_ESC/NP_ESC)/(GSPR_SUM/NP_SUM)) -
0.2415520182*LOG(RWM_ESC/RWM_AVG) - 0.04094702063*@TREND

LOG(XMFGO2_MATL/MFGO2_SUM) = -0.0334790468 - 2.416242134 +
1.343872389*LOG((GSPR_MATL/NP_MATL)/(GSPR_SUM/NP_SUM)) -
0.2415520182*LOG(RWM_MATL/RWM_AVG) - 0.01761992513*@TREND

LOG(XMFGO2_MTN/MFGO2_SUM) = -0.501404003 - 2.416242134 +
1.343872389*LOG((GSPR_MTN/NP_MTN)/(GSPR_SUM/NP_SUM)) -
0.2415520182*LOG(RWM_MTN/RWM_AVG) - 0.01017096079*@TREND

LOG(XMFGO2_NENG/MFGO2_SUM) = -1.544325421 - 2.416242134 +
1.343872389*LOG((GSPR_NENG/NP_NENG)/(GSPR_SUM/NP_SUM)) -
0.2415520182*LOG(RWM_NENG/RWM_AVG) - 0.006481644943*@TREND

LOG(XMFGO2_PAC/MFGO2_SUM) = 0.1561165097 - 2.416242134 +
1.343872389*LOG((GSPR_PAC/NP_PAC)/(GSPR_SUM/NP_SUM)) -
0.2415520182*LOG(RWM_PAC/RWM_AVG) + 0.01018665752*@TREND

LOG(XMFGO2_SATL/MFGO2_SUM) = 1.38004889 - 2.416242134 +
1.343872389*LOG((GSPR_SATL/NP_SATL)/(GSPR_SUM/NP_SUM)) -
0.2415520182*LOG(RWM_SATL/RWM_AVG) + 0.01696622891*@TREND

LOG(XMFGO2_WNC/MFGO2_SUM) = -0.3194882597 - 2.416242134 +
1.343872389*LOG((GSPR_WNC/NP_WNC)/(GSPR_SUM/NP_SUM)) -
0.2415520182*LOG(RWM_WNC/RWM_AVG) - 0.02398237985*@TREND

LOG(XMFGO2_WSC/MFGO2_SUM) = -0.3317130919 - 2.416242134 +
1.343872389*LOG((GSPR_WSC/NP_WSC)/(GSPR_SUM/NP_SUM)) -
0.2415520182*LOG(RWM_WSC/RWM_AVG) - 0.001962216159*@TREND

MFGO3 - Textile Mills & Textile Products

LOG(XMFGO3_ENC/MFGO3_SUM) = -0.2031794136 - 1.924571864 +
0.5202008654*LOG(GSPR_ENC/GSPR_SUM) - 0.01489564983*@TREND

LOG(XMFGO3_ESC/MFGO3_SUM) = 1.120146928 - 1.924571864 +
0.5202008654*LOG(GSPR_ESC/GSPR_SUM) + 0.004739375991*@TREND

LOG(XMFGO3_MATL/MFGO3_SUM) = 0.4813269253 - 1.924571864 +
0.5202008654*LOG(GSPR_MATL/GSPR_SUM) + 0.002390565033*@TREND

LOG(XMFGO3_MTN/MFGO3_SUM) = -1.236925674 - 1.924571864 +
0.5202008654*LOG(GSPR_MTN/GSPR_SUM) + 0.01541615605*@TREND

LOG(XMFGO3_NENG/MFGO3_SUM) = 0.4737760692 - 1.924571864 +
0.5202008654*LOG(GSPR_NENG/GSPR_SUM) + 0.004584385576*@TREND

LOG(XMFGO3_PAC/MFGO3_SUM) = -0.6890207069 - 1.924571864 +
0.5202008654*LOG(GSPR_PAC/GSPR_SUM) + 0.02932349374*@TREND

LOG(XMFGO3_SATL/MFGO3_SUM) = 2.425315351 - 1.924571864 +
0.5202008654*LOG(GSPR_SATL/GSPR_SUM) - 0.004486014543*@TREND

LOG(XMFGO3_WNC/MFGO3_SUM) = -1.439973306 - 1.924571864 +
0.5202008654*LOG(GSPR_WNC/GSPR_SUM) + 0.02336414736*@TREND

LOG(XMFGO3_WSC/MFGO3_SUM) = -0.9314661734 - 1.924571864 +
0.5202008654*LOG(GSPR_WSC/GSPR_SUM) + 0.01315708418*@TREND

MFGO4 - Apparel

LOG(XMFGO4_ENC/MFGO4_SUM) = -1.038490347 - 1.207582757 +
0.8605197019*LOG((GSPR_ENC/NP_ENC)/(GSPR_SUM/NP_SUM)) -
0.6694558057*LOG(RWM_ENC/RWM_AVG) + 0.6652537393*LOG(NP_ENC/NP_SUM)

LOG(XMFGO4_ESC/MFGO4_SUM) = 1.106670159 - 1.207582757 +
0.8605197019*LOG((GSPR_ESC/NP_ESC)/(GSPR_SUM/NP_SUM)) -
0.6694558057*LOG(RWM_ESC/RWM_AVG) + 0.6652537393*LOG(NP_ESC/NP_SUM)

LOG(XMFGO4_MATL/MFGO4_SUM) = 1.105343798 - 1.207582757 +
0.8605197019*LOG((GSPR_MATL/NP_MATL)/(GSPR_SUM/NP_SUM)) -
0.6694558057*LOG(RWM_MATL/RWM_AVG) + 0.6652537393*LOG(NP_MATL/NP_SUM)

LOG(XMFGO4_MTN/MFGO4_SUM) = -1.607687311 - 1.207582757 +
0.8605197019*LOG((GSPR_MTN/NP_MTN)/(GSPR_SUM/NP_SUM)) -
0.6694558057*LOG(RWM_MTN/RWM_AVG) + 0.6652537393*LOG(NP_MTN/NP_SUM)

LOG(XMFGO4_NENG/MFGO4_SUM) = -0.6571094796 - 1.207582757 +
0.8605197019*LOG((GSPR_NENG/NP_NENG)/(GSPR_SUM/NP_SUM)) -
0.6694558057*LOG(RWM_NENG/RWM_AVG) + 0.6652537393*LOG(NP_NENG/NP_SUM)

LOG(XMFGO4_PAC/MFGO4_SUM) = 0.7483070164 - 1.207582757 +
0.8605197019*LOG((GSPR_PAC/NP_PAC)/(GSPR_SUM/NP_SUM)) -
0.6694558057*LOG(RWM_PAC/RWM_AVG) + 0.6652537393*LOG(NP_PAC/NP_SUM)

LOG(XMFGO4_SATL/MFGO4_SUM) = 0.8663175264 - 1.207582757 +
0.8605197019*LOG((GSPR_SATL/NP_SATL)/(GSPR_SUM/NP_SUM)) -
0.6694558057*LOG(RWM_SATL/RWM_AVG) + 0.6652537393*LOG(NP_SATL/NP_SUM)

LOG(XMFGO4_WNC/MFGO4_SUM) = -0.8649125959 - 1.207582757 +
0.8605197019*LOG((GSPR_WNC/NP_WNC)/(GSPR_SUM/NP_SUM)) -
0.6694558057*LOG(RWM_WNC/RWM_AVG) + 0.6652537393*LOG(NP_WNC/NP_SUM)

LOG(XMFGO4_WSC/MFGO4_SUM) = 0.3415612332 - 1.207582757 +
0.8605197019*LOG((GSPR_WSC/NP_WSC)/(GSPR_SUM/NP_SUM)) -
0.6694558057*LOG(RWM_WSC/RWM_AVG) + 0.6652537393*LOG(NP_WSC/NP_SUM)

MFGO5 - Wood Products
LOG(XMFGO5_ENC/MFGO5_SUM) = -0.2790895392 - 0.01670646263 +
0.8655384345*LOG(GSPR_ENC/GSPR_SUM) -
0.9067523205*LOG(RWM_ENC/RWM_AVG) +
0.1558654627*LOG(HUSPS_ENC/HUSPS_SUM) + 0.01676512697*@TREND

LOG(XMFGO5_ESC/MFGO5_SUM) = 0.4921558733 - 0.01670646263 +
0.8655384345*LOG(GSPR_ESC/GSPR_SUM) - 0.9067523205*LOG(RWM_ESC/RWM_AVG)
+ 0.1558654627*LOG(HUSPS_ESC/HUSPS_SUM) + 0.01491459046*@TREND

LOG(XMFGO5_MATL/MFGO5_SUM) = -0.885604028 - 0.01670646263 +
0.8655384345*LOG(GSPR_MATL/GSPR_SUM) -
0.9067523205*LOG(RWM_MATL/RWM_AVG) +
0.1558654627*LOG(HUSPS_MATL/HUSPS_SUM) + 0.008520835573*@TREND

LOG(XMFGO5_MTN/MFGO5_SUM) = 0.4556468948 - 0.01670646263 +
0.8655384345*LOG(GSPR_MTN/GSPR_SUM) -
0.9067523205*LOG(RWM_MTN/RWM_AVG) +
0.1558654627*LOG(HUSPS_MTN/HUSPS_SUM) - 0.03007196914*@TREND

LOG(XMFGO5_NENG/MFGO5_SUM) = -0.318645944 - 0.01670646263 +
0.8655384345*LOG(GSPR_NENG/GSPR_SUM) -
0.9067523205*LOG(RWM_NENG/RWM_AVG) +
0.1558654627*LOG(HUSPS_NENG/HUSPS_SUM) - 0.006479902499*@TREND

LOG(XMFGO5_PAC/MFGO5_SUM) = 0.8852109297 - 0.01670646263 +
0.8655384345*LOG(GSPR_PAC/GSPR_SUM) - 0.9067523205*LOG(RWM_PAC/RWM_AVG)
+ 0.1558654627*LOG(HUSPS_PAC/HUSPS_SUM) - 0.02577091317*@TREND

LOG(XMFGO5_SATL/MFGO5_SUM) = -0.0927721413 - 0.01670646263 +
0.8655384345*LOG(GSPR_SATL/GSPR_SUM) -
0.9067523205*LOG(RWM_SATL/RWM_AVG) +
0.1558654627*LOG(HUSPS_SATL/HUSPS_SUM) + 0.008393877071*@TREND

LOG(XMFGO5_WNC/MFGO5_SUM) = -0.1131362601 - 0.01670646263 +
0.8655384345*LOG(GSPR_WNC/GSPR_SUM) -
0.9067523205*LOG(RWM_WNC/RWM_AVG) +
0.1558654627*LOG(HUSPS_WNC/HUSPS_SUM) + 0.007835407075*@TREND

LOG(XMFGO5_WSC/MFGO5_SUM) = -0.1437657852 - 0.01670646263 +
0.8655384345*LOG(GSPR_WSC/GSPR_SUM) -
0.9067523205*LOG(RWM_WSC/RWM_AVG) +
0.1558654627*LOG(HUSPS_WSC/HUSPS_SUM) + 0.007208715333*@TREND

MFGO6 - Furniture and Related Products
LOG(XMFGO6_ENC/MFGO6_SUM) = 0.7545521112 - 1.819882087 +
0.9216278415*LOG((YPDR_ENC/NP_ENC)/(YPDR_SUM/NP_SUM)) +
0.2558369475*LOG(HUSPS_ENC/HUSPS_SUM) + 0.008189359072*@TREND

LOG(XMFGO6_ESC/MFGO6_SUM) = 0.5924018362 - 1.819882087 +
0.9216278415*LOG((YPDR_ESC/NP_ESC)/(YPDR_SUM/NP_SUM)) +
0.2558369475*LOG(HUSPS_ESC/HUSPS_SUM) + 0.000312367756*@TREND

LOG(XMFGO6_MATL/MFGO6_SUM) = 0.2762015431 - 1.819882087 +
0.9216278415*LOG((YPDR_MATL/NP_MATL)/(YPDR_SUM/NP_SUM)) +
0.2558369475*LOG(HUSPS_MATL/HUSPS_SUM) - 0.01252440197*@TREND

LOG(XMFGO6_MTN/MFGO6_SUM) = -1.236123907 - 1.819882087 +
0.9216278415*LOG((YPDR_MTN/NP_MTN)/(YPDR_SUM/NP_SUM)) +
0.2558369475*LOG(HUSPS_MTN/HUSPS_SUM) + 0.0184018214*@TREND

LOG(XMFGO6_NENG/MFGO6_SUM) = -0.9235352943 - 1.819882087 +
0.9216278415*LOG((YPDR_NENG/NP_NENG)/(YPDR_SUM/NP_SUM)) +
0.2558369475*LOG(HUSPS_NENG/HUSPS_SUM) - 0.002414630328*@TREND

LOG(XMFGO6_PAC/MFGO6_SUM) = 0.1965551269 - 1.819882087 +
0.9216278415*LOG((YPDR_PAC/NP_PAC)/(YPDR_SUM/NP_SUM)) +
0.2558369475*LOG(HUSPS_PAC/HUSPS_SUM) + 0.003913661968*@TREND

LOG(XMFGO6_SATL/MFGO6_SUM) = 0.7608459948 - 1.819882087 +
0.9216278415*LOG((YPDR_SATL/NP_SATL)/(YPDR_SUM/NP_SUM)) +
0.2558369475*LOG(HUSPS_SATL/HUSPS_SUM) - 0.007595309131*@TREND

LOG(XMFGO6_WNC/MFGO6_SUM) = -0.3712629843 - 1.819882087 +
0.9216278415*LOG((YPDR_WNC/NP_WNC)/(YPDR_SUM/NP_SUM)) +
0.2558369475*LOG(HUSPS_WNC/HUSPS_SUM) + 0.01785761325*@TREND

LOG(XMFGO6_WSC/MFGO6_SUM) = -0.04963442631 - 1.819882087 +
0.9216278415*LOG((YPDR_WSC/NP_WSC)/(YPDR_SUM/NP_SUM)) +
0.2558369475*LOG(HUSPS_WSC/HUSPS_SUM) - 0.01753340695*@TREND

MFGO7 - Paper Products
LOG(XMFGO7_ENC/MFGO7_SUM) = 0.5064555899 - 0.6194396369 +
0.7744122265*LOG(GSPR_ENC/GSPR_SUM) -
0.3208132446*LOG(RWM_ENC/RWM_AVG) + 0.0007375193041*@TREND

LOG(XMFGO7_ESC/MFGO7_SUM) = 0.7098353502 - 0.6194396369 +
0.7744122265*LOG(GSPR_ESC/GSPR_SUM) - 0.3208132446*LOG(RWM_ESC/RWM_AVG)
- 0.002940341846*@TREND

LOG(XMFGO7_MATL/MFGO7_SUM) = 0.005431112512 - 0.6194396369 +
0.7744122265*LOG(GSPR_MATL/GSPR_SUM) -
0.3208132446*LOG(RWM_MATL/RWM_AVG) - 0.004792539571*@TREND

LOG(XMFGO7_MTN/MFGO7_SUM) = -1.526813326 - 0.6194396369 +
0.7744122265*LOG(GSPR_MTN/GSPR_SUM) -
0.3208132446*LOG(RWM_MTN/RWM_AVG) + 0.02578614119*@TREND

LOG(XMFGO7_NENG/MFGO7_SUM) = 0.3220989186 - 0.6194396369 +
0.7744122265*LOG(GSPR_NENG/GSPR_SUM) -
0.3208132446*LOG(RWM_NENG/RWM_AVG) - 0.00174760417*@TREND

LOG(XMFGO7_PAC/MFGO7_SUM) = -0.04989517339 - 0.6194396369 +
0.7744122265*LOG(GSPR_PAC/GSPR_SUM) - 0.3208132446*LOG(RWM_PAC/RWM_AVG)
- 0.009259006063*@TREND

LOG(XMFGO7_SATL/MFGO7_SUM) = 0.2448258 - 0.6194396369 +
0.7744122265*LOG(GSPR_SATL/GSPR_SUM) -
0.3208132446*LOG(RWM_SATL/RWM_AVG) + 0.00191130847*@TREND

LOG(XMFGO7_WNC/MFGO7_SUM) = -0.1295223795 - 0.6194396369 +
0.7744122265*LOG(GSPR_WNC/GSPR_SUM) -
0.3208132446*LOG(RWM_WNC/RWM_AVG) + 0.006912712027*@TREND

LOG(XMFGO7_WSC/MFGO7_SUM) = -0.08241589226 - 0.6194396369 +
0.7744122265*LOG(GSPR_WSC/GSPR_SUM) -
0.3208132446*LOG(RWM_WSC/RWM_AVG) + 0.008326806929*@TREND

MFGO8 - Printing
LOG(XMFGO8_ENC/MFGO8_SUM) = 1.080281497 - 2.352921556 +
1.080421996*LOG((GSPR_ENC/NP_ENC)/(GSPR_SUM/NP_SUM)) -
0.9895533123*LOG(RWM_ENC/RWM_AVG)

LOG(XMFGO8_ESC/MFGO8_SUM) = -0.5365279569 - 2.352921556 +
1.080421996*LOG((GSPR_ESC/NP_ESC)/(GSPR_SUM/NP_SUM)) -
0.9895533123*LOG(RWM_ESC/RWM_AVG)

LOG(XMFGO8_MATL/MFGO8_SUM) = 0.605641262 - 2.352921556 +
1.080421996*LOG((GSPR_MATL/NP_MATL)/(GSPR_SUM/NP_SUM)) -
0.9895533123*LOG(RWM_MATL/RWM_AVG)

LOG(XMFGO8_MTN/MFGO8_SUM) = -0.8773614369 - 2.352921556 +
1.080421996*LOG((GSPR_MTN/NP_MTN)/(GSPR_SUM/NP_SUM)) -
0.9895533123*LOG(RWM_MTN/RWM_AVG)

LOG(XMFGO8_NENG/MFGO8_SUM) = -0.4781260507 - 2.352921556 +
1.080421996*LOG((GSPR_NENG/NP_NENG)/(GSPR_SUM/NP_SUM)) -
0.9895533123*LOG(RWM_NENG/RWM_AVG)

LOG(XMFGO8_PAC/MFGO8_SUM) = 0.3002088095 - 2.352921556 +
1.080421996*LOG((GSPR_PAC/NP_PAC)/(GSPR_SUM/NP_SUM)) -
0.9895533123*LOG(RWM_PAC/RWM_AVG)

LOG(XMFGO8_SATL/MFGO8_SUM) = 0.2336334757 - 2.352921556 +
1.080421996*LOG((GSPR_SATL/NP_SATL)/(GSPR_SUM/NP_SUM)) -
0.9895533123*LOG(RWM_SATL/RWM_AVG)

LOG(XMFGO8_WNC/MFGO8_SUM) = 0.08432195752 - 2.352921556 +
1.080421996*LOG((GSPR_WNC/NP_WNC)/(GSPR_SUM/NP_SUM)) -
0.9895533123*LOG(RWM_WNC/RWM_AVG)

LOG(XMFGO8_WSC/MFGO8_SUM) = -0.4120715577 - 2.352921556 +
1.080421996*LOG((GSPR_WSC/NP_WSC)/(GSPR_SUM/NP_SUM)) -
0.9895533123*LOG(RWM_WSC/RWM_AVG)

MFGO9 - Basic Inorganic Chemicals
LOG(XMFGO9_ENC/MFGO9_SUM) = -0.06647799632 + 0.6332685131 +
1.341613885*LOG(GSPR_ENC/GSPR_SUM) + 0.08580172975*LOG(WPI053_1)

LOG(XMFGO9_ESC/MFGO9_SUM) = 1.63122431 + 0.6332685131 +
1.341613885*LOG(GSPR_ESC/GSPR_SUM) + 0.01097852009*LOG(WPI053_1)

LOG(XMFGO9_MATL/MFGO9_SUM) = -0.4484301096 + 0.6332685131 +
1.341613885*LOG(GSPR_MATL/GSPR_SUM) - 0.1966455329*LOG(WPI053_1)

LOG(XMFGO9_MTN/MFGO9_SUM) = -0.4371164294 + 0.6332685131 +
1.341613885*LOG(GSPR_MTN/GSPR_SUM) + 0.3313581007*LOG(WPI053_1)

LOG(XMFGO9_NENG/MFGO9_SUM) = -0.6708505491 + 0.6332685131 +
1.341613885*LOG(GSPR_NENG/GSPR_SUM) + 0.1082800187*LOG(WPI053_1)

LOG(XMFGO9_PAC/MFGO9_SUM) = -0.7136299648 + 0.6332685131 +
1.341613885*LOG(GSPR_PAC/GSPR_SUM) - 0.2878044497*LOG(WPI053_1)

LOG(XMFGO9_SATL/MFGO9_SUM) = 0.1204203264 + 0.6332685131 +
1.341613885*LOG(GSPR_SATL/GSPR_SUM) - 0.1380990201*LOG(WPI053_1)

LOG(XMFGO9_WNC/MFGO9_SUM) = -0.2055931729 + 0.6332685131 +
1.341613885*LOG(GSPR_WNC/GSPR_SUM) + 0.277913367*LOG(WPI053_1)

LOG(XMFGO9_WSC/MFGO9_SUM) = 0.7904535861 + 0.6332685131 +
1.341613885*LOG(GSPR_WSC/GSPR_SUM) + 0.2111197965*LOG(WPI053_1)

MFGO10 - Basic Organic Chemicals
LOG(XMFGO10_ENC/MFGO10_SUM) = 0.1318947895 + 0.3132830931 +
1.473640705*LOG(GSPR_ENC/GSPR_SUM) - 0.009830022086*LOG(WPI053_1)

LOG(XMFGO10_ESC/MFGO10_SUM) = 1.746211235 + 0.3132830931 +
1.473640705*LOG(GSPR_ESC/GSPR_SUM) - 0.06665913943*LOG(WPI053_1)

LOG(XMFGO10_MATL/MFGO10_SUM) = -0.1000718664 + 0.3132830931 +
1.473640705*LOG(GSPR_MATL/GSPR_SUM) - 0.2386512434*LOG(WPI053_1)

LOG(XMFGO10_MTN/MFGO10_SUM) = -1.025995824 + 0.3132830931 +
1.473640705*LOG(GSPR_MTN/GSPR_SUM) + 0.3082753942*LOG(WPI053_1)

LOG(XMFGO10_NENG/MFGO10_SUM) = -0.8673443262 + 0.3132830931 +
1.473640705*LOG(GSPR_NENG/GSPR_SUM) - 0.07024696065*LOG(WPI053_1)

LOG(XMFGO10_PAC/MFGO10_SUM) = -1.888418154 + 0.3132830931 +
1.473640705*LOG(GSPR_PAC/GSPR_SUM) - 0.4571979206*LOG(WPI053_1)

LOG(XMFGO10_SATL/MFGO10_SUM) = 0.0636974224 + 0.3132830931 +
1.473640705*LOG(GSPR_SATL/GSPR_SUM) - 0.1692426089*LOG(WPI053_1)

LOG(XMFGO10_WNC/MFGO10_SUM) = -0.5216865516 + 0.3132830931 +
1.473640705*LOG(GSPR_WNC/GSPR_SUM) + 0.1670531547*LOG(WPI053_1)

LOG(XMFGO10_WSC/MFGO10_SUM) = 2.461713276 + 0.3132830931 +
1.473640705*LOG(GSPR_WSC/GSPR_SUM) + 0.05840097111*LOG(WPI053_1)

MFGO11 - Plastic and Synthetic Rubber Materials
LOG(XMFGO11_ENC/MFGO11_SUM) = 0.686554658 - 2.560617683 + 0.02714357976*LOG(WPI053_1)

LOG(XMFGO11_ESC/MFGO11_SUM) = 0.2508616508 - 2.560617683 - 0.1027828472*LOG(WPI053_1)

LOG(XMFGO11_MATL/MFGO11_SUM) = -0.2141214512 - 2.560617683 - 0.326379906*LOG(WPI053_1)

LOG(XMFGO11_MTN/MFGO11_SUM) = -0.6647589011 - 2.560617683 - 0.5778096646*LOG(WPI053_1)

LOG(XMFGO11_NENG/MFGO11_SUM) = -0.9122916392 - 2.560617683 - 0.1790540061*LOG(WPI053_1)

LOG(XMFGO11_PAC/MFGO11_SUM) = -0.7116882873 - 2.560617683 - 0.4007875953*LOG(WPI053_1)

LOG(XMFGO11_SATL/MFGO11_SUM) = 1.21712197 - 2.560617683 - 0.1350452071*LOG(WPI053_1)

LOG(XMFGO11_WNC/MFGO11_SUM) = -0.9298146747 - 2.560617683 - 0.253594204*LOG(WPI053_1)

LOG(XMFGO11_WSC/MFGO11_SUM) = 1.278136675 - 2.560617683 + 0.3919512173*LOG(WPI053_1)

MFGO12 - Agricultural Chemicals
LOG(XMFGO12_ENC/MFGO12_SUM) = -0.6662875348 - 0.02977178213 + 1.073203399*LOG(GSPR_ENC/GSPR_SUM) + 0.2493418613*LOG(WPI053_1)

LOG(XMFGO12_ESC/MFGO12_SUM) = 0.2700339388 - 0.02977178213 + 1.073203399*LOG(GSPR_ESC/GSPR_SUM) - 0.0174836904*LOG(WPI053_1)

LOG(XMFGO12_MATL/MFGO12_SUM) = -1.619628906 - 0.02977178213 + 1.073203399*LOG(GSPR_MATL/GSPR_SUM) - 0.3419392144*LOG(WPI053_1)

LOG(XMFGO12_MTN/MFGO12_SUM) = 0.257055275 - 0.02977178213 + 1.073203399*LOG(GSPR_MTN/GSPR_SUM) - 0.2390125819*LOG(WPI053_1)

LOG(XMFGO12_NENG/MFGO12_SUM) = -0.1355818955 - 0.02977178213 + 1.073203399*LOG(GSPR_NENG/GSPR_SUM) - 0.3229599316*LOG(WPI053_1)

LOG(XMFGO12_PAC/MFGO12_SUM) = -1.04269705 - 0.02977178213 + 1.073203399*LOG(GSPR_PAC/GSPR_SUM) - 0.1256290793*LOG(WPI053_1)

LOG(XMFGO12_SATL/MFGO12_SUM) = 0.6347623965 - 0.02977178213 +
1.073203399*LOG(GSPR_SATL/GSPR_SUM) - 0.1846447713*LOG(WPI053_1)

LOG(XMFGO12_WNC/MFGO12_SUM) = 1.27611595 - 0.02977178213 +
1.073203399*LOG(GSPR_WNC/GSPR_SUM) + 0.1100647212*LOG(WPI053_1)

LOG(XMFGO12_WSC/MFGO12_SUM) = 1.026227826 - 0.02977178213 +
1.073203399*LOG(GSPR_WSC/GSPR_SUM) + 0.1533959327*LOG(WPI053_1)

MFGO13 - Other Chemical Products
LOG(XMFGO13_ENC/MFGO13_SUM) = 0.6360423704 - 0.1505955655 +
1.038128392*LOG(GSPR_ENC/GSPR_SUM) - 0.001432369024*@TREND

LOG(XMFGO13_ESC/MFGO13_SUM) = -0.2225423992 - 0.1505955655 +
1.038128392*LOG(GSPR_ESC/GSPR_SUM) + 0.009148090398*@TREND

LOG(XMFGO13_MATL/MFGO13_SUM) = 0.7749164572 - 0.1505955655 +
1.038128392*LOG(GSPR_MATL/GSPR_SUM) - 0.00333530675*@TREND

LOG(XMFGO13_MTN/MFGO13_SUM) = -0.6077493283 - 0.1505955655 +
1.038128392*LOG(GSPR_MTN/GSPR_SUM) + 0.000953056723*@TREND

LOG(XMFGO13_NENG/MFGO13_SUM) = 0.08023246678 - 0.1505955655 +
1.038128392*LOG(GSPR_NENG/GSPR_SUM) + 0.00873269406*@TREND

LOG(XMFGO13_PAC/MFGO13_SUM) = -0.5835282847 - 0.1505955655 +
1.038128392*LOG(GSPR_PAC/GSPR_SUM) + 0.006035488927*@TREND

LOG(XMFGO13_SATL/MFGO13_SUM) = 0.03349843325 - 0.1505955655 +
1.038128392*LOG(GSPR_SATL/GSPR_SUM) + 0.01421401274*@TREND

LOG(XMFGO13_WNC/MFGO13_SUM) = 0.2212886359 - 0.1505955655 +
1.038128392*LOG(GSPR_WNC/GSPR_SUM) - 0.0007632418269*@TREND

LOG(XMFGO13_WSC/MFGO13_SUM) = -0.3321583512 - 0.1505955655 +
1.038128392*LOG(GSPR_WSC/GSPR_SUM) - 0.007965643548*@TREND

MFGO14 - Petroleum Refineries
LOG(XMFGO14_ENC/MFGO14_SUM) = 0.3276364303 - 1.631318594 +
0.4938141841*LOG(GSPR_ENC/GSPR_SUM) + 0.2408723903*LOG(WPI05_1)

LOG(XMFGO14_ESC/MFGO14_SUM) = 0.1585795872 - 1.631318594 +
0.4938141841*LOG(GSPR_ESC/GSPR_SUM) + 0.1262070374*LOG(WPI05_1)

LOG(XMFGO14_MATL/MFGO14_SUM) = 0.1145204585 - 1.631318594 +
0.4938141841*LOG(GSPR_MATL/GSPR_SUM) - 0.159701636*LOG(WPI05_1)

LOG(XMFGO14_MTN/MFGO14_SUM) = -0.5881604073 - 1.631318594 +
0.4938141841*LOG(GSPR_MTN/GSPR_SUM) - 0.3871249178*LOG(WPI05_1)

LOG(XMFGO14_NENG/MFGO14_SUM) = -1.184978546 - 1.631318594 +
0.4938141841*LOG(GSPR_NENG/GSPR_SUM) - 0.3824861512*LOG(WPI05_1)

LOG(XMFGO14_PAC/MFGO14_SUM) = 0.7243662564 - 1.631318594 +
0.4938141841*LOG(GSPR_PAC/GSPR_SUM) - 0.1522756177*LOG(WPI05_1)

LOG(XMFGO14_SATL/MFGO14_SUM) = -1.364481243 - 1.631318594 +
0.4938141841*LOG(GSPR_SATL/GSPR_SUM) - 0.3575058751*LOG(WPI05_1)

LOG(XMFGO14_WNC/MFGO14_SUM) = -0.1898022577 - 1.631318594 +
0.4938141841*LOG(GSPR_WNC/GSPR_SUM) - 0.2627526494*LOG(WPI05_1)

LOG(XMFGO14_WSC/MFGO14_SUM) = 2.002319722 - 1.631318594 +
0.4938141841*LOG(GSPR_WSC/GSPR_SUM) + 0.05034025732*LOG(WPI05_1)

MFGO15 - Other Petroleum and Coal Products
LOG(XMFGO15_ENC/MFGO15_SUM) = 1.431237161 - 2.131714711 +
0.2736906024*LOG(GSPR_ENC/GSPR_SUM) + 0.0585597151*LOG(WPI053_1)

LOG(XMFGO15_ESC/MFGO15_SUM) = -1.243402425 - 2.131714711 +
0.2736906024*LOG(GSPR_ESC/GSPR_SUM) - 0.05938319313*LOG(WPI053_1)

LOG(XMFGO15_MATL/MFGO15_SUM) = 0.8634514586 - 2.131714711 +
0.2736906024*LOG(GSPR_MATL/GSPR_SUM) - 0.09069562106*LOG(WPI053_1)

LOG(XMFGO15_MTN/MFGO15_SUM) = -1.224744664 - 2.131714711 +
0.2736906024*LOG(GSPR_MTN/GSPR_SUM) + 0.05299057595*LOG(WPI053_1)

LOG(XMFGO15_NENG/MFGO15_SUM) = -1.427046666 - 2.131714711 +
0.2736906024*LOG(GSPR_NENG/GSPR_SUM) - 0.1768143983*LOG(WPI053_1)

LOG(XMFGO15_PAC/MFGO15_SUM) = 0.1236853482 - 2.131714711 +
0.2736906024*LOG(GSPR_PAC/GSPR_SUM) - 0.06012805911*LOG(WPI053_1)

LOG(XMFGO15_SATL/MFGO15_SUM) = -0.5549023592 - 2.131714711 +
0.2736906024*LOG(GSPR_SATL/GSPR_SUM) - 0.05438747315*LOG(WPI053_1)

LOG(XMFGO15_WNC/MFGO15_SUM) = 0.6732063818 - 2.131714711 +
0.2736906024*LOG(GSPR_WNC/GSPR_SUM) + 0.0184497251*LOG(WPI053_1)

LOG(XMFGO15_WSC/MFGO15_SUM) = 1.358515764 - 2.131714711 +
0.2736906024*LOG(GSPR_WSC/GSPR_SUM) + 0.05010751041*LOG(WPI053_1)

MFGO16 - Plastics and Rubber Products
LOG(XMFGO16_ENC/MFGO16_SUM) = 0.7912469657 - 0.3917923693 +
0.8771046823*LOG(GSPR_ENC/GSPR_SUM) -
0.3402475212*LOG(RWM_ENC/RWM_AVG) + 0.001239464348*@TREND

LOG(XMFGO16_ESC/MFGO16_SUM) = 0.5709856411 - 0.3917923693 +
0.8771046823*LOG(GSPR_ESC/GSPR_SUM) - 0.3402475212*LOG(RWM_ESC/RWM_AVG)
- 0.002980767049*@TREND

LOG(XMFGO16_MATL/MFGO16_SUM) = -0.1307198937 - 0.3917923693 +
0.8771046823*LOG(GSPR_MATL/GSPR_SUM) -
0.3402475212*LOG(RWM_MATL/RWM_AVG) - 0.0009668363123*@TREND

LOG(XMFGO16_MTN/MFGO16_SUM) = -1.16147865 - 0.3917923693 +
0.8771046823*LOG(GSPR_MTN/GSPR_SUM) -
0.3402475212*LOG(RWM_MTN/RWM_AVG) + 0.009777652361*@TREND

LOG(XMFGO16_NENG/MFGO16_SUM) = -0.000979488899 - 0.3917923693 +
0.8771046823*LOG(GSPR_NENG/GSPR_SUM) -
0.3402475212*LOG(RWM_NENG/RWM_AVG) - 0.005609672572*@TREND

LOG(XMFGO16_PAC/MFGO16_SUM) = -0.2928264614 - 0.3917923693 +
0.8771046823*LOG(GSPR_PAC/GSPR_SUM) - 0.3402475212*LOG(RWM_PAC/RWM_AVG)
- 0.003043927929*@TREND

LOG(XMFGO16_SATL/MFGO16_SUM) = 0.04301803216 - 0.3917923693 +
0.8771046823*LOG(GSPR_SATL/GSPR_SUM) -
0.3402475212*LOG(RWM_SATL/RWM_AVG) + 0.003316114619*@TREND

LOG(XMFGO16_WNC/MFGO16_SUM) = 0.193574268 - 0.3917923693 +
0.8771046823*LOG(GSPR_WNC/GSPR_SUM) -
0.3402475212*LOG(RWM_WNC/RWM_AVG) - 0.003033380859*@TREND

LOG(XMFGO16_WSC/MFGO16_SUM) = -0.0128204126 - 0.3917923693 +
0.8771046823*LOG(GSPR_WSC/GSPR_SUM) -
0.3402475212*LOG(RWM_WSC/RWM_AVG) + 0.00102150782*@TREND

MFGO17 - Leather and Allied Products
LOG(XMFGO17_ENC/MFGO17_SUM) = 0.1087159115 - 0.0515164495 +
0.9892721748*LOG(GSPR_ENC/GSPR_SUM) + 0.001946646*@TREND

LOG(XMFGO17_ESC/MFGO17_SUM) = -0.1386184947 - 0.0515164495 +
0.9892721748*LOG(GSPR_ESC/GSPR_SUM) + 0.001946646*@TREND

LOG(XMFGO17_MATL/MFGO17_SUM) = 0.1319112903 - 0.0515164495 +
0.9892721748*LOG(GSPR_MATL/GSPR_SUM) + 0.001946646*@TREND

LOG(XMFGO17_MTN/MFGO17_SUM) = 0.3118334523 - 0.0515164495 +
0.9892721748*LOG(GSPR_MTN/GSPR_SUM) + 0.001946646*@TREND

LOG(XMFGO17_NENG/MFGO17_SUM) = 1.136578716 - 0.0515164495 +
0.9892721748*LOG(GSPR_NENG/GSPR_SUM) + 0.001946646*@TREND

LOG(XMFGO17_PAC/MFGO17_SUM) = -0.9492439404 - 0.0515164495 +
0.9892721748*LOG(GSPR_PAC/GSPR_SUM) + 0.001946646*@TREND

LOG(XMFGO17_SATL/MFGO17_SUM) = -0.5622976064 - 0.0515164495 +
0.9892721748*LOG(GSPR_SATL/GSPR_SUM) + 0.001946646*@TREND

LOG(XMFGO17_WNC/MFGO17_SUM) = 0.2917226543 - 0.0515164495 +
0.9892721748*LOG(GSPR_WNC/GSPR_SUM) + 0.001946646*@TREND

LOG(XMFGO17_WSC/MFGO17_SUM) = -0.3306019826 - 0.0515164495 +
0.9892721748*LOG(GSPR_WSC/GSPR_SUM) + 0.001946646*@TREND

MFGO18 - Glass & Glass Products
LOG(XMFGO18_ENC/MFGO18_SUM) = 0.4829827392 + 1.227575778 +
1.642273643*LOG(GSPR_ENC/GSPR_SUM) + 0.3035031319*LOG(WPI05_1)

LOG(XMFGO18_ESC/MFGO18_SUM) = 1.11256076 + 1.227575778 +
1.642273643*LOG(GSPR_ESC/GSPR_SUM) + 0.1114544681*LOG(WPI05_1)

LOG(XMFGO18_MATL/MFGO18_SUM) = 0.08684744314 + 1.227575778 +
1.642273643*LOG(GSPR_MATL/GSPR_SUM) - 0.2723664768*LOG(WPI05_1)

LOG(XMFGO18_MTN/MFGO18_SUM) = -0.6192202718 + 1.227575778 +
1.642273643*LOG(GSPR_MTN/GSPR_SUM) - 0.6840860735*LOG(WPI05_1)

LOG(XMFGO18_NENG/MFGO18_SUM) = -0.5883663358 + 1.227575778 +
1.642273643*LOG(GSPR_NENG/GSPR_SUM) + 0.1064101451*LOG(WPI05_1)

LOG(XMFGO18_PAC/MFGO18_SUM) = -0.6370366148 + 1.227575778 +
1.642273643*LOG(GSPR_PAC/GSPR_SUM) - 0.530384976*LOG(WPI05_1)

LOG(XMFGO18_SATL/MFGO18_SUM) = 0.1573614197 + 1.227575778 +
1.642273643*LOG(GSPR_SATL/GSPR_SUM) + 0.4427049445*LOG(WPI05_1)

LOG(XMFGO18_WNC/MFGO18_SUM) = 0.0457514107 + 1.227575778 +
1.642273643*LOG(GSPR_WNC/GSPR_SUM) + 0.1445570334*LOG(WPI05_1)

LOG(XMFGO18_WSC/MFGO18_SUM) = -0.04088055067 + 1.227575778 +
1.642273643*LOG(GSPR_WSC/GSPR_SUM) + 0.1515221809*LOG(WPI05_1)

MFGO19 - Cement Manufacturing
LOG(XMFGO19_ENC/MFGO19_SUM) = 0.3320417792 - 1.840874566 +
0.2104311993*LOG(GSPR_ENC/GSPR_SUM) - 0.09458930306*LOG(WPI05_1)

LOG(XMFGO19_ESC/MFGO19_SUM) = -0.008301255726 - 1.840874566 +
0.2104311993*LOG(GSPR_ESC/GSPR_SUM) + 0.07707054312*LOG(WPI05_1)

LOG(XMFGO19_MATL/MFGO19_SUM) = -0.0970484298 - 1.840874566 +
0.2104311993*LOG(GSPR_MATL/GSPR_SUM) - 0.009261198933*LOG(WPI05_1)

LOG(XMFGO19_MTN/MFGO19_SUM) = -0.03131048276 - 1.840874566 +
0.2104311993*LOG(GSPR_MTN/GSPR_SUM) + 0.04683438927*LOG(WPI05_1)

LOG(XMFGO19_NENG/MFGO19_SUM) = -1.500361725 - 1.840874566 +
0.2104311993*LOG(GSPR_NENG/GSPR_SUM) - 0.4301415157*LOG(WPI05_1)

LOG(XMFGO19_PAC/MFGO19_SUM) = 0.3221311381 - 1.840874566 +
0.2104311993*LOG(GSPR_PAC/GSPR_SUM) + 0.06662527733*LOG(WPI05_1)

LOG(XMFGO19_SATL/MFGO19_SUM) = 0.1993382593 - 1.840874566 +
0.2104311993*LOG(GSPR_SATL/GSPR_SUM) - 0.03251319817*LOG(WPI05_1)

LOG(XMFGO19_WNC/MFGO19_SUM) = 0.3919660039 - 1.840874566 +
0.2104311993*LOG(GSPR_WNC/GSPR_SUM) + 0.04233521144*LOG(WPI05_1)

LOG(XMFGO19_WSC/MFGO19_SUM) = 0.3915447131 - 1.840874566 +
0.2104311993*LOG(GSPR_WSC/GSPR_SUM) - 0.03613238265*LOG(WPI05_1)

MFGO20 - Other Nonmetallic Mineral Products
LOG(XMFGO20_ENC/MFGO20_SUM) = 0.1154036894 + 0.3301944679 +
0.9718035687*LOG(GSPR_ENC/GSPR_SUM) +
0.1582929898*LOG(HUSPS_ENC/HUSPS_SUM)

LOG(XMFGO20_ESC/MFGO20_SUM) = 0.3578269458 + 0.3301944679 +
0.9718035687*LOG(GSPR_ESC/GSPR_SUM) +
0.1582929898*LOG(HUSPS_ESC/HUSPS_SUM)

LOG(XMFGO20_MATL/MFGO20_SUM) = -0.2422059211 + 0.3301944679 +
0.9718035687*LOG(GSPR_MATL/GSPR_SUM) +
0.1582929898*LOG(HUSPS_MATL/HUSPS_SUM)

LOG(XMFGO20_MTN/MFGO20_SUM) = 0.09870830469 + 0.3301944679 +
0.9718035687*LOG(GSPR_MTN/GSPR_SUM) +
0.1582929898*LOG(HUSPS_MTN/HUSPS_SUM)

LOG(XMFGO20_NENG/MFGO20_SUM) = -0.2270550502 + 0.3301944679 +
0.9718035687*LOG(GSPR_NENG/GSPR_SUM) +
0.1582929898*LOG(HUSPS_NENG/HUSPS_SUM)

LOG(XMFGO20_PAC/MFGO20_SUM) = -0.4246622606 + 0.3301944679 +
0.9718035687*LOG(GSPR_PAC/GSPR_SUM) +
0.1582929898*LOG(HUSPS_PAC/HUSPS_SUM)

LOG(XMFGO20_SATL/MFGO20_SUM) = -0.1152973408 + 0.3301944679 +
0.9718035687*LOG(GSPR_SATL/GSPR_SUM) +
0.1582929898*LOG(HUSPS_SATL/HUSPS_SUM)

LOG(XMFGO20_WNC/MFGO20_SUM) = 0.3684261821 + 0.3301944679 +
0.9718035687*LOG(GSPR_WNC/GSPR_SUM) +
0.1582929898*LOG(HUSPS_WNC/HUSPS_SUM)

LOG(XMFGO20_WSC/MFGO20_SUM) = 0.06885545071 + 0.3301944679 +
0.9718035687*LOG(GSPR_WSC/GSPR_SUM) +
0.1582929898*LOG(HUSPS_WSC/HUSPS_SUM)

MFGO21 - Iron & Steel Mills, Ferroalloy & Steel Products
LOG(XMFGO21_ENC/MFGO21_SUM) = 1.399397632 + 0.1820653296 +
1.255286116*LOG(GSPR_ENC/GSPR_SUM) + 0.08689645094*LOG(WPI05_1)

LOG(XMFGO21_ESC/MFGO21_SUM) = 0.9214258428 + 0.1820653296 +
1.255286116*LOG(GSPR_ESC/GSPR_SUM) + 0.1892445915*LOG(WPI05_1)

LOG(XMFGO21_MATL/MFGO21_SUM) = 0.3940132324 + 0.1820653296 +
1.255286116*LOG(GSPR_MATL/GSPR_SUM) - 0.006709062749*LOG(WPI05_1)

LOG(XMFGO21_MTN/MFGO21_SUM) = -0.4810227998 + 0.1820653296 +
1.255286116*LOG(GSPR_MTN/GSPR_SUM) - 0.3924926924*LOG(WPI05_1)

LOG(XMFGO21_NENG/MFGO21_SUM) = -0.4924802745 + 0.1820653296 +
1.255286116*LOG(GSPR_NENG/GSPR_SUM) - 0.4577381516*LOG(WPI05_1)

LOG(XMFGO21_PAC/MFGO21_SUM) = -1.000128579 + 0.1820653296 +
1.255286116*LOG(GSPR_PAC/GSPR_SUM) + 0.1153713016*LOG(WPI05_1)

LOG(XMFGO21_SATL/MFGO21_SUM) = -0.505347435 + 0.1820653296 +
1.255286116*LOG(GSPR_SATL/GSPR_SUM) + 0.02207359372*LOG(WPI05_1)

LOG(XMFGO21_WNC/MFGO21_SUM) = -0.4147631212 + 0.1820653296 +
1.255286116*LOG(GSPR_WNC/GSPR_SUM) - 0.1531521761*LOG(WPI05_1)

LOG(XMFGO21_WSC/MFGO21_SUM) = 0.1789055023 + 0.1820653296 +
1.255286116*LOG(GSPR_WSC/GSPR_SUM) + 0.6235499981*LOG(WPI05_1)

MFGO22 - Alumina & Aluminum Products
LOG(XMFGO22_ENC/MFGO22_SUM) = 0.3133555313 + 0.3552182517 + 1.213562942*LOG(GSPR_ENC/GSPR_SUM) + 0.1302323587*LOG(WPI05_1)

LOG(XMFGO22_ESC/MFGO22_SUM) = 1.74702241 + 0.3552182517 + 1.213562942*LOG(GSPR_ESC/GSPR_SUM) + 0.1875167572*LOG(WPI05_1)

LOG(XMFGO22_MATL/MFGO22_SUM) = -0.1361143738 + 0.3552182517 + 1.213562942*LOG(GSPR_MATL/GSPR_SUM) - 0.06067808733*LOG(WPI05_1)

LOG(XMFGO22_MTN/MFGO22_SUM) = -0.3673976569 + 0.3552182517 + 1.213562942*LOG(GSPR_MTN/GSPR_SUM) - 0.3237439281*LOG(WPI05_1)

LOG(XMFGO22_NENG/MFGO22_SUM) = -0.7741813791 + 0.3552182517 + 1.213562942*LOG(GSPR_NENG/GSPR_SUM) - 0.2739646711*LOG(WPI05_1)

LOG(XMFGO22_PAC/MFGO22_SUM) = -0.4024249234 + 0.3552182517 + 1.213562942*LOG(GSPR_PAC/GSPR_SUM) - 0.538655986*LOG(WPI05_1)

LOG(XMFGO22_SATL/MFGO22_SUM) = -0.1815684579 + 0.3552182517 + 1.213562942*LOG(GSPR_SATL/GSPR_SUM) + 0.02983449266*LOG(WPI05_1)

LOG(XMFGO22_WNC/MFGO22_SUM) = -0.2741935833 + 0.3552182517 + 1.213562942*LOG(GSPR_WNC/GSPR_SUM) + 0.1257189435*LOG(WPI05_1)

LOG(XMFGO22_WSC/MFGO22_SUM) = 0.07550243302 + 0.3552182517 + 1.213562942*LOG(GSPR_WSC/GSPR_SUM) + 0.4485394281*LOG(WPI05_1)

MFGO23 - Other Primary Metals
LOG(XMFGO23_ENC/MFGO23_SUM) = 1.228830084 - 1.121802516 + 0.5539562381*LOG(GSPR_ENC/GSPR_SUM) - 0.874037776*LOG(RWM_ENC/RWM_AVG) - 0.001315077885*@TREND

LOG(XMFGO23_ESC/MFGO23_SUM) = 0.1648950437 - 1.121802516 + 0.5539562381*LOG(GSPR_ESC/GSPR_SUM) - 0.874037776*LOG(RWM_ESC/RWM_AVG) + 0.001106551314*@TREND

LOG(XMFGO23_MATL/MFGO23_SUM) = 0.3036838398 - 1.121802516 + 0.5539562381*LOG(GSPR_MATL/GSPR_SUM) - 0.874037776*LOG(RWM_MATL/RWM_AVG) - 0.005063240246*@TREND

LOG(XMFGO23_MTN/MFGO23_SUM) = 0.1278996085 - 1.121802516 + 0.5539562381*LOG(GSPR_MTN/GSPR_SUM) - 0.874037776*LOG(RWM_MTN/RWM_AVG) - 0.006562968026*@TREND

LOG(XMFGO23_NENG/MFGO23_SUM) = -0.1906763887 - 1.121802516 + 0.5539562381*LOG(GSPR_NENG/GSPR_SUM) - 0.874037776*LOG(RWM_NENG/RWM_AVG) + 0.001537160727*@TREND

LOG(XMFGO23_PAC/MFGO23_SUM) = -0.145229357 - 1.121802516 + 0.5539562381*LOG(GSPR_PAC/GSPR_SUM) - 0.874037776*LOG(RWM_PAC/RWM_AVG) - 0.01711611704*@TREND

LOG(XMFGO23_SATL/MFGO23_SUM) = -0.9720067648 - 1.121802516 + 0.5539562381*LOG(GSPR_SATL/GSPR_SUM) - 0.874037776*LOG(RWM_SATL/RWM_AVG) + 0.01418938295*@TREND

LOG(XMFGO23_WNC/MFGO23_SUM) = -0.3806313398 - 1.121802516 + 0.5539562381*LOG(GSPR_WNC/GSPR_SUM) - 0.874037776*LOG(RWM_WNC/RWM_AVG) + 0.00328548352*@TREND

LOG(XMFGO23_WSC/MFGO23_SUM) = -0.1367647253 - 1.121802516 + 0.5539562381*LOG(GSPR_WSC/GSPR_SUM) - 0.874037776*LOG(RWM_WSC/RWM_AVG) + 0.004813507589*@TREND

MFGO24 - Fabricated Metal Products
LOG(XMFGO24_ENC/MFGO24_SUM) = 1.280620515 - 2.407334491 + 0.9896375015*LOG((YPDR_ENC/NP_ENC)/(YPDR_SUM/NP_SUM)) - 0.00240901859*@TREND

LOG(XMFGO24_ESC/MFGO24_SUM) = -0.2080342901 - 2.407334491 + 0.9896375015*LOG((YPDR_ESC/NP_ESC)/(YPDR_SUM/NP_SUM)) + 0.004411266889*@TREND

LOG(XMFGO24_MATL/MFGO24_SUM) = 0.557957968 - 2.407334491 + 0.9896375015*LOG((YPDR_MATL/NP_MATL)/(YPDR_SUM/NP_SUM)) - 0.024037047*@TREND

LOG(XMFGO24_MTN/MFGO24_SUM) = -1.471002359 - 2.407334491 + 0.9896375015*LOG((YPDR_MTN/NP_MTN)/(YPDR_SUM/NP_SUM)) + 0.0270255164*@TREND

LOG(XMFGO24_NENG/MFGO24_SUM) = -0.26282661 - 2.407334491 + 0.9896375015*LOG((YPDR_NENG/NP_NENG)/(YPDR_SUM/NP_SUM)) - 0.01121576901*@TREND

LOG(XMFGO24_PAC/MFGO24_SUM) = 0.1416719104 - 2.407334491 + 0.9896375015*LOG((YPDR_PAC/NP_PAC)/(YPDR_SUM/NP_SUM)) + 0.005110433528*@TREND

LOG(XMFGO24_SATL/MFGO24_SUM) = 0.1614349663 - 2.407334491 +
0.9896375015*LOG((YPDR_SATL/NP_SATL)/(YPDR_SUM/NP_SUM)) +
0.005506277233*@TREND

LOG(XMFGO24_WNC/MFGO24_SUM) = -0.1323955076 - 2.407334491 +
0.9896375015*LOG((YPDR_WNC/NP_WNC)/(YPDR_SUM/NP_SUM)) -
0.0004195287655*@TREND

LOG(XMFGO24_WSC/MFGO24_SUM) = -0.06742659311 - 2.407334491 +
0.9896375015*LOG((YPDR_WSC/NP_WSC)/(YPDR_SUM/NP_SUM)) +
0.01696770495*@TREND

MFGO25 - Machinery
LOG(XMFGO25_ENC/MFGO25_SUM) = 0.3187076305 + 1.268089773 +
1.559109781*LOG(GSPR_ENC/GSPR_SUM) - 1.001693779*LOG(RWM_ENC/RWM_AVG)

LOG(XMFGO25_ESC/MFGO25_SUM) = 0.4042298201 + 1.268089773 +
1.559109781*LOG(GSPR_ESC/GSPR_SUM) - 1.001693779*LOG(RWM_ESC/RWM_AVG)

LOG(XMFGO25_MATL/MFGO25_SUM) = -0.5553727292 + 1.268089773 +
1.559109781*LOG(GSPR_MATL/GSPR_SUM) -
1.001693779*LOG(RWM_MATL/RWM_AVG)

LOG(XMFGO25_MTN/MFGO25_SUM) = -0.1484170513 + 1.268089773 +
1.559109781*LOG(GSPR_MTN/GSPR_SUM) - 1.001693779*LOG(RWM_MTN/RWM_AVG)

LOG(XMFGO25_NENG/MFGO25_SUM) = 0.6092535634 + 1.268089773 +
1.559109781*LOG(GSPR_NENG/GSPR_SUM) -
1.001693779*LOG(RWM_NENG/RWM_AVG)

LOG(XMFGO25_PAC/MFGO25_SUM) = -0.2443086134 + 1.268089773 +
1.559109781*LOG(GSPR_PAC/GSPR_SUM) - 1.001693779*LOG(RWM_PAC/RWM_AVG)

LOG(XMFGO25_SATL/MFGO25_SUM) = -0.9402330749 + 1.268089773 +
1.559109781*LOG(GSPR_SATL/GSPR_SUM) -
1.001693779*LOG(RWM_SATL/RWM_AVG)

LOG(XMFGO25_WNC/MFGO25_SUM) = 0.6060032225 + 1.268089773 +
1.559109781*LOG(GSPR_WNC/GSPR_SUM) - 1.001693779*LOG(RWM_WNC/RWM_AVG)

LOG(XMFGO25_WSC/MFGO25_SUM) = -0.04986276761 + 1.268089773 +
1.559109781*LOG(GSPR_WSC/GSPR_SUM) - 1.001693779*LOG(RWM_WSC/RWM_AVG)

MFGO26 - Other Electronic & Electric Products
LOG(XMFGO26_ENC/MFGO26_SUM) = -1.172416033 + 5.42015766 +
0.830566777*LOG(GSPR_ENC/GSPR_SUM) + 2.512317005*LOG(NP_ENC/NP_SUM)

LOG(XMFGO26_ESC/MFGO26_SUM) = 1.270843031 + 5.42015766 +
0.830566777*LOG(GSPR_ESC/GSPR_SUM) + 2.512317005*LOG(NP_ESC/NP_SUM)

LOG(XMFGO26_MATL/MFGO26_SUM) = -1.38499725 + 5.42015766 +
0.830566777*LOG(GSPR_MATL/GSPR_SUM) + 2.512317005*LOG(NP_MATL/NP_SUM)

LOG(XMFGO26_MTN/MFGO26_SUM) = 1.248762336 + 5.42015766 +
0.830566777*LOG(GSPR_MTN/GSPR_SUM) + 2.512317005*LOG(NP_MTN/NP_SUM)

LOG(XMFGO26_NENG/MFGO26_SUM) = 1.913091403 + 5.42015766 +
0.830566777*LOG(GSPR_NENG/GSPR_SUM) + 2.512317005*LOG(NP_NENG/NP_SUM)

LOG(XMFGO26_PAC/MFGO26_SUM) = -0.8905071232 + 5.42015766 +
0.830566777*LOG(GSPR_PAC/GSPR_SUM) + 2.512317005*LOG(NP_PAC/NP_SUM)

LOG(XMFGO26_SATL/MFGO26_SUM) = -1.561814163 + 5.42015766 +
0.830566777*LOG(GSPR_SATL/GSPR_SUM) + 2.512317005*LOG(NP_SATL/NP_SUM)

LOG(XMFGO26_WNC/MFGO26_SUM) = 0.8151791503 + 5.42015766 +
0.830566777*LOG(GSPR_WNC/GSPR_SUM) + 2.512317005*LOG(NP_WNC/NP_SUM)

LOG(XMFGO26_WSC/MFGO26_SUM) = -0.2381413501 + 5.42015766 +
0.830566777*LOG(GSPR_WSC/GSPR_SUM) + 2.512317005*LOG(NP_WSC/NP_SUM)

MFGO27 - Transportation Equipment
LOG(XMFGO27_ENC/MFGO27_SUM) = 1.275583331 - 0.1606237215 +
1.035317837*LOG(GSPR_ENC/GSPR_SUM) - 0.8805538617*LOG(RWM_ENC/RWM_AVG)

LOG(XMFGO27_ESC/MFGO27_SUM) = 0.5929286986 - 0.1606237215 +
1.035317837*LOG(GSPR_ESC/GSPR_SUM) - 0.8805538617*LOG(RWM_ESC/RWM_AVG)

LOG(XMFGO27_MATL/MFGO27_SUM) = -0.7894753933 - 0.1606237215 +
1.035317837*LOG(GSPR_MATL/GSPR_SUM) -
0.8805538617*LOG(RWM_MATL/RWM_AVG)

LOG(XMFGO27_MTN/MFGO27_SUM) = -0.4383403305 - 0.1606237215 +
1.035317837*LOG(GSPR_MTN/GSPR_SUM) - 0.8805538617*LOG(RWM_MTN/RWM_AVG)

LOG(XMFGO27_NENG/MFGO27_SUM) = -0.3584235964 - 0.1606237215 +
1.035317837*LOG(GSPR_NENG/GSPR_SUM) -
0.8805538617*LOG(RWM_NENG/RWM_AVG)

LOG(XMFGO27_PAC/MFGO27_SUM) = 0.06598997461 - 0.1606237215 +
1.035317837*LOG(GSPR_PAC/GSPR_SUM) - 0.8805538617*LOG(RWM_PAC/RWM_AVG)

LOG(XMFGO27_SATL/MFGO27_SUM) = -0.4999595909 - 0.1606237215 +
1.035317837*LOG(GSPR_SATL/GSPR_SUM) -

0.8805538617*LOG(RWM_SATL/RWM_AVG)

LOG(XMFGO27_WNC/MFGO27_SUM) = 0.6218007361 - 0.1606237215 +
1.035317837*LOG(GSPR_WNC/GSPR_SUM) -
0.8805538617*LOG(RWM_WNC/RWM_AVG)

LOG(XMFGO27_WSC/MFGO27_SUM) = -0.4701038292 - 0.1606237215 +
1.035317837*LOG(GSPR_WSC/GSPR_SUM) - 0.8805538617*LOG(RWM_WSC/RWM_AVG)

MFGO28 - Measuring & Control Instruments
LOG(XMFGO28_ENC/MFGO28_SUM) = 0.1950368328 - 0.6805469341 +
0.7680334056*LOG(GSPR_ENC/GSPR_SUM) - 1.627810812*LOG(RWM_ENC/RWM_AVG)

LOG(XMFGO28_ESC/MFGO28_SUM) = -1.681317669 - 0.6805469341 +
0.7680334056*LOG(GSPR_ESC/GSPR_SUM) - 1.627810812*LOG(RWM_ESC/RWM_AVG)

LOG(XMFGO28_MATL/MFGO28_SUM) = 0.163126269 - 0.6805469341 +
0.7680334056*LOG(GSPR_MATL/GSPR_SUM) -
1.627810812*LOG(RWM_MATL/RWM_AVG)

LOG(XMFGO28_MTN/MFGO28_SUM) = 0.277193333 - 0.6805469341 +
0.7680334056*LOG(GSPR_MTN/GSPR_SUM) - 1.627810812*LOG(RWM_MTN/RWM_AVG)

LOG(XMFGO28_NENG/MFGO28_SUM) = 1.072832316 - 0.6805469341 +
0.7680334056*LOG(GSPR_NENG/GSPR_SUM) -
1.627810812*LOG(RWM_NENG/RWM_AVG)

LOG(XMFGO28_PAC/MFGO28_SUM) = 0.9487692453 - 0.6805469341 +
0.7680334056*LOG(GSPR_PAC/GSPR_SUM) - 1.627810812*LOG(RWM_PAC/RWM_AVG)

LOG(XMFGO28_SATL/MFGO28_SUM) = -0.358486741 - 0.6805469341 +
0.7680334056*LOG(GSPR_SATL/GSPR_SUM) -
1.627810812*LOG(RWM_SATL/RWM_AVG)

LOG(XMFGO28_WNC/MFGO28_SUM) = -0.216939744 - 0.6805469341 +
0.7680334056*LOG(GSPR_WNC/GSPR_SUM) -
1.627810812*LOG(RWM_WNC/RWM_AVG)

LOG(XMFGO28_WSC/MFGO28_SUM) = -0.4002138425 - 0.6805469341 +
0.7680334056*LOG(GSPR_WSC/GSPR_SUM) - 1.627810812*LOG(RWM_WSC/RWM_AVG)

MFGO29 - Miscellaneous Manufacturing
LOG(XMFGO29_ENC/MFGO29_SUM) = -0.3982736778 + 2.249538818 +
0.9079742597*LOG(GSPR_ENC/GSPR_SUM) + 1.061653149*LOG(NP_ENC/NP_SUM)

LOG(XMFGO29_ESC/MFGO29_SUM) = 0.5593773582 + 2.249538818 +
0.9079742597*LOG(GSPR_ESC/GSPR_SUM) + 1.061653149*LOG(NP_ESC/NP_SUM)

LOG(XMFGO29_MATL/MFGO29_SUM) = -0.3320215058 + 2.249538818 +
0.9079742597*LOG(GSPR_MATL/GSPR_SUM) + 1.061653149*LOG(NP_MATL/NP_SUM)

LOG(XMFGO29_MTN/MFGO29_SUM) = 0.4014550811 + 2.249538818 +
0.9079742597*LOG(GSPR_MTN/GSPR_SUM) + 1.061653149*LOG(NP_MTN/NP_SUM)

LOG(XMFGO29_NENG/MFGO29_SUM) = 1.363045299 + 2.249538818 +
0.9079742597*LOG(GSPR_NENG/GSPR_SUM) + 1.061653149*LOG(NP_NENG/NP_SUM)

LOG(XMFGO29_PAC/MFGO29_SUM) = -0.4939798932 + 2.249538818 +
0.9079742597*LOG(GSPR_PAC/GSPR_SUM) + 1.061653149*LOG(NP_PAC/NP_SUM)

LOG(XMFGO29_SATL/MFGO29_SUM) = -0.990583348 + 2.249538818 +
0.9079742597*LOG(GSPR_SATL/GSPR_SUM) + 1.061653149*LOG(NP_SATL/NP_SUM)

LOG(XMFGO29_WNC/MFGO29_SUM) = 0.3727573951 + 2.249538818 +
0.9079742597*LOG(GSPR_WNC/GSPR_SUM) + 1.061653149*LOG(NP_WNC/NP_SUM)

LOG(XMFGO29_WSC/MFGO29_SUM) = -0.4817767082 + 2.249538818 +
0.9079742597*LOG(GSPR_WSC/GSPR_SUM) + 1.061653149*LOG(NP_WSC/NP_SUM)

MFGO30 - Crop Production
LOG(XMFGO30_ENC/MFGO30_SUM) = 0.3654480057 - 2.423183505 +
0.006474590534*@TREND

LOG(XMFGO30_ESC/MFGO30_SUM) = -0.4841584209 - 2.423183505 -
0.01021591651*@TREND

LOG(XMFGO30_MATL/MFGO30_SUM) = -0.6795795415 - 2.423183505 -
0.00217117919*@TREND

LOG(XMFGO30_MTN/MFGO30_SUM) = -0.5252321856 - 2.423183505 +
0.005603980143*@TREND

LOG(XMFGO30_NENG/MFGO30_SUM) = -0.9994907337 - 2.423183505 -
0.01585262232*@TREND

LOG(XMFGO30_PAC/MFGO30_SUM) = 1.186182906 - 2.423183505 +
0.006172417262*@TREND

LOG(XMFGO30_SATL/MFGO30_SUM) = 0.5907953062 - 2.423183505 + 2.746822255e-
005*@TREND

LOG(XMFGO30_WNC/MFGO30_SUM) = 0.5523302143 - 2.423183505 -
0.01249324085*@TREND

LOG(XMFGO30_WSC/MFGO30_SUM) = -0.006295550964 - 2.423183505 - 0.008771194078*@TREND

MFGO31 - Other Agriculture, Forestry, Fishing & Hunting
LOG(XMFGO31_ENC/MFGO31_SUM) = -0.685530402 + 1.435028306 + 1.624672618*LOG(NP_ENC/NP_SUM)

LOG(XMFGO31_ESC/MFGO31_SUM) = 0.5279978069 + 1.435028306 + 1.624672618*LOG(NP_ESC/NP_SUM)

LOG(XMFGO31_MATL/MFGO31_SUM) = -0.835186969 + 1.435028306 + 1.624672618*LOG(NP_MATL/NP_SUM)

LOG(XMFGO31_MTN/MFGO31_SUM) = 0.7303894729 + 1.435028306 + 1.624672618*LOG(NP_MTN/NP_SUM)

LOG(XMFGO31_NENG/MFGO31_SUM) = -0.1402763967 + 1.435028306 + 1.624672618*LOG(NP_NENG/NP_SUM)

LOG(XMFGO31_PAC/MFGO31_SUM) = -0.4852701464 + 1.435028306 + 1.624672618*LOG(NP_PAC/NP_SUM)

LOG(XMFGO31_SATL/MFGO31_SUM) = -0.5294731199 + 1.435028306 + 1.624672618*LOG(NP_SATL/NP_SUM)

LOG(XMFGO31_WNC/MFGO31_SUM) = 1.218019699 + 1.435028306 + 1.624672618*LOG(NP_WNC/NP_SUM)

LOG(XMFGO31_WSC/MFGO31_SUM) = 0.1993300553 + 1.435028306 + 1.624672618*LOG(NP_WSC/NP_SUM)

MFGO32 - Coal Mining
LOG(XMFGO32_ENC/MFGO32_SUM) = 0.8220388265 - 1.419007083 + 0.8534986573*LOG(GSPR_ENC/GSPR_SUM) - 0.6318582496*LOG(WPI05_1)

LOG(XMFGO32_ESC/MFGO32_SUM) = 2.526531453 - 1.419007083 + 0.8534986573*LOG(GSPR_ESC/GSPR_SUM) - 0.2269477554*LOG(WPI05_1)

LOG(XMFGO32_MATL/MFGO32_SUM) = 0.6659106541 - 1.419007083 + 0.8534986573*LOG(GSPR_MATL/GSPR_SUM) + 0.44571677*LOG(WPI05_1)

LOG(XMFGO32_MTN/MFGO32_SUM) = 2.16429006 - 1.419007083 + 0.8534986573*LOG(GSPR_MTN/GSPR_SUM) + 0.3271524473*LOG(WPI05_1)

LOG(XMFGO32_NENG/MFGO32_SUM) = -5.384996004 - 1.419007083 + 0.8534986573*LOG(GSPR_NENG/GSPR_SUM) - 4.385567279*LOG(WPI05_1)

LOG(XMFGO32_PAC/MFGO32_SUM) = -1.896200053 - 1.419007083 +
0.8534986573*LOG(GSPR_PAC/GSPR_SUM) + 0.8455992257*LOG(WPI05_1)

LOG(XMFGO32_SATL/MFGO32_SUM) = 1.742827946 - 1.419007083 +
0.8534986573*LOG(GSPR_SATL/GSPR_SUM) - 0.09948237933*LOG(WPI05_1)

LOG(XMFGO32_WNC/MFGO32_SUM) = -0.5975351316 - 1.419007083 +
0.8534986573*LOG(GSPR_WNC/GSPR_SUM) + 0.1965074505*LOG(WPI05_1)

LOG(XMFGO32_WSC/MFGO32_SUM) = -0.04286775106 - 1.419007083 +
0.8534986573*LOG(GSPR_WSC/GSPR_SUM) + 0.2403135792*LOG(WPI05_1)

MFGO33 - Oil & Gas Extraction & Support Activities
LOG(XMFGO33_ENC/MFGO33_SUM) = -0.6452550687 - 3.236636617 +
0.1496832292*LOG(GSPR_ENC/GSPR_SUM) - 0.6055669347*LOG(WPI053_1)

LOG(XMFGO33_ESC/MFGO33_SUM) = -0.552833341 - 3.236636617 +
0.1496832292*LOG(GSPR_ESC/GSPR_SUM) - 0.1570630731*LOG(WPI053_1)

LOG(XMFGO33_MATL/MFGO33_SUM) = -1.607777392 - 3.236636617 +
0.1496832292*LOG(GSPR_MATL/GSPR_SUM) + 0.7020253168*LOG(WPI053_1)

LOG(XMFGO33_MTN/MFGO33_SUM) = 1.646388217 - 3.236636617 +
0.1496832292*LOG(GSPR_MTN/GSPR_SUM) + 0.03283687361*LOG(WPI053_1)

LOG(XMFGO33_NENG/MFGO33_SUM) = -2.547159762 - 3.236636617 +
0.1496832292*LOG(GSPR_NENG/GSPR_SUM) + 0.2046143186*LOG(WPI053_1)

LOG(XMFGO33_PAC/MFGO33_SUM) = 1.547378757 - 3.236636617 +
0.1496832292*LOG(GSPR_PAC/GSPR_SUM) - 0.211971179*LOG(WPI053_1)

LOG(XMFGO33_SATL/MFGO33_SUM) = -1.165453524 - 3.236636617 +
0.1496832292*LOG(GSPR_SATL/GSPR_SUM) + 0.3130802092*LOG(WPI053_1)

LOG(XMFGO33_WNC/MFGO33_SUM) = 0.190224689 - 3.236636617 +
0.1496832292*LOG(GSPR_WNC/GSPR_SUM) - 0.2639016854*LOG(WPI053_1)

LOG(XMFGO33_WSC/MFGO33_SUM) = 3.134487425 - 3.236636617 +
0.1496832292*LOG(GSPR_WSC/GSPR_SUM) + 0.0487939187*LOG(WPI053_1)

MFGO34 - Other Mining & Quarrying
LOG(XMFGO34_ENC/MFGO34_SUM) = -0.0823638838 - 0.9010901094 +
0.6960426042*LOG(GSPR_ENC/GSPR_SUM)

LOG(XMFGO34_ESC/MFGO34_SUM) = -0.2381962174 - 0.9010901094 +
0.6960426042*LOG(GSPR_ESC/GSPR_SUM)

LOG(XMFGO34_MATL/MFGO34_SUM) = -0.8168444606 - 0.9010901094 +
0.6960426042*LOG(GSPR_MATL/GSPR_SUM)

LOG(XMFGO34_MTN/MFGO34_SUM) = 1.877224548 - 0.9010901094 +
0.6960426042*LOG(GSPR_MTN/GSPR_SUM)

LOG(XMFGO34_NENG/MFGO34_SUM) = -1.086191111 - 0.9010901094 +
0.6960426042*LOG(GSPR_NENG/GSPR_SUM)

LOG(XMFGO34_PAC/MFGO34_SUM) = -0.1952347185 - 0.9010901094 +
0.6960426042*LOG(GSPR_PAC/GSPR_SUM)

LOG(XMFGO34_SATL/MFGO34_SUM) = 0.3084907407 - 0.9010901094 +
0.6960426042*LOG(GSPR_SATL/GSPR_SUM)

LOG(XMFGO34_WNC/MFGO34_SUM) = 0.6488566229 - 0.9010901094 +
0.6960426042*LOG(GSPR_WNC/GSPR_SUM)

LOG(XMFGO34_WSC/MFGO34_SUM) = -0.4157415202 - 0.9010901094 +
0.6960426042*LOG(GSPR_WSC/GSPR_SUM)

MFGO35 - Construction
LOG(XMFGO35_ENC/MFGO35_SUM) = 0.3394311725 - 1.543818375 +
1.26214364*LOG((GSPR_ENC/NP_ENC)/(GSPR_SUM/NP_SUM)) +
0.3205794921*LOG(HUSPS_ENC/HUSPS_SUM) + 0.0013150209*@TREND

LOG(XMFGO35_ESC/MFGO35_SUM) = -0.3338249883 - 1.543818375 +
1.26214364*LOG((GSPR_ESC/NP_ESC)/(GSPR_SUM/NP_SUM)) +
0.3205794921*LOG(HUSPS_ESC/HUSPS_SUM) + 0.004265952321*@TREND

LOG(XMFGO35_MATL/MFGO35_SUM) = 0.4254273779 - 1.543818375 +
1.26214364*LOG((GSPR_MATL/NP_MATL)/(GSPR_SUM/NP_SUM)) +
0.3205794921*LOG(HUSPS_MATL/HUSPS_SUM) - 0.01267591972*@TREND

LOG(XMFGO35_MTN/MFGO35_SUM) = -0.4259592557 - 1.543818375 +
1.26214364*LOG((GSPR_MTN/NP_MTN)/(GSPR_SUM/NP_SUM)) +
0.3205794921*LOG(HUSPS_MTN/HUSPS_SUM) + 0.01475079709*@TREND

LOG(XMFGO35_NENG/MFGO35_SUM) = -0.4048591628 - 1.543818375 +
1.26214364*LOG((GSPR_NENG/NP_NENG)/(GSPR_SUM/NP_SUM)) +
0.3205794921*LOG(HUSPS_NENG/HUSPS_SUM) - 0.00544227866*@TREND

LOG(XMFGO35_PAC/MFGO35_SUM) = 0.1709546778 - 1.543818375 +
1.26214364*LOG((GSPR_PAC/NP_PAC)/(GSPR_SUM/NP_SUM)) +
0.3205794921*LOG(HUSPS_PAC/HUSPS_SUM) + 0.007451235498*@TREND

LOG(XMFGO35_SATL/MFGO35_SUM) = 0.3101549041 - 1.543818375 +
1.26214364*LOG((GSPR_SATL/NP_SATL)/(GSPR_SUM/NP_SUM)) +
0.3205794921*LOG(HUSPS_SATL/HUSPS_SUM) + 0.003504873337*@TREND

LOG(XMFGO35_WNC/MFGO35_SUM) = -0.2057391334 - 1.543818375 +
1.26214364*LOG((GSPR_WNC/NP_WNC)/(GSPR_SUM/NP_SUM)) +
0.3205794921*LOG(HUSPS_WNC/HUSPS_SUM) + 0.004799116636*@TREND

LOG(XMFGO35_WSC/MFGO35_SUM) = 0.1244144079 - 1.543818375 +
1.26214364*LOG((GSPR_WSC/NP_WSC)/(GSPR_SUM/NP_SUM)) +
0.3205794921*LOG(HUSPS_WSC/HUSPS_SUM) - 0.007577615339*@TREND

NMFGO1 - Transportation & Warehousing
LOG(XNMFGO1_ENC/NMFGO1_SUM) = 0.1033066703 - 0.3649866403 +
0.8501961384*LOG(GSPR_ENC/GSPR_SUM) -
1.007397748*LOG(RWNM_ENC/RWNM_AVG) - 0.0003015239259*@TREND

LOG(XNMFGO1_ESC/NMFGO1_SUM) = -0.172460896 - 0.3649866403 +
0.8501961384*LOG(GSPR_ESC/GSPR_SUM) -
1.007397748*LOG(RWNM_ESC/RWNM_AVG) + 0.009992460911*@TREND

LOG(XNMFGO1_MATL/NMFGO1_SUM) = 0.2901968593 - 0.3649866403 +
0.8501961384*LOG(GSPR_MATL/GSPR_SUM) -
1.007397748*LOG(RWNM_MATL/RWNM_AVG) - 0.008898589875*@TREND

LOG(XNMFGO1_MTN/NMFGO1_SUM) = -0.1425744789 - 0.3649866403 +
0.8501961384*LOG(GSPR_MTN/GSPR_SUM) -
1.007397748*LOG(RWNM_MTN/RWNM_AVG) - 0.00943250398*@TREND

LOG(XNMFGO1_NENG/NMFGO1_SUM) = -0.4975103311 - 0.3649866403 +
0.8501961384*LOG(GSPR_NENG/GSPR_SUM) -
1.007397748*LOG(RWNM_NENG/RWNM_AVG) + 0.002278227127*@TREND

LOG(XNMFGO1_PAC/NMFGO1_SUM) = 0.2545101122 - 0.3649866403 +
0.8501961384*LOG(GSPR_PAC/GSPR_SUM) -
1.007397748*LOG(RWNM_PAC/RWNM_AVG) - 0.004909512851*@TREND

LOG(XNMFGO1_SATL/NMFGO1_SUM) = -0.05583972761 - 0.3649866403 +
0.8501961384*LOG(GSPR_SATL/GSPR_SUM) -
1.007397748*LOG(RWNM_SATL/RWNM_AVG) + 0.003415469673*@TREND

LOG(XNMFGO1_WNC/NMFGO1_SUM) = 0.07807128111 - 0.3649866403 +
0.8501961384*LOG(GSPR_WNC/GSPR_SUM) -
1.007397748*LOG(RWNM_WNC/RWNM_AVG) - 0.002281610954*@TREND

LOG(XNMFGO1_WSC/NMFGO1_SUM) = 0.1423005107 - 0.3649866403 + 0.8501961384*LOG(GSPR_WSC/GSPR_SUM) - 1.007397748*LOG(RWNM_WSC/RWNM_AVG) + 0.007176764477*@TREND

NMFGO2 - Broadcasting & Telecommunications
LOG(XNMFGO2_ENC/NMFGO2_SUM) = 0.2837126249 - 0.7699362021 + 0.4434294144*LOG(GSPR_ENC/GSPR_SUM) + 0.2267611474*LOG(NP_ENC/NP_SUM) - 0.02095708539*@TREND

LOG(XNMFGO2_ESC/NMFGO2_SUM) = -0.01962801237 - 0.7699362021 + 0.4434294144*LOG(GSPR_ESC/GSPR_SUM) + 0.2267611474*LOG(NP_ESC/NP_SUM) - 0.02128594942*@TREND

LOG(XNMFGO2_MATL/NMFGO2_SUM) = 0.2922028179 - 0.7699362021 + 0.4434294144*LOG(GSPR_MATL/GSPR_SUM) + 0.2267611474*LOG(NP_MATL/NP_SUM) + 0.001472079641*@TREND

LOG(XNMFGO2_MTN/NMFGO2_SUM) = -0.4230065005 - 0.7699362021 + 0.4434294144*LOG(GSPR_MTN/GSPR_SUM) + 0.2267611474*LOG(NP_MTN/NP_SUM) + 0.01570735058*@TREND

LOG(XNMFGO2_NENG/NMFGO2_SUM) = -0.03269975803 - 0.7699362021 + 0.4434294144*LOG(GSPR_NENG/GSPR_SUM) + 0.2267611474*LOG(NP_NENG/NP_SUM) - 0.01361379461*@TREND

LOG(XNMFGO2_PAC/NMFGO2_SUM) = 0.1039654281 - 0.7699362021 + 0.4434294144*LOG(GSPR_PAC/GSPR_SUM) + 0.2267611474*LOG(NP_PAC/NP_SUM) + 0.002508858194*@TREND

LOG(XNMFGO2_SATL/NMFGO2_SUM) = 0.2347741647 - 0.7699362021 + 0.4434294144*LOG(GSPR_SATL/GSPR_SUM) + 0.2267611474*LOG(NP_SATL/NP_SUM) + 0.006556875298*@TREND

LOG(XNMFGO2_WNC/NMFGO2_SUM) = -0.1506801397 - 0.7699362021 + 0.4434294144*LOG(GSPR_WNC/GSPR_SUM) + 0.2267611474*LOG(NP_WNC/NP_SUM) + 0.002175965849*@TREND

LOG(XNMFGO2_WSC/NMFGO2_SUM) = -0.2886406251 - 0.7699362021 + 0.4434294144*LOG(GSPR_WSC/GSPR_SUM) + 0.2267611474*LOG(NP_WSC/NP_SUM) + 0.01601242869*@TREND

NMFGO3 - Electric Power Generation & Distribution
LOG(XNMFGO3_ENC/NMFGO3_SUM) = 0.1472737228 - 0.4896209824 + 0.7923865199*LOG(NP_ENC/NP_SUM)

LOG(XNMFGO3_ESC/NMFGO3_SUM) = -0.2396441851 - 0.4896209824 + 0.7923865199*LOG(NP_ESC/NP_SUM)

LOG(XNMFGO3_MATL/NMFGO3_SUM) = 0.2196442538 - 0.4896209824 + 0.7923865199*LOG(NP_MATL/NP_SUM)

LOG(XNMFGO3_MTN/NMFGO3_SUM) = -0.2228777797 - 0.4896209824 + 0.7923865199*LOG(NP_MTN/NP_SUM)

LOG(XNMFGO3_NENG/NMFGO3_SUM) = 0.1242798699 - 0.4896209824 + 0.7923865199*LOG(NP_NENG/NP_SUM)

LOG(XNMFGO3_PAC/NMFGO3_SUM) = -0.185457351 - 0.4896209824 + 0.7923865199*LOG(NP_PAC/NP_SUM)

LOG(XNMFGO3_SATL/NMFGO3_SUM) = 0.1580213937 - 0.4896209824 + 0.7923865199*LOG(NP_SATL/NP_SUM)

LOG(XNMFGO3_WNC/NMFGO3_SUM) = -0.173784519 - 0.4896209824 + 0.7923865199*LOG(NP_WNC/NP_SUM)

LOG(XNMFGO3_WSC/NMFGO3_SUM) = 0.1725445946 - 0.4896209824 + 0.7923865199*LOG(NP_WSC/NP_SUM)

NMFGO4 - Natural Gas Distribution

LOG(XNMFGO4_ENC/NMFGO4_SUM) = 0.1546446741 - 0.7737009529 + 0.8107313666*LOG(NP_ENC/NP_SUM)

LOG(XNMFGO4_ESC/NMFGO4_SUM) = -0.02028782929 - 0.7737009529 + 0.8107313666*LOG(NP_ESC/NP_SUM)

LOG(XNMFGO4_MATL/NMFGO4_SUM) = 0.8154094566 - 0.7737009529 + 0.8107313666*LOG(NP_MATL/NP_SUM)

LOG(XNMFGO4_MTN/NMFGO4_SUM) = 0.2214761641 - 0.7737009529 + 0.8107313666*LOG(NP_MTN/NP_SUM)

LOG(XNMFGO4_NENG/NMFGO4_SUM) = -0.3505801959 - 0.7737009529 + 0.8107313666*LOG(NP_NENG/NP_SUM)

LOG(XNMFGO4_PAC/NMFGO4_SUM) = -1.291538591 - 0.7737009529 + 0.8107313666*LOG(NP_PAC/NP_SUM)

LOG(XNMFGO4_SATL/NMFGO4_SUM) = -0.6989397255 - 0.7737009529 + 0.8107313666*LOG(NP_SATL/NP_SUM)

LOG(XNMFGO4_WNC/NMFGO4_SUM) = -0.4822562255 - 0.7737009529 + 0.8107313666*LOG(NP_WNC/NP_SUM)

LOG(XNMFGO4_WSC/NMFGO4_SUM) = 1.652072273 - 0.7737009529 +
0.8107313666*LOG(NP_WSC/NP_SUM)

NMFGO5 - Water, Sewage & Related System
LOG(XNMFGO5_ENC/NMFGO5_SUM) = -0.201985419 - 0.5175712749 +
0.7858449431*LOG(NP_ENC/NP_SUM)

LOG(XNMFGO5_ESC/NMFGO5_SUM) = -0.2084495076 - 0.5175712749 +
0.7858449431*LOG(NP_ESC/NP_SUM)

LOG(XNMFGO5_MATL/NMFGO5_SUM) = 0.5032467933 - 0.5175712749 +
0.7858449431*LOG(NP_MATL/NP_SUM)

LOG(XNMFGO5_MTN/NMFGO5_SUM) = -0.1226526574 - 0.5175712749 +
0.7858449431*LOG(NP_MTN/NP_SUM)

LOG(XNMFGO5_NENG/NMFGO5_SUM) = -0.03333062352 - 0.5175712749 +
0.7858449431*LOG(NP_NENG/NP_SUM)

LOG(XNMFGO5_PAC/NMFGO5_SUM) = 0.2630449141 - 0.5175712749 +
0.7858449431*LOG(NP_PAC/NP_SUM)

LOG(XNMFGO5_SATL/NMFGO5_SUM) = -0.1205222204 - 0.5175712749 +
0.7858449431*LOG(NP_SATL/NP_SUM)

LOG(XNMFGO5_WNC/NMFGO5_SUM) = -0.1709095969 - 0.5175712749 +
0.7858449431*LOG(NP_WNC/NP_SUM)

LOG(XNMFGO5_WSC/NMFGO5_SUM) = 0.0915583175 - 0.5175712749 +
0.7858449431*LOG(NP_WSC/NP_SUM)

NMFGO6 - Wholesale Trade
LOG(XNMFGO6_ENC/NMFGO6_SUM) = -0.09606149059 + 0.7374179765 +
0.7766289903*LOG(GSPR_ENC/GSPR_SUM) + 0.5722760916*LOG(NP_ENC/NP_SUM) -
0.2848898068*LOG(RWNM_ENC/RWNM_AVG) + 0.00435326361*@TREND

LOG(XNMFGO6_ESC/NMFGO6_SUM) = -0.08622734258 + 0.7374179765 +
0.7766289903*LOG(GSPR_ESC/GSPR_SUM) + 0.5722760916*LOG(NP_ESC/NP_SUM) -
0.2848898068*LOG(RWNM_ESC/RWNM_AVG) + 0.006024183736*@TREND

LOG(XNMFGO6_MATL/NMFGO6_SUM) = 0.1846847991 + 0.7374179765 +
0.7766289903*LOG(GSPR_MATL/GSPR_SUM) + 0.5722760916*LOG(NP_MATL/NP_SUM)
- 0.2848898068*LOG(RWNM_MATL/RWNM_AVG) - 0.004291202057*@TREND

LOG(XNMFGO6_MTN/NMFGO6_SUM) = -0.1300738263 + 0.7374179765 +
0.7766289903*LOG(GSPR_MTN/GSPR_SUM) + 0.5722760916*LOG(NP_MTN/NP_SUM) -
0.2848898068*LOG(RWNM_MTN/RWNM_AVG) - 0.001596967501*@TREND

LOG(XNMFGO6_NENG/NMFGO6_SUM) = 0.2291250613 + 0.7374179765 + 0.7766289903*LOG(GSPR_NENG/GSPR_SUM) + 0.5722760916*LOG(NP_NENG/NP_SUM) - 0.2848898068*LOG(RWNM_NENG/RWNM_AVG) + 0.004539732978*@TREND

LOG(XNMFGO6_PAC/NMFGO6_SUM) = -0.004386014623 + 0.7374179765 + 0.7766289903*LOG(GSPR_PAC/GSPR_SUM) + 0.5722760916*LOG(NP_PAC/NP_SUM) - 0.2848898068*LOG(RWNM_PAC/RWNM_AVG) - 0.002859685763*@TREND

LOG(XNMFGO6_SATL/NMFGO6_SUM) = -0.3016592808 + 0.7374179765 + 0.7766289903*LOG(GSPR_SATL/GSPR_SUM) + 0.5722760916*LOG(NP_SATL/NP_SUM) - 0.2848898068*LOG(RWNM_SATL/RWNM_AVG) + 0.001734743703*@TREND

LOG(XNMFGO6_WNC/NMFGO6_SUM) = 0.2422871552 + 0.7374179765 + 0.7766289903*LOG(GSPR_WNC/GSPR_SUM) + 0.5722760916*LOG(NP_WNC/NP_SUM) - 0.2848898068*LOG(RWNM_WNC/RWNM_AVG) + 0.003842499402*@TREND

LOG(XNMFGO6_WSC/NMFGO6_SUM) = -0.0376890608 + 0.7374179765 + 0.7766289903*LOG(GSPR_WSC/GSPR_SUM) + 0.5722760916*LOG(NP_WSC/NP_SUM) - 0.2848898068*LOG(RWNM_WSC/RWNM_AVG) + 0.003762003931*@TREND

NMFGO7 - Retail Trade

LOG(XNMFGO7_ENC/NMFGO7_SUM) = -0.6252936772 + 2.572599892 + 0.9369661246*LOG(GSPR_ENC/GSPR_SUM) + 1.165733269*LOG(NP_ENC/NP_SUM) - 0.3318030727*LOG(RWNM_ENC/RWNM_AVG) + 0.004658963565*@TREND

LOG(XNMFGO7_ESC/NMFGO7_SUM) = 0.5035457278 + 2.572599892 + 0.9369661246*LOG(GSPR_ESC/GSPR_SUM) + 1.165733269*LOG(NP_ESC/NP_SUM) - 0.3318030727*LOG(RWNM_ESC/RWNM_AVG) + 0.004010946792*@TREND

LOG(XNMFGO7_MATL/NMFGO7_SUM) = -0.5981919842 + 2.572599892 + 0.9369661246*LOG(GSPR_MATL/GSPR_SUM) + 1.165733269*LOG(NP_MATL/NP_SUM) - 0.3318030727*LOG(RWNM_MATL/RWNM_AVG) + 0.003467300388*@TREND

LOG(XNMFGO7_MTN/NMFGO7_SUM) = 0.9126222574 + 2.572599892 + 0.9369661246*LOG(GSPR_MTN/GSPR_SUM) + 1.165733269*LOG(NP_MTN/NP_SUM) - 0.3318030727*LOG(RWNM_MTN/RWNM_AVG) - 0.01946623832*@TREND

LOG(XNMFGO7_NENG/NMFGO7_SUM) = 0.6940479977 + 2.572599892 + 0.9369661246*LOG(GSPR_NENG/GSPR_SUM) + 1.165733269*LOG(NP_NENG/NP_SUM) - 0.3318030727*LOG(RWNM_NENG/RWNM_AVG) + 0.003335841566*@TREND

LOG(XNMFGO7_PAC/NMFGO7_SUM) = -0.5706871617 + 2.572599892 + 0.9369661246*LOG(GSPR_PAC/GSPR_SUM) + 1.165733269*LOG(NP_PAC/NP_SUM) - 0.3318030727*LOG(RWNM_PAC/RWNM_AVG) - 0.003058796199*@TREND

LOG(XNMFGO7_SATL/NMFGO7_SUM) = -0.5370536184 + 2.572599892 +
0.9369661246*LOG(GSPR_SATL/GSPR_SUM) + 1.165733269*LOG(NP_SATL/NP_SUM) -
0.3318030727*LOG(RWNM_SATL/RWNM_AVG) - 0.004946046101*@TREND

LOG(XNMFGO7_WNC/NMFGO7_SUM) = 0.3536637991 + 2.572599892 +
0.9369661246*LOG(GSPR_WNC/GSPR_SUM) + 1.165733269*LOG(NP_WNC/NP_SUM) -
0.3318030727*LOG(RWNM_WNC/RWNM_AVG) + 0.005543535203*@TREND

LOG(XNMFGO7_WSC/NMFGO7_SUM) = -0.1326533407 + 2.572599892 +
0.9369661246*LOG(GSPR_WSC/GSPR_SUM) + 1.165733269*LOG(NP_WSC/NP_SUM) -
0.3318030727*LOG(RWNM_WSC/RWNM_AVG) + 1.857024058e-008*@TREND

NMFGO8 - Finance & Insurance, Real Estate
LOG(XNMFGO8_ENC/NMFGO8_SUM) = 0.07123868163 + 0.115056809 +
1.047314344*LOG(GSPR_ENC/GSPR_SUM) - 0.002603906197*@TREND

LOG(XNMFGO8_ESC/NMFGO8_SUM) = -0.02137641907 + 0.115056809 +
1.047314344*LOG(GSPR_ESC/GSPR_SUM) - 0.004770882109*@TREND

LOG(XNMFGO8_MATL/NMFGO8_SUM) = -0.08952376284 + 0.115056809 +
1.047314344*LOG(GSPR_MATL/GSPR_SUM) + 0.01353600097*@TREND

LOG(XNMFGO8_MTN/NMFGO8_SUM) = -0.01169191813 + 0.115056809 +
1.047314344*LOG(GSPR_MTN/GSPR_SUM) - 0.006270536568*@TREND

LOG(XNMFGO8_NENG/NMFGO8_SUM) = 0.06230241325 + 0.115056809 +
1.047314344*LOG(GSPR_NENG/GSPR_SUM) + 0.007682690361*@TREND

LOG(XNMFGO8_PAC/NMFGO8_SUM) = -0.08587948788 + 0.115056809 +
1.047314344*LOG(GSPR_PAC/GSPR_SUM) - 0.005891485861*@TREND

LOG(XNMFGO8_SATL/NMFGO8_SUM) = -0.07851637684 + 0.115056809 +
1.047314344*LOG(GSPR_SATL/GSPR_SUM) + 0.002505946732*@TREND

LOG(XNMFGO8_WNC/NMFGO8_SUM) = 0.2075872409 + 0.115056809 +
1.047314344*LOG(GSPR_WNC/GSPR_SUM) - 0.004590783127*@TREND

LOG(XNMFGO8_WSC/NMFGO8_SUM) = -0.05414037098 + 0.115056809 +
1.047314344*LOG(GSPR_WSC/GSPR_SUM) - 0.009102148252*@TREND

NMFGO9 - Other Services
LOG(XNMFGO9_ENC/NMFGO9_SUM) = -0.003465625357 - 0.2210379827 +
0.6532330498*LOG(GSPR_ENC/GSPR_SUM) + 0.2657655369*LOG(NP_ENC/NP_SUM) -
0.0003953197301*@TREND

LOG(XNMFGO9_ESC/NMFGO9_SUM) = -0.3042512534 - 0.2210379827 + 0.6532330498*LOG(GSPR_ESC/GSPR_SUM) + 0.2657655369*LOG(NP_ESC/NP_SUM) + 0.004262598688*@TREND

LOG(XNMFGO9_MATL/NMFGO9_SUM) = 0.2974599945 - 0.2210379827 + 0.6532330498*LOG(GSPR_MATL/GSPR_SUM) + 0.2657655369*LOG(NP_MATL/NP_SUM) - 0.00715876399*@TREND

LOG(XNMFGO9_MTN/NMFGO9_SUM) = 0.04595393052 - 0.2210379827 + 0.6532330498*LOG(GSPR_MTN/GSPR_SUM) + 0.2657655369*LOG(NP_MTN/NP_SUM) - 0.002484963074*@TREND

LOG(XNMFGO9_NENG/NMFGO9_SUM) = 0.07429226756 - 0.2210379827 + 0.6532330498*LOG(GSPR_NENG/GSPR_SUM) + 0.2657655369*LOG(NP_NENG/NP_SUM) + 6.772521349e-005*@TREND

LOG(XNMFGO9_PAC/NMFGO9_SUM) = 0.1591209948 - 0.2210379827 + 0.6532330498*LOG(GSPR_PAC/GSPR_SUM) + 0.2657655369*LOG(NP_PAC/NP_SUM) - 0.0005405785352*@TREND

LOG(XNMFGO9_SATL/NMFGO9_SUM) = 0.0201590063 - 0.2210379827 + 0.6532330498*LOG(GSPR_SATL/GSPR_SUM) + 0.2657655369*LOG(NP_SATL/NP_SUM) + 0.006064205858*@TREND

LOG(XNMFGO9_WNC/NMFGO9_SUM) = -0.1312260338 - 0.2210379827 + 0.6532330498*LOG(GSPR_WNC/GSPR_SUM) + 0.2657655369*LOG(NP_WNC/NP_SUM) + 0.002754240274*@TREND

LOG(XNMFGO9_WSC/NMFGO9_SUM) = -0.1580432812 - 0.2210379827 + 0.6532330498*LOG(GSPR_WSC/GSPR_SUM) + 0.2657655369*LOG(NP_WSC/NP_SUM) + 0.002815404591*@TREND

NMFGO10 - Public Administration
LOG(XNMFGO10_ENC/NMFGO10_SUM) = -0.1196219494 - 0.2044640447 + 0.3029247975*LOG(GSPR_ENC/GSPR_SUM) + 0.6136479302*LOG(NP_ENC/NP_SUM) + 0.004009242912*@TREND

LOG(XNMFGO10_ESC/NMFGO10_SUM) = -0.06145935863 - 0.2044640447 + 0.3029247975*LOG(GSPR_ESC/GSPR_SUM) + 0.6136479302*LOG(NP_ESC/NP_SUM) + 0.001174824055*@TREND

LOG(XNMFGO10_MATL/NMFGO10_SUM) = 0.07900330954 - 0.2044640447 + 0.3029247975*LOG(GSPR_MATL/GSPR_SUM) + 0.6136479302*LOG(NP_MATL/NP_SUM) - 0.003110933045*@TREND

LOG(XNMFGO10_MTN/NMFGO10_SUM) = 0.1200633462 - 0.2044640447 + 0.3029247975*LOG(GSPR_MTN/GSPR_SUM) + 0.6136479302*LOG(NP_MTN/NP_SUM) - 0.006427003114*@TREND

LOG(XNMFGO10_NENG/NMFGO10_SUM) = -0.1701806912 - 0.2044640447 + 0.3029247975*LOG(GSPR_NENG/GSPR_SUM) + 0.6136479302*LOG(NP_NENG/NP_SUM) + 0.002526095159*@TREND

LOG(XNMFGO10_PAC/NMFGO10_SUM) = 0.129566707 - 0.2044640447 + 0.3029247975*LOG(GSPR_PAC/GSPR_SUM) + 0.6136479302*LOG(NP_PAC/NP_SUM) - 0.002917720788*@TREND

LOG(XNMFGO10_SATL/NMFGO10_SUM) = 0.2145028282 - 0.2044640447 + 0.3029247975*LOG(GSPR_SATL/GSPR_SUM) + 0.6136479302*LOG(NP_SATL/NP_SUM) - 0.0006943819764*@TREND

LOG(XNMFGO10_WNC/NMFGO10_SUM) = -0.1038194352 - 0.2044640447 + 0.3029247975*LOG(GSPR_WNC/GSPR_SUM) + 0.6136479302*LOG(NP_WNC/NP_SUM) + 0.003018190096*@TREND

LOG(XNMFGO10_WSC/NMFGO10_SUM) = -0.08805475655 - 0.2044640447 + 0.3029247975*LOG(GSPR_WSC/GSPR_SUM) + 0.6136479302*LOG(NP_WSC/NP_SUM) + 0.002040808428*@TREND

Regional Employment

Endogenous Variables:

E{I}_{R}	Employment in millions for sector I, region R (e.g. EMFGO1_ENC)
XE{I}_{R}	Employment in millions for sector I, region R, equation estimate (e.g. XEMFGO1_ENC)

Codes and descriptions of the sectors are presented in Table A14. Codes and descriptions of the regions are in Table B4.

Exogenous Variables:

E{I}_SUM	Employment in millions for sector I (national)
{I}_{R}	Output in billions of real 1996 dollars for sector I, region R
{I}_SUM	Output in billions of real 1996 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.

E{I}_{R} = (XE{I}_{R} / XE{I}_SUM) * E{I}_SUM
where:
E{I}_{R} = Employment for sector I, region R
XE{I}_{R} = Employment for sector I, region R, equation estimate
XE{I}_SUM = Sum of 9 regions' XE{I}_{R}
E{I}_SUM = Employment for sector I (national)

Detailed structural equations for XE{I}_{R}:

MFGO1 - Food Products
LOG(XEMFGO1_ENC/EMFGO1_SUM) = -0.05624752746 - 1.343628363 +
0.8503173755*LOG(@MOVAV(MFGO1_ENC_0,2)/@MOVAV(MFGO1_SUM_0,2)) -
0.4731052964*LOG(@MOVAV(RWM_ENC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO1_ESC/EMFGO1_SUM) = 0.05358071041 - 1.343628363 +
0.8503173755*LOG(@MOVAV(MFGO1_ESC_0,2)/@MOVAV(MFGO1_SUM_0,2)) -
0.4731052964*LOG(@MOVAV(RWM_ESC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO1_MATL/EMFGO1_SUM) = 0.08143687773 - 1.343628363 +
0.8503173755*LOG(@MOVAV(MFGO1_MATL_0,2)/@MOVAV(MFGO1_SUM_0,2)) -
0.4731052964*LOG(@MOVAV(RWM_MATL,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO1_MTN/EMFGO1_SUM) = -0.1501194603 - 1.343628363 +
0.8503173755*LOG(@MOVAV(MFGO1_MTN_0,2)/@MOVAV(MFGO1_SUM_0,2)) -
0.4731052964*LOG(@MOVAV(RWM_MTN,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO1_NENG/EMFGO1_SUM) = 0.08159862002 - 1.343628363 +
0.8503173755*LOG(@MOVAV(MFGO1_NENG_0,2)/@MOVAV(MFGO1_SUM_0,2)) -
0.4731052964*LOG(@MOVAV(RWM_NENG,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO1_PAC/EMFGO1_SUM) = 0.1963931959 - 1.343628363 +
0.8503173755*LOG(@MOVAV(MFGO1_PAC_0,2)/@MOVAV(MFGO1_SUM_0,2)) -
0.4731052964*LOG(@MOVAV(RWM_PAC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO1_SATL/EMFGO1_SUM) = 0.08859836078 - 1.343628363 +
0.8503173755*LOG(@MOVAV(MFGO1_SATL_0,2)/@MOVAV(MFGO1_SUM_0,2)) -
0.4731052964*LOG(@MOVAV(RWM_SATL,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO1_WNC/EMFGO1_SUM) = -0.2873736768 - 1.343628363 +
0.8503173755*LOG(@MOVAV(MFGO1_WNC_0,2)/@MOVAV(MFGO1_SUM_0,2)) -
0.4731052964*LOG(@MOVAV(RWM_WNC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO1_WSC/EMFGO1_SUM) = -0.007867100302 - 1.343628363 +
0.8503173755*LOG(@MOVAV(MFGO1_WSC_0,2)/@MOVAV(MFGO1_SUM_0,2)) -
0.4731052964*LOG(@MOVAV(RWM_WSC,2)/@MOVAV(RWM_SUM,2))

MFGO2 - Beverage and Tobacco Products
LOG(XEMFGO2_ENC/EMFGO2_SUM) = 0.1963950524 - 1.796725342 +
0.2387792714*LOG(@MOVAV(MFGO2_ENC_0,2)/@MOVAV(MFGO2_SUM_0,2))

LOG(XEMFGO2_ESC/EMFGO2_SUM) = -0.1400915386 - 1.796725342 +
0.2387792714*LOG(@MOVAV(MFGO2_ESC_0,2)/@MOVAV(MFGO2_SUM_0,2))

LOG(XEMFGO2_MATL/EMFGO2_SUM) = 0.1374113759 - 1.796725342 +
0.2387792714*LOG(@MOVAV(MFGO2_MATL_0,2)/@MOVAV(MFGO2_SUM_0,2))

LOG(XEMFGO2_MTN/EMFGO2_SUM) = -0.1516593531 - 1.796725342 +
0.2387792714*LOG(@MOVAV(MFGO2_MTN_0,2)/@MOVAV(MFGO2_SUM_0,2))

LOG(XEMFGO2_NENG/EMFGO2_SUM) = -0.94447662 - 1.796725342 +
0.2387792714*LOG(@MOVAV(MFGO2_NENG_0,2)/@MOVAV(MFGO2_SUM_0,2))

LOG(XEMFGO2_PAC/EMFGO2_SUM) = 0.5725864612 - 1.796725342 +
0.2387792714*LOG(@MOVAV(MFGO2_PAC_0,2)/@MOVAV(MFGO2_SUM_0,2))

LOG(XEMFGO2_SATL/EMFGO2_SUM) = 0.7473683359 - 1.796725342 +
0.2387792714*LOG(@MOVAV(MFGO2_SATL_0,2)/@MOVAV(MFGO2_SUM_0,2))

LOG(XEMFGO2_WNC/EMFGO2_SUM) = -0.4164603302 - 1.796725342 +
0.2387792714*LOG(@MOVAV(MFGO2_WNC_0,2)/@MOVAV(MFGO2_SUM_0,2))

LOG(XEMFGO2_WSC/EMFGO2_SUM) = -0.001073383497 - 1.796725342 +
0.2387792714*LOG(@MOVAV(MFGO2_WSC_0,2)/@MOVAV(MFGO2_SUM_0,2))

MFGO3 - Textile Mills & Textile Products
LOG(XEMFGO3_ENC/EMFGO3_SUM) = -0.08431077875 - 0.7993250791 +
0.6845977626*LOG(@MOVAV(MFGO3_ENC_0,2)/@MOVAV(MFGO3_SUM_0,2))

LOG(XEMFGO3_ESC/EMFGO3_SUM) = 0.08446579359 - 0.7993250791 +
0.6845977626*LOG(@MOVAV(MFGO3_ESC_0,2)/@MOVAV(MFGO3_SUM_0,2))

LOG(XEMFGO3_MATL/EMFGO3_SUM) = 0.1030876749 - 0.7993250791 +
0.6845977626*LOG(@MOVAV(MFGO3_MATL_0,2)/@MOVAV(MFGO3_SUM_0,2))

LOG(XEMFGO3_MTN/EMFGO3_SUM) = -0.4739012048 - 0.7993250791 +
0.6845977626*LOG(@MOVAV(MFGO3_MTN_0,2)/@MOVAV(MFGO3_SUM_0,2))

LOG(XEMFGO3_NENG/EMFGO3_SUM) = -0.01059995492 - 0.7993250791 +
0.6845977626*LOG(@MOVAV(MFGO3_NENG_0,2)/@MOVAV(MFGO3_SUM_0,2))

LOG(XEMFGO3_PAC/EMFGO3_SUM) = 0.07484795499 - 0.7993250791 +
0.6845977626*LOG(@MOVAV(MFGO3_PAC_0,2)/@MOVAV(MFGO3_SUM_0,2))

LOG(XEMFGO3_SATL/EMFGO3_SUM) = 0.566719258 - 0.7993250791 +
0.6845977626*LOG(@MOVAV(MFGO3_SATL_0,2)/@MOVAV(MFGO3_SUM_0,2))

LOG(XEMFGO3_WNC/EMFGO3_SUM) = -0.295312794 - 0.7993250791 +
0.6845977626*LOG(@MOVAV(MFGO3_WNC_0,2)/@MOVAV(MFGO3_SUM_0,2))

LOG(XEMFGO3_WSC/EMFGO3_SUM) = 0.03500405101 - 0.7993250791 +
0.6845977626*LOG(@MOVAV(MFGO3_WSC_0,2)/@MOVAV(MFGO3_SUM_0,2))

MFGO4 - Apparel
LOG(XEMFGO4_ENC/EMFGO4_SUM) = -0.3856175709 - 1.116823231 +
0.5751000057*LOG(@MOVAV(MFGO4_ENC_0,2)/@MOVAV(MFGO4_SUM_0,2))

LOG(XEMFGO4_ESC/EMFGO4_SUM) = 0.5020581674 - 1.116823231 +
0.5751000057*LOG(@MOVAV(MFGO4_ESC_0,2)/@MOVAV(MFGO4_SUM_0,2))

LOG(XEMFGO4_MATL/EMFGO4_SUM) = 0.3830722698 - 1.116823231 +
0.5751000057*LOG(@MOVAV(MFGO4_MATL_0,2)/@MOVAV(MFGO4_SUM_0,2))

LOG(XEMFGO4_MTN/EMFGO4_SUM) = -0.6439781158 - 1.116823231 +
0.5751000057*LOG(@MOVAV(MFGO4_MTN_0,2)/@MOVAV(MFGO4_SUM_0,2))

LOG(XEMFGO4_NENG/EMFGO4_SUM) = -0.5549940737 - 1.116823231 +
0.5751000057*LOG(@MOVAV(MFGO4_NENG_0,2)/@MOVAV(MFGO4_SUM_0,2))

LOG(XEMFGO4_PAC/EMFGO4_SUM) = 0.3668124743 - 1.116823231 +
0.5751000057*LOG(@MOVAV(MFGO4_PAC_0,2)/@MOVAV(MFGO4_SUM_0,2))

LOG(XEMFGO4_SATL/EMFGO4_SUM) = 0.5349024341 - 1.116823231 +
0.5751000057*LOG(@MOVAV(MFGO4_SATL_0,2)/@MOVAV(MFGO4_SUM_0,2))

LOG(XEMFGO4_WNC/EMFGO4_SUM) = -0.1756977484 - 1.116823231 +
0.5751000057*LOG(@MOVAV(MFGO4_WNC_0,2)/@MOVAV(MFGO4_SUM_0,2))

LOG(XEMFGO4_WSC/EMFGO4_SUM) = -0.02655783681 - 1.116823231 +
0.5751000057*LOG(@MOVAV(MFGO4_WSC_0,2)/@MOVAV(MFGO4_SUM_0,2))

MFGO5 - Wood Products

LOG(XEMFGO5_ENC/EMFGO5_SUM) = 0.2775768542 - 0.8709234491 +
0.6185500732*LOG(@MOVAV(MFGO5_ENC_0,2)/@MOVAV(MFGO5_SUM_0,2))

LOG(XEMFGO5_ESC/EMFGO5_SUM) = 0.09772162104 - 0.8709234491 +
0.6185500732*LOG(@MOVAV(MFGO5_ESC_0,2)/@MOVAV(MFGO5_SUM_0,2))

LOG(XEMFGO5_MATL/EMFGO5_SUM) = -0.07093654636 - 0.8709234491 +
0.6185500732*LOG(@MOVAV(MFGO5_MATL_0,2)/@MOVAV(MFGO5_SUM_0,2))

LOG(XEMFGO5_MTN/EMFGO5_SUM) = -0.2279639153 - 0.8709234491 +
0.6185500732*LOG(@MOVAV(MFGO5_MTN_0,2)/@MOVAV(MFGO5_SUM_0,2))

LOG(XEMFGO5_NENG/EMFGO5_SUM) = -0.3291498585 - 0.8709234491 +
0.6185500732*LOG(@MOVAV(MFGO5_NENG_0,2)/@MOVAV(MFGO5_SUM_0,2))

LOG(XEMFGO5_PAC/EMFGO5_SUM) = 0.07998637569 - 0.8709234491 +
0.6185500732*LOG(@MOVAV(MFGO5_PAC_0,2)/@MOVAV(MFGO5_SUM_0,2))

LOG(XEMFGO5_SATL/EMFGO5_SUM) = 0.2756026594 - 0.8709234491 +
0.6185500732*LOG(@MOVAV(MFGO5_SATL_0,2)/@MOVAV(MFGO5_SUM_0,2))

LOG(XEMFGO5_WNC/EMFGO5_SUM) = -0.07073529674 - 0.8709234491 +
0.6185500732*LOG(@MOVAV(MFGO5_WNC_0,2)/@MOVAV(MFGO5_SUM_0,2))

LOG(XEMFGO5_WSC/EMFGO5_SUM) = -0.0321018934 - 0.8709234491 +
0.6185500732*LOG(@MOVAV(MFGO5_WSC_0,2)/@MOVAV(MFGO5_SUM_0,2))

MFGO6 - Furniture and Related Products

LOG(XEMFGO6_ENC/EMFGO6_SUM) = -0.1161321445 - 0.2352040396 +
0.8967118301*LOG(@MOVAV(MFGO6_ENC_0,2)/@MOVAV(MFGO6_SUM_0,2))

LOG(XEMFGO6_ESC/EMFGO6_SUM) = 0.07799469906 - 0.2352040396 +
0.8967118301*LOG(@MOVAV(MFGO6_ESC_0,2)/@MOVAV(MFGO6_SUM_0,2))

LOG(XEMFGO6_MATL/EMFGO6_SUM) = -0.0404670294 - 0.2352040396 +
0.8967118301*LOG(@MOVAV(MFGO6_MATL_0,2)/@MOVAV(MFGO6_SUM_0,2))

LOG(XEMFGO6_MTN/EMFGO6_SUM) = 0.03183049783 - 0.2352040396 +
0.8967118301*LOG(@MOVAV(MFGO6_MTN_0,2)/@MOVAV(MFGO6_SUM_0,2))

LOG(XEMFGO6_NENG/EMFGO6_SUM) = -0.1726587668 - 0.2352040396 +
0.8967118301*LOG(@MOVAV(MFGO6_NENG_0,2)/@MOVAV(MFGO6_SUM_0,2))

LOG(XEMFGO6_PAC/EMFGO6_SUM) = 0.02429434772 - 0.2352040396 +
0.8967118301*LOG(@MOVAV(MFGO6_PAC_0,2)/@MOVAV(MFGO6_SUM_0,2))

LOG(XEMFGO6_SATL/EMFGO6_SUM) = 0.2084775594 - 0.2352040396 +
0.8967118301*LOG(@MOVAV(MFGO6_SATL_0,2)/@MOVAV(MFGO6_SUM_0,2))

LOG(XEMFGO6_WNC/EMFGO6_SUM) = -0.09449984164 - 0.2352040396 +
0.8967118301*LOG(@MOVAV(MFGO6_WNC_0,2)/@MOVAV(MFGO6_SUM_0,2))

LOG(XEMFGO6_WSC/EMFGO6_SUM) = 0.0811606784 - 0.2352040396 +
0.8967118301*LOG(@MOVAV(MFGO6_WSC_0,2)/@MOVAV(MFGO6_SUM_0,2))

MFGO7 - Paper Products
LOG(XEMFGO7_ENC/EMFGO7_SUM) = 0.2658311616 - 0.4971299543 +
0.792678579*LOG(@MOVAV(MFGO7_ENC_0,2)/@MOVAV(MFGO7_SUM_0,2))

LOG(XEMFGO7_ESC/EMFGO7_SUM) = -0.07478768885 - 0.4971299543 +
0.792678579*LOG(@MOVAV(MFGO7_ESC_0,2)/@MOVAV(MFGO7_SUM_0,2))

LOG(XEMFGO7_MATL/EMFGO7_SUM) = 0.2050614058 - 0.4971299543 +
0.792678579*LOG(@MOVAV(MFGO7_MATL_0,2)/@MOVAV(MFGO7_SUM_0,2))

LOG(XEMFGO7_MTN/EMFGO7_SUM) = -0.2896170767 - 0.4971299543 +
0.792678579*LOG(@MOVAV(MFGO7_MTN_0,2)/@MOVAV(MFGO7_SUM_0,2))

LOG(XEMFGO7_NENG/EMFGO7_SUM) = 0.05676868712 - 0.4971299543 +
0.792678579*LOG(@MOVAV(MFGO7_NENG_0,2)/@MOVAV(MFGO7_SUM_0,2))

LOG(XEMFGO7_PAC/EMFGO7_SUM) = -0.04628280431 - 0.4971299543 +
0.792678579*LOG(@MOVAV(MFGO7_PAC_0,2)/@MOVAV(MFGO7_SUM_0,2))

LOG(XEMFGO7_SATL/EMFGO7_SUM) = 0.08147012885 - 0.4971299543 +
0.792678579*LOG(@MOVAV(MFGO7_SATL_0,2)/@MOVAV(MFGO7_SUM_0,2))

LOG(XEMFGO7_WNC/EMFGO7_SUM) = -0.04542230927 - 0.4971299543 +
0.792678579*LOG(@MOVAV(MFGO7_WNC_0,2)/@MOVAV(MFGO7_SUM_0,2))

LOG(XEMFGO7_WSC/EMFGO7_SUM) = -0.1530215043 - 0.4971299543 +
0.792678579*LOG(@MOVAV(MFGO7_WSC_0,2)/@MOVAV(MFGO7_SUM_0,2))

MFGO8 - Printing
LOG(XEMFGO8_ENC/EMFGO8_SUM) = 0.286445067 - 1.319068064 +
0.6089168175*LOG(@MOVAV(MFGO8_ENC_0,2)/@MOVAV(MFGO8_SUM_0,2)) -
0.1907133378*LOG(@MOVAV(RWM_ENC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO8_ESC/EMFGO8_SUM) = -0.2027149515 - 1.319068064 +
0.6089168175*LOG(@MOVAV(MFGO8_ESC_0,2)/@MOVAV(MFGO8_SUM_0,2)) -
0.1907133378*LOG(@MOVAV(RWM_ESC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO8_MATL/EMFGO8_SUM) = 0.1769844127 - 1.319068064 +
0.6089168175*LOG(@MOVAV(MFGO8_MATL_0,2)/@MOVAV(MFGO8_SUM_0,2)) -
0.1907133378*LOG(@MOVAV(RWM_MATL,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO8_MTN/EMFGO8_SUM) = -0.2883088193 - 1.319068064 +
0.6089168175*LOG(@MOVAV(MFGO8_MTN_0,2)/@MOVAV(MFGO8_SUM_0,2)) -
0.1907133378*LOG(@MOVAV(RWM_MTN,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO8_NENG/EMFGO8_SUM) = -0.1724341858 - 1.319068064 +
0.6089168175*LOG(@MOVAV(MFGO8_NENG_0,2)/@MOVAV(MFGO8_SUM_0,2)) -
0.1907133378*LOG(@MOVAV(RWM_NENG,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO8_PAC/EMFGO8_SUM) = 0.1641833104 - 1.319068064 +
0.6089168175*LOG(@MOVAV(MFGO8_PAC_0,2)/@MOVAV(MFGO8_SUM_0,2)) -
0.1907133378*LOG(@MOVAV(RWM_PAC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO8_SATL/EMFGO8_SUM) = 0.1675243046 - 1.319068064 +
0.6089168175*LOG(@MOVAV(MFGO8_SATL_0,2)/@MOVAV(MFGO8_SUM_0,2)) -
0.1907133378*LOG(@MOVAV(RWM_SATL,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO8_WNC/EMFGO8_SUM) = 0.002664047935 - 1.319068064 +
0.6089168175*LOG(@MOVAV(MFGO8_WNC_0,2)/@MOVAV(MFGO8_SUM_0,2)) -
0.1907133378*LOG(@MOVAV(RWM_WNC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO8_WSC/EMFGO8_SUM) = -0.1343431861 - 1.319068064 +
0.6089168175*LOG(@MOVAV(MFGO8_WSC_0,2)/@MOVAV(MFGO8_SUM_0,2)) -
0.1907133378*LOG(@MOVAV(RWM_WSC,2)/@MOVAV(RWM_SUM,2))

MFGO9 - Basic Inorganic Chemicals
LOG(XEMFGO9_ENC/EMFGO9_SUM) = 0.1806920105 - 0.5240284617 +
0.7874170596*LOG(@MOVAV(MFGO9_ENC_0,2)/@MOVAV(MFGO9_SUM_0,2))

LOG(XEMFGO9_ESC/EMFGO9_SUM) = 0.3028648313 - 0.5240284617 +
0.7874170596*LOG(@MOVAV(MFGO9_ESC_0,2)/@MOVAV(MFGO9_SUM_0,2))

LOG(XEMFGO9_MATL/EMFGO9_SUM) = 0.08926241942 - 0.5240284617 +
0.7874170596*LOG(@MOVAV(MFGO9_MATL_0,2)/@MOVAV(MFGO9_SUM_0,2))

LOG(XEMFGO9_MTN/EMFGO9_SUM) = -0.1974268387 - 0.5240284617 +
0.7874170596*LOG(@MOVAV(MFGO9_MTN_0,2)/@MOVAV(MFGO9_SUM_0,2))

LOG(XEMFGO9_NENG/EMFGO9_SUM) = -0.140867002 - 0.5240284617 +
0.7874170596*LOG(@MOVAV(MFGO9_NENG_0,2)/@MOVAV(MFGO9_SUM_0,2))

LOG(XEMFGO9_PAC/EMFGO9_SUM) = -0.1323061232 - 0.5240284617 +
0.7874170596*LOG(@MOVAV(MFGO9_PAC_0,2)/@MOVAV(MFGO9_SUM_0,2))

LOG(XEMFGO9_SATL/EMFGO9_SUM) = 0.4148551474 - 0.5240284617 +
0.7874170596*LOG(@MOVAV(MFGO9_SATL_0,2)/@MOVAV(MFGO9_SUM_0,2))

LOG(XEMFGO9_WNC/EMFGO9_SUM) = -0.05653989235 - 0.5240284617 +
0.7874170596*LOG(@MOVAV(MFGO9_WNC_0,2)/@MOVAV(MFGO9_SUM_0,2))

LOG(XEMFGO9_WSC/EMFGO9_SUM) = -0.4605345524 - 0.5240284617 +
0.7874170596*LOG(@MOVAV(MFGO9_WSC_0,2)/@MOVAV(MFGO9_SUM_0,2))

MFGO10 - Basic Organic Chemicals
LOG(XEMFGO10_ENC/EMFGO10_SUM) = 0.3332640169 - 0.7958403849 +
0.6680561256*LOG(@MOVAV(MFGO10_ENC_0,2)/@MOVAV(MFGO10_SUM_0,2))

LOG(XEMFGO10_ESC/EMFGO10_SUM) = 0.3904651516 - 0.7958403849 +
0.6680561256*LOG(@MOVAV(MFGO10_ESC_0,2)/@MOVAV(MFGO10_SUM_0,2))

LOG(XEMFGO10_MATL/EMFGO10_SUM) = 0.2718137809 - 0.7958403849 +
0.6680561256*LOG(@MOVAV(MFGO10_MATL_0,2)/@MOVAV(MFGO10_SUM_0,2))

LOG(XEMFGO10_MTN/EMFGO10_SUM) = -0.5536080011 - 0.7958403849 +
0.6680561256*LOG(@MOVAV(MFGO10_MTN_0,2)/@MOVAV(MFGO10_SUM_0,2))

LOG(XEMFGO10_NENG/EMFGO10_SUM) = -0.383988223 - 0.7958403849 +
0.6680561256*LOG(@MOVAV(MFGO10_NENG_0,2)/@MOVAV(MFGO10_SUM_0,2))

LOG(XEMFGO10_PAC/EMFGO10_SUM) = -0.5102521892 - 0.7958403849 +
0.6680561256*LOG(@MOVAV(MFGO10_PAC_0,2)/@MOVAV(MFGO10_SUM_0,2))

LOG(XEMFGO10_SATL/EMFGO10_SUM) = 0.5284994936 - 0.7958403849 +
0.6680561256*LOG(@MOVAV(MFGO10_SATL_0,2)/@MOVAV(MFGO10_SUM_0,2))

LOG(XEMFGO10_WNC/EMFGO10_SUM) = -0.2712653383 - 0.7958403849 +
0.6680561256*LOG(@MOVAV(MFGO10_WNC_0,2)/@MOVAV(MFGO10_SUM_0,2))

LOG(XEMFGO10_WSC/EMFGO10_SUM) = 0.1950713086 - 0.7958403849 +
0.6680561256*LOG(@MOVAV(MFGO10_WSC_0,2)/@MOVAV(MFGO10_SUM_0,2))

MFGO11 - Plastic and Synthetic Rubber Materials
LOG(XEMFGO11_ENC/EMFGO11_SUM) = 0.3127704131 - 1.202139637 +
0.5717489788*LOG(@MOVAV(MFGO11_ENC_0,2)/@MOVAV(MFGO11_SUM_0,2))

LOG(XEMFGO11_ESC/EMFGO11_SUM) = 0.3563458284 - 1.202139637 +
0.5717489788*LOG(@MOVAV(MFGO11_ESC_0,2)/@MOVAV(MFGO11_SUM_0,2))

LOG(XEMFGO11_MATL/EMFGO11_SUM) = 0.2160358356 - 1.202139637 +
0.5717489788*LOG(@MOVAV(MFGO11_MATL_0,2)/@MOVAV(MFGO11_SUM_0,2))

LOG(XEMFGO11_MTN/EMFGO11_SUM) = -0.7567196809 - 1.202139637 +
0.5717489788*LOG(@MOVAV(MFGO11_MTN_0,2)/@MOVAV(MFGO11_SUM_0,2))

LOG(XEMFGO11_NENG/EMFGO11_SUM) = -0.3123619875 - 1.202139637 +
0.5717489788*LOG(@MOVAV(MFGO11_NENG_0,2)/@MOVAV(MFGO11_SUM_0,2))

LOG(XEMFGO11_PAC/EMFGO11_SUM) = -0.3631477244 - 1.202139637 +
0.5717489788*LOG(@MOVAV(MFGO11_PAC_0,2)/@MOVAV(MFGO11_SUM_0,2))

LOG(XEMFGO11_SATL/EMFGO11_SUM) = 0.9990516402 - 1.202139637 +
0.5717489788*LOG(@MOVAV(MFGO11_SATL_0,2)/@MOVAV(MFGO11_SUM_0,2))

LOG(XEMFGO11_WNC/EMFGO11_SUM) = -0.6365496728 - 1.202139637 +
0.5717489788*LOG(@MOVAV(MFGO11_WNC_0,2)/@MOVAV(MFGO11_SUM_0,2))

LOG(XEMFGO11_WSC/EMFGO11_SUM) = 0.1845753483 - 1.202139637 +
0.5717489788*LOG(@MOVAV(MFGO11_WSC_0,2)/@MOVAV(MFGO11_SUM_0,2))

MFGO12 - Agricultural Chemicals
LOG(XEMFGO12_ENC/EMFGO12_SUM) = -0.02623983669 - 1.575449304 +
0.3189617364*LOG(@MOVAV(MFGO12_ENC_0,2)/@MOVAV(MFGO12_SUM_0,2))

LOG(XEMFGO12_ESC/EMFGO12_SUM) = -0.03854604251 - 1.575449304 +
0.3189617364*LOG(@MOVAV(MFGO12_ESC_0,2)/@MOVAV(MFGO12_SUM_0,2))

LOG(XEMFGO12_MATL/EMFGO12_SUM) = -0.4139671056 - 1.575449304 +
0.3189617364*LOG(@MOVAV(MFGO12_MATL_0,2)/@MOVAV(MFGO12_SUM_0,2))

LOG(XEMFGO12_MTN/EMFGO12_SUM) = -0.159862476 - 1.575449304 +
0.3189617364*LOG(@MOVAV(MFGO12_MTN_0,2)/@MOVAV(MFGO12_SUM_0,2))

LOG(XEMFGO12_NENG/EMFGO12_SUM) = -0.4869668382 - 1.575449304 +
0.3189617364*LOG(@MOVAV(MFGO12_NENG_0,2)/@MOVAV(MFGO12_SUM_0,2))

LOG(XEMFGO12_PAC/EMFGO12_SUM) = -0.07205453529 - 1.575449304 +
0.3189617364*LOG(@MOVAV(MFGO12_PAC_0,2)/@MOVAV(MFGO12_SUM_0,2))

LOG(XEMFGO12_SATL/EMFGO12_SUM) = 0.7018523297 - 1.575449304 +
0.3189617364*LOG(@MOVAV(MFGO12_SATL_0,2)/@MOVAV(MFGO12_SUM_0,2))

LOG(XEMFGO12_WNC/EMFGO12_SUM) = 0.2512916452 - 1.575449304 +
0.3189617364*LOG(@MOVAV(MFGO12_WNC_0,2)/@MOVAV(MFGO12_SUM_0,2))

LOG(XEMFGO12_WSC/EMFGO12_SUM) = 0.2444928595 - 1.575449304 +
0.3189617364*LOG(@MOVAV(MFGO12_WSC_0,2)/@MOVAV(MFGO12_SUM_0,2))

MFGO13 - Other Chemical Products

LOG(XEMFGO13_ENC/EMFGO13_SUM) = 0.1669462198 - 0.6274415078 + 0.7217114322*LOG(@MOVAV(MFGO13_ENC_0,2)/@MOVAV(MFGO13_SUM_0,2))

LOG(XEMFGO13_ESC/EMFGO13_SUM) = -0.2394762923 - 0.6274415078 + 0.7217114322*LOG(@MOVAV(MFGO13_ESC_0,2)/@MOVAV(MFGO13_SUM_0,2))

LOG(XEMFGO13_MATL/EMFGO13_SUM) = 0.2169842099 - 0.6274415078 + 0.7217114322*LOG(@MOVAV(MFGO13_MATL_0,2)/@MOVAV(MFGO13_SUM_0,2))

LOG(XEMFGO13_MTN/EMFGO13_SUM) = -0.1760429083 - 0.6274415078 + 0.7217114322*LOG(@MOVAV(MFGO13_MTN_0,2)/@MOVAV(MFGO13_SUM_0,2))

LOG(XEMFGO13_NENG/EMFGO13_SUM) = 0.09481539259 - 0.6274415078 + 0.7217114322*LOG(@MOVAV(MFGO13_NENG_0,2)/@MOVAV(MFGO13_SUM_0,2))

LOG(XEMFGO13_PAC/EMFGO13_SUM) = 0.2306341926 - 0.6274415078 + 0.7217114322*LOG(@MOVAV(MFGO13_PAC_0,2)/@MOVAV(MFGO13_SUM_0,2))

LOG(XEMFGO13_SATL/EMFGO13_SUM) = -0.08029428934 - 0.6274415078 + 0.7217114322*LOG(@MOVAV(MFGO13_SATL_0,2)/@MOVAV(MFGO13_SUM_0,2))

LOG(XEMFGO13_WNC/EMFGO13_SUM) = -0.1054248185 - 0.6274415078 + 0.7217114322*LOG(@MOVAV(MFGO13_WNC_0,2)/@MOVAV(MFGO13_SUM_0,2))

LOG(XEMFGO13_WSC/EMFGO13_SUM) = -0.1081417066 - 0.6274415078 + 0.7217114322*LOG(@MOVAV(MFGO13_WSC_0,2)/@MOVAV(MFGO13_SUM_0,2))

MFGO14 - Petroleum Refineries

LOG(XEMFGO14_ENC/MFGO14_ENC_0) = -0.317951313 + 0.01897137962 + 0.9782323146*LOG(EMFGO14_SUM/MFGO14_SUM_0)

LOG(XEMFGO14_ESC/MFGO14_ESC_0) = 0.3210204163 + 0.01897137962 + 0.9782323146*LOG(EMFGO14_SUM/MFGO14_SUM_0)

LOG(XEMFGO14_MATL/MFGO14_MATL_0) = -0.2912572641 + 0.01897137962 + 0.9782323146*LOG(EMFGO14_SUM/MFGO14_SUM_0)

LOG(XEMFGO14_MTN/MFGO14_MTN_0) = 0.127358895 + 0.01897137962 + 0.9782323146*LOG(EMFGO14_SUM/MFGO14_SUM_0)

LOG(XEMFGO14_NENG/MFGO14_NENG_0) = 0.4372087057 + 0.01897137962 + 0.9782323146*LOG(EMFGO14_SUM/MFGO14_SUM_0)

LOG(XEMFGO14_PAC/MFGO14_PAC_0) = -0.0450828665 + 0.01897137962 + 0.9782323146*LOG(EMFGO14_SUM/MFGO14_SUM_0)

LOG(XEMFGO14_SATL/MFGO14_SATL_0) = 0.3163038615 + 0.01897137962 + 0.9782323146*LOG(EMFGO14_SUM/MFGO14_SUM_0)

LOG(XEMFGO14_WNC/MFGO14_WNC_0) = -0.1977935381 + 0.01897137962 + 0.9782323146*LOG(EMFGO14_SUM/MFGO14_SUM_0)

LOG(XEMFGO14_WSC/MFGO14_WSC_0) = -0.3498068968 + 0.01897137962 + 0.9782323146*LOG(EMFGO14_SUM/MFGO14_SUM_0)

MFGO15 - Other Petroleum and Coal Products

LOG(XEMFGO15_ENC/MFGO15_ENC_0) = -0.3196504202 + 0.45829451 + 1.04118383*LOG(EMFGO15_SUM/MFGO15_SUM_0)

LOG(XEMFGO15_ESC/MFGO15_ESC_0) = 0.3225479145 + 0.45829451 + 1.04118383*LOG(EMFGO15_SUM/MFGO15_SUM_0)

LOG(XEMFGO15_MATL/MFGO15_MATL_0) = -0.2897293883 + 0.45829451 + 1.04118383*LOG(EMFGO15_SUM/MFGO15_SUM_0)

LOG(XEMFGO15_MTN/MFGO15_MTN_0) = 0.130207822 + 0.45829451 + 1.04118383*LOG(EMFGO15_SUM/MFGO15_SUM_0)

LOG(XEMFGO15_NENG/MFGO15_NENG_0) = 0.4366696972 + 0.45829451 + 1.04118383*LOG(EMFGO15_SUM/MFGO15_SUM_0)

LOG(XEMFGO15_PAC/MFGO15_PAC_0) = -0.04729125574 + 0.45829451 + 1.04118383*LOG(EMFGO15_SUM/MFGO15_SUM_0)

LOG(XEMFGO15_SATL/MFGO15_SATL_0) = 0.3185525075 + 0.45829451 + 1.04118383*LOG(EMFGO15_SUM/MFGO15_SUM_0)

LOG(XEMFGO15_WNC/MFGO15_WNC_0) = -0.1998417962 + 0.45829451 + 1.04118383*LOG(EMFGO15_SUM/MFGO15_SUM_0)

LOG(XEMFGO15_WSC/MFGO15_WSC_0) = -0.3514650807 + 0.45829451 + 1.04118383*LOG(EMFGO15_SUM/MFGO15_SUM_0)

MFGO16 - Plastics and Rubber Products

LOG(XEMFGO16_ENC/EMFGO16_SUM) = 0.3636939824 - 1.485155163 + 0.747775564*LOG(@MOVAV(MFGO16_ENC_0,2)/@MOVAV(MFGO16_SUM_0,2)) - 0.4016636931*LOG(@MOVAV(RWM_ENC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO16_ESC/EMFGO16_SUM) = -0.130117157 - 1.485155163 + 0.747775564*LOG(@MOVAV(MFGO16_ESC_0,2)/@MOVAV(MFGO16_SUM_0,2)) - 0.4016636931*LOG(@MOVAV(RWM_ESC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO16_MATL/EMFGO16_SUM) = 0.1468732726 - 1.485155163 +
0.747775564*LOG(@MOVAV(MFGO16_MATL_0,2)/@MOVAV(MFGO16_SUM_0,2)) -
0.4016636931*LOG(@MOVAV(RWM_MATL,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO16_MTN/EMFGO16_SUM) = -0.2454207818 - 1.485155163 +
0.747775564*LOG(@MOVAV(MFGO16_MTN_0,2)/@MOVAV(MFGO16_SUM_0,2)) -
0.4016636931*LOG(@MOVAV(RWM_MTN,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO16_NENG/EMFGO16_SUM) = -0.07185415055 - 1.485155163 +
0.747775564*LOG(@MOVAV(MFGO16_NENG_0,2)/@MOVAV(MFGO16_SUM_0,2)) -
0.4016636931*LOG(@MOVAV(RWM_NENG,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO16_PAC/EMFGO16_SUM) = 0.1602262908 - 1.485155163 +
0.747775564*LOG(@MOVAV(MFGO16_PAC_0,2)/@MOVAV(MFGO16_SUM_0,2)) -
0.4016636931*LOG(@MOVAV(RWM_PAC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO16_SATL/EMFGO16_SUM) = -0.013077927 - 1.485155163 +
0.747775564*LOG(@MOVAV(MFGO16_SATL_0,2)/@MOVAV(MFGO16_SUM_0,2)) -
0.4016636931*LOG(@MOVAV(RWM_SATL,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO16_WNC/EMFGO16_SUM) = -0.05526578988 - 1.485155163 +
0.747775564*LOG(@MOVAV(MFGO16_WNC_0,2)/@MOVAV(MFGO16_SUM_0,2)) -
0.4016636931*LOG(@MOVAV(RWM_WNC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO16_WSC/EMFGO16_SUM) = -0.1550577395 - 1.485155163 +
0.747775564*LOG(@MOVAV(MFGO16_WSC_0,2)/@MOVAV(MFGO16_SUM_0,2)) -
0.4016636931*LOG(@MOVAV(RWM_WSC,2)/@MOVAV(RWM_SUM,2))

MFGO17 - Leather and Allied Products
LOG(XEMFGO17_ENC/EMFGO17_SUM) = 0.03996955281 - 0.6075653778 +
0.7376487319*LOG(@MOVAV(MFGO17_ENC_0,2)/@MOVAV(MFGO17_SUM_0,2))

LOG(XEMFGO17_ESC/EMFGO17_SUM) = -0.1214212844 - 0.6075653778 +
0.7376487319*LOG(@MOVAV(MFGO17_ESC_0,2)/@MOVAV(MFGO17_SUM_0,2))

LOG(XEMFGO17_MATL/EMFGO17_SUM) = 0.1343463525 - 0.6075653778 +
0.7376487319*LOG(@MOVAV(MFGO17_MATL_0,2)/@MOVAV(MFGO17_SUM_0,2))

LOG(XEMFGO17_MTN/EMFGO17_SUM) = -0.7782602764 - 0.6075653778 +
0.7376487319*LOG(@MOVAV(MFGO17_MTN_0,2)/@MOVAV(MFGO17_SUM_0,2))

LOG(XEMFGO17_NENG/EMFGO17_SUM) = 0.003682512296 - 0.6075653778 +
0.7376487319*LOG(@MOVAV(MFGO17_NENG_0,2)/@MOVAV(MFGO17_SUM_0,2))

LOG(XEMFGO17_PAC/EMFGO17_SUM) = 0.1437594348 - 0.6075653778 +
0.7376487319*LOG(@MOVAV(MFGO17_PAC_0,2)/@MOVAV(MFGO17_SUM_0,2))

LOG(XEMFGO17_SATL/EMFGO17_SUM) = 0.05755052857 - 0.6075653778 +
0.7376487319*LOG(@MOVAV(MFGO17_SATL_0,2)/@MOVAV(MFGO17_SUM_0,2))

LOG(XEMFGO17_WNC/EMFGO17_SUM) = 0.04569692736 - 0.6075653778 +
0.7376487319*LOG(@MOVAV(MFGO17_WNC_0,2)/@MOVAV(MFGO17_SUM_0,2))

LOG(XEMFGO17_WSC/EMFGO17_SUM) = 0.4746762524 - 0.6075653778 +
0.7376487319*LOG(@MOVAV(MFGO17_WSC_0,2)/@MOVAV(MFGO17_SUM_0,2))

MFGO18 - Glass & Glass Products
LOG(XEMFGO18_ENC/EMFGO18_SUM) = 0.3228900791 - 0.7388161263 +
0.695079963*LOG(@MOVAV(MFGO18_ENC_0,2)/@MOVAV(MFGO18_SUM_0,2))

LOG(XEMFGO18_ESC/EMFGO18_SUM) = -0.1070584547 - 0.7388161263 +
0.695079963*LOG(@MOVAV(MFGO18_ESC_0,2)/@MOVAV(MFGO18_SUM_0,2))

LOG(XEMFGO18_MATL/EMFGO18_SUM) = 0.226713316 - 0.7388161263 +
0.695079963*LOG(@MOVAV(MFGO18_MATL_0,2)/@MOVAV(MFGO18_SUM_0,2))

LOG(XEMFGO18_MTN/EMFGO18_SUM) = -0.3191939865 - 0.7388161263 +
0.695079963*LOG(@MOVAV(MFGO18_MTN_0,2)/@MOVAV(MFGO18_SUM_0,2))

LOG(XEMFGO18_NENG/EMFGO18_SUM) = -0.2819405619 - 0.7388161263 +
0.695079963*LOG(@MOVAV(MFGO18_NENG_0,2)/@MOVAV(MFGO18_SUM_0,2))

LOG(XEMFGO18_PAC/EMFGO18_SUM) = 0.08871735809 - 0.7388161263 +
0.695079963*LOG(@MOVAV(MFGO18_PAC_0,2)/@MOVAV(MFGO18_SUM_0,2))

LOG(XEMFGO18_SATL/EMFGO18_SUM) = 0.2121206044 - 0.7388161263 +
0.695079963*LOG(@MOVAV(MFGO18_SATL_0,2)/@MOVAV(MFGO18_SUM_0,2))

LOG(XEMFGO18_WNC/EMFGO18_SUM) = -0.1380010439 - 0.7388161263 +
0.695079963*LOG(@MOVAV(MFGO18_WNC_0,2)/@MOVAV(MFGO18_SUM_0,2))

LOG(XEMFGO18_WSC/EMFGO18_SUM) = -0.004247310738 - 0.7388161263 +
0.695079963*LOG(@MOVAV(MFGO18_WSC_0,2)/@MOVAV(MFGO18_SUM_0,2))

MFGO19 - Cement Manufacturing
LOG(XEMFGO19_ENC/EMFGO19_SUM) = -0.005468943809 + 0.02270066567 +
1.010034208*LOG(@MOVAV(MFGO19_ENC_0,2)/@MOVAV(MFGO19_SUM_0,2))

LOG(XEMFGO19_ESC/EMFGO19_SUM) = 0.00560375522 + 0.02270066567 +
1.010034208*LOG(@MOVAV(MFGO19_ESC_0,2)/@MOVAV(MFGO19_SUM_0,2))

LOG(XEMFGO19_MATL/EMFGO19_SUM) = -0.0006259806721 + 0.02270066567 +
1.010034208*LOG(@MOVAV(MFGO19_MATL_0,2)/@MOVAV(MFGO19_SUM_0,2))

LOG(XEMFGO19_MTN/EMFGO19_SUM) = 0.004951349473 + 0.02270066567 +
1.010034208*LOG(@MOVAV(MFGO19_MTN_0,2)/@MOVAV(MFGO19_SUM_0,2))

LOG(XEMFGO19_NENG/EMFGO19_SUM) = 0.008107237084 + 0.02270066567 +
1.010034208*LOG(@MOVAV(MFGO19_NENG_0,2)/@MOVAV(MFGO19_SUM_0,2))

LOG(XEMFGO19_PAC/EMFGO19_SUM) = -0.004304064621 + 0.02270066567 +
1.010034208*LOG(@MOVAV(MFGO19_PAC_0,2)/@MOVAV(MFGO19_SUM_0,2))

LOG(XEMFGO19_SATL/EMFGO19_SUM) = -0.003826812307 + 0.02270066567 +
1.010034208*LOG(@MOVAV(MFGO19_SATL_0,2)/@MOVAV(MFGO19_SUM_0,2))

LOG(XEMFGO19_WNC/EMFGO19_SUM) = -0.002267956607 + 0.02270066567 +
1.010034208*LOG(@MOVAV(MFGO19_WNC_0,2)/@MOVAV(MFGO19_SUM_0,2))

LOG(XEMFGO19_WSC/EMFGO19_SUM) = -0.002168583761 + 0.02270066567 +
1.010034208*LOG(@MOVAV(MFGO19_WSC_0,2)/@MOVAV(MFGO19_SUM_0,2))

MFGO20 - Other Nonmetallic Mineral Products
LOG(XEMFGO20_ENC/EMFGO20_SUM) = 0.1492923127 - 1.244529953 +
0.7499122812*LOG(@MOVAV(MFGO20_ENC_0,2)/@MOVAV(MFGO20_SUM_0,2)) -
0.3065474616*LOG(@MOVAV(RWM_ENC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO20_ESC/EMFGO20_SUM) = -0.08575192535 - 1.244529953 +
0.7499122812*LOG(@MOVAV(MFGO20_ESC_0,2)/@MOVAV(MFGO20_SUM_0,2)) -
0.3065474616*LOG(@MOVAV(RWM_ESC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO20_MATL/EMFGO20_SUM) = 0.1024525914 - 1.244529953 +
0.7499122812*LOG(@MOVAV(MFGO20_MATL_0,2)/@MOVAV(MFGO20_SUM_0,2)) -
0.3065474616*LOG(@MOVAV(RWM_MATL,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO20_MTN/EMFGO20_SUM) = -0.1002137882 - 1.244529953 +
0.7499122812*LOG(@MOVAV(MFGO20_MTN_0,2)/@MOVAV(MFGO20_SUM_0,2)) -
0.3065474616*LOG(@MOVAV(RWM_MTN,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO20_NENG/EMFGO20_SUM) = -0.1315050941 - 1.244529953 +
0.7499122812*LOG(@MOVAV(MFGO20_NENG_0,2)/@MOVAV(MFGO20_SUM_0,2)) -
0.3065474616*LOG(@MOVAV(RWM_NENG,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO20_PAC/EMFGO20_SUM) = 0.03798485314 - 1.244529953 +
0.7499122812*LOG(@MOVAV(MFGO20_PAC_0,2)/@MOVAV(MFGO20_SUM_0,2)) -
0.3065474616*LOG(@MOVAV(RWM_PAC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO20_SATL/EMFGO20_SUM) = 0.138958448 - 1.244529953 +
0.7499122812*LOG(@MOVAV(MFGO20_SATL_0,2)/@MOVAV(MFGO20_SUM_0,2)) -
0.3065474616*LOG(@MOVAV(RWM_SATL,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO20_WNC/EMFGO20_SUM) = -0.1158224011 - 1.244529953 +
0.7499122812*LOG(@MOVAV(MFGO20_WNC_0,2)/@MOVAV(MFGO20_SUM_0,2)) -
0.3065474616*LOG(@MOVAV(RWM_WNC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO20_WSC/EMFGO20_SUM) = 0.004605003626 - 1.244529953 +
0.7499122812*LOG(@MOVAV(MFGO20_WSC_0,2)/@MOVAV(MFGO20_SUM_0,2)) -
0.3065474616*LOG(@MOVAV(RWM_WSC,2)/@MOVAV(RWM_SUM,2))

MFGO21 - Iron & Steel Mills, Ferroalloy & Steel Products
LOG(XEMFGO21_ENC/EMFGO21_SUM) = 0.3849316257 - 1.000450911 +
0.7746286985*LOG(@MOVAV(MFGO21_ENC_0,2)/@MOVAV(MFGO21_SUM_0,2)) -
0.1914636663*LOG(@MOVAV(RWM_ENC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO21_ESC/EMFGO21_SUM) = -0.1244659782 - 1.000450911 +
0.7746286985*LOG(@MOVAV(MFGO21_ESC_0,2)/@MOVAV(MFGO21_SUM_0,2)) -
0.1914636663*LOG(@MOVAV(RWM_ESC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO21_MATL/EMFGO21_SUM) = 0.2854474331 - 1.000450911 +
0.7746286985*LOG(@MOVAV(MFGO21_MATL_0,2)/@MOVAV(MFGO21_SUM_0,2)) -
0.1914636663*LOG(@MOVAV(RWM_MATL,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO21_MTN/EMFGO21_SUM) = -0.1649514045 - 1.000450911 +
0.7746286985*LOG(@MOVAV(MFGO21_MTN_0,2)/@MOVAV(MFGO21_SUM_0,2)) -
0.1914636663*LOG(@MOVAV(RWM_MTN,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO21_NENG/EMFGO21_SUM) = -0.08776158483 - 1.000450911 +
0.7746286985*LOG(@MOVAV(MFGO21_NENG_0,2)/@MOVAV(MFGO21_SUM_0,2)) -
0.1914636663*LOG(@MOVAV(RWM_NENG,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO21_PAC/EMFGO21_SUM) = -0.2474940705 - 1.000450911 +
0.7746286985*LOG(@MOVAV(MFGO21_PAC_0,2)/@MOVAV(MFGO21_SUM_0,2)) -
0.1914636663*LOG(@MOVAV(RWM_PAC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO21_SATL/EMFGO21_SUM) = 0.1385317437 - 1.000450911 +
0.7746286985*LOG(@MOVAV(MFGO21_SATL_0,2)/@MOVAV(MFGO21_SUM_0,2)) -
0.1914636663*LOG(@MOVAV(RWM_SATL,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO21_WNC/EMFGO21_SUM) = -0.06824222972 - 1.000450911 +
0.7746286985*LOG(@MOVAV(MFGO21_WNC_0,2)/@MOVAV(MFGO21_SUM_0,2)) -
0.1914636663*LOG(@MOVAV(RWM_WNC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO21_WSC/EMFGO21_SUM) = -0.1159955348 - 1.000450911 +
0.7746286985*LOG(@MOVAV(MFGO21_WSC_0,2)/@MOVAV(MFGO21_SUM_0,2)) -
0.1914636663*LOG(@MOVAV(RWM_WSC,2)/@MOVAV(RWM_SUM,2))

MFGO22 - Alumina & Aluminum Products

LOG(XEMFGO22_ENC/EMFGO22_SUM) = 0.2186851465 - 0.6242769963 +
0.7275803997*LOG(@MOVAV(MFGO22_ENC_0,2)/@MOVAV(MFGO22_SUM_0,2))

LOG(XEMFGO22_ESC/EMFGO22_SUM) = -0.02888711164 - 0.6242769963 +
0.7275803997*LOG(@MOVAV(MFGO22_ESC_0,2)/@MOVAV(MFGO22_SUM_0,2))

LOG(XEMFGO22_MATL/EMFGO22_SUM) = -0.09208352314 - 0.6242769963 +
0.7275803997*LOG(@MOVAV(MFGO22_MATL_0,2)/@MOVAV(MFGO22_SUM_0,2))

LOG(XEMFGO22_MTN/EMFGO22_SUM) = -0.09186164633 - 0.6242769963 +
0.7275803997*LOG(@MOVAV(MFGO22_MTN_0,2)/@MOVAV(MFGO22_SUM_0,2))

LOG(XEMFGO22_NENG/EMFGO22_SUM) = -0.3330498269 - 0.6242769963 +
0.7275803997*LOG(@MOVAV(MFGO22_NENG_0,2)/@MOVAV(MFGO22_SUM_0,2))

LOG(XEMFGO22_PAC/EMFGO22_SUM) = 0.1714552979 - 0.6242769963 +
0.7275803997*LOG(@MOVAV(MFGO22_PAC_0,2)/@MOVAV(MFGO22_SUM_0,2))

LOG(XEMFGO22_SATL/EMFGO22_SUM) = 0.2300746355 - 0.6242769963 +
0.7275803997*LOG(@MOVAV(MFGO22_SATL_0,2)/@MOVAV(MFGO22_SUM_0,2))

LOG(XEMFGO22_WNC/EMFGO22_SUM) = -0.10740953 - 0.6242769963 +
0.7275803997*LOG(@MOVAV(MFGO22_WNC_0,2)/@MOVAV(MFGO22_SUM_0,2))

LOG(XEMFGO22_WSC/EMFGO22_SUM) = 0.03307655811 - 0.6242769963 +
0.7275803997*LOG(@MOVAV(MFGO22_WSC_0,2)/@MOVAV(MFGO22_SUM_0,2))

MFGO23 - Other Primary Metals

LOG(XEMFGO23_ENC/EMFGO23_SUM) = 0.7484971305 - 1.104480072 +
0.5626736874*LOG(@MOVAV(MFGO23_ENC_0,2)/@MOVAV(MFGO23_SUM_0,2))

LOG(XEMFGO23_ESC/EMFGO23_SUM) = 0.05816738779 - 1.104480072 +
0.5626736874*LOG(@MOVAV(MFGO23_ESC_0,2)/@MOVAV(MFGO23_SUM_0,2))

LOG(XEMFGO23_MATL/EMFGO23_SUM) = 0.2065546736 - 1.104480072 +
0.5626736874*LOG(@MOVAV(MFGO23_MATL_0,2)/@MOVAV(MFGO23_SUM_0,2))

LOG(XEMFGO23_MTN/EMFGO23_SUM) = -0.6764892309 - 1.104480072 +
0.5626736874*LOG(@MOVAV(MFGO23_MTN_0,2)/@MOVAV(MFGO23_SUM_0,2))

LOG(XEMFGO23_NENG/EMFGO23_SUM) = -0.2115939797 - 1.104480072 +
0.5626736874*LOG(@MOVAV(MFGO23_NENG_0,2)/@MOVAV(MFGO23_SUM_0,2))

LOG(XEMFGO23_PAC/EMFGO23_SUM) = 0.1700329509 - 1.104480072 +
0.5626736874*LOG(@MOVAV(MFGO23_PAC_0,2)/@MOVAV(MFGO23_SUM_0,2))

LOG(XEMFGO23_SATL/EMFGO23_SUM) = -0.05532967346 - 1.104480072 +
0.5626736874*LOG(@MOVAV(MFGO23_SATL_0,2)/@MOVAV(MFGO23_SUM_0,2))

LOG(XEMFGO23_WNC/EMFGO23_SUM) = 0.08215611348 - 1.104480072 +
0.5626736874*LOG(@MOVAV(MFGO23_WNC_0,2)/@MOVAV(MFGO23_SUM_0,2))

LOG(XEMFGO23_WSC/EMFGO23_SUM) = -0.3219953721 - 1.104480072 +
0.5626736874*LOG(@MOVAV(MFGO23_WSC_0,2)/@MOVAV(MFGO23_SUM_0,2))

MFGO24 - Fabricated Metal Products
LOG(XEMFGO24_ENC/EMFGO24_SUM) = 0.1557758865 - 0.418310267 +
0.8152424864*LOG(@MOVAV(MFGO24_ENC_0,2)/@MOVAV(MFGO24_SUM_0,2))

LOG(XEMFGO24_ESC/EMFGO24_SUM) = -0.1109400665 - 0.418310267 +
0.8152424864*LOG(@MOVAV(MFGO24_ESC_0,2)/@MOVAV(MFGO24_SUM_0,2))

LOG(XEMFGO24_MATL/EMFGO24_SUM) = 0.05801395519 - 0.418310267 +
0.8152424864*LOG(@MOVAV(MFGO24_MATL_0,2)/@MOVAV(MFGO24_SUM_0,2))

LOG(XEMFGO24_MTN/EMFGO24_SUM) = -0.08395934813 - 0.418310267 +
0.8152424864*LOG(@MOVAV(MFGO24_MTN_0,2)/@MOVAV(MFGO24_SUM_0,2))

LOG(XEMFGO24_NENG/EMFGO24_SUM) = -0.01441384005 - 0.418310267 +
0.8152424864*LOG(@MOVAV(MFGO24_NENG_0,2)/@MOVAV(MFGO24_SUM_0,2))

LOG(XEMFGO24_PAC/EMFGO24_SUM) = 0.08782934065 - 0.418310267 +
0.8152424864*LOG(@MOVAV(MFGO24_PAC_0,2)/@MOVAV(MFGO24_SUM_0,2))

LOG(XEMFGO24_SATL/EMFGO24_SUM) = -0.05386584953 - 0.418310267 +
0.8152424864*LOG(@MOVAV(MFGO24_SATL_0,2)/@MOVAV(MFGO24_SUM_0,2))

LOG(XEMFGO24_WNC/EMFGO24_SUM) = -0.04653109054 - 0.418310267 +
0.8152424864*LOG(@MOVAV(MFGO24_WNC_0,2)/@MOVAV(MFGO24_SUM_0,2))

LOG(XEMFGO24_WSC/EMFGO24_SUM) = 0.008091012388 - 0.418310267 +
0.8152424864*LOG(@MOVAV(MFGO24_WSC_0,2)/@MOVAV(MFGO24_SUM_0,2))

MFGO25 - Machinery
LOG(XEMFGO25_ENC/EMFGO25_SUM) = 0.6114767692 - 2.114572073 +
0.5648941366*LOG(@MOVAV(MFGO25_ENC_0,2)/@MOVAV(MFGO25_SUM_0,2)) -
0.4905617668*LOG(@MOVAV(RWM_ENC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO25_ESC/EMFGO25_SUM) = -0.2356946279 - 2.114572073 +
0.5648941366*LOG(@MOVAV(MFGO25_ESC_0,2)/@MOVAV(MFGO25_SUM_0,2)) -
0.4905617668*LOG(@MOVAV(RWM_ESC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO25_MATL/EMFGO25_SUM) = 0.207634194 - 2.114572073 +
0.5648941366*LOG(@MOVAV(MFGO25_MATL_0,2)/@MOVAV(MFGO25_SUM_0,2)) -
0.4905617668*LOG(@MOVAV(RWM_MATL,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO25_MTN/EMFGO25_SUM) = -0.4569773564 - 2.114572073 +
0.5648941366*LOG(@MOVAV(MFGO25_MTN_0,2)/@MOVAV(MFGO25_SUM_0,2)) -
0.4905617668*LOG(@MOVAV(RWM_MTN,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO25_NENG/EMFGO25_SUM) = -0.1379676214 - 2.114572073 +
0.5648941366*LOG(@MOVAV(MFGO25_NENG_0,2)/@MOVAV(MFGO25_SUM_0,2)) -
0.4905617668*LOG(@MOVAV(RWM_NENG,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO25_PAC/EMFGO25_SUM) = 0.0544376051 - 2.114572073 +
0.5648941366*LOG(@MOVAV(MFGO25_PAC_0,2)/@MOVAV(MFGO25_SUM_0,2)) -
0.4905617668*LOG(@MOVAV(RWM_PAC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO25_SATL/EMFGO25_SUM) = 0.02751998247 - 2.114572073 +
0.5648941366*LOG(@MOVAV(MFGO25_SATL_0,2)/@MOVAV(MFGO25_SUM_0,2)) -
0.4905617668*LOG(@MOVAV(RWM_SATL,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO25_WNC/EMFGO25_SUM) = 0.08365796974 - 2.114572073 +
0.5648941366*LOG(@MOVAV(MFGO25_WNC_0,2)/@MOVAV(MFGO25_SUM_0,2)) -
0.4905617668*LOG(@MOVAV(RWM_WNC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO25_WSC/EMFGO25_SUM) = -0.1540869148 - 2.114572073 +
0.5648941366*LOG(@MOVAV(MFGO25_WSC_0,2)/@MOVAV(MFGO25_SUM_0,2)) -
0.4905617668*LOG(@MOVAV(RWM_WSC,2)/@MOVAV(RWM_SUM,2))

MFGO26 - Other Electronic & Electric Products
LOG(XEMFGO26_ENC/EMFGO26_SUM) = 0.3631792027 - 1.267999885 +
0.4464381303*LOG(@MOVAV(MFGO26_ENC_0,2)/@MOVAV(MFGO26_SUM_0,2))

LOG(XEMFGO26_ESC/EMFGO26_SUM) = -0.2582191564 - 1.267999885 +
0.4464381303*LOG(@MOVAV(MFGO26_ESC_0,2)/@MOVAV(MFGO26_SUM_0,2))

LOG(XEMFGO26_MATL/EMFGO26_SUM) = 0.1456156549 - 1.267999885 +
0.4464381303*LOG(@MOVAV(MFGO26_MATL_0,2)/@MOVAV(MFGO26_SUM_0,2))

LOG(XEMFGO26_MTN/EMFGO26_SUM) = -0.396553084 - 1.267999885 +
0.4464381303*LOG(@MOVAV(MFGO26_MTN_0,2)/@MOVAV(MFGO26_SUM_0,2))

LOG(XEMFGO26_NENG/EMFGO26_SUM) = -0.03815644072 - 1.267999885 +
0.4464381303*LOG(@MOVAV(MFGO26_NENG_0,2)/@MOVAV(MFGO26_SUM_0,2))

LOG(XEMFGO26_PAC/EMFGO26_SUM) = 0.3481994621 - 1.267999885 +
0.4464381303*LOG(@MOVAV(MFGO26_PAC_0,2)/@MOVAV(MFGO26_SUM_0,2))

LOG(XEMFGO26_SATL/EMFGO26_SUM) = 0.1471312551 - 1.267999885 +
0.4464381303*LOG(@MOVAV(MFGO26_SATL_0,2)/@MOVAV(MFGO26_SUM_0,2))

LOG(XEMFGO26_WNC/EMFGO26_SUM) = -0.1933599022 - 1.267999885 +
0.4464381303*LOG(@MOVAV(MFGO26_WNC_0,2)/@MOVAV(MFGO26_SUM_0,2))

LOG(XEMFGO26_WSC/EMFGO26_SUM) = -0.1178369915 - 1.267999885 +
0.4464381303*LOG(@MOVAV(MFGO26_WSC_0,2)/@MOVAV(MFGO26_SUM_0,2))

MFGO27 - Transportation Equipment
LOG(XEMFGO27_ENC/EMFGO27_SUM) = 0.5453181554 - 3.234444915 +
0.5651302595*LOG(@MOVAV(MFGO27_ENC_0,2)/@MOVAV(MFGO27_SUM_0,2)) -
1.016019688*LOG(@MOVAV(RWM_ENC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO27_ESC/EMFGO27_SUM) = -0.3561787064 - 3.234444915 +
0.5651302595*LOG(@MOVAV(MFGO27_ESC_0,2)/@MOVAV(MFGO27_SUM_0,2)) -
1.016019688*LOG(@MOVAV(RWM_ESC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO27_MATL/EMFGO27_SUM) = -0.01817280149 - 3.234444915 +
0.5651302595*LOG(@MOVAV(MFGO27_MATL_0,2)/@MOVAV(MFGO27_SUM_0,2)) -
1.016019688*LOG(@MOVAV(RWM_MATL,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO27_MTN/EMFGO27_SUM) = -0.3682330171 - 3.234444915 +
0.5651302595*LOG(@MOVAV(MFGO27_MTN_0,2)/@MOVAV(MFGO27_SUM_0,2)) -
1.016019688*LOG(@MOVAV(RWM_MTN,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO27_NENG/EMFGO27_SUM) = 0.09792463412 - 3.234444915 +
0.5651302595*LOG(@MOVAV(MFGO27_NENG_0,2)/@MOVAV(MFGO27_SUM_0,2)) -
1.016019688*LOG(@MOVAV(RWM_NENG,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO27_PAC/EMFGO27_SUM) = 0.4049561003 - 3.234444915 +
0.5651302595*LOG(@MOVAV(MFGO27_PAC_0,2)/@MOVAV(MFGO27_SUM_0,2)) -
1.016019688*LOG(@MOVAV(RWM_PAC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO27_SATL/EMFGO27_SUM) = -0.05883128193 - 3.234444915 +
0.5651302595*LOG(@MOVAV(MFGO27_SATL_0,2)/@MOVAV(MFGO27_SUM_0,2)) -
1.016019688*LOG(@MOVAV(RWM_SATL,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO27_WNC/EMFGO27_SUM) = -0.2086737363 - 3.234444915 +
0.5651302595*LOG(@MOVAV(MFGO27_WNC_0,2)/@MOVAV(MFGO27_SUM_0,2)) -
1.016019688*LOG(@MOVAV(RWM_WNC,2)/@MOVAV(RWM_SUM,2))

LOG(XEMFGO27_WSC/EMFGO27_SUM) = -0.03810934649 - 3.234444915 +
0.5651302595*LOG(@MOVAV(MFGO27_WSC_0,2)/@MOVAV(MFGO27_SUM_0,2)) -
1.016019688*LOG(@MOVAV(RWM_WSC,2)/@MOVAV(RWM_SUM,2))

MFGO28 - Measuring & Control Instruments

LOG(XEMFGO28_ENC/EMFGO28_SUM) = 0.08037385959 - 1.133993597 +
0.5181424995*LOG(@MOVAV(MFGO28_ENC_0,2)/@MOVAV(MFGO28_SUM_0,2))

LOG(XEMFGO28_ESC/EMFGO28_SUM) = -0.6975441318 - 1.133993597 +
0.5181424995*LOG(@MOVAV(MFGO28_ESC_0,2)/@MOVAV(MFGO28_SUM_0,2))

LOG(XEMFGO28_MATL/EMFGO28_SUM) = 0.1050265564 - 1.133993597 +
0.5181424995*LOG(@MOVAV(MFGO28_MATL_0,2)/@MOVAV(MFGO28_SUM_0,2))

LOG(XEMFGO28_MTN/EMFGO28_SUM) = -0.1556302941 - 1.133993597 +
0.5181424995*LOG(@MOVAV(MFGO28_MTN_0,2)/@MOVAV(MFGO28_SUM_0,2))

LOG(XEMFGO28_NENG/EMFGO28_SUM) = 0.1648629028 - 1.133993597 +
0.5181424995*LOG(@MOVAV(MFGO28_NENG_0,2)/@MOVAV(MFGO28_SUM_0,2))

LOG(XEMFGO28_PAC/EMFGO28_SUM) = 0.4668247806 - 1.133993597 +
0.5181424995*LOG(@MOVAV(MFGO28_PAC_0,2)/@MOVAV(MFGO28_SUM_0,2))

LOG(XEMFGO28_SATL/EMFGO28_SUM) = 0.1774428891 - 1.133993597 +
0.5181424995*LOG(@MOVAV(MFGO28_SATL_0,2)/@MOVAV(MFGO28_SUM_0,2))

LOG(XEMFGO28_WNC/EMFGO28_SUM) = -0.1349892202 - 1.133993597 +
0.5181424995*LOG(@MOVAV(MFGO28_WNC_0,2)/@MOVAV(MFGO28_SUM_0,2))

LOG(XEMFGO28_WSC/EMFGO28_SUM) = -0.006367342338 - 1.133993597 +
0.5181424995*LOG(@MOVAV(MFGO28_WSC_0,2)/@MOVAV(MFGO28_SUM_0,2))

MFGO29 - Miscellaneous Manufacturing
LOG(XEMFGO29_ENC/EMFGO29_SUM) = 0.1181579541 - 0.5998493284 +
0.7337370738*LOG(@MOVAV(MFGO29_ENC_0,2)/@MOVAV(MFGO29_SUM_0,2))

LOG(XEMFGO29_ESC/EMFGO29_SUM) = -0.1748290734 - 0.5998493284 +
0.7337370738*LOG(@MOVAV(MFGO29_ESC_0,2)/@MOVAV(MFGO29_SUM_0,2))

LOG(XEMFGO29_MATL/EMFGO29_SUM) = 0.1269586395 - 0.5998493284 +
0.7337370738*LOG(@MOVAV(MFGO29_MATL_0,2)/@MOVAV(MFGO29_SUM_0,2))

LOG(XEMFGO29_MTN/EMFGO29_SUM) = -0.06734273473 - 0.5998493284 +
0.7337370738*LOG(@MOVAV(MFGO29_MTN_0,2)/@MOVAV(MFGO29_SUM_0,2))

LOG(XEMFGO29_NENG/EMFGO29_SUM) = -0.08535234744 - 0.5998493284 +
0.7337370738*LOG(@MOVAV(MFGO29_NENG_0,2)/@MOVAV(MFGO29_SUM_0,2))

LOG(XEMFGO29_PAC/EMFGO29_SUM) = 0.1128900206 - 0.5998493284 +
0.7337370738*LOG(@MOVAV(MFGO29_PAC_0,2)/@MOVAV(MFGO29_SUM_0,2))

LOG(XEMFGO29_SATL/EMFGO29_SUM) = 0.06730075362 - 0.5998493284 +
0.7337370738*LOG(@MOVAV(MFGO29_SATL_0,2)/@MOVAV(MFGO29_SUM_0,2))

LOG(XEMFGO29_WNC/EMFGO29_SUM) = -0.056484195 - 0.5998493284 +
0.7337370738*LOG(@MOVAV(MFGO29_WNC_0,2)/@MOVAV(MFGO29_SUM_0,2))

LOG(XEMFGO29_WSC/EMFGO29_SUM) = -0.0412990172 - 0.5998493284 +
0.7337370738*LOG(@MOVAV(MFGO29_WSC_0,2)/@MOVAV(MFGO29_SUM_0,2))

MFGO30 - Crop Production
LOG(XEMFGO30_ENC/EMFGO30_SUM) = 0.3066682765 - 1.124700839 +
0.5222742333*LOG(@MOVAV(MFGO30_ENC_0,2)/@MOVAV(MFGO30_SUM_0,2))

LOG(XEMFGO30_ESC/EMFGO30_SUM) = 0.05001017845 - 1.124700839 +
0.5222742333*LOG(@MOVAV(MFGO30_ESC_0,2)/@MOVAV(MFGO30_SUM_0,2))

LOG(XEMFGO30_MATL/EMFGO30_SUM) = -0.2905077728 - 1.124700839 +
0.5222742333*LOG(@MOVAV(MFGO30_MATL_0,2)/@MOVAV(MFGO30_SUM_0,2))

LOG(XEMFGO30_MTN/EMFGO30_SUM) = -0.3430460427 - 1.124700839 +
0.5222742333*LOG(@MOVAV(MFGO30_MTN_0,2)/@MOVAV(MFGO30_SUM_0,2))

LOG(XEMFGO30_NENG/EMFGO30_SUM) = -0.5798180744 - 1.124700839 +
0.5222742333*LOG(@MOVAV(MFGO30_NENG_0,2)/@MOVAV(MFGO30_SUM_0,2))

LOG(XEMFGO30_PAC/EMFGO30_SUM) = 0.4042456275 - 1.124700839 +
0.5222742333*LOG(@MOVAV(MFGO30_PAC_0,2)/@MOVAV(MFGO30_SUM_0,2))

LOG(XEMFGO30_SATL/EMFGO30_SUM) = 0.2527309639 - 1.124700839 +
0.5222742333*LOG(@MOVAV(MFGO30_SATL_0,2)/@MOVAV(MFGO30_SUM_0,2))

LOG(XEMFGO30_WNC/EMFGO30_SUM) = 0.06997780232 - 1.124700839 +
0.5222742333*LOG(@MOVAV(MFGO30_WNC_0,2)/@MOVAV(MFGO30_SUM_0,2))

LOG(XEMFGO30_WSC/EMFGO30_SUM) = 0.1297390411 - 1.124700839 +
0.5222742333*LOG(@MOVAV(MFGO30_WSC_0,2)/@MOVAV(MFGO30_SUM_0,2))

MFGO31 - Other Agriculture, Forestry, Fishing & Hunting
LOG(XEMFGO31_ENC/EMFGO31_SUM) = 0.09302490549 - 1.014338272 +
0.5580321589*LOG(@MOVAV(MFGO31_ENC_0,2)/@MOVAV(MFGO31_SUM_0,2))

LOG(XEMFGO31_ESC/EMFGO31_SUM) = 0.2142068985 - 1.014338272 +
0.5580321589*LOG(@MOVAV(MFGO31_ESC_0,2)/@MOVAV(MFGO31_SUM_0,2))

LOG(XEMFGO31_MATL/EMFGO31_SUM) = -0.0715106491 - 1.014338272 +
0.5580321589*LOG(@MOVAV(MFGO31_MATL_0,2)/@MOVAV(MFGO31_SUM_0,2))

LOG(XEMFGO31_MTN/EMFGO31_SUM) = -0.1941373737 - 1.014338272 +
0.5580321589*LOG(@MOVAV(MFGO31_MTN_0,2)/@MOVAV(MFGO31_SUM_0,2))

LOG(XEMFGO31_NENG/EMFGO31_SUM) = -0.5550089586 - 1.014338272 +
0.5580321589*LOG(@MOVAV(MFGO31_NENG_0,2)/@MOVAV(MFGO31_SUM_0,2))

LOG(XEMFGO31_PAC/EMFGO31_SUM) = -0.1117547589 - 1.014338272 +
0.5580321589*LOG(@MOVAV(MFGO31_PAC_0,2)/@MOVAV(MFGO31_SUM_0,2))

LOG(XEMFGO31_SATL/EMFGO31_SUM) = 0.1419204268 - 1.014338272 +
0.5580321589*LOG(@MOVAV(MFGO31_SATL_0,2)/@MOVAV(MFGO31_SUM_0,2))

LOG(XEMFGO31_WNC/EMFGO31_SUM) = 0.1416243857 - 1.014338272 +
0.5580321589*LOG(@MOVAV(MFGO31_WNC_0,2)/@MOVAV(MFGO31_SUM_0,2))

LOG(XEMFGO31_WSC/EMFGO31_SUM) = 0.3416351239 - 1.014338272 +
0.5580321589*LOG(@MOVAV(MFGO31_WSC_0,2)/@MOVAV(MFGO31_SUM_0,2))

MFGO32 - Coal Mining
LOG(XEMFGO32_ENC/EMFGO32_SUM) = 0.2941101249 - 0.7135889737 +
0.7505917169*LOG(@MOVAV(MFGO32_ENC_0,2)/@MOVAV(MFGO32_SUM_0,2))

LOG(XEMFGO32_ESC/EMFGO32_SUM) = 0.4424032593 - 0.7135889737 +
0.7505917169*LOG(@MOVAV(MFGO32_ESC_0,2)/@MOVAV(MFGO32_SUM_0,2))

LOG(XEMFGO32_MATL/EMFGO32_SUM) = 0.3238096152 - 0.7135889737 +
0.7505917169*LOG(@MOVAV(MFGO32_MATL_0,2)/@MOVAV(MFGO32_SUM_0,2))

LOG(XEMFGO32_MTN/EMFGO32_SUM) = -0.03380321211 - 0.7135889737 +
0.7505917169*LOG(@MOVAV(MFGO32_MTN_0,2)/@MOVAV(MFGO32_SUM_0,2))

LOG(XEMFGO32_NENG/EMFGO32_SUM) = -0.654133403 - 0.7135889737 +
0.7505917169*LOG(@MOVAV(MFGO32_NENG_0,2)/@MOVAV(MFGO32_SUM_0,2))

LOG(XEMFGO32_PAC/EMFGO32_SUM) = -0.3857824666 - 0.7135889737 +
0.7505917169*LOG(@MOVAV(MFGO32_PAC_0,2)/@MOVAV(MFGO32_SUM_0,2))

LOG(XEMFGO32_SATL/EMFGO32_SUM) = 0.3706098363 - 0.7135889737 +
0.7505917169*LOG(@MOVAV(MFGO32_SATL_0,2)/@MOVAV(MFGO32_SUM_0,2))

LOG(XEMFGO32_WNC/EMFGO32_SUM) = -0.3748091175 - 0.7135889737 +
0.7505917169*LOG(@MOVAV(MFGO32_WNC_0,2)/@MOVAV(MFGO32_SUM_0,2))

LOG(XEMFGO32_WSC/EMFGO32_SUM) = 0.01759536341 - 0.7135889737 +
0.7505917169*LOG(@MOVAV(MFGO32_WSC_0,2)/@MOVAV(MFGO32_SUM_0,2))

MFGO33 - Oil & Gas Extraction & Support Activities
LOG(XEMFGO33_ENC/EMFGO33_SUM) = -0.1384556205 - 2.537926069 +
0.1537463743*LOG(@MOVAV(MFGO33_ENC_0,2)/@MOVAV(MFGO33_SUM_0,2))

LOG(XEMFGO33_ESC/EMFGO33_SUM) = -0.3723375313 - 2.537926069 +
0.1537463743*LOG(@MOVAV(MFGO33_ESC_0,2)/@MOVAV(MFGO33_SUM_0,2))

LOG(XEMFGO33_MATL/EMFGO33_SUM) = -0.8941174533 - 2.537926069 +
0.1537463743*LOG(@MOVAV(MFGO33_MATL_0,2)/@MOVAV(MFGO33_SUM_0,2))

LOG(XEMFGO33_MTN/EMFGO33_SUM) = 0.7267091915 - 2.537926069 +
0.1537463743*LOG(@MOVAV(MFGO33_MTN_0,2)/@MOVAV(MFGO33_SUM_0,2))

LOG(XEMFGO33_NENG/EMFGO33_SUM) = -1.248557291 - 2.537926069 +
0.1537463743*LOG(@MOVAV(MFGO33_NENG_0,2)/@MOVAV(MFGO33_SUM_0,2))

LOG(XEMFGO33_PAC/EMFGO33_SUM) = 0.4272132488 - 2.537926069 +
0.1537463743*LOG(@MOVAV(MFGO33_PAC_0,2)/@MOVAV(MFGO33_SUM_0,2))

LOG(XEMFGO33_SATL/EMFGO33_SUM) = -0.4960052762 - 2.537926069 +
0.1537463743*LOG(@MOVAV(MFGO33_SATL_0,2)/@MOVAV(MFGO33_SUM_0,2))

LOG(XEMFGO33_WNC/EMFGO33_SUM) = -0.1620455668 - 2.537926069 +
0.1537463743*LOG(@MOVAV(MFGO33_WNC_0,2)/@MOVAV(MFGO33_SUM_0,2))

LOG(XEMFGO33_WSC/EMFGO33_SUM) = 2.157596299 - 2.537926069 +
0.1537463743*LOG(@MOVAV(MFGO33_WSC_0,2)/@MOVAV(MFGO33_SUM_0,2))

MFGO34 - Other Mining & Quarrying
LOG(XEMFGO34_ENC/MFGO34_ENC_0) = 0.0638674388 - 0.09620405101 +
0.9562918701*LOG(EMFGO34_SUM/MFGO34_SUM_0)

LOG(XEMFGO34_ESC/MFGO34_ESC_0) = 0.2970351117 - 0.09620405101 +
0.9562918701*LOG(EMFGO34_SUM/MFGO34_SUM_0)

LOG(XEMFGO34_MATL/MFGO34_MATL_0) = 0.1837384344 - 0.09620405101 +
0.9562918701*LOG(EMFGO34_SUM/MFGO34_SUM_0)

LOG(XEMFGO34_MTN/MFGO34_MTN_0) = -0.3896901166 - 0.09620405101 +
0.9562918701*LOG(EMFGO34_SUM/MFGO34_SUM_0)

LOG(XEMFGO34_NENG/MFGO34_NENG_0) = 0.04484598303 - 0.09620405101 +
0.9562918701*LOG(EMFGO34_SUM/MFGO34_SUM_0)

LOG(XEMFGO34_PAC/MFGO34_PAC_0) = -0.3053218808 - 0.09620405101 +
0.9562918701*LOG(EMFGO34_SUM/MFGO34_SUM_0)

LOG(XEMFGO34_SATL/MFGO34_SATL_0) = -0.06285090199 - 0.09620405101 +
0.9562918701*LOG(EMFGO34_SUM/MFGO34_SUM_0)

LOG(XEMFGO34_WNC/MFGO34_WNC_0) = -0.103332981 - 0.09620405101 +
0.9562918701*LOG(EMFGO34_SUM/MFGO34_SUM_0)

LOG(XEMFGO34_WSC/MFGO34_WSC_0) = 0.2717089123 - 0.09620405101 +
0.9562918701*LOG(EMFGO34_SUM/MFGO34_SUM_0)

MFGO35 - Construction
LOG(XEMFGO35_ENC/EMFGO35_SUM) = 0.1302592583 - 0.7335080983 +
0.6780284531*LOG(@MOVAV(MFGO35_ENC_0,2)/@MOVAV(MFGO35_SUM_0,2))

LOG(XEMFGO35_ESC/EMFGO35_SUM) = -0.08607323705 - 0.7335080983 +
0.6780284531*LOG(@MOVAV(MFGO35_ESC_0,2)/@MOVAV(MFGO35_SUM_0,2))

LOG(XEMFGO35_MATL/EMFGO35_SUM) = -0.01545349272 - 0.7335080983 +
0.6780284531*LOG(@MOVAV(MFGO35_MATL_0,2)/@MOVAV(MFGO35_SUM_0,2))

LOG(XEMFGO35_MTN/EMFGO35_SUM) = -0.03793309552 - 0.7335080983 +
0.6780284531*LOG(@MOVAV(MFGO35_MTN_0,2)/@MOVAV(MFGO35_SUM_0,2))

LOG(XEMFGO35_NENG/EMFGO35_SUM) = -0.319943479 - 0.7335080983 +
0.6780284531*LOG(@MOVAV(MFGO35_NENG_0,2)/@MOVAV(MFGO35_SUM_0,2))

LOG(XEMFGO35_PAC/EMFGO35_SUM) = 0.04145325233 - 0.7335080983 +
0.6780284531*LOG(@MOVAV(MFGO35_PAC_0,2)/@MOVAV(MFGO35_SUM_0,2))

LOG(XEMFGO35_SATL/EMFGO35_SUM) = 0.260905408 - 0.7335080983 +
0.6780284531*LOG(@MOVAV(MFGO35_SATL_0,2)/@MOVAV(MFGO35_SUM_0,2))

LOG(XEMFGO35_WNC/EMFGO35_SUM) = -0.07792074272 - 0.7335080983 +
0.6780284531*LOG(@MOVAV(MFGO35_WNC_0,2)/@MOVAV(MFGO35_SUM_0,2))

LOG(XEMFGO35_WSC/EMFGO35_SUM) = 0.1047061283 - 0.7335080983 +
0.6780284531*LOG(@MOVAV(MFGO35_WSC_0,2)/@MOVAV(MFGO35_SUM_0,2))

NMFGO1 - Transportation & Warehousing
LOG(XENMFGO1_ENC/ENMFGO1_SUM) = 0.2190753713 - 0.9487613099 +
0.5842958358*LOG(@MOVAV(NMFGO1_ENC_0,2)/@MOVAV(NMFGO1_SUM_0,2))

LOG(XENMFGO1_ESC/ENMFGO1_SUM) = -0.155570268 - 0.9487613099 +
0.5842958358*LOG(@MOVAV(NMFGO1_ESC_0,2)/@MOVAV(NMFGO1_SUM_0,2))

LOG(XENMFGO1_MATL/ENMFGO1_SUM) = 0.2021016279 - 0.9487613099 +
0.5842958358*LOG(@MOVAV(NMFGO1_MATL_0,2)/@MOVAV(NMFGO1_SUM_0,2))

LOG(XENMFGO1_MTN/ENMFGO1_SUM) = -0.1614052349 - 0.9487613099 +
0.5842958358*LOG(@MOVAV(NMFGO1_MTN_0,2)/@MOVAV(NMFGO1_SUM_0,2))

LOG(XENMFGO1_NENG/ENMFGO1_SUM) = -0.3064243857 - 0.9487613099 +
0.5842958358*LOG(@MOVAV(NMFGO1_NENG_0,2)/@MOVAV(NMFGO1_SUM_0,2))

LOG(XENMFGO1_PAC/ENMFGO1_SUM) = 0.1322001532 - 0.9487613099 +
0.5842958358*LOG(@MOVAV(NMFGO1_PAC_0,2)/@MOVAV(NMFGO1_SUM_0,2))

LOG(XENMFGO1_SATL/ENMFGO1_SUM) = 0.2220507447 - 0.9487613099 +
0.5842958358*LOG(@MOVAV(NMFGO1_SATL_0,2)/@MOVAV(NMFGO1_SUM_0,2))

LOG(XENMFGO1_WNC/ENMFGO1_SUM) = -0.1139127208 - 0.9487613099 +
0.5842958358*LOG(@MOVAV(NMFGO1_WNC_0,2)/@MOVAV(NMFGO1_SUM_0,2))

LOG(XENMFGO1_WSC/ENMFGO1_SUM) = -0.0381152876 - 0.9487613099 +
0.5842958358*LOG(@MOVAV(NMFGO1_WSC_0,2)/@MOVAV(NMFGO1_SUM_0,2))

NMFGO2 - Broadcasting & Telecommunications
LOG(XENMFGO2_ENC/ENMFGO2_SUM) = -0.01332240613 - 0.5269601091 +
0.7641674833*LOG(@MOVAV(NMFGO2_ENC_0,2)/@MOVAV(NMFGO2_SUM_0,2))

LOG(XENMFGO2_ESC/ENMFGO2_SUM) = -0.1566417882 - 0.5269601091 +
0.7641674833*LOG(@MOVAV(NMFGO2_ESC_0,2)/@MOVAV(NMFGO2_SUM_0,2))

LOG(XENMFGO2_MATL/ENMFGO2_SUM) = 0.07607526338 - 0.5269601091 +
0.7641674833*LOG(@MOVAV(NMFGO2_MATL_0,2)/@MOVAV(NMFGO2_SUM_0,2))

LOG(XENMFGO2_MTN/ENMFGO2_SUM) = 0.02378053233 - 0.5269601091 +
0.7641674833*LOG(@MOVAV(NMFGO2_MTN_0,2)/@MOVAV(NMFGO2_SUM_0,2))

LOG(XENMFGO2_NENG/ENMFGO2_SUM) = -0.1703207522 - 0.5269601091 +
0.7641674833*LOG(@MOVAV(NMFGO2_NENG_0,2)/@MOVAV(NMFGO2_SUM_0,2))

LOG(XENMFGO2_PAC/ENMFGO2_SUM) = 0.06047332154 - 0.5269601091 +
0.7641674833*LOG(@MOVAV(NMFGO2_PAC_0,2)/@MOVAV(NMFGO2_SUM_0,2))

LOG(XENMFGO2_SATL/ENMFGO2_SUM) = 0.1291914939 - 0.5269601091 +
0.7641674833*LOG(@MOVAV(NMFGO2_SATL_0,2)/@MOVAV(NMFGO2_SUM_0,2))

LOG(XENMFGO2_WNC/ENMFGO2_SUM) = 0.0003353043934 - 0.5269601091 +
0.7641674833*LOG(@MOVAV(NMFGO2_WNC_0,2)/@MOVAV(NMFGO2_SUM_0,2))

LOG(XENMFGO2_WSC/ENMFGO2_SUM) = 0.05042903102 - 0.5269601091 +
0.7641674833*LOG(@MOVAV(NMFGO2_WSC_0,2)/@MOVAV(NMFGO2_SUM_0,2))

NMFGO3 - Electric Power Generation & Distribution

LOG(XENMFGO3_ENC/NMFGO3_ENC_0) = 0.08005131541 + 0.08319197698 + 1.015904997*LOG(ENMFGO3_SUM/NMFGO3_SUM_0)

LOG(XENMFGO3_ESC/NMFGO3_ESC_0) = -0.03652615344 + 0.08319197698 + 1.015904997*LOG(ENMFGO3_SUM/NMFGO3_SUM_0)

LOG(XENMFGO3_MATL/NMFGO3_MATL_0) = 0.09414872199 + 0.08319197698 + 1.015904997*LOG(ENMFGO3_SUM/NMFGO3_SUM_0)

LOG(XENMFGO3_MTN/NMFGO3_MTN_0) = 0.133543823 + 0.08319197698 + 1.015904997*LOG(ENMFGO3_SUM/NMFGO3_SUM_0)

LOG(XENMFGO3_NENG/NMFGO3_NENG_0) = -0.2786576869 + 0.08319197698 + 1.015904997*LOG(ENMFGO3_SUM/NMFGO3_SUM_0)

LOG(XENMFGO3_PAC/NMFGO3_PAC_0) = -0.09952510102 + 0.08319197698 + 1.015904997*LOG(ENMFGO3_SUM/NMFGO3_SUM_0)

LOG(XENMFGO3_SATL/NMFGO3_SATL_0) = 0.0667959762 + 0.08319197698 + 1.015904997*LOG(ENMFGO3_SUM/NMFGO3_SUM_0)

LOG(XENMFGO3_WNC/NMFGO3_WNC_0) = 0.2194562418 + 0.08319197698 + 1.015904997*LOG(ENMFGO3_SUM/NMFGO3_SUM_0)

LOG(XENMFGO3_WSC/NMFGO3_WSC_0) = -0.1792871369 + 0.08319197698 + 1.015904997*LOG(ENMFGO3_SUM/NMFGO3_SUM_0)

NMFGO4 - Natural Gas Distribution

LOG(XENMFGO4_ENC/NMFGO4_ENC_0) = 0.1568819622 - 0.02546628659 + 0.9501665321*LOG(ENMFGO4_SUM/NMFGO4_SUM_0)

LOG(XENMFGO4_ESC/NMFGO4_ESC_0) = -0.1669307689 - 0.02546628659 + 0.9501665321*LOG(ENMFGO4_SUM/NMFGO4_SUM_0)

LOG(XENMFGO4_MATL/NMFGO4_MATL_0) = -0.6679042912 - 0.02546628659 + 0.9501665321*LOG(ENMFGO4_SUM/NMFGO4_SUM_0)

LOG(XENMFGO4_MTN/NMFGO4_MTN_0) = -0.02742924344 - 0.02546628659 + 0.9501665321*LOG(ENMFGO4_SUM/NMFGO4_SUM_0)

LOG(XENMFGO4_NENG/NMFGO4_NENG_0) = 0.4264529712 - 0.02546628659 + 0.9501665321*LOG(ENMFGO4_SUM/NMFGO4_SUM_0)

LOG(XENMFGO4_PAC/NMFGO4_PAC_0) = -0.02767287297 - 0.02546628659 + 0.9501665321*LOG(ENMFGO4_SUM/NMFGO4_SUM_0)

LOG(XENMFGO4_SATL/NMFGO4_SATL_0) = 0.4835990358 - 0.02546628659 +
0.9501665321*LOG(ENMFGO4_SUM/NMFGO4_SUM_0)

LOG(XENMFGO4_WNC/NMFGO4_WNC_0) = 0.6344020967 - 0.02546628659 +
0.9501665321*LOG(ENMFGO4_SUM/NMFGO4_SUM_0)

LOG(XENMFGO4_WSC/NMFGO4_WSC_0) = -0.8113988893 - 0.02546628659 +
0.9501665321*LOG(ENMFGO4_SUM/NMFGO4_SUM_0)

NMFGO5 - Water, Sewage & Related System
LOG(XENMFGO5_ENC/NMFGO5_ENC_0) = -0.1419719375 - 0.1601598429 +
0.9548548607*LOG(ENMFGO5_SUM/NMFGO5_SUM_0)

LOG(XENMFGO5_ESC/NMFGO5_ESC_0) = 0.2092781799 - 0.1601598429 +
0.9548548607*LOG(ENMFGO5_SUM/NMFGO5_SUM_0)

LOG(XENMFGO5_MATL/NMFGO5_MATL_0) = -0.3313319307 - 0.1601598429 +
0.9548548607*LOG(ENMFGO5_SUM/NMFGO5_SUM_0)

LOG(XENMFGO5_MTN/NMFGO5_MTN_0) = 0.3303556365 - 0.1601598429 +
0.9548548607*LOG(ENMFGO5_SUM/NMFGO5_SUM_0)

LOG(XENMFGO5_NENG/NMFGO5_NENG_0) = 0.2539813704 - 0.1601598429 +
0.9548548607*LOG(ENMFGO5_SUM/NMFGO5_SUM_0)

LOG(XENMFGO5_PAC/NMFGO5_PAC_0) = -0.4699967293 - 0.1601598429 +
0.9548548607*LOG(ENMFGO5_SUM/NMFGO5_SUM_0)

LOG(XENMFGO5_SATL/NMFGO5_SATL_0) = 0.008851940593 - 0.1601598429 +
0.9548548607*LOG(ENMFGO5_SUM/NMFGO5_SUM_0)

LOG(XENMFGO5_WNC/NMFGO5_WNC_0) = -0.1393243116 - 0.1601598429 +
0.9548548607*LOG(ENMFGO5_SUM/NMFGO5_SUM_0)

LOG(XENMFGO5_WSC/NMFGO5_WSC_0) = 0.2801577817 - 0.1601598429 +
0.9548548607*LOG(ENMFGO5_SUM/NMFGO5_SUM_0)

NMFGO6 - Wholesale Trade
LOG(XENMFGO6_ENC/ENMFGO6_SUM) = 0.09514681928 - 1.089632157 +
0.7437186006*LOG(@MOVAV(NMFGO6_ENC_0,2)/@MOVAV(NMFGO6_SUM_0,2)) -
0.2352976912*LOG(@MOVAV(RWNM_ENC,2)/@MOVAV(RWNM_SUM,2))

LOG(XENMFGO6_ESC/ENMFGO6_SUM) = -0.08396020304 - 1.089632157 +
0.7437186006*LOG(@MOVAV(NMFGO6_ESC_0,2)/@MOVAV(NMFGO6_SUM_0,2)) -
0.2352976912*LOG(@MOVAV(RWNM_ESC,2)/@MOVAV(RWNM_SUM,2))

LOG(XENMFGO6_MATL/ENMFGO6_SUM) = 0.07740346562 - 1.089632157 +
0.7437186006*LOG(@MOVAV(NMFGO6_MATL_0,2)/@MOVAV(NMFGO6_SUM_0,2)) -
0.2352976912*LOG(@MOVAV(RWNM_MATL,2)/@MOVAV(RWNM_SUM,2))

LOG(XENMFGO6_MTN/ENMFGO6_SUM) = -0.02205733055 - 1.089632157 +
0.7437186006*LOG(@MOVAV(NMFGO6_MTN_0,2)/@MOVAV(NMFGO6_SUM_0,2)) -
0.2352976912*LOG(@MOVAV(RWNM_MTN,2)/@MOVAV(RWNM_SUM,2))

LOG(XENMFGO6_NENG/ENMFGO6_SUM) = -0.1971408044 - 1.089632157 +
0.7437186006*LOG(@MOVAV(NMFGO6_NENG_0,2)/@MOVAV(NMFGO6_SUM_0,2)) -
0.2352976912*LOG(@MOVAV(RWNM_NENG,2)/@MOVAV(RWNM_SUM,2))

LOG(XENMFGO6_PAC/ENMFGO6_SUM) = 0.1304098616 - 1.089632157 +
0.7437186006*LOG(@MOVAV(NMFGO6_PAC_0,2)/@MOVAV(NMFGO6_SUM_0,2)) -
0.2352976912*LOG(@MOVAV(RWNM_PAC,2)/@MOVAV(RWNM_SUM,2))

LOG(XENMFGO6_SATL/ENMFGO6_SUM) = 0.1398922251 - 1.089632157 +
0.7437186006*LOG(@MOVAV(NMFGO6_SATL_0,2)/@MOVAV(NMFGO6_SUM_0,2)) -
0.2352976912*LOG(@MOVAV(RWNM_SATL,2)/@MOVAV(RWNM_SUM,2))

LOG(XENMFGO6_WNC/ENMFGO6_SUM) = -0.1060133331 - 1.089632157 +
0.7437186006*LOG(@MOVAV(NMFGO6_WNC_0,2)/@MOVAV(NMFGO6_SUM_0,2)) -
0.2352976912*LOG(@MOVAV(RWNM_WNC,2)/@MOVAV(RWNM_SUM,2))

LOG(XENMFGO6_WSC/ENMFGO6_SUM) = -0.03368070053 - 1.089632157 +
0.7437186006*LOG(@MOVAV(NMFGO6_WSC_0,2)/@MOVAV(NMFGO6_SUM_0,2)) -
0.2352976912*LOG(@MOVAV(RWNM_WSC,2)/@MOVAV(RWNM_SUM,2))

NMFGO7 - Retail Trade
LOG(XENMFGO7_ENC/ENMFGO7_SUM) = 0.1597162321 - 1.593794759 +
0.5029824952*LOG(@MOVAV(NMFGO7_ENC_0,2)/@MOVAV(NMFGO7_SUM_0,2)) -
0.4461753114*LOG(@MOVAV(RWNM_ENC,2)/@MOVAV(RWNM_SUM,2)) +
0.227402313*LOG(@MOVAV(GSPR_ENC,2)/@MOVAV(GSPR_SUM,2))

LOG(XENMFGO7_ESC/ENMFGO7_SUM) = -0.1029246103 - 1.593794759 +
0.5029824952*LOG(@MOVAV(NMFGO7_ESC_0,2)/@MOVAV(NMFGO7_SUM_0,2)) -
0.4461753114*LOG(@MOVAV(RWNM_ESC,2)/@MOVAV(RWNM_SUM,2)) +
0.227402313*LOG(@MOVAV(GSPR_ESC,2)/@MOVAV(GSPR_SUM,2))

LOG(XENMFGO7_MATL/ENMFGO7_SUM) = 0.1149257728 - 1.593794759 +
0.5029824952*LOG(@MOVAV(NMFGO7_MATL_0,2)/@MOVAV(NMFGO7_SUM_0,2)) -
0.4461753114*LOG(@MOVAV(RWNM_MATL,2)/@MOVAV(RWNM_SUM,2)) +
0.227402313*LOG(@MOVAV(GSPR_MATL,2)/@MOVAV(GSPR_SUM,2))

LOG(XENMFGO7_MTN/ENMFGO7_SUM) = -0.1589439396 - 1.593794759 +
0.5029824952*LOG(@MOVAV(NMFGO7_MTN_0,2)/@MOVAV(NMFGO7_SUM_0,2)) -

0.4461753114*LOG(@MOVAV(RWNM_MTN,2)/@MOVAV(RWNM_SUM,2)) +
0.227402313*LOG(@MOVAV(GSPR_MTN,2)/@MOVAV(GSPR_SUM,2))

LOG(XENMFGO7_NENG/ENMFGO7_SUM) = -0.1311507644 - 1.593794759 +
0.5029824952*LOG(@MOVAV(NMFGO7_NENG_0,2)/@MOVAV(NMFGO7_SUM_0,2)) -
0.4461753114*LOG(@MOVAV(RWNM_NENG,2)/@MOVAV(RWNM_SUM,2)) +
0.227402313*LOG(@MOVAV(GSPR_NENG,2)/@MOVAV(GSPR_SUM,2))

LOG(XENMFGO7_PAC/ENMFGO7_SUM) = 0.03485775149 - 1.593794759 +
0.5029824952*LOG(@MOVAV(NMFGO7_PAC_0,2)/@MOVAV(NMFGO7_SUM_0,2)) -
0.4461753114*LOG(@MOVAV(RWNM_PAC,2)/@MOVAV(RWNM_SUM,2)) +
0.227402313*LOG(@MOVAV(GSPR_PAC,2)/@MOVAV(GSPR_SUM,2))

LOG(XENMFGO7_SATL/ENMFGO7_SUM) = 0.1936832414 - 1.593794759 +
0.5029824952*LOG(@MOVAV(NMFGO7_SATL_0,2)/@MOVAV(NMFGO7_SUM_0,2)) -
0.4461753114*LOG(@MOVAV(RWNM_SATL,2)/@MOVAV(RWNM_SUM,2)) +
0.227402313*LOG(@MOVAV(GSPR_SATL,2)/@MOVAV(GSPR_SUM,2))

LOG(XENMFGO7_WNC/ENMFGO7_SUM) = -0.07830440261 - 1.593794759 +
0.5029824952*LOG(@MOVAV(NMFGO7_WNC_0,2)/@MOVAV(NMFGO7_SUM_0,2)) -
0.4461753114*LOG(@MOVAV(RWNM_WNC,2)/@MOVAV(RWNM_SUM,2)) +
0.227402313*LOG(@MOVAV(GSPR_WNC,2)/@MOVAV(GSPR_SUM,2))

LOG(XENMFGO7_WSC/ENMFGO7_SUM) = -0.03185928086 - 1.593794759 +
0.5029824952*LOG(@MOVAV(NMFGO7_WSC_0,2)/@MOVAV(NMFGO7_SUM_0,2)) -
0.4461753114*LOG(@MOVAV(RWNM_WSC,2)/@MOVAV(RWNM_SUM,2)) +
0.227402313*LOG(@MOVAV(GSPR_WSC,2)/@MOVAV(GSPR_SUM,2))

NMFGO8 - Finance & Insurance, Real Estate
LOG(XENMFGO8_ENC/ENMFGO8_SUM) = 0.02925759156 - 3.205207995 +
0.8219150124*LOG(@MOVAV(NMFGO8_ENC_0,2)/@MOVAV(NMFGO8_SUM_0,2)) -
1.266027598*LOG(@MOVAV(RWNM_ENC,2)/@MOVAV(RWNM_SUM,2))

LOG(XENMFGO8_ESC/ENMFGO8_SUM) = -0.3452160274 - 3.205207995 +
0.8219150124*LOG(@MOVAV(NMFGO8_ESC_0,2)/@MOVAV(NMFGO8_SUM_0,2)) -
1.266027598*LOG(@MOVAV(RWNM_ESC,2)/@MOVAV(RWNM_SUM,2))

LOG(XENMFGO8_MATL/ENMFGO8_SUM) = 0.3691172941 - 3.205207995 +
0.8219150124*LOG(@MOVAV(NMFGO8_MATL_0,2)/@MOVAV(NMFGO8_SUM_0,2)) -
1.266027598*LOG(@MOVAV(RWNM_MATL,2)/@MOVAV(RWNM_SUM,2))

LOG(XENMFGO8_MTN/ENMFGO8_SUM) = -0.1829685708 - 3.205207995 +
0.8219150124*LOG(@MOVAV(NMFGO8_MTN_0,2)/@MOVAV(NMFGO8_SUM_0,2)) -
1.266027598*LOG(@MOVAV(RWNM_MTN,2)/@MOVAV(RWNM_SUM,2))

LOG(XENMFGO8_NENG/ENMFGO8_SUM) = 0.08238934949 - 3.205207995 +
0.8219150124*LOG(@MOVAV(NMFGO8_NENG_0,2)/@MOVAV(NMFGO8_SUM_0,2)) -
1.266027598*LOG(@MOVAV(RWNM_NENG,2)/@MOVAV(RWNM_SUM,2))

LOG(XENMFGO8_PAC/ENMFGO8_SUM) = 0.2491662347 - 3.205207995 +
0.8219150124*LOG(@MOVAV(NMFGO8_PAC_0,2)/@MOVAV(NMFGO8_SUM_0,2)) -
1.266027598*LOG(@MOVAV(RWNM_PAC,2)/@MOVAV(RWNM_SUM,2))

LOG(XENMFGO8_SATL/ENMFGO8_SUM) = 0.08683154284 - 3.205207995 +
0.8219150124*LOG(@MOVAV(NMFGO8_SATL_0,2)/@MOVAV(NMFGO8_SUM_0,2)) -
1.266027598*LOG(@MOVAV(RWNM_SATL,2)/@MOVAV(RWNM_SUM,2))

LOG(XENMFGO8_WNC/ENMFGO8_SUM) = -0.2170865469 - 3.205207995 +
0.8219150124*LOG(@MOVAV(NMFGO8_WNC_0,2)/@MOVAV(NMFGO8_SUM_0,2)) -
1.266027598*LOG(@MOVAV(RWNM_WNC,2)/@MOVAV(RWNM_SUM,2))

LOG(XENMFGO8_WSC/ENMFGO8_SUM) = -0.07149086757 - 3.205207995 +
0.8219150124*LOG(@MOVAV(NMFGO8_WSC_0,2)/@MOVAV(NMFGO8_SUM_0,2)) -
1.266027598*LOG(@MOVAV(RWNM_WSC,2)/@MOVAV(RWNM_SUM,2))

NMFGO9 - Other Services
LOG(XENMFGO9_ENC/ENMFGO9_SUM) = 0.2346667227 - 1.414028985 +
0.4300731371*LOG(@MOVAV(NMFGO9_ENC_0,2)/@MOVAV(NMFGO9_SUM_0,2)) -
0.2435983984*LOG(@MOVAV(RWNM_ENC,2)/@MOVAV(RWNM_SUM,2)) +
0.1748511291*LOG(@MOVAV(GSPR_ENC,2)/@MOVAV(GSPR_SUM,2)) -
0.003020610639*@TREND

LOG(XENMFGO9_ESC/ENMFGO9_SUM) = -0.2489245393 - 1.414028985 +
0.4300731371*LOG(@MOVAV(NMFGO9_ESC_0,2)/@MOVAV(NMFGO9_SUM_0,2)) -
0.2435983984*LOG(@MOVAV(RWNM_ESC,2)/@MOVAV(RWNM_SUM,2)) +
0.1748511291*LOG(@MOVAV(GSPR_ESC,2)/@MOVAV(GSPR_SUM,2)) -
0.0003248333305*@TREND

LOG(XENMFGO9_MATL/ENMFGO9_SUM) = 0.1062575193 - 1.414028985 +
0.4300731371*LOG(@MOVAV(NMFGO9_MATL_0,2)/@MOVAV(NMFGO9_SUM_0,2)) -
0.2435983984*LOG(@MOVAV(RWNM_MATL,2)/@MOVAV(RWNM_SUM,2)) +
0.1748511291*LOG(@MOVAV(GSPR_MATL,2)/@MOVAV(GSPR_SUM,2)) -
0.0018294474*@TREND

LOG(XENMFGO9_MTN/ENMFGO9_SUM) = -0.1717980784 - 1.414028985 +
0.4300731371*LOG(@MOVAV(NMFGO9_MTN_0,2)/@MOVAV(NMFGO9_SUM_0,2)) -
0.2435983984*LOG(@MOVAV(RWNM_MTN,2)/@MOVAV(RWNM_SUM,2)) +
0.1748511291*LOG(@MOVAV(GSPR_MTN,2)/@MOVAV(GSPR_SUM,2)) +
0.001464909195*@TREND

LOG(XENMFGO9_NENG/ENMFGO9_SUM) = -0.1733600763 - 1.414028985 +
0.4300731371*LOG(@MOVAV(NMFGO9_NENG_0,2)/@MOVAV(NMFGO9_SUM_0,2)) -

0.2435983984*LOG(@MOVAV(RWNM_NENG,2)/@MOVAV(RWNM_SUM,2)) +
0.1748511291*LOG(@MOVAV(GSPR_NENG,2)/@MOVAV(GSPR_SUM,2)) -
0.003728482536*@TREND

LOG(XENMFGO9_PAC/ENMFGO9_SUM) = 0.1292308062 - 1.414028985 +
0.4300731371*LOG(@MOVAV(NMFGO9_PAC_0,2)/@MOVAV(NMFGO9_SUM_0,2)) -
0.2435983984*LOG(@MOVAV(RWNM_PAC,2)/@MOVAV(RWNM_SUM,2)) +
0.1748511291*LOG(@MOVAV(GSPR_PAC,2)/@MOVAV(GSPR_SUM,2)) -
0.002235667904*@TREND

LOG(XENMFGO9_SATL/ENMFGO9_SUM) = 0.1452035191 - 1.414028985 +
0.4300731371*LOG(@MOVAV(NMFGO9_SATL_0,2)/@MOVAV(NMFGO9_SUM_0,2)) -
0.2435983984*LOG(@MOVAV(RWNM_SATL,2)/@MOVAV(RWNM_SUM,2)) +
0.1748511291*LOG(@MOVAV(GSPR_SATL,2)/@MOVAV(GSPR_SUM,2)) +
0.005847521622*@TREND

LOG(XENMFGO9_WNC/ENMFGO9_SUM) = -0.02756259564 - 1.414028985 +
0.4300731371*LOG(@MOVAV(NMFGO9_WNC_0,2)/@MOVAV(NMFGO9_SUM_0,2)) -
0.2435983984*LOG(@MOVAV(RWNM_WNC,2)/@MOVAV(RWNM_SUM,2)) +
0.1748511291*LOG(@MOVAV(GSPR_WNC,2)/@MOVAV(GSPR_SUM,2)) -
0.004677573013*@TREND

LOG(XENMFGO9_WSC/ENMFGO9_SUM) = 0.006286722296 - 1.414028985 +
0.4300731371*LOG(@MOVAV(NMFGO9_WSC_0,2)/@MOVAV(NMFGO9_SUM_0,2)) -
0.2435983984*LOG(@MOVAV(RWNM_WSC,2)/@MOVAV(RWNM_SUM,2)) +
0.1748511291*LOG(@MOVAV(GSPR_WSC,2)/@MOVAV(GSPR_SUM,2)) -
0.0001529877917*@TREND

NMFGO10 - Federal Government
LOG(XENMFGO10_ENC/ENMFGO10_SUM) = 0.09885542135 - 2.369583433 +
0.002855034858*@TREND

LOG(XENMFGO10_ESC/ENMFGO10_SUM) = -0.3512482542 - 2.369583433 -
0.005795035101*@TREND

LOG(XENMFGO10_MATL/ENMFGO10_SUM) = 0.2542056275 - 2.369583433 -
0.003723186537*@TREND

LOG(XENMFGO10_MTN/ENMFGO10_SUM) = -0.3811847413 - 2.369583433 +
0.007350042763*@TREND

LOG(XENMFGO10_NENG/ENMFGO10_SUM) = -0.8555332209 - 2.369583433 +
0.001230693448*@TREND

LOG(XENMFGO10_PAC/ENMFGO10_SUM) = 0.6586570911 - 2.369583433 -
0.01122516457*@TREND

LOG(XENMFGO10_SATL/ENMFGO10_SUM) = 1.102335711 - 2.369583433 + 0.002691198564*@TREND

LOG(XENMFGO10_WNC/ENMFGO10_SUM) = -0.5062380697 - 2.369583433 + 0.005549191489*@TREND

LOG(XENMFGO10_WSC/ENMFGO10_SUM) = -0.01984956465 - 2.369583433 + 0.004902288517*@TREND

NMFGO11 - State and Local Government

LOG(XENMFGO11_ENC/ENMFGO11_SUM) = -0.4649942372 + 1.615429218 + 1.696341633*LOG(NP_ENC/NP_SUM) + 0.004617815867*@TREND

LOG(XENMFGO11_ESC/ENMFGO11_SUM) = 0.2825572977 + 1.615429218 + 1.696341633*LOG(NP_ESC/NP_SUM) + 0.004286063866*@TREND

LOG(XENMFGO11_MATL/ENMFGO11_SUM) = -0.3215709027 + 1.615429218 + 1.696341633*LOG(NP_MATL/NP_SUM) + 0.001179601149*@TREND

LOG(XENMFGO11_MTN/ENMFGO11_SUM) = 0.6671127302 + 1.615429218 + 1.696341633*LOG(NP_MTN/NP_SUM) - 0.01805543571*@TREND

LOG(XENMFGO11_NENG/ENMFGO11_SUM) = 0.2943089977 + 1.615429218 + 1.696341633*LOG(NP_NENG/NP_SUM) + 0.006058498521*@TREND

LOG(XENMFGO11_PAC/ENMFGO11_SUM) = -0.384089718 + 1.615429218 + 1.696341633*LOG(NP_PAC/NP_SUM) + 0.001180844137*@TREND

LOG(XENMFGO11_SATL/ENMFGO11_SUM) = -0.330709458 + 1.615429218 + 1.696341633*LOG(NP_SATL/NP_SUM) - 0.006118715388*@TREND

LOG(XENMFGO11_WNC/ENMFGO11_SUM) = 0.266727567 + 1.615429218 + 1.696341633*LOG(NP_WNC/NP_SUM) + 0.006014533036*@TREND

LOG(XENMFGO11_WSC/ENMFGO11_SUM) = -0.009342276706 + 1.615429218 + 1.696341633*LOG(NP_WSC/NP_SUM) - 0.0005645505656*@TREND