IMF WORKING PAPER

WP/88/23

INTERNATIONAL MONETARY FUND

Research Deparment

MULTIMOD: A Multi-Region Econometric Model*

Prepared by Paul Masson, Steven Symansky, Richard Haas, and Michael Dooley

March 4, 1988

Abstract

The paper describes a global model consisting of several industrial and developing country blocks built to analyze alternative economic policies in a medium-term context. The model, which has been used to construct medium-term scenarios for the World Economic Outlook, consists of aggregate demand and supply relationships, with endogenous determination of interest rates, prices, and exchange rates. Financing flows to developing countries depend on expectations of their ability to service debt. Expectations of interest rates, inflation, and exchange rates are modeled in a way that is consistent with the model's solution, and budget constraints are imposed on governments.

JEL Classification Numbers:
1230; 2120; 3100; 4200; 4300

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* The authors are grateful to Ken Cobb and David Hicks for statistical and programming assistance; Stephen Schwartz helped with the estimation of trade equations for manufactures. We are also indebted to David Currie, John Helliwell, Guy Meredith, Brian O'Reilly, and to numerous colleagues for helpful comments, including especially Charles Adams, James Boughton, Nadeem Haque, Jeroen Kremers, Thomas Mayer, Peter Montiel, and Kenichi Ohno.

Contents

I. Introduction

1. Purpose of model

MULTIMOD, or MULTI-region econometric MODel, has been designed to improve analysis of the effects of industrial country policies on major macroeconomic variables, both in the developed and developing worlds. It is a continuation of modeling work undertaken at the Fund in recent years, in particular the World Trade Model (Spencer [1984]) and MINIMOD (Haas and Masson [1986]), and it supplements individual country and sectoral models, as well as detailed analysis and monitoring performed by country desks. The focus of the model is on the transmission of policy effects, and in this respect therefore it accords well with the Fund's surveillance role over the policies of major countries. More generally the model can be used to trace the effects of changes in the external environment facing developing countries on their economies in the aggregate. To a limited extent, the model can also be used to evaluate policies that developing countries might choose in order to improve their outcomes, for instance, through shifting demand away from consumption and toward investment. However, their monetary and fiscal policy instruments are not at present explicit in the model. The model has not been designed to do unconditional or "baseline" forecasts, nor is it our intention to use it for this purpose. Instead, the model has been designed to utilize a judgemental forecast that incorporates detailed knowledge of country desks as given, and to examine the effects of changes in policies in major countries and other exogenous changes in the economic environment on that baseline.

Given the focus on comparative scenarios, the model can be much simplified compared to a model that must be used to give baseline forecasts. Simplicity in a model is an important characteristic, since it allows easier understanding of the economics behind the model's results; in addition, it allows faster solution of the model, which is important if computer-intensive simulations are to be run, such as those that impose consistency between the model's final solution and model-generated expectations. 1/ A desire for transparency and tractability also motivated a precursor to this model, MINIMOD, which was simpler in structure and consisted of only two blocks--the United States and the Rest of the World. The present model, in order to be useful for considering various policy combinations and economic interactions among industrial countries, has more country disaggregation; in addition, it attempts to capture characteristics of developing countries, in particular their financing constraints and different economic structures.

1/ The behavioral relationships in the model, in particular consumption behavior and the interaction of wages and price setting, have been estimated using the assumption that expectations are formed rationally. Rationally-expected long-term bond rates and exchange rates also appear in the model, but their values are derived from arbitrage conditions.

The model at present includes three separate industrial countries-- the United States, Japan, and the Federal Republic of Germany--and two blocks of the remaining industrial economies, one for the other G-7 countries, labeled the larger industrial (LI) block (France, the United Kingdom, Italy and Canada), and one for the smaller industrial countries (SI). 1/ The rest of the world (RW) has been divided into high-income oil exporters (HO) and developing countries (DC). On the developing country side, there is only one aggregate region, but its industrial structure is disaggregated between production of manufactures, of oil and of primary commodities. The region is assumed to be faced with an endogenous supply schedule for foreign loans that depends on a forward-looking assessment of developing countries' debt service capacity. Given other countries demands for the region's exports, imports are assumed to depend on the level of financing available less interest payments.

The high income oil exporters 2/ are treated separately, in simplified form; they are the residual suppliers of oil, whose price is exogenous in real terms, and their exports of other goods are exogenous. In addition, they are assumed to have explicit import demand equations, instead of a residual determination of imports from the balance of payments identity. Thus their holdings of reserves are modeled as the residual.

2. The transmission of policy effects

The main linkages among the regions modeled are the endogenous determination of prices and volumes of goods trade and the endogenous determination of exchange rates and interest rates. In this respect, the model is a dynamic version of the Mundell-Fleming model, incorporating many of the extensions to that model that have been developed over the years. That basic framework has proved a useful and robust tool for the analysis of economic policies. 3/ The signs of transmission effects of economic policies, and also the magnitudes of their domestic effects, depend on a number of key parameters, including the degree of price stickiness, the elasticity of expenditure with respect to interest rates, the degree of openness to trade, and the size of trade elasticities. 4/ Estimates of these key parameters are necessary to evaluate the transmission effects, which are calculated by computer simulation of the model.

An important linkage between industrial to developing countries is the level of capital flows and the interest rate on outstanding debt. Flows of

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1/ Australia, Austria, Belgium, Denmark, Finland, Iceland, Ireland, Luxembourg, the Netherlands, New Zealand, Norway, Spain, Sweden and Switzerland.

2/ Iran, Iraq, Kuwait, Libya, Oman, Qatar, Saudi Arabia, and the United Arab Emirates.

3/ See Frenkel and Razin [1987].

4/ A survey of the transmission effects of policies appears in Boughton and others [1988].

financing between industrial and developing countries are assumed to depend on the ability of developing countries to service debt. The measure of servicing ability used is the ratio of debt interest payments, corrected for inflation, to exports. Expectations are assumed to be formed for that ratio: if it exceeds a threshold level imposed on the model, then additional financing will not be demanded or supplied. If it is less than the threshold, then financing will be available in an amount that depends on the difference between the expected level and the threshold level.

Developments in industrial countries influence the expected value of that ratio, since the level of interest rates on DC debt appears in the numerator, and demand for the developing countries' exports affects both prices and volumes in the denominator. Increased developing country export price or volume will lead to greater financing flows from industrial to developing countries, and the greater the level of financing, the larger will be DC imports from the industrial countries; some of which will be associated with increased consumption, but the remainder, by increasing DC investment, will affect the capital stock and future growth prospects. Increased demand by industrial countries for manufactures produced by developing countries will first mainly lead to increases in the volume of DC exports, and over time in the price of those exports, while an increase in industrial country demand for primary commodities will lead in the first instance to an increase in their price, and only later to an increase in output. Conversely, any increase in protectionism in industrial countries, by reducing the demand for DC exports, will lead to smaller financing flows and less capital formation in developing countries.

3. Commodity disaggregation

Trade is disaggregated into three different types of goods: oil, primary commodities, and manufactures. Trade in oil is treated separately, and it is assumed to be subject to one world price, fixed exogenously in real terms. 1/ All countries and regions other than the high-income oil exporters have variables for oil production and domestic consumption, and for exports and imports of oil; typically, production is exogenous for the individual producer, while a domestic demand equation determines consumption and either imports or exports residually. 2/ For both the high income oil exporters and the DCs, production and exports are also endogenous, and are determined such that world demand and supply of oil are equal; increases of demand are shared between them in a fixed proportion. Inventories of oil are not explicit in the model; changes in inventories are implicitly included in consumption.

Primary commodities produced by developing countries are assumed to have a price that is perfectly flexible and moves to clear the market. An increase in the relative price (and implicitly, in the profitability of production) of primary commodities will induce a shift of resources into

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1/ Using as deflator a weighted average of industrial country output prices.

2/ The use of oil as an input into production is not made explicit in the model; such use is included with consumption.

this sector, increasing the quantity produced and eventually bringing about an increase in capacity and supply.

The composite manufactured good is assumed to be produced by all regions, and imports and exports of all regions except the high income oil exporters are endogenous to the model. 1/ Furthermore, each region's (or country's) manufactured good is assumed to be an imperfect substitute for other regions' manufactures, and relative prices of the different manufactured goods explain imports and exports. Base period export shares are used as weights for the calculation of relative prices. There is no single price of manufactures, and prices in each region move sluggishly.

4. Estimation strategy

Unlike MINIMOD, whose parameters were not estimated, but were derived by simulation from an existing multi-country model, the parameters of the model described here were to a large extent estimated using historical data. The difference in approach is the result of different requirements on the models. One of the uses of the current model is to help generate medium-term scenarios in conjunction with the World Economic Outlook, and so it is convenient that the model explain data series used in that publication. Differences in data definitions may make the outputs of existing models produced outside the Fund inconsistent with WEO data. In addition, the coverage of regions--all the industrial countries and the developing countries--goes beyond many existing multi-country models, so that necessarily many parameters could not be taken directly from those models.

In estimating model coefficients, a high value is placed on comparability across countries and regions, at least as applies to industrial countries. Rather than specifying and estimating individual country models independently, in many cases a given equation was estimated for the five industrial regions using pooled cross-section, time series estimation. This allowed imposition of common coefficients where the data warranted it. The aim was to avoid differences in country model behavior that were the result of arbitrary differences in specification, rather than parameter differences that were statistically significant.

Therefore, common parameters occur quite frequently in the model, as is described below. Nevertheless, even with common behavioral parameters countries will respond differently to changes in exogenous variables, because of different structural features. For instance, the Federal Republic of Germany exhibits lower fiscal multipliers than the United States in large part because of a greater degree of openness, as exhibited by a higher import/GNP ratio. Similarly, the levels of net foreign assets and different trading patterns in the various countries will lead to different macroeconomic responses to the same shock. In addition, there is an

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1/ The primary commodities produced and exported by industrial countries--including such commodities as cereals and minerals, which are important for a number of countries--are included implicitly in the composite good, labeled "manufactures," that is produced by industrial countries.

asymmetry in the importance of countries in international monetary arrangements; foreign assets and liabilities are assumed to be denominated in dollars, and to pay a U.S. dollar interest rate.

II. Industrial Countries

1. Aggregate demand

a. Consumption behavior

Consumption behavior in each country or region is modeled in a fashion that reflects the correlation between current income flows and consumption, as well as the longer-term relationship between consumption and permanent income or wealth. 1/ The effect of current income flows can be explained by capital market imperfections, taking the form of constraints on borrowing by some households. The consumption equation therefore reflects the assumption that some consumers are only constrained in the level of their consumption spending by their net wealth, while others are also liquidity constrained. The measure of wealth used is financial wealth plus the present discounted value of expected future income, where income is defined as net national income (the value of output domestically produced, net of factor payments abroad) less taxes: it thus includes both physical capital and human capital, and is the net wealth of the private sector.

In calculating wealth a choice must be made of the appropriate rate of discount used by consumers. In the model, it is assumed to be the same as the government's. 2/ As a result, expected increases in taxes offset increases in private holdings of government bonds in the calculation of wealth.

In the definition of wealth, therefore, neither bonds nor taxes appears explicitly since the present value of taxes equals the stock of bonds plus the present value of government spending. Instead, wealth equals the present value of expected net national income minus the government's spending, plus the monetary base and net claims on foreigners. As a result, whether government spending is financed by taxes or bond issues has no effect on wealth, as calculated here. However, since current taxes appear in disposable income, what Barro [1974] has termed Ricardian Equivalence--the equivalence of bond and tax financing--will not hold, as the liquidity constrained consumers will consume less if current taxes rise, reducing their disposable income. 3/

1/ See Hall [1987] for a survey of recent empirical evidence.

2/ Such an assumption is only strictly appropriate if consumers have infinite horizons, for instance, because they care about the utility of their descendants. In some models, e.g. Blanchard [1985], the discount rate of the private sector is higher by a fixed amount, equal to the probability of death.

3/ The importance of liquidity constraints in causing Ricardian non-Equivalence has been emphasized by Poterba and Summers [1987]. See also Haque and Montiel [1987].

As mentioned above, it is assumed that the private sector discounts the future at the same rate as the government, i.e. using the real government bond rate. However, any reasonable historical measure of real interest rates--either long or short--gives some years in the 1970s where the real interest rate is negative; clearly that rate cannot be used to calculate discounted present values. On the other hand, if we constrain the real rate to be a parameter, e.g. to equal the average over some historical period, then interesting valuation effects are lost. The prevailing ex ante real short rate is used to discount next period's flows, but a discount rate that tends to return to the historical average real rate is applied to subsequent periods' flows; the speed of adjustment of the discount rate is estimated using an autoregression on historical data.

The determination of wealth can be derived as follows. The starting point is the definition of net wealth of a representative consumer as being the sum of financial assets per capita and the discounted present value of future income:

$$W = (M + B + NFA/ER)/P + \int_0^{\infty} e^{-r(s)s} \rho(s) Y(s) [1-\tau(s)] ds \qquad (1)$$

where M is outside money, B holdings of government debt, NFA net foreign assets, P the absorption deflator, r the short-term real interest rate, ρ the relative price of output and absorption, Y per capita net national product, and τ is the tax rate. Now the government's budget constraint is given by the following equation, provided that discounted interest payments go to zero so that $e^{-r(s)s}B(s) \Rightarrow 0$ as $s \Rightarrow \infty$:

$$B/P = \int_0^{\infty} e^{-r(s)s} \rho(s) Y(s) [\tau(s)-g(s)] ds \qquad (2)$$

where g is the share of government spending on goods and services in net output. Substitution of (2) into (1) eliminates B and τ:

$$W = (M + NFA/ER)/P + \int_0^{\infty} e^{-r(s)s} \rho(s) Y(s) [1-g(s)] ds \qquad (3)$$

Suppose that $\rho(s)$, r(s), Y(s), and g(s) are all expected to stay constant at their current values, that is ρ, r, Y, and g, respectively. Then equation (3) reduces to

$$W = (M + NFA/ER)/P + (1-g)\rho Y/r \qquad (4).$$

Such an assumption is clearly too restrictive. In general, however, if those variables take arbitrary paths then we cannot collapse the integral in (3). We suppose that the real interest rate, the terms of trade, real output, and the share of government have *normal* values that correspond to long-run equilibrium, equal to $\bar{r}$, $\bar{\rho}$, $\bar{Y}$, and $\bar{g}$, respectively. For output, the long-run equilibrium value is clearly potential output, and hence it is convenient to work with the rate of capacity utilization, $CU = Y/\bar{Y}$. Suppose that r, ρ, CU, and g move gradually from their current levels to their long-run equilibrium values:

$$\begin{aligned} Dr(s) &= \alpha[\bar{r} - r(s)] \\ D\rho(s) &= \beta[\bar{\rho} - \rho(s)] \\ DCU(s) &= \gamma[1 - CU(s)] \\ Dg(s) &= \delta[\bar{g} - g(s)] \end{aligned} \tag{5}$$

This implies that their future paths can be described by the following:

$$r(s) = e^{-\alpha s}(r - \bar{r}) + \bar{r}, \tag{6}$$

and similarly for the other variables. Let the integral in equation (3) be called V. We linearize around the normal values, in the following way:

$$V = \bar{\rho}(1-\bar{g})\bar{Y}/\bar{r} + \int e^{-\bar{r}s}\,\bar{\rho}(1-\bar{g})[Y(s)-\bar{Y}]ds - \int e^{-\bar{r}s}\,\bar{\rho}\bar{Y}[g(s) - \bar{g}]ds +$$

$$\int e^{-\bar{r}s}\,\bar{Y}(1-\bar{g})[\rho(s)-\bar{\rho}]ds - \int e^{-\bar{r}s}\,\bar{\rho}(1-\bar{g})\bar{Y}[r(s)-\bar{r}]ds \tag{7}$$

Given equations (5), the integrals in (7) can be collapsed to give the following:

$$V = \bar{\rho}(1-\bar{g})\bar{Y}/\bar{r}\,\{1 + (CU - 1)/(\bar{r} + \alpha) + (\rho/\bar{\rho} - 1)/(\bar{r} + \beta) - (g - \bar{g})/$$

$$[(1-\bar{g})(\bar{r} + \gamma)] - (r - \bar{r})/(\bar{r} + \delta)\} \tag{8}$$

Therefore, the normal value of wealth is modified by the deviation of the variables from their normal levels, and the faster they are expected to return to their normal levels, the less effect they have on current wealth calculations. Since the adjustment equations above are formulated in continuous time, the speeds of adjustment can approach infinity, in which case (8) reduces to

$$V = \bar{\rho}(1-\bar{g})\bar{Y}/\bar{r} \tag{9}$$

The values of α, β, γ, δ, as well as $\bar{r}$ and $\bar{g}$ are estimated using historical data, using autoregressions over the period 1965-85. A regression of the form

$$X = a\,X(-1) + b \tag{10}$$

was run in order to infer the long-run value b/(1-a) and the speed of adjustment 2(1-a)/(1+a) corresponding to the parameters of (5). 1/ It was first verified that the variables considered above did seem to be stationary; no formal statistical tests were performed, but Figure 1 suggests that this is indeed the case. Capacity utilization, which is calculated in the data to be the ratio of actual output to its trend value, has a normal value of unity, which was imposed, as was the value for the ratio of the output to the absorption price (both are indices, equal to 1.0

1/ Equation (10) is viewed as a discrete approximation to differential equation (5). See Wymer [1972].

in 1980). The speeds of adjustment and long-run values implied by the estimated autoregressions are given in Table 1 below.

Table 1: Implied Long-Run Values and Adjustment Speeds

Country	Real rate		Rel. price		Output		Govt. spending	
	$\bar{r}$	α	$\bar{\rho}$	β	$\overline{CU}$	γ	$\bar{g}$	δ
United States	.027	.138	1.0	.165	1.0	.558	.225	.236
Japan	.009	.361	1.0	.006	1.0	.414	.115	.236
Germany	.027	.688	1.0	.060	1.0	.556	.225	.236
Larger Indus.	.017	.305	1.0	.391	1.0	.190	.217	.236
Smaller Indus.	.010	.471	1.0	.055	1.0	.131	.219	.236

The autoregressions imply a much faster return to normal capacity utilization rates than for relative prices; hence, deviations from normal relative prices have a larger effect on calculated wealth. Equilibrium real short-term interest rates were calculated from the regression coefficients, as described above; surprisingly, they differ considerably across countries. Normal shares of output appropriated by governments, $\bar{g}$ (note that transfers are excluded here), are remarkably similar for the different regions, with the exception of Japan. As noted above, there is also no evidence of trend over the period, suggesting that government spending and net national product are cointegrated. When estimated separately, speeds of adjustment to a normal government share were poorly determined; thus, a pooled time-series cross-section constrained the speed to be the same.

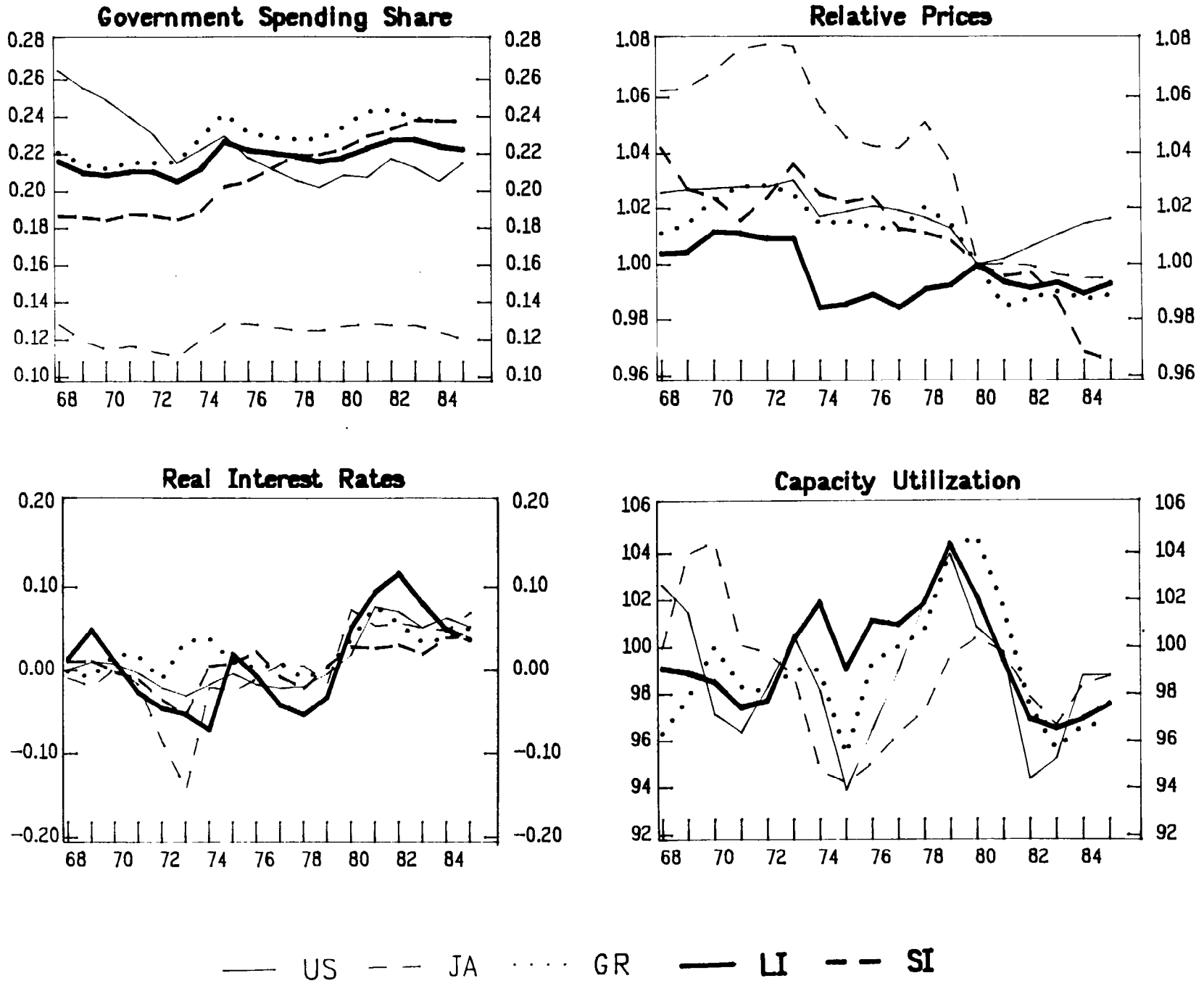
Using the wealth measure defined above, a consumption equation was estimated in error-correction form 1/ that constrained consumption to increase proportionately to increases in wealth in the long run. This specification allows the speed of adjustment to be estimated freely, but ensures that steady-state consumption equals some constant times wealth. The equation also includes the change in the real long-term interest rate ΔR (expressed as a decimal fraction) and the change in the log of disposable income, $\Delta\log(YD)$. The equation was estimated using instrumental variables, 2/ with

1/ See Davidson and others [1978].

2/ Instruments used were the logs of the following variables: the government's share of income, real money balances, and lagged GDP and the capital stock.

Figure 1

Industrial Countries: Plots of Historical Data



pooled data over 1970-85; individual coefficient restrictions were not rejected at the 5 percent level. 1/ The estimated equation has the following coefficients (t-ratios in parentheses; constant terms, which differ across countries, are not reported):

$$\Delta\log(C) = \underset{(2.5)}{.117}\ \log(W_{-1}/C_{-1}) \ \underset{(1.4)}{-.451}\ \Delta R + \underset{(6.3)}{.555}\ \Delta\log(YD) \qquad \bar{R}^2 = .867 \quad \text{SER} = .013 \qquad (11)$$

In the long run steady state, the change in R is zero, and consumption and disposable income settle down to a common growth rate. Therefore, equation (11) implies that the level of consumption in each country or region i will be related to wealth in the following way:

$$C_i = \kappa_i W_i \qquad (12)$$

The constant term κ_i in (12) depends on the country's intercept in (11) as well as the steady-state rate of growth, which is equal to the exogenous combined rate of growth of the labor force and technical progress.

b. Investment behavior

Investment is modeled as a gradual adjustment to an optimal level for the capital stock; in the presence of adjustment costs, the adjustment is spread over time. 2/ As is the case for consumption, this process is modeled as an error correction mechanism. The optimal stock of capital is derived from the production technology: the profit-maximizing level of capital will equate the marginal product of capital to the user cost of capital, UC. In the simple Cobb-Douglas technology assumed here, the marginal product of capital is just the level of output times the share of capital (β), divided by the capital stock. Therefore, the optimal capital stock K^* is given by

$$K^* = \beta\ \text{GDP/UC} \qquad (13)$$

In the models for industrial countries, the user cost is defined in a way that takes into account economic depreciation of the capital stock as well as the tax treatment of depreciation and the non-neutrality of the tax system with respect to inflation. 3/ Such a measure of user cost gives values for UC for several countries that are close to zero in some periods, or even negative (for instance, for the United Kingdom during the 1970s). As a result, equation (13) does not give a useful measure of the desired level of the capital stock. Given measurement problems, the effect of the user cost on capital was estimated freely, instead of imposing the elasticity of minus unity implied by (13).

1/ However, the unrestricted regressions have significantly lower residual sum of squares than equation (11), which imposes all of the restrictions jointly.

2/ Gould [1968] gives a treatment of optimal capital accumulation in the presence of adjustment costs. See Clark [1979] for a comparison of investment equations estimated for the United States.

3/ See, for instance, Brayton and Clark [1985].

The adjustment to the optimal capital stock is modeled as an error-correction mechanism in log form. This permits imposing long run homogeneity of the level of capital with respect to output as is implied by (13) provided steady states with the same UC are compared. There is also a term that captures a short-run accelerator effect of current changes in output on investment.

Unfortunately, adequate data for the real net capital stock, excluding government capital, were not available for all industrial countries. Consequently, pooled estimates were obtained for six of the G-7 countries--all but Italy--and for the SI region. The same coefficients (except for the constant term, which was set equal to the average for the United Kingdom, France and Canada) were imputed to Italy. A dummy variable was included to allow for a shift in investment behavior after the first oil price shock: it is zero before 1974, 1 afterwards. The estimated equation was the following (separate intercept terms are not reported), where *instrumental variables were used to account for the joint endogeneity of* investment, GDP and the user cost: 1/

$$\Delta\log(K) = \underset{(8.5)}{.56}\ \log(GDP_{-1}/K_{-1}) \underset{(1.8)}{-.085}\ UC + \underset{(1.5)}{.086}\ \Delta\log(GDP) - \underset{(3.2)}{.012}\ DUM74 \qquad (14)$$

$$\bar{R}^2 = .960$$
$$SER = .010$$

In the long-run steady state, K and GDP settle down to constant growth rates that are determined by the (exogenous) rates of growth of labor force and technical progress, and are reflected in the constant terms. From (14), in the long run K is therefore given by

$$\log(K) = \log(GDP) - .54\ UC + \text{a constant} \qquad (15)$$

c. Trade volumes

For the industrial countries, trade flows are disaggregated as follows. Oil trade is treated separately from other goods; each country's oil exports are exogenous, while imports of oil are determined residually, as the difference between domestic production (which is exogenous) and domestic consumption plus exports, if any. Domestic consumption of oil depends on relative prices and domestic activity. Industrial countries also import primary commodities from developing countries. 2/ Finally, each industrial country produces a manufactured good, (as do developing countries); each manufactured good is differentiated from other countries' goods. For each country, there is an equation for the total volume of manufactured imports and one for the total volume of manufactured exports.

1/ Instruments used were real money balances, real government spending, the rate of change in the price of oil, DUM74, lagged capital stocks and lagged output.

2/ As mentioned above, their commodity imports from other industrial countries are included with manufactured imports.

In modeling oil, it is assumed that there is one world price; this assumption is realistic for world trade but less so for domestic consumption. Consumption equations were estimated with pooled data, and the same long-run price elasticity was imposed, though in the short run, price elasticities are allowed to differ in order to permit different short-run responses of domestic prices to changes in the world price. An error-correction equation was estimated that imposed a unit elasticity with respect to GDP in the long run, as well as a short-run effect of activity on oil consumption, with coefficients differing across countries. Since oil serves as an input into production, GDP rather than domestic absorption served as the activity variable. For manufactured imports, in contrast, domestic absorption is the activity variable in the equation (see below). The form of the equation for oil consumption was the following, where the relative price RPO is the ratio of the domestic price of oil to the GNP/GDP deflator, and all variables are in logs:

$$\Delta\log(COIL) = \kappa + \alpha \log(RPO_{-1}) + \beta \log(GDP_{-1}/COIL_{-1}) + \gamma \Delta\log(GDP) + \delta \Delta\log(RPO) \quad (16)$$

Estimated coefficients are presented in the following Table; coefficients α and β are constrained to be the same for all countries, as unrestricted coefficients showed a remarkable degree of uniformity across countries.

Table 2. Coefficient Estimates, Oil Consumption Equations, 1964-85

(t-ratios in parentheses)

Country	κ	α	β	γ	δ	$\bar{R}^2$	SER
United States	-.2569	-.0502	.0744	.7502	-.0488		
	(3.61)	(8.88)	(2.91)	(2.87)	(2.21)		
Japan	-.3711	-.0502	.0744	1.545	-.0203		
	(4.61)	(8.88)	(2.91)	(7.31)	(1.03)		
Germany	-.2627	-.0502	.0744	1.529	-.0988	.838	.029
	(3.14)	(8.88)	(2.91)	(5.20)	(5.04)		
Larger Indus.	-.6660	-.0502	.0744	2.000	-.0410		
	(6.33)	(8.88)	(2.91)	(4.96)	(1.98)		
Smaller Indus.	-.2552	-.0502	.0744	0.996	-.0837		
	(3.37)	(8.88)	(2.91)	(2.44)	(4.17)		

The estimates for α and δ imply strong and statistically significant effects of relative prices on oil consumption. The long-run relative price effect, equal to α/β, is about -0.7, but it has a mean lag of about 10

years. Short-run elasticity effects of economic activity on oil consumption are greater than unity for all regions except the United States and the smaller industrials; in the long run, the elasticity is unity, as discussed above. The short-run relative price elasticities are very small.

Imports of oil by each industrial country are determined residually, as the difference between consumption and production. For those countries that produce oil, implied elasticities of oil imports are considerably larger than those for consumption, since production is exogenous. For instance, if oil imports are one quarter of consumption, then the elasticity of imports with respect to either price or GNP will be roughly four times that for consumption, reported above.

As is the case for oil, one world price is assumed to prevail for primary commodities. Primary commodity imports are also modeled in error-correction form, but here the restriction that demand is unit elastic was rejected by the data. Writing RPC for the relative price of commodities and domestic output, i.e. the world price of commodities converted to domestic currency and divided by the GNP/GDP deflator, the equation for commodity imports ICOM can be written as follows:

$$\Delta\log(ICOM) = \kappa + \alpha \log(RPC_{-1}) + \beta \log(GDP_{-1}) + \gamma \log(ICOM_{-1}) + \delta \Delta\log(RPC) + \epsilon \Delta\log(GDP) \qquad (17)$$

Since the price of commodities moves to clear the market, it is clearly endogenous, and ordinary least squares are inappropriate. Instead, instrumental variables was used; GDP and the GDP deflator in all of the industrial countries were instruments. Results are presented in Table 3.

Table 3. Coefficient Estimates, Commodity Import Equations, 1965-85.
(t-ratios in parentheses)

Country	κ	α	β	γ	δ	ϵ	$\bar{R}^2$	SER
United States	-3.68	-.158	.753	-.785	-.640	1.96	.711	.048
	(3.8)	(1.6)	(4.1)	(4.2)	(6.4)	(4.0)		
Japan	-1.15	-.786	.128	-.562	-.634	-.141	.426	.067
	(1.1)	(2.6)	(0.5)	(2.6)	(3.1)	(0.2)		
Germany	-2.23	.160	.463	-.411	-.442	1.86	.779	.038
	(3.3)	(1.1)	(3.9)	(2.5)	(4.2)	(4.1)		
Larger Indus.	.687	-.179	.151	-.594	-.516	2.40	.694	.036
	(0.9)	(1.6)	(2.6)	(2.6)	(6.2)	(3.0)		
Smaller Indus.	-2.07	-.256	.572	-.708	-.515	2.21	.641	.035
	(2.7)	(1.4)	(3.0)	(2.7)	(4.3)	(2.9)		

Coefficients vary considerably across countries and regions; however, relative price and GDP elasticities are generally well determined. Only the estimates of ϵ for Japan and α for Germany differ from their a priori signs; neither is significantly different from zero, however. Estimates of long-run price elasticities, equal to α/γ, are less than unity for all countries except Japan; estimates of long-run GDP elasticities, equal to $-\beta/\gamma$, range from .25 to 1.1.

Manufactured trade equations are modeled in a conventional fashion, using a base period share matrix to weight up the growth in foreign markets and competitors' prices. 1/ Import volumes are assumed to depend on the level of domestic absorption, A, as well as on the ratio of the import price to the non-oil GNP deflator. Export volumes depend on a foreign markets variable, defined as the weighted sum of other countries' imports (with weights that are equal to base period shares of the home country's exports in other countries' imports) and on the ratio of the home country's export price to other countries' export prices. This latter variable incorporates other countries' export prices using a double weighting scheme, reflecting both the importance of all other markets in the home country's exports and the market share of its competitors in those markets.

The equations that were estimated for import volumes have the following form, with lags on relative prices and absorption included where dictated by the data. A time trend is also included in some equations, to capture secular changes in trade liberalization and hence in world trade that is not related to trend growth in absorption or output.

$$\log(IM) = \kappa + \alpha \log(A) + \beta \log(A_{-1}) + \gamma \log(PIM/PGNPNO) + \mu t + \phi \log(IM_{-1}) \qquad (18)$$

Coefficient estimates are presented in Table 5 below.

The import equations have long-run elasticities with respect to absorption that are constrained to be equal to unity (this constraint being accepted by the data), in most cases with adjustment estimated to take place during the first year, the exception here being the Larger Industrial group. Price elasticities are equal to the following values, after lags are taken into account: -0.8 (US), -1.4 (JA), -0.7 (GR), -1.6 (LI), -1.7 (SI).

1/ This approach is standard in multi-country models. It has been used by Taplin [1973], Samuelson [1973], Deppler and Ripley [1978], and Spencer [1984]. See Hickman [1973] and Amano [1980] for a discussion of alternative specifications.

Table 4. Coefficient Estimates, Import Volume Equations, 1966-85
(t-ratios in parentheses)

Country	κ	α	β	γ	μ	ϕ	$\bar{R}^2$	SER
United States	-3.49	1.0	0	-.801	.036	0	.946	.040
	(74)	a	a	(8.3)	(17)	a		
Japan	-1.07	1.0	-.582	-.592	0	.582	.940	.096
	(3.5)	a	b	(3.3)	a	(5.1)		
Germany	-2.15	1.0	0	-.740	.031	0	.994	.030
	(51)	a	a	(5.2)	(16)	a		
Larger Indus.	-.424	.294	0	-.483	0	.706	.221	.049
	(2.2)	(2.5)	a	(2.0)	a	c		
Smaller Indus	-1.31	1.0	0	-1.70	0	0	.800	.102
	(53)	a	a	(8.8)	a			

Notes: a Constrained to a constant.
b Constrained to be equal to $-\phi$.
c Constrained to equal $1-\alpha$.
d First order serial correlation correction is -.50.

Export volume equations depend on weighted foreign demand for imports (FM) and the log of the export price relative to competitors' export prices, (REER). These variables are defined as follows:

$$FM_i = \sum_j s_{ij} IM_j \bar{E}_{ij} \tag{19}$$

$$REER_i = \log(PXM_i) - \sum_j \lambda_{ij} \sum_{k \neq i} s_{kj} \log(PXM_k E_{ik})/(1-s_{ij}) \tag{20}$$

where $\bar{E}_{ij}$ are base period exchange rate indices, and λ_{ij} measure the importance of country j in the exports of country i. The export share matrix s_{ij} is given in Table 5. The double weighting scheme in (20) can be condensed to a single set of weights, and the equation rewritten as follows:

$$REER_i = \log(PXM_i) - \sum_j w_{ij} \log(PXM_j E_{ij}) \tag{20'}$$

The matrix of weights w_{ij} is given in Table 6 below.

Table 5. Shares of Manufactured Export Markets

Exporting Country	Importing Country					
	US	JA	GR	LI	SI	RW
United States	--	.3516	.0769	.2685	.1150	.2187
Japan	.2566	--	.0606	.0533	.0693	.2254
Germany	.0916	.0872	--	.2799	.3655	.1395
Larger Indus.	.3198	.1295	.3533	--	.3721	.2689
Smaller Indus.	.0832	.1037	.3960	.3054	--	.1475
Rest of World	.2489	.3279	.1132	.0929	.0781	--
sum	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Note: The figures give the share of the country in the stub in the total exports to the country in the heading (also equal to that country's total imports, if measurement errors are ignored).

Table 6. Export Competitiveness Weights

	US	JA	GR	LI	SI	RW	sum
United States	--	.1635	.2635	.2402	.2450	.0878	1.0
Japan	.1852	--	.1863	.3496	.1722	.1067	1.0
Germany	.2442	.1471	--	.3293	.1715	.1080	1.0
Larger Indus.	.1845	.2246	.2658	--	.1899	.1351	1.0
Smaller Indus.	.2531	.1512	.2004	.2731	--	.1222	1.0
Rest of World	.1446	.1675	.1906	.3101	.1873	--	1.0

The variable REER for a given country compares its manufactured export prices (in logs) to a weighted average of other countries' prices (in logs), converted to a common currency, with the weights appearing in the

appropriate row of Table 6. It should be emphasized that this measure of the real effective exchange rate excludes competition in the home market; thus it is not a comprehensive measure of competitiveness. Each country's export equation has the following form:

$$\log(XM) = \kappa + \epsilon \log(FM) + \nu \, REER + \phi \, REER_{-1} \qquad (21)$$

Coefficient estimates are given below.

Table 7. Coefficient Estimates, Export Volume Equations, 1970-85
(t-ratios in parentheses)

Country	κ	ϵ	ν	ϕ	$\bar{R}^2$	SER
United States	1.16	.770	-.521	0	.983	.034
	(7.8)	(28)	(7.4)	a		
Japan[b]	-1.76	1.389	-.675	-.389	.991	.038
	(3.6)	(11)	(3.6)	(2.0)		
Germany	.910	.802	-.325	0	.996	.014
	(11)	(64)	(7.4)	a		
Larger Indus.	.911	.849	-.270	0	.993	.022
	(5.8)	(31)	(2.3)	a		
Smaller Indus	1.60	.775	-.281	0	.997	.014
	(24)	(64)	(6.7)	a		
Rest of World	-.764	1.247	-.734	0	.938	.071
	(1.4)	(11)	(3.4)	a		

Notes: a constrained to equal zero.
b Serial correlation correction, $\rho = .70$.

The export equations give conventional estimates, with foreign market coefficients near to unity. To the extent that these elasticities differ from unity, these equations will not be consistent with a steady state with real growth, since a country's export share of foreign markets will not settle down to a stable ratio. The sample period however produces estimates that differ significantly from unity, and alternative specifications with time trends to capture changes in market shares did not give satisfactory results. Fortunately, elasticities do not differ so greatly from unity as to give nonsensical results when the model is simulated, even as far as 30 years into the future; nevertheless, further experimentation with

specifications that allow for transitory changes in market shares, converging to a stable long-run value, is planned.

Long-run effects of relative prices on manufactured exports differ considerably across countries, ranging from -0.3 for Germany and the LI and SI regions, to -0.5 for the United States and -1.1 for Japan. Price elasticities may seem low, but it must be remembered that the foreign market variable itself is implicitly a function of relative prices, since it is a weighted average of imports. Therefore, the Marshall-Lerner conditions are easily satisfied, at least for manufactures.

2. Government sector

The government sector does not include any true behavioral equations; however, in addition to identities that define the budget balance and total expenditures, there are technical relationships and simulation rules. Each country's equation for taxes (net of non-interest transfers) relates tax receipts to a tax rate and a tax base, which is approximated by Net National Product plus interest receipts. 1/ In addition, in simulation tax rates are changed to prevent the stock of government debt from rising without bound relative to GNP.

The equation for tax rates is a simulation rule with imposed parameters; they have not been estimated from historical data. Given exogenous government spending, the logic of the government's intertemporal budget constraint implies that tax rates must eventually be increased, provided that the real interest rate exceeds the real growth rate of the economy. 2/ If tax rates are not increased, then the government bond stock will increase without bound relative to GNP, as the government will be forced to borrow more in order to service the increased debt. If the government bond stock does settle down at a higher level, then even for an unchanged primary (i.e. non-interest) deficit, higher tax rates will be needed to service the higher debt.

A feedback rule was specified for tax rates that makes them respond to the government debt/GNP ratio and to the change in the ratio. Parameters were chosen on the basis of earlier work that studied the dynamics of MINIMOD, and formulated rules that made the model stable. 3/ Such a stability analysis has not yet been performed with the present model; this remains a project for further work.

1/ In reality, tax regulations are extremely complicated, and tax rates differ for different forms of income. The simplification that is used in the model will be valid provided the various forms of income move together.

2/ For a discussion of the implications of the government's intertemporal budget constraint, see for instance Buiter [1984].

3/ See Masson [1987]. There is empirical evidence in favor of such rules; see Kremers [1987].

3. Money and interest rates

As in most theoretical macroeconomic models, monetary policy in MULTIMOD is specified in terms of the supply of money, in particular the monetary base. This, together with the demand for base money, determines the short-run interest rate that clears the money market. Short-term interest rates in turn have an effect on long-term rates and the exchange rate. The supply of money is however not exogenous; instead, there is a reaction function for the central bank's behavior. What is exogenous is a target for the money supply; central banks are assumed to move short-term interest rates to close a gap between the target and the actual stock of money.

Demand equations for real money balances (deflated by the absorption price) were estimated as a function of real GNP and the short-term nominal interest rate. Base money includes both currency and the reserves of commercial banks held with the central bank. Demand for reserves therefore includes the demand derived from required reserves on the part of commercial banks, which depends on demand for their liabilities and the reserve requirement applied to them, plus commercial banks' demands for excess reserves. Each of these components may be expected to vary with the level of economic activity and to be sensitive to interest rate fluctuations. Money balances may also adjust with a lag; this is captured by a lagged dependent variable and lagged independent variables, where significant: 1/

$$\log(M/P) = \kappa + \alpha \log(GNP) + \beta RS + \gamma RS_{-1} + \delta \log(M_{-1}/P_{-1}) \qquad (22)$$

Results of this common specification are presented in Table 8. Tests were performed of equation (22) relative to more general specifications with additional lags; these tests accepted the more parsimonious specification in (22). Lagrange multiplier tests failed to find evidence of serial correlation up to fourth order (see Hendry [1987]).

In many countries, the demand for money has been affected by financial innovations and deregulation that have occurred in the 1980s. 2/ Consequently, it is of interest to test whether the demand functions are stable when the recent period is compared with earlier data. In the first part of Table 8 above, the final column gives a test for stability, when each equation is estimated over 1965-85 (one fewer observation) and used to forecast 1986. If the figure in the final column is greater than the critical value of the χ^2 distribution, which at the 5 percent level of significance (with one degree of freedom) is 3.8, then the hypothesis of

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1/ In practice, only lagged interest rates and the lagged dependent variable had significant explanatory power.

2/ See, among other references, Simpson [1985] and Suzuki [1984].

parameter stability can be rejected. It can be seen that only for the United States does parameter instability seem to be present. 1/

Table 8. Coefficient Estimates, Demand for Base Money, 1965-86
(t-ratios in brackets)

Country	κ	α	β	γ	δ	$\bar{R}^2$	SER	χ^2
United States	.408	.215	-.011	-.004	.617	.722	.028	13.7
	(0.6)	(3.8)	(3.0)	(0.9)	(4.0)			
Japan	-1.127	.456	-.009	-.023	.638	.989	.040	0.1
	(3.3)	(4.0)	(1.4)	(3.1)	(6.6)			
Germany	-.215	.249	-.005	-.005	.695	.865	.061	0.0
	(0.4)	(1.5)	(0.7)	(0.8)	(3.9)			
Larger Indus.	-1.017	.393	-.013	-.010	.670	.916	.027	0.5
	(2.3)	(5.2)	(3.4)	(2.4)	(7.5)			
Smaller Indus.	-.357	.063	-.010	-.004	.797	.937	.030	3.7
	(0.2)	(0.4)	(2.3)	(1.0)	(3.8)			

Long-Run Effects of Explanatory Variables

Country	Income Elasticity	Interest Rate Semi-Elasticity
United States	0.56	-.040
Japan	1.26	-.088
Germany	0.82	-.031
Larger Indus.	1.19	-.068
Smaller Indus.	0.30	-.069

Note: for the Smaller Industrials, the sample period is 1966-86.

1/ More complete tests of parameter stability were also performed; starting from an equation estimated over 1965-77, additional observations were added one year at a time, and parameters tested for stability using PC-GIVE (see Hendry [1987]). Such a procedure also suggests that demand for base money is unstable over this period only for the United States, and only since 1984. It should be noted however that these tests are only asymptotic.

Concern about the effect of financial innovation on money demand has led a number of central banks to abandon or de-emphasize monetary targeting. It is also true that even during the historical period, few central banks targeted the monetary base (the principal exception being the Federal Republic of Germany). Though over some periods and for some countries, other variables, for instance exchange rates, have clearly influenced monetary policies, the approach implemented in the model--imposing a reaction function in which short-term interest rates move to achieve money supply targets--has the advantage of simplicity; it also permits "money supply changes" to be simulated. Despite the deemphasis on monetary targeting, it is useful to associate a neutral stance of monetary policy with an unchanged money supply. An obvious alternative, making interest rates exogenous, provides no nominal anchor for the simulations, and as a rule for monetary policy in the face of shocks it is clearly inadequate.

Another key relationship in this sector is an arbitrage condition between short-term and long-term interest rates. This equation constrains the return on short-term bonds (RS) and the expected return on long-term bonds (RL, plus expected capital gains) to be equal. By assumption, long-term bonds are consols, 1/ so that the price is the inverse of the bond rate; consequently the expected rate of capital gain is just -(RLE - RL)/RL, where RLE is the bond rate expected for next period. The equation can thus be written as

$$RS = RL - (RLE-RL)/RL \qquad (23)$$

In the consistent expectations solution to the model, the expected long-bond rate is equal to its actual value next period. Repeated substitution can then be performed using (23) to express the current long rate as a function of expected future short rates. Thus (23) embodies a pure expectations theory of the term structure, and there is, for instance, no direct effect of the stock of government debt on interest rates. Though it seems likely that when the stock of government debt becomes very large relative to GNP, interest rates would tend to be higher, regressions on recent historical data have had difficulty in isolating such an effect, probably because debt ratios have exhibited insufficient variability.

4. Price determination and aggregate supply

a. Domestic output price

The key behavioral relationship in this sector is a semi-reduced-form equation for the price of output--the non-oil GNP deflator. This equation captures price setting behavior by firms and wage setting in the context of overlapping contracts. Price setting by firms is assumed to depend on the level of capacity utilization, while wage bargains depend on the degree of

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1/ The price of a consol, or perpetual bond, in fact behaves quite similarly in reponse to changes in interest rates to that of a bond with maturity of 10 years or more, which is the relevant muturity of the long-term bonds whose rates are included in the model.

slack in labor markets as well as on the expected real wage. Employment and wages are not modeled explicitly here; instead, they are substituted out, and the level of capacity utilization is used to proxy labor market conditions. 1/ Capacity utilization CU is calculated as the ratio of actual output, as determined by demand, to capacity output, as given by a Cobb-Douglas production function of capital and a trend term that captures both labor force growth and technological progress. As Gordon [1985] shows, an equation for the rate of change of output prices can be derived that depends on expected inflation, on the level of capacity utilization, and on the change in capacity utilization.

Suppose that wage bargaining is characterized by overlapping contracts, ranging in length from 1 period to infinity, and that furthermore the distribution of contracts remains constant over time. Let us call f_i ($i=0,1, \ldots$) the proportion of contracts that were negotiated i periods ago that are in force at any given time. When any contract is negotiated, the wage is determined on the basis of current and expected changes in consumer prices (not output prices) over the term of the contract, and on current labor market conditions, as well as trend productivity growth α. Writing $\Delta w(i)$ as the annual rate of change in the wage negotiated i periods ago, π_{t-i} the prevailing rate of inflation, and π^{e}_{t-i} the annual rate of inflation expected at t-i to prevail over the life of the contract, we therefore suppose that

$$\Delta w_t(i) = \eta\, \pi^{e}_{t-i} + (1-\eta)\, \pi_{t-i} + \phi\, \log(CU_{t-i}) + \alpha \qquad (24)$$

Implicit in this formulation is that there is no front-end loading of wage increases: they occur smoothly over the life of the contract. 2/ It is also the case that expected inflation is assumed to be at the same rate, and not to be dependent on the length of the contract, but only when the expectations are formed. We further suppose that output supply is based on imperfect competition among firms that set prices on the basis of a flexible markup over variable costs, in this case just wages adjusted for productivity increases. The markup also depends on the rate of capacity utilization. Now labor costs are a weighted average of the various contracts in force. Calling v average unit labor costs (in logs),

$$v_t = \sum_{i=0}^{\infty} f_i\, [w_t(i) - \alpha\, t] \qquad (25)$$

and the log of the non-oil output price p_t (in the model listing, this

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1/ Capacity utilization is a better measure of the cyclical position of the economy than the unemployment rate, because it is not distorted by demographic factors and changes in unemployment benefits that have changed the "natural rate of unemployment."

2/ This model differs from that in Taylor [1980] because it does not allow for emulation of wage increases; however, it allows for a distribution of contract lengths and for expected inflation, as well as a price equation that responds to excess capacity.

variable has the name PGNPNO) is given by

$$p_t = v_t + \beta \log(CU_t) + c \qquad (26)$$

Differencing (25) and (26) with respect to time, and substituting into (24), we can write

$$\Delta p_t = \sum_{i=0}^{\infty} f_i \left[\eta \pi^e_{t-i} + (1-\eta) \pi_{t-i} + \phi \log(CU_{t-i})\right] + \beta \Delta\log(CU_t) \qquad (27)$$

If the following assumption is made about the distribution of contracts, then (27) can be considerably simplified. 1/ Let the proportion of contracts negotiated i periods ago be $(1-\lambda)\lambda^i$. Then if L is the lag operator, (27) can be rewritten as

$$\Delta p = [(1-\lambda)/(1-\lambda L)][\eta \pi^e + (1-\eta) \pi + \phi \log(CU)] + \beta \Delta\log(CU) \qquad (28)$$

which gives an equation that can be estimated in the form

$$\Delta p = \lambda \Delta p_{-1} + (1-\lambda) [\eta \pi^e + (1-\eta) \pi + \phi \log(CU)] + \beta \Delta\log(CU) - \lambda \beta \Delta\log(CU_{-1}) + \epsilon \qquad (29)$$

where ϵ is an error term.

Estimated values are given below. Instrumental variables were used since both the capacity utilization rate (it appears in log form in the regressions) and expected inflation are likely to be correlated with the error in (29). 2/ Time series regressions were pooled, 3/ and all coefficients constrained to be the same, since the constraint of common coefficients was not rejected by the data. The constant term was omitted, as implied by (29). An iterative estimation procedure was used to impose the constraint on the coefficients for the lagged dependent variable and on the lagged change in capacity utilization. In particular, starting from an initial estimate for λ, say $\bar{\lambda}$, a regression of the form

$$\Delta p - \Delta p_{-1} = \alpha_1 (\pi^e - \pi) + \alpha_2 (\pi - \Delta p_{-1}) + \alpha_3 \log(CU) + \alpha_4 DCU + \epsilon \qquad (30)$$

was run, where $DCU = \Delta\log(CU) - \bar{\lambda} \Delta\log(CU_{-1})$ and where coefficients were constrained to be the same for all countries. Using the estimated value for α_2, a new estimate for λ was calculated, yielding a new series for DCU, and equation (30) was reestimated until parameter values converged. The resulting estimate for α_4, equal to .11, was insignificant, with a t-ratio

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1/ For a model that makes a similar assumption concerning the distribution of contract lengths, see Calvo [1983].

2/ Instruments used were the rate of change of the money supply, the log of the ratio of government spending to GDP, lagged rate of change of output prices, and the capacity utilization lagged once and twice.

3/ Except for the LI region, where again, adequate historical data for Italy were not available.

of 0.7. Consequently, this variable was dropped, and the equation reestimated, giving the following results:

$$\Delta p - \Delta p_{-1} = \underset{(2.9)}{.397}\ (\pi^{e} - \pi) + \underset{(3.7)}{.545}\ (\pi - \Delta p_{-1}) + \underset{(1.5)}{.146}\ \log(CU)$$

$$\bar{R}^2 = .516 \qquad SER = .017 \tag{31}$$

The implied values for the parameters of equation (30) are $\lambda = .455$, $\eta = .728$, and $\phi = .269$.

The degree of price flexibility is reflected in the size of effects of capacity utilization, and also by the smallness of λ. The mean contract length is estimated by $\lambda/(1-\lambda)$; in the limiting case where λ equals zero, the rate of change of the output price depends only on expected inflation, not past price changes. The estimated value for λ implies a mean contract length of about 10 months. Another important determinant of price flexibility is the weight η applied to expected inflation relative to current inflation: a high value reflects large responses of current wage bargains to forward-looking, rather than backward-looking, changes in consumption prices. The estimated value for η suggests a large forward-looking component.

b. Trade prices

The model also includes equations for trade prices. As discussed above, each country is assumed to produce a non-oil good (which is identified as a manufactured good in the model, though in fact it also includes some semi-finished manufactures and primary commodities) which is differentiated from other countries' goods. Moreover, the export price is distinguished from the domestic output price, since in reality there seems to be a considerable amount of price discrimination between home and foreign markets. 1/ (It is also possible that exporters discriminate between different export markets; this possibility is however not allowed for in the model).

Manufactured import prices are determined in the model as weighted averages of other countries' export prices. The average price of imports of manufactures of country i, PIM_i, is modeled as follows:

$$PIM_i = \sum_j s_{ij}\ (PXM_j\ E_{ij}) + \epsilon \tag{32}$$

where the s_{ij} correspond to the export shares in Table 6 above, PXM_j is the price of exports of country j, and E_{ij} is an index of the value of currency j in terms of currency i.

1/ See, for instance, Mann [1986].

As for export prices, their rate of change is assumed to be a linear combination of the rates of change of domestic and foreign non-oil output prices, where foreign prices use the same doubly-weighting scheme as the real effective exchange rate, reflecting competition in all export markets. In addition, there is a term in the lagged difference (in logs) between domestic prices and export prices: this forces export prices in the long run to go up one-for-one with domestic output prices. Let PXM be the manufactured export price, PGNPNO the home non-oil output price, and PFM be a weighted average of competitors' prices in foreign markets. The estimating equation can be written

$$\Delta\log(PXM) = \kappa + \alpha\,\Delta\log(PGNPNO) + (1-\alpha)\,\Delta\log(PFM) + \beta\,\log(PGNPNO_{-1}/PXM_{-1}) \qquad (33)$$

Ordinary least squares estimates of coefficients are given below. The regions were pooled, and the coefficient β constrained to be the same; this restriction was not rejected by the data.

Table 9. Pooled Coefficient Estimates, Export Price Equations, 1969-85
(t-ratios in parentheses)

Country	κ	α	β	$\bar{R}^2$	SER
United States	-.009 (1.1)	.703 (7.9)	.067 (1.5)	.776	.033
Japan	-.011 (1.4)	.575 (6.9)	.067 (1.5)	.763	.031
Germany	-.000 (0.0)	.769 (7.1)	.067 (1.5)	.929	.016
Larger Indus.	-.005 (0.6)	.595 (5.1)	.067 (1.5)	.789	.021
Smaller Indus.	-.018 (2.4)	.659 (3.7)	.067 (1.5)	.303	.045
overall fit statistics: $\bar{R}^2$ = .695 SER = .030					

The estimates indicate a somewhat greater sensitivity of export prices of Japan and of the larger remaining G-7 countries to the rate of change of foreign prices than is the case for the either Germany or the United States.

5. International accounts and exchange rates

A final block of equations in each country's model concerns the calculation of the current account balance, the net international asset or liability position, and the determination of exchange rates. The trade balance is the sum of a country's exports of manufactures and oil, minus imports of those goods and of primary commodities. The current account is the trade balance plus net interest receipts, which are simply modeled as the product of a weighted average of U.S. short- and long-term interest rates and the country's net foreign asset position. The latter variable, which is assumed to be denominated in dollars, is calculated in the model by cumulation of current account surpluses. Historical data for the major industrial countries do exist, and they differ from cumulated current accounts for various reasons, including valuation effects. However, such effects are not incorporated explicitly in the model's equations, and hence they show up in the residual terms of the equations for the changes in net foreign assets.

The proximate determinant of exchange rates in the model is an equation for open interest parity between short-term interest rates in different countries; that is, the expected appreciation of the dollar exchange rate is set equal to the short-term interest differential in favor of the dollar. 1/ Such an arbitrage condition is analogous to the assumption described above that expected returns on long and short-term bonds are the same; as was the case there, asset stocks (in particular net foreign assets) do not directly affect the expected returns differential. Consequently, without further structure imposed on the model, a country would face a perfectly elastic supply of foreign funds, whatever its net indebtedness position. This is unlikely to be so, even for major industrial countries, and further work will attempt to capture the effects of limits to financing on exchange rates. However, as is the case for long-term bond rates, empirical estimation with recent historical data has had difficulty in uncovering a systematic link between asset stocks and exchange rates. 2/

The level of the exchange rate is thus strongly influenced by monetary forces that affect the short-term interest rate. However, it is also the case that exchange rate expectations--which are made to be consistent with the model's solution for the exchange rate next period--reflect the general equilibrium of the model. Therefore, the exchange rate is the result of more than just monetary factors, and in particular, is affected by fiscal policy variables, the price of oil, and by productivity differences.

The model also generates a competitiveness index (REER) which is a measure of relative export prices, with weights that reflect the importance of other countries as competitors in all export markets (see equation 20

1/ In addition, the equation has an exogenous residual which can be non-zero, and thus allows the model to reach an equilibrium real exchange rate despite real interest rates being different among countries in steady state.

2/ For a recent assessment of exchange rate models, see Isard [1987].

above). These variables appear in equations for the manufactured exports of each of the industrial countries and regions, and of the developing country block.

Of course, the bilateral exchange rates determined in the model can be weighted up in various ways, and it was judged useful to include equations defining the nominal effective exchange rates of industrial countries among themselves. These effective exchange rates are based on the MERM weights used in the effective exchange rates published by the Fund for 18 industrial countries, 1/ but the weights are collapsed to the 5 industrial countries/regions included in the model. The resulting weighting matrix is presented in Table 10.

Table 10. MERM Weights for Industrial Regions in the Model

	US	JA	GR	LI	SI	sum
United States	--	.2125	.1302	.4292	.2281	1.0
Japan	.4974	--	.1318	.2022	.1686	1.0
Germany	.2164	.1255	--	.3558	.3023	1.0
Larger Indus.	.3305	.1076	.1550	--	.4069	1.0
Smaller Indus.	.2535	.1027	.1395	.5043	--	1.0

Note: The effective exchange rate for any country in the stub is calculated by applying the weights in the row for this country to bilateral exchange rates for the countries in the heading.

III. Rest of the World

The rest of the world has been divided into two separate regions; high income oil exporters and the developing countries. While some variables and behavioral relationships are assumed to be the same in these two regions, it was necessary to separate them because a key feature of the model, constraints on external financing, are unlikely to be relevant for the high income oil exporters. Most of the discussion below concerns the developing country block, where financing constraints do apply.

The developing country model has a number of features that distinguish it from the structure described above for industrial countries. First, as a group they are assumed to be financing constrained, in the sense that they

1/ See Artus and McGuirk [1981] for a discussion of how the weights are generated.

do not face a perfectly elastic supply of funds from the industrial countries. Instead, the amount available is determined endogenously, on the basis of a measure of ability to service additional debt. Second, because of the heterogeneity of the countries considered, the developing country model has greater commodity disaggregation; the region produces primary commodities as well as a composite manufactured good and oil. Third, lack of adequate data and the problems of aggregating dissimilar countries have induced us to include less detail on financial markets and on the effects of policy instruments. Finally, the existence of financing constraints implies that some category of expenditure in developing countries is not equal to its desired, equilibrium level. In the model, imports are determined residually by the balance of payments identity; correspondingly, the amount of domestic investment is the counterpart of the decision by foreigners to lend to the region: there is no separate investment function. These features are described in more detail below.

1. *Financing constraints*

A key feature of the model is the determination of the net flow of financing from industrial to developing countries. The availability of financing is assumed to depend on the debt-interest-to-exports ratio 1/, evaluated at expected real interest rates and exports in the future. 2/ Because of its forward-looking nature, it is a measure of solvency. The amount of financing available depends on the difference (if positive) between some critical upper limit for the ratio and its current level. If the gap is negative, developing countries are assumed to be constrained to run down net debt, that is, to run a current account surplus (adjusted for the inflation component in debt service). Therefore, from any initial level the interest ratio will tend to converge, in time, to the critical level, which is imposed exogenously on the model.

Algebraically, the financing equation can be written as follows. Call α the interest to exports ratio, r the U.S. interest rate minus the expected rate of change of U.S. prices (assumed to apply both to debt and to foreign reserves), PX and X are developing-country export prices and volumes, D is the stock of developing-country debt, FR are foreign reserves, and E is the dollar exchange rate. Then

$$\alpha_t = r_t (D_t - FR_t)/(PX_t \cdot X_t \cdot E_t) \qquad (34)$$

The change in debt D is assumed to reflect both expected growth in developing countries' exports plus an adjustment term that takes the interest-to-exports ratio toward its critical level, χ. Let g be the expected average annual growth rate of the dollar value of exports over some future period (in practice the horizon is taken to be 5 years). Let ρ be a fraction between 0 and unity, where ρ is a function of the ratio χ/α such that ρ goes to unity as the ratio goes to infinity and to zero as χ/α goes

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1/ Net of interest receipts on foreign reserves.

2/ For a discussion of the burden of external debt facing developing countries, see Dooley and others [1986].

to zero. Then the financing equation can be written

$$\Delta D = \rho \cdot g \cdot PX_{-1} X_{-1} E_{-1} + \mu \ (\chi \ PX_{-1} X_{-1} E_{-1} / r_{-1} - (D_{-1} - FR_{-1})) \qquad (35)$$

The proportion ρ is intended to capture the fact that within the developing country region there is a distribution of debt ratios, corresponding to a range of indebtedness. For those countries whose ratio far exceeds some critical level, new financing is unlikely to be forthcoming initially, even if exports rise. For other countries whose interest ratios are within the threshold level, financing is likely to grow with exports. However, a sustained growth in exports will tend to graduate countries in the first group into the second group, by bringing their interest ratios down to acceptable levels. The behavior of the average developing country ratio will in a rough way capture the proportion of countries that are below the threshold level at which they can obtain additional financing. In the model that is simulated below, the ρ is set to a constant, 0.3. In future work, its value may be endogenized, however.

Thus financing and repayment for developing countries is a function of the average rate of growth of the value of DC exports over the simulation period, the rate of convergence μ, and the interest to exports ratio α, (which depends on the inherited debt stock and the interest rate). The flow of financing changes as a result of forces largely beyond the control of developing countries themselves--interest rates and demand for their exports. The threshold level χ and the speed of adjustment μ were calibrated to give a realistic path for future financing flows; however, it is clear that these parameters may be influenced both by DC policies and regulations in industrial countries which affect the lending behavior of financial institutions.

There are some components of net debt that can be controlled directly by the country itself. In particular, foreign exchange reserves can be used to cushion shocks to the balance of payments; when there is a shortfall of export earnings or a fall in gross capital inflows, reserves can be run down temporarily, and subsequently built up to a normal relationship with, say, imports. Conversely, favorable developments in the terms of trade or export volumes may lead to temporary increases in reserves above their equilibrium levels; to the extent the favorable export performance is permanent, imports can be expected to rise over time, and reserves will therefore be run down in later periods. Thus reserves serve as a buffer to cushion the economy against shocks to the balance of payments; as a result, imports may not exhibit such extreme fluctuations. 1/ The model includes an equation for foreign exchange reserves FR of the form

$$\Delta FR = \gamma \ [PX \cdot X \cdot E + \Delta D - r(D_{-1} - FR_{-1})] + \delta \ [\theta \ PI_{-1} I_{-1} E_{-1} - FR_{-1}] \qquad (36)$$

where θ is the normal ratio of reserves to imports, so that in equilibrium,

$$\theta = FR \ / \ PI \cdot I \cdot E$$

1/ Other balance of payments items, for instance arrears in debt service, may also play a role in buffering shocks.

Equation (36), along with the balance of payments identity that states that the current account is equal to the change in debt minus the change in reserves, implies that imports are given by the following equation:

$$\Delta(PI \cdot I \cdot E) = (1-\gamma)\ [PX \cdot X \cdot E + \Delta D - r(D_{-1} - FR_{-1})] - \delta\ [\theta\ PI_{-1} I_{-1} E_{-1} - FR_{-1}] \quad (37)$$

Thus, a shock to export earnings, for instance, will be cushioned by a decline in foreign reserves, so that imports decline not by the amount of the decline in exports, but by a proportion $1-\gamma$ that is less than unity. Over time, however, the normal relationship between reserves and imports will be reestablished--this is the role of the second term in equation (37).

2. The structure of the aggregate developing country model

As mentioned above, output of this region consists of a composite manufactured good, oil, primary commodities, and a non-traded good. The supply structure of these four goods is assumed to be quite different. The price of the manufactured good is not perfectly flexible, and does not move immediately to equate demand for the good and potential output. Instead, an increase in demand will increase both output and, over time, the price of the region's manufactured good. Because manufactured goods are differentiated, producers have some market power to price their good differently from goods produced in other countries. The rate of change in the price of the DC manufactured good depends negatively on the gap between capacity output in this sector and actual output. However, since historical data did not exist for capacity output for developing countries as a whole, the coefficient could not be estimated. Instead, the effect of capacity utilization on price was given a value based on similar equations for industrial countries.

The non-traded good also is assumed not to have a perfectly flexible price and hence exhibits increases in output when demand increases. It is assumed that increases in consumption fall on non-traded goods in some fixed proportion. The price of non-traded goods is however not modeled explicitly, and furthermore it is assumed that there is no capacity constraint on the production of non-traded goods: output can be increased without shifting resources out of the other sectors.

In contrast, both oil and primary commodities are treated as a homogeneous goods, each with a single world price. In the case of oil, the price in real terms is taken to be exogenous, and the developing countries and high-income oil exporters are jointly treated as residual suppliers, such that world demand and supply are equal. For primary commodities, the relative price is endogenous, and moves immediately to clear the model. Supply of commodities is assumed to be given by the accumulated capital stock in this sector; the paradigm is a harvest or production from mines where individual producers are too small to influence the price, and where marginal costs of contemporaneous supply are zero. Therefore, an increase in demand for primary commodities will in the first instance bring about an increase in their price but not in the quantity produced. Only over time, as resources are shifted into this sector in response to improved profitability, will supply increase.

Given the quantity of exports and net financing less interest payments, the quantity of imports is determined residually. Implicit then is the assumption that the amount of financing constrains domestic expenditure; notional import demand (if it were made explicit), would be larger than actual imports.

Domestic demand is disaggregated only into consumption and investment; in the data, private and government demands are not distinguished. Consumption (C) depends on wealth (W) as well as the real flow of financing available, as a ratio to lagged consumption:

$$\Delta\log(C) = \underset{(1.9)}{-1.13} + \underset{(1.9)}{.317}\ \log(W_{-1}/C_{-1}) + \underset{(1.2)}{.281}\ (\Delta D/E\cdot P)/C_{-1} \qquad \bar{R}^2 = .172$$
$$SER = .016 \qquad (38)$$

where D is the value in U.S. dollars of outstanding debt, E is the exchange rate and P is the absorption price. Wealth is calculated by capitalizing expected future income, as for the industrial country models, and adding net claims on foreigners (in the case of developing countries, subtracting net liabilities to foreigners). As in the industrial countries, where disposable income has an effect on consumption, here the flow of additional financing tends to lead to increases in current consumption. 1/ The amount of new financing that is not consumed is available for investment. This amount must be large enough to sustain the increased debt interest payments on the higher value of debt, since the model in calculating the amount of endogenous financing, uses the value expected in the future for nominal exports. Starting from an equilibrium with the interest payments ratio at its threshold level, it must therefore be the case that the marginal product of capital, times the proportion invested, must be greater than the rate of interest on an additional unit of debt. Otherwise, an additional dollar of debt will raise the numerator by more than the denominator. Because an assessment of the marginal product of capital is implicit in the equation for the supply of foreign financing, there is no additional investment equation; instead, investment is determined residually as the sum of domestic saving and foreign saving (that is, the current account deficit), with the latter determined by the solvency criterion. 2/

Investment is allocated by sector on the basis of rate of return considerations. There are a number of factors--taxes and subsidies, relative prices and wages, and shifts in production technology--that are necessary for a complete story. Neither the data nor the model are adequate for such a treatment; however, the model does focus on an important element, namely the sharp fall in profitability of producing primary commodities and the overhang of large amount of productive capacity that is the result of a capital stock that was accumulated when investment in this sector was

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1/ Haque and Montiel [1987] also find that liquidity constraints are important for explaining consumption in developing countries.

2/ In a more general model, the government can influence the mix between consumption and investment; for a model incorporating such effects, see Blejer and Khan [1984].

attractive, for instance in mining. Given rates of depreciation that are low, and variable costs of production that are small relative to the capital costs, output may continue to be high even if no new resources are being shifted into the primary commodity sector. In the model, the share of new investment that goes into the production of primary commodities relative to manufactures is made to depend on their relative prices; below a certain level for this ratio, investment in the primary commodities sector is just equal to depreciation--that is, there is no net investment. Only when profitability in primary commodities reaches a certain level (taken to be its previous peak, roughly its 1980 level) will positive net investment in primary commodities resume.

The remaining additional investment will be directed to the production of manufactures; neither non-traded goods nor oil are assumed, for the purposes of the model, to involve capital. The desired supply of manufactures and the production of commodities will then depend on the existing stock of capital in that sector, and a time trend. In the absence of actual data on capital stocks by sector, production functions were not estimated but instead their parameters were chosen on the basis of plausible factor shares. 1/ Once in place, capital is assumed not to be mobile between sectors. Only new net investment will alter the shares of capital in the two sectors.

3. The high income oil exporters

This group of countries 2/ is treated separately, first because the countries are in general considerably wealthier than the developing countries discussed above, and hence do not face constraints on their balance of payments financing at the present time; and second, because their oil exports constitute so large a fraction of GNP that the structure of the model for this region can be made simpler.

In this model, trade volumes and prices are modeled in the same detail as for other developing countries, but domestic demand is not modeled nor is output of manufactures. Furthermore, imports are assumed not to be constrained by available financing; instead, import volume equations for primary commodities and manufactures each depend on the relative price of this region's output (identified with the price of oil) and the import price of the relevant good. The balance of payments identity determines the region's accumulation of net foreign assets.

1/ For an attempt to estimate export supply functions for developing countries, see Bond [1987].

2/This group is constituted by Iran, Iraq, Kuwait, Libya, Oman, Qatar, Saudi Arabia, and the United Arab Emirates. They are classified in the World Economic Outlook as capital exporting countries, and defined as those developing countries that, on average, recorded a current account surplus during the period 1979-81 and were aid donors over the same period.

IV. Some Standard Simulations

1. Industrial country monetary and fiscal shocks

In order to understand the model's properties, it is useful to examine simulations of changes in the major exogenous variables. In particular, since the model will be used to analyze the effects of industrial country policies, we first look at standardized changes in the monetary and fiscal policy instruments in the three major industrial countries, the United States, Japan, and Germany. However, these simulations are not meant to suggest desirable or likely changes in exogenous variables, but rather to elucidate the functioning of the model. These simulations do not therefore serve the same role as those presented in the context of the World Economic Outlook.

In performing these shocks, care was taken not to depart from the historical experience of the countries concerned, nor to perform experiments that violate governments' budget constraints, in the sense that governments are allowed to increase their debt as a ratio of GNP without limit. This would be the case, for instance, if the experiment were a permanent increase in bond-financed government expenditures, without an eventual increase in taxes. The model contains a tax rule that tends to stabilize the bond to GNP ratio, so that explosive growth in debt is ruled out. In addition, we prefer to perform experiments where the ratio of government spending to net national product does not change permanently, but only for some transitory period. The evidence cited above that the government's spending share seemed not to have exhibited any marked trend since 1960 makes such a setup appropriate. Therefore, the fiscal shocks we report below are for a one percent increase in the government's share of output in 1988, declining toward the baseline share with a speed equal to that implied by the historical estimates, namely a mean lag of 4.2 years, the time for half of the adjustment to take place (see section II.1.a above). Even if government spending declines to its baseline level eventually, the accumulation of government debt that has occurred in the meantime will imply some increases in taxes; however, in the simulations reported below, the tax increases are assumed to occur only starting in 1996, beyond the period of interest, which is 1988 to 1995.

A few words are necessary to explain how the simulations were performed. The exogenous and endogenous variables were first projected forward beyond the historical period; in most cases, the projections were simply those implied by the most recent WEO projections. The model was then used to calculate the residuals in the behavioral equations that would give the values of the endogenous variables, given the exogenous variables. Thus, the model is not used itself for making forecasts; instead the baseline projection is imposed on the model.

A complication in solving the model is the existence of expectations variables. These variables are constrained in the solution procedure to equal the values for the relevant future time period that the model produces--that is, the expectations are made to be consistent with the model's predictions. This is achieved through a program that implements the Fair-Taylor algorithm, which constrains expectations and model solutions to

be the same, to a preset tolerance, by iterating. 1/ In general, in order to avoid making the simulation results depend on arbitrary terminal conditions, the model has to be solved beyond the period of interest. In the simulations reported below for 1988-95, the model was in fact solved for 20 additional years, to 2015.

Appendix Table 1 gives the result of an increase in U.S. fiscal expenditures of 1 percent of GNP, declining back toward zero as described above. Because of the scaling, the initial effect on GNP has the interpretation of a standard fiscal multiplier, that is, the change in output resulting in a unit change in government spending. That multiplier is equal to 1.2 for the United States, which is slightly below the mean for existing multi-country models 2/ (and almost exactly equal to MINIMOD's). With the passage of time, the positive effect on output disappears, and by the fifth year output is actually lower; this occurs because of crowding out of demand through two channels--higher interest rates and an appreciation of the dollar. The nominal effective exchange rate appreciates by about 2 percent on impact. Part of the fall off in the positive effect on output is also due to the decline in government spending. Since the model has cyclical mechanisms, such as the interaction of the spending multiplier and investment accelerator, output goes lower for a time; in the longer-run, however, it returns to its baseline path.

Effects on other countries of the fiscal expansion in the United States are also positive as concerns output; they benefit from increased expenditure in the United States as well as currency depreciation. However, interest rates rise in all countries, and this has some unfavorable effects on the developing countries because of higher debt service. Interest payments to export earnings rise, despite substantial increases in exports. Since the developing countries are assumed to peg to a basket of industrial country currencies, they tend to depreciate against the dollar in this simulation.

A U.S. monetary shock is presented in Appendix Table 2. In this simulation, the target for the U.S. stock of base money is increased by 5 percent in 1988, and kept at this higher level thereafter. Since the model is neutral with respect to nominal shocks in the long run, eventually the result will be an increase in the U.S. price level by 5 percent, and a depreciation of the dollar by the same amount. It can be seen that by 1994, the U.S. price level has increased by 5 percent; because the model reaches equilibrium in a cyclical fashion, the price level continues to rise for a time. In the short run, the monetary expansion lowers interest rates and stimulates output; the exchange rate also overshoots its long-run level (i.e. the U.S. effective exchange rate depreciates by more than 5 percent in the first year), as is to be expected in a model with price stickiness.

1/ See Fair and Taylor [1983]. The model is solved using TROLL; see MIT [1983].

2/ See Bryant and others [1988].

Effects on foreign economies are mixed. In keeping with the simple Mundell-Fleming model, monetary policy is negatively transmitted (after the first period) to other industrial countries, and output falls in Germany and Japan as a result of the appreciation of their exchange rates. Developing countries experience a small rise in GDP after the first year, and a substantial decline in their debt service ratio, as a result of lower U.S. interest rates. As mentioned above, the model takes the oil price (in real terms) to be exogenous, so it has not changed as a result of the shock, but the dollar price has risen. Moreover, the U.S. monetary expansion has raised world demand for oil, also increasing the GDP of the oil exporting countries.

Appendix Tables 3-6 give results for the same fiscal and monetary shocks for Japan and Germany. They are qualitatively similar to Appendix Tables 1 and 2. Fiscal multipliers are however considerably lower for Germany, which is natural given its greater openness. Another difference is that policy changes in Germany and Japan have smaller effects on other countries, since they are smaller economies.

2. A decrease in the price of oil

The model contains estimated equations for oil demand on the part of industrial countries, as discussed above. Any increase in demand brings about an increase in production, which is shared between the developing country region and the high-income oil exporters. Thus world demand and supply are brought into balance.

Appendix Table 7 reports a simulation in which the oil price was made exogenous in dollars and decreased by 20 percent, or roughly 4 dollars a barrel. It can be seen that this stimulates output in industrial countries as a group for several years, by about 0.5 percent relative to its baseline level. Interestingly enough, the stimulus to output occurs largely because long-term interest rates fall, anticipating downward pressures on prices that however occur only with a long lag. This mechanism--large effects on expectations, and hence anticipatory effects on long-term rates-- is a feature that depends on having forward-looking expectations as in MULTIMOD. However, individual countries are affected differently; in Japan, because of the yen appreciation, output actually declines after the second year.

Developing countries generally benefit from the fall in oil prices, though, given their position as a net oil exporter, their terms of trade deteriorate. The high income oil exporters show an increase in real GDP, but not of course their real income nor their current account balance (not shown). Given a long run elasticity of oil demand of about 0.7, the value of their exports declines.

3. An increase in financing flows to developing countries

Appendix Table 8 presents a simulation in which the flows of financing from industrial to developing countries are increased by $20 billion each year over 1988-92 relative to their baseline levels. These financing flows are assumed to be the results of official loans at concessional rates and with reimbursement beyond the end of the simulation period, financed by

increased budget deficits in industrial countries (on the basis of GNP shares).

Since the developing countries are assumed to be constrained by available financing, their imports go up one-for-one with the increase in loans. This increase in imports leads to higher economic activity in industrial countries, despite a small increase in their interest rates. Stimulus to activity varies by country, depending on the importance of trade with developing countries and indirect feedbacks. Industrial countries as a group show a substantial, and sustained rise in output. Output in developing countries also increases, as increased imports of investment goods increase the capital stock and aggregate supply.

Table A1. Increase of U.S. Government Spending by 1 Percent of GNP

(PERCENTAGE DEVIATION FROM BASELINE UNLESS OTHERWISE NOTED)

	1988	1989	1990	1991	1992	1993	1994	1995
MAJOR INDUSTRIAL COUNTRIES								
UNITED STATES								
REAL GNP	1.24	1.00	0.53	0.11	-0.17	-0.31	-0.35	-0.34
REAL DOMESTIC DEMAND	1.64	1.45	0.99	0.58	0.30	0.14	0.06	0.03
GNP DEFLATOR	0.54	1.36	2.16	2.78	3.14	3.24	3.13	2.81
SHORT-TERM INTEREST RATE (%)	0.25	0.41	0.54	0.62	0.68	0.68	0.66	0.59
LONG-TERM INTEREST RATE (%)	0.29	0.30	0.27	0.23	0.19	0.14	0.09	0.04
NOMINAL EFFECTIVE EXCHANGE RATE 1/	2.31	2.14	1.90	1.60	1.27	0.90	0.50	0.09
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	-0.27	-0.29	-0.28	-0.28	-0.29	-0.28	-0.28	-0.26
GEN. GOV. FINANCIAL BALANCE	-0.73	-0.65	-0.65	-0.67	-0.67	-0.64	-0.59	-0.54
PRIVATE SAVING	0.60	0.61	0.50	0.38	0.28	0.21	0.16	0.15
GROSS PRIVATE INVESTMENT	0.14	0.25	0.13	-0.01	-0.10	-0.14	-0.15	-0.13
JAPAN								
REAL GNP	0.55	0.75	0.70	0.47	0.24	0.06	-0.01	0.01
REAL DOMESTIC DEMAND	0.23	0.41	0.39	0.22	0.04	-0.10	-0.16	-0.15
GNP DEFLATOR	0.41	1.04	1.68	2.17	2.40	2.37	2.09	1.62
SHORT-TERM INTEREST RATE (%)	0.14	0.24	0.30	0.32	0.31	0.28	0.24	0.19
LONG-TERM INTEREST RATE (%)	0.12	0.11	0.09	0.07	0.05	0.04	0.02	0.00
NOMINAL EFFECTIVE EXCHANGE RATE 1/	-1.15	-1.11	-1.05	-0.94	-0.78	-0.55	-0.28	-0.00
EXCHANGE RATE ($/YEN)	-2.23	-2.10	-1.91	-1.66	-1.34	-0.94	-0.49	-0.03
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	0.16	0.19	0.19	0.17	0.15	0.13	0.13	0.13
GEN. GOV. FINANCIAL BALANCE	0.12	0.19	0.23	0.22	0.20	0.14	0.10	0.07
PRIVATE SAVING	0.19	0.26	0.23	0.14	0.03	-0.01	-0.01	0.01
GROSS PRIVATE INVESTMENT	0.15	0.26	0.27	0.19	0.09	0.00	-0.04	-0.05
GERMANY								
REAL GNP	-0.05	0.06	0.16	0.19	0.17	0.16	0.16	0.18
REAL DOMESTIC DEMAND	-0.08	-0.02	0.05	0.07	0.05	0.04	0.03	0.04
GNP DEFLATOR	0.09	0.27	0.53	0.80	1.02	1.18	1.24	1.19
SHORT-TERM INTEREST RATE (%)	0.02	0.12	0.23	0.33	0.40	0.44	0.46	0.44
LONG-TERM INTEREST RATE (%)	0.14	0.15	0.14	0.12	0.10	0.08	0.05	0.02
NOMINAL EFFECTIVE EXCHANGE RATE 1/	0.37	0.47	0.56	0.61	0.61	0.57	0.47	0.32
EXCHANGE RATE ($/DM)	-1.50	-1.28	-1.01	-0.73	-0.46	-0.20	0.03	0.21

1/ A POSITIVE VALUE INDICATES AN APPRECIATION.

Table A1. Increase of U.S. Government Spending by 1 Percent of GNP (continued)

(PERCENTAGE DEVIATION FROM BASELINE UNLESS OTHERWISE NOTED)

	1988	1989	1990	1991	1992	1993	1994	1995
MAJOR INDUSTRIAL COUNTRIES								
GERMANY (CONTINUED)								
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	0.00	0.04	0.04	0.03	0.03	0.05	0.07	0.09
GEN. GOV. FINANCIAL BALANCE	-0.01	0.02	0.04	0.04	0.04	0.03	0.02	0.02
PRIVATE SAVING	-0.02	0.01	0.03	0.04	0.04	0.06	0.08	0.11
GROSS PRIVATE INVESTMENT	-0.03	-0.01	0.03	0.05	0.05	0.04	0.03	0.03
OTHER MAJOR INDUSTRIAL COUNTRIES (CANADA, FRANCE, ITALY AND THE UNITED KINGDOM)								
REAL GNP	0.25	0.46	0.56	0.49	0.32	0.10	-0.08	-0.19
REAL DOMESTIC DEMAND	0.06	0.26	0.36	0.33	0.20	0.03	-0.12	-0.21
GNP DEFLATOR	0.27	0.72	1.25	1.75	2.10	2.22	2.08	1.70
SHORT-TERM INTEREST RATE (%)	0.10	0.19	0.28	0.33	0.34	0.32	0.27	0.20
LONG-TERM INTEREST RATE (%)	0.16	0.15	0.14	0.11	0.08	0.05	0.02	-0.02
NOMINAL EFFECTIVE EXCHANGE RATE 1/	-1.03	-0.97	-0.91	-0.83	-0.74	-0.61	-0.46	-0.27
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	0.09	0.15	0.20	0.22	0.22	0.19	0.16	0.11
GEN. GOV. FINANCIAL BALANCE	0.05	0.11	0.14	0.14	0.12	0.06	0.01	-0.04
PRIVATE SAVING	0.10	0.19	0.25	0.24	0.18	0.12	0.05	0.00
GROSS PRIVATE INVESTMENT	0.06	0.14	0.19	0.16	0.08	-0.01	-0.10	-0.14
OTHER INDUSTRIAL COUNTRIES								
REAL GNP	0.61	0.56	0.40	0.22	0.09	0.01	-0.02	-0.01
REAL DOMESTIC DEMAND	0.30	0.38	0.24	0.08	-0.03	-0.10	-0.10	-0.07
GNP DEFLATOR	0.35	0.84	1.33	1.71	1.92	1.95	1.82	1.53
SHORT-TERM INTEREST RATE (%)	0.09	0.15	0.21	0.25	0.27	0.27	0.25	0.21
LONG-TERM INTEREST RATE (%)	0.14	0.14	0.14	0.12	0.10	0.07	0.04	0.01
NOMINAL EFFECTIVE EXCHANGE RATE 1/	-0.68	-0.65	-0.57	-0.45	-0.31	-0.18	-0.05	0.06
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	0.20	0.12	0.12	0.12	0.11	0.10	0.08	0.06
GEN. GOV. FINANCIAL BALANCE	0.10	0.09	0.05	-0.01	-0.04	-0.08	-0.09	-0.09
PRIVATE SAVING	0.26	0.28	0.26	0.20	0.16	0.12	0.10	0.09
GROSS PRIVATE INVESTMENT	0.16	0.26	0.18	0.08	0.00	-0.06	-0.07	-0.06

1/ A POSITIVE VALUE INDICATES AN APPRECIATION.

Table A1. Increase of U.S. Government Spending by 1 Percent of GNP (concluded)

(PERCENTAGE DEVIATION FROM BASELINE UNLESS OTHERWISE NOTED)

	1988	1989	1990	1991	1992	1993	1994	1995
TOTAL INDUSTRIALS								
REAL GNP	0.67	0.69	0.53	0.30	0.10	-0.05	-0.12	-0.13
CURRENT ACCOUNT BALANCE, AS A PERCENT OF BASELINE GNP	-0.02	-0.01	0.00	0.00	-0.01	-0.01	-0.02	-0.02
DEVELOPING COUNTRIES								
DEVELOPING COUNTRIES,EXCLUSIVE OF HIGH INCOME OIL EXPORTERS								
REAL GDP	0.23	0.24	0.21	0.17	0.11	0.06	0.02	-0.01
REAL DOMESTIC DEMAND	0.11	0.08	0.06	-0.04	-0.13	-0.19	-0.22	-0.21
GNP DEFLATOR	0.54	1.02	1.49	1.85	2.06	2.09	1.95	1.66
PRICE INDEX OF EXPORTS (IN $)	-1.00	-0.46	0.17	0.74	1.22	1.55	1.73	1.75
REAL EXPORTS	0.91	0.89	0.71	0.49	0.32	0.21	0.17	0.17
REAL IMPORTS	0.49	0.26	0.08	-0.44	-0.79	-0.96	-0.94	-0.76
INTEREST PAYMENTS AS A PERCENTAGE OF EXPORT VALUES	0.03	0.31	0.54	0.72	0.75	0.72	0.66	0.56
(AS A PERCENT OF BASELINE GDP)								
CURRENT ACCOUNT	0.08	0.06	-0.01	-0.01	0.00	0.01	0.02	0.02
TOTAL SAVINGS	0.17	0.10	0.00	-0.07	-0.11	-0.10	-0.07	-0.01
GROSS PRIVATE INVESTMENT	0.09	0.05	0.01	-0.07	-0.11	-0.11	-0.08	-0.03
HIGH INCOME OIL EXPORTING DEVELOPING COUNTRIES								
REAL GDP	0.50	0.53	0.42	0.23	0.05	-0.08	-0.14	-0.14
REAL DOMESTIC DEMAND	-0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00
WORLD PRICES (IN DOLLARS)								
PRICE OF OIL, IN DOLLARS	-1.07	-0.39	0.37	1.04	1.56	1.88	2.01	1.95
PRICE INDEX OF COMMODITIES	0.40	0.44	0.57	0.73	0.92	1.09	1.23	1.31

Table A2. Increase of 5 Percent in the U.S. Money Supply

(PERCENTAGE DEVIATION FROM BASELINE UNLESS OTHERWISE NOTED)

	1988	1989	1990	1991	1992	1993	1994	1995
MAJOR INDUSTRIAL COUNTRIES								
UNITED STATES								
REAL GNP	1.15	1.16	0.96	0.70	0.49	0.34	0.23	0.17
REAL DOMESTIC DEMAND	0.53	0.61	0.47	0.30	0.17	0.10	0.05	0.04
GNP DEFLATOR	0.70	1.57	2.50	3.37	4.11	4.69	5.12	5.41
SHORT-TERM INTEREST RATE (%)	-0.79	-0.61	-0.43	-0.28	-0.15	-0.05	0.02	0.07
LONG-TERM INTEREST RATE (%)	-0.09	-0.05	0.00	0.04	0.06	0.09	0.10	0.11
NOMINAL EFFECTIVE EXCHANGE RATE 1/	-6.33	-5.86	-5.56	-5.32	-5.11	-4.91	-4.73	-4.58
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	0.14	0.17	0.19	0.18	0.15	0.12	0.09	0.06
GEN. GOV. FINANCIAL BALANCE	0.13	0.27	0.22	0.16	0.09	0.07	0.05	0.05
PRIVATE SAVING	0.30	0.29	0.27	0.21	0.14	0.07	0.00	-0.05
GROSS PRIVATE INVESTMENT	0.29	0.39	0.30	0.19	0.09	0.01	-0.04	-0.07
JAPAN								
REAL GNP	-0.55	-0.62	-0.24	-0.02	0.09	0.10	0.04	-0.04
REAL DOMESTIC DEMAND	-0.26	-0.37	-0.14	0.05	0.14	0.14	0.08	0.01
GNP DEFLATOR	-0.15	-0.25	-0.23	-0.06	0.21	0.52	0.82	1.06
SHORT-TERM INTEREST RATE (%)	-0.12	-0.14	-0.07	-0.01	0.03	0.07	0.09	0.11
LONG-TERM INTEREST RATE (%)	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09
NOMINAL EFFECTIVE EXCHANGE RATE 1/	3.28	2.96	2.75	2.59	2.47	2.39	2.33	2.28
EXCHANGE RATE ($/YEN)	6.76	6.18	5.80	5.51	5.28	5.09	4.93	4.79
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	-0.09	-0.11	-0.03	-0.02	-0.00	0.01	0.01	0.01
GEN. GOV. FINANCIAL BALANCE	-0.09	-0.12	-0.05	-0.00	0.03	0.05	0.04	0.03
PRIVATE SAVING	-0.17	-0.24	-0.12	-0.05	-0.01	-0.01	-0.02	-0.04
GROSS PRIVATE INVESTMENT	-0.17	-0.24	-0.14	-0.03	0.02	0.03	0.01	-0.03
GERMANY								
REAL GNP	-0.41	-0.39	-0.12	0.01	0.04	0.02	-0.02	-0.04
REAL DOMESTIC DEMAND	-0.16	-0.22	-0.03	0.10	0.12	0.09	0.04	-0.00
GNP DEFLATOR	-0.13	-0.21	-0.21	-0.11	0.03	0.19	0.32	0.41
SHORT-TERM INTEREST RATE (%)	-0.24	-0.25	-0.16	-0.10	-0.04	0.01	0.04	0.07
LONG-TERM INTEREST RATE (%)	0.05	0.07	0.08	0.10	0.10	0.11	0.11	0.12
NOMINAL EFFECTIVE EXCHANGE RATE 1/	1.83	1.82	1.88	1.93	1.98	2.02	2.05	2.07
EXCHANGE RATE ($/DM)	7.15	6.72	6.50	6.33	6.18	6.05	5.91	5.79

1/ A POSITIVE VALUE INDICATES AN APPRECIATION.

Table A2. Increase of 5 Percent in the U.S. Money Supply (continued)

(PERCENTAGE DEVIATION FROM BASELINE UNLESS OTHERWISE NOTED)

	1988	1989	1990	1991	1992	1993	1994	1995
MAJOR INDUSTRIAL COUNTRIES								
GERMANY (CONTINUED)								
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	0.02	0.04	0.10	0.10	0.10	0.10	0.10	0.11
GEN. GOV. FINANCIAL BALANCE	-0.05	-0.04	0.02	0.05	0.06	0.05	0.04	0.03
PRIVATE SAVING	-0.08	-0.11	-0.02	0.03	0.04	0.03	0.02	0.01
GROSS PRIVATE INVESTMENT	-0.15	-0.19	-0.10	-0.02	-0.01	-0.02	-0.05	-0.07
OTHER MAJOR INDUSTRIAL COUNTRIES (CANADA, FRANCE, ITALY AND THE UNITED KINGDOM)								
REAL GNP	-0.13	-0.19	-0.08	-0.02	0.03	0.05	0.06	0.06
REAL DOMESTIC DEMAND	-0.05	-0.13	-0.07	-0.01	0.03	0.05	0.05	0.04
GNP DEFLATOR	-0.04	-0.03	0.04	0.14	0.28	0.44	0.60	0.75
SHORT-TERM INTEREST RATE (%)	-0.05	-0.05	-0.02	0.01	0.04	0.06	0.09	0.11
LONG-TERM INTEREST RATE (%)	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NOMINAL EFFECTIVE EXCHANGE RATE 1/	1.87	1.72	1.63	1.53	1.42	1.29	1.17	1.09
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	0.08	0.05	0.08	0.07	0.07	0.08	0.08	0.08
GEN. GOV. FINANCIAL BALANCE	0.00	-0.02	0.00	0.01	0.02	0.02	0.02	0.01
PRIVATE SAVING	-0.00	-0.04	-0.00	0.02	0.04	0.05	0.06	0.07
GROSS PRIVATE INVESTMENT	-0.07	-0.11	-0.08	-0.04	-0.02	-0.01	-0.00	-0.00
OTHER INDUSTRIAL COUNTRIES								
REAL GNP	-0.75	-0.43	0.06	0.17	0.14	0.05	-0.04	-0.08
REAL DOMESTIC DEMAND	-0.46	-0.38	0.03	0.20	0.18	0.10	0.01	-0.05
GNP DEFLATOR	-0.19	-0.27	-0.18	0.04	0.30	0.56	0.77	0.92
SHORT-TERM INTEREST RATE (%)	-0.07	-0.06	-0.03	0.01	0.04	0.07	0.09	0.11
LONG-TERM INTEREST RATE (%)	0.07	0.08	0.10	0.11	0.11	0.12	0.12	0.12
NOMINAL EFFECTIVE EXCHANGE RATE 1/	1.86	1.68	1.54	1.44	1.38	1.35	1.31	1.27
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	-0.16	0.02	0.06	0.02	0.02	0.03	0.04	0.04
GEN. GOV. FINANCIAL BALANCE	-0.12	-0.07	0.01	0.03	0.02	-0.00	-0.03	-0.05
PRIVATE SAVING	-0.27	-0.18	-0.00	0.07	0.08	0.07	0.05	0.04
GROSS PRIVATE INVESTMENT	-0.23	-0.27	-0.05	0.08	0.08	0.04	-0.01	-0.05

1/ A POSITIVE VALUE INDICATES AN APPRECIATION.

Table A2. Increase of 5 Percent in the U.S. Money Supply (concluded)

(PERCENTAGE DEVIATION FROM BASELINE UNLESS OTHERWISE NOTED)

	1988	1989	1990	1991	1992	1993	1994	1995
TOTAL INDUSTRIALS								
REAL GNP	0.11	0.11	0.24	0.25	0.21	0.16	0.09	0.04
CURRENT ACCOUNT BALANCE, AS A PERCENT OF BASELINE GNP	0.03	0.05	0.10	0.08	0.08	0.07	0.06	0.06
DEVELOPING COUNTRIES								
DEVELOPING COUNTRIES,EXCLUSIVE OF HIGH INCOME OIL EXPORTERS								
REAL GDP	-0.10	0.03	0.16	0.21	0.23	0.22	0.20	0.18
REAL DOMESTIC DEMAND	0.22	0.39	0.64	0.55	0.46	0.36	0.26	0.17
GNP DEFLATOR	-0.24	-0.08	0.17	0.45	0.74	1.00	1.22	1.38
PRICE INDEX OF EXPORTS (IN $)	5.36	5.25	5.33	5.43	5.54	5.65	5.73	5.78
REAL EXPORTS	-0.41	-0.06	0.23	0.36	0.38	0.37	0.34	0.31
REAL IMPORTS	1.06	1.66	2.56	1.97	1.52	1.06	0.63	0.33
INTEREST PAYMENTS AS A PERCENTAGE OF EXPORT VALUES	-0.65	-1.37	-1.10	-0.86	-0.61	-0.41	-0.27	-0.17
(AS A PERCENT OF BASELINE GDP)								
CURRENT ACCOUNT	-0.15	-0.13	-0.29	-0.21	-0.18	-0.15	-0.12	-0.09
TOTAL SAVINGS	0.01	0.10	0.04	0.00	-0.04	-0.07	-0.09	-0.09
GROSS PRIVATE INVESTMENT	0.16	0.23	0.33	0.21	0.14	0.08	0.03	-0.00
HIGH INCOME OIL EXPORTING DEVELOPING COUNTRIES								
REAL GDP	0.12	0.17	0.34	0.30	0.24	0.16	0.08	0.02
REAL DOMESTIC DEMAND	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00
WORLD PRICES (IN DOLLARS)								
PRICE OF OIL, IN DOLLARS	4.51	4.46	4.62	4.86	5.11	5.33	5.48	5.59
PRICE INDEX OF COMMODITIES	5.20	5.69	6.09	5.97	5.82	5.71	5.65	5.64

Table A3. Increase of Japanese Government Spending by 1 Percent of GNP

(PERCENTAGE DEVIATION FROM BASELINE UNLESS OTHERWISE NOTED)

	1988	1989	1990	1991	1992	1993	1994	1995
MAJOR INDUSTRIAL COUNTRIES								
UNITED STATES								
REAL GNP	0.02	0.06	0.09	0.08	0.06	0.03	0.01	-0.01
REAL DOMESTIC DEMAND	-0.02	0.00	0.02	0.03	0.02	0.01	-0.01	-0.01
GNP DEFLATOR	0.09	0.25	0.45	0.64	0.79	0.90	0.94	0.93
SHORT-TERM INTEREST RATE (%)	0.03	0.08	0.13	0.18	0.21	0.23	0.23	0.22
LONG-TERM INTEREST RATE (%)	0.08	0.10	0.11	0.11	0.11	0.10	0.09	0.08
NOMINAL EFFECTIVE EXCHANGE RATE 1/.	0.14	0.25	0.35	0.44	0.50	0.54	0.54	0.51
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	0.02	0.03	0.02	0.01	-0.00	-0.01	-0.01	-0.02
GEN. GOV. FINANCIAL BALANCE	-0.00	-0.00	-0.01	-0.03	-0.04	-0.05	-0.05	-0.05
PRIVATE SAVING	0.02	0.04	0.05	0.05	0.05	0.04	0.03	0.02
GROSS PRIVATE INVESTMENT	-0.00	0.01	0.02	0.02	0.01	0.00	-0.01	-0.01
JAPAN								
REAL GNP	1.54	1.27	0.63	0.04	-0.33	-0.49	-0.48	-0.36
REAL DOMESTIC DEMAND	1.97	1.81	1.18	0.57	0.16	-0.06	-0.11	-0.06
GNP DEFLATOR	0.63	1.53	2.33	2.81	2.93	2.75	2.41	1.99
SHORT-TERM INTEREST RATE (%)	0.27	0.33	0.32	0.29	0.25	0.21	0.18	0.16
LONG-TERM INTEREST RATE (%)	0.09	0.08	0.07	0.06	0.05	0.04	0.04	0.03
NOMINAL EFFECTIVE EXCHANGE RATE 1/.	0.48	0.18	-0.12	-0.35	-0.50	-0.56	-0.57	-0.54
EXCHANGE RATE ($/YEN)	0.37	0.05	-0.27	-0.51	-0.67	-0.75	-0.75	-0.71
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	-0.22	-0.28	-0.29	-0.29	-0.27	-0.24	-0.21	-0.18
GEN. GOV. FINANCIAL BALANCE	-0.60	-0.43	-0.36	-0.33	-0.31	-0.31	-0.30	-0.27
PRIVATE SAVING	0.62	0.56	0.32	0.07	-0.10	-0.16	-0.15	-0.10
GROSS PRIVATE INVESTMENT	0.24	0.41	0.24	0.02	-0.14	-0.23	-0.24	-0.19
GERMANY								
REAL GNP	-0.07	-0.00	0.05	0.07	0.06	0.05	0.06	0.07
REAL DOMESTIC DEMAND	-0.04	-0.01	0.02	0.03	0.02	0.00	0.00	0.01
GNP DEFLATOR	0.05	0.15	0.30	0.45	0.58	0.67	0.72	0.71
SHORT-TERM INTEREST RATE (%)	-0.02	0.04	0.11	0.16	0.20	0.23	0.24	0.24
LONG-TERM INTEREST RATE (%)	0.07	0.09	0.09	0.10	0.09	0.09	0.08	0.08
NOMINAL EFFECTIVE EXCHANGE RATE 1/.	0.36	0.49	0.60	0.69	0.74	0.77	0.76	0.72
EXCHANGE RATE ($/DM)	0.17	0.21	0.24	0.26	0.27	0.28	0.27	0.26

1/ A POSITIVE VALUE INDICATES AN APPRECIATION.

Table A3. Increase of Japanese Government Spending by 1 Percent of GNP (continued)

(PERCENTAGE DEVIATION FROM BASELINE UNLESS OTHERWISE NOTED)

	1988	1989	1990	1991	1992	1993	1994	1995
MAJOR INDUSTRIAL COUNTRIES								
GERMANY (CONTINUED)								
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	0.00	0.03	0.04	0.04	0.05	0.05	0.06	0.08
GEN. GOV. FINANCIAL BALANCE	-0.01	0.01	0.03	0.03	0.03	0.02	0.01	0.01
PRIVATE SAVING	-0.02	-0.01	0.01	0.02	0.02	0.03	0.04	0.06
GROSS PRIVATE INVESTMENT	-0.03	-0.03	-0.00	0.01	0.00	-0.00	-0.01	-0.01
OTHER MAJOR INDUSTRIAL COUNTRIES (CANADA, FRANCE, ITALY AND THE UNITED KINGDOM)								
REAL GNP	0.06	0.18	0.25	0.26	0.21	0.11	0.00	-0.08
REAL DOMESTIC DEMAND	0.01	0.10	0.16	0.17	0.14	0.06	-0.03	-0.10
GNP DEFLATOR	0.12	0.33	0.62	0.92	1.19	1.38	1.45	1.39
SHORT-TERM INTEREST RATE (%)	0.03	0.08	0.13	0.17	0.20	0.21	0.20	0.18
LONG-TERM INTEREST RATE (%)	0.07	0.08	0.08	0.08	0.08	0.07	0.06	0.05
NOMINAL EFFECTIVE EXCHANGE RATE 1/	-0.29	-0.32	-0.35	-0.39	-0.44	-0.48	-0.50	-0.49
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	0.04	0.08	0.11	0.14	0.15	0.14	0.12	0.10
GEN. GOV. FINANCIAL BALANCE	0.02	0.05	0.07	0.08	0.08	0.05	0.02	-0.01
PRIVATE SAVING	0.03	0.08	0.11	0.13	0.12	0.09	0.06	0.03
GROSS PRIVATE INVESTMENT	0.01	0.04	0.07	0.07	0.05	0.00	-0.04	-0.08
OTHER INDUSTRIAL COUNTRIES								
REAL GNP	0.27	0.28	0.21	0.11	0.04	-0.01	-0.02	-0.02
REAL DOMESTIC DEMAND	0.14	0.19	0.12	0.04	-0.02	-0.07	-0.07	-0.06
GNP DEFLATOR	0.19	0.48	0.79	1.06	1.24	1.34	1.35	1.28
SHORT-TERM INTEREST RATE (%)	0.04	0.08	0.12	0.15	0.17	0.18	0.18	0.17
LONG-TERM INTEREST RATE (%)	0.07	0.08	0.09	0.09	0.09	0.09	0.08	0.07
NOMINAL EFFECTIVE EXCHANGE RATE 1/	-0.23	-0.22	-0.19	-0.16	-0.11	-0.07	-0.04	-0.01
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	0.09	0.07	0.07	0.08	0.08	0.08	0.07	0.06
GEN. GOV. FINANCIAL BALANCE	0.05	0.05	0.03	-0.00	-0.03	-0.05	-0.06	-0.07
PRIVATE SAVING	0.12	0.14	0.14	0.11	0.10	0.08	0.07	0.07
GROSS PRIVATE INVESTMENT	0.07	0.12	0.09	0.04	-0.01	-0.05	-0.06	-0.05

1/ A POSITIVE VALUE INDICATES AN APPRECIATION.

Table A3. Increase of Japanese Government Spending by 1 Percent of GNP (concluded)

(PERCENTAGE DEVIATION FROM BASELINE UNLESS OTHERWISE NOTED)

	1988	1989	1990	1991	1992	1993	1994	1995
TOTAL INDUSTRIALS								
REAL GNP	0.43	0.41	0.27	0.11	-0.02	-0.10	-0.12	-0.11
CURRENT ACCOUNT BALANCE, AS A PERCENT OF BASELINE GNP	-0.01	-0.02	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01
DEVELOPING COUNTRIES								
DEVELOPING COUNTRIES,EXCLUSIVE OF HIGH INCOME OIL EXPORTERS								
REAL GDP	0.10	0.12	0.11	0.10	0.08	0.07	0.06	0.04
REAL DOMESTIC DEMAND	0.06	0.08	0.07	0.04	0.01	-0.02	-0.03	-0.04
GNP DEFLATOR	0.23	0.57	0.90	1.16	1.33	1.39	1.37	1.27
PRICE INDEX OF EXPORTS (IN $)	0.18	0.52	0.84	1.07	1.19	1.22	1.17	1.06
REAL EXPORTS	0.40	0.49	0.44	0.37	0.30	0.25	0.23	0.22
REAL IMPORTS	0.28	0.31	0.25	0.07	-0.07	-0.16	-0.20	-0.19
INTEREST PAYMENTS AS A PERCENTAGE OF EXPORT VALUES	-0.07	-0.06	0.01	0.09	0.15	0.19	0.22	0.23
(AS A PERCENT OF BASELINE GDP)								
CURRENT ACCOUNT	0.01	0.03	0.01	0.01	0.01	0.01	0.01	0.00
TOTAL SAVINGS	0.07	0.08	0.06	0.03	0.01	-0.00	-0.00	0.01
GROSS PRIVATE INVESTMENT	0.05	0.06	0.04	0.02	-0.00	-0.01	-0.01	0.00
HIGH INCOME OIL EXPORTING DEVELOPING COUNTRIES								
REAL GDP	0.27	0.27	0.20	0.09	0.00	-0.06	-0.09	-0.10
REAL DOMESTIC DEMAND	0.01	0.00	-0.00	-0.01	-0.01	-0.01	-0.01	-0.01
WORLD PRICES (IN DOLLARS)								
PRICE OF OIL, IN DOLLARS	0.10	0.33	0.57	0.78	0.92	0.99	0.98	0.91
PRICE INDEX OF COMMODITIES	0.35	1.04	1.56	1.82	1.85	1.69	1.44	1.17

Table A4. Increase of 5 Percent in the Japanese Money Supply

(PERCENTAGE DEVIATION FROM BASELINE UNLESS OTHERWISE NOTED)

	1988	1989	1990	1991	1992	1993	1994	1995
MAJOR INDUSTRIAL COUNTRIES								
UNITED STATES								
REAL GNP	-0.11	-0.15	-0.13	-0.08	-0.03	-0.01	-0.00	-0.01
REAL DOMESTIC DEMAND	0.01	-0.04	-0.05	-0.02	0.00	0.02	0.02	0.01
GNP DEFLATOR	-0.08	-0.17	-0.26	-0.32	-0.35	-0.36	-0.34	-0.32
SHORT-TERM INTEREST RATE (%)	-0.06	-0.08	-0.10	-0.10	-0.10	-0.09	-0.09	-0.08
LONG-TERM INTEREST RATE (%)	-0.08	-0.08	-0.07	-0.07	-0.06	-0.05	-0.05	-0.04
NOMINAL EFFECTIVE EXCHANGE RATE 1/.	0.99	0.96	0.93	0.90	0.89	0.90	0.93	0.97
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	-0.01	-0.02	-0.02	-0.01	-0.00	0.00	0.00	0.00
GEN. GOV. FINANCIAL BALANCE	0.00	-0.00	0.01	0.02	0.03	0.03	0.03	0.02
PRIVATE SAVING	-0.04	-0.07	-0.06	-0.05	-0.04	-0.02	-0.02	-0.02
GROSS PRIVATE INVESTMENT	-0.03	-0.04	-0.04	-0.02	-0.01	0.00	0.01	0.01
JAPAN								
REAL GNP	1.09	1.37	1.05	0.58	0.19	-0.06	-0.17	-0.17
REAL DOMESTIC DEMAND	0.61	0.86	0.67	0.31	-0.00	-0.21	-0.29	-0.27
GNP DEFLATOR	0.70	1.74	2.79	3.63	4.17	4.43	4.48	4.43
SHORT-TERM INTEREST RATE (%)	-0.29	-0.14	-0.08	-0.06	-0.06	-0.07	-0.08	-0.09
LONG-TERM INTEREST RATE (%)	-0.08	-0.07	-0.06	-0.06	-0.05	-0.05	-0.05	-0.04
NOMINAL EFFECTIVE EXCHANGE RATE 1/.	-4.81	-4.74	-4.79	-4.88	-4.94	-4.98	-4.97	-4.95
EXCHANGE RATE ($/YEN)	-4.79	-4.71	-4.75	-4.82	-4.87	-4.90	-4.91	-4.91
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	0.26	0.29	0.24	0.20	0.16	0.14	0.12	0.11
GEN. GOV. FINANCIAL BALANCE	0.24	0.41	0.43	0.42	0.40	0.32	0.26	0.22
PRIVATE SAVING	0.33	0.41	0.28	0.08	-0.12	-0.19	-0.21	-0.20
GROSS PRIVATE INVESTMENT	0.31	0.53	0.47	0.30	0.12	-0.01	-0.07	-0.09
GERMANY								
REAL GNP	0.04	-0.09	-0.12	-0.10	-0.06	-0.04	-0.04	-0.05
REAL DOMESTIC DEMAND	0.10	0.02	-0.04	-0.04	-0.02	-0.01	-0.01	-0.02
GNP DEFLATOR	-0.03	-0.09	-0.16	-0.22	-0.26	-0.27	-0.27	-0.25
SHORT-TERM INTEREST RATE (%)	-0.01	-0.07	-0.09	-0.10	-0.10	-0.10	-0.10	-0.09
LONG-TERM INTEREST RATE (%)	-0.07	-0.07	-0.07	-0.06	-0.05	-0.05	-0.05	-0.04
NOMINAL EFFECTIVE EXCHANGE RATE 1/.	0.29	0.24	0.22	0.22	0.24	0.26	0.29	0.31
EXCHANGE RATE ($/DM)	-0.23	-0.26	-0.26	-0.23	-0.20	-0.19	-0.19	-0.20

1/ A POSITIVE VALUE INDICATES AN APPRECIATION.

Table A4. Increase of 5 Percent in the Japanese Money Supply (continued)

(PERCENTAGE DEVIATION FROM BASELINE UNLESS OTHERWISE NOTED)

	1988	1989	1990	1991	1992	1993	1994	1995
MAJOR INDUSTRIAL COUNTRIES								
GERMANY (CONTINUED)								
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	-0.01	-0.06	-0.05	-0.04	-0.03	-0.03	-0.04	-0.05
GEN. GOV. FINANCIAL BALANCE	0.02	-0.01	-0.03	-0.02	-0.01	-0.01	-0.01	-0.01
PRIVATE SAVING	-0.02	-0.06	-0.06	-0.05	-0.03	-0.02	-0.02	-0.03
GROSS PRIVATE INVESTMENT	0.01	-0.01	-0.04	-0.03	-0.01	0.00	0.01	0.01
OTHER MAJOR INDUSTRIAL COUNTRIES (CANADA, FRANCE, ITALY AND THE UNITED KINGDOM)								
REAL GNP	0.00	-0.17	-0.26	-0.25	-0.16	-0.04	0.07	0.14
REAL DOMESTIC DEMAND	0.02	-0.08	-0.17	-0.17	-0.10	-0.00	0.09	0.14
GNP DEFLATOR	-0.08	-0.24	-0.44	-0.62	-0.75	-0.80	-0.74	-0.62
SHORT-TERM INTEREST RATE (%)	-0.01	-0.06	-0.11	-0.13	-0.13	-0.12	-0.09	-0.06
LONG-TERM INTEREST RATE (%)	-0.07	-0.07	-0.07	-0.06	-0.05	-0.05	-0.05	-0.04
NOMINAL EFFECTIVE EXCHANGE RATE 1/	0.63	0.67	0.75	0.83	0.87	0.87	0.83	0.77
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	-0.03	-0.09	-0.10	-0.11	-0.11	-0.09	-0.07	-0.05
GEN. GOV. FINANCIAL BALANCE	-0.00	-0.04	-0.06	-0.06	-0.05	-0.02	0.01	0.03
PRIVATE SAVING	-0.01	-0.07	-0.12	-0.12	-0.10	-0.06	-0.02	0.01
GROSS PRIVATE INVESTMENT	0.01	-0.03	-0.08	-0.08	-0.04	0.01	0.06	0.09
OTHER INDUSTRIAL COUNTRIES								
REAL GNP	-0.37	-0.34	-0.17	-0.03	0.02	0.02	-0.01	-0.05
REAL DOMESTIC DEMAND	-0.19	-0.23	-0.10	0.02	0.08	0.08	0.04	0.00
GNP DEFLATOR	-0.18	-0.38	-0.54	-0.62	-0.64	-0.60	-0.55	-0.50
SHORT-TERM INTEREST RATE (%)	-0.05	-0.07	-0.09	-0.09	-0.09	-0.08	-0.08	-0.07
LONG-TERM INTEREST RATE (%)	-0.07	-0.07	-0.07	-0.06	-0.06	-0.05	-0.05	-0.05
NOMINAL EFFECTIVE EXCHANGE RATE 1/	0.64	0.60	0.57	0.54	0.53	0.53	0.54	0.55
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	-0.12	-0.07	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05
GEN. GOV. FINANCIAL BALANCE	-0.06	-0.06	-0.02	0.01	0.03	0.03	0.03	0.02
PRIVATE SAVING	-0.16	-0.17	-0.12	-0.08	-0.05	-0.04	-0.05	-0.06
GROSS PRIVATE INVESTMENT	-0.10	-0.16	-0.09	-0.01	0.04	0.05	0.03	0.01

1/ A POSITIVE VALUE INDICATES AN APPRECIATION.

Table A4. Increase of 5 Percent in the Japanese Money Supply (concluded)

(PERCENTAGE DEVIATION FROM BASELINE UNLESS OTHERWISE NOTED)

	1988	1989	1990	1991	1992	1993	1994	1995
TOTAL INDUSTRIALS								
REAL GNP	0.20	0.22	0.15	0.07	0.01	-0.03	-0.04	-0.03
CURRENT ACCOUNT BALANCE, AS A PERCENT OF BASELINE GNP	0.02	0.02	0.01	0.00	0.00	-0.00	0.00	0.00
DEVELOPING COUNTRIES								
DEVELOPING COUNTRIES,EXCLUSIVE OF HIGH INCOME OIL EXPORTERS								
REAL GDP	0.03	-0.01	-0.03	-0.03	-0.01	0.00	0.01	0.01
REAL DOMESTIC DEMAND	0.00	-0.06	-0.08	-0.07	-0.05	-0.02	-0.00	0.01
GNP DEFLATOR	0.10	0.07	0.10	0.14	0.18	0.23	0.28	0.33
PRICE INDEX OF EXPORTS (IN $)	-0.80	-0.91	-0.84	-0.72	-0.59	-0.51	-0.46	-0.44
REAL EXPORTS	0.13	-0.14	-0.18	-0.15	-0.08	-0.02	0.02	0.03
REAL IMPORTS	0.03	-0.31	-0.40	-0.33	-0.21	-0.09	-0.02	0.01
INTEREST PAYMENTS AS A PERCENTAGE OF EXPORT VALUES	0.09	0.05	-0.01	-0.07	-0.10	-0.11	-0.10	-0.09
(AS A PERCENT OF BASELINE GDP)								
CURRENT ACCOUNT	0.02	0.00	0.01	0.02	0.02	0.02	0.02	0.01
TOTAL SAVINGS	0.03	-0.04	-0.05	-0.03	-0.00	0.01	0.02	0.02
GROSS PRIVATE INVESTMENT	0.01	-0.04	-0.06	-0.05	-0.03	-0.01	0.00	0.01
HIGH INCOME OIL EXPORTING DEVELOPING COUNTRIES								
REAL GDP	0.10	0.05	-0.01	-0.04	-0.05	-0.03	-0.01	0.00
REAL DOMESTIC DEMAND	0.01	0.02	0.02	0.01	0.01	0.00	0.00	0.00
WORLD PRICES (IN DOLLARS)								
PRICE OF OIL, IN DOLLARS	-0.63	-0.58	-0.53	-0.49	-0.46	-0.44	-0.43	-0.41
PRICE INDEX OF COMMODITIES	-1.38	-2.10	-1.96	-1.49	-1.02	-0.69	-0.54	-0.51

Table A5. Increase of German Government Spending by 1 Percent of GNP

(PERCENTAGE DEVIATION FROM BASELINE UNLESS OTHERWISE NOTED)

	1988	1989	1990	1991	1992	1993	1994	1995
MAJOR INDUSTRIAL COUNTRIES								
UNITED STATES								
REAL GNP	0.08	0.10	0.09	0.06	0.04	0.02	0.00	-0.00
REAL DOMESTIC DEMAND	0.03	0.05	0.04	0.03	0.01	-0.01	-0.01	-0.01
GNP DEFLATOR	0.05	0.13	0.20	0.27	0.31	0.33	0.34	0.34
SHORT-TERM INTEREST RATE (%)	0.03	0.05	0.07	0.08	0.09	0.09	0.09	0.08
LONG-TERM INTEREST RATE (%)	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02
NOMINAL EFFECTIVE EXCHANGE RATE 1/.	-0.17	-0.16	-0.12	-0.08	-0.04	-0.01	0.02	0.05
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	0.01	0.01	0.01	0.00	-0.00	-0.01	-0.01	-0.01
GEN. GOV. FINANCIAL BALANCE	0.01	0.01	0.00	-0.01	-0.01	-0.02	-0.02	-0.02
PRIVATE SAVING	0.02	0.04	0.04	0.03	0.02	0.02	0.01	0.01
GROSS PRIVATE INVESTMENT	0.02	0.03	0.03	0.02	0.01	0.00	-0.00	-0.01
JAPAN								
REAL GNP	0.12	0.19	0.18	0.12	0.06	0.02	-0.00	-0.00
REAL DOMESTIC DEMAND	0.06	0.11	0.11	0.06	0.02	-0.02	-0.03	-0.03
GNP DEFLATOR	0.07	0.18	0.30	0.38	0.43	0.46	0.45	0.44
SHORT-TERM INTEREST RATE (%)	0.03	0.05	0.06	0.06	0.06	0.05	0.05	0.05
LONG-TERM INTEREST RATE (%)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
NOMINAL EFFECTIVE EXCHANGE RATE 1/.	-0.14	-0.15	-0.16	-0.16	-0.15	-0.13	-0.11	-0.08
EXCHANGE RATE ($/YEN)	0.00	-0.02	-0.05	-0.07	-0.09	-0.09	-0.09	-0.08
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	0.03	0.05	0.04	0.04	0.03	0.03	0.03	0.03
GEN. GOV. FINANCIAL BALANCE	0.02	0.05	0.05	0.05	0.04	0.03	0.02	0.02
PRIVATE SAVING	0.04	0.07	0.07	0.04	0.02	0.00	-0.00	0.00
GROSS PRIVATE INVESTMENT	0.03	0.07	0.07	0.05	0.03	0.00	-0.01	-0.01
GERMANY								
REAL GNP	0.82	0.62	0.21	-0.12	-0.31	-0.38	-0.35	-0.29
REAL DOMESTIC DEMAND	1.60	1.40	0.91	0.48	0.20	0.06	0.02	0.02
GNP DEFLATOR	0.27	0.66	1.00	1.20	1.24	1.17	1.04	0.88
SHORT-TERM INTEREST RATE (%)	0.24	0.29	0.29	0.27	0.24	0.20	0.18	0.16
LONG-TERM INTEREST RATE (%)	0.06	0.06	0.05	0.04	0.03	0.03	0.02	0.02
NOMINAL EFFECTIVE EXCHANGE RATE 1/.	0.79	0.72	0.61	0.50	0.42	0.34	0.27	0.20
EXCHANGE RATE ($/DM)	0.85	0.78	0.65	0.53	0.42	0.32	0.24	0.15

1/ A POSITIVE VALUE INDICATES AN APPRECIATION.

Table A5. Increase of German Government Spending by 1 Percent of GNP (continued)

(PERCENTAGE DEVIATION FROM BASELINE UNLESS OTHERWISE NOTED)

	1988	1989	1990	1991	1992	1993	1994	1995
MAJOR INDUSTRIAL COUNTRIES								
GERMANY (CONTINUED)								
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	-0.50	-0.49	-0.42	-0.34	-0.27	-0.22	-0.18	-0.15
GEN. GOV. FINANCIAL BALANCE	-0.69	-0.56	-0.51	-0.48	-0.45	-0.41	-0.37	-0.33
PRIVATE SAVING	0.35	0.32	0.19	0.08	0.01	-0.00	0.01	0.04
GROSS PRIVATE INVESTMENT	0.15	0.25	0.10	-0.06	-0.16	-0.19	-0.17	-0.13
OTHER MAJOR INDUSTRIAL COUNTRIES (CANADA, FRANCE, ITALY AND THE UNITED KINGDOM)								
REAL GNP	0.15	0.24	0.23	0.15	0.05	-0.04	-0.09	-0.10
REAL DOMESTIC DEMAND	0.08	0.16	0.16	0.09	0.01	-0.06	-0.10	-0.11
GNP DEFLATOR	0.09	0.23	0.39	0.52	0.60	0.61	0.56	0.48
SHORT-TERM INTEREST RATE (%)	0.04	0.08	0.09	0.10	0.09	0.08	0.06	0.05
LONG-TERM INTEREST RATE (%)	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01
NOMINAL EFFECTIVE EXCHANGE RATE 1/	-0.08	-0.07	-0.07	-0.08	-0.10	-0.11	-0.12	-0.12
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	0.06	0.08	0.08	0.08	0.07	0.05	0.04	0.03
GEN. GOV. FINANCIAL BALANCE	0.03	0.06	0.06	0.05	0.03	0.01	-0.01	-0.02
PRIVATE SAVING	0.06	0.10	0.10	0.08	0.04	0.01	-0.01	-0.02
GROSS PRIVATE INVESTMENT	0.04	0.08	0.08	0.05	0.00	-0.04	-0.06	-0.07
OTHER INDUSTRIAL COUNTRIES								
REAL GNP	0.41	0.38	0.20	0.03	-0.06	-0.09	-0.07	-0.03
REAL DOMESTIC DEMAND	0.24	0.28	0.13	-0.02	-0.10	-0.13	-0.10	-0.05
GNP DEFLATOR	0.18	0.41	0.62	0.73	0.77	0.73	0.66	0.57
SHORT-TERM INTEREST RATE (%)	0.05	0.08	0.10	0.11	0.11	0.10	0.09	0.08
LONG-TERM INTEREST RATE (%)	0.02	0.02	0.03	0.03	0.03	0.02	0.02	0.02
NOMINAL EFFECTIVE EXCHANGE RATE 1/	-0.08	-0.05	-0.02	0.00	0.02	0.03	0.04	0.04
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	0.11	0.06	0.04	0.04	0.04	0.04	0.03	0.02
GEN. GOV. FINANCIAL BALANCE	0.07	0.07	0.03	-0.01	-0.03	-0.04	-0.04	-0.04
PRIVATE SAVING	0.16	0.17	0.12	0.07	0.03	0.01	0.01	0.02
GROSS PRIVATE INVESTMENT	0.12	0.18	0.11	0.02	-0.04	-0.07	-0.07	-0.04

1/ A POSITIVE VALUE INDICATES AN APPRECIATION.

Table A5. Increase of German Government Spending by 1 Percent of GNP (concluded)

(PERCENTAGE DEVIATION FROM BASELINE UNLESS OTHERWISE NOTED)

	1988	1989	1990	1991	1992	1993	1994	1995
TOTAL INDUSTRIALS								
REAL GNP	0.22	0.24	0.16	0.07	-0.00	-0.05	-0.06	-0.05
CURRENT ACCOUNT BALANCE, AS A PERCENT OF BASELINE GNP	-0.01	-0.01	-0.00	-0.00	0.00	0.00	-0.00	-0.00
DEVELOPING COUNTRIES								
DEVELOPING COUNTRIES, EXCLUSIVE OF HIGH INCOME OIL EXPORTERS								
REAL GDP	0.04	0.04	0.02	-0.00	-0.02	-0.03	-0.03	-0.02
REAL DOMESTIC DEMAND	0.04	0.03	-0.01	-0.05	-0.08	-0.09	-0.09	-0.08
GNP DEFLATOR	0.19	0.36	0.50	0.58	0.61	0.58	0.54	0.48
PRICE INDEX OF EXPORTS (IN $)	0.49	0.62	0.67	0.66	0.63	0.58	0.52	0.45
REAL EXPORTS	0.17	0.15	0.04	-0.08	-0.14	-0.15	-0.12	-0.07
REAL IMPORTS	0.22	0.15	-0.06	-0.28	-0.41	-0.44	-0.41	-0.32
INTEREST PAYMENTS AS A PERCENTAGE OF EXPORT VALUES	-0.09	-0.06	-0.02	0.03	0.06	0.07	0.08	0.07
(AS A PERCENT OF BASELINE GDP)								
CURRENT ACCOUNT	0.02	0.01	-0.00	-0.01	-0.01	-0.00	-0.00	0.00
TOTAL SAVINGS	0.06	0.04	-0.00	-0.04	-0.06	-0.06	-0.05	-0.03
GROSS PRIVATE INVESTMENT	0.04	0.03	-0.00	-0.04	-0.05	-0.06	-0.05	-0.03
HIGH INCOME OIL EXPORTING DEVELOPING COUNTRIES								
REAL GDP	0.19	0.20	0.12	0.03	-0.05	-0.09	-0.10	-0.09
REAL DOMESTIC DEMAND	-0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00
WORLD PRICES (IN DOLLARS)								
PRICE OF OIL, IN DOLLARS	0.23	0.38	0.50	0.58	0.60	0.58	0.53	0.46
PRICE INDEX OF COMMODITIES	1.07	1.00	0.64	0.29	0.07	-0.02	-0.01	0.05

Table A6. Increase of 5 Percent in the German Money Supply

(PERCENTAGE DEVIATION FROM BASELINE UNLESS OTHERWISE NOTED)

	1988	1989	1990	1991	1992	1993	1994	1995
MAJOR INDUSTRIAL COUNTRIES								
UNITED STATES								
REAL GNP	-0.11	-0.08	-0.04	-0.01	-0.01	-0.01	-0.01	-0.02
REAL DOMESTIC DEMAND	-0.01	-0.02	-0.00	0.01	0.02	0.02	0.01	0.00
GNP DEFLATOR	-0.05	-0.07	-0.08	-0.09	-0.09	-0.08	-0.08	-0.08
SHORT-TERM INTEREST RATE (%)	-0.05	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03
LONG-TERM INTEREST RATE (%)	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03
NOMINAL EFFECTIVE EXCHANGE RATE 1/.	0.88	0.82	0.78	0.74	0.71	0.68	0.65	0.63
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	-0.01	-0.00	0.01	0.01	0.01	0.01	0.01	0.00
GEN. GOV. FINANCIAL BALANCE	-0.00	0.00	0.01	0.02	0.02	0.02	0.01	0.01
PRIVATE SAVING	-0.04	-0.04	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01
GROSS PRIVATE INVESTMENT	-0.03	-0.03	-0.02	-0.01	-0.00	-0.00	-0.00	-0.00
JAPAN								
REAL GNP	0.00	-0.14	-0.13	-0.07	-0.01	0.02	0.02	0.00
REAL DOMESTIC DEMAND	0.02	-0.06	-0.08	-0.04	0.01	0.04	0.04	0.03
GNP DEFLATOR	-0.05	-0.14	-0.23	-0.30	-0.34	-0.34	-0.33	-0.31
SHORT-TERM INTEREST RATE (%)	-0.01	-0.04	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04
LONG-TERM INTEREST RATE (%)	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
NOMINAL EFFECTIVE EXCHANGE RATE 1/.	0.95	0.88	0.85	0.82	0.81	0.80	0.79	0.79
EXCHANGE RATE ($/YEN)	0.07	0.05	0.06	0.07	0.07	0.08	0.09	0.10
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	0.01	-0.05	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02
GEN. GOV. FINANCIAL BALANCE	0.00	-0.03	-0.04	-0.03	-0.02	-0.01	-0.01	-0.01
PRIVATE SAVING	0.00	-0.05	-0.05	-0.03	-0.00	0.01	0.01	0.00
GROSS PRIVATE INVESTMENT	-0.00	-0.04	-0.05	-0.03	-0.01	0.01	0.02	0.01
GERMANY								
REAL GNP	2.17	1.86	1.14	0.55	0.18	-0.01	-0.08	-0.07
REAL DOMESTIC DEMAND	1.04	1.23	0.68	0.17	-0.14	-0.29	-0.31	-0.28
GNP DEFLATOR	0.93	2.07	3.11	3.88	4.37	4.64	4.74	4.76
SHORT-TERM INTEREST RATE (%)	-0.43	-0.24	-0.17	-0.14	-0.12	-0.10	-0.09	-0.08
LONG-TERM INTEREST RATE (%)	-0.10	-0.08	-0.07	-0.06	-0.06	-0.05	-0.05	-0.05
NOMINAL EFFECTIVE EXCHANGE RATE 1/.	-6.04	-5.71	-5.56	-5.48	-5.41	-5.35	-5.30	-5.26
EXCHANGE RATE ($/DM)	-6.12	-5.76	-5.60	-5.49	-5.40	-5.33	-5.26	-5.21

1/ A POSITIVE VALUE INDICATES AN APPRECIATION.

Table A6. Increase of 5 Percent in the German Money Supply (continued)

(PERCENTAGE DEVIATION FROM BASELINE UNLESS OTHERWISE NOTED)

	1988	1989	1990	1991	1992	1993	1994	1995
MAJOR INDUSTRIAL COUNTRIES								
GERMANY (CONTINUED)								
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	0.36	0.10	0.12	0.18	0.22	0.23	0.22	0.19
GEN. GOV. FINANCIAL BALANCE	0.42	0.51	0.46	0.39	0.34	0.27	0.22	0.18
PRIVATE SAVING	0.65	0.54	0.27	0.05	-0.10	-0.15	-0.15	-0.13
GROSS PRIVATE INVESTMENT	0.71	0.95	0.61	0.26	0.02	-0.11	-0.15	-0.14
OTHER MAJOR INDUSTRIAL COUNTRIES (CANADA, FRANCE, ITALY AND THE UNITED KINGDOM)								
REAL GNP	0.04	-0.08	-0.17	-0.19	-0.16	-0.08	0.01	0.07
REAL DOMESTIC DEMAND	0.08	-0.01	-0.10	-0.13	-0.11	-0.05	0.02	0.08
GNP DEFLATOR	-0.03	-0.09	-0.19	-0.31	-0.42	-0.49	-0.50	-0.45
SHORT-TERM INTEREST RATE (%)	-0.01	-0.04	-0.06	-0.08	-0.09	-0.08	-0.07	-0.05
LONG-TERM INTEREST RATE (%)	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04
NOMINAL EFFECTIVE EXCHANGE RATE 1/	1.07	0.95	0.91	0.91	0.92	0.93	0.94	0.95
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	0.05	-0.01	-0.03	-0.05	-0.06	-0.05	-0.04	-0.03
GEN. GOV. FINANCIAL BALANCE	0.03	-0.00	-0.02	-0.03	-0.03	-0.02	0.00	0.02
PRIVATE SAVING	0.02	-0.02	-0.06	-0.08	-0.08	-0.06	-0.03	-0.00
GROSS PRIVATE INVESTMENT	-0.00	-0.02	-0.06	-0.07	-0.05	-0.02	0.02	0.05
OTHER INDUSTRIAL COUNTRIES								
REAL GNP	-1.10	-0.59	-0.09	0.12	0.13	0.05	-0.05	-0.12
REAL DOMESTIC DEMAND	-0.56	-0.46	-0.02	0.20	0.21	0.14	0.03	-0.04
GNP DEFLATOR	-0.30	-0.53	-0.61	-0.56	-0.45	-0.34	-0.26	-0.22
SHORT-TERM INTEREST RATE (%)	-0.13	-0.12	-0.10	-0.08	-0.06	-0.05	-0.05	-0.04
LONG-TERM INTEREST RATE (%)	-0.06	-0.06	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04
NOMINAL EFFECTIVE EXCHANGE RATE 1/	0.61	0.67	0.70	0.70	0.70	0.68	0.67	0.67
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	-0.24	0.03	0.01	-0.03	-0.04	-0.05	-0.04	-0.03
GEN. GOV. FINANCIAL BALANCE	-0.16	-0.07	0.02	0.06	0.06	0.05	0.03	0.02
PRIVATE SAVING	-0.42	-0.28	-0.11	-0.02	0.00	-0.01	-0.04	-0.07
GROSS PRIVATE INVESTMENT	-0.33	-0.38	-0.11	0.06	0.10	0.08	0.02	-0.02

1/ A POSITIVE VALUE INDICATES AN APPRECIATION.

Table A6. Increase of 5 Percent in the German Money Supply (concluded)

(PERCENTAGE DEVIATION FROM BASELINE UNLESS OTHERWISE NOTED)

	1988	1989	1990	1991	1992	1993	1994	1995
TOTAL INDUSTRIALS								
REAL GNP	0.07	0.05	0.03	0.01	-0.00	-0.01	-0.01	-0.01
CURRENT ACCOUNT BALANCE, AS A PERCENT OF BASELINE GNP	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DEVELOPING COUNTRIES								
DEVELOPING COUNTRIES, EXCLUSIVE OF HIGH INCOME OIL EXPORTERS								
REAL GDP	0.10	0.09	0.08	0.07	0.06	0.05	0.04	0.04
REAL DOMESTIC DEMAND	0.09	0.09	0.09	0.08	0.07	0.05	0.04	0.03
GNP DEFLATOR	-0.00	0.24	0.42	0.54	0.60	0.63	0.64	0.65
PRICE INDEX OF EXPORTS (IN $)	-1.06	-0.69	-0.47	-0.36	-0.30	-0.27	-0.25	-0.23
REAL EXPORTS	0.59	0.49	0.40	0.32	0.24	0.18	0.13	0.08
REAL IMPORTS	0.45	0.44	0.42	0.34	0.24	0.16	0.09	0.02
INTEREST PAYMENTS AS A PERCENTAGE OF EXPORT VALUES	0.07	-0.04	-0.05	-0.06	-0.04	-0.03	-0.01	-0.01
(AS A PERCENT OF BASELINE GDP)								
CURRENT ACCOUNT	0.05	0.05	0.04	0.02	0.01	0.01	0.00	-0.00
TOTAL SAVINGS	0.12	0.12	0.10	0.08	0.05	0.03	0.01	-0.00
GROSS PRIVATE INVESTMENT	0.07	0.07	0.07	0.05	0.04	0.02	0.01	-0.00
HIGH INCOME OIL EXPORTING DEVELOPING COUNTRIES								
REAL GDP	0.06	0.04	0.03	0.02	0.01	0.01	0.01	0.02
REAL DOMESTIC DEMAND	-0.01	-0.02	-0.01	-0.01	-0.01	-0.00	-0.00	-0.00
WORLD PRICES (IN DOLLARS)								
PRICE OF OIL, IN DOLLARS	-0.68	-0.59	-0.50	-0.43	-0.37	-0.33	-0.29	-0.25
PRICE INDEX OF COMMODITIES	-0.45	0.26	0.43	0.30	0.12	0.01	-0.05	-0.06

Table A7. Decrease in the World Oil Price by 20 Percent

(PERCENTAGE DEVIATION FROM BASELINE UNLESS OTHERWISE NOTED)

	1988	1989	1990	1991	1992	1993	1994	1995
MAJOR INDUSTRIAL COUNTRIES								
UNITED STATES								
REAL GNP	0.89	0.89	0.62	0.36	0.18	0.09	0.06	0.07
REAL DOMESTIC DEMAND	0.69	0.78	0.57	0.35	0.21	0.14	0.11	0.11
GNP DEFLATOR	-0.06	0.22	0.40	0.39	0.16	-0.26	-0.80	-1.41
SHORT-TERM INTEREST RATE (%)	0.11	0.16	0.15	0.09	0.00	-0.12	-0.26	-0.41
LONG-TERM INTEREST RATE (%)	-0.50	-0.56	-0.59	-0.64	-0.68	-0.74	-0.79	-0.84
NOMINAL EFFECTIVE EXCHANGE RATE 1/	-3.01	-3.03	-3.16	-3.39	-3.69	-4.04	-4.39	-4.72
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	0.16	0.15	0.17	0.19	0.21	0.23	0.25	0.27
GEN. GOV. FINANCIAL BALANCE	0.17	0.21	0.19	0.18	0.17	0.18	0.20	0.22
PRIVATE SAVING	0.20	0.25	0.20	0.13	0.07	0.04	0.02	0.03
GROSS PRIVATE INVESTMENT	0.21	0.31	0.22	0.12	0.03	-0.01	-0.02	-0.02
JAPAN								
REAL GNP	0.14	0.00	-0.11	-0.19	-0.17	-0.10	-0.00	0.08
REAL DOMESTIC DEMAND	0.45	0.37	0.24	0.16	0.15	0.20	0.28	0.35
GNP DEFLATOR	-0.26	-0.69	-1.28	-2.03	-2.88	-3.79	-4.69	-5.54
SHORT-TERM INTEREST RATE (%)	-0.06	-0.13	-0.21	-0.31	-0.40	-0.50	-0.59	-0.68
LONG-TERM INTEREST RATE (%)	-0.52	-0.54	-0.54	-0.54	-0.54	-0.55	-0.56	-0.57
NOMINAL EFFECTIVE EXCHANGE RATE 1/	2.49	2.55	2.75	3.02	3.34	3.68	4.01	4.32
EXCHANGE RATE ($/YEN)	3.82	3.88	4.12	4.49	4.94	5.43	5.92	6.37
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	0.11	0.07	0.08	0.08	0.09	0.11	0.12	0.13
GEN. GOV. FINANCIAL BALANCE	0.06	0.03	-0.02	-0.07	-0.14	-0.14	-0.12	-0.09
PRIVATE SAVING	0.01	0.00	0.01	0.03	0.10	0.14	0.16	0.16
GROSS PRIVATE INVESTMENT	-0.03	-0.04	-0.09	-0.12	-0.13	-0.11	-0.08	-0.05
GERMANY								
REAL GNP	0.84	0.83	0.54	0.23	0.04	-0.06	-0.09	-0.09
REAL DOMESTIC DEMAND	0.79	0.92	0.65	0.36	0.16	0.07	0.04	0.05
GNP DEFLATOR	0.24	0.61	0.89	0.97	0.84	0.52	0.06	-0.48
SHORT-TERM INTEREST RATE (%)	0.24	0.34	0.33	0.26	0.16	0.03	-0.13	-0.30
LONG-TERM INTEREST RATE (%)	-0.46	-0.50	-0.53	-0.56	-0.59	-0.64	-0.68	-0.71
NOMINAL EFFECTIVE EXCHANGE RATE 1/	-1.46	-1.67	-2.00	-2.38	-2.78	-3.20	-3.61	-4.00
EXCHANGE RATE ($/DM)	1.05	0.87	0.68	0.52	0.40	0.31	0.22	0.12

1/ A POSITIVE VALUE INDICATES AN APPRECIATION.

Table A7. Decrease in the World Oil Price by 20 Percent (continued)

(PERCENTAGE DEVIATION FROM BASELINE UNLESS OTHERWISE NOTED)

	1988	1989	1990	1991	1992	1993	1994	1995
MAJOR INDUSTRIAL COUNTRIES								
GERMANY (CONTINUED)								
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	0.24	0.18	0.19	0.22	0.24	0.24	0.23	0.20
GEN. GOV. FINANCIAL BALANCE	0.27	0.30	0.27	0.23	0.19	0.16	0.15	0.15
PRIVATE SAVING	0.23	0.26	0.18	0.09	0.03	0.00	-0.02	-0.03
GROSS PRIVATE INVESTMENT	0.26	0.39	0.27	0.10	-0.02	-0.08	-0.09	-0.08
OTHER MAJOR INDUSTRIAL COUNTRIES (CANADA, FRANCE, ITALY AND THE UNITED KINGDOM)								
REAL GNP	0.37	0.34	0.12	-0.15	-0.35	-0.44	-0.41	-0.29
REAL DOMESTIC DEMAND	0.57	0.56	0.33	0.07	-0.13	-0.23	-0.22	-0.13
GNP DEFLATOR	-0.36	-0.52	-0.83	-1.35	-2.07	-2.93	-3.83	-4.68
SHORT-TERM INTEREST RATE (%)	-0.03	-0.06	-0.14	-0.26	-0.39	-0.53	-0.65	-0.75
LONG-TERM INTEREST RATE (%)	-0.58	-0.62	-0.63	-0.66	-0.68	-0.71	-0.73	-0.75
NOMINAL EFFECTIVE EXCHANGE RATE 1/	2.05	2.06	2.10	2.23	2.44	2.69	2.97	3.23
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	0.07	0.07	0.06	0.03	-0.02	-0.08	-0.13	-0.15
GEN. GOV. FINANCIAL BALANCE	0.12	0.15	0.14	0.11	0.06	0.05	0.08	0.13
PRIVATE SAVING	0.07	0.08	0.02	-0.09	-0.18	-0.26	-0.31	-0.33
GROSS PRIVATE INVESTMENT	0.12	0.16	0.09	-0.01	-0.09	-0.13	-0.11	-0.04
OTHER INDUSTRIAL COUNTRIES								
REAL GNP	0.05	0.18	0.16	0.06	-0.04	-0.10	-0.10	-0.06
REAL DOMESTIC DEMAND	0.37	0.42	0.40	0.30	0.20	0.11	0.08	0.08
GNP DEFLATOR	-0.33	-0.55	-0.88	-1.35	-1.97	-2.71	-3.52	-4.35
SHORT-TERM INTEREST RATE (%)	-0.09	-0.11	-0.16	-0.23	-0.33	-0.43	-0.55	-0.67
LONG-TERM INTEREST RATE (%)	-0.53	-0.57	-0.61	-0.66	-0.71	-0.75	-0.79	-0.82
NOMINAL EFFECTIVE EXCHANGE RATE 1/	0.14	0.25	0.41	0.57	0.71	0.84	0.95	1.05
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	-0.03	0.04	0.06	0.08	0.09	0.13	0.15	0.17
GEN. GOV. FINANCIAL BALANCE	0.08	0.15	0.19	0.24	0.26	0.30	0.36	0.43
PRIVATE SAVING	-0.06	-0.01	-0.02	-0.08	-0.14	-0.20	-0.24	-0.28
GROSS PRIVATE INVESTMENT	0.04	0.09	0.11	0.08	0.03	-0.02	-0.03	-0.02

1/ A POSITIVE VALUE INDICATES AN APPRECIATION.

Table A7. Decrease in the World Oil Price by 20 Percent (concluded)

(PERCENTAGE DEVIATION FROM BASELINE UNLESS OTHERWISE NOTED)

	1988	1989	1990	1991	1992	1993	1994	1995
TOTAL INDUSTRIALS								
REAL GNP	0.50	0.47	0.28	0.07	-0.05	-0.09	-0.07	-0.03
CURRENT ACCOUNT BALANCE, AS A PERCENT OF BASELINE GNP	0.11	0.11	0.11	0.12	0.12	0.13	0.13	0.13
DEVELOPING COUNTRIES								
DEVELOPING COUNTRIES,EXCLUSIVE OF HIGH INCOME OIL EXPORTERS								
REAL GDP	0.15	0.25	0.27	0.26	0.26	0.26	0.27	0.29
REAL DOMESTIC DEMAND	0.05	0.06	0.06	0.05	0.07	0.11	0.17	0.25
GNP DEFLATOR	-0.60	-0.59	-0.74	-1.09	-1.62	-2.27	-2.97	-3.68
PRICE INDEX OF EXPORTS (IN $)	0.11	0.06	-0.14	-0.47	-0.86	-1.32	-1.82	-2.33
REAL EXPORTS	0.76	1.21	1.30	1.31	1.35	1.41	1.49	1.56
REAL IMPORTS	0.25	0.34	0.38	0.39	0.53	0.79	1.14	1.53
INTEREST PAYMENTS AS A PERCENTAGE OF EXPORT VALUES	-0.13	-0.23	-0.35	-0.50	-0.56	-0.65	-0.77	-0.91
(AS A PERCENT OF BASELINE GDP)								
CURRENT ACCOUNT	-0.11	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06
TOTAL SAVINGS	-0.03	0.06	0.07	0.08	0.10	0.14	0.18	0.23
GROSS PRIVATE INVESTMENT	0.08	0.11	0.12	0.13	0.15	0.19	0.24	0.28
HIGH INCOME OIL EXPORTING DEVELOPING COUNTRIES								
REAL GDP	1.23	1.95	2.48	2.95	3.43	3.93	4.44	4.93
REAL DOMESTIC DEMAND	0.03	0.06	0.09	0.12	0.15	0.17	0.19	0.21
WORLD PRICES (IN DOLLARS)								
PRICE OF OIL, IN DOLLARS	-20.00	-20.00	-20.00	-20.00	-20.00	-20.00	-20.00	-20.00
PRICE INDEX OF COMMODITIES	3.66	3.95	3.27	2.43	1.78	1.30	0.97	0.70

Table A8. An Increase in Financing Flows to Developing Countries

(PERCENTAGE DEVIATION FROM BASELINE UNLESS OTHERWISE NOTED)

	1988	1989	1990	1991	1992	1993	1994	1995
MAJOR INDUSTRIAL COUNTRIES								
UNITED STATES								
REAL GNP	0.18	0.24	0.24	0.20	0.15	-0.06	-0.12	-0.12
REAL DOMESTIC DEMAND	0.06	0.12	0.13	0.11	0.08	-0.02	-0.07	-0.07
GNP DEFLATOR	0.17	0.45	0.76	1.01	1.13	1.10	0.94	0.70
SHORT-TERM INTEREST RATE (%)	0.08	0.16	0.23	0.29	0.31	0.26	0.21	0.15
LONG-TERM INTEREST RATE (%)	0.09	0.09	0.07	0.05	0.03	-0.00	-0.03	-0.05
NOMINAL EFFECTIVE EXCHANGE RATE 1/.	0.07	0.07	0.10	0.11	0.10	0.06	-0.04	-0.18
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	-0.08	-0.09	-0.10	-0.11	-0.12	-0.06	-0.06	-0.05
GEN. GOV. FINANCIAL BALANCE	-0.13	-0.13	-0.15	-0.17	-0.19	-0.11	-0.10	-0.09
PRIVATE SAVING	0.08	0.11	0.12	0.12	0.12	0.04	0.01	0.01
GROSS PRIVATE INVESTMENT	0.03	0.07	0.07	0.06	0.05	0.00	-0.03	-0.04
JAPAN								
REAL GNP	0.64	0.73	0.60	0.40	0.26	-0.25	-0.32	-0.17
REAL DOMESTIC DEMAND	0.32	0.47	0.38	0.22	0.08	-0.22	-0.33	-0.22
GNP DEFLATOR	0.37	0.90	1.40	1.69	1.67	1.31	0.78	0.19
SHORT-TERM INTEREST RATE (%)	0.15	0.21	0.25	0.25	0.23	0.11	0.04	-0.00
LONG-TERM INTEREST RATE (%)	0.06	0.05	0.03	0.02	0.00	-0.02	-0.03	-0.03
NOMINAL EFFECTIVE EXCHANGE RATE 1/.	-0.13	-0.16	-0.17	-0.15	-0.08	0.02	0.17	0.31
EXCHANGE RATE ($/YEN)	-0.12	-0.15	-0.17	-0.16	-0.10	0.01	0.19	0.38
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	0.21	0.18	0.17	0.15	0.16	0.02	0.04	0.06
GEN. GOV. FINANCIAL BALANCE	0.04	0.09	0.11	0.10	0.08	0.02	-0.02	-0.02
PRIVATE SAVING	0.33	0.36	0.30	0.22	0.17	-0.06	-0.09	-0.04
GROSS PRIVATE INVESTMENT	0.16	0.27	0.24	0.17	0.10	-0.06	-0.15	-0.12
GERMANY								
REAL GNP	0.15	0.25	0.26	0.23	0.21	-0.08	-0.12	-0.04
REAL DOMESTIC DEMAND	0.10	0.19	0.19	0.15	0.11	-0.07	-0.15	-0.09
GNP DEFLATOR	0.16	0.47	0.82	1.11	1.26	1.22	1.03	0.76
SHORT-TERM INTEREST RATE (%)	0.08	0.21	0.33	0.42	0.46	0.36	0.29	0.22
LONG-TERM INTEREST RATE (%)	0.10	0.09	0.08	0.06	0.03	0.00	-0.02	-0.04
NOMINAL EFFECTIVE EXCHANGE RATE 1/.	0.75	0.76	0.72	0.61	0.44	0.24	0.04	-0.15
EXCHANGE RATE ($/DM)	0.62	0.62	0.57	0.46	0.33	0.17	0.08	0.01

1/ A POSITIVE VALUE INDICATES AN APPRECIATION.

Table A8. An Increase in Financing Flows to Developing Countries (continued)

(PERCENTAGE DEVIATION FROM BASELINE UNLESS OTHERWISE NOTED)

	1988	1989	1990	1991	1992	1993	1994	1995
MAJOR INDUSTRIAL COUNTRIES								
GERMANY (CONTINUED)								
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	0.09	0.10	0.09	0.09	0.10	0.02	0.06	0.09
GEN. GOV. FINANCIAL BALANCE	-0.11	-0.07	-0.05	-0.06	-0.06	-0.02	-0.04	-0.03
PRIVATE SAVING	0.22	0.25	0.24	0.23	0.23	0.02	0.01	0.04
GROSS PRIVATE INVESTMENT	0.02	0.08	0.09	0.08	0.06	-0.03	-0.09	-0.07
OTHER MAJOR INDUSTRIAL COUNTRIES (CANADA, FRANCE, ITALY AND THE UNITED KINGDOM)								
REAL GNP	0.44	0.65	0.67	0.53	0.31	-0.25	-0.54	-0.58
REAL DOMESTIC DEMAND	0.22	0.45	0.49	0.38	0.20	-0.18	-0.47	-0.52
GNP DEFLATOR	0.30	0.80	1.34	1.77	1.92	1.70	1.18	0.46
SHORT-TERM INTEREST RATE (%)	0.13	0.23	0.30	0.33	0.31	0.18	0.06	-0.04
LONG-TERM INTEREST RATE (%)	0.10	0.08	0.06	0.03	-0.00	-0.03	-0.06	-0.07
NOMINAL EFFECTIVE EXCHANGE RATE 1/	-0.18	-0.20	-0.23	-0.27	-0.28	-0.26	-0.18	-0.04
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	0.17	0.21	0.25	0.26	0.25	0.09	0.03	-0.03
GEN. GOV. FINANCIAL BALANCE	-0.07	-0.01	0.02	0.00	-0.04	-0.05	-0.13	-0.16
PRIVATE SAVING	0.34	0.43	0.46	0.43	0.36	0.04	-0.10	-0.16
GROSS PRIVATE INVESTMENT	0.10	0.22	0.23	0.18	0.08	-0.10	-0.26	-0.28
OTHER INDUSTRIAL COUNTRIES								
REAL GNP	0.72	0.63	0.41	0.24	0.16	-0.28	-0.27	-0.14
REAL DOMESTIC DEMAND	0.40	0.48	0.29	0.13	0.05	-0.23	-0.27	-0.14
GNP DEFLATOR	0.36	0.84	1.28	1.56	1.59	1.34	0.95	0.48
SHORT-TERM INTEREST RATE (%)	0.09	0.15	0.20	0.23	0.23	0.17	0.12	0.06
LONG-TERM INTEREST RATE (%)	0.09	0.08	0.07	0.04	0.02	-0.01	-0.03	-0.05
NOMINAL EFFECTIVE EXCHANGE RATE 1/	-0.17	-0.16	-0.11	-0.03	0.05	0.13	0.16	0.16
(AS A PERCENT OF BASELINE GNP)								
CURRENT ACCOUNT BALANCE	0.22	0.10	0.10	0.10	0.11	-0.01	0.04	0.03
GEN. GOV. FINANCIAL BALANCE	-0.04	-0.06	-0.11	-0.16	-0.18	-0.16	-0.16	-0.12
PRIVATE SAVING	0.46	0.46	0.41	0.36	0.34	0.04	0.01	0.03
GROSS PRIVATE INVESTMENT	0.20	0.31	0.21	0.10	0.04	-0.11	-0.18	-0.12

1/ A POSITIVE VALUE INDICATES AN APPRECIATION.

Table A8. An Increase in Financing Flows to Developing Countries (concluded)

(PERCENTAGE DEVIATION FROM BASELINE UNLESS OTHERWISE NOTED)

	1988	1989	1990	1991	1992	1993	1994	1995
TOTAL INDUSTRIALS								
REAL GNP	0.40	0.49	0.43	0.32	0.22	-0.17	-0.27	-0.21
CURRENT ACCOUNT BALANCE, AS A PERCENT OF BASELINE GNP	0.09	0.07	0.07	0.07	0.07	0.00	0.00	0.00
DEVELOPING COUNTRIES								
DEVELOPING COUNTRIES,EXCLUSIVE OF HIGH INCOME OIL EXPORTERS								
REAL GDP	0.03	0.06	0.07	0.07	0.07	0.04	0.03	0.05
REAL DOMESTIC DEMAND	0.74	0.64	0.57	0.48	0.43	-0.08	-0.06	-0.00
GNP DEFLATOR	0.33	0.71	1.08	1.34	1.40	1.18	0.84	0.42
PRICE INDEX OF EXPORTS (IN $)	0.46	0.84	1.19	1.43	1.47	1.18	0.89	0.58
REAL EXPORTS	0.23	0.33	0.28	0.20	0.15	-0.07	-0.10	0.01
REAL IMPORTS	3.68	3.17	2.73	2.23	1.90	-0.69	-0.56	-0.25
INTEREST PAYMENTS AS A PERCENTAGE OF EXPORT VALUES	-0.09	-0.03	0.05	0.14	0.19	0.26	0.22	0.16
(AS A PERCENT OF BASELINE GDP)								
CURRENT ACCOUNT	0.02	0.04	0.02	0.02	0.01	-0.01	-0.02	-0.01
TOTAL SAVINGS	0.68	0.63	0.53	0.43	0.36	-0.14	-0.13	-0.08
GROSS PRIVATE INVESTMENT	0.67	0.58	0.50	0.41	0.35	-0.13	-0.12	-0.07
HIGH INCOME OIL EXPORTING DEVELOPING COUNTRIES								
REAL GDP	0.61	0.64	0.57	0.43	0.31	-0.23	-0.31	-0.25
REAL DOMESTIC DEMAND	0.01	0.01	0.01	0.01	0.01	0.00	-0.00	-0.00
WORLD PRICES (IN DOLLARS)								
PRICE OF OIL, IN DOLLARS	0.24	0.63	1.03	1.33	1.43	1.30	1.02	0.66
PRICE INDEX OF COMMODITIES	1.35	1.72	1.82	1.77	1.59	0.43	0.11	0.09

APPENDIX II. Equation Listing and Coefficient Values

The following pages present a TROLL listing of the equations, with lists of variable and parameter names. At the end of the equation listing is a printout of the coefficient file, associating parameter names with numerical values. Variables can either be exogenous or endogenous; the latter also include "definition" variables which differ only in not requiring input data. "Coefficients" and "parameters" serve the same function. TROLL notation for equations is similar to standard mathematical notation.

MULTIMOD CONTAINS MODELS FOR EACH OF THE G-3 COUNTRIES (US,JA, AND GR), THE REMAINING G-7 COUNTRIES TAKEN AS A GROUP (LI), THE SMALLER INDUSTRIALS (SI), AND THE WEO DEVELOPING COUNTRIES(RW), WHICH ARE DIVIDED INTO THE HIGH INCOME OIL EXPORTERS (HO) AND THE REST OF THE DEVELOPING COUNTRIES (DC). TRADE IS DISAGGREGATED INTO 3 TYPES OF GOODS: OIL (SUFFIX OIL), PRIMARY COMMODITY EXPORTS OF DEVELOPING COUNTRIES(COM) AND REMAINING GOODS AND NON-FACTOR SERVICES (M). NOTE THAT THOUGH OIL EXPORTS AND IMPORTS ARE TAKEN INTO ACCOUNT FOR ALL COUNTRIES (ONE WORLD PRICE, POIL IN DOLLARS, IS ASSUMED TO APPLY), INDUSTRIAL COUNTRIES ARE ASSUMED NOT TO PRODUCE COMMODITIES.

THE NOTATION IS AS FOLLOWS: VARIABLES HAVE A TWO-LETTER PREFIX FOR THE COUNTRY OR REGION AS GIVEN ABOVE, WHILE COEFFICIENTS HAVE A ON-LETTER PREFIX WITHOUT THE UNDERBAR, AND THEY ARE NUMBERED. THE TRADE SHARE AND DOUBLY WEIGHTED COMPETETIVENESS WEIGHTS (SIJ AND WIJ) IDENTIFY THE COUNTRIES BY THE INDICES I AND J

SYMBOL DECLARATIONS

ENDOGENOUS:

DC_A - domestic absorption
DC_ASSETS - Developing country claims on industrial countries
DC_CTOT - Consumption expenditure - including public
DC_DEBT - Stock of debt owed to the industrial countries
DC_GDP - Real GDP
DC_IM - Import volume, manufactures
DC_INVEST - Real gross investment
DC_INVESTC - Real gross investment in commodity production
DC_INVESTM - Real gross investment in manufactures production
DC_IOIL - imports of oil
DC_IT - Total imports price
DC_K - Capital stock
DC_KC - Capital stock in commodity production
DC_KM - Capital stock in maufactures production
DC_NETDEBT - Stock of net debt owed to the industrial countries
DC_NFA - Claims on foreigners , current $
DC_NNPCAP - Capacity Net National Product
DC_P - absorption deflator
DC_PGNP - GDP deflator
DC_PIM - Manufactures Import prices
DC_PIMA - Man. Import prices - adj. for nominal world trade discrepancy
DC_PIT - Total imports price
DC_PXM - Manufactures Export prices
DC_PXT - Total exports price
DC_QNT - Output of non-exported goods
DC_W - Real Wealth (Financial plus discounted future income)
DC_XCOM - Exports of primary commodities
DC_XM - Export volume, manufactures
DC_XMA - Man. Export volume, adj. for world trade discrepancy
DC_XOIL - Exports of oil
DC_XSM - Full capacity supply of manufactured output
DC_XT - Total exports volume
DC_YCAP - Capacity value of real domestic income
GR_A - Domestic absorption
GR_B - Private sector holdings of government bonds
GR_C - Consumption expenditure
GR_COIL - Consumption of oil
GR_CU - Capacity utilization
GR_CURBAL - Current account, in current dollars
GR_CURBALL - Current account, in local currency
GR_ER - Exchange rate, $ per local currency
GR_FM - Foreign export markets for manufactures
GR_GDEF - Nominal government deficit
GR_GDP - Gross domestic product, in real terms
GR_GE - Total government expenditures, nominal
GR_GNP - Real gross national product
GR_ICOM - Import volume, commodities
GR_IM - Import volume, manufactures
GR_INVEST - Gross investment
GR_IOIL - Imports of oil
GR_IT - Total imports price
GR_K - Real net capital stock
GR_M - Monetary base
GR_MERM - MERM weighted effective exchange rate

GR_NFA - Net claims on foreigners, current $
GR_NNP - Net national product
GR_NNPCAP - Capacity net national product
GR_P - Absorption deflator
GR_PFM - Prices in foreign markets
GR_PGNP - Price level (GNP deflator)
GR_PGNPNO - Non-oil GNP deflator
GR_PI - Inflation rate (change in absorption deflator)
GR_PIM - Manufactures Import prices
GR_PIMA - Man. Import prices - adj. for nominal world trade discrepancy
GR_PIT - Total imports price
GR_PXM - Manufactures Export prices
GR_PXT - Total exports price
GR_R - Average interest rate, for calculating nominal interest flows
GR_REER - Real effective exchange rate
GR_RL - Long-term nominal interest rate
GR_RLR - Real ex ante long-term interest rate
GR_RS - Short term nominal interest rate
GR_RSR - Ex ante real short rate
GR_TAX - Government tax receipts, net of non-interest transfers
GR_TRATE - Tax rate
GR_UCSTCAP - Real user cost of capital
GR_W - Real net wealth
GR_XM - Export volume, manufactures
GR_XMA - Man. Export volume, adj. for world trade discrepancy
GR_XT - Total exports volume
GR_YCAP - Capacity output (GDP)
GR_YD - Real disposable income
HO_A - domestic absorption
HO_GDP - Real GDP
HO_ICOM - Import volume, commodities
HO_IM - Import volume, manufactures
HO_IT - Total imports price
HO_NFA - Claims on foreigners , current $
HO_PIT - Total imports price
HO_PXT - Total exports price
HO_QNT - Output of non-exported goods
HO_XOIL - Exports of oil
HO_XT - Total exports volume
JA_A - Domestic absorption
JA_B - Private sector holdings of government bonds
JA_C - Consumption expenditure
JA_COIL - Consumption of oil
JA_CU - Capacity utilization
JA_CURBAL - Current account, in current dollars
JA_CURBALL - Current account, in local currency
JA_ER - Exchange rate, $ per local currency
JA_FM - Foreign export markets for manufactures
JA_GDEF - Nominal government deficit
JA_GDP - Gross domestic product, in real terms
JA_GE - Total government expenditures, nominal
JA_GNP - Real gross national product
JA_ICOM - Import volume, commodities
JA_IM - Import volume, manufactures
JA_INVEST - Gross investment
JA_IOIL - Imports of oil
JA_IT - Total imports price
JA_K - Real net capital stock
JA_M - Monetary base
JA_MERM - MERM weighted effective exchange rate
JA_NFA - Net claims on foreigners, current $
JA_NNP - Net national product
JA_NNPCAP - Capacity net national product
JA_P - Absorption deflator
JA_PFM - Prices in foreign markets
JA_PGNP - Price level (GNP deflator)
JA_PGNPNO - Non-oil GNP deflator
JA_PI - Inflation rate (change in absorption deflator)
JA_PIM - Manufactures Import prices
JA_PIMA - Man. Import prices - adj. for nominal world trade discrepancy
JA_PIT - Total imports price
JA_PXM - Manufactures Export prices
JA_PXT - Total exports price
JA_R - Average interest rate, for calculating nominal interest flows
JA_REER - Real effective exchange rate
JA_RL - Long-term nominal interest rate
JA_RLR - Real ex ante long-term interest rate

JA_RS - Short term nominal interest rate
JA_RSR - Ex ante real short rate
JA_TAX - Government tax receipts, net of non-interest transfers
JA_TRATE - Tax rate
JA_UCSTCAP - Real user cost of capital
JA_W - Real net wealth
JA_XM - Export volume, manufactures
JA_XMA - Man. Export volume, adj. for world trade discrepancy
JA_XT - Total exports volume
JA_YCAP - Capacity output (GDP)
JA_YD - Real disposable income
LI_A - Domestic absorption
LI_B - Private sector holdings of government bonds
LI_C - Consumption expenditure
LI_COIL - Consumption of oil
LI_CU - Capacity utilization
LI_CURBAL - Current account, in current dollars
LI_CURBALL - Current account, in local currency
LI_ER - Exchange rate, $ per local currency
LI_FM - Foreign export markets for manufactures
LI_GDEF - Nominal government deficit
LI_GDP - Gross domestic product, in real terms
LI_GE - Total government expenditures, nominal
LI_GNP - Real gross national product
LI_ICOM - Import volume, commodities
LI_IM - Import volume, manufactures
LI_INVEST - Gross investment
LI_IOIL - Imports of oil
LI_IT - Total imports price
LI_K - Real net capital stock
LI_M - Monetary base
LI_MERM - MERM weighted effective exchange rate
LI_NFA - Net claims on foreigners, current $
LI_NNP - Net national product
LI_NNPCAP - Capacity net national product
LI_P - Absorption deflator
LI_PFM - Prices in foreign markets
LI_PGNP - Price level (GNP deflator)
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LI_R - Average interest rate, for calculating nominal interest flows
LI_REER - Real effective exchange rate
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LI_RLR - Real ex ante long-term interest rate
LI_RS - Short term nominal interest rate
LI_RSR - Ex ante real short rate
LI_TAX - Government tax receipts, net of non-interest transfers
LI_TRATE - Tax rate
LI_UCSTCAP - Real user cost of capital
LI_W - Real net wealth
LI_XM - Export volume, manufactures
LI_XMA - Man. Export volume, adj. for world trade discrepancy
LI_XT - Total exports volume
LI_YCAP - Capacity output (GDP)
LI_YD - Real disposable income
PCOM - Price of primary commodity exports of LDCs, US dollar index
POIL - Price of oil, in US dollars (1980=1)
RW_ER - Exchange rate $ per local currency
RW_FM - Foreign export markets for manufactures
RW_IM - Import volume, manufactures
RW_IT - Total imports price
RW_PFM - Prices in foreign markets
RW_PIM - Manufactures Import prices
RW_PIMA - Man. Import prices - adj. for nominal world trade discrepancy
RW_PIT - Total imports price
RW_PXM - Manufactures Export prices
RW_PXT - Total exports price
RW_REER - Real effective exchange rate
RW_XCOM - Exports of primary commodities
RW_XM - Export volume, manufactures
RW_XMA - Man. Export volume, adj. for world trade discrepancy
RW_XOIL - Exports of oil

RW_XT - Total exports volume
SI_A - Domestic absorption
SI_B - Private sector holdings of government bonds
SI_C - Consumption expenditure
SI_COIL - Consumption of oil
SI_CU - Capacity utilization
SI_CURBAL - Current account, in current dollars
SI_CURBALL - Current account, in local currency
SI_ER - Exchange rate, $ per local currency
SI_FM - Foreign export markets for manufactures
SI_GDEF - Nominal government deficit
SI_GDP - Gross domestic product, in real terms
SI_GE - Total government expenditures, nominal
SI_GNP - Real gross national product
SI_ICOM - Import volume, commodities
SI_IM - Import volume, manufactures
SI_INVEST - Gross investment
SI_IOIL - Imports of oil
SI_IT - Total imports price
SI_K - Real net capital stock
SI_M - Monetary base
SI_MERM - MERM weighted effective exchange rate
SI_NFA - Net claims on foreigners, current $
SI_NNP - Net national product
SI_NNPCAP - Capacity net national product
SI_P - Absorption deflator
SI_PFM - Prices in foreign markets
SI_PGNP - Price level (GNP deflator)
SI_PGNPNO - Non-oil GNP deflator
SI_PI - Inflation rate (change in absorption deflator)
SI_PIM - Manufactures Import prices
SI_PIMA - Man. Import prices - adj. for nominal world trade discrepancy
SI_PIT - Total imports price
SI_PXM - Manufactures Export prices
SI_PXT - Total exports price
SI_R - Average interest rate, for calculating nominal interest flows
SI_REER - Real effective exchange rate
SI_RL - Long-term nominal interest rate
SI_RLR - Real ex ante long-term interest rate
SI_RS - Short term nominal interest rate
SI_RSR - Ex ante real short rate
SI_TAX - Government tax receipts, net of non-interest transfers
SI_TRATE - Tax rate
SI_UCSTCAP - Real user cost of capital
SI_W - Real net wealth
SI_XM - Export volume, manufactures
SI_XMA - Man. Export volume, adj. for world trade discrepancy
SI_XT - Total exports volume
SI_YCAP - Capacity output (GDP)
SI_YD - Real disposable income
US_A - Domestic absorption
US_B - Private sector holdings of government bonds
US_C - Consumption expenditure
US_COIL - Consumption of oil
US_CU - Capacity utilization
US_CURBAL - Current account, in current dollars
US_ER - Exchange rate, $ per local currency
US_FM - Foreign export markets for manufactures
US_GDEF - Nominal government deficit
US_GDP - Gross domestic product, in real terms
US_GE - Total government expenditures, nominal
US_GNP - Real gross national product
US_ICOM - Import volume, commodities
US_IM - Import volume, manufactures
US_INVEST - Gross investment
US_IOIL - Imports of oil
US_IT - Total imports price
US_K - Real net capital stock
US_M - Monetary base
US_MERM - MERM weighted effective exchange rate
US_NFA - Net claims on foreigners, current $
US_NNP - Net national product
US_NNPCAP - Capacity net national product
US_P - Absorption deflator
US_PFM - Prices in foreign markets
US_PGNP - Price level (GNP deflator)
US_PGNPNO - Non-oil GNP deflator

US_PI - Inflation rate (change in absorption deflator)
US_PIM - Manufactures Import prices
US_PIMA - Man. Import prices - adj. for nominal world trade discrepancy
US_PIT - Total imports price
US_PXM - Manufactures Export prices
US_PXT - Total exports price
US_R - Average interest rate, for calculating nominal interest flows
US_REER - Real effective exchange rate
US_RL - Long-term nominal interest rate
US_RLR - Real ex ante long-term interest rate
US_RR - Average real interest rate, for calculating real Debt interest
US_RS - Short term nominal interest rate
US_RSR - Ex ante real short rate
US_TAX - Government tax receipts, net of non-interest transfers
US_TRATE - Tax rate
US_UCSTCAP - Real user cost of capital
US_W - Real net wealth
US_XM - Export volume, manufactures
US_XMA - Man. Export volume, adj. for world trade discrepancy
US_XT - Total exports volume
US_YCAP - Capacity output (GDP)
US_YD - Real disposable income
WTRADE - World trade discrepancy, in nominal terms
WTRADER - World trade discrepancy, in real terms

EXOGENOUS:
DC_ASSETRAT - Target ratio of assets to imports
DC_DELTA - Depreciation rate for capital stock
DC_KCOMSHR - Historical share of investment in commodity production
DC_OILSHR - Oil share of DC's total imports
DC_XOILSHR - DC's share of total RW oil exports
DC_XTNDHIST - baseline $ value of exports used in Debt calculation
DUM - Switch that makes the tax rate endogenous
DUM74
GR_BRATIO - Target ratio of nominal govt debt to GNP
GR_CTRATE - Corporate tax rate
GR_DELTA - Depreciation rate for capital stock
GR_G - Real government spending on goods and services (NA)
GR_GEXOG - Other government spending, in real terms
GR_MT - Target level of the monetary base
GR_PIBAR - Long run expected inflation
GR_PRODOIL - Output of oil
GR_TXCRED - Tax credits
GR_XOIL - Exports of oil
HO_IOIL - Import volume, oil
HO_XM - Export volume, manufactures
JA_BRATIO - Target ratio of nominal govt debt to GNP
JA_CTRATE - Corporate tax rate
JA_DELTA - Depreciation rate for capital stock
JA_G - Real government spending on goods and services (NA)
JA_GEXOG - Other government spending, in real terms
JA_MT - Target level of the monetary base
JA_PIBAR - Long run expected inflation
JA_PRODOIL - Output of oil
JA_TXCRED - Tax credits
JA_XOIL - Exports of oil
LI_BRATIO - Target ratio of nominal govt debt to GNP
LI_CTRATE - Corporate tax rate
LI_DELTA - Depreciation rate for capital stock
LI_G - Real government spending on goods and services (NA)
LI_GEXOG - Other government spending, in real terms
LI_MT - Target level of the monetary base
LI_PIBAR - Long run expected inflation
LI_PRODOIL - Output of oil
LI_TXCRED - Tax credits
LI_XOIL - Exports of oil
RES_DC_ASSETS RES_DC_CTOT RES_DC_CURBAL RES_DC_DEBT RES_DC_INVESTC RES_DC_IOIL
RES_DC_NFA RES_DC_PGNP RES_DC_PIM RES_DC_PIMA RES_DC_PXM RES_DC_QNT RES_DC_XCOM
RES_DC_XOIL RES_DC_XSM RES_GR_A RES_GR_B RES_GR_C RES_GR_COIL RES_GR_ER
RES_GR_GDP RES_GR_GNP RES_GR_ICOM RES_GR_IM RES_GR_INVEST RES_GR_IOIL RES_GR_IT
RES_GR_K RES_GR_M RES_GR_NFA RES_GR_P RES_GR_PGNP RES_GR_PIM RES_GR_PXM
RES_GR_RL RES_GR_RS RES_GR_TAX RES_GR_TRATE RES_GR_W RES_GR_XM RES_GR_XT
RES_GR_YCAP RES_HO_ICOM RES_HO_IM RES_HO_NFA RES_HO_PIT RES_HO_PXT RES_HO_QNT
RES_JA_A RES_JA_B RES_JA_C RES_JA_COIL RES_JA_ER RES_JA_GDP RES_JA_GNP
RES_JA_ICOM RES_JA_IM RES_JA_INVEST RES_JA_IOIL RES_JA_IT RES_JA_K RES_JA_M
RES_JA_NFA RES_JA_P RES_JA_PGNP RES_JA_PIM RES_JA_PXM RES_JA_RL RES_JA_RS
RES_JA_TAX RES_JA_TRATE RES_JA_W RES_JA_XM RES_JA_XT RES_JA_YCAP RES_LI_A

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   RES_LI_B  RES_LI_C  RES_LI_COIL  RES_LI_ER  RES_LI_GDP  RES_LI_GNP  RES_LI_ICOM
   RES_LI_IM  RES_LI_INVEST  RES_LI_IOIL  RES_LI_IT  RES_LI_K  RES_LI_M  RES_LI_NFA
   RES_LI_P  RES_LI_PGNP  RES_LI_PIM  RES_LI_PXM  RES_LI_RL  RES_LI_RS  RES_LI_TAX
   RES_LI_TRATE  RES_LI_W  RES_LI_XM  RES_LI_XT  RES_LI_YCAP  RES_RW_PIM  RES_RW_PXM
   RES_RW_XM  RES_SI_A  RES_SI_B  RES_SI_C  RES_SI_COIL  RES_SI_ER  RES_SI_GDP  RES_SI_GNP
   RES_SI_ICOM  RES_SI_IM  RES_SI_INVEST  RES_SI_IOIL  RES_SI_IT  RES_SI_K  RES_SI_M
   RES_SI_NFA  RES_SI_P  RES_SI_PGNP  RES_SI_PIM  RES_SI_PXM  RES_SI_RL  RES_SI_RS
   RES_SI_TAX  RES_SI_TRATE  RES_SI_W  RES_SI_XM  RES_SI_XT  RES_SI_YCAP  RES_US_A
   RES_US_B  RES_US_C  RES_US_COIL  RES_US_GDP  RES_US_GNP  RES_US_ICOM  RES_US_IM
   RES_US_INVEST  RES_US_IOIL  RES_US_IT  RES_US_K  RES_US_M  RES_US_NFA  RES_US_P
   RES_US_PGNP  RES_US_PIM  RES_US_PXM  RES_US_RL  RES_US_RS  RES_US_TAX  RES_US_TRATE
   RES_US_W  RES_US_XM  RES_US_XT  RES_US_YCAP  RES_WTRADE  RES_WTRADER
   RPOIL     - Real price of oil, (1980=1)
   RW_NEER   - Nominal effective exchange rate
   SI_BRATIO - Target ratio of nominal govt debt to GNP
   SI_CTRATE - Corporate tax rate
   SI_DELTA  - Depreciation rate for capital stock
   SI_G      - Real government spending on goods and services (NA)
   SI_GEXOG  - Other government spending, in real terms
   SI_MT     - Target level of the monetary base
   SI_PIBAR  - Long run  expected inflation
   SI_PRODOIL - Output of oil
   SI_TXCRED - Tax credits
   SI_XOIL   - Exports of oil
   T         - Time
   US_BRATIO - Target ratio of nominal govt debt to GNP
   US_CTRATE - Corporate tax rate
   US_DELTA  - Depreciation rate for capital stock
   US_G      - Real government spending on goods and services (NA)
   US_GEXOG  - Other government spending, in real terms
   US_MT     - Target level of the monetary base
   US_PIBAR  - Long run  expected inflation
   US_PRODOIL - Output of oil
   US_RRBAR  - baseline level of US_RR used in DC Debt calculation
   US_TXCRED - Tax credits
   US_XOIL   - Exports of oil

COEFFICIENT:
   DASS1  DASS2  DBETA  DC0  DC1  DC2  DDEBT1  DDEBT2  DN  DRHOBAR  DW1  DW2  DYCAP0
   GBETA  GCOIL0  GCOIL1  GCOIL2  GCOIL3  GCOIL4  GC0  GC1  GC2  GC3  GE80  GIC0  GIC1
   GIC2  GIC3  GIC4  GIC5  GI0  GI1  GI2  GI3  GI4  GI5  GI6  GK0  GK1  GK2  GK3  GK4  GM0
   GM1  GM2  GM3  GM4  GN  GPXM0  GPXM1  GPXM2  GP1  GP2  GP3  GP4  GR1  GWT  GW1  GW2
   GW3  GW4  GX0  GX1  GX2  GX3  HI0  HI1  HI2  HQNT0  ISR  JBETA  JCOIL0  JCOIL1  JCOIL2
   JCOIL3  JCOIL4  JC0  JC1  JC2  JC3  JE80  JIC0  JIC1  JIC2  JIC3  JIC4  JIC5  JI0  JI1
   JI2  JI3  JI4  JI5  JI6  JK0  JK1  JK2  JK3  JK4  JM0  JM1  JM2  JM3  JM4  JN  JPXM0
   JPXM1  JPXM2  JP1  JP2  JP3  JP4  JR1  JWT  JW1  JW2  JW3  JW4  JX0  JX1  JX2  JX3
   LBETA  LCOIL0  LCOIL1  LCOIL2  LCOIL3  LCOIL4  LC0  LC1  LC2  LC3  LE80  LIC0  LIC1
   LIC2  LIC3  LIC4  LIC5  LI0  LI1  LI2  LI3  LI4  LI5  LI6  LK0  LK1  LK2  LK3  LK4  LM0
   LM1  LM2  LM3  LM4  LN  LPXM0  LPXM1  LPXM2  LP1  LP2  LP3  LP4  LR1  LWT  LW1  LW2
   LW3  LW4  LX0  LX1  LX2  LX3  RE80  RPXM1  RPXM2  RQNT0  RXCOM1  RXSM1  RX0  RX1  RX2
   RX3  RX4  SBETA  SCOIL0  SCOIL1  SCOIL2  SCOIL3  SCOIL4  SC0  SC1  SC2  SC3  SE80  SIC0
   SIC1  SIC2  SIC3  SIC4  SIC5  SI0  SI1  SI2  SI3  SI4  SI5  SI6  SK0  SK1  SK2  SK3
   SK4  SM0  SM1  SM2  SM3  SM4  SN  SPXM0  SPXM1  SPXM2  SP1  SP2  SP3  SP4  SR1  SWT
   SW1  SW2  SW3  SW4  SX0  SX1  SX2  SX3  S11  S12  S13  S14  S15  S16  S21  S22  S23
   S24  S25  S26  S31  S32  S33  S34  S35  S36  S41  S42  S43  S44  S45  S46  S51  S52
   S53  S54  S55  S56  S61  S62  S63  S64  S65  S66  TAU1  TAU2  T1  T2  T3  T4  T5  T6
   UBETA  UCOIL0  UCOIL1  UCOIL2  UCOIL3  UCOIL4  UC0  UC1  UC2  UC3  UIC0  UIC1  UIC2
   UIC3  UIC4  UIC5  UI0  UI1  UI2  UI3  UI4  UI5  UI6  UK0  UK1  UK2  UK3  UK4  UM0  UM1
   UM2  UM3  UM4  UN  UPXM0  UPXM1  UPXM2  UP1  UP2  UP3  UP4  UR1  UWT  UW1  UW2  UW3
   UW4  UX0  UX1  UX2  UX3  V12  V13  V14  V15  V22  V23  V24  V25  V32  V33  V34  V35
   V42  V43  V44  V45  V52  V53  V54  V55  W11  W12  W13  W14  W15  W16  W21  W22  W23
   W24  W25  W26  W31  W32  W33  W34  W35  W36  W41  W42  W43  W44  W45  W46  W51  W52
   W53  W54  W55  W56  W61  W62  W63  W64  W65  W66

PARAMETER:
   GGBAR     - Normal level of G/GNP
   GLAMBDAB  GLAMBDAM
   GRHOBAR   - Normal level of PGNP/P ratio
   GRRBAR    - Normal level of RSR
   JGBAR     - Normal level of G/GNP
   JLAMBDAB  JLAMBDAM
   JRHOBAR   - Normal level of PGNP/P ratio
   JRRBAR    - Normal level of RSR
   LGBAR     - Normal level of G/GNP
   LLAMBDAB  LLAMBDAM
   LRHOBAR   - Normal level of PGNP/P ratio
   LRRBAR    - Normal level of RSR
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SGBAR     - Normal level of G/GNP
SLAMBDAB  SLAMBDAM
SRHOBAR   - Normal level of PGNP/P ratio
SRRBAR    - Normal level of RSR
UGBAR     - Normal level of G/GNP
ULAMBDAB  ULAMBDAM
URHOBAR   - Normal level of PGNP/P ratio
URRBAR    - Normal level of RSR

EQUATIONS

        *****************
         MODEL FOR US
        *****************


        I. Aggregate Demand

        Consumption expenditure:
 1:UC       DEL(1 : LOG(US_C)) = UC0+UC1*LOG(US_W(-1)/US_C(-1))+UC2*DEL(1 : US_RLR)+UC3*
            DEL(1 : LOG(US_YD))+RES_US_C

        Consumption of oil:
 2:UCOIL    DEL(1 : LOG(US_COIL)) = UCOIL0+UCOIL1*DEL(1 : LOG(US_GDP))+UCOIL2*DEL(1 :
            LOG(POIL/US_PGNP))+UCOIL3*LOG(POIL(-1)/US_PGNP(-1))+UCOIL4*LOG(US_GDP(-1)/
            US_COIL(-1))+RES_US_COIL

        Change in the capital stock:
 3:UK       DEL(1 : LOG(US_K)) = UK1*LOG(US_GDP(-1)/US_K(-1))+UK2*DEL(1 : LOG(US_GDP))+
            UK3*US_UCSTCAP+UK0+UK4*DUM74+RES_US_K

        Real gross investment:
 4:UINV     US_INVEST = DEL(1 : US_K)+US_DELTA*US_K(-1)+RES_US_INVEST

        Manufactured exports - real:
 5:UXM      LOG(US_XM) = UX0+UX1*LOG(US_FM)+UX2*US_REER+UX3*US_REER(-1)+RES_US_XM

        Man. exports - real, adjusted for real world trade discrepancy:
 6:UXA      US_XMA = US_XM+T1*WTRADER

        Total exports:
 7:UXT      US_XT = US_XMA+US_XOIL+RES_US_XT

        Imports of manufactures - real:
 8:UIM      LOG(US_IM) = UI0+UI1*LOG(US_A)+UI2*LOG(US_A(-1))+UI3*LOG(US_PIMA/US_PGNPNO)+
            UI4*T+UI5*LOG(US_IM(-1))+RES_US_IM

        Imports of oil:
 9:UIOIL    US_IOIL = US_COIL+US_XOIL-US_PRODOIL+RES_US_IOIL

        Imports of primary commodities (from RW only):
10:UIC      DEL(1 : LOG(US_ICOM)) = UIC0+UIC2*DEL(1 : LOG(PCOM/US_ER/US_PGNP))+UIC1*DEL(
            1 : LOG(US_GDP))+UIC3*LOG(PCOM(-1)/US_ER(-1)/US_PGNP(-1))+UIC4*LOG(US_GDP(-1
            ))+UIC5*LOG(US_ICOM(-1))+RES_US_ICOM

        Total Imports:
11:UIT      US_IT = US_IM+US_IOIL+US_ICOM+RES_US_IT

        Definition of domestic absorption:
12:UA       US_A = US_C+US_INVEST+US_G+RES_US_A

        Real GDP identity:
13:UGDP     US_GDP = US_A+US_XT-US_IT+RES_US_GDP

        Definition of real GNP:
14:UGNP     US_GNP = US_GDP+US_R*US_NFA(-1)/US_PGNP+RES_US_GNP

        Net National Product:
15:UNNP     US_NNP = US_GDP-US_DELTA*US_K(-1)

        Capacity Net National Product:
16:UNNPC    US_NNPCAP = US_YCAP-US_DELTA*US_K(-1)

        Real Wealth (Financial plus discounted future income):
17:UW       US_W = ULAMBDAM*US_M/US_P+0.5*(1+SUM(I = -3 TO -1 : US_RL(I)/3)/US_RL)*
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        US_NFA/US_ER/US_P+US_NNPCAP*(1-UGBAR)*URHOBAR*(1/URRBAR+(US_CU*0.01-1)/(
        URRBAR+UW1)+(US_PGNP/US_P/URHOBAR-1)/(URRBAR+UW2)-(US_RSR-URRBAR)/(URRBAR+
        UW3)-((US_G*US_P+US_GEXOG)/(US_NNP*US_PGNP)-UGBAR)/(1-UGBAR)/(URRBAR+UW4))+
        RES_US_W

   Real disposable income:
18:UYD  US_YD = US_GDP*US_PGNP/US_P-US_DELTA*US_K(-1)-US_TAX/US_P+US_R*(US_B(-1)+
        US_NFA(-1))/US_P-(1-ULAMBDAB)*DEL(1 : US_B)/US_P

   II. Government Sector

   Total government expenditures - nominal:
19:UGE  US_GE = US_P*US_G+US_R*US_B(-1)+US_GEXOG

   Government tax receipts:
20:UTAX US_TAX = US_TRATE*(US_PGNP*US_GNP-US_DELTA*US_K(-1)*US_P+US_R*US_B(-1))+
        RES_US_TAX

   Average tax rate (reaction function):
21:UTRATE DEL(1 : US_TRATE) = (+TAU1)*DUM*(US_B(-1)/US_PGNP(-1)/US_GNP(-1)-US_BRATIO)+
        TAU2*DUM*DEL(1 : US_B(-1)/US_PGNP(-1)/US_GNP(-1))+RES_US_TRATE

   Government balance sheet identity (solves for government debt):
22:UB   DEL(1 : US_B)+DEL(1 : US_M) = US_R*US_B(-1)+(US_P*US_G-US_TAX+US_GEXOG)+
        RES_US_B

   Definition of nominal government deficit:
23:UGDEF US_GDEF = DEL(1 : US_B+US_M)

   III. Money and Interest Rates

   Money demand function (M):
24:UM   LOG(US_M/US_P) = UM0+UM1*LOG(US_GNP)+UM2*US_RS+UM3*US_RS(-1)+UM4*LOG(US_M(-1
        )/US_P(-1))+RES_US_M

   Money supply reaction function :
25:URS  DEL(1 : US_RS) = UR1*(((1-UM4)*LOG(US_MT/US_P)-UM1*LOG(US_GNP)-UM0-RES_US_M)
        /(UM2+UM3)-US_RS(-1))+RES_US_RS

   Term structure of interest rates (solves for long term rate):
26:URL  US_RS/100 = US_RL/100-(US_RL(1)/US_RL-1)+RES_US_RL

   Average interest rate - lagged, annual rate:
27:UR   US_R = 0.5*US_RS(-1)/100+0.5*SUM(I = -3 TO -1 : US_RL(I)/100)/3

   Real long term interest rate (ex ante):
28:URLR US_RLR = (1+US_RL/100)/(1+0.1*US_PI(1)+0.9*US_PIBAR)-1

   Real ex ante short rate:
29:URSR US_RSR = (1+US_RS/100)/(1+US_PI(1))-1

   Average real interest rate, for calculating real Debt interest:
30:URR  US_RR = 0.8*US_RSR(-1)+0.2*SUM(I = -3 TO -1 : US_RLR(I))/3

   Real user cost of capital:
31:UUCST US_UCSTCAP = (US_DELTA+(1-US_CTRATE)*US_RL/100-0.1*US_PI(1)-0.9*US_PIBAR)*(1
        -US_TXCRED-US_CTRATE*0.2/(US_RL/100+0.2))/(1-US_CTRATE)

   IV. Prices and Supply

   Price level (GNP deflator):
32:UPGNP DEL(1 : LOG(US_PGNPNO)) = UP1*LOG(US_CU*0.01)+UP2*DEL(1 : LOG(US_CU))-(1-UP3
        )*UP2*DEL(1 : LOG(US_CU(-1)))+(1-UP3)*DEL(1 : LOG(US_PGNPNO(-1)))+UP3*(UP4*
        US_PI(1)+(1-UP4)*US_PI)+RES_US_PGNP

   Non-oil GNP deflator:
33:UPNO US_PGNPNO = (US_GDP*US_PGNP-US_PRODOIL*POIL)/(US_GDP-US_PRODOIL)

   Nominal GNP identity (solves for absorption deflator):
34:UP   US_PGNP*US_GNP = US_P*US_A+US_XT*US_PXT-US_IT*US_PIT+US_R*US_NFA(-1)+
        RES_US_P

   Inflation rate (absorption deflator) - annual rate:
35:UPI  US_PI = US_P/US_P(-1)-1

   Prices in foreign markets:
36:UPFM LOG(US_PFM) = W12*LOG(JA_PXM*JA_ER/JE80)+W13*LOG(GR_PXM*GR_ER/GE80)+W14*LOG(
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          LI_PXM*LI_ER/LE80)+W15*LOG(SI_PXM*SI_ER/SE80)+W16*LOG(RW_PXM*RW_ER/RE80)

   Non-fuel export prices:
37:UPXM   DEL(1 : LOG(US_PXM)) = UPXM0+UPXM1*DEL(1 : LOG(US_PGNPNO))+(1-UPXM1)*DEL(1
           : LOG(US_PFM))+UPXM2*LOG(US_PGNPNO(-1)/US_PXM(-1))+RES_US_PXM

   Total exports price:
38:UPXT   US_PXT = (US_XMA*US_PXM+POIL*US_XOIL)/US_XT

   Manufactured import prices:
39:UPIM   US_PIM = S11*US_PXM+S21*JA_PXM*JA_ER/JE80+S31*GR_PXM*GR_ER/GE80+S41*LI_PXM*
          LI_ER/LE80+S51*SI_PXM*SI_ER/SE80+S61*RW_PXM*RW_ER/RE80+RES_US_PIM

   Import prices-adjusted for (nominal) world trade discrepancy:
40:UPIMA  US_PIMA = US_PIM+T1*WTRADE/US_IM

   Total imports price:
41:UPIT   US_PIT = (US_IM*US_PIMA+US_IOIL*POIL+US_ICOM*PCOM)/US_IT

   Production function (capacity output):
42:UYCAP  LOG(US_YCAP) = LOG(1+UN)*T*(1-UBETA)+LOG(US_K(-1))*UBETA+RES_US_YCAP

   Capacity utilization:
43:UCU    US_CU = 100*US_GDP/US_YCAP

   V. International Accounts

   Balance of payments (claims on foreigners), current $:
44:UNFA   DEL(1 : US_NFA) = US_XT*US_PXT-(US_IM*US_PIMA+US_IOIL*POIL+US_ICOM*PCOM)+
          US_R*US_NFA(-1)+RES_US_NFA

   Current account - current dollar:
45:UCAB   US_CURBAL = DEL(1 : US_NFA)

   Normalized value of the US$ exchange rate:
46:UER    US_ER = 1

   Competitiveness of Man. exports:
47:UREER  US_REER = (-W11)*LOG(US_PXM)+(-W12)*LOG(JA_PXM*JA_ER/JE80)+(-W13)*LOG(GR_PXM
          *GR_ER/GE80)+(-W14)*LOG(LI_PXM*LI_ER/LE80)+(-W15)*LOG(SI_PXM*SI_ER/SE80)+(-
          W16)*LOG(RW_PXM*RW_ER/RE80)

   Nominal effective exchange rate:
48:UMERM  US_MERM = EXP((-V12)*LOG(JA_ER/JE80)+(-V13)*LOG(GR_ER/GE80)+(-V14)*LOG(LI_ER
          /LE80)+(-V15)*LOG(SI_ER/SE80))

   Foreign export markets for manufact. (using fixed shares):
49:UFM    US_FM = S11*US_IM+S12*(JA_IM*JE80)+S13*(GR_IM*GE80)+S14*(LI_IM*LE80)+S15*(
          SI_IM*SE80)+S16*(RW_IM*RE80)

   ******************
    MODEL FOR JA
   ******************


   I. Aggregate Demand

   Consumption expenditure:
50:JC     DEL(1 : LOG(JA_C)) = JC0+JC1*LOG(JA_W(-1)/JA_C(-1))+JC2*DEL(1 : JA_RLR)+JC3*
          DEL(1 : LOG(JA_YD))+RES_JA_C

   Consumption of oil:
51:JCOIL  DEL(1 : LOG(JA_COIL)) = JCOIL0+JCOIL1*DEL(1 : LOG(JA_GDP))+JCOIL2*DEL(1 :
          LOG(POIL/JA_ER*JE80/JA_PGNP))+JCOIL3*LOG(POIL(-1)/JA_ER(-1)*JE80/JA_PGNP(-1)
          )+JCOIL4*LOG(JA_GDP(-1)/JA_COIL(-1))+RES_JA_COIL

   Change in the capital stock:
52:JK     DEL(1 : LOG(JA_K)) = JK1*LOG(JA_GDP(-1)/JA_K(-1))+JK2*DEL(1 : LOG(JA_GDP))+
          JK3*JA_UCSTCAP+JK0+JK4*DUM74+RES_JA_K

   Real gross investment:
53:JINV   JA_INVEST = DEL(1 : JA_K)+JA_DELTA*JA_K(-1)+RES_JA_INVEST

   Manufactured exports - real:
54:JXM    LOG(JA_XM) = JX0+JX1*LOG(JA_FM)+JX2*JA_REER+JX3*JA_REER(-1)+RES_JA_XM

   Man. exports - real, adjusted for real world trade discrepancy:
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55:JXA     JA_XMA = JA_XM+T2*WTRADER/JE80

   Total exports:
56:JXT     JA_XT = JA_XMA+JA_XOIL+RES_JA_XT

   Imports of manufactures - real:
57:JIM     LOG(JA_IM) = JI0+JI1*LOG(JA_A)+JI2*LOG(JA_A(-1))+JI3*LOG(JA_PIMA/JA_PGNPNO)+
           JI4*T+JI5*LOG(JA_IM(-1))+RES_JA_IM

   Imports of oil:
58:JIOIL   JA_IOIL = JA_COIL+JA_XOIL-JA_PRODOIL+RES_JA_IOIL

   Imports of primary commodities (from RW only):
59:JIC     DEL(1 : LOG(JA_ICOM)) = JIC0+JIC2*DEL(1 : LOG(PCOM/JA_ER/JA_PGNP))+JIC1*DEL(
           1 : LOG(JA_GDP))+JIC3*LOG(PCOM(-1)/JA_ER(-1)/JA_PGNP(-1))+JIC4*LOG(JA_GDP(-1
           ))+JIC5*LOG(JA_ICOM(-1))+RES_JA_ICOM

   Total Imports:
60:JIT     JA_IT = JA_IM+JA_IOIL+JA_ICOM+RES_JA_IT

   Definition of domestic absorption:
61:JA      JA_A = JA_C+JA_INVEST+JA_G+RES_JA_A

   Real GDP identity:
62:JGDP    JA_GDP = JA_A+JA_XT-JA_IT+RES_JA_GDP

   Definition of real GNP:
63:JGNP    JA_GNP = JA_GDP+US_R*JA_NFA(-1)/JA_ER/JA_PGNP+RES_JA_GNP

   Net National Product:
64:JNNP    JA_NNP = JA_GDP-JA_DELTA*JA_K(-1)

   Capacity Net National Product:
65:JNNPC   JA_NNPCAP = JA_YCAP-JA_DELTA*JA_K(-1)

   Real Wealth (Financial plus discounted future income):
66:JW      JA_W = JLAMBDAM*JA_M/JA_P+0.5*(1+SUM(I = -3 TO -1 : US_RL(I)/3)/US_RL)*
           JA_NFA/JA_ER/JA_P+JA_NNPCAP*(1-JGBAR)*JRHOBAR*(1/JRRBAR+(JA_CU*0.01-1)/(
           JRRBAR+JW1)+(JA_PGNP/JA_P/JRHOBAR-1)/(JRRBAR+JW2)-(JA_RSR-JRRBAR)/(JRRBAR+
           JW3)-((JA_G*JA_P+JA_GEXOG)/(JA_NNP*JA_PGNP)-JGBAR)/(1-JGBAR)/(JRRBAR+JW4))+
           RES_JA_W

   Real disposable income:
67:JYD     JA_YD = JA_GDP*JA_PGNP/JA_P-JA_DELTA*JA_K(-1)-JA_TAX/JA_P+JA_R*JA_B(-1)/JA_P
           +US_R*JA_NFA(-1)/JA_ER/JA_P-(1-JLAMBDAB)*DEL(1 : JA_B)/JA_P

   II. Government Sector

   Total government expenditures - nominal:
68:JGE     JA_GE = JA_P*JA_G+JA_R*JA_B(-1)+JA_GEXOG

   Government tax receipts:
69:JTAX    JA_TAX = JA_TRATE*(JA_PGNP*JA_GNP-JA_DELTA*JA_K(-1)*JA_P+JA_R*JA_B(-1))+
           RES_JA_TAX

   Average tax rate (reaction function):
70:JTRATE DEL(1 : JA_TRATE) = TAU1*DUM*(JA_B(-1)/JA_PGNP(-1)/JA_GNP(-1)-JA_BRATIO)+
           TAU2*DUM*DEL(1 : JA_B(-1)/JA_PGNP(-1)/JA_GNP(-1))+RES_JA_TRATE

   Government balance sheet identity (solves for government debt):
71:JB      DEL(1 : JA_B)+DEL(1 : JA_M) = JA_R*JA_B(-1)+(JA_P*JA_G-JA_TAX+JA_GEXOG)+
           RES_JA_B

   Definition of nominal government deficit:
72:JGDEF   JA_GDEF = DEL(1 : JA_B+JA_M)

   III. Money and Interest Rates

   Money demand function (M):
73:JM      LOG(JA_M/JA_P) = JM0+JM1*LOG(JA_GNP)+JM2*JA_RS+JM3*JA_RS(-1)+JM4*LOG(JA_M(-1
           )/JA_P(-1))+RES_JA_M

   Money supply reaction function :
74:JRS     DEL(1 : JA_RS) = JR1*(((1-JM4)*LOG(JA_MT/JA_P)-JM1*LOG(JA_GNP)-JM0-RES_JA_M)
           /(JM2+JM3)-JA_RS(-1))+RES_JA_RS

   Term structure of interest rates (solves for long term rate):
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75:JRL     JA_RS/100 = JA_RL/100-(JA_RL(1)/JA_RL-1)+RES_JA_RL

   Average interest rate - lagged, annual rate:
76:JR      JA_R = 0.5*JA_RS(-1)/100+0.5*SUM(I = -3 TO -1 : JA_RL(I)/100)/3

   Real long term interest rate (ex ante):
77:JRLR    JA_RLR = (1+JA_RL/100)/(1+0.1*JA_PI(1)+0.9*JA_PIBAR)-1

   Real ex ante short rate:
78:JRSR    JA_RSR = (1+JA_RS/100)/(1+JA_PI(1))-1

   Real user cost of capital:
79:JUCST   JA_UCSTCAP = (JA_DELTA+(1-JA_CTRATE)*JA_RL/100-0.1*JA_PI(1)-0.9*JA_PIBAR)*(1
           -JA_TXCRED-JA_CTRATE*0.2/(JA_RL/100+0.2))/(1-JA_CTRATE)

   IV. Prices and Supply

   Price level (GNP deflator):
80:JPGNP   DEL(1 : LOG(JA_PGNPNO)) = JP1*LOG(JA_CU*0.01)+JP2*DEL(1 : LOG(JA_CU))-(1-JP3
           )*JP2*DEL(1 : LOG(JA_CU(-1)))+(1-JP3)*DEL(1 : LOG(JA_PGNPNO(-1)))+JP3*(JP4*
           JA_PI(1)+(1-JP4)*JA_PI)+RES_JA_PGNP

   Non-oil GNP deflator:
81:JPNO    JA_PGNPNO = (JA_GDP*JA_PGNP-JA_PRODOIL*POIL/JA_ER*JE80)/(JA_GDP-JA_PRODOIL)

   Nominal GNP identity (solves for absorption deflator):
82:JP      JA_PGNP*JA_GNP = JA_P*JA_A+JA_XT*JA_PXT-JA_IT*JA_PIT+US_R*JA_NFA(-1)/JA_ER+
           RES_JA_P

   Inflation rate (absorption deflator) - annual rate:
83:JPI     JA_PI = JA_P/JA_P(-1)-1

   Prices in foreign markets:
84:JPFM    LOG(JA_PFM) = W21*LOG(US_PXM)+W22*LOG(JA_ER/JE80)+W23*LOG(GR_PXM*GR_ER/GE80)
           +W24*LOG(LI_PXM*LI_ER/LE80)+W25*LOG(SI_PXM*SI_ER/SE80)+W26*LOG(RW_PXM*RW_ER/
           RE80)

   Non-fuel export prices:
85:JPXM    DEL(1 : LOG(JA_PXM)) = JPXM0+JPXM1*DEL(1 : LOG(JA_PGNPNO))+(1-JPXM1)*DEL(1
            : LOG(JA_PFM))+JPXM2*LOG(JA_PGNPNO(-1)/JA_PXM(-1))+RES_JA_PXM

   Total exports price:
86:JPXT    JA_PXT = (JA_XMA*JA_PXM+POIL/JA_ER*JE80*JA_XOIL)/JA_XT

   Manufactured import prices:
87:JPIM    JA_PIM = (S12*US_PXM+S22*(JA_PXM*JA_ER/JE80)+S32*(GR_PXM*GR_ER/GE80)+S42*(
           LI_PXM*LI_ER/LE80)+S52*(SI_PXM*SI_ER/SE80)+S62*(RW_PXM*RW_ER/RE80))/JA_ER*
           JE80+RES_JA_PIM

   Import prices-adjusted for (nominal) world trade discrepancy:
88:JPIMA   JA_PIMA = JA_PIM+T2*WTRADE/JA_ER/JA_IM

   Total imports price:
89:JPIT    JA_PIT = (JA_IM*JA_PIMA+JA_IOIL*POIL/JA_ER*JE80+JA_ICOM*PCOM/JA_ER*JE80)/
           JA_IT

   Production function (capacity output):
90:JYCAP   LOG(JA_YCAP) = LOG(1+JN)*T*(1-JBETA)+LOG(JA_K(-1))*JBETA+RES_JA_YCAP

   Capacity utilization:
91:JCU     JA_CU = 100*JA_GDP/JA_YCAP

   V. International Accounts

   Balance of payments (claims on foreigners), current $:
92:JNFA    DEL(1 : JA_NFA) = (JA_XT*JA_PXT-(JA_IM*JA_PIMA+JA_IOIL*POIL/JA_ER*JE80+
           JA_ICOM*PCOM/JA_ER*JE80))*JA_ER+US_R*JA_NFA(-1)+RES_JA_NFA

   Current account - local currency:
93:JCABL   JA_CURBALL = US_R*JA_NFA(-1)/JA_ER+(JA_XT*JA_PXT-(JA_IM*JA_PIMA+JA_IOIL*POIL
           /JA_ER*JE80+JA_ICOM*PCOM/JA_ER*JE80))

   Current account - current dollar:
94:JCAB    JA_CURBAL = DEL(1 : JA_NFA)

   Open interest party condition (solves for exchange rate):
95:JER     1+US_RS/100 = (1+JA_RS/100)*(JA_ER(1)/JA_ER)+RES_JA_ER
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   Competitiveness of Man. exports:
96:JREER  JA_REER = (-W21)*LOG(US_PXM)+(-W22)*LOG(JA_PXM*JA_ER/JE80)+(-W23)*LOG(GR_PXM
          *GR_ER/GE80)+(-W24)*LOG(LI_PXM*LI_ER/LE80)+(-W25)*LOG(SI_PXM*SI_ER/SE80)+(-
          W26)*LOG(RW_PXM*RW_ER/RE80)

   Nominal effective exchange rate:
97:JMERM  JA_MERM = EXP((-V22)*LOG(JA_ER/JE80)+(-V23)*LOG(GR_ER/GE80)+(-V24)*LOG(LI_ER
          /LE80)+(-V25)*LOG(SI_ER/SE80))

   Foreign export markets for manufact. (using fixed shares):
98:JFM    JA_FM = (S21*US_IM+S22*(JA_IM*JE80)+S23*(GR_IM*GE80)+S24*(LI_IM*LE80)+S25*(
          SI_IM*SE80)+S26*(RW_IM*RE80))/JE80

   *****************
    MODEL FOR GR
   *****************


   I. Aggregate Demand

   Consumption expenditure:
99:GC     DEL(1 : LOG(GR_C)) = GC0+GC1*LOG(GR_W(-1)/GR_C(-1))+GC2*DEL(1 : JA_RLR)+GC3*
          DEL(1 : LOG(GR_YD))+RES_GR_C

   Consumption of oil:
100:GCOIL DEL(1 : LOG(GR_COIL)) = GCOIL0+GCOIL1*DEL(1 : LOG(GR_GDP))+GCOIL2*DEL(1 :
          LOG(POIL/GR_ER*GE80/GR_PGNP))+GCOIL3*LOG(POIL(-1)/GR_ER(-1)*GE80/GR_PGNP(-1)
          )+GCOIL4*LOG(GR_GDP(-1)/GR_COIL(-1))+RES_GR_COIL

   Change in the capital stock:
101:GK    DEL(1 : LOG(GR_K)) = GK1*LOG(GR_GDP(-1)/GR_K(-1))+GK2*DEL(1 : LOG(GR_GDP))+
          GK3*GR_UCSTCAP+GK0+GK4*DUM74+RES_GR_K

   Real gross investment:
102:GINV  GR_INVEST = DEL(1 : GR_K)+GR_DELTA*GR_K(-1)+RES_GR_INVEST

   Manufactured exports - real:
103:GXM   LOG(GR_XM) = GX0+GX1*LOG(GR_FM)+GX2*GR_REER+GX3*GR_REER(-1)+RES_GR_XM

   Man. exports - real, adjusted for real world trade discrepancy:
104:GXA   GR_XMA = GR_XM+T3*WTRADER/GE80

   Total exports:
105:GXT   GR_XT = GR_XMA+GR_XOIL+RES_GR_XT

   Imports of manufactures - real:
106:GIM   LOG(GR_IM) = GI0+GI1*LOG(GR_A)+GI2*LOG(GR_A(-1))+GI3*LOG(GR_PIMA/GR_PGNPNO)+
          GI4*T+GI5*LOG(GR_IM(-1))+RES_GR_IM

   Imports of oil:
107:GIOIL GR_IOIL = GR_COIL+GR_XOIL-GR_PRODOIL+RES_GR_IOIL

   Imports of primary commodities (from RW only):
108:GIC   DEL(1 : LOG(GR_ICOM)) = GIC0+GIC2*DEL(1 : LOG(PCOM/GR_ER/GR_PGNP))+GIC1*DEL(
          1 : LOG(GR_GDP))+GIC3*LOG(PCOM(-1)/GR_ER(-1)/GR_PGNP(-1))+GIC4*LOG(GR_GDP(-1
          ))+GIC5*LOG(GR_ICOM(-1))+RES_GR_ICOM

   Total Imports:
109:GIT   GR_IT = GR_IM+GR_IOIL+GR_ICOM+RES_GR_IT

   Definition of domestic absorption:
110:GA    GR_A = GR_C+GR_INVEST+GR_G+RES_GR_A

   Real GDP identity:
111:GGDP  GR_GDP = GR_A+GR_XT-GR_IT+RES_GR_GDP

   Definition of real GNP:
112:GGNP  GR_GNP = GR_GDP+US_R*GR_NFA(-1)/GR_ER/GR_PGNP+RES_GR_GNP

   Net National Product:
113:GNNP  GR_NNP = GR_GDP-GR_DELTA*GR_K(-1)

   Capacity Net National Product:
114:GNNPC GR_NNPCAP = GR_YCAP-GR_DELTA*GR_K(-1)

   Real Wealth (Financial plus discounted future income):
```

```
115:GW      GR_W = GLAMBDAM*GR_M/GR_P+0.5*(1+SUM(I = -3 TO -1 : US_RL(I)/3)/US_RL)*
            GR_NFA/GR_ER/GR_P+GR_NNPCAP*(1-GGBAR)*GRHOBAR*(1/GRRBAR+(GR_CU*0.01-1)/(
            GRRBAR+GW1)+(GR_PGNP/GR_P/GRHOBAR-1)/(GRRBAR+GW2)-(GR_RSR-GRRBAR)/(GRRBAR+
            GW3)-((GR_G*GR_P+GR_GEXOG)/(GR_NNP*GR_PGNP)-GGBAR)/(1-GGBAR)/(GRRBAR+GW4))+
            RES_GR_W

    Real disposable income:
116:GYD     GR_YD = GR_GDP*GR_PGNP/GR_P-GR_DELTA*GR_K(-1)-GR_TAX/GR_P+GR_R*GR_B(-1)/GR_P
            +US_R*GR_NFA(-1)/GR_ER/GR_P-(1-GLAMBDAB)*DEL(1 : GR_B)/GR_P

    II. Government Sector

    Total government expenditures - nominal:
117:GGE     GR_GE = GR_P*GR_G+GR_R*GR_B(-1)+GR_GEXOG

    Government tax receipts:
118:GTAX    GR_TAX = GR_TRATE*(GR_PGNP*GR_GNP-GR_DELTA*GR_K(-1)*GR_P+GR_R*GR_B(-1))+
            RES_GR_TAX

    Average tax rate (reaction function):
119:GTRATE  DEL(1 : GR_TRATE) = TAU1*DUM*(GR_B(-1)/GR_PGNP(-1)/GR_GNP(-1)-GR_BRATIO)+
            TAU2*DUM*DEL(1 : GR_B(-1)/GR_PGNP(-1)/GR_GNP(-1))+RES_GR_TRATE

    Government balance sheet identity (solves for government debt):
120:GB      DEL(1 : GR_B)+DEL(1 : GR_M) = GR_R*GR_B(-1)+(GR_P*GR_G-GR_TAX+GR_GEXOG)+
            RES_GR_B

    Definition of nominal government deficit:
121:GGDEF   GR_GDEF = DEL(1 : GR_B+GR_M)

    III. Money and Interest Rates

    Money demand function (M):
122:GM      LOG(GR_M/GR_P) = GM0+GM1*LOG(GR_GNP)+GM2*GR_RS+GM3*GR_RS(-1)+GM4*LOG(GR_M(-1
            )/GR_P(-1))+RES_GR_M

    Money supply reaction function :
123:GRS     DEL(1 : GR_RS) = GR1*(((1-GM4)*LOG(GR_MT/GR_P)-GM1*LOG(GR_GNP)-GM0-RES_GR_M)
            /(GM2+GM3)-GR_RS(-1))+RES_GR_RS

    Term structure of interest rates (solves for long term rate):
124:GRL     GR_RS/100 = GR_RL/100-(GR_RL(1)/GR_RL-1)+RES_GR_RL

    Average interest rate - lagged, annual rate:
125:GR      GR_R = 0.5*GR_RS(-1)/100+0.5*SUM(1 = -3 TO -1 : GR_RL(I)/100)/3

    Real long term interest rate (ex ante):
126:GRLR    GR_RLR = (1+GR_RL/100)/(1+0.1*GR_PI(1)+0.9*GR_PIBAR)-1

    Real ex ante short rate:
127:GRSR    GR_RSR = (1+GR_RS/100)/(1+GR_PI(1))-1

    Real user cost of capital:
128:GUCST   GR_UCSTCAP = (GR_DELTA+(1-GR_CTRATE)*GR_RL/100-0.1*GR_PI(1)-0.9*GR_PIBAR)*(1
            -GR_TXCRED-GR_CTRATE*0.2/(GR_RL/100+0.2))/(1-GR_CTRATE)

    IV. Prices and Supply

    Price level (GNP deflator):
129:GPGNP   DEL(1 : LOG(GR_PGNPNO)) = GP1*LOG(GR_CU*0.01)+GP2*DEL(1 : LOG(GR_CU))-(1-GP3
            )*GP2*DEL(1 : LOG(GR_CU(-1)))+(1-GP3)*DEL(1 : LOG(GR_PGNPNO(-1)))+GP3*(GP4*
            GR_PI(1)+(1-GP4)*GR_PI)+RES_GR_PGNP

    Non-oil GNP deflator:
130:GPNO    GR_PGNPNO = (GR_GDP*GR_PGNP-GR_PRODOIL*POIL/GR_ER*GE80)/(GR_GDP-GR_PRODOIL)

    Nominal GNP identity (solves for absorption deflator):
131:GP      GR_PGNP*GR_GNP = GR_P*GR_A+GR_XT*GR_PXT-GR_IT*GR_PIT+US_R*GR_NFA(-1)/GR_ER+
            RES_GR_P

    Inflation rate (absorption deflator) - annual rate:
132:GPI     GR_PI = GR_P/GR_P(-1)-1

    Prices in foreign markets:
133:GPFM    LOG(GR_PFM) = W31*LOG(US_PXM)+W32*LOG(JA_PXM*JA_ER/JE80)+W33*LOG(GR_ER/GE80)
            +W34*LOG(LI_PXM*LI_ER/LE80)+W35*LOG(SI_PXM*SI_ER/SE80)+W36*LOG(RW_PXM*RW_ER/
            RE80)
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    Non-fuel export prices:
134:GPXM    DEL(1 : LOG(GR_PXM)) = GPXM0+GPXM1*DEL(1 : LOG(GR_PGNPNO))+(1-GPXM1)*DEL(1
             : LOG(GR_PFM))+GPXM2*LOG(GR_PGNPNO(-1)/GR_PXM(-1))+RES_GR_PXM

    Total exports price:
135:GPXT    GR_PXT = (GR_XMA*GR_PXM+POIL/GR_ER*GE80*GR_XOIL)/GR_XT

    Manufactured import prices:
136:GPIM    GR_PIM = (S13*US_PXM+S23*(JA_PXM*JA_ER/JE80)+S33*(GR_PXM*GR_ER/GE80)+S43*(
            LI_PXM*LI_ER/LE80)+S53*(SI_PXM*SI_ER/SE80)+S63*(RW_PXM*RW_ER/RE80))/GR_ER*
            GE80+RES_GR_PIM

    Import prices-adjusted for (nominal) world trade discrepancy:
137:GPIMA   GR_PIMA = GR_PIM+T3*WTRADE/GR_ER/GR_IM

    Total imports price:
138:GPIT    GR_PIT = (GR_IM*GR_PIMA+GR_IOIL*POIL/GR_ER*GE80+GR_ICOM*PCOM/GR_ER*GE80)/
            GR_IT

    Production function (capacity output):
139:GYCAP   LOG(GR_YCAP) = LOG(1+GN)*T*(1-GBETA)+LOG(GR_K(-1))*GBETA+RES_GR_YCAP

    Capacity utilization:
140:GCU     GR_CU = 100*GR_GDP/GR_YCAP

    V. International Accounts

    Balance of payments (claims on foreigners), current $:
141:GNFA    DEL(1 : GR_NFA) = (GR_XT*GR_PXT-(GR_IM*GR_PIMA+GR_IOIL*POIL/GR_ER*GE80+
            GR_ICOM*PCOM/GR_ER*GE80))*GR_ER+US_R*GR_NFA(-1)+RES_GR_NFA

    Current account - local currency:
142:GCABL   GR_CURBALL = US_R*GR_NFA(-1)/GR_ER+(GR_XT*GR_PXT-(GR_IM*GR_PIMA+GR_IOIL*POIL
            /GR_ER*GE80+GR_ICOM*PCOM/GR_ER*GE80))

    Current account - current dollar:
143:GCAB    GR_CURBAL = DEL(1 : GR_NFA)

    Open interest party condition (solves for exchange rate):
144:GER     1+US_RS/100 = (1+GR_RS/100)*(GR_ER(1)/GR_ER)+RES_GR_ER

    Competitiveness of Man. exports:
145:GREER   GR_REER = (-W31)*LOG(US_PXM)+(-W32)*LOG(JA_PXM*JA_ER/JE80)+(-W33)*LOG(GR_PXM
            *GR_ER/GE80)+(-W34)*LOG(LI_PXM*LI_ER/LE80)+(-W35)*LOG(SI_PXM*SI_ER/SE80)+(-
            W36)*LOG(RW_PXM*RW_ER/RE80)

    Nominal effective exchange rate:
146:GMERM   GR_MERM = EXP((-V32)*LOG(JA_ER/JE80)+(-V33)*LOG(GR_ER/GE80)+(-V34)*LOG(LI_ER
            /LE80)+(-V35)*LOG(SI_ER/SE80))

    Foreign export markets for manufact. (using fixed shares):
147:GFM     GR_FM = (S31*US_IM+S32*(JA_IM*JE80)+S33*(GR_IM*GE80)+S34*(LI_IM*LE80)+S35*(
            SI_IM*SE80)+S36*(RW_IM*RE80))/GE80

    ******************
     MODEL FOR LI
    ******************


    I. Aggregate Demand

    Consumption expenditure:
148:LC      DEL(1 : LOG(LI_C)) = LC0+LC1*LOG(LI_W(-1)/LI_C(-1))+LC2*DEL(1 : LI_RLR)+LC3*
            DEL(1 : LOG(LI_YD))+RES_LI_C

    Consumption of oil:
149:LCOIL   DEL(1 : LOG(LI_COIL)) = LCOIL0+LCOIL1*DEL(1 : LOG(LI_GDP))+LCOIL2*DEL(1 :
            LOG(POIL/LI_ER*LE80/LI_PGNP))+LCOIL3*LOG(POIL(-1)/LI_ER(-1)*LE80/LI_PGNP(-1)
            )+LCOIL4*LOG(LI_GDP(-1)/LI_COIL(-1))+RES_LI_COIL

    Change in the capital stock:
150:LK      DEL(1 : LOG(LI_K)) = LK1*LOG(LI_GDP(-1)/LI_K(-1))+LK2*DEL(1 : LOG(LI_GDP))+
            LK3*LI_UCSTCAP+LK0+LK4*DUM74+RES_LI_K

    Real gross investment:
151:LINV    LI_INVEST = DEL(1 : LI_K)+LI_DELTA*LI_K(-1)+RES_LI_INVEST
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    Manufactured exports - real:
152:LXM     LOG(LI_XM) = LX0+LX1*LOG(LI_FM)+LX2*LI_REER+LX3*LI_REER(-1)+RES_LI_XM

    Man. exports - real, adjusted for real world trade discrepancy:
153:LXA     LI_XMA = LI_XM+T4*WTRADER/LE80

    Total exports:
154:LXT     LI_XT = LI_XMA+LI_XOIL+RES_LI_XT

    Imports of manufactures - real:
155:LIM     LOG(LI_IM) = LI0+LI1*LOG(LI_A)+LI2*LOG(LI_A(-1))+LI3*LOG(LI_PIMA/LI_PGNPNO)+
            LI4*T+LI5*LOG(LI_IM(-1))+RES_LI_IM

    Imports of oil:
156:LIOIL   LI_IOIL = LI_COIL+LI_XOIL-LI_PRODOIL+RES_LI_IOIL

    Imports of primary commodities (from RW only):
157:LIC     DEL(1 : LOG(LI_ICOM)) = LIC0+LIC2*DEL(1 : LOG(PCOM/LI_ER/LI_PGNP))+LIC1*DEL(
            1 : LOG(LI_GDP))+LIC3*LOG(PCOM(-1)/LI_ER(-1)/LI_PGNP(-1))+LIC4*LOG(LI_GDP(-1
            ))+LIC5*LOG(LI_ICOM(-1))+RES_LI_ICOM

    Total Imports:
158:LIT     LI_IT = LI_IM+LI_IOIL+LI_ICOM+RES_LI_IT

    Definition of domestic absorption:
159:LA      LI_A = LI_C+LI_INVEST+LI_G+RES_LI_A

    Real GDP identity:
160:LGDP    LI_GDP = LI_A+LI_XT-LI_IT+RES_LI_GDP

    Definition of real GNP:
161:LGNP    LI_GNP = LI_GDP+US_R*LI_NFA(-1)/LI_ER/LI_PGNP+RES_LI_GNP

    Net National Product:
162:LNNP    LI_NNP = LI_GDP-LI_DELTA*LI_K(-1)

    Capacity Net National Product:
163:LNNPC   LI_NNPCAP = LI_YCAP-LI_DELTA*LI_K(-1)

    Real Wealth (Financial plus discounted future income):
164:LW      LI_W = LLAMBDAM*LI_M/LI_P+0.5*(1+SUM(I = -3 TO -1 : US_RL(I)/3)/US_RL)*
            LI_NFA/LI_ER/LI_P+LI_NNPCAP*(1-LGBAR)*LRHOBAR*(1/LRRBAR+(LI_CU*0.01-1)/(
            LRRBAR+LW1)+(LI_PGNP/LI_P/LRHOBAR-1)/(LRRBAR+LW2)-(LI_RSR-LRRBAR)/(LRRBAR+
            LW3)-((LI_G*LI_P+LI_GEXOG)/(LI_NNP*LI_PGNP)-LGBAR)/(1-LGBAR)/(LRRBAR+LW4))+
            RES_LI_W

    Real disposable income:
165:LYD     LI_YD = LI_GDP*LI_PGNP/LI_P-LI_DELTA*LI_K(-1)-LI_TAX/LI_P+LI_R*LI_B(-1)/LI_P
            +US_R*LI_NFA(-1)/LI_ER/LI_P-(1-LLAMBDAB)*DEL(1 : LI_B)/LI_P

    II. Government Sector

    Total government expenditures - nominal:
166:LGE     LI_GE = LI_P*LI_G+LI_R*LI_B(-1)+LI_GEXOG

    Government tax receipts:
167:LTAX    LI_TAX = LI_TRATE*(LI_PGNP*LI_GNP-LI_DELTA*LI_K(-1)*LI_P+LI_R*LI_B(-1))+
            RES_LI_TAX

    Average tax rate (reaction function):
168:LTRATE DEL(1 : LI_TRATE) = TAU1*DUM*(LI_B(-1)/LI_PGNP(-1)/LI_GNP(-1)-LI_BRATIO)+
            TAU2*DUM*DEL(1 : LI_B(-1)/LI_PGNP(-1)/LI_GNP(-1))+RES_LI_TRATE

    Government balance sheet identity (solves for government debt):
169:LB      DEL(1 : LI_B)+DEL(1 : LI_M) = LI_R*LI_B(-1)+(LI_P*LI_G-LI_TAX+LI_GEXOG)+
            RES_LI_B

    Definition of nominal government deficit:
170:LGDEF   LI_GDEF = DEL(1 : LI_B+LI_M)

    III. Money and Interest Rates

    Money demand function (M):
171:LM      LOG(LI_M/LI_P) = LM0+LM1*LOG(LI_GNP)+LM2*LI_RS+LM3*LI_RS(-1)+LM4*LOG(LI_M(-1
            )/LI_P(-1))+RES_LI_M
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    Money supply reaction function :
172:LRS     DEL(1 : LI_RS) = LR1*(((1-LM4)*LOG(LI_MT/LI_P)-LM1*LOG(LI_GNP)-LM0-RES_LI_M)
            /(LM2+LM3)-LI_RS(-1))+RES_LI_RS

    Term structure of interest rates (solves for long term rate):
173:LRL     LI_RS/100 = LI_RL/100-(LI_RL(1)/LI_RL-1)+RES_LI_RL

    Average interest rate - lagged, annual rate:
174:LR      LI_R = 0.5*LI_RS(-1)/100+0.5*SUM(I = -3 TO -1 : LI_RL(I)/100)/3

    Real long term interest rate (ex ante):
175:LRLR    LI_RLR = (1+LI_RL/100)/(1+0.1*LI_PI(1)+0.9*LI_PIBAR)-1

    Real ex ante short rate:
176:LRSR    LI_RSR = (1+LI_RS/100)/(1+LI_PI(1))-1

    Real user cost of capital:
177:LUCST   LI_UCSTCAP = (LI_DELTA+(1-LI_CTRATE)*LI_RL/100-0.1*LI_PI(1)-0.9*LI_PIBAR)*(1
            -LI_TXCRED-LI_CTRATE*0.2/(LI_RL/100+0.2))/(1-LI_CTRATE)

    IV. Prices and Supply

    Price level (GNP deflator):
178:LPGNP   DEL(1 : LOG(LI_PGNPNO)) = LP1*LOG(LI_CU*0.01)+LP2*DEL(1 : LOG(LI_CU))-(1-LP3
            )*LP2*DEL(1 : LOG(LI_CU(-1)))+(1-LP3)*DEL(1 : LOG(LI_PGNPNO(-1)))+LP3*(LP4*
            LI_PI(1)+(1-LP4)*LI_PI)+RES_LI_PGNP

    Non-oil GNP deflator:
179:LPNO    LI_PGNPNO = (LI_GDP*LI_PGNP-LI_PRODOIL*POIL/LI_ER*LE80)/(LI_GDP-LI_PRODOIL)

    Nominal GNP identity (solves for absorption deflator):
180:LP      LI_PGNP*LI_GNP = LI_P*LI_A+LI_XT*LI_PXT-LI_IT*LI_PIT+US_R*LI_NFA(-1)/LI_ER+
            RES_LI_P

    Inflation rate (absorption deflator) - annual rate:
181:LPI     LI_PI = LI_P/LI_P(-1)-1

    Prices in foreign markets:
182:LPFM    LOG(LI_PFM) = W41*LOG(US_PXM)+W42*LOG(JA_PXM*JA_ER/JE80)+W43*LOG(GR_PXM*
            GR_ER/GE80)+W44*LOG(LI_ER/LE80)+W45*LOG(SI_PXM*SI_ER/SE80)+W46*LOG(RW_PXM*
            RW_ER/RE80)

    Non-fuel export prices:
183:LPXM    DEL(1 : LOG(LI_PXM)) = LPXM0+LPXM1*DEL(1 : LOG(LI_PGNPNO))+(1-LPXM1)*DEL(1
             : LOG(LI_PFM))+LPXM2*LOG(LI_PGNPNO(-1)/LI_PXM(-1))+RES_LI_PXM

    Total exports price:
184:LPXT    LI_PXT = (LI_XMA*LI_PXM+POIL/LI_ER*LE80*LI_XOIL)/LI_XT

    Manufactured import prices:
185:LPIM    LI_PIM = (S14*US_PXM+S24*(JA_PXM*JA_ER/JE80)+S34*(GR_PXM*GR_ER/GE80)+S44*(
            LI_PXM*LI_ER/LE80)+S54*(SI_PXM*SI_ER/SE80)+S64*(RW_PXM*RW_ER/RE80))/LI_ER*
            GE80+RES_LI_PIM

    Import prices-adjusted for (nominal) world trade discrepancy:
186:LPIMA   LI_PIMA = LI_PIM+T4*WTRADE/LI_ER/LI_IM

    Total imports price:
187:LPIT    LI_PIT = (LI_IM*LI_PIMA+LI_IOIL*POIL/LI_ER*LE80+LI_ICOM*PCOM/LI_ER*LE80)/
            LI_IT

    Production function (capacity output):
188:LYCAP   LOG(LI_YCAP) = LOG(1+LN)*T*(1-LBETA)+LOG(LI_K(-1))*LBETA+RES_LI_YCAP

    Capacity utilization:
189:LCU     LI_CU = 100*LI_GDP/LI_YCAP

    V. International Accounts

    Balance of payments (claims on foreigners), current $:
190:LNFA    DEL(1 : LI_NFA) = (LI_XT*LI_PXT-(LI_IM*LI_PIMA+LI_IOIL*POIL/LI_ER*LE80+
            LI_ICOM*PCOM/LI_ER*LE80))*LI_ER+US_R*LI_NFA(-1)+RES_LI_NFA

    Current account - local currency:
191:LCABL   LI_CURBALL = US_R*LI_NFA(-1)/LI_ER+(LI_XT*LI_PXT-(LI_IM*LI_PIMA+LI_IOIL*POIL
            /LI_ER*LE80+LI_ICOM*PCOM/LI_ER*LE80))
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    Current account - current dollar:
192:LCAB    LI_CURBAL = DEL(1 : LI_NFA)

    Open interest party condition (solves for exchange rate):
193:LER     1+US_RS/100 = (1+LI_RS/100)*(LI_ER(1)/LI_ER)+RES_LI_ER

    Competitiveness of Man. exports:
194:LREER   LI_REER = (-W41)*LOG(US_PXM)+(-W42)*LOG(JA_PXM*JA_ER/JE80)+(-W43)*LOG(GR_PXM
            *GR_ER/GE80)+(-W44)*LOG(LI_PXM*LI_ER/LE80)+(-W45)*LOG(SI_PXM*SI_ER/SE80)+(-
            W46)*LOG(RW_PXM*RW_ER/RE80)

    Nominal effective exchange rate:
195:LMERM   LI_MERM = EXP((-V42)*LOG(JA_ER/JE80)+(-V43)*LOG(GR_ER/GE80)+(-V44)*LOG(LI_ER
            /LE80)+(-V45)*LOG(SI_ER/SE80))

    Foreign export markets for manufact. (using fixed shares):
196:LFM     LI_FM = (S41*US_IM+S42*(JA_IM*JE80)+S43*(GR_IM*GE80)+S44*(LI_IM*LE80)+S45*(
            SI_IM*SE80)+S46*(RW_IM*RE80))/LE80

    *****************
     MODEL FOR SI
    *****************


    I. Aggregate Demand

    Consumption expenditure:
197:SC      DEL(1 : LOG(SI_C)) = SC0+SC1*LOG(SI_W(-1)/SI_C(-1))+SC2*DEL(1 : SI_RLR)+SC3*
            DEL(1 : LOG(SI_YD))+RES_SI_C

    Consumption of oil:
198:SCOIL   DEL(1 : LOG(SI_COIL)) = SCOIL0+SCOIL1*DEL(1 : LOG(SI_GDP))+SCOIL2*DEL(1 :
            LOG(POIL/SI_ER*SE80/SI_PGNP))+SCOIL3*LOG(POIL(-1)/SI_ER(-1)*SE80/SI_PGNP(-1)
            )+SCOIL4*LOG(SI_GDP(-1)/SI_COIL(-1))+RES_SI_COIL

    Change in the capital stock:
199:SK      DEL(1 : LOG(SI_K)) = SK1*LOG(SI_GDP(-1)/SI_K(-1))+SK2*DEL(1 : LOG(SI_GDP))+
            SK3*SI_UCSTCAP+SK0+SK4*DUM74+RES_SI_K

    Real gross investment:
200:SINV    SI_INVEST = DEL(1 : SI_K)+SI_DELTA*SI_K(-1)+RES_SI_INVEST

    Manufactured exports - real:
201:SXM     LOG(SI_XM) = SX0+SX1*LOG(SI_FM)+SX2*SI_REER+SX3*SI_REER(-1)+RES_SI_XM

    Man. exports - real, adjusted for real world trade discrepancy:
202:SXA     SI_XMA = SI_XM+T5*WTRADER/SE80

    Total exports:
203:SXT     SI_XT = SI_XMA+SI_XOIL+RES_SI_XT

    Imports of manufactures - real:
204:SIM     LOG(SI_IM) = SI0+SI1*LOG(SI_A)+SI2*LOG(SI_A(-1))+SI3*LOG(SI_PIMA/SI_PGNPN0)+
            SI4*T+SI5*LOG(SI_IM(-1))+RES_SI_IM

    Imports of oil:
205:SIOIL   SI_IOIL = SI_COIL+SI_XOIL-SI_PRODOIL+RES_SI_IOIL

    Imports of primary commodities (from RW only):
206:SIC     DEL(1 : LOG(SI_ICOM)) = SIC0+SIC2*DEL(1 : LOG(PCOM/SI_ER/SI_PGNP))+SIC1*DEL(
            1 : LOG(SI_GDP))+SIC3*LOG(PCOM(-1)/SI_ER(-1)/SI_PGNP(-1))+SIC4*LOG(SI_GDP(-1
            ))+SIC5*LOG(SI_ICOM(-1))+RES_SI_ICOM

    Total Imports:
207:SIT     SI_IT = SI_IM+SI_IOIL+SI_ICOM+RES_SI_IT

    Definition of domestic absorption:
208:SA      SI_A = SI_C+SI_INVEST+SI_G+RES_SI_A

    Real GDP identity:
209:SGDP    SI_GDP = SI_A+SI_XT-SI_IT+RES_SI_GDP

    Definition of real GNP:
210:SGNP    SI_GNP = SI_GDP+US_R*SI_NFA(-1)/SI_ER/SI_PGNP+RES_SI_GNP

    Net National Product:
211:SNNP    SI_NNP = SI_GDP-SI_DELTA*SI_K(-1)
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    Capacity Net National Product:
212:SNNPC  SI_NNPCAP = SI_VCAP-SI_DELTA*SI_K(-1)

    Real Wealth (Financial plus discounted future income):
213:SW     SI_W = SLAMBDAM*SI_M/SI_P+0.5*(1+SUM(I = -3 TO -1 : US_RL(I)/3)/US_RL)*
           SI_NFA/SI_ER/SI_P+SI_NNPCAP*(1-SGBAR)*SRHOBAR*(1/SRRBAR+(SI_CU*0.01-1)/(
           SRRBAR+SW1)+(SI_PGNP/SI_P/SRHOBAR-1)/(SRRBAR+SW2)-(SI_RSR-SRRBAR)/(SRRBAR+
           SW3)-((SI_G*SI_P+SI_GEXOG)/(SI_NNP*SI_PGNP)-SGBAR)/(1-SGBAR)/(SRRBAR+SW4))+
           RES_SI_W

    Real disposable income:
214:SYD    SI_YD = SI_GDP*SI_PGNP/SI_P-SI_DELTA*SI_K(-1)-SI_TAX/SI_P+SI_R*SI_B(-1)/SI_P
           +US_R*SI_NFA(-1)/SI_ER/SI_P-(1-SLAMBDAB)*DEL(1 : SI_B)/SI_P

    II. Government Sector

    Total government expenditures - nominal:
215:SGE    SI_GE = SI_P*SI_G+SI_R*SI_B(-1)+SI_GEXOG

    Government tax receipts:
216:STAX   SI_TAX = SI_TRATE*(SI_PGNP*SI_GNP-SI_DELTA*SI_K(-1)*SI_P+SI_R*SI_B(-1))+
           RES_SI_TAX

    Average tax rate (reaction function):
217:STRATE DEL(1 : SI_TRATE) = TAU1*DUM*(SI_B(-1)/SI_PGNP(-1)/SI_GNP(-1)-SI_BRATIO)+
           TAU2*DUM*DEL(1 : SI_B(-1)/SI_PGNP(-1)/SI_GNP(-1))+RES_SI_TRATE

    Government balance sheet identity (solves for government debt):
218:SB     DEL(1 : SI_B)+DEL(1 : SI_M) = SI_R*SI_B(-1)+(SI_P*SI_G-SI_TAX+SI_GEXOG)+
           RES_SI_B

    Definition of nominal government deficit:
219:SGDEF  SI_GDEF = DEL(1 : SI_B+SI_M)

    III. Money and Interest Rates

    Money demand function (M):
220:SM     LOG(SI_M/SI_P) = SM0+SM1*LOG(SI_GNP)+SM2*SI_RS+SM3*SI_RS(-1)+SM4*LOG(SI_M(-1
           )/SI_P(-1))+RES_SI_M

    Money supply reaction function :
221:SRS    DEL(1 : SI_RS) = SR1*(((1-SM4)*LOG(SI_MT/SI_P)-SM1*LOG(SI_GNP)-SM0-RES_SI_M)
           /(SM2+SM3)-SI_RS(-1))+RES_SI_RS

    Term structure of interest rates (solves for long term rate):
222:SRL    SI_RS/100 = SI_RL/100-(SI_RL(1)/SI_RL-1)+RES_SI_RL

    Average interest rate - lagged, annual rate:
223:SR     SI_R = 0.5*SI_RS(-1)/100+0.5*SUM(I = -3 TO -1 : SI_RL(I)/100)/3

    Real long term interest rate (ex ante):
224:SRLR   SI_RLR = (1+SI_RL/100)/(1+0.1*SI_PI(1)+0.9*SI_PIBAR)-1

    Real ex ante short rate:
225:SRSR   SI_RSR = (1+SI_RS/100)/(1+SI_PI(1))-1

    Real user cost of capital:
226:SUCST  SI_UCSTCAP = (SI_DELTA+(1-SI_CTRATE)*SI_RL/100-0.1*SI_PI(1)-0.9*SI_PIBAR)*(1
           -SI_TXCRED-SI_CTRATE*0.2/(SI_RL/100+0.2))/(1-SI_CTRATE)

    IV. Prices and Supply

    Price level (GNP deflator):
227:SPGNP  DEL(1 : LOG(SI_PGNPNO)) = SP1*LOG(SI_CU*0.01)+SP2*DEL(1 : LOG(SI_CU))-(1-SP3
           )*SP2*DEL(1 : LOG(SI_CU(-1)))+(1-SP3)*DEL(1 : LOG(SI_PGNPNO(-1)))+SP3*(SP4*
           SI_PI(1)+(1-SP4)*SI_PI)+RES_SI_PGNP

    Non-oil GNP deflator:
228:SPNO   SI_PGNPNO = (SI_GDP*SI_PGNP-SI_PRODOIL*POIL/SI_ER*SE80)/(SI_GDP-SI_PRODOIL)

    Nominal GNP identity (solves for absorption deflator):
229:SP     SI_PGNP*SI_GNP = SI_P*SI_A+SI_XT*SI_PXT-SI_IT*SI_PIT+US_R*SI_NFA(-1)/SI_ER+
           RES_SI_P

    Inflation rate (absorption deflator) - annual rate:
230:SPI    SI_PI = SI_P/SI_P(-1)-1
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    Prices in foreign markets:
231:SPFM    LOG(SI_PFM) = W51*LOG(US_PXM)+W52*LOG(JA_PXM*JA_ER/JE80)+W53*LOG(GR_PXM*
            GR_ER/GE80)+W54*LOG(LI_PXM*LI_ER/LE80)+W55*LOG(SI_ER/SE80)+W56*LOG(RW_PXM*
            RW_ER/RE80)

    Non-fuel export prices:
232:SPXM    DEL(1 : LOG(SI_PXM)) = SPXM0+SPXM1*DEL(1 : LOG(SI_PGNPNO))+(1-SPXM1)*DEL(1
             : LOG(SI_PFM))+SPXM2*LOG(SI_PGNPNO(-1)/SI_PXM(-1))+RES_SI_PXM

    Total exports price:
233:SPXT    SI_PXT = (SI_XMA*SI_PXM+POIL/SI_ER*SE80*SI_XOIL)/SI_XT

    Manufactured import prices:
234:SPIM    SI_PIM = (S15*US_PXM+S25*(JA_PXM*JA_ER/JE80)+S35*GR_PXM*GR_ER/GE80+S45*
            LI_PXM*LI_ER/LE80+S55*SI_PXM*SI_ER/SE80+S65*RW_PXM*RW_ER/RE80)/(SI_ER/SE80)+
            RES_SI_PIM

    Import prices-adjusted for (nominal) world trade discrepancy:
235:SPIMA   SI_PIMA = SI_PIM+T5*WTRADE/SI_ER/SI_IM

    Total imports price:
236:SPIT    SI_PIT = (SI_IM*SI_PIMA+SI_IOIL*POIL/SI_ER*SE80+SI_ICOM*PCOM/SI_ER*SE80)/
            SI_IT

    Production function (capacity output):
237:SYCAP   LOG(SI_YCAP) = LOG(1+SN)*T*(1-SBETA)+LOG(SI_K(-1))*SBETA+RES_SI_YCAP

    Capacity utilization:
238:SCU     SI_CU = 100*SI_GDP/SI_YCAP

    V. International Accounts

    Balance of payments (claims on foreigners), current $:
239:SNFA    DEL(1 : SI_NFA) = (SI_XT*SI_PXT-(SI_IM*SI_PIMA+SI_IOIL*POIL/SI_ER*SE80+
            SI_ICOM*PCOM/SI_ER*SE80))*SI_ER+US_R*SI_NFA(-1)+RES_SI_NFA

    Current account - local currency:
240:SCABL   SI_CURBALL = US_R*SI_NFA(-1)/SI_ER+(SI_XT*SI_PXT-(SI_IM*SI_PIMA+SI_IOIL*POIL
            /SI_ER*SE80+SI_ICOM*PCOM/SI_ER*SE80))

    Current account - current dollar:
241:SCAB    SI_CURBAL = DEL(1 : SI_NFA)

    Open interest party condition (solves for exchange rate):
242:SER     1+US_RS/100 = (1+SI_RS/100)*(SI_ER(1)/SI_ER)+RES_SI_ER

    Competitiveness of Man. exports:
243:SREER   SI_REER = (-W51)*LOG(US_PXM)+(-W52)*LOG(JA_PXM*JA_ER/JE80)+(-W53)*LOG(GR_PXM
            *GR_ER/GE80)+(-W54)*LOG(LI_PXM*LI_ER/LE80)+(-W55)*LOG(SI_PXM*SI_ER/SE80)+(-
            W56)*LOG(RW_PXM*RW_ER/RE80)

    Nominal effective exchange rate:
244:SMERM   SI_MERM = EXP((-V52)*LOG(JA_ER/JE80)+(-V53)*LOG(GR_ER/GE80)+(-V54)*LOG(LI_ER
            /LE80)+(-V55)*LOG(SI_ER/SE80))

    Foreign export markets for manufact. (using fixed shares):
245:SFM     SI_FM = (S51*US_IM+S52*(JA_IM*JE80)+S53*(GR_IM*GE80)+S54*(LI_IM*LE80)+S55*(
            SI_IM*SE80)+S56*(RW_IM*RE80))/SE80

    ******************
     MODEL FOR DC
    ******************

    I. Aggregate Demand

    Consumption expenditure - including public:
246:DCTOT   DEL(1 : LOG(DC_CTOT)) = DC0+DC1*LOG(DC_W(-1)/DC_CTOT(-1))+DC2*DEL(1 :
            DC_DEBT)/RW_ER/DC_P/DC_CTOT(-1)+RES_DC_CTOT

    Real gross investment:
247:DINV    DC_INVEST = DC_GDP-(DC_XM+DC_XCOM+DC_XOIL)-DC_CTOT+DC_IT

    Real gross investment in commodity production:
248:DINVC   DC_INVESTC = RES_DC_INVESTC+(IF PCOM/RW_ER/RW_PXM LT 1 THEN DC_DELTA*DC_KC(
            -1) ELSE DC_KCOMSHR*DC_INVEST)
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    Capital stock  in commodity production:
249:DKC     DC_KC = DC_KC(-1)*(1-DC_DELTA)+DC_INVESTC

    Capital stock:
250:DK      DC_K = DC_KC+DC_KM

    Real gross investment in manufactures production:
251:DINVM   DC_INVESTM = DC_INVEST-DC_INVESTC

    Capital stock  in maufactures production:
252:DKM     DC_KM = DC_KM(-1)*(1-DC_DELTA)+DC_INVESTM

    Manufactured exports - real:
253:DXM     DC_XM = RW_XM-HO_XM

    Man. exports  real, adjusted for real world trade discrepancy:
254:DXMA    DC_XMA = RW_XMA-HO_XM

    Commodity  exports - real:
255:DXC     DC_XCOM = RW_XCOM+HO_ICOM

    Oil  exports - real:
256:DXOIL   DC_XOIL = DC_XOILSHR*(RW_XOIL-DC_IOIL)+RES_DC_XOIL

    Total exports - real:
257:DXT     DC_XT = DC_XCOM+DC_XOIL+DC_XMA

    Imports of oil:
258:DIOIL   DC_IOIL = DC_OILSHR*DC_IT+RES_DC_IOIL

    Total Imports (solved for imports of manufactures):
259:DIT     DC_IT = DC_IM+DC_IOIL

    Definition of domestic absorption:
260:DA      DC_A = DC_CTOT+DC_INVEST

    Real GDP identity:
261:DGDP    DC_GDP = DC_XM+DC_XCOM+DC_XOIL+DC_QNT

    Output of non-exported goods:
262:DQNT    DEL(1 : DC_QNT) = RQNTO*DEL(1 : DC_CTOT)+RES_DC_QNT

    Capacity Net National Product:
263:DNNPC   DC_NNPCAP = DC_YCAP-DC_DELTA*DC_K(-1)

    Real Wealth (Financial plus discounted future income):
264:DW      DC_W = DC_NFA/RW_ER/DC_P+DC_NNPCAP*DRHOBAR*(1/URRBAR+(DC_GDP/DC_YCAP*0.01-1)
            /(URRBAR+DW1)+(DC_PGNP/DC_P/DRHOBAR-1)/(URRBAR+DW2)-(US_RSR-URRBAR)/(URRBAR+
            UW3))

    IV. Prices and Supply

    Nominal GNP identity (solves for absorption deflator):
265:DP      DC_P = (DC_PXM*DC_QNT+DC_PIT*DC_IT)/(DC_CTOT+DC_INVEST)

    Definition of GDP deflator:
266:DPGNP   DC_PGNP = (DC_PXM*(DC_QNT+DC_XMA)+PCOM/RW_ER*DC_XCOM+POIL/RW_ER*DC_XOIL)/
            DC_GDP+RES_DC_PGNP

    Manufactured  export prices:
267:DPXM    DEL(1 : RW_REER) = RPXM1*RW_REER(-1)+RPXM2*LOG(DC_XSM/DC_XM)+RES_DC_PXM

    Prices in foreign markets:
268:RPFM    LOG(RW_PFM) = W61*LOG(US_PXM)+W62*LOG(JA_PXM*JA_ER/JE80)+W63*LOG(GR_PXM*
            GR_ER/GE80)+W64*LOG(LI_PXM*LI_ER/LE80)+W65*LOG(SI_ER/SE80)+W66*LOG(RW_PXM*
            RW_ER/RE80)

    Commodity export supply (solves for commodity price):
269:PCOM    LOG(DC_XCOM) = RXCOM1*LOG(DC_KC(-1))+RES_DC_XCOM

    Total exports price:
270:DPXT    DC_PXT = (DC_PXM*DC_XMA+PCOM/RW_ER*DC_XCOM+POIL/RW_ER*DC_XOIL)/DC_XT

    Manufactured import prices:
271:DPIM    DC_PIM = RW_PIM+RES_DC_PIM

    Import prices-adjusted for (nominal) world trade discrepancy:
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272:DPIMA  DC_PIMA = RW_PIMA+RES_DC_PIMA

    Total imports price:
273:DPIT   DC_PIT = (DC_PIMA*DC_IM+POIL/RW_ER*DC_IOIL)/DC_IT

    Production function for manufactured output:
274:DXSM   LOG(DC_XSM) = RXSM1*LOG(DC_KM(-1))+RES_DC_XSM

    Capacity value of real domestic income:
275:DYCAP  DC_YCAP = EXP(DYCAP0+LOG(1+DN)*T*(1-DBETA)+LOG(DC_K(-1))*DBETA)

    V. International Accounts

    Developing country claims on industrial countries:
276:DASSET DEL(1 : DC_ASSETS) = DASS1*(RW_ER*DC_XT*DC_PXT+US_R*DC_NFA(-1)+DEL(1 :
           DC_DEBT))-DASS2*(DC_ASSETS(-1)-DC_IT(-1)*DC_PIT(-1)*RW_ER(-1)*DC_ASSETRAT)+
           RES_DC_ASSETS*RW_ER

    Stock of  gross debt owed to the industrial countries:
277:DDEBT  DEL(1 : DC_DEBT) = ((DC_XT(4)*DC_PXT(4)*RW_ER(4)/(DC_XT(-1)*DC_PXT(-1)*RW_ER
           (-1)))**(1/5)-1)*DC_XT(-1)*DC_PXT(-1)*RW_ER(-1)*DDEBT1+DDEBT2*(ISR*DC_PXT(-1
           )*DC_XT(-1)*RW_ER(-1)/US_RRBAR(-1)-DC_NETDEBT(-1))+DDEBT2/10*(ISR*
           DC_XTNDHIST(-1)/US_RR(-1)-DC_NETDEBT(-1))+RES_DC_DEBT

    Stock of net debt owed to the industrial countries:
278:DNDEBT DC_NETDEBT = DC_DEBT-DC_ASSETS

    Claims in foreigners , current $:
279:DNFA   DC_NFA = DC_NFA(-1)-DEL(1 : DC_NETDEBT)+RES_DC_NFA

    Balance of payments , current $ (solved for imports):
280:DCAB   DEL(1 : DC_NFA)/RW_ER = DC_PXM*DC_XMA+PCOM/RW_ER*DC_XCOM+POIL/RW_ER*DC_XOIL-
           DC_PIT*DC_IT+US_R*DC_NFA(-1)/RW_ER+RES_DC_CURBAL

    ******************
     MODEL FOR HO
    ******************

    I. Aggregate Demand

    Oil  exports - real:
281:HXOIL  HO_XOIL = RW_XOIL-DC_XOIL

    Total exports - real:
282:HXT    HO_XT = HO_XOIL+HO_XM

    Imports of commodities - real:
283:HIC    DEL(1 : LOG(HO_ICOM)) = UIC0+UIC2*DEL(1 : LOG(PCOM/RW_ER/RW_PXM))+UIC1*DEL(1
            : LOG(HO_GDP))+RES_HO_ICOM

    Imports of maufactures - real:
284:HIM    LOG(HO_IM) = HI0+HI1*LOG(HO_A)+HI2*LOG(RW_PIMA/(POIL/RW_ER))+RES_HO_IM

    Total imports :
285:HIT    HO_IT = HO_IM+HO_IOIL+HO_ICOM

    Definition of domestic absorption:
286:HA     HO_A = HO_GDP-HO_XT+HO_IT

    Real GDP identity:
287:HGDP   HO_GDP = HO_XT+HO_QNT

    Output of non-exported goods:
288:HQNT   DEL(1 : HO_QNT) = HQNT0*DEL(1 : HO_A)+RES_HO_QNT

    IV. Prices and Supply

    Total exports price:
289:HPXT   HO_PXT = (RW_PXM*HO_XM+POIL/RW_ER*HO_XOIL)/HO_XT+RES_HO_PXT

    Total imports price:
290:HPIT   HO_PIT = (RW_PIMA*HO_IM+POIL/RW_ER*HO_IOIL+PCOM/RW_ER*HO_ICOM)/HO_IT+
           RES_HO_PIT

    V. International Accounts

    Claims on foreigners , current $:
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291:HNFA    DEL(1 : HO_NFA)/RW_ER = HO_PXT*HO_XT-HO_IT*HO_PIT+US_R*HO_NFA(-1)/RW_ER+
            RES_HO_NFA

     ******************
      MODEL FOR RW
     ******************

     I. International Trade and Prices
     Manufactured exports - real:
292:RXM     LOG(RW_XM) = RX0+RX1*LOG(RW_FM)+RX2*RW_REER+RX4*T+RX3*LOG(RW_XM(-1))+
            RES_RW_XM

     Man. exports  real, adjusted for real world trade discrepancy:
293:RXMA    RW_XMA = RW_XM+T6*WTRADER/RE80

     Commodity  exports - real:
294:RXC     RW_XCOM = US_ICOM+JA_ICOM*JE80+GR_ICOM*GE80+LI_ICOM*LE80+SI_ICOM*SE80

     Oil  exports - real:
295:RXOIL   RW_XOIL = (-(US_XOIL-US_IOIL+(JA_XOIL-JA_IOIL)*JE80+(GR_XOIL-GR_IOIL)*GE80+(
            LI_XOIL-LI_IOIL)*LE80+(SI_XOIL-SI_IOIL)*SE80))/RE80+DC_IOIL+HO_IOIL

     Total exports - real:
296:RXT     RW_XT = DC_XT+HO_XT-HO_ICOM

     Manufactured exports - real:
297:RIM     RW_IM = DC_IM+HO_IM

     Total imports :
298:RIT     RW_IT = DC_IT+HO_IT-HO_ICOM

     Manufactured  export prices:
299:RPXM    RW_PXM = DC_PXM+RES_RW_PXM

     Total exports price:
300:RPXT    RW_PXT = (HO_XT*HO_PXT+DC_PXT*DC_XT-HO_ICOM*PCOM)/RW_XT

     Manufactured import prices:
301:RPIM    RW_PIM = (S16*US_PXM+S26*(JA_PXM*JA_ER/JE80)+S36*GR_PXM*GR_ER/GE80+S46*
            LI_PXM*LI_ER/LE80+S56*SI_PXM*SI_ER/SE80+S66*RW_PXM*RW_ER/RE80)/(RW_ER/RE80)+
            RES_RW_PIM

     Import prices-adjusted for (nominal) world trade discrepancy:
302:RPIMA   RW_PIMA = RW_PIM+T6*WTRADE/RW_ER/RW_IM

     Total imports price:
303:RPIT    RW_PIT = (HO_IT*HO_PIT+DC_PIT*DC_IT-HO_ICOM*PCOM)/RW_IT

     Competitiveness of Man. exports:
304:RREER   RW_REER = (-W61)*LOG(US_PXM)+(-W62)*LOG(JA_PXM*JA_ER/JE80)+(-W63)*LOG(GR_PXM
            *GR_ER/GE80)+(-W64)*LOG(LI_PXM*LI_ER/LE80)+(-W65)*LOG(SI_PXM*SI_ER/SE80)+(-
            W66)*LOG(RW_PXM*RW_ER/RE80)

     Nominal effective exchange rate (determines bilateral rate):
305:RNEER   RW_NEER = EXP((-W62)*LOG(JA_ER/JE80)+(-W63)*LOG(GR_ER/GE80)+(-W64)*LOG(LI_ER
            /LE80)+(-W65)*LOG(SI_ER/SE80)+(-W66)*LOG(RW_ER/RE80))

     Foreign export markets for manufact. (using fixed shares):
306:RFM     RW_FM = (S61*US_IM+S62*(JA_IM*JE80)+S63*(GR_IM*GE80)+S64*(LI_IM*LE80)+S65*(
            SI_IM*SE80)+S66*(RW_IM*RE80))/RE80

     Nominal world trade discrepancy:
307:WTRADE  WTRADE = US_XMA*US_PXM-US_IM*US_PIM+(JA_XMA*JA_PXM-JA_IM*JA_PIM)*JA_ER+(
            GR_XMA*GR_PXM-GR_IM*GR_PIM)*GR_ER+(LI_XMA*LI_PXM-LI_IM*LI_PIM)*LI_ER+(SI_XMA
            *SI_PXM-SI_IM*SI_PIM)*SI_ER+(RW_XMA*RW_PXM-RW_IM*RW_PIM)*RW_ER+RES_WTRADE

     Real world trade discrepancy:
308:WTRDR   WTRADER = US_IM-US_XM+(JA_IM-JA_XM)*JE80+(GR_IM-GR_XM)*GE80+(LI_IM-LI_XM)*
            LE80+(SI_IM-SI_XM)*SE80+(RW_IM-RW_XM)*RE80+RES_WTRADER

     Nominal price of oil :
309:POIL    POIL = RPOIL*(US_PGNP**UWT*(JA_PGNP*JA_ER/JE80)**JWT*(GR_PGNP*GR_ER/GE80)**
            GWT*(LI_PGNP*LI_ER/LE80)**LWT*(SI_PGNP*SI_ER/SE80)**SWT)
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MULTI -

UC4	0.	JX2	-0.674518	S21	0.2582
V44	-1.	W62	0.1707	JGBAR	0.11539
SK3	-0.084767	SCOIL4	0.074362	S44	0.
JIC0	-1.1477	JIC1	-0.140731	LC1	0.116817
SX3	0.	JIC2	-0.633915	JIC3	-0.786279
JIC4	0.127629	JIC5	-0.562377	GC3	0.554889
JP2	0.	V15	0.2281	JK0	0.165885
GPXM2	0.066973	JBETA	0.431	ULAMBDAM	1.
W33	-1.	UC2	-0.451232	JX0	-1.76108
S15	0.1155	SP3	0.545376	V42	0.1076
JRRBAR	0.00923	JM3	-0.022538	W56	0.1168
RX3	0.	SK1	0.156326	S42	0.1354
SLAMBDAM	1.	SX1	0.775241	ULAMBDAB	1.
URHOBAR	1.	GC1	0.116817	JI5	0.581637
SM4	0.79701	V13	0.1302	T4	0.232
LK3	-0.084767	S65	0.074	JN	0.057664
DC1	0.317451	LX3	0.	W31	0.2456
JW4	0.23572	UC0	-0.409327	S13	0.0772
UCOIL2	-0.048808	LCOIL2	-0.041001	SLAMBDAB	1.
SRHOBAR	1.	SP1	0.146192	SI6	0.
JM1	0.455525	UK4	-0.011731	W54	0.2746
RX1	1.24726	S36	0.1393	SE80	1.
HI5	-0.686291	DDEBT1	0.6	LP3	0.545376
SCOIL2	-0.083715	JPXM2	0.066973	LPXM0	-0.004794
JWT	0.137909	JI3	-0.5923	SM2	-0.01047
LK1	0.156326	S63	0.109	W25	0.1733
JPXM1	0.574968	LLAMBDAM	1.	LX1	0.848594
GK3	-0.084767	JW2	0.005801	JR1	1.
S11	0.	DYCAP0	3.73926	GX3	0.
UP4	0.7279	V34	0.3558	LM4	0.670109
SI4	0.	UK2	0.08606	W52	0.1526
RE80	1.	S34	0.2813	UX2	-0.521364
SW3	0.471281	GGBAR	0.22475	HI3	0.368385
LLAMBDAB	1.	LRHOBAR	1.	LP1	0.146192
LI6	0.678655	JI1	1.	GP3	0.545376
SM0	0.39105	S61	0.2441	UIC0	-3.67987
LE80	1.	UIC1	1.96306	W23	0.1867
UIC2	-0.640144	GK1	0.156326	UIC3	-0.158202
DASS2	0.3	UIC4	0.752766	UIC5	-0.785342
GLAMBDAM	1.	GX1	0.801924	UPXM0	-0.0091
UP2	0.	V32	0.1255	LM2	-0.012774
SI2	0.	W46	0.1304	UK0	0.160666
GM4	0.694701	SBETA	0.33	S32	0.0911
UX0	1.15908	SW1	0.130632	V55	-1.
HI1	1.	SRRBAR	0.01016	LI4	0.
GCOIL0	-0.262731	UM3	-0.003682	GLAMBDAB	1.
GRHOBAR	1.	GP1	0.146192	GI6	0.
T3	0.129	S55	0.	JC3	0.554889
LW3	0.305137	W21	0.1861	UCOIL3	-0.050163
GE80	0.55113	LCOIL3	-0.050163	UI5	0.
LM0	-1.01748	SI0	-1.31389	UN	0.02971
W44	-1.	GM2	-0.004576	S26	0.2259
UW4	0.23572	V53	0.1395	SCOIL3	-0.050163
LI2	-0.704807	UM1	0.214589	GI4	0.031432
UGBAR	0.21574	S53	0.3979	W15	0.2467
JC1	0.116817	LW1	0.190243	GPXM1	0.769417
GW3	0.688118	UWT	0.354391	UI3	-0.800631
V24	0.2022	W42	0.2261	GM0	-0.215977
JCOIL0	-0.371136	SC2	-0.451232	S24	0.0535
UW2	0.165462	UR1	1.	LI0	-0.430888
RXSM1	0.4	W65	0.1872	GI2	0.
S51	0.0837	W13	0.2646	GW1	0.556428
HQNT0	0.25	UI1	1.	V22	-1.
DBETA	0.393728	JK3	-0.084767	W36	0.1029
DW1	0.281067	JX3	-0.388513	SC0	-0.550586
S22	0.	V45	0.4069	GCOIL1	1.52871
W63	0.1899	SK4	-0.011731	T2	0.087
GI0	-2.14804	S45	0.3738	LC2	-0.451232
W11	-1.	GC4	0.	JP3	0.545376
JPXM0	-0.011412	LPXM2	0.066973	JK1	0.156326
W34	0.3308	UC3	0.554889	JX1	1.3897
S16	0.2185	GCOIL4	0.074362	SP4	0.7279
V43	0.155	RQNT0	0.5	JM4	0.638406
W61	0.1398	RX4	0.115676	SK2	0.08606
S43	0.355	XNE	1.	LC0	-0.395676

SX2	-0.281083	GC2	-0.451232	JP1	0.146192
JI6	0.334279	V14	0.4292	LK4	-0.011731
S66	0.	UPXM1	0.702967	DC2	0.281071
W32	0.1481	SIC0	-2.06844	JE80	4.42825
SIC1	2.20595	UC1	0.116817	JCOIL1	1.54518
SIC2	-0.515267	SIC3	-0.256456	S14	0.2698
SIC4	0.571868	SIC5	-0.708048	SPXM0	-0.017838
SP2	0.	JM2	-0.009388	W55	-1.
RX2	-0.734352	SK0	0.151409	S41	0.3218
DRHOBAR	1.	SX0	1.59628	HI6	-0.06445
ISR	0.03	LP4	0.7279	GC0	-0.325887
JI4	0.	SM3	-0.003905	V12	0.2125
JCOIL4	0.074362	LK2	0.08606	S64	0.0885
RXCOM1	0.3	W26	0.1034	DC0	-1.1277
LX2	-0.270179	GK4	-0.011731	JW3	0.360819
S12	0.3674	V35	0.3023	SI5	0.
GCOIL2	-0.098829	JM0	-1.12662	LGBAR	0.21678
UK3	-0.084767	W53	0.2013	SN	0.015462
RX0	-0.764269	LIC0	0.687478	T1	0.141
LIC1	2.40126	S35	0.3671	UX3	0.
LIC2	-0.515604	LIC3	-0.179167	SW4	0.23572
LIC4	0.151221	LIC5	-0.594397	HI4	0.
LP2	0.	JI2	-0.581637	GP4	0.7279
SM1	0.06309	LK0	0.104782	S62	0.2977
GPXM0	0.00036	LBETA	0.33	SGBAR	0.21863
W24	0.3505	LX0	0.910608	GK2	0.08606
JW1	0.414478	GX2	-0.325111	UP3	0.545376
LRRBAR	0.01711	V33	-1.	SWT	0.152253
T6	0.212	LM3	-0.009668	SI3	-1.7
UK1	0.156326	W51	0.2547	S33	0.
UCOIL0	-0.256946	UX1	0.770054	LCOIL0	-0.666048
SW2	0.055395	GIC0	-2.23099	SR1	1.
GIC1	1.85726	HI2	0.	GIC2	-0.441718
GIC3	0.159613	LI5	0.704807	GIC4	0.463248
GIC5	-0.411424	UM4	0.616738	JI0	-1.06643
GP2	0.	LN	0.030708	S56	0.1482
LW4	0.23572	W22	-1.	GK0	0.192427
GBETA	0.2812	JCOIL2	-0.02031	RPXM2	-0.1
SCOIL0	-0.2552	GX0	0.910385	UP1	0.146192
UI6	0.	LM1	0.393158	SI1	1.
GRRBAR	0.02591	RPXM1	-0.4	W45	0.1912
GM3	-0.004923	S31	0.0922	V54	0.5043
HI0	0.560199	LWT	0.249279	LI3	-0.442325
UM2	-0.011496	GI5	0.	RX01	1.
S54	0.3069	RX02	0.6	JLAMBDAM	1.
LPXM1	0.595305	W16	0.0826	GN	0.028079
JC2	-0.451232	LW2	0.391139	LR1	1.
GW4	0.23572	UI4	0.035895	V25	0.1686
DN	0.045389	GCOIL3	-0.050163	W43	0.2669
GM1	0.249498	SC3	0.554889	S25	0.0696
UW3	0.137719	JLAMBDAB	1.	JRHOBAR	1.
V52	0.1027	TAU1	0.01	TAU2	0.3
LI1	0.295193	W66	-1.	UM0	0.407752
GWT	0.106169	GI3	-0.740307	S52	0.1084
W14	0.2415	JC0	-0.537243	UPXM2	0.066973
GW2	0.060456	GR1	1.	UI2	0.
V23	0.1318	T5	0.199	DASS1	0.3
JK4	-0.011731	UBETA	0.34886	SPXM1	0.65
W41	0.1855	DW2	0.38192	SC1	0.116817
S23	0.0609	UCOIL1	0.750243	UW1	0.557653
LCOIL1	2.00012	URRBAR	0.0273	SPXM2	0.066973
W64	0.3124	GI1	1.	S46	0.2682
LC3	0.554889	W12	0.1646	DDEBT2	0.15
JCOIL3	-0.050163	SCOIL1	0.995915	JP4	0.7279
UI0	-3.48566	UCOIL4	0.074362	LCOIL4	0.074362
JK2	0.08606	W35	0.1726		

REFERENCES

Amano, Akihiro, Eiji Kurihara and Lee Samuelson, "Trade Linkage Sub-Model in the EPA World Economic Model," Economic Bulletin No. 19 [July 1980], Economic Research Institute, Economic Planning Agency, Tokyo, Japan.

Artus, Jacques and Anne McGuirk, "A Revised Version of the Multilateral Exchange Rate Model," International Monetary Fund Staff Papers, vol. 28 [1981], pp. 275-309.

Barro, Robert, "Are Government Bonds Net Wealth?" Journal of Political Economy, vol. 82 [1974], pp. 1095-1117.

Blanchard, Olivier Jean, "Debt. Deficits and Finite Horizons," Journal of Political Economy, vol. 93 [1985], pp. 233-47.

Blejer, Mario and Mohsin Khan, "Government Policy and Private Investment in Developing Countries," International Monetary Fund Staff Papers, vol. 31 [June 1984], pp. 379-403.

Bond, Marian, "An Econometric Study of Exports of Manufactures from Developing Countries," International Monetary Fund Working Paper No. WP/87/55, August 1987.

Boughton, James, Richard Haas and Paul Masson, "The Role of Exchange Rate Movements in Transmitting International Disturbances," forthcoming in D.R. Hodgman and Geoffrey Wood, eds. Macroeconomic Policy and Economic Interdependence, Macmillan, New York [1988].

Brayton, Flint and Peter B. Clark, "The Macroeconomic and Sectoral Effects of the Economic Recovery Tax Act: Some Simulation Results," Staff Study 148, Federal Reserve Board [December 1985].

Bryant, Ralph and others, Empirical Macroeconomics for Interdependent Economies, Brookings Institution, Washington, D.C. [1988].

Buiter, Willem, "Fiscal Policy in Open, Interdependent Economies," NBER Working Paper No. 1429 [August 1984].

Calvo, Guillermo, "Staggered Contracts and Exchange Rate Policy," in J. Frenkel, ed. Exchange Rates and International Macroeconomics, University of Chicago Press, Chicago [1983], pp. 235-52.

Clark, Peter C., "Investment in the 1970's: Theory, Performance, and Prediction," Brookings Papers on Economic Activity [1: 1979], pp. 73-124.

Davidson, J.E.H., David Hendry, Frank Srba and Stephen Yeo, "Econometric Modelling of the Aggregate Time-Series Relationship Between Consumers Expenditure and Income in the United Kingdom," The Economic Journal, vol. 88 [1978], pp. 661-92.

Deppler, Michael and Duncan Ripley, "The World Trade Model: Merchandise Trade," International Monetary Fund Staff Papers, vol. 25 [March 1978].

Dooley, Michael, William Helkie, Ralph Tryon and John Underwood, "An Analysis of External Debt Positions of Eight Developing Countries Through 1990," Journal of Development Economics, vol. 21 [1986], pp. 283-318.

Fair, Ray and John Taylor, "Solution and Maximum Likelihood Estimation of Dynamic Nonlinear Rational Expectations Models," Econometrica vol. 51 [July 1983], pp. 1169-85.

Gould, J.P., "Adjustment Costs in the Theory of Investment of the Firm," Review of Economic Studies, vol. 35 [January 1968], pp. 47-55.

Frenkel, Jacob and Assaf Razin, "The Mundell-Fleming Model A Quarter Century Later: A Unified Exposition," International Monetary Fund Staff Papers, vol. 34 [December 1987], pp. 567-620.

Gandolfo, Giancarlo and Pietro Carlo Padoan, A Disequilibrium Model of Real and Financial Accumulation in an Open Economy, Berlin, Springer-Verlag, 1984.

Gordon, Robert J., "Understanding Inflation in the 1980's," Brookings Papers on Economic Activity [1: 1985], pp. 263-302.

Haas, Richard and Paul Masson, "MINIMOD: Specification and Simulation Results," International Monetary Fund Staff Papers, vol. 33 [December 1986], pp. 722-67.

Hall, Robert E., "Consumption," NBER Working Paper No. 2265 [May 1987].

Haque, Nadeem and Peter Montiel, "Ricardian Equivalence, Liquidity Constraints, and the Yaari-Blanchard Effect: Tests for Developing Countries," International Monetary Fund Working Paper No. WP/87/85 [December 1987].

Hendry, David, "The Econometrics of PC-GIVE," Institute of Economics and Statistics, Oxford, mimeo [November 1987].

Hickman, Bert, "A General Linear Model of World Trade," in R.J. Ball, ed. The International Linkage of National Economic Models, North-Holland, Amsterdam [1973].

Isard, Peter, "Lessons from Empirical Models of Exchange Rates," International Monetary Fund Staff Papers, vol. 34 [March 1987], pp. 1-28.

_____ and Liliana Rojas-Suarez, "Velocity of Money and the Practice of Monetary Targeting: Experience, Theory, and the Policy Debate," Staff Studies for the World Economic Outlook, International Monetary Fund [July 1986], pp. 73-114.

Kremers, Jeroen, "U.S. Federal Deficits and Debt Service," International Monetary Fund Working Paper No. WP/87/27 [April 1987].

Mann, Catharine, "Prices, Profit Margins, and Exchange Rates," Federal Reserve Bulletin, vol. 72 [June 1986], pp. 366-79.

MIT, TROLL Reference Manual, MIT Information Processing Services, Cambridge, Mass. [1983].

Masson, Paul R., "The Dynamics of a Two-Country Minimodel under Rational Expectations," Annales d'Economie et de Statistique, 1987, forthcoming.

Poterba, James and Lawrence Summers, "Finite Lifetimes and the Effects of Budget Deficits on National Saving," Journal of Monetary Economics vol 14 [1987], pp. 369-91.

Samuelson, Lee, "A New Model of World Trade," OECD Economic Outlook, Occasional Studies [December 1973].

Simpson, Thomas, "Changes in the Financial System: Implications for Monetary Policy," Brookings Papers on Economic Activity [1: 1984], pp. 249-65.

Spencer, Grant, "The World Trade Model: Revised Estimates," International Monetary Fund Staff Papers, vol. 31 [September 1984], pp. 469-98.

Suzuki, "Financial Innovation and Monetary Policy in Japan," Bank of Japan Monetary and Economic Studies, vol. 2 [June 1984], pp. 1-47.

Taplin, Grant, "A Model of World Trade," in R.J. Ball, ed. The International Linkage of National Economic Models, North-Holland, Amsterdam [1973].

Taylor, John,"Aggregate Dynamics and Staggered Contracts," Journal of Political Economy, vol. 88, no. 1 [1980], pp. 1-23.

Wymer, Clifford, "Econometric Estimation of Stochastic Differential Equation Systems," Econometrica, vol. 40 [May 1972], pp. 565-577.