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THE JAPANESE SECTOR OF THE MULTI-COUNTRY MODEL

by

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I. INTRODUCTION

This paper describes the structure and presents the main quantitative results of a quarterly econometric model of Japan. This model is part of the Multi-Country Model, which is a set of linked econometric models for the United States and four of its major trading partners that has been developed at the Federal Reserve Board by the Quantitative Studies Section. The present paper deals exclusively with the Japanese sector of this wider model; it refers only very briefly to the over-all structure of the Multi-Country Model (MCM) which has been described in details in previous papers.[1/] Following this introductory chapter, the structure of the model's financial sector is described in Chapter II. Chapter III explains the notation used in the paper and Chapter IV provides detailed estimation results for all the behavioral equations of the model. Chapters V and VI list the model's identities and provide sources and definitions of variables. Finally, Chapter VII presents simulation results for key variables. The results of various policy experiments using the model will be presented in a future publication dealing with the MCM as a whole.[2/]

1/ See in particular Berner et. al. (1977)

2/ For some of the first results of policy experiments using the MCM, see Hernández-Catá, et. al. (1978)

* I am very grateful to Sam Parrillo for his very important contribution to the construction of this model. The views expressed in this paper are those of the author and do not necessarily represent the views of the Federal Reserve System.

a. The prototype model and the MultiCountry Model

The Multi-Country Model consists of five medium-sized macro-econometric models for the U.S., Canada, Germany, Japan and the United Kingdom. These models are linked together into the MCM together with a smaller model representing the rest of the world. The five country models differ -- sometimes markedly -- in institutional detail. However these models share a common structure that can be described in terms of a highly stilized "prototype" model.

The prototype model explains the main domestic variables and international transactions of each country: real and nominal GNP and its components (consumption, investment, exports and imports of goods and services), deflators for domestic absorption, exports and imports, as well as the wage rate, capacity utilization and unemployment. Each country model has a monetary sector which determines short- and long-term interest rates as well as monetary aggregates. The most important instruments of monetary and fiscal policy -- reserve requirements, the discount rate, central bank holdings of domestic and foreign assets, and real government expenditures -- are integrated into each country model.

The individual country models are linked in the MCM through trade flows, prices, interest rates and capital flows. For example, the exports of each country are determined by other countries' imports from that country; and import prices depend on other countries' export prices and on the exchange rates that convert these prices into domestic currency. Movements in foreign price and cost conditions are therefore transmitted to each country's import price, which in turn affects the levels of domestic prices and wages.

The monetary sectors of the various countries in the model are directly linked together through capital flows. A change in monetary conditions in one country will affect its short- and long-term interest rates and funds will move from one country to another as portfolios are readjusted. These international capital movements will directly affect monetary conditions in the receiving countries to the extent that sterilization policies do not isolate the monetary base from the balance of payments. In addition, interest rate changes in one country may affect exchange rates (and therefore have an indirect impact on foreign monetary conditions) through changes in foreign trade balances and demand conditions.

Each country model in the MCM can operate under a variety of exchange-rate regimes. When fixed exchange rates are assumed, each country's over-all balance of payments determines the change in its stock of international reserve assets. When the model operates under a system of managed floating, the change in the country's international reserves is determined by the discretionary intervention behavior of the monetary authorities. This behavior is incorporated into a reaction function which assumes that the central bank attempts to moderate movements in the exchange rate through purchases and sales of foreign exchange. These official reserve movements, together with all the other variables in the balance of payments, jointly determine the bilateral exchange rate between the country's currency and the U.S. dollar.

b. Determination of trade flows in linked and unlinked versions of the Japanese model

There are two alternative versions of the Japanese model; the first is used in isolation, and the second is used when the Japanese model is integrated into the MCM. In the unlinked version, all foreign variables (i.e. price, interest-rate and GNP levels) are exogenous; and merchandise exports are determined through an aggregate export equation representing total world demand for Japanese goods (p. 48). In the linked version of the model there are 5 bilateral import functions representing the demand for Japanese goods on the part of the U.S., Canada, the U.K., Germany and the rest-of-the-world sector, respectively. Each of these five bilateral equations is incorporated in the model for the corresponding importing country and has the following general form:

$$LOG[XJ_j^V/(PXG \cdot E)] = A_{oj} + A_{1j} \cdot LOG(GNP_j) + A_{2j} \cdot LOG[P_j E_j/(PXG \cdot E)]$$

where XJ_j^V = value of Japanese merchandise exports to country j (customs clearance basis) in billions of U.S. dollars

GNP_j = gross national product at constant 1972 prices of country j

P_j = price index of country j

E_j = exchange rate index of country j (in U.S. dollars per local currency)

E = Japanese exchange rate index (in fractions of U.S. dollar per Yen)

PXG = Japanese export price (unit value) index, expressed in Yen.

The estimation results for the five bilateral equations are presented in Table 1. The most striking result in the table is the size of the elasticities with respect to foreign demand. These elasticities are

Table 1

Foreign demand functions for Japanese merchandise exports

Dependent variable Japanese exports to:	Aggregate demand variable a/	Relative price variable b/	$\bar{R}^2$	D.W. [ρ]
Canada	2.20 (6.8)	1.25 (2.4)	0.615	1.86 [0.85]
Germany	2.95 (6.0)	2.64* (3.0)	0.973	1.86
U.K.	1.00c/	2.45* (2.0)	0.913	2.01
U.S.	3.14d/ (4.9)	1.24* (3.3)	0.887	1.41 [0.82]
Rest of the world	2.8 (20.9)	1.39 (6.2)	0.972	2.02 [0.47]

NOTE: The estimated equations also include seasonal variables and, for some countries, dock strike and other dummy variables. The sample period runs through 1975:4, starting in 1961:4 for Germany, 1962:1 for the U.S. and 1961:1 for other areas. ρ is the first-order autocorrelation coefficient.

a/ Real domestic sales for the U.K.; average industrial production index for the rest of the world; real GNP for other countries.

b/ Price index of producer's goods for Germany; wholesale price index of manufacturing output for the U.K.; absorption deflator for Canada and the U.S.; export price index for the rest of the world.

c/ Constrained to 1.0.

d/ Variable lagged one period.

* Indicates sum of lagged coefficients.

considerably larger than those obtained by estimating an aggregate equation for Japanese merchandise exports (see page 48). The elasticities with respect to the relative price variable average out to 1.47 on a trade-weighted basis.

When the Japanese model is linked with the other country models in the MCM, the five bilateral equations presented in Table 1 determine Japanese exports to each of these five areas; and the sum of these five bilateral export flows determines total Japanese exports.[1/]

Both the linked and the unlinked versions of the Japanese model include a set of five bilateral import-demand equations. (see pages 38 to 42). Each equation determines Japanese merchandise imports from one of the other five areas in the MCM on the basis of data reported by the exporting country; and a set of five bilateral bridge equations (allowing for shipment lags) determine the corresponding import flows based on Japanese customs data. Total Japanese imports (on customs clearance basis) are then obtained by adding up these five bilateral import flows; and total imports adjusted to balance of payments basis are determined by a bridge equation which includes an adjustment for cif/fob differentials (page 37).

c. <u>Special features of the Japanese model</u>

The real sector of the model draws heavily on existing macro-econometric models of Japan.[2/] The financial sector -- although it combines many features found in previous papers by Amano (1975), Hamada

[1/] On customs clearance basis. In addition there is a "bridge equation" (page 36) which serves to operate the transition between exports on customs clearance basis and exports on balance of payments basis.

[2/] In particular, the author has relied extensively on various versions of the Economic Planning Agency model (Baba, et. al. 1978); of the Japanese sector of the LINK model (Amano, Ban and Moriguchi, 1975); and of the Bank of Japan's model (Eguchi and Tanigawa, 1976).

and Eguchi (1974), Hanada (1977) and others -- is more innovative and therefore more controversial than the real sector. Moreover, because of the peculiar features of the Japanese financial system, there are some important differences between the financial sector of the Japanese model and the "prototype" financial sector of the MCM as described in Berner, et. al. (1978). For this reason, a somewhat more extensive presentation of the model's financial block is given in Chapter II.

The Japanese model differs from other country models in the MCM in certain other respects. For example the Japanese model emphasizes the ratio of labor demand to labor supply, (the unfilled vacancy ratio) rather than the unemployment rate, because the former variable is generally thought to be a more sensitive and reliable indicator of labor market pressure in Japan. Unlike its U.S. and Canadian counterparts, the Japanese model includes an equation for the wholesale price index (WPI) which was found to perform substantially better than the absorption deflator (P) in various equations, notably in those for merchandise imports and exports.[1/] The differences between those two price variables are particularly pronounced in the Japanese case because of the substantial productivity differential between the services and manufacturing sectors, and because of the relatively large share of services in GNP.

[1/] For similar reasons the U.K. model includes also a wholesale price index, and the German model a producer's price variable. All 5 models have equations for the absorption deflator.

Like the other models in the MCM, the Japanese model includes an equation explaining the wage rate in manufacturing, W (page 66). In addition, however, the Japanese model includes an average wage rate for the economy as a whole (WT). This variable helps to determine total compensation of employees (identity 16., page 89) which is used in various equations, and particularly in the consumption function where total income is broken down between its wage and nonwage components.

II. THE FINANCIAL SECTOR[1/]

The centerpiece of the Japanese financial sector is the consolidated balance sheet of the monetary authorities (Bank of Japan plus Foreign Exchange Fund).

(2) NFA + NGP + OTH = RT - RB + CUR + CURB

NGP = Monetary authorities' claims on government minus government deposits with the monetary authorities

NFA = Net foreign assets of the monetary authorities. This is the cumulated value of DNFA, the change in reserves. DNFA is given by the balance of payments' equation (under fixed rates); and by a reaction function (under the regime of managed floating).

OTH = Other assets, net (exogenous)

CURB = Currency held by banks. (these are small amounts, explained by a simple equation in which CURB is essentially a function of bank deposits.)

CUR = Currency held by the nonbank public. This variable is explained by an equation described later in section c in the general framework of asset demand functions.

RT = Total bank reserves. This is the sum of required reserves (RT) and excess reserves (RE). The breakdown is not publicly available; but amounts in excess reserves are said to be very small.

RB = Banks' borrowed reserves. Corresponds to the concept of monetary authorities claims on "deposit money banks" in the Bank of Japan's Monetary Survey presentation. (See Bank of Japan, Economic Statistics Annual)

[1/] It may be useful to explain certain terms that are frequently used in this chapter and in other parts of this paper.

"All banks" include 13 City banks, 63 regional banks, 7 trust banks and 3 long-term credit banks. "Deposit money banks" include "all banks" plus mutual loan and savings banks, credit associations, the Norinchukin bank and the Shoko Chukin bank. "Financial institutions" include "deposit money banks" plus insurance companies, agricultural cooperatives, the Trust fund bureau and other credit institutions.

a. Net government position

The net government position of the monetary authorities is defined as their claims on the government (CGVT) -- mainly government bonds -- minus government deposits with the Bank of Japan and the Foreign Exchange Fund (DGVT). Government deposits are treated as exogenous while CGVT is determined by an equation describing the behavior of the monetary authorities. This equation is derived from a loss function which assumes that the monetary authorities adjust the level of their claims on the government in such a way as to achieve the best possible compromise between various competing objectives. These objectives include (i) accomodating changes in nominal GNP, (ii) sterilizing the impact of changes in net foreign assets on the monetary base and (iii) achieving a reasonable balance between demand and supply in the labor market. The estimation results for this reaction function are given in Chapter IV, page 87. It may be noted that the coefficient of NFA is approximately 0.5, suggesting that, on average, about one half of the changes in official foreign assets is sterilized.

b. Required reserves

A simplified version of the Japanese reserve requirement systems can be represented by the following equation:

$$(3) \quad RR \simeq d_L DD_L + d_m DD_m + d_s DD_s + t_L TD_L + t_m TD_m + t_s TD_s$$

d_i = reserve requirement ratios on demand deposits (exogenous)

t_i = reserve requirement ratios on time deposits (exogenous)

DD = demand deposits
TD = time deposits
} explained by asset demand functions described in section c.

L, m and s are subscripts for large, medium and small banks, respectively. Equation (3) does not hold identically for the following reasons: (i) the equation ignores the reserve requirements on bank debentures, on trust money balances and on the liabilities of the Norinchunkin bank; it also ignores the marginal reserve requirement on non-resident free yen deposits.[1/] (ii) there are timing problems: the deposit variables used in the model are measured at end of quarter, while reserve requirements in Japan are computed as of the middle of each month. This problem is insuperable in the framework of a quarterly model.

The breakdown of demand and time deposits by size of banks is unfortunately not publicly available. To circumvent this problem, we can rewrite equation (3) as follows:

$$(4)\quad RR \cong [d_L\beta_L + d_m\beta_m + d_s(1-\beta_L-\beta_m)]\cdot DD + [t_L\beta_L + t_m\beta_m + t_s(1-\beta_L-\beta_m)]\cdot TD$$

where β_L and β_m are the proportion of deposits issued by large banks and by medium banks, respectively. For simplicity, it is assumed that the same proportions apply to demand and time deposits.

Next we assume that β_L can be approximated by the ratio of city banks' deposits to total deposits. Since the reserve requirement ratios (the d's and the t's) are exogenous, and since the deposit variables are endogenously determined within the model, all the magnitudes involved in equation (4) are determined with the exception of β_m. There is no way to measure or even approximate β_m as a variable; however if β_m is assumed to

[1/] Future work will involve incorporating the reserve requirement on free yen deposits. The demand for these deposits is endogenously determined within the model (see chapter IV, page 80).

be constant, then it can be estimated by regression. Noting that total reserves (RT) equal required reserves (RR) plus excess reserves (RE), equation (4) can be rewritten as

$$(5)\quad RT - [\ \{d_L\beta_L + d_s(1-\beta_L)\}\ DD + \{t_L\beta_L + t_s\ (1-\beta_L)\}\ TD] \cong$$

$$\beta_m\ [(d_m - d_s)\ DD + (t_m - t_s)\ TD] + ER$$

Further, we may assume that the (unobservable) level of excess reserves is negatively related to the call money rate, i.e., to the opportunity cost of holding excess reserves.

$$(6)\quad RT = RR + RE = RR + \phi_o - \phi_1 RS$$

And combining equations (5) and (6) we obtain

$$(7)\quad \hat{RT} = \beta_m[(d_m - d_s)DD + (t_m - t_s)TD] + \phi_o - \phi_1 RS,$$

where $\hat{RT}$ is equal to the left-hand side of equation (5); and β_m, ϕ_o and ϕ_1, are coefficients which can be estimated by linear regression. The estimation results for equation (7) are given on page 77.

c. Asset demand functions

In general, the demand for the $i^{\underline{th}}$ asset held by the private nonbank sector is assumed to be a function of private net worth (NW), one or more transaction variables, and a vector of expected rates of return

$$(8)\quad \frac{A_i}{NW} = f\ [RTD,\ RL,\ FRS,\ \frac{EE-E}{E},\frac{Y}{NW}]$$

where RTD = rate on 1 year time deposits (exogenous)

RL = yield on bank debentures

FRS = uncovered foreign interest rate (weighted average of U.S. and Eurodollar rates).

$\frac{EE-E}{E}$ = expected change in the dollar/yen exchange rate.

Y is the appropriate transaction's variable. All equations were estimated in linear form.

There are presently 3 asset demand equations in the Japanese model: for currency (CUR), demand deposits (DD) and time deposits (TD).1/ The pattern of expected signs is as follows:

Asset	RTD	RL	FRS	$\frac{EE-E}{E}$	$\frac{Y}{NW}$
Currency (CUR)	-	-	0	0	+
Demand deposits (DD)	-?	-	-	-	+
Time deposits (TD)	+	-	-	-	+?

The time deposit rate is the own rate in the time deposit equation, and the competing rate in the demand deposit and currency equations.2/ The level of RTD is set by the Bank of Japan, and the variable is therefore taken as exogenous. RL is the rate paid on bank debentures; these debentures are issued mainly by long-term credit banks and represent the single most important alternative to holding money and quasi-money in Japan (table 2). RL is a competing rate in all three

1/ Future work might involve estimating a demand function for bank-issued debentures.

2/ In principle RTD should enter the equation for DD with a negative sign. However this is difficult to implement because some demand deposits in Japan also pay interest at a rate which is perfectly correlated with RTD.

Table 2

Japan: Financial Assets and Liabilities
of the Private Nonfinancial Sector
(Amounts outstanding in Trillions of Yen)

	March, 31	
	1970	1976
Assets		
Currency	3.8	10.2
Demand deposits	15.1	43.5
Time deposits	40.0	116.9
Bank debentures	2.4	7.1
Other bonds 1/	3.3	11.3
Stocks	6.3	10.8
Insurance and trust funds	12.5	36.0
Other, net	2.2	7.1
Liabilities		
Loans 2/	67.4	186.3
Bonds	2.8	7.4
Stocks	8.1	13.4

Source: Bank of Japan, Flow of funds, Economic Statistics Annual.

1/ Includes government bonds, securities investment trusts, corporate bonds and Treasury bills.

2/ Mainly from private financial institutions.

Table 3

Lenders and Borrowers in the Call Money Market
(As percent of total, end-of-year)

Lenders	1970	1976	Borrowers	1970	1976
City banks	*	-	City banks	85	87
Other banks	41	55	Other banks	2	4
Mutual loan and savings 1/ banks, credit associations	21	21	All others	13	10
Financial institutions for agriculture and forestry	20	6			
All others	18	17			

Source: Bank of Japan, Economic Statistics Annual

* Less than one half of one percent

1/ Including the National Federation of Credit Associations equations and its coefficient is therefore expected to be negative. It may be noted that the Japanese short-term rate RS (the call money rate) is not included in the equations. This is because RS is determined in the market for call money which is essentially an interbank market to which the private nonfinancial sector has no access. (Table 3).

Table 4

Asset demand equations

		Interest rate on:			Income-wealth ratio[2]
Asset	Dependent variable	Time deposits (RTD)	Bank debentures (RL)	Foreign assets covered[1] (FRS-FORDISC)	(YV/NW)
Currency	CUR/NW	--	-.0024* (5.4)	--	0.119 (12.9)
Demand deposits	DD/NW	--	-0.014* (4.8)	-0.002* (5.9)	0.583 (49.9)
Time deposits	TD/NW	0.037* (3.4)	-0.033* (2.2)	-0.0025* (4.1)	0.539* (25.8)

Note: Stars indicate sums of lagged coefficients. The equations include seasonal dummies. Coefficients of these variables and details on distributed lag structures are given on pages 72 to 74. T ratios are given in parenthesis.

1. Weighted average of U.S. and eurodollar short-term rates minus forward discount on the Yen vis-a-vis the dollar.

2. Wage income for currency and demand deposits; GNP for time deposits.

The foreign interest rate and the expected exchange-rate change are the two components of the expected rate of return on foreign (dollar-denominated) assets. The expected exchange rate change is proxied by the forward premium on the dollar which is itself explained in terms of the assumed determinants of exchange rate expectations.[1/]

The estimation results for the asset demand equations are summarized in table 4. More detailed results are given in Chapter IV.

d. Borrowings from the Bank of Japan

All the variables in the balance sheet equation (2) are now accounted for with the exception of RB. This variable represents largely borrowing by City banks' from the Bank of Japan.[2/] The demand for such borrowings was assumed to be negatively related to the Bank of Japan's discount rate (RD) and positively related to the call rate (RS) and the banks' average lending rate (RLN). The demand for borrowing is also assumed to depend negatively on the change in unborrowed reserves $\Delta UR = \Delta(RT - RB)$, reflecting the assumption that an increase in unborrowed reserves will not be fully used to expand loans in the current quarter, but will result in a temporary reduction in borrowing. Finally the demand for RB is assumed to be homogeneous of degree 1 in the scale variable D' (total deposits of all banks).

(9) $RB = [a_o - a_1 RD + a_2 RS + a_3\ RLN + a_4 \Delta(UR/D')]D'$

[1/] The determinants of expected exchange rates in the MCM are discussed in Berner, et. al. (1977).

The expected rate of return on foreign assets was assumed not to affect the demand for currency. It may be noted that the asset demand functions were not constrained to be homogenous of degree one in net worth. Accordingly the variable NW/P was introduced on the right-hand side of the equations to test for departures from linear homogeneity.

[2/] There is a sharp contrast between City banks and other Japanese banks in terms of their use of the discount window and their role in the call money market. City banks borrow appreciable amounts from the Bank of Japan as well as from the call money market while other types of banks are net suppliers of call loans and have little resort to central bank credit. (See Tables 3 and 5)

Table 5
Selected balance sheet items of Japanese banks
December 1970
(expressed as percent of total assets)

A) CITY BANKS
(Total assets = 32.9 trillion Yen)

Assets		Liabilities	
66.0	Loans and discounts	Deposits	73.8
12.0	Securities held	Debentures	*
*	Call loans	Call money	6.2
22.0	Other assets	Borrowing from BOJ	6.4
		Other liabilities and net worth	13.2

B) ALL BANKS EXCLUDING CITY BANKS
(Total assets = 26.3 trillion Yen)

Assets		Liabilities	
71.9	Loans and discounts	Deposits	69.0
13.0	Securities held	Debentures	18.8
3.0	Call loans	Call money	*
12.0	Other assets	Borrowing from BOJ	*
		Other liabilities and net worth	11.6

* Less than one half of one percent

Equation (9) can be estimated by dividing through by D' and using the borrowing/deposit ratio as the dependent variable; but this form is bound to yield unreliable results because of the strong correlation between the three interest rate variables. One way to reduce collinearity is to solve equation (9) for the call rate RS, which yields

$$(10)\quad RS = -\alpha_o + \alpha_1\, RD - \alpha_3\, RLN + \alpha_4 \Delta(UR/D') + 1/a_2(RB/D')$$

where $\alpha_i = a_i/a_2$

The complete regression results for equation (10) are given in Chapter IV, page 75. The estimates of the α_i's and of $(1/a_2)$ can then be used to compute estimates of the interest-rate coefficients of equation (9), the a_i's

$$\alpha_1 = 1.593 \quad 1/a_2 = 27.528 \quad \alpha_3 = -1.406$$
$$a_1 = -0.058 \quad a_2 = 0.036 \quad a_3 = 0.051$$

These estimates imply that, other things being equal, a one percentage point increase in the call rate would raise the level of borrowing by about 3-1/2% of the outstanding stock of deposits, while a one percentage point rise in the discount rate would reduce borrowings by some 5.8% of the deposit stock.

It may be noted that the procedure used in this model to determine the call rate is formally equivalent to the approach adopted earlier by Amano (1975), Hanada (1977) and others. Amano, for example, specified that the excess demand for call loans is positively related to the discount rate and negatively related to the call rate. Setting this excess demand equal to zero and rearranging terms, he obtains an equation in which the call rate is positively related to the discount rate. The equation also includes banks' borrowings from the Bank of Japan (deflated by bank deposits) as an explanatory variable. When estimating this equation for the period 1963:1 to 1971:1, however, both Amano and Hanada report a negative coefficient on the borrowing/deposit ratio. They interpret this result as confirming their view that the ceilings imposed by the Bank of Japan on borrowing by individual City banks are binding, that there is excess demand for borrowing from the BOJ at the prevailing discount rate, and that this excess demand spills over into the call money market. In such a framework an increase in borrowing by City banks from the BOJ is not interpreted as an increase in the banks' demand for funds, but rather as an indication that the central bank has lowered the discount ceilings.[1/] Thus under this interpretation, it can be reasonably inferred that an increase in BOJ lending reduces the banks' demand for call loans and therefore exerts downward pressure on the call rate.

[1/] Hamada and Eguchi (1974) suggest that effective constraints on borrowing have resulted not from the formal "maximum credit limit" (Gendo-gaku) but rather from the more flexible informal restrictions imposed by the monetary authorities on individual City banks.

In a recent paper, Hanada (1977) reestimated his call rate equation for the period 1963:1 to 1976:1 and found the coefficient of the borrowing/deposit ratio to be significantly greater than zero. This result would seem to be inconsistent with the view that lending to City Banks is effectively rationed by the Bank of Japan. The result is in agreement with the findings reported in the present paper, however; and it would therefore appear to be consistent with the assumption that City bank borrowing from the BOJ is generally determined, given the discount rate, by the banks' decisions based on their own portfolio composition objectives. This conclusion must be qualified, however. The fact that the coefficient of the borrowing/reserve ratio is negative when the call rate equation is estimated for an earlier period and the occurrence of very large differentials between the call rate and the discount rate (in 1964, for example) suggest that the limits imposed by the Bank of Japan may well have been binding over some periods.[1/]

e. <u>Determination of the interest rate on bank loans (RLN)</u>

The user cost of capital is an important determinant of fixed investment in each of the country models included in the MCM. In the Canadian, German, U.K. and U.S. models, the interest-rate component of the user cost of capital is represented by a long-term bond yield. In

[1/] The case of a ceiling that becomes effective only in parts of the sample period can be characterized by the equation $RB = \min(RB^*, \overline{RB})$, where RB^* is the desired level of borrowing from the standpoint of City banks and $\overline{RB}$ is the ceiling. Unfortunately this approach cannot be implemented because there is no publicly available information on $\overline{RB}$.

Japan, however, the corporate bond market remains relatively undeveloped and bank loans are still, by far, the main source of funds for the private-nonbank sector of the economy (Table 2). The Banks' lending rate is therefore the appropriate interest rate to be included in the user cost of capital variable.

In the Japanese model, the determination of the rate on bank loans is based on the banks' supply of loans function, which specifies that the optimal stock of loans is positively related to the banks' lending rate and negatively related to their borrowing rates.

(11) $$LN^s = c_o + c_1\ RLN - c_2\ RD^e - c_3 RS^e$$

where LN^s = supply of loans and discounts by all banks

RLN = interest rate on loans and discounts by all banks

RD = Bank of Japan's discount rate

RS = Call money rate

Because LN (and RLN) refer to loans with maturities extending from one month to several years, the banks will take into account the expected future values of RD and RS, as indicated by the superscript e. If we assume that the actual stock of loans is always equal to the supply of loans (LN^s = LN) and that expected future rates are determined by past values of these rates, then equation (11) can be solved for RLN, yielding the expression

(12) $$RLN = \gamma_o + \bar{\gamma}_2\ RD + \bar{\gamma}_3\ RS + \eta LN$$

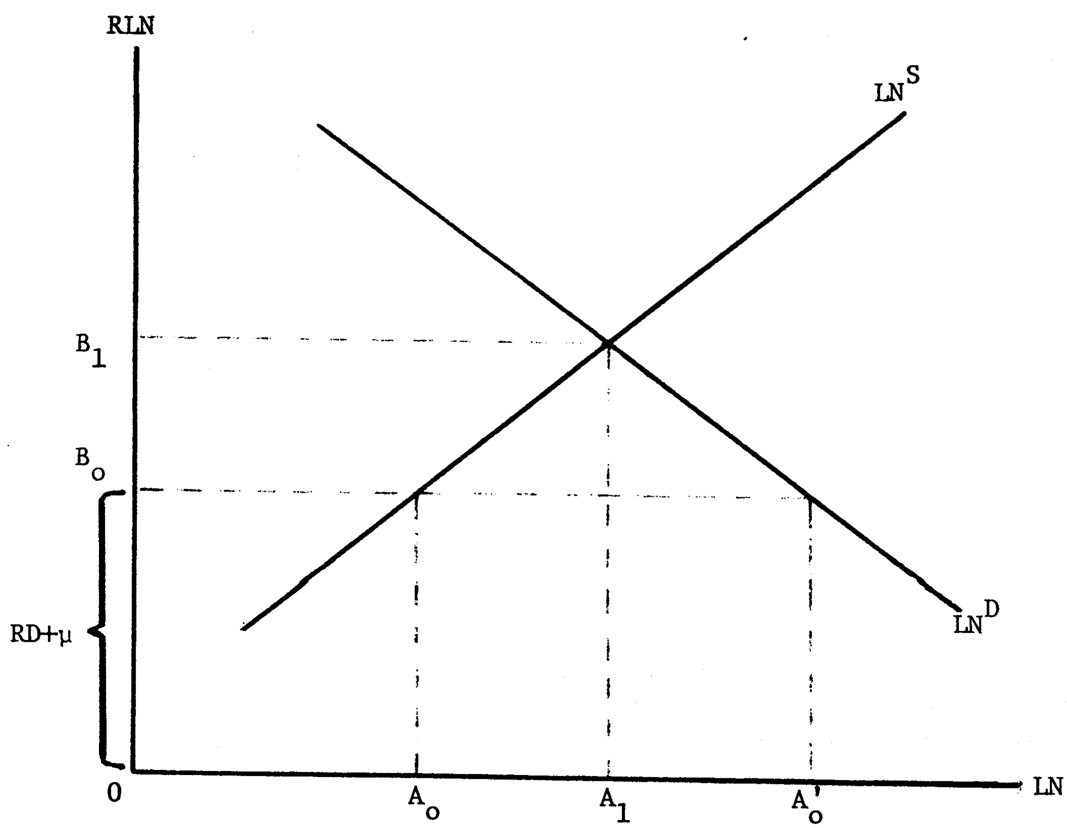
where $\gamma_i = c_i/c_1$, $\eta = 1/c_1$ and a bar above a coefficient indicates a distributed lag structure.

Detailed estimation results for equation (12) are presented in page 76. It may be noted that the estimated equation includes two additional explanatory variables: the yield on bank debentures (RL) which serves as a proxy for the (controlled) prime lending rate of long-term credit banks; and the lagged value of the dependent variable. The reason for including the lagged dependent variable is that RLN is computed as an average interest rate on outstanding loans of all maturities. (Unlike RS and RD which represent interest rates on new borrowings only). Accordingly, movements in RLN partly reflect interest rates changes applicable to loans contracted several quarters, or even several years ago. The variable RLN must therefore be expected to be influenced by current and lagged values of the variables included on the right hand side of equation (12), with distributed lag weights determined by the maturity structure of the outstanding stock of loans. If it is assumed that this maturity structure can be approximately represented by a geometric distribution, then the appropriate distributed lag structure can be generated by introducing a lagged dependent variable on the right-hand side of equation (12).

As pointed out by Hamada and Eguchi (1974) there are two competing views regarding the operation of the market for bank loans in Japan. The first view holds that, except for adjustment lags, "supply and demand determine the equilibrium rate of interest in the commercial loan market." The second view maintains that interest rate rigidities lead to a situation in which "the commercial loan market is most of the time in disequilibrium with excess demand at the prevailing rate of interest."

The theory behind equation (12) is clearly based on the first view, according to which the loan rate is competitively determined. In terms of Fig. I the loan rate is determined at point B_1 by the intersection of the banks' loan supply schedule (LN^S) and the schedule indicating the demand for loans by the nonbank sector (LN^D). It can be shown, however, that equation (12) is not incorpatible with a situation in which the interest rates on some types of loans may be institutionally fixed.

Fig. I



Traditionally, Japanese banks have followed the practice of linking their prime lending rate to the official discount rate, without being required to do so by the monetary authorities. If this system were applied to all loans by all financial institutions the loan market would generally be in a situation of disequilibrium. The loan rate would be equal to the discount rate plus a fixed markup μ (OB_0 in Fig. 1), and whenever this quantity is smaller than the market clearing rate (OB_1) there would be excess demand ($A_o A_o'$) at the prevailing interest rate. However, the practice of linking the lending rate to the discount rate applies only to prime loans;[1/] and even in the case of prime loans there is some evidence suggesting that compensatory balances are sometimes used to fill (at least partially) the gap between the nominal and the market-clearing rate. It would therefore seem more realistic to allow for some competitive elements in the determination of the loan rate.

A possible compromise between the two competing views could be to envisage the loan market as the union of two segmented sub-markets: one for prime loans (with lending rate RLN_1 determined by a markup above the discount rate), and another for all other loans, (with lending rate RLN_2 determined by competitive conditions):

Prime loans: $RLN_1 = RD + \mu$

Other loans: $RLN_2 = \gamma_o + \gamma_2 \, RD + \gamma_3 \, RS + \eta \, LN_2$

[1/] Moreover, there is no control on the ratio of prime to nonprime loans. Banks can therefore adjust their average lending rate in response to a change in market conditions simply by altering this ratio.

The average lending rate RLN would then be given by

$$(13)\quad RLN = [1-\Theta(\mu-\gamma_0)] + [1-\Theta(1-\gamma_2)]\ RD + \Theta\gamma_3 RS + \Theta^2\eta LN$$

where $(1-\Theta)$ is the proportion of loans given at the prime rate. The estimation results presented in page 76 can be analyzed in the light of equation (13). First, it may be noted that the estimated long-run impact on RLN is four times larger for the discount rate than it is for the call rate;[1/] and this suggests that the discount rate may well have a <u>direct</u> impact on the average lending rate of banks -- one which reflects institutional rigidities rather than portfolio-balance considerations. On the other hand, the estimated coefficients of the call rate and of the stock of bank loans (LN) are significantly different from zero suggesting that a competitive loan supply function (such as equation 11) is relevant for at least a significant segment of the commercial loan market.

In concluding the description of the model's financial sector it may be useful to illustrate through an example how a change in the official discount rate influences monetary and real variables in the model.

[1/] The sum of lagged coefficients is 0.374 for the discount rate, and 0.087 for the call rate. Taking into account the coefficient of the lagged dependent variable, the long-run effects are 0.513 and 0.113, respectively. Using an equation estimated over the period 1957:4 to 1971:1, Hamada and Eguchi (1974, p. 30) find a slightly larger long-run discount-rate effect of 0.644.

An increase in the discount rate has a direct positive impact on the rate on bank loans and therefore on the user cost of capital. This leads, over time, to a reduction in fixed investment and hence to a reduction in GNP. But the rise in the discount rate also results in a decline in borrowing by City banks from the Bank of Japan via equation (9). Since the equality between sources and uses of the monetary base -- equation (2) -- must be maintained, the call rate will increase in order to offset the initial decline in borrowings. This increase in the call rate will lead to a rise in the banks' lending rate resulting in additional downward pressure on fixed investment and GNP.

It may be noted that the sequence which starts with an increase in the discount rate and ends with a rise in the call rate can also be interpreted with reference to the call money market. The increase in the discount rate would raise the attractiveness of call loans relative to borrowings from the central bank and this would increase demand in the call money market thus leading to an increase in the call rate.

III. NOTATION AND CONVENTIONS

All national product and income accounts variables are expressed at annual rate and are seasonally adjusted (unless indicated by the mnemonic "NSA"). All balance of payments variables are expressed at annual rates and are not seasonally adjusted (unless indicated by the mnemonic "SA"). All monetary stock variables are measured at end of quarter and are not seasonally adjusted.

The letter "V" appended to a variable name indicates measurement in billions of Yen (unless the variable ends by the symbol "$" in which case it is measured in billions of U.S. dollars). When the "V" is absent, the variable is generally expressed in constant 1972 Yen. Exceptions to this rule are financial variables, such as capital account items and components of the monetary sector, which are all in the nominal terms.

Interest rates are in per cent per annum; and price variables are indexes based 1 in 1972. Exchange rates and interest rates are averages of daily rates. The notation used for dummy variables is illustrated by the following examples. D742 is a variable equal to 1 in the second quarter of 1974, and to zero in all other quarters; D741754 is a variable equal to 1 from the first quarter of 1974 to the fourth quarter of 1975, and to zero in all other quarters.

The numbers in parenthesis below the estimated coefficients are t ratios. The adjusted R^2, the standard error of the estimate (SEE) and the Durbin-Watson statistic (DW) are given for each stochastic equation. The distributed lag structure, the first-order autocorrelation coefficient (ρ) and Durbin's h statistic are also given when applicable. (The h statistic is used to test for serial correlation in equations including one or more values of the lagged dependent variable as regressors.)

Detailed definitions and sources of variables are given in Part VI.

IV. LIST OF BEHAVIORAL EQUATIONS

Consumption function

$$C = \underset{(6.7)}{1326} + \underset{(6.0)}{0.277}\ YWV/P + \underset{(4.5)}{0.105}\ (YV-YWV)/P - \underset{(1.4)}{0.081}\ TV/P - \underset{(8.6)}{26943}\ \Delta P/P + \underset{(15.3)}{0.703}\ C_{-1}$$

$\bar{R}^2 = 0.9995$ SEE = 276.6 DW = 1.76 h = 0.99

Period 61:1 to 75:4

<u>Private residential investment</u>

$$IFPR = \underset{(1.9)}{-3507.15} + \underset{(5.9)}{0.092}\ YD_{-1} - \underset{(2.4)}{301.29}\ RLN_{-1} + \underset{(3.1)}{0.045}\ (NW/P)_{-1}$$

$\bar{R}^2 = 0.891$ SEE = 177.869 DW = 2.08 $\rho = 0.822$

Period 61:1 to 75:4

Private non-residential fixed investment

$$IFPNR = \underset{(1.6)}{-2413.550} + \underset{(7.5)}{0.113}\ KPNR_{-1} + \sum_{i=o}^{16} a_i\ \Delta(GNPV/UCNR)_{-i} - \underset{(4.4)}{2067.170}(D741754)$$

$\bar{R}^2 = 0.718$ SEE = 338.163 DW = 1.86 $\rho = 0.946$

Period 62:2 to 75:4

	0	1	2	3	4	5	6	7	8
a_i	0.003 (0.7)	0.012 (2.5)	0.020 (3.9)	0.026 (4.7)	0.031 (5.3)	0.036 (5.6)	0.039 (5.9)	0.041 (6.1)	0.042 (6.2)

	9	10	11	12	13	14	15	16	SUM
a_i	0.042 (6.3)	0.040 (6.3)	0.038 (6.4)	0.034 (6.4)	0.030 (6.5)	0.024 (6.5)	0.017 (6.5)	0.009 (6.6)	0.483 (5.8)

Capital consumption allowance (private sector)

$$CCAPV = -5202.8 + 0.087\, KP_{-1} + 1150\, P_{-1} + 0.046\, (GNPV - TV - CV)$$
$$\qquad (18.1) \quad (11.3) \qquad\quad (1.3) \qquad\quad (1.9)$$

$\bar{R}^2 = 0.992$ SEE = 197.3 DW = 2.11 $\rho = 0.570$

Period 61:1 to 75:4

Government transfers

$$\underset{(8.2)}{TRANV = 4455.2} + \underset{(8.2)}{0.787}\ GNPV + \underset{(6.0)}{0.0285}(RL \cdot GD_{-1}) + \underset{(3.4)}{0.129}\ XGSNIV - \underset{(8.3)}{65.9}(GNPV/POP)$$

$\bar{R}^2 = 0.991$ SEE = 316.6   DW = 2.15

Period 61:1 to 75:4

<u>Taxes</u>

$$TV = -\ 781.223 + 0.264\ (GNPV - CCAV) + 2137.35\ D751$$
$$\qquad (1.7) \qquad (37.9) \qquad\qquad\qquad (3.3)$$

$\bar{R}^2 = 0.962$ SEE $= 753.549$ DW $= 2.09$ $\rho = 0.629$

Period 61:2 to 75:4

<u>Export bridge equation (customs clearance basis to balance of payments basis)</u>

$$XGV\$ = \underset{(1.9)}{-0.109} + \underset{(450.7)}{0.983}\ XJTV$$

$\bar{R}^2 = 0.9997$ SEE = 0.286 DW = 2.01

Period 61:1 to 75:4

<u>NOTE</u>: This equation applies only to the linked version of the model

Import bridge equation (customs clearance basis to balance of payments basis)

$$\underset{}{MGV\$} = \underset{(4.0)}{-0.225} + \underset{(409.5)}{0.971}\ (CIFR \cdot MJTV)$$

$\bar{R}^2 = 0.9997$ SEE = 0.291   DW = 1.51

Period 61:1 to 75:4

Bilateral import equation: U.S. exports to Japan

$$\underset{}{\mathrm{LOG(XUJV/UPXGUV)}} = \underset{(7.8)}{-8.881} + \underset{(9.1)}{0.936}\ \mathrm{LOG(GNP\text{-}G\text{-}IFG + MGSNI)} - \underset{(2.9)}{1.710}\ \mathrm{LOG(UPXGUV)}$$

$$+ \underset{(3.1)}{1.098}\ \mathrm{LOG(E)} + \underset{(3.1)}{1.929}\ \mathrm{LOG(WPI)} - \underset{(2.3)}{0.038}\ \mathrm{UDILST} - \underset{(0.3)}{0.005}\ \mathrm{Q1}$$

$$- \underset{(3.4)}{0.075}\ \mathrm{Q2} - \underset{(5.4)}{0.103}\ \mathrm{Q3}$$

$\bar{R}^2 = 0.853$ SEE = 0.068 DW = 1.73 $\rho = 0.644$

Period 61:1 to 75:4

Bilateral import equation: U.K. exports to Japan

$$\underset{}{LOG(XEJV/(EPXGUV \cdot EE))} = \underset{(20.7)}{-\,13.020} + \underset{(19.2)}{1.078}\ LOG(GNP-G-IFG + MGSNI) - \underset{(4.5)}{1.324}$$

$$LOG(EPXGUV \cdot EE) + \underset{(3.7)}{1.018}\ LOG(E) + \underset{(3.4)}{1.032}\ LOG(WPI) + \underset{(0.1)}{0.004}\ Q1$$

$$+ \underset{(2.8)}{0.108}\ Q2 - \underset{(0.1)}{0.005}\ Q3$$

$\bar{R}^2 = 0.943$ SEE = 0.105 DW = 1.68

Period 61:1 to 75:4

Bilateral import equation: Canadian exports to Japan

$$\begin{aligned}\mathrm{LOG}(\mathrm{XCJV}/(\mathrm{CPXGUV}\cdot\mathrm{CE})) = &- \underset{(20.0)}{13.671} + \underset{(19.8)}{1.205}\ \mathrm{LOG}(\mathrm{GNP}-\mathrm{G}-\mathrm{IFG} + \mathrm{MGSNI}) - \underset{(4.5)}{3.225} \\ &\mathrm{LOG}(\mathrm{CPXGUV}\cdot\mathrm{CE}) + \underset{(5.2)}{1.547}\ \mathrm{LOG}(\mathrm{E}) + \underset{(4.7)}{3.804}\ \mathrm{LOG}(\mathrm{WPI})\end{aligned}$$

$\bar{R}^2 = 0.962$ SEE = 0.114 DW = 1.90

Period 61:1 to 75:4

Bilateral import equation: German exports to Japan

$$\text{LOG}(\text{XGJV}/(\text{GPXGUV}\cdot\text{GE})) = \underset{(7.2)}{-\ 11.790} + \underset{(6.7)}{1.002}\ \text{LOG}(\text{GNP-G-IFG} + \text{MGSNI})$$

$$- \underset{(2.3)}{1.007}\ \text{LOG}(\text{GPXGUV}\cdot\text{GE}/\text{E}) + \underset{(2.0)}{1.020}\ \text{LOG}(\text{WPI})$$

$\bar{R}^2 = 0.618$ SEE = 0.092 DW = 1.94 $\rho = 0.753$

Period 61:1 to 75:4

Bilateral import equation: Japanese imports from the rest-of-the-world

$$
\begin{aligned}
\mathrm{LOG(MJRV/ROWPXG)} = {} & -\underset{(12.0)}{10.694} + \underset{(14.6)}{1.178}\ \mathrm{LOG(GNP)} - \underset{(2.5)}{0.780}\ \mathrm{LOG(ROWPXG)} \\
& + \underset{(1.1)}{0.328}\ \mathrm{LOG(E)} + \underset{(3.0)}{1.710}\ \mathrm{LOG(WPI)} - \underset{(2.7)}{0.030}\ \mathrm{Q1} + \underset{(1.1)}{0.014}\ \mathrm{Q2} \\
& - \underset{(3.5)}{0.038}\ \mathrm{Q3}
\end{aligned}
$$

$\bar{R}^2 = 0.930$ SEE = 0.043 DW = 2.10 $\rho = 0.750$

Period 61:1 to 75:4

<u>Bilateral bridge equation: U.S.</u>

$$\underset{(12.1)}{\text{MJUV} = 0.740\ \text{XUJV}} + \underset{(7.3)}{0.455}\ \text{XUJV}_{-1} - \underset{(2.9)}{0.702}\ \text{D741} + \underset{(3.7)}{0.871}\ \text{D742}$$

$\bar{R}^2 = 0.996$ SEE = 0.222 DW = 2.25

Period 61:1 to 75:4

Bilateral bridge equation: U.K.

$$\underset{(2.4)}{\text{MJEV} = -0.015} + \underset{(10.6)}{0.721}\ \text{XEJV} + \underset{(4.7)}{0.346}\ \text{XEJV}_{-1} + \underset{(2.0)}{0.130}\ \text{XEJV}_{-2} - \underset{(3.1)}{0.086}\ \text{D741} + \underset{(1.1)}{0.033}\ \text{D742}$$

$\bar{R}^2 = 0.989$ SEE = 0.026 DW = 2.07

Period 61:1 to 75:4

<u>Bilateral bridge equation: Canada</u>

$$\underset{}{MJCV} = \underset{(1.6)}{0.018} + \underset{(10.6)}{0.897}\ XCJV + \underset{(6.3)}{0.283}\ XCJV_{-1} - \underset{(3.3)}{0.206}\ D734 + \underset{(6.0)}{0.382}\ D742$$

$\bar{R}^2 = 0.995$ SEE = 0.057 DW = 1.84

Period 61:1 to 75:4

Bilateral bridge equation: Germany

$$\underset{(0.1)}{MJGV = 0.0002} + \underset{(10.4)}{0.607}\ XGJV + \underset{(3.2)}{0.349}\ XGJV_{-1} + \underset{(3.3)}{0.199}\ XGJV_{-2} - \underset{(3.3)}{0.095}\ D741 + \underset{(3.3)}{0.097}\ D742$$

$\bar{R}^2 = 0.998$ SEE = 0.026 DW = 2.01 $\rho = -0.424$

Period 61:1 to 75:4

Bilateral bridge equation: rest of the world

$$\underset{(4.5)}{MJRV = 1.064} + \underset{(89.5)}{1.083}\ XRJV \underset{(4.1)}{-0.321}\ Q1 \underset{(4.2)}{-0.369}\ Q2 \underset{(2.9)}{-0.219}\ Q3 + \underset{(3.1)}{0.876}\ D741$$

$$- \underset{(4.4)}{1.333}\ D742$$

$\bar{R}^2 = 0.994$ SEE = 0.298 DW = 2.05 $\rho = 0.787$

Period 61:1 to 75:4

Exports of goods (volume)

$$\underset{}{\mathrm{LOG(XG)}} = \underset{(1.4)}{-4.550} + \underset{(4.3)}{2.073}\ \mathrm{LOG(FGNP)} - \underset{(3.3)}{0.472}\ \mathrm{LOG(PXGUV)} + \underset{(2.4)}{0.744}\ \mathrm{LOG(ROWIP)}$$

$$+ \underset{(5.5)}{1.268}\ \mathrm{LOG(FP/E)}\ \underset{(15.6)}{-0.174}\ \mathrm{Q1}\ \underset{(6.9)}{-0.087}\ \mathrm{Q2} - \underset{(5.1)}{0.056}\ \mathrm{Q3}$$

$\bar{R}^2 = 0.980$ SEE = 0.040 DW = 1.91 $\rho = 0.627$

Period 61:1 to 75:4

NOTE: This equation applies only to the unlinked version of the model.

Direct investment income: receipts

$$XSDYV\$ = \underset{(0.4)}{0.00216} + \sum_{i=o}^{6} a_i (LTDC\$ \cdot FRLCD/100)_{-i} + (LTDC\$ \cdot FRLCD/100 \cdot D6575) .$$

$$(\underset{(10.9)}{-0.484} \; Q1 + \underset{(2.6)}{0.108} \; Q2 - \underset{(9.8)}{0.376} \; Q3)$$

$\bar{R}^2 = 0.960$ SEE = 0.034 DW = 1.31

Period 62:2 to 75:4

i	0	1	2	3	4	5	6	Sum
a_i	0.233 (27.7)	0.200 (27.7)	0.166 (27.7)	0.133 (27.7)	0.100 (27.7)	0.067 (27.7)	0.033 (27.7)	0.932 (27.7)

Direct investment income, payments

$$MSDYV\$ = \underset{(2.0)}{-\,0.037} + \underset{(7.0)}{2.400}\,[LTDL\$_{-1} \cdot RLN_{-1}/100 \cdot (1+\Delta E/E)] + (\underset{(3.7)}{1.343}\,Q1 + \underset{(1.3)}{0.466}\,Q2$$

$$\underset{(0.2)}{-\,0.081}\,Q3) \cdot [LTDL\$ \cdot RLN/100 \cdot (1+\Delta E/E)] - \underset{(1.5)}{0.042}\,Q1 \cdot D6168$$

$\bar{R}^2 = 0.702$ SEE = 0.064 DW = 2.11

Period 61:1 to 75:4

Nondirect investment income, receipts

$$XSOYV\$ = FRSC/100\cdot(STBC\$ + NFAT\$)_{-1}(\underset{(11.6)}{0.478}\ S1 - \underset{(0.3)}{0.010}\ S2 + \underset{(10.4)}{0.340}\ S3 - \underset{(5.8)}{0.280}\cdot D6875)$$

$$+ \underset{(13.7)}{0.704}\ FRSC_{-1}/100\cdot(STBC\$ + NFAT\$)_{-2} + \underset{(3.6)}{0.498}\ RLN/100\cdot LTPC\$_{-1}(1 + \Delta E/E_{-1})$$

$$- \underset{(0.5)}{0.087}\ (RLN_{-1}/100\cdot LTPC\$_{-2})(1 + \Delta^2E/E_{-2}) + \underset{(3.6)}{0.448}\ RLN_{-2}/100\cdot LTPC\$_{-3}(1 + \Delta^3E/E_{-3})$$

$$+ (\underset{(0.8)}{0.048}\ Q1 - \underset{(0.1)}{0.007}\ Q2 + \underset{(0.8)}{0.049}\ Q3 - \underset{(1.3)}{0.068})D6368 - \underset{(2.4)}{0.245}\ D701 - \underset{(1.0)}{0.032}$$

$\bar{R}^2 = 0.993$ SEE = 0.096 DW = 1.93

Period 61:3 to 75:4

NOTES: $S_i = Q_i \cdot D6875$

$\Delta^2E = E - E_{-2}$

$\Delta^3E = E - E_{-3}$

Nondirect investment income: payments

$$MSOYV\$ = \underset{(1.9)}{0.144}\ (STL\$\cdot FRSL/100) + \underset{(12.6)}{0.948}\ (STL\$\cdot FRSL/100)_{-1} + \underset{(4.2)}{1.100}\ (LTPL\$\cdot FRLL/100)$$

$$+ D6169 \cdot (\underset{(4.2)}{0.475} - \underset{(4.4)}{0.451}\ Q1 - \underset{(2.2)}{0.230}\ Q2 - \underset{(4.7)}{0.524}\ Q3) \ \underset{(3.9)}{-0.568} + \underset{(6.2)}{0.500}\ Q1$$

$$+ \underset{(2.9)}{0.244}\ Q2 + \underset{(6.2)}{0.554}\ Q3$$

$\bar{R}^2 = 0.986$ SEE = 0.138 DW = 2.37

Period 61:1 to 75:4

Imports of other services (private sector)

$$\underset{(0.1)}{\mathrm{LOG(MSOP)} = -\ 0.051} \ \underset{(7.6)}{+\ 0.476}\ \mathrm{LOG(YD)}\ \underset{(21.2)}{-\ 1.367}\ \mathrm{LOG(PMS)}\ \underset{(20.5)}{+\ 1.805}\ \mathrm{LOG(P)}$$

$$+\sum_{i=o}^{3} a_i \mathrm{LOG(MG \cdot CARGOF)}_{-i} \underset{(0.8)}{-\ 0.011}\ Q1\ \underset{(3.5)}{-\ 0.055}\ Q2\ \underset{(1.3)}{-\ 0.018}\ Q3$$

$\bar{R}^2 = 0.995$ SEE = 0.037 DW = 1.53

Period 61:4 to 75:4

i	0	1	2	3	Sum
a_i	0.150 (3.2)	0.094 (5.9)	0.050 (2.0)	0.019 (0.8)	0.313 (5.9)

Exports of other services (private sector)

$$\begin{aligned}\mathrm{LOG(XSOP)} = & \underset{(1.0)}{-0.836} + \underset{(6.2)}{1.767}\ \mathrm{LOG(FGNP)} - \underset{(12.6)}{1.078}\ \mathrm{LOG(PXS)} + \underset{(16.8)}{2.830}\ \mathrm{LOG(FP)} \\ & - \underset{(5.4)}{1.300}\ \mathrm{LOG(FE)} + \underset{(1.9)}{0.103}\ \mathrm{LOG(XG \cdot CARGOJ)} - \underset{(2.4)}{0.038}\ \mathrm{Q1} - \underset{(1.3)}{0.020}\ \mathrm{Q2} \\ & + \underset{(1.0)}{0.013}\ \mathrm{Q3}\end{aligned}$$

$\bar{R}^2 = 0.974$ SEE $= 0.042$ DW $= 1.81$ $\rho = 0.579$

Period 61:1 to 75:4

<u>Imports of goods and services: bridge equation (from balance of payments to national income accounts basis)</u>

$$\text{MGSNIVNS} = -\underset{(0.9)}{18.943} + \underset{(443.2)}{1.001}\ \text{MGSV}$$

$\bar{R}^2 = 0.999$ SEE = 62.0 DW = 2.06 $\rho = 0.426$

Period 61:1 to 75:4

<u>Exports of goods and services: bridge equation (from balance of payment to national income accounts' basis)</u>

$$\underset{}{XGSNIVNS} = -\underset{(0.9)}{25.548} + \underset{(355.1)}{1.001}\ XGSV$$

$\bar{R}^2 = 0.999$ SEE = 71.6 DW = 2.06 $\rho = 0.481$

Period 61:1 to 75:4

Transfer payments (private)

$$\begin{aligned}
MTRANPV = {} & YDVNSA \cdot D6172 \cdot (\underset{(4.9)}{0.60E{-}3} + \underset{(10.8)}{2.42E{-}3Q1} + \underset{(2.4)}{0.51E{-}3Q2} + \underset{(2.3)}{0.45E{-}3Q3}) \\
& + YDVNSA \cdot D7375 \cdot (\underset{(0.4)}{0.10E{-}3} + \underset{(1.6)}{1.04E{-}3Q1} + \underset{(1.1)}{0.55E{-}3Q2} + \underset{(0.5)}{0.29E{-}3Q3}) \\
& + D7375 \cdot (\underset{(2.1)}{74.57} - \underset{(1.7)}{95.21Q1} - \underset{(1.2)}{60.60Q2} - \underset{(0.6)}{31.46Q3}) + D6172 \cdot (\underset{(3.4)}{-28.22Q1} \\
& - \underset{(1.0)}{8.52Q2} - \underset{(1.0)}{7.98Q3}) - \underset{(0.3)}{1.70}
\end{aligned}$$

$\bar{R}^2 = 0.923$ SEE = 8.578 DW = 1.30

Period 61:1 to 75:4

NOTE: E-3 = 10^{-3}

Transfer receipts

$$\underset{}{XTRANV\$} = \underset{(0.1)}{-0.002} + \underset{(3.3)}{0.000121}\ UYDV + \underset{(2.5)}{0.032}\ (ROWIP \cdot ROWPXG)$$

$\bar{R}^2 = 0.761$ SEE = 0.013 DW = 1.78 $\rho = 0.496$

Period 61:1 to 75:4

Domestic price (absorbtion deflator)

$$\underset{(6.3)}{LOG(P) = -2.7} + \sum_{i=o}^{3} a_i LOG(W)_{-i} + \sum_{i=o}^{3} b_i LOG(GNP/(LE \cdot H))_{-i} + \underset{(13.4)}{0.31}\ LOG(PMGSNI)$$

$$+ \underset{(3.2)}{6.3E{-}6}\ CU^2 + \underset{(7.0)}{0.01}\ TIME$$

$\bar{R}^2 = 0.999$ SEE $= 0.00576$ DW $= 1.87$ $\rho = 0.347$

Period 61:2 to 75:4

i	0	1	2	3	Sum
a_i	0.081 (2.4)	0.062 (4.2)	0.044 (3.2)	0.026 (0.8)	0.213 (5.3)
b_i	−0.183 (3.5)	−0.108 (3.9)	−0.033 (1.6)	0.041 (0.9)	−0.283 (3.6)

NOTE: $E{-}6 = 10^{-6}$

Wholesale price index

$$\underset{(9.8)}{\mathrm{LOG(WPI)} = -\ 5.04} + \sum_{i=o}^{4} a_i \mathrm{LOG(W)}_{-i} + \sum_{i=o}^{4} b_i \mathrm{LOG(GNP/(LE \cdot H))}_{-i} + \underset{(14.0)}{0.33}\ \mathrm{LOG(PMGUV)}$$

$$+ \underset{(7.8)}{2.35E\text{-}5}\ \mathrm{CU}^2 + \underset{(2.9)}{0.024}\ \mathrm{FLOAT} + \underset{(3.5)}{0.02}\ \mathrm{D734741}$$

$\bar{R}^2 = 0.990$ SEE = 0.00756 DW = 1.99 $\rho = 0.624$

Period 61:2 to 75:4

i	0	1	2	3	4	Sum
a_i	0.223 (6.1)	0.164 (7.6)	0.105 (10.3)	0.046 (2.8)	-0.012 (0.4)	0.526 (10.3)
b_i	-0.275 (4.4)	-0.202 (5.6)	-0.129 (8.5)	-0.056 (2.1)	0.016 (0.3)	-0.645 (8.5)

NOTE: $E\text{-}5 = 10^{-5}$

Export unit value

$$\underset{}{LOG(PXGUV)} = \underset{(8.7)}{8.870} + \underset{(1.6)}{0.105}\ LOG(PMGUV) + \sum_{i=o}^{3} a_i LOG(W/(GNP/(LE\cdot H)))_{-1} + \underset{(3.5)}{0.250}\ LOG(CU)$$

$$- \underset{(5.6)}{0.462}\ LOG(FCU) + \sum_{i=o}^{7} b_i LOG(FE/FPXG)_{-i} - \underset{(7.1)}{0.081}\ D6876$$

$\bar{R}^2 = 0.977$ SEE = 0.012 DW = 1.79 $\rho = 0.516$

Period 62:1 to 75:4

i	0	1	2	3	4	5	6	7	Sum
a_i	0.295 (5.8)	0.167 (9.2)	0.038 (1.5)	-0.090 (1.5)					0.410 (8.0)
b_i	-0.434 (4.2)	-0.071 (1.7)	0.108 (2.6)	0.155 (3.7)	0.120 (2.6)	0.053 (1.1)	0.006 (0.2)	0.030 (0.3)	-0.033 (0.3)

Import unit value index (dollar)

$$\text{PMGUV\$} = \underset{(8.1)}{0.196} + \underset{(7.9)}{0.924}\ \text{LOG(FPXGT)} + \underset{(1.9)}{0.215}\ \text{LOG(FPXGT)}_{-1} - 0.003\ \text{TIME}$$

$$+ \underset{(3.3)}{0.072}\ \text{D741} + \underset{(5.2)}{0.075}\ \text{D742}$$

$\bar{R}^2 = 0.989$ SEE = 0.013 DW = 1.65 $\rho = 0.650$

Period 61:1 to 75:4

Services deflator, imports

$$\underset{(0.4)}{LOG(PMS \cdot E) = -0.021} + \underset{(6.7)}{1.08} [0.449 \cdot LOG(UP) + 0.129 \cdot LOG(EP \cdot EE)$$

$$+ 0.106 \cdot LOG(GP \cdot GE) + 0.316 \cdot LOG\ (ROWPXG)]$$

$\bar{R}^2 = 0.961$ SEE = 0.067 DW = 1.67 $\rho = 0.832$

Period 62:2 to 75:4

<u>Services deflator, exports</u>

$$\underset{}{LOG(PXS)} = \underset{(0.7)}{0.337} + \underset{(3.4)}{0.428}\ LOG(CU) + \underset{(6.9)}{0.238}\ D6876 + \sum_{i=o}^{5} a_i LOG(WT/(LE\cdot H))_{-i}$$

$\bar{R}^2 = 0.961$ SEE = 0.061 DW = 1.42

Period 62:1 to 75:4

i	0	1	2	3	4	5	Sum
a_i	0.032	0.054	0.065	0.065	0.054	0.032	0.303
	(11.8)	(11.8)	(11.8)	(11.8)	(11.8)	(11.8)	(11.8)

Capacity utilization

$$\underset{}{\mathrm{LOG(CU)}} = \underset{(1.3)}{1.174} + \underset{(3.0)}{0.530}\ \mathrm{LOG(GNP/(LF \cdot H))} - \underset{(3.8)}{0.797}\ \mathrm{LOG}(\mathrm{KP}_{-1}/(\mathrm{LF} \cdot \mathrm{H}))$$

$$+ \underset{(8.6)}{0.693}\ \mathrm{LOG(CU)}_{-1} - \underset{(1.4)}{0.006}\ \mathrm{TIME} + \underset{(2.6)}{0.0001}\ \mathrm{TIME}^2$$

$\bar{R}^2 = 0.840$ SEE $= 0.018$ DW $= 1.96$ $\rho = 0.481$ h $= 0.25$

Period 61:1 to 75:4

Wage rate in manufacturing

$$(W - W_{-4})/W_{-4} = \underset{(15.8)}{0.220} + \sum_{i=o}^{3} a_i((P - P_{-4})/P_{-4})_{-i} + \sum_{i=o}^{8} b_i(1/LDDLS)_{-i}$$

$$+ \underset{(2.7)}{0.067}\ D743 + \underset{(3.8)}{0.093}\ D751$$

$\bar{R}^2 = 0.892$ SEE = 0.022 DW = 1.88

Period 61:1 to 75:4

i	0	1	2	3	4	5	6	7	8	Sum
a_i	0.287 (9.4)	0.215 (9.4)	0.143 (9.4)	0.072 (9.4)						0.716 (9.4)
b_i	-0.029 (5.8)	-0.023 (7.4)	-0.017 (10.1)	-0.013 (9.4)	-0.009 (5.2)	-0.006 (2.8)	-0.003 (1.6)	-0.001 (0.8)	-0.0004 (0.4)	-0.102 (10.1)

<u>Wage rate (total)</u>

$$\underset{(6.0)}{WT = -\ 20.884} + \underset{(86.8)}{0.691\ W} + \underset{(1.7)}{0.193\ TIME}$$

$\bar{R}^2 = 0.999$ SEE = 6.301 DW = 1.47

Period 61:1 to 75:4

<u>Average weekly hours worked</u>

$$\underset{(5.1)}{\mathrm{LOG(H)} = 3.309} + \underset{(3.3)}{0.057}\ \mathrm{LOG(GNPV/(W \cdot LE))} + \underset{(2.3)}{0.043}\ \mathrm{LOG(CU)} + \underset{(3.0)}{0.080}\ \Delta\mathrm{LOG(CU)}$$

$$+ \underset{(3.2)}{0.390}\ \mathrm{LOG(H)}_{-1} - \underset{(4.6)}{0.001}\ \mathrm{TIME} - \underset{(2.8)}{0.014}\ \mathrm{D741}$$

$\bar{R}^2 = 0.988$ SEE = 0.005 DW = 2.18 h =-2.49

Period 61:1 to 75:4

<u>Unfilled vacancy ratio (labor demand/labor supply)</u>

$$\underset{}{\mathrm{LOG(LDDLS)}} = -\underset{(4.5)}{3.541} + \underset{(4.5)}{0.786}\ \mathrm{LOG(CU)} + \underset{(4.8)}{1.689}\ \mathrm{LOG(CU/CU_{-1})} + \underset{(21.4)}{0.856}\ \mathrm{LOG(LDDLS)_{-1}}$$

$\bar{R}^2 = 0.976$ SEE = 0.053 DW = 1.54 h = 1.87

Period 61:1 to 75:4

Employment

$$\underset{(4.7)}{\text{LOG(LE)} = 3.96} + \underset{(2.9)}{0.044}\ \text{LOG(GNPV/(W·H))} + \underset{(3.0)}{0.040}\ \text{LOG(CU)} + \underset{(1.7)}{0.021}\ \text{LOG(G)}$$

$$+ \underset{(2.0)}{8.2\text{E-}4}\ \text{TIME} + \underset{(4.7)}{0.487}\ \text{LOG}(\text{LE}_{-1})$$

$\bar{R}^2 = 0.995$ SEE = 3.6E-3 DW = 1.96

Period 61:1 to 75:4

Note: E-4 = 10^{-4}

Currency held by banks

$$\underset{}{LOG(CURB)} = \underset{(5.4)}{-\,2.397} + LOG(DT)_{-1}\Big(\underset{(19.9)}{0.849} - \underset{(5.2)}{0.126}\,Q1 - \underset{(2.9)}{0.077}\,Q2 - \underset{(4.1)}{0.093}\,Q3\Big)$$

$$+ \underset{(5.0)}{1.255}\,Q1 + \underset{(2.2)}{0.622}\,Q2 + \underset{(3.8)}{0.899}\,Q3$$

$\bar{R}^2 = 0.896$ SEE $= 0.065$ DW $= 2.35$ $\rho = 0.752$

Period 61:1 to 75:4

Currency held by the nonbank public

$$\underset{(3.0)}{CUR/NW = 0.014} + \underset{(3.8)}{1.039E{-}7}\ NW/P + \underset{(12.9)}{0.119}\ YWV/NW + \sum_{i=o}^{7} a_i\,(RL)_{-1} - \underset{(16.3)}{0.006}\ Q1$$

$$- \underset{(13.5)}{0.005}\ Q2 - \underset{(20.9)}{0.007}\ Q3$$

$\bar{R}^2 = 0.991$ SEE = 0.001 DW = 1.95

Period 62:3 to 75:4

i	0	1	2	3	4	5	6	7	Sum
a_i	-0.4E-4 (0.1)	-2E-4 (1.1)	-4E-4 (3.6)	-4E-4 (5.4)	-5E-4 (4.1)	-4E-4 (3.3)	-3E-4 (2.9)	-2E-4 (2.6)	24E-4 (5.4)

Note: E-7 = 10^{-7}
E-4 = 10^{-4}

Demand deposits

$$DD/NW = \underset{(5.5)}{0.098} + \underset{(49.9)}{0.583}\ YWV/NW + \sum_{i=o}^{4} a_i RL_{-(i+1)} + \sum_{i=o}^{5} b_i (FRSC + FORDISC)_{-i} - \underset{(1.7)}{0.003}\ Q1$$

$$- \underset{(3.3)}{0.005}\ Q2 - \underset{(5.1)}{0.008}\ Q3$$

$\bar{R}^2 = 0.987$ SEE = 0.004 DW = 1.40

Period 62:1 to 75:4

i	0	1	2	3	4	5	Sum
a_i	0.006 (1.6)	- 0.002 (1.5)	- 0.006 (3.7)	- 0.007 (3.7)	- 0.005 (3.4)		- 0.014 (4.8)
b_i	- 4.2E-4 (3.2)	- 4.4E-4 (5.5)	- 4.3E-4 (5.9)	- 3.8E-4 (4.8)	- 2.9E-4 (4.0)	- 1.6E-4 (3.5)	- 0.002 (5.9)

NOTE: E-4 = 10^{-4}

Time deposits

$$TD/NW = \underset{(0.2)}{0.011} + \sum_{i=o}^{6} a_i GNPV/NW_{-i} + \sum_{i=o}^{5} b_i RL_{-i} + \sum_{i=o}^{7} c_i (FRSC + FORDISC)_{-i} + \sum_{i=o}^{5} d_i RTD_{-i}$$

$$- \underset{(4.4)}{0.003}\ Q1 - \underset{(1.8)}{0.001}\ Q2 + \underset{(0.4)}{0.001}\ Q3$$

$\bar{R}^2 = 0.961$ SEE = 0.002 DW = 2.01 $\rho = 0.855$

Period 62:4 to 75:4

i	0	1	2	3	4	5	6	7	Sum
a_i	0.125 (3.1)	0.111 (6.4)	0.096 (25.8)	0.080 (6.2)	0.062 (3.3)	0.043 (2.3)	0.022 (1.8)		0.539 (25.8)
b_i	- 0.007 (1.4)	- 0.007 (2.2)	- 0.007 (2.0)	- 0.006 (1.5)	- 0.004 (1.3)	- 0.002 (1.1)			- 0.033 (2.2)
c_i	-0.6E-4 (0.4)	- 2E-4 (2.2)	- 4E-4 (3.5)	- 4E-4 (4.0)	- 5E-4 (4.1)	- 4E-4 (4.0)	- 3E-4 (4.0)	- 2E-4 (4.0)	- 25E-4 (4.1)
d_i	0.004 (1.2)	0.007 (3.1)	0.008 (3.3)	0.008 (2.9)	0.007 (2.6)	0.004 (2.4)			0.037 (3.4)

NOTE: E-4 = 10^{-4}

Call rate

$$RS = \underset{(1.5)}{4.481} + \underset{(5.9)}{1.593}\ RD - \underset{(2.5)}{1.406}\ RLN + \underset{(2.5)}{19.772}\ \Delta(RT - RB)/DT' + \underset{(3.4)}{27.528}\ RB/DT'$$

$$+ \underset{(3.7)}{0.384}\ RS_{-1}$$

$\bar{R}^2 = 0.850$ SEE $= 0.446$ DW $= 2.02$ $\rho = 0.620$ h $= -0.098$

Period 63:3 to 75:4

Average interest rate on bank loans

$$RLN = \underset{(4.6)}{1.754} + \underset{(12.6)}{0.262}\ RD + \underset{(3.3)}{0.112}\ RD_{-1} + \underset{(2.0)}{0.101}\ RL + \sum_{i=2}^{15} a_i RS_{-i} + \underset{(3.7)}{0.271}\ RLN_{-1} + \underset{(2.9)}{3.16E\text{-}5}\ LN$$

$\bar{R}^2 = 0.976$ SEE $= 0.039$ DW $= 1.72$ $\rho = 0.686$ $h = 1.32$

Period 61:1 to 75:4

i	2	3	4	5	6	7	8
a_i	0.0026	0.0044	0.0059	0.0070	0.0079	0.0084	0.0086
	(0.6)	(1.6)	(2.7)	(3.6)	(4.0)	(4.2)	(4.5)

9	10	11	12	13	14	15	Sum
0.0085	0.0081	0.0075	0.0065	0.0053	0.0038	0.0020	0.087
(4.5)	(4.3)	(3.8)	(3.3)	(2.8)	(2.3)	(2.0)	(4.1)

NOTE: E-5 = 10^{-5}

Banks' reserve deposits with the Bank of Japan

(a) $RT = \hat{RT} + [DD(RRDBL \cdot \beta + RRDBS\ (1-\beta)) + TD(RRTBL \cdot \beta + RRTBS(1-\beta))]/100$

(b) $\hat{RT} = \underset{(15.0)}{0.386}\ [DD(RRDBM - RRDBS) + TD(RRTBM - RRTBS)]/100 - \underset{(2.4)}{4.751}\ RS$

$- \underset{(6.1)}{436.4}\ D754 + \underset{(4.0)}{92.91}\ Q1 - \underset{(0.2)}{4.599}\ Q2 + \underset{(1.7)}{38.63}\ Q3$

$\bar{R}^2 = 0.819$ SEE = 66.923 DW = 1.27

Period 61:1 to 75:4

Stock of short-term private claims on foreigners, banking sector

$$STBC = \underset{(4.1)}{707.54} + \sum_{i=o}^{2} a_i(JRS-JFRSC)_{-i} + \sum_{i=o}^{4} b_i XGV_{-i} + \underset{(1.7)}{1880.3} \quad (E-UPXGUV/PXGUV)$$

$\bar{R}^2 = 0.941$ SEE = 223.3 DW = 1.30

Period 69:1 to 75:6

i	0	1	2	3	4	Sum
a_i	-43.63 (1.5)	-28.66 (1.4)	-14.12 (0.6)			-86.4 (1.9)
b_i	0.074 (3.3)	0.062 (10.5)	0.049 (5.9)	0.034 (2.9)	0.018 (1.9)	0.237 (13.1)

Stock of short-term private liabilities to foreigners, banking sector

$$STBL = \underset{(0.7)}{143.43} + \underset{(2.8)}{253.84}\ D644754 - \underset{(2.7)}{251.59}\ D702754 - \underset{(1.6)}{279.42}\ D732754 + \sum_{i=o}^{4} a_i RDS_{-i}$$

$$+ \sum_{i=o}^{5} b_i\ FRSL_{-i} + \sum_{i=o}^{5} c_i MGV_{-i}$$

$\bar{R}^2 = 0.995$ SEE = 157.32 DW = 1.68

Period 62:3 to 75:4

i	0	1	2	3	4	5	Sum
a_i	30.28 (1.3)	15.89 (1.8)	5.67 (0.7)	-0.39 (0.0)	-2.28 (0.3)		49.17 (1.7)
b_i	-36.72 (2.1)	-47.37 (6.6)	-51.31 (7.8)	-49.54 (5.0)	-39.07 (3.9)	-22.89 (3.3)	-245.89 (9.0)
c_i	0.28 (10.8)	0.17 (15.5)	0.091 (5.6)	0.044 (2.6)	0.027 (2.5)	0.042 (1.7)	0.66 (27.3)

<u>Free Yen deposits</u>

$$\underset{(15.4)}{STBLY\$ = -6.472} + \underset{(15.5)}{0.002UNW} + \underset{(2.3)}{0.043\ RFY} \underset{(5.7)}{-0.065\ FRSL} \underset{(2.0)}{-0.008\ FORDISC}$$

$$+ \underset{(1.3)}{0.164\ DFYD}$$

$\bar{R}^2 = 0.899$ SEE = 0.113 DW = 1.15

Period 66:1 to 75:4

<u>Stock of short-term private liabilities to foreigners, non-banking sector</u>

$$STK = -\underset{(17.8)}{904.76} + \sum_{i=o}^{6} a_i (RLN - FRSL)_{-i} + \sum_{i=o}^{9} b_i \; FORDISC_{-i} + \sum_{i=o}^{4} c_i MGV_{-i}$$

$\bar{R}^2 = 0.991$ SEE = 109.53 DW = 1.27

Period 62:2 to 75:4

i	0	1	2	3	4	5	6	Sum
a_i	15.58 (1.9)	18.97 (4.8)	20.49 (10.0)	20.13 (6.5)	17.91 (4.5)	13.81 (3.6)	7.84 (3.2)	114.72 (9.9)
b_i	-9.77 (3.0)	-15.15 (8.1)	-19.12 (20.0)	-21.68 (23.4)	-22.82 (16.5)	-22.55 (12.9)	-20.87 (11.1)	
c_i	0.102 (4.6)	0.086 (19.9)	0.067 (9.0)	0.047 (3.9)	0.024 (2.6)			0.326 (50.9)

i	7	8	9	Sum
b_i	-17.77 (9.9)	-13.26 (9.2)	-7.34 (8.6)	-170.35 (23.4)

<u>Long-term portfolio claims on foreigners</u>

$$LTPC\$ = -\underset{(8.6)}{6.890} + \underset{(6.2)}{0.024}\ NW\$ + \sum_{i=o}^{4} a_i (RMEB - RL)_{-i} + \sum_{i=o}^{3} b_i FORDISC_{-i} + \sum_{i=o}^{6} c_i XGV\$_{-i}$$

$\bar{R}^2 = 0.994$ SEE = 0.574 DW = 1.19

Period 70:1 to 77:1

	0	1	2	3	4	5	6	Sum
a_i	1.045 (3.9)	0.844 (5.6)	0.640 (5.0)	0.431 (3.4)	0.218 (2.4)			3.177 (5.8)
b_i	0.109 (4.3)	0.059 (5.0)	0.024 (1.0)	0.004 (0.2)				0.196 (4.9)
c_i	0.004 (0.1)	0.025 (1.6)	0.039 (4.5)	0.046 (5.7)	0.045 (4.9)	0.037 (4.2)	0.022 (3.8)	0.218 (4.5)

Direct investment claims on foreigners

$$\underset{(4.5)}{DLTDC\$ = -0.588} + \sum_{i=o}^{10} a_i \Delta\,(FGNPV\$)_{-1} + \sum_{i=o}^{10} b_i\,\Delta(ROWIP \cdot ROWPXG)_{-1} + \underset{(5.9)}{1.41}\ D733$$

$\bar{R}^2 = 0.923$ SEE = 0.218   DW = 1.39

Period 63:4 to 75:4

i	0	1	2	3	4	5
a_i	0.0102 (2.5)	0.0101 (4.3)	0.0099 (6.9)	0.0094 (5.3)	0.0088 (3.5)	0.0081 (2.6)
b_i	0.9866 (3.5)	0.9333 (3.7)	0.8727 (3.6)	0.8049 (3.4)	0.7297 (3.1)	0.6473 (2.8)

i	6	7	8	9	10	Sum
a_i	0.0072 (2.1)	0.0061 (1.8)	0.0048 (1.6)	0.0034 (1.5)	0.0018 (1.3)	0.0800 (4.7)
b_i	0.5576 (2.6)	0.4607 (2.4)	0.3564 (2.2)	0.2449 (2.1)	0.1261 (2.0)	6.720 (3.3)

3-Month forward discount on the Yen vis-a-vis the U.S. dollar

$$\begin{aligned}
\text{FORDISC} = {} & \underset{(9.1)}{4.169} + \underset{(5.0)}{16.28}\,(\text{E-UPXGUV/PXGUV}) - \underset{(13.0)}{13.294}\,[\text{NFAT\$/MGV\$}] \\
& + \text{FLOAT} \cdot [\underset{(2.0)}{3.942} - \underset{(0.3)}{2.692}\,(\text{E-UPXGUV/PXGUV}) - \underset{(1.2)}{7.669}\,(\text{NFAT\$/MGV\$}] \\
& + \underset{(5.2)}{8.045}\,\text{D734} + \underset{(9.9)}{15.811}\,\text{D741}
\end{aligned}$$

$R^2 = 0.884$ SEE = 1.454 DW = 1.81

Period 61:1 to 75:4

Valuation adjustment in the stock of net foreign assets

$$\Delta V\$ = \underset{(3.6)}{0.770} \, (\Delta SDRER \cdot NFAO\$_{-1})$$

$\bar{R}^2 = 0.409$ SEE = 0.055 DW = 2.86

Period 71:3 to 75:4

Reaction function for change in net foreign assets

$$\underset{}{DNFA\$} = -\underset{(3.9)}{60.3} + \underset{(5.5)}{102.0}\,(E/E_{-1}) - \underset{(9.2)}{3.02}\,NFAT\$_{-1}$$

$\bar{R}^2 = 0.890$ SEE $= 2.16$ DW $= 1.66$ $\rho = -0.845$

Period 73:1 to 75:4

<u>Monetary authorities' claims on government</u>

$$\underset{}{CGVT} = \underset{(4.0)}{-71.615} + \underset{(14.8)}{0.051}\ GNPVNSA - \underset{(9.9)}{0.499}\ NFA + FLOAT\ (\underset{(1.7)}{-6874.36} \underset{(7.0)}{-2827.67}\ LDDLS$$

$$+ \underset{(2.2)}{9408.79}\ E) + \underset{(3.2)}{419.689}\ Q1 + \underset{(0.4)}{58.393}\ Q2 \underset{(0.9)}{-117.877}\ Q3$$

$\bar{R}^2 = 0.948$ SEE = 334.311 DW = 1.59

Period 61:1 to 75:4

V. LIST OF IDENTITIES

GNP identities

1. $GNP = (CV + IFPV + IFGV + IIV + GV)/P + XGSNI - MGSNI$

2. $GNPV = CV + IFPV + IFGV + IIV + GV + XGSNIV - MGSNIV$

Components of GNP

3. $CV = C \cdot P$

4. $GV = G \cdot P$

5. $IFGV = IFG \cdot P$

6. $IFP = IFPNR + IFPR$

7. $IFPV = IFP \cdot WPI$

8. $IIV = II \cdot P$

Disposable income proxy

9. $YDVNSA = GNPVNSA - TVNSA + TRANVNSA - CCAVNSA$

Private capital stock (gross)

10. $KP = KP_{-1} + (IFP - SR)/4$

Private inventory stock

11. $SII = SII_{-1} + II/4$

Capital consumption allowance, total

12. $CCAV = CCAPV + CCAGV$

User cost of capital

13. $UCNR = WPI[RLN/100 + \gamma \cdot CCAPV/(WPI \cdot KPNR_{-1})]$

Private net worth proxy

14. $\Delta NW = YDV - CV$

15. $NW = \Delta NW + NW(-1)$

Total compensation of employees

16. $YWV = WT \cdot LE \cdot H \cdot 12/100000$

17. $YW = YWV/P$

Government debt proxy

18. $GD = GD_{-1} + (GV + IFGV + TRANV - TV)/4$

Exports of goods and services

19. $XGS = XG + (XGSV - XGV)/PXS$

20. $XGSNINS = XGS$

21. $XGSV = XGV + XSOPV + XSOGV + (XSDYV\$ + XSOYV\$) \cdot EXG$

Imports of goods and services

22. $MGS = MG + (MGSV - MGV)/PMS$

23. $MGSNINS = MGS$

24. $MGSV = MGV + MSOPV + MSOGV + (MSDYV\$ + MSOYV\$) \cdot EMG$

Merchandise imports, balance of payments basis

25. $MG = MGV/PMGUV$

26. $MGV = MGV\$ \cdot EMG$

Merchandise imports, customs clearance basis (U.S. $)

27. MJTV = MJUV + MJCV + MJGV + MJEV + MJRV

Merchandise exports, balance of payment basis

28. XG = XGV/PXGUV[2/]

29. XGV = XGV$ · EXG[1/]

Merchandise exports, customs clearance basis (U.S. $)[1/]

30. XJTV = XJUV + XJCV + XJGV + XJEV + XJRV

Import conversion factor

31. EMG = EMGR/E · 0.0033

Export conversion factor

32. EXG = EXGR/E · 0.0033

Services

33. MSOPV = MSOP · PMS

34. XSOPV = XSOP · PXS

Transfer payments

35. MTRANV = MTRANPV + MTRANGV

36. XTRANV = XTRANV$ · EXG

1/ Applies only to linked version of the model.

2/ Equation 28 determines XG in the linked version of the model. In the unlinked version of the model XG is determined by an aggregate export function; and XGV is determined by equation 28.

Trade, services, transfers and current account balances

37. TB\$ = XGV\$ - MGV\$

38. TB = TB\$/(E*0.0033)

39. SB\$ =[XSDYV\$ + XSOYV\$ + (XSOPV + XSOGV) /EXG]- [MSDYV\$ + MSOYV\$ + (MSOPV + MSOGV)/EMG]

40. TRANB\$ = XTRANV/EXG - MTRANV/EMG

41. CAB\$ = TB\$ + SB\$ + TRANB\$

GNP deflator

42. PGNP = GNPV/GNP

Deflators for exports and imports of goods and services

43. PXGSNI = XGSNIVNS/XGSNINS

44. PMGSNI = MGSNIVNS/MGSNINS

Import unit value (yen)

45. PMGUV = PMGUV\$/E

Unemployment

46. UE = LF - LE

47. UN = UE/LF · 100

Balance sheet of the monetary authorities

48. NFA + NGP + OTH = RT - RB + CUR + CURB

Net government position of the monetary authorities

49. NGP = CGVT - DGVT

Net foreign assets, stocks

50. $NFA = NFA_{-1} + DNFA/4$

51. $NFA\$ = NFA\$_{-1} + DNFA\$/4$

52. NFAT$ = NFA$ + SDRCA$ + V$

Total deposits ("deposit money banks" basis)

53. DT = DD + TD

Total deposits ("all banks" basis)

54. $DT' = \delta\, DT$

Interest rate on free yen deposits (proxy)

55. RFY = min[RFY*, RTD]

56. RFY* = max[(RS-RRFYD),0]

Direct investment claims and liabilities, stocks

57. $LTDC\$ = DLTDC\$/4 + LTDC\$_{-1}$

58. $LTDL\$ = DLTDL\$/4 + LTDL\$_{-1}$

Long-term portfolio claims, flow

59. $DLTPC\$ = \Delta LTPC\$ \cdot 4$

Long-term portfolio liabilities, stock

60. $LTPL\$ = DLTPL\$/4 + LTPL\$_{-1}$

Short-term claims and liabilities, flows

61. $DSTBL\$ = 4 \cdot \Delta STBL \cdot E \cdot 0.0033$

62. $DSTBC\$ = 4 \cdot \Delta STBC \cdot E \cdot 0.0033$

63. $DSTK\$ = 4 \cdot \Delta STK \cdot E \cdot 0.0033$

Short-term claims and liabilities, stocks

64. $STBL\$ = DSTBL\$/4 + STBL\$_{-1}$

65. $STBC\$ = DSTBC\$/4 + STBC\$_{-1}$

66. $STK\$ = DSTK\$/4 + STK\$_{-1}$

Long-term capital balance

67. $LTKB\$ = (DLTDL\$ + DLTPL\$) - (DLTDC\$ + DLTPC\$)$

Short-term banking capital balance

68. $STKBB\$ = DSTBL\$ - DSTBC\$$

Average interest rates

69. $RDS = RD^{w} \cdot RS^{(1-w)}$

70. $FRSC = URS^{0.6238} \cdot RED^{0.3762}$

71. $FRSL = URS^{0.494} \cdot RED^{0.506}$

Balance of payments

72. $DNFA\$ = TB\$ + SB\$ + TRANB\$ + LTKB\$ + STKBB\$ + DSTK\$ - RES\$ + EANDO\$$

Official reserve changes and exchange rate

73. $DNFA = DNFA\$/(E \cdot 0.0033)$

74. $DNFA = DNFAFX + DNFAFL$

75. $E = EFX + EFL$

76. $EFL(1 - FLOAT) + DNFAFX \cdot FLOAT = 0$

Forward exchange rate

77. $EFR = E \cdot 0.0033/(1 + FORDISC/400)$

VI. SOURCES AND DEFINITIONS OF VARIABLES

The following list provides definitions and source materials for all variables used in the linked and unlinked versions of the Japanese model. The symbol "x" indicates an exogenous variable. The symbol "*" indicates a variable endogenously determined within the multicountry model, but exogenously determined (or not included) in the unlinked Japanese model.

Conventions regarding measurement units and dummy variables are explained in Part III.

The following abbreviations are used:

BOJ = Bank of Japan
BOJ tape = Bank of Japan model data file
BPM = Balance of Payments Monthly (BOJ)
DOT = Direction of Trade (IMF/World Bank)
EPA = Economic Planning Agency
ESA = Economic Statistics Annual (BOJ)
ESM = Economic Statistics Monthly (BOJ)
FRB = Federal Reserve Board
IFS = International Financial Statistics (IMF)
IMF = International Monetary Fund
LINK = Japanese LINK model data file
UN = United Nations, Monthly Bulletin of Statistics

C = private consumption expenditure (C = CV/P)

CAB$ = current account balance, dollars (CAB$ = TB$ + SB$ + TRANB$).

x CARGOF = ratio of import cargo loaded by foreign vessels (LINK)

x CARGOJ = ratio of export cargo loaded by Japanese vessels (LINK)

CCAV, CCAVNSA } = capital consumption allowances (EPA)

x CCAGV = capital consumption allowances, government (CCAGV = CCAV-CCAPV)

CCAPV = capital consumption allowances, private (LINK)

CCAPVNR = capital consumption allowances, private nonresidential (LINK)

* CE = spot exchange rate index, U.S.$/Canadian$ (FRB)

CGVT = monetary authorities, claims on Government (IFS)

x CIFR = FOB/CIF ratio for merchandise imports (IFS)

CPXGUV = Canadian export unit value (statistics Canada)

CU = capacity utilization index, ratio of industrial production index to production capacity index, manufacturing (BOJ, ESA)

CUR = currency in the hands of the non-bank public (BOJ tape)

CURB = currency in the hands of banks (CURB = CURT - CUR)

CURT = currency issue (BOJ tape)

CV, CVNSA } = private consumption expenditure (BOJ tape)

DD = demand deposit component of M1 (BOJ tape)

DFYD = dummy variable for controls on Free Yen deposits. Equal to 1 when RFY* = 0; and to zero otherwise.

x DGVT = monetary authorities, government deposits (IFS)

DLTDC$ = change in long-term direct claims on foreigners (BOJ, BPM)

DLTDL$ = change in long-term direct liabilities to foreigners (BOJ, BPM)

DLTPC$ = change in long-term portfolio claims on foreigners (BOJ, BPM)

DLTPL$ = change in long-term portfolio liabilities to foreigners (BOJ, BPM)

DNFA = DNFA$/(E • 0.0033)

DNFAFX = DNFA •(1-FLOAT)

DNFA$ = change in net foreign assets of the monetary authorities (IFS, line 79d minus line 78bd)

DNFAFL = DNFA• FLOAT

DNFAT$ = ΔNFAT$

DSTBC = change in short-term banking claims on foreigners (BOJ, BPM)

DSTBL$ = change in short-term banking liabilities to foreigners (BOJ, BPM)

DSTK$ = change in short-term nonbanking liabilities to foreigners, net (BOJ, BPM)

DT = total deposits, "deposit money banks" basis. (DT = DD + TD)

DT' = total deposits, "all banks" basis. (BOJ, ESA)

E = spot exchange rate index, U.S. dollars/Yen, (E = ER/0.0033)

* EE = spot exchange rate index, U.S. dollars/U.K. Pound (FRB)

EANDO$ = errors and omissions item (calculated as residual from balance of payments equation)

x EFX = E •(1-FLOAT)

EFL = E •FLOAT

EFR = 3-months forward exchange rate, U.S. dollars/Yen (Bank of Tokyo Weekly Review).

EMG = Import conversion rate, in Yen per U.S. dollar (Japanese Tariff Assn., Summary Report: Trade of Japan)

x EMGR = EMG • E • 0.0033

* EPXGUV = U.K. export unit value

ER = spot exchange rate, in U.S. dollars per Yen (FRB)

EXG = Export conversion rate, in Yen per U.S. Dollar (Japanese Tariff Assn., Summary Report: Trade of Japan) x EXGR = EXG • E • 0.0033

* FCU = weighted average 1/ of foreign capacity utilization indexes

* FE = trade-weighted average 1/ of foreign spot exchange rates

* FGNP = weighted average 1/ of foreign GNP variables

* FGNPV$ = weighted average 1/ of foreign GNPV variables (in U.S. dollars)

x FLOAT = switch variable for floating rate period, 1973:2 - 1975:4 = 1.0

FORDISC = forward discount on Yen (per cent per annum) = 400 ((1/EFR - 1/ER)/(1/ER)

* FP = weighted average 1/ of foreign absorption deflators

* FPXG = weighted average 1/ of foreign export prices

* FPXGT = weighted average 2/ of foreign export prices

* FRLCD = weighted average 1/ of foreign long-term rates (weights based on direct investment claims)

* FRSL }= weighted average of U.S. and Eurodollar short-term rates
* FRSC } (weights based on external liabilities and claims, respectively)

* FRLL = weighted average of long-term U.S. and German rates (weights based on long-term portfolio liabilities)

x G = government expenditures, excluding investment (G = GV/P)

GD = proxy for the stock of government debt (cumulated value of GV + IFGV + TRANV - TV)/4)

* GE = spot exchange rate index, U.S. dollars/deutsche mark (FRB)

GNP = gross national product (BOJ tape)

1/ Average for the United States, Canada, Germany and the United Kingdom

2/ Average for countries listed in footnote 1 plus ROWPXG

$\left.\begin{array}{l}\text{GNPV}\\ \text{GNPVNSA}\end{array}\right\}$ = gross national product (BOJ tape)

* GPXGUV = german export unit value

GV = government expenditures, excluding investment (BOJ tape)

H = average monthly hours worked in all industries (BOJ tape)

x IFG = Government fixed investment (IFG = IFGV/P)

IFGV = Government fixed investment (BOJ tape)

IFP = private fixed investment, total (IFP = IFPR + IFPNR)

IFPR = private fixed investment, residential (IFPR = IFPRV/WPI)

IFPV = private fixed investment, (BOJ tape)

IFPNR = private fixed investment, nonresidential (IFPNR = IFPNRV/WPI)

IFPNRV = private fixed investment, nonresidential (BOJ tape)

II = private inventory investment (II = IIV/P)

IIV = private inventory investment (BOJ tape)

KP = gross private capital stock (cumulated value of (IFP-SR)/4)

KPNR = gross private nonresidential capital stock (cumulated value of (IFPNR-SR)/4)

LDDLS = unfilled vacancy ratio; job offerings to job applicants (BOJ tape)

LE = total employment (BOJ tape)

x LF = labor force (BOJ tape)

x LN = loans and discounts of all banks (BOJ, ESA)

LTC\$ = total long-term claims on foreigners (BOJ, BPM)

LTDL\$ = long-term direct liabilities to foreigners (cumulated value of DLTDL\$/4)

LTDC\$ = long-term direct claims on foreigners (cumulated value of DLTDC\$/4)

LTKB$ = long-term capital balance (LTKB$ = DLTDL$ + DLTPL$ - DLTDC$ - DLTPC$)

LTL$ = total long-term liabilities to foreigners (BOJ, BPM)

LTPC$ = long-term portfolio claims

x LTPL$ = long-term portfolio liabilities to foreigners (LTPL$ = LTL$ - LTDL$)

MG = merchandise imports, balance of payments basis (MG = MGV/PMGUV)

MGS = imports of goods and services, balance of payments basis (MGS = MGSNINS)

MGSNIV, MGSNI = imports of goods and services, national income accounts basis (BOJ tape)

MGSNIVNS = imports of goods and services, n.i.a. basis (EPA)

MGSV = imports of goods and services, balance of payments basis (MGSV = MGV + MSV)

MGSV$ = imports of goods and services, balance of payments basis (MGSV$ = MGV$ + MSV$)

MGV = merchandise imports, balance of payments basis (MGV = MGV$ • EMG)

MGV$ = merchandise imports, balance of payments basis (BOJ, BPM)

MJTV = merchandise imports, c.i.f. customs clearance basis (BOJ, BPM)

MJCV = merchandise imports from Canada, c.i.f. (DOT)

MJEV = merchandise imports from the U.K., c.i.f. (DOT)

MJGV = merchandise imports from Germany, c.i.f. (DOT)

MJRV = merchandise imports from R.O.W., c.i.f. (DOT)

MJUV = merchandise imports from the U.S., c.i.f. (DOT)

MSV$ = all service account payments (BOJ, BPM)

MSDYV$ = direct investment income payments (BOJ, BPM)

MSOV$ = service account payments other than investment income (MSOV$ = MSV$ - MSYV$)

MSOP = other service account payments private, (MSOP = (MSOV$ - MSOGV$)·EMG/PMS)

x MSOGV = MSOGV$ · EMG

MSOGV$ = service account payments other than investment income, government (BOJ, BPM)

MSOPV = MSOPV$ · EMG

MSOPV$ = service account payments other than investment income, private (BOJ, BPM)

MSOYV$ = nondirect investment income payments (BOJ, BPM)

MSYV$ = investment income payments (BOJ, BPM)

x MTRANGV = MTRANV - MTRANPV

MTRANV = BOP transfers, debits (MTRANV = MTRANV$ · EMG)

MTRANV$ = BOP transfers, debits (BOJ, BPM)

MTRANPV = BOP transfers, debits (MTRANV = MTRANV$ · EMG)

MTRANPV$ = BOP transfers, debits private sector (BOJ, BPM)

NFA = net foreign assets of the monetary authorities (cumulated value of DNFA/4)

NFA$ = net foreign assets of the monetary authorities (cumulated value of DNFA$/4)

NGP = net government position of the monetary authorities (NGP = CGVT - DGVT)

x NFAO$ = net foreign assets other than foreign exchange holdings (=NFAT$-NFAFE$)

NFAT$ = net foreign assets of the monetary authorities including the cumulated value of SDR allocations and valuation adjustments (IFS, line 1)

NFAFE$ = foreign exchange component of NFAT$ (IFS)

NW = private net worth proxy (cumulated value of private savings)

NW$ = NW ·ER

x OTH = other assets of the monetary authorities, net (OTH = CURT+RT-NFA-NGP-RB)

P = deflator for aggregate expenditure; P = (GNPV-XGSNIV+MGSNIV)/(GNP-XGSNI+MGSNI)

PGNP = GNP deflator (BOJ tape)

PMGSNI = deflator for imports of goods and services (BOJ tape)

PMGUV = unit value of merchandise imports, Yen (IFS)

PMGUV$ = unit value of merchandise imports, U.S. dollars (PMGUV$ = PMGUV · E)

PMS = price of imported services (PMS = (MGSV-MGV)/(MGSNINS-MG))

x POP = population, 15 years old and over (BOJ, ESA)

PXGSNI = deflator for exports of goods and services (BOJ tape)

PXGUV = unit value of merchandise exports, Yen (IFS)

PXS = price of exported services (PXS = (XGSV-XGV)/(XGSNINS-XG))

Q1, Q2, Q3 = seasonal dummies

RB = banks borrowed reserves = monetary authorities' claims on "deposit money banks" (IFS)

x RD = discount rate of the Bank of Japan (BOJ tape)

RDS = weighted average of RD and RS

x RES$ = residual item in balance of payments (BOJ, BPM)

* RED = 3 months Eurodollar deposit rate (FRB)

RFY = proxy for interest rate on "free yen deposits" (RFY = min[RFY*, RTD])

RFY* = desired value of RFY, (RFY* = max[RS-RRFYD,0])

RL = yield on bank debentures (BOJ, ESA)

RLN = average interest rate on bank loans (BOJ, ESM)

* RMEB = Euro-bond rate, U.S. companies (Morgan Guaranty Trust, <u>World Financial Markets</u>)

* ROWIP = average of industrial production indexes for 9 rest of the world (ROW) countries 1/

* ROWPXG = ROW export price index

x RRDBS = reserve requirement 2/ against demand deposits, small banks (BOJ, ESA)

x RRDBM = reserve requirement against demand deposits, medium banks (BOJ, ESA)

x RRDBL = reserve requirement against demand deposits, large banks (BOJ, ESA)

x RRTBS = reserve requirement against time deposits, small banks (BOJ, ESA)

x RRTBM = reserve requirement agsint time deposits, medium banks (BOJ, ESA)

x RRTBL = reserve requirement against time deposits, large banks (BOJ, ESA)

x RRFYD = marginal reserve requirement against free yen deposits (BOJ, ESA)

RS = interest rate on call money (BOJ tape)

RT = total bank reserve deposits with the Bank of Japan (BOJ, ESA, "Accounts of the Bank of Japan")

x RTD = interest rate on one-year time deposits (BOJ tape)

SB$ = services balance (SB$ = (XGSV$ - XGV$) - (MGSV$ - MGV$))

x SDRCA$ = cumulative allocation of Special Drawing Rights, net of valuation changes (IFS, line 78bd)

* SDRER = exchange rate, U.S. dollars per SDR (IFS)

SII = stock of private inventories (cumulated value of II/4)

STBC = cumulated value of ΔSTBC$/ER

STBC$ = short-term banking claims on foreigners (BOJ, BPM)

1/ Belgium, France, Italy, Korea, Mexico, the Netherlands, Norway, Switzerland and Taiwan.

2/ Reserve requirements are expressed as per cent of specified liabilities.

STBL = cumulated value of ΔSTBL$/ER

STBL$ = short-term banking liabilities to foreigners (BOJ, BPM)

STK = cumulated value of ΔSTK$/ER

STK$ = short-term liabilities to foreigners (BOJ, BPM)

STKBB$ = short-term banking capital balance (STKBB$ = DSTBL$ - DSTBC$)

STL$ = proxy for short-term liabilities to foreigners (STL$ = STBL$ + STK$)

x SR = removal and scrappage of fixed capital (LINK)

TB = trade balance, yen (TB = XGV - MGV)

TB$ = trade balance, U.S. dollars (TB$ = XGV$ - MGV$)

STBLY$ = short-term banking liabilities to foreigners denominated in dollars, (BOJ, BPM)

TD = time deposit component of M2 (BOJ tape)

x TIME = linear time trend

TRANV$ = transfers balance (TRANB$ = XTRANV$ - MTRANV$)

TRANV, TRANVSA } = total government transfers (EPA)

TV, TVNSA } = total government tax receipts (EPA)

UCNR = user cost of capital, private nonresidential sector, UCP = WPI · [RLN/100 + γ · CCAPV/(WPI · KPNR)]

UDILST = dummy variable for U.S. longshormen strikes.

UE = number of unemployed (BOJ tape)

UN = unemployment rate (BOJ tape)

* UNW = U.S. private net worth proxy (cumulated value of private savings)

* UPXGUV = U.S. export unit value (Department of Commerce, Survey of Current Business)

* URS = U.S. Treasury Bill rate (FRB)

* UYDV = U.S. disposable income proxy

W = compensation per man-hour in manufacturing (BOJ, ESA)

WPI = wholesale price index for all commodities (BOJ tape)

WT = total compensation per man hour

V$ = cumulated value of valuation adjustments in NFAT$

XCJV = canadian exports to Japan, f.o.b. (DOT)

XEJV = U.K. exports to Japan, f.o.b. (DOT)

XG = merchandise exports (XG = XGV/PXGUV)

XGJV = German exports to Japan, f.o.b. (DOT)

XGV = merchandise exports, balance of payments basis (XGV = XGV$ • EXG)

XGV$ = merchandise exports, balance of payments basis, (BOJ, BPM)

XGS = exports of goods and services, balance of payments basis

(XGS = XGSNINS)

XGSNI
XGSNIV } = exports of goods and services, national income accounts basis (BOJ tape)

XGSNIVNS = exports of goods and services, national income accounts basis (EPA)

XGSV = exports of goods and services, balance of payments basis

(XGSV = XGSV$ • EXG)

XGSV$ = exports of goods and services, balance of payments basis

(XGSV$ = XGV$ + XSV$)

* XJCV = merchandise exports to Canada, c.i.f. (DOT)

* XJEV = merchandise exports to the U.K., c.i.f., (DOT)

* XJGV = merchandise exports to Germany, c.i.f., (DOT)

* XJRV = merchandise exports to R.O.W., c.i.f., (DOT)

* XJTV = merchandise exports, c.i.f., customs clearance basis (BOJ, BPM)

* XJUV = merchandise exports to the U.S., c.i.f. (DOT)

* XRJV = R.O.W. exports to Japan, f.o.b., (DOT)

XSDYV$ = direct investment income receipts (BOJ, BPM)

x XSOGV = XSOGV$·EXG

XSOGV$ = services account receipts other than investment income, government sector (BOJ, BPM)

XSOPV = XSOPV$·EXG

XSOP = services account receipts other than investment income, private sector (XSOP = XSOPV$·EXG/PXS)

XSOPV$ = services account receipts other than investment income, private sector. (XSOPV$ = XSOV$ - XSOGV$)

XSOV$ = services account receipts other than investment income, total (XSOV$ = XSV$ - XSYV$)

XSOYV$ = other investment income receipts (BOJ, BPM)

XSV$ = all services account payments (BOJ, BPM)

XSYV$ = investment income receipts (BOJ, BPM)

XTRANV = transfer receipts (XTRANV = XTRANV$·EXG)

XTRANV$ = transfer receipts (BOJ, BPM)

* XUJV = U.S. exports to Japan, f.o.b. (DOT)

YD = disposable income proxy (YD = YDV/P)

YDV = disposable income proxy (YDV = GNPV - CCAV - TV + TRANV)

YDVNSA = disposable income proxy

YV = net national product (YV = GNPV - CCAV)

YWV = total compensation of employees (BOJ tape)

x β = ratio of large banks' deposits to total deposits (proxied by the ratio of nonbank deposits held with City banks to DT).

x δ = DT'/DT

x γ = CCAPVNR/CCAPV

VII. DYNAMIC SIMULATION RESULTS

(Unlinked version of the Japanese model)

	Inside sample 1964: 4 to 1975: 4	Inside sample 1973: 2 to 1975: 4	Outside sample 1976: 1 to 1977: 1
GNP	2.96 (-1.2)	1.44 (0.7)	0.67 (0.1)
GNPV	1.99 (-0.6)	1.40 (-0.7)	2.46 (-2.4)
P	1.28 (0.4)	1.62 (-1.5)	2.47 (-2.3)
WPI	2.34 (1.1)	3.67 (-3.0)	3.30 (-2.8)
RS	9.04 (2.7)	4.86 (-1.0)	3.79 (-0.7)
MG	7.84 (1.1)	10.24 (-4.1)	6.23 (4.3)
MGV	6.29 (0.2)	10.36 (-8.1)	4.72 (-0.2)
PMGUV	3.47 (-0.7)	5.51 (-3.9)	4.58 (-4.3)
XG	6.23 (-1.8)	7.2 (-4.0)	4.12 (-2.6)
XGV	6.61 (-0.3)	9.50 (-6.7)	9.36 (-9.2)
PXGUV	2.76 (1.5)	3.61 (-2.8)	7.71 (-6.7)
E	5.29* (2.4)	5.55* (4.70)	5.78 (5.5)
NFA	29.56 (-9.8)	2.56 (1.6)	3.47 (-0.2)
CU	5.32 (-0.2)	3.53 (-0.2)	3.0 (-1.5)

NOTE: Statistics are root-mean-square percentage errors and, in parenthesis, mean percentage errors.

*Computed for the period 1973:2 to 1975:4 only.

REFERENCES

AMANO, Akihiro (1975) An Econometric Model of the Japanese Balance of Payments, 1961-1970. Kobe University, Kobe.

AMANO, A., K. BAN and C. MORIGUCHI (1976) "A Quarterly Forecasting Model of Japan." Discussion paper No. 095

BABA, K. and others (1978) "An Econometric Model for Short-Term Prediction: SP-18", Economic Planning Agency, Tokyo. (March).

BANK OF JAPAN, Economic Statistics Annual, Statistics Department (various issues).

BERNER, Richard, P. CLARK, E. HERNANDEZ-CATA, H. HOWE, S. Y. KWACK and G. STEVENS, (1977) "A Multi-Country Model of the International Influences on the U.S. Economy: Preliminary Results" International Finance Discussion Paper No. 115, Board of Governors of the Federal Reserve System, Washington, D.C.

EGUCHI, Hidekuzu and Shoji TANIGAWA, (1976) "The Bank of Japan Econometric Model - A Progress Report on its Reconstruction." The 2nd Pacific Basin Central Bank Conference on Econometric Modeling (June).

HAMADA, Koichi and H. EGUCHI, "Banking Behavior Under Constraints: Credit Rationing and Monetary Mechanism in Japan." (unpublished).

HANADA, Minoru, (1977) "Financial Block of the BOJ Macro-Economic Model: a Progress Report on its Reconstruction." Third Pacific Basin Central Bank Conference on Econometric Modeling. Wellington, New Zealand.

HERNANDEZ-CATA, Ernesto, H. HOWE, S. Y. KWACK, G. STEVENS, R. BERNER and P. CLARK, (1979) "Monetary Policy Under Alternative Exchange-Rate Regimes: Simulations with a Multi-Country Model." International Finance Discussion Paper Number 130, Board of Governors of the Federal Reserve System, Washington, D. C.