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THE CANADIAN SECTOR OF THE MULTI-COUNTRY MODEL

by

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Introduction

The quarterly econometric model of Canada described in this paper is based on the prototype model of MCM presented in previous papers and in the forthcoming book, The U.S. Economy in an Interdependent World.[1/] Few departures from the prototype specification were required to represent the functioning of the Canadian economy. The most critical area for adaptation of the prototype to Canada lay in the financial sector. The Canadian financial system is characterized by close linkage to U.S. financial markets. Consequently, Canadian interest rates have traditionally moved closely with U.S. interest rates. Because of this linkage, the Bank of Canada, in its RDX2 model, chose to model the process of interest rate determination by postulating a central bank reaction function for the short-term interest rate. Thus, the application of the MCM prototype to Canada represents a departure from accepted procedure for an influential group of Canadian modelers and merits further discussion. The first part of this paper reviews the model's financial sector. The second and third parts present dynamic simulation results and selected multiplier responses that characterize the Canadian model.

The Canadian Financial Sector

Aside from the departure from the RDX2 interest-rate reaction function, several features of the Canadian financial system required adaptation in the prototype model:

(1) Canada has a secondary reserve requirement against time and demand deposits that is to be filled by Treasury bill holdings,

(2) The bulk of Canadian foreign exchange reserves are not held by the Bank of Canada,

(3) The reserve requirement is lagged, and

(4) Borrowed reserves are a very small fraction of central bank assets.[2/]

Secondary reserves.--Most Canadian financial modelers do not seem to think that the secondary reserve requirement has been a binding condition. If it were, however, the requirement would add another component in the demand for Treasury bills. Suppose that the demand for Treasury bills in the absence of a secondary reserve requirement followed a conventional portfolio demand specification where the nonbank demand component is a function of private wealth, income, and rates of return and the bank demand component is a function of deposits (time plus demand), net of the cash reserve requirement and rates of return. Now, if a secondary reserve requirement is imposed, the banks' demand for Treasury bills is the maximum of either the conventional demand for Treasury bills or the secondary reserve ratio times total deposits.

Recall, however, that the MCM does not model the bond market.[3/] Hence, secondary reserves are important only insofar as they might affect the demand for money or other assets (foreign short- or long-term capital inflows and outflows). This indirect effect on the banks' demand for money is probably small. Early tests for this effect by including the secondary reserve requirement in the inverted free reserves equation and the capital flow equations showed no significant effect.

Exchange Fund Account.--The bulk of Canadian foreign exchange reserves are held in the Exchange Fund Account (EFA). Therefore, to get a meaningful measure of net foreign assets in the monetary base equation, it is necessary to work with a balance sheet for the consolidated monetary authorities. (This was done for Japan also.) The consolidated account is generated from the balance sheets of the Bank of Canada (BOC) and the Exchange Fund Account (EFA). For our purposes the balance sheets can be written:

Bank of Canada (BOC)		Exchange Fund Account (EFA)	
Assets	**Liabilities**	**Assets**	**Liabilities**
Net Foreign Assets (NFABOC)	Currency (CUR)	Net Foreign Assets (NFAEFA)	Claims of the Government of Canada on the EFA
Net Government Position (NGPBOC)	Total Reserves (RT)		
Borrowed Reserves (RB)			
Other Assets (OTH)			

The assets of the EFA are combined with those of the BOC to yield total foreign exchange reserves. The liabilities of the EFA are subtracted from the net government position of the BOC (NGPBOC) to obtain NBP of the consolidated monetary authorities (NGP $\equiv$ NGPBOC - NFAEFA).

Assets	Liabilities
NFA[4/]	CUR
NGP	RT
RB	
OTH	

Within the framework of the consolidated monetary authorities, the sources and uses of the unborrowed monetary base are similar to those of the German and Japanese cases.

(1) Sources: $BU \equiv NFA + NGP + OTH$ (net)

(2) Uses: $BU \equiv RR + RF + CUR$

where:

BU = unborrowed monetary base;

NFA = net foreign assets;

NGP = net government position;

OTH = other assets (net);

RR = required reserves;

RF = free reserves; and

CUR = currency.

Unlike the German and Japanese cases, vault cash is an eligible component of reserves and is included there. There is no need for the variable CURB[6/], included in the prototype.

Canadian reserve requirements are much simpler than in the German and Japanese cases. There is no distinction by size of bank. Furthermore, the reserve requirement changed only once over the sample period. Unlike the U.S. monetary system, changes in reserve requirements are not used for monetary control. Prior to 1967, the primary reserve requirement on both demand and time deposits was held at 8 percent. After a 3 quarter transition period, the requirements were set to 12 percent for demand deposits and 4 percent for time deposits. This was a statutory change made for institutional purposes rather than monetary control.

Lagged reserve requirements.--Required reserves are actually based on average deposits over the four consecutive Wednesdays ending with the second last Wednesday of the previous month. The current averaging period for meeting reserve requirements is 15 days. Because U.S. reserve requirements are also lagged, this difference with respect to the prototype is one of degree. The reserves computed from end-of-month deposit data do not correspond to the "true" reserves based on deposits during the previous month. Required reserves are reported on a daily average basis for the month. All other items in the monetary base equation are reported on an end-of-month basis.

On a monthly basis, then, bank deposits are not at all tied to primary reserves. On a quarterly basis, however, a large component (roughly two-thirds) of required reseves are contemporaneous with bank deposits. The procedure in the MCM databank constructs mid-quarter averages of bank deposits and then computes required reserves from the statutory requirements. This computed reserve requirement is linked to the mid-quarter average of the reported daily-average required reserves with a bridge equation. The use of actual required reserves gives a better measure of free reserves than would computed required reserves for use in the inverted reserve identity.

Chartered banks.--Reserves and time and demand deposits are obtained from the balance sheet of the chartered banks. In the Canadian case, the balance sheet was constructed according to a slightly disaggregated version of the balance sheet in the prototype model.

Chartered Banks

Assets	Liabilities
Required Reserves (RR)	Demand Deposits (DD)
Excess Reserves (RX) Total Reserves (RT) less: Required Reserves (-RR)	Time Deposits (TD)
	Borrowed Reserves (RB) (Includes purchase and resale agreements)
Long-term Securities (LTS)	
Short-term Securities (STS)	
Foreign Assets (net) (FA)	
Other Assets (OTHCH)	Net Worth (NWCH)

In this scheme of generating the data, NFA, NGP, RB, CUR, and RT come from the balance sheet of the Consolidated Monetary Authorities. RR, RX, DD, TD, SD are generated from the Chartered Bank balance sheet. It is useful to note that RR is obtained on a different basis from all the other data (daily average for the month). In terms of the balance sheet, assets still equal liabilities exactly because excess reserves are calculated as a residual from total reserves. RT, as all other items in the balance sheet except RR, is available on an end of month basis.

The apparent time pattern of reserve assets over the 15-day averaging period permits RR on a daily-average basis to exceed total reserves on an end-of-month basis. Computation of RX from RT-RR thus leads to negative excess reserves for most observations in the sample. Another difficulty with this procedure for creating data on excess reserves is that all the discrepancy between end-of-month and daily-average measurement of total reserves is picked up in RX. This discrepancy is then passed on to free reserves when RF is calculated as RX-RB. However, a discrepancy of some kind will always be present in RF because RB is also measured on an end-of-month basis.

The final difference between the prototype balance sheets and those for Canada relates to the importance of government securities held by the Chartered Banks under purchase and resale agreements (PRA). Holding eligible securities in a PRA is a legitimate means for a chartered bank to comply with its reserve requirement. In fact, borrowed reserves are very small in Canadian banking, and PRAs exceed borrowed reserves. Thus, in the MCM, RB is defined as borrowed reserves <u>plus</u> PRAs. This procedure requires the assumption that the spread between the purchase and resale price of the security is equivalent to the interest payment on borrowed reserves of the same magnitude at the bank rate (discount rate).

<u>Monetary Sector</u>.--From this point on, the structure of the Canadian monetary sector follows closely that laid out for the prototype model.

RRC is computed from statutory reserve requirements as

(3) $RRC = a \cdot DD + b \cdot TD$

where a and b are the primary reserve requirements. The bridge equation is given by:

(4) $RR = \alpha + \beta RRC + \varepsilon$

Substituting computed required reserves from (3) into the bridge equation (4) and that result into the uses of the unborrowed base (3) yields

(5) $BU = \hat{\alpha} + \hat{\beta} aDD + \hat{\beta} bTD + \hat{\varepsilon} + RF + CUR$

Equation (5) can be expressed in terms of demand deposits.

(6) $DD = [BU - \hat{\alpha} - \hat{\beta}\, bTD - \hat{\varepsilon} - RF - CUR]/\hat{\beta}\, a$

Equation (6) is a rearrangement of the uses side of the monetary base equation. Given BU (from the sources side of the base, eq. (1)), reserve requirements a and b, and n-1 uses of reserves (RF and CUR), the stock of demand deposits that can be supported by the remaining reserves (RR) is determined.

The specifications of the equations determining the four components of equation (6) are as follows:

(7) $\frac{DD}{NW} = DD(GNPV/NW, RS, URS, (EE-E)/E)$

Unlike the German case, there are no appreciable government holdings of time deposits. TD is composed of savings deposits (82% in 1969IV) and other notice deposits or "deposit receipts." Deposit receipts are sold in denominations of \$C 100,000 or more and are described as temporary repositories of excess balances of corporations, governments and other organizations. These corporate notice deposits seem essentially to be negotiable certificates of deposit. Since government deposits could not have been more than part of the remaining 18 percent of time deposits in 1969, wealth (NW) is used as a scale variable for the aggregate TD equations. Savings deposits are not handled separately in the Canadian financial sector.

$$(8) \quad \frac{TD}{NW} = TD\ (GNPV/NW,\ RS,\ URS,\ (EE-E)/E)$$

The equation for free reserves is of the same form as the prototype.

$$(9) \quad \frac{RF}{NDD} = RF(\overset{-}{RS},\ \overset{-}{RS-RD},\ \overset{-}{URS},\ \overset{+}{\Delta RU},\ \overset{-}{\Delta \overline{RR}})$$

where:

$NDD \equiv (1 - \hat{\beta} a)\ DD$, net demand deposits;

$URS \equiv$ U.S. short-term interest rate;

$RU \equiv BU - CUR$ and, unborrowed reserves; and

$\Delta\overline{RR} = \Delta a(DD_{-1}) + \Delta b(TD_{-1})$, change in required reserves.

$\Delta\overline{RR}$ is zero except for a transition period of 3 quarters in 1967 when reserve requirements were changed from a uniform 8 percent to 12 percent on DD and 4 percent on TD. The sign pattern in equation (9) is important for determining the eventual sign on the U.S. short-term interest rate in the Canadian interest rate equation. Borrowed reserves including purchase and resale agreements (PRA) are a negative component of free reserves. Borrowed reserves and PRAs will increase with an increase in the domestic or foreign (U.S.) short-term interest rate, so both the domestic and U.S. short-term rates carry a negative sign.

Public holdings of currency are a simple function of consumption (as a proxy for transactions) and the short-term interest rate.

(10) CUR = CUR(CV, RS)

A term-structure equation explains the long-term interest rate.

(11) $RL = RL(RS, RS_{-1}, \ldots., RS_{-n})$

Five behavioral equations (7) - (11) along with (1) and (6) are used to determine BU, DD, TD, RF, CUR, and RL.

Reduced form interest rate equation.--In estimating the Canadian monetary sector, equation (9) for free reserves was normalized on the short-term interest rate. In this respect, the MCM monetary sector is similar to that of RDX2. But because RF is tied to the monetary base equations, there is a difference in the signs of arguments in the interest rate equation and, indeed, in the roles the equations perform in their respective models. When inverted, equation (9) takes the form

(12) $RS_{MCM} = f(\overset{+}{RS(-1)}, \overset{+}{RD}, \overset{-}{URS}, \overset{-}{RF/NDD}, \ldots.)$

The U.S. interest rate enters with a negative sign because the return on U.S. securities represents an opportunity cost of excess reserves in the free reserve equation. Using the same mnemonics, the key conceptual elements of the RDX2 short-term interest rate equation can be written as

(13) $RS_{RDX2} = f(\overset{+}{RS(-1)}, \overset{+}{URS}, \overset{+}{\text{chartered bank loans}}, \overset{+}{\text{private holdings of government securities}})$

Emprical testing revealed that the Canadian short-term interest rate behaved somewhat differently when the discount rate acted as a penalty rate (RD > RS) than when short-term rates exceeded the discount rate. There are two versions of equation (12) in the MCM, each is switched on during its respective regime.[7/] In the penalty-rate regime, the U.S. short-term rate enters the inverted free reserve equation (with a small negative coefficient). In the regime where the discount rate was less that the short-term rate, the U.S. interest rate does not enter the equation at all. The small direct presence of the U.S. interest rate in the MCM equation contrasts sharply with the dominant presence of the U.S. rate in the RDX2 equation. This has important structural ramifications for the functioning of the model. In the MCM, changes in the U.S. interest rate alter the differential between U.S. and Canadian interest rates, cause a capital flow, a change in the level of foreign exchange holdings, thereby affecting the sources of the monetary base and free reserves (on the uses side of the monetary base) and, <u>in this way</u>, cause a change in Canadian interest rates. In the RDX2 approach, the U.S. effect occurs directly via the reduced form equation, thus, circumventing these important channels of financial flow. The three key differences in the two interest rate functions can be summarized as:

(1) The MCM makes use of the discount rate as one of three policy instruments whereas RDX2 does not. Canadian scholars argue that borrowed reserves and PRAs are a very small share of financial flows and constitute an unreliable link to interest rates. We argue that while smallness may cause estimation problems, the link to the monetary base exists. We also argue that the market rate functions as a signal mechanism much as the discount rate in the United States.

(2) The U.S. interest rate appears with a (small) negative sign in the MCM interest rate equation whereas it appears with a large (0.5) positive sign in the RDX2 equation. While the linkages between the U.S. and Canadian financial markets are strong and the total effect of U.S. rates on Canadian rates must be positive (as shown in the multiplier experiments to follow), the MCM equation is a structural representation in that it captures the substitution effect between U.S. and Canadian assets. When U.S. rates increase, free reserves should decline as indicated in equation (9). But for a ceteris paribus interpretation of equation (12), holding free reserves constant would require an expansion of the Canadian monetary base resulting in a decrease in the Canadian short-term interest rate.

(3) Through their linkage to the monetary base equation, free reserves in the MCM transmit the portfolio effects of changes in foreign financial conditions, via capital flows and changes in foreign exchange holdings, to the Canadian short-term interest rate. As far as responsiveness to Candian policy instruments, the RDX2 interest rate equation responds only indirectly through portfolio holdings (bank loans and private holdings of government securities). Thus, while the MCM may be vulnerable through the small size and volatility of free reserves, the RDX2 structure depends crucially on the ability to model dependably the domestic short- and long-term securities markets. Additionally, while small size and volatility could cause some difficulties in dynamic tracking performance, once the model is aligned on a solution path, the dependability of multipliers depends upon estimation accuracy and the fidelity of the model

structure. On this count we had a decided preference for the monetary base approach over the reduced-form reaction function approach taken in RDX2. In estimation, the discount rate tends to dominate (and stabilize) the MCM short-term interest rate equation while the U.S. rate performs the same function in the RDX2 equation.

The verdict clearly remains open on these two approaches to interest rate determination in the Canadian economy. The MCM approach represents a conscious risk on estimation and tracking performance (although these are not decidedly inferior to other Canadian results as can be seen in the results of the following section) in order to attempt a structural representation of the interdependence between domestic and international financial flows. It is hoped that this work will stimulate additional efforts on structural modeling of the Canadian financial system.

Reaction functions.--Because the model's sample period spanned both fixed and floating rate regimes, different operating rules for the financial authorities were invoked. During the fixed exchange rate period (1961I to 1970 II), the model allows changes in foreign exchange reserves to be determined from the balance of payments identity. Because uncompensated reserve changes during a fixed-rate regime would cause severe fluctuations in the monetary base, we tested for central bank behavior attempting some degree of sterilization of the foreign flows. Systematic partial offset (-.46) of foreign exchange reserves was observed in the equation for changes in the open market position of the monetary authorities.

During the floating exchange rate regime, a stabilizing reaction of "leaning against the wind" to dampen exchange rate fluctuations was observed.

Expected exchange rate changes were resisted by foreign exchange market intervention. The stock of foreign exchange reserves entered the equation with a negative sign representing an "ability to intervene".[8/] Both these functions were operating during the dynamic simulation of and shocks to the model analyzed in the following sections.

Expected exchange rate.--Another significant difference from the specification of the prototype model occurs in the treatment of the expected future spot exchange rate (equation 31a of the prototype, see IFDP No. 115, p. 68). For the fixed exchange rate regime, the Canadian equation uses the product of the relative Canadian export price and net foreign assets scaled by the value of imports, just as specified in the prototype model.

For the floating exchange rate regime, however, the Canadian model uses the specification origninally sought in the MCM. The expected future spot rate is assumed to equal the actual spot rate observed one quarter ahead plus a random error. Only for Canada did this specification provide good estimation results. In simulation of the model, the value of the spot rate one period ahead is replaced by an estimated value obtained from a regression using past exchange rates and changes in net foreign assets as explanatory variables (see ELEAD in the equation list of the appendix to this paper).

Analysis of Errors

The equations of the prototype model, modified in the financial sector and the expected exchange rate equation as described above, were estimated with quarterly Canadian data from the first quarter of 1961 to the fourth quarter of 1975. Ordinary least squares regressions were employed for estimation. Thus, the equation estimates may be subject to simultaneous equation bias.

<u>In-sample tracking</u>.--The Canadian model by itself was simulated dynamically over the eleven-year period between the fourth quarter of 1964 and the fourth quarter of 1975. This simulation period spans both fixed and floating exchange rate regimes. The first column of Table 1 presents the mean percentage errors and the root mean squared percentage errors for key variables in the sample period; the second column presents the same statistics for the five-quarter post-sample period available at the time the model was tested before inclusion in the MCM.

In-sample errors are, by and large, within the range of acceptable error for medium-sized macroeconomic models. The root mean square percentage error (RMSE) for GNP is 2.4 percent over the 45 quarter sample period. This error falls within the bounds for other MCM models wihc range from 2.4 percent for the U.S. model to 4.4 percent for the German model. It compares favorably with the 1.7 percent in-sample error of the RDX2 model of the Bank of Canada.9/ The domestic absorption deflator tracks very well at a RMSE of 0.6 percent, the lowest of the MCM models. Unemployment rates, being a residual number, normally track with a RMSE in the double-digit range; the Canadian model's RMSE for the unemployment rate is 14.1 percent, the lowest of the MCM models.

The interest rate performs worse than the other domestic variables. While interest rate equations normally track on the high side of other variables, the RMSE of 26 percent is the highest of the errors for MCM interest rates This RMSE compares unfavorably with the 6.8 percent error observed for the RDX2 model.9/ The tracking properties of the Canadian interest rate could have been improved considerably by linking the rate directly to the U.S. short-term interest rate. But as explained in the previous section on the financial sector, this approach was eschewed in favor of the specification

Table 1

Dynamic Simulation of the Canadian Model
in Isolation from the MCM

Variables		In-Sample Errors	Post-Sample Errors
		64:4-75:4	76:1-77:1
GNP	ME[1]	0.087	0.3787
	RMSE[2]	2.403	1.403
P	ME	0.161	-0.324
	RMSE	0.633	0.600
CU	ME	0.428	-0.659
	RMSE	3.980	1.067
UN	ME	2.705	-8.896
	RMSE	14.130	12.798
RS	ME	-8.683	16.170
	RMSE	26.064	17.494
MG	ME	-0.554	0.055
	RMSE	6.660	3.630
MGV	ME	-0.490	9.321
	RMSE	5.821	12.959
PMGUV	ME	0.178	9.094
	RMSE	2.557	10.612
XG	ME	-0.232	5.076
	RMSE	1.208	7.393
PXGUV	ME	0.214	9.775
	RMSE	2.200	10.616
E	ME	1.044	-10.062
	RMSE	2.512	10.765
NFAEOQ	ME	39.732	-22.402
	RMSE	57.732	23.713

[1] Mean percentage error.

[2] Root mean squared percentage error.

that linked interest rate determination more directly to the monetary base.

While Canadian exchange rate tracking was good over the sample period with a RMSE of 2.5 percent, the error on the stock of foreign exchange reserves (NFAEOQ) was the highest of all the MCM models at 58 percent. In a simultaneous system it is difficult to establish cause and effect, but the large error on foreign exchange reserves disrupts the monetary base and the interest rate. Correspondingly, large errors in the interest rate cause large errors in capital flows and the change in foreign exchange reserves.

Exports track more closely during the sample period (1.2 percent) than do imports (6.6 percent) largely because foreign activity is exogenous and only the export price and exchange rate are subject to solution error. For imports, the exchange rate and domestic activity are simultaneous. Because the GNP tracking errors (2.4 percent) are larger than those for domestic prices (0.6 percent), imports tend to be thrown off track more than exports.

Post-sample tracking.--Except for the exchange rate and the trade flows affected by it, tracking errors are smaller in the post-sample period than in the sample period. The GNP and interest rate errors decrease to 1.4 percent and 12.8 percent, respectively. The exchange rate error increases to 10.7 percent, and because it affects the relative competitiveness of exports, the errors on exports increase to 7.4 percent. Evidently the individual errors on the exchange rate and GNP are offsetting because the import error declines to 3.6 percent in the post-sample period. Although the post-sample period is relatively short, the goodness of the tracking errors outside the estimation period indicates that the model is a reliable representation of the Canadian economy in the mid-1970s.

Multipliers of the Canadian Model

The multipliers presented in this section were calculated by comparing a solution of the Canadian model that was aligned to history by adding the regression residuals to the estimated equations with a solution using the same regression residuals and a change in the policy instrument. These multipliers solutions were made with the Canadian model in isolation from the rest of the MCM; that is, all foreign variables remained exogenous.

The single-model multipliers presented here differ from those of the MCM version of the model in one crucial aspect. The single model results were obtained with an aggregate export equation used before the MCM bilateral trade system was completed. This is a significant difference in the case of the Canadian model because the export price elasticities in the two trade systems differed significantly. The aggregate export equation had an export price elasticity of -0.73, whereas the trade-weighted average of the bilateral price elasticities was -1.08. With the lower export price elasticity, these multipliers using the aggregate export equation are larger than those of the final MCM version using the bilateral trade equations.

In that the multipliers depend on the magnitudes of activity and prices existing in the period for which the model is solved, it is useful to recall the economic environment between 1973 and 1975. In late 1974 Canada and the rest of the world economy entered a recession. The general effect of this environment on the multiplier paths studied here is a downward bias in the initial real effects and an upward bias in the initial price effects of an economic stimulus.

Government spending.--Table 2 presents key multipliers for a sustained increase in real government purchases of $C 1 billion. The real GNP multiplier starts from 1.013 and increases to 1.428 by the end of the two-year period. The price level also increases steadily over the two-year period to a maximum of 28 percentage points higher than its historical value.

The effect of the increase in government spending on the unemployment rate peaks at a reduction of .192 percentage points three quarters after the fiscal stimulus begins. Thereafter, the unemployment rate remains below that of the control baseline, but the difference oscillates slightly before diminshing in the eleventh period. The early peak is due to the productivity effects of the increase in investment. In the early periods, the rise in investment affects the capital stock only slightly, most of the increased output must come from added labor. As the stimulus continues, the capital stock becomes larger than otherwise and productivity increases. Additionally, the increase in economic activity draws new entrants into the labor force and puts upward pressure on the unemployment rate. These countervailing effects turn back the path of the decline in the unemployment rate and cause its oscillation.

The added activity creates increased loan demand. Since monetary policy remains unchanged with the fiscal stimulus, the added loan demand leads to a steady increase in the short-term interest rate. By the end of 11 quarters, the interest rate is 1.3 percentage points above that of the control path.

The stimulus to activity draws in a large and increasing flow of imports. Table 3 presents the historical levels for the selected multiplier responses reported in this section. With a base level of imports (in current dollar terms) of $C 47.6 billion, the increase of $C 1.9 billion amounts to a 4 percent increase in the value of imports after 11 periods.

Table 2

Effects of a $C 1 billion Increase in
Real Government Purchases of Goods and Services
(1972 dollars)

	1973			1974				1975			
	2	3	4	1	2	3	4	1	2	3	4
GNP[1]	1.013	1.066	1.106	1.108	1.145	1.167	1.287	1.310	1.362	1.400	1.428
P[2]	.001	.002	.004	.006	.007	.010	.013	.017	.021	.025	.028
UN[3]	-.136	-.192	-.192	-.170	-.159	-.150	-.113	-.088	-.111	-.129	-.090
RS[3]	.115	.258	.384	.541	.740	.895	.946	.392[5]	.418[5]	.555[5]	1.309
MGSNIVS[1]	.336	.483	.628	.799	.965	1.209	1.384	1.621	1.824	1.945	1.986
E[4]	-.001	-.005	-.009	-.012	-.015	-.019	-.022	-.030	-.034	-.035	-.031

[1] billions of Canadian dollars, annual rate.

[2] 1972 = 1.00

[3] Percentage points.

[4] U.S. dollars per Canadian dollar, 1972 = 1.0.

[5] This drop in the interest rate effect is spurious. It occurs historically at a point where the interest rate equation experiences a behavioral shift between discount rate regimes. See discussion of the two interest rate equations above in the financial sector of this paper. The 50-odd basis point drop is related to the first quarter of 1975 and not to the eighth period after the fiscal stimulus.

Table 3

Historical Values for Key Variables
in Canadian Multiplier Experiments

	1973			1974				1975			
	2	3	4	1	2	3	4	1	2	3	4
GNP[1]	112.0	113.1	116.1	117.8	117.4	117.2	116.9	116.7	117.9	119.6	120.0
P[2]	1.067	1.089	1.118	1.152	1.200	1.249	1.284	1.329	1.353	1.388	1.416
UN[3]	5.45	5.38	5.57	5.30	5.23	5.20	5.53	6.55	6.95	7.07	7.07
RS[4]	6.27	8.20	9.43	9.20	11.00	11.60	10.20	7.43	7.27	8.09	9.10
MGSNIVS[1]	31.6	29.3	34.8	35.4	41.6	40.9	46.0	43.3	47.7	43.4	47.6
E[4]	.991	.987	.991	1.011	1.026	1.010	1.004	.992	.969	.961	.975

[1] billions of Canadian dollars, annual rate.

[2] 1972 = 1.00

[3] Percentage points.

[4] U.S. dollars per Canadian dollar, 1972 = 1.0.

Under the fiscal stimulus, the capital inflow resulting from portfolio rebalancing in response to the widening of the Canadian interest rate differential is not sufficient to offset the currency outflows resulting from the increase in imports. Consequently, the Canadian dollar depreciates steadily over the period, reaching a peak of 3.5 percentage points 10 quarters after introducing the stimulus.

Taxes.--Table 4 presents the multipliers for a 1 billion (current Canadian dollars) increase in personal income taxes. The multipliers are all smaller (in absolute magnitude) than those for the increase in government spending because the tax increase of \$C 1 billion in current dollars is less than \$C 1 billion in constant dollars and because the increase in tax revenues affects GNP indirectly by changing disposable income. The patterns on the GNP and price paths are similar (with opposite sign) to those of the government spending increase. The unemployment rate effect, however, peaks in the sixth quarter after the stimulus rather than the third. This is most likely the result of smaller productivity effects than in the case of the larger fiscal stimulus.

Interest rates decline because of the slackening in loan demand. The narrowing interest differential and \$C 1.2 billion decrease in imports lead to an appreciation of the Canadian dollar. As the fiscal restraint is about 1/3 the magnitude of the fiscal stimulus (measured by the change in GNP), so is the appreciation of the Canadian dollar about 2/3 the size of the depreciation under the stimulus.

Monetary policy.--The contractionary effects of a tightening in Canadian monetary policy are shown in Table 5 with a one percentage point increase in the discount rate. GNP eventually declines by one half billion Canadian dollars

Table 4

Effects of a \$C 1 billion Increase
in Personal Tax Revenues (current dollars)

	1973			1974				1975			
	2	3	4	1	2	3	4	1	2	3	4
GNP[1]	-.207	-.347	-.489	-.612	-.724	-.748	-.825	-.881	-.925	-.936	-.971
P[2]	0.000	-.001	-.001	-.002	-.004	-.005	-.007	-.010	-.013	-.015	-.017
UN[3]	.028	.058	.096	.114	.129	.133	.129	.116	.114	.111	.092
RS[4]	-.037	-.097	-.172	-.262	-.381	-.482	-.589	-.234[5]	-.260[5]	-.352[5]	-.853
MGSNIVS[1]	-.085	-.170	-.268	-.398	-.541	-.709	-.842	-1.001	-1.140	-1.225	-1.262
E[4]	.001	.003	.004	.006	.008	.011	.014	.020	.028	.023	.021

[1] billions of Canadian dollars, annual rate.

[2] 1972 = 1.0.

[3] Percentage points.

[4] U.S. dollars per Canadian dollar, 1972 = 1.0.

[5] This drop in the interest rate effect is spurious. It occurs historically at a point where the interest rate equation experiences a behavioral shift between discount rate regimes. See discussion of the two interest rate equations above in the financial sector of this paper. The 50-odd basis point drop is related to the first quarter of 1975 and not to the eighth period after the fiscal stimulus.

Table 5

Effects of a One Percentage Point Increase
in the Canadian Discount Rate (Bank Rate)

	1973			1974				1975			
	2	3	4	1	2	3	4	1	2	3	4
GNP[1]	-.090	-.130	-.163	-.217	-.266	-.319	-.377	-.413	-.452	-.481	-.507
P[2]	-.001	-.001	-.002	-.002	-.002	-.003	-.004	-.005	-.006	-.007	-.008
UN[3]	.010	.031	.046	.051	.048	.049	.049	.044	.047	.051	.049
RS[4]	.835	.907	.840	.805	.798	.798	.798	.812	.871	.823	.630[5]
MGNIVS[1]	-.048	-.072	-.077	-.104	-.171	-.266	-.360	-.489	-.509	-.559	-.588
E[4]	.006	.007	.005	.003	.003	.005	.006	.009	.010	.011	.010

1 billions of Canadian dollars, annual rate.

2 1972 = 1.0

3 Percentage points.

4 U.S. dollars per Canadian dollar, 1972 = 1.0.

5 In this experiment, the discount did not exceed the short-term rate until the last quarter of 1975, so the switch of interest rate equations occurred here rather than in the first quarter. Like the previous multiplier responses, the drop in the interest rate response is the result of switching between interest rate equations and not the number of periods after the introduction of the shock.

eleven periods after the increase in the discount rate. In response to this decline in activity, the domestic price level falls slowly at first, eventually declining six tenths of one percent below its base level at the end of 11 quarters. Unemployment increases by one-half percentage point four quarters afer the monetary contraction begins and then fluctuates slightly about that change for the remainder of the period.

The short-term interest rate increases 83 basis points initially, and then by 90 basis points in the second quarter. As activity and loan demand slow, the increase in the short-term interest rate drops back to the 80 basis point range for the remainder of the period. In response to both the slowing of imports and capital inflows responding to the widening of the Canadian-foreign interest rate differential, the Canadian dollar appreciates by roughly 10 percent at the end of two years.

Foreign interest rates.--The final experiment presented for the floating exchange rate period tests the effects of a 100 basis point increase in the U.S. short-term rate accompanied by a 70 basis point increase in the Eurodollar rate. Table 6 presents the multiplier responses indicating that the narrowing of the Canadian-foreign interest rate differential leads intially to a 0.7 percent depreciation of the Canadian dollar. As a result of the depreciation the import price in local currency increases and real imports decrease. The average import price elasticity is less than one, however, (the import price elasticities for the United States and the rest of the world are 0.6 and 0.3, respectively) so the value of imports increases by 0.3 percent in the initial period. As the size of the depreciation diminishes over time, so does the increase in the value of imports.

Table 6

Effects of an Increase in Foreign Interest Rates (100 basis points in the U.S. Short-term rate and 70 basis points in the Eurodollar rate).

	1973			1974				1975			
	2	3	4	1	2	3	4	1	2	3	4
GNP[1]	.007	.030	.045	.061	.048	.032	.017	.018	.013	.015	.011
P[2]	.001	.001	.001	.001	.001	.001	.001	.002	.002	.002	.001
UN[3]	.001	-.014	-.025	-.024	-.014	-.006	.001	.010	.014	.011	.006
RS[4]	.054	.114	.169	.145	.086	.045	.028	-.119[5]	-.129[5]	-.120[5]	-.009[5]
MGSNIVS[1]	.127	.122	.078	.062	.062	.065	.053	.052	.049	.036	.026
E[4]	-.004	-.006	-.003	-.001	-.001	-.001	-.001	-.002	-.001	-.001	0

[1] billions of Canadian dollars, annual rate.

[2] 1972 = 1.0.

[3] Percentage points.

[4] U.S. dollars per Canadian dollar, 1972 = 1.0.

[5] In this experiment, the discount did not exceed the short-term rate until the last quarter of 1975, so the switch of interest rate equations occurred here rather than in the first quarter. Like the previous multiplier responses, the drop in the interest rate response is the result of switching between interest rate equations and not the number of periods after the introduction of the shock.

Export volume increases as a result of the depreciation and acts as a stimulus to GNP. The domestic price level increases slightly in response to the increase in domestic activity.

The depreciation is caused by the narrowing of the Canadian-foreign interest rate differential. The resulting portfolio readjustment results in capital outflows from Canada. These outflows reduce the monetary base. The intervention reaction function which resists the depreciation also results in a reduction in the monetary base. The reduction in the base, in turn, results in a small increase in the Canadian interest rate which peaks at 17 basis points three quarters after the increase in foreign interest rates.

Revaluation of the Canadian dollar.--The final experiment presented in this section explores the effects of a 10 percent revaluation of the Canadian dollar. The experiment was performed during the fixed exchange rate period to illustrate the properties of the Canadian model operating as a fixed exchange rate system.[10/] The exchange rate index had the value of .920 (1972 = 1.0) in the first quarter of 1967, so the exchange rate was increased by .092 for the duration of the experiment.

The contractionary effects are best traced through the trade response first. By raising the relative price of Canadian exports and reducing the relative price of imports, the trade balance in real terms is reduced. As indicated in the last two rows of Table 7, the responses on exports and imports are initially similar in magnitude. But by the fourth period after the shock, the decline in exports is about twice the size of the increase in imports. The resulting increase in the trade deficit is reinforced by a decrease in capital inflows.

Table 7

Effects of a 10 percent Revaluation
of the Canadian Dollar

	1967				1968				1969			
	1	2	3	4	1	2	3	4	1	2	3	4
GNP[1]	-.009	-.107	-.205	-.251	-.227	-.218	-.407	-.029	-.613	-.495	-.689	-.597
P[2]	-.006	-.012	-.017	-.021	-.024	-.027	-.030	-.032	-.034	-.036	-.038	-.040
UN[3]	-.126	.056	.145	.273	.338	.381	.401	.418	.382	.409	.395	.118
RS[4]	-.103	.346	.642	.949	.386	.494	1.33	1.69	1.82	2.26	2.12	2.09
MGSNIVS[1]	-.781	-.757	-.743	-.786	-1.04	-1.09	-1.17	-1.26	-1.58	-1.61	-1.80	-1.97
E[4]	.092	.092	.092	.092	.092	.092	.092	.092	.092	.092	.092	.092
DNFA[1]	-1.08	-.781	-1.03	-.971	-1.34	-.924	-.598	-.676	-.796	-.472	-.723	-.541
MG[1]	.312	.520	.512	.546	.516	.543	.444	.597	.407	.459	.368	.409
XG[1]	.035	-.481	-.679	-.970	-1.03	-1.16	-1.06	-1.15	-1.05	-1.13	-1.03	-1.17

[1] billions of Canadian dollars, annual rate.

[2] 1972 = 1.0.

[3] Percentage points.

[4] U.S. dollars per Canadian dollar, 1972 = 1.0.

[5] In this experiment, the discount did not exceed the short-term rate until the last quarter of 1975, so the switch of interest rate equations occurred here rather than in the first quarter. Like the previous multiplier responses, the drop in the interest rate response is the result of switching between interest rate equations and not the number of periods after the introduction of the shock.

The expected exchange rate function during a fixed exchange rate regime in the Canadian model is an inverse function of the Canadian export price.11/ With an exogenous revaluation of the currency, the relative export price increases and agents' expectations of a future devaluation increase. With these expectations, capital inflows decrease and contribute to the decline in exchange rate reserves.

In response to the contraction in the monetary base resulting from the decline in the stock of reserves, the interest rate increases by 94 basis points at the end of the first year. Since the effect on the monetary base is cumulative, the three-year continuation of an increased trade deficit and decreased capital inflows eventually lead to an increase in the short-term interest rate on the order of 200 basis points.

The increases in both the trade deficit and the interest rate reinforce each other in reducing the level of GNP. The effect is small initally and increases to the order of \$C 0.6 billion at the end of three years. The domestic price level declines accordingly. Corresponding to the decline in activity, the unemployment rate increases, eventually by 0.4 percentage points. The initial decline in the unemployment rate is the result of an initial decline in the real wage resulting from a larger decrease in nominal GNP than in the money wage.

Footnotes

*/ The work described in this paper was carried out while I was an Economist in the International Finance Division. I am very grateful to John Boschen and Joseph Formoso for their important contributions to the construction and testing of the Canadian model. The views expressed in this paper are mine and do not necessarily represent the views of the Federal Reserve System.

1/ The book will be published by the Board of Governors of the Federal Reserve System in late 1982. See also Richard Berner, et al., "Modeling the International Influences on the U.S. Economy: A Multi-Country Approach" (IFDP No. 93) and Richard Berner, et. al. "A Multi-Country Model of the International Influences on the U.S. Economy: Preliminary Results," (IFDP No. 115).

2/ For a useful presentation of Canadian central banking and the financial system see D. E. Bond and R. A. Sherer The Economics of the Canadian Financial System: Theory, Policy and Institutions Prentice Hall Canada Scarborough: Ontario 1972, especially chaps. 16-18.

3/ Refer to the arguments in IFDP No. 98 (pp. 32-37) for the justification behind the substitution of the balance of payments conditions for the bond market.

4/ NFA (which excludes valuation adjustments and SDR allocations) is constructed by accumulating CDNFA (D50712 - D50710) from 1973IV benchmark. The benchmark is B3800 (total reserves) converted to $C by CE x 1.00937. The 1973IV benchmark is chosen for consistency with the stocks of international claims and liabilities. The fourth quarter of 1973 was the latest date for Canada's balance of international indebtedness (Cat. 67-202, Table 1, pp. 72-73) at the time of constructing the MCM databank.

5/ Borrowed reserves, RB, consist of advances to chartered and savings banks plus bankers acceptance plus GOC securities held under repurchase agreements (B209). This last item is netted out from the BOC holdings of own advances to chartered banks, B658, appears as ADV.

6/ Currency held by banks (B252) counts as a reserve asset. Total reserves are B608 = B252 + B255. Comparison of B603 for Jan. 75 end-of-month (3370) with B819, actual reserves of chartered banks, for daily average for second half of Jan. 75 (3571) verifies this. There is no need to handle vault cash separately.

7/ The two versions have the effect of giving different elasticities over different time periods. This problem shows up in the multiplier responses of Tables 2 through 7.

8/ Purchase of foreign exchange reserves to resist an expected appreciation of the Canadian dollar will be lower, as the stock of foreign exchange reserves is higher. Note that this intervention function also behaves as if it were specified as a "target level of reserves" function.

9/ "The Equations of RDX2 Revised and Estimated to 4Q72", Bank of Canada Technical Report 5, 1967, pp. 262, 263.

10/ The MCM models can be operated as both fixed and floating exchange rate systems. When fixed, the exchange rate is declared exogenous and the change in reserves is declared endogenous. When solved as a floating rate system, the exchange rate is declared endogenous and the change in reserve is declared exogenous or explained behaviorally with and additional intervention function.

11/ See equation 31a and related discussion in IFDP No. 115, pp. 12, 68.

Appendix

The Equations of the Canadian Sector of the Multi-Country Model

LIST OF BEHAVIORAL EQUATIONS

PAGE

DISPOSABLE INCOME BRIDGE

$$\begin{array}{llllll} YDVNSA = & -\,1.311 & +\ 2.655\ Q1 & +\ 1.259\ Q2 & +\ 1.116\ Q3 & +\ 0.955\ YDPVNSA \\ & (4.1) & (8.8) & (4.2) & (3.7) & (230.6) \end{array}$$

$\bar{R}^2 = 0.9989 \quad SEE = 0.818 \quad DW = 1.87$

Period 61:1 to 75:4

CONSUMPTION

$$C = -\ 10.873 + \underset{(6.6)}{0.484}\ C_{-1} + \underset{(7.0)}{0.387}\ YDV/P + \underset{(6.2)}{0.119}\ NW_{-1}\ /\ P$$
$$\quad\ (5.4)$$

$\bar{R}^2 = 0.9987$ SEE $= 0.387$ DW $= 1.72$

Period 61:1 to 75:4

PRIVATE FIXED INVESTMENT

$$IFP = -\underset{(2.9)}{5.275} + \underset{(11.3)}{0.083}\ KP_{-1} + \sum_{i=0}^{5} a_i\ \Delta(RL_{-i-1}) + \sum_{i=0}^{11} b_i\ \Delta(GNP_{-i-1} - G_{-i-1}$$

$\bar{R}^2 = 0.760$ SEE = 0.375 DW = 1.5 $\rho = 0.919$

i	0	1	2	3	4	5	SUM
a_i	-0.349	-0.781	-0.985	-0.984	-0.803	-0.467	-4.369
	(2.2)	(3.8)	(4.2)	(4.1)	(3.5)	(2.8)	(4.1)

i	0	1	2	3	4	5	
b_i	0.105	0.102	0.119	0.148	0.185	0.222	
	(2.1)	(2.1)	(2.0)	(2.2)	(2.5)	(2.9)	
	6	7	8	9	10	11	SUM
	0.255	0.276	0.279	0.260	0.211	0.126	2.288
	(3.1)	(3.3)	(3.3)	(3.3)	(3.2)	(3.1)	(3.3)

INVENTORY INVESTMENT

$$II = -\underset{(0.7)}{1.719} + \underset{(3.8)}{0.493} \sum_{i=1}^{4} (C_{-i} + IFP_{-i} + IFG_{-i} + XG_{-i}) /4$$

$$- \underset{(2.9)}{0.865} \sum_{i=1}^{4} (MG_{-i}) /4 + \underset{(4.8)}{0.551}\, MG - \underset{(4.5)}{0.404}\, (C + IFP + IFG + XG)$$

$\bar{R}^2 = 0.258$ SEE $= 0.683$ DW $= 2.23$ $\rho = 0.491$

Period 61:1 to 75:4

no lagged stock

CAPITAL CONSUMPTION ALLOWANCE

$$CCAV = -\underset{(45.2)}{8.570} + \underset{(0.9)}{0.073}\ Q2 - \underset{(1.7)}{0.270}\ Q3 + \underset{(2.7)}{0.229}\ Q4 + \underset{(6.9)}{0.016}\ KP_{-1}$$

$$+ \underset{(22.8)}{15.402}\ P_{-1} + \underset{(2.9)}{0.038}\ (GNPVNSA - TV - CVNSA)$$

$\bar{R}^2 = 0.996$ SEE = 0.226 DW = 0.54

Period 61:1 to 75:4

TAXES -- PERSONAL

$$\text{TPERV} = \underset{(15.2)}{-\,4.489} + \underset{(2.6)}{0.604}\ \text{Q1} + \underset{(0.9)}{0.217}\ \text{Q2} + \underset{(0.5)}{0.110}\ \text{Q3} + \underset{(52.6)}{0.321}\ \text{WBNSA}$$

$$-\ \underset{(3.9)}{0.013}\ \text{WBNSA} * \text{P} * \text{QTAXI}$$

$\bar{R}^2 = 0.991$ SEE = 0.627 DW = 1.61

Period 61:1 to 75:4

TAXES -- NONRESIDENT

$$\underset{}{TNRESV} = \underset{(5.0)}{0.087} - \underset{(5.3)}{0.086}\ Q1 - \underset{(2.7)}{0.043}\ Q2 - \underset{(10.1)}{0.163}\ Q3 + \underset{(18.0)}{0.003}\ GNPVNSA$$

$\bar{R}^2 = 0.878$ SEE = 0.044   DW = 2.83

Period 61:1 to 75:4

TAXES - CORPORATE

$$\underset{}{TCORPV} = -\underset{(1.4)}{0.320} + \underset{(2.6)}{0.480}\ Q1 + \underset{(2.6)}{0.451}\ Q2 - \underset{(6.7)}{1.242}\ Q3$$

$$+ \underset{(12.7)}{0.180}\ (GNPVNSA - WBNSA - CCAV) - \underset{(2.5)}{0.025}\ TIME$$

$\bar{R}^2 = 0.9368$ SEE = 0.468 DW = 1.56

Period 61:1 to 75:4

TAXES - INDIRECT

$$TINDV = \underset{(1.8)}{0.471} + \underset{(2.9)}{0.697}\ Q1 - \underset{(1.6)}{0.371}\ Q2 - \underset{(3.6)}{0.866}\ Q3 + \underset{(59.3)}{0.134}\ GNPVNSA$$

$\bar{R}^2 = 0.983$ SEE = 0.653 DW = 1.16

Period 61:1 to 75:4

GOVERNMENT TRANSFERS

$$\underset{}{\text{TRANV}} = -\underset{(1.7)}{1.119} - \underset{(5.6)}{1.738}\,Q2 - \underset{(7.3)}{2.764}\,Q3 - \underset{(6.4)}{2.033}\,Q4 + \underset{(7.5)}{0.152}\,(\text{GNPVNSA} - \text{XGV})$$

$$+ \underset{(4.2)}{0.283}\,\text{XGV} + \underset{(2.1)}{2.965}\,(\text{UN} * \text{LF}/100) - \underset{(2.0)}{46.473}\,\Delta\,(\text{LOG}(\text{P})) - \underset{(4.6)}{0.085}\,\text{TIME}$$

$\bar{R}^2 = 0.982$ SEE $= 0.732$ DW $= 1.57$

Period 61:1 to 75:4

<u>EXPORTS OF GOODS: BRIDGE EQUATION</u> (Customs clearance to balance of payments basis)

$$\underset{}{XGV * ER} = \underset{(6.9)}{0.679} - \underset{(2.0)}{0.205}\ Q1 - \underset{(0.2)}{0.024}\ Q2 - \underset{(1.7)}{0.172}\ Q3 + \underset{(244.5)}{0.950}\ XCTV$$

$\bar{R}^2 = 0.999$ SEE = 0.282 DW = 1.27

Period 61:1 to 75:4

IMPORTS OF GOODS: BRIDGE EQUATION (Customs clearance to balance of payments basis)

$$\underset{}{MGV * ER} = \underset{(3.0)}{0.133} + \underset{(366.8)}{0.942}\ MCTV/1.1$$

$\bar{R}^2 = 0.999$ SEE $= 0.184$ DW $= 0.94$

Period 61:1 to 75:4

BILATERAL IMPORT DEMAND FUNCTION: IMPORTS FROM GERMANY

$$\begin{aligned}
LOG\,(XGCV/(GPXGUV * GE)) = &- \underset{(7.5)}{8.268} - \underset{(4.0)}{0.164}\ Q1 - \underset{(1.3)}{0.046}\ Q2 - \underset{(6.6)}{0.273}\ Q3 \\
&+ \underset{(6.9)}{1.652}\ LOG(GNPVNSA/PGNP) + \underset{(1.9)}{0.898}\ LOG(P) - \underset{(4.9)}{1.021}\ LOG(GPXGUV * GE) \\
&+ \underset{(3.5)}{1.805}\ LOG(E)
\end{aligned}$$

$\bar{R}^2 = 0.941$ SEE = 0.100 DW = 2.04

Period 61:1 to 75:4

BILATERAL IMPORT DEMAND FUNCTION: IMPORTS FROM JAPAN

$$\text{LOG (XJCV/JPXGUV * JE))} = -\underset{(7.1)}{10.502} + \underset{(1.4)}{0.052}\ \text{Q1} + \underset{(1.4)}{0.043}\ \text{Q2} - \underset{(3.5)}{0.130}\ \text{Q3}$$

$$+ \underset{(6.8)}{2.199}\ \text{LOG (GNPVNSA/PGNP)} + \underset{(2.4)}{1.248}\ \text{LOG (P/(JPXGUV * JE/E)}$$

$\bar{R}^2 = 0.615$ SEE = 0.111   DW = 1.86 $\rho = 0.853$

Period 61:1 to 75:4

BILATERAL IMPORT DEMAND FUNCTION: IMPORTS FROM THE REST-OF-THE-WORLD

$$\mathrm{LOG(MCRV/ROWPXG)} = \underset{(25.6)}{-\,5.610} - \underset{(2.9)}{0.088}\ \mathrm{Q1} + \underset{(0.9)}{0.026}\ \mathrm{Q2} - \underset{(4.4)}{0.134}\ \mathrm{Q3}$$

$$+ \underset{(30.8)}{1.529}\ \mathrm{LOG(GNPVNSA/PGNP)} + \underset{(4.0)}{0.290}\ \mathrm{LOG(P/(ROWPXG/E))}$$

$\bar{R}^2 = 0.949$ SEE = 0.083 DW = 1.57

Period 61:1 to 75:4

BILATERAL IMPORT DEMAND FUNCTION: IMPORTS FROM THE U.K.

$$\underset{}{LOG(XECV/(EPXGUV * EE))} = -\underset{(1.3)}{0.734} - \underset{(4.0)}{0.128}\,Q1 + \underset{(1.2)}{0.039}\,Q2 - \underset{(3.0)}{0.093}\,Q3$$

$$+ \underset{(1.2)}{0.153}\,LOG(GNPVNSA/PGNP) - \underset{(1.5)}{0.141}\,EDV41 - \underset{(1.7)}{0.150}\,EDV50$$

$$- \underset{(0.7)}{0.043}\,EDV30 + \underset{(0.7)}{0.064}\,EDV49 - \underset{(1.4)}{0.125}\,EDV5 + \sum_{i=0}^{4} a_i$$

$$LOG(P_{-i}\ /(EPXGUV_{-i} * EE_{-i}\ /\ E_{-i}))$$

$\bar{R}^2 = 0.604$ SEE = 0.089 DW = 2.02 $\rho = 0.329$

Period 61:1 to 75:4

i	0	1	2	3	4	SUM
a_i	-0.032	0.289	0.453	0.460	0.309	1.479
	(0.1)	(3.2)	(3.4)	(2.5)	(2.2)	(4.8)

BILATERAL IMPORT DEMAND FUNCTION: IMPORTS FROM THE U.S.

$$\text{LOG(XUCV/UPXGUV)} = \underset{(16.1)}{-\ 4.237} + \underset{(1.6)}{0.024}\ \text{Q1} + \underset{(5.5)}{0.084}\ \text{Q2} - \underset{(15.5)}{0.218}\ \text{Q3}$$

$$+ \underset{(25.5)}{1.460}\ \text{LOG(GNPVNSA/PGNP)} + \sum_{i=0}^{2} a_i\ \text{LOG}(P_{-i}/(\text{UPXGUV}_{-i}/E_{-i}))$$

$$+ \underset{(2.9)}{0.017}\ \text{QAUTST}$$

$\bar{R}^2 = 0.944$ SEE = 0.047   DW = 2.35 $\rho = 0.568$

Period 61:1 to 75:4

i	0	1	2	SUM
a_i	0.301	0.201	0.100	0.603
	(2.7)	(2.7)	(2.7)	(2.7)

BILATERAL BRIDGE EQUATION: IMPORTS FROM GERMANY

$$MCGV = -\underset{(0.3)}{0.004} + \underset{(14.1)}{0.974}\ XGCV + \underset{(2.3)}{0.172}\ XGCV_{-1}$$

$\bar{R}^2 = 0.971$ SEE = 0.042 DW = 1.95

Period 61:1 to 75:4

BILATERAL BRIDGE EQUATION: IMPORTS FROM JAPAN

$$MCJV = \underset{(0.4)}{0.004} + \underset{(8.6)}{0.518}\ XJCV + \underset{(9.2)}{0.564}\ XJCV_{-1}$$

$$\bar{R}^2 = 0.987 \quad SEE = 0.057 \quad DW = 3.27$$

Period 61:1 to 75:4

BILATERAL BRIDGE EQUATION: IMPORTS FROM THE REST-OF-THE-WORLD

$$MCRV = \underset{(3.8)}{0.209} + \underset{(10.5)}{0.643}\ XRCV + \underset{(4.3)}{0.271}\ XRCV_{-1}$$

$\bar{R}^2 = 0.991$ SEE = 0.263   DW = 1.39

Period 61:1 to 75:4

BILATERAL BRIDGE EQUATION: IMPORTS FROM THE U.K.

$$MCEV = -\underset{(0.1)}{0.003} + \underset{(19.1)}{0.941}\ XECV + \underset{(3.1)}{0.155}\ XECV_{-1}$$

$\bar{R}^2 = 0.967$ SEE $= 0.047$ DW $= 1.94$

Period 61:1 to 75:4

BILATERAL BRIDGE EQUATION: IMPORTS FROM THE U.S.

$$\underset{}{MCUV} = -\underset{(4.7)}{0.411} + \underset{(39.8)}{1.182}\ XUCV + \underset{(0.6)}{0.018}\ XUCV_{-1}$$

$\bar{R}^2 = 0.997$ SEE = 0.337 DW = 1.32

Period 61:1 to 75:4

EXPORT OF GOODS[1/]

$$\text{LOG(XG)} = \underset{(5.5)}{-2.662} - \underset{(6.8)}{0.102}\ \text{Q1} + \underset{(0.1)}{0.002}\ \text{Q2} - \underset{(2.5)}{0.036}\ \text{Q3} + \underset{(10.1)}{0.930}\ \text{LOG(WMGV/ROWPMG)}$$

$$\sum_{i=0}^{2} a_i\ \text{LOG}(\text{PXGUV}_{-i}/\text{UPXGUV}_{-i}) + \sum_{i=0}^{3} b_i\ \text{LOG}(\text{E}_{-i-1}) + \underset{(1.5)}{0.054}\ \text{QSCALE}$$

$$+ \underset{(1.0)}{0.006}\ \text{QAUTST}$$

$\bar{R}^2 = 0.9661$ SEE = 0.045 DW = 1.77 $\rho = 0.418$

Period 61:1 to 75:4

i	0	1	2	3	Sum
a_i	-0.364	-0.243	-0.121		-0.728
	(1.3)	(1.3)	(1.3)		(1.3)
b_i	-0.430	-0.322	-0.215	-0.197	1.075
	(2.3)	(2.3)	(2.3)	(2.3)	(2.3)

1/ This equation is used only when the Canadian model is simulated in isolation from the other models of the MCM.

EXPORTS OF OTHER SERVICES

$$\underset{}{LOG(XSOV/PXS)} = \underset{(2.1)}{-\,1.095} + \underset{(11.6)}{0.387}\ Q2 + \underset{(17.5)}{0.527}\ Q3 - \underset{(0.5)}{0.028}\ Q4\ +$$

$$+\ \underset{(3.6)}{0.500}\ LOG(XSOV_{-1}/PXS_{-1}) + \underset{(2.3)}{0.202}\ LOG(FGNP) + \underset{(1.4)}{0.060}\ QEXPO$$

$$+\ \underset{(2.0)}{0.034}\ QAUTO + \underset{(1.1)}{0.197}\ LOG(FP/PXS)$$

$\bar{R}^2 = 0.9681$ SEE = 0.061 DW = 2.34

Period 61:1 to 75:4

IMPORTS OF OTHER SERVICES

$$\begin{aligned}\mathrm{LOG}(\mathrm{MSOV}/\mathrm{PMS}) = &- \underset{(3.8)}{1.471} + \underset{(8.5)}{0.132}\ \mathrm{Q2} + \underset{(4.3)}{0.083}\ \mathrm{Q3} - \underset{(4.0)}{0.081}\ \mathrm{Q4} \\ &+ \underset{(6.6)}{0.617}\ \mathrm{LOG}(\mathrm{MSOV}_{-1}/\mathrm{PMS}_{-1}) + \underset{(3.9)}{0.450}\ \mathrm{LOG}(\mathrm{GNP}) + \underset{(1.3)}{0.388}\ \mathrm{LOG}(\mathrm{P}/\mathrm{PMS})\end{aligned}$$

$\bar{R}^2 = 0.9794$ SEE = 0.042   DW = 1.97

Period 61:1 to 75:4

EXPORTS OF GOODS AND SERVICES: BRIDGE EQUATION (balance of payments basis to National Income Accounts basis)

$$XGSNIVS = \underset{(0.2)}{-\ 0.003} + \underset{(1578.4)}{1.000}\ (XGV + XSOV + XSYV)$$

$\bar{R}^2 = 0.999$ SEE $= 0.051$ DW $= 3.08$

Period 61:1 to 75:4

IMPORTS OF GOODS AND SERVICES: BRIDGE EQUATION (balance of payments basis to National Income Accounts basis)

$$MGSNIVS = -\ 0.002 + 1.000\ (MGV + MSOV + MSYV)$$
$$(0.2) \quad (2263.9)$$

$\bar{R}^2 = 0.999$ SEE = 0.038 DW = 2.17

Period 61:1 to 75:4

TRANSFER RECEIPTS

$$
\begin{array}{llllll}
XTRANV = & 0.009 + & 0.137\ Q2 + & 0.099\ Q3 & 0.131\ Q4 + & 0.001\ FYDVNSA \\
 & (0.3) & (5.9) & (3.8) & (5.6) & (21.2)
\end{array}
$$

$\bar{R}^2 = 0.9014$ SEE $= 0.077$ DW $= 2.08$ $\rho = 0.404$

Period 61:1 to 75:4

TRANSFER PAYMENTS

$$\text{MTRANV} = \underset{(8.2)}{0.183} + \underset{(18.4)}{0.007}\ \text{YDVNSA}$$

$\bar{R}^2 = 0.8515$ SEE = 0.073 DW = 1.87

Period 61:1 to 75:4

INVESTMENT INCOME RECEIPTS

$$\underset{(0.9)}{XSYV = 0.003}\ FC + \underset{(2.0)}{0.003}\ Q2 * FC - \underset{(0.8)}{0.001}\ Q3 * FC$$

$$+ \underset{(4.2)}{0.006}\ Q4 * FC + \underset{(2.1)}{0.004}\ (E_{-1}/E) * NFAEOQ_{-1} * FRSC$$

$$+ \underset{(3.9)}{0.008}\ (E_{-1}/E) * URL * LTDC_{-1}$$

$\bar{R}^2 = 0.7934$ SEE = 0.091 DW = 1.9 $\rho = 0.315$

Period 61:1 to 75:4

INVESTMENT INCOME PAYMENTS

$$MSYV = \underset{(5.4)}{0.057}\ FL - \underset{(0.2)}{0.0002}\ Q2 * FL - \underset{(1.8)}{0.002}\ Q3 * FL + \underset{(11.0)}{0.011}\ Q4 * FL$$

$$+ \underset{(7.0)}{0.026}\ (RS * (-STL_{-1}) + RL * (-LTPL_{-1})) - \underset{(5.0)}{0.032}\ RL * (-LTDL_{-1})$$

$\bar{R}^2 = 0.9178$ SEE = 0.155 DW = 1.95 $\rho = 0.415$

Period 61:1 to 75:4

DOMESTIC PRICE

$$\underset{}{LOG(P)} = \underset{(4.5)}{-\ 0.185} + \underset{(10.2)}{0.732}\ LOG(P_{-1}) + \underset{(3.9)}{0.122}\ LOG(W) + \underset{(3.1)}{0.096}\ LOG(PMGSNI)$$

$$+ \underset{(2.6)}{0.0004}\ CU + \underset{(3.7)}{0.017}\ LOG(PPC)$$

$\bar{R}^2 = 0.999$ SEE = 4.09 E-3 DW = 2.30

Period 61:1 to 75:4

EXPORT UNIT VALUE

$$\text{PXGUV} = \underset{(2.4)}{0.213} - \underset{(3.6)}{0.005}\ \text{TIME} + \underset{(2.0)}{0.002}\ \text{CUSTCU}\ \underset{(8.3)}{0.486}\ \text{LOG(PCOMP)} * (1-\text{KFIX})$$

$$+ \underset{(7.2)}{1.038}\ \text{LOG(P)} - \underset{(4.6)}{0.252}\ \text{LOG(P)} * (1-\text{KFIX})$$

$\bar{R}^2 = 0.967$ SEE $= 0.012$ DW $= 1.76$ $\rho = 0.746$

Period 61:1 to 75:4

IMPORT UNIT VALUE

$$\underset{}{LOG(PMGUV) + LOG(E) = -\underset{(4.0)}{0.027} + \underset{(4.3)}{0.370}\,LOG(FPXGUVD) + \underset{(4.2)}{0.369}\,LOG(FPXGUVD_{-1})}$$

$\bar{R}^2 = 0.951$ SEE $= 0.011$ DW $= 1.77$ $\rho = 0.798$

Period 61:1 to 75:4

SERVICE DEFLATOR, EXPORTS

$$\underset{}{LOG(PXS)} = -\underset{(2.7)}{0.017} + \underset{(41.9)}{1.111}\ LOG(P)$$

$\bar{R}^2 = 0.9675$ SEE = 0.041 DW = 2.15

Period 61:1 to 75:4

SERVICE DEFLATOR, IMPORTS

$$\underset{(5.2)}{\mathrm{LOG(PMS)} = 0.496}\ \mathrm{LOG}(\mathrm{PMS}_{-1}) + \underset{(5.3)}{0.550}\ \mathrm{LOG(FP)}$$

$\bar{R}^2 = 0.9856$ SEE = 0.023 DW = 2.05

Period 61:1 to 75:4

CAPACITY UTILIZATION

$$\text{LOG(GNP/LF)} - 0.28 * \text{LOG(KP/LF)} = \underset{(110.6)}{1.286} + \underset{(20.0)}{0.003}\ \text{TIME} + \underset{(10.4)}{0.584}\ \text{LOG(CU/100)}$$

$\bar{R}^2 = 0.933$ SEE = 0.008 DW = 2.03 $\rho = 0.637$

Period 61:1 to 75:4

WAGES

$$(W-W_{-4})/W_{-4} = \underset{(0.2)}{-\ 0.001} + \underset{(2.4)}{0.069}\ QUI + \underset{(1.4)}{0.0003}\ TIME - \underset{(0.9)}{0.008}\ QCNTRL$$

$$+ \underset{(2.2)}{0.210} \left(\sum_{i=0}^{-3} (P_i - P_{i-4})/P_{i-4} \right)/4 - \underset{(0.1)}{0.0001}\ UN_{-1} - \underset{(2.7)}{0.012}\ UN_{-1}{*}QUI$$

$$+ \underset{(6.1)}{0.737} (W_{-1} - W_{-5})/W_{-5}$$

$\bar{R}^2 = 0.9663$ SEE = 0.007   DW = 2.19

Period 62:2 to 75:4

WAGE BILL

$$WB = -\underset{(4.1)}{10.667} + \underset{(168.7)}{1.019}\ LF * (1 - UN/100) * W * 2 + \underset{(3.7)}{0.104}\ CU$$

$\bar{R}^2 = 0.998$ SEE = 0.438 DW = 1.83 $\rho = 0.586$

Period 61:1 to 75:4

EMPLOYMENT

$$\underset{}{LOG(1 - UN/100) + LOG(LF)} = \underset{(3.7)}{0.675} + \underset{(11.4)}{0.005}\ TIME +$$

$$\sum_{i=0}^{4} a_i \ LOG(GNPV_{-i}/(W_{-i}))$$

$\bar{R}^2 = 0.9826$ SEE = 0.005 DW = 1.62 $\rho = 0.768$

Period 62:1 to 75:4

i	0	1	2	3	4	Sum
a_i	0.149	0.095	0.053	0.024	0.006	0.326
	(3.6)	(5.5)	(2.9)	(1.1)	(0.3)	(5.3)

LABOR FORCE PARTICIPATION

$$\text{LOG(LF/POP15)} = -\underset{(8.8)}{0.709} + \underset{(5.9)}{0.279}\ \text{LOG}(W_{-1}/P_{-1}) - \underset{(1.4)}{0.014}\ \text{LOG}(UN_{-1})$$

$$-\underset{(1.3)}{0.001}\ NW_{-2}\ /\ P_{-1}$$

$\bar{R}^2 = 0.4371$ SEE = 0.004 DW = 1.68 $\rho = 0.906$

Period 62:1 to 75:4

DEMAND DEPOSITS

$$
\begin{aligned}
DD/NWNSA = & - \underset{(0.3)}{0.001} - \underset{(6.0)}{0.007}\ Q2 - \underset{(4.4)}{0.009}\ Q3 - \underset{(0.8)}{0.001}\ Q4 - \underset{(2.0)}{2.2E\text{-}04}\ TIME \\
& + \underset{(8.0)}{0.698}\ DD_{-1}/NWNSA + \underset{(3.6)}{0.072}\ GNPVNSA/NWNSA - \underset{(4.5)}{0.001}\ RS
\end{aligned}
$$

$\bar{R}^2 = 0.950 \quad SEE = 0.002 \quad DW = 1.21$

Period 61:1 to 75:4

SAVING DEPOSITS

$$SD/NWNSA = -\underset{(3.3)}{0.014} - \underset{(5.2)}{0.007}\ Q2 - \underset{(1.6)}{0.002}\ Q3 - \underset{(10.3)}{0.016}\ Q4 + \underset{(19.3)}{0.320}\ CVNSA/NWNSA$$

$$- \underset{(5.6)}{0.002}\ KFIX * DEFIXED + \sum_{i=0}^{7} a_i\ RS_{-i}$$

$\bar{R}^2 = 0.981$ SEE = 0.004 DW = 0.65

Period 61:1 to 75:4

i	0	1	2	3	4	5
a_i	7.0E-04	6.0E-04	5.0E-04	4.1E-04	3.2E-04	2.3E-04
	(3.2)	(4.3)	(5.4)	(4.9)	(3.5)	(2.5)

6	7	SUM
1.5E-04	0.7E-04	3.0E-03
(1.9)	(1.5)	(5.4)

NOTICE DEPOSITS

$$ND/NWNSA = -\underset{(15.3)}{0.044} - \underset{(3.1)}{0.004}\ Q2 - \underset{(7.7)}{0.011}\ Q3 - \underset{(4.1)}{0.006}\ Q4 + \underset{(31.2)}{0.129}\ GNPVNSA/NWNSA$$

$$+ \underset{(1.3)}{8.0E-04}\ (RS - URS) - \underset{(3.2)}{9.8E-04}\ KFIX * DEFIXE2$$

$\bar{R}^2 = 0.957$ SEE = 0.004 DW = 0.52

Period 61:1 to 75:4

CURRENCY

$$\underset{}{CUR/NWNSA} = \underset{(4.0)}{0.004} - \underset{(4.8)}{0.002}\ Q2 - \underset{(7.7)}{0.004}\ Q3 - \underset{(5.0)}{0.002}\ Q4 - \underset{(4.4)}{1.5E\text{-}04}\ TIME$$

$$+ \underset{(9.4)}{0.047}\ GNPVNSA/NWNSA - \underset{(4.0)}{3.3E\text{-}04}\ RS$$

$\bar{R}^2 = 0.941$ SEE = 7.5E-04 DW = 0.80

Period 61:1 to 75:4

REQUIRED RESERVES

$$RR = \underset{(7.0)}{0.083} + \underset{(158.6)}{0.908}\ (A * DD + B * TD)/100$$

$\overline{R}^2 = 0.998$ SEE 0.035 DW = 1.41

Period 61:1 to 75:4

SHORT-TERM INTEREST RATE: WHEN SHORT-TERM RATE EXCEEDS THE DISCOUNT RATE

$$RSLD = -\underset{(2.4)}{1.190} - \underset{(2.0)}{27.949}\ RF/NDD + \underset{(1.2)}{12.057}\ \Delta(RU)/NDD - \underset{(2.7)}{67.746}\ DRR/NDD$$

$$+ \underset{(5.6)}{1.090}\ RD + \underset{(2.4)}{0.270}\ RS_{-1} - \underset{(1.0)}{0.0217}\ DEFLOAT * (1 - KFIX)$$

$$- \underset{(1.6)}{0.094}\ QBACTS * RD - \underset{(3.1)}{0.139}\ DEFIXED * KFIX$$

$\bar{R}^2$ = .9525 SEE = 0.469 DW = 1.00

Period 61:1 to 62:1, 63:1, 63:3 to 67:4, 68:3 to 70:3,
72:2 to 74:4, 75:4

SHORT TERM INTEREST RATE: WHEN DISCOUNT RATE EXCEEDS SHORT-TERM RATE

$$RSHD = -\underset{(0.5)}{5.558}\ RF/NDD - \underset{(1.0)}{0.143}\ URS - \underset{(1.1)}{38.880}\ DRR/NDD + \underset{(8.7)}{1.034}\ RD$$

$$- \underset{(1.7)}{0.048}\ DEFLOAT * (1 - KFIX)$$

$\bar{R}^2 = 0.934$ SEE = 0.383   DW = 1.70

Period: 62:2 to 62:4, 63:2, 68:1 to 68:2, 70:4 to 72:1,

75:1 to 75:3

LONG-TERM INTEREST RATE

$$RL = \underset{(3.3)}{1.735} + \sum_{i=0}^{15} a_i \; RS_{-i} + \sum_{i=0}^{5} b_i \; \Delta(LOG(P_{-i}))$$

$\bar{R}^2 = 0.743$ SEE = 0.289 DW = 1.58 $\rho = 0.667$

Period 61:1 to 75:4

i	0	1	2	3	4	5	6	7	
a	0.079	0.077	0.074	0.071	0.068	0.064	0.597	0.055	
	(3.1)	(3.7)	(4.5)	(5.4)	(6.2)	(6.7)	(6.6)	(6.0)	
	8	9	10	11	12	13	14	15	SUM
	0.050	0.045	0.040	0.034	0.028	0.021	0.015	0.007	0.789
	(5.3)	(4.7)	(4.2)	(3.7)	(3.4)	(3.1)	(2.9)	(2.7)	(6.7)

i	0	1	2	3	4	5	SUM
b	13.076	9.804	6.970	4.572	2.611	1.087	38.120
	(1.8)	(2.3)	(1.5)	(0.8)	(0.5)	(0.3)	(1.8)

ERRORS AND OMISSIONS

$$
\begin{aligned}
EANDO = & - \underset{(4.0)}{1.123} + \underset{(4.4)}{1.531}\,Q2 + \underset{(4.6)}{2.192}\,Q3 + \underset{(2.6)}{0.930}\,Q4 - \underset{(3.6)}{0.338}\,\Delta(NWNSA) \\
& - \underset{(3.1)}{0.528}\,(\Delta(XGV) - \Delta(MGV)) - \underset{(2.4)}{0.229}\,(XGV + XSOV + XSYV + XTRANV \\
& - MGV - MSOV - MSYV - MTRANV) - \underset{(1.8)}{1.662}\,QNEP + \underset{(1.3)}{1.235}\,QSMITH
\end{aligned}
$$

$\bar{R}^2 = 0.3805 \quad SEE = 0.898 \quad DW = 2.48$

Period 61:1 to 75:4

CHANGE IN SHORT-TERM LIABILITIES

$$DSTL = -\underset{(0.2)}{0.387} - \underset{(3.6)}{0.943}\,Q2 - \underset{(1.9)}{0.324}\,Q3 - \underset{(2.0)}{0.466}\,Q4 + \underset{(1.7)}{0.091}\,\Delta(MGV)$$

$$-\underset{(1.5)}{0.406}\,QCRISIS - \underset{(1.5)}{0.115}\,\Delta(URS) + \underset{(3.2)}{0.265}\,\Delta(MGV) * KFIX$$

$$-\underset{(3.0)}{0.446}\,QIET2 - \underset{(1.9)}{0.914}\,QRFID + \underset{(1.6)}{0.307}\,QEREG69 + \sum_{i=0}^{5} a_i\ \Delta(UNW_{-i})$$

$$+\sum_{i=0}^{3} b_i\ 1/ER_{-i} + \underset{(1.9)}{0.850}\,QSMITH$$

$\bar{R}^2 = 0.4256$ SEE = 0.424 DW = 2.45

Period 61:1 to 75:4

i	0	1	2	3	4	5	SUM
a	0.014	0.011	0.009	0.007	0.004	0.002	0.048
	(3.2)	(3.2)	(3.2)	(3.2)	(3.2)	(3.2)	(3.2)
b	2.138	0.140	-0.882	-0.929			0.468
	(0.6)	(0.2)	(0.5)	(0.5)			(0.3)

CHANGE IN SHORT-TERM CLAIMS

$$- DSTC = - \underset{(1.7)}{0.534} - \underset{(0.4)}{0.160}\ Q2 + \underset{(3.0)}{0.952}\ Q3 + \underset{(1.1)}{0.423}\ Q4 - \underset{(2.5)}{0.483}\ \Delta(RS)$$

$$+ \underset{(3.4)}{0.549}\ \Delta FRSC + \underset{(2.2)}{0.757}\ QEREG69 + \underset{(1.5)}{0.035}\ \Delta(DEFLOAT) * (1-KFIX)$$

$$+ \underset{(2.0)}{0.157}\ \Delta(XGV) + \underset{(1.5)}{0.129}\ DLTPL - \underset{(1.4)}{1.172}\ QFRID + \underset{(0.7)}{0.282}\ QIET1$$

$$+ \underset{(0.5)}{0.124}\ QIET2 - \underset{(1.8)}{1.493}\ QNEP$$

$\bar{R}^2 = 0.404$ SEE = 0.771 DW = 2.18

Period 61:1 to 75:4

CHANGE IN LONG-TERM LIABILITIES

$$\begin{aligned} DLTPL = & - \underset{(1.3)}{8.439} - \underset{(0.9)}{0.327}\ Q2 - \underset{(0.5)}{0.203}\ Q3 + \underset{(0.8)}{0.304}\ Q4 + \underset{(0.2)}{0.155}\ QMIDEA \\ & + \underset{(1.0)}{0.590}\ \Delta(RL - URL) - \underset{(1.7)}{1.037}\ QIET1 - \underset{(2.8)}{1.261}\ QIET2 \\ & + \underset{(1.5)}{0.009}\ QZEUROF + \underset{(2.3)}{1.019}\ QEREG69 - \underset{(0.8)}{0.579}\ QLOBO + \underset{(0.8)}{0.791}\ QEIETB \\ & + \sum_{i=0}^{5} a_i\ \Delta(UNW_{-i}) + \sum_{i=0}^{5} b_i\ 1/ER_{-i} - \underset{(1.3)}{1.369}\ QSMITH \end{aligned}$$

$\bar{R}^2 = 0.4442$ SEE = 1.001 DW = 1.31

Period 61:1 to 75:4

i	1	2	3	4	5	6	SUM
a	0.049	0.041	0.033	0.025	0.016	0.008	0.171
	(3.4)	(3.4)	(3.4)	(3.4)	(3.4)	(3.4)	(3.4)
b	8.510	3.906	0.577	-1.479	-2.260	-1.767	7.486
	(1.5)	(1.9)	(0.4)	(0.5)	(0.7)	(0.8)	(1.3)

CHANGE IN LONG-TERM CLAIMS

$$
\begin{aligned}
-\,DLTPC = {} & \underset{(0.7)}{0.072} - \underset{(1.6)}{0.117}\ Q2 + \underset{(0.3)}{0.020}\ Q3 + \underset{(1.4)}{0.098}\ Q4 + \underset{(1.1)}{0.098}\ Q2 * KFIX \\
& - \underset{(0.1)}{0.005}\ Q3 * KFIX - \underset{(1.2)}{0.106}\ Q4 * KFIX + \underset{(2.3)}{0.191}\ \Delta(URL) - \Delta(RL) \\
& + \underset{(0.5)}{0.002}\ (1 - KFIX) * \Delta(DEFLOAT) - \underset{(1.1)}{0.167}\ QFRID
\end{aligned}
$$

$\bar{R}^2 = 0.082$ SEE = 0.174 DW = 1.84 $\rho = 0.774$

Period 61:1 to 75:4

FORWARD EXCHANGE RATE

$$EF = 0.022 + \underset{(2.8)}{} 8.142E\text{-}05\ Q2 \underset{(0.3)}{} + 1.108E\text{-}04\ Q3 \underset{(0.4)}{} - 3.449E\text{-}04\ Q4 \underset{(1.1)}{} + 0.002\ E * FRSL \underset{(16.2)}{}$$

$$- 0.002\ E * RS \underset{(13.1)}{} + 0.977\ E \underset{(118.5)}{} - 4.407E\text{-}04\ KFIX * DEFIXED * E \underset{(2.9)}{}$$

$$+ 8.006E\text{-}05\ (1 - KFIX) * DEFLOAT * E \underset{(2.6)}{}$$

$\bar{R}^2 = 0.9995$ SEE = 8.18E-04   DW = 1.18

Period 61:1 to 75:4

LED EXCHANGE RATE

$$ELEAD = \underset{(4.6)}{0.588} - \underset{(0.6)}{0.241}\ KFIX + \sum_{i=0}^{2} a_i\ E_{-i-1} + \sum_{i=0}^{2} b_i\ E_{-i-1}$$

$$* KFIX + \sum_{i=0}^{2} c_i\ DNFA_{-i} + \sum_{i=0}^{2} d_i\ DNFA_{-i} * KFIX$$

$$+ \sum_{i=0}^{1} e_i\ NGP_{-i} + \sum_{i=0}^{1} f_i\ NGP_{-i} * KFIX$$

$\bar{R}^2 = 0.923$ SEE = 0.010 DW = 1.33

Period 61:1 to 75:4

i	0	1	2
a	1.133 (5.6)	- 0.226 (0.8)	- 0.511 (2.5)
b	- 0.093 (0.1)	0.574 (0.5)	- 0.253 (0.4)
c	0.016 (5.0)	0.005 (1.0)	- 0.007 (2.3)
d	--0.013 (3.2)	0.005 (0.9)	0.006 (1.5)
e	0.055 (2.7)	- 0.056 (2.6)	
f	- 0.091 (3.1)	0.091 (3.1)	

NET FOREIGN ASSETS: FLOATING EXCHANGE RATE PERIOD

$$DNFAFL = \underset{(0.7)}{1.219}\ (1 - KFIX) + \underset{(3.8)}{0.114}\ (E/E_{-1}-1) * (1 - KFIX)$$

$$- \underset{(0.7)}{0.228}\ (NFAEOQ_{-1} + NFAEOQ_{-2}) * .5 * (1 - KFIX)$$

$\bar{R}^2 = 0.5011$ SEE = 0.650 DW = 1.72

Period 70:3 to 75:4

CHANGE IN NET GOVERNMENT POSITION: FIXED EXCHANGE RATE PERIOD

$$\underset{}{DNGPFX} = -\underset{(0.9)}{0.139}\ KFIX - \underset{(7.0)}{0.457}\ DNFA * KFIX + \underset{(1.5)}{0.173}\ \Delta(GNP) * KFIX$$

$$-\underset{(1.4)}{0.247}\ \Delta(URS - RS) * KFIX$$

$\bar{R}^2 = 0.5671$ SEE = 0.444   DW = 1.60

Period 61:1 to 70:2

LIST OF IDENTITIES

GNP identities

1. GNP = C + IFP + IFG + II + G + XGSNI - MGSNI + RES

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

3. GNPVNSA = GNPV / SAFGNPV

4. PCHGNP = Δ(LOG(GNP)) * 400

Components of GNP

5. G = GV / P

6. CV = C * P

7. IFPV = IFP * P

8. IFGV = IFG * P

9. IIV = II * P

10. MGSNIV = SAFMNIV * MGSNIVS

11. XGSNIV = SAFXNIV * XGSNIVS

12. CVNSA = CV / SAFCV

13. IFGVNSA = IFGV / SAFIFGV

14. IFPVNSA = IFPV / SAFIFPV

Disposable income proxy

15. YDPVNSA = GNPVNSA - TV + TRANV - CCAV

16. YDV = YDVNSA * SAFYDV

Capital stock

17. KG = (1 - SCRG / 4) * KG_{-1} + IFG / 4

18. KP = (1 - SCRP / 4) * KP_{-1} + IFP / 4

Private net worth proxy

19. DNWNSA = YDPVNSA - CVNSA + XTRANV - MTRANV - RESNSA

20. $NWNSA = NWNSA_{-1} + DNWNSA / 4$

21. DNW = DNWNSA * SAFDNW

22. $NW = NW_{-1} + DNW / 4$

Exports of goods and services

23. XGSNINS = XG + (XSOV + XSYV) / PXS

24. XGSNI = SAFXNI * XGSNINS

Imports of goods and services

25. MGSNINS = MG + (MSOV + MSYV) / PMS

26. MGSNI = SAFMNI * MGSNINS

Merchandise exports, balance of payments basis

27. XGV = XG * PXGUV

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

28. XCTV = XCJV + XCGV + XCEV + XCUV + XCRV + XCJUNK

Merchandise imports, balance of payments basis

29. MGV = GM * PMGUV

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

30. MCTV = MCJV + MCGV + MCEV + MCUV + MCRV

Total tax revenue

31. TV = TPERV + TNRESV + TCORPV + TINDV

Wage Bill

32. WBNSA = WB / SAFWB

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[1] Applied only to linked version of the model.

Trade balance

33. $TB = XGV - MGV$

Total world exports, excluding Canada

34. $WTV = XGTV + XJTV + XUTV + XETV + XRTV$

Canadian exports to trading partners

35. $XUJEGV = XCUV + XCJV + XCEV + XCGV$

Canadian imports to trading partners

36. $MUJEGV = XUCV + XJCV + XECV + XGCV$

Weighted foreign averages of competitors price, capacity utilization price of exports, gross national product, domestic deflator, and disposable income

37. $$PCOMP = (GE * GPXGUV)^{XGTV/WTV} * (JE * JPXGUV)^{XJTV/WTV}$$
$$* (EE * EPXGUV)^{XETV/WTV} * UPXGUV^{XUTV/WTV}$$
$$* ROWPXG^{XRTV/WTV}/E$$

38. $$CUSTCU = UCU^{XCUV/XUJEGV} * JCU^{XCJV/XUJEGV}$$
$$ECU^{XCEV/XUJEGV} * GCU^{XCGV/XUJEGV}$$

39. $$FPXGUVD = UPXGUV^{MCUV/MCTV} * (JPXGUV * JE)^{MCJV/MCTV}$$
$$* (EPXGUV * EE)^{MCEV/MCTV} * (GPXGUV * GE)^{MCGV/MCTV}$$
$$* ROWPXG^{MCRV/MCTV}$$

40. $$FGNP = UGNP^{XCUV/XUJEGV} * JGNP^{XCJV/XUJEGV}$$
$$* EGDP^{XCEV/XUJEGV} * GGNP^{XCGV/XUJEGV}$$

41. $FP = UP^{XUCV/MUJEGV} * (JP * JE)^{XJCV/MUJEGV}$

$* (EP * EE)^{XECV/MUJEGV} * (GP * GE)^{XGCV/MUJEGV} / E$

42. $FYDVNSA = UYDV^{XCUV/XUJEGV} * JYDVNSA^{XCJV/XUJEGV}$

$* EYDVNSA^{XCEV/XUJEGV} * GYDVNSA^{XCGV/XUJEGV}$

Percentage change in domestic deflator

43. $PCHP = \Delta(LOG(P)) * 400$

Percentage change in wages

44. $PCHW = \Delta(LOG(W)) * 400$

GNP deflator

45. PGNP = GNPV / GNP

Deflator for imports of goods and services

46. PMGSNI = MGSNIV / MGSNI

Net foreign assets

47. DNFA = XGV + XSYV + XSOV + XTRANV - MGV - MSYV - MSOV -

MTRANV + DSTL + DLTPL + DSTC + DLTPC + DLTDL

+ DLTDC + EANDO + NGKA

48. $NFAEOQ = NFAEOQ_{-1} + DNFA / 4$

49. NFAFED = (NFAEOQ - NFAEOQR) * ER

Net government position of the monetary authority

50. DNGP = DNGPFX * XFIX + DNGPFL * (1 - KFIX)

51. $NGP = NGP_{-1} + DNGP / 4$

Short-term liabilities and claims, stocks

52. $STL = STL_{-1} - DSTL / 4$

53. $STC = STC_{-1} - DSTC / 4$

Long-term direct liabilities and claims, stocks

54. $LTDL = LTDL_{-1} - DLTDL / 4$

55. $LTDC = LTDC_{-1} - DLTDC / 4$

Long-term protfolio liabilities and claims, stocks

56. $LTPL = LTPL_{-1} - DLTPL / 4$

57. $LTPC = LTPC_{-1} - DLTPC / 4$

Net government capital account, stock

58. $NGK = NGK_{-1} - NGKA / 4$

Stock of financial liabilities and claims by foreigners

59. $FL = -(STL + LTPL + LTDL)$

60. $FC = STC + LTPC + LTDC + NFAEOQ + NGK$

Foreign average short-term interest rate

61. $FRSC = .268 * URS + .732 * RED$

62. $FRSL = .219 * URS + .781 * RED$

Proxy for expected exchange rate

63. $DEFLOAT = (E / ELEAD - 1) * 400$

64. $DEFIXED = MGV_{-1} / (NFAEOQ_{-1} + NFAEOQ_{-2}) * 2 * PXGUV_{-1} / PCOMP_{-1}$

65. $DEFIXE2 = MGV_{-1} / (NFAEOQ_{-1} + NFAEOQ_{-2}) * 2$

Change in reserve requirement

66. $DRR = \Delta(A) * (DD_{-1} - TD_{-1}) / 100$

Net demand deposit

67. NDD - (1 - .9078 * A / 100) * DD

Unborrowed monetary base, sources and uses

68. BU = $(NFAEOQ_{-1} + NFAEOQ) * 0.5 + SDRVAL + NGP + OTH$

69. BU = RR + RF + CUR

Unborrowed reserves

70. RU = BU - CUR

Time deposits

71. TD = SD + ND

Short-term interest rate

72. RS = RSHD * QRD + RSLD * (1 - QRD)

Spot exchange rate

73. ER = E * 1.00937

Official reserves changes and exchange rate

74. E = EFX * KFIX + EFL * (1 - KFIX)

75. DNFA = DNFAFX * KFIX + DNFAFL * (1 - KFIX)

76. 0 = EFL * KFIX + DNFAFX * (1 - KFIX)

DEFINITION AND SOURCES OF VARIABLES

All national product and income account variables are expressed at annual rates 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"). The prefix "SAF" indicates a seasonal adjustment factor used to translate variables from an "NSA" to an "SA" basis or vice-versa. All monetary stock items are measured as mid-quarter averages and are not seasonally adjusted. Where monetary stocks are measured at end of quarter, the suffix "EOQ" is employed.

The letter "V" appended to a variable name indicates measurement in billions of Canadian dollars. When the "V" is absent, the variable is generally expressed in constant 1972 Canadian dollars. Exceptions to this role are financial variables, such as capital account items and components of the monetary sector, which are all in nominal terms.

Interest rates are in per cent per annum; and price variables are indexes based at 1.0 in 1972. Exchange rates and interest rates are averages of daily rates. The symbol "x" indicates an exogenous variable. The "*" indicates a variable endogenously determined within the multi-country model, but exogenous (or not included in the isolated Canadian model.

The following abbreviations are used:

STATCAN	Statistics Canada
BOC	Bank of Canada
DOT	Direction of Trade (IMF)
FRB	Federal Reserve Board
WHARTON	Wharton Econometric Forecasting Associates
IFS	International Financial Statistics

x	A	reserve requirements on demand deposits (STATCAN)
x	B	reserve requirements on time deposits (STATCAN)
	BU	unborrowed reserves (RR + RF + CUR)
	C	consumption expenditure (CV/P)
	CCAV	total capital consumption allowance (STATCAN)
	CU	capacity utilization rate -- total manfactures (WHARTON)
	CUR	currency held by nonbank public (STATCAN)
	CUSTCU	foreign weighted average of capacity utilization[1]
	CV	consumption expenditure (STATCAN)
	CVNSA	consumption expenditure, not seasonally adjusted (STATCAN)
	DD	demand deposits held by residents (BOC)
	DEFIXED	proxy for expected exchange rate change during the fixed-rate regime (before 70:2); the ratio of imports to foreign exchange reserves times the ratio of Canadian export price to competitors' export price index
	DEFIXE2	proxy for expected exchange rate change during the fixed-rate regime (before 70:2); the ratio of imports to foreign exchange reserves
	DEFLOAT	proxy for expected exchange rate change during the floating rate period (after 70:2); percentage change between current and led exchange rates
x	DLTDC	change in long-term direct claims on foreigners (STATCAN)
x	DLTDL	change in long-term direct liabilities to foreigners (STATCAN)
	DLTPC	change in long-term protfolio claims on foreigners (STATCAN)

[1]Trade weighted average for Germany, Japan, the United Kingdom and the United States.

	DLTPL	change in long-term portfolio liabilities to foreigners (STATCAN)
	DNFA	change in net foreign assets of the central bank (STATCAN)
	DNFAFL	DNFA * (1-KFIX)
	DNFAFX	DNFA * KFIX
	DNGP	change in net government position of the consolidated monetary authorities
x	DNGPFL	DNGP * (1-KFIX)
	DNGPFX	DNGP * KFIX
	DNW DNWNSA	change in private net worth (STATCAN)
	DRR	change in required reserves
	DSTC	change in short-term claims on foreigners (STATCAN)
	DSTL	change in short-term liabilities to foreigners (STATCAN)
	E	Canadian spot exchange rate index, US$/C$, (ER/1.009)
	EANDO	errors and omissions (STATCAN)
*	ECU	U.K. capacity utilization index (WHARTON)
x	EDV30	U.K. dummy for shift in automobile imports, 7001 = 1
x	EDV41	U.K. dock strike dummy, 7203 = 1
x	EDV49	U.K. dummy for anticipation of floating of sterling, 7202 = 1
x	EDV5	U.K. dock strike dummy, 1 from 6701 to 6704 (LONDON BUSINESS SCHOOL)
x	EDV50	U.K. dock strike dummy, 7002 = 1
*	EE	spot exchange rate index, U.S.$/£ (FRB)

	EF	Canadian forward exchange rate index, U.S.$/C$, (EFR/1.008)
	EFL	E * (1-KFIX)
	EFX	E * KFIX
*	EGDP	U.K. gross domestic product, output estimates
	ELEAD	Canadian led spot exchange rate index (E_{+1})
*	EP	U.K. absorption deflator (index, 1972=1.0)
*	EPXGUV	U.K. export unit value index (1972=1.0)
	ER	Canadian exchange rate, U.S.$/C$ (FEDERAL RESERVE BULLETIN)
*	EYDVNSA	U.K. disposable income proxy
	FC	stock of financial claims on foreigners (cumulated value of DFC)
	FGNP	foreign weighted average of gross national product[1]
	FL	stock of financial liabilities to foreigners (cumulated value of DFL)
	FP	foreign weighted average of prices[1]
	FPXGUVD	foreign weighted average of price of exports[2]
	FRSC } FRSL }	weighted average of U.S. rate and Eurodollar short-term rates. (Weights based on external claims and liabilities, respectively
	FYDVNSA	foreign weighted average of disposable income[1]
x	G	government expenditure on goods and services (GV/P)

[1]Trade weighted average for Japan, Germany, the United Kingdom, and the United States.

[2]Weights are percentages of Canadian imports from Germany, Japan, R.O.W., the United Kingdom and the United States.

*	GCU	German capacity utilization rate
*	GE	German spot exchange rate index, $/DM (FRB)
*	GGNP	German gross national product
	GNP GNPV	gross national product (STATCAN)
*	GP	German absorption deflator
*	GPXGUV	German export unit value index
	GV	government expenditure on goods and services, current value (STATCAN)
*	GYDVNSA	German disposable income proxy
	IFG	government gross fixed capital formation (IFGV/P)
	IFGV IFGVNSA	government gross fixed capital formation (STATCAN)
	IFP	private fixed investment, housing plus plant and equipment (IFPV/P)
	IFPV IFPVNSA	private fixed investment, housing plus plant and equipment (STATCAN)
	II	inventory investment (IIV/P)
	IIV	inventory investment, current value (STATCAN)
x	INTSHK	dummy variable for simulating changes in foreign exchange intervention, normal value is zero.
*	JCU	Japanese capacity utilization index, ratio of industrial production index to production capacity index (BANK OF JAPAN)
*	JE	spot exchange rate index, U.S.$/YEN, (FRB)

*	JGNP	Japanese gross national product (BANK OF JAPAN)
*	JP	Japanese deflator for aggregate expenditure
*	JPXGUV	Japanese unit value of merchandise exports, Yen (IFS)
*	JYDVNSA	Japanese disposable income proxy
x	KFIX	dummy to reflect a fixed exchange rate regime (1 in 6202 to 7002)
	KG	government gross fixed capital stock (cumulated value of IFG, less scrappage)
	KP	private gross fixed capital stock (cumulated value of IFP less scrappage)
	LF	labor force (STATCAN)
	LTDC	stock of long-term direct claims on foreigners (cumulated value of DLTDC)
	LTDL	stock of long-term direct liabilities to foreigners (cumulated value of DLTDL)
	LTPC	stock of long-term portfolio claims on foreigners (cumulated value of DLTPC)
	LTPL	stock of long-term liabilities to foreigners (cumulated value of DLTPL)
	MCEV	merchandise imports from the U.K., c.i.f. (DOT)
	MCGV	merchandise imports from Germany, c.i.f. (DOT)
	MCJV	merchandise imports from Japan, c.i.f. (DOT)
	MCRV	merchandise imports from R.O.W., c.i.f. (DOT)
	MCTV	merchandise imports, c.i.f. customs clearance basis (DOT)

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

MG import of goods (STATCAN)

MGSNI import of goods and services, national income accounts basis (STATCAN)

MGSNINS import of goods and services, national income accounts basis, not seasonally adjusted (STATCAN)

MGSNIV import of goods and services, national income accounts basis, current value (STATCAN)

MGSNIVS import of goods and services, national income accounts basis, not seasonally adjusted (STATCAN)

MGV import of goods, current value (STATCAN)

MSOV service account payments, except investment income (STATCAN)

MSYV investment income payments, current value (STATCAN)

MTRANV BOP transfer payments, current value (STATCAN)

MUJEGV Canadian imports from Japan, Germany, the United Kingdom and the United States

ND notice deposits (BOC)

NDD net demand deposits, (1-A) * DD

NFAEOQ stock of net foreign assets of the monetary authorities, end of quarter (cumulated value of DNFA)

x NFAEOQR non-dollar component of stock of net foreign assets of the monetary authorities, end of quarter

NFAFED net foreign assets, foreign exchange in U.S. dollars, end of quarter

	NGK	stock of government assets -- excluding foreign private holding of government which are included in LTPL (cumulated value of NGKA)
x	NGKA	net government capital account (STATCAN)
	NGP	net government position of the consolidated monetary authorities (BOC)
	NW NWNSA	stock of private net worth (cumulated value of DNW)
x	OTH	other assets of the Bank of Canada (BOC)
	P	implicit deflator for domestic absorption ((CV + IFGV + IFPV + IIV + GV)/(C + IFG + IFP + II + G))
	PCHGNP	percentage change in gross national product
	PCHP	percentage change in domestic price level
	PCHW	percentage change in wages
	PCOMP	foreign weighted average of the price of exports[1]
	PGNP	implicit deflator for GNP (GNPV/GNP)
	PMGSNI	implicit deflator for imports of goods and services, national income accounts basis (MGSNIV/MGSNI)
	PMGUV	unit value of merchandise imports (STATCAN)
	PMS	implicit deflator of import services ((MGSNIVS - MGV)/(MGSNINS - MG))
x	POP15	Canadian population 15 years of age and older (STATCAN)

[1]Trade weighted average for Germany, Japan, the United Kingdom and the United States.

x	PPC	dollar export price index of cereals, 1972=100 (United Nations Monthly Bulletin of Statistics)
	PXGUV	unit value of merchandise exports (STATCAN)
	PXS	implicit deflator of export services ((XGSNIVS - XGV) /(XGSNIVS - XG))
	QAUTO	dummy to reflect Canadian-U.S. auto agreement
x	QAUTST	dummy to reflect U.S. auto strike
x	QBACTS	dummy for enactment of bank acts of 1967
x	QCNTRL	dummy to reflect Canadian wage and price controls
x	QCRISIS	dummy for exchange rate crises in 1962 and 1968
x	QEIETB	dummy for deferral of new bond issues in the U.S.
x	QEREG69	dummy for divergance of weighted foreign rate from true foreign rate
x	QEXPO	dummy to reflect effects of Expo 67
x	QFRID	dummy to reflect end of quarter occurring on a Friday
x	QIET1	dummy to reflect interest equalization tax
x	QIET2	dummy to reflect interest equalization tax
x	QLOBO	dummy for exchange rate uncertainty and federal policy discouraging foreign borrowing
x	QMIDEA	dummy for Suez Canel closing
x	QNEP	dummy for new economic program in U.S.
x	QRD	dummy for periods when the discount rate is greater than the short term interest rate

x	QSCALE	dummy to reflect economies of scale in Canadian auto manufacture
x	QSMITH	dummy to reflect the Smithsonian agreement
x	QTAXI	dummy for indexation of tax structure to Canadian price level
x	QUI	dummy for revision of the unemployment act
x	QZEUROF	dummy to account for federal borrowing in Deutsche marks
x	Q1,Q2, Q3,Q4	seasonal dummies
x	RD	discount rate (BOC)
*	RED	three month Eurodollar deposit rate (FRB)
x	RES RESNSA	residual error of estimate - from GNP component
x	RESV	residual error of estimate (STATCAN)
	RF	free reserves, excess reserves less borrowed reserves
	RL	long-term interest rate Government of Canada Bonds -- 10 years and over (BOC)
*	ROWPMG	ROW import price index
*	ROWPXG	ROW export price index
	RR	required reserves (BOC)
	RS	short-term interest rate, 90 day finance company paper (BOC)
	RSLD	short-term interest rate (when discount rate is lower than short-term interest rate)

	RSHD	short-term interest rate (when discount rate is higher than short term interest rate)
	RU	unborrowed reserves, total reserves less borrowed reserves
x	SCRG	discard rate for gross government fixed capital stock
x	SCRP	discard rate for gross private fixed capital stock
	SD	savings deposits (BOC)
x	SDRVAL	SDR allocations and valuation adjustment (NFAT - NFA)
	STC	stock of private short-term claims on foreigners (cumulated value of DSTC)
	STL	Canadian stock private short-term liabilities on foreigners (cumulated value of DSTL)
	TB	trade balance (XGV - MGV)
	TCORPV	direct taxes on corporate and government business enterprises (STATCAN)
	TD	time deposits held by residents (BOC)
x	TIME	linear time trend
	TINDV	indirect taxes (STATCAN)
	TNRESV	direct taxes on non-residents (STATCAN)
	TPERV	direct taxes, personal (STATCAN)
	TRANV	government transfers (STATCAN)
	TV	government tax revenue (STATCAN)
*	UCU	U.S. capacity utilization index
*	UGNP	U.S. gross national product
	UN	unemployment rate (STATCAN)

*	UNW	U.S. private net worth proxy (cumulated value of private savings)
*	UP	U.S. deflator for aggregate expenditure
*	UPXGUV	U.S. export unit value (Department of Commerce, Survey of Current Business)
*	URL	U.S. long-term interest rate
*	URS	U.S. Treasury Bill rate (FRB)
*	UYDV	U.S. disposable income proxy
	W	wage rate in manufacturing (STATCAN)
	WB WBNSA	wage bill (STATCAN)
*	WMGV	merchandise imports, balance of payments basis
	WTV	total exports of world excluding Canada
*	XCEV	merchandise exports to the U.K., c.i.f. (DOT)
*	XCGV	merchandise exports to Germany, c.i.f. (DOT)
	XCJUNK	slack variable to insulate bilateral export variables when Canadian model is shocked in isolation (normal value = 0)
*	XCJV	merchandise exports to Japan, c.i.f. (DOT)
*	XCRV	merchandise exports to R.O.W., c.i.f. (DOT)
	XCTV	total Canadian merchandise exports, c.i.f., customs clearence basis (DOT)
*	XCUV	merchandise exports to the U.S., c.i.f. (DOT)
	XECV	U.K. exports to Canada, f.o.b. (DOT)
*	XETV	total U.K. merchandise exports

	XG	export of goods (STATCAN)
	XGCV	German exports to Canada, f.o.b. (DOT)
	XGSNI	exports of goods and services, national income account basis (STATCAN)
	XGSNINS	export of goods and services, national income accounts basis, not seasonally adjusted (STATCAN)
	XGSNIV	exports of goods and services, national income accounts basis, current value (STATCAN)
	XGSNIVS	export of goods and services, national income accounts basis, not seasonally adjusted (STATCAN)
*	XGTV	total German merchandise exports
	XGV	exports of goods (STATCAN)
	XJCV	Japanese exports to Canada, f.o.b. (DOT)
*	XJTV	total Japanese merchandise exports
	XRCV	R.O.W. exports to Canada, f.o.b. (DOT)
*	XRTV	total R.O.W. merchandise exports
	XSOV	service account receipts, excluding investment income (STATCAN)
	XUCV	U.S. exports to Canada, f.o.b. (DOT)
*	XUTV	total U.S. merchandise exports
	XSYV	investment income receipts (STATCAN)
	XTRANV	transfer receipts (STATCAN)
	XUJEGV	Canadian exports from Germany, Japan, the United Kingdom and the United States

YDPVNSA proxy for disposable income (GNPVNSA - TV + TRANV - CCAV)

YDV, YDVNSA disposable income (STATCAN)